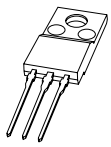


BTA208X-1000C

Three quadrant triacs high commutation

Rev. 01 — 4 October 2005 Product data sheet

1. Product profile

1.1 General description

Passivated high voltage, high commutation triac in a 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/dt can occur. This device will commutate the full rated RMS current at the maximum rated junction temperature, without the aid of a snubber.

1.2 Features

- False trigger immunity
- 1000 V V_{DRM} guaranteed
- Isolated package

1.3 Applications

- Motor control
- Reversible induction motors

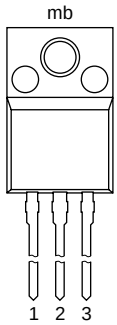
1.4 Quick reference data

- $I_{TSM} \leq 65$ A
- $V_{DRM} \leq 1000$ V
- $I_{T(RMS)} \leq 8$ A
- $I_{GT} \leq 35$ mA

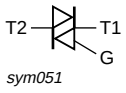
2. Pinning information

Table 1: Pinning

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



SOT186A (3-lead TO-220F)



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3. Ordering information

Table 2: Ordering information

Type number	Package		
	Name	Description	Version
BTA208X-1000C	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 'full pack'	SOT186A

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		-	1000	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_h \leq 73$ °C; see Figure 4 and 5	-	8	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	-	65	A
		t = 16.7 ms	-	71	A
I^2t	I^2t for fusing	t = 10 ms	-	21	A^2s
dI_T/dt	rate of rise of on-state current	$I_{TM} = 12$ 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
$P_{G(AV)}$	average gate power	over any 20 ms period	-	0.5	W
T_{stg}	storage temperature		–40	+150	°C
T_j	junction temperature		-	125	°C

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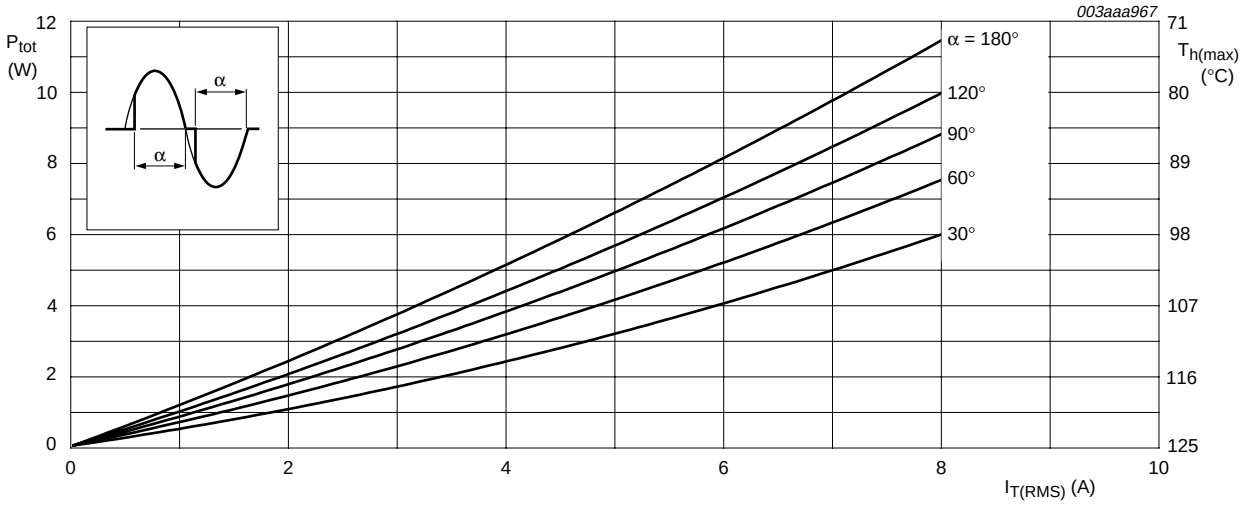
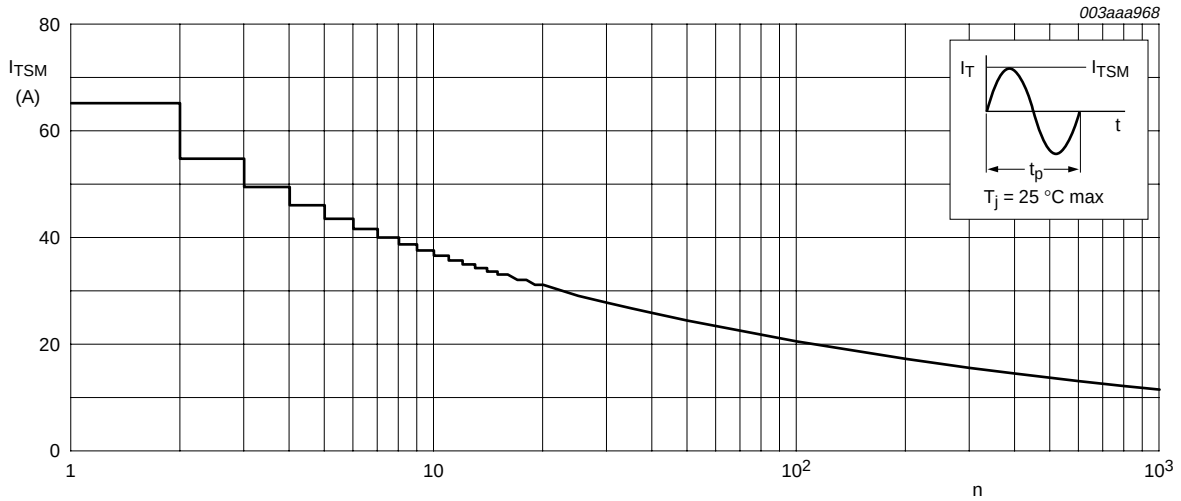


