

## 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 thermal cycling performance and high junction temperature capability ( $T_{j(max)} = 150\text{ °C}$ ).

## 2. Features and benefits

- High junction operating temperature capability
- High thermal cycling performance
- High voltage capability
- Planar passivated for voltage ruggedness and reliability

## 3. Applications

- Ignition circuits
- Motor control
- Protection circuits e.g. SMPS inrush current
- Voltage regulation

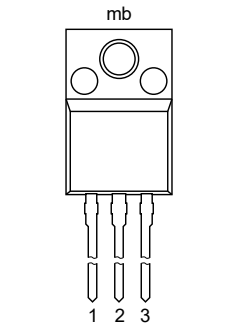

## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	-	600	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_h \leq 81\text{ °C}$ ; <a href="#">Fig. 1</a>	-	-	10.2	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_h \leq 81\text{ °C}$ ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	-	16	A
$I_{TSM}$	non-repetitive peak on-state current	half sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 10\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	-	180	A
		half sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 8.3\text{ ms}$	-	-	198	A
$T_j$	junction temperature		-	-	150	°C
<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	mA
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$ ; $T_j = 150\text{ °C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit	500	-	-	V/ $\mu$ s

## 5. 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		

## 6. Ordering information

Table 3. Ordering information

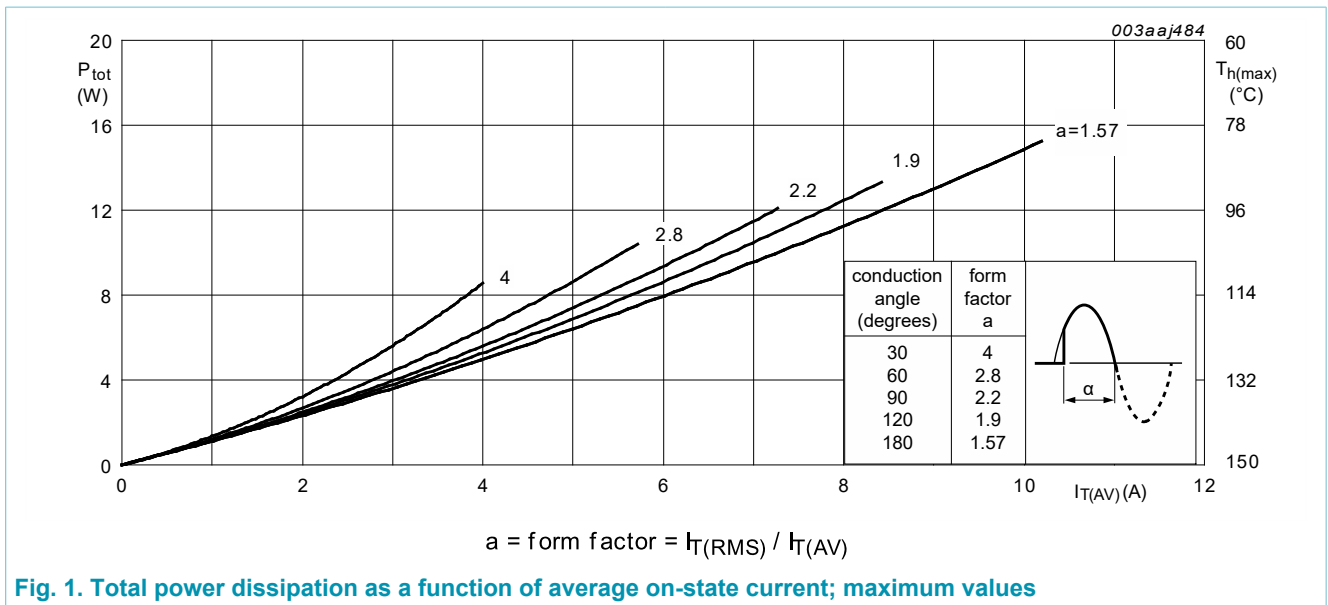
Type number	Package		Version
	Name	Description	
TYN16X-600CT	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack"	SOT186A

