



BT236X series F and G

6 A Four-quadrant triacs

Rev. 3 — 3 November 2011

Product data sheet

1. Product profile

1.1 General description

Passivated triacs in a full pack, plastic package intended for use in applications requiring high bidirectional transient and blocking voltage capability and thermal cycling performance.

1.2 Features and benefits

- Isolated package
- High I_{TSM}

1.3 Applications

- Lamp dimmers
- Motor speed controllers
- High inrush resistive loads
- Heating and static switching

1.4 Quick reference data

- $V_{DRM} \leq 600 \text{ V}$
(BT236X-600_600F_600G)
- $V_{DRM} \leq 800 \text{ V}$ (BT236X-800_800G)
- $I_{TSM} \leq 65 \text{ A}$ ($t = 20 \text{ ms}$)
- $I_{T(RMS)} \leq 6 \text{ A}$
- $I_{GT} \leq 35 \text{ mA}$ (BT236X-600_800)
- $I_{GT} \leq 25 \text{ mA}$ (BT236X-600F)
- $I_{GT} \leq 50 \text{ mA}$ (BT236X-600G_800G)

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)



3. Ordering information

Table 2. Ordering information

Type number	Package		Version
	Name	Description	
BT236X-600	3-lead	plastic single-ended package; isolated heatsink mounted; 1 mounting hole;	SOT186A
BT236X-600F	TO-220F	3 lead TO-220 'full pack'	
BT236X-600G			
BT236X-800			
BT236X-800G			

