



# BT152-500RT

SCR

Rev. 2 — 9 June 2011

Product data sheet

## 1. Product profile

### 1.1 General description

Planar passivated Silicon Controlled Rectifier in a SOT78 (TO-220AB) plastic package intended for use in applications requiring very high inrush current capability, high junction temperature capability and high thermal cycling performance.

### 1.2 Features and benefits

- High junction temperature capability
- High thermal cycling performance
- Planar passivated for voltage ruggedness and reliability
- Very high current surge capability

### 1.3 Applications

- Ignition circuits
- Motor control
- Protection circuits e.g. SMPS inrush current
- Voltage regulation

### 1.4 Quick reference data

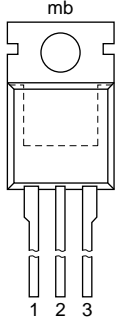

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage		-	-	500	V
$V_{RRM}$	repetitive peak reverse voltage		-	-	500	V
$I_{TSM}$	non-repetitive peak on-state current	half sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 8.3\text{ ms}$	-	-	220	A
		half sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 10\text{ ms}$ ; see <a href="#">Figure 4</a> ; see <a href="#">Figure 5</a>	-	-	200	A
$I_{T(AV)}$	average on-state current	half sine wave; $T_{mb} \leq 122\text{ °C}$ ; see <a href="#">Figure 3</a>	-	-	13	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; see <a href="#">Figure 1</a> ; see <a href="#">Figure 2</a>	-	-	20	A
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 100\text{ mA}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 7</a>	-	3	32	mA



## 2. Pinning information

Table 2. Pinning information

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

**SOT78 (TO-220AB)**

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BT152-500RT	TO-220AB	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; $T_{mb} \leq 122\text{ °C}$ ; see <a href="#">Figure 3</a>	-	13	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; see <a href="#">Figure 1</a> ; see <a href="#">Figure 2</a>	-	20	A
$I_{TSM}$	non-repetitive peak on-state current	half sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 8.3\text{ ms}$	-	220	A
		half sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 10\text{ ms}$ ; see <a href="#">Figure 4</a> ; see <a href="#">Figure 5</a>	-	200	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; sine-wave pulse	-	200	A <sup>2</sup> s
$di_T/dt$	rate of rise of on-state current	$I_T = 50\text{ A}$ ; $I_G = 200\text{ mA}$ ; $di_G/dt = 200\text{ mA}/\mu\text{s}$	-	200	A/ $\mu\text{s}$
$I_{GM}$	peak gate current		-	5	A
$V_{RGM}$	peak reverse gate voltage		-	5	V
$P_{GM}$	peak gate power		-	20	W
$P_{G(AV)}$	average gate power	over any 20 ms period	-	1	W
$T_{stg}$	storage temperature		-40	150	°C
$T_j$	junction temperature		-	150	°C

