TOPT12-800C0

TOPTriac

8 October 2012 **Preliminary data sheet**

1. Product profile

1.1 General description

Planar passivated Temperature and Overload Protected Triac with high commutation performance in a SOT78 (TO-220AB) plastic package. This TOPTriac™ conveniently self protects by turning off in the event of excessive temperature. It is triggered negatively, which can be continuous DC or pulsed.

1.2 Features and benefits

- Exclusive negative gate triggering
- Full cycle AC conduction
- Hi-Com technology for enhanced immunity to false triggering
- High commutation capability with maximum false trigger immunity
- High immunity to false turn-on by dV/dt
- High minimum I_{GT} for guaranteed immunity to gate noise
- Over-temperature self protection function
- Pin compatible with standard triacs
- Planar passivated for voltage ruggedness and reliability

1.3 Applications

- Any suitable circuit for protection against overload and/or over temperature
- Electronic motor starters e.g. refrigeration compressors
- Heating and cooking appliances
- High power motors e.g. vacuum cleaners, window blinds, well pumps

1.4 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_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)}$ = 25 °C; t_p = 20 ms; Fig. 4; Fig. 5		-	-	100	A
T_j	junction temperature	normal operation		-	-	125	°C
		self-protection		-	-	150	°C
$I_{T(RMS)}$	RMS on-state current	full sine wave; T_{mb} ≤ 100 °C; Fig. 1; Fig. 2; Fig. 3		-	-	12	A

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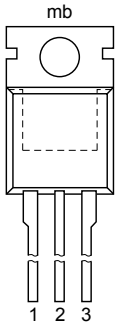
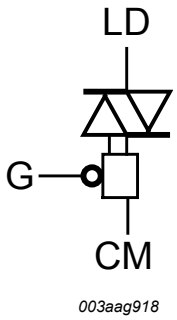
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; LD+ G-; T_j = 25 °C		5	-	35	mA
		V_D = 12 V; I_T = 0.1 A; LD- G-; T_j = 25 °C		5	-	35	mA

2. Pinning information

Table 2. Pinning information

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

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
TOPT12-800C0	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78
TOPT12-800C0/DG	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

4. 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; $T_{mb} \leq 100$ °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 = 16.7 ms		-	110	A

Symbol	Parameter	Conditions		Min	Max	Unit
		full sine wave; $T_{j(init)}$ = 25 °C; t_p = 20 ms; Fig. 4; Fig. 5		-	100	A
I^2t	I^2t for fusing	t_p = 10 ms; SIN		-	50	A^2s
dI_T/dt	rate of rise of on-state current	I_T = 20 A; I_G 0.2 A; dI_G/dt = 0.2 A/µs		-	100	A/µs
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	°C
T_j	junction temperature	normal operation		-	125	°C
		self-protection		-	150	°C

