# DIGITRON SEMICONDUCTORS

## 2N5441-2N5446, T6420 SERIES — 40 AMP SILICON TRIACS

Available Non-RoHS (standard) or RoHS compliant (add PBF suffix).
Available as "HR" (high reliability) screened per MIL-PRF-19500, JANTX level. Add "HR" suffix to base part number.

**MAXIMUM RATINGS** (Sinusoidal supply voltage at frequency 50/60Hz and with resistive or inductive load)

| Rating | Symbol | 2N5441<br>2N5444<br>T6420B | 2N5442<br>2N5445<br>T6420D | 2N5443<br>2N5446<br>T6420M | Unit |
|---|---|---|---|---|---|
| **Repetitive peak off-state voltage**(1)<br>Gate open, $T_J$ = -65 to 100°C | $V_{DROM}$ | 200 | 400 | 600 | V |
| **RMS on-state current (Conduction angle = 360°)**<br>$T_C$ = 70°C (press-fit type)<br>$T_C$ = 65°C (stud type)<br>$T_C$ = 60°C (isolated stud type) | $I_{T(RMS)}$ | | 40<br>40<br>40 | | A |
| **Peak surge (non-repetitive) on state current**<br>For one cycle of applied principal voltage<br>60Hz (sinusoidal)<br>50Hz (sinusoidal) | $I_{TSM}$ | | <br>300<br>265 | | A |
| **Rate of change of on-state current**<br>$V_{DM}$ = $V_{DROM}$, $I_{GT}$ = 200mA, $t_r$ = 0.1µs | di/dt | | 100 | | A/µs |
| **Fusing current**<br>$T_J$ = -65° to 110°C, t = 1.25 to 10ms | $I^2t$ | | 450 | | $A^2s$ |
| **Peak gate trigger current**(2)<br>For 1µs maximum | $I_{GTM}$ | | 12 | | A |
| **Gate power dissipation**<br>Peak (for 10µs maximum, $I_{GTM} \leq$ 4A<br>Average | <br>$P_{GM}$<br>$P_{G(AV)}$ | | <br>40<br>0.75 | | W |
| **Storage temperature range** | $T_{stg}$ | | -65 to 150 | | °C |
| **Operating temperature range** | $T_C$ | | -65 to 110 | | °C |
| **Terminal temperature (during soldering)**<br>For 10 s maximum (terminals and case) | $T_T$ | | 225 | | °C |
| **Maximum stud torque** | $r_s$ | | 50 | | In. lb. |

Note 1: For either polarity of main terminal 2 voltage ($V_{MT2}$) with reference to main terminal 1.
Note 2: For either polarity of gate voltage ($V_G$) with reference to main terminal 1.

## ELECTRICAL CHARACTERISTICS

| Characteristic | Symbol | Limits<br>For all types unless otherwise specified | | | Units |
|---|---|---|---|---|---|
| | | Min | Typ | Max | |
| **Peak off-state current**(1)<br>Gate open, $T_J$ = 110°C, $V_{DROM}$ = maximum rated value | $I_{DROM}$ | - | 0.2 | 4 | mA |
| **Maximum on-state voltage**(1)<br>$I_T$ = 100A(peak), $T_C$ = 25°C<br>$I_T$ = 56A(peak), $T_C$ = 25°C | $V_{TM}$ | -<br>- | 1.7<br>1.5 | 2<br>1.85 | V |
| **DC holding current**(1)<br>Gate open, initial principal current = 500mA(dc), $V_D$ = 12V<br>$T_C$ = 25°C<br>$T_C$ = -65°C | $I_{HO}$ | <br>-<br>- | <br>25<br>- | <br>60<br>100 | mA |
| **Critical rate of rise of commutation voltage**(1)<br>For $V_D$ = $V_{DROM}$, $I_{T(RMS)}$ = 40A, commutating<br>di/dt = 22A/ms, gate unenergized<br>$T_C$ = 70°C (press fit type)<br>$T_C$ = 65°C (stud type)<br>$T_C$ = 60°C (isolated-stud types) | dv/dt | <br><br>5<br>5<br>5 | <br><br>30<br>30<br>30 | <br><br>-<br>-<br>- | V/µs |

