

BTA316-800ET

3Q Hi-Com Triac

Rev. 02 — 1 December 2010

Product data sheet

1. Product profile

1.1 General description

Planar passivated high commutation three quadrant triac in a SOT78 plastic package. The "series ET" triac balances the requirements of commutation performance and gate sensitivity. The "sensitive gate" "series ET" is intended for interfacing with low power drivers including microcontrollers where "high junction operating temperature" capability is required.

1.2 Features and benefits

- 3Q technology for improved noise immunity
- Direct interfacing with low power drivers and microcontrollers
- Good immunity to false turn-on by dV/dt
- High commutation capability with sensitive gate
- High junction operating temperature capability
- High voltage capability
- Planar passivated for voltage ruggedness and reliability
- Triggering in three quadrants only

1.3 Applications

- Applications subject to high temperature
- Electronic thermostats (heating and cooling)
- High power motor controls e.g. washing machines and vacuum cleaners
- Refrigeration and air-conditioner compressor controls

1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	800	V
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{\text{j(init)}} = 25\text{ °C}$; $t_{\text{p}} = 20\text{ ms}$; see Figure 4 ; see Figure 5	-	-	140	A
T_{j}	junction temperature		-	-	150	°C

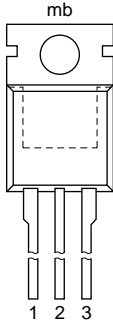



Table 1. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 126\text{ °C}$; see Figure 3 ; see Figure 1 ; see Figure 2	-	-	16	A
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G+; $T_j = 25\text{ °C}$; see Figure 7	-	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ °C}$; see Figure 7	-	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ °C}$; see Figure 7	-	-	10	mA

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1		 sym051
2	T2	main terminal 2		
3	G	gate		
mb	T2	mounting base; main terminal 2		

SOT78 (TO-220AB)

3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
BTA316-800ET	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

4. Limiting values

Table 4. 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		-	800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 126\text{ °C}$; see Figure 3 ; see Figure 1 ; see Figure 2	-	16	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 20\text{ ms}$; see Figure 4 ; see Figure 5	-	140	A
		full sine wave; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 16.7\text{ ms}$	-	150	A
I^2t	I^2t for fusing	$t_p = 10\text{ ms}$; sine-wave pulse	-	98	A ² s
di_T/dt	rate of rise of on-state current	$I_T = 20\text{ A}$; $I_G = 0.2\text{ A}$; $dI_G/dt = 0.2\text{ A}/\mu\text{s}$	-	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		-	150	°C

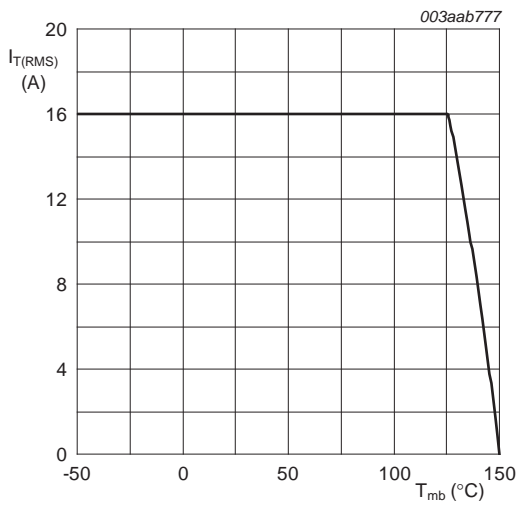
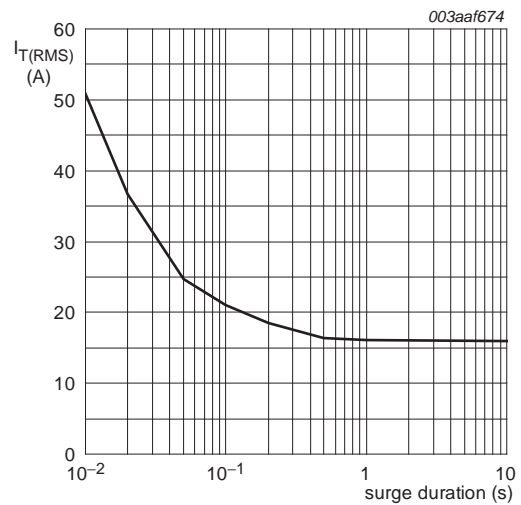


