

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 CT" triac will commute 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	Values			Unit
Absolute maximum rating						
V_{DRM}	repetitive peak off-state voltage		600			V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 119\text{ °C}$ Fig. 1 ; Fig. 2 ; Fig. 3	16			A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 20\text{ ms}$ Fig. 4 ; Fig. 5	140			A
		full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 16.7\text{ ms}$	150			A
T_j	junction temperature		150			°C
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G+; $T_j = 25\text{ °C}$; Fig. 7	2	-	35	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ °C}$; Fig. 7	2	-	35	mA

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ °C}$; Fig. 7	2	-	35	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ °C}$; Fig. 9	-	-	35	mA
V_T	on-state voltage	$I_T = 18\text{ A}$; $T_j = 25\text{ °C}$; Fig. 10	-	1.3	1.5	V
Dynamic characteristics						
dV_{D}/dt	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$; $T_j = 125\text{ °C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit	500	-	-	V/ μ s
		$V_{DM} = 402\text{ V}$; $T_j = 150\text{ °C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit	300	-	-	V/ μ 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	8	-	-	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-600CT	TO263	BTA316B-600CTJ	Reel	800	TO263N (N)	26-Sep-2016
					TO263P (P)	12-Jun-2023
					TO263d (d)	17-Mar-2023

7. Marking

Table 4. Marking codes

Type number	Marking codes		
	Assembly factory: N	Assembly factory: P	Assembly factory: d
BTA316B-600CT	BTA316B 600CT PjNxxxx xx	BTA316B 600CT PjPxxxx xx	BTA316B 600CT Pjdxxxx 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		600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 119\text{ °C}$ Fig 1 ; Fig 2 ; Fig 3	16	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 20\text{ ms}$ Fig 4 ; Fig 5	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	$I_G = 70\text{ mA}$	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 to 150	$^{\circ}C$
T_j	junction temperature		150	$^{\circ}C$

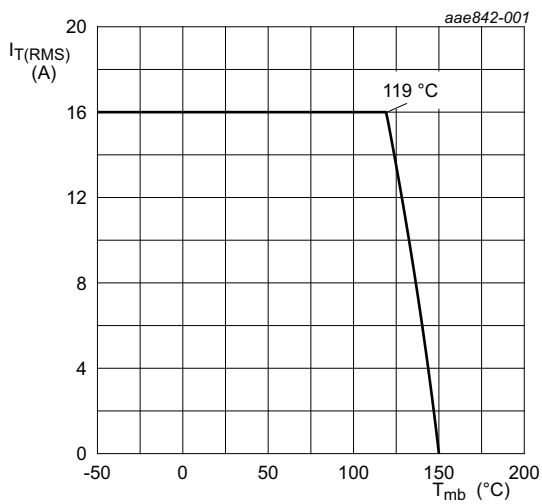
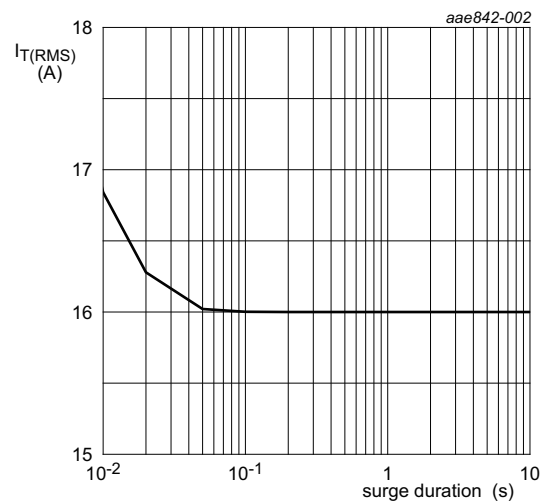
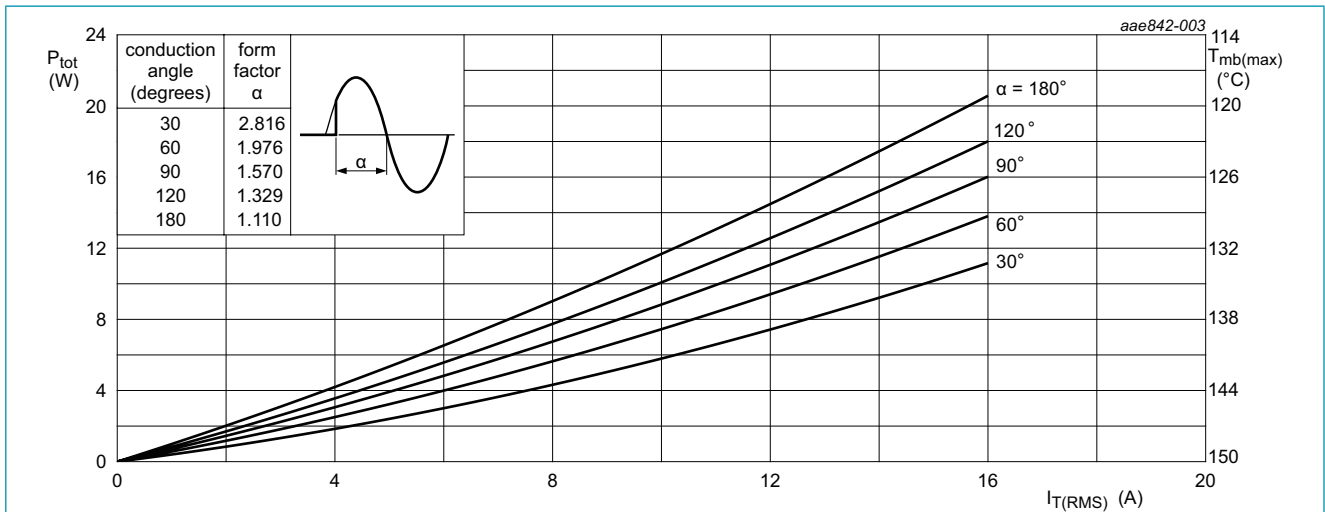


