BTA208X-1000C

High commutation three-quadrant triacs

Rev. 02 — 4 September 2009 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 dIcom/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 and benefits

- 3Q technology with superior commutation performance for improved noise immunity
- High false trigger immunity
- Isolated package
- Very high blocking voltage capability of 1000 V

1.3 Applications

- General purpose motor control
- Reversible induction motor control

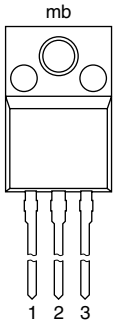
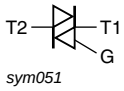
1.4 Quick reference data

Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	1000	V
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)}$ = 25 °C; t_p = 20 ms; see Figure 4 and 5	-	-	65	A
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_h \leq 73$ °C; see Figure 3, 1 and 2	-	-	8	A
Static characteristics						
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; T2+ G+; T_j = 25 °C; see Figure 7	2	6	35	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; see Figure 7	2	13	35	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; see Figure 7	2	23	35	mA

2. Pinning information

Table 2. Pinning information

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

3. Ordering information

Table 3. Ordering information

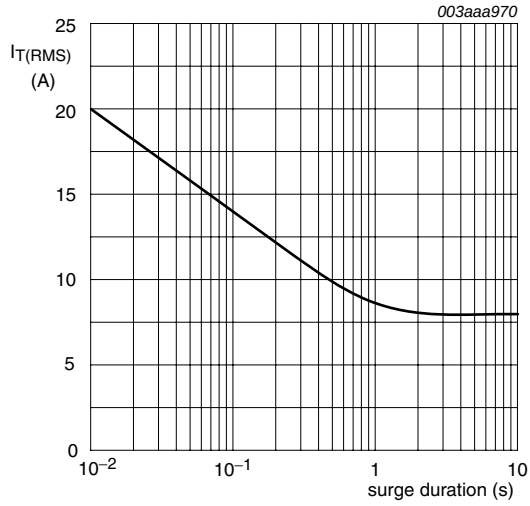
Type number	Package		
	Name	Description	Version
BTA208X-1000C	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack"	SOT186A

4. Limiting values

Table 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		-	1000	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_h \leq 73$ °C; see Figure 3, 1 and 2	-	8	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25$ °C; $t_p = 20$ ms; see Figure 4 and 5	-	65	A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms	-	71	A
I^2t	I^2t for fusing	$t_p = 10$ ms; sine-wave pulse	-	21	A^2s
dI_T/dt	rate of rise of on-state current	$I_T = 12$ 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		-	0.5	W
T_{stg}	storage temperature		-40	150	°C
T_j	junction temperature		-	125	°C