Fig 1. RMS on-state current as a function of mounting base temperature; maximum values



$f = 50\text{ Hz}$; $T_{mb} = 126\text{ °C}$

Fig 2. RMS on-state current as a function of surge duration; maximum values

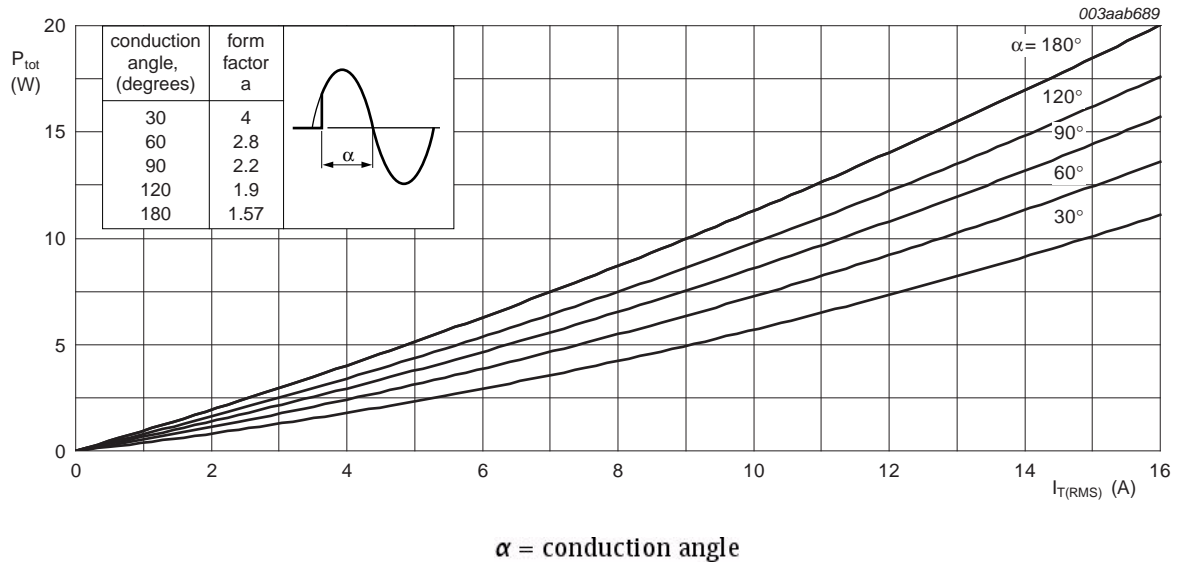


Fig 3. Total power dissipation as a function of RMS on-state current; maximum values

