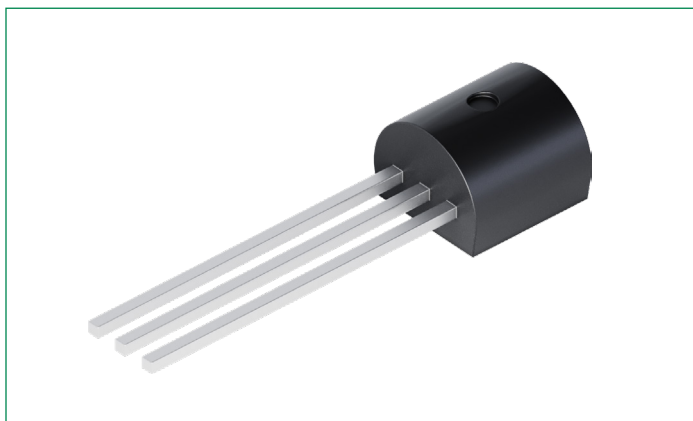


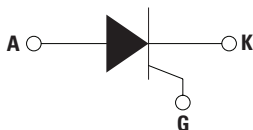
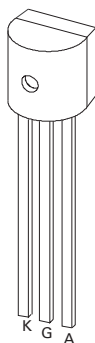
S8X5ECs EV Series

0.5 A Sensitive SCRs

HF RoHS


Pinout Diagram

TO-92


A: Anode; **K:** Cathode; **G:** Gate

Description

The S8X5ECs series offers a high static dv/dt with a low turn off (t_q) time. It is specifically designed for Ground Fault Circuit Interrupter (GFCI), Arc-Fault Circuit Interrupter (AFCI), Residual Current Device (RCD), and Residual Current Circuit Breaker with Overload Protection (RCBO) applications. All SCR junctions are glass-passivated to ensure long term reliability and parametric stability.

Features

- RoHS compliant and halogen-free
- Through-hole package
- Blocking voltage (V_{DRM} / V_{RRM}) capability up to 800 V
- Surge current capability < 20 A
- Sensitive gate for direct microprocessor interface
- High dv/dt noise immunity
- Improved turn-off time (t_q)
- Non-repetitive direct surge peak off-state voltage (V_{DSM}) up to 1150 V
- Non-repetitive reverse surge peak off-state voltage (V_{RSM}) up to 900 V

Applications

- Ground Fault Circuit Interrupter (GFCI) applications
- Arc-Fault Circuit Interrupter (AFCI) applications
- Residual Current Device (RCD) applications
- Residual Current Circuit Breaker with Overload Protection (RCBO) applications

Product Summary

Characteristic	Value	Unit
$I_{T(RMS)}$	0.5	A
V_{DRM} / V_{RRM}	800	V
$V_{DSM} (t_p = 50 \mu s)$	1150	V
$V_{RSM} (t_p = 50 \mu s)$	900	V
I_{GT}	5 to 450	μA

Maximum Ratings

Symbol	Characteristics	Conditions		Value	Units	
$I_{T(RMS)}$	On-state RMS Current	Full sine wave	$T_C = 85\text{ }^\circ\text{C}$	0.5	A	
$I_{T(AV)}$	Average On-state Current	$T_C = 85\text{ }^\circ\text{C}$		0.3	A	
I_{TSM}	Non-repetitive Surge Peak On-state Current	Half-sine wave	$f = 50\text{ Hz}$	T_{vj} initial = $25\text{ }^\circ\text{C}$	10	A
			$f = 60\text{ Hz}$		12	
I^2t	I^2t Value for Fusing	$t_p = 10\text{ ms}$	$f = 50\text{ Hz}$	0.5	A^2s	
di/dt	Critical Rate of Rise of On-state Current	$I_G = 10\text{ mA}$	$T_{vj} = 125\text{ }^\circ\text{C}$	80	$\text{A}/\mu\text{s}$	
I_{GM}	Peak Gate Current	$t_p = 20\text{ }\mu\text{s}$	$T_{vj} = 125\text{ }^\circ\text{C}$	0.5	A	
$P_{G(AV)}$	Average Gate Power Dissipation	$T_{vj} = 125\text{ }^\circ\text{C}$		0.2	W	
T_{stg}	Storage Temperature Range	-		-40 to 150	$^\circ\text{C}$	
T_{vj}	Virtual Junction Temperature Range	-		-40 to 125	$^\circ\text{C}$	

