



BTA416Y-800C

3Q Hi-Com Triac

Rev. 3 — 24 June 2011

Product data sheet

1. Product profile

1.1 General description

Planar passivated high commutation three quadrant triac in a SOT78D (TO-220AB) plastic package intended for use in circuits where high static and dynamic dV/dt and high dI/dt can occur. This "series C" triac will commute the full RMS current at the maximum rated junction temperature without the aid of a snubber. This device has high junction temperature operating capability and an internally isolated mounting base.

1.2 Features and benefits

- 2500 V RMS isolation voltage capability
- 3Q technology for improved noise immunity
- High commutation capability with maximum false trigger immunity
- High immunity to false turn-on by dV/dt
- High junction temperature operating capability
- High surge capability
- High voltage capability
- Internally insulated package
- Internally isolated mounting base
- Planar passivated for voltage ruggedness and reliability
- Triggering in three quadrants only

1.3 Applications

- Electronic thermostats (heating and cooling)
- High power motor controls e.g. vacuum cleaners
- Rectifier-fed DC inductive loads e.g. DC motors and solenoids



1.4 Quick reference data

Table 1. Quick reference data

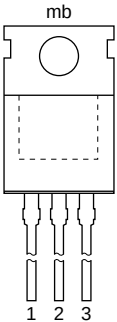
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	800	V
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$; $t_{\text{p}} = 20\text{ ms}$; see Figure 4 ; see Figure 5	-	-	160	A
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{mb}} \leq 108\text{ }^{\circ}\text{C}$; see Figure 1 ; see Figure 2 ; see Figure 3	-	-	16	A

Static characteristics

I_{GT}	gate trigger current	$V_{\text{D}} = 12\text{ V}$; $I_{\text{T}} = 0.1\text{ A}$; T2+ G+; $T_{\text{j}} = 25\text{ }^{\circ}\text{C}$; see Figure 7	2	-	35	mA
		$V_{\text{D}} = 12\text{ V}$; $I_{\text{T}} = 0.1\text{ A}$; T2+ G-; $T_{\text{j}} = 25\text{ }^{\circ}\text{C}$; see Figure 7	2	-	35	mA
		$V_{\text{D}} = 12\text{ V}$; $I_{\text{T}} = 0.1\text{ A}$; T2- G-; $T_{\text{j}} = 25\text{ }^{\circ}\text{C}$; see Figure 7	2	-	35	mA

2. Pinning information

Table 2. Pinning information

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

SOT78D (TO-220AB)

3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
BTA416Y-800C	TO-220AB	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220	SOT78D

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
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{mb}} \leq 108\text{ }^{\circ}\text{C}$; see Figure 1 ; see Figure 2 ; see Figure 3	-	16	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{\text{J(init)}} = 25\text{ }^{\circ}\text{C}$; $t_{\text{p}} = 20\text{ ms}$; see Figure 4 ; see Figure 5	-	160	A
		full sine wave; $T_{\text{J(init)}} = 25\text{ }^{\circ}\text{C}$; $t_{\text{p}} = 16.7\text{ ms}$	-	176	A
I^2t	I^2t for fusing	$t_{\text{p}} = 10\text{ ms}$; sine-wave pulse	-	128	A^2s
di_{T}/dt	rate of rise of on-state current	$I_{\text{T}} = 20\text{ A}$; $I_{\text{G}} = 0.2\text{ A}$; $di_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$	-	100	$\text{A}/\mu\text{s}$
I_{GM}	peak gate current		-	4	A
P_{GM}	peak gate power		-	5	W
$P_{\text{G(AV)}}$	average gate power	over any 20 ms period	-	1	W
T_{stg}	storage temperature		-40	150	$^{\circ}\text{C}$
T_{J}	junction temperature		-	150	$^{\circ}\text{C}$

