

# Advance Information

## TRIACS

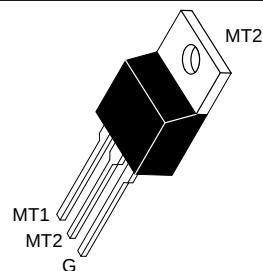
### Silicon Bidirectional Thyristors

## MAC15S SERIES

TRIACS  
15 AMPERES RMS  
400 THRU 800  
VOLTS

Designed for industrial and consumer applications for full wave control of ac loads such as appliance controls, heater controls, motor controls, and other power switching applications.

- Sensitive Gate allows Triggering by Microcontrollers and other Logic Circuits
- High Immunity to  $dv/dt$  — 25 V/ $\mu$ s minimum at 110°C
- High Commutating  $di/dt$  — 8.0 A/ms minimum at 110°C
- Minimum and Maximum Values of  $I_{GT}$ ,  $V_{GT}$  and  $I_H$  specified for ease of design
- On-State Current Rating of 15 Amperes RMS at 70°C
- High Surge Current Capability — 120 Amperes
- Blocking Voltage to 800 Volts
- Rugged, Economical TO220AB Package



CASE 221A-06  
(TO-220AB)  
STYLE 4

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

| Parameter                                                                                                         | Symbol       | Value             | Unit               |
|-------------------------------------------------------------------------------------------------------------------|--------------|-------------------|--------------------|
| Peak Repetitive Off-State Voltage (1)<br>( $T_J = -40$ to $110^\circ\text{C}$ , Sine Wave, 50 to 60Hz, Gate Open) | $V_{DRM}$    | 400<br>600<br>800 | Volts              |
| On-State RMS Current<br>(Full Cycle Sine Wave, 60Hz, $T_J = 70^\circ\text{C}$ )                                   | $I_{T(RMS)}$ | 15                | A                  |
| Peak Non-repetitive Surge Current<br>(One Half Cycle, 60 Hz, $T_J = 110^\circ\text{C}$ )                          | $I_{TSM}$    | 120               | A                  |
| Circuit Fusing Consideration<br>( $t = 8.3$ ms)                                                                   | $I^2t$       | 60                | A <sup>2</sup> sec |
| Peak Gate Power<br>(Pulse Width $\leq 1.0$ $\mu$ s, $T_C = 70^\circ\text{C}$ )                                    | $P_{GM}$     | 20                | Watts              |
| Average Gate Power<br>( $t = 8.3$ ms, $T_C = 70^\circ\text{C}$ )                                                  | $P_{G(AV)}$  | 0.5               | Watts              |
| Operating Junction Temperature Range                                                                              | $T_J$        | -40 to +110       | $^\circ\text{C}$   |
| Storage Temperature Range                                                                                         | $T_{stg}$    | -40 to +150       | $^\circ\text{C}$   |

#### THERMAL CHARACTERISTICS

|                                                                              |                                    |             |                    |
|------------------------------------------------------------------------------|------------------------------------|-------------|--------------------|
| Thermal Resistance<br>— Junction to Case<br>— Junction to Ambient            | $R_{\theta JC}$<br>$R_{\theta JA}$ | 2.0<br>62.5 | $^\circ\text{C/W}$ |
| Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 5 Seconds | $T_L$                              | 260         | $^\circ\text{C}$   |

(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.

# MAC15S SERIES

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

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

### OFF CHARACTERISTICS

|                                                                                           |                  |                        |   |             |    |
|-------------------------------------------------------------------------------------------|------------------|------------------------|---|-------------|----|
| Peak Repetitive Blocking Current<br>(V <sub>D</sub> = Rated V <sub>DRM</sub> , Gate Open) | I <sub>DRM</sub> | —                      | — | 0.01<br>2.0 | mA |
|                                                                                           |                  | T <sub>J</sub> = 25°C  |   |             |    |
|                                                                                           |                  | T <sub>J</sub> = 110°C |   |             |    |

