

BT236X series F and G

6 A Four-quadrant triacs

Rev. 02 — 14 March 2006

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

- Isolated package
- High I_{TSM}

1.3 Applications

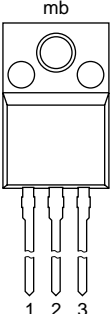

- Lamp dimmers
- High inrush resistive loads
- Motor speed controllers
- Heating and static switching

1.4 Quick reference data

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

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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			

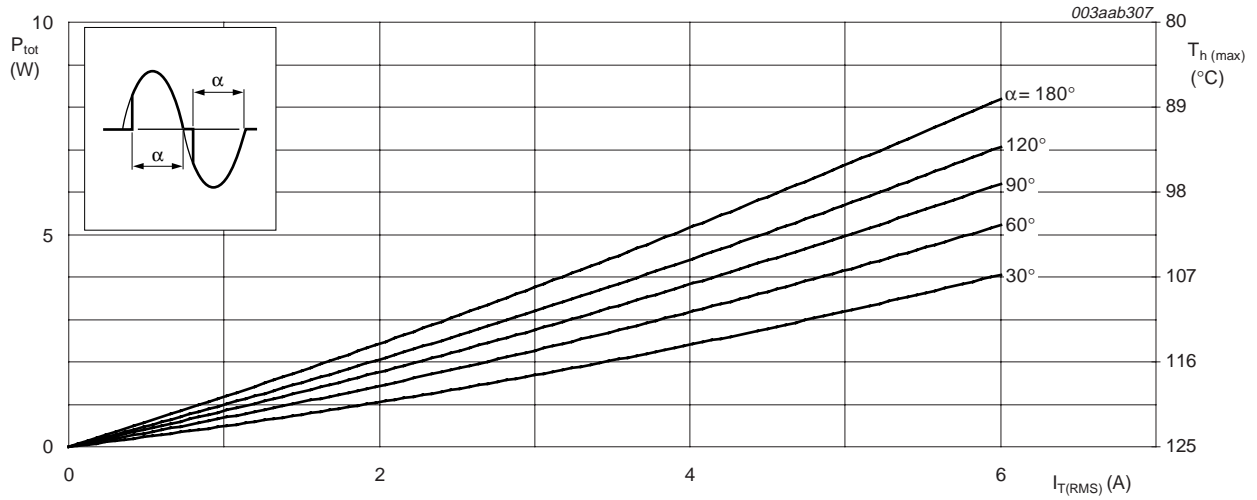
4. Limiting values

Table 3: Limiting values

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

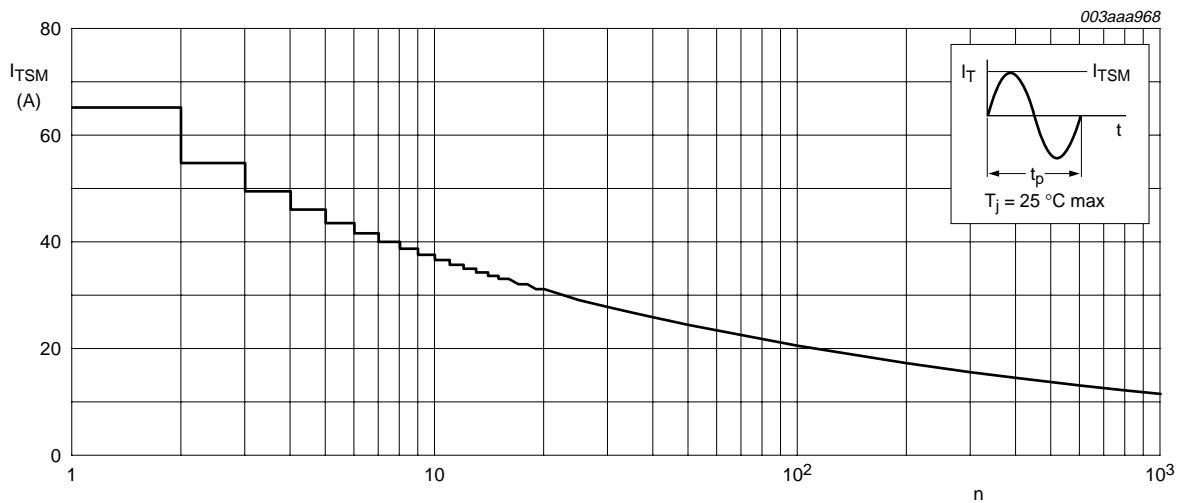
Symbol	Parameter	Conditions	Min	Max	Unit	
V_{DRM}	repetitive peak off-state voltage					
		BT236X-600	[1]	-	600	V
		BT236X-600F	[1]	-	600	V
		BT236X-600G	[1]	-	600	V
		BT236X-800		-	800	V
		BT236X-800G		-	800	V
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{h}} \leq 88 \text{ }^\circ\text{C}$; see Figure 4 and 5	-	6	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			
		$t = 20 \text{ ms}$	-	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 .



