BT169D-L

SCR

Rev.02 - 12 October 2021 Product data sheet

1. General description

Planar passivated very sensitive gate Silicon Controlled Rectifier in a TO92 plastic package.

2. Features and benefits

- Planar passivated for voltage ruggedness and reliability
- Very sensitive gate

3. Applications

- Ignition circuits
- Low power latching circuits
- Protection / shut-down circuits: lighting ballasts
- Protection / shut-down circuits: Switched Mode Power Supplies

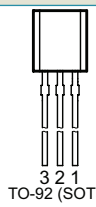
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Absolute maximum rating							
V_{RRM}	repetitive peak reverse voltage			-	-	400	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{lead} \leq 83$ °C; Fig. 1		-	-	0.5	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{lead} \leq 83$ °C; Fig. 2; Fig. 3		-	-	0.8	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{j(init)} = 25$ °C; $t_p = 10$ ms; Fig. 4; Fig. 5		-	-	8	A
		half sine wave; $T_{j(init)} = 25$ °C; $t_p = 8.3$ ms		-	-	9	A
T_j	junction temperature			-	-	125	°C
Static characteristics							
I_{GT}	gate trigger current	$V_D = 12$ V; $I_T = 10$ mA; $T_j = 25$ °C; Fig. 7		-	-	50	µA
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 268$ V; $T_j = 125$ °C; $R_{GK} = 1$ kΩ; (V_{DM} = 67% of V_{DRM}); exponential waveform; Fig. 12		500	800	-	V/µs
		$V_{DM} = 268$ V; $T_j = 125$ °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit; Fig. 12		-	25	-	V/µs

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	A	anode	 TO-92 (SOT54)	 *sym037*
2	G	gate		
3	K	cathode		

6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
BT169D-L	TO92	BT169D-L,116	Reel	2000	SOT54 wide pitch	14-Nov-2013

