BTA416B-800BT

3Q Hi-Com Triac

Rev.01 - 28 June 2023 Product data sheet

1. General description

Planar passivated high commutation three quadrant triac in a TO263 (D2PAK) surface mountable plastic package intended for use in circuits where high static and dynamic dV/dt and high dI/dt can occur. This "series B" triac will commutate the full RMS current at the maximum rated junction temperature without the aid of a snubber. This device has high T_j operating capability.

2. Features and benefits

- 3Q technology for improved noise immunity
- High commutation capability with maximum false trigger immunity
- High immunity to false turn-on by dV/dt
- High surge capability
- High $T_{j(max)}$
- Least sensitive gate for highest noise immunity
- Surface mountable plastic package
- Planar passivated for voltage ruggedness and reliability

3. Applications

- Electronic thermostats (heating and cooling)
- High power motor controls
- Rectifier-fed DC inductive loads e.g. DC motors and solenoids

4. Quick reference data

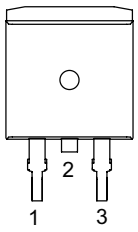
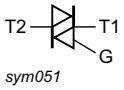
Table 1. Quick reference data

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; $T_{mb} \leq 139$ °C; Fig. 1; Fig. 2; Fig. 3		16			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		160			A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms		176			A
T_j	junction temperature			150			°C
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		2	-	50	mA
		$V_D = 12$ V; $I_T = 0.1$ A; T2+ G-; $T_j = 25$ °C; Fig. 7		2	-	50	mA
		$V_D = 12$ V; $I_T = 0.1$ A; T2- G-; $T_j = 25$ °C; Fig. 7		2	-	50	mA

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
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		-	1.20	1.45	V
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 536 V; T_j = 125 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		1000	-	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 16 A; dV_{com}/dt = 20 V/µs; (snubberless condition); gate open circuit		15	-	-	A/ms

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1		
2	T2	main terminal 2		
3	G	gate		
mb	T2	mounting base; main terminal 2		

6. Ordering information

Table 3. Ordering information

Type number	Package name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
BTA416B-800BT	TO263	BTA416B-800BTJ	Reel	800	TO263d	17-Mar-2023

7. Marking

Table 4. Marking codes

Type number	Marking codes
BTA416B-800BT	BTA416B 800BT

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
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 139$ °C; Fig 1; Fig 2; Fig 3		16	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		160	A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms		176	A
I^2t	I^2t for fusing	$t_p = 10$ ms; SIN		128	A^2s
dI_T/dt	rate of rise of on-state current	$I_G = 0.2$ A		100	A/µs
I_{GM}	peak gate current			4	A
P_{GM}	peak gate power			5	W
$P_{G(AV)}$	average gate power	over any 20 ms period		1	W
T_{stg}	storage temperature			-40 to 150	°C
T_j	junction temperature			150	°C

