

## 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 BT" triac will commutate the full RMS current at the maximum rated junction temperature ( $T_{j(max)} = 150\text{ °C}$ ) without the aid of a snubber. It is used in applications where "high junction operating temperature capability" is required.

## 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 junction operating temperature capability
- High voltage capability
- Less sensitive gate for very high noise immunity
- Planar passivated for voltage ruggedness and reliability
- Surface mountable package
- Triggering in three quadrants only

## 3. Applications

- Applications subject to high temperature
- Electronic thermostats (heating and cooling)
- High power motor controls e.g. washing machines and vacuum cleaners
- Rectifier-fed DC inductive loads e.g. DC motors and solenoids

## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage			-	-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 120\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>		-	-	16	A
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $T_{j(imit)} = 25\text{ °C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig 4</a> ; <a href="#">Fig 5</a>		-	-	140	A
		full sine wave; $T_{j(imit)} = 25\text{ °C}$ ; $t_p = 16.7\text{ ms}$		-	-	150	A
$T_j$	junction temperature			-	-	150	°C
<b>Static characteristics</b>							

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T2+ G+;$ $T_j = 25\text{ }^\circ\text{C};$ <a href="#">Fig. 7</a>		2	-	50	mA
		$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T2+ G-;$ $T_j = 25\text{ }^\circ\text{C};$ <a href="#">Fig. 7</a>		2	-	50	mA
		$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T2- G-;$ $T_j = 25\text{ }^\circ\text{C};$ <a href="#">Fig. 7</a>		2	-	50	mA
$I_H$	holding current	$V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C};$ <a href="#">Fig. 9</a>		-	-	60	mA
$V_T$	on-state voltage	$I_T = 18\text{ A}; T_j = 25\text{ }^\circ\text{C};$ <a href="#">Fig. 10</a>		-	1.3	1.6	V
<b>Dynamic characteristics</b>							
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}; T_j = 150\text{ }^\circ\text{C}; (V_{DM} = 67\%$ of $V_{DRM});$ exponential waveform; gate open circuit		1000	-	-	V/ $\mu$ s
$dI_{com}/dt$	rate of change of commutating current	$V_D = 400\text{ V}; T_j = 150\text{ }^\circ\text{C}; I_{T(RMS)} = 16\text{ A};$ $dV_{com}/dt = 20\text{ V}/\mu\text{s};$ (snubberless condition); gate open circuit		20	-	-	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
BTA316B-600BT	TO263	BTA316B-600BT,118	Reel	800	TO263N (N)	26-Sep-2016
					TO263P (P)	12-Jun-2023

## 7. Marking

Table 4. Marking codes

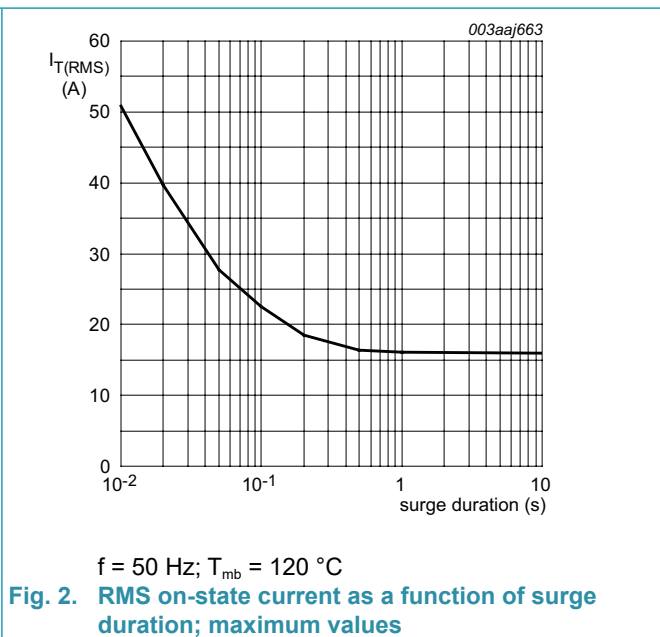
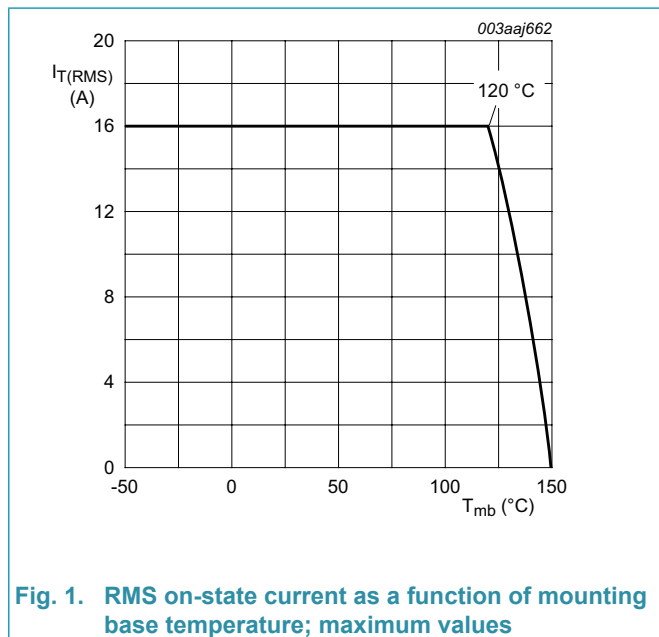
Type number	Marking codes	
	Assembly factory: N	Assembly factory: P
BTA316B-600BT	BTA316B 600BT PJNxxxx xx	BTA316B 600BT PJPxxxx xx

