

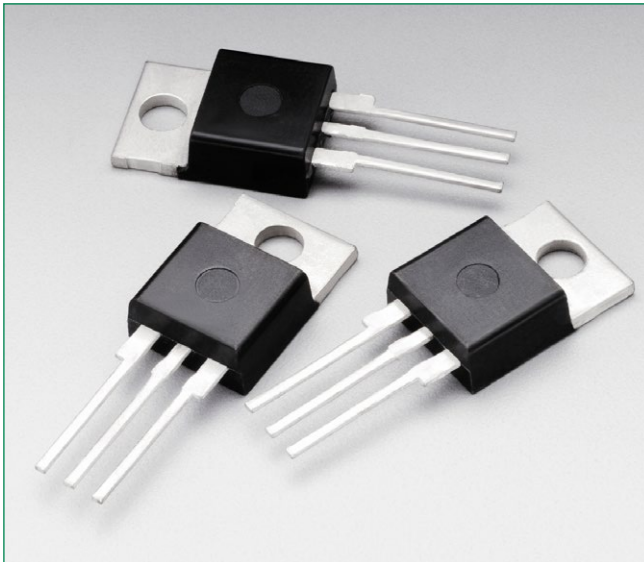


# THE DATASHEET OF MAC15A8G





## MAC15 Series



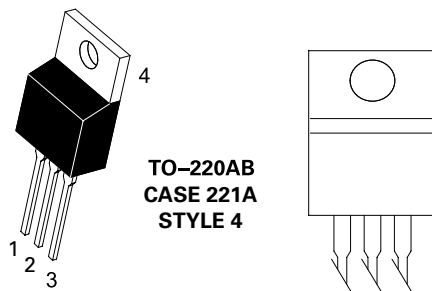
### Description

Designed primarily for full-wave ac control applications, such as solid-state relays, motor controls, heating controls and power supplies; or wherever full-wave silicon gate controlled solid-state devices are needed. Triac type thyristors switch from a blocking to a conducting state for either polarity of applied main terminal voltage with positive or negative gate triggering.

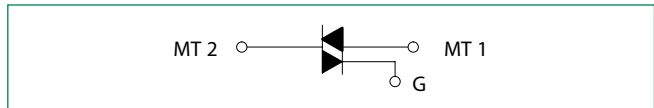
### Features

- Blocking Voltage to 800 V
- All Diffused and Glass Passivated Junctions for Greater Parameter Uniformity and Stability
- Small, Rugged, Thermowatt Construction for Low Thermal Resistance, High Heat Dissipation and Durability
- Gate Triggering Guaranteed in Three Modes (MAC15 Series) or Four Modes (MAC15A Series)
- These Devices are Pb-Free and are RoHS Compliant

### Pin Out



### Functional Diagram



### Additional Information



**Datasheet**



**Resources**



**Samples**

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

| Rating  | Symbol   | Value             | Unit               |
|---|--|-------------------|--------------------|
| Peak Repetitive Off-State Voltage (Note 1)<br>(Gate Open, Sine Wave 50 to 60 Hz, $T_J = 25^\circ$ to $100^\circ\text{C}$ )                | MAC15A6G<br>MAC15-8G, MAC15A8G<br>MAC15-10G, MAC15A10G<br>$V_{DRM}^*$<br>$V_{RRM}$ | 400<br>600<br>800 | V                  |
| On-State RMS Current (Full Cycle Sine Wave, 50 to 60 Hz, $T_C = 90^\circ\text{C}$ )   | $I_{T(RMS)}$   | 15                | A                  |
| Peak Non-Repetitive Surge Current (One Full Cycle Sine Wave, 60 Hz, $T_J = 125^\circ\text{C}$ )<br>Preceded and Followed by Rated Current | $I_{TSM}$  | 150               | A                  |
| Peak Gate Voltage<br>(Pulse Width ::: 1.0 $\mu\text{sec}$ ; $T_C = 90^\circ\text{C}$ )  | $V_{GM}$   | 10                | V                  |
| Circuit Fusing Consideration ( $t = 8.3$ ms)  | $I^2t$   | 93                | A <sup>2</sup> sec |
| Peak Gate Power<br>( $T_C = +80^\circ\text{C}$ , Pulse Width = 1.0 $\mu\text{s}$ )  | $P_{GM}$   | 20                | W                  |
| Peak Gate Current<br>(Pulse Width ::: 1.0 $\mu\text{sec}$ ; $T_C = 90^\circ\text{C}$ )  | $I_{GM}$   | 2.0               | A                  |
| Average Gate Power ( $t = 8.3$ ms, $T_C = 80^\circ\text{C}$ )   | $P_{G(AV)}$  | 0.5               | W                  |
| Operating Junction Temperature Range  | $T_J$  | -40 to +125       | $^\circ\text{C}$   |
| Storage Temperature Range   | $T_{stg}$  | -40 to +150       | $^\circ\text{C}$   |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1.  $V_{DRM}^*$  and  $V_{RRM}$  for all types can be applied on a continuous basis. Ratings apply for zero or negative gate voltage; however, 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 devices are exceeded.