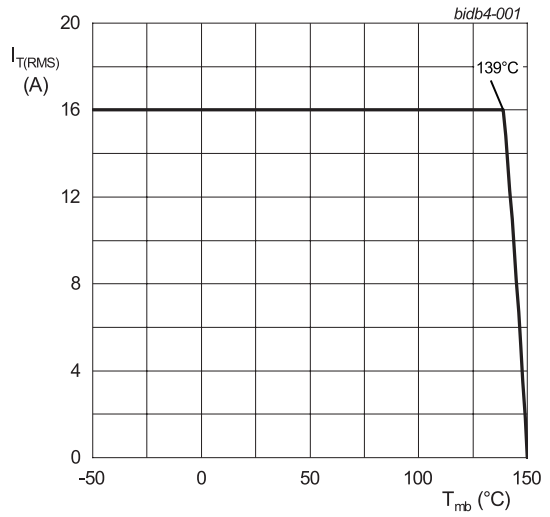
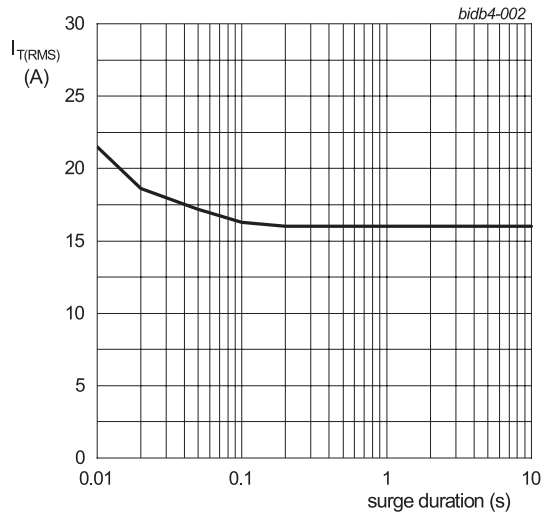
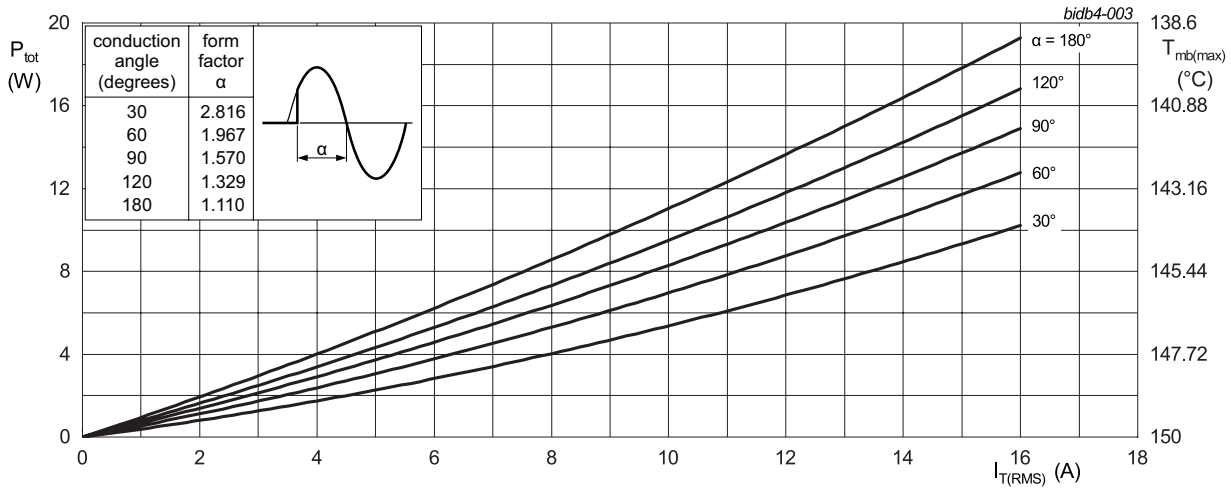


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values



f = 50 Hz; T_{mb} = 139 °C

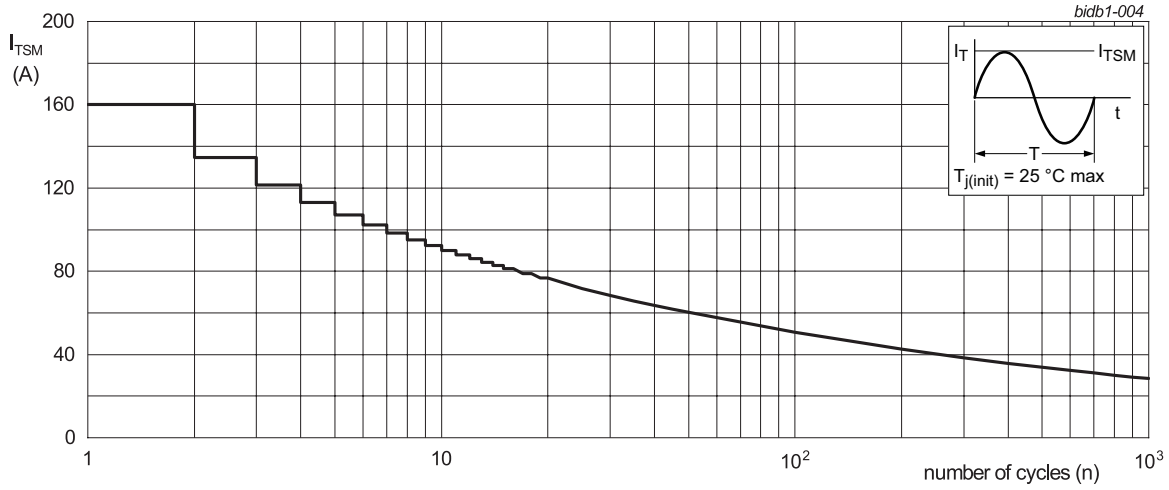
Fig. 2. RMS on-state current as a function of surge duration; maximum values