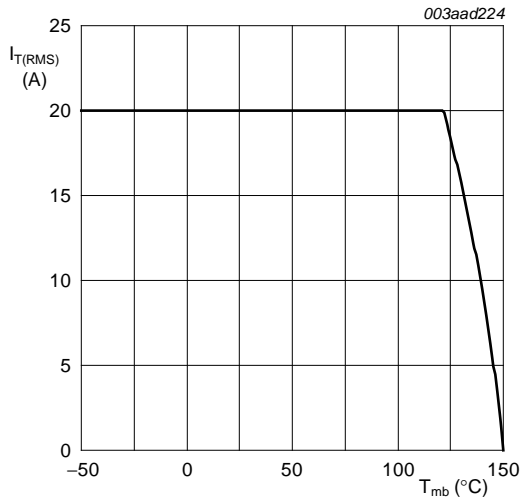
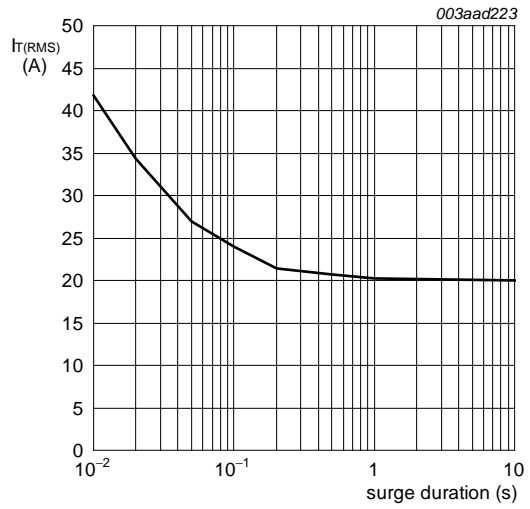
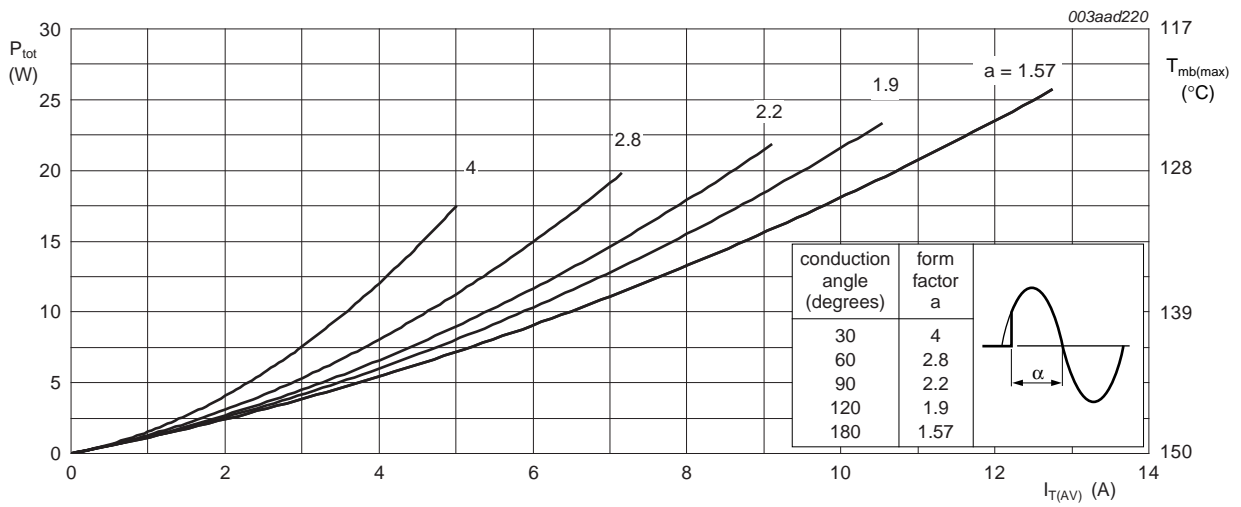


Fig 1. RMS on-state current as a function of mounting base temperature; maximum values



