

MAC4DHM

Preferred Device

Sensitive Gate 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.

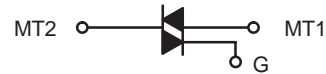
- Small Size Surface Mount DPAK Package
- Passivated Die for Reliability and Uniformity
- Four-Quadrant Triggering
- Blocking Voltage to 600 V
- On-State Current Rating of 4.0 Amperes RMS at 93°C
- Low Level Triggering and Holding Characteristics
- Device Marking: Device Type with “M” truncated, e.g., MAC4DHM: AC4DHM, Date Code



ON Semiconductor

<http://onsemi.com>

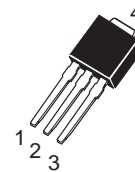
TRIACS
4.0 AMPERES RMS
600 VOLTS



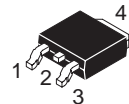
MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

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

(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.



D-PAK
CASE 369
STYLE 6



D-PAK
CASE 369A
STYLE 6

PIN ASSIGNMENT

| Pin | Assignment |
|-----|-----------------|
| 1 | Main Terminal 1 |
| 2 | Main Terminal 2 |
| 3 | Gate |
| 4 | Main Terminal 2 |

ORDERING INFORMATION

| Device | Package | Shipping |
|-----------|-----------|--------------------------------|
| MAC4DHMT4 | DPAK 369A | 16mm Tape and Reel (2.5K/Reel) |
| MAC4DHM-1 | DPAK 369 | 75 Units/Rail |

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

MAC4DHM

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|--|-----------------|-----|---------------|
| Thermal Resistance — Junction to Case | $R_{\theta JC}$ | 3.5 | $^{\circ}C/W$ |
| — Junction to Ambient | $R_{\theta JA}$ | 88 | |
| — Junction to Ambient ⁽¹⁾ | $R_{\theta JA}$ | 80 | |
| Maximum Lead Temperature for Soldering Purposes ⁽²⁾ | T_L | 260 | $^{\circ}C$ |

(1) Surface mounted on minimum recommended pad size.

(2) 1/8" from case for 10 seconds.

ELECTRICAL CHARACTERISTICS ($T_J = 25^{\circ}C$ unless otherwise noted; Electricals apply in both directions)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | |
|---|--------------------|---|---|-------------|---|
| Peak Repetitive Blocking Current ($V_D = \text{Rated } V_{DRM}, V_{RRM}$; Gate Open) | I_{DRM}, I_{RRM} | — | — | 0.01 2.0 | mA |
| | | | | | $T_J = 25^{\circ}C$ $T_J = 110^{\circ}C$ |

ON CHARACTERISTICS

| | | | | | |
|---|----------|--------------------------|------------------------------|--------------------------|---|
| Peak On-State Voltage ⁽¹⁾ ($I_{TM} = \pm 6.0 A$) | V_{TM} | — | 1.3 | 1.6 | Volts |
| Gate Trigger Current (Continuous dc) ($V_D = 12 V, R_L = 100 \Omega$) MT2(+), G(+) MT2(+), G(-) MT2(-), G(-) MT2(-), G(+) | I_{GT} | — | 1.8 2.1 2.4 4.2 | 5.0 5.0 5.0 10 | mA |
| Gate Trigger Voltage (Continuous dc) ($V_D = 12 V, R_L = 100 \Omega$) MT2(+), G(+) MT2(+), G(-) MT2(-), G(-) MT2(-), G(+) | V_{GT} | 0.5 0.5 0.5 0.5 | 0.62 0.57 0.65 0.74 | 1.3 1.3 1.3 1.3 | Volts |
| Gate Non-Trigger Voltage (Continuous dc) ($V_D = 12 V, R_L = 100 \Omega, T_J = 110^{\circ}C$) All Four Quadrants | V_{GD} | 0.1 | 0.4 | — | Volts |
| Holding Current ($V_D = 12 V, \text{Gate Open, Initiating Current} = \pm 200 \text{ mA}$) | I_H | — | 1.5 | 15 | mA |
| Latching Current MT2(+), G(+) MT2(+), G(-) MT2(-), G(-) MT2(-), G(+) | I_L | — | 1.75 5.2 2.1 2.2 | 10 10 10 10 | mA |
| | | | | | ($V_D = 12 V, I_G = 5.0 \text{ mA}$) ($V_D = 12 V, I_G = 5.0 \text{ mA}$) ($V_D = 12 V, I_G = 5.0 \text{ mA}$) ($V_D = 12 V, I_G = 10 \text{ mA}$) |

