



# BT139-800G

## 4Q Triac

27 September 2013

Product data sheet

## 1. General description

Planar passivated four quadrant triac in a SOT78 (T0-220AB) plastic package intended for use in applications requiring high bidirectional transient and blocking voltage capability and high thermal cycling performance.

## 2. Features and benefits

- High voltage capability
- Least sensitive gate for highest noise immunity
- High minimum IGT for guaranteed immunity to gate noise
- Planar passivated for voltage ruggedness and reliability
- Triggering in all four quadrants

## 3. Applications

- General purpose motor controls
- General purpose switching

## 4. Quick reference data

Table 1. Quick reference data

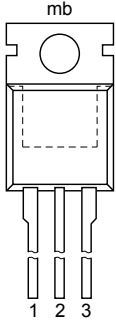

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{\text{DRM}}$	repetitive peak off-state voltage		-	-	800	V
$I_{\text{TSM}}$	non-repetitive peak on-state current	full sine wave; $T_{\text{J}(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; $t_{\text{p}} = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	-	155	A
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{mb}} \leq 99\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	-	16	A
<b>Static characteristics</b>						
$I_{\text{GT}}$	gate trigger current	$V_{\text{D}} = 12\text{ V}$ ; $I_{\text{T}} = 0.1\text{ A}$ ; T2+ G+; $T_{\text{J}} = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 7</a>	-	5	50	mA
		$V_{\text{D}} = 12\text{ V}$ ; $I_{\text{T}} = 0.1\text{ A}$ ; T2+ G-; $T_{\text{J}} = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 7</a>	-	8	50	mA
		$V_{\text{D}} = 12\text{ V}$ ; $I_{\text{T}} = 0.1\text{ A}$ ; T2- G-; $T_{\text{J}} = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 7</a>	-	10	50	mA



Symbol	Parameter	Conditions		Min	Typ	Max	Unit
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G+; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>		-	22	100	mA

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1	 <p>TO-220AB (SOT78)</p>	 <p>sym051</p>
2	T2	main terminal 2		
3	G	gate		
mb	T2	mounting base; main terminal 2		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BT139-800G	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

## 7. Limiting values

**Table 4. Limiting values**

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

Symbol	Parameter	Conditions		Min	Max	Unit
$V_{\text{DRM}}$	repetitive peak off-state voltage			-	800	V
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{mb}} \leq 99\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>		-	16	A
$I_{\text{TSM}}$	non-repetitive peak on-state current	full sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$ ; $t_{\text{p}} = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>		-	155	A
		full sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$ ; $t_{\text{p}} = 16.7\text{ ms}$		-	170	A
$I^2t$	$I^2t$ for fusing	$t_{\text{p}} = 10\text{ ms}$ ; SIN		-	120	$\text{A}^2\text{s}$
$di_{\text{T}}/dt$	rate of rise of on-state current	$I_{\text{T}} = 20\text{ A}$ ; $I_{\text{G}} = 0.2\text{ A}$ ; $dI_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$ ; T2+ G+		-	50	$\text{A}/\mu\text{s}$
		$I_{\text{T}} = 20\text{ A}$ ; $I_{\text{G}} = 0.2\text{ A}$ ; $dI_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$ ; T2+ G-		-	50	$\text{A}/\mu\text{s}$
		$I_{\text{T}} = 20\text{ A}$ ; $I_{\text{G}} = 0.2\text{ A}$ ; $dI_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$ ; T2- G-		-	50	$\text{A}/\mu\text{s}$
		$I_{\text{T}} = 20\text{ A}$ ; $I_{\text{G}} = 0.2\text{ A}$ ; $dI_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$ ; T2- G+		-	10	$\text{A}/\mu\text{s}$
$I_{\text{GM}}$	peak gate current			-	2	A
$P_{\text{GM}}$	peak gate power			-	5	W
$P_{\text{G(AV)}}$	average gate power	over any 20 ms period		-	0.5	W
$T_{\text{stg}}$	storage temperature			-40	150	$^{\circ}\text{C}$
$T_{\text{j}}$	junction temperature			-	125	$^{\circ}\text{C}$