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## ELECTRICAL CHARACTERISTICS

| Characteristic | Symbol | Limits | | | Units |
|---|---|---|---|---|---|
| | | For all types unless otherwise specified | | | |
| | | Min | Typ | Max | |
| **Critical rate of rise of off-state voltage**(1) | | | | | |
| For $V_D = V_{DROM}$, exponential voltage rise, gate open | | | | | |
| $T_C$ = 110°C: | dv/dt | | | | V/µs |
| 2N5441, 2N5444, T6420B | | 50 | 200 | - | |
| 2N5442, 2N5445, T6420D | | 30 | 150 | - | |
| 2N5443, 2N5446, T6420M | | 20 | 100 | - | |
| **DC trigger current** | | | | | |
| ($V_D$ = 12V, $R_L$ = 30Ω, $T_C$ = 25°C) | | | | | |
| MT2(+),G(+) | | - | 15 | 50 | |
| MT2(-), G(-) | | - | 20 | 50 | |
| MT2(+), G(-) | | - | 30 | 80 | |
| MT2(-), G(+) | $I_{GT}$ | - | 40 | 80 | mA |
| ($V_D$ = 12V, $R_L$ = 30Ω, $T_C$ = -65°C) | | | | | |
| MT2(+),G(+) | | - | - | 125 | |
| MT2(-), G(-) | | - | - | 125 | |
| MT2(+), G(-) | | - | - | 240 | |
| MT2(-), G(+) | | - | - | 240 | |
| **DC gate trigger voltage**(1)(2) | | | | | |
| $V_D$ = 12V(dc), $R_L$ = 30Ω | | | | | |
| $T_C$ = 25°C | $V_{GT}$ | - | 1.35 | 2.5 | V |
| $T_C$ = -65°C | | - | 1.80 | 3.4 | |
| $V_D = V_{DROM}$, $R_L$ = 125Ω, $T_C$ = 110°C | | 0.2 | - | - | |
| **Gate controlled turn on time** | | | | | |
| (Delay time + rise time) | $t_{gt}$ | - | 1.7 | 3 | µs |
| $V_D = V_{DROM}$, $I_{GT}$ = 200mA, $t_r$ = 0.1µs, $I_T$ = 60A(peak), $T_C$ = 25°C | | | | | |
| **Thermal resistance, junction to case, steady state** | | | | | |
| Press fit types | $R_{\Theta JC}$ | - | - | 0.8 | °C/W |
| Stud types | | - | - | 0.9 | |
| Isolated stud types | | - | - | 1 | |

Note 1: For either polarity of main terminal 2 voltage ($V_{MT2}$) with reference to main terminal 1.
Note 2: For either polarity of gate voltage ($V_G$) with reference to main terminal 1.


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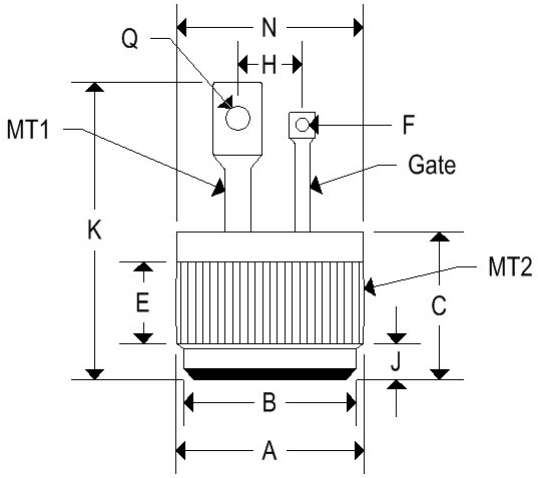
## 2N5441-2N5446, T6420 SERIES — 40 AMP SILICON TRIACS

### MECHANICAL CHARACTERISTICS

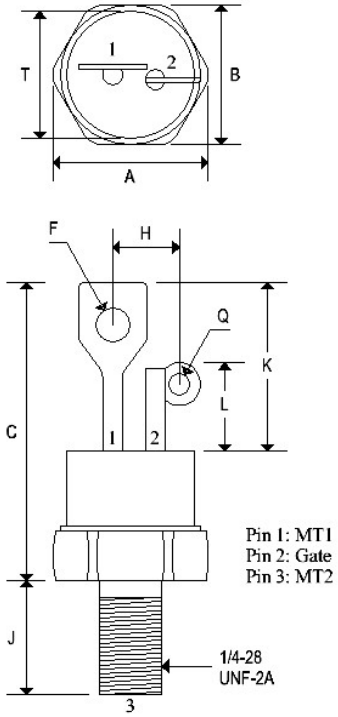
| | |
|---|---|
| **Case** | Digi PF1 (2N5441-2N5443) |
| **Marking** | Alpha-numeric |
| **Polarity** | Cathode is stud |




| | DIGI PF1 | | | |
|---|---|---|---|---|
| | Inches | | Millimeters | |
| | Min | Max | Min | Max |
| A | 0.501 | 0.505 | 12.730 | 12.830 |
| F | - | 0.160 | - | 4.060 |
| G | 0.085 | 0.095 | 2.160 | 2.410 |
| H | 0.060 | 0.070 | 1.520 | 1.780 |
| J | 0.300 | 0.350 | 7.620 | 8.890 |
| K | - | 1.050 | - | 26.670 |
| L | - | 0.670 | - | 17.020 |
| Q | 0.055 | 0.085 | 1.400 | 2.160 |