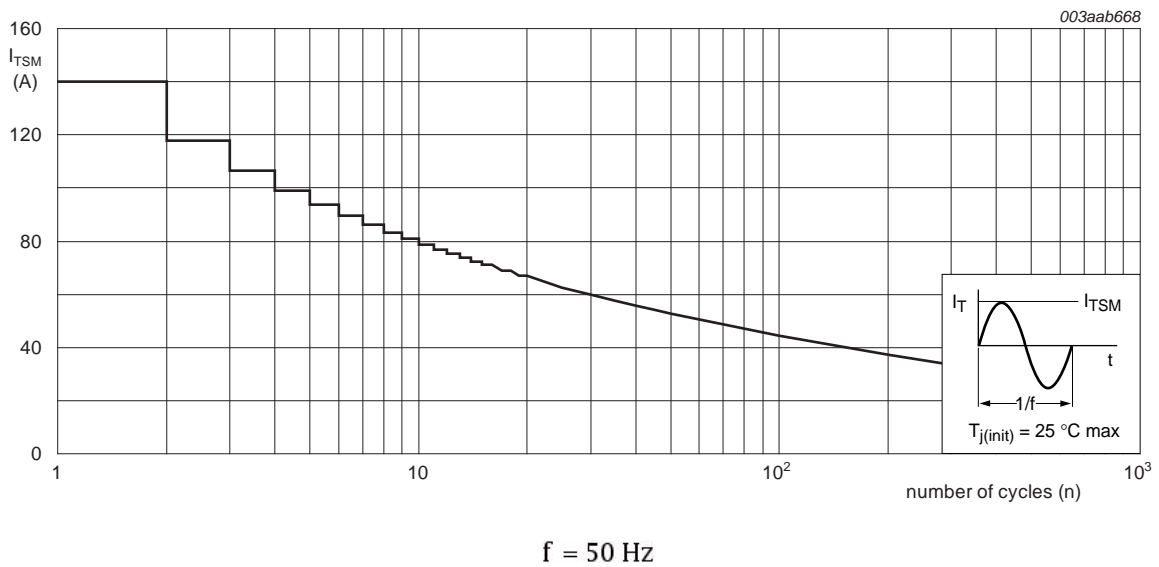
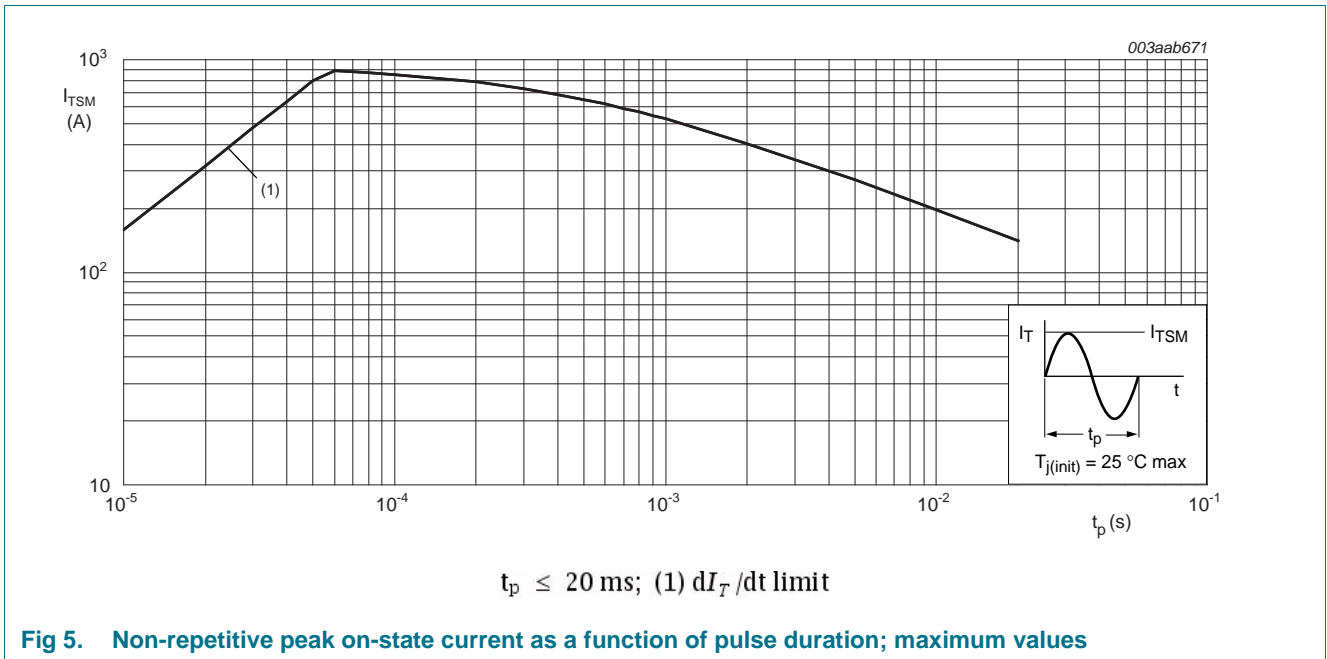


