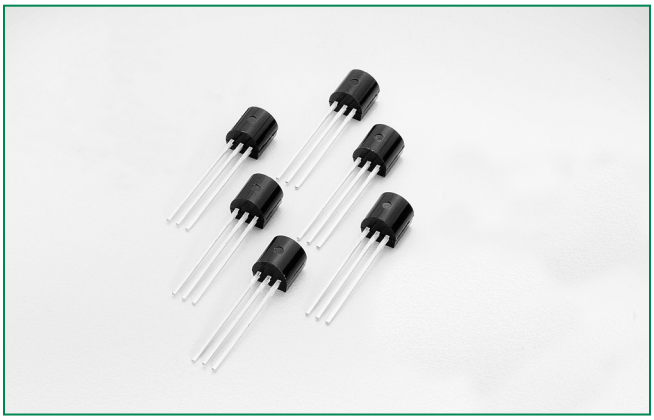
S802ECS

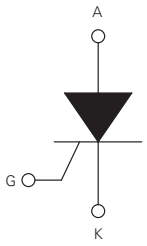
HF RoHS



Main Features

Symbol	Value	Unit
$I_{T(RMS)}$	1.5	A
V_{DRM}/V_{RRM}	800	V
V_{DSM} (t_p = 50 µs)	1250	V
V_{RSM} (t_p = 50 µs)	900	V
I_{GT}	20 to 100	µA

Schematic Symbol



* TO92 with "GAK" pin output

Description

The S802ECS offers a high static dv/dt with a low turn off (tq) time. It is specifically designed for GFCI (Ground Fault Circuit Interrupter) and AFCI (Arc Fault Circuit Interrupter), RCD (Residual Current Device) and RCBO (Residual Current Circuit Breaker with Overload Protection) applications. All SCR junctions are glass-passivated to ensure long term reliability and parametric stability.

Features

- Thru-hole packages
- Surge current capability < 20Amps
- Blocking voltage (V_{DRM} / V_{RRM}) capability - up to 800V
- Non-repetitive direct surge peak off-state voltage (V_{DSM}) up to 1250V
- Non-repetitive reverse surge peak off-state voltage (V_{RSM}) up to 900V
- High dv/dt noise immunity
- Improved turn-off time (t_q)
- Sensitive gate for direct microprocessor interface
- Halogen free and RoHS compliant

Absolute Maximum Ratings

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (full sine wave)		T_C = 52°C	1.5	A
$I_{T(AV)}$	Average on-state current		T_C = 52°C	0.9	A
I_{TSM}	Non repetitive surge peak on-state current (Sine half wave, T_J initial = 25°C)		F= 50Hz	20	A
			F= 60Hz	24	A
I^2t	I^2t Value for fusing	t_p = 10 ms	F = 50 Hz	2	A^2s
di/dt	Critical rate of rise of on-state current I_G = 10mA		T_J = 125°C	80	A/µs
I_{GM}	Peak Gate Current	t_p = 20 µs	T_J = 125°C	0.5	A
$P_{G(AV)}$	Average gate power dissipation	—	T_J = 125°C	0.2	W
T_{stg}	Storage junction temperature range	—	—	-40 to 150	°C
T_J	Operating junction temperature range	—	—	-40 to 125	°C

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

Symbol	Description	Test Conditions		Limit	Value	Unit
I_{GT}	DC Gate Trigger Current	V_D = 6V R_L = 100 Ω		MIN.	20	µA
				MAX.	100	µA
V_{GT}	DC Gate Trigger Voltage	V_D = 6V R_L = 100 Ω		MAX.	0.8	V
V_{GRM}	Peak Reverse Gate Voltage	I_{RG} = 10µA		MIN.	8	V
I_H	Holding Current	R_{GK} = 1 KΩ Initial Current = 20mA		MAX.	3	mA
dv/dt	Critical Rate-of-Rise of Off-State Voltage	T_J = 125°C V_D = 67% of V_{DRM} Exp. Waveform	R_{GK} =1 kΩ	MIN.	40	V/µs
			R_{GK} =220 Ω	MIN.	250	
V_{GD}	Gate Non-Trigger Voltage	V_D = 1/2 V_{DRM} R_{GK} =1 kΩ T_J = 125°C		MIN.	0.2	V
t_q	Turn-Off Time	I_T = 0.5A		MAX.	35	µs
t_{gt}	Turn-On Time	I_G=10mA P_W= 15µsec I_T = 1.6A(pk)		TYP.	2.3	µs

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

Symbol	Description	Test Conditions	Limit	Value	Unit
V_{TM}	Peak On-State Voltage	1.5A device I_{TM} = 4A t_p = 380 µs	MAX.	1.6	V
V_{T0}	Threshold Voltage		MAX	1.03	V
R_D	Dynamic Resistance		MAX	106	mΩ
I_{DRM} / I_{RRM}	Off-State Current, Peak Repetitive	T_J = 25°C	MAX.	3	µA
		T_J = 125°C	MAX.	500	µA

