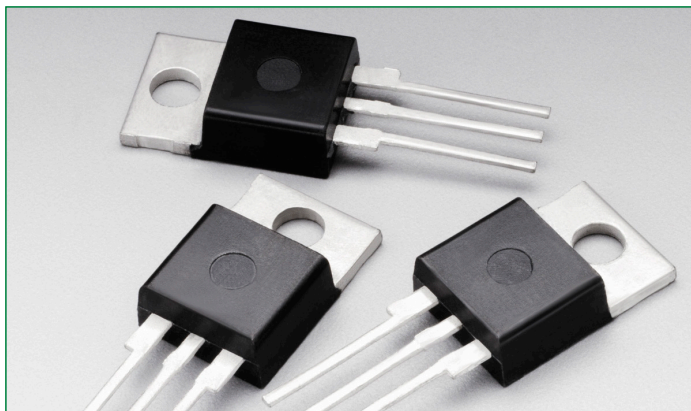
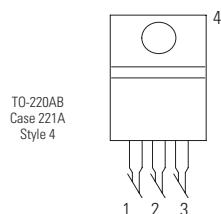


# MCR8SDG, MCR8SMG, MCR8SNG

## Sensitive Gate Silicon Controlled Rectifiers — 400 V - 800 V



### Pinout Diagram



**1,K:** Cathode; **2,4,A:** Anode; **3,G:** Gate

### Description

The MCR8SDG, MCR8SMG, and MCR8SNG are sensitive-gate silicon controlled rectifiers (SCRs) rated for blocking voltages up to 800 V. These devices provide 8 A RMS on-state current capability, 80 A surge current capability, and low gate trigger current. Glass-passivated junctions improve reliability and electrical stability. Typical applications include motor controls, heating controls, lighting controls, and power supplies.

### Features:

- Sensitive gate triggering
- Blocking voltage up to 800 V
- 8 A RMS on-state current capability
- 80 A surge current capability
- Glass-passivated junctions

### Benefits:

- Simplifies interfacing with low-power control circuits.
- Supports operation across a wide range of AC line voltages.
- Increased load handling capability
- Withstands inrush current events
- Enhances device reliability and long-term electrical stability

### Benefits:

- Motor controls
- Heating controls
- Power supplies
- Lighting controls and dimmers

### Product Summary

| Characteristic    | Value         | Unit    |
|-------------------|---------------|---------|
| $V_{RRM}/V_{DRM}$ | 400,600 & 800 | V       |
| $I_{T(RMS)}$      | 8             | A       |
| $I_{GT}$          | 60            | $\mu A$ |

**Maximum Ratings** ( $T_{vj} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

| Symbol              | Characteristics                                               | Conditions                                              |         | Value      | Units            |
|---------------------|---------------------------------------------------------------|---------------------------------------------------------|---------|------------|------------------|
| $V_{RRM} / V_{DRM}$ | Repetitive Peak Reverse / Peak Off-State Voltage <sup>1</sup> | – 40 to 110 °C,<br>Sine Wave, 50 to 60 Hz,<br>Gate Open | MCR8SDG | 400        | V                |
|                     |                                                               |                                                         | MCR8SMG | 600        |                  |
|                     |                                                               |                                                         | MCR8SNG | 800        |                  |
| $I_{T(RMS)}$        | R.M.S On-State Current                                        | 180° Conduction Angles; T <sub>C</sub> = 80 °C          |         | 8.0        | A                |
| $I_{TSM}$           | Non-Repetitive Surge On-State Current                         | 1/2 Cycle, Sine Wave 60 Hz, T <sub>vj</sub> = 110 °C    |         | 80         | A                |
| I <sup>2</sup> t    | I <sup>2</sup> t Value                                        | t <sub>p</sub> = 8.33 ms                                |         | 26.5       | A <sup>2</sup> s |
| P <sub>GM</sub>     | Peak Gate Power Dissipation                                   | Pulse Width ≤ 10 μs, T <sub>C</sub> = 80 °C             |         | 5.0        | W                |
| P <sub>G(AV)</sub>  | Average Gate Power Dissipation                                | t <sub>p</sub> = 8.3 ms, T <sub>C</sub> = 80 °C         |         | 0.5        | W                |
| I <sub>GM</sub>     | Peak Gate Current                                             | Pulse Width ≤ 10 μs, T <sub>C</sub> = 80 °C             |         | 2.0        | A                |
| T <sub>vj</sub>     | Virtual Junction Temperature Range                            | –                                                       |         | -40 to 110 | °C               |
| T <sub>stg</sub>    | Storage Temperature Range                                     | –                                                       |         | -40 to 150 | °C               |
| T <sub>L</sub>      | Maximum Lead Temperature for Soldering                        | 1/8" from Case for 10 Seconds                           |         | 260        | °C               |

