

# MCR8SD, MCR8SM, MCR8SN

Preferred Device

## Sensitive Gate Silicon Controlled Rectifiers

### Reverse Blocking Thyristors

Designed primarily for half-wave ac control applications, such as motor controls, heating controls, and power supplies; or wherever half-wave, silicon gate-controlled devices are needed.

- Sensitive Gate Allows Triggering by Microcontrollers and other Logic Circuits
- Blocking Voltage to 800 Volts
- On-State Current Rating of 8 Amperes RMS at 80°C
- High Surge Current Capability — 80 Amperes
- Rugged, Economical TO220AB Package
- Glass Passivated Junctions for Reliability and Uniformity
- Minimum and Maximum Values of IGT, VGT and IH Specified for Ease of Design
- Immunity to  $dv/dt$  — 5 V/ $\mu$ sec Minimum at 110°C
- Device Marking: Logo, Device Type, e.g., MCRSD, Date Code

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

| Rating                                                                                                                                                         | Symbol                   | Value             | Unit                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------------|------------------------|
| Peak Repetitive Off-State Voltage <sup>(1)</sup><br>( $T_J = -40$ to $110^\circ\text{C}$ , Sine Wave,<br>50 to 60 Hz, Gate Open)<br>MCR8SD<br>MCR8SM<br>MCR8SN | $V_{DRM}$ ,<br>$V_{RRM}$ | 400<br>600<br>800 | Volts                  |
| On-State RMS Current<br>( $180^\circ$ Conduction Angles; $T_C = 80^\circ\text{C}$ )                                                                            | $I_T(\text{RMS})$        | 8.0               | Amps                   |
| Peak Non-Repetitive Surge Current<br>(1/2 Cycle, Sine Wave, 60 Hz,<br>$T_J = 110^\circ\text{C}$ )                                                              | $I_{TSM}$                | 80                | Amps                   |
| Circuit Fusing Consideration<br>( $t = 8.33$ ms)                                                                                                               | $I^2t$                   | 26.5              | $\text{A}^2\text{sec}$ |
| Forward Peak Gate Power<br>(Pulse Width $\leq 1.0$ $\mu\text{s}$ , $T_C = 80^\circ\text{C}$ )                                                                  | $P_{GM}$                 | 5.0               | Watts                  |
| Forward Average Gate Power<br>( $t = 8.3$ ms, $T_C = 80^\circ\text{C}$ )                                                                                       | $P_{G(AV)}$              | 0.5               | Watt                   |
| Forward Peak Gate Current<br>(Pulse Width $\leq 1.0$ $\mu\text{s}$ , $T_C = 80^\circ\text{C}$ )                                                                | $I_{GM}$                 | 2.0               | Amps                   |
| Operating Junction Temperature Range                                                                                                                           | $T_J$                    | -40 to 110        | $^\circ\text{C}$       |
| Storage Temperature Range                                                                                                                                      | $T_{stg}$                | -40 to 150        | $^\circ\text{C}$       |

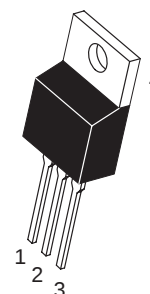
(1)  $V_{DRM}$  and  $V_{RRM}$  for all types can be applied on a continuous basis. Ratings apply for zero or negative gate voltage; positive gate voltage shall not be applied concurrent with negative potential on the anode. Blocking voltages shall not be tested with a constant current source such that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



ON Semiconductor

<http://onsemi.com>

SCRs  
8 AMPERES RMS  
400 thru 800 VOLTS



TO-220AB  
CASE 221A  
STYLE 3

#### PIN ASSIGNMENT

| 1 | Cathode |
|---|---------|
| 2 | Anode   |
| 3 | Gate    |
| 4 | Anode   |

#### ORDERING INFORMATION

| Device | Package | Shipping      |
|--------|---------|---------------|
| MCR8SD | TO220AB | 50 Units/Rail |
| MCR8SM | TO220AB | 50 Units/Rail |
| MCR8SN | TO220AB | 50 Units/Rail |

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

# MCR8SD, MCR8SM, MCR8SN

## THERMAL CHARACTERISTICS

| Characteristic                                                                | Symbol                             | Value       | Unit |
|-------------------------------------------------------------------------------|------------------------------------|-------------|------|
| Thermal Resistance — Junction to Case<br>— Junction to Ambient                | $R_{\theta JC}$<br>$R_{\theta JA}$ | 2.2<br>62.5 | °C/W |
| Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 10 Seconds | $T_L$                              | 260         | °C   |