## 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
$V_{RRM}$	repetitive peak reverse voltage		-	600	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_h \leq 81\text{ }^\circ\text{C}$ ; Fig. 1	-	10.2	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_h \leq 81\text{ }^\circ\text{C}$ ; Fig. 2; Fig. 3	-	16	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	-	180	A
		half sine wave; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; $t_p = 8.3\text{ ms}$	-	198	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; SIN	-	162	A <sup>2</sup> s
$dl_T/dt$	rate of rise of on-state current	$I_G = 30\text{ mA}$	-	50	A/ $\mu\text{s}$
$I_{GM}$	peak gate current		-	4	A
$V_{RGM}$	peak reverse gate voltage		-	5	V
$P_{GM}$	peak gate power		-	10	W
$P_{G(AV)}$	average gate power	over any 20 ms period	-	1	W
$T_{stg}$	storage temperature		-40	150	$^\circ\text{C}$
$T_j$	junction temperature		-	150	$^\circ\text{C}$



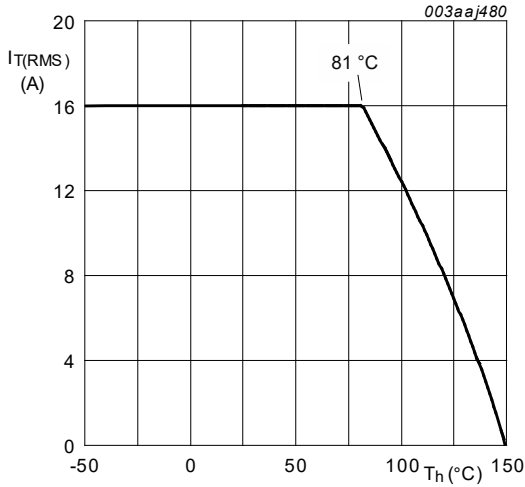


Fig. 2. RMS on-state current as a function of heatsink temperature; maximum values

