BTA16-600B

4Q Triac

Rev.01 - 14 June 2018 Product data sheet

1. General description

Planar passivated four quadrant triac in a SOT78D (IITO-220) internally insulated plastic package intended for use in general purpose bidirectional switching and phase control applications.

2. Features and benefits

- High voltage capability
- Least sensitive gate for highest noise immunity
- High junction operating temperature capability ($T_{j(max)}$ = 150 °C)
- High minimum I_{GT} for guaranteed immunity to gate noise
- Planar passivated for voltage ruggedness and reliability
- Triggering in all four quadrants
- Internally insulated package
- Isolated mounting base with 2500 V (RMS) isolation

3. Applications

- Applications subject to high temperature ($T_{j(max)}$ = 150 °C)
- Compressor starting control circuits
- General purpose motor controls
- General purpose switching

4. Quick reference data

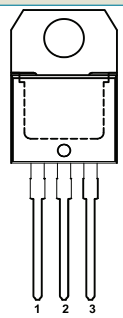
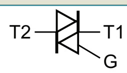
Table 1. Quick reference data

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_{mb} ≤ 112 °C; Fig. 1; Fig. 2; Fig. 3	16	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	160	A
		full sine wave; t_p = 16.7 ms; $T_{j(init)}$ = 25 °C	176	A
T_j	junction temperature		150	°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		10	-	50	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G- T_j = 25 °C; Fig. 7		10	-	50	mA
		V_D = 12 V; I_T = 0.1 A; T2- G- T_j = 25 °C; Fig. 7		10	-	50	mA
		V_D = 12 V; I_T = 0.1 A; T2- G+ T_j = 25 °C; Fig. 7		10	-	70	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	-	60	mA
V_T	on-state voltage	I_T = 20 A; T_j = 25 °C; Fig. 10		-	1.22	1.5	V
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 402 V; T_j = 125 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		500	-	-	V/µs
		V_{DM} = 402 V; T_j = 150 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		400	-	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; T_j = 150 °C; $I_{T(RMS)}$ = 16 A; dV_{com}/dt = 20 V/µs; gate open circuit; snubberless condition		2	-	-	A/ms

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1	 IITO-220 (SOT78D)	 sym051
2	T2	main terminal 2		
3	G	gate		
mb	n.c	mounting base; isolated		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BTA16-600B	IITO-220	Plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3 leads TO-220	IITO-220E

7. Marking

Table 4. Marking codes

Type number	Marking codes
BTA16-600B	BTA16-600B

8. Limiting values

Table 4. Limiting values

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

Symbol	Parameter	Conditions	Values	Unit
V_{DRM}	repetitive peak off-state voltage		600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 112°C$; Fig. 1; Fig. 2; Fig. 3	16	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	160	A
		full sine wave; t_p = 16.7 ms; $T_{j(init)}$ = 25 °C	176	A
I^2t	I^2t for fusing	t_p = 10ms; sine wave	128	A^2s
dI_T/dt	rate of rise of on-state current	I_G = 150mA	50	A/µs
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	0.5	W
T_{stg}	storage temperature		-40 to 150	°C
T_j	junction temperature		150	°C