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

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

## OFF CHARACTERISTICS

|                                                                                                                                                                                                                      |                          |        |        |           |               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------|--------|-----------|---------------|
| Peak Repetitive Forward or Reverse Blocking Current <sup>(1)</sup><br>( $V_D = \text{Rated } V_{DRM} \text{ and } V_{RRM}$ ; $R_{GK} = 1 \text{ k}\Omega$ )<br>$T_J = 25^\circ\text{C}$<br>$T_J = 110^\circ\text{C}$ | $I_{DRM}$ ,<br>$I_{RRM}$ | —<br>— | —<br>— | 10<br>500 | $\mu\text{A}$ |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------|--------|-----------|---------------|

## ON CHARACTERISTICS

|                                                                                                                                                               |          |          |           |            |               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|-----------|------------|---------------|
| Peak Forward On-State Voltage* ( $I_{TM} = 16 \text{ A}$ )                                                                                                    | $V_{TM}$ | —        | —         | 1.8        | Volts         |
| Gate Trigger Current (Continuous dc) <sup>(2)</sup><br>( $V_D = 12 \text{ V}$ ; $R_L = 100 \Omega$ )                                                          | $I_{GT}$ | 5.0      | 25        | 200        | $\mu\text{A}$ |
| Holding Current <sup>(2)</sup><br>( $V_D = 12 \text{ V}$ , Gate Open, Initiating Current = 200 mA)                                                            | $I_H$    | —        | 0.5       | 6.0        | mA            |
| Latch Current <sup>(2)</sup><br>( $V_D = 12 \text{ V}$ , $I_G = 200 \mu\text{A}$ )                                                                            | $I_L$    | —        | 0.6       | 8.0        | mA            |
| Gate Trigger Voltage (Continuous dc) <sup>(2)</sup><br>( $V_D = 12 \text{ V}$ ; $R_L = 100 \Omega$ )<br>$T_J = 25^\circ\text{C}$<br>$T_J = -40^\circ\text{C}$ | $V_{GT}$ | 0.3<br>— | 0.65<br>— | 1.0<br>1.5 | Volts         |
| Gate Non-Trigger Voltage<br>( $V_D = 12 \text{ V}$ , $R_L = 100 \Omega$ )<br>$T_J = 110^\circ\text{C}$                                                        | $V_{GD}$ | 0.2      | —         | —          | Volts         |

## DYNAMIC CHARACTERISTICS

|                                                                                                                                                                |         |     |    |     |                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----|----|-----|------------------------|
| Critical Rate of Rise of Off-State Voltage<br>( $V_D = 67\% V_{DRM}$ , $R_{GK} = 1 \text{ k}\Omega$ , $C_{GK} = 0.1 \mu\text{F}$ , $T_J = 110^\circ\text{C}$ ) | $dv/dt$ | 5.0 | 15 | —   | $\text{V}/\mu\text{s}$ |
| Critical Rate of Rise of On-State Current<br>$IPK = 50 \text{ A}$ , $Pw = 40 \mu\text{sec}$ , $diG/dt = 1 \text{ A}/\mu\text{sec}$ , $I_{gt} = 10 \text{ mA}$  | $di/dt$ | —   | —  | 100 | $\text{A}/\mu\text{s}$ |

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

(1)  $R_{GK} = 1000 \text{ Ohms}$  included in measurement.

(2) Does not include  $R_{GK}$  in measurement.

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## Voltage Current Characteristic of SCR

