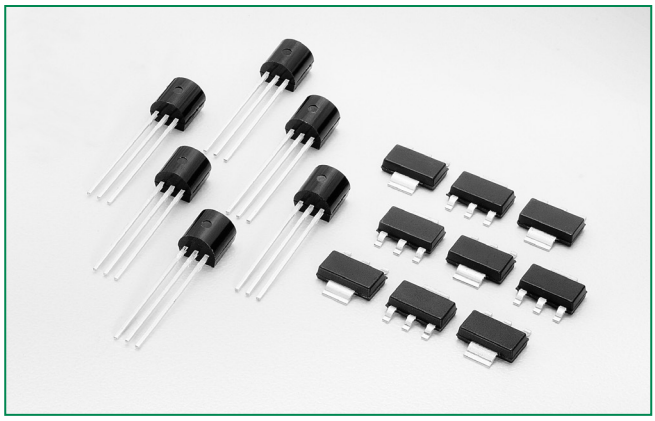
PRELIMINARY & CONFIDENTIAL

Littelfuse, Inc. has characterized initial samples of this device and is currently conducting reliability testing. Parts numbers and specifications are subject to change until the datasheet is made final.

S6002xS

HF RoHS



Main Features

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

Applications

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

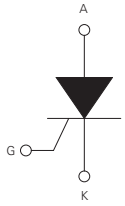
Description

The S6002xS offers high 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 > 25Amps
- Blocking voltage (V_{DRM}/V_{RRM}) capability — up to 600V
- High di/dt capability of 500A/µs
- Improved turn-off time (t_q) < 55 µsec.
- Sensitive gate for direct microprocessor interface
- Thru hole and surface mount packages
- RoHS compliant and Halogen-Free

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	2	A
		SOT-223	T_C = 95°C		
$I_{T(AV)}$	Average on-state current	TO-92	T_C = 65°C	1.2	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	22.5	A
			F = 60 Hz	25.0	
I^2t	I^2t Value for fusing	t_p = 10 ms	F = 50 Hz	2.5	A^2s
di/dt	Critical rate of rise of on-state current IG = 10mA	TO-92 SOT-223	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 range			-40 to 150	°C
T_J	Operating junction temperature range			-40 to 125	°C

Revised: 06/03/19

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

Symbol	Description	Test Conditions	Value		Unit
			Min	Max	
I_{GT}	DC Gate Trigger Current	V_D = 6V R_L = 100 Ω	20	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
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-State Voltage	T_J = 125°C V_D = 67% V_{DRM} Exponential Waveform R_{GK} = 1 kΩ	25	—	V/µs
t_q	Turn-Off Time	I_T=0.5A	—	55	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} = 3A(pk), T_P=380µs	—	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

Thermal Resistances

Symbol	Parameter			Value	Unit
$R_{θ(JC)}$	Junction to case (AC)	I_T = 1.5A $_{(RMS)}$ [1]	TO-92	30	°C/W
			SOT-223	15	
$R_{θ(J-A)}$	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.