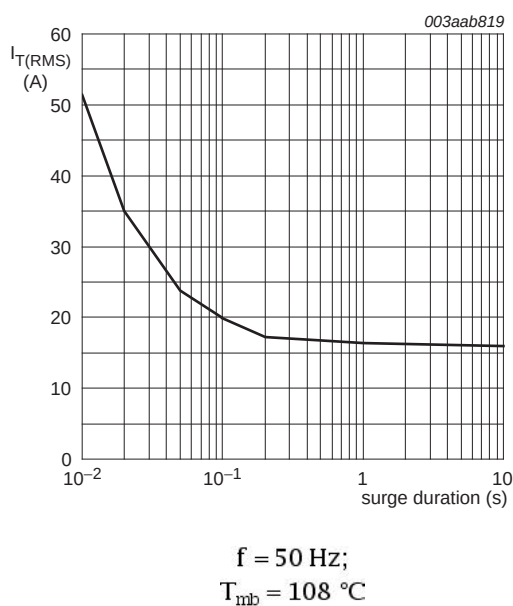


Fig 1. RMS on-state current as a function of surge duration; maximum values

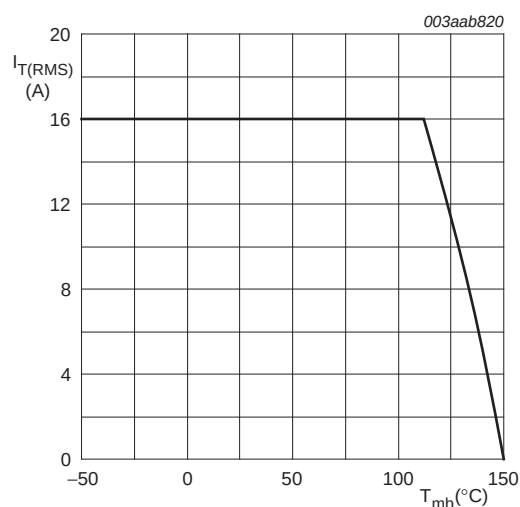


Fig 2. RMS on-state current as a function of mounting base temperature; maximum values

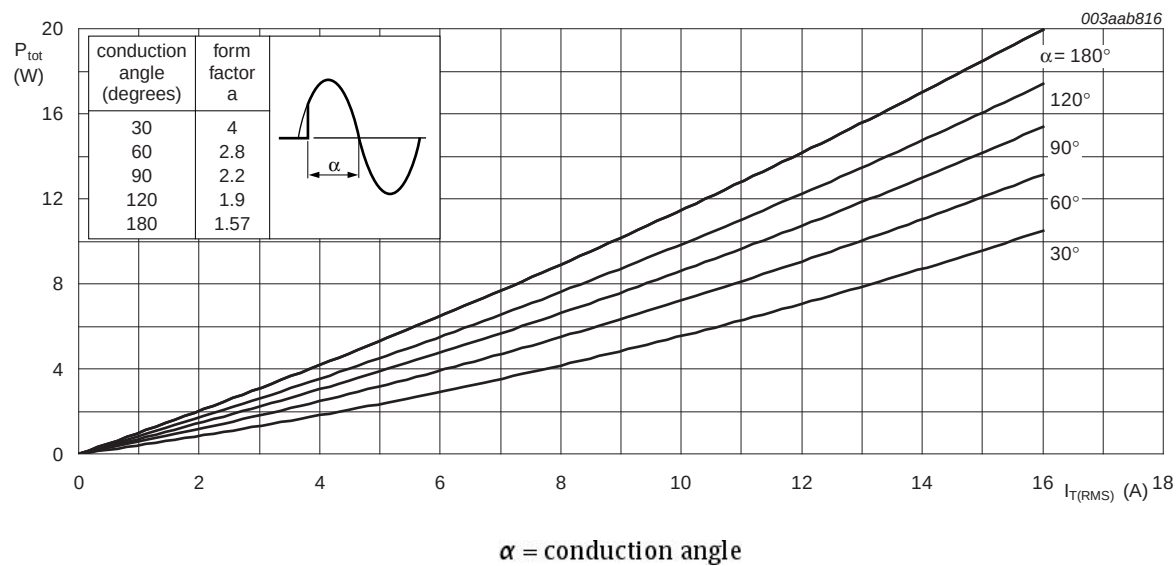


Fig 3. Total power dissipation as a function of RMS on-state current; maximum values

