

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

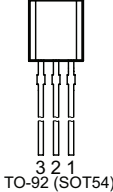
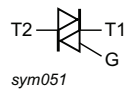
Table 1. Quick reference data

Symbol	Parameter	Conditions	Values				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} ≤ 51 °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
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		-	0.4	3	mA
		V _D = 12 V; I _T = 0.1 A; T2+ G-; T _j = 25 °C; Fig. 7		-	1.3	3	mA
		V _D = 12 V; I _T = 0.1 A; T2- G-; T _j = 25 °C; Fig. 7		-	1.4	3	mA
		V _D = 12 V; I _T = 0.1 A; T2- G+; T _j = 25 °C; Fig. 7		-	3.8	7	mA
I _H	holding current	V _D = 12 V; T _j = 25 °C; Fig. 9		-	1.3	5	mA
V _T	on-state voltage	I _T = 1.4 A; T _j = 25 °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		
2	G	gate		
3	T1	main terminal 1		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BT131-600	TO-92	plastic single-ended leaded (through hole) package; 3 leads	SOT54

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	Values	Unit
V_{DRM}	repetitive peak off-state voltage [1]		600	V
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{lead}} \leq 51\text{ }^{\circ}\text{C}$; Fig 1; Fig 2; Fig 3	1	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$; $t_p = 20\text{ ms}$; Fig 4; Fig 5	12.5	A
		full sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$; $t_p = 16.7\text{ ms}$	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	$I_{\text{G}} = 6\text{ mA}$; T2+ G+	50	$\text{A}/\mu\text{s}$
		$I_{\text{G}} = 6\text{ mA}$; T2+ G-	50	$\text{A}/\mu\text{s}$
		$I_{\text{G}} = 6\text{ mA}$; T2- G-	50	$\text{A}/\mu\text{s}$
		$I_{\text{G}} = 14\text{ mA}$; T2- G+	10	$\text{A}/\mu\text{s}$
I_{GM}	peak gate current		2	A
P_{GM}	peak gate power		5	W
$P_{\text{G(AV)}}$	average gate power	over any 20 ms period	0.1	W
T_{stg}	storage temperature		-40 to 150	$^{\circ}\text{C}$
T_{j}	junction temperature		125	$^{\circ}\text{C}$

[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 $3\text{ A}/\mu\text{s}$.

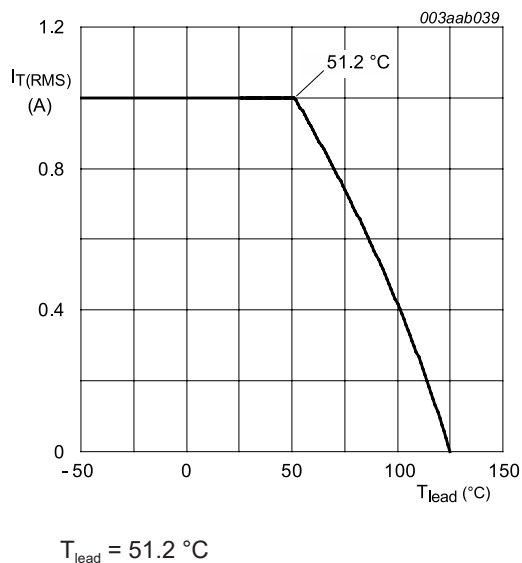
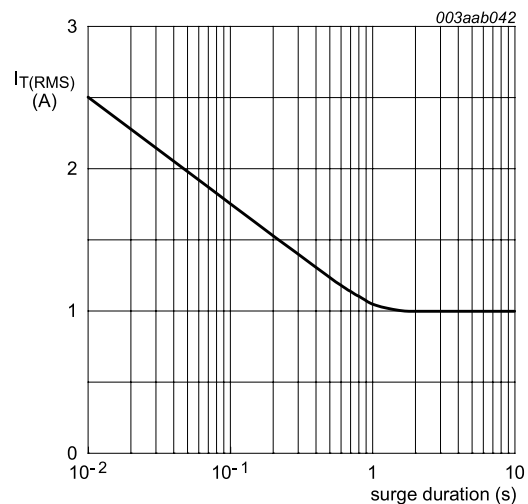


