

BT151X-800R

SCR

24 July 2012

Product data sheet

1. Product profile

1.1 General description

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

1.2 Features and benefits

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

1.3 Applications

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

1.4 Quick reference data

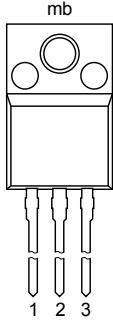

Table 1. Quick reference data

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; $T_{j(init)} = 25\text{ °C}$; $t_p = 10\text{ ms}$; Fig. 4 ; Fig. 5	-	-	120	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_h \leq 69\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3	-	-	12	A
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 25\text{ °C}$; Fig. 7	-	2	15	mA



2. Pinning information

Table 2. Pinning information

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

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BT151X-800R	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack"	SOT186A
BT151X-800R/DG	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack"	SOT186A

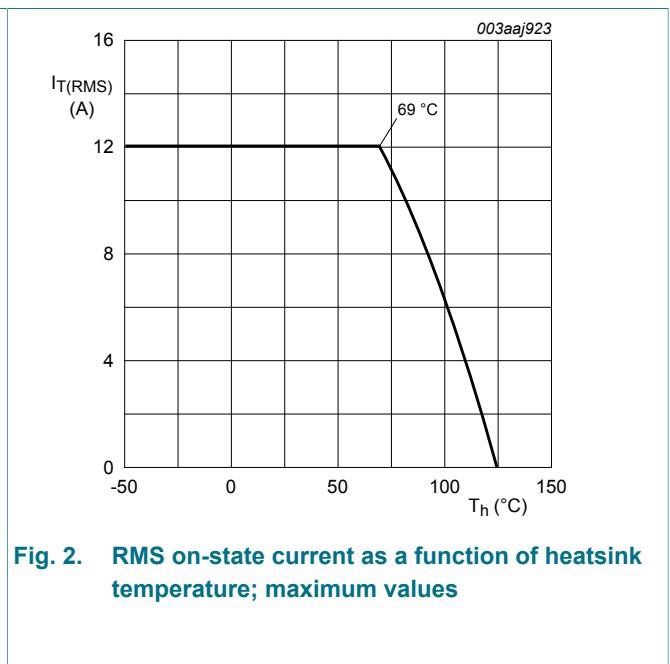
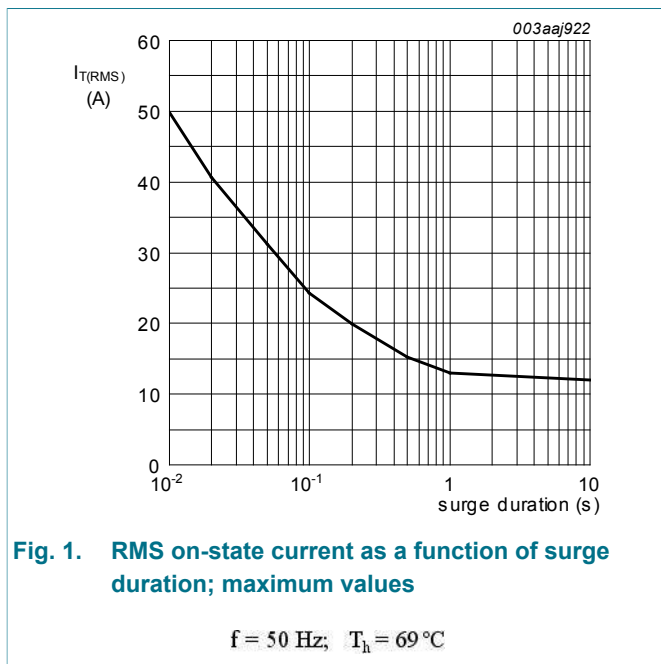
4. Limiting values

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; $T_n \leq 69\text{ }^\circ\text{C}$	-	7.5	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_n \leq 69\text{ }^\circ\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3	-	12	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; $t_p = 10\text{ ms}$; Fig. 4 ; Fig. 5	-	120	A
		half sine wave; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; $t_p = 8.3\text{ ms}$	-	132	A
I^2t	I^2t for fusing	$t_p = 10\text{ ms}$; SIN	-	72	A ² s

