# MAC4DCM, MAC4DCN

# Triacs

## Silicon Bidirectional Thyristors

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

### Features

- Small Size Surface Mount DPAK Package
- Passivated Die for Reliability and Uniformity
- Blocking Voltage to 800 V
- On−State Current Rating of 4.0 A RMS at 108°C
- High Immunity to dv/dt − 500 V/µs at 125°C
- High Immunity to di/dt − 6.0 A/ms at 125°C
- Epoxy Meets UL 94, V−0 @ 0.125 in
- ESD Ratings: Human Body Model, 3B > 8000 V
  Machine Model, C > 400 V

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

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Peak Repetitive Off−State Voltage (Note 1) ($T_J$ = −40 to 125°C, Sine Wave, 50 to 60 Hz, Gate Open)<br>MAC4DCM<br>MAC4DCN | $V_{DRM}$, $V_{RRM}$ | <br><br>600<br>800 | V |
| On−State RMS Current (Full Cycle Sine Wave, 60 Hz, $T_C$ = 108°C) | $I_{T(RMS)}$ | 4.0 | A |
| Peak Non-Repetitive Surge Current (One Full Cycle Sine Wave, 60 Hz, $T_J$ = 125°C) | $I_{TSM}$ | 40 | A |
| Circuit Fusing Consideration (t = 8.3 msec) | $I^2t$ | 6.6 | $A^2$sec |
| Peak Gate Power (Pulse Width ≤ 10 µsec, $T_C$ = 108°C) | $P_{GM}$ | 0.5 | W |
| Average Gate Power (t = 8.3 msec, $T_C$ = 108°C) | $P_{G(AV)}$ | 0.1 | W |
| Peak Gate Current (Pulse Width ≤ 10 µsec, $T_C$ = 108°C) | $I_{GM}$ | 0.5 | A |
| Peak Gate Voltage (Pulse Width ≤ 10 µsec, $T_C$ = 108°C) | $V_{GM}$ | 5.0 | V |
| Operating Junction Temperature Range | $T_J$ | −40 to 125 | °C |
| Storage Temperature Range | $T_{stg}$ | −40 to 150 | °C |

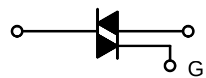
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. $V_{DRM}$ and $V_{RRM}$ 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 device are exceeded.

KERSEMI

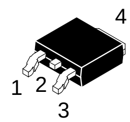
www.kersemi.com

**TRIACS**
**4.0 AMPERES RMS**
**600 − 800 VOLTS**

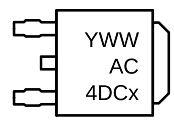
MT2  MT1

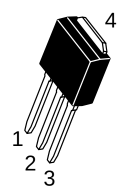
G

**MARKING DIAGRAMS**

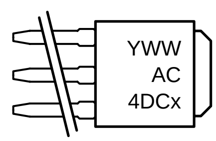



**DPAK**
**CASE 369C**
**STYLE 6**




**DPAK−3**
**CASE 369D**
**STYLE 6**




Y = Year
WW = Work Week
x = M or N

| PIN ASSIGNMENT | |
|---|---|
| 1 | Main Terminal 1 |
| 2 | Main Terminal 2 |
| 3 | Gate |
| 4 | Main Terminal 2 |

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

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

## THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance − Junction−to−Case<br>− Junction−to−Ambient<br>− Junction−to−Ambient (Note 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 (Note 3) | $T_L$ | 260 | °C |