Fig. 1. RMS on-state current as a function of lead temperature; maximum values



$f = 50\text{ Hz}$; $T_{\text{lead}} = 51.2\text{ }^{\circ}\text{C}$

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

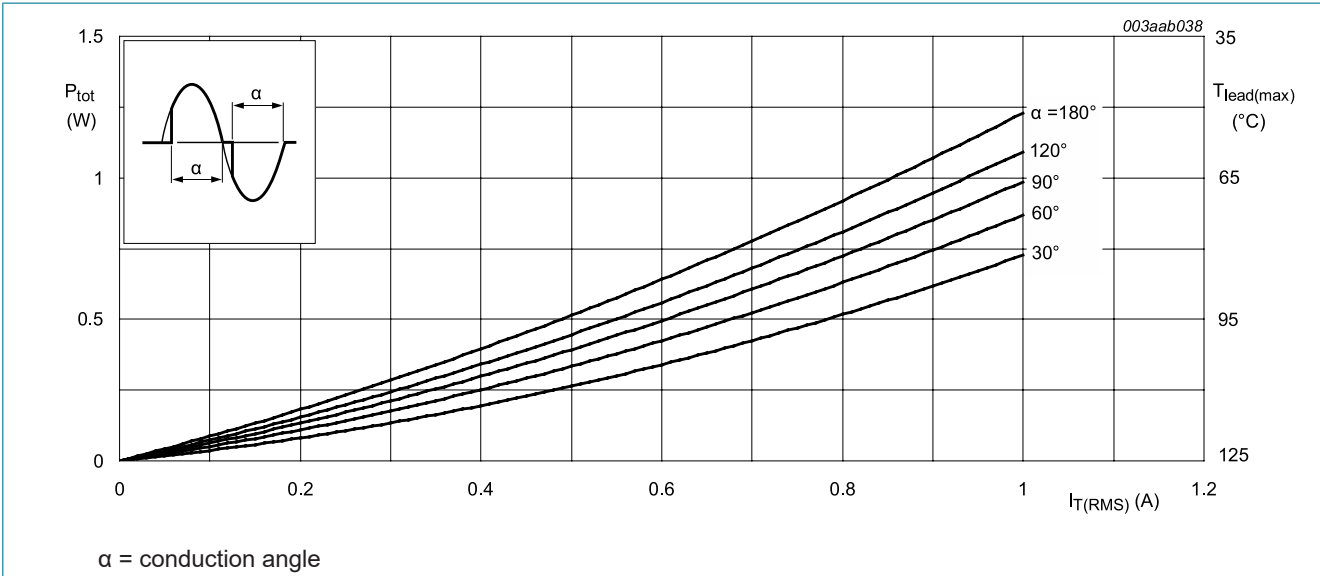


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

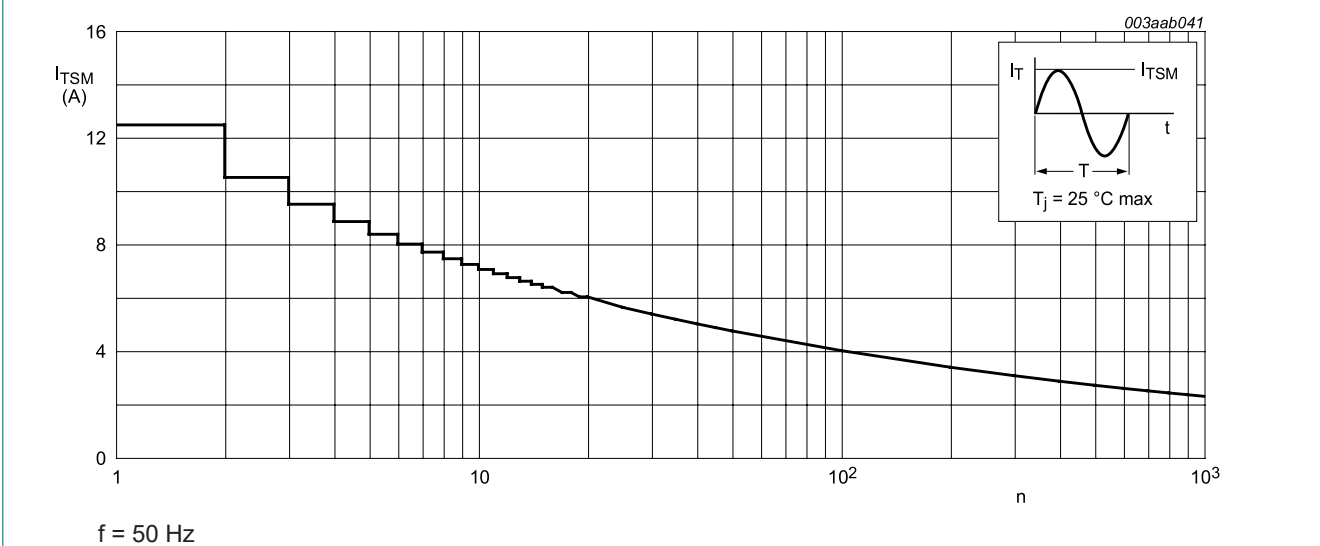
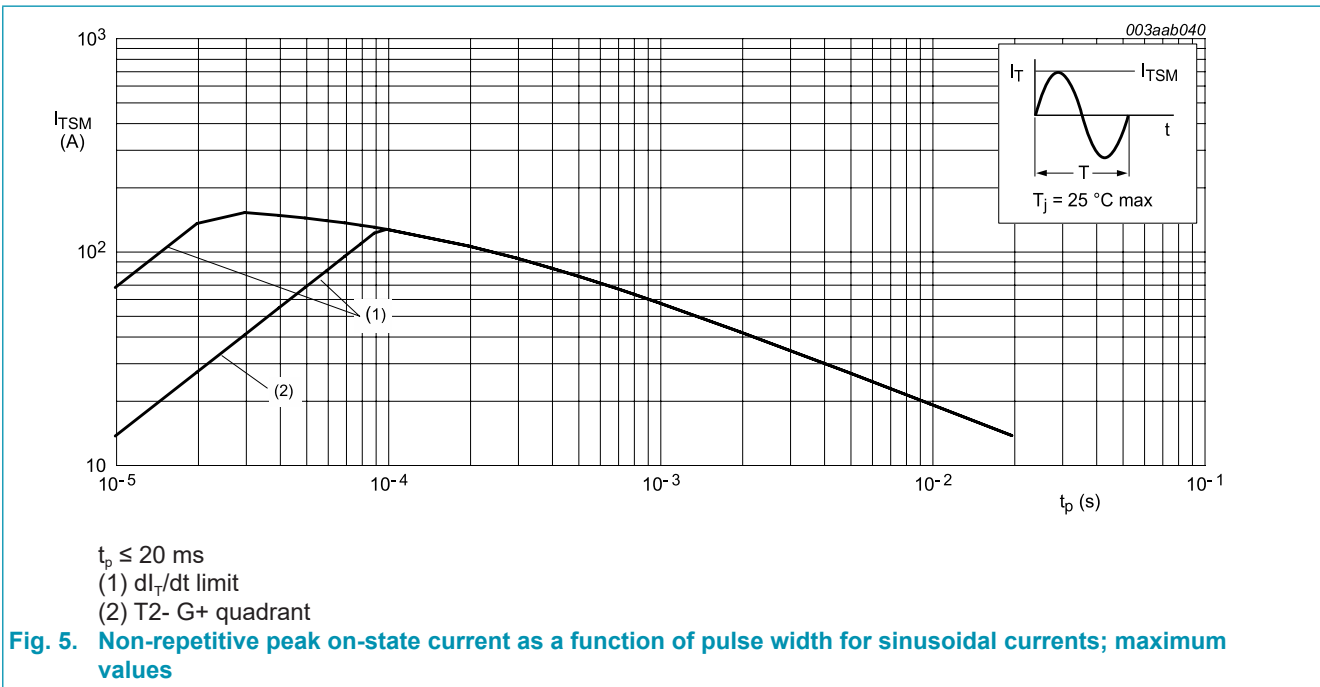


