

BTA312X series B and C

12 A Three-quadrant triacs high commutation

Rev. 02 — 17 December 2007

Product data sheet

1. Product profile

1.1 General description

Passivated, new generation, high commutation triacs in a SOT186A full pack plastic package

1.2 Features

- Very high commutation performance maximized at each gate sensitivity
- High immunity to dV/dt
- High isolation voltage

1.3 Applications

- High power motor control - e.g. washing machines, vacuum cleaners
- Refrigeration and air conditioning compressors
- Non-linear rectifier-fed motor loads
- Electronic thermostats

1.4 Quick reference data

- $V_{DRM} \leq 600 \text{ V}$ (BTA312X-600B/C)
- $I_{GT} \leq 50 \text{ mA}$ (BTA312X-series B)
- $V_{DRM} \leq 800 \text{ V}$ (BTA312X-800B/C)
- $I_{GT} \leq 35 \text{ mA}$ (BTA312X-series C)
- $I_{TSM} \leq 95 \text{ A}$ ($t = 20 \text{ ms}$)
- $I_{T(RMS)} \leq 12 \text{ A}$

2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Symbol
1	main terminal 1 (T1)	SOT186A (TO-220F)	sym051
2	main terminal 2 (T2)		
3	gate (G)		
mb	mounting base; isolated		

3. Ordering information

Table 2. Ordering information

Type number	Package		Version
	Name	Description	
BTA312X-600B	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 'full pack'	SOT186A
BTA312X-600C			
BTA312X-800B			
BTA312X-800C			

4. Limiting values

Table 3. 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	BTA312X-600B; BTA312X-600C	^[1] -	600	V
		BTA312X-800B; BTA312X-800C	-	800	V
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{h}} \leq 61\text{ }^{\circ}\text{C}$; see Figure 4 and 5	-	12	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{\text{j}} = 25\text{ }^{\circ}\text{C}$ prior to surge; see Figure 2 and 3			
		$t = 20\text{ ms}$	-	95	A
		$t = 16.7\text{ ms}$	-	105	A
I^2t	I^2t for fusing	$t = 10\text{ ms}$	-	45	A^2s
di_{T}/dt	rate of rise of on-state current	$I_{\text{TM}} = 20\text{ A}$; $I_{\text{G}} = 0.2\text{ A}$; $di_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$	-	100	$\text{A}/\mu\text{s}$
I_{GM}	peak gate current		-	2	A
P_{GM}	peak gate power		-	5	W
$P_{\text{G(AV)}}$	average gate power	over any 20 ms period	-	0.5	W
T_{stg}	storage temperature		-40	+150	$^{\circ}\text{C}$
T_{j}	junction temperature		-	125	$^{\circ}\text{C}$

- [1] Although not recommended, off-state voltages up to 800 V may be applied without damage, but the triac may switch to the on-state. The rate of rise of current should not exceed 15 A/ μs .

