BT131-600E

4Q Triac

Rev.03 - 19 October 2021 Product data sheet

1. General description

Planar passivated sensitive gate four quadrant triac in a TO92 plastic package.This sensitive gate "series E" triac is intended for interfacing with low power drivers including microcontrollers.

2. Features and benefits

- Direct interfacing to logic level ICs
- Direct interfacing with low power gate drivers and microcontrollers
- High blocking voltage capability
- Planar passivated for voltage ruggedness and reliability
- Sensitive gate in four quadrants
- Triggering in all four quadrants

3. Applications

- Air conditioner indoor fan control
- General purpose low power motor control
- General purpose switching and phase control

4. Quick reference data

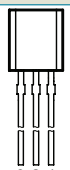
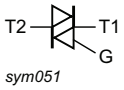
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Absolute maximum rating							
V_{DRM}	repetitive peak off-state voltage			-	-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{lead} \leq 51.2$ °C; Fig. 1; Fig. 2; Fig. 3		-	-	1	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25$ °C; $t_p = 20$ ms; Fig. 4; Fig. 5		-	-	12.5	A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms		-	-	13.7	A
T_j	junction temperature			-	-	125	°C
Static characteristics							
I_{GT}	gate trigger current	$V_D = 12$ V; $I_T = 0.1$ A; T2+ G+; $T_j = 25$ °C; Fig. 7		-	-	10	mA
		$V_D = 12$ V; $I_T = 0.1$ A; T2+ G-; $T_j = 25$ °C; Fig. 7		-	-	10	mA
		$V_D = 12$ V; $I_T = 0.1$ A; T2- G-; $T_j = 25$ °C; Fig. 7		-	-	10	mA
		$V_D = 12$ V; $I_T = 0.1$ A; T2- G+; $T_j = 25$ °C; Fig. 7		-	-	10	mA

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	1.3	10	mA
V_T	on-state voltage	I_T = 1.4 A; T_j = 25 °C; Fig. 10		-	1.2	1.5	V
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 402 V; T_j = 125 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; $R_{GT1(ext)}$ = 1 kΩ		50	-	-	V/µs
dV_{com}/dt	rate of change of commutating voltage	V_D = 400 V; T_j = 125 °C; dI_{com}/dt = 0.5 A/ms; I_T = 1 A; gate open circuit		5	-	-	V/µs

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T2	main terminal 2	 3 2 1 TO-92 (SOT54)	 sym051
2	G	gate		
3	T1	main terminal 1		

6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
BT131-600E	TO92	BT131-600E,412	Bulk	1000	SOT54	14-Nov-2013
BT131-600E	TO92	BT131-600EQP	Reel	2000	SOT54	14-Nov-2013

7. Marking

Table 4. Marking codes

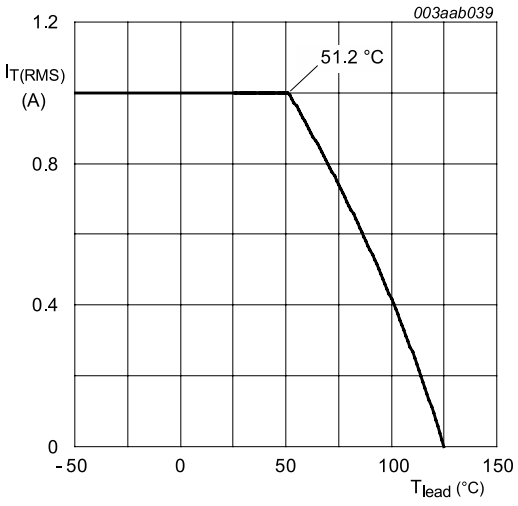
Type number	Marking codes
BT131-600E	131-6E

