RoHS Sx02xS EV Series 1.5 Amp Sensitive SCR

Main Features

Symbol	Value	Unit
$I_{T(RMS)}$	1.5	A
V_{DRM}/V_{RRM}	400 to 600	V
I_{GT}	200	µA

Applications

The Sx02xS EV series is specifically designed for Gas Ignition applications that require high pulse surge current capability.

Description

New 1.5Amp sensitive gate SCR series offers high static dv/dt with low turn off time (tq) through small die planar construction design. All SCR's junctions are glass-passivated to ensure long term reliability and parametric stability.

Features

- RoHS compliant
- Thru hole and surface mount packages
- Surge capability > 15Amps
- Blocking voltage (V_{DRM}/V_{RRM}) capability — up to 600V
- High dv/dt noise immunity
- Improved turn-off time (tq) < 35 µsec.
- Sensitive gate for direct microprocessor interface

Schematic Symbol

Absolute Maximum Ratings

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (full sine wave)	TO-92	T_C = 65°C	1.5	A
		SOT-223	T_L = 95°C		
$I_{T(AV)}$	Average on-state current	TO-92	T_C = 65°C	0.95	A
		SOT-223	T_C = 95°C		
I_{TSM}	Non repetitive surge peak on-state current (Single cycle, T_J initial = 25°C)	TO-92 SOT-223	F = 50 Hz	12.5	A
			F = 60 Hz	15.0	
I^2t	I^2t Value for fusing	t_p = 10 ms	F = 50 Hz	0.78	A^2s
		t_p = 8.3 ms	F = 60 Hz	0.93	
di/dt	Critical rate of rise of on-state current IG = 10mA	TO-92 SOT-223	T_J = 125°C	50	A/µs
I_{GM}	Peak gate current	t_p = 10 µs	T_J = 125°C	1.0	A
$P_{G(AV)}$	Average gate power dissipation		T_J = 125°C	0.1	W
T_{stg}	Storage junction temperature range			-40 to 150	°C
T_J	Operating junction temperature range			-40 to 125	

Electrical Characteristics (T_J = 25°C, unless otherwise specified)

Symbol	Description	Test Conditions	Sx02xS		Unit
			Min	Max	
I_{GT}	DC Gate Trigger Current	V_D = 12V R_L = 60 Ω	15	200	µA
V_{GT}	DC Gate Trigger Voltage		—	0.8	V
V_{GRM}	Peak Reverse Gate Voltage	I_{RG} = 10µA	5	—	V
I_H	Holding Current	R_{GK} = 1 kΩ	—	5	mA
(dv/dt)s	Critical Rate-of-Rise of Off-State Voltage	T_J = 125°C $V_D = V_{DRM}/ V_{RRM}$ Exponential Waveform R_{GK} = 1 kΩ	25	—	V/µs
t_q	Turn-Off Time	T_J = 125°C @ 600 V R_{GK} = 1 kΩ	—	35	µs
t_{gt}	Turn-On Time	I_G = 10mA PW = 15µsec I_T = 3.0A (pk)	—	3	µs

Static Characteristics (T_J = 25°C, unless otherwise specified)

Symbol	Description	Test Conditions	Value		Unit
			Min	Max	
V_{TM}	Peak On-State Voltage	I_{TM} = 3.0A (pk)	—	1.70	V
I_{DRM}	Off-State Current, Peak Repetitive	T_J = 25°C @ $V_D = V_{DRM}$ R_{GK} = 1 kΩ	—	5	µA
		T_J = 125°C @ $V_D = V_{DRM}$ R_{GK} = 1 kΩ	—	500	µA

Thermal Resistances

Symbol	Description	Test Conditions		Value	Unit
$R_{th(j-c)}$	Junction to case (AC)	$I_T = 1.5A_{(RMS)}$ [1]	TO-92	50	°C/W
			SOT-223	25	
$R_{th(j-a)}$	Junction to ambient	$I_T = 1.5A_{(RMS)}$ [1]	TO-92	160	°C/W
			SOT-223	60	

[1] 60Hz AC resistive load condition, 100% conduction.