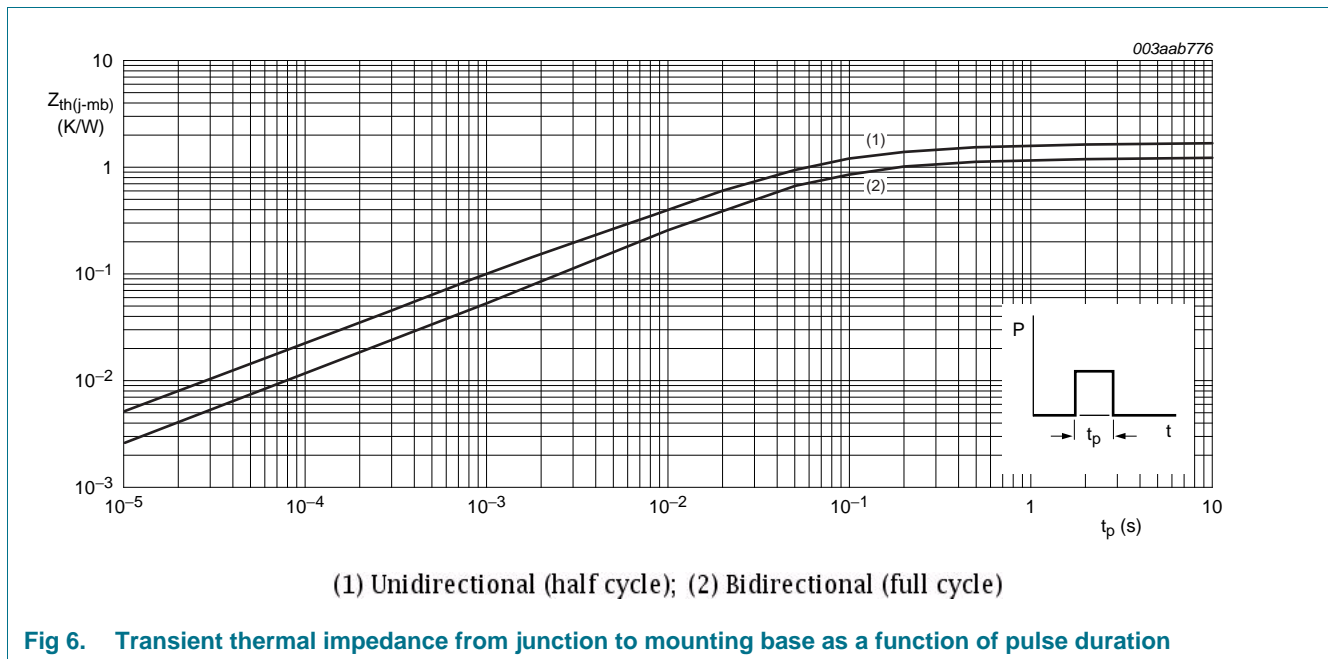
Fig 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