α = conduction angle

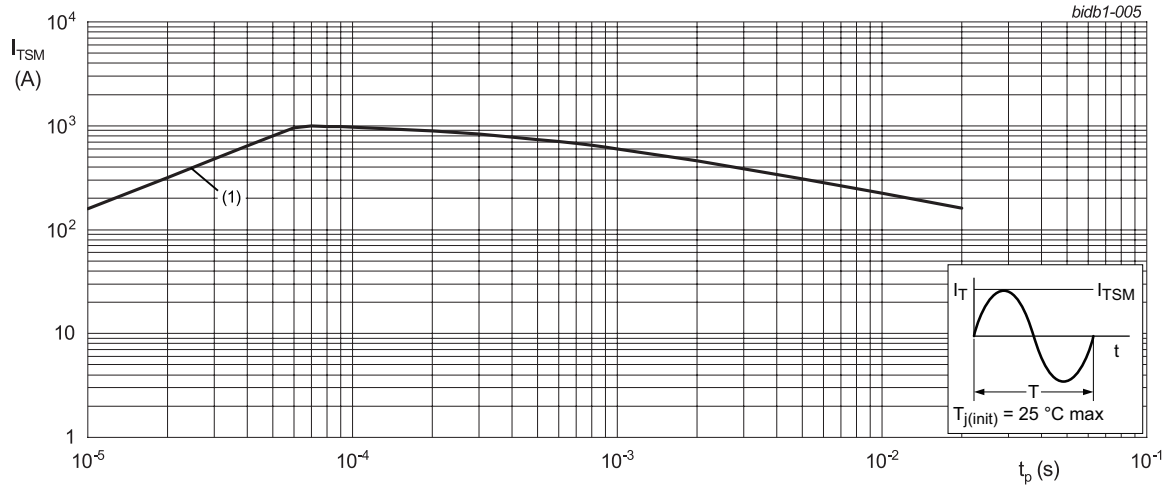
a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

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

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	full cycle; Fig. 6		-	-	0.57	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	55	-	K/W

