

## 1. General description

Planar passivated Silicon Controlled Rectifier in a TO247 plastic package intended for use in applications requiring very high inrush current capability, high thermal cycling performance and high junction temperature capability ( $T_{j(max)} = 150\text{ °C}$ ).

## 2. Features and benefits

- High junction operating temperature capability ( $T_{j(max)} = 150\text{ °C}$ )
- 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
- Soft start 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

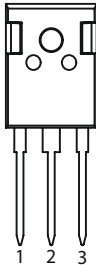

Table 1. Quick reference data

Symbol	Parameter	Conditions	Values	Unit
<b>Absolute maximum rating</b>				
$V_{DRM}$	repetitive peak off-state voltage		1600	V
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 127\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	79	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>	650	A
		half sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 8.3\text{ ms}$	715	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>	-	-	80	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	$I_T = 50\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 11</a>	-	-	1.3	V
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 1070\text{ V}$ ; $T_j = 150\text{ °C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit	1500	-	-	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

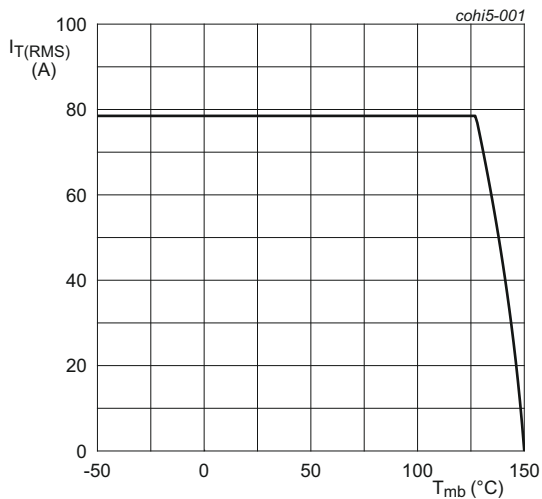
Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
TYN50W-1600T	TO247	TYN50W-1600TQ	Tube	30	TO247N	20-July-2016

## 7. Limiting values

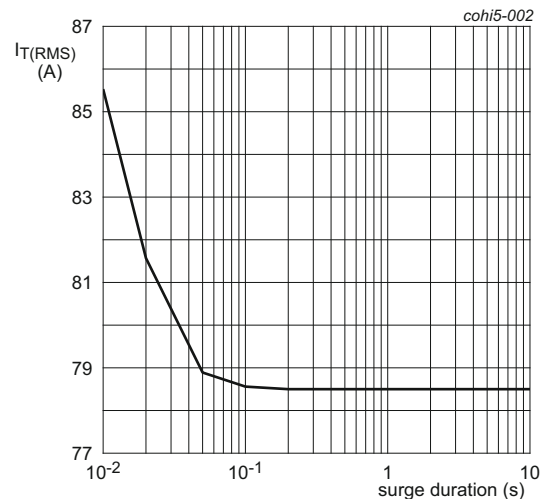
**Table 4. Limiting values**

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

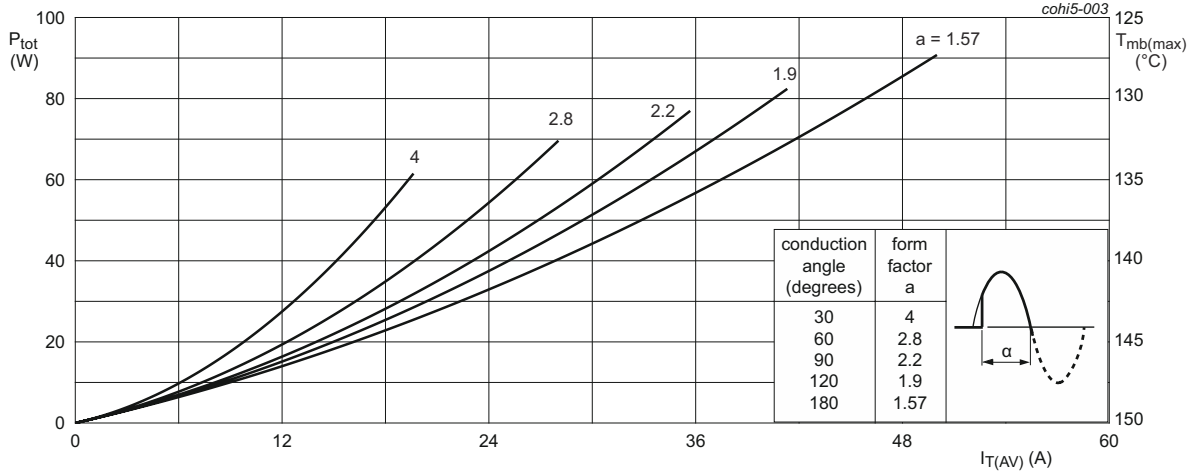
Symbol	Parameter	Conditions	Values	Unit
$V_{DRM}$	repetitive peak off-state voltage		1600	V
$V_{RRM}$	repetitive peak reverse voltage		1600	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{mb} \leq 127^{\circ}\text{C}$ ;	50	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 127^{\circ}\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	79	A
$I_{TSM}$	non-repetitive peak on-state current	half sine wave; $T_{j(\text{init})} = 25^{\circ}\text{C}$ ; $t_p = 10\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	650	A
		half sine wave; $T_{j(\text{init})} = 25^{\circ}\text{C}$ ; $t_p = 8.3\text{ ms}$	715	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; sine wave	2112	$\text{A}^2\text{s}$
$di_T/dt$	rate of rise of on-state current	$I_G = 200\text{ mA}$	150	$\text{A}/\mu\text{s}$
$I_{GM}$	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 to 150	$^{\circ}\text{C}$
$T_j$	junction temperature		150	$^{\circ}\text{C}$



