BT151-500R

SCR, 12 A, 15mA, 500 V, SOT78

Rev. 05 — 2 March 2009 Product data sheet

1. Product profile

1.1 General description

Planar passivated SCR (Silicon Controlled Rectifier) in a SOT78 plastic package.

1.2 Features and benefits

- High reliability
- High surge current capability
- High thermal cycling performance

1.3 Applications

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

1.4 Quick reference data

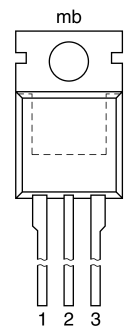
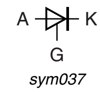
Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	500	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{mb} \leq 109$ °C; see Figure 3	-	-	7.5	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 109$ °C; see Figure 1; see Figure 2	-	-	12	A
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12$ V; $T_j = 25$ °C; $I_T = 100$ mA; see Figure 8	-	2	15	mA

founded by Philips

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 SOT78 (TO-220AB; SC-46)	
2	A	anode		
3	G	gate		
mb	mb	anode		

3. Ordering information

Table 3. Ordering information

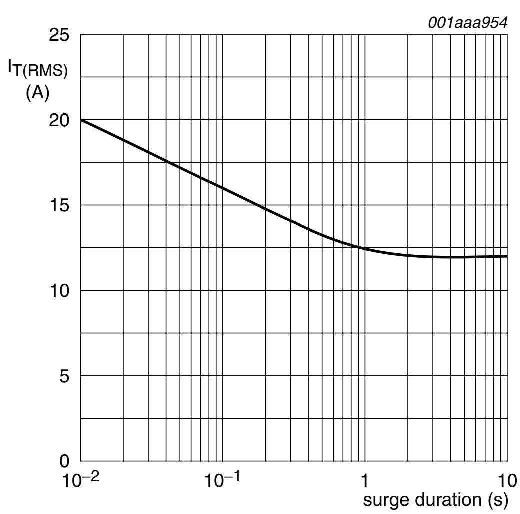
Type number	Package		
	Name	Description	Version
BT151-500R	TO-220AB; SC-46	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

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		-	500	V
V_{RRM}	repetitive peak reverse voltage		-	500	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{mb} \leq 109$ °C; see Figure 3	-	7.5	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 109$ °C; see Figure 1; see Figure 2	-	12	A
dI_T/dt	rate of rise of on-state current	$I_T = 20$ A; $I_G = 50$ mA; $dI_G/dt = 50$ mA/µs	-	50	A/µs
I_{GM}	peak gate current		-	2	A
P_{GM}	peak gate power		-	5	W
T_{stg}	storage temperature		-40	150	°C
T_j	junction temperature		-	125	°C
I_{TSM}	non-repetitive peak on-state current	half sine wave; $t_p = 8.3$ ms; $T_{j(init)} = 25$ °C	-	132	A
		half sine wave; $t_p = 10$ ms; $T_{j(init)} = 25$ °C; see Figure 4; see Figure 5	-	120	A
I^2t	I2t for fusing	$t_p = 10$ ms; sine-wave pulse	-	72	A^2s
$P_{G(AV)}$	average gate power	over any 20 ms period	-	0.5	W
V_{RGM}	peak reverse gate voltage		-	5	V



