

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



MAC223A6

4Q Triac

12 November 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 blocking voltage capability
- High noise immunity
- 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

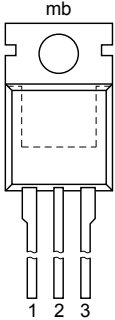
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	400	V
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{\text{J}(\text{init})} = 25\text{ }^{\circ}\text{C}$; $t_{\text{p}} = 20\text{ ms}$; Fig. 4 ; Fig. 5	-	-	190	A
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{mb}} \leq 91\text{ }^{\circ}\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3	-	-	25	A
Static characteristics						
I_{GT}	gate trigger current	$V_{\text{D}} = 12\text{ V}$; $I_{\text{T}} = 0.1\text{ A}$; T2+ G+; $T_{\text{J}} = 25\text{ }^{\circ}\text{C}$; Fig. 7	-	6	50	mA
		$V_{\text{D}} = 12\text{ V}$; $I_{\text{T}} = 0.1\text{ A}$; T2+ G-; $T_{\text{J}} = 25\text{ }^{\circ}\text{C}$; Fig. 7	-	10	50	mA
		$V_{\text{D}} = 12\text{ V}$; $I_{\text{T}} = 0.1\text{ A}$; T2- G-; $T_{\text{J}} = 25\text{ }^{\circ}\text{C}$; Fig. 7	-	11	50	mA



Symbol	Parameter	Conditions		Min	Typ	Max	Unit
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G+; $T_j = 25\text{ }^\circ\text{C}$; Fig. 7		-	23	75	mA

5. Pinning information

Table 2. Pinning information

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

6. Ordering information

Table 3. Ordering information

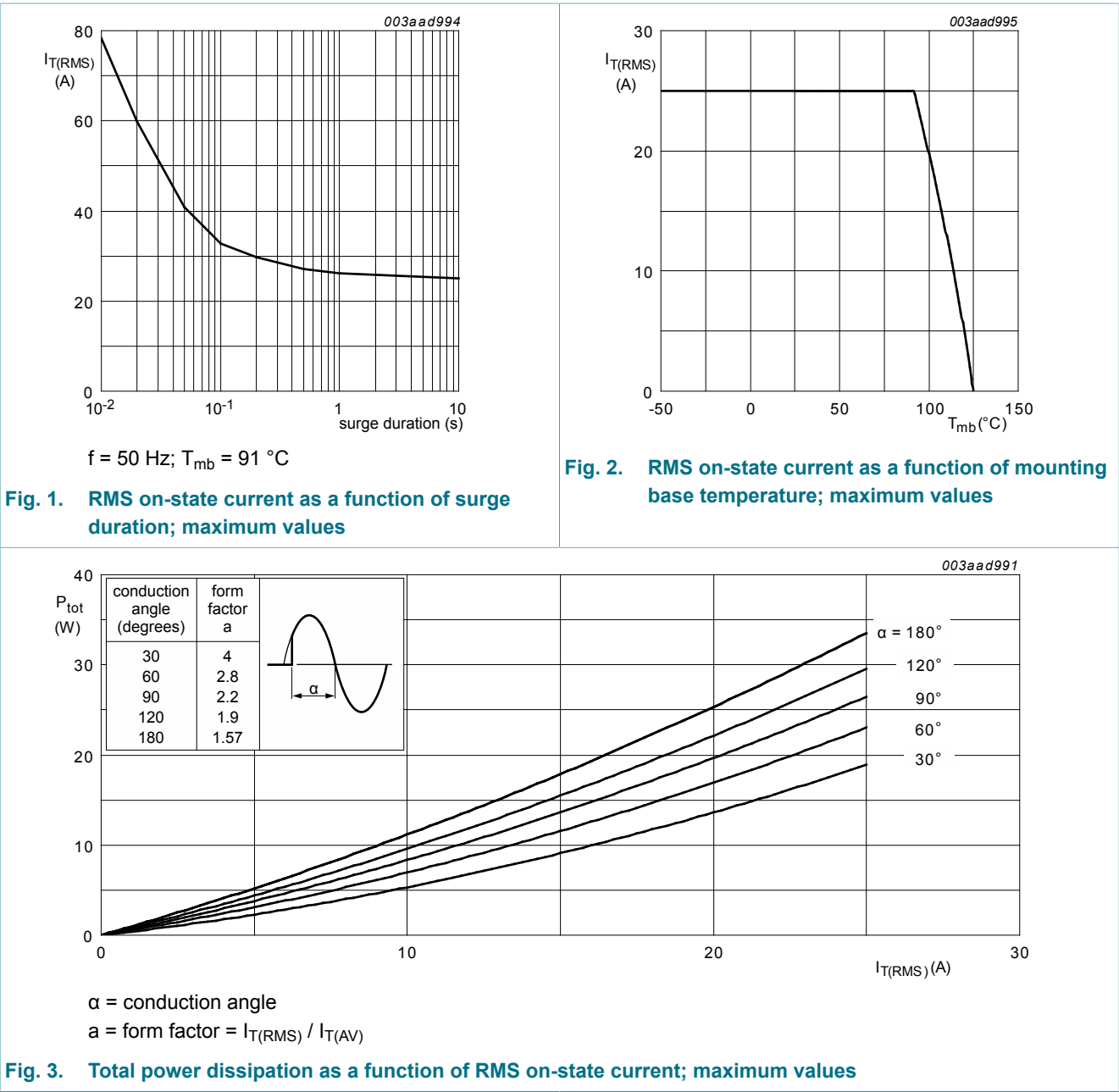
Type number	Package		
	Name	Description	Version
MAC223A6	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

