BTA301-1000D

3Q Triac

Rev.01 - 13 January 2025 Product data sheet

1. General description

Planar passivated high commutation three quadrant triac in a TO92 plastic package. This "series D" triac balances the requirements of commutation performance and gate sensitivity and is intended for interfacing with low power drivers and logic ICs including microcontrollers.

2. Features and benefits

- 3Q technology for improved noise immunity
- Direct gate triggering from low power drivers and logic ICs
- High commutation capability with very sensitive gate
- High voltage capability
- Planar passivated for voltage ruggedness and reliability
- Triggering in three quadrants only
- Very sensitive gate for easy logic level triggering

3. Applications

- Low power motor controls
- Small inductive loads e.g. solenoids, door locks, water valves
- Small loads in large white goods

4. Quick reference data

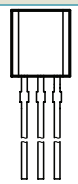
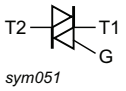
Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V_{DRM}	repetitive peak off-state voltage			1000			V
$I_{T(RMS)}$	RMS on-state current	square-wave pulse; $T_{lead} \leq 50$ °C; Fig. 1; Fig. 2; Fig. 3		1			A
I_{TSM}	non-repetitive peak forward current	full sine wave; $t_p = 20$ ms; $T_{j(init)} = 25$ °C; Fig. 4; Fig. 5		11			A
		full sine wave; $t_p = 16.7$ ms; $T_{j(init)} = 25$ °C		12.1			A
T_j	operating junction temperature			-40 to 125			°C
Static characteristics							
Symbol	**Parameter**	**Conditions**	**Notes**	**Min**	**Typ**	**Max**	**Unit**
I_{GT}	gate trigger current	$V_D = 12$ V; $I_T = 0.1$ A; T2+ G+ $T_j = 25$ °C; Fig. 7		0.25	-	5	mA
		$V_D = 12$ V; $I_T = 0.1$ A; T2+ G- $T_j = 25$ °C; Fig. 7		0.25	-	5	mA
		$V_D = 12$ V; $I_T = 0.1$ A; T2- G- $T_j = 25$ °C; Fig. 7		0.25	-	5	mA
I_H	holding current	$V_D = 12$ V; $T_j = 25$ °C; Fig. 9		-	-	10	mA
V_T	on-state voltage	$I_T = 0.85$ A; $T_j = 25$ °C; Fig. 10		-	1.30	1.60	V

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 670 V; T_j = 125 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		-	150	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 0.8 A; dV_{com}/dt = 10 V/µs; gate open circuit		0.5	-	-	A/ms
		V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 0.8 A; dV_{com}/dt = 1 V/µs; gate open circuit		1	-	-	A/ms

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
BTA301-1000D	TO92	BTA301-1000D,412	Bulk	1000	TO92L	10-May-2021

7. Marking

Table 4. Marking codes

Type number	Marking codes
BTA301-1000D	01-10D

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			1000	V
V_{DRM}	repetitive peak reverse voltage			1000	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{lead} \leq 50°C$; Fig. 1; Fig. 2; Fig. 3		1	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; t_p = 20 ms; $T_{j(init)}$ = 25 °C; Fig. 4; Fig. 5		11	A
		full sine wave; t_p = 16.7 ms; $T_{j(init)}$ = 25 °C		12.1	A
I^2t	I^2t for fusing	t_p = 10ms; sine wave		0.61	A^2/s
dI_T/dt	rate of rise of on-state current	I_G = 20mA		100	A/µs
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