$f = 50Hz;\ T_{mb} = 109\,°C$

Fig 1. RMS on-state current as a function of surge duration; maximum values

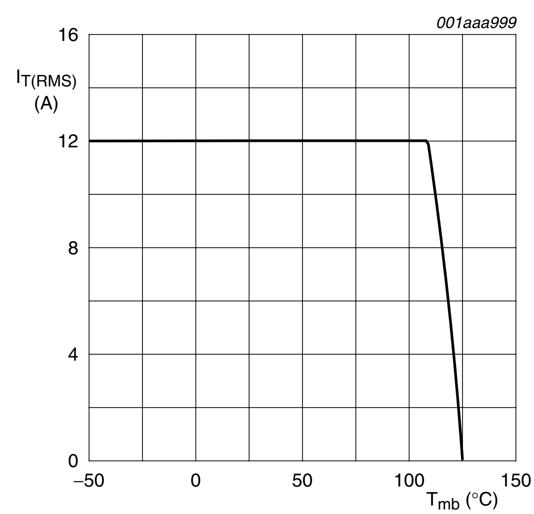
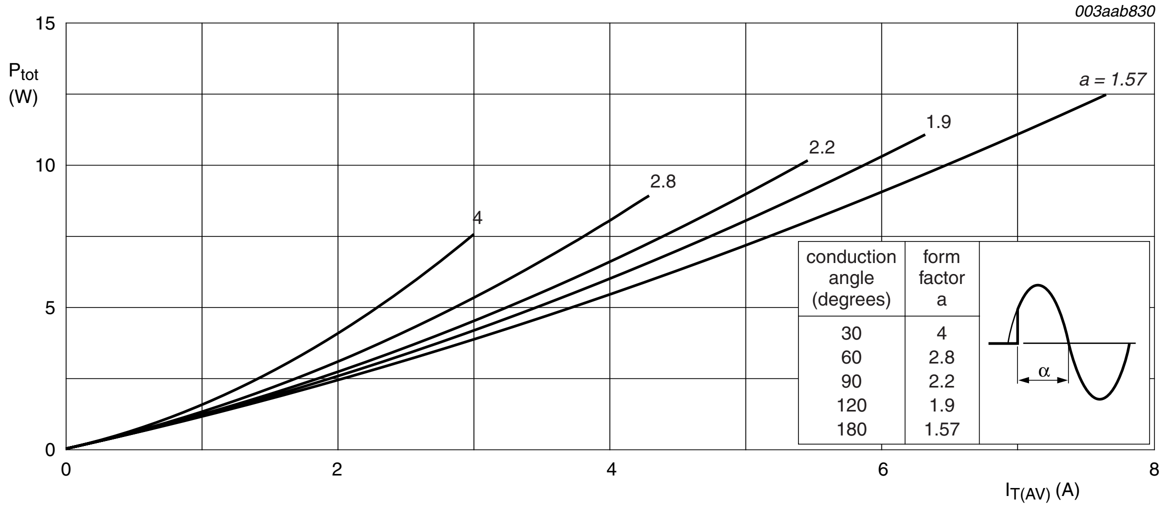
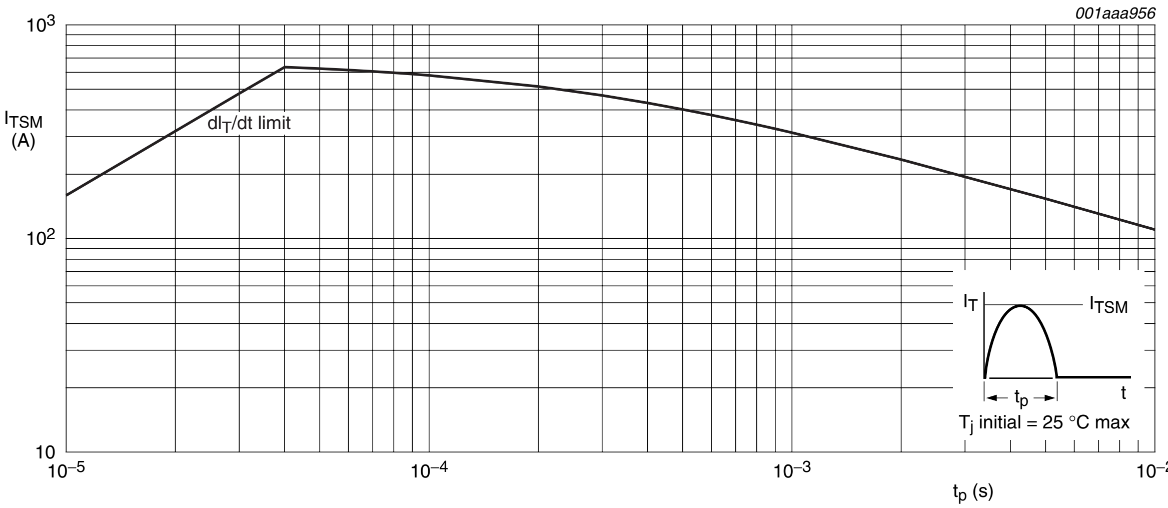


Fig 2. RMS on-state current as a function of mounting base temperature; maximum values