**Electrical Characteristics - Static** ( $T_{vj} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

| Symbol                            | Characteristics                                          | Conditions                                                                                                          |                                                | Value |      |      | Units         |
|-----------------------------------|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------|-------|------|------|---------------|
|                                   |                                                          |                                                                                                                     |                                                | Min.  | Typ. | Max. |               |
| $I_{\text{DRM}} / I_{\text{RRM}}$ | Repetitive Peak Off-State / Reverse Current <sup>3</sup> | $V_{\text{AK}} = \text{Rated } V_{\text{DRM}} \text{ or } V_{\text{RRM}},$<br>$R_{\text{GK}} = 1.0 \text{ k}\Omega$ | $T_{\text{vj}} = 25 \text{ }^{\circ}\text{C}$  | –     | –    | 10   | $\mu\text{A}$ |
|                                   |                                                          |                                                                                                                     | $T_{\text{vj}} = 110 \text{ }^{\circ}\text{C}$ | –     | –    | 500  |               |
| $V_{\text{TM}}$                   | Peak Sinusoidal On-State Voltage                         | $I_{\text{TM}} = 16 \text{ A}$                                                                                      |                                                | –     | –    | 1.8  | V             |
| $I_{\text{GT}}$                   | Gate Trigger Current <sup>4</sup>                        | $V_{\text{D}} = 12 \text{ V}; R_{\text{L}} = 100 \text{ }\Omega$                                                    |                                                | 5.0   | 60   | 200  | $\mu\text{A}$ |
| $I_{\text{H}}$                    | Holding Current <sup>5</sup>                             | $V_{\text{D}} = 12 \text{ V}$ , Gate Open, Initiating Current = 200 mA                                              |                                                | –     | 1    | 6.0  | mA            |
| $I_{\text{L}}$                    | Latching Current <sup>5</sup>                            | $V_{\text{D}} = 12 \text{ V}, I_{\text{G}} = 200 \text{ }\mu\text{A}$                                               |                                                | –     | 1.2  | 8.0  | mA            |
| $V_{\text{GT}}$                   | Gate Trigger Voltage <sup>4</sup>                        | $V_{\text{D}} = 12 \text{ V}, R_{\text{L}} = 100 \text{ }\Omega$                                                    | $T_{\text{vj}} = 25 \text{ }^{\circ}\text{C}$  | 0.3   | 0.65 | 1.0  | V             |
|                                   |                                                          |                                                                                                                     | $T_{\text{vj}} = -40 \text{ }^{\circ}\text{C}$ | –     | –    | 1.5  | V             |
| $V_{\text{GD}}$                   | Gate Non-Trigger Voltage                                 | $V_{\text{D}} = 12 \text{ V}, R_{\text{L}} = 100 \text{ }\Omega$                                                    | $T_{\text{vj}} = 110 \text{ }^{\circ}\text{C}$ | 0.2   | –    | –    | V             |

**Electrical Characteristics - Dynamic** ( $T_{vj} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

| Symbol         | Characteristics                            | Conditions                                                                                                                      | Value |      |      | Units            |
|----------------|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-------|------|------|------------------|
|                |                                            |                                                                                                                                 | Min.  | Typ. | Max. |                  |
| $dv/dt_{(cr)}$ | Critical Rate Of Rise Of Off-State Voltage | $V_D = 67\% V_{DRM}$ , $R_{GK} = 1\text{ k}\Omega$ , $C_{GK} = 0.1\text{ }\mu\text{F}$ , $T_{vj} = 110\text{ }^{\circ}\text{C}$ | 5.0   | 15   | –    | V/ $\mu\text{s}$ |
| $di/dt_{(cr)}$ | Critical Rate Of Rise Of Off-State Current | $I_{PK} = 50\text{ A}$ , $P_w = 40\text{ }\mu\text{s}$ , $di_G/dt = 1\text{ A}/\mu\text{s}$ , $I_{gt} = 10\text{ mA}$           | –     | –    | 100  | A/ $\mu\text{s}$ |