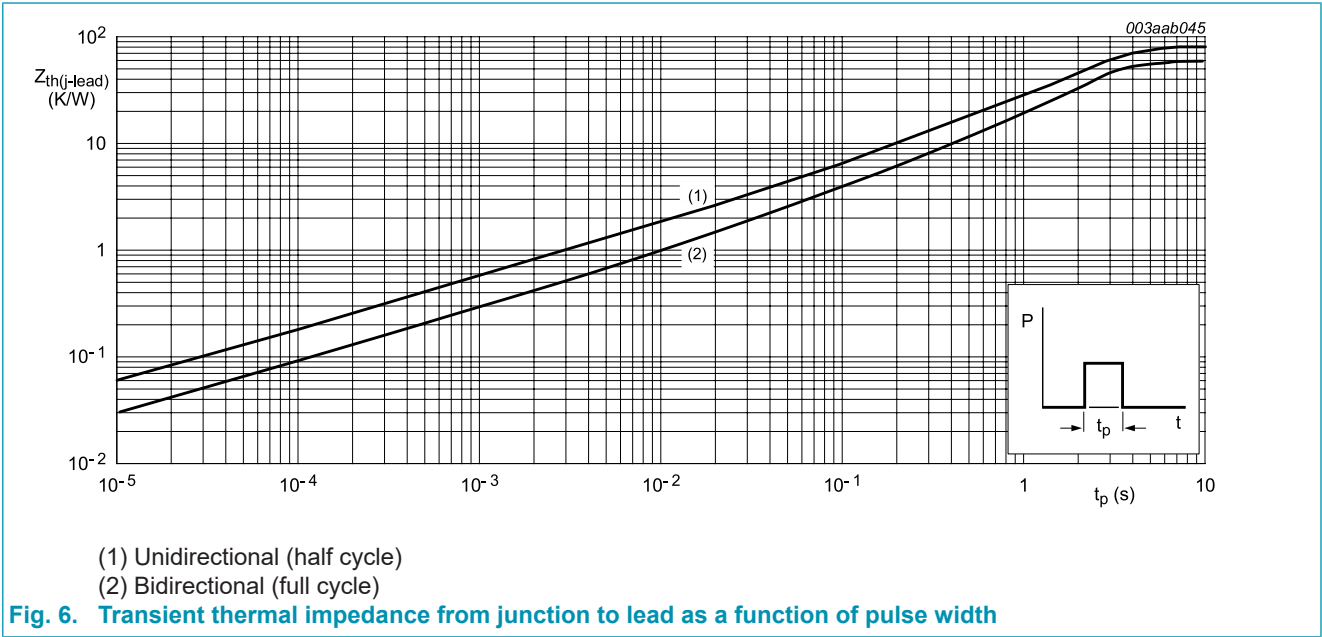
Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



9. Thermal characteristics

Table 6. Thermal characteristics

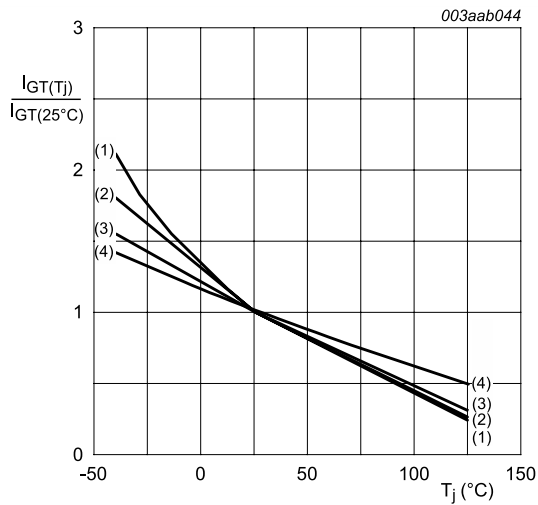
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-lead)}$	thermal resistance from junction to lead	full cycle; Fig.6	-	-	60	K/W
		half cycle; Fig.6	-	-	80	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	printed circuit board mounted: lead length = 4 mm	-	150	-	K/W



