# MCR25D, MCR25M, MCR25N

**Preferred Device**

# 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.

### Features

- Blocking Voltage to 800 Volts
- On-State Current Rating of 25 Amperes RMS
- High Surge Current Capability − 300 Amperes
- Rugged, Economical TO−220AB Package
- Glass Passivated Junctions for Reliability and Uniformity
- Minimum and Maximum Values of $I_{GT}$, $V_{GT}$, and $I_H$ Specified for Ease of Design
- High Immunity to dv/dt − 100 V/μsec Minimum @ 125°C
- Pb−Free Packages are Available*

**MAXIMUM RATINGS** ($T_J$ = 25°C unless otherwise noted)

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Peak Repetitive Off−State Voltage (Note 1) ($T_J$ = −40 to 125°C, Sine Wave, 50 to 60 Hz, Gate Open) MCR25D MCR25M MCR25N | $V_{DRM}$, $V_{RRM}$ | 400 600 800 | V |
| On-State RMS Current (180° Conduction Angles; $T_C$ = 80°C) | $I_{T(RMS)}$ | 25 | A |
| Peak Non-repetitive Surge Current (1/2 Cycle, Sine Wave 60 Hz, $T_J$ = 125°C) | $I_{TSM}$ | 300 | A |
| Circuit Fusing Consideration (t = 8.3 ms) | $I^2t$ | 373 | $A^2$sec |
| Forward Peak Gate Power (Pulse Width ≤ 1.0 μs, $T_C$ = 80°C) | $P_{GM}$ | 20.0 | W |
| Forward Average Gate Power (t = 8.3 ms, $T_C$ = 80°C) | $P_{G(AV)}$ | 0.5 | W |
| Forward Peak Gate Current (Pulse Width ≤ 1.0 μs, $T_C$ = 80°C) | $I_{GM}$ | 2.0 | A |
| Operating Junction Temperature Range | $T_J$ | −40 to +125 | °C |
| Storage Temperature Range | $T_{stg}$ | −40 to +150 | °C |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

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.

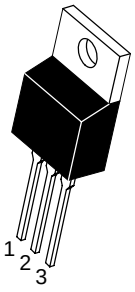
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

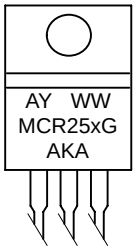
**ON Semiconductor®**

**http://onsemi.com**

**SCRs**
**25 AMPERES RMS**
**400 thru 800 VOLTS**


**MARKING DIAGRAM**




**TO−220AB**
**CASE 221A−09**
**STYLE 3**

A = Assembly Location
Y = Year
WW = Work Week
x = D, M, or N
G = Pb−Free Package
AKA = Diode Polarity

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

**ORDERING INFORMATION**

| Device | Package | Shipping |
|---|---|---|
| MCR25D | TO−220AB | 50 Units / Rail |
| MCR25DG | TO−220AB (Pb−Free) | 50 Units / Rail |
| MCR25M | TO−220AB | 50 Units / Rail |
| MCR25MG | TO−220AB (Pb−Free) | 50 Units / Rail |
| MCR25N | TO−220AB | 50 Units / Rail |
| MCR25NG | TO−220AB (Pb−Free) | 50 Units / Rail |

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

## THERMAL CHARACTERISTICS

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Thermal Resistance, | Junction−to−Case<br>Junction−to−Ambient | $R_{\theta JC}$<br>$R_{\theta JA}$ | 1.5<br>62.5 | °C/W |
| Maximum Lead Temperature for Soldering Purposes 1/8″ from Case for 10 Seconds | | $T_L$ | 260 | °C |