**Thermal Characteristics**

| Symbol        | Characteristics                        | Conditions | Value |      |      | Units |
|---------------|----------------------------------------|------------|-------|------|------|-------|
|               |                                        |            | Min.  | Typ. | Max. |       |
| $R_{th(j-c)}$ | Thermal Resistance Junction to Case    | –          | –     | 2.2  | –    | K/W   |
| $R_{th(j-a)}$ | Thermal Resistance Junction to Ambient | –          | –     | 62.5 | –    | K/W   |

**Notes:** 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.

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

2. Ratings apply for negative gate voltage or  $R_{GK} = 1.0\text{ k}\Omega$ . Devices shall not have a positive gate voltage concurrently with a negative voltage on the anode. Devices should not be tested with a constant current source for forward and reverse blocking capability such that the voltage applied exceeds the rated blocking voltage.

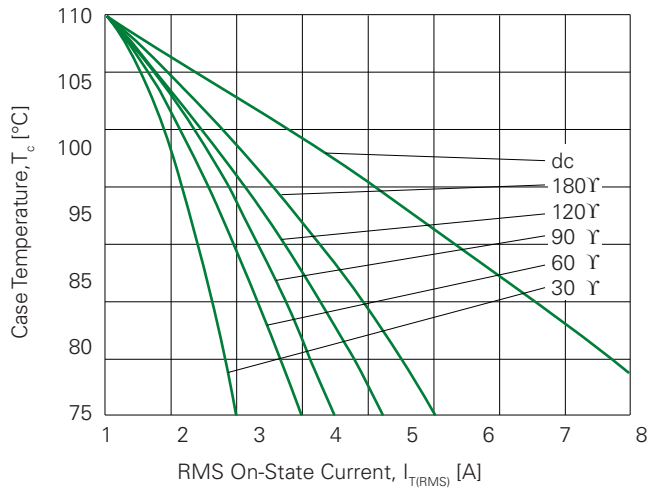
3. Pulse Test; Pulse Width  $\leq 2.0\text{ ms}$ , Duty Cycle  $\leq 2\%$ .

4.  $R_{GK}$  current not included in measurements.

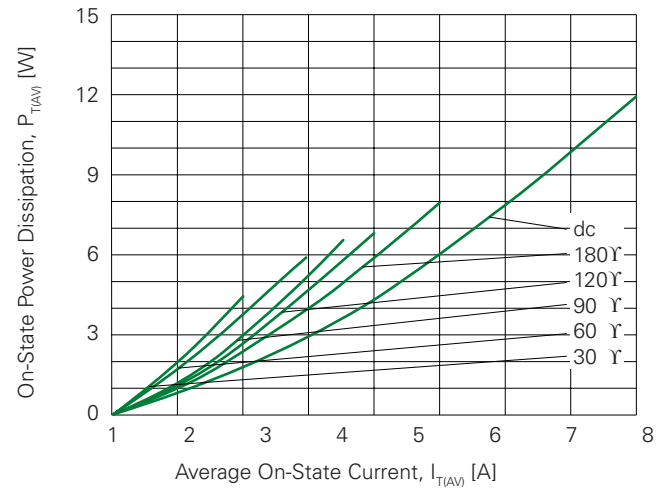
5.  $R_{GK} = 1000\text{ }\Omega$  included in measurement.

## Characteristic Curves

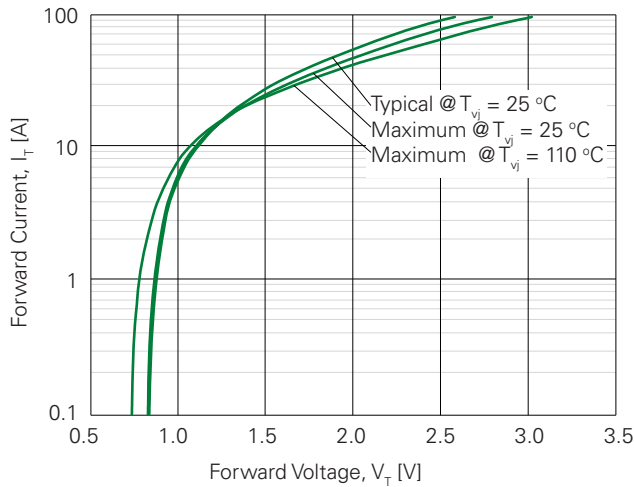
**Fig. 1. Average RMS On-State Current vs. Case Temperature**