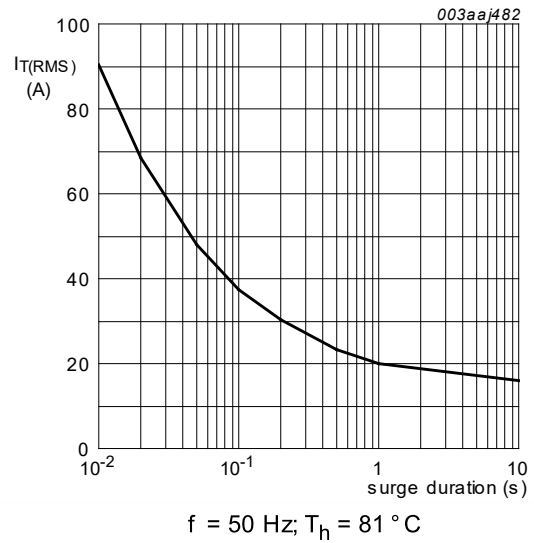


Fig. 3. RMS on-state current as a function of surge duration; maximum values

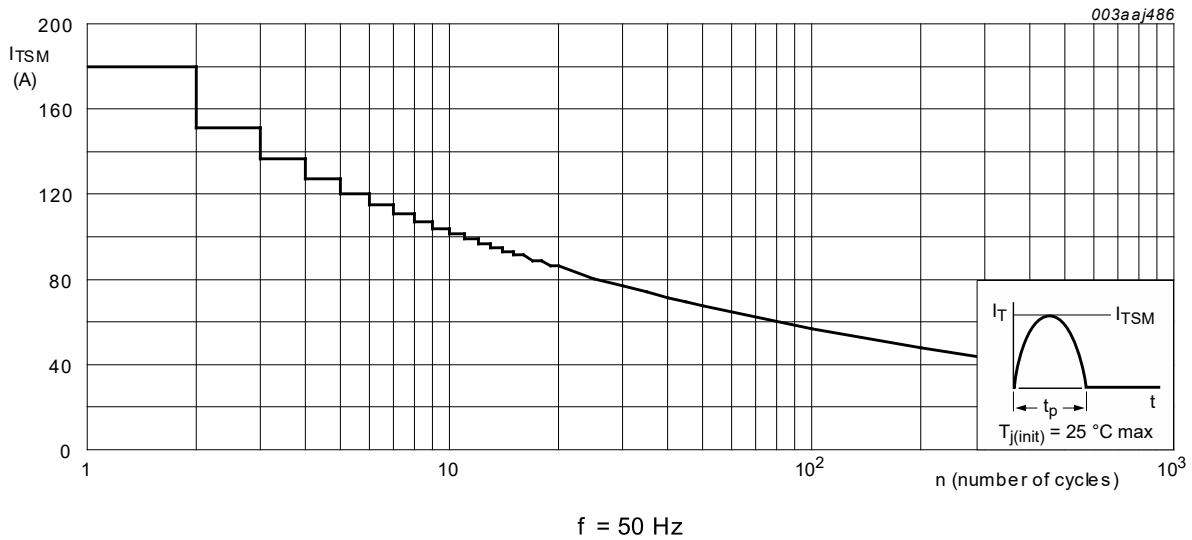
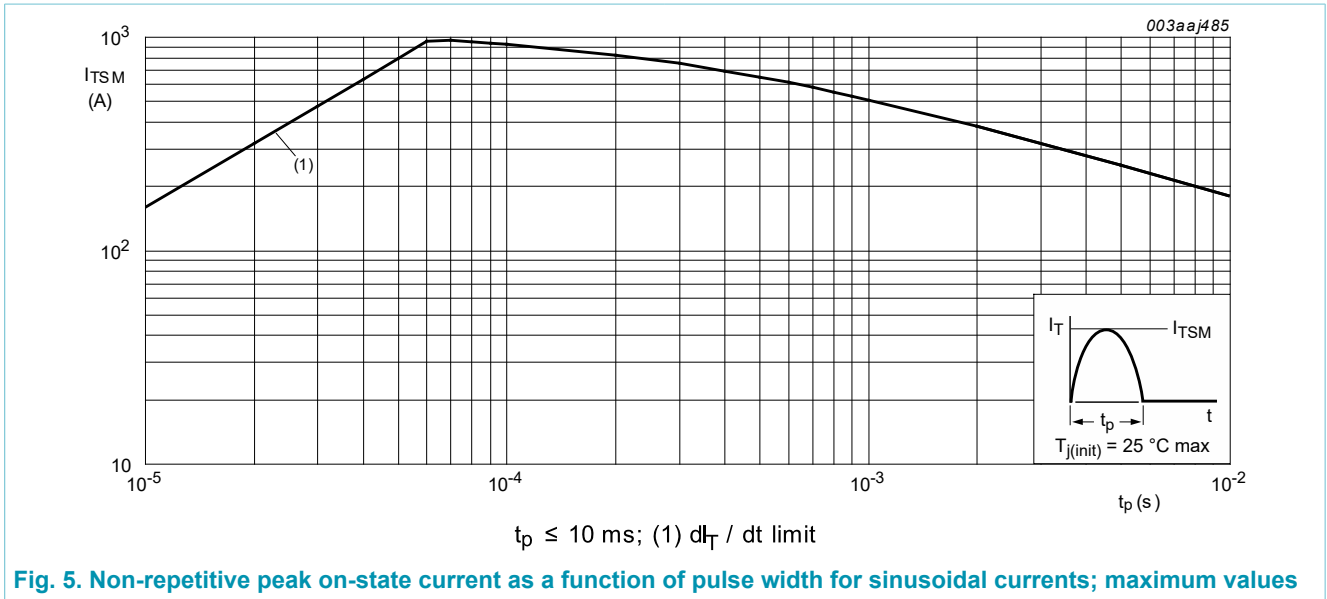