Symbol	Parameter	Conditions	Min	Max	Unit
di_T/dt	rate of rise of on-state current	$I_T = 20\text{ A}$; $I_G = 50\text{ mA}$; $di_G/dt = 50\text{ mA}/\mu\text{s}$	-	50	A/ μs
I_{GM}	peak gate current		-	2	A
V_{RGM}	peak reverse gate voltage		-	5	V
P_{GM}	peak gate power		-	5	W
$P_{G(AV)}$	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	$^{\circ}\text{C}$



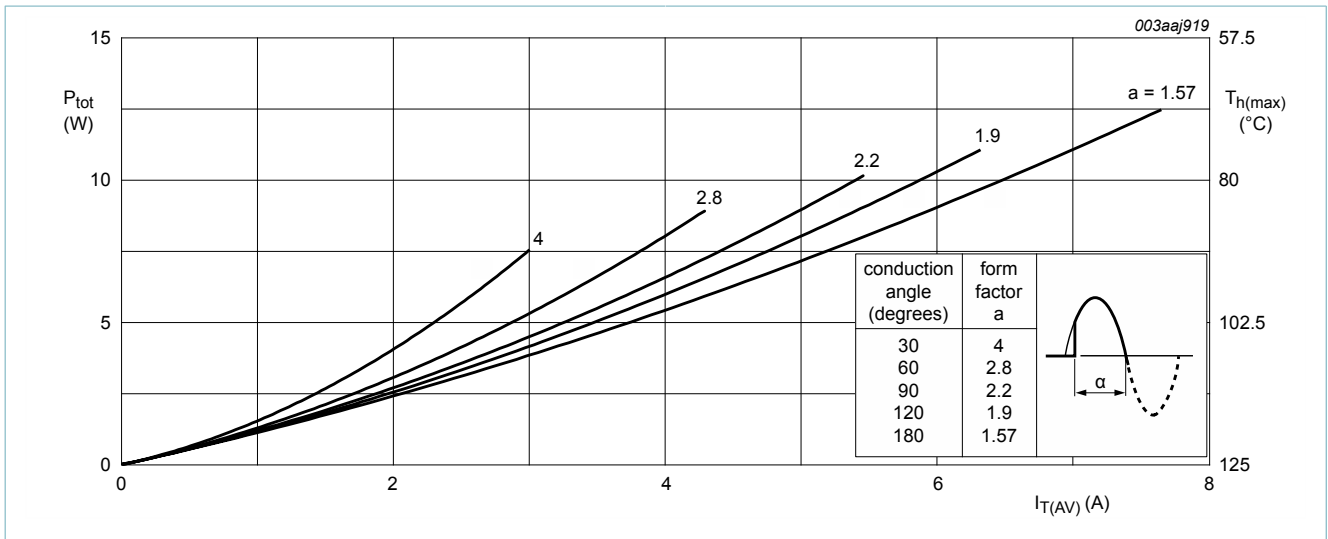


Fig. 3. Total power dissipation as a function of average on-state current; maximum values

