

## 1. General description

AC Thyristor Triac power switch in a SOT78 (TO-220AB) plastic package with self-protective clamping capabilities against low and high energy transients. This "series C0T" 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
- High minimum  $I_{GT}$  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  $dV/dt$

## 3. Applications

- AC fan, pump and compressor controls
- Highly inductive, resistive and safety loads
- Large and small appliances (White Goods)
- Reversing induction motor controls
- Applications subject to high temperature

## 4. Quick reference data

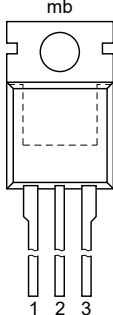
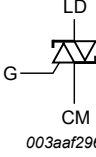
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage		-	-	800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 130\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	-	8	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>	-	-	80	A

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
		full sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 16.7\text{ ms}$	-	-	88	A
$T_j$	junction temperature		-	-	150	$^{\circ}\text{C}$
$V_{PP}$	peak pulse voltage	$T_j = 25\text{ }^{\circ}\text{C}$ ; 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+; $T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 8</a>	5	-	30	mA
		$V_D = 12\text{ V}$ ; $I_T = 100\text{ mA}$ ; LD+ G-; $T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 8</a>	5	-	30	mA
		$V_D = 12\text{ V}$ ; $I_T = 100\text{ mA}$ ; LD- G-; $T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 8</a>	5	-	30	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 10</a>	-	-	35	mA
$V_T$	on-state voltage	$I_T = 10\text{ A}$ ; $T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 11</a>	-	1.3	1.5	V
$V_{CL}$	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	$V_{DM} = 536\text{ V}$ ; $T_j = 150\text{ }^{\circ}\text{C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit	600	-	-	V/ $\mu\text{s}$
$dI_{com}/dt$	rate of change of commutating current	$V_D = 400\text{ V}$ ; $T_j = 150\text{ }^{\circ}\text{C}$ ; $I_{T(RMS)} = 8\text{ A}$ ; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$ ; (snubberless condition); gate open circuit	3	-	-	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
ACTT8-800C0T	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

7. Limiting values

Table 4. Limiting values  
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>DRM</sub>	repetitive peak off-state voltage		-	800	V
I <sub>T(RMS)</sub>	RMS on-state current	full sine wave; T <sub>mb</sub> ≤ 130 °C; Fig. 1; Fig. 2; Fig. 3	-	8	A
I <sub>TSM</sub>	non-repetitive peak on-state current	full sine wave; T <sub>j(init)</sub> = 25 °C; t <sub>p</sub> = 20 ms; Fig. 4; Fig. 5	-	80	A
		full sine wave; T <sub>j(init)</sub> = 25 °C; t <sub>p</sub> = 16.7 ms	-	88	A
I <sup>2</sup> t	I <sup>2</sup> t for fusing	t <sub>p</sub> = 10 ms; sine-wave pulse	-	32	A <sup>2</sup> s
di <sub>T</sub> /dt	rate of rise of on-state current	I <sub>G</sub> = 70 mA	-	100	A/μs
I <sub>GM</sub>	peak gate current	t = 20 μs	-	2	A
P <sub>GM</sub>	peak gate power		-	5	W
P <sub>G(AV)</sub>	average gate power	over any 20 ms period	-	0.5	W
T <sub>j</sub>	junction temperature		-	150	°C
V <sub>PP</sub>	peak pulse voltage	T <sub>j</sub> = 25 °C; non-repetitive, off-state; Fig. 6	-	2	kV