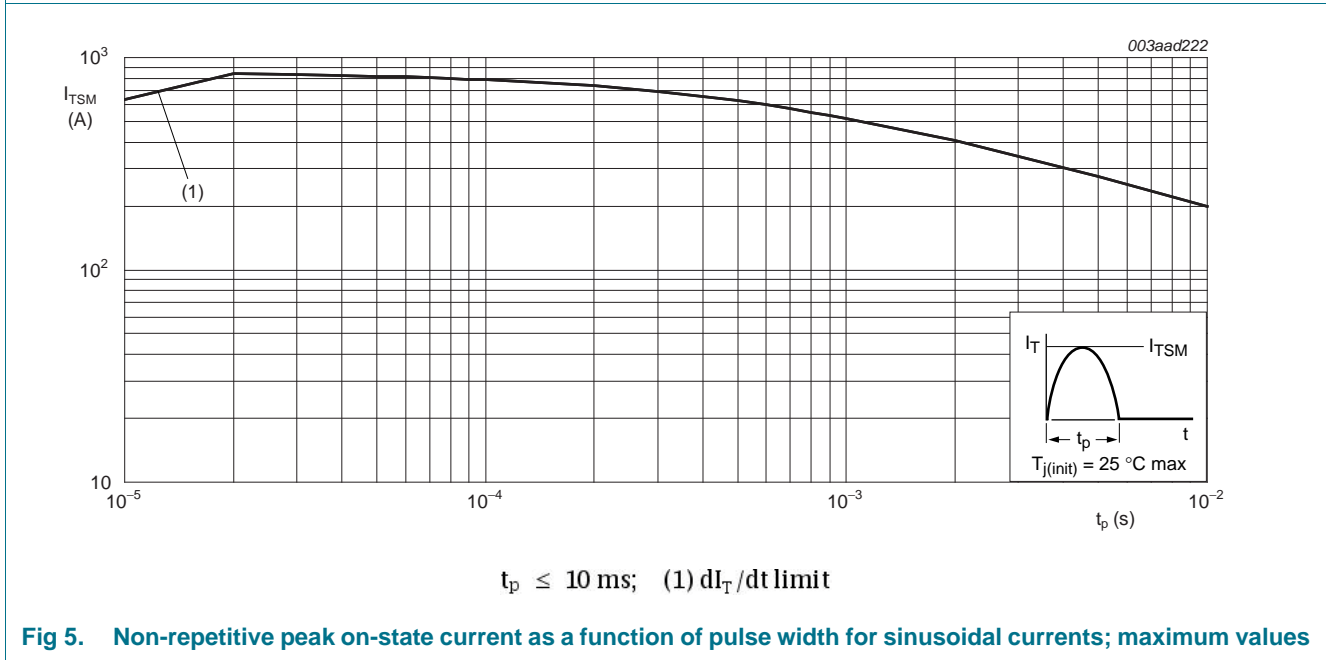
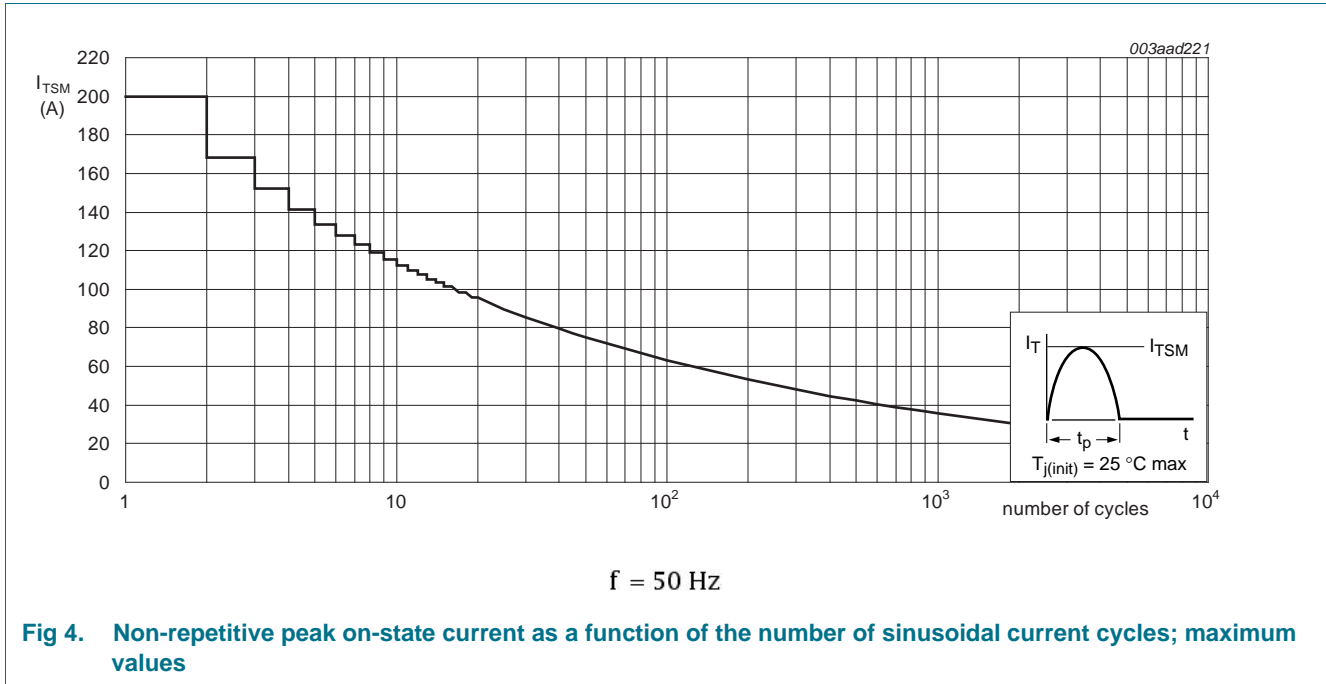
f = 50 Hz; T<sub>mb</sub> = 122 °C