DYNAMIC CHARACTERISTICS

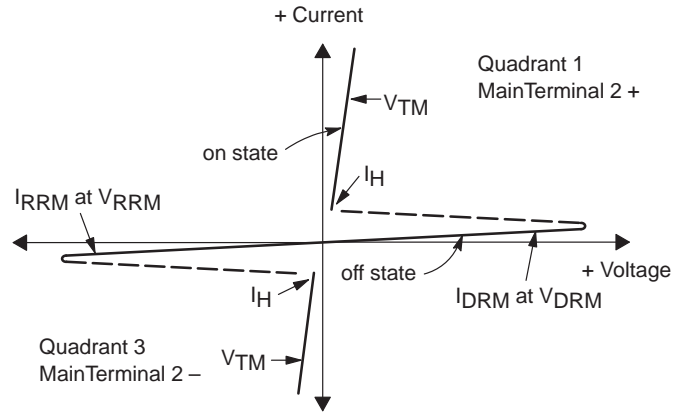
| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|------------|-----|-----|-----|------------------|
| Rate of Change of Commutating Current ($V_D = 200 V, I_{TM} = 1.8 A, \text{Commutating } dv/dt = 1.0 V/\mu\text{sec}, T_J = 110^{\circ}C, f = 250 \text{ Hz}, CL = 5.0 \mu\text{fd}, LL = 80 \text{ mH}, RS = 56 \Omega, CS = 0.03 \mu\text{fd}$) With snubber see Figure 11 | $di/dt(c)$ | — | 3.0 | — | A/ms |
| Critical Rate of Rise of Off-State Voltage ($V_D = 0.67 \times \text{Rated } V_{DRM}, \text{Exponential Waveform, Gate Open, } T_J = 110^{\circ}C$) | dv/dt | 20 | — | — | V/ μs |

(1) Pulse Test: Pulse Width ≤ 2.0 msec, Duty Cycle $\leq 2\%$.

