



# IMPORTANT NOTICE

10 December 2015

## 1. Global joint venture starts operations as WeEn Semiconductors

Dear customer,

As from November 9th, 2015 NXP Semiconductors N.V. and Beijing JianGuang Asset Management Co. Ltd established Bipolar Power joint venture (JV), **WeEn Semiconductors**, which will be used in future Bipolar Power documents together with new contact details.

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Thank you for your cooperation and understanding,

WeEn Semiconductors





# BT150-500R

## SCR

13 March 2014

Product data sheet

## 1. General description

Planar passivated SCR with sensitive gate in a SOT78 (TO-220AB) plastic package. This device is intended to be interfaced directly to microcontrollers, logic integrated circuits and other low power gate trigger circuits.

## 2. Features and benefits

- Sensitive gate
- Planar passivated for voltage ruggedness and reliability
- Direct triggering from low power drivers and logic ICs

## 3. Applications

- General purpose switching
- Protection Circuits

## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{\text{DRM}}$	repetitive peak off-state voltage		[1]	-	-	500	V
$V_{\text{RRM}}$	repetitive peak reverse voltage			-	-	500	V
$I_{\text{TSM}}$	non-repetitive peak on-state current	half sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$ ; $t_{\text{p}} = 10\text{ ms}$ ; Fig. 4; Fig. 5		-	-	35	A
$I_{\text{T(RMS)}}$	RMS on-state current	half sine wave; $T_{\text{mb}} \leq 113\text{ }^{\circ}\text{C}$ ; Fig. 2; Fig. 3		-	-	4	A
<b>Static characteristics</b>							
$I_{\text{GT}}$	gate trigger current	$V_{\text{D}} = 12\text{ V}$ ; $I_{\text{T}} = 0.1\text{ A}$ ; $T_{\text{j}} = 25\text{ }^{\circ}\text{C}$ ; Fig. 7		-	15	200	$\mu\text{A}$

[1] Although not recommended, off-state voltages up to 800V may be applied without damage, but the thyristor may switch to the on-state. The rate of rise of current should not exceed 15 A/ $\mu\text{s}$ .

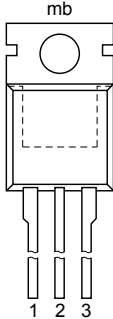



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5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 <p>TO-220AB (SOT78)</p>	
2	A	anode		
3	G	gate		
mb	A	mounting base; connected to anode		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BT150-500R	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