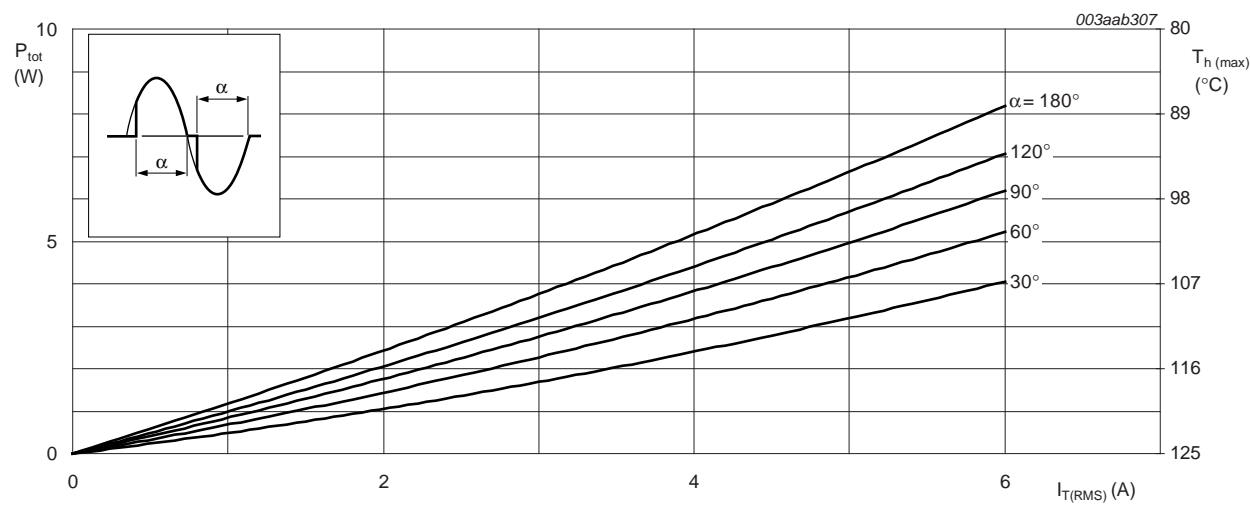
4. Limiting values

Table 3. Limiting values

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

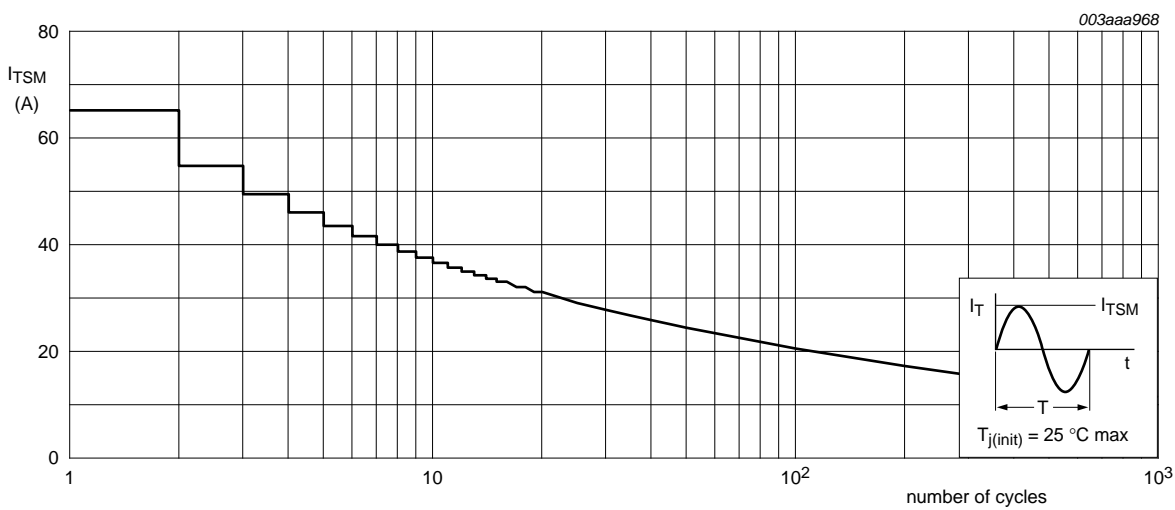
Symbol	Parameter	Conditions	Min	Max	Unit
V_{DRM}	repetitive peak off-state voltage				
	BT236X-600		[1] -	600	V
	BT236X-600F		[1] -	600	V
	BT236X-600G		[1] -	600	V
	BT236X-800		-	800	V
	BT236X-800G		-	800	V
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_h \leq 88^\circ\text{C}$; see Figure 4 and 5	-	6	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_j = 25^\circ\text{C}$ prior to surge; see Figure 2 and 3			
		$t = 20\text{ ms}$	-	65	A
		$t = 16.7\text{ ms}$	-	71	A
I^2t	I^2t for fusing	$t = 10\text{ ms}$	-	21	A^2s
di_T/dt	rate of rise of on-state current	$I_{\text{TM}} = 12\text{ A}$; $I_{\text{G}} = 0.2\text{ A}$; $di_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$			
		T2+ G+	-	50	$\text{A}/\mu\text{s}$
		T2+ G-	-	50	$\text{A}/\mu\text{s}$
		T2- G-	-	50	$\text{A}/\mu\text{s}$
		T2- G+	-	10	$\text{A}/\mu\text{s}$
I_{GM}	peak gate current		-	2	A
V_{GM}	peak gate voltage		-	5	V
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 6 A/ μs .