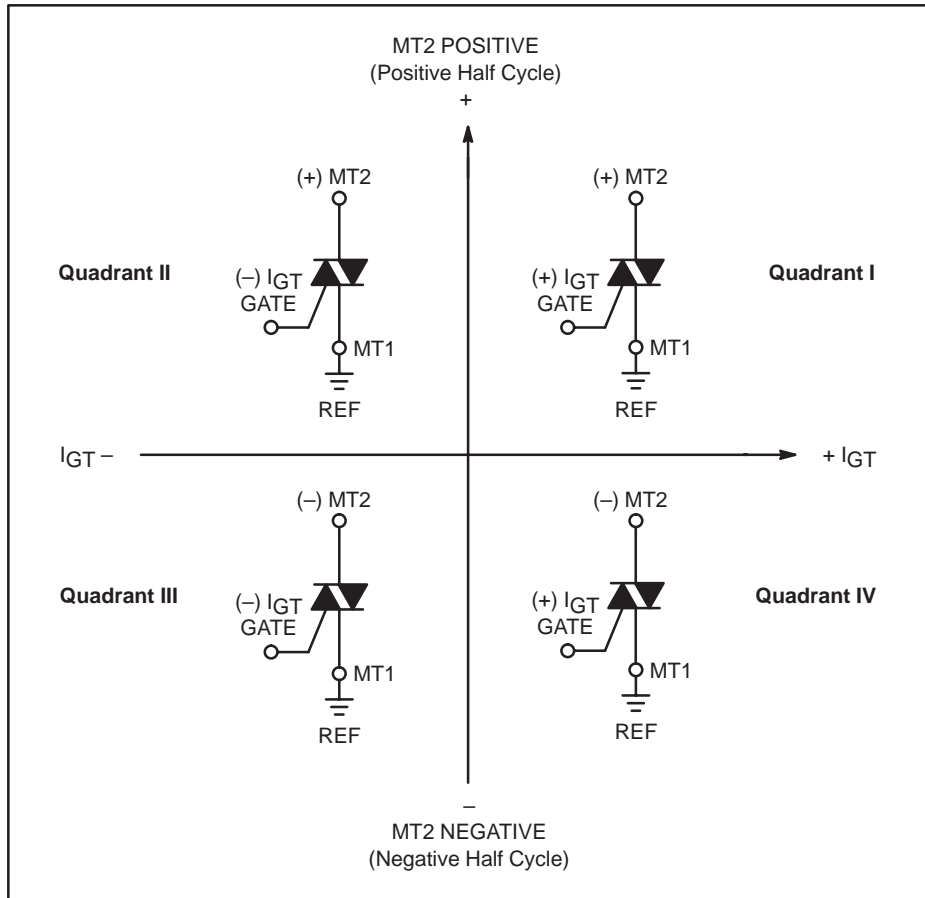
MAC4DHM

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.

