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## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China





# 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.

In this document where the previous NXP references remain, please use the new links as shown below.

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Thank you for your cooperation and understanding,

WeEn Semiconductors





# BT152X-800R

SCR

18 March 2014

Product data sheet

## 1. General description

Planar passivated Silicon Controlled Rectifier (SCR) in a SOT186A (TO-220F) "full pack" plastic package intended for use in applications requiring very high inrush current capability and high thermal cycling performance.

## 2. Features and benefits

- High blocking voltage capability
- High thermal cycling performance
- Isolated mounting base package
- Planar passivated for voltage ruggedness and reliability
- Very high current surge capability

## 3. Applications

- Capacitive Discharge Ignition (CDI)
- Crowbar protection
- Inrush protection
- Motor control
- Voltage regulation

## 4. Quick reference data

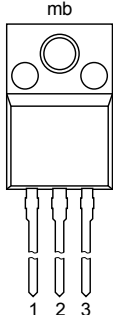

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage		-	-	800	V
$V_{RRM}$	repetitive peak reverse voltage		-	-	800	V
$I_{TSM}$	non-repetitive peak on-state current	half sine wave; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 10\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	-	200	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_h \leq 43\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	-	20	A
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 7</a>	-	3	32	mA



## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 <p>mb</p> <p>1 2 3</p> <p>TO-220F (SOT186A)</p>	 <p>A K</p> <p>G</p> <p>sym037</p>
2	A	anode		
3	G	gate		
mb	n.c.	mounting base; isolated		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BT152X-800R	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack"	SOT186A

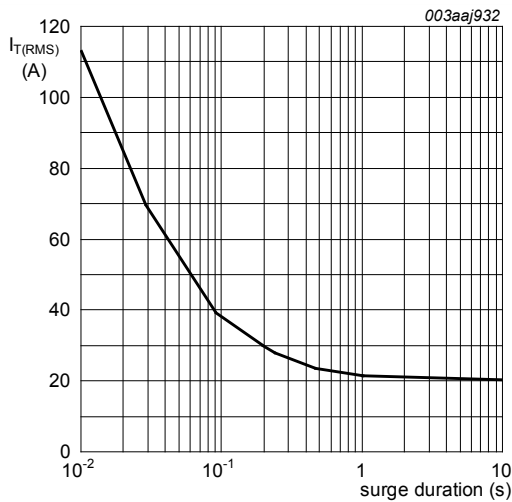
## 7. Limiting values

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		-	800	V
$V_{RRM}$	repetitive peak reverse voltage		-	800	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_h \leq 43\text{ }^\circ\text{C}$	-	13	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_h \leq 43\text{ }^\circ\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	20	A
$I_{TSM}$	non-repetitive peak on-state current	half sine wave; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; $t_p = 10\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	200	A
		half sine wave; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; $t_p = 8.3\text{ ms}$	-	220	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; SIN	-	200	$\text{A}^2\text{s}$
$di_T/dt$	rate of rise of on-state current	$I_T = 50\text{ A}$ ; $I_G = 0.2\text{ A}$ ; $di_G/dt = 0.2\text{ A}/\mu\text{s}$	-	200	$\text{A}/\mu\text{s}$
$I_{GM}$	peak gate current		-	5	A

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{RGM}$	peak reverse gate voltage		-	5	V
$P_{GM}$	peak gate power		-	20	W
$P_{G(AV)}$	average gate power	over any 20 ms period	-	0.5	W
$T_{stg}$	storage temperature		-40	150	°C
$T_j$	junction temperature		-	125	°C



