# MAC16 SERIES*

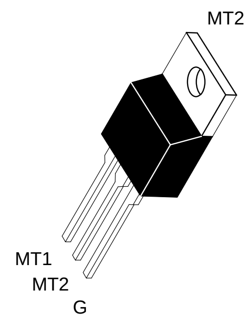
*Motorola preferred devices

# TRIACS
## Silicon Bidirectional Thyristors

Designed for high performance full-wave ac control applications where high noise immunity and high commutating di/dt are required.

- Blocking Voltage to 800 Volts
- On-State Current Rating of 15 Amperes RMS at 80°C
- Uniform Gate Trigger Currents in Three Modes
- High Immunity to dv/dt — 500 V/µs minimum at 125°C
- Minimizes Snubber Networks for Protection
- Industry Standard TO-220AB Package
- High Commutating di/dt — 9.0 A/ms minimum at 125°C

**TRIACS**
**15 AMPERES RMS**
**400 thru 800**
**VOLTS**




**CASE 221A-06**
**(TO-220AB)**
**Style 4**

**MAXIMUM RATINGS** ($T_J$ = 25°C unless otherwise noted)

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{DRM}$ | Peak Repetitive Off-State Voltage, (1)<br>(–40 to 125°C, Sine Wave, 50 to 60 Hz, Gate Open) MAC16D<br>MAC16M<br>MAC16N | <br>400<br>600<br>800 | Volts |
| $I_{T(RMS)}$ | On-State RMS Current<br>(60 Hz, $T_C$ = 80°C) | 15 | A |
| $I_{TSM}$ | Peak Non-repetitive Surge Current<br>(One Full Cycle, 60 Hz, $T_J$ = 125°C) | 150 | A |
| $I^2t$ | Circuit Fusing Consideration (t = 8.3 ms) | 93 | $A^2$sec |
| $P_{GM}$ | Peak Gate Power (Pulse Width ≤ 1.0 µs, $T_C$ = 80°C) | 20 | Watts |
| $P_{G(AV)}$ | Average Gate Power (t = 8.3 ms, $T_C$ = 80°C) | 0.5 | Watts |
| $T_J$ | Operating Junction Temperature Range | –40 to +125 | °C |
| $T_{stg}$ | Storage Temperature Range | –40 to +150 | °C |

**THERMAL CHARACTERISTICS**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{\theta JC}$<br>$R_{\theta JA}$ | Thermal Resistance — Junction to Case<br>— Junction to Ambient | 2.0<br>62.5 | °C/W |
| $T_L$ | Maximum Lead Temperature for Soldering Purposes 1/8″ from Case for 10 Seconds | 260 | °C |

(1) $V_{DRM}$ for all types can be applied on a continuous basis. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.

**Preferred** devices are Motorola recommended choices for future use and best overall value.

**REV 1**

**ELECTRICAL CHARACTERISTICS** ($T_J$ = 25°C unless otherwise noted)

| Symbol | Characteristic | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| $I_{DRM}$ | Peak Repetitive Blocking Current<br>($V_D$ = Rated $V_{DRM}$, Gate Open) $T_J$ = 25°C<br>$T_J$ = 125°C | —<br>— | —<br>— | 0.01<br>2.0 | mA |
| **ON CHARACTERISTICS** | | | | | |
| $V_{TM}$ | Peak On-State Voltage*<br>($I_{TM}$ = ±21 A Peak) | — | 1.2 | 1.6 | Volts |
| $I_{GT}$ | Continuous Gate Trigger Current ($V_D$ = 12 V, $R_L$ = 100 Ω)<br>MT2(+), G(+)<br>MT2(+), G(–)<br>MT2(–), G(–) | 10<br>10<br>10 | 16<br>18<br>22 | 50<br>50<br>50 | mA |
| $I_H$ | Hold Current<br>($V_D$ = 12 V, Gate Open, Initiating Current = ±150 mA) | — | 20 | 50 | mA |
| $I_L$ | Latch Current ($V_D$ = 24 V, $I_G$ = 50 mA)<br>MT2(+), G(+)<br>MT2(+), G(–)<br>MT2(–), G(–) | —<br>—<br>— | 33<br>36<br>33 | 50<br>80<br>50 | mA |
| $V_{GT}$ | Gate Trigger Voltage ($V_D$ = 12 V, $R_L$ = 100 Ω)<br>MT2(+), G(+)<br>MT2(+), G(–)<br>MT2(–), G(–) | 0.5<br>0.5<br>0.5 | 0.75<br>0.72<br>0.82 | 1.5<br>1.5<br>1.5 | Volts |
| **DYNAMIC CHARACTERISTICS** | | | | | |
| $(di/dt)_c$ | Rate of Change of Commutating Current* See Figure 10.<br>($V_D$ = 400 V, $I_{TM}$ = 6.0 A, Commutating dv/dt = 24 V/µs, $C_L$ = 10 µF<br>Gate Open, $T_J$ = 125°C, f = 250 Hz, No Snubber) $L_L$ = 40 mH | 9.0 | — | — | A/ms |
| dv/dt | Critical Rate of Rise of Off-State Voltage<br>($V_D$ = Rated $V_{DRM}$, Exponential Waveform, Gate Open, $T_J$ = 125°C) | 500 | — | — | V/µs |

*Indicates Pulse Test: Pulse Width ≤ 2.0 ms, Duty Cycle ≤ 2%.