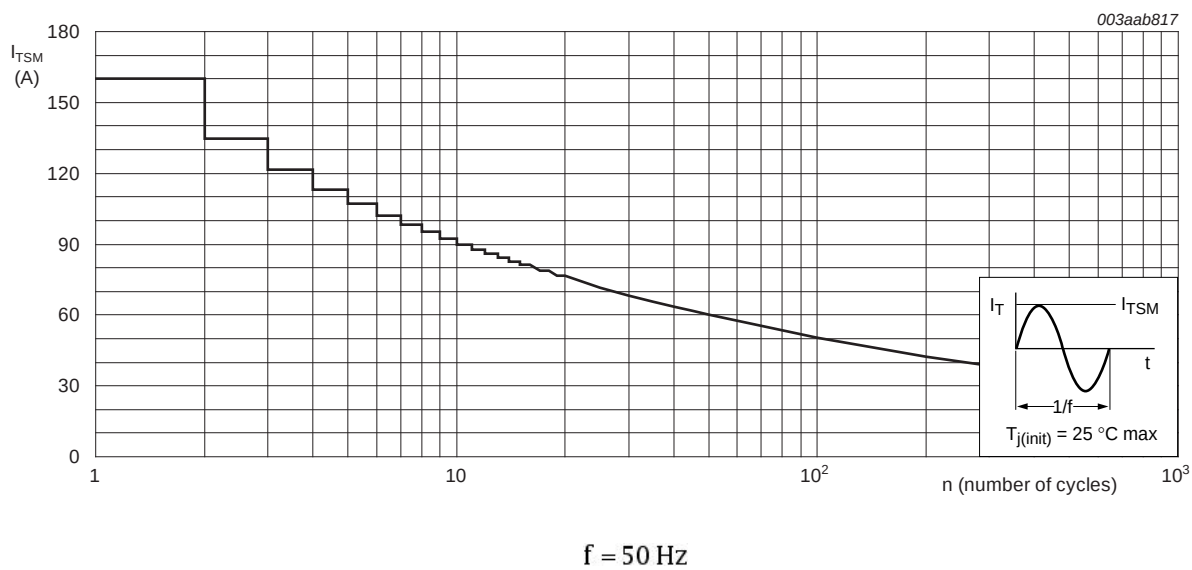
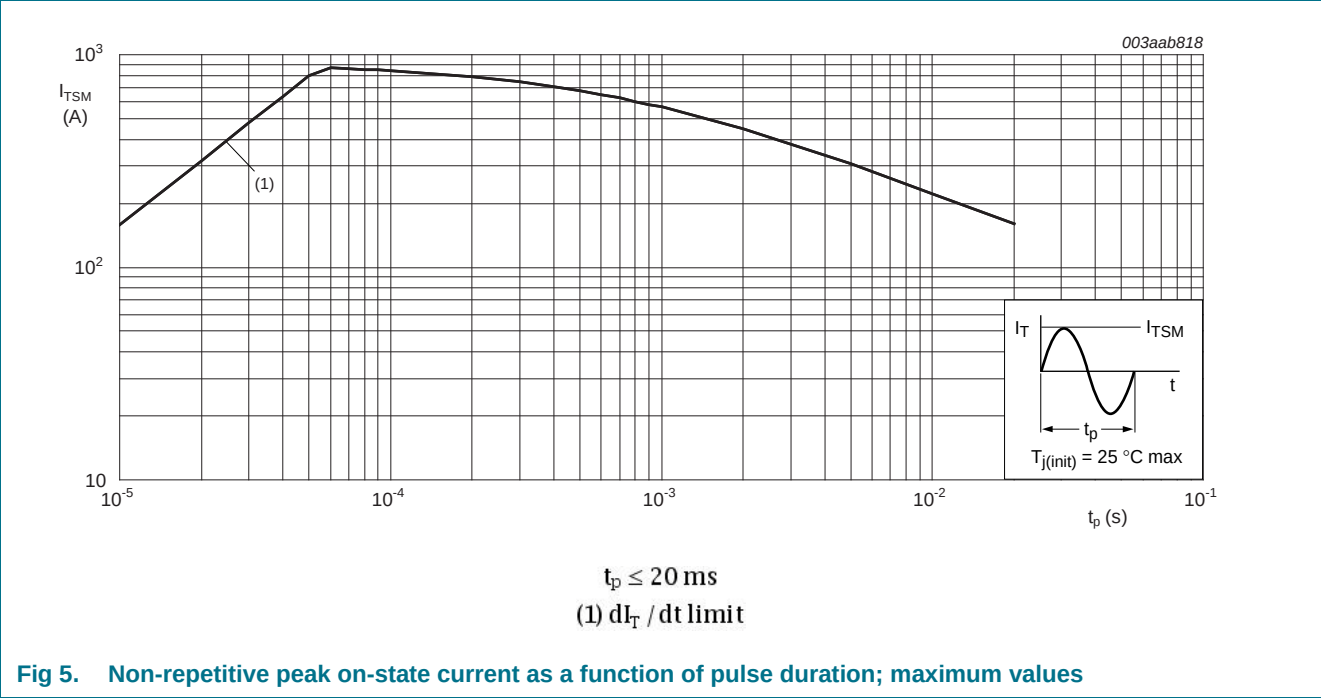


