



# ACTT16-800CTN

Enhanced and high temperature ACTT power switch

24 July 2015

Product data sheet

## 1. General description

AC Thyristor Triac power switch in a SOT78 (TO-220AB) plastic package with selfprotective clamping capabilities against low and high energy transients. This "series CTN" triac will commute the full RMS current at the maximum rated junction temperature ( $T_{j(max)} = 150\text{ °C}$ ) without the aid of a snubber. It is used in applications where "high junction operating temperature capability" is required.

## 2. Features and benefits

- Clamping structure ensuring safe high over-voltage withstand capability
- High junction operating temperature capability ( $T_{j(max)} = 150\text{ °C}$ )
- High minimum IGT for guaranteed immunity to gate noise
- Full cycle AC conduction
- Over-voltage withstand capability to IEC 61000-4-5
- Pin compatible with standard triacs
- Protective self turn-on capability for high energy transients
- Safe clamping capability for low energy over-voltage transients
- Less sensitive gate for high noise immunity
- Triggering in three quadrants only
- Planar passivated for voltage ruggedness and reliability
- High commutation capability with maximum false trigger immunity
- Very high immunity to false turn-on by  $dV/dt$  and IEC 61000-4-4 fast transient
- Package is RoHS compliant
- Package meets UL94V0 flammability requirement

## 3. Applications

- Electronic thermostats (heating and cooling)
- High power motor controls e.g washing machine and vacuum cleaners
- Rectifier-fed DC inductive loads e.g DC motors and solenoids
- Refrigeration and air conditioning compressors
- Applications subject to high temperature ( $T_{j(max)} = 150\text{ °C}$ )

## 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

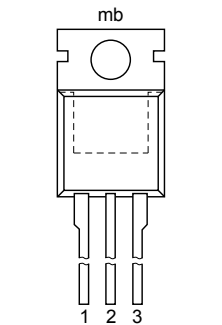
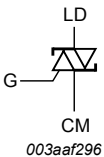


Enhanced and high temperature ACTT power switch

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 126\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	-	16	A
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	-	140	A
		full sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 16.7\text{ ms}$	-	-	150	A
$T_j$	junction temperature		-	-	150	°C
$V_{PP}$	peak pulse voltage	$T_j = 25\text{ °C}$ ; non-repetitive, off-state; <a href="#">Fig. 6</a>	-	-	2	kV
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 100\text{ mA}$ ; LD+ G+; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 8</a>	5	-	35	mA
		$V_D = 12\text{ V}$ ; $I_T = 100\text{ mA}$ ; LD+ G-; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 8</a>	5	-	35	mA
		$V_D = 12\text{ V}$ ; $I_T = 100\text{ mA}$ ; LD- G-; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 8</a>	5	-	35	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 10</a>	-	-	30	mA
$V_T$	on-state voltage	$I_T = 20\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 11</a>	-	-	1.5	V
$V_{CL}$	clamping voltage	$I_{CL} = 0.1\text{ mA}$ ; $t_p = 1\text{ ms}$ ; $T_j = 25\text{ °C}$	850	-	-	V
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 536\text{ V}$ ; $T_j = 125\text{ °C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit	1500	-	-	V/ $\mu$ s
		$V_{DM} = 536\text{ V}$ ; $T_j = 150\text{ °C}$ ; exponential waveform; gate open circuit	1000	-	-	V/ $\mu$ s
$dI_{com}/dt$	rate of change of commutating current	$V_D = 400\text{ V}$ ; $T_j = 150\text{ °C}$ ; $I_{T(RMS)} = 16\text{ A}$ ; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$ ; gate open circuit; snubberless condition	12	-	-	A/ms
		$V_D = 400\text{ V}$ ; $T_j = 150\text{ °C}$ ; $I_{T(RMS)} = 16\text{ A}$ ; $dV_{com}/dt = 10\text{ V}/\mu\text{s}$ ; gate open circuit	15	-	-	A/ms
		$V_D = 400\text{ V}$ ; $T_j = 150\text{ °C}$ ; $I_{T(RMS)} = 16\text{ A}$ ; $dV_{com}/dt = 1\text{ V}/\mu\text{s}$ ; gate open circuit	20	-	-	A/ms