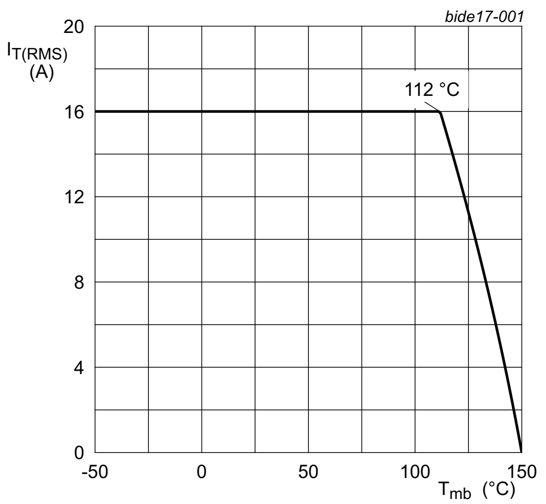
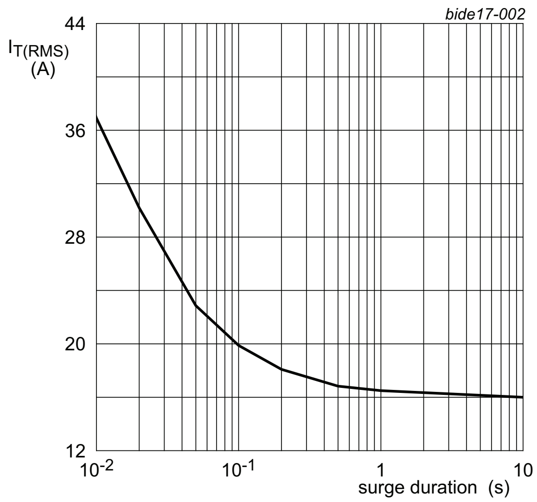
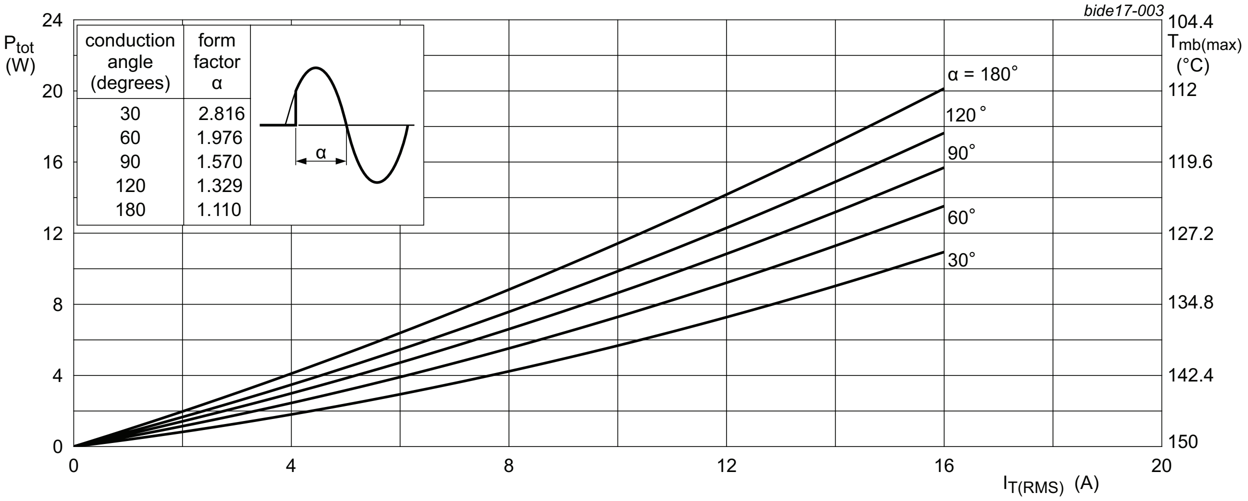


