

## 1. General description

Planar passivated high commutation three quadrant triac in a TO220F "full pack" plastic package. This triac is intended for use in motor control circuits where high blocking voltage, high static and dynamic  $dV/dt$  as well as high  $dI_{com}/dt$  can occur. This "series C0" 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 commutation capability with maximum false trigger immunity
- High immunity to false turn-on by  $dV/dt$
- Isolated mounting base package
- Optimized for highest noise immunity
- Planar passivated for voltage ruggedness and reliability
- Triggering in three quadrants only
- High voltage capability

## 3. Applications

- Compressor starting controls circuits
- General purpose motor controls
- Reversing induction motor control e.g. vertical axis washing machines

## 4. Quick reference data

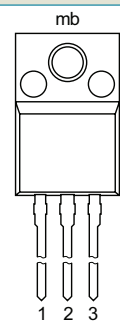
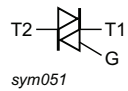
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Absolute maximum rating</b>						
$V_{DRM}$	repetitive peak off-state voltage		-	-	800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_h \leq 75\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	-	8	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>	-	-	60	A
		full sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 16.7\text{ ms}$	-	-	65	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>	5	-	35	mA

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>	5	-	35	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>	5	-	35	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>	-	-	50	mA
$V_T$	on-state voltage	$I_T = 10\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>	-	1.3	1.65	V
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 536\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit	1500	-	-	V/ $\mu\text{s}$
$dI_{com}/dt$	rate of change of commutating current	$V_D = 400\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; $I_{T(RMS)} = 8\text{ A}$ ; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$ ; (snubberless condition); gate open circuit; <a href="#">Fig. 12</a>	12	-	-	A/ms

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1		 sym051
2	T2	main terminal 2		
3	G	gate		
mb	n.c.	mounting base; isolated		

## 6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
BTA308X-800C0	TO220F	BTA308X-800C0Q	Tube	50	SOT186A	14-Nov-2013
BTA308X-800C0/L02	TO220F	BTA308X-800C0/L02Q	Tube	50	SOT186A/L02	14-Nov-2013
BTA308X-800C0/L03	TO220F	BTA308X-800C0/L03Q	Tube	50	SOT186A/L03	14-Nov-2013

## 7. Marking

Table 4. Marking codes

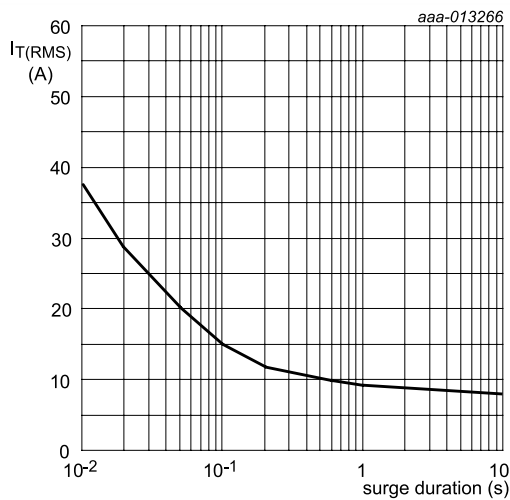
Type number	Marking codes
BTA308X-800C0	BTA308X 800C0

## 8. Limiting values

**Table 5. Limiting values**

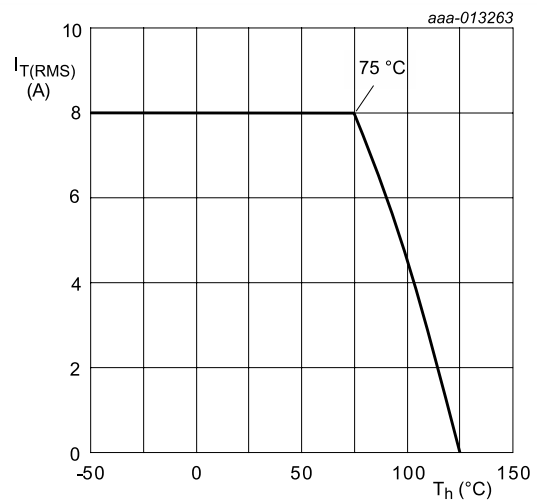
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage		-	800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_h \leq 75\text{ °C}$ ; <a href="#">Fig 1</a> ; <a href="#">Fig 2</a> ; <a href="#">Fig 3</a>	-	8	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>	-	60	A
		full sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 16.7\text{ ms}$	-	65	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; SIN	-	18	$A^2s$
$di_T/dt$	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	$^{\circ}C$
$T_j$	junction temperature		-	125	$^{\circ}C$

