



BTA204X series D, E and F

Three quadrant triacs guaranteed commutation

Rev. 5 — 3 November 2011

Product data sheet

1. Product profile

1.1 General description

Passivated guaranteed commutation triacs in a plastic full pack package. These devices 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 and benefits

- Suitable for interfacing with low power drivers, including microcontrollers
- Isolated mounting base

1.3 Applications

- Motor control
- High inductive loads

1.4 Quick reference data

- $V_{\text{DRM}} \leq 600 \text{ V}$ (BTA204X-600D)
- $V_{\text{DRM}} \leq 600 \text{ V}$ (BTA204X-600E)
- $V_{\text{DRM}} \leq 600 \text{ V}$ (BTA204X-600F)
- $V_{\text{DRM}} \leq 800 \text{ V}$ (BTA204X-800E)
- $I_{\text{T(RMS)}} \leq 4 \text{ A}$
- $I_{\text{GT}} \leq 5 \text{ mA}$ (BTA204X-600D)
- $I_{\text{GT}} \leq 10 \text{ mA}$ (BTA204X-600E)
- $I_{\text{GT}} \leq 25 \text{ mA}$ (BTA204X-600F)

2. Pinning information

Table 1. Pinning

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



3. Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
BTA204X-600D	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3 lead TO-220 'full pack'	SOT186A
BTA204X-600E			
BTA204X-600F			
BTA204X-800E			

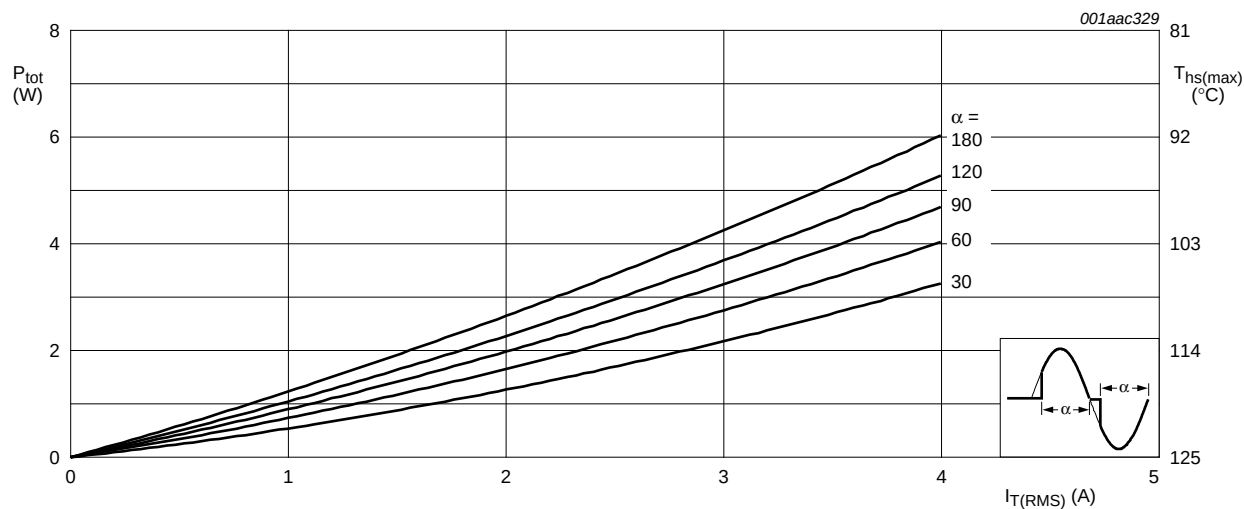
4. Limiting values

Table 3. Limiting values

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

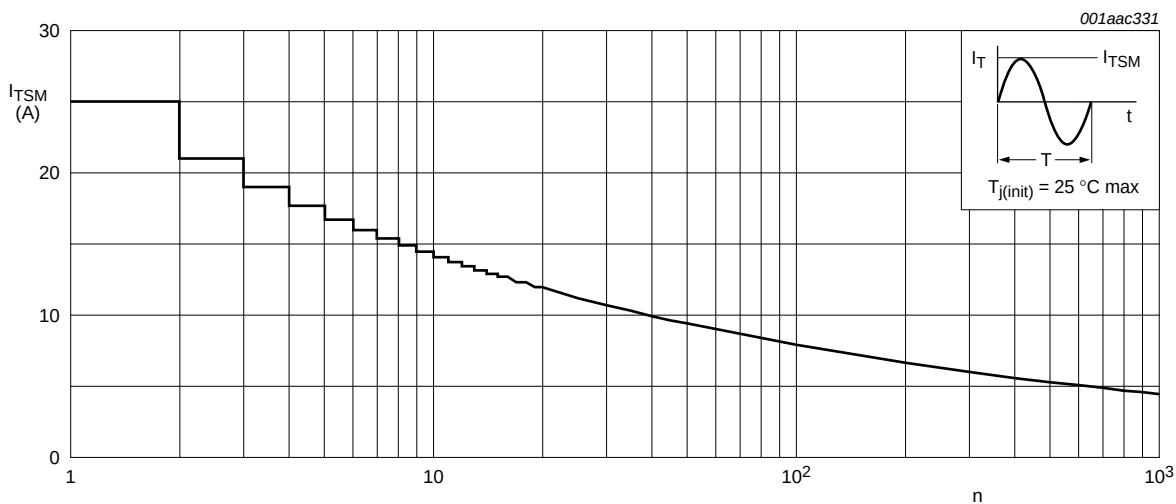
Symbol	Parameter	Conditions	Min	Max	Unit
V_{DRM}	repetitive peak off-state voltage				
	BTA204X-600D		[1] -	600	V
	BTA204X-600E		[1] -	600	V
	BTA204X-600F		[1] -	600	V
	BTA204X-800E		-	800	V
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{hs}} \leq 92\text{ }^{\circ}\text{C}$; Figure 4 and Figure 5	-	4	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{\text{j}} = 25\text{ }^{\circ}\text{C}$ prior to surge; Figure 2 and Figure 3			
		$t = 20\text{ ms}$	-	25	A
		$t = 16.7\text{ ms}$	-	27	A
I^2t	I^2t for fusing	$t = 10\text{ ms}$	-	3.1	A^2S
di_{T}/dt	repetitive rate of rise of on-state current after triggering	$I_{\text{TM}} = 6\text{ A}$; $I_{\text{G}} = 0.2\text{ A}$; $di_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$	-	100	$\text{A}/\mu\text{s}$
I_{GM}	peak gate current		-	2	A
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 .



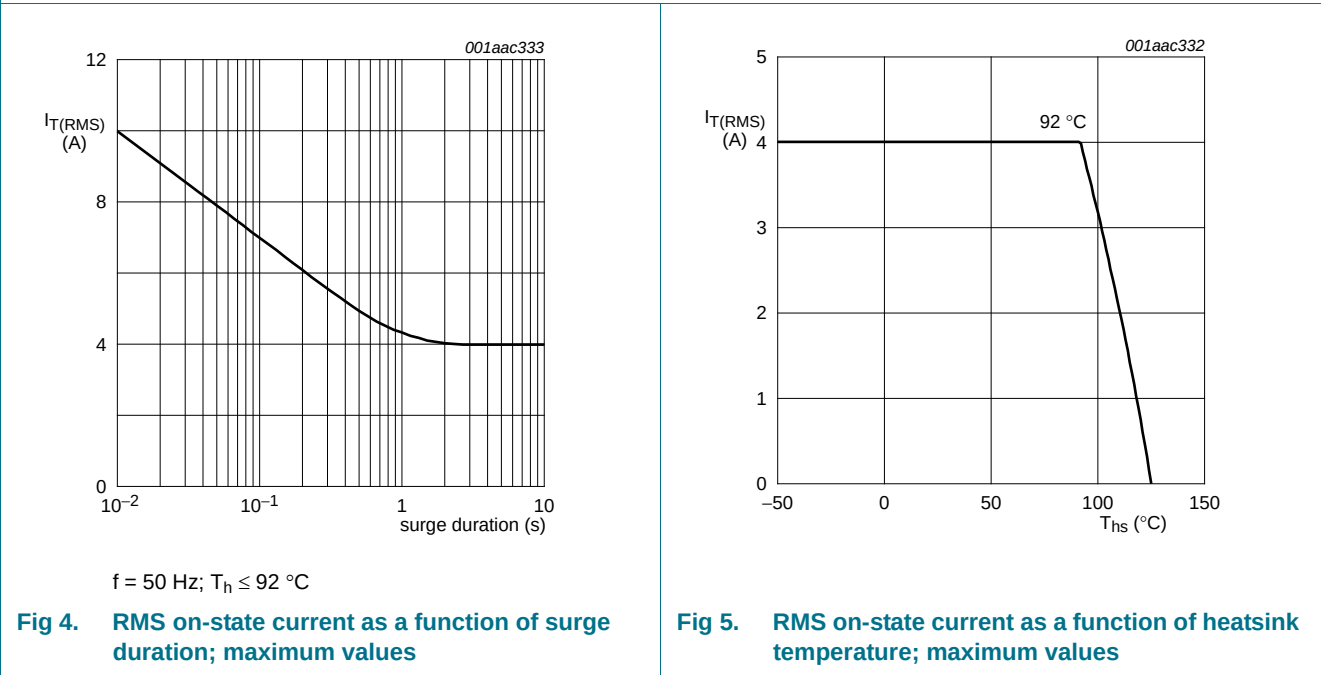
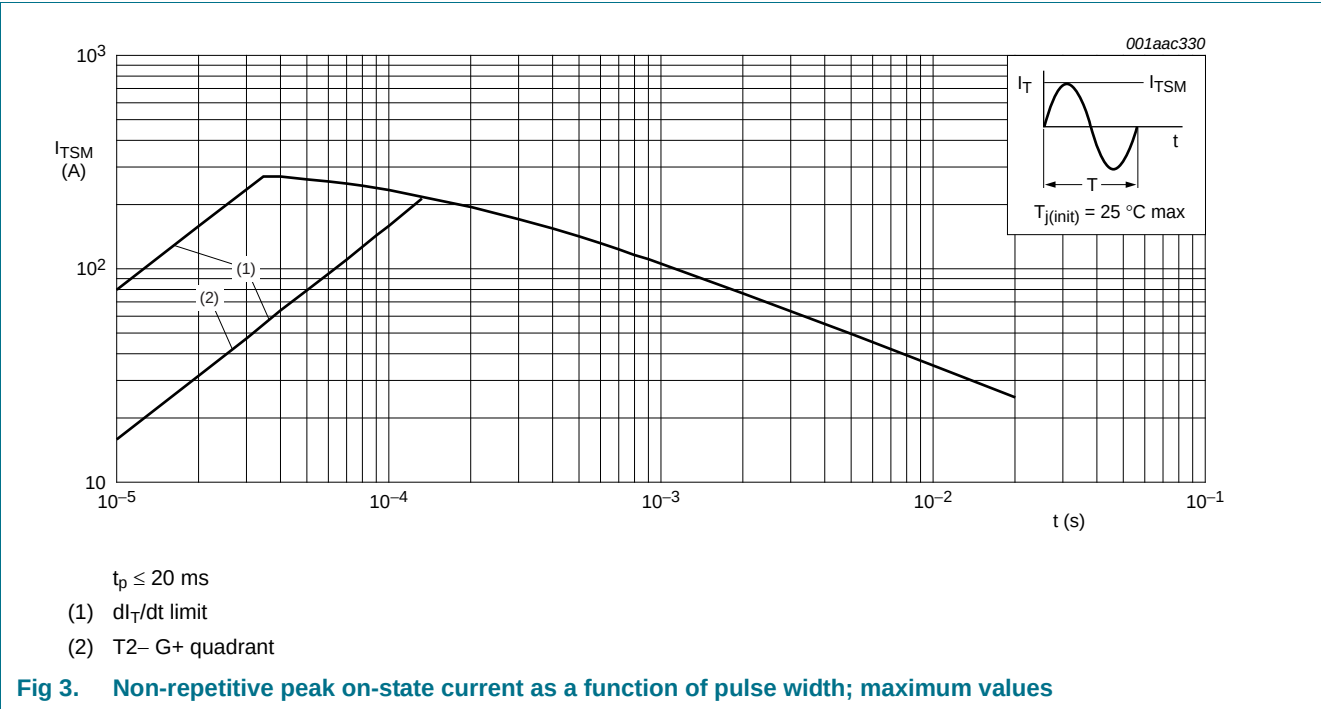
α = conduction angle

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



$f = 50\text{ Hz}$

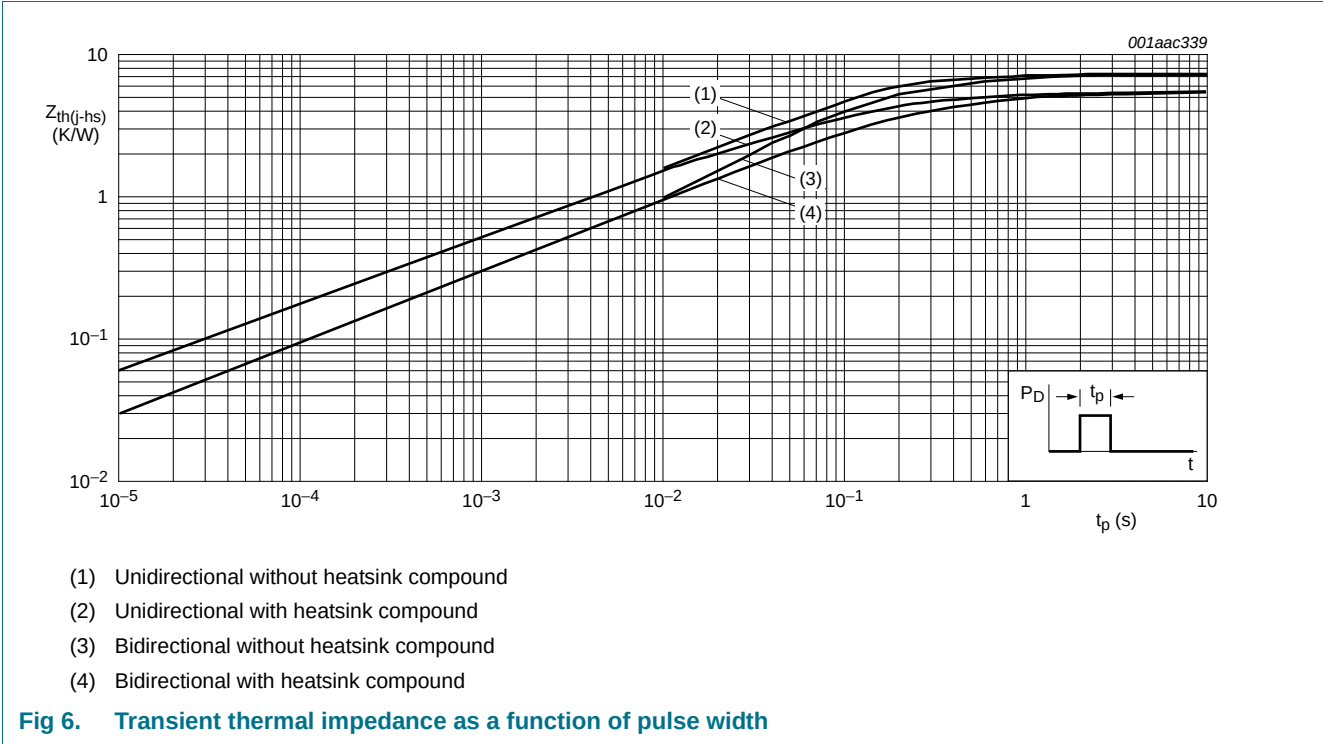
Fig 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



5. Thermal characteristics

Table 4. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-hs)}$	thermal resistance from junction to heatsink	full or half cycle with heatsink compound; Figure 6	-	-	5.5	K/W
		full or half cycle without heatsink compound; Figure 6	-	-	7.2	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	55	-	K/W



6. Isolation characteristics

Table 5. Isolation limiting values and characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{isol}	RMS isolation voltage from all three terminals to external heatsink	$f = 50\text{ Hz to }60\text{ Hz}$; sinusoidal waveform; R.H. $\leq 65\%$; clean and dust free	-	-	2500	V
C_{isol}	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	BTA204X-600D			BTA204X-600E			BTA204X-600F			Unit
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{GT}	gate trigger current	$V_D = 12\text{ V};$ $I_T = 0.1\text{ A};$ Figure 8										
		T2+ G+	-	-	5	-	-	10	-	-	25	mA
		T2+ G-	-	-	5	-	-	10	-	-	25	mA
		T2- G-	-	-	5	-	-	10	-	-	25	mA
I_L	latching current	$V_D = 12\text{ V};$ $I_{GT} = 0.1\text{ A};$ Figure 10										
		T2+ G+	-	-	6	-	-	12	-	-	20	mA
		T2+ G-	-	-	9	-	-	18	-	-	30	mA
		T2- G-	-	-	6	-	-	12	-	-	20	mA
I_H	holding current	$V_D = 12\text{ V};$ $I_{GT} = 0.1\text{ A};$ Figure 11	-	-	6	-	-	12	-	-	20	mA
V_T	on-state voltage	$I_T = 5\text{ A};$ Figure 9	-	1.4	1.7	-	1.4	1.7	-	1.4	1.7	V
V_{GT}	gate trigger voltage	$V_D = 12\text{ V};$ $I_T = 0.1\text{ A};$ 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 leakage 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	BTA204X-600D			BTA204X-600E			BTA204X-600F			Unit
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
dV_D/dt	critical rate of rise of off-state voltage	$V_{DM} = 67\%$ $V_{DRM(max)}$; $T_j = 125\text{ }^{\circ}\text{C}$; exponential waveform; gate open circuit	20	-	-	30	-	-	50	-	-	V/ μs
dI_{com}/dt	critical rate of change of commutating current	$V_{DM} = 400\text{ V}$; $T_j = 125\text{ }^{\circ}\text{C}$; $I_{T(RMS)} = 4\text{ A}$; $dV_{com}/dt = 10\text{ V}/\mu\text{s}$; gate open circuit	1.1	-	-	2.1	-	-	3	-	-	A/ μs
		$V_{DM} = 400\text{ V}$; $T_j = 125\text{ }^{\circ}\text{C}$; $I_{T(RMS)} = 4\text{ A}$; $dV_{com}/dt = 0.1\text{ V}/\mu\text{s}$; gate open circuit	4.5	-	-	8	-	-	15	-	-	A/ μs
t_{gt}	gate controlled turn-on time	$I_{TM} = 20\text{ A}$; $V_D = V_{DRM(max)}$; $I_G = 0.1\text{ A}$; $dI_G/dt = 5\text{ A}/\mu\text{s}$	-	2	-	-	2	-	-	2	-	μs

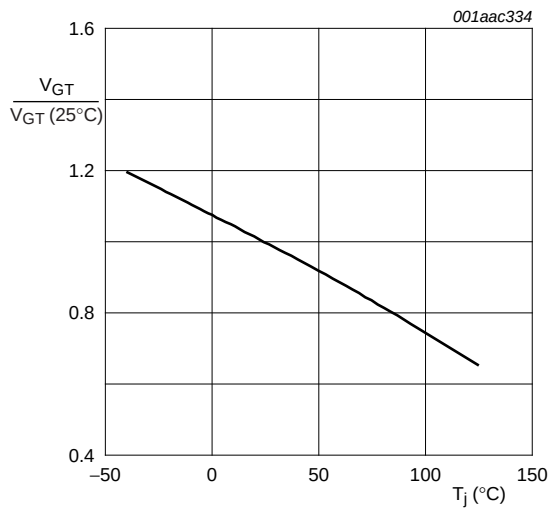


Fig 7. Normalized gate trigger voltage as a function of junction temperature

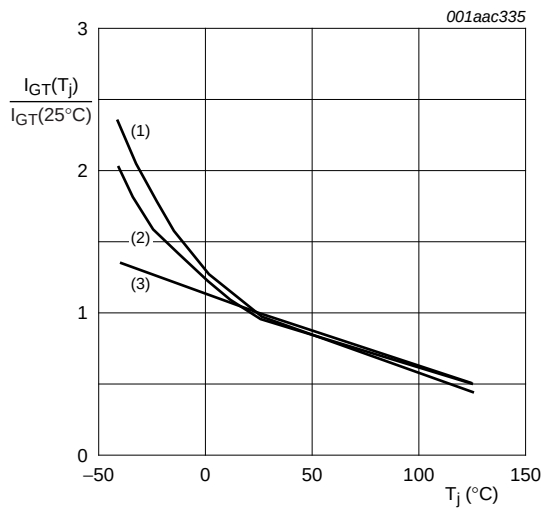
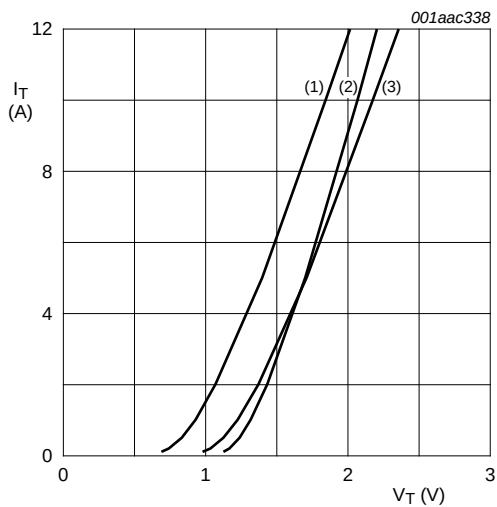


Fig 8. Normalized gate trigger current as a function of junction temperature



- $V_O = 1.27\text{ V}$
 $R_S = 0.091\text{ }\Omega$
- (1) $T_j = 125\text{ }^\circ\text{C}$; typical values
 - (2) $T_j = 25\text{ }^\circ\text{C}$; maximum values
 - (3) $T_j = 125\text{ }^\circ\text{C}$; maximum values

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

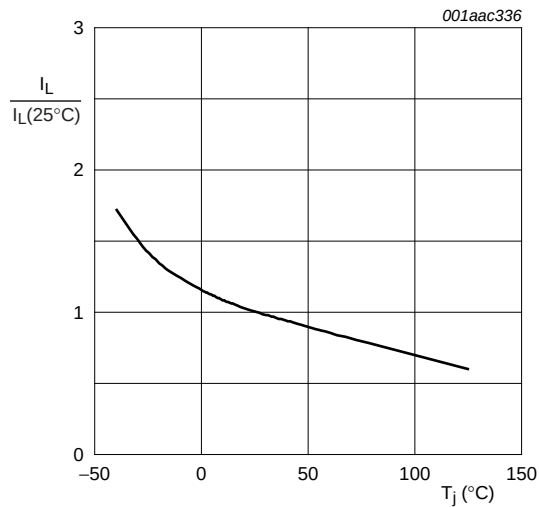


Fig 10. Normalized latching current as a function of junction temperature

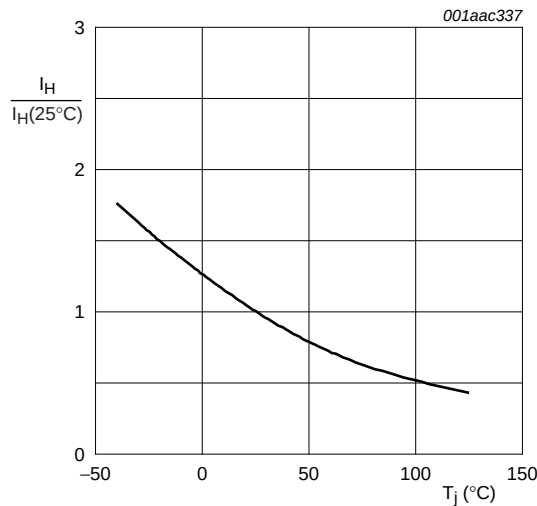


Fig 11. Normalized holding current as a function of junction temperature

9. Package information

Refer to mounting instructions for F-pack packages. Epoxy meets UL94 V-0 at 1⁄8 inch.

10. Package outline

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

SOT186A

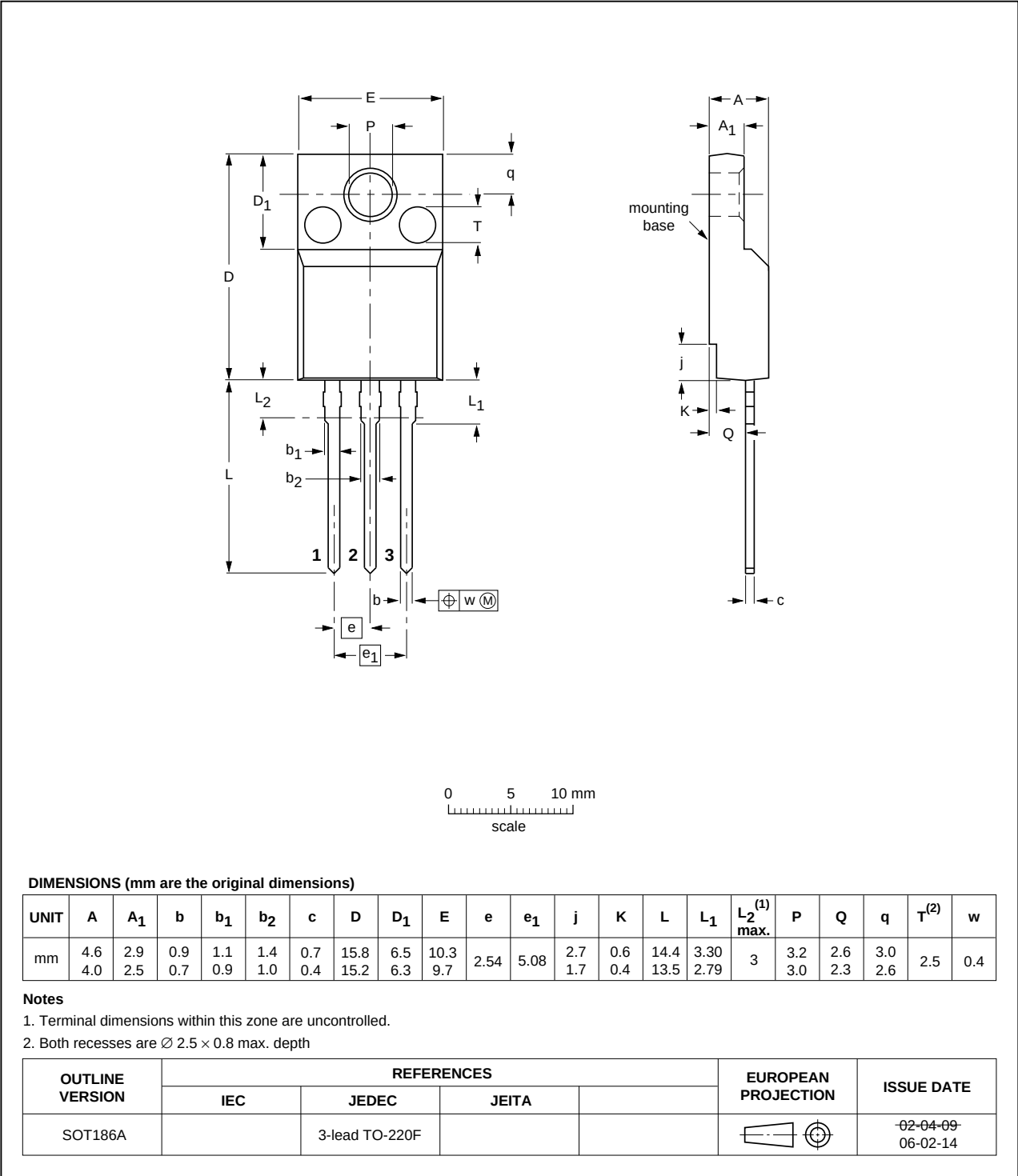


Fig 12. Package outline SOT186A (TO-220F)

11. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BTA204X_SER_D_E_F v.5	20111103	Product data sheet	-	BTA204X_SER_D_E_F v.4
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.		
BTA204X_SER_D_E_F v.4	20050317	Product data sheet	-	BTA204X_SERIES_D_E_F v.3
BTA204X_SERIES_D_E_F v.3	20030501	Product specification	-	BTA204X_SERIES_D_E_F v.2
BTA204X_SERIES_D_E_F v.2	19981201	Product specification	-	BTA204X_SERIES_D_E_F v.1
BTA204X_SERIES_D_E_F v.1	19971001	Product specification	-	-

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Document status ^{[1][2]}	Product status ^[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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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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