

## 1. General description

Planar passivated high commutation three quadrant triac in a SOT404 (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 commute the full rated RMS current at the maximum rated junction temperature without the aid of a snubber.

## 2. Features and benefits

- 3Q technology for improved noise immunity
- High blocking voltage capability
- High commutation capability with maximum false trigger immunity
- High immunity to false turn-on by  $dV/dt$
- 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

- Heating controls
- High power motor control
- High power switching

## 4. Quick reference data

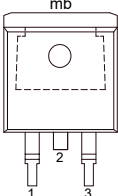
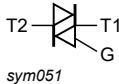
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage		-	-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 91\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	-	25	A
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	-	190	A
		full sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 16.7\text{ ms}$	-	-	208	A
$T_j$	junction temperature		-	-	125	°C
<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	18	50	mA

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>	2	21	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	34	50	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>	-	31	60	mA
$V_T$	on-state voltage	$I_T = 30\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>	-	1.3	1.55	V
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit	1000	4000	-	V/ $\mu\text{s}$
$dI_{com}/dt$	rate of change of commutating current	$V_D = 400\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; $I_{T(RMS)} = 25\text{ A}$ ; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$ ; (without snubber condition); gate open circuit; <a href="#">Fig. 12</a>	-	44	-	A/ms

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1	 <p><b>D2PAK (SOT404)</b></p>	 <p>sym051</p>
2	T2	main terminal 2		
3	G	gate		
mb	T2	mounting base; main terminal 2		

## 6. Ordering information

Table 3. Ordering information

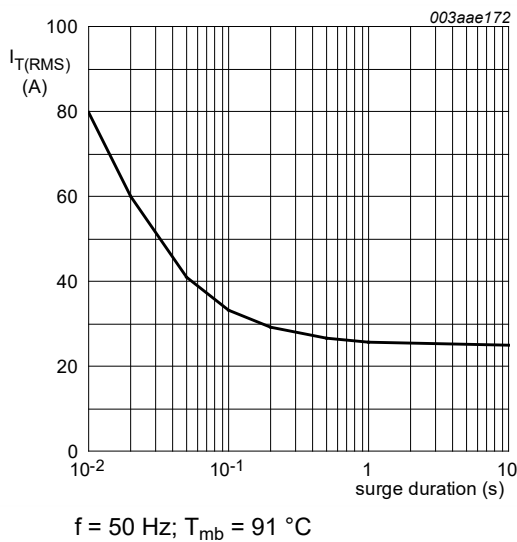
Type number	Package		
	Name	Description	Version
BTA225B-600B	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	SOT404

## 7. Limiting values

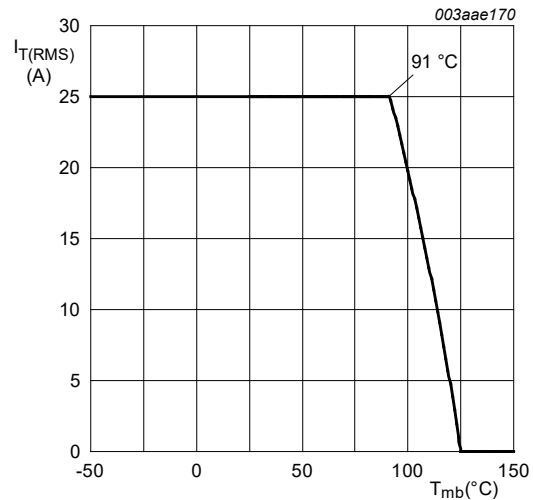
**Table 4. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage		-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 91\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	25	A
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	190	A
		full sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 16.7\text{ ms}$	-	208	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; SIN	-	180	A <sup>2</sup> s
$di_T/dt$	rate of rise of on-state current	$I_G = 0.2\text{ A}$	-	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	°C
$T_j$	junction temperature		-	125	°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**

