1. General description

Planar passivated high commutation three quadrant triac in a SOT78 (TO-220AB) plastic package. This "series ET" triac balances the requirements of commutation performance and gate sensitivity and is intended for interfacing with low power drivers including microcontrollers. It is used in applications where "high junction operating temperature" capability is required.

2. Features and benefits

- 3Q technology for improved noise immunity
- Direct interfacing with low power drivers and microcontrollers
- Good immunity to false turn-on by dV/dt
- High commutation capability with sensitive gate
- High junction operating temperature capability
- High voltage capability
- Planar passivated for voltage ruggedness and reliability
- Sensitive gate for easy logic level triggering
- Triggering in three quadrants only

3. Applications

- Applications subject to high temperature
- Electronic thermostats (heating and cooling)
- Motor controls e.g. washing machines and vacuum cleaners
- Refrigeration and air-conditioner compressor controls

4. Quick reference data

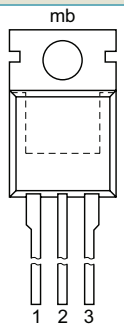
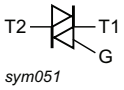
Table 1. Quick reference data

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; $T_{mb} \leq 131$ °C; Fig. 1; Fig. 2; Fig. 3		-	-	10	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		-	-	100	A

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; T2+ G+ T_j = 25 °C; Fig. 7		0.5	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G- T_j = 25 °C; Fig. 7		0.5	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2- G- T_j = 25 °C; Fig. 7		0.5	-	10	mA
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 536 V; T_j = 150 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		50	-	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; T_j = 150 °C; $I_{T(RMS)}$ = 10 A; dV_{com}/dt = 20 V/µs; gate open circuit		5	-	-	A/ms

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1		 sym051
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	Description	Version
BTA410-800ET	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; $T_{mb} \leq 131$ °C; Fig. 1; Fig. 2; Fig. 3		-	10	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		-	100	A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms		-	110	A
I^2t	I^2t for fusing	$t_p = 10$ms; sine-wave pulse		-	50	A^2s
dI_T/dt	rate of rise of on-state current	$I_G = 20$ mA		-	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			-	150	°C

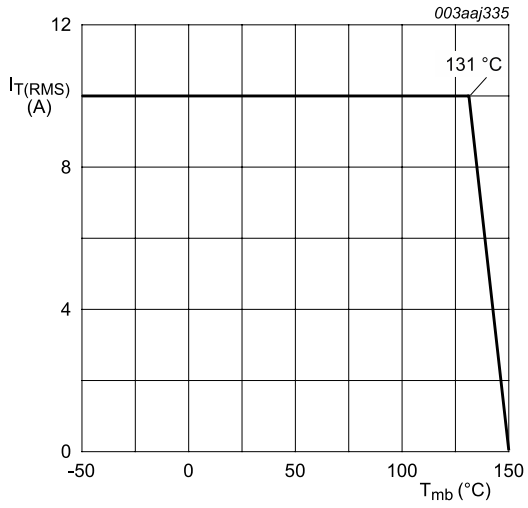
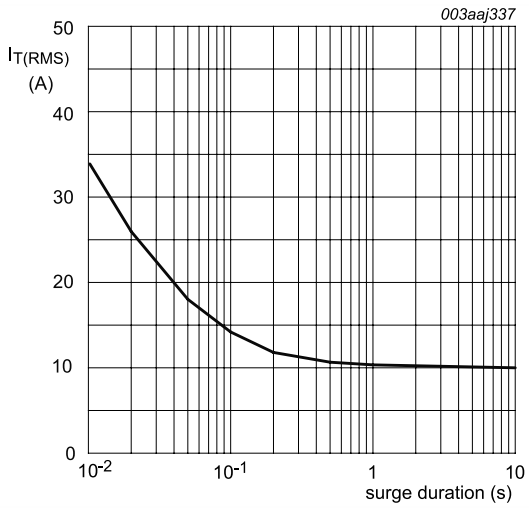
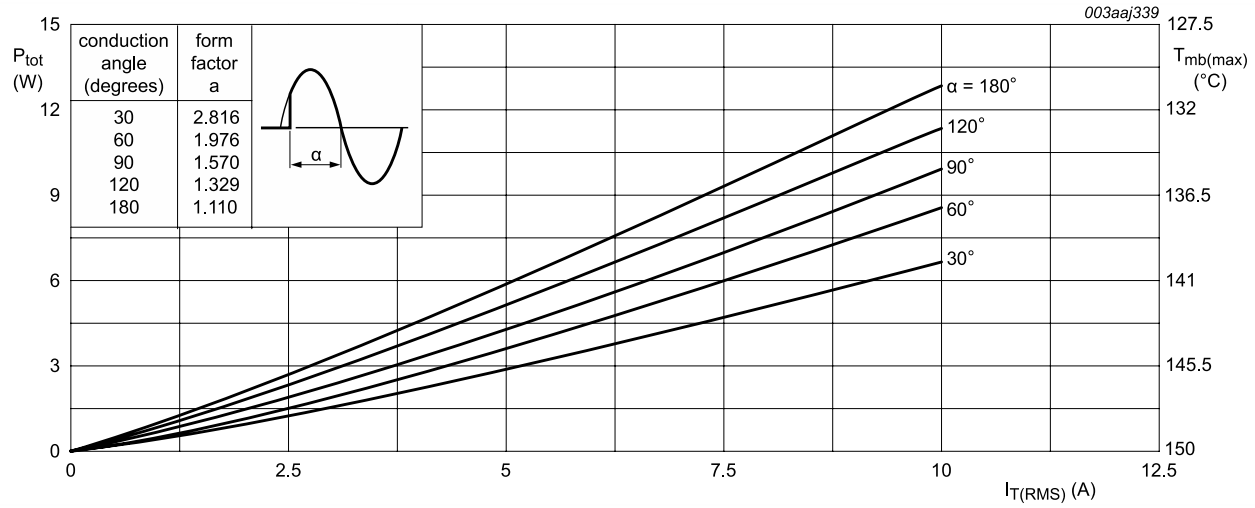