MAC4DHM

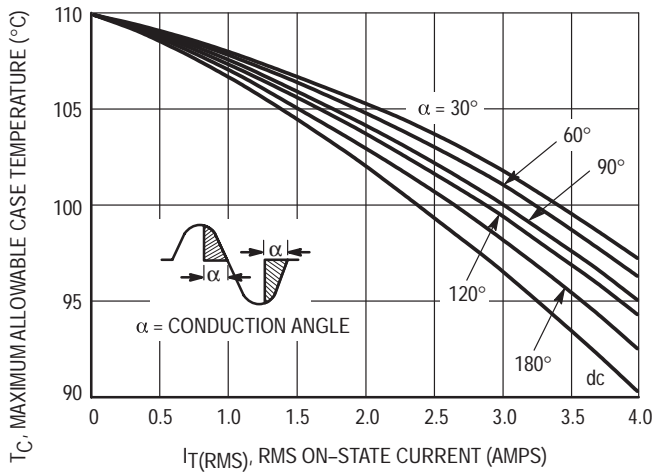


Figure 1. RMS Current Derating

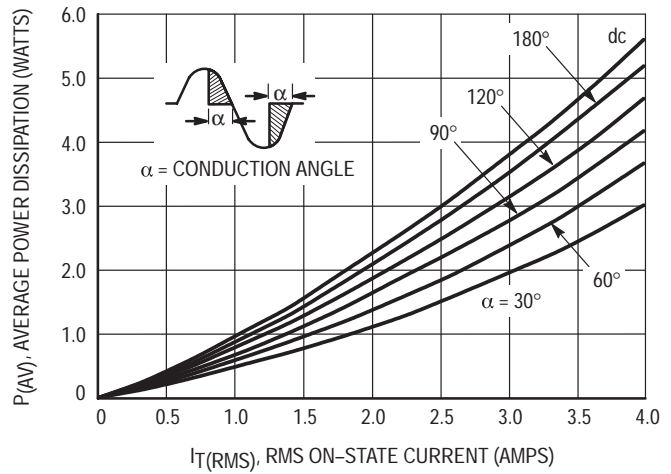


Figure 2. On-State Power Dissipation

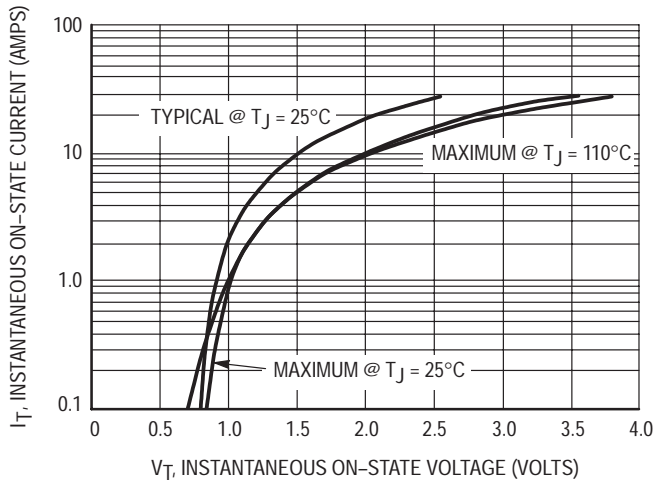


Figure 3. On-State Characteristics

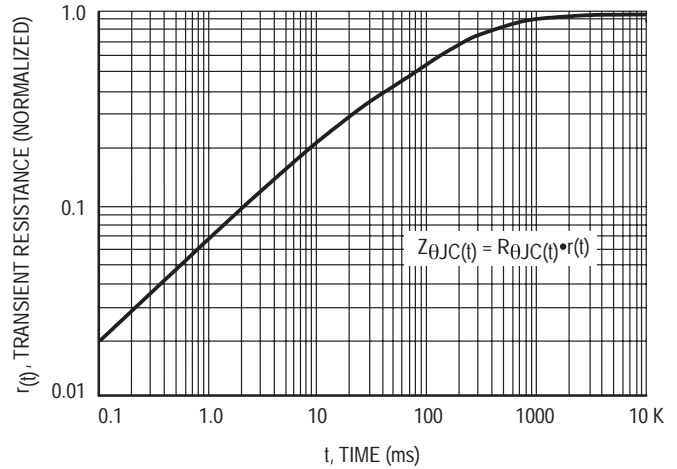


Figure 4. Transient Thermal Response

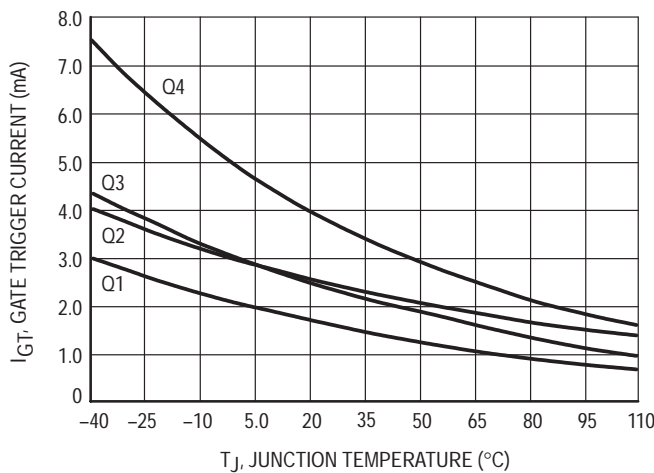


Figure 5. Typical Gate Trigger Current versus Junction Temperature

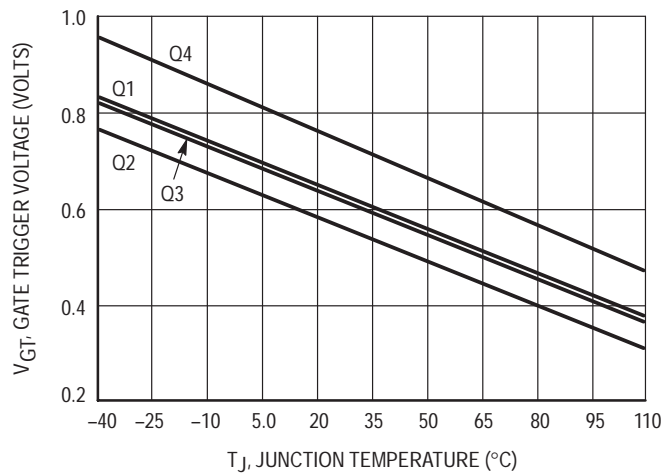


Figure 6. Typical Gate Trigger Voltage versus Junction Temperature

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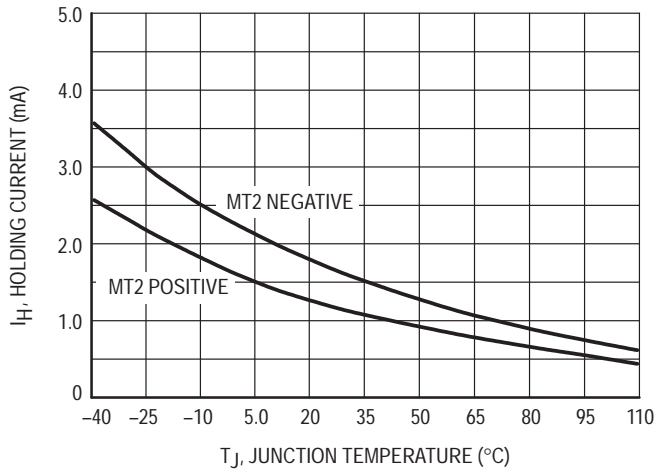


