# MCR12DCM, MCR12DCN

**Preferred Device**

# Silicon Controlled Rectifiers

## Reverse Blocking Thyristors

Designed for high volume, low cost, industrial and consumer applications such as motor control; process control; temperature, light and speed control.

### Features

- Small Size
- Passivated Die for Reliability and Uniformity
- Low Level Triggering and Holding Characteristics
- Epoxy Meets UL 94 V−0 @ 0.125 in
- ESD Ratings: Human Body Model, 3B > 8000 V
  Machine Model, C > 400 V
- 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) MCR12DCM<br>MCR12DCN | $V_{DRM}$, $V_{RRM}$ | <br>600<br>800 | V |
| On−State RMS Current (180° Conduction Angles; $T_C$ = 90°C) | $I_{T(RMS)}$ | 12 | A |
| Average On−State Current (180° Conduction Angles; $T_C$ = 90°C) | $I_{T(AV)}$ | 7.8 | A |
| Peak Non-Repetitive Surge Current (1/2 Cycle, Sine Wave 60 Hz, $T_J$ = 125°C) | $I_{TSM}$ | 100 | A |
| Circuit Fusing Consideration (t = 8.3 msec) | $I^2t$ | 41 | $A^2$sec |
| Forward Peak Gate Power (Pulse Width ≤ 1.0 μsec, $T_C$ = 90°C) | $P_{GM}$ | 5.0 | W |
| Forward Average Gate Power (t = 8.3 msec, $T_C$ = 90°C) | $P_{G(AV)}$ | 0.5 | W |
| Forward Peak Gate Current (Pulse Width ≤ 1.0 μsec, $T_C$ = 90°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. $V_{DRM}$ 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 device are exceeded.

**ON Semiconductor®**

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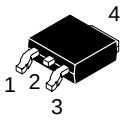
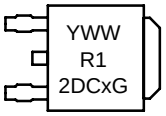
**SCRs**
**12 AMPERES RMS**
**600 − 800 VOLTS**


**DPAK**
**CASE 369C**
**STYLE 4**

**MARKING DIAGRAM**




Y = Year
WW = Work Week
R12DCx = Device Code
x= M or N
G = Pb−Free Package

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

**ORDERING INFORMATION**

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

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

## THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance − Junction−to−Case<br>− Junction−to−Ambient<br>− Junction−to−Ambient (Note 2) | $R_{\theta JC}$<br>$R_{\theta JA}$<br>$R_{\theta JA}$ | 2.2<br>88<br>80 | °C/W |
| Maximum Lead Temperature for Soldering Purposes (Note 3) | $T_L$ | 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) | <br>$T_J$ = 25°C<br>$T_J$ = 125°C | $I_{DRM}$,<br>$I_{RRM}$ | <br>−<br>− | <br>−<br>− | <br>0.01<br>5.0 | mA |
| **ON CHARACTERISTICS** | | | | | | |
| Peak Forward On−State Voltage (Note 4) ($I_{TM}$ = 20 A) | | $V_{TM}$ | − | 1.3 | 1.9 | V |
| Gate Trigger Current (Continuous dc)<br>($V_D$ = 12 V, $R_L$ = 100 Ω) | <br>$T_J$ = 25°C<br>$T_J$ = −40°C | $I_{GT}$ | <br>2.0<br>− | <br>7.0<br>− | <br>20<br>40 | mA |
| Gate Trigger Voltage (Continuous dc)<br>($V_D$ = 12 V, $R_L$ = 100 Ω) | <br>$T_J$ = 25°C<br>$T_J$ = −40°C | $V_{GT}$ | <br>0.5<br>− | <br>0.65<br>− | <br>1.0<br>2.0 | V |
| Gate Non−Trigger Voltage<br>($V_D$ = 12 V, $R_L$ = 100 Ω) | <br>$T_J$ = 125°C | $V_{GD}$ | 0.2 | − | − | V |
| Holding Current<br>($V_D$ = 12 V, Initiating Current = 200 mA, Gate Open) | <br>$T_J$ = 25°C<br>$T_J$ = −40°C | $I_H$ | <br>4.0<br>− | <br>22<br>− | <br>40<br>80 | mA |
| Latching Current<br>($V_D$ = 12 V, $I_G$ = 20 mA, $T_J$ = 25°C)<br>($V_D$ = 12 V, $I_G$ = 40 mA, $T_J$ = −40°C) | | $I_L$ | <br>4.0<br>− | <br>22<br>− | <br>40<br>80 | mA |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| Critical Rate of Rise of Off−State Voltage<br>($V_D$ = Rated $V_{DRM}$, Exponential Waveform, Gate Open, $T_J$ = 125°C) | | dv/dt | <br>50 | <br>200 | <br>− | V/μs |

2. These ratings are applicable when surface mounted on the minimum pad sizes recommended.
3. 1/8″ from case for 10 seconds.
4. Pulse Test: Pulse Width ≤ 2.0 msec, Duty Cycle ≤ 2%.