5. Thermal characteristics

Table 5. Thermal characteristics

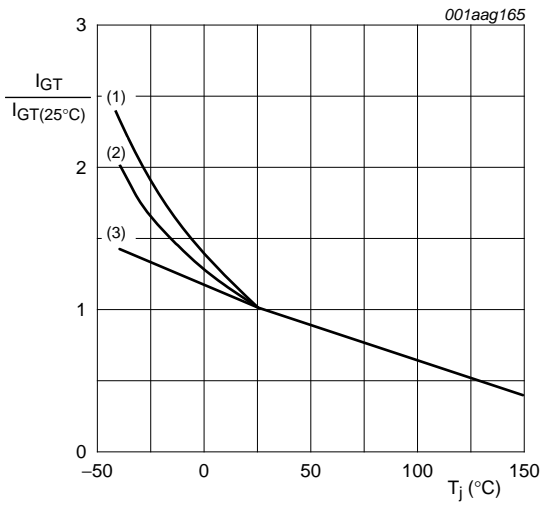
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	full cycle; see Figure 6	-	-	1.2	K/W
		half cycle; see Figure 6	-	-	1.7	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	60	-	K/W



6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G+; $T_j = 25\text{ °C}$; see Figure 7	-	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ °C}$; see Figure 7	-	-	10	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ °C}$; see Figure 7	-	-	10	mA
I_L	latching current	$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G+; $T_j = 25\text{ °C}$; see Figure 8	-	-	25	mA
		$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ °C}$; see Figure 8	-	-	30	mA
		$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ °C}$; see Figure 8	-	-	30	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ °C}$; see Figure 9	-	-	15	mA
V_T	on-state voltage	$I_T = 18\text{ A}$; $T_j = 25\text{ °C}$; see Figure 10	-	1.3	1.5	V
V_{GT}	gate trigger voltage	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 25\text{ °C}$; see Figure 11	-	0.8	1.5	V
		$V_D = 400\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 150\text{ °C}$; see Figure 11	0.25	-	-	V
I_D	off-state current	$V_D = 800\text{ V}$; $T_j = 150\text{ °C}$	-	0.4	2	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 536\text{ V}$; $T_j = 150\text{ °C}$; exponential waveform; gate open circuit	20	-	-	V/ μ s
dI_{com}/dt	rate of change of commutating current	$V_D = 400\text{ V}$; $T_j = 150\text{ °C}$; $I_{T(RMS)} = 16\text{ A}$; $dV_{com}/dt = 10\text{ V}/\mu\text{s}$; gate open circuit	1.2	-	-	A/ms
		$V_D = 400\text{ V}$; $T_j = 150\text{ °C}$; $I_{T(RMS)} = 16\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; "without snubber" condition; gate open circuit	0.8	-	-	A/ms
		$V_D = 400\text{ V}$; $T_j = 150\text{ °C}$; $I_{T(RMS)} = 16\text{ A}$; $dV_{com}/dt = 1\text{ V}/\mu\text{s}$; gate open circuit	6	-	-	A/ms
t_{gt}	gate-controlled turn-on time	$I_{TM} = 20\text{ A}$; $V_D = 800\text{ V}$; $I_G = 0.1\text{ A}$; $dI_G/dt = 5\text{ A}/\mu\text{s}$	-	2	-	μ s



