

## 1. General description

Planar passivated Silicon Controlled Rectifier in a TO247 Plus plastic package intended for use in applications requiring very high inrush current capability and high thermal cycling performance

## 2. Features and benefits

- High junction operating temperature capability ( $T_{j(max)} = 150\text{ }^{\circ}\text{C}$ )
- Very high current surge capability
- Planar passivated for voltage ruggedness and reliability
- High thermal cycling performance
- High voltage capability

## 3. Applications

- Line rectifying 50/60 Hz
- Softstart AC motor control
- DC Motor control
- Power converter
- AC power control
- Lighting and temperature control
- Uninterruptible Power Supply (UPS)
- Solid State Relay (SSR)
- Traction battery charging

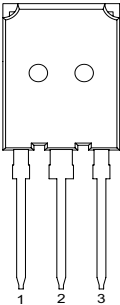

## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
$V_{DRM}$	repetitive peak off-state voltage			1600			V
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 97\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>		250			A
$I_{TSM}$	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>		1600			A
		half sine wave; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 8.3\text{ ms}$		1760			A
$T_j$	operating junction temperature			-40 to 150			$^{\circ}\text{C}$
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
<b>Static characteristics</b>							
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.2\text{ A}$ ; $T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 7</a>		15	-	100	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 9</a>		-	-	200	mA
$V_T$	on-state voltage	$I_T = 160\text{ A}$ ; $T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 11</a>		-	-	1.50	V
<b>Dynamic characteristics</b>							
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 1072\text{ V}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit; $T_j = 150\text{ }^{\circ}\text{C}$		1500	-	-	V/ $\mu\text{s}$

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode		
2	A	anode		
3	G	gate		
mb	A	mounting base; connected to anode		

6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
TYN160WP-1600T	TO247P	TYN160WP-1600TQ	Tube	30	TO247PN	25-Jun-2024

7. Marking

Table 4. Marking codes

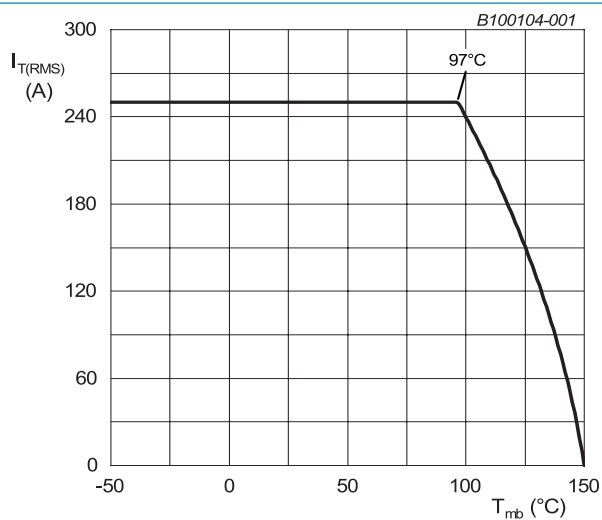
Type number	Marking codes
TYN160WP-1600T	TYN160WP 1600T

