BTA202X series D and E

2 A Three-quadrant triacs high commutation

Rev. 01 — 7 February 2008 Product data sheet

1. Product profile

1.1 General description

Passivated high commutation triacs in a SOT186A ‘full pack’ plastic package. These triacs balance the requirements of commutation performance and gate sensitivity. The ‘sensitive’ gate E series and ‘logic level’ D series are intended for interfacing with low-power drivers, including microcontrollers.

1.2 Features

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

1.3 Applications

- Motor control
- Solenoid driver

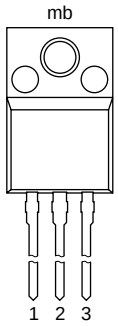
1.4 Quick reference data

- $V_{DRM} \leq 600$ V (BTA202X-600D)
- $V_{DRM} \leq 600$ V (BTA202X-600E)
- $V_{DRM} \leq 800$ V (BTA202X-800D)
- $V_{DRM} \leq 800$ V (BTA202X-800E)
- $I_{T(RMS)} \leq 2$ A
- $I_{GT} \leq 5$ mA (BTA202X-600D)
- $I_{GT} \leq 10$ mA (BTA202X-600E)
- $I_{GT} \leq 5$ mA (BTA202X-800D)
- $I_{GT} \leq 10$ mA (BTA202X-800E)

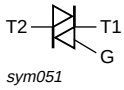
2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	main terminal 1 (T1)		
2	main terminal 2 (T2)		
3	gate (G)		
mb	mounting base (isolated)		



SOT186A (TO-220F)



3. Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
BTA202X-600D	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 'full pack'	SOT186A
BTA202X-600E			
BTA202X-800D			
BTA202X-800E			

4. Limiting values

Table 3. Limiting values

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

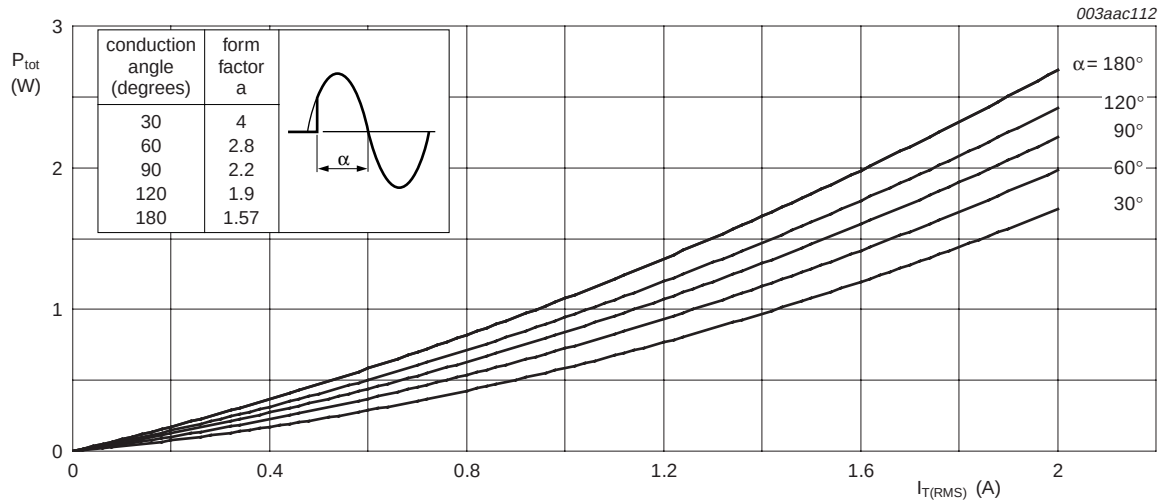
Symbol	Parameter	Conditions		Min	Max	Unit
V_{DRM}	repetitive peak off-state voltage	BTA202X-600D; BTA202X-600E	[1]	-	600	V
		BTA202X-800D; BTA202X-800E			800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_h \leq 110$ °C; see Figure 4 and 5		-	2	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_j = 25$ °C prior to surge; see Figure 2 and 3				
		t = 20 ms		-	14	A
		t = 16.7 ms		-	15.4	A
I^2t	I^2t for fusing	$t_p = 10$ ms		-	0.98	A^2s
dI_T/dt	rate of rise of on-state current	$I_{TM} = 1.5$ A; $I_G = 0.2$ A; $dI_G/dt = 0.2$ A/µs		-	100	A/µs
I_{GM}	peak gate current			-	2	A
P_{GM}	peak gate power			-	5	W