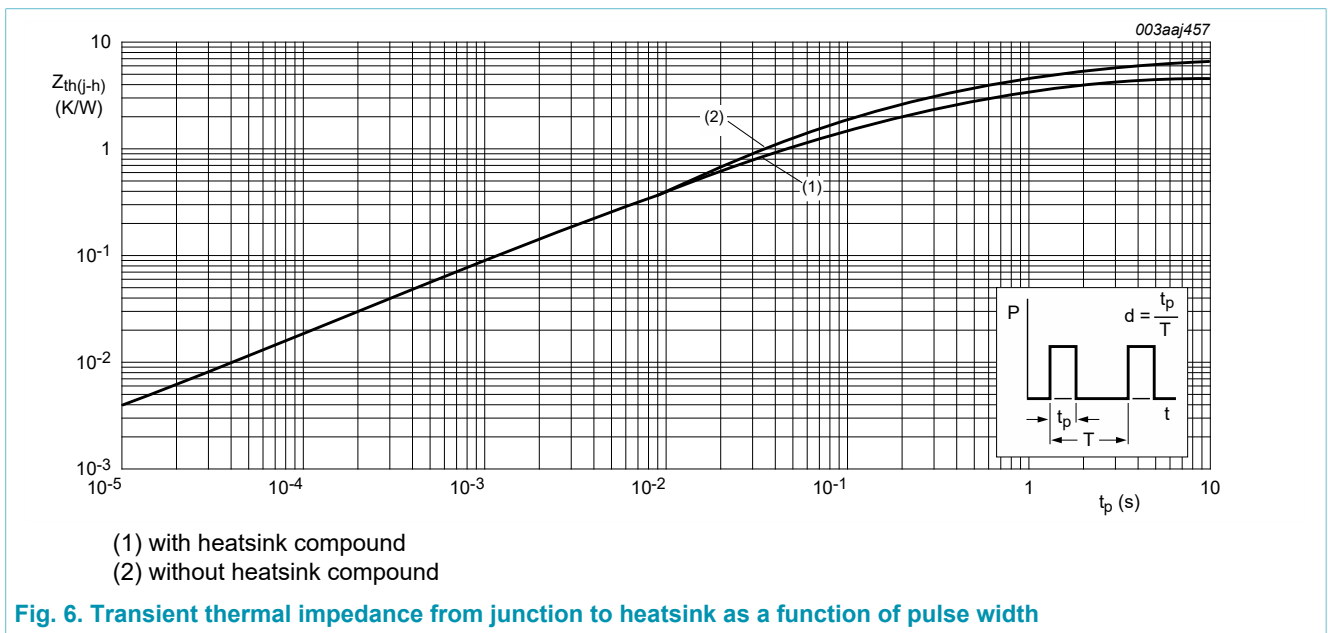
Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



### 8. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
R <sub>th(j-h)</sub>	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 <sub>th(j-a)</sub>	thermal resistance from junction to ambient free air	in free air	-	55	-	K/W



### 9. Isolation characteristics

Table 6. Isolation characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>isol(RMS)</sub>	RMS isolation voltage	from all terminals to external heatsink; sinusoidal waveform; clean and dust free; 50 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; T <sub>h</sub> = 25 °C	-	-	2500	V
C <sub>isol</sub>	isolation capacitance	from anode to external heatsink; f = 1 MHz; T <sub>h</sub> = 25 °C	-	10	-	pF

