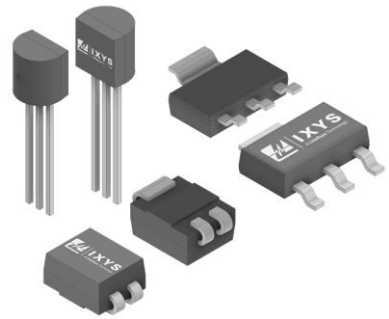
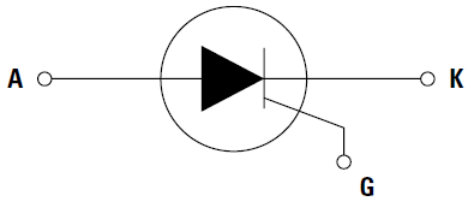
S6002xS Series
EV Series 2 A Sensitive SCRs



Agency Approvals and Environmental

Environmental Approvals
RoHS HF

Schematic Symbol



Product Summary

Characteristic	Value	Unit
$I_{T(RMS)}$	2	A
V_{DRM} / V_{RRM}	600	V
I_{GT}	200	µA

Product Description

The S6002xS offers very high di/dt capability through small die planar construction design. It is glass-passivated to ensure long term reliability and parametric stability.

Features

- Surge capability > 25 A
- Blocking voltage (VDRM/VRRM) capability – up to 600 V
- High di/dt capability of 500 A/µs
- Improved turn-off time (tq) < 55 µsec
- Sensitive gate for direct microprocessor interface
- Through-hole and surface mount packages
- RoHS compliant and Halogen-free

Applications

- The S6002xS is specifically designed for capacitor discharge application such as high-power gas flame ignition.

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1. Maximum Ratings

Symbol	Characteristic	Conditions		Value	Unit
$I_{T(RMS)}$	RMS On-state Current (Full Sine Wave)	TO-92	T_C = 65 °C	2	A
		SOT-223	T_C = 95 °C		
		Compak	T_C = 75 °C		
$I_{T(AV)}$	Average On-state Current	TO-92	T_C = 65 °C	1.2	A
		SOT-223	T_C = 95 °C		
		Compak	T_C = 75 °C		
I_{TSM}	Non-repetitive Surge Peak On-state Current (Full Cycle, T_J Initial = 25 °C)	TO-92 SOT-223 Compak	f = 50 Hz	22.5	A
			f = 60 Hz	25.0	
I^2t	I^2t Value for Fusing		f = 50 Hz, t_p = 10 ms	2.5	A^2s
di/dt	Critical Rate of Rise of On-state Current IG = 10 mA	TO-92 SOT-223 Compak	T_J =25 °C	500	A/µs
I_{GM}	Peak Gate Current		t_p = 20 µs, T_J =125 °C	1.0	A
$P_{G(AV)}$	Average Gate Power Dissipation		T_J =125 °C	0.2	W
T_{STG}	Storage Junction Temperature			-40 to 150	°C
T_J	Operating Junction Temperature			-40 to 125	°C

2. Thermal Characteristics

Symbol	Characteristic			Value	Unit
$R_{th(JC)}$	Thermal Resistance, junction-to-case (AC)	I_T = 1.5 A $_{(RMS)}$[1]	TO-92	30	°C/W
			SOT-223	15	
			Compak	25	
$R_{th(JA)}$	Thermal Resistance, junction-to-ambient (AC)	I_T = 1.5 A $_{(RMS)}$[1]	TO-92	160	°C/W
			SOT-223	60	

