

# MCR25DG, MCR25MG, MCR25NG

## 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.

### Features

- Blocking Voltage to 800 Volts
- On-State Current Rating of 25 Amperes RMS
- High Surge Current Capability – 300 Amperes
- Rugged, Economical TO-220AB Package
- Glass Passivated Junctions for Reliability and Uniformity
- Minimum and Maximum Values of  $I_{GT}$ ,  $V_{GT}$ , and  $I_H$  Specified for Ease of Design
- High Immunity to  $dv/dt$  – 100 V/ $\mu$ sec Minimum @ 125°C
- These are Pb-Free Devices\*

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

Rating	Symbol	Value	Unit
Peak Repetitive Off-State Voltage (Note 1) ( $T_J = -40$ to $125^\circ\text{C}$ , Sine Wave, 50 to 60 Hz, Gate Open)	$V_{DRM}$ , $V_{RRM}$	400 600 800	V
On-State RMS Current (180° Conduction Angles; $T_C = 80^\circ\text{C}$ )	$I_{T(RMS)}$	25	A
Peak Non-repetitive Surge Current (1/2 Cycle, Sine Wave 60 Hz, $T_J = 125^\circ\text{C}$ )	$I_{TSM}$	300	A
Circuit Fusing Consideration ( $t = 8.3$ ms)	$I^2t$	373	A <sup>2</sup> sec
Forward Peak Gate Power (Pulse Width $\leq 1.0$ $\mu$ s, $T_C = 80^\circ\text{C}$ )	$P_{GM}$	20.0	W
Forward Average Gate Power ( $t = 8.3$ ms, $T_C = 80^\circ\text{C}$ )	$P_{G(AV)}$	0.5	W
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

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, 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; 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.

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



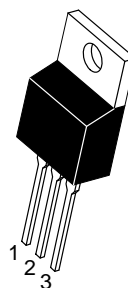
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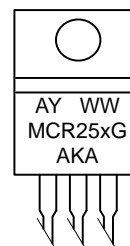
SCRs  
25 AMPERES RMS  
400 thru 800 VOLTS



### MARKING DIAGRAM



TO-220AB  
CASE 221A-09  
STYLE 3



A = Assembly Location  
Y = Year  
WW = Work Week  
x = D, M, or N  
G = Pb-Free Package  
AKA = Diode Polarity

### PIN ASSIGNMENT

1	Cathode
2	Anode
3	Gate
4	Anode

### ORDERING INFORMATION

Device	Package	Shipping
MCR25DG	TO-220AB (Pb-Free)	50 Units / Rail
MCR25MG	TO-220AB (Pb-Free)	50 Units / Rail
MCR25NG	TO-220AB (Pb-Free)	50 Units / Rail

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## THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.5	$^{\circ}\text{C/W}$
Junction-to-Ambient	$R_{\theta JA}$	62.5	
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 ( $V_{AK} = \text{Rated } V_{DRM} \text{ or } V_{RRM}$ , 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 (Note 2) ( $I_{TM} = 50 \text{ A}$ )	$V_{TM}$	–	–	1.8	V
Gate Trigger Current (Continuous dc) ( $V_D = 12 \text{ V}$ , $R_L = 100 \Omega$ )	$I_{GT}$	4.0	12	30	mA
Gate Trigger Voltage (Continuous dc) ( $V_D = 12 \text{ V}$ , $R_L = 100 \Omega$ )	$V_{GT}$	0.5	0.67	1.0	V
Holding Current ( $V_D = 12 \text{ Vdc}$ , Initiating Current = 200 mA, Gate Open)	$I_H$	5.0	13	40	mA
Latching Current ( $V_D = 12 \text{ V}$ , $I_G = 30 \text{ mA}$ )	$I_L$	–	35	80	mA

