.model KT940A npn bf=150 is=400f vaf=200 ikf=60m xtb=1.5 br=1 cjc=24p vjc=.75 mjc=.5 fc=.5 cje=50p vje=.75 mje=.33 tr=50n tf=2.5n itf=50m vtf=10 xtf=2 xti=3 eg=1.11 isc=10f nc=2 ise=700p ne=2 rb=30 rbm=3 irb=.1m rc=3 rco=60 Vo=7 GAMMA=1E-6 QCO=1E-11 Vceo=300 Icrating=100m mfg=USSR
.model kt361g pnp bf=350 br=5 is=400f rb=100 rbm=10 irb=50u rc=10 ikf=70m xti=3 xtb=1.5 xtf=1.1 vaf=70 itf=40m vtf=75 cje=20p xcjc=0.5 cjc=15p tf=0.3n tr=25n vjc=.7 mjc=.33 mje=.33 vje=.5 xcjc=0.15 ne=2 ise=315p nc=2 isc=600p Vceo=35 Icrating=100m mfg=USSR
.model kt342v npn is=20f xti=3 eg=1.11 vaf=90 bf=1400 xtb=1.5 br=1 rb=1.5k rbm=10 rc=1 irb=50u cjc=10p mjc=.39 vjc=.75 fc=.5 cje=14p xcjc=0.1 tf=.4n tr=300n ne=1.33 ise=10f nc=1.34 isc=24f Vceo=10 Icrating=50m mfg=USSR
.model kt315a NPN (Is=2.82f Xti=3 Eg=1.11 Vaf=3.32K Bf=55 Ne=2.35 Ise=554.1p Ikf=18.04m Xtb=1.5 Br=.6455 Nc=2 Isc=0 Ikr=0 Rc=0 Cjc=17p Vjc=.75 Mjc=.333 Fc=.5 Cje=8.55p Vje=.75 Mje=.333 Tr=3.36u Tf=1.02n Itf=0 Vtf=0 Xtf=0 Vceo=25 Icrating=100m mfg=USSR
.model kt315g npn bf=250 is=100f vaf=60 ikf=50m xtb=1.5 br=2 rc=5 rb=200 rbm=20 irb=.3m cjc=15p vjc=.75 mjc=.33 fc=.5 cje=20p vje=.75 mje=.33 tr=250n tf=.4n itf=40m vtf=10 xtf=2 xti=3 eg=1.11 xcjc=0.15 ne=1.8 ise=20p nc=2 isc=600p BVbe=7 IBVbe=20u BVcbo=120 Vceo=35 Icrating=100m mfg=USSR
.model kt3153a9 npn is=20f eg=1.11 vaf=80 bf=250 ikf=1 br=5 var=12 rb=500 rbm=80 irb=50u rc=1 cjc=10p mjc=.56 vjc=.7 fc=.5 cje=15p mje=.64 vje=.7 tf=.4n tr=400n xcjc=0.3 xtb=1.5 xti=3 itf=80m vtf=10 xtf=.5 ne=1.4 ise=20f nc=2 isc=4.4p Vceo=50 Icrating=400m mfg=USSR
.model kt3129b pnp is=10f eg=1.11 vaf=60 bf=310 ikf=.14 br=6 var=12 rb=200 rbm=50 irb=30u rc=1. re=0.6 cjc=11p mjc=.56 vjc=.7 fc=.5 cje=16p mje=.64 vje=.7 tf=.5n tr=75n xcjc=0.3 xtb=1.5 xti=3 itf=10m vtf=10 xtf=.5 ne=1.46 ise=50f nc=2 isc=4.4p Vceo=50 Icrating=100m mfg=USSR
.model kt3107l pnp bf=800 br=5 is=.2p ikf=.1 xtb=1.5 cjc=7p cje=11p tf=.5n vaf=70 ikr=80m rc=.8 tr=30n rb=350 irb=10u xcjc=0.3 itf=80m vtf=50 kf=5.f xtf=1.2 eg=1.11 ne=1.2 ise=10f nc=2 isc=100p Vceo=20 Icrating=100m mfg=USSR
.model kt3102e npn bf=5000 br=5 is=.2p tf=.4n cjc=12p cje=12p vaf=100 tr=45n rc=.5 rb=1.5k rbm=80 irb=10u ikf=50m xcjc=0.3 kf=5f eg=1.11 ne=1.35 ise=0.1p nc=2 isc=1p Vceo=20 Icrating=100m mfg=USSR
.model kt209m pnp bf=100 br=2.5 is=24f rb=100 rbm=40 irb=0.5m rc=1.8 ikf=70m xti=3 xtb=1.5 xtf=2 vaf=30 itf=.2 vtf=5 cje=25p xcjc=0.5 cjc=16p tf=8n tr=64n vjc=.67 mjc=.33 mje=.35 vje=.73 ne=1.5 ise=600f nc=2 isc=10p Vceo=60 Icrating=300m mfg=USSR
.model kt209k pnp bf=185 br=2.5 is=24f rb=100 rbm=40 irb=0.5m rc=1.8 ikf=70m xti=3 xtb=1.5 xtf=2 vaf=30 itf=.2 vtf=5 cje=25p xcjc=0.5 cjc=16p tf=8n tr=64n vjc=.67 mjc=.33 mje=.35 vje=.73 ne=1.5 ise=600f nc=2 isc=10p Vceo=45 Icrating=300m mfg=USSR
.model kt203b pnp is=300f bf=53.2 vaf=50 ikf=6.112m ise=22.18f ne=1.559 br=0.952 nr=0.94 var=55 ikr=4.5m isc=1.2p nc=2 rb=180 rc=13.6 cje=15.27p vje=0.69 mje=0.35 tf=14.64n xtf=1 vtf=15 itf=12.5m cjc=12.95p vjc=0.69 mjc=0.33 tr=144.4n xtb=1.5 eg=1.11 xti=3 fc=0.5 Vceo=30 Icrating=10m mfg=USSR
.model kt312v npn is=6.734f bf=280 vaf=60 ikf=30m ise=6.734f ne=1.205 br=.81 rb=200 rc=1 cje=4.493p vje=.75 mje=.2593 tf=301.2p xtf=2 vtf=5 itf=.4 cjc=3.116p vjc=.75 mjc=.3 tr=244.2n xtb=1.5 eg=1.11 xti=3 fc=.5 Vceo=20 Icrating=30m mfg=USSR
.model kt903 npn is=9.99927f bf=200.011 nf=998.719m vaf=100 ikf=1 ise=1.035p ne=1.45108 br=5 ikr=994.189 isc=2.46003f nc=2 re=1.0747 cje=2p mje=500m tf=1.24961n xtf=500m vtf=10 itf=10.182m cjc=1.15697n vjc=750.038m mjc=501.035m tr=1.218484e-018 eg=1.11 fc=500m Vceo=60 Icrating=3 mfg=USSR
.MODEL KT903_ NPN (IS=221F NF=1 BF=65 VAF=139 IKF=1 ISE=297P NE=2 BR=4 NR=1 VAR=16 IKR=2.7 RE=0.41 RB=1.64 RC=0.164 XTB=1.5 CJE=277P VJE=0.6 MJE=0.5 CJC=180P VJC=0.3 MJC=0.3 TF=1.33N TR=51N Vceo=60 Icrating=3 mfg=USSR)
.model kt961a npn is=500f bf=100 vaf=100 ikf=0.2615 ise=0.988p ne=1.293 br=0.109 ikr=0 isc=0 nc=2 rb=2 re=0.01 rc=0.02 cje=75p vje=0.75 mje=0.39 tf=425p xtf=4 vtf=4 itf=0.6 cjc=60p vjc=0.75 mjc=0.39 tr=444n xtb=1.5 eg=1.11 xti=3 fc=0.5 Vceo=80 Icrating=1.5 mfg=USSR
.model KT646A NPN(IS=17.03f BF=200 BR=4.6 ISE=153.3f ISC=1.35p IKF=0.4095 IKR=0.21 NE=1.368 NC=2 VAF=123 VAR=75 RC=0.35 RB=15 TF=1.8n TR=50n XTF=1 VTF=60 ITF=0.65 CJE=34.4p VJE=0.69 MJE=0.33 CJC=21.24p VJC=0.69 MJC=0.33 FC=0.5 EG=1.11 XTB=1.5 XTI=3 Vceo=60 Icrating=1 mfg=USSR)
.model kt313b pnp is=3.306f bf=153.6 vaf=86.3 ikf=2.47 ise=3.306f ne=1.36 br=3.375 var=40 ikr=.85 isc=33.2f nc=2 rb=23.2 rc=1.345 cje=30.64p vje=.69 mje=.33 tf=267.9p xtf=2 vtf=65 itf=.785 cjc=18.71p vjc=.69 mjc=.31 tr=58.87n xtb=1.5 eg=1.11 xti=3 fc=.5 Vceo=60 Icrating=350m mfg=USSR
.MODEL KT801B NPN IS=190.858F BF=60.6285 VAF=112.9 IKF=970.016m ISE=36.S238N NE=2.76223 BR=2 IKR=9.90801 ISC=0.000104233F NC=2 RE=201.343m RC=26.9255m CJE=430p Cjc=105p mjc=0.4 mje=0.5 Tf=5n tr=500n mfg=USSR
.model KT814a PNP(Is=11.45f Xti=3 Eg=1.11 Vaf=62.37 Bf=176.8 Ise=88.24f Ne=1.411 Ikf=.3656 Nk=.6491 Xtb=1.5 Br=1.238 Isc=269.4f Nc=1.51 Ikr=1.275 Rc=.1654 Rb=4 Cjc=88.73p Mjc=.3333 Vjc=.75 Fc=.5 Cje=71.14p Mje=.33 Vje=.75 Tr=2.046u Tf=26.36n Itf=3 Xtf=5 Vtf=10 Vceo=40 Icrating=1.5 mfg=USSR)
.model KT814b PNP(Is=11.45f Xti=3 Eg=1.11 Vaf=72.62 Bf=128.7 Ise=97.57f Ne=1.421 Ikf=.2157 Nk=.4096 Xtb=1.5

Br=1.928 Isc=637.6f Nc=1.41 Ikr=.5927 Rc=.2979 Rb=4 Cjc=88.73p Mjc=.3333 Vjc=.75 Fc=.5 Cje=71.14p Mje=.3333 Vje=.75 Tr=2.046u Tf=26.36n Itf=3 Xtf=5 Vtf=10 Vceo=50 Icrating=1.5 mfg=USSR)
.model KT814v PNP(Is=11.45f Xti=3 Eg=1.11 Vaf=100 Bf=102.8 Ise=97.57f Ne=1.421 Ikf=.2157 Nk=.4096 Xtb=1.5 Br=1.928 Isc=637.6f Nc=1.41 Ikr=.5927 Rc=.2979 Rb=4 Cjc=88.73p Mjc=.3333 Vjc=.75 Fc=.5 Cje=71.14p Mje=.3333 Vje=.75 Tr=2.046u Tf=26.36n Itf=3 Xtf=5 Vtf=10 Vceo=70 Icrating=1.5 mfg=USSR)
.model KT815a NPN(Is=10.2f Xti=3 Eg=1.11 Vaf=70 Bf=191.7 Ise=349.5f Ne=1.422 Ikf=.4139 Nk=.624 Xtb=1.5 Br=1.683 Isc=706.1f Nc=1.473 Ikr=.5592 Rc=.203 Rb=5 Cjc=88.73p Mjc=.3333 Vjc=.75 Fc=.5 Cje=71.14p Mje=.3333 Vje=.75 Tr=2.046u Tf=24.32n Itf=1 Xtf=2 Vtf=10 Vceo=40 Icrating=1.5 mfg=USSR)
.model KT815b NPN(Is=10.2f Xti=3 Eg=1.11 Vaf=87 Bf=159.4 Ise=573.7f Ne=1.453 Ikf=.3983 Nk=.5 Xtb=1.5 Br=1.576 Isc=231.6f Nc=1.44 Ikr=.3633 Rc=.2936 Rb=5 Cjc=88.73p Mjc=.3333 Vjc=.75 Fc=.5 Cje=71.14p Mje=.3333 Vje=.75 Tr=2.046u Tf=24.32n Itf=1 Xtf=2 Vtf=10 Vceo=50 Icrating=1.5 mfg=USSR)
.model KT815v NPN(Is=10.2f Xti=3 Eg=1.11 Vaf=87 Bf=115.3 Ise=573.7f Ne=1.453 Ikf=.3983 Nk=.5 Xtb=1.5 Br=1.576 Isc=231.6f Nc=1.44 Ikr=.3633 Rc=.2936 Rb=5 Cjc=88.73p Mjc=.3333 Vjc=.75 Fc=.5 Cje=71.14p Mje=.3333 Vje=.75 Tr=2.046u Tf=24.32n Itf=1 Xtf=2 Vtf=10 Vceo=70 Icrating=1.5 mfg=USSR)
.model KT816a PNP(Is=61.09f Xti=3 Eg=1.11 Vaf=63 Bf=210.7 Ise=1.298p Ne=1.571 Ikf=.4055 Nk=.5019 Xtb=1.5 Br=1.216 Isc=1.831p Nc=1.514 Ikr=.7536 Rc=.1198 Cjc=129.88p Mjc=.3333 Vjc=.75 Fc=.5 Cje=110.3p Mje=.3535 Vje=.75 Tr=391.3n Tf=23.31n Itf=1 Xtf=2 Vtf=10 Vceo=40 Icrating=3 mfg=USSR)
.model KT816b PNP(Is=61.09f Xti=3 Eg=1.11 Vaf=85 Bf=137.6 Ise=862.2f Ne=1.481 Ikf=1.642 Nk=.5695 Xtb=1.5 Br=1.453 Isc=1.831p Nc=1.514 Ikr=.7536 Rc=.1198 Cjc=130.06p Mjc=.3333 Vjc=.75 Fc=.5 Cje=100.8p Mje=.3333 Vje=.75 Tr=465.1n Tf=31.79n Itf=1 Xtf=2 Vtf=10 Vceo=45 Icrating=3 mfg=USSR)
.model KT816v PNP(Is=61.09f Xti=3 Eg=1.11 Vaf=85 Bf=100.3 Ise=862.2f Ne=1.481 Ikf=1.642 Nk=.5695 Xtb=1.5 Br=1.453 Isc=1.831p Nc=1.514 Ikr=.7536 Rc=.1198 Cjc=130.06p Mjc=.3333 Vjc=.75 Fc=.5 Cje=100.8p Mje=.3333 Vje=.75 Tr=465.1n Tf=31.79n Itf=1 Xtf=2 Vtf=10 Vceo=60 Icrating=3 mfg=USSR)
.model kt817a NPN(Is=66.19f Xti=3 Eg=1.11 Vaf=100 Bf=287.1 Ise=330.5f Ne=1.426 Ikf=.603 Nk=.5972 Xtb=1.5 Br=1.216 Isc=1.984p Nc=1.514 Ikr=.7536 Rc=.1198 Cjc=116.7p Mjc=.3155 Vjc=.75 Fc=.5 Cje=108.6p Mje=.3333 Vje=.75 Tr=137.2n Tf=26.48n Itf=1 Xtf=2 Vtf=10 Vceo=40 Icrating=3 mfg=USSR)
.model kt817b NPN(Is=66.19f Xti=3 Eg=1.11 Vaf=105 Bf=132.5 Ise=564.1f Ne=1.413 Ikf=.1501 Nk=.4187 Xtb=1.5 Br=1.663 Isc=1.043p Nc=1.476 Ikr=.9431 Rc=.1435 Cjc=98.3p Mjc=.3155 Vjc=.75 Fc=.5 Cje=108.6p Mje=.3333 Vje=.75 Tr=137.2n Tf=26.48n Itf=1 Xtf=2 Vtf=10 Vceo=45 Icrating=3 mfg=USSR)
.model kt817v NPN(Is=66.19f Xti=3 Eg=1.11 Vaf=105 Bf=94.53 Ise=728.1f Ne=1.432 Ikf=.4772 Nk=.4907 Xtb=1.5 Br=1.663 Isc=1.043p Nc=1.476 Ikr=.9431 Rc=.1435 Cjc=98.3p Mjc=.3155 Vjc=.75 Fc=.5 Cje=108.6p Mje=.3333 Vje=.75 Tr=137.2n Tf=26.48n Itf=1 Xtf=2 Vtf=10 Vceo=60 Icrating=3 mfg=USSR)
.MODEL KT818 PNP (IS=368.821F BF=1.01029K VAF=100 IKF=463.629M ISE=52.8319P NE=1.64536 BR=2 IKR=9.16877K ISC=3.270898e-018 RC=85.4283M CJE=2.61852N VJE=700M MJE=499.936M CJC=1.14188N VJC=699.998M MJC=500.189M TF=41.8055N XTF=500.005M VTF=10 ITF=18.5428M TR=1.91831U)
.model KT818a PNP(Is=150.1f Xti=3 Eg=1.11 Vaf=70 Bf=135.8 Ise=2.436p Ne=1.37 Ikf=6.563 Nk=.6668 Xtb=1.5 Br=1.6 Isc=2.847p Nc=1.564 Ikr=.24 Rc=74m Rb=1 Cjc=1.183n Mjc=.3333 Vjc=.75 Fc=.5 Cje=1.635n Mje=.3333 Vje=.75 Tr=2.65u Tf=20.02n Itf=.3063 Xtf=.8299 Vtf=10 Vceo=40 Icrating=10 mfg=USSR)
.model KT818b PNP(Is=150.1f Xti=3 Eg=1.11 Vaf=80 Bf=179.1 Ise=1.171p Ne=1.321 Ikf=5.846 Nk=.6543 Xtb=1.5 Br=1.6 Isc=2.847p Nc=1.564 Ikr=.24 Rc=74m Rb=1 Cjc=1.183n Mjc=.3333 Vjc=.75 Fc=.5 Cje=1.635n Mje=.3333 Vje=.75 Tr=2.203u Tf=20.02n Itf=.3063 Xtf=.8299 Vtf=10 Vceo=50 Icrating=10 mfg=USSR)
.model KT818v PNP(Is=150.1f Xti=3 Eg=1.11 Vaf=100 Bf=179.1 Ise=1.171p Ne=1.321 Ikf=5.846 Nk=.6543 Xtb=1.5 Br=1.6 Isc=2.847p Nc=1.564 Ikr=.24 Rc=74m Rb=1 Cjc=1.183n Mjc=.3333 Vjc=.75 Fc=.5 Cje=1.635n Mje=.3333 Vje=.75 Tr=2.203u Tf=20.02n Itf=.3063 Xtf=.8299 Vtf=10 Vceo=70 Icrating=10 mfg=USSR)
.model KT819a NPN(Is=114.5f Xti=3 Eg=1.11 Vaf=80 Bf=176.5 Ise=1.231p Ne=1.371 Ikf=3.193 Nk=.5458 Xtb=1.5 Br=1 Isc=1.185p Nc=1.533 Ikr=.4086 Rc=36.34m Rb=2 Cjc=1.183n Mjc=.3333 Vjc=.75 Fc=.5 Cje=1.635n Mje=.3333 Vje=.75 Tr=2.955u Tf=14.69n Itf=1.387 Xtf=.4251 Vtf=10 Vceo=40 Icrating=10 mfg=USSR)
.model KT819b NPN(Is=114.5f Xti=3 Eg=1.11 Vaf=90 Bf=161 Ise=1.416p Ne=1.341 Ikf=4.184 Nk=.649 Xtb=1.5 Br=3.8 Isc=1.266p Nc=1.51 Ikr=1.1 Rc=60m Rb=2 Cjc=1.183n Mjc=.3333 Vjc=.75 Fc=.5 Cje=1.635n Mje=.3333 Vje=.75 Tr=1.381u Tf=14.69n Itf=1.387 Xtf=.4251 Vtf=10 Vceo=50 Icrating=10 mfg=USSR)
.model KT819v NPN(Is=114.5f Xti=3 Eg=1.11 Vaf=100 Bf=161 Ise=1.416p Ne=1.341 Ikf=4.184 Nk=.649 Xtb=1.5 Br=3.8 Isc=1.266p Nc=1.51 Ikr=1.1 Rc=60m Rb=2 Cjc=1.183n Mjc=.3333 Vjc=.75 Fc=.5 Cje=1.635n Mje=.3333 Vje=.75 Tr=1.381u Tf=14.69n Itf=1.387 Xtf=.4251 Vtf=10 Vceo=70 Icrating=10 mfg=USSR)
.MODEL KT819G NPN (IS=5.5357p BF=451.87 VAF=100 IKF=.67023 ISE=1.9839n NE=1.8519 BR=499.50 VAR=100 IKR=19.980 ISC=256.11n NC=2.1525 NK=.5187 RB=.41233 RC=83.722m CJE=2.3713n MJE=.33333 CJC=1.1831n MJC=.33333 TF=8.5594n XTF=10 VTF=10 ITF=1 TR=95.284n Vceo=100 Icrating=10 mfg=USSR)
.MODEL KT818G PNP (IS=4.4759p BF=101.08 VAF=100 IKF=3.9089 ISE=1.8829n NE=1.8721 BR=499.50 VAR=100 IKR=18.443 ISC=2.0748n NC=1.5432 NK=.55074 RB=.57769 RC=.3189 CJE=2.3713n MJE=.33333 CJC=1.1831n MJC=.33333 TF=13.905n XTF=10 VTF=10 ITF=1 TR=418.88n Vceo=100 Icrating=10 mfg=USSR)
.model KT837K PNP(IS=100p BF=100 BR=3 ISE=900p ISC=10n IKF=5 NE=1.9 NC=2 VAF=50 RC=0.1 RB=0.4

TF=30n TR=970n XTF=2 VTF=10 ITF=20 CJE=370p VJE=0.75 MJE=0.33 CJC=420p VJC=0.75 MJC=0.33 FC=0.5 EG=1.11 XTB=1.5 XTI=3 Vceo=45 Icrating=8 mfg=USSR)
.model KT203a PNP(Is=459.4E-18 Xti=3 Eg=1.11 Vaf=85.5 Bf=29.73 Ise=14.21f Ne=1.406 Ikf=24.22m Nk=.5 Xtb=1.5 Br=1.432 Isc=183.9f Nc=1.223 Ikr=.8622 Rb265 Rc=.3177 Cjc=15.77p Mjc=.33 Vjc=.75 Fc=.5 Cje=93.8p Mje=.5729 Vje=.75 Tr=10.33u Tf=20.58n Itf=.23 Xtf=2 Vtf=30 mfg=USSR)
.model KT203v PNP(Is=459.4E-18 Xti=3 Eg=1.11 Vaf=46.32 Bf=76.19 Ise=1.666f Ne=1.288 Ikf=11.51m Nk=.5 Xtb=1.5 Br=1.432 Isc=183.9f Nc=1.223 Ikr=.8622 Rb=280 Rc=.3177 Cjc=15.77p Mjc=.33 Vjc=.75 Fc=.5 Cje=93.8p Mje=.5729 Vje=.75 Tr=7.428u Tf=9.768n Itf=.3 Xtf=2 Vtf=10 mfg=USSR)
.model KT208a PNP(Is=8.347f Xti=3 Eg=1.11 Vaf=46.32 Bf=99.51 Ne=1.913 Ise=64.3p Ikf=94.54m Xtb=1.5 Var=13 Br=12.49 Nc=2 Isc=64f Ikr=.305 Rb=13 Rc=.45 Cjc=100p Mjc=.39 Vjc=.75 Fc=.5 Cje=93.8p Mje=.5729 Vje=.75 Tr=383.4n Tf=30.35n Itf=.3 Vtf=20 Xtf=1.5 mfg=USSR)
.model KT208b PNP(Is=8.347f Xti=3 Eg=1.11 Vaf=46.32 Bf=100 Ne=1.523 Ise=357.9f Ikf=.6605 Xtb=1.5 Br=3.606 Nc=2 Isc=64f Ikr=.305 Rb=15 Rc=.4 Cjc=100p Mjc=.39 Vjc=.75 Fc=.5 Cje=93.8p Mje=.5729 Vje=.75 Tr=718.4n Tf=25.14n Itf=.3 Vtf=20 Xtf=1.5 mfg=USSR)
.model KT208v PNP(Is=7.151f Xti=3 Eg=1.11 Vaf=46.32 Bf=138.9 Ne=1.934 Ise=5.84p Ikf=1.068 Xtb=1.5 Br=3.606 Nc=2 Isc=64f Ikr=.305 Rb=15 Rc=.4 Cjc=100p Mjc=.39 Vjc=.75 Fc=.5 Cje=93.8p Mje=.5729 Vje=.75 Tr=583.5n Tf=21.36n Itf=.3 Vtf=20 Xtf=1.5 mfg=USSR)
.model KT208g PNP(Is=8.347f Xti=3 Eg=1.11 Vaf=46.32 Bf=99.51 Ne=1.913 Ise=64.3p Ikf=94.54m Xtb=1.5 Var=13 Br=12.49 Nc=2 Isc=64f Ikr=.305 Rb=13 Rc=.45 Cjc=100p Mjc=.39 Vjc=.75 Fc=.5 Cje=93.8p Mje=.5729 Vje=.75 Tr=383.4n Tf=30.35n Itf=.3 Vtf=30 Xtf=1.5 mfg=USSR)
.model KT208d PNP(Is=8.347f Xti=3 Eg=1.11 Vaf=46.32 Bf=100 Ne=1.523 Ise=357.9f Ikf=.6605 Xtb=1.5 Br=3.606 Nc=2 Isc=64f Ikr=.305 Rb=15 Rc=.4 Cjc=100p Mjc=.39 Vjc=.75 Fc=.5 Cje=93.8p Mje=.5729 Vje=.75 Tr=718.4n Tf=25.14n Itf=.3 Vtf=30 Xtf=1.5 mfg=USSR)
.model KT208e PNP(Is=7.151f Xti=3 Eg=1.11 Vaf=46.32 Bf=138.9 Ne=1.934 Ise=5.84p Ikf=1.068 Xtb=1.5 Br=3.606 Nc=2 Isc=64f Ikr=.305 Rb=15 Rc=.4 Cjc=100p Mjc=.39 Vjc=.75 Fc=.5 Cje=93.8p Mje=.5729 Vje=.75 Tr=583.5n Tf=21.36n Itf=.3 Vtf=30 Xtf=1.5 mfg=USSR)
.model KT208j PNP(Is=8.347f Xti=3 Eg=1.11 Vaf=46.32 Bf=99.51 Ne=1.913 Ise=64.3p Ikf=94.54m Xtb=1.5 Var=13 Br=12.49 Nc=2 Isc=64f Ikr=.305 Rb=13 Rc=.45 Cjc=100p Mjc=.39 Vjc=.75 Fc=.5 Cje=93.8p Mje=.5729 Vje=.75 Tr=383.4n Tf=30.35n Itf=.3 Vtf=45 Xtf=1.5 mfg=USSR)
.model KT208i PNP(Is=8.347f Xti=3 Eg=1.11 Vaf=46.32 Bf=100 Ne=1.523 Ise=357.9f Ikf=.6605 Xtb=1.5 Br=3.606 Nc=2 Isc=64f Ikr=.305 Rb=15 Rc=.4 Cjc=100p Mjc=.39 Vjc=.75 Fc=.5 Cje=93.8p Mje=.5729 Vje=.75 Tr=718.4n Tf=25.14n Itf=.3 Vtf=45 Xtf=1.5 mfg=USSR)
.model KT208k PNP(Is=7.151f Xti=3 Eg=1.11 Vaf=46.32 Bf=138.9 Ne=1.934 Ise=5.84p Ikf=1.068 Xtb=1.5 Br=3.606 Nc=2 Isc=64f Ikr=.305 Rb=15 Rc=.4 Cjc=100p Mjc=.39 Vjc=.75 Fc=.5 Cje=93.8p Mje=.5729 Vje=.75 Tr=583.5n Tf=21.36n Itf=.3 Vtf=50 Xtf=1.5 mfg=USSR)
.MODEL 2T208K PNP (IS=10F BF=202.02 NF=1.00012 VAF=46.2499 IKF=80.3629M ISE=1.350869e-018 NE=1.52899 BR=4.10679 IKR=999.977 ISC=100P NC=2 RE=367.168M CJE=108.675P VJE=700.002M MJE=499.771M CJC=190.373P VJC=700M MJC=500.069M TF=157.6P XTF=500M VTF=10 ITF=10M TR=78.78P EG=1.11 mfg=USSR)
.model KT208l PNP(Is=8.347f Xti=3 Eg=1.11 Vaf=46.32 Bf=99.51 Ne=1.913 Ise=64.3p Ikf=94.54m Xtb=1.5 Var=13 Br=12.49 Nc=2 Isc=64f Ikr=.305 Rb=13 Rc=.45 Cjc=100p Mjc=.39 Vjc=.75 Fc=.5 Cje=93.8p Mje=.5729 Vje=.75 Tr=383.4n Tf=30.35n Itf=.3 Vtf=50 Xtf=1.5 mfg=USSR)
.model KT208m PNP(Is=8.347f Xti=3 Eg=1.11 Vaf=46.32 Bf=100 Ne=1.523 Ise=357.9f Ikf=.6605 Xtb=1.5 Br=3.606 Nc=2 Isc=64f Ikr=.305 Rb=15 Rc=.4 Cjc=100p Mjc=.39 Vjc=.75 Fc=.5 Cje=93.8p Mje=.5729 Vje=.75 Tr=718.4n Tf=25.14n Itf=.3 Vtf=50 Xtf=1.5 mfg=USSR)
.model KT313a PNP(Is=3.306f Xti=3 Eg=1.11 Vaf=86.3 Bf=153.6 Ne=1.36 Ise=3.306f Ikf=2.47 Xtb=1.5 Var=40 Br=3.375 Nc=2 Isc=33.2f Ikr=.85 Rb=23.2 Rc=1.345 Cjc=18.71p Vjc=.69 Mjc=.31 Fc=.5 Cje=30.64p Vje=.69 Mje=.33 Tr=58.87n Tf=267.9p Itf=.785 Vtf=65 Xtf=2 mfg=USSR)
.model KT502a PNP(Is=3.48f Xti=3 Eg=1.11 Vaf=60 Bf=121.1 Ise=27.32f Ne=1.358 Ikf=74.95m Nk=.4803 Xtb=1.5 Br=1 Isc=13.91f Nc=1.34 Ikr=2.077 Rb=12 Rc=.9855 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5 Cje=26.53p Mje=.33 Vje=.75 Tr=923.3n Tf=10.3n Itf=1 Xtf=2 Vtf=25 mfg=USSR)
.model KT502b PNP(Is=3.48f Xti=3 Eg=1.11 Vaf=60 Bf=209.4 Ise=54.03f Ne=1.457 Ikf=27.44m Nk=.5 Xtb=1.5 Br=1.2 Isc=13.91f Nc=1.34 Ikr=2.077 Rb=15 Rc=1.133 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5 Cje=26.53p Mje=.33 Vje=.75 Tr=712.7n Tf=7.62n Itf=1 Xtf=2 Vtf=25 mfg=USSR)
.model KT502v PNP(Is=7.541f Xti=3 Eg=1.11 Vaf=115 Bf=118.8 Ise=61.46f Ne=1.382 Ikf=.1498 Nk=.593 Xtb=1.5 Br=2.3 Isc=13.91f Nc=1.34 Ikr=2.077 Rb=10 Rc=1.2 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5 Cje=26.53p Mje=.33 Vje=.75 Tr=363.5n Tf=10.3n Itf=1 Xtf=2 Vtf=25 mfg=USSR)
.model KT502g PNP(Is=3.48f Xti=3 Eg=1.11 Vaf=100 Bf=209.4 Ise=54.03f Ne=1.457 Ikf=27.44m Nk=.5 Xtb=1.5 Br=1.2 Isc=13.91f Nc=1.34 Ikr=2.077 Rb=15 Rc=1.133 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5 Cje=26.53p Mje=.33 Vje=.75 Tr=712.7n Tf=7.62n Itf=1 Xtf=2 Vtf=40 mfg=USSR)

.model KT502d PNP(Is=7.541f Xti=3 Eg=1.11 Vaf=115 Bf=118.7 Ise=73.88f Ne=1.396 Ikf=.1211 Nk=.5237 Xtb=1.5 Br=2.3 Isc=13.91f Nc=1.34 Ikr=2.077 Rb=15 Rc=1.2 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5 Cje=26.53p Mje=.33 Vje=.75 Tr=484.6n Tf=12.96n Itf=1 Xtf=2 Vtf=50 mfg=USSR)
.model KT502e PNP(Is=3.48f Xti=3 Eg=1.11 Vaf=120 Bf=121.1 Ise=27.32f Ne=1.358 Ikf=74.95m Nk=.4803 Xtb=1.5 Br=1 Isc=13.91f Nc=1.34 Ikr=2.077 Rb=12 Rc=.9855 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5 Cje=26.53p Mje=.33 Vje=.75 Tr=923.3n Tf=10.3n Itf=1 Xtf=2 Vtf=80 mfg=USSR)
.model KT503a NPN(Is=6.843f Xti=3 Eg=1.11 Vaf=60 Bf=104.8 Ise=70.91f Ne=1.372 Ikf=.4526 Nk=.5243 Xtb=1.5 Br=1.1 Isc=26.4p Nc=2.088 Ikr=1.637 Rb=12 Rc=1.538 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5 Cje=30.84p Mje=.33 Vje=.75 Tr=648.9n Tf=10.09n Itf=1 Xtf=2 Vtf=10 mfg=USSR)
.model KT503b NPN(Is=10.07f Xti=3 Eg=1.11 Vaf=60 Bf=166.4 Ise=100.2f Ne=1.452 Ikf=.6117 Nk=.4667 Xtb=1.5 Br=1.7 Isc=47.49f Nc=1.715 Ikr=.7018 Rb=6 Rc=1.208 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5 Cje=30.84p Mje=.33 Vje=.75 Tr=390.4n Tf=10.09n Itf=1 Xtf=2 Vtf=40 mfg=USSR)
.model KT503v NPN(Is=6.843f Xti=3 Eg=1.11 Vaf=114 Bf=130.7 Ise=56.77f Ne=1.358 Ikf=.2659 Nk=.4211 Xtb=1.5 Br=1.2 Isc=26.4p Nc=2.088 Ikr=1.637 Rb=6 Rc=1.538 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5 Cje=30.84p Mje=.33 Vje=.75 Tr=648.9n Tf=15.39n Itf=1 Xtf=2 Vtf=30 mfg=USSR)
.model KT503g NPN(Is=10.07f Xti=3 Eg=1.11 Vaf=145 Bf=166.4 Ise=100.2f Ne=1.452 Ikf=.6117 Nk=.4667 Xtb=1.5 Br=1.7 Isc=47.49f Nc=1.715 Ikr=.7018 Rb=6 Rc=1.208 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5 Cje=30.84p Mje=.33 Vje=.75 Tr=390.4n Tf=10.09n Itf=1 Xtf=2 Vtf=40 mfg=USSR)
.model KT503d NPN(Is=6.843f Xti=3 Eg=1.11 Vaf=129 Bf=106.6 Ise=66.48f Ne=1.384 Ikf=.8419 Nk=.6328 Xtb=1.5 Br=1.2 Isc=26.4p Nc=2.088 Ikr=1.637 Rb=6 Rc=1.538 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5 Cje=30.84p Mje=.33 Vje=.75 Tr=648.9n Tf=12.74n Itf=1 Xtf=2 Vtf=30 mfg=USSR)
.model KT503e NPN(Is=6.843f Xti=3 Eg=1.11 Vaf=145.2 Bf=104.8 Ise=70.91f Ne=1.372 Ikf=.4526 Nk=.5243 Xtb=1.5 Br=1.1 Isc=26.4p Nc=2.088 Ikr=1.637 Rb=12 Rc=1.538 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5 Cje=30.84p Mje=.33 Vje=.75 Tr=648.9n Tf=10.09n Itf=1 Xtf=2 Vtf=60 mfg=USSR)
.model KT504a NPN(Is=26.98f Xti=3 Eg=1.11 Vaf=138 Bf=209.7 Ise=498.3f Ne=1.412 Ikf=1.14 Nk=.5971 Xtb=1.5 Br=1.93 Isc=275.6f Nc=1.445 Ikr=81.42m Rb=6.7 Rc=.5483 Cjc=38.87p Mjc=.35 Vjc=.75 Fc=.5 Cje=592.8p Mje=.33 Vje=.65 Tr=810.9n Tf=1.867n Itf=10.8 Xtf=2 Vtf=40 mfg=USSR)
.model KT505a PNP(Is=77.95f Xti=3 Eg=1.11 Vaf=98 Bf=242.4 Ise=890f Ne=1.403 Ikf=2.079 Nk=.6286 Xtb=1.5 Br=1.93 Isc=53.03p Nc=1.441 Ikr=81.42m Rb=8.3 Rc=.6239 Cjc=59.15p Mjc=.33 Vjc=.75 Fc=.5 Cje=474.3p Mje=.33 Vje=.65 Tr=810.9n Tf=3.558n Itf=8 Xtf=2 Vtf=40 mfg=USSR)
.model KT602g NPN(IS=14.34f BF=173.4 BR=6.458 ISE=14.34f ISC=10n IKF=0.2689 IKR=0 NE=1.272 NC=2 VAF=74.03 RC=1 RB=10 TF=409.7p TR=48.39n XTF=3 VTF=1.7 ITF=0.6 CJE=22.01p VJE=0.75 MJE=0.377 CJC=9.393p VJC=0.75 MJC=0.3416 FC=0.5 EG=1.11 XTB=1.5 XTI=3 mfg=USSR)
.model KT603a NPN(Is=91.85f Xti=3 Eg=1.11 Vaf=90 Bf=73.42 Ne=1.299 Ise=410f Ikf=1.033 Xtb=1.5 Br=.3123 Nc=2 Isc=1.265p Ikr=.41 Rc=1.17 Rb=12 Cjc=5.646p Mjc=.3443 Vjc=.75 Fc=.5 Cje=28.89p Mje=.283 Vje=.75 Tr=255.1n Tf=389.2p Itf=2.04 Vtf=60 Xtf=2 mfg=USSR)
.model KT603b NPN(Is=91.85f Xti=3 Eg=1.11 Vaf=80 Bf=140.3 Ne=1.299 Ise=410f Ikf=1.033 Xtb=1.5 Br=1.113 Nc=2 Isc=1.265p Ikr=.41 Rc=1.17 Rb=12 Cjc=5.646p Mjc=.3443 Vjc=.75 Fc=.5 Cje=28.89p Mje=.283 Vje=.75 Tr=255.1n Tf=389.2p Itf=2.04 Vtf=60 Xtf=2 mfg=USSR)
.model KT604a NPN(Is=19.56f Xti=3 Eg=1.11 Vaf=110 Bf=109.6 Ne=1.427 Ise=209f Ikf=1.478 Xtb=1.5 Br=.113 Nc=2 Isc=1.265p Ikr=.34 Rc=6.14 Rb=18 Cjc=11.42p Mjc=.3159 Vjc=.75 Fc=.5 Cje=31.04p Mje=.2732 Vje=.75 Tr=1.238u Tf=814.9p Itf=1.27 Vtf=80 Xtf=2 mfg=USSR)
.model KT605a NPN(Is=19.56f Xti=3 Eg=1.11 Vaf=110 Bf=109.6 Ne=1.427 Ise=209f Ikf=1.478 Xtb=1.5 Br=.113 Nc=2 Isc=1.265p Ikr=.34 Rc=6.14 Rb=23 Cjc=11.42p Mjc=.3159 Vjc=.75 Fc=.5 Cje=31.04p Mje=.2732 Vje=.75 Tr=1.238u Tf=814.9p Itf=1.27 Vtf=80 Xtf=2 mfg=USSR)
.model KT608a NPN(Is=1p Vaf=60 Var=8 Bf=80 Ikf=0.4 Nc=4 Ne=4 Rb=3 Re=0.5 Ise=10u Isc=10u Cjc=12p Cje=30p Tr=50n Tf=0.6n mfg=USSR)
.model KT632a PNP(Is=14.34f Xti=3 Eg=1.11 Vaf=106 Bf=157.2 Ise=107f Ne=1.424 Ikf=.1495 Nk=.4496 Xtb=1.5 Br=.85 Isc=8.399p Nc=2.28 Ikr=.1449 Rb=44.3 Rc=3.208 Cjc=9.073p Mjc=.33 Vjc=.7 Fc=.5 Mje=.33 Cje=25.11p Vje=.65 Tr=1.49u Tf=531.4p Itf=65.94m Xtf=.2 Vtf=40 mfg=USSR)
.MODEL KT633A NPN (BF=147 BR=122.9m CJC=5.6p CJE=2p FC=500m IKF=373m IKR=139m IS=9.87f ISC=1.402p ISE=768.7f ITF=9.366m MJC=311m MJE=500m NC=2 NE=1.4778 NF=627.628m RE=2 TF=209p TR=200n VAF=100 VJC=700m VTF=10 XTF=500m mfg=USSR)
.model KT638a NPN(Is=49.43f Xti=3 Eg=1.11 Vaf=120 Bf=156.7 Ise=321.8f Ne=1.45 Ikf=.2839 Nk=.5 Xtb=1.5 Br=.58 Isc=5.44p Nc=2.28 Ikr=.142 Rb=45.2 Rc=4.75 Cjc=12.1p Mjc=.33 Vjc=.75 Fc=.5 Cje=32.14p Mje=.33 Vje=.75 Tr=1.725u Tf=501.7p Itf=24.56m Xtf=95.24m Vtf=40 mfg=USSR)
.model KT653a NPN(Is=44.97f Xti=3 Eg=1.11 Vaf=113.3 Bf=130.5 Ise=466.8f Ne=1.384 Ikf=1.511 Nk=.8169 Xtb=1.5 Br=1.93 Isc=640.4f Nc=1.441 Ikr=81.42m Rb=12 Rc=.6239 Cjc=17p Mjc=.33 Vjc=.75 Fc=.5 Cje=41.5p Mje=.33 Vje=.75 Tr=393.8n Tf=805.3p Itf=1 Xtf=2 Vtf=60 mfg=USSR)
.model KT653b NPN(Is=44.97f Xti=3 Eg=1.11 Vaf=79.03 Bf=179.9 Ise=228.5f Ne=1.363 Ikf=.9461 Nk=.7366 Xtb=1.5

Br=1.93 Isc=640.4f Nc=1.441 Ikr=81.42m Rb=25 Rc=.6239 Cjc=17p Mjc=.33 Vjc=.75 Fc=.5 Cje=41.5p Mje=.33 Vje=.75 Tr=451.8n Tf=715.8p Itf=3 Xtf=2 Vtf=50 mfg=USSR)
.MODEL KT803 NPN(IS=10.0013F BF=188.54 NF=959.516M VAF=100 IKF=999.777M ISE=939.177F NE=1.40628 BR=94.1769M IKR=999.307M ISC=77.4497P NC=2 RC=324.659M CJE=2P MJE=500M CJC=1.5185N VJC=750.012M MJC=501.024M FC=500M TF=3.59562N XTF=508.073M VTF=9.99912 ITF=10.0488N TR=10N EG=1.11 mfg=USSR)
.MODEL KT808 NPN (IS=10F BF=200 NF=959.516M VAF=100 IKF=1000M ISE=1.04781P NE=1.32819 BR=87.768M IKR=1.74259 ISC=134.067F NC=2 RC=304.835M CJE=2P MJE=500M CJC=1.89734N VJC=750.004M MJC=500.866M FC=500M TF=11.3898N XTF=500.953M VTF=9.99941 ITF=15.4469M TR=454.404U EG=1.11 mfg=USSR)
.model KT809a NPN(Is=130.1f Xti=3 Eg=1.11 Vaf=100 Bf=82.09 Ise=217.3p Ne=1.719 Ikf=5.346 Nk=.4488 Xtb=1.5 Br=2.813 Isc=2.51p Nc=1.493 Ikr=1.238 Rc=.1166 Rb=1.5 Cjc=394.4p Mjc=.3333 Vjc=.75 Fc=.5 Cje=1.737n Mje=.33 Vje=.75 Tr=847.7n Tf=24.96n Itf=23.15 Xtf=5 Vtf=60 mfg=USSR)
.model KT812a NPN(Is=74.22f Xti=3 Eg=1.11 Vaf=153 Bf=123.5 Ne=1.754 Ise=172p Ikf=19.27 Xtb=1.5 Br=136.9m Nc=2 Isc=1.142p Ikr=8.53 Rc=.21 Rb=.5 Cjc=352.7p Mjc=.33 Vjc=.75 Fc=.5 Cje=800p Mje=.3395 Vje=.75 Xcjc=0.5 Tr=647.1n Tf=11.34n Itf=.45 Vtf=80 Xtf=2 mfg=USSR)
.model KT812b NPN(Is=43.44f Xti=3 Eg=1.11 Vaf=153 Bf=154.7 Ise=10.38p Ne=1.51 Ikf=26.48 Nk=.8517 Xtb=1.5 Br=1 Isc=1.18p Nc=1.576 Ikr=.32 Rc=.2787 Rb=.2 Cjc=352.7p Mjc=.33 Vjc=.75 Fc=.5 Cje=800p Mje=.33 Vje=.75 Tr=647.1n Tf=11.34n Itf=1.5 Xtf=2 Vtf=80 mfg=USSR)
.model KT830a PNP(Is=40.74f Xti=3 Eg=1.11 Vaf=65 Bf=132.5 Ne=1.782 Ise=3.717p Ikf=.936 Xtb=1.5 Var=40 Br=.626 Nc=2 Isc=3.7p Ikr=.96 Rb=9 Rc=.25 Cjc=131.2p Mjc=.33 Vjc=.75 Fc=.5 Cje=114.7p Mje=.35 Vje=.65 Tr=3.056u Tf=17.31n Itf=.95 Vtf=25 Xtf=2 mfg=USSR)
.model KT830b PNP(Is=40.74f Xti=3 Eg=1.11 Vaf=75 Bf=132.5 Ne=1.782 Ise=3.717p Ikf=.936 Xtb=1.5 Var=40 Br=.626 Nc=2 Isc=3.7p Ikr=.96 Rb=9 Rc=.25 Cjc=131.2p Mjc=.33 Vjc=.75 Fc=.5 Cje=114.7p Mje=.35 Vje=.65 Tr=3.056u Tf=17.31n Itf=.95 Vtf=25 Xtf=2 mfg=USSR)
.model KT830v PNP(Is=40.74f Xti=3 Eg=1.11 Vaf=95 Bf=108.8 Ne=1.731 Ise=3.085p Ikf=1.873 Xtb=1.5 Var=50 Br=0.751 Nc=2 Isc=3.1p Ikr=1.8 Rb=12 Rc=.35 Cjc=131.2p Mjc=.33 Vjc=.75 Fc=.5 Cje=114.7p Mje=.35 Vje=.65 Tr=3.056u Tf=17.31n Itf=1.8 Vtf=50 Xtf=2 mfg=USSR)
.model KT831b NPN(Is=56.47f Xti=3 Eg=1.11 Vaf=83 Bf=236.8 Ne=2.918 Ise=8.105n Ikf=6.154 Xtb=1.5 Var=60 Br=.6713 Nc=2 Isc=2p Ikr=2.04 Rb=8.5 Rc=.27 Cjc=78.34p Mjc=.33 Vjc=.75 Fc=.5 Cje=241.4p Mje=.33 Vje=.65 Tr=2.353u Tf=5.055n Itf=4.09 Vtf=45 Xtf=2 mfg=USSR)
.model KT831v NPN(Is=56.47f Xti=3 Eg=1.11 Vaf=80 Bf=255.7 Ne=2.918 Ise=8.105n Ikf=6.154 Xtb=1.5 Var=60 Br=.6713 Nc=2 Isc=2p Ikr=2.04 Rb=8.5 Rc=.27 Cjc=55.64p Mjc=.33 Vjc=.75 Fc=.5 Cje=181.5p Mje=.33 Vje=.65 Tr=1.223u Tf=5.055n Itf=4.09 Vtf=45 Xtf=2 mfg=USSR)
.model KT831g NPN(Is=56.47f Xti=3 Eg=1.11 Vaf=83 Bf=118.4 Ne=2.918 Ise=16.21n Ikf=6.154 Xtb=1.5 Var=60 Br=.6713 Nc=2 Isc=2p Ikr=2.04 Rb=10.1 Rc=.27 Cjc=78.34p Mjc=.33 Vjc=.75 Fc=.5 Cje=241.4p Mje=.33 Vje=.65 Tr=2.353u Tf=5.055n Itf=4.09 Vtf=45 Xtf=2 mfg=USSR)
.model KT838a NPN(Is=74.22f Xti=3 Eg=1.11 Vaf=153 Bf=123.5 Ne=1.754 Ise=172p Ikf=19.27 Xtb=1.5 Br=136.9m Nc=2 Isc=1.142p Ikr=8.53 Rc=.21 Rb=3.4 Cjc=352.7p Mjc=.33 Vjc=.75 Fc=.5 Cje=800p Mje=.3395 Vje=.75 Xcjc=0.5 Tr=647.1n Tf=11.34n Itf=.45 Vtf=80 Xtf=2 mfg=USSR)
.model KT872A npn Is=10p bf=55 vaf=600 ikf=1.2 nk=612m br=0.1 var=50 ikr=5 bvbe=7 ibvbe=10mA ise=5n ne=2 isc=3.3u nc=4 rb=1 irb=150m rbm=20m rc=50m re=10m cjc=550p vjc=0.90 mjc=0.28 cje=4.7n vje=0.68 mje=0.33 fc=0.56 tf=14n itf=1 vtf=13.7 xtf=5.46 tr=1u gamma=30u qco=90n rco=2 vo=1k BVcbo=1500 nBVcbo=2. mfg=USSR
.model KT841a NPN(Is=114.2f Xti=3 Eg=1.11 Vaf=153 Bf=163.5 Ne=1.547 Ise=1.72p Ikf=7.27 Xtb=1.5 Br=1.36 Nc=2 Isc=1.142p Ikr=1.53 Rc=.21 Rb=1 Cjc=352.7p Mjc=.33 Vjc=.75 Fc=.5 Cje=800p Mje=.3395 Vje=.75 Xcjc=0.5 Tr=647.1n Tf=11.34n Itf=45 Vtf=80 Xtf=2 mfg=USSR)
.model KT842a PNP(Is=120.1f Xti=3 Eg=1.11 Vaf=100 Bf=174.1 Ne=1.498 Ise=1.681p Ikf=5.206 Nk=.5749 Xtb=1.5 Br=1.302 Isc=3.044p Nc=1.426 Ikr=1.064 Rb=1 Rc=.2374 Cjc=557.4p Mjc=.3779 Vjc=.75 Fc=.5 Cje=3.051n Mje=.33 Vje=.75 Tr=825.9n Tf=5.126n Itf=25 Xtf=1.1 Vtf=40 mfg=USSR)
.model KT908a NPN(Is=114.5f Xti=3 Eg=1.11 Vaf=100 Bf=87.62 Ise=1.429p Ne=1.286 Ikf=8.713 Nk=.4649 Xtb=1.5 Br=1.423 Isc=2.393p Nc=1.53 Ikr=.9543 Rc=56.36m Rb=1 Cjc=974.7p Mjc=.3085 Vjc=.75 Fc=.5 Cje=1.737n Mje=.33 Vje=.75 Tr=1.534u Tf=1.984n Itf=18.5 Xtf=3.4 Vtf=50 mfg=USSR)
.model KT908b NPN(Is=114.5f Xti=3 Eg=1.11 Vaf=100 Bf=88.91 Ise=803.2f Ne=1.272 Ikf=9.223 Nk=.4226 Xtb=1.5 Br=1.285 Isc=2.344p Nc=1.542 Ikr=1.09 Rc=69.93m Cjc=974.7p Mjc=.3085 Vjc=.75 Fc=.5 Cje=1.737n Mje=.33 Vje=.75 Tr=1.534u Tf=1.984n Itf=18.5 Xtf=3.4 Vtf=50 mfg=USSR)
.model KT921a NPN(Is=282f Xti=3 Eg=1.11 Vaf=47 Bf=69.37 Ne=1.688 Ise=164.3p Ikf=15.22 Xtb=1.5 Br=.3729 Nc=2 Isc=16.43p Ikr=15.22 Rc=.36 Rb=8 Cjc=103.1p Mjc=.245 Vjc=.75 Fc=.5 Cje=420.7p Mje=.4028 Vje=.75 Tr=838.6n Tf=628.1p Itf=15.33 Vtf=15 Xtf=1.5 mfg=USSR)
.model KT922a NPN(Is=134.9f Xti=3 Eg=1.11 Vaf=81.41 Bf=86.36 Ne=1.362 Ise=1.189p Ikf=1.122 Nk=.5086 Xtb=1.5 Br=1 Isc=6.713n Nc=1.805 Ikr=1.087 Rb=3 Rc=1.308 Cjc=26.72p Mjc=.33 Vjc=.75 Fc=.5 Cje=71.52p Mje=.33 Vje=.75 Tr=272.8n Tf=185.4p Itf=1 Xtf=1.3 Vtf=40 mfg=USSR)

.model KT922b NPN(Is=292.3f Xti=3 Eg=1.11 Vaf=81.41 Bf=84.63 Ne=1.406 Ise=4.199p Ikf=2.359 Nk=.5229 Xtb=1.5 Br=1 Isc=17.13p Nc=1.803 Ikr=1.68 Rb=2 Rc=.9759 Cjc=48.58p Mjc=.33 Vjc=.75 Fc=.5 Cje=153.3p Mje=.33 Vje=.75 Tr=141.3n Tf=211.6p Itf=8 Xtf=.45 Vtf=40 mfg=USSR)
.model KT922v NPN(Is=430.3f Xti=3 Eg=1.11 Vaf=81.41 Bf=84.02 Ne=1.397 Ise=5.318p Ikf=3.706 Nk=.5578 Xtb=1.5 Br=1.734 Isc=7.445p Nc=1.577 Ikr=.166 Rb=3 Rc=.5487 Cjc=121.5p Mjc=.33 Vjc=.75 Fc=.5 Cje=408.7p Mje=.33 Vje=.75 Tr=110.7n Tf=234.7p Itf=30 Xtf=.7 Vtf=40 mfg=USSR)
.model KT928a NPN(Is=16.09f Xti=3 Eg=1.11 Vaf=81.41 Bf=127.5 Ise=85.22f Ne=1.284 Ikf=.2716 Nk=.4931 Xtb=1.5 Br=1 Isc=57.65p Nc=2.096 Ikr=1.637 Rb=11 Rc=1.538 Cjc=14.57p Mjc=.33 Vjc=.75 Fc=.5 Cje=78.2p Mje=.33 Vje=.75 Tr=402n Tf=373.8p Itf=1 Xtf=2 Vtf=40 mfg=USSR)
.model KT928b NPN(Is=16.09f Xti=3 Eg=1.11 Vaf=81.41 Bf=247.7 Ise=143.2f Ne=1.385 Ikf=.3491 Nk=.5807 Xtb=1.5 Br=1.2 Isc=57.65p Nc=2.096 Ikr=1.637 Rb=12 Rc=1.654 Cjc=14.57p Mjc=.33 Vjc=.75 Fc=.5 Cje=78.2p Mje=.33 Vje=.75 Tr=279.5n Tf=373.8p Itf=1 Xtf=2 Vtf=40 mfg=USSR)
.model KT933a PNP(Is=18.19f Xti=3 Eg=1.11 Vaf=78 Bf=122.8 Ise=86.44f Ne=1.284 Ikf=.2819 Nk=.4822 Xtb=1.5 Br=1 Isc=57.65p Nc=2.096 Ikr=1.637 Rb=11 Rc=1.538 Cjc=39.2p Mjc=.4435 Vjc=.75 Fc=.5 Cje=23.31p Mje=.201 Vje=.75 Tr=202.1n Tf=313.9p Itf=2.51 Xtf=1.52 Vtf=40 mfg=USSR)
.model KT945a NPN(Is=300.3f Xti=3 Eg=1.11 Vaf=95.7 Bf=193.9 Ise=2.284p Ne=1.377 Ikf=21.59 Nk=.7771 Xtb=1.5 Br=1.216 Isc=8.999p Nc=1.514 Ikr=.7536 Rc=.1198 Cjc=525.9p Mjc=.3229 Vjc=.75 Fc=.5 Cje=3.794n Mje=.33 Vje=.75 Tr=1.695u Tf=2.465n Itf=15 Xtf=2 Vtf=40 mfg=USSR)
.model KT945b NPN(Is=350f Xti=3 Eg=1.11 Vaf=95.7 Bf=193.9 Ise=2.284p Ne=1.377 Ikf=21.59 Nk=.7771 Xtb=1.5 Br=1.216 Isc=8.999p Nc=1.514 Ikr=.7536 Rc=.1198 Cjc=525.9p Mjc=.3229 Vjc=.75 Fc=.5 Cje=3.794n Mje=.33 Vje=.75 Tr=1.695u Tf=2.465n Itf=15 Xtf=2 Vtf=40 mfg=USSR)
.model KT968a NPN(Is=89.93f Xti=3 Eg=1.11 Vaf=86 Bf=184.1 Ise=573.9f Ne=1.436 Ikf=44.6m Nk=.4867 Xtb=1.5 Br=1 Isc=25.95p Nc=1.425 Ikr=2.599 Rb=27 Rc=.701 Cjc=13.31p Mjc=.5595 Vjc=.75 Fc=.5 Cje=34.2p Mje=.33 Vje=.75 Tr=1.045u Tf=1.325n Itf=3 Xtf=2 Vtf=20 mfg=USSR)
.MODEL KT969 NPN (IS=9.92442F BF=663.402 NF=1.09115 VAF=140.7 IKF=10.0012M ISE=7.03949P NE=2.14133 BR=99.8802M IKR=999.872M ISC=1.01247P NC=2 RE=2 RC=759.979M CJE=9.45723P VJE=690M MJE=564.978M CJC=9.45723P VJC=690M MJC=564.978M TF=1.26995N XTF=622.054M VTF=21.0569 ITF=34.701M TR=10N mfg=USSR)
.MODEL KT9115 PNP (IS=9.76087F BF=290.589 NF=1.02655 VAF=100 IKF=97.7242M ISE=155.803F NE=1.70173 BR=1.99753 IKR=10M ISC=99.9881P RE=2.02804 RC=160.272M CJE=45.8458P VJE=699.999M MJE=500.813M CJC=12.0342P VJC=1 MJC=482.727M FC=500M TF=1.61261N XTF=499.997M VTF=10 ITF=10.023M TR=10N Vceo=300 Icrating=0.1 mfg=USSR)
.model KT3108a PNP(Is=1.41f Xti=3 Eg=1.11 Vaf=87 Bf=112.7 Ne=3.346 Ise=114.2p Ikf=31.92m Xtb=1.5 Br=1.883 Nc=2 Isc=114f Ikr=31m Rc=4.25 Rb=52 Cjc=4.372p Mjc=.33 Vjc=.75 Fc=.5 Cje=3.714p Mje=.33 Vje=.75 Tr=67.31n Tf=344.1p Itf=56m Vtf=45 Xtf=1.5 mfg=USSR)
.model KT3108b PNP(Is=863E-18 Xti=3 Eg=1.11 Vaf=85 Bf=112.4 Ne=12.53 Ise=37.65n Ikf=27.99m Xtb=1.5 Var=26 Br=2.984 Nc=2 Isc=1.25p Ikr=56m Rb=52 Rc=4.24 Cjc=4.529p Vjc=.65 Mjc=.33 Fc=.5 Cje=3.763p Vje=.69 Mje=.33 Tr=43.55n Tf=292.3p Itf=58m Vtf=55 Xtf=2 mfg=USSR)
.model KT3108v PNP(Is=1.41f Xti=3 Eg=1.11 Vaf=83 Bf=223.5 Ne=3.657 Ise=101p Ikf=35.11m Xtb=1.5 Br=1.655 Nc=2 Isc=114f Ikr=31m Rc=4.5 Rb=52 Cjc=4.372p Mjc=.33 Vjc=.75 Fc=.5 Cje=3.714p Mje=.33 Vje=.75 Tr=63.22n Tf=339.5p Itf=93m Vtf=40 Xtf=1.5 mfg=USSR)
.model KT3117a NPN(Is=61.27f Xti=3 Eg=1.11 Vaf=95.7 Bf=182 Ne=2.744 Ise=9.293n Ikf=2.622 Xtb=1.5 Var=65 Br=1.894 Nc=2 Isc=1.2n Ikr=2.65 Rb=30.7 Rc=.75 Cjc=28.58p Mjc=.4701 Vjc=.75 Fc=.5 Cje=68.82p Mje=.1985 Vje=.75 Tr=32.04n Tf=261.9p Itf=2.5 Vtf=40 Xtf=1.5 mfg=USSR)
.model KT316b NPN(Is=3.49f Xti=3 Eg=1.11 Vaf=102 Bf=74.97 Ne=1.483 Ise=44.72f Ikf=.1322 Xtb=1.5 Var=55 Br=.2866 Nc=2 Isc=447f Ikr=.254 Rb=66.7 Rc=7.33 Cjc=3.934p Vjc=.65 Mjc=.33 Fc=.5 Cje=1.16p Vje=.69 Mje=.33 Tr=65.92n Tf=94.42p Itf=.15 Vtf=15 Xtf=2 mfg=USSR)
.model KT316v NPN(Is=3.49f Xti=3 Eg=1.11 Vaf=102 Bf=74.97 Ne=1.483 Ise=44.72f Ikf=.1322 Xtb=1.5 Var=55 Br=.2866 Nc=2 Isc=447f Ikr=.254 Rb=66.7 Rc=7.33 Cjc=3.934p Vjc=.65 Mjc=.33 Fc=.5 Cje=1.16p Vje=.69 Mje=.33 Tr=65.92n Tf=94.42p Itf=.15 Vtf=15 Xtf=2 mfg=USSR)
.model KT316g NPN(Is=2.753f Xti=3 Eg=1.11 Vaf=96 Bf=86.5 Ne=2.496 Ise=12.8p Ikf=97.23m Xtb=1.5 Var=55 Br=.6577 Nc=2 Isc=15.5p Ikr=.12 Rb=70.6 Rc=8.35 Cjc=4.089p Vjc=.65 Mjc=.33 Fc=.5 Cje=1.16p Vje=.69 Mje=.33 Tr=27.84n Tf=78.97p Itf=.151 Vtf=25 Xtf=2 mfg=USSR)
.model KT316d NPN(Is=2.753f Xti=3 Eg=1.11 Vaf=96 Bf=136.5 Ne=2.496 Ise=12.8p Ikf=97.23m Xtb=1.5 Var=55 Br=.6577 Nc=2 Isc=15.5p Ikr=.12 Rb=70.6 Rc=8.35 Cjc=4.089p Vjc=.65 Mjc=.33 Fc=.5 Cje=1.16p Vje=.69 Mje=.33 Tr=27.84n Tf=78.97p Itf=.151 Vtf=25 Xtf=2 mfg=USSR)
.model KT325a NPN(Is=19.86f Xti=3 Eg=1.11 Vaf=87 Bf=84.21 Ise=336.8f Ne=1.424 Ikf=76.88m Nk=.5 Xtb=1.5 Br=1.78 Isc=.1p Nc=1.744 Ikr=.6068 Rb=25 Rc=.2997 Cjc=3.549p Mjc=.333 Vjc=.75 Fc=.5 Cje=3.42p Mje=.333 Vje=.75 Tr=16.38n Tf=138.3p Itf=.3 Xtf=1.7 Vtf=25 mfg=USSR)
.model KT325b NPN(Is=19.86f Xti=3 Eg=1.11 Vaf=87 Bf=165.9 Ise=1.151p Ne=1.612 Ikf=72.41m Nk=.5 Xtb=1.5

Br=1.78 Isc=.1p Nc=1.744 Ikr=.6068 Rb=27 Rc=.2997 Cjc=3.155p Mjc=.333 Vjc=.75 Fc=.5 Cje=3.42p Mje=.333 Vje=.75 Tr=11.53n Tf=138.3p Itf=.3 Xtf=1.7 Vtf=25 mfg=USSR)
.model KT325v NPN(Is=9.164f Xti=3 Eg=1.11 Vaf=87 Bf=321.5 Ise=87.74f Ne=1.473 Ikf=87.77m Nk=.5 Xtb=1.5 Br=1.78 Isc=.1p Nc=1.744 Ikr=.6068 Rb=31 Rc=.2997 Cjc=2.958p Mjc=.333 Vjc=.75 Fc=.5 Cje=3.42p Mje=.333 Vje=.75 Tr=8.891n Tf=112.2p Itf=.3 Xtf=2 Vtf=25 mfg=USSR)
.model 2T325B NPN (Is=49.6f Xti=3 Eg=1.11 Vaf=70 Bf=313.5 Ne=1.358 Ise=49.56f Ikf=.135 Xtb=1.5 Br=4 Nc=2 Isc=100p Ikr=20m Rc=20 Cjc=2.5p Vjc=.72 Mjc=.333 Fc=.5 Cje=2.5p Vje=.75 Mje=.333 Tr=250p Tf=516.5p Itf=0 Vtf=0 Vceo=15 Icrating=0.06 mfg=USSR)
.model KT326a PNP(Is=496.3E-18 Xti=3 Eg=1.11 Vaf=110 Bf=79.59 Ne=1.376 Ise=8.406f Ikf=.106 Nk=.5 Xtb=1.5 Br=1 Isc=496.3E-18 Nc=1.636 Ikr=1u Rb=42 Rc=2.141 Cjc=3.7p Mjc=.33 Vjc=.75 Fc=.5 Cje=1.442p Mje=.33 Vje=.75 Tr=3.696u Tf=443.3p Itf=1 Xtf=2 Vtf=20 mfg=USSR)
.model KT326b PNP(Is=16.64f Xti=3 Eg=1.11 Vaf=115 Bf=99.06 Ne=2.527 Ise=54.12p Ikf=.6751 Xtb=1.5 Var=63 Br=1.75 Nc=2 Isc=12.5f Ikr=.52 Rb=52.4 Rc=1.85 Cjc=4.089p Vjc=.69 Mjc=.33 Fc=.5 Cje=3.375p Vje=.75 Mje=.35 Tr=40.04n Tf=160.2p Itf=.1 Vtf=10 Xtf=2 mfg=USSR)
.model KT342a NPN(Is=5.997f Xti=3 Eg=1.11 Vaf=106.8 Bf=394.1 Ise=38.23f Ne=1.421 Ikf=.1685 Nk=.4727 Xtb=1.5 Br=1 Isc=23.96f Nc=1.34 Ikr=2.077 Rb=19 Rc=.9855 Cjc=10.44p Mjc=.3906 Vjc=.75 Fc=.5 Cje=14.23p Mje=.33 Vje=.75 Tr=78.22n Tf=307.5p Itf=.52 Xtf=2 Vtf=50 mfg=USSR)
.model KT342b NPN(Is=5.997f Xti=3 Eg=1.11 Vaf=95.7 Bf=739.7 Ise=50.36f Ne=1.496 Ikf=.1479 Nk=.5 Xtb=1.5 Br=1 Isc=23.96f Nc=1.34 Ikr=2.077 Rb=23 Rc=.9855 Cjc=10.44p Mjc=.3906 Vjc=.75 Fc=.5 Cje=14.23p Mje=.33 Vje=.75 Tr=78.22n Tf=307.5p Itf=.52 Xtf=2 Vtf=50 mfg=USSR)
.model KT351a PNP(Is=4.943f Xti=3 Eg=1.11 Vaf=110 Bf=91.56 Ne=1.776 Ise=1.436p Ikf=.2116 Xtb=1.5 Var=25 Br=1.215 Nc=2 Isc=1.45p Ikr=.25 Rb=75 Rc=.44 Cjc=15.05p Vjc=.69 Mjc=.33 Fc=.5 Cje=24.48p Vje=.65 Mje=.33 Tr=223.6n Tf=217.4p Itf=.28 Vtf=35 Xtf=2 mfg=USSR)
.model KT351b PNP(Is=4.943f Xti=3 Eg=1.11 Vaf=110 Bf=185.3 Ne=1.776 Ise=1.436p Ikf=.2116 Xtb=1.5 Var=25 Br=1.215 Nc=2 Isc=1.45p Ikr=.25 Rb=75 Rc=.44 Cjc=15.05p Vjc=.69 Mjc=.33 Fc=.5 Cje=24.48p Vje=.65 Mje=.33 Tr=223.6n Tf=217.4p Itf=.28 Vtf=35 Xtf=2 mfg=USSR)
.model KT355a NPN(Is=14.02f Xti=3 Eg=1.11 Vaf=82.35 Bf=172.2 Ne=2.211 Ise=9.573p Ikf=.2809 Xtb=1.5 Var=45 Br=.8636 Nc=2 Isc=1.12p Ikr=.253 Rb=41.6 Rc=3.55 Cjc=2.742p Vjc=.75 Mjc=.33 Fc=.5 Cje=2.635p Vje=.69 Mje=.33 Tr=76.29n Tf=65.28p Itf=.532 Vtf=15 Xtf=2 mfg=USSR)
.model KT357a PNP(Is=67.34f Xti=3 Eg=1.11 Vaf=80 Bf=70.83 Ise=746.1f Ne=1.452 Ikf=.1929 Nk=.5153 Xtb=1.5 Br=1 Isc=67.34f Nc=1.071 Ikr=2.269 Rc=3.665 Rb=50 Cjc=12.15p Mjc=.33 Vjc=.75 Fc=.5 Cje=18.5p Mje=.33 Vje=.75 Tr=275.6n Tf=160.9p Itf=56.6m Xtf=.3203 Vtf=40 mfg=USSR)
.model KT357b PNP(Is=31.08f Xti=3 Eg=1.11 Vaf=75 Bf=203.3 Ise=325.3f Ne=1.534 Ikf=.2072 Nk=.5155 Xtb=1.5 Br=1 Isc=34.36f Nc=1.022 Ikr=3.163 Rc=3.748 Rb=70 Cjc=10.93p Mjc=.33 Vjc=.75 Fc=.5 Cje=18.5p Mje=.33 Vje=.75 Tr=275.6n Tf=91.32p Itf=.1303 Xtf=1.762 Vtf=40 mfg=USSR)
.model KT368a NPN(Is=8.675f xcjc=0.1 Xti=3 Eg=1.11 Vaf=108 Bf=250.5 Ne=1.377 Ise=9.128f Ikf=.3608 Xtb=1.5 Var=56 Br=1.45 Nc=2 Isc=16.3f Ikr=.125 Rb=60 Rc=2.445 Cjc=2.35p Vjc=.75 Mjc=.33 Fc=.5 Cje=2.786p Vje=.69 Mje=.37 Tr=2.147n Tf=84.62p Itf=.15 Vtf=25 Xtf=2 mfg=USSR)
.model KT368b NPN(Is=8.675f xcjc=0.1 Xti=3 Eg=1.11 Vaf=108 Bf=325.3 Ne=1.377 Ise=9.128f Ikf=.3608 Xtb=1.5 Var=56 Br=1.45 Nc=2 Isc=16.3f Ikr=.125 Rb=60 Rc=2.445 Cjc=2.35p Vjc=.75 Mjc=.33 Fc=.5 Cje=2.786p Vje=.69 Mje=.37 Tr=2.147n Tf=84.62p Itf=.15 Vtf=25 Xtf=2 mfg=USSR)
.model KT371a NPN(Is=1.378f Xti=3 Eg=1.11 Vaf=68.25 Bf=236 Ne=1.479 Ise=43.8f Ikf=.1777 Xtb=1.5 Var=45 Br=3.414 Nc=2 Isc=55f Ikr=35m Rb=44.1 Rc=2.8 Cjc=1.932p Vjc=.75 Mjc=.33 Fc=.5 Cje=1.747p Vje=.69 Mje=.33 Tr=13.65n Tf=43.78p Itf=.35 Vtf=10 Xtf=2 mfg=USSR)
.model KT3101a NPN(Is=25.63f Xti=3 Eg=1.11 Vaf=56 Bf=245.8 Ne=1.254 Ise=27.93f Ikf=54.66m Xtb=1.5 Var=20 Br=1.883 Nc=2 Isc=108.6f Ikr=57.63m Rb=28 Rbm=8 Irb=.72m Rc=3.45 Cjc=1.166p Mjc=.2974 Vjc=.75 Fc=.5 Xcjc=0.5 Cje=1.354p Mje=.3137 Vje=.65 Tr=463.8p Tf=22.39p Itf=.367 Vtf=12 Xtf=2 mfg=USSR)
.model KT363a PNP(IS=867.6e-18 BF=64.79 BR=0.833 ISE=344f ISC=0 IKF=0.1481 IKR=0 NE=2.092 NC=2 VAF=100 RC=1.75 RB=10 TF=160.9p TR=18.34n XTF=1.5 VTF=3 ITF=0.6 CJE=5.881p VJE=0.75 MJE=0.4345 CJC=4.524p VJC=0.75 MJC=0.2226 FC=0.5 EG=1.11 XTB=1.5 XTI=3 mfg=USSR)
.model KT363am PNP(IS=545.6e-18 BF=76.77 BR=1.365 ISE=344f ISC=0 IKF=50m IKR=0 NE=1.5 NC=2 VAF=100 RC=3.75 RB=10 TF=115.5p TR=4.033n XTF=6 VTF=3 ITF=0.5 CJE=2.65p VJE=0.75 MJE=0.3083 CJC=2.77p VJC=0.75 MJC=0.1416 FC=0.5 EG=1.11 XTB=1.5 XTI=3 mfg=USSR)
.model KT363B PNP(IS=0.9f BF=32 BR=1.18 NR=0.9 ISE=10f ISC=1p IKF=0.195 IKR=0.3 NE=1.971 NC=2 VAF=7 VAR=65 RC=8 RB=75 TF=41.32p TR=6.149n XTF=2 VTF=10 ITF=0.12 CJE=1.112p VJE=0.71 MJE=0.35 CJC=2.958p VJC=0.69 MJC=0.33 FC=0.5 EG=1.11 XTB=1.5 XTI=3 mfg=USSR)
.model KT373A NPN(Is=487.2f Xti=3 Eg=1.11 Vaf=100 Bf=308.6 Ise=895.3f Ne=1.355 Ikf=6.43 Nk=1.576 Xtb=1.5 Var=100 Br=10.88 Isc=996.3f Nc=1.276 Ikr=.1615 Rc=48m Cjc=36.97p Mjc=.3487 Vjc=.3907 Fc=.5 Cje=5p Mje=.3333 Vje=.75 Tr=10n Tf=1n Itf=1 Xtf=0 Vtf=10 mfg=USSR)
.model KT373b NPN(IS=12.03f BF=427.8 BR=4.379 ISE=2.953p ISC=0 IKF=0.1072 IKR=0 NE=1.971 NC=2

VAF=37.37 RC=1 RB=10 TF=385.4p TR=701.7p XTF=8 VTF=3 ITF=0.17 CJE=8.307P VJE=0.75 MJE=0.384 CJC=5.777p VJC=0.75 MJC=0.3199 FC=0.5 EG=1.11 XTB=1.5 XTI=3 mfg=USSR)
.model KT373g NPN(IS=61.01f BF=121.37 BR=0.2359 ISE=122.2p ISC=0 IKF=97.79m IKR=0 NE=1.305 NC=2 VAF=57.37 RC=2.14 RB=10 TF=316.3p TR=1.633u XTF=8 VTF=5 ITF=0.2 CJE=5.928P VJE=0.75 MJE=0.3333 CJC=6.072p VJC=0.75 MJC=0.3333 FC=0.5 EG=1.11 XTB=1.5 XTI=3 mfg=USSR)
.model KT373v NPN(IS=12.03f BF=685.8 BR=4.379 ISE=1.842p ISC=0 IKF=0.1072 IKR=0 NE=1.971 NC=2 VAF=37.37 RC=1 RB=10 TF=385.4p TR=685.3p XTF=8 VTF=3 ITF=0.17 CJE=8.307P VJE=0.75 MJE=0.384 CJC=5.777p VJC=0.75 MJC=0.3199 FC=0.5 EG=1.11 XTB=1.5 XTI=3 mfg=USSR)
.model KT375a NPN(IS=6.734f BF=335.2 BR=0.8073 ISE=6.734f ISC=0 IKF=60.26m IKR=0 NE=1.208 NC=2 VAF=74.03 RC=1 RB=10 TF=300.8p TR=243.9n XTF=2 VTF=4 ITF=0.4 CJE=4.493p VJE=0.75 MJE=0.2593 CJC=3.638p VJC=0.75 MJC=0.3085 FC=0.5 EG=1.11 XTB=1.5 XTI=3 mfg=USSR)
.model KT375b NPN(IS=6.734f BF=416.4 BR=0.7371 ISE=6.734f ISC=0 IKF=66.78m IKR=0 NE=1.259 NC=2 VAF=74.03 RC=1 RB=10 TF=301.2p TR=239.5n XTF=2 VTF=4 ITF=0.4 CJE=4.493p VJE=0.75 MJE=0.2593 CJC=3.638p VJC=0.75 MJC=0.3085 FC=0.5 EG=1.11 XTB=1.5 XTI=3 mfg=USSR
.model KT399A NPN(IS=69.28e-18 BF=288 BR=1.219 ISE=69.28e-18 IKF=21.59m NE=1.167 NC=2 VAF=100 RC=4 RB=10 TF=115.7p TR=1.607n XTF=30 VTF=10 ITF=0.27 CJE=939.3f VJE=0.75 MJE=0.3453 CJC=891.1f VJC=0.75 MJC=0.3017 FC=0.5 EG=1.11 XTB=1.5 XTI=3 mfg=USSR)
.MODEL KT665A9 NPN (IS=7.0489e-14 BF=196.64 BR=4.5875 RB=0 RE=0 RC=0.15103 CJE=2.3944e-10 CJC=5e-11 VJE=0.35035 VJC=0.65363 TF=9.9605e-10 TR=1e-08 MJE=0.34922 MJC=0.41826 VA=100 ISE=7.134e-14 IKF=4.0903 NE=1.2257 NF=1 NR=1 VAR=100 IKR=0.38749 ISC=1.3037e-09 NC=2.4443 IRB=1e+30 RBM=0 XTF=10 VTF=10 ITF=1 VJS=0.75 MJS=0 XTB=0 EG=1.11 XTI=3 FC=0.5 mfg=USSR)
.MODEL KT666A9 NPN(IS=7.974f NF=0.993 ISE=2.266E-16 NE=1.18 BF=122 IKF=0.01029 VAF=25.51 NR=0.999 ISC=4.33p NC=1.397 BR=6.235 IKR=0.02746 VAR=19.43 RB=1 IRB=1E-06 RBM=0.5 RE=0.3814 RC=0.439 XTB=0 EG=1.11 XTI=3 CJE=1.742E-11 VJE=0.4581 MJE=0.3092 TF=7.073E-10 XTF=289.5 VTF=6.144 ITF=0.1495 CJC=5.045p VJC=0.197 MJC=0.1947 XCJC=0.1041 TR=1E-08 FC=0.8555 mfg=USSR)
.MODEL KT317 NPN(Is=233f Bf=200 Rb=200 Rc=20 Cje=1.03pF Cjc=4.1pF Tf=400p xcjc=0.1 mfg=USSR)
.MODEL KT306B NPN(BF=100 IS=2F CJC=4.2P CJE=10.2P RE=1.6 RC=0.52U TF=400P rb=200 xcjc=0.1 Tr=10n mfg=USSR)
.MODEL KT306G NPN(BF=150 IS=2F CJC=4.2P CJE=10.2P RE=1.6 RC=0.52U TF=400P rb=200 xcjc=0.1 Tr=10n mfg=USSR)
.model KT317_ NPN(Is=1.e-13 Bf=200 Br=5 Vaf=74 Var=30 Rb=230 Rc=15 Re=2 Cje=1pF Cjc=3pF Tf=12n Tr=70n mfg=USSR)
.model mp39B pnp bf=140 br=3 eg=0.72 cje=30p cjc=90p tf=0.2u tr=1.u is=3u ikf=50m vaf=15 mje=0.5 mjc=0.5 rb=150 rbm=50 irb=0.1m ise=.3u ne=1.28 isc=0.6u nc=1.28 mfg=GERMANIUM_USSR
.model mp41 pnp bf=140 br=4 eg=0.72 cje=30p cjc=90p tf=0.1u tr=1.u is=3u ikf=50m vaf=15 mje=0.5 mjc=0.5 rb=150 rbm=50 irb=0.1m ise=.3u ne=1.28 isc=0.6u nc=1.28 mfg=GERMANIUM_USSR
.model mp37 npn bf=140 br=4 eg=0.72 cje=30p cjc=90p tf=0.1u tr=1.u is=3u ikf=50m vaf=15 mje=0.5 mjc=0.5 rb=150 rbm=50 irb=0.1m ise=.3u ne=1.28 isc=.6u nc=1.28 mfg=GERMANIUM_USSR
.model mp35 npn bf=140 br=4 eg=0.72 cje=50p cjc=90p tf=0.2u tr=2.u is=3u ikf=50m vaf=15 mje=0.5 mjc=0.5 rb=150 rbm=50 irb=0.1m ise=0.3u ne=1.28 isc=0.6u nc=1.28 mfg=GERMANIUM_USSR
.model mp25a pnp bf=140 br=3 eg=0.72 cje=30p cjc=90p tf=0.4u tr=4u is=3u ikf=40m vaf=30 mje=0.5 mjc=0.5 rb=120 rbm=40 irb=0.1m ise=.3u ne=1.28 isc=.6u nc=1.28 mfg=GERMANIUM_USSR
.model mp26a pnp bf=140 br=3 eg=0.72 cje=30p cjc=90p tf=0.4u tr=4u is=3u ikf=40m vaf=30 mje=0.5 mjc=0.5 rb=120 rbm=40 irb=0.1m ise=.3u ne=1.28 isc=.6u nc=1.28 mfg=GERMANIUM_USSR
.model P416B pnp bf=800 br=.3 eg=0.72 cje=20p cjc=15p tf=1n tr=.4u xcjc=0.5 is=100n ikf=45m vaf=30 mje=0.5 mjc=0.5 rc=20 rb=80 rbm=10 irb=1m ise=25n ne=1.5 isc=.7u nc=1.4 mfg=GERMANIUM_USSR
.model GT338B pnp bf=800 br=.3 eg=0.72 tr=.4u xcjc=0.5 is=100n ikf=45m vaf=30 mje=0.5 mjc=0.5 rc=20 rb=80 rbm=10 irb=1m ise=25n ne=1.5 isc=.7u nc=1.4 BVcbo=21 nBVcbo=1.3 cje=15p cjc=10p tf=50p vtf=2 Xtf=1 mfg=GERMANIUM_USSR
.model GT308B pnp bf=800 br=.3 eg=0.72 cje=20p cjc=15p tf=1n tr=.4u xcjc=0.4 is=100n ikf=45m vaf=30 mje=0.5 mjc=0.5 rc=20 rb=80 rbm=10 irb=1m ise=25n ne=1.5 isc=.7u nc=1.4 mfg=GERMANIUM_USSR
.model GT322 pnp (af=1 bf=85 br=20 cjc=3.75p cje=6p eg=0.670 fc=0.75 ikf=9.981m ikr=1.248m irb=5u is=120.8n isc=120.8n ise=0.435n itf=9.983m kf=5f mjc=0.33 mje=0.4 nc=1.2 ne=1.2 nf=1 nr=1 ptf=1 rb=173.312 rbm=43.328 rc=60 re=20 tf=0.15u tr=2.865u vaf=102.207 var=20 vjc=0.6 vje=0.4 vtf=2 xcjc=0.650 xtb=1.000 xtf=9.996 xti=4.000 mfg=GERMANIUM_USSR)
.model GT322A pnp bf=100 br=.3 eg=0.72 cje=10p cjc=4p tf=1n tr=.4u xcjc=0.3 is=50n ikf=20m vaf=30 mje=0.5 mjc=0.5 rc=10 rb=40 ise=10n ne=1.5 isc=.5u nc=1.4 mfg=GERMANIUM_USSR
.model P217G pnp bf=150 br=4 eg=0.72 cje=500p cjc=900p tf=1u tr=2.u is=50u ikf=2. nk=0.75 vaf=50 mje=0.5 mjc=0.5 rb=5 rbm=2.5 irb=10m re=50m rc=35m ise=10u ne=1.6 isc=300u nc=1.3 BVcbo=61 nBVcbo=4 BVbe=16 Ibvbe=1m mfg=GERMANIUM_USSR

.model GT901B pnp bf=700 br=4 eg=0.72 cje=10n cjc=800p tf=3n tr=1.u is=150u ikf=3. nk=0.5 vaf=50 mje=0.5 mjc=0.333 rb=3 rbm=0.1 irb=10m re=50m rc=35m ise=90u isc=350u ne=1.8 nc=1.3 BVcbo=75 nBVcbo=4 BVbe=0.6 Ibvbe=1m mfg=GERMANIUM_USSR
.model GT905A pnp bf=800 br=4 eg=0.72 cje=10n cjc=800p tf=3n tr=1.u is=150u ikf=3. nk=0.6 vaf=50 mje=0.5 mjc=0.333 rb=3 rbm=0.1 irb=10m re=50m rc=35m ise=15u isc=350u ne=1.4 nc=1.3 BVcbo=75 nBVcbo=4 BVbe=0.6 Ibvbe=1m mfg=GERMANIUM_USSR
.model KT630A NPN (Is=442.7e-18 Xti=3 Eg=1.11 Vaf=120 Bf=80 Ne=1.5 Ise=1e-7 Ikf=.8 Xtb=1.5 Br=1 Nc=2 Isc=1E-6 Ikr=.7 Rc=0.7 rb=10 Cjc=25p Vjc=.75 Mjc=.333 Fc=.5 Cje=65p Vje=.75 Mje=.333 Tr=50n Tf=2n Itf=.75 Vtf=120 Xtf=1.2 Vceo=120 Icrating=1 mfg=USSR)
.model KT630B NPN (Is=442.7e-18 Xti=3 Eg=1.11 Vaf=120 Bf=160 Ne=1.5 Ise=1e-7 Ikf=.8 Xtb=1.5 Br=1 Nc=2 Isc=1E-6 Ikr=.7 Rc=0.7 rb=10 Cjc=25p Vjc=.75 Mjc=.333 Fc=.5 Cje=65p Vje=.75 Mje=.333 Tr=50n Tf=2n Itf=.75 Vtf=120 Xtf=1.2 Vceo=120 Icrating=1 mfg=USSR)
.model KT630V NPN (Is=442.7e-18 Xti=3 Eg=1.11 Vaf=120 Bf=80 Ne=1.5 Ise=1e-7 Ikf=.8 Xtb=1.5 Br=1 Nc=2 Isc=1E-6 Ikr=.7 Rc=0.7 rb=10 Cjc=25p Vjc=.75 Mjc=.333 Fc=.5 Cje=65p Vje=.75 Mje=.333 Tr=50n Tf=2n Itf=.75 Vtf=120 Xtf=1.2 Vceo=150 Icrating=1 mfg=USSR)
.model KT630G NPN (Is=442.7e-18 Xti=3 Eg=1.11 Vaf=120 Bf=80 Ne=1.5 Ise=1e-7 Ikf=.8 Xtb=1.5 Br=1 Nc=2 Isc=1E-6 Ikr=.7 Rc=0.7 rb=10 Cjc=25p Vjc=.75 Mjc=.333 Fc=.5 Cje=65p Vje=.75 Mje=.333 Tr=50n Tf=2n Itf=.75 Vtf=120 Xtf=1.2 Vceo=100 Icrating=1 mfg=USSR)
.model KT630D NPN (Is=442.7e-18 Xti=3 Eg=1.11 Vaf=80 Bf=300 Ne=1.5 Ise=1e-7 Ikf=.8 Xtb=1.5 Br=1 Nc=2 Isc=1E-6 Ikr=.7 Rc=0.7 rb=10 Cjc=25p Vjc=.75 Mjc=.333 Fc=.5 Cje=65p Vje=.75 Mje=.333 Tr=50n Tf=2n Itf=.75 Vtf=120 Xtf=1.2 Vceo=60 Icrating=1 mfg=USSR)
.MODEL KT840A NPN (IS=1.1201p BF=109.51 VAF=100 IKF=2.5530 ISE=81.673p NE=1.5087 BR=499.50 VAR=100 IKR=19.981 ISC=335.58p NC=2.9969 NK=.66844 RB=48.193m RC=.11342 CJE=3.3426n MJE=.20906 CJC=701.93p VJC=.35 MJC=.42087 TF=2.7063n XTF=10 VTF=10 ITF=1 TR=162.42n Vceo=400 Icrating=6A mfg=USSR)
.model kt8101 npn is=29.4733p bf=1.28124k nf=1.00448 vaf=90.7 ikf=5.4099 ise=3.03808p ne=1.14574 br=256.79m ikr=60.2683m isc=3.36943u re=65.1304m rc=10.2639m cje=5p mje=500m tf=8.51949n xtf=500.012m vtf=10 itf=38.2957m cjc=5p mjc=500m tr=10n mfg=INTEGRAL
.model kt8102 pnp is=4.63971p bf=760.901 vaf=100 ikf=4.35839 ise=522.607f ne=1.14076 br=2 ikr=9.97108k isc=12.541f re=75.3313m rc=228.01m cje=5p mje=500m tf=15.1341n xtf=500.003m vtf=10 itf=10.6983m cjc=5p mjc=500m tr=10n mfg=INTEGRAL
.model kt850 npn is=660.244f bf=1.12908k nf=1.09821 vaf=53.2 ikf=861.559m ise=3.06929p ne=1.41561 br=890.176m ikr=24.6746m isc=104.037n re=165.486m rc=30.9187m cje=5p mje=500m tf=8.72561n xtf=500.001m vtf=10 itf=10.0557m cjc=5p mjc=500m tr=49.7597u mfg=INTEGRAL
.model kt851 pnp is=100.801f bf=552.989 nf=1.0329 vaf=100 ikf=870.07m ise=24.0653f ne=1.19228 br=1.93375 ikr=10m isc=97.9119p re=207.275m rc=1.54572 cje=5p mje=500m tf=7.5517n xtf=500m vtf=10 itf=9.91801m cjc=5p mjc=500m tr=10n mfg=INTEGRAL
.model kt864 npn is=24.9153p bf=302.064 nf=1.01568 vaf=62.6667 ikf=5.47508 ise=97.1198p ne=1.34428 br=2 ikr=10k isc=3.056317e-018 re=31.1943m rc=2.58584m cje=2.61852n vje=700m mje=499.936m tf=10.4204n xtf=500m vtf=10 itf=9.65884m cjc=856.505p vjc=700m mjc=500.242m tr=10n mfg=INTEGRAL
.model kt865 pnp is=196.519f bf=179.363 vaf=100 ikf=2.87385 ise=634.214f ne=1.25605 br=2 ikr=9.93273k isc=177.254f nc=2 re=16.408m rc=69.5017m cje=2.61852n vje=700m mje=499.936m tf=6.79763n xtf=500.002m vtf=10 itf=5.81566m cjc=856.505p vjc=700m mjc=500.242m tr=10n mfg=INTEGRAL
.model kt882 npn is=340.104f bf=367.414 nf=1.05592 vaf=45.7 ikf=321.145m ise=163.627p ne=1.81742 br=1.82029 ikr=9.99998m isc=128.201p re=225.736m rc=680.629m cje=589.164p vje=700m mje=499.924m tf=8.43468n xtf=499.998m vtf=10 itf=9.90076m cjc=99.9225p vjc=699.997m mjc=500.226m tr=38.6331u mfg=INTEGRAL
.model kt883 pnp is=8.67669f bf=149.922 nf=1.11422 vaf=100 ikf=467.086m ise=22.4516p ne=2.13339 br=2 ikr=263.268 isc=1.554726e-018 re=566.857m cje=589.164p vje=700m mje=499.924m tf=6.80804n xtf=500m vtf=10 itf=10.0067m cjc=128.324p vjc=700m mjc=499.679m tr=10n mfg=INTEGRAL
.MODEL KT6113G NPN (Is=9f xcjc=0.1 Xti=3 Vaf=75 Bf=102 Ne=2 Ise=2.4p Ikf=250m Xtb=1.5 Br=0.3 Nc=2 Isc=2.4p Ikr=10m Rc=3.5 Cjc=1.8p Mjc=.15 Vjc=.8 Fc=.5 Cje=1.5p Mje=0.5 Vje=.8 Tr=2n Tf=80p Itf=13m Vtf=1.7 Xtf=3 Rb=60 Vceo=15 Icrating=50m mfg=INTEGRAL)
.model 2T355A NPN (Is=14.02f Xti=3 Eg=1.11 Vaf=82.35 Bf=172.2 Ne=2.21 Xtf=2 Ise=9.573p Ikf=.281 Xtb=1.5 Var=45 Br=.864 Nc=2 Isc=1.12p Ikr=.253 Rb=41.6 Rc=3.55 Cjc=2.74p Vjc=.75 Mjc=.33 Fc=.5 Cje=2.64p Vje=.69 Mje=.33 Tr=76.29n Tf=65.28p Itf=.532 Vtf=15 mfg=USSR)
.model 2T3117A NPN (Is=98.35f Xti=3 Eg=1.11 Vaf=123.5 Bf=1.158K Ne=1.356 Ise=1.164p Ikf=.224 Xtb=1.5 Var=96 Br=.343 Nc=2 Isc=1.12p Ikr=1.52 Rb=40.7 Rc=.17 Cjc=14.6p Vjc=.75 Mjc=.33 Fc=.5 Cje=56.2p Vje=.69 Mje=.33 Tr=254.8n Tf=281.9p Itf=1.63 Vtf=40 Xtf=2 mfg=USSR)
.model 2T316B NPN (Is=3.49f Xti=3 Eg=1.11 Vaf=102 Bf=74.97 Ne=1.483 Ise=44.72f Ikf=.1322 Xtb=1.5 Var=55 Br=.2866 Nc=2 Isc=447f Ikr=.254 Rb=66.7 Rc=7.33 Cjc=3.934p Vjc=.65 Mjc=.33 Fc=.5 Cje=1.16p Vje=.69 Mje=.33 Tr=65.92n Tf=94.42p Itf=.15 Vtf=15 Xtf=2 mfg=USSR)

.model KT3107A PNP (Is=6.545f Xti=3 Eg=1.11 Vaf=86.5 Bf=105.5 Ne=8.56 Mje=.35 Ise=7.735n Ikf=.186 Xtb=1.5 Var=32 Br=1.62 Nc=2 Isc=3.35p Ikr=12m Rb=39.1 Rc=.71 Cjc=12.8p Vjc=.65 Mjc=.33 Fc=.5 Cje=12.6p Vje=.69 Tr=30.5n Tf=477.5p Itf=56m Vtf=35 Xtf=2 mfg=USSR)
.model 2T3108A PNP(Is=1.41f Xti=3 Eg=1.11 Vaf=87 Bf=112.7 Ne=3.346 Ise=114.2p Ikf=31.92m Xtb=1.5 Br=1.883 Nc=2 Isc=114f Ikr=31m Rb=52 Cjc=4.372p Mjc=.33 Vjc=.75 Fc=.5 Cje=3.714p Mje=.33 Tr=67.31n Tf=344.1p Itf=56m Vtf=45 Xtf=1.5 Vje=.75 Rc=4.25 mfg=USSR)
.model 2T203B PNP(Is=459.4E-18 Xti=3 Eg=1.11 Vaf=46.32 Bf=59.84 Ise=472E-18 Ne=1.23 Ikf=14.75m Nk=.5 Xtb=1.5 Br=.9521 Isc=183.9f Nc=1.223 Ikr=.8622 Rb=270 Rc=.3177 Cjc=12.95p Mjc=.33 Vjc=.75 Cje=93.8p Mje=.5729 Vje=.75 Tr=10.33u Tf=14.64n Itf=.25 Xtf=2 Vtf=20 Fc=.5 mfg=USSR)
.model KT3157 NPN(Is=1e-13 Bf=200 Br=5 Vaf=74 Var=30 Rb=230 Rc=15 Re=2 Cje=1pF Cjc=3pF Tf=12n Tr=70n mfg=USSR)
.model 2TC3103a1 PNP(Is=449.1e-18 Xti=3 Eg=1.11 Vaf=63.25 Bf=137.7 Ne=3.148 Ise=98.8p Ikf=.1065 Xtb=1.5 Var=42.2 Br=.97 Nc=2 Isc=1.12f Ikr=.251 Rb=56 Rc=6.7 Cjc=3.721p Vjc=.75 Mjc=.33 Fc=.5 Cje=1.8p Vje=.69 Mje=.33 Tr=56.41n Tf=73.23p Itf=45m Vtf=15 Xtf=2 mfg=USSR)
.model 2TS3103A1 PNP(Is=449.1E-18 Xti=3 Eg=1.11 Vaf=63.25 Bf=137.7 Ne=3.148 Ise=98.79p Ikf=.1065 Xtb=1.5 Var=42.2 Br=.9704 Nc=2 Isc=1.12f Ikr=.251 Rb=56 Rc=6.7 Cjc=3.721p Vjc=.75 Mjc=.33 Fc=.5 Cje=1.8p Vje=.69 Mje=.33 Tr=56.41n Tf=73.23p Itf=45m Vtf=15 Xtf=2 mfg=USSR)
.model 2TS3103A2 PNP(Is=566.4E-18 Xti=3 Eg=1.11 Vaf=63.8 Bf=138.9 Ne=3.136 Ise=112.3p Ikf=.1211 Xtb=1.5 Var=42 Br=2.336 Nc=2 Isc=2.563p Ikr=.251 Rb=63 Rc=8.3 Cjc=3.721p Vjc=.75 Mjc=.33 Fc=.5 Cje=1.812p Vje=.69 Mje=.33 Tr=24.66n Tf=81.76p Itf=.134 Vtf=15 Xtf=2 mfg=USSR)
.model 1NT251 NPN(Is=51.37f Xti=3 Eg=1.11 Vaf=87 Bf=108.4 Ne=1.353 Ise=185.4f Ikf=2.926 Xtb=1.5 Var=40 Br=.2127 Nc=2 Isc=185f Ikr=.196 Rb=29.6 Rc=1.85 Cjc=17.01p Mjc=.261 Vjc=.75 Fc=.5 Cje=35.97p Mje=.43 Vje=.75 Tr=537n Tf=287.7p Itf=2 Vtf=40 Xtf=1.5 mfg=USSR)
.MODEL 2SD2704K NPN IS=250f BF=2.3219k VAF=100 IKF=25.778m ISE=270.34f NE=1.8069 BR=45.088 VAR=100 IKR=9.4796 ISC=411.09f NC=2.0254 NK=.54182 RE=.4 RB=3.1823 RC=58.585m CJE=8.7706p MJE=.66324 CJC=15.709p MJC=.53302 TF=3.8352n XTF=32.147 VTF=472.13 ITF=85.294 TR=7.0574n XTB=1.5 Vceo=20 Icrating=300m mfg=Rohm
.MODEL FJN3303 NPN IS=7.921E-10 BF=35.689 NF=1 BR=10.8114 NR=1 ISE=1f NE=1.5 ISC=1.00f NC=2 VAF=38 VAR=20 IKF=0.363 IKR=0.398 RB=0.6 RBM=0.1 IRB=2.51189E-5 RE=0.0018 RC=0.6347 CJE=7.879424p VJE=0.6464066 MJE=0.2596434 FC=0.5 CJC=4.291838p VJC=0.5 MJC=0.1964945 TF=5.012n XTF=2 ITF=0.4 VTF=4 TR=2.395n XTB=1.5 EG=1.17 XTI=3 Vceo=400 Icrating=1.5 mfg=Fairchild
.MODEL FJN13003 NPN IS=2.512E-14 NF=0.977 ISE=2.754E-11 NE=2 BF=25.07 IKF=1.021 VAF=107.5 NR=0.988 ISC=3.631E-14 NC=1.021 BR=2.885 IKR=0.85 VAR=12.27 RB=78.254 IRB=4.862E-06 RBM=0.465 RE=0.03 RC=2.257 XTB=1.236 EG=1.22 XTI=3 CJE=4.12E-10 VJE=0.697 MJE=0.335 CJC=4.96E-11 VJC=0.39 MJC=0.417 XCJC=0.372 FC=0.5 Vceo=400 Icrating=1.5 mfg=Fairchild
.MODEL PZT2222A NPN IS=29.13f NF=992.6m ISE=9.652f NE=1.516 BF=256.7 IKF=489.9m VAF=80.99 NR=984.4m ISC=320.3p NC=1.608 BR=6.59 IKR=192.9m VAR=101.2 RB=1 RE=193.4m RC=224.8m XTB=0 EG=1.11 XTI=3 CJE=25.89p VJE=689.1m MJE=366.8m TF=293.9p XTF=71.78 VTF=20 ITF=4.797 CJC=10.11p VJC=662.2m MJC=416m XCJC=0.5946 TR=320n FC=938.8m Vceo=40 Icrating=600m mfg=Philips
.MODEL 2SB1241 PNP (IS=220.00f BF=140.43 VAF=23.200 IKF=7.9366 ISE=220.00f NE=1.6291 BR=30.282 VAR=100 IKR=13.783 ISC=274.44p NC=1.5976 NK=.83042 RE=50.000m RB=.6938 RC=.149 CJE=311.85p MJE=.35932 CJC=89.315p MJC=.50953 TF=714.69p XTF=11.729 VTF=22.370 ITF=7.7977 TR=101.04n XTB=1.5000 Vceo=80 Icrating=1 mfg=ROHM)
.MODEL 2SB1243 PNP (IS=2.3000p BF=100.72 VAF=6.2769 IKF=4.3760 ISE=2.3000p NE=1.3995 BR=77.572 VAR=100 IKR=15.080 ISC=377.34p NC=1.4838 NK=.67175 RE=.1 RB=.38561 RC=15.139m CJE=983.02p MJE=.58268 CJC=156.05p MJC=.41274 TF=2.0777n XTF=11.061 VTF=14.341 ITF=9.7241 TR=43.264n XTB=1.5000 Vceo=50 Icrating=3 mfg=ROHM)
.model 2SD1863 NPN (IS=280.00f BF=199.80 VAF=40 IKF=4.6752 ISE=280.00f NE=1.5882 BR=404.98 VAR=100 IKR=.40942 ISC=4.9564p NC=1.2884 NK=.97272 RE=40.000m RB=2.0332 RC=51.971m CJE=311.85p MJE=.35932 CJC=41.583E- 12 MJC=.46676 TF=615.97p XTF=27.568 VTF=62.853 ITF=14.820 TR=99.286n XTB=1.5000 Vceo=80 Icrating=1 mfg=ROHM)
.model 2SD1864 NPN (IS=1.2000p BF=91.918 VAF=5.7704 IKF=4.5333 ISE=1.2000p NE=1.4873 BR=344.81 VAR=100 IKR=81.827m ISC=1.4049n NC=1.6296 RE=90.000m RB=.21142 RC=33.065m CJE=562.04p MJE=.559 CJC=145.17p MJC=.43988 TF=1.6562n XTF=57.091 VTF=180.89 ITF=24.514 TR=66.557n XTB=1.5000 Vceo=50 Icrating=3 mfg=ROHM)
.model 2N2222A NPN (Is=14.34f Xti=3 Eg=1.11 Vaf=74.03 Bf=255.9 Ne=1.307 Ise=14.34f Ikf=.2847 Xtb=1.5 Br=6.092 Nc=2 Isc=0 Ikr=0 Rc=1 Cjc=7.306p Mjc=.3416 Vjc=.75 Fc=.5 Cje=22.01p Mje=.377 Vje=.75 Tr=46.91n Tf=411.1p Itf=.6 Vtf=1.7 Xtf=3 Rb=10 Vceo=40 Icrating=800m mfg=Fairchild)
.MODEL 2N2222A/ZTX NPN IS=3.0611E-14 NF=1.00124 BF=220 IKF=0.52 VAF=104 ISE=7.5f NE=1.41 NR=1.005 BR=4 IKR=0.24 VAR=28 ISC=1.06525E-11 NC=1.3728 RB=0.13 RE=0.22 RC=0.12 CJC=9.12p MJC=0.3508

VJC=0.4089 CJE=27.01p TF=0.325n TR=100n mfg=Zetex
.model BC327-25 PNP(IS=1.08E-13 NF=0.99 ISE=2.713E-14 NE=1.4 BF=385.7 IKF=0.3603 VAF=31.29 NR=0.9849 ISC=5.062E-13 NC=1.295 BR=20.57 IKR=0.054 VAR=11.62 RB=1 IRB=1.00E-06 RBM=0.5 RE=0.1415 RC=0.2623 XTB=0 EG=1.11 XTI=3 CJE=5.114E-11 VJE=0.8911 MJE=0.4417 TF=7.359E-10 XTF=1.859 VTF=3.813 ITF=0.4393 PTF=0 CJC=2.656E-11 VJC=0.62 MJC=0.4836 XCJC=0.459 TR=5.00E-08 CJS=0 VJS=0.75 MJS=0.333 FC=0.99 Vceo=45 Icrating=500m mfg=NXP)
.model BC327-40 PNP(IS=2.077E-13 NF=1.005 ISE=1.411E-14 NE=1.3 BF=449.8 IKF=0.36 VAF=29 NR=1.002 ISC=2.963E-13 NC=1.25 BR=20.92 IKR=0.104 VAR=10 RB=40 IRB=1.00E-05 RBM=5.3 RE=0.14 RC=0.32 XTB=0 EG=1.11 XTI=3 CJE=5E-11 VJE=0.9296 MJE=0.456 TF=7E-10 XTF=3.25 VTF=2.5 ITF=0.79 PTF=80 CJC=2.675E-11 VJC=0.8956 MJC=0.4638 XCJC=0.459 TR=3.50E-08 CJS=0 VJS=0.75 MJS=0.333 FC=0.935 Vceo=45 Icrating=500m mfg=NXP)
.MODEL FMMT558 PNP IS=7.84E-14 NF=1 BF=210 IKF=1.8 VAF=349 ISE=3.35E-14 NE=1.69 NR=1 BR=3.4 IKR=0.15 VAR=82 ISC=9.42p NC=1.05 RB=0.5 RE=0.1 RC=0.1 QUASIMOD=1 RCO=54 GAMMA=13e-6 CJC=20.5p MJC=0.38 VJC=0.44 CJE=115p MJE=0.43 VJE=0.85 TF=0.9n TR=18E-5 TRC1=.015 TRB1=.015 TRE1=.015 XTB=1.4 Vceo=400 Icrating=0.15 mfg=Zetex
.MODEL ZXTN07012EFF NPN IS=1.7p NF=1 BF=1100 IKF=5 VAF=25 ISE=3E-13 NE=1.43 NR=1 BR=470 IKR=1 VAR=6.5 ISC=1.2p NC=1.5 RB=0.1 RE=0.03 RC=0.0097 RCO=0.2 GAMMA=10E-10 CJC=106p MJC=0.33 VJC=0.55 CJE=285p MJE=0.41 VJE=0.80 TF=0.4n TR=1.3n XTB=1.4 TRC1=0.003 TRB1=0.003 TRE1=0.003 QUASIMOD=1 Vceo=12 Icrating=4.5 mfg=Zetex
.MODEL ZXTN25012EFL NPN IS=9E-13 NF=1 BF=990 IKF=3.8 VAF=25 ISE=8E-14 NE=1.35 NR=1 BR=410 IKR=1.25 VAR=8 ISC=8e-14 NC=1.35 RB=0.1 RE=0.0117 RC=0.0081 CJC=61p MJC=0.31 VJC=0.52 CJE=168p MJE=0.38 VJE=0.70 TF=0.5n TR=1.7n XTB=1.4 Vceo=12 Icrating=2 mfg=Zetex
.MODEL ZXTN25012EFH NPN IS=9E-13 BF=990 NF=1 VAF=25 IKF=3.8 ISE=8E-14 NE=1.35 BR=410 NR=1 VAR=8 IKR=1.25 ISC=8e-14 NC=1.35 RE=0.0117 RB=0.1 RC=0.0081 CJE=168p VJE=0.7 MJE=0.38 CJC=61p VJC=0.52 MJC=0.31 TF=0.5n TR=1.7n XTB=1.4 Vceo=12 Icrating=6 mfg=Zetex
.MODEL Fzx690B NPN IS=1.5p NF=1 BF=1000 IKF=3 VAF=60 ISE=4E-13 NE=1.37 NR=1 BR=123 IKR=1 VAR=14.5 ISC=4E-13 NC=1.34 RB=0.1 RE=0.045 RC=0.027 CJE=250p VJE=0.68 MJE=0.36 CJC=59p VJC=0.49 MJC=0.36 TF=0.77n TR=18n RCO=0.93 GAMMA=5n QUASIMOD=1 XTB=1.4 TRE1=0.002 TRB1=0.002 TRC1=0.002 Vceo=45 Icrating=2 mfg=Zetex
.MODEL ZTX690B NPN IS=1.5p NF=1 BF=1000 IKF=3 VAF=60 ISE=4E-13 NE=1.37 NR=1 BR=123 IKR=1 VAR=14.5 ISC=4E-13 NC=1.34 RB=0.1 RE=0.045 RC=0.027 CJE=250p VJE=0.68 MJE=0.36 CJC=59p VJC=0.49 MJC=0.36 TF=0.77n TR=18n RCO=0.93 GAMMA=5n QUASIMOD=1 XTB=1.4 TRE1=0.002 TRB1=0.002 TRC1=0.002 Vceo=45 Icrating=2 mfg=Zetex
.MODEL FCX690B NPN IS=1.5p NF=1 BF=1000 IKF=3 VAF=60 ISE=4E-13 NE=1.37 NR=1 BR=123 IKR=1 VAR=14.5 ISC=4E-13 NC=1.34 RB=0.1 RE=0.045 RC=0.027 CJE=250p VJE=0.68 MJE=0.36 CJC=59p VJC=0.49 MJC=0.36 TF=0.77n TR=18n RCO=0.93 GAMMA=5n QUASIMOD=1 XTB=1.4 TRE1=0.002 TRB1=0.002 TRC1=0.002 Vceo=45 Icrating=2 mfg=Zetex
.model 2SC5200 npn IS=229.07p BF=135 NF=1.257 VAF=50 IKF=20 ISE=5.222p NE=1.392 BR=1 NR=1.411 VAR=75 NC=2 RB=4 RE=2m RC=0.0389 CJE=6050p VJE=0.75 MJE=0.234 TF=5.3n XTF=0.4 ITF=4 CJC=440.35p VJC=0.75 MJC=0.233 TR=3.6e-8 XTB=1.08 VCEO=200V ICrating=15A MFG=Toshiba
.model 2SC5200OTU NPN IS=3.0463E-11 BF=96.20 VAF=100 IKF=15.04256 ISE=5.6190E-11 NE=2.0 BR=4.849 IKR=1.05012 VAR=100 ISC=7.18E-8 NC=1.5 RE=0.0025 RB=20.18 RBM=0.0014 IRB=1.0E-7 RC=0.01137 CJE=4.5000E-10 CJC=8.4915E-10 VJC=0.68977 MJC=0.54081 TF=6.8583E-10 XTF=9.5721 VTF=10.425 ITF=6.8697E-2 TR=1.000E-8 XTB=1.45 EG=0.82 FC=0.5 Vceo=250V ICrating=17A mfg=fairchild
.MODEL FZT790A PNP IS=1.09684p NF=1.0102 BF=650 IKF=1.7 NK=0.75 VAF=23.5 ISE=9.88593E-14 NE=1.47256 NR=1.00391 BR=270 IKR=0.2 VAR=30 ISC=5.4933E-14 NC=1.07427 RB=0.055 RE=0.049 RC=0.078 CJC=96p MJC=0.495 VJC=0.67 CJE=275p TF=0.75n TR=10.8n XTB=1.4 TRE1=.0025 TRB1=.0025 TRC1=.0025 Vceo=45 Icrating=2 mfg=Zetex
.MODEL FCX790A PNP IS=1.09684p NF=1.0102 BF=650 IKF=1.7 NK=0.75 VAF=23.5 ISE=9.88593E-14 NE=1.47256 NR=1.00391 BR=270 IKR=0.2 VAR=30 ISC=5.4933E-14 NC=1.07427 RB=0.055 RE=0.049 RC=0.078 CJC=96p MJC=0.495 VJC=0.67 CJE=275p TF=0.75n TR=10.8n XTB=1.4 TRE1=.0025 TRB1=.0025 TRC1=.0025 Vceo=45 Icrating=2 mfg=Zetex
.MODEL ZTX869 NPN IS=1.9p BF=600 IKF=9 VAF=40 ISE=3.752E-13 NE=1.399 NR=1 BR=370 IKR=6 VAR=18 ISC=4.135E-13 NC=1.384 RB=1 RBM=0.01 IRB=1 RE=0.01 RC=0.02 CJC=215p MJC=0.3917 VJC=0.5871 CJE=910.3p MJE=0.3826 VJE=0.7686 TF=1.15n TR=4.01n Vceo=25 Icrating=7 mfg=Zetex
.model ZTX849 NPN(IS=5.8591E-13 NF=0.9919 BF=230 IKF=18 VAF=90 ISE=2.0067E-13 NE=1.4 NR=0.9908 BR=180 IKR=6.8 VAR=20 ISC=5.3E-13 NC=1.46 RB=0.023 RE=0.0223 RC=0.015 CJC=200E-12 MJC=0.3006 VJC=0.3532 CJE=1.21E-9 TF=1.07E-9 TR=9.3E-9 Vceo=30 Icrating=7 mfg=Zetex)
.MODEL FZT869 NPN IS=1.9p BF=600 IKF=9 VAF=40 ISE=3.752E-13 NE=1.399 NR=1 BR=370 IKR=6 VAR=18 ISC=4.135E-13 NC=1.384 RB=1 RBM=0.01 IRB=1 RE=0.01 RC=0.02 CJC=215p MJC=0.3917 VJC=0.5871

