

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
- $V_{\text{DRM}}, V_{\text{RRM}}$ is 1000 V capable
- T_j is 150 °C capable

1.3 Applications

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

1.4 Quick reference data

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

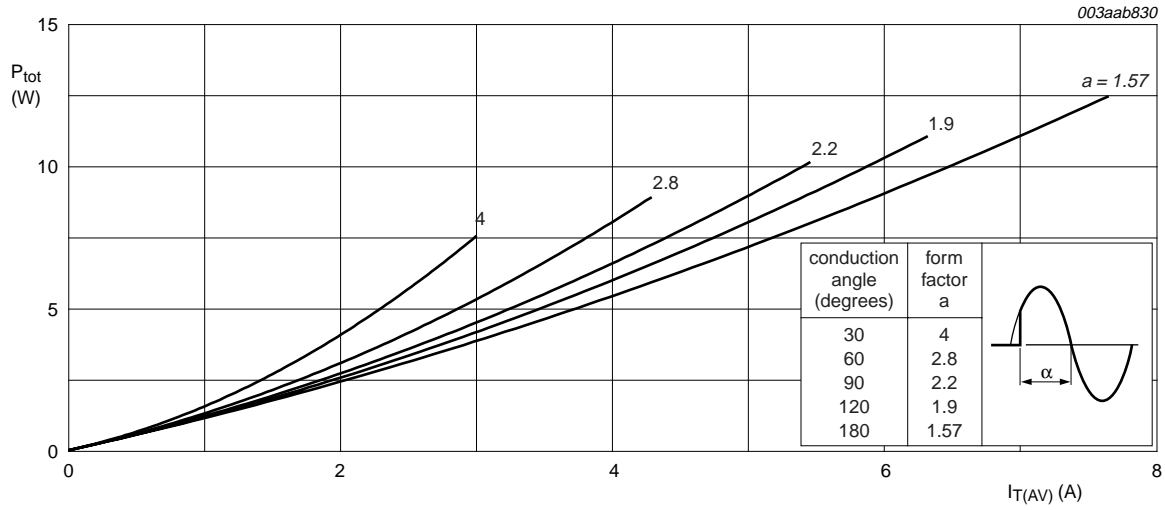
Type number	Package		Version
	Name	Description	
BT151-1000RT	SC-46	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

4. Limiting values

Table 3. Limiting values

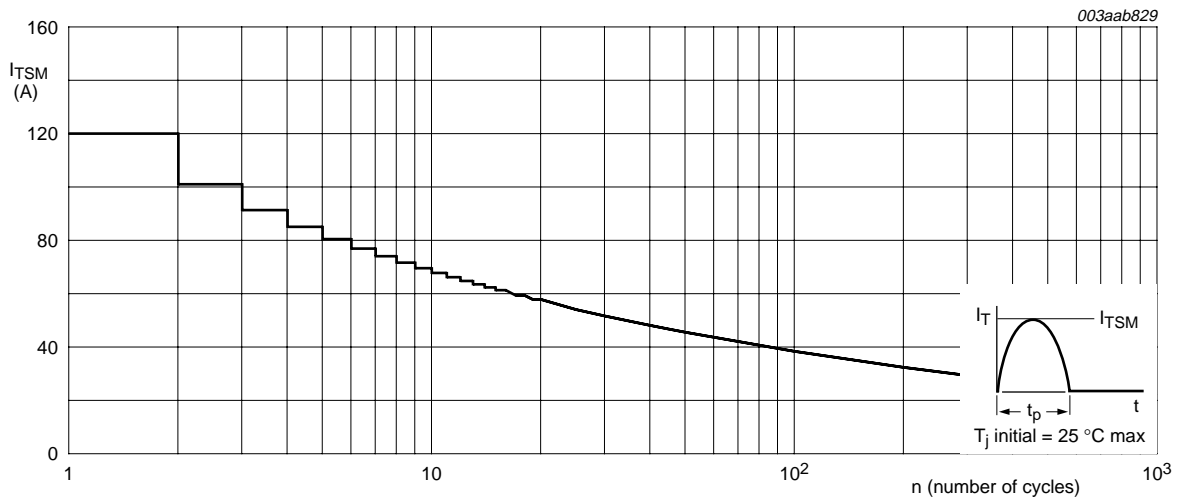
In accordance with the Absolute Maximum Rating System (IEC 60134).