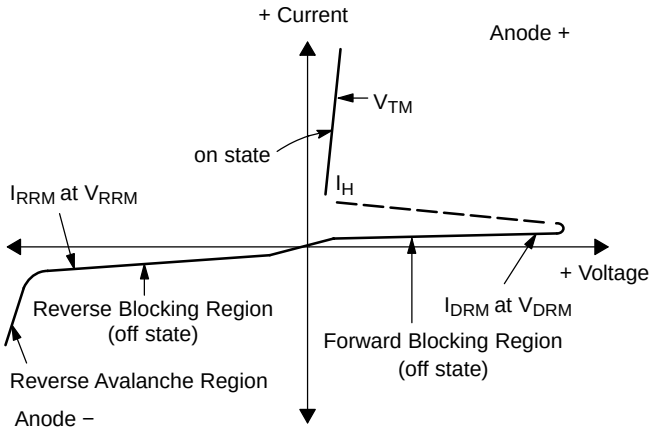
## ELECTRICAL CHARACTERISTICS ($T_J$ = 25°C unless otherwise noted)

| Characteristic | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Peak Repetitive Forward or Reverse Blocking Current<br>($V_{AK}$ = Rated $V_{DRM}$ or $V_{RRM}$, Gate Open) | $T_J$ = 25°C<br>$T_J$ = 125°C | $I_{DRM}$<br>$I_{RRM}$ | −<br>− | −<br>− | 0.01<br>2.0 | mA |
| **ON CHARACTERISTICS** | | | | | | |
| Peak Forward On-State Voltage (Note 2)<br>($I_{TM}$ = 50 A) | | $V_{TM}$ | − | − | 1.8 | V |
| Gate Trigger Current (Continuous dc)<br>($V_D$ = 12 V, $R_L$ = 100 Ω) | | $I_{GT}$ | 4.0 | 12 | 30 | mA |
| Gate Trigger Voltage (Continuous dc)<br>($V_D$ = 12 V, $R_L$ = 100 Ω) | | $V_{GT}$ | 0.5 | 0.67 | 1.0 | V |
| Holding Current<br>($V_D$ =12 Vdc, Initiating Current = 200 mA, Gate Open) | | $I_H$ | 5.0 | 13 | 40 | mA |
| Latching Current<br>($V_D$ = 12 V, $I_G$ = 30 mA) | | $I_L$ | − | 35 | 80 | mA |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| Critical Rate of Rise of Off−State Voltage<br>($V_D$ = 67% of Rated $V_{DRM}$, Exponential Waveform, Gate Open, $T_J$ = 125°C) | | dv/dt | 100 | 250 | − | V/μs |
| Critical Rate of Rise of On−State Current<br>($I_{PK}$ = 50 A, Pw = 30 μsec, diG/dt = 1 A/μsec, Igt = 50 mA) | | di/dt | − | − | 50 | A/μs |

