# L01 Series

Description

This new 1A bi-directional solid state switch series offers direct interlace to microprocessor drivers in a 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 and Halogen-Free
- Blocking voltage (V_{DRM}) capability — up to 800V
- Surge capability > 10Amps
- Static dv/dt > 20 Volts/µsec
- Thru hole and surface mount packages

Main Features

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

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

MT2

G

MT1
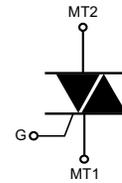
Absolute Maximum Ratings

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

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

Symbol	Description	Test Conditions	Quadrant	Limit	Value L0103Ny	Value L0107xy	Value L0109xy	Unit
I_{GT}	DC Gate Trigger Current	V_D = 12V R_L = 60 Ω	I – II – III	MIN.	-	-	-	mA
			IV	MIN.	-	-	5.7	
			I – II – III	MAX.	3	5	10	mA
			IV	MAX.	5	7	10	
V_{GT}	DC Gate Trigger Voltage		ALL	MAX.	1.3	1.3	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°C V_D = V_{DRM} Exponential Waveform Gate Open		MIN.	10	20	50	V/µs
(dv/dt)c	Critical Rate-of-Rise of Commutating Voltage	(di/dt)c = 0.54A/ms T_J = 110°C		MIN.	0.5	1.0	2.0	V/µs
T_{gt}	Turn-On Time	I_G = 25mA PW = 15µs I_T = 1.2A (pk)		MAX.	2.0	2.0	2.0	µs

Note: x = voltage, y = package

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

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

Thermal Resistances

Symbol	Description	Test Conditions		Value	Unit
$R_{th(JC)}$	Junction to case (AC)	I_T = 1.0A $_{(RMS)}$[1]	TO-92	50	°C/W
			SOT-223	23	
$R_{th(j-a)}$	Junction to ambient	I_T = 1.0A $_{(RMS)}$[1]	TO-92	100	°C/W
			SOT-223	55	

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

Figure 1: Definition of Quadrants

ALL POLARITIES ARE REFERENCED TO MT1
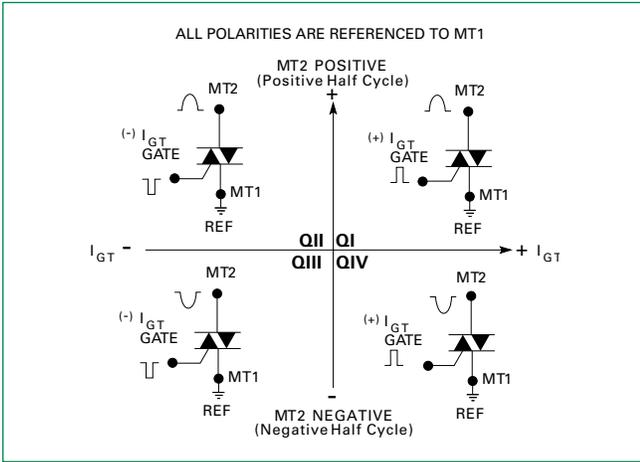
Figure 2: Normalized DC Gate Trigger Current for All Quadrants vs. Junction Temperature
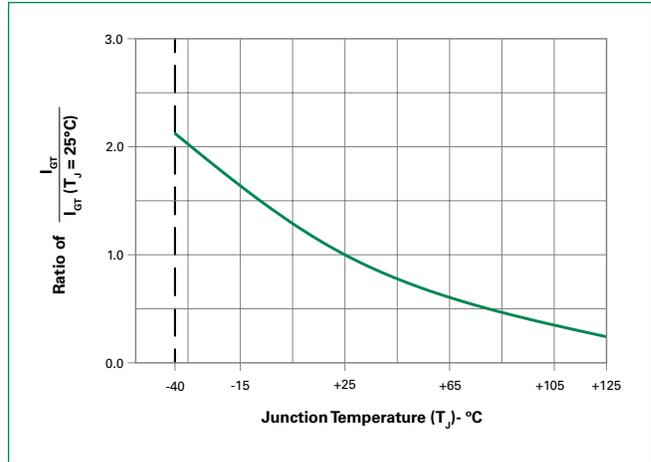
Figure 3: Normalized DC Holding Current vs. Junction Temperature