Fig 2. RMS on-state current as a function of surge duration; maximum values



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

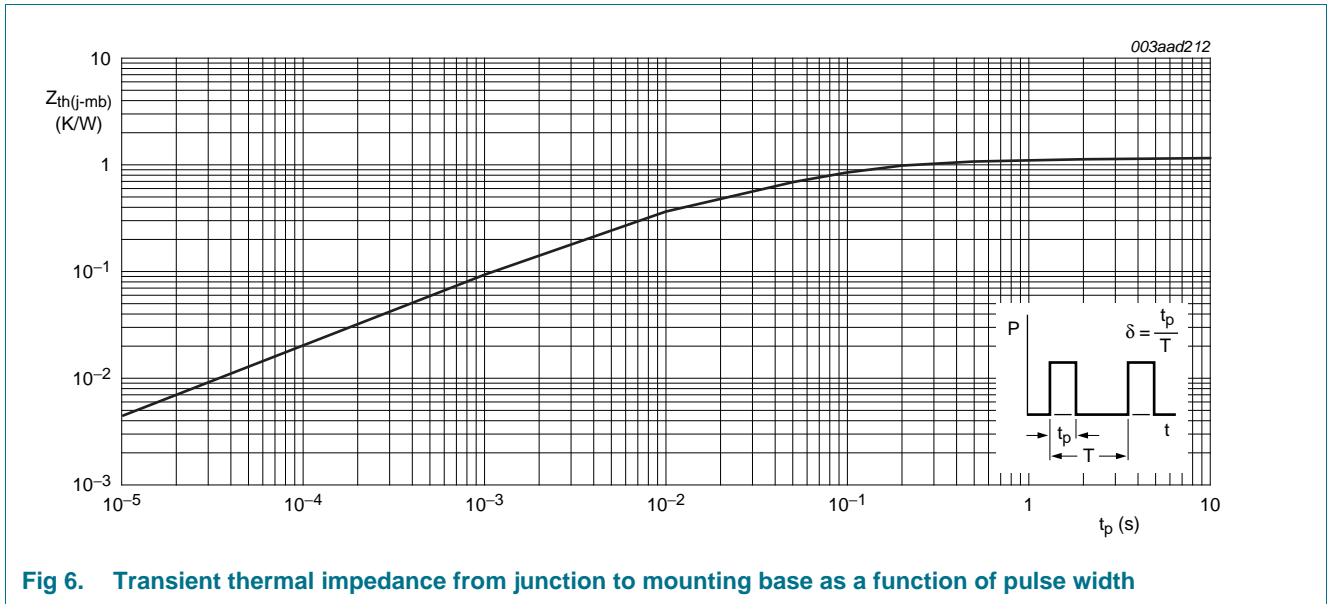
Fig 3. Total power dissipation as a function of average on-state current; maximum values



