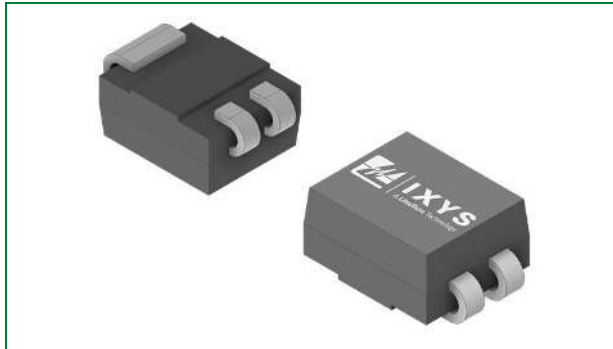Teccor® brand Thyristors

Sx02CSx Series 1.25 Amp Sensitive SCRs

Agency Approvals and Environmental
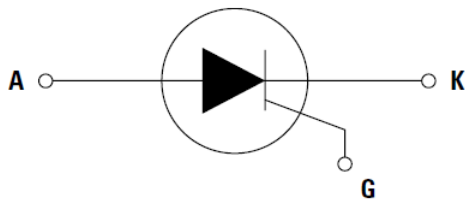
Environmental Approvals
RoHS

Product Summary

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

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

2. Thermal Characteristics

Symbol	Characteristic	Value	Unit
$R_{th(JC)}$	Thermal Resistance, junction-to-case (AC)	60[1]	°C/W

Footnote 1: Mounted on 1 cm² copper (two-ounce) foil surface

3. Electrical Characteristics $(T_J = 25\ °C$ unless otherwise specified)

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

4. Static Characteristics

Symbol	Description	Conditions	Value (Max)	Unit
V_{TM}	Peak On-state Voltage	$I_T = 2.5$ A; $t_p = 380$ µs	1.70	V
I_{DRM}/I_{RRM}	Off-state Current, Peak Repetitive ($V_{DRM} = V_{RRM}$, $R_{GK} = 1$ kΩ)	$T_J = 25°C$	1	µA
		$T_J = 100°C$	50	
		$T_J = 110°C$	500	

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5. Performance Curves

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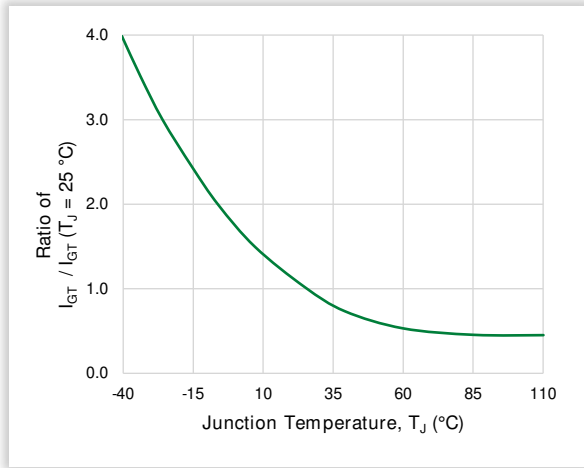Temperature

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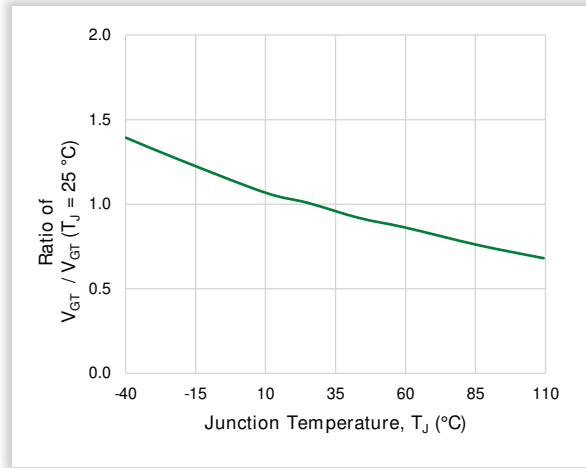Temperature

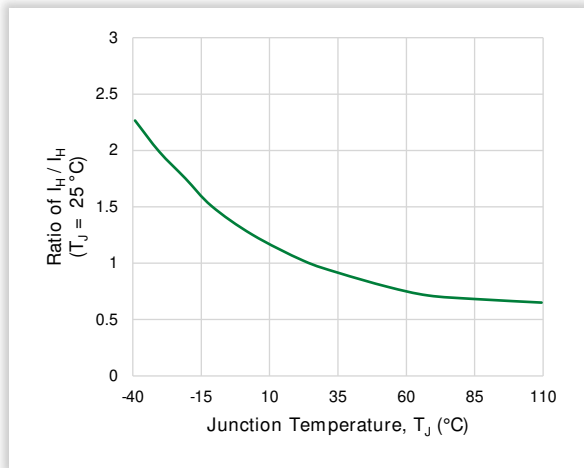Figure 3. Normalized DC Holding Current vs. Junction
Temperature

