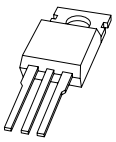


BT151 series L and R

Thyristors

Rev. 04 — 23 October 2006 Product data sheet

1. Product profile

1.1 General description

Passivated thyristors in a SOT78 plastic package.

1.2 Features

- High thermal cycling performance
- High bidirectional blocking voltage

1.3 Applications

- Motor control
- Ignition circuits
- Static switching
- Protection circuits

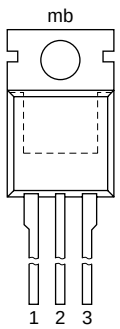
1.4 Quick reference data

- $V_{DRM} \leq 500$ V (BT151-500L/R)
- $V_{RRM} \leq 500$ V (BT151-500L/R)
- $V_{DRM} \leq 650$ V (BT151-650L/R)
- $V_{RRM} \leq 650$ V (BT151-650L/R)
- $V_{DRM} \leq 800$ V (BT151-800R)
- $V_{RRM} \leq 800$ V (BT151-800R)
- $I_{TSM} \leq 120$ A (t = 10 ms)
- $I_{T(RMS)} \leq 12$ A
- $I_{T(AV)} \leq 7.5$ A
- $I_{GT} \leq 5$ mA (BT151 series L)
- $I_{GT} \leq 15$ mA (BT151 series R)

2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Symbol
1	cathode (K)		
2	anode (A)		
3	gate (G)		
mb	mounting base; connected to anode		



SOT78 (3-lead TO-220AB)

founded by Philips

3. Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
BT151-500L	SC-46	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78
BT151-500R			
BT151-650L			
BT151-650R			
BT151-800R			