Thermal Resistances

Symbol	Description	Test Conditions	Value	Unit
$R_{th(JC)}$	Junction to case (AC)	I_T = 1.5A $_{(RMS)}$ [1]	35	°C/W
$R_{th(j-a)}$	Junction to ambient	I_T = 1.5A $_{(RMS)}$ [1]	150	°C/W

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

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

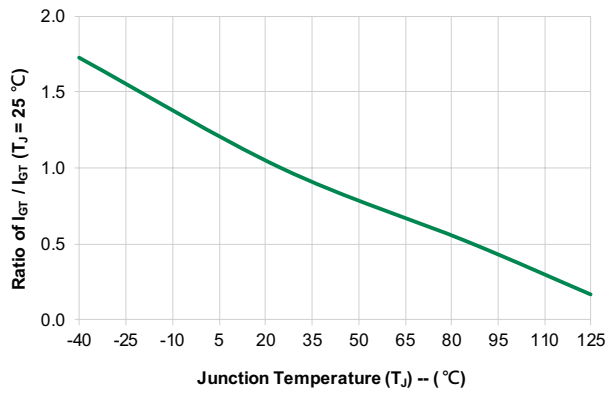


Figure 2: Normalized DC Holding Current vs. Junction Temperature

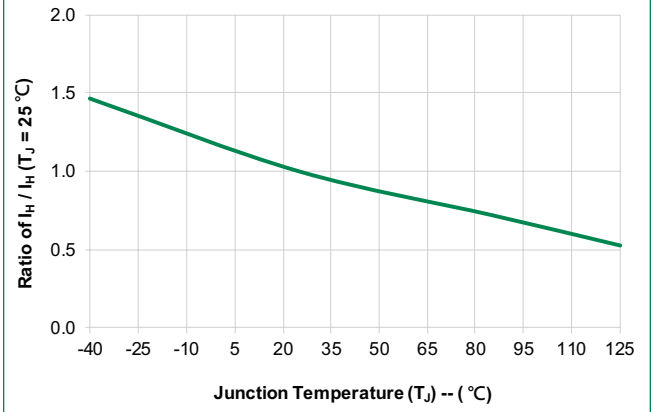


Figure 3: Normalized DC Gate Trigger Voltage vs. Junction Temperature

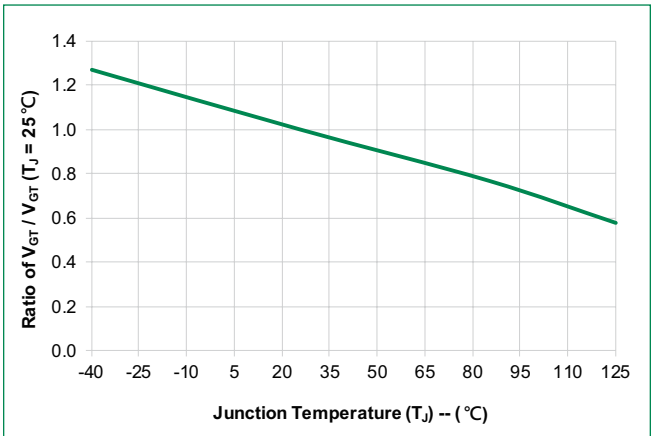


Figure 4: On-State Current vs. On-State Voltage (Typical)