## 7. Limiting values

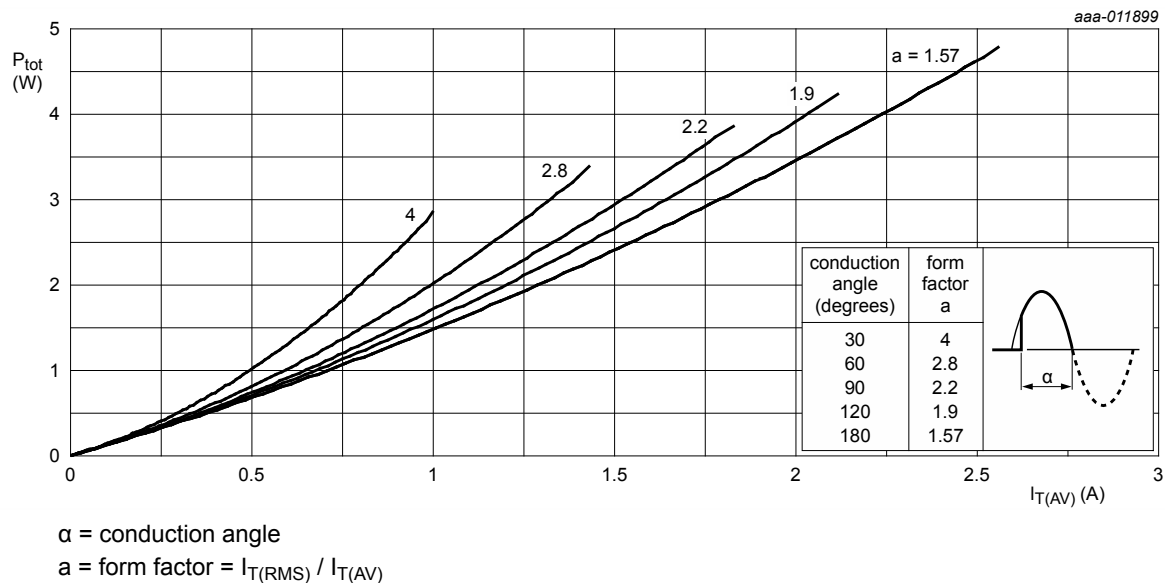
**Table 4. Limiting values**

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

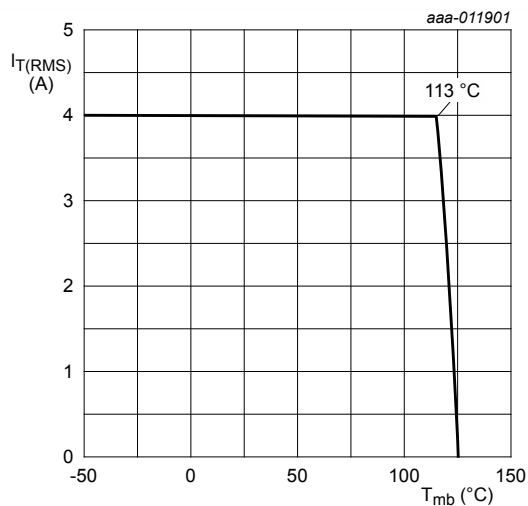
Symbol	Parameter	Conditions		Min	Max	Unit
$V_{\text{DRM}}$	repetitive peak off-state voltage		[1]	-	500	V
$V_{\text{RRM}}$	repetitive peak reverse voltage			-	500	V
$I_{\text{T(AV)}}$	average on-state current	half sine wave; $T_{\text{mb}} \leq 113\text{ °C}$ ; <a href="#">Fig. 1</a>		-	2.5	A
$I_{\text{T(RMS)}}$	RMS on-state current	half sine wave; $T_{\text{mb}} \leq 113\text{ °C}$ ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>		-	4	A
$I_{\text{TSM}}$	non-repetitive peak on-state current	half sine wave; $T_{\text{j(init)}} = 25\text{ °C}$ ; $t_{\text{p}} = 10\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>		-	35	A
		half sine wave; $T_{\text{j(init)}} = 25\text{ °C}$ ; $t_{\text{p}} = 8.3\text{ ms}$		-	38	A
$I^2t$	$I^2t$ for fusing	$t_{\text{p}} = 10\text{ ms}$ ; SIN		-	6.1	$\text{A}^2\text{s}$
$di_{\text{T}}/dt$	rate of rise of on-state current	$I_{\text{T}} = 10\text{ A}$ ; $I_{\text{G}} = 50\text{ mA}$ ; $di_{\text{G}}/dt = 50\text{ mA}/\mu\text{s}$		-	50	$\text{A}/\mu\text{s}$
$I_{\text{GM}}$	peak gate current			-	2	A
$V_{\text{RGM}}$	peak reverse gate voltage			-	5	V
$P_{\text{GM}}$	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	°C
$T_{\text{j}}$	junction temperature		[2]	-	125	°C

[1] Although not recommended, off-state voltages up to 800V may be applied without damage, but the thyristor may switch to the on-state. The rate of rise of current should not exceed 15 A/ $\mu\text{s}$ .