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T_j = 25\text{ }^\circ\text{C};$ Fig. 7	-	-	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	-	-	60	mA
$I_H$	holding current	$V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C};$ Fig. 9	-	-	40	mA
$V_T$	on-state voltage	$I_T = 32\text{ A}; T_j = 25\text{ }^\circ\text{C};$ Fig. 10	-	1.2	1.6	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	1.3	V
		$V_D = 400\text{ V}; I_T = 0.1\text{ A}; T_j = 150\text{ }^\circ\text{C};$ Fig. 11	0.2	0.4	-	V
$I_D$	off-state current	$V_D = 600\text{ V}; T_j = 150\text{ }^\circ\text{C}$	-	0.2	1	mA
$I_R$	reverse current	$V_R = 600\text{ V}; T_j = 150\text{ }^\circ\text{C}$	-	0.2	1	mA
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}; T_j = 150\text{ }^\circ\text{C}; (V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit	500	-	-	V/ $\mu$ s
$t_{gt}$	gate-controlled turn-on time	$I_{TM} = 40\text{ A}; V_D = 600\text{ V}; I_G = 100\text{ mA};$ $dI_G/dt = 5\text{ A}/\mu\text{s}; T_j = 25\text{ }^\circ\text{C}$	-	2	-	$\mu$ s
$t_q$	commutated turn-off time	$V_{DM} = 402\text{ V}; T_j = 125\text{ }^\circ\text{C}; I_{TM} = 20\text{ A};$ $V_R = 25\text{ V}; (dI_T/dt)_M = 30\text{ A}/\mu\text{s}; dV_D/dt = 50\text{ V}/\mu\text{s};$ $R_{GK(ext)} = 100\text{ }\Omega; (V_{DM} = 67\%$ of $V_{DRM})$	-	70	-	$\mu$ s