8. Limiting values

Table 5. Limiting values

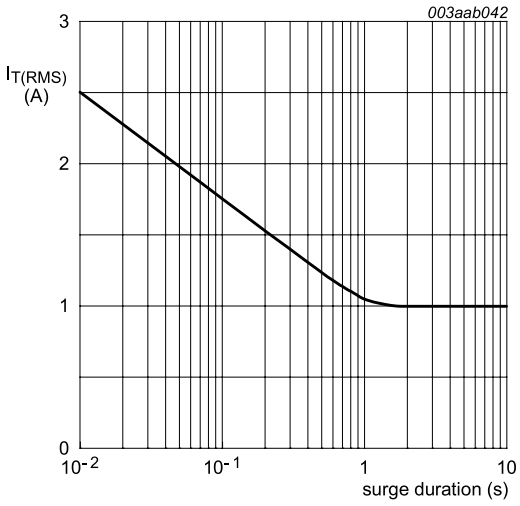
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{DRM}	repetitive peak off-state voltage			-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{lead} \leq 51.2$ °C; Fig 1; Fig 2; Fig 3		-	1	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25$ °C; $t_p = 20$ ms; Fig 4; Fig 5		-	12.5	A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms		-	13.7	A
I^2t	I^2t for fusing	$t_P = 10$ ms; SIN		-	0.78	A^2s
dI_T/dt	rate of rise of on-state current	$I_G = 20$ mA		-	50	A/µs
				-	50	A/µs
				-	10	A/µs
				-	50	A/µs
I_{GM}	peak gate current			-	2	A
P_{GM}	peak gate power			-	5	W
$P_{G(AV)}$	average gate power	over any 20 ms period		-	0.1	W
T_{stg}	storage temperature			-40	150	°C
T_j	junction temperature			-	125	°C