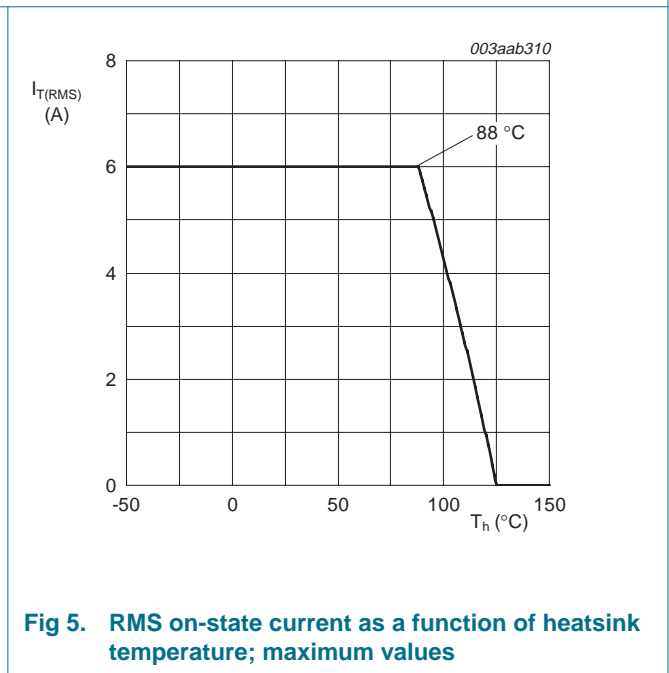
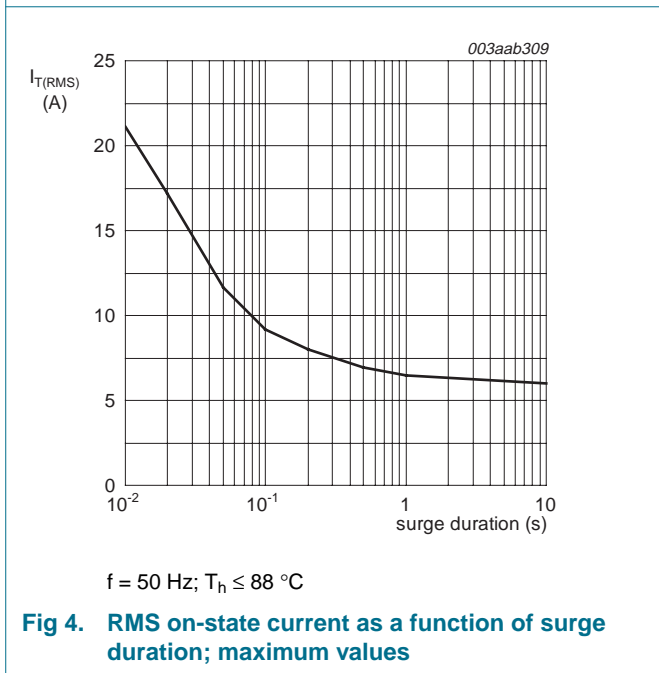