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

Symbol	Description	Conditions	Value		Unit
			Min	Max	
I_{GT}	DC Gate Trigger Current	V_D = 6 V, R_L = 100 Ω	20	200	µA
V_{GT}	DC Gate Trigger Voltage	V_D = 6 V, R_L = 100 Ω	-	0.8	V
V_{GRM}	Peak Reverse Gate Voltage	I_{RG} = 10 µA	5	-	V
I_H	Holding Current	R_{GK} = 1 kΩ	-	5	mA
V_{GD}	Gate Non-trigger Voltage	V_D = V_{DRM}, R_{GK} = 1 kΩ, T_J = 125 °C	0.2	-	V
dv/dt	Critical Rate-of-rise of Off-stage Voltage	TJ = 125 °C, V_D = 67% V_{DRM}, Exponential Waveform, R_{GK} = 1 kΩ	25	-	V/µs
t_q	Turn-off Time	I_T = 0.5 A	-	55	µs
t_{gt}	Turn-on Time	I_G = 10 mA, P_W = 15 µsec, I_T = 3.0 $A_{(PK)}$	-	5	µs

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

Symbol	Description	Conditions	Value		Unit
			Min	Max	
V_{TM}	Peak On-state Voltage	I_{TM} = 3 $A_{(PK)}$, t_P = 380 µs	-	1.5	V
I_{DRM}/I_{RRM}	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

