



**THE DATASHEET OF  
L0109NTRP4**



**RoHS** **L01 Series**



**Main Features**

Symbol	Value	Unit
$I_{T(RMS)}$	1	A
$V_{DRM}/V_{RRM}$	400 to 800	V
$I_{GT}$	3 to 10	mA

**Description**

New 1 Amp bi-directional solid state switch series offering direct interface to microprocessor drivers in economical TO-92 and surface mount packages. The die voltage blocking junctions are glass-passivated to ensure long term reliability and parametric stability.

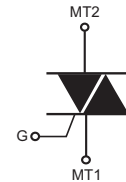
**Features**

- RoHS compliant
- Blocking voltage ( $V_{DRM}$ ) capability — up to 800V
- Surge capability > 10Amps
- Static dv/dt > 20 Volts/ $\mu$ sec
- Thru hole and surface mount packages

**Applications**

The L01 EV Series is especially designed for white goods applications such as valve controls in washing machines as well as replacement of mechanical and hybrid relays where long life is required.

**Schematic Symbol**



**Absolute Maximum Ratings**

Symbol	Parameter	Value	Unit	
$I_{T(RMS)}$	RMS on-state current (full sine wave)	TO-92 $T_c = 50^\circ\text{C}$	1.0A	A
		SOT-223 $T_L = 90^\circ\text{C}$		
$I_{TSM}$	Non repetitive surge peak on-state current (Single cycle, $T_j$ initial = $25^\circ\text{C}$ )	TO-92 SOT-223 F = 50 Hz	10	A
		F = 60 Hz	12	
$I^2t$	$I^2t$ Value for fusing	$t_p = 10$ ms F = 50 Hz	0.50	$\text{A}^2\text{s}$
		$t_p = 8.3$ ms F = 60 Hz	0.59	
di/dt	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$	TO-92 SOT-223 $T_j = 125^\circ\text{C}$	20	A/ $\mu$ s
$I_{GTM}$	Peak gate current	$t_p = 10$ $\mu$ s $T_j = 125^\circ\text{C}$	1	A
$P_{G(AV)}$	Average gate power dissipation	$T_j = 125^\circ\text{C}$	0.1	W
$T_{stg}$	Storage junction temperature range		-40 to 150	$^\circ\text{C}$
$T_j$	Operating junction temperature range		-40 to 125	$^\circ\text{C}$

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

Symbol	Description	Test Conditions	Quadrant	Limit	Value			Unit
					L0103xy	L0107xy	L0109xy	
$I_{GT}$	DC Gate Trigger Current	$V_D = 12\text{V}$ $R_L = 60\ \Omega$	I – II – III IV	MAX.	3 5	5 7	10 10	mA
$V_{GT}$	DC Gate Trigger Voltage		ALL	MAX.	—	1.3	—	V
$I_H$	Holding Current	Gate Open		MAX.	7	10	10	mA
dv/dt	Critical Rate-of-Rise of Off-State Voltage	$T_J = 110^\circ\text{C}$ $V_D = V_{DRM}$ Exponential Waveform Gate Open		MIN.	10	20	50	V/ $\mu\text{s}$
(dv/dt)c	Critical Rate-of-Rise of Commutating Voltage	(di/dt)c = 0.54A/ms $T_J = 110^\circ\text{C}$		MIN.	0.5	1.0	2.0	V/ $\mu\text{s}$
$T_{gt}$	Turn-On Time	$I_G = 25\text{mA}$ $PW = 15\mu\text{s}$ $I_T = 1.2\text{A (pk)}$		MAX.	2.0	2.0	2.0	$\mu\text{s}$

