

# MCR12D, MCR12M, MCR12N

Preferred Device

## Silicon Controlled Rectifiers

### Reverse Blocking Thyristors

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.

- Blocking Voltage to 800 Volts
- On-State Current Rating of 12 Amperes RMS at 80°C
- High Surge Current Capability — 100 Amperes
- Rugged, Economical TO220AB 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/ $\mu$ sec Minimum at 125°C
- Device Marking: Logo, Device Type, e.g., MCR12D, 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> ( $T_J = -40$ to $125^\circ\text{C}$ , Sine Wave, 50 to 60 Hz, Gate Open)	$V_{DRM}$ , $V_{RRM}$		Volts
MCR12D		400	
MCR12M		600	
MCR12N		800	
On-State RMS Current (180° Conduction Angles; $T_C = 80^\circ\text{C}$ )	$I_T(\text{RMS})$	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 ( $t = 8.33$ ms)	$I^2t$	41	A <sup>2</sup> sec
Forward Peak Gate Power (Pulse Width $\leq 1.0$ $\mu$ s, $T_C = 80^\circ\text{C}$ )	$P_{GM}$	5.0	Watts
Forward Average Gate Power ( $t = 8.3$ ms, $T_C = 80^\circ\text{C}$ )	$P_{G(AV)}$	0.5	Watts
Forward Peak Gate Current (Pulse Width $\leq 1.0$ $\mu$ s, $T_C = 80^\circ\text{C}$ )	$I_{GM}$	2.0	A
Operating Junction Temperature Range	$T_J$	-40 to +125	°C
Storage Temperature Range	$T_{stg}$	-40 to +150	°C

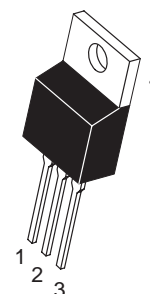
(1)  $V_{DRM}$  and  $V_{RRM}$  for all types can be applied on a continuous basis. Ratings apply for zero or negative gate voltage; positive gate voltage shall not be applied concurrent with negative potential on the anode. Blocking voltages shall not be tested with a constant current source such that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



ON Semiconductor

<http://onsemi.com>

**SCRs**  
**12 AMPERES RMS**  
**400 thru 800 VOLTS**



TO-220AB  
CASE 221A  
STYLE 3

#### PIN ASSIGNMENT

	PIN ASSIGNMENT
1	Cathode
2	Anode
3	Gate
4	Anode

#### ORDERING INFORMATION

Device	Package	Shipping
MCR12D	TO220AB	50 Units/Rail
MCR12M	TO220AB	50 Units/Rail
MCR12N	TO220AB	50 Units/Rail

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

# MCR12D, MCR12M, MCR12N

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Thermal Resistance — Junction to Case — Junction to Ambient	$R_{\theta JC}$ $R_{\theta JA}$	2.2 62.5	°C/W
Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 10 Seconds	$T_L$	260	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit
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## OFF CHARACTERISTICS

Peak Repetitive Forward or Reverse Blocking Current ( $V_D = \text{Rated } V_{DRM} \text{ and } V_{RRM}$ ; Gate Open)	$I_{DRM}$ , $I_{RRM}$	— —	— —	0.01 2.0	mA
$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$					

## ON CHARACTERISTICS

Peak Forward On-State Voltage* ( $I_{TM} = 24 \text{ A}$ )	$V_{TM}$	—	—	2.2	Volts
Gate Trigger Current (Continuous dc) ( $V_D = 12 \text{ V}$ ; $R_L = 100 \Omega$ )	$I_{GT}$	2.0	8.0	20	mA
Holding Current ( $V_D = 12 \text{ V}$ , Gate Open, Initiating Current = 200 mA)	$I_H$	4.0	20	40	mA
Latch Current ( $V_D = 12 \text{ V}$ , $I_G = 20 \text{ mA}$ )	$I_L$	6.0	25	60	mA
Gate Trigger Voltage (Continuous dc) ( $V_D = 12 \text{ V}$ ; $R_L = 100 \Omega$ )	$V_{GT}$	0.5	0.65	1.0	Volts

## DYNAMIC CHARACTERISTICS

Critical Rate of Rise of Off-State Voltage ( $V_D = \text{Rated } V_{DRM}$ , Exponential Waveform, Gate Open, $T_J = 125^\circ\text{C}$ )	$dv/dt$	100	250	—	V/ $\mu\text{s}$
Repetitive Critical Rate of Rise of On-State Current $I_{PK} = 50 \text{ A}$ , $P_w = 40 \mu\text{sec}$ , $di_G/dt = 1 \text{ A}/\mu\text{sec}$ , $I_{gt} = 50 \text{ mA}$	$di/dt$	—	—	50	A/ $\mu\text{s}$

\*Indicates Pulse Test: Pulse Width  $\leq 2.0 \text{ ms}$ , Duty Cycle  $\leq 2\%$ .