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values



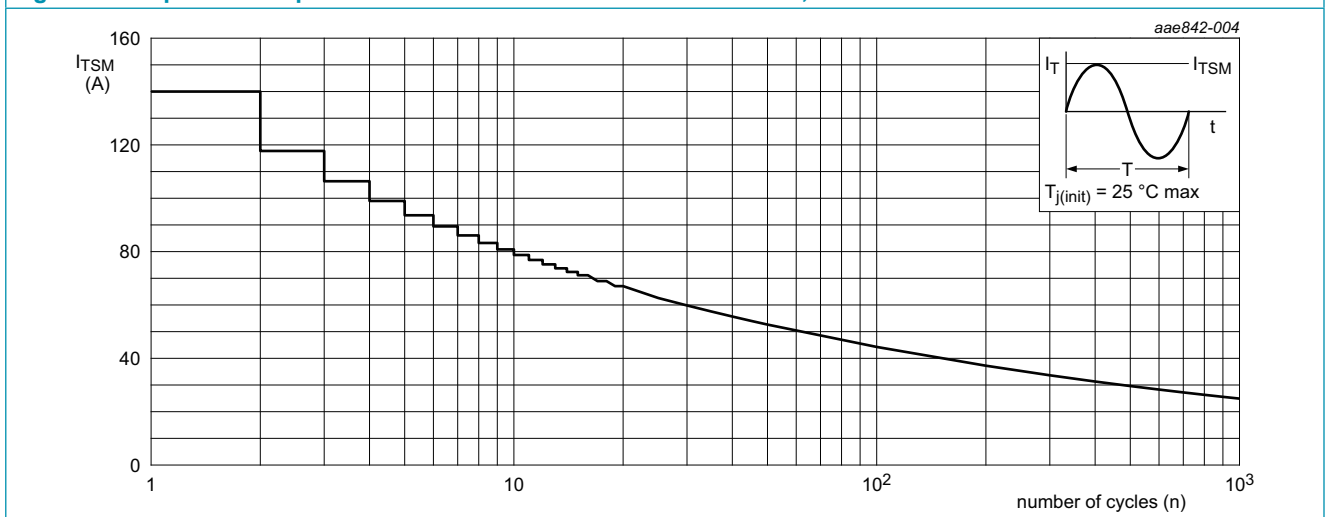
$f = 50\text{ Hz}$; $T_{mb} = 119\text{ °C}$