Note: x = voltage, y = package

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

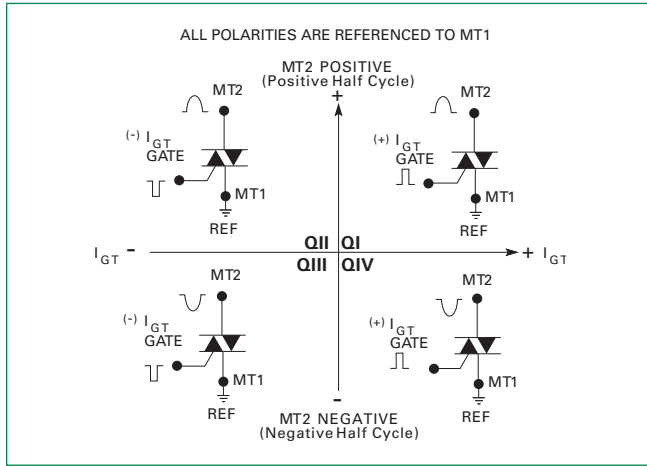
Symbol	Description	Test Conditions	Limit	Value	Unit
$V_{TM}$	Peak On-State Voltage	$I_{TM} = 1.4\text{A (pk)}$	MAX	1.60	V
$I_{DRM}$	Off-State Current, Peak Repetitive	$V_D = V_{DRM}$ $T_J = 25^\circ\text{C}$	MAX	5	$\mu\text{A}$
		$V_D = V_{DRM}$ $T_J = 125^\circ\text{C}$		500	$\mu\text{A}$

**Thermal Resistances**

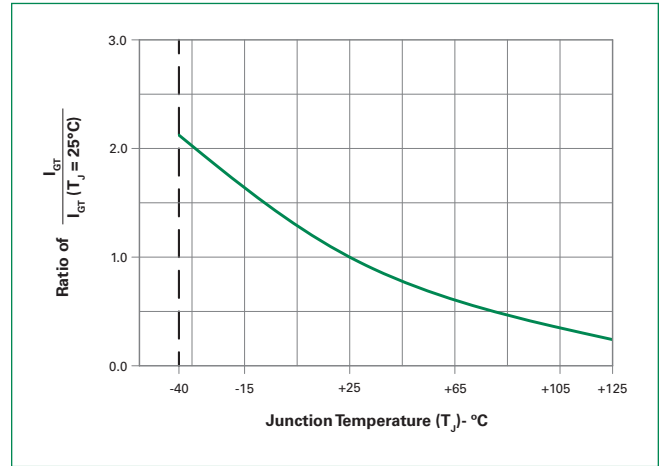
Symbol	Description	Test Conditions	Value	Unit	
$R_{th(j-c)}$	Junction to case (AC)	$I_T = 1.0\text{A}_{(RMS)}$ <sup>1</sup>	TO-92	50	$^\circ\text{C/W}$
			SOT-223	23	
$R_{th(j-a)}$	Junction to ambient	$I_T = 1.0\text{A}_{(RMS)}$ <sup>1</sup>	TO-92	100	$^\circ\text{C/W}$
			SOT-223	55	

<sup>1</sup> 60Hz AC resistive load condition, 100% conduction.

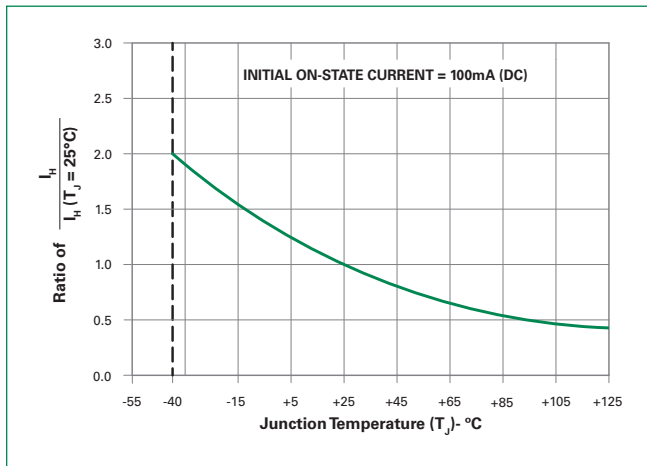
**Figure 1: Definition of Quadrants**



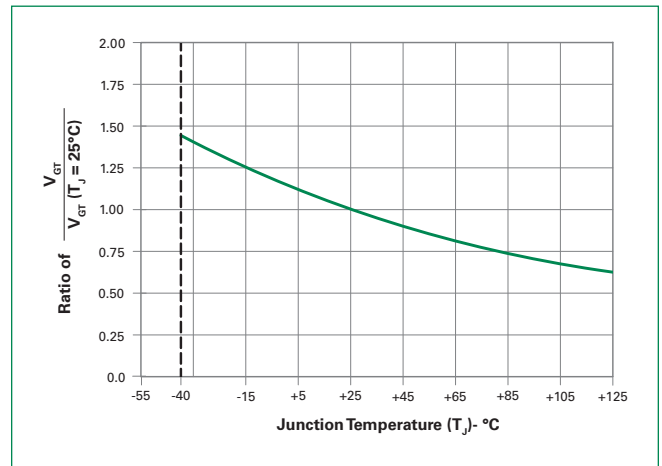
**Figure 2: Normalized DC Gate Trigger Current for All Quadrants vs. Junction Temperature**