# MCR12D, MCR12M, MCR12N

## 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

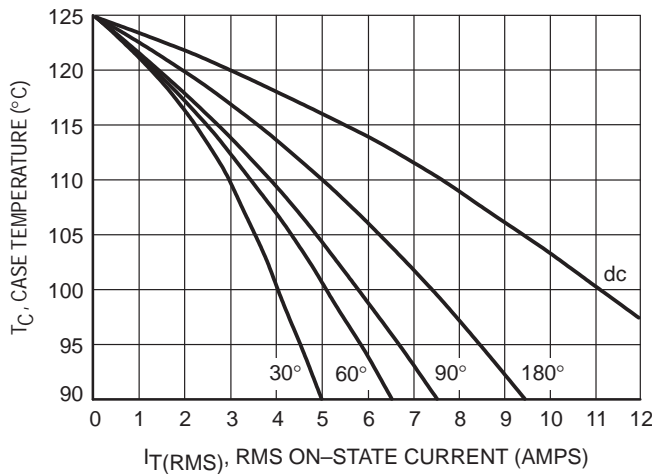
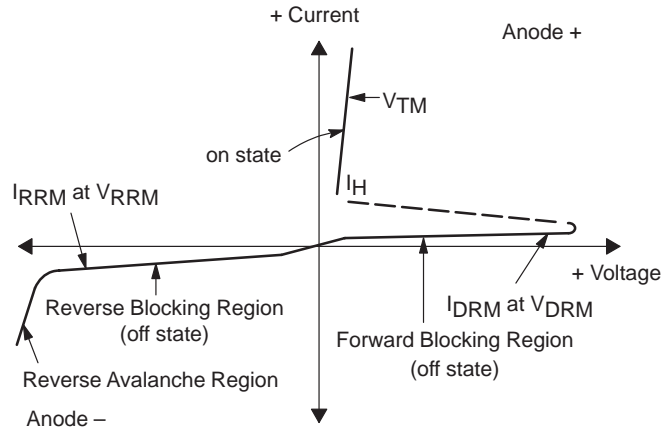