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

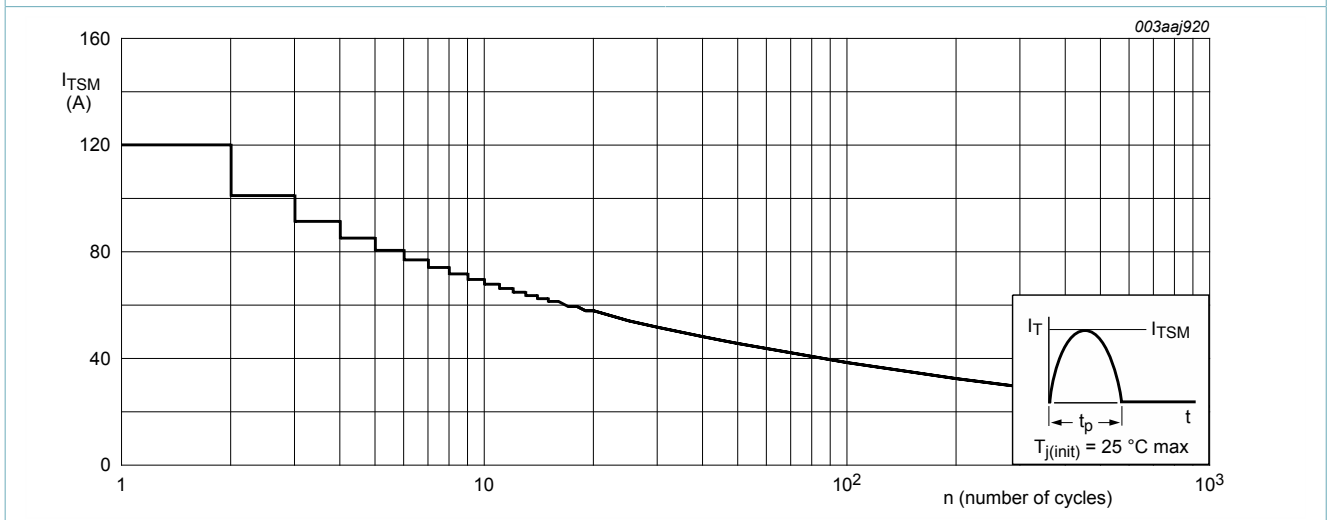
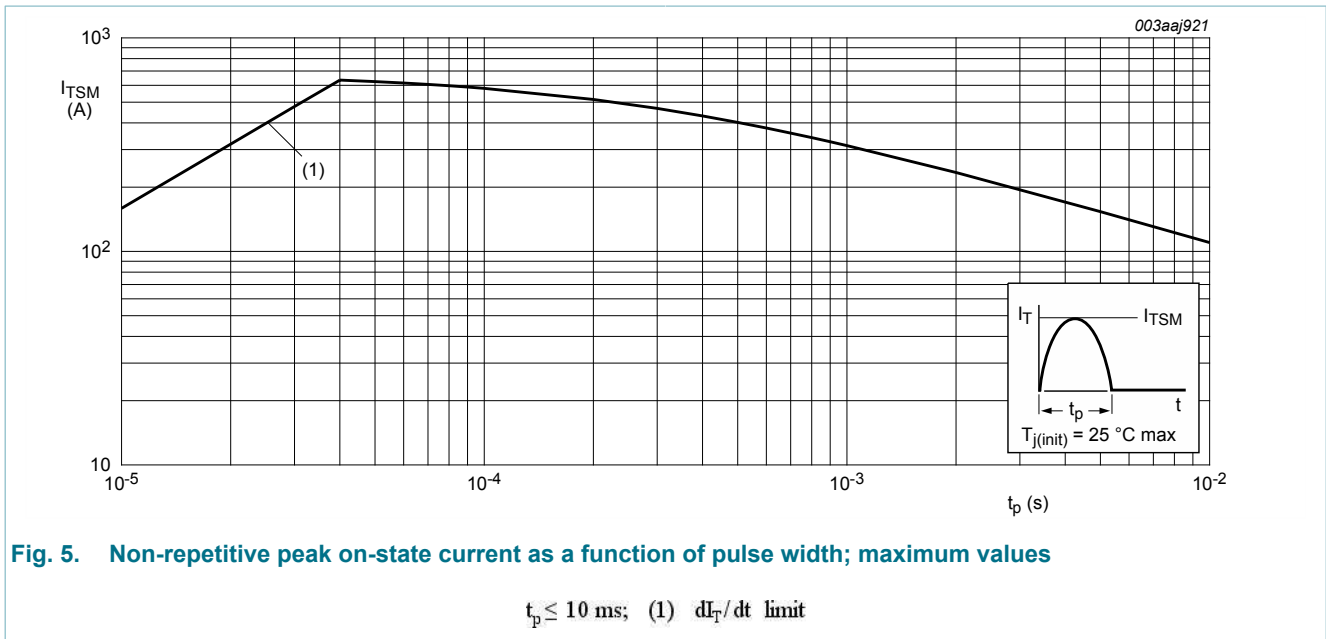