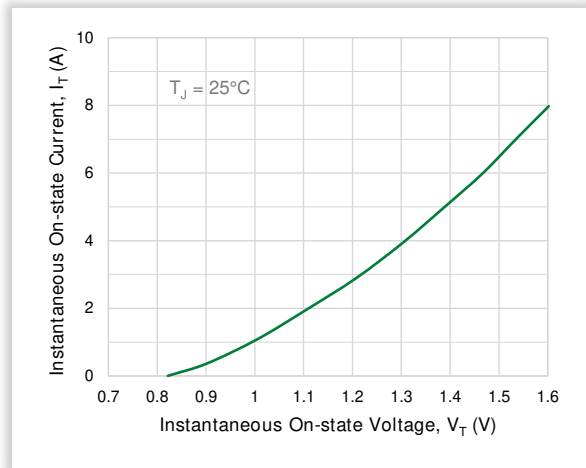Figure 4. Typical On-state Current vs. On-state Voltage

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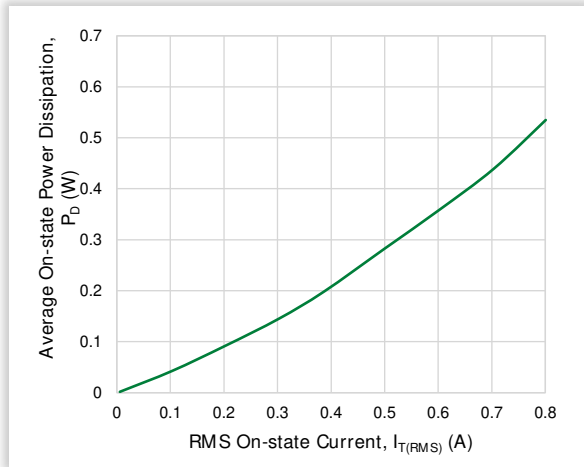

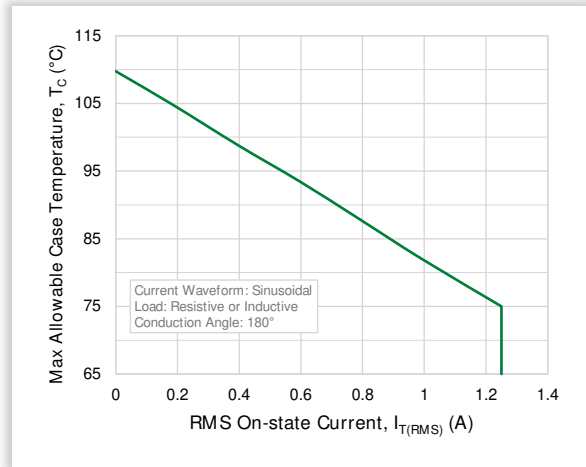Figure 6. Maximum Allowable Case Temperature vs. RMS On-state Current

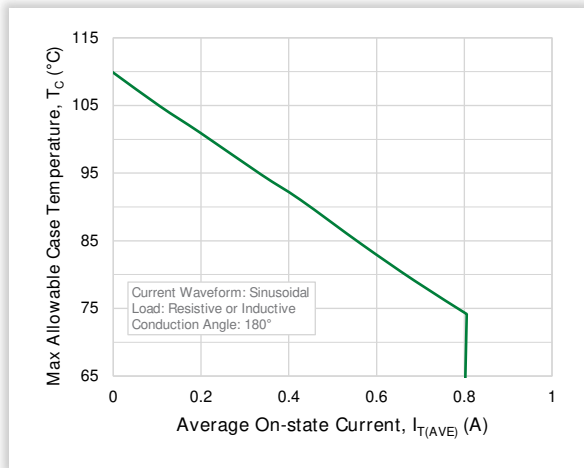Figure 7. Maximum Allowable Case Temperature vs. Average On-state Current
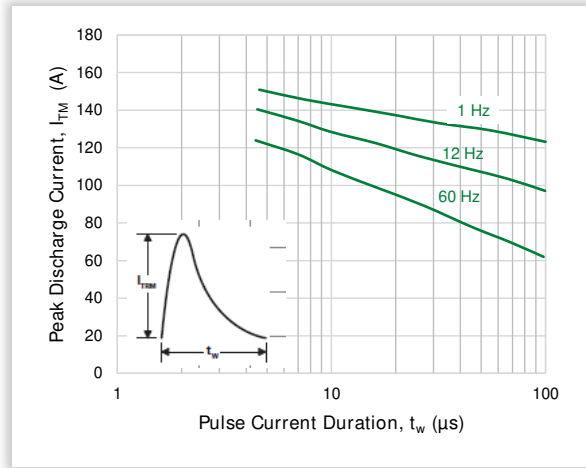