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values



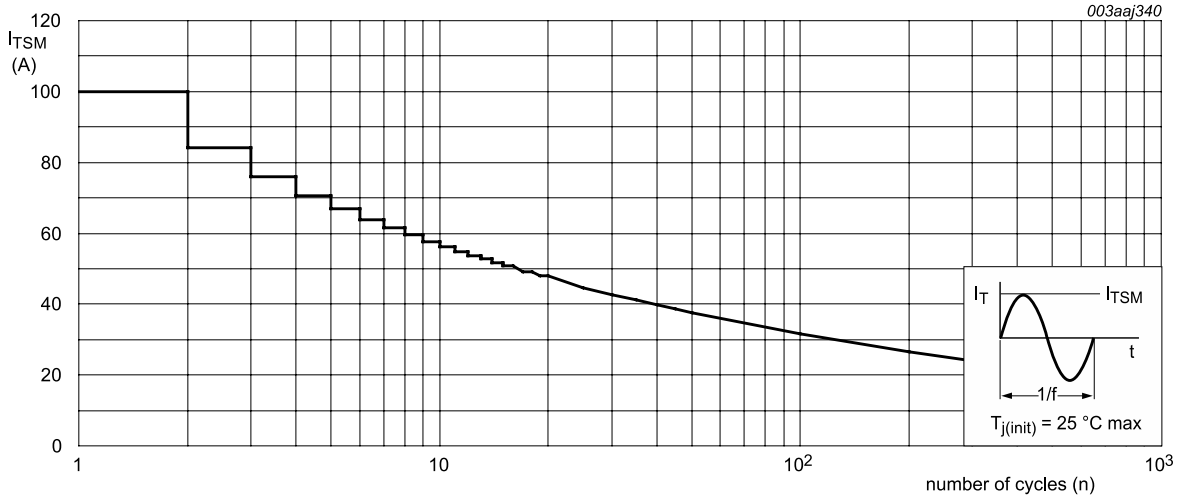
f = 50Hz; T_{mb} =131 °C

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



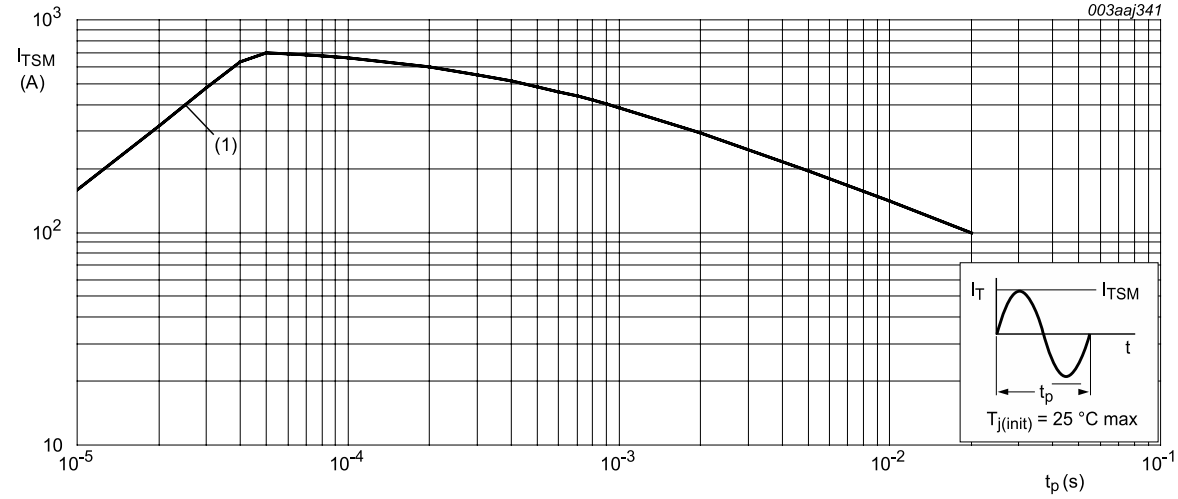
α = conduction angle
a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

