BTA316B-800E

3Q Hi-Com Triac

Rev.03 - 03 January 2024 Product data sheet

1. General description

Planar passivated high commutation three quadrant triac in a TO263(D2PAK) plastic package. This "series E" triac balances the requirements of commutation performance and gate sensitivity. The "sensitive gate" "series E" is intended for interfacing with low power drivers including microcontrollers.

2. Features and benefits

- 3Q technology for improved noise immunity
- Direct interfacing with low power drivers and microcontrollers
- Good immunity to false turn-on by dV/dt
- High commutation capability with sensitive gate
- High voltage capability
- Planar passivated for voltage ruggedness and reliability
- Surface mountable package
- Triggering in three quadrants only

3. Applications

- Electronic thermostats (heating and cooling)
- High power motor controls e.g. washing machines and vacuum cleaners

4. Quick reference data

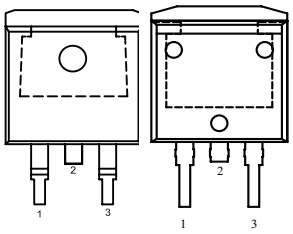
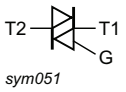
Table 1. Quick reference data

Symbol	Parameter	Conditions	Values				Unit
Absolute maximum rating							
V_{DRM}	repetitive peak off-state voltage		800				V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 101$ °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	140				A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms	150				A
T_j	junction temperature		125				°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		-	-	10	mA
		$V_D = 12$ V; $I_T = 0.1$ A; T2+ G-; $T_j = 25$ °C; Fig. 7		-	-	10	mA

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		-	-	10	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	-	25	mA
V_T	on-state voltage	I_T = 18 A; T_j = 25 °C; Fig. 10		-	1.3	1.5	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		60	-	-	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		5	-	-	A/ms
		V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 16 A; dV_{com}/dt = 10 V/µs; gate open circuit		8	-	-	A/ms
		V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 16 A; dV_{com}/dt = 1 V/µs; gate open circuit		12	-	-	A/ms

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1	 N P	 sym051
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
BTA316B-800E	TO263	BTA316B-800E,118	Reel	800	TO263N (N)	26-Sep-2016
					TO263P (P)	12-Jun-2023

7. Marking

Table 4. Marking codes

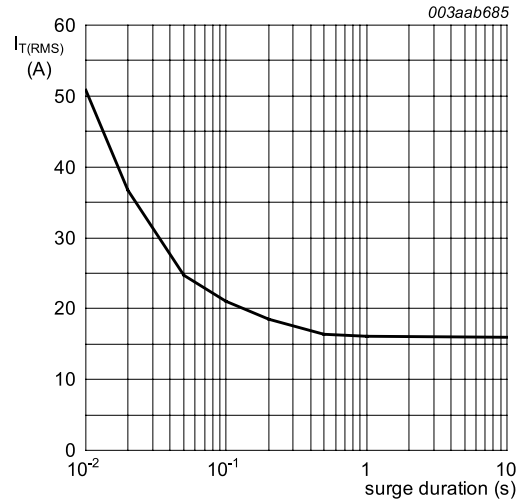
Type number	Marking codes	
	Assembly factory: N	Assembly factory: P
BTA316B-800E	BTA316B 800E PJNxxxx xx	BTA316B 800E PJPxxxx xx

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		800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 101$ °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	140	A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms	150	A
I^2t	I^2t for fusing	$t_P = 10$ ms; SIN	98	A^2s
dI_T/dt	rate of rise of on-state current	$I_G = 20$ mA	100	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		125	°C



