

# 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.

- Small Size
- Passivated Die for Reliability and Uniformity
- Low Level Triggering and Holding Characteristics
- Device Marking: Device Type, e.g., for MCR12DCM: R12DCM, Date Code

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

| Rating                                                                                                                                                   | Symbol                                 | Value          | Unit                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|----------------|------------------------|
| Peak Repetitive Off-State Voltage <sup>(1)</sup><br>( $T_J = -40$ to $125^\circ\text{C}$ , Sine Wave,<br>50 to 60 Hz, Gate Open)<br>MCR12DCM<br>MCR12DCN | $V_{\text{DRM}}$ ,<br>$V_{\text{RRM}}$ | 600<br>800     | Volts                  |
| On-State RMS Current<br>( $180^\circ$ Conduction Angles; $T_C = 90^\circ\text{C}$ )                                                                      | $I_{\text{T(RMS)}}$                    | 12             | Amps                   |
| Average On-State Current<br>( $180^\circ$ Conduction Angles; $T_C = 90^\circ\text{C}$ )                                                                  | $I_{\text{T(AV)}}$                     | 7.6            | Amps                   |
| Peak Non-Repetitive Surge Current<br>(1/2 Cycle, Sine Wave 60 Hz,<br>$T_J = 125^\circ\text{C}$ )                                                         | $I_{\text{TSM}}$                       | 100            | Amps                   |
| Circuit Fusing Consideration<br>( $t = 8.3$ msec)                                                                                                        | $I^2t$                                 | 41             | $\text{A}^2\text{sec}$ |
| Forward Peak Gate Power<br>(Pulse Width $\leq 1.0$ $\mu\text{sec}$ , $T_C = 90^\circ\text{C}$ )                                                          | $P_{\text{GM}}$                        | 5.0            | Watts                  |
| Forward Average Gate Power<br>( $t = 8.3$ msec, $T_C = 90^\circ\text{C}$ )                                                                               | $P_{\text{G(AV)}}$                     | 0.5            | Watts                  |
| Forward Peak Gate Current<br>(Pulse Width $\leq 1.0$ $\mu\text{sec}$ , $T_C = 90^\circ\text{C}$ )                                                        | $I_{\text{GM}}$                        | 2.0            | Amps                   |
| Operating Junction Temperature Range                                                                                                                     | $T_J$                                  | $-40$ to $125$ | $^\circ\text{C}$       |
| Storage Temperature Range                                                                                                                                | $T_{\text{stg}}$                       | $-40$ to $150$ | $^\circ\text{C}$       |

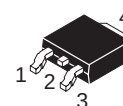
(1)  $V_{\text{DRM}}$  for all types can be applied on a continuous basis. Ratings apply for zero or negative gate voltage; positive gate voltage shall not be applied concurrent with negative potential on the anode. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the device are exceeded.



ON Semiconductor

<http://onsemi.com>

SCRs  
12 AMPERES RMS  
600 thru 800 VOLTS



D-PAK  
CASE 369A  
STYLE 4

#### PIN ASSIGNMENT

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

#### ORDERING INFORMATION

| Device     | Package   | Shipping                       |
|------------|-----------|--------------------------------|
| MCR12DCMT4 | DPAK 369A | 16mm Tape and Reel (2.5K/Reel) |
| MCR12DCNT4 | DPAK 369A | 16mm Tape and Reel (2.5K/Reel) |

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

# MCR12DCM, MCR12DCN

## THERMAL CHARACTERISTICS

| Characteristic                                                 | Symbol          | Max | Unit                 |
|----------------------------------------------------------------|-----------------|-----|----------------------|
| Thermal Resistance — Junction to Case                          | $R_{\theta JC}$ | 2.2 | $^{\circ}\text{C/W}$ |
| — Junction to Ambient                                          | $R_{\theta JA}$ | 88  |                      |
| — Junction to Ambient <sup>(1)</sup>                           | $R_{\theta JA}$ | 80  |                      |
| Maximum Lead Temperature for Soldering Purposes <sup>(2)</sup> | $T_L$           | 260 | $^{\circ}\text{C}$   |