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5. Performance Curves

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

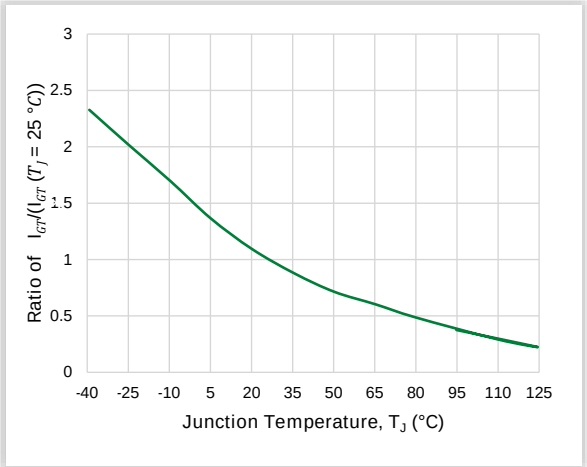

Figure 2. Normalized DC Gate Trigger Voltage vs. Junction Temperature

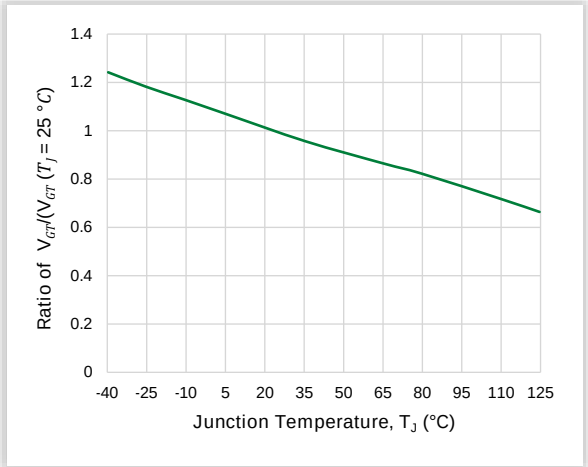

Figure 3. Normalized DC Holding Current vs. Junction Temperature

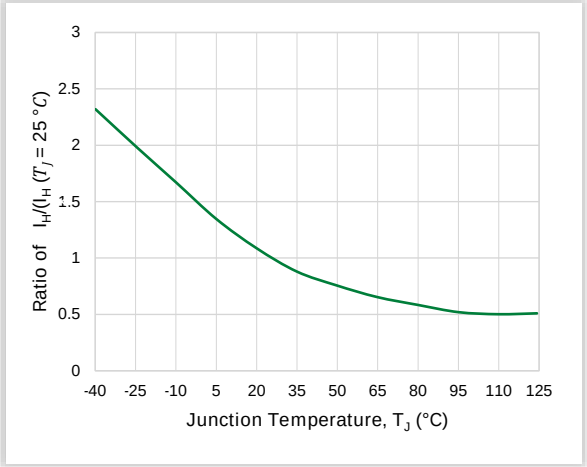

Figure 4. Typical On-state Current vs. On-state Voltage

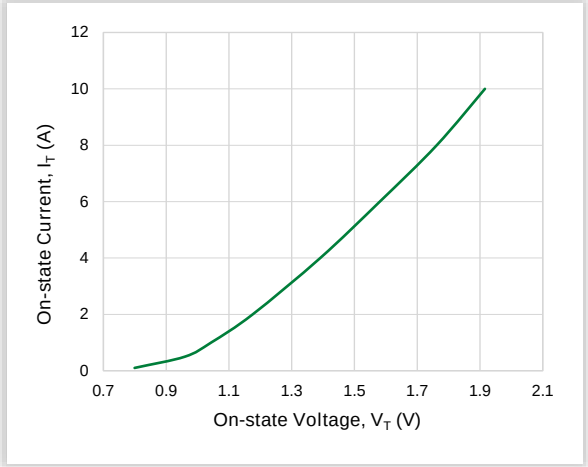

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Figure 5. Typical Power Dissipation vs. RMS On-state Current

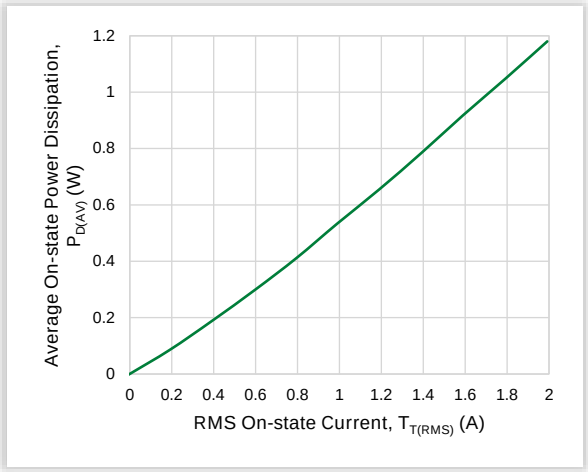


Figure 6. Maximum Allowable Case Temperature vs. RMS On-state Current

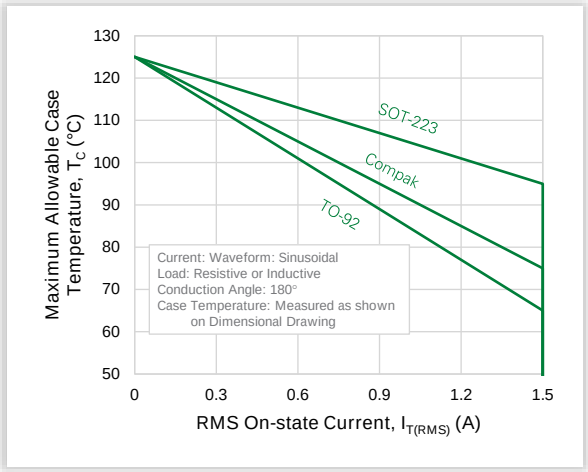
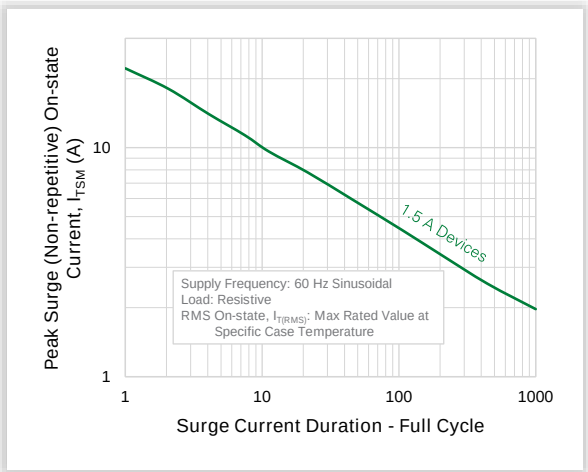


Figure 7. Surge Peak On-state Current vs. Number of Cycles



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 8. Peak Repetitive Capacitor Discharge Current