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

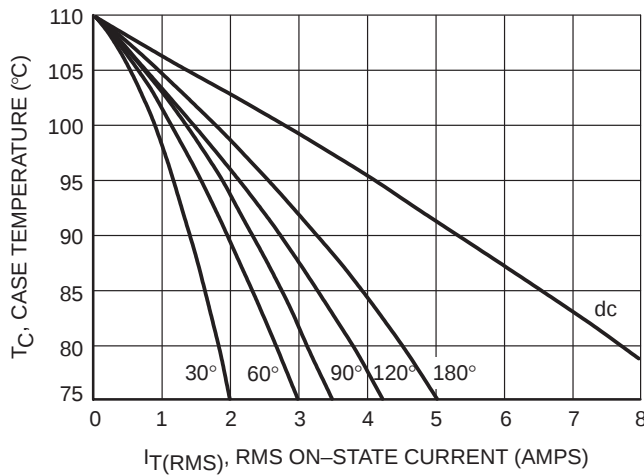
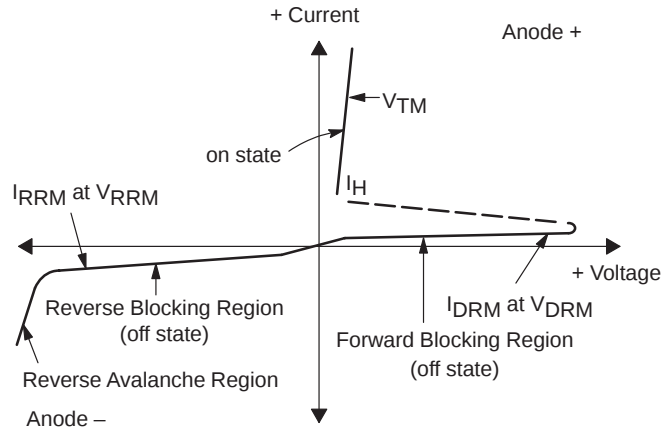