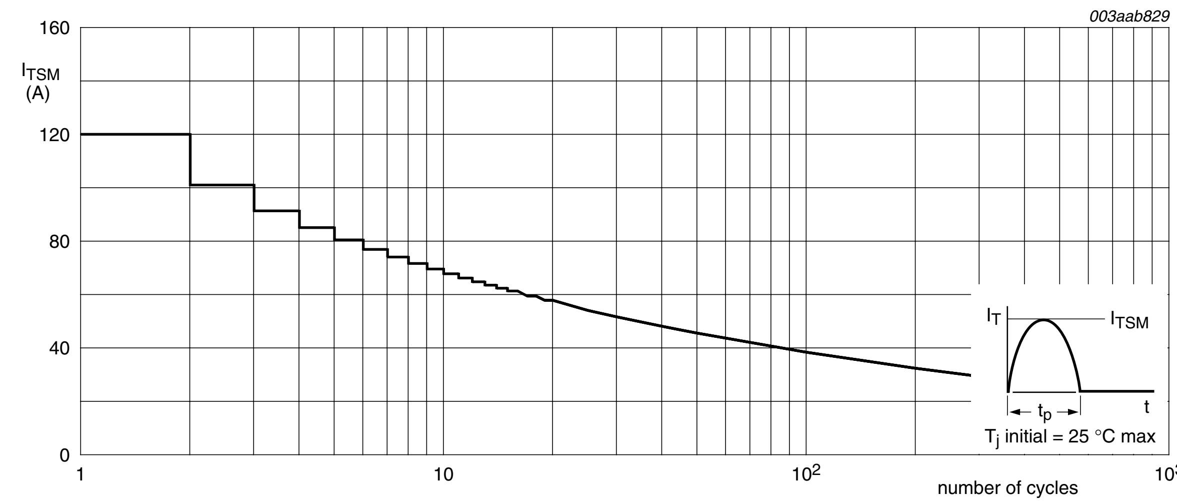
$$a = \text{form factor} = I_{T(RMS)} / I_{T(AV)}$$

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



$$t_p = 10\,ms$$

Fig 4. Non-repetitive peak on-state current as a function of pulse width for sinusoidal currents; maximum values



$f = 50Hz$

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	see Figure 6	-	-	1.3	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air		-	60	-	K/W

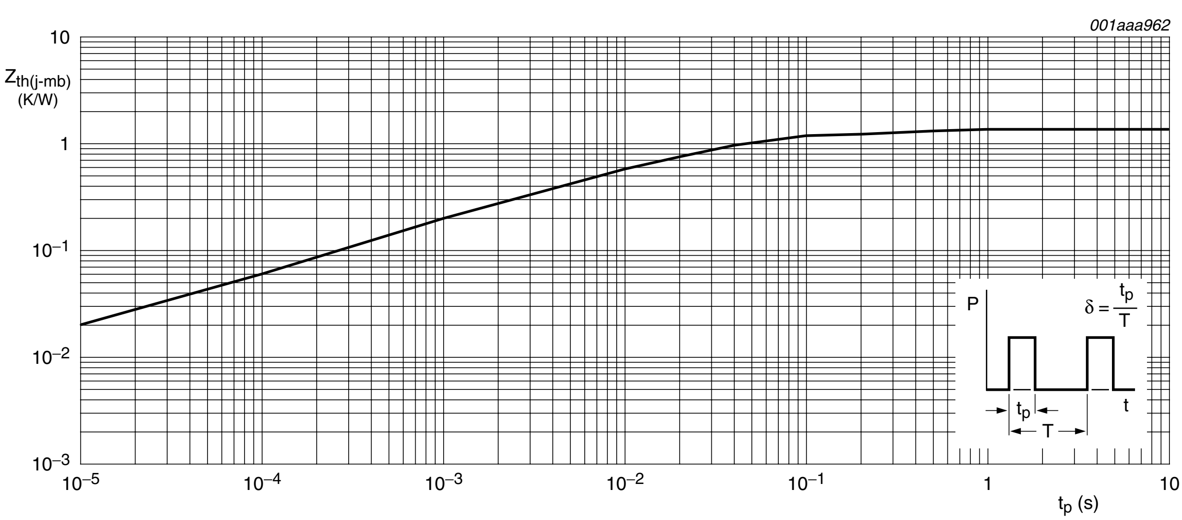
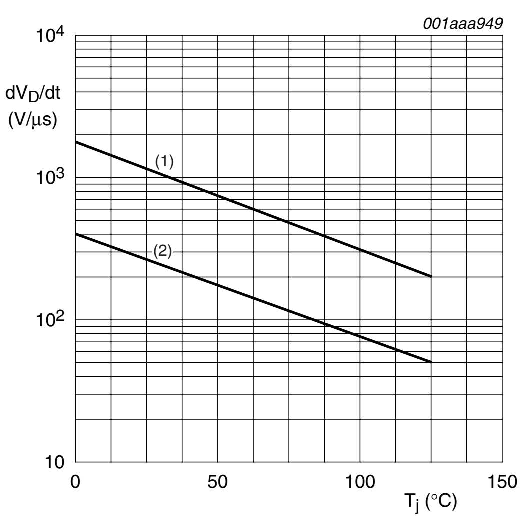