CJE=910.3p MJE=0.3826 VJE=0.7686 TF=1.15n TR=4.01n Vceo=25 Icrating=7 mfg=Zetex
.MODEL FZT1147A PNP IS=1.272p NF=0.989 ISE=2.5e-13 NE=1.65 BF=500 VAF=14.59 IKF=8 NR=1 ISC=8e-14 NC=1.6 BR=90 VAR=3.1 IKR=1.2 RE=15m RB=145m RC=13m CJE=560p CJC=255p VJC=0.6288 MJC=0.4048 TF=1.2n TR=13n Vceo=12 Icrating=5 mfg=Zetex
.MODEL FZT968 PNP IS=3.58p NF=1.015 BF=500 IKF=11 VAF=11.4 ISE=1.576E-13 NE=1.42 NR=1.01 BR=245 IKR=1.4 VAR=8.4 ISC=1.48E-11 NC=1.637 RB=0.024 RE=0.0164 RC=0.0235 CJC=438p MJC=0.361 VJC=0.673 CJE=1.05n TF=1.38n TR=2.3n Vceo=12 Icrating=6 mfg=Zetex
.MODEL FMMT458 NPN IS=5.32E-14 NF=1 BF=230 IKF=1.5 VAF=1500 ISE=2.1E-14 NE=1.385 NR=1.05 BR=8 IKR=0.7 VAR=64 ISC=6.42p NC=1.25 RB=0.5 RE=0.224 RC=0.134 QUASIMOD=1 RCO=80 GAMMA=4E-7 CJC=9.5p MJC=0.32 VJC=0.4 CJE=115p MJE=0.37 VJE=0.8 TF=1.3n TR=16u TRC1=.004 TRB1=.004 TRE1=.004 XTB=1.4 Vceo=400 Icrating=225m mfg=Zetex
.MODEL FMMT624 NPN IS=6.855E-13 NF=1.0037 BF=540 IKF=0.95 VAF=231 ISE=2.23E-13 NE=1.4195 NR=1.0024 BR=100 IKR=2 VAR=61 ISC=3p NC=1.2276 RB=0.036 RE=0.065 RC=0.1 CJC=28p MJC=0.4348 VJC=0.4934 CJE=207p TF=0.85n TR=49n Vceo=125 Icrating=1 mfg=Zetex
.MODEL FMMT717 PNP IS=5.5E-13 BF=500 IKF=3 VAF=14.93 ISE=1.75E-13 NE=1.5 NR=1 BR=280 IKR=0.3 VAR=5.64 ISC=6.01E-13 NC=1.34 RB=0.3 RE=0.03 RC=0.025 CJC=116.9p MJC=0.3456 VJC=0.4576 CJE=223.6p MJE=0.4803 VJE=0.9091 TF=1.2n TR=2n Vceo=12 Icrating=2.5 mfg=Zetex
.MODEL FMMT718 PNP IS=6.8E-13 BF=480 IKF=2 VAF=23 ISE=0.8E-13 NE=1.5567 NR=1 BR=70 IKR=0.4 VAR=7 ISC=7.5E-14 NC=1.19 RB=0.085 RE=0.04 RC=0.045 CJC=70.02p MJC=0.4685 VJC=0.7714 CJE=203.6p MJE=0.5029 VJE=0.9403 TF=0.71n TR=23.7n Vceo=20 Icrating=1.5 mfg=Zetex
.MODEL FMMT723 PNP IS=5.5E-13 BF=440 IKF=1 VAF=50.88 ISE=1.554E-13 NE=1.477 NR=1.03 BR=30 IKR=0.7 VAR=13.79 ISC=1.3p NC=1.198 RB=1.5 RE=0.02 RC=0.14 CJC=45.74p MJC=0.4889 VJC=0.711 CJE=204.3p MJE=0.5105 VJE=0.9711 TF=0.63n TR=95n Vceo=100 Icrating=1 mfg=Zetex
.MODEL FMMT617 NPN IS=5.92E-13 BF=500 IKF=5 VAF=34.6 ISE=1.27E-13 NE=1.425 NR=1 BR=280 IKR=2 VAR=12.25 ISC=6.138E-13 NC=1.46 RB=0.1 RE=0.025 RC=0.017 CJC=76p MJC=0.2981 VJC=0.4414 CJE=230p MJE=0.3569 VJE=0.7042 TF=1.12n TR=2.15n Vceo=15 Icrating=3 mfg=Zetex
.MODEL FMMT497 NPN IS=5E-14 NF=1 BF=250 IKF=500m VAF=1020 ISE=2.5E-14 NE=1.38 RCO=60 GAMMA=10E-7 NR=1 BR=5 IKR=0 VAR=55 ISC=5p NC=1.31 RB=3 RE=0.05 RC=0.05 QUASIMOD=1 CJC=10.95p MJC=0.265 VJC=0.3905 CJE=125.2p TF=0.6n TR=0.66e-6 XTB=1.4 Vceo=300 Icrating=500m mfg=Zetex
.MODEL FMMT459 NPN IS=4E-14 NF=1 BF=130 VAF=1000 ISE=4E-13 NE=1.59 RCO=60 GAMMA=1E-7 NR=1 BR=10 VAR=100 ISC=1e-10 NC=1.6 IKR=30m RB=1 RE=.1 RC=.1 CJC=9p MJC=0.36 VJC=0.51 CJE=99p MJE=0.42 VJE=0.88 TF=2n TR=1.2e-6 XTB=1.5 QUASIMOD=1 Vceo=450 Icrating=150m mfg=Zetex
.MODEL ZXTN2007G NPN IS=1.5p NF=1 BF=210 IKF=8 VAF=100 ISE=7.5E-13 NE=1.39 NR=1 BR=120 IKR=5 VAR=25 ISC=0.9p NC=1.37 RC=5m TRC1=3m RB=0.3 TRB1=6m RE=24m TRE1=3m CJC=110p MJC=0.44 VJC=0.65 CJE=650p TF=0.8n TR=9n XTB=1.4 Vceo=30 Icrating=7 mfg=Zetex
.MODEL ZTX751 PNP IS=2.715E-13 BF=170 VAF=70 NF=1.004 IKF=2.75 ISE=1E-13 NE=1.535 BR=23 VAR=40 NR=1.005 IKR=.55 ISC=5.15E-14 NC=1.13 RB=.07 RE=.065 RC=.085 CJE=360p TF=.94n CJC=90p TR=60n VJC=.705 MJC=.46 Vceo=60 Icrating=2 mfg=Zetex
.model BCX54 npn is=3.06f bf=1.29e+02 nf=8.55e-01 vaf=7.24e+02 ikf=9.06e-01 ise=1.62e-16 ne=1 br=2.92 nr=9.10e-01 var=5.46e+01 ikr=1 isc=4.08e-14 nc=1 rb=1.65e+01 irb=2.38e-02 rbm=1.73e-02 re=1.26e-02 rc=3.11e-01 cje=1.17e-10 vje=3.00e-01 mje=4.22e-01 tf=1.42n xtf=7.75e-01 vtf=9.99e+05 itf=5.64e-01 cjc=4.85e-11 vjc=3.00e-01 mjc=5.09e-01 tr=1u xtb=0 eg=1.11 xti=3 fc=0.5 Vceo=45 Icrating=1 mfg=Philips
.model BCP54-16 npn is=6.119e-14 bf=130.4 nf=0.9948 vaf=54.27 ikf=0.8 ise=5.844f ne=1.469 br=14.53 nr=0.9905 var=30 ikr=0.2049 isc=1.342e-13 nc=1.183 rb=0.5 irb=1e-06 rbm=0.5 re=0.1114 rc=0.082 cje=1.234e-10 vje=0.6917 mje=0.338 tf=6.543e-10 xtf=223.8 vtf=1.892 itf=10 cjc=3.49e-11 vjc=0.5 mjc=0.388 xcjc=0.15 tr=999n xtb=0 eg=1.11 xti=3 fc=0.9232 Vceo=45 Icrating=1 mfg=Philips
.MODEL FJP5027 NPN IS=1.62181E-13 NF=0.966 ISE=3.01995p NE=1.5 BF=30.1 IKF=0.88539 VAF=9.00825 NR=0.998 ISC=2.089896p NC=1.164 BR=1.085 IKR=0.0145053 VAR=4.88051 RB=163.0 IRB=1.20226u RBM=0.307 RE=0.008 RC=0.01 XTB=1.1074 EG=1.1571 XTI=3 CJE=2.54n VJE=0.637 MJE=0.335 CJC=2.39E-10 VJC=0.426 MJC=0.428 XCJC=0.4785 FC=0.5 TF=8.6753n XTF=10 VTF=10 ITF=1 TR=1.0000E-8 Vceo=800 Icrating=10 mfg=fairchild
.MODEL FJPF5027 NPN IS=1.62181E-13 NF=0.966 ISE=3.01995p NE=1.5 BF=30.1 IKF=0.88539 VAF=9.00825 NR=0.998 ISC=2.089896p NC=1.164 BR=1.085 IKR=0.0145053 VAR=4.88051 RB=163.0 IRB=1.20226u RBM=0.307 RE=0.008 RC=0.01 XTB=1.1074 EG=1.1571 XTI=3 CJE=2.54n VJE=0.637 MJE=0.335 CJC=2.39E-10 VJC=0.426 MJC=0.428 XCJC=0.4785 FC=0.5 TF=8.6753n XTF=10 VTF=10 ITF=1 TR=1.0000E-8 Vceo=800 Icrating=10 mfg=fairchild
.MODEL KSC5027 NPN IS=1.62181E-13 NF=0.966 ISE=3.01995p NE=1.5 BF=30.1 IKF=0.88539 VAF=9.00825 NR=0.998 ISC=2.089896p NC=1.164 BR=1.085 IKR=0.0145053 VAR=4.88051 RB=163.0 IRB=1.20226u RBM=0.307 RE=0.008 RC=0.01 XTB=1.1074 EG=1.1571 XTI=3 CJE=2.54n VJE=0.637 MJE=0.335 CJC=2.39E-10 VJC=0.426 MJC=0.428 XCJC=0.4785 FC=0.5 TF=8.6753n XTF=10 VTF=10 ITF=1 TR=1.0000E-8 Vceo=800 Icrating=10

mfg=fairchild
.MODEL BD140 PNP (IS=2.9537E-13 BF=201.4 NF=1.0 BR=23.765 NR=1.021 ISE=1.8002E-13 NE=1.5 ISC=7.0433p NC=1.38 VAF=137.0 VAR=8.41 IKF=1.0993 IKR=0.10 RB=1.98 RBM=0.01 IRB=0.011 RE=0.1109 RC=0.01 CJE=2.1982E-10 VJE=0.7211 MJE=0.3685 FC=0.5 CJC=6.8291E-11 VJC=0.5499 MJC=0.3668 XCJC=0.5287 XTB=1.4883 EG=1.2343 XTI=3 Vceo=80 Icrating=3 mfg=fairchild)
.MODEL BD139 NPN (IS=2.3985E-13 BF=244.9 NF=1.0 BR=78.11 NR=1.007 ISE=1.0471E-14 NE=1.2 ISC=1.9314E-11 NC=1.45 VAF=98.5 VAR=7.46 IKF=1.1863 IKR=0.1445 RB=2.14 RBM=0.001 IRB=0.031 RE=0.0832 RC=0.01 CJE=2.92702E-10 VJE=0.67412 MJE=0.3300 FC=0.5 CJC=4.8831E-11 VJC=0.5258 MJC=0.3928 XCJC=0.5287 XTB=1.1398 EG=1.2105 XTI=3 Vceo=80 Icrating=3 mfg=fairchild)
.MODEL BD139_ NPN(IS=1n BF=222.664 NF=0.85 VAF=36.4079 IKF=0.166126 ISE=5.03418n NE=1.45313 BR=1.35467 NR=1.33751 VAR=142.931 IKR=1.66126 ISC=5.02557n NC=3.10227 RB=26.9143 IRB=0.1 RBM=0.1 RE=0.000472454 RC=1.04109 XTB=0.727762 XTI=1.04311 EG=1.05 CJE=1e-11 VJE=0.75 MJE=0.33 TF=1e-09 XTF=1 VTF=10 ITF=0.01 CJC=1e-11 VJC=0.75 MJC=0.33 XCJC=0.9 FC=0.5 TR=1e-07 PTF=0 VCEO=80 ICRATING=1A MFG=PHILIPS)
.MODEL MJE13003 npn IS=3.38476e-13 BF=70.4395 NF=1.46002 VAF=713.551 IKF=0.2266 ISE=2.74992e-11 NE=2.22158 BR=3.83365 NR=1.38008 VAR=126.023 IKR=0.100002 ISC=9.43838e-14 NC=2.29404 RB=10 IRB=0.2 RBM=10 RE=0.0001 RC=0.061224 XTB=1.35204 XTI=3.03161 EG=1.206 CJE=4.7174e-10 VJE=0.43016 MJE=0.295041 TF=1e-08 XTF=1.76126 VTF=4.70624 ITF=0.001 CJC=7.38617e-11 VJC=0.4 MJC=0.359328 XCJC=0.794116 FC=0.8 TR=3.2234u Vceo=400 Icrating=1.5
.model 13003 npn Is=0f3 Bf=16 Nf=0.98 Vaf=300 Ikf=3.45 Nk=0.84 Br=0.63 Var=493 Ikr=2.45 Bvbe=7 Ise=0f54 Ne=1.24 Isc=5f7 Nc=2.54 Rb=1.54 Irb=0.2 Rbm=88m Re=8m Rc=217m Cjc=5p6 Vjc=0.90 Mjc=0.28 Cje=35p Vje=0.68 Mje=0.33 Fc=0.56 Tf=17n Itf=0m192 Vtf=13.7 Xtf=5.46 Tr=0u1 Gamma=19p Qco=4n5 Rco=1.5 Vo=15
.MODEL MMBT6428 npn IS=2.04174p BF=248.7 NF=1 BR=0.0275 NR=1 ISE=4.7544E-13 NE=2 ISC=2.29087f NC=1.5 VAF=176.831 VAR=35.3 IKF=0.544627 IKR=0.158489 RB=125 RBM=8.092 IRB=1.12202E-7 RE=0.28 RC=2.4 CJE=8.50889p VJE=0.7175263 MJE=0.3413777 FC=0.5 CJC=6.03462p VJC=0.5 MJC=0.3226407 XTB=1.26 EG=0.84 XTI=3 TF=8.73n Vceo=50 Icrating=0.5 mfg=fairchild)
.MODEL AC127 NPN(IS=5u ISC=5u ISE=600n IKF=300m ITF=300m NC=2 NE=2 BF=160 BR=5 RB=100 RC=1.5 vaf=50 var=50 CJC=200p CJE=60p TR=3u TF=60n FC=0.5 eg=0.72 VJC=0.4 VJE=0.4 VTF=4 MJC=0.333 MJE=0.333 XTB=1.5 XTF=6 XTI=3 Vceo=12 Icrating=300m MFG=GERMANIUM-TYPE)
.MODEL AC128 PNP(IS=5u ISC=1u ISE=200n IKF=3 ITF=1 NC=2 NE=1.5 BF=90 BR=5 RB=7 RC=0.2 RE=0.1 vaf=40 var=40 CJC=250p CJE=80p TR=5u TF=150n FC=0.5 eg=0.72 VJC=0.4 VJE=0.4 VTF=4 MJC=0.333 MJE=0.333 XTB=1.5 XTF=6 XTI=3 Vceo=16 Icrating=1 MFG=GERMANIUM-TYPE)
.MODEL GEBJTPNP PNP(IS=120.8N BF=85 NF=1 VAF=102.207 IKF=9.981M ISE=0.435N NE=1.200 BR=20.000 NR=1 VAR=20 IKR=1.248M ISC=120.8N NC=1.200 RB=173.312 IRB=5U RBM=43.328 RE=20 RC=60 CJE=6P VJE=0.4 MJE=0.4 TF=0.15U XTF=9.996 VTF=2 ITF=9.983M PTF=1 CJC=3.75P VJC=0.6 MJC=0.330 XCJC=0.650 TR=2.865U XTB=1.000 EG=0.670 XTI=4.000 KF=5.000F AF=1.000 FC=0.750 MFG=GERMANIUM-TYPE)
.model Q2N2193A NPN(Is=14.1f Vaf=100 Bf=88.85 Ikf=.75 Nk=.5 Xtb=1.5 Br=5.591 Nc=2 Rc=.7 Cjc=15.65p Mjc=.3603 Vjc=.75 Fc=.5 Cje=55.06p Mje=.1553 Vje=.75 Tr=34.18n Tf=808.1p Itf=1.2 Xtf=55 Vtf=5)
.model 2N2222 NPN(IS=1E-14 VAF=100 BF=200 IKF=0.3 XTB=1.5 BR=3 CJC=8E-12 CJE=25E-12 TR=100E-9 TF=400E-12 ITF=1 VTF=2 XTF=3 RB=10 RC=.3 RE=.2 Vceo=30 Icrating=800m mfg=NXP)
.MODEL 2N2222_ NPN (IS=61f NF=1 BF=410 VAF=114 IKF=0.121 ISE=14.8p NE=2 BR=4.00 NR=1 VAR=24 IKR=0.3 RE=0.269 RB=1.08 RC=0.108 XTB=1.5 CJE=27.6p VJE=1.10 MJE=0.5 CJC=15p VJC=0.3 MJC=0.3 TF=496p TR=84.1n EG=1.12)
.MODEL PZT2907A PNP IS=4.43E-14 NF=0.9912 ISE=1.088E-14 NE=1.778 BF=247 IKF=0.505 VAF=46.5 NR=0.9921 ISC=7.13f NC=1.08 BR=17.69 IKR=0.06 VAR=14 RB=34 IRB=0.00015 RBM=2.5 RE=0.1092 RC=0.25 XTB=0 EG=1.11 XTI=3 CJE=3.37E-11 VJE=0.8967 MJE=0.4354 TF=4.9E-10 XTF=4 VTF=10 ITF=0.7 CJC=2.203E-11 VJC=0.9 MJC=0.4495 XCJC=0.6 TR=8n FC=0.999 Vceo=40 Icrating=600m mfg=NXP
.model 2N2907 PNP(IS=1E-14 VAF=120 BF=250 IKF=0.3 XTB=1.5 BR=3 CJC=8E-12 CJE=30E-12 TR=100E-9 TF=400E-12 ITF=1 VTF=2 XTF=3 RB=10 RC=.3 RE=.2 Vceo=40 Icrating=600m mfg=NXP)
.model 2N3904 NPN(IS=1E-14 VAF=100 Bf=300 IKF=0.4 XTB=1.5 BR=4 CJC=4E-12 CJE=8E-12 RB=20 RC=0.1 RE=0.1 TR=250E-9 TF=350E-12 ITF=1 VTF=2 XTF=3 Vceo=40 Icrating=200m mfg=NXP)
.model 2N3904-pSpice NPN Is=6.734f Xti=3 Eg=1.11 Vaf=74.03 Bf=416.4 Ne=1.259 Ise=6.734f Ikf=66.78m Xtb=1.5 Br=.7371 Nc=2 Isc=0 Ikr=0 Rc=1 Cjc=3.638p Mjc=.3085 Vjc=.75 Fc=.5 Cje=4.493p Mje=.2593 Vje=.75 Tr=239.5n Tf=301.2p Itf=.4 Vtf=4 Xtf=2 Rb=10 Vceo=40 Icrating=200m
.MODEL 2N3904-springer npn IS=6.9716e-14 BF=545.416 NF=1.09328 VAF=10 IKF=0.0228393 ISE=5.71808e-12 NE=1.88204 BR=4.70256 NR=1.3912 VAR=2.31769 IKR=0.074093 ISC=5.71808e-12 NC=1.36259 RB=1.733 IRB=1.12054 RBM=0.876202 RE=0.356192 RC=1.78096 XTB=0.1 XTI=1 EG=1.05 CJE=4.47982e-12 VJE=0.4 MJE=0.240345 TF=4e-10 XTF=1.5 VTF=1 ITF=1 CJC=3.76637e-12 VJC=0.4 MJC=0.241382 XCJC=0.8 FC=0.533333 CJS=0 VJS=0.75 MJS=0.5 Vceo=40 Icrating=200m
.MODEL 2n3904-OnSemi npn IS=1.26532e-10 BF=206.302 NF=1.5 VAF=1000 IKF=0.0272221 ISE=2.30771e-09

NE=3.31052 BR=20.6302 NR=2.89609 VAR=9.39809 IKR=0.272221 ISC=2.30771e-09 NC=1.9876 RB=5.8376 IRB=50.3624 RBM=0.634251 RE=0.0001 RC=2.65711 XTB=0.1 XTI=1 EG=1.05 CJE=4.64214e-12 VJE=0.4 MJE=0.256227 TF=4.19578e-10 XTF=0.906167 VTF=8.75418 ITF=0.0105823 CJC=3.76961e-12 VJC=0.4 MJC=0.238109 XCJC=0.8 FC=0.512134 CJS=0 VJS=0.75 MJS=0.5 TR=6.82023e-08 PTF=0 KF=0 AF=1 Vceo=40 Icrating=200m
.MODEL 2n3904T NPN(IS=4.1799f BF=215.38 VAF=79.874 IKF=.88689 ISE=4.2698f NE=1.9988 BR=4.8050 VAR=100 IKR=.54262 ISC=2.5346p NC=1.4324 NK=1.3890 RB=14.616 RC=.53092 CJE=9.4850p MJE=.33333 CJC=7.6517p MJC=.33333 TF=481.51p XTF=10 VTF=10 ITF=1 TR=124.93n Vceo=40 Icrating=600m mfg=Philips)
.model PZT3906 PNP(IS=1E-14 VAF=100 BF=200 IKF=0.4 XTB=1.5 BR=4 CJC=4.5E-12 CJE=10E-12 RB=20 RC=0.1 RE=0.1 TR=250E-9 TF=350E-12 ITF=1 VTF=2 XTF=3 Vceo=40 Icrating=200m mfg=NXP)
.model 2N3906 PNP(IS=1E-14 VAF=100 BF=200 IKF=0.4 XTB=1.5 BR=4 CJC=4.5E-12 CJE=10E-12 RB=20 RC=0.1 RE=0.1 TR=250E-9 TF=350E-12 ITF=1 VTF=2 XTF=3 Vceo=40 Icrating=200m mfg=NXP)
.model FZT849 NPN(IS=5.8591E-13 NF=0.9919 BF=230 IKF=18 VAF=90 ISE=2.0067E-13 NE=1.4 NR=0.9908 BR=180 IKR=6.8 VAR=20 ISC=5.3E-13 NC=1.46 RB=0.023 RE=0.0223 RC=0.015 CJC=200E-12 MJC=0.3006 VJC=0.3532 CJE=1.21E-9 TF=1.07E-9 TR=9.3E-9 Vceo=30 Icrating=7 mfg=Zetex) ; (C) 1993 ZETEX PLC, Last revision 14/3/97
.model ZTX1048A NPN(IS=13.73E-13 NF=1.0 BF=550 IKF=8.0 VAF=120 ISE=2.6E-13 NE=1.38 NR=1.0 BR=300 IKR=6 VAR=15 ISC=1.6E-12 NC=1.4 RB=0.1 RE=0.022 RC=0.010 CJC=136E-12 CJE=559.1E-12 MJC=0.267 MJE=0.299 VJC=0.420 VJE=0.533 TF=600E-12 TR=3E-9 Vceo=17.5 Icrating=5 mfg=Zetex) ; (C) 1994 ZETEX PLC, Last revision 20/01/95
.model 2N4124 NPN(Is=6.734f Xti=3 Eg=1.11 Vaf=74.03 Bf=495 Ne=1.28 Ise=6.734f Ikf=69.35m Xtb=1.5 Br=.7214 Nc=2 Isc=0 Ikr=0 Rc=1 Cjc=3.638p Mjc=.3085 Vjc=.75 Fc=.5 Cje=4.493p Mje=.2593 Vje=.75 Tr=238.3n Tf=301.3p Itf=.4 Vtf=4 Xtf=2 Rb=10 Vceo=25 Icrating=200m mfg=Fairchild)
.model 2N4126 PNP(Is=1.41f Xti=3 Eg=1.11 Vaf=18.7 Bf=203.7 Ne=1.5 Ise=0 Ikf=80m Xtb=1.5 Br=4.924 Nc=2 Isc=0 Ikr=0 Rc=2.5 Cjc=9.728p Mjc=.5776 Vjc=.75 Fc=.5 Cje=8.063p Mje=.3677 Vje=.75 Tr=33.23n Tf=179.3p Itf=.4 Vtf=4 Xtf=6 Rb=10 Rb=10 Vceo=25 Icrating=200m mfg=Fairchild)
.MODEL 2N4125 PNP(IS=1.41f ISE=0 ISC=0 XTI=3 BF=85.04 BR=5.576 IKF=80m IKR=0 XTB=1.5 VAF=18.7 VAR=6.5 VJE=0.65 VJC=0.65 RE=0.15 RC=2.5 RB=10 CJE=8.063p CJC=9.728p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.5 NC=2 MJE=0.3677 MJC=0.5776 TF=179.3p TR=35.25E-9 ITF=0.4 VTF=4 XTF=6 EG=1.11 KF=1E-9 AF=1 VCEO=30 ICrating=200M MFG=NSC)
.MODEL 2N4126_ PNP(IS=3.18E-13 ISE=1.20E-13 ISC=1.29E-13 XTI=3.00 BF=2.52E2 BR=5.00E1 IKF=2.93E-2 IKR=1.00 XTB=1.5 VAF=3.49E1 VAR=1.86E1 VJE=3.00E-1 VJC=3.00E-1 RE=1.00E-2 RC=1.44 RB=4.06E1 RBM=4.87 IRB=9.90m CJE=1.01E-11 CJC=7.17p XCJC=1.00 FC=5.00E-1 NF=1.17 NR=1.13 NE=1.75 NC=1.29 MJE=3.91E-1 MJC=4.05E-1 TF=179.3p TR=33.23E-9 PTF=0 ITF=3.22m VTF=9.99E5 XTF=2.73 EG=1.11 KF=1E-9 AF=1 VCEO=25 ICrating=200M MFG=Siemens)
.model 2N3391A NPN(Is=12.03f Xti=3 Eg=1.11 Vaf=37.37 Bf=427.8 Ne=1.971 Ise=2.953p Ikf=.1072 Xtb=1.5 Br=4.379 Nc=2 Isc=0 Ikr=0 Rc=1 Cjc=5.777p Mjc=.3199 Vjc=.75 Fc=.5 Cje=8.307p Mje=.384 Vje=.75 Tr=701.7p Tf=385.4p Itf=.17 Vtf=3 Xtf=8 Rb=10 Vceo=25 Icrating=500m mfg=Fairchild)
.model 2N5089 NPN(Is=5.911f Xti=3 Eg=1.11 Vaf=62.37 Bf=1.434K Ne=1.421 Ise=5.911f Ikf=15.4m Xtb=1.5 Br=1.262 Nc=2 Isc=0 Ikr=0 Rc=1.61 Cjc=4.017p Mjc=.3174 Vjc=.75 Fc=.5 Cje=4.973p Mje=.4146 Vje=.75 Tr=4.671n Tf=822.3p Itf=.35 Vtf=4 Xtf=7 Rb=10 Vceo=25 Icrating=100m mfg=Fairchild)
.model mmbt5089 NPN(Is=5.911f Xti=3 Eg=1.11 Vaf=62.37 Bf=1.434K Ne=1.421 Ise=5.911f Ikf=15.4m Xtb=1.5 Br=1.262 Nc=2 Isc=0 Ikr=0 Rc=1.61 Cjc=4.017p Mjc=.3174 Vjc=.75 Fc=.5 Cje=4.973p Mje=.4146 Vje=.75 Tr=4.671n Tf=822.3p Itf=.35 Vtf=4 Xtf=7 Rb=10 Vceo=25 Icrating=100m mfg=Fairchild)
.model 2N5210 NPN(Is=5.911f Xti=3 Eg=1.11 Vaf=62.37 Bf=809.9 Ne=1.358 Ise=5.911f Ikf=14.26m Xtb=1.5 Br=1.287 Nc=2 Isc=0 Ikr=0 Rc=1.61 Cjc=4.017p Mjc=.3174 Vjc=.75 Fc=.5 Cje=4.973p Mje=.4146 Vje=.75 Tr=4.68n Tf=820.9p Itf=.35 Vtf=4 Xtf=7 Rb=10 Vceo=50 Icrating=100m mfg=Fairchild)
.model 2N5087 PNP(Is=6.734f Xti=3 Eg=1.11 Vaf=45.7 Bf=254.1 Ne=1.741 Ise=6.734f Ikf=.1962 Xtb=1.5 Br=2.683 Nc=2 Isc=0 Ikr=0 Rc=1.67 Cjc=6.2p Mjc=.301 Vjc=.75 Fc=.5 Cje=7.5p Mje=.2861 Vje=.75 Tr=10.1n Tf=467.8p Itf=.17 Vtf=5 Xtf=8 Rb=10 Vceo=50 Icrating=100m mfg=Fairchild)
.model 2N2219A NPN(Is=14.34f Xti=3 Eg=1.11 Vaf=74.03 Bf=255.9 Ne=1.307 Ise=14.34f Ikf=.2847 Xtb=1.5 Br=6.092 Nc=2 Isc=0 Ikr=0 Rc=1 Cjc=7.306p Mjc=.3416 Vjc=.75 Fc=.5 Cje=22.01p Mje=.377 Vje=.75 Tr=46.91n Tf=411.1p Itf=.6 Vtf=1.7 Xtf=3 Rb=10 Vceo=40 Icrating=800m mfg=NXP)
.model 2N2905A PNP(Is=650.6E-18 Xti=3 Eg=1.11 Vaf=115.7 Bf=231.7 Ne=1.829 Ise=54.81f Ikf=1.079 Xtb=1.5 Br=3.563 Nc=2 Isc=0 Ikr=0 Rc=.715 Cjc=14.76p Mjc=.5383 Vjc=.75 Fc=.5 Cje=19.82p Mje=.3357 Vje=.75 Tr=111.3n Tf=603.7p Itf=.65 Vtf=5 Xtf=1.7 Rb=10 Vceo=60 Icrating=600m mfg=NXP)
.model 2N4401 NPN(Is=26.03f Xti=3 Eg=1.11 Vaf=90.7 Bf=4.292K Ne=1.244 Ise=26.03f Ikf=.2061 Xtb=1.5 Br=1.01 Nc=2 Isc=0 Ikr=0 Rc=.5 Cjc=11.01p Mjc=.3763 Vjc=.75 Fc=.5 Cje=24.07p Mje=.3641 Vje=.75 Tr=233.7n Tf=466.5p Itf=0 Vtf=0 Xtf=0 Rb=10 Vceo=40 Icrating=600m mfg=Fairchild)
.model 2N4403 PNP(Is=650.6E-18 Xti=3 Eg=1.11 Vaf=115.7 Bf=216.2 Ne=1.829 Ise=58.72f Ikf=1.079 Xtb=1.5

Br=3.578 Nc=2 Isc=0 Ikr=0 Rc=.715 Cjc=14.76p Mjc=.5383 Vjc=.75 Fc=.5 Cje=19.82p Mje=.3357 Vje=.75 Tr=111.6n Tf=603.7p Itf=.65 Vtf=5 Xtf=1.7 Rb=10 Vceo=40 Icrating=600m mfg=Fairchild)
.MODEL PZT4403 PNP IS=3.202E-14 NF=0.9778 ISE=3.543f NE=1.45 BF=226.9 IKF=0.55 VAF=50.66 NR=0.979 ISC=8.53f NC=1.09 BR=22.84 IKR=0.09 VAR=14 RB=28 IRB=0.00021 RBM=2.5 RE=0.11 RC=0.2467 XTB=0 EG=1.11 XTI=3 CJE=3.539E-11 VJE=0.8759 MJE=0.4257 TF=5.109E-10 XTF=5 VTF=7 ITF=0.7 PTF=12 CJC=2.452E-11 VJC=0.9 MJC=0.546 XCJC=0.601 TR=1.6E-08 FC=0.999 Vceo=40 Icrating=600m mfg=NXP
.model 2N5550 NPN(Is=2.511f Xti=3 Eg=1.11 Vaf=100 Bf=213.4 Ne=1.241 Ise=2.511f Ikf=.3495 Xtb=1.5 Br=3.24 Nc=2 Isc=0 Ikr=0 Rc=1 Cjc=4.883p Mjc=.3047 Vjc=.75 Fc=.5 Cje=18.79p Mje=.3416 Vje=.75 Tr=1.212n Tf=560.1p Itf=50m Vtf=5 Xtf=8 Rb=10 Vceo=150 Icrating=600m mfg=Fairchild)
.model 2N5401 PNP(Is=21.48f Xti=3 Eg=1.11 Vaf=100 Bf=132.1 Ne=1.375 Ise=21.48f Ikf=.1848 Xtb=1.5 Br=3.661 Nc=2 Isc=0 Ikr=0 Rc=1.6 Cjc=17.63p Mjc=.5312 Vjc=.75 Fc=.5 Cje=73.39p Mje=.3777 Vje=.75 Tr=1.476n Tf=641.9p Itf=0 Vtf=0 Xtf=0 Rb=10 Vceo=150 Icrating=600m mfg=Fairchild)
.model 2N2369 NPN(Is=44.14f Xti=3 Eg=1.11 Vaf=100 Bf=78.32 Ne=1.389 Ise=91.95f Ikf=.3498 Xtb=1.5 Br=12.69m Nc=2 Isc=0 Ikr=0 Rc=.6 Cjc=2.83p Mjc=86.19m Vjc=.75 Fc=.5 Cje=4.5p Mje=.2418 Vje=.75 Tr=1.073u Tf=227.6p Itf=.3 Vtf=4 Xtf=4 Rb=10 Vceo=15 Icrating=200m mfg=NXP)
.model 2N5769 NPN(Is=44.14f Xti=3 Eg=1.11 Vaf=100 Bf=78.32 Ne=1.389 Ise=91.95f Ikf=.3498 Xtb=1.5 Br=12.69m Nc=2 Isc=0 Ikr=0 Rc=.6 Cjc=2.83p Mjc=86.19m Vjc=.75 Fc=.5 Cje=4.5p Mje=.2418 Vje=.75 Tr=1.073u Tf=227.6p Itf=.3 Vtf=4 Xtf=4 Rb=10 Vceo=15 Icrating=200m mfg=Fairchild)
.model 2N5769_ NPN(Is=44.14f Xti=3 Eg=1.11 Vaf=100 Bf=78.32 Ne=1.389 Ise=91.95f Ikf=50m Xtb=1.5 Br=1.365 Nc=2 Isc=0 Ikr=0 Rc=.6 Cjc=2.83p Mjc=86.19m Vjc=.75 Fc=.5 Cje=4.5p Mje=.2418 Vje=.75 Tr=1.073u Tf=227.6p Itf=.3 Vtf=4 Xtf=4 Rb=10 Vceo=15 Icrating=200m mfg=Fairchild)
.model 2N5771 PNP(Is=545.6E-18 Xti=3 Eg=1.11 Vaf=100 Bf=76.77 Ne=1.5 Ise=0 Ikf=50m Xtb=1.5 Br=1.365 Nc=2 Isc=0 Ikr=0 Rc=3.75 Cjc=2.77p Mjc=.1416 Vjc=.75 Fc=.5 Cje=2.65p Mje=.3083 Vje=.75 Tr=4.033n Tf=118.5p Itf=.5 Vtf=3 Xtf=6 Rb=10 Vceo=15 Icrating=200m mfg=Fairchild)
.model 2N5771_ PNP(Is=44.1f Xti=3 Eg=1.11 Vaf=100 Bf=76.77 Ne=1.389 Ise=91.95f Ikf=50m Xtb=1.5 Br=1.365 Nc=2 Isc=0 Ikr=0 Rc=3.75 Cjc=2.77p Mjc=.1416 Vjc=.75 Fc=.5 Cje=2.65p Mje=.3083 Vje=.75 Tr=4.033n Tf=118.5p Itf=.5 Vtf=3 Xtf=6 Rb=10 Vceo=15 Icrating=200m mfg=Fairchild)
.MODEL FJL6920 NPN IS=1.047p NF=0.996 ISE=2.878p NE=1.204 BF=23.7 IKF=7.65 VAF=5.37 NR=1.001 ISC=3.631p NC=1.03 BR=3.23 IKR=4.548 VAR=3.88 RB=94.4 IRB=4.397E-07 RBM=0.082 RE=0.015 RC=0.078 XTB=0.73 EG=1.21 XTI=3 CJE=1.38E-08 VJE=0.583 MJE=0.335 CJC=6.18E-10 VJC=0.284 MJC=0.343 XCJC=0.33 FC=0.5 Vceo=800 Icrating=20 mfg=Fairchild
.model 2N3055 NPN(Bf=73 Br=2.66 Rb=.81 Rc=.0856 Re=.000856 CJC=1000P PC=.75 MC=.33 Tr=.5703U Is=2.37E-8 CJE=415P PE=.75 ME=.5 TF=99.52N NE=1.26 IK=1 Vceo=60 Icrating=10 mfg=STMicro)
.model BCW60A NPN(IS=20f VAF=100 BF=120 IKF=0.8 XTB=1.5 BR=5 CJC=20p CJE=8p TR=100n TF=600p RB=10 RC=3 RE=1 Vceo=32 Icrating=200m mfg=Rohm)
.model BCW60B NPN(IS=20f VAF=80 BF=240 IKF=1.0 XTB=1.5 BR=5 CJC=20p CJE=8p TR=100n TF=600p RB=10 RC=3 RE=1 Vceo=32 Icrating=200m mfg=Rohm)
.model BCW60C NPN(IS=20f VAF=65 BF=360 IKF=1.3 XTB=1.5 BR=5 CJC=20p CJE=8p TR=100n TF=600p RB=10 RC=3 RE=1 Vceo=32 Icrating=200m mfg=Rohm)
.model BCW60D NPN(IS=20f VAF=45 BF=500 IKF=1.5 XTB=1.5 BR=5 CJC=20p CJE=8p TR=100n TF=600p RB=10 RC=3 RE=1 Vceo=32 Icrating=200m mfg=Rohm)
.model BCW68F PNP(Is=40f VAF=100 Bf=175 IKF=2 Br=6 RC=.5 RE=0.1 RB=0.2 CJC=13p CJE=60p TR=12n TF=600p Vceo=45 Icrating=800m mfg=ROHM)
.model BCW68G PNP(Is=40f VAF=80 Bf=280 IKF=2.5 Br=6 RC=.5 RE=0.1 RB=0.2 CJC=13p CJE=60p TR=12n TF=600p Vceo=45 Icrating=800m mfg=Rohm)
.model EndOfStdLib NPN mfg=StartOfCopirateNpnBjt
.model EndOfStd_Lib PNP mfg=StartOfCopiratePnpBjt
.MODEL 2N6726A PNP(IS=24.64f ISE=0 ISC=0 XTI=3 BF=154.5 BR=1.424 IKF=1.25 IKR=0 XTB=1.5 VAF=100 VAR=30 VJE=0.65 VJC=0.65 RE=0.06 RC=0.6 RB=10 CJE=132.4p CJC=63.67p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.5 NC=2 MJE=0.4174 MJC=0.4749 TF=645.4p TR=5.721n ITF=0.8 VTF=6 XTF=4.5 EG=1.11 VCEO=40 ICRATING=2 MFG=NSC)
.MODEL 2N6728A PNP(IS=9.348f ISE=12.45f ISC=0 XTI=3 BF=166.8 BR=8.369 IKF=10.29 IKR=0 XTB=1.5 VAF=100 VAR=30 VJE=0.65 VJC=0.65 RE=0.15 RC=0.38 RB=10 CJE=105.6p CJC=48p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.459 NC=2 MJE=0.4351 MJC=0.5152 TF=685.2p TR=1.021n ITF=0.3 VTF=4 XTF=10 EG=1.11 VCEO=60 ICRATING=2 MFG=NSC)
.MODEL 2SA1213 PNP(IS=2.6E-13 ISE=1.2E-13 ISC=12.04E-13 XTI=3 BF=210 BR=70 IKF=7 IKR=0.6 XTB=1.5 VAF=27 VAR=14 VJE=0.65 VJC=0.305 RE=0.065 RC=0.04 RB=0.3 CJE=410p CJC=140p XCJC=0.75 FC=0.5 NF=0.999 NR=0.982 NE=1.43 NC=1.4474 MJE=0.35 MJC=0.35 TF=0.65n TR=12n EG=1.11 VCEO=45V ICRATING=100M MFG=ZETEX)
.model BC211 NPN(Is=48f Xti=3 Eg=1.11 Vaf=45 Bf=203 Ise=50f Ne=1.5 Ikf=0 Nk=.7 Xtb=1.5 Br=5.5 Isc=48f Nc=2

Ikr=0 Rc=.7 Cjc=25p Mjc=.417 Vjc=.75 Fc=.5 Cje=85p Mje=.3431 Vje=.75 Tr=100n Tf=800p Itf=1.2 Xtf=10 Vtf=5 RCO=5 GAMMA=6E-8 QCO=1E-11)
.MODEL BC212A PNP(IS=1.149E-14 ISE=5E-14 ISC=1.43E-14 XTI=3 BF=330 BR=13 IKF=0.1 IKR=0.012 XTB=1.5 VAF=84.56 VAR=8.15 VJE=0.65 VJC=0.565 RE=0.4 RC=0.95 RB=0.2 CJE=16p CJC=10.5p XCJC=0.75 FC=0.5 NF=0.9872 NR=0.996 NE=1.4 NC=1.1 MJE=0.415 MJC=0.415 TF=0.493n TR=73.55n EG=1.11 VCEO=45V ICRATING=100M MFG=ZETEX)
.MODEL BC307A PNP(IS=1.149E-14 ISE=5E-14 ISC=1.43E-14 XTI=3 BF=330 BR=13 IKF=0.1 IKR=0.012 XTB=1.5 VAF=84.56 VAR=8.15 VJE=0.65 VJC=0.565 RE=0.4 RC=0.95 RB=0.2 CJE=16p CJC=10.5p XCJC=0.75 FC=0.5 NF=0.9872 NR=0.996 NE=1.4 NC=1.1 MJE=0.415 MJC=0.415 TF=0.493n TR=73.55n EG=1.11 VCEO=45V ICRATING=100M MFG=ZETEX)
.model BC313 PNP(Is=44.3f Xti=3 Eg=1.11 Vaf=62 Bf=200 Ise=44.3f Ne=1.5 Ikf=2 Nk=.7 Xtb=1.5 Br=10 Isc=0 Nc=2 Ikr=0 Rc=.5 Cjc=48p Mjc=.4218 Vjc=.75 Fc=.5 Cje=95p Mje=.3937 Vje=.75 Tr=120n Tf=1.1n Itf=.1 Xtf=.1 Vtf=5 RCO=3.5 GAMMA=2n QCO=1E-11)
.MODEL BC327S PNP(IS=0.230p ISE=39.284f ISC=0.118f XTI=4.800 BF=504.327 BR=23.0 IKF=0.780 IKR=0.195 XTB=1.700 VAF=26.0 VAR=4.500 VJE=1.0 VJC=1.0 RE=0.203 RC=0.262 RB=0.800 RBM=0.400 IRB=0.100m CJE=57.177p CJC=28.600p XCJC=0.650 FC=0.750 NF=1.0 NR=1.002 NE=1.944 NC=3.025 MJE=0.470 MJC=0.520 TF=0.664n TR=2.600n PTF=1.0 ITF=0.250 VTF=2.0 XTF=6.350 EG=1.110 MFG=SIEMENS)
.MODEL BC369P PNP(IS=2.105E-13 ISE=3.766f ISC=2.789E-11 XTI=3 BF=281.1 BR=45.67 IKF=2.834 IKR=0.344 XTB=1.5 VAF=44.23 VAR=7.259 VJE=0.8827 VJC=0.1427 RE=0.05919 RC=0.0262 RB=1 RBM=1 IRB=1E-06 CJE=2.046E-10 CJC=1.378E-10 XCJC=0.508 FC=0.309 NF=0.9952 NR=0.9869 NE=1.4 NC=2.447 MJE=0.448 MJC=0.3018 TF=7.919E-10 TR=1m2 ITF=0.409 VTF=2.332 XTF=1.397 EG=1.11 VCEO=25 ICRATING=500m MFG=PHILIPS)
.MODEL BC369S PNP(IS=7.82f ISE=3.05E-17 ISC=1.00E-17 XTI=3.00 BF=2.25E2 BR=9.96 IKF=5.88 IKR=1.00 XTB=1.5 VAF=1.00E2 VAR=5.00E1 VJE=5.03E-1 VJC=3.00E-1 RE=1.34E-1 RC=2.17E-2 RB=1.00E-2 RBM=1.00E-2 IRB=1.00E-6 CJE=3.28E-10 CJC=1.94E-10 .00 FC=5.00E-1 NF=8.54E-1 NR=8.80E-1 NE=1.00 NC=2.00 MJE=5.26E-1 MJC=4.03E-1 TF=1.39n TR=0 ITF=4.21E1 VTF=9.99E5 XTF=4.93E2 EG=1.11 VCEO=40 ICRATING=800M MFG=SIEMENS)
.MODEL BC416A PNP(IS=1.149E-14 ISE=5E-14 ISC=1.43E-14 XTI=3 BF=330 BR=13 IKF=0.1 IKR=0.012 XTB=1.5 VAF=84.56 VAR=8.15 VJE=0.65 VJC=0.565 RE=0.4 RC=0.95 RB=0.2 CJE=16p CJC=10.5p XCJC=0.75 FC=0.5 NF=0.9872 NR=0.996 NE=1.4 NC=1.1 MJE=0.415 MJC=0.415 TF=0.493n TR=73.55n EG=1.11 VCEO=45V ICRATING=100M MFG=ZETEX)
.MODEL BC557A PNP(IS=2.059E-14 ISE=2.971f ISC=1.339E-14 XTI=3 BF=227.3 BR=7.69 IKF=0.08719 IKR=0.07646 XTB=1.5 VAF=37.2 VAR=11.42 VJE=0.5912 VJC=0.1 RE=0.688 RC=0.6437 RB=1 RBM=1 IRB=1E-06 CJE=1.4E-11 CJC=1.113E-11 XCJC=0.6288 FC=0.7947 NF=1.003 NR=1.007 NE=1.316 NC=1.15 MJE=0.3572 MJC=0.3414 TF=7.046E-10 TR=1m2 ITF=0.1947 VTF=5.367 XTF=4.217 EG=1.11 VCEO=45 ICRATING=100M MFG=PHILIPS)
.model BC557B PNP(IS=3.83E-14 NF=1.008 ISE=1.22E-14 NE=1.528 BF=344.4 IKF=0.08039 VAF=21.11 NR=1.005 ISC=2.85E-13 NC=1.28 BR=14.84 IKR=0.047 VAR=32.02 RB=1 IRB=1.00E-06 RBM=1 RE=0.6202 RC=0.5713 XTB=0 EG=1.11 XTI=3 CJE=1.23E-11 VJE=0.6106 MJE=0.378 TF=5.60E-10 XTF=3.414 VTF=5.23 ITF=0.1483 PTF=0 CJC=1.08E-11 VJC=0.1022 MJC=0.3563 XCJC=0.6288 TR=1.00E-32 CJS=0 VJS=0.75 MJS=0.333 FC=0.8027 Vceo=45 Icrating=100m mfg=NXP)
.model BC557C PNP(IS=5.83E-14 NF=1.009 ISE=3.88E-15 NE=1.408 BF=516.7 IKF=0.08039 VAF=26.03 NR=1.006 ISC=4.01E-14 NC=1.313 BR=12.45 IKR=0.07238 VAR=6.717 RB=1 IRB=1.00E-06 RBM=1 RE=0.5685 RC=0.6257 XTB=0 EG=1.11 XTI=3 CJE=1.26E-11 VJE=0.3809 MJE=0.3545 TF=5.23E-10 XTF=4.339 VTF=5.425 ITF=0.1896 PTF=0 CJC=7.80E-12 VJC=0.5897 MJC=0.4569 XCJC=0.6288 TR=1.00E-32 CJS=0 VJS=0.75 MJS=0.333 FC=0.5729 Vceo=45 Icrating=100m mfg=NXP)
.MODEL BC559B PNP(IS=5.826E-14 ISE=3.884f ISC=4.014E-14 XTI=3 BF=516.7 BR=12.45 IKF=0.08039 IKR=0.07238 XTB=1.5 VAF=26.03 VAR=6.717 VJE=0.3809 VJC=0.5897 RE=0.5685 RC=0.6257 RB=1 RBM=1 IRB=1E-06 CJE=1.26E-11 CJC=7.798p XCJC=0.6288 FC=0.5729 NF=1.009 NR=1.006 NE=1.408 NC=1.313 MJE=0.3545 MJC=0.4569 TF=5.233E-10 TR=1m2 ITF=0.1896 VTF=5.425 XTF=4.339 EG=1.11 VCEO=45 ICRATING=100M MFG=PHILIPS)
.MODEL BC560A PNP(IS=1.149E-14 ISE=5E-14 ISC=1.43E-14 XTI=3 BF=330 BR=13 IKF=0.1 IKR=0.012 XTB=1.5 VAF=84.56 VAR=8.15 VJE=0.65 VJC=0.565 RE=0.4 RC=0.95 RB=0.2 CJE=16p CJC=10.5p XCJC=0.75 FC=0.5 NF=0.9872 NR=0.996 NE=1.4 NC=1.1 MJE=0.415 MJC=0.415 TF=0.493n TR=73.55n EG=1.11 VCEO=45V ICRATING=100M MFG=ZETEX)
.MODEL BC638 PNP(IS=4.60p ISE=1.99E-14 ISC=9.45E-17 XTI=3.00 BF=1.85E2 BR=4.28 IKF=9.69E-1 IKR=1.00 XTB=1.5 VAF=1.44E2 VAR=1.97E1 VJE=5.43E-1 VJC=3.62E-1 RE=1.00E-2 RC=2.62E-1 RB=4.84 RBM=1.00E1 IRB=1.62E-1 CJE=1.27E-10 CJC=8.00E-11 .00 FC=5.00E-1 NF=1.19 NR=1.23 NE=1.23 NC=2.00 MJE=4.94E-1 MJC=5.07E-1 TF=1.07n TR=0 ITF=4.53E-1 VTF=9.99E5 XTF=6.31E-1 EG=1.11 VCEO=40 ICRATING=800M MFG=SIEMENS)
.MODEL BC807P PNP(IS=1.08E-13 ISE=2.713E-14 ISC=5.062E-13 XTI=3 BF=385.7 BR=20.57 IKF=0.3603 IKR=0.054

XTB=1.5 VAF=31.29 VAR=11.62 VJE=0.8911 VJC=0.62 RE=0.1415 RC=0.2623 RB=1 RBM=0.5 IRB=1E-06 CJE=5.114E-11 CJC=2.656E-11 XCJC=0.459 FC=0.99 NF=0.99 NR=0.9849 NE=1.4 NC=1.295 MJE=0.4417 MJC=0.4836 TF=7.359E-10 TR=5.00E-08 ITF=0.4393 VTF=3.813 XTF=1.859 EG=1.11 MFG=PHILIPS)
.MODEL BC807S PNP(IS=0.230p ISE=39.284f ISC=0.118f XTI=4.800 BF=504.327 BR=23.0 IKF=0.780 IKR=0.195 XTB=1.700 VAF=26.0 VAR=4.500 VJE=1.0 VJC=1.0 RE=0.203 RC=0.262 RB=0.800 RBM=0.400 IRB=0.100m CJE=57.177p CJC=28.600p XCJC=0.650 FC=0.750 NF=1.0 NR=1.002 NE=1.944 NC=3.025 MJE=0.470 MJC=0.520 TF=0.664n TR=2.600n PTF=1.0 ITF=0.250 VTF=2.0 XTF=6.350 EG=1.110 MFG=SIEMENS)
.MODEL BCP51P PNP(IS=6.1530E-14 ISE=1.382E-16 ISC=6.480f XTI=3 BF=150.8 BR=8.074 IKF=1.225 IKR=0.3627 XTB=1.5 VAF=105.4 VAR=18.20 VJE=0.7300 VJC=0.6591 RE=5.562E-02 RC=0.1449 RB=2 RBM=2 IRB=1E-06 CJE=1.157E-10 CJC=5.264E-11 XCJC=0.4401 FC=0.9427 NF=0.9911 NR=0.9965 NE=1.089 NC=1.022 MJE=0.3751 MJC=0.4533 TF=8.666E-10 TR=2.75E-07 ITF=0.4581 VTF=3.008 XTF=1.231 EG=1.11 VCEO=40 ICRATING=800M MFG=PHILIPS)
.MODEL BCP51S PNP(IS=4.60p ISE=1.99E-14 ISC=9.45E-17 XTI=3.00 BF=1.85E2 BR=4.28 IKF=9.69E-1 IKR=1.00 XTB=1.5 VAF=1.44E2 VAR=1.97E1 VJE=5.43E-1 VJC=3.62E-1 RE=1.00E-2 RC=2.62E-1 RB=4.84 RBM=1.00E1 IRB=1.62E-1 CJE=1.27E-10 CJC=8.00E-11 .00 FC=5.00E-1 NF=1.19 NR=1.23 NE=1.23 NC=2.00 MJE=4.94E-1 MJC=5.07E-1 TF=1.07n TR=0 ITF=4.53E-1 VTF=9.99E5 XTF=6.31E-1 EG=1.11 VCEO=40 ICRATING=800M MFG=SIEMENS)
.MODEL BCP69P PNP(IS=2.105E-13 ISE=3.766f ISC=2.789E-11 XTI=3 BF=281.1 BR=45.67 IKF=2.834 IKR=0.344 XTB=1.5 VAF=44.23 VAR=7.259 VJE=0.8827 VJC=0.1427 RE=0.05919 RC=0.0262 RB=1 RBM=1 IRB=1E-06 CJE=2.046E-10 CJC=1.378E-10 XCJC=0.508 FC=0.309 NF=0.9952 NR=0.9869 NE=1.4 NC=2.447 MJE=0.448 MJC=0.3018 TF=7.919E-10 TR=1m2 ITF=0.409 VTF=2.332 XTF=1.397 EG=1.11 VCEO=40 ICRATING=800M MFG=PHILIPS)
.MODEL BCP69S PNP(IS=7.82f ISE=3.05E-17 ISC=1.00E-17 XTI=3.00 BF=2.25E2 BR=9.96 IKF=5.88 IKR=1.00 XTB=1.5 VAF=1.00E2 VAR=5.00E1 VJE=5.03E-1 VJC=3.00E-1 RE=1.34E-1 RC=2.17E-2 RB=1.00E-2 RBM=1.00E-2 IRB=1.00E-6 CJE=3.28E-10 CJC=1.94E-10 .00 FC=5.00E-1 NF=8.54E-1 NR=8.80E-1 NE=1.00 NC=2.00 MJE=5.26E-1 MJC=4.03E-1 TF=1.39n TR=0 ITF=4.21E1 VTF=9.99E5 XTF=4.93E2 EG=1.11 VCEO=40 ICRATING=800M MFG=SIEMENS)
.MODEL BCP70 PNP(IS=0.750p ISE=1.850f ISC=25.000f XTI=5.0 BF=228.200 BR=130 IKF=1.220 IKR=2.200 XTB=2.100 VAF=16.500 VAR=5.0 VJE=1.200 VJC=0.720 RE=35.000m RC=39.961m RB=0.500 RBM=0.300 IRB=10.000m CJE=0.295n CJC=0.228n XCJC=0.723 FC=0.500 NF=1.010 NR=1.007 NE=2.004 NC=1.078 MJE=0.600 MJC=0.320 TF=0.275n TR=0.100E-6 PTF=1.0 ITF=2.500 VTF=2.500 XTF=0.800 EG=1.120 MFG=SIEMENS)
.MODEL BCV62 PNP(IS=28.000f ISE=24.903f ISC=0.125p XTI=3.300 BF=284.436 BR=4.800 IKF=0.380 IKR=0.932 XTB=1.600 VAF=43.0 VAR=6.960 VJE=1.0 VJC=0.900 RE=0.300 RC=2.251 RB=2.200 RBM=1.500 IRB=0.100m CJE=11.800p CJC=8.700p XCJC=0.650 FC=0.750 NF=1.0 NR=1.005 NE=2.234 NC=2.074 MJE=0.435 MJC=0.600 TF=0.600n TR=2.604n PTF=1.0 ITF=0.314 VTF=2.0 XTF=6.500 EG=1.110 MFG=SIEMENS)
.MODEL BCW29 PNP(IS=1.149E-14 ISE=5E-14 ISC=1.43E-14 XTI=3 BF=330 BR=13 IKF=0.1 IKR=0.012 XTB=1.5 VAF=84.56 VAR=8.15 VJE=0.65 VJC=0.565 RE=0.4 RC=0.95 RB=0.2 CJE=16p CJC=10.5p XCJC=0.75 FC=0.5 NF=0.9872 NR=0.996 NE=1.4 NC=1.1 MJE=0.415 MJC=0.415 TF=0.493n TR=73.55n EG=1.11 VCEO=45V ICRATING=100M MFG=ZETEX)
.MODEL BCW61 PNP(IS=28.000f ISE=24.903f ISC=0.125p XTI=3.300 BF=284.436 BR=4.800 IKF=0.380 IKR=0.932 XTB=1.600 VAF=43.0 VAR=6.960 VJE=1.0 VJC=0.900 RE=0.300 RC=2.251 RB=2.200 RBM=1.500 IRB=0.100m CJE=11.800p CJC=8.700p XCJC=0.650 FC=0.750 NF=1.0 NR=1.005 NE=2.234 NC=2.074 MJE=0.435 MJC=0.600 TF=0.600n TR=2.604n PTF=1.0 ITF=0.314 VTF=2.0 XTF=6.500 EG=1.110 VCEO=45V ICRATING=100M MFG=SIEMENS)
.MODEL BCW67 PNP(IS=0.230p ISE=39.284f ISC=0.118f XTI=4.800 BF=504.327 BR=23.0 IKF=0.780 IKR=0.195 XTB=1.700 VAF=26.0 VAR=4.500 VJE=1.0 VJC=1.0 RE=0.203 RC=0.262 RB=0.800 RBM=0.400 IRB=0.100m CJE=57.177p CJC=28.600p XCJC=0.650 FC=0.750 NF=1.0 NR=1.002 NE=1.944 NC=3.025 MJE=0.470 MJC=0.520 TF=0.664n TR=2.600n PTF=1.0 ITF=0.250 VTF=2.0 XTF=6.350 EG=1.110 VCEO=45V ICRATING=100M MFG=SIEMENS)
.MODEL BCW69 PNP(IS=1.149E-14 ISE=5E-14 ISC=1.43E-14 XTI=3 BF=330 BR=13 IKF=0.1 IKR=0.012 XTB=1.5 VAF=84.56 VAR=8.15 VJE=0.65 VJC=0.565 RE=0.4 RC=0.95 RB=0.2 CJE=16p CJC=10.5p XCJC=0.75 FC=0.5 NF=0.9872 NR=0.996 NE=1.4 NC=1.1 MJE=0.415 MJC=0.415 TF=0.493n TR=73.55n EG=1.11 VCEO=45V ICRATING=100M MFG=ZETEX)
.MODEL BCW89 PNP(IS=1.149E-14 ISE=5E-14 ISC=1.43E-14 XTI=3 BF=330 BR=13 IKF=0.1 IKR=0.012 XTB=1.5 VAF=84.56 VAR=8.15 VJE=0.65 VJC=0.565 RE=0.4 RC=0.95 RB=0.2 CJE=16p CJC=10.5p XCJC=0.75 FC=0.5 NF=0.9872 NR=0.996 NE=1.4 NC=1.1 MJE=0.415 MJC=0.415 TF=0.493n TR=73.55n EG=1.11 VCEO=45V ICRATING=100M MFG=ZETEX)
.model BCX17 PNP(Is=300.00E-15 Bf=238.66 Vaf=100 Ikf=7.9962 Ise=300.00E-15 Ne=1.8179 Br=24.969 Var=100 Ikr=8.6844 Isc=20.673E-12 Nc=1.4876 Nk=1.2295 Re=.1 Rb=1.5116 Rc=.15941 Cje=127.81E-12 Mje=.41399 Cjc=41.583E-12 Mjc=.46676 Tf=475.21E-12 Xtf=26.772 Vtf=68.517 Itf=13.643 Tr=36.831E-9 Xtb=1.5000 Vceo=45

Icrating=0.5 mfg=Rohm)
.MODEL BCX42 PNP(IS=7.59E-14 ISE=1.90E-14 ISC=1.72p XTI=3.00 BF=1.52E2 BR=1.16E-1 IKF=1.18E-1 IKR=1.00 XTB=1.5 VAF=3.28E2 VAR=2.61E1 VJE=3.15E-1 VJC=3.00E-1 RE=1.00E-2 RC=8.89E-1 RB=2.42 RBM=4.95 IRB=8.03E-2 CJE=5.74E-11 CJC=3.90E-11 .00 FC=5.00E-1 NF=1.01 NR=1.21 NE=1.27 NC=2.00 MJE=4.41E-1 MJC=4.85E-1 TF=8.18E-10 TR=2E-7 ITF=1.28 VTF=9.99E5 XTF=5.01 EG=1.11 VCEO=40 ICRATING=800M MFG=SIEMENS)
.MODEL BCX51 PNP(IS=4.60p ISE=1.99E-14 ISC=9.45E-17 XTI=3.00 BF=1.85E2 BR=4.28 IKF=9.69E-1 IKR=1.00 XTB=1.5 VAF=1.44E2 VAR=1.97E1 VJE=5.43E-1 VJC=3.62E-1 RE=1.00E-2 RC=2.62E-1 RB=4.84 RBM=1.00E1 IRB=1.62E-1 CJE=1.27E-10 CJC=8.00E-11 .00 FC=5.00E-1 NF=1.19 NR=1.23 NE=1.23 NC=2.00 MJE=4.94E-1 MJC=5.07E-1 TF=1.07n TR=0 ITF=4.53E-1 VTF=9.99E5 XTF=6.31E-1 EG=1.11 VCEO=40 ICRATING=800M MFG=SIEMENS)
.MODEL BCX58 PNP(IS=28.000f ISE=24.903f ISC=0.125p XTI=3.300 BF=284.436 BR=4.800 IKF=0.380 IKR=0.932 XTB=1.600 VAF=43.0 VAR=6.960 VJE=1.0 VJC=0.900 RE=0.300 RC=2.251 RB=2.200 RBM=1.500 IRB=0.100m CJE=11.800p CJC=8.700p XCJC=0.650 FC=0.750 NF=1.0 NR=1.005 NE=2.234 NC=2.074 MJE=0.435 MJC=0.600 TF=0.600n TR=2.604n PTF=1.0 ITF=0.314 VTF=2.0 XTF=6.500 EG=1.110 MFG=SIEMENS)
.MODEL BCX69 PNP(IS=7.82f ISE=3.05E-17 ISC=1.00E-17 XTI=3.00 BF=2.25E2 BR=9.96 IKF=5.88 IKR=1.00 XTB=1.5 VAF=1.00E2 VAR=5.00E1 VJE=5.03E-1 VJC=3.00E-1 RE=1.34E-1 RC=2.17E-2 RB=1.00E-2 RBM=1.00E-2 IRB=1.00E-6 CJE=3.28E-10 CJC=1.94E-10 .00 FC=5.00E-1 NF=8.54E-1 NR=8.80E-1 NE=1.00 NC=2.00 MJE=5.26E-1 MJC=4.03E-1 TF=1.39n TR=0 ITF=4.21E1 VTF=9.99E5 XTF=4.93E2 EG=1.11 VCEO=40 ICRATING=800M MFG=SIEMENS)
.MODEL BCX71 PNP(IS=28.000f ISE=24.903f ISC=0.125p XTI=3.300 BF=284.436 BR=4.800 IKF=0.380 IKR=0.932 XTB=1.600 VAF=43.0 VAR=6.960 VJE=1.0 VJC=0.900 RE=0.300 RC=2.251 RB=2.200 RBM=1.500 IRB=0.100m CJE=11.800p CJC=8.700p XCJC=0.650 FC=0.750 NF=1.0 NR=1.005 NE=2.234 NC=2.074 MJE=0.435 MJC=0.600 TF=0.600n TR=2.604n PTF=1.0 ITF=0.314 VTF=2.0 XTF=6.500 EG=1.110 VCEO=45V ICRATING=100M MFG=SIEMENS)
.MODEL 2N2484 NPN(IS=5.911f ISE=5.911f ISC=0 XTI=3 BF=697.1 BR=1.297 IKF=13.93m IKR=0 XTB=1.5 VAF=62.37 VAR=21.5 VJE=0.65 VJC=0.65 RE=0.15 RC=1.61 RB=10 CJE=4.973p CJC=4.017p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.342 NC=2 MJE=0.4146 MJC=0.3174 TF=820.4p TR=4.687n ITF=0.35 VTF=4 XTF=7 EG=1.11 VCEO=60 ICRATING=50m MFG=NSC)
.MODEL 2N2905 PNP(IS=650.6E-18 ISE=54.81f ISC=0 XTI=3 BF=231.7 BR=3.563 IKF=1.079 IKR=0 XTB=1.5 VAF=115.7 VAR=35 VJE=0.65 VJC=0.65 RE=0.15 RC=0.715 RB=10 CJE=19.82p CJC=14.76p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.829 NC=2 MJE=0.3357 MJC=0.5383 TF=603.7p TR=111.3n ITF=0.65 VTF=5 XTF=1.7 EG=1.11 VCEO=40 ICRATING=600M MFG=PHILIPS)
.MODEL 2N2907P PNP(IS=650.6E-18 ISE=54.81f ISC=0 XTI=3 BF=231.7 BR=3.563 IKF=1.079 IKR=0 XTB=1.5 VAF=115.7 VAR=35 VJE=0.65 VJC=0.65 RE=0.15 RC=0.715 RB=10 CJE=19.82p CJC=14.76p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.829 NC=2 MJE=0.3357 MJC=0.5383 TF=603.7p TR=111.3n ITF=0.65 VTF=5 XTF=1.7 EG=1.11 VCEO=40 ICRATING=600M MFG=NSC-PHILIPS)
.MODEL 2N2907S PNP(IS=2.32E-13 ISE=6.69E-16 ISC=1.65E-13 XTI=3.00 BF=3.08E2 BR=2.18E1 IKF=8.42E-1 IKR=1.00 XTB=1.5 VAF=1.41E2 VAR=1.35E1 VJE=3.49E-1 VJC=3.00E-1 RE=1.00E-2 RC=8.46E-1 RB=4.02E1 RBM=1.00E-2 IRB=1.25E-2 CJE=2.66E-11 CJC=1.93E-11 .00 FC=5.00E-1 NF=1.04 NR=1.12 NE=1.09 NC=1.13 MJE=4.60E-1 MJC=4.65E-1 TF=4.95E-10 TR=0 ITF=3.36E-1 VTF=6.54 XTF=1.87E1 EG=1.11 VCEO=80 ICRATING=5 MFG=SIEMENS)
.MODEL 2N3390 NPN(IS=12.03f ISE=1.842p ISC=0 XTI=3 BF=685.8 BR=4.379 IKF=0.1072 IKR=0 XTB=1.5 VAF=37.37 VAR=12.5 VJE=0.65 VJC=0.65 RE=0.1 RC=1 RB=10 CJE=8.307p CJC=5.777p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.971 NC=2 MJE=0.384 MJC=0.3199 TF=385.4p TR=685.3p ITF=0.17 VTF=3 XTF=8 EG=1.11 VCEO=25 ICRATING=100m MFG=NSC)
.MODEL 2N3392 NPN(IS=12.03f ISE=4.958p ISC=0 XTI=3 BF=254.8 BR=4.379 IKF=0.1072 IKR=0 XTB=1.5 VAF=37.37 VAR=12.5 VJE=0.65 VJC=0.65 RE=0.1 RC=1 RB=10 CJE=8.307p CJC=5.777p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.971 NC=2 MJE=0.384 MJC=0.3199 TF=385.4p TR=732.1p ITF=0.17 VTF=3 XTF=8 EG=1.11 VCEO=25 ICRATING=100m MFG=NSC)
.MODEL 2N3393 NPN(IS=12.03f ISE=8.195p ISC=0 XTI=3 BF=154.1 BR=4.379 IKF=0.1072 IKR=0 XTB=1.5 VAF=37.37 VAR=12.5 VJE=0.65 VJC=0.65 RE=0.1 RC=1 RB=10 CJE=8.307p CJC=5.777p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.971 NC=2 MJE=0.384 MJC=0.3199 TF=385.4p TR=783.8p ITF=0.17 VTF=3 XTF=8 EG=1.11 VCEO=25 ICRATING=100M MFG=NSC)
.MODEL 2N3415 NPN(IS=12.03f ISE=3.346p ISC=0 XTI=3 BF=377.5 BR=4.379 IKF=0.1072 IKR=0 XTB=1.5 VAF=37.37 VAR=12.5 VJE=0.65 VJC=0.65 RE=0.1 RC=1 RB=10 CJE=8.307p CJC=5.777p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.971 NC=2 MJE=0.384 MJC=0.3199 TF=385.4p TR=707.6p ITF=0.17 VTF=3 XTF=8 EG=1.11 VCEO=25 ICRATING=500m MFG=NSC)
.MODEL 2N3416 NPN(IS=12.03f ISE=8.031p ISC=0 XTI=3 BF=157.3 BR=4.379 IKF=0.1072 IKR=0 XTB=1.5 VAF=37.37 VAR=12.5 VJE=0.65 VJC=0.65 RE=0.1 RC=1 RB=10 CJE=8.307p CJC=5.777p XCJC=0.75 FC=0.5 NF=1

NR=1 NE=1.971 NC=2 MJE=0.384 MJC=0.3199 TF=385.4p TR=781.1p ITF=0.17 VTF=3 XTF=8 EG=1.11 VCEO=50 ICRATING=500m MFG=NSC)
.MODEL 2N3417 NPN(IS=12.03f ISE=3.346p ISC=0 XTI=3 BF=377.5 BR=4.379 IKF=0.1072 IKR=0 XTB=1.5 VAF=37.37 VAR=12.5 VJE=0.65 VJC=0.65 RE=0.1 RC=1 RB=10 CJE=8.307p CJC=5.777p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.971 NC=2 MJE=0.384 MJC=0.3199 TF=385.4p TR=707.6p ITF=0.17 VTF=3 XTF=8 EG=1.11 VCEO=50 ICRATING=500M MFG=NSC)
.MODEL 2N3565 NPN(IS=5.911f ISE=5.911f ISC=0 XTI=3 BF=697.1 BR=1.297 IKF=13.93m IKR=0 XTB=1.5 VAF=62.37 VAR=21.5 VJE=0.65 VJC=0.65 RE=0.15 RC=1.61 RB=10 CJE=4.973p CJC=4.017p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.342 NC=2 MJE=0.4146 MJC=0.3174 TF=820.4p TR=4.687n ITF=0.35 VTF=4 XTF=7 EG=1.11 VCEO=30 ICRATING=50m MFG=NSC)
.MODEL 2N3640 PNP(IS=545.6E-18 ISE=0 ISC=0 XTI=3 BF=59.22 BR=1.438 IKF=50m IKR=0 XTB=1.5 VAF=100 VAR=30 VJE=0.65 VJC=0.65 RE=0.15 RC=3.75 RB=10 CJE=2.65p CJC=2.77p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.5 NC=2 MJE=0.3083 MJC=0.1416 TF=118.5p TR=4.123n ITF=0.5 VTF=3 XTF=6 EG=1.11 VCEO=12 ICRATING=80m MFG=NSC)
.MODEL 2N3642 NPN(IS=14.34f ISE=14.34f ISC=0 XTI=3 BF=118.6 BR=7.134 IKF=0.2524 IKR=0 XTB=1.5 VAF=74.03 VAR=28 VJE=0.65 VJC=0.65 RE=0.1 RC=1 RB=10 CJE=22.01p CJC=7.306p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.236 NC=2 MJE=0.377 MJC=0.3416 TF=410.3p TR=50.96n ITF=0.6 VTF=1.7 XTF=3 EG=1.11 VCEO=45 ICRATING=500m MFG=NSC)
.MODEL 2N3643 NPN(IS=14.34f ISE=14.34f ISC=0 XTI=3 BF=255.9 BR=6.092 IKF=0.2847 IKR=0 XTB=1.5 VAF=74.03 VAR=28 VJE=0.65 VJC=0.65 RE=0.1 RC=1 RB=10 CJE=22.01p CJC=7.306p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.307 NC=2 MJE=0.377 MJC=0.3416 TF=411.1p TR=46.91n ITF=0.6 VTF=1.7 XTF=3 EG=1.11 VCEO=30 ICRATING=500m MFG=NSC)
.MODEL 2N3646 NPN(IS=1.017f ISE=34.11p ISC=0 XTI=3 BF=85.99 BR=3.587 IKF=0.2617 IKR=0 XTB=1.5 VAF=100 VAR=30 VJE=0.65 VJC=0.65 RE=0.15 RC=1.75 RB=10 CJE=8.359p CJC=4.256p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=2.048 NC=2 MJE=0.3504 MJC=0.1053 TF=289.3p TR=5.32n ITF=0.35 VTF=5 XTF=2 EG=1.11 VCEO=40 ICRATING=200m MFG=NSC)
.MODEL 2N3859A NPN(IS=5.911f ISE=5.911f ISC=0 XTI=3 BF=393.6 BR=1.372 IKF=12.43m IKR=0 XTB=1.5 VAF=62.37 VAR=21.5 VJE=0.65 VJC=0.65 RE=0.15 RC=1.61 RB=10 CJE=4.973p CJC=4.017p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.271 NC=2 MJE=0.4146 MJC=0.3174 TF=818.2p TR=4.761n ITF=0.35 VTF=4 XTF=7 EG=1.11 VCEO=60 ICRATING=100m MFG=NSC)
.MODEL 2N3638A PNP(IS=650.6E-18 ISE=200f ISC=0 XTI=3 BF=63.49 BR=4.254 IKF=1.079 IKR=0 XTB=1.5 VAF=115.7 VAR=35 VJE=0.65 VJC=0.65 RE=0.15 RC=0.715 RB=10 CJE=19.82p CJC=14.76p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.829 NC=2 MJE=0.3357 MJC=0.5383 TF=761.3p TR=121.3n ITF=0.65 VTF=5 XTF=1.7 EG=1.11 VCEO=25 ICRATING=500m MFG=NSC)
.MODEL 2N3645 PNP(IS=650.6E-18 ISE=54.81f ISC=0 XTI=3 BF=231.7 BR=3.563 IKF=1.079 IKR=0 XTB=1.5 VAF=115.7 VAR=35 VJE=0.65 VJC=0.65 RE=0.15 RC=0.715 RB=10 CJE=19.82p CJC=14.76p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.829 NC=2 MJE=0.3357 MJC=0.5383 TF=603.7p TR=111.3n ITF=0.65 VTF=5 XTF=1.7 EG=1.11 VCEO=60 ICRATING=500m MFG=NSC)
.MODEL 2N3702 PNP(IS=650.6E-18 ISE=97.16f ISC=0 XTI=3 BF=133.8 BR=3.73 IKF=1.081 IKR=0 XTB=1.5 VAF=115.7 VAR=35 VJE=0.65 VJC=0.65 RE=0.15 RC=0.715 RB=10 CJE=19.82p CJC=14.76p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.832 NC=2 MJE=0.3357 MJC=0.5383 TF=761.3p TR=114.1n ITF=0.65 VTF=5 XTF=1.7 EG=1.11 VCEO=40 ICRATING=200m MFG=NSC)
.MODEL 2N3703 PNP(IS=650.6E-18 ISE=189.7f ISC=0 XTI=3 BF=66.92 BR=4.197 IKF=1.079 IKR=0 XTB=1.5 VAF=115.7 VAR=35 VJE=0.65 VJC=0.65 RE=0.15 RC=0.715 RB=10 CJE=19.82p CJC=14.76p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.829 NC=2 MJE=0.3357 MJC=0.5383 TF=761.3p TR=120.6n ITF=0.65 VTF=5 XTF=1.7 EG=1.11 VCEO=45 ICRATING=200m MFG=NSC)
.MODEL 2N3903 NPN(IS=6.734f ISE=6.734f ISC=0 XTI=3 BF=335.2 BR=0.8073 IKF=60.26m IKR=0 XTB=1.5 VAF=74.03 VAR=28 VJE=0.65 VJC=0.65 RE=0.1 RC=1 RB=10 CJE=4.493p CJC=3.638p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.208 NC=2 MJE=0.2593 MJC=0.3085 TF=300.8p TR=243.9n ITF=0.4 VTF=4 XTF=2 EG=1.11 VCEO=60 ICRATING=200M MFG=NSC)
.MODEL 2N3905 PNP(IS=1.41f ISE=0 ISC=0 XTI=3 BF=90.35 BR=5.502 IKF=80m IKR=0 XTB=1.5 VAF=18.7 VAR=6.5 VJE=0.65 VJC=0.65 RE=0.15 RC=2.5 RB=10 CJE=8.063p CJC=9.728p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.5 NC=2 MJE=0.3677 MJC=0.5776 TF=179.3p TR=35.05n ITF=0.4 VTF=4 XTF=6 EG=1.11 VCEO=40 ICRATING=200m MFG=NSC)
.MODEL 2N4121 PNP(IS=1.41f ISE=0 ISC=0 XTI=3 BF=122.2 BR=5.215 IKF=80m IKR=0 XTB=1.5 VAF=18.7 VAR=6.5 VJE=0.65 VJC=0.65 RE=0.15 RC=2.5 RB=10 CJE=8.063p CJC=9.728p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.5 NC=2 MJE=0.3677 MJC=0.5776 TF=179.3p TR=34.2n ITF=0.4 VTF=4 XTF=6 EG=1.11 VCEO=40 ICRATING=100M MFG=NSC)
.MODEL 2N4122 PNP(IS=1.41f ISE=0 ISC=0 XTI=3 BF=219.7 BR=4.894 IKF=80m IKR=0 XTB=1.5 VAF=18.7 VAR=6.5 VJE=0.65 VJC=0.65 RE=0.15 RC=2.5 RB=10 CJE=8.063p CJC=9.728p XCJC=0.75 FC=0.5 NF=1 NR=1

NE=1.5 NC=2 MJE=0.3677 MJC=0.5776 TF=179.3p TR=33.13n ITF=0.4 VTF=4 XTF=6 EG=1.11 VCEO=40 ICRATING=100M MFG=NSC)
.MODEL 2N4143 PNP(IS=650.6E-18 ISE=54.81f ISC=0 XTI=3 BF=231.7 BR=3.563 IKF=1.079 IKR=0 XTB=1.5 VAF=115.7 VAR=35 VJE=0.65 VJC=0.65 RE=0.15 RC=0.715 RB=10 CJE=19.82p CJC=14.76p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.829 NC=2 MJE=0.3357 MJC=0.5383 TF=603.7p TR=111.3n ITF=0.65 VTF=5 XTF=1.7 EG=1.11 VCEO=60 ICRATING=200m MFG=NSC)
.MODEL 2N4249 PNP(IS=6.734f ISE=6.734f ISC=0 XTI=3 BF=161.4 BR=2.767 IKF=0.1806 IKR=0 XTB=1.5 VAF=45.7 VAR=15 VJE=0.65 VJC=0.65 RE=0.15 RC=1.67 RB=10 CJE=7.5p CJC=6.2p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.672 NC=2 MJE=0.2861 MJC=0.301 TF=467.4p TR=10.54n ITF=0.17 VTF=5 XTF=8 EG=1.11 VCEO=60 ICRATING=100m MFG=NSC)
.MODEL 2N4250A PNP(IS=6.734f ISE=6.734f ISC=0 XTI=3 BF=388.2 BR=2.635 IKF=0.205 IKR=0 XTB=1.5 VAF=45.7 VAR=15 VJE=0.65 VJC=0.65 RE=0.167 RC=1.67 RB=10 CJE=7.5p CJC=6.2p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.806 NC=2 MJE=0.2861 MJC=0.301 TF=467.9p TR=9.861n ITF=0.17 VTF=5 XTF=8 EG=1.11 VCEO=60 ICRATING=100m MFG=NSC)
.MODEL 2N4258 PNP(IS=545.6E-18 ISE=0 ISC=0 XTI=3 BF=61.42 BR=1.426 IKF=50m IKR=0 XTB=1.5 VAF=100 VAR=30 VJE=0.65 VJC=0.65 RE=0.15 RC=3.75 RB=10 CJE=2.65p CJC=2.77p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.5 NC=2 MJE=0.3083 MJC=0.1416 TF=118.5p TR=4.109n ITF=0.5 VTF=3 XTF=6 EG=1.11 VCEO=12 ICRATING=50m MFG=NSC)
.MODEL 2N4355 PNP(IS=12.27p ISE=12.27p ISC=0 XTI=3 BF=194.8 BR=1.184 IKF=1.123 IKR=0 XTB=1.5 VAF=100 VAR=30 VJE=0.65 VJC=0.65 RE=0.06 RC=0.6 RB=10 CJE=106.7p CJC=48.28p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.649 NC=2 MJE=0.5168 MJC=0.5615 TF=867p TR=474.5n ITF=0.2 VTF=2 XTF=0.8 EG=1.11 VCEO=60 ICRATING=500m MFG=NSC)
.MODEL 2N4356 PNP(IS=12.27p ISE=12.27p ISC=0 XTI=3 BF=110.2 BR=1.252 IKF=1.036 IKR=0 XTB=1.5 VAF=100 VAR=30 VJE=0.65 VJC=0.65 RE=0.06 RC=0.6 RB=10 CJE=106.7p CJC=48.28p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.558 NC=2 MJE=0.5168 MJC=0.5615 TF=866.1p TR=489.1n ITF=0.2 VTF=2 XTF=0.8 EG=1.11 VCEO=80 ICRATING=500m MFG=NSC)
.MODEL 2N4402 PNP(IS=650.6E-18 ISE=146.9f ISC=0 XTI=3 BF=108 BR=3.83 IKF=1.115 IKR=0 XTB=1.5 VAF=115.7 VAR=35 VJE=0.65 VJC=0.65 RE=0.15 RC=0.715 RB=10 CJE=19.82p CJC=14.76p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.86 NC=2 MJE=0.3357 MJC=0.5383 TF=761.3p TR=115.7n ITF=0.65 VTF=5 XTF=1.7 EG=1.11 VCEO=40 ICRATING=600m MFG=NSC)
.MODEL 2N4917 PNP(IS=1.41f ISE=0 ISC=0 XTI=3 BF=219.7 BR=4.894 IKF=80m IKR=0 XTB=1.5 VAF=18.7 VAR=6.5 VJE=0.65 VJC=0.65 RE=0.15 RC=2.5 RB=10 CJE=8.063p CJC=9.728p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.5 NC=2 MJE=0.3677 MJC=0.5776 TF=179.3p TR=33.13n ITF=0.4 VTF=4 XTF=6 EG=1.11 VCEO=30 ICRATING=100m MFG=NSC)
.MODEL 2N507 PNP(IS=6.734f ISE=6.734f ISC=0 XTI=3 BF=254.1 BR=2.683 IKF=0.1962 IKR=0 XTB=1.5 VAF=45.7 VAR=15 VJE=0.65 VJC=0.65 RE=0.15 RC=1.67 RB=10 CJE=7.5p CJC=6.2p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.741 NC=2 MJE=0.2861 MJC=0.301 TF=467.8p TR=10.1n ITF=0.17 VTF=5 XTF=8 EG=1.11 VCEO=40 ICRATING=100m MFG=NSC)
.MODEL 2N5086 PNP(IS=28.000f ISE=24.903f ISC=0.125p XTI=3.300 BF=284.436 BR=4.800 IKF=0.380 IKR=0.932 XTB=1.600 VAF=43.0 VAR=6.960 VJE=1.0 VJC=0.900 RE=0.300 RC=2.251 RB=2.200 RBM=1.500 IRB=0.100m CJE=11.800p CJC=8.700p XCJC=0.650 FC=0.750 NF=1.0 NR=1.005 NE=2.234 NC=2.074 MJE=0.435 MJC=0.600 TF=0.600n TR=2.604n PTF=1.0 ITF=0.314 VTF=2.0 XTF=6.500 EG=1.110 VCEO=50 ICRATING=50m MFG=SIEMENS)
.MODEL 2N5138 PNP(IS=1.41f ISE=0 ISC=0 XTI=3 BF=274.6 BR=4.82 IKF=80m IKR=0 XTB=1.5 VAF=18.7 VAR=6.5 VJE=0.65 VJC=0.65 RE=0.15 RC=2.5 RB=10 CJE=8.063p CJC=9.728p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.5 NC=2 MJE=0.3677 MJC=0.5776 TF=179.3p TR=32.86n ITF=0.4 VTF=4 XTF=6 EG=1.11 VCEO=50 ICRATING=50m MFG=NSC)
.MODEL 2N5366 PNP(IS=650.6E-18 ISE=90.78f ISC=0 XTI=3 BF=166.3 BR=3.649 IKF=1.105 IKR=0 XTB=1.5 VAF=115.7 VAR=35 VJE=0.65 VJC=0.65 RE=0.15 RC=0.715 RB=10 CJE=19.82p CJC=14.76p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.853 NC=2 MJE=0.3357 MJC=0.5383 TF=761.3p TR=112.8n ITF=0.65 VTF=5 XTF=1.7 EG=1.11 VCEO=40 ICRATING=300m MFG=NSC)
.MODEL 2N5400 PNP(IS=21.48f ISE=21.48f ISC=0 XTI=3 BF=93.44 BR=3.874 IKF=0.1798 IKR=0 XTB=1.5 VAF=100 VAR=30 VJE=0.65 VJC=0.65 RE=0.15 RC=1.6 RB=10 CJE=73.39p CJC=17.63p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.344 NC=2 MJE=0.3777 MJC=0.5312 TF=641.5p TR=1.512n ITF=0 VTF=0 XTF=0 EG=1.11 VCEO=130 ICRATING=600m MFG=NSC)
.MODEL 2N4123 NPN(IS=6.734f ISE=6.734f ISC=0 XTI=3 BF=335.3 BR=0.7925 IKF=61.27m IKR=0 XTB=1.5 VAF=74.03 VAR=28 VJE=0.65 VJC=0.65 RE=0.1 RC=1 RB=10 CJE=4.493p CJC=3.638p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.216 NC=2 MJE=0.2593 MJC=0.3085 TF=300.8p TR=243.1n ITF=0.4 VTF=4 XTF=2 EG=1.11 VCEO=40 ICRATING=200M MFG=NSC)
.MODEL 2N4141 NPN(IS=14.34f ISE=14.34f ISC=0 XTI=3 BF=255.9 BR=6.092 IKF=0.2847 IKR=0 XTB=1.5

VAF=74.03 VAR=28 VJE=0.65 VJC=0.65 RE=0.1 RC=1 RB=10 CJE=22.01p CJC=7.306p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.307 NC=2 MJE=0.377 MJC=0.3416 TF=411.1p TR=46.91n ITF=0.6 VTF=1.7 XTF=3 EG=1.11 VCEO=60 ICRATING=200m MFG=NSC)
.MODEL 2N4275 NPN(IS=44.14f ISE=97.82f ISC=0 XTI=3 BF=73.62 BR=12.84m IKF=0.3498 IKR=0 XTB=1.5 VAF=100 VAR=30 VJE=0.65 VJC=0.65 RE=0.06 RC=0.6 RB=10 CJE=4.5p CJC=2.83p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.389 NC=2 MJE=0.2418 MJC=0.862 TF=227.6p TR=1.079E-6 ITF=0.3 VTF=4 XTF=4 EG=1.11 VCEO=40 ICRATING=100m MFG=NSC)
.MODEL 2N4400 NPN(IS=26.03f ISE=26.7f ISC=0 XTI=3 BF=77.56 BR=1.06 IKF=0.2397 IKR=0 XTB=1.5 VAF=90.7 VAR=29 VJE=0.65 VJC=0.65 RE=0.15 RC=0.5 RB=10 CJE=24.07p CJC=11.01p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.204 NC=2 MJE=0.3641 MJC=0.3763 TF=573.2p TR=244n ITF=0 VTF=0 XTF=0 EG=1.11 VCEO=60 ICRATING=600m MFG=NSC)
.MODEL 2N4410 NPN(IS=5.911f ISE=5.911f ISC=0 XTI=3 BF=413.6 BR=1.361 IKF=12.6m IKR=0 XTB=1.5 VAF=62.37 VAR=21.5 VJE=0.65 VJC=0.65 RE=0.15 RC=1.61 RB=10 CJE=4.973p CJC=4.017p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.278 NC=2 MJE=0.4146 MJC=0.3174 TF=818.4p TR=4.749n ITF=0.35 VTF=4 XTF=7 EG=1.11 VCEO=120 ICRATING=250m MFG=NSC)
.MODEL 2N5088 NPN(IS=5.911f ISE=5.911f ISC=0 XTI=3 BF=1122 BR=1.271 IKF=14.92m IKR=0 XTB=1.5 VAF=62.37 VAR=21.5 VJE=0.65 VJC=0.65 RE=0.15 RC=1.61 RB=10 CJE=4.973p CJC=4.017p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.394 NC=2 MJE=0.4146 MJC=0.3174 TF=821.7p TR=4.673n ITF=0.35 VTF=4 XTF=7 EG=1.11 VCEO=35 ICRATING=50m MFG=NSC)
.MODEL 2N5134 NPN(IS=44.14f ISE=116.4f ISC=0 XTI=3 BF=61.88 BR=13.33m IKF=0.3498 IKR=0 XTB=1.5 VAF=100 VAR=30 VJE=0.65 VJC=0.65 RE=0.06 RC=0.6 RB=10 CJE=4.5p CJC=2.83p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.389 NC=2 MJE=0.2418 MJC=0.862 TF=227.6p TR=1.097E-6 ITF=0.3 VTF=4 XTF=4 EG=1.11 VCEO=20 ICRATING=100m MFG=NSC)
.MODEL 2N5172 NPN(IS=12.03f ISE=4.098p ISC=0 XTI=3 BF=308.3 BR=4.379 IKF=0.1072 IKR=0 XTB=1.5 VAF=37.37 VAR=12.5 VJE=0.65 VJC=0.65 RE=0.1 RC=1 RB=10 CJE=8.307p CJC=5.777p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.971 NC=2 MJE=0.384 MJC=0.3199 TF=385.4p TR=718.9p ITF=0.17 VTF=3 XTF=8 EG=1.11 VCEO=25 ICRATING=100M MFG=NSC)
.MODEL mmbt5179 NPN(IS=69.28E-18 ISE=69.28E-18 ISC=0 XTI=3 BF=282.1 BR=1.176 IKF=22.03m IKR=0 XTB=1.5 VAF=100 VAR=30 VJE=0.65 VJC=0.65 RE=0.15 RC=4 RB=10 CJE=1.52p CJC=1.042p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.177 NC=2 MJE=0.3223 MJC=0.2468 TF=135.6p TR=1.588n ITF=0.27 VTF=10 XTF=30 EG=1.11 VCEO=12 ICRATING=50m MFG=NSC)
.MODEL 2N5179 NPN(IS=69.28E-18 ISE=69.28E-18 ISC=0 XTI=3 BF=282.1 BR=1.176 IKF=22.03m IKR=0 XTB=1.5 VAF=100 VAR=30 VJE=0.65 VJC=0.65 RE=0.15 RC=4 RB=10 CJE=1.52p CJC=1.042p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.177 NC=2 MJE=0.3223 MJC=0.2468 TF=135.6p TR=1.588n ITF=0.27 VTF=10 XTF=30 EG=1.11 VCEO=12 ICRATING=50m MFG=NSC)
.MODEL 2N5551 NPN(IS=2.511f ISE=2.511f ISC=0 XTI=3 BF=242.6 BR=3.197 IKF=0.3458 IKR=0 XTB=1.5 VAF=100 VAR=30 VJE=0.65 VJC=0.65 RE=0.1 RC=1 RB=10 CJE=18.79p CJC=4.883p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.249 NC=2 MJE=0.3416 MJC=0.3047 TF=560p TR=1.202n ITF=50m VTF=5 XTF=8 EG=1.11 VCEO=180 ICRATING=600m MFG=NSC)
.MODEL CZT5551 NPN IS=24.240E-15 BF=210.11 VAF=100 IKF=.1213 ISE=234.58E-15 NE=1.5426 BR=.96749 VAR=100 IKR=2.7338 ISC=1.5687E-12 NC=1.8752 NK=.66562 RB=.86415 CJE=50.447E-12 VJE=.70813 MJE=.32821 CJC=8.0670E-12 VJC=.48157 MJC=.2562 TF=96.238E-12 XTF=55.940 VTF=20.111 ITF=57.419E-3 TR=10.000E-9 VCEO=180 ICRATING=600m MFG=Central_Semi
.MODEL CZT5401 PNP IS=20.743E-15 BF=516.02 VAF=100 IKF=.23172 ISE=30.077E-15 NE=1.2905 BR=.1001 VAR=100 IKR=2.7895 ISC=4.1177E-12 NC=2.0459 NK=.80454 RB=1.0110 CJE=50.447E-12 VJE=.70813 MJE=.32821 CJC=9.0325E-12 VJC=.41518 MJC=.33181 TF=48.913E-12 XTF=57.737 VTF=18.593 ITF=23.057E-3 TR=10.000E-9 VCEO=160 ICRATING=600m MFG=Central_Semi
.MODEL 2N5772 NPN(IS=44.14f ISE=94.79f ISC=0 XTI=3 BF=75.97 BR=12.76m IKF=0.3498 IKR=0 XTB=1.5 VAF=100 VAR=30 VJE=0.65 VJC=0.65 RE=0.06 RC=0.6 RB=10 CJE=4.5p CJC=2.83p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.389 NC=2 MJE=0.2418 MJC=0.862 TF=227.6p TR=1.076E-6 ITF=0.3 VTF=4 XTF=4 EG=1.11 VCEO=40 ICRATING=200m MFG=NSC)
.MODEL 2N6428 NPN(IS=45.000f ISE=55.668f ISC=1.084p XTI=3.200 BF=516.544 BR=7.745 IKF=0.708 IKR=1.0 XTB=1.400 VAF=74.0 VAR=14.0 VJE=0.690 VJC=0.750 RE=0.350 RC=1.445 RB=9.0 RBM=4.500 IRB=0.100m CJE=13.050p CJC=4.100p XCJC=0.650 FC=0.750 NF=1.010 NR=1.015 NE=2.567 NC=4.063 MJE=0.375 MJC=0.420 TF=0.620n TR=2.5n PTF=1.0 ITF=0.720 VTF=1.0 XTF=68.0 EG=1.110 VCEO=60 ICRATING=200m MFG=SIEMENS)
.MODEL 2N6429 NPN(IS=45.000f ISE=55.668f ISC=1.084p XTI=3.200 BF=516.544 BR=7.745 IKF=0.708 IKR=1.0 XTB=1.400 VAF=74.0 VAR=14.0 VJE=0.690 VJC=0.750 RE=0.350 RC=1.445 RB=9.0 RBM=4.500 IRB=0.100m CJE=13.050p CJC=4.100p XCJC=0.650 FC=0.750 NF=1.010 NR=1.015 NE=2.567 NC=4.063 MJE=0.375 MJC=0.420 TF=0.620n TR=2.5n PTF=1.0 ITF=0.720 VTF=1.0 XTF=68.0 EG=1.110 VCEO=55 ICRATING=200M MFG=SIEMENS)
.MODEL 2N6715 NPN(IS=2.218E-13 ISE=2.9E-14 ISC=2.971E-13 XTI=3 BF=185.2 BR=1.271 IKF=856.8m IKR=0.1

XTB=1.5 VAF=100 VAR=30 VJE=0.65 VJC=0.595 RE=0.075 RC=0.15 RB=10 CJE=318p CJC=51p XCJC=0.75 FC=0.5 NF=0.9956 NR=0.995 NE=1.35 NC=1.321 MJE=0.3822 MJC=0.4937 TF=0.77n TR=27n EG=1.11 VCEO=50 ICRATING=2 MFG=ZETEX)
.MODEL 2N930 NPN(IS=5.911f ISE=5.911f ISC=0 XTI=3 BF=578.3 BR=1.313 IKF=13.5m IKR=0 XTB=1.5 VAF=62.37 VAR=21.5 VJE=0.65 VJC=0.65 RE=0.15 RC=1.61 RB=10 CJE=4.973p CJC=4.017p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.32 NC=2 MJE=0.4146 MJC=0.3174 TF=819.8p TR=4.701n ITF=0.35 VTF=4 XTF=7 EG=1.11 VCEO=45 ICRATING=30m MFG=NSC)
.MODEL 2SC2873 NPN(IS=3E-13 ISE=1.1E-13 ISC=6.5E-13 XTI=3 BF=225 BR=110 IKF=2.8 IKR=0.8 XTB=1.5 VAF=80 VAR=28 VJE=0.65 VJC=0.65 RE=0.063 RC=0.07 RB=0.3 CJE=325p CJC=70p XCJC=0.75 FC=0.5 NF=1 NR=0.972 NE=1.37 NC=1.372 MJE=0.33 MJC=0.33 TF=1n TR=10n EG=1.11 VCEO=50V ICRATING=2 MFG=ZETEX)
.MODEL BC182B NPN(IS=1.8E-14 ISE=5.0E-14 ISC=1.72E-13 XTI=3 BF=400 BR=35.5 IKF=0.14 IKR=0.03 XTB=1.5 VAF=80 VAR=12.5 VJE=0.58 VJC=0.54 RE=0.6 RC=0.25 RB=0.56 CJE=13p CJC=4p XCJC=0.75 FC=0.5 NF=0.9955 NR=1.005 NE=1.46 NC=1.27 MJE=0.33 MJC=0.33 TF=0.64n TR=50.72n EG=1.11 VCEO=60 ICRATING=200m MFG=ZETEX)
.MODEL BC237B NPN(IS=1.8E-14 ISE=5.0E-14 ISC=1.72E-13 XTI=3 BF=400 BR=35.5 IKF=0.14 IKR=0.03 XTB=1.5 VAF=80 VAR=12.5 VJE=0.58 VJC=0.54 RE=0.6 RC=0.25 RB=0.56 CJE=13p CJC=4p XCJC=0.75 FC=0.5 NF=0.9955 NR=1.005 NE=1.46 NC=1.27 MJE=0.33 MJC=0.33 TF=0.64n TR=50.72n EG=1.11 VCEO=45V ICRATING=100M MFG=ZETEX)
.MODEL BC337-16 NPN(IS=4.887E-14 ISE=2.552f ISC=7.006E-14 XTI=3 BF=207.2 BR=21.85 IKF=0.902 IKR=0.1 XTB=1.5 VAF=184.8 VAR=20 VJE=0.6596 VJC=0.1419 RE=0.119 RC=0.25 RB=50 RBM=2 IRB=0.0002 CJE=4.217E-11 CJC=1.734E-11 XCJC=0.455 FC=0.652 NF=1.002 NR=1.002 NE=1.65 NC=1.25 MJE=0.3434 MJC=0.3484 TF=6E-10 TR=3.5E-08 PTF=86 ITF=0.79 VTF=2.4 XTF=2.1 EG=1.11 VCEO=45 ICRATING=200M MFG=PHILIPS)
.model BC337-25 NPN(IS=4.13E-14 NF=0.9822 ISE=3.534E-15 NE=1.35 BF=292.4 IKF=0.9 VAF=145.7 NR=0.982 ISC=1.957E-13 NC=1.3 BR=23.68 IKR=0.1 VAR=20 RB=60 IRB=2.00E-04 RBM=8 RE=0.1129 RC=0.25 XTB=0 EG=1.11 XTI=3 CJE=3.799E-11 VJE=0.6752 MJE=0.3488 TF=5.4E-10 XTF=4 VTF=4.448 ITF=0.665 PTF=90 CJC=1.355E-11 VJC=0.3523 MJC=0.3831 XCJC=0.455 TR=3.00E-08 CJS=0 VJS=0.75 MJS=0.333 FC=0.643 Vceo=45 Icrating=500m mfg=NXP)
.model BC337-40 NPN(IS=7.809E-14 NF=0.9916 ISE=2.069E-15 NE=1.4 BF=436.8 IKF=0.8 VAF=103.6 NR=0.991 ISC=6.66E-14 NC=1.2 BR=44.14 IKR=0.09 VAR=14 RB=70 IRB=2.00E-04 RBM=8 RE=0.12 RC=0.24 XTB=0 EG=1.11 XTI=3 CJE=3.579E-11 VJE=0.6657 MJE=0.3596 TF=5E-10 XTF=2.5 VTF=2 ITF=0.5 PTF=88 CJC=1.306E-11 VJC=0.3647 MJC=0.3658 XCJC=0.455 TR=2.50E-08 CJS=0 VJS=0.75 MJS=0.333 FC=0.843 Vceo=45 Icrating=500m mfg=NXP)
.MODEL BC337S NPN(IS=0.18p ISE=8.480f ISC=0.102p XTI=4.800 BF=449.302 BR=16.919 IKF=0.820 IKR=0.663 XTB=1.500 VAF=95.0 VAR=13.0 VJE=0.850 VJC=0.780 RE=0.170 RC=0.289 RB=0.750 RBM=0.375 IRB=0.100m CJE=63.400p CJC=16.600p XCJC=0.650 FC=0.750 NF=1.0 NR=1.005 NE=1.566 NC=1.764 MJE=0.372 MJC=0.433 TF=0.810n TR=2.600n PTF=1.0 ITF=0.450 VTF=1.500 XTF=4.300 EG=1.110 VCEO=45 ICRATING=100m MFG=SIEMENS)
.MODEL BC368P NPN(IS=2.474E-13 ISE=4.403E-14 ISC=2.009E-13 XTI=3 BF=196.2 BR=30.57 IKF=4.8360 IKR=0.3264 XTB=1.5 VAF=127.5 VAR=17.26 VJE=0.8011 VJC=0.5995 RE=0.1021 RC=9.070E-02 RB=1 RBM=1 IRB=1E-06 CJE=2.2260E-10 CJC=8.735E-11 XCJC=0.500 FC=0.6153 NF=0.9998 NR=0.9995 NE=1.400 NC=1.500 MJE=0.3833 MJC=0.4009 TF=6.469E-10 TR=1m2 ITF=0.3542 VTF=1.735 XTF=1.257 EG=1.11 VCEO=25 ICRATING=1 MFG=PHILIPS)
.MODEL BC368S NPN(IS=9.77E-14 ISE=1.49E-16 ISC=4.11E-14 XTI=3 BF=1.61E2 BR=3.66 IKF=7.74 IKR=1 XTB=1.5 VAF=5.63E2 VAR=3.49E1 VJE=3.00E-1 VJC=3.00E-1 RE=1.01E-2 RC=2.06E-1 RB=1.91E1 RBM=3.03 IRB=6.95E-2 CJE=2.52E-10 CJC=1.37E-10 .00 FC=5.00E-1 NF=9.64E-1 NR=1.23 NE=1.01 NC=1.02 MJE=4.11E-1 MJC=4.87E-1 TF=1.38n TR=0 ITF=1.00E1 VTF=9.99E5 XTF=3.26E1 EG=1.11 VCEO=25 ICRATING=1 MFG=SIEMENS)
.MODEL BC384C NPN(IS=1.8E-14 ISE=5.0E-14 ISC=1.72E-13 XTI=3 BF=325 BR=35.5 IKF=0.14 IKR=0.03 XTB=1.5 VAF=80 VAR=12.5 VJE=0.58 VJC=0.54 RE=0.6 RC=0.25 RB=0.56 CJE=13p CJC=4p XCJC=0.75 FC=0.5 NF=0.9955 NR=1.005 NE=1.46 NC=1.27 MJE=0.33 MJC=0.33 TF=0.64n TR=50.72n EG=1.11 VCEO=45V ICRATING=100M MFG=ZETEX)
.MODEL BC414B NPN(IS=1.8E-14 ISE=5.0E-14 ISC=1.72E-13 XTI=3 BF=400 BR=35.5 IKF=0.14 IKR=0.03 XTB=1.5 VAF=80 VAR=12.5 VJE=0.58 VJC=0.54 RE=0.6 RC=0.25 RB=0.56 CJE=13p CJC=4p XCJC=0.75 FC=0.5 NF=0.9955 NR=1.005 NE=1.46 NC=1.27 MJE=0.33 MJC=0.33 TF=0.64n TR=50.72n EG=1.11 VCEO=50V ICRATING=100m MFG=ZETEX)
.MODEL BC547A NPN(IS=1.533E-14 ISE=7.932E-16 ISC=8.305E-14 XTI=3 BF=178.7 BR=8.628 IKF=0.1216 IKR=0.1121 XTB=1.5 VAF=69.7 VAR=44.7 VJE=0.4209 VJC=0.2 RE=0.6395 RC=0.6508 RB=1 RBM=1 IRB=1E-06 CJE=1.61E-11 CJC=4.388p XCJC=0.6193 FC=0.7762 NF=1.002 NR=1.004 NE=1.436 NC=1.207 MJE=0.3071 MJC=0.2793 TF=4.995E-10 TR=1m2 ITF=0.7021 VTF=3.523 XTF=139 EG=1.11 VCEO=50 ICRATING=100m

MFG=PHILIPS)
.model BC547B NPN(IS=2.39E-14 NF=1.008 ISE=3.545E-15 NE=1.541 BF=294.3 IKF=0.1357 VAF=63.2 NR=1.004 ISC=6.272E-14 NC=1.243 BR=7.946 IKR=0.1144 VAR=25.9 RB=1 IRB=1.00E-06 RBM=1 RE=0.4683 RC=0.85 XTB=0 EG=1.11 XTI=3 CJE=1.358E-11 VJE=0.65 MJE=0.3279 TF=4.391E-10 XTF=120 VTF=2.643 ITF=0.7495 PTF=0 CJC=3.728E-12 VJC=0.3997 MJC=0.2955 XCJC=0.6193 TR=1.00E-32 CJS=0 VJS=0.75 MJS=0.333 FC=0.9579 Vceo=45 Icrating=100m mfg=NXP)
.model BC547B_ NPN(Is=1.96f Xti=3 Eg=1.11 Vaf=112 Bf=300 Ise=14.42f Ne=2.163 Ikf=.2247 Nk=.5 Xtb=1.5 Br=4.64 Isc=4.02f Nc=1.152 Ikr=.221 Rc=1.351 Cjc=4.5p Mjc=.3333 Vjc=.75 Fc=.5 Cje=12.5p Mje=.3333 Vje=.75 Tr=500n Tf=479.5p Itf=2.962 Xtf=195.8 Vtf=10 RCO=27.675 GAMMA=1.75n VO=2.74)
.MODEL BC547B__ NPN (BF=530 NE=1.3 ISE=9.72F IKF=80M IS=20F VAF=50 BR=10 NC=2 ISC=47P IKR=12M VAR=10 RB=280 RE=1 RC=40 TR=.3U CJE=12P VJE=.48 MJE=0.5 CJC=6P VJC=.7 MJC=.33 TF=.5N)
.model BC547C NPN(IS=4.679E-14 NF=1.01 ISE=2.642E-15 NE=1.581 BF=458.7 IKF=0.1371 VAF=52.64 NR=1.019 ISC=2.337E-14 NC=1.164 BR=11.57 IKR=0.1144 VAR=364.5 RB=1 IRB=1.00E-06 RBM=1 RE=0.2598 RC=1 XTB=0 EG=1.11 XTI=3 CJE=1.229E-11 VJE=0.5591 MJE=0.3385 TF=4.689E-10 XTF=160 VTF=2.828 ITF=0.8842 PTF=0 CJC=4.42E-12 VJC=0.1994 MJC=0.2782 XCJC=0.6193 TR=1.00E-32 CJS=0 VJS=0.75 MJS=0.333 FC=0.7936 Vceo=45 Icrating=100m mfg=NXP)
.MODEL BC548C NPN(IS=1.95E-14 ISE=1.31f ISC=1.00E-13 XTI=3.00 BF=4.66E2 BR=2.42 IKF=1.80E-1 IKR=1.00 XTB=1.5 VAF=9.17E1 VAR=2.47E1 VJE=6.32E-1 VJC=3.39E-1 RE=1.00 RC=1.73 RB=2.65E1 RBM=1.00E1 IRB=1.00E1 CJE=1.33E-11 CJC=5.17p .00 FC=9.00E-1 NF=9.93E-1 NR=1.20 NE=1.32 NC=2.00 MJE=3.26E-1 MJC=3.19E-1 TF=6.52E-10 TR=0 ITF=1.03 VTF=1.65 XTF=1.00E2 EG=1.11 VCEO=30 ICRATING=100m MFG=PHILIPS)
.MODEL BC549B NPN(IS=4.679E-14 ISE=2.642f ISC=2.337E-14 XTI=3 BF=458.7 BR=11.57 IKF=0.1371 IKR=0.1144 XTB=1.5 VAF=52.64 VAR=364.5 VJE=0.5591 VJC=0.1994 RE=0.2598 RC=1 RB=1 RBM=1 IRB=1E-06 CJE=1.229E-11 CJC=4.42p XCJC=0.6193 FC=0.7936 NF=1.01 NR=1.019 NE=1.581 NC=1.164 MJE=0.3385 MJC=0.2782 TF=4.689E-10 TR=1m2 ITF=0.8842 VTF=2.828 XTF=160 EG=1.11 VCEO=30 ICRATING=100m MFG=PHILIPS)
.MODEL BC550B NPN(IS=1.8E-14 ISE=5.0E-14 ISC=1.72E-13 XTI=3 BF=400 BR=35.5 IKF=0.14 IKR=0.03 XTB=1.5 VAF=80 VAR=12.5 VJE=0.58 VJC=0.54 RE=0.6 RC=0.25 RB=0.56 CJE=13p CJC=4p XCJC=0.75 FC=0.5 NF=0.9955 NR=1.005 NE=1.46 NC=1.27 MJE=0.33 MJC=0.33 TF=0.64n TR=50.72n EG=1.11 VCEO=50 ICRATING=100M MFG=ZETEX)
.MODEL BC637 NPN(IS=3.06f ISE=1.62E-16 ISC=4.08E-14 XTI=3.00 BF=1.29E2 BR=2.92 IKF=9.06E-1 IKR=1.00 XTB=1.5 VAF=7.24E2 VAR=5.46E1 VJE=3.00E-1 VJC=3.00E-1 RE=1.26E-2 RC=3.11E-1 RB=1.65E1 RBM=1.73E-2 IRB=2.38E-2 CJE=1.17E-10 CJC=4.85E-11 .00 FC=5.00E-1 NF=8.55E-1 NR=9.10E-1 NE=1.00 NC=1.00 MJE=4.22E-1 MJC=5.09E-1 TF=1.42n TR=0 ITF=5.64E-1 VTF=9.99E5 XTF=7.75E-1 EG=1.11 VCEO=60 ICRATING=1 MFG=SIEMENS)
.MODEL BCP55S NPN(IS=3.06f ISE=1.62E-16 ISC=4.08E-14 XTI=3.00 BF=1.29E2 BR=2.92 IKF=9.06E-1 IKR=1.00 XTB=1.5 VAF=7.24E2 VAR=5.46E1 VJE=3.00E-1 VJC=3.00E-1 RE=1.26E-2 RC=3.11E-1 RB=1.65E1 RBM=1.73E-2 IRB=2.38E-2 CJE=1.17E-10 CJC=4.85E-11 .00 FC=5.00E-1 NF=8.55E-1 NR=9.10E-1 NE=1.00 NC=1.00 MJE=4.22E-1 MJC=5.09E-1 TF=1.42n TR=0 ITF=5.64E-1 VTF=9.99E5 XTF=7.75E-1 EG=1.11 VCEO=60 ICRATING=1 MFG=SIEMENS)
.MODEL BCP55P NPN(IS=6.119E-14 ISE=5.844f ISC=1.342E-13 XTI=3 BF=130.4 BR=14.53 IKF=0.8 IKR=0.2049 XTB=1.5 VAF=54.27 VAR=30 VJE=0.6917 VJC=0.5 RE=0.1114 RC=0.082 RB=0.5 RBM=0.5 IRB=1E-06 CJE=1.234E-10 CJC=3.49E-11 XCJC=0.15 FC=0.9232 NF=0.9948 NR=0.9905 NE=1.469 NC=1.183 MJE=0.338 MJC=0.388 TF=6.543E-10 TR=1m2 ITF=10 VTF=1.892 XTF=223.8 EG=1.11 VCEO=60 ICRATING=1 MFG=PHILIPS)
.MODEL BCP68P NPN(IS=2.474E-13 ISE=4.403E-14 ISC=2.009E-13 XTI=3 BF=196.2 BR=30.57 IKF=4.836 IKR=0.3264 XTB=1.5 VAF=127.5 VAR=17.26 VJE=0.8011 VJC=0.5995 RE=0.1021 RC=0.0252 RB=1 RBM=1 IRB=1E-06 CJE=2.226E-10 CJC=8.735E-11 XCJC=0.5 FC=0.6153 NF=0.9998 NR=0.9995 NE=1.4 NC=1.5 MJE=0.3833 MJC=0.4009 TF=6.469E-10 TR=1m2 ITF=0.3542 VTF=1.735 XTF=1.257 EG=1.11 VCEO=25 ICRATING=1 MFG=PHILIPS)
.MODEL BCP68S NPN(IS=9.77E-14 ISE=1.49E-16 ISC=4.11E-14 XTI=3.00 BF=1.61E2 BR=3.66 IKF=7.74 IKR=1.00 XTB=1.5 VAF=5.63E2 VAR=3.49E1 VJE=3.00E-1 VJC=3.00E-1 RE=1.01E-2 RC=2.06E-1 RB=1.91E1 RBM=3.03 IRB=6.95E-2 CJE=2.52E-10 CJC=1.37E-10 .00 FC=5.00E-1 NF=9.64E-1 NR=1.23 NE=1.01 NC=1.02 MJE=4.11E-1 MJC=4.87E-1 TF=1.38n TR=0 ITF=1.00E1 VTF=9.99E5 XTF=3.26E1 EG=1.11 VCEO=25 ICRATING=1 MFG=SIEMENS)
.MODEL BCW65 NPN(IS=0.180p ISE=8.480f ISC=0.102p XTI=4.800 BF=449.302 BR=16.919 IKF=0.820 IKR=0.663 XTB=1.500 VAF=95.0 VAR=13.0 VJE=0.850 VJC=0.780 RE=0.170 RC=0.289 RB=0.750 RBM=0.375 IRB=0.100m CJE=63.400p CJC=16.600p XCJC=0.650 FC=0.750 NF=1.0 NR=1.005 NE=1.566 NC=1.764 MJE=0.372 MJC=0.433 TF=0.810n TR=2.600n PTF=1.0 ITF=0.450 VTF=1.500 XTF=4.300 EG=1.110 VCEO=60 ICRATING=800M MFG=SIEMENS)
.MODEL BCW65A NPN(IS=3.941445E-14 ISE=7.4025f ISC=3.157E-13 XTI=3 BF=175 BR=20.5 IKF=0.8 IKR=0.1

XTB=1.5 VAF=109.45 VAR=14.25 VJE=0.65 VJC=0.505 RE=0.1259 RC=0.0539 RB=1.1 CJE=63p CJC=15.8p XCJC=0.75 FC=0.5 NF=1 NR=0.974 NE=1.3 NC=1.2 MJE=0.39 MJC=0.39 TF=0.75n TR=85n EG=1.11 VCEO=60 ICRATING=800m MFG=ZETEX)
.MODEL BCX41 NPN(IS=1.69p ISE=3.23E-14 ISC=9.92E-13 XTI=3.00 BF=1.70E2 BR=9.55E-2 IKF=2.13E-1 IKR=1.00 XTB=1.5 VAF=7.00E2 VAR=8.58E1 VJE=3.00E-1 VJC=3.00E-1 RE=1.00E-2 RC=5.54E-1 RB=7.17 RBM=1.00E1 IRB=6.59E-2 CJE=4.69E-11 CJC=2.58E-11 .00 FC=5.00E-1 NF=1.20 NR=1.41 NE=1.28 NC=2.00 MJE=3.97E-1 MJC=5.11E-1 TF=1.50n TR=0 ITF=6.20 VTF=1.00E6 XTF=1.00E2 EG=1.11 VCEO=125 ICRATING=800m MFG=SIEMENS)
.MODEL BCX56S NPN(IS=3.06f ISE=1.62E-16 ISC=4.08E-14 XTI=3.00 BF=1.29E2 BR=2.92 IKF=9.06E-1 IKR=1.00 XTB=1.5 VAF=7.24E2 VAR=5.46E1 VJE=3.00E-1 VJC=3.00E-1 RE=1.26E-2 RC=3.11E-1 RB=1.65E1 RBM=1.73E-2 IRB=2.38E-2 CJE=1.17E-10 CJC=4.85E-11 .00 FC=5.00E-1 NF=8.55E-1 NR=9.10E-1 NE=1.00 NC=1.00 MJE=4.22E-1 MJC=5.09E-1 TF=1.42n TR=55n ITF=5.64E-1 VTF=9.99E5 XTF=7.75E-1 EG=1.11 VCEO=100 ICRATING=1 MFG=SIEMENS)
.MODEL BCX56Z NPN(IS=6E-14 ISE=1E-14 ISC=1.2E-13 XTI=3 BF=250 BR=30 IKF=0.9 IKR=0.5 XTB=1.5 VAF=270 VAR=27 VJE=0.7 VJC=0.51 RE=0.08 RC=0.08 RB=0.2 CJE=108p CJC=15.9p XCJC=0.75 FC=0.5 NF=0.99 NR=0.98 NE=1.2 NC=1.2 MJE=0.35 MJC=0.4 TF=0.8n TR=55n EG=1.11 VCEO=100 ICRATING=1 MFG=ZETEX NK=0.7 GAMMA=5n RCO=5)
.MODEL BCX68 NPN(IS=9.77E-14 ISE=1.49E-16 ISC=4.11E-14 XTI=3.00 BF=1.61E2 BR=3.66 IKF=7.74 IKR=1.00 XTB=1.5 VAF=5.63E2 VAR=3.49E1 VJE=3.00E-1 VJC=3.00E-1 RE=1.01E-2 RC=2.06E-1 RB=1.91E1 RBM=3.03 IRB=6.95E-2 CJE=2.52E-10 CJC=1.37E-10 .00 FC=5.00E-1 NF=9.64E-1 NR=1.23 NE=1.01 NC=1.02 MJE=4.11E-1 MJC=4.87E-1 TF=1.38n TR=0 ITF=1.00E1 VTF=9.99E5 XTF=3.26E1 EG=1.11 VCEO=25 ICRATING=1 MFG=SIEMENS)
.MODEL BCX79 NPN(IS=45.000f ISE=55.668f ISC=1.084p XTI=3.200 BF=516.544 BR=7.745 IKF=0.708 IKR=1.0 XTB=1.400 VAF=74.0 VAR=14.0 VJE=0.690 VJC=0.750 RE=0.350 RC=1.445 RB=9.0 RBM=4.500 IRB=0.100m CJE=13.050p CJC=4.100p XCJC=0.650 FC=0.750 NF=1.010 NR=1.015 NE=2.567 NC=4.063 MJE=0.375 MJC=0.420 TF=0.620n TR=2.5n PTF=1.0 ITF=0.720 VTF=1.0 XTF=68.0 EG=1.110 VCEO=45 ICRATING=100m MFG=SIEMENS)
.MODEL BD131 NPN(IS=2.171E-13 ISE=2.423E-14 ISC=3.626E-13 XTI=3 BF=133 BR=18.54 IKF=3.09 IKR=0.35 XTB=1.5 VAF=91 VAR=30 VJE=0.9472 VJC=0.1708 RE=0.19 RC=0.04082 RB=13 RBM=4.441E-10 IRB=0.0005946 CJE=3.968E-10 CJC=2.687E-10 XCJC=0.75 FC=0.78 NF=0.9918 NR=0.9926 NE=1.274 NC=1.193 MJE=0.4214 MJC=0.3977 TF=1.354E-09 TR=4.6E-08 ITF=3.692 VTF=7 XTF=7 EG=1.11 VCEO=70 ICRATING=3 MFG=PHILIPS)
.model BD135 NPN(Is=40f Xti=3 Eg=1.11 Vaf=115.7 Bf=180.2 Ise=40f Ne=1.363 Ikf=4.927 Nk=1.247 Xtb=1.5 Br=10 Isc=85f Nc=2 Ikr=0 Rc=0 Cjc=19.23p Mjc=.3439 Vjc=.5635 Fc=.5 Cje=60.49p Mje=.3589 Vje=.7585 Tr=116n Tf=550p Itf=1 Xtf=0 Vtf=10 QCO=1E-10 GAMMA=1E-8 RCO=5)
.MODEL BD135_ NPN (IS=2.3985E-13 BF=244.9 NF=1.0 BR=78.11 NR=1.007 ISE=1.0471E-14 NE=1.2 ISC=1.9314E-11 NC=1.45 VAF=98.5 VAR=7.46 IKF=1.1863 IKR=0.1445 RB=2.14 RBM=0.001 IRB=0.031 RE=0.0832 RC=0.01 CJE=2.92702E-10 VJE=0.67412 MJE=0.3300 FC=0.5 CJC=4.8831E-11 VJC=0.5258 MJC=0.3928 XCJC=0.5287 XTB=1.1398 EG=1.2105 XTI=3 Vceo=45 Icrating=2 mfg=Philips)
.MODEL BD135P NPN(IS=4.815E-14 ISE=1.389E-14 ISC=1.295E-13 XTI=3 BF=124.2 BR=13.26 IKF=1.6 IKR=0.29 XTB=1.5 VAF=222 VAR=81.4 VJE=0.7313 VJC=0.5642 RE=0.165 RC=0.096 RB=0.5 RBM=0.5 IRB=1E-06 CJE=1.243E-10 CJC=3.04E-11 XCJC=0.15 FC=0.9359 NF=0.9897 NR=0.9895 NE=1.6 NC=1.183 MJE=0.3476 MJC=0.4371 TF=6.478E-10 TR=1m2 ITF=3.35 VTF=2.648 XTF=29 EG=1.11 VCEO=45 ICRATING=1.5 MFG=PHILIPS)
.MODEL BD137F NPN(IS=2.3985E-13 ISE=1.0471E-14 ISC=1.9314E-11 XTI=3 BF=244.9 BR=78.11 IKF=1.1863 IKR=0.1445 XTB=1.1398 VAF=98.5 VAR=7.46 VJE=0.67412 VJC=0.5258 RE=0.01 RC=0.1 RB=2.14 RBM=0.001 IRB=0.031 CJE=2.92702E-10 CJC=4.8831E-11 XCJC=0.5287 FC=0.5 NF=1 NR=1 NE=1.2 NC=1.45 MJE=0.3300 MJC=0.3928 EG=1.2105 VCEO=60 ICRATING=1.5 MFG=FAIRCHILD)
.MODEL BD243A NPN(IS=3.11126E-13 ISE=6.90683E-11 ISC=3.31131E-13 XTI=3 BF=93.0 BR=9.78891 IKF=5.62341 IKR=0.0382066 XTB=1.9711 VAF=174.5 VAR=122.381 VJE=0.6403992 VJC=0.4308133 RE=0.701391 RC=0.701391 RB=43.8404 RBM=0.436865 IRB=5.2264E-5 CJE=8.001919E-10 CJC=1.34699E-10 XCJC=0.5559 FC=0.5 NF=0.973751 NR=0.980115 NE=2.0 NC=1.09387 MJE=0.339666 MJC=0.347066 EG=1.2325 VCEO=55 ICRATING=6 MFG=PHILIPS)
.MODEL BD329 NPN(IS=2.474E-13 ISE=4.403E-14 ISC=2.009E-13 XTI=3 BF=196.2 BR=30.57 IKF=4.836 IKR=0.3264 XTB=1.5 VAF=127.5 VAR=17.26 VJE=0.8011 VJC=0.5995 RE=0.1021 RC=0.0252 RB=1 RBM=1 IRB=1E-06 CJE=2.226E-10 CJC=8.735E-11 XCJC=0.5 FC=0.6153 NF=0.9998 NR=0.9995 NE=1.4 NC=1.5 MJE=0.3833 MJC=0.4009 TF=6.469E-10 TR=1m2 ITF=0.3542 VTF=1.735 XTF=1.257 EG=1.11 VCEO=32 ICRATING=3 MFG=PHILIPS)
.MODEL BDP947 NPN(IS=0.650p ISE=0.178p ISC=38.669f XTI=4.900 BF=237.934 BR=25.0 IKF=3.900 IKR=3.200 XTB=2.400 VAF=135.0 VAR=22.0 VJE=0.800 VJC=0.730 RE=45.000m RC=0.173 RB=0.250 RBM=0.200 IRB=10.000m CJE=0.430n CJC=88.500p XCJC=0.723 FC=0.500 NF=1.004 NR=1.015 NE=1.649 NC=1.062 MJE=0.350 MJC=0.435 TF=1.010n TR=0.100E-6 PTF=1.0 ITF=0.900 VTF=0.350 XTF=0.900 EG=1.110 VCEO=45