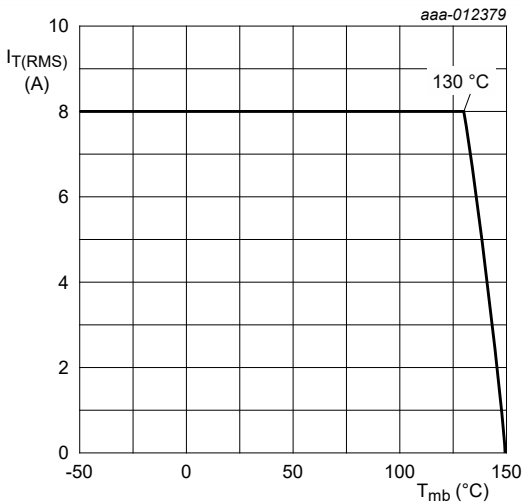


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values

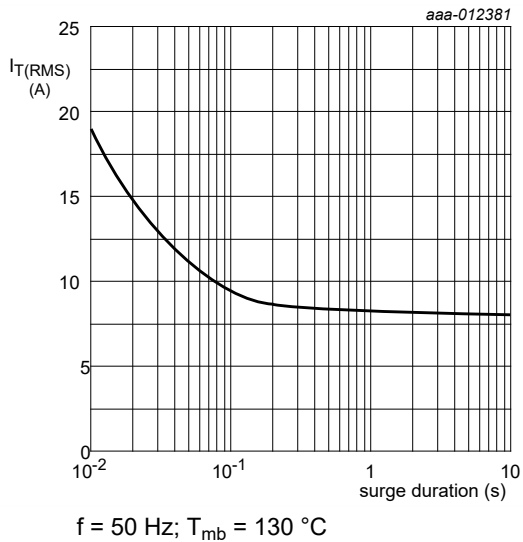


Fig. 2. RMS on-state current as a function of surge duration; maximum values  
f = 50 Hz; T<sub>mb</sub> = 130 °C

