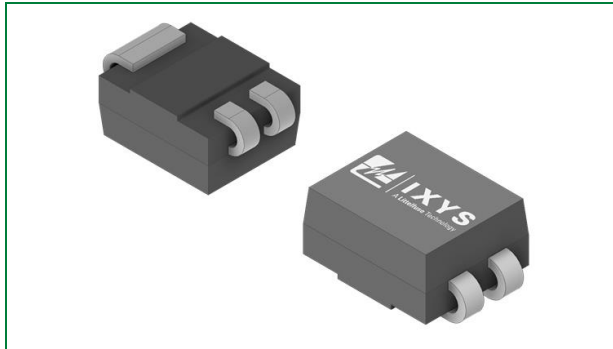


## Teccor® brand Thyristors Sx02CSx Series 1.25 Amp Sensitive SCRs



### Agency Approvals and Environmental

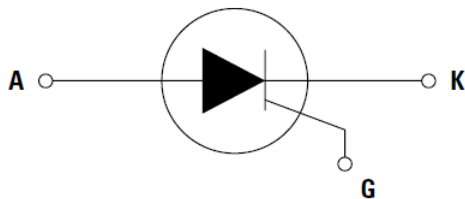
Environmental Approvals

**RoHS**

### Product Summary

Characteristic	Value	Unit
$I_{T(RMS)}$	1.25	A
$V_{DRM} / V_{RRM}$	800	V
$I_{GT}$	50 to 200	$\mu A$

### Schematic Symbol



### Product Description

The Sx02CSx offers excellent unidirectional switches for phase control applications such as heating and motor speed controls.

Sensitive gate SCRs are easily triggered with microAmps of current as furnished by sense coils, proximity switches, and microprocessors.

### Features

- RoHS compliant
- Glass-passivated junctions
- Voltage capability up to 800 V
- Surge capability up to 20 A

### Applications

Typical applications are capacitive discharge systems for strobe lights and gas engine ignition. They also include controls for power tools, home/brown goods, and white goods appliances

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## 1. Maximum Ratings

Symbol	Characteristic	Conditions	Value	Unit
$V_{DSM}$	Non-repetitive Peak Off-state Voltage	$T_J = 25^\circ\text{C}$ , $t_p = 1\text{ ms}$ , $R_{GK} = 220\ \Omega$	1250	V
$V_{RSM}$	Non-repetitive Peak Reverse Voltage	$T_J = 25^\circ\text{C}$ , $t_p = 1\text{ ms}$ , $R_{GK} = 220\ \Omega$	900	V
$I_{T(RMS)}$	RMS On-state Current	$T_c = 75^\circ\text{C}$	1.25	A
$I_{T(AV)}$	Average On-state Current	$T_c = 75^\circ\text{C}$	0.8	A
$I_{TSM}$	Peak Non-repetitive Surge Current (Single Half Cycle, $T_{J,initial} = 25^\circ\text{C}$ )	$f = 50\text{ Hz}$	16	A
		$f = 60\text{ Hz}$	20	
$I^2t$	$I^2t$ Value for Fusing	$t_p = 8.3\text{ ms}$	1.6	$\text{A}^2\text{s}$
$di/dt$	Critical Rate of Rise of On-state Current	$f = 60\text{ Hz}$ , $T_J = 110^\circ\text{C}$	50	$\text{A}/\mu\text{s}$
$I_{GM}$	Peak Gate Current	$T_J = 110^\circ\text{C}$	1.0	A
$P_{G(AV)}$	Average Gate Power Dissipation	$T_J = 110^\circ\text{C}$	0.1	W
$T_{STG}$	Storage Temperature	-	-40 to 150	$^\circ\text{C}$
$T_J$	Operating Junction Temperature	-	-40 to 110	$^\circ\text{C}$

## 2. Thermal Characteristics

Symbol	Characteristic	Value	Unit
$R_{\theta(JC)}$	Thermal Resistance, junction-to-case (AC)	60 <sup>1</sup>	$^\circ\text{C}/\text{W}$