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

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

## OFF CHARACTERISTICS

|                                                                                                                            |                    |   |   |      |    |
|----------------------------------------------------------------------------------------------------------------------------|--------------------|---|---|------|----|
| Peak Repetitive Forward or Reverse Blocking Current<br>( $V_{AK} = \text{Rated } V_{DRM} \text{ or } V_{RRM}$ , Gate Open) | $I_{DRM}, I_{RRM}$ | — | — | 0.01 | mA |
| $T_J = 25^{\circ}\text{C}$                                                                                                 |                    | — | — | 5.0  |    |
| $T_J = 125^{\circ}\text{C}$                                                                                                |                    | — | — |      |    |

## ON CHARACTERISTICS

|                                                                                                                                                                                     |          |     |      |     |       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----|------|-----|-------|
| Peak Forward On-State Voltage <sup>(3)</sup><br>( $I_{TM} = 20 \text{ A}$ )                                                                                                         | $V_{TM}$ | —   | 1.3  | 1.9 | Volts |
| Gate Trigger Current (Continuous dc)<br>( $V_D = 12 \text{ V}$ , $R_L = 100 \Omega$ )                                                                                               | $I_{GT}$ | 2.0 | 7.0  | 20  | mA    |
| $T_J = 25^{\circ}\text{C}$                                                                                                                                                          |          | —   | —    | 40  |       |
| $T_J = -40^{\circ}\text{C}$                                                                                                                                                         |          |     |      |     |       |
| Gate Trigger Voltage (Continuous dc)<br>( $V_D = 12 \text{ V}$ , $R_L = 100 \Omega$ )                                                                                               | $V_{GT}$ | 0.5 | 0.65 | 1.0 | Volts |
| $T_J = 25^{\circ}\text{C}$                                                                                                                                                          |          | —   | —    | 2.0 |       |
| $T_J = -40^{\circ}\text{C}$                                                                                                                                                         |          |     |      |     |       |
| Gate Non-Trigger Voltage<br>( $V_D = 12 \text{ V}$ , $R_L = 100 \Omega$ )                                                                                                           | $V_{GD}$ | 0.2 | —    | —   | Volts |
| $T_J = 125^{\circ}\text{C}$                                                                                                                                                         |          |     |      |     |       |
| Holding Current<br>( $V_D = 12 \text{ V}$ , Initiating Current = 200 mA, Gate Open)                                                                                                 | $I_H$    | 4.0 | 22   | 40  | mA    |
| $T_J = 25^{\circ}\text{C}$                                                                                                                                                          |          | —   | —    | 80  |       |
| $T_J = -40^{\circ}\text{C}$                                                                                                                                                         |          |     |      |     |       |
| Latching Current<br>( $V_D = 12 \text{ V}$ , $I_G = 20 \text{ mA}$ , $T_J = 25^{\circ}\text{C}$ )<br>( $V_D = 12 \text{ V}$ , $I_G = 40 \text{ mA}$ , $T_J = -40^{\circ}\text{C}$ ) | $I_L$    | 4.0 | 22   | 40  | mA    |
|                                                                                                                                                                                     |          | —   | —    | 80  |       |

## DYNAMIC CHARACTERISTICS

| Characteristic                                                                                                                                    | Symbol  | Min | Typ | Max | Unit                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----|-----|-----|------------------------|
| Critical Rate of Rise of Off-State Voltage<br>( $V_D = \text{Rated } V_{DRM}$ , Exponential Waveform, Gate Open,<br>$T_J = 125^{\circ}\text{C}$ ) | $dv/dt$ | 50  | 200 | —   | $\text{V}/\mu\text{s}$ |

(1) Surface mounted on minimum recommended pad size.

(2) 1/8" from case for 10 seconds.

(3) Pulse Test: Pulse Width  $\leq 2.0 \text{ msec}$ , Duty Cycle  $\leq 2\%$ .