Electrical Characteristics ($T_{vj} = 25\text{ }^\circ\text{C}$, unless otherwise specified)

Symbol	Characteristics	Conditions	S8X5ECS			S8X5ECS2			Units
			Min.	Typ.	Max.	Min.	Typ.	Max.	
I_{GT}	DC Gate Trigger Current	$V_D = 6\text{ V}, R_L = 100\text{ }\Omega$	20	-	-	20	-	-	μA
			-	-	100	-	-	50	
V_{GT}	DC Gate Trigger Voltage	$V_D = 6\text{ V}, R_L = 100\text{ }\Omega$	-	-	0.8	-	-	0.8	V
V_{GRM}	Peak Reverse Gate Voltage	$I_{RG} = 10\text{ }\mu\text{A}$	8	-	-	8	-	-	V
V_{GD}	Gate Non-trigger Voltage	$V_D = \frac{1}{2}V_{DRM}, R_{GK} = 1\text{ k}\Omega, T_{vj} = 125\text{ }^\circ\text{C}$	0.2	-	-	0.2	-	-	V
I_H	Holding Current	$R_{GK} = 1\text{ k}\Omega$, Initial current = 20 mA	-	-	3	-	-	3	mA
$dv/dt_{(cr)}$	Critical Rate-of-rise of Off-stage Voltage	$T_{vj} = 125\text{ }^\circ\text{C}, V_D = \frac{2}{3}V_{DRM}$, Exp. Waveform, $R_{GK} = 1\text{ k}\Omega$	40	-	-	40	-	-	$\text{V}/\mu\text{s}$
t_q	Turn-off Time	$I_T = 0.5\text{ A}$	-	-	35	-	-	35	μs
t_{gt}	Turn-on Time	$I_G = 10\text{ mA}, P_W = 15\text{ }\mu\text{s}, I_T = 1.6\text{ A}_{pk}$	-	2.3	-	-	2.3	-	μs

Static Characteristics ($T_{vj} = 25\text{ }^\circ\text{C}$, unless otherwise specified)

Symbol	Characteristics	Conditions	Maximum Value	Units
V_{TM}	Peak On-state Voltage	0.5 A device, $I_{TM} = 4\text{ A}, t_p = 380\text{ }\mu\text{s}$	1.8	V
V_{T0}	Threshold Voltage	-	1.03	V
r_T	Slope Resistance	-	106	$\text{m}\Omega$
I_{DRM}/I_{RRM}	Repetitive Peak Off-state Current	$T_{vj} = 25\text{ }^\circ\text{C}$	3	μA
		$T_{vj} = 125\text{ }^\circ\text{C}$	500	

Thermal Characteristics

Symbol	Characteristics	Conditions	Value	Units
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (AC)	$I_T = 0.8\text{ A}_{(RMS)}$ ¹	35	K/W
$R_{th(j-a)}$	Thermal Resistance, Junction to Ambient	$I_T = 0.8\text{ A}_{(RMS)}$ ¹	150	K/W

Note 1: 60 Hz AC resistive load condition, 100% conduction

Characteristic Curves

Fig. 1. Normalized DC Gate Trigger Current for all Quadrants vs. Junction Temperature