7. Marking

Table 4. Marking codes

Type number	Marking codes
BT169D-L	BT169DL

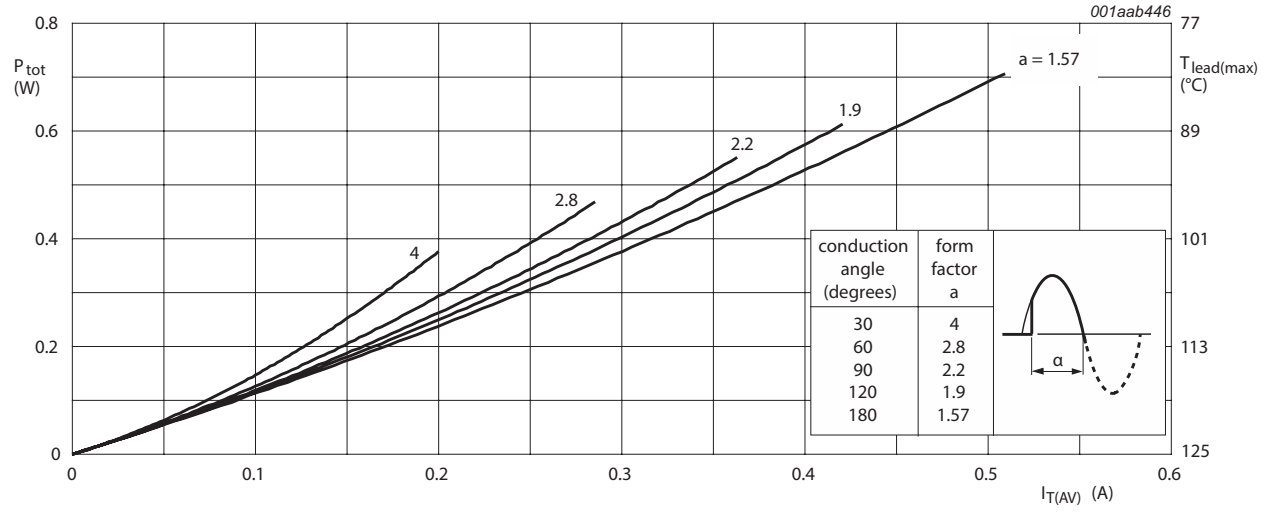
8. Limiting values

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			-	400	V
V_{RRM}	repetitive peak reverse voltage			-	400	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{lead} \leq 83$ °C; Fig. 1		-	0.5	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{lead} \leq 83$ °C; Fig. 2; Fig. 3		-	0.8	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{j(init)} = 25$ °C; $t_p = 10$ ms; Fig. 4; Fig. 5		-	8	A
		half sine wave; $T_{j(init)} = 25$ °C; $t_p = 8.3$ ms		-	9	A
I^2t	I^2t for fusing	$t_p = 10$ ms; SIN		-	0.32	A^2s
dI_T/dt	rate of rise of on-state current	$I_T = 2$ A; $I_G = 10$ mA; $dI_G/dt = 100$ mA/µs		-	50	A/µs
I_{GM}	peak gate current			-	1	A
V_{RGM}	peak reverse gate voltage			-	5	V
P_{GM}	peak gate power			-	2	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		[1]	-	125	°C

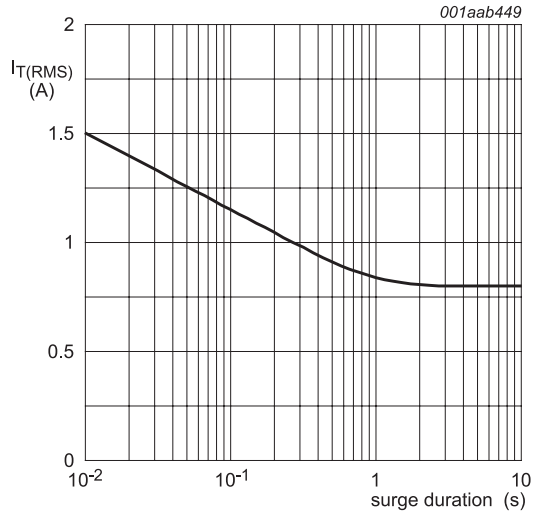
[1] Operation above 110˚C may require the use of a gate to cathode resistor of 1kΩ or less.



a = form factor = $I_{T(RMS)} / I_{T(AV)}$

α = conduction angle

Fig. 1. Total power dissipation as a function of average on-state current; maximum values



f = 50 Hz; T_{lead} = 83 °C

Fig. 2. RMS on-state current as a function of surge duration for sinusoidal currents