# MCR12DCM, MCR12DCN

## 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                           |

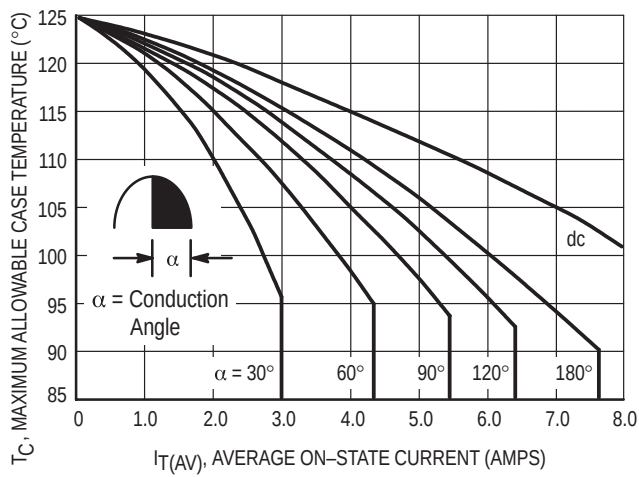
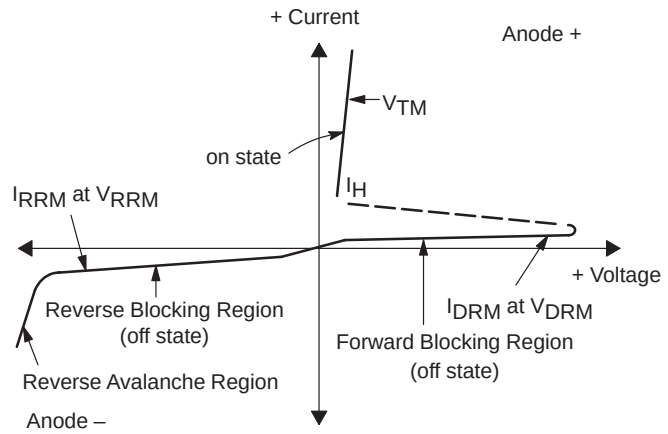