Revised: 02/15/19

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

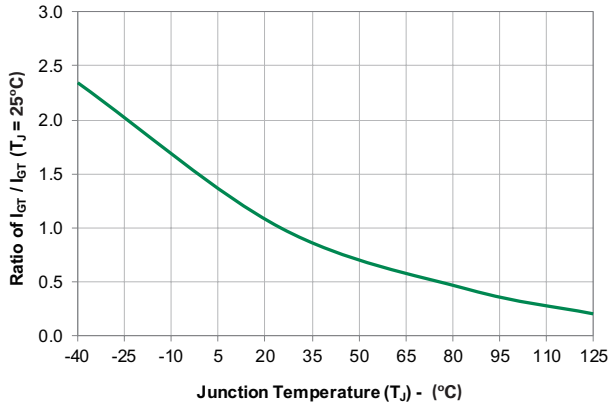


Figure 2: Normalized DC Holding Current vs. Junction Temperature

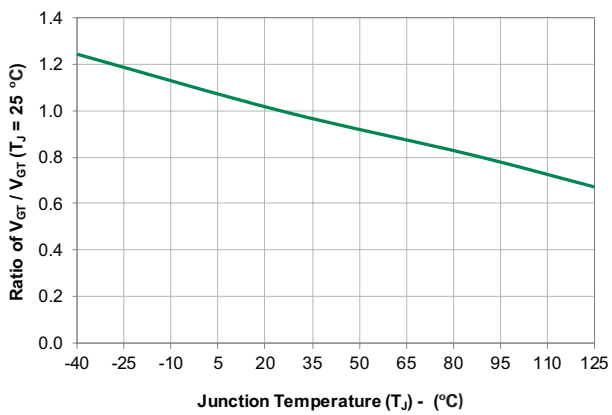


Figure 3: Normalized DC Gate Trigger Voltage vs. Junction Temperature

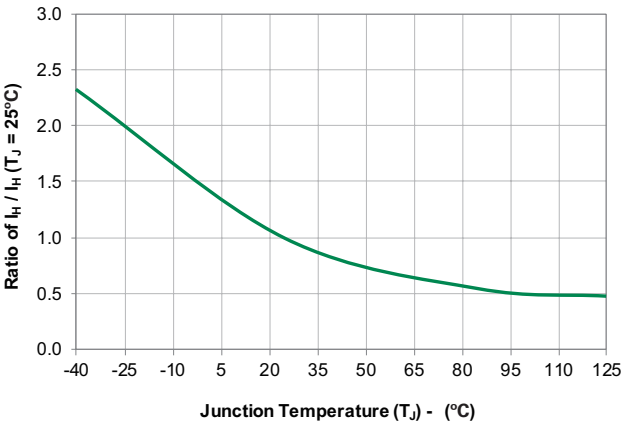


Figure 4: On-State Current vs. On-State Voltage (Typical)

