

IMPORTANT NOTICE

10 December 2015

1. Global joint venture starts operations as WeEn Semiconductors

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Thank you for your cooperation and understanding,

WeEn Semiconductors



MAC223A8X

4Q Triac

1 May 2015

Product data sheet

1. General description

Planar passivated four quadrant triac in a SOT186A "full pack" plastic package intended for use in applications requiring high bidirectional transient and blocking voltage capability and high thermal cycling performance. Typical applications include motor control, industrial and domestic lighting, heating and static switching.

2. Features and benefits

- High blocking voltage capability
- High noise immunity
- Isolated package
- Planar passivated for voltage ruggedness and reliability
- Triggering in all four quadrants

3. Applications

- General purpose motor control
- Protection Circuits

4. Quick reference data

Table 1. Quick reference data

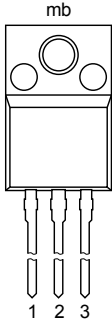
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	600	V
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$; $t_p = 20\text{ ms}$; Fig. 4 ; Fig. 5	-	-	190	A
		full sine wave; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$; $t_p = 16.7\text{ ms}$	-	-	230	A
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_h \leq 25\text{ }^{\circ}\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3	-	-	20	A
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G+; $T_j = 25\text{ }^{\circ}\text{C}$; 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



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		-	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

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1	 TO-220F (SOT186A)	 sym051
2	T2	main terminal 2		
3	G	gate		
mb	n.c.	mounting base; isolated		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
MAC223A8X	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack"	SOT186A

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		-	600	V
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_h \leq 25^\circ\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3	-	20	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{\text{j(init)}} = 25^\circ\text{C}$; $t_p = 20\text{ ms}$; Fig. 4 ; Fig. 5	-	190	A
		full sine wave; $T_{\text{j(init)}} = 25^\circ\text{C}$; $t_p = 16.7\text{ ms}$	-	230	A
I^2t	I^2t for fusing	$t_p = 10\text{ ms}$; SIN	-	180	A^2s
dl_T/dt	rate of rise of on-state current	$I_G = 100\text{ mA}$; T2+ G+	-	50	$\text{A}/\mu\text{s}$
		$I_G = 100\text{ mA}$; T2+ G-	-	50	$\text{A}/\mu\text{s}$
		$I_G = 150\text{ mA}$; T2- G+	-	10	$\text{A}/\mu\text{s}$
		$I_G = 100\text{ mA}$; T2- G-	-	50	$\text{A}/\mu\text{s}$
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		-40	125	$^\circ\text{C}$

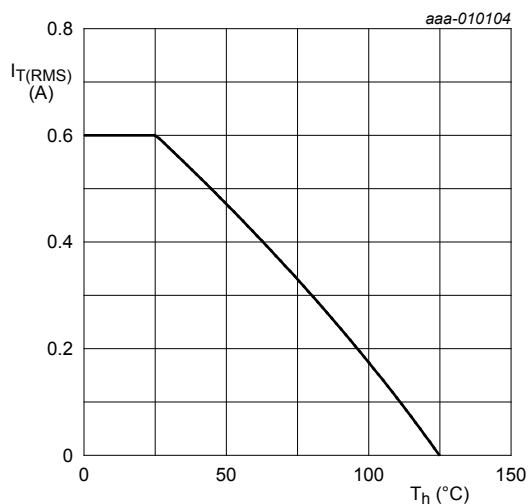
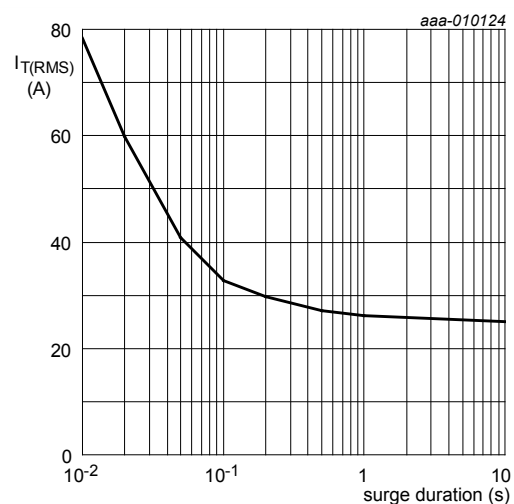