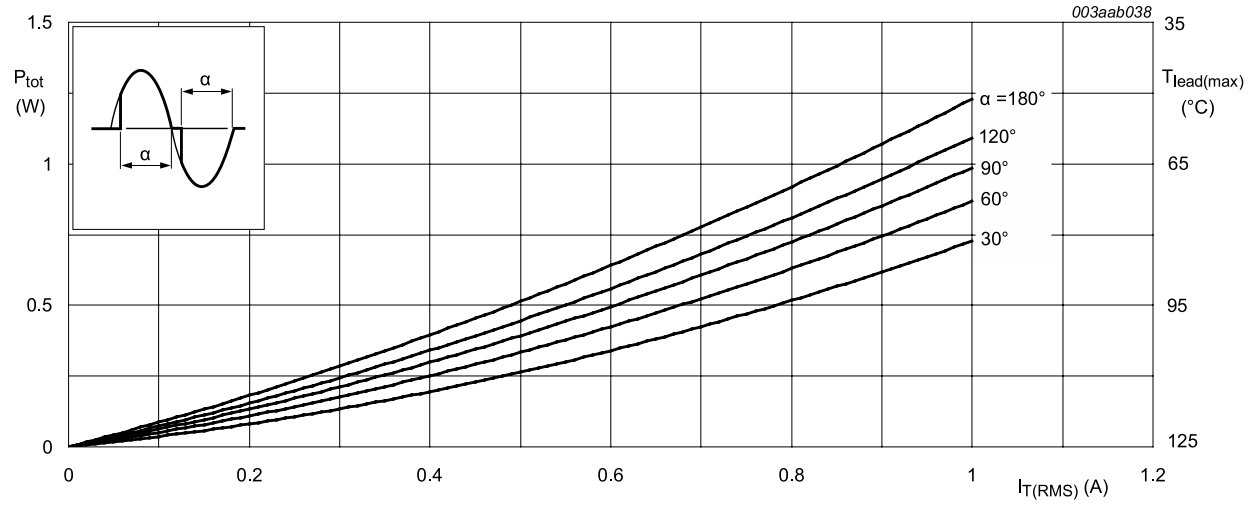
$T_{lead} = 51.2$ °C

Fig. 1. RMS on-state current as a function of lead temperature; maximum values



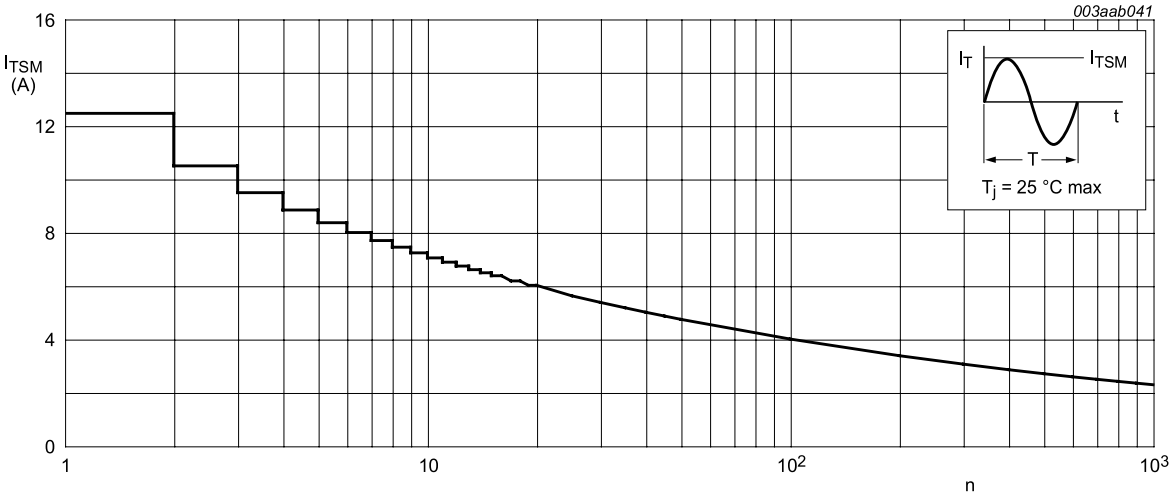
$f = 50$ Hz; $T_{lead} = 51.2$ °C

Fig. 2. RMS on-state current as a function of surge duration; maximum values



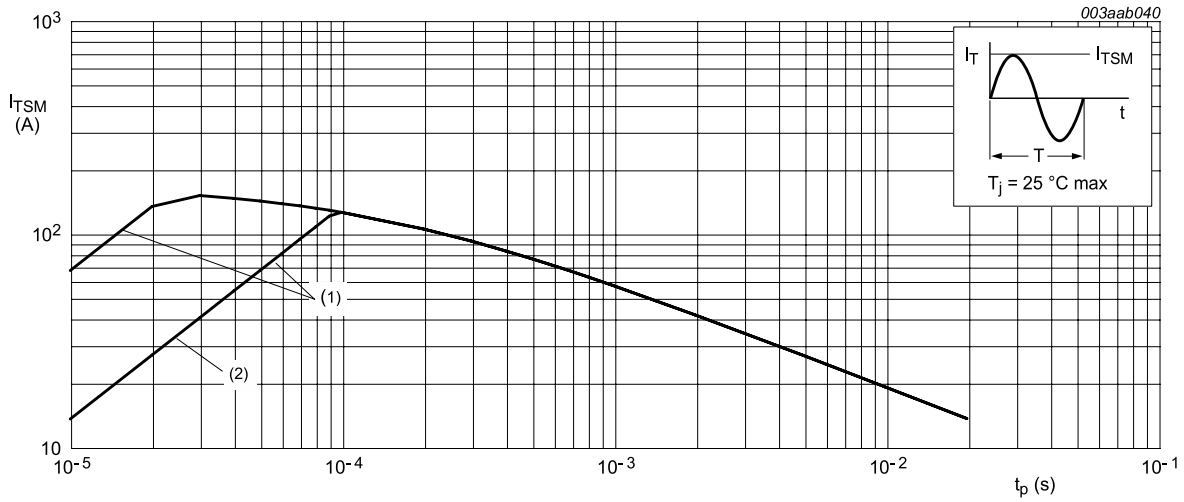
α = conduction angle

Fig. 3. Total power dissipation as a function of RMS on-state current; maximum value



f = 50 Hz

Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



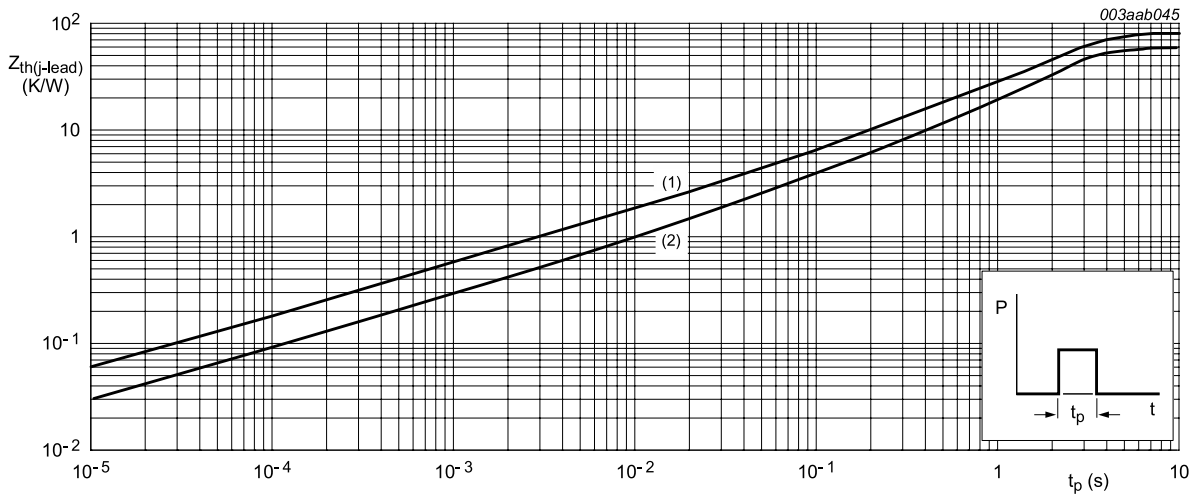
$t_p \leq 20$ ms
(1) dI_T/dt limit
(2) T2- G+ quadrant