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

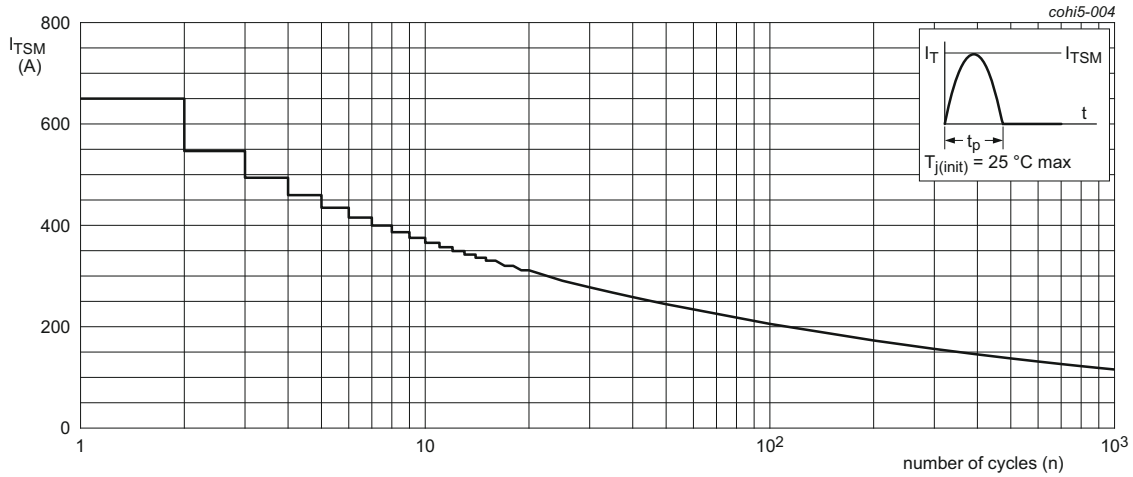


$f = 50\text{ Hz}$ ;  $T_{mb} = 127^{\circ}\text{C}$   
**Fig. 2. RMS on-state current as a function of surge duration; maximum values**



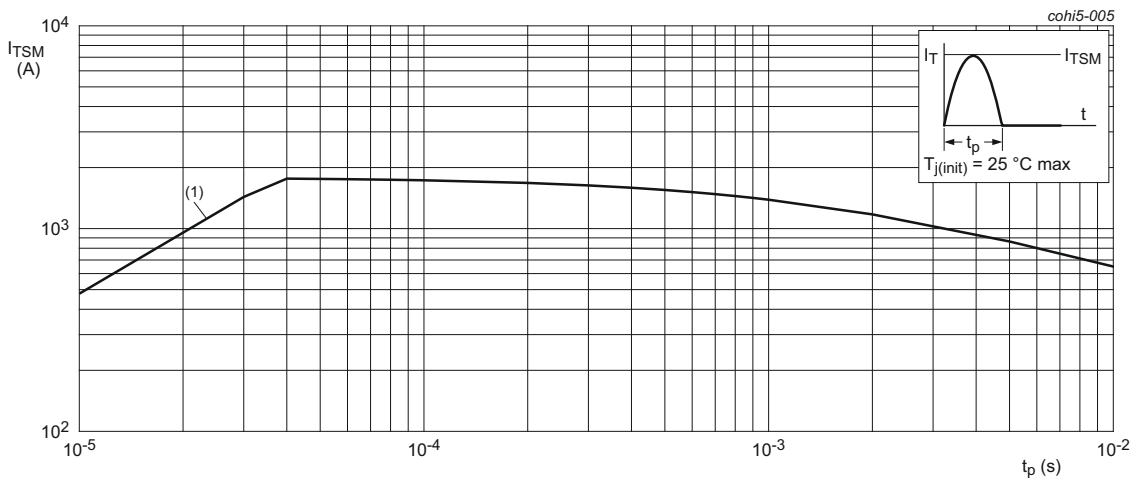
$\alpha$  = conduction angle  
 $a$  = form factor =  $I_{T(RMS)} / I_{T(AV)}$