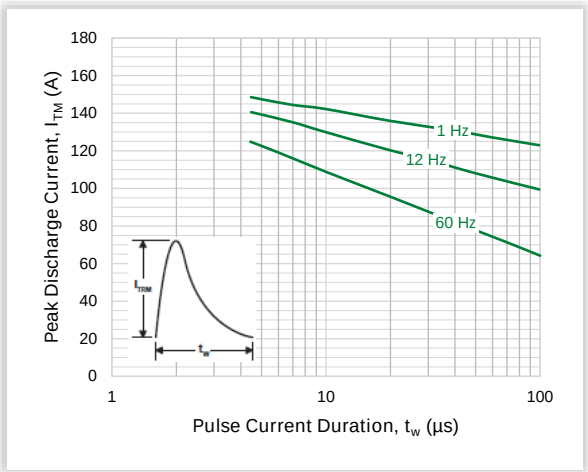
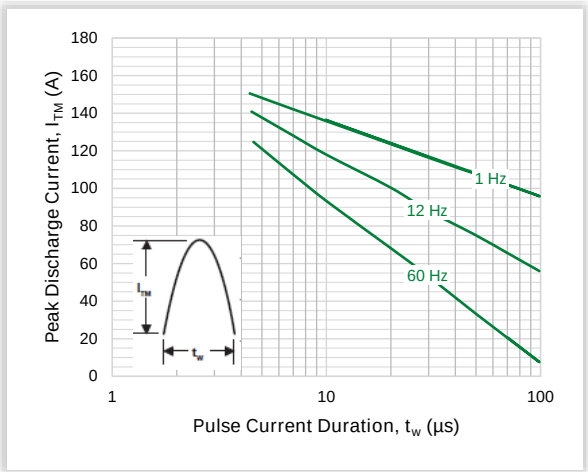


Figure 9. Peak Repetitive Sinusoidal Pulse Current



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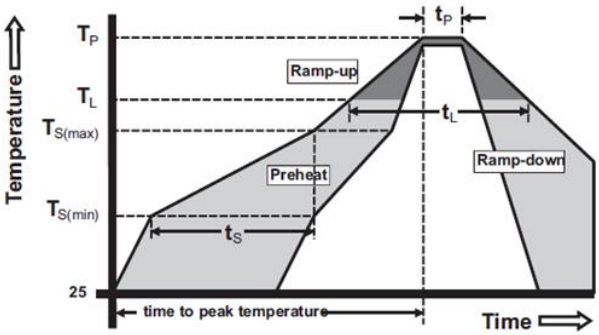
6. Soldering Parameters



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_L	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
Body Material	UL Recognized Epoxy meeting Flammability Rating 94 V-0
Terminal Material	Copper Alloy

8. 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; -40°C to +150°C; 15 min dwell time
Temperature/Humidity	EIA / JEDEC, JESD22-A101 1008 hours; 160V - DC: 85°C; 85% relative humidity
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

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.

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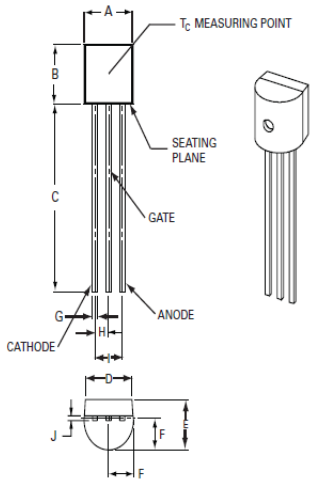
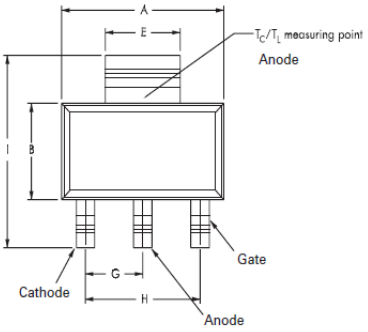
10. Package Dimensions

