

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
- High immunity to dV/dt
- Isolated mounting base
- 2500 V RMS isolation voltage

1.3 Applications

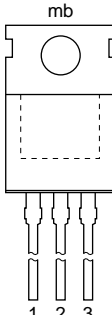

- Motor control - e.g. washing machines
- Non-linear rectifier-fed motor loads
- Refrigeration compressors
- Lamp dimmers for US market

1.4 Quick reference data

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

2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Symbol
1	main terminal 1 (T1)	 <p style="text-align: center;">SOT78D (TO-220)</p>	
2	main terminal 2 (T2)		
3	gate (G)		
mb	mounting base; isolated		

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; 3-lead TO-220	SOT78D
BTA312Y-800C			

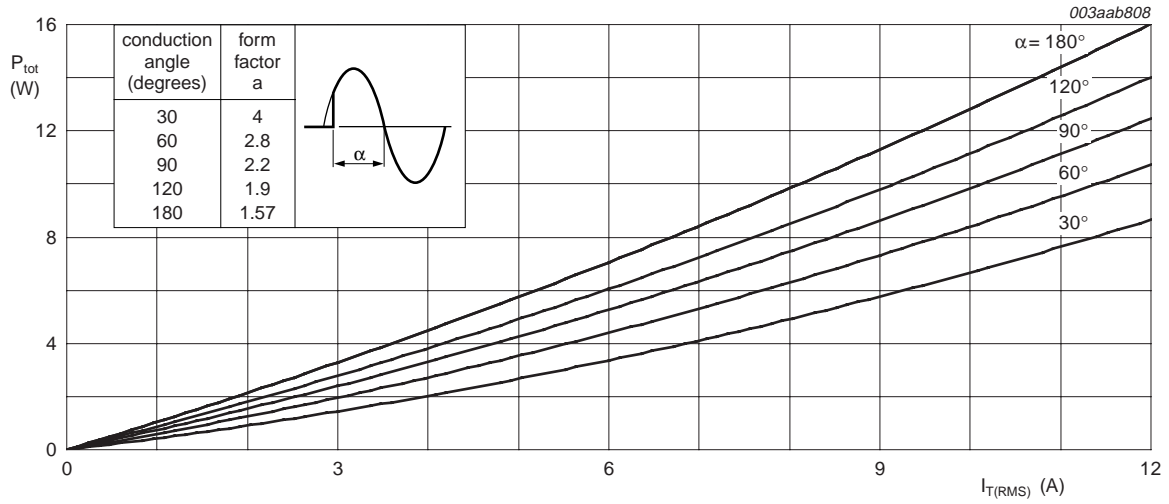
4. Limiting values

Table 3. Limiting values

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

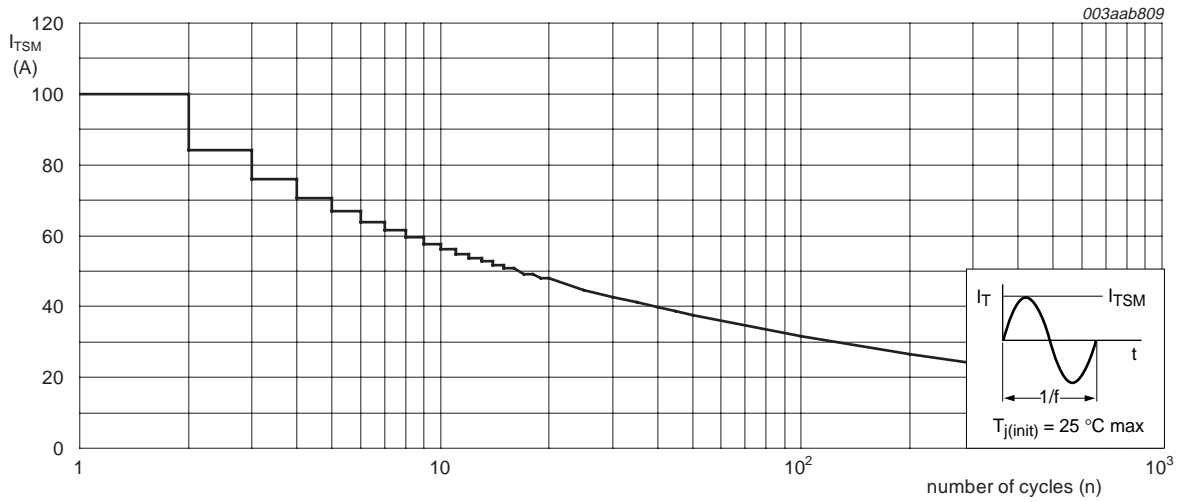