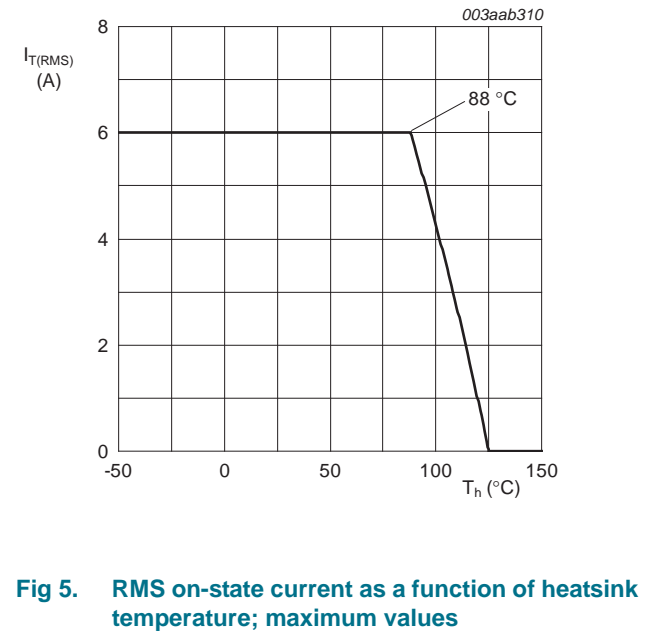
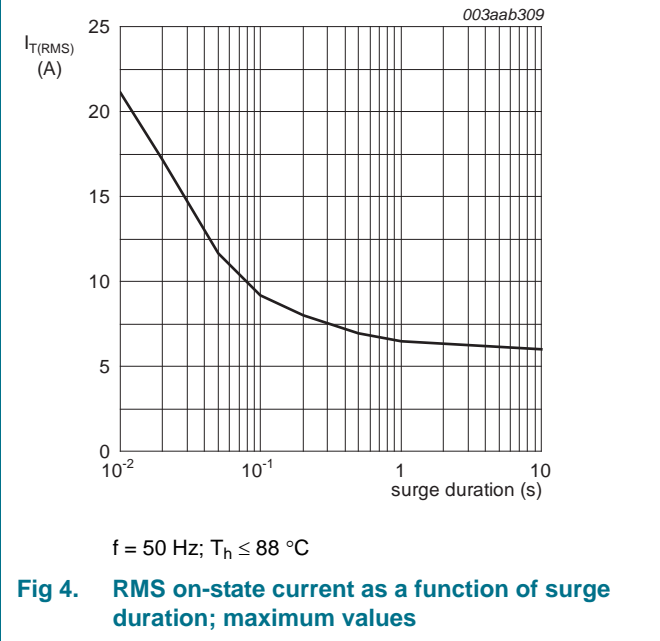
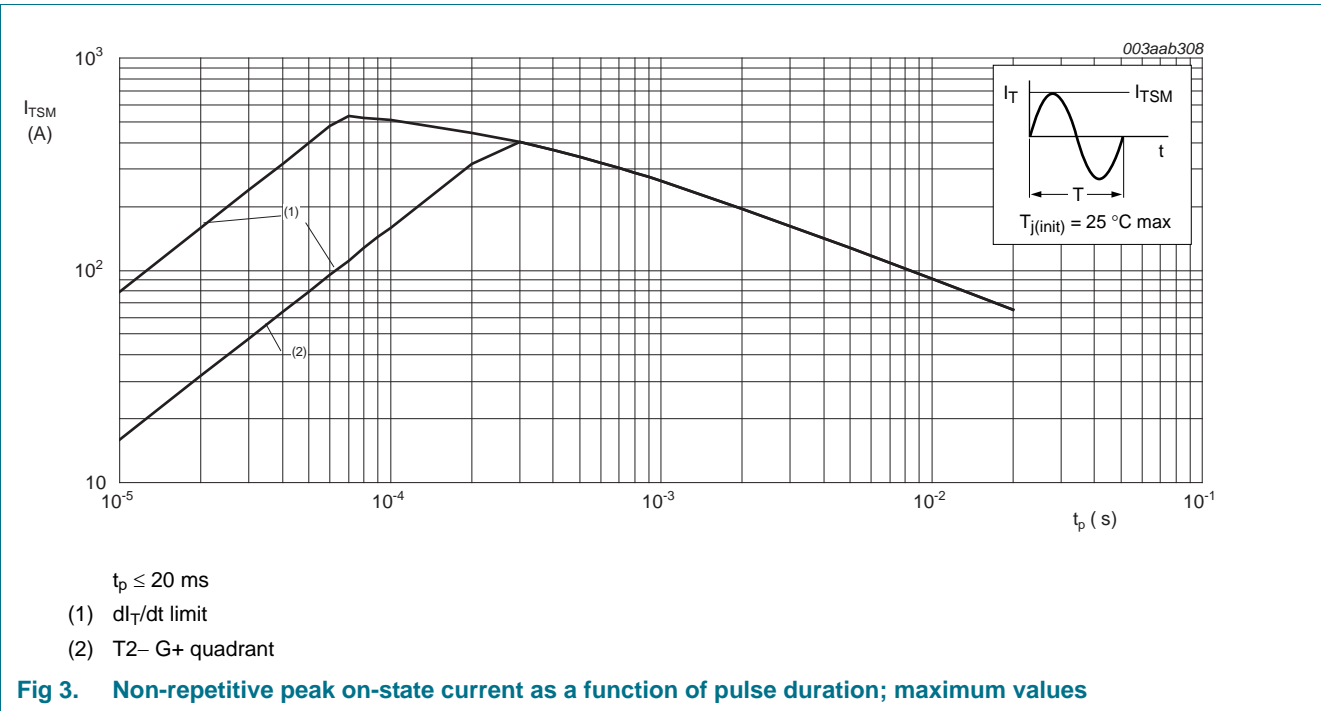
α = conduction angle

