

# MCR69-2, MCR69-3

## Silicon Controlled Rectifiers – 400V - 800V



### Description

Designed for overvoltage protection in crowbar circuits.

### Features & Benefits

- Glass-Passivated Junctions for Greater Parameter Stability and Reliability
- Center-Gate Geometry for Uniform Current Spreading Enabling High Discharge Current
- Small Rugged, Thermowatt Package Constructed for Low Thermal Resistance and Maximum Power Dissipation and Durability
- High Capacitor Discharge Current, 750 Amps
- Pb-Free Packages are Available

### Additional Information



Resources

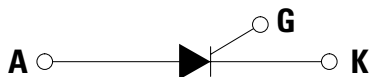


Accessories

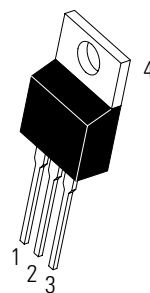


Samples

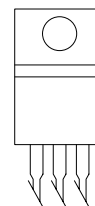
### Functional Diagram



### Pin Out



**TO-220AB  
Case 221A  
Style 3**



# MCR69-2, MCR69-3

## 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 $+125^\circ\text{C}$ , Gate Open)	MCR169-2 MCR69-3	$V_{\text{DRM}}$ , $V_{\text{RRM}}$	50 100	V
Peak Discharge Current (Note 2)		$I_{\text{TM}}$	750	A
On-State RMS Current (180° Conduction Angles; $T_C = 85^\circ\text{C}$ )		$I_{\text{T (RMS)}}$	25	A
Average On-State Current (180° Conduction Angles; $T_C = 80^\circ\text{C}$ )		$I_{\text{T(AV)}}$	16	A
Peak Non-Repetitive Surge Current (1/2 Cycle, Sine Wave, 60 Hz, $T_J = 125^\circ\text{C}$ )		$I_{\text{TSM}}$	300	A
Circuit Fusing Considerations ( $t = 8.3$ ms)		$I^2t$	375	$\text{A}^2\text{sec}$
Forward Peak Gate Current ( $t \leq 1.0$ $\mu\text{s}$ , $T_C = 85^\circ\text{C}$ )		$I_{\text{GM}}$	2.0	A
Forward Peak Gate Power ( $t \leq 1.0\mu\text{s}$ , $T_C = 85^\circ\text{C}$ )		$P_{\text{GM}}$	20	W
Operating Junction Temperature Range		$T_J$	-40 to +125	$^\circ\text{C}$
Storage Temperature Range		$T_{\text{stg}}$	-40 to +150	$^\circ\text{C}$
Mounting Torque		—	8.0	in. lb.

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. VDRM and VRRM 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.
2. Ratings apply for  $t_w = 1$  ms. See Figure 1 for ITM capability for various duration of an exponentially decaying current waveform,  $t_w$  is defined as 5 time constants of an exponentially decaying current pulse.
3. Test Conditions:  $I_G = 150$  mA,  $V_D = \text{Rated } V_{\text{DRM}}$ ,  $I_{\text{TM}} = \text{Rated Value}$ ,  $T_J = 125^\circ\text{C}$ .

### Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta\text{JC}}$	1.5	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta\text{JA}}$	60	
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 ( $V_{\text{AK}} = V_{\text{DRM}} = V_{\text{RRM}}$ ; Gate Open)	$T_J = 25^\circ\text{C}$ $I_{\text{DRM}}$	—	—	10	$\mu\text{A}$
	$T_J = 125^\circ\text{C}$ $I_{\text{RRM}}$	—	—	2.0	mA

