

1. General description

Planar passivated high commutation three quadrant triac in a TO220 plastic package intended for use in circuits where high static and dynamic dV/dt and high dI/dt can occur. This "series C" triac will commute the full RMS current at the maximum rated junction temperature without the aid of a snubber.

2. Features and benefits

- 3Q technology for improved noise immunity
- High commutation capability with maximum false trigger immunity
- High immunity to false turn-on by dV/dt
- High voltage capability
- Less sensitive gate for high noise immunity
- Planar passivated for voltage ruggedness and reliability
- Triggering in three quadrants only

3. Applications

- Electronic thermostats (heating and cooling)
- Motor controls e.g. washing machines and vacuum cleaners
- Rectifier-fed DC inductive loads e.g. DC motors and solenoids

4. Quick reference data

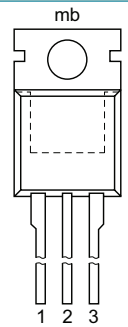
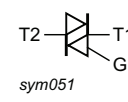
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Absolute maximum rating						
V_{DRM}	repetitive peak off-state voltage		-	-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 106\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3	-	-	10	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(initial)} = 25\text{ °C}$; $t_p = 20\text{ ms}$; Fig. 4 ; Fig. 5	-	-	85	A
		full sine wave; $T_{j(initial)} = 25\text{ °C}$; $t_p = 16.7\text{ ms}$	-	-	93	A
T_j	junction temperature		-	-	125	°C
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G+; $T_j = 25\text{ °C}$; Fig. 7	2	-	35	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_j = 25\text{ °C}$; Fig. 7	2	-	35	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_j = 25\text{ °C}$; Fig. 7	2	-	35	mA

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ °C}$; Fig. 9	-	-	35	mA
V_T	on-state voltage	$I_T = 12\text{ A}$; $T_j = 25\text{ °C}$; Fig. 10	-	1.25	1.5	V
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$; $T_j = 125\text{ °C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit	500	-	-	V/ μ s
dI_{com}/dt	rate of change of commutating current	$V_D = 400\text{ V}$; $T_j = 125\text{ °C}$; $I_{T(RMS)} = 10\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit	20	-	-	A/ms
		$V_D = 400\text{ V}$; $T_j = 125\text{ °C}$; $I_{T(RMS)} = 10\text{ A}$; $dV_{com}/dt = 10\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit	28	-	-	A/ms
		$V_D = 400\text{ V}$; $T_j = 125\text{ °C}$; $I_{T(RMS)} = 10\text{ A}$; $dV_{com}/dt = 1\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit	40	-	-	A/ms

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1		
2	T2	main terminal 2		
3	G	gate		
mb	T2	mounting base; main terminal 2		

6. Ordering information

Table 3. Ordering information

Type number	Package name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
BTA310-600C	TO220	BTA310-600C,127	Tube	50	SOT78	13-Jun-2008

7. Marking

Table 4. Marking codes

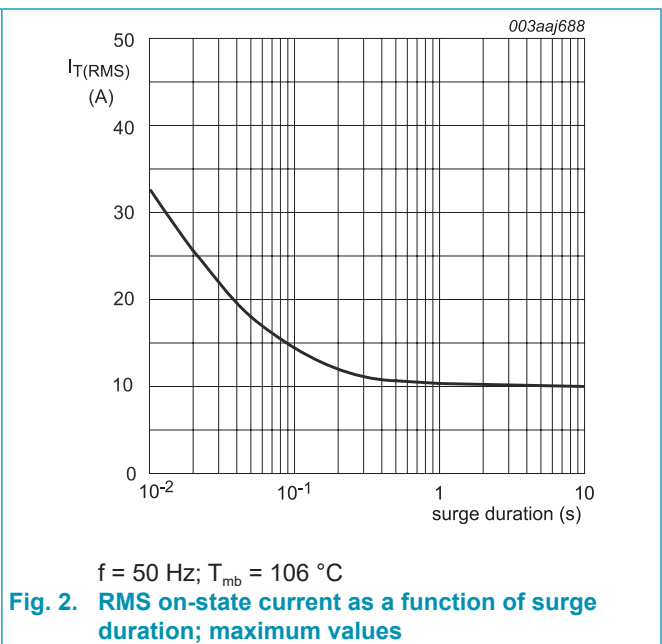
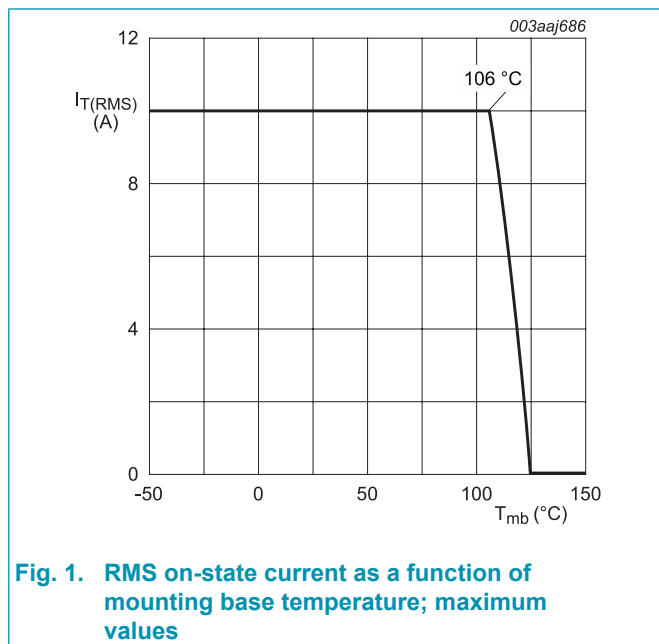
Type number	Marking codes	
	Assembly factory: d	Assembly factory: A
BTA310-600C	BTA310 600C PJdxxxx xx	BTA310 600C PJAxxxx xx