## 8. Limiting values

**Table 5. Limiting values**

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

Symbol	Parameter	Conditions	Notes	Min	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage			-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 120\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>		-	16	A
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig 4</a> ; <a href="#">Fig 5</a>		-	140	A
		full sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 16.7\text{ ms}$		-	150	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; SIN		-	98	$A^2s$
$di_T/dt$	rate of rise of on-state current	$I_G = 100\text{ mA}$		-	100	$A/\mu s$
$I_{GM}$	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	150	$^{\circ}C$
$T_j$	junction temperature			-	150	$^{\circ}C$



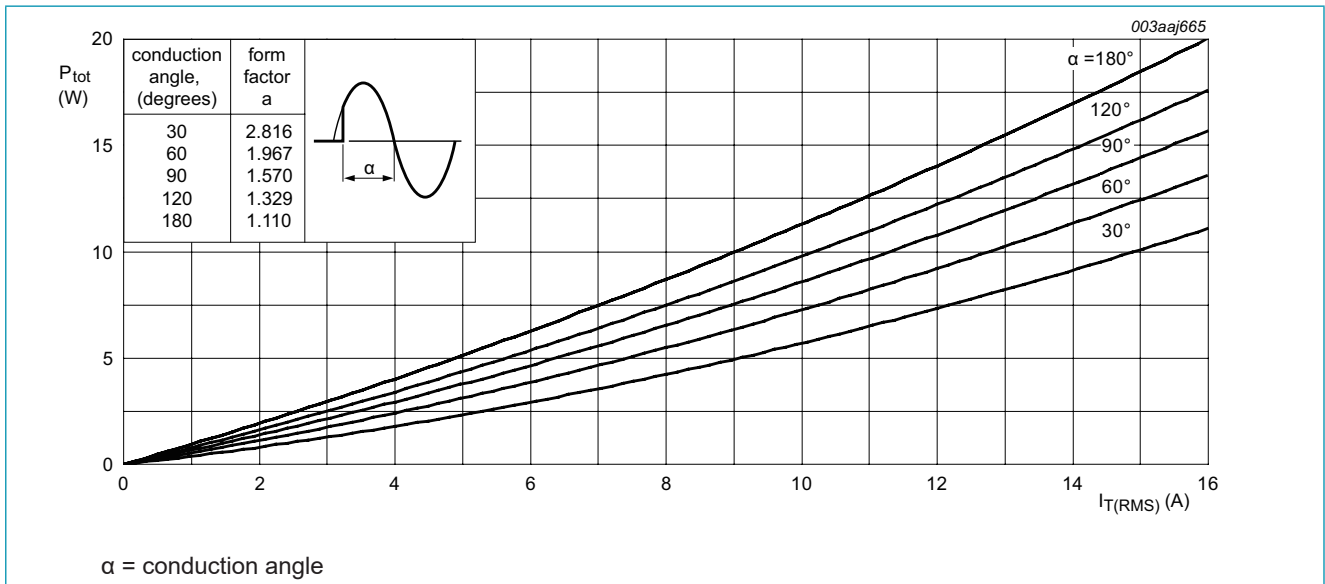


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

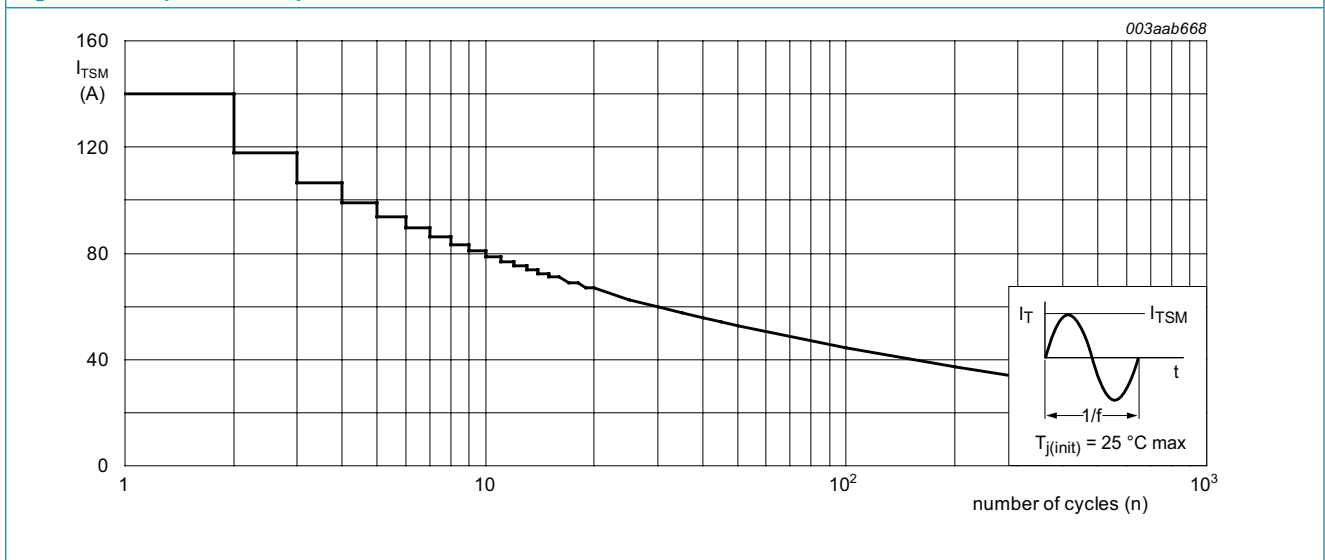
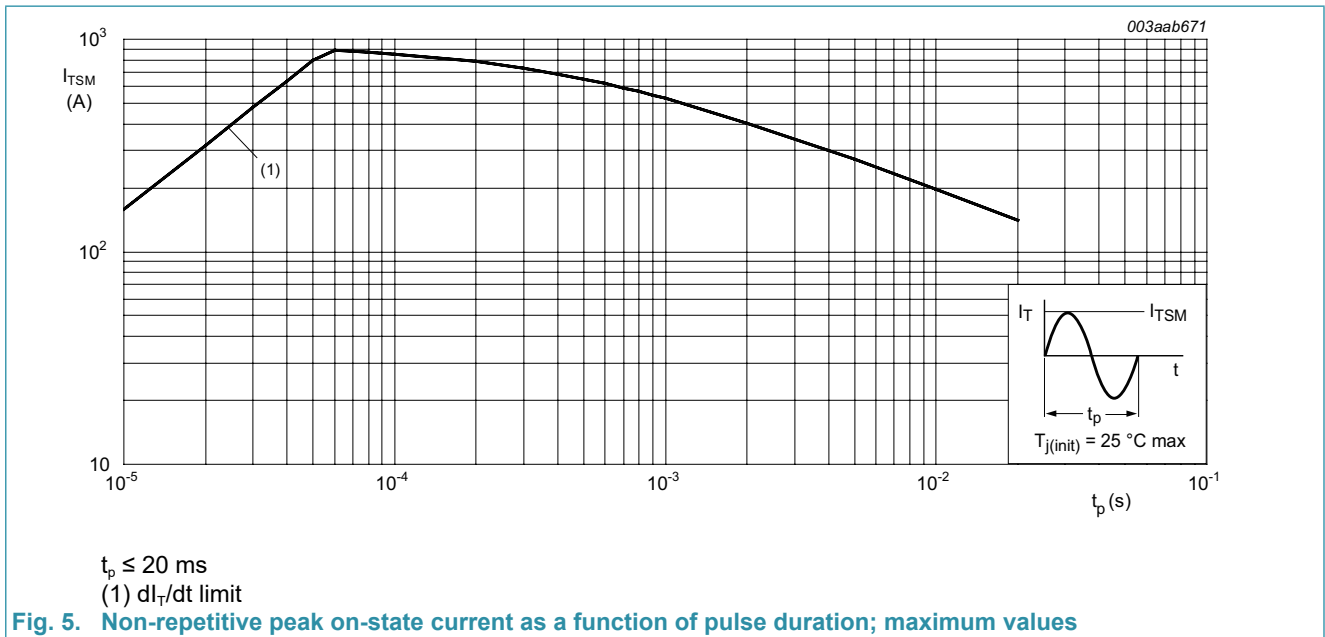


