

1. General description

Planar passivated very sensitive gate four quadrant triac in a TO-92 plastic package intended for interfacing with low power drivers including microcontrollers.

2. Features and benefits

- High blocking voltage capability
- Very sensitive gate
- Planar passivated for voltage ruggedness and reliability
- Triggering in all four quadrants
- Direct interfacing to logic level ICs
- Direct interfacing to low power gate drive circuits and microcontrollers

3. Applications

- General purpose motor control
- General purpose switching
- Air conditioner indoor fan control

4. Quick reference data

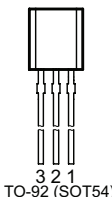
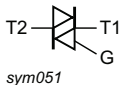
Table 1. Quick reference data

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; $T_{lead} \leq 51.2 \text{ }^\circ\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3	-	-	1	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(initial)} = 25 \text{ }^\circ\text{C}$; $t_p = 20 \text{ ms}$; Fig. 4 ; Fig. 5	-	-	12.5	A
		full sine wave; $T_{j(initial)} = 25 \text{ }^\circ\text{C}$; $t_p = 16.7 \text{ ms}$	-	-	13.7	A
T_j	junction temperature		-	-	125	$^\circ\text{C}$
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12 \text{ V}$; $I_T = 0.1 \text{ A}$; T2+ G+; $T_j = 25 \text{ }^\circ\text{C}$; Fig. 7	-	0.4	3	mA
		$V_D = 12 \text{ V}$; $I_T = 0.1 \text{ A}$; T2+ G-; $T_j = 25 \text{ }^\circ\text{C}$; Fig. 7	-	1.3	3	mA
		$V_D = 12 \text{ V}$; $I_T = 0.1 \text{ A}$; T2- G-; $T_j = 25 \text{ }^\circ\text{C}$; Fig. 7	-	1.4	3	mA
		$V_D = 12 \text{ V}$; $I_T = 0.1 \text{ A}$; T2- G+; $T_j = 25 \text{ }^\circ\text{C}$; Fig. 7	-	3.8	7	mA
I_H	holding current	$V_D = 12 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; Fig. 9	-	1.3	5	mA
V_T	on-state voltage	$I_T = 1.4 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$; Fig. 10	-	1.2	1	V

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$; $T_j = 125\text{ °C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; $R_{GT1(ext)} = 1\text{ k}\Omega$; Fig. 12	10	20	-	V/ μ s
dV_{com}/dt	rate of change of commutating voltage	$V_D = 400\text{ V}$; $T_j = 125\text{ °C}$; $dI_{com}/dt = 0.5\text{ A/ms}$; $I_T = 1\text{ A}$; gate open circuit	2	-	-	V/ μ s

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T2	main terminal 2	 <p>TO-92 (SOT54)</p>	 <p>sym051</p>
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
BT131-600	TO92	BT131-600,412	Bulk	1000	SOT54	14-Nov-2013
BT131-600	TO92	BT131-600,116	Reel	2000	SOT54 wide pitch	14-Nov-2013
BT131-600/DG	TO92	BT131-600/DG,412	Bulk	1000	SOT54	14-Nov-2013
BT131-600/DG	TO92	BT131-600/DG,116	Reel	2000	SOT54 wide pitch	14-Nov-2013

