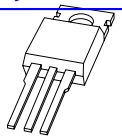


BT151-1000RT

12 A thyristor high blocking voltage high operating temperature

Rev. 01 — 6 August 2007 Product data sheet

1. Product profile

1.1 General description

Passivated thyristor in a SOT78 plastic package.

1.2 Features

- High thermal cycling performance
- T_j is 150 °C capable
- V_{DRM}, V_{RRM} is 1000 V capable

1.3 Applications

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

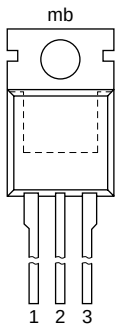
1.4 Quick reference data

- $V_{DRM} \leq 1000$ V
- $V_{RRM} \leq 1000$ V
- $I_{TSM} \leq 120$ A (t = 10 ms)
- $I_{T(RMS)} \leq 12$ A
- $I_{GT} \leq 15$ mA
- $T_j \leq 150$ °C

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)

3. Ordering information

Table 2. Ordering information

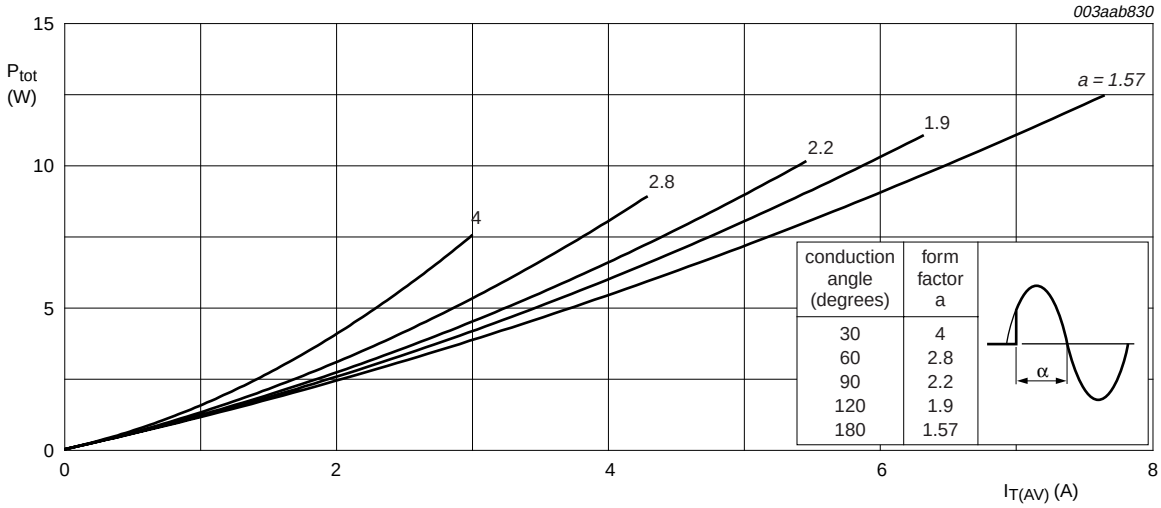
Type number	Package		
	Name	Description	Version
BT151-1000RT	SC-46	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

