

# Silicon Controlled Rectifiers

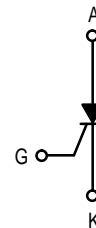
## Reverse Blocking Thyristors

Designed for high volume, low cost, industrial and consumer applications such as motor control; process control; temperature, light and speed control.

- Small Size
- Passivated Die for Reliability and Uniformity
- Low Level Triggering and Holding Characteristics
- Available in Two Package Styles
  - Surface Mount Lead Form — Case 369A
  - Miniature Plastic Package — Straight Leads — Case 369

### ORDERING INFORMATION

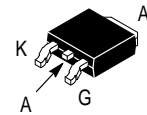
- To Obtain "DPAK" in Surface Mount Leadform (Case 369A)
  - Shipped in Sleeves — No Suffix, i.e. MCR12DSN
  - Shipped in 16 mm Tape and Reel — Add "T4" Suffix to Device Number, i.e. MCR12DSNT4
- To Obtain "DPAK" in Straight Lead Version (Case 369) Shipped in Sleeves — Add "-1" Suffix to Device Number, i.e. MCR12DSN-1



**MCR12DSM**  
**MCR12DSN**

Motorola Preferred Devices

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



**CASE 369A-13**  
**STYLE 4**

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

Rating	Symbol	Value	Unit
Peak Repetitive Off-State Voltage (1) Peak Repetitive Reverse Voltage ( $T_J = -40$ to $110^\circ\text{C}$ , $R_{GK} = 1.0\text{ K}\Omega$ )	$V_{DRM}$ $V_{RRM}$	600 800	Volts
On-State RMS Current (All Conduction Angles; $T_C = 75^\circ\text{C}$ )	$I_T(\text{RMS})$	12	Amps
Average On-State Current (All Conduction Angles; $T_C = 75^\circ\text{C}$ )	$I_T(\text{AV})$	7.6	
Peak Non-Repetitive Surge Current (One Half Cycle, 60 Hz, $T_J = 110^\circ\text{C}$ )	$I_{TSM}$	100	
Circuit Fusing Consideration ( $t = 8.3\text{ msec}$ )	$I^2t$	41	$\text{A}^2\text{sec}$
Peak Gate Power (Pulse Width $\leq 10\ \mu\text{sec}$ , $T_C = 75^\circ\text{C}$ )	$P_{GM}$	5.0	Watts
Average Gate Power ( $t = 8.3\text{ msec}$ , $T_C = 75^\circ\text{C}$ )	$P_{G(\text{AV})}$	0.5	
Peak Gate Current (Pulse Width $\leq 10\ \mu\text{sec}$ , $T_C = 75^\circ\text{C}$ )	$I_{GM}$	2.0	Amps
Operating Junction Temperature Range	$T_J$	-40 to 110	$^\circ\text{C}$
Storage Temperature Range	$T_{\text{stg}}$	-40 to 150	

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance — Junction to Case	$R_{\theta JC}$	2.2	$^\circ\text{C}/\text{W}$
— Junction to Ambient	$R_{\theta JA}$	88	
— Junction to Ambient (2)	$R_{\theta JA}$	80	
Maximum Lead Temperature for Soldering Purposes (3)	$T_L$	260	$^\circ\text{C}$

(1)  $V_{DRM}$  for all types can be applied on a continuous basis. Ratings apply for negative gate voltage or  $R_{GK} = 1.0\text{ K}\Omega$ ; 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 device are exceeded.

(2) Surface mounted on minimum recommended pad size.

(3) 1/8" from case for 10 seconds.