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



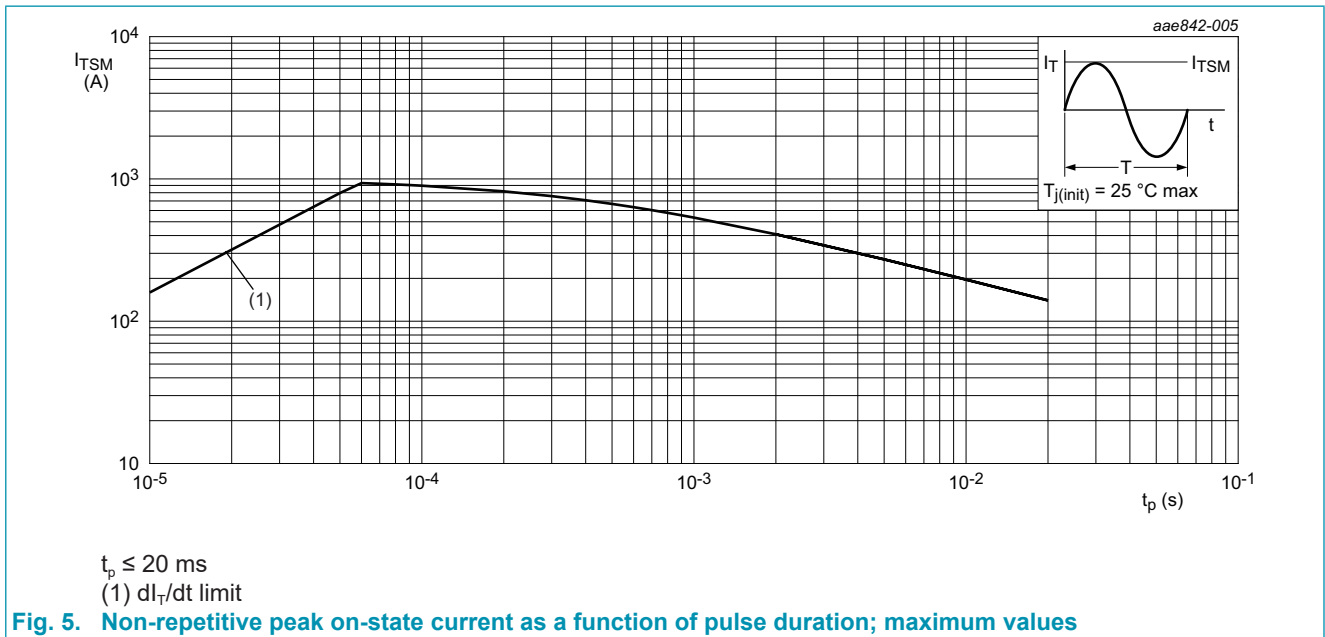
α = conduction angle
 a = form factor = $I_{T(RMS)} / I_{T(AV)}$