### MECHANICAL CHARACTERISTICS

| | |
|---|---|
| **Case** | TO-48 (2N5444-2N5446) |
| **Marking** | Alpha-numeric |
| **Polarity** | Cathode is stud |




| | TO-48 | | | |
|---|---|---|---|---|
| | Inches | | Millimeters | |
| | Min | Max | Min | Max |
| A | 0.604 | 0.614 | 15.340 | 15.600 |
| B | 0.551 | 0.559 | 14.000 | 14.200 |
| C | 1.050 | 1.190 | 2.670 | 30.230 |
| F | 0.135 | 0.160 | 3.430 | 4.060 |
| H | - | 0.265 | - | 6.730 |
| J | 0.420 | 0.455 | 10.670 | 11.560 |
| K | 0.620 | 0.670 | 15.750 | 17.020 |
| L | 0.300 | 0.350 | 7.620 | 8.890 |
| Q | 0.055 | 0.085 | 1.400 | 2.160 |
| T | 0.501 | 0.505 | 12.730 | 12.830 |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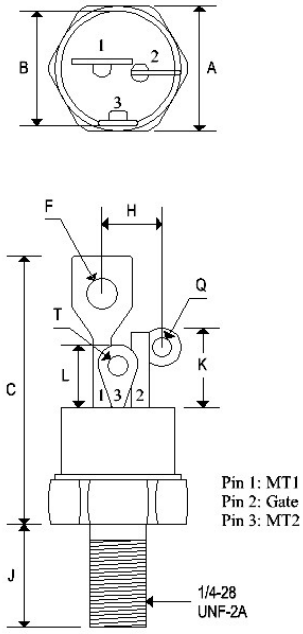
## 2N5441-2N5446, T6420 SERIES — 40 AMP SILICON TRIACS

### MECHANICAL CHARACTERISTICS

| | |
|---|---|
| **Case** | TO-48 ISO (T6420 Series) |
| **Marking** | Alpha-numeric |
| **Polarity** | Cathode is stud |




| | TO-48 ISO | | | |
|---|---|---|---|---|
| | Inches | | Millimeters | |
| | Min | Max | Min | Max |
| A | 0.551 | 0.559 | 14.000 | 14.200 |
| B | 0.501 | 0.505 | 12.730 | 12.830 |
| C | - | 1.280 | - | 32.510 |
| F | - | 0.160 | - | 4.060 |
| H | - | 0.265 | - | 6.730 |
| J | 0.420 | 0.455 | 10.670 | 11.560 |
| K | 0.300 | 0.350 | 7.620 | 8.890 |
| L | 0.255 | 0.275 | 6.480 | 6.990 |
| Q | 0.055 | 0.085 | 1.400 | 2.160 |
| T | 0.135 | 0.150 | 3.430 | 3.810 |

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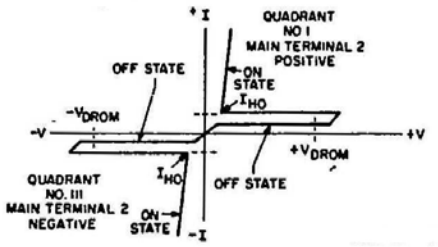