### Electrical Characteristics - ON

Characteristic	Symbol	Min	Typ	Max	Unit
Peak Forward On-State Voltage (Note 4) ( $I_{\text{TM}} = 50$ A) ( $I_{\text{TM}} = 750$ A, $t_w = 1$ ms) (Note 5)	$V_{\text{TM}}$	—	—	1.8	V
		—	6.0	—	
Gate Trigger Current (Continuous dc) ( $V_D = 12$ V, $R_L = 100$ $\Omega$ )	$I_{\text{GT}}$	2.0	7.0	30	mA
Gate Trigger Voltage (Continuous dc) ( $V_D = 12$ Vdc, $R_L = 100$ $\Omega$ )	$V_{\text{GT}}$	—	0.65	1.5	V
Gate Non-Trigger Voltage (Continuous dc) ( $V_D = 12$ Vdc, $R_L = 100$ $\Omega$ , $T_J = 125^\circ\text{C}$ )	$V_{\text{GD}}$	0.2	0.40	—	V
Holding Current ( $V_D = 12$ Vdc, Initiating Current = 200 mA, Gate Open)	$I_{\text{H}}$	3.0	15	50	mA
Latch Current ( $V_D = 12$ Vdc, $I_G = 150$ mA)	$I_{\text{L}}$	—	—	60	mA
Gate Controlled Turn-On Time (Note 6) ( $V_D = \text{Rated } V_{\text{DRM}}$ , $I_G = 150$ mA) ( $I_{\text{TM}} = 50$ A Peak)	$t_{\text{gt}}$	—	1.0	—	$\mu\text{s}$

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## Silicon Controlled Rectifiers – 400V - 800V

### Dynamic Characteristics

Characteristic	Symbol	Min	Typ	Max	Unit
Critical Rate-of-Rise of Off-State Voltage ( $V_D = \text{Rated } V_{DRM}$ , Exponential Waveform, Gate Open, $T_J = 125^\circ\text{C}$ )	$dv/dt$	10	–	–	V/ $\mu\text{s}$
Critical Rate of Rise of On-State Current $I_G = 150 \text{ mA}$ , $T_J = 125^\circ\text{C}$	$di/dt$	–	–	100	A/ $\mu\text{s}$

4. Pulse duration  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2\%$ .

5. Ratings apply for  $t_w = 1 \text{ ms}$ . See Figure 1 for  $I_{TM}$  capability for various durations of an exponentially decaying current waveform.  $t_w$  is defined as 5 time constants of an exponentially decaying current pulse.