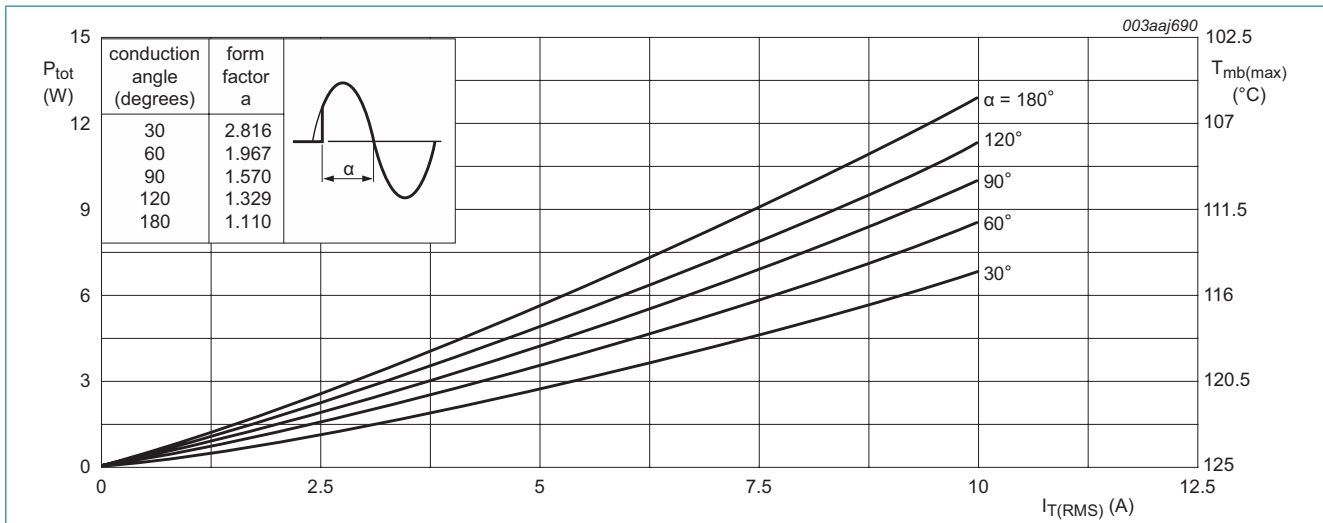
8. Limiting values

Table 5. Limiting values

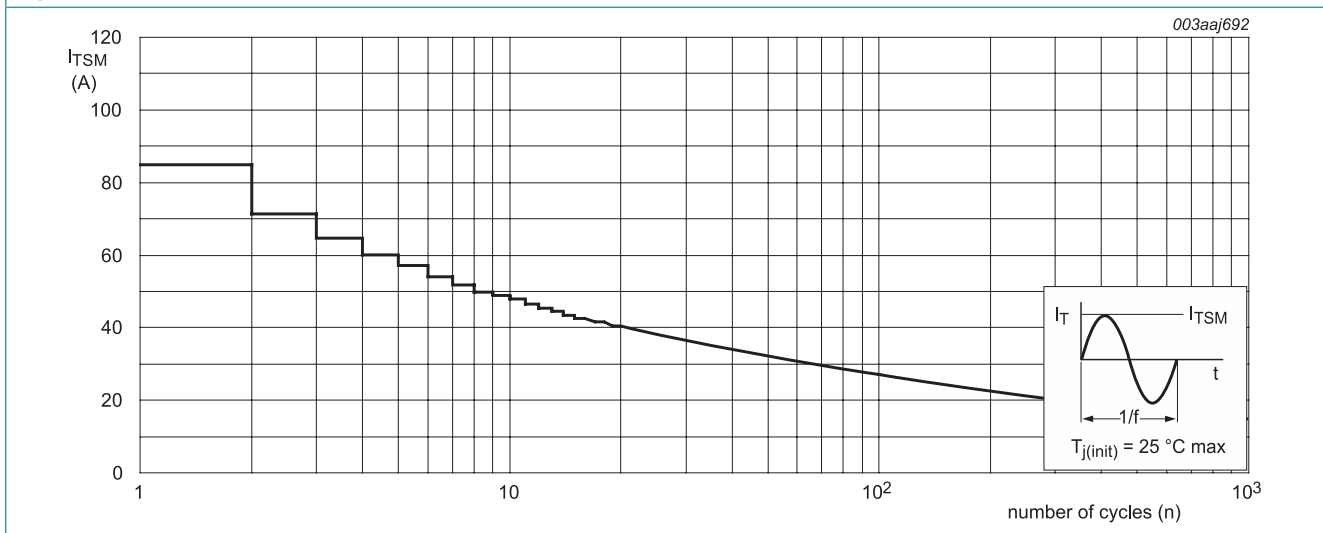
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 106\text{ °C}$; Fig 1 ; Fig 2 ; Fig 3	-	10	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 20\text{ ms}$; Fig 4 ; Fig 5	-	85	A
		full sine wave; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 16.7\text{ ms}$	-	93	A
I^2t	I^2t for fusing	$t_p = 10\text{ ms}$; sine-wave pulse	-	36.1	A^2s
di_T/dt	rate of rise of on-state current	$I_G = 0.2\text{ A}$	-	100	$A/\mu s$
I_{GM}	peak gate current		-	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		-	125	$^{\circ}C$