### Thermal Characteristics

| Rating  | Symbol                             | Value       | Unit                      |
|---|------------------------------------|-------------|---------------------------|
| Thermal Resistance,<br>Junction-to-Case (AC)<br>Junction-to-Ambient               | $R_{\theta JC}$<br>$R_{\theta JA}$ | 2.0<br>62.5 | $^\circ\text{C}/\text{W}$ |
| Maximum Lead Temperature for Soldering Purposes, 1/8" from case for<br>10 seconds | $T_L$                              | 260         | $^\circ\text{C}$          |

### Electrical Characteristics - OFF ( $T_J = 25^\circ\text{C}$ unless otherwise noted ; Electricals apply in both directions)

| Characteristic   | Symbol                   | Min | Typ | Max | Unit |
|--|--------------------------|-----|-----|-----|------|
| Peak Repetitive Blocking Current<br>( $V_D = V_{DRM}^* = V_{RRM}^*$ ; Gate Open) | $I_{DRM}^*$<br>$I_{RRM}$ | -   | -   | 1.0 | mA   |
|  |                          | -   | -   | 2.0 |      |

### Electrical Characteristics - ON ( $T_J = 25^\circ\text{C}$ unless otherwise noted; Electricals apply in both directions)

| Characteristic  | Symbol   | Min          | Typ | Max  | Unit |   |
|---|----------|--------------|-----|------|------|---|
| Peak On-State Voltage (Note 2) ( $I_{TM} = \pm 21$ A Peak)  | $V_{TM}$ | -            | 1.3 | 1.6  | V    |   |
| Gate Trigger Current<br>(Continuous dc)<br>( $V_D = 12$ V, $R_L = 100$ $\Omega$ )                   | $I_{GT}$ | MT2(+), G(+) | -   | 50   | mA   |   |
|   |          | MT2(+), G(-) | -   | 50   |      |   |
|   |          | MT2(-), G(-) | -   | 50   |      |   |
|   |          | MT2(-), G(+) | -   | 75   |      |   |
| Gate Trigger Voltage<br>(Continuous dc)<br>( $V_D = 12$ V, $R_L = 100$ $\Omega$ )                   | $V_{GT}$ | MT2(+), G(+) | 0.5 | 0.62 | 1.3  | V |
|   |          | MT2(+), G(-) | 0.5 | 0.57 | 1.3  |   |
|   |          | MT2(-), G(-) | 0.5 | 0.65 | 1.3  |   |
|   |          | MT2(-), G(+) | 0.5 | 0.74 | 1.3  |   |
| Gate Non-Trigger Voltage<br>( $T_J = 125^\circ\text{C}$ )<br>( $V_D = 12$ V, $R_L = 100$ $\Omega$ ) | $V_{GD}$ | MT2(+), G(+) | 0.2 | -    | -    | V |
|   |          | MT2(+), G(-) | 0.2 | -    | -    |   |
|   |          | MT2(-), G(-) | 0.2 | -    | -    |   |
|   |          | MT2(-), G(+) | 0.2 | -    | -    |   |
| Holding Current ( $V_D = 12$ V <sub>dc</sub> , Gate Open, Initiating Current = $\pm 200$ mA)        | $I_H$    | -            | 6.0 | 40   | mA   |   |