Fig. 1. RMS on-state current as a function of heatsink temperature; maximum values



$f = 50\text{ Hz}$; $T_h = 25^\circ\text{C}$

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

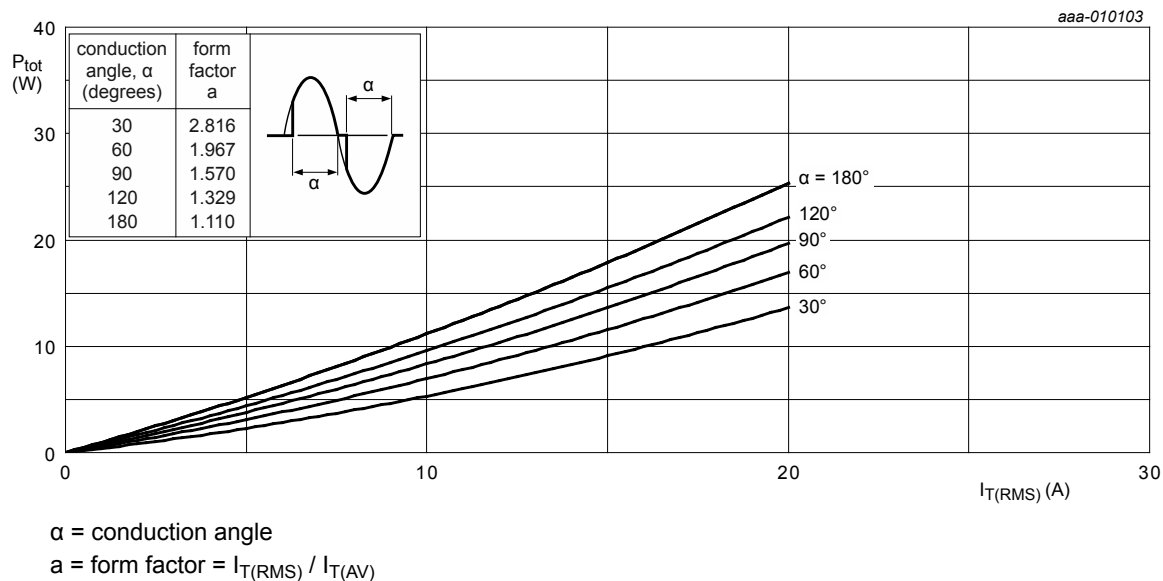


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

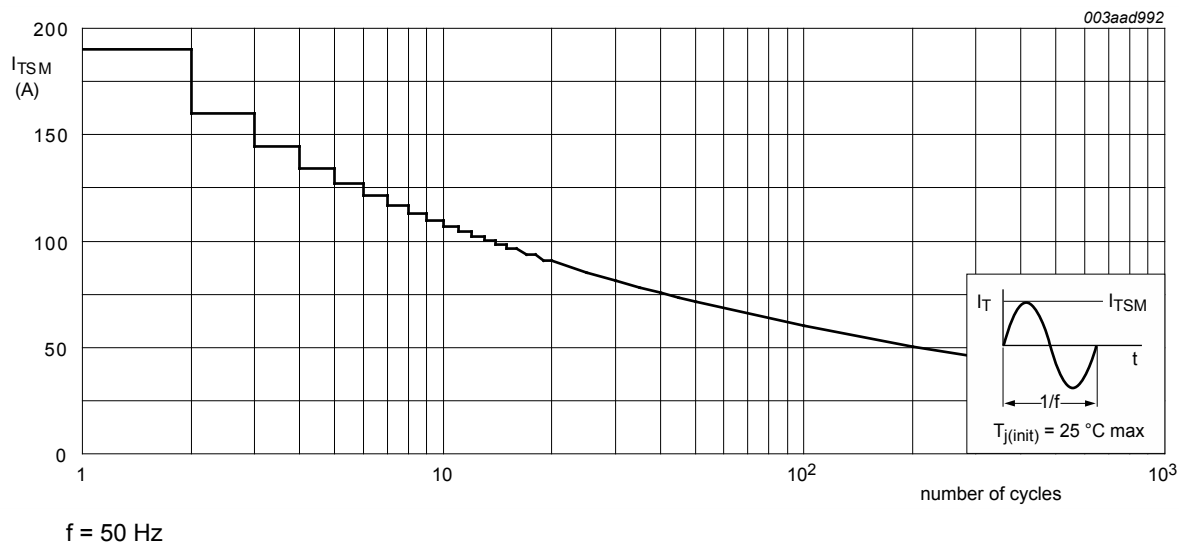
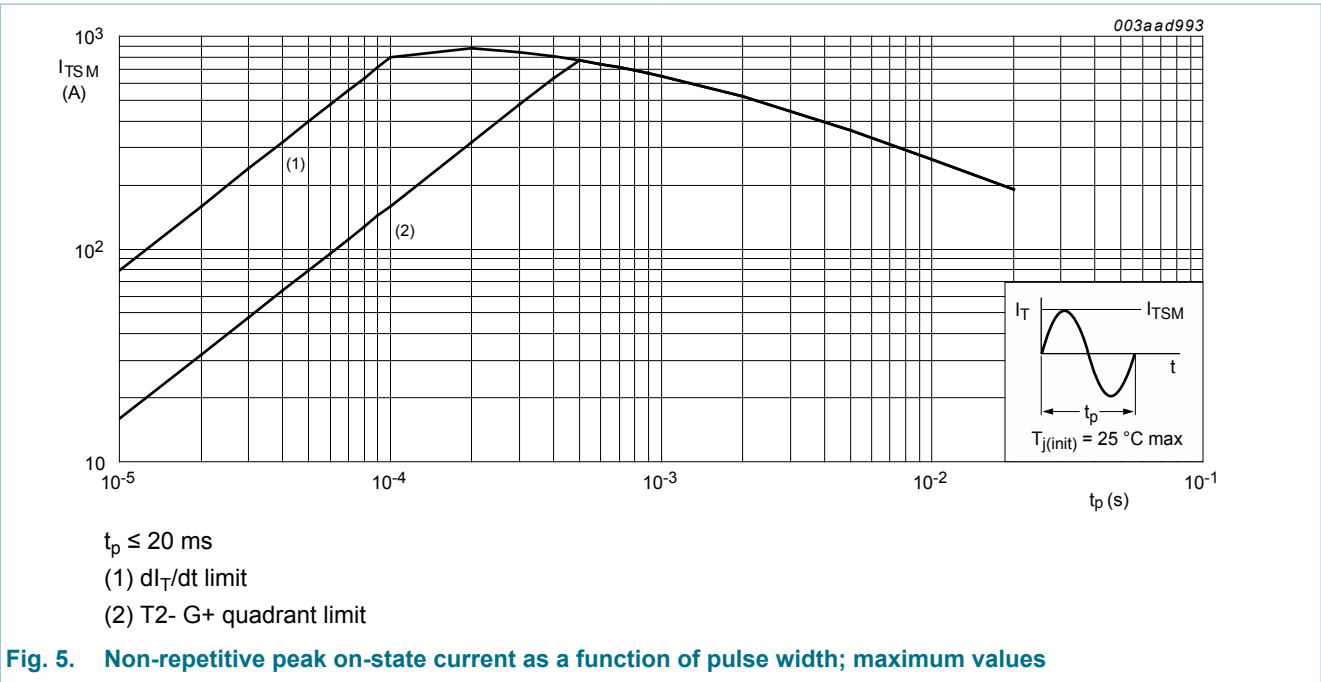