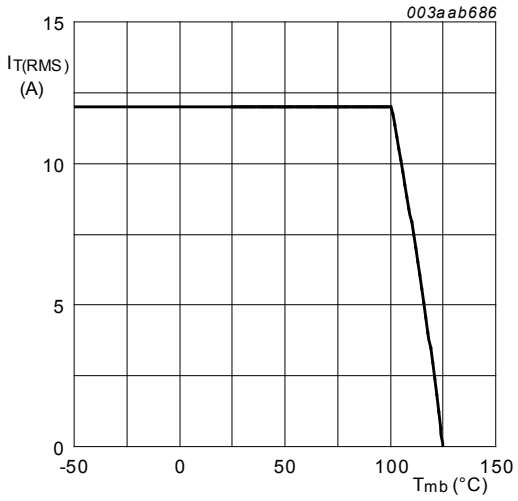
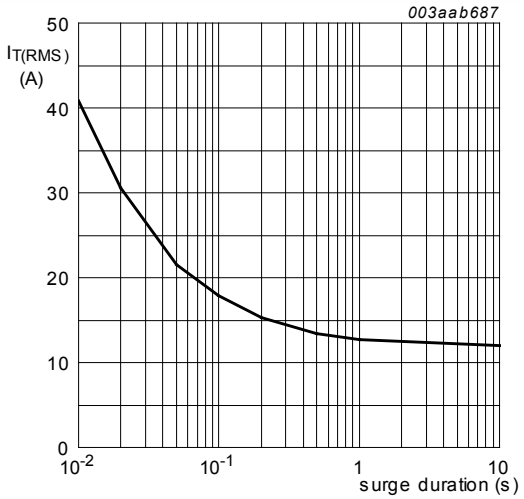
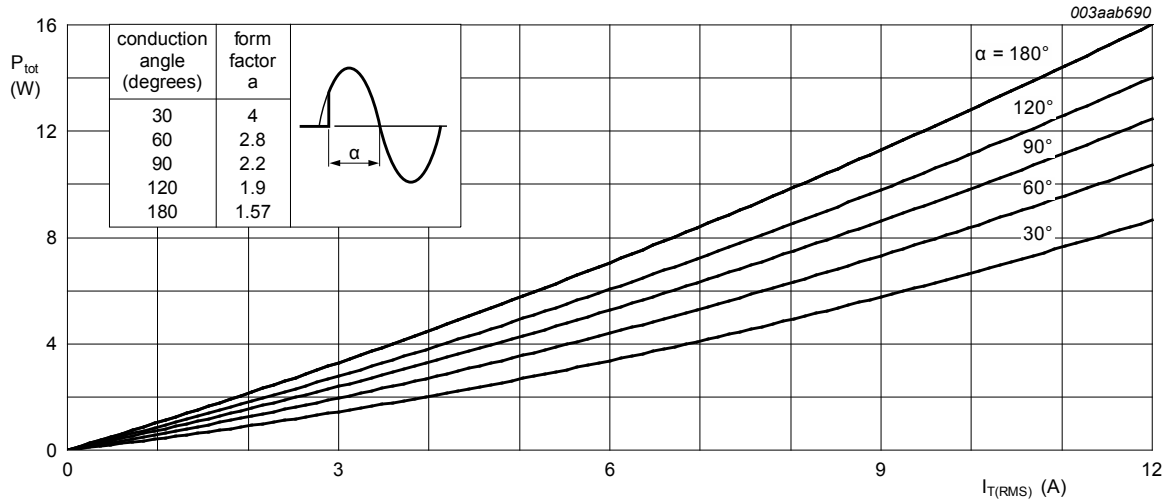