$f = 50 \text{ Hz}; T_h = 43 \text{ }^\circ\text{C}$

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

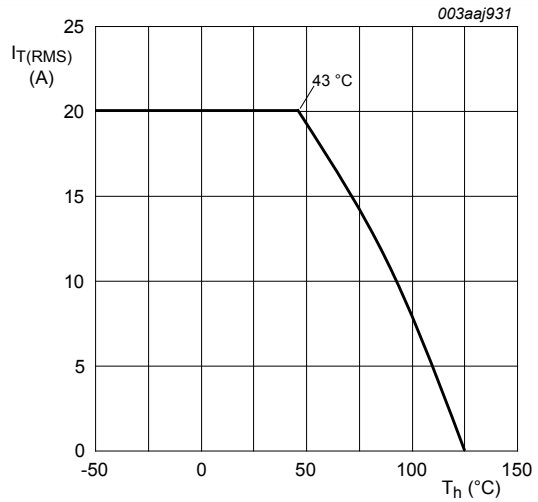
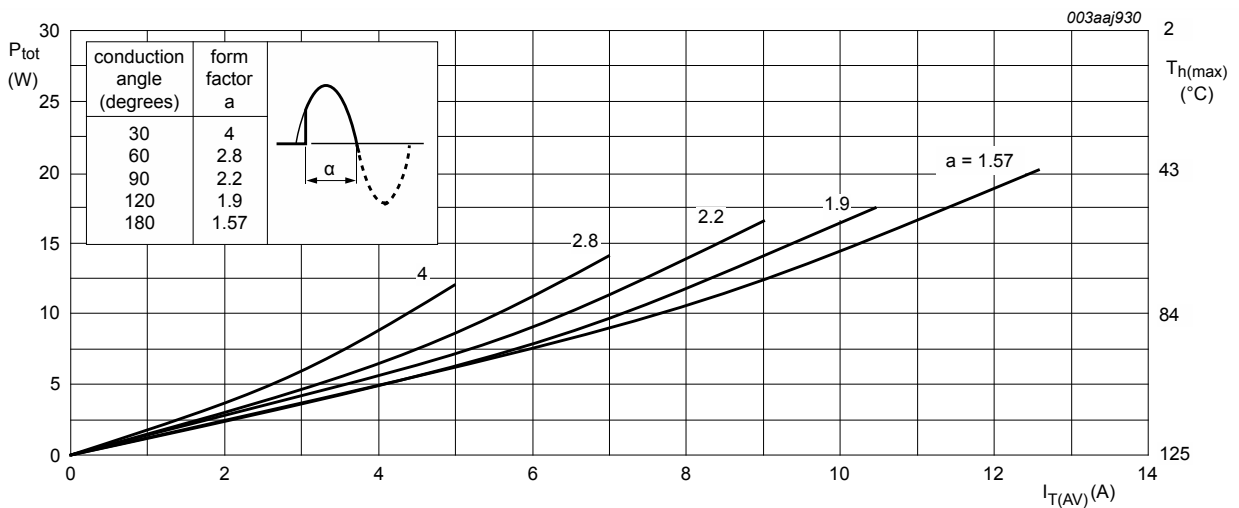
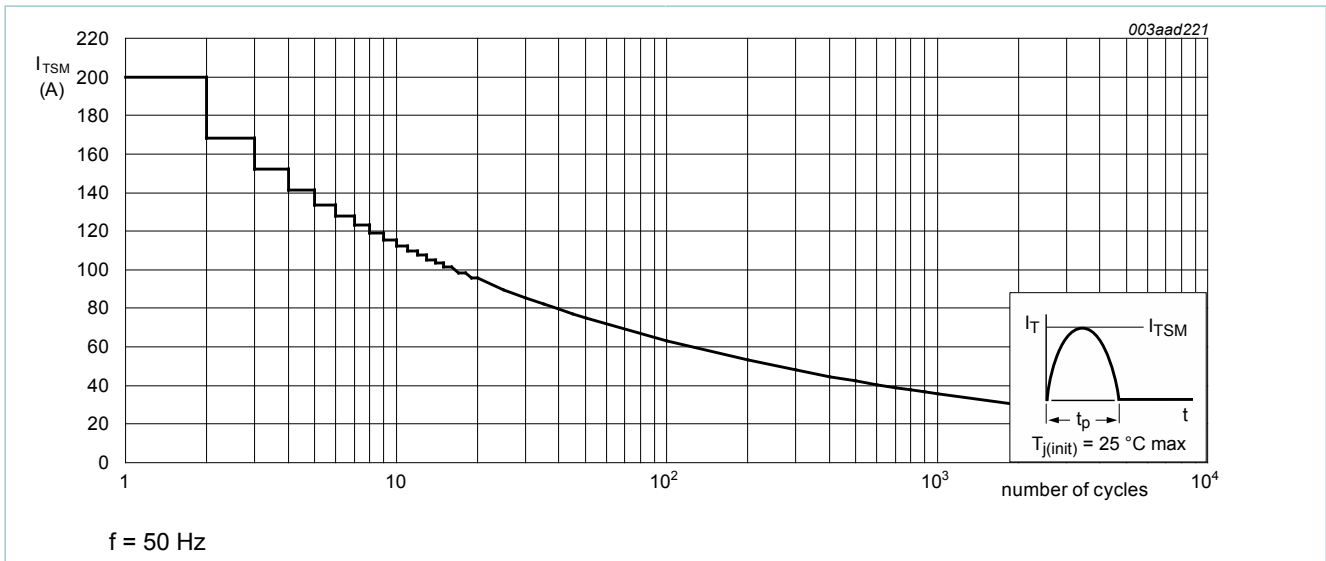