Footnote 1: Mounted on 1 cm<sup>2</sup> copper (two-ounce) foil surface

## 3. Electrical Characteristics ( $T_J = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Description	Conditions	S802CS1			S802CS2			Unit
			Min	Typ	Max	Min	Typ	Max	
$I_{GT}$	DC Gate Trigger Current	$V_D = 6\text{ V}$ , $R_L = 100\ \Omega$	-	-	50	-	-	200	$\mu\text{A}$
$V_{GT}$	DC Gate Trigger Voltage	$V_D = 6\text{ V}$ , $R_L = 100\ \Omega$	-	-	0.8	-	-	0.8	V
$V_{GRM}$	Peak Reverse Gate Voltage	$I_{RG} = 10\ \mu\text{A}$	5	-	-	5	-	-	V
$I_H$	Holding Current	$I_T = 20\text{ mA}$ (initial), $R_{GK} = 1\text{ k}\Omega$	-	-	3	-	-	5	mA
$dv/dt$	Critical Rate-of-rise of Off-stage Voltage	$V_D = V_{DRM}$ , $R_{GK} = 1\text{ k}\Omega$ $T_J = 110^\circ\text{C}$	10	-	-	15	-	-	$\text{V}/\mu\text{s}$
$t_q$	Turn-off Time	$I_T = 1\text{ A}$ , $t_p = 50\ \mu\text{s}$ , $dv/dt = 5\text{ V}/\mu\text{s}$ , $di/dt = 5\text{ A}/\mu\text{s}$	-	-	50	-	-	50	$\mu\text{s}$
$t_{gt}$	Turn-on Time	$I_G = 2 \times I_{GT}$ , $PW = 15\ \mu\text{s}$ , $I_T = 1.6\text{ A}$	-	3	-	-	20	-	$\mu\text{s}$
$V_{GD}$	Gate Non-trigger Voltage	$V_D = V_{DRM}$ , $R_L = 3.3\text{ k}\Omega$ , $T_J = 110^\circ\text{C}$	0.25	-	-	0.25	-	-	V

## 4. Static Characteristics

Symbol	Description	Conditions	Value (Max)	Unit
$V_{TM}$	Peak On-state Voltage	$I_T = 2.5\text{ A}$ ; $t_p = 380\ \mu\text{s}$	1.70	V
$I_{DRM}/I_{RRM}$	Off-state Current, Peak Repetitive ( $V_{DRM} = V_{RRM}$ , $R_{GK} = 1\text{ k}\Omega$ )	$T_J = 25^\circ\text{C}$	1	$\mu\text{A}$
		$T_J = 100^\circ\text{C}$	50	
		$T_J = 110^\circ\text{C}$	500	