Figure 1. Average Current Derating

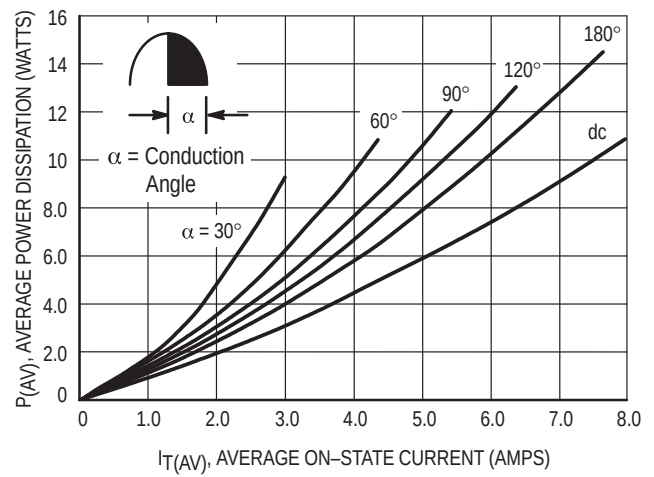


Figure 2. On-State Power Dissipation

# MCR12DCM, MCR12DCN

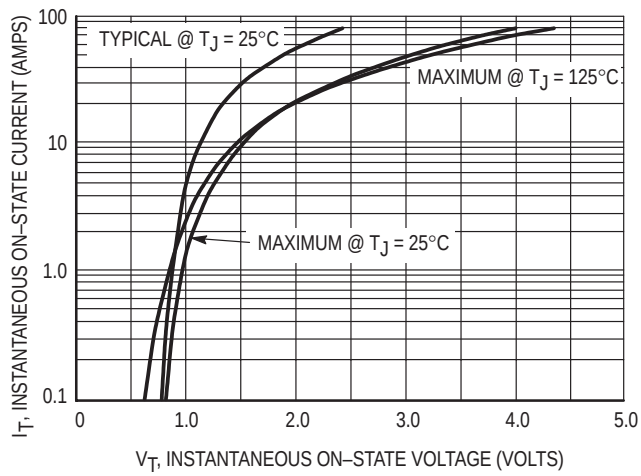


Figure 3. On-State Characteristics

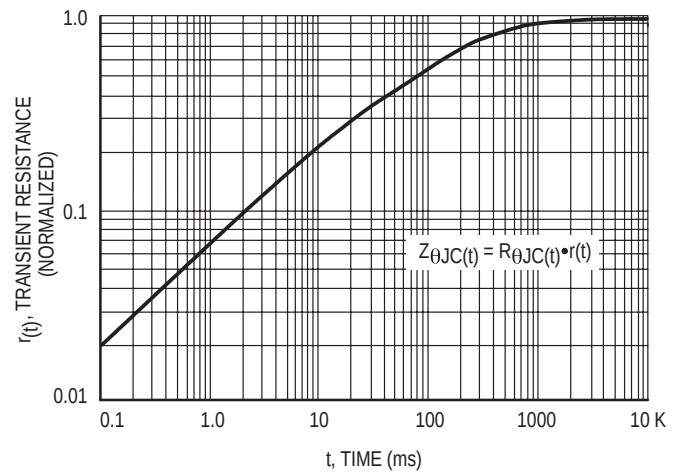


Figure 4. Transient Thermal Response

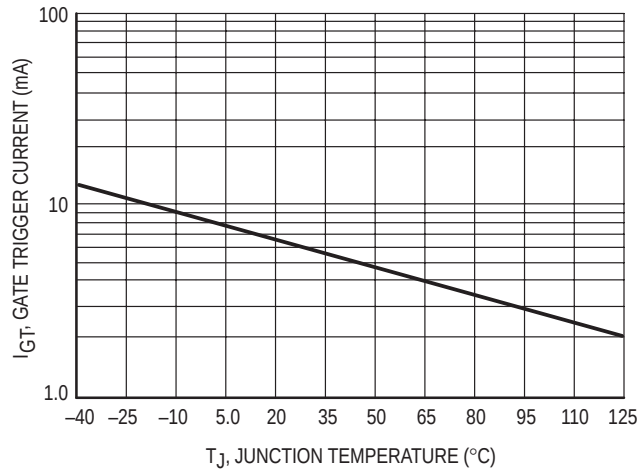


Figure 5. Typical Gate Trigger Current versus Junction Temperature

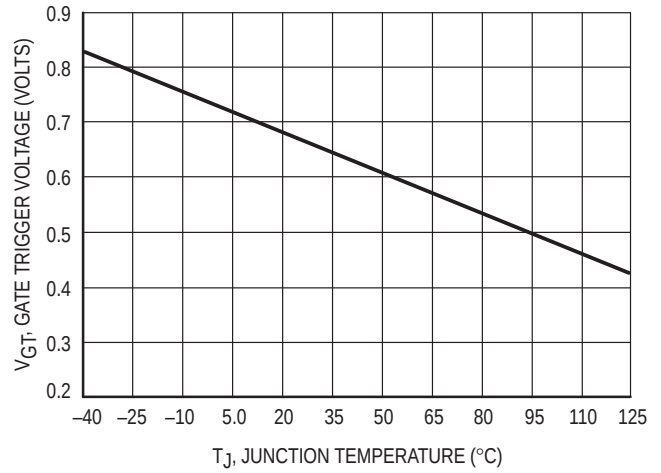
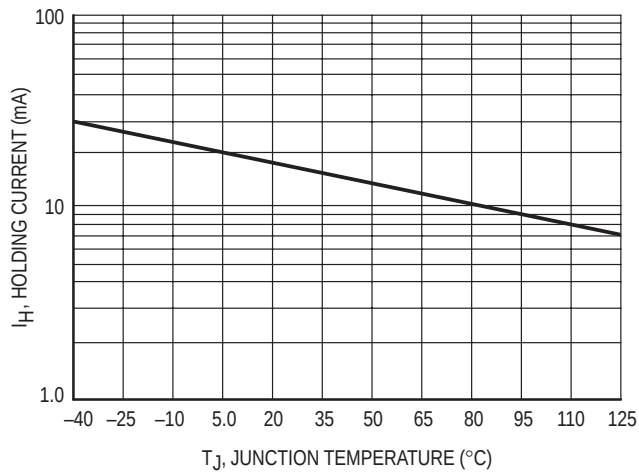
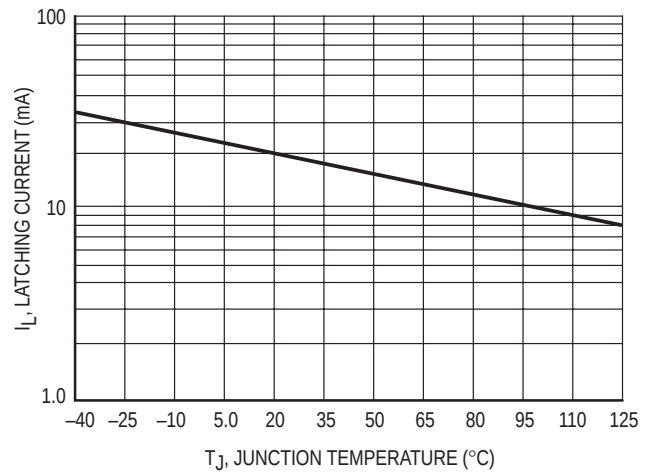