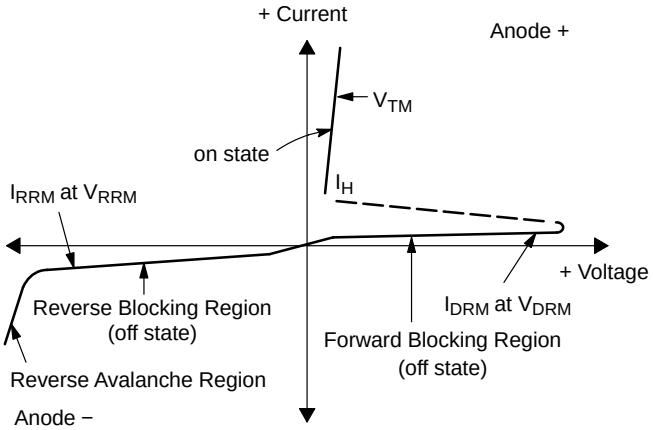
## ORDERING INFORMATION

| Device | Package | Shipping† |
|---|---|---|
| MCR12DCMT4 | DPAK | 2500 / Tape and Reel |
| MCR12DCMT4G | DPAK<br>(Pb−Free) | 2500 / Tape and Reel |
| MCR12DCNT4 | DPAK | 2500 / Tape and Reel |
| MCR12DCNT4G | DPAK<br>(Pb−Free) | 2500 / Tape and Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

