

## 1. General description

Planar passivated Silicon Controlled Rectifier in a TO247 (SOT429) plastic package intended for use in applications requiring very high inrush current capability and high thermal cycling performance.

## 2. Features and benefits

- High thermal cycling performance
- Planar passivated for voltage ruggedness and reliability
- High voltage capacity
- Very high current surge 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

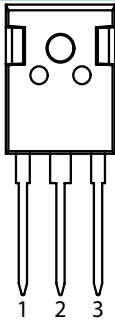

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Absolute maximum rating</b>						
$V_{RRM}$	repetitive peak reverse voltage		-	-	1200	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{mb} \leq 117\text{ °C}$	-	-	80	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 117\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	-	126	A
$I_{TSM}$	non-repetitive peak on-state current	half sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 10\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	-	1100	A
		half sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 8.3\text{ ms}$	-	-	1210	A
$T_j$	junction temperature		-	-	150	°C

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 7</a> ; <a href="#">Fig. 8</a>	-	-	70	mA
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 804\text{ V}$ ; $T_j = 125\text{ °C}$ ; $R_{GK} = 100\text{ }\Omega$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform	1500	-	-	V/ $\mu$ s
		$V_{DM} = 804\text{ V}$ ; $T_j = 150\text{ °C}$ ; $R_{GK} = 100\text{ }\Omega$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform	1000	-	-	V/ $\mu$ 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

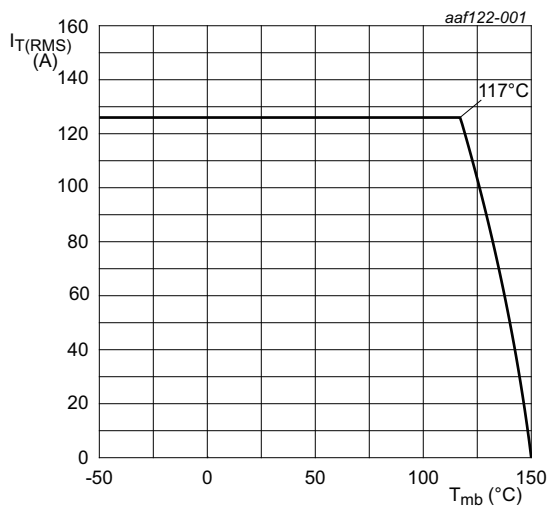
Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
BT158W-1200T	TO247	BT158W-1200TQ	Tube	30	TO247N	20-July-2016

## 7. Limiting values

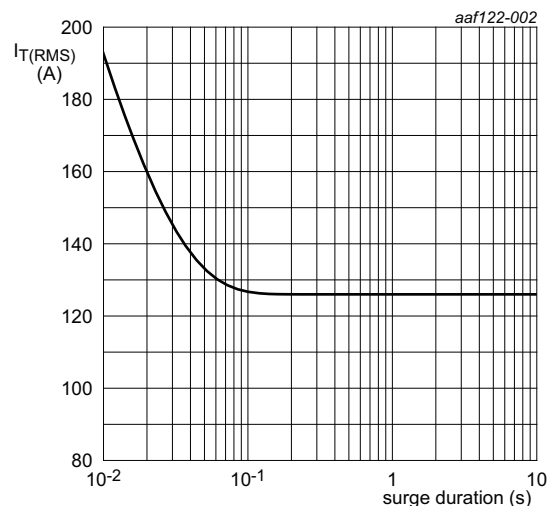
**Table 4. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage		-	1200	V
$V_{RRM}$	repetitive peak reverse voltage		-	1200	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{mb} \leq 117\text{ °C}$	-	80	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 117\text{ °C}$ ; <a href="#">Fig 1</a> ; <a href="#">Fig 2</a> ; <a href="#">Fig 3</a>	-	126	A
$I_{TSM}$	non-repetitive peak on-state current	half sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 10\text{ ms}$ ; <a href="#">Fig 4</a> ; <a href="#">Fig 5</a>	-	1100	A
		half sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 8.3\text{ ms}$	-	1210	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; sine-wave pulse; $T_{j(\text{init})} = 25\text{ °C}$ ; no voltage reapplied	-	6115	A <sup>2</sup> s
$di_T/dt$	rate of rise of on-state current	$I_G = 200\text{mA}$	-	150	A/ $\mu\text{s}$
$I_{GM}$	peak gate current		-	8	A
$V_{RGM}$	peak reverse gate voltage		-	5	V
$P_{GM}$	peak gate power		-	20	W
$P_{G(AV)}$	average gate power	over any 20 ms period	-	1	W
$T_{stg}$	storage temperature		-40	150	°C
$T_j$	junction temperature		-	150	°C