## ELECTRICAL CHARACTERISTICS ($T_J$ = 25°C unless otherwise noted; Electricals apply in both directions)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Peak Repetitive Blocking Current<br>($V_D$ = Rated $V_{DRM}$, $V_{RRM}$; Gate Open) $T_J$ = 25°C<br>$T_J$ = 125°C | $I_{DRM}$,<br>$I_{RRM}$ | <br>−<br>− | <br>−<br>− | <br>0.01<br>2.0 | mA |
| **ON CHARACTERISTICS** | | | | | |
| Peak On−State Voltage (Note 4)<br>($I_{TM}$ = ±6.0 A) | $V_{TM}$ | − | 1.3 | 1.6 | V |
| Gate Trigger Current (Continuous dc) ($V_D$ = 12 V, $R_L$ = 100 Ω)<br>MT2(+), G(+)<br>MT2(+), G(−)<br>MT2(−), G(−) | $I_{GT}$ | <br>8.0<br>8.0<br>8.0 | <br>12<br>18<br>22 | <br>35<br>35<br>35 | mA |
| Gate Trigger Voltage (Continuous dc) ($V_D$ = 12 V, $R_L$ = 100 Ω)<br>MT2(+), G(+)<br>MT2(+), G(−)<br>MT2(−), G(−) | $V_{GT}$ | <br>0.5<br>0.5<br>0.5 | <br>0.8<br>0.8<br>0.8 | <br>1.3<br>1.3<br>1.3 | V |
| Gate Non−Trigger Voltage (Continuous dc) ($V_D$ = 12 V, $R_L$ = 100 Ω)<br>MT2(+), G(+); MT2(+), G(−); MT2(−), G(−) $T_J$ = 125°C | $V_{GD}$ | 0.2 | 0.4 | − | V |
| Holding Current<br>($V_D$ = 12 V, Gate Open, Initiating Current = ±200 mA) | $I_H$ | 6.0 | 22 | 35 | mA |
| Latching Current ($V_D$ = 12 V, $I_G$ = 35 mA)<br>MT2(+), G(+)<br>MT2(+), G(−)<br>MT2(−), G(−) | $I_L$ | <br>−<br>−<br>− | <br>30<br>50<br>20 | <br>60<br>80<br>60 | mA |

### DYNAMIC CHARACTERISTICS

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Rate of Change of Commutating Current<br>($V_D$ = 400 V, $I_{TM}$ = 4.0 A, Commutating dv/dt = 18 V/μsec,<br>Gate Open, $T_J$ = 125°C, f = 250 Hz, CL = 5.0 μF, LL = 20 mH, No Snubber)<br>(See Figure 16) | di/dt(c) | 6.0 | 8.4 | − | A/ms |
| Critical Rate of Rise of Off−State Voltage<br>($V_D$ = 0.67 X Rated $V_{DRM}$, Exponential Waveform, Gate Open, $T_J$ = 125°C) | dv/dt | 500 | 1700 | − | V/μs |

2. These ratings are applicable when surface mounted on the minimum pad sizes recommended.
3. 1/8″ from case for 10 seconds.
4. Pulse Test: Pulse Width ≤ 2.0 msec, Duty Cycle ≤ 2%.

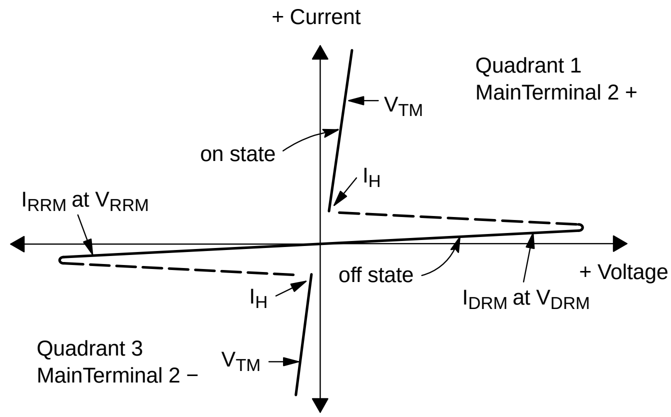
## ORDERING INFORMATION

| Device | Package Type | Package | Shipping† |
|---|---|---|---|
| MAC4DCM−001 | DPAK−3 | 369D | 75 Units / Rail |
| MAC4DCMT4 | DPAK | 369C | 16 mm Tape & Reel (2.5 k / Reel) |
| MAC4DCN−001 | DPAK−3 | 369D | 75 Units / Rail |
| MAC4DCNT4 | DPAK | 369C | 16 mm Tape & Reel (2.5 k / Reel) |