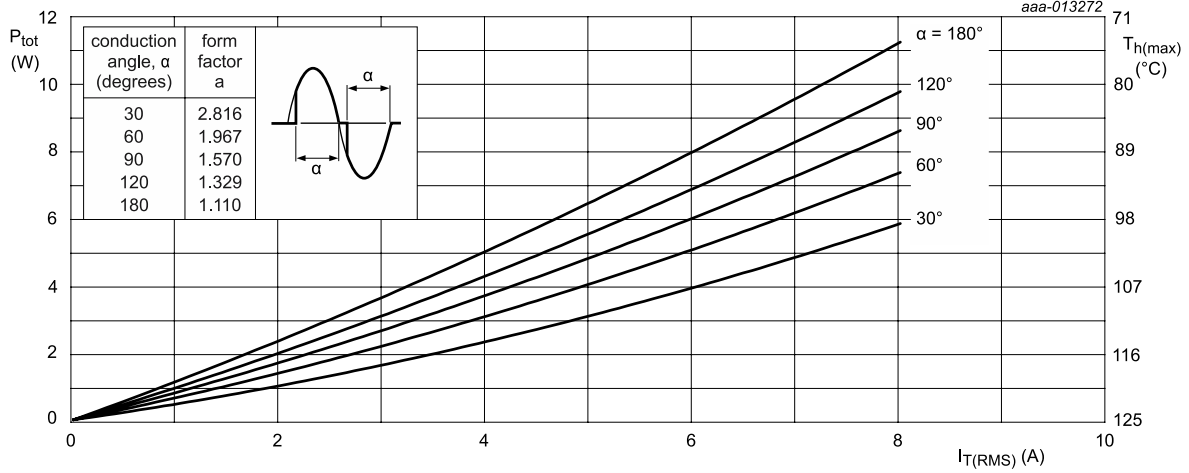


$f = 50\text{ Hz}$ ;  $T_h = 75\text{ °C}$

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

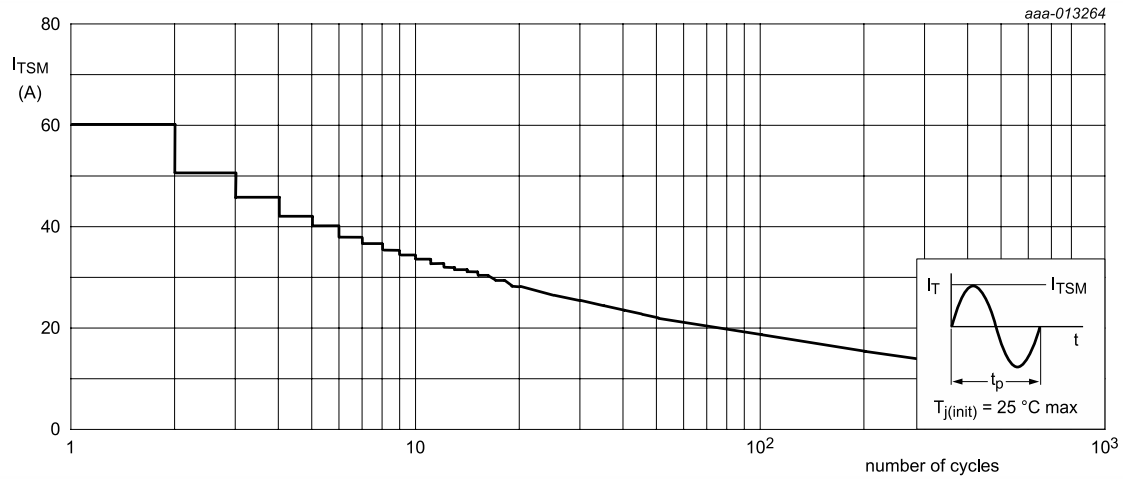


**Fig. 2. RMS on-state current as a function of heatsink temperature; maximum