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

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

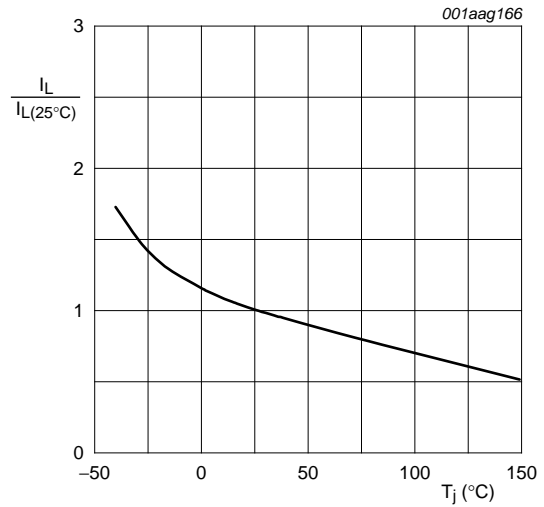


Fig 8. Normalized latching current as a function of junction temperature

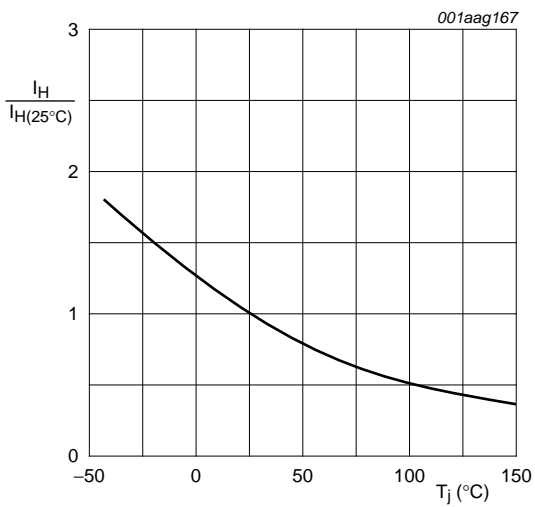
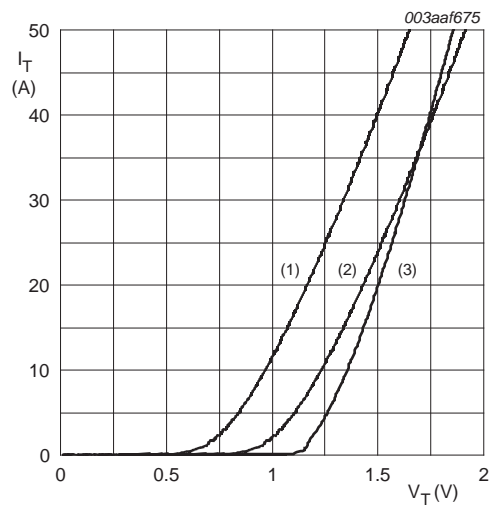