7. Limiting values

Table 4. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_{DRM}	repetitive peak off-state voltage			-	400	V
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{mb}} \leq 91\text{ }^{\circ}\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3		-	25	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$; $t_{\text{p}} = 20\text{ ms}$; Fig. 4 ; Fig. 5		-	190	A
		full sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$; $t_{\text{p}} = 16.7\text{ ms}$		-	230	A
I^2t	I^2t for fusing	$t_{\text{p}} = 10\text{ ms}$; SIN		-	180	A^2s
di_{T}/dt	rate of rise of on-state current	$I_{\text{T}} = 30\text{ A}$; $I_{\text{G}} = 0.2\text{ A}$; $dI_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$; T2+ G+		-	50	$\text{A}/\mu\text{s}$
		$I_{\text{T}} = 30\text{ A}$; $I_{\text{G}} = 0.2\text{ A}$; $dI_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$; T2+ G-		-	50	$\text{A}/\mu\text{s}$
		$I_{\text{T}} = 30\text{ A}$; $I_{\text{G}} = 0.2\text{ A}$; $dI_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$; T2- G-		-	50	$\text{A}/\mu\text{s}$
		$I_{\text{T}} = 30\text{ A}$; $I_{\text{G}} = 0.2\text{ A}$; $dI_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$; T2- G+		-	10	$\text{A}/\mu\text{s}$
I_{GM}	peak gate current			-	2	A
P_{GM}	peak gate power			-	5	W
$P_{\text{G(AV)}}$	average gate power	over any 20 ms period		-	0.5	W
T_{stg}	storage temperature			-40	150	$^{\circ}\text{C}$
T_{j}	junction temperature			-	125	$^{\circ}\text{C}$