Table 3. Limiting values *...continued*

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

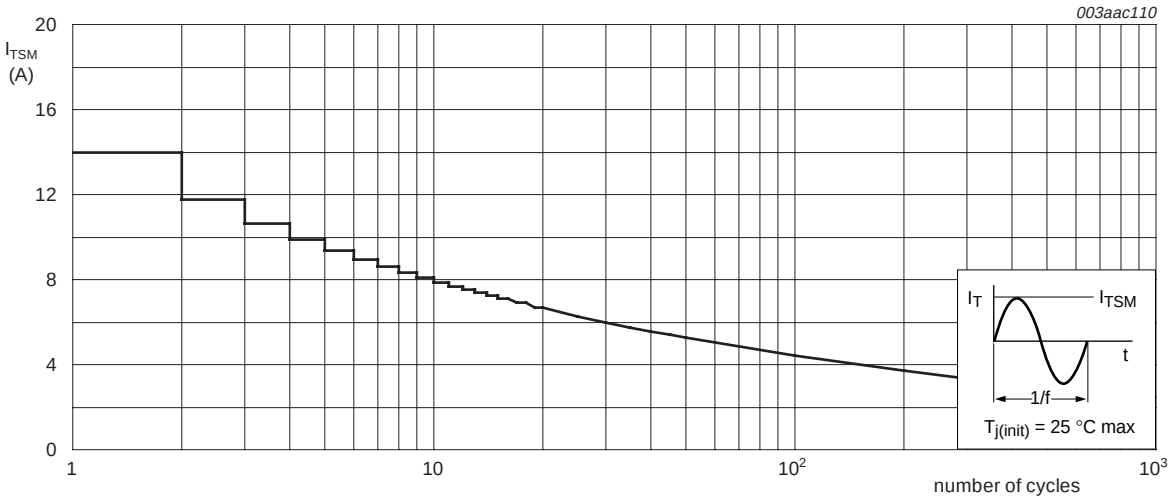
Symbol	Parameter	Conditions	Min	Max	Unit
$P_{G(AV)}$	average gate power	over any 20 ms period	-	0.5	W
T_{stg}	storage temperature		–40	+150	°C
T_j	junction temperature		-	125	°C

[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 6 A/µs.