Fig 9. Normalized holding current as a function of junction temperature



$V_o = 1.024 \text{ V}$

$R_s = 0.021 \text{ } \Omega$

(1) $T_j = 150 \text{ } ^\circ\text{C}$; typical values

(2) $T_j = 150 \text{ } ^\circ\text{C}$; maximum values

(3) $T_j = 25 \text{ } ^\circ\text{C}$; maximum values

Fig 10. On-state current as a function of on-state voltage

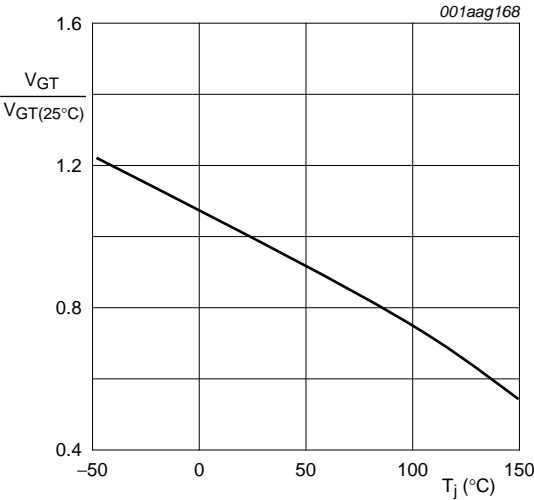


Fig 11. Normalized gate trigger voltage as a function of junction temperature

7. Package outline

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

SOT78

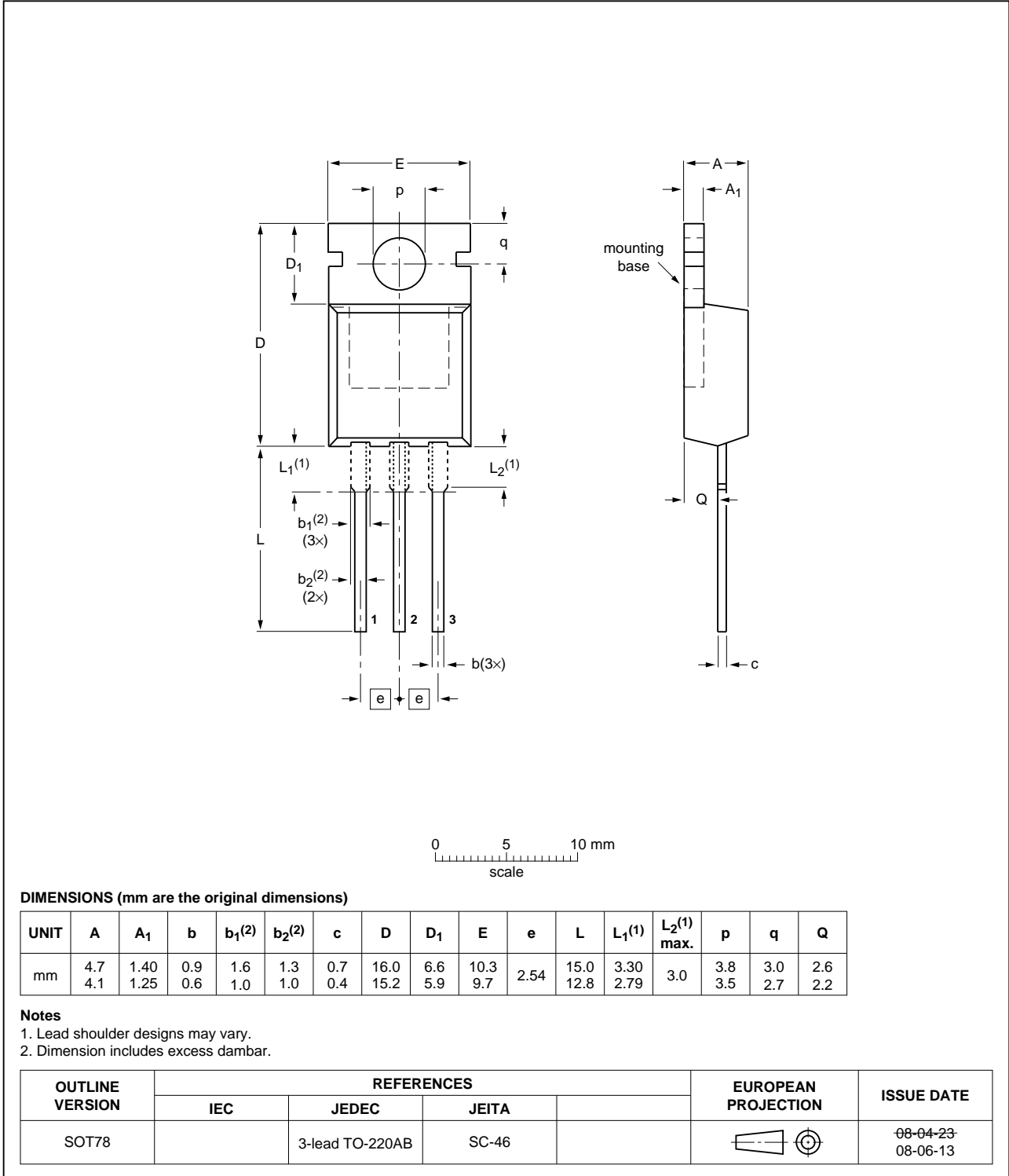


Fig 12. Package outline SOT78 (TO-220AB)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BTA316-800ET v.2	20101201	Product data sheet	-	BTA316-800ET v.1
Modifications:	• Various changes to content.			
BTA316-800ET v.1	20100329	Product data sheet	-	-

9. Legal information

9.1 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.
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[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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11. 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	2
3	Ordering information	2
4	Limiting values	3
5	Thermal characteristics	6
6	Characteristics	7
7	Package outline	10
8	Revision history	11
9	Legal information	12
9.1	Data sheet status	12
9.2	Definitions	12
9.3	Disclaimers	12
9.4	Trademarks	13
10	Contact information	13

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