### 5. Thermal characteristics

Table 5. Thermal characteristics

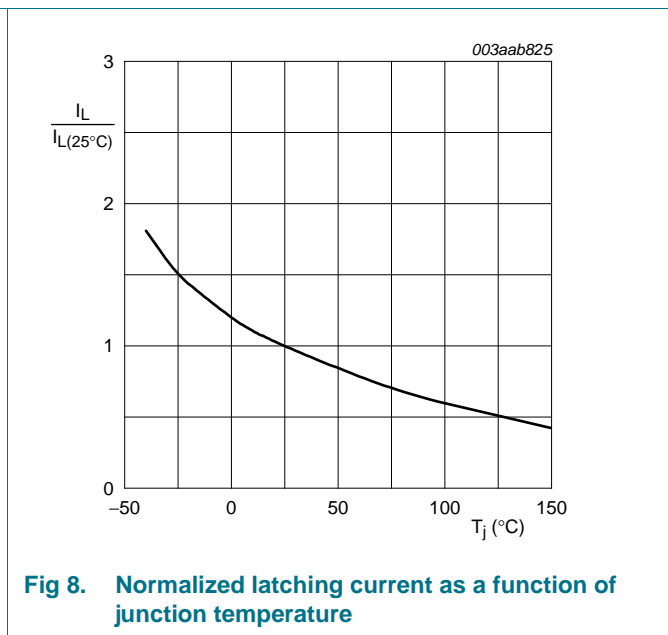
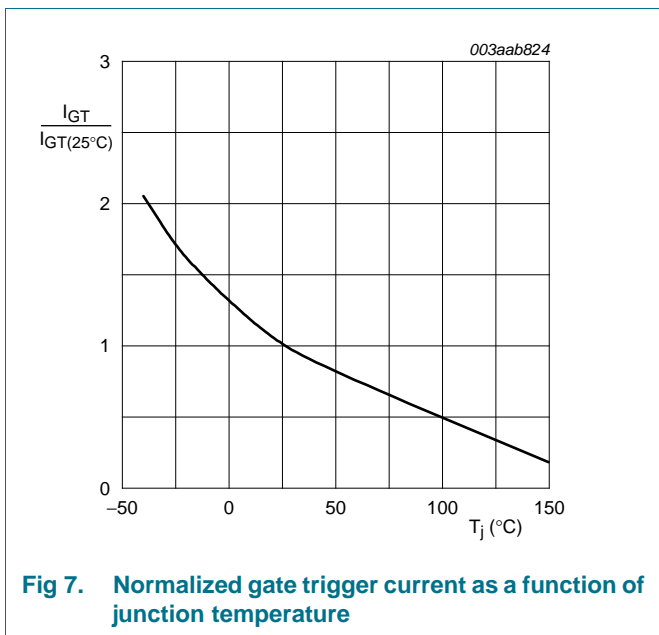
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see <a href="#">Figure 6</a>	-	-	1.1	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	60	-	K/W

