Three quadrant triacs guaranteed commutation

BTA212 series D, E and F

GENERAL DESCRIPTION

Passivated guaranteed commutation triacs in a plastic envelope intended for use in motor control circuits or with other highly inductive loads. These devices balance the requirements of commutation performance and gate sensitivity. The "sensitive gate" E series and "logic level" D series are intended for interfacing with low power drivers, including micro controllers.
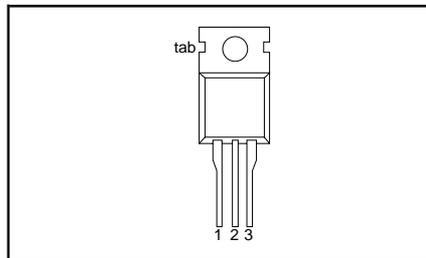
QUICK REFERENCE DATA

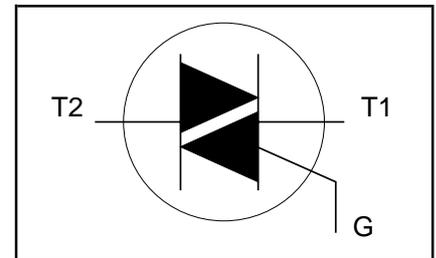| SYMBOL	PARAMETER	MAX.	UNIT
	BTA212-	600D	
	BTA212-	600E	
	BTA212-	600F	
V_{DRM}	Repetitive peak off-state voltages	600	V
$I_{T(RMS)}$	RMS on-state current	12	A
I_{TSM}	Non-repetitive peak on-state current	95	A

PINNING - TO220AB

PIN	DESCRIPTION
1	main terminal 1
2	main terminal 2
3	gate
tab	main terminal 2

PIN CONFIGURATION

SYMBOL

LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DRM}	Repetitive peak off-state voltages		-	600[1]	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 99\ ^\circ C$	-	12	A
I_{TSM}	Non-repetitive peak on-state current	full sine wave; $T_j = 25\ ^\circ C$ prior to surge			
		t = 20 ms	-	95	A
		t = 16.7 ms	-	105	A
I^2t	I^2t for fusing	t = 10 ms	-	45	A^2s
dI_T/dt	Repetitive rate of rise of on-state current after triggering	$I_{TM} = 20\ A$; $I_G = 0.2\ A$; $dI_G/dt = 0.2\ A/\mu s$		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	Operating junction temperature		-	125	$^\circ C$

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1 Although not recommended, off-state voltages up to 800V may be applied without damage, but the triac may switch to the on-state. The rate of rise of current should not exceed 15 A/μs.

THERMAL RESISTANCES

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$R_{th\ j\text{-}mb}$	Thermal resistance junction to mounting base	full cycle	-	-	1.5	K/W
		half cycle	-	-	2.0	K/W
$R_{th\ j\text{-}a}$	Thermal resistance junction to ambient	in free air	-	60	-	K/W

STATIC CHARACTERISTICS

T_j = 25 ˚C unless otherwise stated

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.			UNIT
		BTA212-		**...D**	**...E**	**...F**	
I_{GT}	Gate trigger current[2]	V_D = 12 V; I_T = 0.1 A					
		T2+ G+	-	5	10	25	mA
		T2+ G-	-	5	10	25	mA
		T2- G-	-	5	10	25	mA
I_L	Latching current	V_D = 12 V; I_{GT} = 0.1 A					
		T2+ G+	-	15	20	25	mA
		T2+ G-	-	25	30	40	mA
		T2- G-	-	25	30	40	mA
I_H	Holding current	V_D = 12 V; I_{GT} = 0.1 A	-	15	25	30	mA
V_T	On-state voltage	I_T = 17 A	-		1.6		V
V_{GT}	Gate trigger voltage	V_D = 12 V; I_T = 0.1 A	-		1.5		V
		V_D = 400 V; I_T = 0.1 A; T_j = 125 ˚C	0.25		-		V
I_D	Off-state leakage current	V_D = $V_{DRM(max)}$; T_j = 125 ˚C	-		0.5		mA

