ACTT12-800C

AC Thyristor Triac power switch

5 September 2018 Product data sheet

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.

2. Features and benefits

- Clamping structure ensuring safe high over-voltage withstand capability
- Full cycle AC conduction
- Over-voltage withstand capability to IEC 61000-4-5
- Pin compatible with standard triacs
- Planar passivated for voltage ruggedness and reliability
- 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
- 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

4. Quick reference data

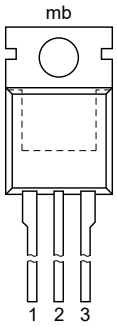
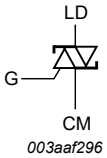
Table 1. Quick reference data

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; $T_{mb} \leq 95$ °C; Fig. 1; Fig. 2; Fig. 3		-	-	12	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25$ °C; $t_p = 20$ ms; Fig. 4; Fig. 5		-	-	120	A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms		-	-	132	A
T_j	junction temperature			-	-	125	°C
V_{PP}	peak pulse voltage	$T_j = 25$ °C; non-repetitive, off-state; Fig. 6		-	-	2	kV
Static characteristics							

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{GT}	gate trigger current	V_D = 12 V; I_T = 100 mA; LD+ G+; T_j = 25 °C; Fig. 8		-	-	35	mA
		V_D = 12 V; I_T = 100 mA; LD+ G-; T_j = 25 °C; Fig. 8		-	-	35	mA
		V_D = 12 V; I_T = 100 mA; LD- G-; T_j = 25 °C; Fig. 8		-	-	35	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 10		-	-	50	mA
V_T	on-state voltage	I_T = 17 A; T_j = 25 °C; Fig. 11		-	1.25	1.5	V
V_{CL}	clamping voltage	I_{CL} = 0.1 mA; t_p = 1 ms; T_j = 25 °C		850	-	-	V
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 536 V; T_j = 125 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		3000	-	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 12 A; dV_{com}/dt = 20 V/µs; (snubberless condition); gate open circuit		14	-	-	A/ms

5. Pinning information

Table 2. Pinning information

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

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
ACTT12-800C	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_{DRM}	repetitive peak off-state voltage			-	800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 95$ °C; Fig. 1; Fig. 2; Fig. 3		-	12	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25$ °C; $t_p = 20$ ms; Fig. 4; Fig. 5		-	120	A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms		-	132	A
I^2t	I^2t for fusing	$t_p = 10$ ms; sine-wave pulse		-	72	A^2s
dI_T/dt	rate of rise of on-state current	$I_G = 0.2$ A		-	100	A/µs
I_{GM}	peak gate current	t = 20 µs		-	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	°C
T_j	junction temperature			-	125	°C
V_{PP}	peak pulse voltage	$T_j = 25$ °C; non-repetitive, off-state; Fig. 6		-	2	kV