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

## MCR12DSM MCR12DSN

### ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ ; $R_{GK} = 1.0\text{ K}\Omega$ unless otherwise noted)

Characteristics	Symbol	Min	Typ	Max	Unit
Peak Reverse Gate Blocking Voltage ( $I_{GR} = 10\ \mu\text{A}$ )	$V_{GRM}$	10	12.5	18	Volts
Peak Forward Blocking Current Peak Reverse Blocking Current ( $V_{AK} = \text{Rated } V_{DRM} \text{ or } V_{RRM}$ ) (1) $T_J = 25^\circ\text{C}$ $T_J = 110^\circ\text{C}$	$I_{DRM}$ $I_{RRM}$	— —	— —	10 500	$\mu\text{A}$
Peak Reverse Gate Blocking Current ( $V_{GR} = 10\ \text{V}$ )	$I_{RGM}$	—	—	1.2	$\mu\text{A}$
Peak On-State Voltage (2) ( $I_{TM} = 24\ \text{A}$ )	$V_{TM}$	—	1.4	2.1	Volts
Gate Trigger Current (Continuous dc) (3) ( $V_D = 12\ \text{V}$ , $R_L = 100\ \Omega$ , $T_J = 25^\circ\text{C}$ ) ( $V_D = 12\ \text{V}$ , $R_L = 100\ \Omega$ , $T_J = -40^\circ\text{C}$ )	$I_{GT}$	5.0 —	12 —	200 300	$\mu\text{A}$
Gate Trigger Voltage (Continuous dc) ( $V_D = 12\ \text{V}$ , $R_L = 100\ \Omega$ , $T_J = 25^\circ\text{C}$ ) ( $V_D = 12\ \text{V}$ , $R_L = 100\ \Omega$ , $T_J = -40^\circ\text{C}$ ) ( $V_D = 12\ \text{V}$ , $R_L = 100\ \Omega$ , $T_J = 110^\circ\text{C}$ )	$V_{GT}$	0.45 — 0.2	0.65 — —	1.0 1.5 —	Volts
Holding Current ( $V_D = 12\ \text{V}$ , $I_{(init)} = 200\ \text{mA}$ , $T_J = 25^\circ\text{C}$ ) ( $V_D = 12\ \text{V}$ , $I_{(init)} = 200\ \text{mA}$ , $T_J = -40^\circ\text{C}$ )	$I_H$	0.5 —	1.0 —	6.0 10	mA
Latching Current ( $V_D = 12\ \text{V}$ , $I_G = 2.0\ \text{mA}$ , $T_J = 25^\circ\text{C}$ ) ( $V_D = 12\ \text{V}$ , $I_G = 2.0\ \text{mA}$ , $T_J = -40^\circ\text{C}$ )	$I_L$	0.5 —	1.0 —	6.0 10	mA

### DYNAMIC CHARACTERISTICS

Characteristics	Symbol	Min	Typ	Max	Unit
Total Turn-On Time (Source Voltage = 12 V, $R_S = 6.0\ \text{K}\Omega$ , $I_T = 16\ \text{A(pk)}$ , $R_{GK} = 1.0\ \text{K}\Omega$ ) ( $V_D = \text{Rated } V_{DRM}$ , Rise Time = 20 ns, Pulse Width = 10 $\mu\text{s}$ )	tgt	—	2.0	5.0	$\mu\text{s}$
Critical Rate of Rise of Off-State Voltage ( $V_D = 0.67 \times \text{Rated } V_{DRM}$ , Exponential Waveform, $R_{GK} = 1.0\ \text{K}\Omega$ , $T_J = 110^\circ\text{C}$ )	dv/dt	2.0	10	—	$\text{V}/\mu\text{s}$

(1) Ratings apply for negative gate voltage or  $R_{GK} = 1.0\ \text{K}\Omega$ . Devices shall not have a positive gate voltage concurrently with a negative voltage on the anode. Devices should not be tested with a constant current source for forward and reverse blocking capability such that the voltage applied exceeds the rated blocking voltage.

(2) Pulse Test; Pulse Width  $\leq 2.0\ \text{msec}$ , Duty Cycle  $\leq 2\%$ .

(3) Does not include  $R_{GK}$  current.