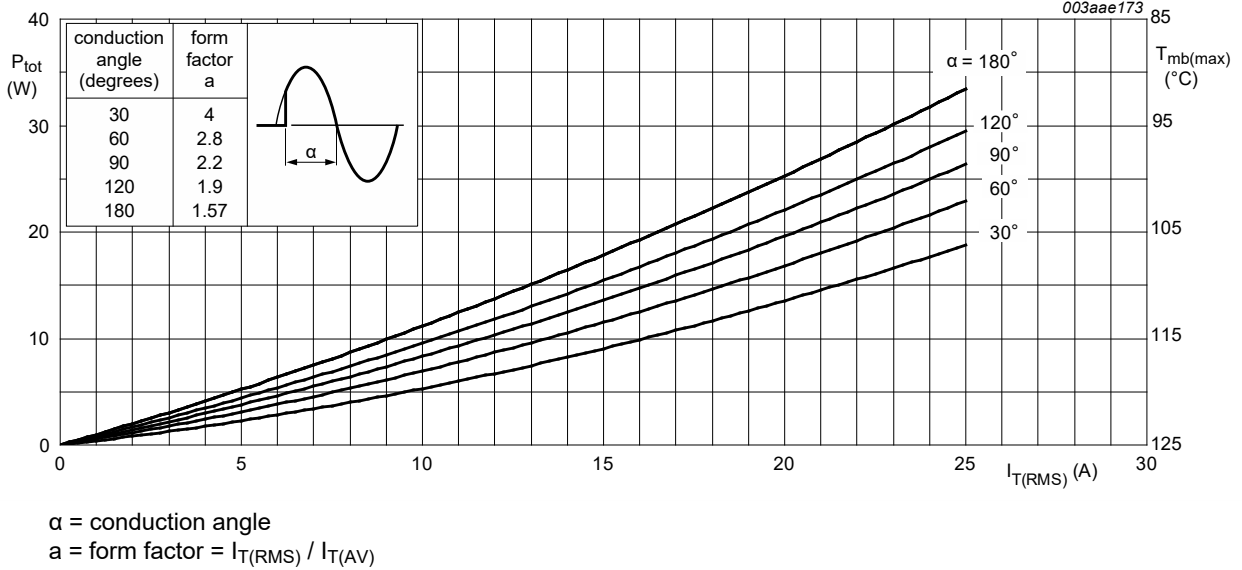


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

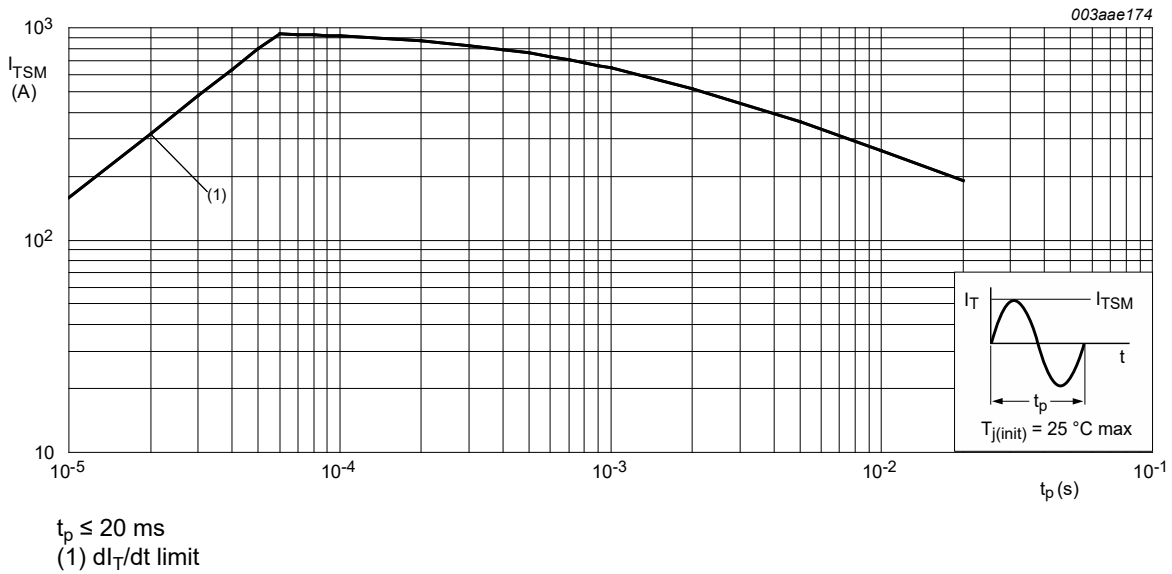