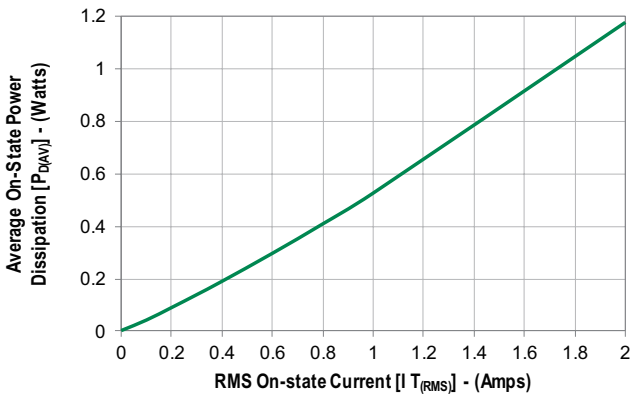


Figure 5: Power Dissipation (Typical) vs. RMS On-State Current

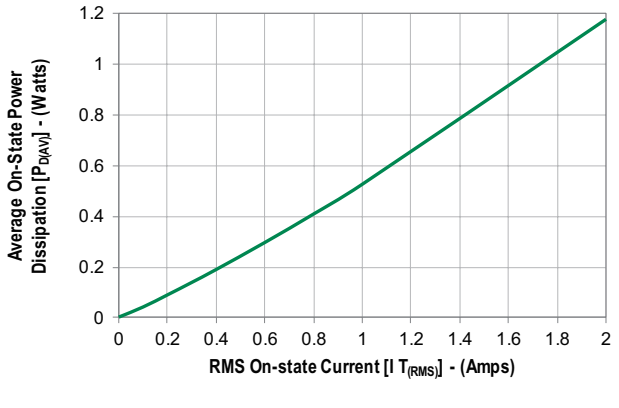
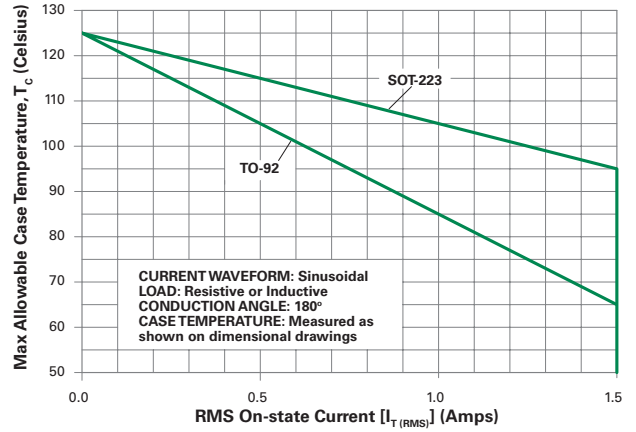
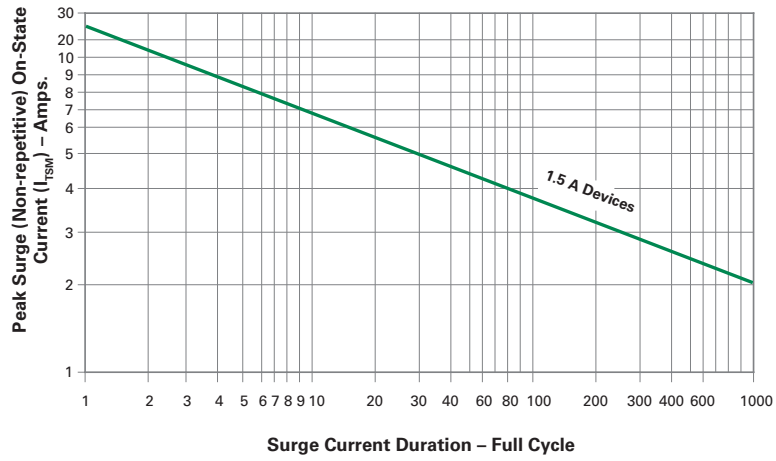


Figure 6: Maximum Allowable Case Temperature vs. On-State Current



Revised: 02/15/19

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.

Figure 8: Peak Repetitive Capacitor Discharge Current

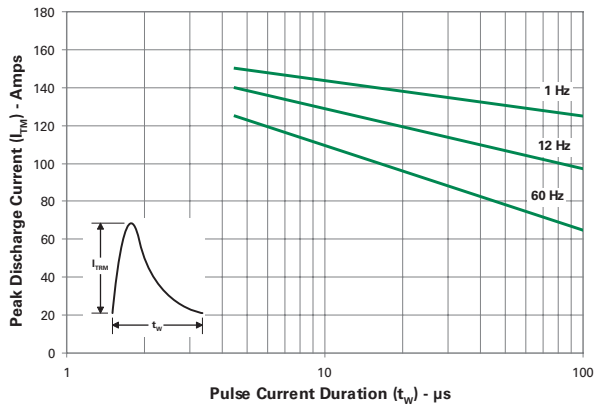
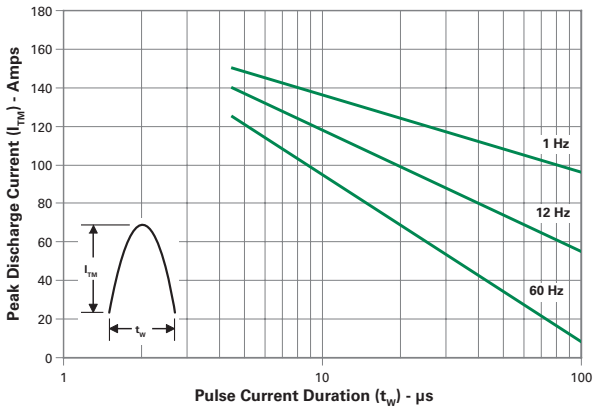


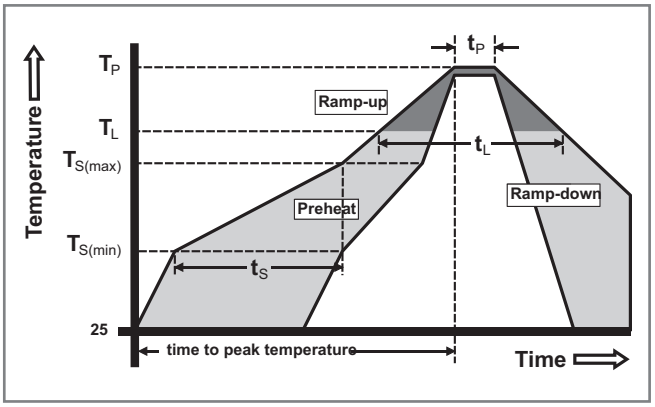
Figure 9: Peak Repetitive Sinusoidal Pulse Current



