

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 thermal cycling performance
- High temperature capable
- Very high surge capability

1.3 Applications

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

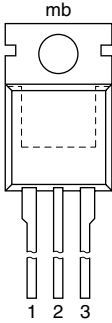

1.4 Quick reference data

Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	500	V
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 Figure 3	-	-	13	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; all conduction angles; see Figure 1 ; see Figure 2	-	-	20	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $t_p = 8.3\text{ ms}$; $T_{j(\text{init})} = 25\text{ °C}$	-	-	220	A
		half sine wave; $t_p = 10\text{ ms}$; $T_{j(\text{init})} = 25\text{ °C}$; see Figure 4 ; see Figure 5	-	-	200	A
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $T_j = 25\text{ °C}$; $I_T = 100\text{ mA}$; see Figure 8	-	3	32	mA

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode		 sym037
2	A	anode		
3	G	gate		
mb	A	mounting base; connected to anode		

SOT78
(TO-220AB; SC-46)

3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
BT152-500RT	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; $T_{mb} \leq 122\text{ °C}$; see Figure 3	-	13	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; all conduction angles; see Figure 1 ; see Figure 2	-	20	A
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/ μs
I_{GM}	peak gate current		-	5	A
P_{GM}	peak gate power		-	20	W
T_{stg}	storage temperature		-40	150	°C
T_j	junction temperature		-	150	°C

Table 4. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
I_{TSM}	non-repetitive peak on-state current	half sine wave; $t_p = 8.3$ ms; $T_{j(\text{init})} = 25$ °C	-	220	A
		half sine wave; $t_p = 10$ ms; $T_{j(\text{init})} = 25$ °C; see Figure 4 ; see Figure 5	-	200	A
I^2t	I^2t for fusing	$t_p = 10$ ms; sine-wave pulse	-	200	A ² s
$P_{G(AV)}$	average gate power	over any 20 ms period	-	1	W
V_{RGM}	peak reverse gate voltage		-	5	V

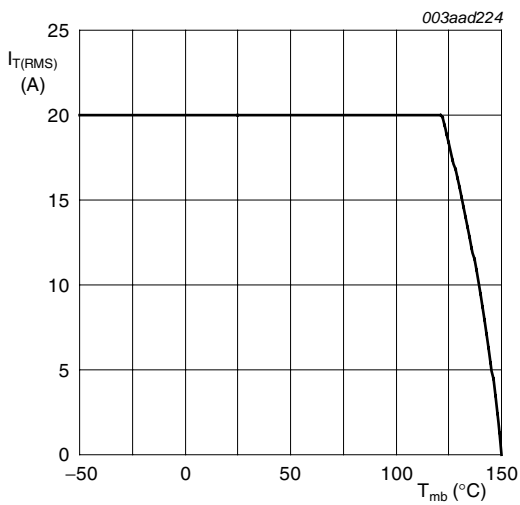
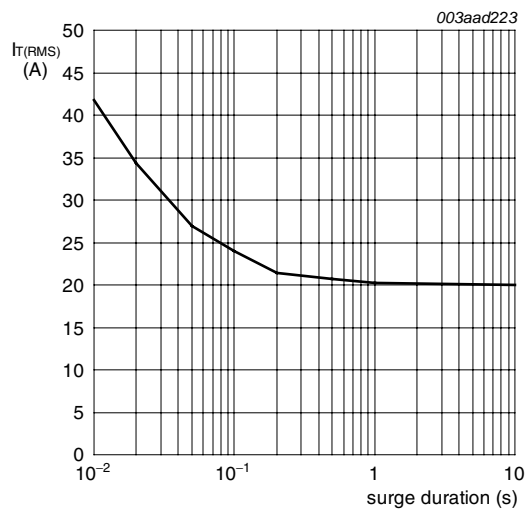
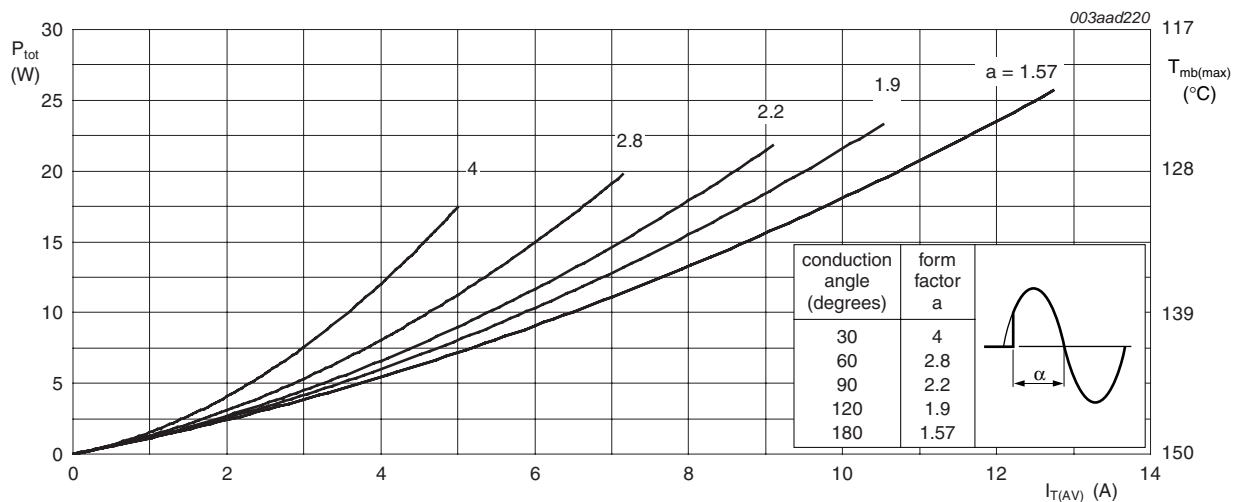