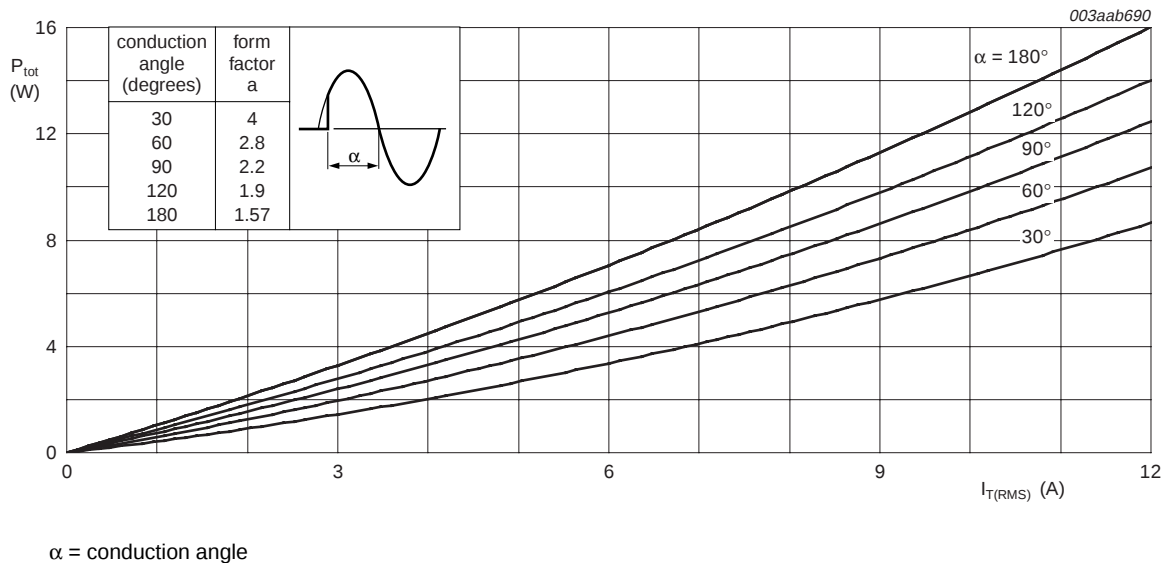


Fig 1. Total power dissipation as a function of RMS on-state current; maximum values