ICRATING=3 MFG=SIEMENS)
.MODEL BF240 NPN(IS=6.686E-16 ISE=1.84f ISC=9.197f XTI=3 BF=135 BR=6.24 IKF=0.06 IKR=0.05 XTB=1.5 VAF=116.5 VAR=5.34 VJE=0.55 VJC=0.1927 RE=0.6 RC=1.8 RB=1 RBM=0.5 IRB=0.01 CJE=2.288p CJC=9.099E-13 XCJC=0.811 FC=0.8999 NF=0.9934 NR=1.003 NE=1.632 NC=1.133 MJE=0.2019 MJC=0.1982 TF=2.911E-10 TR=1m2 ITF=0.1644 VTF=1.762 XTF=54.94 EG=1.11 VCEO=40 ICRATING=25m MFG=PHILIPS)
.MODEL BF370R NPN(IS=1.519f ISE=4.063E-14 ISC=2.05E-09 XTI=3 BF=84 BR=0.3731 IKF=0.15 IKR=0.01 XTB=1.5 VAF=44.28 VAR=29.6 VJE=0.6785 VJC=0.4973 RE=0.483 RC=1.57 RB=0.5 RBM=0.5 IRB=1E-06 CJE=3.753p CJC=1.809p XCJC=0.4 FC=0.9027 NF=0.994 NR=0.979 NE=1.6 NC=1.931 MJE=0.2947 MJC=0.191 TF=2.13E-10 TR=50n ITF=1.834 VTF=2.3 XTF=107 EG=1.11 VCEO=40 ICRATING=100m MFG=PHILIPS)
.MODEL BF420P NPN(IS=7.974f ISE=2.266E-16 ISC=4.33p XTI=3 BF=122 BR=6.235 IKF=0.01029 IKR=0.02746 XTB=1.5 VAF=25.51 VAR=19.43 VJE=0.4581 VJC=0.197 RE=0.3814 RC=0.439 RB=1 RBM=0.5 IRB=1E-06 CJE=1.742E-11 CJC=5.045p XCJC=0.1041 FC=0.8555 NF=0.993 NR=0.999 NE=1.18 NC=1.397 MJE=0.3092 MJC=0.1947 TF=7.073E-10 TR=1E-08 ITF=0.1495 VTF=6.144 XTF=289.5 EG=1.11 VCEO=300 ICRATING=50m MFG=PHILIPS)
.MODEL BF420S NPN(IS=6.46E-16 ISE=2.80E-17 ISC=2.89E-14 XTI=3.00 BF=1.23E2 BR=5.61 IKF=4.09E-2 IKR=1.00 XTB=1.5 VAF=4.15E2 VAR=4.30E2 VJE=3.00E-1 VJC=3.00E-1 RE=4.41E-1 RC=4.08E-1 RB=4.64E1 RBM=2.17E1 IRB=2.42E-2 CJE=4.19E-11 CJC=5.49p .00 FC=5.00E-1 NF=9.11E-1 NR=1.86 NE=1.00 NC=1.03 MJE=3.90E-1 MJC=5.21E-1 TF=1.13n TR=0 ITF=2.65 VTF=8.76E5 XTF=6.01E2 EG=1.11 VCEO=300 ICRATING=50m MFG=SIEMENS)
.MODEL BF469 NPN(IS=7.974f ISE=2.266E-16 ISC=4.33p XTI=3 BF=122 BR=6.235 IKF=0.01029 IKR=0.02746 XTB=1.5 VAF=25.51 VAR=19.43 VJE=0.4581 VJC=0.197 RE=0.3814 RC=0.439 RB=1 RBM=0.5 IRB=1E-06 CJE=1.742E-11 CJC=5.045p XCJC=0.1041 FC=0.8555 NF=0.993 NR=0.999 NE=1.18 NC=1.397 MJE=0.3092 MJC=0.1947 TF=7.073E-10 TR=1E-08 ITF=0.1495 VTF=6.144 XTF=289.5 EG=1.11 VCEO=250 ICRATING=30m MFG=PHILIPS)
.MODEL BF517 NPN(IS=0.480f ISE=7.490f ISC=0.200f XTI=3 BF=99.655 BR=38.400 IKF=0.190 IKR=93.200m XTB=1.600 VAF=90 VAR=7.0 VJE=0.700 VJC=0.610 RE=0.500 RC=2.680 RB=1.500 RBM=1.200 IRB=0.100m CJE=1.325p CJC=1.050p XCJC=0.400 FC=0.890 NF=1.008 NR=1.010 NE=1.762 NC=1.042 MJE=0.220 MJC=0.240 TF=56.940p TR=1.000n PTF=21.0 ITF=0.700 VTF=0.600 XTF=68.398 EG=1.110 VCEO=20 ICRATING=25m MFG=SIEMENS)
.MODEL BF570 NPN(IS=1.222f ISE=3.895E-14 ISC=1.85E-09 XTI=3 BF=82.01 BR=0.1731 IKF=0.196 IKR=0.1 XTB=1.5 VAF=35.3 VAR=29.6 VJE=0.7352 VJC=0.198 RE=0.612 RC=1.527 RB=0.5 RBM=0.5 IRB=1E-06 CJE=3.411p CJC=1.605p XCJC=0.4 FC=0.9399 NF=0.9901 NR=0.974 NE=1.632 NC=2.01 MJE=0.3437 MJC=0.1711 TF=2.115E-10 TR=60n ITF=1.534 VTF=2.3 XTF=127 EG=1.11 VCEO=40V ICRATING=100M MFG=PHILIPS)
.MODEL BF622P NPN(IS=7.974f ISE=2.266E-16 ISC=4.33p XTI=3 BF=122 BR=6.235 IKF=0.01029 IKR=0.02746 XTB=1.5 VAF=25.51 VAR=19.43 VJE=0.4581 VJC=0.197 RE=0.3814 RC=0.439 RB=1 RBM=0.5 IRB=1E-06 CJE=1.742E-11 CJC=5.045p XCJC=0.1041 FC=0.8555 NF=0.993 NR=0.999 NE=1.18 NC=1.397 MJE=0.3092 MJC=0.1947 TF=7.073E-10 TR=1E-08 ITF=0.1495 VTF=6.144 XTF=289.5 EG=1.11 VCEO=250V ICRATING=50m MFG=PHILIPS)
.MODEL BF622S NPN(IS=6.46E-16 ISE=2.80E-17 ISC=2.89E-14 XTI=3.00 BF=1.23E2 BR=5.61 IKF=4.09E-2 IKR=1.00 XTB=1.5 VAF=4.15E2 VAR=4.30E2 VJE=3.00E-1 VJC=3.00E-1 RE=4.41E-1 RC=4.08E-1 RB=4.64E1 RBM=2.17E1 IRB=2.42E-2 CJE=4.19E-11 CJC=5.49p .00 FC=5.00E-1 NF=9.11E-1 NR=1.86 NE=1.00 NC=1.03 MJE=3.90E-1 MJC=5.21E-1 TF=1.13n TR=0 ITF=2.65 VTF=8.76E5 XTF=6.01E2 EG=1.11 VCEO=250 ICRATING=50m MFG=SIEMENS)
.MODEL BF775A NPN(IS=2.2E-16 ISE=2.1f ISC=1E-17 XTI=3 BF=312 BR=1 IKF=0.02 IKR=0.5 XTB=1.5 VAF=36 VAR=60 VJE=0.85 VJC=0.75 RE=0.9 RC=3.2 RB=26 RBM=2.2 IRB=0.25 CJE=2.5p CJC=1E-14 XCJC=0.3 FC=0.5 NF=0.97 NR=1 NE=2.6 NC=2 MJE=0.33 MJC=0.33 TF=0 TR=0 ITF=0 VTF=1k0 XTF=0 EG=1.11 VCEO=25 ICRATING=30m MFG=SIEMENS)
.MODEL BF799 NPN(IS=9.72E-16 ISE=2.26E-13 ISC=1.00E-13 XTI=3.00 BF=1.39E2 BR=1.00E-2 IKF=2.34E-1 IKR=1.00 XTB=1.5 VAF=6.40E1 VAR=1.29E1 VJE=4.75E-1 VJC=3.00E-1 RE=3.22E-2 RC=1.56 RB=1.00E-2 RBM=1.00E-2 IRB=2.25E-4 CJE=3.85p CJC=2.37p .00 FC=7.64E-1 NF=9.94E-1 NR=1.23 NE=1.75 NC=2.00 MJE=2.26E-1 MJC=2.40E-1 TF=1.37E-10 TR=0 ITF=4.64E-1 VTF=3.43E-1 XTF=1.00E2 EG=1.11 VCEO=40 ICRATING=100m MFG=SIEMENS)
.MODEL BF822 NPN(IS=9.109f ISE=5.02E-24 ISC=6.582p XTI=3 BF=141.1 BR=11.42 IKF=0.009124 IKR=0.02146 XTB=1.5 VAF=22.16 VAR=93 VJE=0.7202 VJC=0.158 RE=0.3288 RC=0.5195 RB=1 RBM=0.5 IRB=1E-06 CJE=1.504E-11 CJC=3.751p XCJC=0.1041 FC=0.895 NF=0.9949 NR=0.9917 NE=2.5 NC=1.397 MJE=0.3499 MJC=0.2757 TF=1.26E-09 TR=1E-08 ITF=0.1815 VTF=2.447 XTF=298.9 EG=1.11 VCEO=250V ICRATING=100m MFG=PHILIPS)
.MODEL BF840 NPN(IS=4.948E-16 ISE=1.08E-16 ISC=2.118E-16 XTI=3 BF=105.8 BR=2.665 IKF=0.08 IKR=0.05 XTB=1.5 VAF=125.5 VAR=5.34 VJE=0.5956 VJC=0.3305 RE=0.447 RC=1.9 RB=19.38 RBM=2.549 IRB=0.0009481 CJE=2.171p CJC=7.61E-13 XCJC=0.811 FC=0.9221 NF=0.9871 NR=0.999 NE=1.26 NC=1 MJE=0.2307 MJC=0.2596

TF=3.062E-10 TR=5E-08 ITF=0.1344 VTF=1.48 XTF=54.94 EG=1.11 VCEO=40V ICRATING=25m MFG=PHILIPS)
.MODEL BF869 NPN(IS=7.974f ISE=2.266E-16 ISC=4.33p XTI=3 BF=122 BR=6.235 IKF=0.01029 IKR=0.02746 XTB=1.5 VAF=25.51 VAR=19.43 VJE=0.4581 VJC=0.197 RE=0.3814 RC=0.439 RB=1 RBM=0.5 IRB=1E-06 CJE=1.742E-11 CJC=5.045p XCJC=0.1041 FC=0.8555 NF=0.993 NR=0.999 NE=1.18 NC=1.397 MJE=0.3092 MJC=0.1947 TF=7.073E-10 TR=1E-08 ITF=0.1495 VTF=6.144 XTF=289.5 EG=1.11 VCEO=250V ICRATING=100m MFG=PHILIPS)
.MODEL BFG135A NPN(IS=9.6952f ISE=3.7545f ISC=4.5491E-18 XTI=3 BF=86.665 NR=1.1471 IKF=1.9049 IKR=0.019155 XTB=1.5 VAF=33.548 VAR=45.693 VJE=0.87721 VJC=1.0086 RE=1.4768 RC=0.075508 RB=1.0193 RBM=0 IRB=0.00020816 CJE=3.2968E-14 CJC=2.9998p XCJC=0.020778 FC=0.56371 NF=0.46449 BR=61.012 NE=0.74837 NC=1.2809 MJE=0.51738 MJC=0.39102 TF=4.2719E-11 TR=1.3578E-10 ITF=0.0047293 VTF=0.11783 XTF=0.26853 EG=1.11 VCEO=25V ICRATING=150m MFG=SIEMENS)
.MODEL BFG193 NPN(IS=2.738E-16 ISE=1.0627E-14 ISC=3.7409E-17 XTI=3 BF=125 BR=14.267 IKF=0.26949 IKR=0.037925 XTB=1.5 VAF=24 VAR=3.8742 VJE=0.70276 VJC=1.1828 RE=0.76534 RC=0.11938 RB=1.8368 RBM=1 IRB=0.00091763 CJE=1.1824f CJC=9.3503E-13 XCJC=0.053563 FC=0.72063 NF=0.95341 NR=1.4289 NE=1.935 NC=0.94371 MJE=0.48654 MJC=0.30002 TF=1.8828E-11 TR=1.0037n ITF=0.00096893 VTF=0.8 XTF=0.69477 EG=1.11 VCEO=20V ICRATING=80m MFG=SIEMENS)
.MODEL BFG196 NPN(IS=1.7264f ISE=1.1922E-13 ISC=4.8666f XTI=3 BF=125 BR=10.584 IKF=0.4294 IKR=0.019511 XTB=1.5 VAF=20 VAR=3.8128 VJE=0.7308 VJC=0.73057 RE=0.75103 RC=0.27137 RB=1.2907 RBM=1 IRB=8.4011E-5 CJE=1.3325E-14 CJC=1.667p XCJC=0.29998 FC=0.50922 NF=0.80012 NR=0.94288 NE=1.1766 NC=0.88299 MJE=0.33018 MJC=0.3289 TF=2.3994E-11 TR=2.2413n ITF=0.0019775 VTF=0.1 XTF=0.44322 EG=1.11 VCEO=20V ICRATING=100m MFG=SIEMENS)
.MODEL BFG198 NPN(IS=1.8998f ISE=7.1424E-14 ISC=2.0992f XTI=3 BF=132.75 BR=11.407 IKF=0.44125 IKR=0.010016 XTB=1.5 VAF=15 VAR=4.1613 VJE=0.85909 VJC=0.81533 RE=1.1351 RC=0.27485 RB=1.2652 RBM=1.0893 IRB=2.8135E-5 CJE=5.0933f CJC=2.3278p XCJC=0.14496 FC=0.92887 NF=0.89608 NR=0.91008 NE=1.3235 NC=1.4602 MJE=0.69062 MJC=0.46849 TF=3.5786E-11 TR=1.2466n ITF=0.062059 VTF=0.10681 XTF=0.44444 EG=1.11 VCEO=20V ICRATING=100m MFG=SIEMENS)
.MODEL BFN22 NPN(IS=6.46E-16 ISE=2.80E-17 ISC=2.89E-14 XTI=3.00 BF=1.23E2 BR=5.61 IKF=4.09E-2 IKR=1.00 XTB=1.5 VAF=4.15E2 VAR=4.30E2 VJE=3.00E-1 VJC=3.00E-1 RE=4.41E-1 RC=4.08E-1 RB=4.64E1 RBM=2.17E1 IRB=2.42E-2 CJE=4.19E-11 CJC=5.49p .00 FC=5.00E-1 NF=9.11E-1 NR=1.86 NE=1.00 NC=1.03 MJE=3.90E-1 MJC=5.21E-1 TF=1.13n TR=0 ITF=2.65 VTF=8.76E5 XTF=6.01E2 EG=1.11 VCEO=250 ICRATING=25m MFG=SIEMENS)
.MODEL BFN24 NPN(IS=1.59E-13 ISE=3.62E-16 ISC=9.06E-11 XTI=3.00 BF=7.04E1 BR=1.76E1 IKF=1.00E1 IKR=1.00 XTB=1.5 VAF=4.51E1 VAR=9.11E1 VJE=3.00E-1 VJC=4.64E-1 RE=4.19E-1 RC=4.11E-1 RB=3.23E1 RBM=7.75E-2 IRB=1.30m CJE=1.31E-10 CJC=1.56E-11 .00 FC=5.00E-1 NF=1.03 NR=1.11 NE=1.21 NC=1.47 MJE=4.02E-1 MJC=5.80E-1 TF=1.73n TR=0 ITF=1.33 VTF=9.99E5 XTF=1.00E2 EG=1.11 VCEO=250 ICRATING=200m MFG=SIEMENS)
.MODEL BFN26 NPN(IS=1.59E-13 ISE=3.62E-16 ISC=9.06E-11 XTI=3.00 BF=7.04E1 BR=1.76E1 IKF=1.00E1 IKR=1.00 XTB=1.5 VAF=4.51E1 VAR=9.11E1 VJE=3.00E-1 VJC=4.64E-1 RE=4.19E-1 RC=4.11E-1 RB=3.23E1 RBM=7.75E-2 IRB=1.30m CJE=1.31E-10 CJC=1.56E-11 .00 FC=5.00E-1 NF=1.03 NR=1.11 NE=1.21 NC=1.47 MJE=4.02E-1 MJC=5.80E-1 TF=1.73n TR=0 ITF=1.33 VTF=9.99E5 XTF=1.00E2 EG=1.11 VCEO=300 ICRATING=200m MFG=SIEMENS)
.MODEL BFP136 NPN(IS=1.5813f ISE=4.637E-14 ISC=8.0864E-18 XTI=3 BF=113.32 NR=1.8047 IKF=1.4907 IKR=0.033605 XTB=1.5 VAF=12.331 VAR=31.901 VJE=0.71518 VJC=1.1381 RE=0.22081 RC=0.01636 RB=1.0078 RBM=0 IRB=0.00083992 CJE=3.3904E-14 CJC=2.9774p XCJC=0.02899 FC=0.99886 NF=1.0653 BR=86.718 NE=1.4254 NC=1.8821 MJE=0.36824 MJC=0.31461 TF=2.0691E-11 TR=1.0033n ITF=0.0045579 VTF=0.10174 XTF=0.31338 EG=1.11 VCEO=20 ICRATING=150m MFG=SIEMENS)
.MODEL BFP180 NPN(IS=1.8519E-16 ISE=1.3093E-13 ISC=6.1852f XTI=3 BF=94.687 BR=20.325 IKF=0.025252 IKR=0.012138 XTB=1.5 VAF=26.867 VAR=3.2134 VJE=1.1812 VJC=1.1812 RE=3.7045 RC=0.56 RB=60 RBM=1.4255 IRB=1E-5 CJE=3.2473f CJC=1.8369E-13 XCJC=0.08334 FC=0.87906 NF=1.0236 NR=0.93013 NE=1.9818 NC=1.6195 MJE=0.41827 MJC=0.30423 TF=1.4866E-11 TR=2.2648n ITF=0.0010202 VTF=0.22023 XTF=0.3062 EG=1.11 KF=0AF=1) VCEO=15 ICRATING=4m MFG=SIEMENS)
.MODEL BFP181 NPN(IS=1.0519E-18 ISE=1.2603E-14 ISC=1.1195E-17 XTI=3 BF=96.461 NR=0.87757 IKF=0.12146 IKR=0.24951 XTB=1.5 VAF=22.403 VAR=5.1127 VJE=0.73155 VJC=1.1633 RE=2.1372 RC=2.2171 RB=9.9037 RBM=6.6315 IRB=0.00069278 CJE=1.8168f CJC=3.1969E-13 XCJC=0.082903 FC=0.99768 NF=0.90617 BR=16.504 NE=1.7631 NC=1.6528 MJE=0.43619 MJC=0.30013 TF=1.7028E-11 TR=2.7449n ITF=0.0010549 VTF=0.12571 XTF=0.33814 EG=1.11 VCEO=20 ICRATING=20m MFG=SIEMENS)
.MODEL BFP182 NPN(IS=4.8499f ISE=8.4254f ISC=5.9438f XTI=3 BF=84.113 NR=0.54818 IKF=0.14414 IKR=0.039478 XTB=1.5 VAF=21.742 VAR=2.2595 VJE=1.0378 VJC=1.0132 RE=2.1858 RC=1.8159 RB=3.4217 RBM=2.8263 IRB=7.1955E-5 CJE=8.8619f CJC=4.9025E-13 XCJC=0.19281 FC=0.64175 NF=0.56639 BR=10.004 NE=0.91624 NC=0.5641 MJE=0.40796 MJC=0.31068 TF=2.272E-11 TR=1.7541n ITF=0.0065523 VTF=0.34608

XTF=0.43147 EG=1.11 VCEO=20 ICRATING=35m MFG=SIEMENS)
.MODEL BFP183 NPN(IS=1.0345f ISE=1.6818E-14 ISC=1.3559f XTI=3 BF=115.98 NR=0.99543 IKF=0.14562 IKR=0.013483 XTB=1.5 VAF=14.772 VAR=3.4276 VJE=1.0792 VJC=1.1967 RE=1.3435 RC=0.20486 RB=2.5426 RBM=1.0112 IRB=0.00043801 CJE=2.3077E-14 CJC=4.6011E-13 XCJC=0.053823 FC=0.54852 NF=0.80799 BR=10.016 NE=1.2149 NC=0.85331 MJE=0.45354 MJC=0.3 TF=2.2746E-11 TR=1.0553n ITF=0.0018773 VTF=0.50905 XTF=0.36823 EG=1.11 VCEO=20 ICRATING=65m MFG=SIEMENS)
.MODEL BFP193 NPN(IS=2.738E-16 ISE=1.0627E-14 ISC=3.7409E-17 XTI=3 BF=125 BR=14.267 IKF=0.26949 IKR=0.037925 XTB=1.5 VAF=24 VAR=3.8742 VJE=0.70276 VJC=1.1828 RE=0.76534 RC=0.11938 RB=1.8368 RBM=1 IRB=0.00091763 CJE=1.1824f CJC=9.3503E-13 XCJC=0.053563 FC=0.72063 NF=0.95341 NR=1.4289 NE=1.935 NC=0.94371 MJE=0.48654 MJC=0.30002 TF=1.8828E-11 TR=1.0037n ITF=0.00096893 VTF=0.8 XTF=0.69477 EG=1.11 VCEO=20 ICRATING=80m MFG=SIEMENS)
.MODEL BFP196 NPN(IS=1.7264f ISE=1.1922E-13 ISC=4.8666f XTI=3 BF=125 BR=10.584 IKF=0.4294 IKR=0.019511 XTB=1.5 VAF=20 VAR=3.8128 VJE=0.7308 VJC=0.73057 RE=0.75103 RC=0.27137 RB=1.2907 RBM=1 IRB=8.4011E-5 CJE=1.3325E-14 CJC=1.667p XCJC=0.29998 FC=0.50922 NF=0.80012 NR=0.94288 NE=1.1766 NC=0.88299 MJE=0.33018 MJC=0.3289 TF=2.3994E-11 TR=2.2413n ITF=0.0019775 VTF=0.1 XTF=0.44322 EG=1.11 VCEO=20 ICRATING=100m MFG=SIEMENS)
.MODEL BFP22 NPN(IS=1.59E-13 ISE=3.62E-16 ISC=9.06E-11 XTI=3.00 BF=7.04E1 BR=1.76E1 IKF=1.00E1 IKR=1.00 XTB=1.5 VAF=4.51E1 VAR=9.11E1 VJE=3.00E-1 VJC=4.64E-1 RE=4.19E-1 RC=4.11E-1 RB=3.23E1 RBM=7.75E-2 IRB=1.30m CJE=1.31E-10 CJC=1.56E-11 .00 FC=5.00E-1 NF=1.03 NR=1.11 NE=1.21 NC=1.47 MJE=4.02E-1 MJC=5.80E-1 TF=1.73n TR=0 ITF=1.33 VTF=9.99E5 XTF=1.00E2 EG=1.11 VCEO=200 ICRATING=200m MFG=SIEMENS)
.MODEL BFP280 NPN(IS=6.472f ISE=1.5596E-14 ISC=1.409f XTI=3 BF=89.888 BR=20.238 IKF=0.073457 IKR=0.012696 XTB=1.5 VAF=25.609 VAR=5.6909 VJE=0.70035 VJC=1.1943 RE=2.4518 RC=6.989 RB=15 RBM=14.999 IRB=3.1958E-5 CJE=3.6218E-14 CJC=2.5299E-13 XCJC=0.19188 FC=0.96275 NF=1.0801 NR=0.83403 NE=1.6163 NC=1.0651 MJE=0.69773 MJC=0.30017 TF=1.1744E-11 TR=2.3693n ITF=0.0062179 VTF=0.2035 XTF=0.21585 EG=1.11 VCEO=15 ICRATING=10m MFG=SIEMENS)
.MODEL BFP405 NPN(IS=2.1024E-16 ISE=1.5761E-14 ISC=3.7223E-17 XTI=3 BF=83.23 BR=10.526 IKF=0.16493 IKR=0.25052 XTB=1.5 VAF=39.251 VAR=34.368 VJE=0.70367 VJC=0.99532 RE=1.9289 RC=0.12691 RB=15 RBM=1.3491 IRB=0.00021215 CJE=3.7265f CJC=9.6941E-14 XCJC=0.08161 FC=0.99469 NF=1.0405 NR=0.96647 NE=1.7763 NC=1.3152 MJE=0.37747 MJC=0.48652 TF=4.5899p TR=1.4935n ITF=0.0013364 VTF=0.19762 XTF=0.3641 EG=1.11 VCEO=15 ICRATING=12m MFG=SIEMENS)
.MODEL BFP420 NPN(IS=2.0045E-16 ISE=1.9049E-14 ISC=1.9237E-17 XTI=3 BF=72.534 BR=7.8287 IKF=0.48731 IKR=0.69141 XTB=1.5 VAF=28.383 VAR=19.705 VJE=0.8051 VJC=0.81969 RE=0.31111 RC=0.10105 RB=8.5757 RBM=3.4849 IRB=0.00072983 CJE=1.8063f CJC=2.3453E-13 XCJC=0.3 FC=0.73234 NF=1.2432 NR=1.3325 NE=2.0518 NC=1.1724 MJE=0.46576 MJC=0.30232 TF=6.7661p TR=2.3249n ITF=0.001 VTF=0.23794 XTF=0.42199 EG=1.11 VCEO=15 ICRATING=35m MFG=SIEMENS)
.MODEL BFP450 NPN(IS=1.3125E-16 ISE=2.8341E-14 ISC=1.2292E-17 XTI=3 BF=76.123 NR=1.2966 IKF=0.58905 IKR=0.25878 XTB=1.5 VAF=24.165 VAR=13.461 VJE=0.95292 VJC=1.1487 RE=0.45346 RC=0.50084 RB=5.403 RBM=2.1659 IRB=1.3181E-5 CJE=3.2276f CJC=1.0495p XCJC=0.28285 FC=0.91274 NF=0.79652 BR=21.254 NE=1.5563 NC=0.70543 MJE=0.48672 MJC=0.50644 TF=7.5068p TR=2.6912n ITF=1.7655E-5 VTF=0.66148 XTF=0.69972 EG=1.11 VCEO=15 ICRATING=100m MFG=SIEMENS)
.MODEL BFP490 NPN(IS=4.5104E-16 ISE=1.591p ISC=3.7479f XTI=3 BF=114.96 NR=1.3531 IKF=0.76939 IKR=0.090033 XTB=1.5 VAF=24.664 VAR=16.035 VJE=0.93266 VJC=0.9832 RE=0.32476 RC=0.10737 RB=2.1262 RBM=1.0754 IRB=0.00017683 CJE=1.227f CJC=6.1521p XCJC=0.3 FC=0.75835 NF=1.1472 BR=21.04 NE=1.9962 NC=1.339 MJE=0.36885 MJC=0.34153 TF=3.9147p TR=1.115n ITF=0.0032793 VTF=0.27348 XTF=0.61664 EG=1.11 VCEO=15 ICRATING=600m MFG=SIEMENS)
.MODEL BFP520 NPN(IS=1.5E-17 ISE=2.5E-14 ISC=2E-14 XTI=0.035 BF=235 NR=1 IKF=0.4 IKR=0.01 XTB=-0.25 VAF=25 VAR=2 VJE=0.958 VJC=0.661 RE=0.6 RC=7.6 RB=11 RBM=7.5 IRB=0.00069278 CJE=2.35E-13 CJC=9.3E-14 FC=0.5 NF=1 BR=1.5 NE=2 NC=2 MJE=0.335 MJC=0.236 TF=1.7p TR=5E-8 PTF=50 ITF=0.7 VTF=5 XTF=10 EG=1.11 VCEO=12 ICRATING=40m MFG=SIEMENS)
.MODEL BFP81 NPN(IS=1.703E-14 ISE=5.8728f ISC=1.6977E-13 XTI=3 BF=110 BR=25.974 IKF=0.22241 IKR=0.011566 XTB=1.5 VAF=35 VAR=2.3785 VJE=0.4318 VJC=0.26339 RE=1.1731 RC=0.3715 RB=5.7058 RBM=1.5489 IRB=0.00011894 CJE=3.3977E-14 CJC=6.9381E-13 XCJC=0.1254 FC=0.74346 NF=0.80846 NR=0.36321 NE=1.0668 NC=1.2237 MJE=1.7707 MJC=0.24448 TF=2.1842E-11 TR=1.2554n ITF=0.014701 VTF=0.48042 XTF=0.26781 EG=1.11 VCEO=25 ICRATING=30m MFG=SIEMENS)
.MODEL BFP93A NPN(IS=8.6752f ISE=2.6193p ISC=7.0823E-16 XTI=3 BF=137.63 NR=0.88761 IKF=0.33395 IKR=0.015129 XTB=1.5 VAF=20.011 VAR=26.834 VJE=0.70393 VJC=0.72744 RE=1.0075 RC=0.13193 RB=7.2326 RBM=3.4649 IRB=4.3806E-5 CJE=3.1538f CJC=1.0395p XCJC=0.21422 FC=0.75935 NF=0.93633 BR=59 NE=1.5466 NC=1.95 MJE=0.5071 MJC=0.34565 TF=3.3388E-11 TR=1.1061n ITF=0.0025184 VTF=0.17765 XTF=0.28319 EG=1.11 VCEO=20 ICRATING=35m MFG=SIEMENS)

.MODEL BFQ181 NPN(IS=2.8E-16 ISE=1.95f ISC=1E-17 XTI=3 BF=100 BR=1 IKF=0.018 IKR=0.5 XTB=1.5 VAF=35 VAR=360 VJE=0.85 VJC=0.75 RE=1 RC=4.5 RB=35.2 RBM=1.9 IRB=0.25 CJE=1p CJC=1E-13 XCJC=0.3 FC=0.5 NF=1 NR=1 NE=4.95 NC=2 MJE=0.33 MJC=0.33 TF=0 TR=0 ITF=0 VTF=1k0 XTF=0 EG=1.11 VCEO=20 ICRATING=20m MFG=SIEMENS)
.MODEL BFQ182 NPN(IS=2E-16 ISE=1.3E-14 ISC=1E-17 XTI=2 BF=70.22 BR=1 IKF=0.32 IKR=0.5 XTB=1.5 VAF=32.284 VAR=3.22 VJE=1.02 VJC=0.629 RE=0.45 RC=2.147 RB=9 RBM=0.9 IRB=0.251 CJE=8.66E-13 CJC=1.2E-13 XCJC=0.495 FC=0.497 NF=0.9 NR=1 NE=1.775 NC=2 MJE=0.353 MJC=0.734 TF=1.11E-11 TR=1.11E-11 ITF=0.1 VTF=1.705 XTF=19.761 EG=1.11 VCEO=20 ICRATING=35m MFG=SIEMENS)
.MODEL BFQ196 NPN(IS=1.5f ISE=5.3f ISC=1E-17 XTI=3 BF=141 BR=1 IKF=0.067 IKR=0.5 XTB=1.5 VAF=120 VAR=365 VJE=0.85 VJC=0.75 RE=0.11 RC=2.2 RB=20 RBM=1.8 IRB=0.25 CJE=3p CJC=1E-13 XCJC=0.9 FC=0.5 NF=0.95 NR=1 NE=2.17 NC=2 MJE=0.33 MJC=0.33 TF=0 TR=0 ITF=0 VTF=1k0 XTF=0 EG=1.11 VCEO=40 ICRATING=100M MFG=SIEMENS)
.MODEL BFQ31 NPN(IS=1.73E-13 ISE=241p ISC=8.31E-13 XTI=3 BF=200 BR=3.124 IKF=8.8m IKR=0.02 XTB=1.5 VAF=90 VAR=9.7 VJE=0.65 VJC=0.415 RE=2.13 RC=30 RB=17 CJE=2.27p CJC=1.2p XCJC=0.75 FC=0.5 NF=1 NR=0.9705 NE=1.701 NC=1.112 MJE=0.145 MJC=0.145 TF=0.2n TR=1n EG=1.11 VCEO=30 ICRATING=100m MFG=ZETEX)
.MODEL BFQ74 NPN(IS=2.2E-16 ISE=2.1f ISC=1E-17 XTI=3 BF=312 BR=1 IKF=0.02 IKR=0.5 XTB=1.5 VAF=36 VAR=60 VJE=0.85 VJC=0.75 RE=0.9 RC=3.2 RB=26 RBM=2.2 IRB=0.25 CJE=2.5p CJC=1E-14 XCJC=0.3 FC=0.5 NF=0.97 NR=1 NE=2.6 NC=2 MJE=0.33 MJC=0.33 TF=0 TR=0 ITF=0 VTF=1k0 XTF=0 EG=1.11 VCEO=25 ICRATING=35m MFG=SIEMENS)
.MODEL BFQ81 NPN(IS=1.703E-14 ISE=5.8728f ISC=1.6977E-13 XTI=3 BF=110 BR=25.974 IKF=0.22241 IKR=0.011566 XTB=1.5 VAF=35 VAR=2.3785 VJE=0.4318 VJC=0.26339 RE=1.1731 RC=0.3715 RB=5.7058 RBM=1.5489 IRB=0.00011894 CJE=3.3977E-14 CJC=6.9381E-13 XCJC=0.1254 FC=0.74346 NF=0.80846 NR=0.36321 NE=1.0668 NC=1.2237 MJE=1.7707 MJC=0.24448 TF=2.1842E-11 TR=1.2554n ITF=0.014701 VTF=0.48042 XTF=0.26781 EG=1.11 VCEO=25 ICRATING=30M MFG=SIEMENS)
.MODEL BFQ82 NPN(IS=9.3E-16 ISE=3.9f ISC=1E-17 XTI=3 BF=100 BR=1 IKF=0.055 IKR=0.5 XTB=1.5 VAF=41 VAR=217 VJE=0.85 VJC=0.75 RE=0.18 RC=2.8 RB=29 RBM=0.82 IRB=0.25 CJE=2.4E-11 CJC=5E-13 XCJC=0.01 FC=0.5 NF=0.96 NR=1 NE=2.43 NC=2 MJE=0.33 MJC=0.33 TF=0 TR=0 ITF=0 VTF=1k0 XTF=0 EG=1.11 VCEO=20 ICRATING=80m MFG=SIEMENS)
.MODEL BFR106 NPN(IS=1.8998f ISE=7.1424E-14 ISC=2.0992f XTI=3 BF=132.75 BR=11.407 IKF=0.44125 IKR=0.010016 XTB=1.5 VAF=15 VAR=4.1613 VJE=0.85909 VJC=0.81533 RE=1.1351 RC=0.27485 RB=1.2652 RBM=1.0893 IRB=2.8135E-5 CJE=5.0933f CJC=2.3278p XCJC=0.14496 FC=0.92887 NF=0.89608 NR=0.91008 NE=1.3235 NC=1.4602 MJE=0.69062 MJC=0.46849 TF=3.5786E-11 TR=1.2466n ITF=0.062059 VTF=0.10681 XTF=0.44444 EG=1.11 VCEO=20 ICRATING=100m MFG=SIEMENS)
.MODEL BFR180 NPN(IS=1.8519E-16 ISE=1.3093E-13 ISC=6.1852f XTI=3 BF=94.687 BR=20.325 IKF=0.025252 IKR=0.012138 XTB=1.5 VAF=26.867 VAR=3.2134 VJE=1.1812 VJC=1.1812 RE=3.7045 RC=0.56 RB=60 RBM=1.4255 IRB=1E-5 CJE=3.2473f CJC=1.8369E-13 XCJC=0.08334 FC=0.87906 NF=1.0236 NR=0.93013 NE=1.9818 NC=1.6195 MJE=0.41827 MJC=0.30423 TF=1.4866E-11 TR=2.2648n ITF=0.0010202 VTF=0.22023 XTF=0.3062 EG=1.11 VCEO=15 ICRATING=4m MFG=SIEMENS)
.MODEL BFR181 NPN(IS=1.0519E-18 ISE=1.2603E-14 ISC=1.1195E-17 XTI=3 BF=96.461 NR=0.87757 IKF=0.12146 IKR=0.24951 XTB=1.5 VAF=22.403 VAR=5.1127 VJE=0.73155 VJC=1.1633 RE=2.1372 RC=2.2171 RB=9.9037 RBM=6.6315 IRB=0.00069278 CJE=1.8168f CJC=3.1969E-13 XCJC=0.082903 FC=0.99768 NF=0.90617 BR=16.504 NE=1.7631 NC=1.6528 MJE=0.43619 MJC=0.30013 TF=1.7028E-11 TR=2.7449n ITF=0.0010549 VTF=0.12571 XTF=0.33814 EG=1.11 VCEO=20 ICRATING=20m MFG=SIEMENS)
.MODEL BFR182 NPN(IS=4.8499f ISE=8.4254f ISC=5.9438f XTI=3 BF=84.113 NR=0.54818 IKF=0.14414 IKR=0.039478 XTB=1.5 VAF=21.742 VAR=2.2595 VJE=1.0378 VJC=1.0132 RE=2.1858 RC=1.8159 RB=3.4217 RBM=2.8263 IRB=7.1955E-5 CJE=8.8619f CJC=4.9025E-13 XCJC=0.19281 FC=0.64175 NF=0.56639 BR=10.004 NE=0.91624 NC=0.5641 MJE=0.40796 MJC=0.31068 TF=2.272E-11 TR=1.7541n ITF=0.0065523 VTF=0.34608 XTF=0.43147 EG=1.11 VCEO=20 ICRATING=35m MFG=SIEMENS)
.MODEL BFR183 NPN(IS=1.0345f ISE=1.6818E-14 ISC=1.3559f XTI=3 BF=115.98 NR=0.99543 IKF=0.14562 IKR=0.013483 XTB=1.5 VAF=14.772 VAR=3.4276 VJE=1.0792 VJC=1.1967 RE=1.3435 RC=0.20486 RB=2.5426 RBM=1.0112 IRB=0.00043801 CJE=2.3077E-14 CJC=4.6011E-13 XCJC=0.053823 FC=0.54852 NF=0.80799 BR=10.016 NE=1.2149 NC=0.85331 MJE=0.45354 MJC=0.3 TF=2.2746E-11 TR=1.0553n ITF=0.0018773 VTF=0.50905 XTF=0.36823 EG=1.11 VCEO=20 ICRATING=65m MFG=SIEMENS)
.MODEL BFR193 NPN(IS=2.738E-16 ISE=1.0627E-14 ISC=3.7409E-17 XTI=3 BF=125 BR=14.267 IKF=0.26949 IKR=0.037925 XTB=1.5 VAF=24 VAR=3.8742 VJE=0.70276 VJC=1.1828 RE=0.76534 RC=0.11938 RB=1.8368 RBM=1 IRB=0.00091763 CJE=1.1824f CJC=9.3503E-13 XCJC=0.053563 FC=0.72063 NF=0.95341 NR=1.4289 NE=1.935 NC=0.94371 MJE=0.48654 MJC=0.30002 TF=1.8828E-11 TR=1.0037n ITF=0.00096893 VTF=0.8 XTF=0.69477 EG=1.11 VCEO=20 ICRATING=80m MFG=SIEMENS)
.MODEL BFR280 NPN(IS=6.472f ISE=1.5596E-14 ISC=1.409f XTI=3 BF=89.888 BR=20.238 IKF=0.073457

IKR=0.012696 XTB=1.5 VAF=25.609 VAR=5.6909 VJE=0.70035 VJC=1.1943 RE=2.4518 RC=6.989 RB=15
RBM=14.999 IRB=3.1958E-5 CJE=3.6218E-14 CJC=2.5299E-13 XCJC=0.19188 FC=0.96275 NF=1.0801 NR=0.83403
NE=1.6163 NC=1.0651 MJE=0.69773 MJC=0.30017 TF=1.1744E-11 TR=2.3693n ITF=0.0062179 VTF=0.2035
XTF=0.21585 EG=1.11 VCEO=15 ICRATING=10m MFG=SIEMENS)
.MODEL BFR35A NPN(IS=1.213E-16 ISE=1.2955E-13 ISC=7.5557E-16 XTI=3 BF=94.733 NR=0.8983 IKF=0.46227
IKR=0.01 XTB=1.5 VAF=30 VAR=14.599 VJE=0.70618 VJC=0.84079 RE=0.29088 RC=0.13793 RB=14.998
RBM=7.8145 IRB=1.652E-5 CJE=1.0416E-14 CJC=9.4647E-13 XCJC=0.13464 FC=0.99545 NF=1.0947 BR=10.729
NE=1.9052 NC=1.371 MJE=0.34686 MJC=0.4085 TF=2.6796E-11 TR=1.2744n ITF=0.0044601 VTF=0.32861
XTF=0.3817 EG=1.11 VCEO=20 ICRATING=30m MFG=SIEMENS)
.MODEL BFS17 NPN(IS=0.480f ISE=7.490f ISC=0.200f XTI=3 BF=99.655 BR=38.400 IKF=0.190 IKR=93.200m
XTB=1.600 VAF=90 VAR=7.0 VJE=0.700 VJC=0.610 RE=0.500 RC=2.680 RB=1.500 RBM=1.200 IRB=0.100m
CJE=1.325p CJC=1.050p XCJC=0.400 FC=0.890 NF=1.008 NR=1.010 NE=1.762 NC=1.042 MJE=0.220 MJC=0.240
TF=56.940p TR=2.4E-8 PTF=21.0 ITF=0.700 VTF=0.600 XTF=68.398 EG=1.110 VCEO=25 ICRATING=25m
MFG=SIEMENS)
.MODEL BFS18 NPN(IS=5.7880E-16 ISE=1.078f ISC=4.317E-16 XTI=3 BF=115.2 BR=4.540 IKF=7.822E-02
IKR=2.986E-02 XTB=1.5 VAF=79.23 VAR=20.64 VJE=0.6720 VJC=0.4244 RE=0.7900 RC=0.7958 RB=1 RBM=1
IRB=1E-06 CJE=1.901p CJC=1.625p XCJC=0.1200 FC=0.8118 NF=0.9898 NR=0.9896 NE=1.516 NC=1.009
MJE=0.2981 MJC=0.1884 TF=4.932E-10 TR=1.00E-08 ITF=0.1208 VTF=6.182 XTF=300 EG=1.11 VCEO=30
ICRATING=30m MFG=PHILIPS)
.MODEL BFS19 NPN(IS=2.9320E-16 ISE=1.814f ISC=3.133E-16 XTI=3 BF=84.24 BR=2.933 IKF=0.1702 IKR=9.000
XTB=1.5 VAF=130.5 VAR=4.860 VJE=0.6927 VJC=0.3932 RE=0.8047 RC=0.9861 RB=1 RBM=1 IRB=1E-06
CJE=1.922p CJC=1.554p XCJC=0.1200 FC=0.9333 NF=0.9869 NR=0.9848 NE=1.411 NC=0.9935 MJE=0.3045
MJC=0.1891 TF=6.298E-10 TR=1.00E-07 ITF=0.4458 VTF=5.391 XTF=113.6 EG=1.11 VCEO=30 ICRATING=30m
MFG=PHILIPS)
.MODEL BFS20 NPN(IS=3.4640E-16 ISE=1.00f ISC=1.231f XTI=3 BF=147.8 BR=4.078 IKF=0.1343 IKR=0.1809
XTB=1.5 VAF=117.1 VAR=1.954 VJE=0.5979 VJC=0.5323 RE=0.7337 RC=1.1040 RB=1 RBM=1 IRB=1E-06
CJE=2.372p CJC=0.842p XCJC=0.1500 FC=0.9793 NF=0.9740 NR=0.9420 NE=1.508 NC=1.148 MJE=0.170
MJC=0.2749 TF=2.089E-10 TR=2.00E-08 ITF=0.2547 VTF=1.451 XTF=198.3 EG=1.11 VCEO=30 ICRATING=25m
MFG=PHILIPS)
.MODEL BFS480 NPN(IS=6.472f ISE=1.5596E-14 ISC=1.409f XTI=3 BF=89.888 BR=20.238 IKF=0.073457
IKR=0.012696 XTB=1.5 VAF=25.609 VAR=5.6909 VJE=0.70035 VJC=1.1943 RE=2.4518 RC=6.989 RB=15
RBM=14.999 IRB=3.1958E-5 CJE=3.6218E-14 CJC=2.5299E-13 XCJC=0.19188 FC=0.96275 NF=1.0801 NR=0.83403
NE=1.6163 NC=1.0651 MJE=0.69773 MJC=0.30017 TF=1.1744E-11 TR=2.3693n ITF=0.0062179 VTF=0.2035
XTF=0.21585 EG=1.11 VCEO=10 ICRATING=10m MFG=SIEMENS)
.MODEL BFS481 NPN(IS=1.0519E-18 ISE=1.2603E-14 ISC=1.1195E-17 XTI=3 BF=96.461 NR=0.87757 IKF=0.12146
IKR=0.24951 XTB=1.5 VAF=22.403 VAR=5.1127 VJE=0.73155 VJC=1.1633 RE=2.1372 RC=2.2171 RB=9.9037
RBM=6.6315 IRB=0.00069278 CJE=1.8168f CJC=3.1969E-13 XCJC=0.082903 FC=0.99768 NF=0.90617 BR=16.504
NE=1.7631 NC=1.6528 MJE=0.43619 MJC=0.30013 TF=1.7028E-11 TR=2.7449n ITF=0.0010549 VTF=0.12571
XTF=0.33814 EG=1.11 VCEO=20 ICRATING=20m MFG=SIEMENS)
.MODEL BFS482 NPN(IS=4.8499f ISE=8.4254f ISC=5.9438f XTI=3 BF=84.113 NR=0.54818 IKF=0.14414
IKR=0.039478 XTB=1.5 VAF=21.742 VAR=2.2595 VJE=1.0378 VJC=1.0132 RE=2.1858 RC=1.8159 RB=3.4217
RBM=2.8263 IRB=7.1955E-5 CJE=8.8619f CJC=4.9025E-13 XCJC=0.19281 FC=0.64175 NF=0.56639 BR=10.004
NE=0.91624 NC=0.5641 MJE=0.40796 MJC=0.31068 TF=2.272E-11 TR=1.7541n ITF=0.0065523 VTF=0.34608
XTF=0.43147 EG=1.11 VCEO=20 ICRATING=35m MFG=SIEMENS)
.MODEL BFS483 NPN(IS=1.0345f ISE=1.6818E-14 ISC=1.3559f XTI=3 BF=115.98 NR=0.99543 IKF=0.14562
IKR=0.013483 XTB=1.5 VAF=14.772 VAR=3.4276 VJE=1.0792 VJC=1.1967 RE=1.3435 RC=0.20486 RB=2.5426
RBM=1.0112 IRB=0.00043801 CJE=2.3077E-14 CJC=4.6011E-13 XCJC=0.053823 FC=0.54852 NF=0.80799
BR=10.016 NE=1.2149 NC=0.85331 MJE=0.45354 MJC=0.3 TF=2.2746E-11 TR=1.0553n ITF=0.0018773
VTF=0.50905 XTF=0.36823 EG=1.11 VCEO=20 ICRATING=65m MFG=SIEMENS)
.MODEL BFV420 NPN(IS=2E-14 ISE=8.61E-13 ISC=1.063p XTI=3 BF=335.9 BR=20.05 IKF=0.195 IKR=0.03 XTB=1.5
VAF=303.4 VAR=23 VJE=0.773 VJC=0.05 RE=0.388 RC=0.45 RB=36.6 RBM=7.069 IRB=0.0001391 CJE=1.611E-11
CJC=3.38p XCJC=0.553 FC=0.909 NF=0.9861 NR=0.989 NE=1.751 NC=1.35 MJE=0.3749 MJC=0.2154 TF=6.79E-10
TR=7.14E-08 ITF=0.1806 VTF=2.217 XTF=19.83 EG=1.11 VCEO=140 ICRATING=100m MFG=PHILIPS)
.MODEL BSP19 NPN(IS=1.524E-14 ISE=6.205f ISC=5.528E-13 XTI=3 BF=99.15 BR=2.769 IKF=0.287 IKR=0.1
XTB=1.5 VAF=222.6 VAR=1000 VJE=0.6926 VJC=0.1878 RE=0.25 RC=1.08 RB=28.54 RBM=11.96 IRB=0.0001965
CJE=4.144E-11 CJC=6.207p XCJC=0.4132 FC=0.8605 NF=0.9939 NR=0.98 NE=1.35 NC=1.3 MJE=0.338
MJC=0.1811 TF=1.3E-09 TR=5.5E-07 ITF=0.08 VTF=3.5 XTF=40 EG=1.11 VCEO=450 ICRATING=1 MFG=PHILIPS)
.MODEL BSR13 NPN(IS=29.13f ISE=9.652f ISC=320.3p XTI=3.000 BF=256.7 BR=6.590 IKF=489.9m IKR=192.9m
XTB=0.000 VAF=80.99 VAR=101.2 VJE=689.1m VJC=662.2m RE=193.4m RC=224.8m RB=1.000 RBM=1.000
IRB=1.000m CJE=25.89p CJC=10.11p XCJC=0.5946 FC=938.8m NF=992.6m NR=984.4m NE=1.516 NC=1.608

MJE=366.8m MJC=416m TF=293.9p TR=320n ITF=4.797 VTF=20 XTF=71.78 EG=1.110 VCEO=60 ICRATING=800m MFG=PHILIPS)
.MODEL BSR14 NPN(IS=29.13f ISE=9.652f ISC=320.3p XTI=3.000 BF=256.7 BR=6.590 IKF=489.9m IKR=192.9m XTB=0.000 VAF=80.99 VAR=101.2 VJE=689.1m VJC=662.2m RE=193.4m RC=224.8m RB=1.000 RBM=1.000 IRB=1.000m CJE=25.89p CJC=10.11p XCJC=0.5946 FC=938.8m NF=992.6m NR=984.4m NE=1.516 NC=1.608 MJE=366.8m MJC=416m TF=293.9p TR=320n ITF=4.797 VTF=20 XTF=71.78 EG=1.110 VCEO=60 ICRATING=800m MFG=PHILIPS)
.MODEL BSR40 NPN(IS=6E-14 ISE=1E-14 ISC=1.2E-13 XTI=3 BF=250 BR=30 IKF=0.9 IKR=0.5 XTB=1.5 VAF=270 VAR=27 VJE=0.7 VJC=0.51 RE=0.08 RC=0.08 RB=0.2 CJE=108p CJC=15.9p XCJC=0.75 FC=0.5 NF=0.99 NR=0.98 NE=1.2 NC=1.2 MJE=0.35 MJC=0.4 TF=0.8n TR=55n EG=1.11 VCEO=70 ICRATING=1 MFG=ZETEX NK=0.7 GAMMA=5n RCO=5)
.MODEL BSS64 NPN(IS=1.69p ISE=3.23E-14 ISC=9.92E-13 XTI=3.00 BF=1.70E2 BR=9.55E-2 IKF=2.13E-1 IKR=1.00 XTB=1.5 VAF=7.00E2 VAR=8.58E1 VJE=3.00E-1 VJC=3.00E-1 RE=1.00E-2 RC=5.54E-1 RB=7.17 RBM=1.00E1 IRB=6.59E-2 CJE=4.69E-11 CJC=2.58E-11 .00 FC=5.00E-1 NF=1.20 NR=1.41 NE=1.28 NC=2.00 MJE=3.97E-1 MJC=5.11E-1 TF=1.50n TR=0 ITF=6.20 VTF=1.00E6 XTF=1.00E2 EG=1.11 VCEO=120 ICRATING=100m MFG=SIEMENS)
.MODEL BSS79 NPN(IS=1.75p ISE=5.92E-14 ISC=9.42E-14 XTI=3.00 BF=3.03E2 BR=1.00E-2 IKF=2.11E-1 IKR=1.00 XTB=1.5 VAF=3.60E2 VAR=1.64E1 VJE=3.00E-1 VJC=3.00E-1 RE=1.00E-2 RC=1.07 RB=8.63E1 RBM=1.00E-2 IRB=9.62m CJE=2.64E-11 CJC=1.37E-11 .00 FC=5.00E-1 NF=1.10 NR=1.71 NE=1.26 NC=1.00 MJE=4.09E-1 MJC=4.89E-1 TF=5.16E-10 TR=0 ITF=5.09E-1 VTF=1.09E5 XTF=1.64 EG=1.11 VCEO=40 ICRATING=800m MFG=SIEMENS)
.MODEL BSS80 NPN(IS=2.32E-13 ISE=6.69E-16 ISC=1.65E-13 XTI=3.00 BF=3.08E2 BR=2.18E1 IKF=8.42E-1 IKR=1.00 XTB=1.5 VAF=1.41E2 VAR=1.35E1 VJE=3.49E-1 VJC=3.00E-1 RE=1.00E-2 RC=8.46E-1 RB=4.02E1 RBM=1.00E-2 IRB=1.25E-2 CJE=2.66E-11 CJC=1.93E-11 .00 FC=5.00E-1 NF=1.04 NR=1.12 NE=1.09 NC=1.13 MJE=4.60E-1 MJC=4.65E-1 TF=4.95E-10 TR=0 ITF=3.36E-1 VTF=6.54 XTF=1.87E1 EG=1.11 VCEO=40 ICRATING=800m MFG=SIEMENS)
.MODEL BST40 NPN(IS=5E-14 ISE=9f ISC=5p XTI=3 BF=230 BR=5 IKF=250m IKR=0 XTB=1.5 VAF=610 VAR=45 VJE=0.65 VJC=0.3905 RE=0.07 RC=0.07 RB=7 CJE=68.6p CJC=9.26p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.28 NC=1.3 MJE=0.241 MJC=0.241 TF=1.1n TR=0.9E-6 EG=1.11 VCEO=300 ICRATING=1 MFG=ZETEX GAMMA=3.1E-7 RCO=75)
.MODEL BSV52 NPN(IS=1.222f ISE=3.895E-14 ISC=1.85E-09 XTI=3 BF=82.01 BR=0.1731 IKF=0.196 IKR=0.1 XTB=1.5 VAF=35.3 VAR=29.6 VJE=0.7352 VJC=0.198 RE=0.612 RC=1.527 RB=0.5 RBM=0.5 IRB=1E-06 CJE=3.411p CJC=1.605p XCJC=0.4 FC=0.9399 NF=0.9901 NR=0.974 NE=1.632 NC=2.01 MJE=0.3437 MJC=0.1711 TF=2.115E-10 TR=60n ITF=1.534 VTF=2.3 XTF=127 EG=1.11 VCEO=20 ICRATING=100m MFG=PHILIPS)
.MODEL D44H11 NPN(IS=7.079646E-14 ISE=2.92884E-11 ISC=3.98107E-13 XTI=3 BF=392.02 BR=67.165 IKF=1.72 IKR=1.58489 XTB=1.77681 VAF=63.5 VAR=58.42 VJE=0.785 VJC=0.5 RE=0.034 RC=0.2 RB=271 RBM=0.361 IRB=5.011872E-6 CJE=8.49E-10 CJC=3.66E-10 XCJC=0.54505 FC=0.5 NF=0.828 NR=0.825 NE=1.72 NC=1.07 MJE=0.387 MJC=0.352 EG=0.958 VCEO=80 ICRATING=10 MFG=FAIRCHILD)
.MODEL MPSA05 NPN(IS=75.000f ISE=11.429f ISC=60.000f XTI=4.0 BF=149.627 BR=2.900 IKF=2.0 IKR=36.690m XTB=1.500 VAF=300 VAR=25.0 VJE=1.0 VJC=0.720 RE=0.100 RC=0.212 RB=0.400 RBM=0.200 IRB=20.000E-6 CJE=79.000p CJC=16.000p XCJC=0.650 FC=0.900 NF=1.010 NR=1.020 NE=1.663 NC=1.428 MJE=0.365 MJC=0.465 TF=1.100n TR=2.000n PTF=1 ITF=0.600 VTF=4.0 XTF=3.450 EG=1.110 VCEO=60 ICRATING=500m MFG=SIEMENS)
.MODEL MPSA10 NPN(IS=61.01f ISE=76.83f ISC=0 XTI=3 BF=193 BR=0.2195 IKF=97.79m IKR=0 XTB=1.5 VAF=57.37 VAR=19 VJE=0.65 VJC=0.65 RE=0.15 RC=2.14 RB=10 CJE=5.928p CJC=6.072p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.305 NC=2 MJE=0.3333 MJC=0.3333 TF=316.3p TR=1.573E-6 ITF=0.2 VTF=5 XTF=8 EG=1.11 VCEO=40 ICRATING=100m MFG=NSC)
.MODEL MPSA18 NPN(IS=33.58f ISE=166.7f ISC=0 XTI=3 BF=236 BR=5.774 IKF=0.1172 IKR=0 XTB=1.5 VAF=100 VAR=30 VJE=0.65 VJC=0.65 RE=0.1 RC=1 RB=10 CJE=7.547p CJC=4.948p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.579 NC=2 MJE=0.3765 MJC=0.4109 TF=310.1p TR=800.3p ITF=0.6 VTF=6 XTF=35 EG=1.11 VCEO=45 ICRATING=200m MFG=NSC)
.MODEL MPSA20 NPN(IS=45.000f ISE=55.668f ISC=1.084p XTI=3.200 BF=516.544 BR=7.745 IKF=0.708 IKR=1.0 XTB=1.400 VAF=74.0 VAR=14.0 VJE=0.690 VJC=0.750 RE=0.350 RC=1.445 RB=9.0 RBM=4.500 IRB=0.100m CJE=13.050p CJC=4.100p XCJC=0.650 FC=0.750 NF=1.010 NR=1.015 NE=2.567 NC=4.063 MJE=0.375 MJC=0.420 TF=0.620n TR=50.72n PTF=1 ITF=0.720 VTF=1.0 XTF=68.0 EG=1.110 VCEO=40 ICRATING=100m MFG=SIEMENS)
.MODEL MPSA43 NPN(IS=1.59E-13 ISE=3.62E-16 ISC=9.06E-11 XTI=3.00 BF=7.04E1 BR=1.76E1 IKF=1.00E1 IKR=1.00 XTB=1.5 VAF=4.51E1 VAR=9.11E1 VJE=3.00E-1 VJC=4.64E-1 RE=4.19E-1 RC=4.11E-1 RB=3.23E1 RBM=7.75E-2 IRB=1.30m CJE=1.31E-10 CJC=1.56E-11 .00 FC=5.00E-1 NF=1.03 NR=1.11 NE=1.21 NC=1.47 MJE=4.02E-1 MJC=5.80E-1 TF=1.73n TR=934.3p ITF=1.33 VTF=9.99E5 XTF=1.00E2 EG=1.11 VCEO=200 ICRATING=500m MFG=SIEMENS)

.MODEL MPSH10 NPN(IS=5.6E-16 ISE=6.367f ISC=1f XTI=3 BF=133 BR=8 IKF=2.5E-2 IKR=1E-2 XTB=1.5 VAF=40 VAR=6 VJE=1.195 VJC=0.5617 RE=0.65 RC=1.8 RB=150 RBM=0.5 IRB=5E-4 CJE=1.012p CJC=1.197p XCJC=0.75 FC=0.5 NF=1 NR=0.99 NE=1.75 NC=1.167 MJE=0.4496 MJC=0.2588 TF=6E-11 TR=40.5n ITF=0.27 VTF=10 XTF=30 EG=1.11 VCEO=30 ICRATING=50m MFG=ZETEX)
.MODEL MPSL01 NPN(IS=2.511f ISE=2.511f ISC=0 XTI=3 BF=213.4 BR=3.24 IKF=0.3495 IKR=0 XTB=1.5 VAF=100 VAR=30 VJE=0.65 VJC=0.65 RE=0.1 RC=1 RB=10 CJE=18.79p CJC=4.883p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.241 NC=2 MJE=0.3416 MJC=0.3047 TF=560.1p TR=1.212n ITF=50m VTF=5 XTF=8 EG=1.11 VCEO=120 ICRATING=150 MFG=NSC)
.MODEL T0221 NPN(IS=0.180p ISE=8.480f ISC=0.102p XTI=4.800 BF=449.302 BR=16.919 IKF=0.820 IKR=0.663 XTB=1.500 VAF=95.0 VAR=13.0 VJE=0.850 VJC=0.780 RE=0.170 RC=0.289 RB=0.750 RBM=0.375 IRB=0.100m CJE=63.400p CJC=16.600p XCJC=0.650 FC=0.750 NF=1.0 NR=1.005 NE=1.566 NC=1.764 MJE=0.372 MJC=0.433 TF=0.81n TR=2.6n PTF=1 ITF=0.45 VTF=1.5 XTF=4.3 EG=1.11 MFG=SIEMENS)
.MODEL T0357 NPN(IS=45.000f ISE=55.668f ISC=1.084p XTI=3.200 BF=516.544 BR=7.745 IKF=0.708 IKR=1.0 XTB=1.400 VAF=74.0 VAR=14.0 VJE=0.690 VJC=0.750 RE=0.350 RC=1.445 RB=9.0 RBM=4.500 IRB=0.100m CJE=13.050p CJC=4.100p XCJC=0.650 FC=0.750 NF=1.010 NR=1.015 NE=2.567 NC=4.063 MJE=0.375 MJC=0.420 TF=0.62n TR=2.5n PTF=1 ITF=0.72 VTF=1 XTF=68 EG=1.11 MFG=SIEMENS)
.MODEL T236 NPN(IS=9.6952f ISE=3.7545f ISC=4.5491E-18 XTI=3 BF=86.665 NR=1.1471 IKF=1.9049 IKR=0.019155 XTB=1.5 VAF=33.548 VAR=45.693 VJE=0.87721 VJC=1.0086 RE=1.4768 RC=0.075508 RB=1.0193 RBM=0 IRB=0.00020816 CJE=3.2968E-14 CJC=2.9998p XCJC=0.020778 FC=0.56371 NF=0.46449 BR=61.012 NE=0.74837 NC=1.2809 MJE=0.51738 MJC=0.39102 TF=4.2719E-11 TR=1.3578E-10 ITF=0.0047293 VTF=0.11783 XTF=0.26853 EG=1.11 MFG=SIEMENS)
.MODEL TIP31C NPN(IS=1.62181E-13 ISE=1.75416E-11 ISC=4.36516E-14 XTI=3 BF=80 BR=20.607 IKF=6.98433 IKR=0.997156 XTB=1.5301 VAF=110.5 VAR=159.374 VJE=0.636 VJC=0.408 RE=0.56 RC=0.96 RB=164.793 RBM=0.100291 IRB=1.24287E-7 CJE=4.77E-10 CJC=7.29E-11 XCJC=0.589205 FC=0.5 NF=0.9899 NR=0.989511 NE=1.95 NC=1.014 MJE=0.327 MJC=0.339 TF=2.3733E-8 TR=1.0000E-8 ITF=1 VTF=10 XTF=10 EG=1.1605 KF=1E-9 AF=1 VCEO=100 ICRATING=3 MFG=NSC-FAIRCHILD)
.MODEL 2 NPN(IS=1.62181E-13 ISE=1.75416E-11 ISC=4.36516E-14 XTI=3 BF=80 BR=20.607 IKF=6.98433 IKR=0.997156 XTB=1.5301 VAF=110.5 VAR=159.374 VJE=0.636 VJC=0.408 RE=0.56 RC=0.96 RB=164.793 RBM=0.100291 IRB=1.24287E-7 CJE=4.77E-10 CJC=7.29E-11 XCJC=0.589205 FC=0.5 NF=0.9899 NR=0.989511 NE=1.95 NC=1.014 MJE=0.327 MJC=0.339 TF=2.3733E-8 TR=1.0000E-8 ITF=1 VTF=10 XTF=10
.MODEL TIS97 NPN(IS=12.03f ISE=1.439p ISC=0 XTI=3 BF=877.7 BR=4.379 IKF=0.1072 IKR=0 XTB=1.5 VAF=37.37 VAR=12.5 VJE=0.65 VJC=0.65 RE=0.1 RC=1 RB=10 CJE=8.307p CJC=3.123p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.971 NC=2 MJE=0.384 MJC=0.3199 TF=390p TR=679.5p ITF=0.17 VTF=3 XTF=8 EG=1.11 VCEO=60 ICRATING=200m MFG=NSC)
.MODEL TIS98 NPN(IS=4.872f ISE=14.65f ISC=0 XTI=3 BF=96 BR=6.935 IKF=0.1434 IKR=0 XTB=1.5 VAF=100 VAR=30 VJE=0.65 VJC=0.65 RE=0.15 RC=0.7 RB=10 CJE=10.49p CJC=8.866p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.315 NC=2 MJE=0.4602 MJC=0.4312 TF=405.1p TR=565p ITF=0.18 VTF=3 XTF=2.5 EG=1.11 VCEO=80 ICRATING=200m MFG=NSC)
.MODEL BD132 PNP(IS=2.171E-13 ISE=2.423E-14 ISC=3.626E-13 XTI=3 BF=133 BR=18.54 IKF=3.09 IKR=0.35 XTB=1.5 VAF=91 VAR=23 VJE=0.9472 VJC=0.1708 RE=0.19 RC=0.04082 RB=13 RBM=4.441E-10 IRB=0.0005946 CJE=3.968E-10 CJC=2.687E-10 XCJC=0.75 FC=0.78 NF=0.9918 NR=0.9926 NE=1.274 NC=1.193 MJE=0.4214 MJC=0.3977 TF=1.354E-09 TR=4.6E-08 ITF=3.692 VTF=7 XTF=7 EG=1.11 VCEO=45 ICRATING=2 MFG=PHILIPS)
.model BD136 PNP(Is=10f Xti=3 Eg=1.11 Vaf=95.7 Bf=178.7 Ise=134.1f Ne=1.553 Ikf=2 Nk=.8366 Xtb=1.5 Br=5 Isc=85f Nc=2 Ikr=0 Rc=0 Cjc=60p Mjc=.4 Vjc=.8 Fc=.8 Cje=115.6p Mje=.3766 Vje=.7703 Tr=116n Tf=500p Itf=1 Xtf=0 Vtf=10 QCO=1E-10 GAMMA=5n RCO=5)
.model BD136_138_140 PNP(Is=10f Xti=3 Eg=1.11 Vaf=95.7 Bf=178.7 Ise=134.1f Ne=1.553 Ikf=2 Nk=.8366 Xtb=1.5 Br=5 Isc=85f Nc=2 Ikr=0 Rc=0 Cjc=60p Mjc=.4 Vjc=.8 Fc=.8 Cje=115.6p Mje=.3766 Vje=.7703 Tr=116n Tf=500p Itf=1 Xtf=0 Vtf=10 QCO=1E-10 GAMMA=5n RCO=5)
.MODEL BD136P PNP(IS=7.401E-14 ISE=4.104E-16 ISC=1.290E-14 XTI=3 BF=336.5 BR=13.91 IKF=0.1689 IKR=9.888E-2 XTB=1.5 VAF=224.7 VAR=30.00 VJE=0.6900 VJC=0.6431 RE=0.208 RC=5.526E-02 RB=0.500 RBM=0.500 IRB=1E-06 CJE=1.066E-10 CJC=5.234E-11 XCJC=0.440 FC=0.990 NF=0.9938 NR=0.9913 NE=1.054 NC=1.100 MJE=0.3676 MJC=0.4436 TF=2.578E-10 TR=1E-25 ITF=1.3040 VTF=2.366 XTF=13.56 EG=1.11 VCEO=45 ICRATING=1.5 MFG=PHILIPS)
.MODEL BD138F PNP(IS=2.9537E-13 ISE=1.8002E-13 ISC=7.0433p XTI=3 BF=201.4 BR=23.765 IKF=1.0993 IKR=0.10 XTB=1.4883 VAF=137.0 VAR=8.41 VJE=0.7211 VJC=0.5499 RE=0.01 RC=0.1 RB=1.98 RBM=0.01 IRB=0.011 CJE=2.1982E-10 CJC=6.8291E-11 XCJC=0.5287 FC=0.5 NF=1.0 NR=1.021 NE=1.5 NC=1.38 MJE=0.3685 MJC=0.3668 EG=1.2343 VCEO=60 ICRATING=1.5 MFG=FAIRCHILD)
.MODEL BD244A PNP(IS=1.09078p ISE=2.51189p ISC=9.14539E-13 XTI=3 BF=240.3 BR=20.265 IKF=1.1124198 IKR=0.524807 XTB=1.3913 VAF=153.184 VAR=36.6808 VJE=0.5862666 VJC=0.4538756 RE=1.0135 RC=1.0135 RB=49.2185 RBM=0.727994 IRB=5.84552E-5 CJE=4.484304E-10 CJC=2.066303E-10 XCJC=0.6935 FC=0.5

NF=1.00172 NR=0.9935 NE=1.5 NC=1.21111 MJE=0.3243386 MJC=0.3323408 EG=1.2342 VCEO=70 ICRATING=6 MFG=PHILIPS)
.MODEL BD330 PNP(IS=2.105E-13 ISE=3.766f ISC=2.789E-11 XTI=3 BF=281.1 BR=45.67 IKF=2.834 IKR=0.344 XTB=1.5 VAF=44.23 VAR=7.259 VJE=0.8827 VJC=0.1427 RE=0.05919 RC=0.0262 RB=1 RBM=1 IRB=1E-06 CJE=2.046E-10 CJC=1.378E-10 XCJC=0.508 FC=0.309 NF=0.9952 NR=0.9869 NE=1.4 NC=2.447 MJE=0.448 MJC=0.3018 TF=7.919E-10 TR=1m2 ITF=0.409 VTF=2.332 XTF=1.397 EG=1.11 VCEO=32 ICRATING=3 MFG=PHILIPS)
.model BDP285 NPN(Is=1.129p Xti=3 Eg=1.11 Vaf=100 Bf=161 Ise=31.17p Ne=1.557 Ikf=1.948 Nk==.648 Xtb=2 Br=1 Isc=23.5p Nc=1.489 Ikr=31.34m Rc=.1682 Cjc=251.5p Mjc=.5045 Vjc=.75 Fc=.5 Cje=286.3p Mje=.4961 Vje=.75 Tr=810n Tf=23.64n Itf=10.92 Xtf=.3795 Vtf=10 Rb=.1)
.MODEL BDP952 PNP(IS=0.800p ISE=0.309p ISC=0.200p XTI=5.0 BF=250 BR=44.0 IKF=0.700 IKR=1.0 XTB=2.0 VAF=70.500 VAR=7.840 VJE=0.921 VJC=0.775 RE=50.000m RC=59.947m RB=0.250 RBM=0.200 IRB=10.000m CJE=0.390n CJC=0.139n XCJC=0.720 FC=0.500 NF=0.995 NR=1.0 NE=2.330 NC=1.079 MJE=0.430 MJC=0.49 TF=0.73n TR=0.1u PTF=1 ITF=0.6 VTF=2 XTF=1 EG=1.125 VCEO=100 ICRATING=3 MFG=SIEMENS)
.MODEL BF421P PNP(IS=9.124f ISE=1.672f ISC=2.139E-13 XTI=3 BF=198.2 BR=1.256 IKF=0.13 IKR=0.1 XTB=1.5 VAF=465.9 VAR=13 VJE=0.8484 VJC=0.6298 RE=0.635 RC=1.42 RB=5 RBM=0.5 IRB=1E-06 CJE=1.447E-11 CJC=8.483p XCJC=0.619 FC=0.99 NF=0.9904 NR=0.99 NE=1.527 NC=1.08 MJE=0.3884 MJC=0.4561 TF=1.38E-09 TR=1m2 ITF=0.065 VTF=2 XTF=21.78 EG=1.11 VCEO=300 ICRATING=50m MFG=PHILIPS)
.MODEL BF421S PNP(IS=5.35E-16 ISE=9.81E-17 ISC=1.00E-13 XTI=3.00 BF=1.40E2 BR=1.00E-2 IKF=2.41E-2 IKR=1.00 XTB=1.5 VAF=1.49E2 VAR=9.18E1 VJE=3.00E-1 VJC=3.00E-1 RE=1.85E-2 RC=2.22 RB=1.99E1 RBM=2.41E-2 IRB=1.10E-2 CJE=4.20E-11 CJC=1.65E-11 .00 FC=5.00E-1 NF=8.73E-1 NR=9.84E-1 NE=1.03 NC=2.00 MJE=4.13E-1 MJC=7.00E-1 TF=1.11n TR=0 ITF=3.00 VTF=9.99E5 XTF=5.76E2 EG=1.11 VCEO=300 ICRATING=500m MFG=SIEMENS)
.MODEL BF450 PNP(IS=8.083E-16 ISE=8.858E-16 ISC=2.382E-16 XTI=3 BF=114.1 BR=4.502 IKF=0.03 IKR=0.00056 XTB=1.5 VAF=37.65 VAR=10 VJE=0.6822 VJC=0.6482 RE=0.8 RC=2.28 RB=1 RBM=0.5 IRB=1E-06 CJE=1.86p CJC=1.19p XCJC=0.828 FC=0.9297 NF=0.9985 NR=0.9859 NE=1.45 NC=1 MJE=0.2643 MJC=0.3185 TF=1.633E-10 TR=1m2 ITF=0.07408 VTF=1.864 XTF=11.46 EG=1.11 VCEO=40 ICRATING=25m MFG=PHILIPS)
.MODEL BF470 PNP(IS=9.124f ISE=1.672f ISC=2.139E-13 XTI=3 BF=198.2 BR=1.256 IKF=0.13 IKR=0.1 XTB=1.5 VAF=465.9 VAR=13 VJE=0.8484 VJC=0.6298 RE=0.635 RC=1.42 RB=5 RBM=0.5 IRB=1E-06 CJE=1.447E-11 CJC=8.483p XCJC=0.619 FC=0.99 NF=0.9904 NR=0.99 NE=1.527 NC=1.08 MJE=0.3884 MJC=0.4561 TF=1.38E-09 TR=1m2 ITF=0.065 VTF=2 XTF=21.78 EG=1.11 VCEO=250 ICRATING=30m MFG=PHILIPS)
.MODEL BF550 PNP(IS=5.565E-16 ISE=4.594E-16 ISC=2.38E-16 XTI=3 BF=114 BR=4.5 IKF=0.034 IKR=0.00056 XTB=1.5 VAF=42.41 VAR=5 VJE=0.7931 VJC=0.9168 RE=0.4 RC=1.4 RB=21 RBM=0.73 IRB=0.0005556 CJE=1.536p CJC=1.066p XCJC=0.828 FC=0.9297 NF=0.9971 NR=0.9989 NE=1.4 NC=1 MJE=0.3515 MJC=0.397 TF=2E-10 TR=1m2 ITF=0.06 VTF=3.7 XTF=7.5 EG=1.11 VCEO=40 ICRATING=25m MFG=PHILIPS)
.MODEL BF603 PNP(IS=5.35E-16 ISE=9.81E-17 ISC=1.00E-13 XTI=3.00 BF=1.40E2 BR=1.00E-2 IKF=2.41E-2 IKR=1.00 XTB=1.5 VAF=1.49E2 VAR=9.18E1 VJE=3.00E-1 VJC=3.00E-1 RE=1.85E-2 RC=2.22 RB=1.99E1 RBM=2.41E-2 IRB=1.10E-2 CJE=4.20E-11 CJC=1.65E-11 .00 FC=5.00E-1 NF=8.73E-1 NR=9.84E-1 NE=1.03 NC=2.00 MJE=4.13E-1 MJC=7.00E-1 TF=1.11n TR=0 ITF=3.00 VTF=9.99E5 XTF=5.76E2 EG=1.11 VCEO=40 ICRATING=800M MFG=SIEMENS)
.MODEL BF621 PNP(IS=4E-14 ISE=8f ISC=8p XTI=3 BF=105 BR=4 IKF=800m IKR=55m XTB=1.5 VAF=300 VAR=40 VJE=0.65 VJC=0.536 RE=0.1 RC=0.1 RB=9 CJE=80.9p CJC=16.9p XCJC=0.75 FC=0.5 NF=1.01 NR=1 NE=1.38 NC=1.3 MJE=0.382 MJC=0.382 TF=0.7n TR=1.6E-6 EG=1.11 VCEO=300 ICRATING=50m MFG=ZETEX GAMMA=0.85E-7 RCO=59)
.MODEL BF623 PNP(IS=5.35E-16 ISE=9.81E-17 ISC=1.00E-13 XTI=3.00 BF=1.40E2 BR=1.00E-2 IKF=2.41E-2 IKR=1.00 XTB=1.5 VAF=1.49E2 VAR=9.18E1 VJE=3.00E-1 VJC=3.00E-1 RE=1.85E-2 RC=2.22 RB=1.99E1 RBM=2.41E-2 IRB=1.10E-2 CJE=4.20E-11 CJC=1.65E-11 .00 FC=5.00E-1 NF=8.73E-1 NR=9.84E-1 NE=1.03 NC=2.00 MJE=4.13E-1 MJC=7.00E-1 TF=1.11n TR=0 ITF=3.00 VTF=9.99E5 XTF=5.76E2 EG=1.11 VCEO=250 ICRATING=50m MFG=SIEMENS)
.MODEL BF721 PNP(IS=5.35E-16 ISE=9.81E-17 ISC=1.00E-13 XTI=3.00 BF=1.40E2 BR=1.00E-2 IKF=2.41E-2 IKR=1.00 XTB=1.5 VAF=1.49E2 VAR=9.18E1 VJE=3.00E-1 VJC=3.00E-1 RE=1.85E-2 RC=2.22 RB=1.99E1 RBM=2.41E-2 IRB=1.10E-2 CJE=4.20E-11 CJC=1.65E-11 .00 FC=5.00E-1 NF=8.73E-1 NR=9.84E-1 NE=1.03 NC=2.00 MJE=4.13E-1 MJC=7.00E-1 TF=1.11n TR=0 ITF=3.00 VTF=9.99E5 XTF=5.76E2 EG=1.11 VCEO=300 ICRATING=50m MFG=SIEMENS)
.MODEL BF824 PNP(IS=2.948E-16 ISE=1.879E-14 ISC=2.21f XTI=3 BF=42 BR=1.5 IKF=0.05266 IKR=0.05 XTB=1.5 VAF=35 VAR=33.62 VJE=0.7113 VJC=0.4038 RE=0.1038 RC=4.2 RB=1 RBM=0.5 IRB=1E-06 CJE=2.453p CJC=3.237p XCJC=0.0464 FC=0.8618 NF=0.99 NR=0.9809 NE=2.469 NC=1.25 MJE=0.3218 MJC=0.3117 TF=2.602E-10 TR=1m2 ITF=0.1748 VTF=2.773 XTF=9.349 EG=1.11 VCEO=30 ICRATING=25m MFG=PHILIPS)
.MODEL BFG194 PNP(IS=4.574f ISE=2.1629E-14 ISC=7.8447E-18 XTI=3 BF=111.78 NR=0.43618 IKF=0.84785 IKR=0.012843 XTB=1.5 VAF=9.1007 VAR=1.7871 VJE=0.84843 VJC=0.71631 RE=0.15908 RC=0.10833 RB=4.1356

RBM=0.75304 IRB=6.1674E-5 CJE=1.7699E-14 CJC=3.5856p XCJC=0.063742 FC=0.90755 NF=0.66503 BR=92.296 NE=0.841 NC=1.6 MJE=0.48212 MJC=0.40003 TF=5.311E-11 TR=9.7481E-10 ITF=0.010453 VTF=0.10323 XTF=0.65766 EG=1.11 VCEO=20 ICRATING=100m MFG=SIEMENS)
.MODEL BFN19 PNP(IS=9.53E-14 ISE=8.37E-13 ISC=9.99E-11 XTI=3.00 BF=9.80E1 BR=4.78 IKF=3.49E-2 IKR=1.00 XTB=1.5 VAF=2.60E2 VAR=1.40E2 VJE=3.00E-1 VJC=3.00E-1 RE=1.00E-2 RC=1.00E-2 RB=2.76E1 RBM=6.66E-2 IRB=7.02E-4 CJE=9.54E-11 CJC=4.66E-11 .00 FC=5.00E-1 NF=1.00 NR=1.55 NE=1.49 NC=1.50 MJE=4.26E-1 MJC=7.00E-1 TF=9.52E-10 TR=1.6E-6 ITF=4.12E-1 VTF=9.99E5 XTF=1.03 EG=1.11 VCEO=300 ICRATING=200m MFG=SIEMENS)
.MODEL BFN21 PNP(IS=5.35E-16 ISE=9.81E-17 ISC=1.00E-13 XTI=3.00 BF=1.40E2 BR=1.00E-2 IKF=2.41E-2 IKR=1.00 XTB=1.5 VAF=1.49E2 VAR=9.18E1 VJE=3.00E-1 VJC=3.00E-1 RE=1.85E-2 RC=2.22 RB=1.99E1 RBM=2.41E-2 IRB=1.10E-2 CJE=4.20E-11 CJC=1.65E-11 .00 FC=5.00E-1 NF=8.73E-1 NR=9.84E-1 NE=1.03 NC=2.00 MJE=4.13E-1 MJC=7.00E-1 TF=1.11n TR=0 ITF=3.00 VTF=9.99E5 XTF=5.76E2 EG=1.11 VCEO=300 ICRATING=25m MFG=SIEMENS)
.MODEL BFN25 PNP(IS=9.53E-14 ISE=8.37E-13 ISC=9.99E-11 XTI=3.00 BF=9.80E1 BR=4.78 IKF=3.49E-2 IKR=1.00 XTB=1.5 VAF=2.60E2 VAR=1.40E2 VJE=3.00E-1 VJC=3.00E-1 RE=1.00E-2 RC=1.00E-2 RB=2.76E1 RBM=6.66E-2 IRB=7.02E-4 CJE=9.54E-11 CJC=4.66E-11 .00 FC=5.00E-1 NF=1.00 NR=1.55 NE=1.49 NC=1.50 MJE=4.26E-1 MJC=7.00E-1 TF=9.52E-10 TR=0 ITF=4.12E-1 VTF=9.99E5 XTF=1.03 EG=1.11 VCEO=250 ICRATING=200m MFG=SIEMENS)
.MODEL BFN37 PNP(IS=9.53E-14 ISE=8.37E-13 ISC=9.99E-11 XTI=3.00 BF=9.80E1 BR=4.78 IKF=3.49E-2 IKR=1.00 XTB=1.5 VAF=2.60E2 VAR=1.40E2 VJE=3.00E-1 VJC=3.00E-1 RE=1.00E-2 RC=1.00E-2 RB=2.76E1 RBM=6.66E-2 IRB=7.02E-4 CJE=9.54E-11 CJC=4.66E-11 .00 FC=5.00E-1 NF=1.00 NR=1.55 NE=1.49 NC=1.50 MJE=4.26E-1 MJC=7.00E-1 TF=9.52E-10 TR=0 ITF=4.12E-1 VTF=9.99E5 XTF=1.03 EG=1.11 VCEO=250 ICRATING=200m MFG=SIEMENS)
.MODEL BFP194 PNP(IS=4.574f ISE=2.1629E-14 ISC=7.8447E-18 XTI=3 BF=111.78 NR=0.43618 IKF=0.84785 IKR=0.012843 XTB=1.5 VAF=9.1007 VAR=1.7871 VJE=0.84843 VJC=0.71631 RE=0.15908 RC=0.10833 RB=4.1356 RBM=0.75304 IRB=6.1674E-5 CJE=1.7699E-14 CJC=3.5856p XCJC=0.063742 FC=0.90755 NF=0.66503 BR=92.296 NE=0.841 NC=1.6 MJE=0.48212 MJC=0.40003 TF=5.311E-11 TR=9.7481E-10 ITF=0.010453 VTF=0.10323 XTF=0.65766 EG=1.11 VCEO=20 ICRATING=100m MFG=SIEMENS)
.MODEL BFP23 PNP(IS=9.53E-14 ISE=8.37E-13 ISC=9.99E-11 XTI=3.00 BF=9.80E1 BR=4.78 IKF=3.49E-2 IKR=1.00 XTB=1.5 VAF=2.60E2 VAR=1.40E2 VJE=3.00E-1 VJC=3.00E-1 RE=1.00E-2 RC=1.00E-2 RB=2.76E1 RBM=6.66E-2 IRB=7.02E-4 CJE=9.54E-11 CJC=4.66E-11 .00 FC=5.00E-1 NF=1.00 NR=1.55 NE=1.49 NC=1.50 MJE=4.26E-1 MJC=7.00E-1 TF=9.52E-10 TR=0 ITF=4.12E-1 VTF=9.99E5 XTF=1.03 EG=1.11 VCEO=90 ICRATING=1 MFG=SIEMENS)
.MODEL BFV421 PNP(IS=2.508E-14 ISE=9.673f ISC=1.695p XTI=3 BF=256.8 BR=3.903 IKF=0.17 IKR=0.03 XTB=1.5 VAF=114.9 VAR=15 VJE=0.9 VJC=0.6865 RE=0.5 RC=0.69 RB=64.07 RBM=10.57 IRB=0.0001398 CJE=1.572E-11 CJC=9.067p XCJC=0.5 FC=0.8 NF=0.9935 NR=0.988 NE=1.469 NC=1.3 MJE=0.4352 MJC=0.4535 TF=6.868E-10 TR=1.2E-07 PTF=55 ITF=0.1102 VTF=1.488 XTF=19.57 EG=1.11 VCEO=140 ICRATING=100m MFG=SIEMENS)
.MODEL BSP31 PNP(IS=6.330E-14 ISE=8.576E-17 ISC=6.121f XTI=3 BF=191.4 BR=11.65 IKF=1.3660 IKR=0.2553 XTB=1.5 VAF=106.1 VAR=13.41 VJE=0.7589 VJC=0.7124 RE=5.555E-02 RC=0.1597 RB=2 RBM=2 IRB=1E-06 CJE=1.036E-10 CJC=5.025E-11 XCJC=0.3899 FC=0.800 NF=0.9938 NR=0.9976 NE=1.045 NC=1.021 MJE=0.3930 MJC=0.5012 TF=7.518E-10 TR=2.25E-07 ITF=1.9360 VTF=1.806 XTF=8.402 EG=1.11 VCEO=70 ICRATING=1 MFG=PHILIPS)
.MODEL BSS63 PNP(IS=7.59E-14 ISE=1.90E-14 ISC=1.72p XTI=3.00 BF=1.52E2 BR=1.16E-1 IKF=1.18E-1 IKR=1.00 XTB=1.5 VAF=3.28E2 VAR=2.61E1 VJE=3.15E-1 VJC=3.00E-1 RE=1.00E-2 RC=8.89E-1 RB=2.42 RBM=4.95 IRB=8.03E-2 CJE=5.74E-11 CJC=3.90E-11 .00 FC=5.00E-1 NF=1.01 NR=1.21 NE=1.27 NC=2.00 MJE=4.41E-1 MJC=4.85E-1 TF=8.18E-10 TR=0 ITF=1.28 VTF=9.99E5 XTF=5.01 EG=1.11 VCEO=110 ICRATING=100m MFG=SIEMENS)
.MODEL BST15 PNP(IS=4E-14 ISE=8f ISC=8p XTI=3 BF=105 BR=4 IKF=800m IKR=55m XTB=1.5 VAF=300 VAR=40 VJE=0.65 VJC=0.536 RE=0.1 RC=0.1 RB=9 CJE=80.9p CJC=16.9p XCJC=0.75 FC=0.5 NF=1.01 NR=1 NE=1.38 NC=1.3 MJE=0.382 MJC=0.382 TF=0.7n TR=1.6E-6 EG=1.11 VCEO=200V ICRATING=1 MFG=ZETEX GAMMA=0.85E-7 RCO=59)
.model D45H11 PNP(IS=7.89979e-11 BF=65.9745 NF=0.851012 VAF=10.7084 IKF=10 Ise=4.79702e-14 Ne=4 BR=1.96197 Nr=1.29503 VAR=23.2874 IKR=9.99625 Isc=4.79702e-14 Nc=3.59375 Rb=2.35587 Irb=0.108633 Rbm=0.101928 Re=0.000100027 Rc=0.122304 XTB=0.137608 XTI=1.0316 Eg=1.12218 Cje=1.03083e-09 Vje=0.651747 Mje=0.353069 TF=3.89762e-09 XTF=1.35721 VTF=0.99569 ITF=0.999994 Cjc=5e-10 Vjc=0.42654 Mjc=0.24282 Xcjc=0.803125 FC=0.533457 Cjs=0 Vjs=0.75 Mjs=0.5 TR=4.90984e-07 PTF=0 KF=0 AF=1 Vceo=80 Icrating=10 mfg=On_Semiconductor)
.MODEL MJE2955 PNP(IS=2.37E-8 ISE=1n ISC=0 XTI=3 BF=73 BR=2.66 IKF=0.8 IKF=0.4 XTB=1.5 VAF=90 VAR=30 VJE=0.65 VJC=0.65 RE=0.00856 RC=0.0856 RB=0.81 CJE=415p CJC=1000p XCJC=0.75 FC=0.75 NF=1 NR=1 NE=1.26 NC=1.5 MJE=0.5 MJC=0.33 TF=140n TR=0.75E-6 EG=1.11 VCEO=70 ICRATING=15 MFG=STMICRO)

.MODEL MJE2955_ PNP(Is=66.19f Xti=3 Eg=1.11 Vaf=100 Bf=137.6 Ise=862.2f Ne=1.481 Ikf=1.642 Nkf=.5695 Xtb=2 Br=5.88 Isc=273.5f Nc=1.24 Ikr=3.555 Rc=79.39m Cjc=870.4p Mjc=.6481 Vjc=.75 Fc=.5 Cje=390.1p Mje=.4343 Vje=.75 Tr=235.4n Tf=23.21n Itf=71.33 Xtf=5.982 Vtf=10 Rb=.1)
.MODEL MPSA55 PNP(IS=65f ISE=45.000f ISC=62.000f XTI=4.300 BF=151.409 BR=5.0 IKF=0.825 IKR=75.000m XTB=1.900 VAF=81.400 VAR=10.808 VJE=1.090 VJC=1.0 RE=0.277 RC=0.311 RB=0.350 RBM=0.200 IRB=20.000E-6 CJE=74.000p CJC=27.800p XCJC=0.650 FC=0.750 NF=0.988 NR=0.985 NE=2.223 NC=1.478 MJE=0.410 MJC=0.571 TF=1.1n TR=2n PTF=1 ITF=0.487 VTF=2 XTF=5 EG=1.110 VCEO=60 ICRATING=500m MFG=SIEMENS)
.MODEL MPSA70 PNP(IS=28f ISE=24.903f ISC=0.125p XTI=3.300 BF=284.436 BR=4.800 IKF=0.380 IKR=0.932 XTB=1.600 VAF=43.0 VAR=6.960 VJE=1.0 VJC=0.900 RE=0.300 RC=2.251 RB=2.200 RBM=1.500 IRB=0.100m CJE=11.800p CJC=8.700p XCJC=0.650 FC=0.750 NF=1.0 NR=1.005 NE=2.234 NC=2.074 MJE=0.435 MJC=0.600 TF=0.600n TR=2.604n PTF=1 ITF=0.314 VTF=2 XTF=6.5 EG=1.110 VCEO=40 ICRATING=100m MFG=SIEMENS)
.MODEL MPSA92 PNP(IS=9.53E-14 ISE=8.37E-13 ISC=9.99E-11 XTI=3.00 BF=9.80E1 BR=4.78 IKF=3.49E-2 IKR=1.00 XTB=1.5 VAF=2.60E2 VAR=1.40E2 VJE=3.00E-1 VJC=3.00E-1 RE=1.00E-2 RC=1.00E-2 RB=2.76E1 RBM=6.66E-2 IRB=7.02E-4 CJE=9.54E-11 CJC=4.66E-11 .00 FC=5.00E-1 NF=1.00 NR=1.55 NE=1.49 NC=1.50 MJE=4.26E-1 MJC=7.00E-1 TF=9.52E-10 TR=516.9p ITF=4.12E-1 VTF=9.99E5 XTF=1.03 EG=1.11 VCEO=300 ICRATING=500m MFG=SIEMENS)
.MODEL MPSL51 PNP(IS=21.48f ISE=21.48f ISC=0 XTI=3 BF=116.7 BR=3.728 IKF=0.1803 IKR=0 XTB=1.5 VAF=100 VAR=30 VJE=0.65 VJC=0.65 RE=0.15 RC=1.6 RB=10 CJE=73.39p CJC=21.16p XCJC=0.75 FC=0.5 NF=1 NR=1 NE=1.362 NC=2 MJE=0.3777 MJC=0.5312 TF=639.1p TR=1.487n ITF=0 VTF=0 XTF=0 EG=1.11 VCEO=100 ICRATING=600m MFG=NSC)
.MODEL TIP2955 PNP(IS=4.66p BF=360 VAF=100 IKF=0.25 ISE=3.339E-11 BR=2 ISC=5n RB=3 IRB=0.001 RBM=0.4 RC=0.04 CJE=5.802E-10 VJE=1.2 MJE=0.45 TF=8E-8 XTF=1 ITF=3 PTF=120 CJC=2.121E-10 MJC=0.4 TR=2.55u XTB=1) VCEO=100 ICRATING=15 MFG=TEXAS)
.MODEL TIP32C PNP(IS=6.77594E-13 ISE=1.31133E-11 ISC=1.31133E-11 XTI=3 BF=198.8 BR=25.4966 IKF=0.891251 IKR=0.410482 XTB=1.2648 VAF=77.429 VAR=70.9603 VJE=0.59 VJC=0.5 RE=0.06 RC=0.16 RB=161.0 RBM=3.097 IRB=3.548134E-5 CJE=2.7E-10 CJC=1.07E-10 XCJC=0.589205 FC=0.5 NF=1.001 NR=1.004 NE=1.98 NC=1.12 MJE=0.319 MJC=0.352 TF=2.3733E-8 TR=1.0000E-8 ITF=1 VTF=10 XTF=10 EG=1.0863 VCEO=100 ICRATING=3 MFG=TEXAS)
.MODEL CA3046 NPN(IS=10f BF=145.76 VAF=100 IKF=46.747m XTB=0 ISE=114.23f NE=1.483 BR=100.1m VAR=100 IKR=10.01m nc=2 ISC=10f RC=10 CJE=1.026p MJE=333.33m CJC=991.79f RC=10 MJC=333.33m TF=277.09p XTF=309.38 VTF=16.364 ITF=1.7597 TR=10n CJS=6.3P VJS=0.749 MJS=0.5 VCEO=20 ICRATING=50m MFG=RCA)
.MODEL CA3096N NPN(IS=10f BF=466.52 VAF=100 IKF=14.03m ISE=74.093f NE=1.6606 BR=100.1m VAR=100 IKR=10.01m ISC=10f NK=468.98m RC=10 CJE=1.2825p MJE=333.33m CJC=786.59f MJC=333.33m TF=490.39p XTF=5.3212 VTF=28.396 VCEO=35 ICRATING=50m MFG=RCA)
.MODEL CA3096P PNP(IS=10f BF=94.511 VAF=100 IKF=1.1177m ISE=976.47f NE=1.998 BR=100.1m VAR=100 IKR=10.01m ISC=10f NK=532.43m CJE=1.4535p MJE=333.33m CJC=3.8474p MJC=333.33m TF=24.3n XTF=10.054 VTF=9.792 ITF=1.2571 TR=10n VCEO=35 ICRATING=50m MFG=RCA)
.MODEL CA3127 NPN(IS=3.2168p BF=95.245 VAF=100 IKF=61.522m ISE=20.48p NE=1.9984 BR=100.1m VAR=100 IKR=10.01m ISC=10.805n RC=10 CJE=651.92f MJE=336.97m CJC=281.16f MJC=138.65m TF=122.68p XTF=2.0529K VTF=307.73 ITF=1.6076 TR=10n VCEO=20 ICRATING=20m MFG=RCA)
.model EndOfCopirate NPN mfg=StartOfPsPiceEuroNpnBjt
.model EndOf_Copirate PNP mfg=StartOfPsPiceEuroPnpBjt
.model BC107 NPN(Is=40.72f Vaf=21.03 Bf=407 Ise=40.72f Ne=1.305 Ikf=1 Xtb=1.5 Isc=594.8p Nc=2.033 Ikr=3.726 Rc=1.393 Cjc=6p Mjc=.3821 Cje=12.5p Mje=.4869 Vje=.5391 Tr=114n Tf=441.1p)
.model BC107A NPN(Is=7.049f Xti=3 Eg=1.11 Vaf=116.3 Bf=375.5 Ise=7.049f Ne=1.281 Ikf=4.589 Nk=.5 Xtb=1.5 Br=2.611 Isc=121.7p Nc=1.865 Ikr=5.313 Rc=1.464 Cjc=5.38p Mjc=.329 Vjc=.6218 Fc=.5 Cje=11.5p Mje=.2717 Vje=.5 Tr=10n Tf=451p Itf=6.194 Xtf=17.43 Vtf=10 Vceo=50 Icrating=100m mfg=Philips)
.model BC107B NPN(Is=7.049f Xti=3 Eg=1.11 Vaf=59.59 Bf=381.7 Ise=59.74f Ne=1.522 Ikf=3.289 Nk=.5 Xtb=1.5 Br=2.359 Isc=192.9p Nc=1.954 Ikr=7.807 Rc=1.427 Cjc=5.38p Mjc=.329 Vjc=.6218 Fc=.5 Cje=11.5p Mje=.2718 Vje=.5 Tr=10n Tf=438p Itf=5.716 Xtf=14.51 Vtf=10 Vceo=50 Icrating=100m mfg=Philips)
.model BC108A NPN(Is=7.049f Xti=3 Eg=1.11 Vaf=116.3 Bf=375.5 Ise=7.049f Ne=1.281 Ikf=4.589 Nk=.5 Xtb=1.5 Br=2.611 Isc=121.7p Nc=1.865 Ikr=5.313 Rc=1.464 Cjc=5.38p Mjc=.329 Vjc=.6218 Fc=.5 Cje=11.5p Mje=.2717 Vje=.5 Tr=10n Tf=451p Itf=6.194 Xtf=17.43 Vtf=10 Vceo=30 Icrating=100m mfg=Philips)
.model BC108B NPN(Is=7.049f Xti=3 Eg=1.11 Vaf=59.59 Bf=381.7 Ise=59.74f Ne=1.522 Ikf=3.289 Nk=.5 Xtb=1.5 Br=2.359 Isc=192.9p Nc=1.954 Ikr=7.807 Rc=1.427 Cjc=5.38p Mjc=.329 Vjc=.6218 Fc=.5 Cje=11.5p Mje=.2718 Vje=.5 Tr=10n Tf=438p Itf=5.716 Xtf=14.51 Vtf=10 Vceo=30 Icrating=100m mfg=Philips)
.model BC108C NPN(Is=7.049f Xti=3 Eg=1.11 Vaf=28.14 Bf=677 Ise=7.049f Ne=1.38 Ikf=96.23 Nk=.5 Xtb=1.5 Br=2.209 Isc=250.3p Nc=2.002 Ikr=10.73 Rc=1.433 Cjc=5.38p Mjc=.329 Vjc=.6218 Fc=.5 Cje=11.5p Mje=.2717 Vje=.5

Tr=10n Tf=437.8p Itf=3.097 Xtf=12.85 Vtf=10 Vceo=30 Icrating=100m mfg=Philips)
.model BC109B NPN(Is=7.049f Xti=3 Eg=1.11 Vaf=59.59 Bf=381.7 Ise=59.74f Ne=1.522 Ikf=3.289 Nk=.5 Xtb=1.5 Br=2.359 Isc=192.9p Nc=1.954 Ikr=7.807 Rc=1.427 Cjc=5.38p Mjc=.329 Vjc=.6218 Fc=.5 Cje=11.5p Mje=.2718 Vje=.5 Tr=10n Tf=438p Itf=5.716 Xtf=14.51 Vtf=10 Vceo=30 Icrating=100m mfg=Philips)
.model BC109C NPN(Is=7.049f Xti=3 Eg=1.11 Vaf=28.14 Bf=677 Ise=7.049f Ne=1.38 Ikf=96.23 Nk=.5 Xtb=1.5 Br=2.209 Isc=250.3p Nc=2.002 Ikr=10.73 Rc=1.433 Cjc=5.38p Mjc=.329 Vjc=.6218 Fc=.5 Cje=11.5p Mje=.2717 Vje=.5 Tr=10n Tf=437.8p Itf=3.097 Xtf=12.85 Vtf=10 Vceo=30 Icrating=100m mfg=Philips)
.model BC147 NPN(Is=67.34f Xti=3 Eg=1.11 Vaf=45.39 Bf=1.717K Ise=589f Ne=1.516 Ikf=27.52m Nk=.8051 Xtb=1.5 Br=1 Isc=0 Nc=2 Ikr=0 Rc=0 Cjc=6p Mjc=.333 Vjc=.75 Fc=.5 Cje=12p Mje=.3333 Vje=.75 Tr=404.7n Tf=472p Itf=113.6 Xtf=1.94 Vtf=10)
.model BC177 PNP(Is=336.7f Xti=3 Eg=1.11 Vaf=55.46 Bf=154.4 Ise=412.1f Ne=1.429 Ikf=.2994 Nk=.7028 Xtb=1.5 Br=3.99 Isc=1.03n Nc=1.958 Ikr=9.726 Rc=1.833 Cjc=11p Mjc=.2223 Vjc=.5 Fc=.5 Cje=33p Mje=.3333 Vje=.5 Tr=10n Tf=847.7p Itf=2.198 Xtf=23.26 Vtf=10 Vceo=50 Icrating=100m mfg=Philips)
.model BC178A PNP(Is=336.7f Xti=3 Eg=1.11 Vaf=44.61 Bf=187 Ise=336.8f Ne=1.459 Ikf=.2059 Nk=.5081 Xtb=1.5 Br=4.068 Isc=1.121n Nc=1.953 Ikr=10.05 Rc=1.86 Cjc=11p Mjc=.2223 Vjc=.5 Fc=.5 Cje=33p Mje=.3333 Vje=.5 Tr=10n Tf=845.5p Itf=1.701 Xtf=19.04 Vtf=10 Vceo=30 Icrating=100m mfg=Philips)
.model BC178B PNP(Is=336.7f Xti=3 Eg=1.11 Vaf=30.75 Bf=271.9 Ise=2.821p Ne=1.925 Ikf=.2462 Nk=.5416 Xtb=1.5 Br=3.009 Isc=1.753n Nc=2.075 Ikr=8.143 Rc=1.803 Cjc=11p Mjc=.2223 Vjc=.5 Fc=.5 Cje=33p Mje=.3333 Vje=.5 Tr=10n Tf=846p Itf=1.546 Xtf=18.27 Vtf=10 Vceo=30 Icrating=100m mfg=Philips)
.model BC179A PNP(Is=336.7f Xti=3 Eg=1.11 Vaf=44.61 Bf=187 Ise=336.8f Ne=1.459 Ikf=.2059 Nk=.5081 Xtb=1.5 Br=4.068 Isc=1.121n Nc=1.953 Ikr=10.05 Rc=1.86 Cjc=11p Mjc=.2223 Vjc=.5 Fc=.5 Cje=33p Mje=.3333 Vje=.5 Tr=10n Tf=845.5p Itf=1.701 Xtf=19.04 Vtf=10 Vceo=25 Icrating=100m mfg=Philips)
.model BC179B PNP(Is=336.7f Xti=3 Eg=1.11 Vaf=30.75 Bf=271.9 Ise=2.821p Ne=1.925 Ikf=.2462 Nk=.5416 Xtb=1.5 Br=3.009 Isc=1.753n Nc=2.075 Ikr=8.143 Rc=1.803 Cjc=11p Mjc=.2223 Vjc=.5 Fc=.5 Cje=33p Mje=.3333 Vje=.5 Tr=10n Tf=846p Itf=1.546 Xtf=18.27 Vtf=10 Vceo=25 Icrating=100m mfg=Philips)
.model BC368 NPN(Is=14.06f Xti=3 Eg=1.11 Vaf=100 Bf=187.6 Ise=137.2f Ne=1.468 Ikf=4.103 Nk=.5507 Xtb=1.5 Br=4.541 Isc=44.13f Nc=1.471 Ikr=1.701 Rc=91m Cjc=52.24p Mjc=.3333 Vjc=.5 Fc=.5 Cje=156p Mje=.3333 Vje=.5 Tr=10n Tf=964.8p Itf=595.3 Xtf=1.001K Vtf=10 VCEO=25 ICRATING=1 MFG=SIEMENS)
.model BC369 PNP(Is=13.01f Xti=3 Eg=1.11 Vaf=100 Bf=191.1 Ise=105f Ne=1.695 Ikf=2.253 Nk=.5176 Xtb=1.5 Br=9.046MEG Isc=853.3f Nc=9.905 Ikr=116.1 Rc=.1694 Cjc=87.73p Mjc=.3333 Vjc=.5 Fc=.5 Cje=261p Mje=.3333 Vje=.5 Tr=10n Tf=998.5p Itf=14.84 Xtf=15.37 Vtf=10 Vceo=25 Icrating=1 mfg=Philips)
.model BC546A NPN(Is=7.049f Xti=3 Eg=1.11 Vaf=127.9 Bf=253 Ise=96.26f Ne=1.556 Ikf=77.05m Nk=.5305 Xtb=1.5 Br=1 Isc=130.8f Nc=1.602 Ikr=3.321 Rc=.8766 Cjc=5.25p Mjc=.3147 Vjc=.5697 Fc=.5 Cje=11.5p Mje=.6715 Vje=.5 Tr=10n Tf=409.5p Itf=1.994 Xtf=40.12 Vtf=10 Vceo=80 Icrating=100m mfg=Philips)
.model BC546B NPN(IS=2.39E-14 NF=1.008 ISE=3.55E-15 NE=1.541 BF=294.3 IKF=0.1357 VAF=63.2 NR=1.004 ISC=6.27E-14 NC=1.243 BR=7.946 IKR=0.1144 VAR=25.9 RB=1 IRB=1.00E-06 RBM=1 RE=0.4683 RC=0.85 XTB=0 EG=1.11 XTI=3 CJE=1.36E-11 VJE=0.65 MJE=0.3279 TF=4.39E-10 XTF=120 VTF=2.643 ITF=0.7495 PTF=0 CJC=3.73E-12 VJC=0.3997 MJC=0.2955 XCJC=0.6193 TR=1.00E-32 CJS=0 VJS=0.75 MJS=0.333 FC=0.9579 Vceo=65 Icrating=100m mfg=NXP)
.model BC548A NPN(Is=7.049f Xti=3 Eg=1.11 Vaf=127.9 Bf=253 Ise=96.26f Ne=1.556 Ikf=77.05m Nk=.5305 Xtb=1.5 Br=1 Isc=130.8f Nc=1.602 Ikr=3.321 Rc=.8766 Cjc=5.25p Mjc=.3147 Vjc=.5697 Fc=.5 Cje=11.5p Mje=.6715 Vje=.5 Tr=10n Tf=409.5p Itf=1.994 Xtf=40.12 Vtf=10 Vceo=30 Icrating=100m mfg=Philips)
.model BC548B NPN(Is=7.049f Xti=3 Eg=1.11 Vaf=62.79 Bf=374.6 Ise=68f Ne=1.576 Ikf=81.57m Nk=.4767 Xtb=1.5 Br=1 Isc=12.4f Nc=1.835 Ikr=3.924 Rc=.9747 Cjc=5.25p Mjc=.3147 Vjc=.5697 Fc=.5 Cje=11.5p Mje=.6715 Vje=.5 Tr=10n Tf=410.2p Itf=1.491 Xtf=40.06 Vtf=10 Vceo=30 Icrating=100m mfg=Philips)
.model BC549C NPN(Is=7.049f Xti=3 Eg=1.11 Vaf=23.89 Bf=493.2 Ise=99.2f Ne=1.829 Ikf=.1542 Nk=.6339 Xtb=1.5 Br=2.886 Isc=7.371p Nc=1.508 Ikr=5.426 Rc=1.175 Cjc=5.5p Mjc=.3132 Vjc=.4924 Fc=.5 Cje=11.5p Mje=.6558 Vje=.5 Tr=10n Tf=420.3p Itf=1.374 Xtf=39.42 Vtf=10 Vceo=30 Icrating=100m mfg=Philips)
.model BC550C NPN(Is=7.049f Xti=3 Eg=1.11 Vaf=23.89 Bf=493.2 Ise=99.2f Ne=1.829 Ikf=.1542 Nk=.6339 Xtb=1.5 Br=2.886 Isc=7.371p Nc=1.508 Ikr=5.426 Rc=1.175 Cjc=5.5p Mjc=.3132 Vjc=.4924 Fc=.5 Cje=11.5p Mje=.6558 Vje=.5 Tr=10n Tf=420.3p Itf=1.374 Xtf=39.42 Vtf=10 Vceo=30 Icrating=100m mfg=Philips)
.model BC556A PNP(Is=1.02f Xti=3 Eg=1.11 Vaf=73.79 Bf=174.7 Ise=10.73f Ne=1.644 Ikf=.1023 Nk=.5033 Xtb=1.5 Br=4.432 Isc=14.74f Nc=1.296 Ikr=2.237 Rc=1.039 Cjc=9.81p Mjc=.332 Vjc=.4865 Fc=.5 Cje=30p Mje=.3333 Vje=.5 Tr=10n Tf=830.3p Itf=.8981 Xtf=10.32 Vtf=10 Vceo=80 Icrating=100m mfg=Philips)
.model BC556B PNP(IS=3.83E-14 NF=1.008 ISE=1.22E-14 NE=1.528 BF=344.4 IKF=0.08039 VAF=21.11 NR=1.005 ISC=2.85E-13 NC=1.28 BR=14.84 IKR=0.047 VAR=32.02 RB=1 IRB=1.00E-06 RBM=1 RE=0.6202 RC=0.5713 XTB=0 EG=1.11 XTI=3 CJE=1.23E-11 VJE=0.6106 MJE=0.378 TF=5.60E-10 XTF=3.414 VTF=5.23 ITF=0.1483 PTF=0 CJC=1.08E-11 VJC=0.1022 MJC=0.3563 XCJC=0.6288 TR=1.00E-32 CJS=0 VJS=0.75 MJS=0.333 FC=0.8027 Vceo=65 Icrating=100m mfg=NXP)
.model BC558A PNP(Is=1.02f Xti=3 Eg=1.11 Vaf=73.79 Bf=174.7 Ise=10.73f Ne=1.644 Ikf=.1023 Nk=.5033 Xtb=1.5

Br=4.432 Isc=14.74f Nc=1.296 Ikr=2.237 Rc=1.039 Cjc=9.81p Mjc=.332 Vjc=.4865 Fc=.5 Cje=30p Mje=.3333 Vje=.5 Tr=10n Tf=830.3p Itf=.8981 Xtf=10.32 Vtf=10 Vceo=30 Icrating=100m mfg=Philips)
.model BC558B PNP(Is=1.02f Xti=3 Eg=1.11 Vaf=52.31 Bf=306.5 Ise=10.27f Ne=1.764 Ikf=91.85m Nk=.5351 Xtb=1.5 Br=6.48 Isc=1.472f Nc=1.294 Ikr=.5584 Rc=1.086 Cjc=9.81p Mjc=.332 Vjc=.4865 Fc=.5 Cje=30p Mje=.3333 Vje=.5 Tr=10n Tf=611.6p Itf=1.373 Xtf=26.05 Vtf=10 Vceo=30 Icrating=100m mfg=Philips)
.model BC558C PNP(Is=1.02f Xti=3 Eg=1.11 Vaf=30.52 Bf=416.3 Ise=14.67f Ne=1.854 Ikf=.2088 Nk=.8219 Xtb=1.5 Br=9.102 Isc=4.1f Nc=3.982 Ikr=19.25m Rc=.9373 Cjc=9.81p Mjc=.332 Vjc=.4865 Fc=.5 Cje=30p Mje=.3333 Vje=.5 Tr=10n Tf=516.2p Itf=1.701 Xtf=35.24 Vtf=10 Vceo=30 Icrating=100m mfg=Philips)
.model BC559A PNP(Is=1.02f Xti=3 Eg=1.11 Vaf=74.76 Bf=175.1 Ise=10.26f Ne=1.641 Ikf=88.84m Nk=.4971 Xtb=1.5 Br=4.329 Isc=71.92f Nc=1.401 Ikr=9.634 Rc=1.071 Cjc=9.81p Mjc=.332 Vjc=.4865 Fc=.5 Cje=30p Mje=.3333 Vje=.5 Tr=10n Tf=822.7p Itf=3.991 Xtf=174.7 Vtf=10 Vceo=30 Icrating=100m mfg=Philips)
.model BC559C PNP(Is=1.02f Xti=3 Eg=1.11 Vaf=34.62 Bf=401.6 Ise=38.26p Ne=5.635 Ikf=74.73m Nk=.512 Xtb=1.5 Br=9.011 Isc=1.517f Nc=1.831 Ikr=.1469 Rc=1.151 Cjc=9.81p Mjc=.332 Vjc=.4865 Fc=.5 Cje=30p Mje=.3333 Vje=.5 Tr=10n Tf=524p Itf=.9847 Xtf=17.71 Vtf=10 Vceo=30 Icrating=100m mfg=Philips)
.model BC560B PNP(Is=1.02f Xti=3 Eg=1.11 Vaf=51.26 Bf=289.6 Ise=9.846f Ne=1.845 Ikf=.1026 Nk=.5413 Xtb=1.5 Br=6.124 Isc=1.113f Nc=1.97 Ikr=.2035 Rc=1.078 Cjc=9.81p Mjc=.332 Vjc=.4865 Fc=.5 Cje=30p Mje=.3333 Vje=.5 Tr=10n Tf=612.4p Itf=1.287 Xtf=25.55 Vtf=10 Vceo=30 Icrating=100m mfg=Philips)
.model BC560C PNP(Is=1.02f Xti=3 Eg=1.11 Vaf=34.62 Bf=401.6 Ise=38.26p Ne=5.635 Ikf=74.73m Nk=.512 Xtb=1.5 Br=9.011 Isc=1.517f Nc=1.831 Ikr=.1469 Rc=1.151 Cjc=9.81p Mjc=.332 Vjc=.4865 Fc=.5 Cje=30p Mje=.3333 Vje=.5 Tr=10n Tf=524p Itf=.9847 Xtf=17.71 Vtf=10 Vceo=30 Icrating=100m mfg=Philips)
.model BC807-16 PNP(Is=300.00E-15 Bf=183.4 Vaf=100 Ikf=7.9962 Ise=300.00E-15 Ne=1.8179 Br=24.969 Var=100 Ikr=8.6844 Isc=20.673E-12 Nc=1.4876 Nk=1.2295 Re=.1 Rb=1.5116 Rc=.15941 Cje=127.81E-12 Mje=.41399 Cjc=41.583E-12 Mjc=.46676 Tf=475.21E-12 Xtf=26.772 Vtf=68.517 Itf=13.643 Tr=36.831E-9 Xtb=1.5000 Vceo=45 Icrating=0.5 mfg=Rohm)
.model BC807-25 PNP(IS=1.08E-13 NF=0.99 ISE=2.713E-14 NE=1.4 BF=385.7 IKF=0.3603 VAF=31.29 NR=0.9849 ISC=5.062E-13 NC=1.295 BR=20.57 IKR=0.054 VAR=11.62 RB=1 IRB=1.00E-06 RBM=0.5 RE=0.1415 RC=0.2623 XTB=0 EG=1.11 XTI=3 CJE=5.114E-11 VJE=0.8911 MJE=0.4417 TF=7.359E-10 XTF=1.859 VTF=3.813 ITF=0.4393 PTF=0 CJC=2.656E-11 VJC=0.62 MJC=0.4836 XCJC=0.459 TR=5.00E-08 CJS=0 VJS=0.75 MJS=0.333 FC=0.99 Vceo=45 Icrating=500m mfg=NXP)
.model BC807-40 PNP(IS=2.077E-13 NF=1.005 ISE=1.411E-14 NE=1.3 BF=449.8 IKF=0.36 VAF=29 NR=1.002 ISC=2.963E-13 NC=1.25 BR=20.92 IKR=0.104 VAR=10 RB=40 IRB=1.00E-05 RBM=5.3 RE=0.14 RC=0.32 XTB=0 EG=1.11 XTI=3 CJE=5E-11 VJE=0.9296 MJE=0.456 TF=7E-10 XTF=3.25 VTF=2.5 ITF=0.79 PTF=80 CJC=2.675E-11 VJC=0.8956 MJC=0.4638 XCJC=0.459 TR=3.50E-08 CJS=0 VJS=0.75 MJS=0.333 FC=0.935 Vceo=45 Icrating=500m mfg=NXP)
.model BC808-16 PNP(Is=32.53f Xti=3 Eg=1.11 Vaf=100 Bf=209 Ise=318.3f Ne=1.542 Ikf=.6049 Nk=.6086 Xtb=1.5 Br=6.501 Isc=179.5f Nc=1.832 Ikr=.1402 Rc=.4026 Cjc=24.29p Mjc=.3333 Vjc=.5 Fc=.5 Cje=71.14p Mje=.3333 Vje=.5 Tr=10n Tf=703p Itf=13.36 Xtf=1.289K Vtf=10 Vceo=30 Icrating=500m mfg=Siemens)
.model BC808-25 PNP(Is=32.53f Xti=3 Eg=1.11 Vaf=100 Bf=340 Ise=288.9f Ne=1.568 Ikf=.4118 Nk=.5241 Xtb=1.5 Br=6.333 Isc=262.4f Nc=1.87 Ikr=32.84m Rc=.3998 Cjc=24.29p Mjc=.3333 Vjc=.5 Fc=.5 Cje=71.14p Mje=.3333 Vje=.5 Tr=10n Tf=704.1p Itf=14.26 Xtf=1.332K Vtf=10 Vceo=30 Icrating=500m mfg=Siemens)
.model BC808-40 PNP(Is=32.53f Xti=3 Eg=1.11 Vaf=100 Bf=460.8 Ise=301.2f Ne=1.615 Ikf=.4967 Nk=.5594 Xtb=1.5 Br=6.87 Isc=283.2f Nc=1.97 Ikr=9.135m Rc=.3759 Cjc=24.29p Mjc=.3333 Vjc=.5 Fc=.5 Cje=71.14p Mje=.3333 Vje=.5 Tr=10n Tf=704.3p Itf=13.89 Xtf=1.333K Vtf=10 Vceo=30 Icrating=500m mfg=Siemens)
.model BC817-16 NPN(Is=250.00E-15 Bf=204.8 Vaf=100 Ikf=2 Ise=250.00E-15 Ne=1.4602 Br=34.771 Var=100 Ikr=1.9204 Isc=32.139E-12 Nc=1.4582 Nk=.95449 Re=.11 Rb=2.2167 Rc=.20594 Cje=140.16E-12 Mje=.34085 Cjc=22.788E-12 Mjc=.41739 Tf=993.07E-12 Xtf=116.12 Vtf=18.131 Itf=28.198 Tr=108.22E-9 Xtb=1.5000 Vceo=45 Icrating=0.5 mfg=Rohm)
.model BC817-25 NPN(IS=9.198E-14 NF=1.003 ISE=4.468E-16 NE=1.65 BF=338.8 IKF=0.4913 VAF=107.9 NR=1.002 ISC=5.109E-15 NC=1.071 BR=29.48 IKR=0.193 VAR=25 RB=1 IRB=1000 RBM=1 RE=0.2126 RC=0.143 XTB=0 EG=1.11 XTI=3 CJE=3.825E-11 VJE=0.7004 MJE=0.364 TF=5.229E-10 XTF=219.7 VTF=3.502 ITF=7.257 PTF=0 CJC=1.27E-11 VJC=0.4431 MJC=0.3983 XCJC=0.4555 TR=7E-11 CJS=0 VJS=0.75 MJS=0.333 FC=0.905 Vceo=45 Icrating=500m mfg=NXP)
.model BC817-40 NPN(IS=6.286E-14 NF=0.9917 ISE=4.53E-15 NE=1.774 BF=416.3 IKF=0.4913 VAF=98.08 NR=0.9895 ISC=1.877E-13 NC=1.3 BR=24.49 IKR=0.203 VAR=25 RB=1 IRB=1000 RBM=1 RE=0.2256 RC=0.143 XTB=0 EG=1.11 XTI=3 CJE=3.568E-11 VJE=0.726 MJE=0.3721 TF=4.826E-10 XTF=120 VTF=3.654 ITF=5.104 PTF=0 CJC=1.296E-11 VJC=0.3241 MJC=0.3742 XCJC=0.455 TR=7E-11 CJS=0 VJS=0.75 MJS=0.333 FC=0.8662 Vceo=45 Icrating=500m mfg=NXP)
.model BC818-16 NPN(Is=32.53f Xti=3 Eg=1.11 Vaf=100 Bf=190.4 Ise=299f Ne=1.583 Ikf=.7695 Nk=.5467 Xtb=1.5 Br=6.313 Isc=138f Nc=2.053 Ikr=.187 Rc=.4216 Cjc=24.29p Mjc=.3333 Vjc=.5 Fc=.5 Cje=71.14p Mje=.3333 Vje=.5 Tr=10n Tf=660.1p Itf=2.204 Xtf=66.65 Vtf=10 Vceo=30 Icrating=500m mfg=Siemens)

