

MCR12DG, MCR12MG, MCR12NG



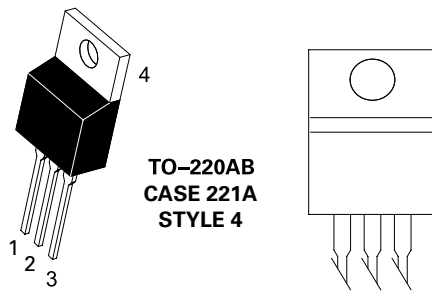
**Description**

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.

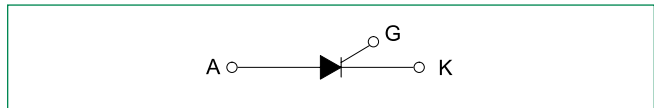
**Features**

- 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 are Specified for Ease of Design
- High Immunity to dv/dt – 100 V/sec Minimum at 125°C
- These are Pb-Free devices

**Pin Out**



**Functional Diagram**



**Additional Information**



Datasheet



Resources



Samples

### 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 $110^\circ\text{C}$ , Sine Wave, 50 to 60 Hz, Gate Open)	MCR12DG MCR12MG MCR12NG	$V_{\text{DRM}}$ $V_{\text{RRM}}$	400 600 800	V
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, $T_J = 125^\circ\text{C}$ )		$I_{\text{TSM}}$	100	A
Circuit Fusing Consideration ( $t = 8.3$ ms)		$I^2t$	41	A <sup>2</sup> sec
Forward Peak Gate Power (Pulse Width $\leq 1.0$ $\mu\text{s}$ , $T_C = 80^\circ\text{C}$ )		$P_{\text{GM}}$	5.0	W
Forward Average Gate Power ( $t = 8.3$ ms, $T_C = 80^\circ\text{C}$ )		$P_{\text{GM (AV)}}$	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 $\leq 1.0$ s, $T_C = 90^\circ\text{C}$ )		$I_{\text{GM}}$	2.0	A
Operating Junction Temperature Range		$T_J$	-40 to +125	$^\circ\text{C}$
Storage Temperature Range		$T_{\text{sig}}$	-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.

- $V_{\text{DRM}}$  and  $V_{\text{RRM}}$  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	$R_{\theta\text{JC}}$ $R_{\theta\text{JA}}$	2.2 62.5	$^\circ\text{C/W}$
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 $V_{\text{RRM}}$ ; Gate Open)	$I_{\text{DRM}}$ $I_{\text{RRM}}$	-	-	0.01	mA
		-	-	2.0	

### Electrical Characteristics - ON

Characteristic	Symbol	Min	Typ	Max	Unit
Peak Forward On-State Voltage (Note 2) ( $I_{\text{TM}} = 24$ A)	$V_{\text{TM}}$	-	-	1.7	V
Gate Trigger Voltage (Continuous dc) ( $V_D = 12$ V, $R_L = 100$ $\Omega$ )	$V_{\text{GT}}$	2.0	8.0	20	mV
Holding Current ( $V_D = 12$ Vdc, Initiating Current = 200 mA, Gate Open)	$I_{\text{H}}$	-	18	40	mA
Latch Current ( $V_D = 12$ V, $I_G = 20$ mA)	$I_{\text{L}}$	6.0	25	60	mA
Gate Trigger Voltage (Continuous dc) ( $V_D = 12$ Vdc, $R_L = 100$ $\Omega$ )	$V_{\text{GT}}$	0.5	0.65	1.0	V

### Dynamic Characteristics

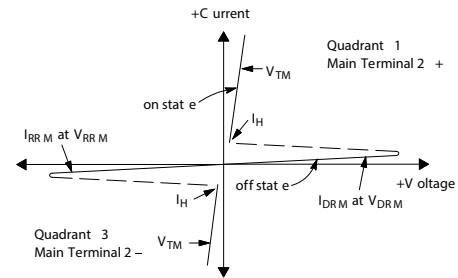
Characteristic	Symbol	Min	Typ	Max	Unit
Critical Rate-of-Rise of Off-State Voltage ( $V_D = \text{Rated } V_{\text{DRM}}$ , Exponential Waveform, Gate Open, $T_J = 125^\circ\text{C}$ )	dv/dt	100	250	-	V/ $\mu\text{s}$
Repetitive Critical Rate of Rise of On-State Current IPK = 50 A, Pw = 40 $\mu\text{sec}$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