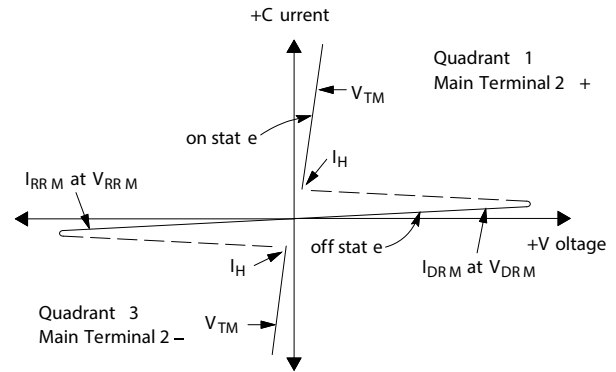
2. Indicates Pulse Test: Pulse Width  $\leq 2.0$  ms, Duty Cycle  $\leq 2\%$ .

**Dynamic Characteristics**

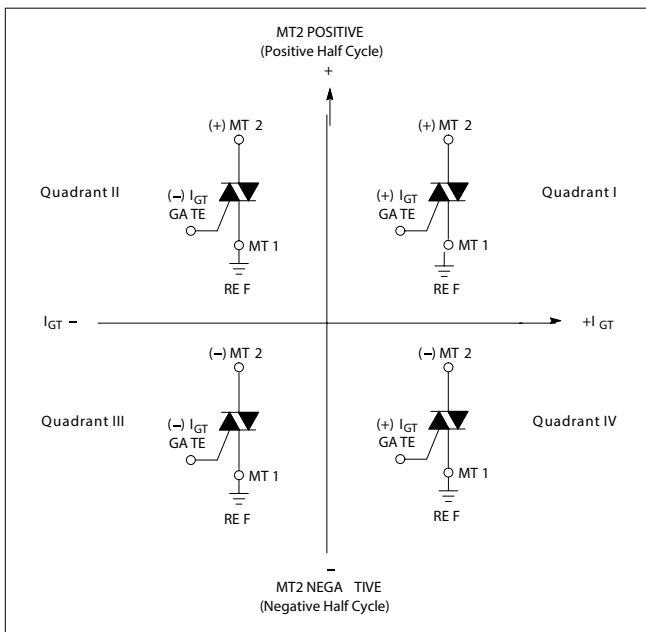
| Characteristic   | Symbol | Min | Typ | Max | Unit             |
|--|--------|-----|-----|-----|------------------|
| Critical Rate of Rise of Commutation Voltage ( $V_D = \text{Rated } V_{DRM}, I_{TM} = 21 \text{ A}$ , Commutating $di/dt = 7.6 \text{ A/ms}$ , Gate Unenergized, $TC = 80^\circ\text{C}$ ) | dV/dt  | -   | 5.0 | -   | V/ $\mu\text{s}$ |

**Voltage Current Characteristic of SCR**

| 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                           |