Symbol	Parameter	Conditions	Min	Max	Unit
V _{DRM}	repetitive peak off-state voltage	BTA312Y-600C;	[1] -	600	V
		BTA312Y-800C;	-	800	V
I _{T(RMS)}	RMS on-state current	full sine wave; T _{mb} ≤ 85 °C; see Figure 4 and 5	-	12	A
I _{TSM}	non-repetitive peak on-state current	full sine wave; T _j = 25 °C prior to surge; see Figure 2 and 3			
		t = 20 ms	-	100	A
		t = 16.7 ms	-	110	A
I ² t	I ² t for fusing	t = 10 ms	-	50	A ² s
di _T /dt	rate of rise of on-state current	I _{TM} = 20 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	over any 20 ms period	-	0.5	W
T _{stg}	storage temperature		-40	+150	°C
T _j	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.



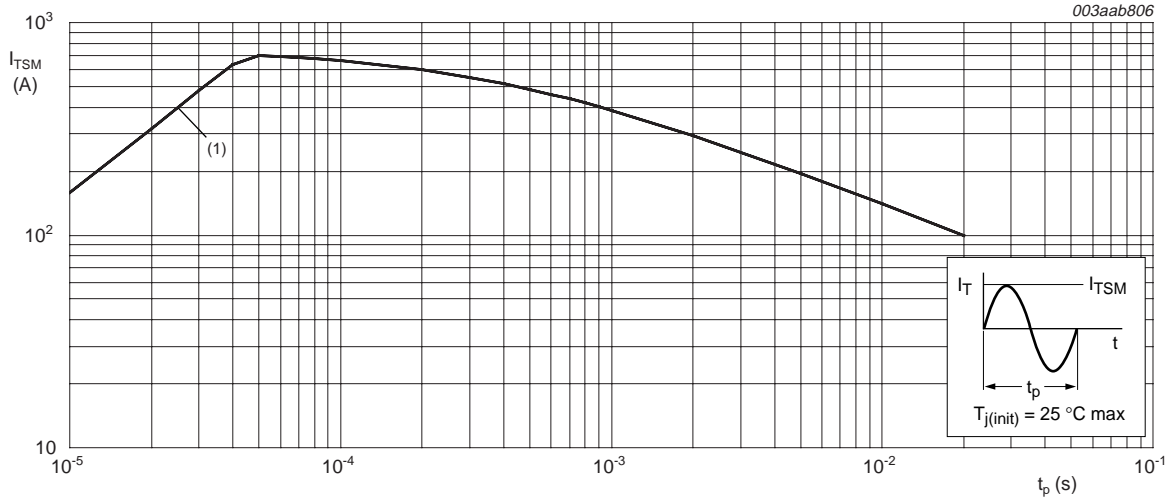
α = conduction angle

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



f = 50 Hz

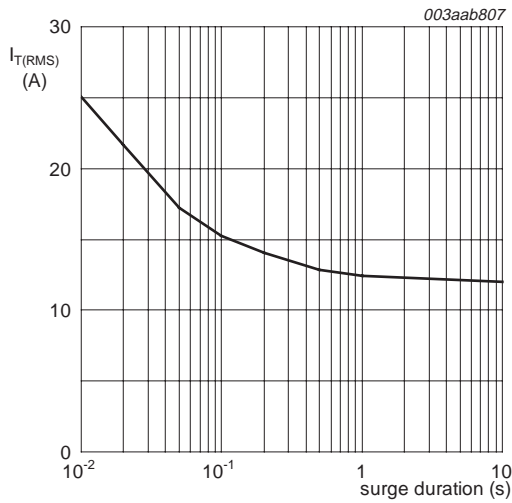
Fig 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