## 8. Limiting values

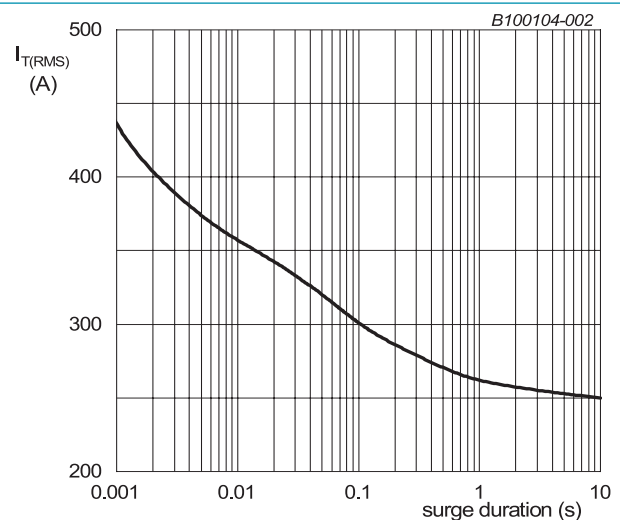
**Table 5. Limiting values**

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

Symbol	Parameter	Conditions	Notes	Values	Unit
$V_{\text{DRM}}$	repetitive peak off-state voltage			1600	V
$V_{\text{RRM}}$	repetitive peak reverse voltage			1600	V
$I_{\text{T(AV)}}$	average on-state current	half sine wave; $T_{\text{mb}} \leq 97\text{ }^{\circ}\text{C}$ ;		160	A
$I_{\text{T(RMS)}}$	RMS on-state current	half sine wave; $T_{\text{mb}} \leq 97\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>		250	A
$I_{\text{TSM}}$	non-repetitive peak on-state current	half sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$ ; $t_{\text{p}} = 10\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>		1600	A
		half sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$ ; $t_{\text{p}} = 8.3\text{ ms}$		1760	A
$I^2t$	$I^2t$ for fusing	$t_{\text{p}} = 10\text{ ms}$ ; sine-wave pulse		12800	$\text{A}^2\text{s}$
$di_{\text{T}}/dt$	rate of rise of on-state current	$I_{\text{G}} = 200\text{ mA}$		200	$\text{A}/\mu\text{s}$
$I_{\text{GM}}$	peak gate current			10	A
$V_{\text{GRM}}$	peak reverse gate voltage			5	V
$P_{\text{GM}}$	peak gate power			20	W
$P_{\text{G(AV)}}$	average gate power	over any 20 ms period		0.5	W
$T_{\text{stg}}$	storage temperature			-40 to 150	$^{\circ}\text{C}$
$T_{\text{j}}$	operating junction temperature			-40 to 150	$^{\circ}\text{C}$