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



f = 50 Hz

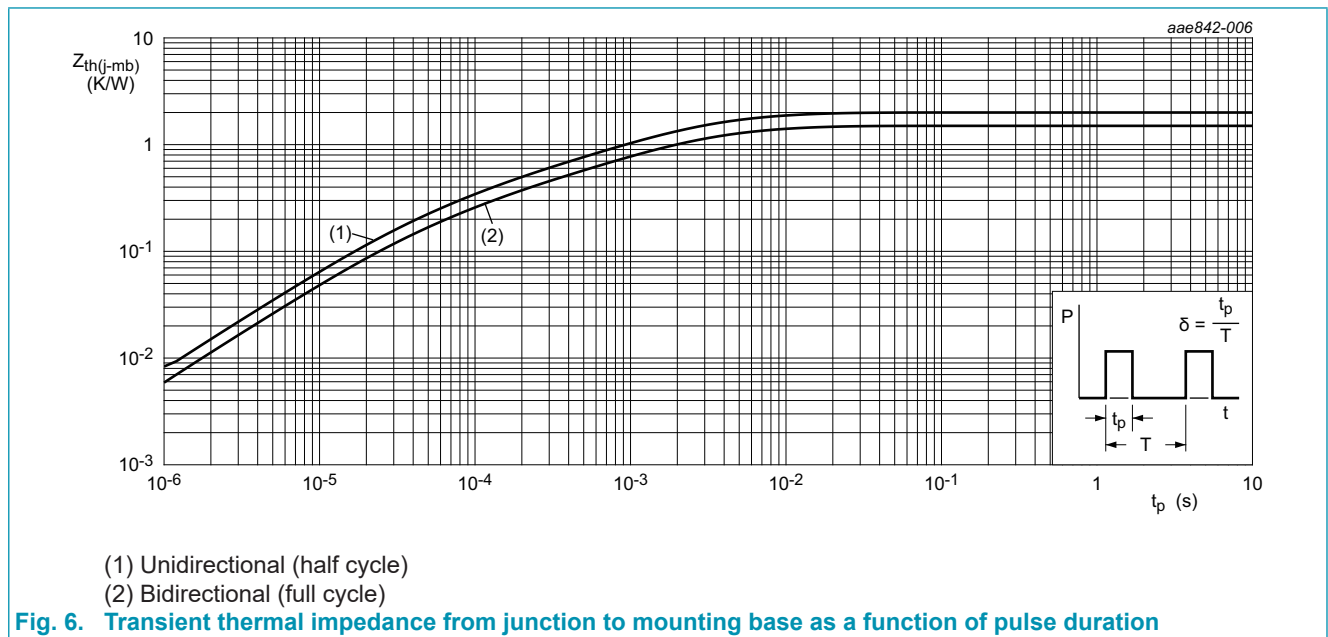
Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



9. Thermal characteristics

Table 6. Thermal characteristics

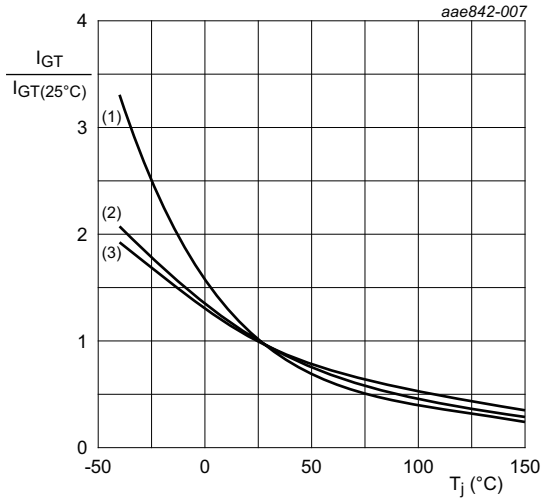
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	full cycle; Fig 6	-	-	1.5	K/W
		half cycle; Fig 6	-	-	2	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	60	-	K/W



10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G+; $T_J = 25\text{ °C}$; Fig. 7	2	-	35	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_J = 25\text{ °C}$; Fig. 7	2	-	35	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_J = 25\text{ °C}$; Fig. 7	2	-	35	mA
I_L	latching current	$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G+; $T_J = 25\text{ °C}$; Fig. 8	-	-	50	mA
		$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G-; $T_J = 25\text{ °C}$; Fig. 8	-	-	60	mA
		$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2- G-; $T_J = 25\text{ °C}$; Fig. 8	-	-	50	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_J = 25\text{ °C}$; Fig. 9	-	-	35	mA
V_T	on-state voltage	$I_T = 18\text{ A}$; $T_J = 25\text{ °C}$; Fig. 10	-	1.3	1.5	V
V_{GT}	gate trigger voltage	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_J = 25\text{ °C}$; Fig. 11	-	0.8	1	V
		$V_D = 400\text{ V}$; $I_T = 0.1\text{ A}$; $T_J = 125\text{ °C}$	0.25	0.4	-	V
I_D	off-state current	$V_D = 600\text{ V}$; $T_J = 25\text{ °C}$	-	-	10	μA
		$V_D = 600\text{ V}$; $T_J = 150\text{ °C}$	-	0.4	2	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$; $T_J = 125\text{ °C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit	500	-	-	V/ μs
		$V_{DM} = 402\text{ V}$; $T_J = 150\text{ °C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit	300	-	-	V/ μs
dI_{com}/dt	rate of change of commutating current	$V_D = 400\text{ V}$; $T_J = 125\text{ °C}$; $I_{T(RMS)} = 16\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit	8	-	-	A/ms



