



BUJ103A

Silicon diffused power transistor

Rev. 4 — 8 November 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

- Low thermal resistance
- Fast switching

1.3 Applications

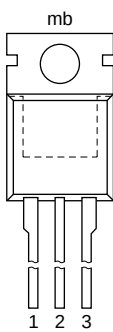
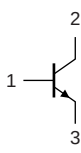
- Electronic lighting ballasts
- DC-to-DC converters
- Inverters
- Motor control systems

1.4 Quick reference data

- $V_{CESM} \leq 700 \text{ V}$
- $I_C \leq 4 \text{ A}$
- $P_{tot} \leq 80 \text{ W}$
- $h_{FEsat} = 12.5 \text{ (typ)}$

2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Symbol
1	base		
2	collector		
3	emitter		
mb	mounting base; connected to collector		

SOT78 (TO-220AB)



3. Ordering information

Table 2. Ordering information

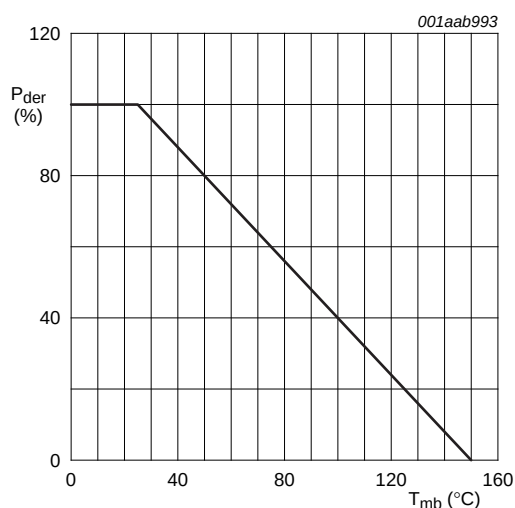
Type number	Package		Version
	Name	Description	
BUJ103A	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-leads	SOT78

4. Limiting values

Table 3. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CESM}	peak collector-emitter voltage	$V_{BE} = 0\text{ V}$	-	700	V
V_{CBO}	collector-base voltage	open emitter	-	700	V
V_{CEO}	collector-emitter voltage	open base	-	400	V
I_C	collector current (DC)		-	4	A
I_{CM}	peak collector current		-	8	A
I_B	base current (DC)		-	2	A
I_{BM}	peak base current		-	4	A
P_{tot}	total power dissipation	$T_{mb} \leq 25\text{ °C}$; see Figure 1	-	80	W
T_{stg}	storage temperature		-65	+150	°C
T_j	junction temperature		-	150	°C



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

Fig 1. Normalized total power dissipation as a function of mounting base temperature

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 2	-	-	1.56	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	60	-	K/W