Fig. 2. RMS on-state current as a function of heatsink temperature; maximum values

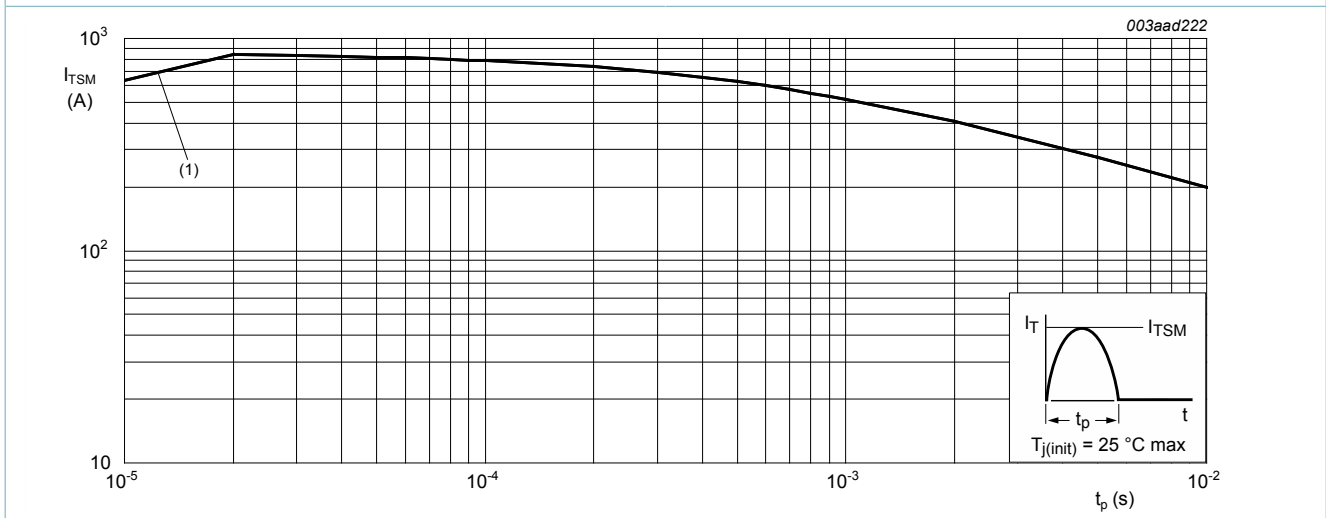


alpha = conduction angle  
 $a = \text{form factor} = I_{T(RMS)} / I_{T(AV)}$

Fig. 3. Total power dissipation as a function of average 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**