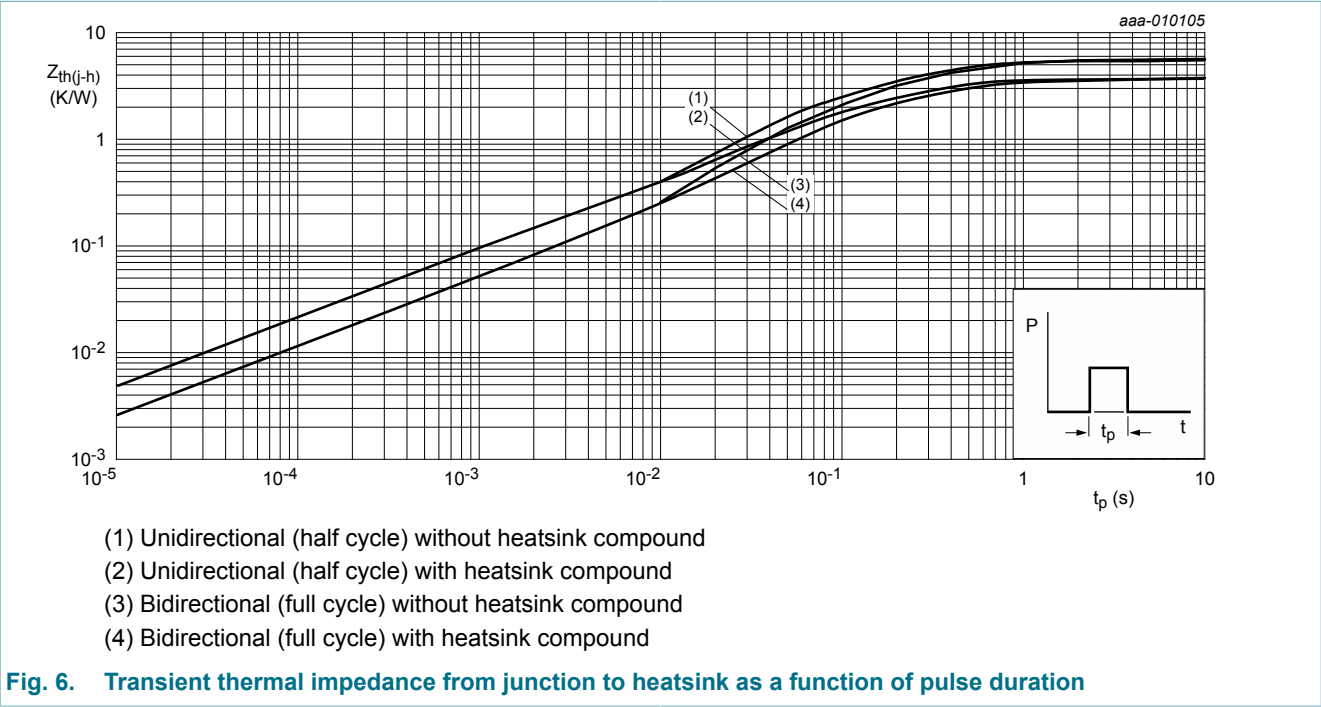
Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



8. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
R _{th(j-h)}	thermal resistance from junction to heatsink	full or half cycle; without heatsink compound; Fig. 6	-	-	3.85	K/W
		full or half cycle; with heatsink compound; Fig. 6	-	-	5.5	K/W
R _{th(j-a)}	thermal resistance from junction to ambient	in free air	-	55	-	K/W