values**



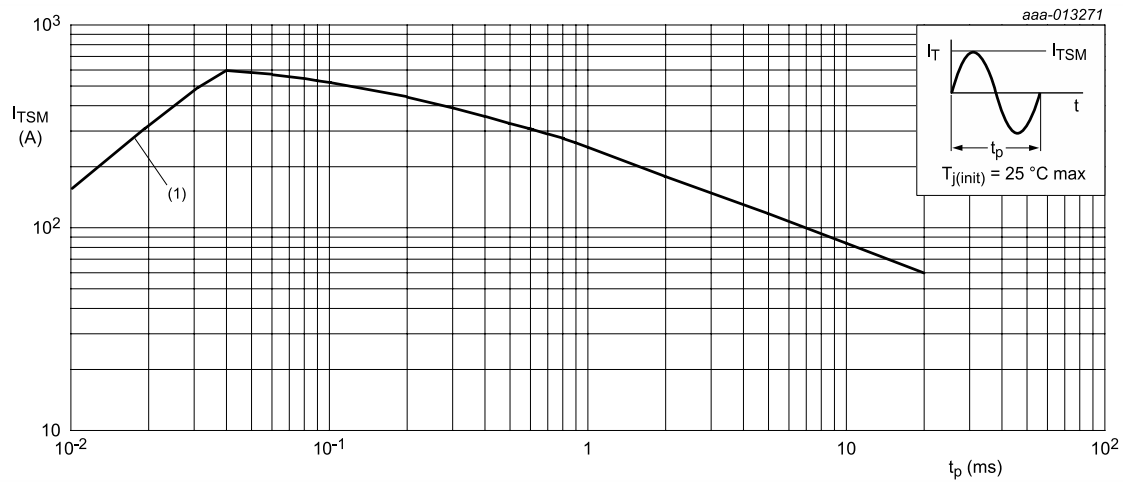
$\alpha$  = conduction angle  
 $a$  = form factor =  $I_{T(RMS)} / I_{T(AV)}$

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



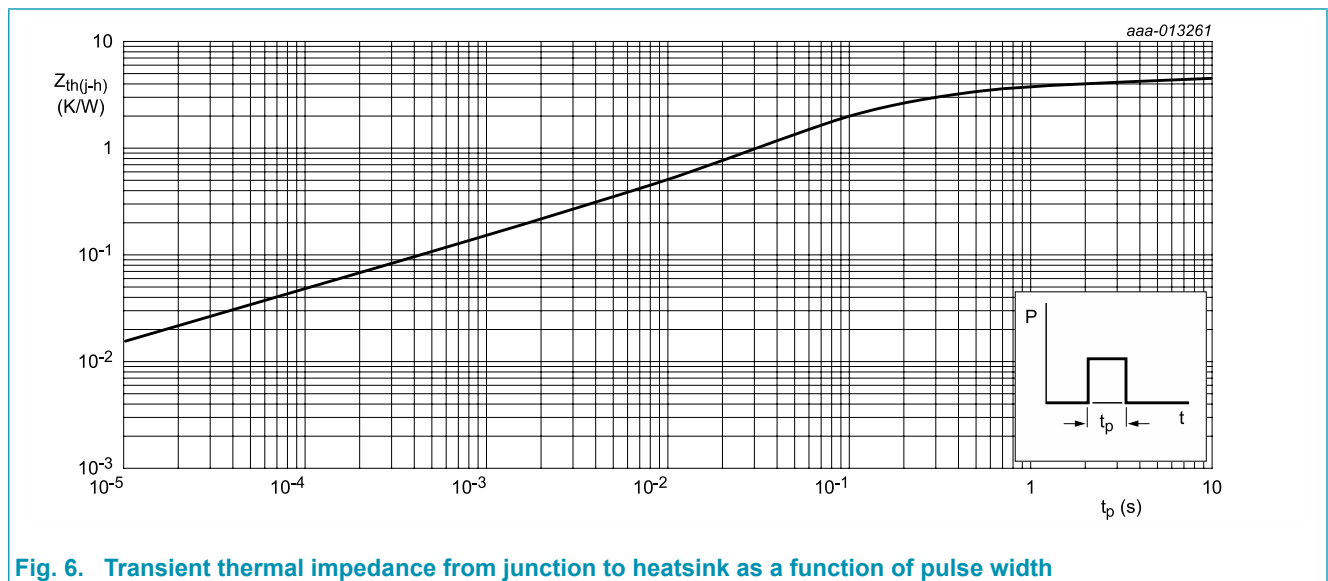
$t_p \leq 20$  ms  
 (1)  $di_T/dt$  limit