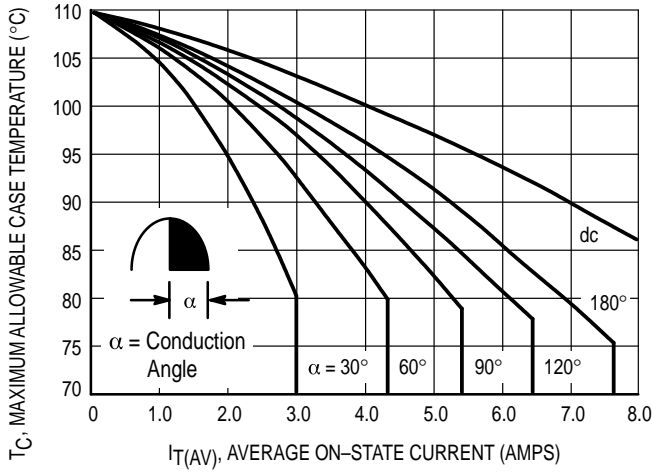


Figure 1. Average Current Derating

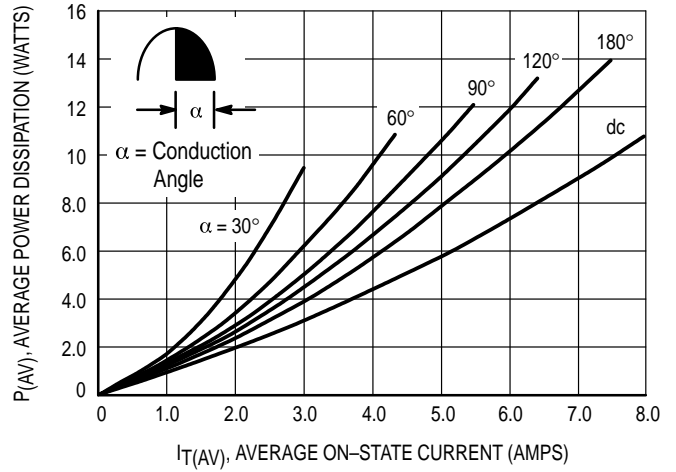


Figure 2. On-State Power Dissipation

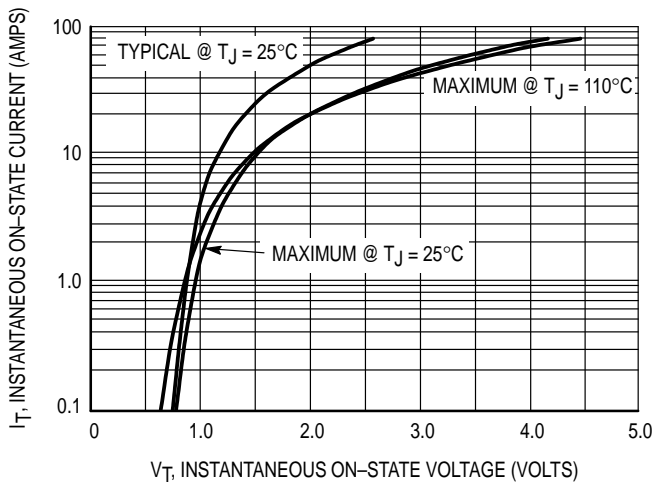


Figure 3. On-State Characteristics

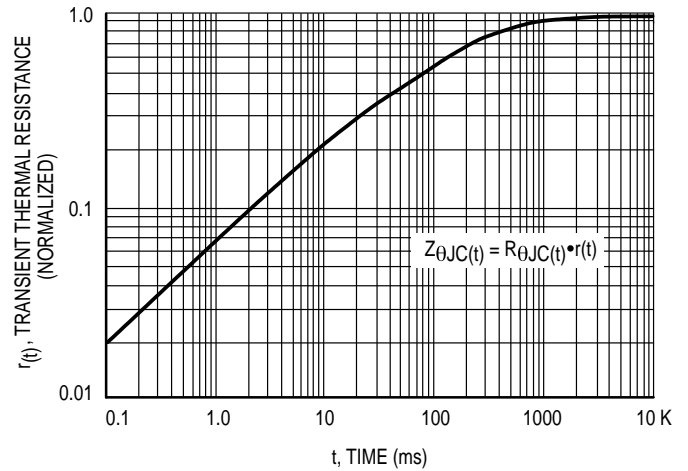