f = 50 Hz; T_{mb} = 101 °C

Fig. 1. RMS on-state current as a function of surge duration; maximum values

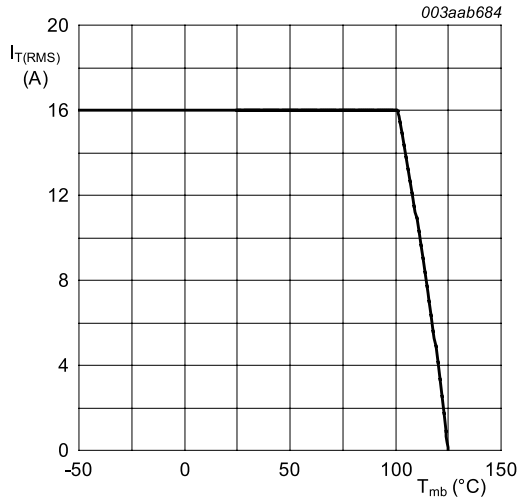
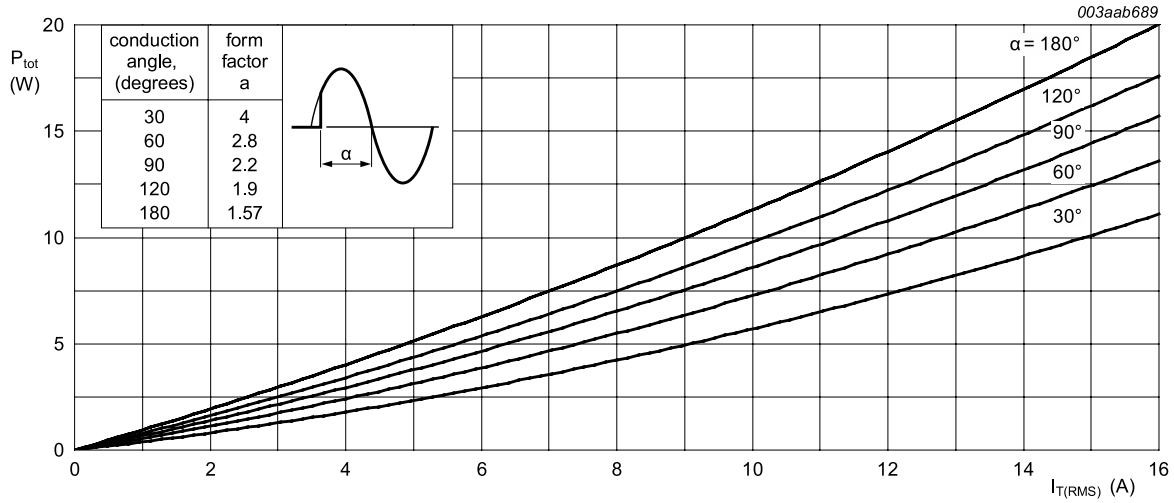


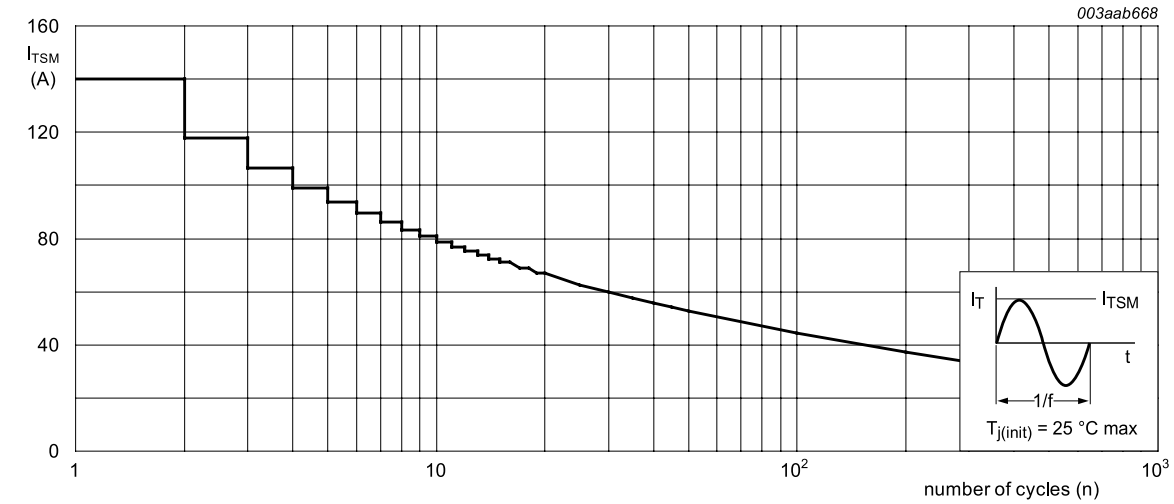
Fig. 2. RMS on-state current as a function of mounting base temperature; maximum values