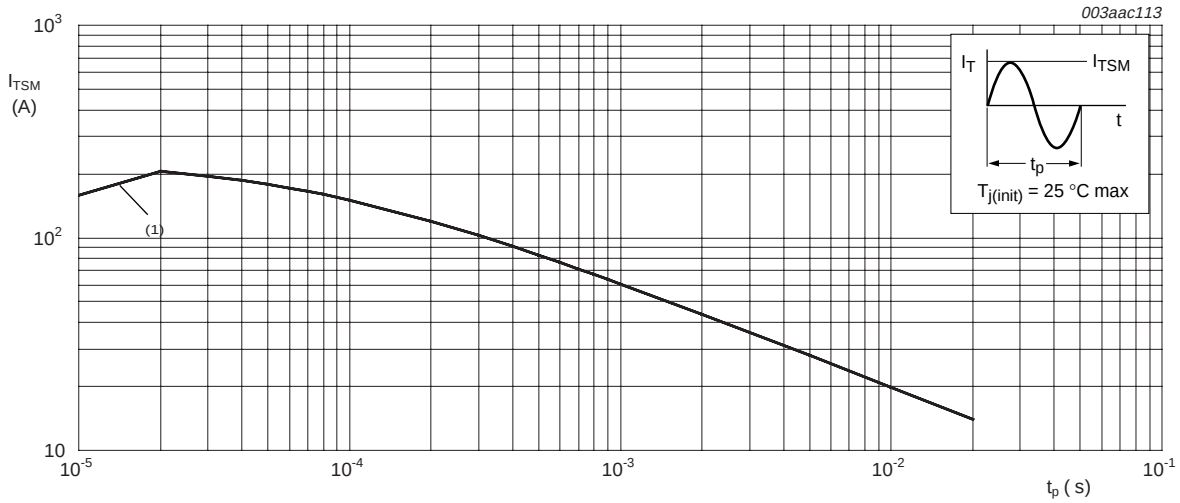
α = conduction angle

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



f = 50 Hz

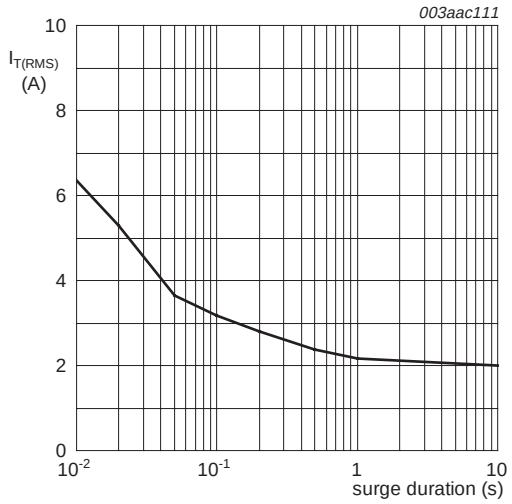
Fig 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



$t_p \leq 20$ ms

(1) dI_T/dt limit

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



f = 50 Hz; T_h = 110 °C

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

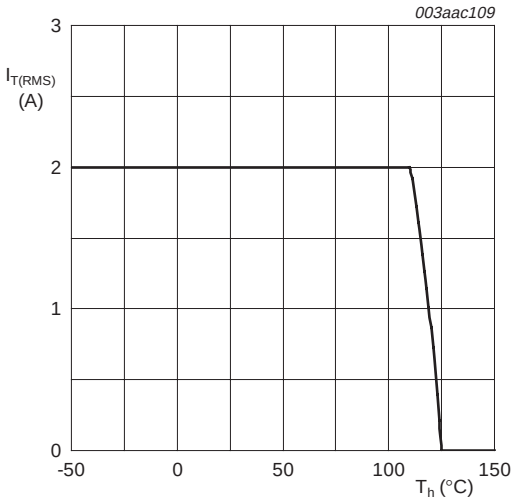


Fig 5. RMS on-state current as a function of heatsink temperature; maximum values

5. Thermal characteristics

Table 4. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	bidirectional; see Figure 6	-	-	5.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	55	-	K/W

