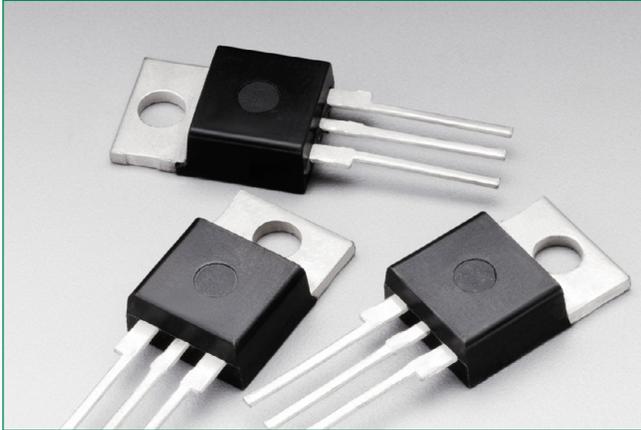


MCR12DG, MCR12MG, MCR12NG

Silicon Controlled Rectifiers — 400V - 800V



Description

Designed primarily for half-wave ac control applications, such as motor controls, heating controls and power supplies; or wherever half-wave silicon gate-controlled, solid-state devices are needed.

Features

- Blocking Voltage to 800 Volts
- On-State Current Rating of 12 Amperes RMS at 80°C
- High Surge Current Capability – 100 Amperes
- Rugged, Economical TO-220AB Package
- Glass Passivated Junctions for Reliability and Uniformity
- Minimum and Maximum Values of IGT, VGT and IH Specified for Ease of Design
- High Immunity to dv/dt – 100 V/μsec Minimum at 125°C
- These are Pb-Free devices

Additional Information



Resources



Accessories

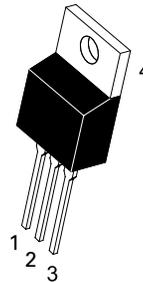


Samples

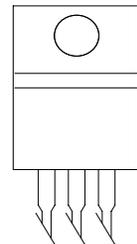
Functional Diagram



Pin Out



TO-220AB
CASE 221A
STYLE 4



MCR12DG, MCR12MG, MCR12NG

Silicon Controlled Rectifiers — 400V - 800V

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

| Rating | Part Number | Symbol | Value | Unit |
|---|-------------|----------------------|-------------|------------------------|
| Peak Repetitive Off-State Voltage (Note 1) ($T_J = -40$ to 125°C , Sine Wave, 50 to 60 Hz, Gate Open) | MCR12DG | V_{DRM} | 400 | V |
| | MCR12MG | V_{DRM} | 600 | |
| | MCR12NG | V_{RRM} | 800 | |
| On-State RMS Current (180° Conduction Angles; $T_C = 80^\circ\text{C}$) | | $I_{\text{T (RMS)}}$ | 12 | 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^2sec |
| Forward Peak Gate Power (Pulse Width ≤ 1.0 μs , $T_C = 80^\circ\text{C}$) | | P_{GM} | 5.0 | W |
| Forward Average Gate Power ($t = 8.3$ ms, $T_C = 80^\circ\text{C}$) | | $P_{\text{G (AV)}}$ | 0.5 | W |
| Average On-State Current (180° Conduction Angles; $T_C = 80^\circ\text{C}$) | | $I_{\text{T(AV)}}$ | 7.8 | A |
| Forward Peak Gate Current (Pulse Width ≤ 1.0 s, $T_C = 90^\circ\text{C}$) | | 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 Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

- 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 (AC) Junction-to-Ambient | $R_{\theta\text{JC}}$ | 2.2 | $^\circ\text{C}/\text{W}$ |
| | $R_{\theta\text{JA}}$ | 62.5 | $^\circ\text{C}/\text{W}$ |
| Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds | T_L | 260 | $^\circ\text{C}$ |

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 ($V_D = \text{Rated } V_{\text{DRM}}$ and V_{RRM} ; Gate Open) | I_{DRM} I_{RRM} | $T_J = 25^\circ\text{C}$ | - | - | 0.01 | mA |
| | | $T_J = 125^\circ\text{C}$ | - | - | 2.0 | |

Electrical Characteristics - ON

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|-----------------|-----|------|-----|------|
| Peak Forward On-State Voltage (Note 2) ($I_{\text{TM}} = 24$ A) | V_{TM} | - | - | 2.2 | V |
| Gate Trigger Current (Continuous dc) ($V_D = 12$ V, $R_L = 100$ Ω) | I_{GT} | 2.0 | 8.0 | 20 | mA |
| Holding Current ($V_D = 12$ V, Initiating Current = 200 mA, Gate Open) | I_{H} | 4.0 | 20 | 40 | mA |
| Latch Current ($V_D = 12$ V, $I_{\text{G}} = 20$ mA) | I_{L} | 6.0 | 25 | 60 | mA |
| Gate Trigger Voltage (Continuous dc) ($V_D = 12$ Vdc, $R_L = 100$ Ω) | V_{GT} | 0.5 | 0.65 | 1.0 | V |

Dynamic Characteristics

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|--------|-----|-----|-----|------------------------|
| Critical Rate-of-Rise of Off-State Voltage ($V_D = \text{Rated } V_{\text{DRM}}$, Exponential Waveform, Gate Open, $T_J = 125^\circ\text{C}$) | dv/dt | 100 | 250 | - | $\text{V}/\mu\text{s}$ |
| Repetitive Critical Rate of Rise of On-State Current IPK = 50 A, Pw = 40 μsec , diG/dt = 1 A/ μsec , lgt = 50 mA | di/dt | - | - | 50 | $\text{A}/\mu\text{s}$ |

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.