$t_p \leq 20\text{ ms}$

(1) di_T/dt limit

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



$f = 50\text{ Hz}$

$T_{mb} = 85\text{ °C}$

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

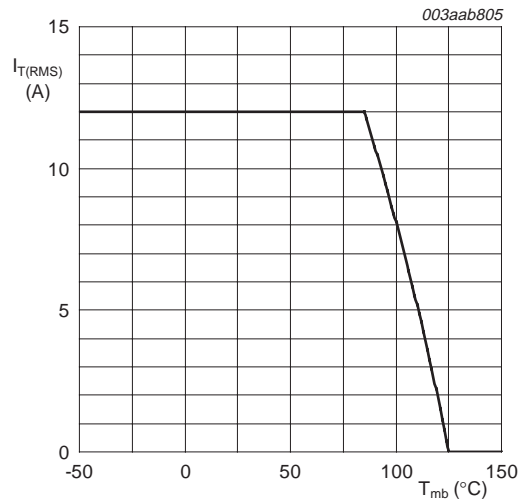


Fig 5. RMS on-state current as a function of mounting base temperature; maximum values

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 Figure 6	-	-	2.3	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	60	-	K/W

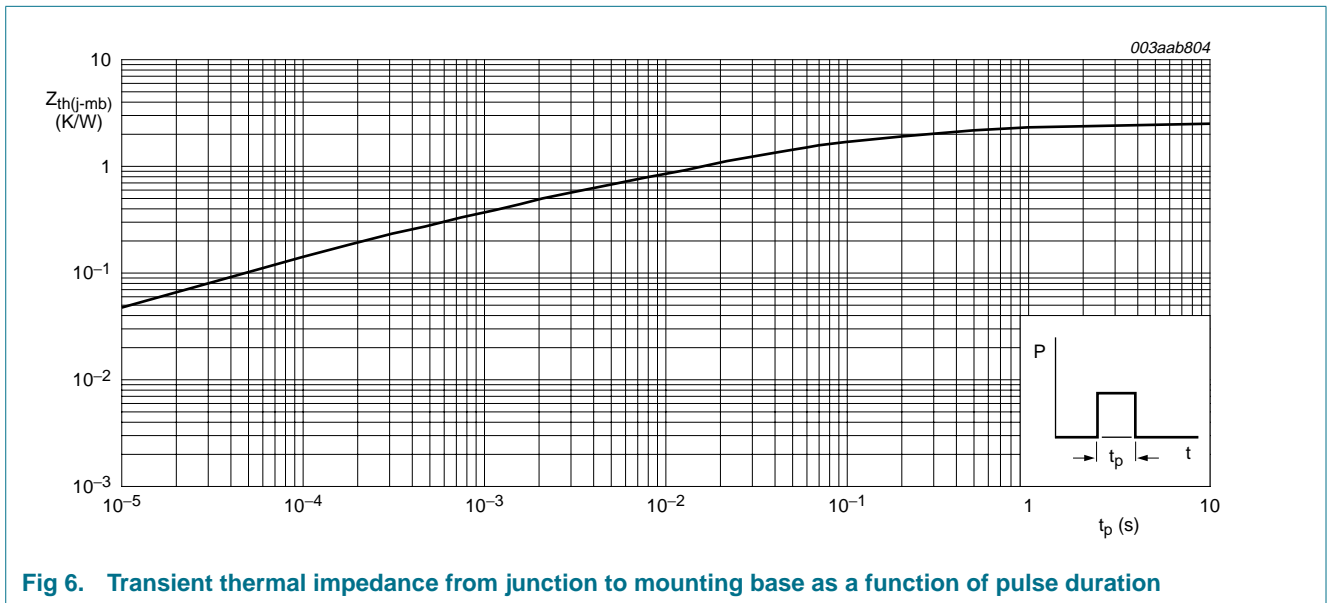


Fig 6. Transient thermal impedance from junction to mounting base as a function of pulse duration