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



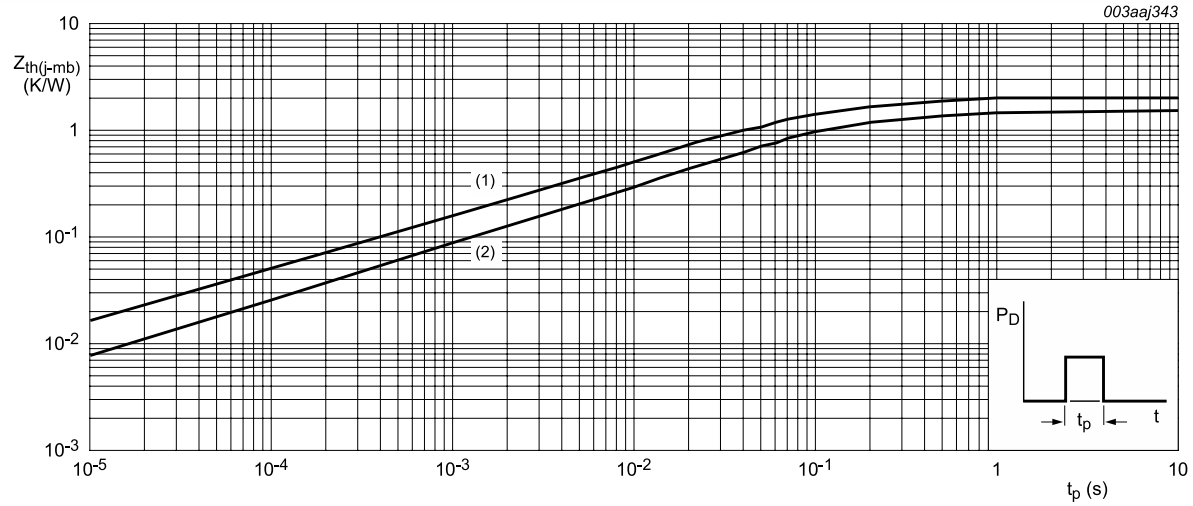
t_p ≤ 20 ms ;
(1) dI_T/dt limit

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

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. 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