6. The gate controlled turn-on time in a crowbar circuit will be influenced by the circuit inductance.

### 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

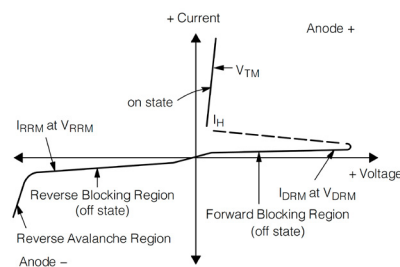


Figure 1. Typical RMS Current Derating

Figure 2. Peak Capacitor Discharge Current Derating

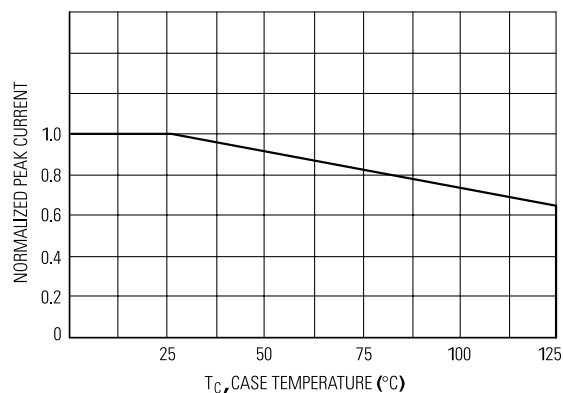


Figure 3. Current Derating

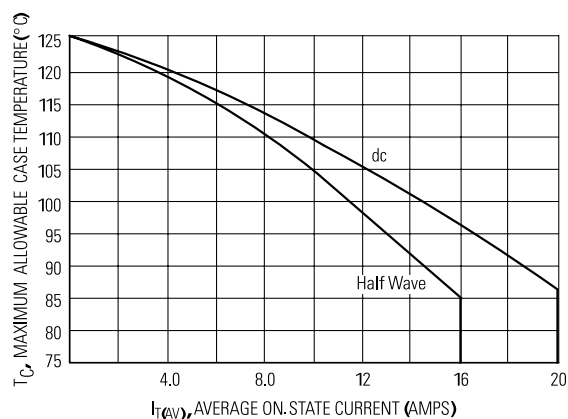
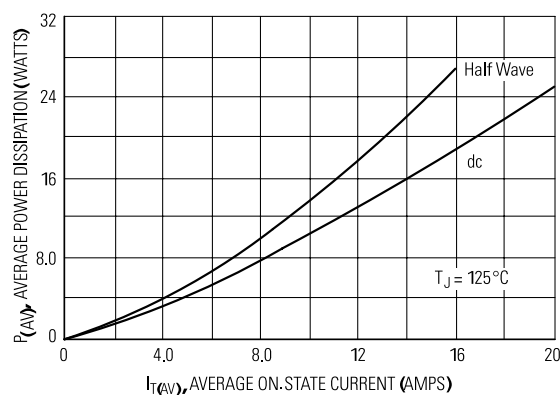