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

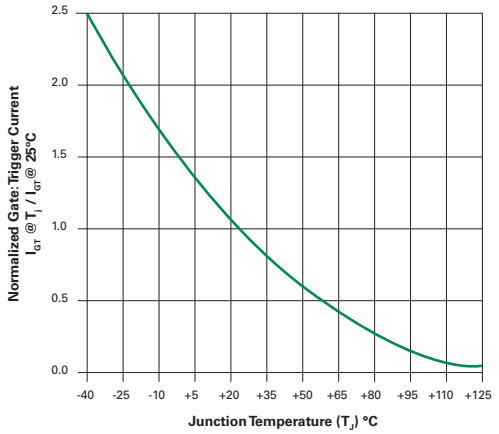


Figure 2: Normalized DC Holding Current vs. Junction Temperature

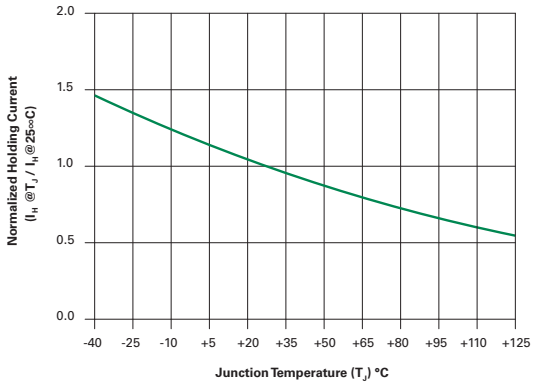


Figure 3: Normalized DC Gate Trigger Voltage vs. Junction Temperature

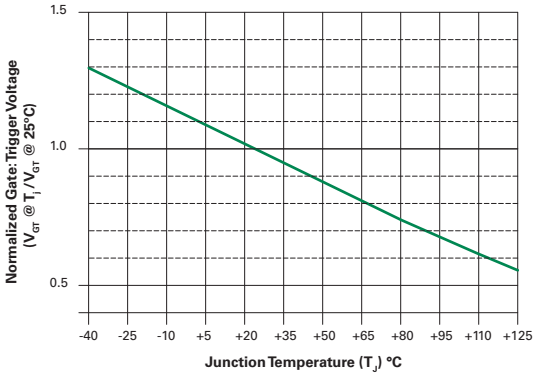


Figure 4: Power Dissipation (Typical) vs. RMS On-State Current

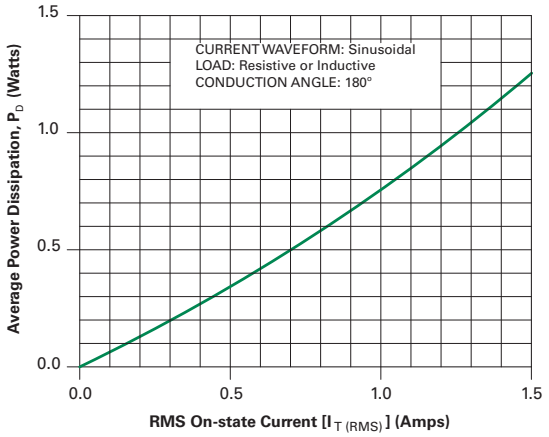


Figure 5: Maximum Allowable Case Temperature vs. On-State Current

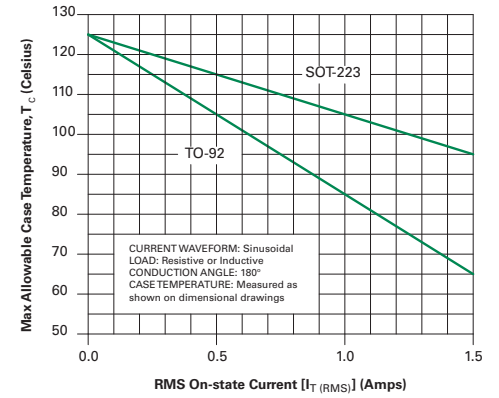
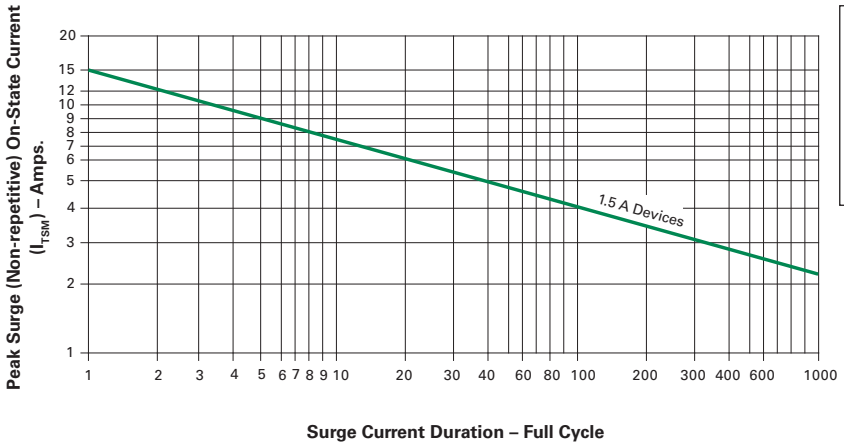