α = conduction angle

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

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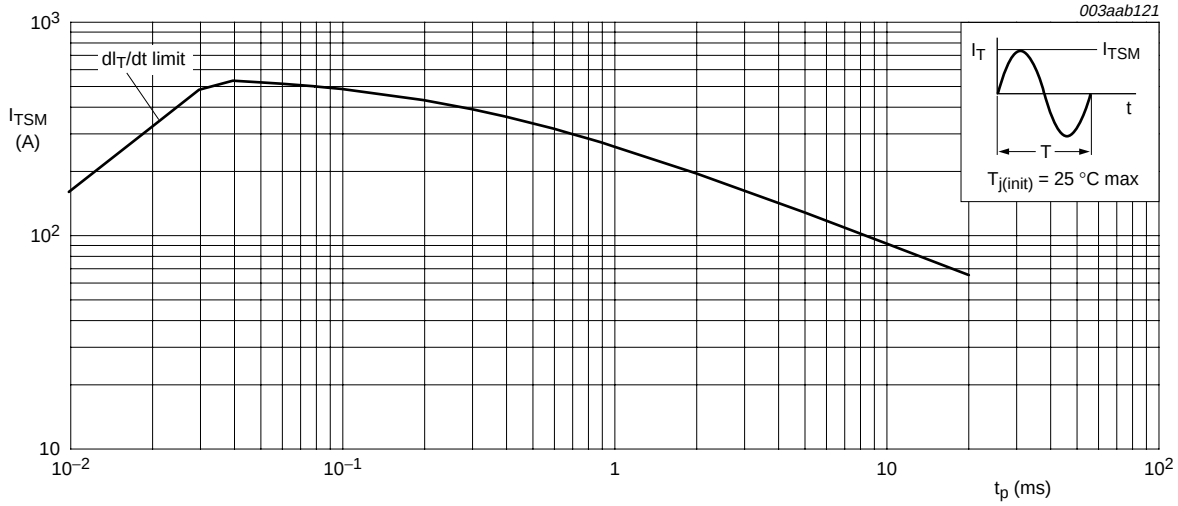
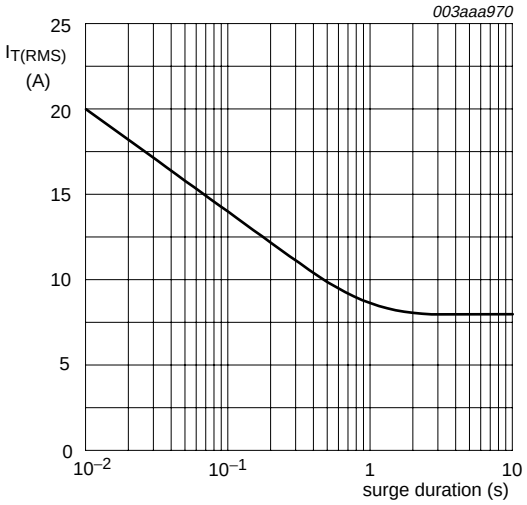


