

# Silicon Controlled Rectifiers

## Reverse Blocking Thyristors

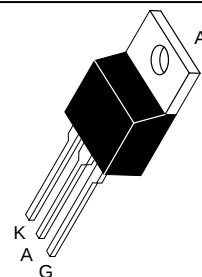
Designed primarily for half-wave ac control applications, such as motor controls, heating controls, and power supplies; or wherever half-wave, silicon gate-controlled devices are needed.

- Blocking Voltage to 800 Volts
- On-State Current Rating of 25 Amperes RMS
- High Surge Current Capability — 300 Amperes
- Industry Standard TO-220AB Package for Ease of Design
- Glass Passivated Junctions for Reliability and Uniformity

### MCR25 SERIES\*

\*Motorola preferred devices

SCRs  
25 AMPERES RMS  
400 thru 800  
VOLTS



CASE 221A-06  
(TO-220AB)  
Style 3

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

| Parameter                                                                                                          | Symbol                               | Value             | Unit                   |
|--------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------|------------------------|
| Peak Repetitive Off-State Voltage (1)<br>Peak Repetitive Reverse Voltage<br>( $T_J = -40$ to $125^\circ\text{C}$ ) | $V_{\text{DRM}}$<br>$V_{\text{RRM}}$ | 400<br>600<br>800 | Volts                  |
| On-State RMS Current<br>(All Conduction Angles)                                                                    | $I_{\text{T(RMS)}}$                  | 25                | A                      |
| Peak Non-repetitive Surge Current<br>(One Half Cycle, 60 Hz, $T_J = 125^\circ\text{C}$ )                           | $I_{\text{TSM}}$                     | 300               | A                      |
| Circuit Fusing Consideration ( $t = 8.3$ ms)                                                                       | $I^2t$                               | 373               | $\text{A}^2\text{sec}$ |
| Peak Gate Power (Pulse Width $\leq 1.0$ $\mu\text{s}$ , $T_C = 80^\circ\text{C}$ )                                 | $P_{\text{GM}}$                      | 20.0              | Watts                  |
| Average Gate Power ( $t = 8.3$ ms, $T_C = 80^\circ\text{C}$ )                                                      | $P_{\text{G(AV)}}$                   | 0.5               | Watts                  |
| Peak Gate Current (Pulse Width $\leq 1.0$ $\mu\text{s}$ , $T_C = 80^\circ\text{C}$ )                               | $I_{\text{GM}}$                      | 2.0               | A                      |
| Operating Junction Temperature Range                                                                               | $T_J$                                | $-40$ to $+125$   | $^\circ\text{C}$       |
| Storage Temperature Range                                                                                          | $T_{\text{stg}}$                     | $-40$ to $+150$   | $^\circ\text{C}$       |

#### THERMAL CHARACTERISTICS

|                                                                              |                                                |             |                    |
|------------------------------------------------------------------------------|------------------------------------------------|-------------|--------------------|
| Thermal Resistance — Junction to Case<br>— Junction to Ambient               | $R_{\theta\text{JC}}$<br>$R_{\theta\text{JA}}$ | 1.5<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)  $V_{\text{DRM}}$  and  $V_{\text{RRM}}$  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.

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

REV 2

## MCR25 SERIES

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

| Characteristic                                                                                                                               | Symbol    | Min | Typ  | Max  | Unit             |
|----------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----|------|------|------------------|
| <b>OFF CHARACTERISTICS</b>                                                                                                                   |           |     |      |      |                  |
| Peak Forward Blocking Current                                                                                                                | $I_{DRM}$ | —   | —    | 0.01 | mA               |
| Peak Reverse Blocking Current<br>( $V_{AK} = \text{Rated } V_{DRM} \text{ or } V_{RRM}$ , Gate Open)                                         | $I_{RRM}$ | —   | —    | 2.0  | mA               |
| <b>ON CHARACTERISTICS</b>                                                                                                                    |           |     |      |      |                  |
| Peak On-State Voltage* ( $I_{TM} = 50 \text{ A}$ )                                                                                           | $V_{TM}$  | —   | —    | 1.8  | Volts            |
| Gate Trigger Current (Continuous dc) ( $V_D = 12 \text{ V}$ , $R_L = 100 \Omega$ )                                                           | $I_{GT}$  | 4.0 | 10   | 30   | mA               |
| Gate Trigger Voltage (Continuous dc) ( $V_D = 12 \text{ V}$ , $R_L = 100 \Omega$ )                                                           | $V_{GT}$  | 0.5 | 0.65 | 1.0  | Volts            |
| Hold Current (Anode Voltage = 12 V)                                                                                                          | $I_H$     | 5.0 | 25   | 40   | mA               |
| <b>DYNAMIC CHARACTERISTICS</b>                                                                                                               |           |     |      |      |                  |
| Critical Rate of Rise of Off-State Voltage<br>( $V_D = \text{Rated } V_{DRM}$ , Exponential Waveform, Gate Open, $T_J = 125^\circ\text{C}$ ) | $dv/dt$   | 50  | 200  | —    | V/ $\mu\text{s}$ |

