

1. General description

Planar passivated very sensitive gate four quadrant triac in a TO92 plastic package intended for use in applications requiring direct interfacing to logic ICs and low power gate drivers.

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

3. Applications

- Industrial process control
- General purpose low power motor control
- Home appliances
- Low power AC Fan controllers

4. Quick reference data

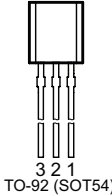
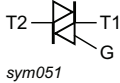
Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V_{DRM}	repetitive peak off-state voltage			800			V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{lead} \leq 66\text{ °C}$; 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		11			A
		full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 16.7\text{ ms}$		12.1			A
T_j	operating junction temperature			-40 to 125			°C
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G+; $T_j = 25\text{ °C}$; Fig. 7		-	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ °C}$; Fig. 7		-	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ °C}$; Fig. 7		-	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G+; $T_j = 25\text{ °C}$; Fig. 7		-	-	10	mA

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ °C}$; Fig. 9		-	-	10	mA
V_T	on-state voltage	$I_T = 1\text{ A}$; $T_j = 25\text{ °C}$; Fig. 10		-	1.3	1.5	V
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 536\text{ V}$; $T_j = 125\text{ °C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit		100	-	-	V/ μ s
dV_{com}/dt	rate of change of commutating voltage	$V_D = 400\text{ V}$; $T_j = 125\text{ °C}$; $dI_{com}/dt = 0.5\text{ A/ms}$; gate open circuit		0.5	-	-	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
BT231-800E	TO92	BT231-800EF	Bulk	1000	TO92L	10-May-2021

7. Marking

Table 4. Marking codes

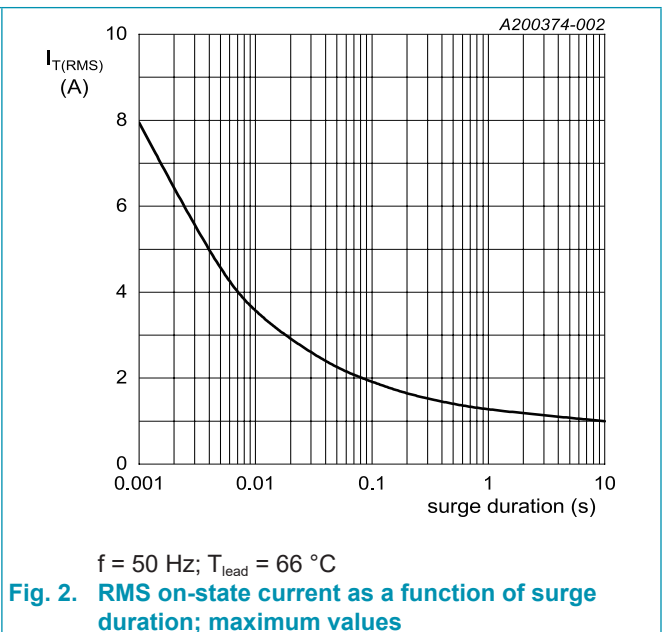
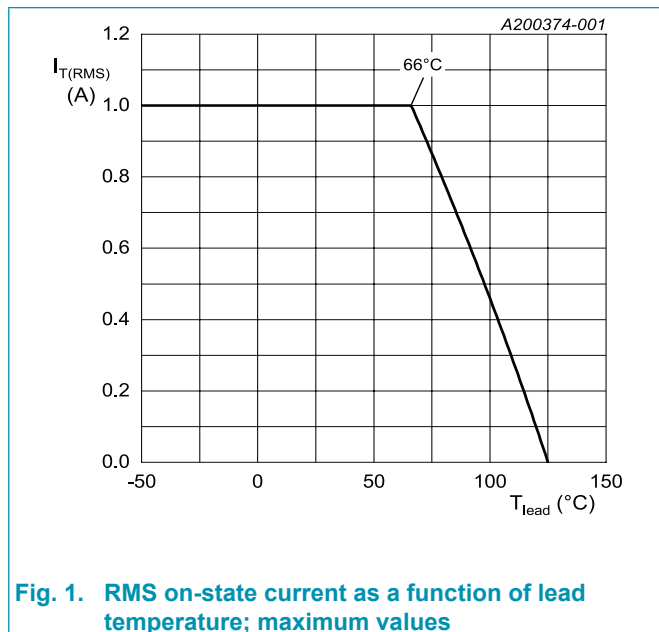
Type number	Marking codes
BT231-800E	231E-8