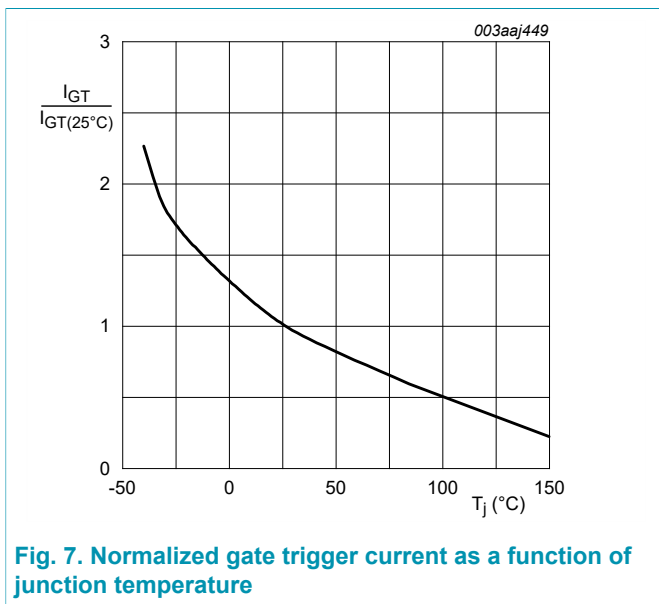


Fig. 7. Normalized gate trigger current as a function of junction temperature

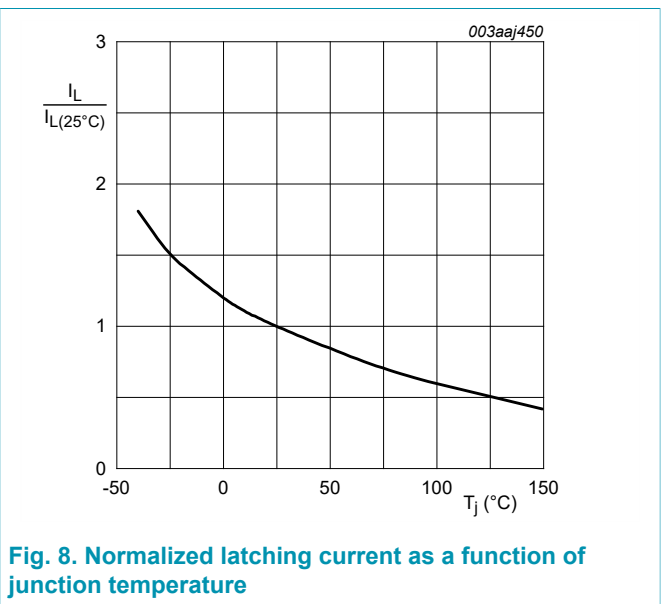


Fig. 8. Normalized latching current as a function of junction temperature

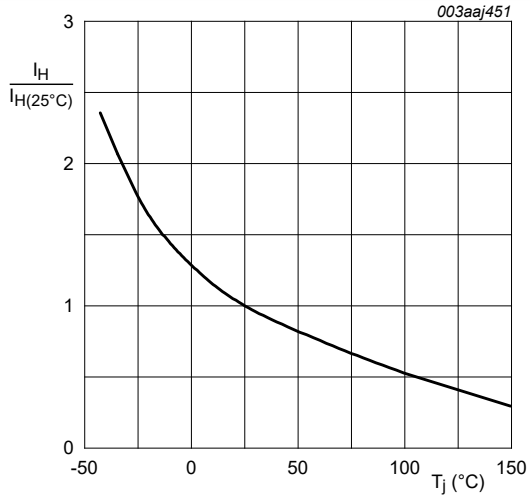
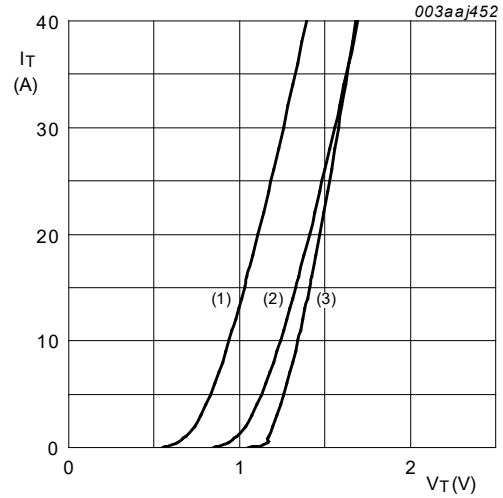