Figure 6: Surge Peak On-State Current vs. Number of Cycles

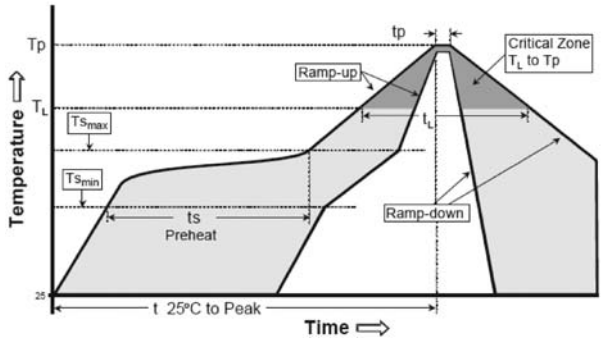


Supply Frequency: 60Hz Sinusoidal
Load: Resistive
RMS On-State Current [$I_{T(RMS)}$]: Max Rated Value at Specific Case Temperature

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.

Soldering Parameters

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 – 180 secs
Average ramp up rate (Liquidus Temp) (T_L) to peak		5°C/second max
$T_{S(max)}$ to T_L - Ramp-up Rate		5°C/second max
Reflow	-Temperature (T_L) (Liquidus)	217°C
	-Time (min to max) (t_s)	60 – 150 seconds
Peak Temperature (T_P)		$260^{+0/-5}$ °C
Time within 5°C of actual peak Temperature (t_p)		20 – 40 seconds
Ramp-down Rate		5°C/second max
Time 25°C to peak Temperature (T_P)		8 minutes Max.
Do not exceed		280°C



Physical Specifications

Terminal Finish	100% Matte Tin-plated.
Body	UL recognized epoxy meeting flammability classification 94V-0.
Lead Material	Copper Alloy

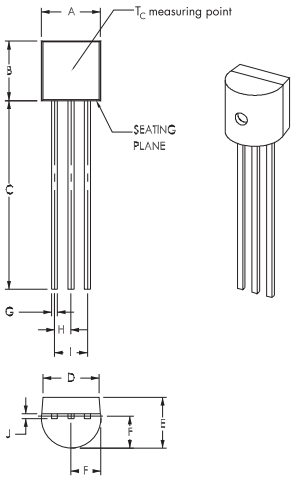
Design Considerations

Careful selection of the correct device 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 device 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.

Environmental Specifications

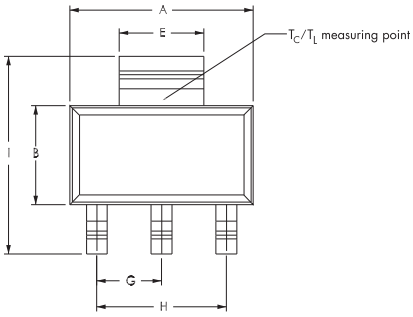
Test	Specifications and Conditions
AC Blocking	MIL-STD-750, M-1040, Cond A Applied Peak AC voltage @ 125°C for 1008 hours
Temperature Cycling	MIL-STD-750, M-1051, 100 cycles; -40°C to +150°C; 15-min dwell-time
Temperature/ Humidity	EIA / JEDEC, JESD22-A101 1008 hours; 320V - DC: 85°C; 85% rel humidity
High Temp Storage	MIL-STD-750, M-1031, 1008 hours; 150°C
Low-Temp Storage	1008 hours; -40°C
Thermal Shock	MIL-STD-750, M-1056 10 cycles; 0°C to 100°C; 5-min dwell-time at each temperature; 10 sec (max) transfer time between temperature
Autoclave	EIA / JEDEC, JESD22-A102 168 hours (121°C at 2 ATMs) and 100% R/H
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