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

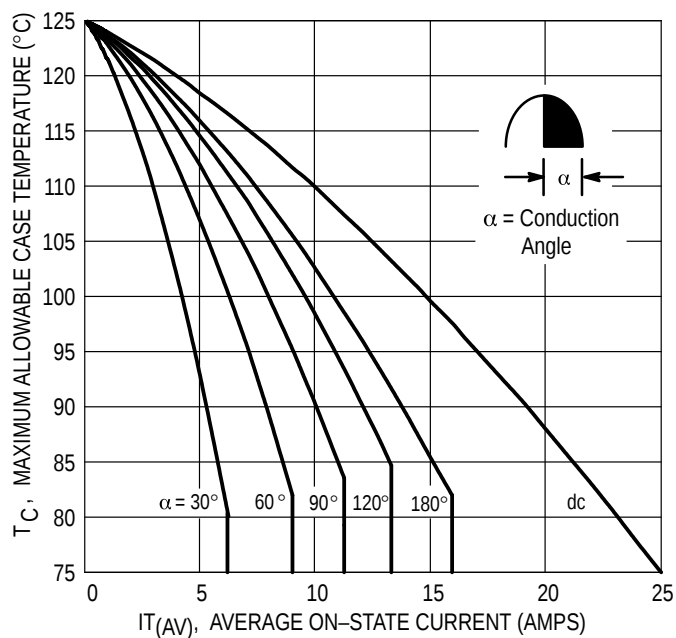


Figure 1. Average Current Derating

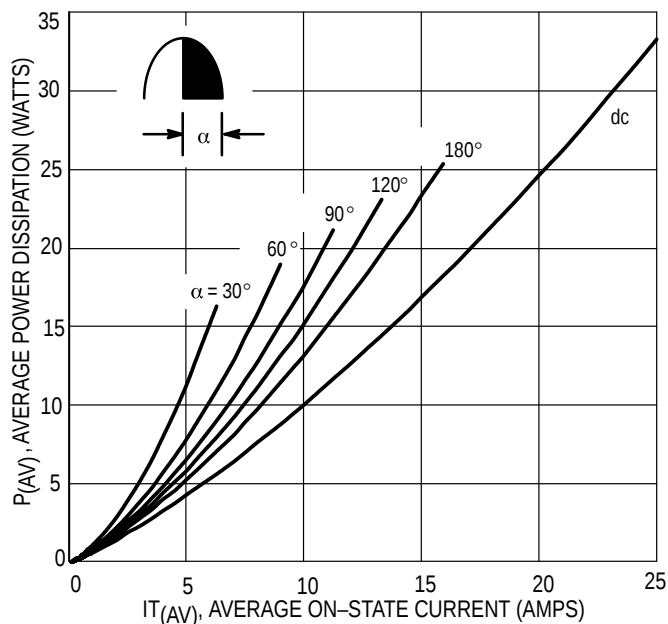


Figure 2. Maximum On-State Power Dissipation

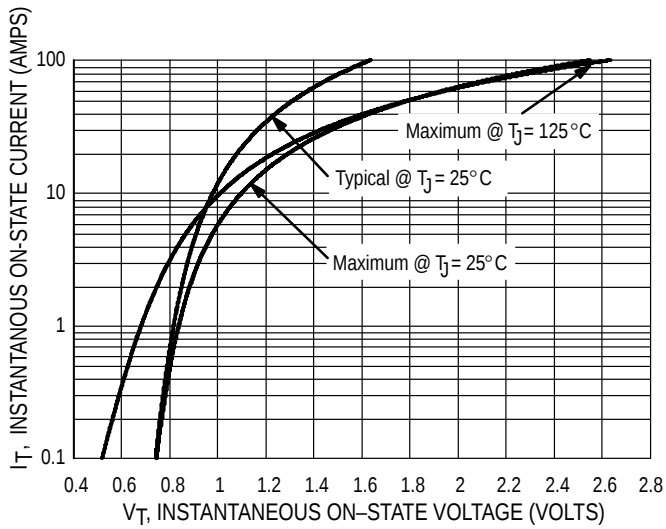


