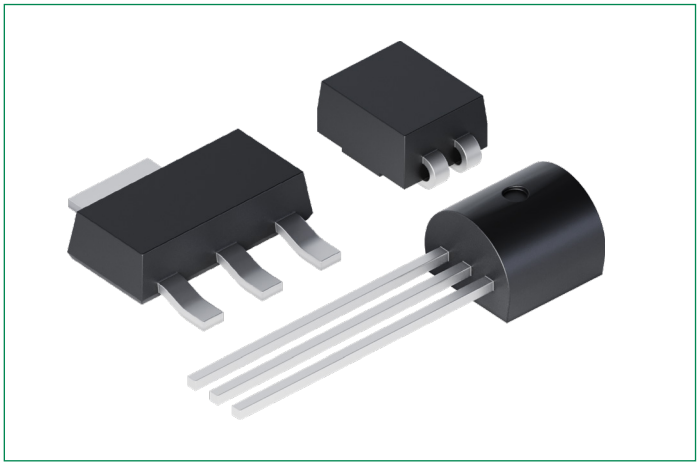
S6002xS Series

EV Series 2 A Sensitive SCRs

HF RoHS



Description

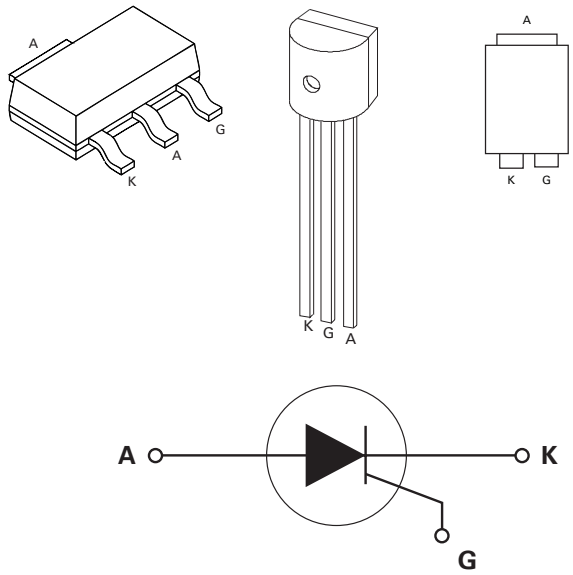
The S6002xS series offers very high di/dt capability through small die planar construction design. It is glass-passivated to ensure long term reliability and parametric stability.

Features

- Surge current capability > 24 A
- High di/dt capability of 500 A/µs
- Blocking voltage (V_{DRM}/V_{RRM}) capability up to 600 V
- Improved turn-off time (t_q) < 55 µs
- Sensitive gate for direct microprocessor interface
- RoHS compliant and halogen-free
- Through-hole and surface mount packages

Pinout Diagram

SOT-223 TO-92 Compak



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

Applications

These devices are specifically designed for capacitor discharge applications such as high-power gas flame ignition.

Product Summary

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

Revised: TK.08/08/2024

Maximum Ratings

Symbol	Characteristics	Conditions			Value	Units
$I_{T(RMS)}$	On-state RMS Current	TO-92	T_C = 65 °C	Full sine wave	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	TO-92 SOT-223 Compak	f = 50 Hz	T_{vj} initial = 25 °C, Full cycle	22.5	A
			f = 60 Hz		25	
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	TO-92 SOT-223 Compak	I_G = 10 mA	T_{vj} = 125 °C	500	A/µs
I_{GM}	Peak Gate Current	t_p = 20 µs		T_{vj} = 125 °C	1.0	A
$P_{G(AV)}$	Average Gate Power Dissipation	T_{vj} = 125 °C			0.2	W
T_{stg}	Storage Temperature Range	–			–40 to 150	°C
T_{vj}	Virtual Junction Temperature Range	–			–40 to 125	°C

Electrical Characteristics (T_{vj} = 25 °C, unless otherwise specified)