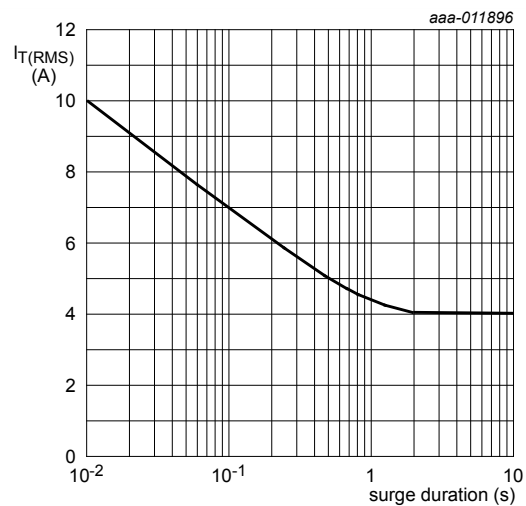
[2] Operation above 110°C may require the use of a gate to cathode resistor of 1k $\Omega$  or less.



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



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



$f = 50\text{ Hz}$ ;  $T_{mb} = 113\text{ °C}$

**Fig. 3. RMS on-state current as a function of surge duration; maximum values**

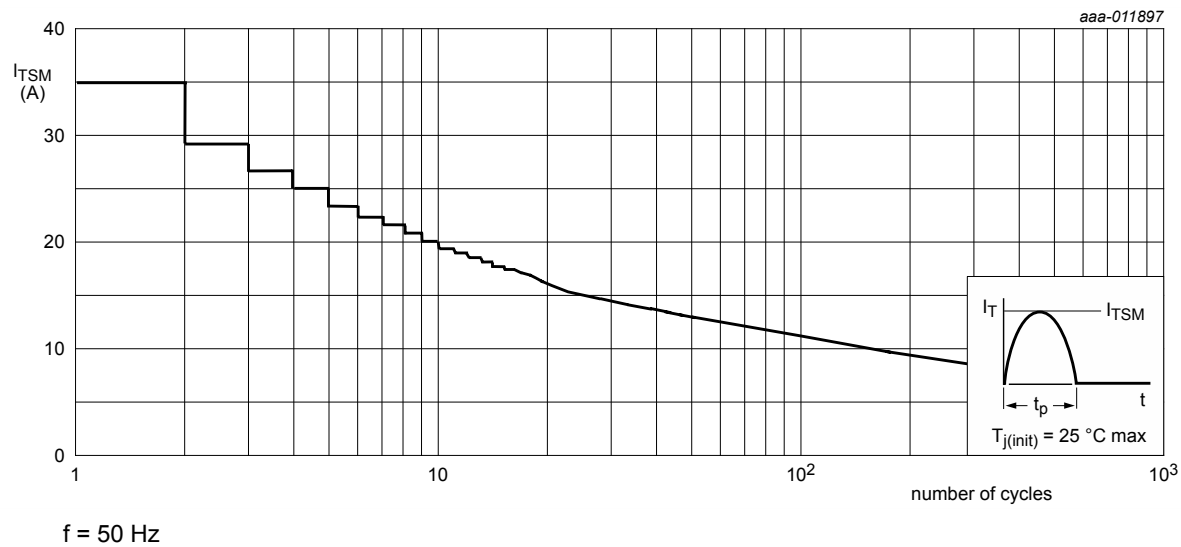


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

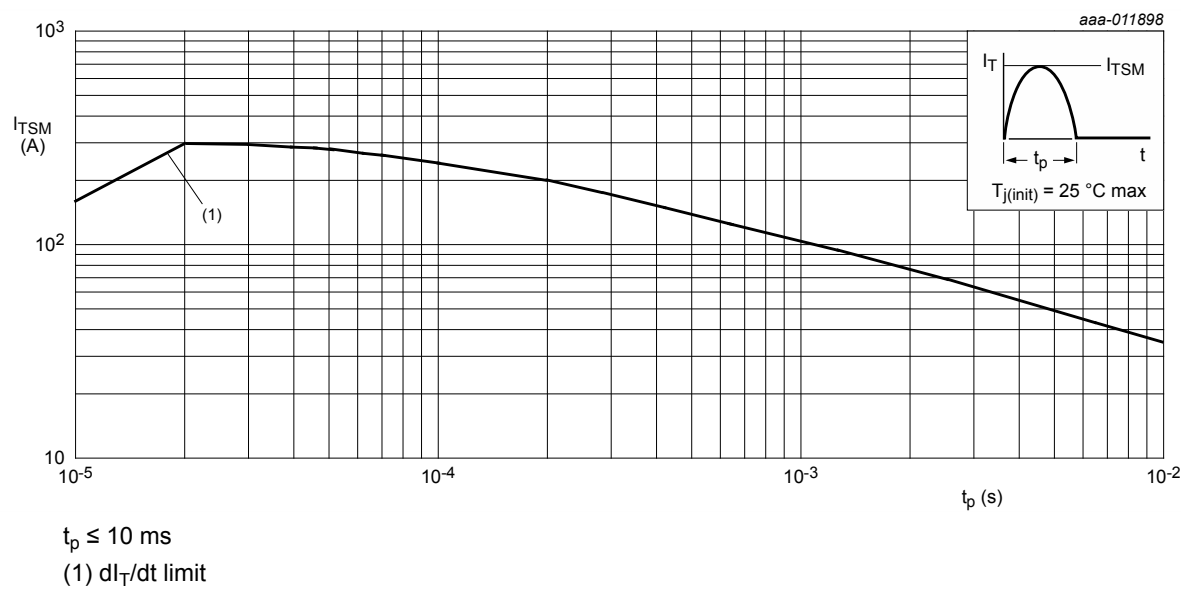
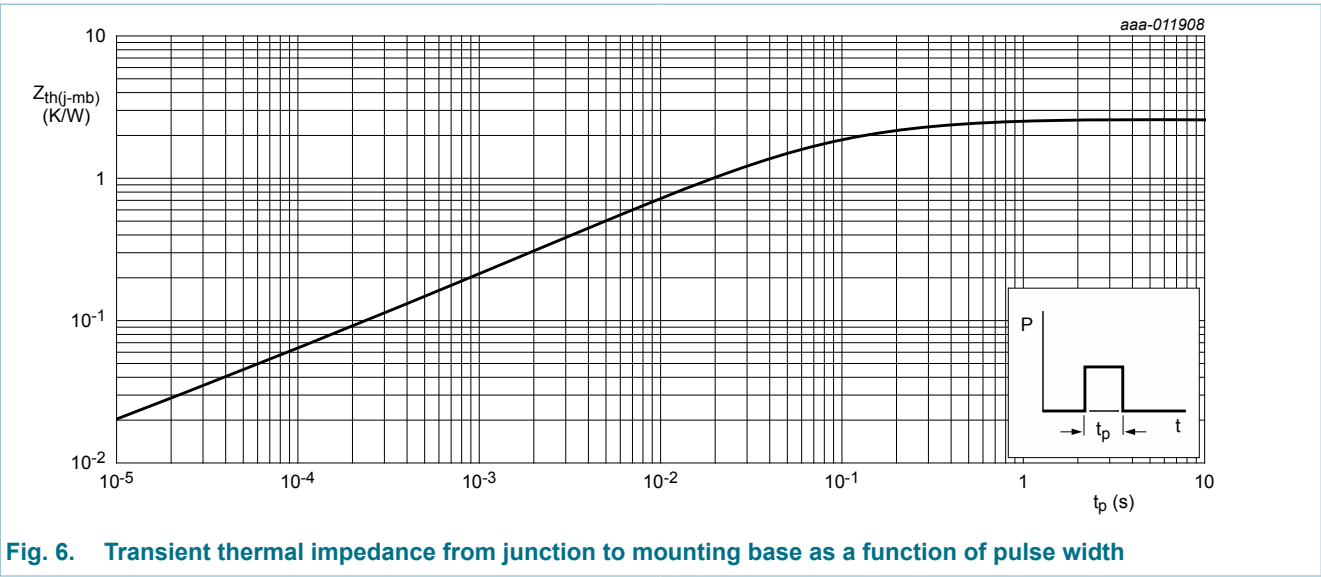