Figure 3. On-State Characteristics

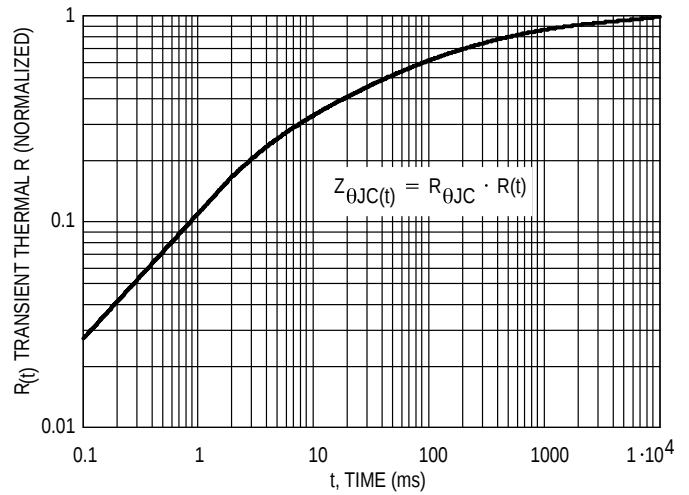


Figure 4. Transient Thermal Response

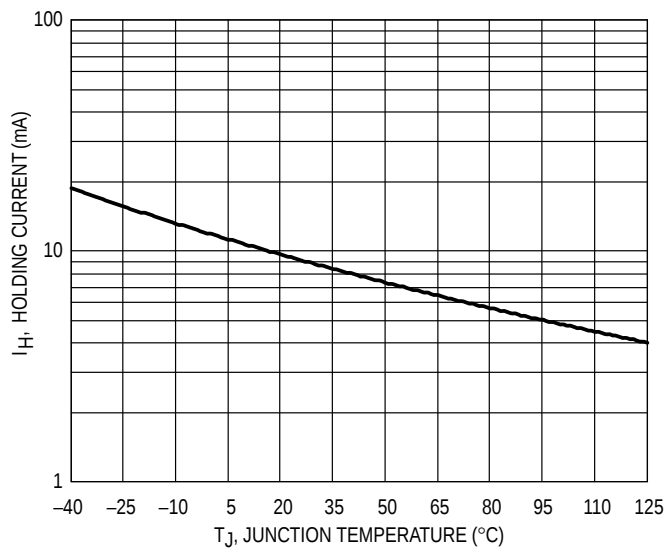


Figure 5. Typical Holding Current Versus Junction Temperature

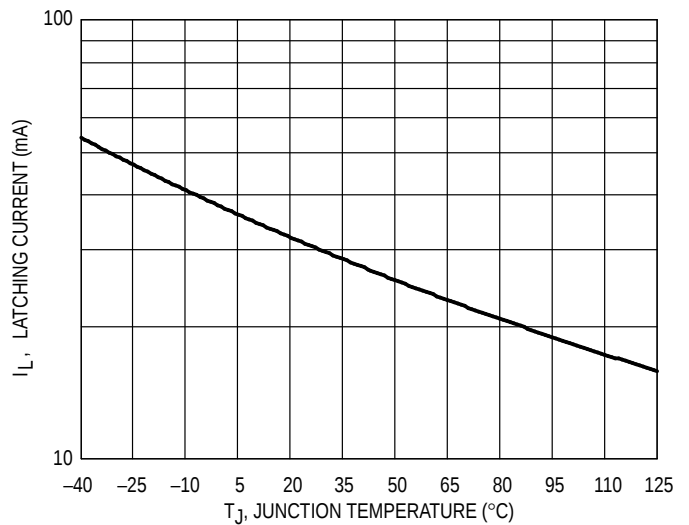