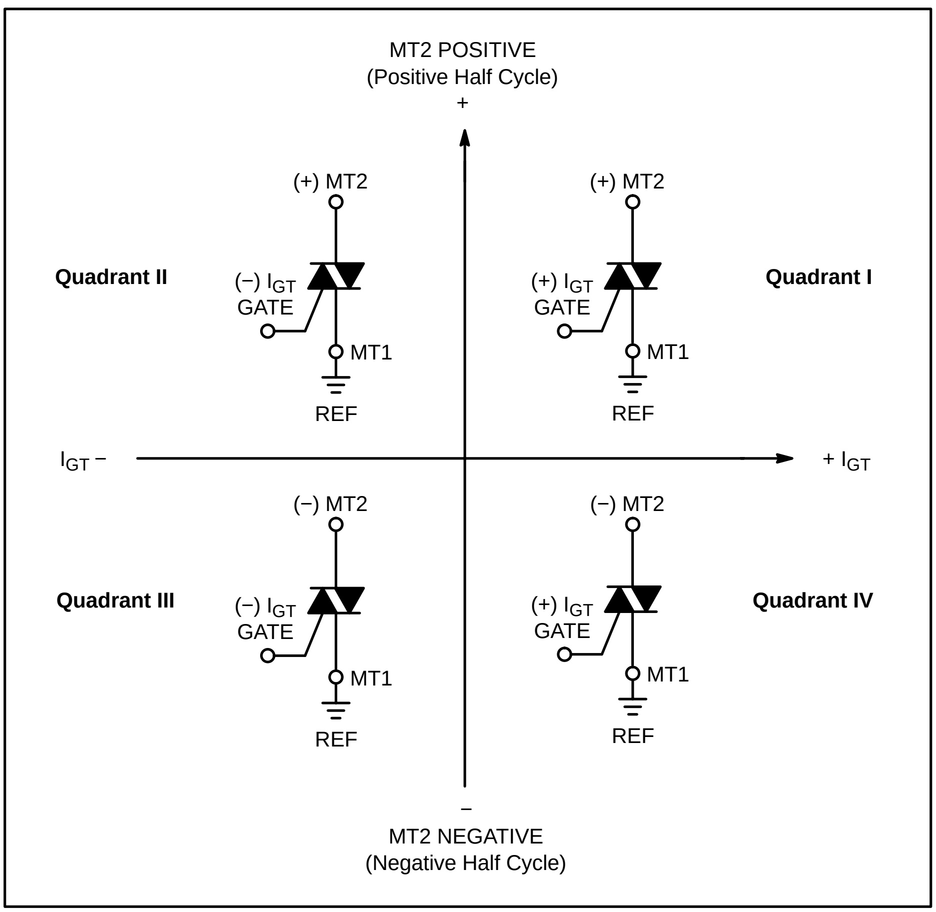
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

## Voltage Current Characteristic of Triacs (Bidirectional Device)

| Symbol | Parameter |
|---|---|
| $V_{DRM}$ | Peak Repetitive Forward Off−State Voltage |
| $I_{DRM}$ | Peak Forward Blocking Current |
| $V_{RRM}$ | Peak Repetitive Reverse Off−State Voltage |
| $I_{RRM}$ | Peak Reverse Blocking Current |
| $V_{TM}$ | Maximum On−State Voltage |
| $I_H$ | Holding Current |




## Quadrant Definitions for a Triac




All polarities are referenced to MT1.
With in−phase signals (using standard AC lines) quadrants I and III are used.