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	CM	common	 <p>TO-220AB (SOT78)</p>	
2	LD	load		
3	G	gate		
mb	LD	mounting base; load		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
ACTT16-800CTN	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

## 7. Marking

Table 4. Marking codes

Type number	Marking code
ACTT16-800CTN	ACTT16-800CTN

## 8. Limiting values

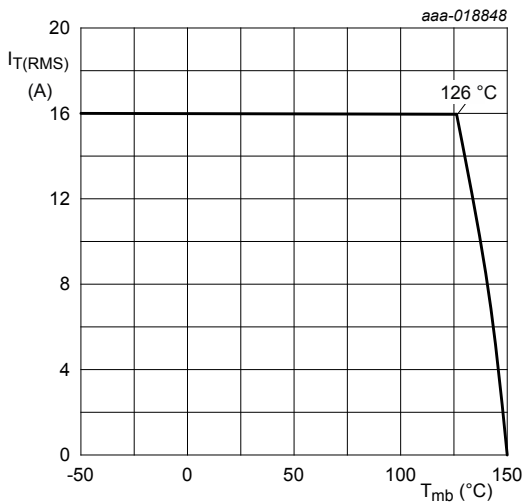
Table 5. Limiting values

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

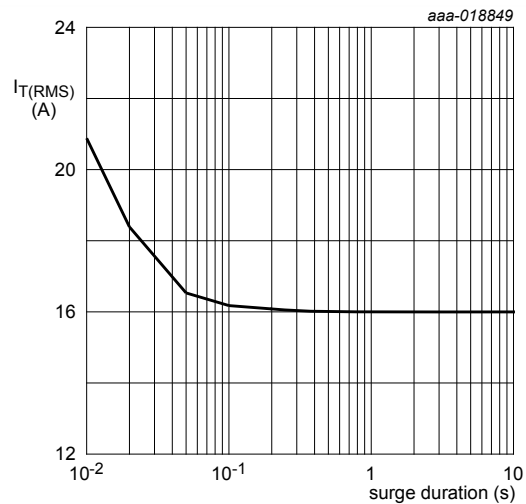
Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage		-	800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 126\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	16	A
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	140	A
		full sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 16.7\text{ ms}$	-	150	A

Enhanced and high temperature ACTT power switch

Symbol	Parameter	Conditions	Min	Max	Unit
$I^2t$	$I^2t$ for fusing	$t_p = 10$ ms; sine-wave pulse	-	98	A <sup>2</sup> s
$di_T/dt$	rate of rise of on-state current	$I_G = 70$ mA	-	100	A/ $\mu$ s
$I_{GM}$	peak gate current	$t = 20$ $\mu$ s	-	2	A
$P_{GM}$	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	$^{\circ}$ C
$T_j$	junction temperature		-	150	$^{\circ}$ C
$V_{PP}$	peak pulse voltage	$T_j = 25$ $^{\circ}$ C; non-repetitive, off-state; <a href="#">Fig. 6</a>	-	2	kV