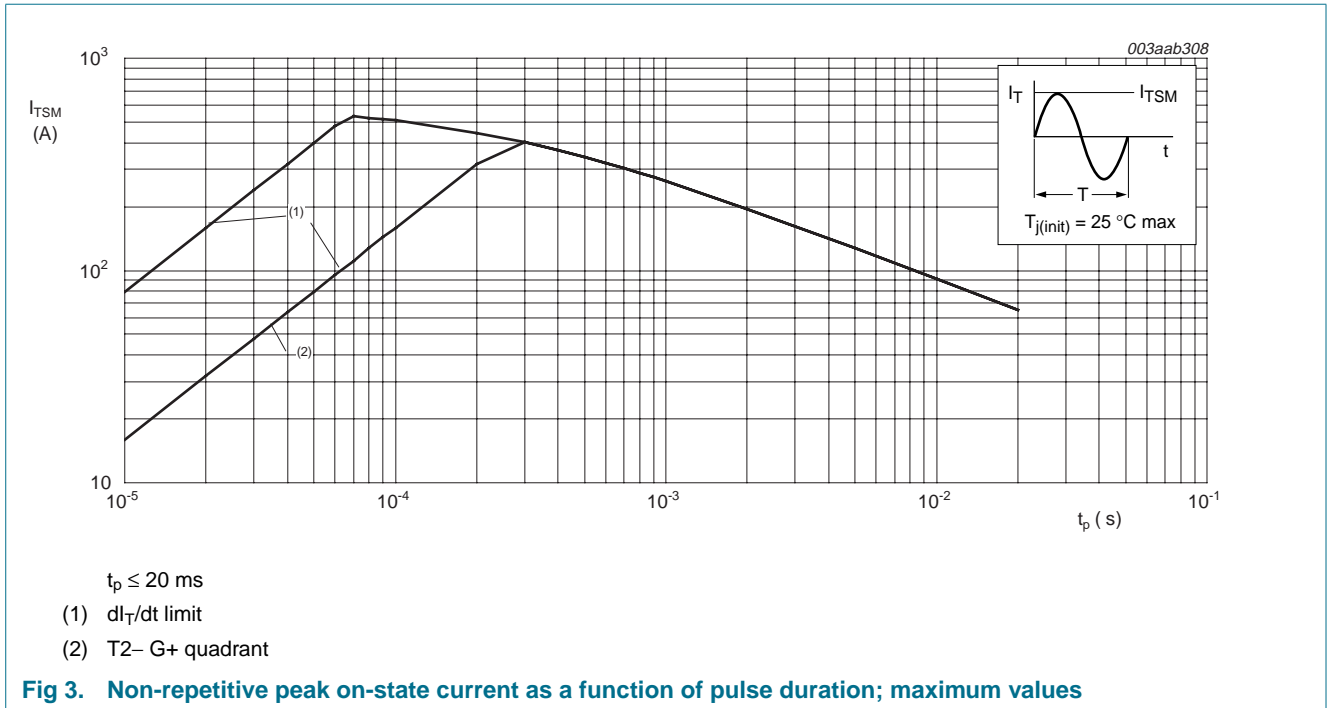
α = conduction angle