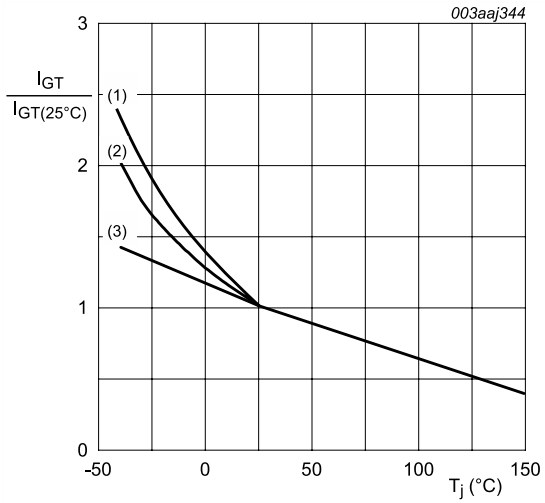
(1) Unidirectional (half cycle)
(2) Bidirectional (full cycle)

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

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 = 0.1 A; T2+ G+; T_j = 25 °C; Fig. 7		0.5	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 7		0.5	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; Fig. 7		0.5	-	10	mA
I_L	latching current	V_D = 12 V; I_G = 0.1 A; T2+ G+; T_j = 25 °C; Fig. 8		-	-	25	mA
		V_D = 12 V; I_G = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 8		-	-	30	mA
		V_D = 12 V; I_G = 0.1 A; T2- G-; T_j = 25 °C; Fig. 8		-	-	25	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	-	15	mA
V_T	on-state voltage	I_T = 15 A; T_j = 25 °C; Fig. 10		-	1.3	1.6	V
V_{GT}	gate trigger voltage	V_D = 12 V; T_j = 25 °C;Fig. 11		-	0.7	1	V
		V_D = 400 V; T_j = 150 °C; Fig. 11		0.25	0.4	-	V
I_D	off-state current	V_D = 800 V; T_j = 150 °C		-	0.4	2	mA
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 536 V; T_j = 150 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		50	-	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; T_j = 150 °C; $I_{T(RMS)}$ = 10 A; dV_{com}/dt = 20 V/µs; (snubberless condition); gate open circuit		2	-	-	A/ms
		V_D = 400 V; T_j = 150 °C; $I_{T(RMS)}$ = 10 A; dV_{com}/dt = 10 V/µs; gate open circuit		3.5	-	-	A/ms
		V_D = 400 V; T_j = 150 °C; $I_{T(RMS)}$ = 10 A; dV_{com}/dt = 1 V/µs; gate open circuit		5	-	-	A/ms