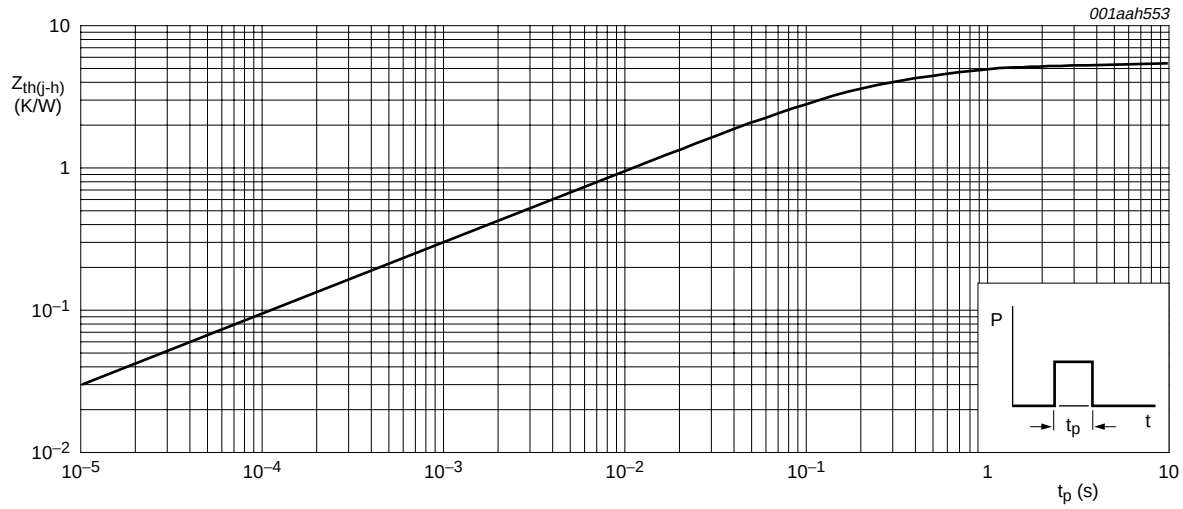


Fig 6. Transient thermal impedance from junction to heatsink as a function of pulse width

6. Isolation characteristics

Table 5. Isolation limiting values and characteristics

T_h = 25 °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 °C unless otherwise specified.

Symbol	Parameter	Conditions	BTA202X-600D BTA202X-800D			BTA202X-600E BTA202X-800E			Unit
			Min	Typ	Max	Min	Typ	Max	
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; see Figure 8							
		T2+ G+	0.25	-	5	0.5	-	10	mA
		T2+ G–	0.25	-	5	0.5	-	10	mA
		T2– G–	0.25	-	5	0.5	-	10	mA
I_L	latching current	V_D = 12 V; I_{GT} = 0.1 A; see Figure 10							
		T2+ G+	-	-	5	-	-	12	mA
		T2+ G–	-	-	10	-	-	20	mA
		T2– G–	-	-	5	-	-	12	mA
I_H	holding current	V_D = 12 V; I_{GT} = 0.1 A; see Figure 11	-	-	5	-	-	12	mA
V_T	on-state voltage	I_T = 3 A; see Figure 9	-	1.63	2	-	1.63	2	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; see Figure 7	-	0.7	1.5	-	0.7	1.5	V
		V_D = 400 V; I_T = 0.1 A; T_j = 125 °C	0.2	0.3	-	0.2	0.3	-	V
I_D	off-state current	$V_D = V_{DRM(max)}$; T_j = 125 °C	-	0.1	0.5	-	0.1	0.5	mA

8. Dynamic characteristics

Table 7. Dynamic characteristics

Symbol	Parameter	Conditions	BTA202X-600D BTA202X-800D			BTA202X-600E BTA202X-800E			Unit
			Min	Typ	Max	Min	Typ	Max	
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 0.67 \times V_{DRM(max)}$; T_j = 125 °C; exponential waveform; $R_{(G-MT1)}$ = 220 Ω	-	350	-	-	500	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_{DM} = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 2 A; dV_{com}/dt = 20 V/µs; gate open circuit	1.0	-	-	2.0	-	-	A/ms
		V_{DM} = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 2 A; dV_{com}/dt = 10 V/µs; gate open circuit	1.2	-	-	2.3	-	-	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