.model BC818-25 NPN(Is=32.53f Xti=3 Eg=1.11 Vaf=100 Bf=294.4 Ise=318.5f Ne=1.642 Ikf=.8311 Nk=.5663 Xtb=1.5 Br=5.855 Isc=199.7f Nc=2.09 Ikr=.1075 Rc=.4196 Cjc=24.29p Mjc=.3333 Vjc=.5 Fc=.5 Cje=71.14p Mje=.3333 Vje=.5 Tr=10n Tf=660.8p Itf=2.569 Xtf=88.29 Vtf=10 Vceo=30 Icrating=500m mfg=Siemens)
.model BC818-40 NPN(Is=32.53f Xti=3 Eg=1.11 Vaf=100 Bf=407.8 Ise=333.4f Ne=1.692 Ikf=.9448 Nk=.6041 Xtb=1.5 Br=6.39 Isc=268.8f Nc=2.125 Ikr=.1193 Rc=.4205 Cjc=24.29p Mjc=.3333 Vjc=.5 Fc=.5 Cje=71.14p Mje=.3333 Vje=.5 Tr=10n Tf=662p Itf=3.238 Xtf=134.9 Vtf=10 Vceo=30 Icrating=500m mfg=Siemens)
.model BC846A NPN(Is=7.049f Xti=3 Eg=1.11 Vaf=106.8 Bf=182.9 Ise=85.16f Ne=1.709 Ikf=.1196 Nk=.5227 Xtb=1.5 Br=3.988 Isc=10.68f Nc=2.417 Ikr=2.721 Rc=1.374 Cjc=7.287p Mjc=.3333 Vjc=.5 Fc=.5 Cje=9.485p Mje=.3333 Vje=.5 Tr=10n Tf=662.3p Itf=1.577 Xtf=14.27 Vtf=10 Vceo=80 Icrating=100m mfg=Siemens)
.model BC846B NPN(IS=1.82E-14 NF=0.9932 ISE=2.89E-16 NE=1.4 BF=324.4 IKF=0.109 VAF=82 NR=0.9931 ISC=9.98E-12 NC=1.763 BR=8.29 IKR=0.09 VAR=17.9 RB=10 IRB=5.00E-06 RBM=5 RE=0.649 RC=0.7014 XTB=0 EG=1.11 XTI=3 CJE=1.24E-11 VJE=0.7579 MJE=0.3656 TF=4.91E-10 XTF=9.51 VTF=2.927 ITF=0.3131 PTF=0 CJC=3.35E-12 VJC=0.5463 MJC=0.391 XCJC=0.6193 TR=9.00E-08 CJS=0 VJS=0.75 MJS=0.333 FC=0.979 Vceo=65 Icrating=100m mfg=NXP)
.model BC847A NPN(IS=9.677E-15 NF=0.9922 ISE=5.44E-15 NE=2 BF=182.1 IKF=0.14 VAF=143.8 NR=0.9935 ISC=5.236E-12 NC=1.53 BR=7.004 IKR=0.06 VAR=31.15 RB=10 IRB=5.00E-06 RBM=4 RE=0.78 RC=0.656 XTB=0 EG=1.11 XTI=3 CJE=1.443E-11 VJE=0.733 MJE=0.3514 TF=6.04E-10 XTF=8.94 VTF=3.78 ITF=0.2711 PTF=0 CJC=3.287E-12 VJC=0.5444 MJC=0.3954 XCJC=0.6193 TR=0.00000011 CJS=0 VJS=0.75 MJS=0.333 FC=0.789 Vceo=45 Icrating=100m mfg=NXP)
.model BC847B NPN(IS=1.822E-14 NF=0.9932 ISE=2.894E-16 NE=1.4 BF=324.4 IKF=0.109 VAF=82 NR=0.9931 ISC=9.982E-12 NC=1.763 BR=8.29 IKR=0.09 VAR=17.9 RB=10 IRB=5.00E-06 RBM=5 RE=0.649 RC=0.7014 XTB=0 EG=1.11 XTI=3 CJE=1.244E-11 VJE=0.7579 MJE=0.3656 TF=4.908E-10 XTF=9.51 VTF=2.927 ITF=0.3131 PTF=0 CJC=3.347E-12 VJC=0.5463 MJC=0.391 XCJC=0.6193 TR=9.00E-08 CJS=0 VJS=0.75 MJS=0.333 FC=0.979 Vceo=45 Icrating=100m mfg=NXP)
.model BC847BN NPN(IS=1.822E-14 NF=0.9932 ISE=2.894E-16 NE=1.4 BF=324.4 IKF=0.109 VAF=82 NR=0.9931 ISC=9.982E-12 NC=1.763 BR=8.29 IKR=0.09 VAR=17.9 RB=10 + IRB=5.00E-06 RBM=5 RE=0.649 RC=0.7014 XTB=0 EG=1.11 XTI=3 CJE=1.244E-11 VJE=0.7579 MJE=0.3656 TF=4.908E-10 XTF=9.51 VTF=2.927 ITF=0.3131 PTF=0 CJC=3.347E-12 VJC=0.5463 MJC=0.391 XCJC=0.6193 TR=9.00E-08 FC=0.979 Vceo=45 KF=1f AF=1 Icrating=100m mfg=Philips)
.model BC847C NPN(IS=2.375E-14 NF=0.9925 ISE=5.16E-16 NE=1.3 BF=524.9 IKF=0.09 VAF=49.77 NR=0.9931 ISC=7.064E-12 NC=1.78 BR=10.04 IKR=0.132 VAR=16 RB=10 IRB=5.00E-06 RBM=5 RE=0.653 RC=0.78 XTB=0 EG=1.11 XTI=3 CJE=1.132E-11 VJE=0.7685 MJE=0.3733 TF=4.258E-10 XTF=6.319 VTF=6.4 ITF=0.1845 PTF=0 CJC=3.379E-12 VJC=0.5444 MJC=0.3968 XCJC=0.6193 TR=0.000000095 CJS=0 VJS=0.75 MJS=0.333 FC=0.999 Vceo=45 Icrating=100m mfg=NXP)
.model BC848A NPN(Is=7.049f Xti=3 Eg=1.11 Vaf=106.8 Bf=182.9 Ise=85.16f Ne=1.709 Ikf=.1196 Nk=.5227 Xtb=1.5 Br=3.988 Isc=10.68f Nc=2.417 Ikr=2.721 Rc=1.374 Cjc=7.287p Mjc=.3333 Vjc=.5 Fc=.5 Cje=9.485p Mje=.3333 Vje=.5 Tr=10n Tf=662.3p Itf=1.577 Xtf=14.27 Vtf=10 Vceo=30 Icrating=100m mfg=Siemens)
.model BC848B NPN(Is=70.000E-15 Bf=277.08 Vaf=114.03 Ikf=1 Ise=70.000E-15 Ne=1.8934 Br=11.565 Var=100 Ikr=.11266 Isc=1.0228E-12 Nc=1.3260 Nk=.71869 Re=.2 Rb=13.897 Rc=1.2190 Cje=11.342E-12 Mje=.38289 Cjc=4.0230E-12 Mjc=.34629 Tf=338.92E-12 Xtf=4.0449 Vtf=167.36 Itf=.85959 Tr=110.25E-9 Xtb=1.5000 Vceo=30 Icrating=0.1 mfg=Rohm)
.model BC848C NPN(Is=7.049f Xti=3 Eg=1.11 Vaf=29.03 Bf=462.4 Ise=57.19f Ne=2.002 Ikf=.1609 Nk=.6124 Xtb=1.5 Br=3.988 Isc=10.68f Nc=2.417 Ikr=2.721 Rc=1.374 Cjc=7.287p Mjc=.3333 Vjc=.5 Fc=.5 Cje=9.485p Mje=.3333 Vje=.5 Tr=10n Tf=663.1p Itf=1.423 Xtf=14.94 Vtf=10 Vceo=30 Icrating=100m mfg=Siemens)
.model BC849B NPN(Is=7.049f Xti=3 Eg=1.11 Vaf=62.37 Bf=279.1 Ise=59.16f Ne=1.81 Ikf=.2201 Nk=.6305 Xtb=1.5 Br=3.816 Isc=16.17f Nc=2.394 Ikr=1.859 Rc=1.508 Cjc=7.287p Mjc=.3333 Vjc=.5 Fc=.5 Cje=9.485p Mje=.3333 Vje=.5 Tr=10n Tf=664p Itf=4.664 Xtf=147 Vtf=10 Vceo=30 Icrating=100m mfg=Siemens)
.model BC849C NPN(Is=7.049f Xti=3 Eg=1.11 Vaf=29.03 Bf=462.4 Ise=57.19f Ne=2.002 Ikf=.1609 Nk=.6124 Xtb=1.5 Br=3.988 Isc=10.68f Nc=2.417 Ikr=2.721 Rc=1.374 Cjc=7.287p Mjc=.3333 Vjc=.5 Fc=.5 Cje=9.485p Mje=.3333 Vje=.5 Tr=10n Tf=663.1p Itf=1.423 Xtf=14.94 Vtf=10 Vceo=30 Icrating=100m mfg=Siemens)
.model BC850B NPN(Is=7.049f Xti=3 Eg=1.11 Vaf=62.37 Bf=279.1 Ise=59.16f Ne=1.81 Ikf=.2201 Nk=.6305 Xtb=1.5 Br=3.816 Isc=16.17f Nc=2.394 Ikr=1.859 Rc=1.508 Cjc=7.287p Mjc=.3333 Vjc=.5 Fc=.5 Cje=9.485p Mje=.3333 Vje=.5 Tr=10n Tf=664p Itf=4.664 Xtf=147 Vtf=10 Vceo=80 Icrating=100m mfg=Siemens)
.model BC850C NPN(Is=7.049f Xti=3 Eg=1.11 Vaf=29.03 Bf=462.4 Ise=57.19f Ne=2.002 Ikf=.1609 Nk=.6124 Xtb=1.5 Br=3.988 Isc=10.68f Nc=2.417 Ikr=2.721 Rc=1.374 Cjc=7.287p Mjc=.3333 Vjc=.5 Fc=.5 Cje=9.485p Mje=.3333 Vje=.5 Tr=10n Tf=663.1p Itf=1.423 Xtf=14.94 Vtf=10) Vceo=50 Icrating=100m mfg=Siemens)
.model BC856A PNP(Is=336.7f Xti=3 Eg=1.11 Vaf=106.8 Bf=180.6 Ise=2.666p Ne=1.944 Ikf=.1094 Nk=.4986 Xtb=1.5 Br=7.16 Isc=196p Nc=1.815 Ikr=9.677 Rc=2.791 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5 Tr=10n Tf=605.1p Itf=2.326 Xtf=20.43 Vtf=10 Vceo=80 Icrating=100m mfg=Siemens)
.model BC856B PNP(IS=2.01E-14 NF=0.9974 ISE=6.58E-15 NE=1.45 BF=315.3 IKF=0.079 VAF=39.15 NR=0.9952

ISC=1.63E-14 NC=1.15 BR=8.68 IKR=0.09 VAR=9.5 RB=10 IRB=5.00E-06 RBM=5.00E-06 RE=0.663 RC=0.718 XTB=0 EG=1.11 XTI=3 CJE=1.14E-11 VJE=0.7071 MJE=0.3808 TF=6.55E-10 XTF=5.387 VTF=6.245 ITF=0.2108 PTF=0 CJC=6.40E-12 VJC=0.4951 MJC=0.44 XCJC=0.6288 TR=5.50E-08 CJS=0 VJS=0.75 MJS=0.333 FC=0.9059 Vceo=65 Icrating=100m mfg=NXP)
.model BC857A PNP(IS=1.17E-14 NF=0.9972 ISE=1.762E-14 NE=1.661 BF=161.3 IKF=0.15 VAF=59.62 NR=0.9967 ISC=1.506E-13 NC=1.32 BR=6.78 IKR=0.048 VAR=15.4 RB=10 IRB=5.00E-06 RBM=5 RE=0.689 RC=0.61 CJE=1.325E-11 VJE=0.8514 MJE=0.3999 TF=8.333E-10 XTF=2.41 VTF=6.262 ITF=0.097 PTF=0 CJC=6.396E-12 VJC=0.2182 MJC=0.333 XCJC=0.6288 TR=0.00000007 CJS=0 VJS=0.75 MJS=0.333 XTB=0 XTI=3 EG=1.11 FC=0.8981 Vceo=45 Icrating=100m mfg=NXP)
.model BC857B PNP(IS=2.014E-14 NF=0.9974 ISE=6.578E-15 NE=1.45 BF=315.3 IKF=0.079 VAF=39.15 NR=0.9952 ISC=1.633E-14 NC=1.15 BR=8.68 IKR=0.09 VAR=9.5 RB=10 IRB=5.00E-06 RBM=5.00E-06 RE=0.663 RC=0.718 CJE=1.135E-11 VJE=0.7071 MJE=0.3808 TF=6.546E-10 XTF=5.387 VTF=6.245 ITF=0.2108 PTF=0 CJC=6.395E-12 VJC=0.4951 MJC=0.44 XCJC=0.6288 TR=5.50E-08 CJS=0 VJS=0.75 MJS=0.333 XTB=0 XTI=3 EG=1.11 FC=0.9059 Vceo=45 Icrating=100m mfg=NXP)
.model BC857C PNP(IS=3.258E-14 NF=0.999 ISE=3.003E-15 NE=1.45 BF=515.4 IKF=0.066 VAF=25 NR=0.9985 ISC=4.393E-15 NC=1.2 BR=15.26 IKR=0.039 VAR=8 RB=10 IRB=5.00E-06 RBM=5 RE=0.7071 RC=0.58 CJE=1.024E-11 VJE=0.9 MJE=0.453 TF=5.971E-10 XTF=4.137 VTF=6.31 ITF=0.2108 PTF=0 CJC=6.345E-12 VJC=0.4254 MJC=0.423 XCJC=0.6288 TR=0.000000035 CJS=0 VJS=0.75 MJS=0.333 XTB=0 XTI=3 EG=1.11 FC=0.78 Vceo=45 Icrating=100m mfg=NXP)
.model BC858A PNP(Is=336.7f Xti=3 Eg=1.11 Vaf=106.8 Bf=180.6 Ise=2.666p Ne=1.944 Ikf=.1094 Nk=.4986 Xtb=1.5 Br=7.16 Isc=196p Nc=1.815 Ikr=9.677 Rc=2.791 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5 Tr=10n Tf=605.1p Itf=2.326 Xtf=20.43 Vtf=10 Vceo=30 Icrating=100m mfg=Siemens)
.model BC858B PNP(Is=70.000E-15 Bf=266.38 Vaf=50.700 Ikf=.27914 Ise=70.000E-15 Ne=1.7618 Br=1.8730 Var=100 Ikr=2.0006 Isc=270.82E-12 Nc=1.7915 Re=.2 Rb=7.8035 Rc=1.0862 Cje=22.937E-12 Mje=.58268 Cjc=11.613E-12 Mjc=.43988 Tf=328.92E-12 Xtf=331.17 Vtf=254.25 Itf=8.1505 Tr=327.28E-9 Xtb=1.5000 Vceo=30 Icrating=0.1 mfg=Rohm)
.model BC858C PNP(Is=336.7f Xti=3 Eg=1.11 Vaf=29.03 Bf=462.2 Ise=1.648p Ne=2.405 Ikf=.1165 Nk=.5254 Xtb=1.5 Br=7.16 Isc=196p Nc=1.815 Ikr=9.677 Rc=2.791 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5 Tr=10n Tf=605.4p Itf=3.088 Xtf=41.48 Vtf=10 Vceo=30 Icrating=100m mfg=Siemens)
.model BC859A PNP(Is=336.7f Xti=3 Eg=1.11 Vaf=106.8 Bf=180.6 Ise=2.666p Ne=1.944 Ikf=.1094 Nk=.4986 Xtb=1.5 Br=7.16 Isc=196p Nc=1.815 Ikr=9.677 Rc=2.791 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5 Tr=10n Tf=605.1p Itf=2.326 Xtf=20.43 Vtf=10 Vceo=30 Icrating=100m mfg=Siemens)
.model BC859B PNP(Is=336.7f Xti=3 Eg=1.11 Vaf=62.37 Bf=277.7 Ise=1.966p Ne=2.123 Ikf=.1686 Nk=.545 Xtb=1.5 Br=7.16 Isc=196p Nc=1.815 Ikr=9.677 Rc=2.891 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5 Tr=10n Tf=605.9p Itf=2.133 Xtf=23.02 Vtf=10 Vceo=30 Icrating=100m mfg=Siemens)
.model BC859C PNP(Is=336.7f Xti=3 Eg=1.11 Vaf=29.03 Bf=462.2 Ise=1.648p Ne=2.405 Ikf=.1165 Nk=.5254 Xtb=1.5 Br=7.16 Isc=196p Nc=1.815 Ikr=9.677 Rc=2.791 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5 Tr=10n Tf=605.4p Itf=3.088 Xtf=41.48 Vtf=10 Vceo=30 Icrating=100m mfg=Siemens)
.model BC860B PNP(Is=336.7f Xti=3 Eg=1.11 Vaf=62.37 Bf=277.7 Ise=1.966p Ne=2.123 Ikf=.1686 Nk=.545 Xtb=1.5 Br=7.16 Isc=196p Nc=1.815 Ikr=9.677 Rc=2.891 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5 Tr=10n Tf=605.9p Itf=2.133 Xtf=23.02 Vtf=10 Vceo=30 Icrating=100m mfg=Siemens)
.model BC860C PNP(Is=336.7f Xti=3 Eg=1.11 Vaf=29.03 Bf=462.2 Ise=1.648p Ne=2.405 Ikf=.1165 Nk=.5254 Xtb=1.5 Br=7.16 Isc=196p Nc=1.815 Ikr=9.677 Rc=2.791 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5 Tr=10n Tf=605.4p Itf=3.088 Xtf=41.48 Vtf=10 Vceo=30 Icrating=100m mfg=Siemens)
.model BCW60FF NPN(Is=26.39f Xti=3 Eg=1.11 Vaf=62.37 Bf=331.9 Ise=278.6f Ne=2.004 Ikf=2.57 Nk=.5 Xtb=1.5 Br=9.451 Isc=15.74p Nc=1.797 Ikr=2.344 Rc=3.117 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5 Tr=10n Tf=597.1p Itf=2.501 Xtf=233.9 Vtf=10 Vceo=32 Icrating=200m mfg=Siemens)
.model BCW60FN NPN(Is=26.39f Xti=3 Eg=1.11 Vaf=35.7 Bf=449.2 Ise=191.3f Ne=2.138 Ikf=1.969 Nk=.5 Xtb=1.5 Br=9.116 Isc=14.45p Nc=1.778 Ikr=3.14 Rc=3.154 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5 Tr=10n Tf=596.3p Itf=2.629 Xtf=282 Vtf=10 Vceo=32 Icrating=200m mfg=Siemens)
.model BCW61A PNP(Is=26.39f Xti=3 Eg=1.11 Vaf=106.8 Bf=166.5 Ise=249.1f Ne=1.806 Ikf=1.217 Nk=.5 Xtb=1.5 Br=8.744 Isc=82.16p Nc=2.283 Ikr=29.82m Rc=2.543 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5 Tr=10n Tf=590.5p Itf=.603 Xtf=225 Vtf=1 Vceo=32 Icrating=200m mfg=Siemens)
.model BCW61B PNP(Is=26.39f Xti=3 Eg=1.11 Vaf=79.03 Bf=243.9 Ise=236.2f Ne=1.831 Ikf=.4069 Nk=.5 Xtb=1.5 Br=8.138 Isc=92.15p Nc=2.252 Ikr=.3702 Rc=2.597 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5 Tr=10n Tf=590.5p Itf=.642 Xtf=225.6 Vtf=1 Vceo=32 Icrating=200m mfg=Siemens)
.model BCW61C PNP(Is=26.39f Xti=3 Eg=1.11 Vaf=62.37 Bf=330.6 Ise=285.2f Ne=2.013 Ikf=2.498 Nk=.5 Xtb=1.5 Br=7.258 Isc=104.6p Nc=2.312 Ikr=.332 Rc=2.694 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5 Tr=10n Tf=590.8p Itf=.8403 Xtf=457.4 Vtf=1 Vceo=32 Icrating=200m mfg=Siemens)
.model BCW61D PNP(Is=26.39f Xti=3 Eg=1.11 Vaf=35.7 Bf=464.5 Ise=227f Ne=2.108 Ikf=.1247 Nk=.5 Xtb=1.5

Br=7.094 Isc=90.49p Nc=2.24 Ikr=.4226 Rc=2.604 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5
Tr=10n Tf=591.1p Itf=.7698 Xtf=230.9 Vtf=1 Vceo=32 Icrating=200m mfg=Siemens)
.model BCW61FF PNP(Is=26.39f Xti=3 Eg=1.11 Vaf=62.37 Bf=330.6 Ise=285.2f Ne=2.013 Ikf=2.498 Nk=.5 Xtb=1.5
Br=7.258 Isc=104.6p Nc=2.312 Ikr=.332 Rc=2.694 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5
Tr=10n Tf=590.8p Itf=.8403 Xtf=457.4 Vtf=1 Vceo=32 Icrating=200m mfg=Siemens)
.model BCW61FN PNP(Is=26.39f Xti=3 Eg=1.11 Vaf=35.7 Bf=464.5 Ise=227f Ne=2.108 Ikf=.1247 Nk=.5 Xtb=1.5
Br=7.094 Isc=90.49p Nc=2.24 Ikr=.4226 Rc=2.604 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5
Tr=10n Tf=591.1p Itf=.7698 Xtf=230.9 Vtf=1 Vceo=32 Icrating=200m mfg=Siemens)
.model BCW65B NPN(Is=44.97f Xti=3 Eg=1.11 Vaf=100 Bf=364.7 Ise=44.99f Ne=1.337 Ikf=1.029 Nk=.7096 Xtb=1.5
Br=5.792 Isc=1.332p Nc=1.307 Ikr=6.716 Rc=.421 Cjc=14.57p Mjc=.3333 Vjc=.5 Fc=.5 Cje=71.14p Mje=.3333 Vje=.5
Tr=10n Tf=707.9p Itf=5.32 Xtf=23.35 Vtf=10 Vceo=60 Icrating=800m mfg=Siemens)
.model BCW65C NPN(Is=44.97f Xti=3 Eg=1.11 Vaf=100 Bf=500.5 Ise=45.03f Ne=1.363 Ikf=1.017 Nk=.7023 Xtb=1.5
Br=5.448 Isc=1.983p Nc=1.344 Ikr=6.609 Rc=.4217 Cjc=14.57p Mjc=.3333 Vjc=.5 Fc=.5 Cje=71.14p Mje=.3333 Vje=.5
Tr=10n Tf=697.1p Itf=2.639 Xtf=24.55 Vtf=10 Vceo=60 Icrating=800m mfg=Siemens)
.model BCW66F NPN(Is=44.97f Xti=3 Eg=1.11 Vaf=100 Bf=242.4 Ise=44.98f Ne=1.302 Ikf=1.006 Nk=.7057 Xtb=1.5
Br=5.128 Isc=6.206p Nc=1.474 Ikr=6.858 Rc=.4184 Cjc=14.57p Mjc=.3333 Vjc=.5 Fc=.5 Cje=71.14p Mje=.3333 Vje=.5
Tr=10n Tf=707.7p Itf=5.249 Xtf=23.37 Vtf=10 Vceo=75 Icrating=800m mfg=Siemens)
.model BCW66G NPN(Is=893.9E-21 Xti=3 Eg=1.11 Vaf=100 Bf=452.8 Ise=1.053E-18 Ne=1.21 Ikf=.9479 Nk=.6981
Xtb=1.5 Br=5.401 Isc=1.897f Nc=1.415 Ikr=3.105 Rc=.4201 Cjc=14.57p Mjc=.3333 Vjc=.5 Fc=.5 Cje=71.14p Mje=.3333
Vje=.5 Tr=10n Tf=689.5p Itf=6.121 Xtf=23.27 Vtf=10 Vceo=75 Icrating=800m mfg=Siemens
.model BCW66H NPN(Is=44.97f Xti=3 Eg=1.11 Vaf=100 Bf=500.5 Ise=45.03f Ne=1.363 Ikf=1.017 Nk=.7023 Xtb=1.5
Br=5.448 Isc=1.983p Nc=1.344 Ikr=6.609 Rc=.4217 Cjc=14.57p Mjc=.3333 Vjc=.5 Fc=.5 Cje=71.14p Mje=.3333 Vje=.5
Tr=10n Tf=697.1p Itf=2.639 Xtf=24.55 Vtf=10 Vceo=75 Icrating=800m mfg=Siemens)
.model BCW67A PNP(Is=44.97f Xti=3 Eg=1.11 Vaf=100 Bf=256.4 Ise=424.6f Ne=1.46 Ikf=.5694 Nk=.6383 Xtb=1.5
Br=13.26 Isc=1.56p Nc=1.654 Ikr=9.432 Rc=.554 Cjc=14.57p Mjc=.3333 Vjc=.5 Fc=.5 Cje=71.14p Mje=.3333 Vje=.5
Tr=10n Tf=655p Itf=.8418 Xtf=10.72 Vtf=10 Vceo=45 Icrating=800m mfg=Siemens)
.model BCW67B PNP(Is=44.97f Xti=3 Eg=1.11 Vaf=100 Bf=373.4 Ise=600f Ne=1.538 Ikf=.6542 Nk=.669 Xtb=1.5
Br=12.01 Isc=1.997p Nc=1.678 Ikr=9.679 Rc=.5562 Cjc=14.57p Mjc=.3333 Vjc=.5 Fc=.5 Cje=71.14p Mje=.3333 Vje=.5
Tr=10n Tf=669.8p Itf=1.943 Xtf=37.78 Vtf=10 Vceo=45 Icrating=800m mfg=Siemens)
.model BCW67C PNP(Is=44.97f Xti=3 Eg=1.11 Vaf=100 Bf=550.3 Ise=233.3f Ne=1.478 Ikf=.5906 Nk=.646 Xtb=1.5
Br=12.01 Isc=1.997p Nc=1.678 Ikr=9.679 Rc=.5562 Cjc=14.57p Mjc=.3333 Vjc=.5 Fc=.5 Cje=71.14p Mje=.3333 Vje=.5
Tr=10n Tf=675.6p Itf=3.423 Xtf=96.44 Vtf=10 Vceo=45 Icrating=800m mfg=Siemens)
.model BCW68H PNP(Is=44.97f Xti=3 Eg=1.11 Vaf=100 Bf=550.3 Ise=233.3f Ne=1.478 Ikf=.5906 Nk=.646 Xtb=1.5
Br=12.01 Isc=1.997p Nc=1.678 Ikr=9.679 Rc=.5562 Cjc=14.57p Mjc=.3333 Vjc=.5 Fc=.5 Cje=71.14p Mje=.3333 Vje=.5
Tr=10n Tf=675.6p Itf=3.423 Xtf=96.44 Vtf=10 Vceo=45 Icrating=800m mfg=Siemens)
.model BCX70G NPN(Is=26.39f Xti=3 Eg=1.11 Vaf=106.8 Bf=167.4 Ise=254.6f Ne=1.806 Ikf=1.363 Nk=.5 Xtb=1.5
Br=9.901 Isc=20.57p Nc=1.912 Ikr=3.201 Rc=3.001 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5
Tr=10n Tf=597.7p Itf=2.959 Xtf=293.8 Vtf=10 Vceo=45 Icrating=200m mfg=Siemens)
.model BCX70H NPN(Is=26.39f Xti=3 Eg=1.11 Vaf=79.03 Bf=243.1 Ise=274.6f Ne=1.859 Ikf=1.798 Nk=.5 Xtb=1.5
Br=8.91 Isc=13.41p Nc=1.847 Ikr=7.019 Rc=3.011 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5
Tr=10n Tf=596.8p Itf=2.553 Xtf=234.7 Vtf=10 Vceo=45 Icrating=200m mfg=Siemens)
.model BCX70J NPN(Is=26.39f Xti=3 Eg=1.11 Vaf=62.37 Bf=331.9 Ise=278.6f Ne=2.004 Ikf=2.57 Nk=.5 Xtb=1.5
Br=9.451 Isc=15.74p Nc=1.797 Ikr=2.344 Rc=3.117 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5
Tr=10n Tf=597.1p Itf=2.501 Xtf=233.9 Vtf=10 Vceo=45 Icrating=200m mfg=Siemens)
.model BCX70K NPN(Is=26.39f Xti=3 Eg=1.11 Vaf=35.7 Bf=449.2 Ise=191.3f Ne=2.138 Ikf=1.969 Nk=.5 Xtb=1.5
Br=9.116 Isc=14.45p Nc=1.778 Ikr=3.14 Rc=3.154 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5
Tr=10n Tf=596.3p Itf=2.629 Xtf=282 Vtf=10 Vceo=45 Icrating=200m mfg=Siemens)
.model BCX71G PNP(Is=26.39f Xti=3 Eg=1.11 Vaf=106.8 Bf=166.5 Ise=249.1f Ne=1.806 Ikf=1.217 Nk=.5 Xtb=1.5
Br=8.744 Isc=82.16p Nc=2.283 Ikr=29.82m Rc=2.543 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865
Vje=.5 Tr=10n Tf=590.5p Itf=.603 Xtf=225 Vtf=1 Vceo=45 Icrating=200m mfg=Siemens)
.model BCX71H PNP(Is=26.39f Xti=3 Eg=1.11 Vaf=79.03 Bf=243.9 Ise=236.2f Ne=1.831 Ikf=.4069 Nk=.5 Xtb=1.5
Br=8.138 Isc=92.15p Nc=2.252 Ikr=.3702 Rc=2.597 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5
Tr=10n Tf=590.5p Itf=.642 Xtf=225.6 Vtf=1 Vceo=45 Icrating=200m mfg=Siemens)
.model BCX71J PNP(Is=26.39f Xti=3 Eg=1.11 Vaf=62.37 Bf=330.6 Ise=285.2f Ne=2.013 Ikf=2.498 Nk=.5 Xtb=1.5
Br=7.258 Isc=104.6p Nc=2.312 Ikr=.332 Rc=2.694 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5
Tr=10n Tf=590.8p Itf=.8403 Xtf=457.4 Vtf=1 Vceo=45 Icrating=200m mfg=Siemens)
.model BCX71K PNP(Is=26.39f Xti=3 Eg=1.11 Vaf=35.7 Bf=464.5 Ise=227f Ne=2.108 Ikf=.1247 Nk=.5 Xtb=1.5
Br=7.094 Isc=90.49p Nc=2.24 Ikr=.4226 Rc=2.604 Cjc=11.51p Mjc=.3626 Vjc=.5 Fc=.5 Cje=8.397p Mje=.3865 Vje=.5
Tr=10n Tf=591.1p Itf=.7698 Xtf=230.9 Vtf=1 Vceo=45 Icrating=200m mfg=Siemens)
.model BCY58-8 NPN(Is=64.04f Xti=3 Eg=1.11 Vaf=79.03 Bf=395.1 Ise=599f Ne=1.598 Ikf=.1799 Nk=.6331 Xtb=1.5

Br=1 Isc=9.225n Nc=3.14 Ikr=16.96 Rc=1.286 Cjc=11.15p Mjc=.3333 Vjc=.5 Fc=.5 Cje=16.78p Mje=.3333 Vje=.5
Tr=629.7n Tf=423.5p Itf=2.989 Xtf=106 Vtf=10 Vceo=32 Icrating=200m mfg=Philips)
.model BCY58-9 NPN(Is=64.04f Xti=3 Eg=1.11 Vaf=62.37 Bf=473.2 Ise=549.7f Ne=1.721 Ikf=.1237 Nk=.6057 Xtb=1.5
Br=1 Isc=22.53n Nc=3.624 Ikr=10.72 Rc=1.261 Cjc=11.15p Mjc=.3333 Vjc=.5 Fc=.5 Cje=16.78p Mje=.3333 Vje=.5
Tr=622.7n Tf=423.4p Itf=3.503 Xtf=107 Vtf=10 Vceo=32 Icrating=200m mfg=Philips)
.model BCY58-10 NPN(Is=64.04f Xti=3 Eg=1.11 Vaf=35.7 Bf=676 Ise=444.3f Ne=1.771 Ikf=.1013 Nk=.6259 Xtb=1.5
Br=1 Isc=38.48n Nc=4.097 Ikr=5.942 Rc=1.19 Cjc=11.15p Mjc=.3333 Vjc=.5 Fc=.5 Cje=16.78p Mje=.3333 Vje=.5
Tr=609.8n Tf=423.5p Itf=3.794 Xtf=108.1 Vtf=10 Vceo=32 Icrating=200m mfg=Philips)
.model BCY59-7 NPN(Is=64.04f Xti=3 Eg=1.11 Vaf=106.8 Bf=4.957K Ise=6.195p Ne=1.686 Ikf=12.15m Nk=.4944
Xtb=1.5 Br=2.624 Isc=2.92n Nc=3.015 Ikr=3.889 Rc=1.149 Cjc=11.15p Mjc=.3333 Vjc=.5 Fc=.5 Cje=16.78p Mje=.3333
Vje=.5 Tr=638n Tf=410.8p Itf=15.08 Xtf=118.1 Vtf=10 Vceo=45 Icrating=200m mfg=Philips)
.model BCY59-8 NPN(Is=64.04f Xti=3 Eg=1.11 Vaf=79.03 Bf=395.1 Ise=599f Ne=1.598 Ikf=.1799 Nk=.6331 Xtb=1.5
Br=1 Isc=9.225n Nc=3.14 Ikr=16.96 Rc=1.286 Cjc=11.15p Mjc=.3333 Vjc=.5 Fc=.5 Cje=16.78p Mje=.3333 Vje=.5
Tr=629.7n Tf=423.5p Itf=2.989 Xtf=106 Vtf=10 Vceo=45 Icrating=200m mfg=Philips)
.model BCY59-9 NPN(Is=64.04f Xti=3 Eg=1.11 Vaf=62.37 Bf=473.2 Ise=549.7f Ne=1.721 Ikf=.1237 Nk=.6057 Xtb=1.5
Br=1 Isc=22.53n Nc=3.624 Ikr=10.72 Rc=1.261 Cjc=11.15p Mjc=.3333 Vjc=.5 Fc=.5 Cje=16.78p Mje=.3333 Vje=.5
Tr=622.7n Tf=423.4p Itf=3.503 Xtf=107 Vtf=10 Vceo=45 Icrating=200m mfg=Philips)
.model BCY59-10 NPN(Is=64.04f Xti=3 Eg=1.11 Vaf=35.7 Bf=676 Ise=444.3f Ne=1.771 Ikf=.1013 Nk=.6259 Xtb=1.5
Br=1 Isc=38.48n Nc=4.097 Ikr=5.942 Rc=1.19 Cjc=11.15p Mjc=.3333 Vjc=.5 Fc=.5 Cje=16.78p Mje=.3333 Vje=.5
Tr=609.8n Tf=423.5p Itf=3.794 Xtf=108.1 Vtf=10 Vceo=45 Icrating=200m mfg=Philips)
.model BCY71 PNP(Is=22.48f Xti=3 Eg=1.11 Vaf=68.32 Bf=323.6 Ise=291.5f Ne=1.906 Ikf=.1158 Nk=.5113 Xtb=1.5
Br=1 Isc=1.181p Nc=1.234 Ikr=9.81 Rc=2.019 Cjc=23.19p Mjc=.2354 Vjc=.5 Fc=.5 Cje=9p Mje=.3117 Vje=.5 Tr=809.2n
Tf=275.3p Itf=17.79 Xtf=214.9 Vtf=10 Vceo=50 Icrating=200m mfg=Philips)
.model BCY78-7 PNP(Is=55.58p Xti=3 Eg=1.11 Vaf=106.8 Bf=188.5 Ise=230.7p Ne=2.751 Ikf=74.06m Nk=.5019
Xtb=1.5 Br=2.429 Isc=34.94n Nc=2.499 Ikr=1.387 Rc=2.829 Cjc=16p Mjc=.3333 Vjc=.5 Fc=.5 Cje=16.78p Mje=.3333
Vje=.5 Tr=283n Tf=762.6p Itf=5.95 Xtf=180.6 Vtf=10 Vceo=32 Icrating=100m mfg=Philips)
.model BCY78-8 PNP(Is=55.58p Xti=3 Eg=1.11 Vaf=79.03 Bf=272.6 Ise=223.2p Ne=2.939 Ikf=77.89m Nk=.5 Xtb=1.5
Br=2.429 Isc=34.94n Nc=2.499 Ikr=1.387 Rc=2.829 Cjc=16p Mjc=.3333 Vjc=.5 Fc=.5 Cje=16.78p Mje=.3333 Vje=.5
Tr=272.7n Tf=762.4p Itf=5.969 Xtf=203.6 Vtf=10 Vceo=32 Icrating=100m mfg=Philips)
.model BCY78-9 PNP(Is=55.58p Xti=3 Eg=1.11 Vaf=62.37 Bf=361.2 Ise=160.7p Ne=3.065 Ikf=98.02m Nk=.5 Xtb=1.5
Br=2.429 Isc=34.94n Nc=2.499 Ikr=1.387 Rc=2.829 Cjc=16p Mjc=.3333 Vjc=.5 Fc=.5 Cje=16.78p Mje=.3333 Vje=.5
Tr=267n Tf=763.1p Itf=5.112 Xtf=203.8 Vtf=10 Vceo=32 Icrating=100m mfg=Philips)
.model BCY78-10 PNP(Is=55.58p Xti=3 Eg=1.11 Vaf=35.7 Bf=523.4 Ise=161.8p Ne=2.89 Ikf=70.98m Nk=.5 Xtb=1.5
Br=2.429 Isc=34.94n Nc=2.499 Ikr=1.387 Rc=2.829 Cjc=16p Mjc=.3333 Vjc=.5 Fc=.5 Cje=16.78p Mje=.3333 Vje=.5
Tr=262.5n Tf=763p Itf=5.411 Xtf=180.8 Vtf=10 Vceo=32 Icrating=100m mfg=Philips)
.model BCY79-7 PNP(Is=55.58p Xti=3 Eg=1.11 Vaf=106.8 Bf=188.5 Ise=230.7p Ne=2.751 Ikf=74.06m Nk=.5019
Xtb=1.5 Br=2.429 Isc=34.94n Nc=2.499 Ikr=1.387 Rc=2.829 Cjc=16p Mjc=.3333 Vjc=.5 Fc=.5 Cje=16.78p Mje=.3333
Vje=.5 Tr=283n Tf=762.6p Itf=5.95 Xtf=180.6 Vtf=10 Vceo=45 Icrating=100m mfg=Philips)
.model BCY79-8 PNP(Is=55.58p Xti=3 Eg=1.11 Vaf=79.03 Bf=272.6 Ise=223.2p Ne=2.939 Ikf=77.89m Nk=.5 Xtb=1.5
Br=2.429 Isc=34.94n Nc=2.499 Ikr=1.387 Rc=2.829 Cjc=16p Mjc=.3333 Vjc=.5 Fc=.5 Cje=16.78p Mje=.3333 Vje=.5
Tr=272.7n Tf=762.4p Itf=5.969 Xtf=203.6 Vtf=10 Vceo=45 Icrating=100m mfg=Philips)
.model BCY79-9 PNP(Is=55.58p Xti=3 Eg=1.11 Vaf=62.37 Bf=361.2 Ise=160.7p Ne=3.065 Ikf=98.02m Nk=.5 Xtb=1.5
Br=2.429 Isc=34.94n Nc=2.499 Ikr=1.387 Rc=2.829 Cjc=16p Mjc=.3333 Vjc=.5 Fc=.5 Cje=16.78p Mje=.3333 Vje=.5
Tr=267n Tf=763.1p Itf=5.112 Xtf=203.8 Vtf=10 Vceo=45 Icrating=100m mfg=Philips)
.model BCY79-10 PNP(Is=55.58p Xti=3 Eg=1.11 Vaf=35.7 Bf=523.4 Ise=161.8p Ne=2.89 Ikf=70.98m Nk=.5 Xtb=1.5
Br=2.429 Isc=34.94n Nc=2.499 Ikr=1.387 Rc=2.829 Cjc=16p Mjc=.3333 Vjc=.5 Fc=.5 Cje=16.78p Mje=.3333 Vje=.5
Tr=262.5n Tf=763p Itf=5.411 Xtf=180.8 Vtf=10 Vceo=45 Icrating=100m mfg=Philips)
.model BFT44 PNP(Is=7.34n Xti=3 Eg=1.11 Vaf=100 Bf=131.8 Ise=7.34n Ne=1.593 Ikf=.862 Nk=.7194 Xtb=1.5 Br=1
Isc=2.155u Nc=2.236 Ikr=4.712 Rc=3.255 Cjc=44.37p Mjc=.3333 Vjc=.5 Fc=.5 Cje=133.1p Mje=.3333 Vje=.5 Tr=10n
Tf=1.576n Itf=9.045 Xtf=221.6 Vtf=10 Vceo=300 Icrating=500m mfg=Philips)
.model BFT45 PNP(Is=7.34n Xti=3 Eg=1.11 Vaf=100 Bf=131.8 Ise=7.34n Ne=1.593 Ikf=.862 Nk=.7194 Xtb=1.5 Br=1
Isc=2.155u Nc=2.236 Ikr=4.712 Rc=3.255 Cjc=44.37p Mjc=.3333 Vjc=.5 Fc=.5 Cje=133.1p Mje=.3333 Vje=.5 Tr=10n
Tf=1.576n Itf=9.045 Xtf=221.6 Vtf=10 Vceo=250 Icrating=500m mfg=Philips)
.model BFX34 NPN(Is=3.31p Xti=3 Eg=1.11 Vaf=100 Bf=361 Ise=465.3p Ne=1.745 Ikf=1.936 Nk=.5128 Xtb=1.5
Br=1.239 Isc=62.67p Nc=1.486 Ikr=.9787 Rc=.1321 Cjc=87.45p Mjc=.3333 Vjc=.5 Fc=.5 Cje=521.7p Mje=.3333 Vje=.5
Tr=10n Tf=1.489n Itf=17.31 Xtf=13.82 Vtf=10 Vceo=120 Icrating=2 mfg=Philips)
.model BFY50 NPN(Is=1.476f Xti=3 Eg=1.11 Vaf=281.4 Bf=6.07K Ise=2.327p Ne=1.652 Ikf=.1692 Nk=.6378 Xtb=1.5
Br=678.6 Isc=17.55p Nc=1.43 Ikr=.6167 Rc=.5062 Cjc=16p Mjc=.3333 Vjc=.5 Fc=.5 Cje=48p Mje=.3333 Vje=.5
Tr=1.218u Tf=1.064n Itf=214.3 Xtf=17K Vtf=10 Vceo=80 Icrating=1 mfg=Philips)
.model BFY51 NPN(Is=160.8p Xti=3 Eg=1.11 Vaf=281.4 Bf=314 Ise=10.14n Ne=1.947 Ikf=.3372 Nk=.5752 Xtb=1.6

Br=1 Isc=70.08n Nc=1.483 Ikr=.9179 Rc=.5481 Cjc=16p Mjc=.3333 Vjc=.5 Fc=.5 Cje=48p Mje=.3333 Vje=.5 Tr=1.536u Tf=940.4p Itf=28.19 Xtf=1.77K Vtf=10 Vceo=60 Icrating=1 mfg=Philips)
.model BFY52 NPN(Is=160.8p Xti=3 Eg=1.11 Vaf=281.4 Bf=24.98K Ise=19.66n Ne=2.048 Ikf=.1072 Nk=.6601 Xtb=1.5 Br=2.015 Isc=91.99n Nc=1.566 Ikr=1.721 Rc=.4963 Cjc=16p Mjc=.3333 Vjc=.5 Fc=.5 Cje=48p Mje=.3333 Vje=.5 Tr=815.2n Tf=792.7p Itf=214.9 Xtf=2.303K Vtf=10 Vceo=40 Icrating=1 mfg=Philips)
.model BFY55 NPN(Is=3.367p Xti=3 Eg=1.11 Vaf=310.9 Bf=94.46 Ise=33.05p Ne=1.483 Ikf=.5451 Nk=.4767 Xtb=1.5 Br=8.334 Isc=34.05p Nc=1.468 Ikr=.6541 Rc=.6467 Cjc=28.15p Mjc=.3333 Vjc=.5 Fc=.5 Cje=93.85p Mje=.3333 Vje=.5 Tr=49.58n Tf=1.782n Itf=49.71 Xtf=9.095K Vtf=10 Vceo=80 Icrating=1 mfg=Philips)
.model BSV15-6 PNP(Is=70.49f Xti=3 Eg=1.11 Vaf=100 Bf=78.81 Ise=795.9f Ne=1.5 Ikf=.9977 Nk=.6579 Xtb=1.5 Br=18.45 Isc=715.1f Nc=1.23 Ikr=1.222 Rc=.8335 Cjc=47.58p Mjc=.3333 Vjc=.5 Fc=.5 Cje=212.4p Mje=.3333 Vje=.5 Tr=391.7n Tf=1.983n Itf=11.92 Xtf=64.06 Vtf=10 Vceo=40 Icrating=1 mfg=Philips)
.model BSV15-10 PNP(Is=70.49f Xti=3 Eg=1.11 Vaf=100 Bf=118.4 Ise=681f Ne=1.558 Ikf=.5245 Nk=.525 Xtb=1.5 Br=18.45 Isc=715.1f Nc=1.23 Ikr=1.222 Rc=.8335 Cjc=47.58p Mjc=.3333 Vjc=.5 Fc=.5 Cje=212.4p Mje=.3333 Vje=.5 Tr=304.6n Tf=1.977n Itf=11.86 Xtf=55.69 Vtf=10 Vceo=40 Icrating=1 mfg=Philips)
.model BSV15-16 PNP(Is=70.49f Xti=3 Eg=1.11 Vaf=100 Bf=180.1 Ise=735.8f Ne=1.64 Ikf=.6947 Nk=.596 Xtb=1.5 Br=18.45 Isc=715.1f Nc=1.23 Ikr=1.222 Rc=.8335 Cjc=47.58p Mjc=.3333 Vjc=.5 Fc=.5 Cje=212.4p Mje=.3333 Vje=.5 Tr=262.5n Tf=1.981n Itf=14.46 Xtf=75.99 Vtf=10 Vceo=40 Icrating=1 mfg=Philips)
.model BSV16-6 PNP(Is=70.49f Xti=3 Eg=1.11 Vaf=100 Bf=78.81 Ise=795.9f Ne=1.5 Ikf=.9977 Nk=.6579 Xtb=1.5 Br=18.45 Isc=715.1f Nc=1.23 Ikr=1.222 Rc=.8335 Cjc=47.58p Mjc=.3333 Vjc=.5 Fc=.5 Cje=212.4p Mje=.3333 Vje=.5 Tr=391.7n Tf=1.983n Itf=11.92 Xtf=64.06 Vtf=10 Vceo=60 Icrating=1 mfg=Philips)
.model BSV16-10 PNP(Is=70.49f Xti=3 Eg=1.11 Vaf=100 Bf=118.4 Ise=681f Ne=1.558 Ikf=.5245 Nk=.525 Xtb=1.5 Br=18.45 Isc=715.1f Nc=1.23 Ikr=1.222 Rc=.8335 Cjc=47.58p Mjc=.3333 Vjc=.5 Fc=.5 Cje=212.4p Mje=.3333 Vje=.5 Tr=304.6n Tf=1.977n Itf=11.86 Xtf=55.69 Vtf=10 Vceo=60 Icrating=1 mfg=Philips)
.model BSV16-16 PNP(Is=70.49f Xti=3 Eg=1.11 Vaf=100 Bf=180.1 Ise=735.8f Ne=1.64 Ikf=.6947 Nk=.596 Xtb=1.5 Br=18.45 Isc=715.1f Nc=1.23 Ikr=1.222 Rc=.8335 Cjc=47.58p Mjc=.3333 Vjc=.5 Fc=.5 Cje=212.4p Mje=.3333 Vje=.5 Tr=262.5n Tf=1.981n Itf=14.46 Xtf=75.99 Vtf=10 Vceo=60 Icrating=1 mfg=Philips)
.model BSV17-6 PNP(Is=70.49f Xti=3 Eg=1.11 Vaf=100 Bf=78.81 Ise=795.9f Ne=1.5 Ikf=.9977 Nk=.6579 Xtb=1.5 Br=18.45 Isc=715.1f Nc=1.23 Ikr=1.222 Rc=.8335 Cjc=35.44p Mjc=.3333 Vjc=.5 Fc=.5 Cje=212.4p Mje=.3333 Vje=.5 Tr=391.7n Tf=1.986n Itf=14.75 Xtf=94.3 Vtf=10 Vceo=90 Icrating=1 mfg=Philips)
.model BSV17-10 PNP(Is=70.49f Xti=3 Eg=1.11 Vaf=100 Bf=118.4 Ise=681f Ne=1.558 Ikf=.5245 Nk=.525 Xtb=1.5 Br=18.45 Isc=715.1f Nc=1.23 Ikr=1.222 Rc=.8335 Cjc=36.44p Mjc=.3333 Vjc=.5 Fc=.5 Cje=213.4p Mje=.3333 Vje=.5 Tr=304.6n Tf=1.98n Itf=14.64 Xtf=81.44 Vtf=10 Vceo=90 Icrating=1 mfg=Philips)
.model BSW66A NPN(Is=44.97f Xti=3 Eg=1.11 Vaf=100 Bf=315.4 Ise=102f Ne=1.261 Ikf=.8199 Nk=.7642 Xtb=1.5 Br=4.824 Isc=159.8f Nc=1.705 Ikr=.3971 Rc=.2572 Cjc=52p Mjc=.3767 Vjc=.5 Fc=.5 Cje=240p Mje=.2501 Vje=.5 Tr=10n Tf=1.05n Itf=2.639 Xtf=36.17 Vtf=10 Vceo=100 Icrating=1 mfg=Philips)
.model BSW67A NPN(Is=44.97f Xti=3 Eg=1.11 Vaf=100 Bf=315.4 Ise=102f Ne=1.261 Ikf=.8199 Nk=.7642 Xtb=1.5 Br=4.824 Isc=159.8f Nc=1.705 Ikr=.3971 Rc=.2572 Cjc=52p Mjc=.3767 Vjc=.5 Fc=.5 Cje=240p Mje=.2501 Vje=.5 Tr=10n Tf=1.05n Itf=2.639 Xtf=36.17 Vtf=10 Vceo=120 Icrating=1 mfg=Philips)
.model BSW68A NPN(Is=44.97f Xti=3 Eg=1.11 Vaf=100 Bf=315.4 Ise=102f Ne=1.261 Ikf=.8199 Nk=.7642 Xtb=1.5 Br=4.824 Isc=159.8f Nc=1.705 Ikr=.3971 Rc=.2572 Cjc=52p Mjc=.3767 Vjc=.5 Fc=.5 Cje=240p Mje=.2501 Vje=.5 Tr=10n Tf=1.05n Itf=2.639 Xtf=36.17 Vtf=10 Vceo=150 Icrating=1 mfg=Philips)
.model BSX19 NPN(Is=20.75f Xti=3 Eg=1.11 Vaf=100 Bf=738K Ise=14.86p Ne=1.709 Ikf=1.366m Nk=.4817 Xtb=1.5 Br=507 Isc=45.28p Nc=1.452 Ikr=2.923 Rc=.8978 Cjc=3.334p Mjc=.2086 Vjc=.5 Fc=.5 Cje=4.118p Mje=.3794 Vje=.5 Tr=4n Tf=280.7p Itf=321.5 Xtf=8.541K Vtf=10 Vceo=40 Icrating=500m mfg=Philips)
.model BSX20 NPN(Is=20.75f Xti=3 Eg=1.11 Vaf=100 Bf=113.4 Ise=224.4f Ne=1.439 Ikf=76.38m Nk=.5276 Xtb=1.8 Br=2.025 Isc=163.1p Nc=1.438 Ikr=5.567 Rc=1.156 Cjc=3.334p Mjc=.2086 Vjc=.5 Fc=.5 Cje=4.118p Mje=.3794 Vje=.5 Tr=45.49n Tf=236.7p Itf=1.912 Xtf=43.51 Vtf=10 Vceo=40 Icrating=500m mfg=Philips)
.model 2N4427T NPN(Is=20.75f Xti=3 Eg=1.11 Vaf=100 Bf=200 Ise=224.4f Ne=1.439 Ikf=76.38m Nk=.5276 Xtb=1.8 Br=2.025 Isc=163.1p Nc=1.438 Ikr=5.567 Rc=1.156 Cjc=3.334p Mjc=.2086 Vjc=.5 Fc=.5 Cje=4.118p Mje=.3794 Vje=.5 Tr=45.49n Tf=236.7p Itf=1.912 Xtf=43.51 Vtf=10 Vceo=40 Icrating=500m mfg=Philips)
.model 2N4427M NPN IS=10.000f BF=12.656 VAF=100 IKF=.50673 ISE=119.65f NE=1.5060 BR=.1001 VAR=100 IKR=10.010m ISC=10.000f NK=.68565 CJE=2.0000p CJC=13.487p+ MJC=.33333 TF=305.55p XTF=10 VTF=10 ITF=1 TR=10.000n
.model BSX45-10 NPN(Is=66.19f Xti=3 Eg=1.11 Vaf=100 Bf=367.1 Ise=752.8f Ne=1.418 Ikf=.1276 Nk=.5462 Xtb=1.5 Br=967.1 Isc=3.662n Nc=1.779 Ikr=2.449 Rc=.5938 Cjc=60.73p Mjc=.3333 Vjc=.5 Fc=.5 Cje=94.85p Mje=.3333 Vje=.5 Tr=10n Tf=1.358n Itf=1.081 Xtf=22.58 Vtf=10 Vceo=80 Icrating=1 mfg=Philips)
.model BSX45-16 NPN(Is=66.19f Xti=3 Eg=1.11 Vaf=100 Bf=600.9 Ise=93.12f Ne=1.31 Ikf=.1347 Nk=.5522 Xtb=1.2 Br=889.8 Isc=3.42n Nc=1.74 Ikr=12.98 Rc=.5886 Cjc=60.73p Mjc=.3333 Vjc=.5 Fc=.5 Cje=94.85p Mje=.3333 Vje=.5 Tr=10n Tf=1.353n Itf=2.957 Xtf=145.5 Vtf=10 Vceo=80 Icrating=1 mfg=Philips)
.model BSX46-10 NPN(Is=66.19f Xti=3 Eg=1.11 Vaf=100 Bf=367.1 Ise=752.8f Ne=1.418 Ikf=.1276 Nk=.5462 Xtb=1.5

Br=967.1 Isc=3.662n Nc=1.779 Ikr=2.449 Rc=.5938 Cjc=48.58p Mjc=.3333 Vjc=.5 Fc=.5 Cje=94.85p Mje=.3333 Vje=.5
Tr=10n Tf=1.372n Itf=1.216 Xtf=16.64 Vtf=10 Vceo=100 Icrating=1 mfg=Philips)
.model BSX46-16 NPN(Is=66.19f Xti=3 Eg=1.11 Vaf=100 Bf=600.9 Ise=93.12f Ne=1.31 Ikf=.1347 Nk=.5522 Xtb=1.2
Br=889.8 Isc=3.42n Nc=1.74 Ikr=12.98 Rc=.5886 Cjc=48.58p Mjc=.3333 Vjc=.5 Fc=.5 Cje=94.85p Mje=.3333 Vje=.5
Tr=10n Tf=1.361n Itf=2.994 Xtf=146.2 Vtf=10 Vceo=100 Icrating=1 mfg=Philips)
.model BSX47-10 NPN(Is=66.19f Xti=3 Eg=1.11 Vaf=100 Bf=367.1 Ise=752.8f Ne=1.418 Ikf=.1276 Nk=.5462 Xtb=1.5
Br=967.1 Isc=3.662n Nc=1.779 Ikr=2.449 Rc=.5938 Cjc=48.58p Mjc=.3333 Vjc=.5 Fc=.5 Cje=94.85p Mje=.3333 Vje=.5
Tr=10n Tf=1.372n Itf=1.216 Xtf=16.64 Vtf=10 Vceo=120 Icrating=1 mfg=Philips)
.model BSX59 NPN(Is=2.148p Xti=3 Eg=1.11 Vaf=100 Bf=5.51MEG Ise=14.31p Ne=1.341 Ikf=1.467 Nk=.8282
Xtb=1.75 Br=2.722 Isc=4.352u Nc=2.902 Ikr=11.54 Rc=.4745 Cjc=19.04p Mjc=.2126 Vjc=.5 Fc=.5 Cje=45.81p
Mje=.3426 Vje=.5 Tr=10n Tf=300.6p Itf=3.73 Xtf=40.95 Vtf=10 Vceo=45 Icrating=1 mfg=Philips)
.model BSX60 NPN(Is=991.3f Xti=3 Eg=1.11 Vaf=100 Bf=45.02MEG Ise=5.844p Ne=1.342 Ikf=1.513 Nk=.8609
Xtb=1.35 Br=11.94 Isc=294n Nc=2.206 Ikr=69.6m Rc=.4327 Cjc=19.04p Mjc=.2126 Vjc=.5 Fc=.5 Cje=45.81p
Mje=.3426 Vje=.5147 Tr=10n Tf=300.3p Itf=3.307 Xtf=32.58 Vtf=10 Vceo=30 Icrating=1 mfg=Philips)
.model BSX61 NPN(Is=377.1f Xti=3 Eg=1.11 Vaf=100 Bf=3.39K Ise=1.529p Ne=1.314 Ikf=1.57 Nk=.8664 Xtb=1.5
Br=13.35 Isc=153.1n Nc=2.243 Ikr=2.079 Rc=.4756 Cjc=19.04p Mjc=.2126 Vjc=.5 Fc=.5 Cje=45.81p Mje=.3426
Vje=.5147 Tr=10n Tf=300p Itf=3.281 Xtf=51.95 Vtf=10 Vceo=30 Icrating=1 mfg=Philips)
.model SMBTA05 NPN(Is=9.744f Xti=3 Eg=1.11 Vaf=100 Bf=104 Ise=96.9f Ne=1.615 Ikf=.6711 Nk=.5215 Xtb=1.5
Br=7.835 Isc=6.488p Nc=1.471 Ikr=1.021 Rc=.3037 Cjc=12p Mjc=.3333 Vjc=.5 Fc=.5 Cje=36p Mje=.3333 Vje=.5
Tr=10n Tf=1.333n Itf=30.41 Xtf=484.6 Vtf=10 Vceo=60 Icrating=500m mfg=Siemens)
.model SMBTA06 NPN(Is=9.744f Xti=3 Eg=1.11 Vaf=100 Bf=104 Ise=96.9f Ne=1.615 Ikf=.6711 Nk=.5215 Xtb=1.5
Br=7.835 Isc=6.488p Nc=1.471 Ikr=1.021 Rc=.3037 Cjc=12p Mjc=.3333 Vjc=.5 Fc=.5 Cje=36p Mje=.3333 Vje=.5
Tr=10n Tf=1.333n Itf=30.41 Xtf=484.6 Vtf=10 Vceo=80 Icrating=500m mfg=Siemens)
.model SMBTA20 NPN(Is=3.31f Xti=3 Eg=1.11 Vaf=100 Bf=315.3 Ise=30.83f Ne=1.744 Ikf=67.18m Nk=.3523 Xtb=1.5
Br=5.232 Isc=1.227p Nc=1.561 Ikr=.6492 Rc=1.623 Cjc=12.2p Mjc=.3333 Vjc=.5 Fc=.5 Cje=8.614p Mje=.3333 Vje=.5
Tr=10n Tf=591p Itf=1.423 Xtf=51.17 Vtf=10 Vceo=40 Icrating=100m mfg=Siemens)
.model SMBTA55 PNP(Is=9.744f Xti=3 Eg=1.11 Vaf=100 Bf=107.1 Ise=9.747f Ne=1.377 Ikf=1.26 Nk=.7865 Xtb=1.5
Br=3.584 Isc=59.76f Nc=1.511 Ikr=1.901 Rc=.6051 Cjc=29.15p Mjc=.3333 Vjc=.5 Fc=.5 Cje=87.45p Mje=.3333 Vje=.5
Tr=10n Tf=977.7p Itf=13.98 Xtf=131.9 Vtf=10 Vceo=60 Icrating=500m mfg=Siemens)
.model SMBTA56 PNP(Is=9.744f Xti=3 Eg=1.11 Vaf=100 Bf=107.1 Ise=9.747f Ne=1.377 Ikf=1.26 Nk=.7865 Xtb=1.5
Br=3.584 Isc=59.76f Nc=1.511 Ikr=1.901 Rc=.6051 Cjc=29.15p Mjc=.3333 Vjc=.5 Fc=.5 Cje=87.45p Mje=.3333 Vje=.5
Tr=10n Tf=977.7p Itf=13.98 Xtf=131.9 Vtf=10 Vceo=80 Icrating=500m mfg=Siemens)
.model SMBT2222 NPN(Is=9.744f Xti=3 Eg=1.11 Vaf=100 Bf=122.1 Ise=116.9f Ne=1.485 Ikf=.5201 Nk=.5543 Xtb=1.5
Br=5.309 Isc=7.693n Nc=2.439 Ikr=15.54 Rc=.6155 Cjc=17.01p Mjc=.49 Vjc=.5 Fc=.5 Cje=51p Mje=.3333 Vje=.5
Tr=57.91n Tf=482.2p Itf=.7603 Xtf=12.98 Vtf=10 Vceo=100 Icrating=500m mfg=Siemens)
.model SMBT2907 PNP(Is=67.34f Xti=3 Eg=1.11 Vaf=100 Bf=183.9 Ise=602.5f Ne=1.428 Ikf=.4354 Nk=.648 Xtb=1.5
Br=111.8 Isc=1.068n Nc=1.667 Ikr=10.24 Rc=2.035 Cjc=16.82p Mjc=.3333 Vjc=.5 Fc=.5 Cje=50.46p Mje=.3333 Vje=.5
Tr=83.81n Tf=503.5p Itf=4.162 Xtf=30.04 Vtf=10 Vceo=40 Icrating=600m mfg=Siemens)
.model SMBT3904 NPN(Is=9.744f Xti=3 Eg=1.11 Vaf=190.7 Bf=589.6 Ise=173.5f Ne=1.416 Ikf=20.51m Nk=.5689
Xtb=1.5 Br=1 Isc=99.04p Nc=1.675 Ikr=10.67 Rc=1.971 Cjc=6.901p Mjc=.3333 Vjc=.5 Fc=.5 Cje=6.64p Mje=.3333
Vje=.5 Tr=386.2n Tf=296.4p Itf=241.2 Xtf=496.2K Vtf=10 Vceo=40 Icrating=200m mfg=Siemens)
.model SMBT3906 PNP(Is=9.744f Xti=3 Eg=1.11 Vaf=65.24 Bf=149.8 Ise=82.57f Ne=1.449 Ikf=28.66m Nk=.4984
Xtb=1.5 Br=1 Isc=38.84p Nc=1.759 Ikr=9.336 Rc=1.714 Cjc=6.211p Mjc=.3333 Vjc=.5 Fc=.5 Cje=8.299p Mje=.3333
Vje=.5 Tr=304.2n Tf=365.5p Itf=13.39 Xtf=148.4 Vtf=10 Vceo=40 Icrating=200m mfg=Siemens)
.model EndOfEbipolar NPN mfg=StartOfPsPiceEuroPwrNpn
.model EndOf_Ebipolar PNP mfg=StartOfPsPiceEuroPwrPnp
.MODEL BD440 PNP(Is=632.4f Xti=3 Eg=1.11 Vaf=100 Bf=112.1 Ise=962.8f Ne=1.373 Ikf=2.187 Nk=.6196 Xtb=2.1
Br=66.4 Isc=974.4f Nc=1.207 Ikr=125.8 Rc=.2066 Cjc=508.9p Mjc=.4847 Vjc=.75 Fc=.5 Cje=379.8p Mje=.4937 Vje=.75
Tr=89.17n Tf=17.41n Itf=5.921 Xtf=1.062 Vtf=10 Rb=.1 Vceo=80 Icrating=4 mfg=Philips
.MODEL BD441 NPN(Is=1.129p Xti=3 Eg=1.11 Vaf=100 Bf=161 Ise=31.17p Ne=1.557 Ikf=1.948 Nk=.648 Xtb=2 Br=1
Isc=23.5p Nc=1.489 Ikr=31.34m Rc=.1682 Cjc=251.5p Mjc=.5045 Vjc=.75 Fc=.5 Cje=286.3p Mje=.4961 Vje=.75
Tr=810n Tf=23.64n Itf=10.92 Xtf=.3795 Vtf=10 Rb=.1 Vceo=80 Icrating=4 mfg=Philips)
.model BDX35 NPN(Is=3.108p Xti=3 Eg=1.11 Vaf=100 Bf=142.3 Ise=6.491p Ne=1.454 Ikf=11.52 Nk=.7978 Xtb=1.5
Br=1.376 Isc=67.94p Nc=1.505 Ikr=.7805 Rc=.1082 Cjc=97.16p Mjc=.3333 Vjc=.5 Fc=.5 Cje=291.5p Mje=.3333 Vje=.5
Tr=1u Tf=1.557n Itf=448.8 Xtf=89.4 Vtf=10 Vceo=40 Icrating=5 mfg=Philips)
.model BDX36 NPN(Is=3.108p Xti=3 Eg=1.11 Vaf=100 Bf=142.3 Ise=6.491p Ne=1.454 Ikf=11.52 Nk=.7978 Xtb=1.5
Br=1.376 Isc=67.94p Nc=1.505 Ikr=.7805 Rc=.1082 Cjc=97.16p Mjc=.3333 Vjc=.5 Fc=.5 Cje=291.5p Mje=.3333 Vje=.5
Tr=1u Tf=1.557n Itf=448.8 Xtf=89.4 Vtf=10 Vceo=60 Icrating=5 mfg=Philips)
.model BDX37 NPN(Is=3.108p Xti=3 Eg=1.11 Vaf=100 Bf=136.4 Ise=14.05p Ne=1.373 Ikf=10.46 Nk=.7878 Xtb=1.5
Br=8.022 Isc=4.708p Nc=1.658 Ikr=3.131 Rc=.1056 Cjc=97.16p Mjc=.3333 Vjc=.5 Fc=.5 Cje=291.5p Mje=.3333 Vje=.5

Tr=1u Tf=1.556n Itf=447.7 Xtf=90.04 Vtf=10 Vceo=60 Icrating=5 mfg=Philips)
.model BDX77 NPN(Is=487.2f Xti=3 Eg=1.11 Vaf=100 Bf=14.34K Ise=391.7p Ne=1.908 Ikf=.3088 Nk=.6439 Xtb=1.5
Br=222.1 Isc=750.1f Nc=1.777 Ikr=1.062 Rc=63.13m Cjc=485.8p Mjc=.3333 Vjc=.5 Fc=.5 Cje=1.457n Mje=.3333 Vje=.5
Tr=1u Tf=13.87n Itf=5.655K Xtf=7.064 Vtf=10 Vceo=100 Icrating=8 mfg=Philips)
.model BDX78 PNP(Is=1.554p Xti=3 Eg=1.11 Vaf=100 Bf=257.6 Ise=14.36p Ne=1.662 Ikf=1.865 Nk=.6053 Xtb=1.5
Br=1.749 Isc=48.91p Nc=1.594 Ikr=.2185 Rc=54.28m Cjc=340.1p Mjc=.3333 Vjc=.5 Fc=.5 Cje=1.02n Mje=.3333 Vje=.5
Tr=1u Tf=11.41n Itf=85.35 Xtf=9.975 Vtf=10 Vceo=80 Icrating=8 mfg=Philips)
.model BSS79B NPN(Is=1.009p Xti=3 Eg=1.11 Vaf=100 Bf=152.7 Ise=1.041p Ne=1.355 Ikf=.4144 Nk=.5579 Xtb=1.5
Br=3.366 Isc=136.8p Nc=1.377 Ikr=.8852 Rc=.7122 Cjc=15.66p Mjc=.3438 Vjc=.5 Fc=.5 Cje=47.1p Mje=.3333 Vje=.5
Tr=325n Tf=520.6p Itf=3.531 Xtf=83.82 Vtf=10 Vceo=40 Icrating=800m mfg=Siemens)
.model BSS79C NPN(Is=1.009p Xti=3 Eg=1.11 Vaf=100 Bf=328.1 Ise=8.891p Ne=1.743 Ikf=.3947 Nk=.527 Xtb=1.5
Br=20.21 Isc=2.646n Nc=1.692 Ikr=1.242 Rc=.7827 Cjc=15.66p Mjc=.3438 Vjc=.5 Fc=.5 Cje=47.1p Mje=.3333 Vje=.5
Tr=285n Tf=520.4p Itf=3.369 Xtf=83.42 Vtf=10 Vceo=40 Icrating=800m mfg=Siemens)
.model BSS80B PNP(Is=9.744f Xti=3 Eg=1.11 Vaf=100 Bf=144.2 Ise=1.345p Ne=1.642 Ikf=1.079 Nk=.8891 Xtb=1.5
Br=1.985 Isc=6.583n Nc=2.16 Ikr=.9399 Rc=1.678 Cjc=16.99p Mjc=.4804 Vjc=.5 Fc=.5 Cje=51p Mje=.3333 Vje=.5
Tr=82.44n Tf=504.8p Itf=8.87 Xtf=627.8 Vtf=10) Vceo=40 Icrating=800m mfg=Siemens)
.model BSS80C PNP(Is=9.744f Xti=3 Eg=1.11 Vaf=100 Bf=348.4 Ise=15.57p Ne=2.076 Ikf=.8077 Nk=.8941 Xtb=1.5
Br=1.729 Isc=9.826n Nc=2.227 Ikr=1.336 Rc=1.633 Cjc=16.99p Mjc=.4804 Vjc=.5 Fc=.5 Cje=51p Mje=.3333 Vje=.5
Tr=82.75n Tf=504.1p Itf=11.14 Xtf=535.9 Vtf=10 Vceo=40 Icrating=800m mfg=Siemens)
.model BSS81B NPN(Is=1.009p Xti=3 Eg=1.11 Vaf=100 Bf=152.7 Ise=1.041p Ne=1.355 Ikf=.4144 Nk=.5579 Xtb=1.5
Br=3.366 Isc=136.8p Nc=1.377 Ikr=.8852 Rc=.7122 Cjc=15.66p Mjc=.3438 Vjc=.5 Fc=.5 Cje=47.1p Mje=.3333 Vje=.5
Tr=325n Tf=520.6p Itf=3.531 Xtf=83.82 Vtf=10 Vceo=35 Icrating=800m mfg=Siemens)
.model BSS81C NPN(Is=1.009p Xti=3 Eg=1.11 Vaf=100 Bf=328.1 Ise=8.891p Ne=1.743 Ikf=.3947 Nk=.527 Xtb=1.5
Br=20.21 Isc=2.646n Nc=1.692 Ikr=1.242 Rc=.7827 Cjc=15.66p Mjc=.3438 Vjc=.5 Fc=.5 Cje=47.1p Mje=.3333 Vje=.5
Tr=285n Tf=520.4p Itf=3.369 Xtf=83.42 Vtf=10 Vceo=35 Icrating=800m mfg=Siemens)
.model BSS82B PNP(Is=9.744f Xti=3 Eg=1.11 Vaf=100 Bf=144.2 Ise=1.345p Ne=1.642 Ikf=1.079 Nk=.8891 Xtb=1.5
Br=1.985 Isc=6.583n Nc=2.16 Ikr=.9399 Rc=1.678 Cjc=16.99p Mjc=.4804 Vjc=.5 Fc=.5 Cje=51p Mje=.3333 Vje=.5
Tr=82.44n Tf=504.8p Itf=8.87 Xtf=627.8 Vtf=10 Vceo=60 Icrating=800m mfg=Siemens)
.model BSS82C PNP(Is=9.744f Xti=3 Eg=1.11 Vaf=100 Bf=348.4 Ise=15.57p Ne=2.076 Ikf=.8077 Nk=.8941 Xtb=1.5
Br=1.729 Isc=9.826n Nc=2.227 Ikr=1.336 Rc=1.633 Cjc=16.99p Mjc=.4804 Vjc=.5 Fc=.5 Cje=51p Mje=.3333 Vje=.5
Tr=82.75n Tf=504.1p Itf=11.14 Xtf=535.9 Vtf=10 Vceo=60 Icrating=800m mfg=Siemens)
.model BU207 NPN(Is=70.49f Xti=3 Eg=1.11 Vaf=100 Bf=41.51 Ise=184.7p Ne=1.683 Ikf=1.977 Nk=.6679 Xtb=1.5
Br=1.065 Isc=990.3f Nc=1.573 Ikr=.947 Rc=35.58m Cjc=303.6p Mjc=.3333 Vjc=.5 Fc=.5 Cje=910.8p Mje=.3333 Vje=.5
Tr=193.4u Tf=22.17n Itf=114.7K Xtf=49.25K Vtf=10 Vceo=1300 Icrating=5 mfg=TFK)
.model BU208 NPN(Is=70.49f Xti=3 Eg=1.11 Vaf=100 Bf=41.51 Ise=184.7p Ne=1.683 Ikf=1.977 Nk=.6679 Xtb=1.5
Br=1.065 Isc=990.3f Nc=1.573 Ikr=.947 Rc=35.58m Cjc=303.6p Mjc=.3333 Vjc=.5 Fc=.5 Cje=910.8p Mje=.3333 Vje=.5
Tr=193.4u Tf=22.17n Itf=114.7K Xtf=49.25K Vtf=10 Vceo=1500 Icrating=5 mfg=TFK)
.model BU208A NPN(Is=70.49f Xti=3 Eg=1.11 Vaf=100 Bf=41.51 Ise=184.7p Ne=1.683 Ikf=1.977 Nk=.6679 Xtb=1.5
Br=1.065 Isc=990.3f Nc=1.573 Ikr=.947 Rc=35.58m Cjc=303.6p Mjc=.3333 Vjc=.5 Fc=.5 Cje=910.8p Mje=.3333 Vje=.5
Tr=193.4u Tf=22.17n Itf=114.7K Xtf=49.25K Vtf=10 Vceo=700 Icrating=5 mfg=TFK)
.model BU209 NPN(Is=70.49f Xti=3 Eg=1.11 Vaf=100 Bf=364 Ise=5.912p Ne=1.357 Ikf=1.587 Nk=.6998 Xtb=1.5
Br=2.651 Isc=4.394p Nc=1.301 Ikr=1.707 Rc=39.15m Cjc=303.6p Mjc=.3333 Vjc=.5 Fc=.5 Cje=910.8p Mje=.3333
Vje=.5 Tr=19.61u Tf=22.16n Itf=649.2K Xtf=288.6K Vtf=10 Vceo=1700 Icrating=5 mfg=TFK)
.model BU508 NPN(Is=148.5p Xti=3 Eg=1.11 Vaf=100 Bf=30 Ise=1.355n Ne=1.413 Ikf=8.245 Nk=.8069 Xtb=1.75
Br=2.131 Isc=529.1p Nc=1.567 Ikr=1.689 Rc=32.64m Cjc=303.6p Mjc=.3333 Vjc=.5 Fc=.5 Cje=910.8p Mje=.3333
Vje=.5 Tr=16.1u Tf=22.02n Itf=183.6 Xtf=18.91K Vtf=10 Vceo=1500 Icrating=8 mfg=TFK)
.model BU508A NPN(Is=148.5p Xti=3 Eg=1.11 Vaf=100 Bf=43.23 Ise=1.355n Ne=1.413 Ikf=8.245 Nk=.8069 Xtb=1.75
Br=2.131 Isc=529.1p Nc=1.567 Ikr=1.689 Rc=32.64m Cjc=303.6p Mjc=.3333 Vjc=.5 Fc=.5 Cje=910.8p Mje=.3333
Vje=.5 Tr=16.1u Tf=22.02n Itf=183.6 Xtf=18.91K Vtf=10 Vceo=1500 Icrating=8 mfg=TFK)
.model BU508DR NPN(Is=85.92p Xti=3 Eg=1.11 Vaf=100 Bf=43.48K Ise=18.19u Ne=2.9 Ikf=1.639 Nk=.8151 Xtb=1.5
Br=11.84 Isc=5.251n Nc=1.556 Ikr=1.229 Rc=7.009m Cjc=303.6p Mjc=.3333 Vjc=.5 Fc=.5 Cje=910.6p Mje=.3333
Vje=.5 Tr=5.692u Tf=21.03n Itf=9.956 Xtf=231.8 Vtf=10 Vceo=1500 Icrating=8 mfg=TFK)
.model BU705 NPN(Is=30.73n Xti=3 Eg=1.11 Vaf=100 Bf=19.28 Ise=246.8n Ne=1.832 Ikf=1.083 Nk=.6266 Xtb=1.5
Br=2.014 Isc=6.122u Nc=1.683 Ikr=1.552 Rc=40.87m Cjc=194.3p Mjc=.3333 Vjc=.5 Fc=.5 Cje=582p Mje=.3333 Vje=.5
Tr=1u Tf=20.83n Itf=498.9 Xtf=51.13K Vtf=10 Vceo=1500 Icrating=2500m mfg=TFK)
.model BU908 NPN(Is=148.5p Xti=3 Eg=1.11 Vaf=100 Bf=656.7 Ise=11.42n Ne=1.614 Ikf=.542 Nk=.6352 Xtb=1.75
Br=6.932 Isc=463.7p Nc=1.522 Ikr=2.814 Rc=22.73m Cjc=303.6p Mjc=.3333 Vjc=.5 Fc=.5 Cje=910.8p Mje=.3333
Vje=.5 Tr=1u Tf=21.44n Itf=27.47 Xtf=1.214K Vtf=10 Vceo=1500 Icrating=8 mfg=TFK)
.model BUV47 NPN(Is=974.4f Xti=3 Eg=1.11 Vaf=100 Bf=94.74 Ise=2.566p Ne=1.206 Ikf=15.7 Nk=.8401 Xtb=2
Br=20.89 Isc=198.1p Nc=1.474 Ikr=10.96 Rc=35.63m Cjc=364.4p Mjc=.3333 Vjc=.5 Fc=.5 Cje=1.093n Mje=.3333

Vje=.5 Tr=988.4n Tf=21.48n Itf=100.2 Xtf=205.4 Vtf=10 Vceo=400 Icrating=9 mfg=TFK)
.model BUV47A NPN(Is=974.4f Xti=3 Eg=1.11 Vaf=100 Bf=94.74 Ise=2.566p Ne=1.206 Ikf=15.7 Nk=.8401 Xtb=2 Br=20.89 Isc=198.1p Nc=1.474 Ikr=10.96 Rc=35.63m Cjc=364.4p Mjc=.3333 Vjc=.5 Fc=.5 Cje=1.093n Mje=.3333 Vje=.5 Tr=988.4n Tf=21.48n Itf=100.2 Xtf=205.4 Vtf=10 Vceo=400 Icrating=9 mfg=TFK)
.model BUV48 NPN(Is=743.3f Xti=3 Eg=1.11 Vaf=100 Bf=41.88 Ise=743.3f Ne=1.171 Ikf=10.06 Nk=.5974 Xtb=1.5 Br=7.434 Isc=4.347p Nc=1.57 Ikr=2.795 Rc=31.86m Cjc=607.3p Mjc=.3333 Vjc=.5 Fc=.5 Cje=1.822n Mje=.3333 Vje=.5 Tr=2.944u Tf=30.09n Itf=106 Xtf=353.7 Vtf=10 Vceo=400 Icrating=15 mfg=TFK)
.model BUV48A NPN(Is=743.3f Xti=3 Eg=1.11 Vaf=100 Bf=41.88 Ise=743.3f Ne=1.171 Ikf=10.06 Nk=.5974 Xtb=1.5 Br=7.434 Isc=4.347p Nc=1.57 Ikr=2.795 Rc=31.86m Cjc=607.3p Mjc=.3333 Vjc=.5 Fc=.5 Cje=1.822n Mje=.3333 Vje=.5 Tr=2.445u Tf=30.15n Itf=202.4 Xtf=1.227K Vtf=10 Vceo=400 Icrating=15 mfg=TFK)
.model BUV48T NPN(Is=305.5f Xti=3 Eg=1.11 Vaf=100 Bf=92.39 Ise=609.6f Ne=1.181 Ikf=19.52 Nk=.7617 Xtb=2 Br=19.28 Isc=733.1f Nc=1.49 Ikr=2.357 Rc=27.48m Cjc=607.3p Mjc=.3333 Vjc=.5 Fc=.5 Cje=1.822n Mje=.3333 Vje=.5 Tr=1.934u Tf=28.64n Itf=44.23 Xtf=136.6 Vtf=10 Vceo=800 Icrating=15 mfg=TFK)
.model BUX47 NPN(Is=305.5f Xti=3 Eg=1.11 Vaf=100 Bf=54.08K Ise=536.1f Ne=1.16 Ikf=13.47 Nk=.8217 Xtb=1.5 Br=3.59 Isc=852f Nc=1.46 Ikr=4.723 Rc=30.78m Cjc=364.4p Mjc=.3333 Vjc=.5 Fc=.5 Cje=1.093n Mje=.3333 Vje=.5 Tr=2.682u Tf=21.49n Itf=71.86 Xtf=157.1 Vtf=10 Vceo=400 Icrating=9 mfg=TFK)
.model BUX47A NPN(Is=305.5f Xti=3 Eg=1.11 Vaf=100 Bf=54.08K Ise=536.1f Ne=1.16 Ikf=13.47 Nk=.8217 Xtb=1.5 Br=3.59 Isc=852f Nc=1.46 Ikr=4.723 Rc=30.78m Cjc=364.4p Mjc=.3333 Vjc=.5 Fc=.5 Cje=1.093n Mje=.3333 Vje=.5 Tr=3.031u Tf=21.58n Itf=100.7 Xtf=293.8 Vtf=10 Vceo=400 Icrating=9 mfg=TFK)
.model BUX48 NPN(Is=370.6f Xti=3 Eg=1.11 Vaf=100 Bf=34.44 Ise=7.119p Ne=1.351 Ikf=9.232 Nk=.5851 Xtb=1.5 Br=3.89 Isc=674.4f Nc=1.417 Ikr=4.746 Rc=31.6m Cjc=607.3p Mjc=.3333 Vjc=.5 Fc=.5 Cje=1.822n Mje=.3333 Vje=.5 Tr=4.048u Tf=26.69n Itf=1.383K Xtf=202.3K Vtf=10 Vceo=400 Icrating=15 mfg=TFK)
.model BUX48A NPN(Is=370.6f Xti=3 Eg=1.11 Vaf=100 Bf=34.44 Ise=7.119p Ne=1.351 Ikf=9.232 Nk=.5851 Xtb=1.5 Br=3.89 Isc=674.4f Nc=1.417 Ikr=4.746 Rc=31.6m Cjc=607.3p Mjc=.3333 Vjc=.5 Fc=.5 Cje=1.822n Mje=.3333 Vje=.5 Tr=3.416u Tf=26.69n Itf=1.383K Xtf=202.3K Vtf=10 Vceo=400 Icrating=15 mfg=TFK)
.model S518T NPN(Is=150.1f Xti=3 Eg=1.11 Vaf=100 Bf=49.32 Ise=58.07p Ne=1.525 Ikf=1.856 Nk=.6661 Xtb=1.5 Br=1.867 Isc=274.5f Nc=1.685 Ikr=2.673 Rc=42.09m Cjc=303.6p Mjc=.3333 Vjc=.5 Fc=.5 Cje=910.8p Mje=.3333 Vje=.5 Tr=1u Tf=20.52n Itf=4.991 Xtf=87.42 Vtf=10 Vceo=700 Icrating=8 mfg=TFK)
.model EndOfEPpwrBjt NPN mfg=StartOfMiscNpnBjt
.model EndOfEPpwBjt PNP mfg=StartOfMiscPnpBjt
.MODEL 2SC4542 NPN(IS=446.20f BF=14.226 VAF=100 IKF=19.980 XTB=1.5 ISE=468.83p NE=1.9980 BR=.1001 VAR=100 IKR=10.000m ISC=446.20f NK=.1001 CJE=2.0000p CJC=510.12p MJC=.33333 TF=47.976n XTF=10 VTF=10 ITF=1 TR=58.992E-6 Vceo=1500 Icrating=10 mfg=Japan)
.MODEL 2SC5150 NPN(IS=1.1585f BF=14.353 VAF=100 IKF=19.980 XTB=1.5 ISE=1.1585f NE=1.9980 BR=.1001 VAR=100 IKR=10.000m ISC=1.1585f NK=.1001 CJE=2.0000p CJC=449.39p MJC=.33333 TF=10.000n XTF=10 VTF=10 ITF=1 TR=79.661E-6 Vceo=1700 Icrating=10 mfg=Japan)
.MODEL uCBU207 NPN (IS=10.3282F BF=13.1001 NF=868.322M VAF=100 IKF=2.06725 ISE=69.4153F NE=1.08535 BR=100.641M IKR=999.881M ISC=2.02044P RE=80.6943M RC=1.78647 CJE=2P MJE=500M CJC=572.558P VJC=700M MJC=558.066M TF=31.5018N XTF=499.999M VTF=10 ITF=10.3511M TR=10N Vceo=1300 Icrating=5 mfg=Siemens)
.MODEL uCBU208 NPN (IS=10.3282F BF=13.1001 NF=868.322M VAF=100 IKF=2.06725 ISE=69.4153F NE=1.08535 BR=100.641M IKR=999.881M ISC=2.02044P RE=80.6943M RC=1.78647 CJE=2P MJE=500M CJC=572.558P VJC=700M MJC=558.066M TF=31.5018N XTF=499.999M VTF=10 ITF=10.3511M TR=10N Vceo=1500 Icrating=5 mfg=Siemens)
.MODEL uCBU208A NPN (IS=10.1528F BF=15.3953 NF=897.779M VAF=100 IKF=4.99915 ISE=2.7109P NE=1.3065 BR=252.11M IKR=1.00007 ISC=5.51464P RE=52.8902M RC=500M CJE=2P MJE=500M CJC=572.558P VJC=700M MJC=558.066M TF=31.6684N XTF=500M VTF=10 ITF=10.3555M TR=429.265U Vceo=1500 Icrating=5 mfg=Philips)
.model Q2N3055 NPN(Is=974.4f Xti=3 Eg=1.11 Vaf=50 Bf=99.49 Ne=1.941 Ise=902.5p Ikf=4.029 Xtb=1.5 Br=2.949 Nc=2 Isc=0 Ikr=0 Rc=.1 Cjc=276p Vjc=.75 Mjc=.3333 Fc=.5 Cje=569.1p Vje=.75 Mje=.3333 Tr=971.7n Tf=39.11n Itf=20 Vtf=10 Xtf=2 Rb=.1 Vceo=60 Icrating=15 mfg=Texas)
.MODEL Q2N3055_ NPN(IS=4.66p BF=360 VAF=100 IKF=0.25 ISE=3.339E-11 BR=2 ISC=5n RB=3 IRB=0.001 RBM=0.4 RC=0.04 CJE=5.802E-10 VJE=1.2 MJE=0.45 TF=8E-8 XTF=1 ITF=3 PTF=120 CJC=2.121E-10 MJC=0.4 TR=2.55E-6 XTB=1)
.MODEL uCBU326 NPN (IS=9.83587F BF=33.9956 NF=926.412M VAF=100 IKF=1.52471 ISE=374.09F NE=1.36684 BR=28.2634M IKR=999.6 ISC=99.9315P RE=57.7275M RC=48.4213M CJE=2P MJE=500M CJC=5P MJC=500M TF=25.1005N XTF=500M VTF=10 ITF=9.18217M TR=332.114U Vceo=800 Icrating=6 mfg=Texas)
.MODEL uCBU326A NPN (IS=9.83587F BF=33.9956 NF=926.412M VAF=100 IKF=1.52471 ISE=374.09F NE=1.36684 BR=28.2634M IKR=999.6 ISC=99.9315P RE=57.7275M RC=48.4213M CJE=2P MJE=500M CJC=5P MJC=500M TF=25.1005N XTF=500M VTF=10 ITF=9.18217M TR=332.114U Vceo=900 Icrating=6 mfg=Texas)
.MODEL uCBU406 NPN (IS=9.9822F BF=55.108 NF=1.02229 VAF=100 IKF=4.2725 ISE=40.1051P NE=1.96698

BR=138.579M IKR=999.958M ISC=14.8407P RE=61.0112M RC=99.1446M CJE=2P MJE=500M CJC=366.438P VJC=700M MJC=558.067M TF=14.9903N XTF=500M VTF=10 ITF=16.299M TR=10N Vceo=375 Icrating=6 mfg=Texas)
.MODEL uCBU406D NPN (IS=9.9822F BF=55.108 NF=1.02229 VAF=100 IKF=4.2725 ISE=40.1051P NE=1.96698 BR=138.579M IKR=999.958M ISC=14.8407P RE=61.0112M RC=99.1446M CJE=2P MJE=500M CJC=366.438P VJC=700M MJC=558.067M TF=14.9903N XTF=500M VTF=10 ITF=16.299M TR=10N Vceo=400 Icrating=7 mfg=Texas)
.MODEL bu406 npn IS=3.31042e-11 BF=40.9297 NF=0.85 VAF=23.6173 IKF=9.89434 ISE=4.75p NE=3.46875 BR=2.17748 NR=1.5 VAR=19.8032 IKR=10 ISC=3.25p NC=3.65625 RB=2.68547 IRB=0.101586 RBM=0.1 RE=0.0001 RC=0.198649 XTB=0.128676 XTI=1.18913 EG=1.17512 CJE=6.29276e-10 VJE=0.651734 MJE=0.35309 TF=4.49798n XTF=1.35722 VTF=0.995767 ITF=0.999981 CJC=2.66401e-10 VJC=0.409483 MJC=0.371615 XCJC=0.803125 FC=0.533467 TR=100n PTF=0
.MODEL uCBU407 NPN (IS=9.9822F BF=55.108 NF=1.02229 VAF=100 IKF=4.2725 ISE=40.1051P NE=1.96698 BR=138.579M IKR=999.958M ISC=14.8407P RE=61.0112M RC=99.1446M CJE=2P MJE=500M CJC=366.438P VJC=700M MJC=558.067M TF=14.9903N XTF=500M VTF=10 ITF=16.299M TR=10N Vceo=330 Icrating=7 mfg=Texas)
.MODEL uCBU407D NPN (IS=9.9822F BF=55.108 NF=1.02229 VAF=100 IKF=4.2725 ISE=40.1051P NE=1.96698 BR=138.579M IKR=999.958M ISC=14.8407P RE=61.0112M RC=99.1446M CJE=2P MJE=500M CJC=366.438P VJC=700M MJC=558.067M TF=14.9903N XTF=500M VTF=10 ITF=16.299M TR=10N Vceo=330 Icrating=7 mfg=Texas)
.MODEL uCBU426 NPN (IS=31.5849F BF=43.0341 NF=888.243M VAF=100 IKF=1.60065 ISE=6.016602E-019 NE=1.18011 BR=51.6234M IKR=999.97 ISC=99.9778P RE=83.5348M RC=24.7066M CJE=2P MJE=500M CJC=5P MJC=500M TF=25.1542N XTF=500M VTF=10 ITF=10.197M TR=218.485U Vceo=800 Icrating=6 mfg=Texas)
.MODEL uCBU426A NPN (IS=31.5849F BF=43.0341 NF=888.243M VAF=100 IKF=1.60065 ISE=6.016602E-019 NE=1.18011 BR=51.6234M IKR=999.97 ISC=99.9778P RE=83.5348M RC=24.7066M CJE=2P MJE=500M CJC=5P MJC=500M TF=25.1542N XTF=500M VTF=10 ITF=10.197M TR=218.485U Vceo=900 Icrating=6 mfg=Texas)
.MODEL Q2SA1020 PNP (IS=22.874f BF=157.34 VAF=100 IKF=6.1540 ISE=211.08f NE=1.4906 BR=500 VAR=100 IKR=20 ISC=37.417f NC=1.1098 NK=.83537 RB=1 RC=.19037 CJE=64.281p MJE=.33333 CJC=97.165p MJC=.33333 TF=395.80p XTF=10 VTF=10 ITF=1 TR=168.00n Vceo=50 Icrating=2 mfg=Japan)
.MODEL Q2SA1302 PNP (IS=21.479p BF=136.48 VAF=100 IKF=19.980 ISE=21.504p NE=1.3784 BR=329.48 VAR=100 IKR=19.980 ISC=4.3670n NC=1.4264 NK=.72845 RC=93.301m CJE=755.31p MJE=.33333 CJC=1.1417n MJC=.33333 TF=1.2802n XTF=10 VTF=10 ITF=1 TR=10.000n Vceo=200 Icrating=15 mfg=Japan)
.MODEL Q2SA1304 PNP (IS=10.000f BF=134.98 VAF=100 IKF=.70373 ISE=206.07f NE=1.4074 BR=1.9998 VAR=100 IKR=19.007 ISC=224.58n NC=2.9970 NK=.54868 RC=.41468 CJE=88.387p MJE=.33333 CJC=133.60p MJC=.33333 TF=10.257n XTF=10 VTF=10 ITF=1 TR=10.000n Vceo=150 Icrating=1.5 mfg=Japan)
.MODEL Q2SA1327 PNP (IS=289.73f BF=220.01 VAF=100 IKF=20 ISE=289.75f NE=1.3484 BR=40.829 VAR=100 IKR=11.903 ISC=106.40p NC=1.6066 NK=.66302 RC=36.278m CJE=642.81p MJE=.33333 CJC=971.65p MJC=.33333 TF=587.82p XTF=10 VTF=10 ITF=1 TR=60.099n Vceo=50 Icrating=10 mfg=Japan)
.MODEL Q2SA1357 PNP (IS=89.641f BF=225.69 VAF=100 IKF=14.045 ISE=100.77f NE=1.4217 BR=499.52 VAR=100 IKR=20 ISC=23.567p NC=1.4956 NK=.8764 RC=.13188 CJE=99.636p MJE=.33333 CJC=150.61p MJC=.33333 TF=254.08p XTF=10 VTF=10 ITF=1 TR=10.000n Vceo=35 Icrating=5 mfg=Japan)
.MODEL TIP42C PNP(Is=66.19f Xti=3 Eg=1.11 Vaf=100 Bf=137.6 Ise=862.2f Ne=1.481 Ikf=1.642 Nk=.5695 Xtb=2 Br=5.88 Isc=273.5f Nc=1.24 Ikr=3.555 Rc=79.39m Cjc=870.4p Mjc=.6481 Vjc=.75 Fc=.5 Cje=390.1p Mje=.4343 Vje=.75 Tr=235.4n Tf=23.21n Itf=71.33 Xtf=5.982 Vtf=10 Rb=.1 Vceo=100 Icrating=6 mfg=Texas)
.model 2N3019 NPN(Is=14f Vaf=100 Bf=200 Ikf=.75 Xtb=1.5 Br=5 Rc=.7 Cjc=16p Mjc=.36 Cje=55p Mje=.1553 Tr=800p Tf=800p Itf=1.2 Vtf=5 Xtf=55 Rb=10 Vceo=80 Icrating=1 mfg=Semicoa)
.MODEL PN100 NPN (IS=50.8F NF=1 BF=292 VAF=156 IKF=0.3 ISE=22.4P NE=2 BR=4 NR=1 VAR=24 IKR=0.45 RE=0.103 RB=0.412 RC=41.2M XTB=1.5 CJE=15.2P VJE=1.1 MJE=0.5 CJC=7.1P VJC=0.3 MJC=0.3 TF=636P TR=357N Vceo=45 Icrating=500m mfg=Fairchild)
.MODEL PN100A NPN (IS=50.8F NF=1 BF=585 VAF=156 IKF=0.3 ISE=11.2P NE=2 BR=4 NR=1 VAR=24 IKR=0.45 RE=0.103 RB=0.412 RC=41.2M XTB=1.5 CJE=15.2P VJE=1.1 MJE=0.5 CJC=7.1P VJC=0.3 MJC=0.3 TF=636P TR=357N Vceo=45 Icrating=500m mfg=Fairchild)
.MODEL PN4356 PNP (IS=81.2F NF=1 BF=130 VAF=161 IKF=0.48 ISE=80.6P NE=2 BR=4 NR=1 VAR=20 IKR=0.72 RE=64.4M RB=0.258 RC=25.8M XTB=1.5 CJE=133P VJE=1.1 MJE=0.5 CJC=86.7P VJC=0.3 MJC=0.3 TF=795P TR=552N Vceo=80 Icrating=500m mfg=Fairchild)
.model ss8550 pnp is=117.63f bf=178.2 vaf=51.25 ikf=3.303 ise=18.82f ne=1.5 br=5 var=36.68 ikr=0.01 isc=0.2f nc=1.5 rb=122 irb=83.22u rbm=27.07 rc=1 cje=99.51p Vceo=25 Icrating=1.5 mfg=Fairchild
.model ss9012 pnp is=2.0417e-14 bf=143.3 vaf=47.75 ikf=0.5743 ise=75.86f ne=2 br=14.345 nr=0.999 var=86.14 ikr=0.4265 isc=1.585f nc=1.0087 rb=57.5 irb=7.943u rbm=8.09 re=0.02 rc=0.743 cje=35.1p vje=0.866 mje=0.411 cjc=19.1p vjc=0.787 mjc=0.394 xcjc=0.349 xtb=1.413 eg=1.0885 xti=3 fc=0.5 Vceo=20 Icrating=0.5 mfg=Fairchild

.model ss9013 npn is=3.40675e-14 bf=166 vaf=67 ikf=1.164 ise=12.37f ne=2 br=15.17 var=40.84 ikr=0.261352 isc=1.905f nc=1.066 rb=63.2 irb=5.62u rbm=22.1 re=0.02 rc=0.7426 cje=3.53e-11 vje=0.808 mje=0.372 cjc=1.74e-11 vjc=0.614 mjc=0.388 xcjc=0.349 xtb=1.4025 eg=1.0999 xti=3 fc=0.5 Vceo=20 Icrating=0.5 mfg=Fairchild
.model ss9014 npn is=2.87599e-14 bf=377.5 vaf=123 ikf=1.1841 ise=4.7863f ne=1.5 br=4.79 var=11.29 ikr=0.275423 isc=1.44544e-14 nc=1.5 rb=200 irb=1e-5 rbm=10 re=0.56 rc=5 cje=1.7205e-11 vje=0.6905907 mje=0.3193434 tf=5.89463e-10 cjc=6.2956p vjc=0.4164212 mjc=0.2559546 xcjc=0.451391 xtb=1.8881 eg=1.2415 xti=3 fc=0.5 Vceo=45 Icrating=0.1 mfg=Fairchild
.model ss9015 pnp is=28.76f bf=125.5 nf=1 vaf=123 ikf=0.6041 ise=4.79f ne=1.5 br=4.79 nr=1 var=11.29 ikr=0.275423 isc=14.454f nc=1.5 rb=200 irb=10u rbm=10 re=0.56 rc=5 tf=837.7p cjc=20.96p vjc=0.5164 mjc=0.656 xcjc=0.451 Vceo=45 Icrating=0.1 mfg=Fairchild
.MODEL KSP44 NPN IS=2.4446E-13 BF=184.79 VAF=100 IKF=9.6380E-2 ISE=2.8775p BR=0.17129 VAR=100 IKR=2.2351 ISC=6.0845E-10 NC=1.5000 RE=0.1 RB=4.7095 RC=2.7922 CJE=1.0100E-10 CJC=1.9010E-11 VJC=0.66207 MJC=0.40238 TF=1.1000E-8 XTF=10 VTF=10 ITF=1 TR=3.86493E-5 FC=0.5 XTI=3 EG=1.11 Vceo=500 Icrating=0.3 mfg=Fairchild
.model 2SC2344 NPN(Is=26.94p Eg=1.11 Vaf=100 Bf=333.1 Ise=192.6p Ne=1.488 Ikf=2.436 Nk=1.017 Xtb=1.5 Br=216.9 Isc=241.8n Nc=2.259 Ikr=482.5 Rc=.6049 Cjc=250.5p Mjc=.4004 Vjc=11.36m Cje=250p Tr=33.47n Tf=1.526n Itf=13.13 Xtf=41.6 Vtf=10 Vceo=160 Icrating=1.5 mfg=Sanyo)
.model 2SA1011 PNP(Is=6.734p Eg=1.11 Vaf=100 Bf=106.7 Ise=6.755p Ne=1.328 Ikf=2.481 Nk=.8564 Xtb=1.5 Br=8.268 Isc=6.734p Nc=1.167 Ikr=.9435 Rc=1.155 Cjc=483.8p Mjc=.3806 Vjc=6.248m Cje=500p Tr=181.1n Tf=1.603n Itf=1.08 Xtf=4.227 Vtf=10 Vceo=160 Icrating=1.5 mfg=Sanyo)
.MODEL FMMT555 PNP IS=1.3E-13 NF=1 BF=220 IKF=1.2 VAF=110 ISE=3E-14 NE=1.5 RCO=12 GAMMA=3E-8 NR=1 BR=8 VAR=15.5 ISC=1e-13 NC=1.06 RB=5 RE=0.2 RC=0.2 QUASIMOD=1 XTB=1.4 CJC=28p MJC=0.45 VJC=0.736 CJE=112p TF=0.7n TR=2e-7 mfg=Zetex
.MODEL BF199 NPN(IS=4.031E-16 NF=0.9847 ISE=9.187E-17 NE=1.24 BF=122.5 IKF=0.065 VAF=135 NR=0.991 ISC=4.1E-13 NC=1.37 BR=5.036 IKR=0.04 VAR=8 RB=16 IRB=0.0004 RBM=8 RE=0.402 RC=5 XTB=0 EG=1.11 XTI=3 CJE=2.258p VJE=0.444 MJE=0.136 TF=2.92E-10 XTF=8 VTF=8 ITF=0.14 PTF=20 CJC=9.333E-13 VJC=0.2488 MJC=0.1974 XCJC=0.86 TR=35n FC=0.9 Vceo=25 Icrating=25m mfg=Philips)
.MODEL 2N3055H NPN(IS=2.37426e-14 BF=129.119 NF=0.85 VAF=31.1252 IKF=0.990922 ISE=2.47498e-10 NE=1.89002 BR=1.01252 NR=0.924456 VAR=254.624 IKR=2.70227 ISC=2.47498e-10 NC=2.90624 RB=3.66609 IRB=0.1 RBM=0.1 RE=0.000352673 RC=0.0764459 XTB=1.34801 XTI=1.07207 EG=1.206 CJE=9.03089e-08 VJE=0.513954 MJE=0.59999 TF=1e-08 XTF=1.36696 VTF=1.02605 ITF=0.987296 CJC=5e-10 VJC=0.400243 MJC=0.410238 XCJC=0.803124 FC=0.661216 TR=1e-07 VCEO=60 ICRATING=15 MFG=Motorola)
.MODEL mjk055t npn IS=1.92238e-13 BF=327.43 NF=0.85 VAF=36.105 IKF=0.620037 ISE=1.4602e-10 NE=1.50926 BR=0.654697 NR=0.935367 VAR=361.05 IKR=6.20037 ISC=6.85154p NC=2.96871 RB=16.05 IRB=0.1 RBM=0.161446 RE=0.000602331 RC=0.0632768 XTB=0.943656 XTI=1.12302 EG=1.05 CJE=9.23675e-08 VJE=0.506151 MJE=0.607139 TF=1e-08 XTF=1.35736 VTF=0.997047 ITF=0.999796 CJC=5e-10 VJC=0.400198 MJC=0.410184 XCJC=0.803125 FC=0.658133 TR=1e-07
.MODEL mje2955t pnp IS=4.14254e-10 BF=449.16 NF=0.85 VAF=17.4911 IKF=0.414206 ISE=1e-08 NE=1.47014 BR=0.1 NR=1.09325 VAR=174.911 IKR=4.14206 ISC=7.59792e-09 NC=3.02799 RB=20.1795 IRB=0.1 RBM=0.1 RE=0.000499379 RC=0.0813684 XTB=0.1 XTI=1.16399 EG=1.05 CJE=9.97416e-08 VJE=0.416937 MJE=0.61618 TF=9.98874e-09 XTF=1.35736 VTF=0.997021 ITF=0.999788 CJC=4.99998e-10 VJC=0.40025 MJC=0.410011 XCJC=0.803124 FC=0.661649 TR=1e-07 PTF=0
.model 2sc3281 npn IS=229.07p BF=135 NF=1.257 VAF=50 IKF=20 ISE=5.222p NE=1.392 BR=1 NR=1.411 VAR=75 NC=2 RB=4 RE=2m RC=0.0389 CJE=6050p VJE=0.75 MJE=0.234 TF=5.3n XTF=0.4 ITF=4 CJC=440.35p VJC=0.75 MJC=0.233 TR=3.6e-8 XTB=1.08 VCEO=200V ICrating=15A MFG=Toshiba
.model MJk40 NPN (IS=1.03431e-13 BF=172.974 NF=0.939811 VAF=27.3487 IKF=0.0260146 ISE=4.48447e-11 NE=1.61605 BR=16.6725 NR=0.796984 VAR=6.11596 IKR=0.10004 ISC=9.99914e-14 NC=1.99995 RB=1.47761 IRB=0.2 RBM=1.47761 RE=0.0001 RC=1.42228 XTB=2.70726 XTI=1 EG=1.206 CJE=1e-11 VJE=0.75 MJE=0.33 TF=1e-09 XTF=1 VTF=10 ITF=0.01 CJC=1e-11 VJC=0.75 MJC=0.33 XCJC=0.9 FC=0.5 CJS=0 VJS=0.75 MJS=0.5 TR=1e-07 Vceo=300 Icrating=500m mfg=Fairchild)
.model MJk50 PNP (IS=6.01619f BF=157.387 NF=0.910131 VAF=23.273 IKF=0.0564808 ISE=4.48479p NE=1.58557 BR=0.1 NR=1.03823 VAR=4.14543 IKR=0.0999978 ISC=1.00199e-13 NC=1.98851 RB=0.1 IRB=0.202965 RBM=0.1 RE=0.0710678 RC=0.355339 XTB=1.03638 XTI=3.8424 EG=1.206 CJE=1e-11 VJE=0.75 MJE=0.33 TF=1e-09 XTF=1 VTF=10 ITF=0.01 CJC=1e-11 VJC=0.75 MJC=0.33 XCJC=0.9 FC=0.5 TR=1e-07 Vceo=300 Icrating=500m mfg=Fairchild)
.model MMBTA06 NPN (IS=50.8f NF=1.00 BF=479 VAF=161 IKF=91.1m ISE=9.99p NE=2.00 BR=4.00 NR=1.00 VAR=16.0 IKR=0.225 RE=0.103 RB=0.412 RC=41.2m XTB=1.5 CJE=58.7p VJE=1.10 MJE=0.500 CJC=18.9p VJC=0.300 MJC=0.300 TF=576p TR=110n EG=1.12 Vceo=80 Icrating=500m mfg=Fairchild)
.model MMBTA56 PNP (IS=50.8f NF=1.00 BF=479 VAF=161 IKF=91.1m ISE=9.99p NE=2.00 BR=4.00 NR=1.00 VAR=16.0 IKR=0.225 RE=0.103 RB=0.412 RC=41.2m XTB=1.5 CJE=125p VJE=1.10 MJE=0.500 CJC=40.2p

VJC=0.300 MJC=0.300 TF=660p TR=149n EG=1.12 Vceo=80 Icrating=500m mfg=Fairchild)
.model 2SC1815 NPN(Is=2.04f Xti=3 Eg=1.11 Vaf=6 Bf=400 Ikf=20m Xtb=1.5 Br=3.377 Rc=1 Cjc=1p Mjc=.3333 Vjc=.75 Fc=.5 Cje=25p Mje=.3333 Vje=.75 Tr=450n Tf=20n Itf=0 Vtf=0 Xtf=0 VCEO=45V ICrating=150M MFG=Toshiba)
.model Q2SC1815 NPN(Is=2.04f Xti=3 Eg=1.11 Vaf=6 Bf=400 Ikf=20m Xtb=1.5 Br=3.377 Rc=1 Cjc=1p Mjc=.3333 Vjc=.75 Fc=.5 Cje=25p Mje=.3333 Vje=.75 Tr=450n Tf=20n Itf=0 Vtf=0 Xtf=0 VCEO=45V ICrating=150M MFG=Toshiba)
.model 2SC1815GR NPN(Is=10f Bf=283 Ikf=3 Nk=1.5 Br=2 Vaf=100 Rc=1.3 Re=50m RB=13 Cjc=5p Vjc=0.2 Mjc=0.2 Cje=12p Vje=0.75 Mje=0.33 Tr=5n Tf=500p Vceo=50 Icrating=150m mfg=TOSHIBA)
.model 2SA1015 PNP(Is=295.1E-18 Xti=3 Eg=1.11 Vaf=100 Bf=110 Xtb=1.5 Br=10.45 Rc=15 Cjc=66.2p Mjc=1.054 Vjc=.75 Fc=.5 Cje=5p Mje=.3333 Vje=.75 Tr=10n Tf=1.661n VCEO=45V ICrating=150M MFG=Toshiba)
.model Q2SA1015 PNP(Is=295.1E-18 Xti=3 Eg=1.11 Vaf=100 Bf=110 Xtb=1.5 Br=10.45 Rc=15 Cjc=66.2p Mjc=1.054 Vjc=.75 Fc=.5 Cje=5p Mje=.3333 Vje=.75 Tr=10n Tf=1.661n VCEO=45V ICrating=150M MFG=Toshiba)
.model mje15030 npn IS=137.17p BF=150 NF=1.1308 VAF=200 IKF=4 BR=2.67 NR=1.13 VAR=500 RB=0.503 RBM=0.503 RE=0.01 RC=0.051 CJE=2000p VJE=0.342 MJE=0.4 TF=1.872n CJC=525p VJC=0.342 MJC=0.35 XCJC=0.5 TR=754n XTB=1.7145 EG=1.11 XTI=3 FC=0.5
.model mje15031 pnp IS=137.17p BF=150 NF=1.1308 VAF=200 IKF=4 BR=2.67 NR=1.13 VAR=500 RB=0.503 RBM=0.503 RE=0.01 RC=0.051 CJE=2000p VJE=0.342 MJE=0.4 TF=1.872n CJC=525p VJC=0.342 MJC=0.35 XCJC=0.5 TR=754n XTB=1.7145 EG=1.11 XTI=3 FC=0.5
.MODEL KSA1943 PNP IS=3.5476E-11 BF=159.9 NF=1.0 BR=25.75 NR=1.011 ISE=2.5119E-10 NE=2 ISC=7.9433E-11 NC=1.37 VAF=60 VAR=11.07 IKF=2.837 IKR=0.3548 RB=2.74 RBM=0.0381 IRB=3.6308m RE=0.06 RC=0.01 CJE=4.1783n VJE=0.6354 MJE=0.3374 FC=0.5 CJC=1.1383n VJC=0.5 MJC=0.3699 XCJC=0.7624 XTB=1.5306 EG=1.1751 XTI=3
.MODEL KSA1943_ PNP (IS=3.5476E-11 BF=159.9 NF=1.0 BR=25.75 NR=1.011 ISE=2.5119E-10 NE=2 ISC=7.9433E-11 NC=1.37 VAF=60.0 VAR=11.07 IKF=2.837 IKR=0.3548 RB=2.74 RBM=0.0381 IRB=3.6308E-3 RE=0.06 RC=0.01 CJE=4.1783n VJE=0.6354 MJE=0.3374 FC=0.5 CJC=1.1383n VJC=0.5 MJC=0.3699 XCJC=0.7624 XTB=1.5306 EG=1.1751 XTI=3 RCO=0.21 GAMMA=10E-8)
.MODEL KSC5200 NPN IS=4.3031p BF=152.1 BR=6.155 NR=1.028 ISE=1.3924E-11 NE=1.5 ISC=2.7542E-11 NC=1.95 VAF=60 VAR=6.51 IKF=10.8637 IKR=0.1585 RB=2.47 RBM=0.02 IRB=0.08 RE=0.04 RC=0.015 CJE=5.8111n VJE=0.6506 MJE=0.3357 FC=0.5 CJC=6.4394E-10 VJC=0.5 MJC=0.3966 XCJC=0.7624 XTB=1.0445 EG=1.1663 XTI=3
.MODEL KSC5200_ NPN (IS=4.3031p BF=152.1 NF=1.0 BR=6.155 NR=1.028 ISE=1.3924E-11 NE=1.5 ISC=2.7542E-11 NC=1.95 VAF=60.0 VAR=6.51 IKF=10.8637 IKR=0.1585 RB=2.47 RBM=0.02 IRB=0.08 RE=0.04 RC=0.015 CJE=5.8111n VJE=0.6506 MJE=0.3357 FC=0.5 CJC=6.4394E-10 VJC=0.5 MJC=0.3966 XCJC=0.7624 XTB=1.0445 EG=1.1663 XTI=3 RCO=0.21 GAMMA=10E-8)
.MODEL KSA1220 PNP IS=4.7863E-13 BF=289.3 BR=9.76 NR=1.006 ISE=5.2481p NE=2 ISC=2.4909E-11 NC=1.5 VAF=98.5 VAR=6.7 IKF=2.7061 IKR=0.0759 RB=2.26 RBM=0.2308 IRB=0.001 RE=0.1908 RC=1.1748 QCO=0.02 RCO=3.9811 VO=11.078 GAMMA=5.01187E-8 CJE=3.4786E-10 VJE=0.9575 MJE=0.4694 FC=0.5 CJC=1.1224E-10 VJC=0.5761 MJC=0.4365 XCJC=0.4955 XTB=1.7978 EG=1.2255 XTI=3
.MODEL KSC2690 NPN IS=1.7783E-13 BF=132.5 BR=8.495 NR=1.005 ISE=1.9953E-13 NE=1.5 ISC=1.5849n NC=1.98 VAF=580.75 VAR=18.15 IKF=4.0271 IKR=0.012 RB=2.98 RBM=0.001 IRB=0.6396 RE=0.0909 RC=1.4705 QCO=0.68 RCO=3.6239 VO=6.587 GAMMA=2.8216E-7 CJE=4.0082E-10 VJE=0.6696 MJE=0.3296 FC=0.5 CJC=6.0404E-11 VJC=0.5 MJC=0.4266 XCJC=0.4955 XTB=1.2590 EG=1.2277 XTI=3
.model 2sc3423 npn IS=14f BF=130 VAF=50 IKF=300m BR=5.61 VAR=500 RB=10 RE=0.01 RC=0.8 CJE=5p VJE=0.7 MJE=0.5 TF=795.77p XTF=7 VTF=6 ITF=50m CJC=4.4p VJC=0.6 MJC=0.286 XCJC=0.5 TR=4n XTB=1.5 EG=1.11 XTI=3 FC=0.5
.MODEL 2SC2240 NPN IS=1.32133E-13 NF=1.00637 VAF=297.325 IKF=0.155303 ISE=3.90472f NE=1.33344 BR=7.41092 NR=1.0535 VAR=12.2874 IKR=0.552266 ISC=6.17974E-14 NC=1.01042 RB=1E-06 RE=0.0662541 EG=1.11 XTI=3 CJE=3.86068E-11 VJE=0.7132 MJE=0.36586 VJC=0.379984 MJC=0.307996 FC=0.5 BF=4.539950E+02 CJC=8.22821p RC=8.343630E-01 TF=2.756641n TR=28n XTF=1
.MODEL 2sc2240_ NPN IS=5.908e-015 NF=1 ISE=6.239e-017 NE=1.061e+000 BF=8.319e+002 BR=1 IKF=1.500e-001 VAF=4.384e+002 VAR=2.000e+001 EG=1.110e+000 XTI=3.000e+000 XTB=0.000e+000 RC=6.000e-001 RB=7.500e-001 RE=0.000e+000 CJE=2.500e-011 MJE=1.740e-001 VJE=1.250e-001 CJC=5.371e-012
.model Q2SC2240 NPN(Is=1.41f Xti=3 Eg=1.11 Vaf=100 Bf=310 Ne=1.5 Ise=0 Ikf=70m Xtb=1.5 Br=.8893 Nc=2 Isc=0 Ikr=0 Rc=30 Cjc=6.878p Mjc=.2725 Vjc=.75 Fc=.5 Cje=5p Mje=.3333 Vje=.75 Tr=10n Tf=1.276n Itf=0 Vtf=0 Xtf=0)
.model Q2sc2240_ NPN(Is=99.13f Xti=3 Eg=1.11 Vaf=422.2 Bf=352.8 Ise=1.179p Ne=1.782 Ikf=.4704 Nk=.9631 Xtb=1.5 Var=100 Br=1.663 Isc=555.1p Nc=1.796 Ikr=5.85 Rc=.2032 Cjc=7.561p Mjc=.2472 Vjc=.3905 Fc=.5 Cje=5p Mje=.3333 Vje=.75 Tr=10n Tf=1.295n Itf=1 Xtf=0 Vtf=10)
.model 2SA970 PNP(Is=465.4f Xti=3 Eg=1.11 Vaf=57 Bf=407.6 Ise=4.683p Ne=2.051 Ikf=.3998 Nk=1.192 Xtb=1.5 Var=100 Br=1 Isc=465.4f Nc=1.048 Ikr=6.032 Rc=2.343 Cjc=11.59p Mjc=.4014 Vjc=1.155 Fc=.5 Cje=5p Mje=.3333 Vje=.75 Tr=10n Tf=1.252n Itf=1 Xtf=0 Vtf=10)