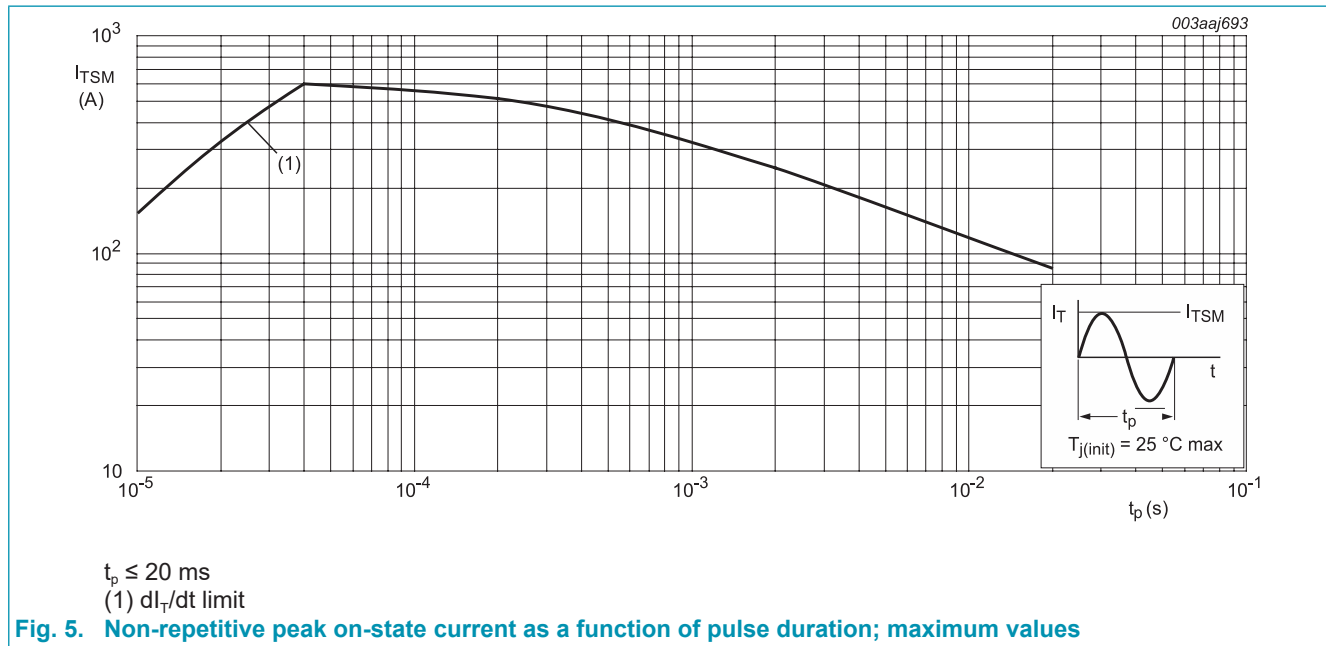




α = conduction angle
 a = form factor = $I_{T(RMS)} / I_{T(AV)}$
Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values



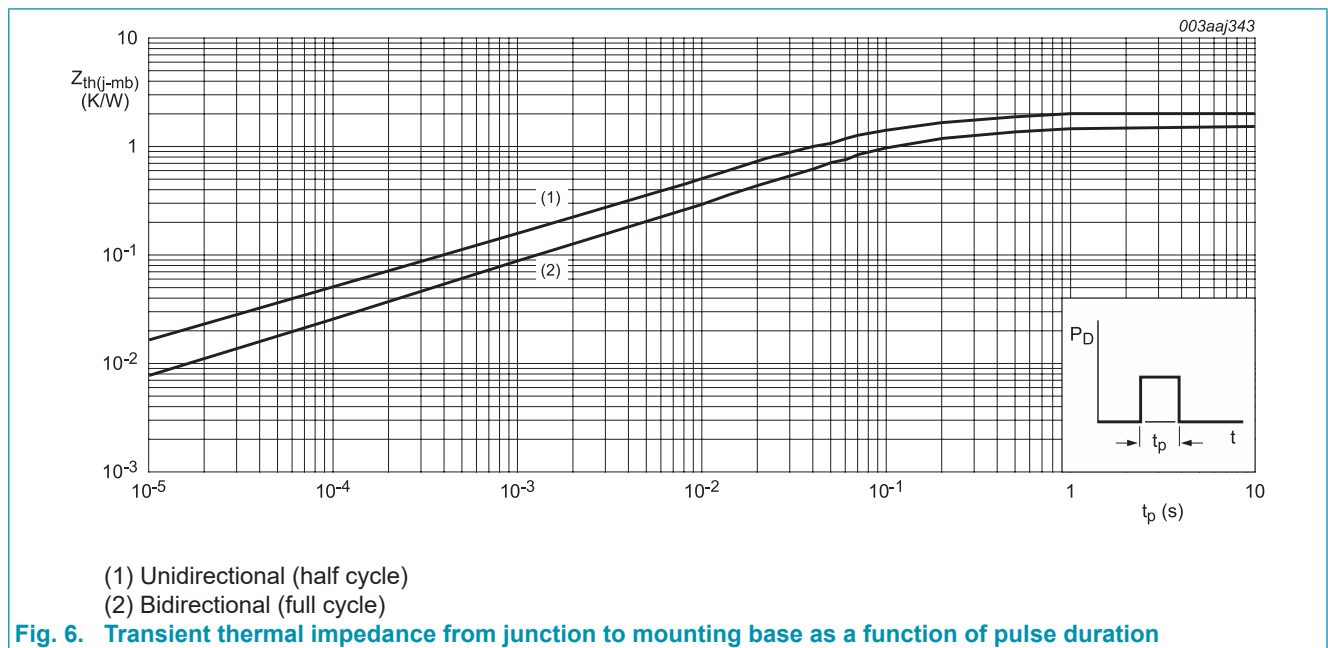
$f = 50 \text{ Hz}$
Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