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; $T_{mb} \leq 134\text{ °C}$; 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; $T_j = 25\text{ °C}$ prior to surge; see Figure 2 and 3			
		$t = 10\text{ ms}$	-	120	A
		$t = 8.3\text{ ms}$	-	131	A
I^2t	I^2t for fusing	$t = 10\text{ ms}$	-	72	A ² s
dl_T/dt	rate of rise of on-state current	$I_{TM} = 20\text{ A}$; $I_G = 50\text{ mA}$; $dl_G/dt = 50\text{ mA}/\mu\text{s}$	-	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



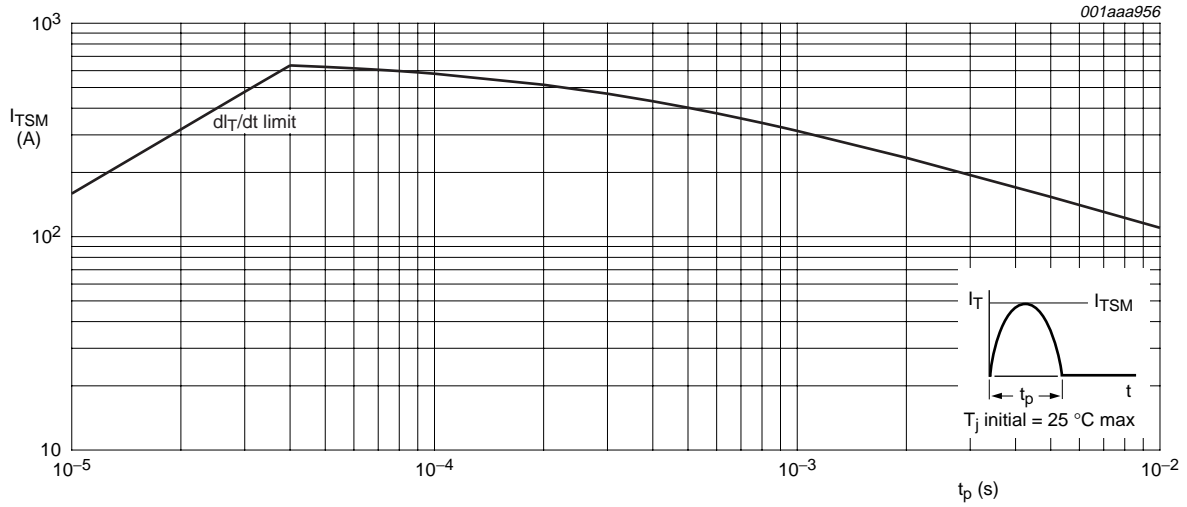
Form factor $a = I_{T(RMS)} / I_{T(AV)}$