## 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 |



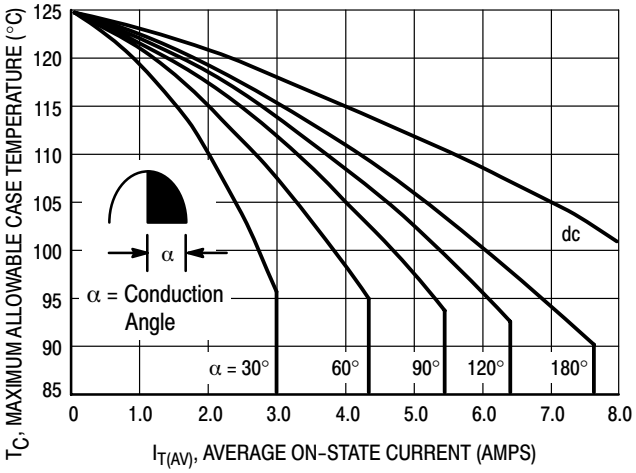




**Figure 1. Average Current Derating**

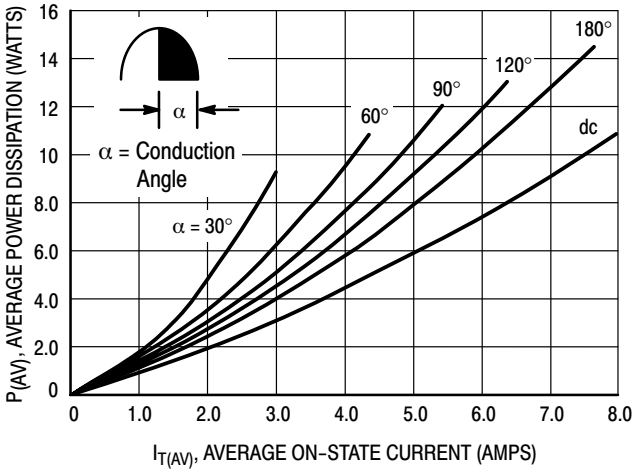



**Figure 2. On−State Power Dissipation**

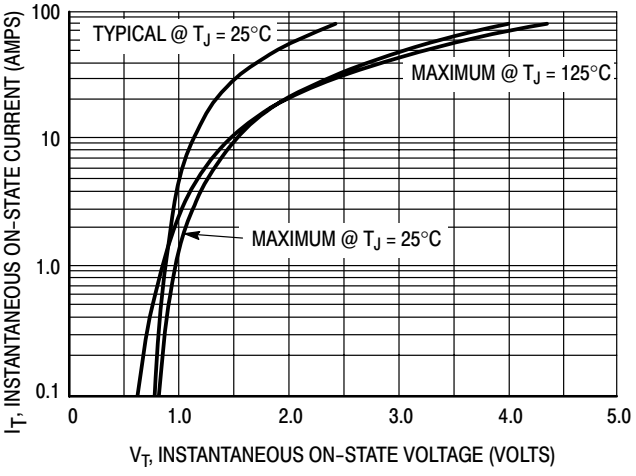



**Figure 3. On−State Characteristics**

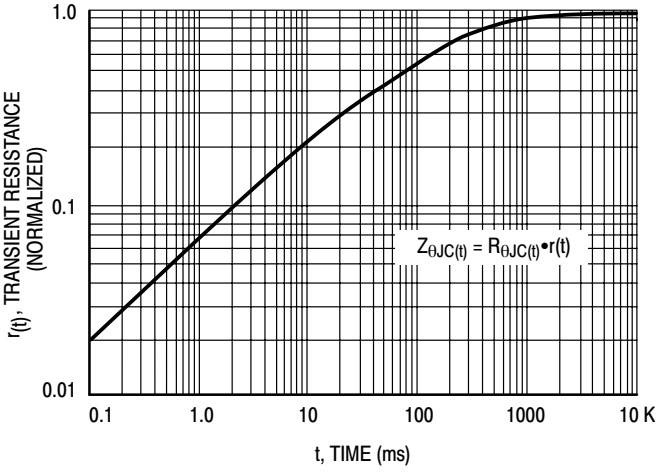



**Figure 4. Transient Thermal Response**

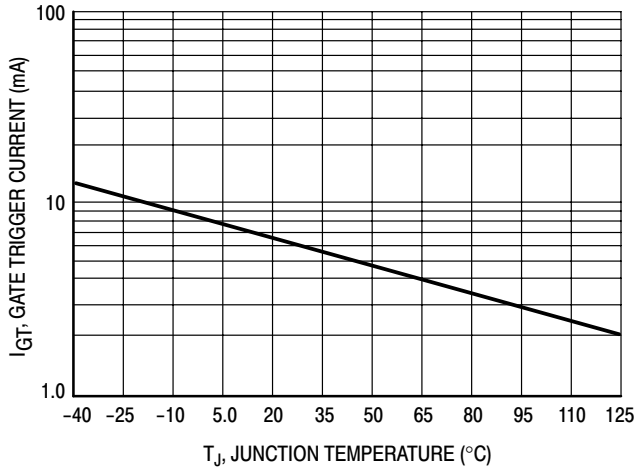



**Figure 5. Typical Gate Trigger Current versus Junction Temperature**

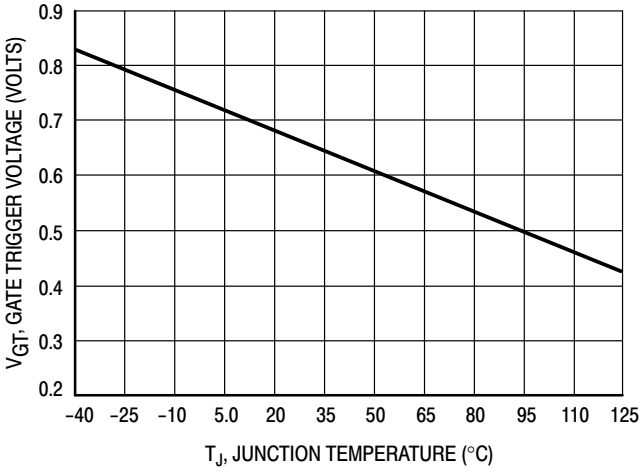



**Figure 6. Typical Gate Trigger Voltage versus Junction Temperature**

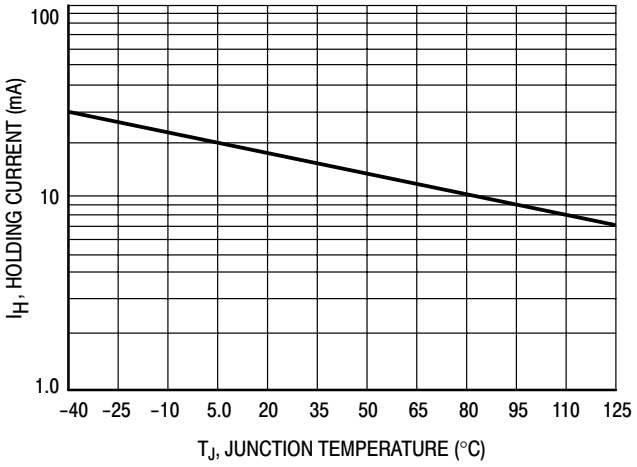



**Figure 7. Typical Holding Current versus Junction Temperature**

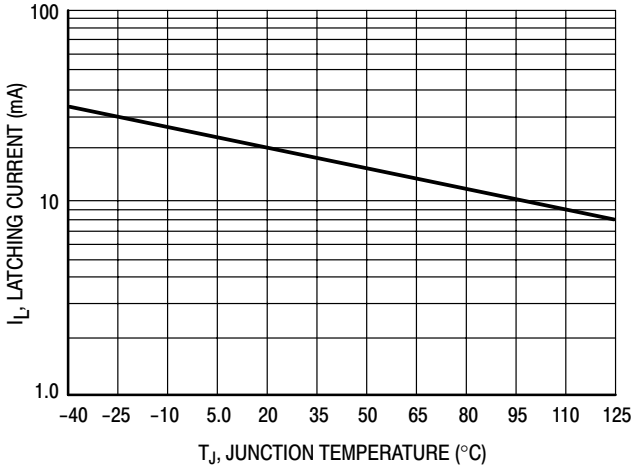



**Figure 8. Typical Latching Current versus Junction Temperature**

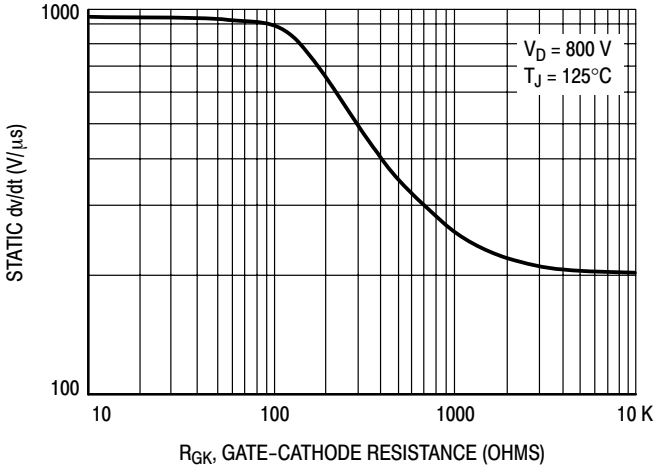
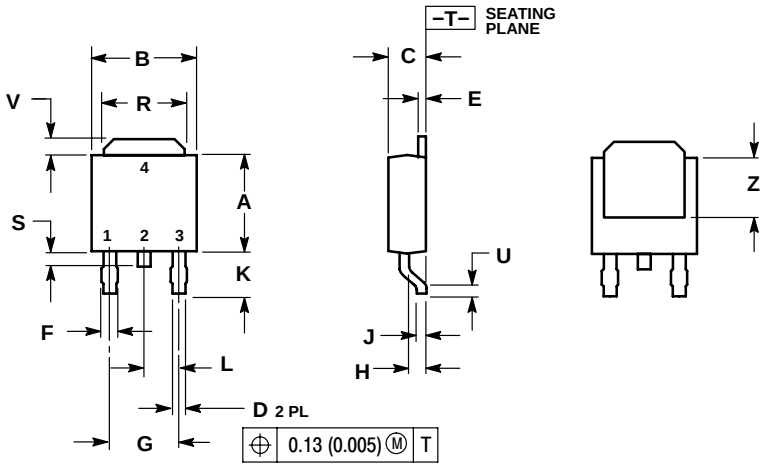



