



BUJ303A

NPN power transistor

Rev. 6 — 8 February 2012

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
- Low thermal resistance
- Very high voltage capability
- Very low switching and conduction losses

1.3 Applications

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

1.4 Quick reference data

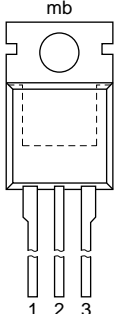
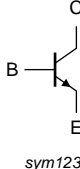
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_C	collector current	see Figure 1 ; see Figure 2 ; see Figure 4	-	-	5	A
P_{tot}	total power dissipation	$T_{mb} \leq 25\text{ °C}$; see Figure 3	-	-	100	W
V_{CESM}	collector-emitter peak voltage	$V_{BE} = 0\text{ V}$	-	-	1000	V
Static characteristics						
h_{FE}	DC current gain	$I_C = 5\text{ mA}$; $V_{CE} = 5\text{ V}$; $T_{mb} = 25\text{ °C}$; see Figure 11	10	22	35	
		$I_C = 500\text{ mA}$; $V_{CE} = 5\text{ V}$; $T_{mb} = 25\text{ °C}$; see Figure 11	14	25	35	



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

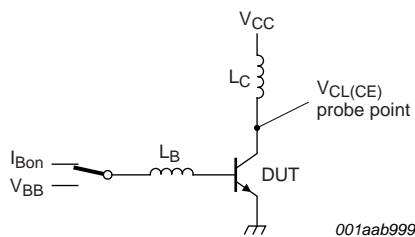
Type number	Package		
	Name	Description	Version
BUJ303A	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

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	$V_{BE} = 0\text{ V}$	-	1000	V
V_{CEO}	collector-emitter voltage	$I_B = 0\text{ A}$	-	500	V
I_C	collector current	see Figure 1 ; see Figure 2 ; see Figure 4	-	5	A
I_{CM}	peak collector current		-	10	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	-	100	W
T_{stg}	storage temperature		-65	150	°C
T_j	junction temperature		-	150	°C



$V_{CL(CE)} \leq 1000\text{ V}; V_{CC} = 150\text{ V}; V_{BB} = -5\text{ V};$
 $L_B = 1\text{ }\mu\text{H}; L_C = 200\text{ }\mu\text{H}$

Fig 1. Test circuit for reverse bias safe operating area

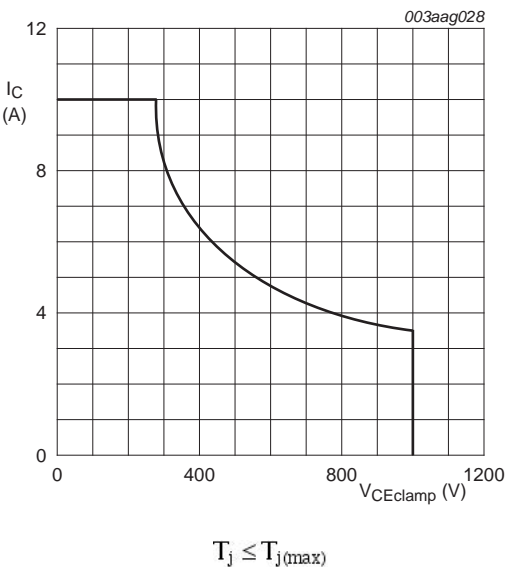
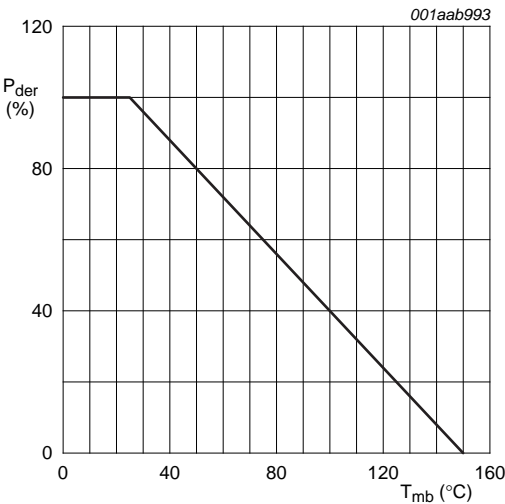
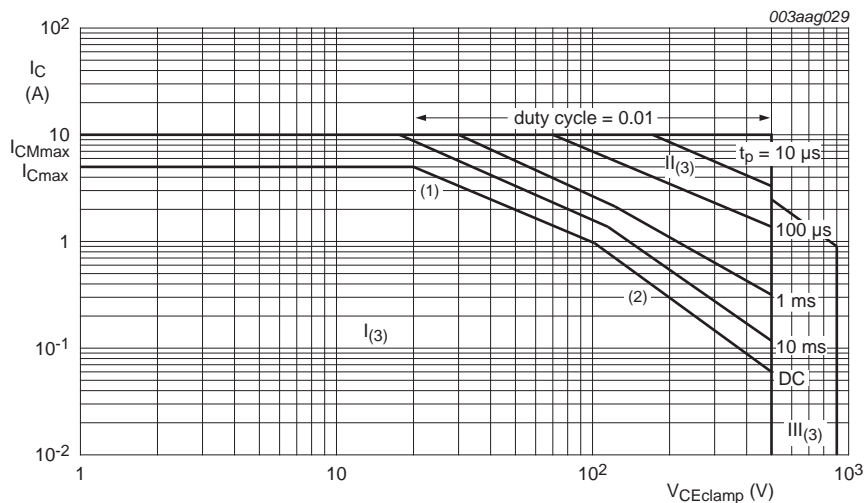