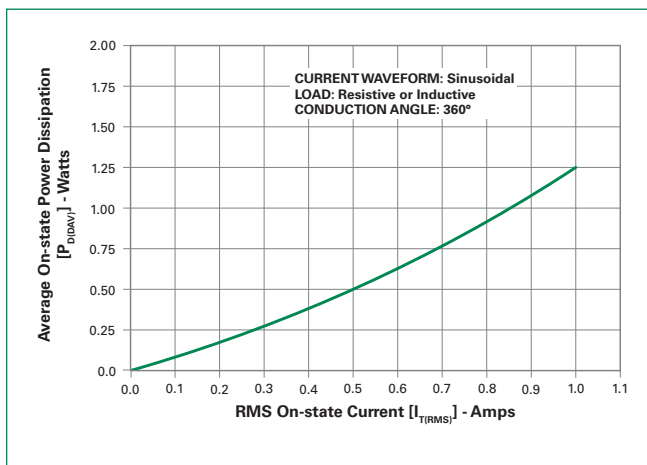
**Figure 3: Normalized DC Holding Current vs. Junction Temperature**



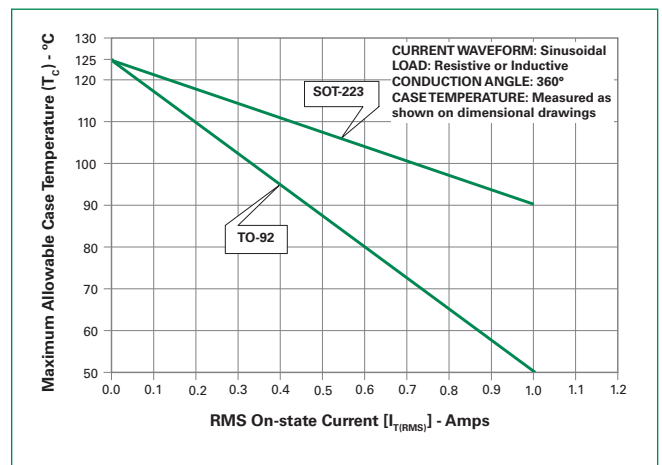
**Figure 4: Normalized DC Gate Trigger Voltage for All Quadrants vs. Junction Temperature**



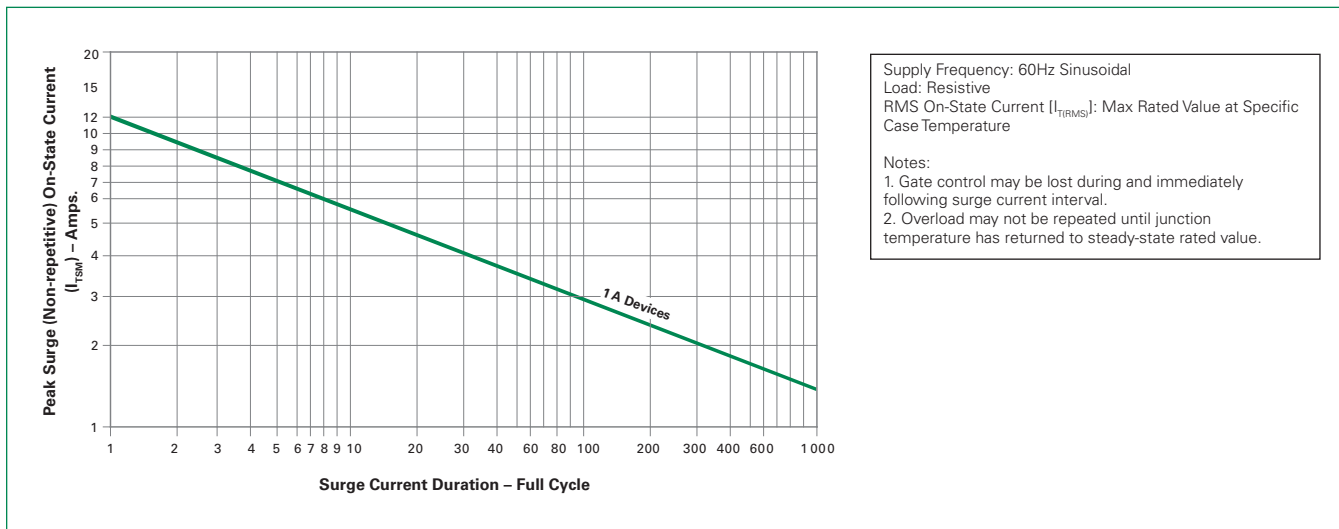
**Figure 5: Power Dissipation (Typical) vs. RMS On-State Current**



