

# MCR12LD, MCR12LM, MCR12LN

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 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/ $\mu$ sec Minimum at 125°C
- Device Marking: Logo, Device Type, e.g., MCR12LD, 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) MCR12LD MCR12LM MCR12LN	$V_{DRM}$ , $V_{RRM}$	400 600 800	Volts
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 ( $t = 8.3$ 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	Watt
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

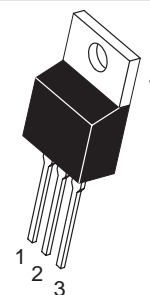
(1)  $V_{DRM}$  and  $V_{RRM}$  for all types can be applied on a continuous basis. Ratings apply for zero or negative gate voltage; positive gate voltage shall not be applied concurrent with negative potential on the anode. Blocking voltages shall not be tested with a constant current source such that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

#### ORDERING INFORMATION

Device	Package	Shipping
MCR12LD	TO220AB	50 Units/Rail
MCR12LM	TO220AB	50 Units/Rail
MCR12LN	TO220AB	50 Units/Rail

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

# MCR12LD, MCR12LM, MCR12LN

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Thermal Resistance — Junction to Case — Junction to Ambient	$R_{\theta JC}$ $R_{\theta JA}$	2.2 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 ( $T_J = 25^{\circ}\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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## OFF CHARACTERISTICS

Peak Repetitive Forward or Reverse Blocking Current ( $V_D = \text{Rated } V_{DRM}$ and $V_{RRM}$ ; Gate Open)	$T_J = 25^{\circ}\text{C}$ $T_J = 125^{\circ}\text{C}$	$I_{DRM}$ , $I_{RRM}$	— —	— —	0.01 2.0	mA
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## 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	4.0	8.0	mA
Holding Current ( $V_D = 12 \text{ V}$ , Gate Open, Initiating Current = 200 mA)	$I_H$	4.0	10	20	mA
Latch Current ( $V_D = 12 \text{ V}$ , $I_g = 20 \text{ mA}$ )	$I_L$	6.0	12	30	mA
Gate Trigger Voltage (Continuous dc) ( $V_D = 12 \text{ V}$ , $R_L = 100 \Omega$ )	$V_{GT}$	0.5	0.65	0.8	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	—	$\text{V}/\mu\text{s}$
Critical Rate of Rise of On-State Current $I_{PK} = 50 \text{ A}$ ; $P_w = 40 \mu\text{sec}$ ; $di/dt = 1 \text{ A}/\mu\text{sec}$ , $I_{gt} = 50 \text{ mA}$	$di/dt$	—	—	50	$\text{A}/\mu\text{s}$

\*Indicates Pulse Test: Pulse Width  $\leq 1.0 \text{ ms}$ , Duty Cycle  $\leq 2\%$ .

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## 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

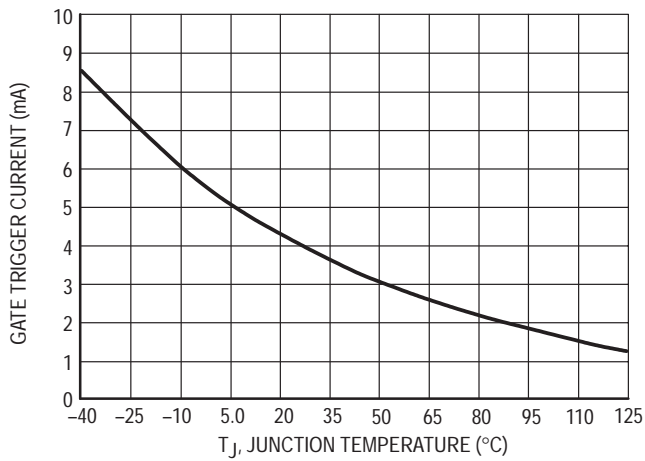
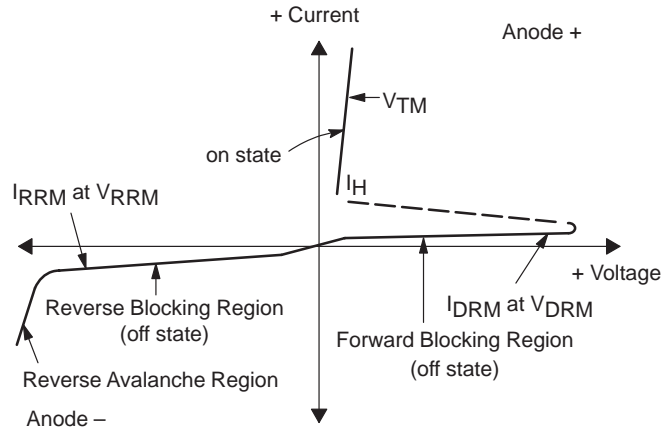