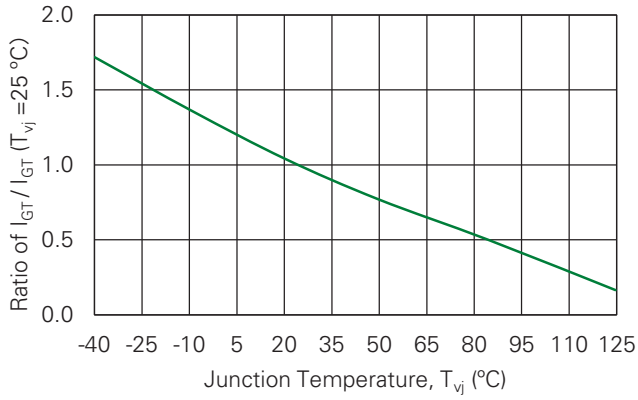


Fig. 2. Normalized DC Holding Current vs. Junction Temperature

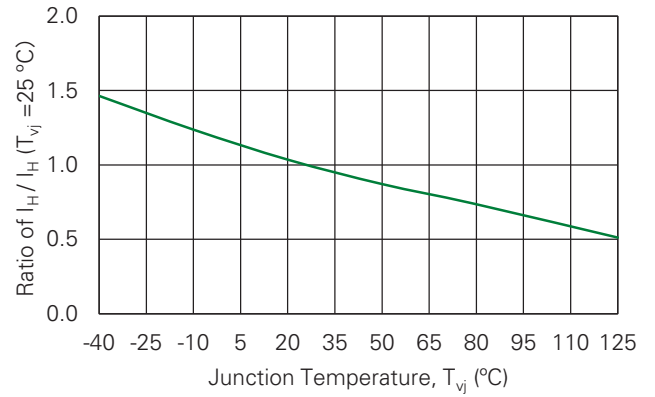


Fig. 3. Normalized DC Gate Trigger Voltage vs. Junction Temperature

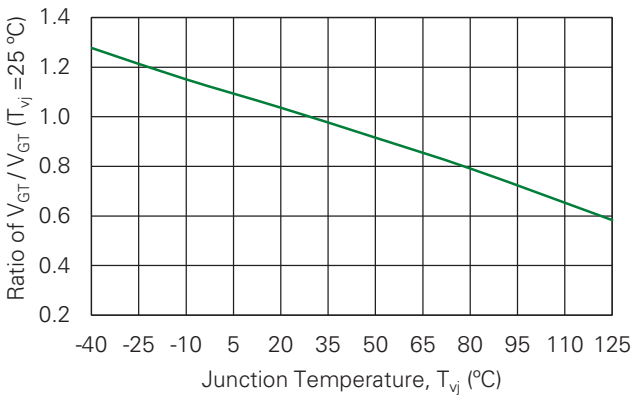


Fig. 4. Typical On-state Current vs. On-state Voltage

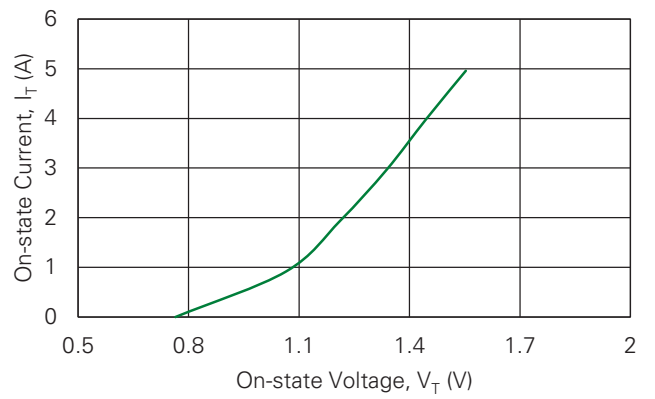


