

## NPN EPITAXIAL SILICON TRANSISTOR FOR MICROWAVE LOW-NOISE AMPLIFICATION

The 2SC3603 is an NPN epitaxial transistor designed for low-noise amplification at 0.5 to 4.0 GHz. This transistor has low-noise and high-gain characteristics in a wide collector current region, and has a wide dynamic range.

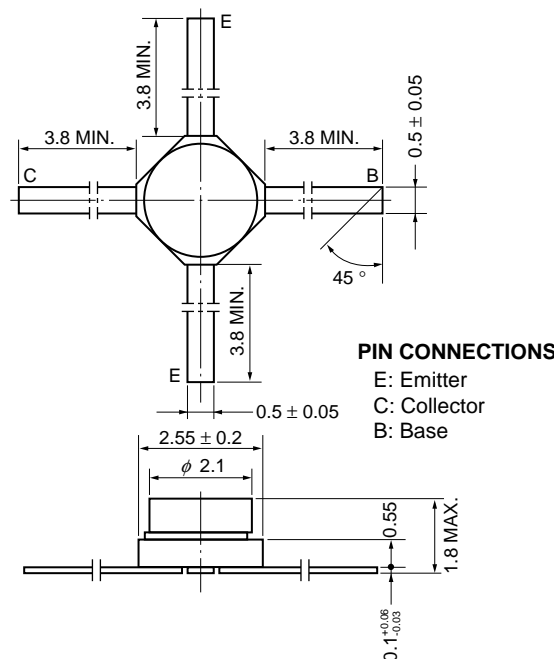
### FEATURES

- Low noise :  $NF = 2.1 \text{ dB TYP. @ } f = 2.0 \text{ GHz}$
- High power gain :  $G_A = 10 \text{ dB TYP. @ } f = 2.0 \text{ GHz}$

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

PARAMETER	SYMBOL	RATING	UNIT
Collector to Base Voltage	$V_{CBO}$	20	V
Collector to Emitter Voltage	$V_{CEO}$	12	V
Emitter to Base Voltage	$V_{EBO}$	3	V
Collector Current	$I_C$	100	mA
Total Power Dissipation	$P_T (T_C = 25^\circ\text{C})$	580	mW
Junction Temperature	$T_j$	200	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-65 to +150	$^\circ\text{C}$

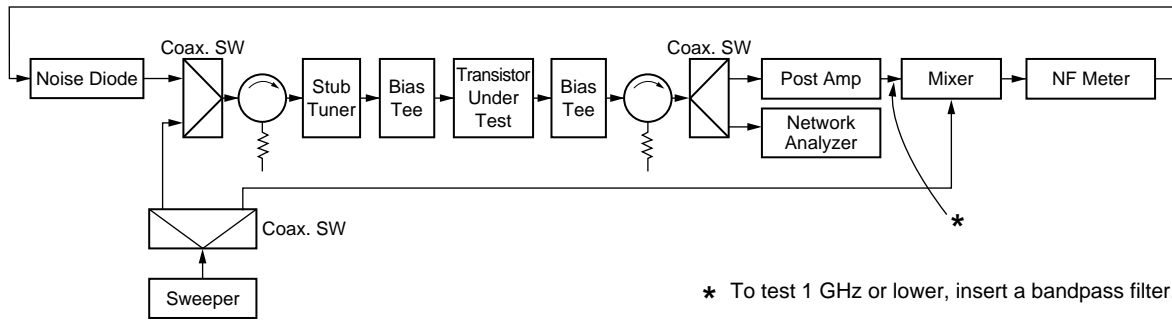
### PACKAGE DIMENSIONS (in mm)