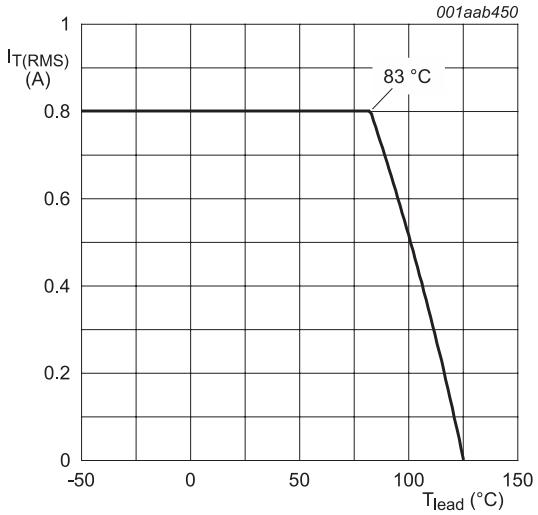
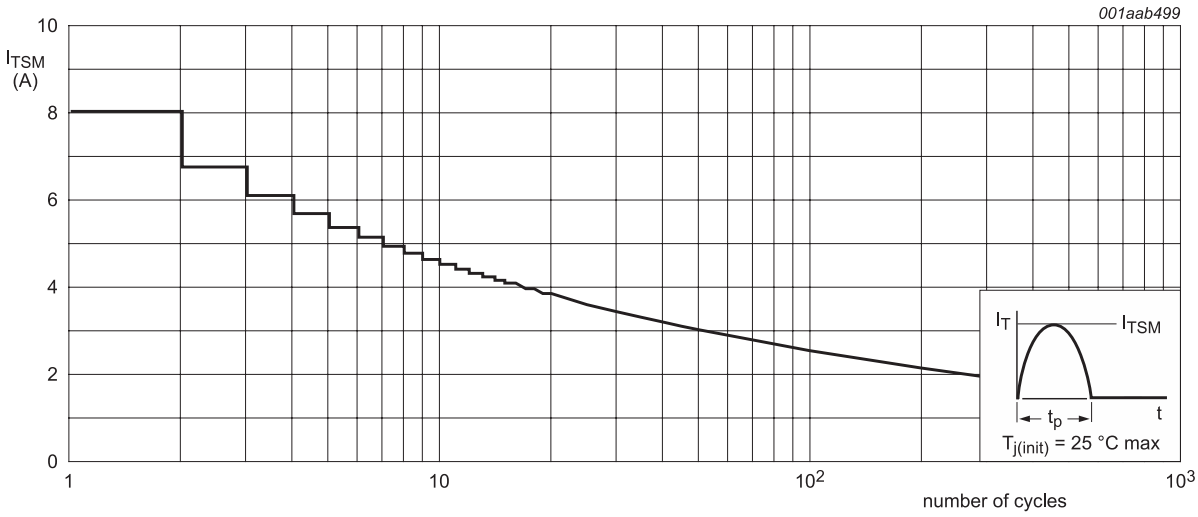
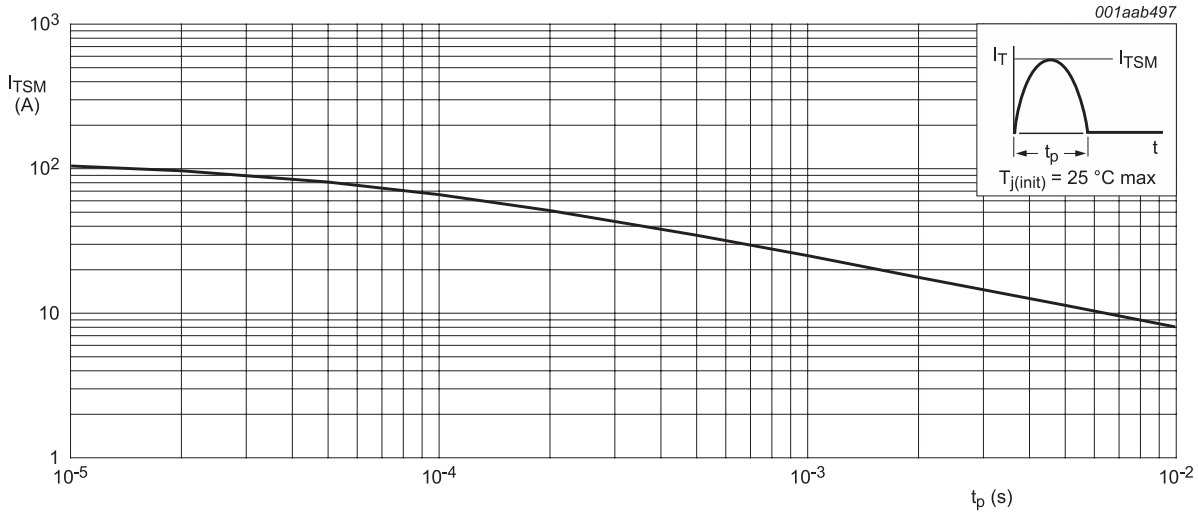


Fig. 3. RMS on-state current as a function of lead temperature; maximum values



f = 50 Hz

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



$t_p \leq 10$ ms

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	Fig. 6		-	-	60	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

