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MCR25DG, MCR25MG, MCR25NG

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/ μ sec Minimum @ 125°C
- These are Pb-Free Devices*

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

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, 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.



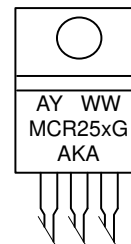
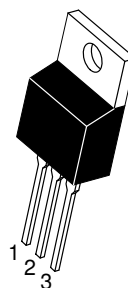
ON Semiconductor®

www.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

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

ORDERING INFORMATION

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

MCR25DG, MCR25MG, MCR25NG

THERMAL CHARACTERISTICS

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

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

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

OFF CHARACTERISTICS

| | | | | | |
|--|-----------|---|---|------|----------------------|
| Peak Repetitive Forward or Reverse Blocking Current ($V_{AK} = \text{Rated } V_{DRM} \text{ or } V_{RRM}$, Gate Open) | I_{DRM} | - | - | 0.01 | mA |
| | I_{RRM} | - | - | 2.0 | mA |
| | | | | | $T_J = 25^{\circ}C$ |
| | | | | | $T_J = 125^{\circ}C$ |

ON CHARACTERISTICS

| | | | | | |
|---|----------|-----|------|-----|----|
| Peak Forward On-State Voltage (Note 2) ($I_{TM} = 50 \text{ A}$) | V_{TM} | - | - | 1.8 | V |
| Gate Trigger Current (Continuous dc) ($V_D = 12 \text{ V}$, $R_L = 100 \Omega$) | I_{GT} | 4.0 | 12 | 30 | mA |
| Gate Trigger Voltage (Continuous dc) ($V_D = 12 \text{ V}$, $R_L = 100 \Omega$) | V_{GT} | 0.5 | 0.67 | 1.0 | V |
| Holding Current ($V_D = 12 \text{ Vdc}$, Initiating Current = 200 mA, Gate Open) | I_H | 5.0 | 13 | 40 | mA |
| Latching Current ($V_D = 12 \text{ V}$, $I_G = 30 \text{ mA}$) | I_L | - | 35 | 80 | mA |

DYNAMIC CHARACTERISTICS

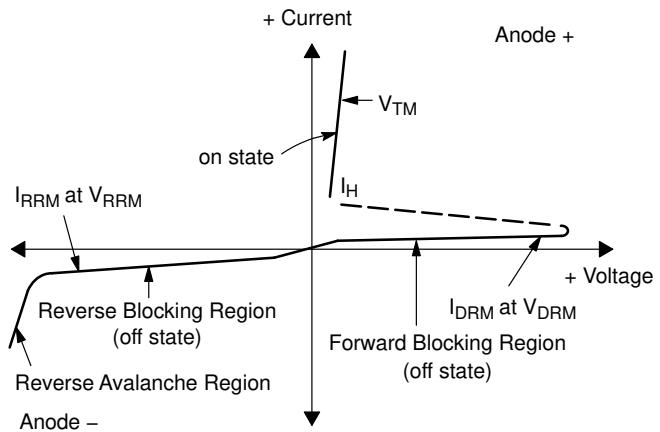
| | | | | | |
|---|---------|-----|-----|----|-----------|
| Critical Rate of Rise of Off-State Voltage ($V_D = 67\%$ of Rated V_{DRM} , Exponential Waveform, Gate Open, $T_J = 125^{\circ}C$) | dv/dt | 100 | 250 | - | $V/\mu s$ |
| Critical Rate of Rise of On-State Current ($I_{PK} = 50 \text{ A}$, $P_w = 30 \mu s$, $diG/dt = 1 \text{ A}/\mu s$, $I_{gt} = 50 \text{ mA}$) | di/dt | - | - | 50 | $A/\mu s$ |

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

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 |



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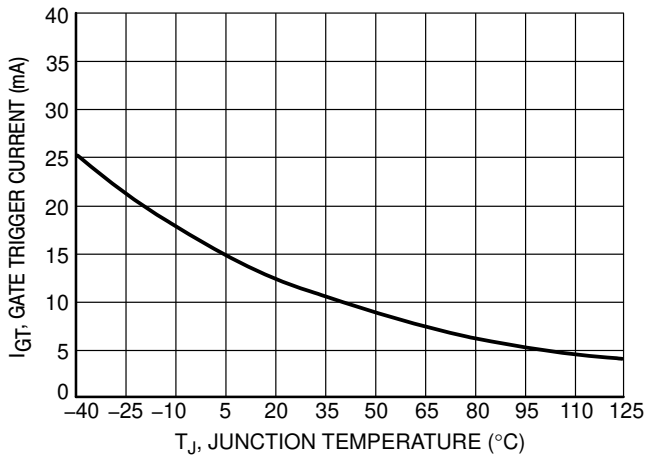