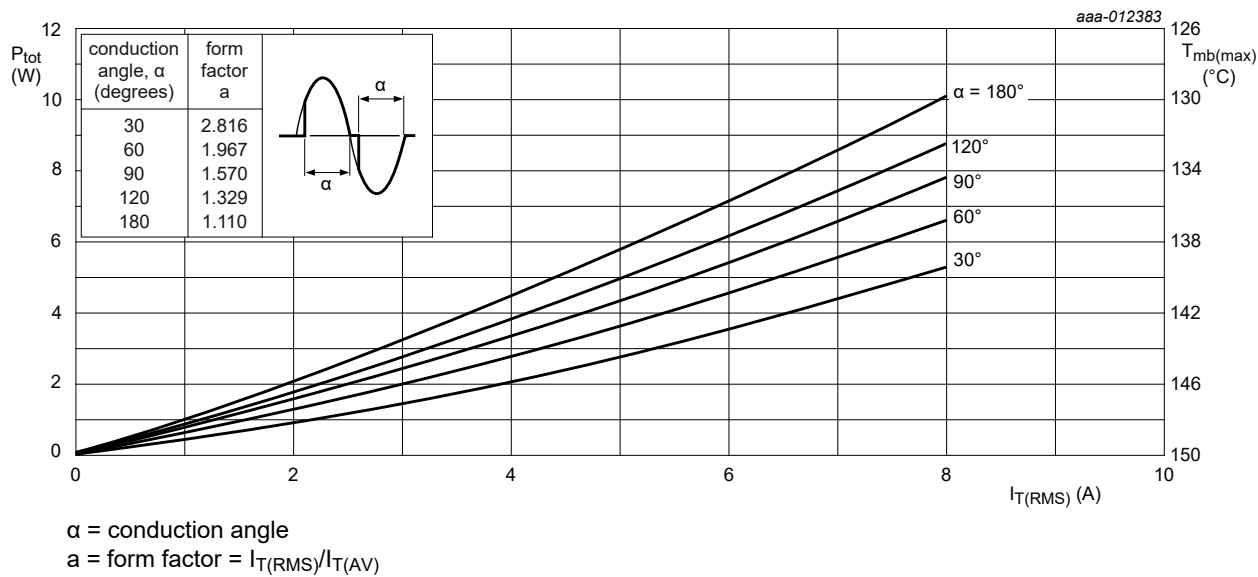


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

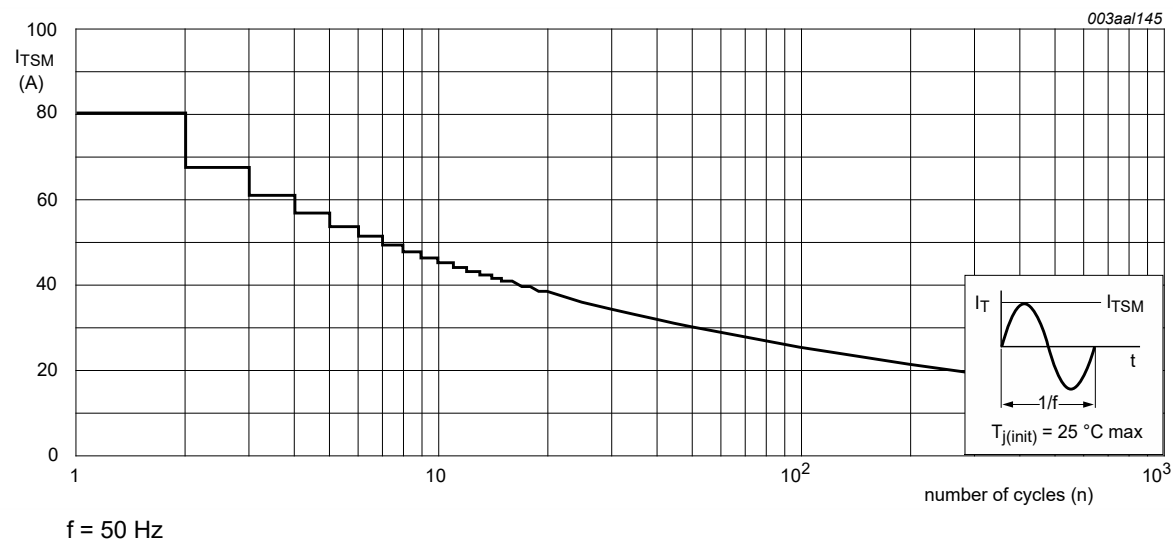


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

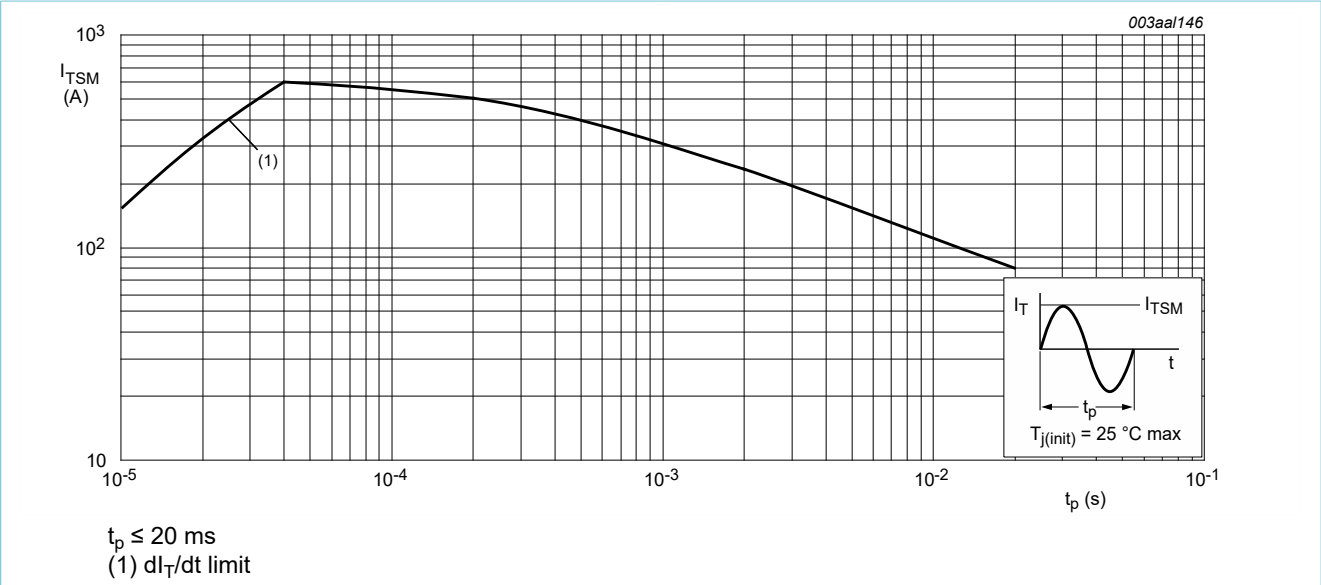


Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