### 5. Performance Curves

Figure 1. Normalized DC Gate Trigger Current vs. Junction Temperature

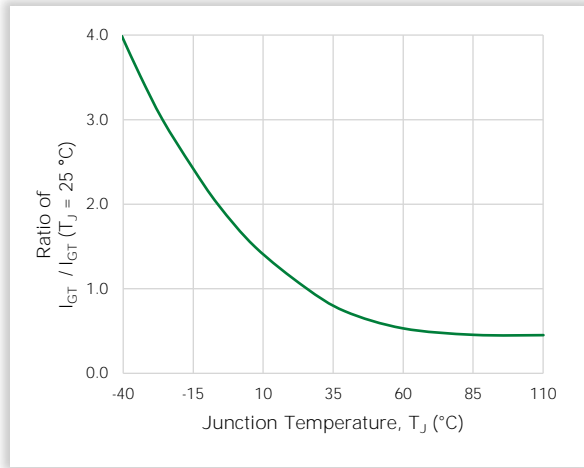


Figure 2. Normalized DC Gate Trigger Voltage vs. Junction Temperature

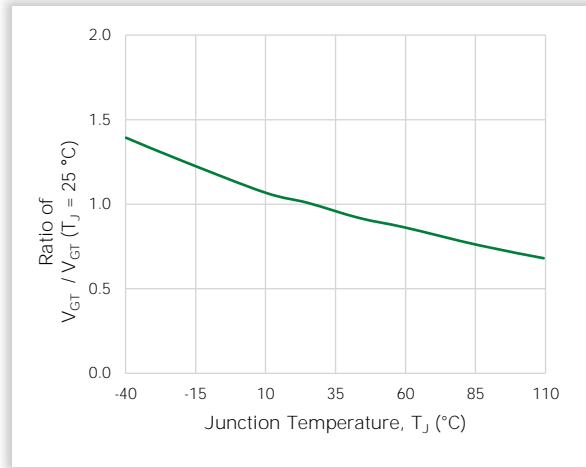


Figure 3. Normalized DC Holding Current vs. Junction Temperature

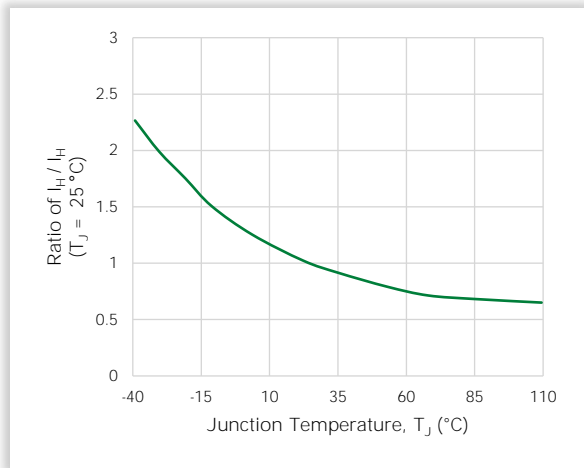


Figure 4. Typical On-state Current vs. On-state Voltage

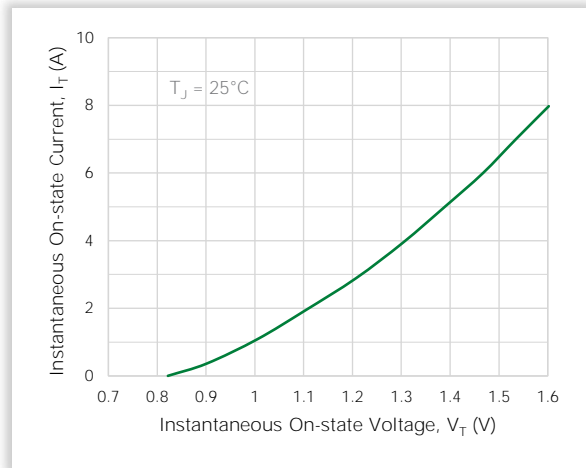


Figure 5. Typical Power Dissipation vs. RMS On-state Current