Fig. 5. Non-repetitive peak on-state current as a function of pulse width for sinusoidal currents; maximum values

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j\text{-}lead)}$	thermal resistance from junction to lead	full cycle; Fig 6		-	-	60	K/W
		half cycle; Fig 6		-	-	80	K/W
$R_{th(j\text{-}a)}$	thermal resistance from junction to ambient free air	printed circuit board mounted: lead length = 4 mm		-	150	-	K/W



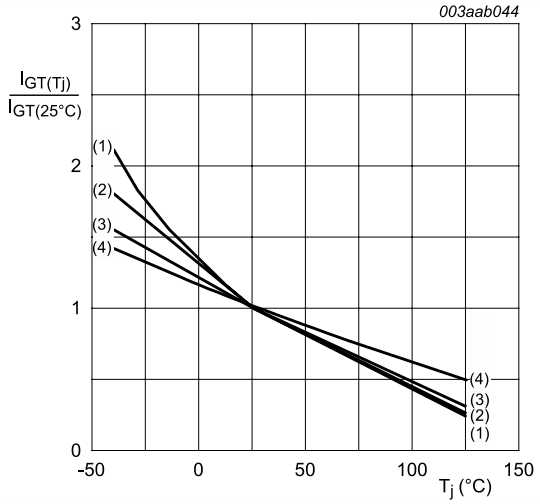
(1) Unidirectional (half cycle)
(2) Bidirectional (full cycle)

Fig. 6. Transient thermal impedance from junction to lead as a function of pulse width

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; T2+ G+; T_j = 25 °C; Fig. 7		-	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 7		-	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; Fig. 7		-	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2- G+; T_j = 25 °C; Fig. 7		-	-	10	mA
I_L	latching current	V_D = 12 V; I_G = 0.1 A; T2+ G+; T_j = 25 °C; Fig. 8		-	-	15	mA
		V_D = 12 V; I_G = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 8		-	-	25	mA
		V_D = 12 V; I_G = 0.1 A; T2- G-; T_j = 25 °C; Fig. 8		-	-	15	mA
		V_D = 12 V; I_G = 0.1 A; T2- G+; T_j = 25 °C; Fig. 8		-	-	15	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	1.3	10	mA
V_T	on-state voltage	I_T = 1.4 A; T_j = 25 °C; Fig. 10		-	1.2	1.5	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C; Fig. 11		-	0.7	1	V
		V_D = 400 V; I_T = 0.1 A; T_j = 125 °C		0.2	0.3	-	V
I_D	off-state current	V_D = 600 V; T_j = 125 °C		-	0.1	0.5	mA
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 402 V; T_j = 125 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; $R_{GT1(ext)}$ = 1 kΩ		50	-	-	V/µs
dV_{com}/dt	rate of change of commutating voltage	V_D = 400 V; T_j = 125 °C; dI_{com}/dt = 0.5 A/ms; I_T = 1 A; gate open circuit		5	-	-	V/µs
t_{gt}	gate-controlled turn-on time	I_{TM} = 1.5 A; V_D = 600 V; I_G = 0.1 A; dI_G/dt = 5 A/µs		-	2	-	µs