## DYNAMIC CHARACTERISTICS

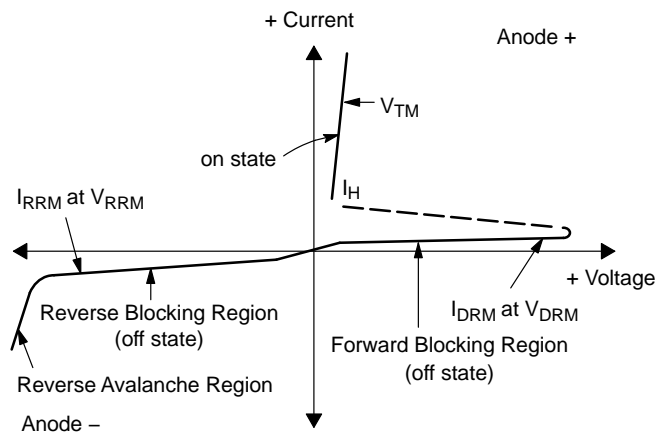
Critical Rate of Rise of Off-State Voltage ( $V_D = 67\%$ of Rated $V_{DRM}$ , Exponential Waveform, Gate Open, $T_J = 125^{\circ}\text{C}$ )	$dv/dt$	100	250	–	$\text{V}/\mu\text{s}$
Critical Rate of Rise of On-State Current ( $I_{PK} = 50 \text{ A}$ , $P_w = 30 \mu\text{sec}$ , $di_G/dt = 1 \text{ A}/\mu\text{sec}$ , $I_{gt} = 50 \text{ mA}$ )	$di/dt$	–	–	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.

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

## 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



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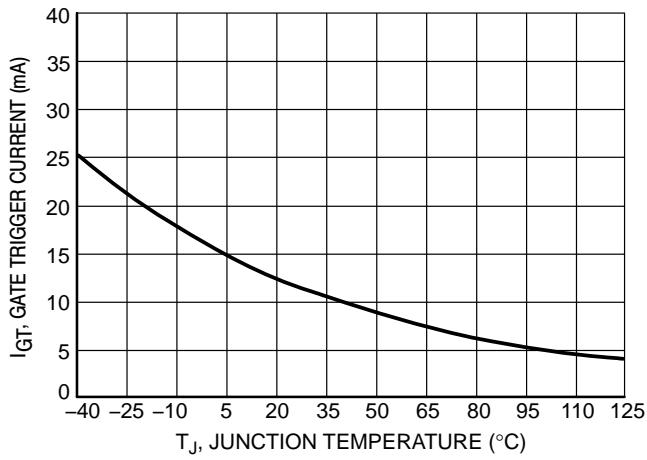