Fig 3. Non-repetitive peak on-state current as a function of pulse width; maximum values



f = 50 Hz; $T_h \leq 73$ °C

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

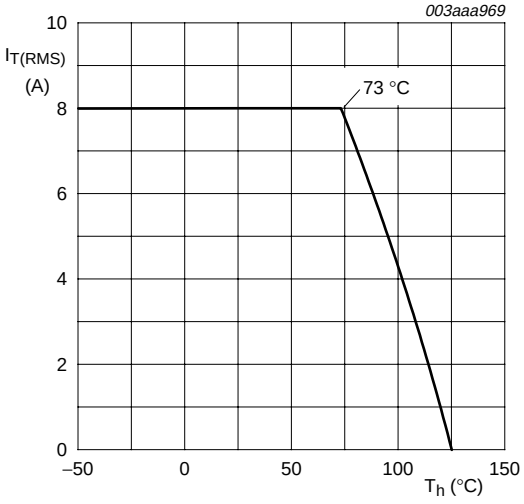


Fig 5. RMS on-state current as a function of heatsink temperature; maximum values

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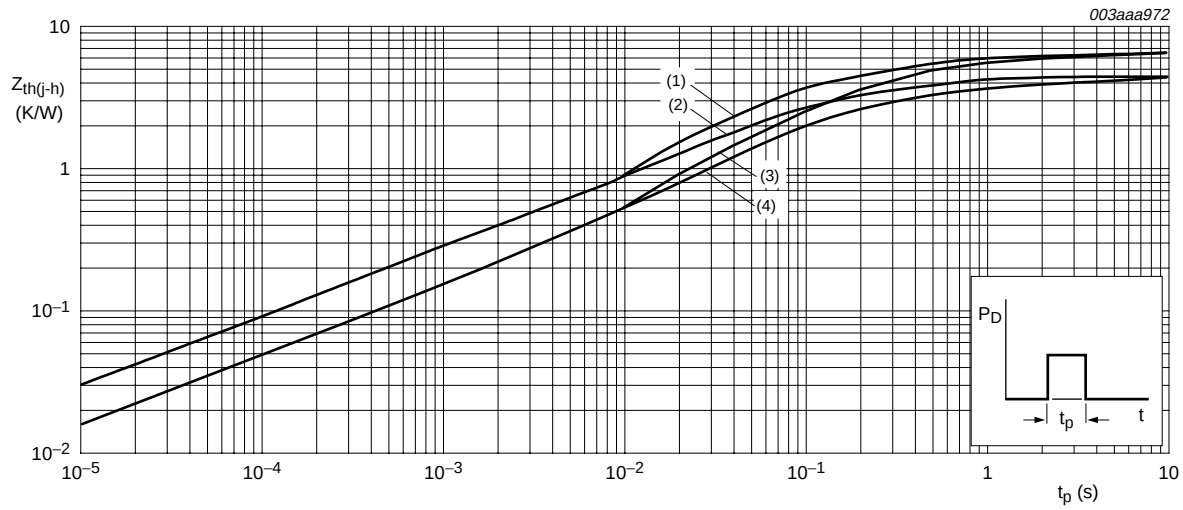
5. Thermal characteristics

Table 4: Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	see Figure 6	[1]	-	-	4.5	K/W
		see Figure 6	[2]	-	-	6.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	55	-	K/W

[1] Full or half cycle; with heatsink compound.

[2] Full or half cycle; without heatsink compound.



(1) Unidirectional without heatsink compound

(2) Unidirectional with heatsink compound

(3) Bidirectional without heatsink compound

(4) Bidirectional with heatsink compound

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	f = 50 Hz to 60 Hz; sinusoidal waveform; RH ≤ 65 %; clean and dust free; from all three terminals to external heatsink	-	-	2500	V
C_{isol}	isolation capacitance	f = 1 MHz; from pin 2 to external heatsink	-	10	-	pF

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7. Characteristics

Table 6: Characteristics

T_j = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; see Figure 8 [1]				
		T2+ G+	2	6	35	mA
		T2+ G–	2	13	35	mA
		T2– G–	2	23	35	mA
I_L	latching current	V_D = 12 V; I_{GT} = 0.1 A; see Figure 10				
		T2+ G+	-	25	50	mA
		T2+ G–	-	48	75	mA
		T2– G–	-	30	50	mA
I_H	holding current	V_D = 12 V; I_{GT} = 0.1 A; see Figure 11	-	20	50	mA
V_T	on-state voltage	I_T = 10 A; see Figure 9	-	1.3	1.65	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; see Figure 7	-	0.7	1.5	V
		V_D = 400 V; I_T = 0.1 A; T_j = 125 °C	0.25	0.4	-	V
I_D	off-state current	$V_D = V_{DRM(max)}$; T_j = 125 °C	-	0.1	0.5	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 67 % $V_{DRM(max)}$; T_j = 125 °C; exponential waveform; gate open circuit	1000	4000	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_{DM} = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 8 A; without snubber; gate open circuit; see Figure 12	12	32	-	A/ms
t_{gt}	gate-controlled turn-on time	I_{TM} = 12 A; $V_D = V_{DRM(max)}$; I_G = 0.1 A; dI_G/dt = 5 A/µs	-	2	-	µs

[1] Device will not trigger in the T2– G+ quadrant.