Figure 1. Typical Gate Trigger Current versus Junction Temperature

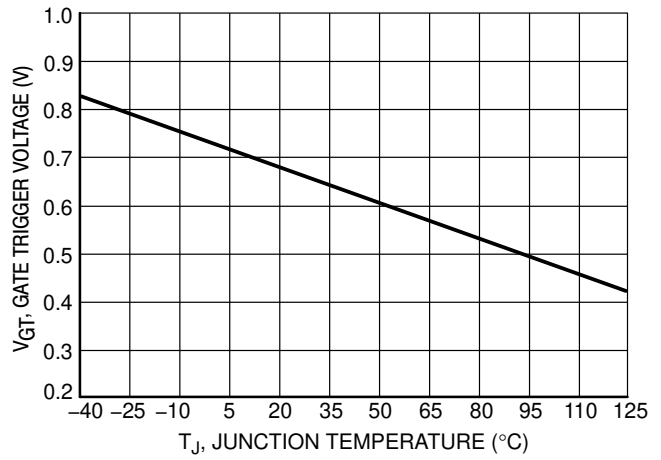


Figure 2. Typical Gate Trigger Voltage versus Junction Temperature

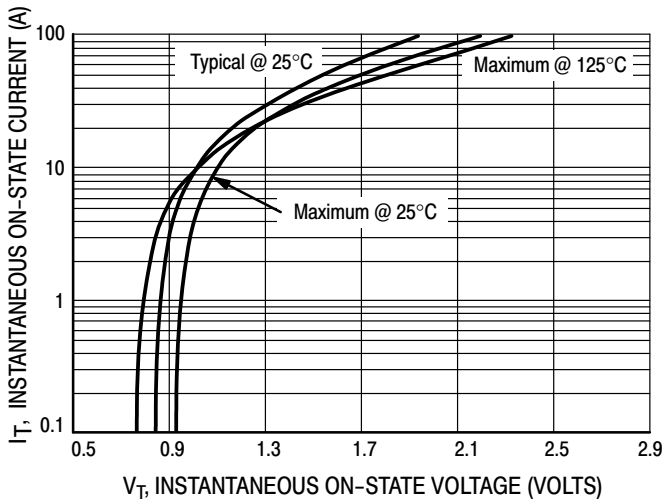


Figure 3. Typical On-State Characteristics

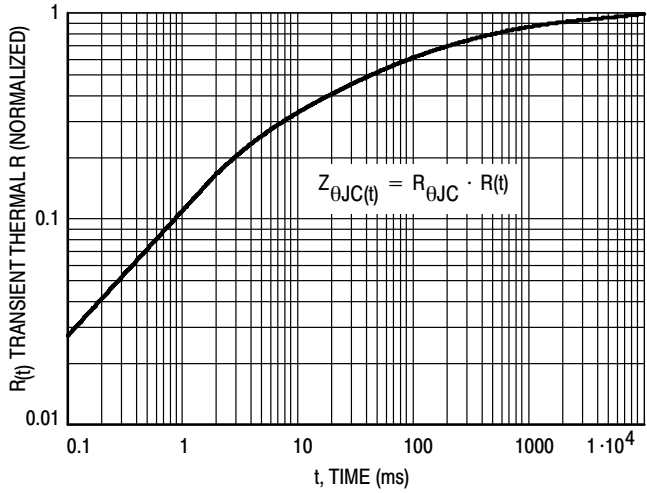


Figure 4. Transient Thermal Response

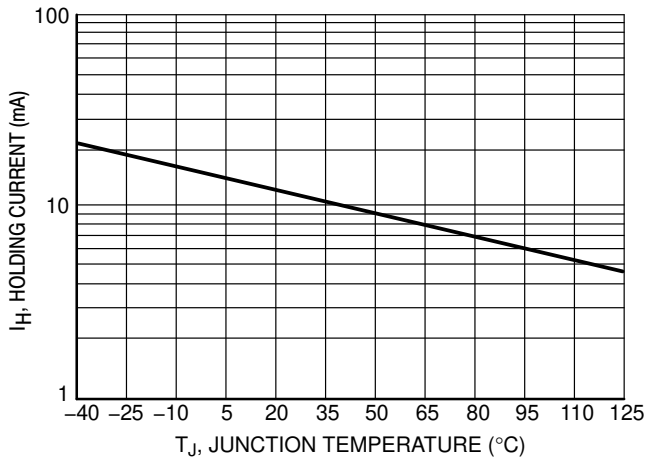


Figure 5. Typical Holding Current versus Junction Temperature

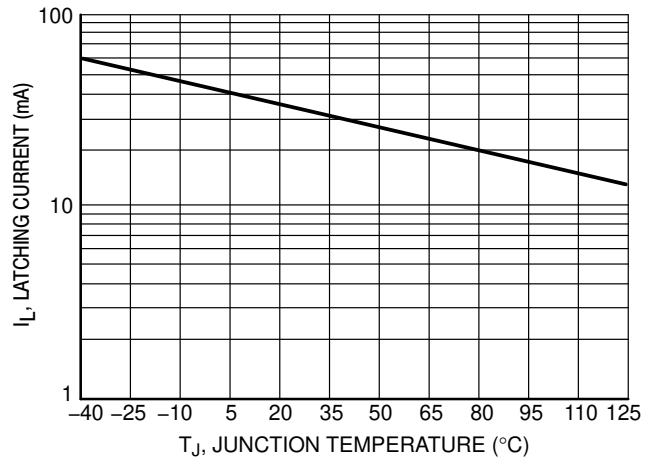


Figure 6. Typical Latching Current versus Junction Temperature