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



f = 50 Hz

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



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

Fig. 5. Total power dissipation as a function of RMS on-state current; maximum values

### 8. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	<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

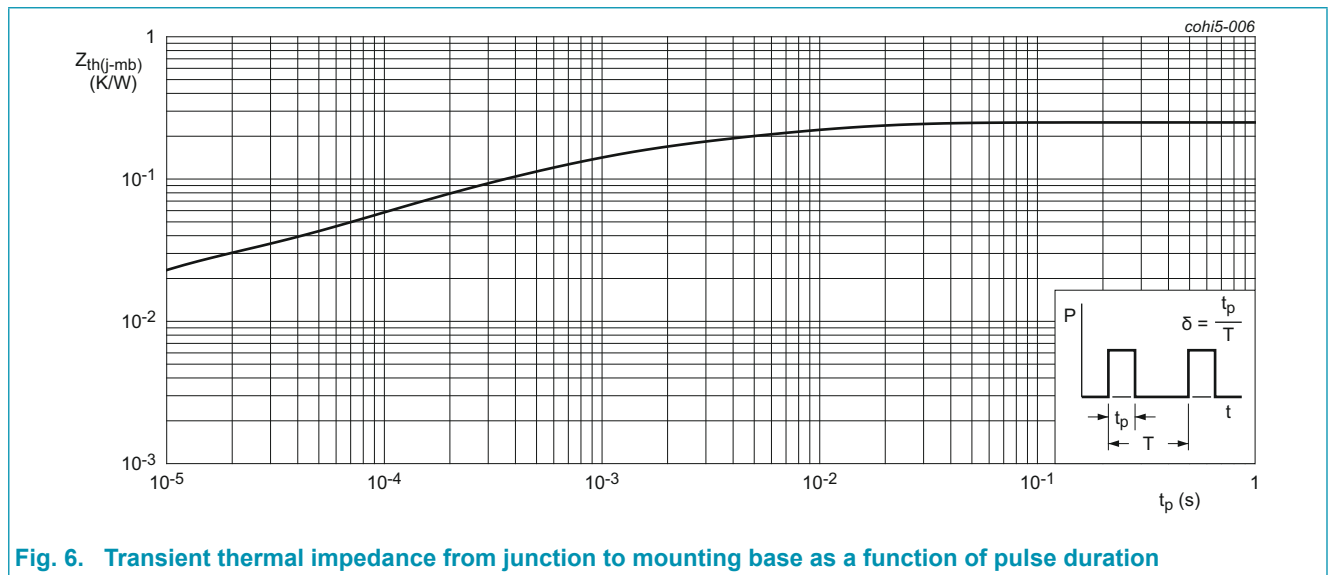


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 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>	-	-	80	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ; <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	$I_T = 50\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 11</a>	-	-	1.3	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	$V_D = 1600\text{ V}$ ; $T_j = 25\text{ °C}$	-	-	10	$\mu\text{A}$
		$V_D = 1600\text{ V}$ ; $T_j = 125\text{ °C}$	-	-	3	mA
$I_R$	reverse current	$V_D = 1600\text{ V}$ ; $T_j = 25\text{ °C}$	-	-	10	$\mu\text{A}$
		$V_D = 1600\text{ V}$ ; $T_j = 125\text{ °C}$	-	-	3	mA
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 1070\text{ V}$ ; $T_j = 125\text{ °C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit	2000	-	-	V/ $\mu\text{s}$
		$V_{DM} = 1070\text{ V}$ ; $T_j = 150\text{ °C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit	1500	-	-	V/ $\mu\text{s}$
$t_{gt}$	gate-controlled turn-on time	$I_{TM} = 50\text{ A}$ ; $V_D = 800\text{ V}$ ; $I_G = 100\text{ mA}$ ; ( $dI_G/dt$ ) $_M = 0.5\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ °C}$		2	-	$\mu\text{s}$
$t_q$	commutated turn-off time	$V_{DM} = 1070\text{ V}$ ; $T_j = 125\text{ °C}$ ; $I_{TM} = 50\text{ A}$ ; $V_R = 25\text{ V}$ ; $dV_D/dt = 50\text{ V}/\mu\text{s}$ ; ( $dI_T/dt$ ) $_M = 30\text{ A}/\mu\text{s}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ )		150	-	$\mu\text{s}$