α = conduction angle

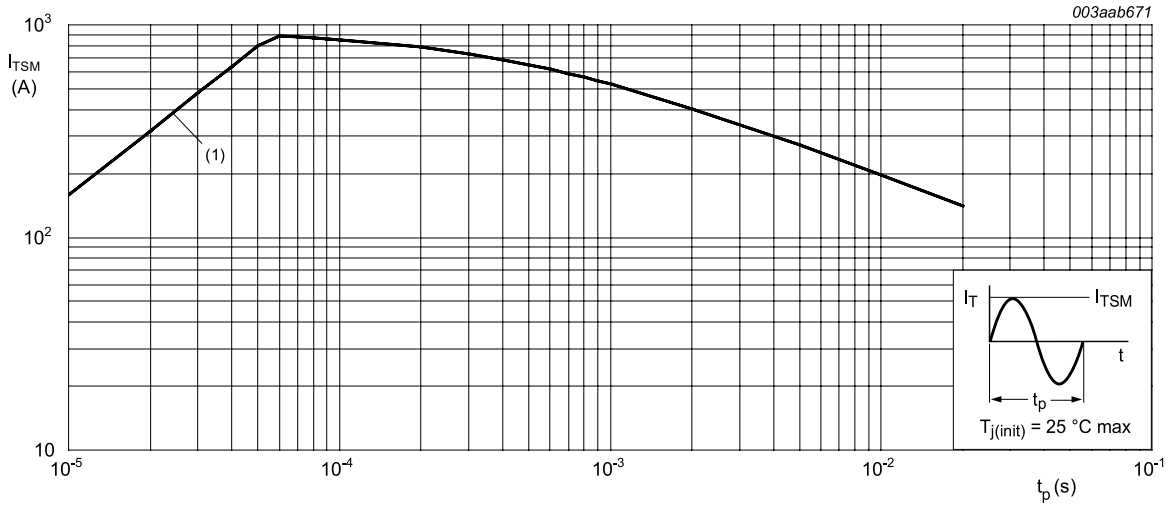
a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

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

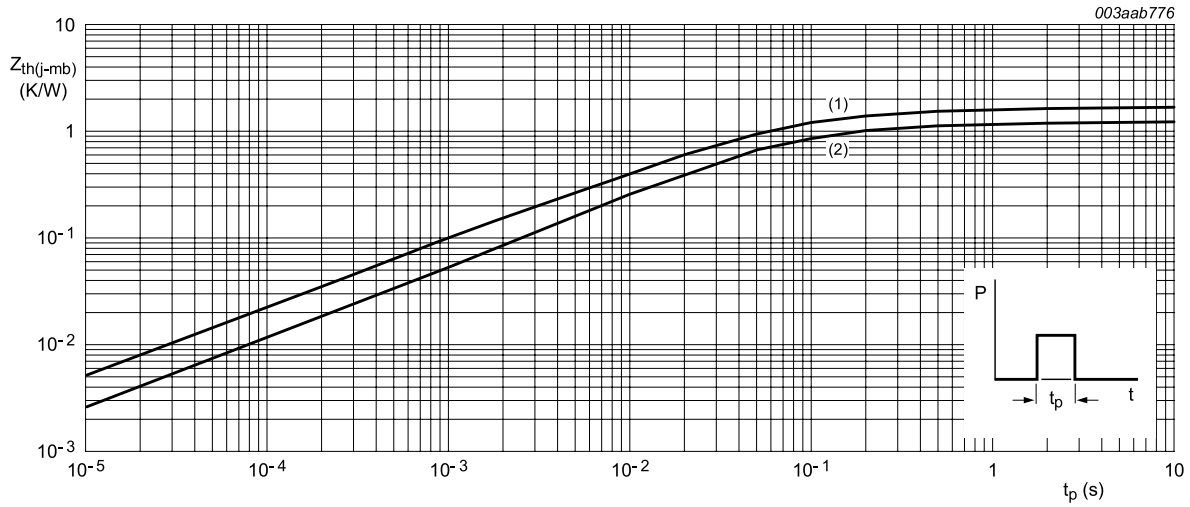
(1) dI_T/dt limit

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		-	-	1.2	K/W
		half cycle; Fig 6		-	-	1.7	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	printed circuit board mounted; minimum footprint		-	55	-	K/W