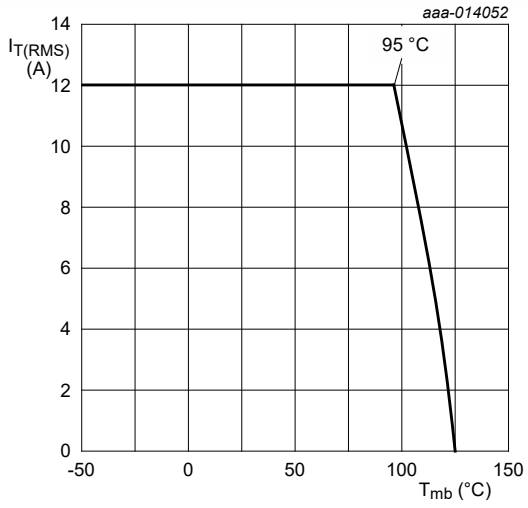
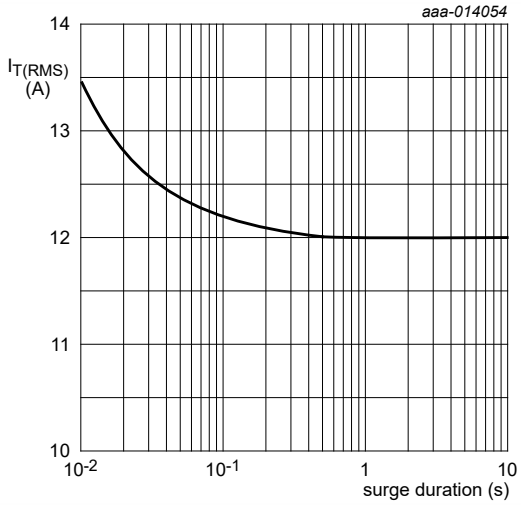
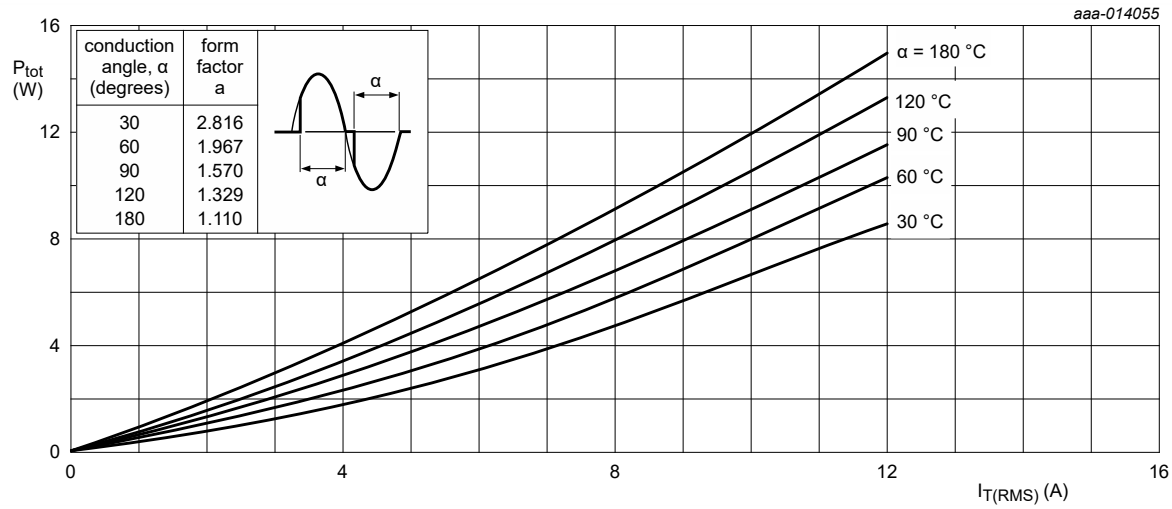


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values



f = 50 Hz; T_{mb} = 95 °C

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

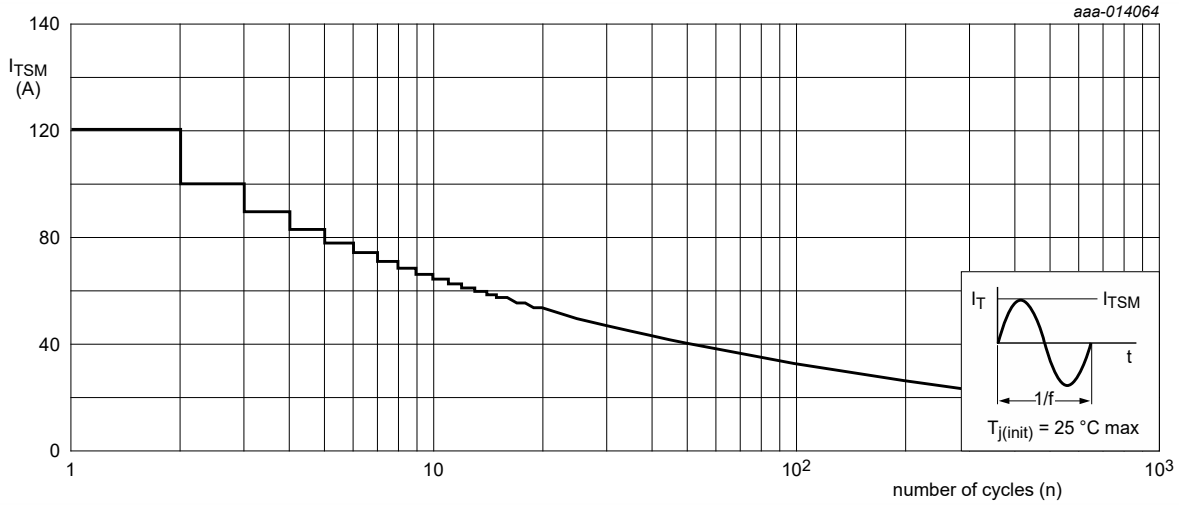


conduction angle, α (degrees)	form factor a
30	2.816
60	1.967
90	1.570
120	1.329
180	1.110