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



$f = 50$ Hz

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

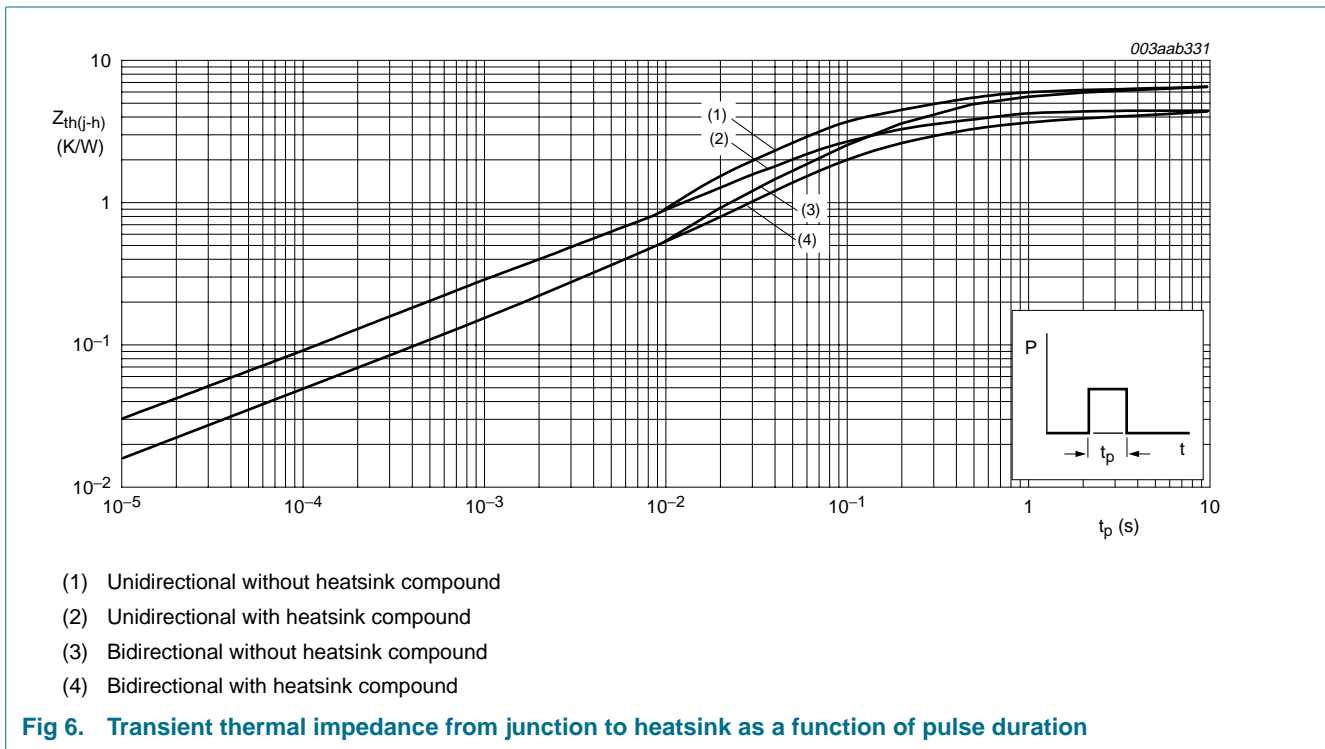


5. Thermal characteristics

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



6. Isolation characteristics

Table 5: Isolation limiting values and characteristics

$T_h = 25^\circ C$ 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; $RH \leq 65\%$; 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