Fig. 5. Typical Power Dissipation vs. RMS On-state Current

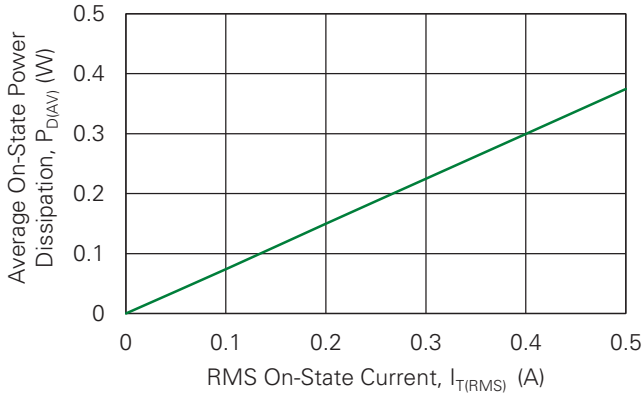


Fig. 6. Maximum Allowable Case Temperature vs. On-state Current

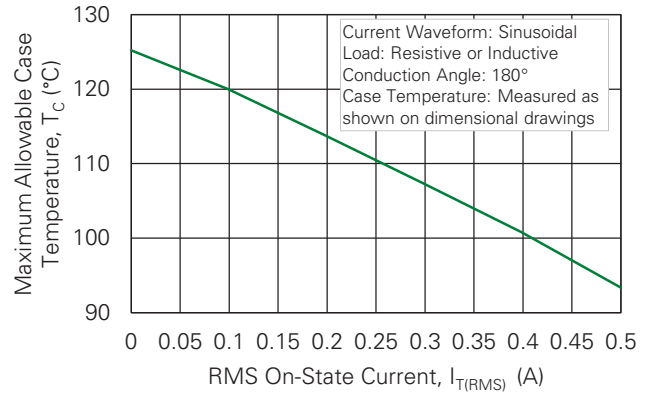
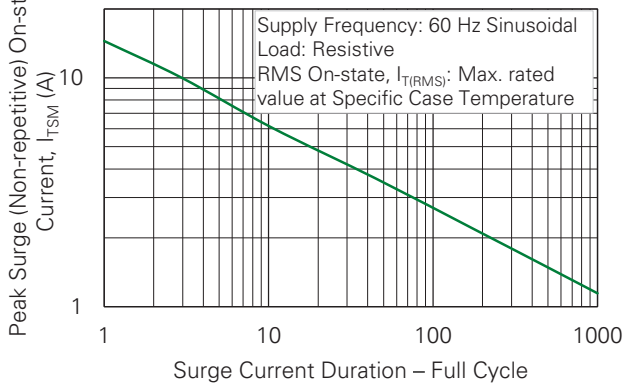


Fig. 7. Surge Peak On-state Current vs. Number of Cycles

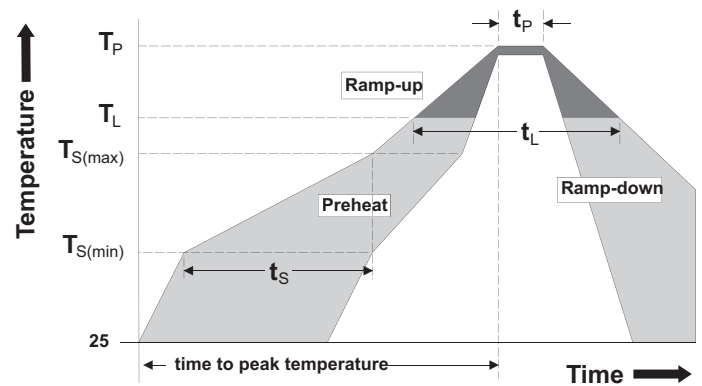


Notes:

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.