$f = 50\ Hz T_h = 73\ °C$

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

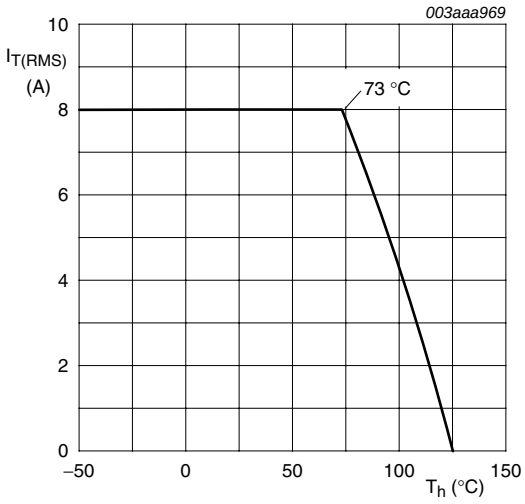
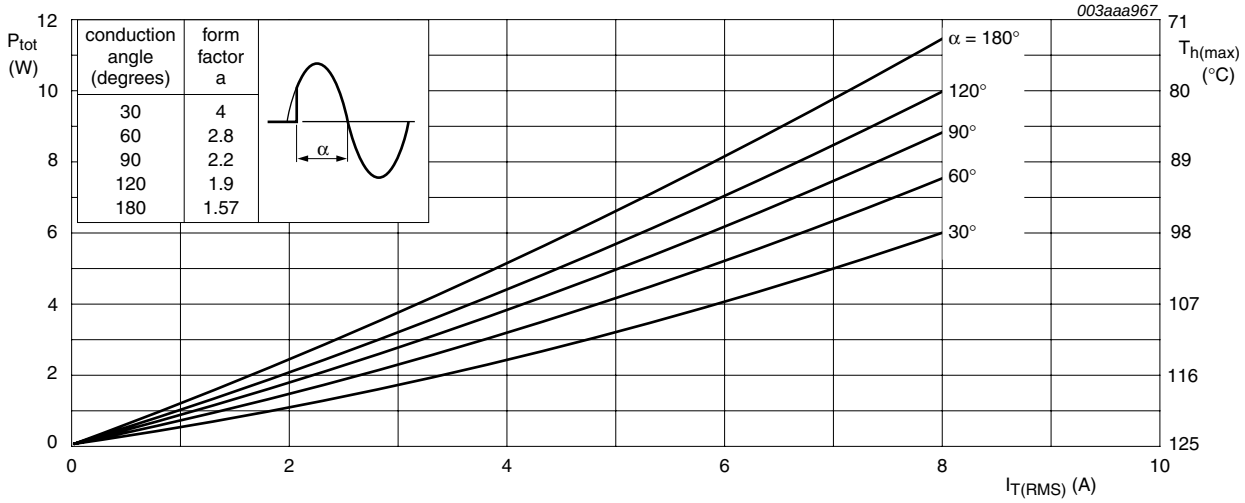
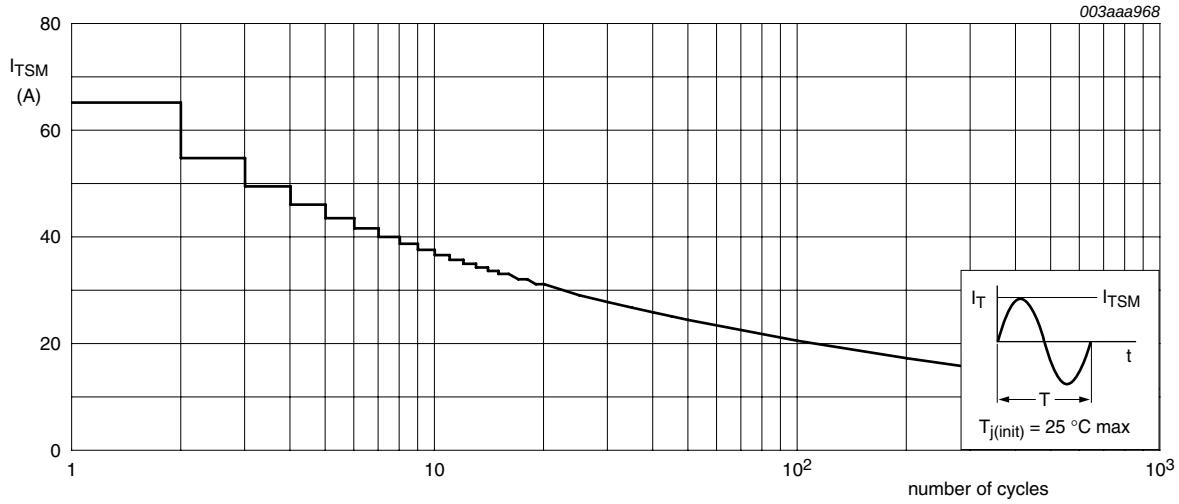


Fig 2. RMS on-state current as a function of heatsink temperature; maximum values