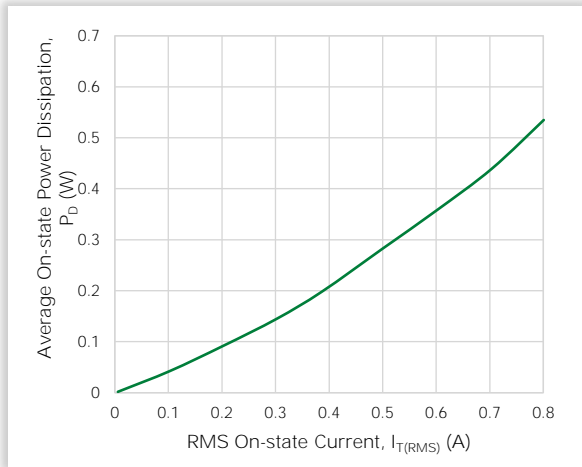


Figure 6. Maximum Allowable Case Temperature vs. RMS On-state Current

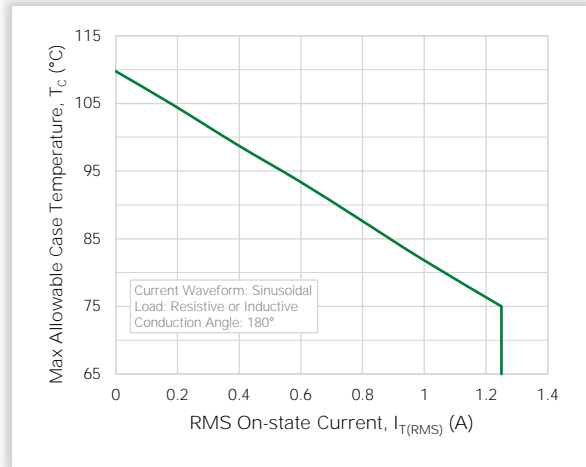


Figure 7. Maximum Allowable Case Temperature vs. Average On-state Current

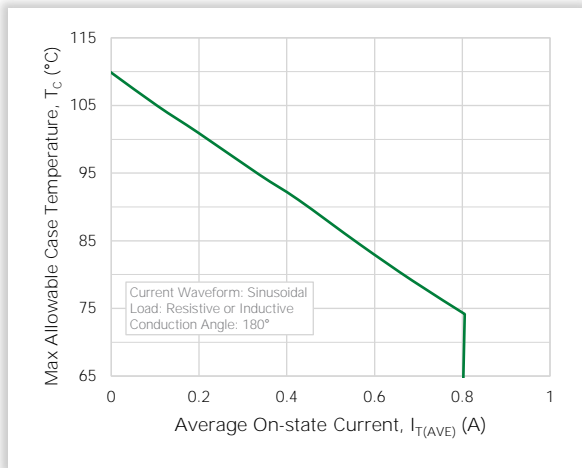


Figure 8. Peak Capacitor Discharge Current

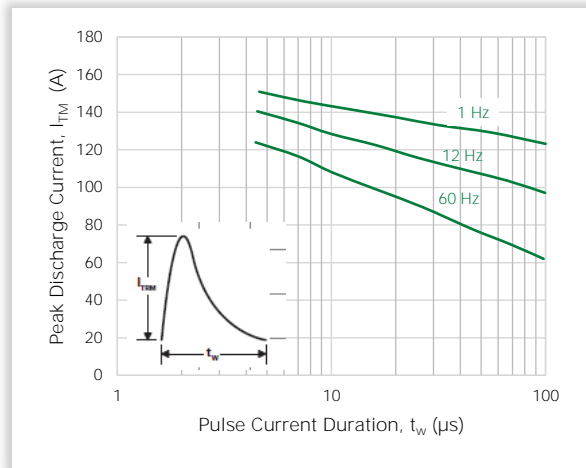


Figure 9. Peak Repetitive Sinusoidal Pulse Current

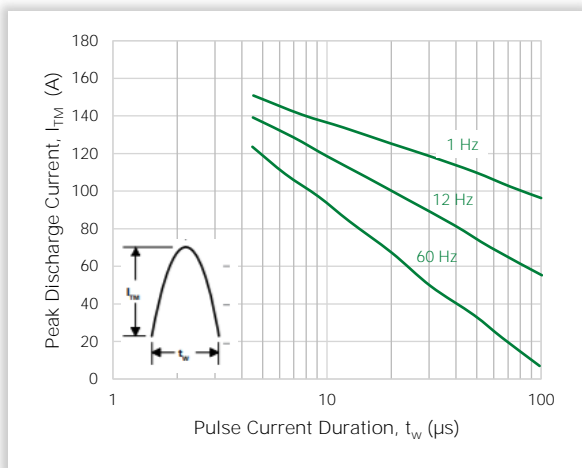
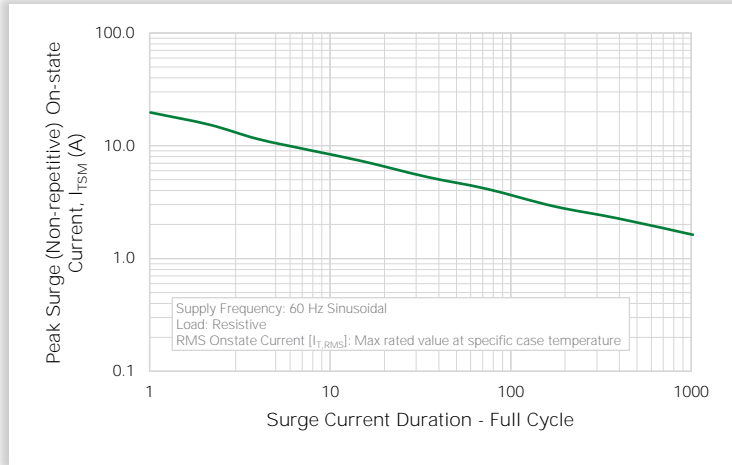