*Fig. 1 - Principal voltage-current characteristic.*

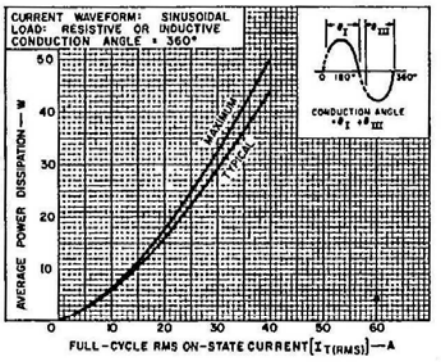


*Fig. 2 - Power dissipation vs. on-state current.*

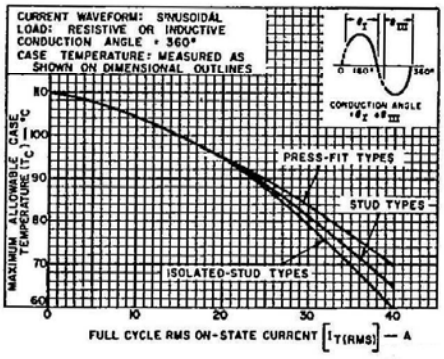


*Fig. 3 - Maximum allowable case temperature vs. on-state current.*

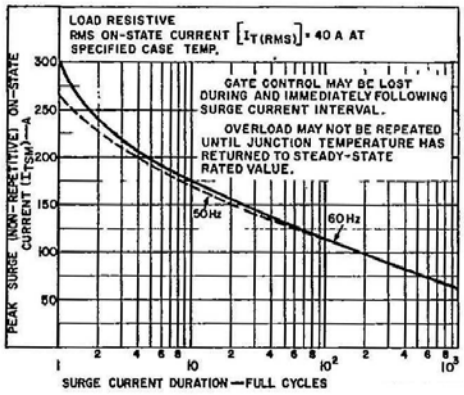


*Fig. 4 - Peak surge on-state current vs. surge current duration.*

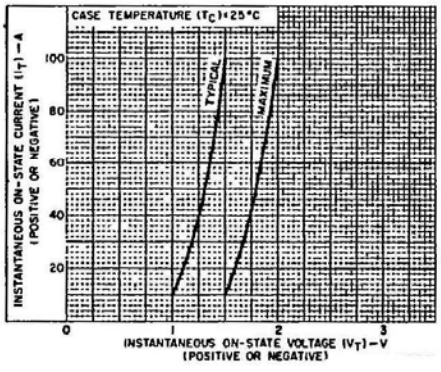


*Fig. 5 - On-state current vs. on-stage voltage.*

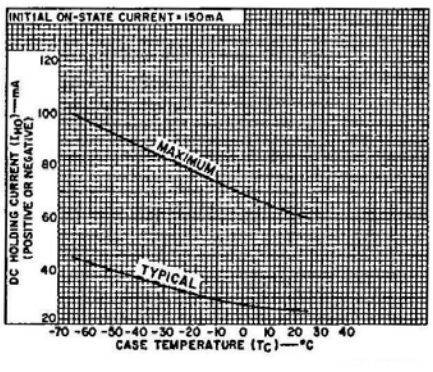


*Fig. 6 - DC holding current vs. case temperature.*

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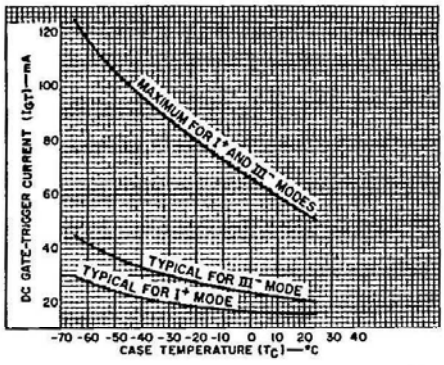