Figure 1. Typical Gate Trigger Current versus Junction Temperature

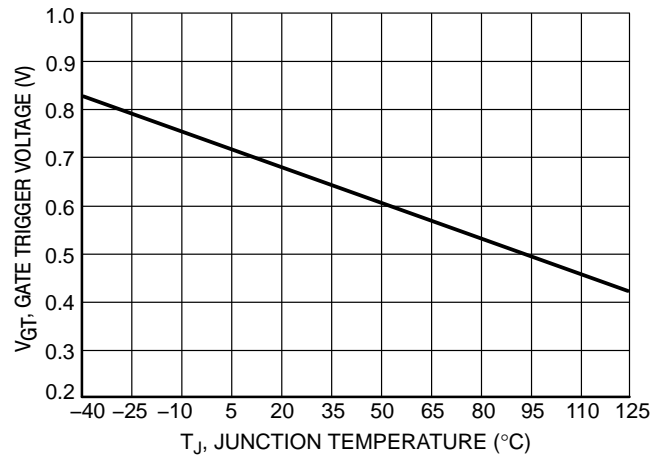


Figure 2. Typical Gate Trigger Voltage versus Junction Temperature

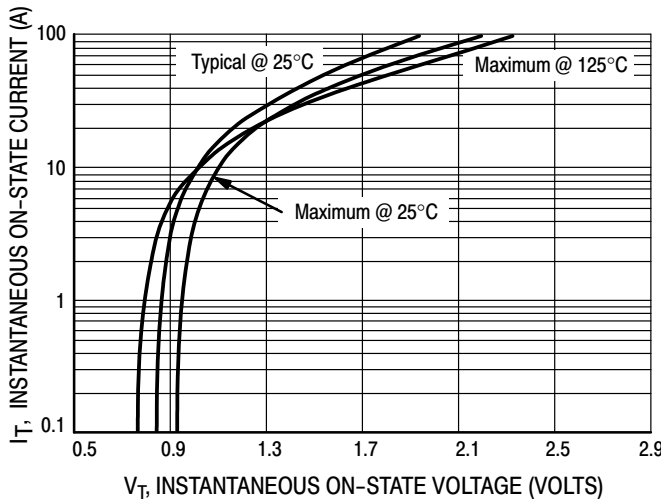


Figure 3. Typical On-State Characteristics

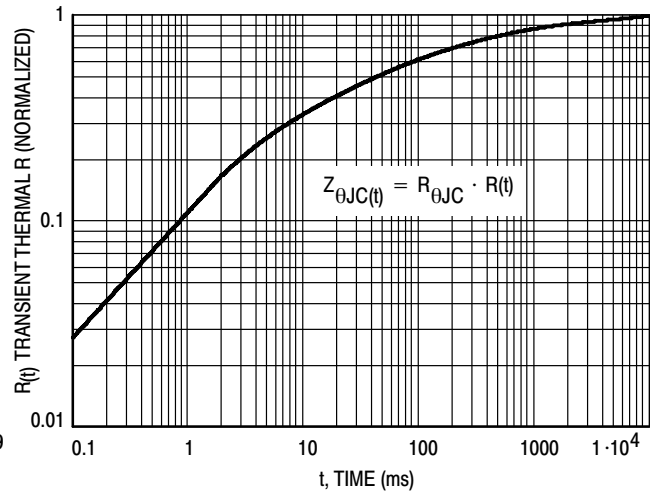