Figure 4. Transient Thermal Response

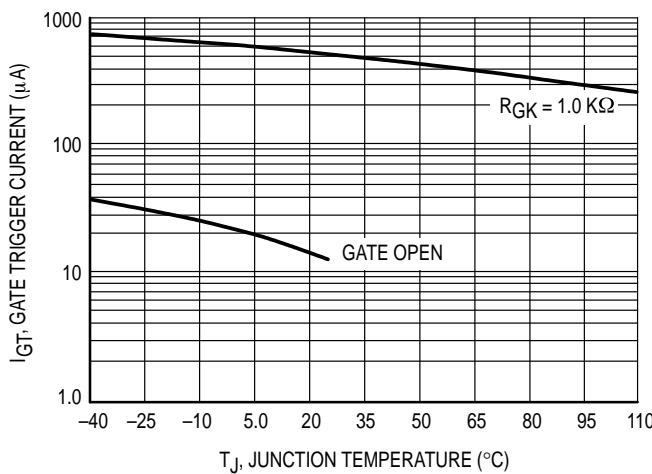


Figure 5. Typical Gate Trigger Current versus Junction Temperature

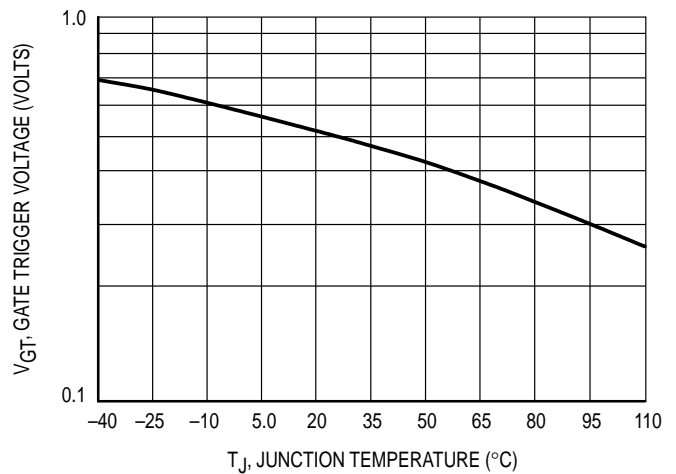
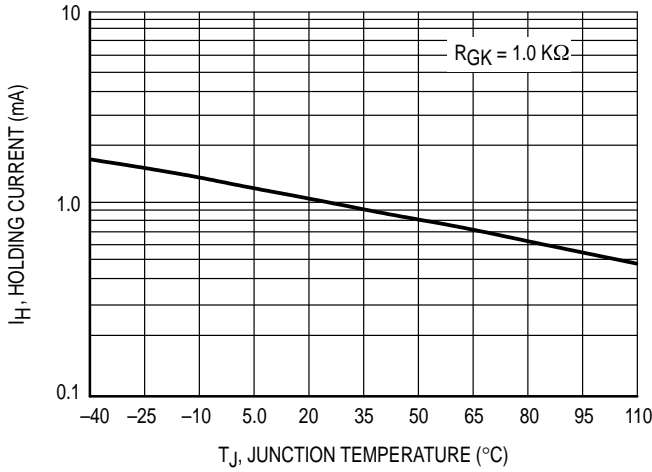
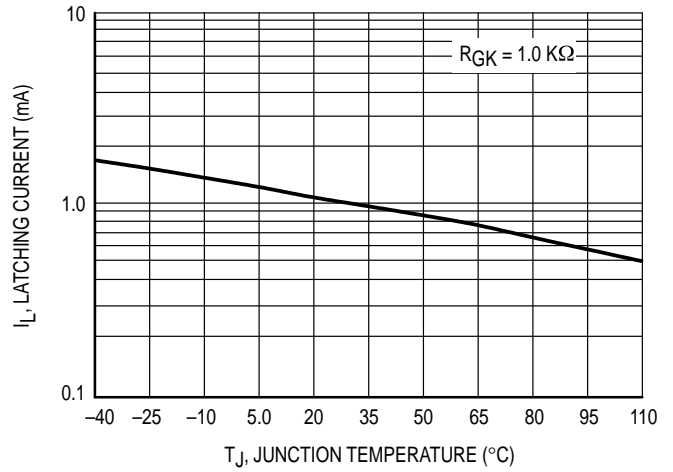