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



$f = 50\text{ Hz}$ ;  $T_{mb} = 117\text{ °C}$   
**Fig. 2. RMS on-state current as a function of surge duration; maximum values**

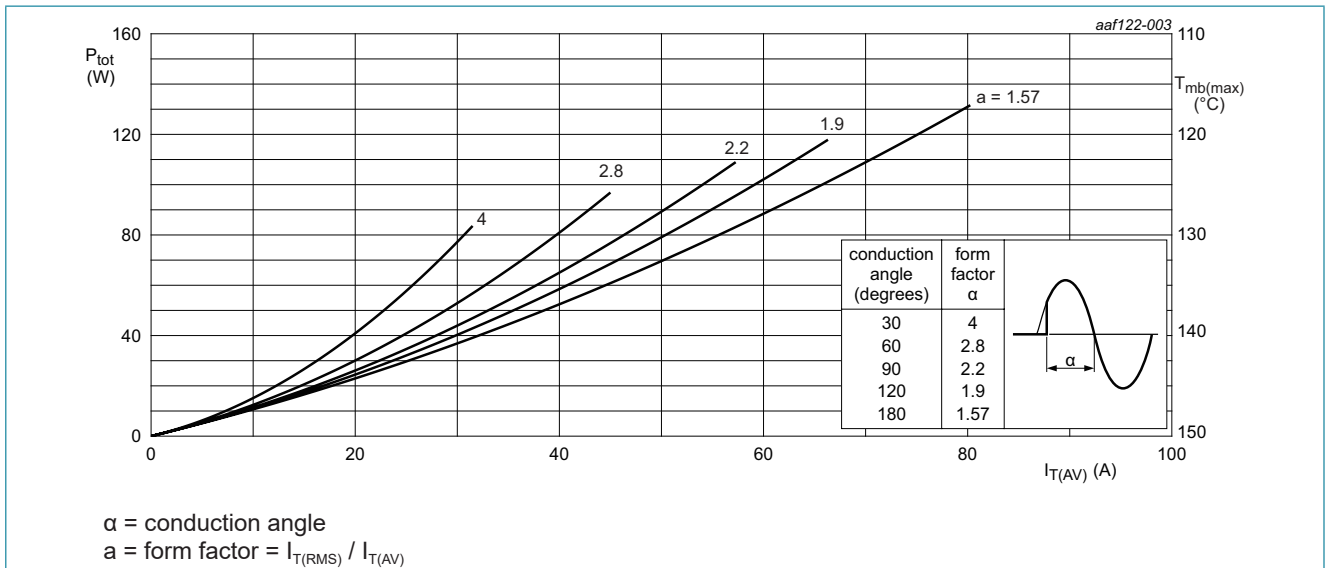


Fig. 3. Total power dissipation as a function of average on-state current; maximum values