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



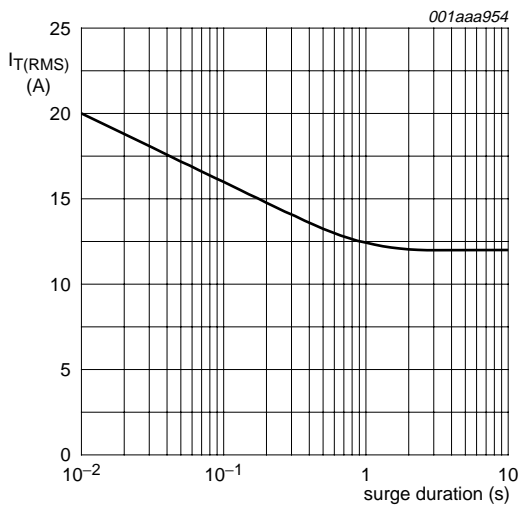
f = 50 Hz

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

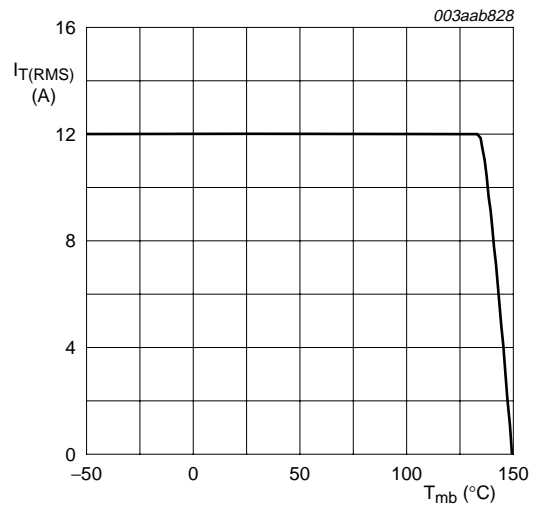


Fig 5. RMS on-state current as a function of mounting base temperature; maximum values

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

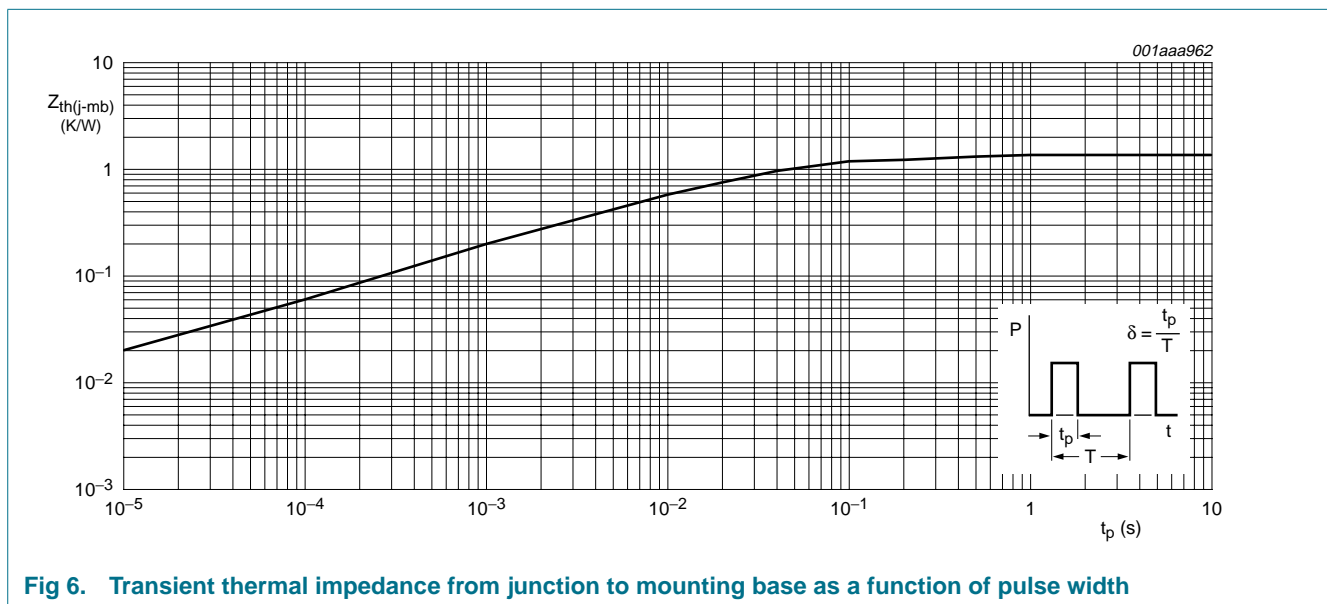


Fig 6. Transient thermal impedance from junction to mounting base as a function of pulse width