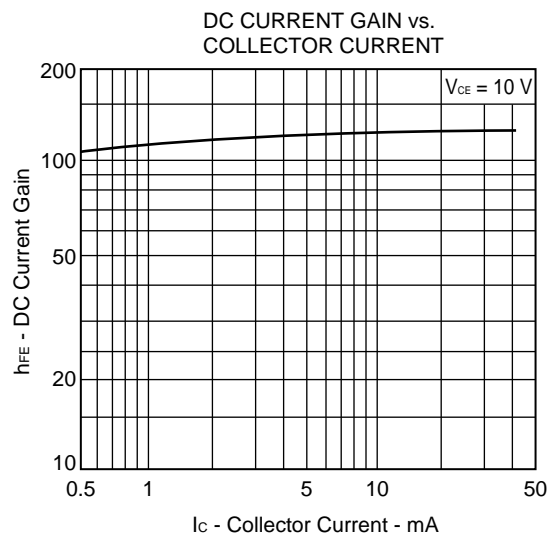
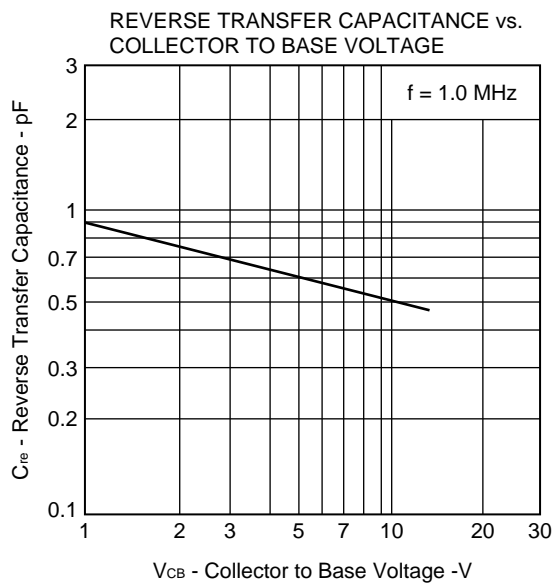
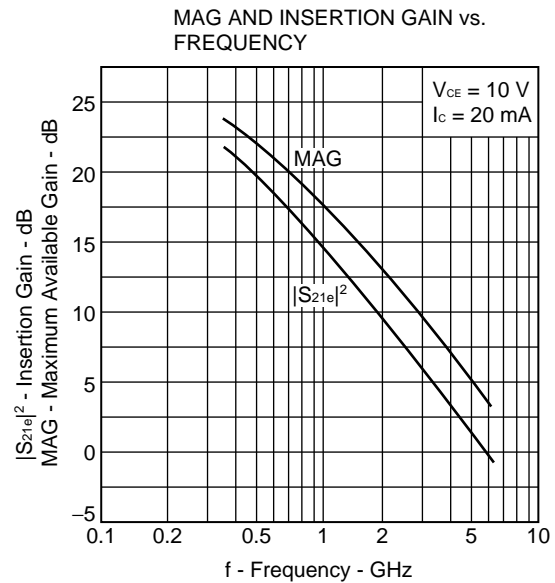
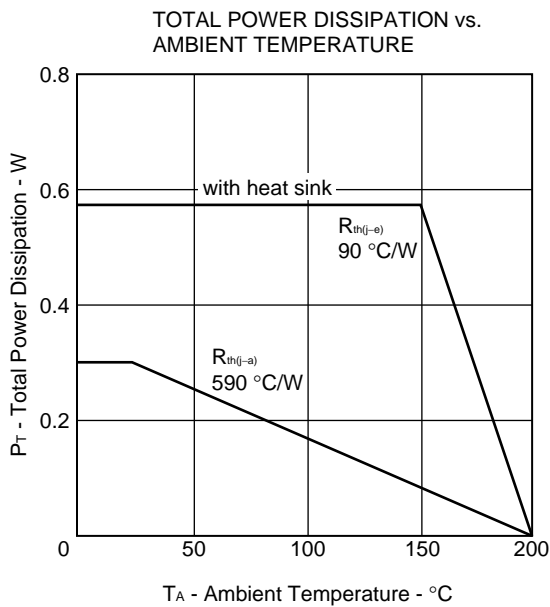
### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )