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

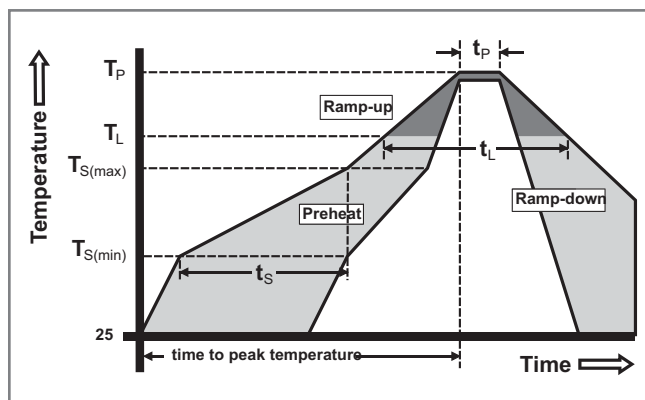


**Figure 7: Surge Peak On-State Current vs. Number of Cycles**



**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 <sup>+0/-5</sup> °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**

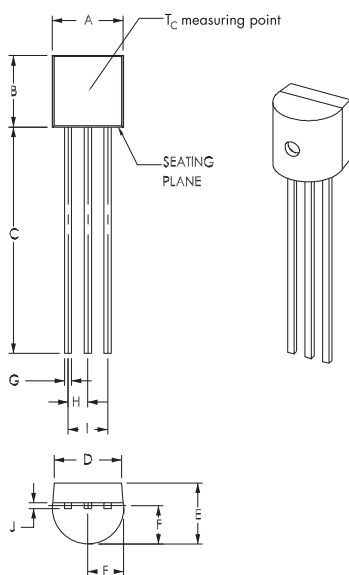
<b>Terminal Finish</b>	100% Matte Tin-plated.
<b>Body Material</b>	UL recognized epoxy meeting flammability classification 94V-0.
<b>Lead Material</b>	Copper Alloy

**Design Considerations**

Careful selection of the correct device 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 device 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.

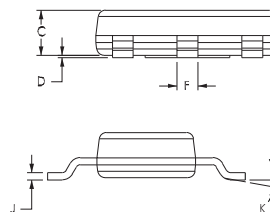
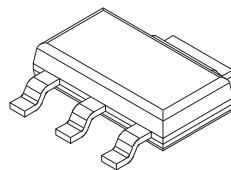
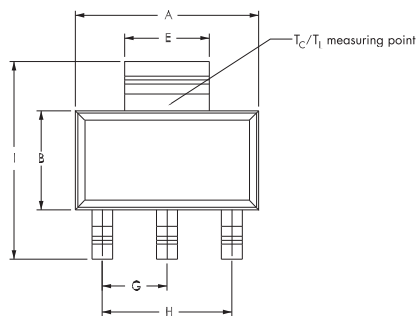
**Environmental Specifications**

Test	Specifications and Conditions
<b>AC Blocking</b>	MIL-STD-750, M-1040, Cond A Applied Peak AC voltage @ 125°C for 1008 hours
<b>Temperature Cycling</b>	MIL-STD-750, M-1051, 100 cycles; -40°C to +150°C; 15-min dwell-time
<b>Temperature/Humidity</b>	EIA / JEDEC, JESD22-A101 1008 hours; 320V - DC: 85°C; 85% rel humidity
<b>High Temp Storage</b>	MIL-STD-750, M-1031, 1008 hours; 150°C
<b>Low-Temp Storage</b>	1008 hours; -40°C
<b>Thermal Shock</b>	MIL-STD-750, M-1056 10 cycles; 0°C to 100°C; 5-min dwell-time at each temperature; 10 sec (max) transfer time between temperature
<b>Autoclave</b>	EIA / JEDEC, JESD22-A102 168 hours (121°C at 2 ATMs) and 100% R/H
<b>Resistance to Solder Heat</b>	MIL-STD-750 Method 2031
<b>Solderability</b>	ANSI/J-STD-002, category 3, Test A
<b>Lead Bend</b>	MIL-STD-750, M-2036 Cond E