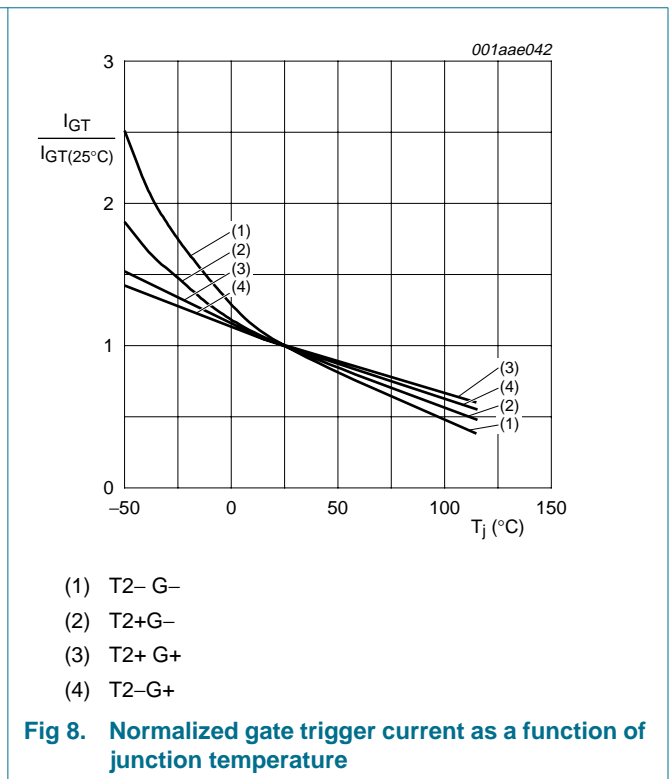
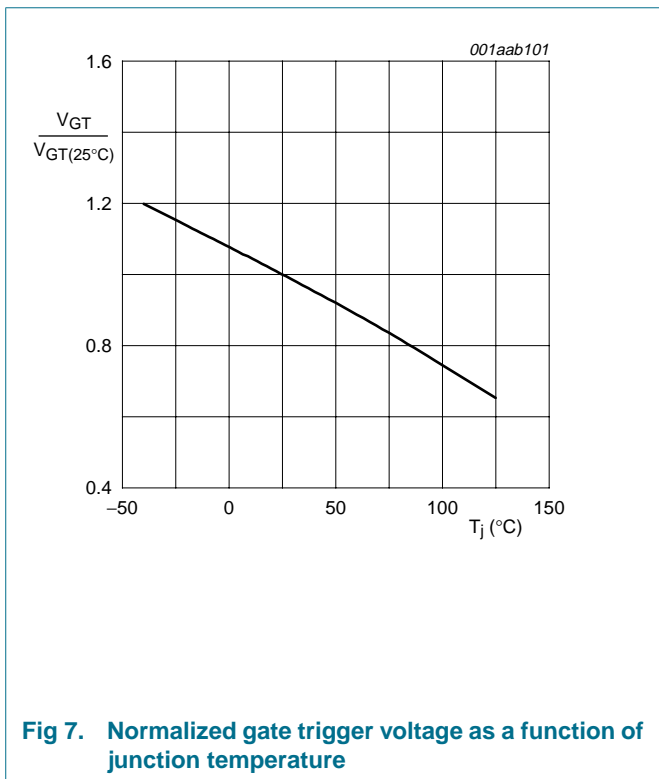
$T_j = 25\text{ °C}$ unless otherwise specified.

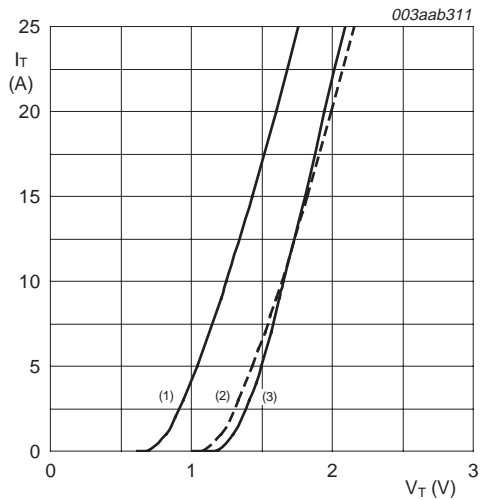
Symbol	Parameter	Conditions	BT236X-600 BT236X-800			BT236X-600F			BT236X-600G BT236X-800G			Unit
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{GT}	gate trigger current	$V_D = 12\text{ V};$ $I_T = 0.1\text{ A};$ see Figure 8										
		T2+ G+	-	5	35	-	5	25	-	5	50	mA
		T2+ G-	-	8	35	-	8	25	-	8	50	mA
		T2- 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
		$V_D = 400\text{ V};$ $I_T = 0.1\text{ A};$ $T_j = 125\text{ °C}$	0.25	0.4	-	0.25	0.4	-	0.25	0.4	-	V
I_D	off-state current	$V_D = V_{DRM(max)};$ $T_j = 125\text{ °C}$	-	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





$V_o = 1.26 \text{ V}$
 $R_s = 0.0378 \text{ } \Omega$

- (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

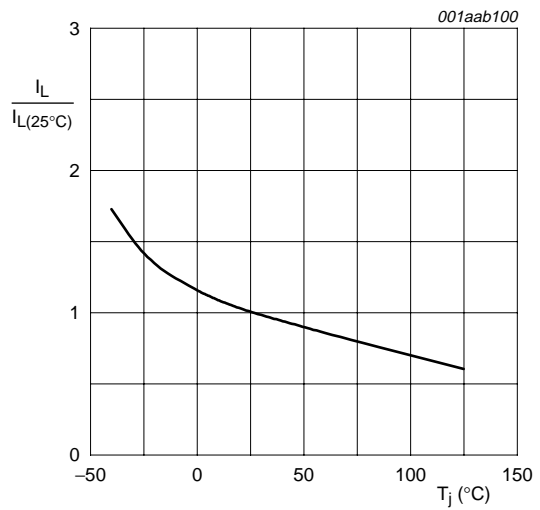


Fig 10. Normalized latching current as a function of junction temperature

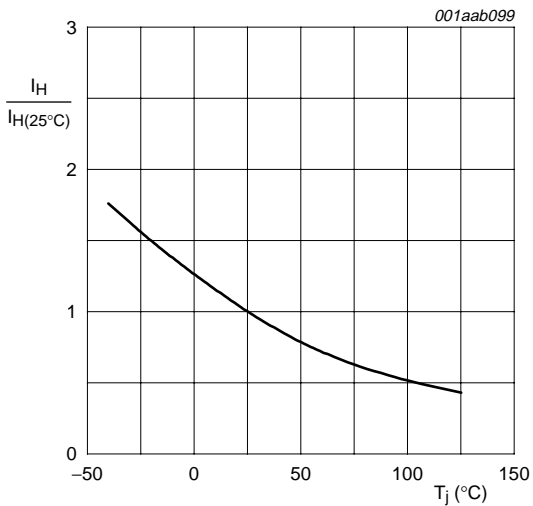
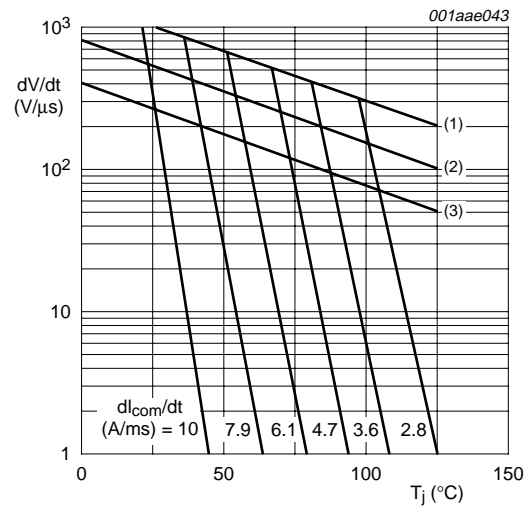