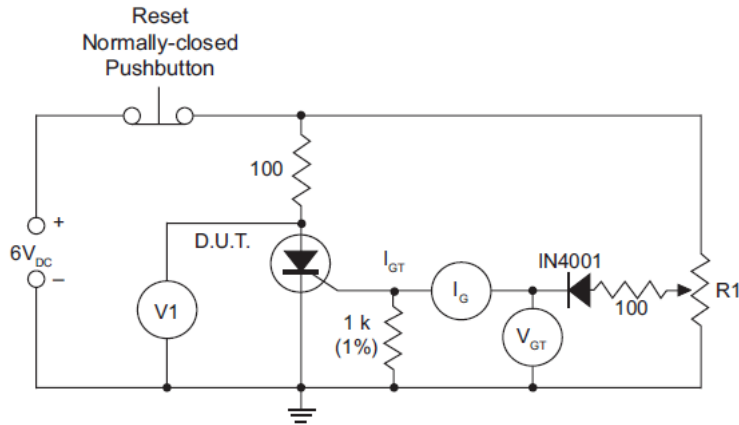
Figure 10. Surge Peak On-state Current vs. Number of Cycles



Notes

1. Gate control may be lost during and immediately following surge current interval.
2. Overload may not be repeated until junction temperature has returned to steady-state rated value.

Figure 11. Simple Test Circuit for Gate Trigger Voltage and Current



Notes

- V1 — 0 V to 10 V dc meter
- V<sub>GT</sub> — 0 V to 1 V dc meter
- I<sub>G</sub> — 0 mA to 1 mA dc milliammeter
- R1 — 1 k potentiometer

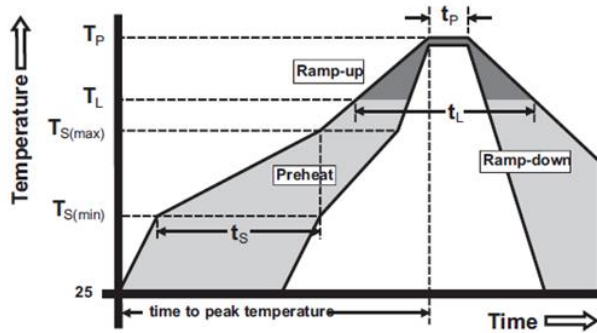
To measure gate trigger voltage and current, raise gate voltage (V<sub>GT</sub>) until meter reading V1 drops from 6 V to 1 V. Gate trigger voltage is the reading on V<sub>GT</sub> just prior to V1 dropping. Gate trigger current I<sub>GT</sub> Can be computed from the relationship.

$$I_{GT} = I_G - V_{GT} / 1000 \text{ A}$$

where I<sub>G</sub> is reading (in amperes) on meter just prior to V1 dropping.

2. I<sub>GT</sub> may turn out to be a negative quantity (trigger current flows out from gate lead). If negative current occurs, I<sub>GT</sub> value is not a valid reading. Remove 1 k resistor and use I<sub>G</sub> as the more correct I<sub>GT</sub> value. This will occur on 12 μA gate products.