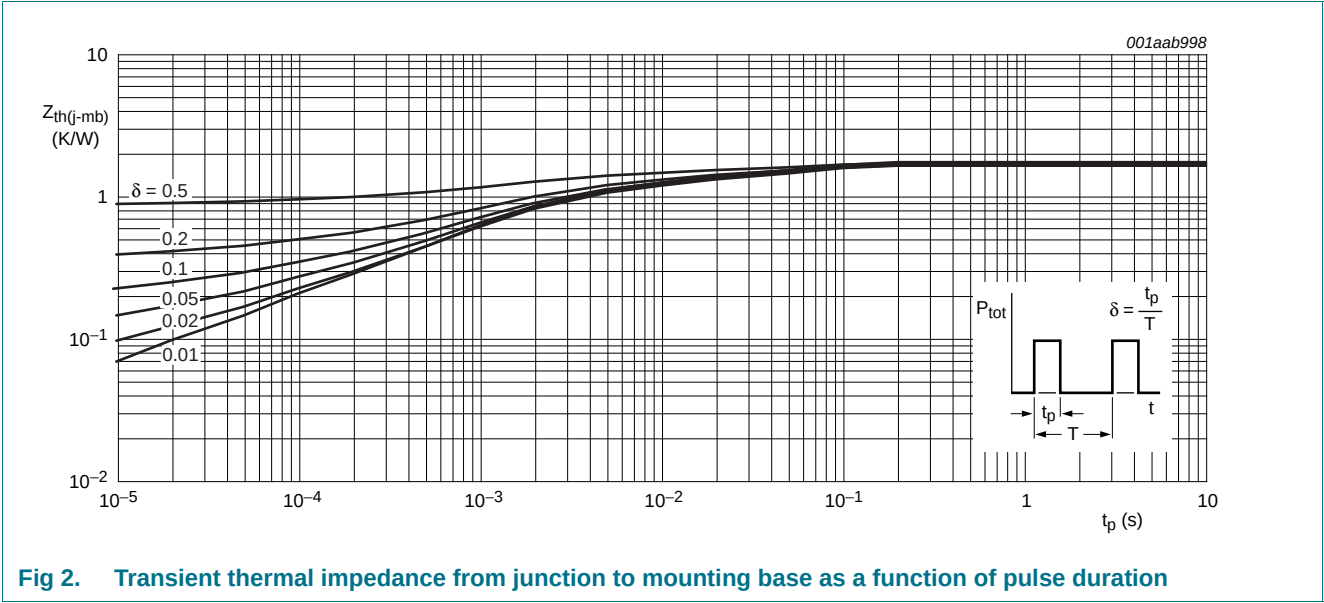


Fig 2. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

Table 5. Characteristics

$T_{mb} = 25\text{ }^{\circ}\text{C}$; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I _{CES}	collector-emitter cut-off current	V _{BE} = 0 V; V _{CE} = V _{CESMmax}	[1]	-	1	mA
		V _{BE} = 0 V; V _{CE} = V _{CESMmax} ; T _j = 125 °C	[1]	-	2	mA
I _{CBO}	collector-base cut-off current	V _{BE} = 0 V; V _{CE} = V _{CESMmax}	[1]	-	1	mA
I _{CEO}	collector-emitter cut-off current	V _{CEO} = V _{CEOMmax} = 400 V	[1]	-	0.1	mA
I _{EBO}	emitter-base cut-off current	V _{EB} = 7 V; I _C = 0 A	-	-	0.1	mA
V _{CEOsus}	collector-emitter sustaining voltage	I _B = 0 A; I _C = 10 mA; L = 25 mH; see Figure 3 and 4	400	-	-	V
V _{CEsat}	collector-emitter saturation voltage	I _C = 3.0 A; I _B = 0.6 A; see Figure 10	-	0.25	1	V
V _{BEsat}	base-emitter saturation voltage	I _C = 3.0 A; I _B = 0.6 A; see Figure 11	-	0.97	1.5	V
h _{FE}	DC current gain	I _C = 1 mA; V _{CE} = 5 V; see Figure 9	10	17	32	
		I _C = 500 mA; V _{CE} = 5 V	13	22	32	
h _{FEsat}	DC saturation current gain	I _C = 2.0 A; V _{CE} = 5 V	11	16	22	
		I _C = 3.0 A; V _{CE} = 5 V	-	12.5	-	
Dynamic characteristics						
Switching times (resistive load); see Figure 5 and 6						
t _{on}	turn-on time	I _{Con} = 2.5 A; I _{Bon} = -I _{Boff} = 0.5 A; R _L = 75 Ω	-	0.52	0.6	μs
t _{stg}	storage time		-	2.7	3.3	μs
t _f	fall time		-	0.3	0.35	μs
Switching times (inductive load); see Figure 7 and 8						
t _{stg}	storage time	I _{Con} = 2 A; I _{Bon} = 0.4 A; L _B = 1 μH; V _{BB} = -5 V	-	1.2	1.4	μs
t _f	fall time		-	30	60	ns
Switching times (inductive load); see Figure 7 and 8						
t _{stg}	storage time	I _{Con} = 2 A; I _{Bon} = 0.4 A; L _B = 1 μH; V _{BB} = -5 V; T _j = 100 °C	-	-	1.8	μs
t _f	fall time		-	-	120	ns

[1] Measured with half sine-wave voltage (curve tracer).