Figure 1. Typical Gate Trigger Current versus Junction Temperature

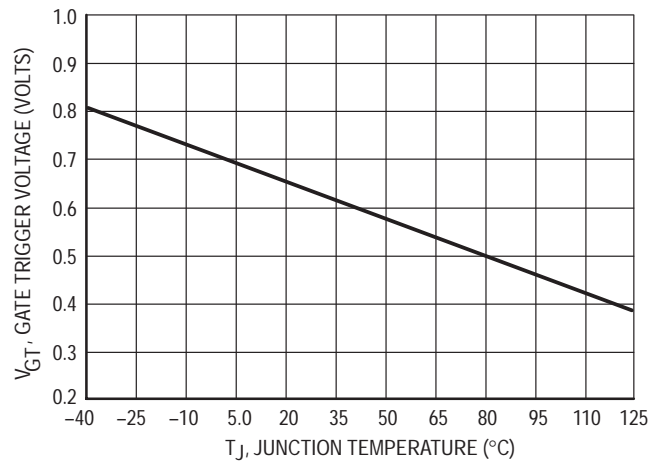


Figure 2. Typical Gate Trigger Voltage versus Junction Temperature

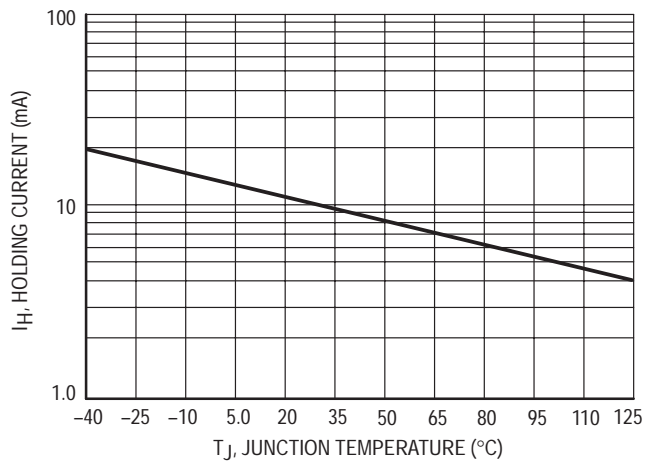


Figure 3. Typical Holding Current versus Junction Temperature

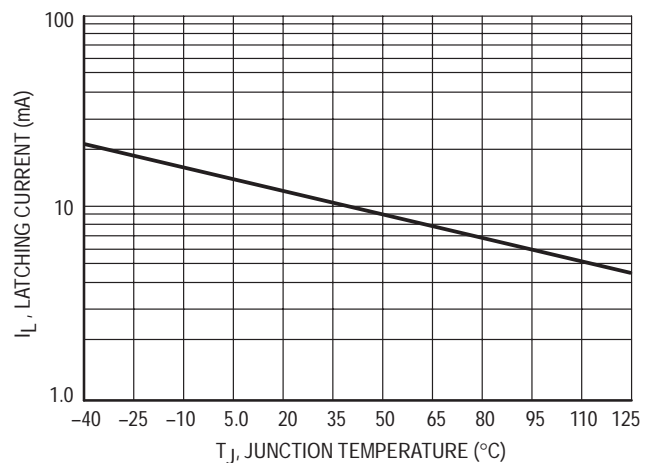


Figure 4. Typical Latching Current versus Junction Temperature

## MCR12LD, MCR12LM, MCR12LN

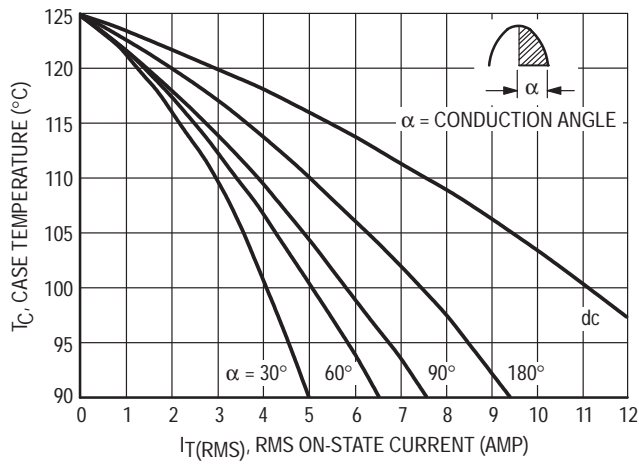