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	Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	full cycle or half cycle; with heatsink compound; <a href="#">Fig 6</a>	-	-	4.5	K/W
		full cycle or half cycle; without heatsink compound	-	-	6.5	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 heatsink as a function of pulse width**

## 10. Isolation characteristics

**Table 7. Isolation characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{isol(RMS)}$	RMS isolation voltage	from all terminals to external heatsink; sinusoidal waveform; clean and dust free; $50\text{ Hz} \leq f \leq 60\text{ Hz}$ ; $RH \leq 65\%$ ; $T_h = 25\text{ }^\circ\text{C}$	-	-	2500	V
$C_{isol}$	isolation capacitance	from main terminal 2 to external heatsink; $f = 1\text{ MHz}$ ; $T_h = 25\text{ }^\circ\text{C}$	-	10	-	pF

## 11. Characteristics

Table 8. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T2+ G+;$ $T_J = 25\text{ °C};$ <a href="#">Fig. 7</a>	5	-	35	mA
		$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T2+ G-;$ $T_J = 25\text{ °C};$ <a href="#">Fig. 7</a>	5	-	35	mA
		$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T2- G-;$ $T_J = 25\text{ °C};$ <a href="#">Fig. 7</a>	5	-	35	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>	-	-	50	mA
		$V_D = 12\text{ V}; I_G = 0.1\text{ A}; T2+ G-;$ $T_J = 25\text{ °C};$ <a href="#">Fig. 8</a>	-	-	75	mA
		$V_D = 12\text{ V}; I_G = 0.1\text{ A}; T2- G-;$ $T_J = 25\text{ °C};$ <a href="#">Fig. 8</a>	-	-	50	mA
$I_H$	holding current	$V_D = 12\text{ V}; T_J = 25\text{ °C};$ <a href="#">Fig. 9</a>	-	-	50	mA
$V_T$	on-state voltage	$I_T = 10\text{ A}; T_J = 25\text{ °C};$ <a href="#">Fig. 10</a>	-	1.3	1.65	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>	-	0.7	1	V
		$V_D = 400\text{ V}; I_T = 0.1\text{ A}; T_J = 125\text{ °C}$	0.2	0.45	-	V
$I_D$	off-state current	$V_D = 800\text{ V}; T_J = 25\text{ °C}$	-	-	10	$\mu\text{A}$
		$V_D = 800\text{ V}; T_J = 125\text{ °C}$	-	-	0.5	mA
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 536\text{ V}; T_J = 125\text{ °C}; (V_{DM} = 67\%$ of $V_{DRM});$ exponential waveform; gate open circuit	1500	-	-	V/ $\mu\text{s}$
$dI_{com}/dt$	rate of change of commutating current	$V_D = 400\text{ V}; T_J = 125\text{ °C}; I_{T(RMS)} = 8\text{ A};$ $dV_{com}/dt = 20\text{ V}/\mu\text{s};$ (snubberless condition); gate open circuit; <a href="#">Fig. 12</a>	12	-	-	A/ms