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

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

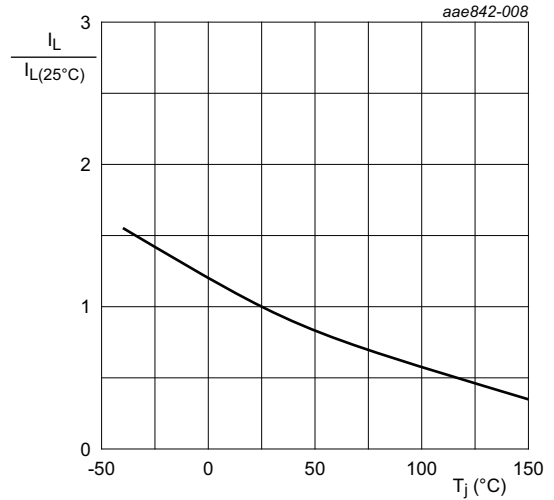


Fig. 8. Normalized latching current as a function of junction temperature

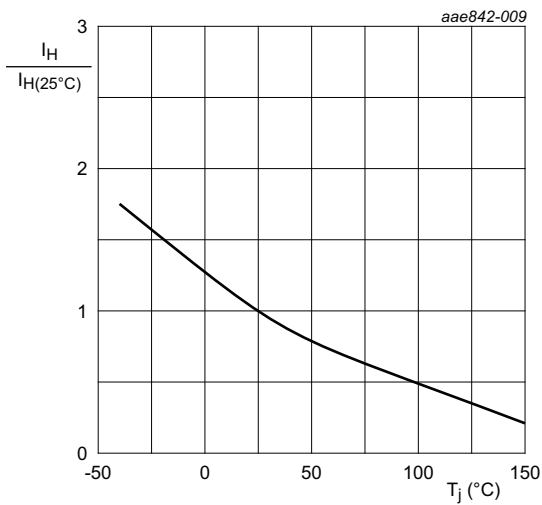
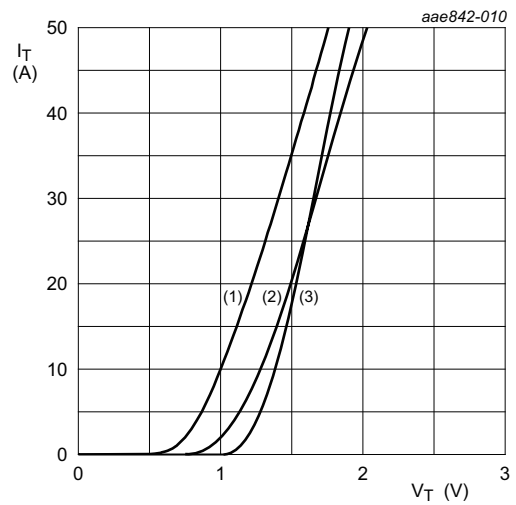


Fig. 9. Normalized holding current as a function of junction temperature



- $V_o = 1.078\text{ V}; R_s = 0.0197\ \Omega$
 (1) $T_j = 150^\circ\text{C}$; typical values
 (2) $T_j = 150^\circ\text{C}$; maximum values
 (3) $T_j = 25^\circ\text{C}$; maximum values