7. Marking

Table 4. Marking codes

Type number	Marking codes
BT131-600	131-6

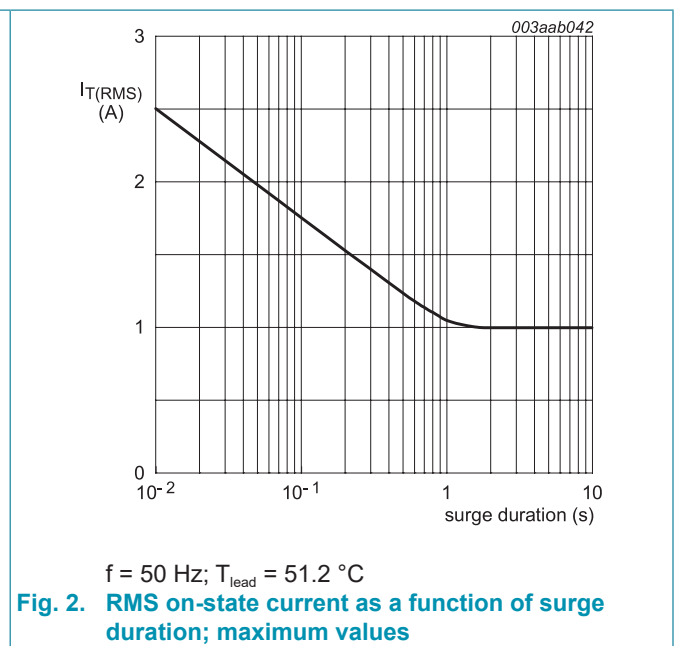
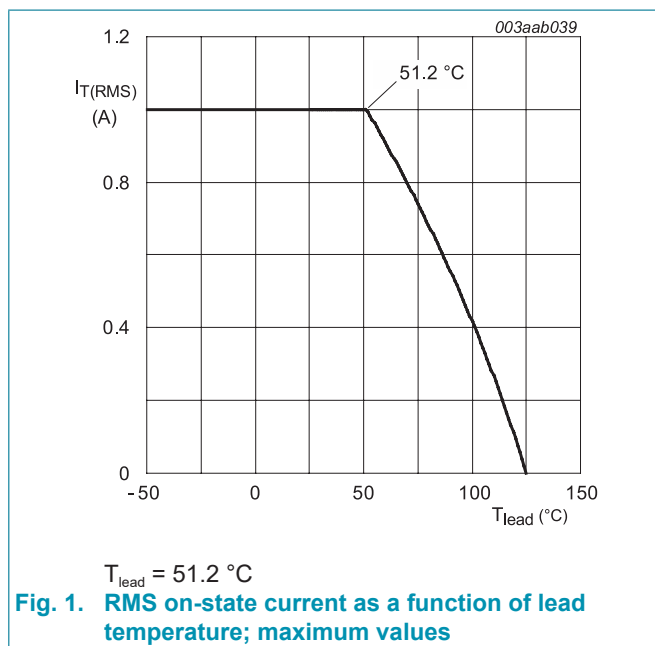
8. Limiting values