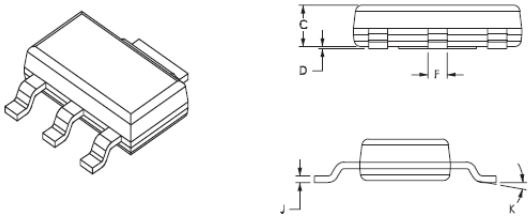
TO-92 (E- Package)



Dimension	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	12.700	-	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

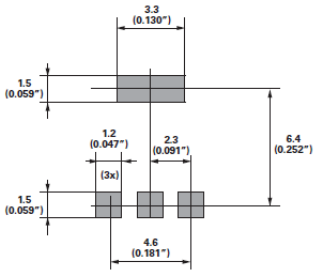
SOT-223





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

Pad Layout for SOT-223



Dimensions in Millimeters (Inches)

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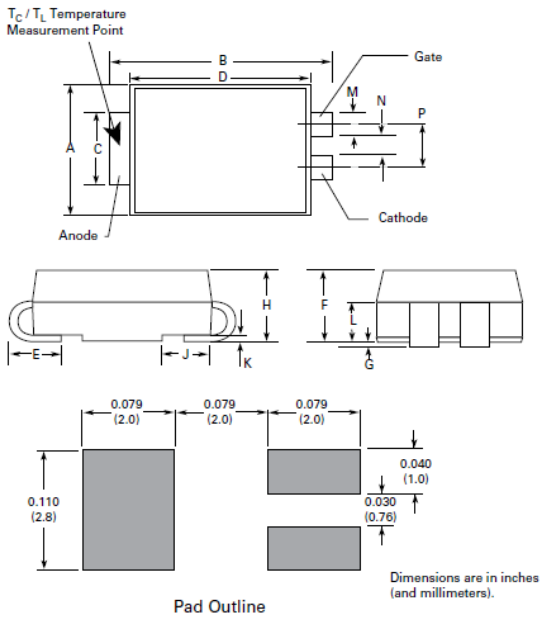
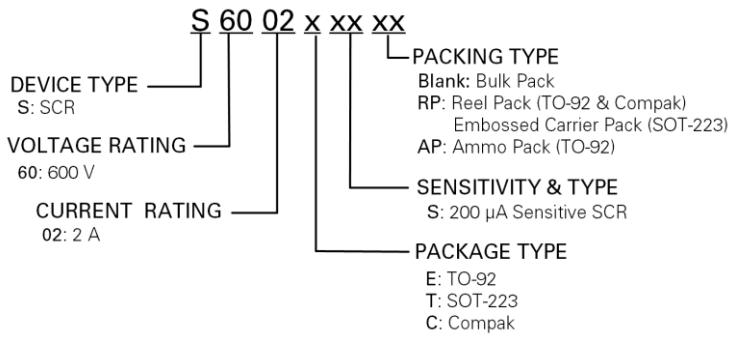
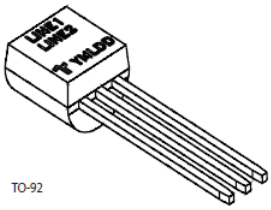
Compak (C- Package)

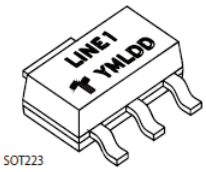


Dimension	Millimeters		Inches	
	Min	Max	Min	Max
A	3.30	3.95	0.130	0.156
B	5.10	5.60	0.201	0.220
C	1.95	2.20	0.077	0.087
D	4.05	4.60	0.159	0.181
E	0.75	1.60	0.030	0.063
F	1.90	2.45	0.075	0.096
G	0.05	0.20	0.002	0.008
H	1.95	2.65	0.077	0.104
J	1.09	1.35	0.043	0.053
K	0.15	0.41	0.006	0.016
L	0.76	1.40	0.030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

11. Part Numbering and Marking

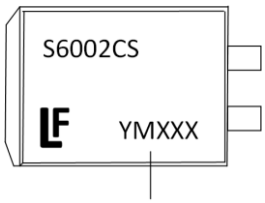






Line1 = Littelfuse Part Number
Line2 = continuation…Littelfuse Part Number
Y = Last Digit of Calendar Year
M = Letter Month Code (A-L for Jan-Dec)
L = Location Code
DD = Calendar Date