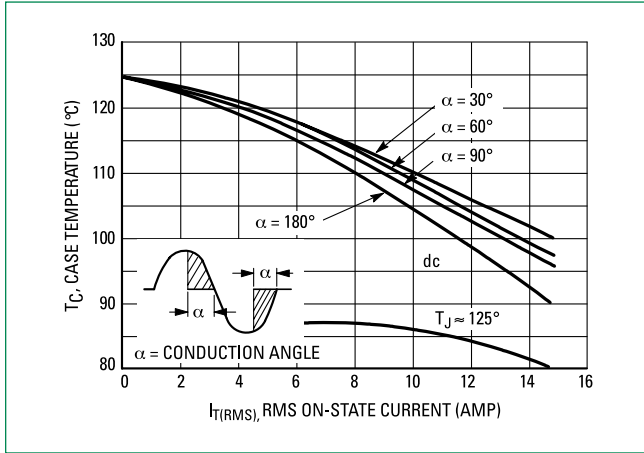


**Quadrant Definitions for a Triac**

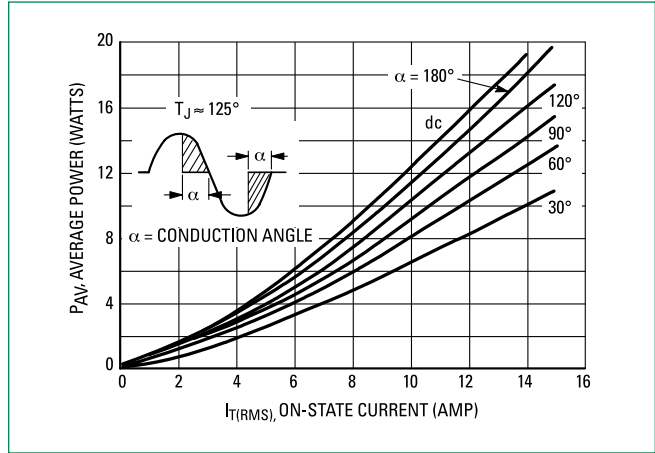


All polarities are referenced to MT1.  
With in-phase signals (using standard AC lines) quadrants I and III are used

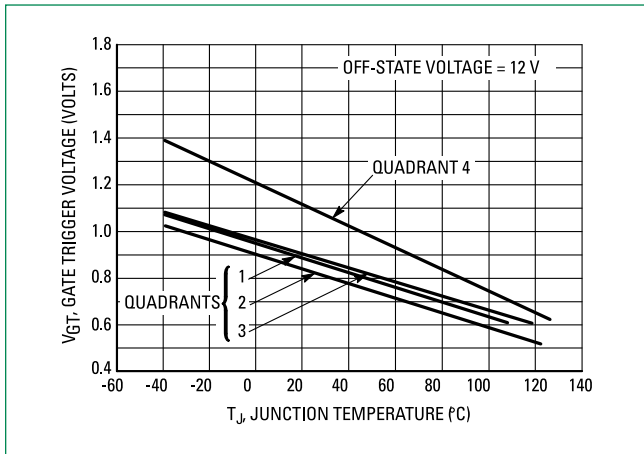
**Figure 1. RMS Current Derating**



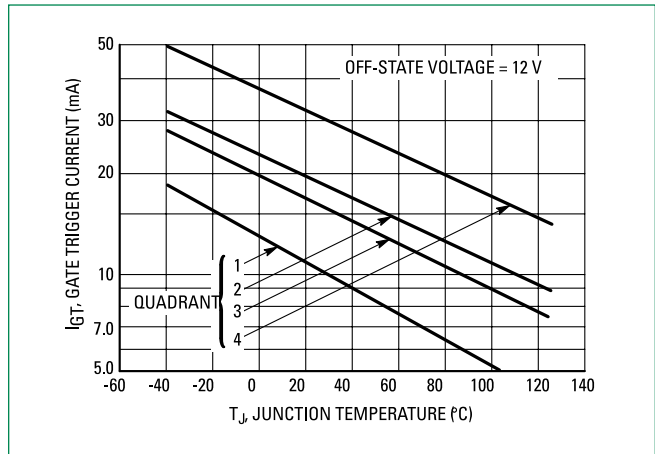
**Figure 2. On-State Power Dissipation**



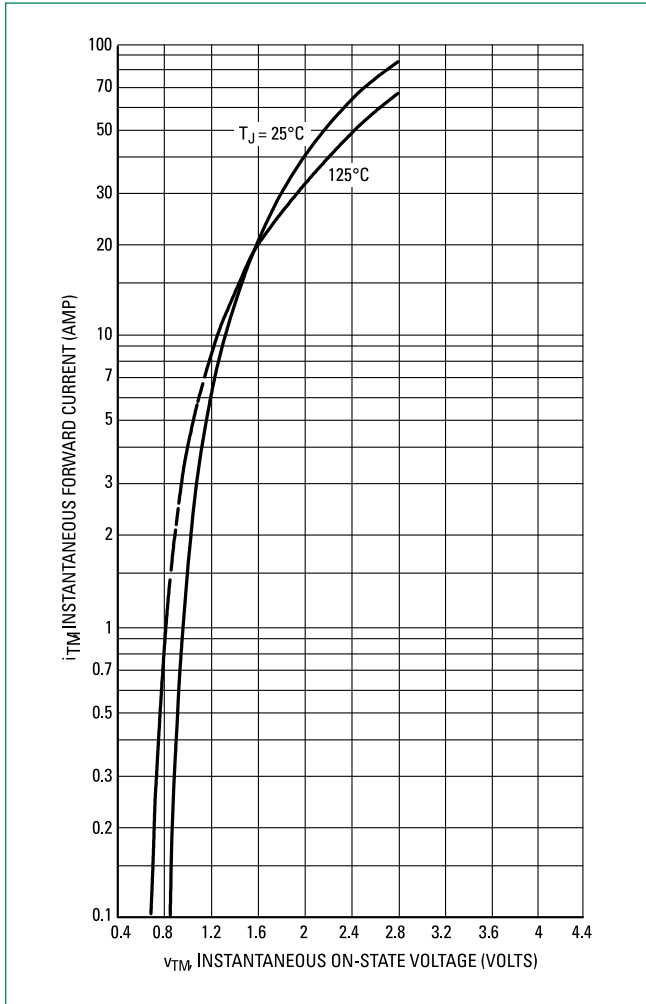
**Figure 3. Typical Gate Trigger Voltage**