6. Characteristics

Table 5. Characteristics

$T_j = 25\text{ °C}$ unless otherwise stated.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; see Figure 8	2	-	15	mA
I_L	latching current	$V_D = 12\text{ V}$; $I_{GT} = 100\text{ mA}$; see Figure 10	-	-	40	mA
I_H	holding current	$V_D = 12\text{ V}$; $I_{GT} = 100\text{ mA}$; see Figure 11	-	-	20	mA
V_T	on-state voltage	$I_T = 23\text{ A}$	-	1.4	1.75	V
V_{GT}	gate trigger voltage	$I_T = 100\text{ mA}$; see Figure 7				
		$V_D = 12\text{ V}$	-	0.6	1.5	V
		$V_D = V_{DRM(max)}$; $T_j = 150\text{ °C}$	0.25	0.4	-	V
I_D	off-state current	$V_R = V_{DRM(max)}$; $T_j = 150\text{ °C}$	-	0.5	2.5	mA
I_R	reverse current	$V_R = V_{RRM(max)}$; $T_j = 150\text{ °C}$	-	0.5	2.5	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 0.67 \times V_{DRM(max)}$; $T_j = 150\text{ °C}$; exponential waveform; gate open circuit; see Figure 12	-	300	-	V/ μ s
t_{gt}	gate-controlled turn-on time	$I_{TM} = 40\text{ A}$; $V_D = V_{DRM(max)}$; $I_G = 100\text{ mA}$; $dI_G/dt = 5\text{ A}/\mu\text{s}$	-	2	-	μ s
t_q	commutated turn-off time	$V_{DM} = 0.67 \times V_{DRM(max)}$; $T_j = 150\text{ °C}$; $I_{TM} = 20\text{ A}$; $V_R = 25\text{ V}$; $(dI_T/dt)_M = 30\text{ A}/\mu\text{s}$; $dV_D/dt = 50\text{ V}/\mu\text{s}$; $R_{GK} = 100\ \Omega$	-	70	-	μ s

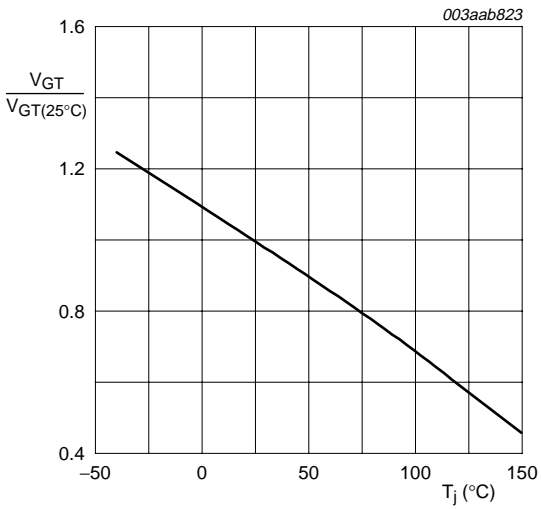


Fig 7. Normalized gate trigger voltage as a function of junction temperature

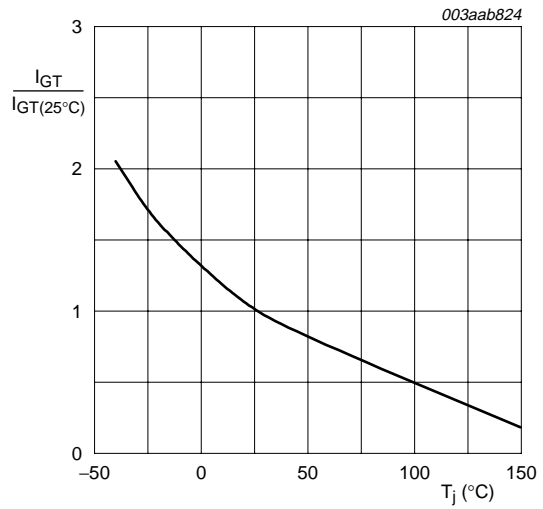
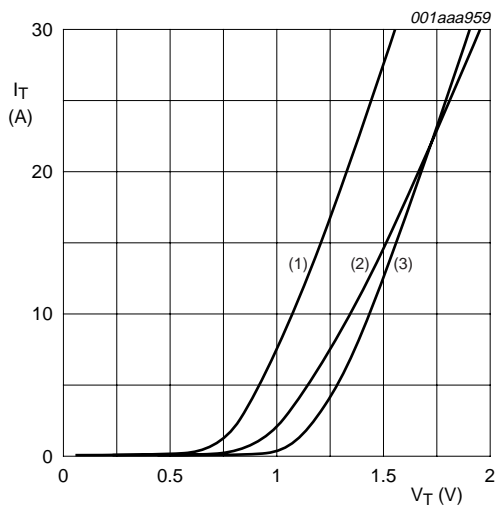