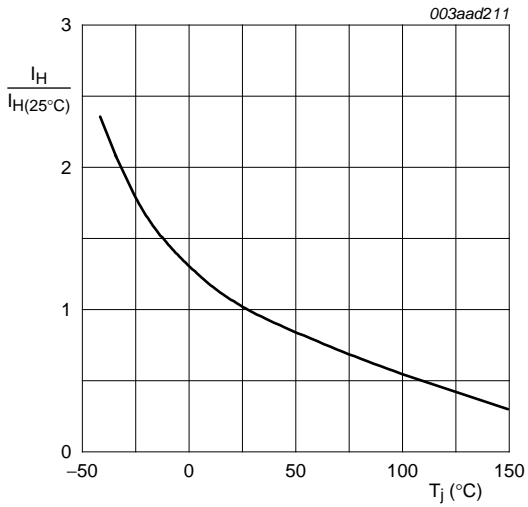


## 6. Characteristics

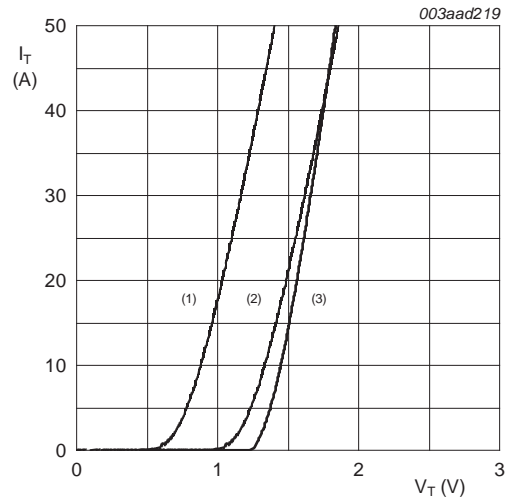
Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 100\text{ mA}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 7</a>	-	3	32	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_G = 100\text{ mA}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 8</a>	-	25	80	mA
$I_H$	holding current	$T_j = 25\text{ °C}$ ; see <a href="#">Figure 9</a>	-	15	60	mA
$V_T$	on-state voltage	$I_T = 40\text{ A}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 10</a>	-	1.4	1.75	V
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V}$ ; $I_T = 100\text{ mA}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 11</a>	-	0.6	1.5	V
		$V_D = 500\text{ V}$ ; $I_T = 100\text{ mA}$ ; $T_j = 125\text{ °C}$ ; see <a href="#">Figure 11</a>	0.25	0.4	-	V
$I_D$	off-state current	$V_D = 500\text{ V}$ ; $T_j = 125\text{ °C}$	-	0.2	1	mA
$I_R$	reverse current	$T_j = 125\text{ °C}$ ; $V_R = 500\text{ V}$	-	0.2	1	mA
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 335\text{ V}$ ; $T_j = 125\text{ °C}$ ; exponential waveform; gate open circuit; see <a href="#">Figure 12</a>	200	300	-	V/ $\mu$ s
$t_{gt}$	gate-controlled turn-on time	$I_{TM} = 40\text{ A}$ ; $V_D = 500\text{ V}$ ; $I_G = 100\text{ mA}$ ; $dI_G/dt = 5\text{ A}/\mu\text{s}$	-	2	-	$\mu$ s
$t_q$	commutated turn-off time	$V_{DM} = 335\text{ V}$ ; $T_j = 125\text{ °C}$ ; $I_{TM} = 20\text{ A}$ ; $V_R = 25\text{ V}$ ; $(dI_T/dt)_M = 30\text{ A}/\mu\text{s}$ ; $dV_D/dt = 50\text{ V}/\mu\text{s}$ ; $R_{GK} = 100\text{ }\Omega$	-	70	-	$\mu$ s





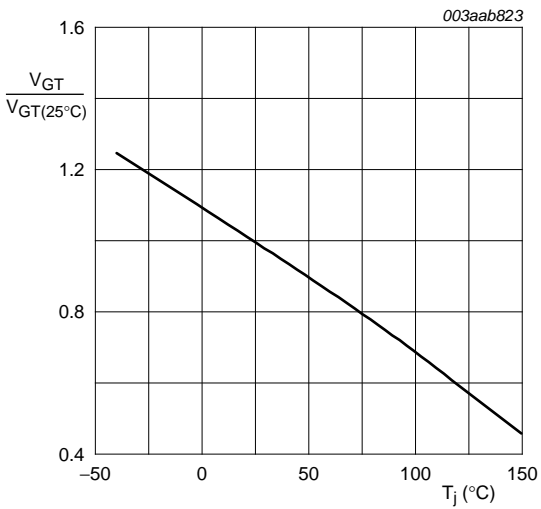
**Fig 9. Normalized holding current as a function of junction temperature**



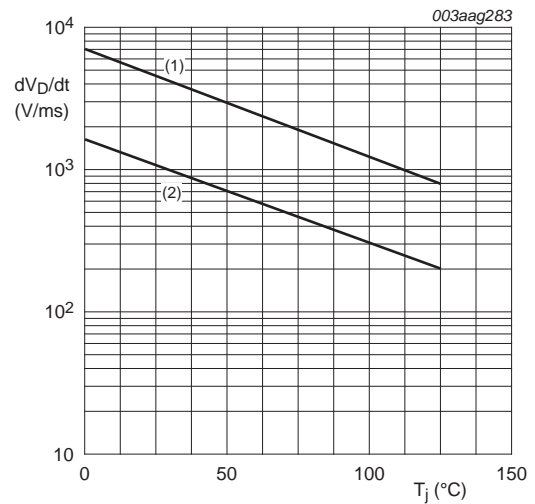
$V_o = 1.06 \text{ V}; R_s = 0.03 \Omega$

- (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 10. On-state current as a function of on-state voltage**



**Fig 11. Normalized gate trigger voltage as a function of junction temperature**



- (1)  $R_{GK} = 100 \Omega$
- (2) 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