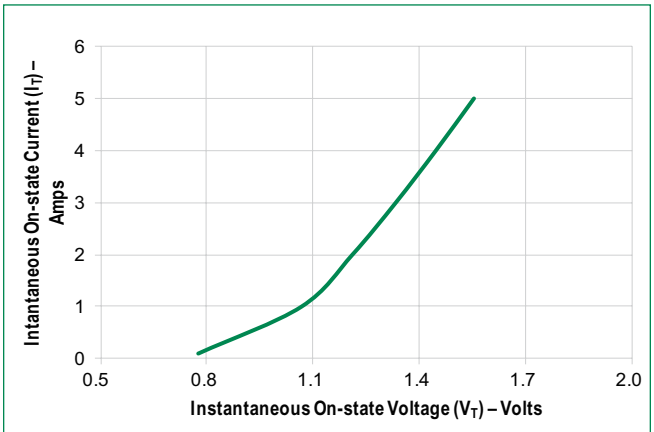


Figure 5: Power Dissipation (Typical) vs. RMS On-State Current

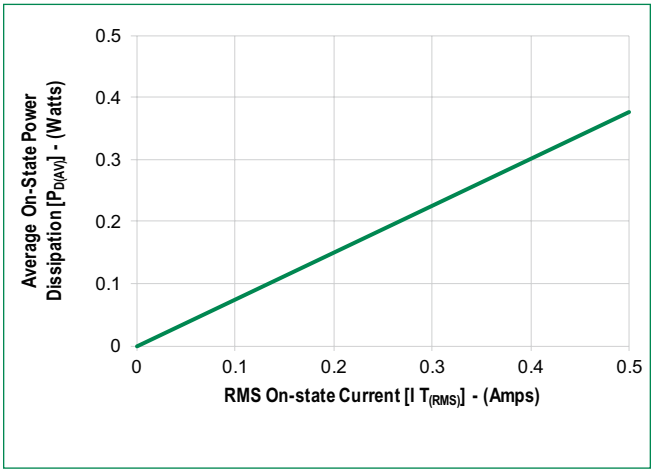
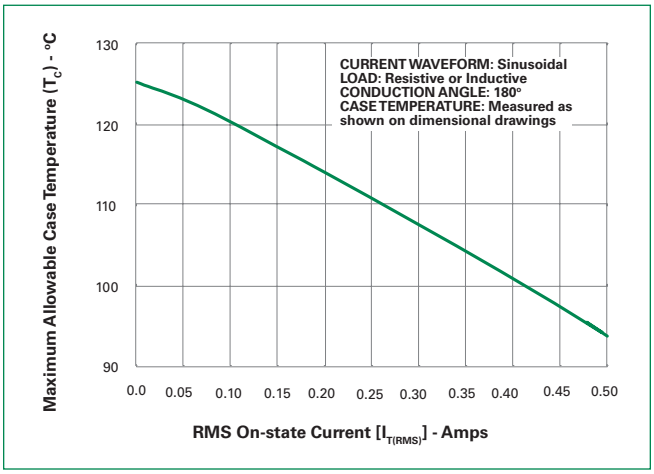


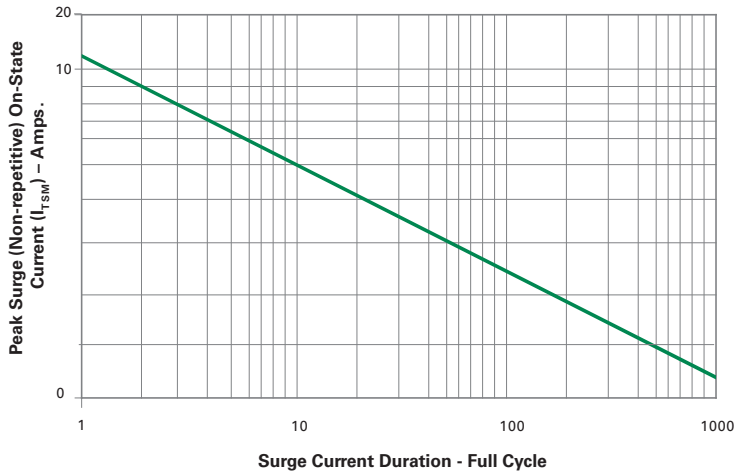
Figure 6: Maximum Allowable Case Temperature vs. On-State Current



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Figure 7: Surge Peak On-State Current vs. Number of Cycles

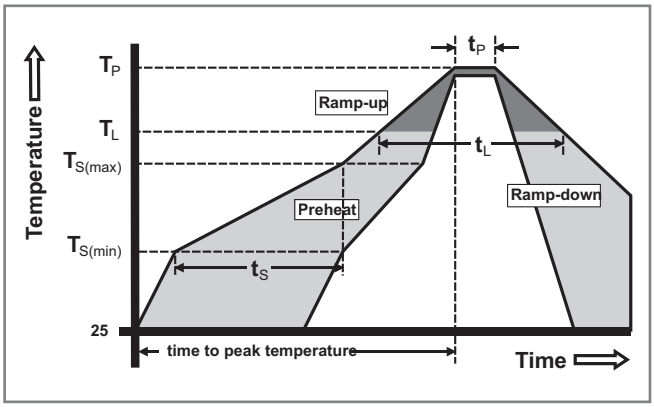


Supply Frequency: 60Hz Sinusoidal
Load: Resistive
RMS On-State Current [$I_{T(RMS)}$]: Max Rated Value at Specific Case Temperature

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



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Thyristors

EV Series 1.5 Amp Sensitive SCRs

Physical Specifications

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

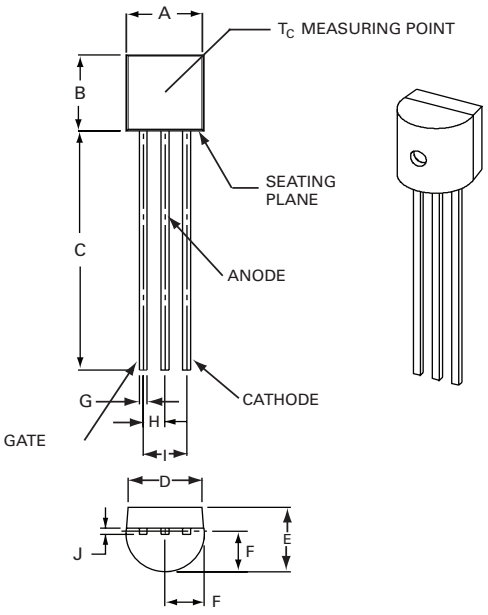
Design Considerations

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.