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



$f = 50\text{ Hz}$ ;  $T_{\text{mb}} = 97\text{ }^{\circ}\text{C}$

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

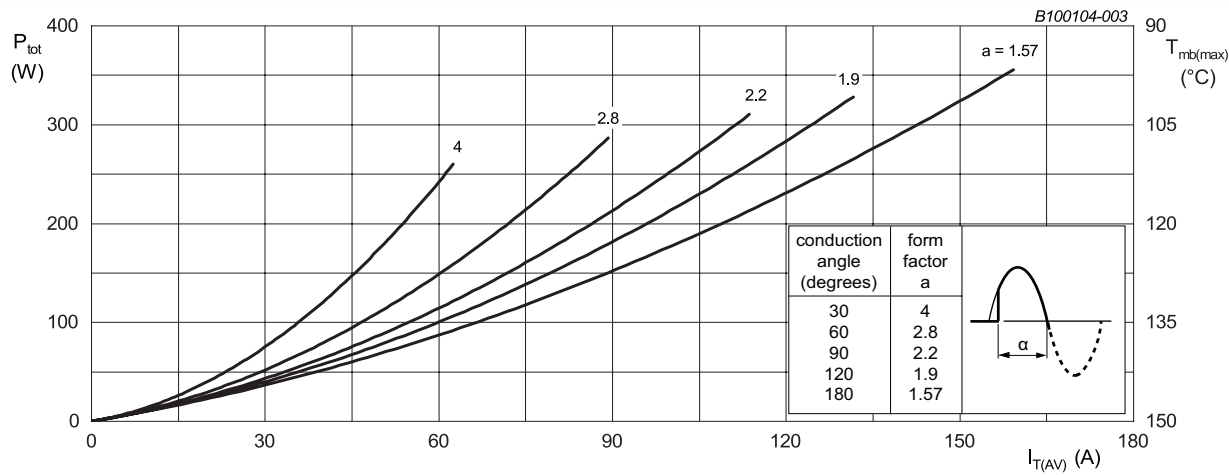
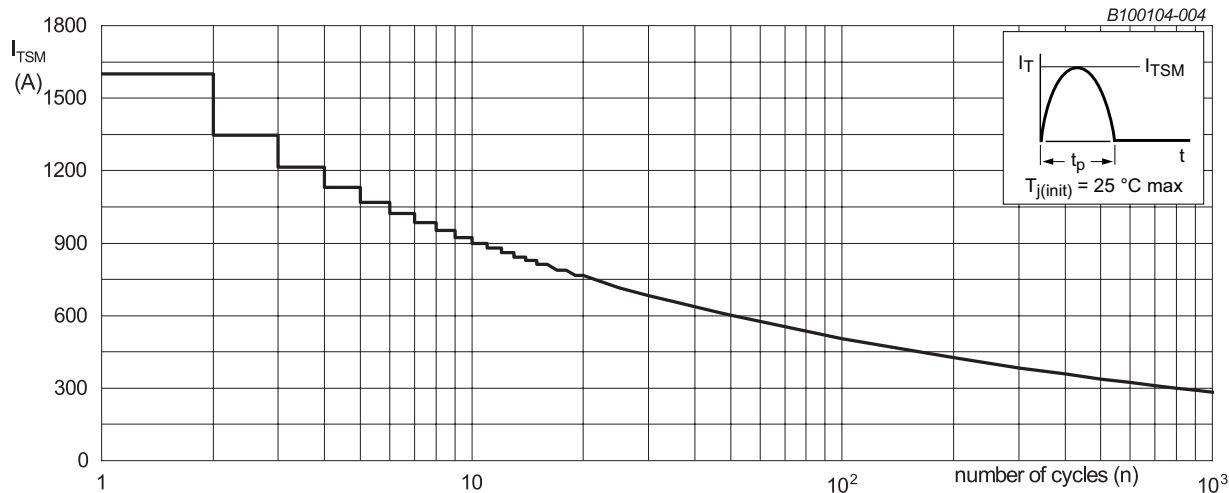
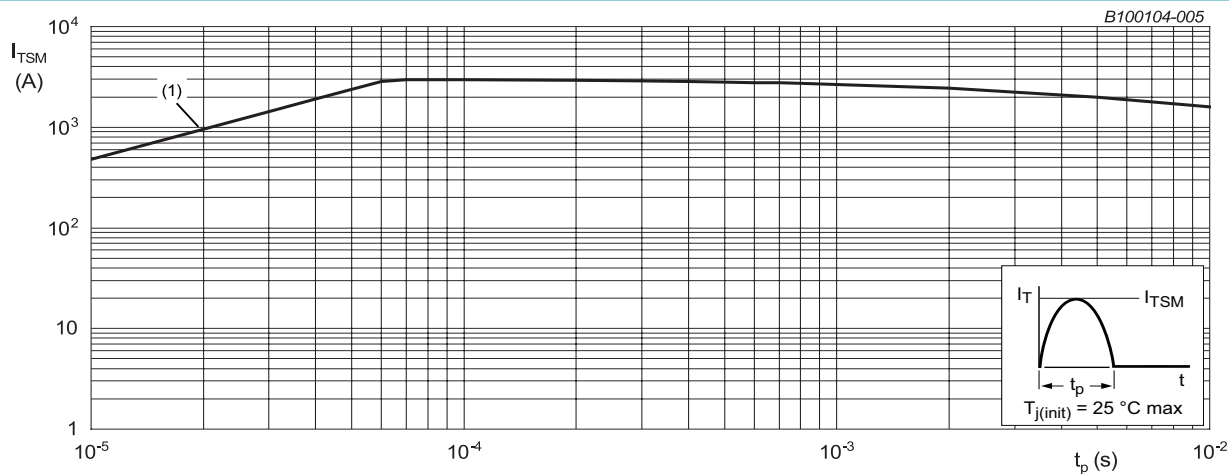


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values



$f = 50\text{ Hz}$

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



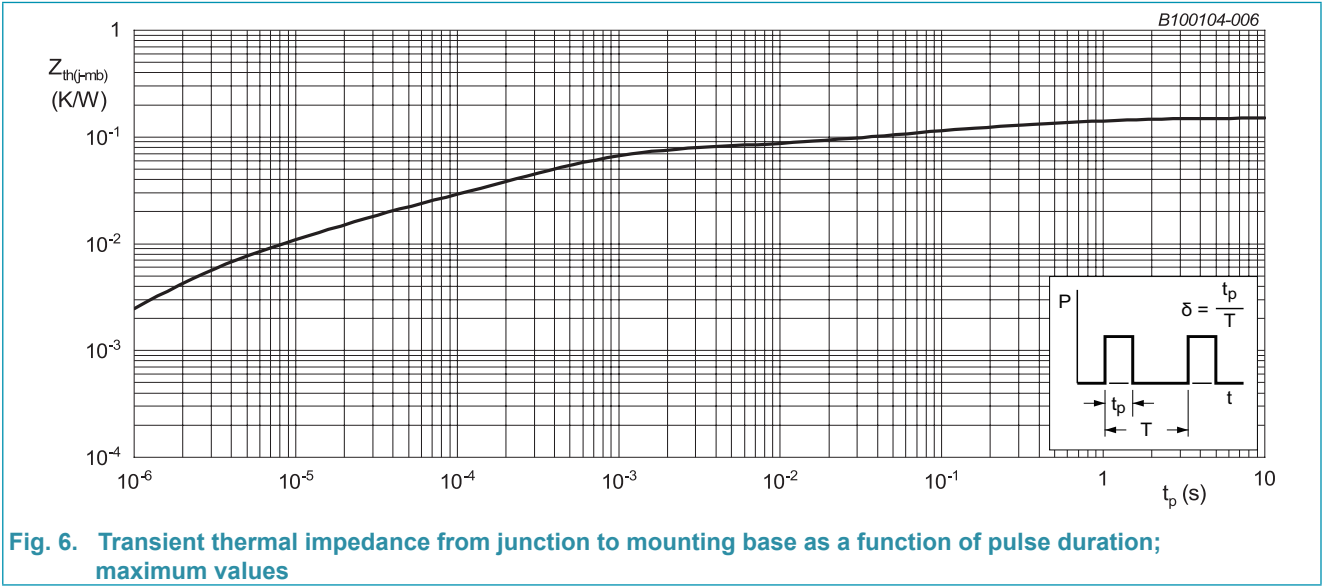
$t_p \leq 10\text{ ms}$   
(1)  $di_T/dt$  limit