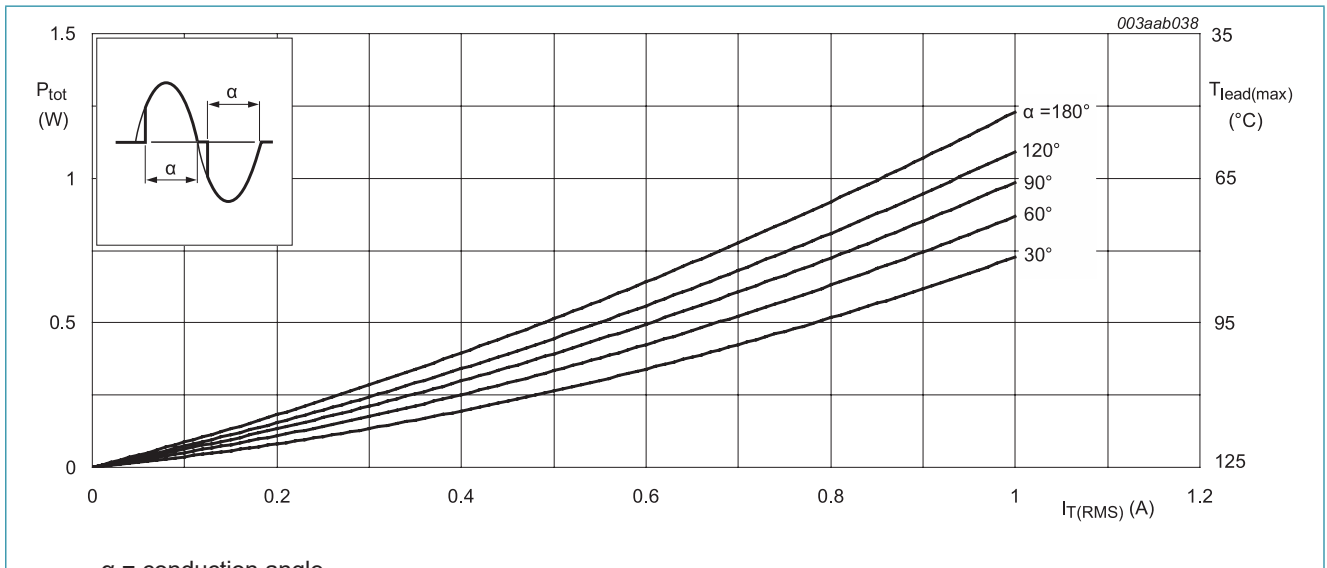
Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DRM}	repetitive peak off-state voltage [1]		-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{lead} \leq 51.2\text{ °C}$; Fig 1; Fig 2; Fig 3	-	1	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 20\text{ ms}$; Fig 4; Fig 5	-	12.5	A
		full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 16.7\text{ ms}$	-	13.7	A
I^2t	I^2t for fusing	$t_p = 10\text{ ms}$; sine-wave pulse	-	0.78	A^2s
di_T/dt	rate of rise of on-state current	$I_G = 6\text{ mA}$; T2+ G+	-	50	$A/\mu s$
		$I_G = 6\text{ mA}$; T2+ G-	-	50	$A/\mu s$
		$I_G = 6\text{ mA}$; T2- G-	-	50	$A/\mu s$
		$I_G = 14\text{ mA}$; T2- G+	-	10	$A/\mu s$
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	$^{\circ}C$
T_j	junction temperature		-	125	$^{\circ}C$

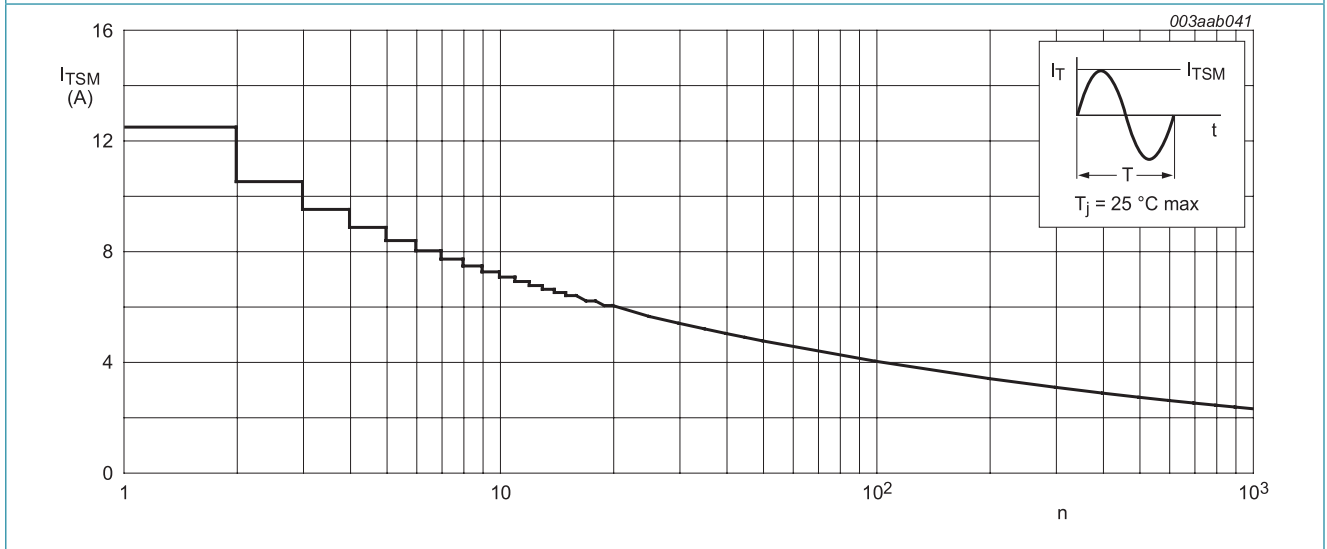
[1] Although not recommended, off-state voltage up to V_{DRM} may be applied without damage, but the triac may switch to the on-state. The rate of rise of current should not exceed $3A/\mu s$.