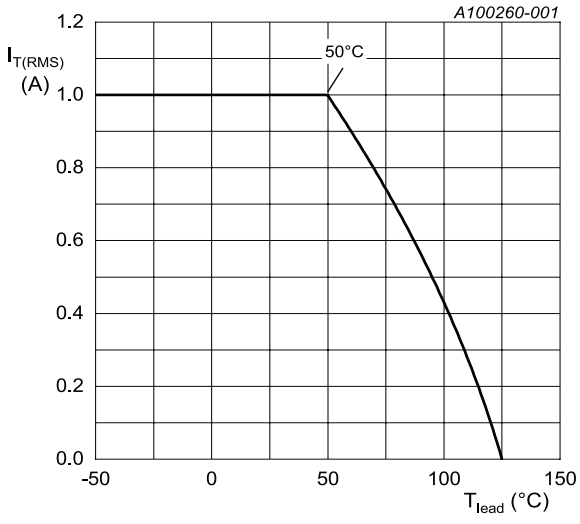
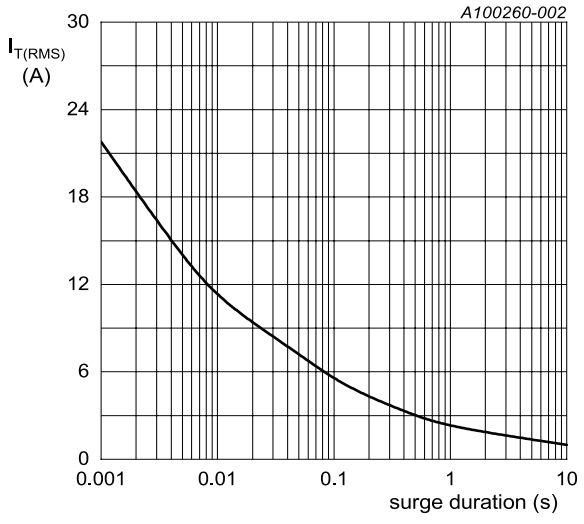
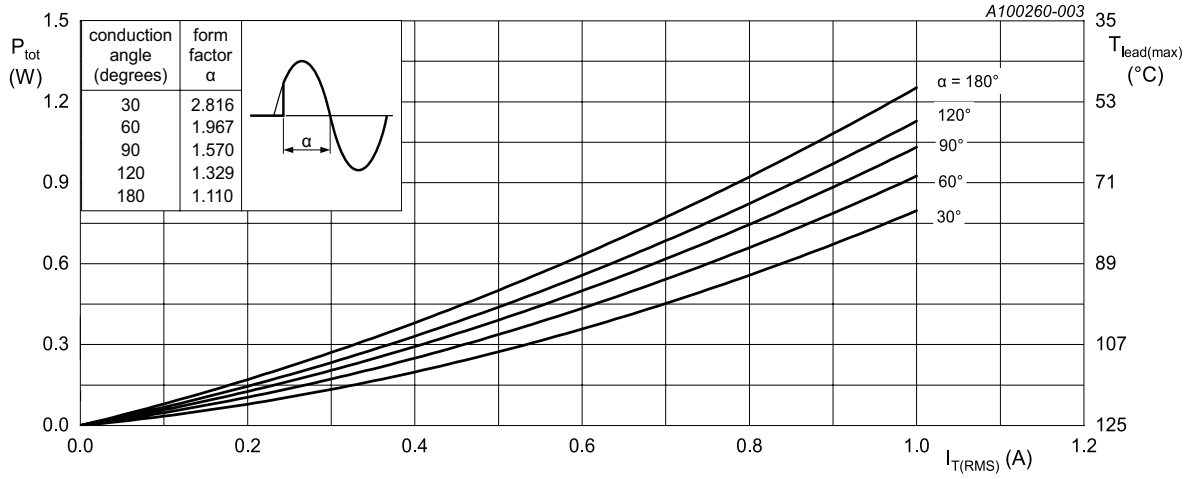


Fig. 1. RMS on-state current as a function of lead temperature; maximum values



f = 50 Hz; T_{lead} = 50 °C

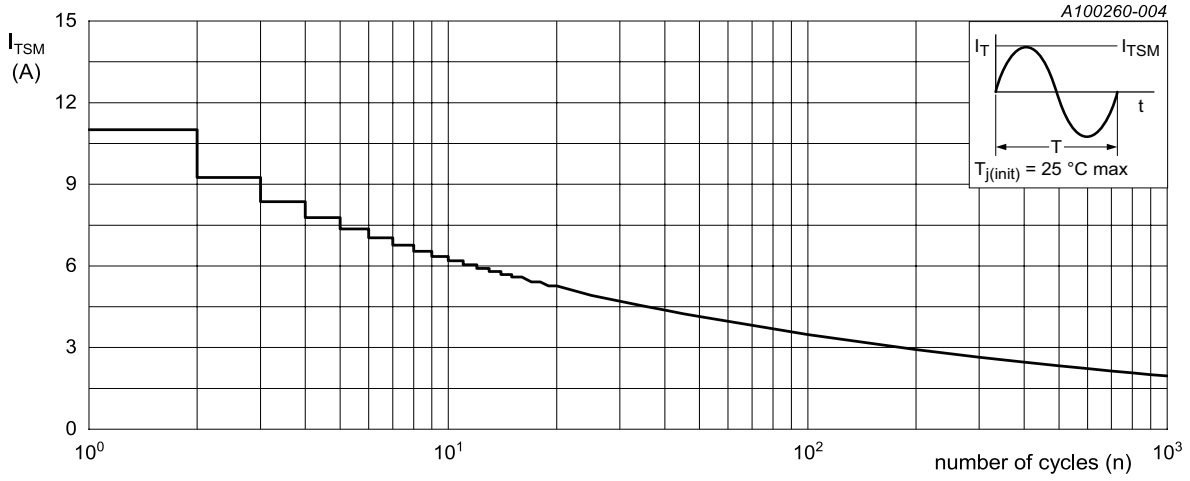
Fig. 2. RMS on-state current as a function of surge duration; maximum values