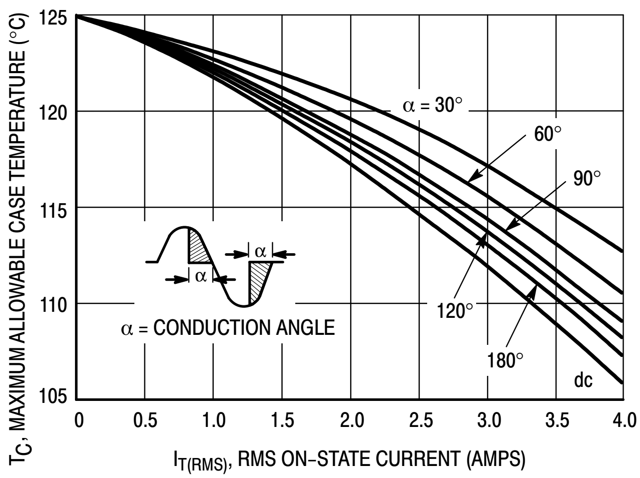



**Figure 1. RMS Current Derating**

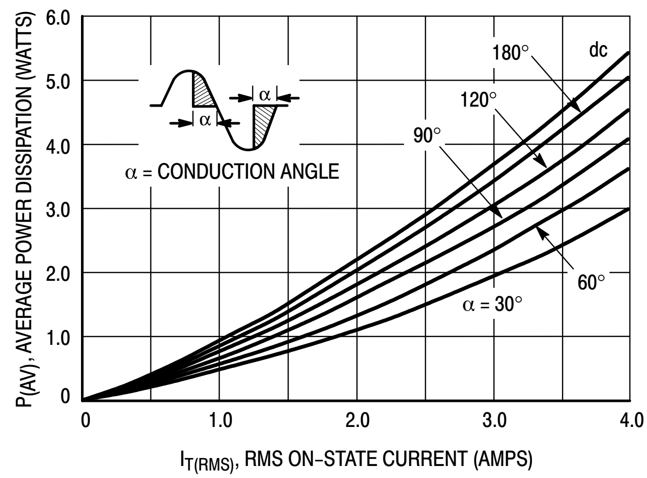



**Figure 2. On−State Power Dissipation**

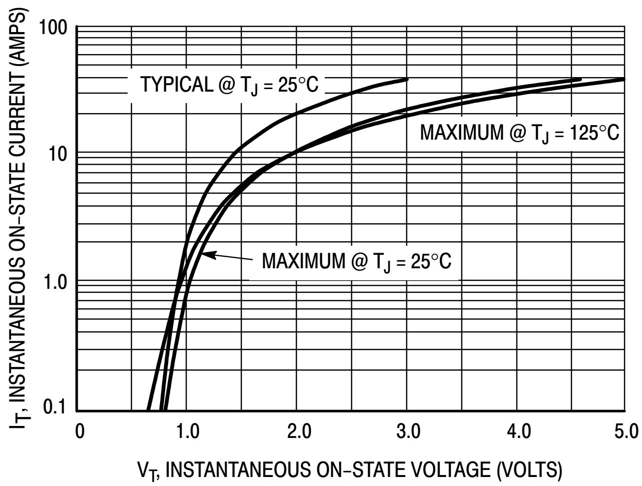



**Figure 3. On−State Characteristics**

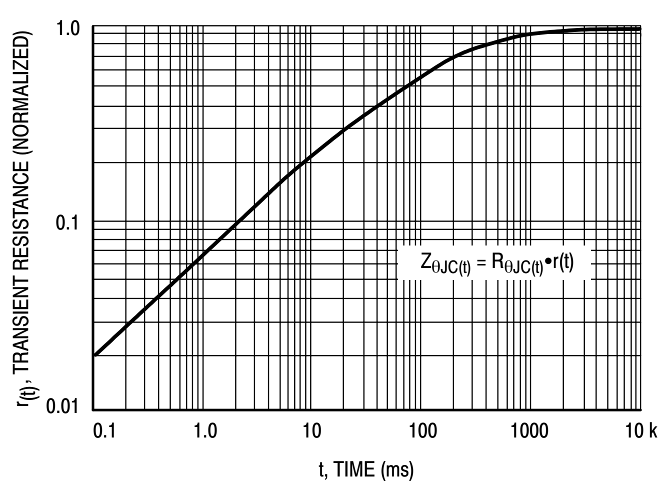



**Figure 4. Transient Thermal Response**

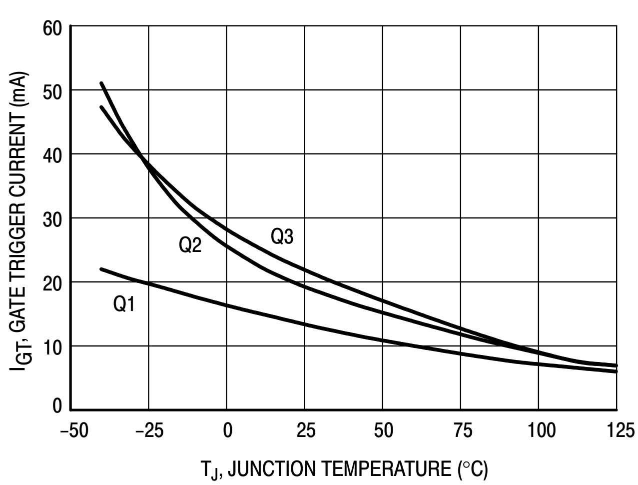