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



$f = 50$  Hz;  $T_{mb} = 126$   $^{\circ}$ C

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

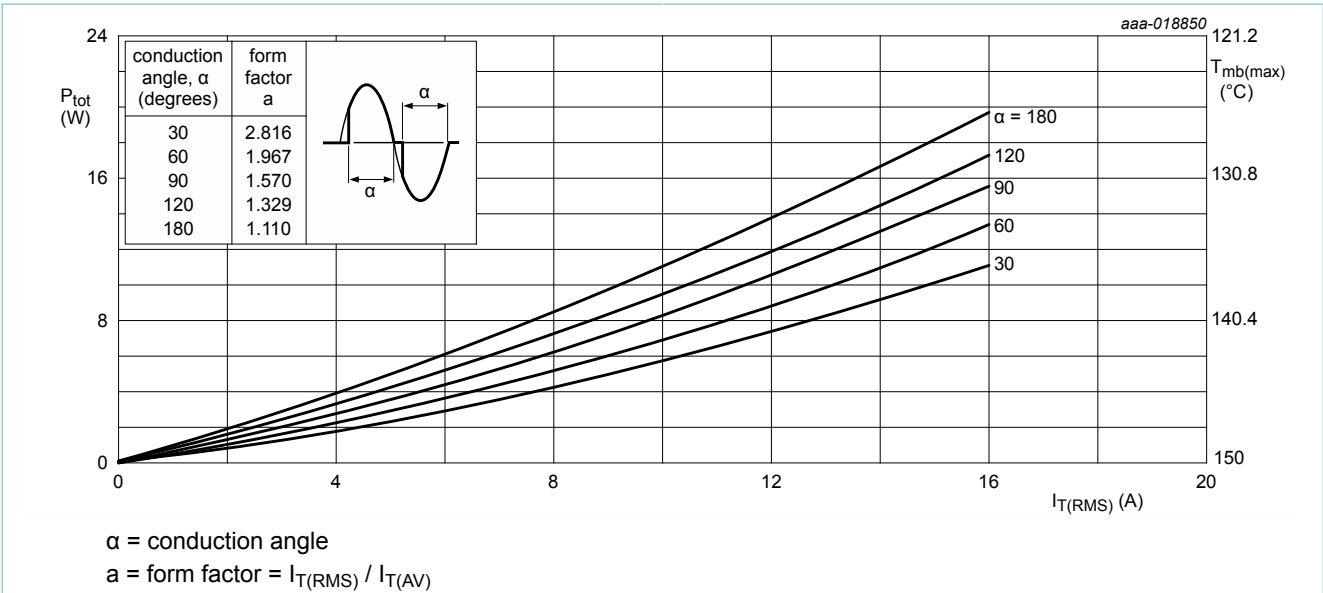


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

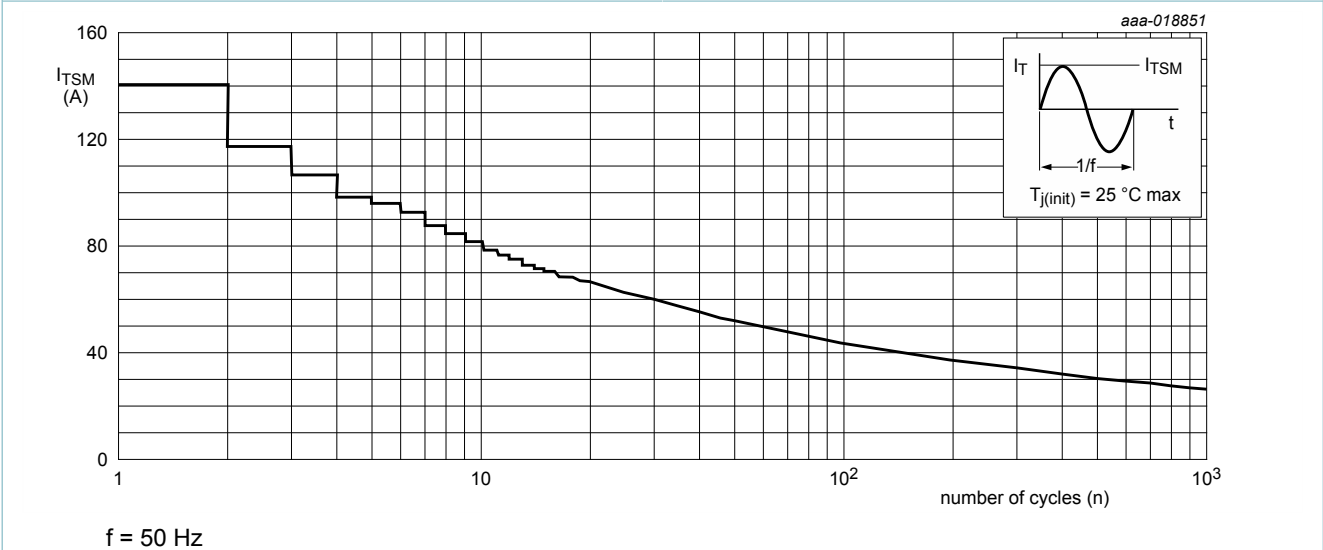


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