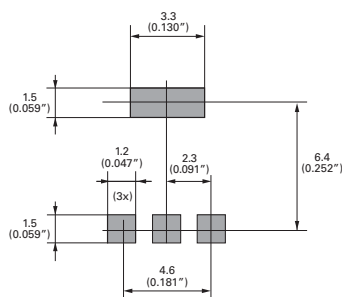
**Dimensions — TO-92 (E Package)**


Dimensions	Inches			Millimeters		
	Min	Typ	Max	Min	Typ	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	0.165	—	3.430	4.190	—
E	0.125	—	0.165	3.180	—	4.190
F	0.080	0.095	0.105	2.040	2.400	2.660
G	0.016	—	0.021	0.407	—	0.533
H	0.045	0.050	0.055	1.150	1.270	1.390
I	0.095	0.100	0.105	2.420	2.540	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					

**Product Selector**

Part Number	Voltage	Gate Sensitivity Quadrants		Package
		I II III	IV	
L0103DE	400 V	3 mA	5 mA	TO-92
L0103ME	600 V	3 mA	5 mA	TO-92
L0103NE	800 V	3 mA	5 mA	TO-92
L0103DT	400 V	3 mA	5 mA	SOT-223
L0103MT	600 V	3 mA	5 mA	SOT-223
L0103NT	800 V	3 mA	5 mA	SOT-223
L0107DE	400 V	5 mA	7 mA	TO-92
L0107ME	600 V	5 mA	7 mA	TO-92
L0107NE	800 V	5 mA	7 mA	TO-92
L0107DT	400 V	5 mA	7 mA	SOT-223
L0107MT	600 V	5 mA	7 mA	SOT-223
L0107NT	800 V	5 mA	7 mA	SOT-223
L0109DE	400 V	10 mA	10 mA	TO-92
L0109ME	600 V	10 mA	10 mA	TO-92
L0109NE	800 V	10 mA	10 mA	TO-92
L0109DT	400 V	10 mA	10 mA	SOT-223
L0109MT	600 V	10 mA	10 mA	SOT-223
L0109NT	800 V	10 mA	10 mA	SOT-223

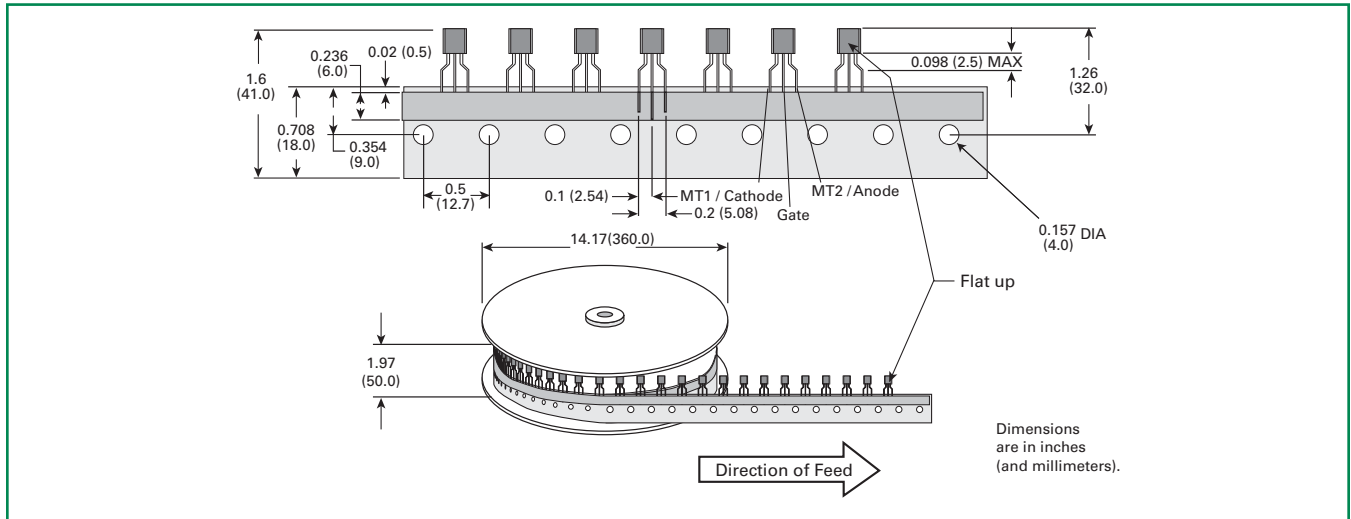
**Packing Options**

Part Number	Marking	Weight	Packing Mode	Base Quantity
L01xxyE	L01xxyE	0.170 g	Bulk	2500
L01xxyEAP	L01xxyE	0.170 g	Ammo Pack	2000
L01xxyERP	L01xxyE	0.170 g	Tape & Reel	2000
L01xxyTRP	L01xxyT	0.120 g	Tape & Reel	1000