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 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

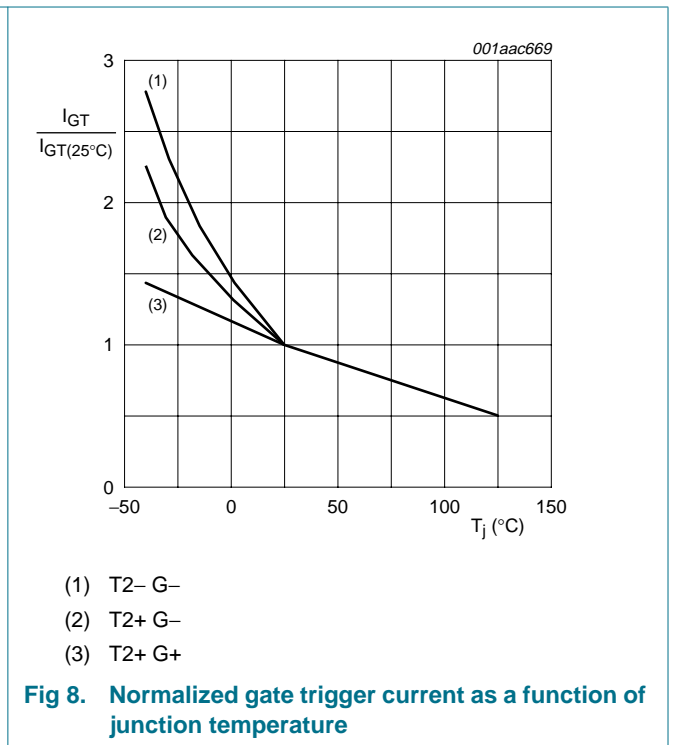
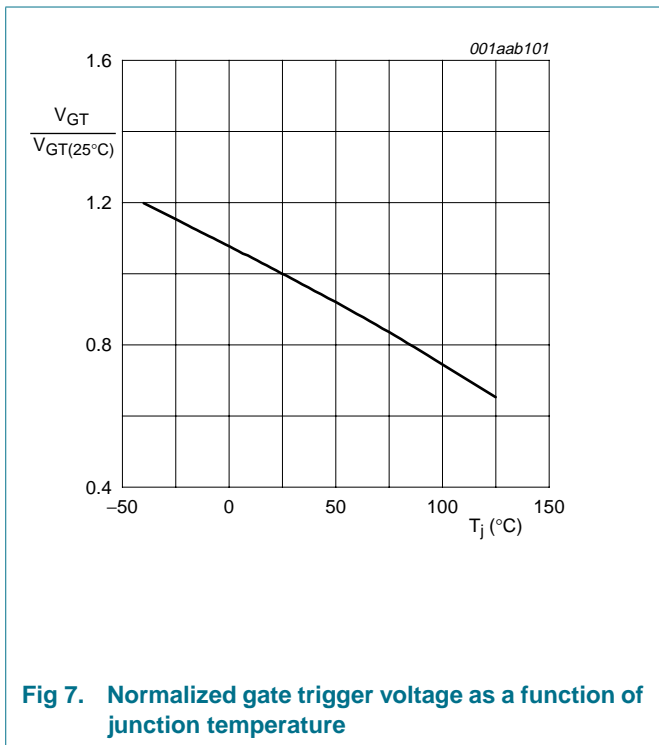
$T_j = 25\text{ °C}$ unless otherwise specified.