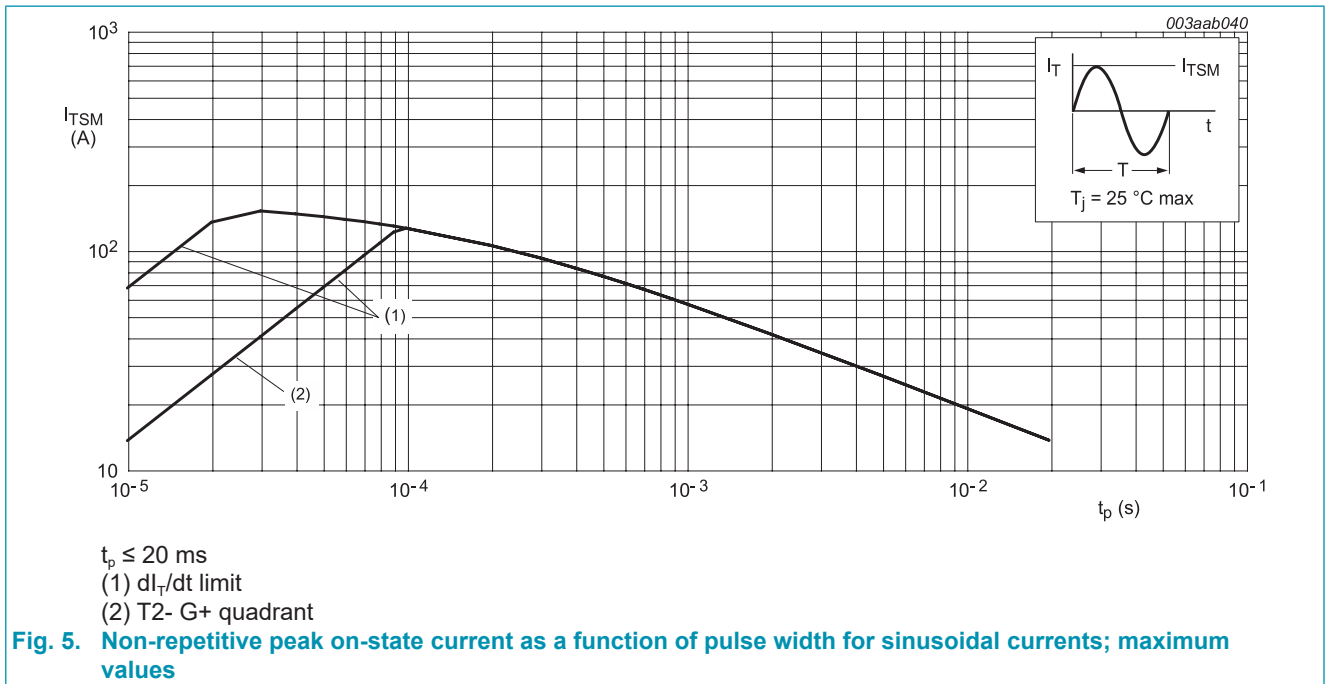
α = conduction angle

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



$f = 50\text{ Hz}$

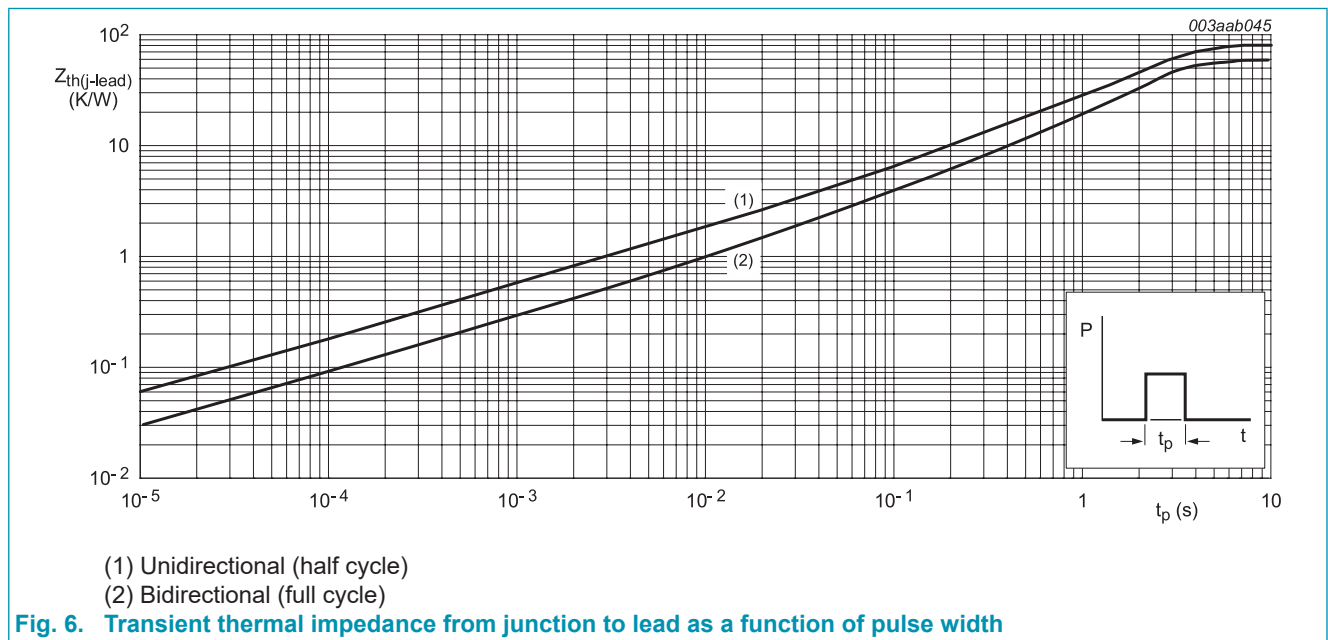
Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



9. Thermal characteristics

Table 6. Thermal characteristics

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



10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_2+ G+;$ $T_j = 25\text{ }^\circ\text{C};$ Fig. 7	-	0.4	3	mA
		$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_2+ G-;$ $T_j = 25\text{ }^\circ\text{C};$ Fig. 7	-	1.3	3	mA
		$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_2- G-;$ $T_j = 25\text{ }^\circ\text{C};$ Fig. 7	-	1.4	3	mA
		$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_2- G+;$ $T_j = 25\text{ }^\circ\text{C};$ Fig. 7	-	3.8	7	mA
I_L	latching current	$V_D = 12\text{ V}; I_G = 0.1\text{ A}; T_2+ G+;$ $T_j = 25\text{ }^\circ\text{C};$ Fig. 8	-	1.2	5	mA
		$V_D = 12\text{ V}; I_G = 0.1\text{ A}; T_2+ G-;$ $T_j = 25\text{ }^\circ\text{C};$ Fig. 8	-	4	8	mA
		$V_D = 12\text{ V}; I_G = 0.1\text{ A}; T_2- G-;$ $T_j = 25\text{ }^\circ\text{C};$ Fig. 8	-	1	5	mA