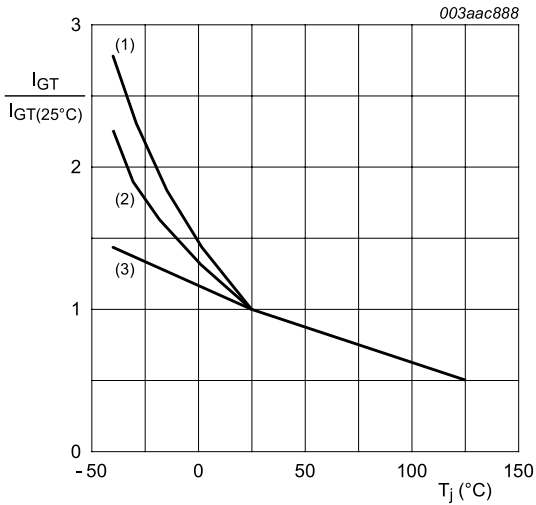


Fig. 7. Normalized gate trigger current as a function of junction temperature

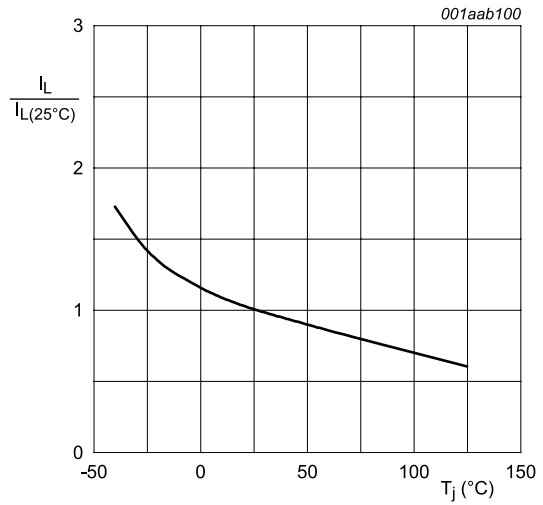


Fig. 8. Normalized latching current as a function of junction temperature

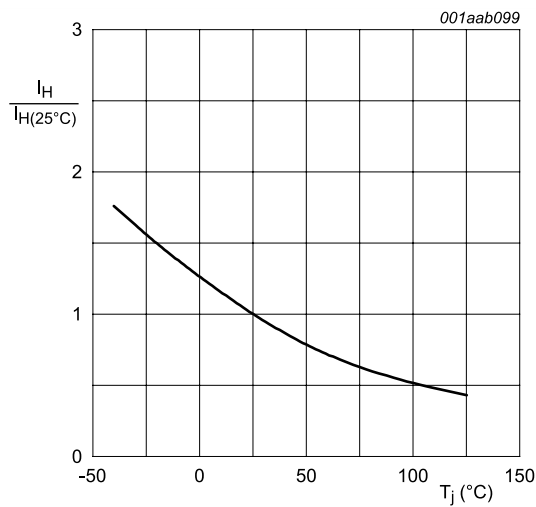