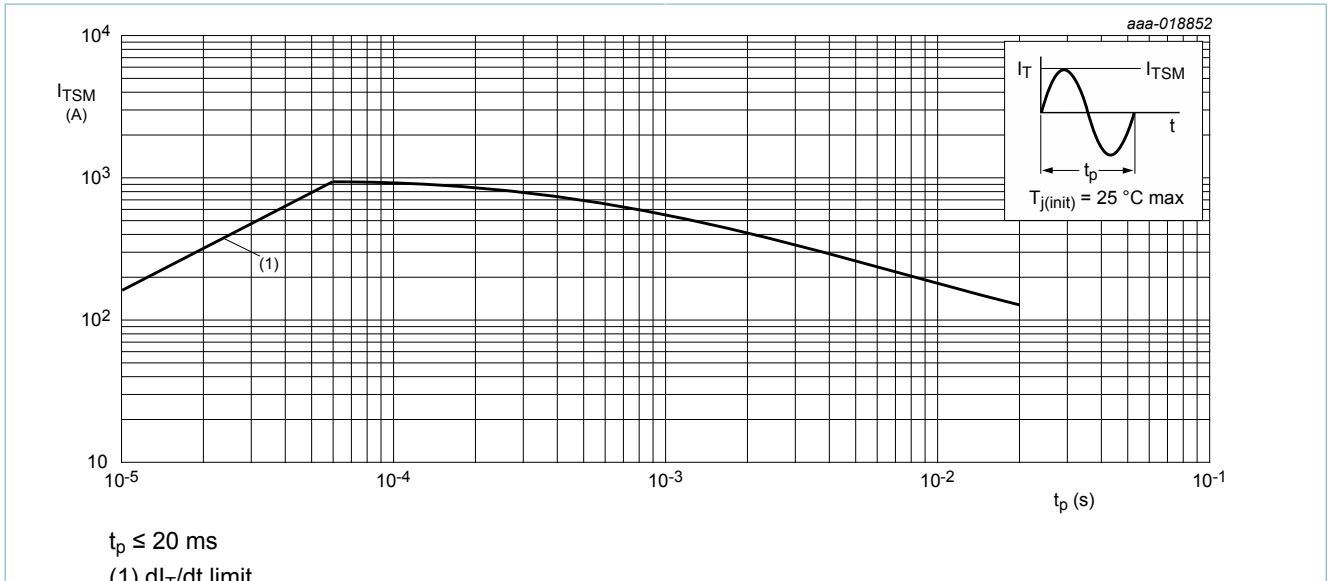


Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

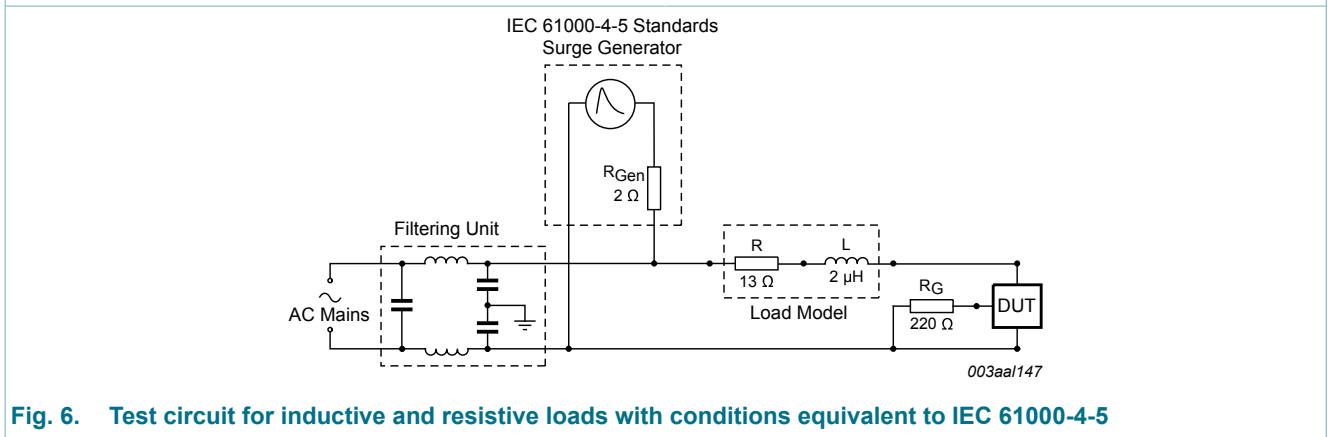


Fig. 6. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5

## 9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	full cycle; Fig. 7	-	-	1.2	K/W
		half cycle	-	-	1.7	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	60	-	K/W