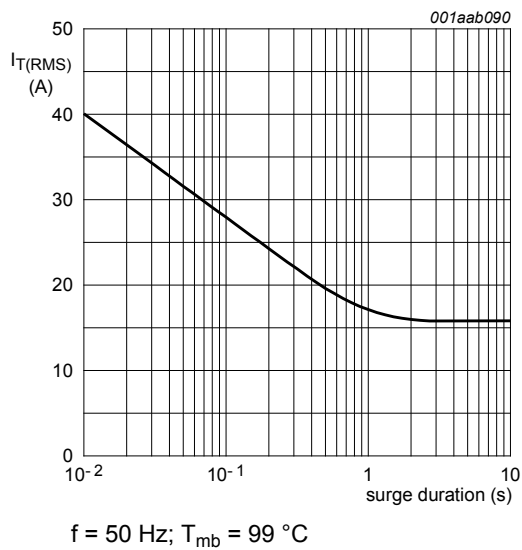


Fig. 1. RMS on-state current as a function of surge duration; maximum values

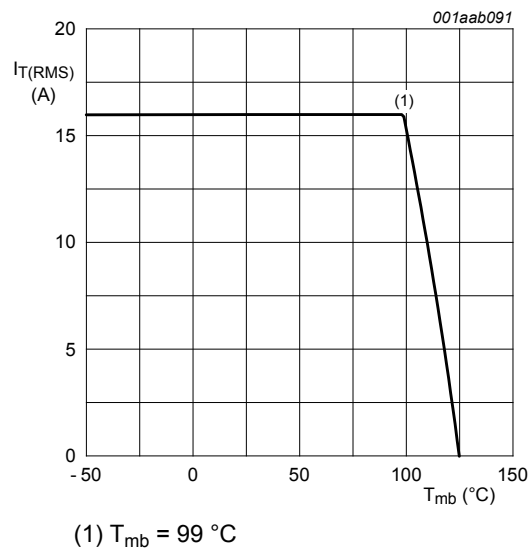


Fig. 2. RMS on-state current as a function of mounting base temperature; maximum values