Fig 2. Reverse bias safe operating area



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

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



- (1) P_{tot} maximum and P_{tot} peak maximum lines.
- (2) Second breakdown limits.
- (3) I = Region of permissible DC operation.
 II = Extension for repetitive pulse operation.
 III = Extension during turn-on in single transistor converters provided that $R_{BE} \leq 100 \, \Omega$ and $t_p \leq 0.6 \, \mu s$.

Fig 4. Forward bias safe operating area for $T_{mb} \leq 25 \, ^\circ C$

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

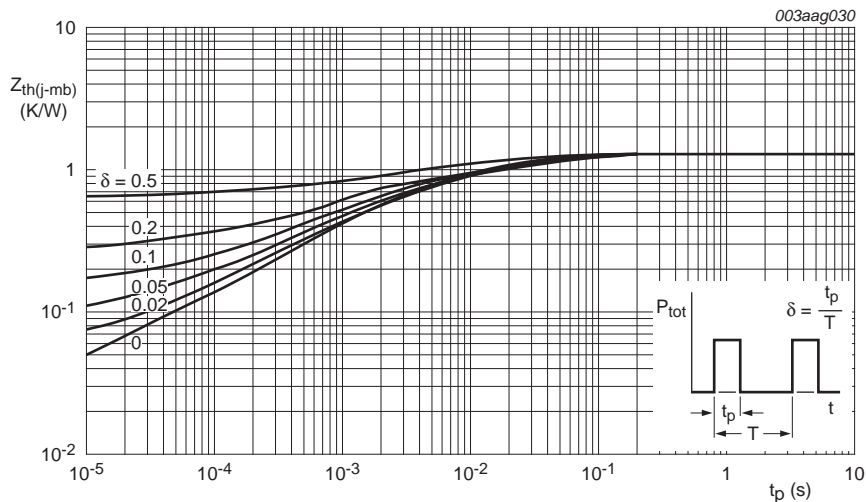


Fig 5. Transient thermal impedance from junction to mounting base as a function of pulse width

6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I _{CES}	collector-emitter cut-off current	V _{BE} = 0 V; V _{CE} = 1000 V; T _{mb} = 25 °C; Measured with half-sine wave voltage (curve tracer)	-	-	1	mA
		V _{BE} = 0 V; V _{CE} = 1000 V; T _j = 125 °C; Measured with half-sine wave voltage (curve tracer)	-	-	2	mA
I _{CBO}	collector-base cut-off current	V _{CB} = 1000 V; I _E = 0 A; T _{mb} = 25 °C; Measured with half-sine wave voltage (curve tracer)	-	-	1	mA
I _{CEO}	collector-emitter cut-off current	V _{CE} = 500 V; I _B = 0 A; T _{mb} = 25 °C; Measured with half-sine wave voltage (curve tracer)	-	-	0.1	mA
I _{EBO}	emitter-base cut-off current	V _{EB} = 9 V; I _C = 0 A; T _{mb} = 25 °C	-	-	0.1	mA
V _{CEOsus}	collector-emitter sustaining voltage	I _B = 0 A; I _C = 100 mA; L _C = 25 mH; T _{mb} = 25 °C; see Figure 6 ; see Figure 7	500	-	-	V
V _{CEsat}	collector-emitter saturation voltage	I _C = 3 A; I _B = 0.6 A; T _{mb} = 25 °C; see Figure 8 ; see Figure 9	-	0.35	1.5	V
V _{BEsat}	base-emitter saturation voltage	I _C = 3 A; I _B = 0.6 A; T _{mb} = 25 °C; see Figure 10	-	1.01	1.3	V
h _{FE}	DC current gain	I _C = 5 mA; V _{CE} = 5 V; T _{mb} = 25 °C; see Figure 11	10	22	35	
		I _C = 500 mA; V _{CE} = 5 V; T _{mb} = 25 °C; see Figure 11	14	25	35	
h _{FEsat}	DC saturation current gain	I _C = 2.5 A; V _{CE} = 5 V; T _{mb} = 25 °C; see Figure 11	10	13.5	17	
		I _C = 3 A; V _{CE} = 5 V; T _{mb} = 25 °C; see Figure 11	-	11	-	
Dynamic Characteristics (switching times - resistive load)						
t _s	turn-off delay time	I _C = 2.5 A; I _{Bon} = 0.5 A; I _{Boff} = -0.5 A; R _L = 75 Ω; T _{mb} = 25 °C; see Figure 12 ;	-	3.3	4	μs
t _f	fall time	see Figure 13	-	0.33	0.45	μs
Dynamic Characteristics (switching times - inductive load)						
t _s	turn-off delay time	I _C = 2.5 A; I _{Bon} = 0.5 A; V _{BB} = -5 V; L _B = 1 μH; T _{mb} = 25 °C; see Figure 14 ; see Figure 15	-	1.4	1.6	μs
t _s	turn-off delay time	I _C = 2.5 A; I _{Bon} = 0.5 A; V _{BB} = -5 V; L _B = 1 μH; T _j = 100 °C; see Figure 14 ; see Figure 15	-	1.7	1.9	μs
t _f	fall time	I _C = 2.5 A; I _{Bon} = 0.5 A; V _{BB} = -5 V; L _B = 1 μH; T _{mb} = 25 °C; see Figure 14 ; see Figure 15	-	145	160	ns
		I _C = 2.5 A; I _{Bon} = 0.5 A; V _{BB} = -5 V; L _B = 1 μH; T _j = 100 °C; see Figure 14 ; see Figure 15	-	160	200	ns

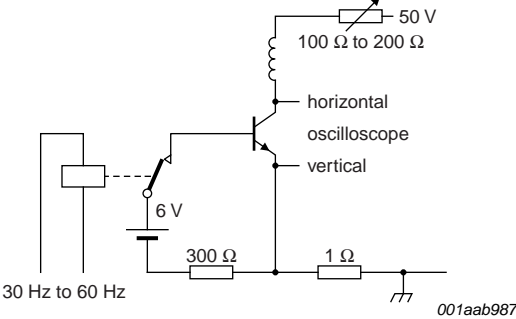


Fig 6. Test circuit for collector-emitter sustaining voltage

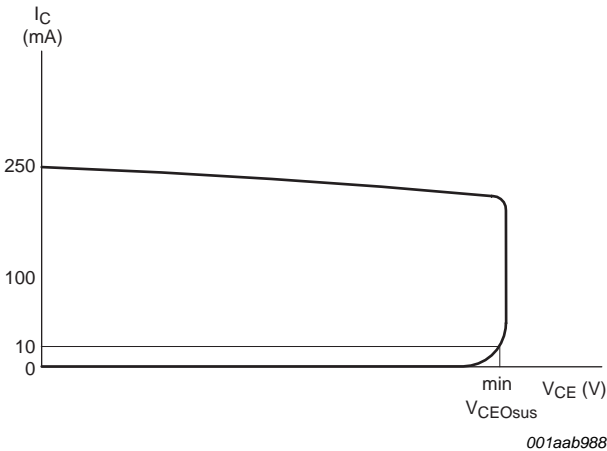


Fig 7. Oscilloscope display for collector-emitter sustaining voltage test waveform