2. Indicates Pulse Test: Pulse Width ≤ 2.0 ms, Duty Cycle ≤ 2%.

## 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 |



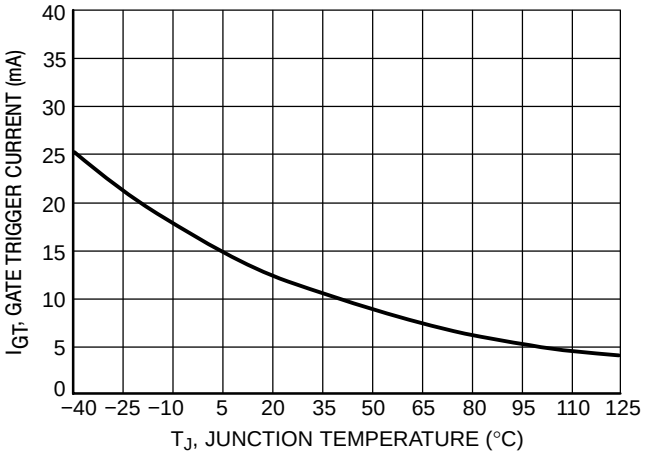



**Figure 1. Typical Gate Trigger Current versus Junction Temperature**

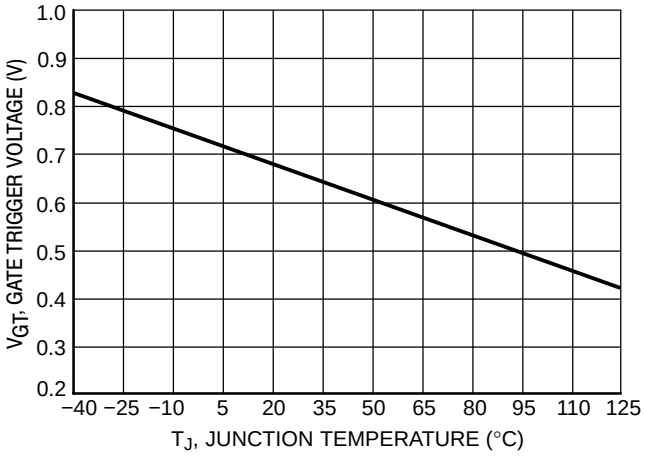



**Figure 2. Typical Gate Trigger Voltage versus Junction Temperature**

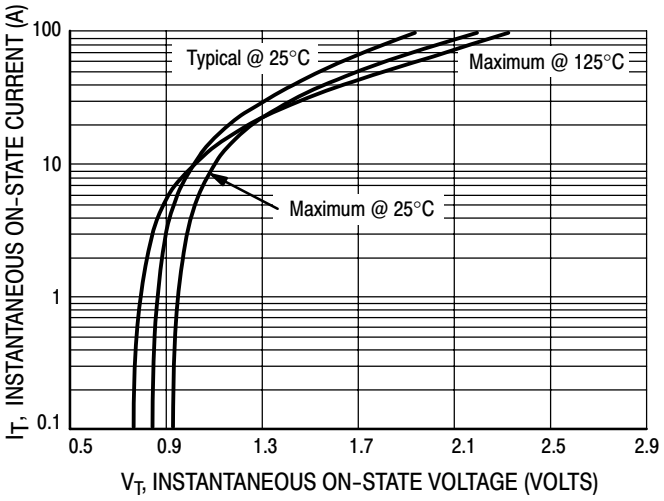



**Figure 3. Typical On−State Characteristics**

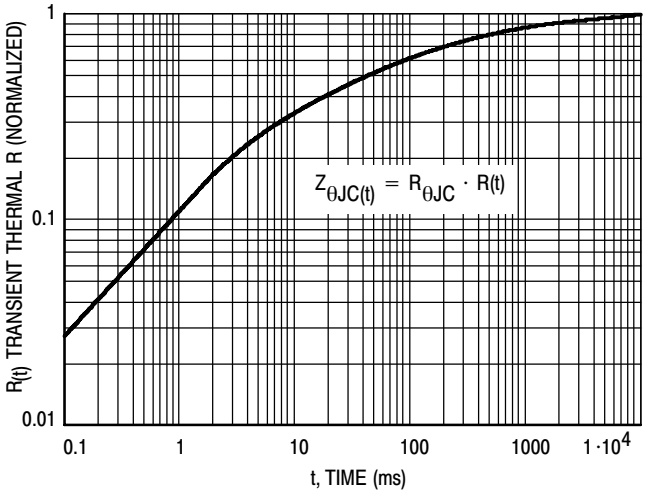