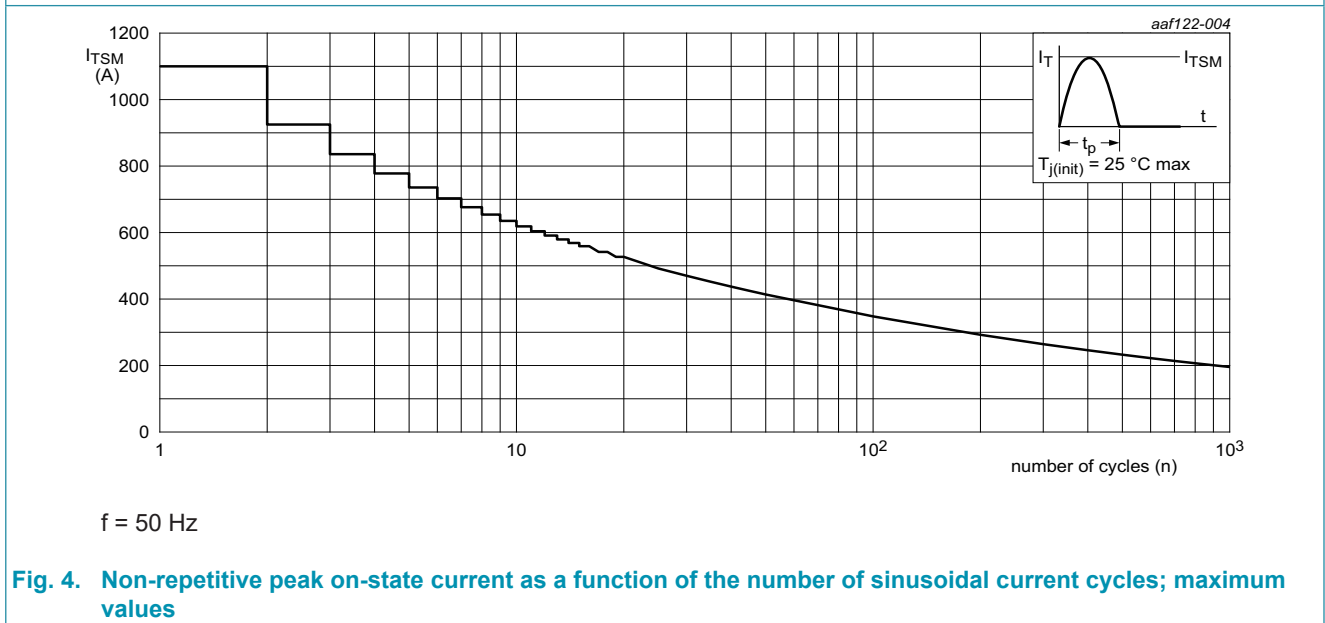


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

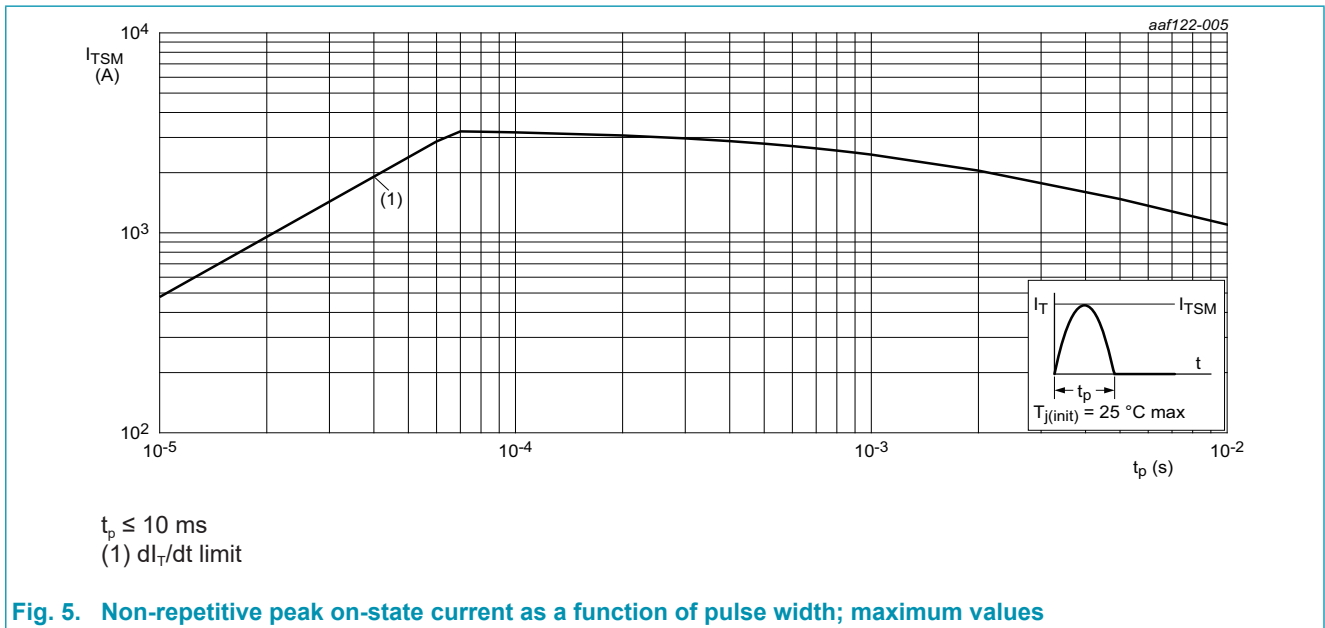


Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

## 8. Thermal & Mechanical characteristics

Table 5. Thermal & Mechanical characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	full cycle; <a href="#">Fig 6</a>	-	-	0.25	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	50	-	K/W