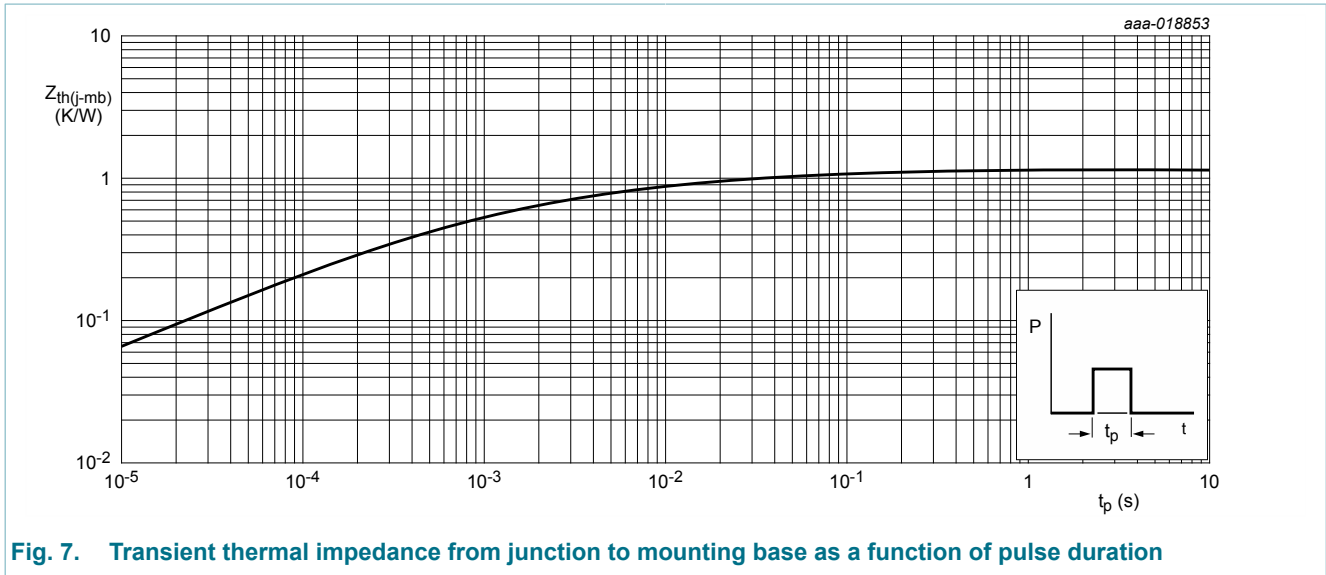


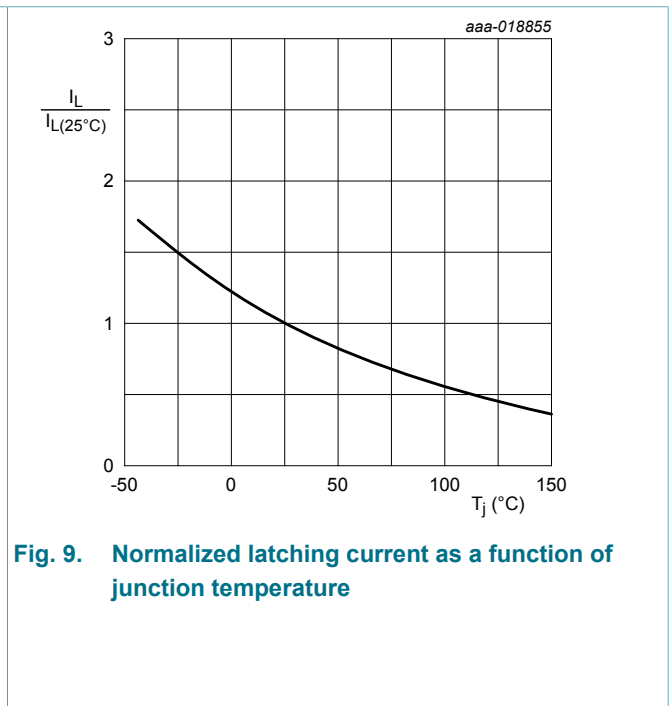
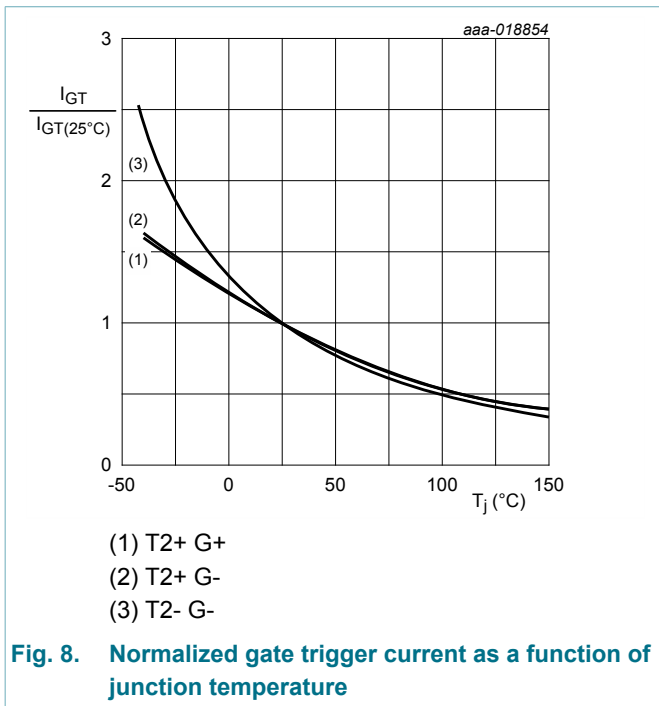
Fig. 7. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
I <sub>GT</sub>	gate trigger current	V <sub>D</sub> = 12 V; I <sub>T</sub> = 100 mA; LD+ G+; T <sub>j</sub> = 25 °C; <a href="#">Fig. 8</a>	5	-	35	mA
		V <sub>D</sub> = 12 V; I <sub>T</sub> = 100 mA; LD+ G-; T <sub>j</sub> = 25 °C; <a href="#">Fig. 8</a>	5	-	35	mA
		V <sub>D</sub> = 12 V; I <sub>T</sub> = 100 mA; LD- G-; T <sub>j</sub> = 25 °C; <a href="#">Fig. 8</a>	5	-	35	mA
I <sub>L</sub>	latching current	V <sub>D</sub> = 12 V; I <sub>G</sub> = 100 mA; LD+ G+; T <sub>j</sub> = 25 °C; <a href="#">Fig. 9</a>	-	-	40	mA
		V <sub>D</sub> = 12 V; I <sub>G</sub> = 100 mA; LD+ G-; T <sub>j</sub> = 25 °C; <a href="#">Fig. 9</a>	-	-	50	mA
		V <sub>D</sub> = 12 V; I <sub>G</sub> = 100 mA; LD- G-; T <sub>j</sub> = 25 °C; <a href="#">Fig. 9</a>	-	-	40	mA
I <sub>H</sub>	holding current	V <sub>D</sub> = 12 V; T <sub>j</sub> = 25 °C; <a href="#">Fig. 10</a>	-	-	30	mA
V <sub>T</sub>	on-state voltage	I <sub>T</sub> = 20 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 11</a>	-	-	1.5	V
V <sub>GT</sub>	gate trigger voltage	V <sub>D</sub> = 12 V; I <sub>T</sub> = 100 mA; T <sub>j</sub> = 25 °C; <a href="#">Fig. 12</a>	-	0.8	1	V
		V <sub>D</sub> = 400 V; I <sub>T</sub> = 100 mA; T <sub>j</sub> = 150 °C; <a href="#">Fig. 12</a>	0.2	0.45	-	V
I <sub>D</sub>	off-state current	V <sub>D</sub> = 800 V; T <sub>j</sub> = 25 °C	-	-	10	μA
		V <sub>D</sub> = 800 V; T <sub>j</sub> = 150 °C	-	-	2	mA