Figure 4. Transient Thermal Response

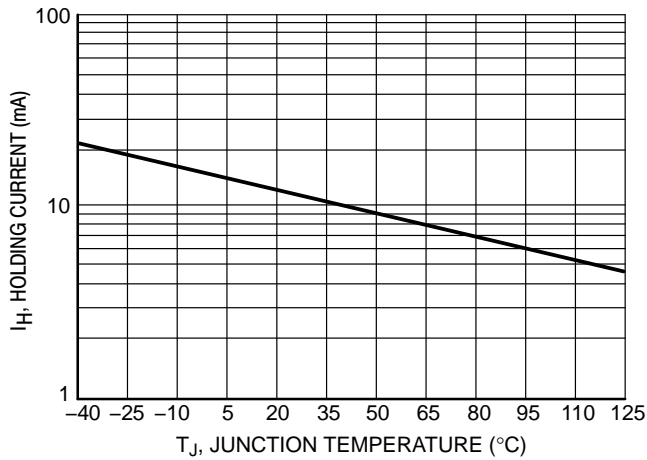


Figure 5. Typical Holding Current versus Junction Temperature

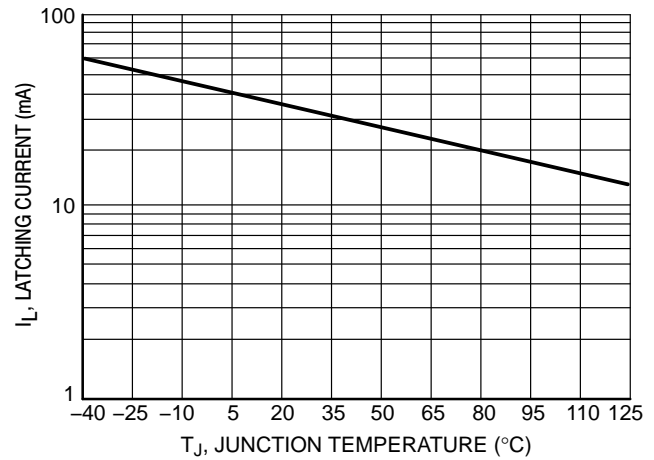


Figure 6. Typical Latching Current versus Junction Temperature

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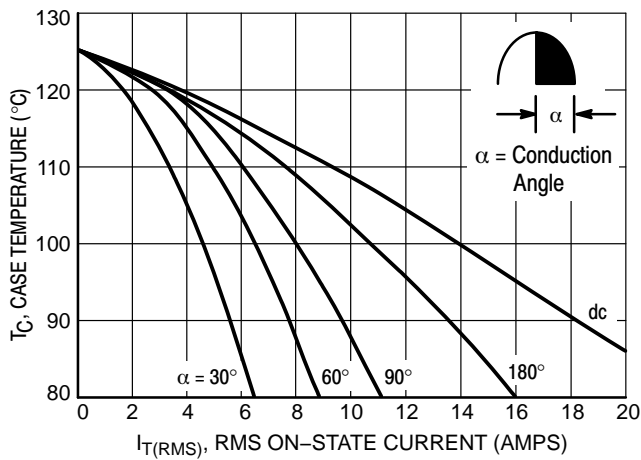