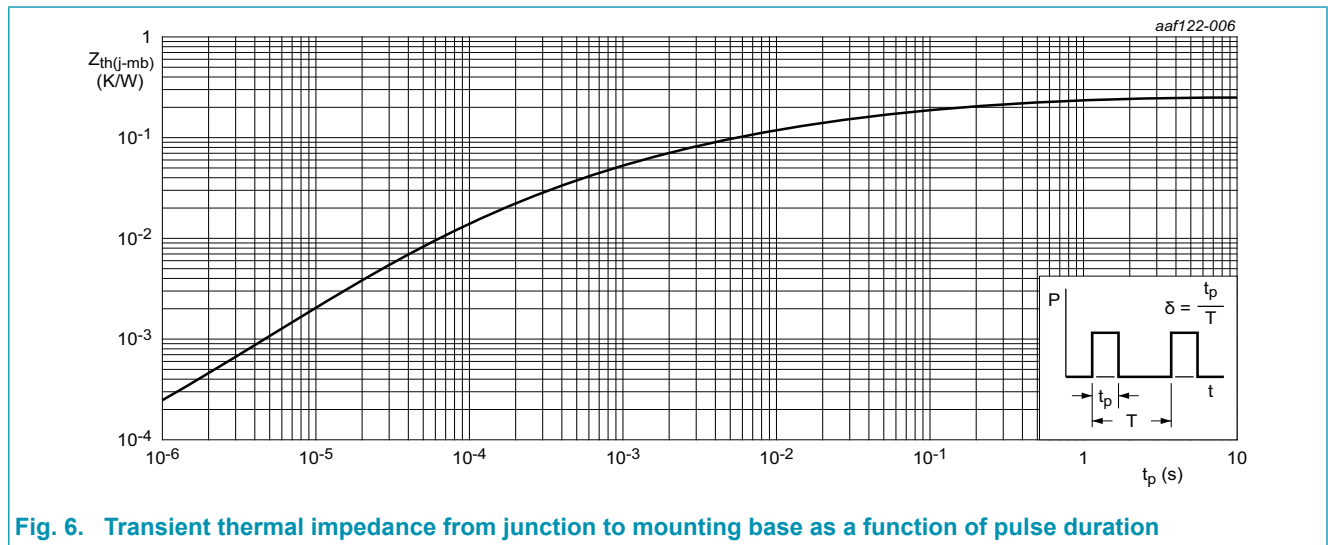


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 7</a> ; <a href="#">Fig. 8</a>	-	-	70	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 9</a>	-	-	300	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 10</a>	-	-	200	mA
$V_T$	on-state voltage	$I_T = 80\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 11</a>	-	-	1.35	V
		$I_T = 160\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 11</a>	-	-	1.65	V
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 12</a>	-	0.7	1	V
		$V_D = 800\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 125\text{ °C}$	0.25	0.4	-	V
$I_D$	off-state current	$V_D = 1200\text{ V}$ ; $T_j = 25\text{ °C}$	-	-	10	$\mu\text{A}$
		$V_D = 1200\text{ V}$ ; $T_j = 125\text{ °C}$	-	-	5	mA
$I_R$	reverse current	$V_D = 1200\text{ V}$ ; $T_j = 25\text{ °C}$	-	-	10	$\mu\text{A}$
		$V_D = 1200\text{ V}$ ; $T_j = 125\text{ °C}$	-	-	5	mA
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 804\text{ V}$ ; $T_j = 125\text{ °C}$ ; $R_{GK} = 100\ \Omega$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform	1500	-	-	V/ $\mu\text{s}$
		$V_{DM} = 804\text{ V}$ ; $T_j = 150\text{ °C}$ ; $R_{GK} = 100\ \Omega$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform	1000	-	-	V/ $\mu\text{s}$
$t_{gt}$	gate-controlled turn-on time	$I_{TM} = 40\text{ A}$ ; $V_D = 800\text{ V}$ ; $I_G = 0.1\text{ A}$ ; $dI_G/dt = 5\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ °C}$	-	2	-	$\mu\text{s}$
$t_q$	commutated turn-off time	$V_{DM} = 804\text{ V}$ ; $T_j = 125\text{ °C}$ ; $I_{TM} = 20\text{ A}$ ; $V_R = 25\text{ V}$ ; $(dI_T/dt)_M = 30\text{ A}/\mu\text{s}$ ; $dV_D/dt = 50\text{ V}/\mu\text{s}$ ; $R_{GK(ext)} = 100\text{ k}\Omega$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ )	-	150	-	$\mu\text{s}$