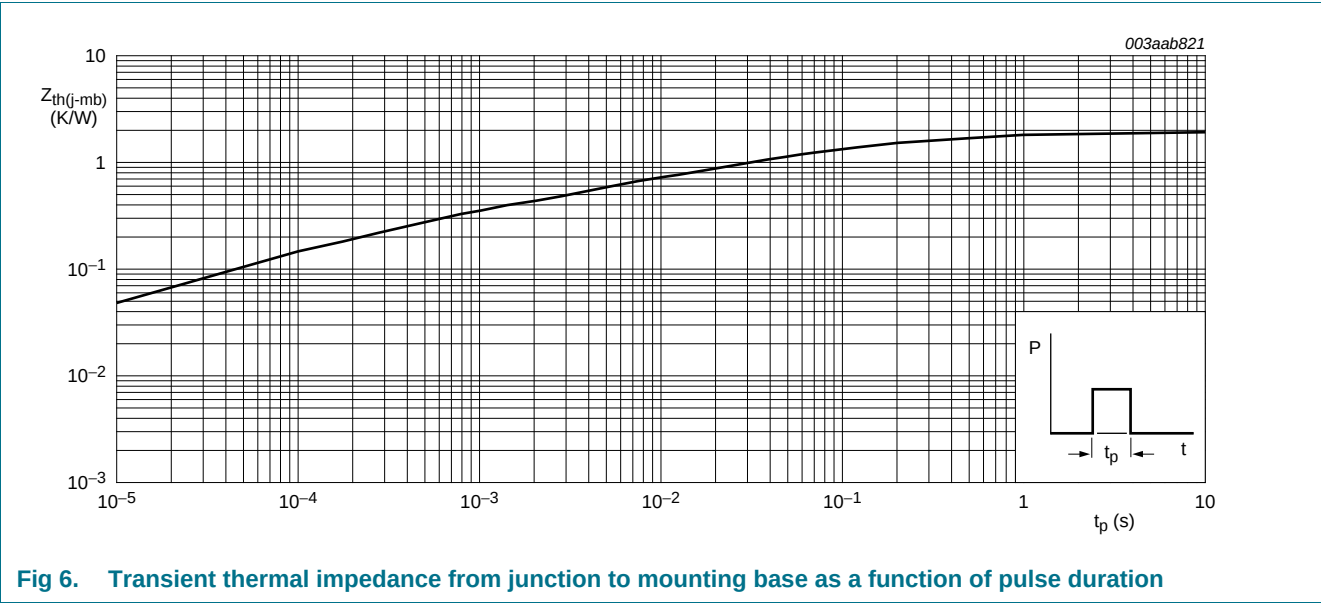
Fig 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



