Preferred Device

# Sensitive Gate 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.

#### **Features**

- Small Size
- Passivated Die for Reliability and Uniformity
- Low Level Triggering and Holding Characteristics
- Available in Two Package Styles
   Surface Mount Lead Form Case 369C
   Miniature Plastic Package Straight Leads Case 369
- Epoxy Meets UL 94 V-0 @ 0.125 in
- ESD Ratings: Human Body Model, 3B > 8000 V Machine Model, C > 400 V
- Pb-Free Packages are Available

#### MAXIMUM RATINGS (T, I = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
	V <sub>DRM,</sub> V <sub>RRM</sub>	600 800	>
On–State RMS Current (180° Conduction Angles; T <sub>C</sub> = 90°C)	I <sub>T(RMS)</sub>	8.0	Α
Average On-State Current (180° Conduction Angles; T <sub>C</sub> = 90°C)	I <sub>T(AV)</sub>	5.1	Α
Peak Non-Repetitive Surge Current (1/2 Cycle, Sine Wave 60 Hz, T <sub>J</sub> = 110°C)	I <sub>TSM</sub>	90	Α
Circuit Fusing Consideration (t = 8.3 msec)	l <sup>2</sup> t	34	A <sup>2</sup> sec
Forward Peak Gate Power (Pulse Width $\leq$ 10 $\mu$ sec, T <sub>C</sub> = 90°C)	P <sub>GM</sub>	5.0	W
Forward Average Gate Power (t = 8.3 msec, T <sub>C</sub> = 90°C)	P <sub>G(AV)</sub>	0.5	W
Forward Peak Gate Current (Pulse Width $\leq$ 10 $\mu$ sec, $T_C$ = 90°C)	I <sub>GM</sub>	2.0	Α
Operating Junction Temperature Range	$T_J$	-40 to 110	°C
Storage Temperature Range	T <sub>stg</sub>	-40 to 150	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

 V<sub>DRM</sub> and V<sub>RRM</sub> for all types can be applied on a continuous basis. Ratings apply for 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 device are exceeded.

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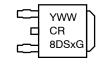
### SCRs 8 AMPERES RMS 600 – 800 VOLTS



#### MARKING DIAGRAM



DPAK CASE 369C STYLE 4



Y = Year

WW = Work Week

CR8DSx = Device Code

x= M or N

G = Pb-Free Package

PIN ASSIGNMENT				
1	Cathode			
2	Anode			
3	Gate			
4	Anode			

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

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

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance – Junction-to-Case – Junction-to-Ambient – Junction-to-Ambient (Note 2)	$egin{aligned} & R_{ hetaJC} \ & R_{ hetaJA} \ & R_{ hetaJA} \end{aligned}$	2.2 88 80	°C/W
Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 10 Seconds	TL	260	°C

maximam zead remperatare for condening r diposes 1/6	TOTAL GUODE FOR TO GOODING	, i		_00		_
ELECTRICAL CHARACTERISTICS (T <sub>J</sub> = 25°C unles	s otherwise noted)					
Characteristics		Symbol	Min	Тур	Max	Unit
OFF CHARACTERISTICS						
Peak Repetitive Forward or Reverse Blocking Current ( $V_{AK}$ = Rated $V_{DRM}$ or $V_{RRM}$ ; $R_{GK}$ = 1.0 k $\Omega$ ) (Note 3)	T <sub>J</sub> = 25°C T <sub>J</sub> = 110°C	I <sub>DRM</sub> I <sub>RRM</sub>	- -	_ _	10 500	μΑ
ON CHARACTERISTICS						
Peak Reverse Gate Blocking Voltage (I <sub>GR</sub> = 10 μA)		$V_{GRM}$	10	12.5	18	V
Peak Reverse Gate Blocking Current (V <sub>GR</sub> = 10 V)		I <sub>RGM</sub>	_	-	1.2	μΑ
Peak Forward On-State Voltage (Note 4) (I <sub>TM</sub> = 16 A)		$V_{TM}$	-	1.4	1.8	V
Gate Trigger Current (Continuous dc) (Note 5) $(V_D = 12 \text{ V}, R_L = 100 \Omega)$	$T_J = 25^{\circ}C$ $T_J = -40^{\circ}C$	I <sub>GT</sub>	5.0 -	12 -	200 300	μΑ
Gate Trigger Voltage (Continuous dc) (Note 5) $(V_D = 12 \text{ V}, \text{ R}_L = 100 \ \Omega)$	$T_J = 25^{\circ}C$ $T_J = -40^{\circ}C$ $T_J = 110^{\circ}C$	V <sub>GT</sub>	0.45 - 0.2	0.65 - -	1.0 1.5 -	V
Holding Current ( $V_D$ = 12 V, Initiating Current = 200 mA, $R_{GK}$ = 1 k $\Omega$ )	$T_J = 25^{\circ}C$ $T_J = -40^{\circ}C$	I <sub>H</sub>	0.5	1.0	6.0 10	mA
Latching Current ( $V_D$ = 12 V, $I_G$ = 2.0 mA, $R_{GK}$ = 1 k $\Omega$ )	$T_J = 25^{\circ}C$ $T_J = -40^{\circ}C$	IL	0.5	1.0	6.0 10	mA
Total Turn–On Time (Source Voltage = 12 V, $R_S$ = 6.0 k $\Omega$ , $I_T$ = 16 A(pk), $R_G$ ( $V_D$ = Rated $V_{DRM}$ , Rise Time = 20 ns, Pulse Width = 1	,	tgt	-	2.0	5.0	μs
DYNAMIC CHARACTERISTICS						
Critical Rate of Rise of Off-State Voltage  (V <sub>D</sub> = 0.67 X Rated V <sub>DRM</sub> , Exponential Waveform,		d∨/dt	2.0	10	_	V/μs