Fig 1. RMS on-state current as a function of mounting base temperature; maximum values



$f = 50$ Hz $T_{sp} = 122$ °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

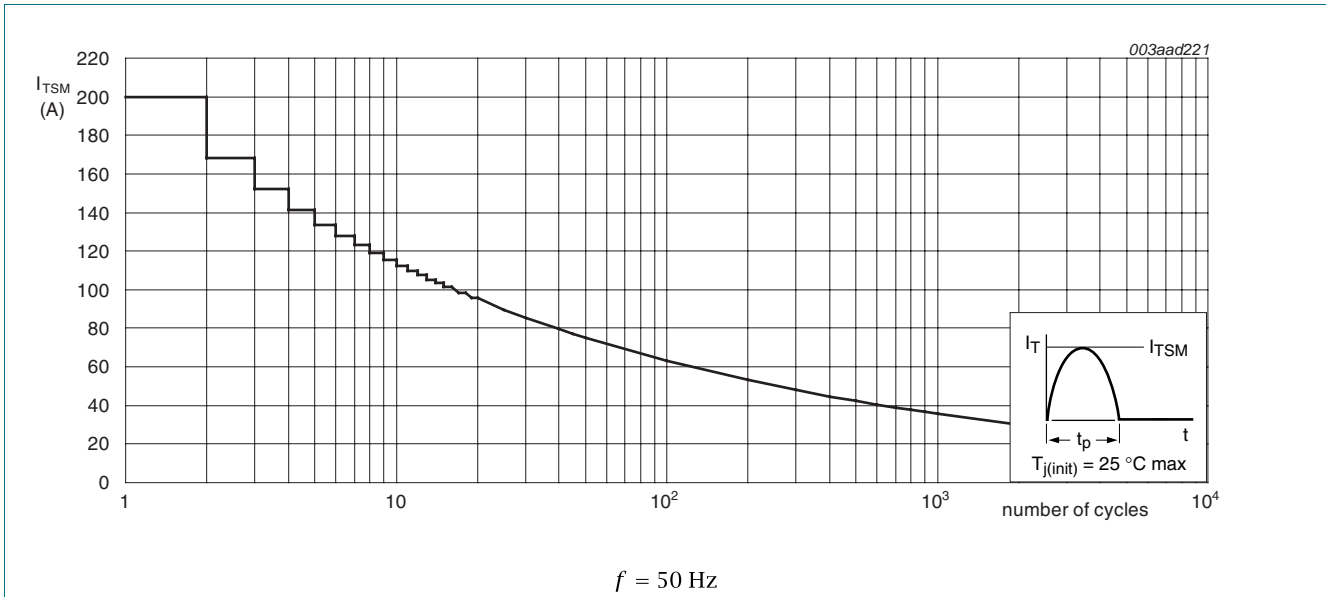


Fig 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

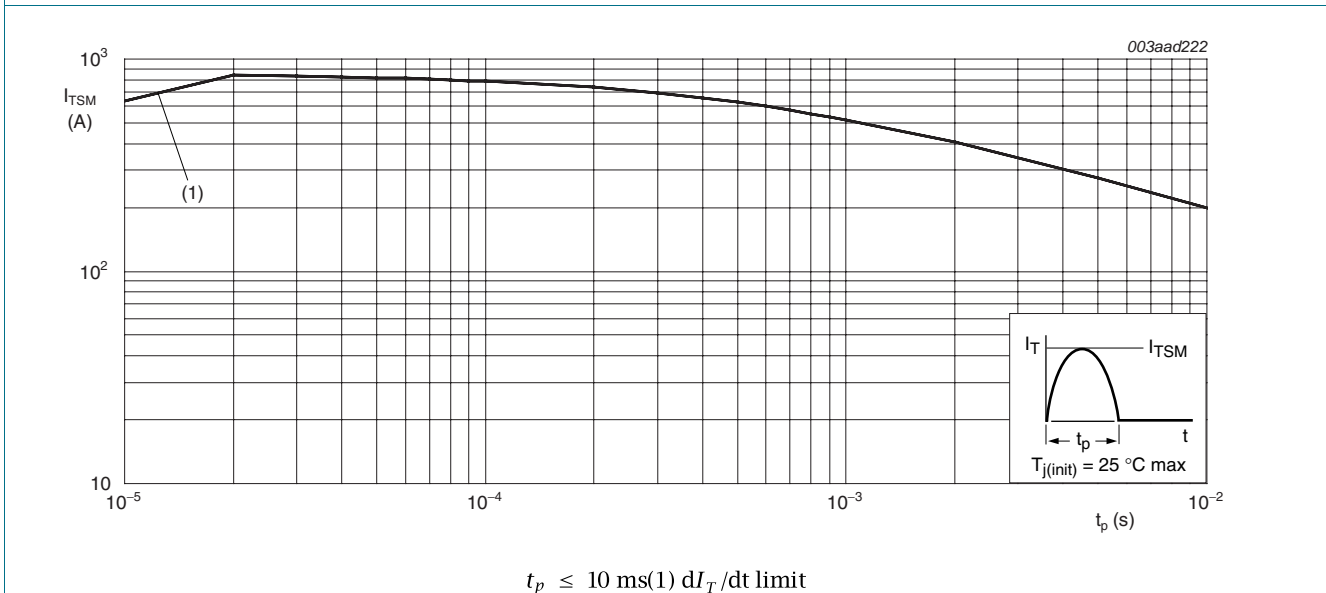


Fig 5. Non-repetitive peak on-state current as a function of pulse width for sinusoidal currents; maximum values