4. Limiting values

Table 3. Limiting values

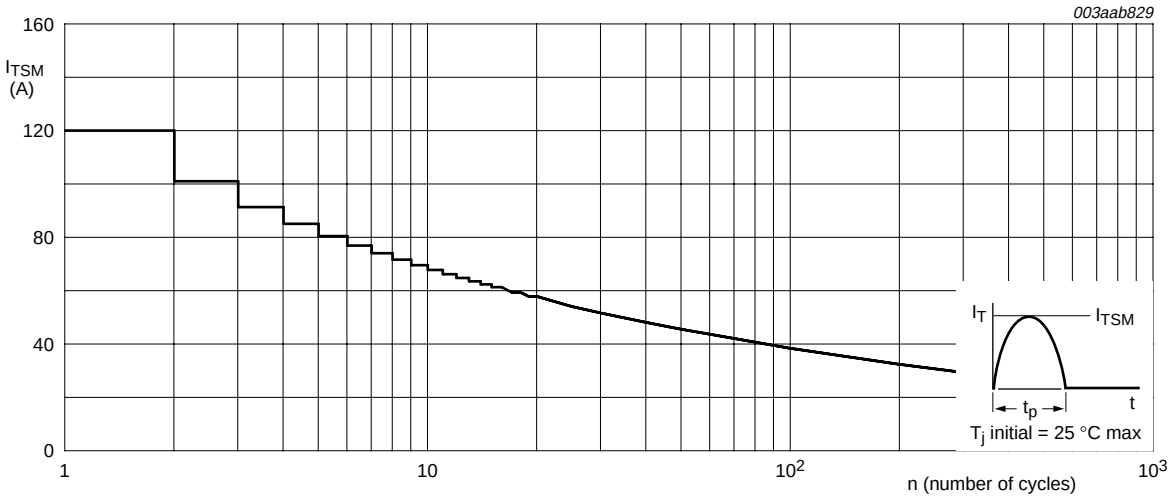
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	1000	V
V_{RRM}	repetitive peak reverse voltage		-	1000	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{mb} \leq 134$ °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	-	131	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
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



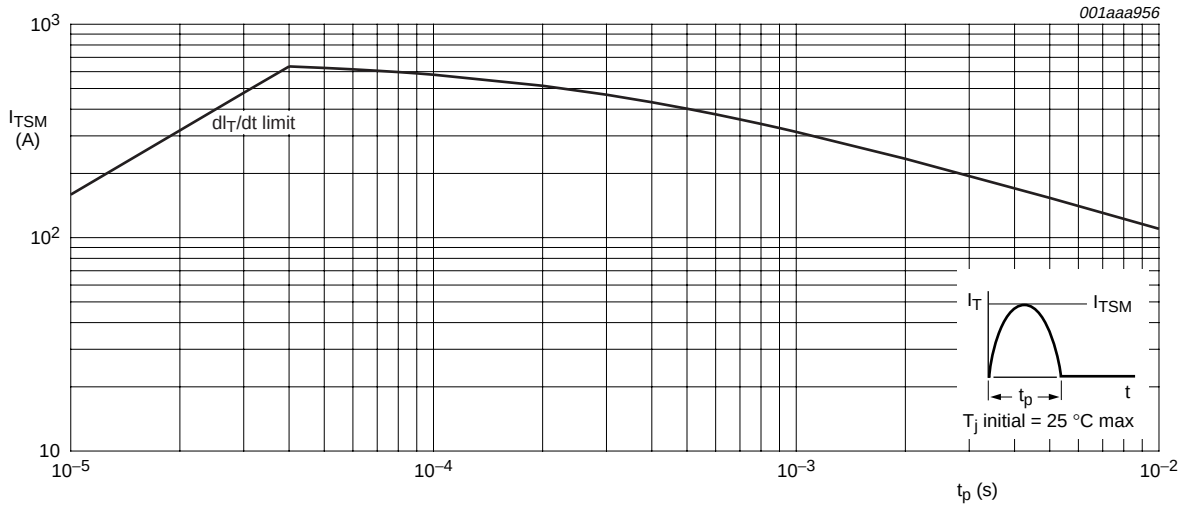
Form factor a = $I_{T(RMS)}$ / $I_{T(AV)}$

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



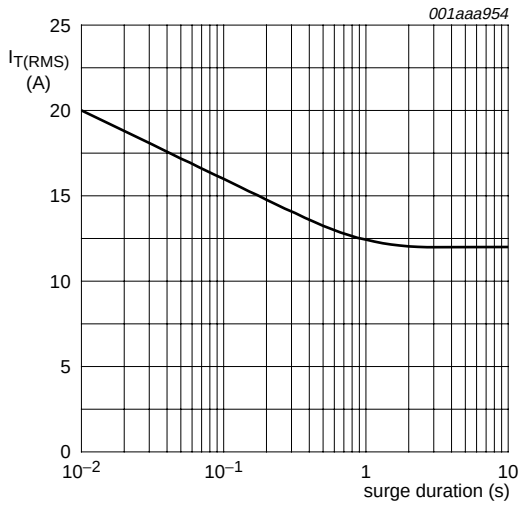
f = 50 Hz

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; $T_{mb} \leq 134$ °C

Fig 4. RMS on-state current as a function of surge duration for sinusoidal currents