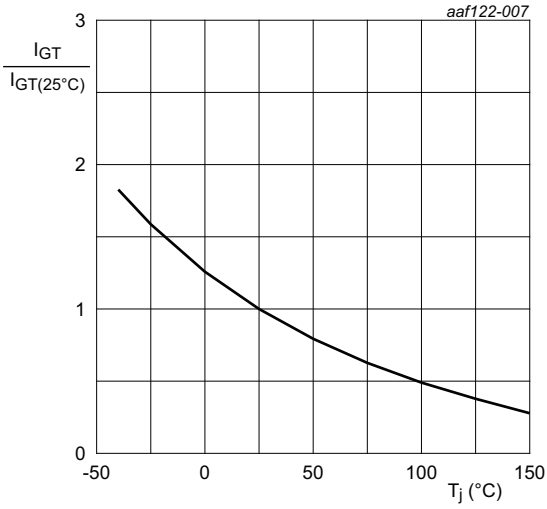


Fig. 7. Normalized gate trigger current as a function of junction temperature

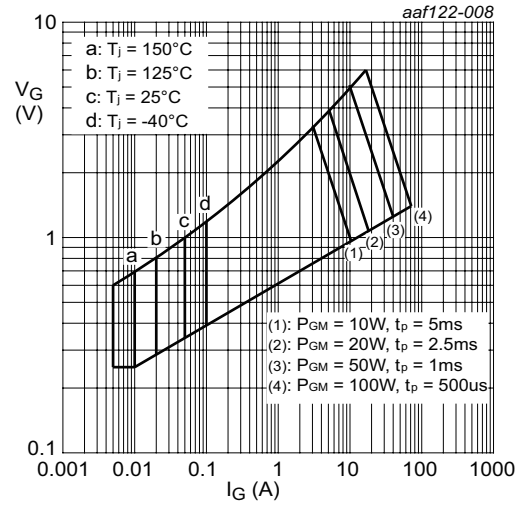


Fig. 8. Gate voltage as a function of gate current

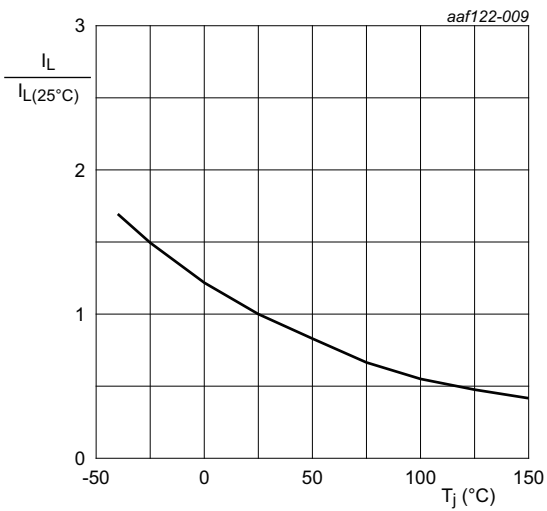


Fig. 9. Normalized latching current as a function of junction temperature

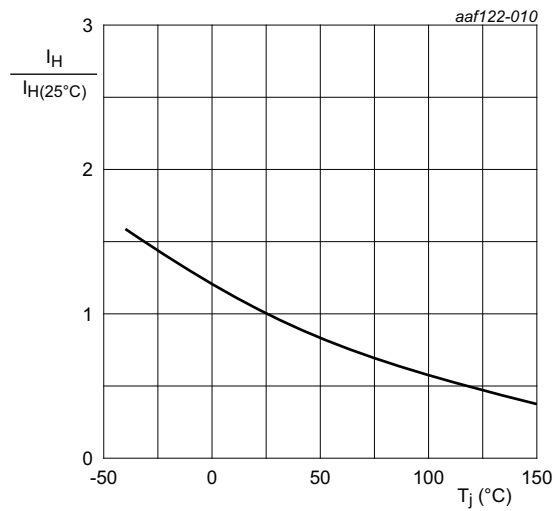
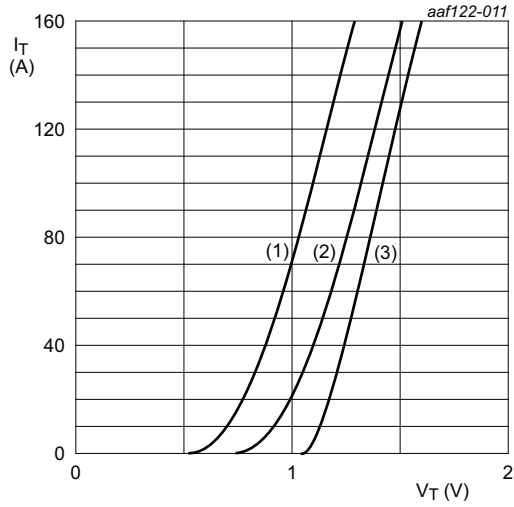