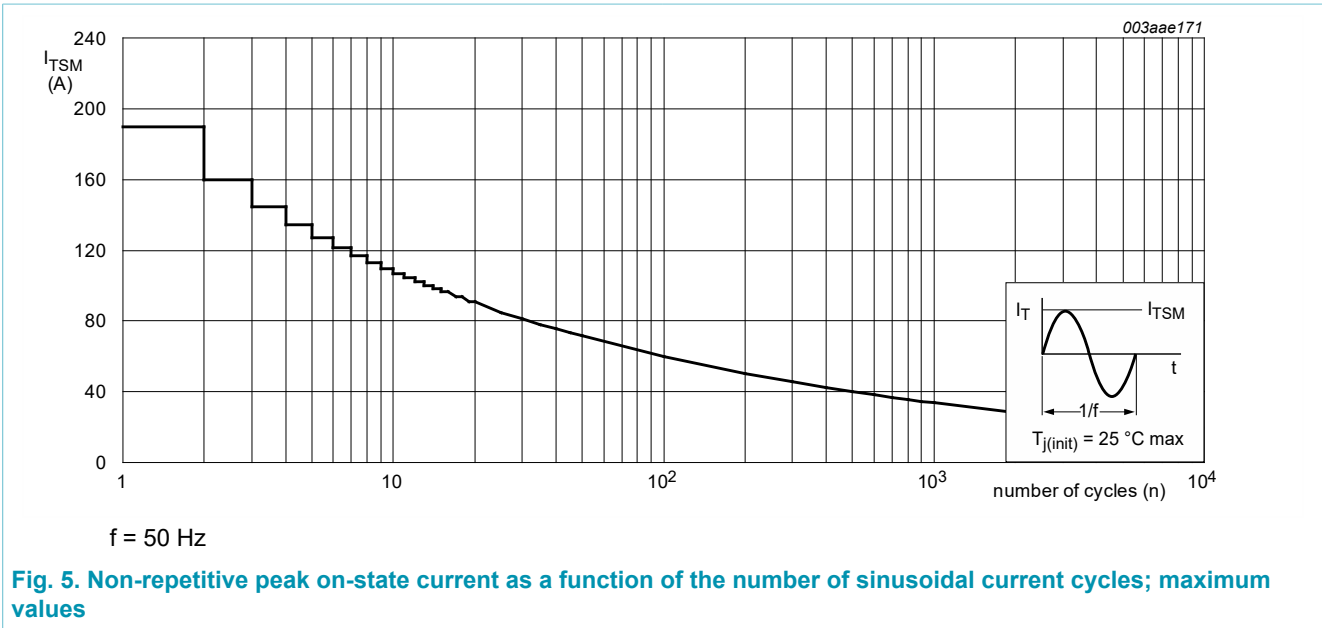


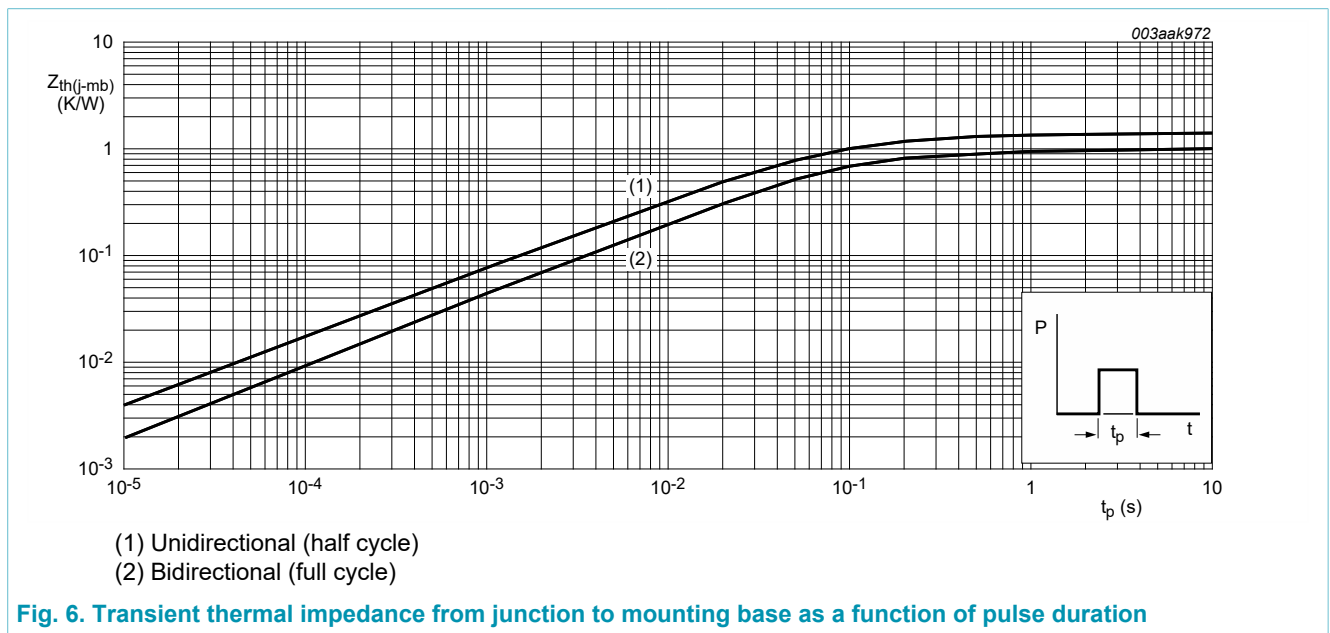
Fig. 4. Non-repetitive peak on-state current as a function of pulse width; maximum values