Figure 1. Typical RMS Current Derating

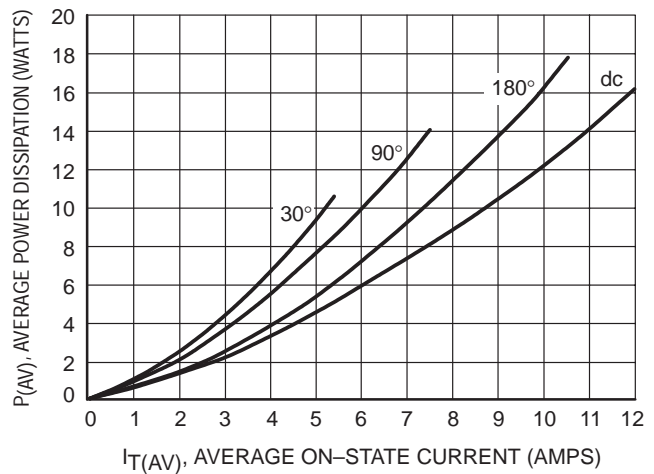


Figure 2. On-State Power Dissipation

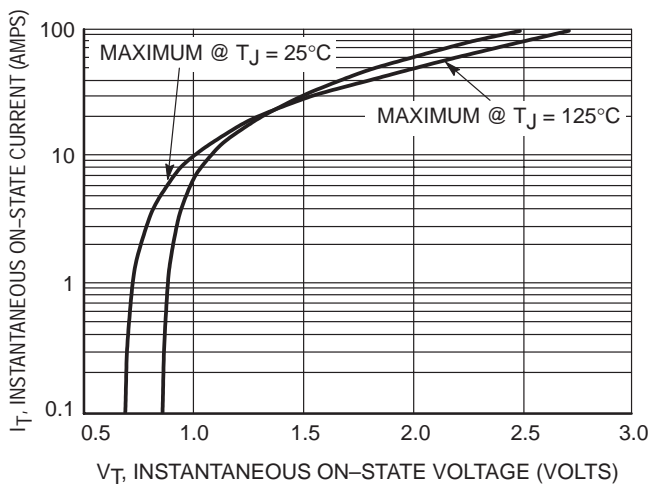


Figure 3. Typical On-State Characteristics

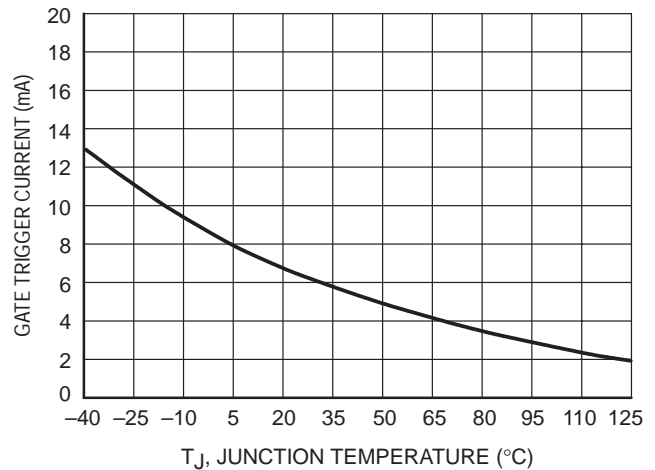
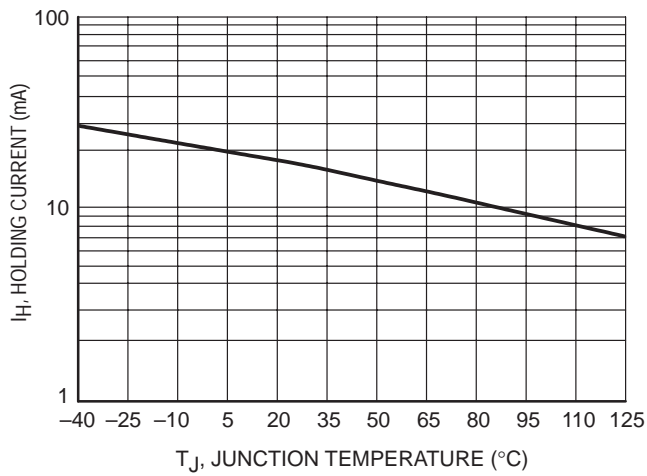
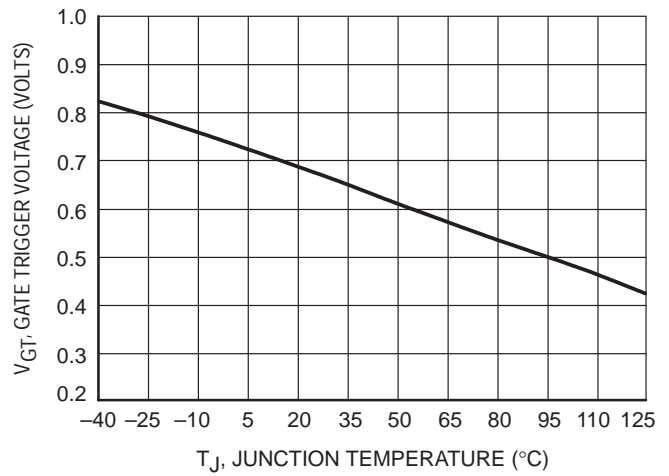


Figure 4. Typical Gate Trigger Current versus Junction Temperature

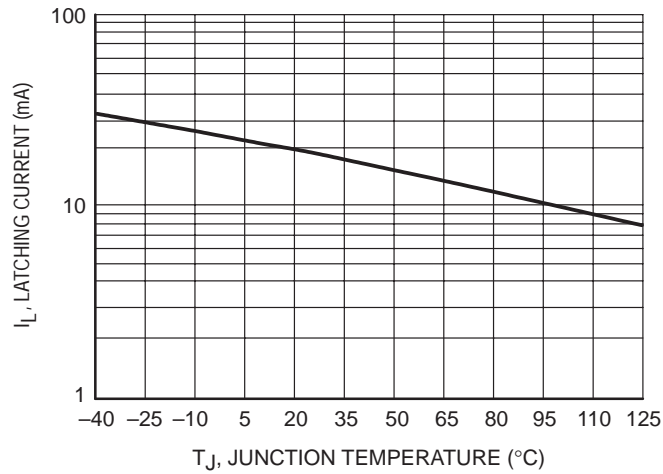
## MCR12D, MCR12M, MCR12N



**Figure 5. Typical Holding Current versus Junction Temperature**



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

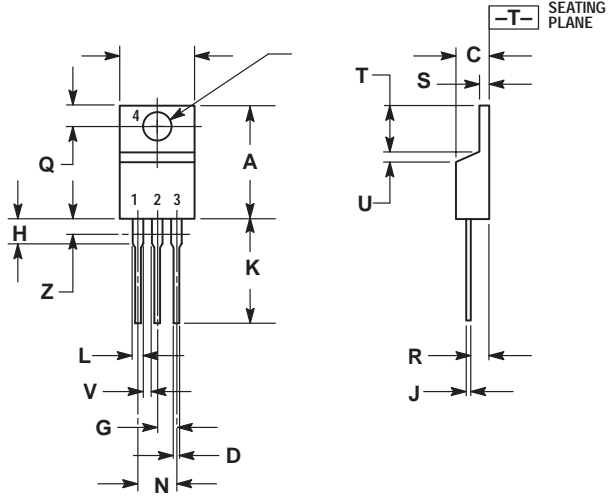


**Figure 7. Typical Latching Current versus Junction Temperature**

# MCR12D, MCR12M, MCR12N

## PACKAGE DIMENSIONS

### TO-220AB CASE 221A-09 ISSUE Z



#### NOTES:

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.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
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

#### STYLE 3:

- PIN 1. CATHODE
- ANODE
- GATE
- ANODE

## **Notes**

## **Notes**

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