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CL}$	clamping voltage	$I_{CL} = 0.1 \text{ mA}$ ; $t_p = 1 \text{ ms}$ ; $T_j = 25 \text{ }^\circ\text{C}$	850	-	-	V
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 536 \text{ V}$ ; $T_j = 125 \text{ }^\circ\text{C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit	1500	-	-	V/ $\mu\text{s}$
		$V_{DM} = 536 \text{ V}$ ; $T_j = 150 \text{ }^\circ\text{C}$ ; exponential waveform; gate open circuit	1000	-	-	V/ $\mu\text{s}$
$dI_{com}/dt$	rate of change of commutating current	$V_D = 400 \text{ V}$ ; $T_j = 150 \text{ }^\circ\text{C}$ ; $I_{T(RMS)} = 16 \text{ A}$ ; $dV_{com}/dt = 20 \text{ V}/\mu\text{s}$ ; gate open circuit; snubberless condition	12	-	-	A/ms
		$V_D = 400 \text{ V}$ ; $T_j = 150 \text{ }^\circ\text{C}$ ; $I_{T(RMS)} = 16 \text{ A}$ ; $dV_{com}/dt = 10 \text{ V}/\mu\text{s}$ ; gate open circuit	15	-	-	A/ms
		$V_D = 400 \text{ V}$ ; $T_j = 150 \text{ }^\circ\text{C}$ ; $I_{T(RMS)} = 16 \text{ A}$ ; $dV_{com}/dt = 1 \text{ V}/\mu\text{s}$ ; gate open circuit	20	-	-	A/ms