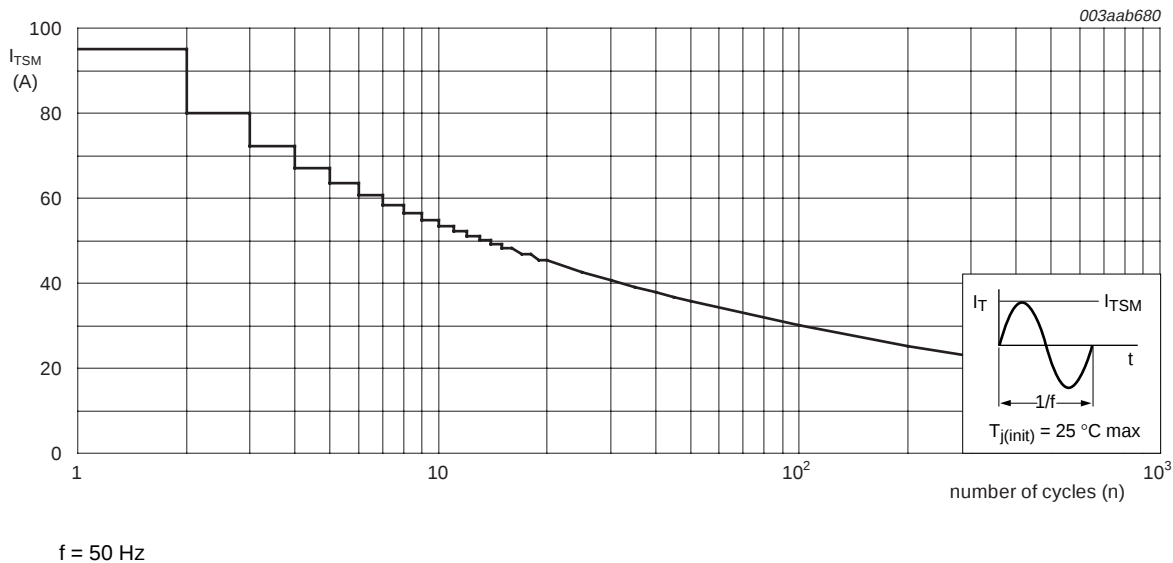
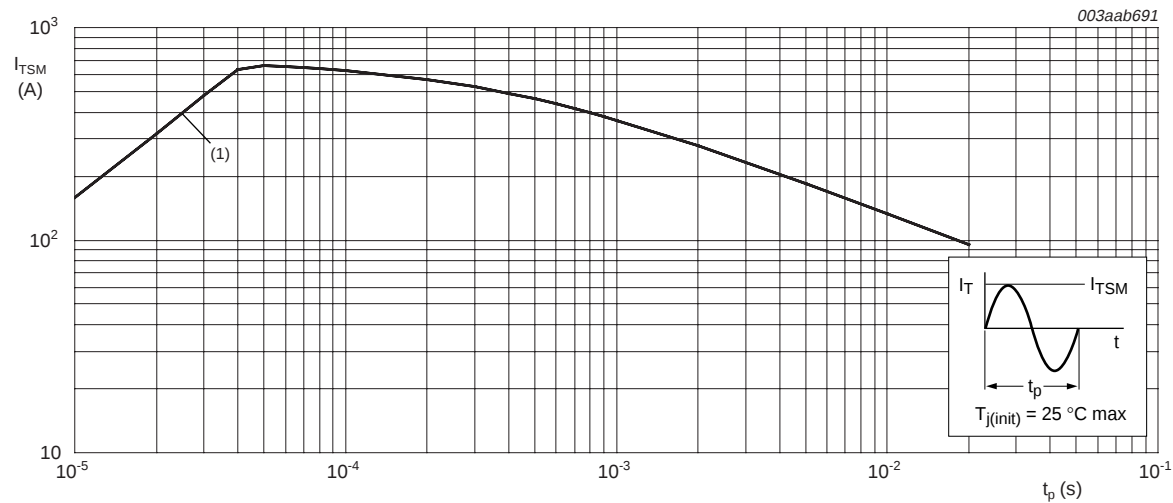
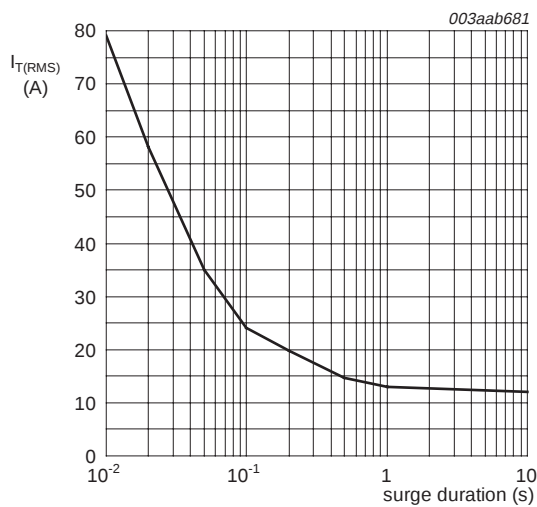