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

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	<a href="#">Fig. 6</a>		-	-	0.15	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	45	-	K/W



## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
I <sub>GT</sub>	gate trigger current	V <sub>D</sub> = 12 V; I <sub>T</sub> = 0.2 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>		15	-	100	mA
I <sub>L</sub>	latching current	V <sub>D</sub> = 12 V; I <sub>G</sub> = 0.2 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 8</a>		-	-	300	mA
I <sub>H</sub>	holding current	V <sub>D</sub> = 12 V; T <sub>j</sub> = 25 °C; <a href="#">Fig. 9</a>		-	-	200	mA
V <sub>T</sub>	on-state voltage	I <sub>T</sub> = 160 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 11</a>		-	-	1.50	V
V <sub>GT</sub>	gate trigger voltage	V <sub>D</sub> = 12 V; I <sub>T</sub> = 0.2 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 10</a>		-	0.7	1.0	V
		V <sub>D</sub> = 1600 V; I <sub>T</sub> = 0.2 A; T <sub>j</sub> = 150 °C		0.25	0.45	-	V
I <sub>D</sub>	off-state current	V <sub>D</sub> = 1600 V; T <sub>j</sub> = 25 °C		-	-	100	μA
		V <sub>D</sub> = 1600 V; T <sub>j</sub> = 150 °C		-	-	15	mA
I <sub>R</sub>	reverse current	V <sub>D</sub> = 1600 V; T <sub>j</sub> = 25 °C		-	-	100	μA
		V <sub>D</sub> = 1600 V; T <sub>j</sub> = 150 °C		-	-	15	mA
Dynamic characteristics							
dV <sub>D</sub> /dt	rate of rise of off-state voltage	V <sub>DM</sub> = 1072 V; (V <sub>DM</sub> = 67% of V <sub>DRM</sub> ); exponential waveform; gate open circuit; T <sub>j</sub> = 150 °C		1500	-	-	V/μs
t <sub>gt</sub>	gate-controlled turn-on time	I <sub>TM</sub> = 50 A; V <sub>D</sub> = 800 V; I <sub>G</sub> = 0.2 A; dI <sub>G</sub> /dt = 5 A/μs; T <sub>j</sub> = 25 °C		-	2	-	μs
t <sub>q</sub>	commutated turn-off time	V <sub>DM</sub> = 1072 V; (V <sub>DM</sub> = 67% of V <sub>DRM</sub> ); I <sub>TM</sub> = 160 A; V <sub>R</sub> = 25 V; (d <sub>IT</sub> /d <sub>t</sub> ) <sub>M</sub> = 30 A/μs; dV <sub>D</sub> /dt = 50 V/μs; R <sub>GK(ext)</sub> = 100 kΩ; T <sub>j</sub> = 125 °C		-	150	-	μs