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



6. Isolation characteristics

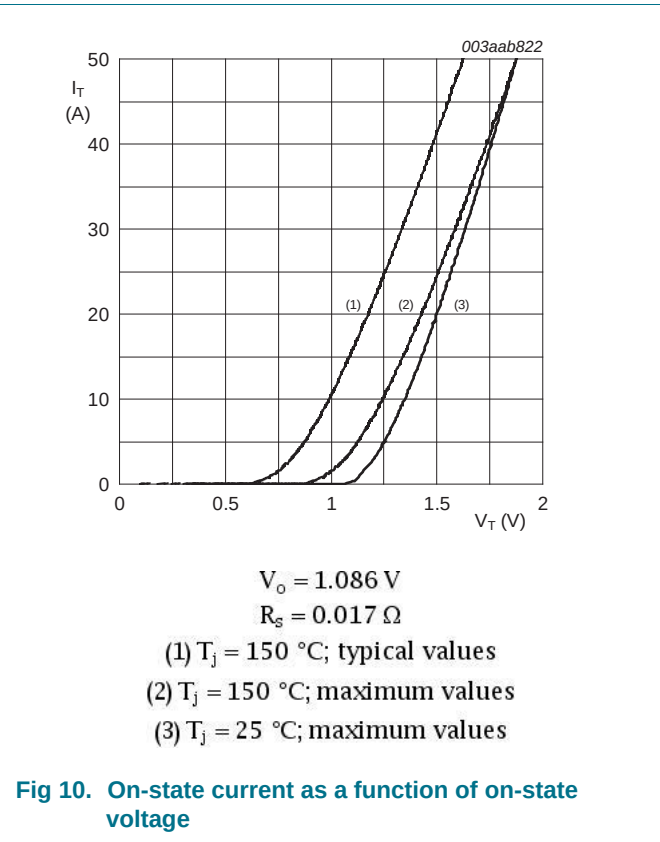
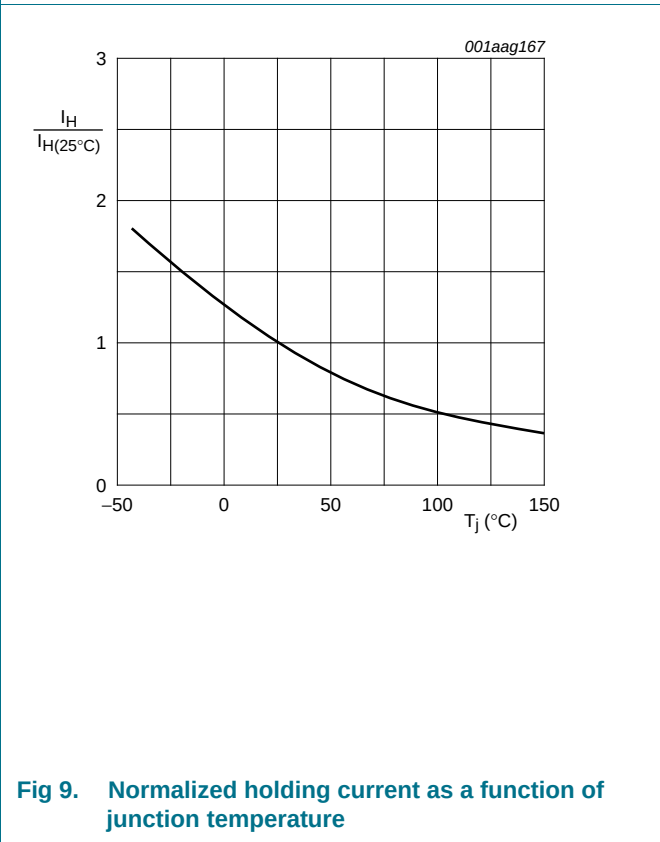
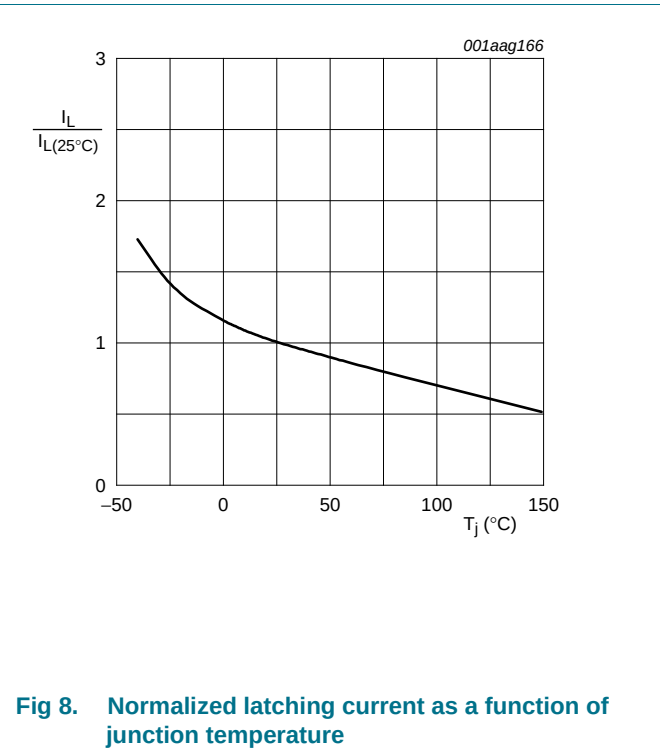
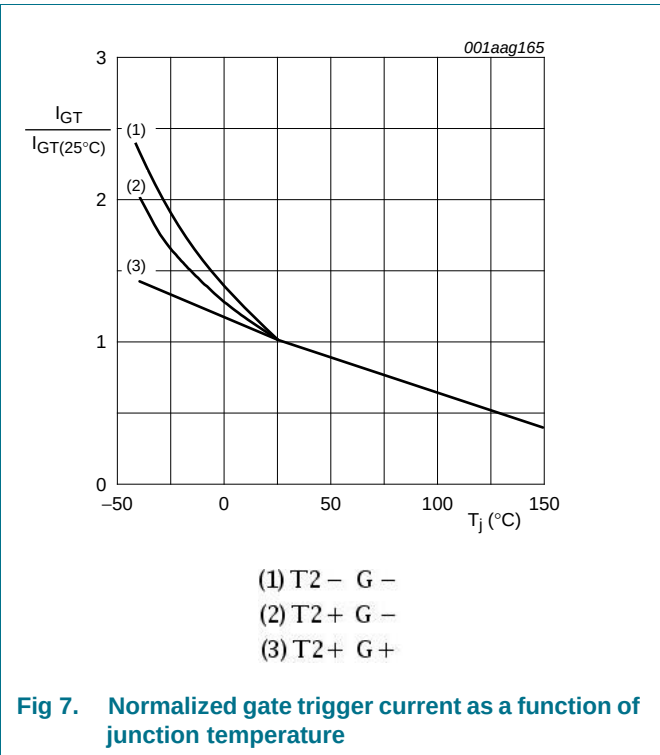
Table 6. Isolation characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{\text{isol(RMS)}}$	RMS isolation voltage	from all terminals to external heatsink; sinusoidal waveform; clean and dust free ; $50 \text{ Hz} \leq f \leq 60 \text{ Hz}$; $\text{RH} \leq 65 \%$; $T_{\text{mb}} = 25 \text{ }^{\circ}\text{C}$	-	-	2500	V
C_{isol}	isolation capacitance	from main terminal 2 to external heatsink ; $f = 1 \text{ MHz}$; $T_{\text{mb}} = 25 \text{ }^{\circ}\text{C}$	-	10	-	pF

7. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_{\text{D}} = 12 \text{ V}$; $I_{\text{T}} = 0.1 \text{ A}$; T2+ G+; $T_{\text{j}} = 25 \text{ }^{\circ}\text{C}$; see Figure 7	2	-	35	mA
		$V_{\text{D}} = 12 \text{ V}$; $I_{\text{T}} = 0.1 \text{ A}$; T2+ G-; $T_{\text{j}} = 25 \text{ }^{\circ}\text{C}$; see Figure 7	2	-	35	mA
		$V_{\text{D}} = 12 \text{ V}$; $I_{\text{T}} = 0.1 \text{ A}$; T2- G-; $T_{\text{j}} = 25 \text{ }^{\circ}\text{C}$; see Figure 7	2	-	35	mA
I_{L}	latching current	$V_{\text{D}} = 12 \text{ V}$; $I_{\text{G}} = 0.1 \text{ A}$; T2+ G+; $T_{\text{j}} = 25 \text{ }^{\circ}\text{C}$; see Figure 8	-	-	50	mA
		$V_{\text{D}} = 12 \text{ V}$; $I_{\text{G}} = 0.1 \text{ A}$; T2+ G-; $T_{\text{j}} = 25 \text{ }^{\circ}\text{C}$; see Figure 8	-	-	60	mA
		$V_{\text{D}} = 12 \text{ V}$; $I_{\text{G}} = 0.1 \text{ A}$; T2- G-; $T_{\text{j}} = 25 \text{ }^{\circ}\text{C}$; see Figure 8	-	-	50	mA
I_{H}	holding current	$V_{\text{D}} = 12 \text{ V}$; $T_{\text{j}} = 25 \text{ }^{\circ}\text{C}$; see Figure 9	-	-	35	mA
V_{T}	on-state voltage	$I_{\text{T}} = 20 \text{ A}$; $T_{\text{j}} = 25 \text{ }^{\circ}\text{C}$; see Figure 10	-	1.2	1.5	V
V_{GT}	gate trigger voltage	$V_{\text{D}} = 12 \text{ V}$; $I_{\text{T}} = 0.1 \text{ A}$; $T_{\text{j}} = 25 \text{ }^{\circ}\text{C}$; see Figure 11	-	0.7	1.5	V
		$V_{\text{D}} = 400 \text{ V}$; $I_{\text{T}} = 0.1 \text{ A}$; $T_{\text{j}} = 150 \text{ }^{\circ}\text{C}$	0.25	0.4	-	V
I_{D}	off-state current	$V_{\text{D}} = 800 \text{ V}$; $T_{\text{j}} = 125 \text{ }^{\circ}\text{C}$	-	0.1	0.5	mA
		$V_{\text{D}} = 800 \text{ V}$; $T_{\text{j}} = 150 \text{ }^{\circ}\text{C}$	-	0.4	2	mA
Dynamic characteristics						
dV_{D}/dt	rate of rise of off-state voltage	$V_{\text{DM}} = 536 \text{ V}$; $T_{\text{j}} = 125 \text{ }^{\circ}\text{C}$; exponential waveform; gate open circuit	500	-	-	V/ μs
		$V_{\text{DM}} = 536 \text{ V}$; $T_{\text{j}} = 150 \text{ }^{\circ}\text{C}$; exponential waveform; gate open circuit	300	-	-	V/ μs
dI_{com}/dt	rate of change of commutating current	$V_{\text{D}} = 400 \text{ V}$; $T_{\text{j}} = 125 \text{ }^{\circ}\text{C}$; $I_{\text{T(RMS)}} = 16 \text{ A}$; $dV_{\text{com}}/dt = 20 \text{ V}/\mu\text{s}$; (without snubber condition); gate open circuit	10	-	-	A/ms
		$V_{\text{D}} = 400 \text{ V}$; $T_{\text{j}} = 150 \text{ }^{\circ}\text{C}$; $I_{\text{T(RMS)}} = 16 \text{ A}$; $dV_{\text{com}}/dt = 20 \text{ V}/\mu\text{s}$; (without snubber condition); gate open circuit	4	-	-	A/ms
t_{gt}	gate-controlled turn-on time	$I_{\text{TM}} = 20 \text{ A}$; $V_{\text{D}} = 800 \text{ V}$; $I_{\text{G}} = 100 \text{ mA}$; $dI_{\text{G}}/dt = 5 \text{ A}/\mu\text{s}$	-	2	-	μs