Fig 6. Transient thermal impedance from junction to mounting base as a function of pulse width

6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	V_D = 12 V; T_j = 25 °C; I_T = 100 mA; see Figure 8	-	2	15	mA
I_L	latching current	V_D = 12 V; T_j = 25 °C; see Figure 9	-	10	40	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; see Figure 10	-	7	20	mA
V_T	on-state voltage	I_T = 23 A; T_j = 25 °C; see Figure 11	-	1.4	1.75	V
V_{GT}	gate trigger voltage	I_T = 100 mA; V_D = 12 V; T_j = 25 °C; see Figure 12	-	0.6	1.5	V
		I_T = 100 mA; V_D = 500 V; T_j = 125 °C	0.25	0.4	-	V
I_D	off-state current	V_D = 500 V; T_j = 125 °C	-	0.1	0.5	mA
I_R	reverse current	V_R = 500 V; T_j = 125 °C	-	0.1	0.5	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 335 V; T_j = 125 °C; exponential waveform; gate open circuit	50	130	-	V/µs
		V_{DM} = 335 V; T_j = 125 °C; R_{GK} = 100 Ω; exponential waveform; see Figure 7	200	1000	-	V/µs
t_{gt}	gate-controlled turn-on time	I_{TM} = 40 A; V_D = 500 V; I_G = 100 mA; dI_G/dt = 5 A/µs; T_j = 25 °C	-	2	-	µs
t_q	commutated turn-off time	V_{DM} = 335 V; 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



(1) $R_{GK} = 100\ \Omega$

(2) Gate open circuit

Fig 7. Critical rate of rise of off-state voltage as a function of junction temperature; minimum values

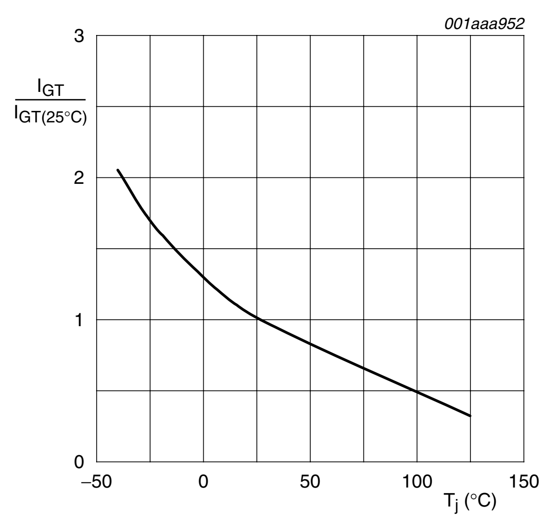


Fig 8. Normalized gate trigger current as a function of junction temperature

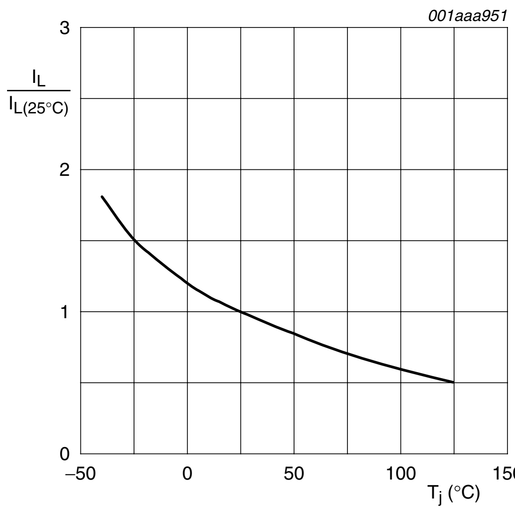


Fig 9. Normalized latching current as a function of junction temperature

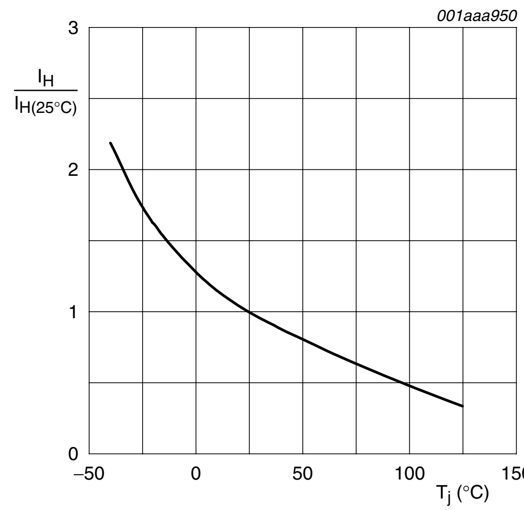
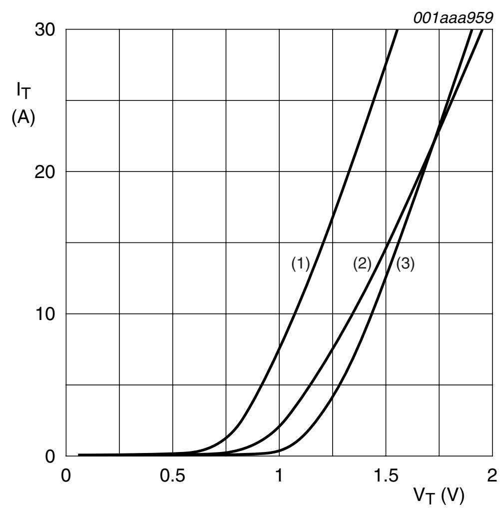