		$V_D = 12\text{ V}; I_G = 0.1\text{ A}; T_2- G+;$ $T_j = 25\text{ }^\circ\text{C};$ Fig. 8	-	2.5	8	mA
I_H	holding current	$V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C};$ Fig. 9	-	1.3	5	mA
V_T	on-state voltage	$I_T = 1.4\text{ A}; T_j = 25\text{ }^\circ\text{C};$ Fig. 10	-	1.2	1	V
V_{GT}	gate trigger voltage	$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_j = 25\text{ }^\circ\text{C};$ Fig. 11	-	0.7	1	V
		$V_D = 400\text{ V}; I_T = 0.1\text{ A}; T_j = 125\text{ }^\circ\text{C}$	0.2	0.3	-	V
I_D	off-state current	$V_D = 600\text{ V}; T_j = 125\text{ }^\circ\text{C}$	-	0.1	0.5	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}; T_j = 125\text{ }^\circ\text{C}; (V_{DM} = 67\%$ of V_{DRM}); exponential waveform; $R_{GT1(ext)} = 1\text{ k}\Omega;$ Fig. 12	10	20	-	V/ μs
dV_{com}/dt	rate of change of commutating voltage	$V_D = 400\text{ V}; T_j = 125\text{ }^\circ\text{C}; dI_{com}/dt = 0.5\text{ A/}$ ms; $I_T = 1\text{ A};$ gate open circuit	2	-	-	V/ μs
t_{gt}	gate-controlled turn-on time	$I_{TM} = 1.5\text{ A}; V_D = 600\text{ V}; I_G = 0.1\text{ A}; dI_G/$ dt = 5 A/ μs	-	2	-	μs