## 8. Thermal characteristics

Table 5. Thermal characteristics

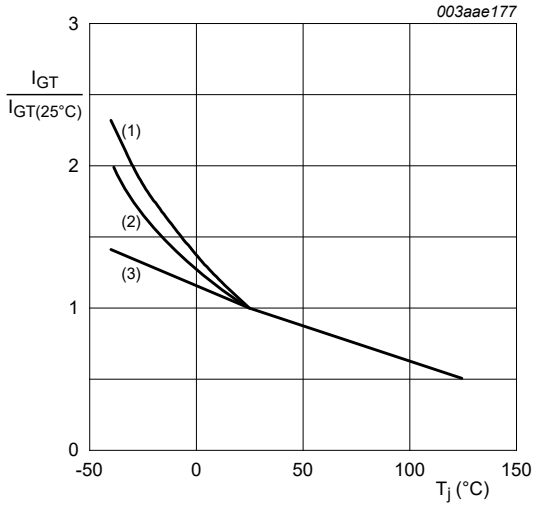
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	full cycle; Fig. 6	-	-	1	K/W
		half cycle; Fig. 6	-	-	1.4	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	printed circuit board (FR4) mounted	-	55	-	K/W



## 9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	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+; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>	2	18	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	21	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	34	50	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G+; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a>	-	31	60	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a>	-	34	90	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a>	-	30	60	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>	-	31	60	mA
$V_T$	on-state voltage	$I_T = 30\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>	-	1.3	1.55	V
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 11</a>	-	0.7	1	V
		$V_D = 400\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; <a href="#">Fig. 11</a>	0.25	0.4	-	V
$I_D$	off-state current	$V_D = 600\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$	-	0.1	0.5	mA
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit	1000	4000	-	V/ $\mu\text{s}$
$dI_{com}/dt$	rate of change of commutating current	$V_D = 400\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; $I_{T(RMS)} = 25\text{ A}$ ; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$ ; (without snubber condition); gate open circuit; <a href="#">Fig. 12</a>	-	44	-	A/ms