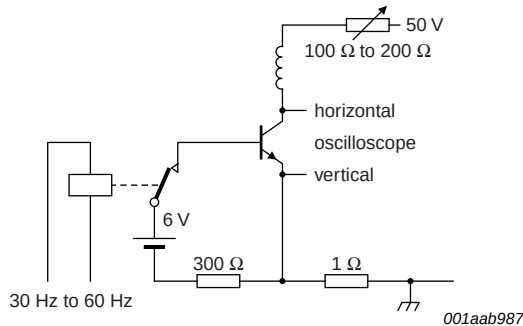


Fig 3. Test circuit for collector-emitter sustaining voltage

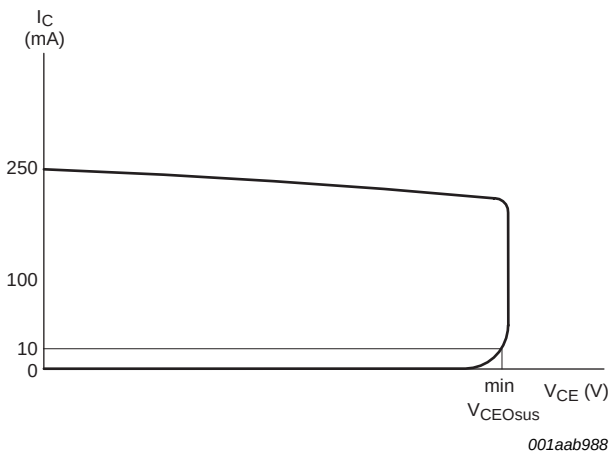
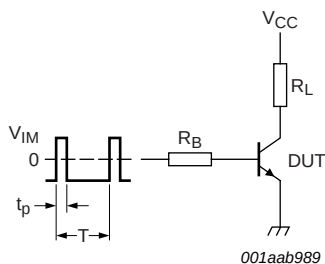


Fig 4. Oscilloscope display for collector-emitter sustaining voltage test waveform



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

Fig 5. Test circuit for resistive load switching

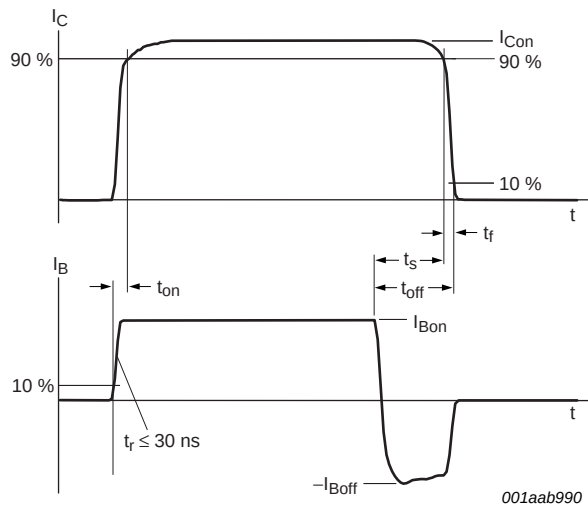
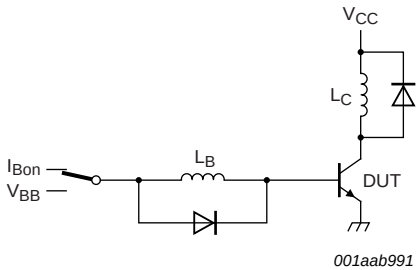