**Figure 4. Transient Thermal Response**

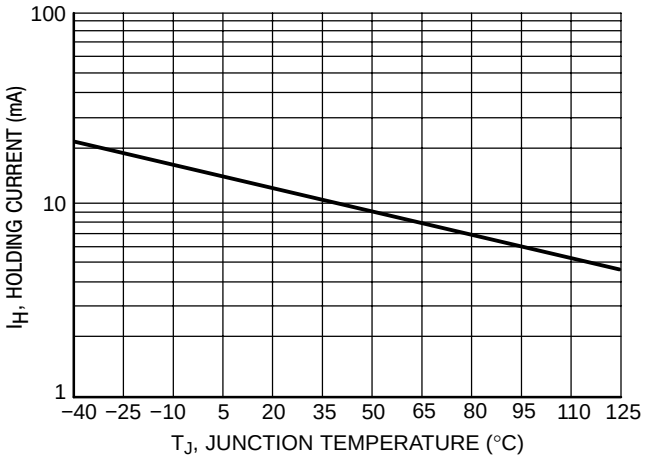



**Figure 5. Typical Holding Current versus Junction Temperature**

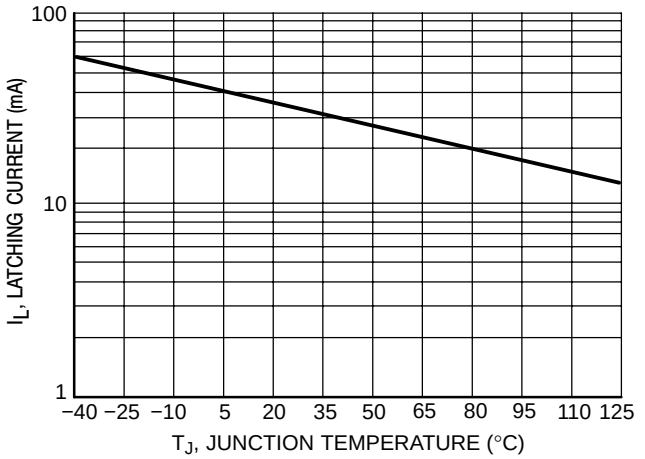



**Figure 6. Typical Latching Current versus Junction Temperature**

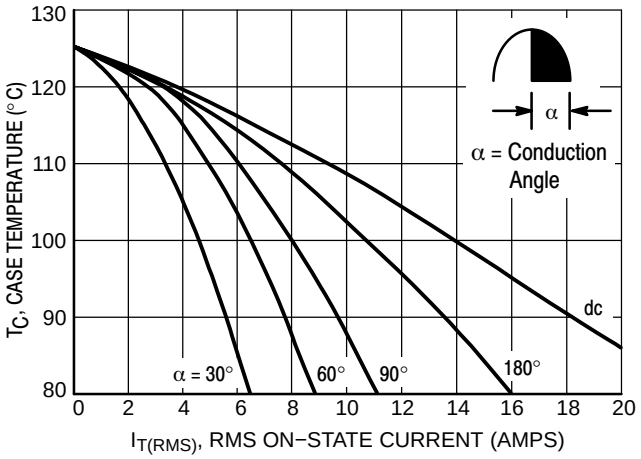



**Figure 7. Typical RMS Current Derating**

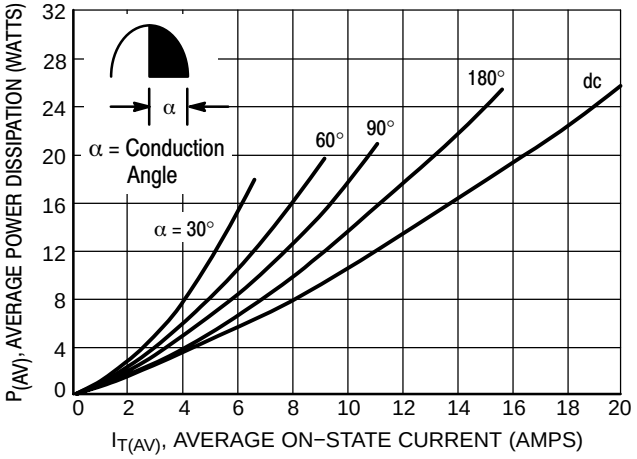



**Figure 8. On State Power Dissipation**

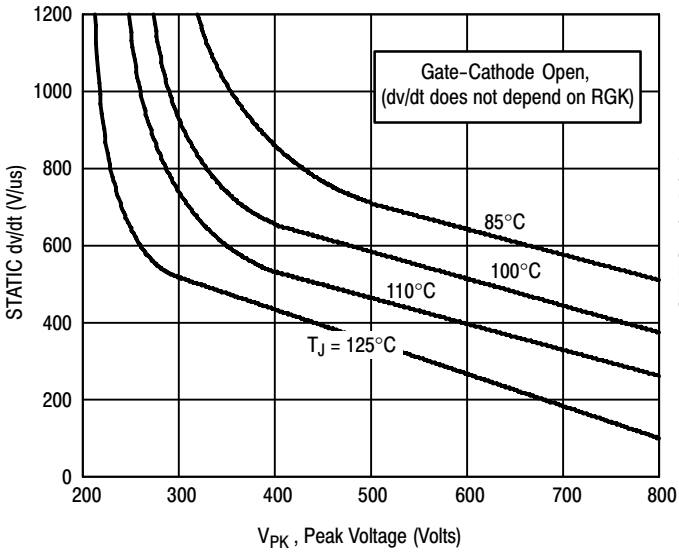



**Figure 9. Typical Exponential Static dv/dt Versus Peak Voltage**

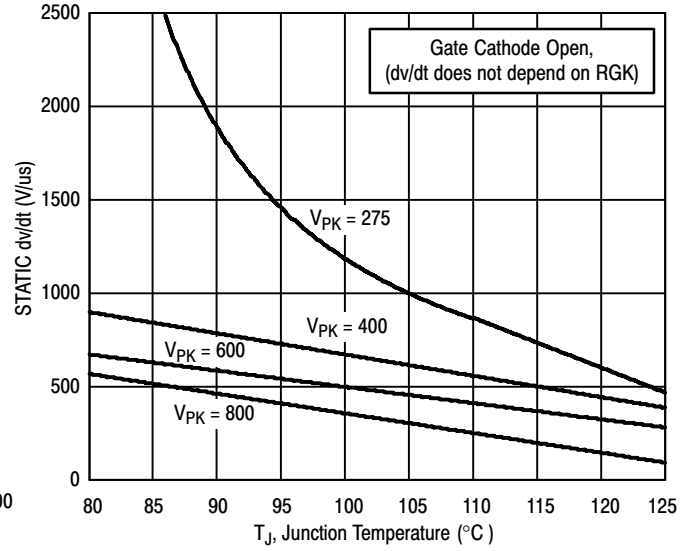