**Figure 5. Typical Gate Trigger Current versus Junction Temperature**

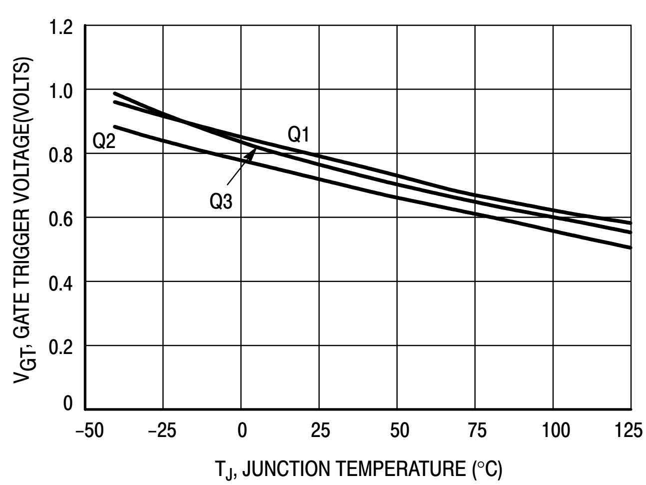



**Figure 6. Typical Gate Trigger Voltage versus Junction Temperature**

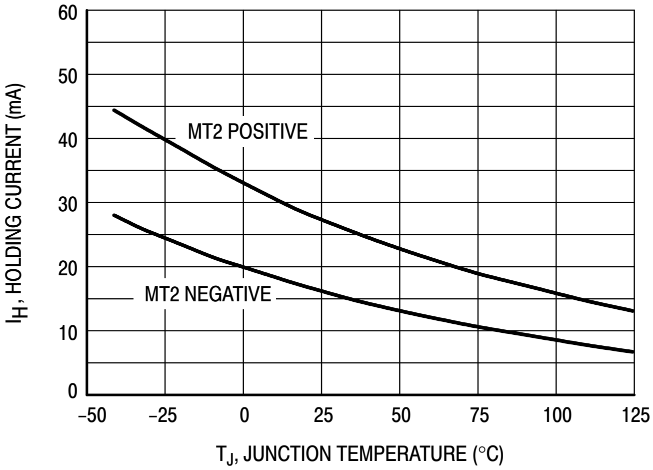



**Figure 7. Typical Holding Current versus Junction Temperature**

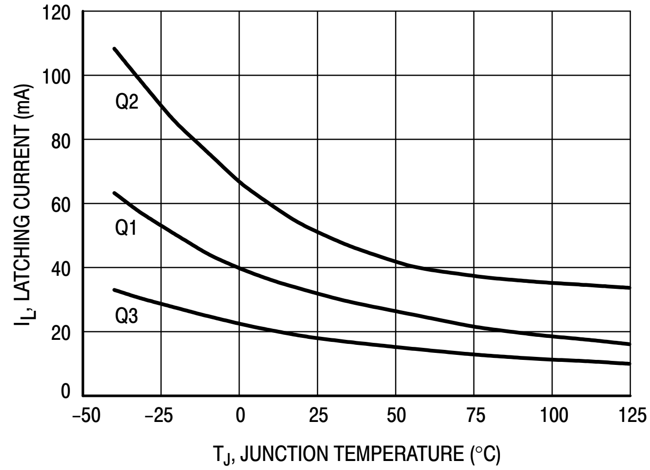



**Figure 8. Typical Latching Current versus Junction Temperature**

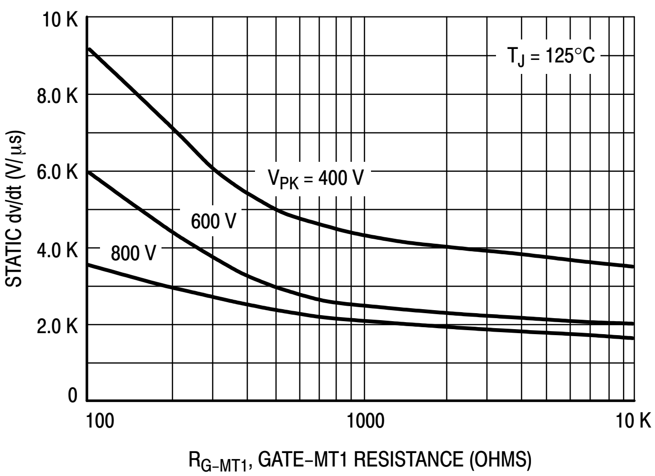