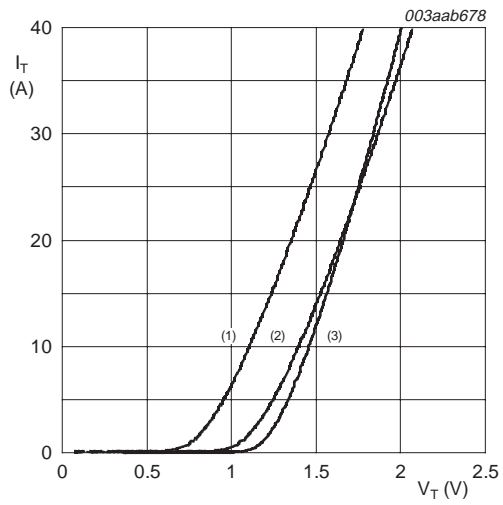
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; see Figure 8				
		T2+ G+	2	-	35	mA
		T2+ G-	2	-	35	mA
		T2- G-	2	-	35	mA
I_L	latching current	$V_D = 12\text{ V}$; $I_{GT} = 0.1\text{ A}$; see Figure 10				
		T2+ G+	-	-	50	mA
		T2+ G-	-	-	60	mA
		T2- G-	-	-	50	mA
I_H	holding current	$V_D = 12\text{ V}$; $I_{GT} = 0.1\text{ A}$; see Figure 11	-	-	35	mA
V_T	on-state voltage	$I_T = 15\text{ A}$; see Figure 9	-	1.3	1.6	V
V_{GT}	gate trigger voltage	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; see Figure 7	-	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/ μs
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	-	μs





