# Sensitive Gate TRIACS

## Silicon Bidirectional Thyristors

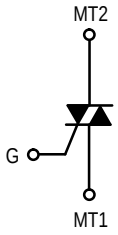
**MAC4DHM**
**MAC4DLM**

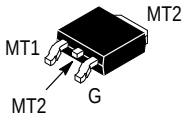
**Motorola Preferred Devices**

Designed for high volume, low cost, industrial and consumer applications such as motor control; process control; temperature, light and speed control.

- Small Size Surface Mount DPAK Package
- Passivated Die for Reliability and Uniformity
- Four–Quadrant Triggering
- Blocking Voltage to 600 V
- On–State Current Rating of 4.0 Amperes RMS at 93°C
- Low Level Triggering and Holding Characteristics

**TRIACS**
**4.0 AMPERES RMS**
**600 VOLTS**




**CASE 369A–13**
**STYLE 6**

### ORDERING INFORMATION

- To Obtain “DPAK” in Surface Mount Leadform (Case 369A) Shipped in 16 mm Tape and Reel — Add “T4” Suffix to Device Number, i.e. MAC4DHMT4
- To Obtain “DPAK” in Straight Lead Version (Case 369) Shipped in Sleeves — Add “–1” Suffix to Device Number, i.e. MAC4DHM–1

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

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Peak Repetitive Off–State Voltage (1) ($T_J$ = –40 to 110°C, Sine Wave, 50 to 60 Hz, Gate Open) MAC4DHM / MAC4DLM | $V_{DRM}$ | 600 / 600 | Volts |
| On–State RMS Current (Full Cycle Sine Wave, 60 Hz, $T_C$ = 93°C) | $I_{T(RMS)}$ | 4.0 | Amps |
| Peak Non–Repetitive Surge Current (One Full Cycle, 60 Hz, $T_J$ = 110°C) | $I_{TSM}$ | 40 | |
| Circuit Fusing Consideration (t = 8.3 msec) | $I^2t$ | 6.6 | $A^2$sec |
| Peak Gate Power (Pulse Width ≤ 10 μsec, $T_C$ = 93°C) | $P_{GM}$ | 0.5 | Watts |
| Average Gate Power (t = 8.3 msec, $T_C$ = 93°C) | $P_{G(AV)}$ | 0.1 | |
| Peak Gate Current (Pulse Width ≤ 10 μsec, $T_C$ = 93°C) | $I_{GM}$ | 0.2 | Amps |
| Peak Gate Voltage (Pulse Width ≤ 10 μsec, $T_C$ = 93°C) | $V_{GM}$ | 5.0 | Volts |
| Operating Junction Temperature Range | $T_J$ | –40 to 110 | °C |
| Storage Temperature Range | $T_{stg}$ | –40 to 150 | |

**THERMAL CHARACTERISTICS**

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance — Junction to Case<br>— Junction to Ambient<br>— Junction to Ambient (2) | $R_{\theta JC}$<br>$R_{\theta JA}$<br>$R_{\theta JA}$ | 3.5<br>88<br>80 | °C/W |
| Maximum Lead Temperature for Soldering Purposes (3) | $T_L$ | 260 | °C |

(1) $V_{DRM}$ for all types can be applied on a continuous basis. Ratings apply for zero or negative gate voltage; positive gate voltage shall not be applied concurrent with negative potential on the anode. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the device are exceeded.

(2) Surface mounted on minimum recommended pad size.

(3) 1/8″ from case for 10 seconds.