Figure 6. Typical Gate Trigger Voltage versus Junction Temperature

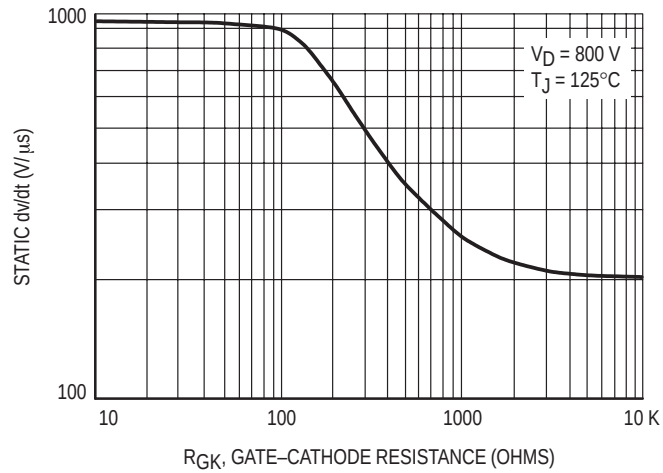
## MCR12DCM, MCR12DCN



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



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



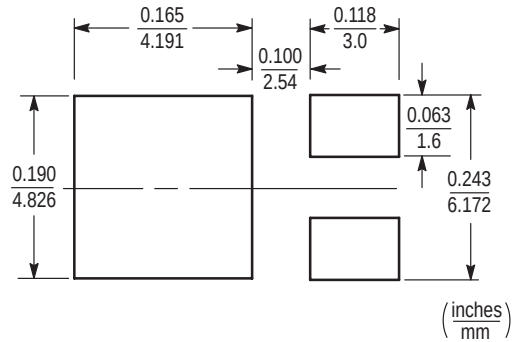
**Figure 9. Exponential Static dv/dt versus Gate-Cathode Resistance**

## MCR12DCM, MCR12DCN

### MINIMUM RECOMMENDED FOOTPRINT FOR SURFACE MOUNTED APPLICATIONS

Surface mount board layout is a critical portion of the total design. The footprint for the semiconductor packages must be the correct size to insure proper solder connection

interface between the board and the package. With the correct pad geometry, the packages will self align when subjected to a solder reflow process.

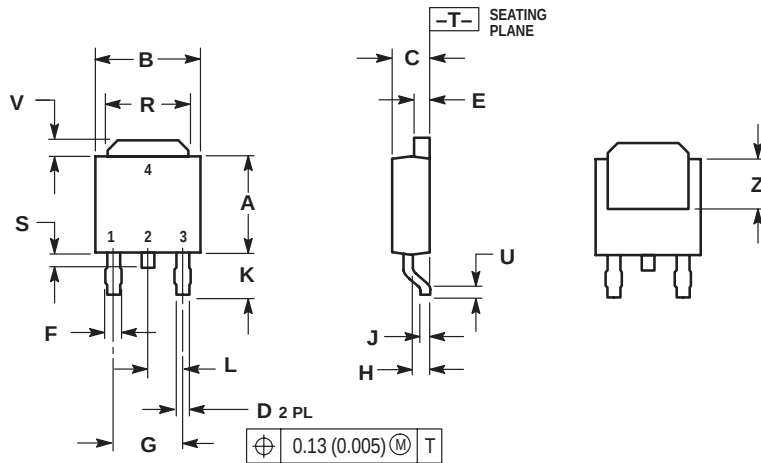


**DPAK**

# MCR12DCM, MCR12DCN

## PACKAGE DIMENSIONS

### D-PAK CASE 369A-13 ISSUE Z



#### NOTES:

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

| DIM | INCHES    |       | MILLIMETERS |      |
|-----|-----------|-------|-------------|------|
|     | MIN       | MAX   | MIN         | MAX  |
| A   | 0.235     | 0.250 | 5.97        | 6.35 |
| 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   | 0.033     | 0.040 | 0.84        | 1.01 |
| F   | 0.037     | 0.047 | 0.94        | 1.19 |
| 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   | 0.175     | 0.215 | 4.45        | 5.46 |
| S   | 0.020     | 0.050 | 0.51        | 1.27 |
| U   | 0.020     | —     | 0.51        | —    |
| V   | 0.030     | 0.050 | 0.77        | 1.27 |
| Z   | 0.138     | —     | 3.51        | —    |

#### STYLE 4:

- PIN 1: CATHODE  
 2: ANODE  
 3: GATE  
 4: ANODE

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