**Figure 9. Exponential Static dv/dt versus Gate−Cathode Resistance**

## PACKAGE DIMENSIONS

**DPAK**
CASE 369C
ISSUE O

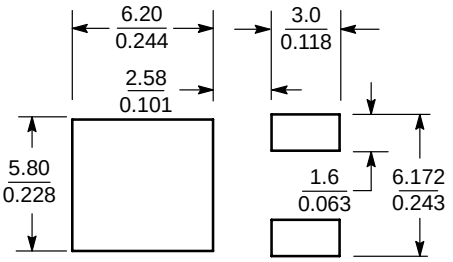



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 0.235 | 0.245 | 5.97 | 6.22 |
| B | 0.250 | 0.265 | 6.35 | 6.73 |
| C | 0.086 | 0.094 | 2.19 | 2.38 |
| D | 0.027 | 0.035 | 0.69 | 0.88 |
| E | 0.018 | 0.023 | 0.46 | 0.58 |
| F | 0.037 | 0.045 | 0.94 | 1.14 |
| G | 0.180 BSC | | 4.58 BSC | |
| H | 0.034 | 0.040 | 0.87 | 1.01 |
| J | 0.018 | 0.023 | 0.46 | 0.58 |
| K | 0.102 | 0.114 | 2.60 | 2.89 |
| L | 0.090 BSC | | 2.29 BSC | |
| R | 0.180 | 0.215 | 4.57 | 5.45 |
| S | 0.025 | 0.040 | 0.63 | 1.01 |
| U | 0.020 | −−− | 0.51 | −−− |
| V | 0.035 | 0.050 | 0.89 | 1.27 |
| Z | 0.155 | −−− | 3.93 | −−− |

STYLE 4:
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE

### SOLDERING FOOTPRINT*




SCALE 3:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

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



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