Symbol	Characteristics	Conditions		Value		Units
				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
$dv/dt_{(cr)}$	Critical Rate-of-rise of Off-stage Voltage	T_{vj} = 125 °C, V_D = 67 % of V_{DRM}, Exponential Waveform	R_{GK} = 1 kΩ	25	–	V/µs
V_{GD}	Non-trigger Gate Voltage	$V_D = V_{DRM}$, R_{GK} = 1 kΩ, T_{vj} = 125 °C		0.2	–	V
t_q	Turn-off Time	I_T = 0.5 A		–	55	µs
t_{gt}	Turn-on Time	I_G = 10 mA, P_W = 15 µs, I_T = 3.0 A_{pk}		–	5	µs

Thermal Characteristics

Symbol	Characteristics	Conditions		Value	Units
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (AC)	I_T = 1.5 $A_{(RMS)}$ [1]	TO-92	30	K/W
			SOT-223	15	
			Compak	25	
$R_{th(j-a)}$	Thermal Resistance, Junction to Ambient	I_T = 1.5 $A_{(RMS)}$ [1]	TO-92	160	K/W
			SOT-223	60	

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

Static Characteristics (T_{vj} = 25 °C, unless otherwise specified)

Symbol	Characteristics	Conditions	Maximum Value	Units
V_{TM}	Peak On-state Voltage	I_{TM} = 3 A, tp = 380 µs	1.5	V
I_{DRM}/I_{RRM}	Repetitive Peak Off-state Current	T_{vj} = 25 °C @ V_D= V_{DRM}, R_{GK} = 1 kΩ	5	µA
		T_{vj} = 125 °C @ V_D= V_{DRM}, R_{GK} = 1 kΩ	500	