Note: xx = gate sensitivity, y = voltage

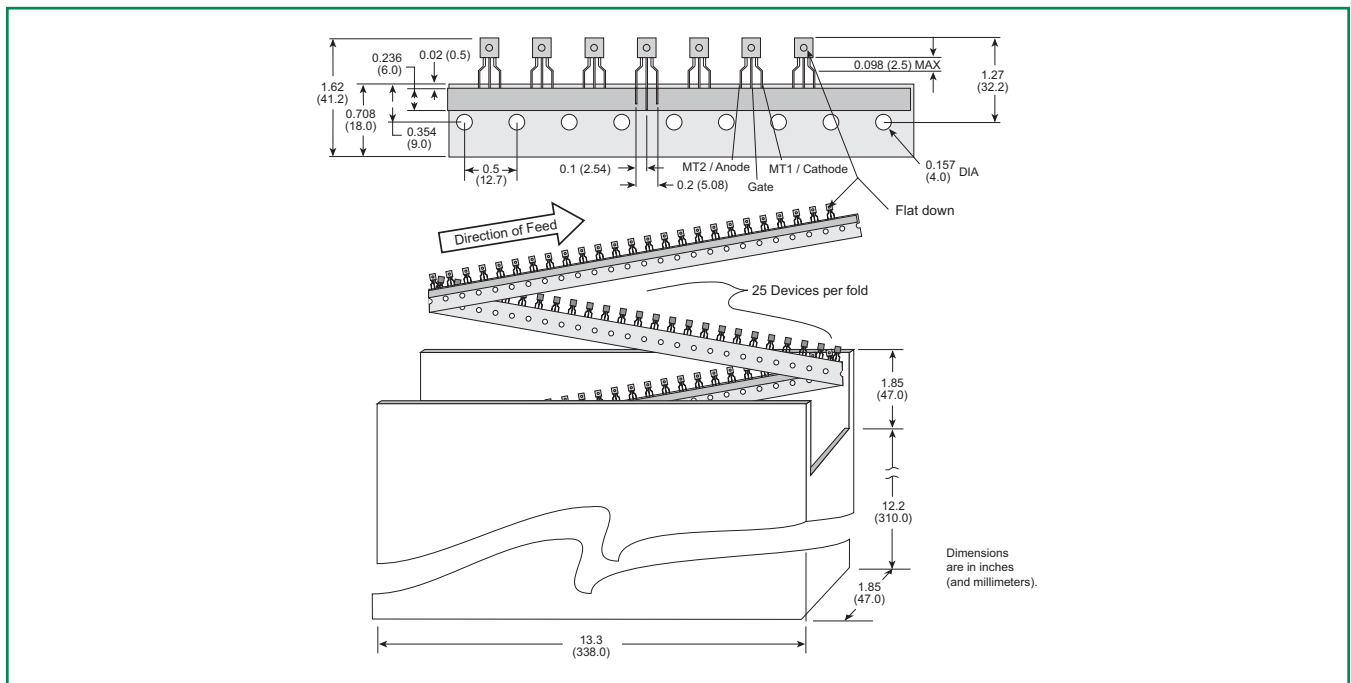
**TO-92 (3-lead) Reel Pack (RP) Radial Leaded Specifications**