MCR25DG, MCR25MG, MCR25NG

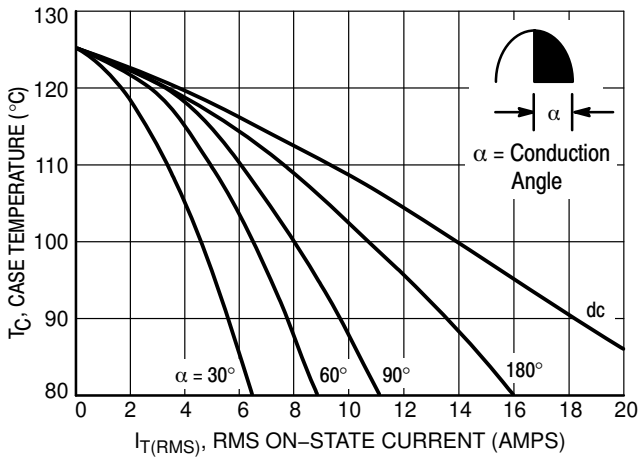


Figure 7. Typical RMS Current Derating

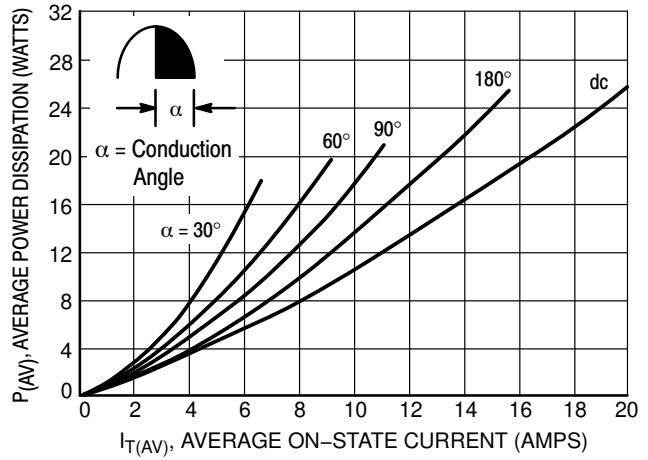


Figure 8. On State Power Dissipation

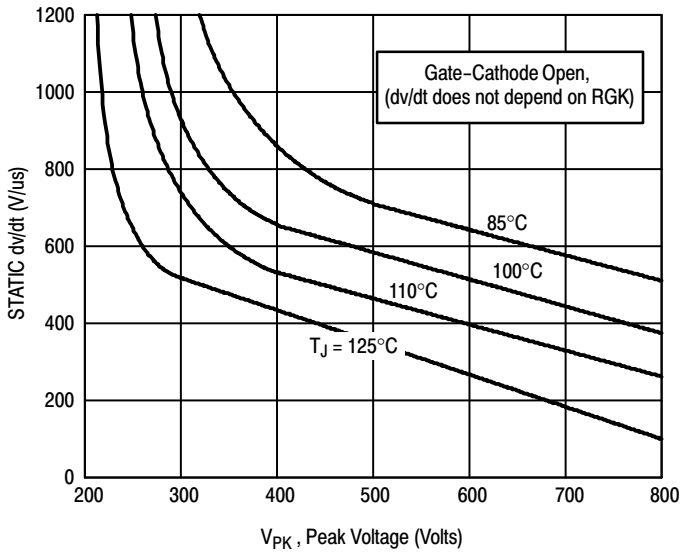


Figure 9. Typical Exponential Static dv/dt Versus Peak Voltage

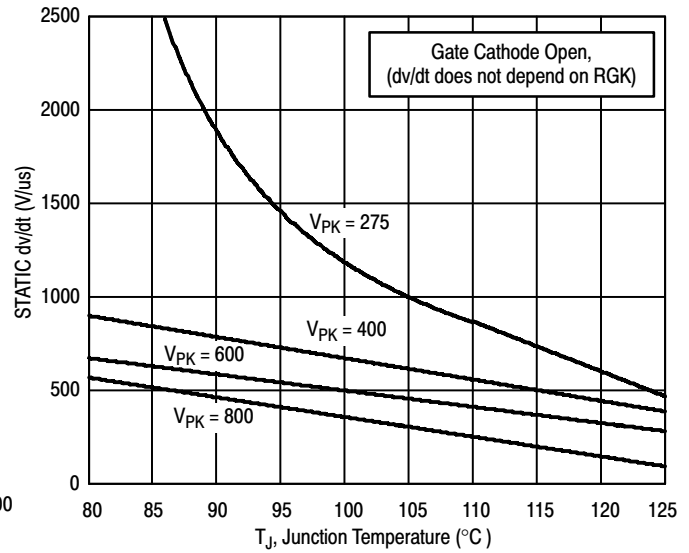


Figure 10. Typical Exponential Static dv/dt Versus Junction Temperature

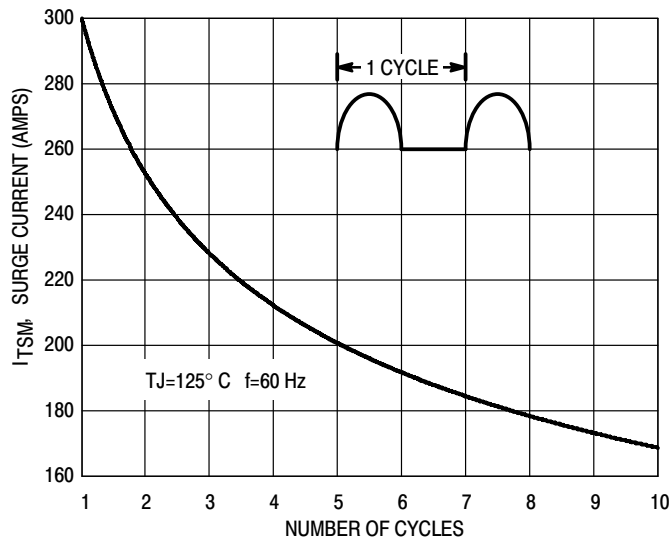
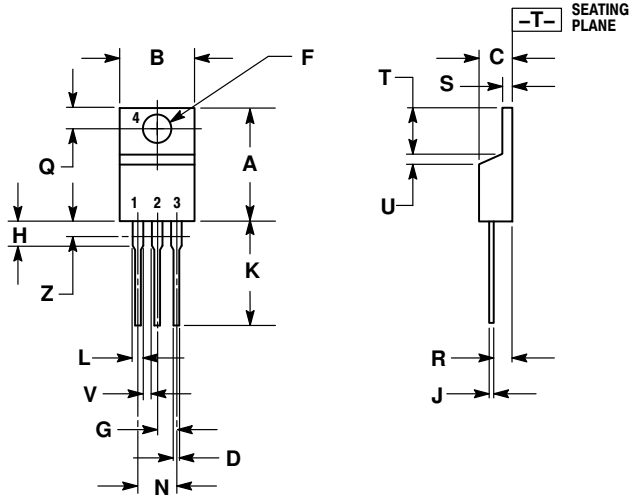


Figure 11. Maximum Non-Repertive Surge Current

MCR25DG, MCR25MG, MCR25NG

PACKAGE DIMENSIONS

TO-220
CASE 221A-09
ISSUE AH




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 | 0.415 | 9.66 | 10.53 |
| C | 0.160 | 0.190 | 4.07 | 4.83 |
| D | 0.025 | 0.038 | 0.64 | 0.96 |
| F | 0.142 | 0.161 | 3.61 | 4.09 |
| G | 0.095 | 0.105 | 2.42 | 2.66 |
| H | 0.110 | 0.161 | 2.80 | 4.10 |
| J | 0.014 | 0.024 | 0.36 | 0.61 |
| 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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