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



$f = 50\text{ Hz}$

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



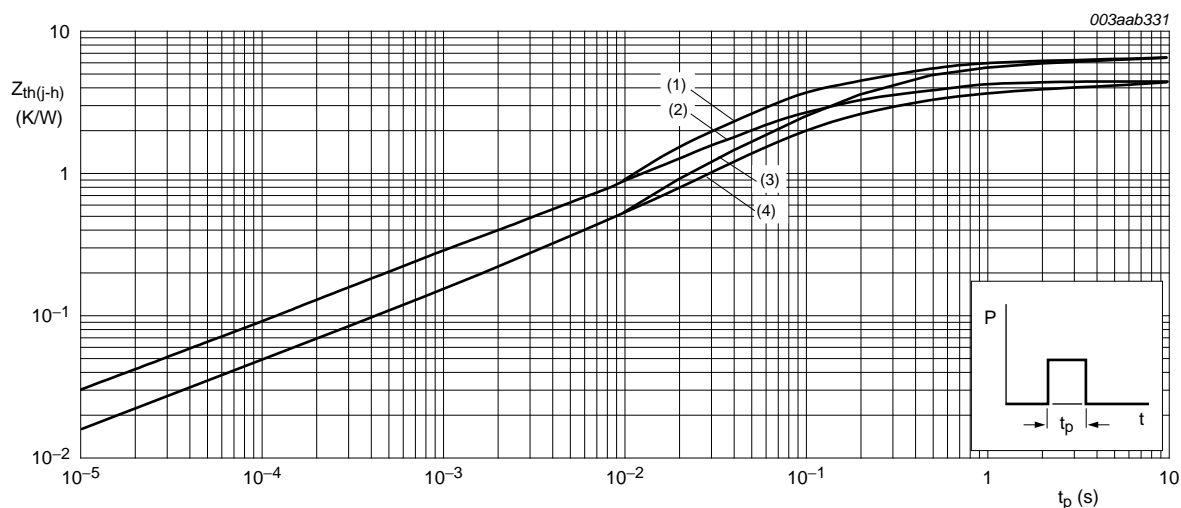
5. Thermal characteristics

Table 4. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	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 duration

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

7. Static characteristics

Table 6. Static characteristics

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

Symbol	Parameter	Conditions	BT236X-600 BT236X-800			BT236X-600F			BT236X-600G BT236X-800G			Unit
			Min	Typ	Max	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+	-	5	35	-	5	25	-	5	50	mA
		T2+ G-	-	8	35	-	8	25	-	8	50	mA
		T2- G-	-	11	35	-	11	25	-	11	50	mA
		T2- G+	-	30	70	-	30	70	-	30	100	mA
I_L	latching current	$V_D = 12\text{ V};$ $I_{GT} = 0.1\text{ A};$ see Figure 10										
		T2+ G+	-	7	30	-	7	30	-	7	45	mA
		T2+ G-	-	16	45	-	16	45	-	16	60	mA
		T2- G-	-	5	30	-	5	30	-	5	45	mA
		T2- G+	-	7	45		7	45	-	7	60	mA
I_H	holding current	$V_D = 12\text{ V};$ $I_{GT} = 0.1\text{ A};$ see Figure 11	-	5	20	-	5	20	-	5	40	mA
V_T	on-state voltage	$I_T = 10\text{ A};$ see Figure 9	-	1.3	1.65	-	1.3	1.65	-	1.3	1.65	V
V_{GT}	gate trigger voltage	$V_D = 12\text{ V};$ $I_T = 0.1\text{ A};$ see Figure 7	-	0.7	1.5	-	0.7	1.5	-	0.7	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	-	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	-	0.1	0.5	mA