Figure 8. Peak Capacitor Discharge Current

Figure 9. Peak Repetitive Sinusoidal Pulse Current

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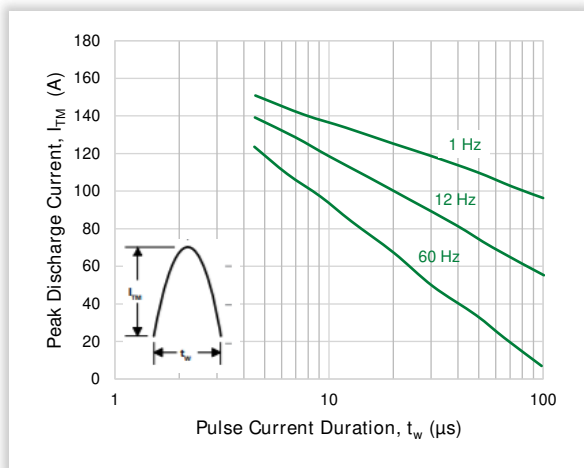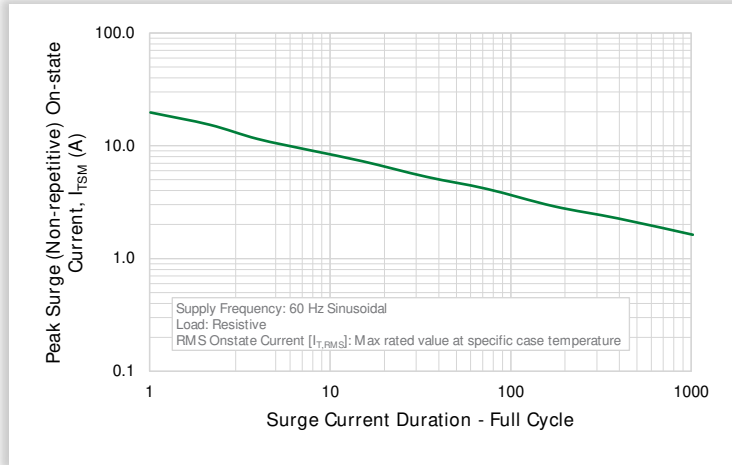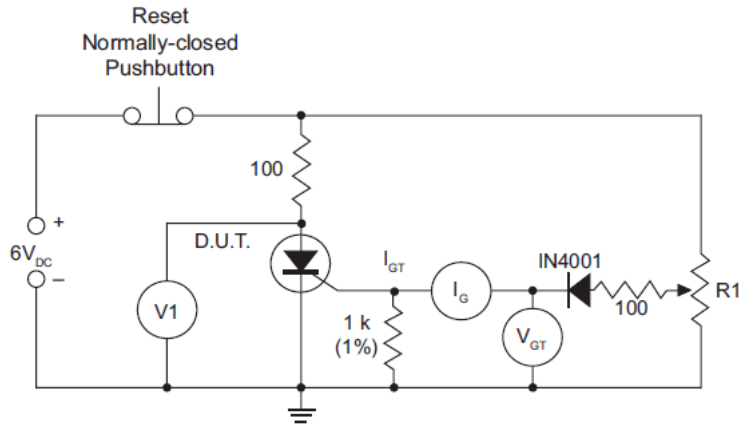
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Figure 10. Surge Peak On-state Current vs. Number of Cycles

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_{GT} — 0 V to 1 V dc meter

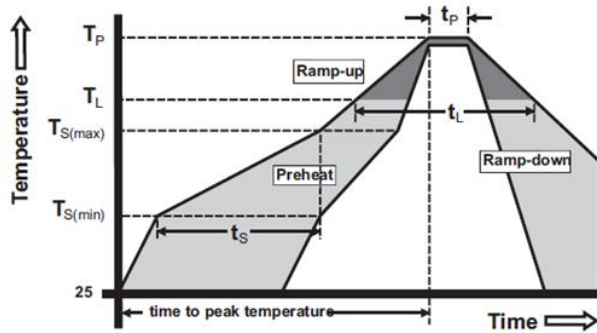I_G — 0 mA to 1 mA dc milliammeter

R1 — 1 k potentiometer

To measure gate trigger voltage and current, raise gate voltage (V_{GT}) until meter reading V1 drops from 6 V to 1 V. Gate trigger voltage is the reading on V_{GT} just prior to V1 dropping. Gate trigger current I_{GT} Can be computed from the relationship.