**Figure 9. Exponential Static dv/dt versus Gate−MT1 Resistance, MT2(+)**

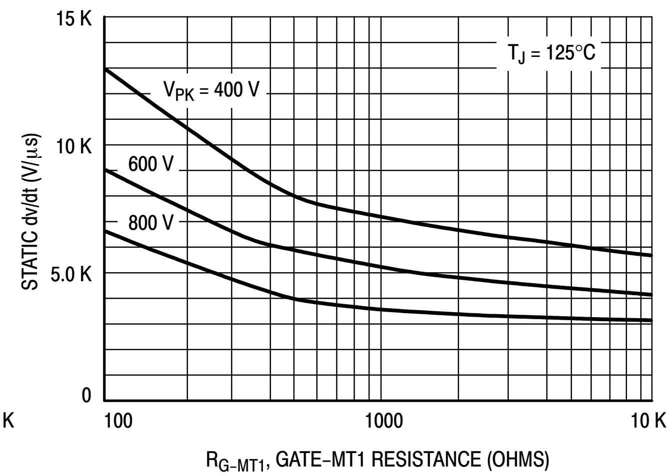



**Figure 10. Exponential Static dv/dt versus Gate−MT1 Resistance, MT2(−)**

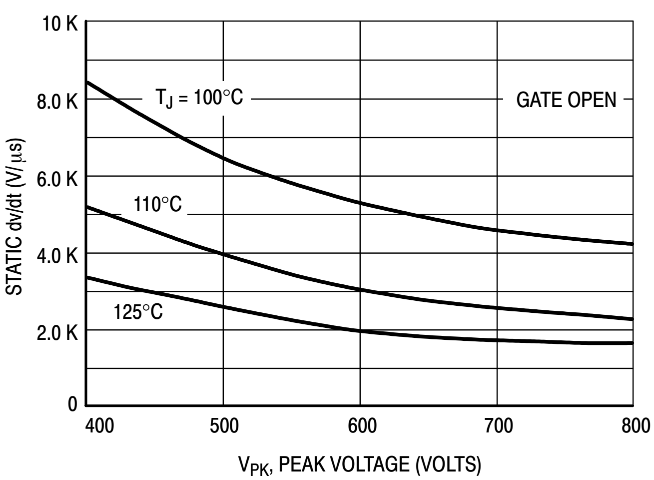



**Figure 11. Exponential Static dv/dt versus Peak Voltage, MT2(+)**

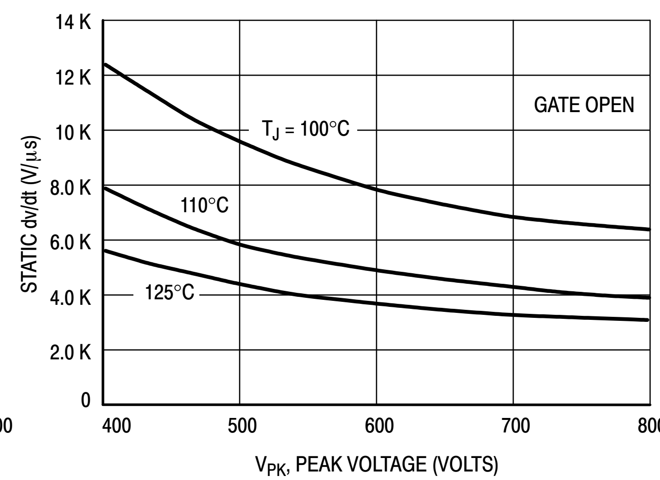