$V_o = 1.127 \text{ V}$

$R_s = 0.027 \text{ } \Omega$

- (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

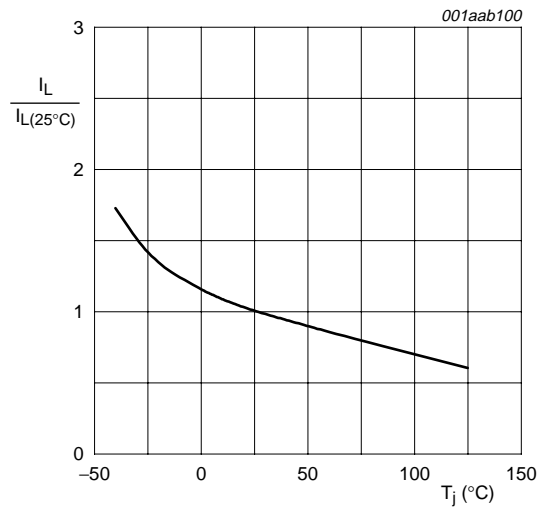


Fig 10. Normalized latching current as a function of junction temperature

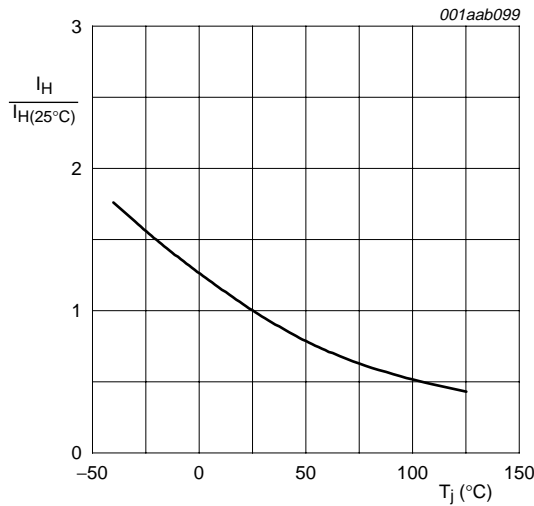


Fig 11. Normalized holding current as a function of junction temperature

9. Package outline

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

SOT78D

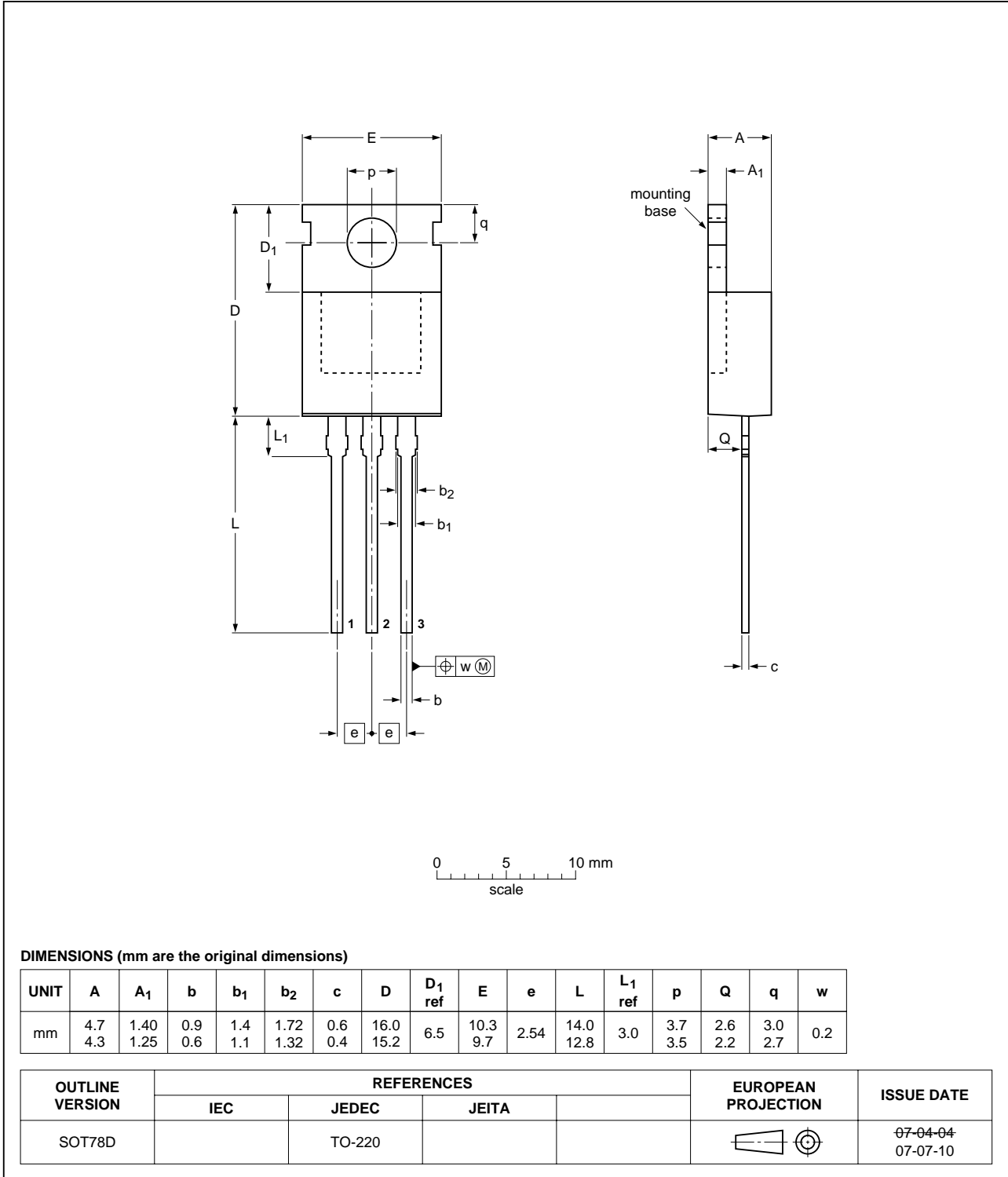


Fig 12. Package outline SOT78D (3-lead TO-220)

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 ^{[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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