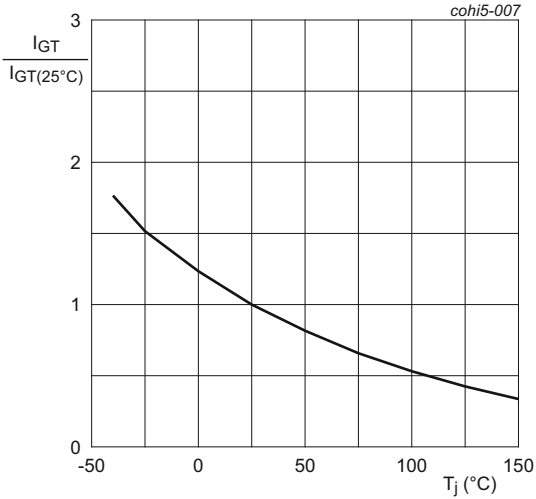


Fig. 7. Normalized gate trigger current as a function of junction temperature

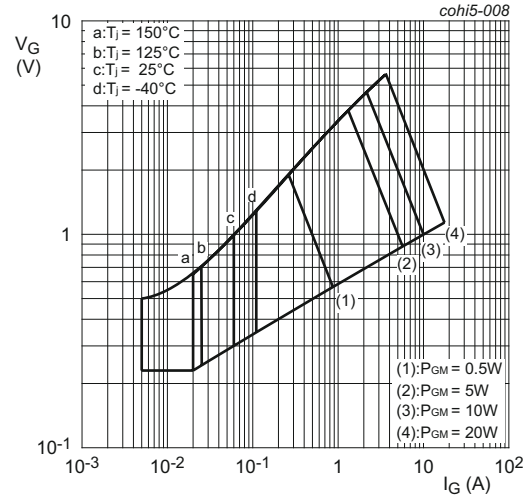


Fig. 8. Gate voltage as a function of gate current

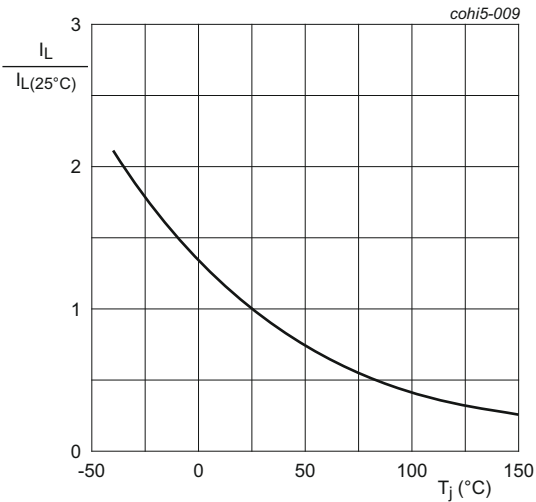


Fig. 9. Normalized latching current as a function of junction temperature

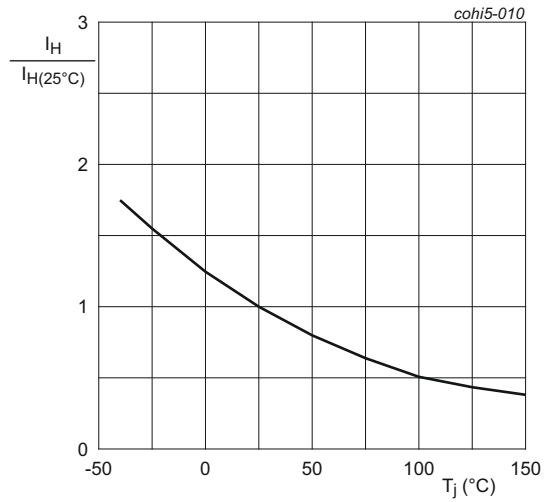
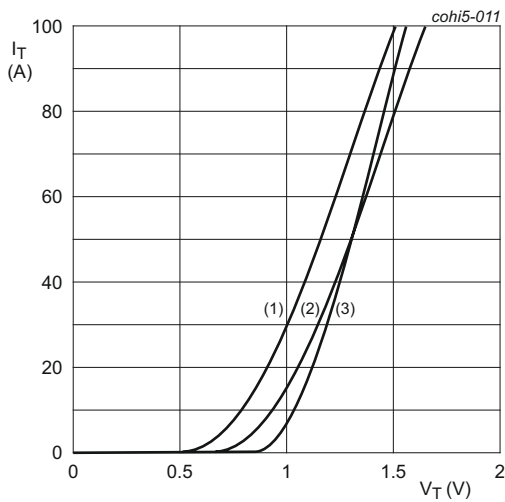