**Figure 12. Exponential Static dv/dt versus Peak Voltage, MT2(−)**

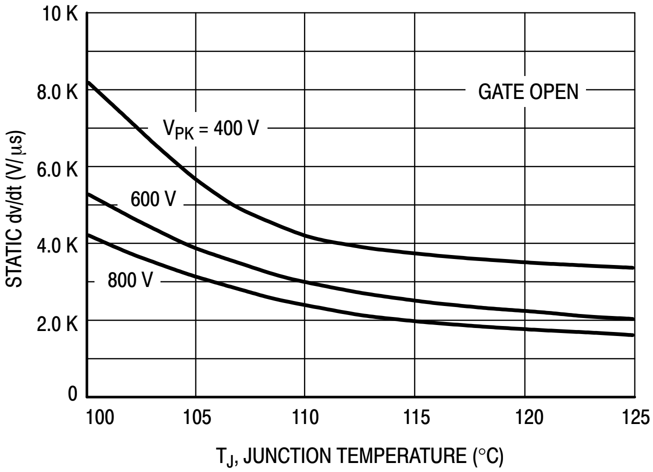



**Figure 13. Typical Exponential Static dv/dt versus Junction Temperature, MT2(+)**

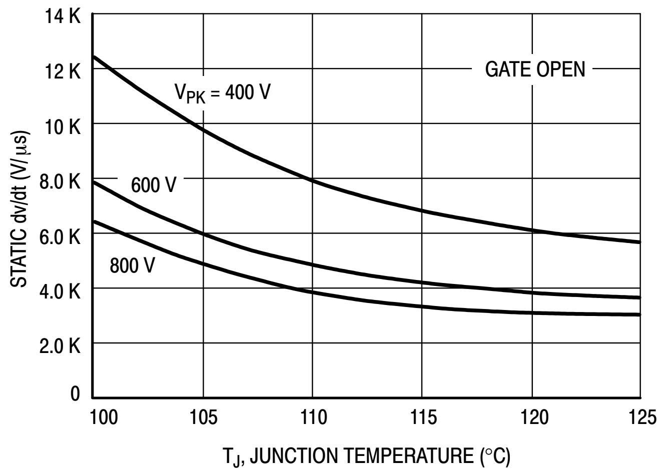



**Figure 14. Typical Exponential Static dv/dt versus Junction Temperature, MT2(−)**

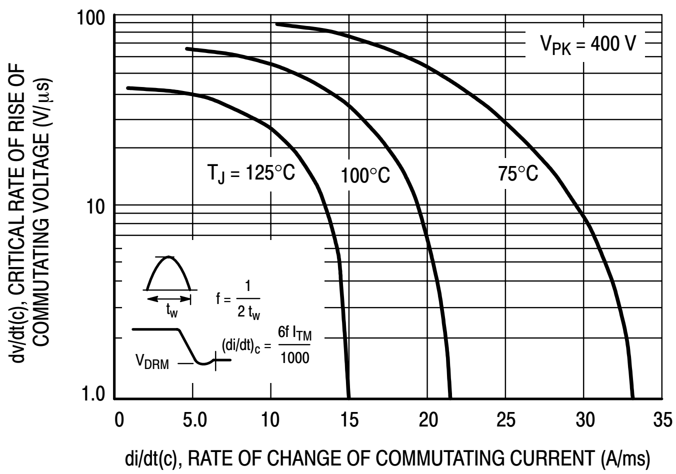
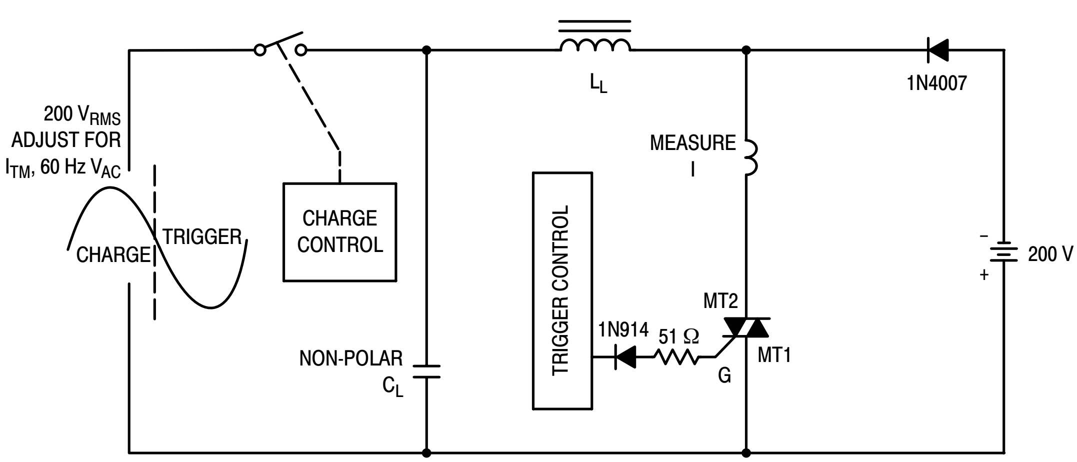