Fig. 5. Non-repetitive peak on-state current as a function of pulse width for sinusoidal currents; maximum values

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	<a href="#">Fig. 6</a>		-	-	2.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	60	-	K/W

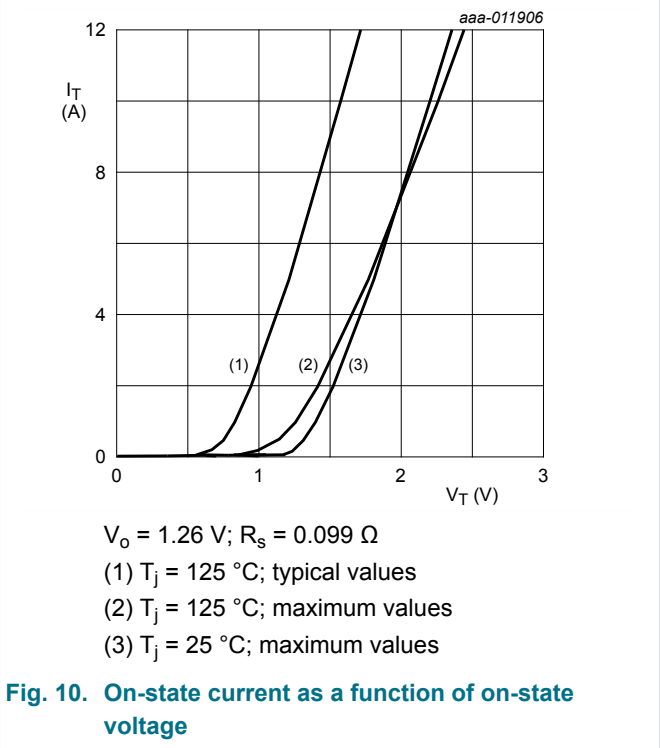
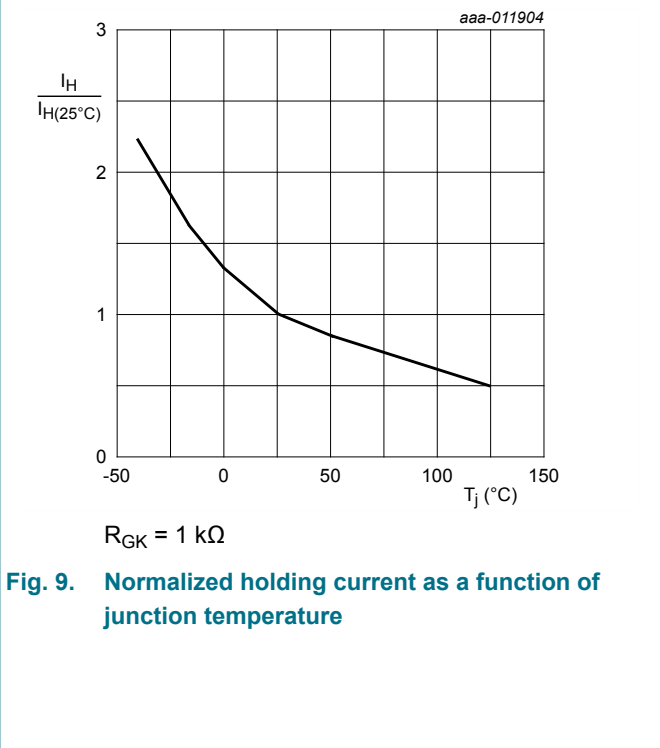
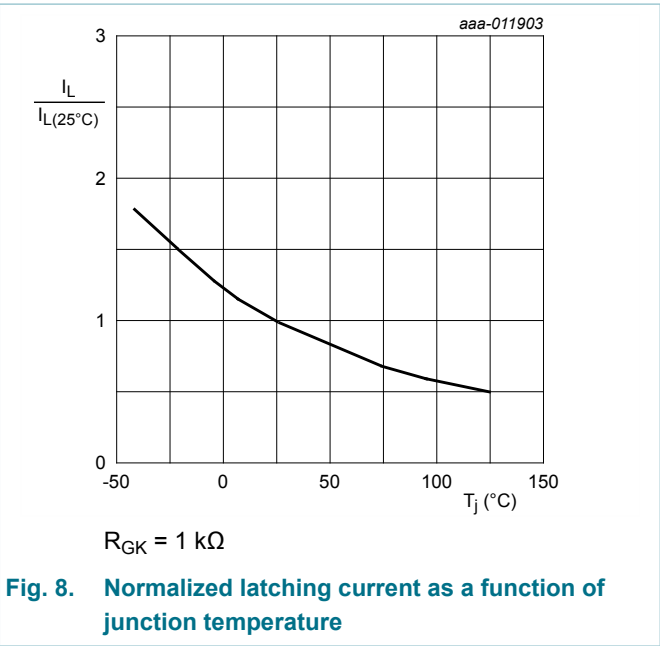
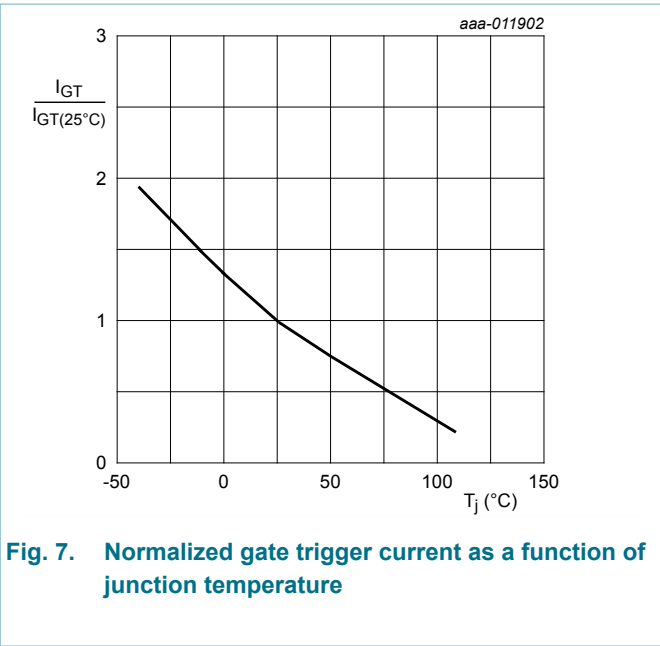