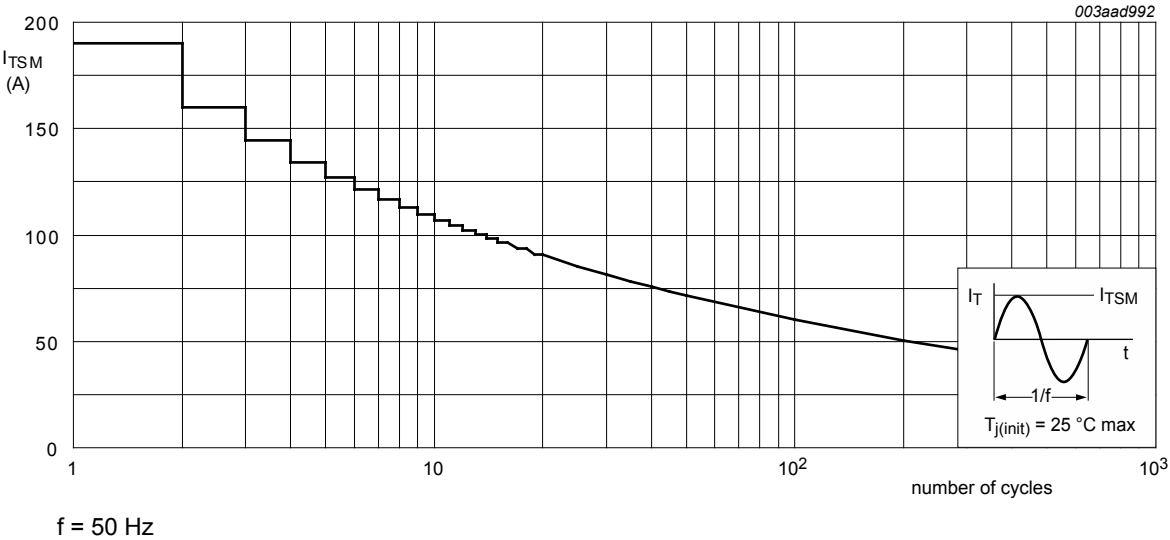


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