Figure 7. Typical Holding Current versus Junction Temperature

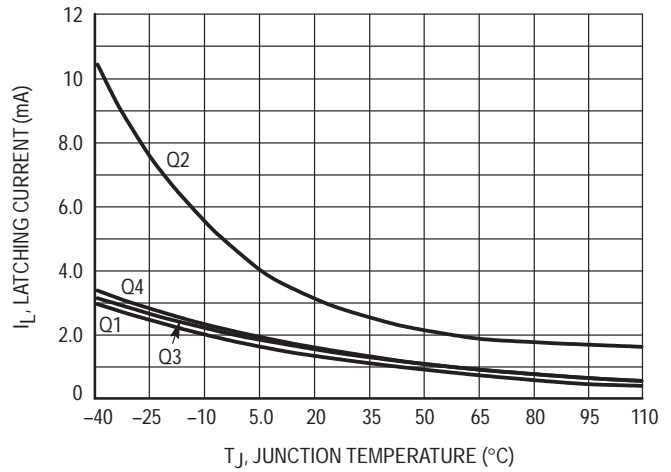


Figure 8. Typical Latching Current versus Junction Temperature

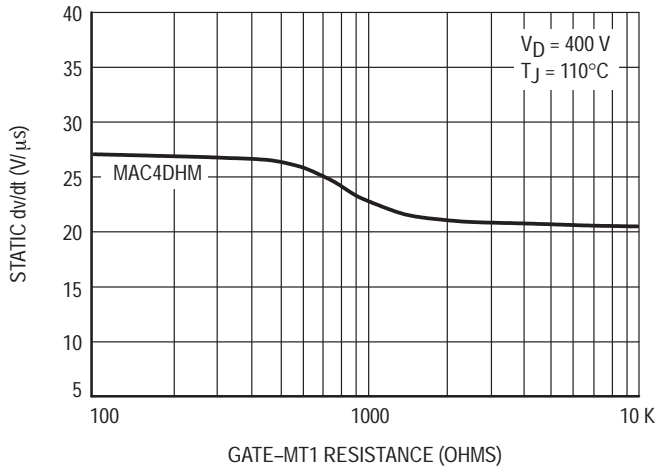


Figure 9. Minimum Exponential Static dv/dt versus Gate-MT1 Resistance

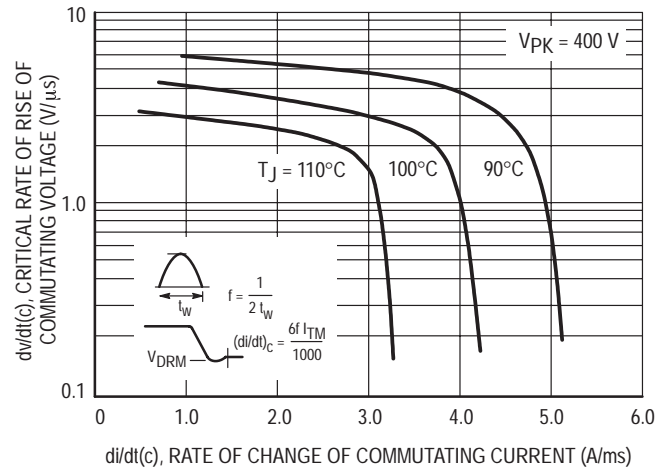
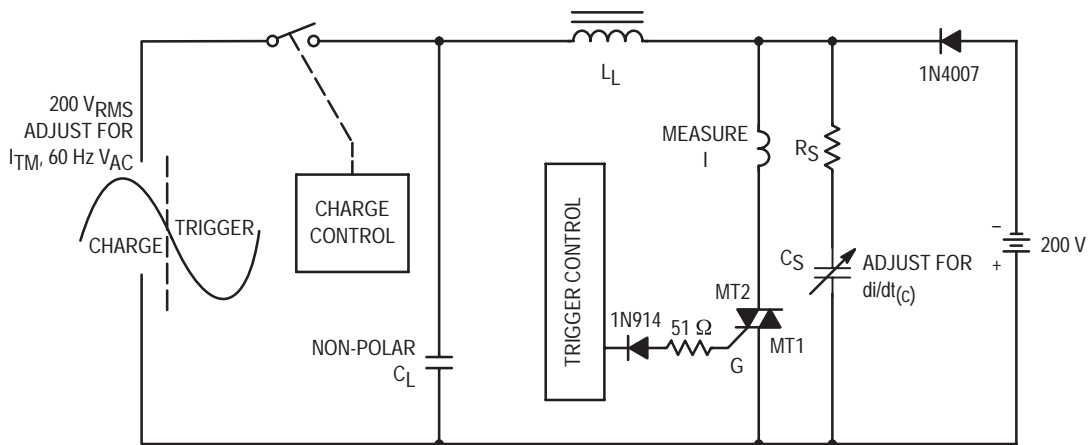