8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions	Notes	Values	Unit
V_{DRM}	repetitive peak off-state voltage			800	V
V_{RRM}	repetitive peak reverse voltage			800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{sp} \leq 66\text{ °C}$; 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		11	A
		full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 16.7\text{ ms}$		12.1	A
I^2t	I^2t for fusing	$t_p = 10\text{ ms}$; SIN		0.6	A ² s
di_T/dt	rate of rise of on-state current	$I_G = 10\text{ mA}$		50	A/ μ s
I_{GM}	peak gate current			1	A
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 to 150	°C
T_j	operating junction temperature			-40 to 125	°C



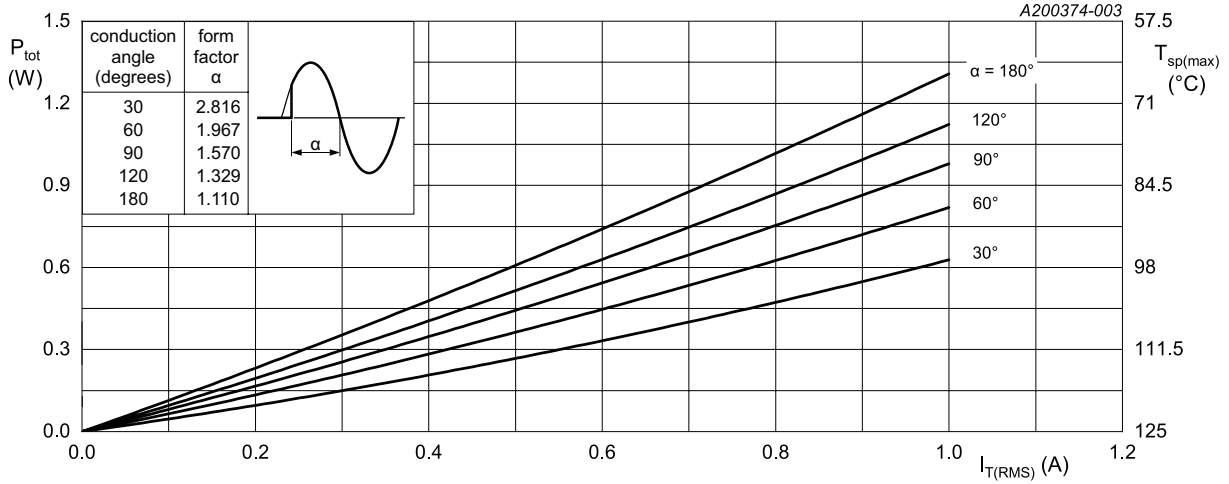


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

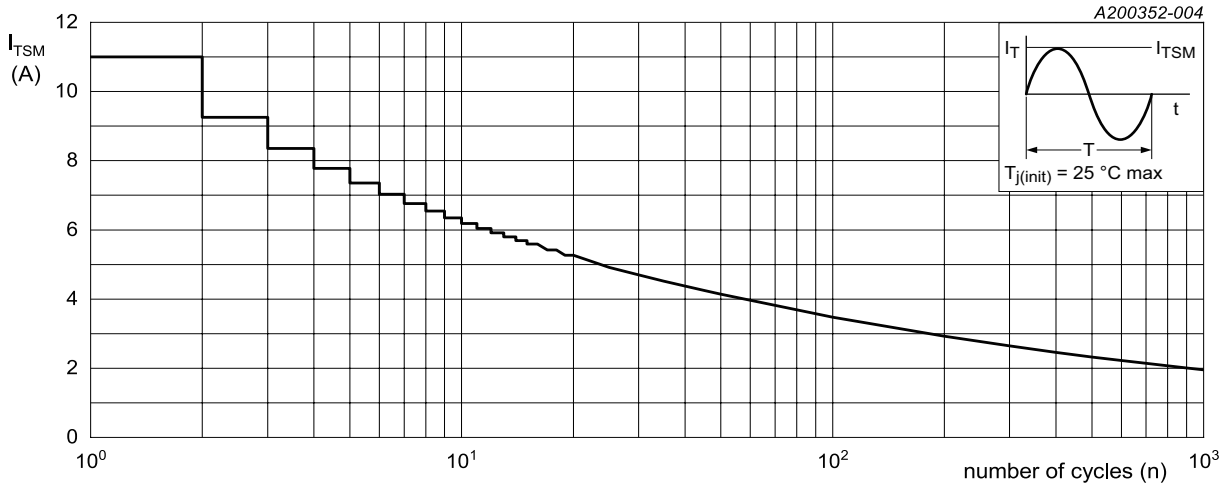


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

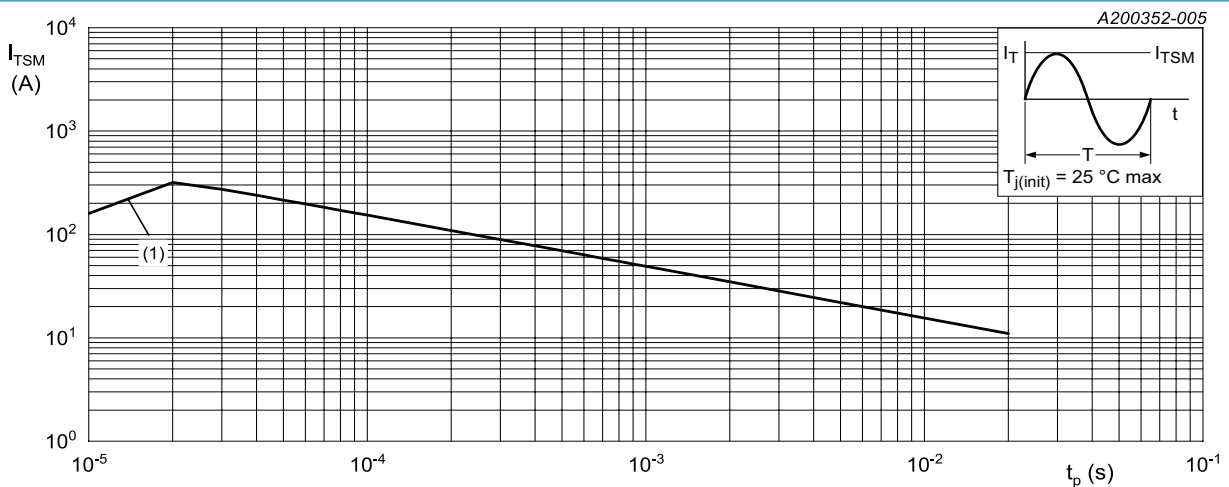
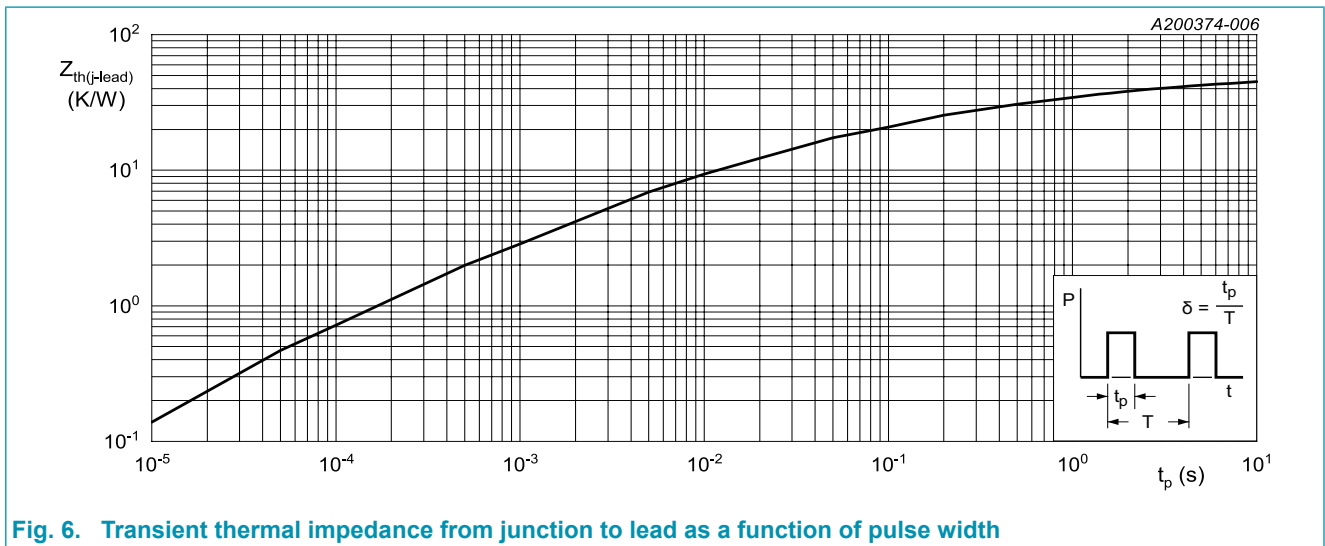


Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-lead)}$	thermal resistance from junction to lead	Fig 6		-	-	45	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	150	-	K/W



10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Notes	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		-	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 7		-	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 7		-	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G+; $T_j = 25\text{ }^\circ\text{C}$; Fig. 7		-	-	10	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		-	-	10	mA
		$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 8		-	-	10	mA
		$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 8		-	-	10	mA
		$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2- G+; $T_j = 25\text{ }^\circ\text{C}$; Fig. 8		-	-	20	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 9		-	-	10	mA
V_T	on-state voltage	$I_T = 1\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 10		-	1.3	1.5	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		-	-	1	V
		$V_D = 400\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 125\text{ }^\circ\text{C}$		0.2	-	-	V
I_D	off-state current	$V_D = 800\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$		-	-	10	μA
		$V_D = 800\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$		-	-	0.5	mA
I_R	reverse current	$V_R = 800\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$		-	-	10	μA
		$V_R = 800\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$		-	-	0.5	mA
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 536\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit		100	-	-	V/ μs
dV_{com}/dt	rate of change of commutating voltage	$V_D = 400\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $dI_{com}/dt = 0.5\text{ A/ms}$; gate open circuit		0.5	-	-	V/ μs

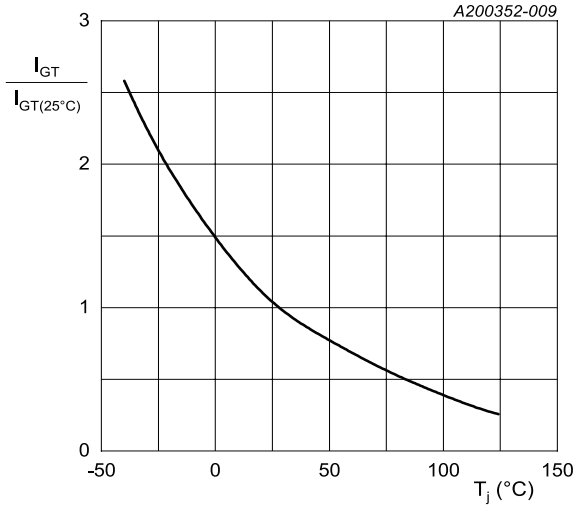


Fig. 7. Normalized gate trigger current as a function of junction temperature

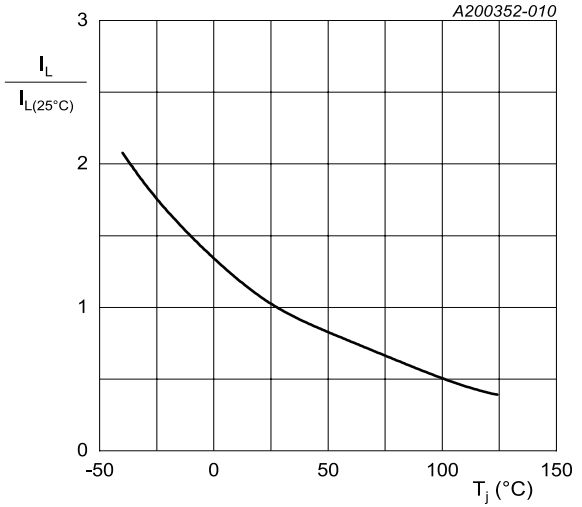


Fig. 8. Normalized latching current as a function of junction temperature

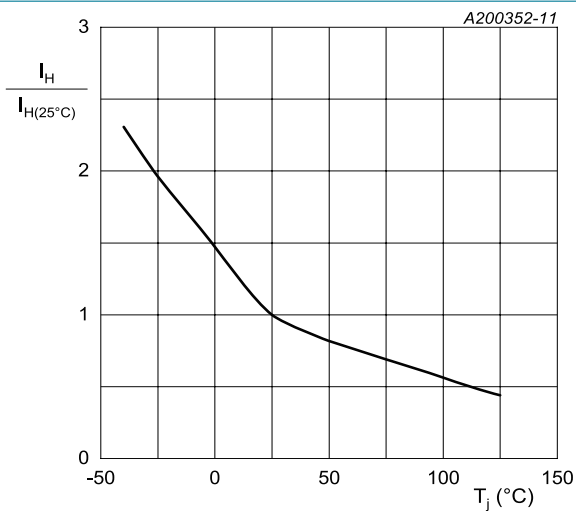
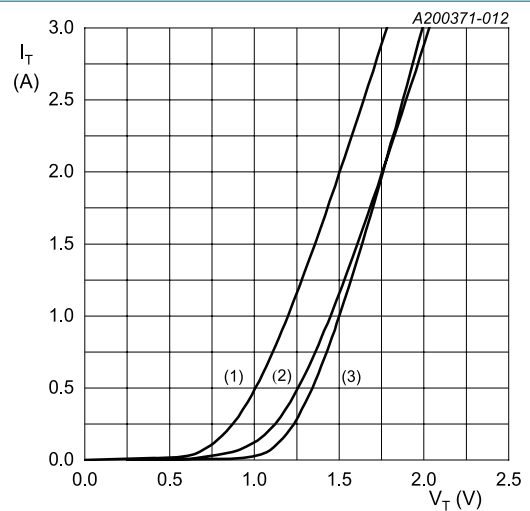


Fig. 9. Normalized holding current as a function of junction temperature



$V_o = 1.246 \text{ V}; R_s = 0.1850 \Omega$
 (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

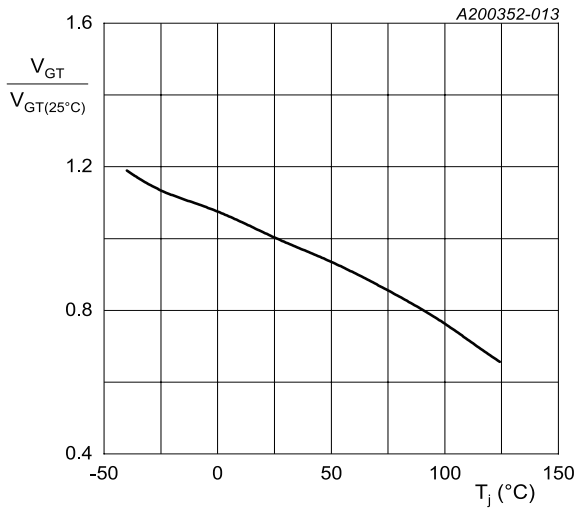
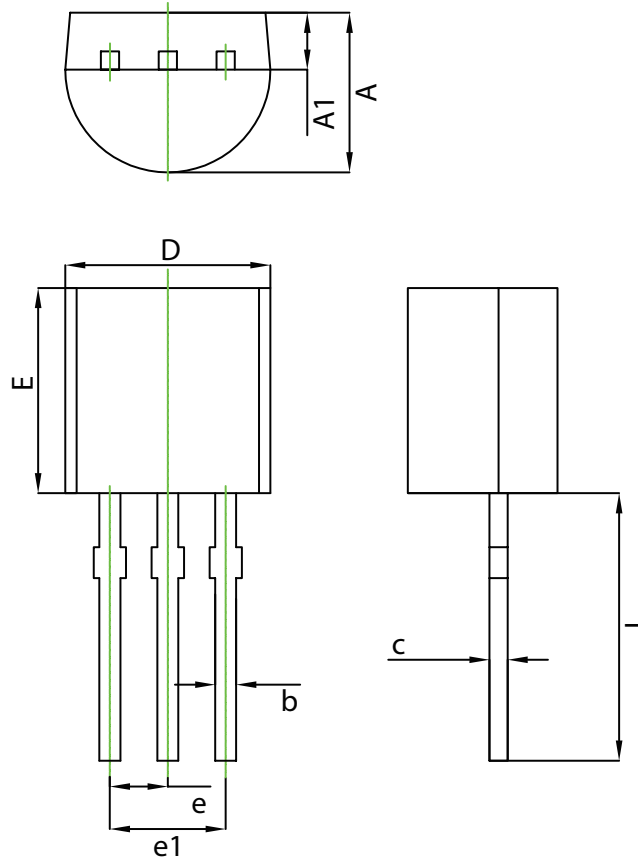


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

11. Package outline

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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 20 June 2025