INITIAL ON-STATE CURRENT = 100mA (DC)
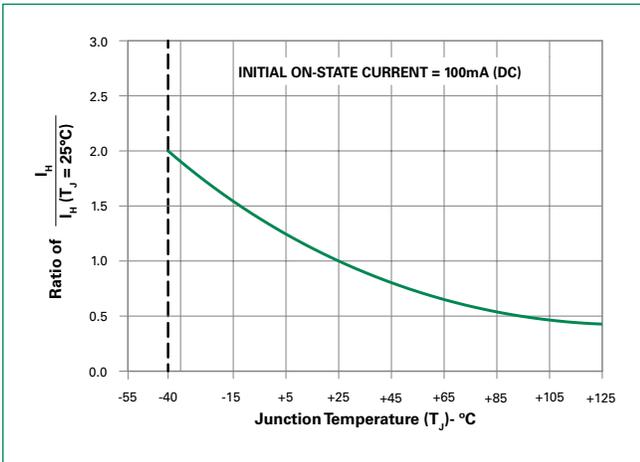
Figure 4: Normalized DC Gate Trigger Voltage for All Quadrants vs. Junction Temperature
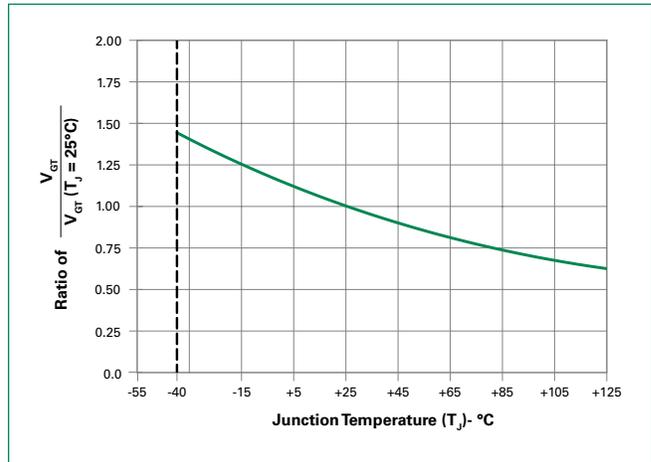
Figure 5: Power Dissipation (Typical) vs. RMS On-State Current

CURRENT WAVEFORM: Sinusoidal
LOAD: Resistive or Inductive
CONDUCTION ANGLE: 360°
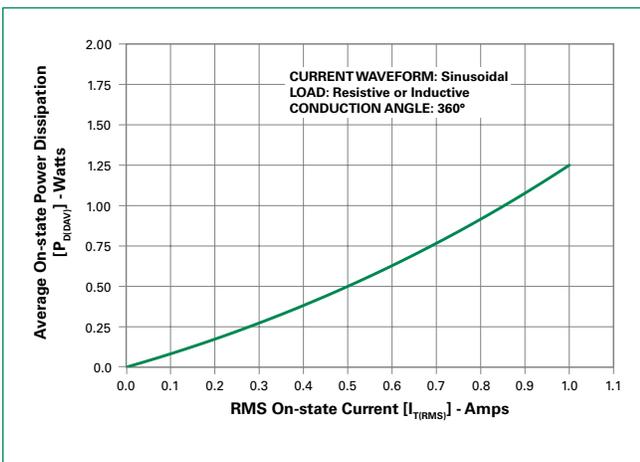
Figure 6: Maximum Allowable Case Temperature vs. On-State Current

CURRENT WAVEFORM: Sinusoidal
LOAD: Resistive or Inductive
CONDUCTION ANGLE: 360°
CASE TEMPERATURE: Measured as shown on dimensional drawings