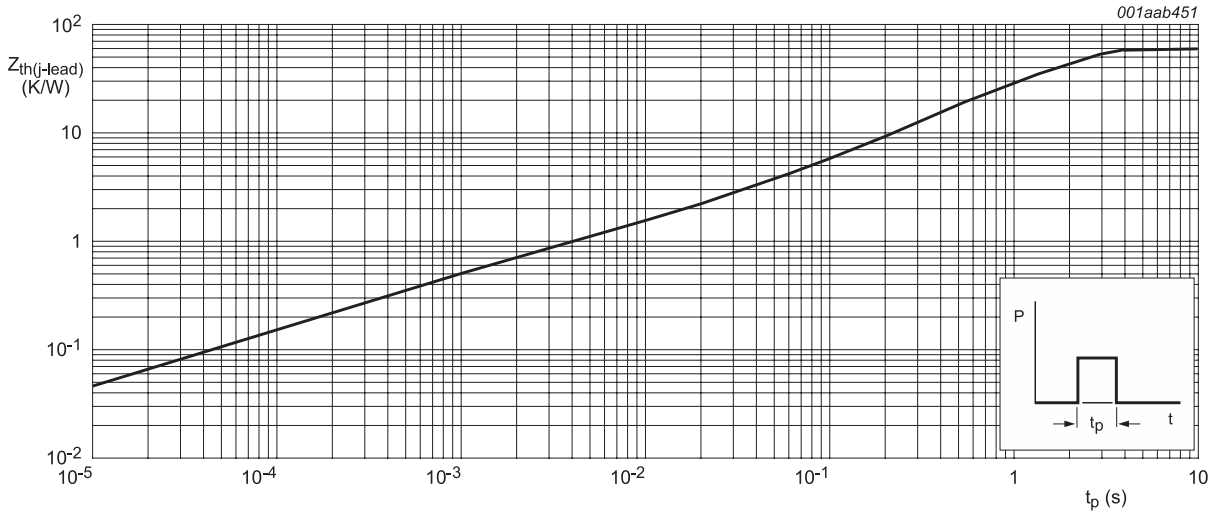


Fig. 6. Transient thermal impedance from junction to lead as a function of pulse width

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 = 10 mA; T_j = 25 °C; Fig. 7		-	-	50	µA
I_L	latching current	V_D = 12 V; I_G = 0.5 mA; T_j = 25 °C; Fig. 8		-	2	4	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	0.4	1	mA
V_T	on-state voltage	I_T = 1.2 A; T_j = 25 °C; Fig. 10		-	1.25	1.7	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 10 mA; T_j = 25 °C; Fig. 11		-	0.5	0.8	V
		V_D = 12 V; I_T = 10 mA; T_j = 125 °C		0.2	0.3	-	V
I_D	off-state current	V_D = 400 V; R_{GK} = 1 kΩ; T_j = 25 °C		-	-	2	µA
		V_D = 400 V; R_{GK} = 1 kΩ; T_j = 125 °C		-	0.05	0.1	mA
I_R	reverse current	V_R = 400 V; T_j = 25 °C; R_{GK} = 1 kΩ		-	0.05	2	µA
		V_R = 400 V; T_j = 125 °C; R_{GK} = 1 kΩ		-	0.05	0.1	mA
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 268 V; T_j = 125 °C; R_{GK} = 1 kΩ; (V_{DM} = 67% of V_{DRM}); exponential waveform; Fig. 12		500	800	-	V/µs
		V_{DM} = 268 V; T_j = 125 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit; Fig. 12		-	25	-	V/µs

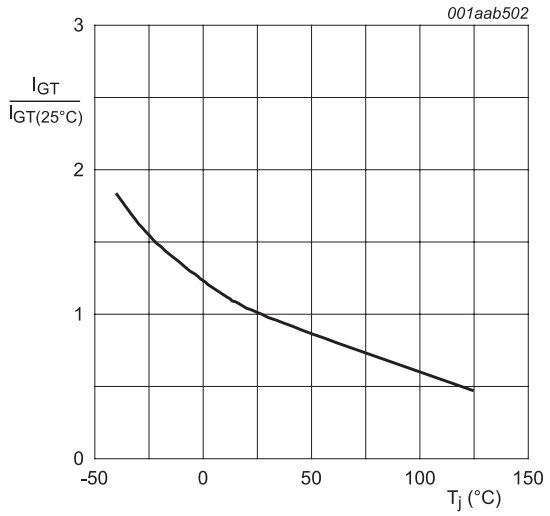
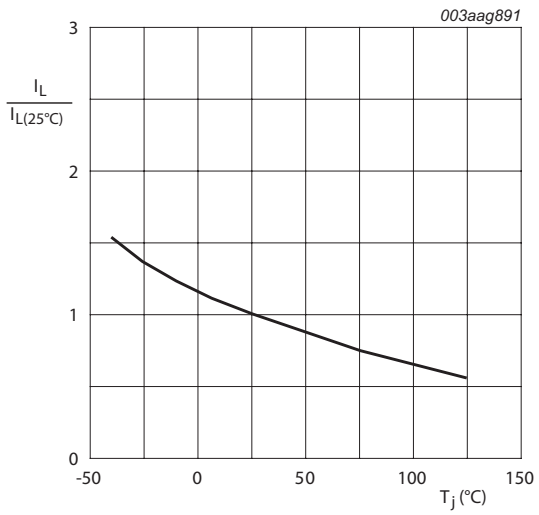
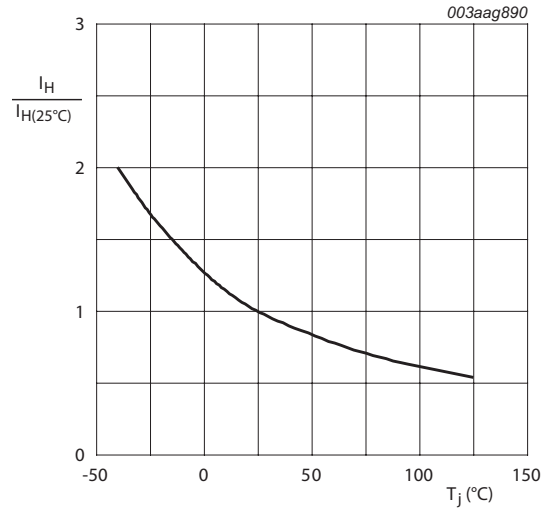