9. Thermal characteristics

Table 6. Thermal characteristics

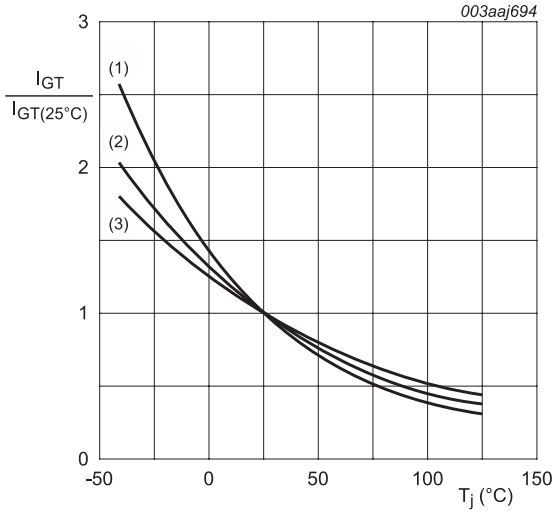
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	full cycle; Fig 6	-	-	1.5	K/W
		half cycle; Fig 6	-	-	2	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	60	-	K/W



10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G+; $T_J = 25\text{ °C}$; Fig. 7	2	-	35	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2+ G-; $T_J = 25\text{ °C}$; Fig. 7	2	-	35	mA
		$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; T2- G-; $T_J = 25\text{ °C}$; Fig. 7	2	-	35	mA
I_L	latching current	$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G+; $T_J = 25\text{ °C}$; Fig. 8	-	-	50	mA
		$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2+ G-; $T_J = 25\text{ °C}$; Fig. 8	-	-	60	mA
		$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; T2- G-; $T_J = 25\text{ °C}$; Fig. 8	-	-	50	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_J = 25\text{ °C}$; Fig. 9	-	-	35	mA
V_T	on-state voltage	$I_T = 12\text{ A}$; $T_J = 25\text{ °C}$; Fig. 10	-	1.25	1.5	V
V_{GT}	gate trigger voltage	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_J = 25\text{ °C}$; Fig. 11	-	0.8	1	V
		$V_D = 400\text{ V}$; $I_T = 0.1\text{ A}$; $T_J = 125\text{ °C}$	0.25	0.4	-	V
I_D	off-state current	$V_D = 600\text{ V}$; $T_J = 125\text{ °C}$	-	0.1	0.5	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$; $T_J = 125\text{ °C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit	500	-	-	V/ μ s
di_{com}/dt	rate of change of commutating current	$V_D = 400\text{ V}$; $T_J = 125\text{ °C}$; $I_{T(RMS)} = 10\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit	20	-	-	A/ms
		$V_D = 400\text{ V}$; $T_J = 125\text{ °C}$; $I_{T(RMS)} = 10\text{ A}$; $dV_{com}/dt = 10\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit	28	-	-	A/ms
		$V_D = 400\text{ V}$; $T_J = 125\text{ °C}$; $I_{T(RMS)} = 10\text{ A}$; $dV_{com}/dt = 1\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit	40	-	-	A/ms