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



## 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; <a href="#">Fig 6</a>		-	-	1.5	K/W
		half cycle; <a href="#">Fig 6</a>		-	-	2	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

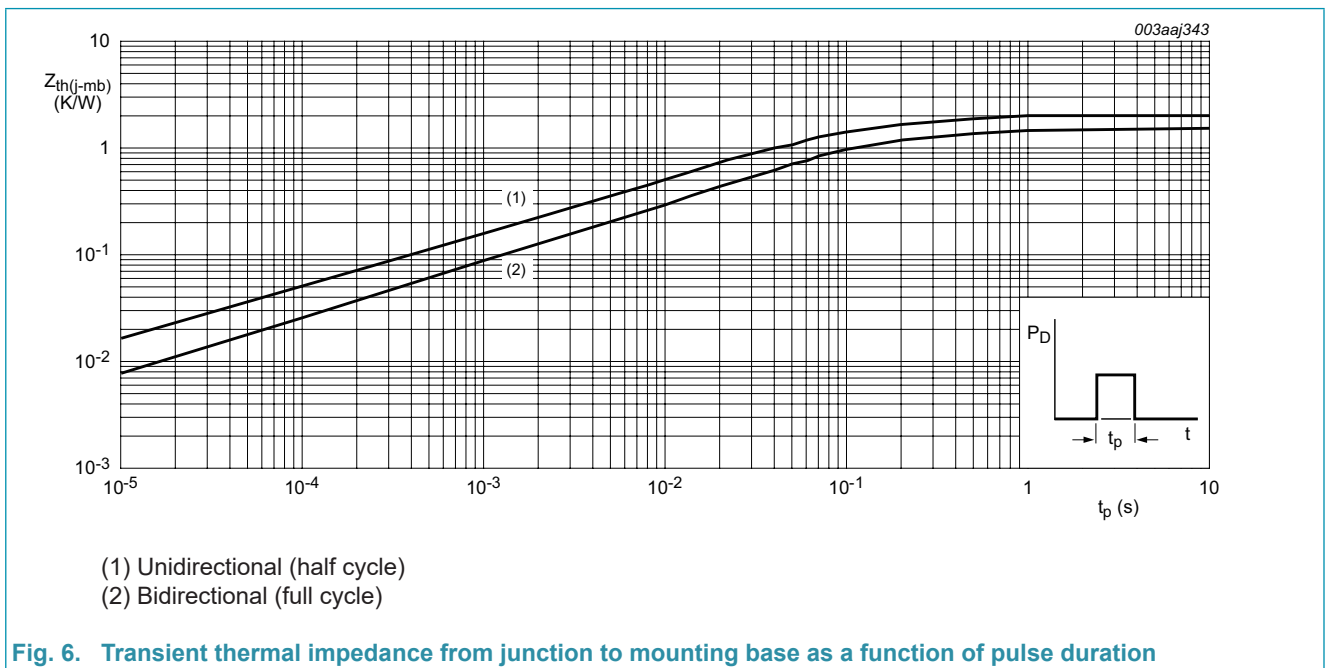


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
<b>Static characteristics</b>							
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G+; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 7</a>		2	-	50	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 7</a>		2	-	50	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 7</a>		2	-	50	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G+; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 8</a>		-	-	60	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 8</a>		-	-	90	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 8</a>		-	-	60	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 9</a>		-	-	60	mA
$V_T$	on-state voltage	$I_T = 18\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 10</a>		-	1.3	1.6	V
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 11</a>		-	0.8	1	V
		$V_D = 400\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 150\text{ °C}$ ; <a href="#">Fig. 11</a>		0.25	0.4	-	V
$I_D$	off-state current	$V_D = 600\text{ V}$ ; $T_j = 150\text{ °C}$		-	0.1	0.5	mA
<b>Dynamic characteristics</b>							
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$ ; $T_j = 150\text{ °C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit		1000	-	-	V/ $\mu$ s
$dI_{com}/dt$	rate of change of commutating current	$V_D = 400\text{ V}$ ; $T_j = 150\text{ °C}$ ; $I_{T(RMS)} = 16\text{ A}$ ; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$ ; (snubberless condition); gate open circuit		20	-	-	A/ms