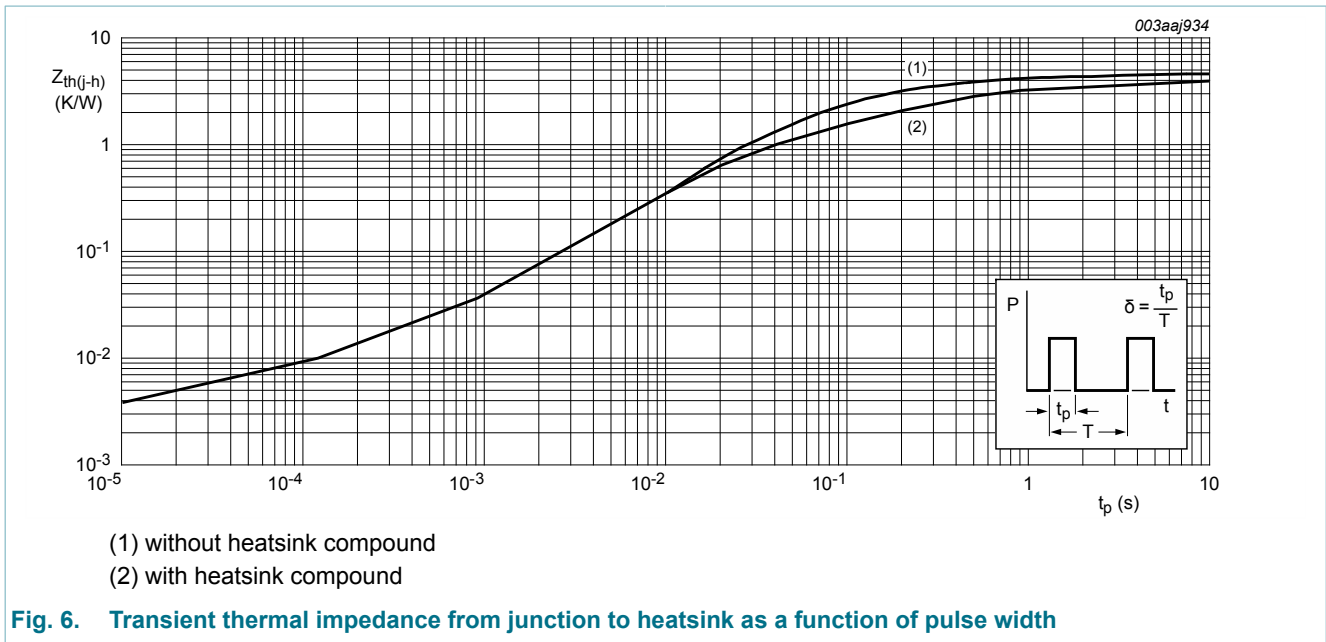
**Fig. 5. Non-repetitive peak on-state current as a function of pulse width for sinusoidal currents; maximum values**

$t_p \leq 10 \text{ ms}$ ; (1)  $dI_T/dt$  limit

## 8. Thermal characteristics

**Table 5. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	with heatsink compound; <a href="#">Fig. 6</a>	-	-	4	K/W
		without heatsink compound; <a href="#">Fig. 6</a>	-	-	4.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient		-	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; $50\text{ Hz} \leq f \leq 60\text{ Hz}$ ; $RH \leq 65\%$ ; $T_h = 25\text{ }^\circ\text{C}$	-	-	2500	V
$C_{isol}$	isolation capacitance	from anode to external heatsink; $f = 1\text{ MHz}$ ; $T_h = 25\text{ }^\circ\text{C}$	-	10	-	pF

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>	-	3	32	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a>	-	25	80	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>	-	15	60	mA
$V_T$	on-state voltage	$I_T = 40\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>	-	1.4	1.75	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>	-	0.6	1	V
		$V_D = 800\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; <a href="#">Fig. 11</a>	0.25	0.4	-	V