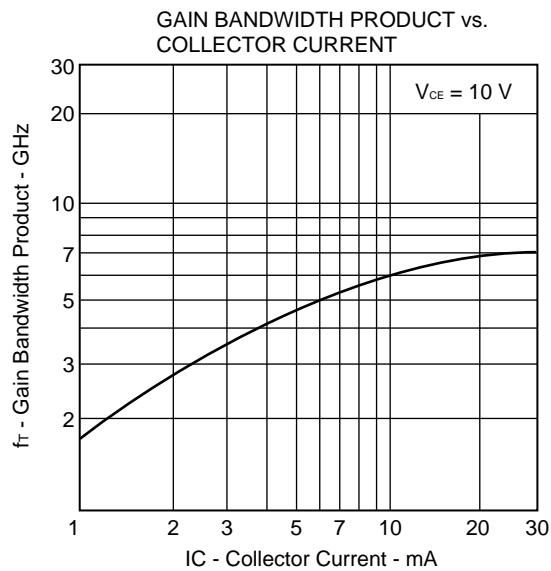
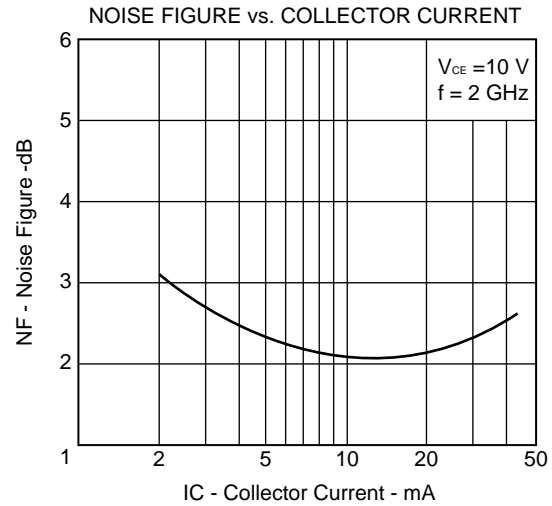
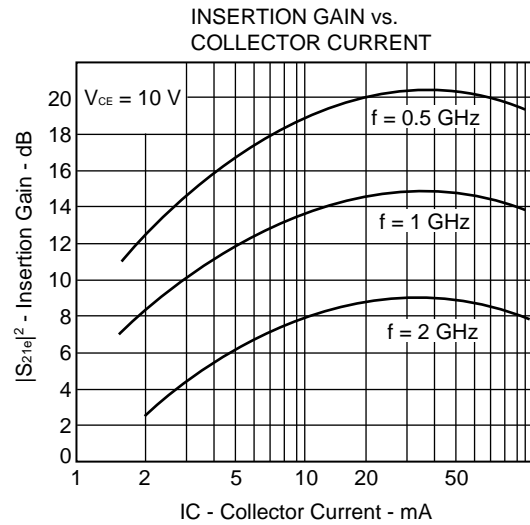
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current	$I_{CBO}$	$V_{CB} = 10 \text{ V, } I_E = 0$			1.0	$\mu\text{A}$
Emitter Cut-off Current	$I_{EBO}$	$V_{EB} = 1 \text{ V, } I_C = 0$			1.0	$\mu\text{A}$
DC Current Gain	$h_{FE}$	$V_{CE} = 10 \text{ V, } I_C = 20 \text{ mA Pulse}$	50	120	300	
Gain Bandwidth Product	$f_T$	$V_{CE} = 10 \text{ V, } I_C = 20 \text{ mA}$		7		GHz
Reverse Transfer Capacitance	$C_{re}$	$V_{CB} = 10 \text{ V, } I_E = 0, f = 1 \text{ MHz}$		0.5	1.0	pF
Noise Figure	$NF^{\text{Note}}$	$V_{CE} = 10 \text{ V, } I_C = 7 \text{ mA, } f = 2 \text{ GHz}$		2.1	3.4	dB
Insertion Gain	$ S_{21e} ^2$	$V_{CE} = 10 \text{ V, } I_C = 20 \text{ mA, } f = 2 \text{ GHz}$	7.0	9.0		dB
Maximum Available Gain	MAG	$V_{CE} = 10 \text{ V, } I_C = 20 \text{ mA, } f = 2 \text{ GHz}$	10.0	12.0		dB
Power Gain	$G_A$	$V_{CE} = 10 \text{ V, } I_C = 7 \text{ mA, } f = 2 \text{ GHz}$		10		dB

**Note** Test block diagram



### TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )





### S PARAMETER

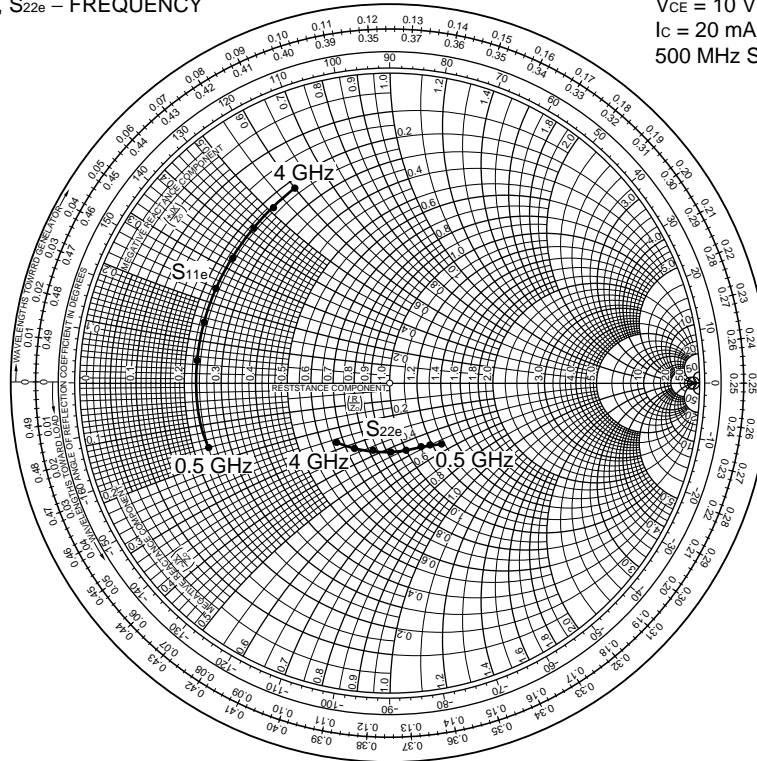
$V_{CE} = 10 \text{ V}$ ,  $I_C = 20 \text{ mA}$ ,  $Z_O = 50 \Omega$