8. Dynamic characteristics

Table 7. Dynamic characteristics

Symbol	Parameter	Conditions	BT236X-600 BT236X-800			BT236X-600F			BT236X-600G BT236X-800G			Unit
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 0.67V_{DRM(max)}$; $T_j = 125\text{ }^{\circ}\text{C}$; exponential waveform; gate open circuit	100	250	-	50	250	-	200	250	-	V/ μs
dV_{com}/dt	rate of change of commutating voltage	$V_{DM} = 400\text{ V}$; $T_j = 95\text{ }^{\circ}\text{C}$; $I_{T(RMS)} = 6\text{ A}$; $dI_{com}/dt = 3.6\text{ A/ms}$; gate open circuit; see Figure 12	-	20	-	-	20	-	10	20	-	V/ μs
t_{gt}	gate-controlled turn-on time	$I_{TM} = 12\text{ A}$; $V_D = V_{DRM(max)}$; $I_G = 0.1\text{ A}$; $dI_G/dt = 5\text{ A}/\mu\text{s}$	-	2	-	-	2	-	-	2	-	μs

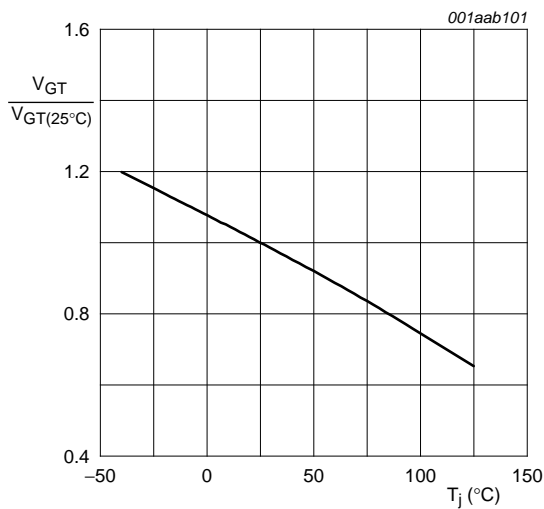
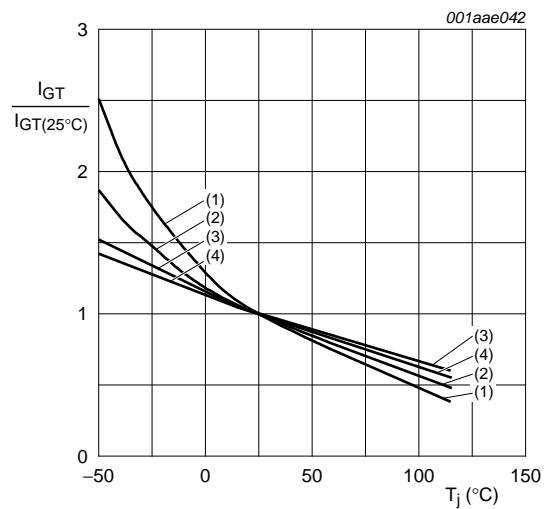
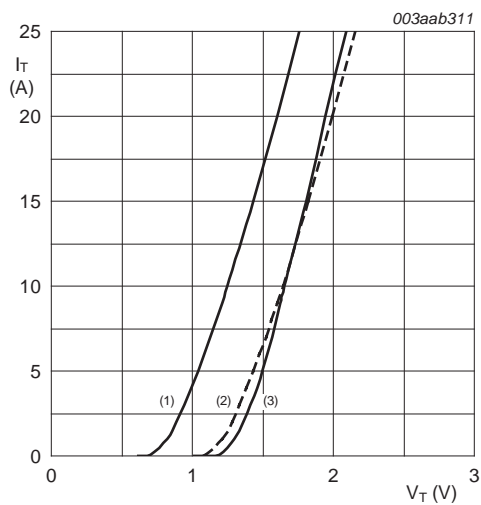


Fig 7. Normalized gate trigger voltage as a function of junction temperature



- (1) T2- G-
- (2) T2+ G-
- (3) T2+ G+
- (4) T2- G+

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



$V_o = 1.26\text{ V}$
 $R_s = 0.0378\text{ }\Omega$
 (1) $T_j = 125\text{ }^\circ\text{C}$; typical values
 (2) $T_j = 125\text{ }^\circ\text{C}$; maximum values
 (3) $T_j = 25\text{ }^\circ\text{C}$; maximum values