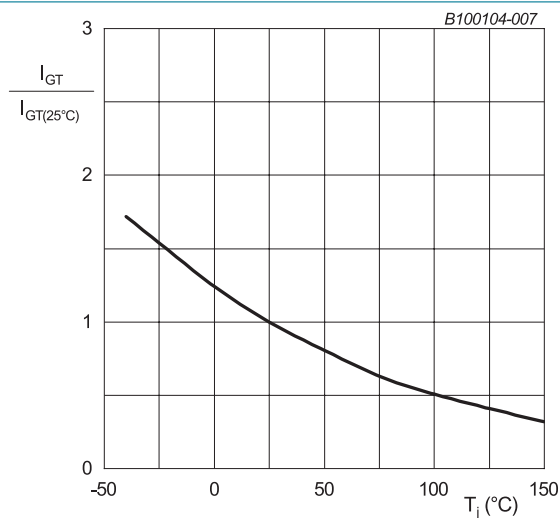


Fig. 7. Normalized gate trigger current as a function of junction temperature

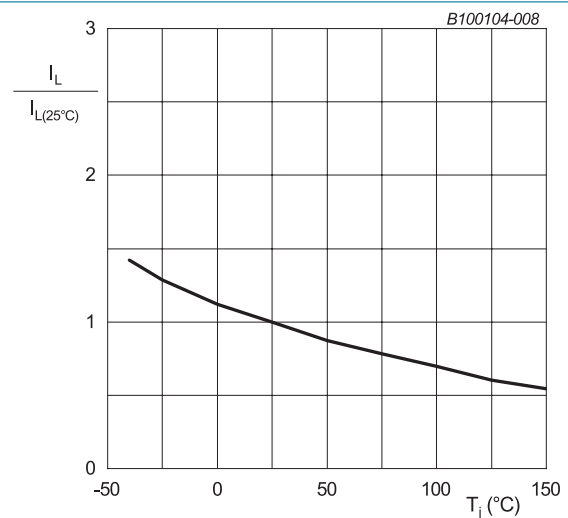


Fig. 8. Normalized latching current as a function of junction temperature

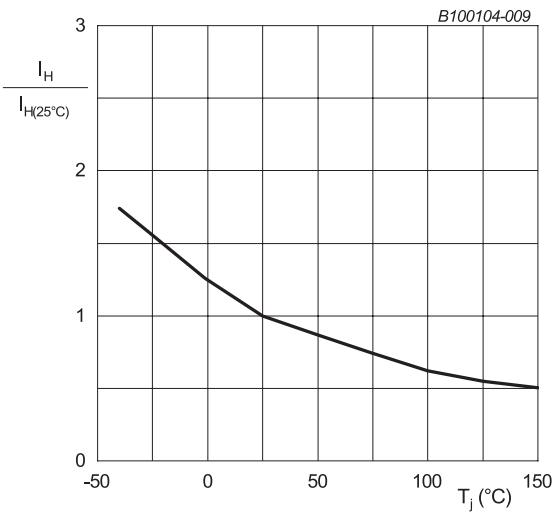


Fig. 9. Normalized holding current as a function of junction temperature

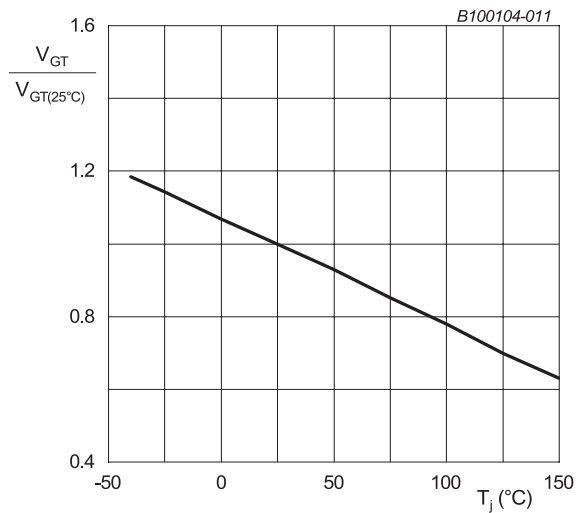
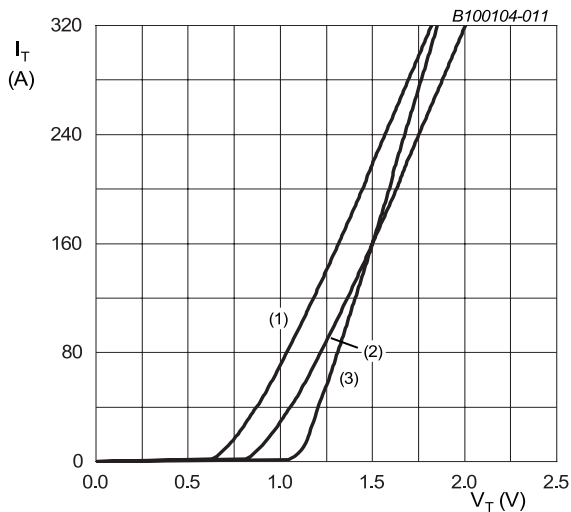