### ON CHARACTERISTICS

|                                                                                     |                 |      |      |     |       |
|-------------------------------------------------------------------------------------|-----------------|------|------|-----|-------|
| Peak On-State Voltage* (I <sub>TM</sub> = ±21A)                                     | V <sub>TM</sub> | —    | —    | 1.8 | Volts |
| Continuous Gate Trigger Current (V <sub>D</sub> = 12 V, R <sub>L</sub> = 100Ω)      | I <sub>GT</sub> | .8   | 2.0  | 5.0 | mA    |
| MT2(+), G(+)                                                                        |                 | .8   | 3.0  | 5.0 |       |
| MT2(+), G(-)                                                                        |                 | .8   | 3.0  | 5.0 |       |
| MT2(-), G(-)                                                                        |                 |      |      |     |       |
| Hold Current (V <sub>D</sub> = 12 V, Gate Open, Initiating Current = ±150mA)        | I <sub>H</sub>  | 1.0  | 3.0  | 10  | mA    |
| Latching Current (V <sub>D</sub> = 24V, I <sub>G</sub> = 5mA)                       | I <sub>L</sub>  | 2.0  | 5.0  | 15  | mA    |
| MT2(+), G(+)                                                                        |                 | 2.0  | 10   | 20  |       |
| MT2(+), G(-)                                                                        |                 | 2.0  | 5.0  | 15  |       |
| MT2(-), G(-)                                                                        |                 |      |      |     |       |
| Gate Trigger Voltage (Continuous dc) (V <sub>D</sub> = 12 V, R <sub>L</sub> = 100Ω) | V <sub>GT</sub> | 0.45 | 0.62 | 1.5 | Volts |
| MT2(+), G(+)                                                                        |                 | 0.45 | 0.60 | 1.5 |       |
| MT2(+), G(-)                                                                        |                 | 0.45 | 0.65 | 1.5 |       |
| MT2(-), G(-)                                                                        |                 |      |      |     |       |

### DYNAMIC CHARACTERISTICS

|                                                                                                                                                                                                                                                           |                      |     |    |   |      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----|----|---|------|
| Critical Rate of Rise of Off-State Voltage<br>(V <sub>D</sub> = 400V, I <sub>TM</sub> = 3.5A, Commutating dv/dt = 10V/μsec,<br>Gate Open, T <sub>J</sub> = 110°C, f = 500Hz, Snubber: C <sub>S</sub> = 0.01 μF, R <sub>S</sub> = 15Ω,<br>see figure 15. ) | (dv/dt) <sub>c</sub> | 8.0 | 10 | — | A/ms |
| Critical Rate of Rise of Off-State Voltage<br>(V <sub>D</sub> = Rate V <sub>DRM</sub> , Exponential Waveform, R <sub>GK</sub> = 510Ω, T <sub>J</sub> = 110°C)                                                                                             | dv/dt                | 25  | 75 | — | V/μs |