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

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

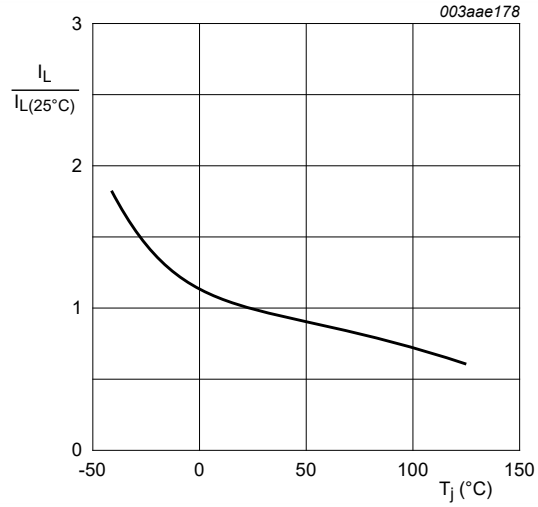


Fig. 8. Normalized holding current as a function of junction temperature

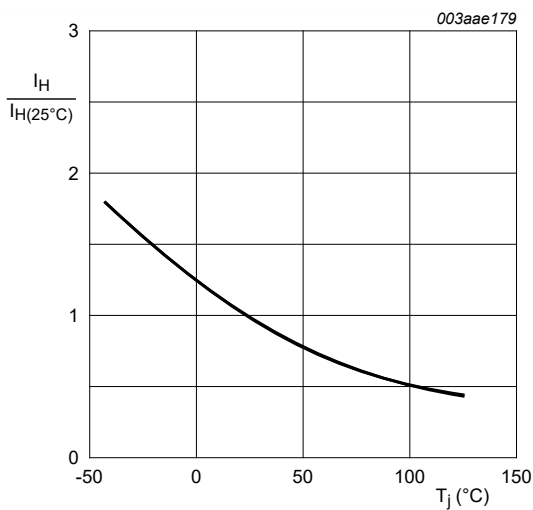
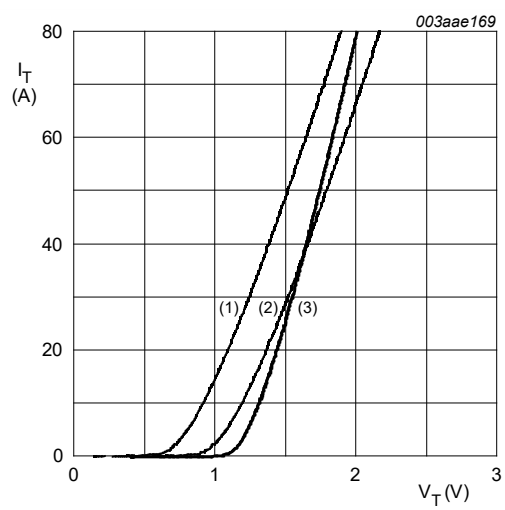


Fig. 9. Normalized latching current as a function of junction temperature

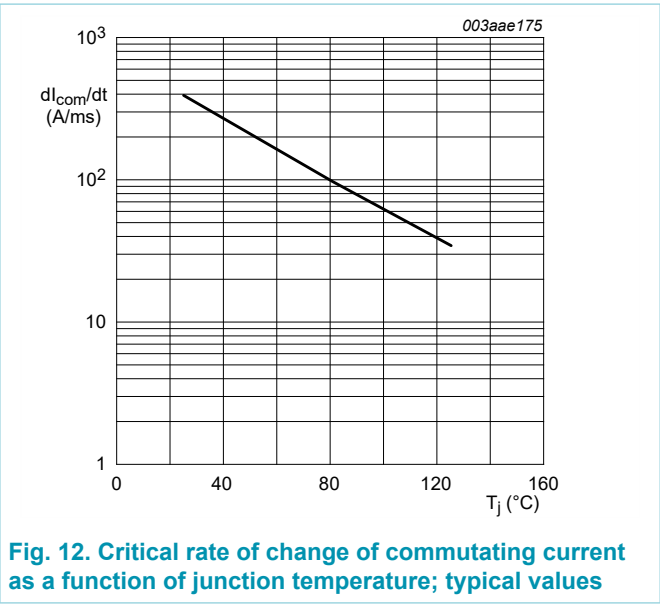
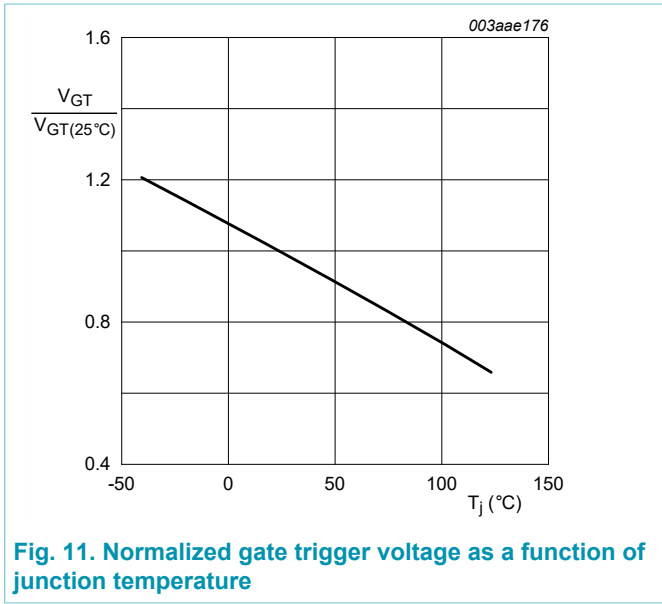