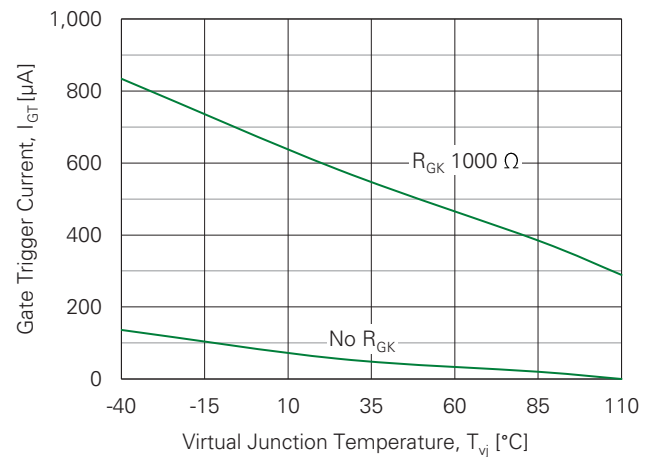
**Fig. 2. Average On-State Power Dissipation vs. Average On-State Current**



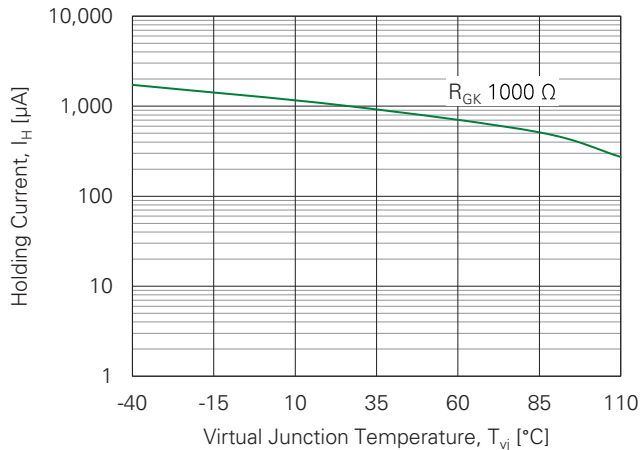
**Fig. 3. Typical Forward Characteristics**



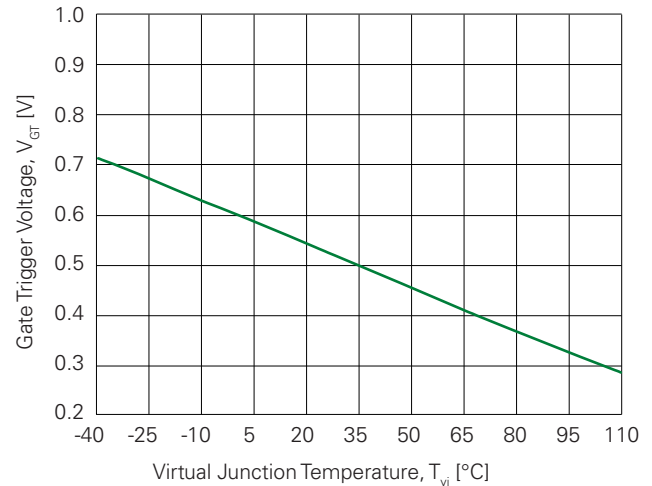
**Fig. 4. Gate Trigger Current vs. Virtual Junction Temperature**



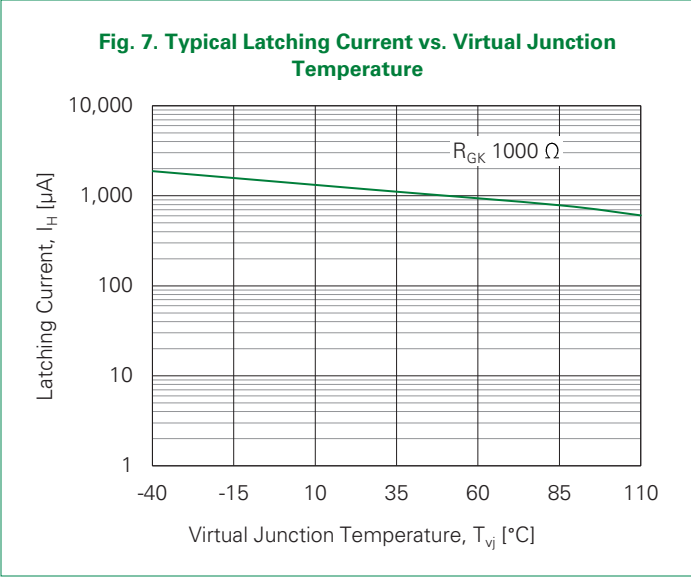
**Fig. 5. Typical Holding Current vs. Virtual Junction Temperature**