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

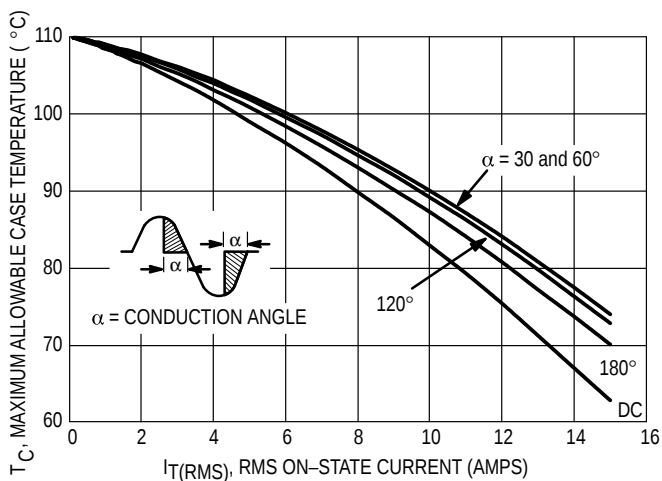


Figure 1.0 RMS Current Derating

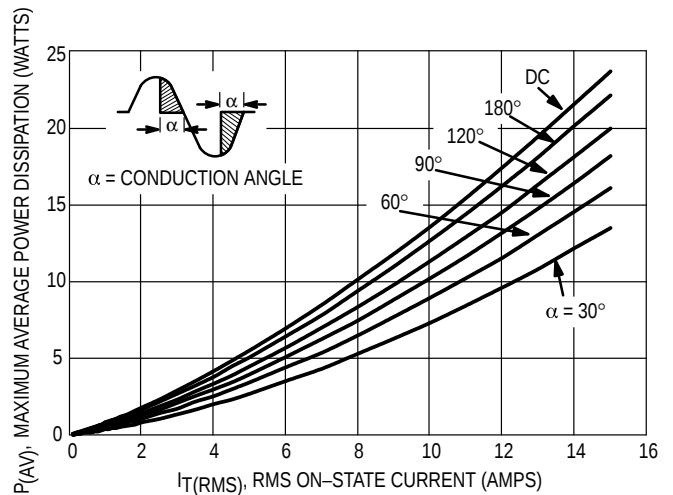
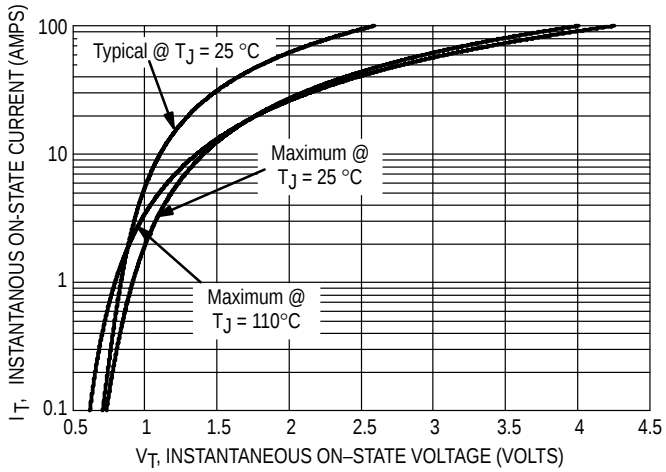
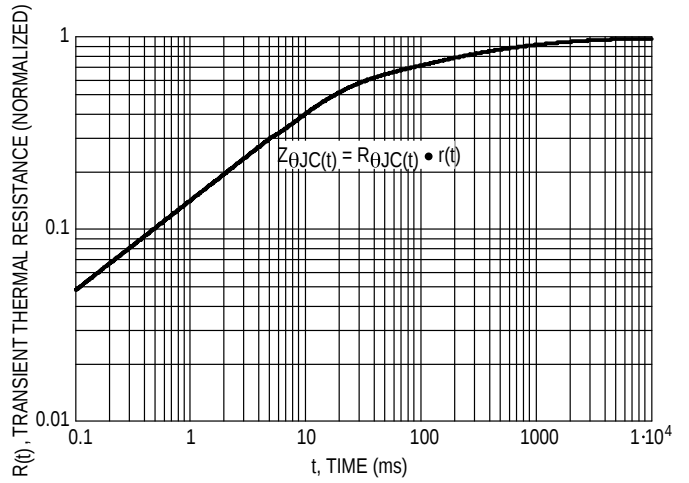