.model 2SA970_ PNP IS=9.9855F BF=477.115 NF=965.739M VAF=64.7 IKF=116.959M ISE=2.13187F NE=1.27276 BR=385.069M NR=1 IKR=308.018 ISC=13.4194P NC=2 NK=500M RC=7.03858 CJE=2P VJE=750M MJE=500M CJC=19.119P VJC=749.982M MJC=498.685M FC=500M TF=1.49138N XTF=500M VTF=10 ITF=10.0655M PTF=0 TR=10N XTB=0 XTI=3
.MODEL Q2SA1360 PNP IS=116.73f BF=147.48 VAF=100 IKF=78.684m ISE=297.72f NE=1.5511 BR=.77363 VAR=100 IKR=1.0217 ISC=26.92n NC=2.9970 NK=.49889 RC=4.5038 CJE=4.0176p MJE=.33333 CJC=6.287p VJC=.35 MJC=.26272 TF=344.39p XTF=84.382 VTF=7.0050 ITF=.11443 TR=10n
.MODEL 2SA1360 PNP IS=116.73f BF=147.48 VAF=100 IKF=78.684m ISE=297.72f NE=1.5511 BR=.77363 VAR=100 IKR=1.0217 ISC=26.92n NC=2.9970 NK=.49889 RC=4.5038 CJE=4.0176p MJE=.33333 CJC=6.287p VJC=.35 MJC=.26272 TF=344.39p XTF=84.382 VTF=7.0050 ITF=.11443 TR=10n
.MODEL 2SA1943 PNP (IS=3.5476E-11 BF=159.9 VAF=60 IKF=2.8370 ISE=2.5119E-10 NE=2 BR=25.75 NR=1.011 VAR=11.07 IKR=0.3548 ISC=7.9433E-11 NC=1.37 RE=0.06 RB=2.74 RBM=0.0381 IRB=3.6308m RC=0.01 CJE=4.1783n VJE=0.6354 MJE=0.3374 CJC=1.1383n VJC=0.5 MJC=0.3699 XCJC=0.7624 FC=0.5 EG=1.1751 XTB=1.5306 XTI=3.0)
.model 2SA1943OTU PNP IS=1.30E-10 BF=91.42 VAF=100 IKF=4.48 ISE=1.02E-10 NE=2 VAR=100 ISC=5.0900n NC=1.5 BR=0.882 IKR=2.9015 RE=0.0011 RC=0.0553 RB=140.05 RBM=0.0041 IRB=8.5n CJE=2.00E-10 FC=0.5 CJC=9.45E-10 VJC=0.48 MJC=0.28 TF=9.250E-10 XTF=10 VTF=10 ITF=1 TR=1.00E-8 EG=0.76 XTB=2.68 Vceo=250V ICrating=17A mfg=fairchild
.model 2sa1265n pnp IS=1p BF=102 VAF=110 IKF=17.5 ISE=150p NE=2 BR=4 ISC=800p NC=1.65 RB=500m RBM=500m RE=47.5m RC=70m CJE=4.75n VJE=900m MJE=500m TF=4.5n XTF=1.5 VTF=10 ITF=8 CJC=1.16494n VJC=750m XCJC=500m TR=1.00065u XTB=2.69319 FC=800m
.model 2sc3182n npn IS=5p BF=106 VAF=85 IKF=18.5 ISE=4.5p NE=1.4 BR=11.50697 RB=111.7753m RE=44.3534m RC=5m CJE=4.74999n VJE=900m MJE=500m TF=4.5n XTF=8 VTF=10 ITF=8 CJC=533.9324p XCJC=0.5 TR=2.50801u XTB=3.3931 FC=0.7
.model 2sa733 pnp IS=55.9f BF=205 NF=1.01201 VAF=135 IKF=462.6m ISE=180f NE=1.65 BR=2.048 NR=1.012 RB=20 RE=10m RC=1.7 CJE=35p VJE=900m MJE=500m TF=700p XTF=10 VTF=10 ITF=700m CJC=13p VJC=750m MJC=400m XCJC=500m TR=10n XTB=2.00849 EG=1.11 XTI=3 FC=500m
.model 2sc945 npn IS=3.577E-14 BF=2.382E+02 NF=1.01 VAF=1.206E+02 IKF=3.332E-01 ISE=3.038E-16 NE=1.205 BR=1.289E+01 NR=1.015 VAR=1.533E+01 IKR=2.037E-01 ISC=3.972E-14 NC=1.115 RB=3.680E+01 IRB=1.004E-04 RBM=1 RE=8.338E-01 RC=1.557E+00 CJE=1.877E-11 VJE=7.211E-01 MJE=3.486E-01 TF=4.149E-10 XTF=1.000E+02 VTF=9.956 ITF=5.118E-01 CJC=6.876p VJC=3.645E-01 MJC=3.074E-01 TR=5.145E-08 XTB=1.5 EG=1.11 XTI=3 FC=0.5 Vceo=50 Icrating=100m MFG=NEC
.MODEL BD203 NPN(Is=457.5f Xti=3 Eg=1.11 Vaf=50 Bf=156.7 Ise=1.346p Ne=1.34 Ikf=3.296 Nk=.5961 Xtb=2.2 Br=7.639 Isc=604.1f Nc=2.168 Ikr=8.131m Rc=91.29m Cjc=278.7p Mjc=.385 Vjc=.75 Fc=.5 Cje=433p Mje=.5 Vje=.75 Tr=1.412u Tf=37.34n Itf=35.68 Xtf=1.163 Vtf=10 Rb=.1)
.MODEL BD204 PNP(Is=66.19f Xti=3 Eg=1.11 Vaf=100 Bf=137.6 Ise=862.2f Ne=1.481 Ikf=1.642 Nk=.5695 Xtb=2 Br=5.88 Isc=273.5f Nc=1.24 Ikr=3.555 Rc=79.39m Cjc=870.4p Mjc=.6481 Vjc=.75 Fc=.5 Cje=390.1p Mje=.4343 Vje=.75 Tr=235.4n Tf=23.21n Itf=71.33 Xtf=5.982 Vtf=10 Rb=.1)
.model mps751 pnp IS=3.302E-13 BF=3.103E+02 VAF=3.891E+01 IKF=6.028 ISE=9.055f NE=1.111 BR=5.822E+01 NR=1.006 VAR=2.892E+01 IKR=5.541E-01 ISC=4.007p NC=1.353 RB=3.346E+01 IRB=3.605E-03 RBM=2.104E-02 RE=0.1 RC=0.1 CJE=3.180E-10 VJE=6.329E-01 MJE=3.346E-01 TF=6.2137E-10 XTF=8.330E+02 VTF=9.674E+02 ITF=3.801E+01 CJC=6.088E-11 VJC=5.111E-01 MJC=4.220E-01 XTB=1.5 EG=1.11 XTI=3 FC=0.5
.MODEL MPS750 PNP (IS=203F NF=1 BF=130 VAF=114 IKF=1.2 ISE=202P NE=2 BR=4 NR=1 VAR=20 IKR=1.8 RE=25.8M RB=0.103 RC=10.3M XTB=1.5 CJE=477P VJE=1.1 MJE=0.5 CJC=154P VJC=0.3 MJC=0.3 TF=1.59N TR=1.1U VCEO=40V ICrating=2 MFG=Motorola)
.MODEL MPS651 NPN (IS=72.1F NF=1 BF=260 VAF=139 IKF=2.5 ISE=67.1P NE=2 BR=4 NR=1 VAR=20 IKR=3.75 RE=28.2M RB=.113 RC=11.3M XTB=1.5 CJE=212P VJE=1.1 MJE=.5 CJC=68.6P VJC=.3 MJC=.3 TF=1.44N TR=1U)
.MODEL 2SD2012 NPN BR=20 CJE=1E-13 EG=1.11 FC=0.5 IKF=0.214 IKR=1 IRB=0.000422 IS=6.83p ISC=1E-13 ISE=2.3p ITF=0 MJC=0.33 MJE=0.33 NC=2 NE=1.36 NF=1.03 NR=1.04 RB=56.2 RBM=0.01 RE=0.0001 VAF=84.7 VAR=50 VJC=0.75 VJE=0.75 VTF=1E+06 XTB=0.95 XTI=3.5 BF=6.92E+02 CJC=8.43E-11 RC=1.53E-01 TF=5.3E-08 XTF=1
.MODEL 2SB1375 PNP BR=20 CJE=1E-13 EG=1.11 FC=0.5 IKF=0.35 IKR=1 IRB=0.00139 IS=1E-10 ISC=1E-13 ISE=2.32E-11 ITF=0 MJC=0.33 MJE=0.33 NC=2 NE=1.53 NF=1.12 NR=1.11 RB=50 RBM=0.0119 RE=0.00183 VAF=32 VAR=50 VJC=0.75 VJE=0.75 VTF=1E+06 XTB=1.17 XTI=2.5 BF=3.340000E+02 CJC=1.200000E-10 RC=2.600000E-01 TF=1.770000E-08 XTF=1
.MODEL bd438 pnp IS=5.98934e-11 BF=183.991 NF=1.127 VAF=21.7853 IKF=6.2324 ISE=4.75017p NE=3.46873 BR=3.76807 NR=0.753494 VAR=6.28524 IKR=3.28572 ISC=4.75e-13 NC=3.96875 RB=13.6523 IRB=0.1 RBM=0.108939 RE=0.000637295 RC=0.00318648 XTB=0.104451 XTI=1 EG=1.1019 CJE=4.99274e-08 VJE=0.606966 MJE=0.432728 TF=1e-08 XTF=1.36423 VTF=0.997185 ITF=0.986562 CJC=4.44441e-10 VJC=0.40011 MJC=0.4107 XCJC=0.803121 FC=0.574598 TR=1e-07

.MODEL bd437t npn IS=8.34782e-16 BF=165.443 NF=0.926448 VAF=10 IKF=10 ISE=7.27965e-13 NE=3.8389 BR=5.48519 NR=0.75 VAR=23.5414 IKR=3.31211 ISC=2.63503e-16 NC=1.13181 RB=11.9793 IRB=0.1 RBM=0.174073 RE=0.0001 RC=0.001 XTB=2.18586 XTI=4 EG=1.206 CJE=7.57559e-09 VJE=0.4 MJE=0.717544 TF=1e-08 XTF=1.778 VTF=1.0303 ITF=0.482967 CJC=3.17585e-10 VJC=0.600305 MJC=0.409491 XCJC=0.799462 FC=0.799978 TR=1e-07
.MODEL BD437 NPN(Is=1.129p Xti=3 Eg=1.11 Vaf=100 Bf=161 Ise=31.17p Ne=1.557 Ikf=1.948 Nk=.648 Xtb=2 Br=1 Isc=23.5p Nc=1.489 Ikr=31.34m Rc=.1682 Cjc=251.5p Mjc=.5045 Vjc=.75 Fc=.5 Cje=286.3p Mje=.4961 Vje=.75 Tr=810n Tf=23.64n Itf=10.92 Xtf=.3795 Vtf=10 Rb=.1)
.model BF257 npn (IS=2.48E-14 VAF=45.7 BF=200 IKF=0.1509 NE=1.1981 ISE=1.668E-14 IKR=0.05 ISC=1p NC=1.5 NR=1 BR=5 RC=10 CJC=1.5E-11 FC=0.5 MJC=0.38 VJC=0.2 CJE=49p MJE=0.42 VJE=0.7 TF=1.7n ITF=1 VTF=20 XTF=100 RE=0.8)
.model BF459 npn (IS=2.48E-14 VAF=45.7 BF=200 IKF=0.1509 NE=1.1981 ISE=1.668E-14 IKR=0.05 ISC=1p NC=1.5 NR=1 BR=5 RC=10 CJC=1.5E-11 FC=0.5 MJC=0.38 VJC=0.2 CJE=49p MJE=0.42 VJE=0.7 TF=1.7n ITF=1 VTF=20 XTF=100 RE=0.8)
.MODEL mj15024 npn IS=1n BF=80.9237 NF=1.41415 VAF=29.8965 IKF=3.58072 ISE=1e-16 NE=4 BR=1.00135 NR=1.5 VAR=281.892 IKR=5.80356 ISC=1e-16 NC=2.99908 RB=9.25367 IRB=0.1 RBM=0.1 RE=0.00042229 RC=0.0571126 XTB=1.12257 XTI=1.22156 EG=1.206 CJE=6.19402n VJE=0.4 MJE=0.457365 TF=1e-08 XTF=1000 VTF=1.07131 ITF=0.743213 CJC=5e-10 VJC=0.95 MJC=0.344125 XCJC=0.1 FC=0.8 TR=1e-07
.MODEL mj15025 pnp IS=1n BF=80.6168 NF=1.32219 VAF=27.5881 IKF=2.86343 ISE=4.07413n NE=3.50785 BR=0.777511 NR=1.5 VAR=275.881 IKR=4.83687 ISC=4.07413e-09 NC=2.99735 RB=8.67339 IRB=0.1 RBM=0.1 RE=0.000422878 RC=0.0620212 XTB=1.12927 XTI=1.22017 EG=1.17172 CJE=7.12267e-09 VJE=0.4 MJE=0.461473 TF=1e-08 XTF=1000 VTF=1.06865 ITF=0.653882 CJC=5e-10 VJC=0.95 MJC=0.23 XCJC=0.1 FC=0.8 TR=1e-07
.MODEL mj21193 pnp IS=2.11472e-10 BF=286.381 NF=1.1016 VAF=1000 IKF=3.10565 ISE=1.63547e-08 NE=2.06994 BR=0.00431616 NR=1.78217 VAR=1.71712 IKR=10 ISC=2.56806e-13 NC=3.96746 RB=2.81058 IRB=1p RBM=1.04377 RE=0.00951621 RC=0.047581 XTB=0.1 XTI=0.01 EG=1.05 CJE=6.08799e-08 VJE=0.99 MJE=0.391391 TF=1.90715e-08 XTF=1.24582 VTF=12.9644 ITF=4.57909 CJC=2.19003n VJC=0.0988421 MJC=0.34222 XCJC=0.744224 FC=1e-21 TR=1e-07
.MODEL mj21194 npn IS=4.02325e-14 BF=10000 NF=1.1488 VAF=10000 IKF=0.377331 ISE=2.16244n NE=2.49213 BR=0.1 NR=1.5 VAR=1.70851 IKR=3.77331 ISC=1.00031e-16 NC=3.99945 RB=0.1 IRB=0.1 RBM=0.1 RE=0.00775691 RC=0.0387846 XTB=0.1 XTI=1 EG=1.05 CJE=1.07724e-08 VJE=0.975489 MJE=0.524369 TF=1e-08 XTF=2.16157e+06 VTF=0.184568 ITF=5.56361 CJC=2.68609e-10 VJC=1.64862 MJC=0.242322 XCJC=0.1 FC=0.910137 TR=1e-07
.MODEL mjl1302a pnp IS=3.25053p BF=60.3363 NF=0.992063 VAF=19.8199 IKF=7.18352 ISE=3.25712p NE=3.42487 BR=5.15499 NR=1.03617 VAR=2.77936 IKR=9.38159 ISC=2.5e-13 NC=3.89405 RB=0.776136 IRB=0.0998107 RBM=0.776136 RE=0.000613663 RC=0.0424163 XTB=1.43773 XTI=1 EG=1.05 CJE=1.57135e-08 VJE=0.728073 MJE=0.42161 TF=2.63264e-09 XTF=1000 VTF=4.11586 ITF=266.249 CJC=1.79861e-09 VJC=0.814822 MJC=0.473271 FC=0.8 TR=1e-07
.MODEL mjl3281a npn IS=6.5498e-11 BF=139.247 NF=1.00176 VAF=46.776 IKF=10 ISE=7.75232p NE=3.34341 BR=4.98985 NR=1.09511 VAR=4.32026 IKR=4.37516 ISC=3.25e-13 NC=3.96875 RB=11.988 IRB=0.111742 RBM=0.102914 RE=0.00127227 RC=0.209833 XTB=0.115253 XTI=1.03146 EG=1.11986 CJE=1e-07 VJE=0.4 MJE=0.450375 TF=7.04629e-10 XTF=1000 VTF=2.06045 ITF=41.8156 CJC=5e-10 VJC=0.4 MJC=0.85 XCJC=0.959922 FC=0.1 TR=1e-07 Icrating=15 MFG=ONSEMI
.MODEL BF472 PNP(IS=9.124f NF=0.9904 ISE=1.672f NE=1.527 BF=198.2 IKF=0.13 VAF=465.9 NR=0.99 ISC=2.139E-13 NC=1.08 BR=1.256 IKR=0.1 VAR=13 RB=5 IRB=1E-06 RBM=0.5 RE=0.635 RC=1.42 XTB=0 EG=1.11 XTI=3 CJE=1.447E-11 VJE=0.8484 MJE=0.3884 TF=1.38n XTF=21.78 VTF=2 ITF=0.065 CJC=8.483p VJC=0.6298 MJC=0.4561 XCJC=0.619 TR=1m2 XTB=0 XTI=3 EG=1.11 FC=0.99)
.MODEL BF471 NPN(IS=7.974f NF=0.993 ISE=2.266E-16 NE=1.18 BF=122 IKF=0.01029 VAF=25.51 NR=0.999 ISC=4.33p NC=1.397 BR=6.235 IKR=0.02746 VAR=19.43 RB=1 IRB=1E-06 RBM=0.5 RE=0.3814 RC=0.439 XTB=0 EG=1.11 XTI=3 CJE=1.742E-11 VJE=0.4581 MJE=0.3092 TF=7.073E-10 XTF=289.5 VTF=6.144 ITF=0.1495 CJC=5.045p VJC=0.197 MJC=0.1947 XCJC=0.1041 TR=1E-08 FC=0.8555)
.model 2SD1898 NPN(Is=280.00E-15 Bf=199.80 Vaf=40 Ikf=4.6752 Ise=280.00E-15 Ne=1.5882 Br=404.98 Var=100 Ikr=.40942 Isc=4.9564E-12 Nc=1.2884 Nk=.97272 Re=40m Rb=2.0332 Rc=51.971E-3 Cje=311.85E-12 Mje=.35932 Cjc=41.583E-12 Mjc=.46676 Tf=615.97E-12 Xtf=27.568 Vtf=62.853 Itf=14.820 Tr=99.286E-9 Xtb=1.5000 Vceo=80 Icrating=1 mfg=Rohm)
.model 2SA1037AK PNP(Is=70f Bf=266.4 Vaf=50.7 Ikf=279.1m Ise=70f Ne=1.762 Br=1.873 Var=100 Ikr=2.001 Isc=270.8p Nc=1.792 Re=200m Rb=7.804 Rc=1.086 Cje=22.94p Mje=582.7m Cjc=11.61p Mjc=439.9m Tf=328.9p Xtf=331.2 Vtf=254.3 Itf=8.151 Tr=327.3n Xtb=1.5 Vceo=50 Icrating=0.15 mfg=Rohm)
.model 2SC2412K NPN(Is=70f Bf=277.1 Vaf=114 Ikf=1 Ise=70f Ne=1.893 Br=11.57 Var=100 Ikr=112.7m Isc=1.023p Nc=1.326 Nk=718.7m Re=200m Rb=13.9 Rc=1.219 Cje=11.34p Mje=382.9m Cjc=4.023p Mjc=346.3m Tf=338.9p Xtf=4.045 Vtf=167.4 Itf=859.6m Tr=110.3n Xtb=1.5 Vceo=50 Icrating=0.15 mfg=Rohm)

.MODEL MPSA06 npn IS=6.03149f BF=559.138 NF=0.841146 VAF=996.086 IKF=0.187838 ISE=1e-08 NE=3.53096 BR=43.984 NR=0.893292 VAR=1.45264 IKR=1e-05 ISC=3.06474e-11 NC=3.98114 RB=0.01 IRB=0.269152 RBM=0.01 RE=1e-05 RC=0.000928752 XTB=1.17305 XTI=1 EG=1.05 CJE=5.54912e-11 VJE=0.577764 MJE=0.313139 TF=5.4629e-10 XTF=23.7458 VTF=7.07849 ITF=4.69733 CJC=1.76218e-11 VJC=0.4 MJC=0.285166 XCJC=0.902334 FC=0.732277 TR=1e-07
.MODEL MPSA56 pnp IS=9.62586p BF=246.647 NF=1.19008 VAF=19.1507 IKF=0.332189 ISE=1.74278e-11 NE=1.95504 BR=0.1 NR=1.49124 VAR=3.92539 IKR=4.71144 ISC=3.90265e-13 NC=3.98982 RB=0.772559 IRB=0.184627 RBM=0.365314 RE=0.00202964 RC=0.26419 XTB=0.467199 XTI=1 EG=0.851752 CJE=4.05433e-11 VJE=0.4 MJE=0.748564 TF=7.64992e-10 XTF=4.80943 VTF=12.6194 ITF=0.441135 CJC=4.21506e-11 VJC=0.4 MJC=0.352218 XCJC=0.899996 FC=0.180025 TR=1e-07
.MODEL MPSA42/INF NPN(BF=7.04E+01 BR=1.76E+01 CJC=1.56E-11 CJE=1.31E-10 FC=5.00E-01 IKF=1.00E+01 IKR=1 IRB=1.30E-03 IS=1.59E-13 ISC=9.06E-11 ISE=3.62E-16 ITF=1.33 MJC=5.80E-01 MJE=4.02E-01 NC=1.47 NE=1.21E+00 NF=1.03E+00 NR=1.11 RB=3.23E+01 RBM=7.75E-02 RC=4.11E-01 RE=4.19E-01 TF=1.73n VAF=4.51E+01 VAR=9.11E+01 VJC=4.64E-01 VJE=3.00E-01 VTF=9.99E+05 XTB=0 XTF=1.00E+02 XTI=3)
.MODEL MPSA42/NS NPN (IS=34.9F XTI=3 EG=1.11 VAF=100 BF=2.56K NE=1.708 ISE=16.32P IKF=23.79M XTB=1.5 BR=9.769 NC=2 ISC=0 IKR=0 RC=7 CJC=14.23P MJC=.5489 VJC=.75 FC=.5 CJE=49.62P MJE=.4136 VJE=.75 TR=934.3P TF=1.69N ITF=5 VTF=20 XTF=150 RB=10)
.model KSP42TA NPN (IS=34.9F XTI=3 EG=1.11 VAF=100 BF=2.56K NE=1.708 ISE=16.32P IKF=23.79M XTB=1.5 BR=9.769 NC=2 ISC=0 IKR=0 RC=7 CJC=14.23P MJC=.5489 VJC=.75 FC=.5 CJE=49.62P MJE=.4136 VJE=.75 TR=934.3P TF=1.69N ITF=5 VTF=20 XTF=150 RB=10 VCEO=300 ICRATING=0.5)
.MODEL MPSA56/NS PNP (IS=12.27P XTI=3 EG=1.11 VAF=100 BF=91.63 NE=1.531 ISE=12.27P IKF=1.009 XTB=1.5 BR=1.287 NC=2 ISC=0 IKR=0 RC=.6 CJC=48.28P MJC=.5615 VJC=.75 FC=.5 CJE=106.7P MJE=.5168 VJE=.75 TR=496.3N TF=865.8P ITF=.2 VTF=2 XTF=.8 RB=10)
.MODEL MPSA06/NS NPN (IS=8.324F XTI=3 EG=1.11 VAF=100 BF=12.16K NE=1.368 ISE=73.27F IKF=.1096 XTB=1.5 BR=11.1 NC=2 ISC=0 IKR=0 RC=.25 CJC=18.36P MJC=.3843 VJC=.75 FC=.5 CJE=55.61P MJE=.3834 VJE=.75 TR=72.15N TF=516.1P ITF=.5 VTF=4 XTF=6 RB=10)
.MODEL 2SA1406 PNP (IS=10.1F NF=1 BF=390 VAF=254 IKF=60M ISE=2.6P NE=2 BR=4 NR=1 VAR=16 IKR=90M RE=1.88 RB=7.53 RC=.753 XTB=1.5 CJE=16.8P VJE=1.1 MJE=.5 CJC=5.44P VJC=.3 MJC=.3 TF=397P TR=276N VCEO=200 ICrating=100M MFG=Sanyo)
.model 2sc3600 npn IS=20.9f BF=95 VAF=80 IKF=1.9 BR=0.2138 VAR=20 IKR=0.5 RB=4.0 RBM=4.0 RE=0.4 RC=3 CJE=5.84p VJE=0.5 MJE=0.3083 TF=340p XTF=1 VTF=10.0 ITF=8 CJC=5.32p VJC=0.5 MJC=0.3271 XCJC=0.5 TR=10n XTB=2.3 EG=1.11 XTI=3 FC=0.5
.MODEL 2SD1609 NPN AF=1 BR=0.00356 CJE=50p EG=1.11 FC=0.5 IKF=0.0077 IKR=1 IRB=2.17E-05 IS=5.24E-14 ISC=1E-13 ISE=6.18E-11 ITF=0.789 MJC=0.248 MJE=0.33 MJS=0.33 NC=2 NE=2 NF=0.98 NR=1.24 RB=1 RBM=0.01 RE=0.000287 VAF=263 VAR=50 VJC=0.3 VJE=0.75 VJS=0.75 VTF=996000 XTB=0.001 XTI=2.5 BF=335 CJC=8.99p RC=1.28 TF=7.9E-10 XTF=2.85
.MODEL 2SB1109 PNP BR=0.0352 CJE=4E-11 EG=1.11 FC=0.5 IKF=0.0761 IKR=1 IRB=0.00026 IS=1.14E-14 ISC=1E-13 ISE=2.01f ITF=0.213 MJC=0.425 MJE=0.33 MJS=0.33 NC=2 NE=1.09 NF=0.94 NR=1.09 RB=4 RBM=0.01 RE=0.000121 VAF=262 VAR=50 VJC=0.495 VJE=0.75 VTF=999000 XTB=1.85 XTI=2.5 BF=216 CJC=2.210000E-11 RC=2.22 TF=8.230000E-10 XTF=6.44
.MODEL Q2SA1930 PNP(IS=10f BF=210 VAF=78 IKF=10.000m XTB=1.5 BR=.1001 VAR=100 IKR=10.000m ISC=10.000f CJE=3.252p CJC=63.196p MJC=.33333 TF=83.239p XTF=10 VTF=10 ITF=1)
.MODEL Q2SC5171 NPN(IS=10f BF=210 VAF=100 IKF=10.000m XTB=1.5 BR=.1001 VAR=100 IKR=10.000m ISC=10.000f CJE=2.0000p CJC=38.866p MJC=.33333 TF=83.239p XTF=10 VTF=10 ITF=1)
.MODEL 2SC5171 NPN(IS=10f BF=210 VAF=100 IKF=10m XTB=1.5 BR=.1001 VAR=100 IKR=10m ISC=10f CJE=2p CJC=38.866p MJC=.33333 TF=83.239p XTF=10 VTF=10 ITF=1)
.MODEL 2SC5171_ NPN (BF=200 BR=122.6733m CJC=48p CJE=500p FC=0.5 IKF=10 IKR=10m IS=10f ISC=0.0026757f ISE=200f ITF=2 MJC=0.36 MJE=0.33 NE=1.4 NF=859m RB=1.8 RC=35.72m RE=0.11 TF=600p TR=10n VAF=100 VAR=20 VJC=0.5 VJE=0.67 VTF=10 XTF=10)
.model mj15003 npn IS=2.87E-11 BF=195 NF=1.051 VAF=50 IKF=1.535 ISE=3.576E-11 NE=1.455 BR=7.82 NR=1 VAR=500 IKR=1.0 ISC=0.0 NC=2.0 RB=2.729 IRB=3.715E-1 RBM=1.0E-2 RE=0.001 RC=0.06 CJE=1471.48p VJE=0.8 MJE=0.6 TF=0.045u XTF=1 VTF=10 ITF=10 CJC=692.79p VJC=0.65 MJC=0.314 XCJC=0.5 TR=1E-6 XTB=1.28 XTI=3 FC=0.5
.MODEL MJ15004 PNP (IS=1e-09 BF=220 +NF=0.85 VAF=43.4348 IKF=10 ISE=1e-08 NE=1.79698 BR=1.65466 NR=1.5 VAR=434.348 IKR=4.42319 ISC=5.49997e-09 NC=3.18751 RB=43.922 IRB=0.1 RBM=0.1 RE=0.0001 RC=0.20765 XTB=0.746102 XTI=1 EG=1.05 CJE=9.99946e-08 VJE=0.4 MJE=0.658304 TF=9.99976e-09 XTF=1.3573 VTF=0.996475 ITF=0.99985 CJC=1.22854e-09 VJC=0.95 MJC=0.23 XCJC=0.803124 FC=0.761291 TR=1e-07)
.MODEL FMMT495 NPN IS=1E-13 NF=1 BF=205 IKF=4 VAF=300 ISE=1E-13 NE=1.5 NR=0.98 BR=24 VAR=45 ISC=1e-13 NC=1.2 RB=.4 RE=.07 RC=.08 RCO=17 GAMMA=9E-8 CJC=15.3p MJC=0.27 VJC=0.35 CJE=114p MJE=0.33 VJE=0.68 TF=0.8n TR=120n XTB=1.4 QUASIMOD=1 VCEO=150 ICRATING=1 MFG=ZETEX

.MODEL FZT491 NPN IS=3.05E-13 NF=1.0034 BF=200 IKF=0.8 VAF=165 ISE=8.0191E-14 NE=1.4126 NR=1.001 BR=50 IKR=0.6 VAR=69 ISC=1.6p NC=1.38 RB=0.065 RE=0.109 RC=0.075 CJC=17.2p MJC=0.3429 VJC=0.4298 CJE=96p TF=0.71n TR=2.5n VCEO=40 ICRATING=1 MFG=ZETEX
.MODEL 2SA1837 PNP (IS=2.39372559E-10 NF=1.304015937 BF=300 VAF=273 IKF=2.087725944 NK=0.94719458 ISE=1.46829699E-11 NE=1.526663542 BR=4 NR=1 VAR=20 IKR=1.05 RE=0 RB=1.8 RC=1.65 CJE=4.7407E-10 VJE=1.1 MJE=0.5 CJC=8.6700E-11 VJC=0.3 MJC=0.3 TF=1.642191E-09 FC=0.5 ITF=1.076260106 XTF=5.868994022 TR=1.38U)
.MODEL 2SC4793 NPN (IS=1.8n NF=1.43 BF=146.38 VAF=273 IKF=2.6 NK=0.95 ISE=6.286997E-10 NE=2.223629 BR=4 NR=1 VAR=20 IKR=1.05 RE=0 RB=1.7 RC=1.25 CJE=5.96964E-10 VJE=1.1 MJE=0.5 CJC=5.78E-11 VJC=0.3 MJC=0.3 TF=1.22678E-09 FC=0.5 ITF=10 XTF=99.52253015 TR=983N)
.MODEL PH_BC817-40 NPN(IS=6.286E-14 NF=0.9917 ISE=4.53f NE=1.774 BF=416.3 IKF=0.4913 VAF=98.08 NR=0.9895 ISC=1.877E-13 NC=1.3 BR=24.49 IKR=0.203 VAR=25 RB=1 IRB=1000 RBM=1 RE=0.2256 RC=0.143 XTB=0 EG=1.11 XTI=3 CJE=3.568E-11 VJE=0.726 MJE=0.3721 TF=4.826E-10 XTF=120 VTF=3.654 ITF=5.104 CJC=1.296E-11 VJC=0.3241 MJC=0.3742 XCJC=0.455 TR=7E-11 FC=0.8662)
.MODEL PH_BC817-40W NPN(IS=6.286E-14 NF=0.9917 ISE=4.53f NE=1.774 BF=416.3 IKF=0.4913 VAF=98.08 NR=0.9895 ISC=1.877E-13 NC=1.3 BR=24.49 IKR=0.203 VAR=25 RB=1 IRB=1000 RBM=1 RE=0.2256 RC=0.143 XTB=0 EG=1.11 XTI=3 CJE=3.568E-11 VJE=0.726 MJE=0.3721 TF=4.826E-10 XTF=120 VTF=3.654 ITF=5.104 CJC=1.296E-11 VJC=0.3241 MJC=0.3742 XCJC=0.455 TR=7E-11 FC=0.8662)
.MODEL ZXTN19100CFF NPN IS=5.7E-13 NF=1 BF=390 IKF=6 VAF=183 ISE=1E-13 NE=1.42 NR=1 BR=43 IKR=.1 VAR=32 ISC=5.5E-13 NC=1.25 RB=.15 RE=.01 RC=.01 CJC=52p MJC=0.378 VJC=0.45 CJE=373p MJE=0.38 VJE=0.77 TF=8.5E-10 TR=5.1E-8 XTB=1.4 TRC1=.004 TRB1=.004 TRE1=.004 QUASIMOD=1 RCO=2.1 GAMMA=1.9E-8 VCEO=100 ICRATING=4.5 MFG=ZETEX
.MODEL 2SC4154 NPN IS=153.7p BF=168.7 VAF=100 IKF=.1918 ISE=153.7p NE=1.605 VAR=100 IKR=10m CJC=6.414p VJC=.35 MJC=.3214 TF=910.2p XTF=1.534n VTF=5.262 ITF=190.6 TR=10n
.MODEL KSA992 pnp (IS=5.7544E-14 BF=348.1 NF=1 BR=3.62 NR=0.95 ISE=5.7544f NE=1.5 ISC=1.8378E-14 NC=1 VAF=144 VAR=16.68 IKF=0.298 IKR=0.0525 RB=140 RBM=16.084 IRB=1.4125m RE=0.38 RC=0.47 CJE=2.3093E-11 VJE=0.855 MJE=0.4104 FC=0.5 CJC=8.9251p VJC=0.5 MJC=0.3497 XTB=1.2849 EG=1.1603 XTI=3 XCJC=0.3062)
.MODEL KSA992/Fair pnp (IS=4.0544E-13 BF=365.1 NF=1 BR=0.20 NR=1.0 ISE=4.0544E-14 NE=1.5 ISC=1.0378E-13 NC=1.5 VAF=13 VAR=100 IKF=36.498 IKR=0.0225 RB=186 RBM=1.04 IRB=1.0125E-6 RE=0.0044 RC=0.048 CJE=2.3093E-11 VJE=0.855 MJE=0.4404 FC=0.5 CJC=6.8251p VJC=0.64 MJC=0.2897 XTB=1.2849 EG=1.1603 XTI=3 TF=5.86e-10 XTF=4.0 ITF=0.024 VTF=4.0 TR=1.0e-8 mfg=Fairchild)
.MODEL KSC1845 npn IS=1.075431E-13 BF=600.7 NF=1 BR=13.565 NR=1 ISE=1.98107E-13 NE=2 ISC=1.8378E-11 NC=1.5 VAF=82.803 VAR=20.6691 IKF=0.596 IKR=0.0190546 RB=157 RBM=12.092 IRB=1.258925E-6 RE=1.5 RC=180.7 CJE=2.057447E-11 VJE=0.7300286 MJE=0.3619943 FC=0.5 CJC=4.525739p VJC=0.5 MJC=0.3659045 XTB=1.7281 EG=1.1809 XTI=3 TF=3.14E-11 mfg=Fairchild
.MODEL KSA1381 pnp IS=5.5544E-14 BF=148 BR=1.592 ISE=2.0546f NE=1.5 ISC=3.24807E-10 NC=2 VAF=580 VAR=100 IKF=0.2163 IKR=0.087544 RB=10.18 RE=0.0512 RC=4.072 CJE=9.572p VJE=0.748 MJE=0.371 FC=0.5 CJC=1.147p VJC=0.541 MJC=0.329 TF=1.0312E-09 XTB=0.907 EG=0.62 XTI=3
.MODEL Qmjk40 npn IS=1.03431e-13 BF=172.974 NF=0.939811 VAF=27.3487 IKF=0.0260146 ISE=4.48447e-11 NE=1.61605 BR=16.6725 NR=0.796984 VAR=6.11596 IKR=0.10004 ISC=9.99914e-14 NC=1.99995 RB=1.47761 IRB=0.2 RBM=1.47761 RE=0.0001 RC=1.42228 XTB=2.70726 XTI=1 EG=1.206 CJE=1e-11 VJE=0.75 MJE=0.33 TF=1e-09 XTF=1 VTF=10 ITF=0.01 CJC=1e-11 VJC=0.75 MJC=0.33 XCJC=0.9 FC=0.5 TR=1e-07
.MODEL Qnjw0302g pnp IS=5.16751e-16 BF=114.657 NF=0.895716 VAF=50.2189 IKF=6.409 ISE=3.9641f NE=4 BR=1.47167 NR=0.923324 VAR=255.567 IKR=6.34299 ISC=3.96408f NC=2.82194 RB=2.66347 IRB=0.1 RBM=2.0828 RE=0.0001 RC=0.0652395 XTB=1.45322 XTI=1.08126 EG=1.05 CJE=2.14504e-09 VJE=0.4 MJE=0.376227 TF=2.16864e-09 XTF=1000 VTF=843.737 ITF=501.348 CJC=5e-10 VJC=0.95 MJC=0.251547 FC=0.8 TR=1e-07
.MODEL Qnjw0281g npn IS=4.36849p BF=98.1488 NF=1.01332 VAF=37.9046 IKF=9.71849 ISE=1e-16 NE=1.8326 BR=0.79921 NR=1.09994 VAR=339.743 IKR=5.77305 ISC=1e-16 NC=2.71592 RB=2.74892 IRB=0.33289 RBM=2.74892 RE=0.000344671 RC=0.03203 XTB=1.7742 XTI=1.12262 EG=1.20598 CJE=3.66793e-09 VJE=0.74806 MJE=0.85 TF=2.27115e-09 XTF=1000 VTF=912.955 ITF=296.602 CJC=5e-10 VJC=0.95 MJC=0.270858 XCJC=0.98254 FC=0.8 TR=1e-07
.MODEL Qmje15032 npn IS=3.7344e-10 BF=86.8313 NF=1.23974 VAF=31.5491 IKF=9.1678 ISE=9.2499p NE=3.28127 BR=5.59346 NR=1.33161 VAR=2.1791 IKR=5.15023 ISC=4e-13 NC=4 RB=9.54492 IRB=0.1 RBM=0.1 RE=0.000568481 RC=0.0931741 XTB=0.737036 XTI=1.04983 EG=1.206 CJE=3.05969e-09 VJE=0.648491 MJE=0.352663 TF=4.94819e-09 XTF=1.50001 VTF=1.0001 ITF=0.999982 CJC=3.00108e-10 VJC=0.600021 MJC=0.40991 XCJC=0.8 FC=0.534651 TR=1e-07
.MODEL Qmje15033 pnp IS=7.51228e-10 BF=134.35 NF=1.25737 VAF=12.5778 IKF=1.88497 ISE=7.74267p NE=3.34528 BR=5.14173 NR=1.47488 VAR=1.4505 IKR=7.47186 ISC=3.25e-13 NC=4 RB=4.37743 IRB=0.1 RBM=0.1 RE=0.000332989 RC=0.381218 XTB=0.223027 XTI=1 EG=1.05 CJE=3.06005e-09 VJE=0.64838 MJE=0.352991 TF=4.78203e-09 XTF=1.50001 VTF=1.00006 ITF=0.999988 CJC=3.00101e-10 VJC=0.600019 MJC=0.409916

XCJC=0.8 FC=0.534975 TR=1e-07
.MODEL 2SA872 PNP BR=1 CJE=1E-11 EG=1.11 FC=0.5 IKF=0.017 IKR=1 IRB=1E-06 IS=9.03E-16 ISC=1E-13 ISE=1.7E-13 ITF=0.296 MJC=0.232 MJE=0.33 MJS=0.33 NC=2 NE=2 NF=0.88 NR=1 RB=0.6 RBM=0.01 RE=0.0001 Tr=10n VAF=10 VAR=50 VJC=0.3 VJE=0.75 VTF=994000 XTB=1.48 XTI=2.5 BF=2.570000E+02 CJC=5.000000p RC=1.000000E-02 TF=1.25n XTF=4.66E+01
.MODEL 2SA1358 PNP BR=0.01 CJE=1E-13 EG=1.11 FC=0.5 IKF=0.855 IKR=1 IRB=0.000289 IS=3.62E-14 ISC=1E-13 ISE=5.78E-11 ITF=0 KF=0 MJC=0.33 MJE=0.33 NC=2 NE=2 NF=0.915 NR=1.14 RB=50 RBM=1 RE=0.0001 TR=10.000n VAF=20.8 VAR=50 VJC=0.75 VJE=0.75 VTF=1E+06 XTB=1.8 XTI=2.5 BF=1.160000E+02 CJC=1.250000E-11 RC=7.270000E-01 TF=1.33n XTF=1.
.MODEL 2SC1775 NPN BR=1 CJE=1.11E-11 EG=1.11 FC=0.5 IKF=0.116 IKR=1 IRB=1E-06 IS=5.98E-14 ISC=1E-13 ISE=2.7f ITF=4.64 MJC=0.155 MJE=0.33 NC=2 NE=1.24 NF=1.01 NR=1 RB=0.01 RBM=0.01 RE=0 TR=10.000n VAF=100 VAR=50 VJC=0.3 VJE=0.75 VTF=1E+06 XTB=0 XTI=3 BF=1.000000E+03 CJC=3.280000p RC=0.000000E+00 TF=3.800000E-10 XTF=4.37k
.MODEL 2SC2922 NPN (BF=110.13 CJC=200P CJE=500P FC=0.5 IKF=99.99 IS=122.9N ISE=122.9N ITF=6.76K MJC=.3333 MJE=.3333 NE=1.677 NK=1.384 TF=4.584N TR=2.581U VAF=100 VAR=100 VJC=.75 VJE=.75 VTF=10 XTB=1.5)
.MODEL 2SA1216 PNP (IS=10.3142F BF=2K NF=859.228M VAF=100 IKF=1.63669 ISE=1.04476P NE=1.21974 BR=345.69M IKR=1.29764 ISC=168.339F NC=2 RE=34.4482M RC=1.41289M CJE=7.64286N VJE=700M MJE=1000M CJC=3.29536N VJC=998.778M MJC=786.017M FC=500M TF=3.61143N XTF=509.7M VTF=9.99862 ITF=547.898F TR=10N EG=1.11)
.MODEL 2SC3421 NPN BR=0.01 CJE=1E-13 EG=1.11 FC=0.5 IKF=0.373 IKR=1 IRB=0.0283 IS=1.07E-14 ISC=1E-13 ISE=6.38E-14 ITF=0 MJC=0.33 MJE=0.33 NC=2 NE=1.22 NF=0.898 NR=1.1 RB=9.33 RBM=1.24 RE=0.000124 TR=1.9743E-6 VAF=31.6 VAR=50 VJC=0.75 VJE=0.75 VTF=1E+06 XTB=2.4 XTI=2.5 BF=2.150000E+02 CJC=3.610000E-11 RC=2.640000E-01 TF=1.320000E-09 XTF=1
.MODEL KSC2316 NPN IS=1.04713p BF=146 BR=1.475 NR=1.022 ISE=2.75423E-13 NE=1.5 ISC=1.07152p NC=1.5 VAF=26.6 VAR=36.6808 IKF=1.39 IKR=0.0144544 NK=0.8335 RB=10.9 RBM=3.229 IRB=3.98107E-8 RE=0.18 RC=0.116 CJE=2.305506E-10 VJE=0.678627 MJE=0.3428803 FC=0.5 CJC=3.237556E-11 VJC=0.4314661 MJC=0.392328 TF=1.32629n XCJC=0.648954 XTB=1.4595 EG=1.1835 XTI=3
.model 2sa916 PNP(Is=91.5f Xti=3 Eg=1.11 Vaf=100 Bf=245.4 Ise=91.69f Ne=1.419 Ikf=76.21m Nk=.7132 Xtb=1.5 Var=100 Br=1 Isc=161.6p Nc=1.772 Ikr=6.597 Rc=5.3 Cjc=7.904p Mjc=.3494 Vjc=.3905 Fc=.5 Cje=13.59p Mje=.3255 Vje=.3905 Tr=10n Tf=1.849n Itf=.5153 Xtf=48.28 Vtf=10)
.model TN2219A NPN(Is=14.34f Xti=3 Eg=1.11 Vaf=74.03 Bf=255.9 Ne=1.307 Ise=14.34f Ikf=.2847 Xtb=1.5 Br=6.092 Nc=2 Isc=0 Ikr=0 Rc=1 Cjc=7.306p Mjc=.3416 Vjc=.75 Fc=.5 Cje=22.01p Mje=.377 Vje=.75 Tr=46.91n Tf=411.1p Itf=.6 Vtf=1.7 Xtf=3 Rb=10)
.MODEL KSC2328A NPN IS=2.24306E-13 BF=260.5 NF=1 BR=48.5 NR=0.99 ISE=2.4627p NE=2 ISC=3.85885p NC=1.5 VAF=89.75 VAR=28.93 IKF=5.78598 IKR=0.775 RB=5.92527 RBM=8.03712 IRB=1.01312E-5 RE=0.0581465 RC=0.304881 CJE=2.493517E-10 VJE=0.6680574 MJE=0.3297066 FC=0.5 CJC=5.631294E-11 VJC=0.559565 MJC=0.3668788 XTB=1.3532 EG=1.1791 XTI=3 XCJC=0.7062
.MODEL 2N5109 NPN (BF=44 VAF=160 VAR=16 RC=0.69 RB=1.57 RE=2.75 IKF=0.28 ISE=0.36E-13 TF=0.111n TR=8n ITF=0.82E-01 VTF=0.66E+01 CJC=3p CJE=2p XTI=3 NE=1.5 ISC=0.12E-13 EG=1.11 XTB=1.5 BR=1.14 VJC=0.75 VJE=0.75 IS=0.40E-14 MJC=0.33 MJE=0.33 XTF=4 IKR=0.28 KF=1f NC=1.7 FC=0.5 RBM=1.1 IRB=0.40E-01 XCJC=0.5 mfg=Motorola)
.MODEL 2N3866 NPN (BF=100 VAF=240 VAR=24 RC=4.9 RB=12.2 RE=0.132 IKF=0.28 ISE=3.6E-14 TF=7.1E-11 TR=8n ITF=0.12 VTF=9.9 CJC=2.7p CJE=3.5p XTI=3 NE=1.5 ISC=1.2E-14 EG=1.11 XTB=1.5 BR=1.5 VJC=0.75 VJE=0.75 IS=4f MJC=0.33 MJE=0.33 XTF=4.0 IKR=0.28 KF=1f NC=1.7 FC=0.5 RBM=9 IRB=0.04 XCJC=0.5)
.model MMBTH81 PNP(Is=10f Xti=3 Eg=1.11 Vaf=100 Bf=133.8 Ise=1.678p Ne=2.159 Ikf=.1658 Nk=.901 Xtb=1.5 Var=100 Br=1 Isc=9.519n Nc=3.88 Ikr=5.813 Rc=7.838 Cjc=2.81p Mjc=.1615 Vjc=.8282 Fc=.5 Cje=2.695p Mje=.3214 Vje=.7026 Tr=11.32n Tf=97.83p Itf=69.29 Xtf=599u Vtf=10 Vceo=20 Icrating=50m mfg=Fairchild)
.model MPSH81 PNP(Is=10f Xti=3 Eg=1.11 Vaf=100 Bf=133.8 Ise=1.678p Ne=2.159 Ikf=.1658 Nk=.901 Xtb=1.5 Var=100 Br=1 Isc=9.519n Nc=3.88 Ikr=5.813 Rc=7.838 Cjc=2.81p Mjc=.1615 Vjc=.8282 Fc=.5 Cje=2.695p Mje=.3214 Vje=.7026 Tr=11.32n Tf=97.83p Itf=69.29 Xtf=599u Vtf=10 Vceo=20 Icrating=50m mfg=Fairchild)
.MODEL ZXTN25012EZ NPN IS=9E-13 BF=990 NF=1 VAF=25 IKF=3.8 ISE=8E-14 NE=1.35 BR=410 NR=1 VAR=8 IKR=1.25 ISC=8e-14 NC=1.35 RE=0.0117 RB=0.1 RC=0.0081 CJE=168p VJE=0.7 MJE=0.38 CJC=61p VJC=0.52 MJC=0.31 TF=0.5n TR=1.7n XTB=1.4 Vceo=12 Icrating=6.5 mfg=Zetex
.model 2N5817 PNP(Is=650.6E-18 Xti=3 Eg=1.11 Vaf=115.7 Bf=127 Ne=1.829 Ise=99.99f Ikf=1.079 Xtb=1.5 Br=3.752 Nc=2 Isc=0 Ikr=0 Rc=.715 Cjc=14.76p Mjc=.5383 Vjc=.75 Fc=.5 Cje=19.82p Mje=.3357 Vje=.75 Tr=114.4n Tf=761.3p Itf=.65 Vtf=5 Xtf=1.7 Rb=10)
.MODEL 2SC5200_k npn IS=300f BF=100 NF=1 BR=8.025 NR=1 ISE=200p IKF=18 NE=2.0 ISC=2.01764E-10 NC=1.5 VAF=400 VAR=100 IKR=1.39087 RB=1.1 RBM=0.00011 IRB=1.51189E-6 RE=0.0032 RC=0.0183 CJE=6.1n VJE=0.711 MJE=0.304 FC=0.5 CJC=380p VJC=0.84 MJC=0.25 TF=5n TR=3.342E-7 XTB=1.72 EG=0.78 XTI=3

.MODEL 2SA1943_k pnp IS=650f BF=100 NF=1 BR=8.805 NR=1 ISE=10p IKF=15 NE=2.0 ISC=2.01764E-10 NC=1.5 VAF=600 VAR=100 IKR=1.39087 RB=1.1 RBM=0.00011 IRB=1.51189n RE=0.0061 RC=0.0103 CJE=5.26n VJE=0.711 MJE=0.304 FC=0.5 CJC=750p VJC=0.84 MJC=0.25 TF=5n TR=3.342E-7 XTB=2.28 EG=0.81 XTI=3
.MODEL MMBT2369 NPN IS=1.41f ISE=8.78E-14 NE=1.851 BF=95.39 IKF=0.1968 NK=1.605 VAF=47.34 ISC=3.283E-10 NC=1.664 BR=1 IKR=11.89 RC=1.282 XTB=1.5 EG=1.11 XTI=3 CJE=4.568p VJE=0.6397 MJE=0.2747 CJC=1.948p VJC=1.558 MJC=8.834E-02 FC=0.5 TR=1.432E-07 TF=2.502E-10 ITF=0.6489 XTF=19.05 VTF=10
.MODEL ZXTAM322 NPN IS=5.92E-13 BF=500 IKF=5 VAF=34.6 ISE=1.27E-13 NE=1.425 NR=1 BR=280 IKR=2 VAR=12.25 ISC=6.138E-13 NC=1.46 RB=0.1 RE=0.025 RC=0.017 CJC=76p MJC=0.2981 VJC=0.4414 CJE=230p MJE=0.3569 VJE=0.7042 TF=1.12n TR=2.15n
.MODEL 2N3553 NPN BR=5.68 CJE=5.36E-11 EG=1.11 FC=0.5 IKF=0.74 IKR=0.0943 IS=1.93E-14 ISC=4.76E-14 ISE=3.16E-13 ITF=0.134 MJC=0.42 MJE=0.266 MJS=0.33 NC=1.14 NE=1.57 NF=1.01 NR=1.01 RB=8.07 RE=0.0274 VAF=252 VAR=15.8 VJC=0.583 VJE=0.646 VJS=0.75 VTF=0.1 XTB=0 XTI=3 BF=6.53E+01 CJC=3.46E-11 RC=5.18E-01 TF=2.6E-10 XTF=1.0E-01
.MODEL Q2SD717 NPN IS=372.08f BF=233.75 VAF=100 IKF=6.5821 ISE=3.7798p NE=1.4138 BR=16.414 VAR=100 IKR=2.1719 ISC=427.04f NC=1.1742 NK=.56032 RB=.25 RC=33.315m CJE=1.0967n MJE=.33333 CJC=850.19p MJC=.33333 TF=2.7237n XTF=10 VTF=10 ITF=1 TR=436.3n
.model Q2SB688 PNP(Bf=70 Br=1 Is=73f Eg=1.11 Cjc=4.8p Cje=10p Vaf=100 Tf=1.923n Tr=10n Mjc=.330 Vjc=.75 Mje=.33 Vje=.75 Cjs=2p)
.model 2SB688 PNP(Bf=70 Br=1 Is=73f Eg=1.11 Cjc=4.8p Cje=10p Vaf=100 Tf=1.923n Tr=10n Mjc=.330 Vjc=.75 Mje=.33 Vje=.75 Cjs=2p)
.MODEL BC639 NPN IS=6.119E-14 NF=0.9948 ISE=5.844f NE=1.469 BF=130.4 IKF=0.8 VAF=54.27 NR=0.9905 ISC=1.342E-13 NC=1.183 BR=14.53 IKR=0.2049 VAR=30 RB=0.5 IRB=1E-06 RBM=0.5 RE=0.1114 RC=0.082 XTB=0 EG=1.11 XTI=3 CJE=1.234E-10 VJE=0.6917 MJE=0.338 TF=6.543E-10 XTF=223.8 VTF=1.892 ITF=10 CJC=3.49E-11 VJC=0.5 MJC=0.388 XCJC=0.15 TR=10n FC=0.9232
.MODEL BC640 PNP IS=6.1530E-14 NF=0.9911 ISE=1.382E-16 NE=1.089 BF=150.8 IKF=1.225 VAF=105.4 NR=0.9965 ISC=6.480f NC=1.022 BR=8.074 IKR=0.3627 VAR=18.20 RB=2 IRB=1E-06 RBM=2 RE=5.562E-02 RC=0.1449 XTB=0 EG=1.11 XTI=3 CJE=1.157E-10 VJE=0.7300 MJE=0.3751 TF=8.666E-10 XTF=1.231 VTF=3.008 ITF=0.4581 CJC=5.264E-11 VJC=0.6591 MJC=0.4533 XCJC=0.4401 TR=2.75E-07 FC=0.9427
.MODEL 2N242 PNP (IS=524N NF=1 BF=156 VAF=106 IKF=3 ISE=330N NE=2 BR=4 NR=1 VAR=40 IKR=4.5 RE=.190 RB=.763 RC=76.3M XTB=1.5 CJE=1.07N CJC=315P TF=1.5U TR=3u Vceo=35 Icrating=5 MFG=Germanium-type)
.MODEL 2Nxxxx PNP (IS=1.25N NF=1 BF=78 VAF=90 IKF=60M ISE=4.57N NE=2 BR=4 NR=1 VAR=14 IKR=90M RE=2.63 RB=10.5 RC=1.05 XTB=1.5 CJE=27.9P CJC=8.22P TF=437P TR=17N Vceo=25 Icrating=100m MFG=Germanium-type)
.MODEL 2N2955 PNP(IS=4.66p BF=360 VAF=100 IKF=0.25 ISE=3.339E-11 BR=2 ISC=5n RB=3 IRB=0.001 RBM=0.4 RC=0.04 CJE=5.802E-10 VJE=1.2 MJE=0.45 TF=8E-8 XTF=1 ITF=3 PTF=120 CJC=2.121E-10 MJC=0.4 TR=2.55u XTB=1 Vceo=70 Icrating=15)
.MODEL Q2N2955 PNP(IS=4.66p BF=360 VAF=100 IKF=0.25 ISE=3.339E-11 BR=2 ISC=5n RB=3 IRB=0.001 RBM=0.4 RC=0.04 CJE=5.802E-10 VJE=1.2 MJE=0.45 TF=8E-8 XTF=1 ITF=3 PTF=120 CJC=2.121E-10 MJC=0.4 TR=2.55E-6 XTB=1)
.MODEL GEPNPrf PNP (IS=1.25N BF=78 VAF=90 IKF=60M ISE=4.57N NE=2 BR=4 NR=1 VAR=14 IKR=90M RE=2.63 RB=10.5 RC=1.05 XTB=1.5 CJE=27.9P CJC=8.22P TF=437P TR=17N Vceo=25 Icrating=100m MFG=Germanium-type) ;363 MHz
.MODEL BF422 NPN(IS=7.974f NF=0.993 ISE=2.266E-16 NE=1.18 BF=122 IKF=0.01029 VAF=25.51 NR=0.999 ISC=4.33p NC=1.397 BR=6.235 IKR=0.02746 VAR=19.43 RB=1 IRB=1u RBM=0.5 RE=0.3814 RC=0.439 XTB=0 EG=1.11 XTI=3 CJE=1.742E-11 VJE=0.4581 MJE=0.3092 TF=7.073E-10 XTF=289.5 VTF=6.144 ITF=0.1495 CJC=5.045p VJC=0.197 MJC=0.1947 XCJC=0.1041 TR=10n FC=0.8555 mfg=Philips)
.MODEL BF423 PNP(IS=9.124f NF=0.9904 ISE=1.672f NE=1.527 BF=198.2 IKF=0.13 VAF=465.9 NR=0.99 ISC=2.139E-13 NC=1.08 BR=1.256 IKR=0.1 VAR=13 RB=5 IRB=1u RBM=0.5 RE=0.635 RC=1.42 XTB=0 EG=1.11 XTI=3 CJE=1.447E-11 VJE=0.8484 MJE=0.3884 TF=1.38n XTF=21.78 VTF=2 ITF=0.065 CJC=8.483p VJC=0.6298 MJC=0.4561 XCJC=0.619 TR=10n FC=0.99 mfg=Philips)
.model DSS5220V PNP(Is=2f Xti=3 Eg=1.11 Vaf=100 Bf=513.3 Ise=2f Ne=3.535 Ikf=.8893 Nk=.3933 Xtb=1.5 Br=46.02 Isc=18.73f Nc=1.396 Ikr=.3797 Rc=94.13m Cjc=53p Mjc=.3235 Vjc=.3991 Cje=150p Mje=1.026 Vje=3.109 Tr=5.947n Tf=941.6p Vceo=20 Icrating=2 mfg=Diodes)
.MODEL 2N5339 NPN (IS=5.714601E-13 BF=152.57 NF=0.9805931 VAF=61.1748129 IKF=9.7 ISE=7.21052E-14 NE=1.19901 BR=13.852 NR=0.9784 VAR=48.653531 IKR=0.6209 ISC=6.3E-13 NC=1.1115541 RB=13.93 IRB=6.583436E-4 RBM=1.2294809 RE=1m RC=0.1875 CJE=1.302694n VJE=0.6346739 MJE=0.330941 TF=1.05n XTF=26.935 VTF=0.2766874 ITF=2.0724567 PTF=9.69 CJC=3.569026E-10 VJC=0.4519862 MJC=0.4118022 TR=2E-7 XTB=1.886 EG=1.11 XTI=6.7495 FC=0.7632526

.MODEL 2SD669A NPN (BR=0.0116 CJE=1.5E-10 CJS=0 EG=1.11 FC=0.5 IKF=0.403 IKR=1 IRB=1E-06 IS=6.73f ISC=1E-13 ISE=1.14E-14 ITF=9.99 MJC=0.407 MJE=0.33 NC=2 NE=1.04 NF=0.8 NR=1.03 RB=4 RBM=0.761 RE=0.00255 TR=0 VAF=25.1 VAR=50 VJC=0.3 VJE=0.75 VTF=1E +06 XTB=3.82 XTI=2.5 BF=335 CJC=6.11E-11 RC=5.55E-01 TF=9.01E-10 XTF=4.45E+01)
.model 2SB649A pnp (IS=293.5f BF=216 NF=1.0 VAF=40 IKF=1.5 ISE=101.1p NE=2.6797 BR=7 NR=1.0 VAR=20 IKR=0.05 ISC=1.345p NC=1.5558 RB=0.46 RBM=0.46 RE=5m RC=1.07 CJE=295.4p VJE=0.6977 MJE=0.5197 TF=0.8569n XTF=53.4 VTF=2.83 ITF=1.22 CJC=113.1p VJC=0.5466 MJC=0.5742 XCJC=0.5 TR=14.65n XTB=1.87 EG=1.11 XTI=3 FC=0.5)
.MODEL 2SD667 NPN (BR=11.9 CJE=4.91E-10 EG=1.11 FC=0.5 IKF=0.376 IKR=1 IRB=0.227 IS=2.93p ISC=1E-13 ISE=6.87E-13 ITF=100 MJC=0.449 MJE=0.33 NC=2 NE=1.36 NF=1.08 NR=1.03 RB=6.91 RBM=2.35 RE=0.01 VAF=41.6 VAR=50 VJC=0.518 VJE=0.75 VTF=1E+06 XTB=0.001 XTI=1 BF=364 CJC=4.11E-11 RC=2.45E-01 TF=8.52E-10 XTF=5.27E+03)
.model 2SB647 PNP (Is=50.43p Xti=3 Eg=1.11 Vaf=100 Bf=207.5 Ise=50.43p Ne=1.804 Ikf=2.527 Nk=.9904 Xtb=1.5 Var=100 Br=1.006 Isc=10.65n Nc=1.71 Ikr=.1739 Rc=.7486 Cjc=62.31p Mjc=.5547 Vjc=1.389 Fc=.5 Cje=5p Mje=.3333 Vje=.75 Tr=10n Tf=1.356n Itf=1.72 Xtf=0 Vtf=10)
.model 2N1711 NPN(IS=5.80495E-14 NF=1.00578 VAF=430.283 IKF=1.47556 ISE=5.00431E-16 NE=1.17121 BR=6.50271 NR=1.00234 VAR=29.3468 IKR=0.396801 ISC=7.02023f NC=1.01086 RB=61.0257 RE=0.0649012 EG=1.11 XTI=3 CJE=6.12932E-11 VJE=0.718394 MJE=0.34929 VJC=0.490763 MJC=0.358852 FC=0.5 BF=146.604 CJC=1.8145E-11 RC=1.16875 TF=2.273642n XTF=1)
.model 2N3053 NPN (IS=71.1F NF=1 BF=260 VAF=113 IKF=.42 ISE=27.3P NE=2 BR=4 NR=1 VAR=20 IKR=.63 RE=73.6M RB=.294 RC=29.4M XTB=1.5 CJE=79.2P VJE=1.1 MJE=.5 CJC=25.5P VJC=.3 MJC=.3 TF=858P TR=596N Vceo=40 ICrating=700M mfg=Motorola)
.model 2SA1302 PNP(IS=21.479p BF=136.48 VAF=100 IKF=19.980 ISE=21.504p NE=1.3784 BR=329.48 VAR=100 IKR=19.980 ISC=4.3670n NC=1.4264 RC=93.301m CJE=755.31p MJE=.33333 CJC=1.1417n MJC=.33333 TF=1.2802n XTF=10 VTF=10 ITF=1 TR=10.000n VCEO=200V ICrating=15A MFG=Toshiba)
.model BC212B PNP (IS=10.2F NF=1 BF=156 VAF=127 IKF=60M ISE=8.4P NE=2 BR=4 NR=1 VAR=20 IKR=90M RE=0.515 RB=2.06 RC=0.206 XTB=1.5 CJE=30.8P VJE=1.1 MJE=0.5 CJC=9.94P VJC=0.3 MJC=0.3 TF=568P TR=395N VCEO=50V ICrating=100M MFG=Motorola)
.model BCV61A NPN(IS=45.000f ISE=55.668f ISC=1.084p XTI=3.200 BF=180 BR=7.745 IKF=0.708 IKR=1.0 XTB=1.4 VAF=74 VAR=14 VJE=0.690 VJC=0.750 RE=0.350 RC=1.445 RB=9.0 RBM=4.500 IRB=0.100m CJE=13.050p CJC=4.100p XCJC=0.650 FC=0.750 NF=1.01 NR=1.015 NE=2.567 NC=4.063 MJE=0.375 MJC=0.42 TF=0.62n TR=2.5n PTF=1 ITF=0.720 VTF=1.0 XTF=68.0 EG=1.110 KF=1n AF=1 MFG=Siemens)
.model BCV61B NPN(IS=45.000f ISE=55.668f ISC=1.084p XTI=3.200 BF=280 BR=7.745 IKF=0.708 IKR=1.0 XTB=1.4 VAF=74 VAR=14 VJE=0.690 VJC=0.750 RE=0.350 RC=1.445 RB=9.0 RBM=4.500 IRB=0.100m CJE=13.050p CJC=4.100p XCJC=0.650 FC=0.750 NF=1.01 NR=1.015 NE=2.567 NC=4.063 MJE=0.375 MJC=0.42 TF=0.62n TR=2.5n PTF=1 ITF=0.720 VTF=1.0 XTF=68.0 EG=1.110 KF=1n AF=1 MFG=Siemens)
.model BCV61C NPN(IS=45.000f ISE=55.668f ISC=1.084p XTI=3.200 BF=480 BR=7.745 IKF=0.708 IKR=1.0 XTB=1.4 VAF=74 VAR=14 VJE=0.690 VJC=0.750 RE=0.350 RC=1.445 RB=9.0 RBM=4.500 IRB=0.100m CJE=13.050p CJC=4.100p XCJC=0.650 FC=0.750 NF=1.01 NR=1.015 NE=2.567 NC=4.063 MJE=0.375 MJC=0.42 TF=0.62n TR=2.5n PTF=1 ITF=0.720 VTF=1.0 XTF=68.0 EG=1.110 KF=1n AF=1 MFG=Siemens)
.model BD911 NPN(IS=2.53133E-13 BF=886.474 NF=0.85 VAF=86.5699 IKF=1 ISE=3.83814E-10 NE=1.64879 BR=0.1 NR=1.02906 VAR=1.23433 IKR=10 ISC=2.5002E-13 NC=3.99999 RB=0.74113 IRB=0.1 RBM=0.74113 RE=0.0136941 RC=0.0684703 CJE=9.84329E-09 VJE=0.701902 MJE=0.85 TF=9.08724E-10 XTF=2000 VTF=0.547983 ITF=0.0242429 CJC=2.39469E-10 VJC=0.4 MJC=0.402994 XCJC=0.1 TR=1E-07 CJS=0 VJS=0.75 MJS=0.5 XTB=0.418994 EG=1.206 XTI=1 FC=0.8)
.model BD912 PNP(IS=1n BF=3.500E+02 NF=1.009 VAF=1.000E+02 IKF=3.571E-01 ISE=2.107E-08 NE=1.897 BR=4.056 VAR=50 IKR=1.000E+09 ISC=0.000E+00 NC=2.000E+00 RB=1.297 IRB=1 RBM=1.297 RE=2.911E-02 RC=1.674E-01 CJE=1.400E-08 VJE=7.500E-01 MJE=3.300E-01 TF=2.767E-08 XTF=7.974E-01 VTF=9.990E+05 ITF=3.675E+01
.model BF495 NPN(IS=3.0731e-10 BF=80 BR=1 CJE=2p CJC=2p VJE=0.75 VJC=0.75 TF=5.174e-10 TR=1e-08 MJE=0.33 MJC=0.33 VA=100 IKF=0.01 VAR=100 IKR=0.01 XTF=10 VTF=10 ITF=1 XTB=0 EG=1.11 XTI=3)
.model BF496 NPN(IS=1e-14 BF=100 BR=1 CJE=2p CJC=2p VJE=0.75 VJC=0.75 TF=1e-08 TR=1e-08 MJE=0.33 MJC=0.33 VA=100 VAR=100 XTF=10 VTF=10 ITF=1 XTB=0 EG=1.11 XTI=3)
.model ZTX212 PNP(IS=1.15E-14 BF=330 NF=0.9872 VAF=84.56 IKF=0.1 ISE=5E-14 NE=1.4 BR=13 NR=0.996 VAR=8.15 IKR=0.012 ISC=1.43E-14 NC=1.1 RB=0.2 RE=0.4 RC=0.95 CJE=1.6E-11 TF=4.93E-10 CJC=1.05E-11 VJC=0.565 MJC=0.415 TR=7.355E-8 Vceo=30 ICrating=100m mfg=Zetex)
.model ZTX550 PNP(IS=3.2E-14 BF=170 NF=0.977 VAF=45 IKF=1.25 ISE=7f NE=1.35 BR=50 NR=0.986 VAR=50 IKR=0.15 ISC=9f NC=1.08 RB=0.16 RE=0.195 RC=0.185 CJE=1.04E-10 TF=7E-10 CJC=3.05E-11 VJC=0.395 MJC=0.415 TR=3n Vceo=30 ICrating=100m mfg=Zetex)
.MODEL PMBTA92 PNP(IS=1.737E-14 NF=0.9934 ISE=8.208f NE=1.559 BF=141.4 IKF=0.8 VAF=350 NR=0.9755

ISC=2.097E-10 NC=1.65 BR=2.5 IKR=0.06 VAR=17 RB=70 IRB=5E-05 RBM=0.3 RE=0.418 RC=2.5 XTB=0 EG=1.11 XTI=3 CJE=3.916E-11 VJE=0.7361 MJE=0.3612 TF=1.356E-09 XTF=19 VTF=9 ITF=0.2 CJC=1.071E-11 VJC=0.726 MJC=0.5717 XCJC=0.413 TR=3.3E-07 CJS=0 VJS=0.75 MJS=0.333 FC=0.999 Vceo=300 Icrating=100m MFG=Philips)
.MODEL PMBTA42 NPN(IS=1.766E-14 NF=0.9902 ISE=1.982f NE=1.25 BF=108.1 IKF=0.21 VAF=394 NR=0.99 ISC=9.5E-10 NC=1.95 BR=4.928 IKR=0.045 VAR=57 RB=100 IRB=2E-05 RBM=0.01 RE=0.365 RC=1.5 XTB=0 EG=1.11 XTI=3 CJE=4.181E-11 VJE=0.6301 MJE=0.329 TF=1.303E-09 XTF=35 VTF=5 ITF=0.11 CJC=4.632p VJC=0.2621 MJC=0.4164 XCJC=0.4132 TR=1.9E-07 CJS=0 VJS=0.75 MJS=0.333 FC=0.842 Vceo=300 Icrating=100m MFG=Philips)
.MODEL BCP53-16 PNP IS=6.1530E-14 NF=0.9911 ISE=1.382E-16 NE=1.089 BF=150.8 IKF=1.225 VAF=105.4 NR=0.9965 ISC=6.480f NC=1.022 BR=8.074 IKR=0.3627 VAR=18.20 RB=2 IRB=1E-06 RBM=2 RE=5.562E-02 RC=0.1449 XTB=0 EG=1.11 XTI=3 CJE=1.157E-10 VJE=0.7300 MJE=0.3751 TF=8.666E-10 XTF=1.231 VTF=3.008 ITF=0.4581 CJC=5.264E-11 VJC=0.6591 MJC=0.4533 XCJC=0.4401 TR=2.75E-07 CJS=0 VJS=0.75 MJS=0.333 FC=0.9427 Vceo=80 Icrating=1 MFG=Philips
.MODEL BCP69-16 PNP IS=2.105E-13 NF=0.9952 ISE=3.766f NE=1.4 BF=281.1 IKF=2.834 VAF=44.23 NR=0.9869 ISC=2.789E-11 NC=2.447 BR=45.67 IKR=0.344 VAR=7.259 RB=1 RE=0.05919 RC=0.0262 XTB=0 EG=1.11 XTI=3 CJE=2.046E-10 VJE=0.8827 MJE=0.448 TF=7.919E-10 XTF=1.397 VTF=2.332 ITF=0.409 CJC=1.378E-10 VJC=0.1427 MJC=0.3018 XCJC=0.508 FC=0.309 Vceo=20 Icrating=1 MFG=NXP
.model PN4258 PNP (Is=545.6E-18 Xti=3 Eg=1.11 Vaf=100 Bf=61.42 Ne=1.5 Ise=0 Ikf=50m Xtb=1.5 Br=1.426 Nc=2 Isc=0 Ikr=0 Rc=3.75 Cjc=2.77p Mjc=.1416 Vjc=.75 Fc=.5 Cje=2.65p Mje=.3083 Vje=.75 Tr=4.109n Tf=118.5p Itf=.5 Vtf=3 Xtf=6 Rb=10 Vceo=12 Icrating=200m MFG=Fairchild)
.model MMBT4258 PNP (Is=545.6E-18 Xti=3 Eg=1.11 Vaf=100 Bf=61.42 Ne=1.5 Ise=0 Ikf=50m Xtb=1.5 Br=1.426 Nc=2 Isc=0 Ikr=0 Rc=3.75 Cjc=2.77p Mjc=.1416 Vjc=.75 Fc=.5 Cje=2.65p Mje=.3083 Vje=.75 Tr=4.109n Tf=118.5p Itf=.5 Vtf=3 Xtf=6 Rb=10 Vceo=12 Icrating=200m MFG=Fairchild)
.MODEL MMBT3640 PNP IS=1.41f ISE=9.681f NE=1.503 BF=115.7 IKF=0.1689 NK=0.7029 VAF=47.34 ISC=5.382E-11 NC=4.97 BR=1 IKR=4.659 RC=7.763 XTB=1.5 EG=1.11 XTI=3 CJE=2.82p VJE=0.6397 MJE=0.4073 CJC=1.886p VJC=0.3802 MJC=4.556E-02 FC=0.5 Tr=6n Tf=150p Itf=.5 Vtf=3 Vceo=12 Icrating=200m MFG=Fairchild
.MODEL PN3640 PNP IS=1.41f ISE=9.681f NE=1.503 BF=115.7 IKF=0.1689 NK=0.7029 VAF=47.34 ISC=5.382E-11 NC=4.97 BR=1 IKR=4.659 RC=7.763 XTB=1.5 EG=1.11 XTI=3 CJE=2.82p VJE=0.6397 MJE=0.4073 CJC=1.886p VJC=0.3802 MJC=4.556E-02 FC=0.5 Tr=6n Tf=150p Itf=.5 Vtf=3 Vceo=12 Icrating=200m MFG=Fairchild
.model MMBTH10 npn IS=69.28e-18 XTI=3 EG=1.11 VAF=100 BF=308.6 NE=1.197 ISE=69.28e-18 IKF=22.83m XTB=1.5 BR=1.11 NC=2 IKR=0 RC=4 CJC=1.042p MJC=0.2468 VJC=0.75 FC=0.5 CJE=1.52p MJE=0.3223 VJE=0.75 TR=1.558n TF=135.8p ITF=0.27 VTF=10 XTF=30 RB=10 Vceo=25 Icrating=50m MFG=Fairchild
.model MMBTH11 npn IS=1.09739E-14 BF=152.3 NF=1 BR=0.34 NR=1 ISE=1.46737p NE=2.0 ISC=8.31131n NC=1.5 VAF=100.25 VAR=11.78 IKF=0.2611 IKR=7.50638E-2 RB=38.5 RBM=0.085 IRB=3.5E-6 RE=0.044 RC=4.85 CJE=2.83322p VJE=0.443943 MJE=0.2580119 FC=0.5 CJC=6.004932E-13 VJC=0.5 MJC=0.2397007 TF=2.38E-10 XTB=1.1926 EG=0.84 XTI=3 Vceo=25 Icrating=50m MFG=Fairchild
.MODEL njl1302d pnp IS=9.82035e-11 BF=82.1357 NF=1.38754 VAF=10.043 IKF=9.06286 ISE=6.57086p NE=3.31141 BR=3.74385 NR=1.6349 VAR=6.726 IKR=6.49075 ISC=2.50558e-13 NC=3.99895 RB=3.68893 IRB=0.0183457 RBM=0.1 RE=0.000386841 RC=0.093766 XTB=0.929578 XTI=1.31423 EG=0.861487 CJE=1.51689e-08 VJE=0.922965 MJE=0.447498 TF=2.75424e-09 XTF=1000 VTF=3.17307 ITF=255.984 CJC=1e-09 VJC=0.95 MJC=0.235697 FC=0.707596 TR=1e-07 Vceo=260 Icrating=15 MFG=Onsemi
.MODEL njl3281d npn IS=4.06068p BF=108.067 NF=1.01389 VAF=33.707 IKF=9.7899 ISE=4.00073p NE=3.49994 BR=2.92796 NR=1.0727 VAR=5.37566 IKR=9.53639 ISC=5.5e-13 NC=3.9375 RB=5.68023 IRB=0.1 RBM=0.253 RE=0.000516188 RC=0.0540679 XTB=0.837253 XTI=1.03611 EG=1.05 CJE=1.11456e-08 VJE=0.769163 MJE=0.420032 TF=2.04968e-09 XTF=1000 VTF=3.97956 ITF=173.585 CJC=1e-09 VJC=0.765901 MJC=0.480482 FC=0.8 TR=1e-07 Vceo=260 Icrating=15 MFG=Onsemi
.MODEL KSC2682 NPN(IS=7.010E-13 BF=156.09 NF=1 BR=0.64499 NR=1 ISE=1.2538E-14 NE=1.5 ISC=6.4644E-09 NC=1.5 VAF=600 VAR=100 IKF=0.12325 IKR=0.05102 RB=12.134 RBM=0.034 IRB=3.0e-6 RE=0.108 RC=1.215 CJE=7.10p FC=0.5 CJC=8.20p TF=7.025E-10 TR=1.0E-8 XTB=1.5 EG=0.76 XTF=2 VTF=35 ITF=1 XTI=3 KF=0 AF=1 Vceo=180 Icrating=100m mfg=Fairchild)
.MODEL KSA1142 PNP(IS=3.09029p BF=200.5 NF=1 BR=0.115 NR=1 ISE=1.7378E-13 NE=1.5 ISC=1.31826E-10 NC=1.5 VAF=146.5 VAR=100 IKF=0.121 IKR=0.524807 RB=30.5 RBM=0.20 IRB=2.623413E-7 RE=0.0016 RC=1.34 CJE=5.403E-11 VJE=0.777948 MJE=0.372295 FC=0.5 CJC=1.60035E-11 VJC=0.523999 MJC=0.343255 TF=5.09E-10 TR=1.0E-08 XTB=2.182EG=0.7074 XTI=3 KF=0 AF=1 Vceo=180 Icrating=100m mfg=Fairchild)
.model FJL4215 PNP IS=1.3E-10 BF=91.42 VAF=100 IKF=4.480 ISE=1.02E-10 NE=2 VAR=100 ISC=5.0900n NC=1.5 BR=0.882 IKR=2.9015 RE=0.0011 RC=0.0553 RB=140.05 RBM=0.0041 IRB=8.5n CJE=2.00E-10 FC=0.5 CJC=9.45E-10 VJC=0.48 MJC=0.28 TF=9.250E-10 XTF=10 VTF=10 ITF=1 TR=1.00E-8 EG=0.76 XTB=2.68 Vceo=250 Icrating=17 MFG=Fairchild
.model FJL4315 NPN IS=3.0463E-11 BF=96.20 VAF=100 IKF=15.04256 ISE=5.6190E-11 NE=2 BR=4.849 IKR=1.05012 VAR=100 ISC=7.18E-8 NC=1.5 RE=0.0025 RB=20.18 RBM=0.0014 IRB=1.0E-7 RC=0.01137

CJE=4.5000E-10 CJC=8.4915E-10 VJC=0.68977 MJC=0.54081 TF=6.8583E-10 XTF=9.5721 VTF=10.425 ITF=6.8697E-2 TR=1.000E-8 XTB=1.45 EG=0.82 FC=0.5 Vceo=250 Icrating=17 MFG=Fairchild
.MODEL 2SC3953 NPN (IS=5.80f BF=120 NF=0.98 VAF=23.0 IKF=4 ISE=70.0f NE=1.70 BR=1.40 NR=1.00 VAR=38.0 IKR=20 ISC=10f NC=1.50 RB=360m IRB=1 RBM=80m RE=60m RC=180.0m XTB=0 XTI=3 EG=1.11 NK=0.68 CJC=6.7p FC=0.5 MJC=0.33 VJC=0.75 MJE=0.33 VJE=0.75 CJE=15p TF=400p ITF=1 XTF=10 VTF=20 MFG=SANYO)
.MODEL 2SA1538 PNP (IS=10.2f BF=120 NF=0.98 VAF=15 IKF=5 ISE=30f NE=1.7 BR=0.38 NR=1.00 VAR=60 IKR=2 ISC=20.0f NC=1.80 RB=180m IRB=1.00 RBM=180m RE=40.0m RC=190.0m XTB=0 XTI=3 EG=1.11 NK=0.82 CJC=9.5p FC=0.5 MJC=0.33 VJC=0.75 MJE=0.33 VJE=0.75 CJE=17p TF=500p ITF=1 XTF=10 VTF=20 MFG=SANYO)
.MODEL 2SA1220A PNP (IS=4.7863E-13 BF=289.3 NF=1.0 BR=9.76 NR=1.006 ISE=5.2481p NE=2 ISC=2.4909E-11 NC=1.5 VAF=98.5 VAR=6.7 IKF=2.7061 IKR=0.0759 RB=2.26 RBM=0.2308 IRB=0.001 RE=0.1908 RC=1.1748 QCO=0.02 RCO=3.9811 VO=11.078 GAMMA=5.01187E-8 CJE=3.4786E-10 VJE=0.9575 MJE=0.4694 FC=0.5 CJC=1.1224E-10 VJC=0.5761 MJC=0.4365 XCJC=0.4955 XTB=1.7978 EG=1.2255 XTI=3)
.MODEL 2SC2690A NPN (IS=1.7783E-13 BF=132.5 NF=1.0 BR=8.495 NR=1.005 ISE=1.9953E-13 NE=1.5 ISC=1.5849n NC=1.98 VAF=580.75 VAR=18.15 IKF=4.0271 IKR=0.0120 RB=2.98 RBM=0.001 IRB=0.6396 RE=0.0909 RC=1.4705 QCO=0.68 RCO=3.6239 VO=6.587 GAMMA=2.8216E-7 CJE=4.0082E-10 VJE=0.6696 MJE=0.3296 FC=0.5 CJC=6.0404E-11 VJC=0.5 MJC=0.4266 XCJC=0.4955 XTB=1.2590 EG=1.2277 XTI=3)
.model 2sd965 npn IS=569.2f BF=400 NF=0.9993 VAF=80 IKF=4.444 ISE=2.7373p NE=1.6036 BR=10.2 NR=1.03 VAR=30 IKR=0.466 ISC=10.56p NC=1.055 RB=200 IRB=270u RBM=50 RE=5m RC=0.5 CJE=251.6p VJE=0.5 MJE=0.3674 TF=7.377E-10 XTF=17.6 VTF=1.31 ITF=7.91 CJC=93.77p VJC=0.6 MJC=0.3283 XCJC=0.5 TR=23n XTB=1.61 EG=1.11 XTI=3 FC=0.5
.MODEL KSE45H PNP IS=1.29p NF=0.976 ISE=3.981E-11 NE=2.0 BF=232.8 IKF=2.974 VAF=52.923 NR=0.979 ISC=1.873E-13 NC=1.043 BR=31.629 IKR=0.327 VAR=79.194 RB=100.0 IRB=9.1E-05 RBM=4.096 RE=0.001 RC=0.15 XTB=1.48 EG=1.148 XTI=3 CJE=8.38E-10 VJE=0.732 MJE=0.383 CJC=3.68E-10 VJC=0.457 MJC=0.34 XCJC=0.47 FC=0.5 Vceo=80 Icrating=10 MFG=Fairchild
.MODEL KSE44H NPN LEVEL=1 IS=8.512E-13 NF=0.961 ISE=2.754E-11 NE=2.0 BF=226.056 IKF=5.688 VAF=569.967 NR=0.957 ISC=6.868E-14 NC=0.988 BR=25.635 IKR=0.82 VAR=495.578 RB=100.632 IRB=7.346E-05 RBM=3.135 RE=0.001 RC=0.15 XTB=1.268 EG=1.158 XTI=3 CJE=1.25E-09 VJE=0.692 MJE=0.34 CJC=2.65E-10 VJC=0.531 MJC=0.426 XCJC=0.47 FC=0.5 Vceo=80 Icrating=10 MFG=Fairchild
.model 2SC1306 npn IS=117.72f BF=140 NF=1.088 VAF=120 IKF=1.0 ISE=82p NE=2.225 BR=1.0 NR=1.088 VAR=500 RB=3 RBM=3 RE=0.03 RC=0.4 CJE=61p VJE=1.0375 MJE=0.4179 TF=243.4p XTF=2 VTF=10 ITF=0.1 CJC=13.7p VJC=0.1758 MJC=0.2153 XCJC=0.5 TR=40n XTB=1.765 EG=1.11 XTI=3 MFG=NEC
.MODEL 2N3904_Cordell npn IS=3.5f BF=160 VAF=400 IKF=0.15 ISE=4e-16 NE=1.26 NF=1 RB=30.1 RC=1 RE=0.1 CJE=15p MJE=0.25 VJE=0.75 CJC=3.6p MJC=0.30 VJC=0.75 FC=0.5 TF=380p XTF=30 VTF=4 ITF=0.4 TR=240n BR=0.7 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 mfg=CA022411
.MODEL 2N3906_Cordell pnp IS=10f BF=180 VAF=40 IKF=0.6 ISE=30f NE=1.5 NF=1 RB=33 RC=1 RE=0.1 CJE=12p MJE=0.7 VJE=1.0 CJC=12p MJC=0.7 VJC=1.0 FC=0.5 TF=550p XTF=20000 VTF=10 ITF=3.5 TR=10n BR=4 IKR=11 EG=1.1 XTB=1.5 XTI=3 NC=15.5 ISC=0.5f VAR=100 NK=1.0 mfg=CA022411
.MODEL 2N4401_Cordell npn IS=26f BF=205 VAF=200 IKF=0.35 ISE=10f NE=1.5 NF=1 RB=13 RC=0.5 RE=0.1 CJE=24p MJE=0.36 VJE=0.75 CJC=11p MJC=0.38 VJC=0.75 FC=0.5 TF=570p XTF=400 VTF=10 ITF=4 TR=230n BR=1 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 mfg=CA022311
.MODEL 2N4403_Cordell pnp IS=20f BF=120 VAF=50 IKF=0.9 ISE=5f NE=1.83 NF=1 RB=38 RC=0.7 RE=0.1 CJE=20p MJE=0.35 VJE=0.75 CJC=18p MJC=0.55 VJC=0.75 FC=0.5 TF=750p XTF=400 VTF=10 ITF=4 TR=100n BR=4 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 mfg=CA030911
.MODEL 2N5087_Cordell pnp IS=9f BF=197 VAF=90 IKF=0.08 ISE=6f NE=1.42 NF=1 RB=193 RC=1.7 RE=0.1 CJE=2.5p MJE=0.3 VJE=0.75 CJC=6p MJC=0.3 VJC=0.75 FC=0.5 TF=540p XTF=7 VTF=4 ITF=0.45 TR=10n BR=2.7 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 mfg=CA030911
.MODEL 2N5089_Cordell npn IS=35f BF=500 VAF=110 IKF=0.05 ISE=6f NE=1.42 NF=1 RB=295 RC=1.6 RE=0.1 CJE=9p MJE=0.40 VJE=0.75 CJC=4p MJC=0.30 VJC=0.75 FC=0.5 TF=850p XTF=7 VTF=4 ITF=0.35 TR=500n BR=1.5 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 mfg=CA030911
.MODEL 2N5210_Cordell npn IS=35f BF=500 VAF=110 IKF=0.05 ISE=6f NE=1.42 NF=1 RB=900 RC=2 RE=0.1 CJE=9p MJE=0.40 VJE=0.75 CJC=4p MJC=0.30 VJC=0.75 FC=0.5 TF=850p XTF=7 VTF=4 ITF=0.35 TR=500n BR=1.5 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 mfg=CA031011
.MODEL 2N5401_Cordell pnp IS=25f BF=220 VAF=196 IKF=0.2 ISE=2f NE=1.4 NF=1 RB=60 RC=2 RE=0.1 CJE=35p MJE=0.40 VJE=0.75 CJC=15p MJC=0.55 VJC=0.75 FC=0.5 TF=800p XTF=60 VTF=0 ITF=4 TR=1.5n BR=4 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 mfg=CA031011
.MODEL 2N5551_Cordell npn IS=9f BF=125 VAF=667 IKF=0.09 ISE=1f NE=1.3 NF=1 RB=92 RC=1 RE=0.1 CJE=45p MJE=0.35 VJE=0.75 CJC=4.9p MJC=0.30 VJC=0.75 FC=0.5 TF=565p XTF=300 VTF=5 ITF=2.0 TR=1.2n BR=3 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 mfg=CA031011

.MODEL 2SA1381_Cordell pnp IS=50f BF=160 VAF=328 IKF=0.5 ISE=10f NE=1.5 NF=1 RB=17 RC=4.1 RE=0.05 CJE=71p MJE=0.35 VJE=0.75 CJC=8p MJC=0.35 VJC=0.55 FC=0.5 TF=900p XTF=10000 VTF=35 ITF=20 TR=1n BR=1.6 IKR=0.09 EG=0.6 XTB=0.9 XTI=3 NC=2 ISC=3.2e-10 VAR=100 mfg=CA031111
.MODEL 2SA1381C pnp IS=50f BF=160 VAF=328 IKF=0.5 ISE=10f NE=1.5 NF=1 RB=17 RC=4.1 RE=0.05 CJE=71p MJE=0.35 VJE=0.75 CJC=8p MJC=0.35 VJC=0.55 FC=0.5 TF=900p XTF=10000 VTF=35 ITF=20 TR=1n BR=1.6 IKR=0.09 EG=0.6 XTB=0.9 XTI=3 NC=2 ISC=3.2e-10 VAR=100 mfg=CA031111
.MODEL 2SC3503_Cordell npn IS=40f BF=170 VAF=769 IKF=0.08 ISE=200f NE=1.5 NF=1.0 RB=75 RC=1.5 RE=0.1 CJE=95p MJE=0.35 VJE=0.75 CJC=7p MJC=0.35 VJC=0.75 FC=0.5 TF=585p XTF=10000 VTF=35 ITF=20 TR=10n BR=0.6 IKR=0.05 EG=0.75 XTB=1.5 XTI=3 NC=1.5 ISC=7f NR=1.0 VAR=100 IRB=3e-6 RBM=0.035 .0 mfg=CA031111
.MODEL 2SC3503C npn IS=40f BF=170 VAF=769 IKF=0.08 ISE=200f NE=1.5 NF=1.0 RB=75 RC=1.5 RE=0.1 CJE=95p MJE=0.35 VJE=0.75 CJC=7p MJC=0.35 VJC=0.75 FC=0.5 TF=585p XTF=10000 VTF=35 ITF=20 TR=10n BR=0.6 IKR=0.05 EG=0.75 XTB=1.5 XTI=3 NC=1.5 ISC=7f NR=1.0 VAR=100 IRB=3e-6 RBM=0.035 .0 mfg=CA031111
.MODEL 2SA1407_Cordell pnp IS=70f BF=110 VAF=135 IKF=0.2 ISE=5000f NE=2 NF=1 RB=30 RC=3 RE=0.5 CJE=80p MJE=0.5 VJE=1.0 CJC=10p MJC=0.3 VJC=0.5 FC=0.5 TF=320p XTF=10000 VTF=35 ITF=20 TR=100n BR=1.6 IKR=0.09 EG=0.6 XTB=0.9 XTI=3 NC=2 ISC=3e-10 VAR=100 mfg=CA041011
.MODEL 2SC3601_Cordell npn IS=65f BF=140 VAF=250 IKF=0.13 ISE=400f NE=1.5 NF=1.0 RB=150 RC=1.5 RE=0.1 CJE=76p MJE=0.35 VJE=0.75 CJC=9p MJC=0.35 VJC=0.75 FC=0.5 TF=350p XTF=10000 VTF=35 ITF=30 TR=10n BR=0.6 IKR=0.05 EG=0.75 XTB=1.5 XTI=3 NC=1.5 ISC=7f NR=1.0 VAR=100 IRB=3e-6 RBM=0.035 .0 mfg=CA041011
.MODEL BC550_Cordell npn IS=45f BF=689 VAF=162 IKF=0.09 ISE=4600f NE=2 NF=0.9965 RB=167 RC=1 RE=0.04 CJE=18.7p MJE=0.35 VJE=0.75 CJC=6.2p MJC=0.25 VJC=0.4 FC=0.5 TF=595p XTF=10 VTF=10 ITF=1 TR=10n BR=12.2 IKR=0.34 EG=1.2 XTB=1.65 XTI=3 NC=0.996 NR=1.0 VAR=120 IRB=7e-5 RBM=1.1 XCJC=0.6 ISC=5f mfg=CA030111
.MODEL BC560_Cordell pnp IS=60f BF=900 VAF=160 IKF=0.10 ISE=70f NE=1.42 NF=1 RB=170 RC=1.0 RE=0.05 CJE=19p MJE=0.3 VJE=0.75 CJC=3.9p MJC=0.3 VJC=0.75 FC=0.5 TF=600p XTF=7 VTF=4 ITF=0.45 TR=10n BR=3 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 mfg=CA030211
.MODEL BD139_Cordell npn IS=150f BF=260 VAF=99 IKF=1.2 ISE=70f NE=1.2 NF=1.0 RB=5 RC=0.01 RE=0.08 CJE=293p MJE=0.33 VJE=0.67 CJC=49p MJC=0.39 VJC=0.52 FC=0.5 TF=585p XTF=10000 VTF=35 ITF=20 TR=10n BR=78 IKR=0.14 EG=1.21 XTB=1.14 XTI=3 NC=1.45 ISC=19p NR=1.0 VAR=7.5 IRB=0.03 RBM=0.001 XCJC=0.53 mfg=CA041311
.MODEL BD140_Cordell pnp IS=120f BF=113 VAF=140 IKF=1.5 ISE=1000f NE=1.5 NF=1 RB=5 RC=0.01 RE=0.1 CJE=220p MJE=0.35 VJE=0.7 CJC=68p MJC=0.35 VJC=0.6 XCJC=0.5 FC=0.5 TF=320p XTF=10000 VTF=35 ITF=20 TR=100n BR=25 IKR=0.1 EG=1.2 XTB=1.5 XTI=3 NC=1.4 ISC=7p NR=1.0 VAR=8 IRB=0.01 RBM=0.01 mfg=CA041311
.MODEL MJE243_Cordell npn IS=800f BF=190 VAF=1177 IKF=1.2 ISE=10p NE=1.7 NF=1.06 RB=45 RC=0.2 RE=0.01 CJE=210p MJE=0.4 VJE=1 CJC=85p MJC=0.3 VJC=0.4 FC=0.58 TF=3300p XTF=7 VTF=11 ITF=5 TR=1000n BR=1.7 IKR=1.0 EG=1.05 XTB=1.2 XTI=0.8 NC=2.9 ISC=1e-16 NR=1.04 VAR=140 IRB=5e-5 RBM=0.001 XCJC=0.8 mfg=CA031111
.MODEL MJE253_Cordell pnp IS=300f BF=150 VAF=310 IKF=1.2 ISE=30p NE=2 NF=1.015 RB=40 RC=0.3 RE=0.01 CJE=150p MJE=0.35 VJE=1 CJC=55p MJC=0.2 VJC=0.35 FC=0.55 TF=3300p XTF=7 VTF=10 ITF=5 TR=1000n BR=4 IKR=4.4 EG=1.05 XTB=1.3 XTI=0.01 NC=2.9 ISC=6e-13 NR=1.15 VAR=50 IRB=7u RBM=0.001 XCJC=0.8 mfg=CA041611
.MODEL MJk40_Cordell npn IS=800f BF=180 VAF=100 IKF=0.35 ISE=25p NE=1.5 RB=21 RC=2 RE=0.01 CJE=170p CJC=140p TF=7600p XTF=10 VTF=10 ITF=1 TR=10000p BR=0.004 IKR=0.05 EG=0.64 NC=2 ISC=1.5e-10 VAR=100 mfg=CA030711
.MODEL MJk50_Cordell pnp IS=110f BF=118 VAF=100 IKF=0.06 ISE=1.7p NE=1.5 RB=9 RC=1 RE=0.01 CJE=200p MJE=0.35 VJE=0.75 CJC=120p MJC=0.35 VJC=0.55 FC=0.5 TF=4500p BR=0.04 IKR=0.0075 EG=0.75 XTB=1.1 XTI=3 NC=2.0 ISC=5p VAR=100 mfg=CA030711
.MODEL MJE15032_Cordell npn IS=50p BF=105 VAF=2000 IKF=9 ISE=10p NE=2 NF=1.2 RB=16 RBM=0.1 IRB=0.1 RC=0.1 CJE=3.1n MJE=0.35 VJE=0.65 RE=0.01 CJC=0.3n MJC=0.4 VJC=0.6 FC=0.5 TF=3.8n XTF=4 VTF=10 ITF=2 TR=100n BR=6 VAR=15 NR=1.5 EG=1.2 XCJC=0.8 XTB=0.7 XTI=1.05 NC=4 ISC=0.4p IKR=5.2 mfg=CA032911
.MODEL MJE15033_Cordell pnp IS=300p BF=160 VAF=500 IKF=3 ISE=10p NE=2 NF=1.3 RB=5 RBM=0.1 IRB=0.1 RC=0.5 CJE=3.1n MJE=0.35 VJE=0.65 RE=0.01 CJC=0.3n MJC=0.4 VJC=0.6 FC=0.5 TF=3.7n XTF=4 VTF=10 ITF=2 TR=100n BR=5 VAR=15 NR=1.5 EG=1.05 XCJC=0.8 XTB=0.22 XTI=1 NC=4 ISC=0.3p IKR=7.5 mfg=CA041611
.MODEL mjl21193_Cordell pnp IS=1.6p BF=110 VAF=300 IKF=4 ISE=5p NE=1.5 NF=0.95 RB=2.0 RBM=2 IRB=10 RC=0.06 CJE=13n MJE=0.35 VJE=0.5 RE=0.001 CJC=1.5n MJC=0.5 VJC=0.6 FC=0.5 TF=24n XTF=1.0 VTF=10 ITF=10 TR=100n BR=5 VAR=100 NR=1.1 EG=1.1 XCJC=0.96 XTB=0.1 XTI=1 NC=4 ISC=0.3p mfg=CA112210
.MODEL mjl21193C pnp IS=1.6p BF=110 VAF=300 IKF=4 ISE=5p NE=1.5 NF=0.95 RB=2.0 RBM=2.0 IRB=10 RC=0.06 CJE=13n MJE=0.35 VJE=0.5 RE=0.001 CJC=1.5n MJC=0.5 VJC=0.6 FC=0.5 TF=24n XTF=1.0 VTF=10 ITF=10 TR=100n BR=5 VAR=100 NR=1.1 EG=1.1 XCJC=0.96 XTB=0.1 XTI=1.0 NC=4 ISC=0.3p mfg=CA112210
.MODEL mjl21193 pnp(IS=2.37302e-11 BF=92.8585 NF=0.85 VAF=1000 IKF=7.81463 ISE=9.34142e-13 NE=1.83168

BR=1.39987 NR=0.905395 VAR=421.163 IKR=1.8668 ISC=9.34142e-13 NC=3.03125 RB=14.6266 IRB=0.1
RBM=0.149902 RE=0.000682292 RC=0.146081 XTB=1.32633 XTI=1.05623 EG=1.05 CJE=1.15773e-08 VJE=0.57352
MJE=0.417157 TF=1e-08 XTF=1.946 VTF=17401.6 ITF=3.36265 CJC=5e-10 VJC=0.95 MJC=0.23891
XCJC=0.999998 FC=0.987529 TR=1e-07 PTF=0)
.MODEL mjl21194_Cordell npn IS=4p BF=70 VAF=500 IKF=14 ISE=1.2n NE=2.0 NF=1.01 RB=3.4 RBM=0.1 IRB=1.0
RC=0.06 CJE=8n MJE=0.35 VJE=0.5 RE=0.01 CJC=1.2n MJC=0.5 VJC=0.6 FC=0.5 TF=21n XTF=90 VTF=10
ITF=100 TR=100n BR=5 VAR=100 NR=1.1 EG=1.1 XCJC=0.96 XTB=0.1 XTI=1 NC=4 ISC=0.3p mfg=CA112210
.MODEL mjl21194 npn(IS=9.56205e-11 BF=62.3633 NF=0.858602 VAF=29.6613 IKF=9.86004 ISE=7.00007p
NE=3.43749 BR=4.96358 NR=0.925054 VAR=6.18692 IKR=4.87016 ISC=3.25e-13 NC=4 RB=11.0204 IRB=0.1
RBM=0.1 RE=0.000675706 RC=0.124974 XTB=0.150823 +XTI=1.00001 EG=1.11955 CJE=1.70807e-08 VJE=0.4
MJE=0.520397 TF=1e-08 XTF=47.3046 VTF=1.88154 ITF=0.560261 CJC=5e-10 VJC=0.95 MJC=0.238884
XCJC=0.800727 FC=0.8 TR=1e-07 PTF=0)
.MODEL MJL1302_Cordell pnp IS=7p BF=114 VAF=550 IKF=30 ISE=1e-7 NE=5 NF=1.0 RB=3.3 RC=0.1 CJE=16n
MJE=0.45 VJE=0.8 CJC=2.3n MJC=0.4 VJC=0.3 FC=0.1 TF=3.0n XTF=1000 VTF=2 ITF=150 TR=100n BR=5
VAR=4.3 NR=1.1 EG=1.1 XTB=0.1 XTI=1.0 NC=4 ISC=0.3p IKR=4.5 Vceo=200 Icrating=15 mfg=CA041611
.MODEL MJL3281_Cordell npn IS=5p BF=158 VAF=1000 IKF=50 ISE=20p NE=1.5 NF=1 RB=3.0 RC=0.1 CJE=11n
MJE=0.35 VJE=0.5 CJC=1.2n MJC=0.5 VJC=0.6 FC=0.1 TF=2.7n XTF=7500 VTF=3 ITF=750 TR=100n BR=5
VAR=4.3 NR=1.1 EG=1.1 XTB=0.12 XTI=1.0 NC=4 ISC=0.3p IKR=4.4 Vceo=200 Icrating=15 mfg=CA041611
.MODEL MJL4281_Cordell npn IS=5p BF=158 VAF=1000 IKF=50 ISE=20p NE=1.5 NF=1 RB=3.0 RC=0.1 CJE=11n
MJE=0.35 VJE=0.5 CJC=1.2n MJC=0.5 VJC=0.6 FC=0.1 TF=2.7n XTF=7500 VTF=3 ITF=750 TR=100n BR=5
VAR=4.3 NR=1.1 EG=1.1 XTB=0.12 XTI=1.0 NC=4 ISC=0.3p IKR=4.4 Vceo=200 Icrating=15 mfg=CA041611
.MODEL MJL4302_Cordell pnp IS=7p BF=114 VAF=550 IKF=30 ISE=1e-7 NE=5 NF=1 RB=3.3 RC=0.1 CJE=16n
MJE=0.45 VJE=0.8 CJC=2.3n MJC=0.4 VJC=0.3 FC=0.1 TF=3n XTF=1000 VTF=2 ITF=150 TR=100n BR=5 VAR=4.3
NR=1.1 EG=1.1 .0 XTB=0.12 XTI=1.0 NC=4 ISC=0.3p IKR=4.4 Vceo=200 Icrating=15 mfg=CA041611
.MODEL NJL1302_Cordell pnp IS=7p BF=114 VAF=571 IKF=30 ISE=1e-7 NE=5 NF=1 RB=3.3 RC=0.06 CJE=16n
MJE=0.43 VJE=0.78 CJC=2.3n MJC=0.4 VJC=0.3 FC=0.1 TF=3n XTF=1000 VTF=2 ITF=150 TR=100n BR=5 VAR=4.3
NR=1.1 EG=1.1 XCJC=0.96 XTB=0.12 XTI=1.03 NC=4 ISC=0.3p IKR=4.4 Vceo=200 Icrating=15 mfg=CA112210
.MODEL NJL3281_Cordell npn IS=5p BF=158 VAF=1000 IKF=50 ISE=20p NE=1.5 NF=1 RB=3 RC=0.06 CJE=11n
MJE=0.35 VJE=0.5 CJC=1.2n MJC=0.5 VJC=0.6 FC=0.1 TF=2.7n XTF=7500 VTF=3 ITF=750 TR=100n BR=5
VAR=4.3 NR=1.1 EG=1.1 XCJC=0.96 XTB=0.12 XTI=1.03 NC=4 ISC=0.3p IKR=4.4 Vceo=200 Icrating=15
mfg=CA112210
.MODEL MJ16110 NPN IS=16.932p BF=50.96 IKF=10.234 ISE=3.6577n NE=1.569 BR=9.928 IKR=10m ISC=256.41p
NC=1.6639 NK=.54291 RB=.26863 RC=64.148m CJE=8.996n VJE=.35 MJE=.33668 CJC=1n VJC=.35 MJC=.47185
TR=3.6u TF=32n XTF=3.47 VTF=2.25 ITF=0.106
.model 2SC5551A NPN(IS=4.58f BF=150 NF=1.003 VAF=35 IKF=1.2 ISE=5f NE=1.6 BR=35 NR=1.001 VAR=20
IKR=10.98m ISC=255.9f NC=1.5 RB=1.5 IRB=300.0m RBM=300m RE=280m RC=1.25 XTB=0 EG=1.11 XTI=3
CJE=2.36p VJE=199.0m MJE=73.20m TF=30.50p XTF=13.45m VTF=280.0m ITF=25.80m PTF=25.7 CJC=3.08p
VJC=520.0m MJC=380.8m .15m TR=1.38n FC=1.51m)
.MODEL D44H11_HD NPN(IS=2.14e-10 NF=1.271265 BF=208.89 RB=2 RBM=0.1 IRB=10 VAF=342 NE=2.7349
ISE=1e-8 IKF=30 NK=0.9687 BR=4 IKR=1.05 VAR=35 XTF=1800 TF=1.9n ITF=200 VTF=40 CJE=1.4n
MJE=0.3092662 VJE=0.4723539b CJC=175.527p MJC=0.383595 VJC=0.479488 TNOM=25 Vceo=80 Icrating=8
mfg=ON)
.MODEL PSS9014C NPN IS=1.822E-14 NF=0.9932 ISE=2.894E-16 NE=1.4 BF=324.4 IKF=0.109 VAF=82 NR=0.9931
ISC=9.982p NC=1.763 BR=8.29 IKR=0.09 VAR=17.9 RB=10 IRB=5u RBM=5 RE=0.649 RC=0.7014 XTB=0 EG=1.11
XTI=3 CJE=1.244E-11 VJE=0.7579 MJE=0.3656 TF=4.908E-10 XTF=9.51 VTF=2.927 ITF=0.3131 CJC=3.347p
VJC=0.5463 MJC=0.391 XCJC=0.6193 TR=9E-08 FC=0.979 Vceo=400 Icrating=0.25 mfg=NXP ; TO92
.MODEL MJE18008 npn IS=1n BF=16.2807 NF=0.85 VAF=17.9534 IKF=8.91667 ISE=6.94438p NE=3.38189
BR=1.62807 NR=0.82571 VAR=5.01712 IKR=3.65604 ISC=4.43005e-13 NC=3.99216 RB=2.7149 IRB=0.1 RBM=0.1
RE=0.0001 RC=0.0871278 XTB=0.121787 XTI=1 EG=1.05 CJE=4.65558n VJE=0.446548 MJE=0.330981 TF=1e-08
XTF=1.83198 VTF=3.88526 ITF=0.338593 CJC=3.83049e-10 VJC=0.4 MJC=0.456299 XCJC=0.799262 FC=0.8
TR=9.46239u Vceo=450 Icrating=8 mfg=On_Semi
.MODEL MJE5852 pnp IS=4.84135e-11 BF=49.5599 NF=1.2559 VAF=17.4453 IKF=9.22751 ISE=1.61853p
NE=3.62369 BR=2.68007 NR=1.32025 VAR=2.2277 IKR=5.04702 ISC=1.46595p NC=3.76353 RB=1.98711 IRB=0.1
RBM=0.1 RE=0.000292279 RC=0.105657 XTB=0.132887 XTI=1.10371 EG=1.11619 CJE=2.93452n VJE=0.687172
MJE=0.387331 TF=4e-10 XTF=1.5 VTF=1 ITF=1 CJC=8.63044e-10 VJC=0.467483 MJC=0.416593 XCJC=0.8
FC=0.533333 TR=3.4177e-07 Vceo=400 Icrating=8 mfg=On_Semi
.MODEL MJ6503 PNP (BF=151.123 BR=79.46m CJC=811.1p CJE=3.019n FC=500m IKF=1.0035
IKR=1.041683410264 IS=10.004f ISC=.033496f ISE=98.238p ITF=10m MJC=431.592m MJE=420.792m NC=2
NE=1.61725 NF=868.661m RC=8.446m RE=75.92m TF=1n TR=65.23u VAF=100 VJC=700m VJE=998.57m VTF=10
XTF=500m Vceo=400 Icrating=8 mfg=On_Semi)

.MODEL MJH16018 NPN (BF=56.307 BR=5 CJC=979.2p CJE=11n IKF=1 IKR=1 IS=10f ISC=.000041917f ISE=91.2145p ITF=10m MJC=499.767m MJE=674.36m NC=2 NE=1.1848 NF=710.736m RC=476.5m RE=28.51m TF=1n TR=13.65u VAF=100 VJC=700m VJE=757.6m VTF=10 XTF=500m Vceo=800 Icrating=10 mfg=On_Semi)
.MODEL MJH16010A NPN (BF=162.27 BR=2.74m CJC=1.06n CJE=9.48n FC=500m IKF=999.1m IKR=541.62 IS=9.742f ISC=98.3p ISE=98.4623p ITF=10m MJC=456.493m MJE=540.839m NC=2 NE=1.4412 NF=861.448m RC=51m RE=23m TF=1n TR=3.482318035635m VAF=100 VJC=700m VJE=994m VTF=10 XTF=500m Vceo=500 Icrating=15 mfg=On_Semi)
.MODEL MJE12007 NPN (BF=33.39 BR=18.749860161962m CJC=229p CJE=2n FC=500m IKF=387.32m IKR=21.27m IS=9.84f ISC=99.74p ISE=1.0031p ITF=6.253m MJC=558m MJE=500m NC=2 NE=1.24009351669 NF=906.91m RE=113.48m TF=29.075n TR=10n VAF=100 VJC=700m VTF=10 XTF=500m Vceo=1500 Icrating=2.5 mfg=On_Semi)
.MODEL 2SB1011 PNP (IS=10.1F NF=1 BF=286 VAF=360 IKF=60M ISE=3.54P NE=2 BR=4 NR=1 VAR=16 IKR=90M RE=15.6 RB=62.5 RC=6.25 XTB=1.5 CJE=66P VJE=1.1 MJE=.5 CJC=21.3P VJC=.3 MJC=.3 TF=2.27N TR=1.57U Vceo=400 Icrating=100m mfg=Matsushita)
.MODEL PBHV9050T PNP IS=81.67f NF=0.9707 ISE=39.86f NE=1.399 BF=158 IKF=7m VAF=8 NR=0.965 ISC=1.307p NC=1.143 BR=11 IKR=0.5 VAR=81 RB=12.3 IRB=0.000232 RBM=1.45 RE=0.137 RC=0.341 XTB=0 EG=1.11 XTI=3 CJE=199.3p VJE=0.749 MJE=0.3789 TF=1.1n XTF=30 VTF=20 ITF=1.5 CJC=3.453E-011 VJC=0.5 MJC=0.4589 TR=8E-007 FC=0.6 Vceo=500 Icrating=150m mfg=NXP
.MODEL PBHV9050Z PNP IS=81.67f NF=0.9707 ISE=39.86f NE=1.399 BF=158 IKF=7m VAF=8 NR=0.965 ISC=1.307p NC=1.143 BR=11 IKR=0.5 VAR=81 RB=12.3 IRB=0.000232 RBM=1.45 RE=0.137 RC=0.341 XTB=0 EG=1.11 XTI=3 CJE=199.3p VJE=0.749 MJE=0.3789 TF=1.1n XTF=30 VTF=20 ITF=1.5 CJC=3.453E-011 VJC=0.5 MJC=0.4589 TR=8E-007 FC=0.6 Vceo=500 Icrating=250m mfg=NXP
.MODEL FMMT560 PNP IS=4E-14 NF=0.98 BF=140 VAF=104 ISE=1p NE=1.54 RCO=100 GAMMA=1.5E-7 NR=1 BR=2 VAR=100 ISC=1e-13 NC=2 IKR=10m RB=25 RE=.3 RC=.3 CJC=29p MJC=0.364 VJC=0.511 CJE=100.3p MJE=0.419 VJE=0.877 TF=2E-10 TR=1.5e-6 XTB=1.5 QUASIMOD=1 Vceo=500 Icrating=150m mfg=Zetex
.MODEL MMBT3906 pnp IS=6.84896E-14 BF=135.6 NF=1 BR=0.304 NR=1.0 ISE=5.524807E-13 NE=1.5 ISC=1.71764E-10 NC=1.5 VAF=18.7 VAR=200 IKF=0.0882 IKR=0.229087 RB=1.05 RBM=0.011 IRB=1.51189m RE=0.022 RC=1.57 CJE=8.032025p VJE=0.7118251 MJE=0.3042244 FC=0.5 CJC=9.505229p VJC=0.8414405 MJC=0.5 TF=3.193E-10 ITF=0.4 VTF=4.0 XTF=6 TR=3.342E-8 XTB=1.58 EG=0.78 XTI=3 Vceo=40 Icrating=200m mfg=Fairchild
.MODEL MMBT3904 NPN IS=4.639f NF=0.9995 ISE=2.091E-14 NE=1.6 BF=160.1 IKF=0.12 VAF=98.69 NR=1.001 ISC=3.257p NC=1.394 BR=5.944 IKR=0.06 VAR=19.29 RB=1 RE=0.3614 RC=1.755 XTB=0 EG=1.11 XTI=3 CJE=5.631p VJE=0.7002 MJE=0.3385 TF=3.001E-10 XTF=27 VTF=1.461 ITF=0.2723 CJC=4.949p VJC=0.5969 MJC=0.1928 XCJC=0.864 TR=9.4E-8 FC=0.5582 Vceo=40 Icrating=200m mfg=NXP
.model 2SC2078 NPN(Is=20.4f Xti=3 Eg=1.11 Vaf=100 Bf=810 Ise=22.8f + Ne=1.166 Ikf=21.53 Nk=1.298 Xtb=1.5 Isc=20.4f Ikr=0 Cjc=111p Mjc=.4 Vjc=.984 Cje=100p Tf=944.5p Itf=84.5 Xtf=232.7 Vtf=10 Vceo=75 Icrating=3 mfg=Sanyo)
.MODEL 2N5088_F npn IS=3.80189E-14 BF=405.19 NF=1 BR=16.246 NR=1 ISE=2.51189E-14 NE=2 ISC=9.84993p NC=1.5 VAF=219.367 VAR=10.6729 IKF=0.40519 IKR=0.020893 RB=898 RBM=7.525 IRB=2.179E-6 RE=2.5 RC=1.5 CJE=1.984254E-11 VJE=1.2 MJE=0.05 FC=0.5 CJC=5.858717p VJC=0.5 MJC=0.3080685 TF=3.185n XTB=1.8883 EG=1.1884 XTI=3 VCEO=35 ICRATING=50m MFG=Fairchild
.MODEL njL0281dg_bjt npn IS=7.35019e-14 BF=113.063 NF=1.21951 VAF=10.158 IKF=8.51404 ISE=8.83106p NE=2.0497 BR=4.9071 NR=1.25326 VAR=8.60208 IKR=6.78731 ISC=3.59743e-13 NC=3.99215 RB=0.526348 IRB=0.1 RBM=0.526348 RE=0.000612798 RC=0.0302655 XTB=0.1 XTI=1 EG=1.05 CJE=5.60463n VJE=0.600913 MJE=0.848202 TF=2.07647e-09 XTF=1000 VTF=4157.4 ITF=217.206 CJC=4.77948e-10 VJC=0.528497 MJC=0.23 FC=0.430232 TR=1e-07 Vceo=260 Icrating=15 mfg=ON_Semi
.MODEL njL0302dg_bjt pnp IS=1.68444p BF=84.9671 NF=0.992223 VAF=10.01 IKF=7.49667 ISE=1e-08 NE=2.87955 BR=8.49671 NR=0.990995 VAR=99.9986 IKR=0.382704 ISC=3.81183e-16 NC=1 RB=4.23352 IRB=0.1 RBM=4.23351 RE=0.00779693 RC=0.0390712 XTB=1.60824 XTI=3.9999 EG=1.20458 CJE=1.56322e-08 VJE=0.99 MJE=0.23 TF=1.97297e-09 XTF=1000 VTF=817.29 ITF=453.232 CJC=5e-10 VJC=0.95 MJC=0.23 XCJC=0.756601 FC=0.8 TR=1e-07 Vceo=260 Icrating=15 mfg=ON_Semi
.MODEL njL21193dg_bjt pnp IS=2.37302e-11 BF=92.8585 NF=0.85 VAF=1000 IKF=7.81463 ISE=9.34142e-13 NE=1.83168 BR=1.39987 NR=0.905395 VAR=421.163 IKR=1.8668 ISC=9.34142e-13 NC=3.03125 RB=14.6266 IRB=0.1 RBM=0.149902 RE=0.000682292 RC=0.146081 XTB=1.32633 XTI=1.05623 EG=1.05 CJE=1.15773e-08 VJE=0.57352 MJE=0.417157 TF=1e-08 XTF=1.946 VTF=17401.6 ITF=3.36265 CJC=5e-10 VJC=0.95 MJC=0.23891 XCJC=0.999998 FC=0.987529 TR=1e-07 Vceo=250 Icrating=16 mfg=ON_Semi
.MODEL njL21194dg_bjt npn IS=9.56205e-11 BF=62.3633 NF=0.858602 VAF=29.6613 IKF=9.86004 ISE=7.00007p NE=3.43749 BR=4.96358 NR=0.925054 VAR=6.18692 IKR=4.87016 ISC=3.25e-13 NC=4 RB=11.0204 IRB=0.1 RBM=0.1 RE=0.000675706 RC=0.124974 XTB=0.150823 XTI=1.00001 EG=1.11955 CJE=1.70807e-08 VJE=0.4 MJE=0.520397 TF=1e-08 XTF=47.3046 VTF=1.88154 ITF=0.560261 CJC=5e-10 VJC=0.95 MJC=0.238884 XCJC=0.800727 FC=0.8 TR=1e-07 Vceo=250 Icrating=16 mfg=ON_Semi