Figure 7. Typical RMS Current Derating

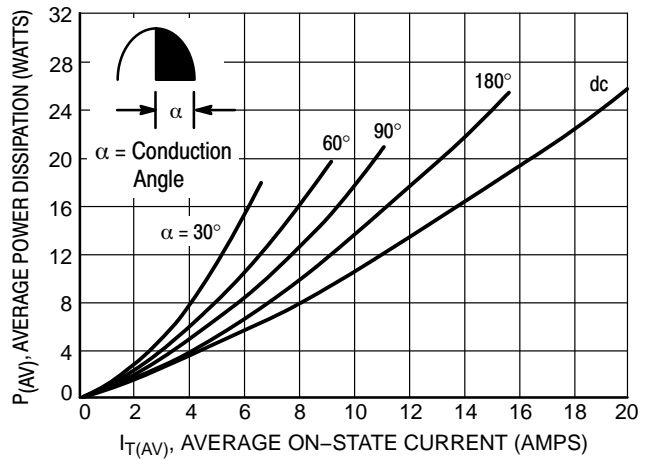


Figure 8. On State Power Dissipation

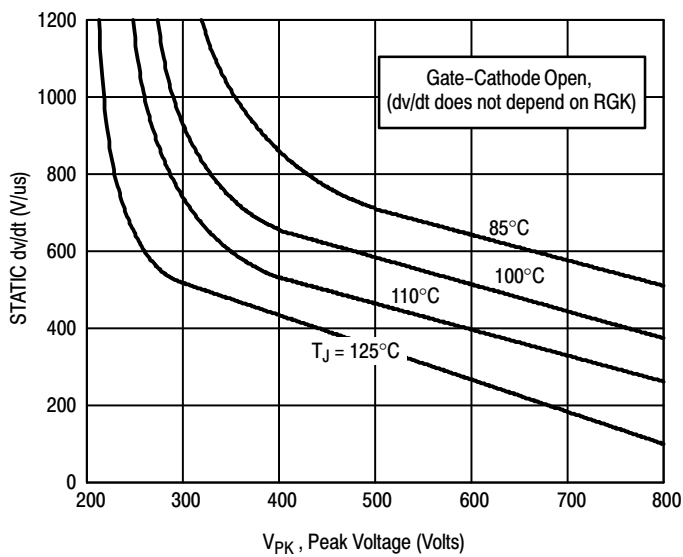


Figure 9. Typical Exponential Static  $dv/dt$  Versus Peak Voltage

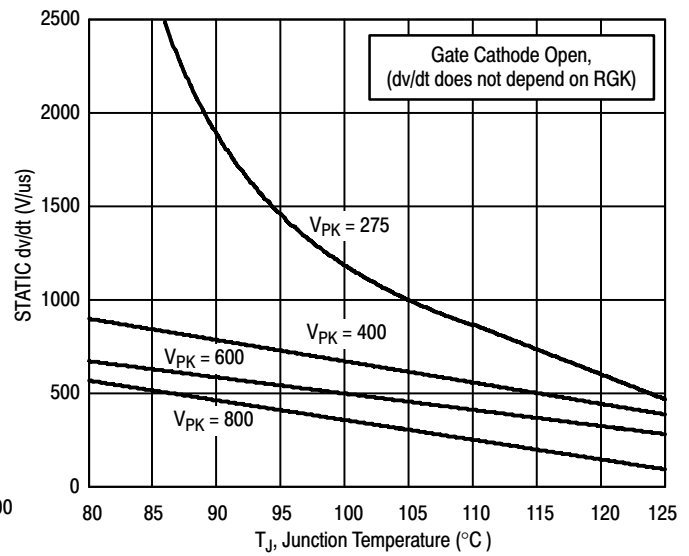


Figure 10. Typical Exponential Static  $dv/dt$  Versus Junction Temperature

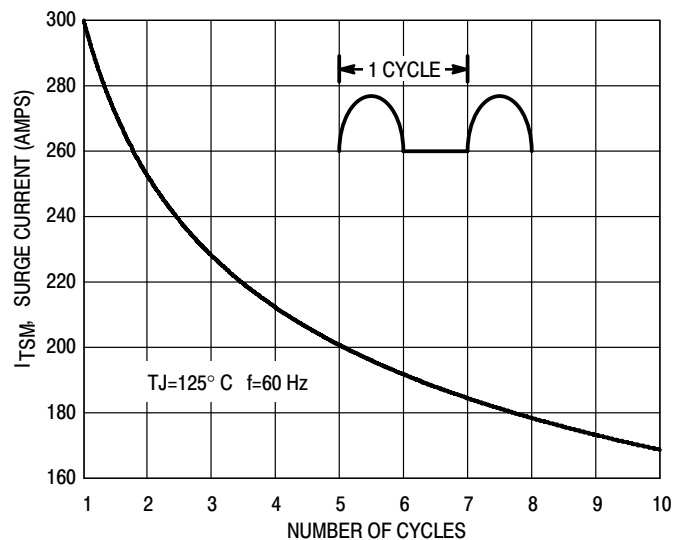
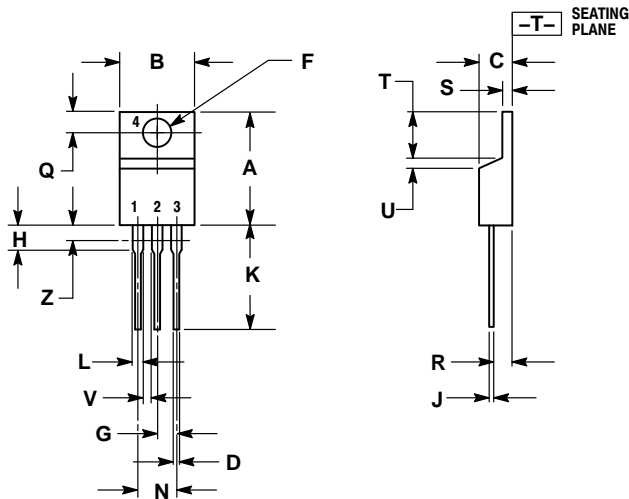


Figure 11. Maximum Non-Repetitive Surge Current

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## PACKAGE DIMENSIONS

TO-220  
CASE 221A-09  
ISSUE AH




### 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	0.415	9.66	10.53
C	0.160	0.190	4.07	4.83
D	0.025	0.038	0.64	0.96
F	0.142	0.161	3.61	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.161	2.80	4.10
J	0.014	0.024	0.36	0.61
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

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