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

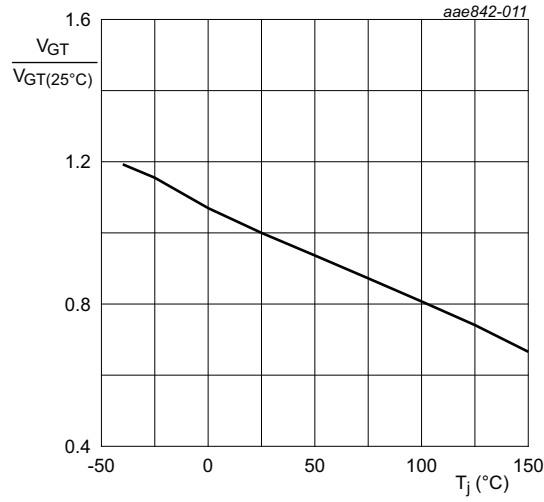
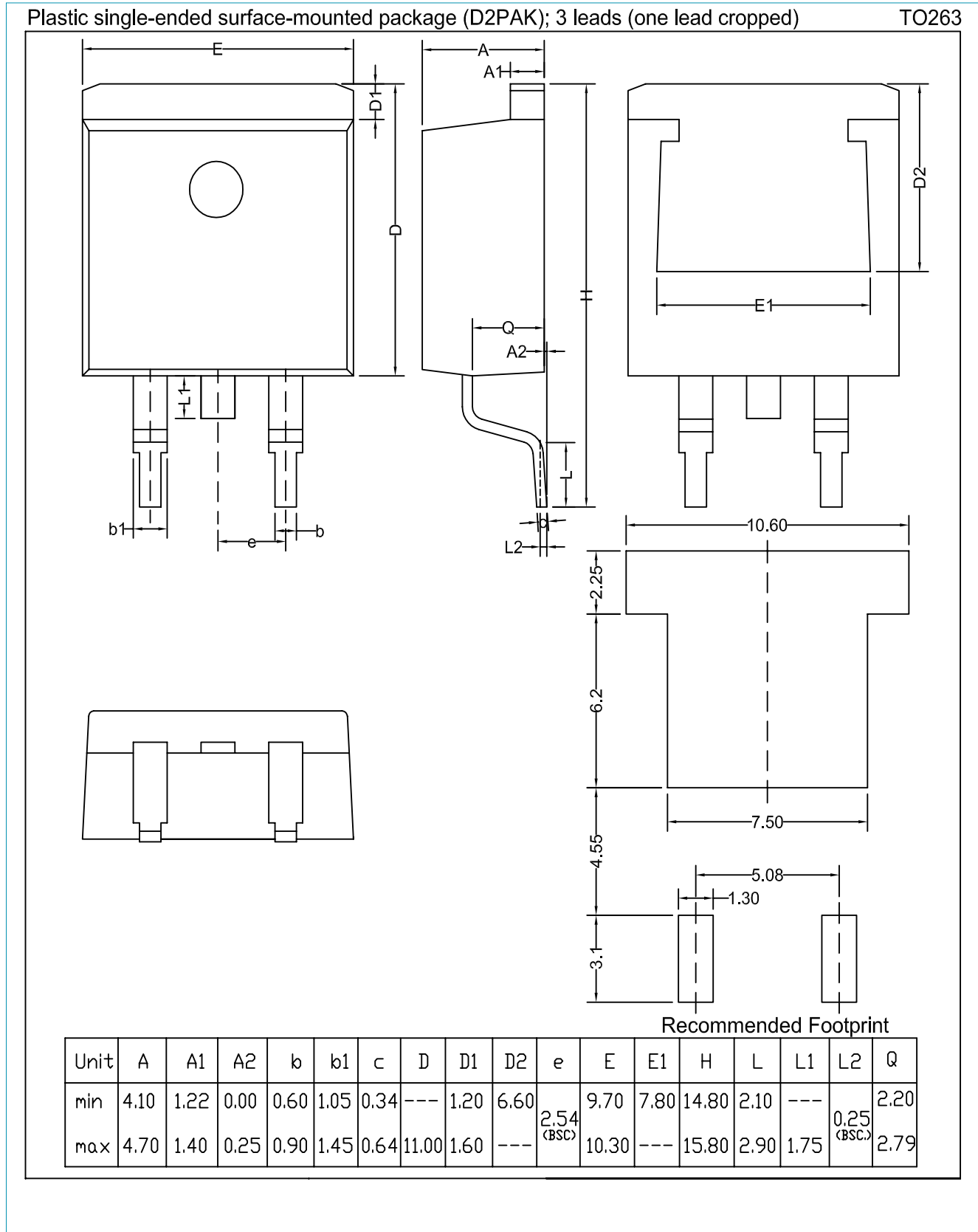


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

11. Package outline

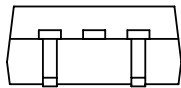
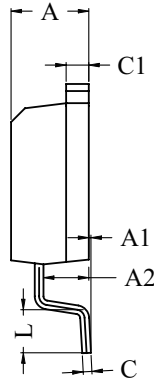
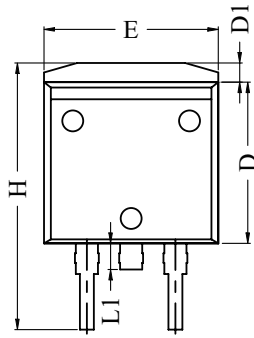
Assembly factory: N