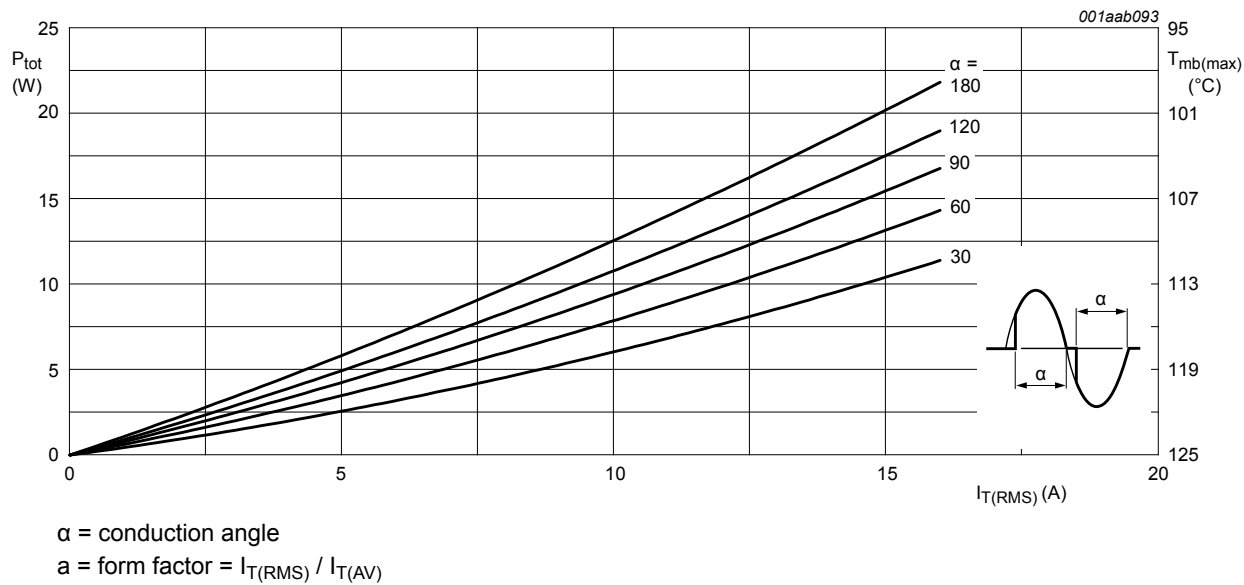
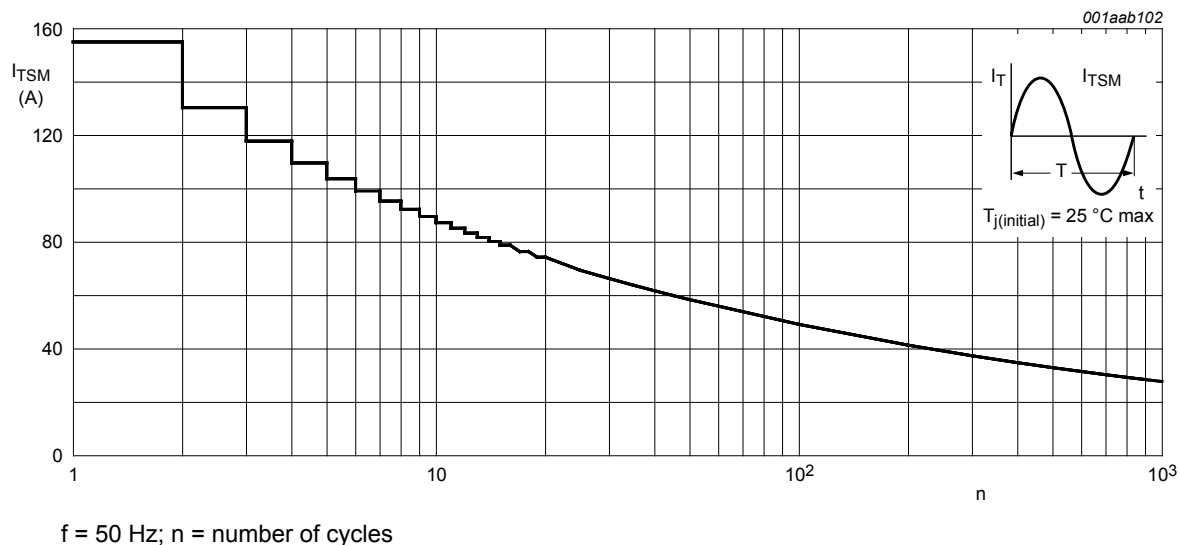