Fig 6. Switching times waveforms for resistive load



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

Fig 7. Test circuit for inductive load switching

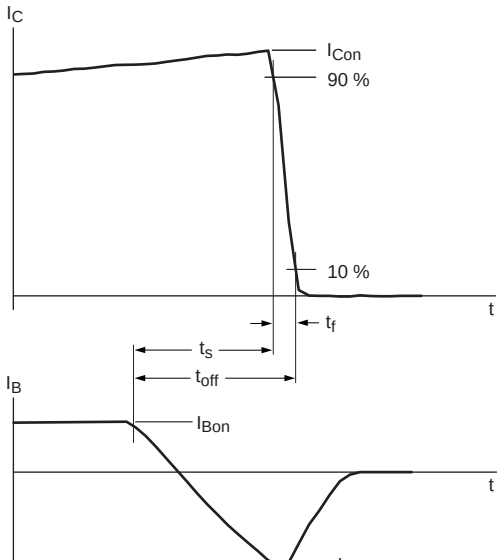


Fig 8. Switching times waveforms for inductive load

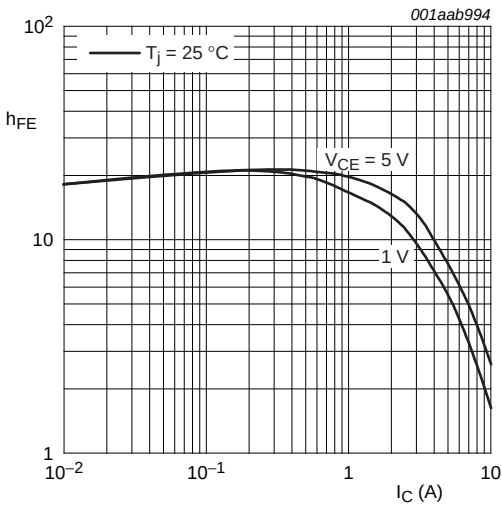
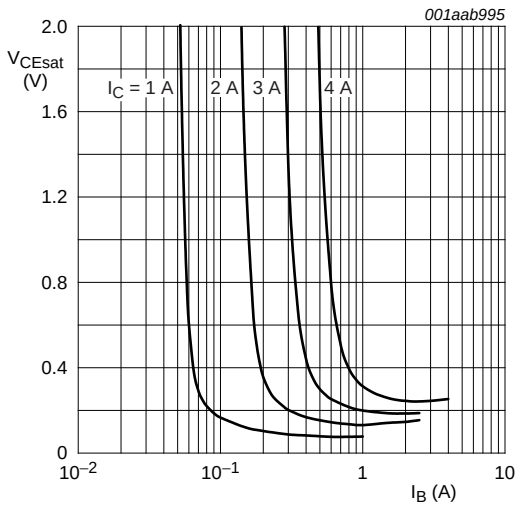
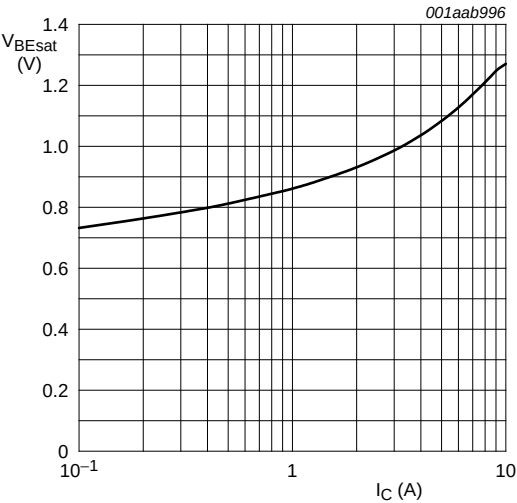


Fig 9. DC current gain as a function of collector current; typical values

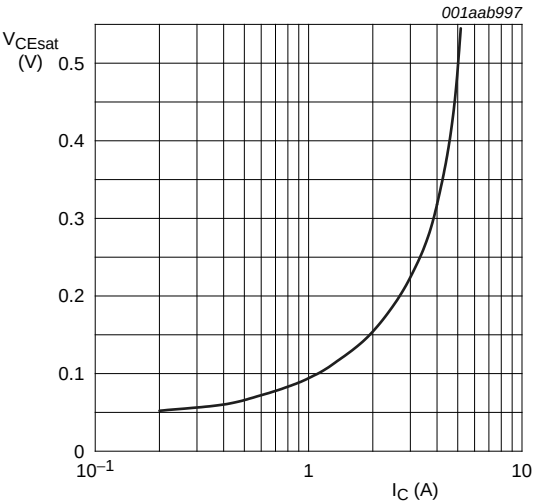


$T_J = 25\text{ }^\circ\text{C}$.
Fig 10. Collector-emitter saturation voltage as a function of base current; typical values



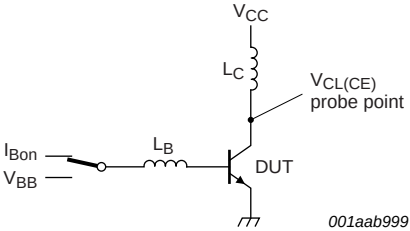
$I_C/I_B = 4$.

Fig 11. Base-emitter saturation voltage as a function of collector current; typical values



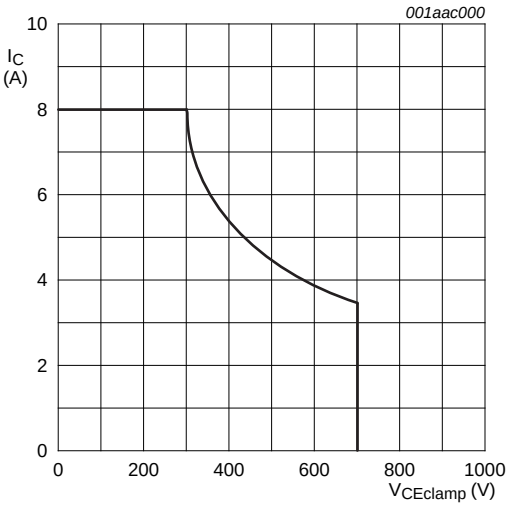
$I_C/I_B = 4$.

