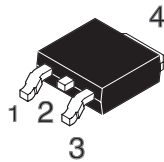


MCR12DCM, MCR12DCN



Pin Out



Description

This thyristor is 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

- Small Size
- Passivated Die for Reliability and Uniformity
- Low Level Triggering and Holding Characteristics
- UL Recognized compound meets flammability rating V-0.
- ESD Ratings: Human Body Model, 3B > 8000 V
Machine Model, C > 400 V
- Pb-Free Packages are Available

Functional Diagram



Additional Information



Datasheet



Resources



Samples

Maximum Ratings ($T_J = 25^\circ\text{C}$ unless otherwise noted)

| Rating | Symbol | Value | Unit |
|---|--------------|------------|--------------------|
| Peak Repetitive Off-State Voltage (Note 1) (– 40 to 110°C, Sine Wave, 50 to 60 Hz, Gate Open) | MCR12DCM | V_{DRM} | 600 |
| | MCR12DCN | V_{RRM} | 800 |
| On-State RMS Current (180° Conduction Angles; $T_C = 90^\circ\text{C}$) | $I_{T(RMS)}$ | 12 | A |
| Average On-State Current (180° Conduction Angles; $T_C = 90^\circ\text{C}$) | $I_{T(AV)}$ | 7.8 | A |
| Peak Non-Repetitive Surge Current (1/2 Cycle, Sine Wave 60 Hz, $T_J = 125^\circ\text{C}$) | I_{TSM} | 100 | A |
| Circuit Fusing Consideration ($t = 8.3$ ms) | I^2t | 41 | A ² sec |
| Forward Peak Gate Power (Pulse Width ≤ 10 μsec , $T_C = 90^\circ\text{C}$) | P_{GM} | 5.0 | W |
| Forward Average Gate Power ($t = 8.3$ msec, $T_C = 90^\circ\text{C}$) | $P_{GM(AV)}$ | 0.5 | W |
| Forward Peak Gate Current (Pulse Width ≤ 1.0 μsec , $T_C = 90^\circ\text{C}$) | 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 component 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, component 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; however, 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.

Thermal Characteristics

| Rating | Symbol | Value | Unit |
|---|-----------------|-------|------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 2.2 | °C/W |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 88 | |
| Thermal Resistance, Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 80 | |
| Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 10 Seconds | T_L | 260 | °C |

Electrical Characteristics - OFF ($T_J = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|--|------------------------|---------------------------|-----|-----|------|
| Peak Repetitive Forward or Reverse Blocking Current ($V_{AK} = \text{Rated } V_{DRM}$ or V_{RRM} , Gate Open) | I_{DRM} I_{RRM} | $T_J = 25^\circ\text{C}$ | – | – | 0.01 |
| | | $T_J = 125^\circ\text{C}$ | – | – | 5.0 |

Electrical Characteristics - ON ($T_J = 25^\circ\text{C}$ unless otherwise noted; Electricals apply in both directions)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|--|----------|---------------------------|-----|------|------|
| Peak Forward On-State Voltage (Note 2) ($I_{TM} = 16$ A) | V_{TM} | – | 1.3 | 1.9 | V |
| Gate Trigger Current (Continuous dc) ($V_D = 12$ V; $R_L = 100$ Ω) | I_{GT} | $T_J = 25^\circ\text{C}$ | 2.0 | 7.0 | 20 |
| | | $T_J = -40^\circ\text{C}$ | – | – | 40 |
| Gate Trigger Voltage (Continuous dc) ($V_D = 12$ V, $R_L = 100$ Ω) | V_{GT} | $T_J = 25^\circ\text{C}$ | 0.5 | 0.65 | 1.0 |
| | | $T_J = -40^\circ\text{C}$ | – | – | 2.5 |
| Gate Non-Trigger Voltage ($V_D = 12$ V, $R_L = 100$ Ω) | V_{GD} | 0.2 | – | – | V |
| Holding Current ($V_D = 12$ V, Gate Open, Initiating Current = 200 mA) | I_H | $T_J = 25^\circ\text{C}$ | 4.0 | 22 | 40 |
| | | $T_J = -40^\circ\text{C}$ | – | – | 80 |
| Latch Current ($V_D = 12$ V, $I_G = 20$ μA , $T_J = 25^\circ\text{C}$) ($V_D = 12$ V, $I_G = 40$ μA , $T_J = -40^\circ\text{C}$) | I_L | | 4.0 | 22 | 40 |
| | | | – | – | 80 |

Dynamic Characteristics

| Characteristic | Symbol | Min | Typ | Max | Unit |
|--|--------|-----|-----|-----|------------------|
| Critical Rate of Rise of Off-State Voltage ($V_D = \text{Rated } V_{DRM}$ Exponential Waveform, Gate Open, $T_J = 125^\circ\text{C}$) | dv/dt | 50 | 200 | - | 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 $\leq 2\%$.