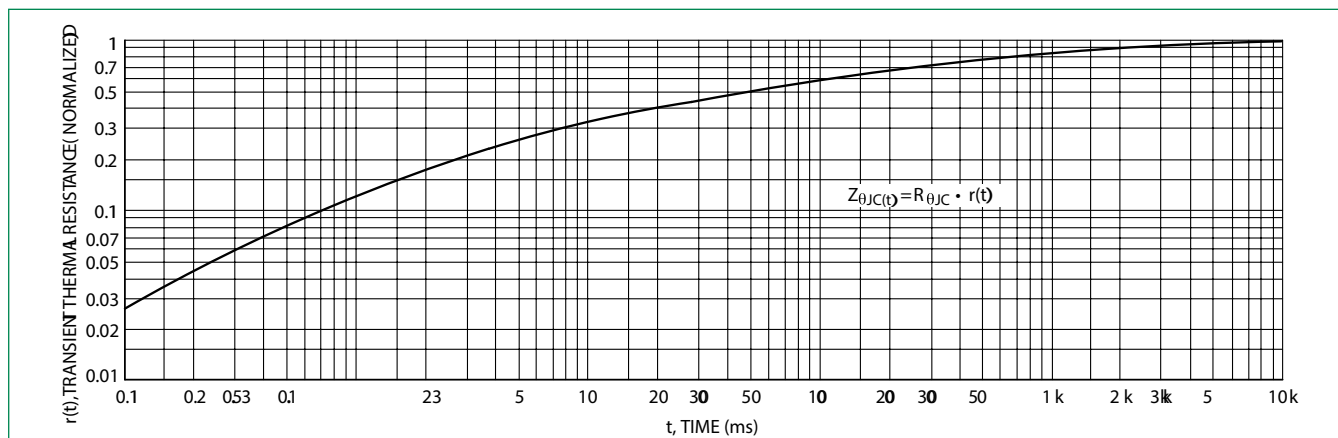
Figure 4. Maximum Power Dissipation



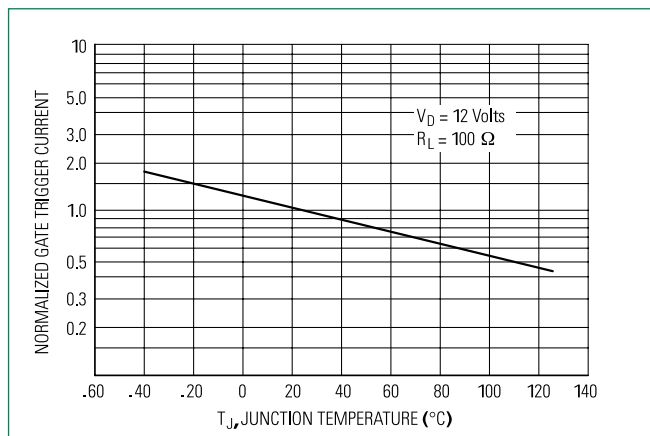
# MCR69-2, MCR69-3

## Silicon Controlled Rectifiers – 400V - 800V

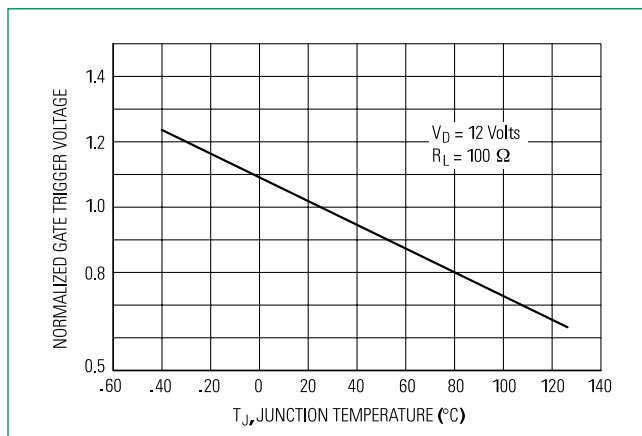
**Figure 5.**  
Thermal Response



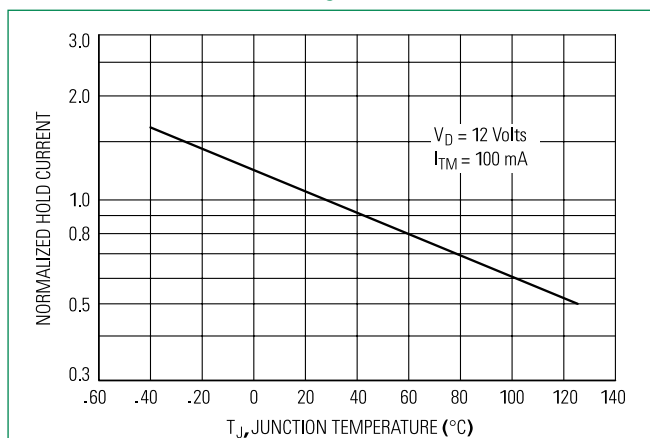
**Figure 6.**  
Gate Trigger Current



**Figure 7.**  
Gate Trigger Voltage



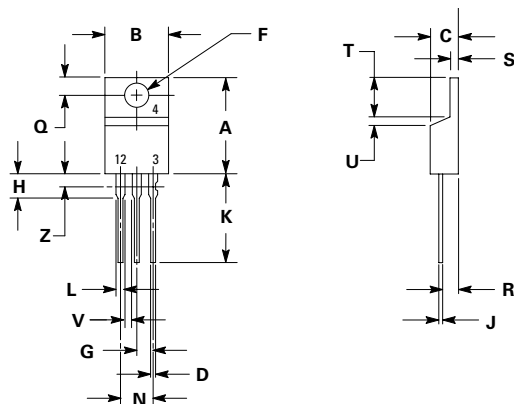
**Figure 8.**  
Holding Current



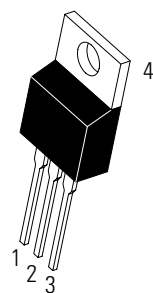
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## Silicon Controlled Rectifiers – 400V - 800V

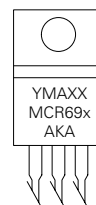
### Dimensions



### Part Marking System



**TO-220AB  
Case 221A  
Style 3**



MCR69 = Device Code  
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

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.

### Pin Assignment

Pin	Assignment
1	Cathode
2	Anode
3	Gate
4	Anode

### Ordering Information

Device	Package	Shipping
MCR69-2	TO-220AB	1000 / Box
MCR69-2G	TO-220AB (Lead-Free)	
MCR69-3	TO-220AB	
MCR69-3G	TO-220AB (Lead-Free)	

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