Soldering Parameters

Characteristic		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 – 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 (t_L)	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



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, 1000 cycles; -55 °C to +150 °C; 15-min dwell-time
Temperature/Humidity	EIA / JEDEC, JESD22-A101, 1008 hours; 320 V - DC: 85 °C; 85 % relative humidity
UHASt	JESD22-A118, 96 hours, 130 °C, 85 %RH
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

Physical Specifications

Characteristic	Value
Terminal Finish	100% Matte Tin-plated
Body Material	UL Recognized compound meeting flammability rating V-0
Lead Material	Copper Alloy

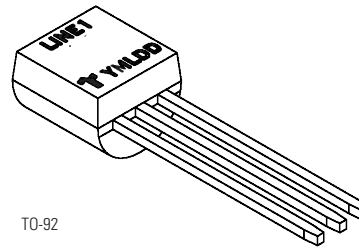
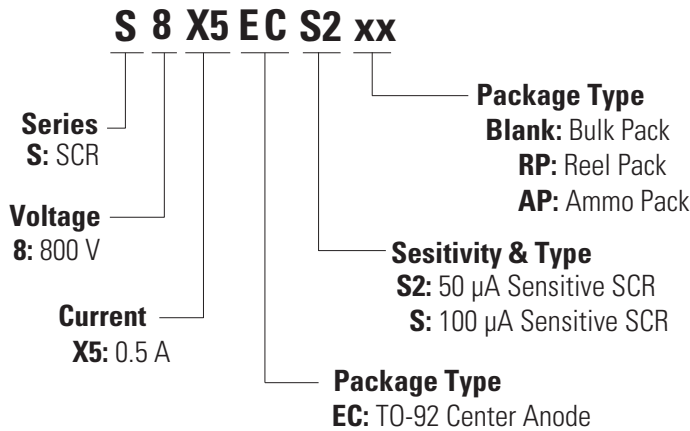
Design Considerations

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.

Packing Options

Part Number	Marking	Weight	Packing Mode	Base Quantity
S8X5ECS	S8X5ECS	0.217 g	Bulk	2500
S8X5ECSR	S8X5ECS	0.217 g	Tape & Reel	2000
S8X5ECSAP	S8X5ECS	0.217 g	Ammo Pack	2000
S8X5ECS2	S8X5ECS2	0.217 g	Bulk	2500
S8X5ECS2RP	S8X5ECS2	0.217 g	Tape & Reel	2000
S8X5ECS2AP	S8X5ECS2	0.217 g	Ammo Pack	2000

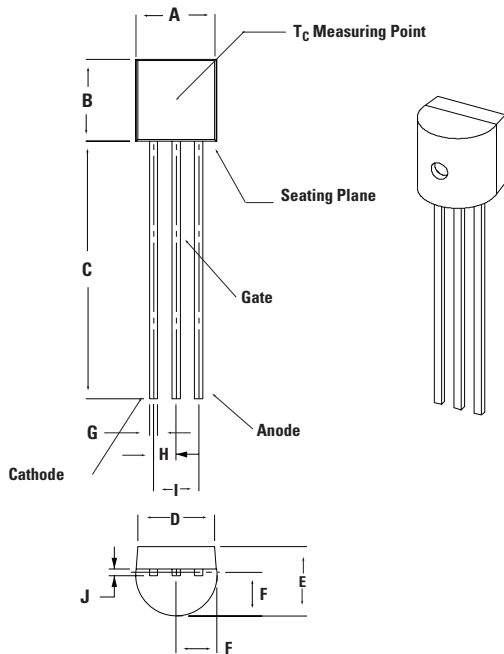
Part Numbering and Marking



Line1 = Littelfuse Part Number
Y = Last Digit of Calendar Year
M = Letter Month Code (A-L for Jan-Dec)
L = Location Code
DD = Calendar Date