10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; 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_L	latching current	$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G+; $T_J = 25\text{ }^\circ\text{C}$; Fig. 8		-	1.2	5	mA
		$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G-; $T_J = 25\text{ }^\circ\text{C}$; Fig. 8		-	4	8	mA
		$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2- G-; $T_J = 25\text{ }^\circ\text{C}$; Fig. 8		-	1	5	mA
		$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2- 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
		$V_D = 400\text{ V}$; $I_T = 0.1\text{ A}$; $T_J = 125\text{ }^\circ\text{C}$; Fig. 11		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	$I_{TM} = 1.5\text{ A}$; $V_D = 600\text{ V}$; $I_G = 0.1\text{ A}$; $dI_G/dt = 5\text{ A}/\mu\text{s}$		-	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

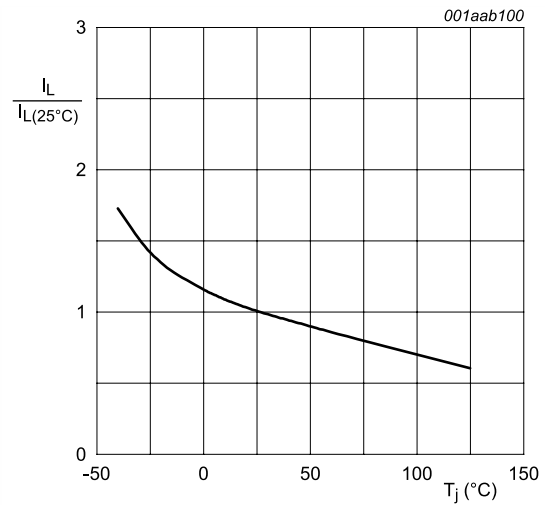


Fig. 8. Normalized latching current as a function of junction temperature

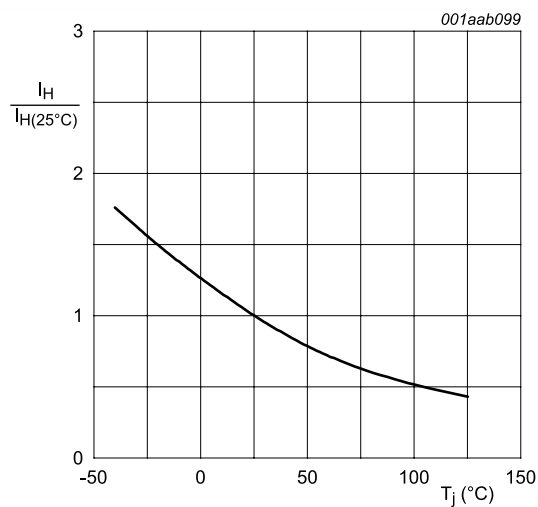
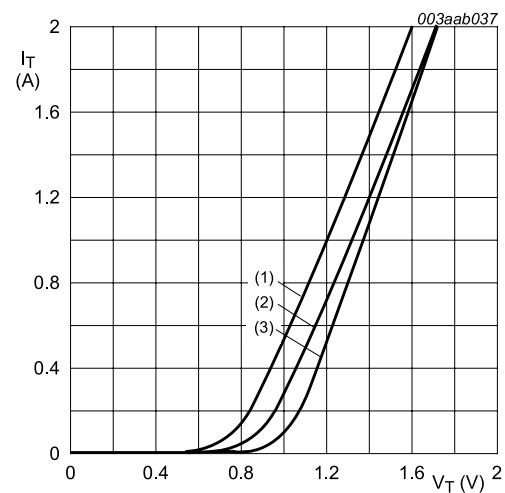