Fig 10. Normalized holding current as a function of junction temperature



$V_0 = 1.06\ V;\ R_s = 0.0304\ \Omega$

(1) $T_j = 150\ °C$; typical values

(2) $T_j = 150\ °C$; maximum values

(3) $T_j = 25\ °C$; maximum values

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

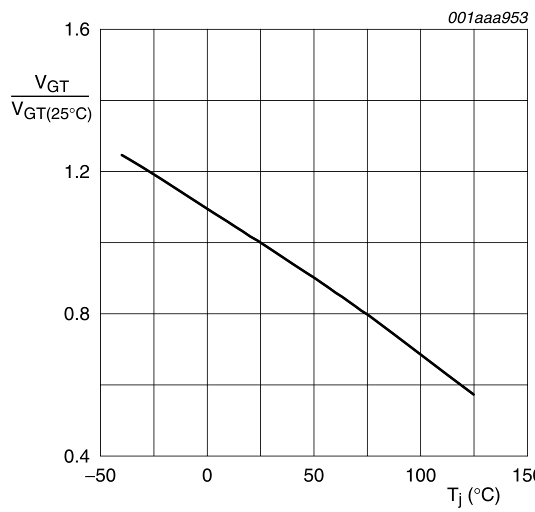
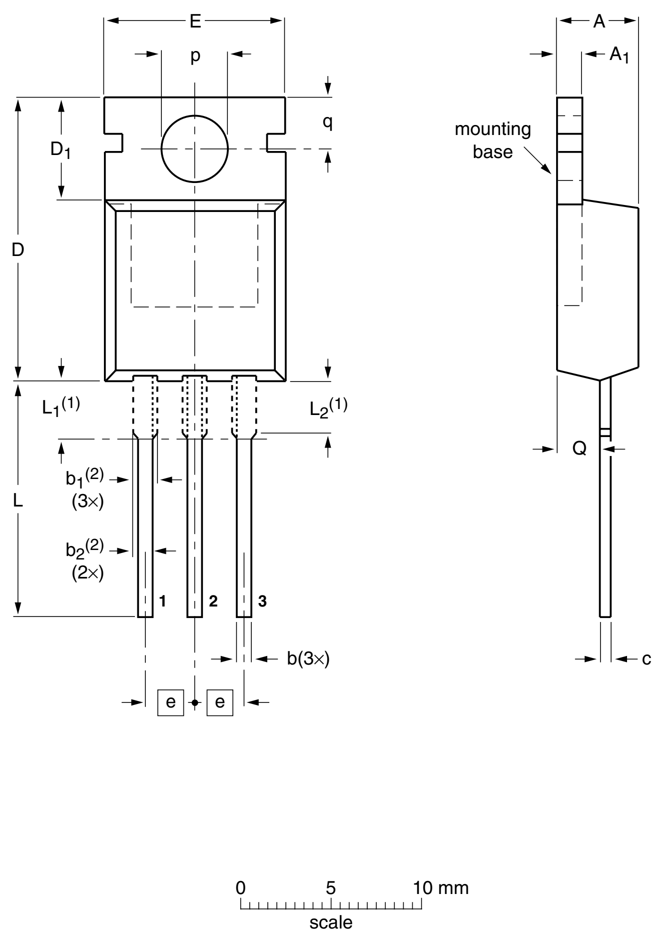


Fig 12. Normalized gate trigger voltage as a function of junction temperature

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 13. Package outline SOT78 (TO-220AB)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BT151-500R_5	20090302	Product data sheet	-	BT151_SER_L_R_4
Modifications:	• Package outline updated. • Type number BT151-500R separated from data sheet BT151_SER_L_R_4.			
BT151_SER_L_R_4	20061023	Product data sheet	-	BT151_SERIES_3
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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11. Contents

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