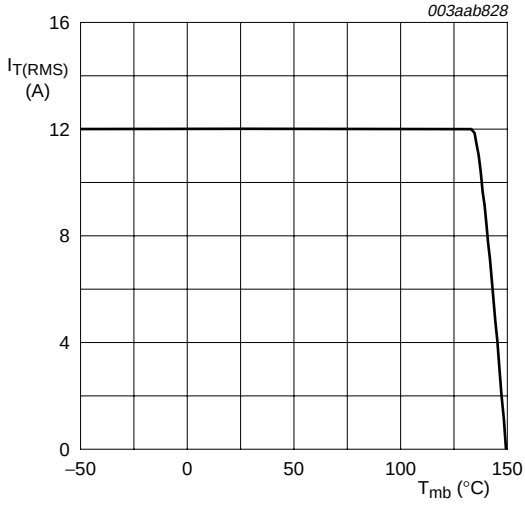


Fig 5. RMS on-state current as a function of mounting base temperature; maximum values

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

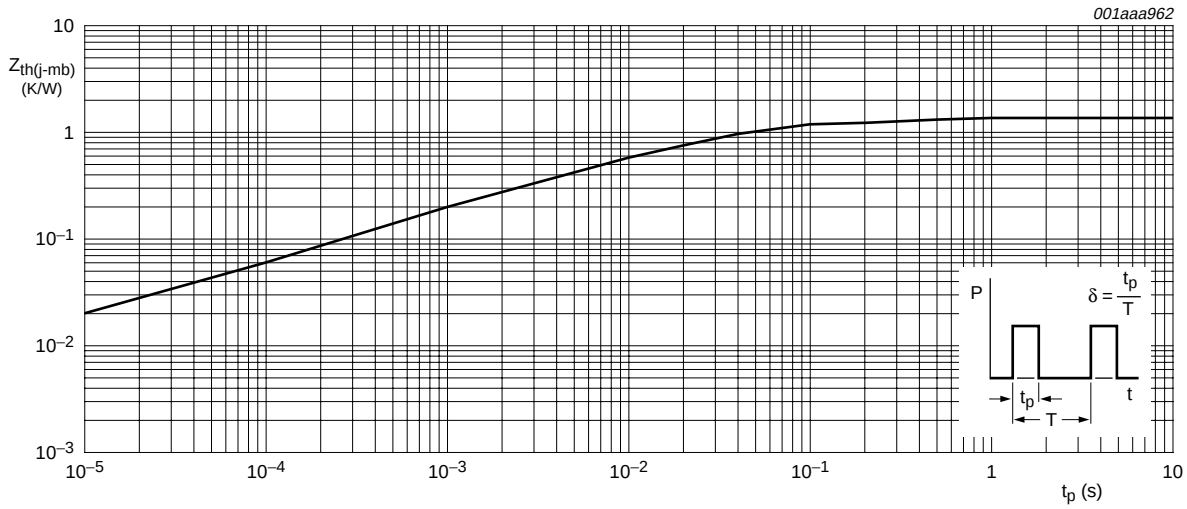


Fig 6. Transient thermal impedance from junction to mounting base as a function of pulse width

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	2	-	15	mA
I_L	latching current	V_D = 12 V; I_{GT} = 100 mA; see Figure 10	-	-	40	mA
I_H	holding current	V_D = 12 V; I_{GT} = 100 mA; see Figure 11	-	-	20	mA
V_T	on-state voltage	I_T = 23 A	-	1.4	1.75	V
V_{GT}	gate trigger voltage	I_T = 100 mA; see Figure 7				
		V_D = 12 V	-	0.6	1.5	V
		$V_D = V_{DRM(max)}$; T_j = 150 °C	0.25	0.4	-	V
I_D	off-state current	$V_R = V_{DRM(max)}$; T_j = 150 °C	-	0.5	2.5	mA
I_R	reverse current	$V_R = V_{RRM(max)}$; T_j = 150 °C	-	0.5	2.5	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 0.67 \times V_{DRM(max)}$; T_j = 150 °C; exponential waveform; gate open circuit; see Figure 12	-	300	-	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	$V_{DM} = 0.67 \times V_{DRM(max)}$; T_j = 150 °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