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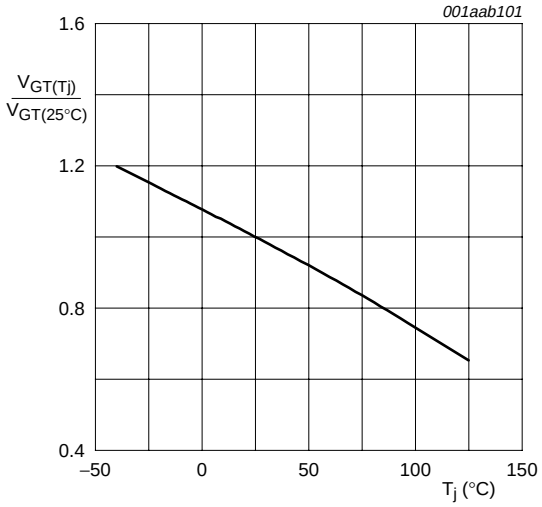
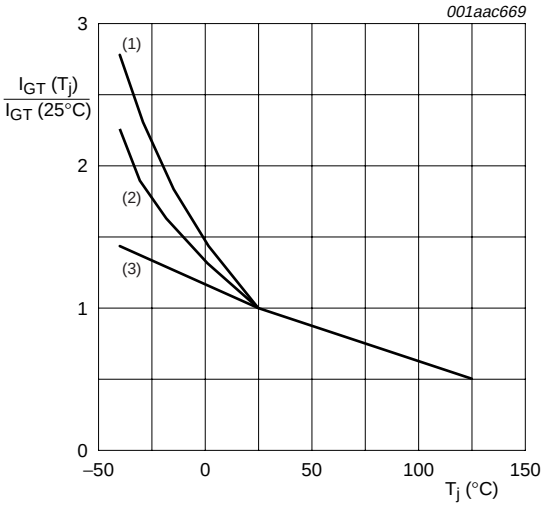