- (1) T2- G-
- (2) T2+ G-
- (3) T2+ G+

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

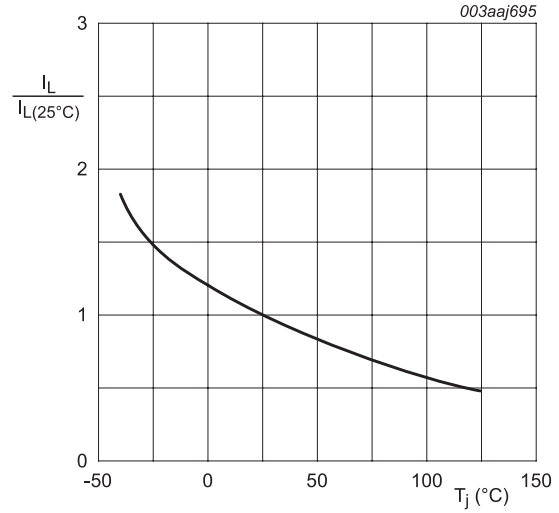


Fig. 8. Normalized latching current as a function of junction temperature

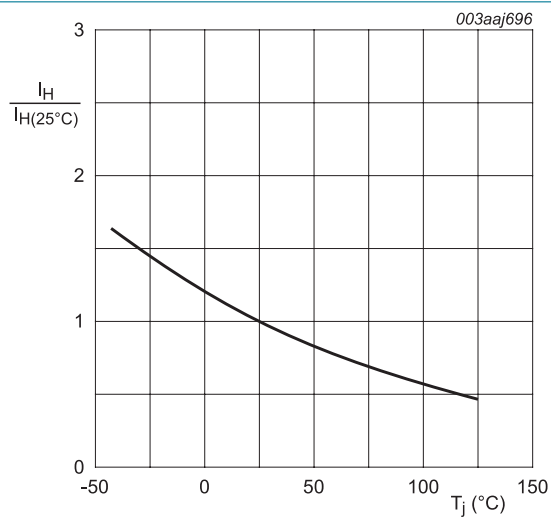
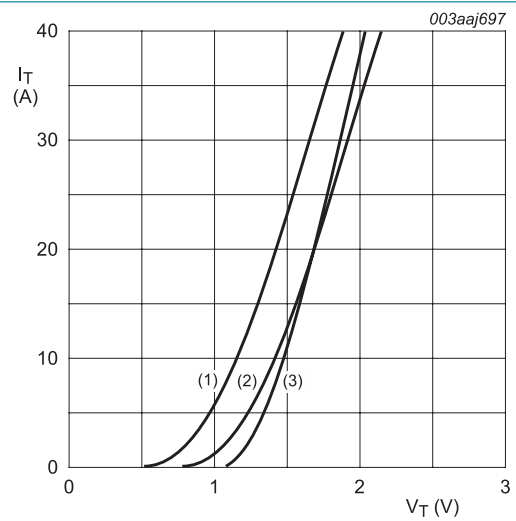


Fig. 9. Normalized holding current as a function of junction temperature



- $V_o = 1.103 \text{ V}; R_s = 0.030 \Omega$
- (1) $T_j = 125^\circ \text{C}$; typical values
 - (2) $T_j = 125^\circ \text{C}$; maximum values
 - (3) $T_j = 25^\circ \text{C}$; maximum values

Fig. 10. On-state current as a function of on-state voltage