- Indicates Pulse Test: Pulse Width ≤ 2.0 ms, Duty Cycle $\leq 2\%$.

MCR12DG, MCR12MG, MCR12NG

Silicon Controlled Rectifiers — 400V - 800V

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 |

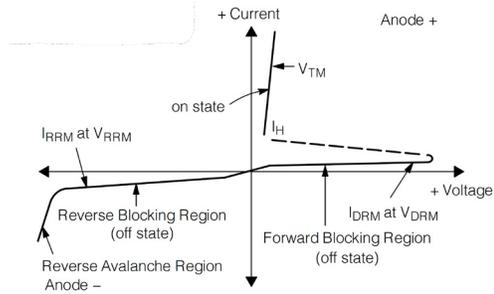


Figure 1.
Typical RMS Current Derating

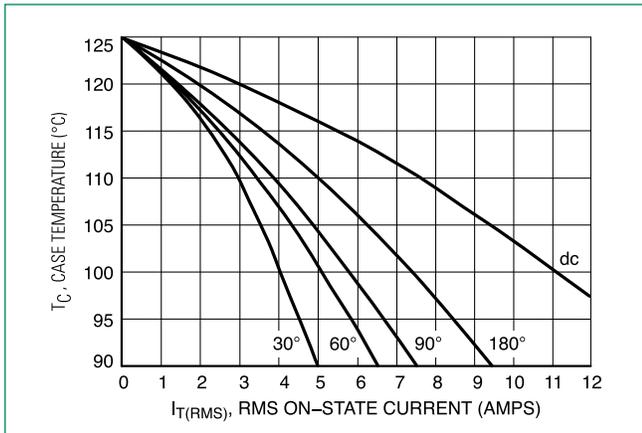


Figure 3.
Typical On-State Characteristics

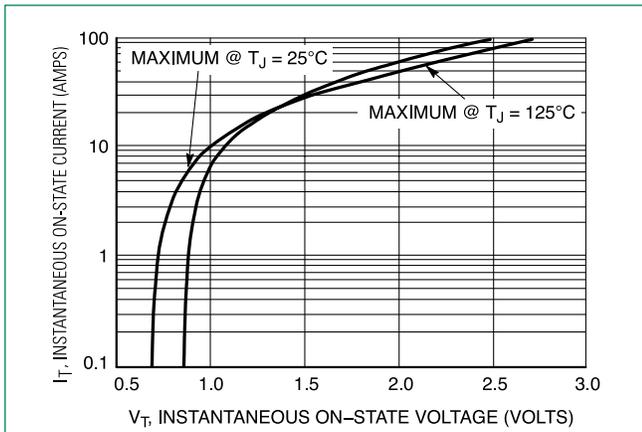


Figure 2.
On-State Power Dissipation

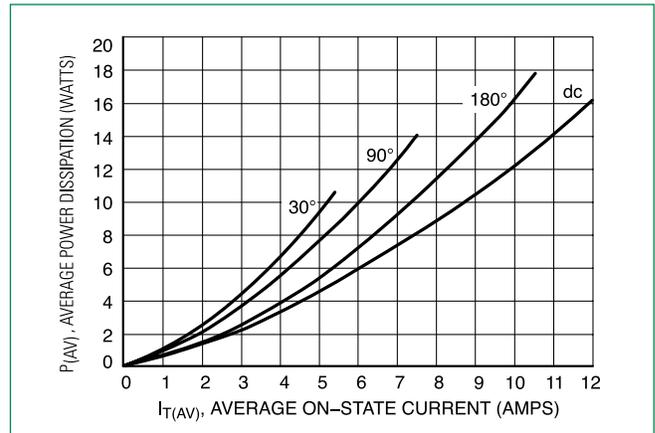


Figure 4.
Typical Gate Trigger Current vs Junction Temp

MCR12DG, MCR12MG, MCR12NG

Silicon Controlled Rectifiers — 400V - 800V

Figure 5.
Typical Holding Current vs Junction Temp

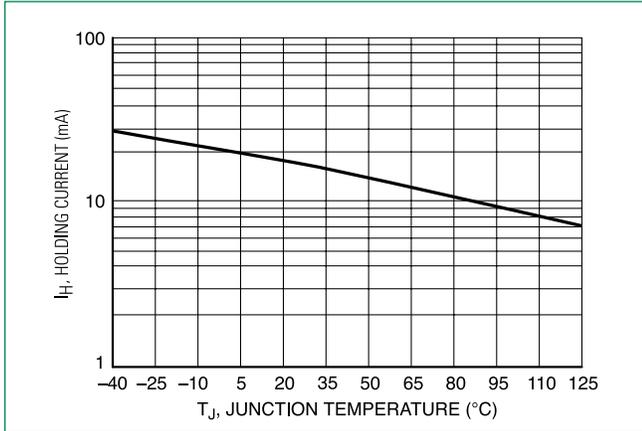


Figure 6.
Typical Gate Trigger Voltage vs Junction Temp

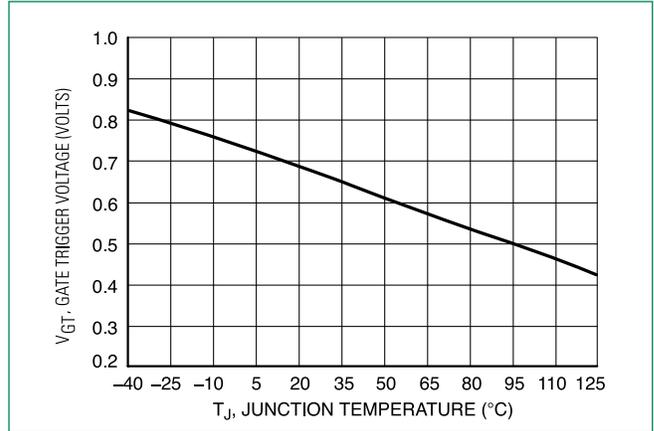
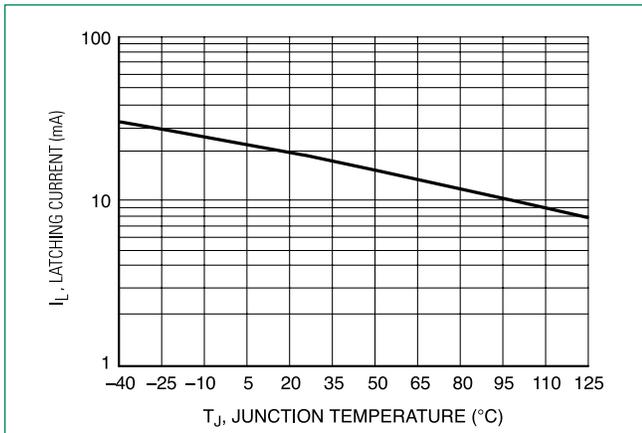


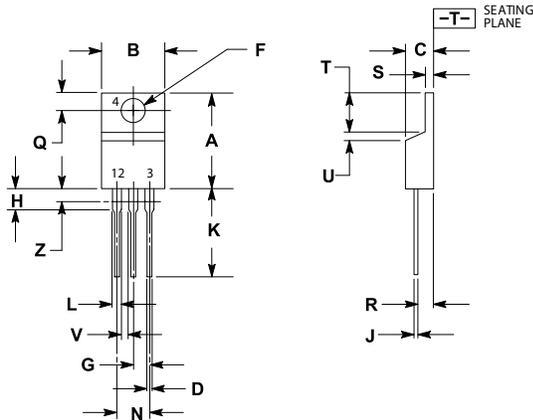
Figure 7.
Typical Latching Current vs Junction Temp



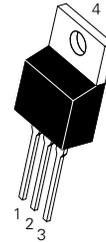
MCR12DG, MCR12MG, MCR12NG

Silicon Controlled Rectifiers — 400V - 800V

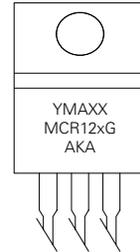
Dimensions



Part Marking System