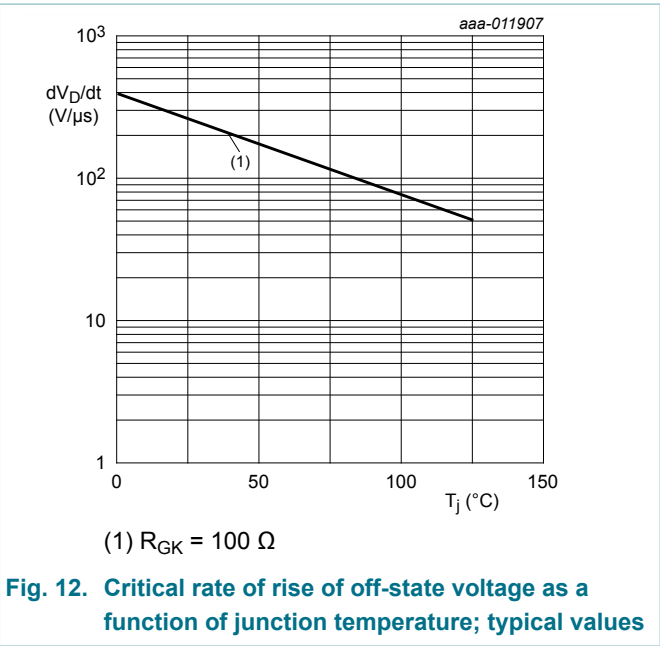
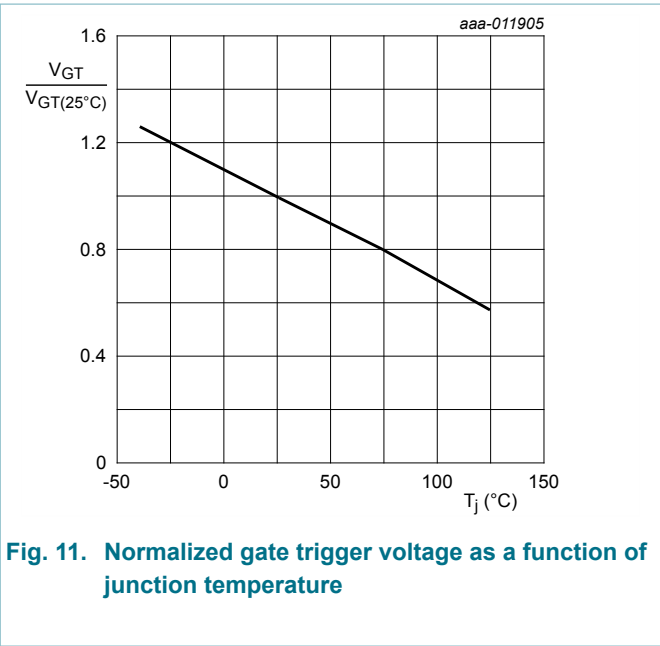
## 9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
<b>Static characteristics</b>							
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 7</a>		-	15	200	$\mu\text{A}$
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 8</a>		-	0.17	10	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 9</a>		-	0.1	6	mA
$V_T$	on-state voltage	$I_T = 5\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 10</a>		-	1.23	1.8	V
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 11</a>		-	0.4	1	V
		$V_D = 500\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 110\text{ °C}$ ; <a href="#">Fig. 11</a>		0.1	0.2	-	V
$I_D$	off-state current	$V_D = 500\text{ V}$ ; $T_j = 125\text{ °C}$		-	0.1	0.5	mA
$I_R$	reverse current	$V_R = 500\text{ V}$ ; $T_j = 125\text{ °C}$		-	0.1	0.5	mA
<b>Dynamic characteristics</b>							
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 335\text{ V}$ ; $T_j = 125\text{ °C}$ ; $R_{GK} = 100\text{ }\Omega$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; <a href="#">Fig. 12</a>		-	50	-	V/ $\mu\text{s}$
$t_{gt}$	gate-controlled turn-on time	$I_{TM} = 10\text{ A}$ ; $V_D = 500\text{ V}$ ; $I_G = 5\text{ mA}$ ; $dI_G/dt = 0.2\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ °C}$		-	2	-	$\mu\text{s}$
$t_q$	commutated turn-off time	$V_{DM} = 335\text{ V}$ ; $T_j = 125\text{ °C}$ ; $I_{TM} = 8\text{ A}$ ; $V_R = 10\text{ V}$ ; $(dI_T/dt)_M = 10\text{ A}/\mu\text{s}$ ; $dV_D/dt = 2\text{ V}/\mu\text{s}$ ; $R_{GK} = 1\text{ k}\Omega$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ )		-	100	-	$\mu\text{s}$