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_D$	off-state current	$V_D = 800\text{ V}; T_j = 125\text{ }^\circ\text{C}$	-	0.2	1	mA
$I_R$	reverse current	$V_R = 800\text{ V}; T_j = 125\text{ }^\circ\text{C}$	-	0.2	1	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 $V_{DRM}$ ); gate open circuit; exponential waveform; <a href="#">Fig. 12</a>	200	300	-	V/ $\mu$ s
$t_{gt}$	gate-controlled turn-on time	$I_{TM} = 40\text{ A}; V_D = 800\text{ V}; I_G = 0.1\text{ A}; dI_G/dt = 5\text{ A}/\mu\text{s}; T_j = 25\text{ }^\circ\text{C}$	-	2	-	$\mu$ s
$t_q$	commutated turn-off time	$V_{DM} = 536\text{ V}; T_j = 125\text{ }^\circ\text{C}; I_{TM} = 50\text{ A}; V_R = 25\text{ V}; (dI_T/dt)_M = 50\text{ A}/\mu\text{s}; dV_D/dt = 30\text{ V}/\mu\text{s}; R_{GK} = 100\text{ }\Omega; (V_{DM} = 67\%$ of $V_{DRM}$ )	-	70	-	$\mu$ s

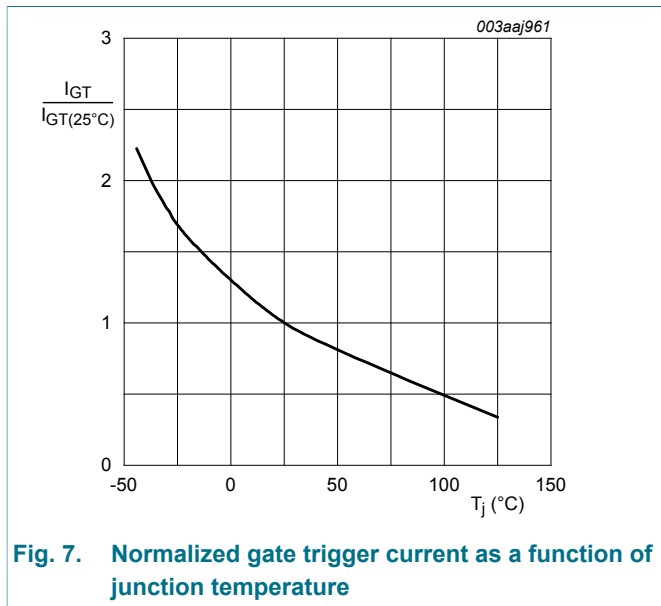


Fig. 7. Normalized gate trigger current as a function of junction temperature

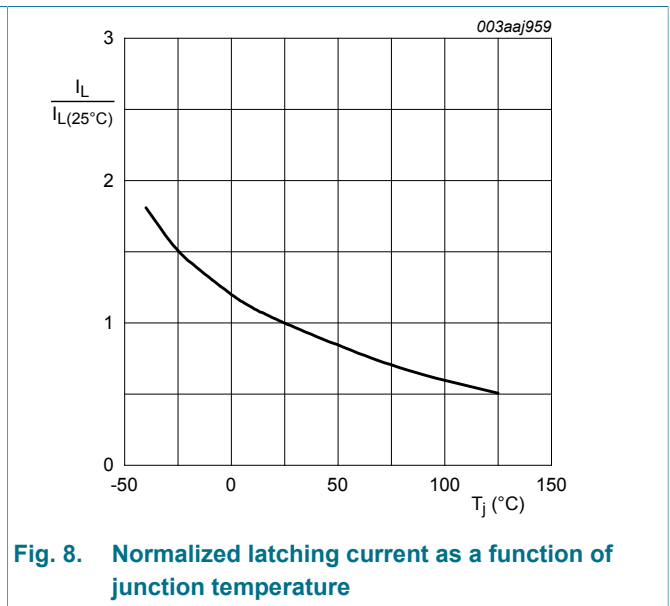
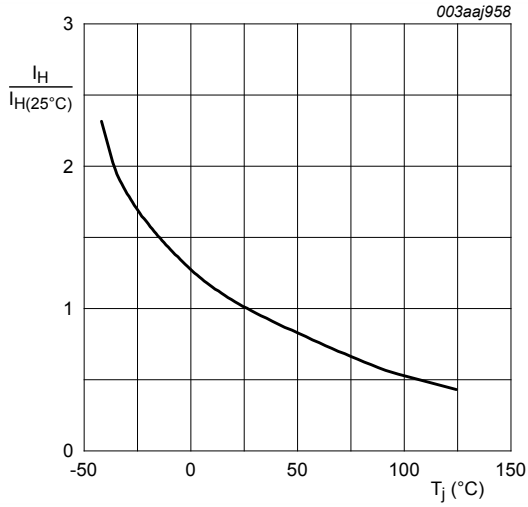
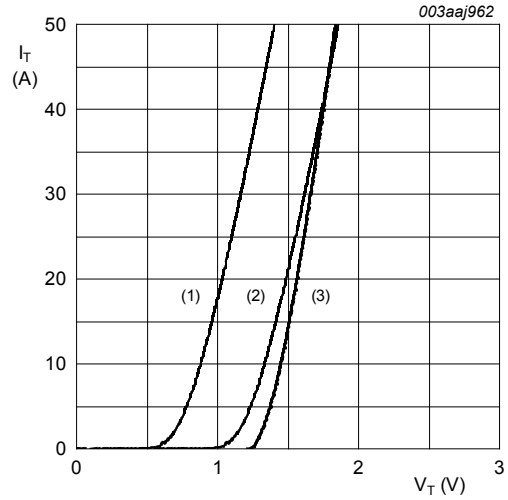