Assembly factory: P

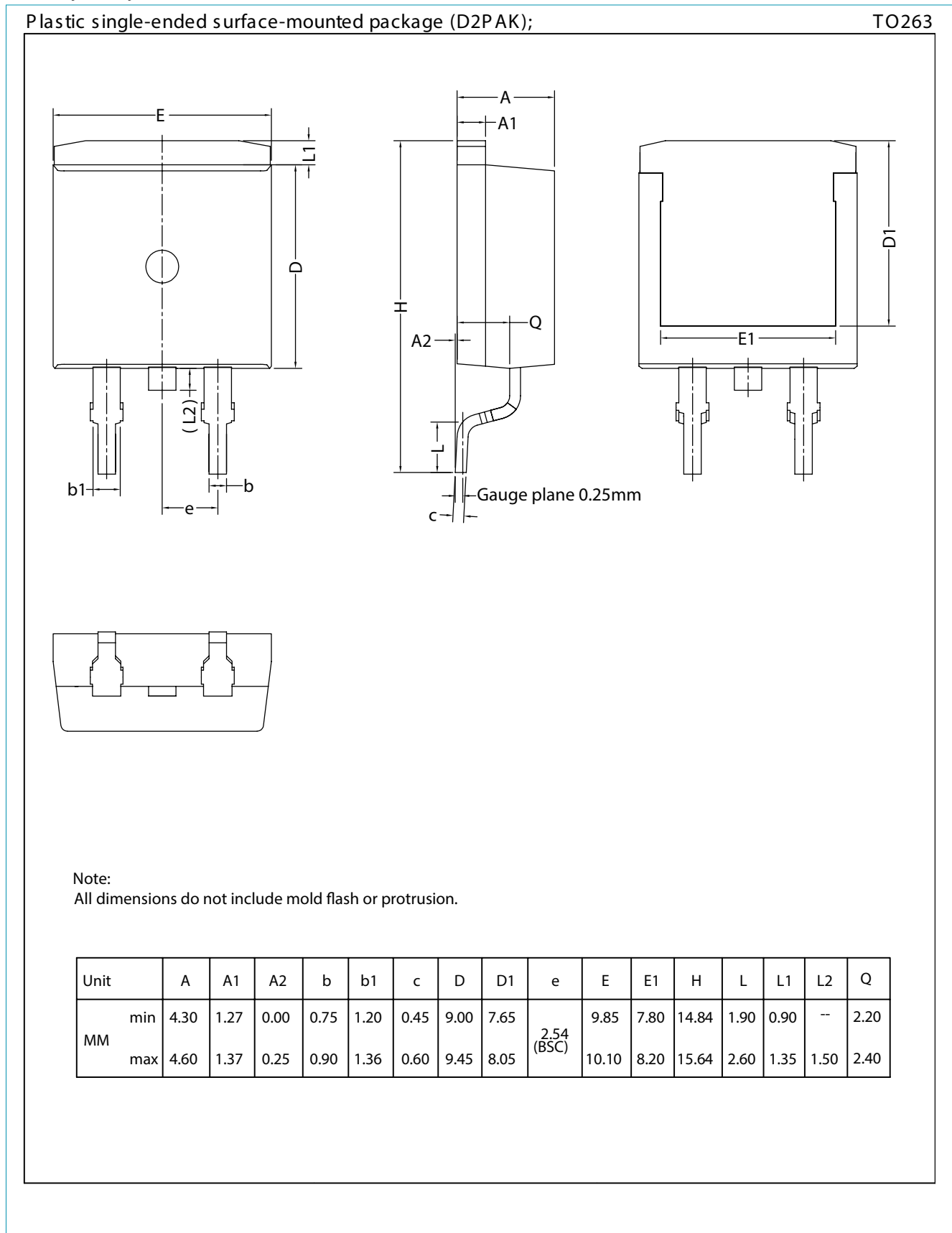
Plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)

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

Assembly factory: d



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