9. Isolation characteristics

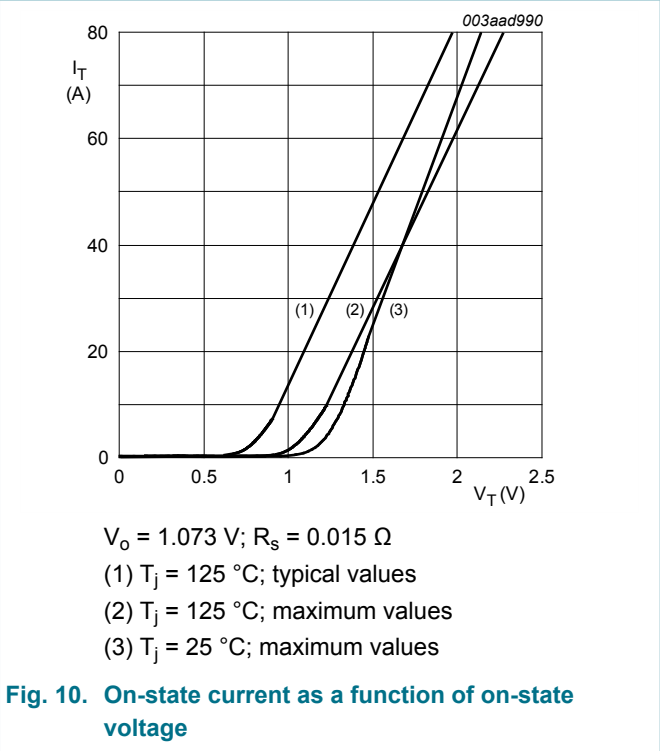
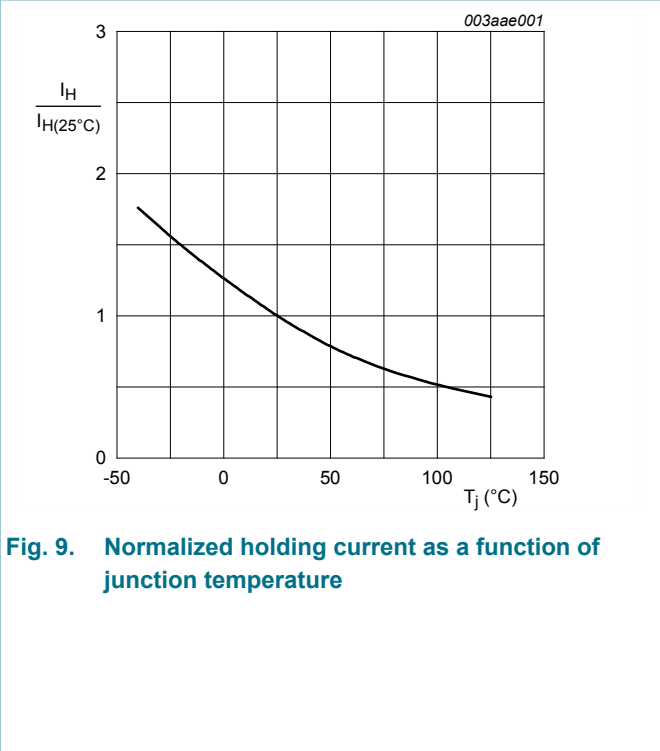
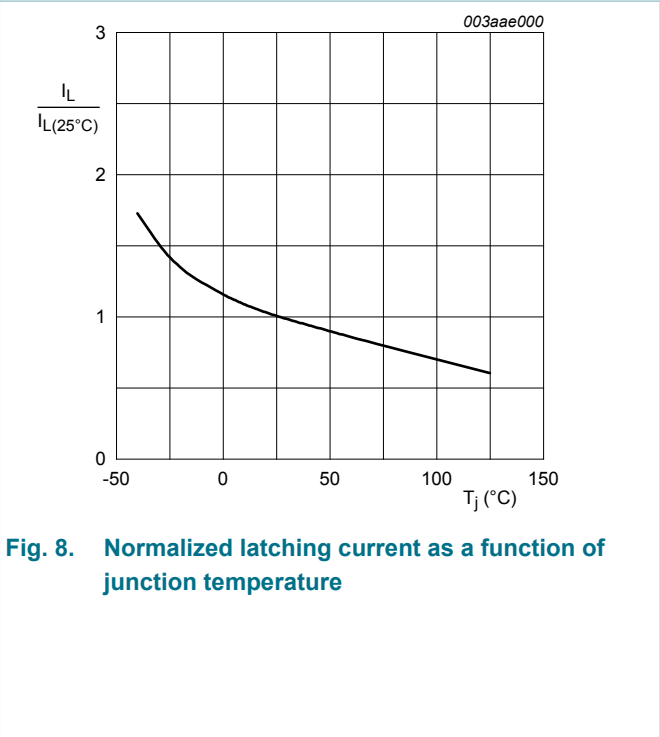
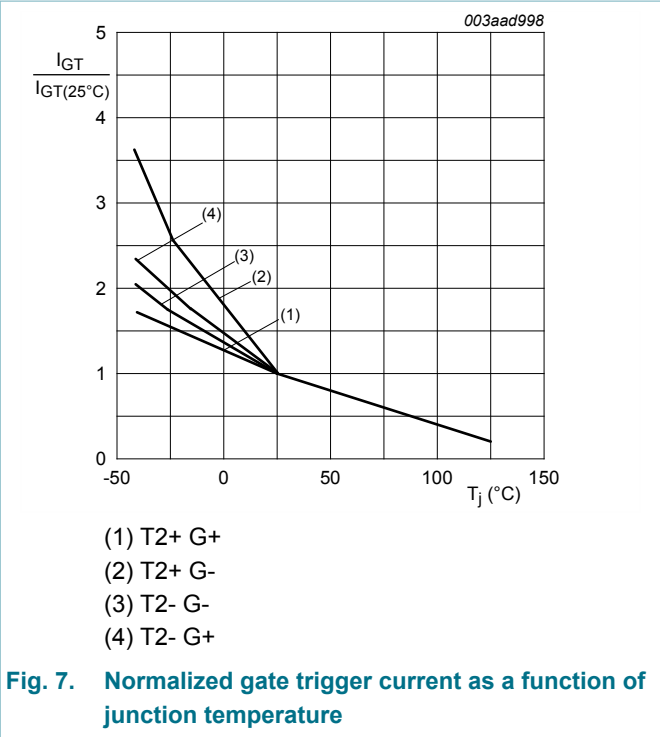
Table 6. Isolation characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{isol(RMS)}	RMS isolation voltage	from all terminals to external heatsink; sinusoidal waveform; clean and dust free; 50 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; T _h = 25 °C	-	-	2500	V
C _{isol}	isolation capacitance	from main terminal 2 to external heatsink; f = 1 MHz; T _h = 25 °C	-	10	-	pF