Figure 6. Typical Gate Trigger Voltage versus Junction Temperature

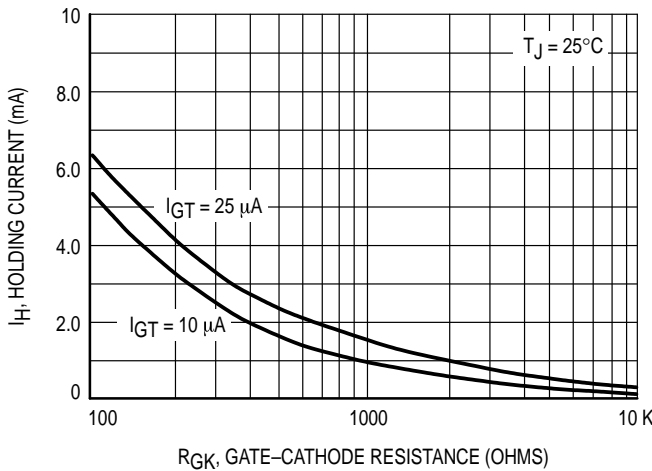
**MCR12DSM MCR12DSN**



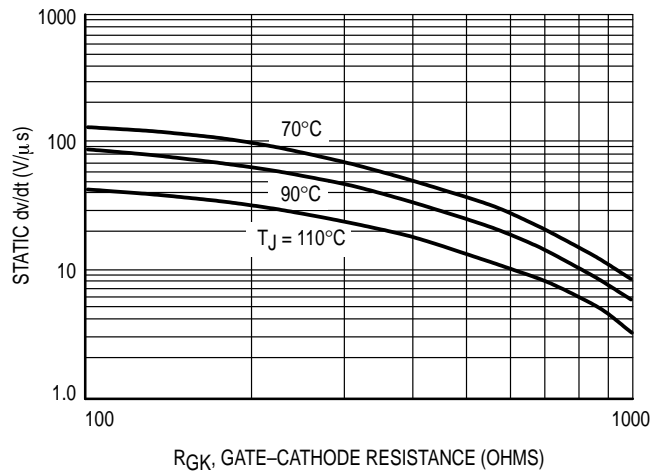
**Figure 7. Typical Holding Current versus Junction Temperature**



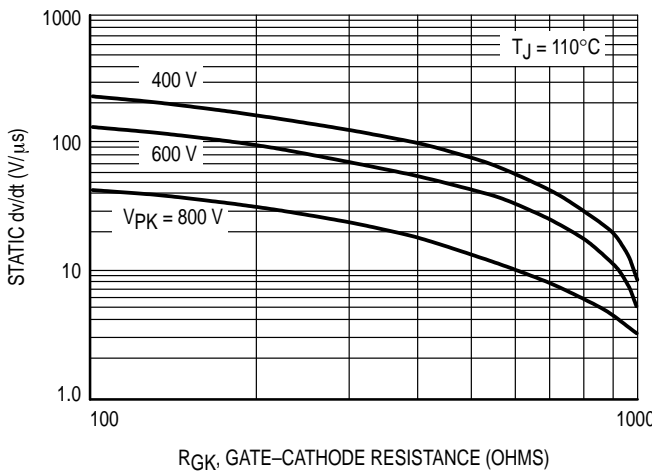
**Figure 8. Typical Latching Current versus Junction Temperature**