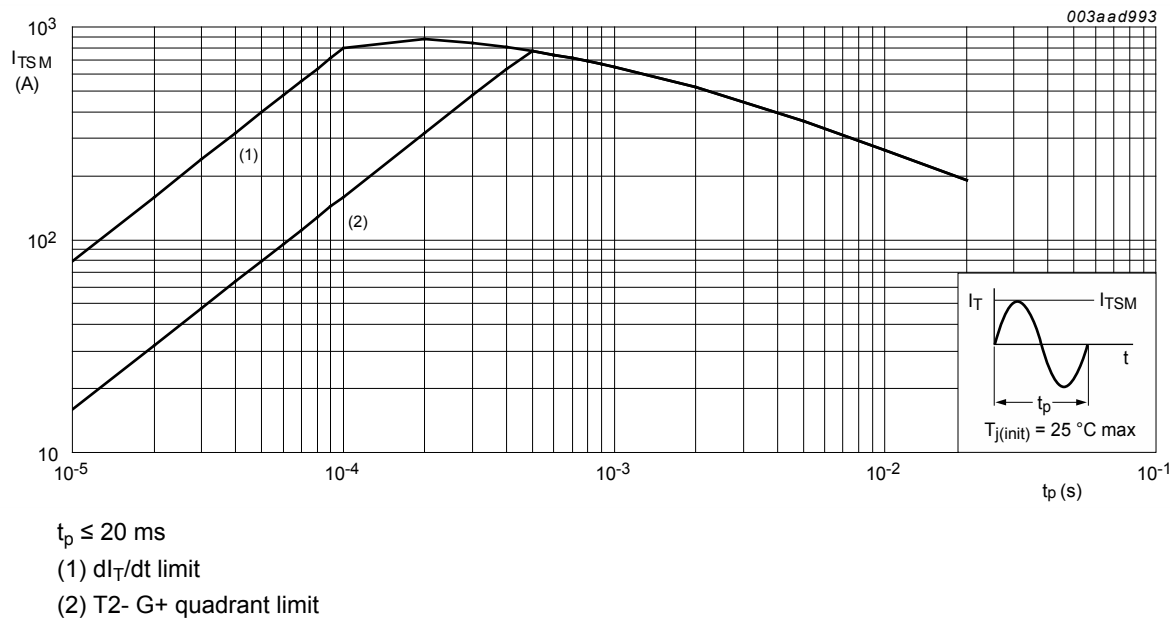
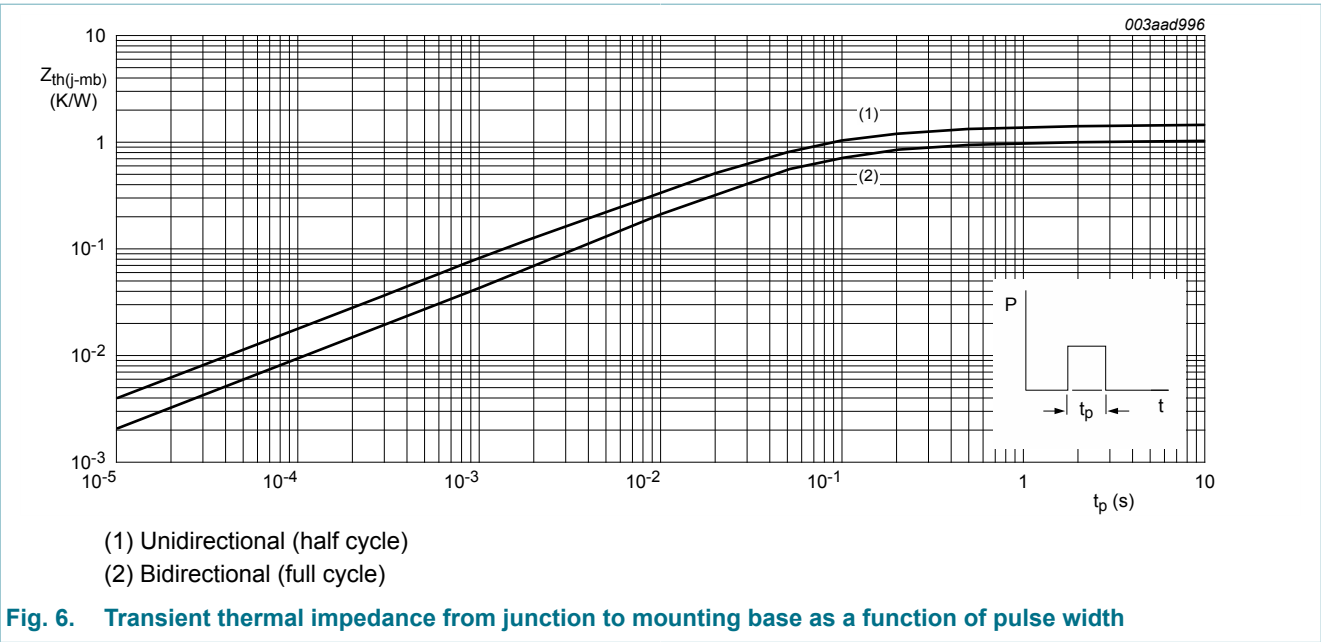


Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

8. Thermal characteristics

Table 5. Thermal characteristics

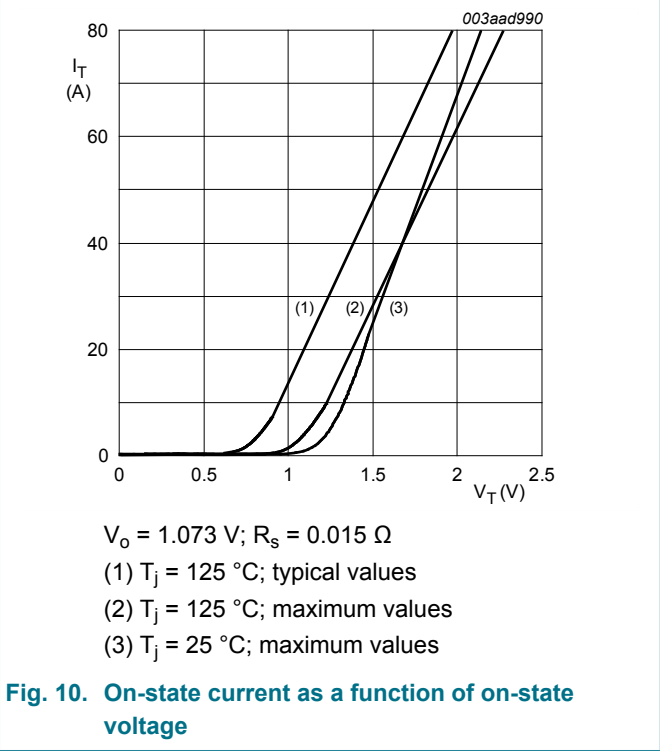
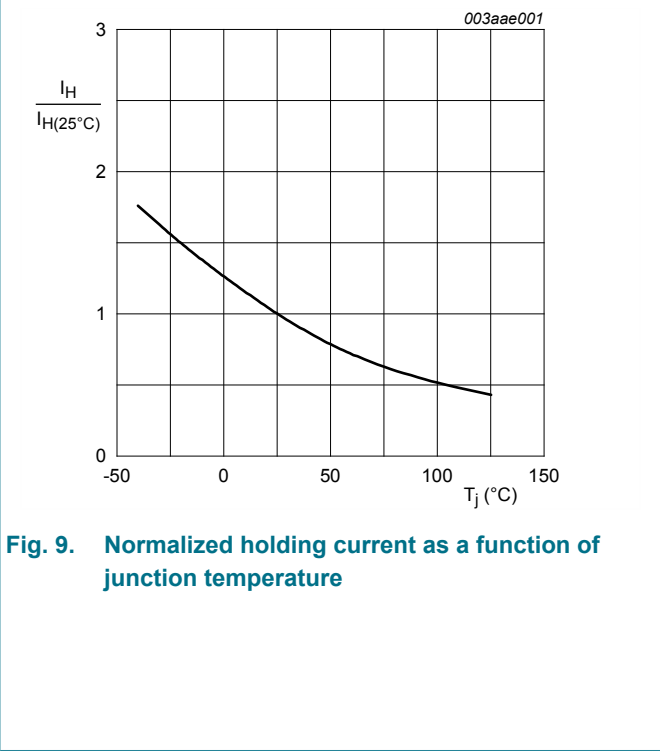
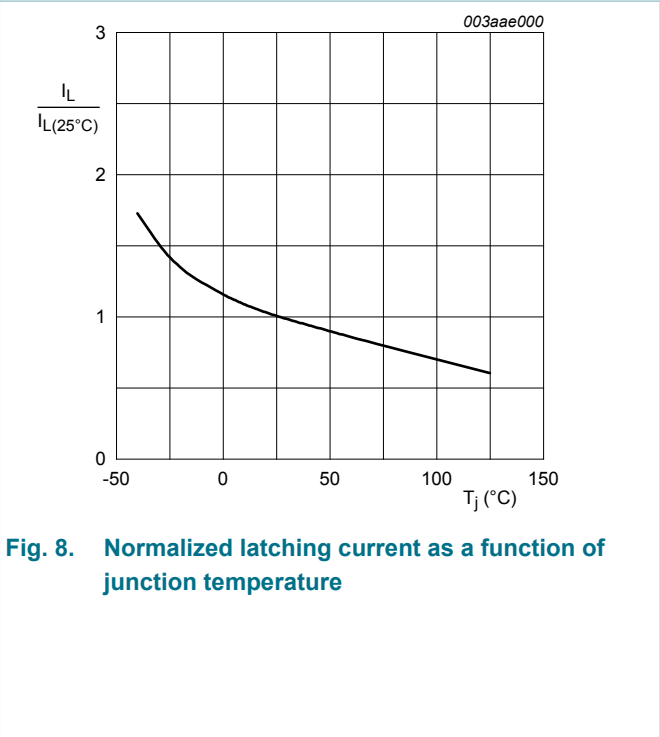
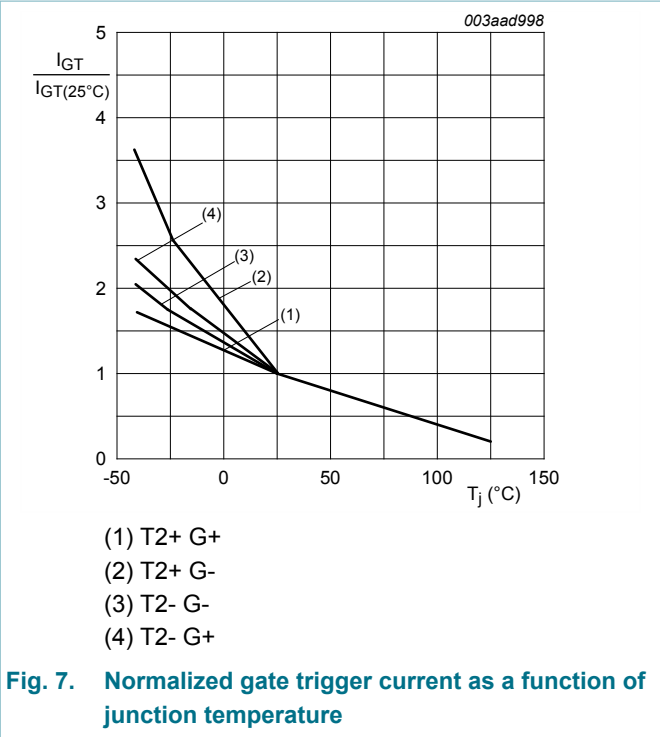
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	full cycle; Fig. 6		-	-	1	K/W
		half cycle; Fig. 6		-	-	1.4	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	60	-	K/W



