

## MCR310



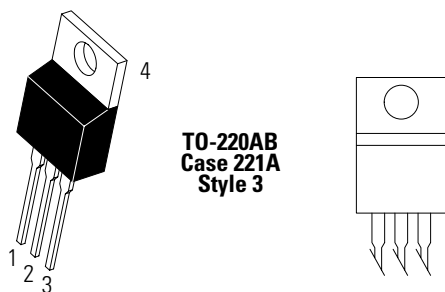
### Description

Designed for industrial and consumer applications such as temperature, light and speed control; process and remote controls; warning systems; capacitive discharge circuits and MPU interface.

### Features

- Center Gate Geometry for Uniform Current Density
- All Diffused and Glass-Passivated Junctions for Parameter Uniformity and Stability
- Small, Rugged, Thermowatt Construction for Low Thermal Resistance, High Heat Dissipation and Durability
- Low Trigger Currents, 200  $\mu$ A Maximum for Direct Driving from Integrated Circuits
- Pb-Free Packages are Available

### Pin Out



### Functional Diagram



### Additional Information



**Datasheet**



**Resources**



**Samples**

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

| Rating                                                                                           | Part Number                       | Symbol                                 | Value             | Unit                   |
|--------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------|-------------------|------------------------|
| Peak Repetitive Off-State Voltage (Note 1)<br>( $T_J = -40$ to $+125^\circ\text{C}$ , Gate Open) | MCR310-6<br>MCR310-8<br>MCR310-10 | $V_{\text{DRM}}$ ,<br>$V_{\text{RRM}}$ | 400<br>600<br>800 | V                      |
| On-State RMS Current ( $T_C = 75^\circ\text{C}$ )                                                |                                   | $I_{\text{T (RMS)}}$                   | 10                | A                      |
| Peak Non-Repetitive Surge Current (1/2 Cycle, 60 Hz, $T_J = -40$ to $110^\circ\text{C}$ )        |                                   | $I_{\text{TSM}}$                       | 100               | A                      |
| Circuit Fusing ( $t = 8.3$ ms)                                                                   |                                   | $I^2t$                                 | 40                | $\text{A}^2\text{sec}$ |
| Peak Gate Voltage ( $t \leq 10$ $\mu\text{s}$ )                                                  |                                   | $V_{\text{GM}}$                        | $\pm 5$           | V                      |
| Peak Gate Current ( $t \leq 10$ $\mu\text{s}$ )                                                  |                                   | $I_{\text{GM}}$                        | 1                 | A                      |
| Peak Gate Power ( $t \leq 10$ $\mu\text{s}$ )                                                    |                                   | $P_{\text{GM}}$                        | 5                 | W                      |
| Average Gate Power                                                                               |                                   | $P_{\text{G (AV)}}$                    | 0.75              | W                      |
| Operating Junction Temperature Range                                                             |                                   | $T_J$                                  | $-40$ to $+110$   | $^\circ\text{C}$       |
| Storage Temperature Range                                                                        |                                   | $T_{\text{stg}}$                       | $-40$ to $+150$   | $^\circ\text{C}$       |
| Mounting Torque                                                                                  |                                   | –                                      | 8.0               | in. lb.                |

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. VDRM and VRRM 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

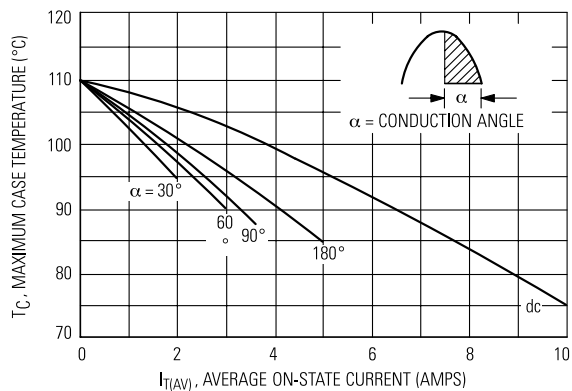
| Characteristic                          | Symbol                | Value | Unit               |
|-----------------------------------------|-----------------------|-------|--------------------|
| Thermal Resistance, Junction-to-Case    | $R_{\theta\text{JC}}$ | 2.2   | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta\text{JA}}$ | 60    |                    |