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

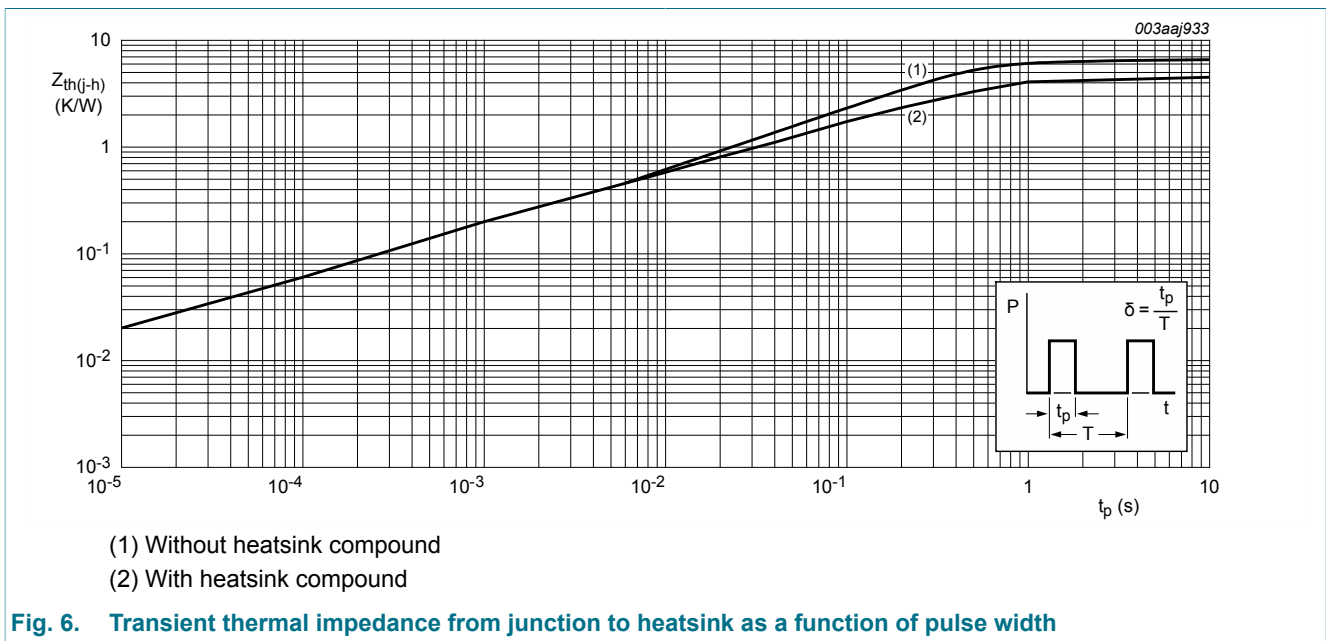
f = 50 Hz



5. 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; Fig. 6	-	-	4.5	K/W
		without heatsink compound; Fig. 6	-	-	6.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	55	-	K/W



6. Isolation characteristics

Table 6. Isolation characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{\text{isol(RMS)}}$	RMS isolation voltage	from all terminals to external heatsink; sinusoidal waveform; clean and dust free ; 50 Hz \leq f \leq 60 Hz; RH \leq 65 %; $T_h = 25\text{ }^\circ\text{C}$	-	-	2500	V
C_{isol}	isolation capacitance	from anode to external heatsink ; f = 1 MHz; $T_h = 25\text{ }^\circ\text{C}$	-	10	-	pF

7. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 7	-	2	15	mA
I_L	latching current	$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 8	-	10	40	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 9	-	7	20	mA
V_T	on-state voltage	$I_T = 23\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 10	-	1.4	1.75	V
V_{GT}	gate trigger voltage	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 11	-	0.6	1.5	V
		$V_D = 800\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 125\text{ }^\circ\text{C}$; 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
I_R	reverse current	$T_j = 125\text{ }^\circ\text{C}$; $V_R = 800\text{ V}$	-	0.1	0.5	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{\text{DM}} = 536\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $R_{\text{GK}} = 100\text{ }\Omega$; exponential waveform; ($V_{\text{DM}} = 67\%$ of V_{DRM}); Fig. 12	200	1000	-	V/ μs
		$V_{\text{DM}} = 536\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; exponential waveform; gate open circuit; ($V_{\text{DM}} = 67\%$ of V_{DRM}); Fig. 12	50	130	-	V/ μs
t_{gt}	gate-controlled turn-on time	$I_{\text{TM}} = 40\text{ A}$; $V_D = 800\text{ V}$; $I_G = 100\text{ mA}$; $di_G/dt = 5\text{ A}/\mu\text{s}$; $T_j = 25\text{ }^\circ\text{C}$	-	2	-	μs
t_q	commutated turn-off time	$V_{\text{DM}} = 536\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $I_{\text{TM}} = 20\text{ A}$; $V_R = 25\text{ V}$; $(di_T/dt)_M = 30\text{ A}/\mu\text{s}$; $dV_D/dt = 50\text{ V}/\mu\text{s}$; $R_{\text{GK}} = 100\text{ }\Omega$; ($V_{\text{DM}} = 67\%$ of V_{DRM})	-	70	-	μs

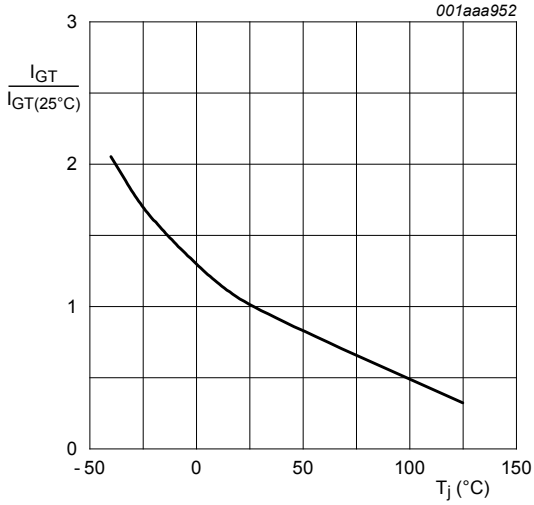


Fig. 7. Normalized gate trigger current as a function of junction temperature

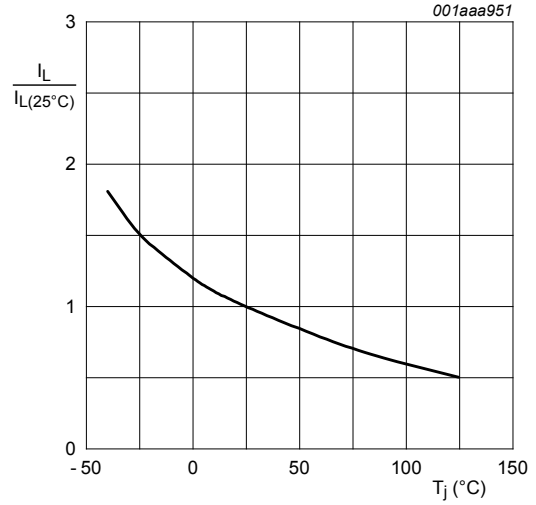


Fig. 8. Normalized latching current as a function of junction temperature

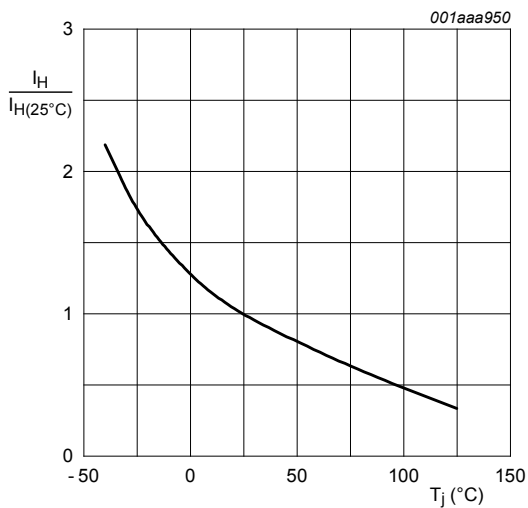
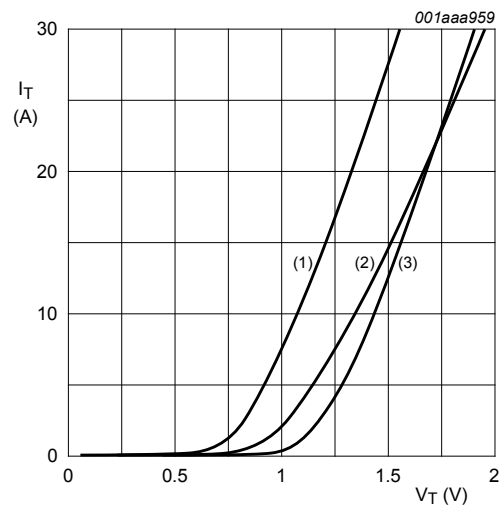