Characteristic Curves

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

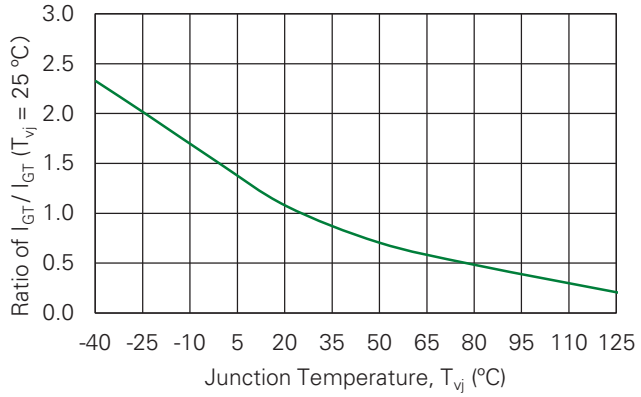


Fig. 2. Normalized DC Gate Trigger Voltage vs. Junction Temperature

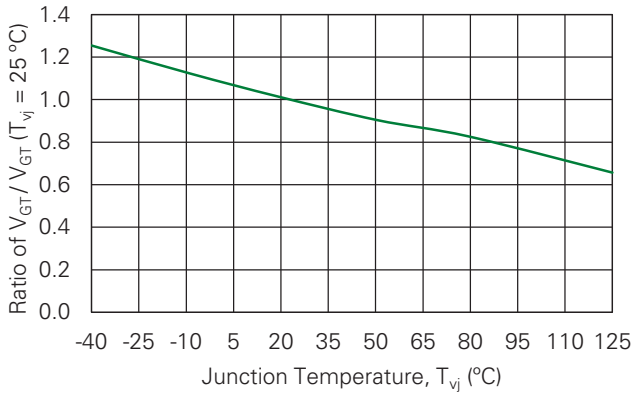


Fig. 3. Normalized DC Holding Current vs. Junction Temperature

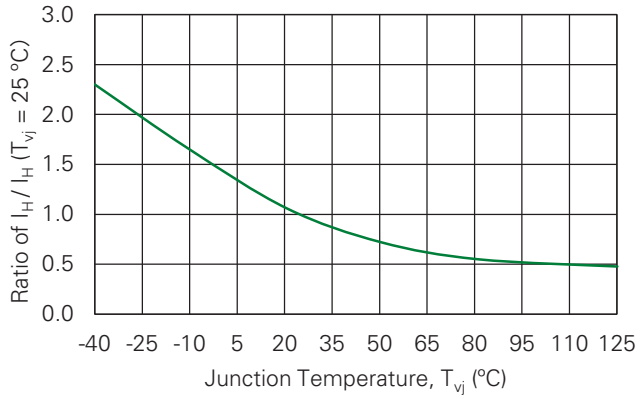


Fig. 4. Typical On-state Current vs. On-state Voltage

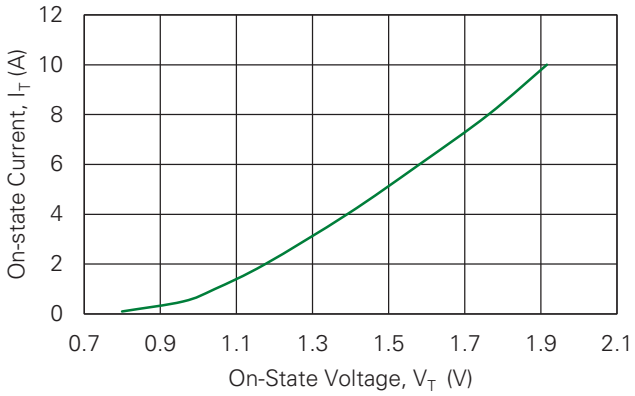


Fig. 5. Typical Power Dissipation vs. RMS On-state Current

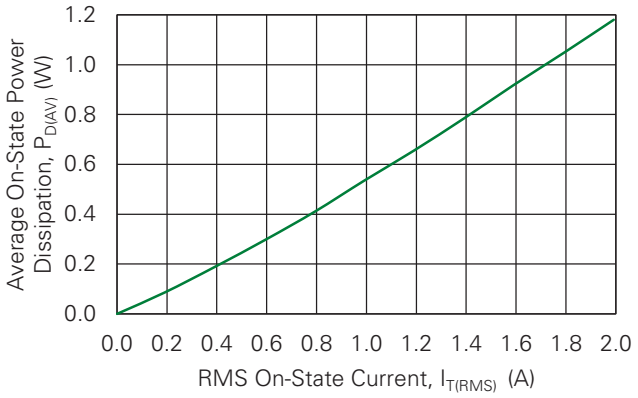


Fig. 6. Maximum Allowable Case Temperature vs. RMS On-state Current

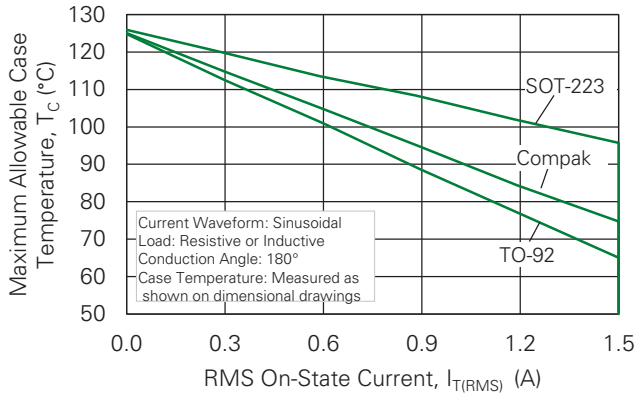


Fig. 7. Surge Peak On-state Current vs. Number of Cycles

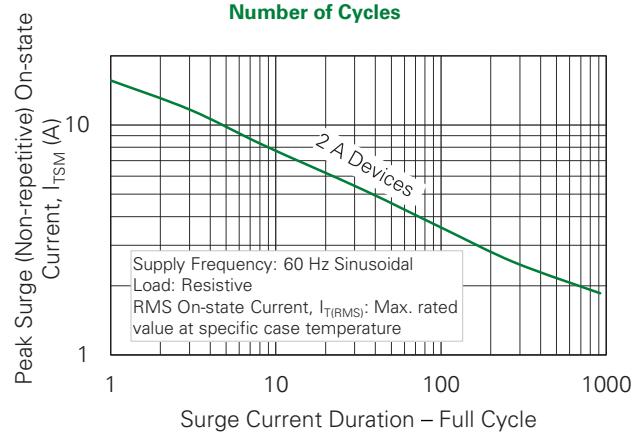
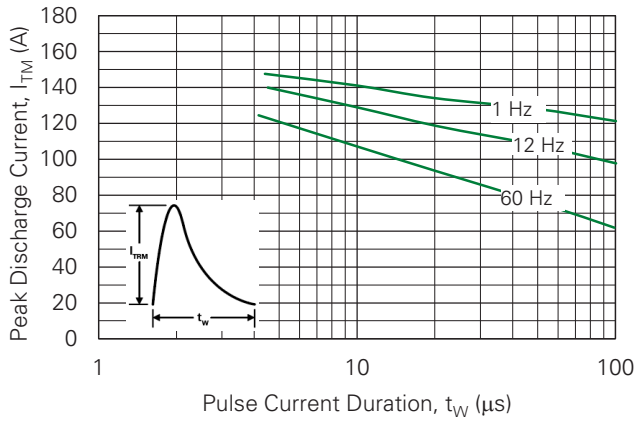


Fig. 8. Peak Repetitive Capacitor Discharge Current

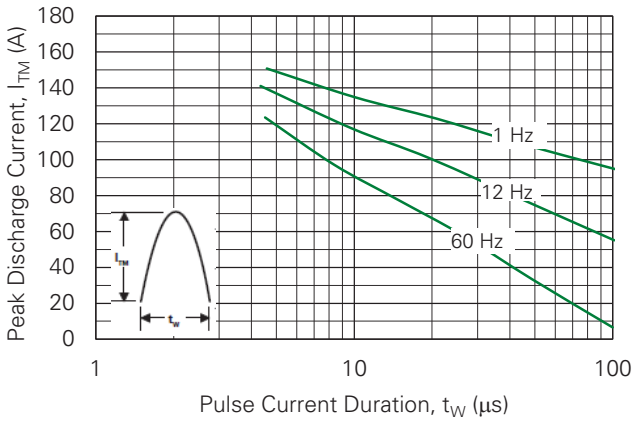


Notes:

1. Gate control may be lost during and immediately following surge current interval.

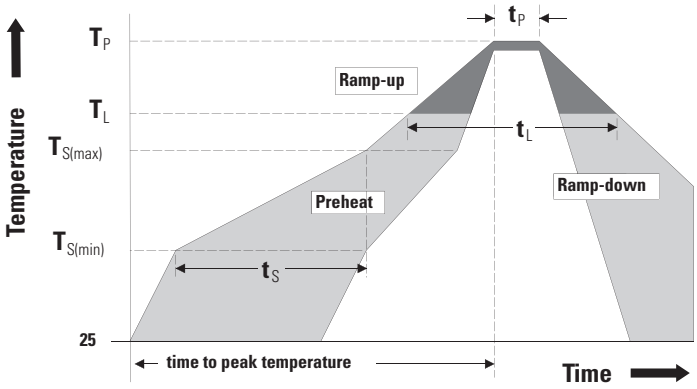
2. Overload should not be repeated until junction temperature has returned to steady-state rated value.

Fig. 9. Peak Repetitive Sinusoidal Pulse Current



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



Physical Specifications

Characteristic	Value
Terminal Finish	100% Matte Tin-plated
Body Material	UL Recognized epoxy meeting flammability rating 94 V-0
Lead Material	Copper Alloy

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/Humidity	EIA / JEDEC, JESD22-A101, 1008 hours; 160 V - DC: 85 °C; 85 % relative humidity
Temperature Cycling	MIL-STD-750, M-1051,1000 cycles; -40 °C to +150 °C; 15-min dwell-time
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

Product Selector

Part Number	Voltage	Gate Sensitivity	Package
	600 V		
S6002ES	X	200 µA	TO-92
S802TS	X	200 µA	SOT-223
S6002CS	X	200 µA	Compak