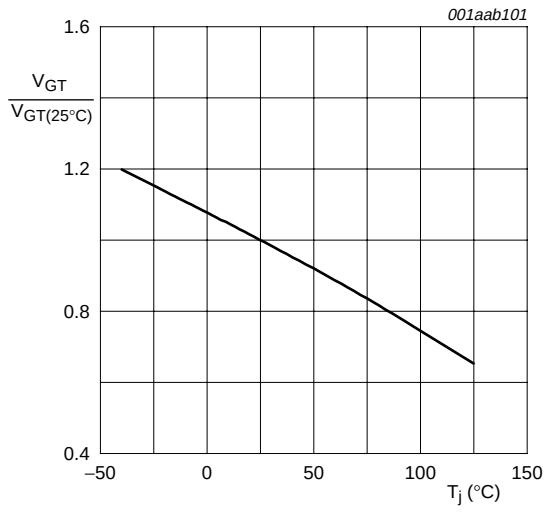
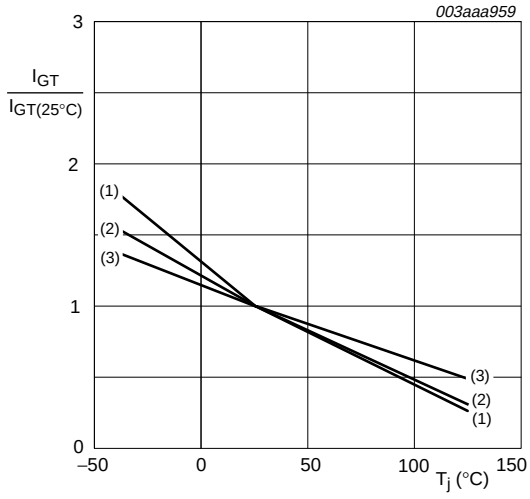
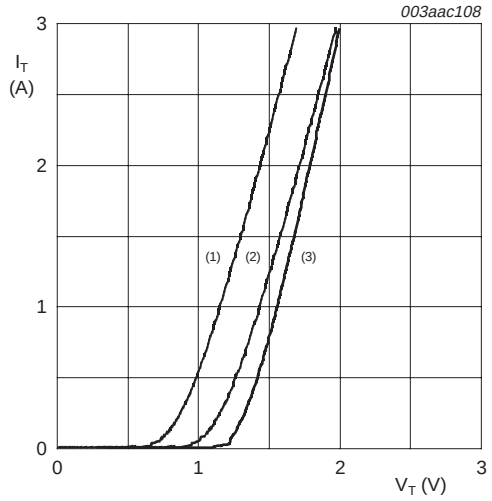