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

**REV 1**

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

| Characteristics | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Peak Repetitive Blocking Current | $I_{DRM}$ | | | | mA |
| ($V_D$ = Rated $V_{DRM}$, Gate Open) $T_J$ = 25°C | | — | — | 0.01 | |
| $T_J$ = 110°C | | — | — | 2.0 | |
| Peak On–State Voltage (1) | $V_{TM}$ | | | | Volts |
| ($I_{TM}$ = ±6.0 A) | | — | 1.3 | 1.6 | |
| Gate Trigger Current (Continuous dc) ($V_D$ = 12 V, $R_L$ = 100 Ω) | $I_{GT}$ | | | | mA |
| MT2(+), G(+) MAC4DLM | | — | 1.8 | 3.0 | |
| MT2(+), G(–) | | — | 2.1 | 3.0 | |
| MT2(–), G(–) | | — | 2.4 | 3.0 | |
| MT2(–), G(+) | | — | 4.2 | 5.0 | |
| MT2(+), G(+) MAC4DHM | | — | 1.8 | 5.0 | |
| MT2(+), G(–) | | — | 2.1 | 5.0 | |
| MT2(–), G(–) | | — | 2.4 | 5.0 | |
| MT2(–), G(+) | | — | 4.2 | 10 | |
| Gate Trigger Voltage (Continuous dc) ($V_D$ = 12 V, $R_L$ = 100 Ω) | $V_{GT}$ | | | | Volts |
| MT2(+), G(+) | | 0.5 | 0.62 | 1.3 | |
| MT2(+), G(–) | | 0.5 | 0.57 | 1.3 | |
| MT2(–), G(–) | | 0.5 | 0.65 | 1.3 | |
| MT2(–), G(+) | | 0.5 | 0.74 | 1.3 | |
| ($V_D$ = 12 V, $R_L$ = 10 K Ω, $T_J$ = 110°C) | | | | | |
| MT2(+), G(+); MT2(+), G(–); MT2(–), G(–); MT2(–), G(+) | | 0.1 | 0.4 | — | |
| Holding Current | $I_H$ | | | | mA |
| ($V_D$ = 12 V, Gate Open, $I_T$ = ±200 mA) | | — | 1.5 | 15 | |
| Latching Current | $I_L$ | | | | mA |
| MT2(+), G(+) ($V_D$ = 12 V, $I_G$ = 5.0 mA) | | — | 1.75 | 10 | |
| MT2(+), G(–) ($V_D$ = 12 V, $I_G$ = 5.0 mA) | | — | 5.2 | 10 | |
| MT2(–), G(–) ($V_D$ = 12 V, $I_G$ = 5.0 mA) | | — | 2.1 | 10 | |
| MT2(–), G(+) ($V_D$ = 12 V, $I_G$ = 10 mA) | | — | 2.2 | 10 | |

**DYNAMIC CHARACTERISTICS**

| Characteristics | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Rate of Change of Commutating Current (1)<br>($V_D$ = 200 V, $I_{TM}$ = 1.8 A, Commutating dv/dt = 1.0 V/μsec, $T_J$ = 110°C, f = 250 Hz, CL = 5.0 μfd, LL = 80 mH, RS = 56 Ω, CS = 0.03 μfd)<br>See Figure 10 | di/dt(c) | — | 3.0 | — | A/ms |
| Critical Rate of Rise of Off–State Voltage<br>($V_D$ = 0.67 X Rated $V_{DRM}$, Exponential Waveform, Gate Open, $T_J$ = 110°C) | dv/dt | — | 10 | — | V/μs |

(1) Pulse test: Pulse Width ≤ 2.0 msec, Duty Cycle ≤ 2%.