.MODEL njL4281dg_bjt npn IS=1.28825e-11 BF=300 NF=1.02019 VAF=10.7547 IKF=0.97929 ISE=2.28745e-11 NE=1.44568 BR=0.1 NR=1.29449 VAR=4.22157 IKR=9.7929 ISC=1.04073e-16 NC=2.85967 RB=1.34764 IRB=0.140361 RBM=0.1 RE=0.00828762 RC=0.0414381 XTB=0.1 XTI=1 EG=1.05 CJE=2.34884e-08 VJE=22.295 MJE=0.69263 TF=1.28186n XTF=131.233 VTF=63578.9 ITF=53.7291 CJC=4.85466e-10 VJC=0.95 MJC=0.23 FC=0.8 TR=1e-07 Vceo=350 Icrating=15 mfg=ON_Semi
.MODEL njL4302dg_bjt pnp IS=3.25338e-14 BF=108.5 NF=0.85 VAF=10 IKF=1.18382 ISE=2.89523e-13 NE=1.1985 BR=0.100727 NR=1.08725 VAR=97.7807 IKR=1e-05 ISC=2.05388e-13 NC=3.23408 RB=0.876821 IRB=0.1 RBM=0.876821 RE=0.00441506 RC=0.0220753 XTB=5.59761 XTI=4 EG=1.206 CJE=1.56701e-08 VJE=0.99 MJE=0.542371 TF=1.8605n XTF=1000 VTF=100000 ITF=245.118 CJC=5e-10 VJC=0.95 MJC=0.23 FC=0.8 TR=1e-07 Vceo=350 Icrating=15 mfg=ON_Semi
.MODEL mjL4281a npn IS=9.94641e-11 BF=191.836 NF=1.11524 VAF=24.7449 IKF=5.75399 ISE=6.4507p NE=3.39407 BR=4.35182 NR=1.1764 VAR=4.25175 IKR=6.61715 ISC=3.89999e-13 NC=3.99 RB=4.37715 IRB=0.00966879 RBM=1f RE=0.00608852 RC=0.0434329 XTB=0.661303 XTI=1.00355 EG=1.05 CJE=9.04931n VJE=0.99 MJE=0.844324 TF=1.6665n XTF=1000 VTF=17023.9 ITF=152.472 CJC=8.80163e-10 VJC=0.942802 MJC=0.23183 FC=0.8 TR=1e-07 Vceo=350 Icrating=15 mfg=ON_Semi
.MODEL mjL4302a pnp IS=8.52181e-11 BF=505.26 NF=1.14612 VAF=15.6851 IKF=2.86699 ISE=3.82966n NE=2.09196 BR=50.526 NR=1.18655 VAR=1.41005 IKR=9.95655 ISC=4.51392e-11 NC=1.28018 RB=98.7069 IRB=4.30971e-06 RBM=0.110355 RE=0.00577433 RC=0.0288716 XTB=0.00344757 XTI=0.00948369 EG=1.05 CJE=1.42406e-08 VJE=0.99 MJE=0.23 TF=2.22092e-09 XTF=15.6824 VTF=100000 ITF=63.5289 CJC=5.00002e-10 VJC=0.893622 MJC=2.3e-21 FC=0.1 TR=1e-07 Vceo=350 Icrating=15 mfg=ON_Semi
.MODEL mmbt2369alt1 npn IS=1.43984e-13 BF=526.086 NF=1.21978 VAF=3.62518 IKF=0.00878191 ISE=1e-08 NE=3.71149 BR=2.58372 NR=1.22662 VAR=7.2229 IKR=0.0878191 ISC=1e-08 NC=2.29158 RE=0.0001 RC=1.22519 XTB=1p XTI=1p EG=1.05 CJE=3.2936p VJE=0.329753 MJE=0.23 TF=4e-10 XTF=1.5 VTF=1 ITF=1 CJC=3.07126p VJC=0.120633 MJC=0.0566184 XCJC=0.8 FC=0.533333 TR=6.09825e-09 mfg=ON_Semi
.MODEL nsf2250wt1 npn IS=4.01844e-16 BF=300.352 NF=0.919176 VAF=1000 IKF=0.0715213 ISE=1.64917e-10 NE=3.65708 BR=6.92239 NR=0.904339 VAR=2.45616 IKR=0.715213 ISC=1e-16 NC=4 RB=1000 IRB=100 RBM=0.711072 RE=0.288938 RC=1.44469 XTB=0.571921 XTI=40 EG=1.05 CJE=9.19185e-13 VJE=0.854523 MJE=0.85 TF=2.50954e-11 XTF=1000 VTF=1303.15 ITF=1.96943 CJC=1.43298p VJC=0.95 MJC=0.23 XCJC=0.1 FC=0.8 TR=1e-07 mfg=ON_Semi
.MODEL PBSS302NX NPN IS=1.39p NF=0.9539 ISE=1.265E-014 NE=1.426 BF=570 IKF=13 VAF=40 NR=0.954 ISC=4.055E-014 NC=1.216 BR=380 IKR=1.2 VAR=14 RB=19.5 IRB=0.00052 RBM=0.688 RE=0.015 RC=0.0084 XTB=0 EG=1.11 XTI=3 CJE=9.419E-010 VJE=0.7772 MJE=0.3561 TF=1.85n XTF=1 VTF=5 ITF=1.9 CJC=2.947E-010 VJC=0.6762 MJC=0.4078 TR=1n FC=0.8 Vceo=20 Icrating=5.3 mfg=NXP
.MODEL BF722 NPN IS=1.766E-14 NF=0.9902 ISE=1.982f NE=1.25 BF=108.1 IKF=0.21 VAF=394 NR=0.99 ISC=9.5E-10 NC=1.95 BR=4.928 IKR=0.045 VAR=57 RB=100 IRB=2E-05 RBM=0.01 RE=0.365 RC=1.5 XTB=0 EG=1.11 XTI=3 CJE=4.181E-11 VJE=0.6301 MJE=0.329 TF=1.303n XTF=35 VTF=5 ITF=0.11 CJC=4.632p VJC=0.2621 MJC=0.4164 XCJC=0.4132 TR=1.9E-07 FC=0.842 Vceo=250 Icrating=100m mfg=NXP
.MODEL 2SC4682 NPN (IS=10f BF=2200 ne=2 ise=300f VAF=100 IKF=1.25 XTB=1.5 BR=400 rc=80m rb=3 VAR=50 IKR=300m nc=2 ISC=10p CJE=500p CJC=70p MJC=.33333 TF=90p tr=5n XTF=10 VTF=10 ITF=1 Vceo=15 Icrating=3 mfg=Toshiba) ;my
.MODEL 2N5962 npn IS=4.67735E-14 BF=1336.1 NF=1 BR=4.49 NR=1.011 ISE=9.12011E-14 NE=2 ISC=3.63078E-16 NC=1.5 VAF=46 VAR=9.33 IKF=0.0436516 IKR=0.0144544 RB=143 RBM=36.064 IRB=5.01187E-4 RE=1.06 RC=1.8 CJE=6.20343p VJE=0.574074 MJE=0.222819 FC=0.5 CJC=4.92525p VJC=0.5 MJC=0.300786 XTB=1.5 EG=1.17 XTI=3 TF=1.56n tr=200n Vceo=45 Icrating=100m mfg=Fairchild
.MODEL MMBT5962 npn IS=4.67735E-14 BF=1336.1 NF=1 BR=4.49 NR=1.011 ISE=9.12011E-14 NE=2 ISC=3.63078E-16 NC=1.5 VAF=46 VAR=9.33 IKF=0.0436516 IKR=0.0144544 RB=143 RBM=36.064 IRB=5.01187E-4 RE=1.06 RC=1.8 CJE=6.20343p VJE=0.574074 MJE=0.222819 FC=0.5 CJC=4.92525p VJC=0.5 MJC=0.300786 XTB=1.5 EG=1.17 XTI=3 TF=1.56n tr=200n Vceo=45 Icrating=100m mfg=Fairchild
.MODEL 2SD2707 NPN IS=400f BF=1.3544k VAF=69.931 IKF=.16193 ISE=400.02f NE=1.6742 BR=9.6205 VAR=100 IKR=1.1285 ISC=725.25f NC=2.026 NK=.74645 RE=.3 RB=16.704 RC=.12233 CJE=27.484p MJE=.37516 CJC=6.554p MJC=.31941 TF=474.5p XTF=38.562 VTF=63.249 ITF=2.3187 TR=79.789n XTB=1.5 mfg=ROHM
.MODEL 2SD2654 NPN IS=400f BF=1.3544k VAF=69.931 IKF=.16193 ISE=400.02f NE=1.6742 BR=9.6205 VAR=100 IKR=1.1285 ISC=725.25f NC=2.026 NK=.74645 RE=.3 RB=16.704 RC=.12233 CJE=27.484p MJE=.37516 CJC=6.554p MJC=.31941 TF=474.5p XTF=38.562 VTF=63.249 ITF=2.3187 TR=79.789n XTB=1.5 mfg=ROHM
.MODEL 2SD2537 NPN IS=1.4p BF=1.1790k VAF=22.2 IKF=5.5281 ISE=1.4p NE=1.9029 BR=60.245 VAR=100 IKR=.79198 ISC=1.5775p NC=2.1625 NK=.84174 RE=50m RB=.98045 RC=35.460m CJE=202.04p MJE=.52038 CJC=65.705p MJC=.44672 TF=527.26p XTF=45.284 VTF=31.121 ITF=22.741 TR=14.999n XTB=1.5 mfg=ROHM
.MODEL 2SD2351 NPN IS=400f BF=1.3544k VAF=69.931 IKF=.16193 ISE=400.02f NE=1.6742 BR=9.6205 VAR=100 IKR=1.1285 ISC=725.25f NC=2.026 NK=.74645 RE=.3 RB=16.704 RC=.12233 CJE=27.484p MJE=.37516 CJC=6.554p MJC=.31941 TF=474.5p XTF=38.562 VTF=63.249 ITF=2.3187 TR=79.789n XTB=1.5 mfg=ROHM

.MODEL 2SD2226K NPN IS=400f BF=1.3544k VAF=69.931 IKF=.16193 ISE=400.02f NE=1.6742 BR=9.6205 VAR=100 IKR=1.1285 ISC=725.25f NC=2.026 NK=.74645 RE=.3 RB=16.704 RC=.12233 CJE=27.484p MJE=.37516 CJC=6.554p MJC=.31941 TF=474.5p XTF=38.562 VTF=63.249 ITF=2.3187 TR=79.789n XTB=1.5 mfg=ROHM
.MODEL 2SD2153 NPN IS=2p BF=1.3807k VAF=23.841 IKF=1.6517 ISE=2p NE=2.1217 BR=83.056 VAR=100 IKR=.2628 ISC=2p NC=5.0113 RE=70m RB=.47007 RC=14.429m CJE=196.60p MJE=.58268 CJC=73.348p MJC=.45226 TF=407.47p XTF=129.56 VTF=13.874 ITF=9.8498 TR=17.625n XTB=1.5 mfg=ROHM
.MODEL 2SD2114K NPN IS=1.5p BF=1.0520k VAF=36.7 IKF=3.2468 ISE=1.5p NE=2.3002 BR=52.73 VAR=100 IKR=.37406 ISC=1.7779p NC=2.1499 NK=.96651 RE=.1 RB=2.7608 RC=.17064 CJE=51.912p MJE=.39966 CJC=22.112p MJC=.38184 TF=384.39p XTF=23.667 VTF=33.125 ITF=5.091 TR=6.2144n XTB=1.5 mfg=ROHM
.MODEL SS9018G NPN (Is=3f xcjc=0.1 Xti=3 Vaf=75 Bf=102 Ne=2 Ise=0.8p Ikf=250m Xtb=1.5 Br=0.3 Nc=2 Isc=0.8p Ikr=10m Rc=3.5 Cjc=1.8p Mjc=.15 Vjc=.8 Fc=.5 Cje=1.5p Mje=0.5 Vje=.8 Tr=2n Tf=110p Itf=13m Vtf=1.7 Xtf=3 Rb=60 Vceo=15 Icrating=50m mfg=Fairchild)
.MODEL SS9018 NPN (IS=1e-14 XTI=3 EG=1.11 VAF=50 BF=80 BR=1 RB=10 CJE=2p CJC=1.7p VJE=0.75 VJC=0.75 TF=2.6126e-10 TR=10n MJE=0.33 MJC=0.33 VA=100 ISE=0 IKF=0.01 NE=1.5 NF=1 NR=1 VAR=100 IKR=0.01 ISC=0 NC=2 XTF=10 VTF=10 ITF=1 PTF=0 XTB=1.5 FC=0.5 Vceo=15 Icrating=50m MFG=Fairchild)
.MODEL PZTA42 NPN IS=1.285E-014 NF=0.9841 ISE=1.56E-014 NE=1.387 BF=159.3 IKF=0.01406 VAF=19.72 NR=0.9898 ISC=5.445E-016 NC=1.224 BR=7.551 IKR=0.4786 VAR=54.95 RB=1.5 IRB=7E-005 RBM=460 RE=0.003999 RC=0.3995 XTB=0 EG=1.11 XTI=3 CJE=3.899E-011 VJE=0.6544 MJE=0.3086 TF=2n XTF=30 VTF=1.652 ITF=0.05943 CJC=5.94p VJC=0.3006 MJC=0.3099 TR=1E-008 FC=0.8177
.MODEL 2n6609 pnp IS=8.97366e-11 BF=153.874 NF=1.29572 VAF=27.5393 IKF=5.54461 ISE=7.75047p NE=3.34356 BR=3.573 NR=1.41276 VAR=2.67072 IKR=7.74392 ISC=4.75e-13 NC=3.96875 RB=2.45357 IRB=0.100056 RBM=0.25225 RE=0.000604503 RC=0.0795809 XTB=0.1 XTI=1.09973 EG=1.206 CJE=1e-11 VJE=0.75 MJE=0.33 TF=1n XTF=1 VTF=10 ITF=0.01 CJC=1e-11 VJC=0.75 MJC=0.33 XCJC=0.9 FC=0.5 TR=1e-07
.MODEL BD633 NPN(Is=2.447p Xti=3 Eg=1.11 Vaf=100 Bf=208.2 Ise=70.69p Ne=1.565 Ikf=.9743 Nk=.6134 Xtb=1.5 Br=12.59 Isc=11.68n Nc=1.835 Ikr=3.86 Rc=.4685 Cjc=142p Mjc=.4353 Vjc=.75 Fc=.5 Cje=188.5p Mje=.4878 Vje=.75 Tr=194.2n Tf=19.85n Itf=164.1 Xtf=5.945 Vtf=10 Rb=.1)
.MODEL 2N5961 NPN IS=2.61162E-14 NF=1.00346 VAF=95.0254 IKF=0.029931 ISE=7.61259E-16 NE=1.21454 BR=5.96205 NR=1.03052 VAR=9.07938 IKR=0.0214923 ISC=3.89612f NC=1.04471 RB=57.8892 RE=0.18172 EG=1.11 XTI=3 CJE=4.90357p VJE=0.671322 MJE=0.328132 VJC=0.376047 MJC=0.253526 FC=0.5 BF=784.646 CJC=4.08683p RC=1.97533 TF=1.591549n
.MODEL ZXTN07045EFF NPN IS=1.5p NF=1 BF=1160 IKF=4 VAF=60 ISE=4E-13 NE=1.37 NR=1 BR=123 IKR=1 VAR=14.5 ISC=4E-13 NC=1.34 RB=0.1 RE=0.022 RC=0.015 CJE=250p VJE=0.68 MJE=0.36 CJC=59p VJC=0.49 MJC=0.36 TF=0.6n TR=9n RCO=0.75 GAMMA=5n QUASIMOD=1 XTB=1.4 TRE1=0.004 TRB1=0.004 TRC1=0.004 Vceo=45 Icrating=4 mfg=Zetex
.MODEL PMBT6429 NPN IS=3.591E-14 NF=0.997 ISE=1.17E-14 NE=1.95 BF=600 IKF=0.08 VAF=77 NR=0.9927 ISC=2.885E-18 NC=0.8 BR=20 VAR=27 RB=478 IRB=2.5E-05 RBM=1 RE=0.35 RC=0.8 XTB=0 EG=1.11 XTI=3 CJE=1.116E-11 VJE=0.6 MJE=0.3536 TF=3.8E-10 XTF=6 VTF=6.4 ITF=0.16 CJC=3.552p VJC=0.3992 MJC=0.3822 TR=2.5E-08 FC=0.78 Vceo=45 Icrating=100m mfg=NXP
.model 2sc3112 NPN(Is=14.1f Xti=3 Eg=1.11 Vaf=100 Bf=1.439K Ise=14.1f Ne=1.68 Ikf=.9998 Nk=.9651 Xtb=1.5 Var=100 Br=15.46 Isc=1.526p Nc=1.5 Ikr=20.84m Rc=.4072 Cjc=10.83p Mjc=.3585 Vjc=.3905 Fc=.5 Cje=5p Mje=.3333 Vje=.75 Tr=10n Tf=609.5p Itf=2.975 Xtf=0 Vtf=10)
.model 2sd1938 NPN(Is=43.03f Xti=3 Eg=1.11 Vaf=100 Bf=1.318K Ise=43.04f Ne=2 Ikf=28.32m Nk=.4038 Xtb=1.5 Var=100 Br=45 Isc=43.03f Nc=2 Ikr=26.89m Rc=1.6 Cjc=12.35p Mjc=.3429 Vjc=.3905 Fc=.5 Cje=5p Mje=.3333 Vje=.75 Tr=10n Tf=1n Itf=1 Xtf=0 Vtf=10)
.model 2sd1979 NPN(Is=43.03f Xti=3 Eg=1.11 Vaf=100 Bf=1.318K Ise=43.04f Ne=2 Ikf=28.32m Nk=.4038 Xtb=1.5 Var=100 Br=45 Isc=43.03f Nc=2 Ikr=26.89m Rc=1.6 Cjc=12.35p Mjc=.3429 Vjc=.3905 Fc=.5 Cje=5p Mje=.3333 Vje=.75 Tr=10n Tf=1n Itf=1 Xtf=0 Vtf=10)
.model 2sd1780 NPN(Is=143.4f Xti=3 Eg=1.11 Vaf=100 Bf=1.993K Ise=3.776p Ne=2.055 Ikf=3.435 Nk=.9089 Xtb=1.5 Var=100 Br=417.7 Isc=7.458p Nc=1.61 Ikr=.2559 Rc=83.96m Cjc=2p Mjc=.3333 Vjc=.75 Fc=.5 Cje=5p Mje=.3333 Vje=.75 Tr=36.36n Tf=1n Itf=1 Xtf=0 Vtf=10)
.model 2sd1458 NPN(Is=50.43p Xti=3 Eg=1.11 Vaf=100 Bf=1.909K Ise=70.47p Ne=2.02 Ikf=2.323 Nk=.8578 Xtb=1.5 Var=100 Br=76.92 Isc=51.14p Nc=2.259 Ikr=68.13m Rc=.1355 Cjc=26.3p Mjc=.3621 Vjc=.4802 Fc=.5 Cje=5p Mje=.3333 Vje=.75 Tr=10n Tf=1n Itf=1 Xtf=0 Vtf=10)
.model 2sd1483 NPN(Is=50.43p Xti=3 Eg=1.11 Vaf=100 Bf=1.909K Ise=70.47p Ne=2.02 Ikf=2.323 Nk=.8578 Xtb=1.5 Var=100 Br=76.92 Isc=51.14p Nc=2.259 Ikr=68.13m Rc=.1355 Cjc=28.59p Mjc=.3645 Vjc=.3907 Fc=.5 Cje=5p Mje=.3333 Vje=.75 Tr=10n Tf=1n Itf=1 Xtf=0 Vtf=10)
.model 2n3773 npn IS=1.12p BF=280 NF=1 VAF=40 IKF=1.9 ISE=83.27n NE=2.7324 BR=1.25 NR=1 VAR=50 IKR=1.9 ISC=83n NC=2.7 RB=0.6 RBM=0.6 RE=0.001 RC=89.3m CJE=1378.4p VJE=0.5 MJE=0.4958 TF=48.2n XTF=2 VTF=30 ITF=9 CJC=684.94p VJC=0.7 MJC=0.3221 XCJC=0.5 TR=200n XTB=0.887 EG=1.11 XTI=3 FC=0.5
.MODEL 2N3773G NPN (IS=4.27569e-10 BF=110.833 NF=1.04275 VAF=24.8913 IKF=9.09316 ISE=7.75051p

NE=3.34364 BR=2.12581 NR=1.08667 VAR=3.43591 IKR=14.4171 ISC=6.25e-13 NC=3.90625 RB=3.19163 IRB=0.1 RBM=0.1 RE=0.000132792 RC=0.0777476 XTB=0.1 XTI=1.02282 EG=1.05074 CJE=1.49308e-09 VJE=0.890172 MJE=0.698851 TF=3.95e-10 XTF=1.35721 VTF=0.995664 ITF=1 CJC=5e-10 VJC=0.95 MJC=0.404162 XCJC=0.803125 FC=0.8 TR=1e-07 PTF=0 mfg=onsemimodpex)
.MODEL BF959 NPN (IS=10.2F NF=1 BF=78 VAF=80.5 IKF=60M ISE=16.8P NE=2 BR=4 NR=1 VAR=12 IKR=90M RE=0.515 RB=2.06 RC=0.206 XTB=1.5 CJE=1.74P VJE=1.1 MJE=0.5 CJC=2.25P VJC=0.3 MJC=0.3 TF=227P TR=158N Vceo=20 Icrating=100m mfg=Motorola)
.MODEL TIP41C NPN (IS=7.55826e-11 BF=260.542 NF=1.11221 VAF=100 IKF=0.526814 ISE=1e-08 NE=2.18072 BR=26.0542 NR=1.5 VAR=1000 IKR=3.54059 ISC=1e-08 NC=1.63849 RB=4.56157 IRB=0.1 RBM=0.1 RE=0.0162111 RC=0.0810556 XTB=0.1 XTI=1 EG=1.206 CJE=1.93296e-10 VJE=0.4 MJE=0.259503 TF=1e-08 XTF=4.06972 VTF=7.1157 ITF=0.001 CJC=1.09657e-10 VJC=0.730921 MJC=0.23 XCJC=0.803085 FC=0.8 TR=9.01013e-08 PTF=0 Vceo=100 ICrating=6 mfg=ON_Semi)
.MODEL TIP42C_ PNP (IS=5.65618e-10 BF=120.073 NF=1.24004 VAF=90.6071 IKF=1.46498 ISE=6.98929e-14 NE=4 BR=2.83268 NR=1.30331 VAR=27.1221 IKR=10 ISC=6.98934e-14 NC=3.78125 RB=4.71382 IRB=0.234602 RBM=0.12691 RE=0.000666374 RC=0.0927424 XTB=3.21145 XTI=1 EG=1.05 CJE=1.93221e-10 VJE=0.4 MJE=0.259369 TF=9.99163e-09 XTF=4.41941 VTF=6.53488 ITF=0.001 CJC=1.0962e-10 VJC=0.731968 MJC=0.23 XCJC=0.799902 FC=0.799995 TR=1e-07 PTF=0 KF=0 Vceo=100 ICrating=6 mfg=ON_Semi)
.MODEL TIP41C_ NPN (IS=290.83f BF=113.55 VAF=100 IKF=1.9905 ISE=1.3946p NE=1.4763 BR=.1001 VAR=100 IKR=10.010m ISC=320.65p NC=1.8994 NK=.58929 RB=.71129 CJE=348.44p VJE=.78228 MJE=.42865 CJC=184.26p VJC=.47897 MJC=.40458 TF=36.381n XTF=100.32 VTF=21.563 ITF=28.791 TR=10n Vceo=100 ICrating=6 mfg=Central_Semi)
.MODEL mjf44h11 npn IS=1.32547e-11 BF=164.27 NF=1.16023 VAF=46.9759 IKF=4.32946 ISE=2.61723p NE=1.62633 BR=1.80421 NR=1.16498 VAR=469.765 IKR=0.670133 ISC=2.61723p NC=3.00051 RB=1.61538 IRB=0.1 RBM=0.1 RE=0.00864486 RC=0.0432243 XTB=0.1 XTI=1 EG=1.05 CJE=1.04839e-09 VJE=0.651544 MJE=0.353502 TF=3.84017e-09 XTF=1.35721 VTF=0.995712 ITF=0.999991 CJC=3.7959e-10 VJC=0.422311 MJC=0.334082 XCJC=0.803125 FC=0.533765 TR=1.93641e-08 PTF=0
.MODEL 2SC2413K npn IS=40f BF=378.97 VAF=100 IKF=.11754 ISE=403.75f NE=1.4655 BR=6.6209 VAR=100 IKR=11.942m ISC=41.950p NC=2.0763 NK=.82547 RB=12.661 RC=1.0143 CJE=3.8356p MJE=.37142 CJC=2p MJC=.19187 TF=299.22p XTF=26.349 VTF=8.3572 ITF=1.0238 TR=26.534n XTB=1.5
.MODEL 2SC4098 NPN IS=40f BF=378.97 VAF=100 IKF=.11754 ISE=403.75f NE=1.4655 BR=6.6209 VAR=100 IKR=11.942m ISC=41.950p NC=2.0763 NK=.82547 RB=12.661 RC=1.0143 CJE=3.8356p MJE=.37142 CJC=2p MJC=.19187 TF=299.22p XTF=26.349 VTF=8.3572 ITF=1.0238 TR=26.534n XTB=1.5
.model 2N344 PNP(Is=100p bf=22 Vaf=15 Cje=5p Cjc=2.5p Tf=3n Eg=.67 Rb=100 Re=10 MFG=GERMANIUM-TYPE)
.MODEL ECG101 NPN (IS=1.51N NF=1 BF=52 VAF=80.5 IKF=0.18 ISE=16.8N NE=2 BR=4 NR=1 VAR=80 IKR=0.27 RE=0.172 RB=0.687 RC=68.7M XTB=1.5 CJE=38.2P VJE=1.1 MJE=0.5 CJC=12.3P VJC=0.3 MJC=0.3 TF=31.8N TR=22.1U Vceo=20 ICrating=300m MFG=GERMANIUM-TYPE)
.MODEL ECG103 NPN (IS=1.25N NF=1 BF=117 VAF=72 IKF=0.15 ISE=6.22N NE=2 BR=4 NR=1 VAR=80 IKR=0.225 RE=0.206 RB=0.824 RC=82.4M XTB=1.5 CJE=33P VJE=1.1 MJE=0.5 CJC=10.7P VJC=0.3 MJC=0.3 TF=79.5N TR=55.2U Vceo=16 ICrating=250m MFG=GERMANIUM-TYPE)
.MODEL ECG103A NPN (IS=2.51N NF=1 BF=136 VAF=102 IKF=0.3 ISE=10.7N NE=2 BR=4 NR=1 VAR=40 IKR=0.45 RE=0.103 RB=0.412 RC=41.2M XTB=1.5 CJE=58.7P VJE=1.1 MJE=0.5 CJC=18.9P VJC=0.3 MJC=0.3 TF=63.6N TR=44.2U Vceo=32 ICrating=500m MFG=GERMANIUM-TYPE)
.MODEL AC151 pnp(IS=10u ISC=5u ISE=1u IKF=400m ITF=200m NC=2 NE=2 BF=110 BR=5 RB=75 rbm=5 irb=0.25m RC=0.5 RE=0.5 vaf=20 var=20 CJC=75p CJE=30p TR=3u TF=100n FC=0.5 eg=0.72 VJC=0.4 VJE=0.4 VTF=4 MJC=0.4 MJE=0.4 XTB=1.5 XTF=6 XTI=3 Vceo=24 Icrating=200m MFG=GERMANIUM-TYPE)
.MODEL 2SC2705 NPN (IS=9.98627F BF=2K NF=967.67M VAF=100 IKF=49.6929M ISE=1.04163F NE=1.07574 BR=601.257M IKR=462.798U ISC=32.904P RC=899.97M CJE=2P MJE=500M CJC=6.42174P VJC=749.999M MJC=499.509M TF=713.346P XTF=500M VTF=10 ITF=9.9976M TR=10N)
.MODEL 2SA1145 PNP (IS=10F BF=134.853 VAF=100 IKF=109.96M ISE=221.874F NE=1.66575 BR=10 IKR=880.176M ISC=187.58P NC=1.90472 RE=1 RC=15.5104 CJE=2P MJE=500M CJC=6.24728P VJC=692.028M MJC=340.013M TF=1.08385N XTF=16.9293 VTF=9.36211 ITF=670.025M TR=10N)
.MODEL MPS6520 NPN (IS=10.2F NF=1 BF=390 VAF=90 IKF=60M ISE=3.36P NE=2 BR=4 NR=1 VAR=16 IKR=90M RE=0.515 RB=2.06 RC=0.206 XTB=1.5 CJE=17.6P VJE=1.1 MJE=0.5 CJC=5.68P VJC=0.3 MJC=0.3 TF=324P TR=225N Vceo=25 ICrating=100m mfg=Motorola)
.MODEL KSC3503 NPN IS=2.0893E-14 BF=101.5 NF=1 BR=7.655 NR=1.007 ISE=4.3652E-14 NE=1.5 ISC=1.2598n NC=2 VAF=717.25 VAR=13.16 IKF=0.2512 IKR=0.0832 RB=2.98 RBM=0.001 IRB=0.001 RE=0.5305 RC=0.9 QCO=0.05 RCO=50.1187 VO=2.476 GAMMA=1.8231E-7 CJE=6.6039E-11 VJE=0.7017 MJE=0.3253 FC=0.5 CJC=6.6072p VJC=0.5 MJC=0.2439 XCJC=0.6488 XTB=1.4089 EG=1.2129 XTI=3 Vceo=300 Icrating=100m mfg=Fairchild
.MODEL FJP5200 npn (IS=1.24896E-10 BF=220.2 NF=1 BR=1.025 NR=1.0 ISE=2.04807E-8 NE=2 ISC=2.01764n

NC=1.5 VAF=188.7 VAR=100 IKF=5.2182 IKR=1.39087 RB=22.1 RBM=0.00011 IRB=1.51189E-6 RE=0.0032 RC=0.0183 CJE=1.132025E-10 VJE=0.711 MJE=0.304 FC=0.5 CJC=6.88229E-10 VJC=0.84 MJC=0.25 TF=5.1703n TR=3.342E-7 XTB=1.72 EG=0.78 XTI=3)
.MODEL FJP1943 pnp (IS=6.04896E-11 BF=200.2 NF=1 BR=8.805 NR=1.0 ISE=8.24807n NE=2 ISC=4.01764E-10 NC=1.5 VAF=18.7 VAR=20 IKF=2.2182 IKR=0.19087 RB=1.1 RBM=0.000011 IRB=1.51189n RE=0.00611 RC=0.0103 CJE=1.132025E-10 VJE=0.711 MJE=0.304 FC=0.5 CJC=6.88229E-10 VJC=0.84 MJC=0.25 TF=5.3703n TR=3.342E-7 XTB=2.28 EG=0.81 XTI=3)
.MODEL BF871 NPN(IS=7.974f NF=0.993 ISE=2.266E-16 NE=1.18 BF=122 IKF=0.01029 VAF=25.51 NR=0.999 ISC=4.33p NC=1.397 BR=6.235 IKR=0.02746 VAR=19.43 RB=1 IRB=1u RBM=0.5 RE=0.3814 RC=0.439 XTB=0 EG=1.11 XTI=3 CJE=1.742E-11 VJE=0.4581 MJE=0.3092 TF=7.073E-10 XTF=289.5 VTF=6.144 ITF=0.1495 PTF=0 CJC=5.045p VJC=0.197 MJC=0.1947 XCJC=0.1041 TR=1E-08 FC=0.8555)
.MODEL ksp94 PNP IS=1.41254E-13 NF=1.01971 ISE=1.74684E-14 NE=1.1055 BF=59.4 IKF=0.17378 VAF=8.02 NR=1.038 ISC=1.096478E-13 NC=0.9935 BR=15.7813 IKR=0.57894 VAR=7.84 RB=105.0 IRB=1.25893u RBM=1.20226 RE=0.03675 RC=0.43 XTB=1.9403 EG=1.1722 XTI=3 CJE=2.47E-10 VJE=0.824 MJE=0.397 CJC=3.85E-11 VJC=0.5 MJC=0.422 XCJC=0.612 FC=0.5
.MODEL ZTX214 PNP(IS=1.15E-14 BF=330 NF=0.9872 VAF=84.56 IKF=0.1 ISE=5E-14 NE=1.4 BR=13 NR=0.996 VAR=8.15 IKR=0.012 ISC=1.43E-14 NC=1.1 RB=0.2 RE=0.4 RC=0.95 CJE=1.6E-11 TF=4.93E-10 CJC=1.05E-11 VJC=0.565 MJC=0.415 TR=7.355E-8 mfg=Zetex)
.MODEL ZTX109 NPN(IS=1.8E-14 BF=400 NF=0.9955 VAF=80 IKF=0.14 ISE=5E-14 NE=1.46 BR=35.5 NR=1.005 VAR=12.5 IKR=0.03 ISC=1.72E-13 NC=1.27 RB=0.56 RE=0.6 RC=0.25 CJE=1.3E-11 TF=6.4E-10 CJC=4p VJC=0.54 TR=5.072E-8 mfg=Zetex)
.model 2n697 npn IS=7.370E-14 BF=7.432E+01 NF=1 VAF=2.838E+02 IKF=8.500E-01 ISE=3.713E-14 NE=1.303 BR=1.983 NR=1.033 VAR=4.811E+01 IKR=1.494E-02 ISC=9.322E-13 NC=1.205 IRB=1.000E-04 RE=1.641 RC=4.971 CJE=8.523E-11 VJE=7.288E-01 MJE=3.415E-01 TF=1.383n XTF=5.975E+01 VTF=3.900E-01 ITF=4.746E-01 PTF=0 CJC=2.684E-11 VJC=5.359E-01 MJC=3.748E-01 TR=1.714E-07 XTB=1.5 EG=1.11 XTI=3 FC=0.5
.MODEL mje340 NPN(IS=1.03431e-13 BF=172.974 NF=0.939811 VAF=27.3487 IKF=0.0260146 ISE=4.48447e-11 NE=1.61605 BR=16.6725 NR=0.796984 VAR=6.11596 IKR=0.10004 ISC=9.99914e-14 NC=1.99995 RB=1.47761 IRB=0.2 RBM=1.47761 RE=0.0001 RC=1.42228 XTB=2.70726 XTI=1 EG=1.206 CJE=1e-11 VJE=0.75 MJE=0.33 TF=1e-09 XTF=1 VTF=10 ITF=0.01 CJC=1e-11 VJC=0.75 MJC=0.33 XCJC=0.9 FC=0.5 CJS=0 VJS=0.75 MJS=0.5 TR=1e-07 PTF=0 Vceo=300 Icrating=0.5A mfg=OnSemi)
.MODEL qmje340 NPN(IS=1.03431e-13 BF=172.974 NF=0.939811 VAF=27.3487 IKF=0.0260146 ISE=4.48447e-11 NE=1.61605 BR=16.6725 NR=0.796984 VAR=6.11596 IKR=0.10004 ISC=9.99914e-14 NC=1.99995 RB=1.47761 IRB=0.2 RBM=1.47761 RE=0.0001 RC=1.42228 XTB=2.70726 XTI=1 EG=1.206 CJE=1e-11 VJE=0.75 MJE=0.33 TF=1e-09 XTF=1 VTF=10 ITF=0.01 CJC=1e-11 VJC=0.75 MJC=0.33 XCJC=0.9 FC=0.5 CJS=0 VJS=0.75 MJS=0.5 TR=1e-07 PTF=0 Vceo=300 Icrating=0.5A mfg=OnSemi)
.MODEL mje350 PNP(IS=6.01619f BF=157.387 NF=0.910131 VAF=23.273 IKF=0.0564808 ISE=4.48479p NE=1.58557 BR=0.1 NR=1.03823 VAR=4.14543 IKR=0.0999978 ISC=1.00199e-13 NC=1.98851 RB=0.1 IRB=0.202965 RBM=0.1 RE=0.0710678 RC=0.355339 XTB=1.03638 XTI=3.8424 EG=1.206 CJE=1e-11 VJE=0.75 MJE=0.33 TF=1e-09 XTF=1 VTF=10 ITF=0.01 CJC=1e-11 VJC=0.75 MJC=0.33 XCJC=0.9 FC=0.5 CJS=0 VJS=0.75 MJS=0.5 TR=1e-07 PTF=0 Vceo=300 Icrating=0.5A mfg=OnSemi)
.MODEL qmje350 PNP(IS=6.01619f BF=157.387 NF=0.910131 VAF=23.273 IKF=0.0564808 ISE=4.48479p NE=1.58557 BR=0.1 NR=1.03823 VAR=4.14543 IKR=0.0999978 ISC=1.00199e-13 NC=1.98851 RB=0.1 IRB=0.202965 RBM=0.1 RE=0.0710678 RC=0.355339 XTB=1.03638 XTI=3.8424 EG=1.206 CJE=1e-11 VJE=0.75 MJE=0.33 TF=1e-09 XTF=1 VTF=10 ITF=0.01 CJC=1e-11 VJC=0.75 MJC=0.33 XCJC=0.9 FC=0.5 CJS=0 VJS=0.75 MJS=0.5 TR=1e-07 PTF=0 Vceo=300 Icrating=0.5A mfg=OnSemi)
.MODEL KSA1182 pnp(IS=5.7544E-14 BF=254 NF=1 BR=11.42 NR=0.995 ISE=1.90546E-13 NE=2 ISC=5.24807p NC=2 VAF=714.539 VAR=10.31 IKF=0.47863 IKR=0.057544 RB=860 RBM=1.099 IRB=1.77828u RE=1.4 RC=1.8 CJE=3.172039E-11 VJE=0.748394 MJE=0.3714983 FC=0.5 CJC=1.947968E-11 VJC=0.5403711 MJC=0.3242059 TF=7.962E-10 XTB=1.7722 EG=1.2236 XTI=3 mfg=Fairchild)
.MODEL KSA1015 PNP (IS=3.09029E-14 BF=181.5 NF=1 BR=5.615 NR=1 ISE=1.7378E-14 NE=1.5 ISC=1.31826E-13 NC=1.5 VAF=56.5 VAR=10.8 IKF=1.21 IKR=0.0524807 NK=0.883 RB=9.5 RBM=4.72 IRB=5.623413E-7 RE=0.56 RC=5.4 CJE=1.7403E-11 VJE=0.777948 MJE=0.372295 FC=0.5 CJC=9.70035p VJC=0.523999 MJC=0.283255 XCJC=0.45 TF=1.99n XTB=1.182 EG=1.1574 XTI=3 mfg=Fairchild)
.MODEL KSC1815 NPN (IS=2.04174E-14 BF=127.6 NF=1 BR=4.595 NR=1 ISE=1.20226E-14 NE=1.5 ISC=1.31826E-13 NC=1.5 VAF=121.25 VAR=24.03 IKF=1.13 IKR=0.793 NK=0.853 RB=34 RBM=17.083 IRB=5.62341u RE=0.38 RC=7.7 CJE=2.041E-11 VJE=0.692258 MJE=0.315545 FC=0.5 CJC=6.29422p VJC=0.410107 MJC=0.247613 XCJC=0.45 TF=1.99n XTB=1.6738 EG=1.1971 XTI=3 mfg=Fairchild)
.MODEL ZXT13P20DE6 PNP IS=1.3p NF=1 BF=450 IKF=6 VAF=15 ISE=0.8E-13 NE=1.4 NR=1 BR=210 VAR=5 ISC=4e-14 NC=1.18 RB=1 RE=.0075 RC=.07 CJC=235p MJC=0.38 VJC=0.51 CJE=674p MJE=0.52 VJE=0.95 TF=1.1n TR=3.6n XTB=1.5 Vceo=20 Icrating=3.5 mfg=Zetex

.MODEL FJT44 NPN IS=4.24p BF=110 NF=1 VAF=68.7 IKF=0.264 ISE=3.184E-10 NE=2 BR=0.00452 NR=1 VAR=100 IKR=1.981E-2 ISC=1p NC=2.0 RB=0.065 RE=0.0012 RC=1.615 FC=0.5 CJE=1.001E-10 VJE=0.9319 MJE=0.3121 CJC=1.799E-11 VJC=0.5529 MJC=0.4051 EG=1.15 XTB=2.15 XTI=3 mfg=Fairchild
.MODEL BD166 PNP (BF=68.588 BR=5 CJC=5P CJE=2P IKF=291.742824770597M IKR=1000 IS=10F ISC=100P ISE=1.025255687498P ITF=12.665625454832M MJC=0.5 MJE=0.5 NC=2.000000002364 NE=1.571835481126 RE=0.5 TF=18.162056423086N TR=10N VAF=100 VTF=10 XTF=0.5 Vceo=45 Icrating=1.5)
.MODEL 2N1132 NPN (IS=9.99916F BF=55.9464 NF=998.061M VAF=100 IKF=9.98401K ISE=3.62279F NE=1.10688 BR=1.55171 IKR=9.99993M ISC=106.162P RE=3.44553 RC=5.64395 CJE=104.717P VJE=700.004M MJE=499.511M CJC=175.838P VJC=699.998M MJC=499.794M TF=2.66025N XTF=500.005M VTF=10 ITF=9.68022M TR=10N).
.model 2SC3357 NPN (IS=684.2e-18 BF=161.1 VAF=51 IKF=574.6m BR=10.71 VAR=2.1 IKR=28.05m ISE=1.0e-18 NE=1.193 ISC=6.211e-18 NC=1.1 RB=3 IRB=75.9e-5 RBM=1 RE=2.67 RC=3.5 CJE=1.847p VJE=1.014 MJE=464.8m CJC=1.086p VJC=617.4m MJC=353.8m XCJC=0.1 FC=0.5 TF=23p XTF=0.39 VTF=0.668 ITF=0.06 TR=100p PTF=20 EG=1.11 XTI=3 XTB=0 Vceo=12 Icrating=100m mfg=NEC)
.MODEL 2n2102 npn IS=1.1791e-10 BF=79.3546 NF=1.42901 VAF=30.134 IKF=0.640083 ISE=7.91563p NE=3.31476 BR=3.76239 NR=1.5 VAR=3.69384 IKR=2.76346 ISC=3.24999e-13 NC=3.96875 RB=0.1 IRB=0.1 RBM=0.1 RE=0.00431604 RC=0.38569 XTB=0.1 XTI=1 EG=1.05 CJE=1e-11 VJE=0.75 MJE=0.33 TF=1n XTF=1 VTF=10 ITF=0.01 CJC=1.3035e-11 VJC=0.62509 MJC=0.23 XCJC=0.9 FC=0.5 CJS=0 VJS=0.75 MJS=0.5 TR=1e-07 PTF=0
.MODEL 2SC3052 NPN IS=43.773f BF=375.71 VAF=86.6 IKF=.7 ISE=43.773f NE=1.7679 BR=8.5951 VAR=5 IKR=10.01m ISC=145.43p NC=2.2998 NK=.68987 RB=9.7807 RC=.6642 CJE=15.662p VJE=.83869 MJE=.38051 CJC=6.4060p VJC=.46595 MJC=.2832 TF=558.14p XTF=294.17 VTF=315.74 ITF=4.6695 TR=195.43n XTB=1.5
.MODEL DSA8102 PNP IS=285f BF=167.62 VAF=34 IKF=4.6 ISE=1.72f NE=1.2832 BR=10 VAR=5.9 IKR=180m ISC=250f NC=1.1464 NK=1 RE=0.15 RB=0.075 RC=0.18 CJE=107.02p VJE=0.87293 MJE=0.44464 CJC=30.032p VJC=0.42134 MJC=0.26843 FC=0.8 TF=1.0412n XTF=2.2909 VTF=2.2796k ITF=1.7986 TR=10n XTB=1.77 XTI=4.0
.MODEL 2SC3518 NPN IS=709.89f BF=431.07 VAF=57.697 IKF=19.978 ISE=709.93f NE=1.3389 BR=499.5 VAR=100 IKR=5.0102 ISC=817.89f NC=1.1585 NK=.94521 RB=.74114 RC=46.045m CJE=1.2537n VJE=.7026 MJE=.35297 CJC=248.80p VJC=.57919 MJC=.41657 TF=1.3153n XTF=102.32 VTF=4.4459 ITF=92.645 TR=49.083n TRC1=2m TRB1=3.0E-2 XTB=1.5
.model 2SC2075 NPN(Is=10f Eg=1.11 Bf=127.6 Ise=12.37f Ne=1.196 Ikf=40 Nk=1.838 Xtb=1.5 Cjc=103p Mjc=.43 Vjc=1.25 Cje=100p Tr=10n Tf=1.633n Itf=50 Xtf=52.5 Vtf=10 Vceo=80 Icrating=4 mfg=Toshiba)
.MODEL 2n5657 npn IS=2.60089e-13 BF=46.1881 NF=0.9868 VAF=61.921 IKF=6.79554 ISE=7.20462p NE=3.28966 BR=4.46937 NR=0.866274 VAR=7.19873 IKR=3.17468 ISC=1.74986e-13 NC=3.90625 RB=10.927 IRB=0.1 RBM=0.1 RE=0.0141049 RC=2.43986 XTB=0.136699 XTI=1.1199 EG=1.206 CJE=2.13868e-10 VJE=0.99 MJE=0.391421 TF=1.01847e-08 XTF=1.77369 VTF=3.60195 ITF=0.226713 CJC=4.74919e-11 VJC=0.95 MJC=0.361447 XCJC=0.789467 FC=0.8 TR=9.5407u PTF=0
.model 2N6517 NPN(Is=37.71f Xti=3 Eg=1.11 Vaf=100 Bf=943.2 Ne=1.194 Ise=38.57f Ikf=.1418 Xtb=1.5 Br=7.24 Nc=2 Isc=0 Rc=7 Cjc=13.97p Mjc=.4696 Vjc=.75 Fc=.5 Cje=57.62p Mje=.3536 Vje=.75 Tr=876.8n Tf=2.056n Itf=.65 Vtf=14 Xtf=200 Rb=10 Vceo=350 Icrating=0.5)
.MODEL Q2N6517 NPN (IS=67.3F NF=1 BF=320 VAF=336 IKF=90M ISE=97.3P NE=2 BR=4 NR=1 VAR=24 IKR=.135 RE=9.63 RB=38.5 RC=3.85 XTB=1.5 CJE=58P VJE=1.1 MJE=.5 CJC=13.3P VJC=.3 MJC=.3 TF=795P TR=5.1U Vceo=350 Icrating=0.5)
.model bd907 npn IS=4.150E-13 BF=337.8 NF=0.9 VAF=100 IKF=5.123E-01 ISE=2.086E-10 NE=1.609 BR=3 VAR=50 ISC=0 NC=2 RB=3.5 RC=1 CJE=1.500E-08 VJE=7.500E-01 MJE=3.300E-01 TF=3.038E-08 XTF=1.93 VTF=3.842 ITF=3.827E+01 PTF=0 CJC=3.388E-10 VJC=0.1 MJC=3.598E-01 TR=5.065E-07 XTB=1.5 EG=1.11 XTI=3 FC=0.5
.model bd908 pnp IS=1n BF=350 NF=1.009 VAF=100 IKF=3.571E-01 ISE=2.107E-08 NE=1.897 BR=4.056 VAR=50 ISC=0 NC=2 RB=1.297 RE=2.911E-02 RC=1.674E-01 CJE=1.400E-08 VJE=7.500E-01 MJE=3.300E-01 TF=2.767E-08 XTF=7.974E-01 ITF=3.675E+01 PTF=0 CJC=4.267E-10 VJC=0.22 MJC=3.49E-01 TR=270n XTB=0 EG=1.11 XTI=1.5 FC=0.5
.MODEL MJE15034 NPN (IS=3.92866p BF=260.938 NF=1.02215 VAF=15.3399 IKF=0.160087 ISE=1e-08 NE=2.54491 BR=26.0938 NR=1.10885 VAR=153.399 IKR=1.60087 ISC=10n NC=1.89024 RB=0.41209 IRB=0.1 RBM=0.41209 RE=0.0001 RC=0.208002 XTB=0.897431 XTI=1.39234 EG=1.206 CJE=1.61534n VJE=0.698417 MJE=0.382854 TF=1.03079n XTF=1000 VTF=100000 ITF=42.9041 CJC=1.04458e-10 VJC=0.441587 MJC=0.23 XCJC=1 FC=0.8 TR=100n PTF=0 mfg=OnSemi)
.MODEL MJE15035 PNP (IS=5.81508f BF=313.373 NF=0.85 VAF=40.5017 IKF=0.897023 ISE=6.74258e-16 NE=1.04249 BR=0.958017 NR=0.894461 VAR=148.639 IKR=7.05393 ISC=6.74258e-16 NC=2.84461 RB=3.62039 IRB=0.1 RBM=0.1 RE=0.000923293 RC=0.233799 XTB=2.92628 XTI=1.01325 EG=1.17461 CJE=1.5597n VJE=0.99 MJE=0.554057 TF=1.35882n XTF=1000 VTF=467.207 ITF=58.3338 CJC=1.58888e-10 VJC=0.4 MJC=0.23 XCJC=0.786287 FC=0.8 TR=100n PTF=0 mfg=OnSemi)
.model 2N3585 NPN(Is=915f Xti=3 Eg=1.11 Vaf=100 Bf=247.7 Ise=39.59p Ne=1.547 Ikf=.3138 Nk=.5973 Xtb=2.2 Var=100 Br=14.99 Isc=285.2p Nc=1.423 Ikr=.8443 Rc=.4036 Cjc=146.5p Mjc=.3375 Vjc=.3905 Fc=.5 Cje=733.3p Mje=.6277 Vje=1.878 Tr=1.722u Tf=3.962n Itf=6.051 Xtf=48.54 Vtf=10)

.model 2N3868 PNP(Is=20.4f Xti=3 Eg=1.11 Vaf=100 Bf=127.3 Ise=2.393p Ne=1.431 Ikf=29.49 Nk=1.325 Xtb=1 Var=100 Br=3.462 Isc=20.4f Nc=1.659 Ikr=.9991 Rc=.2438 Cjc=201.9p Mjc=.4284 Vjc=.9346 Fc=.5 Cje=459p Mje=.2692 Vje=.3905 Tr=98.05n Tf=2.593n Itf=1 Xtf=0 Vtf=10)
.model 2N3506 NPN(Is=86.76f Xti=3 Eg=1.11 Vaf=100 Bf=116.1 Ise=190.9p Ne=2.064 Ikf=2.36 Nk=.6321 Xtb=1.5 Var=100 Br=30m Isc=1p Nc=2 Ikr=1 Rc=.2 Cjc=48.58p Mjc=.3333 Vjc=.75 Fc=.5 Cje=256.5p Mje=.3333 Vje=.75 Tr=2.112u Tf=1.867n Itf=1 Xtf=0 Vtf=10)
.model 2N6032 NPN(Is=2.767p Xti=3 Eg=1.11 Vaf=100 Bf=112.2 Ise=2.767p Ne=1.323 Ikf=36.77 Nk=.7385 Xtb=1.5 Var=100 Br=10 Isc=10f Nc=5 Ikr=50 Rc=11m Cjc=1.914n Mjc=.3625 Vjc=.3905 Fc=.5 Cje=10n Mje=.3333 Vje=.75 Tr=361.8n Tf=40n Itf=1 Xtf=0 Vtf=10)
.MODEL 2N5794 NPN IS=17.882E-18 BF=259.74 VAF=100 IKF=1.7249 ISE=3.5488f NE=1.5028 BR=2.2512 VAR=100 IKR=20 ISC=3.9625n NC=2.997 NK=1.1338 RC=.58862 CJE=26.137p MJE=.45696 CJC=17.393p MJC=.46853 TF=77.901p XTF=9.99 VTF=10 ITF=1.1273m TR=1n XTB=1.75
.MODEL MPSA93 PNP(BF=98 BR=4.78 CJC=4.66E-11 CJE=9.54E-11 EG=1.11E+00 FC=5E-01 IKF=3.49E-02 IKR=1.00E+00 IRB=7.02E-04 IS=9.53E-14 ISC=9.99E-11 ISE=8.37E-13 ITF=4.12E-01 MJC=7.00E-01 MJE=4.26E-01 NC=1.5 NE=1.49 NR=1.55 PTF=0 RB=2.76E+01 RBM=6.66E-02 RC=1.00E-02 RE=1E-02 TF=9.52E-10 VAF=2.6E+02 VAR=1.4E+02 VJC=3.00E-01 VJE=3.00E-01 VJS=7.50E-01 VTF=9.99E+05 XTB=0 XTF=1.03 XTI=3)
.MODEL MPSA44 NPN IS=186.36f BF=60.596 VAF=9.2909 IKF=.1107 ISE=1.8215p NE=1.5767 BR=499.5 VAR=100 IKR=19.98 ISC=1.2445u NC=2.997 NK=.78598 RE=490u RB=5.2315 RC=1m CJE=104.69p VJE=1.0643 MJE=.41036 CJC=9.8356p VJC=.35 MJC=.28065 TF=5.1798n XTF=3.2122 VTF=25.04 ITF=.19258 TR=6.837u
.MODEL bd237 npn IS=3.39253p BF=108.002 NF=0.85 VAF=54.0829 IKF=1.0435 ISE=6.43245p NE=3.3968 BR=4.46493 NR=0.843007 VAR=4.13248 IKR=3.42156 ISC=3.89999e-13 NC=3.99 RB=8.81471 IRB=0.1 RBM=0.1 RE=0.00101545 RC=0.282939 XTB=0.1 XTI=1 EG=1.206 CJE=6.77107e-08 VJE=0.559947 MJE=0.503582 TF=10n XTF=1.35725 VTF=0.996034 ITF=0.999921 CJC=4.44295e-10 VJC=0.400232 MJC=0.41007 XCJC=0.803125 FC=0.598714 TR=100n PTF=0
.MODEL bd238 pnp IS=6.82166e-13 BF=112.18 NF=0.852203 VAF=88.5742 IKF=0.971633 ISE=6.55349p NE=3.38335 BR=4.87698 NR=0.829022 VAR=4.07273 IKR=6.06127 ISC=3.89994e-13 NC=3.99 RB=9.80893 IRB=0.1 RBM=0.1 RE=0.000963169 RC=0.239477 XTB=0.100036 XTI=1.0218 EG=1.206 CJE=6.4357e-08 VJE=0.569245 MJE=0.494207 TF=1e-08 XTF=1.35725 VTF=0.99604 ITF=0.999923 CJC=4.44225e-10 VJC=0.400202 MJC=0.41017 XCJC=0.803125 FC=0.59817 TR=100n PTF=0
.MODEL 2N3439 NPN (Is=2.644p Xti=3 Eg=1.11 Vaf=100 Bf=1.557K Ne=1.305 Ise=5.292p Ikf=38.4m Xtb=1.5 Br=10.22 Nc=2 Isc=0 Ikr=0 Rc=6 Cjc=24.28p Mjc=.4169 Vjc=.75 Fc=.5 Cje=105.8p Mje=.3681 Vje=.75 Tr=303.6n Tf=2.033n Itf=5 Vtf=10 Xtf=20 Rb=10 Vceo=350 Icrating=1 mfg=Motorola)
.MODEL 2n3439_ npn IS=4.95669e-14 BF=217.608 NF=0.989177 VAF=144.204 IKF=1.16129 ISE=7.22363p NE=2.22456 BR=1.16323 NR=0.965806 VAR=35.1857 IKR=10 ISC=7.22363p NC=3.89846 RB=14.7195 IRB=0.1 RBM=0.1 RE=0.00296577 RC=0.408396 XTB=1.32969 XTI=4 EG=1.206 CJE=1.17247e-10 VJE=0.4 MJE=0.306342 TF=5.70574e-09 XTF=1000 VTF=3.89508 ITF=0.608387 CJC=1.89145e-11 VJC=0.501432 MJC=0.30394 XCJC=0.1 FC=0.8 TR=100n PTF=0 Vceo=350 Icrating=1
.MODEL 2SA1316 PNP (IS=10.1F NF=1 BF=910 VAF=161 IKF=60M ISE=1.11P NE=2 BR=4 NR=1 VAR=20 IKR=90M RE=3.15 RB=12.6 RC=1.26 XTB=1.5 CJE=45.5P VJE=1.1 MJE=.5 CJC=14.6P VJC=.3 MJC=.3 TF=3.18N TR=2.21U Vceo=80 Icrating=0.1A mfg=Toshiba
.MODEL 2SC3329 NPN(Is=214.8f Xti=3 Eg=1.11 Vaf=215.7 Bf=358.9 Ise=2.465p Ne=2.265 Ikf=1.542 Nk=.8514 Xtb=1.5 Var=100 Br=6.713 Isc=303.1f Nc=1.158 Ikr=787.1 Rc=5.9 Cjc=19.21p Mjc=.3345 Vjc=.3905 Fc=.5 Cje=5p Mje=.3333 Vje=.75 Tr=10n Tf=3.395n Itf=1 Xtf=0 Vtf=10 Vceo=80 Icrating=0.1A mfg=Toshiba
.MODEL 2N6546 NPN (Is=204f Xti=3 Eg=1.11 Vaf=100 Bf=59.51 Ise=498.8f Ne=1.194 Ikf=26.17 Nk=.914 Xtb=1.5 Br=781.1 Isc=228.7f Nc=1.311 Ikr=23.63 Rc=17.8m Cjc=2.222n Mjc=.3333 Vjc=.5 Fc=.5 Cje=9.603n Mje=.3333 Vje=.5 Tr=657.9n Tf=8.247n Itf=882.8 Xtf=385 Vtf=10 mfg=Harris)
.model af124 PNP(Is=34.46n Xti=3 Eg=1.11 Vaf=100 Bf=171.3 Ise=199.4n Ne=5.944 Ikf=27.01m Nk=.5 Xtb=1.5 Br=1 Isc=0 Nc=2 Ikr=0 Rc=0 Cjc=4.3p Mjc=.3333 Vjc=.75 Fc=.5 Cje=15p Mje=.3333 Vje=.75 Tr=100n Tf=1.256n Itf=2.175 Xtf=8.882K Vtf=10 MFG=GERMANIUM-TYPE)
.MODEL 2SC2911 npn (IS=53f BF=160 VAF=11 IKF=100m ISE=10p NE=2 BR=11 VAR=30 IKR=90m ISC=1.1n NC=2 RB=30 IRB=600u RBM=17.6 RE=190m RC=165m XTB=0 EG=1.11 XTI=3 CJE=54p VJE=680m MJE=325m TF=700p XTF=200 VTF=500 ITF=4 PTF=0 CJC=10p VJC=500m MJC=160m TR=50n FC=0.5
.MODEL 2SC2911_ NPN(IS=1.91E-13 ISE=4.9E-11 NF=1.073 NE=2.8 BF=274 IKF=0.0836 VAF=320 CJC=6.4p TF=8.84E-10 MJC=0.31 VJC=0.98 CJE=6.4p MJE=0.3 VJE=0.4
.model KC509 NPN (BF=1500 BR=2 IS=12P CJC=2.8P CJE=1.4P RC=1.01U VAF=100 TF=718.4P TR=10N MJC=375.7M VJC=690M MJE=375.77M VJE=690.00M NF=1.259 ISE=33.7P ISC=0.001566F IKF=9.44M IKR=4.62K NE=2.18 RE=32.4M VTF=113.5 ITF=533.9K XTF=19.25M)
.model 2SC2334 NPN(Is=704.9f Xti=3 Eg=1.11 Vaf=100 Bf=212.2 Ise=1.526p Ne=1.244 Ikf=32.01 Nk=1.034 Xtb=1.5 Br=7.171 Isc=13.08u Nc=7.357 Ikr=21.29 Rc=36.51m Cjc=100p Cje=100p Tr=655.2n Tf=6.359n Vceo=100 Icrating=7 mfg=NEC)

.model 2SC2810 NPN(Is=17.71f Xti=3 Eg=1.11 Vaf=100 Bf=10 Br=1 Isc=17.71f Tr=5u Tf=8.84n Vceo=400 Icrating=7 mfg=Savantic)
.model 2SC3089 NPN(Is=30.78n Xti=3 Eg=1.11 Vaf=100 Bf=31.61 Ise=121.5n Ne=1.534 Ikf=3.227 Nk=.5628 Xtb=1.5 Br=7.814 Isc=31.71n Nc=1.128 Ikr=7.78 Rc=.1275 Cjc=194.3p Cje=200p Tr=4.798u Tf=8.822n Vceo=500 Icrating=7 mfg=Sanyo)
.MODEL MPS4250 PNP (IS=9.85F RE=3.18 RC=1 RB=10 VAF=56.7 VAR=28.3 ISE=22.4F ISC=22.4F NE=1.5 NC=1.5 NS=1 BF=729 BR=5 IKF=22.7M IKR=22.7M CJC=13.1P CJE=17.3P VJC=515M VJE=185 MJC=330M MJE=28.3 TF=531P TR=69N)
.model 2SC5201 NPN (IS=1.7e-13 BF=170 BR=0.5 RC=1 RB=2 IKF=0.15 NK=0.9 ISE=2e-13 NE=1.5 VAF=16 CJC=15p CJE=22p)
.model 2SC3675 NPN(IS=5.2e-14 BF=50 BR=0.05 RC=15 RB=50 IKF=0.22 NK=0.9 ISE=1e-14 NE=1.5 VAF=16 CJC=7p CJE=10p TF=2.7e-8)
.model 2SC3676 NPN(IS=2.9f BF=50 BR=0.1 RC=2 RB=10 IKF=0.2 NK=0.7 ISE=1f NE=1.5 VAF=16 CJC=22p CJE=33p TF=2.7e-8)
.model 2SC5466 NPN(IS=8.1f BF=28 BR=0.02 RC=1 RB=4 IKF=0.1 NK=0.9 ISE=1p NE=1.5 VAF=16 CJC=7p CJE=10p TF=2.9e-8)
.MODEL 2N5320 NPN (IS=108.76f BF=75.557 VAF=100 IKF=19.981 ISE=108.76f NE=1.2954 BR=8.1070 VAR=100 IKR=1.2571 ISC=10.535p NC=1.3628 NK=1.2746 RB=1.6598 RC=.19817 CJE=314.72p VJE=.69158 MJE=.32398 CJC=69.649p VJC=.51925 MJC=.35642 TF=1.3723n XTF=9.6209 VTF=10.153 ITF=6.1352 TR=10n Vceo=100 Icrating=2 mfg=CentralSemi)
.MODEL MPS3866 NPN (IS=40.6F NF=1 BF=130 VAF=98.6 IKF=0.24 ISE=40.3P NE=2 BR=4 NR=1 VAR=14 IKR=0.36 RE=0.129 RB=0.515 RC=51.5M XTB=1.5 CJE=48.4P VJE=1.1 MJE=0.5 CJC=15.6P VJC=0.3 MJC=0.3 TF=318P TR=221N)
.model 2N2511 NPN(Is=5.911f Xti=3 Eg=1.11 Vaf=62.37 Bf=659.4 Ne=1.336 Ise=5.911f Ikf=13.81m Xtb=1.5 Br=1.301 Nc=2 Isc=0 Ikr=0 Rc=1.61 Cjc=4.017p Mjc=.3174 Vjc=.75 Fc=.5 Cje=4.973p Mje=.4146 Vje=.75 Tr=4.691n Tf=820.3p Itf=.35 Vtf=4 Xtf=7 Rb=10)
.model MPS8099 NPN(Is=4.872f Xti=3 Eg=1.11 Vaf=100 Bf=9.599K Ne=1.315 Ise=14.65f Ikf=.1434 Xtb=1.5 Br=6.935 Nc=2 Isc=0 Ikr=0 Rc=.7 Cjc=5.805p Mjc=.4312 Vjc=.75 Fc=.5 Cje=10.49p Mje=.4602 Vje=.75 Tr=565p Tf=407p Itf=.18 Vtf=3 Xtf=2.5 Rb=10)
.model MPS8599 PNP(Is=10.68f Xti=3 Eg=1.11 Vaf=100 Bf=187.7 Ne=1.401 Ise=26.07f Ikf=.2203 Xtb=1.5 Br=1.833 Nc=2 Isc=0 Ikr=0 Rc=.8 Cjc=14.16p Mjc=.5585 Vjc=.75 Fc=.5 Cje=25.11p Mje=.3626 Vje=.75 Tr=358.6n Tf=591.1p Itf=1.5 Vtf=12 Xtf=50 Rb=10)
.model 2N5416 PNP(Is=77.48f Xti=3 Eg=1.11 Vaf=100 Bf=53.77 Ne=1.67 Ise=4.061p Ikf=1.205 Xtb=1.5 Br=5.622 Nc=2 Isc=0 Ikr=0 Rc=1.3 Cjc=44.48p Mjc=.4495 Vjc=.75 Fc=.5 Cje=148.7p Mje=.4081 Vje=.75 Tr=617.4n Tf=3.386n Itf=.5 Vtf=8 Xtf=40 Rb=10)
.model 2sb772 PNP(Is=282f Xti=3 Eg=1.11 Vaf=100 Bf=213.6 Ise=1.659p Ne=1.787 Ikf=6.472 Nk=.7894 Xtb=1.5 Var=100 Br=39.18 Isc=12.72p Nc=1.637 Ikr=.1652 Rc=64.89m Cjc=145.6p Mjc=.2985 Vjc=.3905 Fc=.5 Cje=255.3p Mje=.5064 Vje=1.615 Tr=10n Tf=1.927n Itf=6.218 Xtf=0 Vtf=10)
.model 2sd882 NPN(Is=282f Xti=3 Eg=1.11 Vaf=100 Bf=200.7 Ise=288.7f Ne=1.368 Ikf=20 Nk=1.235 Xtb=1.5 Var=100 Br=52.37 Isc=8.515p Nc=1.527 Ikr=.2617 Rc=15.88m Cjc=166.3p Mjc=.4069 Vjc=.3905 Fc=.5 Cje=291.8p Mje=.3606 Vje=.75 Tr=10n Tf=1.551n Itf=1 Xtf=0 Vtf=10)
.MODEL 2SC5198 NPN(IS=10f BF=105 VAF=100 IKF=10m XTB=1.5 BR=.1001 VAR=100 IKR=10m ISC=10f CJE=2p CJC=412.95p MJC=.33333 TF=608p XTF=10 VTF=10 ITF=1 mfg=Toshiba)
.MODEL 2SA1941 PNP IS=1u BF=155 VAF=100 IKF=10m BR=2 VAR=100 IKR=10m ISC=1u CJE=2p CJC=777.32p MJC=.33333 TF=624.93p XTF=10 VTF=10 ITF=1 TR=10n mfg=Toshiba
.model MJ3055 npn (IS=2.37E-13 VAF=200.0 BF=90 IKF=1.8495 NE=1.5319 ISE=2.876E-11 IKR=0.1 ISC=1n NC=1.5 BR=10 RC=0.05 CJC=6.00E-10 FC=0.5 MJC=0.33 VJC=0.5 CJE=3.5n MJE=0.5 VJE=1.5 TF=2.20E-08 ITF=10 VTF=5 XTF=5 RE=0.03 TR=4.4u)
.MODEL mj4502 pnp IS=1.2724e-13 BF=85.6177 NF=0.85 VAF=43.264 IKF=10 ISE=7.56367e-13 NE=2.10325 BR=0.846124 NR=0.884962 VAR=432.64 IKR=4.77195 ISC=1e-16 NC=2.96875 RB=1.17262 IRB=0.1 RBM=0.1 RE=0.00182261 RC=0.0472333 XTB=0.72496 XTI=1.23156 EG=1.05 CJE=1e-07 VJE=0.4 MJE=0.791595 TF=1e-08 XTF=1.35771 VTF=1.0001 ITF=0.999451 CJC=5e-10 VJC=0.400213 MJC=0.410137 XCJC=0.803125 FC=0.775723 CJS=0 VJS=0.75 MJS=0.5 TR=1e-07 PTF=0 KF=0 AF=1
.MODEL bd241c npn IS=1e-09 BF=144.987 NF=0.521792 VAF=16.0104 IKF=1.39046 ISE=8.61786p NE=3.32675 BR=0.1 NR=0.75 VAR=19.8928 IKR=10 ISC=3.98816p NC=3.60784 RB=0.1 RE=0.0001 RC=0.0646733 XTB=0.864855 XTI=1 EG=1.05 CJE=3.18622e-10 VJE=0.491278 MJE=0.48194 TF=1e-08 XTF=4.00977 VTF=7.58156 ITF=0.001 CJC=3.12657e-10 VJC=0.63057 MJC=0.450516 XCJC=0.799994 FC=0.511498 TR=9.57121u PTF=0
.MODEL DSS4160U NPN IS=5E-13 BF=650 NF=1.005 VAF=58 IKF=2 ISE=6E-14 NE=1.4 BR=25 NR=1 VAR=16 IKR=1 ISC=4.8E-13 NC=1.44 RE=0.035 RB=1 RC=0.035 CJE=152p VJE=0.8 MJE=0..4 CJC=27p VJC=0.5 MJC=0.42 TF=0.5n TR=25n RCO=1.9 GAMMA=2E-8 QUASIMOD=1 XTB=1.35 TRE1=0.005 TRB1=0.004 TRC1=0.005

.MODEL CM5160 PNP (IS=4.1802f BF=71.467 VAF=100 IKF=3.999 ISE=4.1869f NE=1.2996 BR=.44876 VAR=100 IKR=.90522 ISC=775.19f NC=1.743 NK=2.0566 RB=3.0617 RC=.35185 CJE=13.679p VJE=1.5 MJE=.57793 CJC=18.02p VJC=.67844 MJC=.5779 TF=190.26p XTF=325.86 VTF=112.07 ITF=9.1737 TR=10n)
.model BF324 PNP(IS=4.031E-16 NF=0.9847 ISE=9.187E-17 NE=1.24 BF=122.5 IKF=0.065 VAF=135 NR=0.991 ISC=4.1E-13 NC=1.37 BR=5.036 IKR=0.04 VAR=8 RB=16 IRB=0.0004 RBM=8 RE=0.402 RC=5 XTB=0 EG=1.11 XTI=3 CJE=2p VJE=0.444 MJE=0.136 TF=2.92E-10 XTF=8 VTF=8 ITF=0.14 PTF=20 CJC=8E-13 VJC=0.2488 MJC=0.1974 XCJC=0.86 TR=3.5E-08 CJS=0 VJS=0.75 MJS=0.333 FC=0.9001 Vceo=30 Icrating=25m mfg=Philips)
.MODEL 2N1893 npn(Is=2.079f Xti=3 Eg=1.11 Vaf=100 Bf=167.2 Ise=24.36f Ne=1.357 Ikf=1.088 Nk=.8271 Xtb=1.5 Br=1.502 Isc=264.6f Nc=1.545 Ikr=.3028 Rc=.9069 Cjc=45.29p Mjc=.31 Vjc=.5 Fc=.5 Cje=58.12p Mje=.441 Vje=.5 Tr=1u Tf=738.1p Itf=2.376 Xtf=24.93 Vtf=10)
.MODEL 2N1613 NPN IS=10f BF=20 VAF=100 IKF=10m BR=.1001 VAR=100 IKR=10.010m ISC=10f CJE=94.85p MJE=.33333 CJC=60.728p MJC=.33333 TF=1.3362En XTF=10 VTF=10 ITF=1 TR=10n mfg=NXP
.MODEL 2N3441 NPN BR=20 CJE=3.47326E-10 EG=1.11 FC=0.5 IKF=0.167 IKR=0.927 IRB=0.257 IS=1.13p ISC=1E-17 ISE=1E-17 ITF=0.001 MJC=0.394068 MJE=0.281415 NC=1.04 NE=2 NF=1.08 NR=0.925 PTF=0 RB=4.4 RBM=3.02 RE=0.0759 Tf=10n VAF=53.9 VAR=72.6 VJC=0.451007 VJE=0.535781 VTF=1 XTB=0 XTI=3 BF=1.730000E+02 CJC=2.132140E-10 RC=5.640000E-02 Tr=10n XTF=1
.MODEL 2N3467 PNP IS=10f BF=104.72 VAF=100 IKF=7.9180 ISE=658.34f NE=1.3999 BR=.38818 VAR=100 IKR=19.925 ISC=2.7698p NC=1.0369 NK=1.7551 RC=.67719 CJE=118.56p MJE=.33333 CJC=60.728p MJC=.33333 TF=766.35p XTF=10 VTF=10 ITF=1 TR=32.32u
.MODEL 2N5192 NPN(Is=1.129p Xti=3 Eg=1.11 Vaf=100 Bf=161 Ise=31.17p Ne=1.557 Ikf=1.948 Nk=.648 Xtb=2 Br=1 Isc=23.5p Nc=1.489 Ikr=31.34m Rc=.1682 Cjc=251.5p Mjc=.5045 Vjc=.75 Fc=.5 Cje=286.3p Mje=.4961 Vje=.75 Tr=810n Tf=23.64n Itf=10.92 Xtf=.3795 Vtf=10 Rb=.1)
.MODEL 2N5193 PNP(Is=632.4f Xti=3 Eg=1.11 Vaf=100 Bf=112.1 Ise=962.8f Ne=1.373 Ikf=2.187 Nk=.6196 Xtb=2.1 Br=66.4 Isc=974.4f Nc=1.207 Ikr=125.8 Rc=.2066 Cjc=508.9p Mjc=.4847 Vjc=.75 Fc=.5 Cje=379.8p Mje=.4937 Vje=.75 Tr=89.17n Tf=17.41n Itf=5.921 Xtf=1.062 Vtf=10 Rb=.1)
.MODEL BC238 NPN (IS=1.8E-14 ISE=5E-14 NF=.9955 NE=1.46 BF=400 BR=35.5 IKF=.14 IKR=.03 ISC=1.72E-13 NC=1.27 NR=1.005 RB=.56 RE=.6 RC=.25 VAF=80 VAR=12.5 CJE=13p TF=.64n CJC=4p TR=50.72n VJC=.54 MJC=.33)
.model MJE15028 NPN (VAF=100 IS=9.3E-08 NF=1.66465 BF=400 NE=2.99976 ISE=1.97E-07 IKF=0.86181 MJE=0.19 CJE=1070p VJC=1 MJC=0.416871 CJC=287.1405p VJC=0.4 TF=5.31n)
.model 2sb536 pnp(CJC=7.7e-11 TF=4n TR=2.38e-07 CJE=2.45e-10 RC=0.33333 VAF=100 IKF=1.05 IS=3f)
.model 2sb539 pnp(CJC=9.24e-10 TF=2.28571428571429e-08 TR=1.19u CJE=2.94n RC=0.05 VAF=100 IKF=7 IS=20f)
.model 2sd287 npn(CJC=6.6e-10 TF=2e-08 TR=1.19u CJE=2.1n RC=0.05 VAF=100 IKF=7 IS=2e-14)
.model 2sd381 npn(CJC=5.5e-11 TF=3.5555n TR=2.38e-07 CJE=1.75e-10 RC=0.3333 VAF=100 IKF=1.05 IS=3f)
.MODEL FZT853 NPN IS=8E-13 NF=0.99 BF=240 IKF=1.4 VAF=200 ISE=4E-13 NE=1.27 NR=0.99 BR=90 IKR=1.4 VAR=46 ISC=100p NC=1.65 CJC=127p MJC=0.46 VJC=.65 CJE=1.07n RB=.3 RC=.014 RE=.014 TF=0.9n TR=20n mfg=Zetex
.MODEL FZT953 PNP IS=1.6649p NF=1.0139 BF=220 IKF=4 VAF=55 ISE=6.2E-13 NE=1.62 NR=1.0107 BR=40 IKR=0.95 VAR=43 ISC=3p NC=1.4 RB=0.032 RE=0.0295 RC=0.034 CJC=265p MJC=0.5286 VJC=0.76 CJE=1.1n TF=0.8n TR=29n XTB=1.4 NK=0.7 TRE1=.0025 TRB1=.0025 TRC1=.0025 mfg=Zetex
.MODEL ZTX953 PNP IS=1.6649p NF=1.0139 BF=220 IKF=4 VAF=55 ISE=6.2E-13 NE=1.62 NR=1.0107 BR=40 IKR=0.95 VAR=43 ISC=3p NC=1.4 RB=0.032 RE=0.0295 RC=0.034 CJC=265p MJC=0.5286 VJC=0.76 CJE=1.1n TF=0.8n TR=29n XTB=1.4 NK=0.7 TRE1=.0025 TRB1=.0025 TRC1=.0025 mfg=Zetex
.MODEL ZTX853 NPN IS=8E-13 NF=0.99 BF=240 IKF=1.4 VAF=200 ISE=4E-13 NE=1.27 NR=0.99 BR=90 IKR=1.4 VAR=46 ISC=100p NC=1.65 CJC=127p MJC=0.46 VJC=.65 CJE=1.07n RB=.3 RC=.014 RE=.014 TF=0.9n TR=20n mfg=Zetex
.MODEL PBSS4240DPN_NPN NPN IS=1.967E-13 NF=0.9876 ISE=1.999E-13 NE=2.5 BF=480 IKF=1 VAF=85 NR=0.9878 ISC=1E-18 NC=2.563 BR=65 IKR=5.5 VAR=12 RB=80 IRB=3E-05 RBM=0.6 RE=0.051 RC=0.073 XTB=0 EG=1.11 XTI=3 CJE=1.158E-10 VJE=0.5499 MJE=0.3105 TF=4.5E-10 XTF=9 VTF=3 ITF=0.8 PTF=0 CJC=2.146E-11 VJC=0.739 MJC=0.4495 TR=15n FC=0.5 mfg=NXP
.MODEL PBSS4240DPN_PNP PNP IS=2.526E-13 NF=0.9959 ISE=1.056E-13 NE=1.763 BF=480 IKF=0.49 VAF=40 NR=0.994 ISC=5.238E-14 NC=1.128 BR=75 IKR=0.3 VAR=10 RB=21 IRB=0.00019 RBM=0.2 RE=0.048 RC=0.085 XTB=0 EG=1.11 XTI=3 CJE=9.2E-11 VJE=0.8407 MJE=0.4065 TF=5.6E-10 XTF=10 VTF=1 ITF=0.4 PTF=0 CJC=3.212E-11 VJC=0.5149 MJC=0.3901 TR=6n FC=0.78 mfg=NXP
.MODEL D44H11_D NPN(IS=2.14e-10 NF=1.271265 BF=208.89 RB=2 RBM=0.1 IRB=10 VAF=342 NE=2.7349 ISE=1e-8 IKF=30 NK=0.9687 BR=4 IKR=1.05 VAR=35 XTF=1800 TF=1.9n ITF=200 VTF=40 CJE=1.4n MJE=0.3092662 VJE=0.4723539 CJC=175.527p MJC=0.383595 VJC=0.479488 TNOM=25 Vceo=80 Icrating=8 mfg=ON)
.MODEL D45H11_D PNP(IS=6.246e-13 NF=0.96736 BF=137 RB=2.5 VAF=135 NE=2.7 ISE=3.06n IKF=11.5 NK=0.55

BR=4 IKR=1.05 VAR=13.5 XTF=800 TF=1.62n ITF=200 VTF=40 CJE=1.65n MJE=0.321191 VJE=0.350637 CJC=371.89p MJC=0.3952624 VJC=0.6393911 TNOM=25 Vceo=80 Icrating=8 mfg=ON)
.MODEL MJl21193_C pnp IS=1.6p BF=110 VAF=300 IKF=4 ISE=5p NE=1.5 NF=0.95 RB=2.0 RBM=2.0 IRB=10 RC=0.06 CJE=13n MJE=0.35 VJE=0.5 RE=0.001 CJC=1.5n MJC=0.5 VJC=0.6 FC=0.5 TF=24n XTF=1.0 VTF=10 ITF=10 TR=100n BR=5 VAR=100 NR=1.1 EG=1.1 XCJC=0.96 XTB=0.1 XTI=1.0 NC=4 ISC=0.3p Vceo=250 Icrating=16A mfg=OnSemi
.MODEL MJl21194_C npn IS=4p BF=70 VAF=500 IKF=14 ISE=1.2n NE=2.0 NF=1.01 RB=3.4 RBM=0.1 IRB=1.0 RC=0.06 CJE=8n MJE=0.35 VJE=0.5 RE=0.01 CJC=1.2n MJC=0.5 VJC=0.6 FC=0.5 TF=21n XTF=90 VTF=10 ITF=100 TR=100n BR=5 VAR=100 NR=1.1 EG=1.1 XCJC=0.96 XTB=0.1 XTI=1.0 NC=4 ISC=0.3p Vceo=250 Icrating=16A mfg=OnSemi
.MODEL MJL1302_C pnp IS=7p BF=114 VAF=550 IKF=30 ISE=1e-7 NE=5 NF=1.0 RB=3.3 RC=0.1 CJE=16n MJE=0.45 VJE=0.8 RE=0.0 CJC=2.3n MJC=0.4 VJC=0.3 FC=0.1 TF=3.0n XTF=1000 VTF=2 ITF=150 TR=100n BR=5 VAR=4.3 NR=1.1 EG=1.1 XCJC=1.0 XTB=0.1 XTI=1.0 NC=4 ISC=0.3p IKR=4.5 CJS=0 VJS=0.75 MJS=0.5 PTF=0 KF=0 AF=1 Vceo=200 Icrating=15 mfg=OnSemi
.MODEL MJl1302A_A pnp IS=9.8145p BF=122.925 NF=1.00 VAF=40 IKF=19 ISE=9.18577762370362E-07 NE=5.0 BR=4.98985 NR=1.09511 VAR=4.32026 IKR=4.37516 ISC=3.25e-13 NC=3.96875 RB=3.30 RE=0.00 RC=0.06 XTB=0.115253 XTI=1.03146 EG=1.11986 CJE=1.561e-08 VJE=0.781803 MJE=0.433868 TF=3.257n XTF=1000 VTF=2.0 ITF=260 CJC=2.346838n VJC=0.27876 MJC=0.411324 XCJC=0.959922 FC=0.1 CJS=0 VJS=0.75 MJS=0.5 TR=1e-07 PTF=0 KF=0 AF=1 Vceo=200 Icrating=15 mfg=OnSemi
.MODEL MJL3281_C npn IS=5p BF=158 VAF=1000 IKF=50 ISE=20p NE=1.5 NF=1.0 RB=3.0 RC=0.1 CJE=11n MJE=0.35 VJE=0.5 RE=0.0 CJC=1.2n MJC=0.5 VJC=0.6 FC=0.1 TF=2.7n XTF=7500 VTF=3 ITF=750 TR=100n BR=5 VAR=4.3 NR=1.1 EG=1.1 XCJC=1.0 XTB=0.12 XTI=1.0 NC=4 ISC=0.3p IKR=4.4 CJS=0 VJS=0.75 MJS=0.5 PTF=0 KF=0 AF=1 Vceo=200 Icrating=15 mfg=OnSemi
.MODEL MJl3281A_A npn IS=9.8145p BF=438.0 NF=1.00 VAF=38 IKF=19.0 ISE=1.0p NE=1.1237388682 BR=4.98985 NR=1.09511 VAR=4.32026 IKR=4.37516 ISC=3.25e-13 NC=3.96875 RB=3.997 RE=0.00 RC=0.06 XTB=0.115253 XTI=1.03146 EG=1.11986 CJE=1.144e-08 VJE=0.468574 MJE=0.34957 TF=2.6769n XTF=7500 VTF=3.0 ITF=1000 CJC=1.093685n VJC=0.623643 MJC=0.482111 XCJC=0.959922 FC=0.1 CJS=0 VJS=0.75 MJS=0.5 TR=1e-07 PTF=0 KF=0 AF=1 Vceo=200 Icrating=15 mfg=OnSemi
.MODEL MJL4281_C npn IS=5p BF=158 VAF=1000 IKF=50 ISE=20p NE=1.5 NF=1.0 RB=3.0 RC=0.1 CJE=11n MJE=0.35 VJE=0.5 RE=0.0 CJC=1.2n MJC=0.5 VJC=0.6 FC=0.1 TF=2.7n XTF=7500 VTF=3 ITF=750 TR=100n BR=5 VAR=4.3 NR=1.1 EG=1.1 XCJC=1.0 XTB=0.12 XTI=1.0 NC=4 ISC=0.3p IKR=4.4 CJS=0 VJS=0.75 MJS=0.5 PTF=0 KF=0 AF=1 Vceo=200 Icrating=15 mfg=OnSemi
.MODEL MJL4302_C pnp IS=7p BF=114 VAF=550 IKF=30 ISE=1e-7 NE=5 NF=1.0 RB=3.3 RC=0.1 CJE=16n MJE=0.45 VJE=0.8 RE=0.0 CJC=2.3n MJC=0.4 VJC=0.3 FC=0.1 TF=3.0n XTF=1000 VTF=2 ITF=150 TR=100n BR=5 VAR=4.3 NR=1.1 EG=1.1 XCJC=1.0 XTB=0.12 XTI=1.0 NC=4 ISC=0.3p IKR=4.4 CJS=0 VJS=0.75 MJS=0.5 PTF=0 KF=0 AF=1 Vceo=200 Icrating=15 mfg=OnSemi
.MODEL NJL1302_C pnp IS=7p BF=114 VAF=571 IKF=30 ISE=1e-7 NE=5 NF=1.0 RB=3.3 RC=0.06 CJE=16n MJE=0.43 VJE=0.78 RE=0.0 CJC=2.3n MJC=0.4 VJC=0.3 FC=0.1 TF=3.0n XTF=1000 VTF=2 ITF=150 TR=100n BR=5 VAR=4.3 NR=1.1 EG=1.1 XCJC=0.96 XTB=0.12 XTI=1.03 NC=4 ISC=0.3p IKR=4.4 CJS=0 VJS=0.75 MJS=0.5 PTF=0 KF=0 AF=1 Vceo=200 Icrating=15 mfg=OnSemi
.MODEL NJL3281_C npn IS=5p BF=158 VAF=1000 IKF=50 ISE=20p NE=1.5 NF=1.0 RB=3.0 RC=0.06 CJE=11n MJE=0.35 VJE=0.5 RE=0.0 CJC=1.2n MJC=0.5 VJC=0.6 FC=0.1 TF=2.7n XTF=7500 VTF=3 ITF=750 TR=100n BR=5 VAR=4.3 NR=1.1 EG=1.1 XCJC=0.96 XTB=0.12 XTI=1.03 NC=4 ISC=0.3p IKR=4.4 CJS=0 VJS=0.75 MJS=0.5 PTF=0 KF=0 AF=1 Vceo=200 Icrating=15 mfg=Onsemi
.MODEL MJE15032_C npn IS=50p BF=105 VAF=2000 IKF=9.0 ISE=10p NE=2 NF=1.2 RB=16 RBM=0.1 IRB=0.1 RC=0.1 CJE=3.1n MJE=0.35 VJE=0.65 RE=0.01 CJC=0.3n MJC=0.4 VJC=0.6 FC=0.5 TF=3.8n XTF=4 VTF=10 ITF=2 TR=100n BR=6 VAR=15 NR=1.5 EG=1.2 XCJC=0.8 XTB=0.7 XTI=1.05 NC=4 ISC=0.4p IKR=5.2 Vceo=250 Icrating=8A mfg=Onsemi
.MODEL MJE15032_A NPN IS=1.2490p NF=1 BF=258 IKF=3.01679 ISE=1.86174e-009 NE=1.99634 NK=0.65578 NR=1.0 BR=4 VAR=20 IKR=4.5 ISC=0 RE=0 RC=30e-3 RB=1.223 RBM=0.061 IRB=0.0548269 TR=5.44e-6 VAF=285 CJC=309.76p MJC=0.370609 VJC=0.2 FC=0.998439 TF=1.94948n XTF=10000 CJE=9.391e-10 VJE=0.796504 MJE=1 ITF=3047.95 Vceo=250 Icrating=8A mfg=Onsemi
.MODEL MJE15033_C pnp IS=300p BF=160 VAF=500 IKF=3.0 ISE=10p NE=2 NF=1.3 RB=5 RBM=0.1 IRB=0.1 RC=0.5 CJE=3.1n MJE=0.35 VJE=0.65 RE=0.01 CJC=0.3n MJC=0.4 VJC=0.6 FC=0.5 TF=3.7n XTF=4 VTF=10 ITF=2 TR=100n BR=5 VAR=15 NR=1.5 EG=1.05 XCJC=0.8 XTB=0.22 XTI=1.0 NC=4 ISC=0.3p IKR=7.5 Vceo=250 Icrating=8A mfg=Onsemi
.MODEL MJE15033_A PNP IS=1.8218p NF=1.0 BF=250 IKF=2.30938 ISE=2.16901e-10 NE=1.6451 NK=0.690173 NR=1.0 BR=4 VAR=20 IKR=4.05 ISC=0 RE=0 RC=30.9e-3 RB=2.292 RBM=7.999e-5 IRB=0.00829722 TR=2.04e-6 VAF=285 CJC=608.41p MJC=0.383513 VJC=0.2 FC=0.96067 TF=1.44563n XTF=10000 CJE=8.0488e-10 VJE=0.779546 MJE=1 ITF=27373 Vceo=250 Icrating=8A mfg=Onsemi

.MODEL MJE243_C npn IS=800f BF=190 VAF=1177 IKF=1.2 ISE=10p NE=1.7 NF=1.06 RB=45 RC=0.2 RE=0.01 CJE=210p MJE=0.4 VJE=1.0 CJC=85p MJC=0.3 VJC=0.4 FC=0.58 TF=3300p XTF=7 VTF=11 ITF=5 TR=1000n BR=1.7 IKR=1.0 EG=1.05 XTB=1.2 XTI=0.8 NC=2.9 ISC=1e-16 NR=1.04 VAR=140 IRB=5e-5 RBM=0.001 XCJC=0.8 Vceo=100 Icrating=4 mfg=OnSemi
.MODEL MJE253_C pnp IS=300f BF=150 VAF=310 IKF=1.2 ISE=30p NE=2 NF=1.015 RB=40 RC=0.3 RE=0.01 CJE=150p MJE=0.35 VJE=1.0 CJC=55p MJC=0.2 VJC=0.35 FC=0.55 TF=3300p XTF=7 VTF=10 ITF=5 TR=1000n BR=4 IKR=4.4 EG=1.05 XTB=1.3 XTI=0.01 NC=2.9 ISC=6e-13 NR=1.15 VAR=50 IRB=7e-6 RBM=0.001 XCJC=0.8 Vceo=100 Icrating=4 mfg=OnSemi
.MODEL BD139_C npn IS=150f BF=260 VAF=99 IKF=1.2 ISE=70f NE=1.2 NF=1.0 RB=5 RC=0.01 RE=0.08 CJE=293p MJE=0.33 VJE=0.67 CJC=49p MJC=0.39 VJC=0.52 FC=0.5 TF=585p XTF=10000 VTF=35 ITF=20 TR=10n BR=78 IKR=0.14 EG=1.21 XTB=1.14 XTI=3 NC=1.45 ISC=19p NR=1.0 VAR=7.5 IRB=0.03 RBM=0.001 XCJC=0.53 Vceo=80 Icrating=1.5A mfg=Fairchild
.MODEL BD140_C pnp IS=120f BF=113 VAF=140 IKF=1.5 ISE=1000f NE=1.5 NF=1 RB=5 RC=0.01 RE=0.1 CJE=220p MJE=0.35 VJE=0.7 CJC=68p MJC=0.35 VJC=0.6 XCJC=0.5 FC=0.5 TF=320p XTF=10000 VTF=35 ITF=20 TR=100n BR=25 IKR=0.1 EG=1.2 XTB=1.5 XTI=3 NC=1.4 ISC=7p NR=1.0 VAR=8 IRB=0.01 RBM=0.01 Vceo=80 Icrating=1.5A mfg=Fairchild
.MODEL BC639-10 NPN IS=7.17E-014 NF=0.9928 ISE=1.113E-014 NE=1.443 BF=119 IKF=0.65 VAF=8 NR=0.9943 ISC=2.266E-014 NC=1.361 BR=35.83 IKR=1.8 VAR=81 RB=10.4 IRB=0.0011 RBM=2.5 RE=0.0864 RC=0.1173 XTB=0 EG=1.11 XTI=3 CJE=1.442E-010 VJE=0.7013 MJE=0.3245 TF=7.8E-010 XTF=7 VTF=5 ITF=2 PTF=0 CJC=2.052E-011 VJC=0.5 MJC=0.4015 XCJC=1 TR=2.3E-008 CJS=0 VJS=0.75 MJS=0.333 FC=0.9 Vceo=80 Icrating=1A mfg=NXP
.MODEL BC639-16 NPN IS=8.811E-014 NF=0.9954 ISE=1.113E-014 NE=1.52 BF=146 IKF=0.465 VAF=8 NR=0.9943 ISC=2.266E-014 NC=1.361 BR=35.83 IKR=1.8 VAR=81 RB=10.4 IRB=0.0011 RBM=2.5 RE=0.0864 RC=0.1173 XTB=0 EG=1.11 XTI=3 CJE=1.442E-010 VJE=0.7013 MJE=0.3245 TF=7.8E-010 XTF=7 VTF=5 ITF=2 PTF=0 CJC=2.052E-011 VJC=0.5 MJC=0.4015 XCJC=1 TR=2.3E-008 CJS=0 VJS=0.75 MJS=0.333 FC=0.9 Vceo=80 Icrating=1A mfg=NXP
.MODEL BC640-10 PNP IS=6.1530E-14 NF=0.9911 ISE=1.382E-16 NE=1.089 BF=150.8 IKF=1.225 VAF=105.4 NR=0.9965 ISC=6.480f NC=1.022 BR=8.074 IKR=0.3627 VAR=18.20 RB=2 IRB=1E-06 RBM=2 RE=5.562E-02 RC=0.1449 XTB=0 EG=1.11 XTI=3 CJE=1.157E-10 VJE=0.7300 MJE=0.3751 TF=8.666E-10 XTF=1.231 VTF=3.008 ITF=0.4581 PTF=0 CJC=5.264E-11 VJC=0.6591 MJC=0.4533 XCJC=0.4401 TR=2.75E-07 CJS=0 VJS=0.75 MJS=0.333 FC=0.9427 Vceo=80 Icrating=1A mfg=NXP
.MODEL BC640-16 PNP IS=6.1530E-14 NF=0.9911 ISE=1.382E-16 NE=1.089 BF=150.8 IKF=1.225 VAF=105.4 NR=0.9965 ISC=6.480f NC=1.022 BR=8.074 IKR=0.3627 VAR=18.20 RB=2 IRB=1E-06 RBM=2 RE=5.562E-02 RC=0.1449 XTB=0 EG=1.11 XTI=3 CJE=1.157E-10 VJE=0.7300 MJE=0.3751 TF=8.666E-10 XTF=1.231 VTF=3.008 ITF=0.4581 PTF=0 CJC=5.264E-11 VJC=0.6591 MJC=0.4533 XCJC=0.4401 TR=2.75E-07 CJS=0 VJS=0.75 MJS=0.333 FC=0.9427 Vceo=80 Icrating=1A mfg=NXP
.MODEL BCP56 NPN IS=7.905E-014 NF=0.9948 ISE=6.507E-015 NE=1.302 BF=143 IKF=0.45 VAF=8 NR=0.9943 ISC=2.266E-014 NC=1.361 BR=35.83 IKR=1.8 VAR=81 RB=10.4 IRB=0.0011 RBM=2.5 RE=0.0864 RC=0.1173 XTB=0 EG=1.11 XTI=3 CJE=1.442E-010 VJE=0.7013 MJE=0.3245 TF=7.8E-010 XTF=7 VTF=5 ITF=2 PTF=0 CJC=2.052E-011 VJC=0.5 MJC=0.4015 XCJC=1 TR=2.3E-008 CJS=0 VJS=0.75 MJS=0.333 FC=0.9 Vceo=80 Icrating=1A mfg=NXP
.MODEL BCP56-10 NPN IS=7.17E-014 NF=0.9928 ISE=1.113E-014 NE=1.443 BF=119 IKF=0.65 VAF=8 NR=0.9943 ISC=2.266E-014 NC=1.361 BR=35.83 IKR=1.8 VAR=81 RB=10.4 IRB=0.0011 RBM=2.5 RE=0.0864 RC=0.1173 XTB=0 EG=1.11 XTI=3 CJE=1.442E-010 VJE=0.7013 MJE=0.3245 TF=7.8E-010 XTF=7 VTF=5 ITF=2 PTF=0 CJC=2.052E-011 VJC=0.5 MJC=0.4015 XCJC=1 TR=2.3E-008 CJS=0 VJS=0.75 MJS=0.333 FC=0.9 Vceo=80 Icrating=1A mfg=NXP
.MODEL BCP56-16 NPN IS=8.811E-014 NF=0.9954 ISE=1.113E-014 NE=1.52 BF=146 IKF=0.465 VAF=8 NR=0.9943 ISC=2.266E-014 NC=1.361 BR=35.83 IKR=1.8 VAR=81 RB=10.4 IRB=0.0011 RBM=2.5 RE=0.0864 RC=0.1173 XTB=0 EG=1.11 XTI=3 CJE=1.442E-010 VJE=0.7013 MJE=0.3245 TF=7.8E-010 XTF=7 VTF=5 ITF=2 PTF=0 CJC=2.052E-011 VJC=0.5 MJC=0.4015 XCJC=1 TR=2.3E-008 CJS=0 VJS=0.75 MJS=0.333 FC=0.9 Vceo=80 Icrating=1A mfg=NXP
.MODEL BCP53 PNP IS=6.1530E-14 NF=0.9911 ISE=1.382E-16 NE=1.089 BF=150.8 IKF=1.225 VAF=105.4 NR=0.9965 ISC=6.480f NC=1.022 BR=8.074 IKR=0.3627 VAR=18.20 RB=2 IRB=1E-06 RBM=2 RE=5.562E-02 RC=0.1449 XTB=0 EG=1.11 XTI=3 CJE=1.157E-10 VJE=0.7300 MJE=0.3751 TF=8.666E-10 XTF=1.231 VTF=3.008 ITF=0.4581 PTF=0 CJC=5.264E-11 VJC=0.6591 MJC=0.4533 XCJC=0.4401 TR=2.75E-07 CJS=0 VJS=0.75 MJS=0.333 FC=0.9427 Vceo=80 Icrating=1A mfg=NXP
.MODEL BCP53-10 PNP IS=6.1530E-14 NF=0.9911 ISE=1.382E-16 NE=1.089 BF=150.8 IKF=1.225 VAF=105.4 NR=0.9965 ISC=6.480f NC=1.022 BR=8.074 IKR=0.3627 VAR=18.20 RB=2 IRB=1E-06 RBM=2 RE=5.562E-02 RC=0.1449 XTB=0 EG=1.11 XTI=3 CJE=1.157E-10 VJE=0.7300 MJE=0.3751 TF=8.666E-10 XTF=1.231 VTF=3.008 ITF=0.4581 PTF=0 CJC=5.264E-11 VJC=0.6591 MJC=0.4533 XCJC=0.4401 TR=2.75E-07 CJS=0 VJS=0.75

MJS=0.333 FC=0.9427 Vceo=80 Icrating=1A mfg=NXP
.MODEL MJE340_C npn IS=800f BF=180 VAF=100 IKF=0.35 ISE=25p NE=1.5 RB=21 RC=2 RE=0.01 CJE=170p CJC=140p TF=7600p XTF=10 VTF=10 ITF=1 TR=10000p BR=0.004 IKR=0.05 EG=0.64 NC=2 ISC=1.5e-10 VAR=100 Vceo=300 Icrating=500m mfg=Fairchild
.MODEL MJE350_C pnp IS=110f BF=118 VAF=100 IKF=0.06 ISE=1.7p NE=1.5 RB=9 RC=1 RE=0.01 CJE=200p MJE=0.35 VJE=0.75 CJC=120p MJC=0.35 VJC=0.55 FC=0.5 TF=4500p BR=0.04 IKR=0.0075 EG=0.75 XTB=1.1 XTI=3 NC=2.0 ISC=5p VAR=100 Vceo=300 Icrating=500m mfg=Fairchild
.MODEL 2SC4883A_k npn (IS=725f BF=162 NF=1 VAF=150 IKF=18 ISE=1u NE=10 NK=1.2 BR=1.97064 NR=1.50008 VAR=22.902 IKR=35.9467 ISC=4.75p NC=3.59375 RB=7.5 IRB=0.1 RBM=0.1 RE=0.0001 RC=0.130733 XTB=0.337319 XTI=1.40625 EG=1.31 CJE=1.2n VJE=0.651779 MJE=0.35303 TF=1.2n XTF=1.35721 VTF=0.995654 ITF=1 CJC=90p VJC=0.429208 MJC=0.35114 XCJC=0.803125 FC=0.533449 TR=85n PTF=0 KF=0 AF=1 Vceo=180 Icrating=2A mfg=Sanken)
.MODEL 2SA1859A_k pnp (IS=600f BF=162 NF=1 VAF=300 IKF=18 ISE=1u NE=10 NK=1.1 BR=1.96197 NR=1.29503 VAR=23.2874 IKR=9.99625 ISC=4.79702e-14 NC=3.59375 RB=6.5 IRB=0.108633 RBM=0.101928 RE=0.000100027 RC=0.122304 XTB=0.137608 XTI=1.0316 EG=1.32 CJE=1.495n VJE=0.651747 MJE=0.353069 TF=1.7n XTF=1.35721 VTF=0.99569 ITF=0.999994 CJC=68p VJC=0.42654 MJC=0.24282 XCJC=0.803125 FC=0.533457 TR=188.8n PTF=0 Vceo=180 Icrating=2A mfg=Sanken)
.MODEL 2SC5171_D NPN(IS=549.422f NF=1.017914574 RB=9.805 RBM=0.1 IRB=10 VAF=250 BF=198 NE=2.0 ISE=1e-16 IKF=1.5 TF=700p VTF=5 FC=0.5 XTF=500 ITF=20 CJE=750p MJE=0.332617 VJE=.378977 CJC=56.636p MJC=0.466097542 VJC=0.577374486 TNOM=25 Vceo=180 Icrating=2 mfg=Toshiba)
.MODEL 2SA1930_D PNP(IS=1.573p NF=1.04 RB=20 RBM=0.1 IRB=10 VAF=83 BF=250 NE=2.154 ISE=1f IKF=7 NK=0.85 BR=4 IKR=1.05 VAR=8.3 TF=455p VTF=2.2 FC=0.5 XTF=5500 ITF=40 CJE=640p MJE=0.52939885 VJE=0.814106 CJC=112.474p MJC=0.535605 VJC=0.805555 TNOM=25 Vceo=180 Icrating=2 mfg=Toshiba)
.MODEL 2SC4793_A NPN (IS=1.8E-09 NF=1.43 BF=250 VAF=273 IKF=1.86762 NK=0.862397 ISE=4.7530e-11 NE=1.62116 BR=4 NR=1 VAR=20 IKR=1.05 RE=0 RB=1.4529 RC=1.25 CJE=2.4119e-010 VJE=0.776851 MJE=1 CJC=48.15p VJC=0.75 MJC=0.33 TF=9.5343e-010 FC=0.947804 ITF=1169.93 XTF=10000 VTF=35 TR=983N Vceo=230 Icrating=1A mfg=Toshiba)
.MODEL 2SA1837_A PNP (IS=2.3937e-010 NF=1.304 BF=250 VAF=273 IKF=1.9914 NK=0.9117 ISE=2.1180e-011 NE=1.5815 BR=4 NR=1 VAR=20 IKR=1.05 RE=0 RB=1.702 RC=1.65 CJE=1.5564e-010 VJE=0.726406 MJE=1 CJC=7.2230e-011 VJC=0.75 MJC=0.33 TF=1.16651n FC=0.966476 ITF=1270.37 XTF=10000 VTF=35 TR=1.38U Vceo=230 Icrating=1A mfg=Toshiba)
.MODEL KSC2690A_k NPN (IS=1.7783E-13 BF=132.5 NF=1.0 BR=8.495 NR=1.005 ISE=1.9953E-13 NE=1.5 ISC=1.5849n NC=1.98 VAF=580.75 VAR=18.15 IKF=4.0271 IKR=0.0120 RB=2.98 RBM=0.001 IRB=0.6396 RE=0.0909 RC=1.4705 QCO=0 RCO=0 VO=6.587 GAMMA=2.8216E-7 CJE=4.0082E-10 VJE=0.6696 MJE=0.3296 FC=0.5 CJC=6.0404E-11 VJC=0.5 MJC=0.4266 XCJC=0.4955 XTB=1.2590 EG=1.2277 XTI=3.0 Tf=830p Vceo=160 Icrating=1.2A mfg=Fairchild)
.MODEL KSA1220A_k PNP (IS=4.7863E-13 BF=289.3 NF=1.0 BR=9.76 NR=1.006 ISE=5.2481p NE=2 ISC=2.4909E-11 NC=1.5 VAF=98.5 VAR=6.7 IKF=2.7061 IKR=0.0759 RB=2.26 RBM=0.2308 IRB=0.001 RE=0.1908 RC=1.1748 QCO=0.02 RCO=3.9811 VO=11.078 GAMMA=5.01187E-8 CJE=3.4786E-10 VJE=0.9575 MJE=0.4694 FC=0.5 CJC=1.1224E-10 VJC=0.5761 MJC=0.4365 XCJC=0.4955 XTB=1.7978 EG=1.2255 XTI=3.0 Tf=970p Vceo=160 Icrating=1.2A mfg=Fairchild)
.MODEL ZTX450 NPN IS=3.941445E-14 BF=175 VAF=109.45 NF=1 IKF=.8 ISE=7.4025f NE=1.3 BR=20.5 VAR=14.25 NR=.974 IKR=.1 ISC=3.157E-13 NC=1.2 RB=1.1 RE=.1259 RC=.0539 CJE=63p TF=.75n CJC=15.8p TR=85n VJC=.505 MJC=.39 Vceo=45 Icrating=1A mfg=Zetex
.MODEL 2SC3503_C npn IS=40f BF=170 VAF=769 IKF=0.08 ISE=200f NE=1.5 NF=1.0 RB=75 RC=1.5 RE=0.1 CJE=95p MJE=0.35 VJE=0.75 CJC=7p MJC=0.35 VJC=0.75 FC=0.5 TF=585p XTF=10000 VTF=35 ITF=20 TR=10n BR=0.6 IKR=0.05 EG=0.75 XTB=1.5 XTI=3 NC=1.5 ISC=7f NR=1.0 VAR=100 IRB=3e-6 RBM=0.035 XCJC=1.0 Vceo=300 Icrating=100m mfg=Sanyo
.MODEL 2SA1381_C pnp IS=50f BF=160 VAF=328 IKF=0.5 ISE=10f NE=1.5 NF=1 RB=17 RC=4.1 RE=0.05 CJE=71p MJE=0.35 VJE=0.75 CJC=8p MJC=0.35 VJC=0.55 FC=0.5 TF=900p XTF=10000 VTF=35 ITF=20 TR=1n BR=1.6 IKR=0.09 EG=0.6 XTB=0.9 XTI=3 NC=2 ISC=3.2e-10 VAR=100 Vceo=300 Icrating=100m mfg=Sanyo
.MODEL 2SC3601_C npn IS=65f BF=140 VAF=250 IKF=0.13 ISE=400f NE=1.5 NF=1.0 RB=150 RC=1.5 RE=0.1 CJE=76p MJE=0.35 VJE=0.75 CJC=9p MJC=0.35 VJC=0.75 FC=0.5 TF=350p XTF=10000 VTF=35 ITF=30 TR=10n BR=0.6 IKR=0.05 EG=0.75 XTB=1.5 XTI=3 NC=1.5 ISC=7f NR=1.0 VAR=100 IRB=3e-6 RBM=0.035 XCJC=1.0 Vceo=200 Icrating=150m mfg=Sanyo
.MODEL 2SA1407_C pnp IS=70f BF=110 VAF=135 IKF=0.2 ISE=5000f NE=2 NF=1 RB=30 RC=3 RE=0.5 CJE=80p MJE=0.5 VJE=1.0 CJC=10p MJC=0.3 VJC=0.5 FC=0.5 TF=320p XTF=10000 VTF=35 ITF=20 TR=100n BR=1.6 IKR=0.09 EG=0.6 XTB=0.9 XTI=3 NC=2 ISC=3e-10 VAR=100 Vceo=200 Icrating=150m mfg=Sanyo
.MODEL 2SC3601_syn08 NPN (IS=15.2F NF=1 BF=416 VAF=254 IKF=90M ISE=3.66P NE=2 BR=4 NR=1 VAR=20 IKR=.135 RE=5.63 RB=22.5 RC=2.25 XTB=1.5 CJE=18.3P VJE=1.1 MJE=.5 CJC=5.91P VJC=.3 MJC=.3 TF=397P

TR=276N Vceo=200 Icrating=150m mfg=Sanyo)
.MODEL 2SA1407_syn08 PNP (IS=15.2F NF=1 BF=416 VAF=254 IKF=90M ISE=3.66P NE=2 BR=4 NR=1 VAR=20 IKR=.135 RE=7.63 RB=30.5 RC=3.05 XTB=1.5 CJE=22P VJE=1.1 MJE=.5 CJC=7.1P VJC=.3 MJC=.3 TF=397P TR=276N Vceo=200 Icrating=150m mfg=Sanyo)
.MODEL 2SC3423_k NPN (IS=10.000f BF=156.29 VAF=100 IKF=72.247E-3 XTB=1.5 ISE=103.97f NE=1.5392 BR=2.3164 VAR=100 IKR=10.000E-3 ISC=10.000f NK=.4999 CJE=28p CJC=4.2p VJC=.35 MJC=.21196 TF=550p VTF=8.7934 ITF=114.51 TR=25.505E-6 Vceo=150 Icrating=50m mfg=Toshiba)
.MODEL 2SA1360_k PNP (IS=116.73f BF=120 VAF=100 IKF=78.684E-3 ISE=297.72f NE=1.5511 BR=.77363 VAR=100 IKR=1.0217 ISC=26.920f NC=2.9970 NK=.49889 RC=4.5038 CJE=31p MJE=.33333 CJC=6.3p VJC=.35 MJC=.26272 TF=255p XTF=84.382 VTF=7.0050 ITF=.11443 TR=10.000n Vceo=150 Icrating=50m mfg=Toshiba)
.MODEL KSC1845_k npn IS=1.075431E-13 BF=600.7 NF=1 BR=13.565 NR=1 ISE=1.98107E-13 NE=2 ISC=1.8378E-11 NC=1.5 VAF=82.803 VAR=20.6691 IKF=0.596 IKR=0.0190546 RB=157 RBM=12.092 IRB=1.258925E-6 RE=1.5 RC=0 CJE=2.057447E-11 VJE=0.7300286 MJE=0.3619943 FC=0.5 CJC=4.525739p VJC=0.5 MJC=0.3659045 XTB=1.7281 EG=1.1809 XTI=3 TF=3.14E-11 Vceo=120 Icrating=50m mfg=Fairchild
.MODEL 2N5401_C pnp IS=25f BF=220 VAF=196 IKF=0.2 ISE=2f NE=1.4 NF=1 RB=60 RC=2 RE=0.1 CJE=35p MJE=0.40 VJE=0.75 CJC=15p MJC=0.55 VJC=0.75 FC=0.5 TF=800p XTF=60 VTF=0 ITF=4 TR=1.5n BR=4 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 Vceo=150 Icrating=600m mfg=Fairchild
.MODEL 2N5551_C npn IS=9f BF=125 VAF=667 IKF=0.09 ISE=1f NE=1.3 NF=1 RB=92 RC=1 RE=0.1 CJE=45p MJE=0.35 VJE=0.75 CJC=4.9p MJC=0.30 VJC=0.75 FC=0.5 TF=565p XTF=300 VTF=5 ITF=2.0 TR=1.2n BR=3 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 Vceo=150 Icrating=600m mfg=Fairchild
.MODEL BC550C_C npn IS=45f BF=689 VAF=162 IKF=0.09 ISE=4600f NE=2 NF=0.9965 RB=167 RC=1 RE=0.04 CJE=18.7p MJE=0.35 VJE=0.75 CJC=6.2p MJC=0.25 VJC=0.4 FC=0.5 TF=595p XTF=10 VTF=10 ITF=1 TR=10n BR=12.2 IKR=0.34 EG=1.2 XTB=1.65 XTI=3 NC=0.996 NR=1.0 VAR=120 IRB=7e-5 RBM=1.1 XCJC=0.6 ISC=5f Vceo=45 Icrating=100m mfg=NXP
.MODEL BC560C_C pnp IS=60f BF=900 VAF=160 IKF=0.10 ISE=70f NE=1.42 NF=1 RB=170 RC=1.0 RE=0.05 CJE=19p MJE=0.3 VJE=0.75 CJC=3.9p MJC=0.3 VJC=0.75 FC=0.5 TF=600p XTF=7 VTF=4 ITF=0.45 TR=10n BR=3 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 Vceo=45 Icrating=100m mfg=NXP
.MODEL BC550C_Ck npn IS=45f BF=689 VAF=162 IKF=0.09 ISE=4600f NE=2 NF=0.9965 RB=167 RC=1 RE=0.04 CJE=6.2p MJE=0.35 VJE=0.75 CJC=3.5p MJC=0.25 VJC=0.4 FC=0.5 TF=1n XTF=10 VTF=10 ITF=1 TR=10n BR=12.2 IKR=0.34 EG=1.2 XTB=1.65 XTI=3 NC=0.996 NR=1.0 VAR=120 IRB=7e-5 RBM=1.1 XCJC=0.6 ISC=5f Vceo=45 Icrating=100m mfg=OnSemi
.MODEL BC560C_Ck pnp IS=60f BF=900 VAF=160 IKF=0.10 ISE=70f NE=1.42 NF=1 RB=170 RC=1.0 RE=0.05 CJE=6.2p MJE=0.3 VJE=0.75 CJC=3.5p MJC=0.3 VJC=0.75 FC=0.5 TF=1n XTF=7 VTF=4 ITF=0.45 TR=10n BR=3 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 Vceo=45 Icrating=100m mfg=OnSemi
.MODEL 2N5089_C npn IS=35f BF=500 VAF=110 IKF=0.05 ISE=6f NE=1.42 NF=1 RB=295 RC=1.6 RE=0.1 CJE=9p MJE=0.40 VJE=0.75 CJC=4p MJC=0.30 VJC=0.75 FC=0.5 TF=850p XTF=7 VTF=4 ITF=0.35 TR=500n BR=1.5 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 Vceo=25 Icrating=100m
.MODEL 2N5210_C npn IS=35f BF=500 VAF=110 IKF=0.05 ISE=6f NE=1.42 NF=1 RB=900 RC=2 RE=0.1 CJE=9p MJE=0.40 VJE=0.75 CJC=4p MJC=0.30 VJC=0.75 FC=0.5 TF=850p XTF=7 VTF=4 ITF=0.35 TR=500n BR=1.5 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 Vceo=50 Icrating=100m
.MODEL 2N5087_C pnp IS=9f BF=197 VAF=90 IKF=0.08 ISE=6f NE=1.42 NF=1 RB=193 RC=1.7 RE=0.1 CJE=2.5p MJE=0.3 VJE=0.75 CJC=6p MJC=0.3 VJC=0.75 FC=0.5 TF=540p XTF=7 VTF=4 ITF=0.45 TR=10n BR=2.7 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 Vceo=50 Icrating=100m
.MODEL 2N3904_C npn IS=3.5f BF=160 VAF=400 IKF=0.15 ISE=4e-16 NE=1.26 NF=1 RB=30.1 RC=1 RE=0.1 CJE=15p MJE=0.25 VJE=0.75 CJC=3.6p MJC=0.30 VJC=0.75 FC=0.5 TF=380p XTF=30 VTF=4 ITF=0.4 TR=240n BR=0.7 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 Vceo=40 Icrating=200m mfg=Renesas
.MODEL 2N3906_C pnp IS=10f BF=180 VAF=40 IKF=0.6 ISE=30f NE=1.5 NF=1 RB=33 RC=1 RE=0.1 CJE=12p MJE=0.7 VJE=1.0 CJC=12p MJC=0.7 VJC=1.0 FC=0.5 TF=550p XTF=20000 VTF=10 ITF=3.5 TR=10n BR=4 IKR=11 EG=1.1 XTB=1.5 XTI=3 NC=15.5 ISC=0.5f VAR=100 NK=1.0 Vceo=40 Icrating=200m mfg=Fairchild
.MODEL 2N4401_C npn IS=26f BF=205 VAF=200 IKF=0.35 ISE=10f NE=1.5 NF=1 RB=13 RC=0.5 RE=0.1 CJE=24p MJE=0.36 VJE=0.75 CJC=11p MJC=0.38 VJC=0.75 FC=0.5 TF=570p XTF=400 VTF=10 ITF=4 TR=230n BR=1 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 Vceo=40 Icrating=600m mfg=Fairchild
.MODEL 2N4403_C pnp IS=20f BF=120 VAF=50 IKF=0.9 ISE=5f NE=1.83 NF=1 RB=38 RC=0.7 RE=0.1 CJE=20p MJE=0.35 VJE=0.75 CJC=18p MJC=0.55 VJC=0.75 FC=0.5 TF=750p XTF=400 VTF=10 ITF=4 TR=100n BR=4 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 Vceo=40 Icrating=600m mfg=Fairchild
.model 2N5769_k NPN(Is=1.2f Xti=3 Eg=1.16 Vaf=100 Bf=88 Rb=45 Ikf=200m Ise=33f Ne=1.7 Xtb=1.7 Br=1.365 Nc=2 Isc=0 Ikr=0 Rc=.6 Cjc=2.83p Mjc=86.19m Vjc=.75 Fc=.5 Cje=4.5p Mje=.2418 Vje=.75 Tr=1.073u Tf=227.6p Itf=.3 Vtf=4 Xtf=4 Vceo=15 Icrating=200m mfg=Fairchild)
.model 2N5771_k PNP(Is=1.2f Xti=3 Eg=1.16 Vaf=100 Bf=125 Rb=45 Ikf=100m Ise=62f Ne=1.7 Xtb=1.7 Br=1.365 Nc=2 Isc=0 Ikr=0 Rc=3.75 Cjc=2.77p Mjc=.1416 Vjc=.75 Fc=.5 Cje=2.65p Mje=.3083 Vje=.75 Tr=4.033n Tf=118.5p

Itf=.5 Vtf=3 Xtf=6 Rb=10 Vceo=15 Icrating=200m mfg=Fairchild)
.MODEL 2N5109_RF NPN (BF=44 VAF=160 VAR=16.0 RC=0.69 RB=1.57 RE=2.75 IKF=0.28E+00 ISE=0.36E-13 TF=0.111E-09 TR=0.80E-08 ITF=0.82E-01 VTF=0.66E+01 CJC=2.758p CJE=1.822p XTI=3.0 NE=1.5 ISC=0.12E-13 EG=1.11 XTB=1.5 BR=1.14 VJC=0.75 VJE=0.75 IS=0.40E-14 MJC=0.33 MJE=0.33 XTF=4.0 IKR=0.28E+00 KF=0.1E-14 NC=1.7 FC=0.50 RBM=1.1 IRB=0.40E-01 XCJC=0.5)
.model 2N5179_RF NPN(Is=69.28E-18 Xti=3 Eg=1.11 Vaf=100 Bf=282.1 Ne=1.177 Ise=69.28E-18 Ikf=22.03m Xtb=1.5 Br=1.176 Nc=2 Isc=0 Ikr=0 Rc=4 Cjc=893.1f Mjc=.3017 Vjc=.75 Fc=.5 Cje=939.8f Mje=.3453 Vje=.75 Tr=1.588n Tf=141.1p Itf=.27 Vtf=10 Xtf=30 Rb=10)
.MODEL BC846 NPN IS=1.822E-14 NF=0.9932 ISE=2.894E-16 NE=1.4 BF=324.4 IKF=0.109 VAF=82 NR=0.9931 ISC=9.982p NC=1.763 BR=8.29 IKR=0.09 VAR=17.9 RB=10 IRB=5E-06 RBM=5 RE=0.649 RC=0.7014 XTB=0 EG=1.11 XTI=3 CJE=1.244E-11 VJE=0.7579 MJE=0.3656 TF=4.908E-10 XTF=9.51 VTF=2.927 ITF=0.3131 PTF=0 CJC=3.347p VJC=0.5463 MJC=0.391 XCJC=0.6193 TR=9E-08 CJS=0 VJS=0.75 MJS=0.333 FC=0.979 Vceo=65 Icrating=100m mfg=NXP
.MODEL BC856 PNP IS=2.014E-14 NF=0.9974 ISE=6.578f NE=1.45 BF=315.3 IKF=0.079 VAF=39.15 NR=0.9952 ISC=1.633E-14 NC=1.15 BR=8.68 IKR=0.09 VAR=9.5 RB=10 IRB=5E-06 RBM=5E-06 RE=0.663 RC=0.718 XTB=0 EG=1.11 XTI=3 CJE=1.135E-11 VJE=0.7071 MJE=0.3808 TF=6.546E-10 XTF=5.387 VTF=6.245 ITF=0.2108 PTF=0 CJC=6.395p VJC=0.4951 MJC=0.44 XCJC=0.6288 TR=5.5E-08 CJS=0 VJS=0.75 MJS=0.333 FC=0.9059 Vceo=65 Icrating=100m mfg=NXP
.MODEL BC857 PNP IS=2.014E-14 NF=0.9974 ISE=6.578f NE=1.45 BF=315.3 IKF=0.079 VAF=39.15 NR=0.9952 ISC=1.633E-14 NC=1.15 BR=8.68 IKR=0.09 VAR=9.5 RB=10 IRB=5E-06 RBM=5E-06 RE=0.663 RC=0.718 XTB=0 EG=1.11 XTI=3 CJE=1.135E-11 VJE=0.7071 MJE=0.3808 TF=6.546E-10 XTF=5.387 VTF=6.245 ITF=0.2108 PTF=0 CJC=6.395p VJC=0.4951 MJC=0.44 XCJC=0.6288 TR=5.5E-08 CJS=0 VJS=0.75 MJS=0.333 FC=0.9059 Vceo=45 Icrating=100m mfg=NXP
.MODEL BC847 NPN IS=1.822E-14 NF=0.9932 ISE=2.894E-16 NE=1.4 BF=324.4 IKF=0.109 VAF=82 NR=0.9931 ISC=9.982p NC=1.763 BR=8.29 IKR=0.09 VAR=17.9 RB=10 IRB=5E-06 RBM=5 RE=0.649 RC=0.7014 XTB=0 EG=1.11 XTI=3 CJE=1.244E-11 VJE=0.7579 MJE=0.3656 TF=4.908E-10 XTF=9.51 VTF=2.927 ITF=0.3131 PTF=0 CJC=3.347p VJC=0.5463 MJC=0.391 XCJC=0.6193 TR=9E-08 CJS=0 VJS=0.75 MJS=0.333 FC=0.979 Vceo=45 Icrating=100m mfg=NXP
.MODEL BC817 NPN IS=9.198E-14 NF=1.003 ISE=4.468E-16 NE=1.65 BF=338.8 IKF=0.4913 VAF=107.9 NR=1.002 ISC=5.109f NC=1.071 BR=29.48 IKR=0.193 VAR=25 RB=1 IRB=1000 RBM=1 RE=0.2126 RC=0.143 XTB=0 EG=1.11 XTI=3 CJE=3.825E-11 VJE=0.7004 MJE=0.364 TF=5.229E-10 XTF=219.7 VTF=3.502 ITF=7.257 PTF=0 CJC=1.27E-11 VJC=0.4431 MJC=0.3983 XCJC=0.4555 TR=7E-11 CJS=0 VJS=0.75 MJS=0.333 FC=0.905 Vceo=45 Icrating=500m mfg=NXP
.MODEL BC807 PNP IS=1.08E-13 NF=0.99 ISE=2.713E-14 NE=1.4 BF=385.7 IKF=0.3603 VAF=31.29 NR=0.9849 ISC=5.062E-13 NC=1.295 BR=20.57 IKR=0.054 VAR=11.62 RB=1 IRB=1E-06 RBM=0.5 RE=0.1415 RC=0.2623 XTB=0 EG=1.11 XTI=3 CJE=5.114E-11 VJE=0.8911 MJE=0.4417 TF=7.359E-10 XTF=1.859 VTF=3.813 ITF=0.4393 PTF=0 CJC=2.656E-11 VJC=0.62 MJC=0.4836 XCJC=0.459 TR=5.00E-08 CJS=0 VJS=0.75 MJS=0.333 FC=0.99 Vceo=45 Icrating=500m mfg=NXP
.MODEL BC337 NPN IS=9.198E-14 NF=1.003 ISE=4.468E-16 NE=1.65 BF=338.8 IKF=0.4913 VAF=107.9 NR=1.002 ISC=5.109f NC=1.071 BR=29.48 IKR=0.193 VAR=25 RB=1 IRB=1000 RBM=1 RE=0.2126 RC=0.143 XTB=0 EG=1.11 XTI=3 CJE=3.825E-11 VJE=0.7004 MJE=0.364 TF=5.229E-10 XTF=219.7 VTF=3.502 ITF=7.257 PTF=0 CJC=1.27E-11 VJC=0.4431 MJC=0.3983 XCJC=0.4555 TR=7E-11 CJS=0 VJS=0.75 MJS=0.333 FC=0.905 Vceo=45 Icrating=500m mfg=NXP
.MODEL BC327 PNP IS=1.08E-13 NF=0.99 ISE=2.713E-14 NE=1.4 BF=385.7 IKF=0.3603 VAF=31.29 NR=0.9849 ISC=5.062E-13 NC=1.295 BR=20.57 IKR=0.054 VAR=11.62 RB=1 IRB=1E-06 RBM=0.5 RE=0.1415 RC=0.2623 XTB=0 EG=1.11 XTI=3 CJE=5.114E-11 VJE=0.8911 MJE=0.4417 TF=7.359E-10 XTF=1.859 VTF=3.813 ITF=0.4393 PTF=0 CJC=2.656E-11 VJC=0.62 MJC=0.4836 XCJC=0.459 TR=5.00E-08 CJS=0 VJS=0.75 MJS=0.333 FC=0.99 Vceo=45 Icrating=500m mfg=NXP
.MODEL BC327-16 PNP IS=4.676E-014 NF=0.9813 ISE=7.921E-015 NE=1.335 BF=185.2 IKF=0.5928 VAF=30.79 NR=0.9811 ISC=2.73E-014 NC=1.133 BR=26.63 IKR=0.9621 VAR=25 RB=18 IRB=0.00116 RBM=0.8 RE=0.14 RC=0.1059 XTB=0 EG=1.11 XTI=3 CJE=6.28E-011 VJE=0.77 MJE=0.38 TF=1.08E-009 XTF=1.859 VTF=3.813 ITF=0.4393 PTF=0 CJC=2E-011 VJC=0.45 MJC=0.3768 XCJC=0.459 TR=1.9E-008 CJS=0 VJS=0.75 MJS=0.333 FC=0.99 Vceo=45 Icrating=500m mfg=NXP
.MODEL QPNP_THAT_NS PNP (IS=2.330327f BF=80 NF=0.998 BR=54.6051301 NR=1 ISE=6.471784E-14 NE=1.5256667 ISC=9.821992E-14 NC=1.4090231 VAF=50 VAR=8.5915034 IKF=0.1605012 IKR=2.997951E-3 RB=25 RBM=1.604356 IRB=1.3734E-4 RE=0.2 RC=17.9803001 CJE=5.921046p VJE=0.7302802 MJE=0.49864 FC=0.9317095 CJC=3.374991p VJC=0.6162124 MJC=0.497456 TF=2.416792E-10 XTF=5.9184348 ITF=0.0726275 VTF=1.2378779 QCO=1p RCO=1 VO=1 GAMMA=1E-13 XTB=1.2 PTF=20)
.MODEL QNPN_THAT_NS NPN (IS=5.005475f BF=150 NF=1 BR=119.4532856 NR=1 ISE=3.002016E-16 NE=1.3340565 ISC=3.173175E-14 NC=1.6525 VAF=60 VAR=10.8094728 IKF=0.2850543 IKR=0.0103675 RB=30