Packing Options

Part Number	Marking	Weight	Packing Mode	Base Quantity
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

Part Numbering and Marking

S 60 02 x xx xx

Device Type
S: SCR

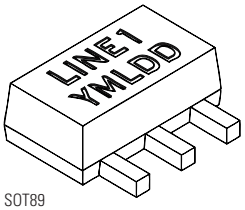
Voltage
60: 600 V

Current
02: 2 A

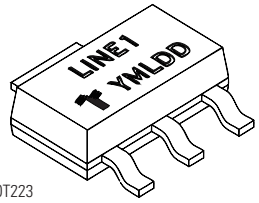
Package Type
E: TO-92
T: SOT-223
C: Compak

Sensitivity
S: 200 µA Sensitive SCR

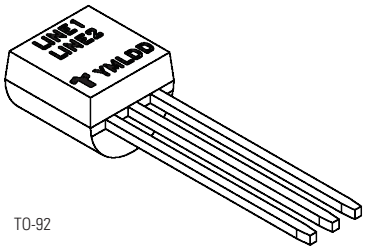
Package Type
Blank: Bulk Pack
RP: Reel Pack (TO-92)
: Embossed Carrier Pack (SOT-223)
AP: Ammo Pack (TO-92)



SOT89



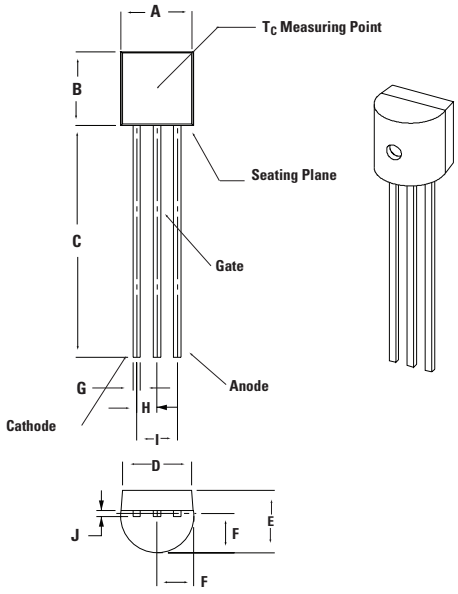
SOT223



TO-92

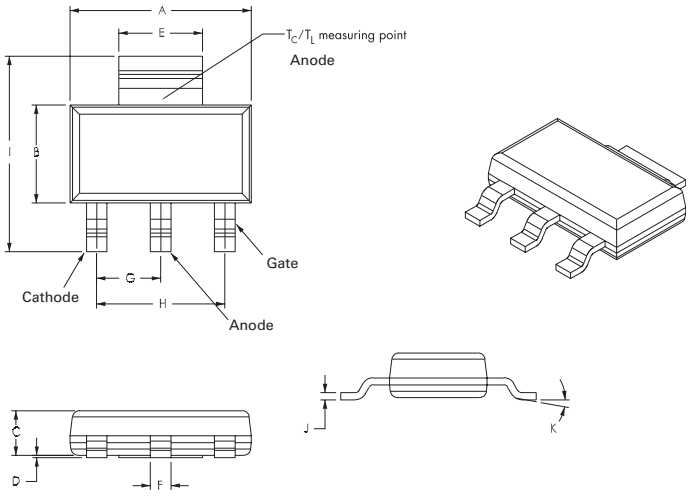
Line1 = Littelfuse Part Number
Line2 = continuation…Littelfuse Part Number
Y = Last Digit of Calendar Year
M = Letter Month Code (A-L for Jan-Dec)
L = Location Code
DD = Calendar Date

Package Dimensions TO-92 (E Package)