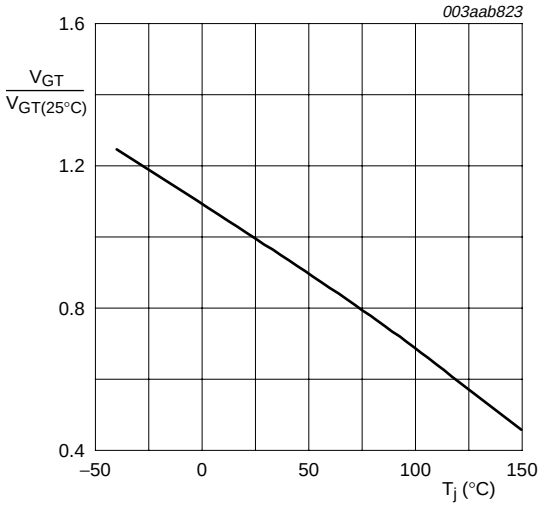


Fig 7. Normalized gate trigger voltage as a function of junction temperature

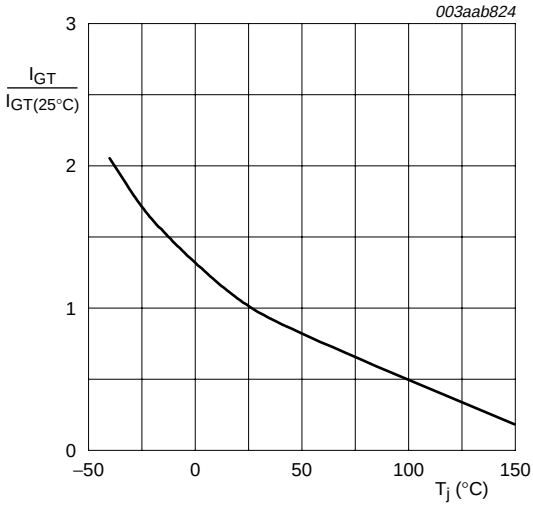
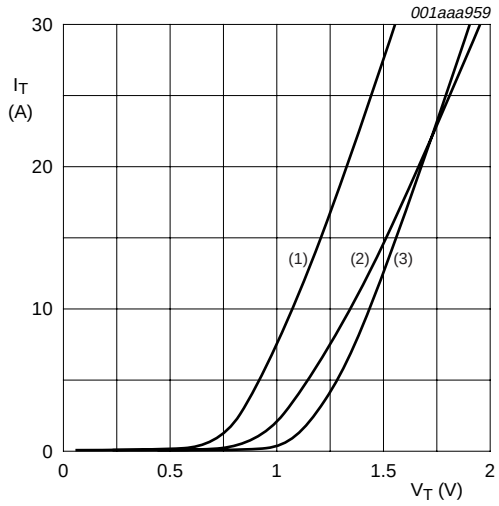