### Electrical Characteristics ( $T_C = 25^\circ\text{C}$ , $R_{\text{GK}} = 1$ k $\Omega$ unless otherwise noted)

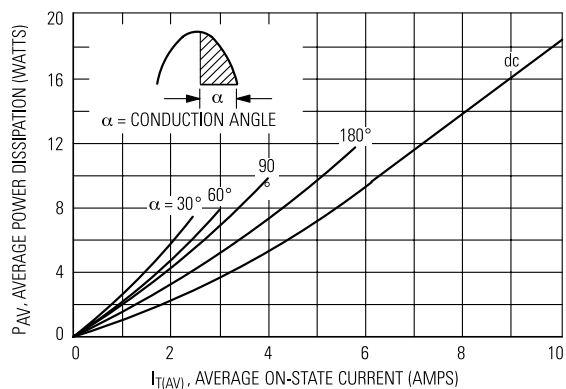
| Characteristic                                                                                                                                  |                           | Symbol           | Min      | Typ      | Max      | Unit             |
|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------------------|----------|----------|----------|------------------|
| Peak Forward Blocking Current (Note 1)<br>( $T_J = 110^\circ\text{C}$ , $V_D = \text{Rated } V_{\text{DRM}}$ )                                  | $T_C = 110^\circ\text{C}$ | $I_{\text{DRM}}$ | –        | –        | 500      | $\mu\text{A}$    |
|                                                                                                                                                 | $T_C = 25^\circ\text{C}$  |                  | –        | –        | 10       |                  |
| Peak Reverse Blocking Current (Note 1)<br>( $T_J = 110^\circ\text{C}$ , $V_R = \text{Rated } V_{\text{DRM}}$ )                                  | $T_C = 110^\circ\text{C}$ | $I_{\text{RRM}}$ | –        | –        | 500      | $\mu\text{A}$    |
|                                                                                                                                                 | $T_C = 25^\circ\text{C}$  |                  | –        | –        | 10       |                  |
| On-State Voltage ( $I_{\text{TM}} = 20$ A Peak, Pulse Width $\leq 1$ ms, Duty Cycle $\leq 2\%$ )                                                |                           | $V_{\text{TM}}$  | –        | 1.7      | 2.2      | V                |
| Gate Trigger Current Continuous dc (Note 2) ( $V_D = 12$ Vdc, $R_L = 100$ $\Omega$ )                                                            |                           | $I_{\text{GT}}$  | –        | 30       | 200      | $\mu\text{A}$    |
| Gate Trigger Voltage, Continuous dc<br>( $V_D = \text{Rated } V_{\text{DRM}}$ , $R_L = 10$ k $\Omega$ , $T_J = 110^\circ\text{C}$ )             |                           | $V_{\text{GT}}$  | –<br>0.1 | 0.5<br>– | 1.5<br>– | mA               |
| Holding Current ( $V_D = 12$ V, $I_{\text{TM}} = 100$ mA)                                                                                       |                           | $I_{\text{H}}$   | –        | –        | 6        | mA               |
| Critical Rate of Rise of Forward Blocking Voltage<br>( $V_D = \text{Rated } V_{\text{DRM}}$ , $T_J = 110^\circ\text{C}$ , Exponential Waveform) |                           | $dv/dt$          | –        | 10       | –        | V/ $\mu\text{s}$ |
| Gate Controlled Turn-On Time ( $V_D = \text{Rated } V_{\text{DRM}}$ , $I_{\text{TM}} = 20$ A, $I_{\text{G}} = 2$ mA)                            |                           | $t_{\text{gt}}$  | –        | 1        | –        | $\mu\text{s}$    |

1. Ratings apply for negative gate voltage or RGK = 1 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.
2. Does not include RGK current.

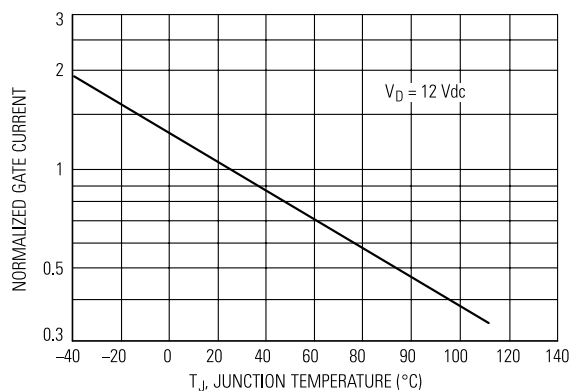
**Figure 1. Typical RMS Current Derating**



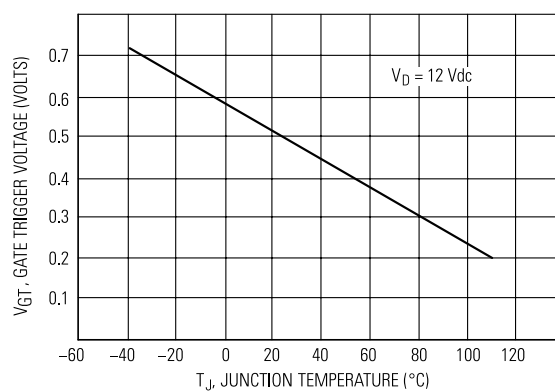
**Figure 2. Peak Capacitor Discharge Current Derating**



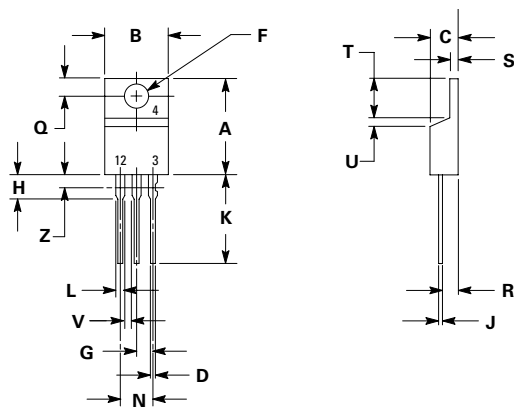
**Figure 3. Current Derating**



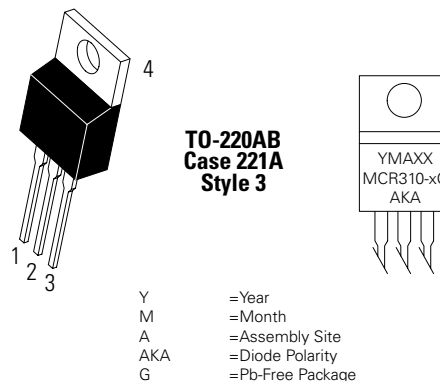
**Figure 4. Maximum Power Dissipation**



### Dimensions



### Part Marking System



| 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              | Cathode |
| 2              | Anode   |
| 3              | Gate    |
| 4              | Anode   |

### Ordering Information

| Device     | Package            | Shipping        |
|------------|--------------------|-----------------|
| MCR310-6   | TO-220AB           | 500 Units / Box |
| MCR310-6G  | TO-220AB (Pb-Free) |                 |
| MCR310-8   | TO-220AB           |                 |
| MCR310-8G  | TO-220AB (Pb-Free) |                 |
| MCR310-10  | TO-220AB           |                 |
| MCR310-10G | TO-220AB (Pb-Free) |                 |

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