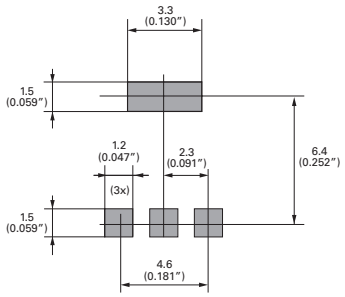
Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max
A	4.450	5.200	0.175	0.205
B	4.320	5.330	0.170	0.210
C	12.70	–	0.500	–
D	3.430	–	0.135	–
E	3.180	4.190	0.125	0.165
F	2.040	2.660	0.080	0.105
G	0.407	0.533	0.016	0.021
H	1.150	1.390	0.045	0.055
I	2.420	2.660	0.095	0.105
J	0.380	0.500	0.015	0.020

Package Dimensions SOT-223



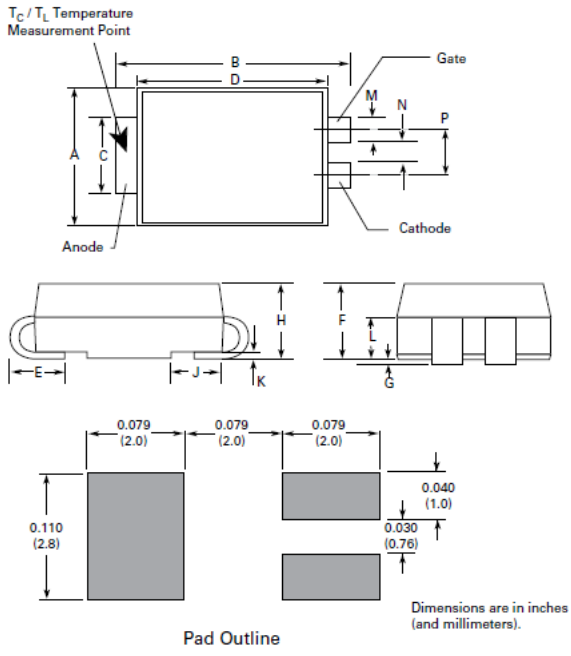
Symbol	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	6.30	6.50	6.70	0.248	0.256	0.264
B	3.30	3.50	3.70	0.130	0.138	0.146
C	–	–	1.80	–	–	0.071
D	0.02	–	0.10	0.001	–	0.004
E	2.90	3.00	3.15	0.114	0.118	0.124
F	0.60	0.70	0.85	0.024	0.027	0.034
G	–	2.30	–	–	0.090	–
H	–	4.60	–	–	0.181	–
I	6.70	7.00	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)

Package Dimensions Compak (C Package)