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

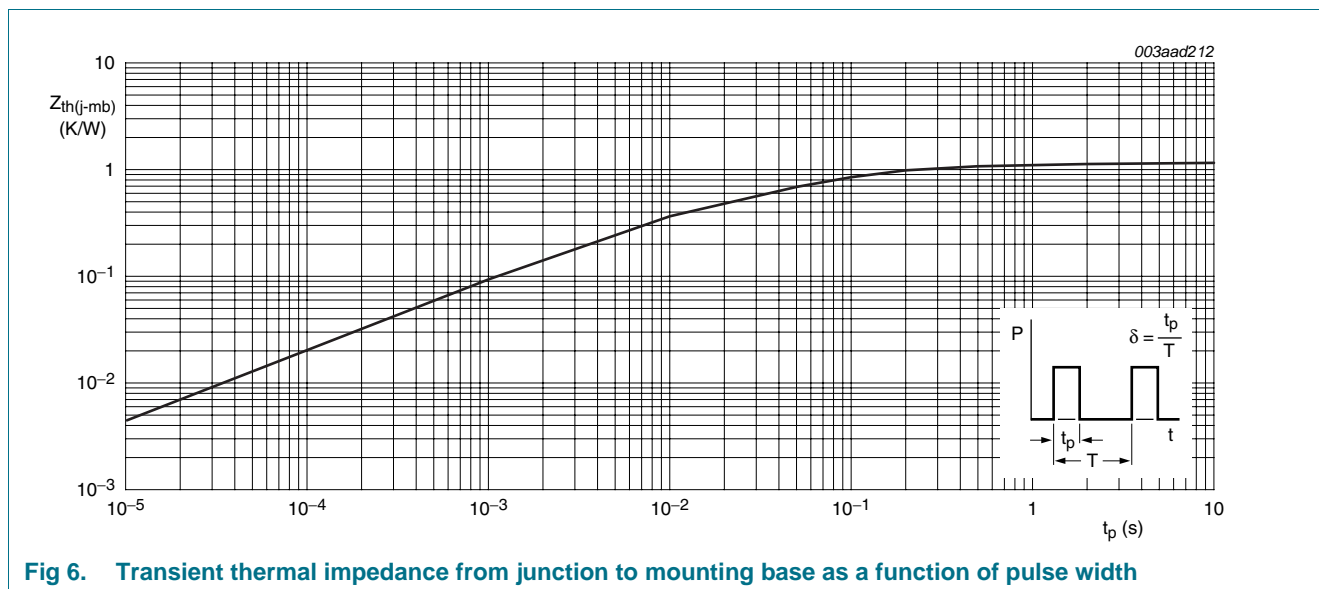


Fig 6. Transient thermal impedance from junction to mounting base as a function of pulse width

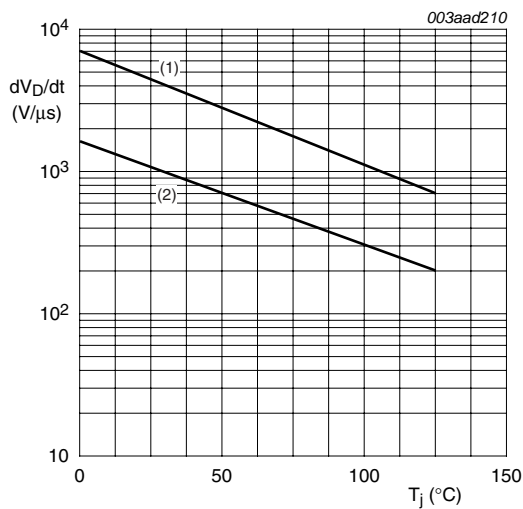
6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C}; I_T = 100\text{ mA};$ see Figure 8	-	3	32	mA
I_L	latching current	$V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C}; I_G = 100\text{ mA};$ see Figure 9	-	25	80	mA
I_H	holding current	$T_j = 25\text{ }^\circ\text{C};$ see Figure 10	-	15	60	mA
V_T	on-state voltage	$I_T = 40\text{ A}; T_j = 25\text{ }^\circ\text{C};$ see Figure 11	-	1.4	1.75	V
V_{GT}	gate trigger voltage	$I_T = 100\text{ mA}; V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C};$ see Figure 12	-	0.6	1.5	V
		$I_T = 100\text{ mA}; V_D = 500\text{ V}; T_j = 125\text{ }^\circ\text{C}$	0.25	0.4	-	V
I_D	off-state current	$V_D = 500\text{ V}; T_j = 125\text{ }^\circ\text{C}$	-	0.2	1	mA
I_R	reverse current	$V_R = 500\text{ V}; T_j = 125\text{ }^\circ\text{C}$	-	0.2	1	mA

Table 6. Characteristics ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 335\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; gate open circuit; see Figure 7	200	300	-	$\text{V}/\mu\text{s}$
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	-	μs
t_q	commutated turn-off time	$V_{DM} = 335\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $I_{TM} = 20\text{ A}$; $V_R = 25\text{ V}$; $(dI_T/dt)_M = 30\text{ A}/\mu\text{s}$; $dV_D/dt = 50\text{ V}/\mu\text{s}$; $R_{GK} = 100\ \Omega$	-	70	-	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; typical values