(1) T2- G+
(2) T2- G-
(3) T2+ G-
(4) T2+ G+

Fig. 7. Normalized gate trigger current as a function of junction temperature

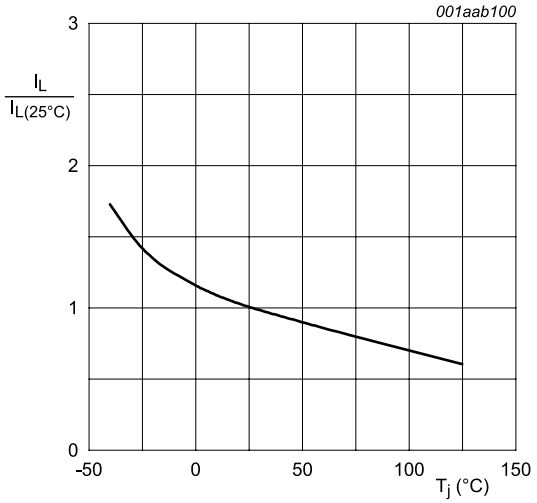


Fig. 8. Normalized latching current as a function of junction temperature

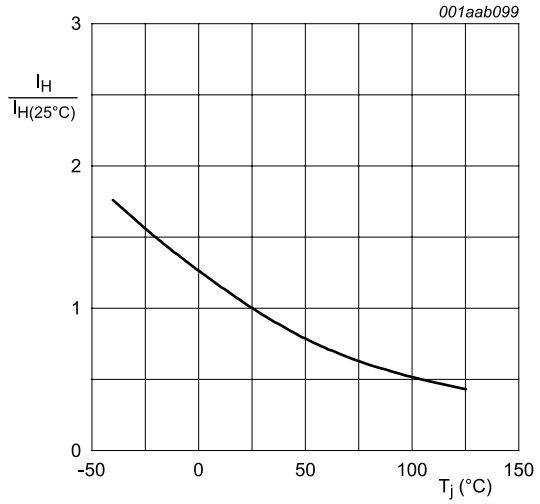
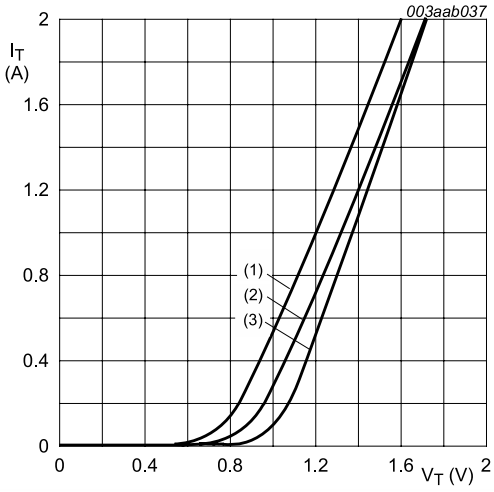


Fig. 9. Normalized holding current as a function of junction temperature



V_o = 0.92 V; R_s = 0.4 Ω
(1) T_j = 125 °C; typical values
(2) T_j = 125 °C; maximum values
(3) T_j = 25 °C; maximum values

Fig. 10. On-state current as a function of on-state voltage

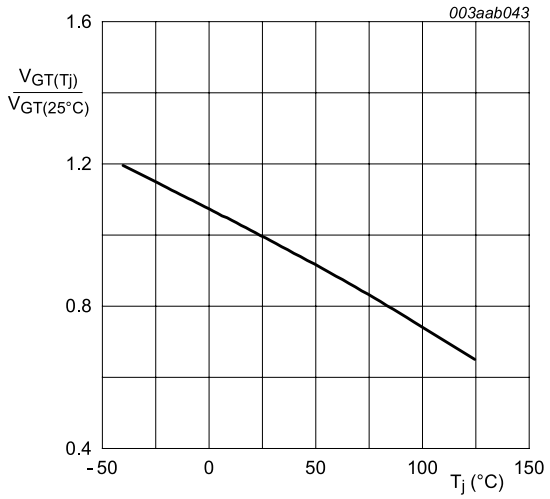
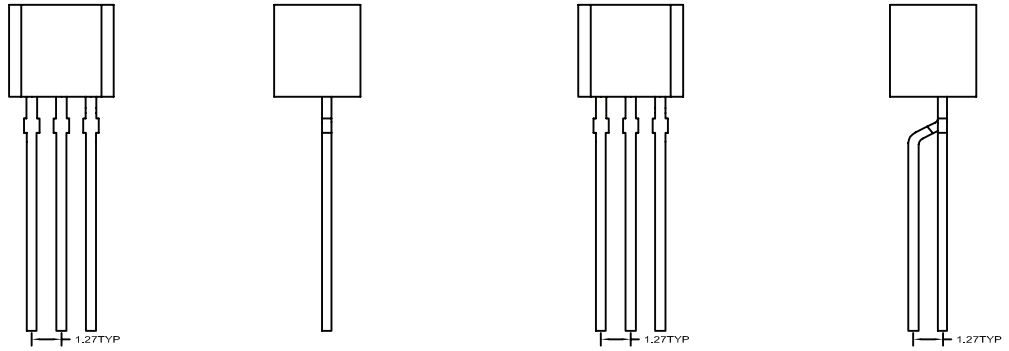