α = conduction angle

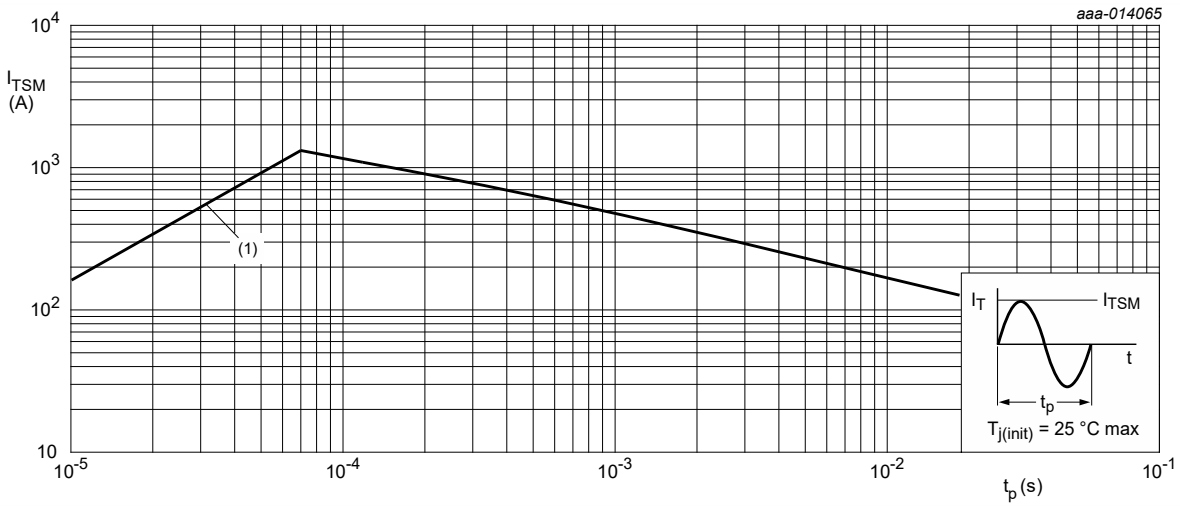
a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

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



f = 50 Hz

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



$t_p \leq 20$ ms

(1) dI_T/dt limit

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

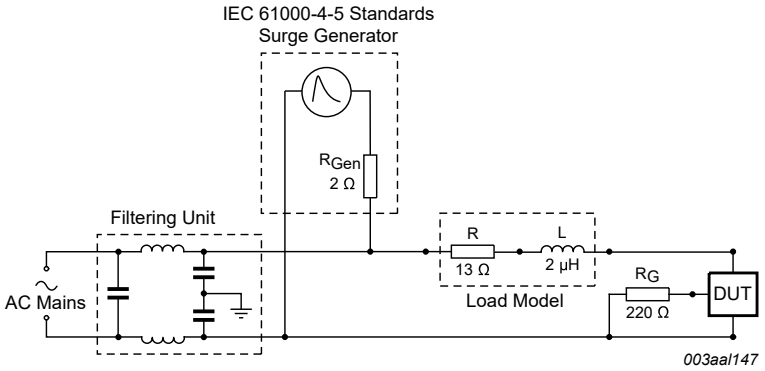


Fig. 6. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5

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
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

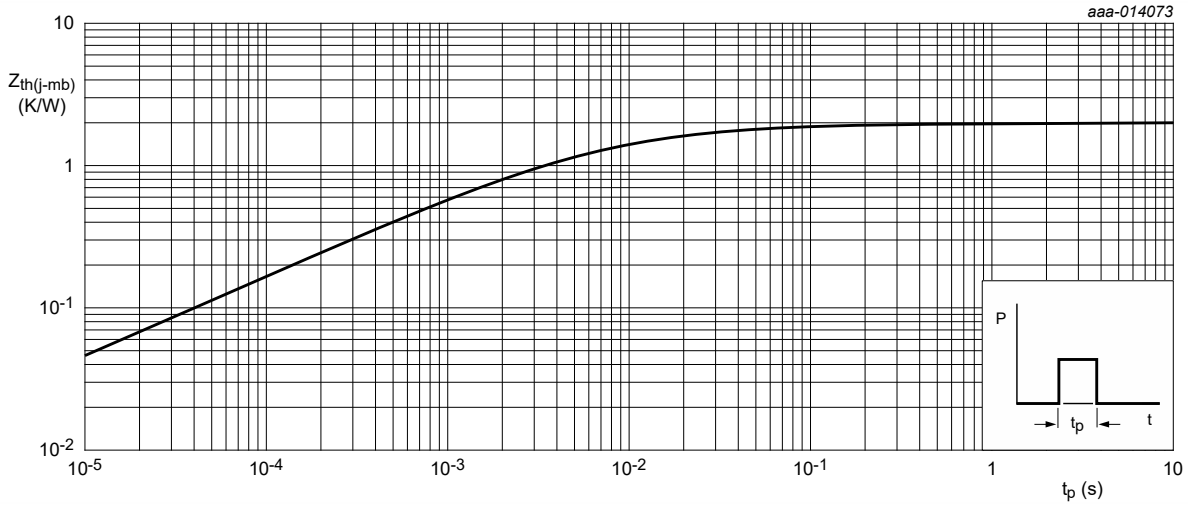
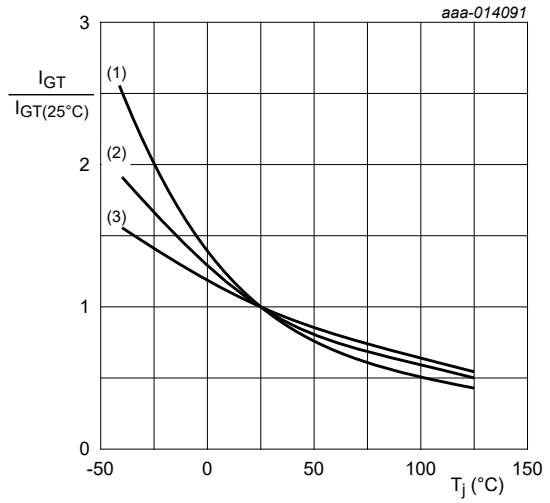