Reliability/Environmental Tests

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; 320V - DC: 85°C; 85% rel humidity
UHAST	JESD22-A118, 96 hours, 130°C, 85%RH
High Temp Storage	MIL-STD-750, M-1031, 1008 hours; 150°C
Low-Temp 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

Dimensions – TO-92



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

Packing Option

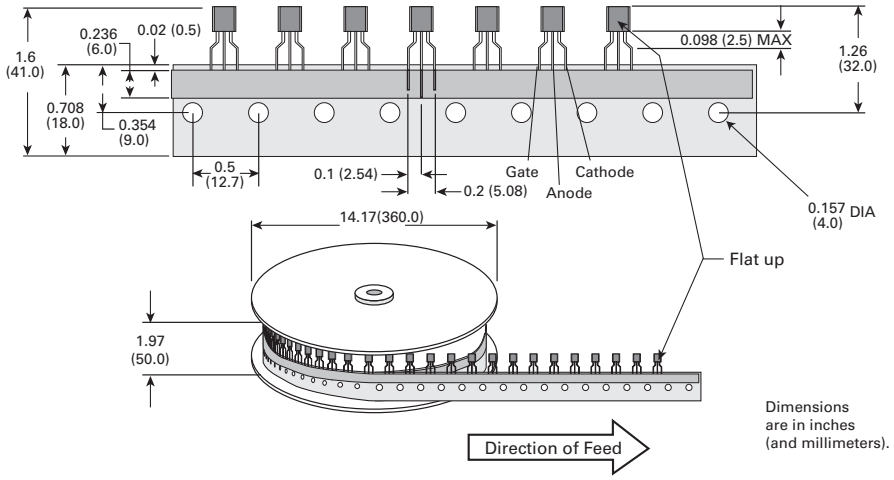
Part Number	Marking	Weight	Packing Mode	Base Quantity
S802ECS	S802ECS	0.217G	Bulk	2500
S802ECSRP	S802ECS	0.217G	Tape & Reel	2000
S802ECSAP	S802ECS	0.217G	Ammo Pack	2000

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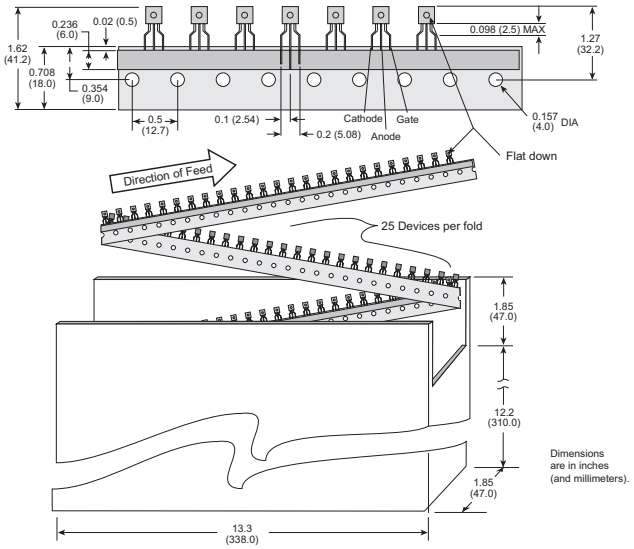
TO-92 (3-lead) Reel Pack (RP) Radial Leaded Specifications

Meets all EIA-468-C Standards



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

Meets all EIA-468-C Standards

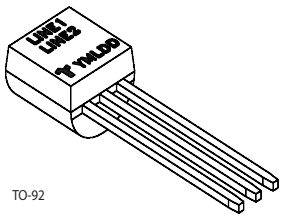


Part Numbering System

S802ECSxx

- **SERIES** — **S:** SCR
- **VOLTAGE** — **8:** 800V
- **CURRENT** — **02:** 1.5A
- **PACKAGE TYPE** — **EC:** TO-92 Center Anode
- **SENSITIVITY & TYPE** — **S:** 100µA Sensitive SCR
- **PACKING TYPE** — **Blank:** Bulk Pack, **RP:** Reel Pack, **AP:** Ammo Pack

Part Marking System



TO-92

Line1 = Littelfuse Part Number
Line2 = continuation…Littelfuse Part Number
Y = Last Digit of Calendar Year
M = Letter Month Code (A-L for Jan-Dec)
L = Location Code
DD = Calendar Date

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