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

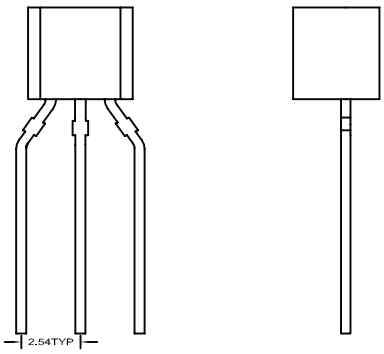
11. Package outline

SOT54 PACKAGE OUTLINE

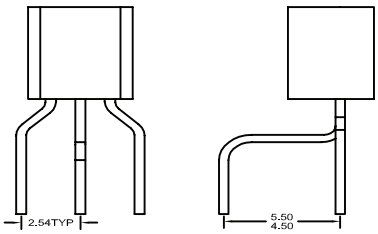


SOT54
Bulk Pack - 412

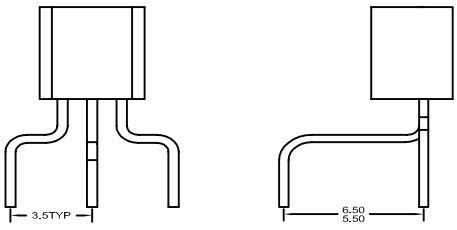
SOT54 LEADS ON CIRCLE
Bulk Pack - 112



SOT54 WIDE PITCH
Tape/ Reel Pack - 116
Ammo Pack - 126



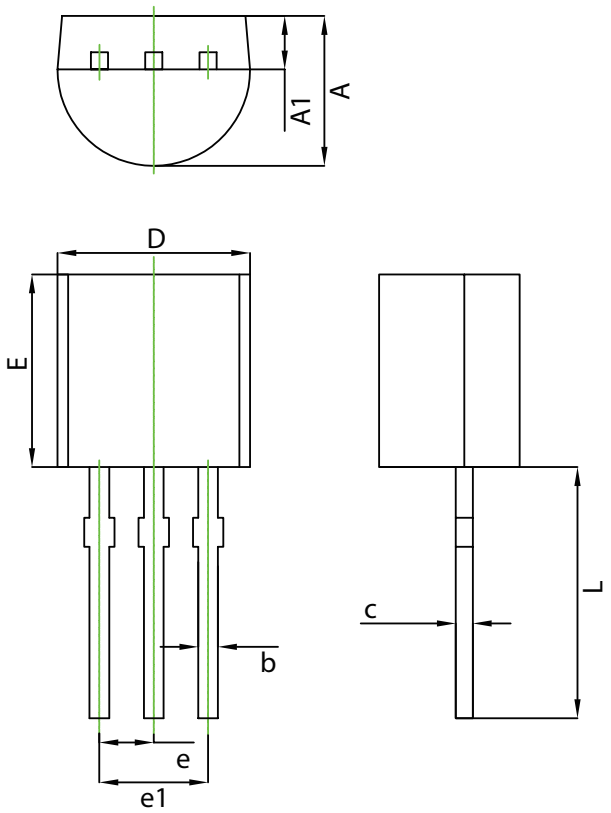
SOT54 LEAD BEND L01
Bulk Pack - 412



SOT54 LEAD BEND L02
Bulk Pack - 412

Remark: Detailed dimensions refer to POD drawing.

Plastic single-ended leaded(through hole) package; 3 leads TO92



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.300	3.700	0.130	0.146
A1	1.100	1.400	0.043	0.055
b	0.380	0.550	0.015	0.022
c	0.360	0.510	0.014	0.020
D	4.300	4.700	0.169	0.185
E	4.300	4.700	0.169	0.185
e	1.270 TYP.		0.050 TYP.	
e1	2.440	2.640	0.096	0.104
L	14.100	14.500	0.555	0.571

12. Legal information

Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term 'short data sheet' is explained in section "Definitions".
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