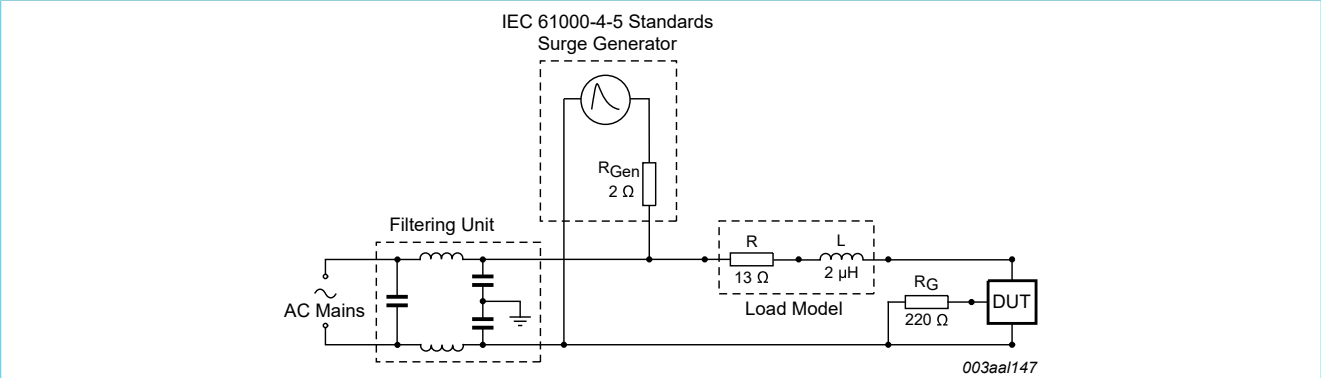
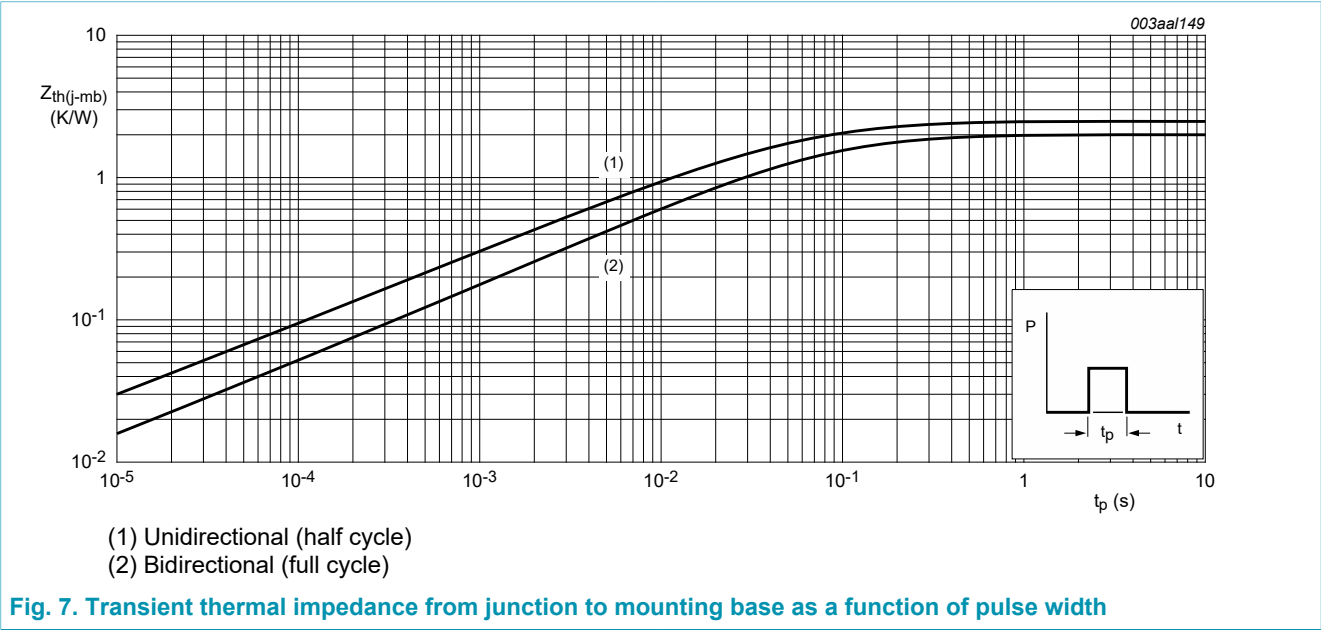


Fig. 6. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5

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	full cycle; Fig. 7	-	-	2	K/W
		half cycle; Fig. 7	-	-	2.4	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	60	-	K/W