Fig. 7. Normalized gate trigger current as a function of junction temperature



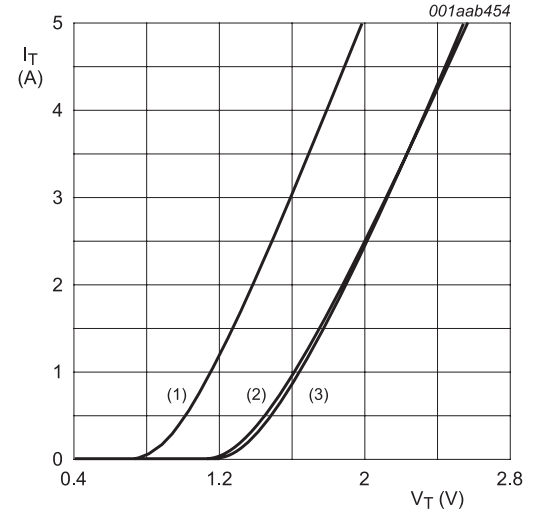
R_{GK} = 1 kΩ

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



R_{GK} = 1 kΩ

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



V_o = 1.067 V; R_s = 0.187 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

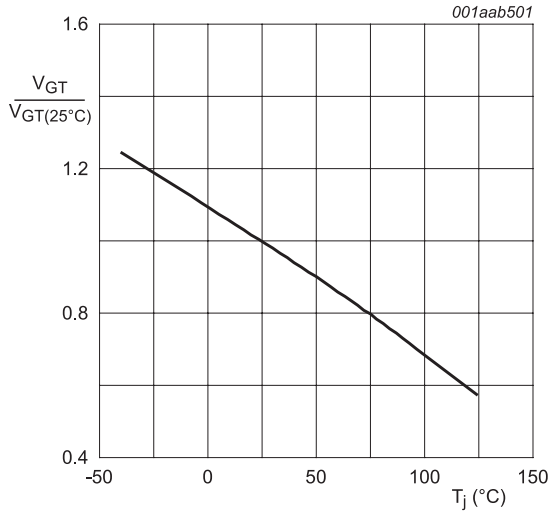
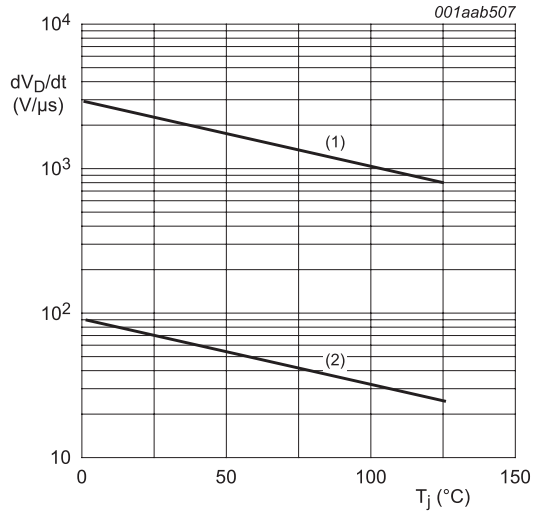