Fig 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



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

Fig 3. Non-repetitive peak on-state current as a function of pulse duration; maximum values



$f = 50\text{ Hz}$
 $T_h = 61\text{ °C}$

Fig 4. RMS on-state current as a function of surge duration; maximum values

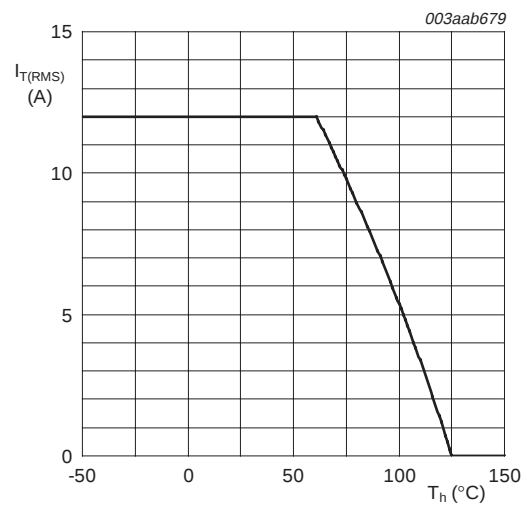
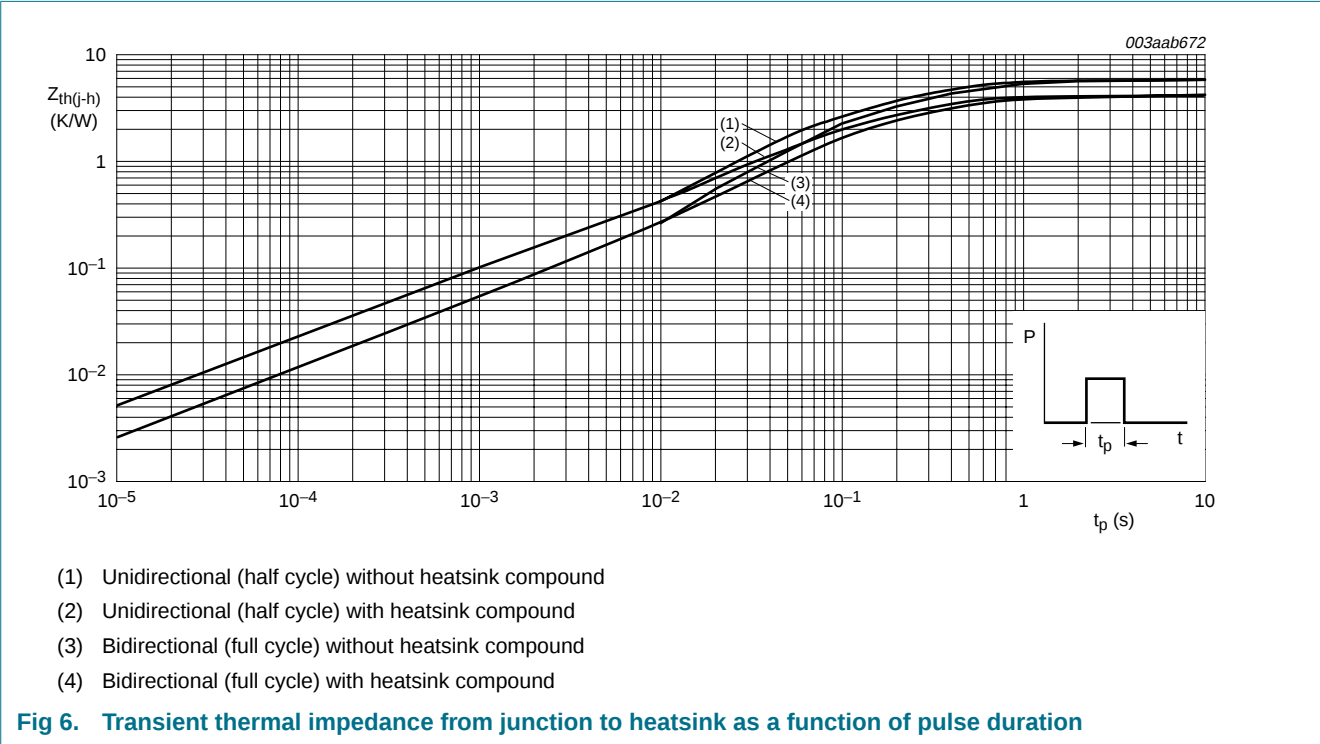


Fig 5. RMS on-state current as a function of heatsink temperature; maximum values

5. Thermal characteristics

Table 4. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
R _{th(j-h)}	thermal resistance from junction to heatsink	full or half cycle; without heatsink compound; see Figure 6	-	-	5.5	K/W
		full or half cycle; with heatsink compound; see Figure 6	-	-	4.0	K/W
R _{th(j-a)}	thermal resistance from junction to ambient	in free air	-	55	-	K/W



6. Isolation characteristics

Table 5. Isolation limiting values and characteristics

$T_h = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{isol(RMS)}	RMS isolation voltage	from all three terminals to external heatsink; f = 50 Hz to 60 Hz; sinusoidal waveform; RH ≤ 65 %; clean and dust free	-	-	2500	V
C _{isol}	isolation capacitance	from pin 2 to external heatsink; f = 1 MHz	-	10	-	pF