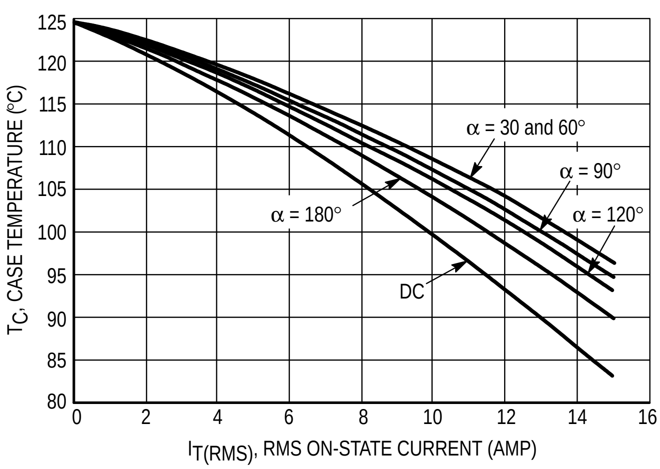



**Figure 1. RMS Current Derating**

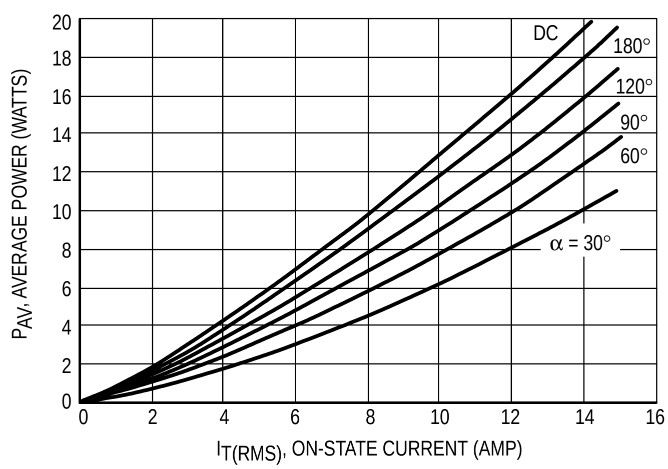



**Figure 2. On-State Power Dissipation**

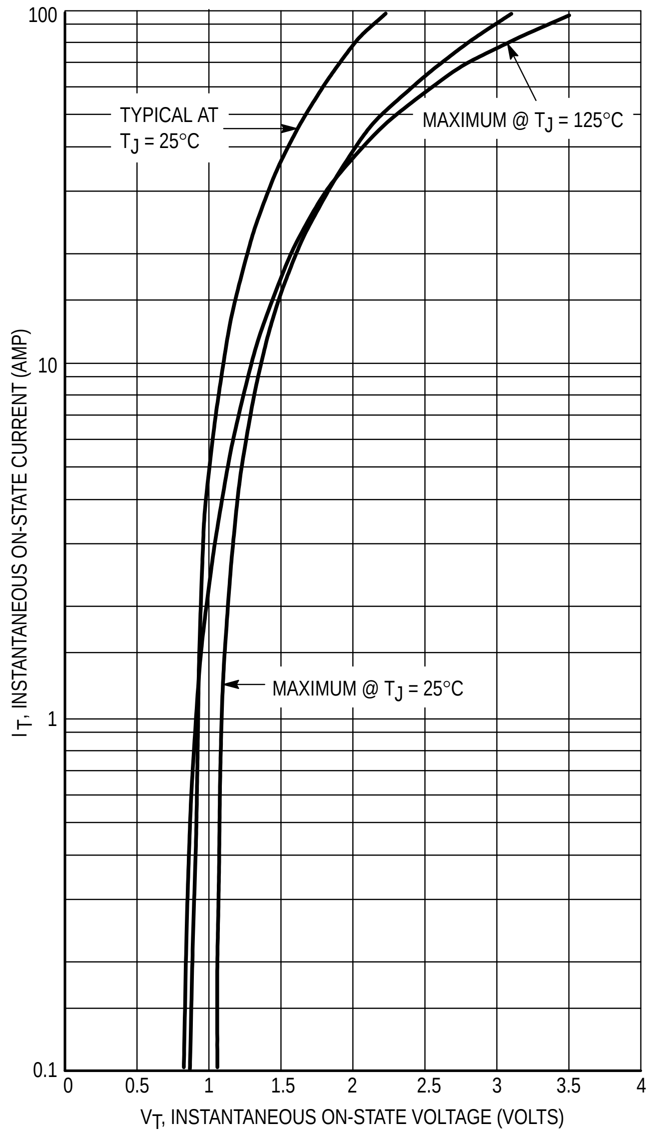



**Figure 3. On-State Characteristics**

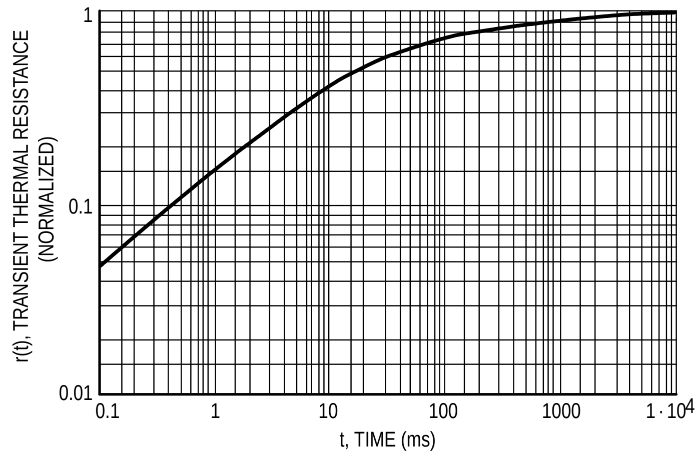



**Figure 4. Thermal Response**

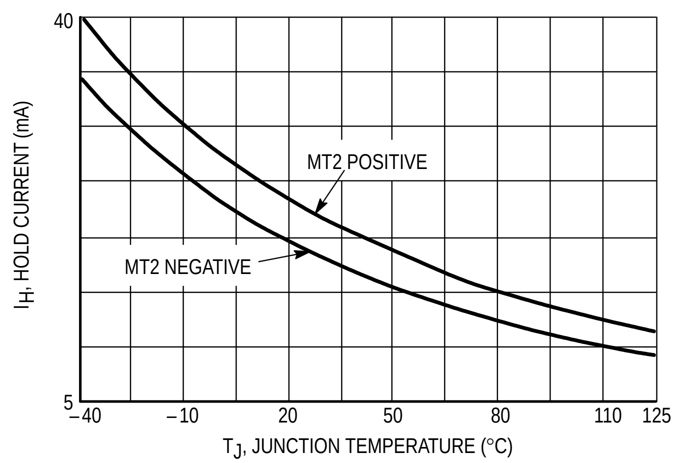