### 6. Soldering Parameters



Parameter	Value	
Reflow Condition	Pb-free Assembly	
Pre-Heat	Temperature Min, T <sub>S(Min)</sub>	150 °C
	Temperature Max, T <sub>S(Max)</sub>	200 °C
	Time (Min to Max), t <sub>s</sub>	60 to 180 s
Average Ramp-up Rate Liquidus Temp., T <sub>L</sub> to peak	5 °C/s (Max)	
T <sub>S(Max)</sub> to T <sub>L</sub> Ramp-up Rate	5 °C/s (Max)	
Reflow	Temperature, T <sub>L</sub> Liquidus	217 °C
	Time, t <sub>s</sub>	60 to 150 s
Peak Temperature, T <sub>P</sub>	260 °C (±5 °C)	
Time within 5 °C of Actual Peak Temperature, t <sub>p</sub>	20 to 40 s	
Ramp-down Rate	5 °C/s (Max)	
Time 25 °C to Peak Temperature, T <sub>P</sub>	8 minutes (Max)	
Do Not Exceed	280 °C	

### 7. Physical Specifications

Device Feature	Detail
Terminal Finish	100% Matte Tin-plated/ Pb-free Solder Dipped
Body Material	UL Recognized epoxy meeting Flammability Rating V-0
Lead Material	Copper Alloy

### 9. Design Considerations

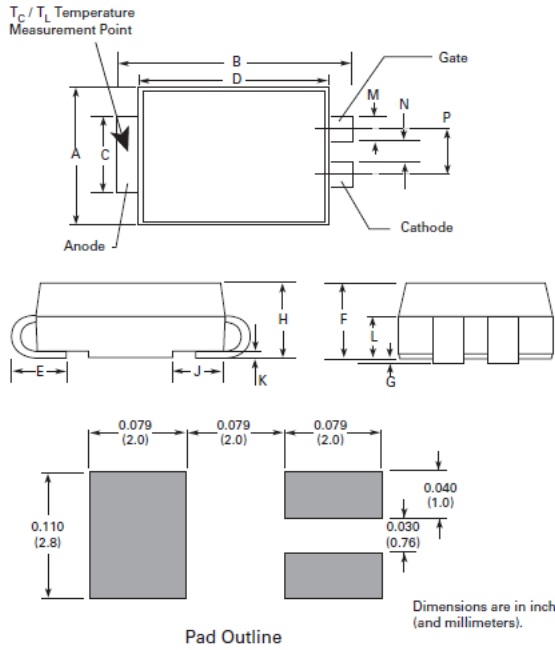
Careful selection of the correct component for the application’s operating parameters and environment will go a long way toward extending the operating life of the Thyristor. Good design practice should limit the maximum continuous current through the main terminals to 75% of the component rating. Other ways to ensure long life for a power discrete semiconductor are proper heat sinking and selection of voltage ratings for worst case conditions. Overheating, overvoltage (including dv/dt), and surge currents are the main killers of semiconductors. Correct mounting, soldering, and forming of the leads also help protect against component damage.

### 8. Environmental Specifications

Test	Specifications and Conditions
AC Blocking	MIL-STD-750, M-1040, Cond A Applied Peak AC voltage @ 110°C for 1008 hours
Temperature Cycling	MIL-STD-750, M-1051, 100 cycles, -40°C to +150°C, 15 min dwell time
Temperature/Humidity	EIA / JEDEC, JESD22-A101 1008 hours: 320V - DC: 85°C; 85% relative humidity
High Temperature Storage	MIL-STD-750, M-1031, 1008 hours, 150°C
Low Temperature Storage	1008 hours, -40°C
Resistance to Solder Heat	MIL-STD-750 Method 2031
Solderability	ANSI/J-STD-002, category 3, Test A
Lead Bend	MIL-STD-750, M-2036 Cond E