Revised: 02/15/19

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 Material	UL Recognized compound meeting flammability rating V-0.
Lead Material	Copper Alloy

Design Considerations

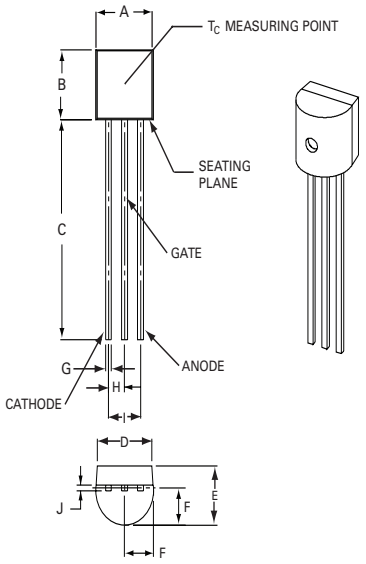
Careful selection of the correct component for the application's operating parameters and environment will go a long way toward extending the operating life of the Thyristor. Good design practice should limit the maximum continuous current through the main terminals to 75% of the component rating. Other 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.

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; 160V - 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
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

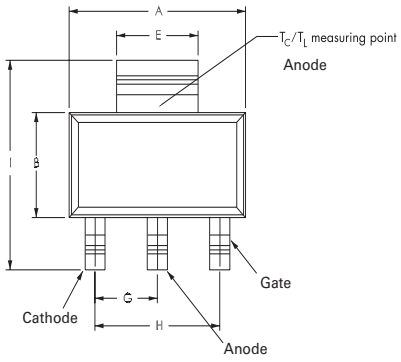
Revised: 02/15/19

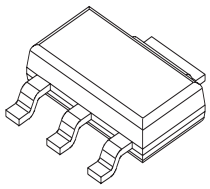
Dimensions — TO-92 (E Package)

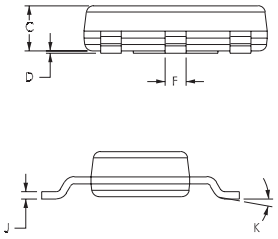


Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.175	0.205	4.450	5.200
B	0.170	0.210	4.320	5.330
C	0.500	—	12.700	—
D	0.135	—	3.430	—
E	0.125	0.165	3.180	4.190
F	0.080	0.105	2.040	2.660
G	0.016	0.021	0.407	0.533
H	0.045	0.055	1.150	1.390
I	0.095	0.105	2.420	2.660
J	0.015	0.020	0.380	0.500

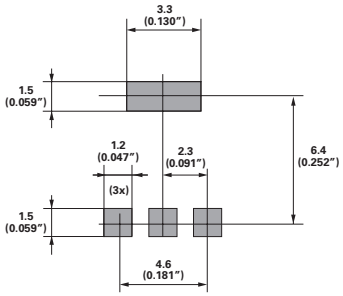
Dimensions – SOT-223







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° MAX					

Revised: 02/15/19

Thyristors

EV Series 2.0 Amp Sensitive SCRs

Product Selector

Part Number	Voltage	Gate Sensitivity	Package
	600V		
S6002ES	X	200µA	TO92
S6002TS	X	200µA	SOT223

Packing Options

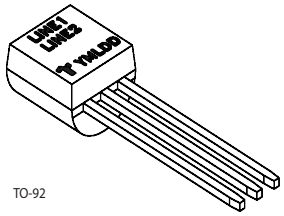
Part Number	Marking	Weight	Packing Mode	Base Quantity
S6002ES	S6002ES	0.217g	Bulk	2500
SS6002ESAP	S6002ES	0.217g	Ammo Pack	2000
S6002ESRP	S6002ES	0.217g	Tape & Reel	2000
S6002TSRP	S6002TS	0.120g	Tape & Reel	1000