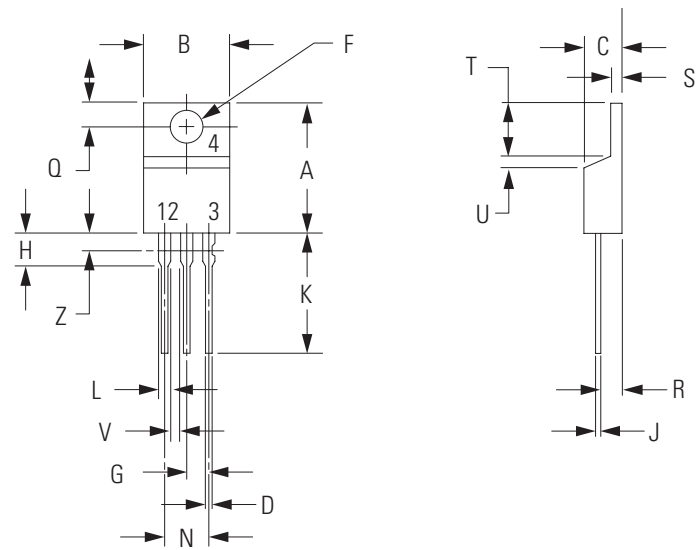
**Fig. 6. Typical Gate Trigger Voltage vs. Virtual Junction Temperature**



Characteristic Curves



Part Outline Drawing (TO-220 AB (R- Package) – Non-isolated Mounting Tab Common with Center Lead)

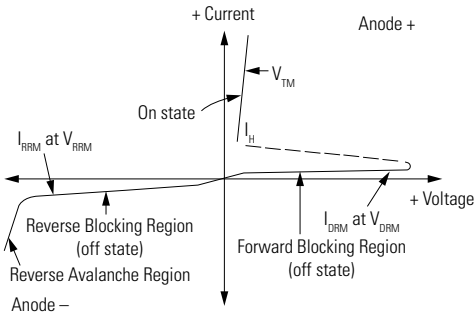


| Dim | Inches |       | Millimeters |       |
|-----|--------|-------|-------------|-------|
|     | Min    | Max   | Min         | Max   |
| A   | 0.590  | 0.620 | 14.99       | 15.75 |
| B   | 0.380  | 0.420 | 9.65        | 10.67 |
| C   | 0.178  | 0.188 | 4.52        | 4.78  |
| D   | 0.025  | 0.035 | 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  |

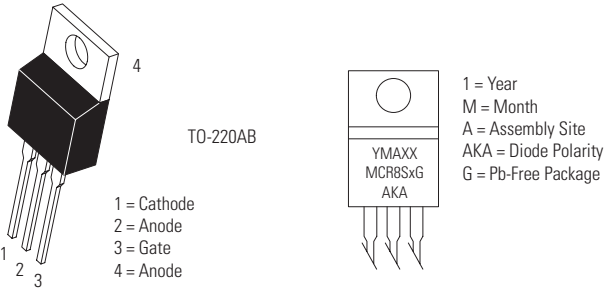
1. Dimensioning and tolerancing per ansi y14.5m, 1982.
- 2.Controlling dimension: inch.
- 3.Dimension z defines a zone where all body and lead irregularities are allowed.

Voltage Current Characteristics of SCR

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



Part Marking and Numbering



**Disclaimer Notice**  
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Read complete Disclaimer Notice at <http://www.littelfuse.com/disclaimer-electronics>.

Packing Options

| Device  | Package            | Shipping         |
|---------|--------------------|------------------|
| MCR8SDG | TO-220AB (Pb-Free) | 1000 Units / Box |
| MCR8SMG |                    |                  |
| MCR8SNG |                    |                  |



Part of:

