



BUJ302A

NPN power transistor

Rev. 02 — 28 March 2011

Product data sheet

1. Product profile

1.1 General description

High-voltage, high-speed planar-passivated NPN power switching transistor in a SOT78 (TO-220AB) plastic package.

1.2 Features and benefits

- Fast switching
- High voltage capability
- Low thermal resistance

1.3 Applications

- DC-to-DC converters
- High-frequency electronic lighting ballast applications
- Inverters
- Motor control systems

1.4 Quick reference data

Table 1. Quick reference data

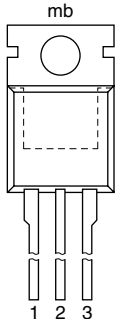
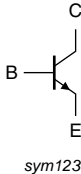
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_C	collector current	see Figure 1 ; see Figure 2 ; see Figure 4	-	-	4	A
P_{tot}	total power dissipation	$T_{mb} \leq 25\text{ °C}$; see Figure 3	-	-	80	W
V_{CESM}	collector-emitter peak voltage	$V_{BE} = 0\text{ V}$	-	-	1050	V
Static characteristics						
h_{FE}	DC current gain	$I_C = 0.1\text{ A}$; $V_{CE} = 5\text{ V}$; $T_{mb} = 25\text{ °C}$; see Figure 11	[1] 48	66	100	
		$I_C = 0.8\text{ A}$; $V_{CE} = 3\text{ V}$; $T_{mb} = 25\text{ °C}$; see Figure 12	[1] 25	42	50	

[1] Pulse test: pulse duration $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$



2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base		
2	C	collector		
3	E	emitter		
mb	C	mounting base; connected to collector		

SOT78 (TO-220AB)

3. Ordering information

Table 3. Ordering information

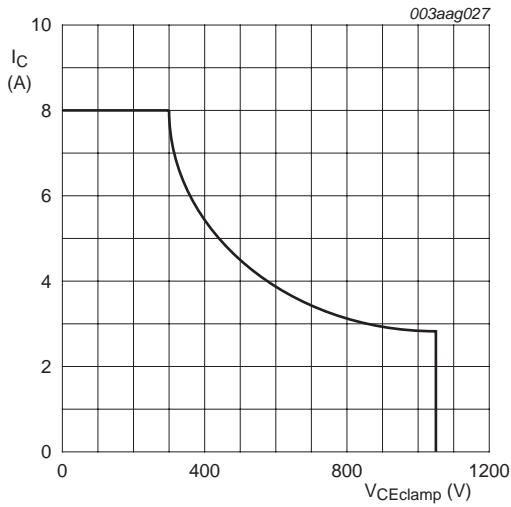
Type number	Package		
	Name	Description	Version
BUJ302A	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

4. Limiting values

Table 4. Limiting values

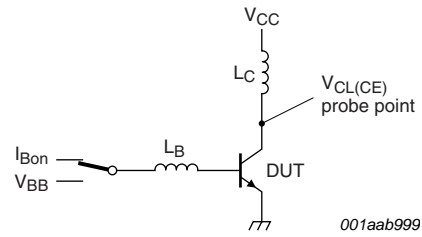
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CESM}	collector-emitter peak voltage	$V_{BE} = 0\text{ V}$	-	1050	V
V_{CEO}	collector-emitter voltage	$I_B = 0\text{ A}$	-	400	V
I_C	collector current	see Figure 1 ; see Figure 2 ; see Figure 4	-	4	A
I_{CM}	peak collector current		-	8	A
I_B	base current		-	2	A
I_{BM}	peak base current		-	4	A
P_{tot}	total power dissipation	$T_{mb} \leq 25\text{ °C}$; see Figure 3	-	80	W
T_{stg}	storage temperature		-65	150	°C
T_j	junction temperature		-	150	°C
V_{EBO}	emitter-base voltage	$I_C = 0\text{ A}$; $I_E = 2\text{ A}$; $t_p < 10\text{ ms}$	-	24	V



$$T_j \leq T_{j(max)} \text{ } ^\circ\text{C}$$

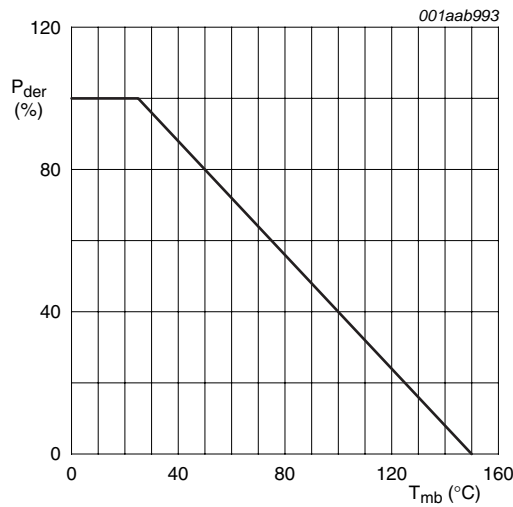
Fig 1. Reverse bias safe operating area



$$V_{CL(CE)} \leq 1000 \text{ V}; V_{CC} = 150 \text{ V}; V_{BB} = -5 \text{ V};$$

$$L_B = 1 \mu\text{H}; L_C = 200 \mu\text{H}$$

Fig 2. Test circuit for reverse bias safe operating area



$$P_{der} = \frac{P_{tot}}{P_{tot(25^\circ\text{C})}} \times 100 \%$$

Fig 3. Normalized total power dissipation as a function of mounting base temperature

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 5	-	-	1.56	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	60	-	K/W

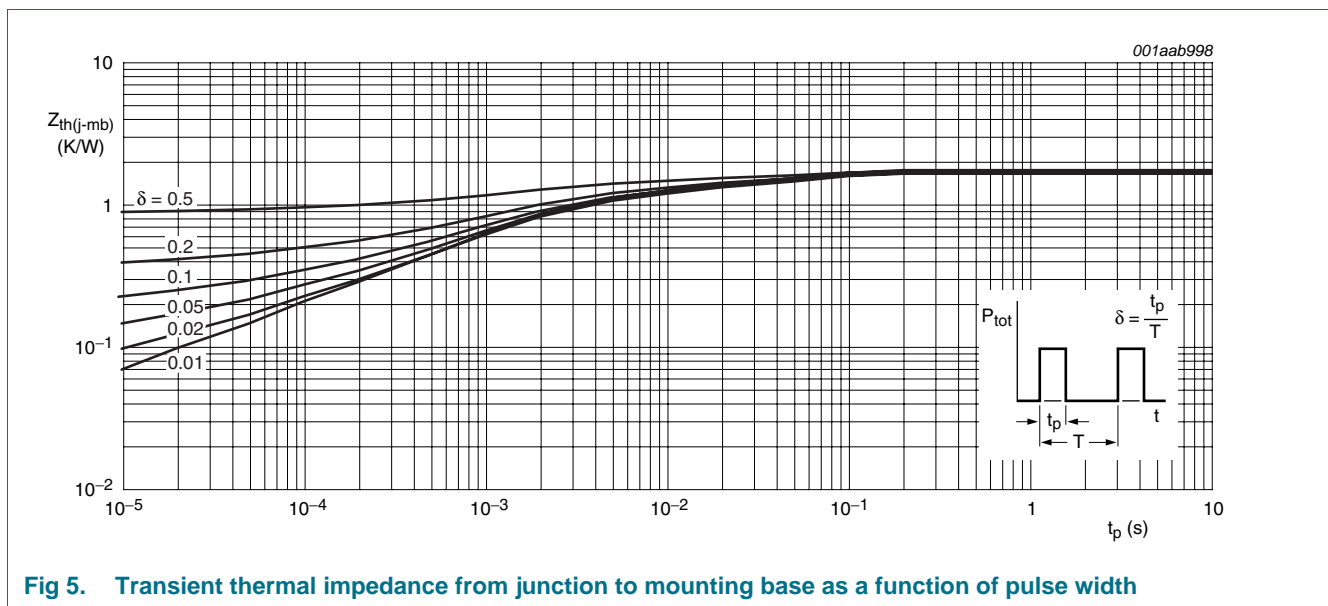


Fig 5. Transient thermal impedance from junction to mounting base as a function of pulse width

6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
Static characteristics							
I_{CES}	collector-emitter cut-off current	$V_{BE} = 0\text{ V}; V_{CE} = 1050\text{ V}; T_{mb} = 25\text{ }^\circ\text{C}$	-	0.2	10	μA	
I_{CEO}	collector-emitter cut-off current	$V_{CE} = 400\text{ V}; I_B = 0\text{ A}; T_{mb} = 25\text{ }^\circ\text{C}$	-	10	250	mA	
$V_{(BR)EBO}$	open-collector emitter-base breakdown voltage	$I_B = 1\text{ mA}; I_C = 0\text{ A}; T_{mb} = 25\text{ }^\circ\text{C}$	15	19	-	V	
V_{CEOsus}	collector-emitter sustaining voltage	$I_B = 0\text{ A}; I_C = 10\text{ mA}; L_C = 25\text{ mH}; T_{mb} = 25\text{ }^\circ\text{C};$ see Figure 6 ; see Figure 7	[1]	400	470	V	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 1\text{ A}; I_B = 0.2\text{ A}; T_{mb} = 25\text{ }^\circ\text{C};$ see Figure 8 ; see Figure 9	[1]	-	0.15	0.5	V
		$I_C = 3.5\text{ A}; I_B = 1\text{ A}; T_{mb} = 25\text{ }^\circ\text{C};$ see Figure 8 ; see Figure 9	[1]	-	0.6	1.5	V
V_{BEsat}	base-emitter saturation voltage	$I_C = 3.5\text{ A}; I_B = 1\text{ A}; T_{mb} = 25\text{ }^\circ\text{C};$ see Figure 10	[1]	-	1.1	1.5	V
h_{FE}	DC current gain	$I_C = 0.1\text{ A}; V_{CE} = 5\text{ V}; T_{mb} = 25\text{ }^\circ\text{C};$ see Figure 11	[1]	48	66	100	
		$I_C = 0.8\text{ A}; V_{CE} = 3\text{ V}; T_{mb} = 25\text{ }^\circ\text{C};$ see Figure 12	[1]	25	42	50	
Dynamic characteristics							
t_s	storage time	$I_C = 2.5\text{ A}; I_{B(on)} = 0.5\text{ A};$	-	-	3.5	μs	
t_f	fall time	$I_{B(off)} = -0.5\text{ A}; R_L = 60\text{ }\Omega;$ $V_{BB} = -5\text{ V}; T_{mb} = 25\text{ }^\circ\text{C};$ resistive load; $t_p = 300\text{ }\mu\text{s};$ see Figure 13 ; see Figure 14	-	-	500	ns	

[1] Pulse test: pulse duration $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$

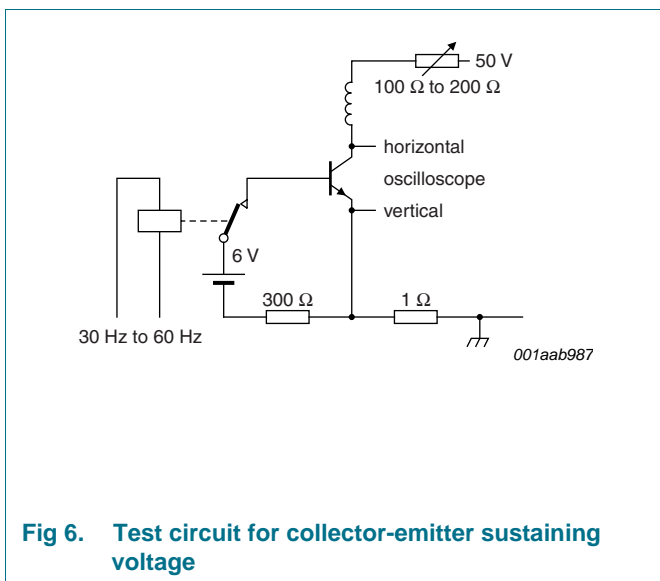


Fig 6. Test circuit for collector-emitter sustaining voltage

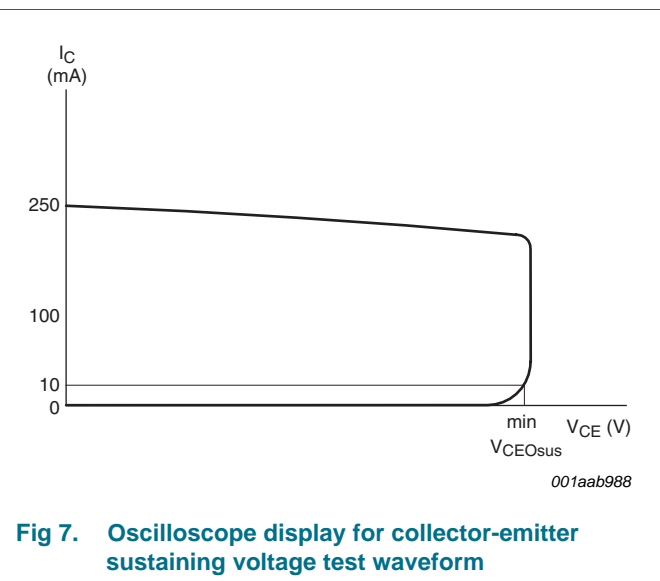
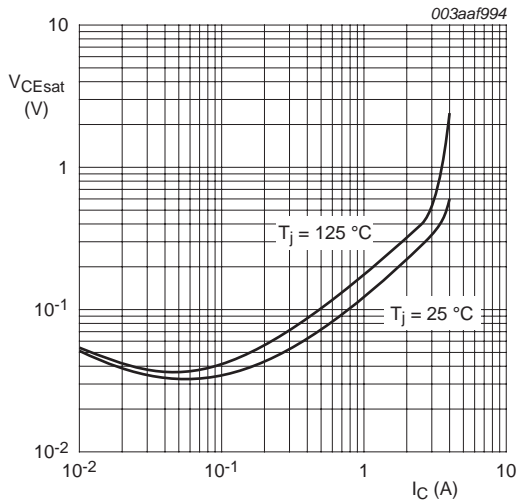


Fig 7. Oscilloscope display for collector-emitter sustaining voltage test waveform



$I_C / I_B = 3$

Fig 8. Collector-emitter saturation voltage as a function of collector current; typical values

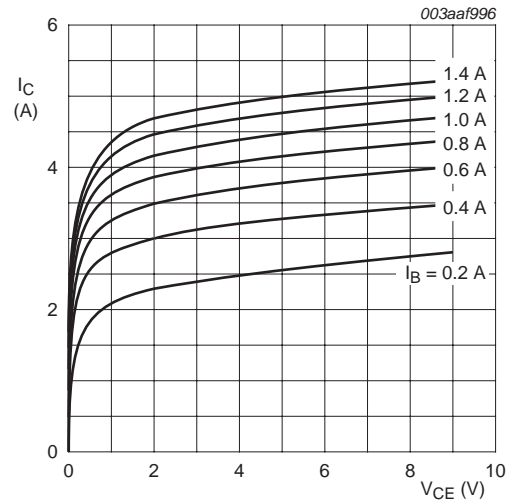
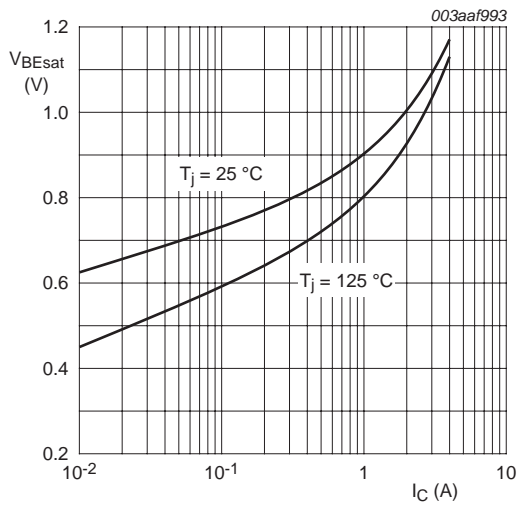


Fig 9. Collector current as a function of collector-emitter voltage; typical values



$I_C / I_B = 3$

Fig 10. Base-emitter saturation voltage as a function of collector current; typical values

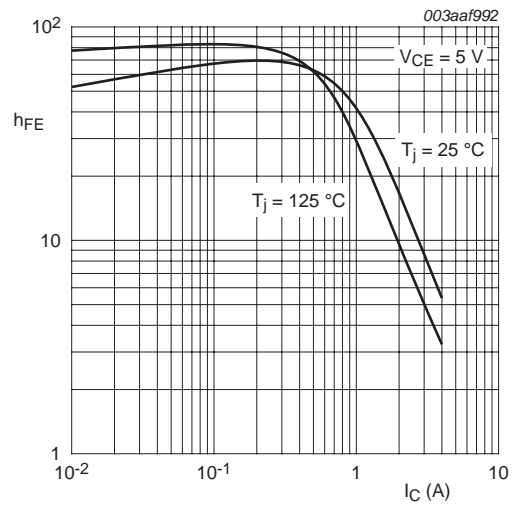


Fig 11. DC current gain as a function of collector current; typical values

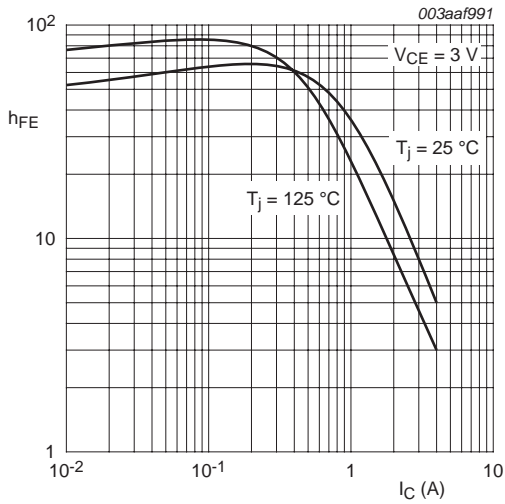
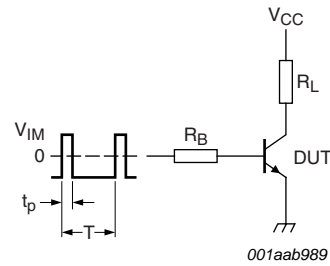


Fig 12. DC current gain as a function of collector current; typical values



$V_{IM} = -6 \text{ to } +8 \text{ V}; V_{CC} = 250 \text{ V}; t_p = 20 \mu\text{s}; \delta = \frac{t_p}{T} = 0.01$
 R_B and R_L calculated from I_{Con} and I_{Bon} requirements.

Fig 13. Test circuit for resistive load switching

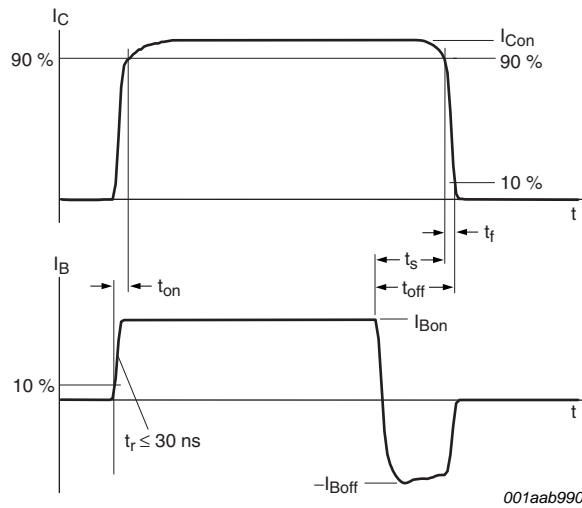


Fig 14. Switching times waveforms for resistive load

7. Package outline

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

SOT78

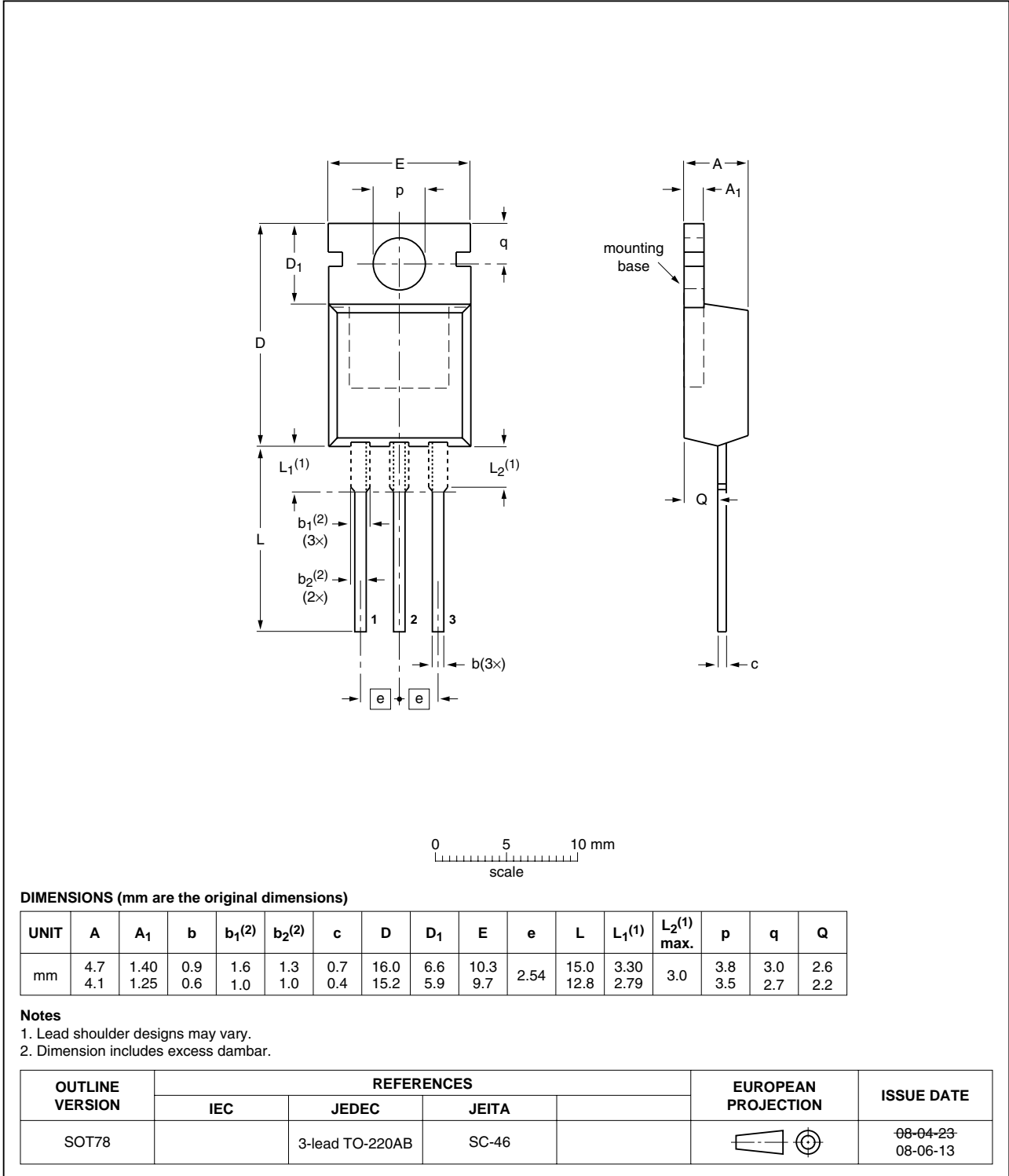


Fig 15. Package outline SOT78 (TO-220AB)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUJ302A v.2	20110328	Product data sheet	-	BUJ302A v.1
Modifications:	<ul style="list-style-type: none">• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.• Legal texts have been adapted to the new company name where appropriate.			
BUJ302A v.1	19980801	Objective specification	-	-

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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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