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values



f = 50 Hz; T_{mb} = 112 °C

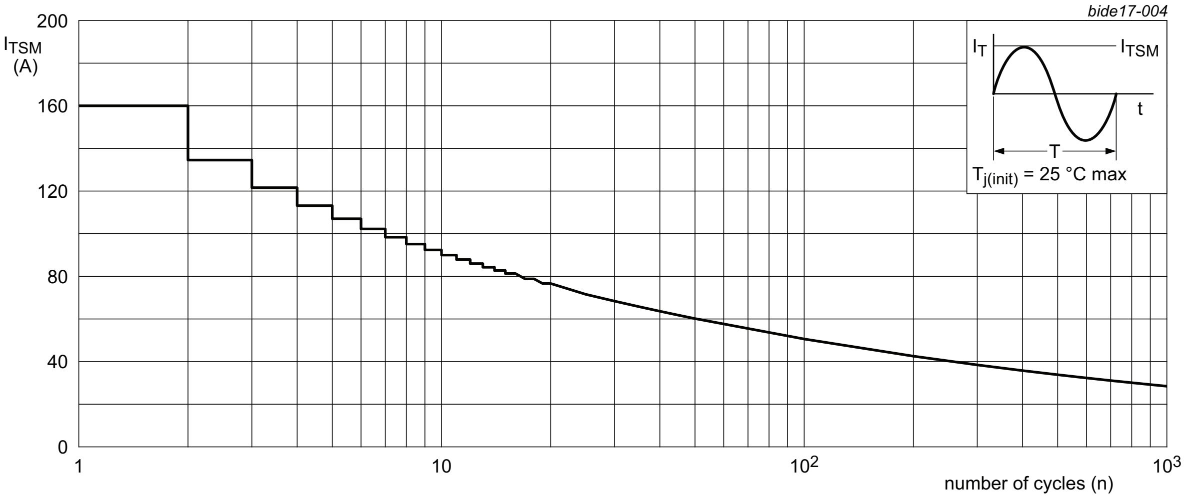
Fig. 2. RMS on-state current as a function of surge duration; maximum values



α = conduction angle

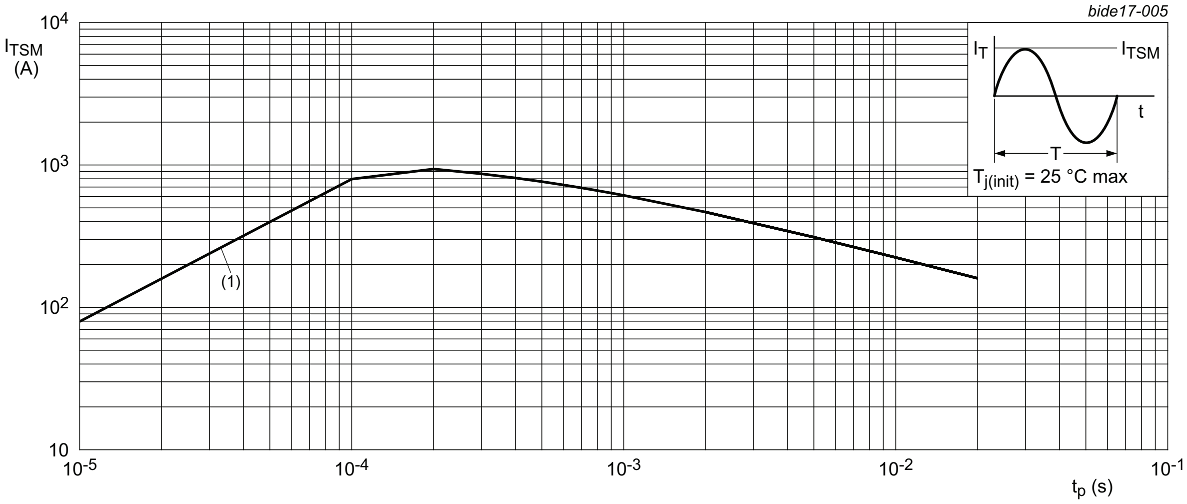
a = form factor = $I_{T(RMS)} / I_{T(AV)}$

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 5. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	Fig. 6		-	-	1.9	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