Fig. 10. Normalized holding current as a function of junction temperature



$V_o = 0.963 \text{ V}$ ;  $R_s = 0.0069 \text{ } \Omega$   
 (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

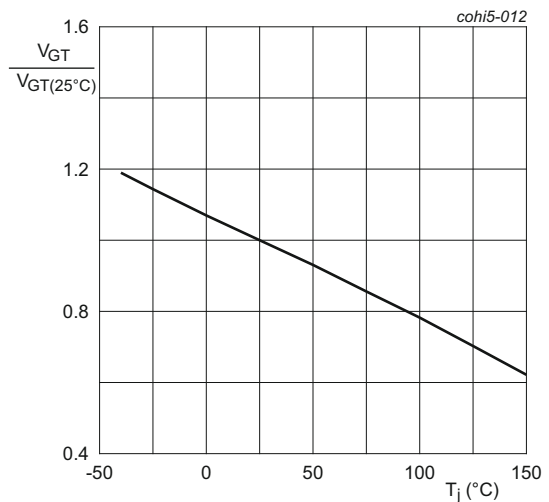
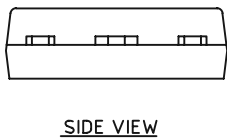
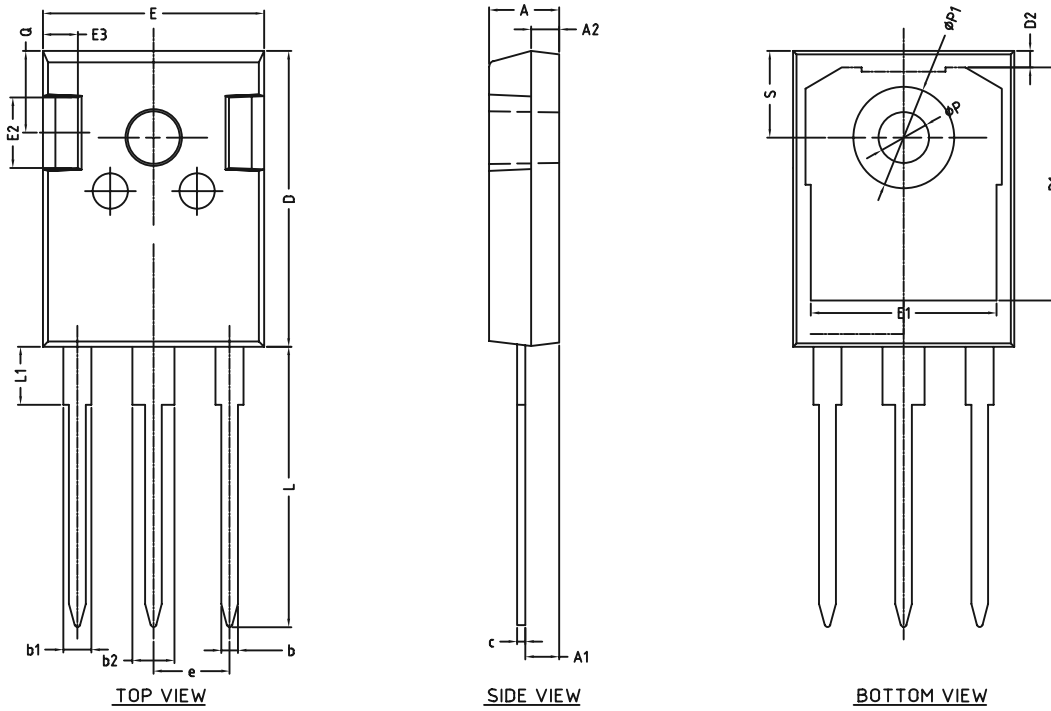


Fig. 12. Normalized gate trigger voltage as a function of junction temperature

### 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	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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