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values



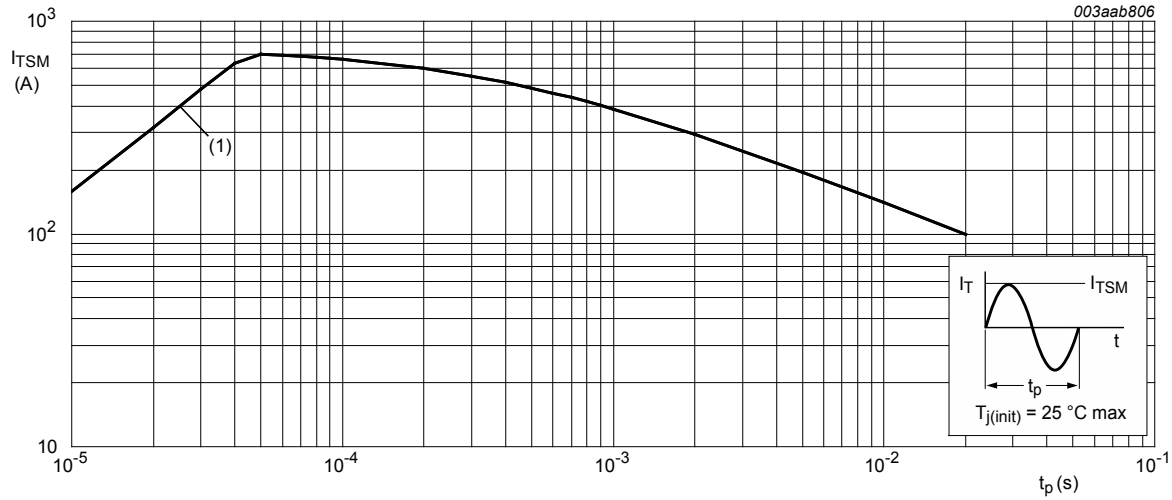
f = 50 Hz; T_{mb} = 100 °C

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



α = conduction angle

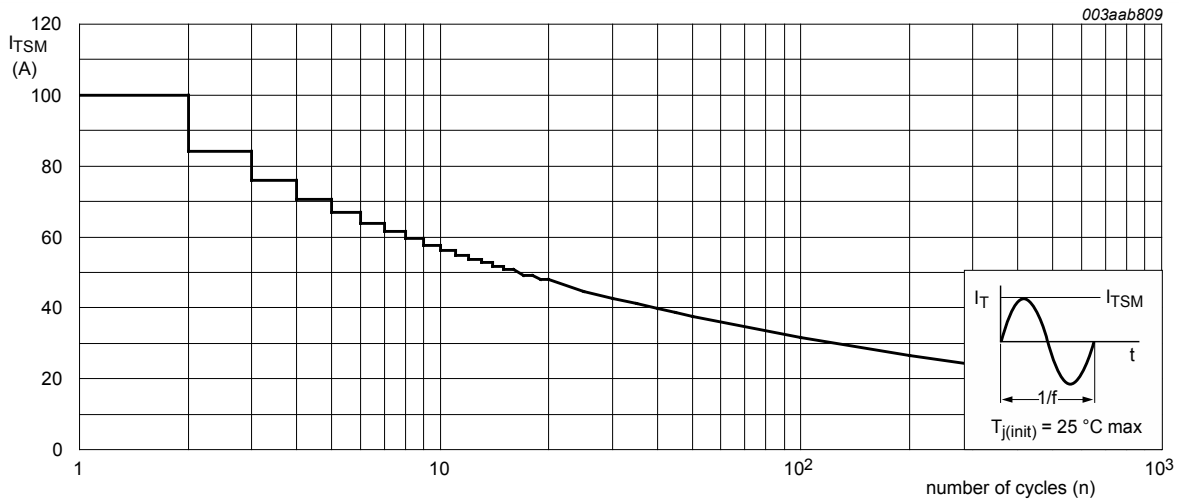
Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values



$t_p \leq 20$ ms

(1) dI_T/dt limit

Fig. 4. Non-repetitive peak on-state current as a function of pulse duration; maximum values



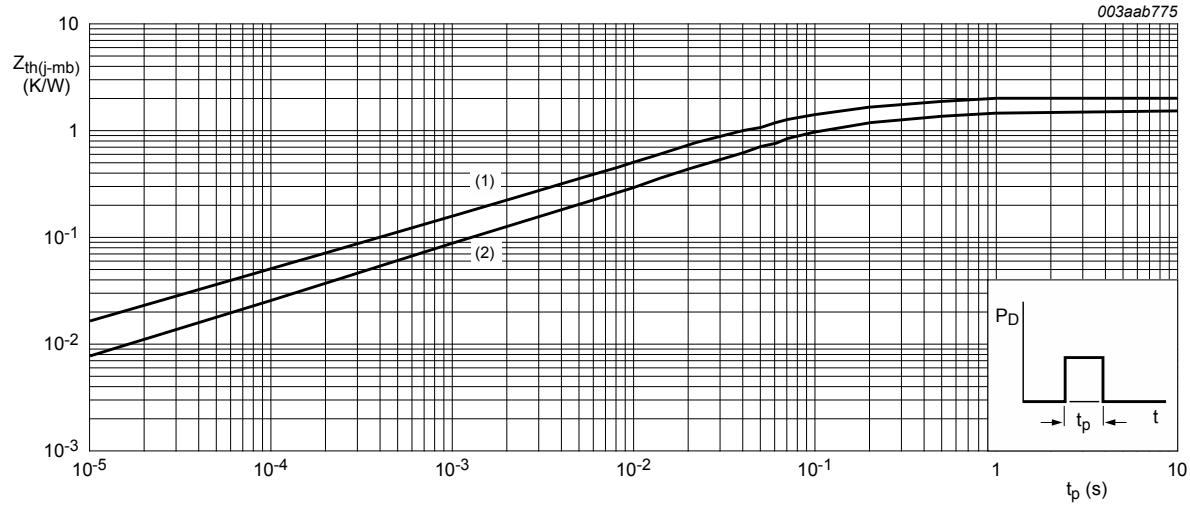
f = 50 Hz

Fig. 5. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

5. Thermal characteristics

Table 5. Thermal characteristics

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



(1) Unidirectional (half cycle)
(2) Bidirectional (full cycle)