Figure 2.0 Maximum On-State Power Dissipation

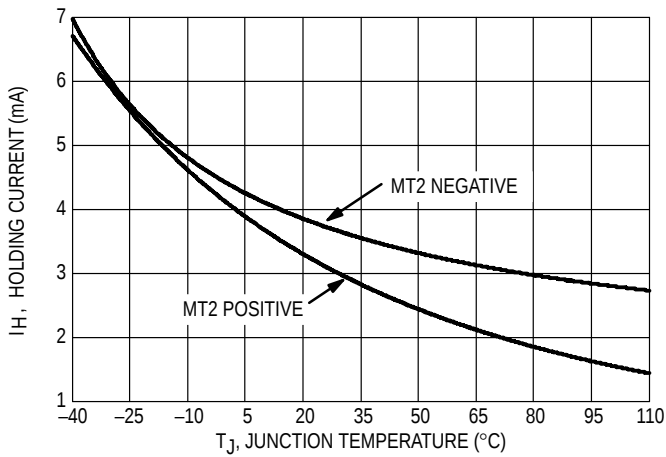
# MAC15S SERIES



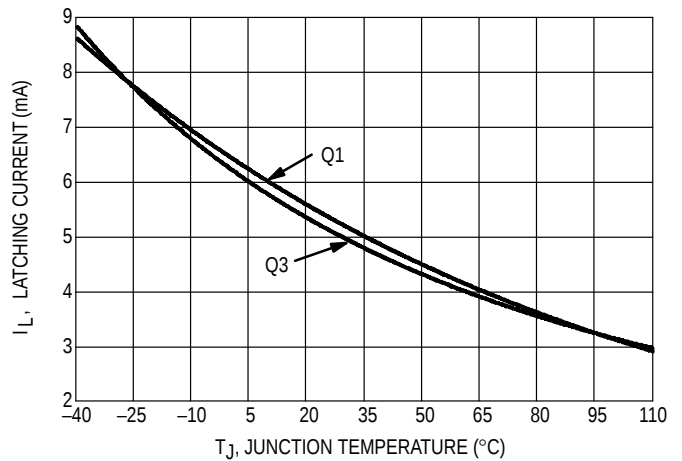
**Figure 3.0 On-State Characteristics**



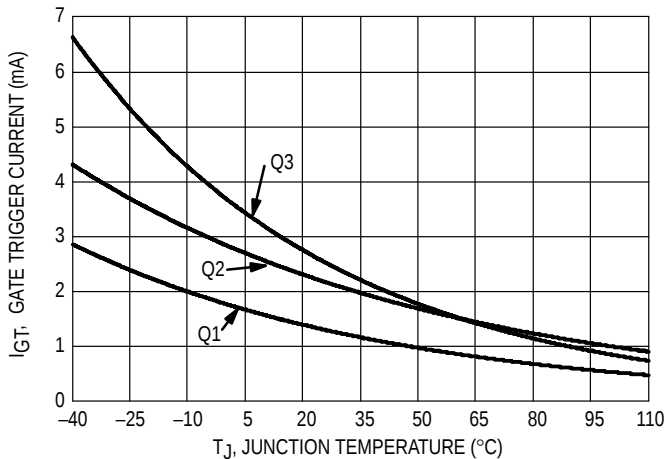
**Figure 4.0 Transient Thermal Response**



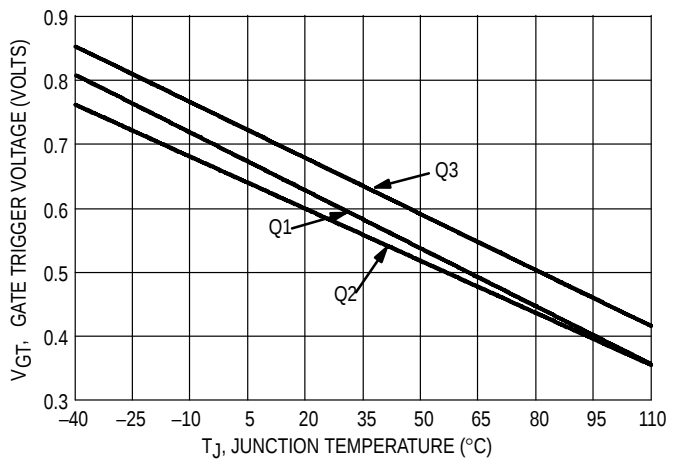
**Figure 5.0 Typical Holding Current Versus Junction Temperature**