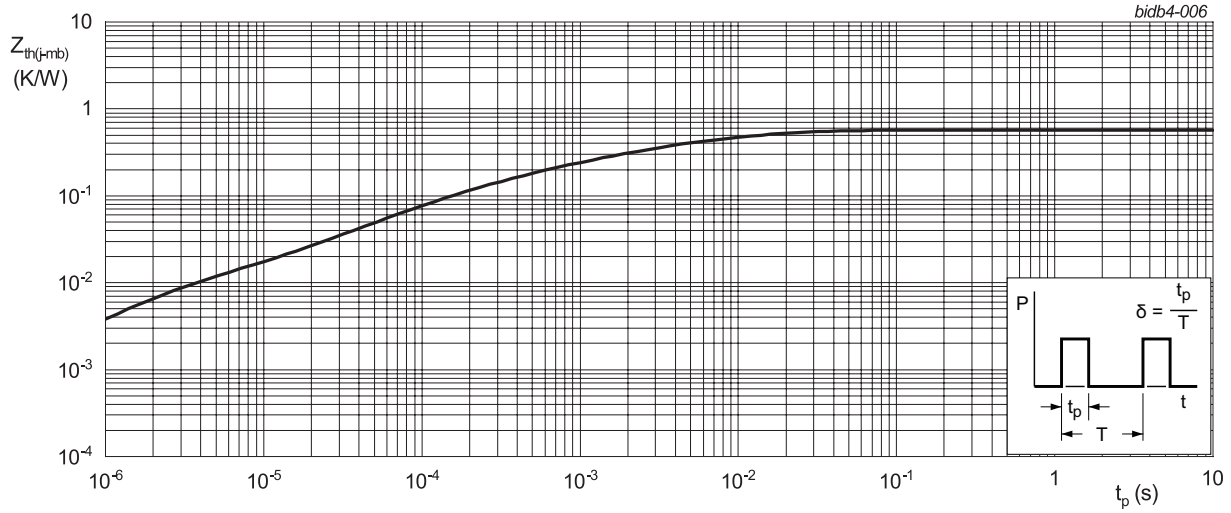
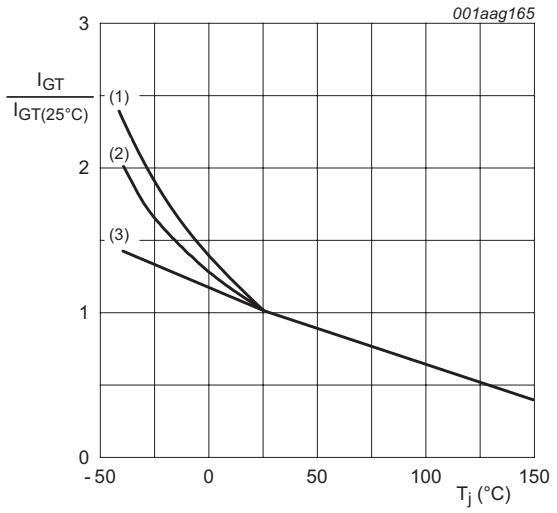


Fig. 6. Transient thermal impedance from junction to moungting base as a function of pulse duration

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		2	-	50	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 7		2	-	50	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; Fig. 7		2	-	50	mA
I_L	latching current	V_D = 12 V; I_G = 0.1 A; T2+ G+; T_j = 25 °C; Fig. 8		-	-	60	mA
		V_D = 12 V; I_G = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 8		-	-	90	mA
		V_D = 12 V; I_G = 0.1 A; T2- G-; T_j = 25 °C; Fig. 8		-	-	60	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		-	1.20	1.45	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		0.25	0.4	-	V
I_D	off-state current	V_D = 800 V; T_j = 25 °C		-	-	5	µA
		V_D = 800 V; T_j = 150 °C		-	-	2	mA
I_R	reverse current	V_D = 800 V; T_j = 25 °C		-	-	5	µA
		V_D = 800 V; T_j = 150 °C		-	-	2	mA
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 536 V; T_j = 125 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		1000	-	-	V/µs
		V_{DM} = 536 V; T_j = 150 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; (snubberless condition); gate open circuit		600	-	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 16 A; dV_{com}/dt = 20 V/µs; (snubberless condition); gate open circuit		15	-	-	A/ms
		V_D = 400 V; T_j = 150 °C; $I_{T(RMS)}$ = 16 A; dV_{com}/dt = 20 V/µs; (snubberless condition); gate open circuit		6	-	-	A/ms