Fig. 10. Normalized holding current as a function of junction temperature

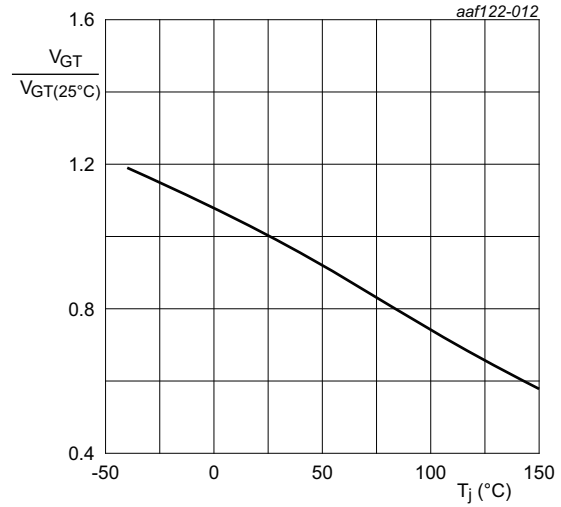




$V_o = 0.984 \text{ V}; R_s = 0.0033 \Omega$

- (1)  $T_j = 150 \text{ }^\circ\text{C}$ ; typical values
- (2)  $T_j = 150 \text{ }^\circ\text{C}$ ; maximum values
- (3)  $T_j = 25 \text{ }^\circ\text{C}$ ; maximum values

**Fig. 11. On-state current as a function of on-state voltage**

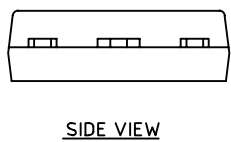
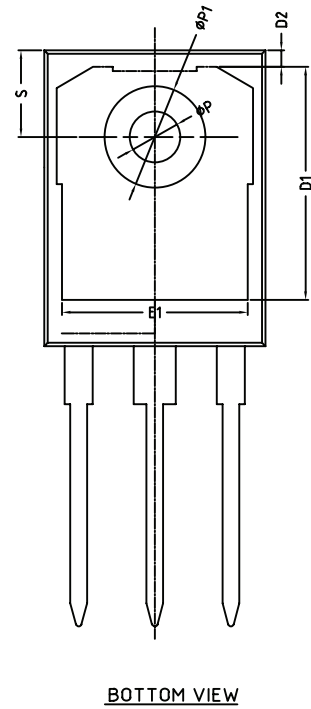
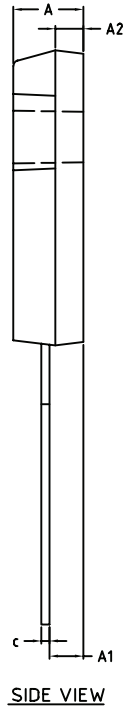
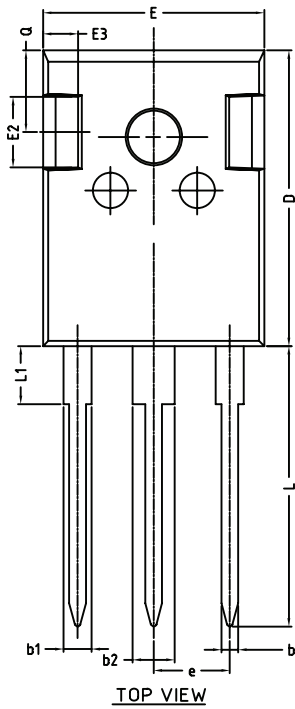


**Fig. 12. Normalized gate trigger voltage as a function of junction temperature**

### 10. Package outline

Plastic single-ended through-hole package; heatsink mounted; 1 mounting hole; 3-lead TO-247

SOT429N



UNIT	A	A1	A2	b	b1	b2	c	D	D1	D2	E	E1	E2	E3	e	L	L1	P	P1	Q	S	
mm	MAX	5.20	2.60	2.10	1.40	2.20	3.20	0.70	21.10	16.85	1.35	15.90	13.50	5.20	2.60	5.45	20.10	4.75	3.70	7.40	6.00	6.25
	MIN	4.70	2.20	1.90	1.00	1.80	2.80	0.50	20.90	16.25	1.05	15.70	13.10	4.80	2.40	19.80	-	3.50	-	5.60	6.05	

OUTLINE VERSION	REFERENCES				PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT429N		TO-247				

## 11. 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.
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- [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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