Meets all EIA-468-B 1994 Standards



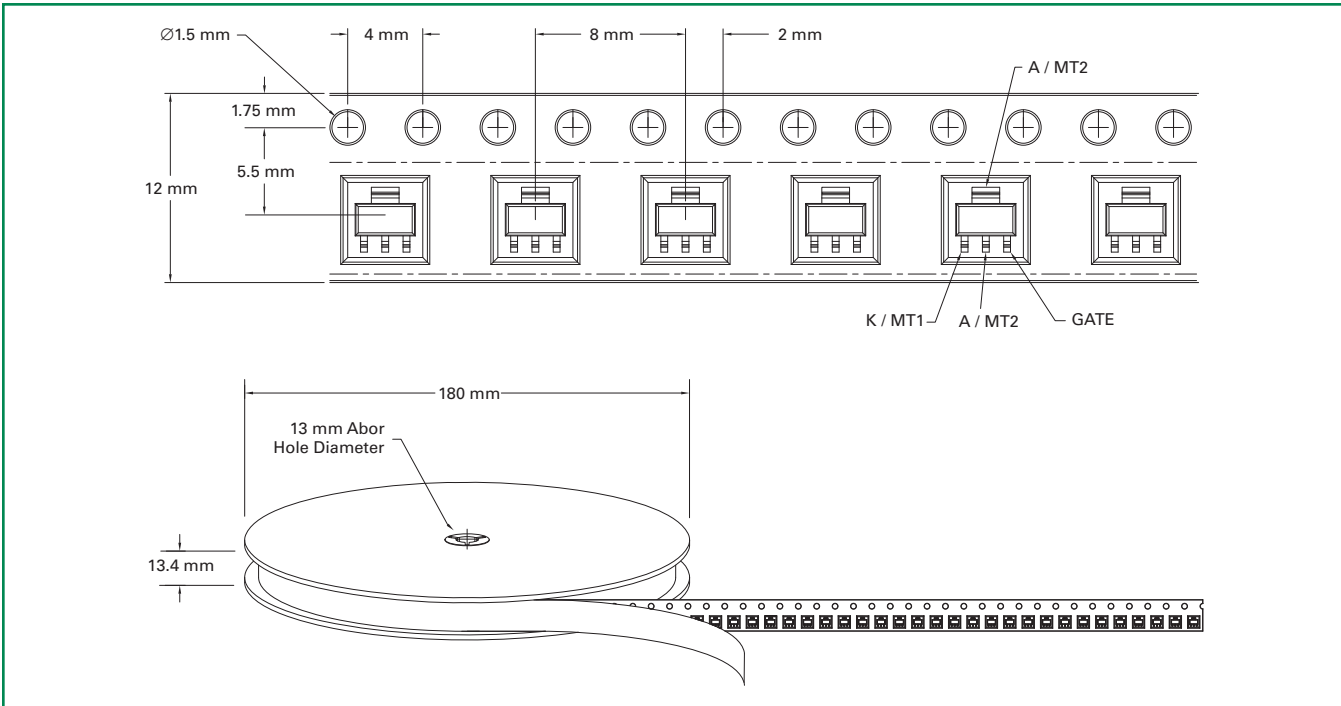
**TO-92 (3-lead) Ammo Pack (AP) Radial Leaded Specifications**

Meets all EIA-468-B 1994 Standards

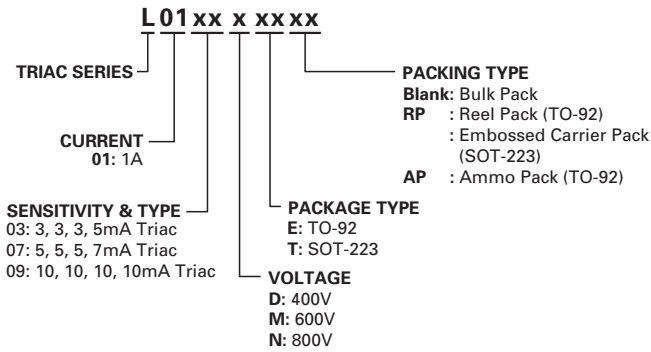


EV 1.0 A TRIACS

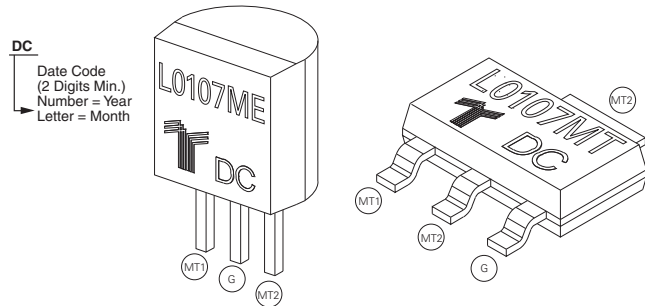
**SOT-223 Reel Pack (RP) Specifications**



**Part Numbering System**



**Part Marking System**



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