**Figure 5. Hold Current Variation**

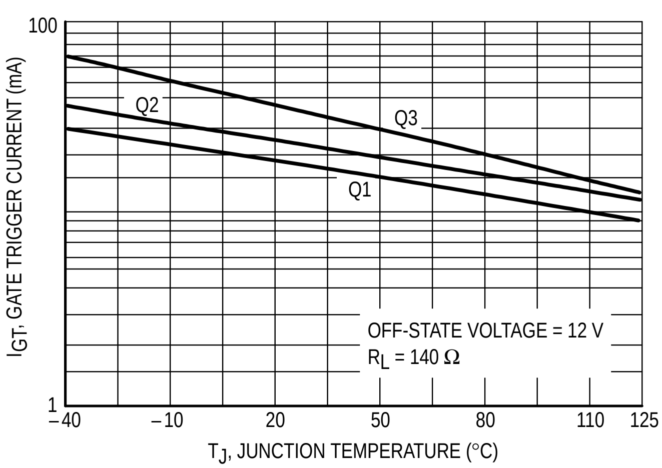



**Figure 6. Gate Trigger Current Variation**

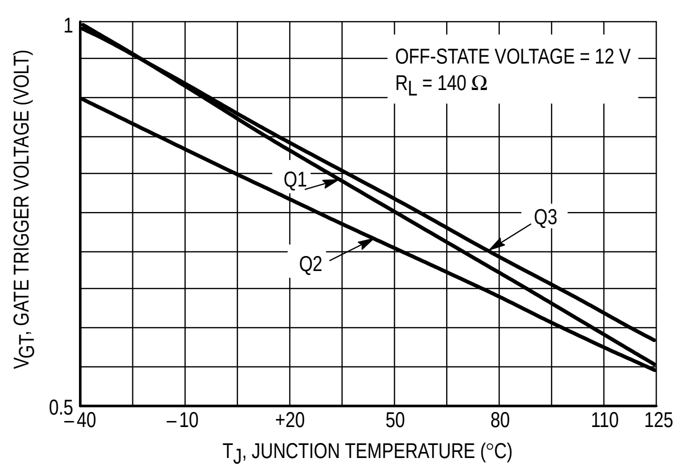



**Figure 7. Gate Trigger Voltage Variation**

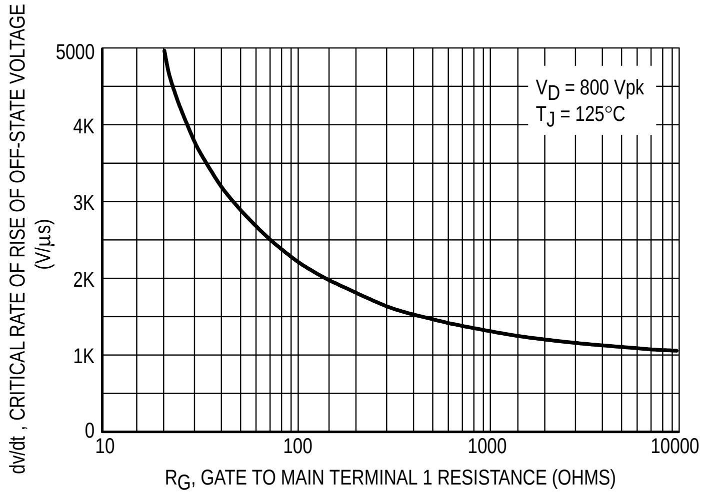



**Figure 8. Critical Rate of Rise of Off-State Voltage (Exponential)**

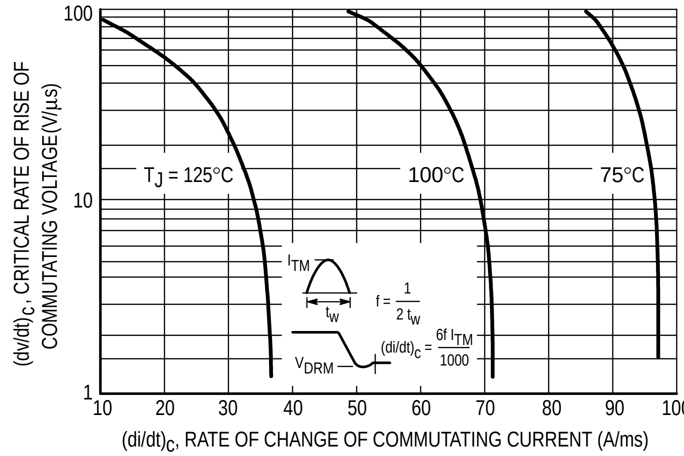