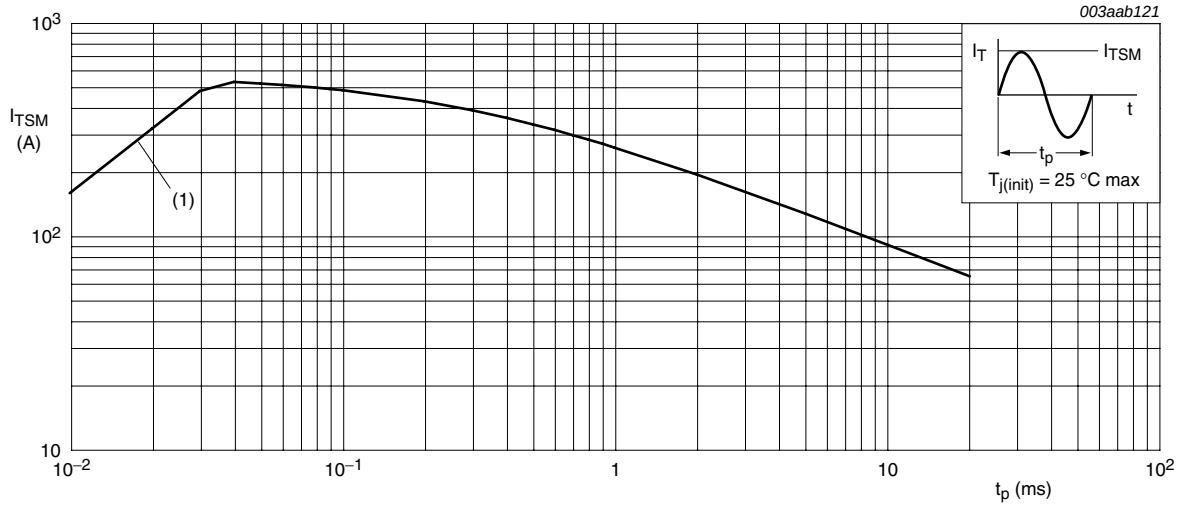
α = conduction angle

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



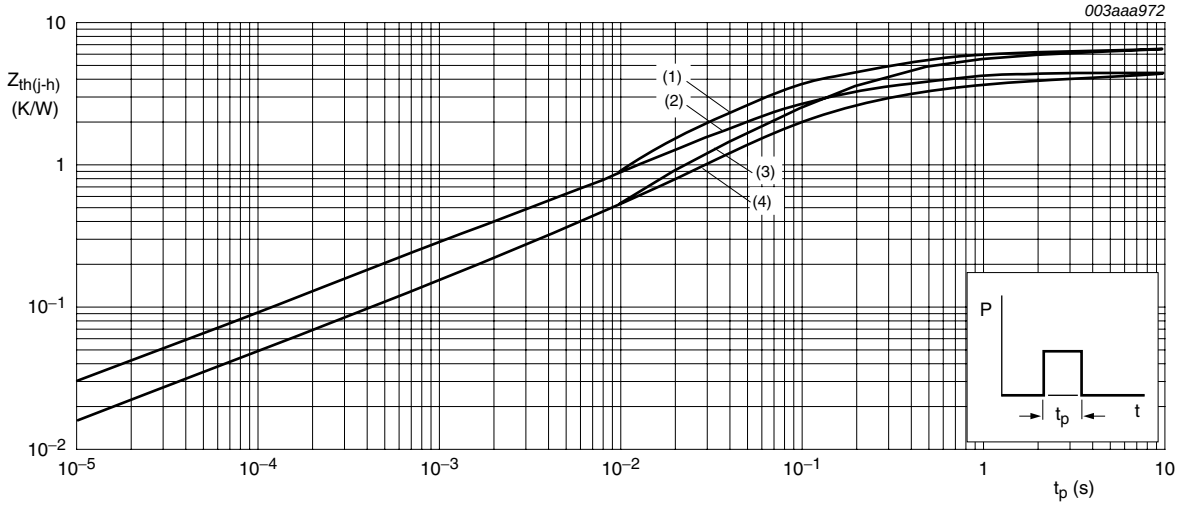
$t_p \leq 20$ ms(1) dI_T/dt limit

Fig 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

5. Thermal characteristics

Table 5. 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; see Figure 6	-	-	4.5	K/W
		full cycle or half cycle without heatsink compound; see Figure 6	-	-	6.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient		-	55	-	K/W



(1) half-cycle without heatsink compound
(2) half-cycle with heatsink compound
(3) full-cycle without heatsink compound
(4) full-cycle with heatsink compound

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

6. Isolation characteristics

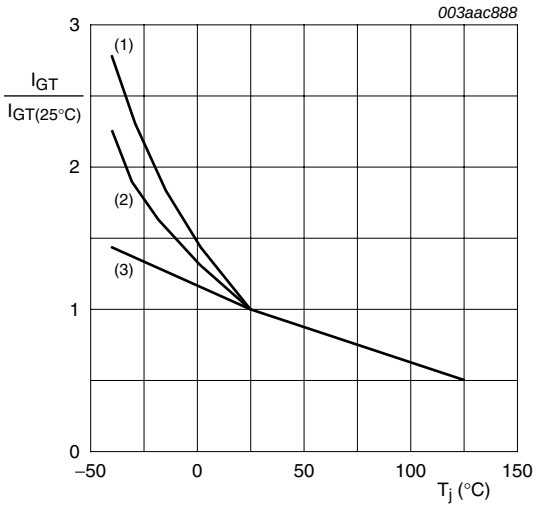
Table 6. Isolation characteristics

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 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; T_h = 25 °C	-	-	2500	V
C_{isol}	isolation capacitance	from main terminal 2 to external heatsink; f = 1 MHz; T_h = 25 °C	-	10	-	pF

7. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; T2+ G+; T_j = 25 °C; see Figure 7	2	6	35	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; see Figure 7	2	13	35	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; see Figure 7	2	23	35	mA
I_L	latching current	V_D = 12 V; I_G = 0.1 A; T2+ G+; T_j = 25 °C; see Figure 8	-	25	50	mA
		V_D = 12 V; I_G = 0.1 A; T2+ G-; T_j = 25 °C; see Figure 8	-	48	75	mA
		V_D = 12 V; I_G = 0.1 A; T2- G-; T_j = 25 °C; see Figure 8	-	30	50	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; see Figure 9	-	20	50	mA
V_T	on-state voltage	I_T = 10 A; T_j = 25 °C; see Figure 10	-	1.3	1.65	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C; see Figure 11	-	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 = 1000 V; T_j = 125 °C	-	0.1	0.5	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 670 V; T_j = 125 °C; exponential waveform; gate open circuit	1000	4000	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 8 A; dV_{com}/dt = 20 V/µs; gate open circuit; see Figure 12	12	32	-	A/ms
t_{gt}	gate-controlled turn-on time	I_{TM} = 12 A; V_D = 1000 V; I_G = 0.1 A; dI_G/dt = 5 A/µs	-	2	-	µs



(1) T2− G−(2) T2+ G−(3) T2+ G+

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

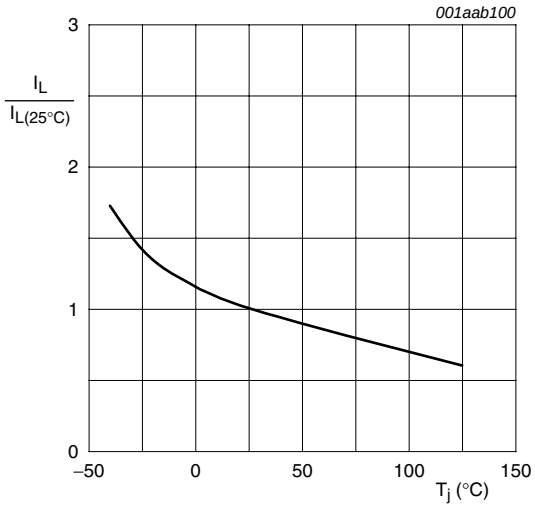


Fig 8. Normalized latching current as a function of junction temperature

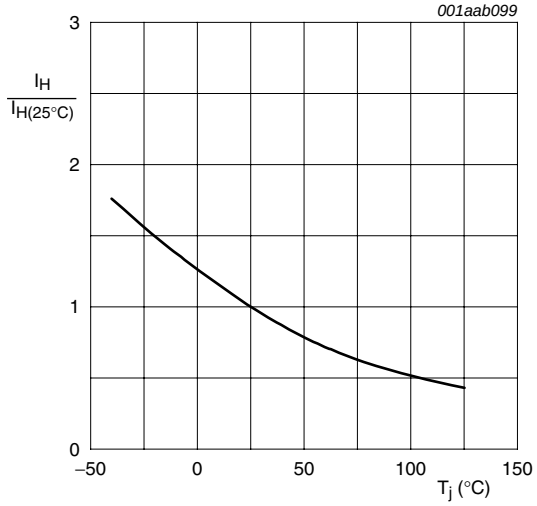
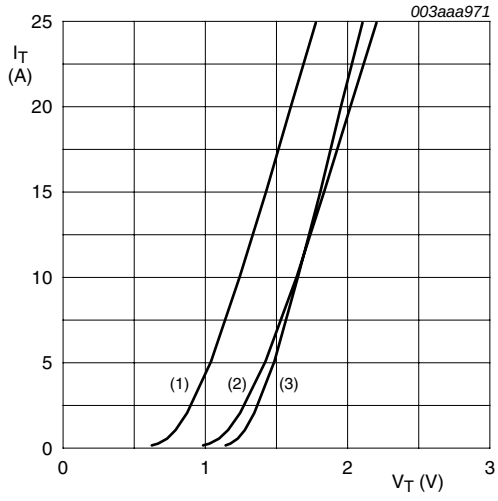


Fig 9. Normalized holding current as a function of junction temperature



$V_0 = 1.22$ V; $R_s = 0.04\ \Omega$
(1) $T_j = 125$ °C; typical values
(2) $T_j = 125$ °C; maximum values
(3) $T_j = 25$ °C; maximum values