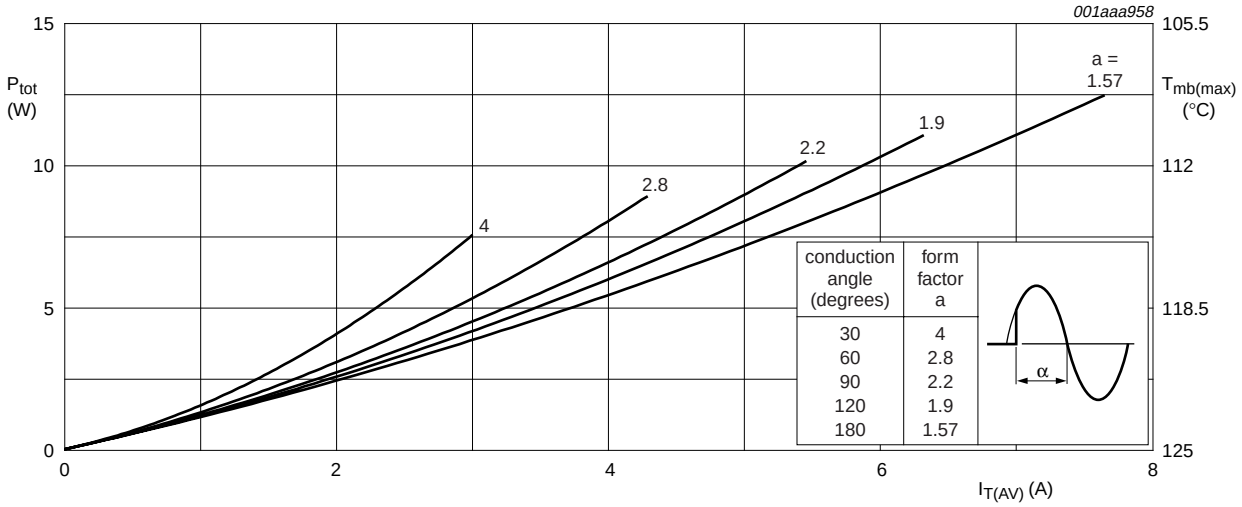
4. Limiting values

Table 3. Limiting values

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

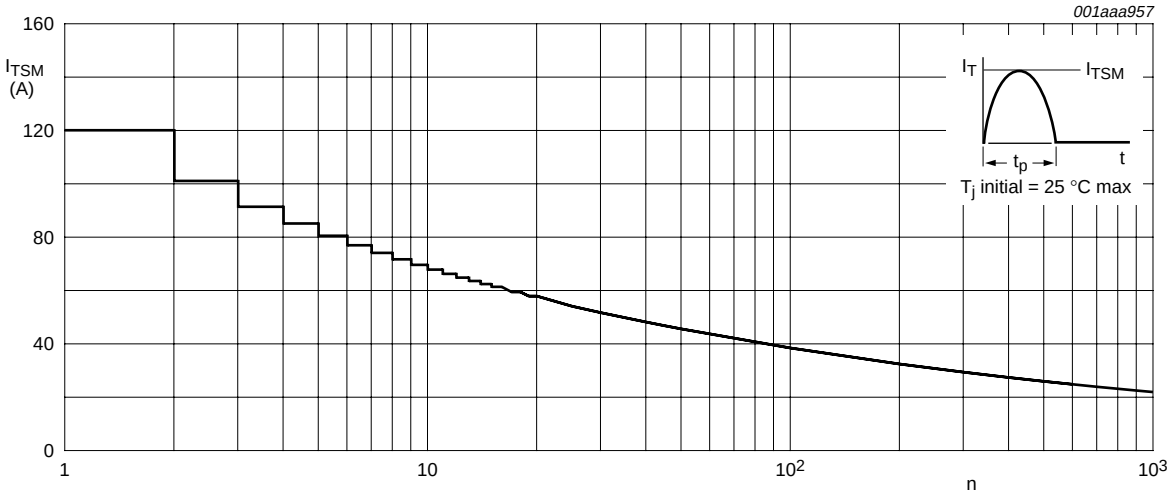
Symbol	Parameter	Conditions		Min	Max	Unit
V_{DRM}	repetitive peak off-state voltage	BT151-500L; BT151-500R	[1]	-	500	V
		BT151-650L; BT151-650R	[1]	-	650	V
		BT151-800R		-	800	V
V_{RRM}	repetitive peak reverse voltage	BT151-500L; BT151-500R	[1]	-	500	V
		BT151-650L; BT151-650R	[1]	-	650	V
		BT151-800R		-	800	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{mb} \leq 109$ °C; see Figure 1		-	7.5	A
$I_{T(RMS)}$	RMS on-state current	all conduction angles; see Figure 4 and 5		-	12	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_j = 25$ °C prior to surge; see Figure 2 and 3				
		t = 10 ms		-	120	A
		t = 8.3 ms		-	132	A
I^2t	I^2t for fusing	t = 10 ms		-	72	A^2s
dI_T/dt	rate of rise of on-state current	$I_{TM} = 20$ A; $I_G = 50$ mA; $dI_G/dt = 50$ mA/µs		-	50	A/µs
I_{GM}	peak gate current			-	2	A
V_{RGM}	peak reverse gate voltage			-	5	V
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