Fig. 9. Normalized holding current as a function of junction temperature



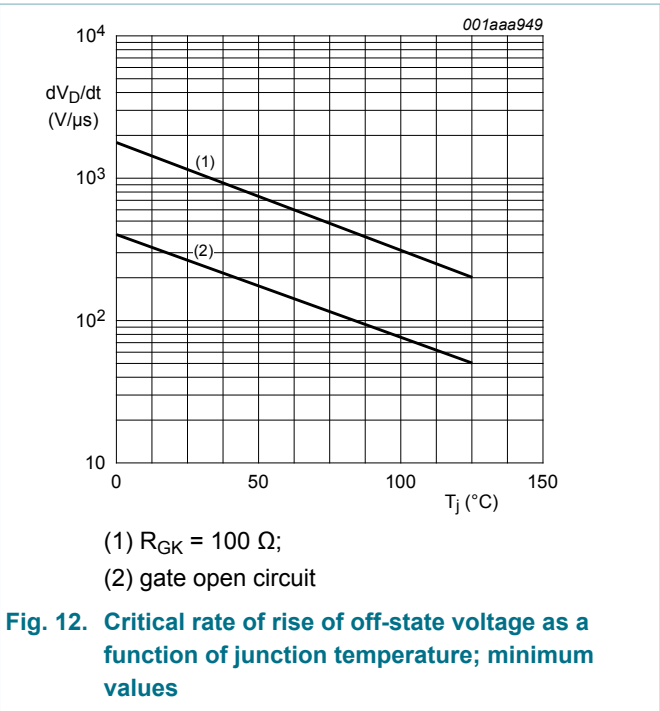
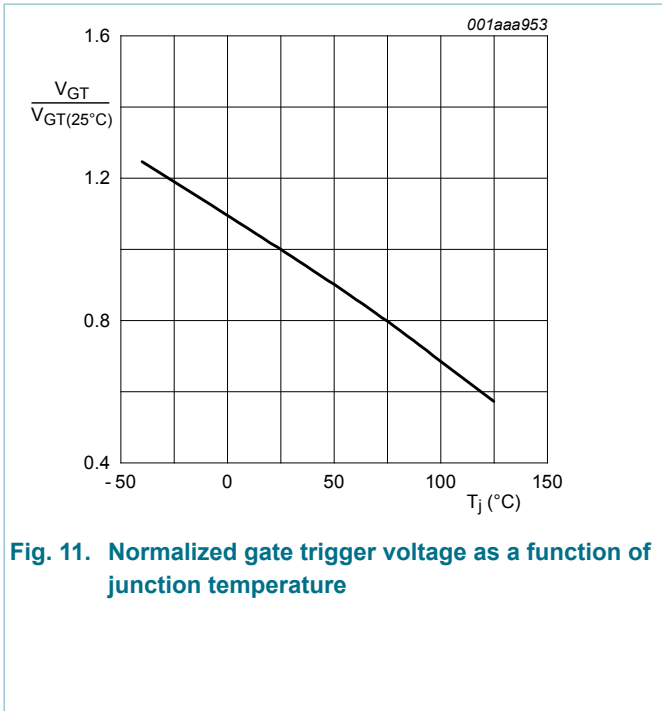
$V_o = 1.06 \text{ V}; R_s = 0.0304 \ \Omega$