**Figure 15. Critical Rate of Rise of Commutating Voltage**

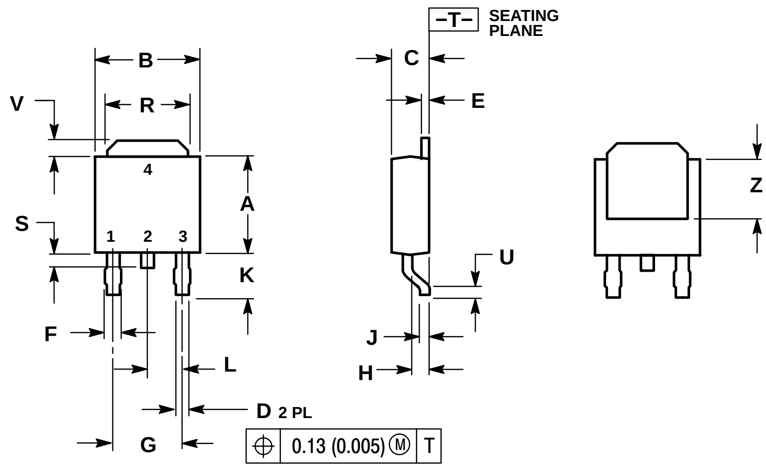



Note: Component values are for verification of rated $(di/dt)_c$. See AN1048 for additional information.

**Figure 16. Simplified Test Circuit to Measure the Critical Rate of Rise of Commutating Current $(di/dt)_c$**

## PACKAGE DIMENSIONS

**DPAK**
CASE 369C
ISSUE O

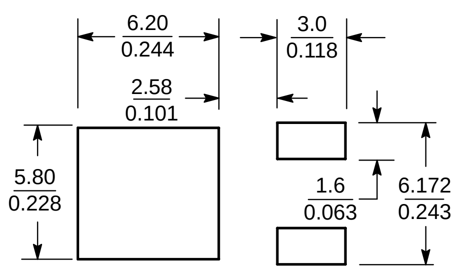



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES MIN | INCHES MAX | MILLIMETERS MIN | MILLIMETERS MAX |
|---|---|---|---|---|
| A | 0.235 | 0.245 | 5.97 | 6.22 |
| 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 | 0.018 | 0.023 | 0.46 | 0.58 |
| F | 0.037 | 0.045 | 0.94 | 1.14 |
| 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 | 0.180 | 0.215 | 4.57 | 5.45 |
| S | 0.025 | 0.040 | 0.63 | 1.01 |
| U | 0.020 | --- | 0.51 | --- |
| V | 0.035 | 0.050 | 0.89 | 1.27 |
| Z | 0.155 | --- | 3.93 | --- |

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

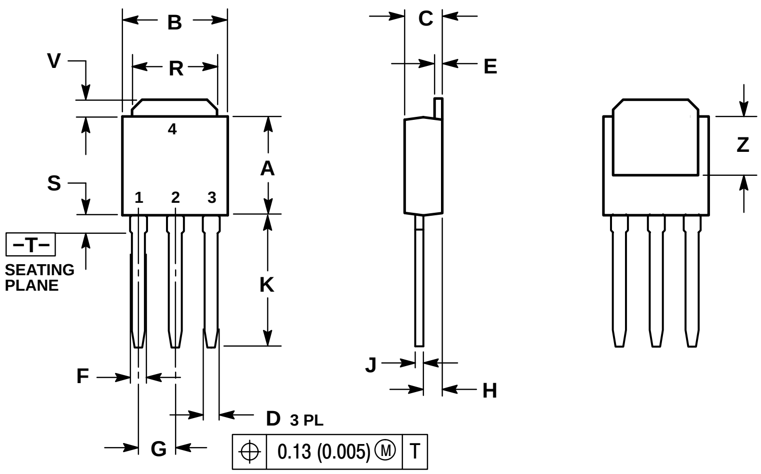
## SOLDERING FOOTPRINT




SCALE 3:1 (mm / inches)

## PACKAGE DIMENSIONS

**DPAK−3**
CASE 369D−01
ISSUE B




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

| DIM | INCHES MIN | INCHES MAX | MILLIMETERS MIN | MILLIMETERS MAX |
|---|---|---|---|---|
| A | 0.235 | 0.245 | 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 | 0.018 | 0.023 | 0.46 | 0.58 |
| F | 0.037 | 0.045 | 0.94 | 1.14 |
| G | 0.090 BSC | | 2.29 BSC | |
| H | 0.034 | 0.040 | 0.87 | 1.01 |
| J | 0.018 | 0.023 | 0.46 | 0.58 |
| K | 0.350 | 0.380 | 8.89 | 9.65 |
| R | 0.180 | 0.215 | 4.45 | 5.45 |
| S | 0.025 | 0.040 | 0.63 | 1.01 |
| V | 0.035 | 0.050 | 0.89 | 1.27 |
| Z | 0.155 | −−− | 3.93 | −−− |

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