Part Numbering System

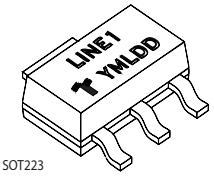
S 60 02 x xx xx

- **SCR SERIES**
- **VOLTAGE**
  60: 600V
- **CURRENT**
  02: 2A
- **SENSITIVITY**
  S: 200µA Sensitive SCR
- **PACKAGE TYPE**
  E: TO-92
  T: SOT-223
- **PACKING TYPE**
  Blank: Bulk Pack
  RP: Reel Pack (TO-92)
  : Embossed Carrier Pack (SOT-223)
  AP: Ammo Pack (TO-92)

Part Marking System



TO-92

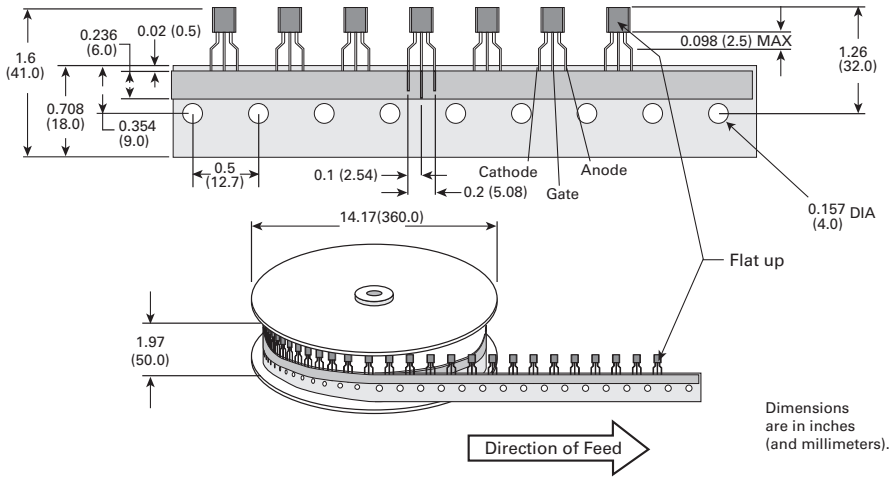


SOT223

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

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

Meets all EIA-468-C Standards

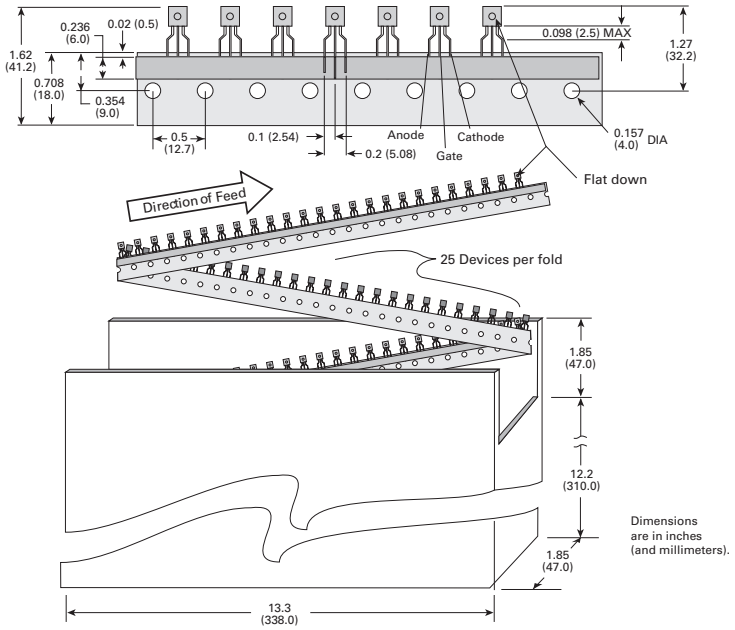


Dimensions are in inches (and millimeters).

Revised: 02/15/19

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

Meets all EIA-468-C Standards



SOT-223 Reel Pack (RP) Specifications