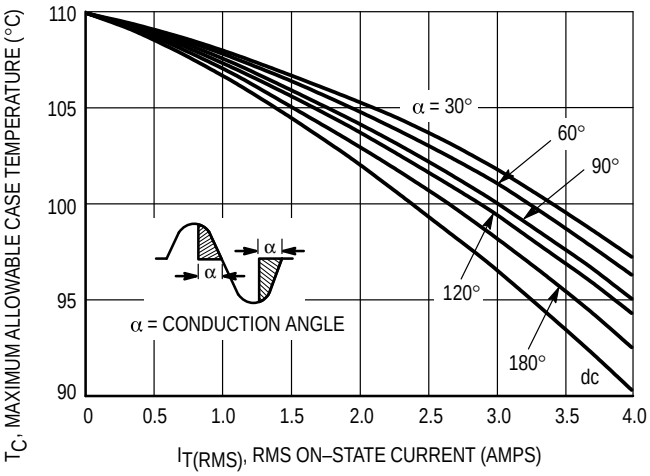



**Figure 1. RMS Current Derating**

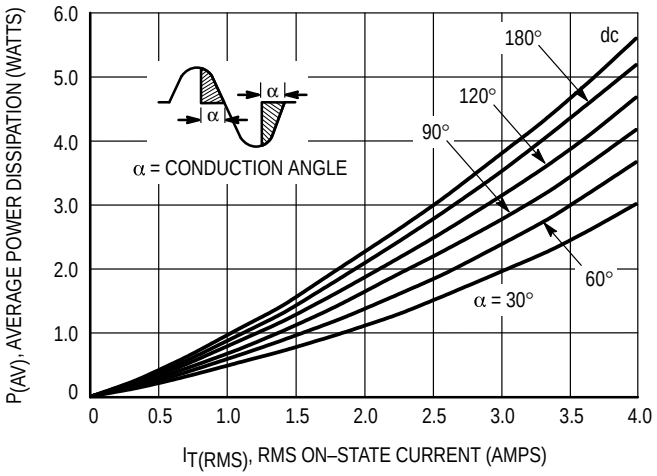



**Figure 2. On–State Power Dissipation**

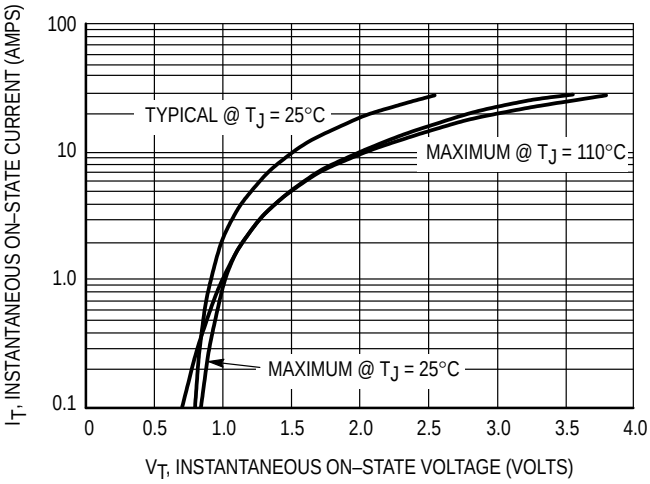



**Figure 3. On–State Characteristics**

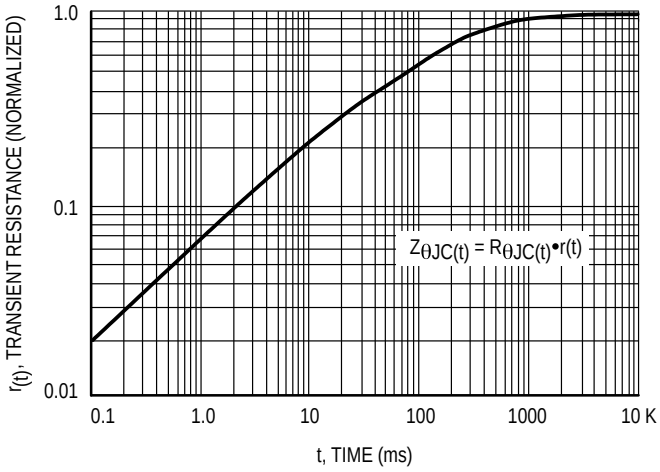



**Figure 4. Transient Thermal Response**

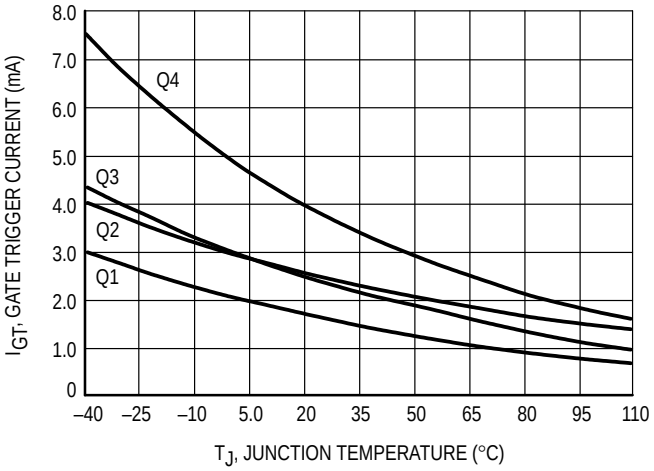



**Figure 5. Typical Gate Trigger Current versus Junction Temperature**

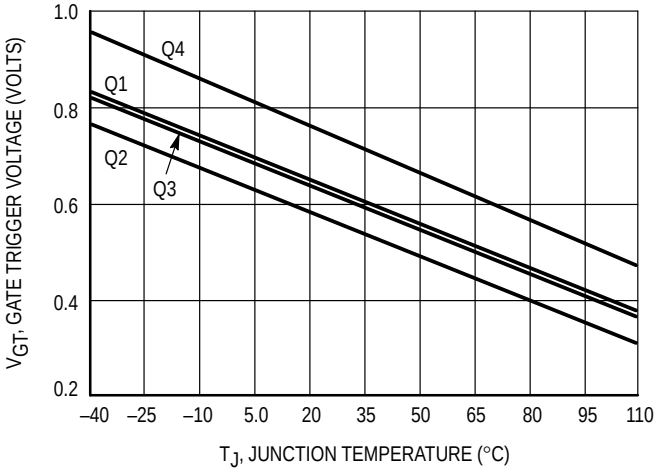



**Figure 6. Typical Gate Trigger Voltage versus Junction Temperature**

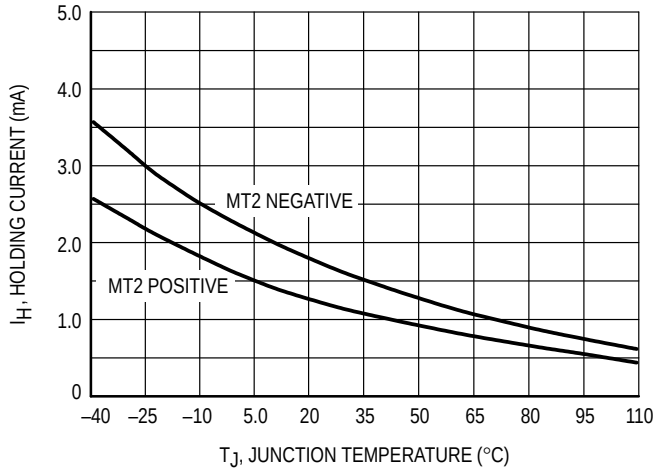



**Figure 7. Typical Holding Current versus Junction Temperature**

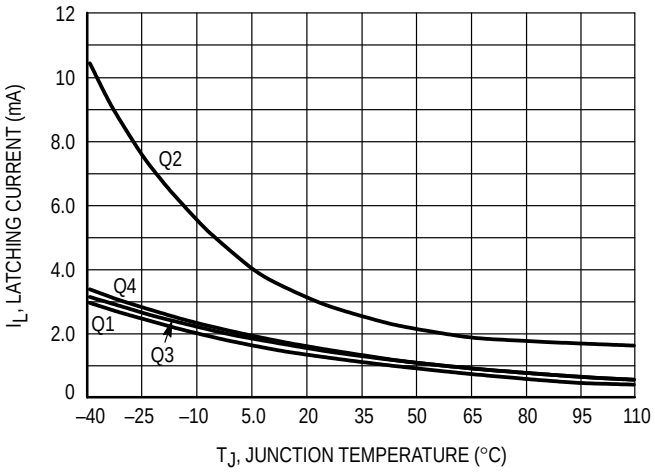