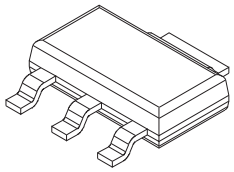
Dimensions — TO-92

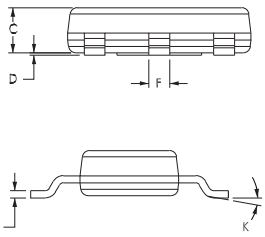


Dimensions	Inches			Millimeters		
	Min	Typ	Max	Min	Typ	Max
A	0.175	—	0.205	4.450	—	5.200
B	0.170	—	0.210	4.320	—	5.330
C	0.500	—	—	12.700	—	—
D	0.135	0.165	—	3.430	4.190	—
E	0.125	—	0.165	3.180	—	4.190
F	0.080	0.095	0.105	2.040	2.400	2.660
G	0.016	—	0.021	0.407	—	0.533
H	0.045	0.050	0.055	1.150	1.270	1.390
I	0.095	0.100	0.105	2.420	2.540	2.660
J	0.015	—	0.020	0.380	—	0.500

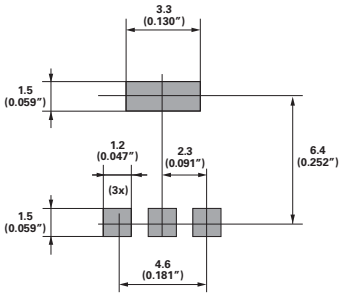
Dimensions – SOT-223







Pad Layout for SOT-223



Dimensions in Millimeters (Inches)

Dimensions	Inches			Millimeters		
	Min	Typ	Max	Min	Typ	Max
A	0.248	0.256	0.264	6.30	6.50	6.70
B	0.130	0.138	0.146	3.30	3.50	3.70
C	—	—	0.071	—	—	1.80
D	0.001	—	0.004	0.02	—	0.10
E	0.114	0.118	0.124	2.90	3.00	3.15
F	0.024	0.027	0.034	0.60	0.70	0.85
G	—	0.090	—	—	2.30	—
H	—	0.181	—	—	4.60	—
I	0.264	0.276	0.287	6.70	7.00	7.30
J	0.009	0.010	0.014	0.24	0.26	0.35
K	10^{o} MAX					

Product Selector

Part Number	Voltage		Gate Sensitivity	Package
	400V	600V		
S402ES	X	—	200µA	TO-92
S602ES	—	X	200µA	TO-92
S402TS	X	—	200µA	SOT-223
S602TS	—	X	200µA	SOT-223

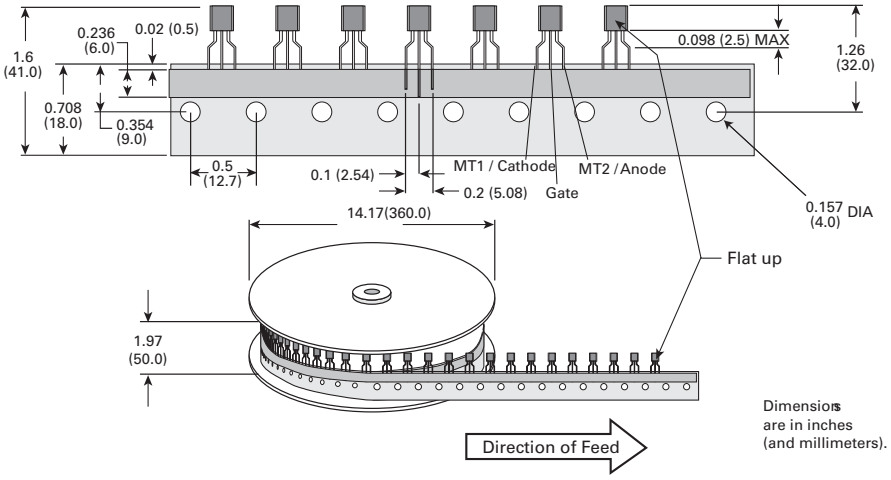
Packing Options

Part Number	Marking	Weight	Packing Mode	Base Quantity
Sx02ES	Sx02ES	0.170 g	Bulk	2500
Sx02ESAP	Sx02ES	0.170 g	Ammo Pack	2000
Sx02ESRP	Sx02ES	0.170 g	Tape & Reel	2000
Sx02TSRP	Sx02TS	0.120 g	Tape & Reel	1000