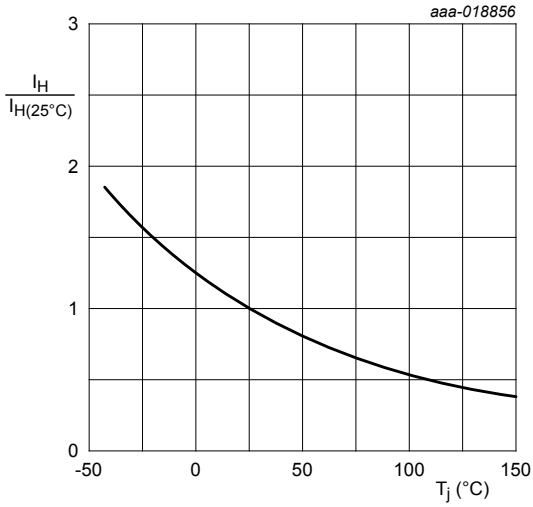
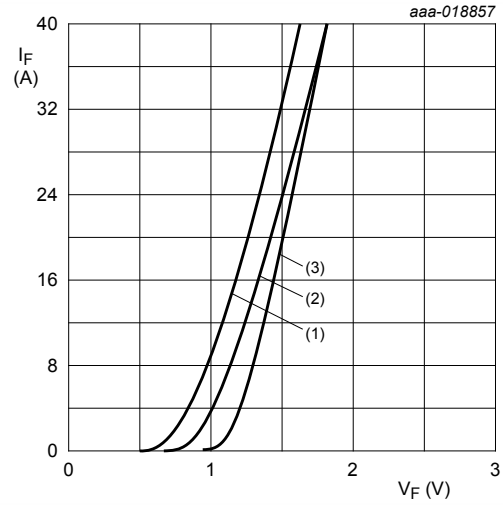


Fig. 10. Normalized holding current as a function of junction temperature



$V_o = 0.981 \text{ V}$ ;  $R_s = 0.022 \Omega$   
 (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

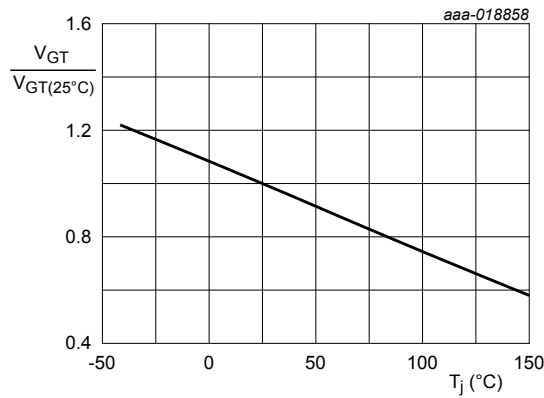


Fig. 12. Normalized gate trigger voltage as a function of junction temperature

### 11. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB

SOT78



**DIMENSIONS** (mm are the original dimensions)

UNIT	A	A <sub>1</sub>	b	b <sub>1</sub> (2)	b <sub>2</sub> (2)	c	D	D <sub>1</sub>	E	e	L	L <sub>1</sub> (1)	L <sub>2</sub> (1) max.	p	q	Q
mm	4.7 4.1	1.40 1.25	0.9 0.6	1.6 1.0	1.3 1.0	0.7 0.4	16.0 15.2	6.6 5.9	10.3 9.7	2.54	15.0 12.8	3.30 2.79	3.0	3.8 3.5	3.0 2.7	2.6 2.2

**Notes**

- 1. Lead shoulder designs may vary.
- 2. Dimension includes excess dambar.

OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
SOT78		3-lead TO-220AB	SC-46		08-04-23 08-06-13

Fig. 13. Package outline TO-220AB (SOT78)

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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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## 13. Contents

1	General description .....	1
2	Features and benefits .....	1
3	Applications .....	1
4	Quick reference data .....	1
5	Pinning information .....	3
6	Ordering information .....	3
7	Marking .....	3
8	Limiting values .....	3
9	Thermal characteristics .....	6
10	Characteristics .....	7
11	Package outline .....	10
12	Legal information .....	11
12.1	Data sheet status .....	11
12.2	Definitions .....	11
12.3	Disclaimers .....	11
12.4	Trademarks .....	12

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- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.