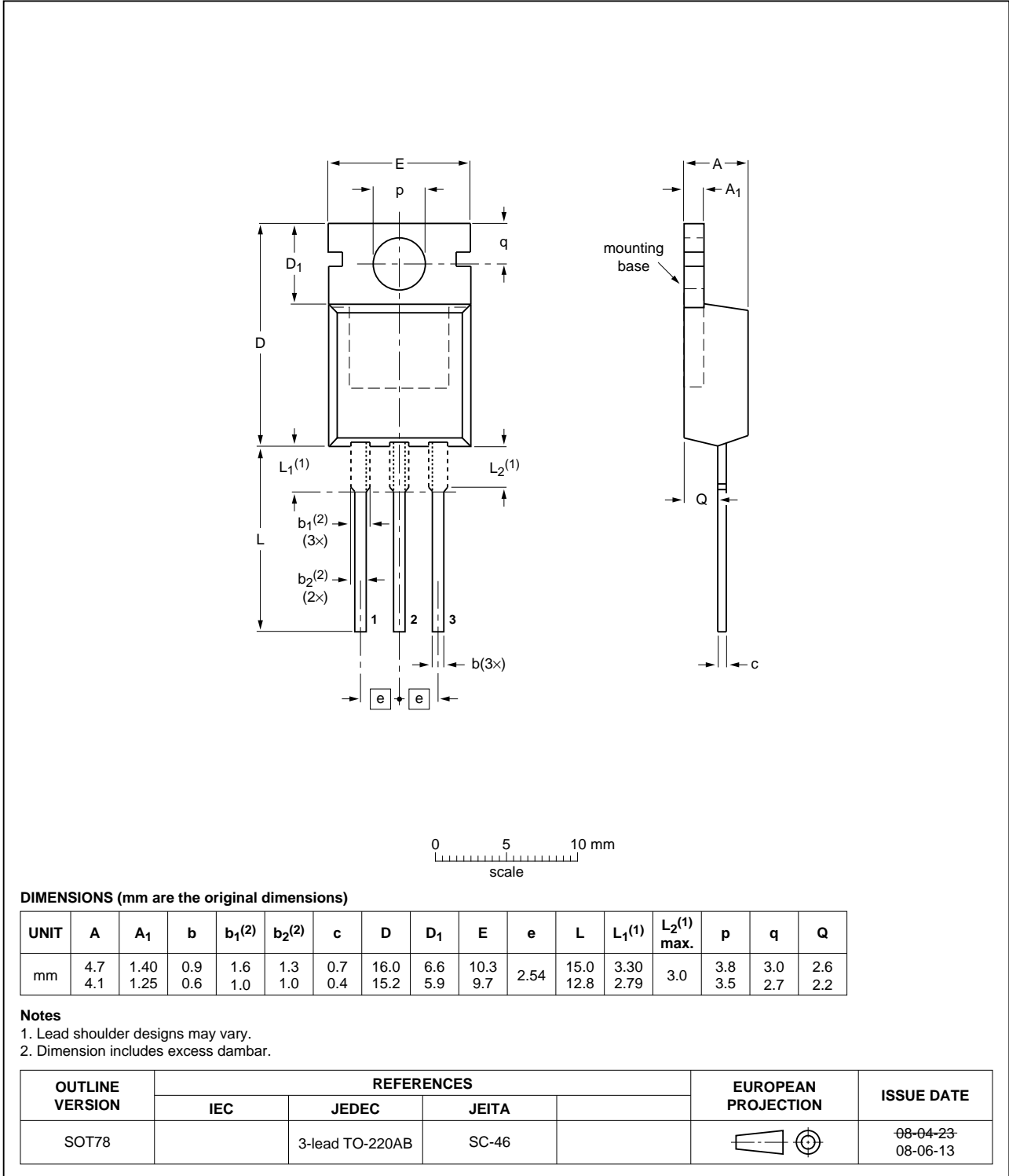


Fig 13. Package outline SOT78 (TO-220AB)



## 8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BT152-500RT v.2	20110609	Product data sheet	-	BT152-500RT v.1
Modifications:	• Various changes to content.			
BT152-500RT v.1	20090512	Product data sheet	-	-

## 9. Legal information

### 9.1 Data sheet status

Document status <sup>[1]</sup> <sup>[2]</sup>	Product status <sup>[3]</sup>	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.

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