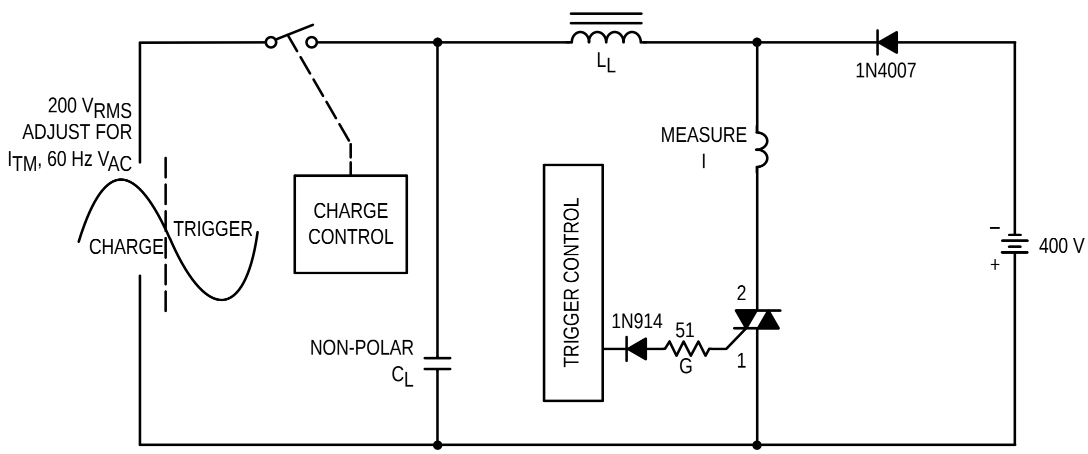



**Figure 9. Critical Rate of Rise of Commutating Voltage**




Note: Component values are for verification of rated $(dv/dt)_c$. See AN1048 for additional information.

**Figure 10. Simplified Test Circuit to Measure the Critical Rate of Rise of Commutating Voltage**