Fig 8. Normalized gate trigger current as a function of junction temperature



$V_o = 1.06 \text{ V}$
 $R_s = 0.0304 \text{ } \Omega$

- (1) $T_j = 150 \text{ } ^\circ\text{C}$; typical values
- (2) $T_j = 150 \text{ } ^\circ\text{C}$; maximum values
- (3) $T_j = 25 \text{ } ^\circ\text{C}$; maximum values

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

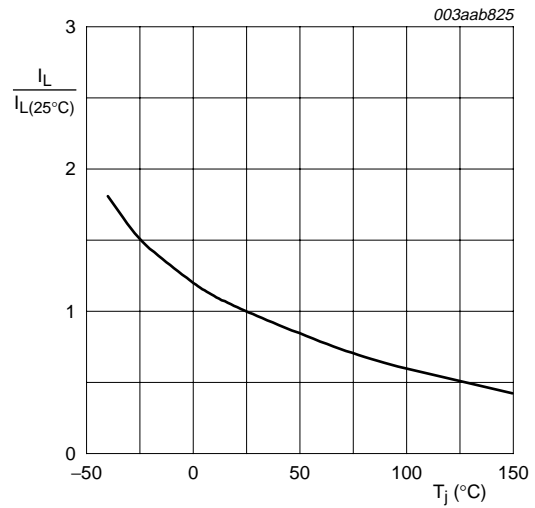


Fig 10. Normalized latching current as a function of junction temperature

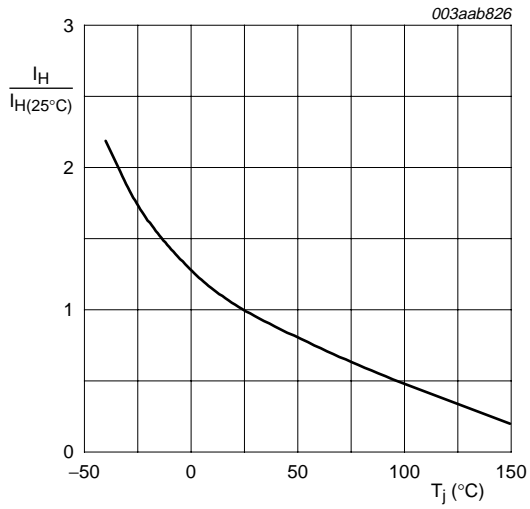
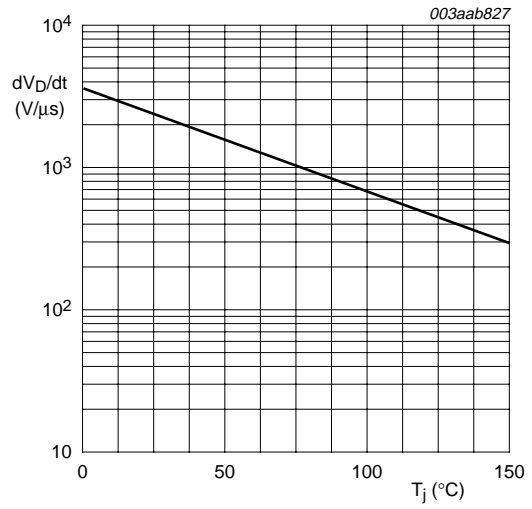