Figure 5. Typical RMS Current Derating

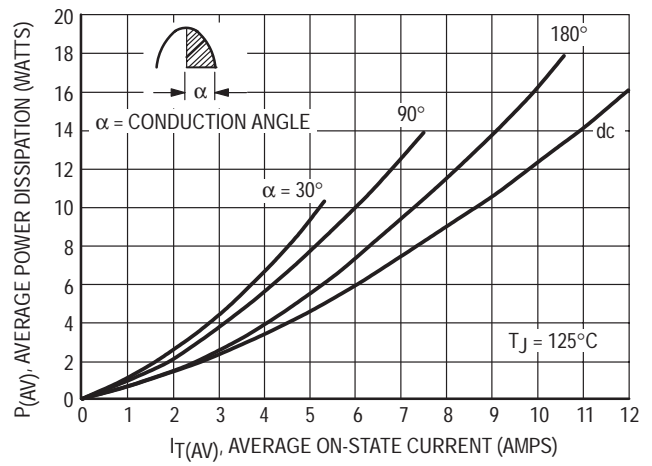


Figure 6. On-State Power Dissipation

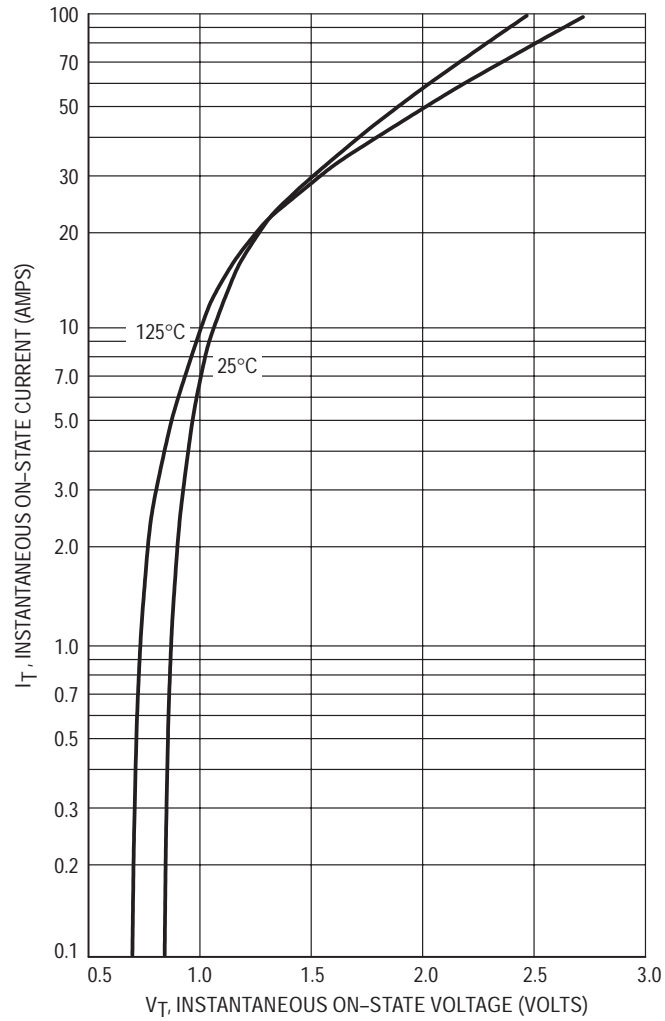
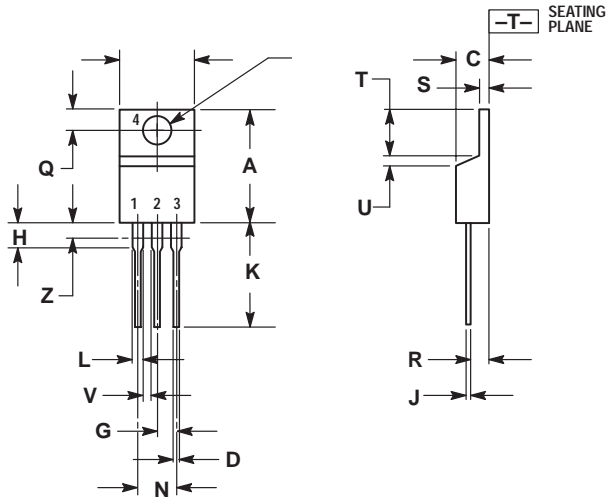


Figure 7. Typical On-State Characteristics

# MCR12LD, MCR12LM, MCR12LN

## 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  
2: ANODE  
3: GATE  
4: ANODE

## **Notes**

## **Notes**

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