**Figure 6.0 Typical Latching Current Versus Junction Temperature**

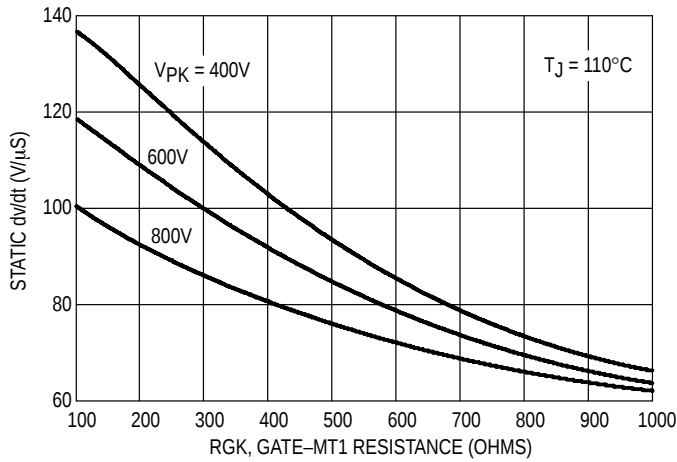


**Figure 7.0 Typical Gate Trigger Current Versus Junction Temperature**

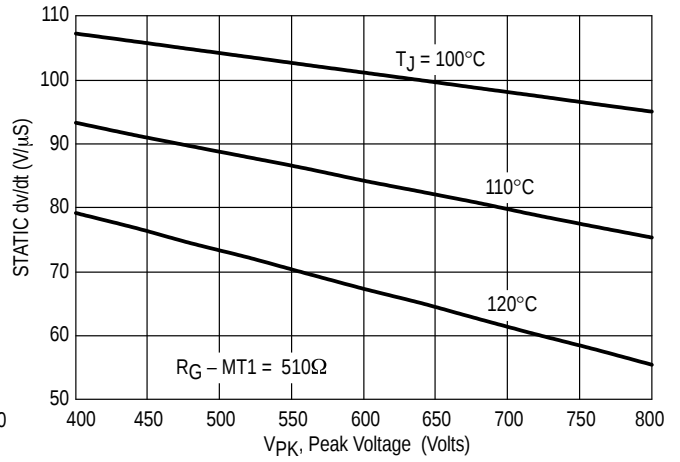


**Figure 8.0 Typical Gate Trigger Voltage Versus Junction Temperature**

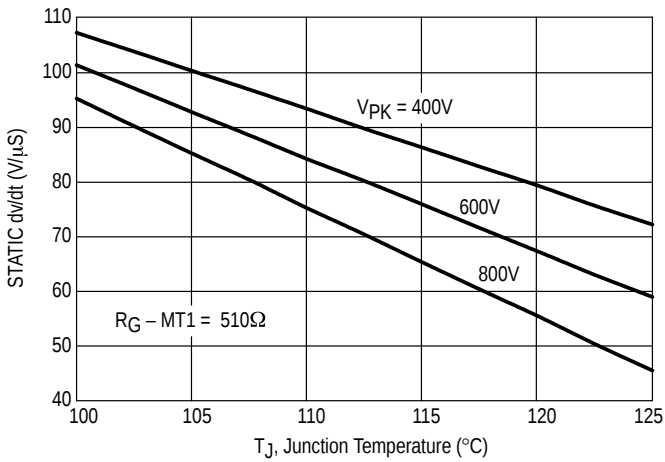
# MAC15S SERIES



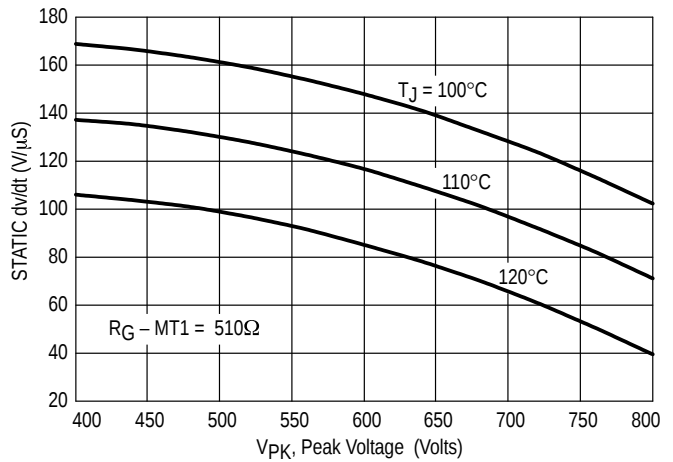
**Figure 9.0 Typical Exponential Static  $dv/dt$  Versus Gate-MT1 Resistance, MT2(+).**