TO-92

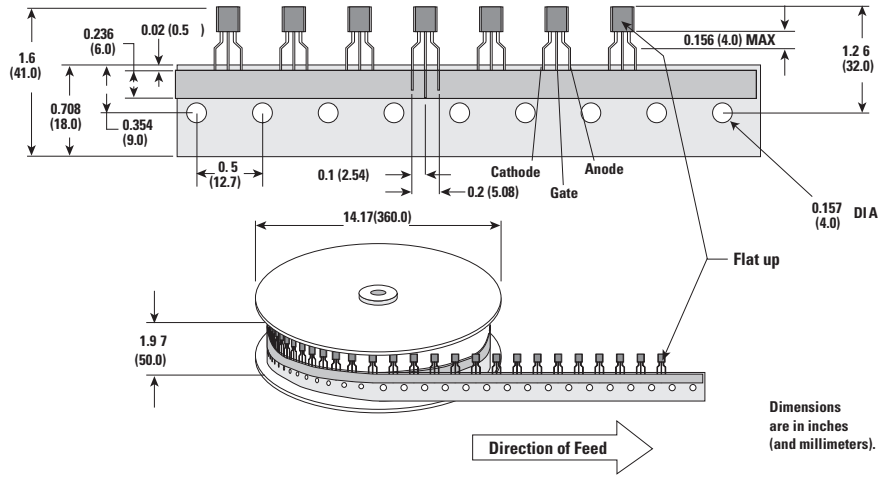
Package Dimensions TO-92



Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.450	5.200	0.175	0.205
B	4.320	5.330	0.170	0.210
C	12.70	–	0.500	–
D	3.430	–	0.135	–
E	3.180	4.190	0.125	0.165
F	2.040	2.660	0.080	0.105
G	0.407	0.533	0.016	0.021
H	1.150	1.390	0.045	0.055
I	2.420	2.660	0.095	0.105
J	0.380	0.500	0.015	0.020

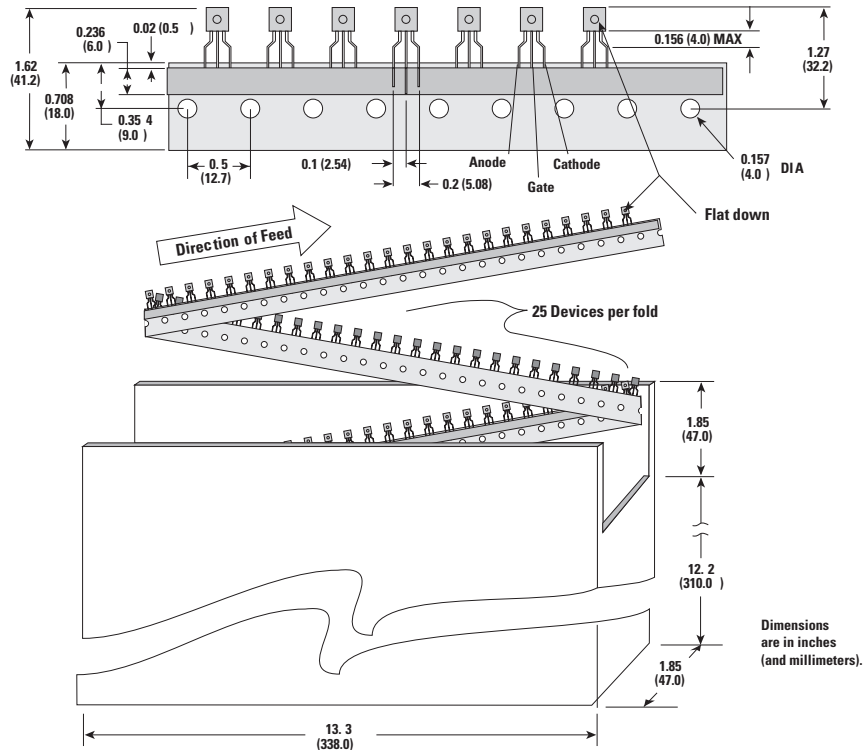
TO-92 (3-lead) Reel Pack (RP) Radial Leaded Specifications

Meets all EIA-468-C Standards



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

Meets all EIA-468-C Standards



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Part of:

