

# BTA312Y series C

12 A Three-quadrant triacs high commutation insulated

Rev. 01 — 27 September 2007

Product data sheet

## 1. Product profile

### 1.1 General description

Passivated, new generation, high commutation triacs in an internally insulated TO-220 plastic package

### 1.2 Features

- Very high commutation performance
- Isolated mounting base
- High immunity to dV/dt
- 2500 V RMS isolation voltage

### 1.3 Applications

- Motor control - e.g. washing machines
- Refrigeration compressors
- Non-linear rectifier-fed motor loads
- Lamp dimmers for US market

### 1.4 Quick reference data

- $V_{DRM} \leq 600$  V (BTA312Y-600C)
- $V_{DRM} \leq 800$  V (BTA312Y-800C)
- $I_{GT} \leq 35$  mA
- $I_{T(RMS)} \leq 12$  A
- $I_{TSM} \leq 100$  A ( $t = 20$  ms)
- $I_{TSM} \leq 110$  A ( $t = 16.7$  ms)

## 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		
		SOT78D (TO-220)	

### 3. Ordering information

**Table 2.** Ordering information

Type number	Package		Version
	Name	Description	
BTA312Y-600C	TO-220	plastic single-ended package; isolated heatsink mounted; 1 mounting hole;	SOT78D
BTA312Y-800C		3-lead TO-220	

### 4. Limiting values

**Table 3.** Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>DRM</sub>	repetitive peak off-state voltage	BTA312Y-600C;	[1] -	600	V
		BTA312Y-800C;	-	800	V
I <sub>T(RMS)</sub>	RMS on-state current	full sine wave; T <sub>mb</sub> ≤ 85 °C; see <a href="#">Figure 4</a> and <a href="#">5</a>	-	12	A
I <sub>TSM</sub>	non-repetitive peak on-state current	full sine wave; T <sub>j</sub> = 25 °C prior to surge; see <a href="#">Figure 2</a> and <a href="#">3</a>			
		t = 20 ms	-	100	A
		t = 16.7 ms	-	110	A
I <sup>2</sup> t	I <sup>2</sup> t for fusing	t = 10 ms	-	50	A <sup>2</sup> s
di <sub>T</sub> /dt	rate of rise of on-state current	I <sub>TM</sub> = 20 A; I <sub>G</sub> = 0.2 A; di <sub>G</sub> /dt = 0.2 A/μs	-	100	A/μs
I <sub>GM</sub>	peak gate current		-	2	A
P <sub>GM</sub>	peak gate power		-	5	W
P <sub>G(AV)</sub>	average gate power	over any 20 ms period	-	0.5	W
T <sub>stg</sub>	storage temperature		-40	+150	°C
T <sub>j</sub>	junction temperature		-	125	°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 15 A/μs.

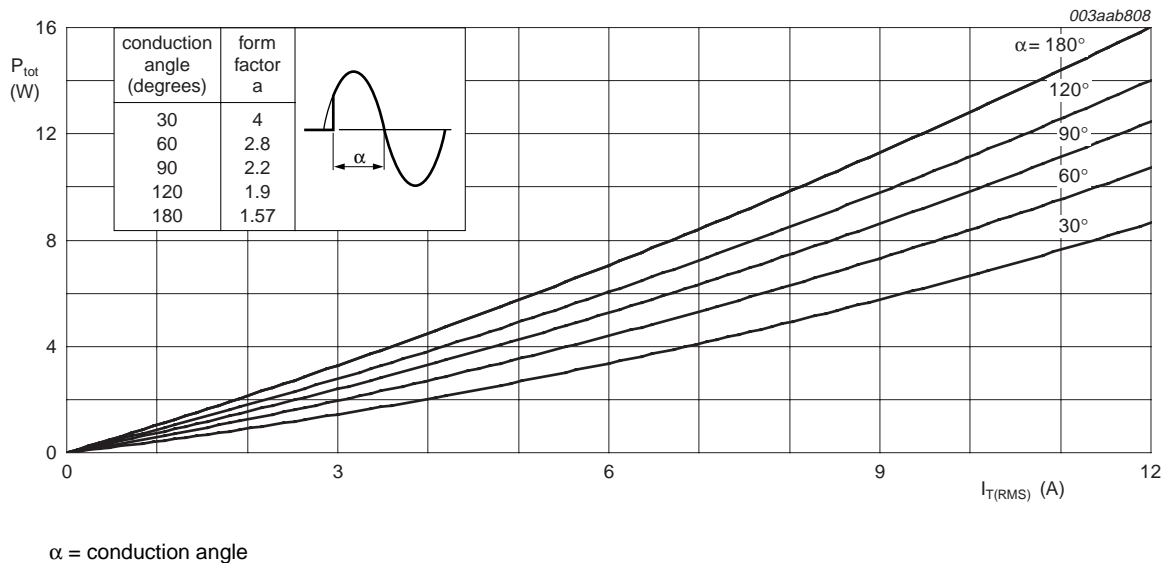


Fig 1. Total power dissipation as a function of RMS on-state current; maximum values

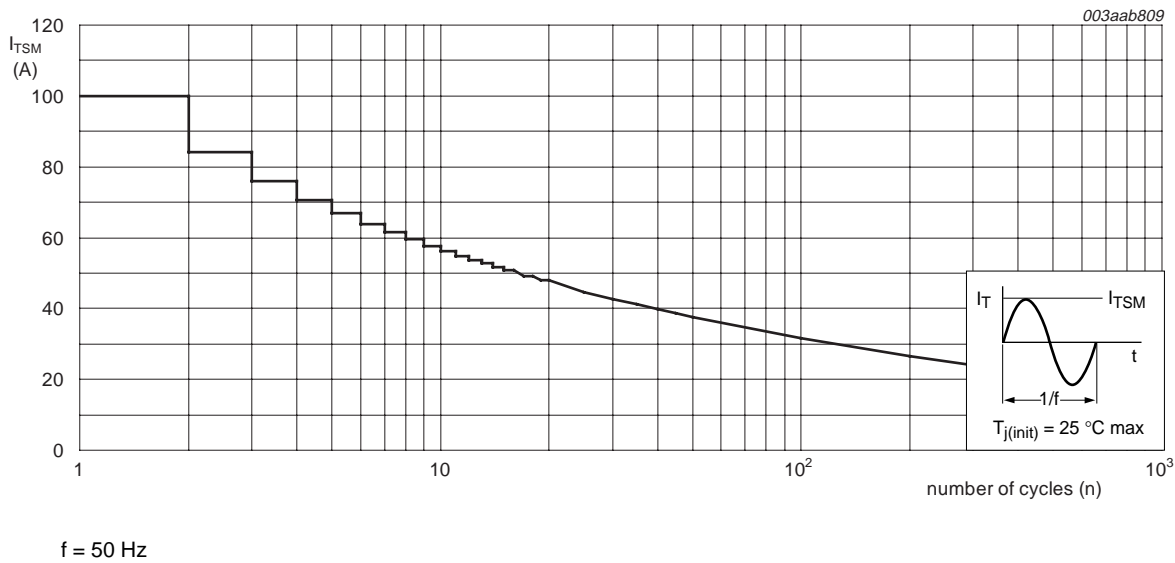
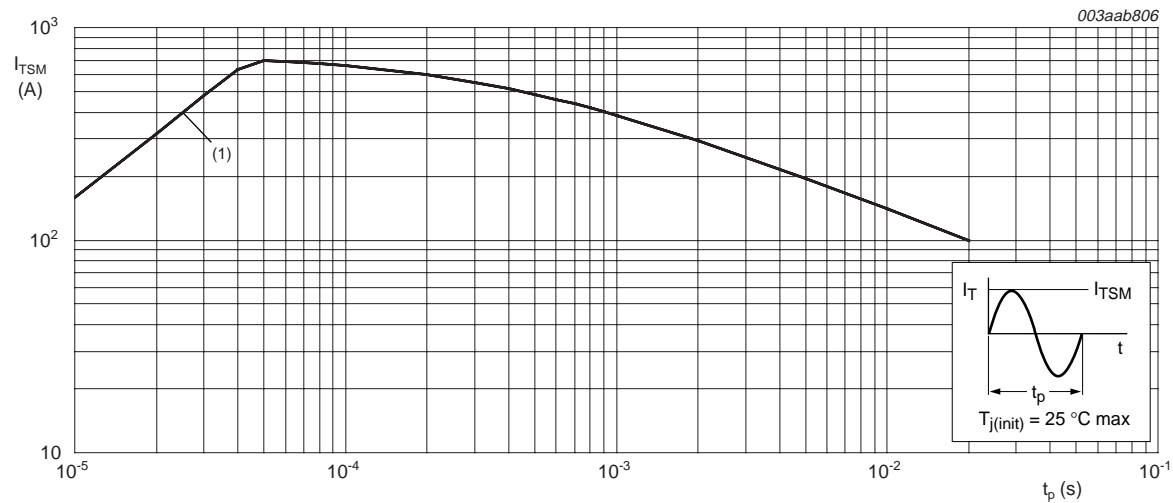
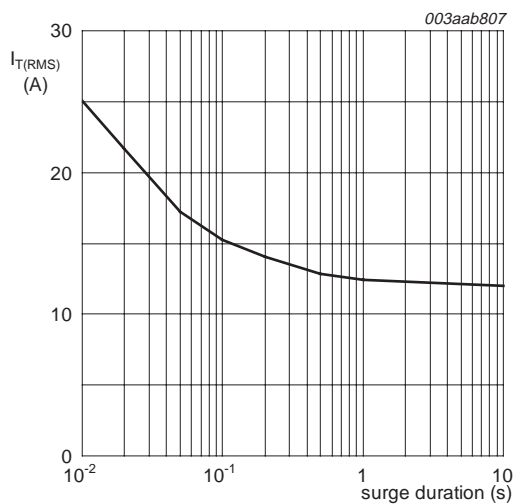


Fig 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



$t_p \leq 20\text{ ms}$   
(1)  $di_T/dt$  limit

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



$f = 50\text{ Hz}$   
 $T_{mb} = 85^\circ\text{C}$

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

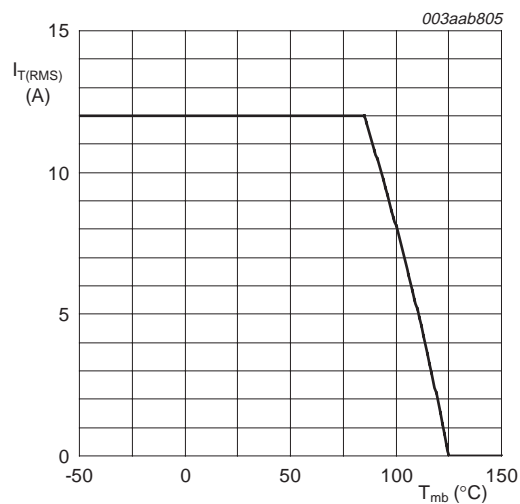


Fig 5. RMS on-state current as a function of mounting base temperature; maximum values

## 5. Thermal characteristics

Table 4. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	full cycle; see <a href="#">Figure 6</a>	-	-	2.3	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	60	-	K/W

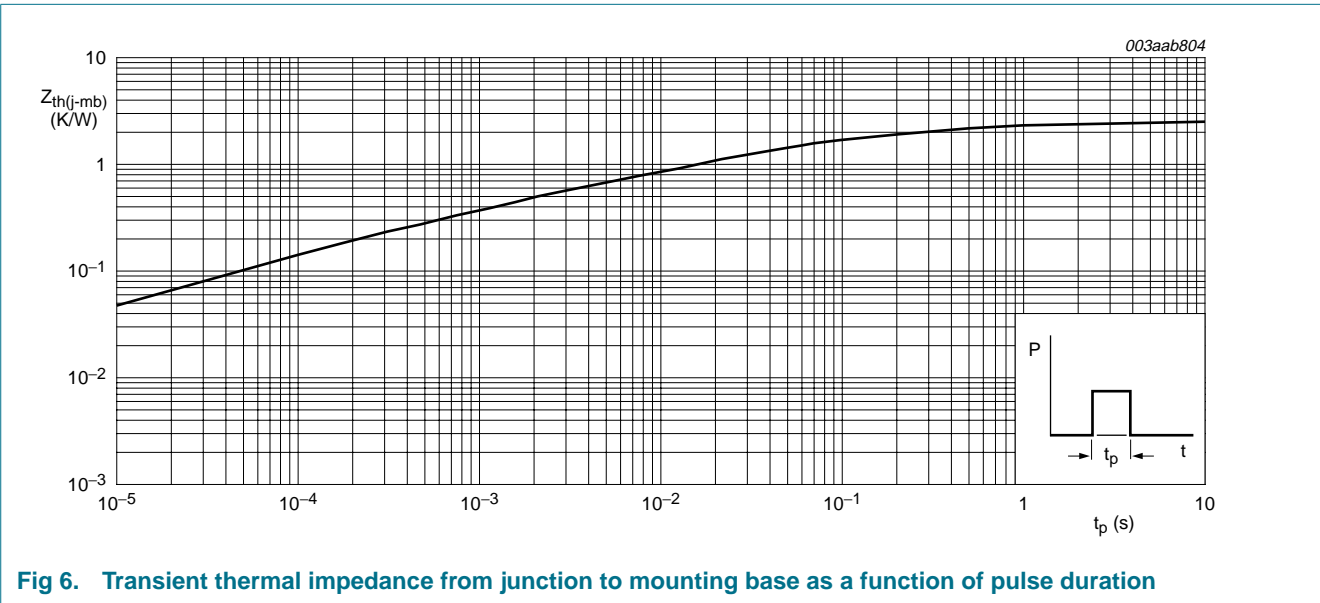


Fig 6. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 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 $60\text{ Hz}$ ; 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**

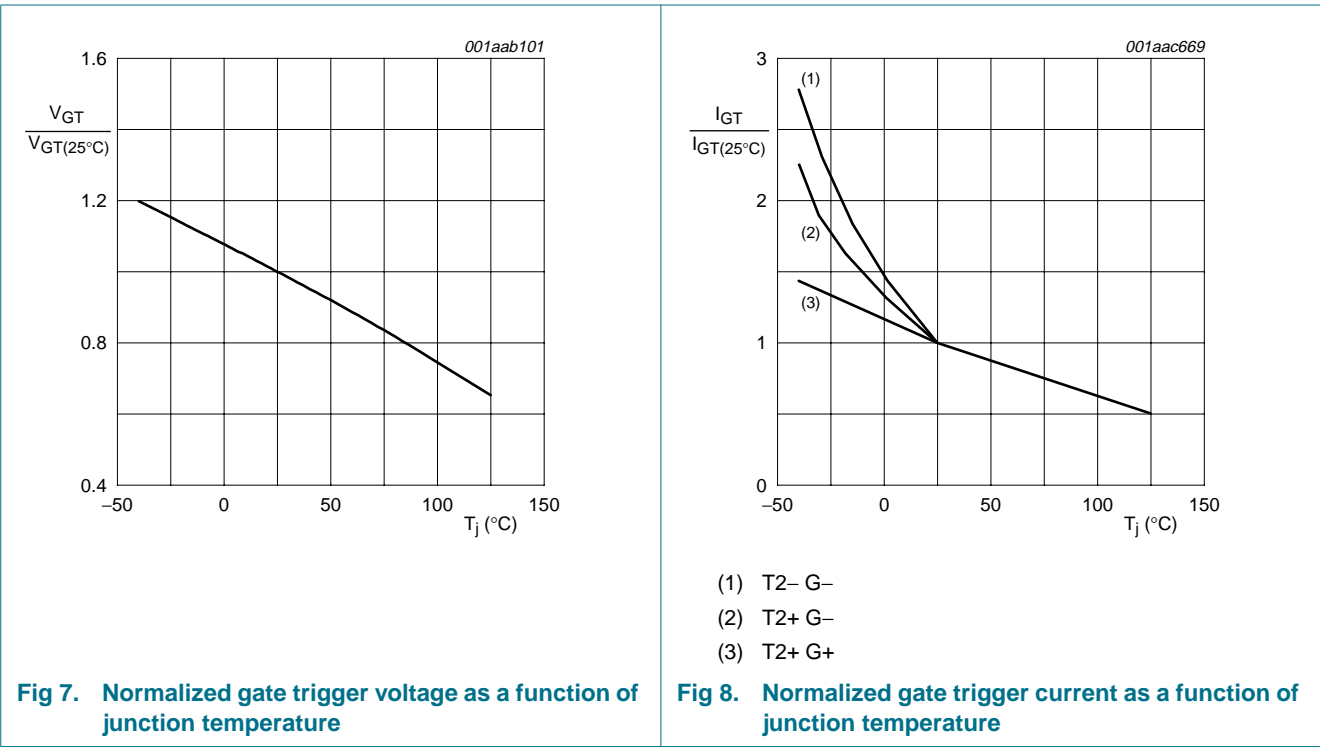
$T_j = 25\text{ °C}$  unless otherwise specified.

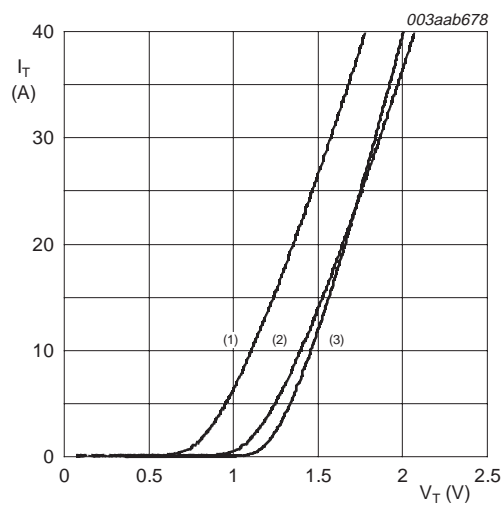
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; see <a href="#">Figure 8</a>				
		T2+ G+	2	-	35	mA
		T2+ G-	2	-	35	mA
		T2- G-	2	-	35	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_{GT} = 0.1\text{ A}$ ; see <a href="#">Figure 10</a>				
		T2+ G+	-	-	50	mA
		T2+ G-	-	-	60	mA
		T2- G-	-	-	50	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $I_{GT} = 0.1\text{ A}$ ; see <a href="#">Figure 11</a>	-	-	35	mA
$V_T$	on-state voltage	$I_T = 15\text{ A}$ ; see <a href="#">Figure 9</a>	-	1.3	1.6	V
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; see <a href="#">Figure 7</a>	-	0.8	1.5	V
		$V_D = 400\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 125\text{ °C}$	0.25	0.4	-	V
$I_D$	off-state current	$V_D = V_{DRM(max)}$ ; $T_j = 125\text{ °C}$	-	0.1	0.5	mA

8. Dynamic characteristics

Table 7. Dynamic characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 0.67 \times V_{DRM(max)}$ ; $T_j = 125\text{ }^{\circ}\text{C}$ ; exponential waveform; gate open circuit	500	-	-	V/ $\mu\text{s}$
$dI_{com}/dt$	rate of change of commutating current	$V_{DM} = 400\text{ V}$ ; $T_j = 125\text{ }^{\circ}\text{C}$ ; $I_{T(RMS)} = 12\text{ A}$ ; without snubber; gate open circuit	20	-	-	A/ms
$t_{gt}$	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	-	$\mu\text{s}$





$V_O = 1.127 \text{ V}$

$R_S = 0.027 \text{ } \Omega$

- (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

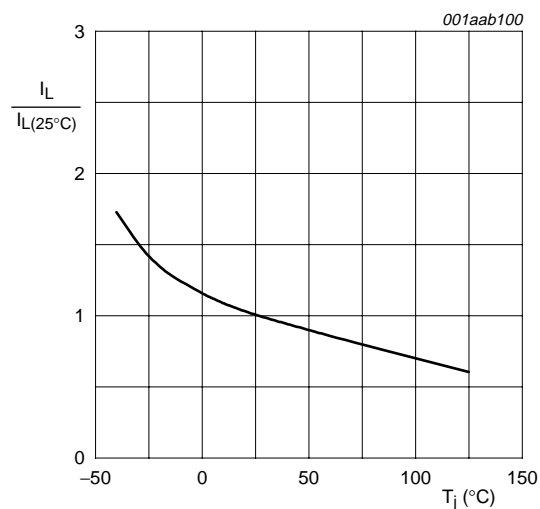


Fig 10. Normalized latching current as a function of junction temperature

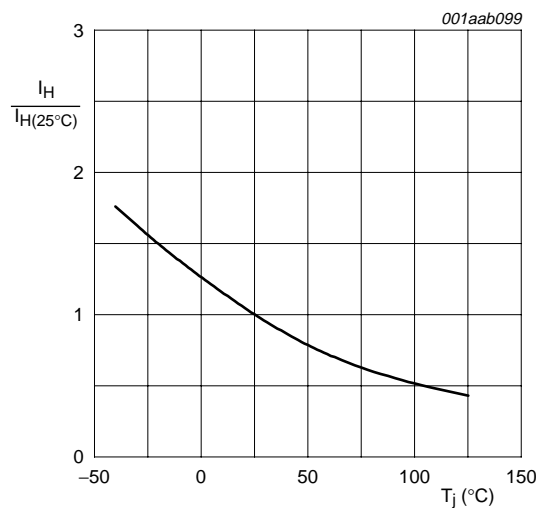


Fig 11. Normalized holding current as a function of junction temperature



9. Package outline

Plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 SOT78D

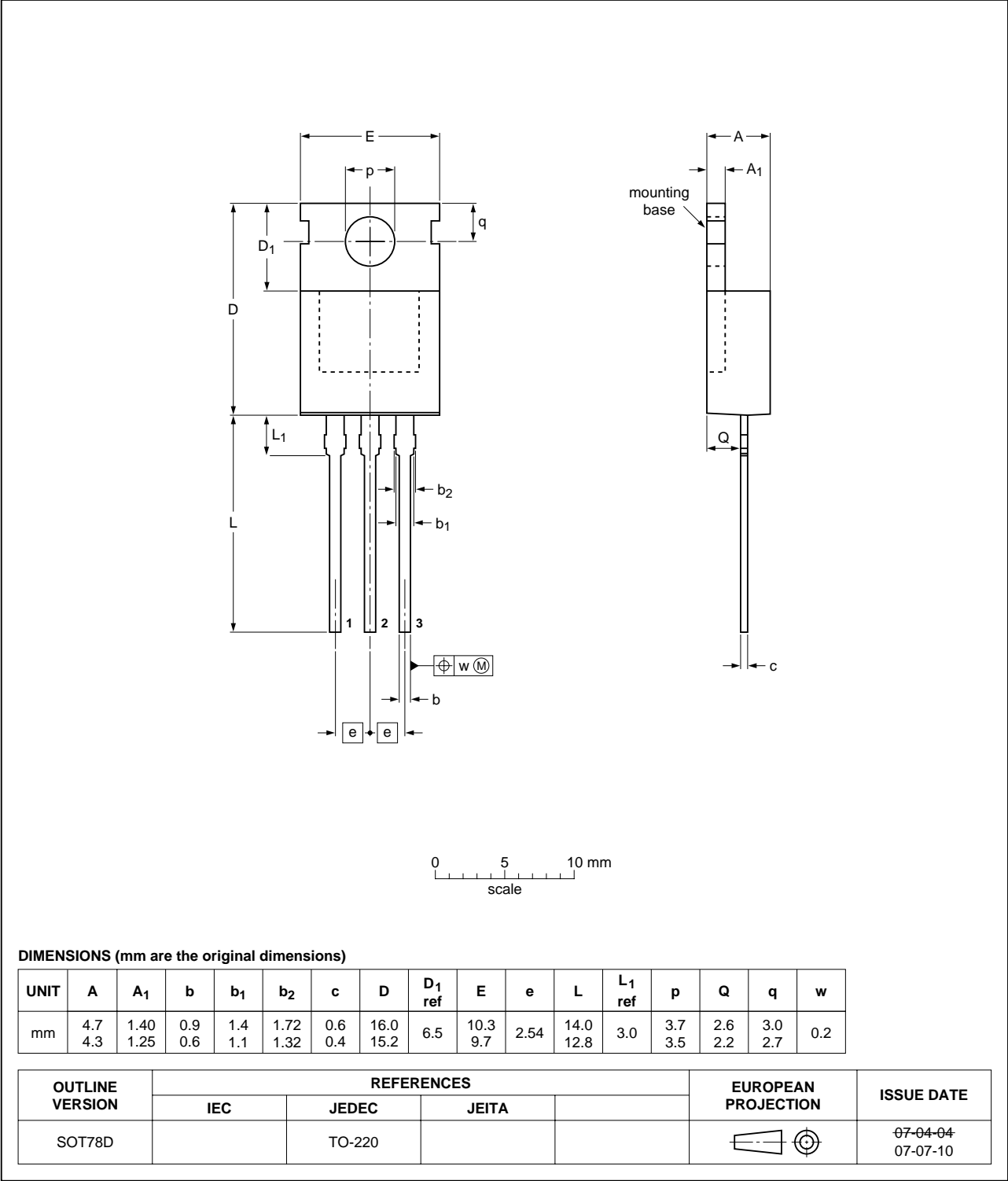


Fig 12. Package outline SOT78D (3-lead TO-220)

10. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BTA312Y_SER_C_1	20070927	Product data sheet	-	-

## 11. Legal information

### 11.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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[2] The term 'short data sheet' is explained in section "Definitions".

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