Figure 6. Typical Latching Current Versus Junction Temperature

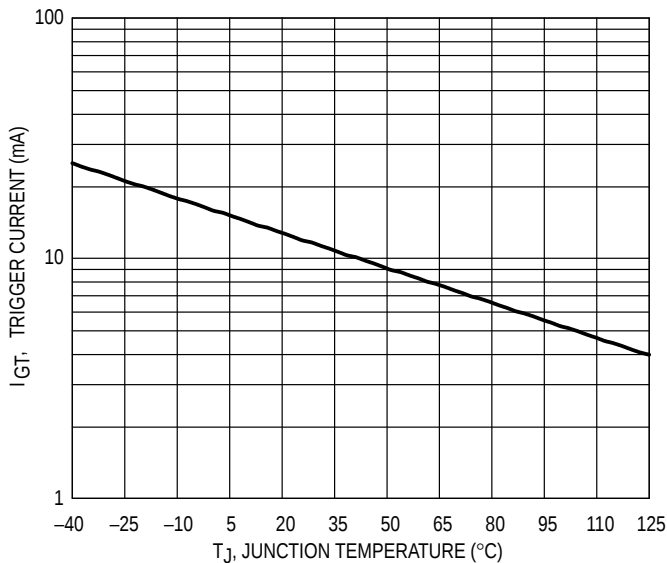


Figure 7. Typical Gate Trigger Current Versus Junction Temperature

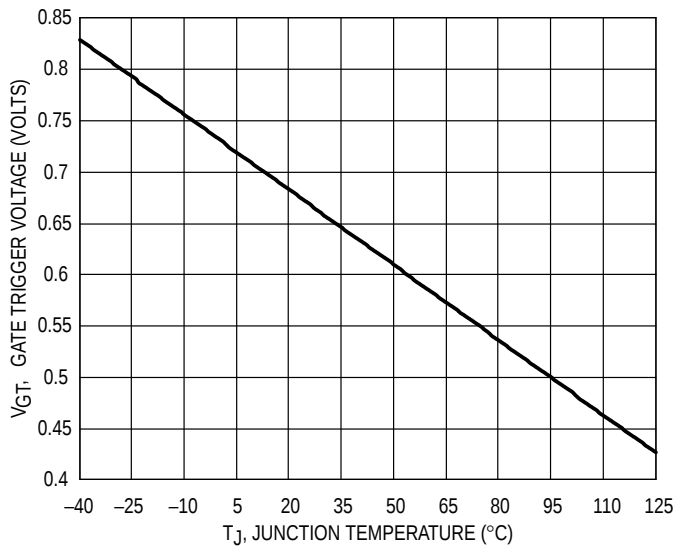
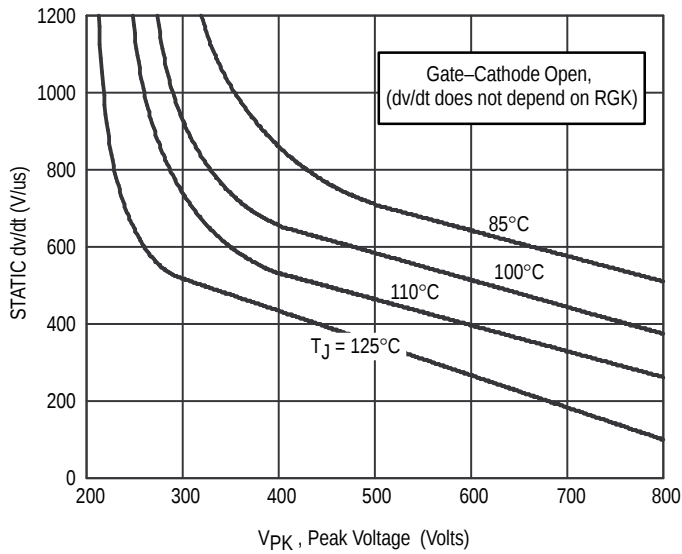
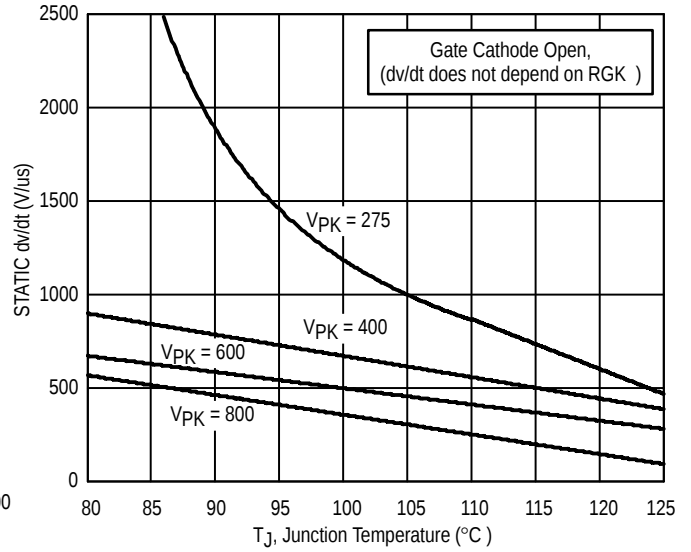