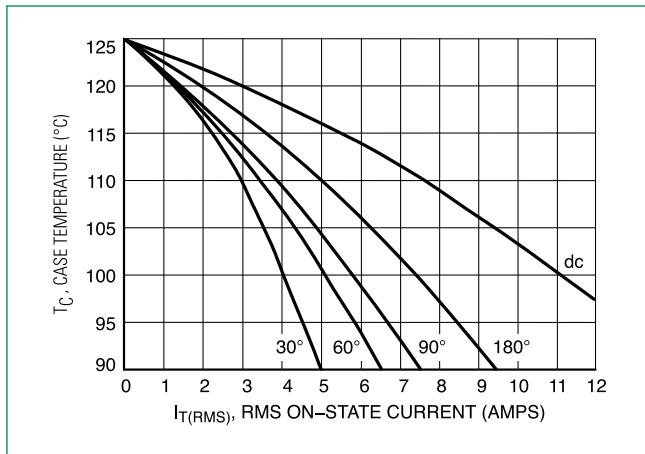
- Indicates Pulse Test: Pulse Width  $\leq 2.0$  ms, Duty Cycle  $\leq 2\%$ .

**Voltage Current Characteristic of SCR**

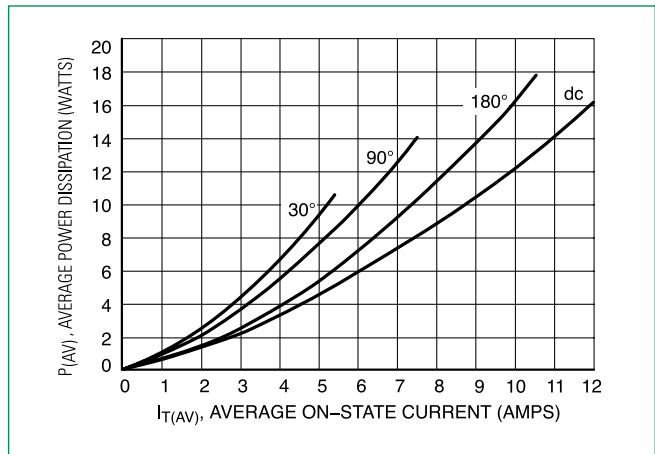
Symbol	Parameter
$V_{DRM}$	Peak Repetitive Forward Off State Voltage
$I_{DRM}$	Peak Forward Blocking Current
$V_{RRM}$	Peak Repetitive Reverse Off State Voltage
$I_{RRM}$	Peak Reverse Blocking Current
$V_{TM}$	Maximum On State Voltage
$I_H$	Holding Current



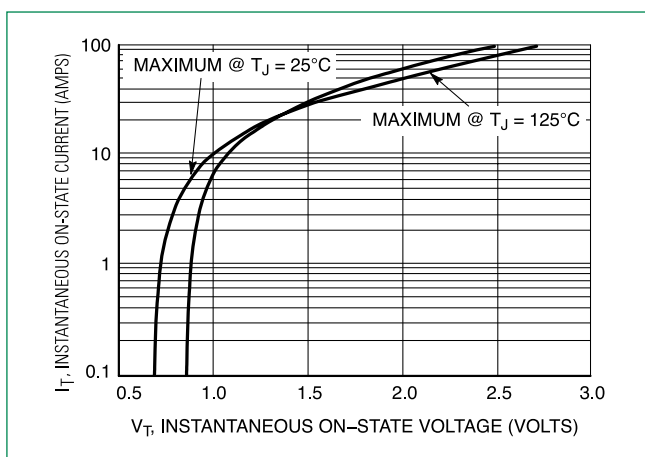
**Figure 1. Typical RMS Current Derating**



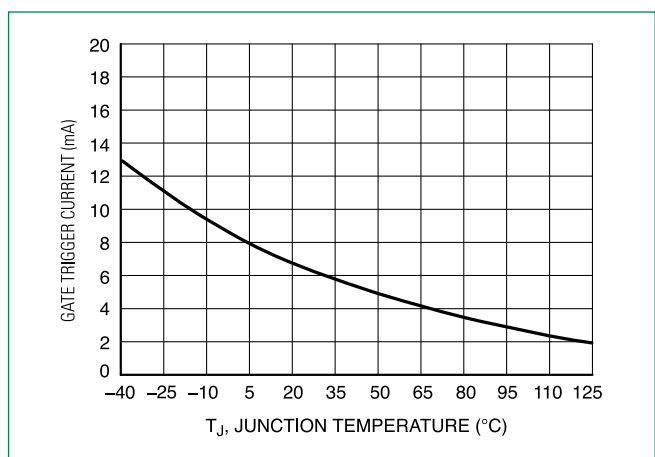
**Figure 2. On-State Power Dissipation**