RBM=2.94235 IRB=1.750788E-4 RE=0.2 RC=12.4561714 CJE=5.086292p VJE=0.7241957 MJE=0.49456 FC=0.97 CJC=2.190824p VJC=0.5595858 MJC=0.498675 TF=7.063932E-11 XTF=17.846692 ITF=0.0862198 VTF=1.7447209 QCO=1p RCO=1 VO=1 GAMMA=1E-13 XTB=1.1 PTF=20)
.MODEL QPNP_THAT_HF PNP (IS=2.330327f BF=80 NF=0.998 BR=54.6051301 NR=1 ISE=6.471784E-14 NE=1.5256667 ISC=9.821992E-14 NC=1.4090231 VAF=50 VAR=8.5915034 IKF=0.1605012 IKR=2.997951E-3 RB=103.345 RBM=2.20352 IRB=1.3734E-4 RE=0.2 RC=17.9803001 CJE=5.921046p VJE=0.7302802 MJE=0.49864 FC=0.9317095 CJC=3.374991p VJC=0.6162124 MJC=0.497456 TF=2.416792E-10 XTF=5.9184348 ITF=0.0726275 VTF=1.2378779 QCO=1p RCO=1 VO=1 GAMMA=1E-13 XTB=1.2 PTF=20)
.MODEL QNPN_THAT_HF NPN (IS=5.005475f BF=150 NF=1 BR=119.4532856 NR=1 ISE=3.002016E-16 NE=1.3340565 ISC=3.173175E-14 NC=1.6525 VAF=60 VAR=10.8094728 IKF=0.2850543 IKR=0.0103675 RB=117.3192 RBM=2.035 IRB=1.750788E-4 RE=0.2 RC=12.4561714 CJE=5.086292p VJE=0.7241957 MJE=0.49456 FC=0.97 CJC=2.190824p VJC=0.5595858 MJC=0.498675 TF=7.063932E-11 XTF=17.846692 ITF=0.0862198 VTF=1.7447209 QCO=1p RCO=1 VO=1 GAMMA=1E-13 XTB=1.1 PTF=20)
.model LS3250A NPN(Is=10f Xti=4.53 Eg=1.17 Vaf=251 Bf=458 Ne=1.18 Ise=0.16f Nr=1 Ikf=18m Xtb=1.41 Br=5.9 Ikr=26m Var=8.35 Isc=4.38p Nc=1.47 Nf=1 Rb=100 Re=6.5 Rc=21 Cjc=3.62p Cje=6.4p Mjc=200m Mje=304m Vjc=414m Vje=685m Tf=0.2n Tr=10n Vtf=5 Xtf=1 Rbm=12 Irb=10u Ptf=20 Fc=0.98 Itf=70m Mfg=Linear_Systems)
.model LS3250B NPN(Is=5.43f Xti=4.4 Eg=1.17 Vaf=272.5 Bf=264 Ne=1.11 Ise=0.057f Nr=1 Ikf=28m Xtb=1.42 Br=5.0 Ikr=26m Var=8.35 Isc=4.39p Nc=1.47 Nf=1 Rb=100 Re=6.5 Rc=21 Cjc=3.6p Cje=6.63p Mjc=198m Mje=301m Vjc=412m Vje=679m Tf=0.24n Tr=10n Vtf=5 Xtf=1 Rbm=12 Irb=10u Ptf=20 Fc=0.98 Itf=46m Mfg=Linear_Systems)
.model LS3550A PNP(Is=9.04f Xti=3.65 Eg=1.17 Vaf=28.2 Bf=202 Ne=2 Ise=0.003f Nr=1 Ikf=45m Xtb=2.30 Br=6.87 Ikr=500u Var=20 Isc=0.41p Nc=1.8 Nf=1 Rb=100 Re=0.06 Rc=30 Cjc=6.02p Cje=5.48p Mjc=280m Mje=285.48m Vjc=538m Vje=622m Tf=0.26n Tr=10n Vtf=5 Xtf=0.1 Rbm=10 Irb=10u Ptf=20 Fc=0.97 Itf=40m Mfg=Linear_Systems)
.model LS3550C PNP(Is=10.35f Xti=3.5 Eg=1.17 Vaf=43.80 Bf=214 Ne=1.98 Ise=62.3f Nr=1 Ikf=34m Xtb=2.08 Br=6.3 Ikr=420u Var=20 Isc=1.65p Nc=1.8 Nf=1 Rb=100 Re=0.06 Rc=30 Cjc=4.47p Cje=5.57p Mjc=189m Mje=321m Vjc=422.6m Vje=717m Tf=0.48n Tr=10n Vtf=5 Xtf=1 Rbm=10 Irb=10u Ptf=20 Fc=0.97 Itf=40m Mfg=Linear_Systems)
.model LS301 NPN(Is=18.04p Xti=3.7 Eg=1.17 Vaf=23.6 Bf=1495 Ne=1.34 Ise=0.66f Nr=1 Ikf=16.7m Xtb=1.56 Br=5.89 Ikr=26.3m Var=8.35 Isc=0.001n Nc=1.72 Nf=1 Rb=1194 Re=0.94 Rc=203 Cjc=2.46p Cje=2.36p Mjc=135m Mje=219m Vjc=400m Vje=648m Tf=0.24n Tr=10n Vtf=5 Xtf=1 Rbm=11.6 Irb=10u Ptf=20 Fc=0.9 Itf=50m Tikf1=-5.38m Tvaf1=-364u Trc1=3.3m Level=1 mfg=Linear_Systems)
.model LS310 NPN(Is=5.78f Xti=3.63 Eg=1.17 Vaf=145 Bf=466 Ne=1.44 Ise=0.87f Nr=1 Ikf=64m Xtb=1.36 Br=1.37 Ikr=10m Var=8.35 Isc=0.2f Nc=2 Nf=1 Rb=100 Re=0.36 Rc=10 Cjc=2.2p Cje=3.16p Mjc=129m Mje=236m Vjc=400m Vje=665m Tf=0.31n Tr=10n Vtf=14 Xtf=9 Rbm=10 Irb=10u Ptf=20 Fc=0.98 Itf=48m Mfg=Linear_Systems)
.model LS350 PNP(Is=3.82f Xti=3 Eg=1.17 Vaf=37.3 Bf=676 Ne=1.45 Ise=1.45f Nr=1 Ikf=6m Xtb=1.5 Br=638m Ikr=489u Var=20 Isc=0.001f Nc=1.9 Nf=1 Rb=200 Re=0.9 Rc=231 Cjc=2.53p Cje=1.99p Mjc=179.5m Mje=217m Vjc=400m Vje=604m Tf=0.72n Tr=10n Vtf=5 Xtf=2.04 Rbm=10 Irb=10u Ptf=20 Fc=0.5 Itf=18m Mfg=Linear_Systems)
.model LS311 NPN(Is=5.78f Xti=3.63 Eg=1.17 Vaf=145 Bf=466 Ne=1.44 Ise=0.87f Nr=1 Ikf=64m Xtb=1.36 Br=1.37 Ikr=10m Var=8.35 Isc=0.2f Nc=2 Nf=1 Rb=100 Re=0.36 Rc=10 Cjc=2.2p Cje=3.16p Mjc=129m Mje=236m Vjc=400m Vje=665m Tf=0.31n Tr=10n Vtf=14 Xtf=9 Rbm=10 Irb=10u Ptf=20 Fc=0.98 Itf=48m Mfg=Linear_Systems)
.model LS351 PNP(Is=1.95f Xti=3.41 Eg=1.17 Vaf=66.94 Bf=274 Ne=1.36 Ise=1.2f Nr=1 Ikf=14m Xtb=1.71 Br=449m Ikr=421u Var=20 Isc=12.15p Nc=1.9 Nf=1 Rb=200 Re=0.91 Rc=231 Cjc=2.79p Cje=2.16p Mjc=252m Mje=194.29m Vjc=763m Vje=562m Tf=0.81n Tr=10n Vtf=5 Xtf=1.49 Rbm=10 Irb=10u Ptf=20 Fc=0.97 Itf=11m Mfg=Linear_Systems)
.model LS312 NPN(Is=2.31f Xti=3.91 Eg=1.17 Vaf=244.8 Bf=401 Ne=1.64 Ise=0.99f Nr=1 Ikf=65m Xtb=1.35 Br=1.5 Ikr=10m Var=8.35 Isc=7.91p Nc=1.8 Nf=1 Rb=100 Re=0.44 Rc=43 Cjc=1.83p Cje=2.02p Mjc=129m Mje=213m Vjc=400m Vje=666m Tf=0.53n Tr=10n Vtf=5 Xtf=17 Rbm=10 Irb=10u Ptf=20 Fc=0.96 Itf=26m Mfg=Linear_Systems)
.model LS352 PNP(Is=2.31f Xti=3.52 Eg=1.17 Vaf=58.99 Bf=433 Ne=1 Ise=0.0018f Nr=1 Ikf=8.2m Xtb=1.80 Br=869m Ikr=209u Var=20 Isc=0.001f Nc=1.84 Nf=1 Rb=200 Re=0.21 Rc=231 Cjc=1.88p Cje=1.70p Mjc=131m Mje=221m Vjc=400m Vje=634m Tf=0.391n Tr=10n Vtf=5 Xtf=1.2 Rbm=10 Irb=10u Ptf=20 Fc=0.9 Itf=10m Mfg=Linear_Systems)
.model LS313 NPN(Is=9.58f Xti=3.56 Eg=1.17 Vaf=78.92 Bf=850 Ne=1.66 Ise=0.99f Nr=1 Ikf=29m Xtb=1.27 Br=4.43 Ikr=10m Var=8.35 Isc=0.001f Nc=1.8 Nf=1 Rb=100 Re=0.36 Rc=99 Cjc=2.0612p Cje=2.4p Mjc=159m Mje=273.2m Vjc=432m Vje=757m Tf=0.27n Tr=10n Vtf=5 Xtf=1 Rbm=10 Irb=10u Fc=0.98 Itf=30m Mfg=Linear_Systems)
.MODEL LS318 NPN (IS=2.10752f BF=209.671 NF=1 BR=2.88428 NR=1 ISE=1.60468E-16 NE=1.27199 ISC=7.86027E-13 NC=1.8 VAF=189.773 VAR=8.35 IKF=0.131663 IKR=0.0262983 RB=66.9008 RBM=10 IRB=1E-5 RE=0.22355 RC=24 CJE=2.9043p VJE=0.683222 MJE=0.235615 FC=0.98 CJC=2.6782p VJC=0.42551 MJC=0.14401 TF=2.038294E-10 XTF=1 ITF=0.07 VTF=5 PTF=20 TR=1E-8 XTB=1.35165 EG=1.17 XTI=3.74793)
.model LS358 PNP(Is=2.30f Xti=3.67 Eg=1.17 Vaf=23.34 Bf=350 Ne=1.35 Ise=0.58f Nr=1 Ikf=16m Xtb=1.75 Br=1.54 Ikr=300u Var=20 Isc=0.001f Nc=1.84 Nf=1 Rb=200 Re=0.08 Rc=128 Cjc=3.40p Cje=2.27p Mjc=227.m Mje=222.92m Vjc=400m Vje=660m Tf=0.5n Tr=10n Vtf=5 Xtf=2 Rbm=10 Irb=10u Ptf=20 Fc=0.98 Itf=35m Mfg=Linear_Systems)
.MODEL THAT300P_NS PNP (IS=2.330327f BF=80 NF=0.998 BR=54.6051301 NR=1 ISE=6.471784E-14 NE=1.5256667 ISC=9.821992E-14 NC=1.4090231 VAF=50 VAR=8.5915034 IKF=0.1605012 IKR=2.997951E-3 RB=25 RBM=1.604356 IRB=1.3734E-4 RE=0.2 RC=17.9803001 CJE=5.921046p VJE=0.7302802 MJE=0.49864

FC=0.9317095 CJC=3.374991p VJC=0.6162124 MJC=0.497456 TF=2.416792E-10 XTF=5.9184348 ITF=0.0726275 VTF=1.2378779 QCO=1p RCO=1 VO=1 GAMMA=1E-13 XTB=1.2 PTF=20)
.MODEL THAT300N_NS NPN (IS=5.005475f BF=150 NF=1 BR=119.4532856 NR=1 ISE=3.002016E-16 NE=1.3340565 ISC=3.173175E-14 NC=1.6525 VAF=60 VAR=10.8094728 IKF=0.2850543 IKR=0.0103675 RB=30 RBM=2.94235 IRB=1.750788E-4 RE=0.2 RC=12.4561714 CJE=5.086292p VJE=0.7241957 MJE=0.49456 FC=0.97 CJC=2.190824p VJC=0.5595858 MJC=0.498675 TF=7.063932E-11 XTF=17.846692 ITF=0.0862198 VTF=1.7447209 QCO=1p RCO=1 VO=1 GAMMA=1E-13 XTB=1.1 PTF=20)
.MODEL THAT300P_HF PNP (IS=2.330327f BF=80 NF=0.998 BR=54.6051301 NR=1 ISE=6.471784E-14 NE=1.5256667 ISC=9.821992E-14 NC=1.4090231 VAF=50 VAR=8.5915034 IKF=0.1605012 IKR=2.997951E-3 RB=103.345 RBM=2.20352 IRB=1.3734E-4 RE=0.2 RC=17.9803001 CJE=5.921046p VJE=0.7302802 MJE=0.49864 FC=0.9317095 CJC=3.374991p VJC=0.6162124 MJC=0.497456 TF=2.416792E-10 XTF=5.9184348 ITF=0.0726275 VTF=1.2378779 QCO=1p RCO=1 VO=1 GAMMA=1E-13 XTB=1.2 PTF=20)
.MODEL THAT300N_HF NPN (IS=5.005475f BF=150 NF=1 BR=119.4532856 NR=1 ISE=3.002016E-16 NE=1.3340565 ISC=3.173175E-14 NC=1.6525 VAF=60 VAR=10.8094728 IKF=0.2850543 IKR=0.0103675 RB=117.3192 RBM=2.035 IRB=1.750788E-4 RE=0.2 RC=12.4561714 CJE=5.086292p VJE=0.7241957 MJE=0.49456 FC=0.97 CJC=2.190824p VJC=0.5595858 MJC=0.498675 TF=7.063932E-11 XTF=17.846692 ITF=0.0862198 VTF=1.7447209 QCO=1p RCO=1 VO=1 GAMMA=1E-13 XTB=1.1 PTF=20)
.model HFA_npn NPN (IS=1.840E-16 XTI=3 EG=1.11 VAF=72 VAR=4.5 BF=103.6 ISE=1.686E-19 NE=1.4 IKF=54m XTB=0 BR=10 ISC=1.605E-14 NC=1.8 IKR=54m RC=11.4 CJC=0.398p MJC=0.24 VJC=0.97 FC=0.5 CJE=0.24p MJE=0.51 VJE=8.690E - 01 TR=4n TF=10.51p ITF=35m XTF=2.3 VTF=3.5 PTF=0 XCJC=0.9 CJS=0.115p VJS=0.75 MJS=0 RE=1.848 RB=50.07 RBM=1.974)
.model HFA_pnp PNP (IS=1.027E-16 XTI=3 EG=1.11 VAF=30 VAR=4.5 BF=52.28 ISE=9.398E-20 NE=1.4 IKF=54.12m XTB=0 BR=7 ISC=1.027E-14 NC=1.8 IKR=54.12m RC=34.2 CJC=0.4951p MJC=0.3 VJC=1.23 FC=0.5 CJE=0.2927p MJE=0.57 VJE=0.88 TR=4n TF=20.05p ITF=20.01m XTF=1.534 VTF=1.8 PTF=0 XCJC=0.9 CJS=0.115p VJS=0.75 MJS=0 RE=1.848 RB=32.71 RBM=0.9902)
.MODEL ZTX458 NPN IS=5.32E-14 NF=1 BF=230 IKF=1.5 VAF=1500 ISE=2.1E-14 NE=1.385 NR=1.05 BR=8 IKR=0.7 VAR=64 ISC=6.42p NC=1.25 RB=0.5 RE=0.224 RC=0.134 QUASIMOD=1 RCO=80 GAMMA=4E-7 CJC=9.5p MJC=0.32 VJC=0.4 CJE=115p MJE=0.37 VJE=0.8 TF=1.3n TR=16u TRC1=.004 TRB1=.004 TRE1=.004 XTB=1.4 mfg=Zetex
.MODEL 2SC4883A_kq npn (Bf=140 Ikf=100 Is=600f Vaf=100 Rb=1.7 Re=105m RC=0 Rco=6 Ibc=150f Vo=30 Gamma=250n Cje=1.2n Cjc=72p Tf=875p Vtf=1.2 Itf=1 Qco=8p Nk=1.2 Br=2 Var=22.9 Ikr=36 TR=85n Xtb=0.34 Xtf=1.36 Vceo=180 Icrating=2A mfg=Sanken)
.MODEL 2SA1859A_kq pnp (Bf=162 IKF=10 Is=500f Vaf=300 Rb=0 Re=0 Rc=90m Rco=3.25 Ibc=150f Vo=120 Gamma=22n Cje=1.5n Cjc=72p Tf=1.9n Vtf=1.9 Itf=1 Qco=8p Br=2 Ikr=10 Var=23 Tr=188.8n Xtb=0.138 Xtf=5 Vceo=180 Icrating=2A mfg=Sanken)
.MODEL FMMT494 NPN IS=6E-14 NF=0.99 BF=250 IKF=0.9 NK=0.7 VAF=270 ISE=1E-14 NE=1.2 NR=0.98 BR=30 IKR=0.5 VAR=27 ISC=1.2e-13 NC=1.2 RB=0.2 RE=0.08 RC=0.08 RCO=7.5 GAMMA=1E-8 CJC=15.9p MJC=0.4 VJC=0.51 CJE=108p MJE=0.35 VJE=0.7 TF=0.8n TR=55n XTB=1.4 QUASIMOD=1 mfg=Zetex
.MODEL STN0214 NPN Is=0.327E-13 Bf=6.221 Vaf=144 Ikf=0.553 Ise=0.132p Ne=1.841 Br=1.731 Var=412 Ikr=0.96 Isc=0.519p Nc=2.721 Nk=0.771 Rb=1.591 Rbm=0.747E-01 Nf=0.986 Re=0.218E-02 Rc=0.999E-01 Qco=0.767E-07 Rco=0.501 Vo=28.301 Gamma=0.181E-11 Cjc=0.645p Vjc=0.720 Mjc=0.286 Cje=0.393E-13 Vje=0.849 Mje=0.361 Fc=0.423 Tr=0.332E-04 Tf=0.178u Itf=0.154 Vtf=77.501 Xtf=3.471 Vceo=1200 Icrating=400m mfg=STMicro
.model BD709 NPN(Is=2p Xti=3 Eg=1.11 Vaf=50 Bf=600 Ise=5.8p Ne=1.44 Ikf=.74 Nk=.55 Xtb=1.5 Var=100 Br=6 Isc=500f Nc=2 Ikr=1 Rc=.16 Cjc=300p Mjc=.333 Vjc=.75 Fc=.5 Cje=400p Mje=.333 Vje=.75 Tr=970n Tf=32n Itf=1 Xtf=0 Vtf=10 Rb=1)
.model BD710 PNP(Is=.6p Xti=3 Eg=1.11 Vaf=50 Bf=205 Ise=64u Ne=98 Ikf=1.07 Nk=.52 Xtb=1.5 Var=100 Br=11 Isc=.6p Nc=1.2 Ikr=15 Rc=.13 Cjc=400p Mjc=.333 Vjc=.75 Fc=0 Cje=500p Mje=.333 Vje=.75 Tr=970n Tf=29n Itf=1 Xtf=0 Vtf=10 Rb=2.2)
.model GA10JT12 NPN IS=5E-47 ISE=1.26E-28 EG=3.23 BF=85 BR=0.55 IKF=5000 NF=1 NE=2 RB=4.67 IRB=0.001 RBM=0.16 RE=0.005 RC=0.099 CJC=427.39p VJC=3.1004 MJC=0.4752 CJE=1373p VJE=10.6442 MJE=0.21376 XTI=3 XTB=-1.27 TRC1=6.8m VCEO=1200 ICRATING=10 MFG=GeneSiC_Semiconductor
.model GA20JT12 NPN IS=9.833E-48 ISE=1.073E-26 EG=3.23 BF=100 BR=0.55 IKF=5000 NF=1 NE=2 RB=3.09 IRB=0.006 RBM=0.101 RE=0.005 RC=0.04 CJC=752.4p VJC=3.17 MJC=0.48 CJE=3.014n VJE=3.568 MJE=0.538 XTI=3 XTB=-1.5 TRC1=8.5m VCEO=1200 ICRATING=20 MFG=GeneSiC_Semiconductor
.model GA50JT17 NPN IS=9.833E-48 ISE=1.073E-26 EG=3.23 BF=110 BR=0.55 IKF=9000 NF=1 NE=2 RB=0.95 IRB=0.005 RBM=0.073 RE=0.005 RC=0.014 CJC=2.398n VJC=2.8346 MJC=0.4846 CJE=6.026n VJE=3.1791 MJE=0.5295 XTI=3 XTB=-1.5 TRC1=9m VCEO=1700 ICRATING=50 MFG=GeneSiC_Semiconductor
.model GA50JT12 NPN IS=9.833E-4S ISE=1.073E-26 EG=3.23 BF=110 BR=0.55 IKF=9000 NF=1 NE=2 RB=0.95 IRB=0.005 RBM=0.073 RE=0.005 RC=0.014 CJC=2.398n VJC=2.8346 MJC=0.4846 CJE=6.026n VJE=3.1791 MJE=0.5295 XTI=3 XTB=-1.5 TRC1=9m VCEO=1200 ICRATING=50 MFG=GeneSiC_Semiconductor

.model 2N7636 npn is=1.22e-47 ise=3.908e-27 EG=3.23 BF=121 BR=0.55 IKF=999 NF=1 NE=2.022 RB=10 re=0.231 RC=0.16 cjc=137p vjc=3.150960833 mjc=0.43821105 cje=297p vje=2.901930244 mje=0.475141754 xti=3 xtb=-0.45 trc1=15m VCEO=600 ICRATING=10 MFG=GeneSiC_Semiconductor
.model BitSiC1206 NPN (IS=1.5e-48 BF=20 NF=1 ISE=2.2e-26 NE=2 BR=0.55 RB=0.26 RC=0.06 XTI=3 XTB=-1.1 EG=3.2 TRC1=4e-3 CJE=1233pF VJE=2.9 MJE=0.5 CJC=425pF VJC=2.9 MJC=0.5 VCEO=1200 ICRATING=6)
.MODEL PBSS303ND NPN IS=7.902E-013 NF=0.9608 ISE=3.296E-014 NE=1.749 BF=563 IKF=1.5 VAF=10 NR=0.961 ISC=1E-018 NC=3 BR=60 IKR=5 VAR=50 RB=22.2 IRB=0.0006 RBM=2.3 RE=0.03 RC=0.025 XTB=0 EG=1.11 XTI=3 CJE=5.681E-010 VJE=0.7622 MJE=0.3574 TF=1.8E-009 XTF=3 VTF=0.5 ITF=0.6 PTF=0 CJC=1.16E-010 VJC=0.01835 MJC=0.1902 XCJC=1 TR=1.5n FC=0.1
.MODEL PBSS303NX NPN IS=1.738E-012 NF=0.9779 ISE=5.321E-014 NE=1.856 BF=505 IKF=6 VAF=20 NR=0.978 ISC=1.357E-014 NC=1.183 BR=188 IKR=2.5 VAR=13.5 RB=15 IRB=0.0003 RBM=0.69 RE=0.016 RC=0.012 XTB=0 EG=1.11 XTI=3 CJE=9.553E-010 VJE=0.7508 MJE=0.3501 TF=8E-010 XTF=5 VTF=1 ITF=1 PTF=0 CJC=1.388E-010 VJC=0.05796 MJC=0.1793 XCJC=1 TR=2n FC=0.7
.MODEL PBSS303PX PNP IS=1.797E-012 NF=0.9878 ISE=2.024E-013 NE=1.518 BF=400 IKF=4 VAF=24 NR=0.9875 ISC=6.554E-014 NC=1.072 BR=140 IKR=3 VAR=7 RB=15.25 IRB=0.0008109 RBM=0.1448 RE=0.016 RC=0.009 XTB=0 EG=1.11 XTI=3 CJE=7.781E-010 VJE=0.8192 MJE=0.3993 TF=1.9n XTF=2 VTF=1.8 ITF=0.8 PTF=0 CJC=2.973E-010 VJC=0.464 MJC=0.2978 XCJC=1 TR=2n FC=0.9
.model 2n5160 pnp IS=10f BF=150 NF=1 VAF=50 IKF=40m ISE=80f NE=1.5 BR=1 NR=1 ISC=0 NC=1 RB=10 IRB=10n RBM=0.1 RE=0.01 RC=20 CJE=12p VJE=0.6 MJE=0.6 TF=50p XTF=4.00 VTF=4.00 ITF=0.300 PTF=20 CJC=8.5p VJC=0.75 MJC=0.333 XCJC=0.5 TR=100p XTB=1.5 EG=1.11 XTI=3 KF=0 AF=1 FC=0.5
.MODEL 2N5160_ PNP BR=20 CJE=1.98683E-11 EG=1.11 FC=0.5 IKF=0.474812 IKR=1 IRB=0.0001 IS=9.00671f ISC=2.62044E-13 ISE=5.9926E-14 ITF=0 MJC=0.498243 MJE=0.412384 NC=1.26048 NE=1.43522 NF=1.0034 NR=1.0126 PTF=0 RB=37.1705 RBM=14.1378 RE=0.2 TR=1E-08 VAF=48.3618 VAR=5.98481 VJC=0.682839 VJE=0.796288 XCJC=1 XTB=1 XTI=3 BF=9.939980E+01 CJC=1.476847E-11 RC=2.000000E-01 TF=1.768388E-10 XTF=1
.MODEL AG128 PNP (AF=1 BF=85 BR=20 CJC=3.75P CJE=6P EG=0.67 FC=0.75 IKF=9.981M IKR=1.248M IRB=5U IS=120.8N ISC=120.8N ISE=0.435N ITF=9.983M KF=5F MJC=0.33 MJE=0.4 NC=1.2 NE=1.2 NF=1 NR=1 PTF=1 RB=173.312 RBM=43.328 RC=60 RE=20 TF=0.15U TR=2.865U VAF=102.207 VAR=20 VJC=0.6 VJE=0.4 VJS=0.7 VTF=2 XCJC=0.65 XTB=1 XTF=9.996 XTI=4 mfg=GERMANIUM)
.MODEL 2SC5706 npn (IS=650f BF=340 NF=1 VAF=10 IKF=790m ISE=2p NE=2 BR=90 NR=1 VAR=40 IKR=780m ISC=350p NC=2 RB=780m IRB=100m RBM=35m RE=21m RC=24m XTB=1 EG=1.11 XTI=3 CJE=270p VJE=680m MJE=350m TF=350p XTF=40 VTF=20 ITF=30 PTF=0 CJC=45p VJC=600.0m MJC=400.0m TR=50p FC=500m)
.MODEL 2SA2039 pnp (IS=650f BF=340 NF=1 VAF=10 IKF=790m ISE=2p NE=2 BR=90 NR=1 VAR=40 IKR=780m ISC=350p NC=2 RB=780m IRB=100m RBM=35m RE=21m RC=24m XTB=1 EG=1.11 XTI=3 CJE=270p VJE=680m MJE=350m TF=350p XTF=40 VTF=20 ITF=30 PTF=0 CJC=45p VJC=600m MJC=400m TR=50p FC=500m)
.MODEL 2N3055A NPN IS=4.66P BF=360 XTB=1 TR=2.55U TF=80N CJC=212P CJE=580P IKF=.25 PTF=120 XTF=1 ITF=3ISE=33.4P ISC=15N RB=3 IRB=1M RBM=.4 RC=.04 NE=1.5 MJC=.4 MJE=.4 VJC=1.8 VJE=.75 BR=2 VAF=100
.MODEL FPNH10 NPN (Is=69.28E-18 Xti=3 Eg=1.11 Vaf=100 Bf=308.6 Ne=1.197 Ise=69.28E-18 Ikf=22.83m Xtb=1.5 Br=1.11
.MODEL 2n6338 npn IS=1n BF=95.5778 NF=0.85 VAF=23.5439 IKF=10.0491 ISE=7.75037p NE=3.34367 BR=2.9033 NR=0.749999 VAR=7.67876 IKR=5.30455 ISC=5.5e-13 NC=3.875 RB=5.78713 IRB=0.111453 RBM=0.1 RE=0.000328839 RC=0.0510123 XTB=0.103896 XTI=1 EG=1.10835 CJE=3.57297n VJE=0.657487 MJE=0.483183 TF=1.47241e-09 XTF=1.22996 VTF=11.447 ITF=0.010002 CJC=5e-10 VJC=0.95 MJC=0.383411 XCJC=0.799998 FC=0.560833 TR=5.55774e-07 PTF=0 ICRATING=25
.MODEL Qbd139 npn IS=1e-09 BF=222.664 NF=0.85 VAF=36.4079 IKF=0.166126 ISE=5.03418e-09 NE=1.45313 BR=1.35467 NR=1.33751 VAR=142.931 IKR=1.66126 ISC=5.02557e-09 NC=3.10227 RB=26.9143 IRB=0.1 RBM=0.1 RE=0.000472454 RC=1.04109 XTB=0.727762 XTI=1.04311 EG=1.05 CJE=1e-11 VJE=0.75 MJE=0.33 TF=1e-09 XTF=1 VTF=10 ITF=0.01 CJC=1e-11 VJC=0.75 MJC=0.33 XCJC=0.9 FC=0.5 TR=1e-07 PTF=0
.MODEL 2N708 npn(Is=1.017f Xti=3 Eg=1.11 Vaf=100 Bf=93.51 Ne=2.048 Ise=31.36p Ikf=.2617 Xtb=1.5 Br=3.509 Nc=2 Isc=0 Ikr=0 Rc=1.75 Cjc=4.256p Mjc=.1053 Vjc=.75 Fc=.5 Cje=8.359p Mje=.3504 Vje=.75 Tr=5.263n Tf=289.3p Itf=.35 Vtf=5 Xtf=2 Rb=10 mfg=National)
.MODEL BF494 NPN (IS=3.0731e-10 BF=140 BR=1 CJE=2p CJC=2p VJE=0.75 VJC=0.75 TF=5.174e-10 TR=1e-08 MJE=0.33 MJC=0.33 VA=100 IKF=0.01 VAR=100 IKR=0.01 XTF=10 VTF=10 ITF=1 PTF=0 XTB=0 EG=1.11 XTI=3 FC=0.5)
.model 2sc4054 npn IS=2.4201p BF=92.371 VAF=44.7 IKF=4.5256 ISE=5.4332p NE=1.2547 BR=3.2573 VAR=1.8738 IKR=20 ISC=11.004n NC=1.8738 NK=.65071 RB=.16891 RC=95.122m CJE=2.2596n VJE=.53979 MJE=.30943 CJC=321.38p VJC=.53259 MJC=.4805 TF=21n XTF=10 VTF=10 ITF=1 TR=427n
.model 2N1420 NPN(Is=14.34f Xti=3 Eg=1.11 Vaf=74.03 Bf=255.9 Ne=1.307 Ise=14.34f Ikf=.2847 Xtb=1.5 Br=6.092 Nc=2 Isc=0 Ikr=0 Rc=1 Cjc=9.393p Mjc=.3416 Vjc=.75 Fc=.5 Cje=22.01p Mje=.377 Vje=.75 Tr=46.91n Tf=410p Itf=.6 Vtf=1.7 Xtf=3 Rb=10 mfg=National)

.MODEL DMMT5401 PNP (IS=20.3f BF=328 VAF=220 IKF=72.9m ISE=8.24p NE=2 BR=4 VAR=20 IKR=0.180 RE=0.257 RB=1.03 RC=0.103 XTB=1.5 CJE=54.3p VJE=1.1 MJE=0.5 CJC=17.5p VJC=0.3 MJC=0.3 TF=315p TR=81.7n EG=1.12 Vceo=150 Icrating=0.2 mfg=Diodes) ;dual,Matched BJTs
.MODEL DMMT5551 NPN (IS=15.4f BF=342 VAF=228 IKF=42.5m ISE=5.27p NE=2 BR=4 VAR=24 IKR=0.105 RE=0.257 RB=1.03 RC=0.103 XTB=1.5 CJE=52.0p VJE=1.1 MJE=0.5 CJC=16.8p VJC=0.3 MJC=0.3 TF=873p TR=163n EG=1.12 Vceo=160 Icrating=0.2 mfg=Diodes) ;dual,Matched BJTs
.MODEL DMMT5551_ NPN (IS=6.5E-15 NF=1 BF=110 VAF=288 ISE=1.0E-14 NE=1.5 NR=1 BR=4.5 VAR=70 ISC=3E-12 NC=1.35 RC=0.5 RB=0.26 RE=0.23 CJC=6.1E-12 MJC=0.31 VJC=0.4 CJE=57E-12 MJE=0.35 VJE=0.8 TF=0.2E-9 TR=1.5E-6 XTB=1.4 QUASIMOD=1 RCO=170 VO=35 GAMMA=2.2E-7 Vceo=160 Icrating=0.2 mfg=Diodes) ;dual,Matched BJTs)
.MODEL 2n3772 npn IS=10p BF=155 NF=1 VAF=50 IKF=4 ISE=5n NE=2.1 BR=12.29 NR=1 VAR=500 IKR=0.1 ISC=0 NC=1 RB=0.4 RE=1m RC=43m CJE=2.145n VJE=0.1 MJE=0.3031 TF=2.37E-8 XTF=1 VTF=500 ITF=20 PTF=0 CJC=1.251n VJC=0.1721 MJC=0.2896 XCJC=0.5 TR=2.88E-7 VJS=0.7 MJS=0.5 XTB=2.4 EG=1.11 XTI=3 FC=0.5
.model 2N3772_ npn IS=2.37E-13 VAF=100 BF=200 IKF=2.9581 NE=4.7081 ISE=2.589u IKR=0.1 ISC=1n NC=2 NR=1 BR=5 RC=0.3 CJC=950p FC=0.5 MJC=0.33 VJC=0.75 CJE=800p MJE=0.5 VJE=0.2 TF=0.5u ITF=100 VTF=5 XTF=10 RE=0.05 TR=0.5u
.MODEL 2N3772__ npn(IS=1.39079e-17 BF=236.075 NF=0.85 VAF=14.4713 IKF=2.37962 ISE=1.27426e-11 NE=1.72808 BR=4.65882 NR=1.5 VAR=144.713 IKR=1.27393 ISC=1e-16 NC=3.09197 RB=8.13873 IRB=0.1 RBM=0.146852 RE=0.0273915 RC=0.136957 XTB=1.00374 XTI=1.14536 EG=1.206 CJE=1.80675e-09 VJE=0.4 MJE=0.416814 TF=1e-08 XTF=21.5645 VTF=5.57447 ITF=0.00100002 CJC=1.13016e-09 VJC=0.4 MJC=0.322815 XCJC=0.1 FC=0.1 TR=4.15174e-10 PTF=0
.MODEL 2SA1209 PNP IS=1.6E-13 ISE=5.2E-11 NF=1.073 NE=2.57 BF=257 IKF=0.081 VAF=125 CJC=8.7p TF=9.95E-10 MJC=0.313 VJC=0.975 CJE=8.7p MJE=0.3 VJE=0.4
.MODEL 2DB1713 PNP IS=1.252Ep NF=1.0119 BF=770 IKF=2.6 VAF=11 ISE=1.3185E-13 NE=1.4832 NR=1.0047 BR=350 IKR=0.32 VAR=10.5 ISC=5.2648E-14 NC=1.186 RB=0.053 RE=0.031 RC=0.044 CJC=137p MJC=0.34 VJC=0.275 CJE=280p TF=0.75n TR=2.3n Vceo=12 Icrating=6A mfg=Zetex
.MODEL FCX1147A PNP IS=1.272p NF=0.989 ISE=2.5e-13 NE=1.65 BF=500 VAF=14.59 IKF=8 NR=1 ISC=8e-14 NC=1.6 BR=90 VAR=3.1 IKR=1.2 RE=15m RB=145m RC=13m CJE=560p CJC=255p VJC=0.6288 MJC=0.4048 TF=1.2n TR=13n Vceo=12 Icrating=20A mfg=Zetex
.MODEL 2SC4207 NPN IS=1.2179f BF=147.18 VAF=100 IKF=.60443 XTB=1.5 ISE=12.936f NE=1.6772 BR=4.2485 VAR=100 IKR=1.5406 ISC=152.72f NC=1.3932 RC=.13126 CJE=2p CJC=6.0728p MJC=.33333 TF=295.26p XTF=10 VTF=10 ITF=1 TR=10n
.MODEL MJE3055 NPN(Is=457.5f Xti=3 Eg=1.11 Vaf=50 Bf=156.7 Ise=1.346p Ne=1.34 Ikf=3.296 Nkf=.5961 Xtb=2.2 Br=7.639 Isc=604.1f Nc=2.168 Ikr=8.131m Rc=91.29m Cjc=278.7p Mjc=.385 Vjc=.75 Fc=.5 Cje=433p Mje=.5 Vje=.75 Tr=1.412u Tf=37.34n Itf=35.68 Xtf=1.163 Vtf=10 Rb=.1)
.model 2SA1576A PNP(Is=70.000E-15 Bf=266.38 Vaf=50.700 Ikf=.27914 Ise=70.000E-15 Ne=1.7618 Br=1.8730 Var=100 Ikr=2.0006 Isc=270.82E-12 Nc=1.7915 Re=.2 Rb=7.8035 Rc=1.0862 Cje=22.937E-12 Mje=.58268 Cjc=11.613E-12 Mjc=.43988 Tf=328.92E-12 Xtf=331.17 Vtf=254.25 Itf=8.1505 Tr=327.28E-9 Xtb=1.5000 Vceo=50 Icrating=0.15 mfg=Rohm)
.model 2SA1579 PNP(Is=60.000E-15 Bf=410.23 Vaf=58.369 Ikf=.24851 Ise=60.000E-15 Ne=1.6719 Br=.99563 Var=100 Ikr=.5153 Isc=26.592E-12 Nc=1.6784 Nk=.94666 Rb=19.288 Rc=2.0146 Cje=24.180E-12 Mje=.64498 Cjc=11.927E-12 Mjc=.47137 Tf=381.07E-12 Xtf=3.9957 Vtf=6.2068 Itf=.11044 Tr=790.19E-9 Xtb=1.5000 Vceo=120 Icrating=0.05 mfg=Rohm)
.model 2SA1774 PNP(Is=70.000E-15 Bf=266.38 Vaf=50.700 Ikf=.27914 Ise=70.000E-15 Ne=1.7618 Br=1.8730 Var=100 Ikr=2.0006 Isc=270.82E-12 Nc=1.7915 Re=.2 Rb=7.8035 Rc=1.0862 Cje=22.937E-12 Mje=.58268 Cjc=11.613E-12 Mjc=.43988 Tf=328.92E-12 Xtf=331.17 Vtf=254.25 Itf=8.1505 Tr=327.28E-9 Xtb=1.5000 Vceo=50 Icrating=0.15 mfg=Rohm)
.model 2SA2088 PNP(Is=65.000E-15 Bf=249.50 Vaf=100 Ikf=.69106 Ise=65.001E-15 Ne=1.4594 Br=10.162 Var=100 Ikr=11.394 Isc=5.0270E-12 Nc=1.3515 Nk=.79748 Re=.5 Rb=.81834 Rc=.20879 Cje=96.030E-12 Mje=.77026 Cjc=32.647E-12 Mjc=.57832 Tf=304.61E-12 Xtf=11.555 Vtf=13.588 Itf=8.1887 Tr=35.022E-9 Xtb=1.5000 Vceo=60 Icrating=0.5 mfg=Rohm)
.model 2SAR293P PNP(Is=500.00E-15 Bf=444.31 Vaf=24.600 Ikf=2.3829 Ise=500.00E-15 Ne=1.6482 Br=4.9950E3 Var=7.7000 Ikr=15.229 Isc=75.178E-12 Nc=1.5444 Nk=.86085 Re=80.000E-3 Rb=2.3056 Rc=.4924 Cje=83.703E-12 Vje=1.0522 Mje=.49837 Cjc=23.220E-12 Vjc=.80782 Mjc=.46231 Tf=451.11E-12 Xtf=108.26 Vtf=53.372 Itf=49.404 Tr=2.0000E-9 Xtb=1.5000 Vceo=30 Icrating=1 mfg=Rohm)
.model 2SAR512P PNP(Is=240.00E-15 Bf=307.48 Vaf=23.200 Ikf=4.9543 Ise=240.00E-15 Ne=1.9535 Br=39.080 Var=16.500 Ikr=.47302 Isc=241.00E-15 Nc=2.4667 Nk=.94551 Re=40.000E-3 Rb=2.1402 Rc=.205 Cje=128.66E-12 Vje=.96698 Mje=.45709 Cjc=50.453E-12 Vjc=1.0394 Mjc=.54257 Tf=301.41E-12 Xtf=3.9532 Vtf=16.722 Itf=1.7306 Tr=12.500E-9 Xtb=1.5000 Vceo=30 Icrating=2 mfg=Rohm)
.model 2SAR513P PNP(Is=220.00E-15 Bf=295.38 Vaf=29.700 Ikf=1.8760 Ise=220.00E-15 Ne=1.5781 Br=29.217

Var=100 Ikr=10.657 Isc=229.66E-15 Nc=1.2092 Nk=.79924 Re=40.000E-3 Rb=1.8898 Rc=.30868 Cje=119.67E-12 Vje=.93671 Mje=.39223 Cjc=42.157E-12 Vjc=.91676 Mjc=.50722 Tf=358.55E-12 Xtf=13.139 Vtf=20.331 Itf=6.8573 Tr=17.500E-9 Xtb=1.5000 Vceo=50 Icrating=1 mfg=Rohm)
.model 2SAR514P PNP(Is=210.00E-15 Bf=239.74 Vaf=41.200 Ikf=2.4755 Ise=474.84E-15 Ne=1.7638 Br=9.1977 Var=26.200 Ikr=.91518 Isc=852.09E-15 Nc=1.2356 Nk=.98791 Re=80.000E-3 Rb=2.5397 Rc=.43853 Cje=120.71E-12 Vje=.74112 Mje=.3555 Cjc=21.650E-12 Vjc=.78879 Mjc=.29529 Tf=378.45E-12 Xtf=12.388 Vtf=8.5169 Itf=4.1911 Tr=76.500E-9 Xtb=1.5000 Vceo=80 Icrating=0.7 mfg=Rohm)
.model 2SAR533P PNP(Is=440.00E-15 Bf=279.15 Vaf=26 Ikf=8.0272 Ise=440.00E-15 Ne=1.5728 Br=16.298 Var=20.300 Ikr=.91246 Isc=1.4308E-12 Nc=2.2472 Nk=.99016 Re=45.000E-3 Rb=.29167 Rc=.1656 Cje=292.97E-12 Vje=.92742 Mje=.4422 Cjc=88.275E-12 Vjc=1.0381 Mjc=.55271 Tf=406.22E-12 Xtf=3.7885 Vtf=12.425 Itf=1.8659 Tr=32.700E-9 Xtb=1.5000 Vceo=50 Icrating=3 mfg=Rohm)
.model 2SAR542P PNP(Is=1.0000E-12 Bf=324.46 Vaf=39.700 Ikf=15.590 Ise=1.0000E-12 Ne=1.8237 Br=53.188 Var=9 Ikr=.73045 Isc=23.931E-12 Nc=2.5940 Nk=.92781 Re=25.000E-3 Rb=.57452 Rc=42.636E-3 Cje=233.18E-12 Vje=1.0430 Mje=.48765 Cjc=148.41E-12 Vjc=1.0315 Mjc=.55325 Tf=569.73E-12 Xtf=13.952 Vtf=3.5264 Itf=2.8917 Tr=10.300E-9 Xtb=1.5000 Vceo=30 Icrating=5 mfg=Rohm)
.model 2SAR544P PNP(Is=800.00E-15 Bf=212.07 Vaf=31.300 Ikf=8.2359 Ise=800.00E-15 Ne=1.7883 Br=14.147 Var=17.900 Ikr=1.0101 Isc=22.559E-12 Nc=1.5653 Nk=.81025 Re=30.000E-3 Rb=.87781 Rc=.13136 Cje=472.89E-12 Vje=.97942 Mje=.46473 Cjc=113.51E-12 Vjc=.76024 Mjc=.47779 Tf=401.61E-12 Xtf=2.3288 Vtf=12.359 Itf=1.0144 Tr=54.500E-9 Xtb=1.5000 Vceo=80 Icrating=2.5 mfg=Rohm)
.model 2SAR552P PNP(Is=520.00E-15 Bf=315.13 Vaf=26.700 Ikf=3.4558 Ise=520.00E-15 Ne=1.7403 Br=49.558 Var=15.400 Ikr=.66084 Isc=936.07E-15 Nc=2.8590 Nk=.62209 Re=35.000E-3 Rb=.75418 Rc=.12127 Cje=242.81E-12 Vje=1.0272 Mje=.49015 Cjc=84.668E-12 Vjc=1.0523 Mjc=.55603 Tf=409.23E-12 Xtf=527.57 Vtf=34.767 Itf=68.903 Tr=6.1000E-9 Xtb=1.5000 Vceo=30 Icrating=3 mfg=Rohm)
.model 2SAR553P PNP(Is=380.00E-15 Bf=292.25 Vaf=34.200 Ikf=5.8054 Ise=380.00E-15 Ne=1.6438 Br=15.006 Var=18.200 Ikr=.99968 Isc=588.69E-15 Nc=2.3881 Nk=.9836 Re=30.000E-3 Rb=1.4634 Rc=.20116 Cje=254.26E-12 Vje=.92645 Mje=.44177 Cjc=78.299E-12 Vjc=1.0229 Mjc=.5476 Tf=383.08E-12 Xtf=2.0291 Vtf=10.898 Itf=.99144 Tr=27.600E-9 Xtb=1.5000 Vceo=50 Icrating=2 mfg=Rohm)
.model 2SAR554P PNP(Is=400.00E-15 Bf=222.84 Vaf=30.600 Ikf=5.0617 Ise=400.03E-15 Ne=1.6004 Br=10.181 Var=20.600 Ikr=6.6435 Isc=1.0067E-12 Nc=1.2721 Nk=.99646 Re=40.000E-3 Rb=1.7344 Rc=.27337 Cje=188.26E-12 Vje=.98456 Mje=.46391 Cjc=50.752E-12 Vjc=.7732 Mjc=.47558 Tf=413.28E-12 Xtf=6.8712 Vtf=5.9615 Itf=2.6873 Tr=52.300E-9 Xtb=1.5000 Vceo=80 Icrating=1.5 mfg=Rohm)
.model 2SB1260 PNP(Is=220.00E-15 Bf=140.43 Vaf=23.200 Ikf=7.9366 Ise=220.00E-15 Ne=1.6291 Br=30.282 Var=100 Ikr=13.783 Isc=274.44E-12 Nc=1.5976 Nk=.83042 Re=50.000E-3 Rb=.6938 Rc=.149 Cje=311.85E-12 Mje=.35932 Cjc=89.315E-12 Mjc=.50953 Tf=714.69E-12 Xtf=11.729 Vtf=22.370 Itf=7.7977 Tr=101.04E-9 Xtb=1.5000 Vceo=80 Icrating=1 mfg=Rohm)
.model 2SB1694 PNP(Is=400.00E-15 Bf=418.17 Vaf=30 Ikf=1.9086 Ise=400.00E-15 Ne=1.6342 Br=248.11 Var=100 Ikr=14.338 Isc=3.3973E-12 Nc=1.2942 Nk=.96066 Re=70.000E-3 Rb=2.2125 Rc=.30535 Cje=96.033E-12 Mje=.55512 Cjc=23.534E-12 Mjc=.4554 Tf=404.28E-12 Xtf=161.24 Vtf=.14046 Itf=15.584 Tr=14.264E-9 Xtb=1.5000 Vceo=30 Icrating=1 mfg=Rohm)
.model 2SC4081 NPN(Is=70.000E-15 Bf=277.08 Vaf=114.03 Ikf=1 Ise=70.000E-15 Ne=1.8934 Br=11.565 Var=100 Ikr=.11266 Isc=1.0228E-12 Nc=1.3260 Nk=.71869 Re=.2 Rb=13.897 Rc=1.2190 Cje=11.342E-12 Mje=.38289 Cjc=4.0230E-12 Mjc=.34629 Tf=338.92E-12 Xtf=4.0449 Vtf=167.36 Itf=.85959 Tr=110.25E-9 Xtb=1.5000 Vceo=50 Icrating=0.15 mfg=Rohm)
.model 2SC4102 NPN(Is=63.000E-15 Bf=380.57 Vaf=100 Ikf=.14961 Ise=63.000E-15 Ne=1.5906 Br=8.8318 Var=100 Ikr=3.5414 Isc=122.12E-12 Nc=1.7074 Nk=.88203 Rb=15.568 Rc=.86281 Cje=19.487E-12 Mje=.39031 Cjc=6.2787E-12 Mjc=.31695 Tf=431.99E-12 Xtf=12.431 Vtf=17.638 Itf=1.4622 Tr=29.726E-9 Xtb=1.5000 Vceo=120 Icrating=0.05 mfg=Rohm)
.model 2SC4617 NPN(Is=70.000E-15 Bf=277.08 Vaf=114.03 Ikf=1 Ise=70.000E-15 Ne=1.8934 Br=11.565 Var=100 Ikr=.11266 Isc=1.0228E-12 Nc=1.3260 Nk=.71869 Re=.2 Rb=13.897 Rc=1.2190 Cje=11.342E-12 Mje=.38289 Cjc=4.0230E-12 Mjc=.34629 Tf=338.92E-12 Xtf=4.0449 Vtf=167.36 Itf=.85959 Tr=110.25E-9 Xtb=1.5000 Vceo=50 Icrating=0.15 mfg=Rohm)
.model 2SC5876 NPN(Is=120.00E-15 Bf=307.96 Vaf=100 Ikf=.76113 Ise=120.00E-15 Ne=1.3985 Br=6.1588 Var=100 Ikr=4.8827 Isc=2.8942E-12 Nc=1.3100 Nk=.76124 Re=.3 Rb=.88626 Rc=32.521E-3 Cje=49.151E-12 Mje=.58268 Cjc=13.141E-12 Mjc=.44672 Tf=495.75E-12 Xtf=31.937 Vtf=20.740 Itf=18.600 Tr=49.533E-9 Xtb=1.5000 Vceo=60 Icrating=0.5 mfg=Rohm)
.model 2SCR293P NPN(Is=500.00E-15 Bf=451.29 Vaf=48.900 Ikf=4.2513 Ise=501.24E-15 Ne=1.5637 Br=38.840 Var=17.200 Ikr=1.8267 Isc=2.9152E-12 Nc=1.3407 Nk=.97869 Re=.14 Rb=2.8446 Rc=.11402 Cje=87.669E-12 Vje=1.7347 Mje=.55171 Cjc=18.808E-12 Vjc=.63549 Mjc=.41539 Tf=463.35E-12 Xtf=432.42 Vtf=40.605 Itf=67.031 Tr=16.000E-9 Xtb=1.5000 Vceo=30 Icrating=1 mfg=Rohm)
.model 2SCR372P NPN(Is=210.00E-15 Bf=252.16 Vaf=127 Ikf=1.2622 Ise=210.00E-15 Ne=1.4631 Br=96.802

Var=34.900 Ikr=.35608 Isc=16.104E-12 Nc=1.4132 Nk=.81181 Rb=2.3517 Rc=.10552 Cje=252.06E-12 Vje=.75202 Mje=.35934 Cjc=26.852E-12 Vjc=.5121 Mjc=.40073 Tf=631.13E-12 Xtf=3.6863 Vtf=98.578 Itf=4.0741 Tr=101.00E-9 Xtb=1.5000 Vceo=120 Icrating=0.7 mfg=Rohm)
.model 2SCR375P NPN(Is=800.00E-15 Bf=153.42 Vaf=4.8443 Ikf=1.5296 Ise=800.00E-15 Ne=1.5062 Br=39.462 Var=41.110 Ikr=2.4021 Isc=125.69E-12 Nc=1.5464 Nk=.69119 Re=50.000E-3 Rb=.5743 Rc=39.911E-3 Cje=479.27E-12 Vje=.7466 Mje=.35988 Cjc=46.626E-12 Vjc=.43755 Mjc=.42493 Tf=695.25E-12 Xtf=488.45 Vtf=269.93 Itf=15.733 Tr=39.000E-9 Xtb=1.2500 Tre1=0.004 Vceo=120 Icrating=1.5 mfg=Rohm)
.model 2SCR512P NPN(Is=400.00E-15 Bf=309.94 Vaf=89.700 Ikf=4.6721 Ise=400.00E-15 Ne=1.6749 Br=74.978 Var=100 Ikr=9.1517 Isc=427.00E-15 Nc=1.2408 Nk=.86551 Re=60.000E-3 Rb=.95732 Rc=.14944 Cje=119.28E-12 Vje=.90437 Mje=.34878 Cjc=26.288E-12 Vjc=.63292 Mjc=.34258 Tf=438.11E-12 Xtf=48.471 Vtf=6.9833 Itf=12.924 Tr=6.5000E-9 Xtb=1.5000 Vceo=30 Icrating=2 mfg=Rohm)
.model 2SCR513P NPN(Is=200.00E-15 Bf=307.43 Vaf=59.700 Ikf=2.3788 Ise=200.00E-15 Ne=1.5493 Br=142.53 Var=100 Ikr=.44171 Isc=211.42E-15 Nc=1.1815 Nk=.87267 Re=60.000E-3 Rb=1.1339 Rc=87.110E-3 Cje=114.19E-12 Vje=.83581 Mje=.33116 Cjc=20.985E-12 Vjc=.84637 Mjc=.43044 Tf=418.72E-12 Xtf=63.597 Vtf=12.889 Itf=20.566 Tr=18.000E-9 Xtb=1.5000 Vceo=50 Icrating=1 mfg=Rohm)
.model 2SCR514P NPN(Is=220.00E-15 Bf=293.86 Vaf=100 Ikf=1.6587 Ise=231.44E-15 Ne=1.4600 Br=160.89 Var=43 Ikr=.14544 Isc=15.133E-12 Nc=1.4486 Nk=.98503 Re=20.000E-3 Rb=4.7775 Rc=87.567E-3 Cje=120.71E-12 Vje=.74112 Mje=.3555 Cjc=14.464E-12 Vjc=1.2084 Mjc=.38033 Tf=454.14E-12 Xtf=5.9469 Vtf=35.154 Itf=3.2575 Tr=48.000E-9 Xtb=1.5000 Vceo=80 Icrating=0.7 mfg=Rohm)
.model 2SCR533P NPN(Is=420.00E-15 Bf=307.28 Vaf=140 Ikf=5 Ise=420.00E-15 Ne=1.5998 Br=128.39 Var=30 Ikr=4.2658 Isc=420.91E-15 Nc=1.2171 Nk=.7604 Re=20.000E-3 Rb=1.7158 Rc=89.720E-3 Cje=283.62E-12 Vje=.7243 Mje=.35199 Cjc=44.087E-12 Vjc=.54497 Mjc=.40197 Tf=450.93E-12 Xtf=66.611 Vtf=32.273 Itf=29.362 Tr=11.200E-9 Xtb=1.5000 Vceo=50 Icrating=3 mfg=Rohm)
.model 2SCR542P NPN(Is=700.00E-15 Bf=336.60 Vaf=111 Ikf=14.480 Ise=700.00E-15 Ne=1.7454 Br=111.04 Var=19 Ikr=.98304 Isc=2.0888E-12 Nc=1.3942 Nk=.62374 Re=20.000E-3 Rb=.89756 Rc=51.259E-3 Cje=491.67E-12 Vje=.73414 Mje=.35298 Cjc=85.063E-12 Vjc=.65513 Mjc=.43196 Tf=412.36E-12 Xtf=29.416 Vtf=2.1315 Itf=2.2660 Tr=3.6000E-9 Xtb=1.5000 Vceo=30 Icrating=5 mfg=Rohm)
.model 2SCR544P NPN(Is=650.00E-15 Bf=259.69 Vaf=111 Ikf=5.9184 Ise=650.00E-15 Ne=1.5840 Br=59.135 Var=31 Ikr=2.6484 Isc=21.843E-12 Nc=1.4311 Nk=.79477 Re=20.000E-3 Rb=1.1435 Rc=57.199E-3 Cje=496.31E-12 Vje=.75391 Mje=.3575 Cjc=59.190E-12 Vjc=.50973 Mjc=.43023 Tf=457.42E-12 Xtf=5.2931 Vtf=10.060 Itf=3.4079 Tr=31.900E-9 Xtb=1.5000 Vceo=80 Icrating=2.5 mfg=Rohm)
.model 2SCR552P NPN(Is=380.00E-15 Bf=346.49 Vaf=88 Ikf=13.358 Ise=380.20E-15 Ne=1.6220 Br=86.406 Var=19 Ikr=2.3526 Isc=380.00E-15 Nc=1.2701 Nk=.99842 Re=30.000E-3 Rb=1.3796 Rc=89.865E-3 Cje=259.26E-12 Vje=.74817 Mje=.35387 Cjc=47.225E-12 Vjc=.57493 Mjc=.39869 Tf=432.25E-12 Xtf=8.2951 Vtf=4.2756 Itf=3.9270 Tr=9.0000E-9 Xtb=1.5000 Vceo=30 Icrating=3 mfg=Rohm)
.model 2SCR553P NPN(Is=530.00E-15 Bf=331.71 Vaf=100 Ikf=4.9995 Ise=530.00E-15 Ne=1.5363 Br=57.892 Var=21 Ikr=1.3895 Isc=1.4590E-12 Nc=1.3414 Nk=.91654 Re=25.000E-3 Rb=1.5828 Rc=.11459 Cje=225.98E-12 Vje=.77511 Mje=.37227 Cjc=39.676E-12 Vjc=.54411 Mjc=.39785 Tf=373.84E-12 Xtf=1.4326 Vtf=13.619 Itf=1.9978 Tr=18.200E-9 Xtb=1.5000 Vceo=50 Icrating=2 mfg=Rohm)
.model 2SCR554P NPN(Is=550.00E-15 Bf=277.41 Vaf=103 Ikf=3.2386 Ise=550.00E-15 Ne=1.5553 Br=33.281 Var=28.600 Ikr=11.836 Isc=8.1161E-9 Nc=2.6073 Nk=.8866 Re=25.000E-3 Rb=2.7470 Rc=92.861E-3 Cje=120.16E-12 Vje=.77848 Mje=.36337 Cjc=14.464E-12 Vjc=1.2084 Mjc=.38033 Tf=505.30E-12 Xtf=22.139 Vtf=16.772 Itf=10.670 Tr=33.600E-9 Xtb=1.5000 Vceo=80 Icrating=1.5 mfg=Rohm)
.model 2SCR573D NPN(Is=1.0000E-12 Bf=305.78 Vaf=100.77 Ikf=15 Ise=9.2726E-12 Ne=1.9977 Br=55.087 Var=30 Ikr=4.3418 Isc=11.133E-12 Nc=1.4838 Nk=1.0139 Re=35m Rb=.50911 Rc=35.473E-3 Cje=466.80E-12 Vje=.77265 Mje=.35972 Cjc=69.345E-12 Vjc=.56296 Mjc=.42599 Tf=434.78E-12 Xtf=400.18 Vtf=196.30 Itf=82.816 Tr=14.336E-9 Xtb=1.5000 Vceo=50 Icrating=3 mfg=Rohm)
.model 2SCR574D NPN(Is=1.0000E-12 Bf=226.21 Vaf=103.70 Ikf=15 Ise=1.0000E-12 Ne=1.5805 Br=78.835 Var=43 Ikr=1.3435 Isc=5.2175E-12 Nc=1.2893 Nk=1.0840 Re=30m Rb=1.4908 Rc=55.610E-3 Cje=496.19E-12 Vje=.76899 Mje=.35078 Cjc=63.898E-12 Vjc=.75325 Mjc=.4557 Tf=498.62E-12 Xtf=454.99 Vtf=242.95 Itf=83.905 Tr=33.570E-9 Xtb=1.2500 TRE1=0.005 Vceo=80 Icrating=2 mfg=Rohm)
.model 2SD2656 NPN(Is=400.00E-15 Bf=413.31 Vaf=30 Ikf=2.4205 Ise=2.1950E-12 Ne=1.8979 Br=51.833 Var=100 Ikr=.79315 Isc=1.5842E-9 Nc=2.1922 Nk=.98841 Re=70m Rb=2.4948 Rc=.10728 Cje=91.854E-12 Mje=.40813 Cjc=15.894E-12 Mjc=.43434 Tf=323.06E-12 Xtf=365.63 Vtf=123.24 Itf=80.819 Tr=32.978E-9 Xtb=1.5000 Vceo=30 Icrating=1 mfg=Rohm)
.MODEL 2SC2712 npn(Is=639.5E-18 Xti=3 Eg=1.11 Vaf=172.5 Bf=151.1 Ise=3.827f Ne=1.607 Ikf=.9977 Nk=.7224 Xtb=1.5 Var=100 Br=8.525 Isc=2.567f Nc=1.141 Ikr=30.27 Rc=.815 Cjc=4.858p Mjc=.3333 Vjc=.75 Fc=.5 Cje=5p Mje=.3333 Vje=.75 Tr=10n Tf=314.2p Itf=9.945 Xtf=0 Vtf=10)
.MODEL 2SC2712_ npn IS=5E-10 BF=1.641E+02 NF=1.426 VAF=10 IKF=2.199E-01 ISE=8.173p NE=1.593 BR=6.184 NR=1.442 VAR=10 RB=1.157E+01 RE=1.000E-01 RC=5.750E-01 CJE=1.578E-11 VJE=9.000E-01 MJE=3.924E-01

TF=2.780E-10 XTF=1.053E+01 VTF=9.990E+05 ITF=9.447E-01 PTF=0 CJC=5.42p VJC=4.000E-01 MJC=2.784E-01 TR=5.966n XTB=0 EG=4.110E-01 XTI=0 FC=5.000E-01
.MODEL 2SC4051 NPN(Is=0.382p Bf=58.4 Vaf=57 Rb=70m Re=20m Rc=30m Cje=1.25n Cjc=163.4p Vje=0.379 Vjc=0.534 Mje=0.2469 Mjc=0.4785 Isc=0.653p Eg=1.11 Ikf=2 Ikr=1.7 Tf=59.7n Tr=3.75u Br=1.47 Var=305.25 Nf=1.01 Ne=1.233 Nr=0.86 Nk=0.67
.MODEL BD433 NPN(Is=1.129p Xti=3 Eg=1.11 Vaf=100 Bf=161 Ise=31.17p Ne=1.557 Ikf=1.948 Nk=.648 Xtb=2 Br=1 Isc=23.5p Nc=1.489 Ikr=31.34m Rc=.1682 Cjc=251.5p Mjc=.5045 Vjc=.75 Fc=.5 Cje=286.3p Mje=.4961 Vje=.75 Tr=810n Tf=23.64n Itf=10.92 Xtf=.3795 Vtf=10 Rb=.1)
.MODEL CJD50 NPN (IS=103.43f BF=54.506 VAF=100 IKF=1.1424 ISE=1.9338p NE=1.4142 BR=474.59 VAR=100 IKR=18.269 ISC=61.843n NC=2.1043 NK=.56313 RB=.65638 RC=.26576 CJE=1.0117n VJE=.6676 MJE=.34403 CJC=110.89p VJC=.41121 MJC=.38646 TF=7.5319n XTF=4.9255 VTF=11.221 ITF=1.6898 TR=10n Vceo=400 Icrating=1 mfg=Central_Semi)
.MODEL FMMT722 PNP IS=6.348E-13 BF=450 IKF=1.25 VAF=30.24 ISE=1.375E-13 NE=1.5 NR=1.00 BR=25 IKR=0.8 VAR=12.6 ISC=1E-13 NC=1.093 RB=0.081 RE=0.09 RC=0.1 CJC=49.87p MJC=0.494 VJC=0.7653 CJE=199p MJE=0.5045 VJE=0.9617 TF=0.57n TR=57n mfg=Zetex
.MODEL MPS8050 NPN (IS=102F NF=1 BF=195 VAF=90 IKF=0.6 ISE=67.2P NE=2 BR=4 NR=1 VAR=24 IKR=0.9 RE=51.5M RB=0.206 RC=20.6M XTB=1.5 CJE=44.2P VJE=1.1 MJE=0.5 CJC=18.9P VJC=0.3 MJC=0.3 TF=1.03N TR=713N Vceo=25 Icrating=1)
.MODEL MPS6560 NPN (IS=50.8F NF=1 BF=162 VAF=90 IKF=0.3 ISE=40.3P NE=2 BR=4 NR=1 VAR=20 IKR=0.45 RE=0.103 RB=0.412 RC=41.2M XTB=1.5 CJE=58.7P VJE=1.1 MJE=0.5 CJC=18.9P VJC=0.3 MJC=0.3 TF=2.65N TR=1.84U Vceo=25 Icrating=500m)
.MODEL MPS8550 PNP (IS=81.2F NF=1 BF=390 VAF=90 IKF=0.48 ISE=26.9P NE=2 BR=4 NR=1 VAR=24 IKR=0.72 RE=64.4M RB=0.258 RC=25.8M XTB=1.5 CJE=41.5P VJE=1.1 MJE=0.5 CJC=28.4P VJC=0.3 MJC=0.3 TF=1.27N TR=884N Vceo=25 Icrating=800m)
.MODEL MPS6562 PNP (IS=50.8F NF=1 BF=162 VAF=90 IKF=0.3 ISE=40.3P NE=2 BR=4 NR=1 VAR=20 IKR=0.45 RE=0.103 RB=0.412 RC=41.2M XTB=1.5 CJE=125P VJE=1.1 MJE=0.5 CJC=40.2P VJC=0.3 MJC=0.3 TF=1.77N TR=1.23U Vceo=25 Icrating=500m)
.model 2sc3355 npn IS=0.5345f BF=83 NF=1.0022 VAF=86 IKF=0.5 ISE=1.331p NE=2.2447 BR=10.2 NR=1.03 VAR=30 IKR=0.466 ISC=10.56p NC=1.055 RB=140 IRB=8u RBM=20 RE=0.56 RC=3.48 CJE=3.24p VJE=0.6 MJE=0.3014 TF=10p XTF=14 VTF=2 ITF=35m PTF=0 CJC=2.29p VJC=0.75 MJC=0.3004 XCJC=0.5 TR=3n XTB=1.5 EG=1.11 XTI=3.0 FC=0.5
.MODEL 2SC1384 npn(Is=47.89f Xti=3 Eg=1.11 Vaf=100 Bf=272.2 Ise=400.4f Ne=1.43 Ikf=5.497 Nk=1.293 Xtb=1.5 Var=100 Br=9.847 Isc=103.4f Nc=1.747 Ikr=0 Rc=.3055 Cjc=42.92p Mjc=.4011 Vjc=.3905 Fc=.5 Cje=5p Mje=.3333 Vje=.75 Tr=10n Tf=1n Itf=1 Xtf=0 Vtf=10)
.model 2sa1300 PNP(Is=331f Xti=3 Eg=1.11 Vaf=100 Bf=410.1 Ise=2.354p Ne=2.231 Ikf=2.152 Nk=.5312 Xtb=1.5 Var=100 Br=68.68 Isc=1.864p Nc=1.704 Ikr=.2816 Rc=52.22m Cjc=121.5p Mjc=.3333 Vjc=.75 Fc=.5 Cje=5p Mje=.3333 Vje=.75 Tr=10n Tf=1.129n Itf=1 Xtf=0 Vtf=10)
.MODEL CA3086 NPN IS=10.000f BF=156.66 VAF=100 IKF=36.783E-3 ISE=114.82f NE=1.4743 BR=.1001 VAR=100 IKR=10.010E-3 ISC=10.000f RC=10 CJE=1.0260p MJE=.33333 CJC=991.79f MJC=.33333 TF=278.55p XTF=91.905 VTF=18.899 ITF=.77631 TR=10.000n
.MODEL CA3083 NPN IS=10.000f BF=112.82 VAF=100 IKF=.12091 ISE=99.047f NE=1.4169 BR=16.076 VAR=100 IKR=29.844E-3 ISC=116.12f NC=1.7076 RC=10 CJE=1.0260p MJE=.33333 CJC=991.79f MJC=.33333 TF=275.05p XTF=91.993 VTF=18.982 ITF=.37511 TR=10.000n
.model qmmbt6429lt1 npn is=1.74559e-13 bf=6084.63 nf=1.03273 vaf=967.955 ikf=0.193795 ise=6.34199e-14 ne=1.47005 br=608.463 nr=1.00262 var=1000 ikr=0.031621 isc=1e-18 nc=1.44458 rb=0.17795 irb=0.322674 rbm=0.17795 re=0.183715 rc=0.918576 xtb=0.478471 xti=3.51897 eg=1.206 cje=8.08142p vje=0.409905 mje=0.346138 tf=2.76368e-10 xtf=9002.67 vtf=819.758 itf=10.4957 cjc=4.4457p vjc=0.741953 mjc=0.345663 xcjc=0.804314 fc=0.725464 cjs=0 vjs=0.75 mjs=0.5 tr=1e-07 ptf=0 kf=2f af=1
.model mmbt6429lt1 npn is=1.74559e-13 bf=6084.63 nf=1.03273 vaf=967.955 ikf=0.193795 ise=6.34199e-14 ne=1.47005 br=608.463 nr=1.00262 var=1000 ikr=0.031621 isc=1e-18 nc=1.44458 rb=0.17795 irb=0.322674 rbm=0.17795 re=0.183715 rc=0.918576 xtb=0.478471 xti=3.51897 eg=1.206 cje=8.08142p vje=0.409905 mje=0.346138 tf=2.76368e-10 xtf=9002.67 vtf=819.758 itf=10.4957 cjc=4.4457p vjc=0.741953 mjc=0.345663 xcjc=0.804314 fc=0.725464 cjs=0 vjs=0.75 mjs=0.5 tr=1e-07 ptf=0 kf=2f af=1
.model qd44vh10 npn is=4.53661e-11 bf=83.9638 nf=0.85 vaf=31.568 ikf=9.92986 ise=5.25921p ne=3.44907 br=6.29465 nr=1.29718 var=8.99475 ikr=7.12846 isc=1.37406e-13 nc=3.9992 rb=7.54185 irb=0.1 rbm=0.1 re=0.00041815 rc=0.0774661 xtb=0.102716 xti=1.11826 eg=1.11385 cje=9.60619e-10 vje=0.649572 mje=0.350659 tf=2.84126e-09 xtf=1.5 vtf=1 itf=1 cjc=3.16396e-10 vjc=0.615633 mjc=0.340325 xcjc=0.8 fc=0.533544 cjs=0 vjs=0.75 mjs=0.5 tr=1.83249e-07 ptf=0 kf=0 af=1
.model d44vh10 npn is=4.53661e-11 bf=83.9638 nf=0.85 vaf=31.568 ikf=9.92986 ise=5.25921p ne=3.44907 br=6.29465 nr=1.29718 var=8.99475 ikr=7.12846 isc=1.37406e-13 nc=3.9992 rb=7.54185 irb=0.1 rbm=0.1

re=0.00041815 rc=0.0774661 xtb=0.102716 xti=1.11826 eg=1.11385 cje=9.60619e-10 vje=0.649572 mje=0.350659 tf=2.84126e-09 xtf=1.5 vtf=1 itf=1 cjc=3.16396e-10 vjc=0.615633 mjc=0.340325 xcjc=0.8 fc=0.533544 cjs=0 vjs=0.75 mjs=0.5 tr=1.83249e-07 ptf=0 kf=0 af=1
.model 2SC1589 NPN(Is=10f Eg=1.11 Vaf=100 Bf=55 Xtb=1.5 Br=1 Cjc=35p Cje=30p Tr=200n Tf=215p Vceo=36 Icrating=700m mfg=NEC)
.MODEL 2SC2979 NPN IS=43.966p VAF=28.53 IKF=.87836 ISE=304.97p NE=1.3348 BR=7.1988 VAR=315 IKR=1.5593 ISC=199.77p NC=1.5628 NK=.67042 RB=.4941 RC=.52125 CJE=2.7232n VJE=.6031 MJE=.32602CJC=213.35p VJC=.40348 MJC=.42559 TF=540n XTF=10 VTF=10 iTF=1 TR=10n
.MODEL 2SA1930 PNP(IS=10f BF=210 VAF=78 IKF=10.000E-3 XTB=1.5 BR=.1001 VAR=100 IKR=10m ISC=10.000f CJE=3.252p CJC=63.196p MJC=.33333 TF=83.239p XTF=10 VTF=10 ITF=1)
.MODEL 2N5087c pnp IS=9f BF=197 VAF=90 IKF=0.08 ISE=6f NE=1.42 NF=1 RB=193 RC=1.7 RE=0.1 CJE=2.5p MJE=0.3 VJE=0.75 CJC=6p MJC=0.3 VJC=0.75 FC=0.5 TF=540p XTF=7 VTF=4 ITF=0.45 TR=10n BR=2.7 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 mfg=CA030911
.MODEL 2N5089c npn IS=35f BF=500 VAF=110 IKF=0.05 ISE=6f NE=1.42 NF=1 RB=295 RC=1.6 RE=0.1 CJE=9p MJE=0.40 VJE=0.75 CJC=4p MJC=0.30 VJC=0.75 FC=0.5 TF=850p XTF=7 VTF=4 ITF=0.35 TR=500n BR=1.5 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 mfg=CA030911
.MODEL 2N5210c npn IS=35f BF=500 VAF=110 IKF=0.05 ISE=6f NE=1.42 NF=1 RB=900 RC=2 RE=0.1 CJE=9p MJE=0.40 VJE=0.75 CJC=4p MJC=0.30 VJC=0.75 FC=0.5 TF=850p XTF=7 VTF=4 ITF=0.35 TR=500n BR=1.5 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 mfg=CA031011
.MODEL 2N5401c pnp IS=25f BF=220 VAF=196 IKF=0.2 ISE=2f NE=1.4 NF=1 RB=60 RC=2 RE=0.1 CJE=35p MJE=0.40 VJE=0.75 CJC=15p MJC=0.55 VJC=0.75 FC=0.5 TF=800p XTF=60 VTF=0 ITF=4 TR=1.5n BR=4 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 mfg=CA031011
.MODEL 2N5551c npn IS=9f BF=125 VAF=667 IKF=0.09 ISE=1f NE=1.3 NF=1 RB=92 RC=1 RE=0.1 CJE=45p MJE=0.35 VJE=0.75 CJC=4.9p MJC=0.30 VJC=0.75 FC=0.5 TF=565p XTF=300 VTF=5 ITF=2.0 TR=1.2n BR=3 IKR=0 EG=1.1 XTB=1.5 XTI=3 NC=2 ISC=0 mfg=CA031011
.MODEL 2SA1407c pnp IS=70f BF=110 VAF=135 IKF=0.2 ISE=5000f NE=2 NF=1 RB=30 RC=3 RE=0.5 CJE=80p MJE=0.5 VJE=1.0 CJC=10p MJC=0.3 VJC=0.5 FC=0.5 TF=320p XTF=10000 VTF=35 ITF=20 TR=100n BR=1.6 IKR=0.09 EG=0.6 XTB=0.9 XTI=3 NC=2 ISC=3e-10 VAR=100 mfg=CA041011
.MODEL 2SC3601c npn IS=65f BF=140 VAF=250 IKF=0.13 ISE=400f NE=1.5 NF=1.0 RB=150 RC=1.5 RE=0.1 CJE=76p MJE=0.35 VJE=0.75 CJC=9p MJC=0.35 VJC=0.75 FC=0.5 TF=350p XTF=10000 VTF=35 ITF=30 TR=10n BR=0.6 IKR=0.05 EG=0.75 XTB=1.5 XTI=3 NC=1.5 ISC=7f NR=1.0 VAR=100 IRB=3e-6 RBM=0.035 XCJC=1.0 mfg=CA041011
.MODEL BC847BLP_DI NPN (IS=5.62f NF=1.00 BF=450 VAF=121 IKF=70.3m ISE=191f NE=2.00 BR=4.00 NR=1.00 VAR=24.0 IKR=0.120 RE=0.700 RB=2.80 RC=0.280 XTB=1.5 CJE=14.6p VJE=1.10 MJE=0.500 CJC=6.93p VJC=0.300 MJC=0.300 TF=541p TR=86.5n EG=1.12)
.MODEL BC857B_DI PNP (IS=5.51f NF=1.00 BF=424 VAF=121 IKF=36.4m ISE=2.35p NE=2.00 BR=4.00 NR=1.00 VAR=20.0 IKR=90.0m RE=0.765 RB=3.06 RC=0.306 XTB=1.5 CJE=26.9p VJE=1.10 MJE=0.500 CJC=8.67p VJC=0.300 MJC=0.300 TF=700p TR=121n EG=1.12)
.MODEL BC857C_DI PNP (IS=10.2f NF=1.00 BF=1.09k VAF=121 IKF=36.4m ISE=1.24p NE=2.00 BR=4.00 NR=1.00 VAR=20.0 IKR=90.0m RE=0.715 RB=2.86 RC=0.286 XTB=1.5 CJE=13.3p VJE=1.10 MJE=0.500 CJC=7.80p VJC=0.300 MJC=0.300 TF=587p TR=95.0n EG=1.12)
.MODEL mmbta06lt1 npn (IS=7.08104e-14 BF=895.434 NF=0.982088 VAF=10 IKF=0.12859 ISE=2.10147e-14 NE=1.28133 BR=89.5434 NR=1.5 VAR=1.39756 IKR=1.2859 ISC=2.10147e-14 NC=1.02259 RB=3.33018 IRB=0.1 RBM=0.1 RE=0.0001 RC=0.001 XTB=0.1 XTI=4 EG=1.206 CJE=7.75263e-11 VJE=0.616699 MJE=0.328978 TF=2.93023e-10 XTF=1000 VTF=639.614 ITF=4.90114 CJC=8.90416p VJC=0.590719 MJC=0.347015 XCJC=0.938693 FC=0.8 CJS=0 VJS=0.75 MJS=0.5 TR=9.57121e-06 PTF=0 KF=0 AF=1 Vceo=80 Icrating=0.5 mfg=On_Semiconductor)
.MODEL MJL1302C pnp IS=7p BF=114 VAF=550 IKF=30 ISE=1e-7 NE=5 NF=1.0 RB=3.3 RC=0.1 CJE=16n MJE=0.45 VJE=0.8 RE=0.0 CJC=2.3n MJC=0.4 VJC=0.3 FC=0.1 TF=3.0n XTF=1000 VTF=2 ITF=150 TR=100n BR=5 VAR=4.3 NR=1.1 EG=1.1 XCJC=1.0 XTB=0.1 XTI=1.0 NC=4 ISC=0.3p IKR=4.5 CJS=0 VJS=0.75 MJS=0.5 PTF=0 KF=0 AF=1 Vceo=200 Icrating=15 mfg=CA041611
.MODEL MJL3281c npn IS=5p BF=158 VAF=1000 IKF=50 ISE=20p NE=1.5 NF=1.0 RB=3.0 RC=0.1 CJE=11n MJE=0.35 VJE=0.5 RE=0.0 CJC=1.2n MJC=0.5 VJC=0.6 FC=0.1 TF=2.7n XTF=7500 VTF=3 ITF=750 TR=100n BR=5 VAR=4.3 NR=1.1 EG=1.1 XCJC=1.0 XTB=0.12 XTI=1.0 NC=4 ISC=0.3p IKR=4.4 CJS=0 VJS=0.75 MJS=0.5 PTF=0 KF=0 AF=1 Vceo=200 Icrating=15 mfg=CA041611
.MODEL MJL4281c npn IS=5p BF=158 VAF=1000 IKF=50 ISE=20p NE=1.5 NF=1.0 RB=3.0 RC=0.1 CJE=11n MJE=0.35 VJE=0.5 RE=0.0 CJC=1.2n MJC=0.5 VJC=0.6 FC=0.1 TF=2.7n XTF=7500 VTF=3 ITF=750 TR=100n BR=5 VAR=4.3 NR=1.1 EG=1.1 XCJC=1.0 XTB=0.12 XTI=1.0 NC=4 ISC=0.3p IKR=4.4 CJS=0 VJS=0.75 MJS=0.5 PTF=0 KF=0 AF=1 Vceo=200 Icrating=15 mfg=CA041611
.MODEL mjl21194c npn IS=4p BF=70 VAF=500 IKF=14 ISE=1.2n NE=2.0 NF=1.01 RB=3.4 RBM=0.1 IRB=1.0

RC=0.06 CJE=8n MJE=0.35 VJE=0.5 RE=0.01 CJC=1.2n MJC=0.5 VJC=0.6 FC=0.5 TF=21n XTF=90 VTF=10 ITF=100 TR=100n BR=5 VAR=100 NR=1.1 EG=1.1 XCJC=0.96 XTB=0.1 XTI=1.0 NC=4 ISC=0.3p mfg=CA112210
.MODEL MJE243c npn IS=800f BF=190 VAF=1177 IKF=1.2 ISE=10p NE=1.7 NF=1.06 RB=45 RC=0.2 RE=0.01 CJE=210p MJE=0.4 VJE=1.0 CJC=85p MJC=0.3 VJC=0.4 FC=0.58 TF=3300p XTF=7 VTF=11 ITF=5 TR=1000n BR=1.7 IKR=1.0 EG=1.05 XTB=1.2 XTI=0.8 NC=2.9 ISC=1e-16 NR=1.04 VAR=140 IRB=5e-5 RBM=0.001 XCJC=0.8 mfg=CA031111
.MODEL MJE253c pnp IS=300f BF=150 VAF=310 IKF=1.2 ISE=30p NE=2 NF=1.015 RB=40 RC=0.3 RE=0.01 CJE=150p MJE=0.35 VJE=1.0 CJC=55p MJC=0.2 VJC=0.35 FC=0.55 TF=3300p XTF=7 VTF=10 ITF=5 TR=1000n BR=4 IKR=4.4 EG=1.05 XTB=1.3 XTI=0.01 NC=2.9 ISC=6e-13 NR=1.15 VAR=50 IRB=7e-6 RBM=0.001 XCJC=0.8 mfg=CA041611
.MODEL MJE340c npn IS=800f BF=180 VAF=100 IKF=0.35 ISE=25p NE=1.5 RB=21 RC=2 RE=0.01 CJE=170p CJC=140p TF=7600p XTF=10 VTF=10 ITF=1 TR=10000p BR=0.004 IKR=0.05 EG=0.64 NC=2 ISC=1.5e-10 VAR=100 mfg=CA030711
.MODEL MJE350c pnp IS=110f BF=118 VAF=100 IKF=0.06 ISE=1.7p NE=1.5 RB=9 RC=1 RE=0.01 CJE=200p MJE=0.35 VJE=0.75 CJC=120p MJC=0.35 VJC=0.55 FC=0.5 TF=4500p BR=0.04 IKR=0.0075 EG=0.75 XTB=1.1 XTI=3 NC=2.0 ISC=5p VAR=100 mfg=CA030711
.MODEL MJE15032c npn IS=50p BF=105 VAF=2000 IKF=9.0 ISE=10p NE=2 NF=1.2 RB=16 RBM=0.1 IRB=0.1 RC=0.1 CJE=3.1n MJE=0.35 VJE=0.65 RE=0.01 CJC=0.3n MJC=0.4 VJC=0.6 FC=0.5 TF=3.8n XTF=4 VTF=10 ITF=2 TR=100n BR=6 VAR=15 NR=1.5 EG=1.2 XCJC=0.8 XTB=0.7 XTI=1.05 NC=4 ISC=0.4p IKR=5.2 mfg=CA032911
.MODEL MJE15033c pnp IS=300p BF=160 VAF=500 IKF=3.0 ISE=10p NE=2 NF=1.3 RB=5 RBM=0.1 IRB=0.1 RC=0.5 CJE=3.1n MJE=0.35 VJE=0.65 RE=0.01 CJC=0.3n MJC=0.4 VJC=0.6 FC=0.5 TF=3.7n XTF=4 VTF=10 ITF=2 TR=100n BR=5 VAR=15 NR=1.5 EG=1.05 XCJC=0.8 XTB=0.22 XTI=1.0 NC=4 ISC=0.3p IKR=7.5 mfg=CA041611
.MODEL NJL1302c pnp IS=7p BF=114 VAF=571 IKF=30 ISE=1e-7 NE=5 NF=1.0 RB=3.3 RC=0.06 CJE=16n MJE=0.43 VJE=0.78 RE=0.0 CJC=2.3n MJC=0.4 VJC=0.3 FC=0.1 TF=3.0n XTF=1000 VTF=2 ITF=150 TR=100n BR=5 VAR=4.3 NR=1.1 EG=1.1 XCJC=0.96 XTB=0.12 XTI=1.03 NC=4 ISC=0.3p IKR=4.4 CJS=0 VJS=0.75 MJS=0.5 PTF=0 KF=0 AF=1 Vceo=200 Icrating=15 mfg=CA112210
.MODEL NJL3281c npn IS=5p BF=158 VAF=1000 IKF=50 ISE=20p NE=1.5 NF=1.0 RB=3.0 RC=0.06 CJE=11n MJE=0.35 VJE=0.5 RE=0.0 CJC=1.2n MJC=0.5 VJC=0.6 FC=0.1 TF=2.7n XTF=7500 VTF=3 ITF=750 TR=100n BR=5 VAR=4.3 NR=1.1 EG=1.1 XCJC=0.96 XTB=0.12 XTI=1.03 NC=4 ISC=0.3p IKR=4.4 CJS=0 VJS=0.75 MJS=0.5 PTF=0 KF=0 AF=1 Vceo=200 Icrating=15 mfg=CA112210
.MODEL 2N6277_ NPN(IS=3E-8 NF=1.67 BF=150 VAF=100 IKF=20 BR=10 RC=.04 MJC=.45 MJE=.45 XTB=1 CJE=5NF TF=3n CJC=2NF TR=.16U Vceo=150 Icrating=50)
.model 2n6277 npn IS=3.849p BF=232.9 NF=1.062 VAF=50 IKF=8.972 ISE=7.01p NE=1.406 BR=0.583 NR=1 VAR=500 IKR=1 ISC=0 NC=2 RB=2.503 IRB=1.127 RBM=1.0E-2 RE=1m RC=0.039 CJE=5694p VJE=0.6 MJE=0.36 TF=1.32n XTF=1 VTF=10 ITF=10 PTF=0 CJC=1860p VJC=0.5 MJC=0.4912 XCJC=0.5 TR=9.7u XTB=1.485 EG=1.11 XTI=3 FC=0.5
.model 2SC2510 npn (is=19f bf=100 vaf=100 ikf=0.18 ise=50p ne=2.5 br=7.5 var=6.4 ikr=12m isc=8.7p nc=1.2 rb=50 re=0.4 rc=0.3 cje=.0022p tf=0.2n cjc=.0022p tr=0.2n xtb=1.5 kf=0.002f af=1)
.MODEL BUD42D NPN (IS=3.49298E-11 BF=19.6305 NF=1.46166 VAF=10 IKF=5.00366 ISE=7.75392p NE=2.22512 BR=1.96305 NR=1.5 VAR=5.28726 IKR=4.5355 ISC=4.75001E-13 NC=2.85087 RB=0.1 IRB=0.1 RBM=0.1 RE=0.000627834 RC=0.0742659 XTB=0.1 XTI=1 EG=1.05 CJE=5.49988E-10 VJE=0.99 MJE=0.365972 TF=4E-10 XTF=1.5 VTF=1 ITF=1 CJC=1.01534E-10 VJC=0.95 MJC=0.394566 XCJC=0.8 FC=0.533333 CJS=0 VJS=0.75 MJS=0.5 TR=9.57121E-06 PTF=0 KF=0 AF=1)
.MODEL ZTX327 NPN (IS=3.15f BF=95 VAF=90 ISE=2.21E-13 NE=1.637 BR=8 VAR=10 NF=.9835 NR=.987 IKR=.12 ISC=7.12E-14 NC=1.27 RB=.5 RE=0.07 RC=.44 CJE=15p TF=.13n CJC=7.22p TR=1.3E-7 VJC=.539 MJC=.4017 XTF=3 ITF=.35
.MODEL NJW3281G NPN (BF=119.415 BR=10.3886 CJC=5E-10 CJE=9.32161E-09 EG=1.206 FC=0.8 IKF=10 IKR=3.27392 IRB=0.1 IS=4.81888E-11 ISC=1E-16 ISE=1E-16 ITF=121.9 MJC=0.23 MJE=0.322215 MJS=0.5 NC=2.90616 NE=1 NF=1.06881 NR=1.06797 RB=4.74135 RBM=1.57648 TF=1.817E-09 TR=1E-07 VAF=21.6596 VAR=216.596 VJC=0.8 VJE=0.523647 VJS=0.75 VTF=15.2293 XCJC=0.1 XTB=0.1 XTF=1000 XTI=1)
.MODEL NJW1302G PNP (BF=100.173 BR=0.562437 CJC=5E-10 CJE=1.1214E-08 EG=1.05 FC=0.8 IKF=4.32732 IKR=0.0147402 IRB=0.1 IS=5.45163E-13 ISC=6.43606p ISE=6.43606p ITF=95.9461 MJC=0.23 MJE=0.32843 MJS=0.5 NC=1.3691 NE=1.46233 NF=0.981788 NR=1.095 RB=3.70218 RBM=0.163972 TF=2.35244E-09 TR=1E-07 VAF=10 VAR=100 VJC=0.95 VJE=0.663546 VJS=0.75 VTF=4.60515 XCJC=0.901894 XTB=1.67324 XTF=79.0726 XTI=1)
.MODEL 2SC1173 NPN (BF=196.362 BR=10 CJC=136.835P CJE=2P IKF=1.44837 IKR=3.90743 IS=10F ISC=.0000121848F ISE=429.303F ITF=155.473P MJC=499.989M MJE=500M NC=2.99801 NE=1.45943 RC=192.44M RE=1 TF=1.09981N TR=10N VAF=100 VJC=700M VTF=9.99926 XTF=501.066M)
.MODEL 2N5415 PNP (BF=74.2112 BR=85.2761M CJC=43.3264P CJE=152.963P FC=500.001M IKF=75.8818M IKR=340.159 IS=28.9269F ISC=100P ISE=514.68F ITF=12.3462M MJC=414.315M MJE=485.682M NE=1.30369

NF=896.708M RC=1.31647 RE=570.13M TF=3.55347N TR=33.4849U VAF=100 VJC=700.177M VJE=999.929M VTF=10.0722 XTF=870.488M)
.MODEL 2N3440 NPN (BF=239.069 BR=265.04M CJC=19.8784P CJE=108.211P FC=500.001M IKF=10.5948M IKR=1.00891 IS=9.94996F ISC=4.89752P ISE=99.2945P ITF=1.75717P MJC=317.349M MJE=432.698M NE=1.9593 NF=913.046M RE=329.989M TF=1N TR=14.2947U VAF=100 VJC=700M VJE=999.674M VTF=9.96322 XTF=3.39469)
.MODEL MJ15002M PNP (IS=5.9955p BF=1255.86 NF=0.989791 VAF=10 IKF=0.142606 ISE=1E-08 NE=2.01784 BR=9.03224 NR=1.5 VAR=100 IKR=0.00777049 ISC=1E-08 NC=1.68621 RB=3.45026 IRB=0.1 RBM=0.333146 RE=0.012422 RC=0.0621099 XTB=0.1 XTI=1 EG=1.05 CJE=7.68242E-10 VJE=0.4 MJE=0.389835 TF=3.59815E-09 XTF=1000 VTF=1.16654 ITF=0.00860153 CJC=5.08874E-10 VJC=0.95 MJC=0.415655 XCJC=0.1 FC=0.467765 CJS=0 VJS=0.75 MJS=0.5 TR=1E-07 PTF=0)
.MODEL MJ15001M NPN (BF=115.914 BR=4.58573 CJC=5E-10 CJE=1.33292E-09 EG=1.206 FC=0.10001 IKF=1.263 IKR=1.20463 IRB=0.1 IS=1.23312E-13 ISC=6.28301E-13 ISE=6.43082E-13 ITF=0.001 MJC=0.85 MJE=0.385557 MJS=0.5 NC=2.79011 NE=1.59704 NF=0.85 NR=0.930118 RB=2.81251 RBM=0.1 RC=0.109491 RE=0.0218983 TF=9.99606E-09 TR=1E-07 VAF=10 VAR=99.9721 VJC=0.95 VJE=0.40062 VJS=0.75 VTF=1.74347 XCJC=0.797142 XTB=0.1 XTF=179.464 XTI=1)
.model BSY95A NPN(Is=804.2f Xti=3 Eg=1.11 Bf=203 Ise=6.304p Ne=1.498 Ikf=64.88m Nk=.6165 Xtb=1.5 Br=7.207 Isc=6.955n Nc=1.533 Ikr=16.41 Rc=5.044 Cjc=6.967p Mjc=.1759 Vjc=.3005 Cje=6.189p Mje=.3454 VAF=100 Vje=.6855 Tr=744.6n Tf=488.7p Itf=1 Vtf=10 Vceo=15 Icrating=200m)
.MODEL 2SA992 pnp(Is=45.75f Xti=3 Eg=1.11 Vaf=100 Bf=484.8 Ise=98.2f Ne=2.522 Ikf=.1779 Nk=1.143 Xtb=1.5 Var=100 Br=1.919 Isc=45.75f Nc=1.454 Ikr=2.467 Rc=3.606 Cjc=7.279p Mjc=.2944 Vjc=.3905 Fc=.5 Cje=5p Mje=.3333 Vje=.75 Tr=10n Tf=884.8p Itf=3.237 Xtf=0 Vtf=10)
.MODEL 2SC1845 NPN(IS=1.485p BF=674.1 VAF=100 IKF=10.01m ISE=1.485p NE=1.883 BR=2.734 VAR=100 IKR=10.01m ISC=1.485p NC=3 NK=.3535 RC=1.704 CJC=5.210p VJC=.35 MJC=.2694 TF=909.9p VTF=5.724 ITF=134 TR=10.00n)
.MODEL MMBT5088 npn(IS=12.6F NF=991M NR=991M RE=305M RC=1 RB=10 VAF=56.7 VAR=28.3 ISE=83.4F ISC=83.4F ISS=0 NE=1.5 NC=1.5 NS=1 BF=1.16K BR=5 IKF=629M IKR=629M CJC=4.69P CJE=7.59P CJS=0 VJC=1.99 VJE=915M VJS=750M MJC=602M MJE=431M MJS=0 TF=398P TR=51.7N EG=1.11 KF=0 AF=1)
.MODEL MJE200 npn(IS=5.63378p BF=1673.02 NF=1.06081 VAF=10 IKF=0.171676 ISE=4.93484e-09 NE=2.24782 BR=1.02548 NR=1.5 VAR=35.1785 IKR=1e-05 ISC=4.93484e-09 NC=1.77854 RB=2.58454 IRB=0.1 RBM=0.1 RE=0.0328689 RC=0.164345 XTB=0.1 XTI=1 EG=1.206 CJE=2.04566e-10 VJE=0.99 MJE=0.369379 TF=9.3862e-10 XTF=1.50007 VTF=1.00065 ITF=0.999818 CJC=1.32472e-10 VJC=0.95 MJC=0.302992 XCJC=0.8 FC=0.633331 CJS=0 VJS=0.75 MJS=0.5 TR=1e-07 PTF=0 KF=0 AF=1)
.MODEL MJE210 pnp(IS=2.34648p BF=2898.77 NF=1.04368 VAF=10 IKF=2.68577 ISE=2.11024e-11 NE=1.52801 BR=0.1 NR=1.36033 VAR=1.10942 IKR=1.405 ISC=1.75644e-11 NC=2.96677 RB=4.17738 IRB=0.1 RBM=0.1 RE=0.0333623 RC=0.166811 XTB=0.867165 XTI=1 EG=1.05 CJE=1.57825e-10 VJE=0.763516 MJE=0.33146 TF=6.87164e-10 XTF=0.890652 VTF=9.29288 ITF=0.0100644 CJC=1.08217e-10 VJC=0.41025 MJC=0.318771 XCJC=0.8 FC=0.520639 CJS=0 VJS=0.75 MJS=0.5 TR=1e-07 PTF=0 KF=0 AF=1)
.MODEL mje181 npn IS=1e-17 BF=198.35 NF=1.0206 VAF=12.4376 IKF=1.11965 ISE=7.21502p NE=3.15832 BR=4.34273 NR=1.1475 VAR=2.3972 IKR=10 ISC=3.89992e-13 NC=3.99001 RB=0.1 IRB=0.1 RBM=0.1 RE=0.0001 RC=0.49763 XTB=0.1 XTI=1.08146 EG=1.206 CJE=1.20187e-10 VJE=0.813111 MJE=0.386263 TF=9.98546e-10 XTF=0.998055 VTF=9.87785 ITF=0.00987268 CJC=2.86035e-11 VJC=0.4 MJC=0.246763 XCJC=0.8 FC=0.537414 TR=6.20767e-07 PTF=0
.MODEL mje170 pnp IS=5.37678e-14 BF=144.999 NF=1.31124 VAF=37.7636 IKF=0.3377 ISE=3.90593e-13 NE=1.94164 BR=2.16743 NR=1.5 VAR=341.991 IKR=1.01149 ISC=3.90593e-13 NC=2.99994 RB=0.143784 IRB=0.1 RBM=0.143784 RE=0.000974472 RC=0.479448 XTB=0.965901 XTI=1.10736 EG=1.206 CJE=1.19394e-10 VJE=0.418187 MJE=0.353257 TF=9.42564e-10 XTF=0.98021 VTF=9.92389 ITF=0.0101545 CJC=8.86819e-11 VJC=0.4 MJC=0.380776 XCJC=0.8 FC=0.527944 TR=1.15732e-06 PTF=0
.MODEL mje171 pnp IS=5.37678e-14 BF=144.999 NF=1.31124 VAF=37.7636 IKF=0.3377 ISE=3.90593e-13 NE=1.94164 BR=2.16743 NR=1.5 VAR=341.991 IKR=1.01149 ISC=3.90593e-13 NC=2.99994 RB=0.143784 IRB=0.1 RBM=0.143784 RE=0.000974472 RC=0.479448 XTB=0.965901 XTI=1.10736 EG=1.206 CJE=1.19394e-10 VJE=0.418187 MJE=0.353257 TF=9.42564e-10 XTF=0.98021 VTF=9.92389 ITF=0.0101545 CJC=8.86819e-11 VJC=0.4 MJC=0.380776 XCJC=0.8 FC=0.527944 TR=1.15732e-06 PTF=0
.MODEL MJE13005 NPN IS=913.83f BF=43.978 VAF=100 IKF=2.9165 ISE=4.8517p NE=1.3631 BR=.439 VAR=100 IKR=78.535E-3 ISC=6.4476p NC=2.1679 NK=.67708 RB=.29573 RC=68.591E-3 CJE=1.2417n VJE=.35 MJE=.2639 CJC=175.77p VJC=.35 MJC=.32584 TF=25.518n XTF=10 VTF=10 ITF=1 TR=8.5576E-6
.MODEL STX13003 NPN Is=0.302f Bf=16.001 Vaf=301 Ikf=3.451 Ise=0.536f Ne=1.241 Br=0.628 Var=493 Ikr=2.451 Isc=0.572E-14 Nc=2.541 Nk=0.837 Rb=1.541 Rbm=0.884E-01 Nf=0.983 Re=0.776E-02 Rc=0.217 Qco=0.446E-08 Rco=1.491 Vo=15.101 Gamma=0.191E-10 Cjc=0.561E-11 Vjc=0.901 Mjc=0.278 Cje=0.349E-11 Vje=0.676 Mje=0.331 Fc=0.558 Tr=0.104E-06 Tf=0.170E-07 Itf=0.192E-03 Vtf=13.701 Xtf=5.461 Vceo=400 Icrating=1 mfg=STMicro
.MODEL ST13003 NPN Is=0.302f Bf=16.001 Vaf=301 Ikf=3.451 Ise=0.536f Ne=1.241 Br=0.628 Var=493 Ikr=2.451

Isc=0.572E-14 Nc=2.541 Nk=0.837 Rb=1.541 Rbm=0.884E-01 Nf=0.983 Re=0.776E-02 Rc=0.217 Qco=0.446E-08 Rco=1.491 Vo=15.101 Gamma=0.191E-10 Cjc=0.561E-11 Vjc=0.901 Mjc=0.278 Cje=0.349E-11 Vje=0.676 Mje=0.331 Fc=0.558 Tr=0.104E-06 Tf=0.170E-07 Itf=0.192E-03 Vtf=13.701 Xtf=5.461 Vceo=400 Icrating=1 mfg=STMicro
.model 2SC2669 NPN(Bf=100 Br=1 Is=1.59e-20 Eg=1.11 Cjc=7p Cje=49p Vaf=100 Tf=0.883n Tr=10n Mjc=.330 Vjc=.75 Mje=.33 Vje=.75 Cjs=2p)
.MODEL 2STR1215 NPN Is=0.367p Bf=404.557 Vaf=63.204 Ikf=4.336 Ise=0.203p Ne=1.761 Br=49.888 Var=41.473 Ikr=1.084 Isc=0.637E-16 Nc=2.829 Nk=0.701 Rb=3.144 Rbm=0.571E-01 Nf=0.981 Re=0.573E-01 Rc=0.879E-01 Qco=0.213E-10 Rco=1.273 Vo=16.377 Gamma=0.649E-07 Cjc=0.376E-10 Vjc=0.714 Mjc=0.411 Cje=0.683E-09 Vje=0.668 Mje=0.396 Fc=0.583 Tr=0.123E-08 Tf=0.965E-09 Itf=0.223 Vtf=39.196 Xtf=1.007 Vceo=15 Icrating=3 mfg=STMicro ;Sot-23
.MODEL MJE13009 NPN IS=418.55f BF=21.619 VAF=100 IKF=11.864 ISE=5.9443p NE=1.4275 BR=.2103 VAR=100 IKR=4.4990 ISC=701.45p NC=1.270 NK=.6367 RB=82.769m RC=25.254E-3 CJE=3.1796n VJE=1.5 MJE=.11593 CJC=516.27p VJC=1.5 MJC=.39769 TF=12.894n XTF=10 VTF=10 ITF=1 TR=64.234u Vceo=400 Icrating=12
.MODEL MJE13009_ NPN (IS=5.36792p BF=22.7911 NF=0.85 VAF=10 IKF=5.53474 ISE=8.27274e-13 NE=3.68432 BR=2.27911 NR=0.75 VAR=4.68261 IKR=8.44426 ISC=8.27274e-13 NC=3.65698 RB=0.938365 IRB=0.1 RBM=0.1 RE=0.0001 RC=0.0350521 XTB=0.114306 XTI=1 EG=1.12482 CJE=4.50839n VJE=0.4 MJE=0.23 TF=1e-08 XTF=2.77017 VTF=6.06314 ITF=0.001 CJC=5e-10 VJC=0.95 MJC=0.457977 XCJC=0.799439 FC=0.8 TR=1.76449u PTF=0 Vceo=400 Icrating=12)
.MODEL MJE13007 NPN (IS=9.59892e-10 BF=24.066 NF=1.44636 VAF=43.3934 IKF=9.47036 ISE=8.46474p NE=3.44625 BR=2.4066 NR=1.5 VAR=4.62023 IKR=6.00849 ISC=8.99763e-13 NC=3.98961 RB=0.170683 IRB=0.1 RBM=0.16933 RE=0.000751231 RC=0.364734 XTB=0.101064 XTI=1.12372 EG=1.05578 CJE=2.45947n VJE=0.99 MJE=0.252048 TF=1e-08 XTF=1.76389 VTF=3.04056 ITF=0.53948 CJC=2.73168e-10 VJC=0.656279 MJC=0.464188 XCJC=0.799939 FC=0.8 TR=2.63173u PTF=0)
.MODEL ZXT1053AK NPN IS=2.1p NF=1.0 BF=600 IKF=2.2 VAF=100 ISE=0.9E-13 NE=1.25 NR=0.99 BR=150 IKR=2.5 VAR=15 ISC=5.0E-10 NC=1.76 RB=0.1 RE=0.028 RC=0.016 CJC=75.1p CJE=520p MJC=0.415 MJE=0.367 VJC=0.512 VJE=0.766 TF=550p TR=22n Vceo=75 Icrating=5 mfg=Diodes ;DPAK
.MODEL ZXT953K PNP IS=1.6649p NF=1.0139 BF=220 IKF=4 VAF=55 ISE=6.2E-13 NE=1.62 NR=1.0107 BR=40 IKR=0.95 VAR=43 ISC=3p NC=1.4 RB=0.032 RE=0.0295 RC=0.034 CJC=265p MJC=0.5286 VJC=0.76 CJE=1.1n TF=0.8n TR=29n XTB=1.4 NK=0.7 TRE1=.0025 TRB1=.0025 TRC1=.0025 Vceo=100 Icrating=5 mfg=Diodes ;DPAK
.MODEL ZXTN25060BFH NPN IS=2E-13 NF=1 BF=315 IKF=4.0 VAF=210 ISE=1.2E-13 NE=1.3 NR=1 BR=12 IKR=0.5 VAR=27 ISC=4.2e-13 NC=1.33 RE=.005 RB=0.25 RC=.005 RCO=1.9 GAMMA=16n QUASIMOD=1 CJE=222p VJE=0.73 MJE=0.35 CJC=34p VJC=0.46 MJC=0.34 TF=7.4E-10 TR=7.6e-8 XTB=1.4 TRE1=.004 TRB1=.004 TRC1=.004
.MODEL mjl3281a_x npn IS=9.8145p BF=438.0 NF=1 VAF=38 IKF=19.0 ISE=1p NE=1.1237388682 BR=4.98985 NR=1.09511 VAR=4.32026 IKR=4.37516 ISC=3.25e-13 NC=3.96875 RB=3.997 RE=0 RC=0.06 XTB=0.115253 XTI=1.03146 EG=1.11986 CJE=1.144e-08 VJE=0.468574 MJE=0.34957 TF=2.6769n XTF=7500 VTF=3 ITF=1000 CJC=1.093685n VJC=0.623643 MJC=0.482111 XCJC=0.959922 FC=0.1 TR=100n PTF=0 Vceo=200 Icrating=15 mfg=OnSemiconductor
.MODEL mjl1302a_x pnp IS=9.8145p BF=122.925 NF=1 VAF=40 IKF=19 ISE=9.18577762370362E-07 NE=5 BR=4.98985 NR=1.09511 VAR=4.32026 IKR=4.37516 ISC=3.25e-13 NC=3.96875 RB=3.30 RE=0 RC=0.06 XTB=0.115253 XTI=1.03146 EG=1.11986 CJE=1.561e-08 VJE=0.781803 MJE=0.433868 TF=3.257n XTF=1000 VTF=2 ITF=260 CJC=2.346838n VJC=0.27876 MJC=0.411324 XCJC=0.959922 FC=0.1 TR=100n PTF=0 Vceo=200 Icrating=15 mfg=OnSemiconductor
.model GA03JT12 NPN IS=3.01E-49 ISE=1.00E-27 EG=3.2 BF=58.5 BR=0.55 IKF=200 NF=1 NE=2 RB=18.0 RBM=0.9 IRB=1e-4 RE=0.184170194 RC=0.342829806 CJC=1.37E-10 VJC=3.150960833 MJC=0.43821105 CJE=2.97E-10 VJE=2.901930244 MJE=0.475141754 XTI=3 XTB=-1.24 TRC1=5.00E-3 VCEO=1200 ICRATING=3 MFG=GeneSiC_Semiconductor
.MODEL ZX5T2E6 PNP IS=11E-13 BF=610 NF=1 VAF=20.1 IKF=2.5 ISE=1.1E-13 NE=1.49 BR=75 NR=1 VAR=4.3 IKR=1 ISC=1.1e-13 NC=1.31 RE=0.0072 RB=0.3 RC=0.012 CJE=460p VJE=1.0 MJE=0.54 CJC=170p VJC=0.62 MJC=0.42 TF=9E-10 TR=8.5n RCO=0.5 GAMMA=25E-10 QUASIMOD=1 XTB=1.5 TRE1=.003 TRB1=.003 TRC1=.003 Vceo=20 Icrating=3.5 mfg=Zetex
.MODEL PN3563 NPN (IS=5.08F NF=1 BF=195 VAF=69.7 IKF=30M ISE=3.36P NE=2 BR=4 NR=1 VAR=8 IKR=45M RE=1.03 RB=4.12 RC=0.412 XTB=1.5 CJE=12.5P VJE=1.1 MJE=0.5 CJC=4.02P VJC=0.3 MJC=0.3 TF=229P TR=159N Vceo=15 Icrating=50m mfg=Fairchild)
.model MAT-02 NPN(Is=.6p Bf=500 Vaf=150 BR=0.5 Var=7 Rb=13 Rc=10 Re=.3 Cje=82p Vje=.7 Mje=.4 TF=.3n TR=5n Cjc=33p Vjc=.55 Mjc=.5 IKF=.3 PTF=25 Vceo=40 Icrating=20m mfg=Analog_Devices)
.MODEL PN2222A NPN (IS=14.34F XTI=3 EG=1.11 VAF=74.03 BF=255.9 NE=1.307 ISE=14.34F IKF=.2847 XTB=1.5 BR=6.092 NC=2 ISC=0 IKR=0 RC=1 CJC=7.306P MJC=.3416 VJC=.75 FC=.5 CJE=22.01P MJE=.377 VJE=.75 TR=46.91N TF=411.1P ITF=.6 VTF=1.7 XTF=3 RB=10)
.model SSTA56 PNP(Is=150.00E-15 Bf=203.04 Vaf=18.361 Ikf=5 Ise=971.59E-15 Ne=1.9289 Br=7.0110 Var=36.400

Ikr=.67756 Isc=16.920E-12 Nc=1.5725 Nk=1.5787 Re=.12 Rb=2.3408 Rc=95.332E-3 Cje=136.96E-12 Vje=.638 Mje=.37877 Cjc=37.879E-12 Vjc=.56971 Mjc=.42396 Tf=658.37E-12 Xtf=17.348 Vtf=27.994 Itf=6.7271 Tr=200.38E-9 Xtb=1.5000 Tre1=0.005 Vceo=80 Icrating=0.5 mfg=Rohm)
.model SST3906 PNP(Is=10.000E-15 Bf=214.10 Vaf=39 Ikf=.36736 Ise=6.2628E-12 Ne=1.9555 Br=14.872 Var=5.4000 Ikr=2.3066E-3 Isc=1.2518E-9 Nc=2.4667 Nk=.78931 Re=.3 Rb=2.1776 Rc=.38693 Cje=7.4001E-12 Vje=.73481 Mje=.32446 Cjc=5.4100E-12 Vjc=.55262 Mjc=.35478 Tf=352.19E-12 Xtf=4.0704 Vtf=1.2425E3 Itf=.18254 Tr=10.101E-9 Xtb=1.5000 Vceo=40 Icrating=0.2 mfg=Rohm)
.model SST4403 PNP(Is=80.000E-15 Bf=148.59 Vaf=19 Ikf=1.4062 Ise=12.409E-12 Ne=1.8629 Br=8.2898 Var=5.1000 Ikr=28.654E-3 Isc=44.995E-12 Nc=1.5887 Nk=.95413 Re=50.000E-3 Rb=4.1286 Rc=.27878 Cje=31.612E-12 Vje=.51401 Mje=.29441 Cjc=22.050E-12 Vjc=.55911 Mjc=.44294 Tf=426.74E-12 Xtf=1.1468 Vtf=479.32 Itf=.31201 Tr=58.204E-9 Xtb=1.5000 Vceo=40 Icrating=0.6 mfg=Rohm)
.model SST2907A PNP(Is=80.000E-15 Bf=148.59 Vaf=19 Ikf=1.4062 Ise=12.409E-12 Ne=1.8629 Br=8.2898 Var=5.1000 Ikr=28.654E-3 Isc=44.995E-12 Nc=1.5887 Nk=.95413 Re=50.000E-3 Rb=4.1286 Rc=.27878 Cje=31.612E-12 Vje=.51401 Mje=.29441 Cjc=22.050E-12 Vjc=.55911 Mjc=.44294 Tf=426.74E-12 Xtf=1.1468 Vtf=479.32 Itf=.31201 Tr=58.204E-9 Xtb=1.5000 Vceo=60 Icrating=0.6 mfg=Rohm)
.model BCX19 NPN(Is=43.522E-15 Bf=212.62 Vaf=100 Ikf=1.1384 Ise=43.554E-15 Ne=1.4099 Br=10.166 Var=100 Ikr=71.304E-3 Isc=19.105E-12 Nc=1.8086 Nk=.87081 Re=.1 Rb=3.7985 Rc=.12522 Cje=40.045E-12 Mje=.34085 Cjc=13.820E-12 Mjc=.38184 Tf=192.81E-12 Xtf=140.05 Vtf=32.781 Itf=.79171 Tr=99.284E-9 Xtb=1.5000 Vceo=45 Icrating=0.5 mfg=Rohm)
.model SSTA06 NPN(Is=100.00E-15 Bf=200.65 Vaf=210.70 Ikf=1.5862 Ise=100.00E-15 Ne=1.5769 Br=385.26 Var=71.270 Ikr=.18206 Isc=2.2073E-12 Nc=1.2569 Nk=.98282 Re=50.000E-3 Rb=2.3695 Rc=.19338 Cje=72.128E-12 Vje=.46975 Mje=.32476 Cjc=15.723E-12 Vjc=.457 Mjc=.3653 Tf=481.26E-12 Xtf=58.730 Vtf=17.623 Itf=4.5070 Tr=51.994E-9 Xtb=1.2000 Tre1=0.01 Vceo=80 Icrating=0.5 mfg=Rohm)
.model SST3904 NPN(Is=7.8000E-15 Bf=418.50 Vaf=210 Ikf=.11777 Ise=107.33E-15 Ne=1.4561 Br=1.4445 Var=16 Ikr=14.562 Isc=71.780E-12 Nc=1.5919 Nk=.73861 Rb=7.1334 Rc=.86215 Cje=6.3252E-12 Vje=.62919 Mje=.35786 Cjc=3.1745E-12 Vjc=.77077 Mjc=.19463 Tf=281.52E-12 Xtf=1.6571E3 Vtf=945.94 Itf=10.142 Tr=121.92E-9 Xtb=1.5000 Vceo=40 Icrating=0.2 mfg=Rohm)
.model SST4401 NPN(Is=27.000E-15 Bf=389.37 Vaf=68 Ikf=1.0897 Ise=27.019E-15 Ne=1.2394 Br=3.7134 Var=37 Ikr=.12973 Isc=65.318E-12 Nc=1.5315 Nk=.80478 Re=40.000E-3 Rb=2.5421 Rc=.37477 Cje=31.822E-12 Vje=.56719 Mje=.3632 Cjc=15.123E-12 Vjc=.7312 Mjc=.6022 Tf=370.77E-12 Xtf=523.38 Vtf=330.48 Itf=32.287 Tr=107.39E-9 Xtb=1.5000 Vceo=40 Icrating=0.6 mfg=Rohm)
.model SST2222A NPN(Is=27.000E-15 Bf=389.37 Vaf=68 Ikf=1.0897 Ise=27.019E-15 Ne=1.2394 Br=3.7134 Var=37 Ikr=.12973 Isc=65.318E-12 Nc=1.5315 Nk=.80478 Re=40.000E-3 Rb=2.5421 Rc=.37477 Cje=31.822E-12 Vje=.56719 Mje=.3632 Cjc=15.123E-12 Vjc=.7312 Mjc=.6022 Tf=370.77E-12 Xtf=523.38 Vtf=330.48 Itf=32.287 Tr=107.39E-9 Xtb=1.5000 Vceo=40 Icrating=0.6 mfg=Rohm)
.model AD162 pnp bf=295 br=4 eg=0.72 cje=200p cjc=200p tf=0.1u tr=1.u is=5u ikf=1.5 nk=0.4 vaf=15 mje=0.5 mjc=0.5 rb=15 rbm=10 irb=1m rc=35m ise=.4u ne=1.6 isc=2u nc=1.3 mfg=germanium
.model AD161 npn bf=395 br=4 eg=0.72 cje=200p cjc=200p tf=0.1u tr=1.u is=5u ikf=1.5 nk=0.65 vaf=15 mje=0.5 mjc=0.5 rb=15 rbm=5 irb=1m rc=0.25 ise=.9u ne=1.6 isc=2u nc=1.3 mfg=germanium
.MODEL 2SC3649 NPN (IS=375.4f BF=200.8 NF=999.8m VAF=4 IKF=288.2m ISE=326.1f NE=1.479 BR=50 NR=1 VAR=49 IKR=30.00m ISC=500.0p NC=2 RB=400.0m IRB=100.0m RBM=10.00m RE=70.00m RC=40.00m XTB=0 EG=1.11 XTI=3)
.MODEL 2SA1507 pnp (IS=520.0f BF=340 NF=1 VAF=6.4 IKF=40.00m ISE=42.00p NE=2 BR=50 NR=1 VAR=110 IKR=71.00m ISC=2.500n NC=2 RB=730.0m IRB=80.00m RBM=386.0m RE=50.00m RC=64.00m XTB=1 EG=1.11 XTI=3 CJE=270.0p VJE=700.0m MJE=373.0m TF=910p XTF=1 VTF=1.000K ITF=5 PTF=0 CJC=96.00p VJC=650.0m MJC=480.0m XCJC=1 TR=1.000n FC=500.0m KF=0 AF=1)
.MODEL nss40300mz4 pnp IS=6.10762p BF=372.791 NF=1.11525 VAF=123.792 IKF=1.70048 ISE=5.62041e-13 NE=1.62641 BR=29.1646 NR=1.12282 VAR=239.503 IKR=2.19487 ISC=9.2457e-14 NC=4 RB=2.14688 IRB=0.1 RBM=0.1 RE=0.0138635 RC=0.0693177 XTB=1.17404 XTI=1 EG=1.10086 CJE=3.27154e-10 VJE=0.4 MJE=0.317786 TF=7.25283e-10 XTF=22.4348 VTF=100000 ITF=4.79652 CJC=1.01869e-10 VJC=0.4 MJC=0.304596 XCJC=0.812733 FC=0.78261 CJS=0 VJS=0.75 MJS=0.5 TR=1e-07 PTF=0
.model bux81 npn IS=39.05f BF=51 NF=0.9208 VAF=40 IKF=4.5 ISE=3.16n NE=1.8858 BR=0.101 NR=0.9208 VAR=50 RB=0.43 RBM=0.43 RE=0.002 RC=76.7m CJE=1762.3p VJE=0.5 MJE=0.34 TF=5.31n XTF=2 VTF=10 ITF=10 PTF=0 CJC=516.4p VJC=0.65 MJC=0.4437 XCJC=0.5 TR=778n XTB=2.225 EG=1.11 XTI=3 FC=0.5 Vceo=450 Icrating=10 mfg=SEMELAB)
.model NTE386 npn IS=39.05f BF=51 NF=0.9208 VAF=40 IKF=4.5 ISE=3.16n NE=1.8858 BR=0.101 NR=0.9208 VAR=50 RB=0.43 RBM=0.43 RE=0.002 RC=76.7m CJE=1762.3p VJE=0.5 MJE=0.34 TF=5.31n XTF=2 VTF=10 ITF=10 PTF=0 CJC=516.4p VJC=0.65 MJC=0.4437 XCJC=0.5 TR=778n XTB=2.225 EG=1.11 XTI=3 FC=0.5 Vceo=450 Icrating=10 mfg=NTE)
.model BC857BT116 PNP(Is=70.000E-15 Bf=266.38 Vaf=50.700 Ikf=.27914 Ise=70.000E-15 Ne=1.7618 Br=1.8730