### $R_{GK} = 1.0 \text{ k}\Omega, T_{J} = 110^{\circ}\text{C}$

### **ORDERING INFORMATION**

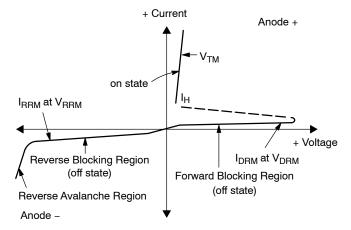
Device	Package	Shipping
MCR8DSMT4	DPAK	
MCR8DSMT4G	DPAK (Pb-Free)	9599 / Town 9 Book
MCR8DSNT4	DPAK	2500 / Tape & Reel
MCR8DSNT4G	DPAK (Pb-Free)	

<sup>2.</sup> Surface mounted on minimum recommended pad size. Ratings apply for negative gate voltage or R<sub>GK</sub> = 1.0 kΩ. 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.

<sup>4.</sup> Pulse Test; Pulse Width  $\leq$  2.0 msec, Duty Cycle  $\leq$  2%. 5.  $R_{GK}$  current not included in measurements.

### **Voltage Current Characteristic of SCR**

Symbol	Parameter
V <sub>DRM</sub>	Peak Repetitive Off-State Forward Voltage
I <sub>DRM</sub>	Peak Forward Blocking Current
V <sub>RRM</sub>	Peak Repetitive Off-State Reverse Voltage
I <sub>RRM</sub>	Peak Reverse Blocking Current
V <sub>TM</sub>	Peak On-State Voltage
IH	Holding Current



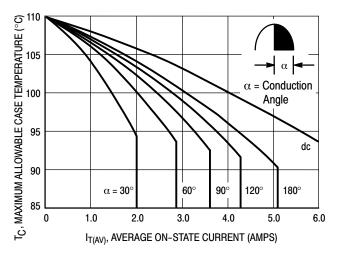


Figure 1. Average Current Derating

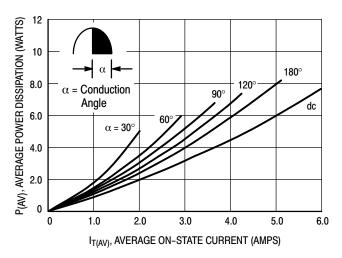
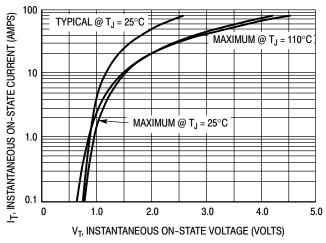


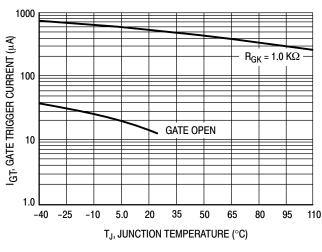
Figure 2. On-State Power Dissipation



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Figure 3. On-State Characteristics

Figure 4. Transient Thermal Response



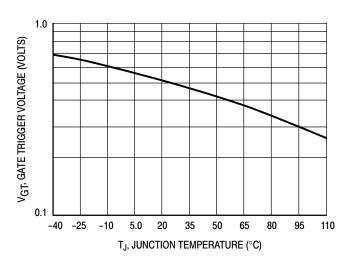
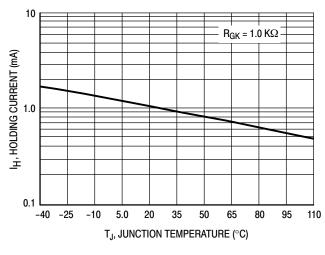