f (MHz)	S <sub>11</sub>	∠S <sub>11</sub>	S <sub>21</sub>	∠S <sub>21</sub>	S <sub>12</sub>	∠S <sub>12</sub>	S <sub>22</sub>	∠S <sub>22</sub>
500	.629	-160.8	10.100	92.6	.040	41.5	.256	-49.0
1000	.631	175.8	5.411	75.1	.048	51.4	.244	-57.2
1500	.628	162.5	3.565	60.6	.070	59.2	.232	-66.8
2000	.646	152.2	2.720	48.4	.086	56.0	.22	-77.4
2500	.659	142.1	2.161	38.8	.105	52.2	.213	-89.1
3000	.677	132.0	1.916	25.7	.127	45.1	.217	-103.1
3500	.695	123.8	1.585	14.3	.151	39.7	.232	-119.5
4000	.713	116.5	1.392	5.3	.168	34.8	.254	-134.0

S PARAMETER

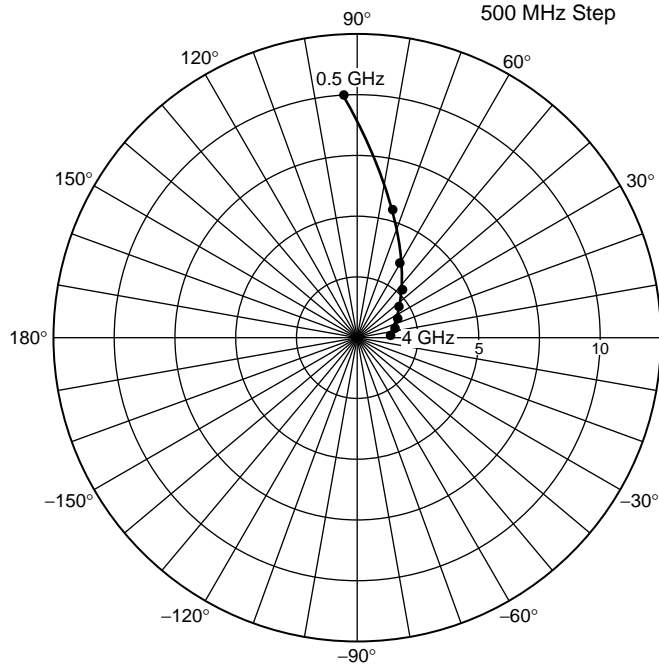
$S_{11e}$ ,  $S_{22e}$  – FREQUENCY

$V_{CE} = 10\text{ V}$   
 $I_C = 20\text{ mA}$   
 500 MHz Step



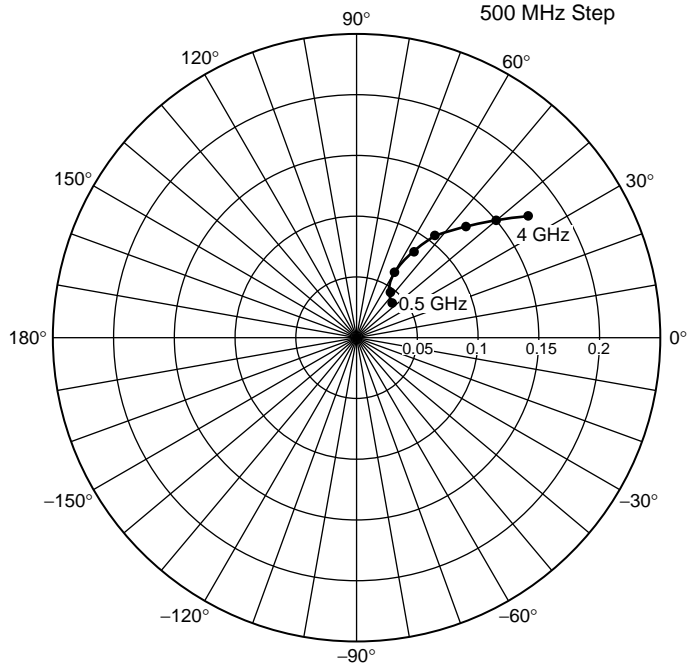
$S_{21}$  – FREQUENCY

$V_{CC} = 10\text{ V}$   
 $I_C = 20\text{ mA}$   
 500 MHz Step



$S_{12}$  – FREQUENCY

$V_{CE} = 10\text{ V}$   
 $I_C = 20\text{ mA}$   
 500 MHz Step



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Anti-radioactive design is not implemented in this product.



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