Compak (C Package)



Date Code Marking
Y: Year Code
M: Month Code
XXX: Lot Trace Code

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12. Product Selector

Part Number	Voltage 600 V	Gate Sensitivity	Package
S6002ES	X	200 µA	TO-92
S6002TS	X	200 µA	SOT-223
S6002CS	X	200 µA	Compak

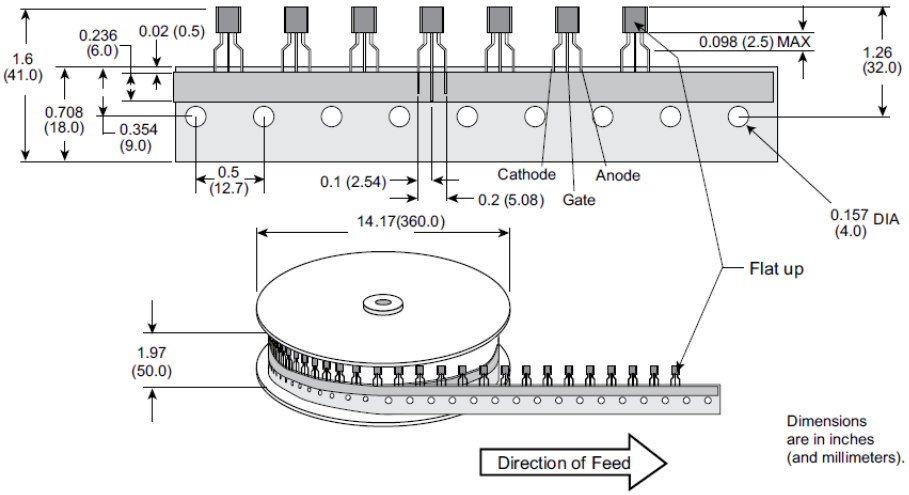
13. Packing Options

Part Number	Marking	Weight	Packing Mode	M.O.Q
S6002ES	S6002ES	0.217 g	Bulk	2500
S6002ESAP	S6002ES	0.217 g	Ammo Pack	2000
S6002ESRP	S6002ES	0.217 g	Tape & Reel	2000
S6002TSRP	S6002TS	0.120 g	Tape & Reel	1000
S6002CSRP	S6002CS	0.120 g	Tape & Reel	2500