**Figure 8. Typical Latching Current versus Junction Temperature**

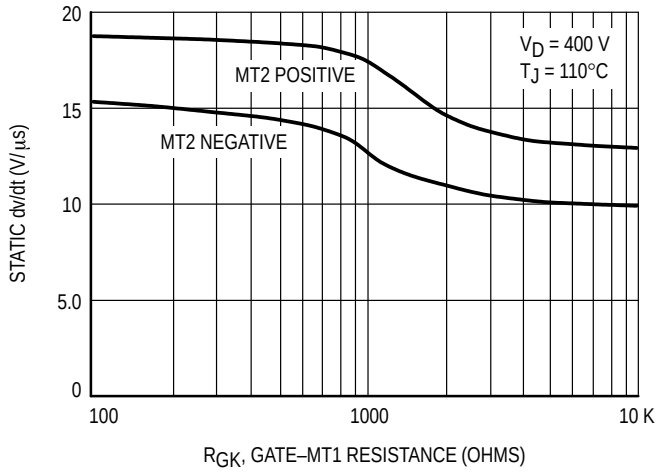



**Figure 9. Exponential Static dv/dt versus Gate–MT1 Resistance, MT2(+)**

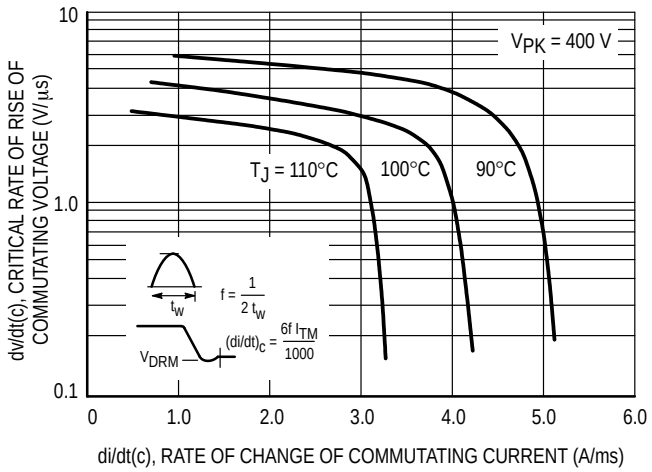
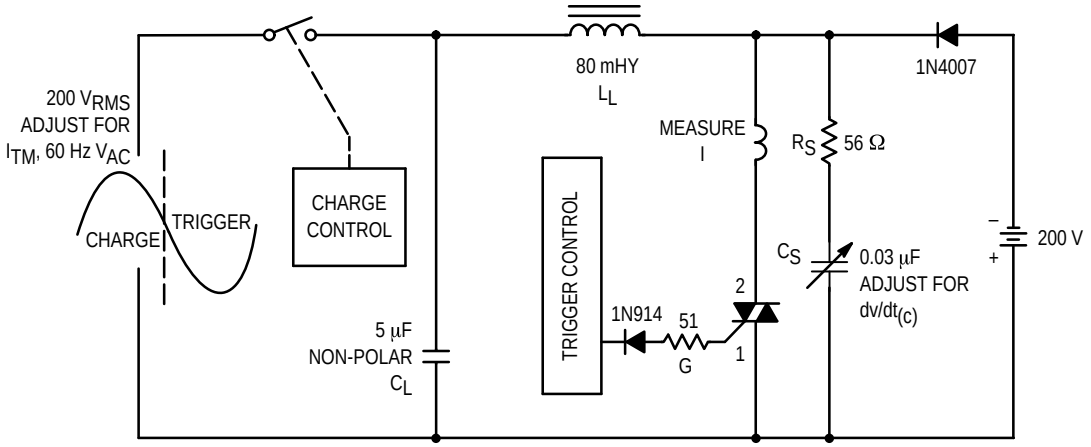


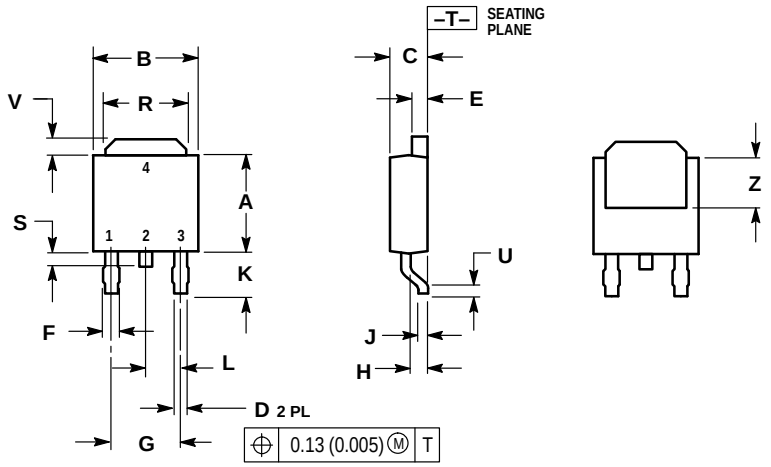

**Figure 10. Critical Rate of Rise of Commutating Voltage**




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

**Figure 11. Simplified Test Circuit to Measure the Critical Rate of Rise of Commutating Voltage**

## PACKAGE DIMENSIONS




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 0.235 | 0.250 | 5.97 | 6.35 |
| B | 0.250 | 0.265 | 6.35 | 6.73 |
| C | 0.086 | 0.094 | 2.19 | 2.38 |
| D | 0.027 | 0.035 | 0.69 | 0.88 |
| E | 0.033 | 0.040 | 0.84 | 1.01 |
| F | 0.037 | 0.047 | 0.94 | 1.19 |
| G | 0.180 BSC | | 4.58 BSC | |
| H | 0.034 | 0.040 | 0.87 | 1.01 |
| J | 0.018 | 0.023 | 0.46 | 0.58 |
| K | 0.102 | 0.114 | 2.60 | 2.89 |
| L | 0.090 BSC | | 2.29 BSC | |
| R | 0.175 | 0.215 | 4.45 | 5.46 |
| S | 0.020 | 0.050 | 0.51 | 1.27 |
| U | 0.020 | — | 0.51 | — |
| V | 0.030 | 0.050 | 0.77 | 1.27 |
| Z | 0.138 | — | 3.51 | — |

STYLE 6:
PIN 1. MT1
2. MT2
3. GATE
4. MT2

**CASE 369A–13**
**ISSUE Z**

# NOTES

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