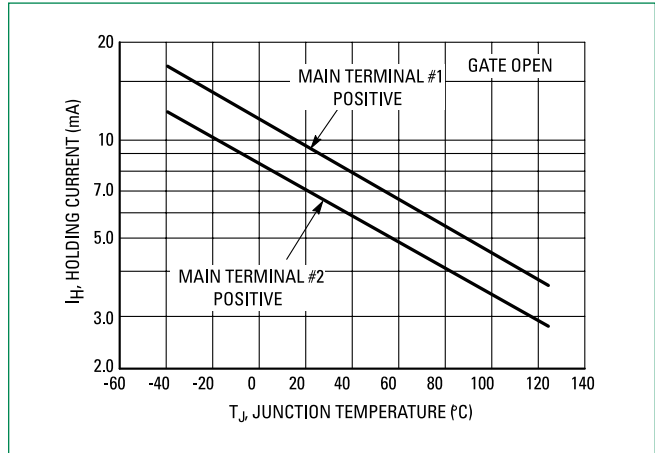
**Figure 4. Typical Gate Trigger Current**



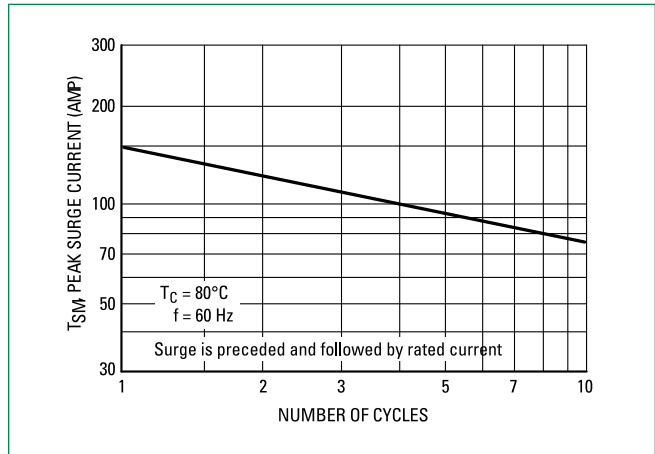
**Figure 5. On-State Characteristics**



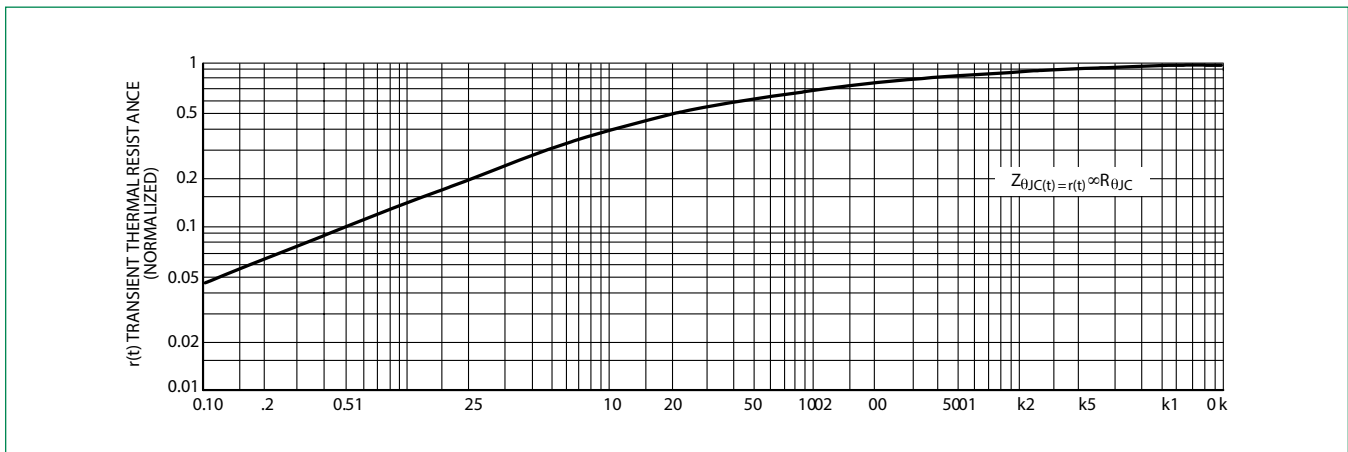
**Figure 6. Typical Holding Current**



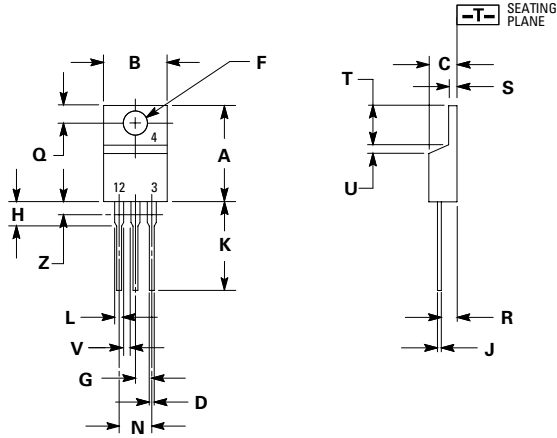
**Figure 7. Maximum Non-Repetitive Surge Current**



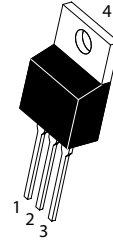
**Figure 8. Thermal Response**



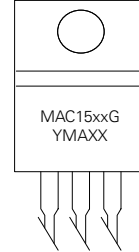
**Dimensions**



**Part Marking System**



**TO-220AB  
CASE 221A  
STYLE 12**



xx =See Table on Page 2  
Y =Year  
M =Month  
A =Assembly Site  
XX =Lot Serial Code  
G =Pb-Free Package

| Dim | Inches |       | Millimeters |       |
|-----|--------|-------|-------------|-------|
|     | Min    | Max   | Min         | Max   |
| A   | 0.590  | 0.620 | 14.99       | 15.75 |
| B   | 0.380  | 0.420 | 9.65        | 10.67 |
| C   | 0.178  | 0.188 | 4.52        | 4.78  |
| D   | 0.025  | 0.035 | 0.64        | 0.89  |
| F   | 0.142  | 0.147 | 3.61        | 3.73  |
| G   | 0.095  | 0.105 | 2.41        | 2.67  |
| H   | 0.110  | 0.130 | 2.79        | 3.30  |
| J   | 0.018  | 0.024 | 0.46        | 0.61  |
| K   | 0.540  | 0.575 | 13.72       | 14.61 |
| L   | 0.060  | 0.075 | 1.52        | 1.91  |
| N   | 0.195  | 0.205 | 4.95        | 5.21  |
| Q   | 0.105  | 0.115 | 2.67        | 2.92  |
| R   | 0.085  | 0.095 | 2.16        | 2.41  |
| S   | 0.045  | 0.060 | 1.14        | 1.52  |
| 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  |

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.

| Pin Assignment |                 |
|----------------|-----------------|
| 1              | Main Terminal 1 |
| 2              | Main Terminal 2 |
| 3              | Gate            |
| 4              | No Connection   |



**Ordering Information**

| Device    | Device Marking | Package               | Shipping      |
|-----------|----------------|-----------------------|---------------|
| MAC15-8G  | MAC15-8        | TO-220AB<br>(Pb-Free) | 500 Units/Box |
| MAC15-10G | MAC1510        |                       |               |
| MAC15A6G  | MAC15A6        |                       |               |
| MAC15A8G  | MAC15A8        |                       |               |
| MAC15A10G | MAC15A10       |                       |               |

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