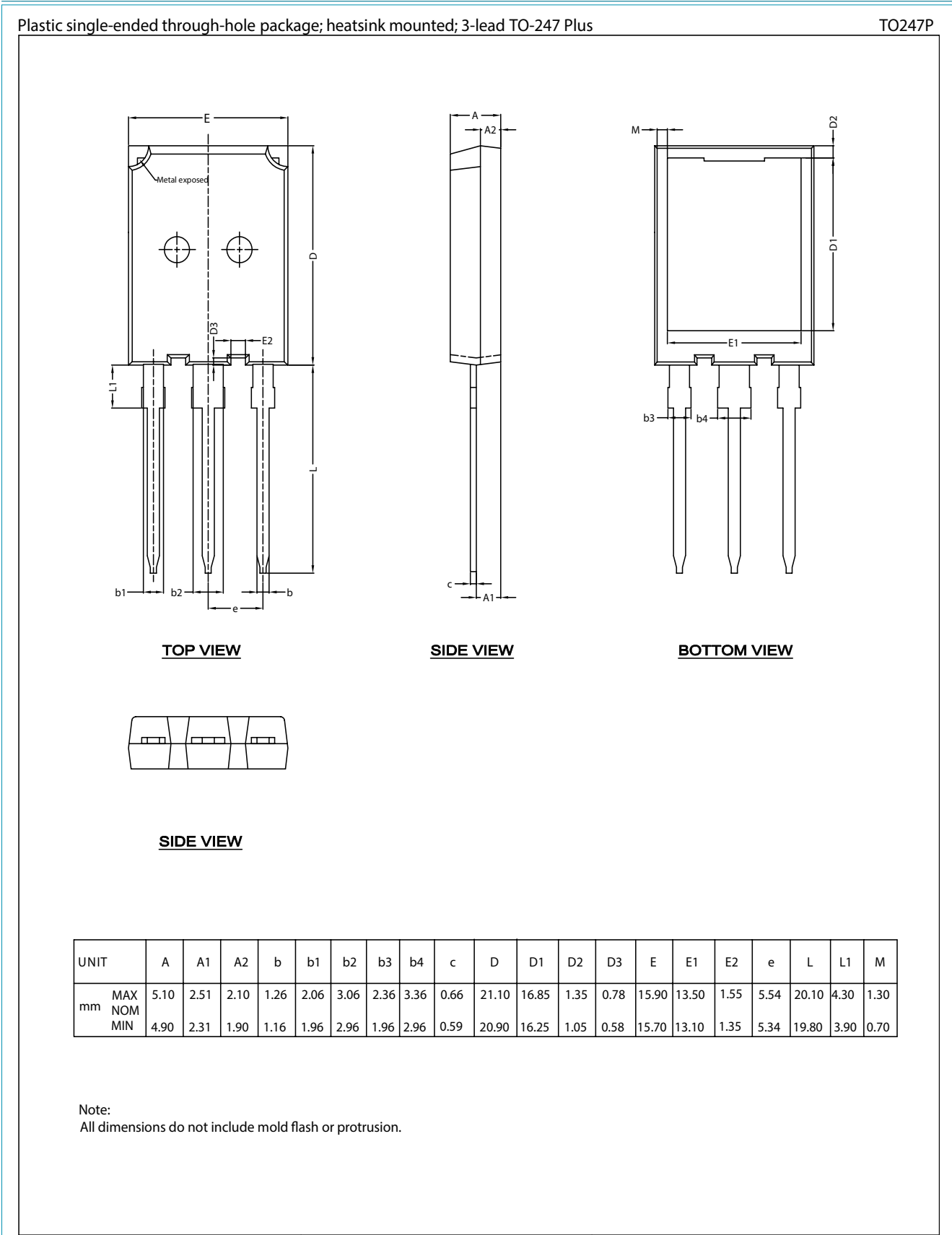
Fig. 10. Normalized gate trigger voltage as a function of junction temperature



$V_o = 0.986 \text{ V}$ ;  $R_s = 0.0032 \Omega$   
(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. 11. On-state current as a function of on-state voltage

11. Package outline





## 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.
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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