7. Static characteristics

Table 6. Static characteristics

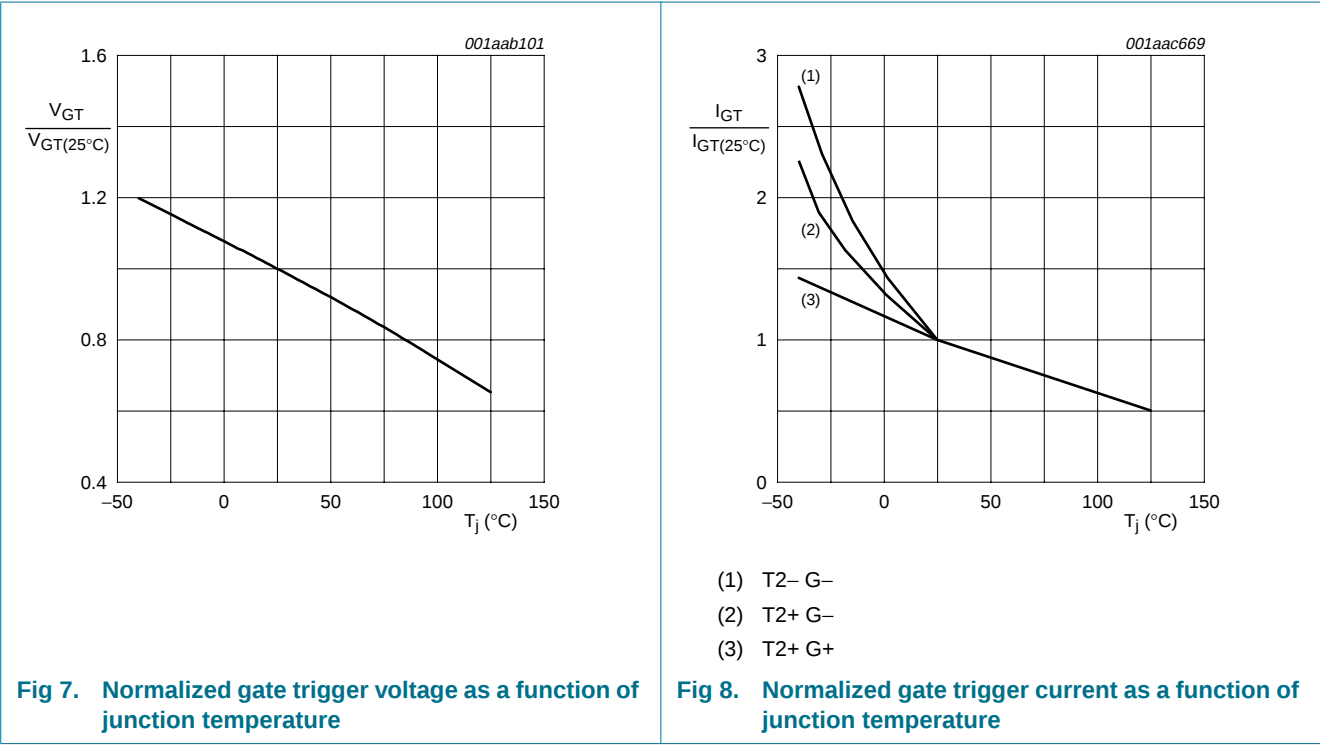
$T_j = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

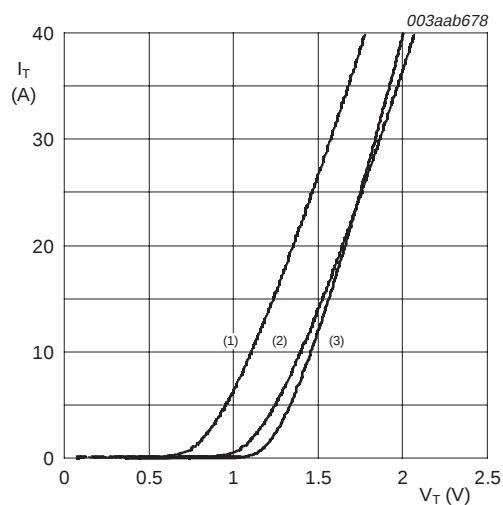
Symbol	Parameter	Conditions	BTA312X-600B BTA312X-800B			BTA312X-600C BTA312X-800C			Unit
			Min	Typ	Max	Min	Typ	Max	
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; see Figure 8							
		T2+ G+	2	-	50	2	-	35	mA
		T2+ G-	2	-	50	2	-	35	mA
		T2- G-	2	-	50	2	-	35	mA
I_L	latching current	$V_D = 12\text{ V}$; $I_{GT} = 0.1\text{ A}$; see Figure 10					-		
		T2+ G+	-	-	60	-	-	50	mA
		T2+ G-	-	-	90	-	-	60	mA
		T2- G-	-	-	60	-	-	50	mA
I_H	holding current	$V_D = 12\text{ V}$; $I_{GT} = 0.1\text{ A}$; see Figure 11	-	-	60	-	-	35	mA
V_T	on-state voltage	$I_T = 15\text{ A}$; see Figure 9	-	1.3	1.6	-	1.3	1.6	V
V_{GT}	gate trigger voltage	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; see Figure 7	-	0.8	1.5	-	0.8	1.5	V
		$V_D = 400\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 125\text{ }^{\circ}\text{C}$	0.25	0.4	-	0.25	0.4	-	V
I_D	off-state current	$V_D = V_{DRM(max)}$; $T_j = 125\text{ }^{\circ}\text{C}$	-	0.1	0.5	-	0.1	0.5	mA