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

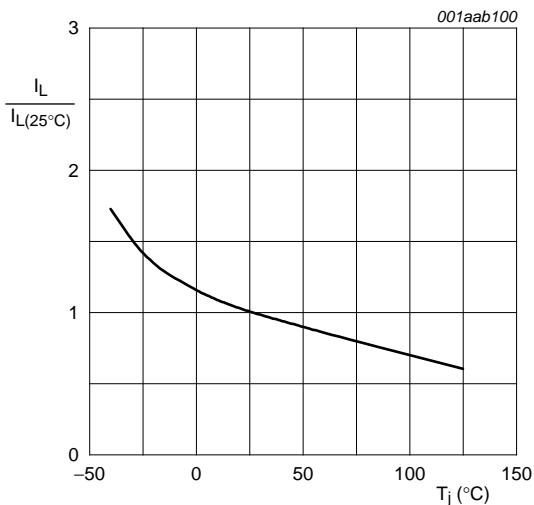


Fig 10. Normalized latching current as a function of junction temperature

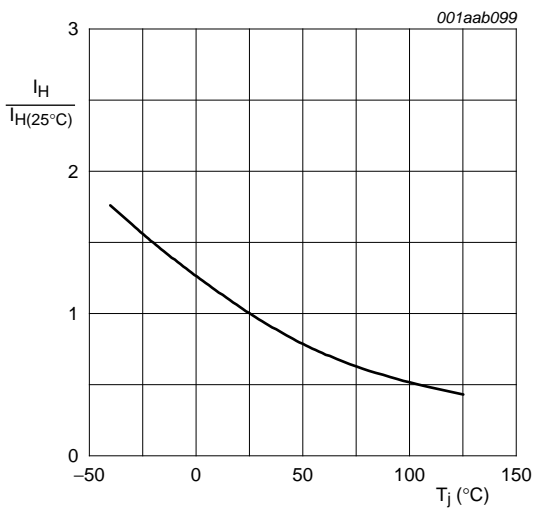
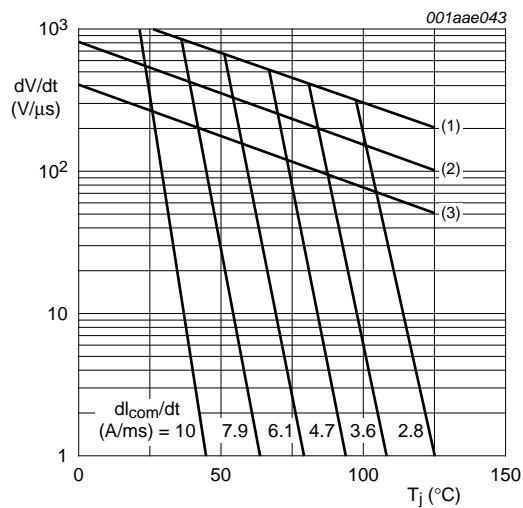


Fig 11. Normalized holding current as a function of junction temperature



The triac should commute when the dV/dt is below the value on the appropriate curve for pre-commutation dI_T/dt .

- (1) Off-state dV/dt limit for BT236X-600G_800G
- (2) Off-state dV/dt limit for BT236X-600_800
- (3) Off-state dV/dt limit for BT236X-600F