9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G+; $T_j = 25\text{ }^\circ\text{C}$; Fig. 7	-	6	50	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 7	-	10	50	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 7	-	11	50	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G+; $T_j = 25\text{ }^\circ\text{C}$; Fig. 7	-	23	75	mA
I_L	latching current	$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G+; $T_j = 25\text{ }^\circ\text{C}$; Fig. 8	-	8	40	mA
		$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 8	-	30	60	mA
		$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ }^\circ\text{C}$; Fig. 8	-	18	40	mA
		$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2- G+; $T_j = 25\text{ }^\circ\text{C}$; Fig. 8	-	15	60	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; T2+; Fig. 9	-	7	30	mA
		$V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; T2-; Fig. 9	-	12	30	mA
V_T	on-state voltage	$I_T = 30\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 10	-	1.3	1.55	V
V_{GT}	gate trigger voltage	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 11	-	0.7	1	V
		$V_D = 400\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 125\text{ }^\circ\text{C}$; Fig. 11	0.25	0.4	-	V
I_D	off-state current	$V_D = 400\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$	-	0.1	0.5	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 268\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit	100	300	-	V/ μs
dV_{com}/dt	rate of change of commutating voltage	$V_D = 400\text{ V}$; $T_j = 95\text{ }^\circ\text{C}$; $dI_{com}/dt = 9\text{ A/ms}$; $I_T = 25\text{ A}$; gate open circuit	-	10	-	V/ μs
t_{gt}	gate-controlled turn-on time	$I_{TM} = 30\text{ A}$; $V_D = 400\text{ V}$; $I_G = 0.1\text{ A}$; $dI_G/dt = 5\text{ A}/\mu\text{s}$	-	2	-	μs