SOT-223

TO-92
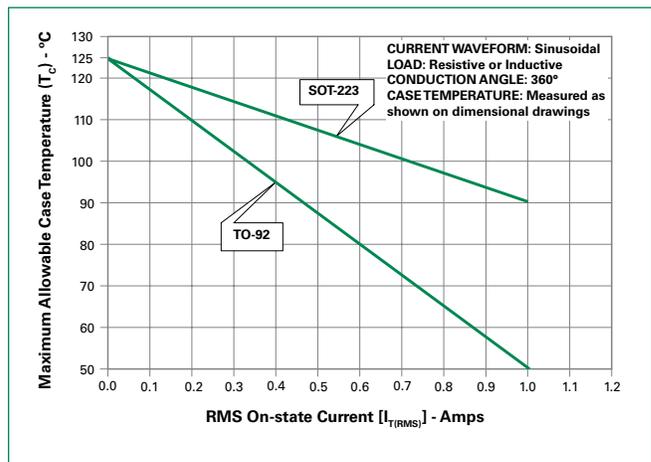
Figure 7: Surge Peak On-State Current vs. Number of Cycles

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.
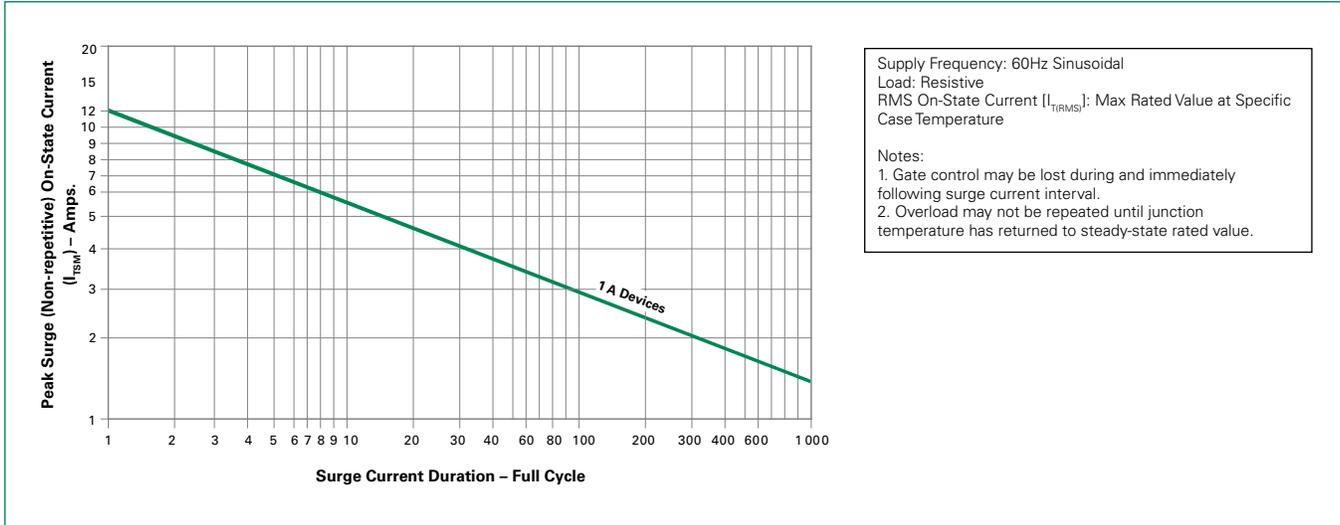
Soldering Parameters