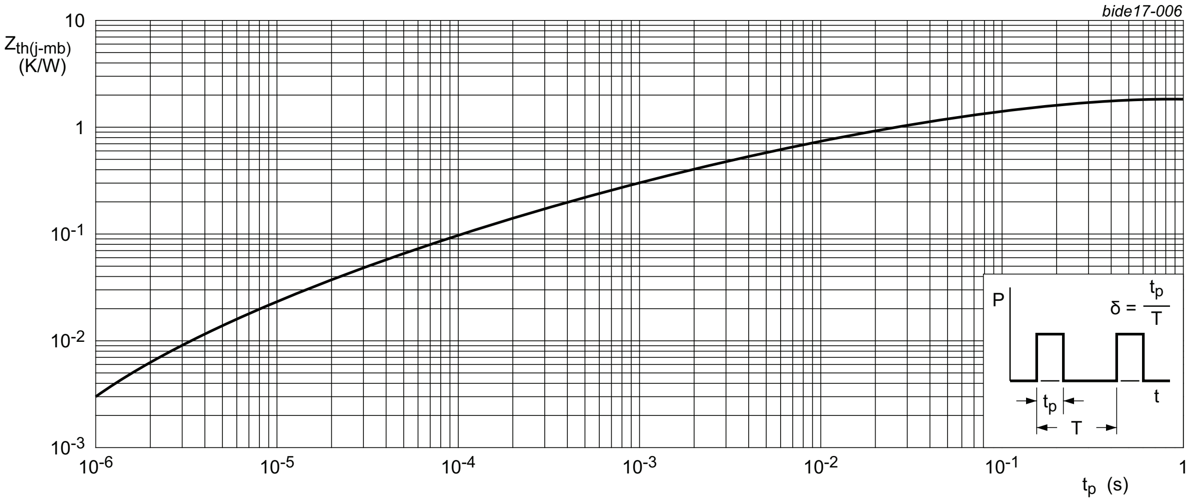


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Isolation characteristics

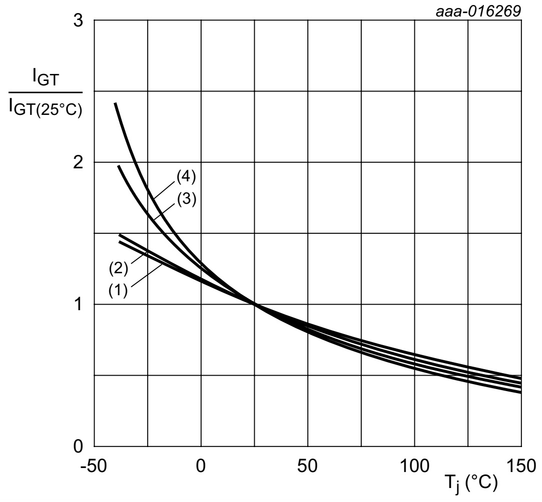
Table 6. Isolation characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{isol(RMS)}$	RMS isolation voltage	50 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; from all pins to external heatsink; sinusoidal waveform; clean and dust free		-	-	2500	V
C_{isol}	isolation capacitance	from cathode to external heatsink		-	10	-	PF

11. Characteristics

Table 7. Characteristics

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		10	-	50	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 7		10	-	50	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; Fig. 7		10	-	50	mA
		V_D = 12 V; I_T = 0.1 A; T2- G+; T_j = 25 °C; Fig. 7		10	-	70	mA
I_L	latching current	V_D = 12 V; I_T = 0.1 A; T2+ G+; T_j = 25 °C; Fig. 8		-	-	60	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 8		-	-	90	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; Fig. 8		-	-	60	mA
		V_D = 12 V; I_T = 0.1 A; T2- G+; T_j = 25 °C; Fig. 8		-	-	90	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	-	60	mA
V_T	on-state voltage	I_T = 20 A; T_j = 25 °C; Fig. 10		-	1.22	1.5	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C; Fig. 11		-	0.7	1	V
		V_D = 400 V; I_T = 0.1 A; T_j = 150 °C; Fig. 11		0.25	0.4	-	V
I_D	off-state current	V_D = 600 V; T_j = 25 °C		-	-	5	µA
		V_D = 600 V; T_j = 150 °C		-	0.4	2	mA
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 402 V; T_j = 125 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		500	-	-	V/µs
		V_{DM} = 402 V; T_j = 150 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		400	-	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; T_j = 150 °C; $I_{T(RMS)}$ = 16 A; dV_{com}/dt = 20 V/µs; gate open circuit; snubberless condition		2	-	-	A/ms