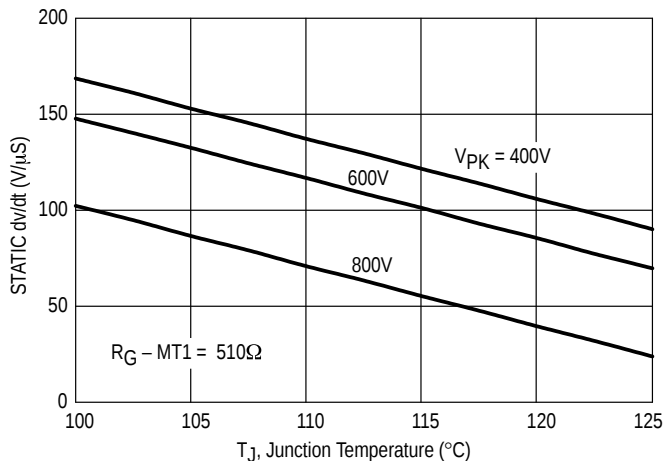
**Figure 10.0 Typical Exponential Static  $dv/dt$  Versus Peak Voltage, MT2(+).**



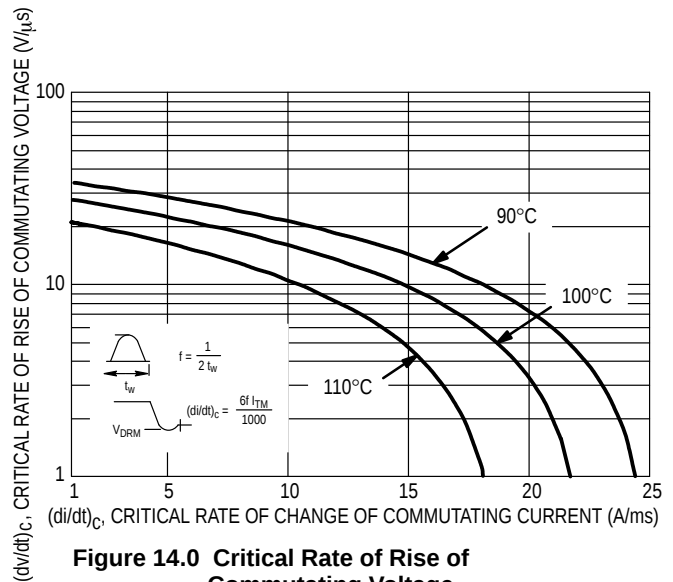
**Figure 11.0 Typical Exponential Static  $dv/dt$  Versus Junction Temperature, MT2(+).**