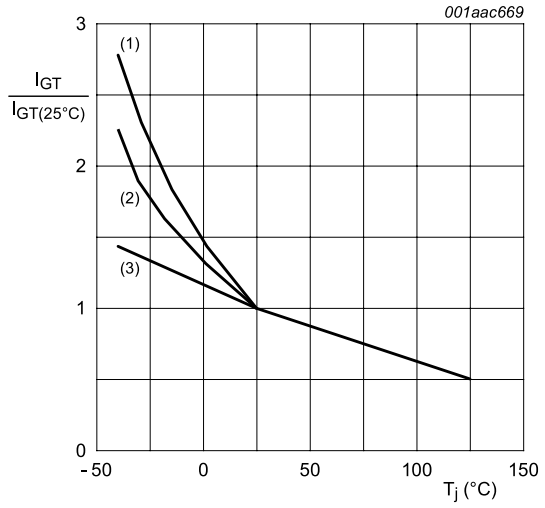
(1) Unidirectional (half cycle)
(2) Bidirectional (full cycle)

Fig. 6. Transient thermal impedance from junction to mounting 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		-	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 7		-	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; Fig. 7		-	-	10	mA
I_L	latching current	V_D = 12 V; I_G = 0.1 A; T2+ G+; T_j = 25 °C; Fig. 8		-	-	25	mA
		V_D = 12 V; I_G = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 8		-	-	30	mA
		V_D = 12 V; I_G = 0.1 A; T2- G-; T_j = 25 °C; Fig. 8		-	-	30	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	-	25	mA
V_T	on-state voltage	I_T = 18 A; T_j = 25 °C; Fig. 10		-	1.3	1.5	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C; Fig. 11		-	0.8	1	V
		V_D = 400 V; I_T = 0.1 A; T_j = 125 °C		0.25	0.4	-	V
I_D	off-state current	V_D = 800 V; T_j = 125 °C		-	0.1	0.5	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		60	-	-	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		5	-	-	A/ms
		V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 16 A; dV_{com}/dt = 10 V/µs; gate open circuit		8	-	-	A/ms
		V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 16 A; dV_{com}/dt = 1 V/µs; gate open circuit		12	-	-	A/ms



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

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

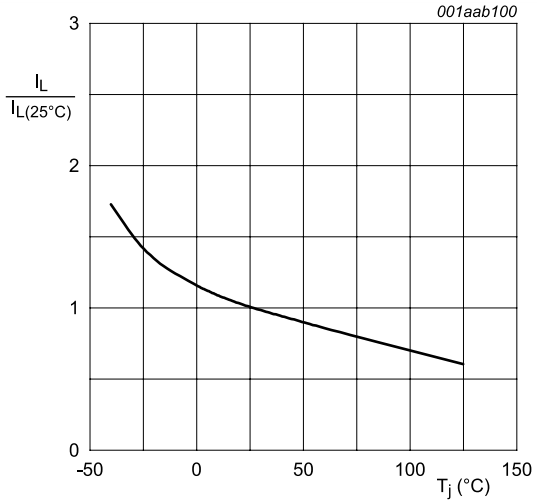


Fig. 8. Normalized latching current as a function of junction temperature

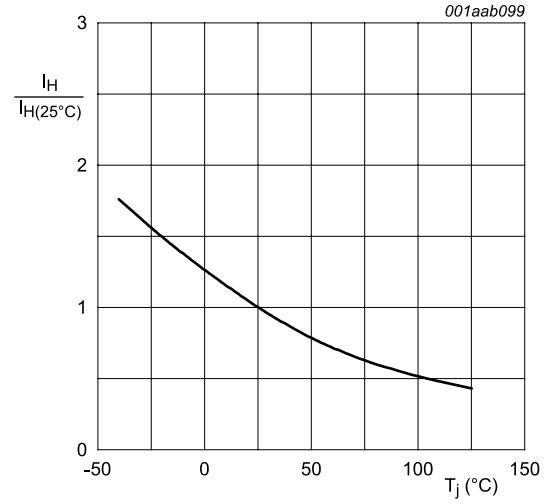
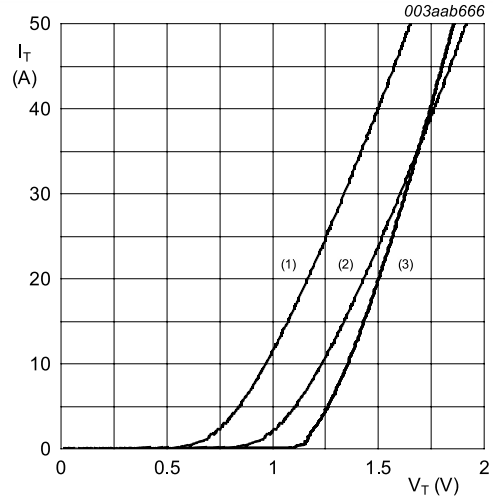