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



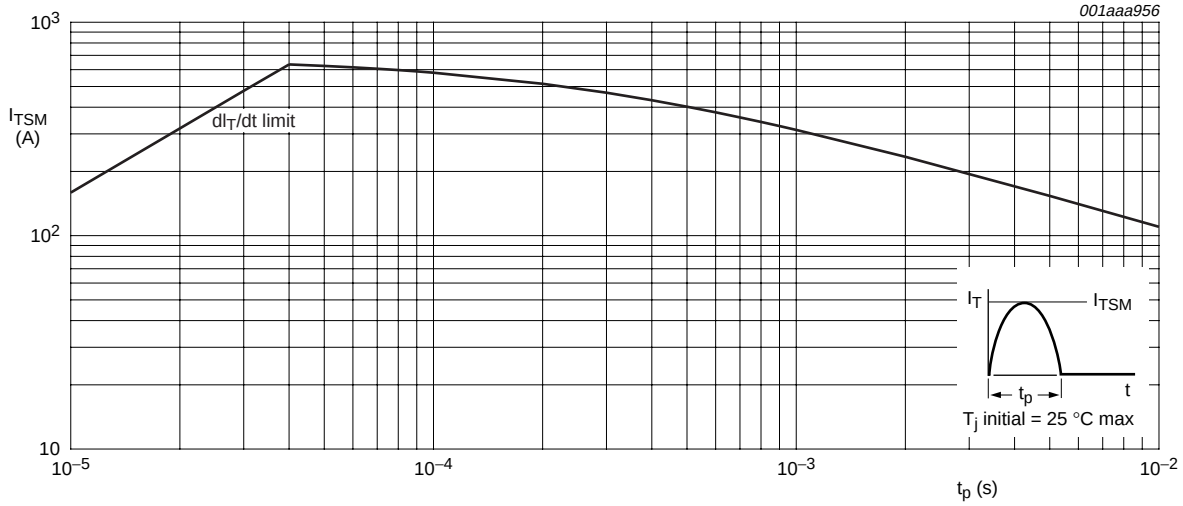
Form factor a = $I_{T(RMS)}/I_{T(AV)}$

Fig 1. Total power dissipation as a function of average on-state current; maximum values



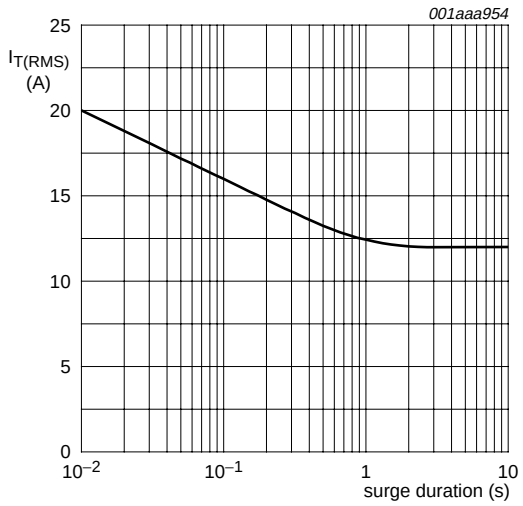
f = 50 Hz

Fig 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



$t_p \leq 10$ ms

Fig 3. Non-repetitive peak on-state current as a function of pulse width for sinusoidal currents; maximum values



f = 50 Hz; $T_{mb} \leq 109$ °C

Fig 4. RMS on-state current as a function of surge duration; maximum values

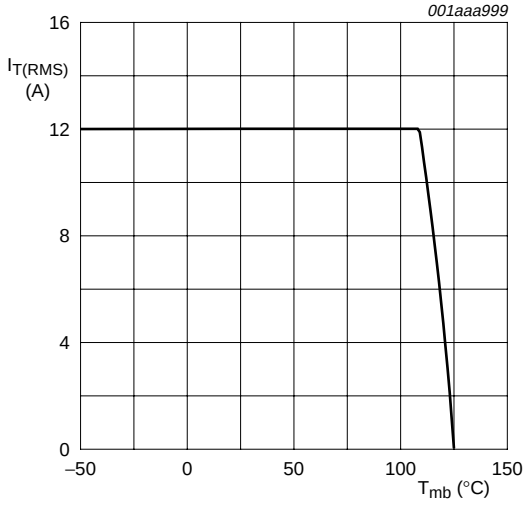


Fig 5. RMS on-state current as a function of mounting base temperature; maximum values

5. Thermal characteristics

Table 4. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see Figure 6	-	-	1.3	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	60	-	K/W