Voltage Current Characteristic of SCR

| Symbol | Parameter |
|-----------|---|
| V_{DRM} | Peak Repetitive Forward Off State Voltage |
| I_{DRM} | Peak Forward Blocking Current |
| V_{RRM} | Peak Repetitive Reverse Off State Voltage |
| I_{RRM} | Peak Reverse Blocking Current |
| V_{TM} | Maximum On State Voltage |
| I_H | Holding Current |

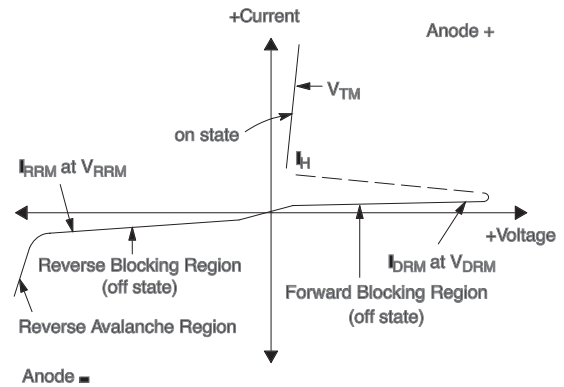


Figure 1. Average RMS Current Derating

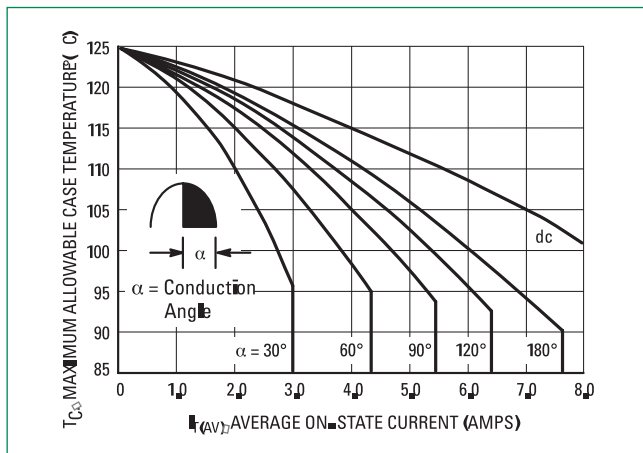


Figure 2. On-State Power Dissipation

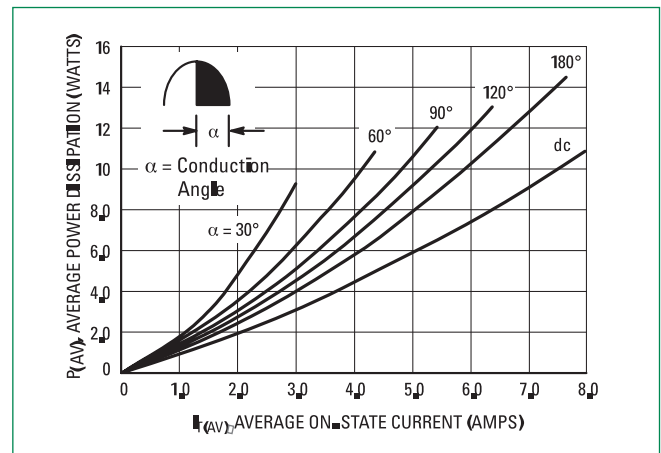


Figure 3. On-State Characteristics

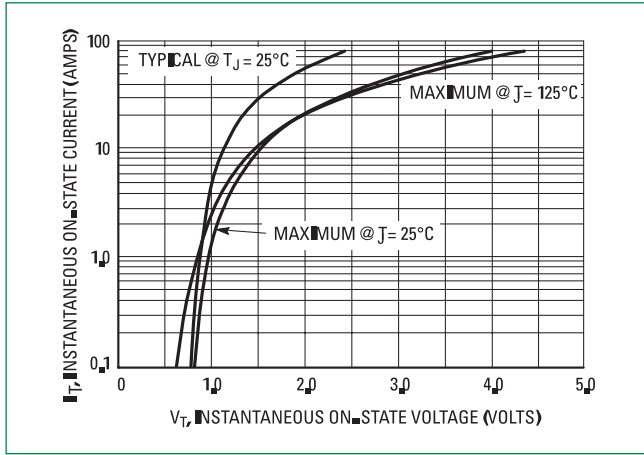


Figure 4. Transient Thermal Response

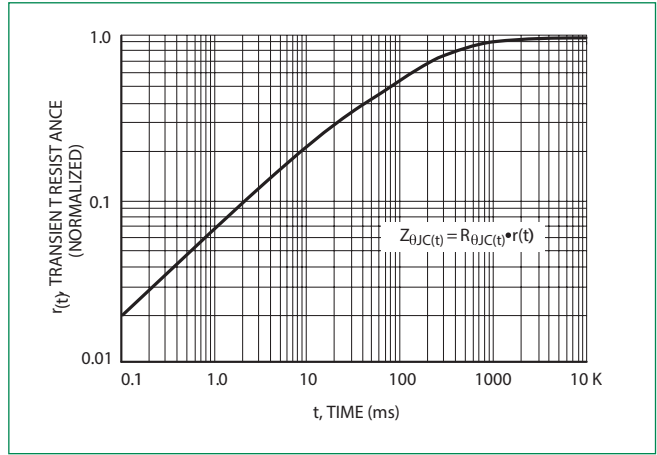


Figure 5. Typical Gate Trigger Current vs Junction Temperature

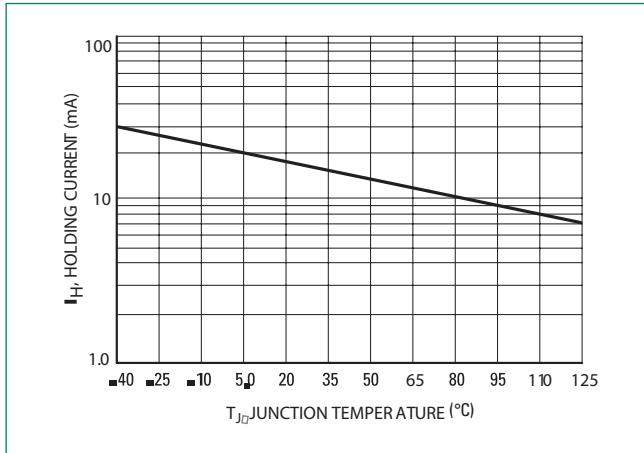