TO-220AM



- x =D, M, or N
- Y =Year
- M =Month
- A =Assembly Site
- AKA =Diode Polarity
- G =Pb-Free Package

| Dim | Inches | | Millimeters | |
|-----|--------|-------|-------------|-------|
| | Min | Max | Min | Max |
| A | 0.590 | 0.620 | 14.99 | 15.75 |
| B | 0.380 | 0.420 | 9.65 | 10.67 |
| C | 0.178 | 0.188 | 4.52 | 4.78 |
| D | 0.025 | 0.035 | 0.64 | 0.89 |
| F | 0.142 | 0.147 | 3.61 | 3.73 |
| G | 0.095 | 0.105 | 2.41 | 2.67 |
| H | 0.110 | 0.130 | 2.79 | 3.30 |
| J | 0.018 | 0.024 | 0.46 | 0.61 |
| K | 0.540 | 0.575 | 13.72 | 14.61 |
| L | 0.060 | 0.075 | 1.52 | 1.91 |
| N | 0.195 | 0.205 | 4.95 | 5.21 |
| Q | 0.105 | 0.115 | 2.67 | 2.92 |
| R | 0.085 | 0.095 | 2.16 | 2.41 |
| S | 0.045 | 0.060 | 1.14 | 1.52 |
| 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 |

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

Ordering Information

| Device | Package | Shipping |
|---------|-----------------------|------------------|
| MCR12DG | TO-220AB (Pb-Free) | 1000 Units / Box |
| MCR12MG | | |
| MCR12NG | | |

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.

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