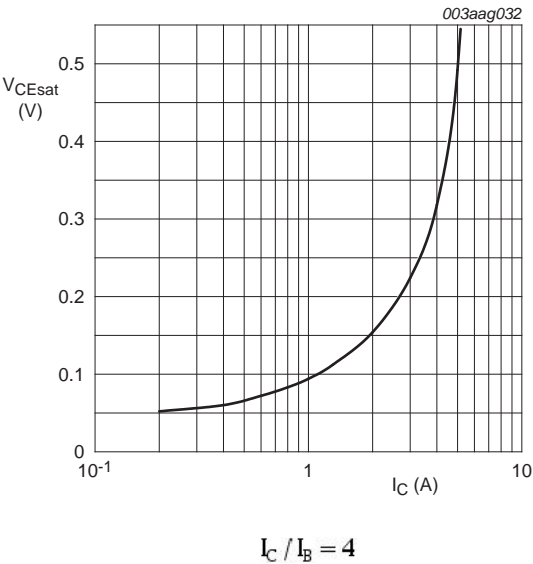


Fig 8. Collector-emitter saturation voltage as a function of collector current; typical values

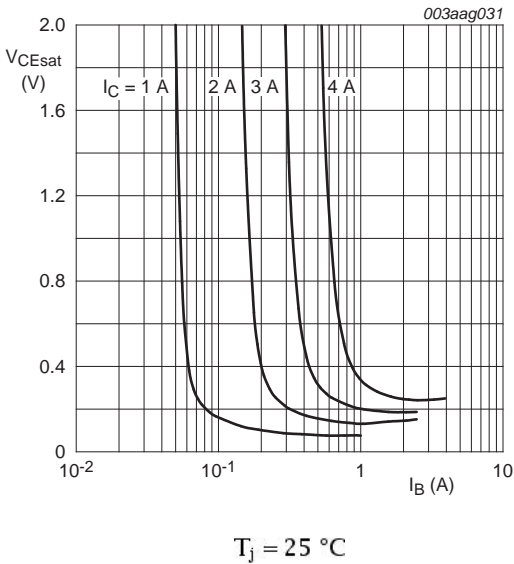


Fig 9. Collector-emitter saturation voltage as a function of base current; typical values

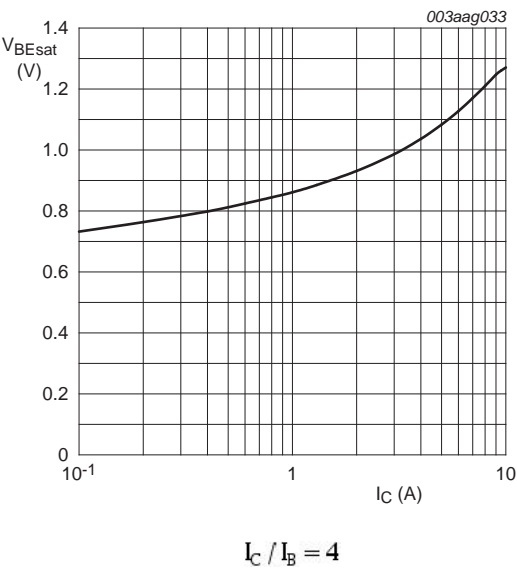


Fig 10. Base-emitter saturation voltage as a function of collector current; typical values