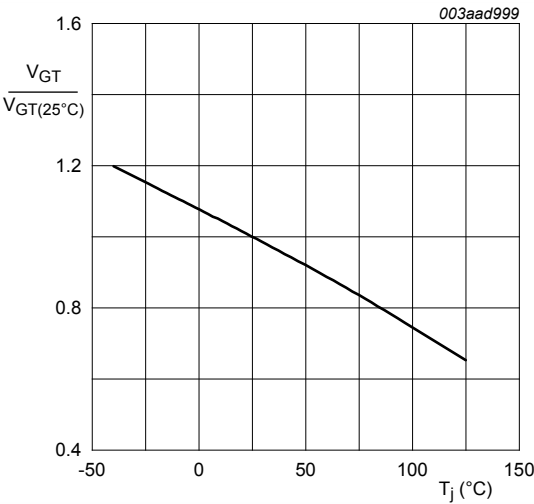


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

10. Package outline

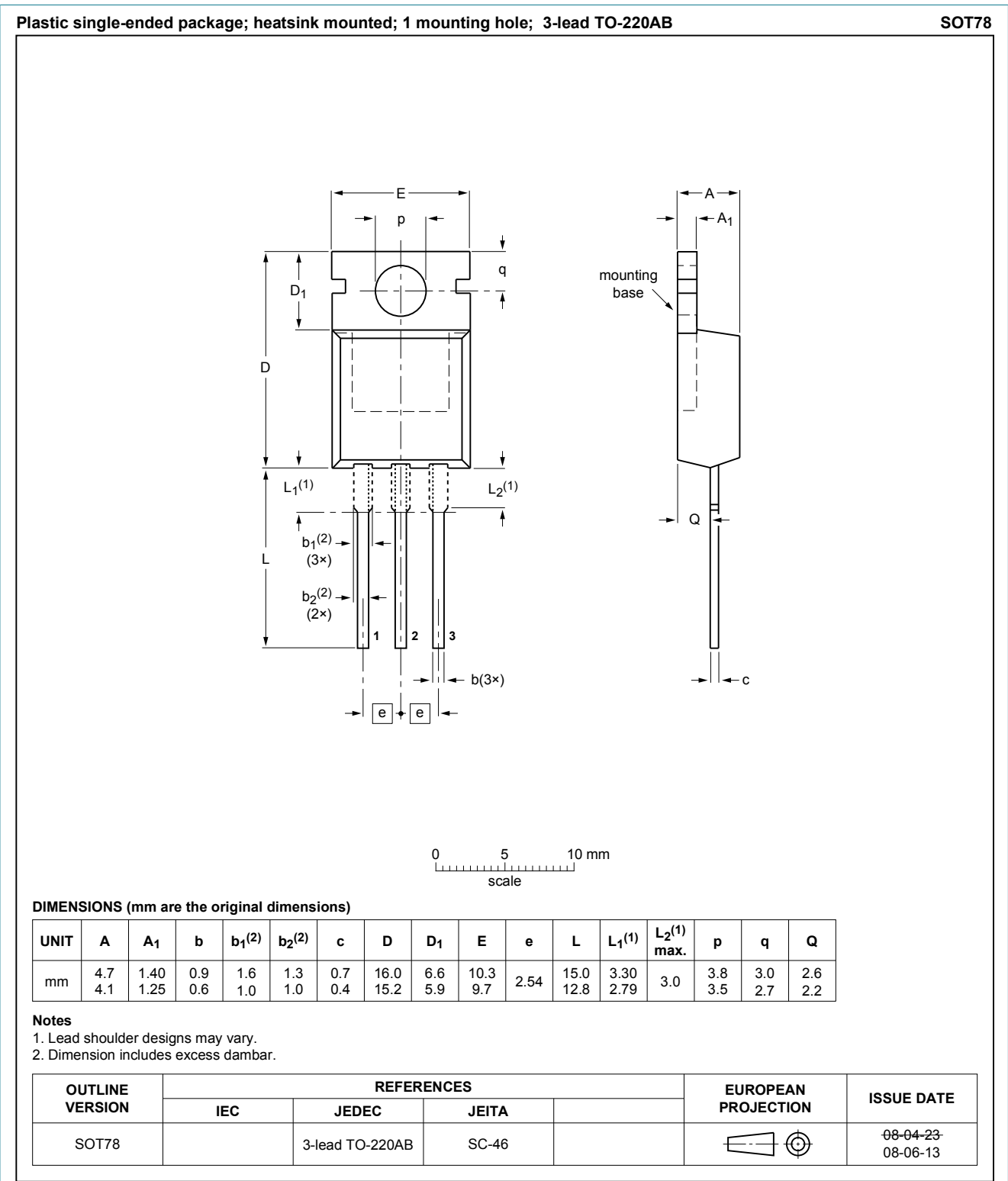


Fig. 12. Package outline TO-220AB (SOT78)

11. Legal information

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.

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