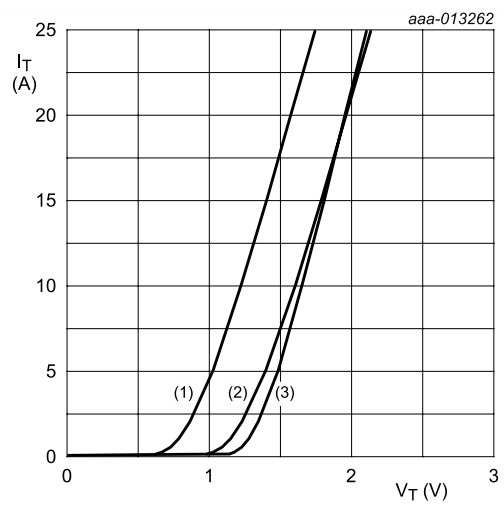
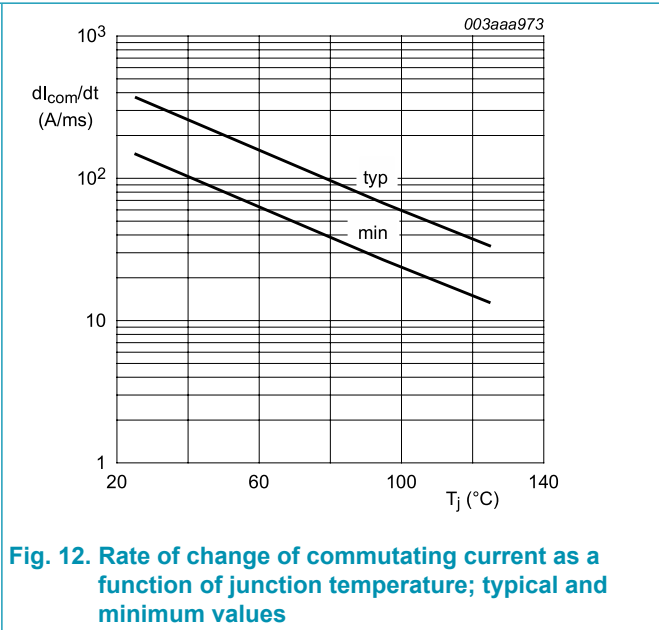
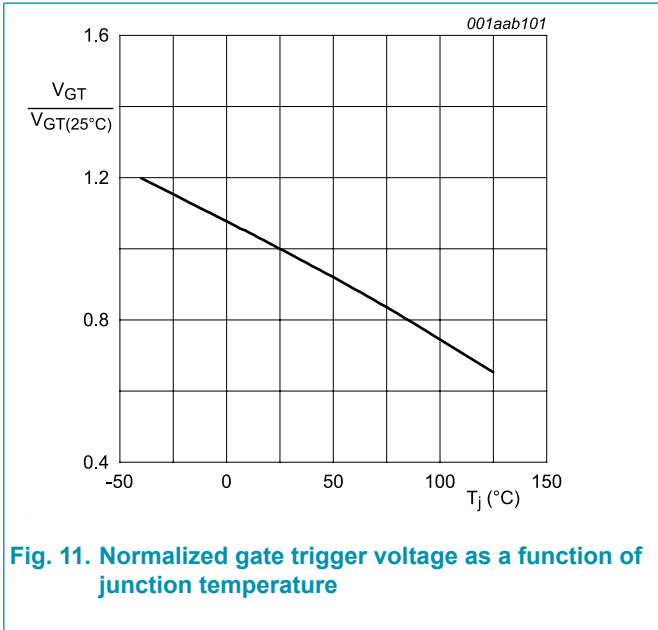


Fig. 9. Normalized holding current as a function of junction temperature



$V_o = 1.205\text{ V}; R_s = 0.039\ \Omega$   
 (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