8. Dynamic characteristics

Table 7. Dynamic characteristics

Symbol	Parameter	Conditions	BTA312X-600B BTA312X-800B			BTA312X-600C BTA312X-800C			Unit
			Min	Typ	Max	Min	Typ	Max	
dV _D /dt	rate of rise of off-state voltage	V _{DM} = 0.67 × V _{DRM(max)} ; T _j = 125 °C; exponential waveform; gate open circuit	1000	2000	-	500	-	-	V/μs
dI _{com} /dt	rate of change of commutating current	V _{DM} = 400 V; T _j = 125 °C; I _{T(RMS)} = 12 A; without snubber; gate open circuit	30	-	-	20	-	-	A/ms
t _{gt}	gate-controlled turn-on time	I _{TM} = 20 A; V _D = V _{DRM(max)} ; I _G = 0.1 A; dI _G /dt = 5 A/μs	-	2	-	-	2	-	μs





$V_o = 1.127$ V

$R_s = 0.027$ Ω

- (1) $T_j = 125$ °C; typical values
- (2) $T_j = 125$ °C; maximum values
- (3) $T_j = 25$ °C; maximum values

Fig 9. On-state current as a function of on-state voltage

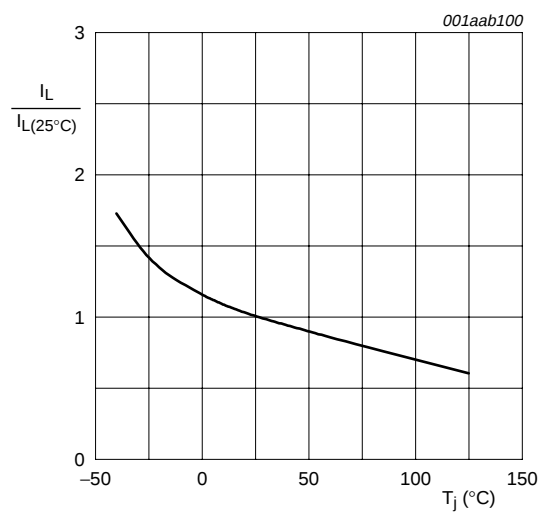


Fig 10. Normalized latching current as a function of junction temperature

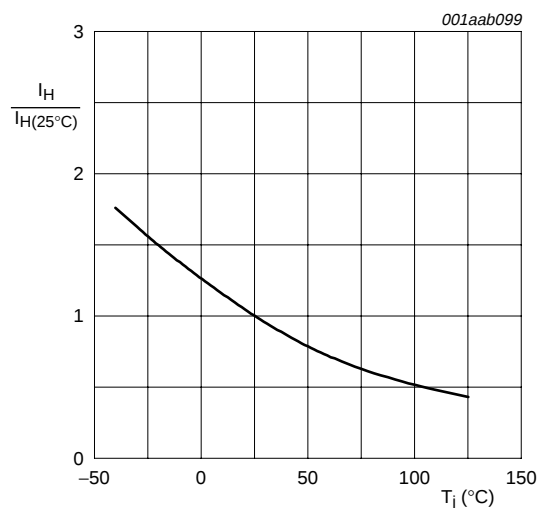


Fig 11. Normalized holding current as a function of junction temperature

9. Package information

Epoxy meets UL94 V-0 at 3.175 mm.