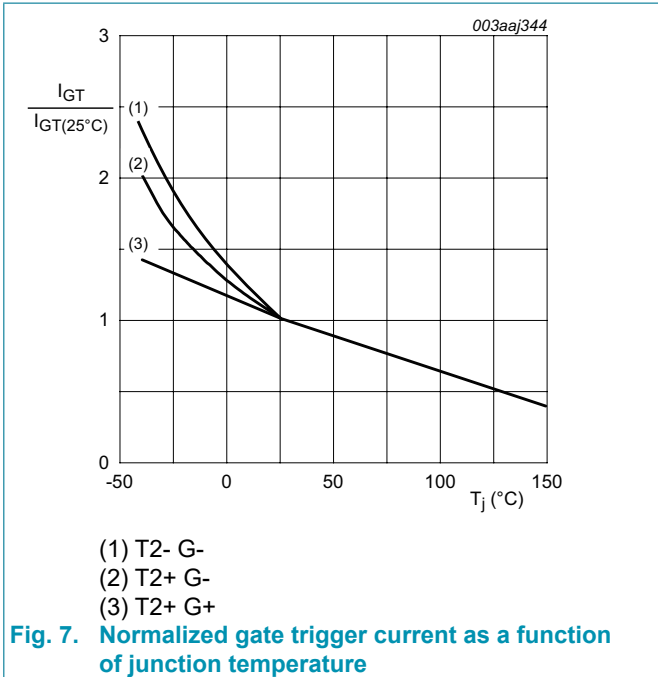


Fig. 7. Normalized gate trigger current as a function of junction temperature

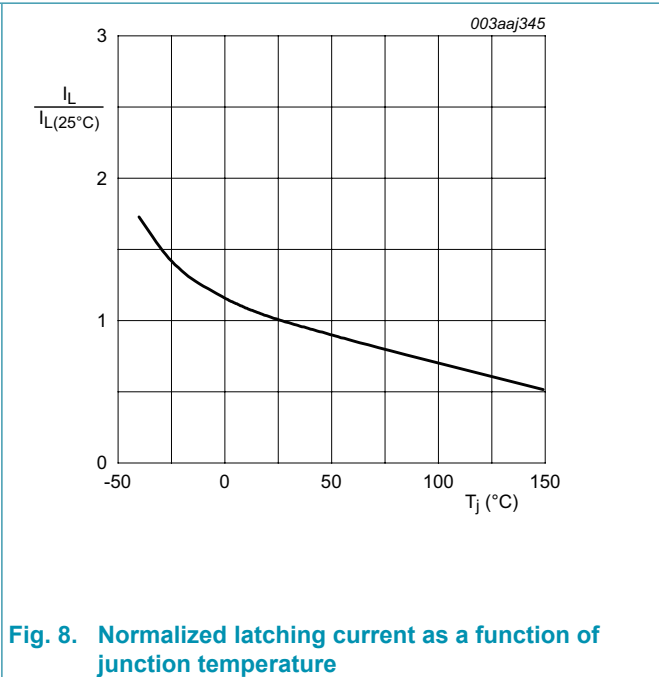


Fig. 8. Normalized latching current as a function of junction temperature

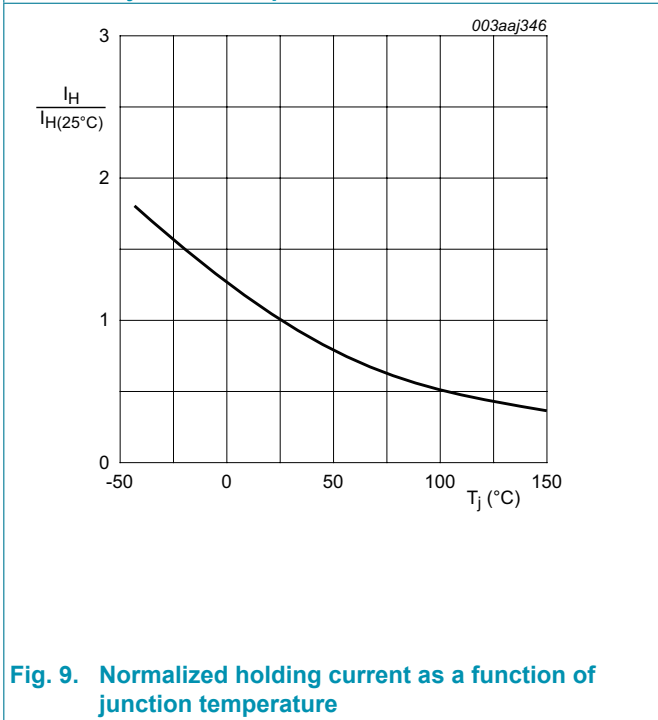


Fig. 9. Normalized holding current as a function of junction temperature