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

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

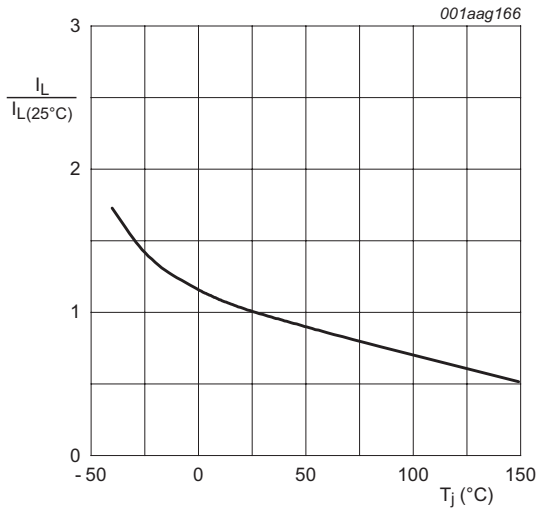


Fig. 8. Normalized latching current as a function of junction temperature

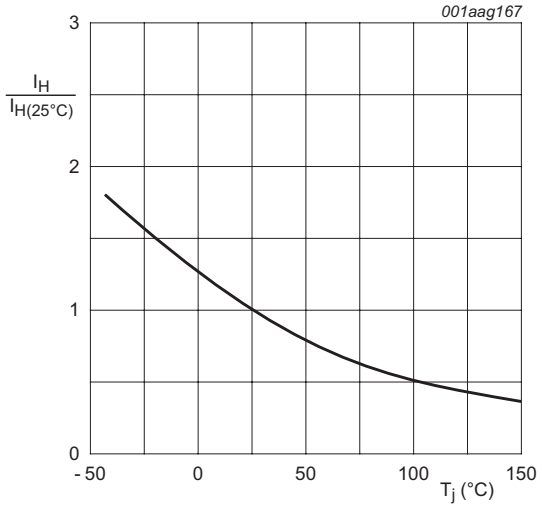
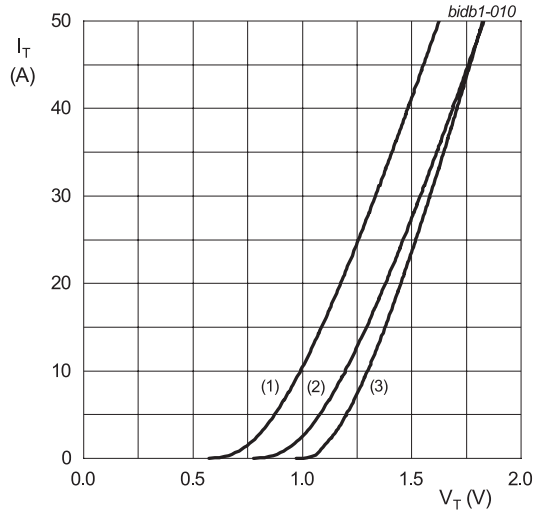


Fig. 9. Normalized holding current as a function of junction temperature



V_o = 1.038 V; R_s = 0.0169 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