10. Characteristics

Table 7. 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	-	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	-	15	60	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; T2+; Fig. 9	-	7	30	A
		$V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; 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	$V_D = 800\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$	-	0.1	0.5	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 536\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; ($V_{DM} = 67\%$ 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	$I_{TM} = 30\text{ A}$; $V_D = 800\text{ V}$; $I_G = 0.1\text{ A}$; $dI_G/dt = 5\text{ A}/\mu\text{s}$	-	2	-	μs



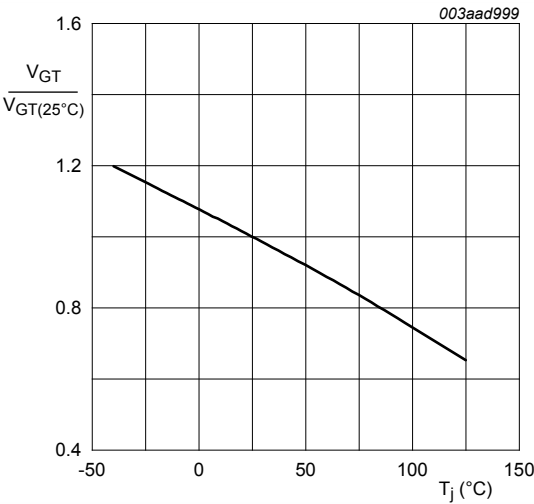


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

11. Package outline

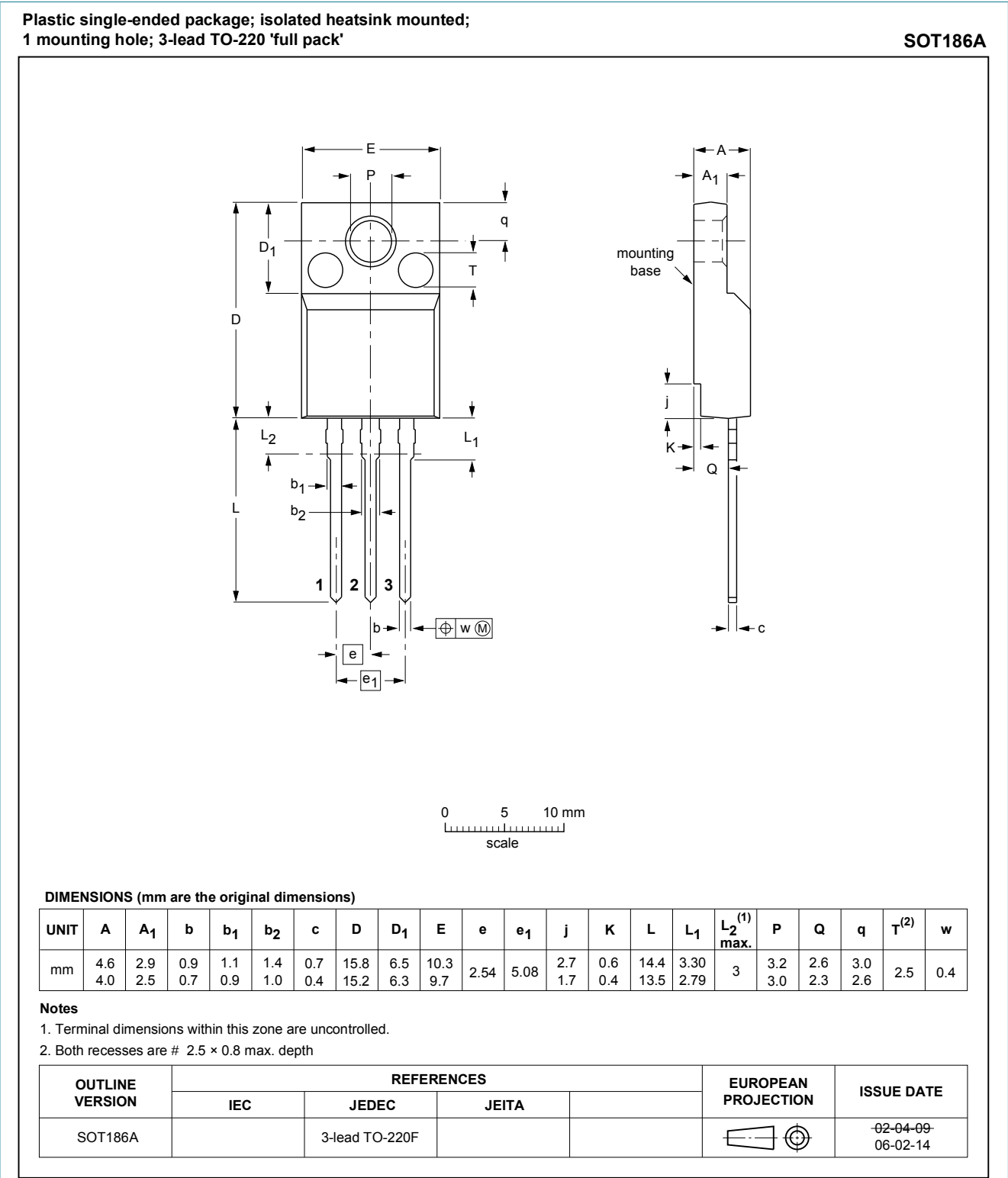


Fig. 12. Package outline TO-220F (SOT186A)

12. Legal information

12.1 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.

- [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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