Fig. 7. Transient thermal impedance from junction to mounting base as a function of pulse width

9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I_{GT}	gate trigger current	V_D = 12 V; I_T = 100 mA; LD+ G+; T_j = 25 °C; Fig. 8		-	-	35	mA
		V_D = 12 V; I_T = 100 mA; LD+ G-; T_j = 25 °C; Fig. 8		-	-	35	mA
		V_D = 12 V; I_T = 100 mA; LD- G-; T_j = 25 °C; Fig. 8		-	-	35	mA
I_L	latching current	V_D = 12 V; I_G = 100 mA; LD+ G+; T_j = 25 °C; Fig. 9		-	-	50	mA
		V_D = 12 V; I_G = 100 mA; LD+ G-; T_j = 25 °C; Fig. 9		-	-	70	mA
		V_D = 12 V; I_G = 100 mA; LD- G-; T_j = 25 °C; Fig. 9		-	-	50	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 10		-	-	50	mA
V_T	on-state voltage	I_T = 17 A; T_j = 25 °C; Fig. 11		-	1.25	1.5	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 100 mA; T_j = 25 °C; Fig. 12		-	0.8	1	V
		V_D = 400 V; I_T = 100 mA; T_j = 125 °C; Fig. 12		0.2	0.45	-	V
I_D	off-state current	V_D = 800 V; T_j = 25 °C		-	-	10	µA
		V_D = 800 V; T_j = 125 °C		-	-	0.5	mA
V_{CL}	clamping voltage	I_{CL} = 0.1 mA; t_p = 1 ms; T_j = 25 °C		850	-	-	V
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 536 V; T_j = 125 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		3000	-	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 12 A; dV_{com}/dt = 20 V/µs; (snubberless condition); gate open circuit		14	-	-	A/ms