Figure 5. Typical Gate Trigger Current versus
Junction Temperature

Figure 6. Typical Gate Trigger Voltage versus Junction Temperature



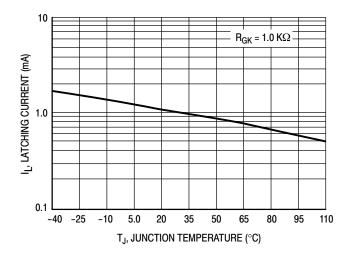


Figure 7. Typical Holding Current versus Junction Temperature

Figure 8. Typical Latching Current versus Junction Temperature

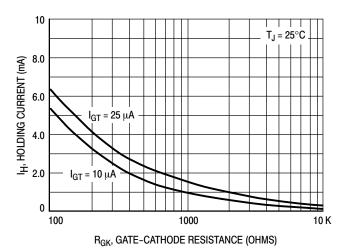
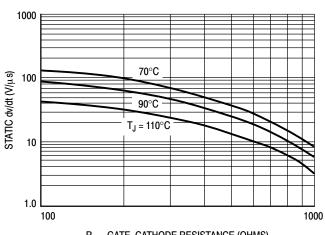


Figure 9. Holding Current versus **Gate-Cathode Resistance** 



R<sub>GK</sub>, GATE-CATHODE RESISTANCE (OHMS)

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

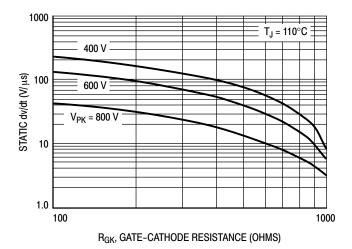
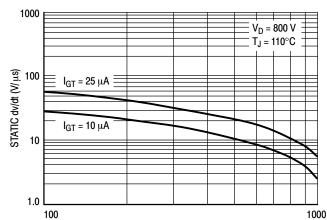


Figure 11. Exponential Static dv/dt versus Gate-Cathode Resistance and Peak Voltage

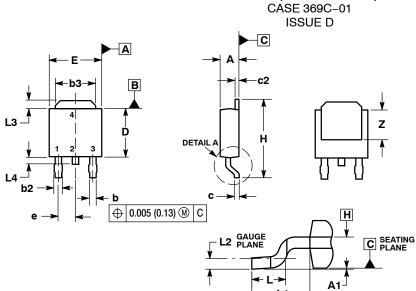


R<sub>GK</sub>, GATE-CATHODE RESISTANCE (OHMS)

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

#### PACKAGE DIMENSIONS

#### **DPAK (SINGLE GAUGE)**



#### NOTES:

- 1. DIMENSIONING AND TOLERANCING PER ASME
- Y14.5M, 1994. CONTROLLING DIMENSION: INCHES.
- 3. THERMAL PAD CONTOUR OPTIONAL WITHIN DI-MENSIONS b3, L3 and Z.
- MENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
- DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
- DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.

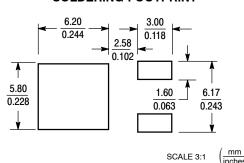
	INCHES		MILLIN	IETERS
DIM	MIN	MAX	MIN	MAX
Α	0.086	0.094	2.18	2.38
A1	0.000	0.005	0.00	0.13
b	0.025	0.035	0.63	0.89
b2	0.030	0.045	0.76	1.14
b3	0.180	0.215	4.57	5.46
C	0.018	0.024	0.46	0.61
c2	0.018	0.024	0.46	0.61
D	0.235	0.245	5.97	6.22
Е	0.250	0.265	6.35	6.73
е	0.090 BSC		2.29 BSC	
Н	0.370	0.410	9.40	10.41
L	0.055	0.070	1.40	1.78
L1	0.108	REF	2.74	REF
L2	0.020 BSC		0.51	BSC
L3	0.035	0.050	0.89	1.27
L4		0.040		1.01
Z	0.155		3.93	

STYLE 4: PIN 1. CATHODE 2. ANODE

- 3. GATE 4. ANODE

#### **SOLDERING FOOTPRINT**

**DETAIL A ROTATED 90' CW** 



Littelfuse products are not designed for, and shall not be used for, any purpose (including, without limitation, automotive, military, aerospace, medical, life-saving, life-sustaining or nuclear facility applications, devices intended for surgical implant into the body, or any other application in which the failure or lack of desired operation of the product may result in personal injury, death, or property damage) other than those expressly set forth in applicable Littelfuse product documentation. Warranties granted by Littelfuse shall be deemed void for products used for any purpose not expressly set forth in applicable Littelfuse documentation. Littelfuse shall not be liable for any claims or damages arising out of products used in applications not expressly intended by Littelfuse as set forth in applicable Littelfuse documentation. The sale and use of Littelfuse products is subject to Littelfuse Terms and Conditions of Sale, unless otherwise agreed by Littelfuse.

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