*Fig. 7 - DC gate-trigger current vs. case temperature ($I^+$ & $III^-$ modes).*

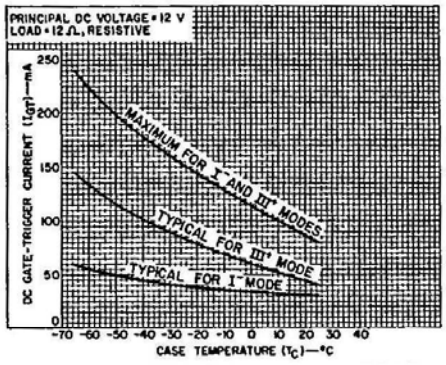


*Fig. 8 - DC gate-trigger current vs. case temperature ($I^-$ & $III^-$ modes).*

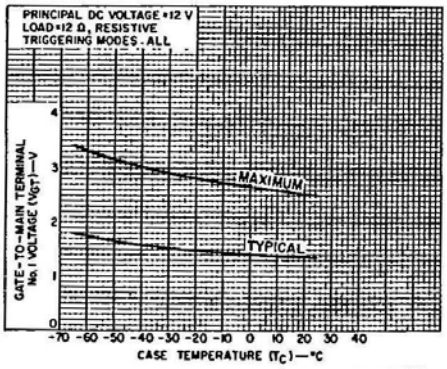


*Fig. 9 - DC gate trigger voltage vs. case temperature.*

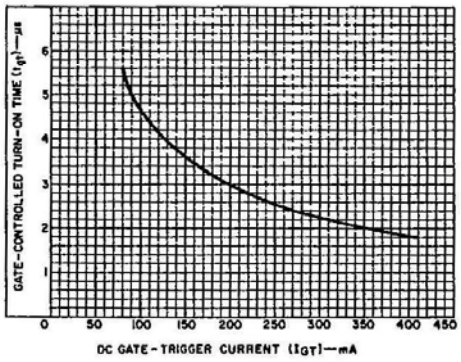


*Fig. 10 - Turn-on time vs. gate-trigger current.*

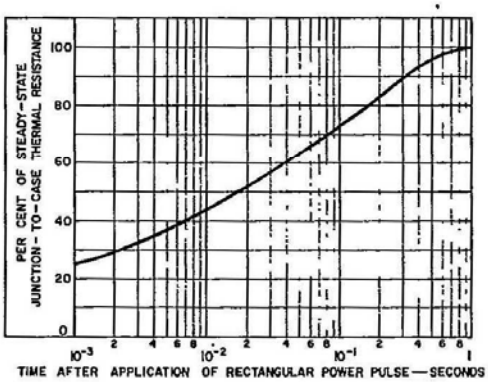


*Fig. 11 - Transient junction-to-case thermal reistance vs. time for press-fit and stud types.*


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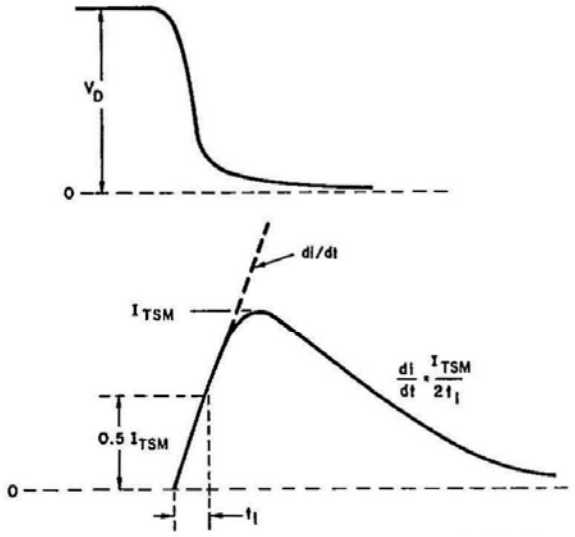


*Fig. 12 - Rate of change of on-state current with time (defining di/dt).*

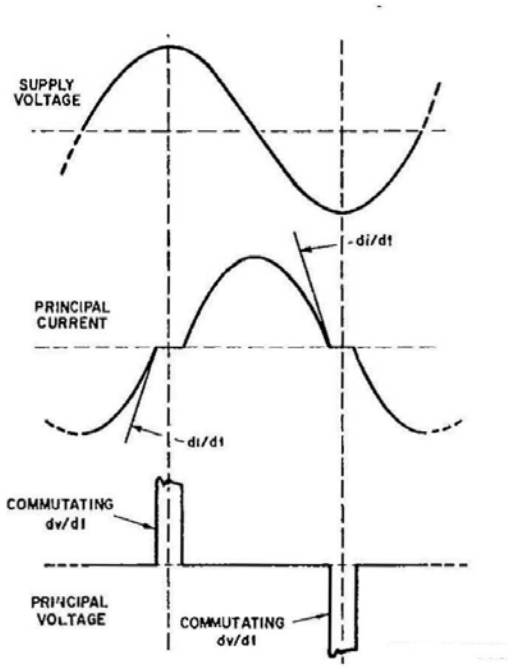


*Fig. 13 - Relationship between supply voltage and principal current (inductive load) showing reference points for definition of commutating voltage (dv/dt).*

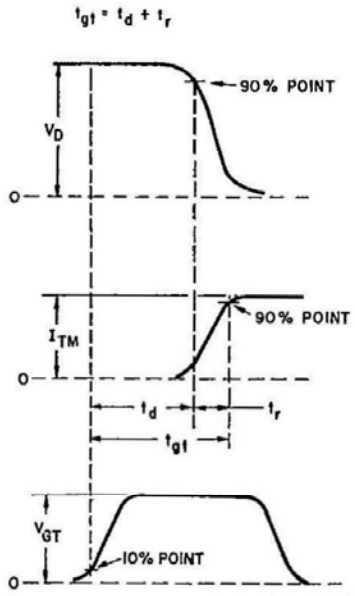


*Fig. 14 - Relationship between off-state voltage, on-state current, and gate-trigger voltage showing reference points for definition of turn-on time ($t_{gt}$).*


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