10. Package outline

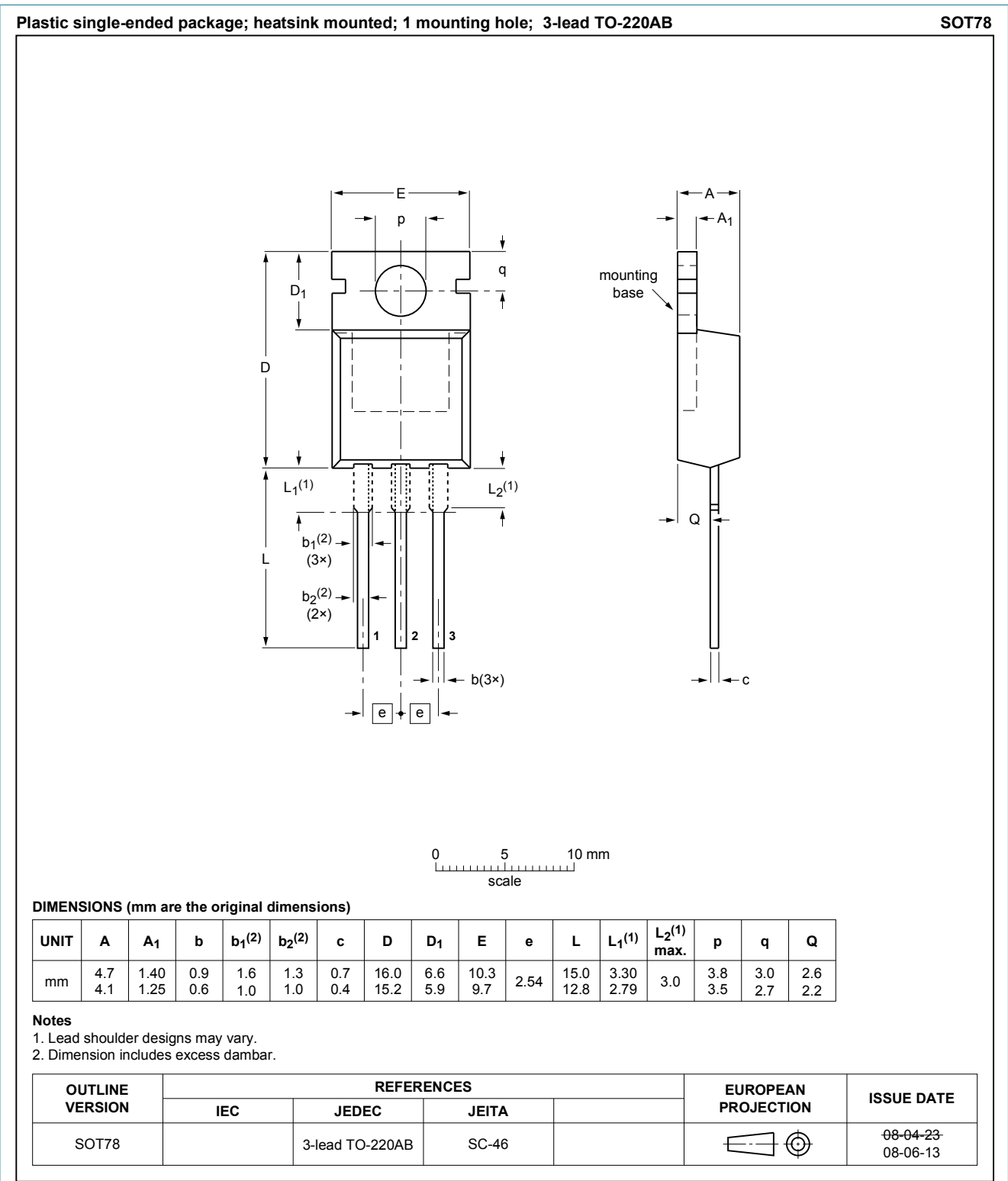


Fig. 13. Package outline TO-220AB (SOT78)

## 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.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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