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

where I_G is reading (in amperes) on meter just prior to V1 dropping.

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

6. Soldering Parameters

Parameter		Value
Reflow Condition		Pb-free Assembly
Pre-Heat	Temperature Min, $T_{S(Min)}$	150 °C
	Temperature Max, $T_{S(Max)}$	200 °C
	Time (Min to Max), t_s	60 to 180 s
Average Ramp-up Rate Liquidus Temp., T_L to peak		5 °C/s (Max)
$T_{S(Max)}$ to T_L Ramp-up Rate		5 °C/s (Max)
Reflow	Temperature, T_L Liquidus	217 °C
	Time, t_s	60 to 150 s
Peak Temperature, T_P		260 °C (±5 °C)
Time within 5 °C of Actual Peak Temperature, t_P		20 to 40 s
Ramp-down Rate		5 °C/s (Max)
Time 25 °C to Peak Temperature, T_P		8 minutes (Max)
Do Not Exceed		280 °C

7. Physical Specifications

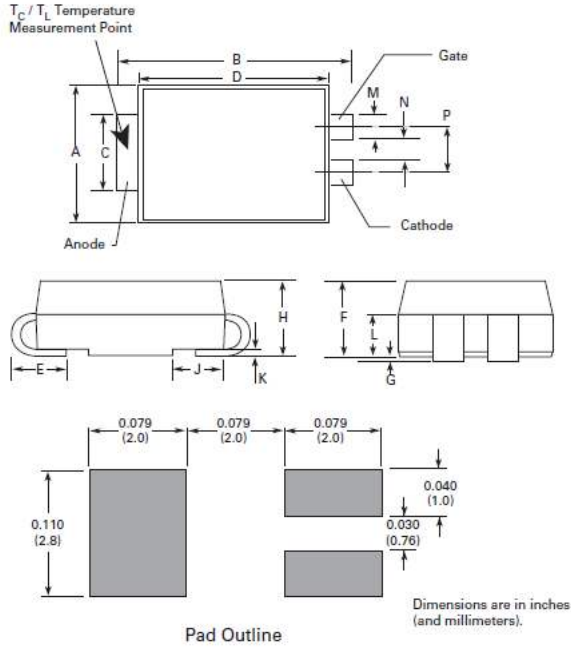| Device Feature	Detail
Terminal Finish	100% Matte Tin-plated/ Pb-free Solder Dipped
Body Material	UL Recognized epoxy meeting Flammability Rating V-0
Lead Material	Copper Alloy

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

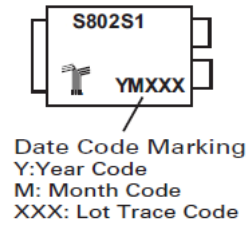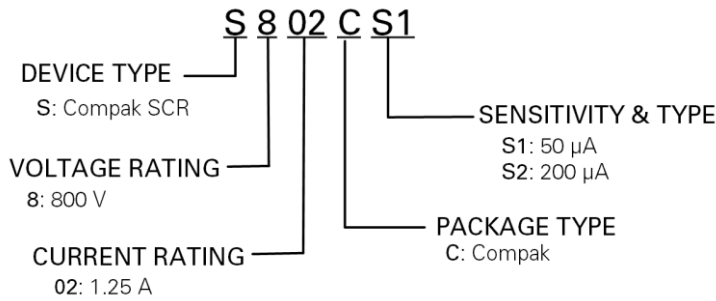| Test	Specifications and Conditions
AC Blocking	MIL-STD-750, M-1040, Cond A Applied Peak AC voltage @110°C for 1008 hours
Temperature Cycling	MIL-STD-750, M-1051, 100 cycles, -40°C to +150°C, 15 min dwell time
Temperature/Humidity	EIA / JEDEC, JESD22-A101 1008 hours; 320V - DC: 85°C; 85% relative humidity
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

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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

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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