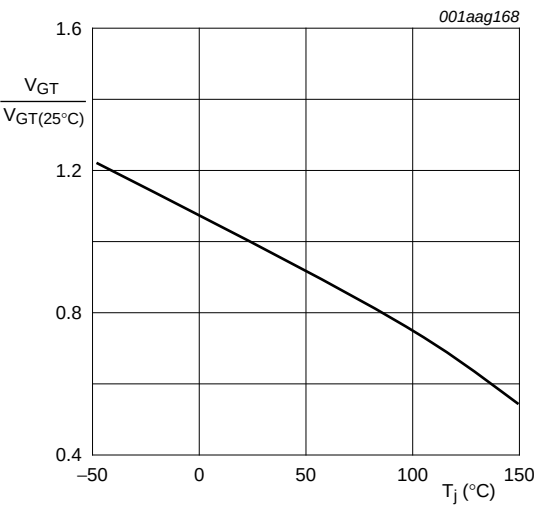


Fig 11. Normalized gate trigger voltage as a function of junction temperature

8. Package outline

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

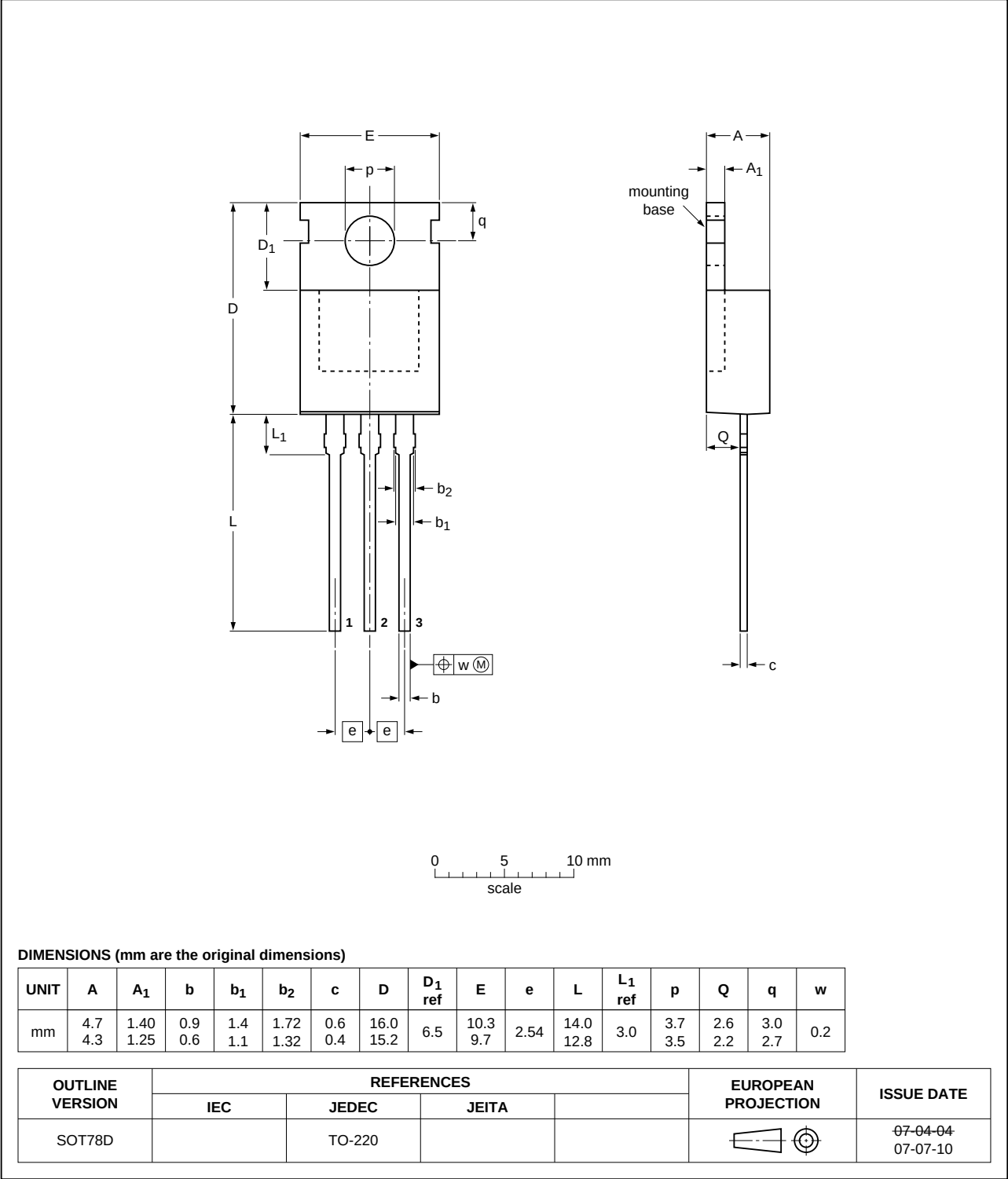


Fig 12. Package outline SOT78D (TO-220AB)

9. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BTA416Y-800C v.3	20110624	Product data sheet	-	BTA416Y_SER_B_C_2
Modifications:	• Type number BTA416Y-800C separated from data sheet BTA416Y_SER_B_C_2. • Various changes to content.			
BTA416Y_SER_B_C_2	20080311	Product data sheet	-	BTA416Y_SER_B_C_1

10. Legal information

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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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[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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Date of release: 24 June 2011

Document identifier: BTA416Y-800C