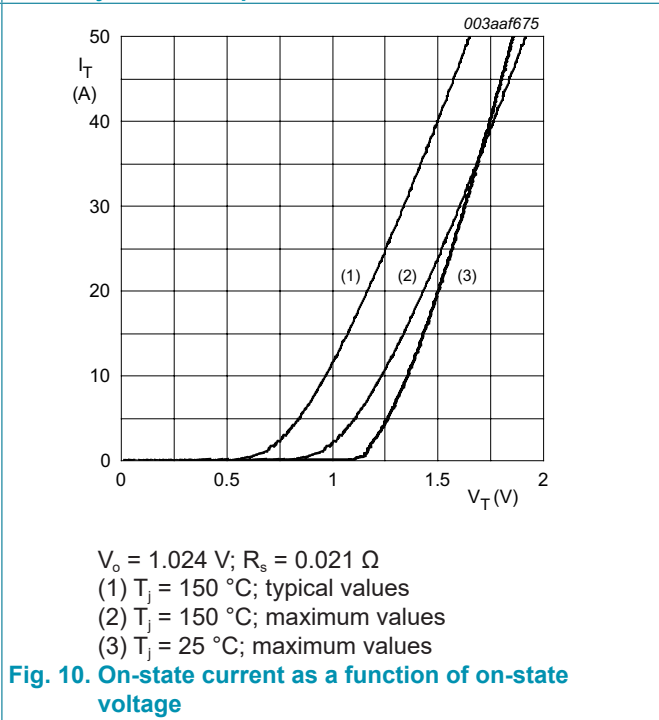


Fig. 10. On-state current as a function of on-state voltage



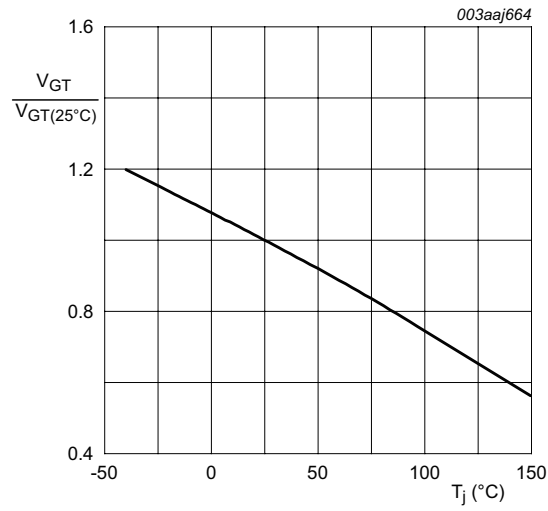


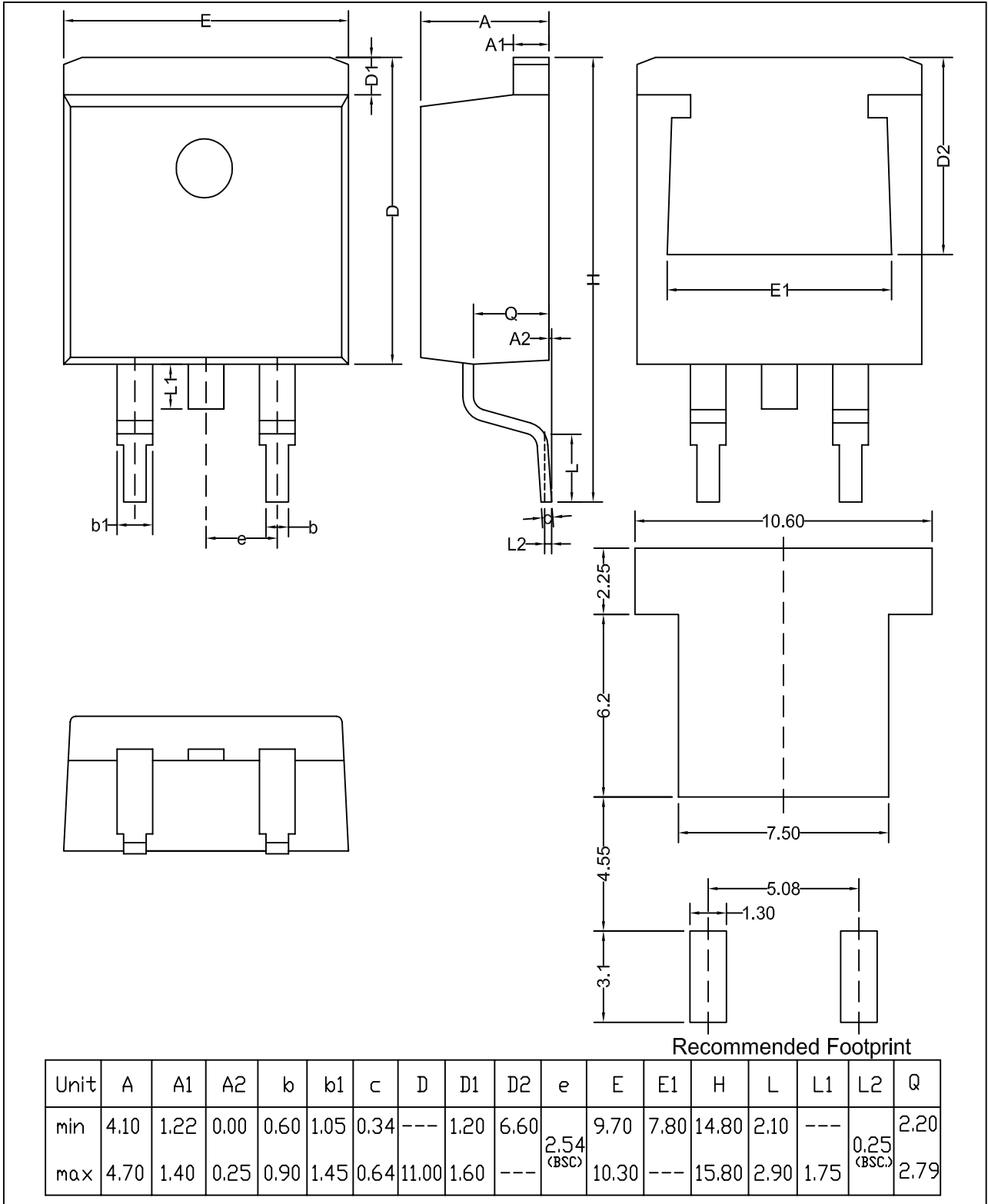
Fig. 11. Normalized gate trigger voltage as a function of junction temperature

### 11. Package outline

Assembly factory: N

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

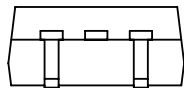
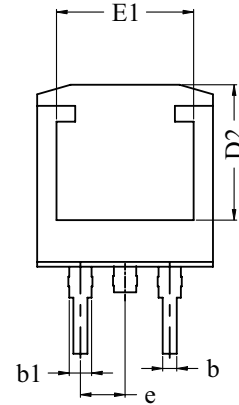
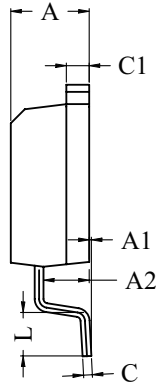
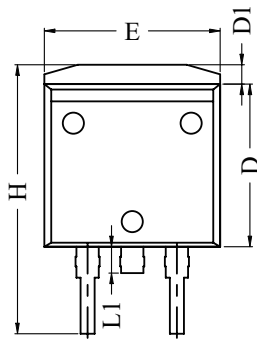
TO263



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.

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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