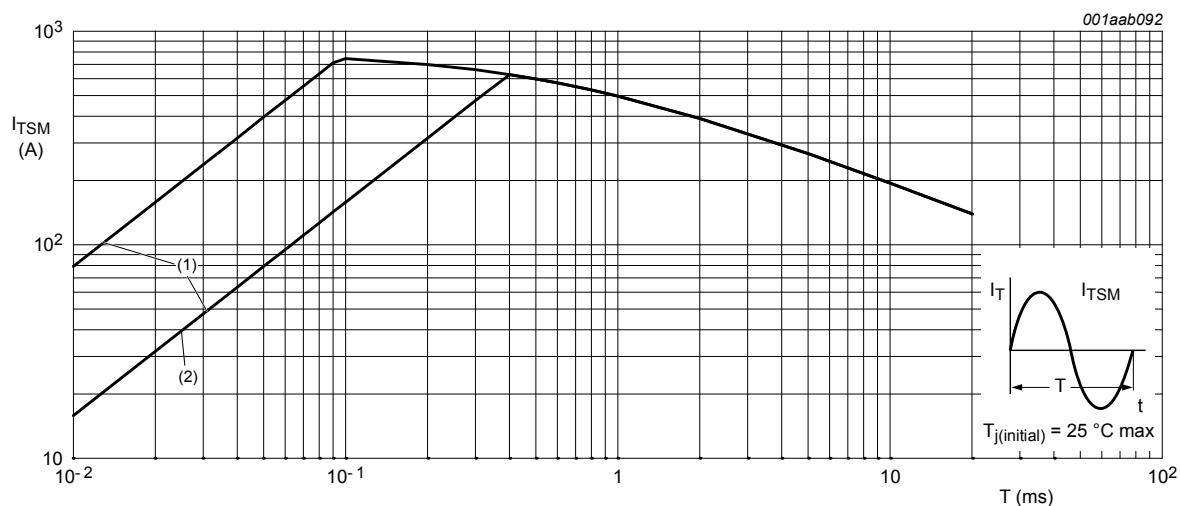


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values.