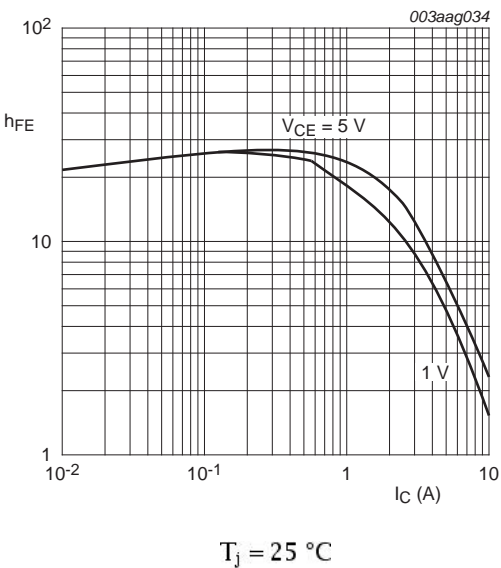


Fig 11. DC current gain as a function of collector current; typical values

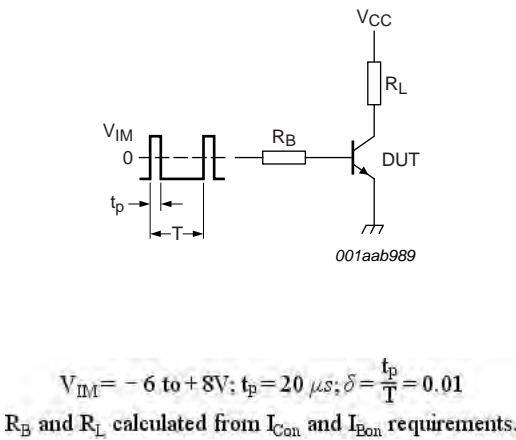


Fig 12. Test circuit for resistive load switching

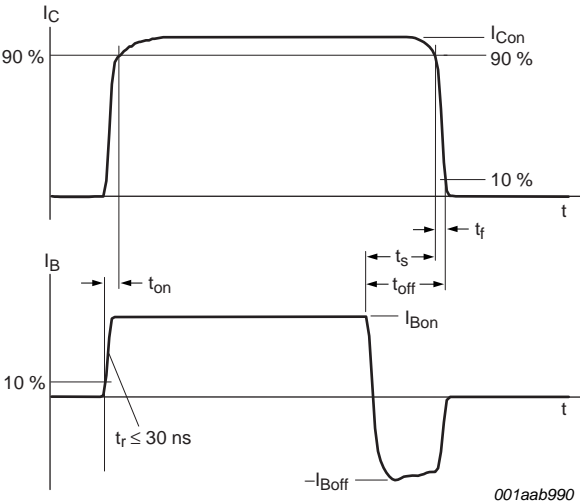
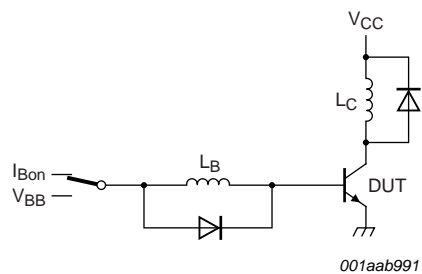


Fig 13. Switching times waveforms for resistive load



$V_{CC} = 300\text{ V}; V_{BB} = -5\text{ V}; L_C = 200\text{ }\mu\text{H}; L_B = 1\text{ }\mu\text{H}$