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

6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; LD+ G-; T_j = 25 °C		5	-	35	mA
		V_D = 12 V; I_T = 0.1 A; LD- G-; T_j = 25 °C		5	-	35	mA
I_L	latching current	V_D = 12 V; I_G = 0.1 A; LD+ G-; T_j = 25 °C		-	-	60	mA
		V_D = 12 V; I_G = 0.1 A; LD- G-; T_j = 25 °C; Fig. 7		-	-	50	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 8		-	-	35	mA
V_T	on-state voltage	I_T = 15 A; T_j = 25 °C; Fig. 9		-	1.3	1.6	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C; Fig. 10		-	1.4	2.3	V
		V_D = 400 V; I_T = 0.1 A; T_j = 125 °C; Fig. 10		0.5	-	-	V
I_D	off-state current	V_D = 800 V; T_j = 125 °C		-	0.1	0.5	mA
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		500	-	-	V/µs

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; $I_{T(RMS)}$ = 12 A; dV_{com}/dt = 20 V/µs; (snubberless condition); gate open circuit		20	-	-	A/ms
Over-temperature protection characteristics							
T_{trip}	trip junction temperature	see application information		125	-	150	°C
$V_{G(trip)}$	trip gate voltage	I_G = 2 mA; see application information		0.3	-	-	V
		I_G = 50 mA; see application information		-	-	0.9	V
Over-temperature protection limiting values (for pulsed gate triggering)							
$I_{G(bl)}$	gate bleed current	T_j = 150 °C; $V_G = V_{GT}$; see application information		-	-	2	mA
		T_j = 25 °C; $V_G = V_{G(trip)}$; see application information		0.5	-	-	mA

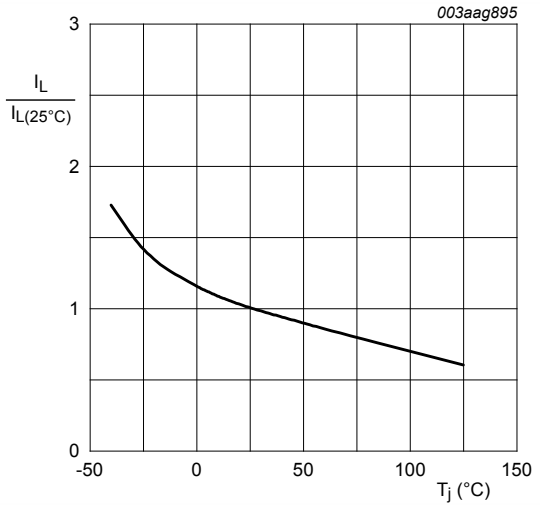


Fig. 7. Normalized latching current as a function of junction temperature

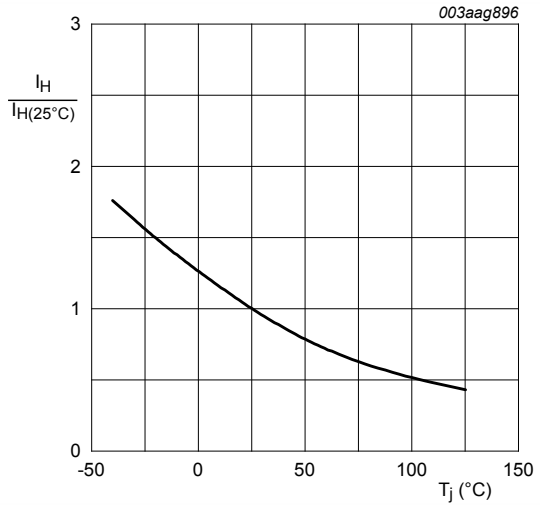
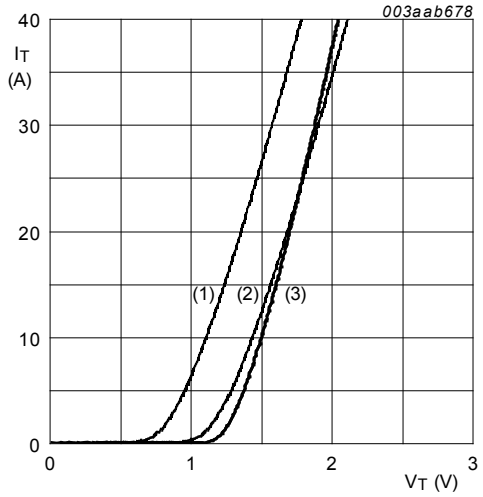