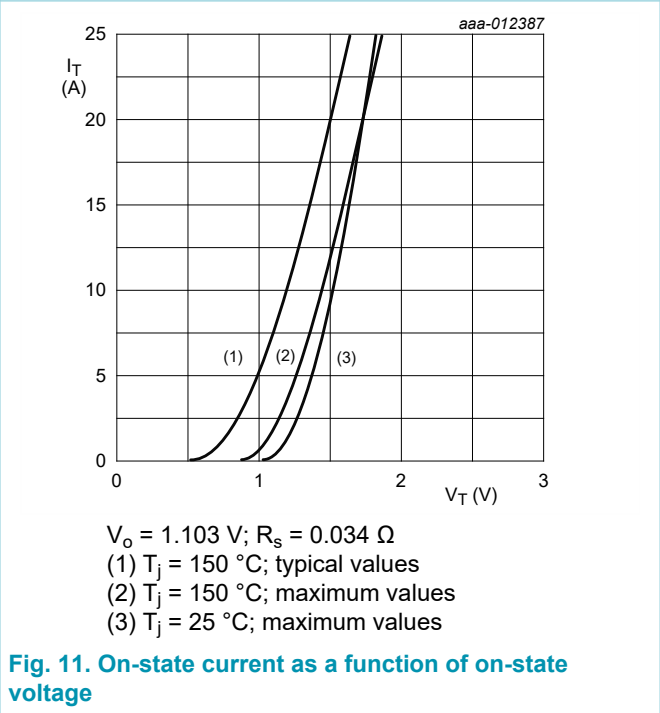
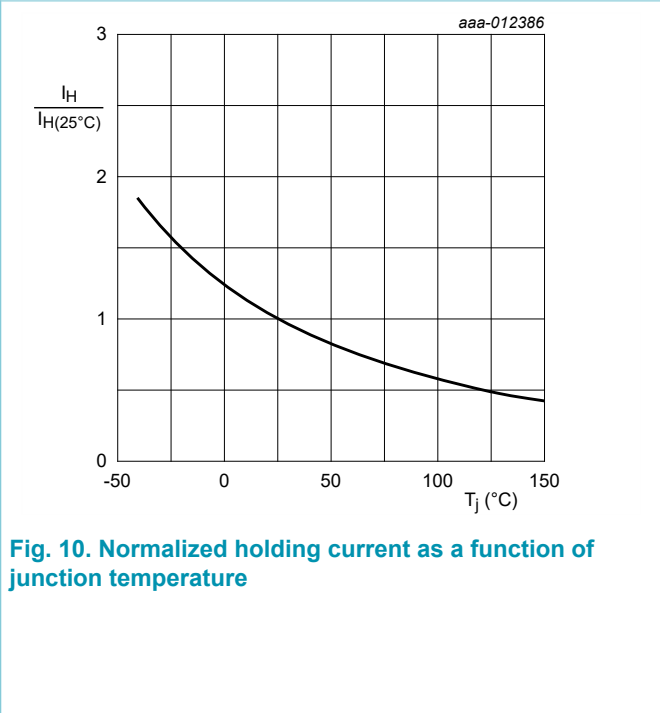
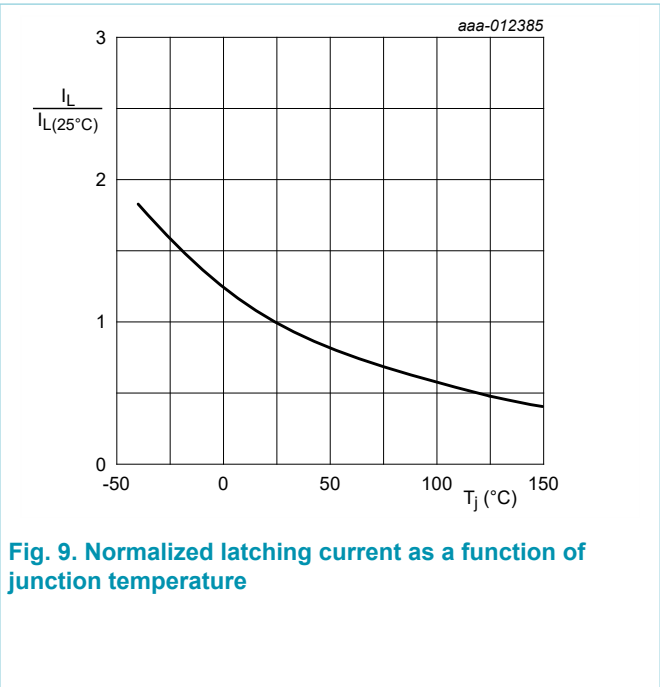
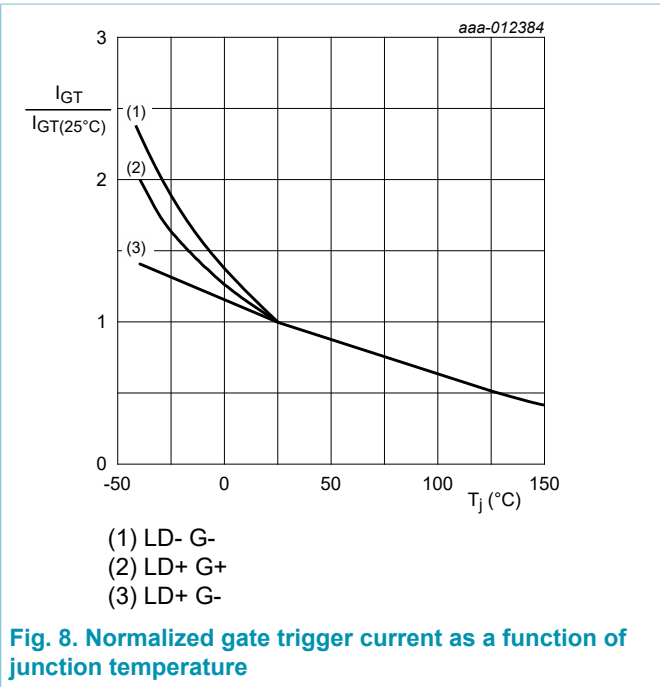