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

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

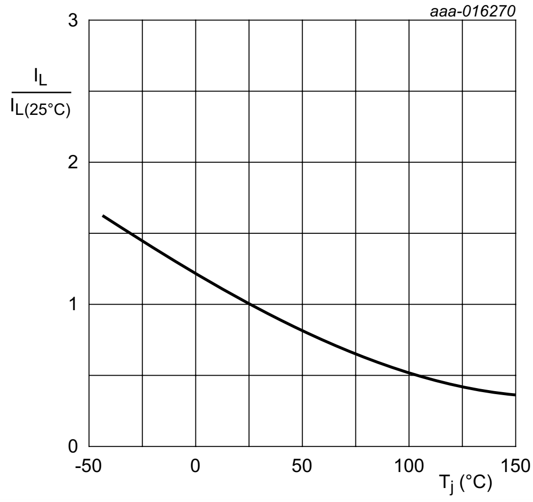


Fig. 8. Normalized latching current as a function of junction temperature

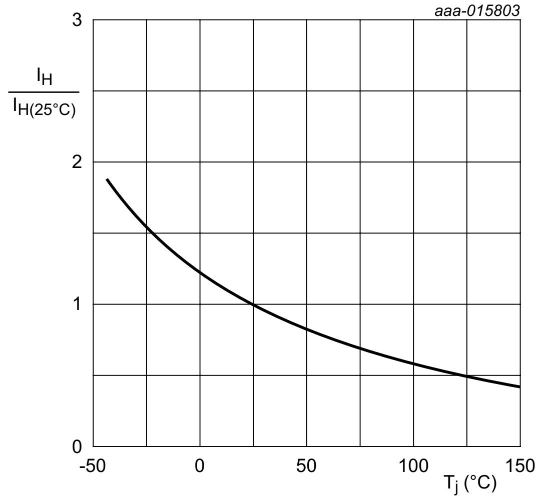
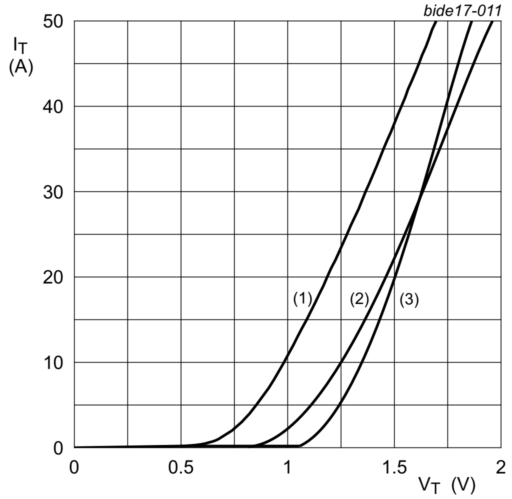


Fig. 9. Normalized holding current as a function of junction temperature



V_o = 1.053 V; R_s = 0.0194 Ω
(1) T_j = 150 °C; typical values
(2) T_j = 150 °C; maximum values
(3) T_j = 25 °C; maximum values