Fig. 9. Normalized holding current as a function of junction temperature



V_o = 1.024 V; R_s = 0.021 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

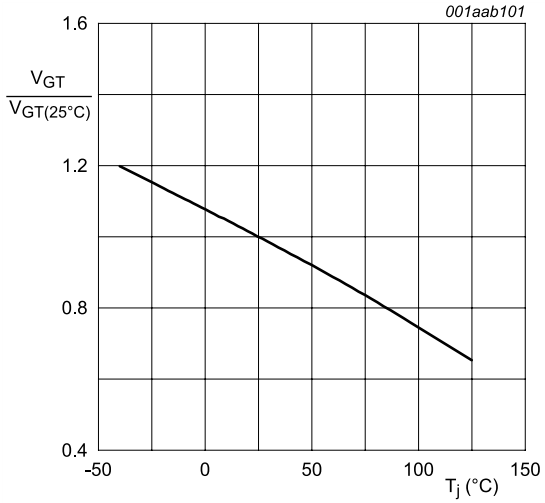
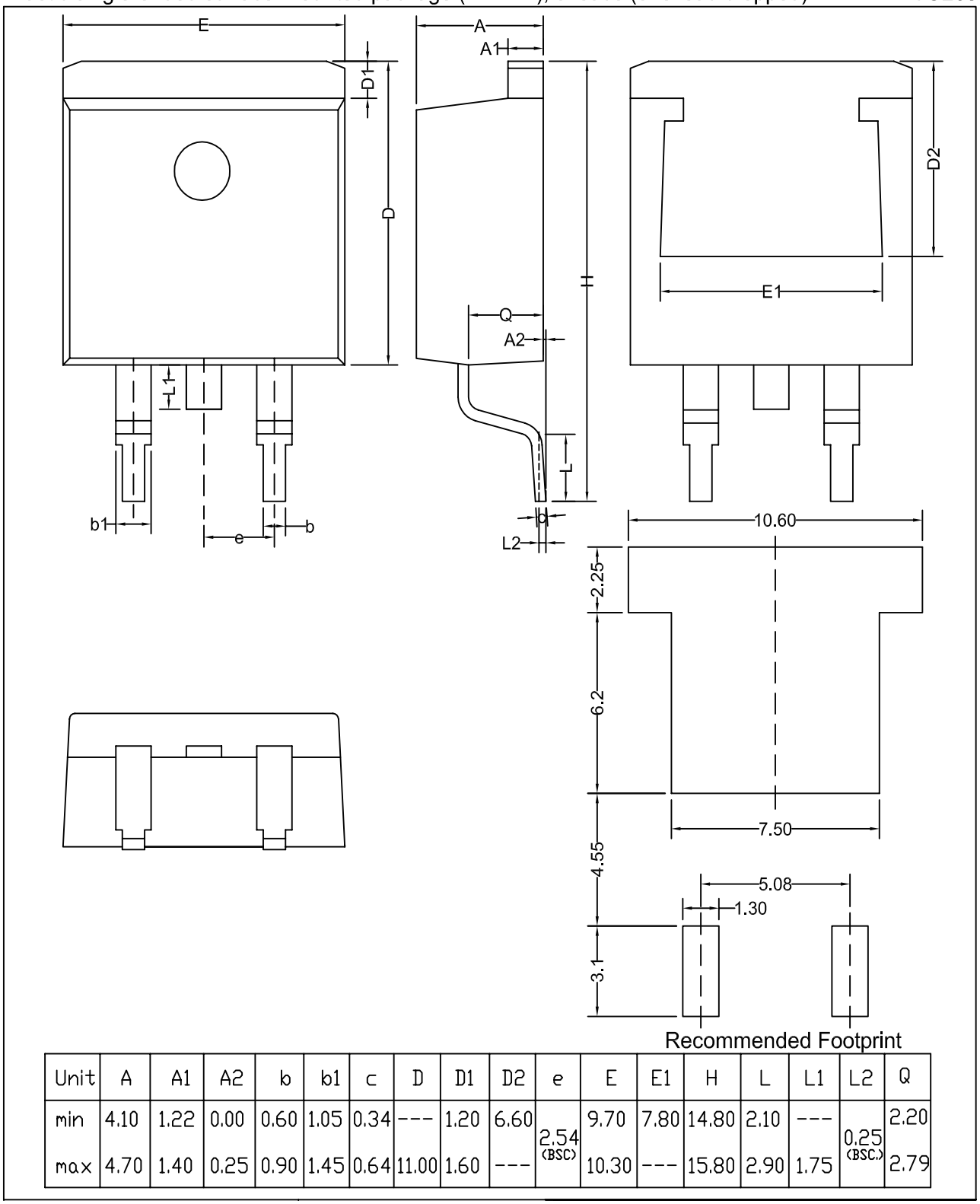