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

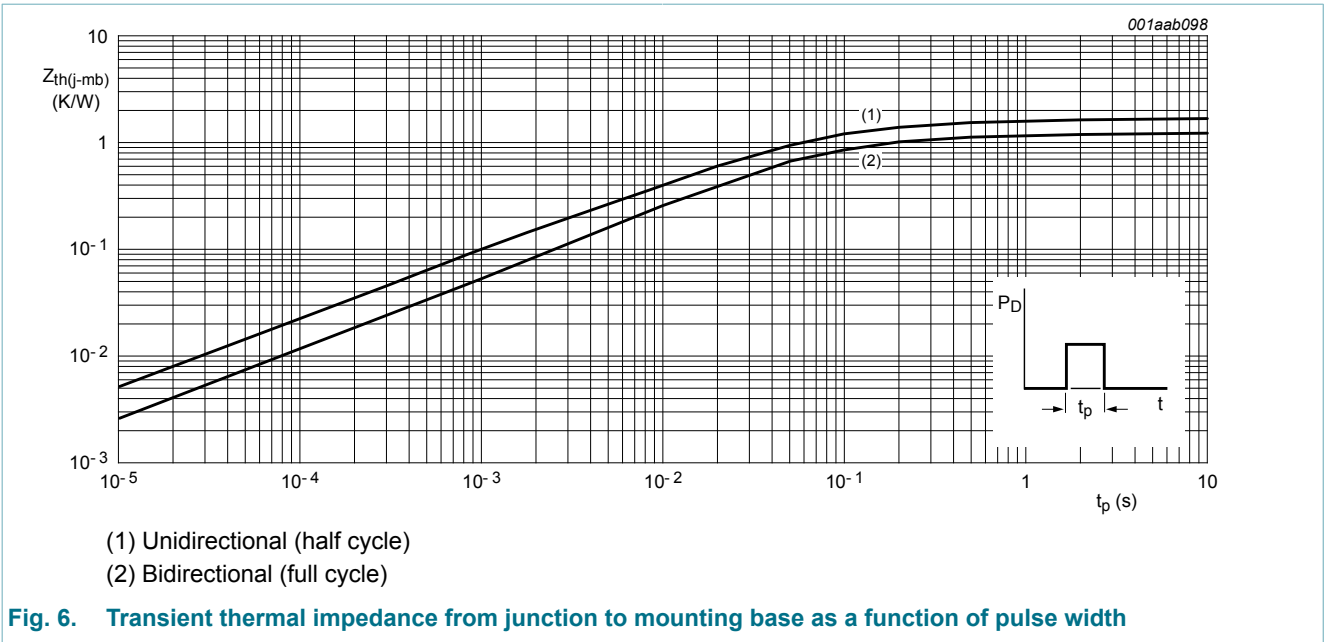


**Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values**

8. Thermal characteristics

Table 5. Thermal characteristics

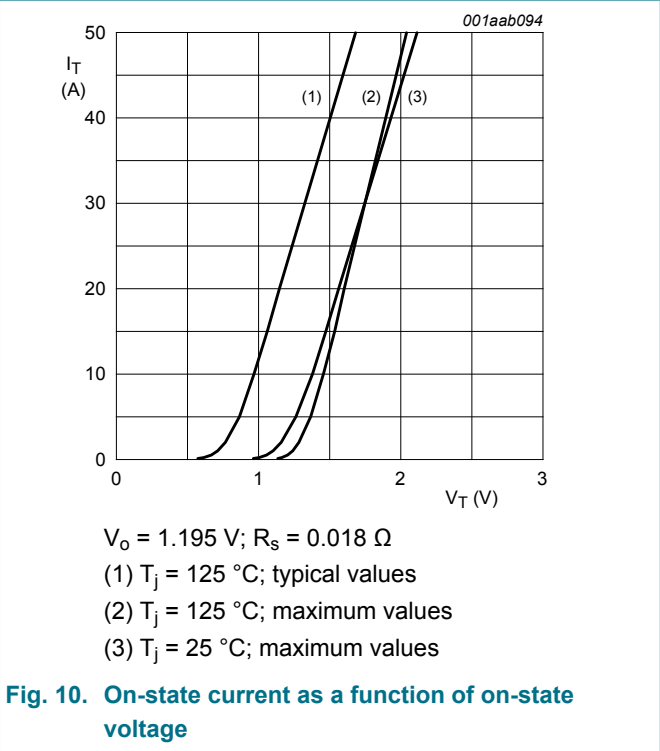