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

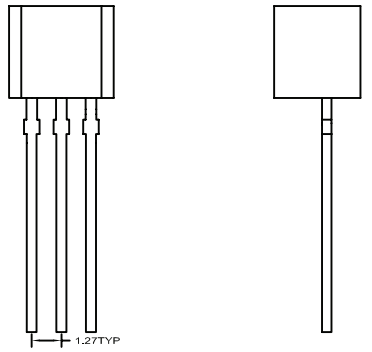


(1) R_{GK} = 1 kΩ;
(2) gate open circuit

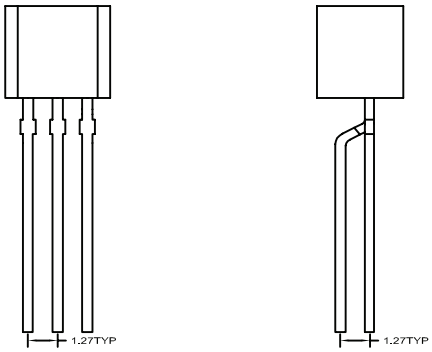
Fig. 12. Critical rate of rise of off-state voltage as a function of junction temperature; typical values

11. Package outline

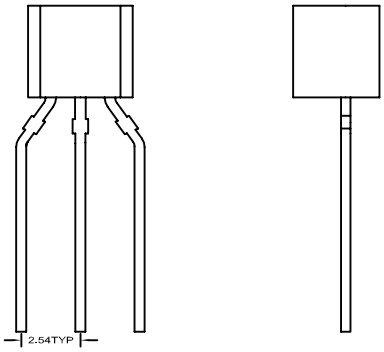
SOT54 PACKAGE OUTLINE



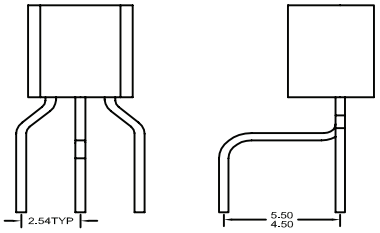
SOT54
Bulk Pack - 412



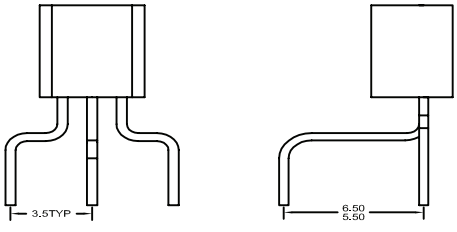
SOT54 LEADS ON CIRCLE
Bulk Pack - 112



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



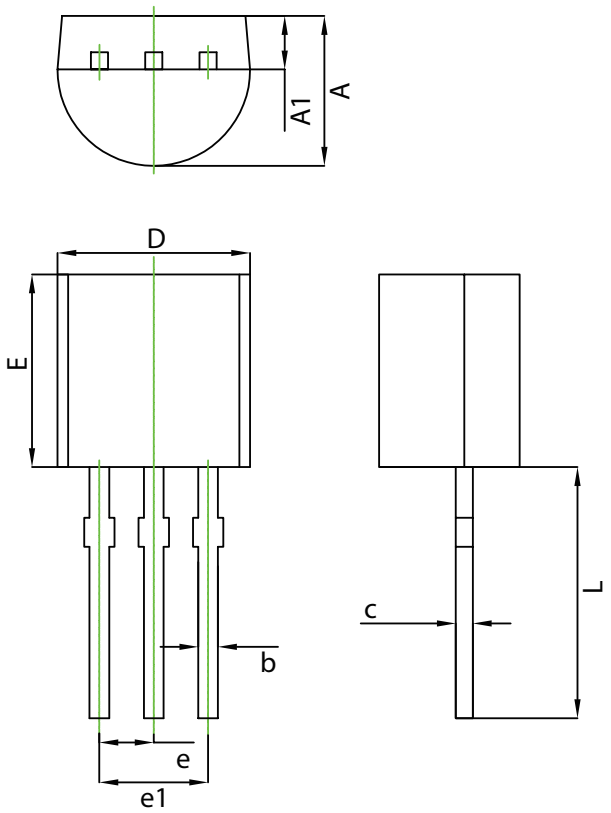
SOT54 LEAD BEND L01
Bulk Pack - 412



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

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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.

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13. Contents

1. General description 1
2. Features and benefits 1
3. Applications 1
4. Quick reference data 1
5. Pinning information 2
6. Ordering information 2
7. Marking 2
8. Limiting values 3
9. Thermal characteristics 6
10. Characteristics 7
11. Package outline 10
12. Legal information 12
13. Contents 14

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Date of release: 12 October 2021