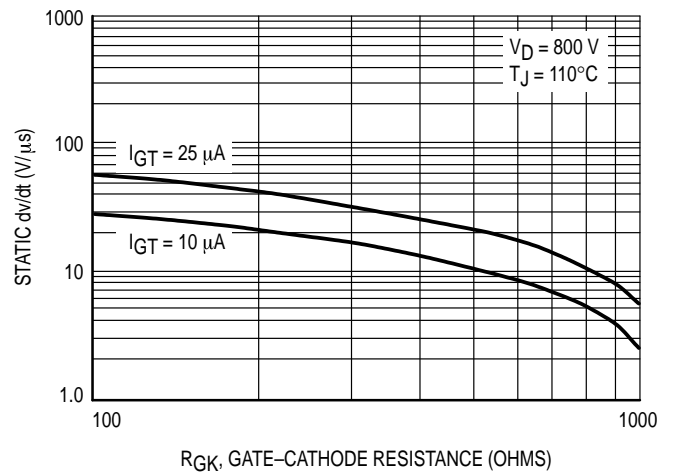
**Figure 9. Holding Current versus Gate-Cathode Resistance**



**Figure 10. Exponential Static dv/dt versus Gate-Cathode Resistance and Junction Temperature**

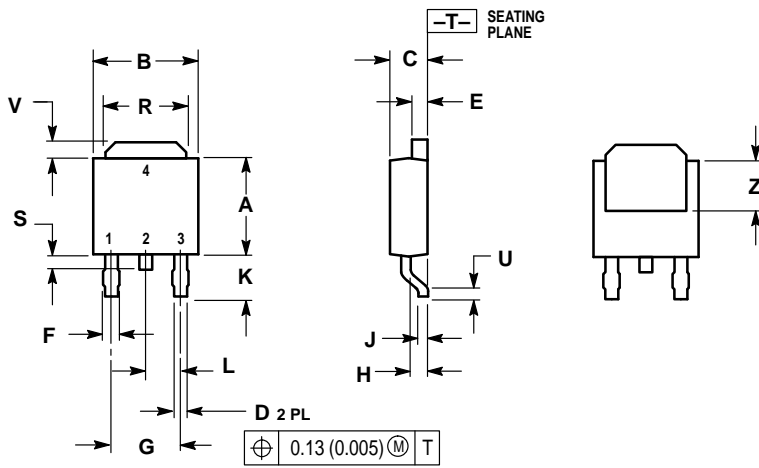


**Figure 11. Exponential Static dv/dt versus Gate-Cathode Resistance and Peak Voltage**



**Figure 12. Exponential Static dv/dt versus Gate-Cathode Resistance and Gate Trigger Current Sensitivity**

PACKAGE DIMENSIONS




- NOTES:  
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
 2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.250	5.97	6.35
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.033	0.040	0.84	1.01
F	0.037	0.047	0.94	1.19
G	0.180 BSC		4.58 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.102	0.114	2.60	2.89
L	0.090 BSC		2.29 BSC	
R	0.175	0.215	4.45	5.46
S	0.020	0.050	0.51	1.27
U	0.020	—	0.51	—
V	0.030	0.050	0.77	1.27
Z	0.138	—	3.51	—

STYLE 4:  
 PIN 1. CATHODE  
 2. ANODE  
 3. GATE  
 4. ANODE

CASE 369A-13  
 ISSUE Y

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