Fig 8. Normalized gate trigger current as a function of junction temperature



V_o = 1.06 V

R_s = 0.0304 Ω

(1) T_j = 150 °C; typical values

(2) T_j = 150 °C; maximum values

(3) T_j = 25 °C; maximum values

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

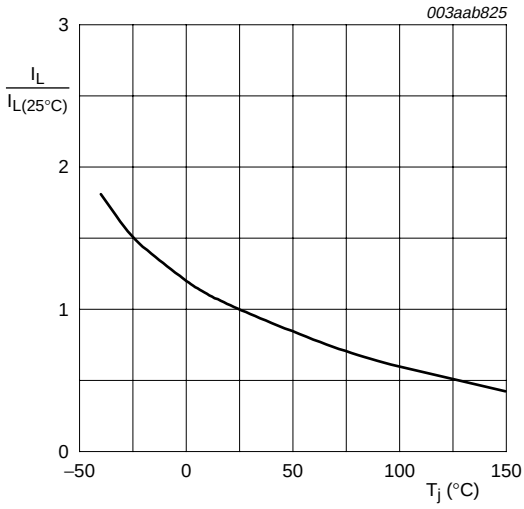


Fig 10. Normalized latching current as a function of junction temperature

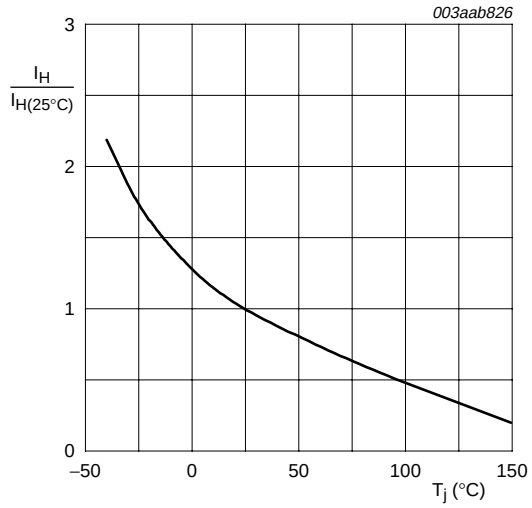
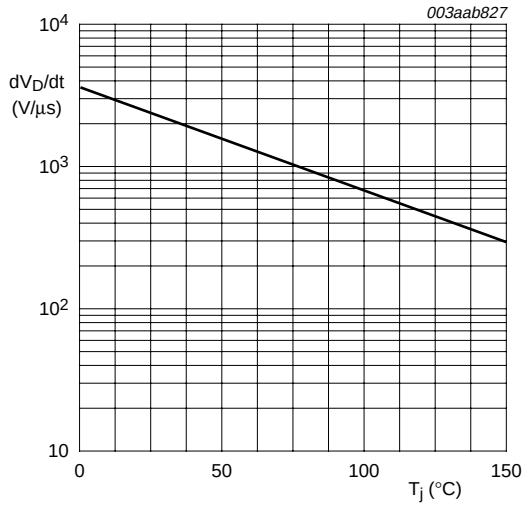


Fig 11. Normalized holding current as a function of junction temperature

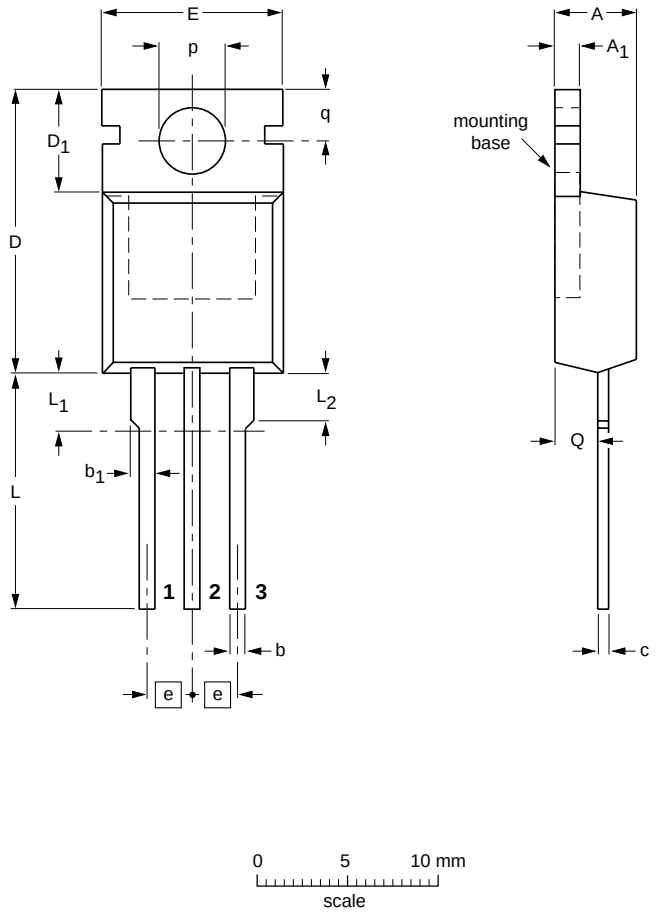


Gate open circuit

Fig 12. Critical rate of rise of off-state voltage as a function of junction temperature; typical 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 (3-lead TO-220AB)

8. Revision history

Table 6. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BT151-1000RT_1	20070806	Product data sheet	-	-

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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