## 9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 100\text{ mA}$ ; LD+ G+; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a>	5	-	30	mA
		$V_D = 12\text{ V}$ ; $I_T = 100\text{ mA}$ ; LD+ G-; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a>	5	-	30	mA
		$V_D = 12\text{ V}$ ; $I_T = 100\text{ mA}$ ; LD- G-; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a>	5	-	30	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_G = 100\text{ mA}$ ; LD+ G+; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>	-	-	50	mA
		$V_D = 12\text{ V}$ ; $I_G = 100\text{ mA}$ ; LD+ G-; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>	-	-	70	mA
		$V_D = 12\text{ V}$ ; $I_G = 100\text{ mA}$ ; LD- G-; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>	-	-	50	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>	-	-	35	mA
$V_T$	on-state voltage	$I_T = 10\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 11</a>	-	1.3	1.5	V
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V}$ ; $I_T = 100\text{ mA}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 12</a>	-	0.8	1	V
		$V_D = 400\text{ V}$ ; $I_T = 100\text{ mA}$ ; $T_j = 150\text{ }^\circ\text{C}$ ; <a href="#">Fig. 12</a>	0.2	0.45	-	V
$I_D$	off-state current	$V_D = 800\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$	-	-	10	$\mu\text{A}$
		$V_D = 800\text{ V}$ ; $T_j = 150\text{ }^\circ\text{C}$	-	-	2	mA
$V_{CL}$	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	$V_{DM} = 536\text{ V}$ ; $T_j = 150\text{ }^\circ\text{C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit	600	-	-	V/ $\mu\text{s}$
$dI_{com}/dt$	rate of change of commutating current	$V_D = 400\text{ V}$ ; $T_j = 150\text{ }^\circ\text{C}$ ; $I_{T(RMS)} = 8\text{ A}$ ; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$ ; (snubberless condition); gate open circuit	3	-	-	A/ms