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

Fig. 8. Normalized gate trigger current as a function of junction temperature

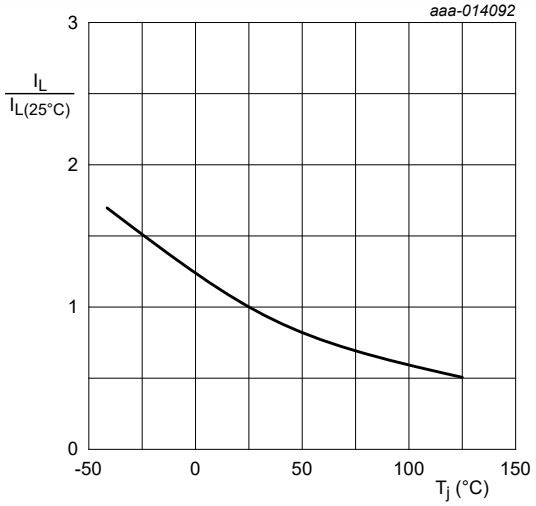


Fig. 9. Normalized latching current as a function of junction temperature

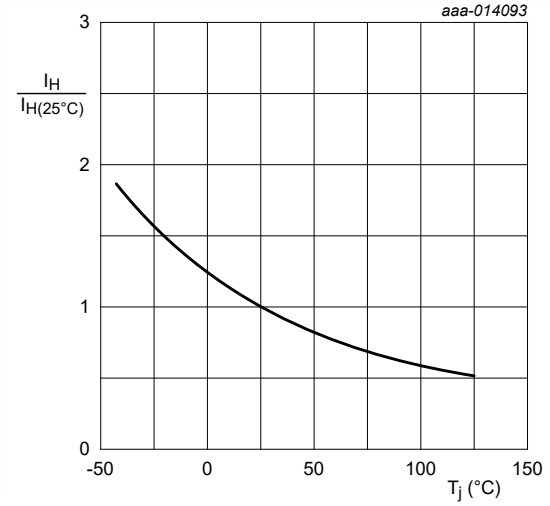
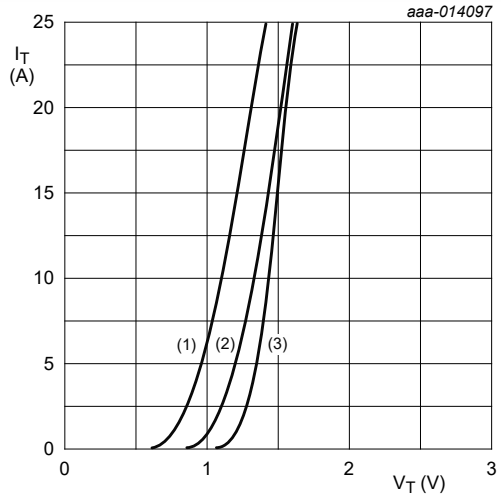


Fig. 10. Normalized holding current as a function of junction temperature



V_o = 1.018 V; R_s = 0.028 Ω
(1) T_j = 125 °C; typical values
(2) T_j = 125 °C; maximum values
(3) T_j = 25 °C; maximum values

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

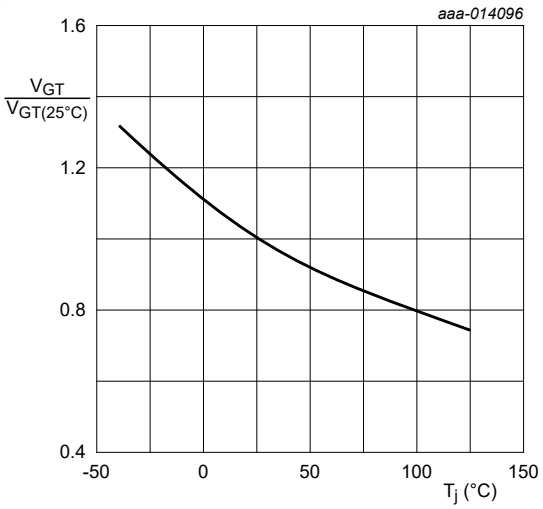
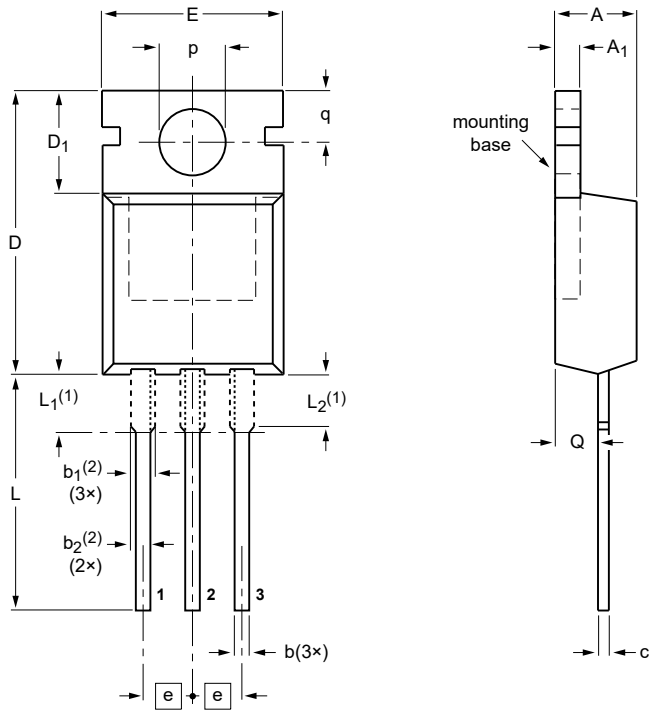


Fig. 12. Normalized gate trigger voltage as a function of junction temperature

10. Package outline

Plastic single-ended 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

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

11. Legal information

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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.
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