Fig. 8. Normalized holding current as a function of junction temperature



V_o = 1.164 V; R_s = 0.027 Ω

(1) T_j = 125 °C; typical values

(2) T_j = 125 °C; maximum values

(3) T_j = 25 °C; maximum values

Fig. 9. On-state current as a function of on-state voltage

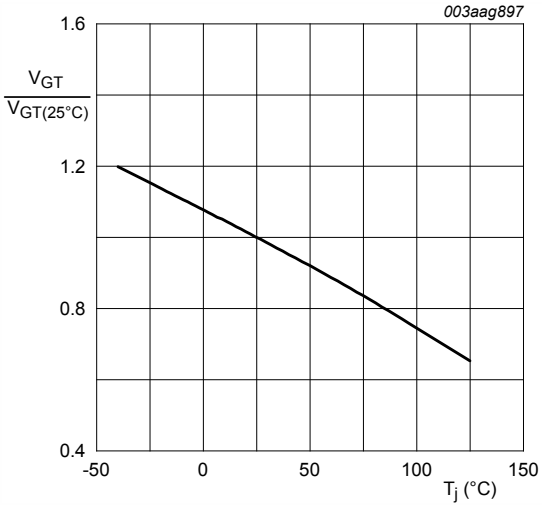
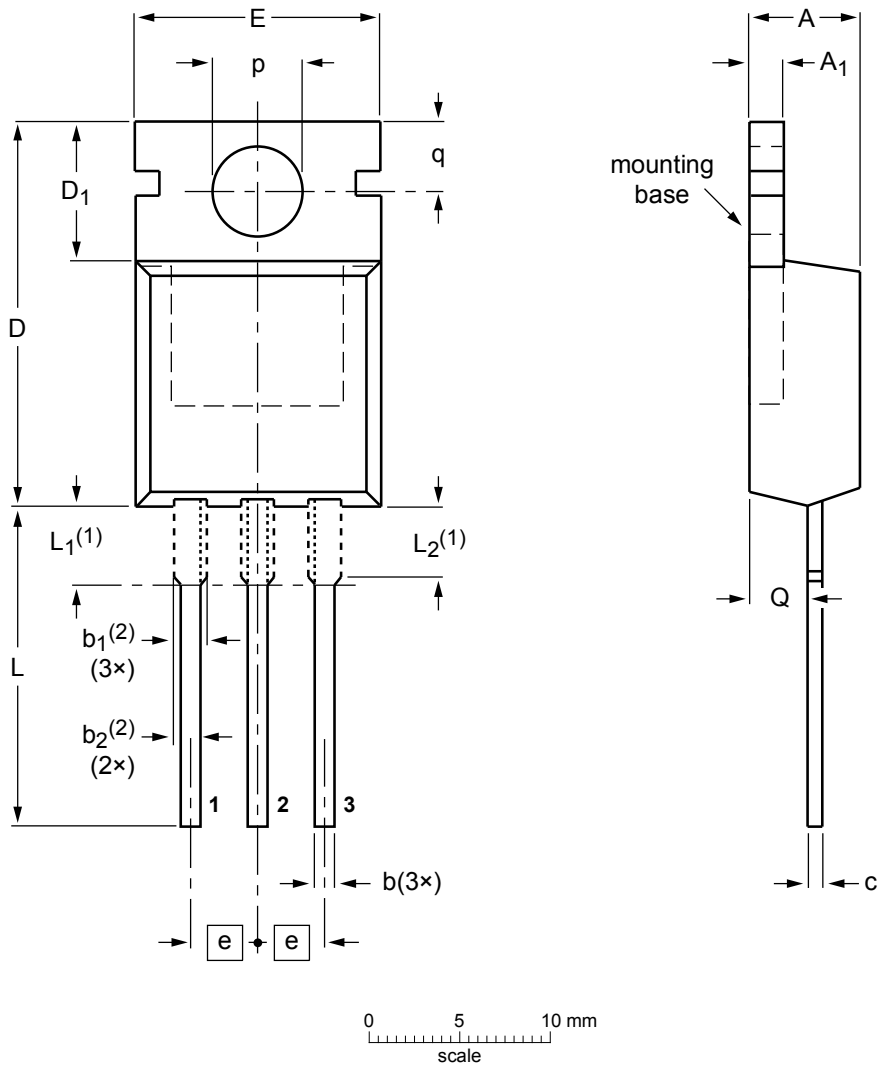


Fig. 10. Normalized gate trigger voltage as a function of junction temperature

7. 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. 11. Package outline TO-220AB (SOT78)

8. Legal information

8.1 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.

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Date of release: 8 October 2012