14. Packing Specifications

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

Meets all EIA-468-C Standards



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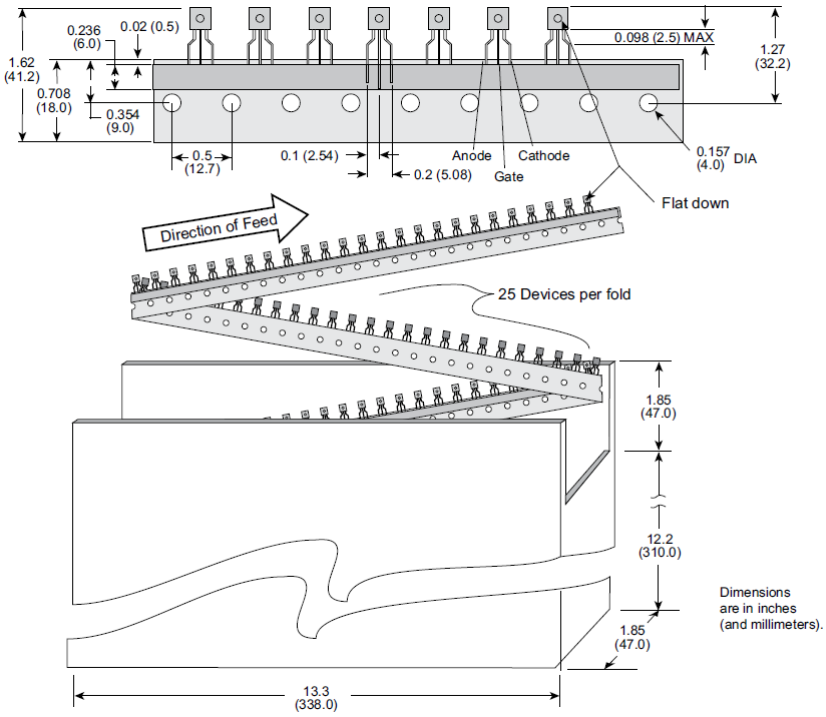
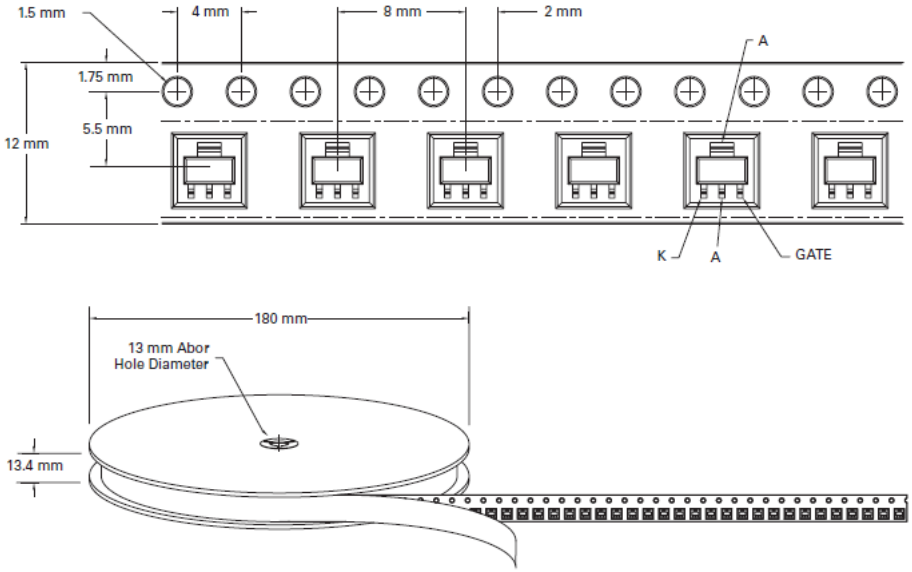
TO-92 (3-Lead) Ammo Pack (AP) Radial Leaded Specifications

Meets all EIA-468-C Standards



SOT-223 Reel Pack (RP) Specifications



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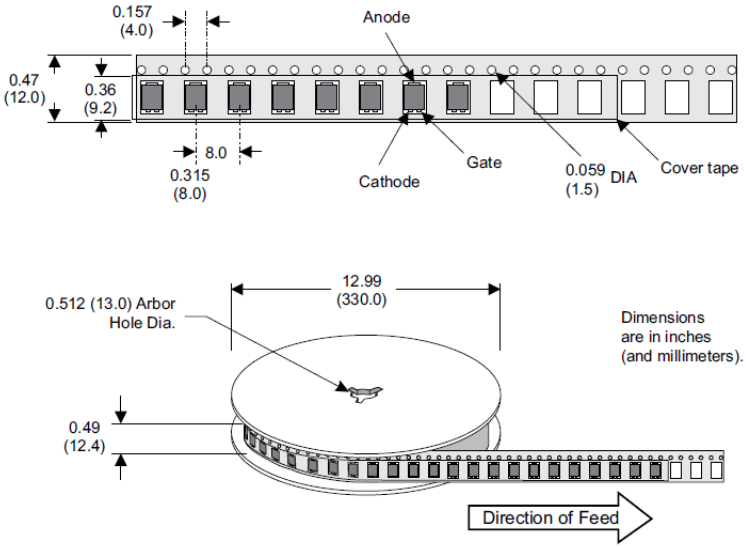
Compak Embossed Carrier Reel Pack (RP) Specifications

Meets all EIA-481-1 Standards



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