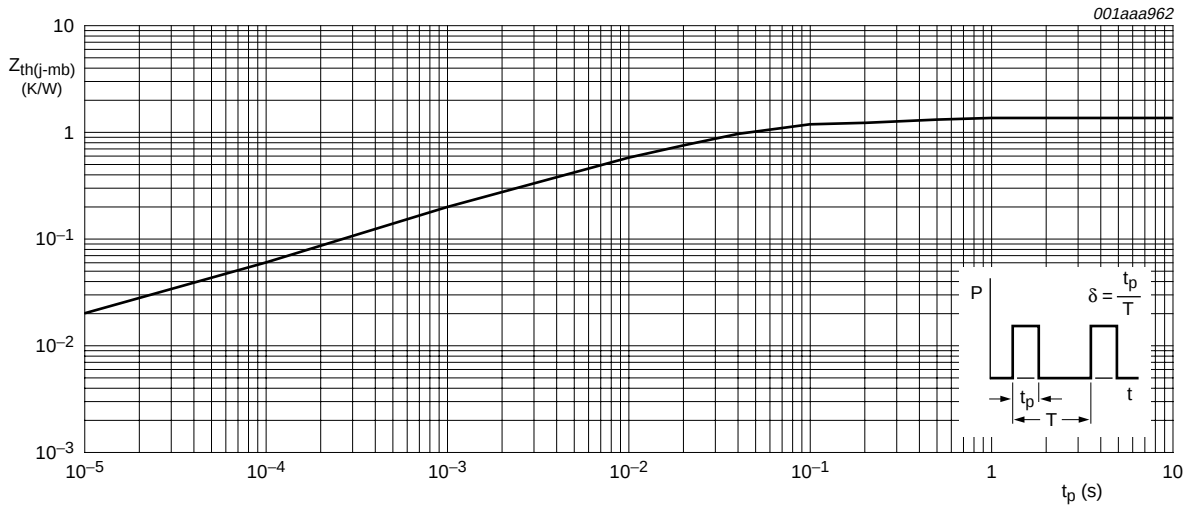


Fig 6. Transient thermal impedance from junction to mounting base as a function of pulse width

6. Characteristics

Table 5. Characteristics

T_j = 25 °C unless otherwise stated.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	V_D = 12 V; I_T = 100 mA; see Figure 8				
		BT151-500L	-	2	5	mA
		BT151-500R	-	2	15	mA
		BT151-650L	-	2	5	mA
		BT151-650R	-	2	15	mA
		BT151-800R	-	2	15	mA
I_L	latching current	V_D = 12 V; I_{GT} = 100 mA; see Figure 10	-	10	40	mA
I_H	holding current	V_D = 12 V; I_{GT} = 100 mA; see Figure 11	-	7	20	mA
V_T	on-state voltage	I_T = 23 A; see Figure 9	-	1.4	1.75	V
V_{GT}	gate trigger voltage	I_T = 100 mA; V_D = 12 V; see Figure 7	-	0.6	1.5	V
		I_T = 100 mA; V_D = $V_{DRM(max)}$; T_j = 125 °C	0.25	0.4	-	V
I_D	off-state current	V_D = $V_{DRM(max)}$; T_j = 125 °C	-	0.1	0.5	mA
I_R	reverse current	V_R = $V_{RRM(max)}$; T_j = 125 °C	-	0.1	0.5	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 0.67 × $V_{DRM(max)}$; T_j = 125 °C; exponential waveform; see Figure 12				
		R_{GK} = 100 Ω	200	1000	-	V/µs
		gate open circuit	50	130	-	V/µs
t_{gt}	gate-controlled turn-on time	I_{TM} = 40 A; V_D = $V_{DRM(max)}$; I_G = 100 mA; dI_G/dt = 5 A/µs	-	2	-	µs
t_q	commutated turn-off time	V_{DM} = 0.67 × $V_{DRM(max)}$; T_j = 125 °C; I_{TM} = 20 A; V_R = 25 V; $(dI_T/dt)_M$ = 30 A/µs; dV_D/dt = 50 V/µs; R_{GK} = 100 Ω	-	70	-	µs