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

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

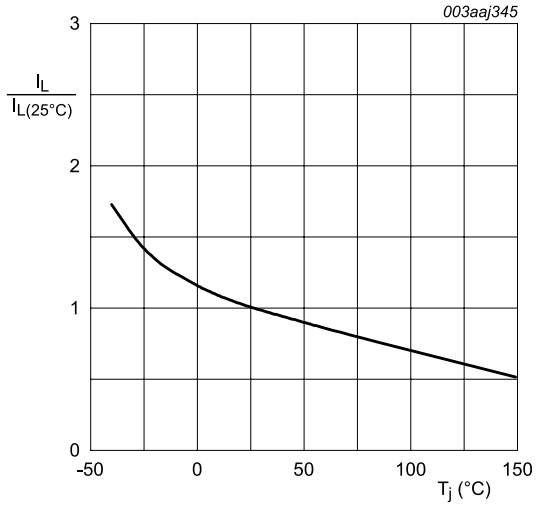


Fig. 8. Normalized latching current as a function of junction temperature

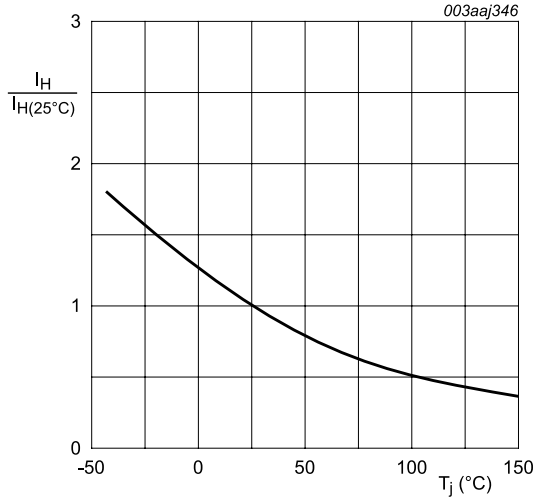
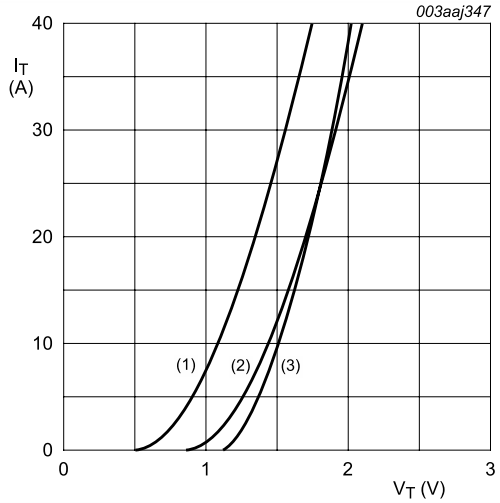


Fig. 9. Normalized holding current as a function of junction temperature



V_o = 1.142 V; R_s = 0.027 Ω
(1) T_j = 150 °C; typical values
(2) T_j = 150 °C; maximum values
(3) T_j = 25 °C; maximum values

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

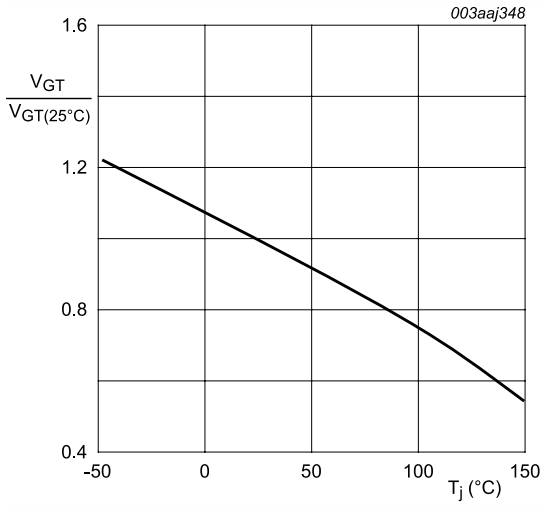
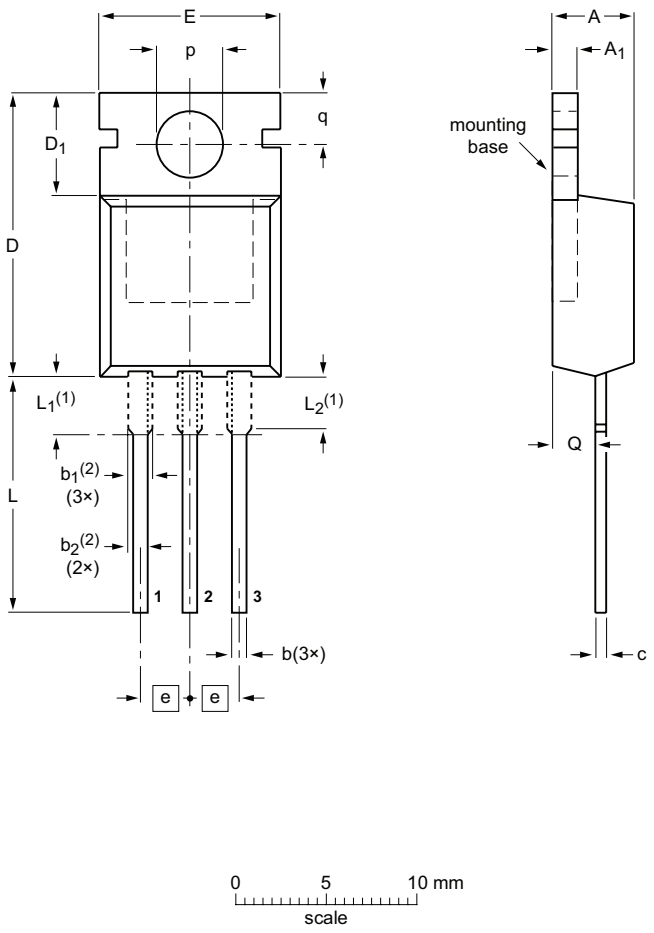


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

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