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

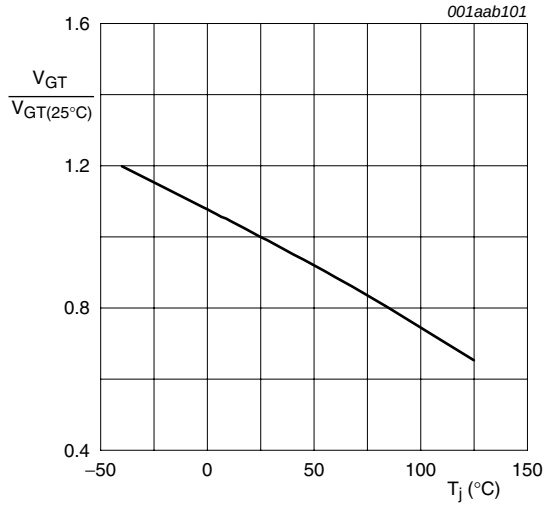


Fig 11. Normalized gate trigger voltage as a function of junction temperature

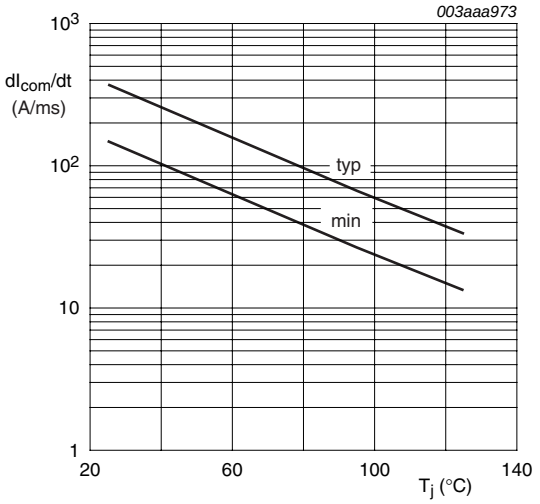
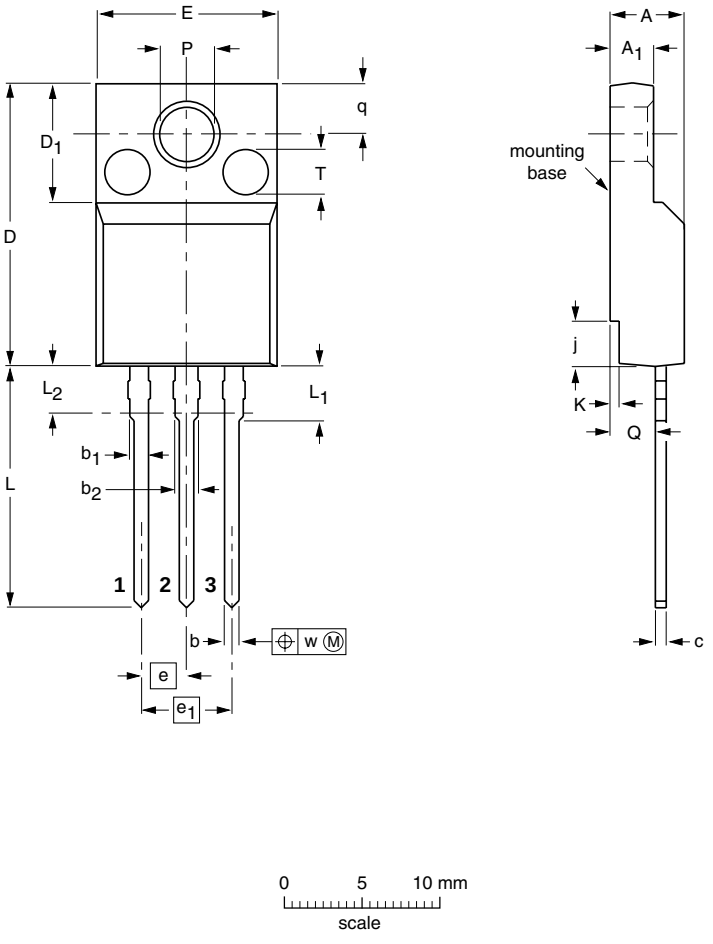


Fig 12. Rate of change of commutating current as a function of junction temperature; typical and minimum values

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.
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 13. Package outline SOT186A (TO-220F)

9. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BTA208X-1000C_2	20090904	Product data sheet	-	BTA208X-1000C_1
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate.			
BTA208X-1000C_1	20051004	Product data sheet	-	-

10. Legal information

10.1 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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12. Contents

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