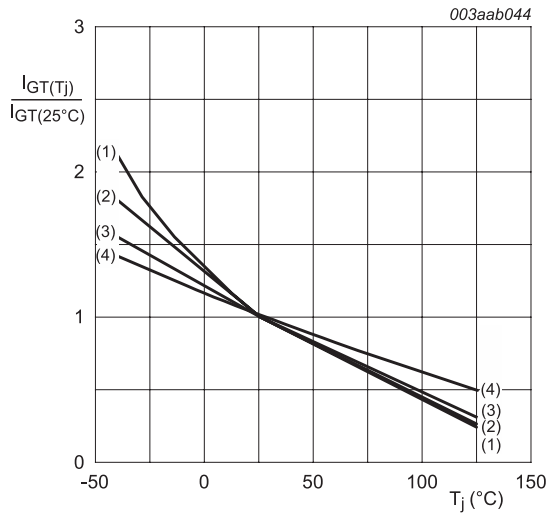


Fig. 7. Normalized gate trigger current as a function of junction temperature

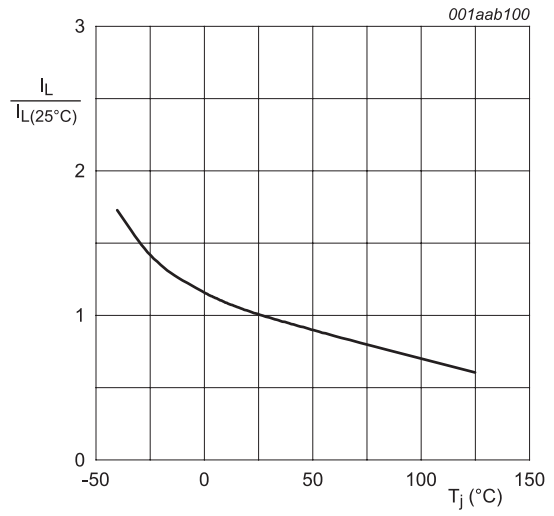


Fig. 8. Normalized latching current as