Var=100 Ikr=2.0006 Isc=270.82E-12 Nc=1.7915 Re=.2 Rb=7.8035 Rc=1.0862 Cje=22.937E-12 Mje=.58268
Cjc=11.613E-12 Mjc=.43988 Tf=328.92E-12 Xtf=331.17 Vtf=254.25 Itf=8.1505 Tr=327.28E-9 Xtb=1.5000 Vceo=45
Icrating=0.1 mfg=Rohm)
.model BC807-25T116 PNP(Is=300.00E-15 Bf=293.7 Vaf=100 Ikf=7.9962 Ise=300.00E-15 Ne=1.8179 Br=24.969
Var=100 Ikr=8.6844 Isc=20.673E-12 Nc=1.4876 Nk=1.2295 Re=.1 Rb=1.5116 Rc=.15941 Cje=127.81E-12 Mje=.41399
Cjc=41.583E-12 Mjc=.46676 Tf=475.21E-12 Xtf=26.772 Vtf=68.517 Itf=13.643 Tr=36.831E-9 Xtb=1.5000 Vceo=45
Icrating=0.5 mfg=Rohm)
.model BC807-40T116 PNP(Is=300.00E-15 Bf=446.2 Vaf=100 Ikf=7.9962 Ise=300.00E-15 Ne=1.8179 Br=24.969
Var=100 Ikr=8.6844 Isc=20.673E-12 Nc=1.4876 Nk=1.2295 Re=.1 Rb=1.5116 Rc=.15941 Cje=127.81E-12 Mje=.41399
Cjc=41.583E-12 Mjc=.46676 Tf=475.21E-12 Xtf=26.772 Vtf=68.517 Itf=13.643 Tr=36.831E-9 Xtb=1.5000 Vceo=45
Icrating=0.5 mfg=Rohm)
.model BC847BT116 NPN(Is=70.000E-15 Bf=277.08 Vaf=114.03 Ikf=1 Ise=70.000E-15 Ne=1.8934 Br=11.565 Var=100
Ikr=.11266 Isc=1.0228E-12 Nc=1.3260 Nk=.71869 Re=.2 Rb=13.897 Rc=1.2190 Cje=11.342E-12 Mje=.38289
Cjc=4.0230E-12 Mjc=.34629 Tf=338.92E-12 Xtf=4.0449 Vtf=167.36 Itf=.85959 Tr=110.25E-9 Xtb=1.5000 Vceo=45
Icrating=0.1 mfg=Rohm)
.model BC817-25T116 NPN(Is=250.00E-15 Bf=336.5 Vaf=100 Ikf=2 Ise=250.00E-15 Ne=1.4602 Br=34.771 Var=100
Ikr=1.9204 Isc=32.139E-12 Nc=1.4582 Nk=.95449 Re=.11 Rb=2.2167 Rc=.20594 Cje=140.16E-12 Mje=.34085
Cjc=22.788E-12 Mjc=.41739 Tf=993.07E-12 Xtf=116.12 Vtf=18.131 Itf=28.198 Tr=108.22E-9 Xtb=1.5000 Vceo=45
Icrating=0.5 mfg=Rohm)
.model BC817-40T116 NPN(Is=250.00E-15 Bf=530.5 Vaf=100 Ikf=2 Ise=250.00E-15 Ne=1.4602 Br=34.771 Var=100
Ikr=1.9204 Isc=32.139E-12 Nc=1.4582 Nk=.95449 Re=.11 Rb=2.2167 Rc=.20594 Cje=140.16E-12 Mje=.34085
Cjc=22.788E-12 Mjc=.41739 Tf=993.07E-12 Xtf=116.12 Vtf=18.131 Itf=28.198 Tr=108.22E-9 Xtb=1.5000 Vceo=45
Icrating=0.5 mfg=Rohm)
.MODEL BC160 PNP (IS=35.6P NF=1 NR=1 RE=378M RC=1 RB=10 VAF=90 VAR=45 ISE=37.5P ISC=37.5P ISS=0
NE=1.5 NC=1.5 NS=1 BF=195 BR=5 IKF=132M IKR=132M CJC=63.8P CJE=199P CJS=0 VJC=1.14 VJE=1.42
VJS=750M MJC=330M MJE=330M MJS=0 TF=3.18N TR=414N EG=1.11 KF=0 AF=1)
.MODEL BC160-16 PNP (IS=3.23E-0017 NF=714M NR=714M RE=303M RC=1 RB=10 VAF=144 VAR=71.9 ISE=72.9F
ISC=72.9F ISS=0 NE=1.36 NC=1.36 NS=1 BF=200 BR=5 IKF=294M IKR=294M CJC=24.5P CJE=71P CJS=0
VJC=242M VJE=699M VJS=750M MJC=283M MJE=403M MJS=0 TF=3.18N TR=414N EG=1.11 KF=0 AF=1)
.MODEL BC161 PNP (IS=35.6P NF=1 NR=1 RE=378M RC=1 RB=10 VAF=90 VAR=45 ISE=37.5P ISC=37.5P ISS=0
NE=1.5 NC=1.5 NS=1 BF=195 BR=5 IKF=132M IKR=132M CJC=63.8P CJE=199P CJS=0 VJC=1.14 VJE=1.42
VJS=750M MJC=330M MJE=330M MJS=0 TF=3.18N TR=414N EG=1.11 KF=0 AF=1)
.MODEL BC161-16 PNP (IS=3.23E-0017 NF=714M NR=714M RE=303M RC=1 RB=10 VAF=144 VAR=71.9 ISE=72.9F
ISC=72.9F ISS=0 NE=1.36 NC=1.36 NS=1 BF=200 BR=5 IKF=294M IKR=294M CJC=24.5P CJE=71P CJS=0
VJC=242M VJE=699M VJS=750M MJC=283M MJE=403M MJS=0 TF=3.18N TR=414N EG=1.11 KF=0 AF=1)
.MODEL BC140 NPN (IS=76.5P NF=1 NR=1 RE=598M RC=1 RB=10 VAF=90 VAR=45 ISE=181P ISC=181P ISS=0
NE=1.5 NC=1.5 NS=1 BF=301 BR=5 IKF=98M IKR=98M CJC=63.8P CJE=97.5P CJS=0 VJC=624M VJE=606M
VJS=750M MJC=330M MJE=330M MJS=0 TF=3.18N TR=414N EG=1.11 KF=0 AF=1)
.MODEL BC140-10 NPN (IS=12.6F NF=991M NR=991M RE=305M RC=1 RB=10 VAF=56.7 VAR=28.3 ISE=30.1F
ISC=30.1F ISS=0 NE=1.41 NC=1.41 NS=1 BF=96.6 BR=5 IKF=385M IKR=385M CJC=15.6P CJE=51.6P CJS=0
VJC=1.36 VJE=2.98 VJS=750M MJC=454M MJE=585M MJS=0 TF=796P TR=103N EG=1.11 KF=0 AF=1)
.MODEL BC140-16 NPN (IS=12.6F NF=991M NR=991M RE=305M RC=1 RB=10 VAF=56.7 VAR=28.3 ISE=1.77F
ISC=1.77F ISS=0 NE=1.24 NC=1.24 NS=1 BF=169 BR=5 IKF=395M IKR=395M CJC=15.6P CJE=51.6P CJS=0
VJC=1.36 VJE=2.98 VJS=750M MJC=454M MJE=585M MJS=0 TF=796P TR=103N EG=1.11 KF=0 AF=1)
.MODEL bc327_ pnp IS=2.69972e-13 BF=255 NF=1.02306 VAF=10 IKF=1.61069 ISE=1.54904e-10 NE=2.52512
BR=2.08944 NR=1.06916 VAR=100 IKR=10 ISC=8.82272e-11 NC=3.4075 RB=5.73192 IRB=0.1 RBM=0.1
RE=0.0874431 RC=0.437216 XTB=0.614751 XTI=1 EG=1.206 CJE=3.79878e-11 VJE=0.4 MJE=0.428861
TF=7.72055e-10 XTF=0.545495 VTF=1.21513 ITF=0.001 CJC=2.55655e-11 VJC=0.95 MJC=0.434575
XCJC=0.899807 FC=0.8 TR=1e-07 PTF=0
.model NUHFARRY NPN (IS=1.840E-16 XTI=3.000E+00 EG=1.110E+00 VAF=7.200E+01 VAR=4.500E+00
BF=1.036E+02 ISE=1.686E-19 NE=1.400E+00 IKF=5.400E-02 XTB=0.000E+00 BR=1.000E+01 ISC=1.605E-14
NC=1.800E+00 IKR=5.400E-02 RC=1.140E+01 CJC=3.980E-13 MJC=2.400E-01 VJC=9.700E-01 FC=5.000E-01
CJE=2.400E-13 MJE=5.100E-01 VJE=8.690E-01 TR=4.000E-09 TF=10.51E-12 ITF=3.500E-02 XTF=2.300E+00
VTF=3.500E+00 PTF=0.000E+00 XCJC=9.000E-01 CJS=1.150E-13 VJS=7.500E-01 MJS=0.000E+00 RE=1.848E+00
RB=5.007E+01 RBM=1.974E+00 KF=0.000E+00 AF=1.000E+00)
.model PUHFARRY PNP (IS=1.027E-16 XTI=3.000E+00 EG=1.110E+00 VAF=3.000E+01 VAR=4.500E+00
BF=5.228E+01 ISE=9.398E-20 NE=1.400E+00 IKF=5.412E-02 XTB=0.000E+00 BR=7.000E+00 ISC=1.027E-14
NC=1.800E+00 IKR=5.412E-02 RC=3.420E+01 CJC=4.951E-13 MJC=3.000E-01 VJC=1.230E+00 FC=5.000E-01
CJE=2.927E-13 MJE=5.700E-01 VJE=8.800E-01 TR=4.000E-09 TF=20.05E-12 ITF=2.001E-02 XTF=1.534E+00
VTF=1.800E+00 PTF=0.000E+00 XCJC=9.000E-01 CJS=1.150E-13 VJS=7.500E-01 MJS=0.000E+00 RE=1.848E+00

RB=3.271E+01 RBM=9.902E-01 KF=0.000E+00 AF=1.000E+00)
.model HFA3134 NPN (IS=1.98E-16 VAF=2.00E+01 BF=1.20E+02 IKF=2.1 ISE=7.70E-15 NE=2 VAR=2.64 BR=17.8 IKR=6.1m ISC=2.26E-16 NC=1.57 NK=3 CJC=6.00E-13 MJC=3.80E-01 VJC=6.00E-01 CJE=7.00E-13 MJE=5.10E-01 VJE=8.72E-01 XCJC=9.00E-01 CJS=1.39E-13 VJS=7.50E-01 MJS=0.00E+00 FC=5.00E-01 TR=2.50E-09 TF=1.30E-11 ITF=2.80E-01 XTF=2.01E+01 VTF=2.37 PTF=3.70E+01 RC=5.25 RE=8.70E-01 RB=1.29E+01 RBM=6.47
.model HFA3135 PNP IS=1.31456E-16 XTI=3 EG=1.11 VAF=30 VAR=4.5 BF=5.228E+01 ISE=12.02944E-20 NE=1 IKF=6.92736E-02 XTB=0.000E+00 BR=7 ISC=1.31456E-14 NC=1.8 IKR=6.92736E-02 RC=2.671875E+01 CJC=6.33728E-13 MJC=3.000E-01 VJC=1.23 FC=5.000E-01 CJE=3.74656E-13 MJE=5.700E-01 VJE=8.800E-01 TR=4n TF=20.05p ITF=2.56128E-02 XTF=1.534 VTF=1.8 PTF=0 XCJC=9.000E-01 CJS=1.472E-13 VJS=7.500E-01 MJS=0 RE=1.44375 RB=2.55546875E+01 RBM=7.7359375E-01
.MODEL 2SA2142 PNP(TNOM=25 IS=6e-013 BF=210 IKF=0.095 ISE=1.0e-21 NE=2.4 NK=0.705 XTB=1 XTI=1 TRC1=0 NF=1 VAF=18 VAR=50 BR=1 IKR=0.1 ISC=1.0e-21 NR=1 NC=1 RB=0.5 RC=2.5 RE=0.05 CJC=5.78E-011 MJC=0.33 VJC=0.75 CJE=5e-11 MJE=0.33 VJE=0.75 EG=1.11 TR=9u TF=4.43n Vceo=600 Icrating=0.5 mfg=TOSHIBA)
.MODEL 2SC5354 NPN(TNOM=25 IS=2e-012 BF=500 NF=1 VAF=45 IKF=1.2 ISE=1.15e-012 NE=1.15 BR=10 NR=1.006 VAR=100 IKR=10 ISC=2e-009 NC=1.4 NK=0.617 RE=0.03 RB=0.1 RC=0.009 CJE=500E-012 VJE=0.75 MJE=0.33 CJC=500E-012 VJC=0.75 MJC=0.33 FC=0.5 TF=10E-009 XTF=10 VTF=2 ITF=1 PTF=0 TR=100E-09 EG=1.11 XTB=1.5 XTI=3 TRC1=0 Vceo=800 Icrating=5 mfg=TOSHIBA)
.MODEL 2SC6105_BJT NPN(TNOM=25 IS=1.4e-013 BF=210 VAF=18 IKF=0.06 ISE=2e-013 NE=1.409 BR=0.15 VAR=100 IKR=0.001 ISC=1.737E-12 NC=1.389 NF=1 NR=1 RB=5 NK=0.75 RE=0.0001 RC=4 CJE=1.0E-11 VJE=0.75 MJE=0.4479 CJC=1.375E-11 VJC=0.75 MJC=0.2814 XTB=1.7 XTI=4 TRC1=0 EG=1.11 TR=50n TF=700p Vceo=600 Icrating=50m mfg=TOSHIBA)
.MODEL 2SC6127 NPN(TNOM=25 IS=8e-015 BF=40 VAF=50 IKF=0.057 ISE=1.8e-013 NE=1.38 BR=138.4 VAR=100 IKR=0.5 ISC=1e-010 NC=1.389 NF=1 NR=1 RB=2 NK=0.638 RE=0.1 RC=0.8 CJE=7.650E-12 VJE=0.75 MJE=0.4479 CJC=7.15E-12 VJC=0.75 MJC=0.2814 XTB=1.5 XTI=5 TRC1=0.009 EG=1.11 TR=50.00E-9 TF=1.045E-8 Vceo=800 Icrating=50m mfg=TOSHIBA)
.model OC44 pnp is=1.4u BF=307 br=20 VAF=8.2 VAR=15 ikf=44m ikr=612m ise=31n isc=214n ne=1.32 nc=1.26 Rb=33 Re=1 Rc=1 cje=410p Cjc=10p tf=20n tr=800n MFG=GERMANIUM-TYPE
.MODEL 2SC2592 NPN (IS=101F NF=1 BF=421 VAF=241 IKF=.6 ISE=24.1P NE=2 BR=4 NR=1 VAR=16 IKR=.9 RE=.663 RB=2.65 RC=.265 XTB=1.5 CJE=183P VJE=1.1 MJE=.5 CJC=59.1P VJC=.3 MJC=.3 TF=795P TR=552N)
.model 2sa958 pnp IS=3.678n BF=190 NF=1.4615 VAF=130 IKF=2514.3m ISE=8661.5132p NE=2.9311 BR=4000 NR=1.5 VAR=200 ISC=0 RB=5 IRB=0.4 RBM=1 RE=0.1 RC=0.6 CJE=15p VJE=0.75 MJE=0.38 TF=7.958n CJC=9p VJC=0.75 MJC=0.33 TR=4.838E-6 XTB=0.5 XTI=3
.model 2sc2168 npn IS=113f BF=210 NF=876.1m VAF=190 IKF=1.912 ISE=265p NE=1.751 BR=1 NR=0.8 VAR=200 ISC=0 NC=2 RB=2 IRB=0.4 RBM=1 RE=0.1 RC=1 CJE=20p VJE=0.75 MJE=0.33 TF=8n XTF=20 VTF=5 ITF=1 CJC=14p VJC=0.75 MJC=0.33 TR=4.95u XTB=3.01 EG=1.11 XTI=3
.MODEL 2SB755 PNP AF=1 BR=0.0288 CJE=4.16E-09 CJS=0 EG=1.11 FC=0.5 IKF=2.45 IKR=1 IRB=0.000109 IS=1E-10 ISC=1E-13 ISE=1.14E-12 ITF=2.64 KF=0 MJC=0.33 MJE=0.33 MJS=0.33 NC=2 NE=1.23 NF=1.14 NR=1.43 PTF=0 RB=31.1 RBM=2.15 RE=0.000101 TR=0 VAF=18.2 VAR=50 VJC=0.75 VJE=0.75 VJS=0.75 VTF=999000 XCJC=1 XTB=1.6 XTI=2.5 BF=1.300000E+02 CJC=1.080000E-09 RC=1.910000E-01 TF=8.190000E-09 XTF=8.500000E-01
.MODEL 2SC2001 npn(IS=2.768e-014 NF=1.000e000 ISE=6.957e-015 NE=1.230e000 BF=5.375e002 BR=1 IKF=8.000e-001 VAF=100 VAR=20 EG=1.11 XTI=2.878 XTB=1.816e000 RC=2.e-001 RB=2.375e-001 RE=0 CJE=4.465e-011 MJE=2.799e-001 VJE=4.900e-001 CJC=2.848e-011)
.model 2SC3324 NPN(Is=99.13f Xti=3 Eg=1.11 Vaf=422.2 Bf=352.8 Ise=1.179p Ne=1.782 Ikf=.4704 Nk=.9631 Xtb=1.5 Var=100 Br=1.663 Isc=555.1p Nc=1.796 Ikr=5.85 Rc=.2032 Cjc=7.561p Mjc=.2472 Vjc=.3905 Fc=.5 Cje=5p Mje=.3333 Vje=.75 Tr=10n Tf=1.295n Itf=1 Xtf=0 Vtf=10)
.MODEL 2SC3324_ NPN (IS=9.9761F BF=424.353 NF=932.918M VAF=470.89 IKF=100.2M ISE=27.3241F NE=1.36185 BR=175.47M IKR=996.694 ISC=792.926P RC=211.533M CJE=2P MJE=500M CJC=11.7009P VJC=750.027M MJC=498.869M TF=1.42434N XTF=500.194M VTF=9.99996 ITF=10.8095M TR=10N)
.model 2SA1312 PNP (Is=465.4f Xti=3 Eg=1.11 Vaf=55.42 Bf=402.1 Ise=1.909p Ne=1.86 Ikf=.4984 Nk=1.463 Xtb=1.5 Var=100 Br=1 Isc=620.5f Nc=1.111 Ikr=20.07 Rc=3.939 Cjc=12.11p Mjc=.3862 Vjc=.8655 Fc=.5 Cje=5p Mje=.3333 Vje=.75 Tr=10n Tf=1.256n Itf=1 Xtf=0 Vtf=10 Vceo=120 ICrating=100m Mfg=Toshiba)
.MODEL TIP29A npn(IS=2.35E-18 NF=886M NR=886M RE=370M RC=1 RB=10 VAF=40 VAR=20 ISE=19.8F ISC=19.8F ISS=0 NE=1.5 NC=1.5 NS=1 BF=513 BR=5 IKF=195M IKR=195M CJC=131P CJE=131P CJS=0 VJC=515M VJE=515M VJS=750M MJC=330M MJE=330M MJS=0 TF=53.1N TR=6.9U EG=1.11 KF=0 AF=1)
.MODEL TIP29B npn(IS=2.35E-18 NF=886M NR=886M RE=370M RC=1 RB=10 VAF=40 VAR=20 ISE=19.8F ISC=19.8F ISS=0 NE=1.5 NC=1.5 NS=1 BF=513 BR=5 IKF=195M IKR=195M CJC=131P CJE=131P CJS=0 VJC=515M VJE=515M VJS=750M MJC=330M MJE=330M MJS=0 TF=53.1N TR=6.9U EG=1.11 KF=0 AF=1)

.MODEL TIP29C npn(IS=2.35E-18 NF=886M NR=886M RE=370M RC=1 RB=10 VAF=40 VAR=20 ISE=19.8F ISC=19.8F ISS=0 NE=1.5 NC=1.5 NS=1 BF=513 BR=5 IKF=195M IKR=195M CJC=131P CJE=131P CJS=0 VJC=515M VJE=515M VJS=750M MJC=330M MJE=330M MJS=0 TF=53.1N TR=6.9U EG=1.11 KF=0 AF=1)
.MODEL NSC_5F PNP (Is=51.23f Xti=3 Eg=1.11 Vaf=100 Bf=434.1 Ise=51.23f Ne=1.22 Ikf=.3883 Nk=.5544 Xtb=2.2 Br=55.47 Isc=51.23f Nc=1.205 Ikr=10.87 Rc=.3443 Cjc=136.9p Mjc=.3155 Vjc=.75 Fc=.5 Cje=179.9p Mje=.4294 Vje=.75 Tr=20.25n Tf=13.05n Itf=6.85 Xtf=1.573 Vtf=10 Rb=.1)
.MODEL TIP30 PNP (Is=51.23f Xti=3 Eg=1.11 Vaf=100 Bf=434.1 Ise=51.23f Ne=1.22 Ikf=.3883 Nk=.5544 Xtb=2.2 Br=55.47 Isc=51.23f Nc=1.205 Ikr=10.87 Rc=.3443 Cjc=136.9p Mjc=.3155 Vjc=.75 Fc=.5 Cje=179.9p Mje=.4294 Vje=.75 Tr=20.25n Tf=13.05n Itf=6.85 Xtf=1.573 Vtf=10 Rb=.1)
.MODEL ZXTP25012EFH PNP IS=5.5E-13 NF=1 BF=650 VAF=20 ISE=1.9E-13 IKF=2.5 NE=1.53 BR=72 VAR=4.1 ISC=7E-14 NC=1.2 IKR=0.25 RC=0.010 RB=0.15 RE=0.006 QUASIMOD=1 RCO=0.7 GAMMA=1.7E-9 CJC=57E-12 MJC=0.35 VJC=0.53 CJE=168E-12 MJE=0.54 VJE=0.95 TF=0.42E-9 TR=8.4E-9 TRC1=0.005 TRB1=0.005 TRE1=0.005 XTB=1.4 Vceo=12 Icrating=4 mfg=Diodes
.model ZXTN19020DG NPN IS=9E-13 NF=1 BF=530 IKF=6 VAF=105 ISE=8E-14 NE=1.4 NR=1 BR=174 IKR=1 VAR=12.8 ISC=4E-13 NC=1.37 RB=0.17 RE=0.0055 RC=0.0035 CJC=89E-12 MJC=0.34 VJC=0.51 CJE=365E-12 MJE=0.39 VJE=0.8 TF=9E-10 TR=0.55E-8 XTB=1.4 TRC1=.005 TRB1=.005 TRE1=.005 QUASIMOD=1 RCO=0.15 GAMMA=0.3E-9 Vceo=20 Icrating=9 mfg=Diodes
.model ZXTP19020DG PNP IS=8.5E-13 NF=1 BF=530 VAF=25.8 ISE=1.2E-13 IKF=3.8 NE=1.48 BR=130 VAR=5.15 ISC=0.8E-13 NC=1.23 RC=0.0045 RB=0.15 RE=0.009 QUASIMOD=1 RCO=0.27 GAMMA=2E-10 CJC=112E-12 MJC=0.4 VJC=0.6 CJE=345E-12 MJE=0.53 VJE=0.95 TF=0.59E-9 TR=4.2E-9 TRC1=.003 TRB1=.003 TRE1=.003 XTB=1.4 Vceo=20 Icrating=8 mfg=Diodes
.MODEL 2N4265 npn(IS=5.47448e-14 BF=258.073 NF=1.05729 VAF=373.162 IKF=0.114864 ISE=1.45413e-13 NE=1.39925 BR=0.1 NR=1.04646 VAR=576.535 IKR=0.41634 ISC=1.45413e-13 NC=4 RB=3.24855 IRB=2.19611 RBM=1.89005 RE=0.182207 RC=0.911032 XTB=0.1 XTI=1 EG=1.206 CJE=5.87224p VJE=5.07453 MJE=0.23 TF=4.10534e-10 XTF=0.554739 VTF=6.45763 ITF=0.0350619 CJC=6.27959p VJC=0.95 MJC=0.336188 XCJC=0.9 FC=0.515187 CJS=0 VJS=0.75 MJS=0.5 TR=2.12931e-07 PTF=0 Vceo=12 Icrating=0.2)
.MODEL 2N4265_ NPN (IS=20.3F NF=1 BF=325 VAF=62.4 IKF=0.2 ISE=8.06P NE=2 BR=4 NR=1 VAR=24 IKR=0.3 RE=0.258 RB=1.03 RC=0.103 XTB=1.5 CJE=6.91P VJE=1.1 MJE=0.5 CJC=6.39P VJC=0.3 MJC=0.3 TF=530P TR=368N Vceo=12 Icrating=0.2)
.MODEL 2N4265__ NPN (IS=4.86F NF=1 BF=1.49K VAF=62.3 IKF=.11 ISE=5.51P NE=2 BR=4 NR=1 VAR=24 IKR=.165 RE=1.15 RB=4.63 RC=.463 XTB=1.5 CJE=6.61P CJC=5.28P TF=374P TR=87.4N Vceo=12 Icrating=0.2)
.MODEL ZXTN25015DFH NPN IS=5E-13 NF=1 BF=500 IKF=5.5 VAF=57 ISE=2.3E-13 NE=1.55 NR=1 BR=160 IKR=1 VAR=12.3 ISC=6e-13 NC=1.47 RB=0.15 RE=.009 RC=.006 RCO=0.2 GAMMA=1.8E-10 CJC=60E-12 MJC=0.33 VJC=0.55 CJE=200E-12 MJE=0.38 VJE=0.75 TF=0.6E-9 TR=2.6e-9 XTB=1.4 TRC1=.005 TRB1=.005 TRE1=.005 QUASIMOD=1
.MODEL ZXTN25020BFH NPN IS=2E-13 BF=280 NF=1 VAF=40 IKF=4.3 ISE=1E-13 NE=1.4 BR=90 NR=1 VAR=19 IKR=2.0 ISC=5e-13 NC=1.45 RE=0.0131 RB=0.14 RC=0.0086 CJE=224E-12 VJE=0.67 MJE=0.33 CJC=62.5E-12 VJC=0.55 MJC=0.335 TF=0.65E-9 TR=7.5e-9 RCO=0.13 GAMMA=1E-10 QUASIMOD=1 XTB=1.4
.MODEL ZXTN25020CFH NPN IS=2.8E-13 NF=1 BF=390 IKF=9 NK=0.73 VAF=67 ISE=7E-14 NE=1.4 NR=1 BR=36 IKR=1.7 VAR=14 ISC=4e-13 NC=1.4 RB=0.15 RE=.008 RC=.006 RCO=0.29 GAMMA=1.1E-9 CJC=47E-12 MJC=0.33 VJC=0.49 CJE=196E-12 MJE=0.34 VJE=0.68 TF=0.7E-9 TR=20e-9 XTB=1.4 TRE1=.005 TRB1=.005 TRC1=.005 QUASIMOD=1
.MODEL ZXTN25020DFH NPN IS=4E-13 BF=550 NF=1 VAF=25 IKF=4.5 ISE=1E-13 NE=1.4 BR=120 NR=1 VAR=8 IKR=1.7 ISC=4e-13 NC=1.4 RE=0.010 RB=0.1 RC=0.0085 CJE=190E-12 VJE=0.67 MJE=0.345 CJC=47E-12 VJC=0.525 MJC=0.34 TF=0.53E-9 TR=8.6e-9 RCO=0.29 GAMMA=0.8E-9 QUASIMOD=1 XTB=1.4
.MODEL ZXTN25020DFL NPN IS=4E-13 BF=550 NF=1 VAF=25 IKF=4.5 ISE=1E-13 NE=1.4 BR=120 NR=1 VAR=8 IKR=1.7 ISC=4e-13 NC=1.4 RE=0.010 RB=0.1 RC=0.0085 CJE=190E-12 VJE=0.67 MJE=0.345 CJC=47E-12 VJC=0.525 MJC=0.34 TF=0.53E-9 TR=8.6e-9 RCO=0.29 GAMMA=0.8E-9 QUASIMOD=1 XTB=1.4
.MODEL ZXTN25040DFH NPN IS=5.1E-13 BF=480 NF=1 VAF=99 IKF=3.3 ISE=1.2E-13 NE=1.49 BR=65 NR=1 VAR=24 IKR=1 ISC=1.1E-13 NC=1.31 RE=0.0115 RB=0.15 RC=0.012 CJE=192E-12 VJE=0.75 MJE=0.38 CJC=35E-12 VJC=0.47 MJC=0.34 TF=0.62E-9 TR=20E-9 RCO=1.9 GAMMA=1E-8 QUASIMOD=1 XTB=1.35 TRE1=0.005 TRB1=0.005 TRC1=0.005
.MODEL ZXTN25040DFL NPN IS=5.1E-13 BF=480 NF=1 VAF=99 IKF=3.3 ISE=1.2E-13 NE=1.49 BR=65 NR=1 VAR=24 IKR=1 ISC=1.1E-13 NC=1.31 RE=0.0115 RB=0.15 RC=0.012 CJE=192E-12 VJE=0.75 MJE=0.38 CJC=35E-12 VJC=0.47 MJC=0.34 TF=0.62E-9 TR=20E-9 RCO=1.9 GAMMA=1E-8 QUASIMOD=1 XTB=1.35 TRE1=0.005 TRB1=0.005 TRC1=0.005
.MODEL ZXTN25040DZ NPN IS=5.1E-13 BF=480 NF=1 VAF=99 IKF=3.3 ISE=1.2E-13 NE=1.49 BR=65 NR=1 VAR=24 IKR=1 ISC=1.1E-13 NC=1.31 RE=0.0115 RB=0.15 RC=0.012 CJE=192E-12 VJE=0.75 MJE=0.38 CJC=35E-12 VJC=0.47 MJC=0.34 TF=0.62E-9 TR=20E-9 RCO=1.9 GAMMA=1E-8 QUASIMOD=1 XTB=1.35 TRE1=0.005 TRB1=0.005 TRC1=0.005

.MODEL ZXTN25050DFH NPN IS=5E-13 NF=1 BF=520 IKF=5.6 VAF=115 ISE=1.1E-13 NE=1.38 NR=1 BR=22 IKR=1 VAR=65 ISC=3E-13 NC=1.25 RB=0.2 RE=0.00125 RC=0.00128 CJC=35.5E-12 MJC=0.32 VJC=0.45 CJE=183E-12 MJE=0.38 VJE=0.75 TF=5.7E-10 TR=5.3E-8 XTB=1.4 TRC1=.01 TRB1=.01 TRE1=.01 QUASIMOD=1 RCO=1.7 GAMMA=1.2E-8
.MODEL ZXTN25060BZ NPN IS=2E-13 NF=1 BF=315 IKF=4.0 VAF=210 ISE=1.2E-13 NE=1.3 NR=1 BR=12 IKR=0.5 VAR=27 ISC=4.2e-13 NC=1.33 RE=.005 RB=0.25 RC=.005 RCO=1.9 GAMMA=16E-9 QUASIMOD=1 CJE=222E-12 VJE=0.73 MJE=0.35 CJC=34E-12 VJC=0.46 MJC=0.34 TF=7.4E-10 TR=7.6e-8 XTB=1.4 TRE1=.004 TRB1=.004 TRC1=.004
.MODEL ZXTN25100BFH NPN IS=3E-13 NF=1 BF=315 IKF=5 VAF=256 ISE=1.1E-13 NE=1.43 NR=1 BR=31 IKR=1 VAR=40 ISC=3e-13 NC=1.15 RB=0.15 RE=.014 RC=.015 RCO=4.5 GAMMA=4.5E-8 CJC=30E-12 MJC=0.3 VJC=0.42 CJE=210E-12 MJE=0.38 VJE=0.8 TF=0.8E-9 TR=70e-9 XTB=1.4 TRC1=.003 TRB1=.003 TRE1=.003 QUASIMOD=1
.MODEL ZXTN25100DFH NPN IS=6E-13 NF=1 BF=550 IKF=4 VAF=117 ISE=1.3E-13 NE=1.42 NR=1 BR=35 IKR=1 VAR=36 ISC=5E-13 NC=1.18 RB=0.2 RE=0.0013 RC=0.0016 CJC=28E-12 MJC=0.3 VJC=0.4 CJE=182E-12 MJE=0.39 VJE=0.78 TF=7.5E-10 TR=5.3E-8 XTB=1.4 TRC1=.005 TRB1=.005 TRE1=.005 QUASIMOD=1 RCO=7 GAMMA=8.3E-8
.MODEL ZXTN25100DG NPN IS=6E-13 NF=1 BF=550 IKF=4 VAF=117 ISE=1.3E-13 NE=1.42 NR=1 BR=35 IKR=1 VAR=36 ISC=5E-13 NC=1.18 RB=0.2 RE=0.0013 RC=0.0016 CJC=28E-12 MJC=0.3 VJC=0.4 CJE=182E-12 MJE=0.39 VJE=0.78 TF=7.5E-10 TR=5.3E-8 XTB=1.4 TRC1=.005 TRB1=.005 TRE1=.005 QUASIMOD=1 RCO=7 GAMMA=8.3E-8
.MODEL ZXTN25100DZ NPN IS=6E-13 NF=1 BF=550 IKF=4 VAF=117 ISE=1.3E-13 NE=1.42 NR=1 BR=35 IKR=1 VAR=36 ISC=5E-13 NC=1.18 RB=0.2 RE=0.0013 RC=0.0016 CJC=28E-12 MJC=0.3 VJC=0.4 CJE=182E-12 MJE=0.39 VJE=0.78 TF=7.5E-10 TR=5.3E-8 XTB=1.4 TRC1=.005 TRB1=.005 TRE1=.005 QUASIMOD=1 RCO=7 GAMMA=8.3E-8
.MODEL ZXTN26020DMF NPN IS=7.5E-13 BF=700 NF=1.005 VAF=61 IKF=3.3 ISE=8.5E-14 NE=1.35 BR=130 NR=1 VAR=11.3 IKR=1.4 ISC=6E-13 NC=1.38 RE=0.061 RB=0.5 RC=0.010 CJE=143E-12 VJE=0.80 MJE=0.39 CJC=39E-12 VJC=0.40 MJC=0.26 TF=0.48E-9 TR=2.7E-9 RCO=0.42 GAMMA=2E-9 QUASIMOD=1 XTB=1.35 TRE1=0.004 TRB1=0.004 TRC1=0.004
.MODEL ZXTN26070 NPN IS=300E-15 NF=1 BF=350 ISE=60E-15 NE=1.35 BR=16 ISC=400E-15 NC=1.25 NR=1 CJC=30.37E-12 MJC=0.33 VJC=0.5 CJE=160.7E-12 MJE=0.37 VJE=0.75 RC=93.2m RE=30m RB=2 TF=.8n TR=80n
.MODEL ZXTN4004K NPN IS=7.5E-13 NF=1.008 BF=440 IKF=3 VAF=220 ISE=1E-13 NE=1.4 NR=1.008 BR=36 IKR=0.5 VAR=39.6 ISC=1E-12 NC=1.2 RB=0.8 RE=0.026 RC=0.046 CJC=26E-12 MJC=0.4 VJC=0.4 CJE=220E-12 MJE=0.35 VJE=0.73 TF=0.5E-9 TR=380E-9 RCO=9 GAMMA=2E-7 QUASIMOD=1 TRE1=0.0045 TRB1=0.0035 TRC1=0.0045 XTB=1.5 XTI=4
.MODEL ZXTN4004Z NPN IS=7.5E-13 NF=1.008 BF=440 IKF=3 VAF=220 ISE=1E-13 NE=1.4 NR=1.008 BR=36 IKR=0.5 VAR=39.6 ISC=1E-12 NC=1.2 RB=0.8 RE=0.026 RC=0.046 CJC=26E-12 MJC=0.4 VJC=0.4 CJE=220E-12 MJE=0.35 VJE=0.73 TF=0.5E-9 TR=380E-9 RCO=9 GAMMA=2E-7 QUASIMOD=1 TRE1=0.0045 TRB1=0.0035 TRC1=0.0045 XTB=1.5 XTI=4
.MODEL ZXTN5551FL NPN IS=6.5E-15 NF=1 BF=110 VAF=288 ISE=1.0E-14 NE=1.5 NR=1 BR=4.5 VAR=70 ISC=3E-12 NC=1.35 RC=0.5 RB=0.26 RE=0.23 CJC=6.1E-12 MJC=0.31 VJC=0.4 CJE=57E-12 MJE=0.35 VJE=0.8 TF=0.2E-9 TR=1.5E-6 XTB=1.4 QUASIMOD=1 RCO=170 VO=35 GAMMA=2.2E-7
.MODEL ZXTN5551Z NPN IS=6.5E-15 NF=1 BF=110 VAF=288 ISE=1.0E-14 NE=1.5 NR=1 BR=4.5 VAR=70 ISC=3E-12 NC=1.35 RC=0.5 RB=0.26 RE=0.23 CJC=6.1E-12 MJC=0.31 VJC=0.4 CJE=57E-12 MJE=0.35 VJE=0.8 TF=0.2E-9 TR=1.5E-6 XTB=1.4 QUASIMOD=1 RCO=170 VO=35 GAMMA=2.2E-7
.MODEL X07P12E PNP IS=1.3E-12 BF=660 NF=1 VAF=11 IKF=4 ISE=2E-13 NE=1.48 BR=230 NR=1 VAR=6 IKR=0.65 ISC=1.2e-13 NC=1.33 RE=0.035 RB=0.1 RC=0.018 CJE=280E-12 VJE=0.8 MJE=0.47 CJC=145E-12 VJC=0.75 MJC=0.46 TF=3.3E-10 TR=2e-9 RCO=0.26 GAMMA=20E-10 QUASIMOD=1 TRB1=0.001 TRE1=0.001 TRC1=0.001 XTB=1.5
.MODEL ZXTP07040DFF PNP IS=7.5E-13 NF=1 BF=490 VAF=34 ISE=1.9E-13 IKF=3 NE=1.49 BR=69 VAR=5.7 ISC=1.3E-13 NC=1.22 RC=0.006 RB=0.1 RE=0.022 CJC=105E-12 MJC=0.44 VJC=0.65 CJE=299E-12 MJE=0.52 VJE=0.96 TF=0.47E-9 TR=10E-9 XTB=1.4 TRC1=.005 TRB1=.005 TRE1=.005 RCO=0.58 GAMMA=6E-10 QUASIMOD=1
.MODEL ZXTP08400BFF PNP IS=3.8E-13 BF=200 NF=1 VAF=250 ISE=2E-13 NE=1.48 BR=5 NR=1 VAR=65 ISC=3.8E-13 NC=1.05 RC=0.045 RE=0.068 RB=0.1 CJE=370E-12 VJE=0.8 MJE=0.43 CJC=65E-12 VJC=0.5 MJC=0.43 TF=1.2E-9 TR=2400E-9 RCO=14 GAMMA=7E-8 QUASIMOD=1 XTB=1.5
.MODEL ZXTP19020CFF PNP IS=6.3E-13 NF=1 BF=400 VAF=21.5 ISE=1.2E-13 IKF=4.6 NE=1.42 BR=140 VAR=4.9 ISC=1.3E-13 NC=1.25 RC=0.0045 RB=0.15 RE=0.009 CJC=145E-12 MJC=0.33 VJC=0.6 CJE=379E-12 MJE=0.47 VJE=0.85 TF=0.4E-9 TR=4.5E-9 XTB=1.4 QUASIMOD=1 RCO=0.18 GAMMA=0.3E-9 TRC1=.003 TRB1=.003 TRE1=.003
.MODEL ZXTP19020DFF PNP IS=8.5E-13 NF=1 BF=530 VAF=25.8 ISE=1.2E-13 IKF=3.8 NE=1.48 BR=130 VAR=5.15 ISC=0.8E-13 NC=1.23 RC=0.0045 RB=0.15 RE=0.009 QUASIMOD=1 RCO=0.27 GAMMA=2E-10 CJC=112E-12

MJC=0.4 VJC=0.6 CJE=345E-12 MJE=0.53 VJE=0.95 TF=0.59E-9 TR=4.2E-9 TRC1=.003 TRB1=.003 TRE1=.003 XTB=1.4
.MODEL ZXTP19020DZ PNP IS=8.5E-13 NF=1 BF=530 VAF=25.8 ISE=1.2E-13 IKF=3.8 NE=1.48 BR=130 VAR=5.15 ISC=0.8E-13 NC=1.23 RC=0.0045 RB=0.15 RE=0.009 QUASIMOD=1 RCO=0.27 GAMMA=2E-10 CJC=112E-12 MJC=0.4 VJC=0.6 CJE=345E-12 MJE=0.53 VJE=0.95 TF=0.59E-9 TR=4.2E-9 TRC1=.003 TRB1=.003 TRE1=.003 XTB=1.4
.MODEL ZXTP19060CFF PNP IS=6E-13 NF=1 BF=385 VAF=55.2 ISE=1.3E-13 IKF=3.8 NE=1.45 BR=43 VAR=10.4 ISC=1.3E-13 NC=1.18 RC=0.0045 RB=0.15 RE=0.009 CJC=98E-12 MJC=0.42 VJC=0.66 CJE=360E-12 MJE=0.5 VJE=0.95 TF=0.53E-9 TR=21E-9 XTB=1.4 QUASIMOD=1 RCO=0.7 GAMMA=7.5E-10 TRC1=.003 TRB1=.003 TRE1=.003
.MODEL ZXTP19060CG PNP IS=6E-13 NF=1 BF=385 VAF=55.2 ISE=1.3E-13 IKF=3.8 NE=1.45 BR=43 VAR=10.4 ISC=1.3E-13 NC=1.18 RC=0.0045 RB=0.15 RE=0.009 CJC=98E-12 MJC=0.42 VJC=0.66 CJE=360E-12 MJE=0.5 VJE=0.95 TF=0.53E-9 TR=21E-9 XTB=1.4 QUASIMOD=1 RCO=0.7 GAMMA=7.5E-10 TRC1=.003 TRB1=.003 TRE1=.003
.MODEL ZXTP19060CZ PNP IS=6E-13 NF=1 BF=385 VAF=55.2 ISE=1.3E-13 IKF=3.8 NE=1.45 BR=43 VAR=10.4 ISC=1.3E-13 NC=1.18 RC=0.0045 RB=0.15 RE=0.009 CJC=98E-12 MJC=0.42 VJC=0.66 CJE=360E-12 MJE=0.5 VJE=0.95 TF=0.53E-9 TR=21E-9 XTB=1.4 QUASIMOD=1 RCO=0.7 GAMMA=7.5E-10 TRC1=.003 TRB1=.003 TRE1=.003
.MODEL ZXTP19100CFF PNP IS=5E-13 NF=1 BF=370 VAF=70 ISE=1E-13 IKF=3.5 NE=1.45 BR=16 VAR=6 ISC=1.8E-13 NC=1.09 RC=0.009 RB=0.2 RE=0.014 QUASIMOD=1 RCO=2.25 GAMMA=1.0E-8 CJC=80E-12 MJC=0.47 VJC=0.75 CJE=360E-12 MJE=0.51 VJE=1 TF=0.85E-9 TR=1.15E-7 TRC1=0.003 TRB1=0.003 TRE1=0.003 XTB=1.4
.MODEL ZXTP19100CG PNP IS=5E-13 NF=1 BF=370 VAF=70 ISE=1E-13 IKF=3.5 NE=1.45 BR=16 VAR=6 ISC=1.8E-13 NC=1.09 RC=0.009 RB=0.2 RE=0.014 QUASIMOD=1 RCO=2.25 GAMMA=1.0E-8 CJC=80E-12 MJC=0.47 VJC=0.75 CJE=360E-12 MJE=0.51 VJE=1 TF=0.85E-9 TR=1.15E-7 TRC1=0.003 TRB1=0.003 TRE1=0.003 XTB=1.4
.MODEL ZXTP19100CZ PNP IS=5E-13 NF=1 BF=370 VAF=70 ISE=1E-13 IKF=3.5 NE=1.45 BR=16 VAR=6 ISC=1.8E-13 NC=1.09 RC=0.009 RB=0.2 RE=0.014 QUASIMOD=1 RCO=2.25 GAMMA=1.0E-8 CJC=80E-12 MJC=0.47 VJC=0.75 CJE=360E-12 MJE=0.51 VJE=1 TF=0.85E-9 TR=1.15E-7 TRC1=0.003 TRB1=0.003 TRE1=0.003 XTB=1.4
.MODEL ZXTP2006E6 PNP IS=11E-13 BF=610 NF=1 VAF=20.1 IKF=2.5 ISE=1.1E-13 NE=1.49 BR=75 NR=1 VAR=4.3 IKR=1 ISC=1.1e-13 NC=1.31 RE=0.0072 RB=0.3 RC=0.012 CJE=460E-12 VJE=1.0 MJE=0.54 CJC=170E-12 VJC=0.62 MJC=0.42 TF=9E-10 TR=8.5e-9 RCO=0.5 GAMMA=25E-10 QUASIMOD=1 XTB=1.5 TRE1=.003 TRB1=.003 TRC1=.003
.MODEL ZXTP2008G PNP IS=1.5111E-12 NF=1.0127 BF=208 XTB=1.4 IKF=7.5 VAF=43.4 ISE=1.335E-13 NE=1.42 NR=1.009 BR=100 IKR=1.3 VAR=9.7 ISC=1.392E-13 NC=1.22 RB=0.12 RE=0.022 RC=0.004 CJC=246E-12 MJC=0.338 VJC=0.4294 CJE=796E-12 TF=1.01E-9 TR=5E-9
.MODEL ZXTP2008Z PNP IS=1.5111E-12 NF=1.0127 BF=208 XTB=1.4 IKF=7.5 VAF=43.4 ISE=1.335E-13 NE=1.42 NR=1.009 BR=100 IKR=1.3 VAR=9.7 ISC=1.392E-13 NC=1.22 RB=0.12 RE=0.022 RC=0.004 CJC=246E-12 MJC=0.338 VJC=0.4294 CJE=796E-12 TF=1.01E-9 TR=5E-9
.MODEL ZXTP2009Z PNP IS=2e-12 NF=1 ISE=9e-13 NE=1.55 BF=600 VAF=26 IKF=2.5 NR=.97 ISC=2e-13 NC=1.4 BR=105 VAR=2.41 IKR=1.5 RE=2e-3 RB=700e-3 RC=20e-3 CJE=535e-12 CJC=165e-12 TF=0.6e-9 TR=10e-9 XTB=1.5
.MODEL ZXTP2012A PNP IS=5.3E-13 NF=1.0 BF=220 IKF=11 VAF=84 ISE=5E-14 NE=1.4 NR=1 BR=45 VAR=8.9 ISC=5E-14 IKR=5 NC=1.07 RB=0.27 RE=0.015 RC=0.022 CJC=170E-12 MJC=0.4 VJC=0.55 CJE=750E-12 MJE=0.4 VJE=0.68 TF=0.5E-9 TR=2.2E-8 XTB=1.4 TRB1=.005 TRE1=.005 QUASIMOD=1 RCO=0.22 GAMMA=5e-10
.MODEL ZXTP2012G PNP IS=5.3E-13 NF=1.0 BF=220 IKF=11 VAF=84 ISE=5E-14 NE=1.4 NR=1 BR=45 VAR=8.9 ISC=5E-14 IKR=5 NC=1.07 RB=0.27 RE=0.015 RC=0.022 CJC=170E-12 MJC=0.4 VJC=0.55 CJE=750E-12 MJE=0.4 VJE=0.68 TF=0.5E-9 TR=2.2E-8 XTB=1.4 TRB1=.005 TRE1=.005 QUASIMOD=1 RCO=0.22 GAMMA=5e-10
.MODEL ZXTP2012Z PNP IS=5.3E-13 NF=1.0 BF=220 IKF=11 VAF=84 ISE=5E-14 NE=1.4 NR=1 BR=45 VAR=8.9 ISC=5E-14 IKR=5 NC=1.07 RB=0.27 RE=0.015 RC=0.022 CJC=170E-12 MJC=0.4 VJC=0.55 CJE=750E-12 MJE=0.4 VJE=0.68 TF=0.5E-9 TR=2.2E-8 XTB=1.4 TRB1=.005 TRE1=.005 QUASIMOD=1 RCO=0.22 GAMMA=5e-10
.MODEL ZXTP2013G PNP IS=1E-13 NF=1 BF=200 VAF=44 ISE=1.3E-13 IKF=8 NE=1.6 NR=1 BR=22 VAR=16 ISC=1.3E-13 IKR=4 NC=1.4 RC=0.017 RB=0.13 RE=0.019 CJC=136E-12 MJC=0.41 VJC=0.50 CJE=570E-12 MJE=0.45 VJE=0.86 TF=0.7E-9 TR=45E-9 XTB=1.5 QUASIMOD=1 RCO=0.7 GAMMA=5E-10
.MODEL ZXTP2013Z PNP IS=1E-13 NF=1 BF=200 VAF=44 ISE=1.3E-13 IKF=8 NE=1.6 NR=1 BR=22 VAR=16 ISC=1.3E-13 IKR=4 NC=1.4 RC=0.017 RB=0.13 RE=0.019 CJC=136E-12 MJC=0.41 VJC=0.50 CJE=570E-12 MJE=0.45 VJE=0.86 TF=0.7E-9 TR=45E-9 XTB=1.5 QUASIMOD=1 RCO=0.7 GAMMA=5E-10
.MODEL ZXTP2014G PNP IS=370E-14 NF=.99 BF=180 ISE=150E-15 NE=1.35 BR=6 ISC=260E-15 NC=1.1 NR=.99 CJC=121E-12 MJC=0.4 VJC=0.6 CJE=687E-12 MJE=0.4 VJE=0.75 RC=40m RE=40m RB=.18 TF=.8n TR=150n

XTB=1.65 NK=.78 IKF=5.1 EG=1.4
.MODEL ZXTP2014Z PNP IS=370E-14 NF=.99 BF=180 ISE=150E-15 NE=1.35 BR=6 ISC=260E-15 NC=1.1 NR=.99 CJC=121E-12 MJC=0.4 VJC=0.6 CJE=687E-12 MJE=0.4 VJE=0.75 RC=40m RE=40m RB=.18 TF=.8n TR=150n XTB=1.65 NK=.78 IKF=5.1 EG=1.4
.MODEL ZXTP2025F PNP IS=6E-13 NF=.996 BF=340 VAF=31 ISE=1.3E-13 IKF=4 NE=1.7 BR=45 VAR=12 ISC=7E-14 NC=1.7 RC=0.009 RB=.19 RE=0.009 CJC=130E-12 MJC=0.425 VJC=0.68 CJE=510E-12 MJE=0.4 VJE=0.68 TF=0.75E-9 TR=11E-9 XTB=1.4 QUASIMOD=1 RCO=0.4 GAMMA=0.5E-9
.MODEL ZXTP2027F PNP IS=6.3E-13 NF=1 BF=270 VAF=22 ISE=1E-13 IKF=7 NE=1.4 BR=120 VAR=8 ISC=1.3E-13 NC=1.5 RC=0.009 RB=0.15 RE=0.013 CJC=180E-12 MJC=0.36 VJC=0.55 CJE=520E-12 MJE=0.35 VJE=0.8 QUASIMOD=1 RCO=0.32 GAMMA=4E-10 TF=0.72E-9 TR=4.1E-9 XTB=1.4
.MODEL ZXTP2029F PNP IS=470E-15 NF=1 BF=270 VAF=72 ISE=100E-15 IKF=18 NE=1.46 +NR=1 BR=22 VAR=16 ISC=470E-15 IKR=1 NC=1.37 RC=0.01 RB=0.15 RE=0.02 CJC=130E-12 MJC=0.43 VJC=0.68 CJE=570E-12 MJE=0.4 VJE=0.68 TF=0.55E-9 TR=25E-9 XTB=1.4 QUASIMOD=1 RCO=1.5 GAMMA=2E-8
.MODEL ZXTP2039F PNP IS=3.2E-14 BF=170 VAF=45 NF=0.977 IKF=1.25 ISE=7E-15 NE=1.35 BR=50 VAR=50 NR=.986 IKR=0.15 ISC=0.9E-14 NC=1.08 RB=0.16 RE=0.195 RC=0.185 CJE=104E-12 TF=0.7E-9 CJC=30.5E-12 TR=3E-9 VJC=0.395 MJC=0.415
.MODEL ZXTP2041F PNP IS=3.0572E-13 NF=1.0103 BF=450 IKF=0.93 VAF=20 ISE=1.5E-14 NE=1.52 NR=1.007 BR=160 IKR=0.08 VAR=33 ISC=3.8736E-14 NC=1.0893 RB=0.112 RE=0.144 RC=0.156 CJC=42E-12 MJC=0.4449 VJC=0.3131 CJE=91E-12 TF=0.51E-9 TR=3.6E-9
.MODEL ZXTP23015CFH PNP IS=6.5E-13 BF=470 NF=1 VAF=16.5 IKF=6 ISE=0.6E-13 NE=1.4 BR=240 NR=1 VAR=3.1 ISC=1.3E-13 NC=1.45 RE=0.0122 RB=0.1 RC=0.0051 CJE=540E-12 VJE=0.95 MJE=0.3 CJC=202E-12 VJC=0.45 MJC=0.3 TF=0.55E-9 TR=1.4E-9 TRB1=0.007 XTB=1.4
.MODEL ZXTP23140BFH PNP IS=4E-13 NF=1 BF=230 VAF=99 ISE=1.2E-13 IKF=6 NE=1.4 BR=16 VAR=5.15 ISC=2E-13 NC=1.09 RC=0.0045 RB=0.15 RE=0.014 QUASIMOD=1 RCO=1.4 GAMMA=7E-9 CJC=103E-12 MJC=0.405 VJC=0.55 CJE=630E-12 MJE=0.47 VJE=0.95 TF=0.9E-9 TR=5E-8 TRC1=.003 TRB1=.003 TRE1=.003 XTB=1.4
.MODEL ZXTP25015DFH PNP IS=5E-13 BF=480 NF=1 VAF=18 IKF=2.5 ISE=1.2E-13 NE=1.48 BR=65 NR=1 VAR=6.9 IKR=1 ISC=8e-14 NC=1.31 RE=0.0125 RB=0.11 RC=0.0089 CJE=191E-12 VJE=1.05 MJE=0.56 CJC=68E-12 VJC=0.52 MJC=0.31 TF=3.7E-10 TR=6.5e-9 RCO=0.39 GAMMA=8.5E-10 QUASIMOD=1 XTB=1.5 TRE1=.004 TRB1=.004 TRC1=.004
.MODEL ZXTP25020BFH PNP IS=1.7E-13 NF=1 BF=220 IKF=3.3 VAF=21 ISE=8E-14 NE=1.45 NR=1 BR=44 IKR=1 VAR=7 ISC=8e-14 NC=1.4 RE=0.0133 RB=0.12 RC=0.0092 RCO=0.5 GAMMA=2.5E-9 CJC=62E-12 MJC=0.33 VJC=0.55 CJE=226E-12 MJE=0.34 VJE=0.7 TF=4.1E-10 TR=10e-9 XTB=1.5 TRE1=0.002 TRB1=0.002 TRC1=0.002 QUASIMOD=1
.MODEL ZXTP25020CFF PNP IS=2.5E-13 BF=400 NF=1 VAF=18.7 IKF=3.8 ISE=1.9E-13 NE=1.5 BR=110 NR=1 VAR=5 IKR=2 ISC=1.3e-13 NC=1.45 RE=0.01 RB=0.2 RC=0.02 CJE=199E-12 VJE=0.9 MJE=0.48 CJC=80E-12 VJC=0.53 MJC=0.3 TF=3.8E-10 TR=3.8e-9 TRB1=.02 XTB=1.5
.MODEL ZXTP25020CFH PNP IS=2.5E-13 NF=1 BF=400 IKF=3.8 VAF=18.7 ISE=1.9E-13 NE=1.5 NR=1 BR=110 IKR=2 VAR=5 ISC=1.3e-13 NC=1.45 RB=0.2 RE=0.01 RC=0.02 CJC=80E-12 MJC=0.3 VJC=0.53 CJE=199E-12 MJE=0.48 VJE=0.9 TF=3.8E-10 TR=3.8e-9 XTB=1.5 TRB1=.02
.MODEL ZXTP25020DFH PNP IS=4E-13 NF=1 BF=510 IKF=3.5 VAF=23 ISE=10E-14 NE=1.49 NR=1 BR=97 IKR=1 VAR=4.5 ISC=7.5e-14 NC=1.2 RE=0.0136 RB=0.12 RC=0.0094 RCO=0.9 GAMMA=2.5E-9 CJC=60E-12 MJC=0.33 VJC=0.51 CJE=183E-12 MJE=0.5 VJE=0.9 TF=3.4E-10 TR=4.5e-9 XTB=1.5 TRE1=.002 TRB1=.002 TRC1=.002 QUASIMOD=1
.MODEL ZXTP25020DFL PNP IS=4E-13 NF=1 BF=510 IKF=3.5 VAF=23 ISE=10E-14 NE=1.49 NR=1 BR=97 IKR=1 VAR=4.5 ISC=7.5e-14 NC=1.2 RE=0.0136 RB=0.12 RC=0.0094 RCO=0.9 GAMMA=2.5E-9 CJC=60E-12 MJC=0.33 VJC=0.51 CJE=183E-12 MJE=0.5 VJE=0.9 TF=3.4E-10 TR=4.5e-9 XTB=1.5 TRE1=.002 TRB1=.002 TRC1=.002 QUASIMOD=1
.MODEL ZXTP25040DFH PNP IS=4E-13 NF=1 BF=470 IKF=3.5 VAF=23 ISE=10E-14 NE=1.49 NR=1 BR=97 IKR=1 VAR=4.5 ISC=7.5e-14 NC=1.2 RE=0.014 RB=0.12 RC=0.0111 RCO=0.88 GAMMA=0.6E-9 CJC=58E-12 MJC=0.41 VJC=0.62 CJE=183E-12 MJE=0.5 VJE=0.95 TF=3.9E-10 TR=7.8e-9 XTB=1.5 TRE1=0.003 TRB1=0.003 TRC1=0.003 QUASIMOD=1
.MODEL ZXTP25040DFL PNP IS=4E-13 NF=1 BF=470 IKF=3.5 VAF=23 ISE=10E-14 NE=1.49 NR=1 BR=97 IKR=1 VAR=4.5 ISC=7.5e-14 NC=1.2 RE=0.014 RB=0.12 RC=0.0111 RCO=0.88 GAMMA=0.6E-9 CJC=58E-12 MJC=0.41 VJC=0.62 CJE=183E-12 MJE=0.5 VJE=0.95 TF=3.9E-10 TR=7.8e-9 XTB=1.5 TRE1=0.003 TRB1=0.003 TRC1=0.003 QUASIMOD=1
.MODEL ZXTP25040DZ PNP IS=4E-13 NF=1 BF=470 IKF=3.5 VAF=23 ISE=10E-14 NE=1.49 NR=1 BR=97 IKR=1 VAR=4.5 ISC=7.5e-14 NC=1.2 RE=0.014 RB=0.12 RC=0.0111 RCO=0.88 GAMMA=0.6E-9 CJC=58E-12 MJC=0.41 VJC=0.62 CJE=183E-12 MJE=0.5 VJE=0.95 TF=3.9E-10 TR=7.8e-9 XTB=1.5 TRE1=0.003 TRB1=0.003 TRC1=0.003 QUASIMOD=1

.MODEL ZXTP25060BFH PNP IS=1.5E-13 BF=230 NF=1 VAF=72 IKF=3.5 ISE=8E-14 NE=1.55 BR=15 NR=1 VAR=8 IKR=1 ISC=8e-14 NC=1.2 RE=0.014 RB=0.11 RC=0.0103 CJE=239E-12 VJE=0.98 MJE=0.495 CJC=59E-12 VJC=0.51 MJC=0.33 TF=5E-10 TR=34e-9 RCO=0.85 GAMMA=8.5E-10 QUASIMOD=1 XTB=1.5 TRE1=.008 TRB1=.008 TRC1=.008
.MODEL ZXTP25100BFH PNP IS=2E-13 NF=1 BF=200 VAF=121 ISE=1.6E-14 IKF=6 NE=1.65 BR=17 VAR=16 ISC=1.4E-13 NC=1.1 IKR=1 RC=0.015 RB=0.2 RE=0.012 QUASIMOD=1 RCO=3.8 GAMMA=2.5E-8 CJC=49E-12 MJC=0.34 VJC=0.5 CJE=231E-12 MJE=0.46 VJE=0.9 TF=0.6E-9 TR=6.5E-8 TRC1=0.005 TRB1=0.005 TRE1=0.005 XTB=1.4
.MODEL ZXTP25100CFH PNP IS=2E-13 NF=1 BF=375 VAF=75 ISE=4E-14 IKF=1.4 NE=1.65 BR=15 VAR=9 ISC=9E-14 NC=1.2 IKR=0.45 RC=0.012 RB=0.3 RE=0.016 QUASIMOD=1 VO=7 RCO=3.4 GAMMA=0.4E-8 CJC=45E-12 MJC=0.38 VJC=0.52 CJE=190E-12 MJE=0.46 VJE=0.85 TF=3.9E-10 TR=5.3E-8 TRC1=0.004 TRB1=0.004 TRE1=0.004 XTB=1.4
.MODEL ZXTP25100CZ PNP IS=2E-13 NF=1 BF=375 VAF=75 ISE=4E-14 IKF=1.4 NE=1.65 BR=15 VAR=9 ISC=9E-14 NC=1.2 IKR=0.45 RC=0.012 RB=0.3 RE=0.016 QUASIMOD=1 VO=7 RCO=3.4 GAMMA=0.4E-8 CJC=45E-12 MJC=0.38 VJC=0.52 CJE=190E-12 MJE=0.46 VJE=0.85 TF=3.9E-10 TR=5.3E-8 TRC1=0.004 TRB1=0.004 TRE1=0.004 XTB=1.4
.MODEL ZXTP25140BFH PNP IS=1.6E-13 NF=1 BF=210 VAF=175 ISE=3E-14 IKF=4.2 NE=1.4 BR=12 VAR=5.15 ISC=1E-13 NC=1.08 IKR=0.7 RC=0.013 RB=0.2 RE=0.016 QUASIMOD=1 RCO=4 GAMMA=1.4E-8 CJC=42E-12 MJC=0.32 VJC=0.44 CJE=237E-12 MJE=0.44 VJE=0.85 TF=0.95E-9 TR=22E-8 TRC1=.005 TRB1=.005 TRE1=.005 XTB=1.4
.MODEL ZXTP26020DMF PNP IS=5.5e-13 NF=1.005 ISE=1.2e-13 NE=1.55 BF=590 VAF=21 IKF=2 ISC=1.8e-13 NC=1.39 BR=52 VAR=5.7 IKR=0.6 RE=0.067 RB=0.33 RC=0.012 CJE=147e-12 VJE=0.88 MJE=0.48 CJC=51e-12 VJC=0.51 MJC=0.33 TF=4.5e-10 TR=5.6e-9 QUASIMOD=1 RCO=0.66 GAMMA=1.3e-9 XTB=1.5 TRE1=0.004 TRB1=0.003 TRC1=0.004
.MODEL ZXTP5401FL PNP IS=6E-14 NF=1 BF=130 VAF=360 ISE=6E-14 NE=1.5 NR=1 BR=6.5 VAR=37 ISC=8E-12 NC=1.35 RC=0.08 RB=1 RE=0.25 CJC=13E-12 MJC=0.46 VJC=0.7 CJE=63E-12 MJE=0.41 VJE=0.9 TF=6.7E-10 TR=1.03E-6 XTB=1.5 QUASIMOD=1 RCO=14 GAMMA=1.5E-8
.MODEL ZXTP5401G PNP IS=6E-14 NF=1 BF=130 VAF=360 ISE=6E-14 NE=1.5 NR=1 BR=6.5 VAR=37 ISC=8E-12 NC=1.35 RC=0.08 RB=1 RE=0.25 CJC=13E-12 MJC=0.46 VJC=0.7 CJE=63E-12 MJE=0.41 VJE=0.9 TF=6.7E-10 TR=1.03E-6 XTB=1.5 QUASIMOD=1 RCO=14 GAMMA=1.5E-8
.MODEL ZXTP5401Z PNP IS=6E-14 NF=1 BF=130 VAF=360 ISE=6E-14 NE=1.5 NR=1 BR=6.5 VAR=37 ISC=8E-12 NC=1.35 RC=0.08 RB=1 RE=0.25 CJC=13E-12 MJC=0.46 VJC=0.7 CJE=63E-12 MJE=0.41 VJE=0.9 TF=6.7E-10 TR=1.03E-6 XTB=1.5 QUASIMOD=1 RCO=14 GAMMA=1.5E-8
.MODEL ZXTP558L PNP IS=7.84E-14 NF=1 BF=210 IKF=1.8 VAF=349 ISE=3.35E-14 NE=1.69 NR=1 BR=3.4 IKR=0.15 VAR=82 ISC=9.42E-12 NC=1.05 RB=0.5 RE=0.1 RC=0.1 QUASIMOD=1 RCO=54 GAMMA=13e-6 CJC=20.5E-12 MJC=0.38 VJC=0.44 CJE=115E-12 MJE=0.43 VJE=0.85 TF=0.9E-9 TR=18E-5 TRC1=.015 TRB1=.015 TRE1=.015 XTB=1.4
.MODEL ZXTP717MA PNP IS=5.5E-13 BF=500 IKF=3 VAF=14.93 ISE=1.75E-13 NE=1.5 NR=1.00 BR=280 IKR=0.3 VAR=5.64 ISC=6.01E-13 NC=1.34 RB=0.3 RE=0.03 RC=0.025 CJC=116.9E-12 MJC=0.3456 VJC=0.4576 CJE=223.6E-12 MJE=0.4803 VJE=0.9091 TF=1.2E-9 TR=2E-9
.MODEL ZXTP718MA PNP IS=6.8E-13 BF=480 IKF=2 VAF=23 ISE=0.8E-13 NE=1.5567 NR=1.00 BR=70 IKR=0.4 VAR=7 ISC=7.5E-14 NC=1.19 RB=0.085 RE=0.04 RC=0.045 CJC=70.02E-12 MJC=0.4685 VJC=0.7714 CJE=203.6E-12 MJE=0.5029 VJE=0.9403 TF=0.71E-9 TR=23.7E-9
.MODEL ZXTP720MA PNP IS=6.261E-13 BF=500 IKF=1.4 VAF=28.4 ISE=1.057E-13 NE=1.4923 NR=1.00 BR=42 IKR=0.65 VAR=10.21 ISC=6E-14 NC=1.124 RB=0.078 RE=0.077 RC=0.04 CJC=59.54E-12 MJC=0.5058 VJC=0.8427 CJE=201.4E-12 MJE=0.5244 VJE=1.021 TF=0.68E-9 TR=23.7E-9 NK=0.75 XTB=1.8 TRE1=.0025 TRB1=.0025 TRC1=.0025
.MODEL ZXTP722MA PNP IS=6.348E-13 BF=450 IKF=1.25 VAF=30.24 ISE=1.375E-13 NE=1.5 NR=1.00 BR=25 IKR=0.8 VAR=12.6 ISC=1E-13 NC=1.093 RB=0.081 RE=0.09 RC=0.1 CJC=49.87E-12 MJC=0.494 VJC=0.7653 CJE=199E-12 MJE=0.5045 VJE=0.9617 TF=0.57E-9 TR=57E-9
.MODEL KSA1156 PNP IS=5.7544E-14 NF=0.9555 ISE=1.31826E-13 NE=1.36 BF=89.2 IKF=0.0343 VAF=6.395 NR=0.96 ISC=3.98107E-13 NC=1.05 BR=8.495 IKR=0.378183 VAR=4.95543 RB=108.5 IRB=3.98107E-6 RBM=5.095 RE=0.02179 RC=0.56 XTB=1.798 EG=1.2203 XTI=3 CJE=2.46E-10 VJE=0.727 MJE=0.366 CJC=6.27E-11 VJC=0.503 MJC=0.418 XCJC=0.432571 FC=0.5
.model 2SA2029 PNP(Is=70f Bf=266.4 Vaf=50.7 Ikf=279.1m Ise=70f Ne=1.762 Br=1.873 Var=100 Ikr=2.001 Isc=270.8p Nc=1.792 Re=200m Rb=7.804 Rc=1.086 Cje=22.94p Mje=582.7m Cjc=11.61p Mjc=439.9m Tf=328.9p Xtf=331.2 Vtf=254.3 Itf=8.151 Tr=327.3n Xtb=1.5 Vceo=50 Icrating=0.15 mfg=Rohm)
.model 2SC5658 NPN(Is=70f Bf=277.1 Vaf=114 Ikf=1 Ise=70f Ne=1.893 Br=11.57 Var=100 Ikr=112.7m Isc=1.023p Nc=1.326 Nk=718.7m Re=200m Rb=13.9 Rc=1.219 Cje=11.34p Mje=382.9m Cjc=4.023p Mjc=346.3m Tf=338.9p Xtf=4.045 Vtf=167.4 Itf=859.6m Tr=110.3n Xtb=1.5 Vceo=50 Icrating=0.15 mfg=Rohm)

.model 2SA1774EB PNP(Is=70f Bf=266.4 Vaf=50.7 Ikf=279.1m Ise=70f Ne=1.762 Br=1.873 Var=100 Ikr=2.001 Isc=270.8p Nc=1.792 Re=200m Rb=7.804 Rc=1.086 Cje=22.94p Mje=582.7m Cjc=11.61p Mjc=439.9m Tf=328.9p Xtf=331.2 Vtf=254.3 Itf=8.151 Tr=327.3n Xtb=1.5 Vceo=50 Icrating=0.15 mfg=Rohm)
.model 2SAR502EB PNP(Is=100f Bf=505.1 Vaf=32.26 Ikf=363.3m Ise=100.1f Ne=2 Br=136.3 Var=17.82 Ikr=10.01m Isc=267p Nc=1.974 Nk=610.4m Re=10m Rb=11.14 Rc=513.8m Cje=30.3p Vje=1.031 Mje=471.8m Cjc=16.79p Vjc=1.151 Mjc=577.3m Tf=267.5p Xtf=7.249 Vtf=11.66 Itf=1.506 Tr=4.206n Xtb=1.2 Tre1=40m Vceo=30 Icrating=0.5 mfg=Rohm)
.model 2SC4617EB NPN(Is=70f Bf=277.1 Vaf=114 Ikf=1 Ise=70f Ne=1.893 Br=11.57 Var=100 Ikr=112.7m Isc=1.023p Nc=1.326 Nk=718.7m Re=200m Rb=13.9 Rc=1.219 Cje=11.34p Mje=382.9m Cjc=4.023p Mjc=346.3m Tf=338.9p Xtf=4.045 Vtf=167.4 Itf=859.6m Tr=110.3n Xtb=1.5 Vceo=50 Icrating=0.15 mfg=Rohm)
.model 2SCR502EB NPN(Is=100f Bf=403.9 Vaf=68.84 Ikf=1.66 Ise=100f Ne=2 Br=55.22 Var=29.24 Ikr=186.6m Isc=34.52p Nc=1.707 Nk=1.054 Re=50m Rb=8.646 Rc=257.5m Cje=31.45p Vje=701.1m Mje=352.8m Cjc=7.889p Vjc=505.3m Mjc=280.3m Tf=408.6p Xtf=5.307 Vtf=58.05 Itf=830.7m Tr=6.933n Xtb=900m Tre1=10m Vceo=30 Icrating=0.5 mfg=Rohm)
.model 2SA1576UB PNP(Is=70f Bf=266.4 Vaf=50.7 Ikf=279.1m Ise=70f Ne=1.762 Br=1.873 Var=100 Ikr=2.001 Isc=270.8p Nc=1.792 Re=200m Rb=7.804 Rc=1.086 Cje=22.94p Mje=582.7m Cjc=11.61p Mjc=439.9m Tf=328.9p Xtf=331.2 Vtf=254.3 Itf=8.151 Tr=327.3n Xtb=1.5 Vceo=50 Icrating=0.15 mfg=Rohm)
.model 2SAR502UB PNP(Is=100f Bf=505.1 Vaf=32.26 Ikf=363.3m Ise=100.1f Ne=2 Br=136.3 Var=17.82 Ikr=10.01m Isc=267p Nc=1.974 Nk=610.4m Re=10m Rb=11.14 Rc=513.8m Cje=30.3p Vje=1.031 Mje=471.8m Cjc=16.79p Vjc=1.151 Mjc=577.3m Tf=267.5p Xtf=7.249 Vtf=11.66 Itf=1.506 Tr=4.206n Xtb=1.2 Tre1=40m Vceo=30 Icrating=0.5 mfg=Rohm)
.model 2SC4081UB NPN(Is=70f Bf=277.1 Vaf=114 Ikf=1 Ise=70f Ne=1.893 Br=11.57 Var=100 Ikr=112.7m Isc=1.023p Nc=1.326 Nk=718.7m Re=200m Rb=13.9 Rc=1.219 Cje=11.34p Mje=382.9m Cjc=4.023p Mjc=346.3m Tf=338.9p Xtf=4.045 Vtf=167.4 Itf=859.6m Tr=110.3n Xtb=1.5 Vceo=50 Icrating=0.15 mfg=Rohm)
.model 2SCR502UB NPN(Is=100f Bf=403.9 Vaf=68.84 Ikf=1.66 Ise=100f Ne=2 Br=55.22 Var=29.24 Ikr=186.6m Isc=34.52p Nc=1.707 Nk=1.054 Re=50m Rb=8.646 Rc=257.5m Cje=31.45p Vje=701.1m Mje=352.8m Cjc=7.889p Vjc=505.3m Mjc=280.3m Tf=408.6p Xtf=5.307 Vtf=58.05 Itf=830.7m Tr=6.933n Xtb=900m Tre1=10m Vceo=30 Icrating=0.5 mfg=Rohm)
.model 2SA1036K PNP(Is=60f Bf=194.1 Vaf=31.85 Ikf=1.986 Ise=60f Ne=1.449 Br=8.869 Var=100 Ikr=59.05m Isc=60.1p Nc=1.743 Nk=1.003 Re=110m Rb=1.744 Rc=259.6m Cje=60.61p Mje=520.4m Cjc=21.13p Mjc=404.3m Tf=14.87p Xtf=121.2 Vtf=54.43 Itf=27.78m Tr=102.1n Xtb=1.5 Vceo=32 Icrating=0.5 mfg=Rohm)
.model 2SB1197K PNP(Is=300f Bf=238.7 Vaf=100 Ikf=7.996 Ise=300f Ne=1.818 Br=24.97 Var=100 Ikr=8.684 Isc=20.67p Nc=1.488 Nk=1.23 Re=100m Rb=1.512 Rc=159.4m Cje=127.8p Mje=414m Cjc=41.58p Mjc=466.8m Tf=475.2p Xtf=26.77 Vtf=68.52 Itf=13.64 Tr=36.83n Xtb=1.5 Vceo=32 Icrating=0.8 mfg=Rohm)
.model 2SB1198K PNP(Is=270f Bf=202.5 Vaf=25 Ikf=4.999 Ise=270f Ne=1.598 Br=6.447 Var=100 Ikr=718m Isc=8.777p Nc=1.532 Nk=1.294 Re=150m Rb=1.505 Rc=126.7m Cje=153.1p Mje=502.6m Cjc=41.58p Mjc=466.8m Tf=678.3p Xtf=25.77 Vtf=53.41 Itf=10 Tr=134.1n Xtb=1.5 Vceo=80 Icrating=0.5 mfg=Rohm)
.model 2SA1514K PNP(Is=60f Bf=410.2 Vaf=58.37 Ikf=248.5m Ise=60f Ne=1.672 Br=995.6m Var=100 Ikr=515.3m Isc=26.59p Nc=1.678 Nk=946.7m Rb=19.29 Rc=2.015 Cje=24.18p Mje=645m Cjc=11.93p Mjc=471.4m Tf=381.1p Xtf=3.996 Vtf=6.207 Itf=110.4m Tr=790.2n Xtb=1.5 Vceo=120 Icrating=0.05 mfg=Rohm)
.model 2SC2411K NPN(Is=5p Bf=207.4 Vaf=29.45 Ikf=2.217 Ise=5p Ne=1.594 Br=10.47 Var=100 Ikr=257.1m Isc=10.57p Nc=1.251 Nk=944.5m Re=80m Rb=3.396 Rc=377.3m Cje=46.39p Mje=438.2m Cjc=40.04p Mjc=706.6m Tf=514.3p Xtf=16.73 Vtf=40.64 Itf=549.4 Tr=86.44n Xtb=1.5 Vceo=32 Icrating=0.5 mfg=Rohm)
.model 2SD1781K NPN(Is=180f Bf=237 Vaf=100 Ikf=2.736 Ise=180f Ne=1.558 Br=18.77 Var=100 Ikr=396.1m Isc=287.2f Nc=4.096 Nk=912.3m Re=170m Rb=378.2m Rc=7.653m Cje=115.9p Mje=365.9m Cjc=31.79p Mjc=434.3m Tf=768.6p Xtf=176.9 Vtf=66.73 Itf=7.964 Tr=48.6n Xtb=1.5 Vceo=32 Icrating=0.8 mfg=Rohm)
.model 2SD1484K NPN(Is=43.52f Bf=212.6 Vaf=100 Ikf=1.138 Ise=43.55f Ne=1.41 Br=10.17 Var=100 Ikr=71.3m Isc=19.11p Nc=1.809 Nk=870.8m Re=100m Rb=3.799 Rc=125.2m Cje=40.05p Mje=340.9m Cjc=13.82p Mjc=381.8m Tf=192.8p Xtf=140.1 Vtf=32.78 Itf=791.7m Tr=99.28n Xtb=1.5 Vceo=50 Icrating=0.5 mfg=Rohm)
.model 2SD1782K NPN(Is=250f Bf=260.4 Vaf=100 Ikf=2 Ise=250f Ne=1.46 Br=34.77 Var=100 Ikr=1.92 Isc=32.14p Nc=1.458 Nk=954.5m Re=110m Rb=2.217 Rc=205.9m Cje=140.2p Mje=340.9m Cjc=22.79p Mjc=417.4m Tf=993.1p Xtf=116.1 Vtf=18.13 Itf=28.2 Tr=108.2n Xtb=1.5 Vceo=80 Icrating=0.5 mfg=Rohm)
.model 2SC3906K NPN(Is=63f Bf=380.6 Vaf=100 Ikf=149.6m Ise=63f Ne=1.591 Br=8.832 Var=100 Ikr=3.541 Isc=122.1p Nc=1.707 Nk=882m Rb=15.57 Rc=862.8m Cje=19.49p Mje=390.3m Cjc=6.279p Mjc=317m Tf=432p Xtf=12.43 Vtf=17.64 Itf=1.462 Tr=29.73n Xtb=1.5 Vceo=120 Icrating=0.05 mfg=Rohm)
.model 2SC6145-Y_kq NPN Bf=93 Br=8 Re=8m Rc=16m Rb=4 Rbm=0 Irb=0.3 Vaf=1000 Is=5p Ise=200f Ikf=200 Nk=1.9 Rco=0.68 Gamma=255n Vo=100 quasimod=1 Qco=100p Tf=2.45n Cje=9.7n Cjc=880p Vje=0.68 Mjc=0.48 Fc=0.9 Xtf=30 Itf=15 Vtf=0.95 Xtb=0.9 Eg=1.16 Vceo=230 Icrating=15A mfg=Sanken ; Revision 3 by keantoken - March 1 2019
.model 2SA2223-Y_kq PNP Bf=99 Br=8 Re=10m Rc=18m Rb=2.38 Rbm=0 Irb=0.9 Vaf=500 Is=3.5p Ise=50f Ikf=3

Nk=0.15 Rco=395m gamma=14n Vo=30 quasimod=1 Qco=100p Tf=3.65n Cje=8.3n Cjc=1.6n Vje=0.68 Mjc=0.48 Fc=0.9 Xtf=50 Itf=110 Vtf=2.6 Xtb=1.4 Eg=1.16 Vceo=230 Icrating=15A mfg=Sanken ; Revision 3 by keantoken - March 1 2019
.model 2SC3263-Y_kq npn Bf=84 Vaf=150 Is=1.8p Cjc=600p Cje=15n Tf=2.2n Rb=.22 Rbm=0 Irb=200m Re=38m Rc=1m Rco=750m Vo=1000 Gamma=24n Qco=100p quasimod=1 Br=8 Ise=16p Ikf=1000 Nk=0.2 Itf=10 Xtf=100 Vtf=0.8 Xtb=1.4 Vceo=230 Icrating=15A mfg=Sanken ; Revision 4 by keantoken - Feb 27 2019
.model 2SA1294-Y_kq pnp Bf=90 Vaf=150 Is=60f Cjc=1.2n Cje=20n Tf=3.9n Rb=1.4 Rbm=0 Irb=3 Re=33m Rc=8m Rco=380m Vo=1000 Gamma=160p Qco=100p quasimod=1 Br=8 Ise=0 Ikf=22 Nk=0.5 Itf=10 Xtf=100 Vtf=0.8 Xtb=1.7 Vceo=230 Icrating=15A mfg=Sanken ; Revision 3 by keantoken - Feb 27 2019
.model 2SC3264-Y_kq npn Bf=84 Vaf=150 Is=1.8p Cjc=600p Cje=15n Tf=2.2n Rb=.22 Rbm=0 Irb=200m Re=38m Rc=1m Rco=750m Vo=1000 Gamma=24n Qco=100p quasimod=1 Br=8 Ise=16p Ikf=1000 Nk=0.2 Itf=10 Xtf=100 Vtf=0.8 Xtb=1.4 Vceo=230 Icrating=17A mfg=Sanken ; Revision 4 by keantoken - Feb 27 2019
.model 2SA1295-Y_kq pnp Bf=90 Vaf=150 Is=60f Cjc=1.2n Cje=20n Tf=3.9n Rb=1.4 Rbm=0 Irb=3 Re=33m Rc=8m Rco=380m Vo=1000 Gamma=160p Qco=100p quasimod=1 Br=8 Ise=0 Ikf=22 Nk=0.5 Itf=10 Xtf=100 Vtf=0.8 Xtb=1.7 Vceo=230 Icrating=17A mfg=Sanken ; Revision 3 by keantoken - Feb 27 2019
.MODEL ZXGD3003N NPN IS=2.5E-13 NF=1 BF=600 IKF=1 VAF=51 ISE=2E-13 NE=1.4 NR=1 BR=150 IKR=.5 VAR=25 ISC=1e-13 NC=1.47 RB=0.5 RE=0.055 RC=0.055 CJC=23E-12 MJC=0.33 VJC=0.75 CJE=98p TF=0.8E-9 TR=30e-9 Vceo=40 Icrating=5 mfg=Diodes
.MODEL ZXGD3003P PNP IS=2e-13 BF=550 XTB=1.4 NF=1 VAF=21 IKF=0.25 ISE=1e-13 NE=1.38 BR=55 NR=1 VAR=9.9 IKR=0.25 ISC=1e-13 NC=1.18 RE=0.06 RB=0.7 RC=0.06 CJE=95.9p VJE=0.897 MJE=0.468 CJC=43.4p VJC=1.816 MJC=0.85 TF=495e-12 TR=25n Vceo=40 Icrating=5 mfg=Diodes
.model SFT1202 NPN(IS=50.032f VAF=21 BF=250 IKF=0.5 XTB=1.5 BR=5 CJC=20p CJE=8p TR=100n TF=600p RB=10 RC=3 RE=1 Vceo=60 Icrating=2 mfg=Rohm)
.MODEL KSC2690_KSC2690A NPN (IS=1.7783E-13 BF=132.5 NF=1.0 BR=8.495 NR=1.005 ISE=1.9953E-13 NE=1.5 ISC=1.5849E-9 NC=1.98 VAF=580.75 VAR=18.15 IKF=4.0271 IKR=0.0120 RB=2.98 RBM=0.001 IRB=0.6396 RE=0.0909 RC=1.4705 QCO=0.68 RCO=3.6239 VO=6.587 GAMMA=2.8216E-7 CJE=4.0082E-10 VJE=0.6696 MJE=0.3296 FC=0.5 CJC=6.0404E-11 VJC=0.5 MJC=0.4266 XCJC=0.4955 XTB=1.2590 EG=1.2277 XTI=3.0)
.MODEL TTC004B NPN(TNOM=25 IS=1.374e-013 BF=137.2 NF=1 VAF=11.95 IKF=0.5057 ISE=8.098e-013 NE=1.8 BR=35.11 NR=1 VAR=1000 IKR=10 ISC=1.916e-011 NC=1.5 NK=0.55 RE=0.115 RB=0.885 RC=0.0709 CJE=5.78E-011 VJE=0.75 MJE=0.33 CJC=2.89E-011 VJC=0.75 MJC=0.33 FC=0.5 TF=1.545E-009 XTF=1 VTF=1 ITF=1 PTF=0 TR=0 EG=1.11 XTB=1.4 XTI=6.467)
.MODEL TTA004B PNP(TNOM=25 IS=7.5e-014 BF=190 IKF=0.47 ISE=5e-011 NE=2.4 NK=0.63 XTB=1 XTI=2 TRC1=0.003 NF=1 VAF=6.8 VAR=50 BR=6 IKR=5 ISC=1.0e-21 NR=1.015 NC=1 RB=4 RC=0.125 RE=0.05 CJC=4.09E-011 MJC=0.33 VJC=0.75 CJE=1e-11 MJE=0.33 VJE=0.75 EG=1.11 TR=1E-009 TF=1.59E-009)
.MODEL PBHV9040T_AB PNP IS=4.955E-014 NF=0.923 ISE=5.034E-015 NE=1.152 BF=150 IKF=0.1 VAF=35 NR=0.9202 ISC=1.559E-012 NC=1.703 BR=4.334 IKR=0.611 VAR=25 RB=10 IRB=0.00025 RBM=4.5 RE=0.02843 RC=0.06427 XTB=1.571 XTI=0.23 CJE=2.082E-010 VJE=0.7359 MJE=0.3698 TF=1.75n XTF=360 VTF=5 ITF=1.898 PTF=0 CJC=3.971E-011 VJC=0.5371 MJC=0.4399 TR=1.6E-007 FC=0.9183 RCO=53 BVcbo=1450 nBVcbo=7 Gamma=7n Vceo=500 Icrating=0.25 mfg=NXP
.MODEL PBHV9040T PNP IS=4.955E-014 NF=0.923 ISE=5.034E-015 NE=1.152 BF=150 IKF=0.1 VAF=35 NR=0.9202 ISC=1.559E-012 NC=1.703 BR=4.334 IKR=0.611 VAR=25 RB=10 IRB=0.00025 RBM=4.5 RE=0.02843 RC=0.06427 XTB=1.571 XTI=0.23 CJE=2.082E-010 VJE=0.7359 MJE=0.3698 TF=1.75n XTF=360 VTF=5 ITF=1.898 PTF=0 CJC=3.971E-011 VJC=0.5371 MJC=0.4399 TR=1.6E-007 FC=0.9183 RCO=53 BVcbo=1450 nBVcbo=7 Gamma=7n Vceo=500 Icrating=0.25 mfg=NXP
.MODEL TIP35C npn(IS=7.88586e-11 BF=256.257 NF=0.951481 VAF=25.9112 IKF=6.91656 ISE=6.4p NE=3.4 BR=4.49993 NR=1.08286 VAR=4.40924 IKR=3.69854 NC=3.99 RB=20.929 IRB=0.1 RBM=0.135255 RE=0.000998231 RC=0.0563125 XTB=0.1 XTI=1 EG=1.10826 CJE=1e-07 VJE=0.421306 MJE=0.693953 TF=1e-08 XTF=1.35777 VTF=1.00063 ITF=0.9994 CJC=5e-10 VJC=0.400277 MJC=0.409924 XCJC=0.803124 FC=0.720291 CJS=0 VJS=0.75 MJS=0.5 ISC=3.9e-13 TR=4.99888e-07 PTF=0 KF=0 AF=1)
.MODEL TIP36C pnp(IS=7.88586e-11 BF=256.257 NF=0.951481 VAF=25.9112 IKF=6.91657 ISE=6.4p NE=3.4 BR=4.49993 NR=1.08286 VAR=4.40924 IKR=3.69854 NC=3.99 RB=20.929 IRB=0.1 RBM=0.135255 RE=0.000998231 RC=0.0563123 XTB=0.1 XTI=1 EG=1.10826 CJE=1e-07 VJE=0.4 MJE=0.735975 ISC=3.9e-13 TF=1e-08 XTF=1.35769 VTF=1 ITF=0.99952 CJC=5e-10 VJC=0.400257 MJC=0.409987 XCJC=0.80312 FC=0.724857 CJS=0 VJS=0.75 MJS=0.5 TR=2.03153e-07 PTF=0 KF=0 AF=1)
.model LS302 NPN(Is=18.04p Xti=3.7 Eg=1.17 Vaf=23.6 Bf=1495 Ne=1.34 Ise=0.66f Nr=1 Ikf=16.7m Xtb=1.56 Br=5.89 Ikr=26.3m Var=8.35 Isc=0.001n Nc=1.72 Nf=1 Rb=1194 Re=0.94 Rc=203 Cjc=2.46p Cje=2.36p Mjc=135m Mje=219m Vjc=400m Vje=648m Tf=0.24n Tr=10n Vtf=5 Xtf=1 Rbm=11.6 Irb=10u Ptf=20 Fc=0.9 Itf=50m Tikf1=-5.38m Tvaf1=-364u Trc1=3.3m Level=1 mfg=Linear_Systems)
.model LS303 NPN(Is=18.04p Xti=3.7 Eg=1.17 Vaf=23.6 Bf=1495 Ne=1.34 Ise=0.66f Nr=1 Ikf=16.7m Xtb=1.56 Br=5.89 Ikr=26.3m Var=8.35 Isc=0.001n Nc=1.72 Nf=1 Rb=1194 Re=0.94 Rc=203 Cjc=2.46p Cje=2.36p Mjc=135m Mje=219m

Vjc=400m Vje=648m Tf=0.24n Tr=10n Vtf=5 Xtf=1 Rbm=11.6 Irb=10u Ptf=20 Fc=0.9 Itf=50m Tikf1=-5.38m Tvaf1=-364u Trc1=3.3m Level=1 mfg=Linear_Systems)
.model LS3250C NPN(Is=5.43f Xti=4.4 Eg=1.17 Vaf=272.5 Bf=264 Ne=1.11 Ise=0.057f Nr=1 Ikf=28m Xtb=1.42 Br=5.0 Ikr=26m Var=8.35 Isc=4.39p Nc=1.47 Nf=1 Rb=100 Re=6.5 Rc=21 Cjc=3.6p Cje=6.63p Mjc=198m Mje=301m Vjc=412m Vje=679m Tf=0.24n Tr=10n Vtf=5 Xtf=1 Rbm=12 Irb=10u Ptf=20 Fc=0.98 Itf=46m Mfg=Linear_Systems)
.model LS3550B PNP(Is=9.04f Xti=3.65 Eg=1.17 Vaf=28.2 Bf=202 Ne=2 Ise=0.003f Nr=1 Ikf=45m Xtb=2.30 Br=6.87 Ikr=500u Var=20 Isc=0.41p Nc=1.8 Nf=1 Rb=100 Re=0.06 Rc=30 Cjc=6.02p Cje=5.48p Mjc=280m Mje=285.48m Vjc=538m Vje=622m Tf=0.26n Tr=10n Vtf=5 Xtf=0.1 Rbm=10 Irb=10u Ptf=20 Fc=0.97 Itf=40m Mfg=Linear_Systems)
.MODEL CPH5905_TR NPN (IS=17.60f BF=212.0 NF=1.023 VAF=246.0 IKF=410.0m ISE=3.20f NE=1.38 BR=3.20 NR=1.05 VAR=1000.0 IKR=20.0 ISC=1.00f NC=1.50 RB=620.0m IRB=60.0m RBM=240.0m RE=460.0m RC=410.0m XTB=0 XTI=3 EG=1.11 NK=0.71 CJE=19.2p VJE=0.78 MJE=0.27 CJC=5.30p VJC=0.57 MJC=0.28)
.MODEL 2SAR522EB PNP IS=20.000E-15 BF=311.65 VAF=25.800 IKF=.59878 ISE=20.000E-15 NE=1.4546 BR=10.057 VAR=6.1100 IKR=53.963E-3 ISC=413.88E-15 NC=1.5497 NK=.77781 RE=.25 RB=5.2646 RC=.45936 CJE=13.254p VJE=.92613 MJE=.41651 CJC=10.583p VJC=1.2414 MJC=.55143 TF=361.87p XTF=8.6164 VTF=20.767 ITF=.86632 TR=25.500E-9 XTB=1.5000
.MODEL 2SC4027 NPN IS=375f BF=1k VAF=200 IKF=1.5 BVcbo=200 nBVcbo=5.4 ISE=8p NE=1.5 BR=50 NR=1 VAR=4 IKR=30m ISC=500p NC=2 RB=400m IRB=100m RBM=10m RE=70m RC=40m XTB=0 EG=1.11 CJC=50p VJC=650m MJC=0.5 VTF=1K ITF=5 PTF=0 quasimod=1 rco=10 vo=25 gamma=2.2e-7 vceo=160 icrating=1.5 XTI=3 tr=10n tf=1n CJE=200p VJE=700m Vceo=32 Icrating=0.8
.MODEL 2N2946A_ PNP IS=3.44803E-14 NF=0.988387 VAF=30.7851 IKF=0.0095632 ISE=2.92141E-15 NE=1.16009 BR=82.4123 NR=0.990515 VAR=18.7935 IKR=0.00414712 ISC=6.99709E-15 NC=1.08257 RB=95.944 RE=0.0637657 EG=1.11 XTI=3 CJE=1.04834E-11 VJE=0.607391 MJE=0.436841 VJC=0.564175 MJC=0.353784 XCJC=1 VJS=0.75 FC=0.5 BF=5.070890E+02 CJC=1.450710E-11 RC=1.813500E+00 TF=3.183099E-08 XTF=1.000000E+00
.model 2n2946a pnp IS=148.31E-15 BF=400 NF=1.0 VAF=12 IKF=65.7E-3 ISE=2.536p NE=1.8147 BR=120 NR=1.0 VAR=50 IKR=0.05 ISC=1.345p NC=1.5558 RB=47.4 IRB=0.3E-3 RBM=11.56 RE=2E-3 RC=0.3 CJE=10.65p VJE=0.653 MJE=0.4539 TF=1.6E-9 XTF=1 VTF=4 ITF=0.5 PTF=0.0 CJC=13.8p VJC=0.5 MJC=0.336 XCJC=0.5 TR=14.65E-9 CJS=0 VJS=0.7 MJS=0.5 XTB=1.034 EG=1.11 XTI=3.0 KF=0 AF=1 FC=0.5
.MODEL FZT1049A NPN IS=1.5p NF=1 BF=600 IKF=7.5 VAF=100 ISE=0.9E-13 NE=1.25 NR=1.0 BR=150 IKR=3 VAR=15 ISC=5.0E-13 NC=1.76 RB=0.1 RE=0.018 RC=0.007 CJC=136p CJE=550p MJC=0.352 MJE=0.36 VJC=0.554 VJE=0.726 TF=400p TR=6.9n
.model 2sc3502_AB npn is=40f bf=153 vaf=769 ikf=0.08 ise=200f ne=1.5 nf=1.0 rb=75 re=0.1 cje=95p mje=0.35 vje=0.75 cjc=7p mjc=0.35 vjc=0.75 fc=0.5 tf=585p xtf=10000 vtf=35 itf=20 tr=10n br=0.6 ikr=0.05 eg=0.75 xtb=1.5 xti=3 nc=1.5 isc=7f nr=1.0 var=100 irb=3e-6 rbm=0.035 rc=1.5 rco=97 vo=5 gamma=.7e-6 qco=1p xcjc=1.0 vceo=200 icrating=100m mfg=sanyo
.MODEL MPS6515 npn(Is=6.734f Xti=3 Eg=1.11 Vaf=74.03 Bf=760.5 Ne=1.325 Ise=6.734f Ikf=74.54m Xtb=1.5 Br=.7009 Nc=2 Isc=0 Ikr=0 Rc=1 Cjc=3.118p Mjc=.3086 Vjc=.75 Fc=.5 Cje=4.493p Mje=.2593 Vje=.75 Tr=236.6n Tf=302p Itf=.4 Vtf=4 Xtf=2 Rb=10)
.MODEL 2SA1832 PNP(TNOM=25 IS=2.5e-014 BF=190 NF=1 VAF=30 IKF=0.3 ISE=1E-016 NE=1.5 BR=15 NR=1 VAR=1000 IKR=0.01 ISC=4e-013 NC=1.4 NK=0.53 RE=0.001 RB=8 RC=1.1 CJE=9.0E-012 VJE=0.75 MJE=0.33 CJC=9.63E-012 VJC=0.75 MJC=0.33 FC=0.5 TR=4e-008 TF=1.78E-009 XTF=1 VTF=1 ITF=1 PTF=0 EG=1.1 TRC1=0 XTB=2 XTI=2)
.MODEL SS8050 NPN IS=377.21E-15 BF=218.082 NF=1.0409 VAF=32.0909 BF=218.08 NF=1.0409 VAF=32.0909 NF=1.0409 VAF=32.0909 VAF=32.091 IKF=.84522 ISE=5.17224E-11 NE=2.12785 BR=5.45795 ISE=51.722E-12 NE=2.12785 BR=5.45795 NE=2.1279 BR=5.45795 BR=5.4580 NR=1.0619 VAR=49.0994 IKR=2.19792 ISC=5.17224E-11 VAR=49.099 IKR=2.19792 ISC=5.17224E-11 IKR=2.1979 ISC=5.17224E-11 ISC=51.722E-12 NC=3.9685 RB=5.74704 IRB=0.1 RBM=0.1 RE=841.72E-6 RC=0.248242 XTB=0.626944 XTI=1 RB=5.7470 IRB=0.1 RBM=0.1 RC=.24824 XTB=0.626944 XTI=1 CJE=27.335E-12 VJE=0.721406 MJE=0.85 VJE=.72141 MJE=0.85 MJE=.85 CJC=26.000E-12 VJC=0.4 MJC=0.367851 XCJC=0.1 VJC=.4 MJC=0.367851 XCJC=0.1 MJC=.36785 XCJC=0.1 FC=.9999 CJS=0 VJS=0.75 MJS=0.5 TF=643.94E-12 XTF=1.43228 VTF=0.344801 ITF=1.20072 XTF=1.4323 VTF=0.344801 ITF=1.20072 VTF=.3448 ITF=1.20072 ITF=1.2007 TR=100.00E-9 PTF=0 KF=0 AF=1 EG=1.0500 CJE=2.73346E-11 VJE=0.721406 MJE=0.85 XTB=.62694 XTI=1 XTI=1
.MODEL MJE13001 NPN IS=2.5f NF=1 ISE=2p NE=2 BF=50 IKF=200m VAF=107.5 NR=1 ISC=10p NC=2 BR=3 IKR=0.85 VAR=12.27 RB=100 IRB=1m RBM=10 RE=0.03 RC=0.5 XTB=1.236 EG=1.22 XTI=3 CJE=300p VJE=0.7 MJE=0.335 CJC=10p VJC=0.4 MJC=0.417 Bvbe=7 Gamma=2p Qco=4n5 Rco=10 Vo=15 Tr=.32u Tf=10n nk=0.7 BVcbo=700 nBVcbo=3.2 XCJC=0.5 FC=0.5 Vceo=400 Icrating=200m
.MODEL Q2SD880 NPN IS=39.864E-15 BF=332.17 VAF=100 IKF=3.5344 ISE=1.2053E-12 NE=1.4486 BR=499.50 VAR=100 IKR=19.980 ISC=2.0758E-12 NC=1.2733 NK=.79902 RC=.14484 CJE=219.35E-12 MJE=.33333 CJC=170.04E-12 MJC=.33333 TF=14.092E-9 XTF=10 VTF=10 ITF=1 TR=73.000E-9
.MODEL 2SD880 NPN IS=39.864E-15 BF=332.17 VAF=100 IKF=3.5344 ISE=1.2053p NE=1.4486 BR=499.50 VAR=100 IKR=19.980 ISC=2.0758p NC=1.2733 NK=.79902 RC=.14484 CJE=219.35E-12 MJE=.33333 CJC=170.04p

MJC=.33333 TF=14.092n XTF=10 VTF=10 ITF=1 TR=73n
.MODEL TIP41 NPN(Is=457.5f Xti=3 Eg=1.11 Vaf=50 Bf=156.7 Ise=1.346p Ne=1.34 Ikf=3.296 Nk=.5961 Xtb=2.2 Br=7.639 Isc=604.1f Nc=2.168 Ikr=8.131m Rc=91.29m Cjc=278.7p Mjc=.385 Vjc=.75 Fc=.5 Cje=433p Mje=.5 Vje=.75 Tr=1.412u Tf=37.34n Itf=35.68 Xtf=1.163 Vtf=10 Rb=.1)
.MODEL TIP41A NPN(Is=457.5f Xti=3 Eg=1.11 Vaf=50 Bf=156.7 Ise=1.346p Ne=1.34 Ikf=3.296 Nk=.5961 Xtb=2.2 Br=7.639 Isc=604.1f Nc=2.168 Ikr=8.131m Rc=91.29m Cjc=278.7p Mjc=.385 Vjc=.75 Fc=.5 Cje=433p Mje=.5 Vje=.75 Tr=1.412u Tf=37.34n Itf=35.68 Xtf=1.163 Vtf=10 Rb=.1)
.MODEL TIP41B NPN(Is=457.5f Xti=3 Eg=1.11 Vaf=50 Bf=156.7 Ise=1.346p Ne=1.34 Ikf=3.296 Nk=.5961 Xtb=2.2 Br=7.639 Isc=604.1f Nc=2.168 Ikr=8.131m Rc=91.29m Cjc=278.7p Mjc=.385 Vjc=.75 Fc=.5 Cje=433p Mje=.5 Vje=.75 Tr=1.412u Tf=37.34n Itf=35.68 Xtf=1.163 Vtf=10 Rb=.1)
.MODEL TIP42 PNP(Is=66.19f Xti=3 Eg=1.11 Vaf=100 Bf=137.6 Ise=862.2f Ne=1.481 Ikf=1.642 Nk=.5695 Xtb=2 Br=5.88 Isc=273.5f Nc=1.24 Ikr=3.555 Rc=79.39m Cjc=870.4p Mjc=.6481 Vjc=.75 Fc=.5 Cje=390.1p Mje=.4343 Vje=.75 Tr=235.4n Tf=23.21n Itf=71.33 Xtf=5.982 Vtf=10 Rb=.1)
.MODEL TIP42A PNP(Is=66.19f Xti=3 Eg=1.11 Vaf=100 Bf=137.6 Ise=862.2f Ne=1.481 Ikf=1.642 Nk=.5695 Xtb=2 Br=5.88 Isc=273.5f Nc=1.24 Ikr=3.555 Rc=79.39m Cjc=870.4p Mjc=.6481 Vjc=.75 Fc=.5 Cje=390.1p Mje=.4343 Vje=.75 Tr=235.4n Tf=23.21n Itf=71.33 Xtf=5.982 Vtf=10 Rb=.1)
.MODEL TIP42B PNP(Is=66.19f Xti=3 Eg=1.11 Vaf=100 Bf=137.6 Ise=862.2f Ne=1.481 Ikf=1.642 Nk=.5695 Xtb=2 Br=5.88 Isc=273.5f Nc=1.24 Ikr=3.555 Rc=79.39m Cjc=870.4p Mjc=.6481 Vjc=.75 Fc=.5 Cje=390.1p Mje=.4343 Vje=.75 Tr=235.4n Tf=23.21n Itf=71.33 Xtf=5.982 Vtf=10 Rb=.1)
.MODEL 2SA1516 PNP IS=10.000E-15 BF=109.19 VAF=300 IKF=19.980 ISE=10.000E-15 NE=1.3084 BR=55.256 VAR=100 IKR=19.980 ISC=844.64E-12 NC=1.8467 NK=.55464 RB=.3 RC=.11345 CJE=2.0000E-12 CJC=1.1417E-9 MJC=.33333 TF=1.2726E-9 XTF=10 VTF=10 ITF=1 TR=10.000E-9
.MODEL 2SC3180 NPN IS=249.03E-15 BF=111.56 VAF=100 IKF=5.6833 ISE=249.03E-15 NE=1.3225 BR=2.9100 VAR=100 IKR=42.253E-3 ISC=395.89E-12 NC=1.7595 NK=.49439 RC=67.852E-3 CJE=2.0000E-12 CJC=255.06E-12 MJC=.33333 TF=4.1433E-9 XTF=2.5831E3 VTF=3.6251 ITF=129.24 TR=3.0000E-6
.MODEL BCX56 NPN IS=6.119E-14 NF=0.9948 ISE=5.844E-15 NE=1.469 BF=130.4 IKF=0.8 VAF=54.27 NR=0.9905 ISC=1.342E-13 NC=1.183 BR=14.53 IKR=0.2049 VAR=30 RB=0.5 IRB=1E-06 RBM=0.5 RE=0.1114 RC=0.082 XTB=0 EG=1.11 XTI=3 CJE=1.234E-10 VJE=0.6917 MJE=0.338 TF=6.543E-10 XTF=223.8 VTF=1.892 ITF=10 PTF=0 CJC=3.49E-11 VJC=0.5 MJC=0.388 XCJC=0.15 TR=1E-32 FC=0.9232
.MODEL 2SC3425 NPN(IS=368.91E-18 BF=115.86 VAF=100 IKF=1.2554 XTB=1.5 XTB=1.5 ISE=8.9814E-15 NE=1.3627 BR=3.3884 VAR=100 IKR=1.6831 ISC=378.07E-15 NC=1.3903 NK=1.1918 RC=.42883 CJE=2p CJC=2p TF=10n XTF=10 VTF=10 ITF=1 TR=5.7756u Vceo=400 Icrating=800m)
.MODEL KSC3503DS NPN IS=3.510E-14 BF=174.09 VAF=600 IKF=0.12325 ISE=2.2538E-13 NE=2.0 BR=0.64499 VAR=100 IKR=0.43102 ISC=6.4644E-10 NC=1.5 RE=0.048 RC=0.815 RB=8.134 RBM=0.034 IRB=3.0e-6 CJE=8.10p MJE=0.401 VJE=0.75 CJC=8.20p MJC=0.31 VJC=0.75 TF=9.995E-10 XTF=2 VTF=35 ITF=1 TR=1.0E-8 EG=0.84 XTB=2.5 FC=0.5 Vceo=300 Icrating=100m
.model bc159 pnp IS=8.935E-15 BF=1.815E+02 NF=1.000E+00 VAF=3.578E+01 IKF=2.747E-02 ISE=1.656E-14 NE=1.357E+00 BR=4.896E+00 NR=1.006E+00 VAR=1.000E+01 IKR=3.856E-02 ISC=1.179E-11 NC=1.482E+00 IRB=1.000E-04 RE=1.199E+00 RC=2.549E+00 CJE=8.491p VJE=8.000E-01 MJE=3.600E-01 TF=8.672E-11 XTF=8.797E+01 VTF=6.806E+01 ITF=5.163E-01 PTF=0 CJC=6.469p VJC=3.000E-01 MJC=2.699E-01 XCJC=1.0 TR=5.729E-08 XTB=1.5 EG=1.11 XTI=3.0 KF=0 AF=1.0 FC=0.5
.model 2N5133 NPN(Is=5.911f Xti=3 Eg=1.11 Vaf=62.37 Bf=529.8 Ne=1.31 Ise=5.911f Ikf=13.29m Xtb=1.5 Br=1.322 Nc=2 Isc=0 Ikr=0 Rc=1.61 Cjc=4.017p Mjc=.3174 Vjc=.75 Fc=.5 Cje=4.973p Mje=.4146 Vje=.75 Tr=4.709n Tf=819.5p Itf=.35 Vtf=4 Xtf=7 Rb=10)
.model A1302 PNP(XTI=3 IS=21.5p BF=136 VAF=100 IKF=20 ISE=21.5p NE=1.3784 BR=329 VAR=100 IKR=20 ISC=4.367n NC=1.426 RC=93m RB=1 CJE=8n MJE=.333 CJC=1.1n MJC=.333 TF=1.28n XTF=10 VTF=10 ITF=1 TR=50n VCEO=200V ICrating=15A MFG=Toshiba)
.model C3182 NPN(XTI=3 IS=21.5p BF=136 VAF=100 IKF=20 ISE=21.5p NE=1.3784 BR=329 VAR=100 IKR=20 ISC=4.367n NC=1.426 RC=93m RB=1 CJE=8n MJE=.333 CJC=1.1n MJC=.333 TF=1.28n XTF=10 VTF=10 ITF=1 TR=50n VCEO=200V ICrating=15A MFG=Toshiba)
.MODEL C5171_ NPN (XTI=3 XTB=1.5 BF=200 BR=122m CJC=48p CJE=200p FC=0.5 IKF=10 IKR=10m IS=10f ISC=0.00267f ISE=200f ITF=2 MJC=0.36 MJE=0.33 NE=1.4 NF=859m RB=1.8 RC=35.7m RE=0.11 TF=600p TR=10n VAF=100 VAR=20 VJC=0.5 VJE=0.67 VTF=10 XTF=10)
.MODEL A1930_ PNP (XTI=3 XTB=1.5 BF=200 BR=122m CJC=48p CJE=200p FC=0.5 IKF=10 IKR=10m IS=10f ISC=0.00267f ISE=200f ITF=2 MJC=0.36 MJE=0.33 NE=1.4 NF=859m RB=1.8 RC=35.7m RE=0.11 TF=600p TR=10n VAF=100 VAR=20 VJC=0.5 VJE=0.67 VTF=10 XTF=10)
.MODEL C2705 NPN (XTI=3 XTB=1.5 BF=155.8 BR=502M CJC=4.7P CJE=8P FC=500M IKF=216M IKR=10M IS=9.9F ISC=99.9P ISE=994F ITF=163.6M MJC=314M MJE=500M NC=2 NE=2.006 NF=922.9M RC=509M RE=1.99 RB=1 TF=700P TR=632N VAF=157.3 VJC=700M VTF=162M XTF=5.188)
.MODEL A1145 PNP (XTI=3 XTB=1.5 BF=162.6 BR=58M CJC=7.9P CJE=10.69P FC=500M IKF=44.2M IKR=21.47M

IS=10F ISC=.003287F ISE=961F ITF=17.8M MJC=508M MJE=500M NC=2 NE=1.811 NF=960.5M RC=1.99 RE=1.36 RB=1 TF=634P TR=18U VAF=100 VJC=750M VJE=700M VTF=9.99 XTF=616.7M)
.MODEL 2N3710 npn(Is=5.911f Xti=3 Eg=1.11 Vaf=62.37 Bf=423.8 Ne=1.282 Ise=5.911f Ikf=12.67m Xtb=1.5 Br=1.356 Nc=2 Isc=0 Ikr=0 Rc=1.61 Cjc=4.017p Mjc=.3174 Vjc=.75 Fc=.5 Cje=4.973p Mje=.4146 Vje=.75 Tr=4.743n Tf=818.6p Itf=.35 Vtf=4 Xtf=7 Rb=10 mfg=National)
.MODEL ZTX951 PNP (IS=1.3766E-12 NF=1.013 BF=187 IKF=5.0 VAF=66.3 ISE=1.4E-13 NE=1.41 NR=1.0099 BR=56 IKR=0.9 VAR=33 ISC=1.7E-12 NC=1.4 RB=0.029 RE=0.020 RC=0.0255 CJC=287E-12 MJC=0.4522 VJC=0.4956 CJE=1.15E-9 TF=0.83E-9 TR=20E-9)
.MODEL PN200 PNP (IS=50.8F NF=1 BF=286 VAF=139 IKF=0.3 ISE=22.9P NE=2 BR=4 NR=1 VAR=24 IKR=0.45 RE=0.103 RB=0.412 RC=41.2M XTB=1.5 CJE=15.2P VJE=1.1 MJE=0.5 CJC=9.7P VJC=0.3 MJC=0.3 TF=636P TR=442N Vceo=60 Icrating=500m)
.MODEL PN200A PNP (IS=50.8F NF=1 BF=585 VAF=139 IKF=0.3 ISE=11.2P NE=2 BR=4 NR=1 VAR=24 IKR=0.45 RE=0.103 RB=0.412 RC=41.2M XTB=1.5 CJE=15.2P VJE=1.1 MJE=0.5 CJC=9.7P VJC=0.3 MJC=0.3 TF=636P TR=442N Vceo=60 Icrating=500m)
.model 2STF1360 NPN(Is=9.414f Xti=3 Eg=1.11 Vaf=100 Bf=422.9 Ise=16.39f Ne=1.385 Ikf=26.48 Nk=1.411 Xtb=1.5 Br=55.99 Isc=59.71f Nc=1.464 Ikr=1.158 Rc=8.74m Cjc=70.47p Mjc=.5356 Vjc=.5156 Fc=.5 Cje=595.5p Mje=.3452 Vje=.5132 Tr=447.9n Tf=884.9p Itf=1 Xtf=0 Vtf=10 Vceo=60 Icrating=3 mfg=STMicro)
.model 2STF2360 PNP(Is=141f Xti=3 Eg=1.11 Vaf=100 Bf=313.5 Ise=206f Ne=2.492 Ikf=14.57 Nk=.7741 Xtb=1.5 Br=83.03 Isc=183.3f Nc=1.406 Ikr=.3205 Rc=59.21m Cjc=7.138n Mjc=.5648 Vjc=937u Fc=.5 Cje=2.708n Mje=.2477 Vje=1.032m Tr=19.46n Tf=0 Itf=1 Xtf=0 Vtf=10 Vceo=60 Icrating=3 mfg=STMicro)
.MODEL CPH6223 npn (IS=500.0f BF=350 NF=1 VAF=6 IKF=1.9 ISE=30.00p NE=2 BR=120 NR=1 VAR=30 IKR=2.7 ISC=370.0p NC=2 RB=3.5 IRB=100.0m RBM=12.00m RE=40.00m RC=38.50m XTB=1.7 EG=1.11 XTI=3 CJE=300.0p VJE=680.0m MJE=360.0m TF=300p XTF=30 VTF=1.000K ITF=5 PTF=0 CJC=45.00p VJC=555.0m MJC=420.0m XCJC=1 TR=1.000n FC=500.0m
.model 2N274 PNP(Is=1e-7 bf=20 Vaf=10 Cje=25p Cjc=25p Eg=.67 MFG=GERMANIUM-TYPE)
.model 2N597 PNP(Is=1e-7 bf=50 Vaf=10 Cje=50p Cjc=10p Eg=.67 MFG=GERMANIUM-TYPE)
.MODEL 2N6520 PNP(IS=1.98E-14 BF=104 VAF=336 IKF=0.09 ISE=1.66E-11 NE=2 BR=4 VAR=20 IKR=0.135 RB=3.66 RE=0.915 RC=0.366 CJE=9.81E-11 VJE=1.1 MJE=0.5 TF=1.89E-9 CJC=3.07E-11 VJC=0.3 MJC=0.3 TR=1.31E-6 XTB=1.5 Vceo=350 Icrating=500m)
.MODEL 2SC4544 NPN BR=0.0001 CJE=8.42E-11 FC=0.5 IKF=6m IKR=1 IRB=1.36E-07 IS=3.4E-15 ISC=1E-13 ISE=4.11E-13 ITF=1.62 MJC=0.265 MJE=0.33 NC=2 NE=1.8 NF=0.939 NR=1.41 PTF=0 RB=18.2 RBM=0.933 RE=0.0038 TR=10n VAF=500 VAR=50 VJC=0.2 VJE=0.75 XTB=1.8 XTI=2.5 BF=380 CJC=1.13E-11 RC=5.13 TF=1.8n XTF=3.0E+02 rco=60 Vo=15 GAMMA=20n QCO=1E-11 Vceo=300 Icrating=100m mfg=SavantIC