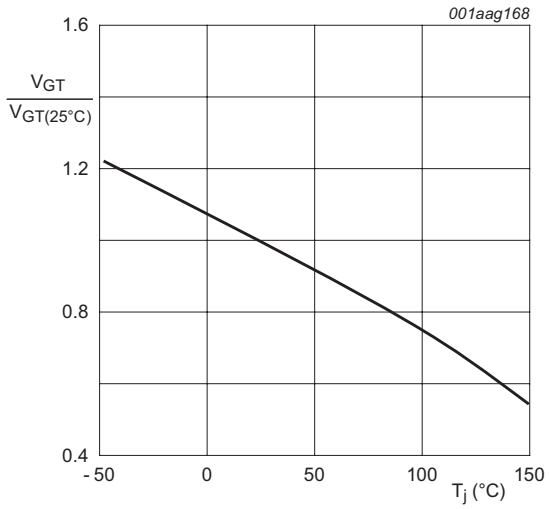
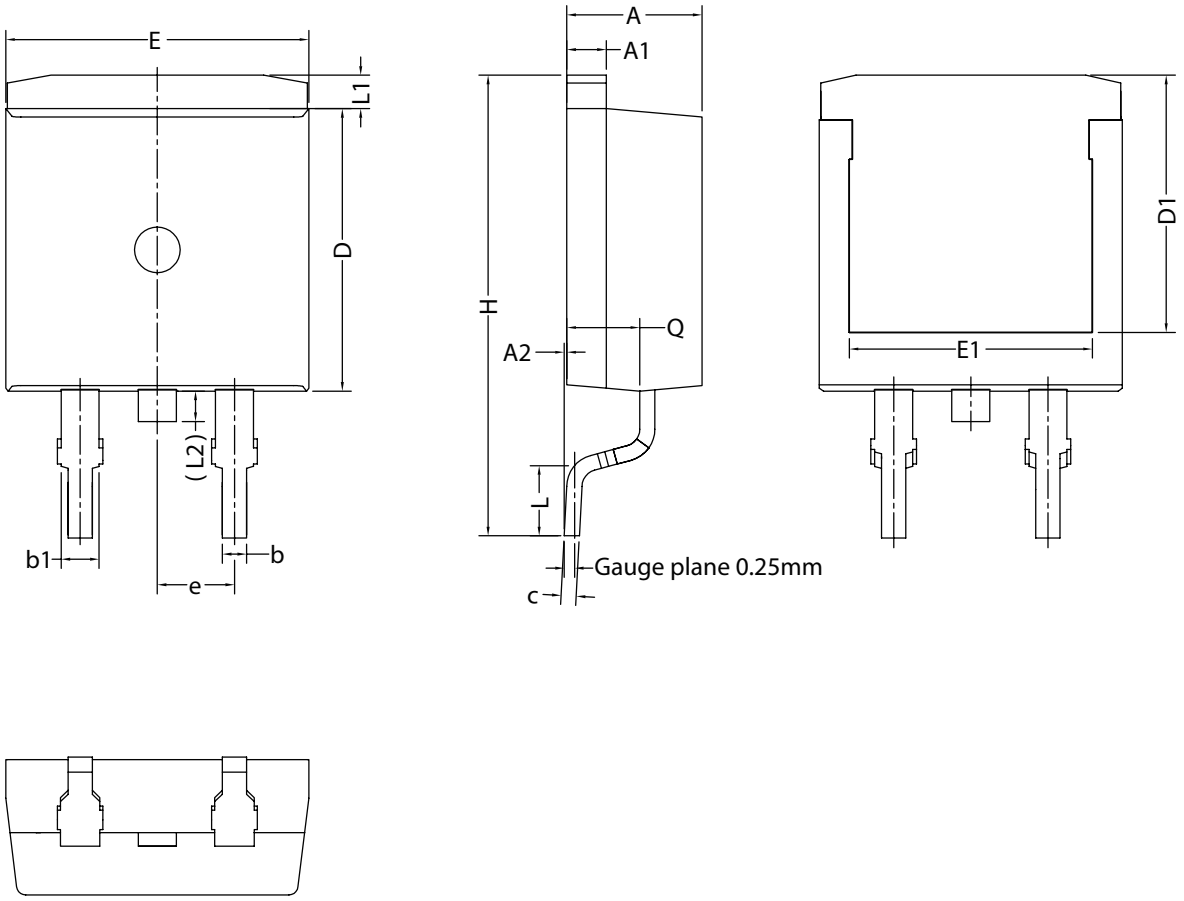


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

11. Package outline

Plastic single-ended surface-mounted package (D2PAK); TO263



Note:
All dimensions do not include mold flash or protrusion.

Unit		A	A1	A2	b	b1	c	D	D1	e	E	E1	H	L	L1	L2	Q
MM	min	4.30	1.27	0.00	0.75	1.20	0.45	9.00	7.65	2.54 (BSC)	9.85	7.80	14.84	1.90	0.90	--	2.20
	max	4.60	1.37	0.25	0.90	1.36	0.60	9.45	8.05		10.10	8.20	15.64	2.60	1.35	1.50	2.40

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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.
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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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