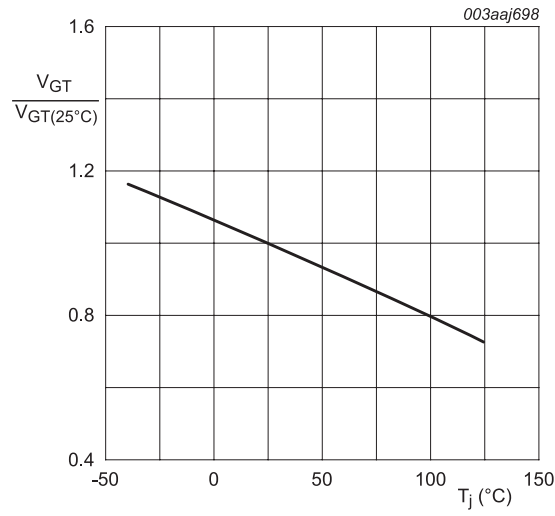


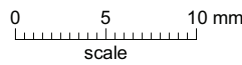
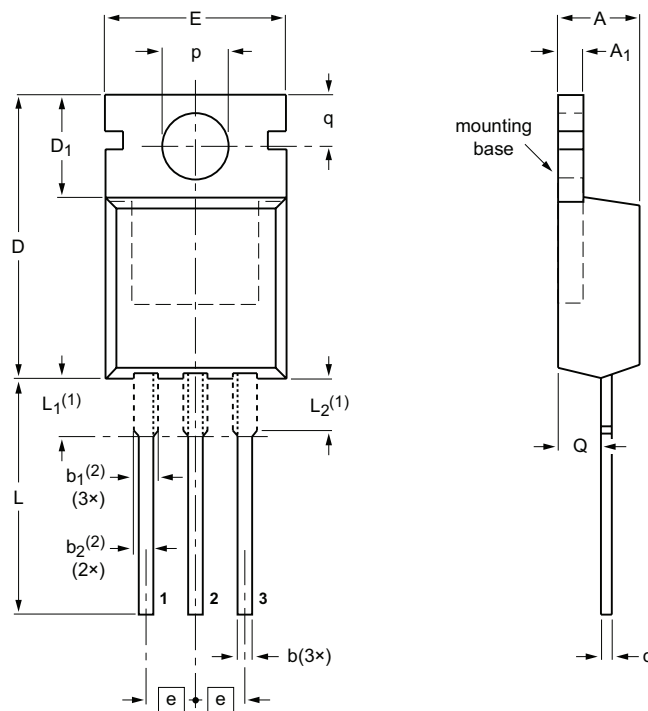
Fig. 11. Normalized gate trigger voltage as a function of junction temperature

11. Package outline

Assembly factory: d & A

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

SOT78



DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁	b	b ₁ (²)	b ₂ (²)	c	D	D ₁	E	e	L	L ₁ (¹)	L ₂ (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

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.

- [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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