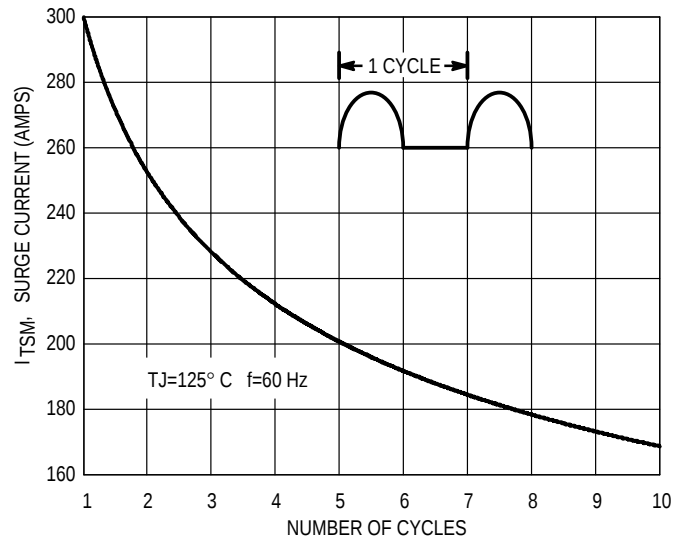
Figure 8. Typical Gate Trigger Voltage Versus Junction Temperature



**Figure 9. Typical Exponential Static dv/dt Versus Peak Voltage.**

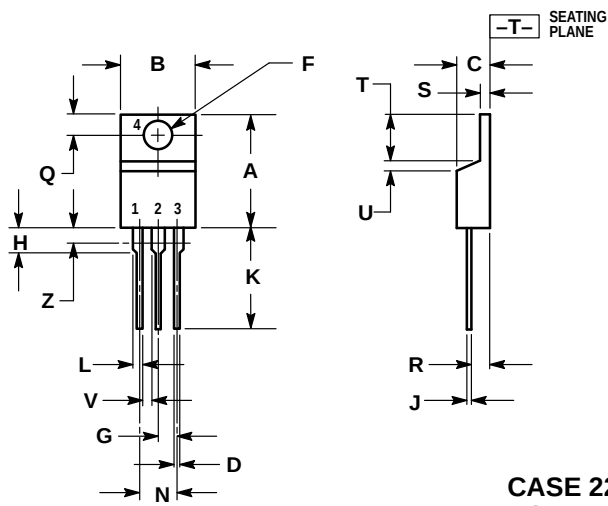


**Figure 10. Typical Exponential Static dv/dt Versus Junction Temperature.**



**Figure 11. Maximum Non-Repetitive Surge Current**

## PACKAGE DIMENSIONS



**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  |

## MCR25 SERIES

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**MOTOROLA**



MCR25/D