DYNAMIC CHARACTERISTICS

T_j = 25 ˚C unless otherwise stated

SYMBOL	PARAMETER	CONDITIONS	MIN.			MAX.	UNIT
		BTA212-	**...D**	**...E**	**...F**		
dV_D/dt	Critical rate of rise of off-state voltage	V_{DM} = 67% $V_{DRM(max)}$; T_j = 110 ˚C; exponential waveform; gate open circuit	30	60	70	-	V/µs
dI_{com}/dt	Critical rate of change of commutating current	V_{DM} = 400 V; T_j = 125 ˚C; $I_{T(RMS)}$ = 12 A; dV_{com}/dt = 20v/µs; gate open circuit	1.2	3.5	5	-	A/ms
dI_{com}/dt	Critical rate of change of commutating current	V_{DM} = 400 V; T_j = 125 ˚C; $I_{T(RMS)}$ = 12 A; dV_{com}/dt = 0.1v/µs; gate open circuit	4.3	16	19	-	A/ms

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2 Device does not trigger in the T2-, G+ quadrant.

Three quadrant triacs
guaranteed commutation

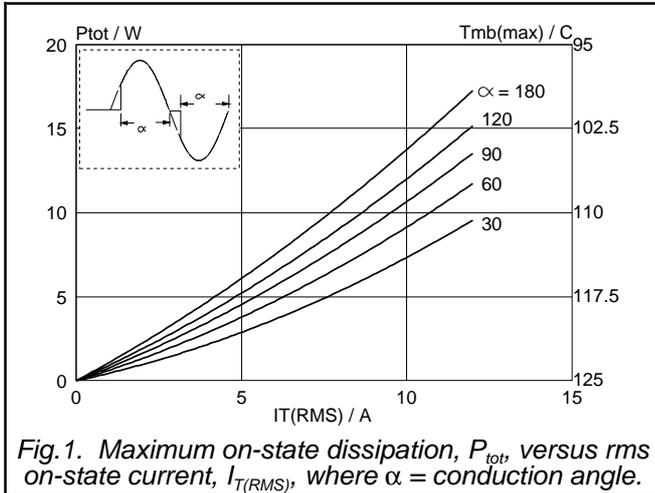BTA212 series D, E and F

Fig.1. Maximum on-state dissipation, P_{tot}, versus rms
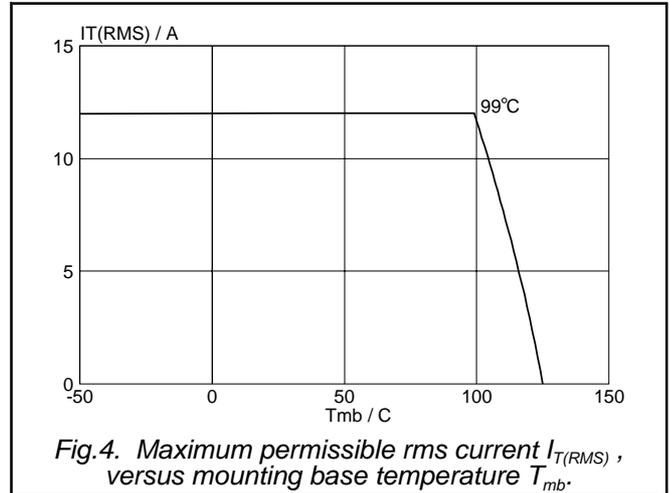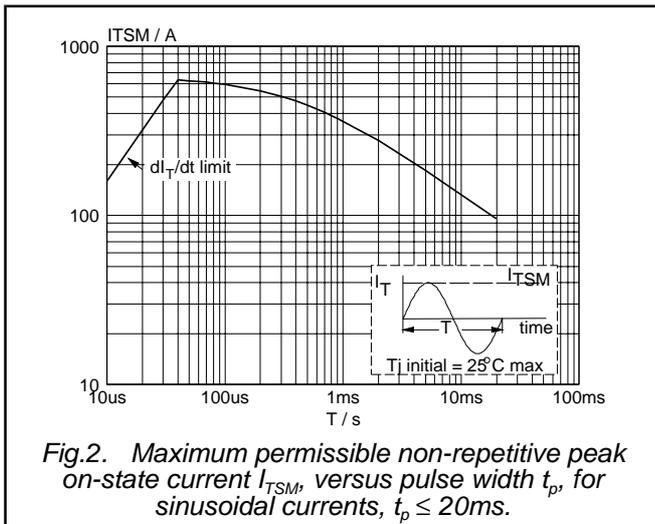on-state current, $I_{T(RMS)}$, where α = conduction angle.