Fig 14. Test circuit for inductive load switching

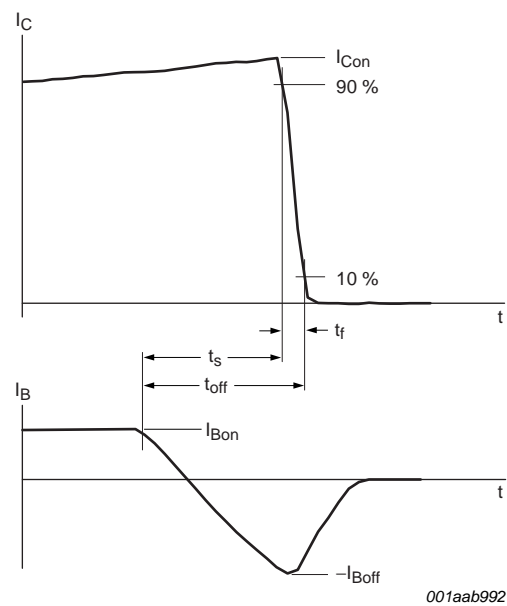


Fig 15. Switching times waveforms for inductive load

7. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB SOT78

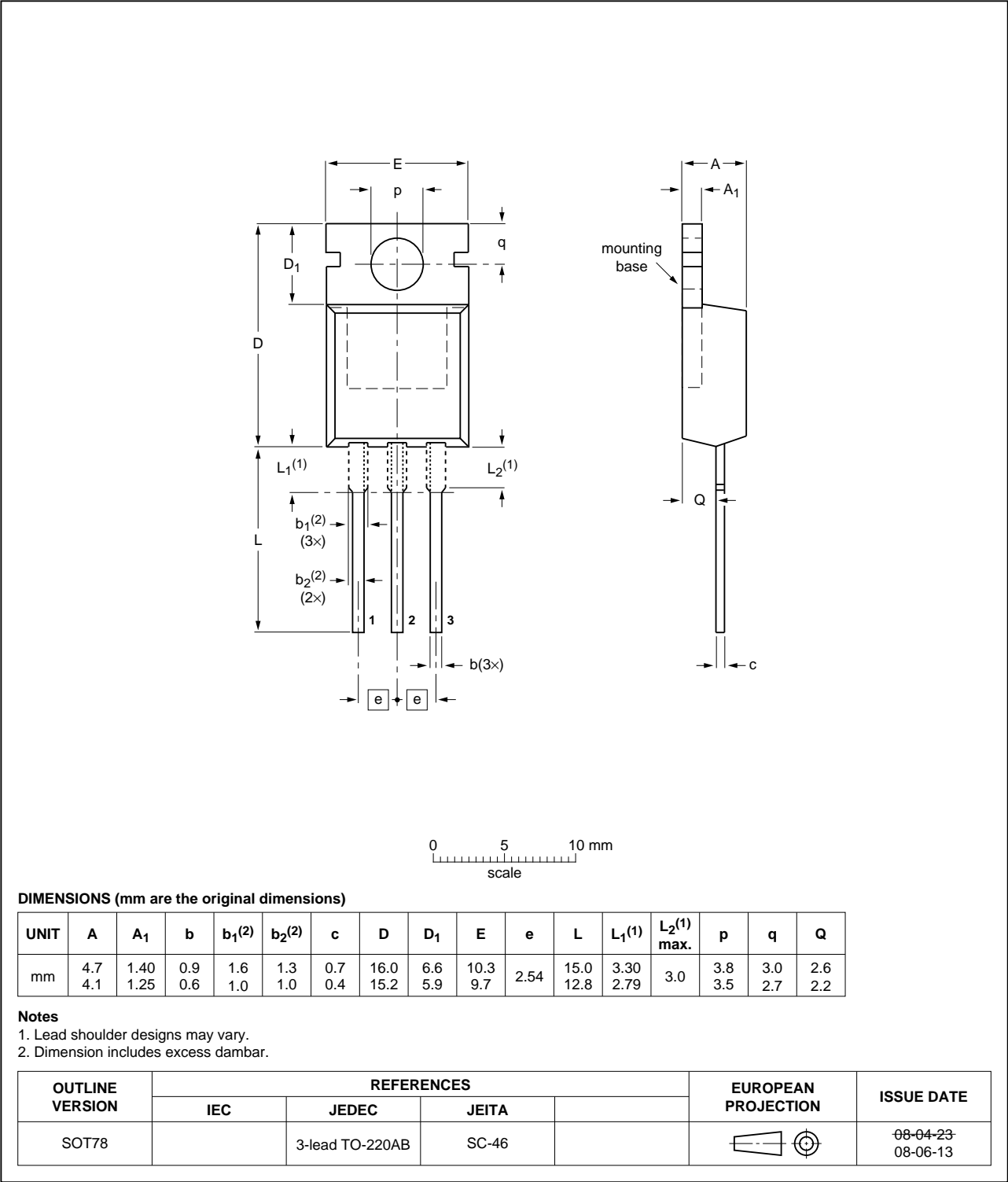


Fig 16. Package outline SOT78 (TO-220AB)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUJ303A v.6	20120208	Product data sheet	-	BUJ303A v.5
Modifications:	<ul style="list-style-type: none">• Various changes to content.			
BUJ303A v.5	20110503	Product data sheet	-	BUJ303A v.4

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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.

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[2] The term 'short data sheet' is explained in section "Definitions".

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