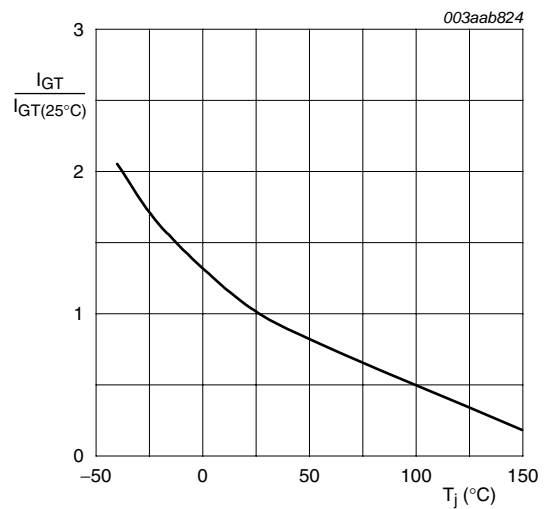


Fig 8. Normalized gate trigger current as a function of junction temperature

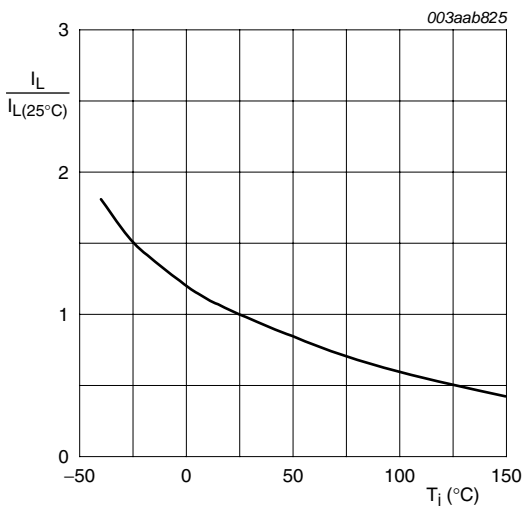


Fig 9. Normalized latching current as a function of junction temperature

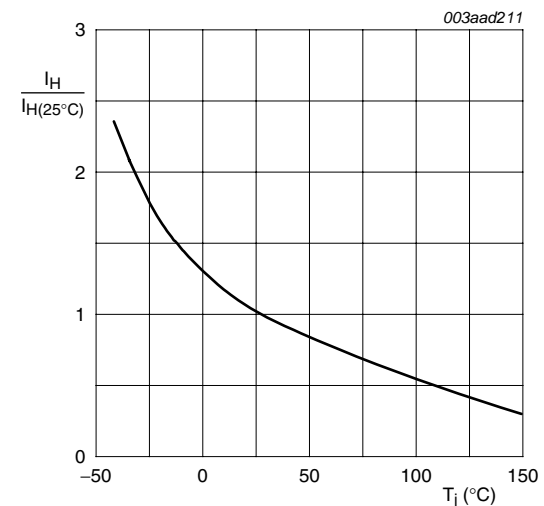
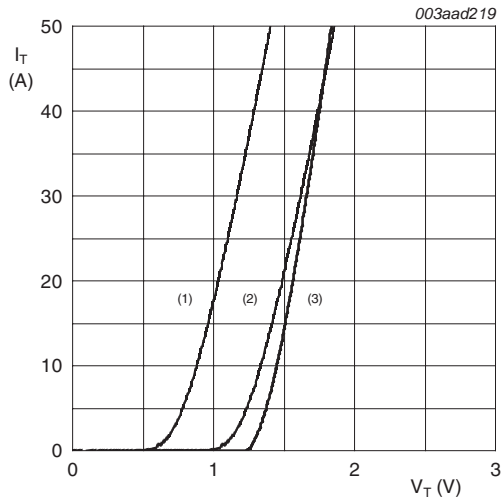