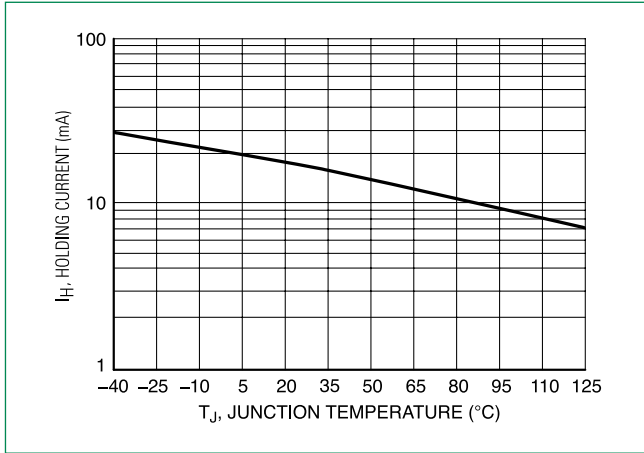
**Figure 3. Typical On-State Characteristics**



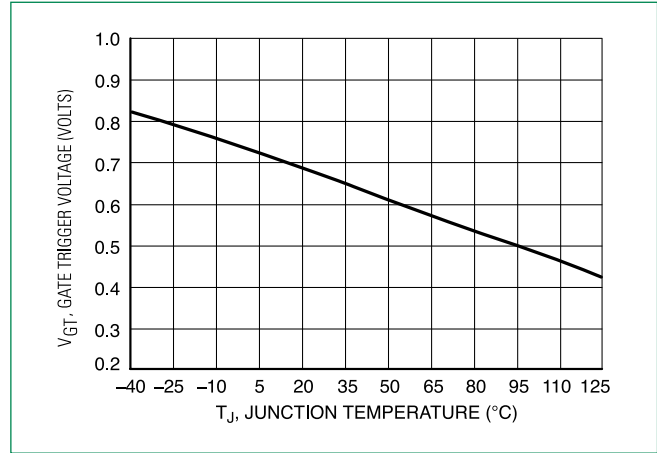
**Figure 4. Typical Gate Trigger Current vs Junction Temp**



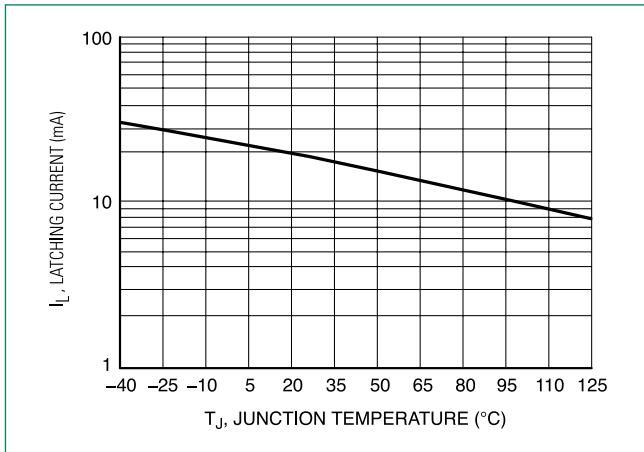
**Figure 5. Typical Holding Current vs Junction Temp**



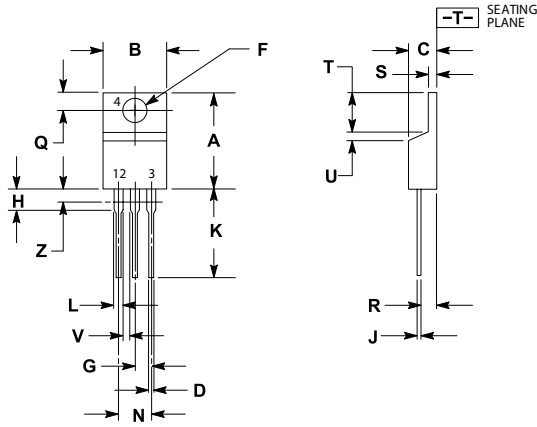
**Figure 6. Typical Gate Trigger Voltage vs Junction Temp**



**Figure 7. Typical Latching Current vs Junction Temp**



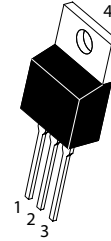
### Dimensions



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

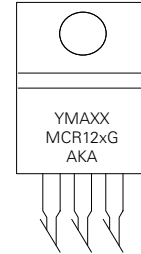
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

### Part Marking System



**TO-220AB  
CASE 221A  
STYLE 12**

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



Pin Assignment	
1	Cathode
2	Anode
3	Gate
4	Anode

### Ordering Information

Device	Package	Shipping
MCR12DG	TO-220AB (Pb-Free)	500 Units / Box
MCR12MG		
MCR12NG		

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