Fig. 8. Normalized latching current as a function of junction temperature





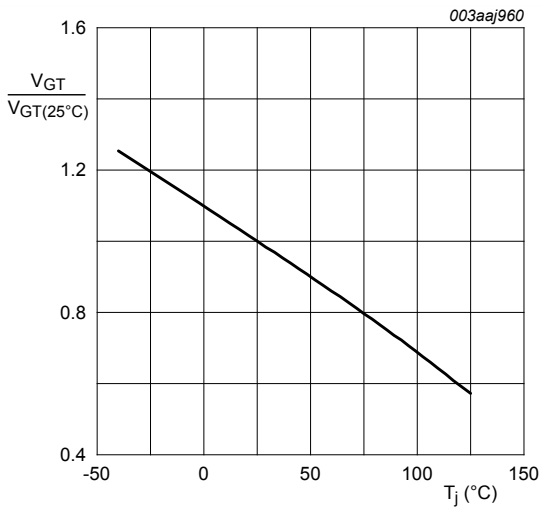
**Fig. 9. Normalized holding current as a function of junction temperature**



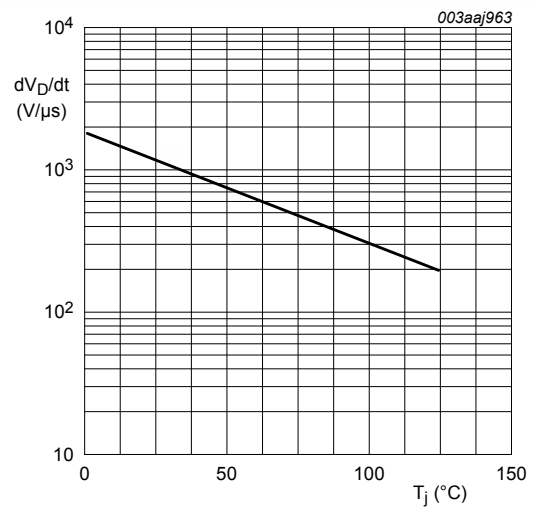
$V_o = 1.12 \text{ V}; R_s = 0.015 \Omega$

- (1)  $T_j = 125^\circ\text{C}$ ; typical values
- (2)  $T_j = 125^\circ\text{C}$ ; maximum values
- (3)  $T_j = 25^\circ\text{C}$ ; maximum values