Figure 1. Typical RMS Current Derating

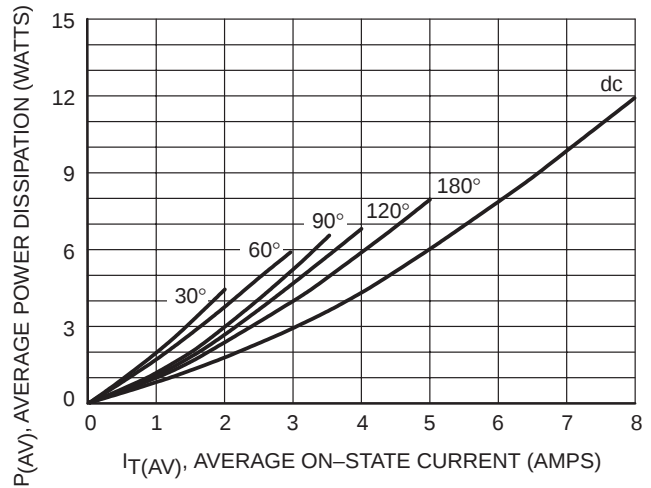


Figure 2. On-State Power Dissipation

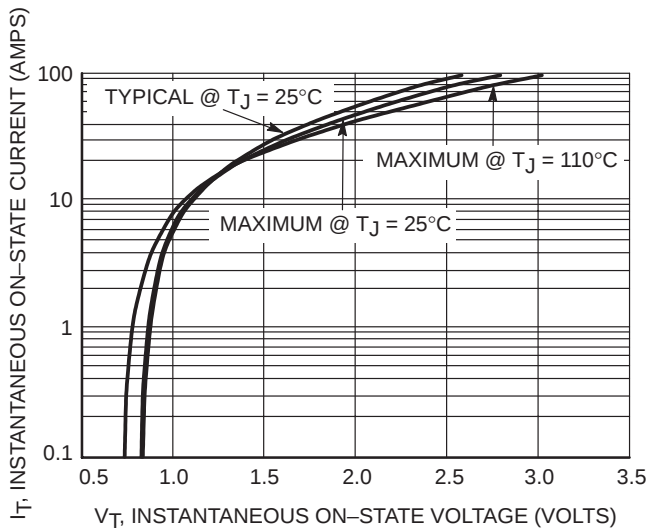


Figure 3. Typical On-State Characteristics

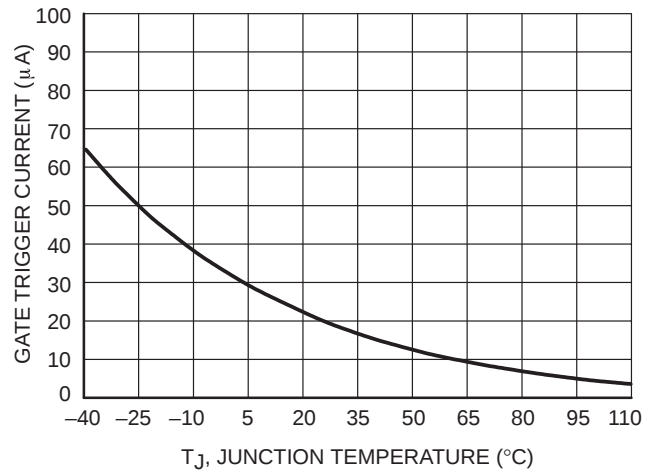
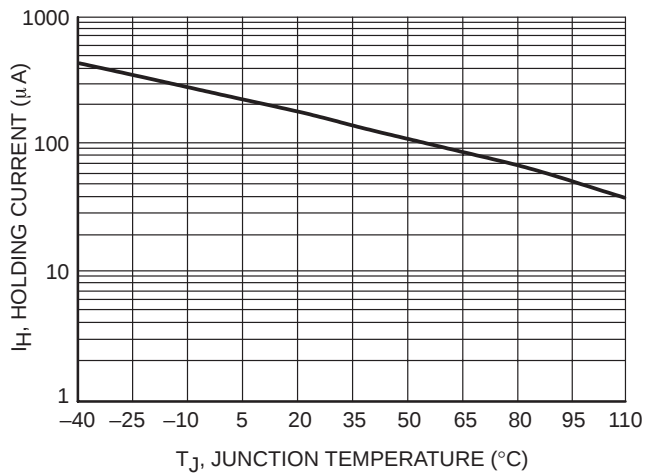
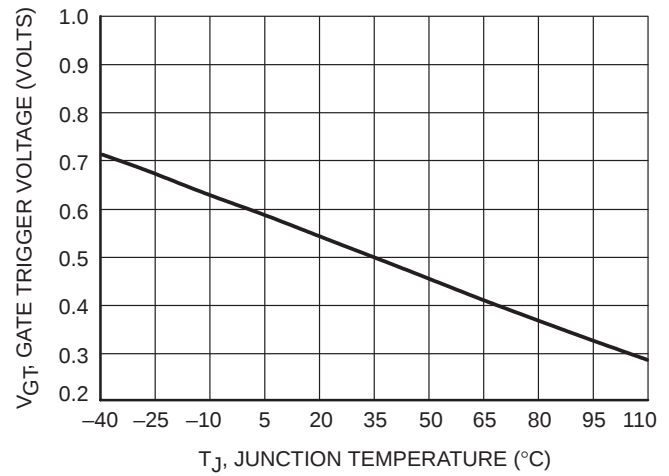


Figure 4. Typical Gate Trigger Current versus Junction Temperature

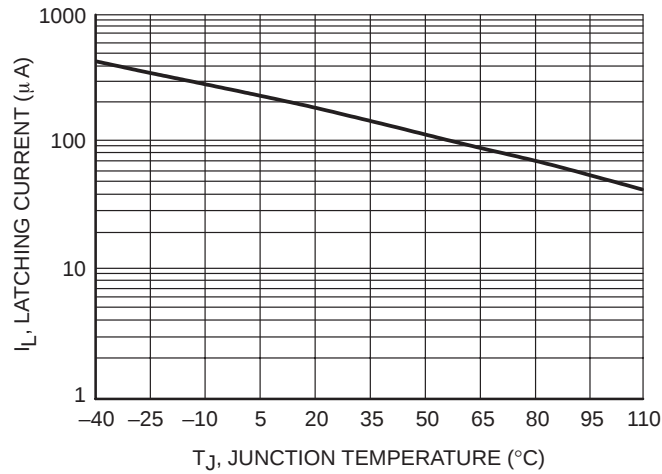
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**Figure 5. Typical Holding Current versus Junction Temperature**



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

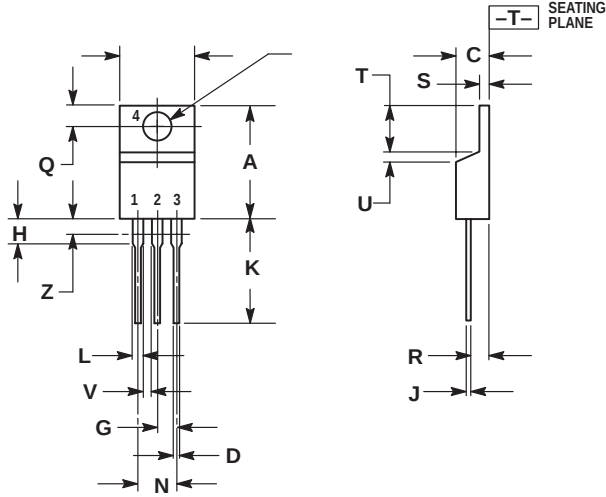


**Figure 7. Typical Latching Current versus Junction Temperature**

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## PACKAGE DIMENSIONS

### TO-220AB CASE 221A-09 ISSUE Z



#### 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  |

#### STYLE 3:

- PIN 1. CATHODE
- ANODE
- GATE
- ANODE

## **Notes**

## Notes

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