Fig 11. Normalized holding current as a function of junction temperature



The triac should commutate 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

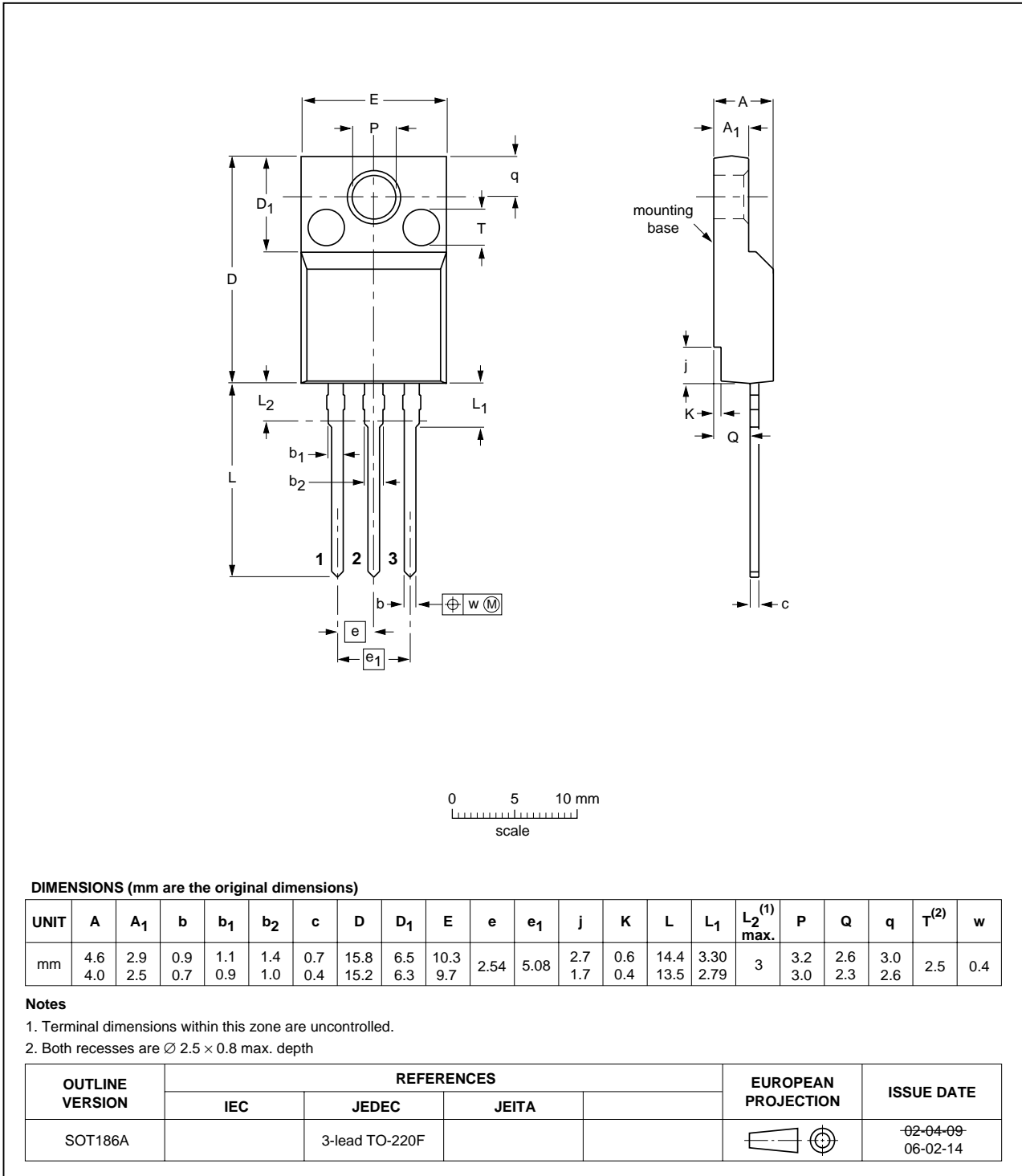


Fig 13. Package outline SOT186A (3-lead TO-220F)

10. Revision history

Table 8: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
BT236X_SER_F_G_2	20060314	Product data sheet	-	-	-
Modifications:					
					<ul style="list-style-type: none">• In Figure 7, Figure 8, Figure 10 and Figure 11: spaces have been removed between 25 and degree signs.• In Figure 5: the figure note has been deleted.• Figure 8: has been modified.• In Table 3: corrected the symbol dl_T/dt.• The entry in IMPULSE has been modified by PD Coding (updated to SOT186A for all types).
BT236X_SER_F_G_1	20060209	Product data sheet	-	-	-

11. 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.
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[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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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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