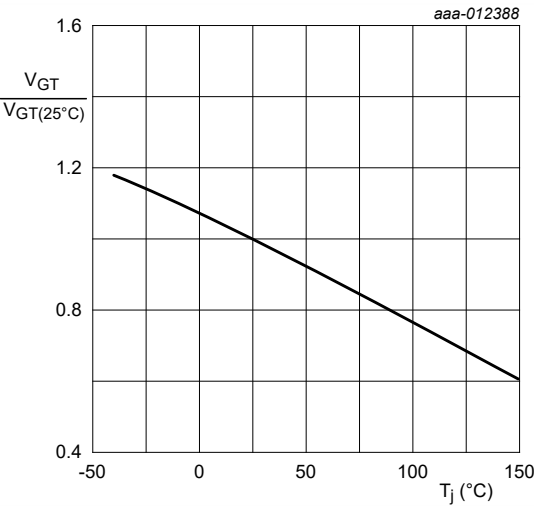


Fig. 12. Normalized gate trigger voltage as a function of junction temperature

10. Package outline

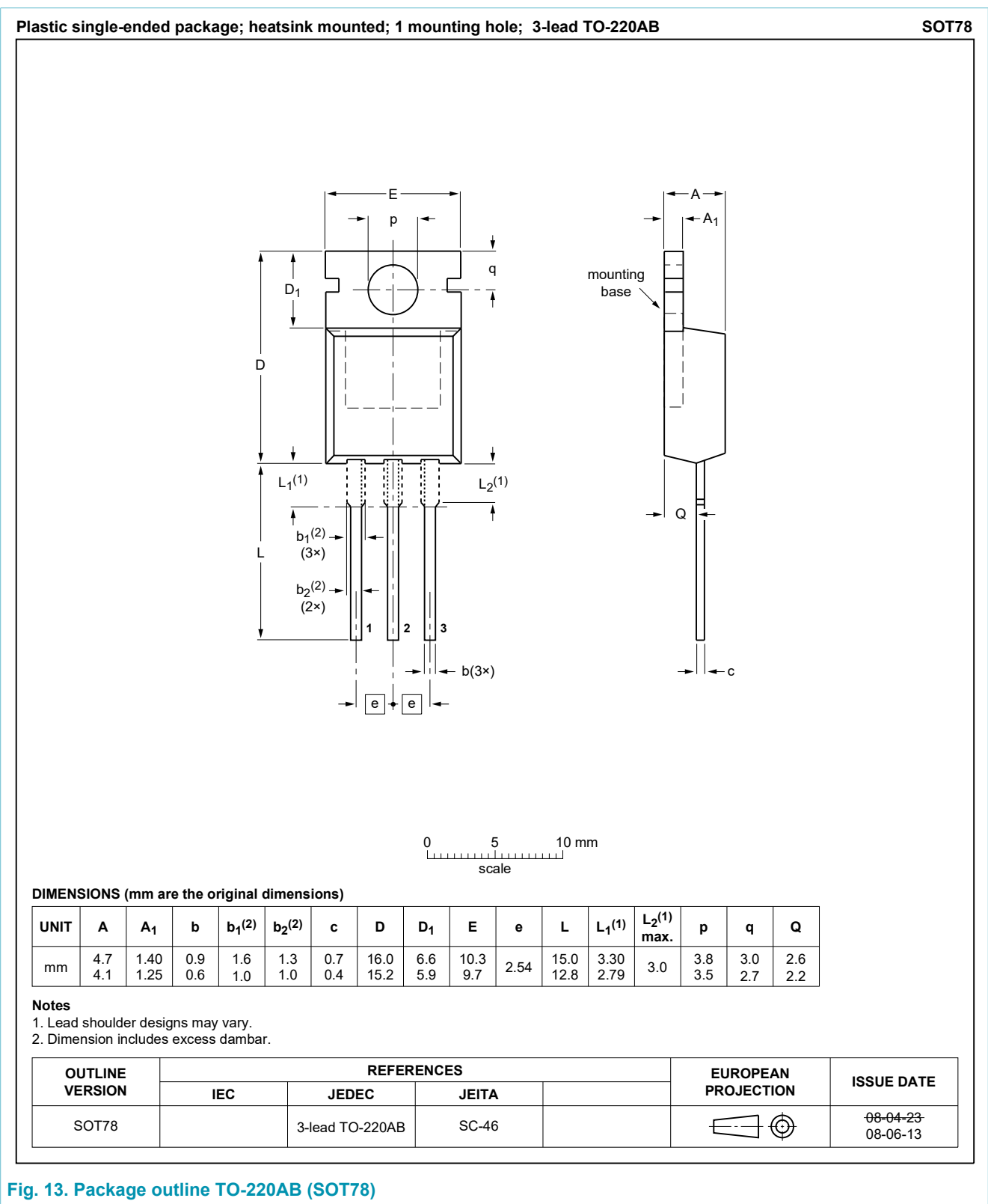


Fig. 13. Package outline TO-220AB (SOT78)

## 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.
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