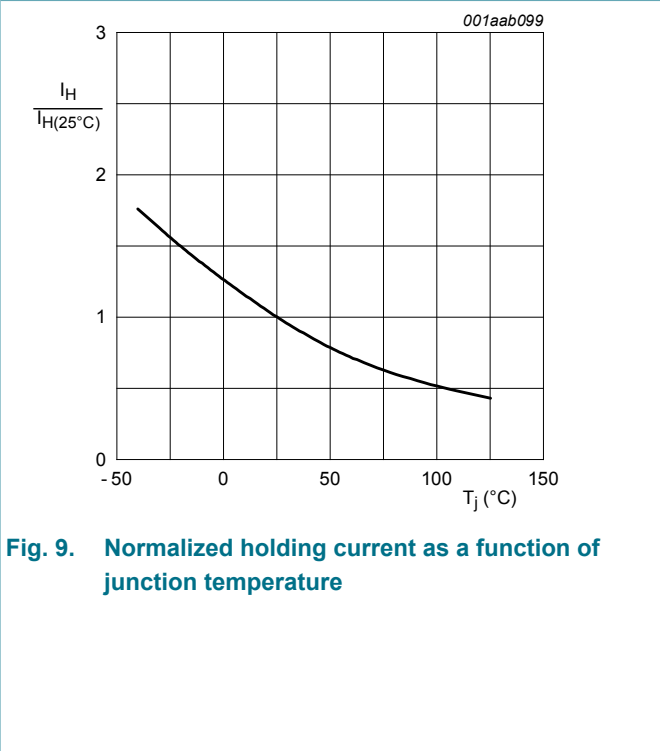
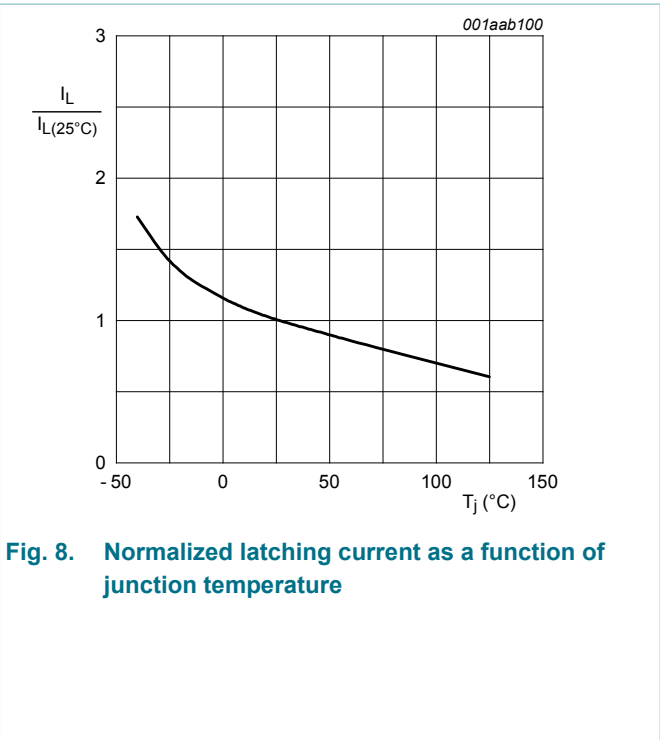
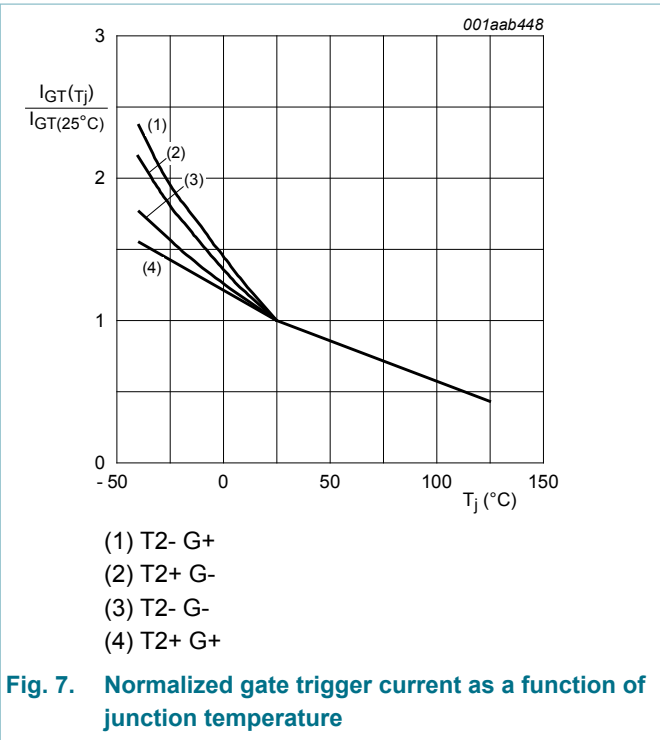
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	half cycle; Fig. 6	-	-	1.7	K/W
		full cycle; Fig. 6	-	-	1.2	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	60	-	K/W