**Figure 12.0 Typical Exponential Static  $dv/dt$  Versus Peak Voltage, MT2(-).**

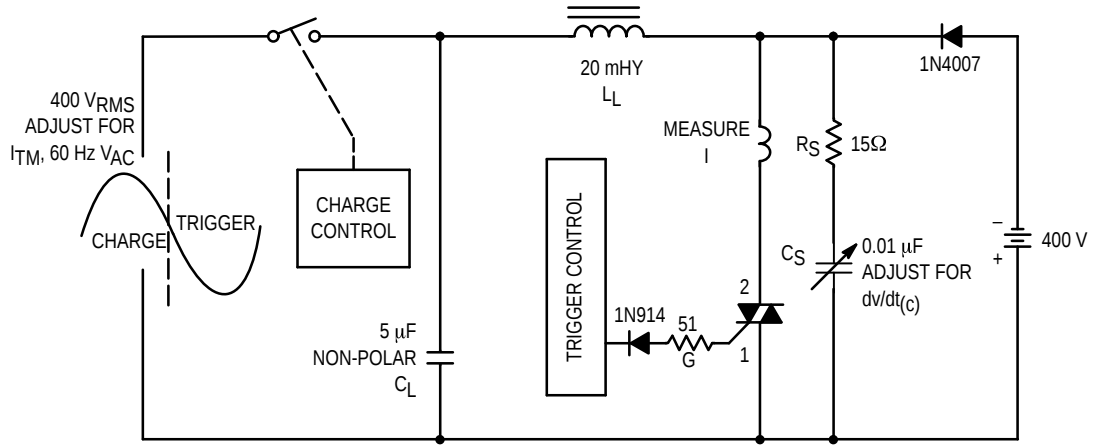


**Figure 13.0 Typical Exponential Static  $dv/dt$  Versus Junction Temperature, MT2(-).**



**Figure 14.0 Critical Rate of Rise of Commutating Voltage**

## MAC15S SERIES



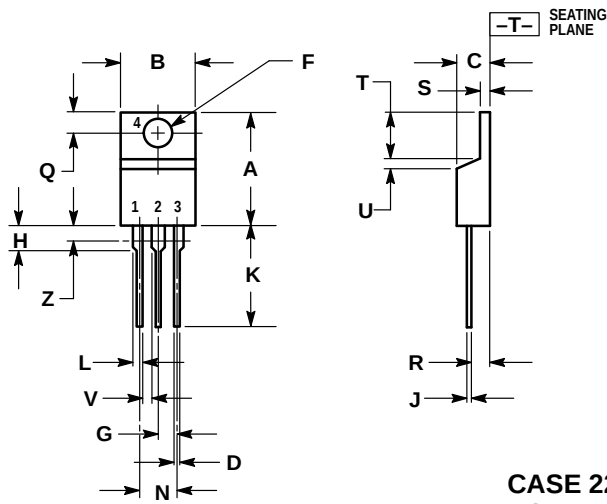
Note: Component values are for verification of rated  $(dv/dt)_C$ . See AN1048 for additional information.

**Figure 15.0 Simplified Test Circuit to Measure the Critical Rate of Rise of Commutating Voltage**

# NOTES

# NOTES

# **MAC15S SERIES** **PACKAGE DIMENSIONS**



STYLE 4:  
PIN 1. MAIN TERMINAL 1  
2. MAIN TERMINAL 2  
3. GATE  
4. MAIN TERMINAL 2

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

- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

| DIM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 0.570  | 0.620 | 14.48       | 15.75 |
| B   | 0.380  | 0.405 | 9.66        | 10.28 |
| C   | 0.160  | 0.190 | 4.07        | 4.82  |
| D   | 0.025  | 0.035 | 0.64        | 0.88  |
| F   | 0.142  | 0.147 | 3.61        | 3.73  |
| G   | 0.095  | 0.105 | 2.42        | 2.66  |
| H   | 0.110  | 0.155 | 2.80        | 3.93  |
| J   | 0.018  | 0.025 | 0.46        | 0.64  |
| K   | 0.500  | 0.562 | 12.70       | 14.27 |
| L   | 0.045  | 0.060 | 1.15        | 1.52  |
| N   | 0.190  | 0.210 | 4.83        | 5.33  |
| Q   | 0.100  | 0.120 | 2.54        | 3.04  |
| R   | 0.080  | 0.110 | 2.04        | 2.79  |
| S   | 0.045  | 0.055 | 1.15        | 1.39  |
| T   | 0.235  | 0.255 | 5.97        | 6.47  |
| U   | 0.000  | 0.050 | 0.00        | 1.27  |
| V   | 0.045  | —     | 1.15        | —     |
| Z   | —      | 0.080 | —           | 2.04  |

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