Figure 10. Typical Critical Rate of Rise of Commutating Voltage



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

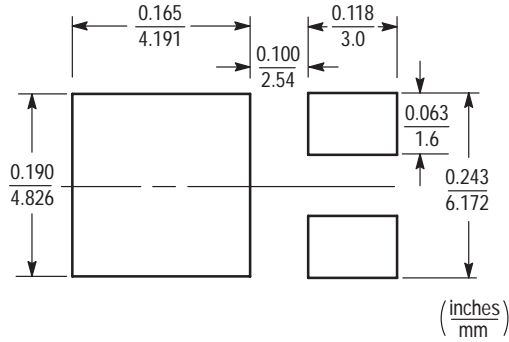
Figure 11. Simplified Test Circuit to Measure the Critical Rate of Rise of Commutating Current $(di/dt)_C$

MAC4DHM

MINIMUM RECOMMENDED FOOTPRINT FOR SURFACE MOUNTED APPLICATIONS

Surface mount board layout is a critical portion of the total design. The footprint for the semiconductor packages must be the correct size to insure proper solder connection

interface between the board and the package. With the correct pad geometry, the packages will self align when subjected to a solder reflow process.

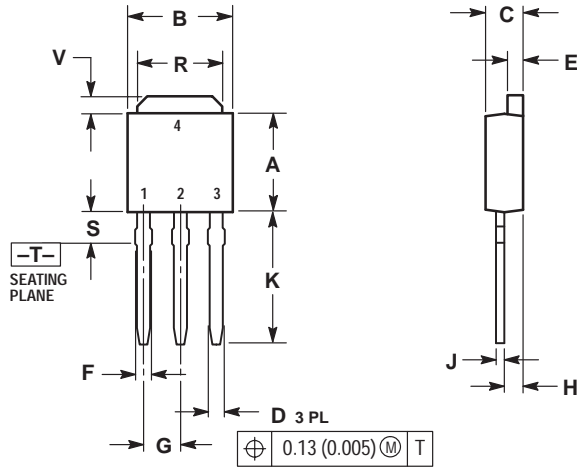


DPAK

MAC4DHM

PACKAGE DIMENSIONS

D-PAK CASE 369-07 ISSUE L

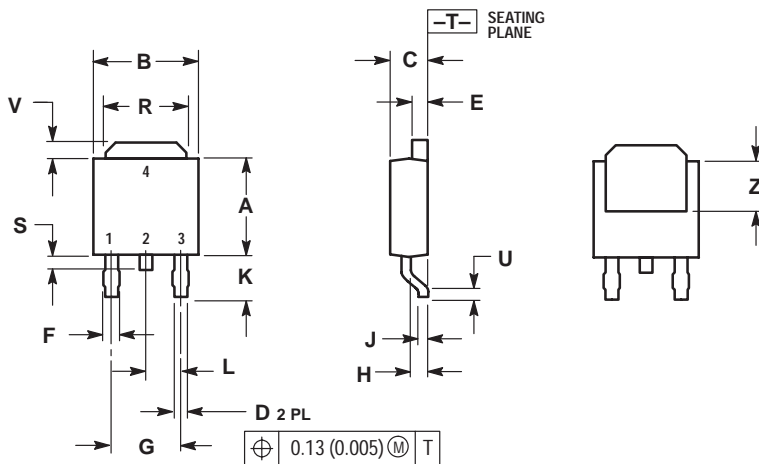


- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|------|
| | 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 | 0.090 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 | 0.175 | 0.215 | 4.45 | 5.46 |
| S | 0.050 | 0.090 | 1.27 | 2.28 |
| V | 0.030 | 0.050 | 0.77 | 1.27 |

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

D-PAK CASE 369A-13 ISSUE Z



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

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|------|
| | 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

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