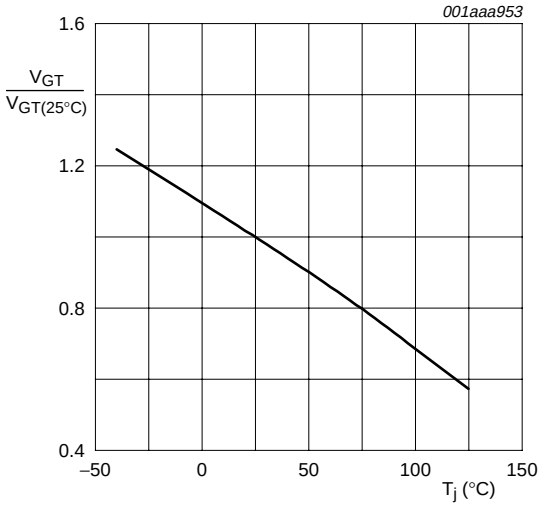


Fig 7. Normalized gate trigger voltage as a function of junction temperature

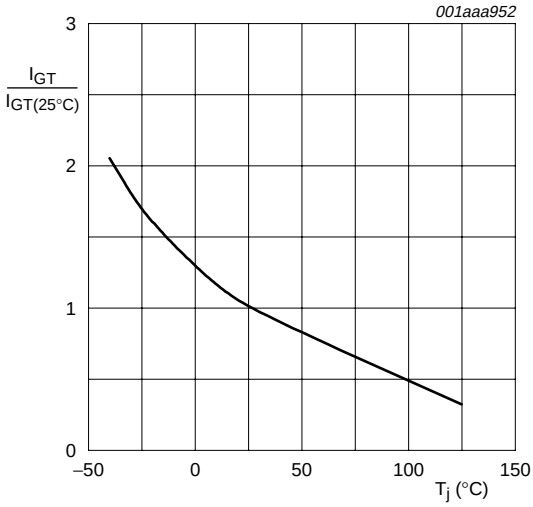
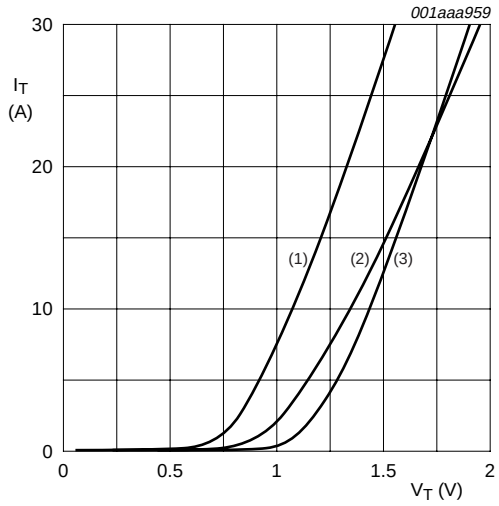