Fig.2. Maximum permissible non-repetitive peak
on-state current I_{TSM}, versus pulse width t_p, for
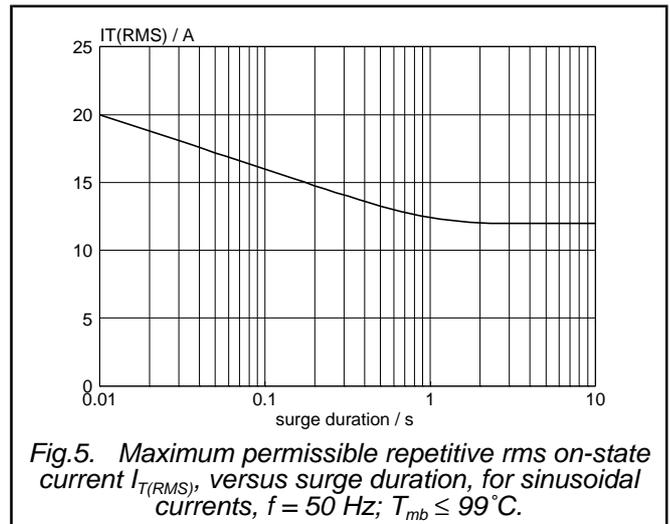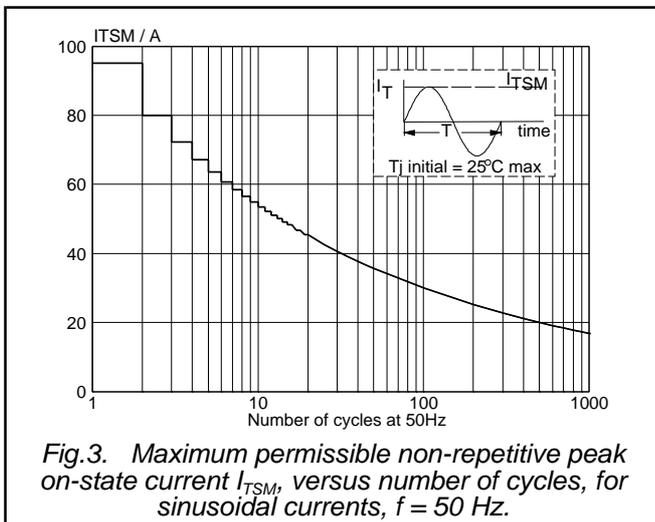sinusoidal currents, $t_p \leq 20ms$.

Fig.3. Maximum permissible non-repetitive peak
on-state current I_{TSM}, versus number of cycles, for
sinusoidal currents, f = 50 Hz.