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

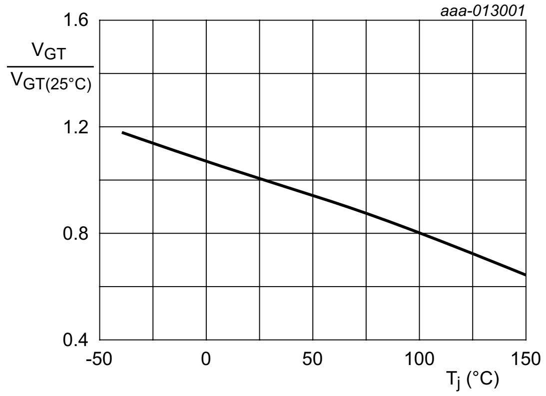
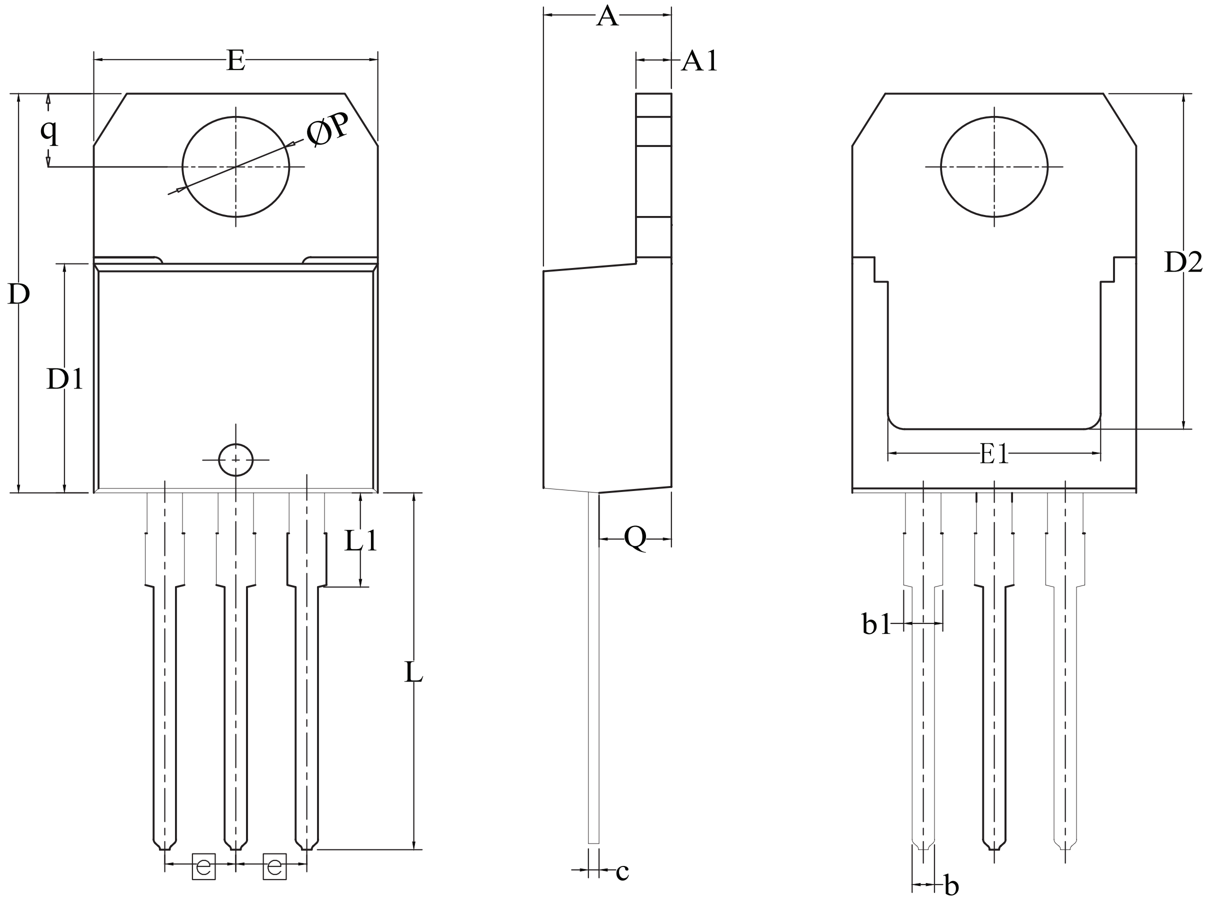


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

12. Package outline

Plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3 leads TO-220 IITO220



Unit		A	A1	b	b1	c	D	D1	D2	E	E1	e	L	L1	P	Q	q
MM	min	4.30	1.25	0.69	1.20	0.40	15.20	8.50	12.20	10.00	6.86	2.54 (BSC)	12.80	2.70	3.70	2.40	2.70
	max	4.70	1.40	0.90	1.72	0.60	16.00	9.02	12.88	10.40	8.89		14.00	3.30	3.95	2.80	3.00

13. 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.
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