**Fig. 10. On-state current as a function of on-state voltage**



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



gate open circuit

**Fig. 12. Critical rate of rise of off-state voltage as a function of junction temperature; minimum values**

### 11. Package outline

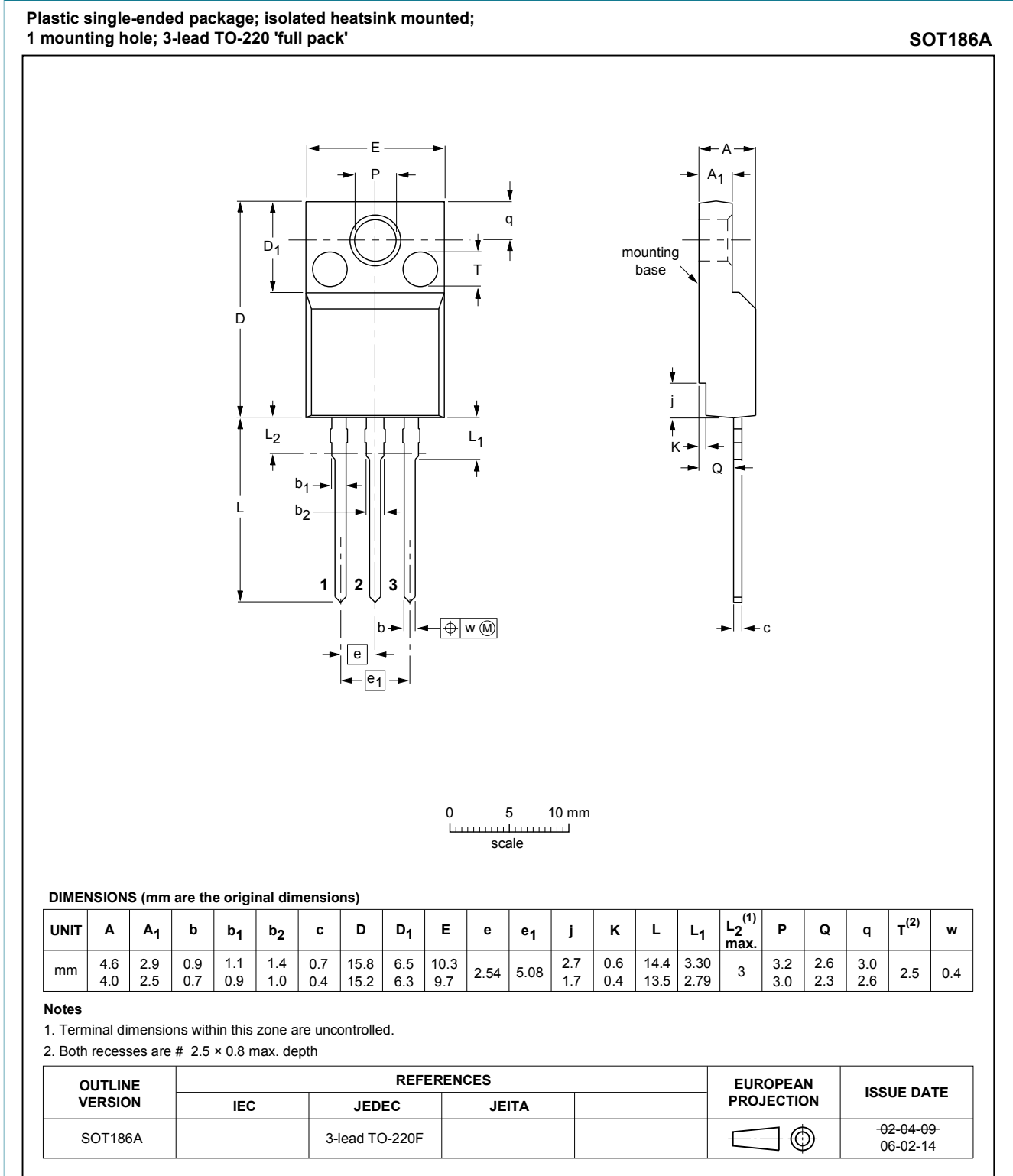


Fig. 13. Package outline TO-220F (SOT186A)

## 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.

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