Fig 8. Normalized gate trigger current as a function of junction temperature



V_o = 1.06 V

R_s = 0.0304 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

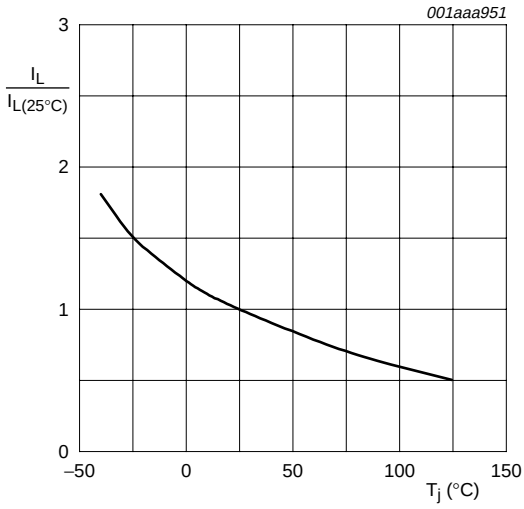


Fig 10. Normalized latching current as a function of junction temperature

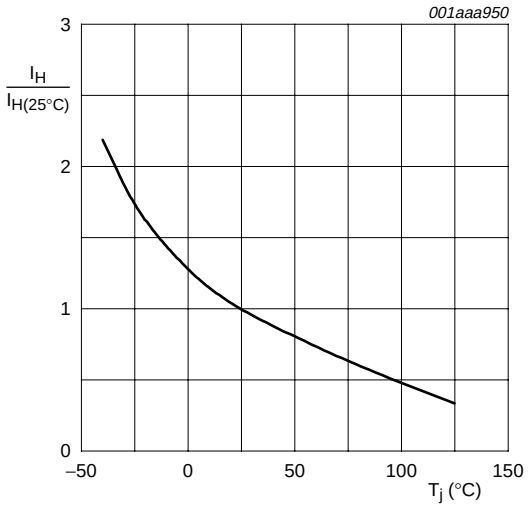
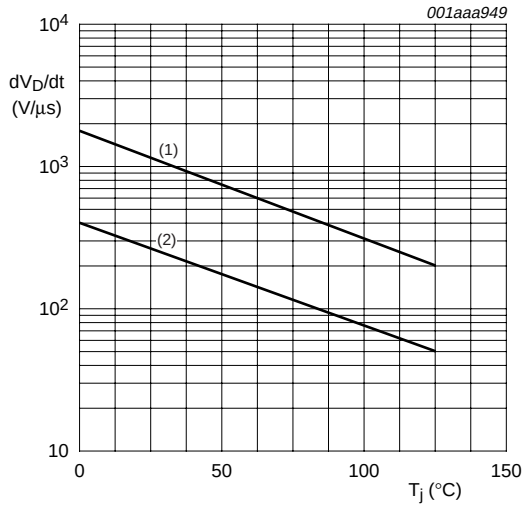


Fig 11. Normalized holding current as a function of junction temperature



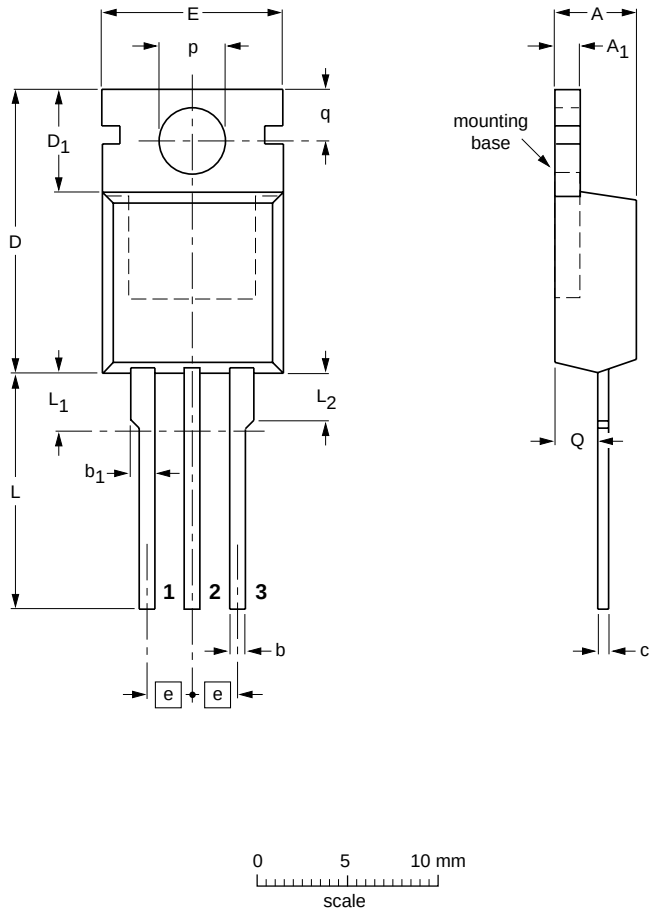
(1) R_{GK} = 100 Ω

(2) Gate open circuit

Fig 12. Critical rate of rise of off-state voltage as a function of junction temperature; minimum values

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	c	D	D_1	E	e	L	L_1	L_2 max.	p	q	Q
mm	4.7 4.1	1.40 1.25	0.9 0.6	1.45 1.00	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

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT78		3-lead TO-220AB	SC-46			~~05-03-22~~ 05-10-25

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

8. Revision history

Table 6. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BT151_SER_L_R_4	20061023	Product data sheet	-	BT151_SERIES_3
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Added type numbers BT151-500L and BT151-650L			
BT151_SERIES_3 (9397 750 13159)	20040607	Product specification	-	BT151_SERIES_2
BT151_SERIES_2	19990601	Product specification	-	BT151_SERIES_1
BT151_SERIES_1	19970901	Product specification	-	-

9. Legal information

9.1 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.

[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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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