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
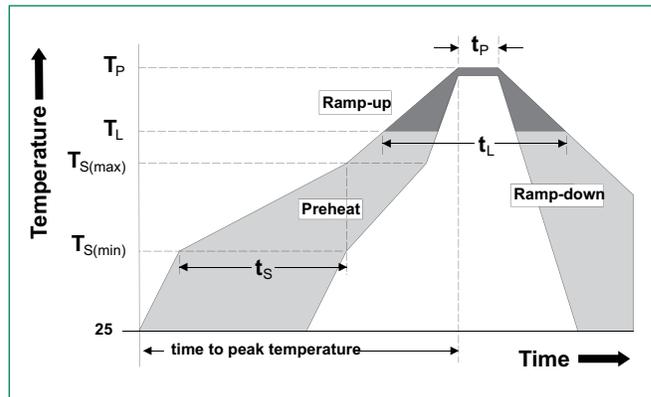
Physical Specifications

| 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, 100 cycles; -40°C to +150°C; 15-min dwell-time
Temperature/Humidity	EIA / JEDEC, JESD22-A101 1008 hours; 320V - 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

Dimensions — TO-92 (E Package)
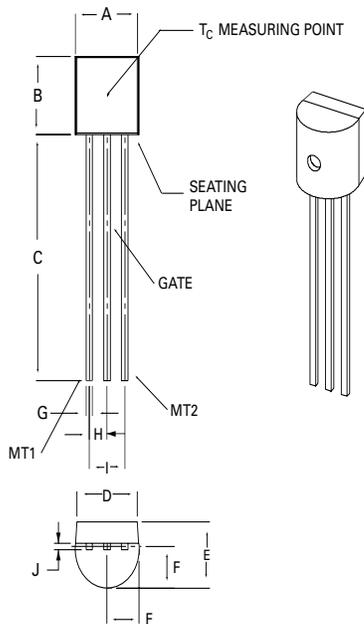
Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.175	0.205	4.450	5.200
B	0.170	0.210	4.320	5.330
C	0.500		12.70	
D	0.135		3.430	
E	0.125	0.165	3.180	4.190
F	0.080	0.105	2.040	2.660
G	0.016	0.021	0.407	0.533
H	0.045	0.055	1.150	1.390
I	0.095	0.105	2.420	2.660
J	0.015	0.020	0.380	0.500

Dimensions – SOT-223
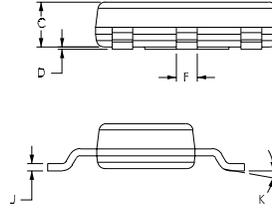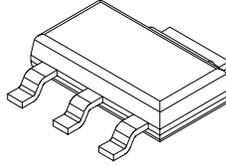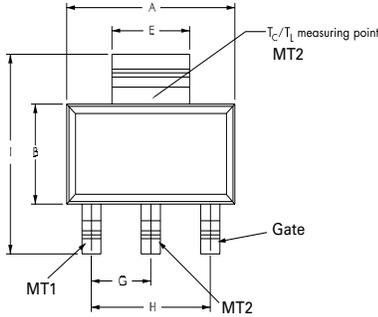
Pad Layout for SOT-223
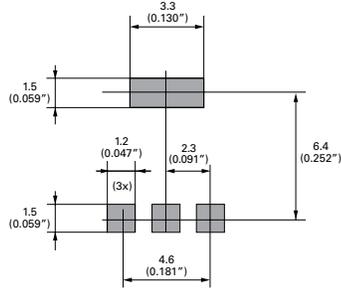
Dimensions in Millimeters (Inches)

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	7 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	7 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-233
L0107NT	800 V	5 mA	7 mA	SOT-233
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	0.217 g	Bulk	2500
L01xxyEAP	L01xxyE	0.217 g	Ammo Pack	2000
L01xxyERP	L01xxyE	0.217 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-C Standards

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

Meets all EIA-468-C Standards

SOT-223 Reel Pack (RP) Specifications

Part Numbering System

L 01 xx x xx xx

TRIAC SERIES

CURRENT
01: 1A

SENSITIVITY & TYPE
03: 3, 3, 3, 5 or 7mA Triac
07: 5, 5, 5, 7mA Triac
09: 10, 10, 10, 10mA Triac

VOLTAGE
D: 400V
M: 600V
N: 800V

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

TO92

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

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