(1) $T_j = 125 \text{ }^\circ\text{C}$; typical values

(2) $T_j = 125 \text{ }^\circ\text{C}$; maximum values

(3) $T_j = 25 \text{ }^\circ\text{C}$; maximum values

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



8. Package outline

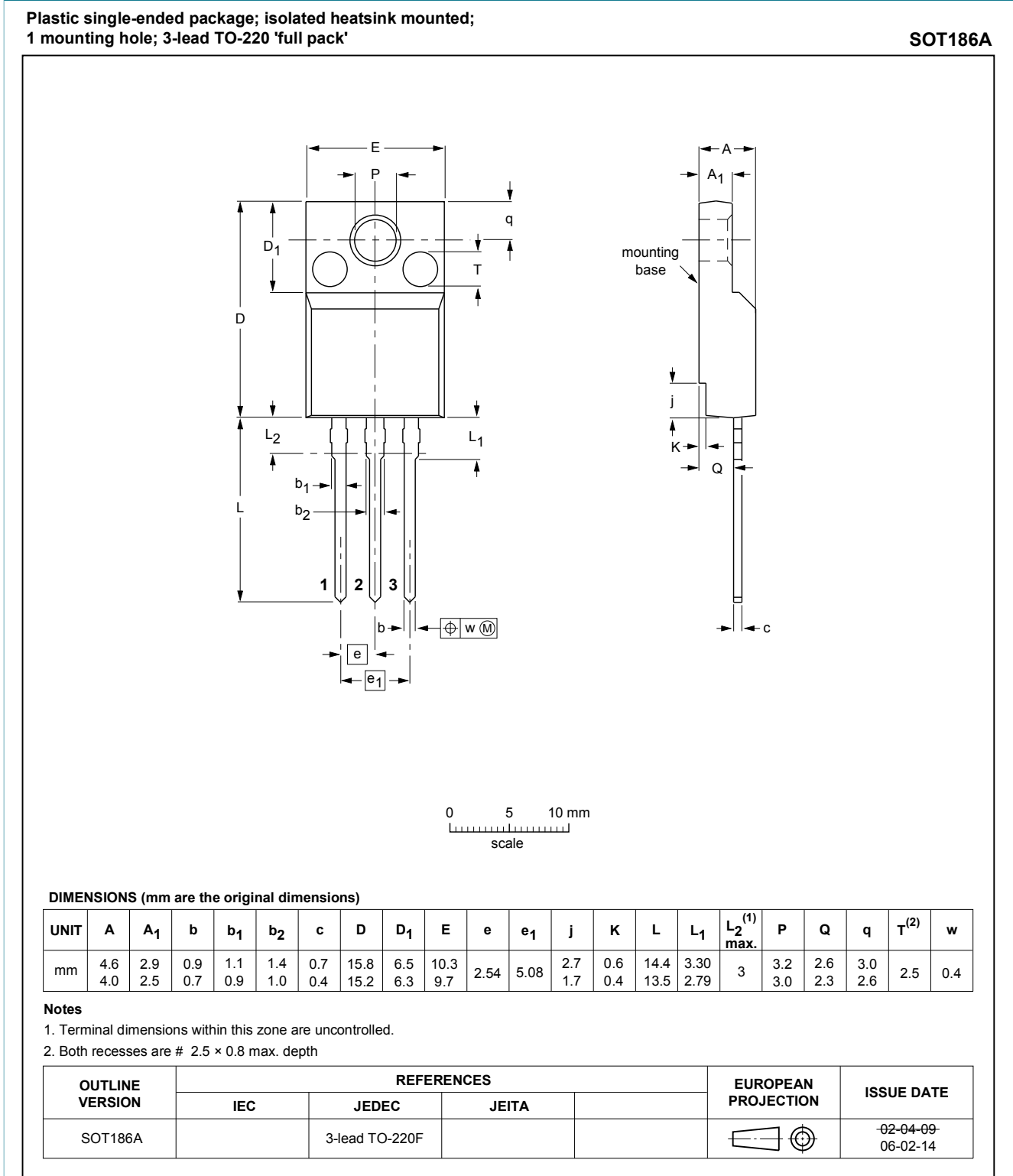


Fig. 13. TO-220F (SOT186A)

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Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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