10. Package outline

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

SOT186A

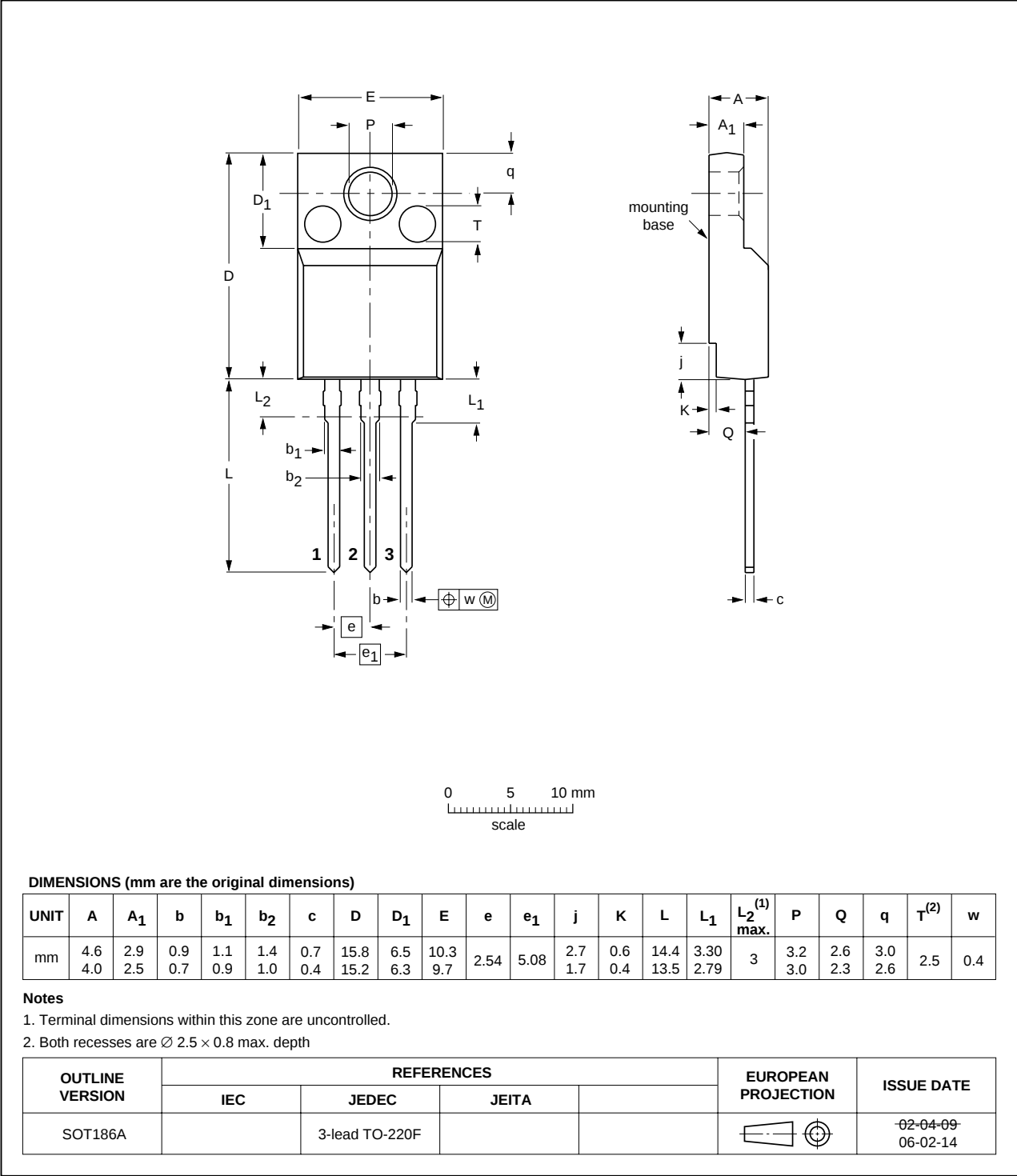


Fig 12. Package outline SOT186A (3-lead TO-220F)

11. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BTA312X_SER_B_C_2	20071217	Product data sheet	-	BTA312X_SER_B_C_1
Modifications:				
• BTA312X-800C product added: – Section 1.4 "Quick reference data" on page 1 updated. – Section 3 "Ordering information" on page 2 updated. – Section 4 "Limiting values" on page 2 updated. – Section 7 "Static characteristics" on page 6 updated. – Section 8 "Dynamic characteristics" on page 7 updated.				
BTA312X_SER_B_C_1	20070411	Product data sheet	-	-

12. Legal information

12.1 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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