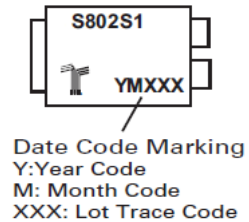
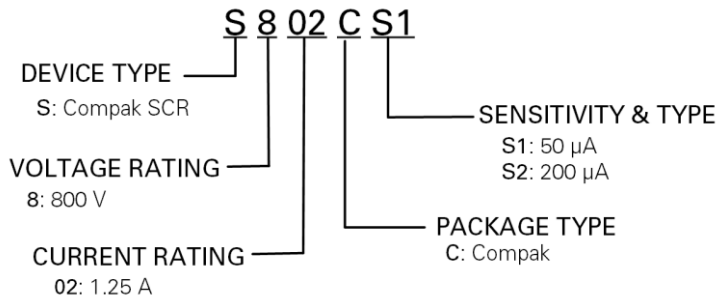
### 10. Package Dimensions

Compak (C Package)



Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	0.130	0.156	3.30	3.95
B	0.201	0.220	5.10	5.60
C	0.077	0.087	1.95	2.20
D	0.159	0.181	4.05	4.60
E	0.030	0.063	0.75	1.60
F	0.075	0.096	1.90	2.45
G	0.002	0.008	0.05	0.20
H	0.077	0.104	1.95	2.65
J	0.043	0.053	1.09	1.35
K	0.006	0.016	0.15	0.41
L	0.030	0.055	0.76	1.40
M	0.022	0.028	0.56	0.71
N	0.027	0.033	0.69	0.84
P	0.052	0.058	1.32	1.47

### 11. Part Numbering and Marking



### 12. Packing Options

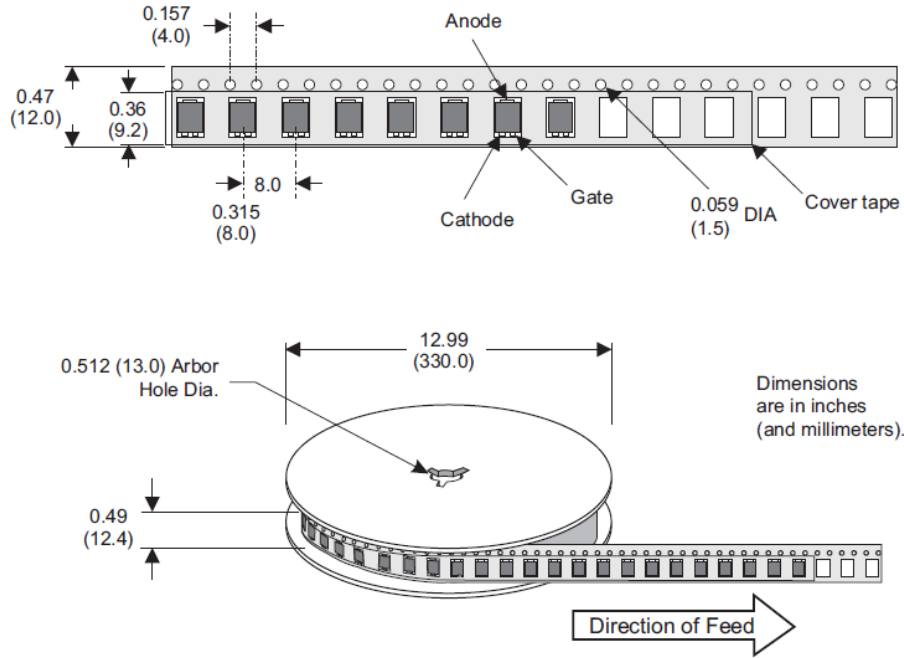
Part Number	Marking	Gate Sensitivity	Weight	Packing Mode	Base Quantity
S802CS1RP	S802S1	50 µA	0.08 g	Embossed Carrier	2500
S802CS2RP	S802S2	200 µA	0.08 g	Embossed Carrier	2500



### 13. Packing Specifications

#### Compak Embossed Carrier Reel Pack (RP) Specifications

Meets all EIA-481-1 Standards



For additional information please visit [www.Littelfuse.com/powersemi](http://www.Littelfuse.com/powersemi)

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