Fig 11. Normalized holding current as a function of junction temperature



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

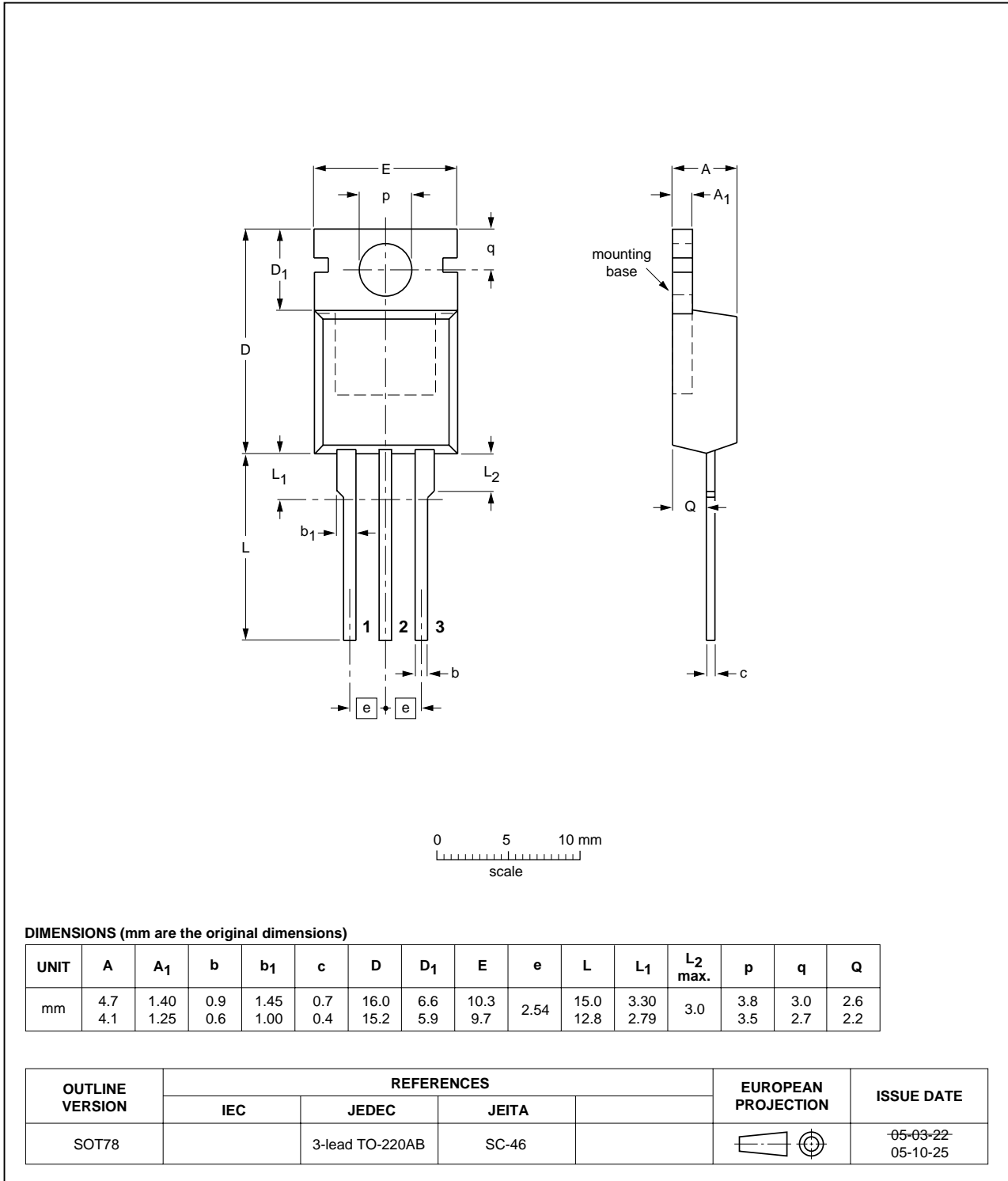


Fig 13. Package outline SOT78 (3-lead TO-220AB)

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".

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