α = conduction angle

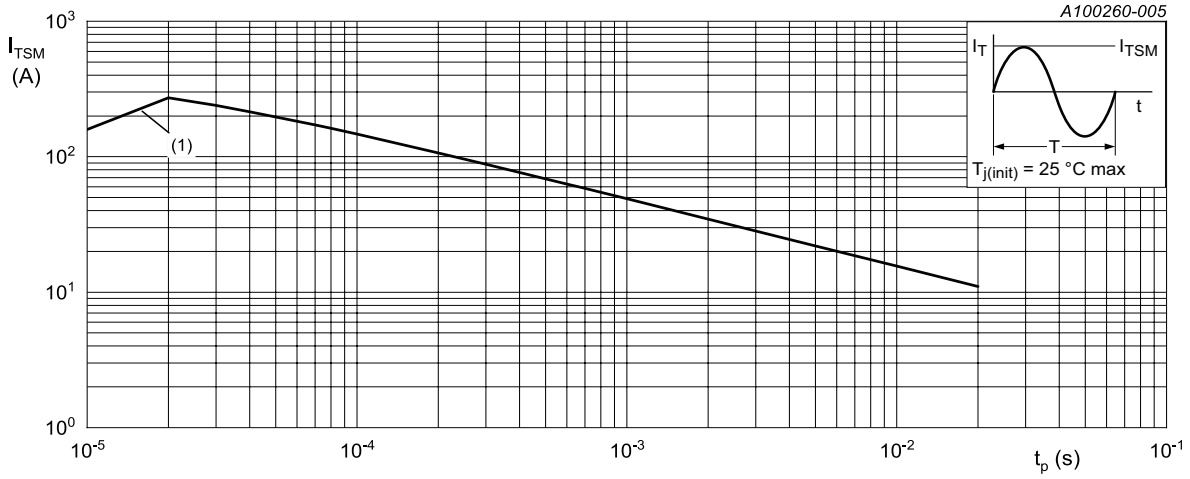
a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

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



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

Fig. 5. Total power dissipation as a function of RMS on-state current; maximum values

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	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	in free air		-	150	-	K/W

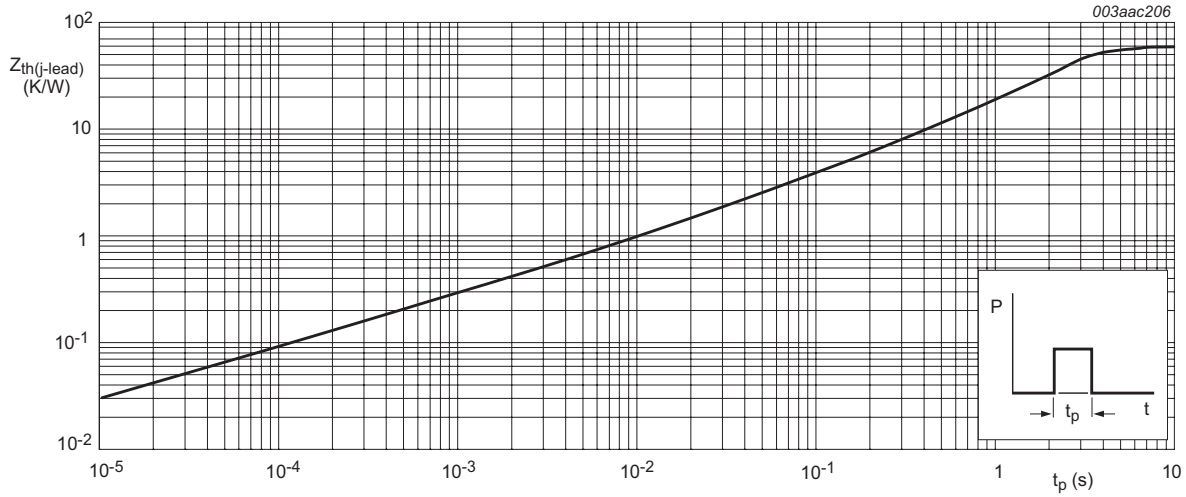
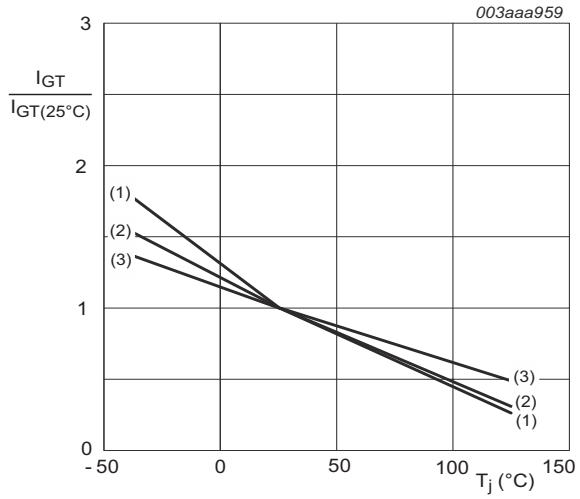