Fig 10. Normalized holding current as a function of junction temperature



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

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

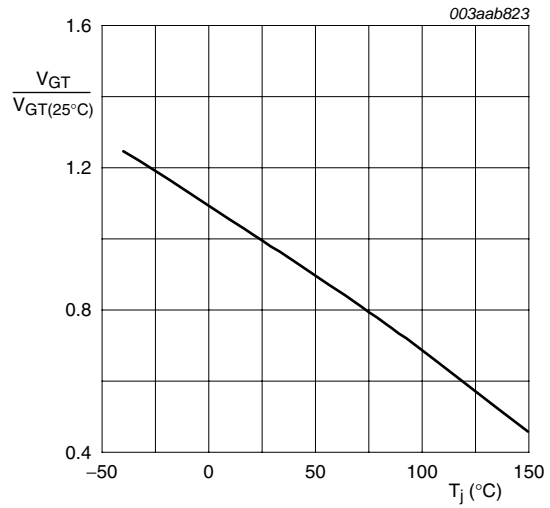


Fig 12. Normalized gate trigger voltage as a function of junction temperature

7. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB

SOT78

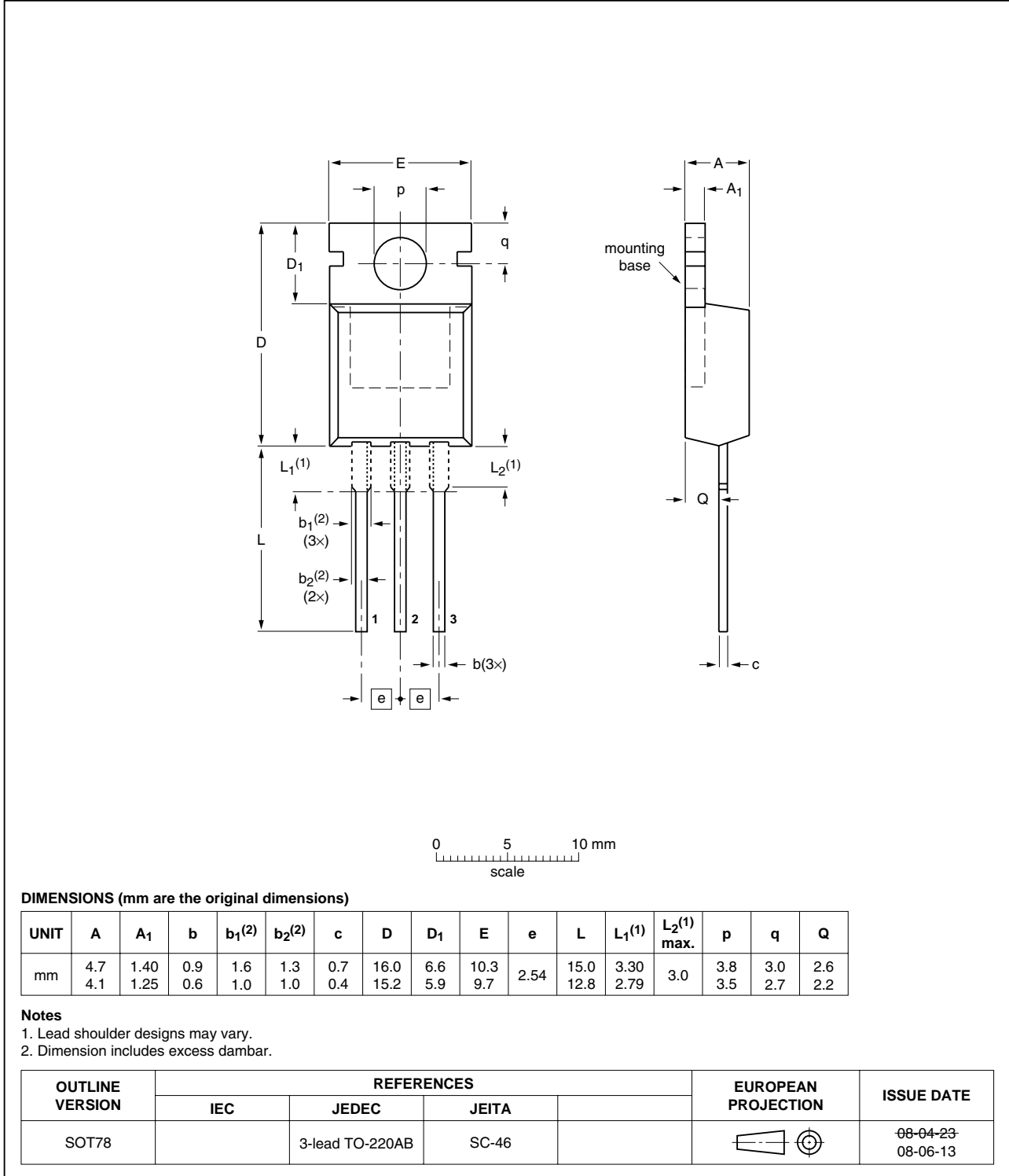


Fig 13. Package outline SOT78 (TO-220AB)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BT152-500RT_1	20090512	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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