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

11. Package outline

Assembly factory: N

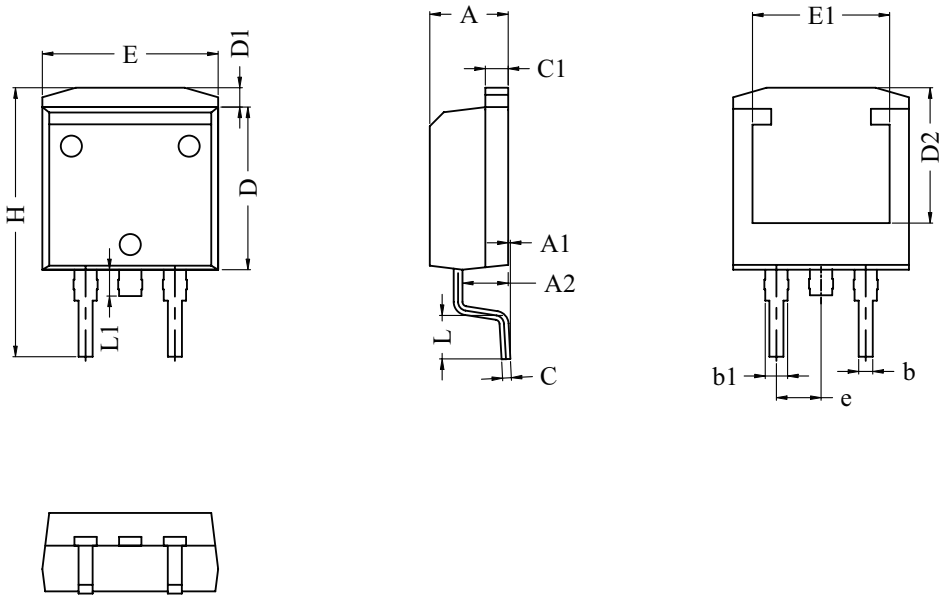
Plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped) TO263



Unit	A	A1	A2	b	b1	c	D	D1	D2	e	E	E1	H	L	L1	L2	Q
min	4.10	1.22	0.00	0.60	1.05	0.34	---	1.20	6.60	2.54 (BSC)	9.70	7.80	14.80	2.10	---	0.25 (BSC)	2.20
max	4.70	1.40	0.25	0.90	1.45	0.64	11.00	1.60	---		10.30	---	15.80	2.90	1.75		2.79

Assembly factory: P

Plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped) TO263



Dim	All Dimensions in Millimeters		
	Min	Typ	Max
A	4.30	4.46	4.60
A1	0	0.13	0.25
A2	2.50	2.60	2.70
b	0.70	0.80	0.90
b1	1.10	1.27	1.45
C	0.40	0.52	0.60
C1	1.17	1.30	1.40
D	9.10	9.25	9.40
D1	1.00	1.10	1.30
D2	7.40	7.70	8.00
E	9.80	10.00	10.20
E1	7.60	7.80	8.00
e	2.54 BSC		
H	14.80	15.30	15.80
L	2.10	2.47	2.80
L1	1.30	1.50	1.70

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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13. Contents

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