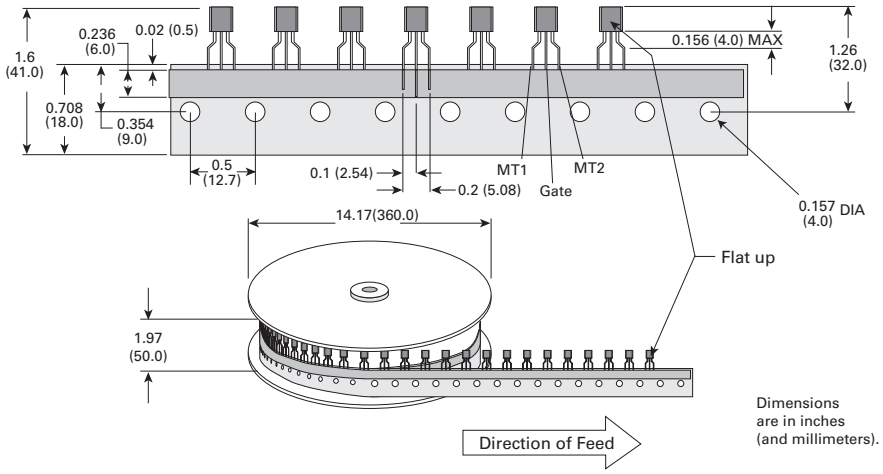


Pad Outline

Symbol	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

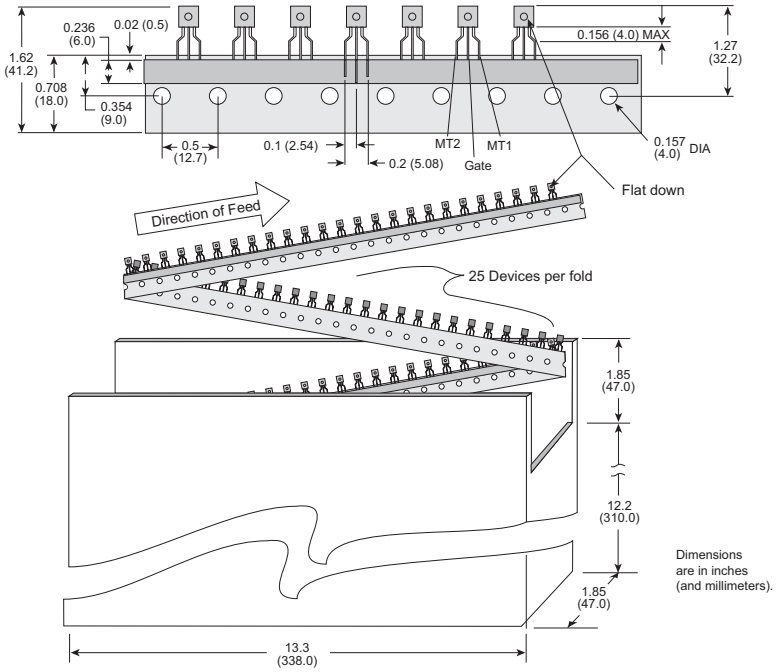
TO-92 (3-lead) Reel Pack (RP) Radial Leaded Specifications

Meets all EIA-468-C Standards

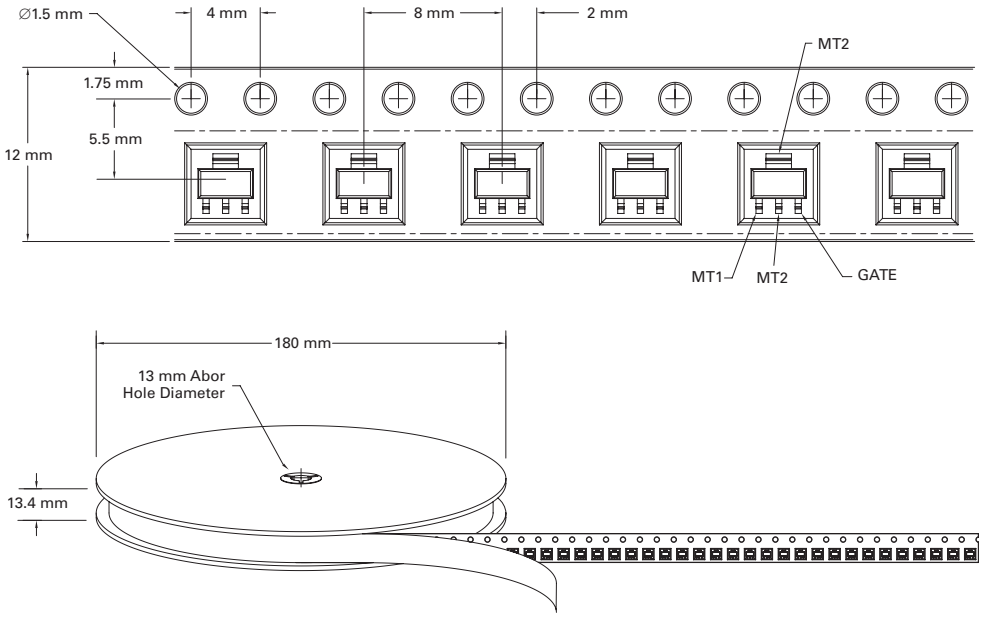


TO-92 (3-lead) Ammo Pack (AP) Radial Leaded Specifications

Meets all EIA-468-C Standards



SOT-223 Reel Pack (RP) Specifications



Compak Embossed Carrier Reel Pack (RP) Specifications

Meets all EIA-481-1 Standards