Fig 12. Collector-emitter saturation voltage as a function of collector current; typical values



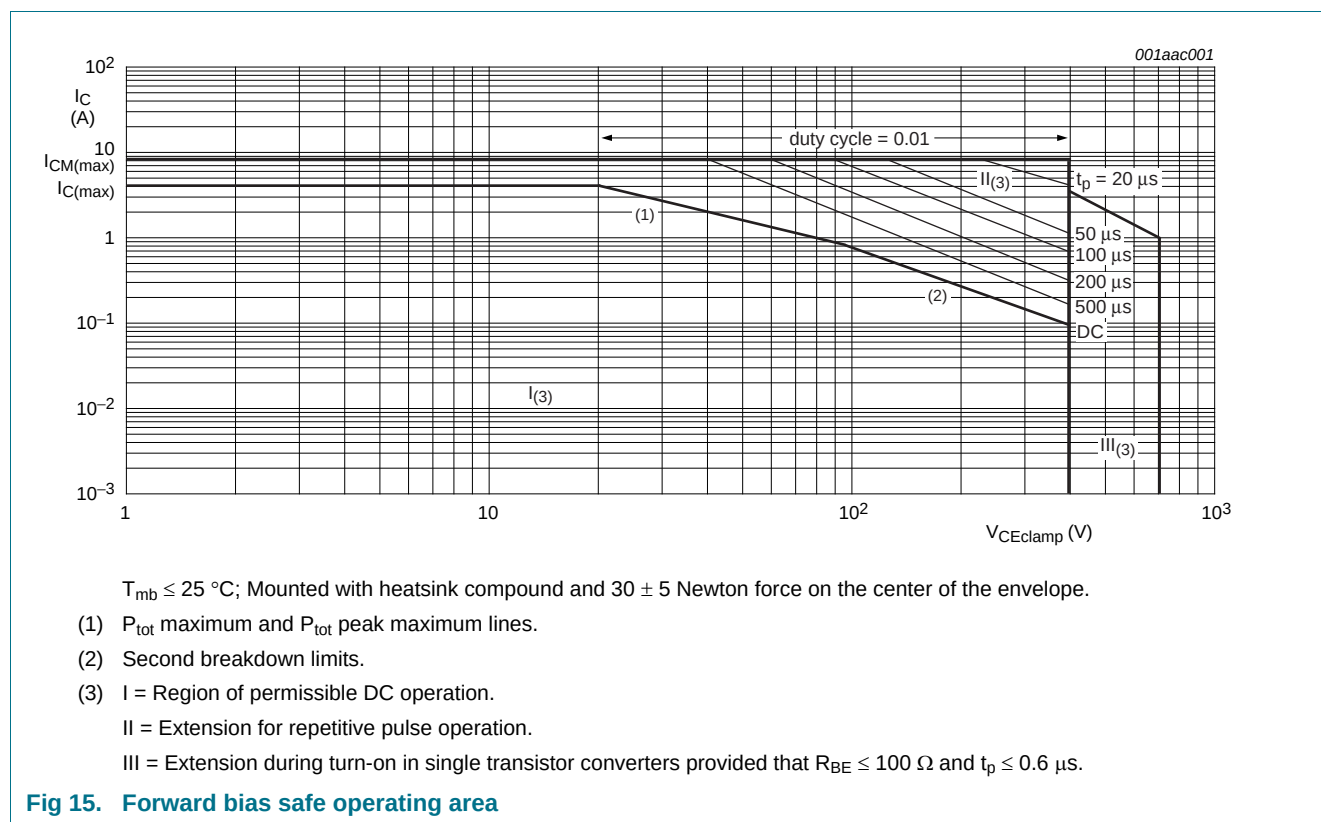
$V_{CEclamp} \leq 1000$ V; $V_{CC} = 150$ V; $V_{BB} = -5$ V; $L_B = 1$ μ H; $L_C = 200$ μ H.

Fig 13. Test circuit for reverse bias safe operating area



$T_J \leq T_{J(max)}$.

Fig 14. Reverse bias safe operating area



7. Package information

Epoxy meets requirements of UL94 V-0 at 1/8 inch.