Note: x = voltage

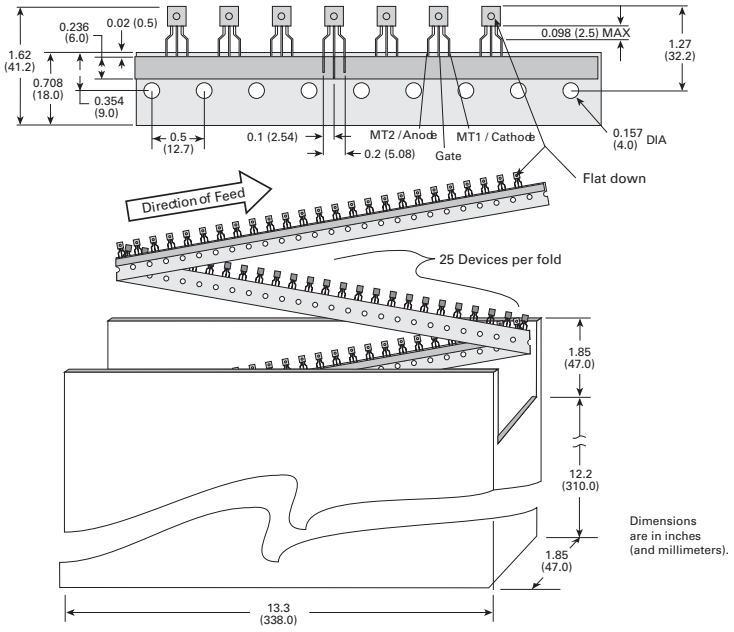
TO-92 (3-lead) Reel Pack (RP) Radial Leaded

Meets all EIA-468-B 1994 Standards

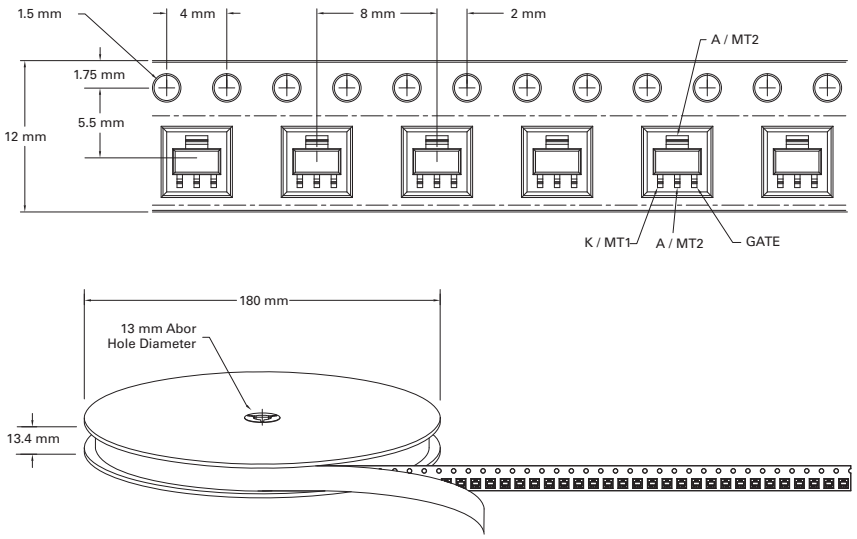


TO-92 (3-lead) Ammo Pack (AP) Radial Leaded

Meets all EIA-468-B 1994 Standards



Tape & Reel Specifications for SOT-223



Part Numbering System

Sx02xxxx

SCR SERIES

VOLTAGE
4: 400V
6: 600V

CURRENT
02: 1.5A

SENSITIVITY
S: 200µA Sensitive SCR

PACKAGE TYPE
E: TO-92
T: SOT-223

PACKING TYPE
Blank: Bulk
RP: Reel Pack (TO-92)
: Embossed Carrier Pack (SOT-223)
AP: Ammo Pack (TO-92)

Part Marking System