Fig 7. Normalized gate trigger voltage as a function of junction temperature



(1) T2– G–
(2) T2+ G–
(3) T2+ G+

Fig 8. Normalized gate trigger current as a function of junction temperature



V_o = 0.9 V

R_s = 0.267 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

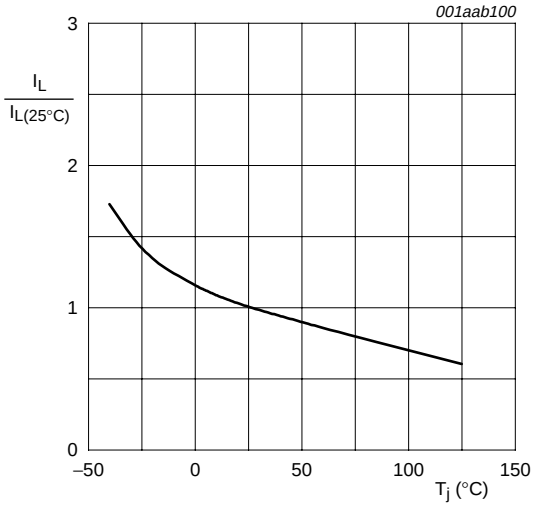


Fig 10. Normalized latching current as a function of junction temperature

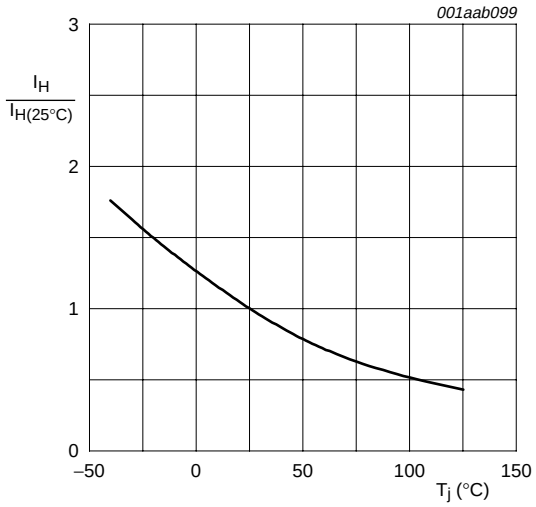


Fig 11. Normalized holding current as a function of junction temperature

9. Package information

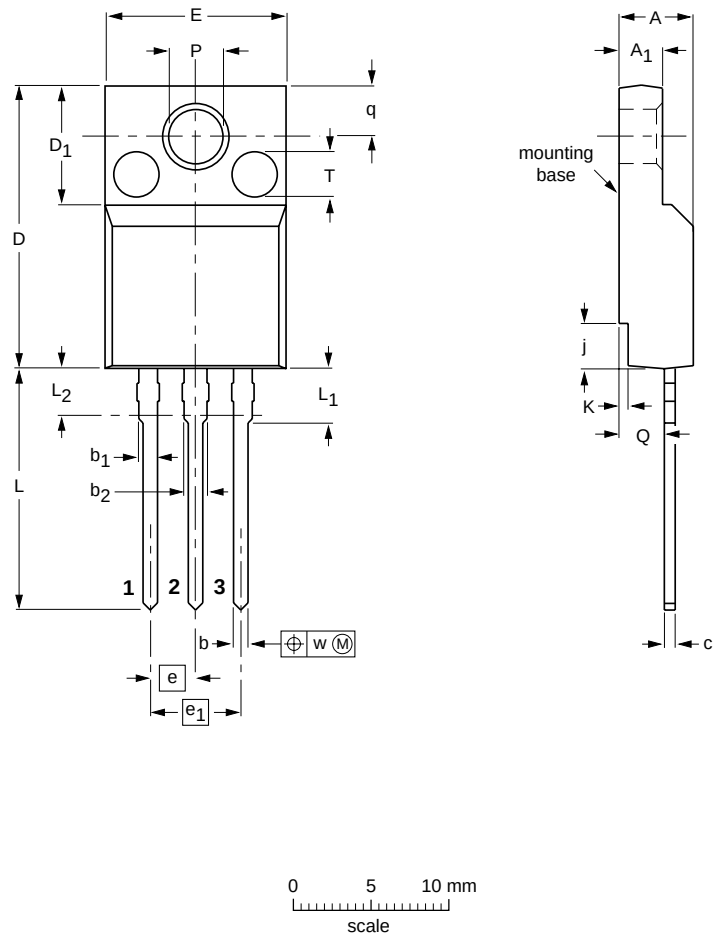
Refer to mounting instructions for F-pack packages.

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



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	b_1	b_2	c	D	D_1	E	e	e_1	j	K	L	L_1	L_2 (1) max.	P	Q	q	T (2)	w
mm	4.6 4.0	2.9 2.5	0.9 0.7	1.1 0.9	1.4 1.0	0.7 0.4	15.8 15.2	6.5 6.3	10.3 9.7	2.54	5.08	2.7 1.7	0.6 0.4	14.4 13.5	3.30 2.79	3	3.2 3.0	2.6 2.3	3.0 2.6	2.5	0.4

Notes

1. Terminal dimensions within this zone are uncontrolled.
2. Both recesses are ∅ 2.5 × 0.8 max. depth

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT186A		3-lead TO-220F				~~02-04-09~~ 06-02-14

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
BTA202X_SER_D_E_1	20080207	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".

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14. Contents

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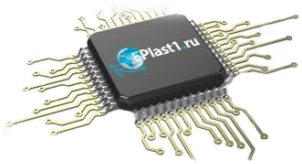

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Телефон: 8 (812) 309 58 32 (многоканальный)
Факс: 8 (812) 320-02-42
Электронная почта: org@eplast1.ru
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.