a function of junction temperature

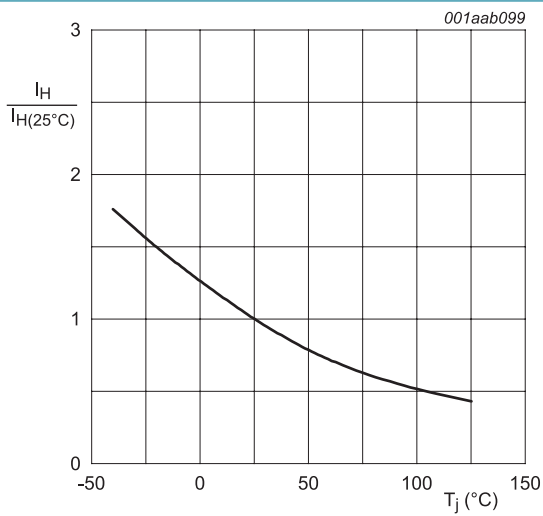
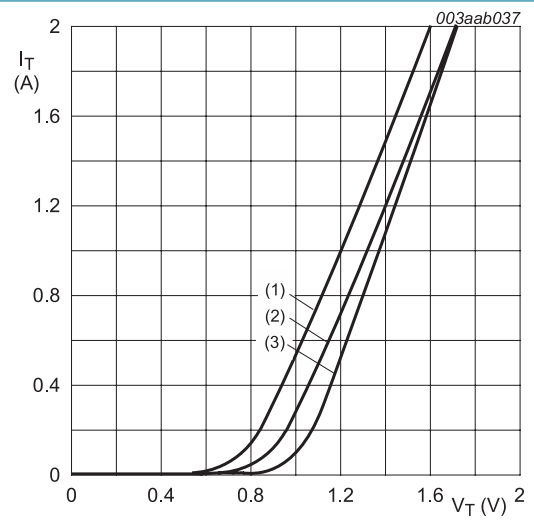
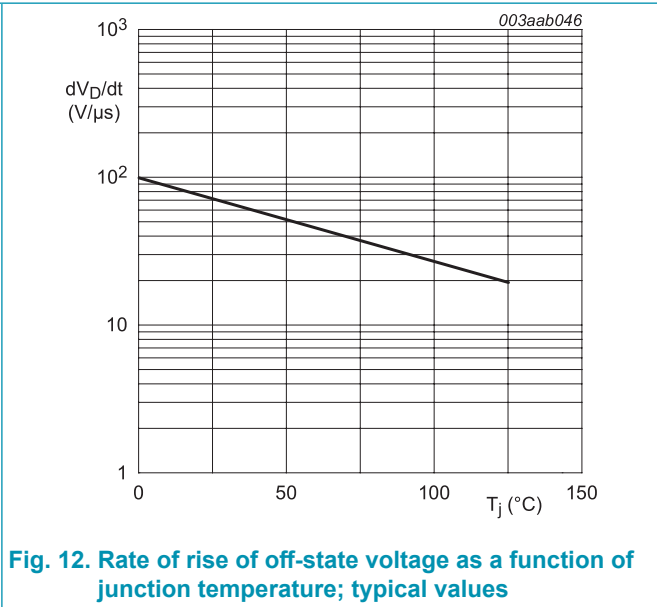
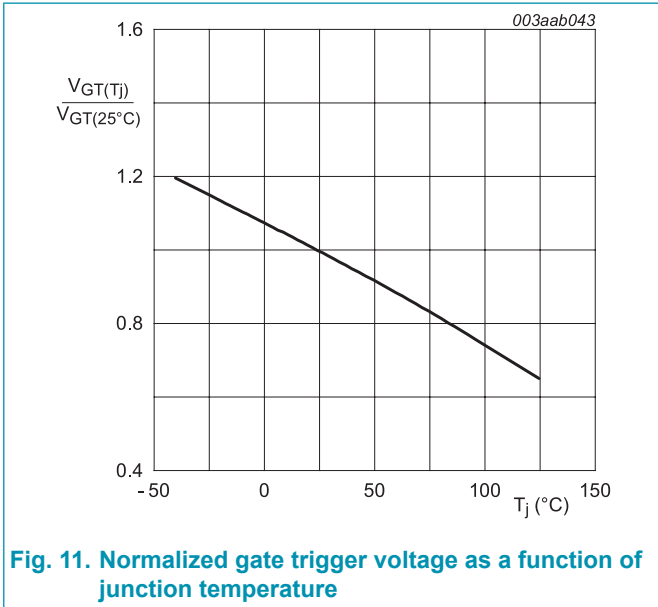