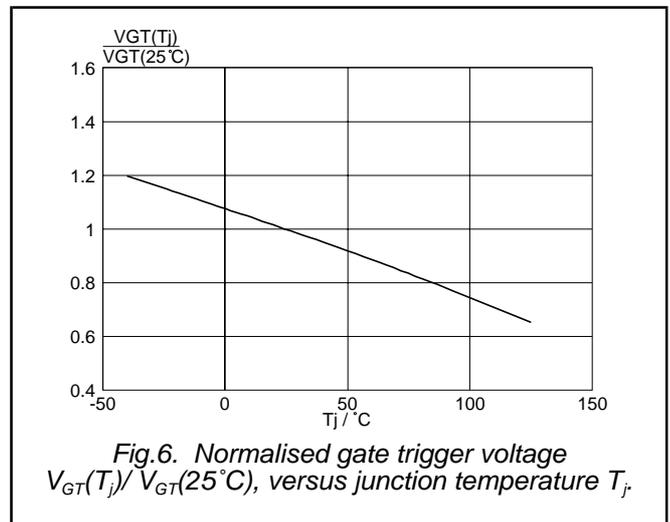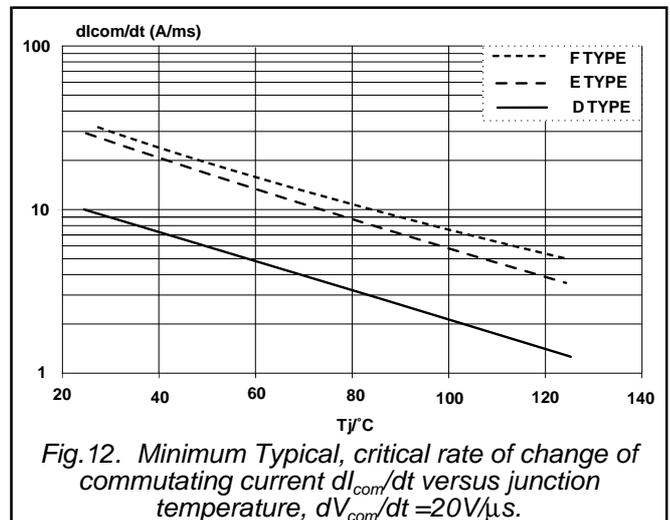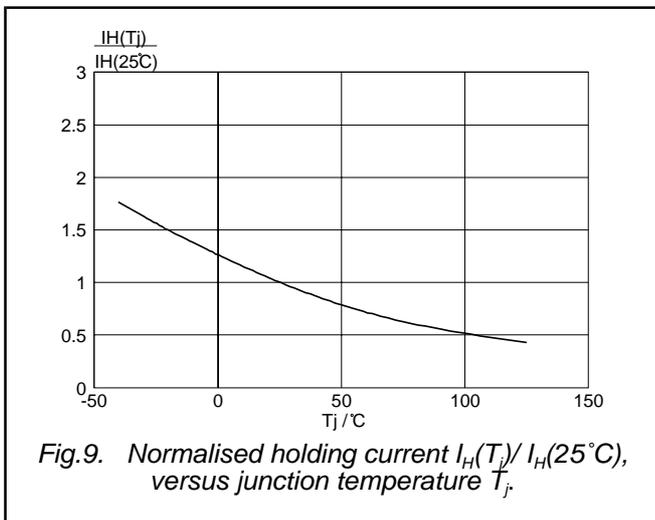Fig.4. Maximum permissible rms current $I_{T(RMS)}$,
versus mounting base temperature T_{mb}.

Fig.5. Maximum permissible repetitive rms on-state
current $I_{T(RMS)}$, versus surge duration, for sinusoidal
currents, f = 50 Hz; $T_{mb} \leq 99°C$.
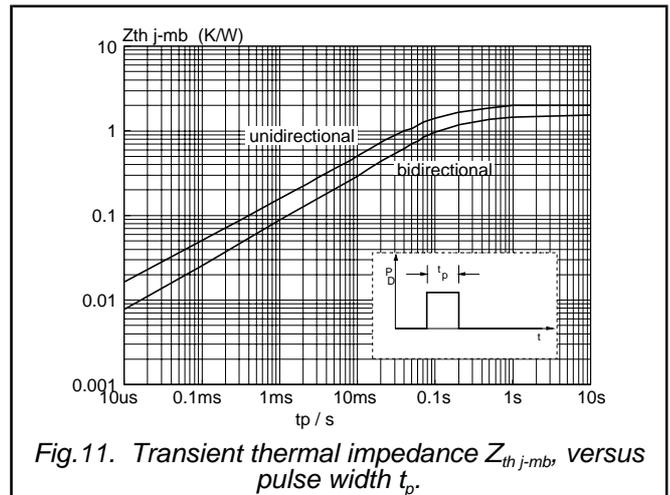

Fig.6. Normalised gate trigger voltage
$V_{GT}(T_j)/ V_{GT}(25°C)$, versus junction temperature T_j.

Fig.7.   Normalised gate trigger current
$I_{GT}(T_j)/ I_{GT}(25°C)$, versus junction temperature T_j.

Fig.10.   Typical and maximum on-state characteristic.

Fig.8.   Normalised latching current $I_L(T_j)/ I_L(25°C)$,
versus junction temperature T_j.

Fig.11.   Transient thermal impedance $Z_{th\,j\text{-}mb}$, versus
pulse width t_p.