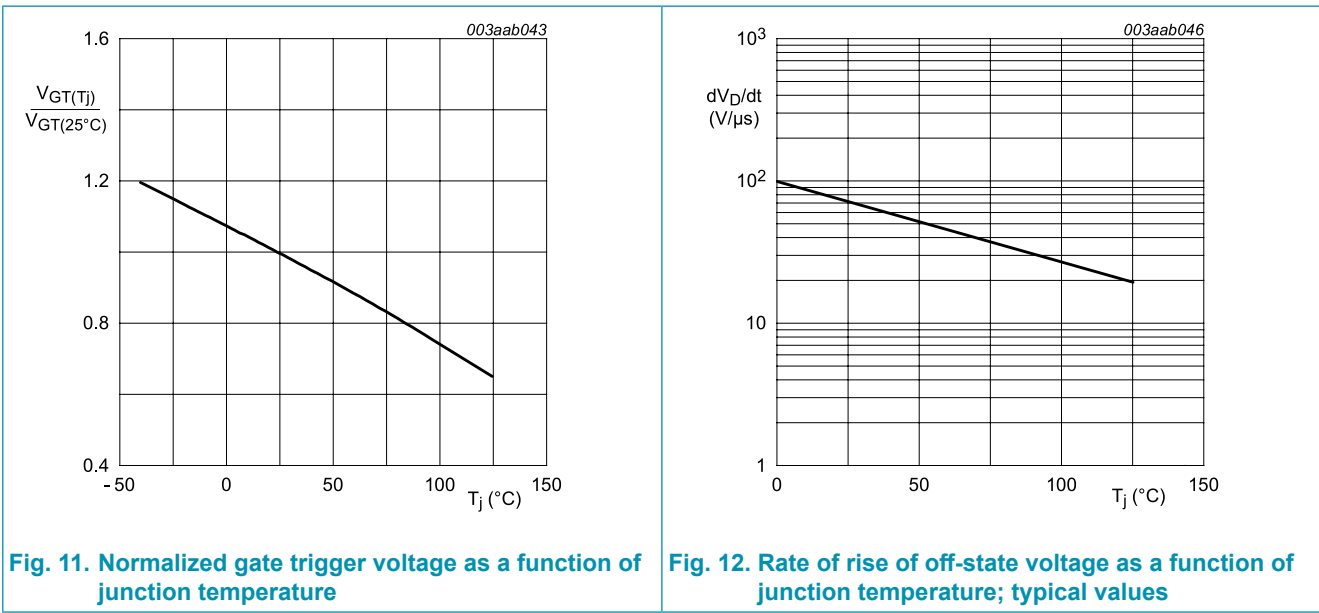
Fig. 9. Normalized holding current as a function of junction temperature



$V_o = 0.92 \text{ V}; R_s = 0.4 \Omega$

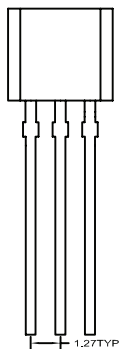
- (1) $T_j = 125^\circ\text{C}$; typical values
- (2) $T_j = 125^\circ\text{C}$; maximum values
- (3) $T_j = 25^\circ\text{C}$; maximum values

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

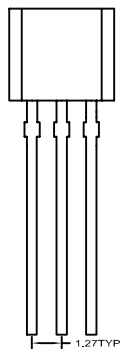
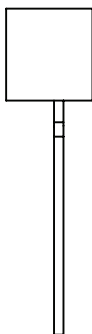


11. Package outline

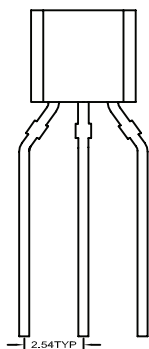
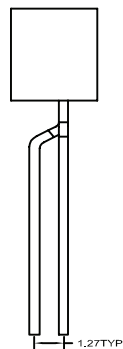
SOT54 PACKAGE OUTLINE



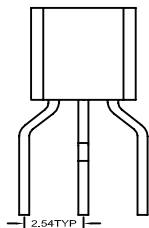
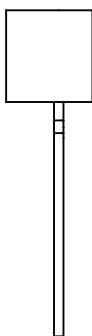
SOT54
Bulk Pack - 412



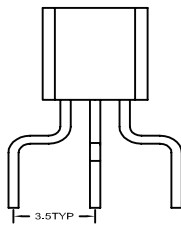
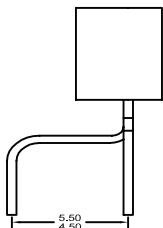
SOT54 LEADS ON CIRCLE
Bulk Pack - 112



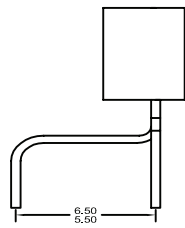
SOT54 WIDE PITCH
Tape/ Reel Pack - 116
Ammo Pack - 126



SOT54 LEAD BEND L01
Bulk Pack - 412



SOT54 LEAD BEND L02
Bulk Pack - 412



Remark: Detailed dimensions refer to POD drawing.

12. Legal information

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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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