Fig. 9. Normalized holding current as a function of junction temperature



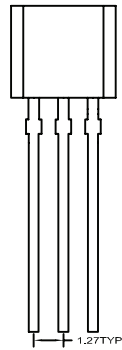
$V_o = 0.92\text{ V}; R_s = 0.4\ \Omega$
 (1) $T_j = 125^\circ\text{C}$; typical values
 (2) $T_j = 125^\circ\text{C}$; maximum values
 (3) $T_j = 25^\circ\text{C}$; maximum values

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

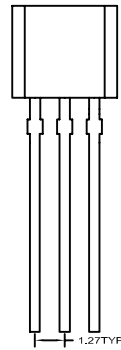
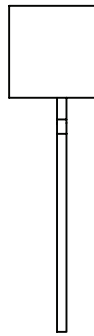


11. Package outline

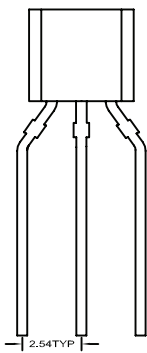
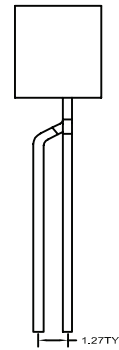
SOT54 PACKAGE OUTLINE



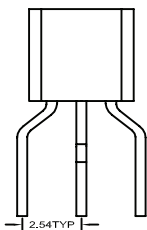
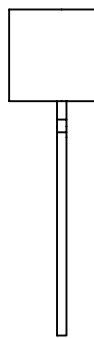
SOT54
Bulk Pack - 412



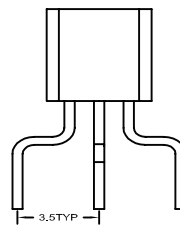
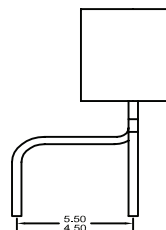
SOT54 LEADS ON CIRCLE
Bulk Pack - 112



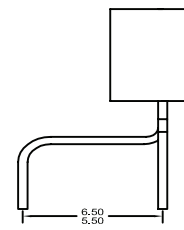
SOT54 WIDE PITCH
Tape/ Reel Pack - 116
Ammo Pack - 126



SOT54 LEAD BEND L01
Bulk Pack - 412



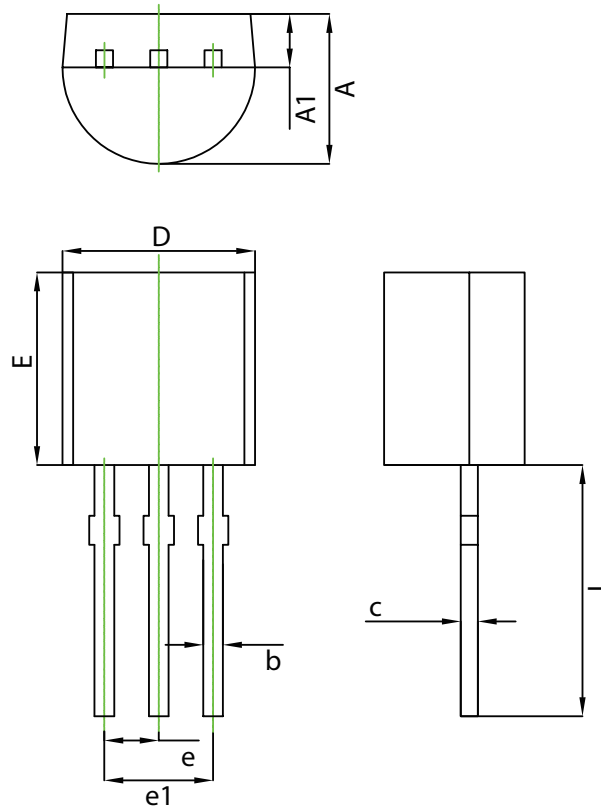
SOT54 LEAD BEND L02
Bulk Pack - 412



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.

- [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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