Fig. 9. Normalized holding current as a function of junction temperature



$V_o = 1.08 \text{ V}; R_s = 0.0165 \Omega$

(1)  $T_j = 150^\circ\text{C}$ ; typical values

(2)  $T_j = 150^\circ\text{C}$ ; maximum values

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

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

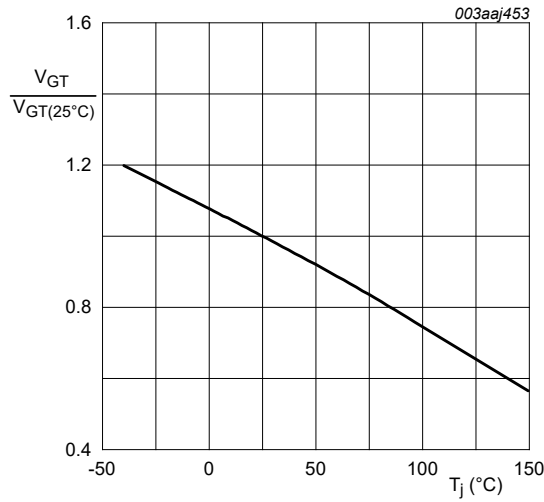


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

### 11. Package outline

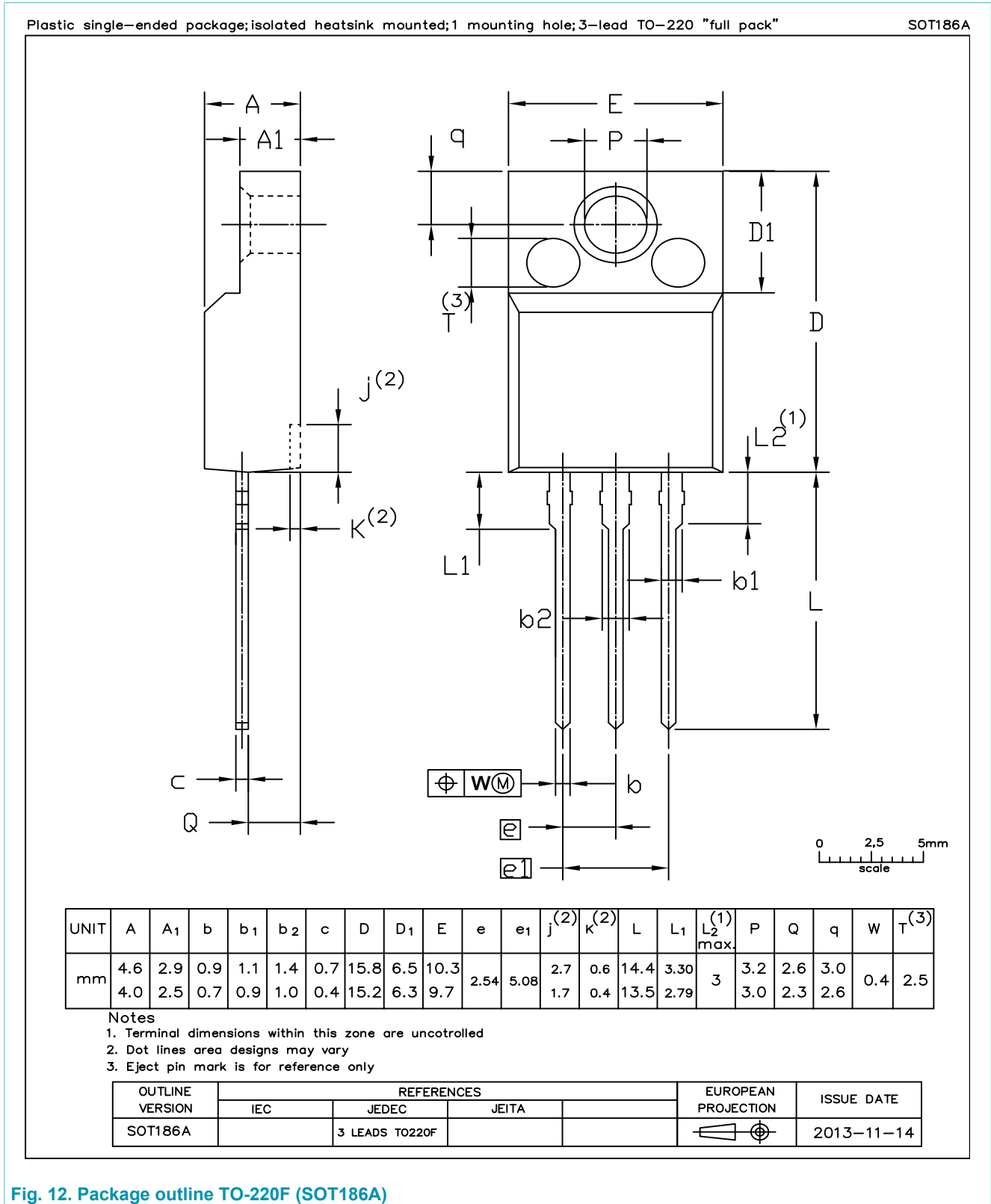


Fig. 12. Package outline TO-220F (SOT186A)

## 12. Legal information

### 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.
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### 13. Contents

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- 1. General description..... 1
- 2. Features and benefits..... 1
- 3. Applications..... 1
- 4. Quick reference data..... 1
- 5. Pinning information.....2
- 6. Ordering information.....2
- 7. Limiting values..... 3
- 8. Thermal characteristics..... 6
- 9. Isolation characteristics.....6
- 10. Characteristics.....7
- 11. Package outline..... 9
- 12. Legal information..... 10

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