Fig 12. Typical commutation dV/dt as a function of junction temperature

9. Package outline

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

SOT186A

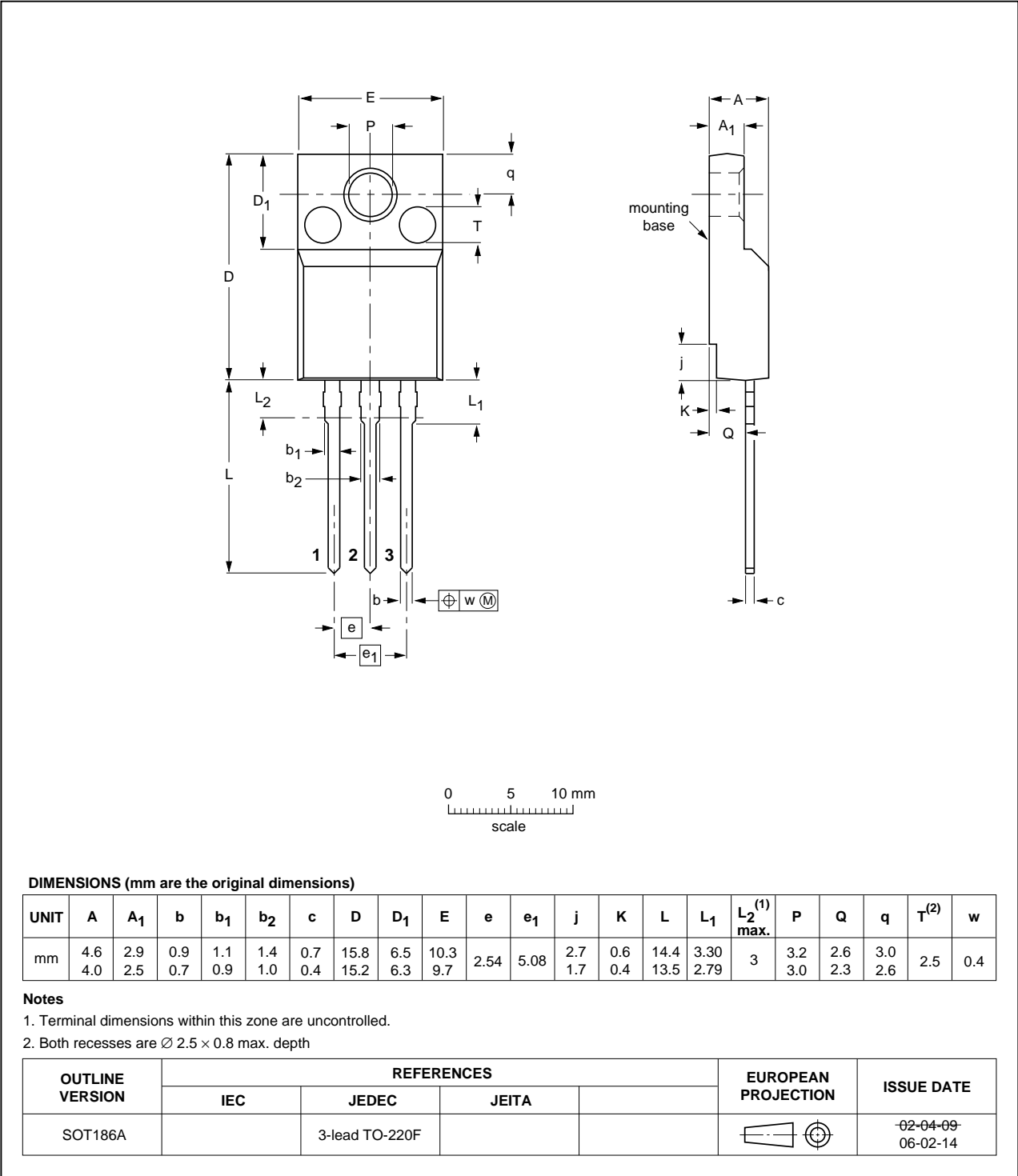


Fig 13. Package outline SOT186A (3-lead TO-220F)

10. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BT236X_SER_F_G v.3	20111103	Product data sheet	-	BT236X_SER_F_G v.2
Modifications:	<ul style="list-style-type: none">• 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.			
BT236X_SER_F_G v.2	20060314	Product data sheet	-	BT236X_SER_F_G v.1
BT236X_SER_F_G v.1	20060209	Product data sheet	-	-

11. Legal information

11.1 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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13. Contents

1	Product profile	1
1.1	General description	1
1.2	Features and benefits	1
1.3	Applications	1
1.4	Quick reference data	1
2	Pinning information	1
3	Ordering information	2
4	Limiting values	2
5	Thermal characteristics	5
6	Isolation characteristics	5
7	Static characteristics	6
8	Dynamic characteristics	7
9	Package outline	9
10	Revision history	10
11	Legal information	11
11.1	Data sheet status	11
11.2	Definitions	11
11.3	Disclaimers	11
11.4	Trademarks	12
12	Contact information	12
13	Contents	13

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