Figure 6. Typical Gate Trigger Voltage vs Junction Temperature

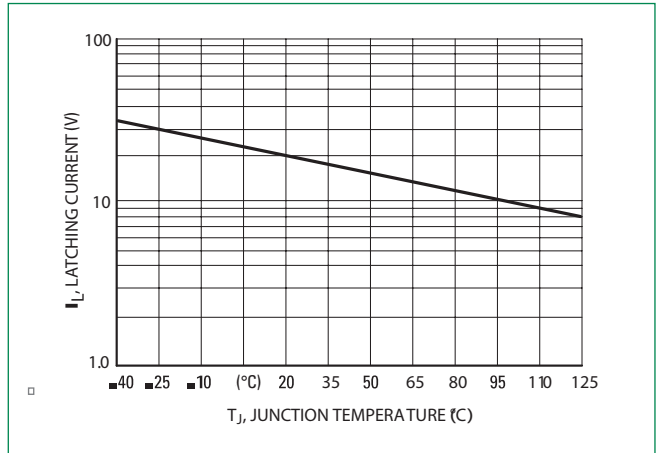


Figure 7. Typical Holding Current vs Junction Temperature

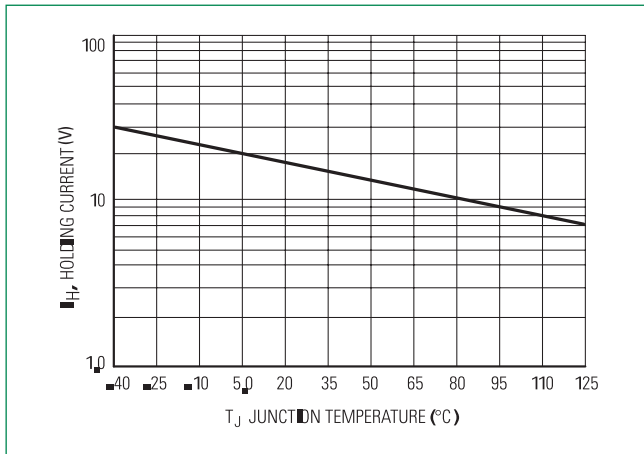
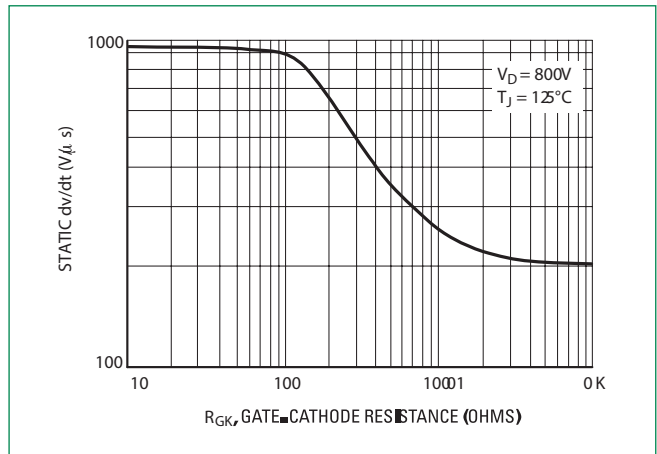
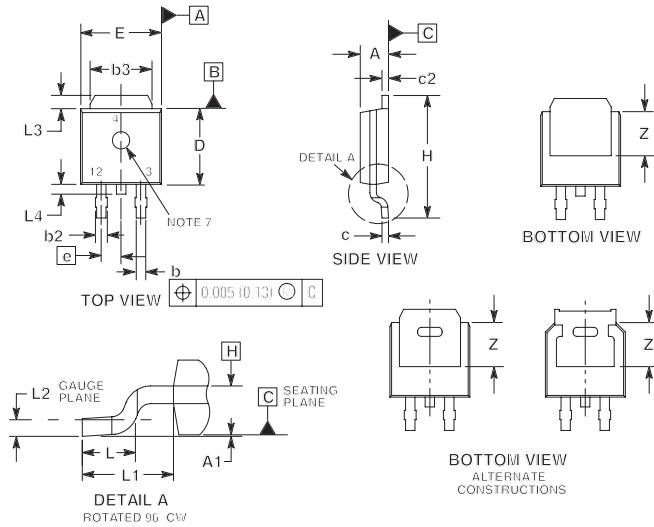


Figure 9. Exponential Static dv/dt vs Gate-Cathode Resistance



Dimensions

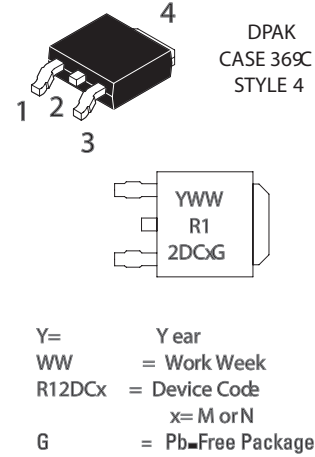


| Dim | Inches | | Millimeters | |
|-----|--------|-------|-------------|-------|
| | Min | Max | Min | Max |
| A | 0.087 | 0.094 | 2.20 | 2.40 |
| A1 | 0.000 | 0.005 | 0.00 | 0.12 |
| b | 0.022 | 0.030 | 0.55 | 0.75 |
| b2 | 0.026 | 0.033 | 0.65 | 0.85 |
| b3 | 0.209 | 0.217 | 5.30 | 5.50 |
| c | 0.019 | 0.023 | 0.49 | 0.59 |
| c2 | 0.019 | 0.023 | 0.49 | 0.59 |
| D | 0.213 | 0.224 | 5.40 | 5.70 |
| E | 0.252 | 0.260 | 6.40 | 6.60 |
| e | 0.091 | | 2.30 | |
| H | 0.374 | 0.406 | 9.50 | 10.30 |
| L | 0.058 | 0.070 | 1.47 | 1.78 |
| L1 | 0.114 | | 2.90 | |
| L2 | 0.019 | 0.023 | 0.49 | 0.59 |
| L3 | 0.053 | 0.065 | 1.35 | 1.65 |
| L4 | 0.028 | 0.039 | 0.70 | 1.00 |
| Z | 0.154 | - | 3.90 | - |

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

2. CONTROLLING DIMENSION: INCH.

Part Marking System



Pin Assignment

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

Ordering Information

| Device | Package | Shipping |
|-------------|-------------------|-----------------------|
| MCR12DCMT4 | DPAK | 2500 / Tape & Reel |
| MCR12DCMT4G | DPAK (Pb-Free) | |
| MCR12DCNT4 | TO-220AB | |
| MCR12DCNT4G | DPAK (Pb-Free) | |

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