8. Package outline

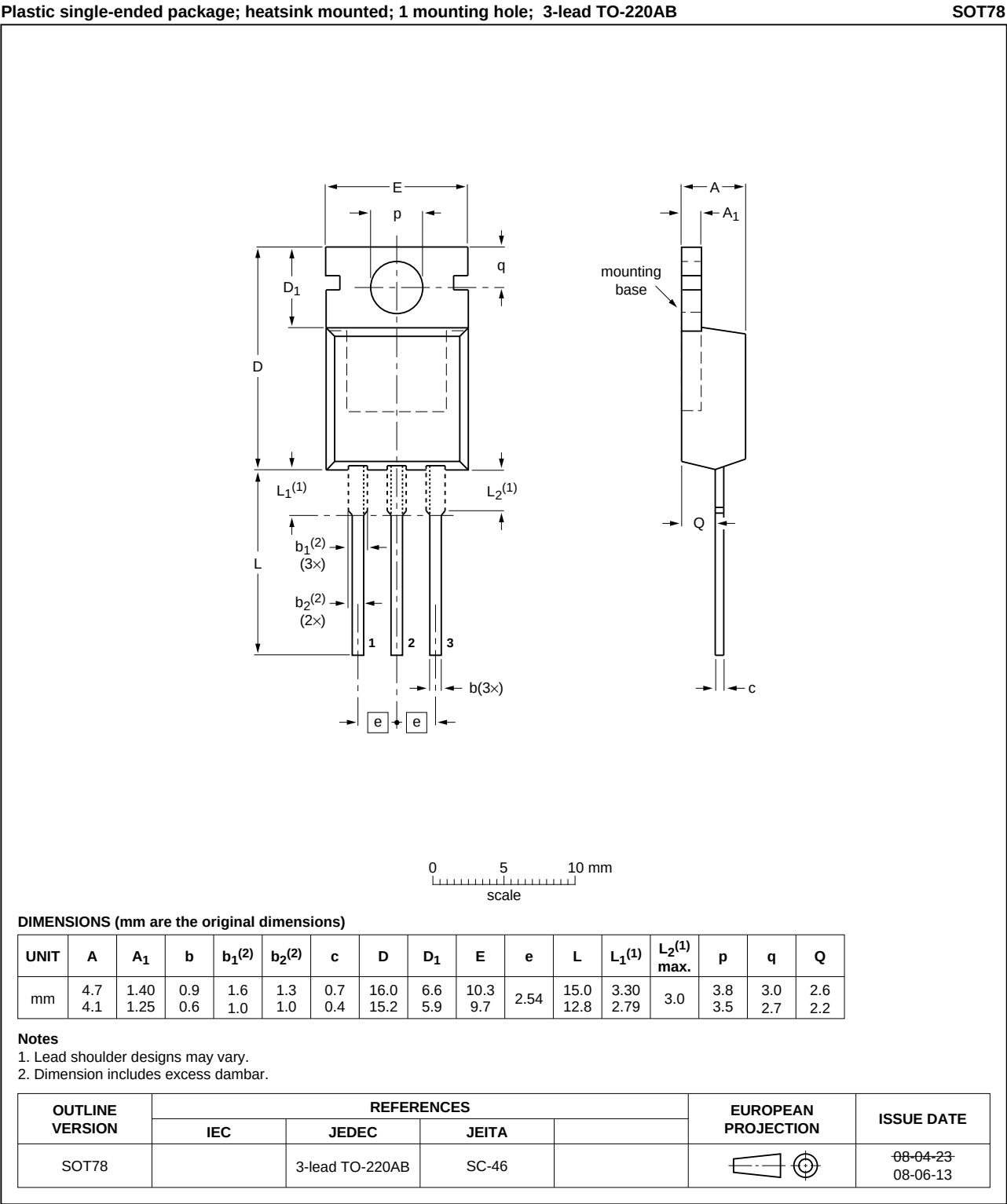


Fig 16. Package outline SOT78 (TO-220AB)

9. Revision history

Table 6. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUJ103A v.4	20111108	Product data sheet	-	BUJ103A v.3
Modifications:	• 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.			
BUJ103A v.3	20050303	Product data sheet	-	BUJ103A_HG v.2
BUJ103A_HG v.2	19980918	Product data sheet	-	BUJ103A v.1
BUJ103A v.1	19980801	Product data sheet	-	-

10. Legal information

10.1 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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12. Contents

1	Product profile	1
1.1	General description	1
1.2	Features and benefits	1
1.3	Applications	1
1.4	Quick reference data	1
2	Pinning information	1
3	Ordering information	2
4	Limiting values	2
5	Thermal characteristics	3
6	Characteristics	4
7	Package information	8
8	Package outline	9
9	Revision history	10
10	Legal information	11
10.1	Data sheet status	11
10.2	Definitions	11
10.3	Disclaimers	11
10.4	Trademarks	12
11	Contact information	12
12	Contents	13

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