Fig. 6. Transient thermal impedance from junction to lead as a function of pulse duration

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Notes	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		0.25	-	5	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 7		0.25	-	5	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; Fig. 7		0.25	-	5	mA
I_L	latching current	V_D = 12 V; I_T = 0.1 A; T2+ G+; T_j = 25 °C; Fig. 8		-	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 8		-	-	20	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; Fig. 8		-	-	10	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	-	10	mA
V_T	on-state voltage	I_T = 0.85 A; T_j = 25 °C; Fig. 10		-	1.30	1.60	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C; Fig. 11		-	0.85	1.00	V
		V_D = 400 V; I_T = 0.1 A; T_j = 125 °C; Fig. 11		0.2	0.3	-	V
I_D	off-state current	V_D = 1000 V; T_j = 125 °C		-	0.1	0.5	mA
I_R	reverse current	V_R = 1000 V; T_j = 125 °C		-	0.1	0.5	mA
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 670 V; T_j = 125 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		-	150	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 0.8 A; dV_{com}/dt = 10 V/µs; gate open circuit		0.5	-	-	A/ms
		V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 0.8 A; dV_{com}/dt = 1 V/µs; gate open circuit		1	-	-	A/ms



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

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

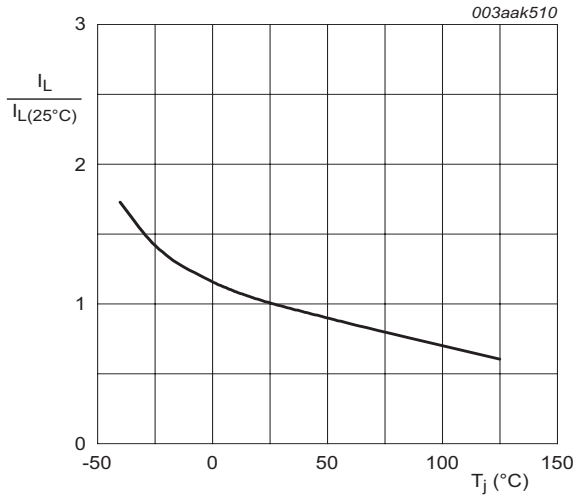


Fig. 8. Normalized latching current as a function of junction temperature

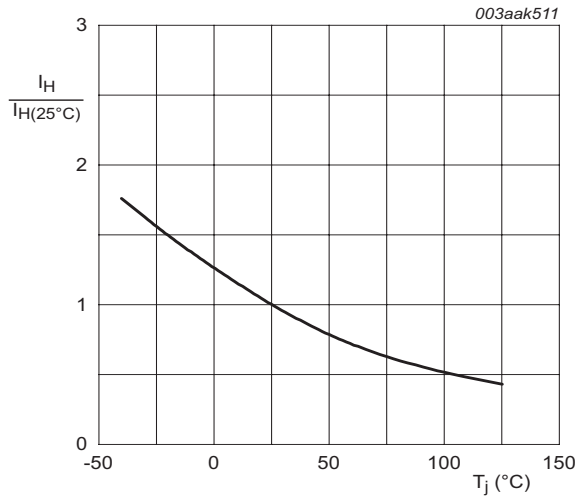
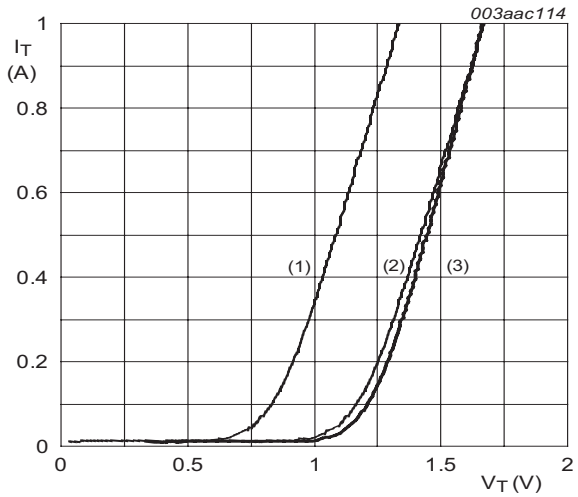


Fig. 9. Normalized holding current as a function of junction temperature



V_o = 0.835 V; R_s = 0.500 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

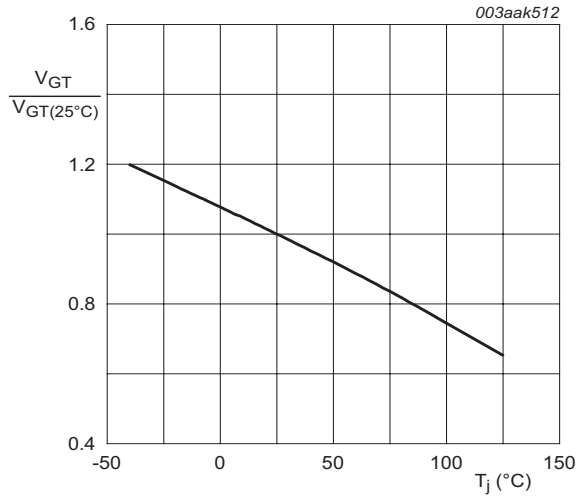
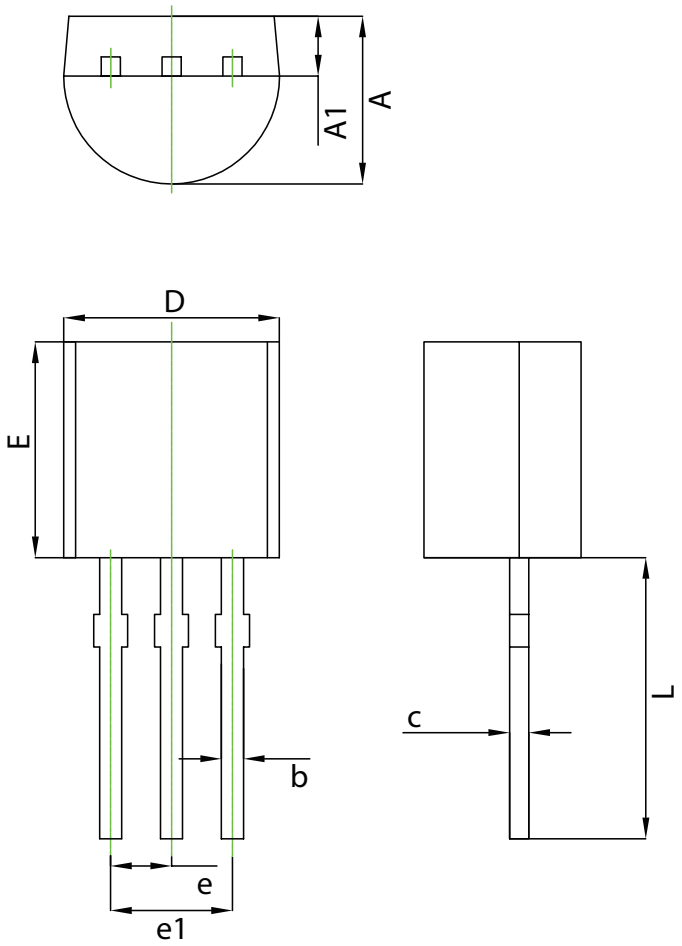


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

11. Package outline

TO92L 412



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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[2] The term 'short data sheet' is explained in section "Definitions".
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13. Contents

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