**Figure 10. Typical Exponential Static dv/dt Versus Junction Temperature**

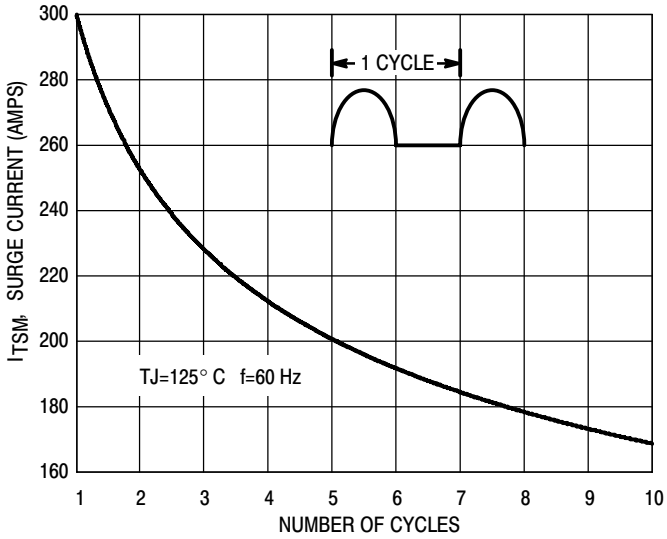
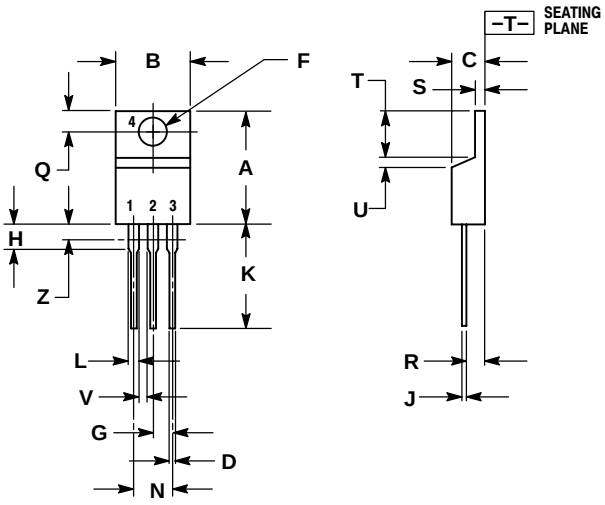



**Figure 11. Maximum Non−Repetitive Surge Current**

## PACKAGE DIMENSIONS

**TO−220AB**
CASE 221A−09
ISSUE AA




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.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | 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
2. ANODE
3. GATE
4. ANODE



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