$V_o = 1.073 \text{ V}; R_s = 0.015 \Omega$

- (1)  $T_j = 125^\circ\text{C}$ ; typical values
- (2)  $T_j = 125^\circ\text{C}$ ; maximum values
- (3)  $T_j = 25^\circ\text{C}$ ; maximum values

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





10. Package outline

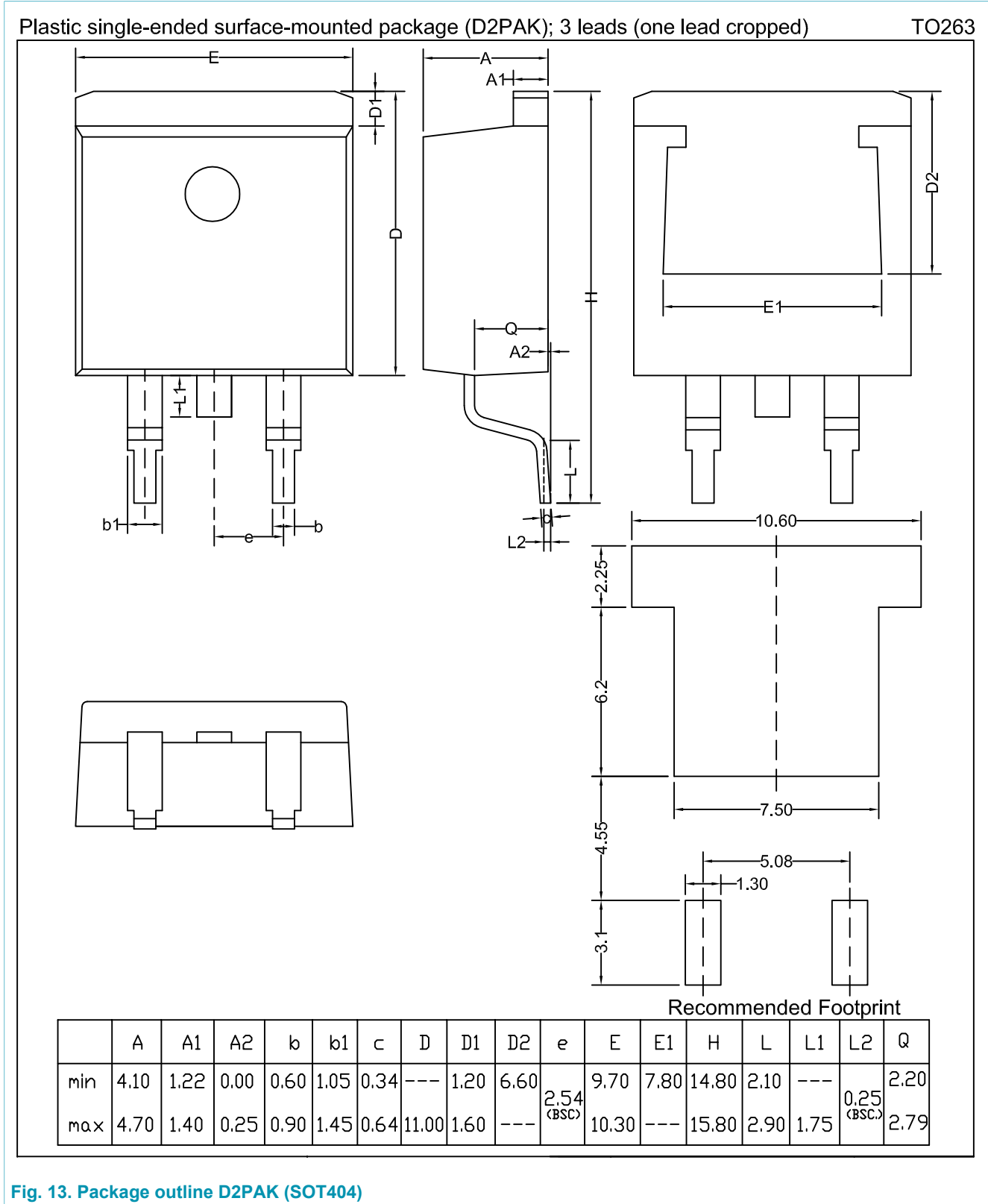


Fig. 13. Package outline D2PAK (SOT404)

## 11. 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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