Fig 7. Normalized gate trigger voltage as a function of junction temperature

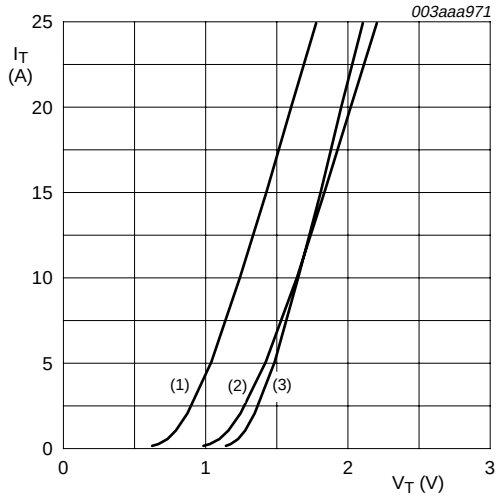


(1) T2– G–

(2) T2+ G–

(3) T2+ G+

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



V_o = 1.22 V; R_S = 0.04 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

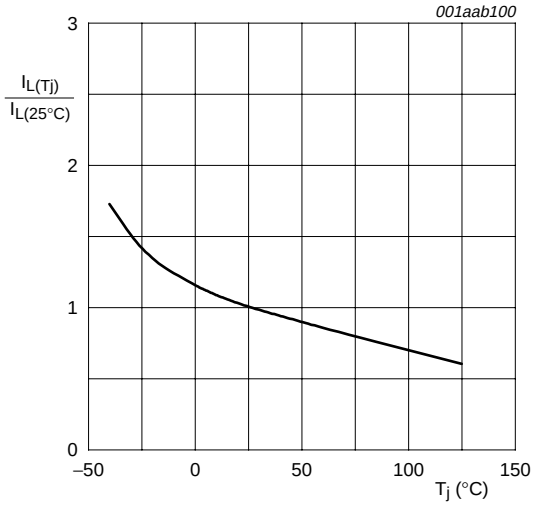


Fig 10. Normalized latching current as a function of junction temperature

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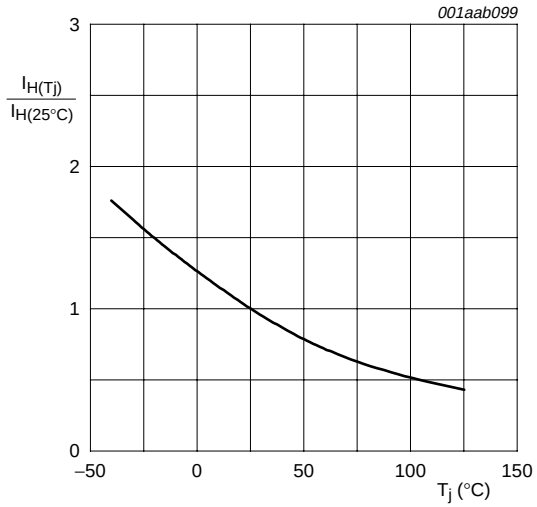

Fig 11. Normalized holding current as a function of junction temperature

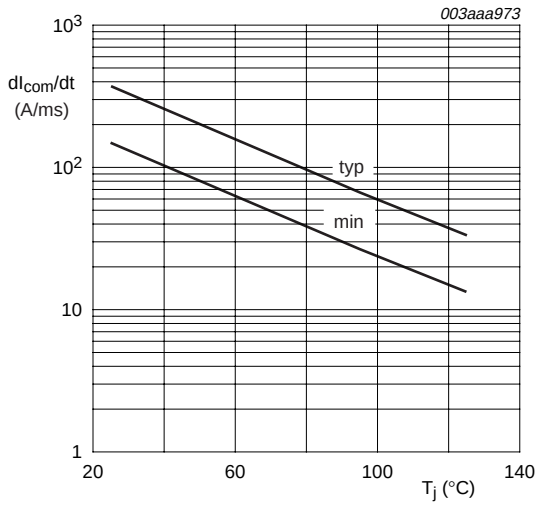

Fig 12. Rate of change of commutating current as a function of junction temperature; typical and minimum values

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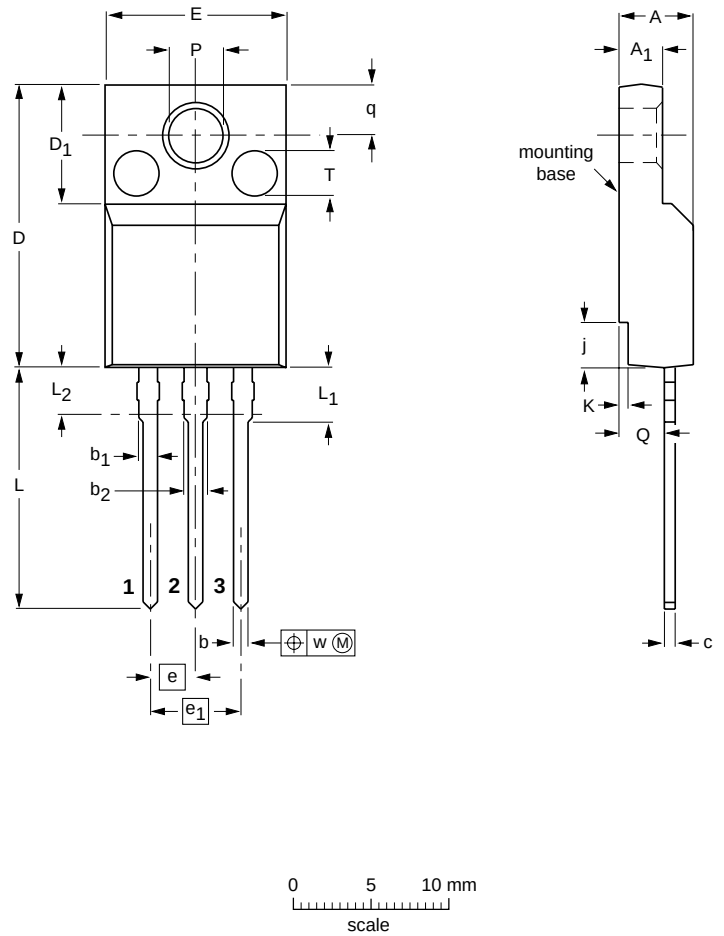
8. Package outline

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. Terminals in this zone are not tinned.
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				~~02-03-12~~ 02-04-09

Fig 13. Package outline SOT186A (3-lead TO-220F)

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9. Revision history

Table 7: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
BTA208X-1000C_1	20051004	Product data sheet	-	-	-

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10. Data sheet status

Level	Data sheet status [1]	Product status [2] [3]	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
III	Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN).

[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

11. Definitions

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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15. Contents

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Date of release: 4 October 2005
Document number: BTA208X-1000C_1

Published in The Netherlands