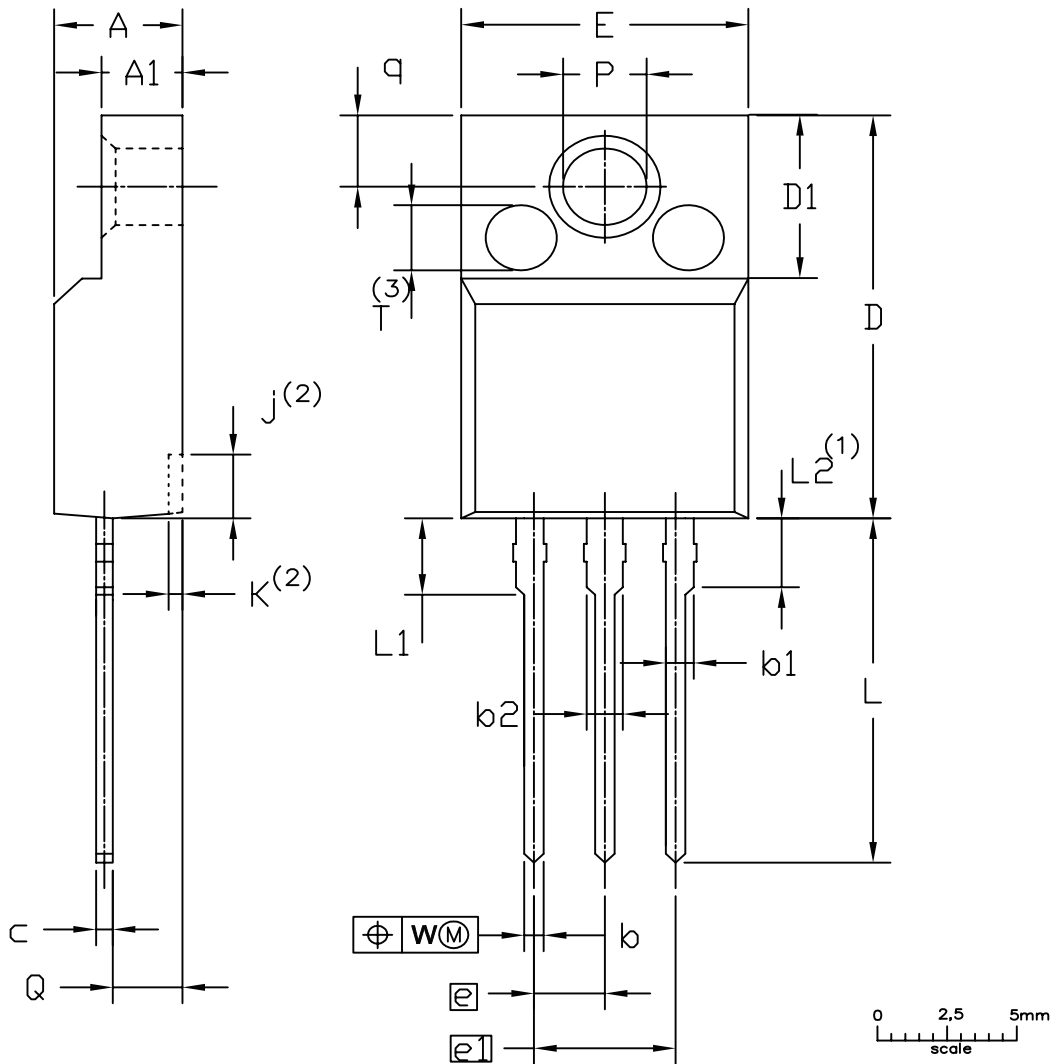




## 12. Package outline

Plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack"

SOT186A



UNIT	A	A <sub>1</sub>	b	b <sub>1</sub>	b <sub>2</sub>	c	D	D <sub>1</sub>	E	e	e <sub>1</sub>	j <sup>(2)</sup>	k <sup>(2)</sup>	L	L <sub>1</sub>	L <sub>2</sub> <sup>(1)</sup> max.	P	Q	q	W	T <sup>(3)</sup>
mm	4.6	2.9	0.9	1.1	1.4	0.7	15.8	6.5	10.3	2.54	5.08	2.7	0.6	14.4	3.30	3	3.2	2.6	3.0	0.4	2.5
	4.0	2.5	0.7	0.9	1.0	0.4	15.2	6.3	9.7			1.7	0.4	13.5	2.79		3.0	2.3	2.6		

**Notes**

1. Terminal dimensions within this zone are uncontrolled
2. Dot lines area designs may vary
3. Eject pin mark is for reference only

OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
SOT186A		3 LEADS TO220F			2013-11-14

· PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.

## 13. 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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For sales office addresses, please send an email to: [salesaddresses@ween-semi.com](mailto:salesaddresses@ween-semi.com)  
Date of release: 18 August 2021

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