Fig.9.   Normalised holding current $I_H(T_j)/ I_H(25°C)$,
versus junction temperature T_j.

Fig.12.   Minimum Typical, critical rate of change of
commutating current dI_{com}/dt versus junction
temperature, $dV_{com}/dt =20V/\mu s$.
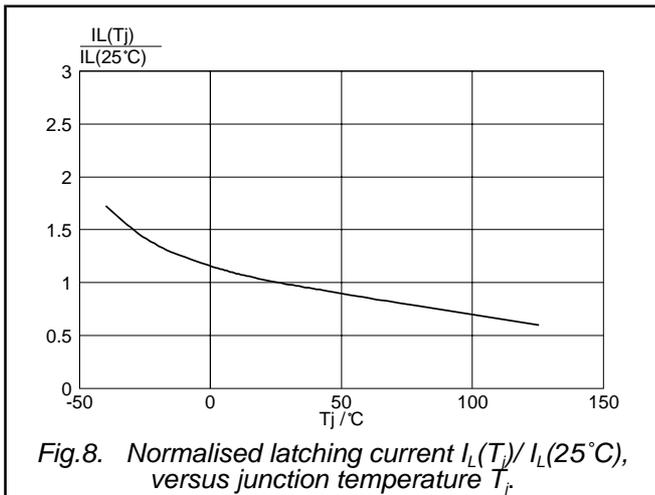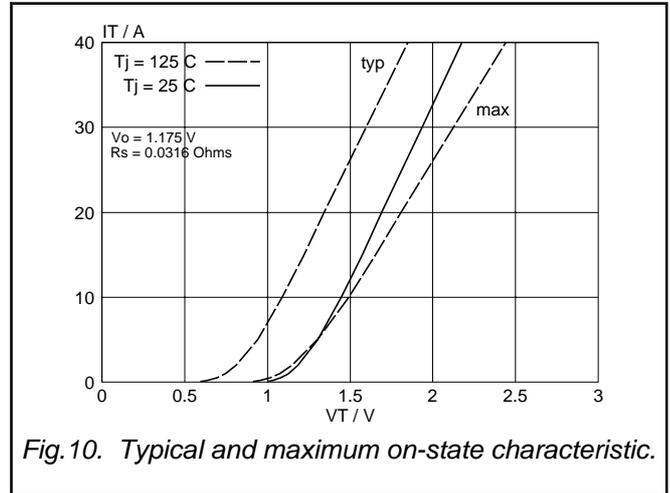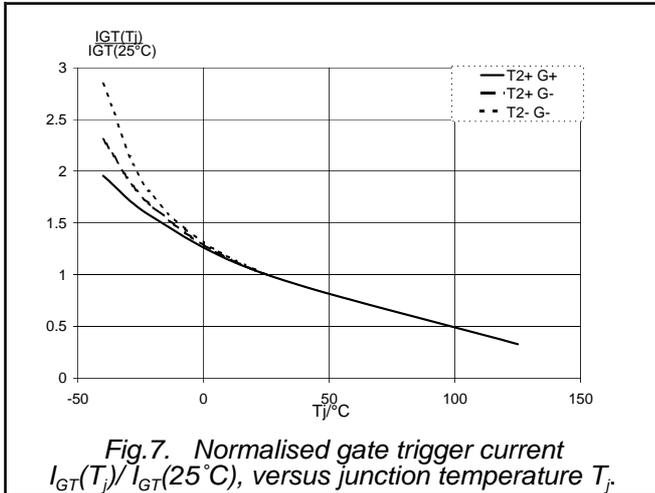
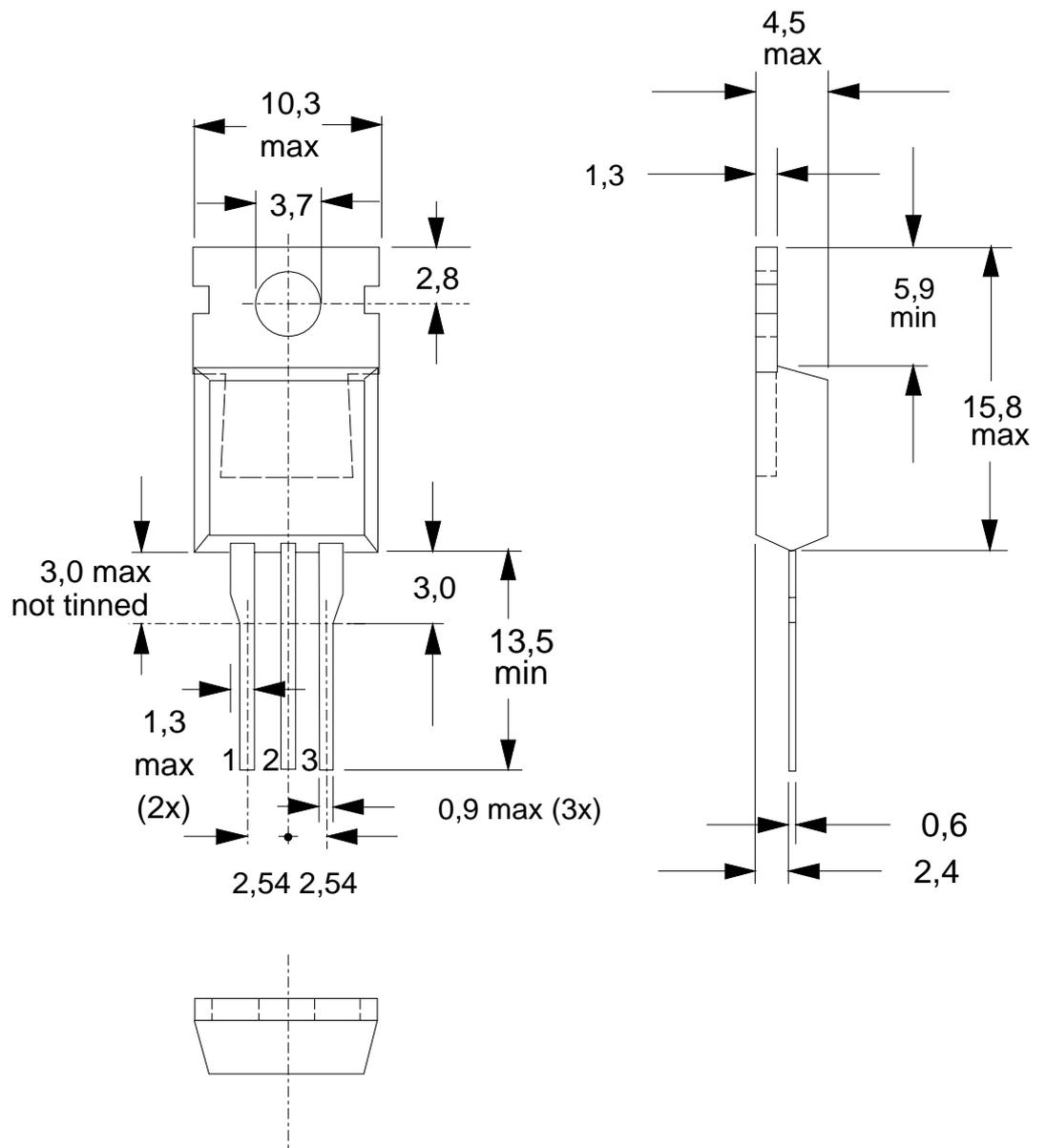## MECHANICAL DATA

Dimensions in mm

Net Mass: 2 g

Fig.13. SOT78 (TO220AB). pin 2 connected to mounting base.

Notes
1. Refer to mounting instructions for SOT78 (TO220) envelopes.
2. Epoxy meets UL94 V0 at 1/8".

DEFINITIONS

DATA SHEET STATUS		
DATA SHEET STATUS[3]	**PRODUCT STATUS**[4]	**DEFINITIONS**
Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice
Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product
Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Changes will be communicated according to the Customer Product/Process Change Notification (CPCN) procedure SNW-SQ-650A
Limiting values		
Limiting values are given in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of this specification is not implied. Exposure to limiting values for extended periods may affect device reliability.		
Application information		
Where application information is given, it is advisory and does not form part of the specification.		
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3 Please consult the most recently issued datasheet before initiating or completing a design.

4 The product status of the device(s) described in this datasheet may have changed since this datasheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.