## 9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G+; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>	-	5	50	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>	-	8	50	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>	-	10	50	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G+; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>	-	22	100	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G+; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a>	-	7	60	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a>	-	20	90	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a>	-	8	60	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2- G+; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a>	-	10	90	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>	-	6	60	mA
$V_T$	on-state voltage	$I_T = 20\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>	-	1.2	1.6	V
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 11</a>	-	0.7	1	V
		$V_D = 400\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; <a href="#">Fig. 11</a>	0.25	0.4	-	V
$I_D$	off-state current	$V_D = 800\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$	-	0.1	0.5	mA
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 536\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit	200	250	-	V/ $\mu\text{s}$
$dV_{com}/dt$	rate of change of commutating voltage	$V_D = 400\text{ V}$ ; $T_j = 95\text{ }^\circ\text{C}$ ; $dI_{com}/dt = 7.2\text{ A/ms}$ ; $I_T = 16\text{ A}$ ; gate open circuit	10	20	-	V/ $\mu\text{s}$
$t_{gt}$	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	-	$\mu\text{s}$





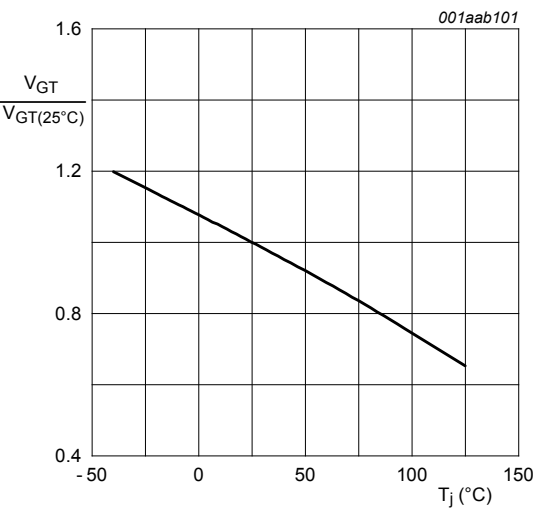


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

10. Package outline

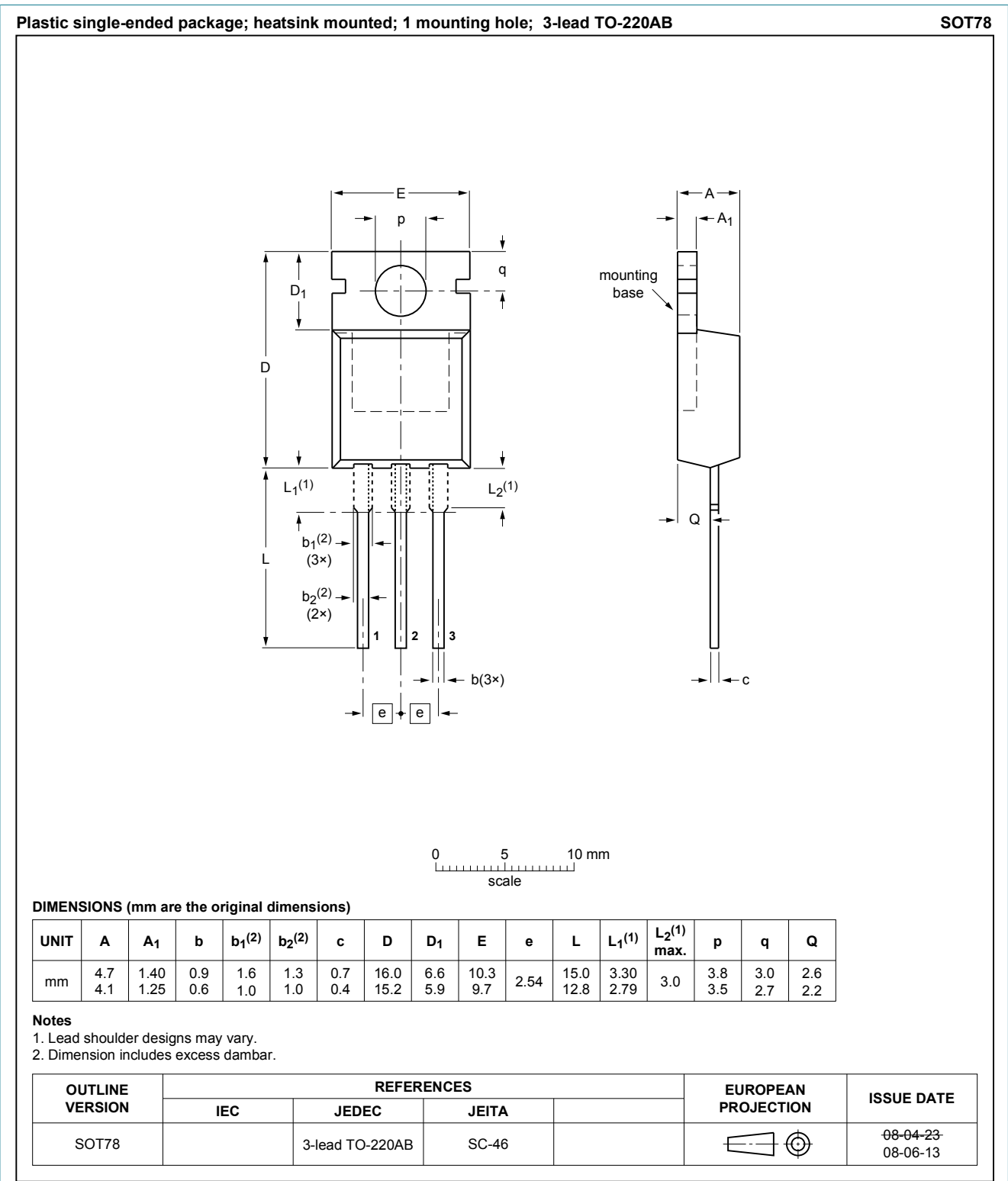


Fig. 12. Package outline TO-220AB (SOT78)

## 11. 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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12. Contents

1 General description ..... 1

2 Features and benefits ..... 1

3 Applications ..... 1

4 Quick reference data ..... 1

5 Pinning information ..... 2

6 Ordering information ..... 2

7 Limiting values ..... 3

8 Thermal characteristics ..... 6

9 Characteristics ..... 7

10 Package outline ..... 10

11 Legal information ..... 11

11.1 Data sheet status ..... 11

11.2 Definitions ..... 11

11.3 Disclaimers ..... 11

11.4 Trademarks ..... 12

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