

1. General description

High voltage, high speed, planar passivated NPN power switching transistor with integrated anti-parallel E-C diode in a SOT78 (TO220AB) plastic package.

2. Features and benefits

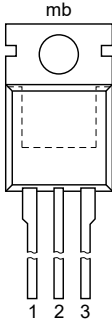
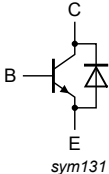
- Fast switching
- High voltage capability
- Integrated anti-parallel E-C diode
- Very low switching and conduction losses

3. Applications

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

4. Pinning information

Table 1. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 TO-220AB (SOT78)	 <i>sym131</i>
2	C	collector		
3	E	emitter		
mb	C	mounting base; connected to collector		

5. Ordering information

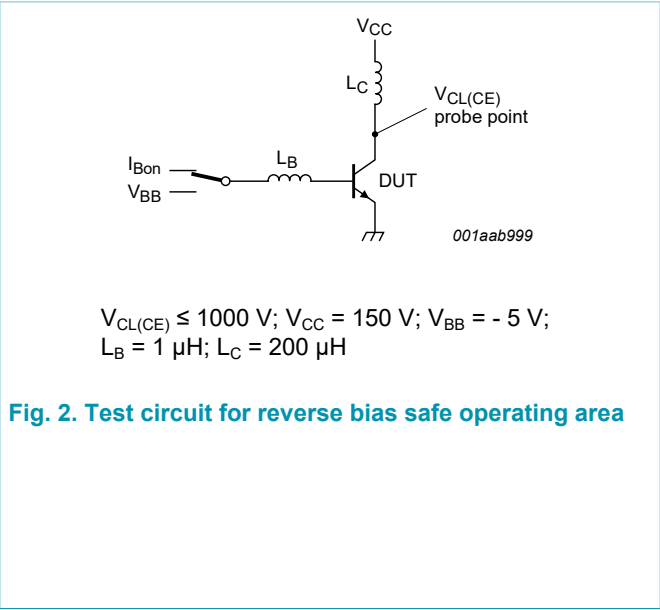
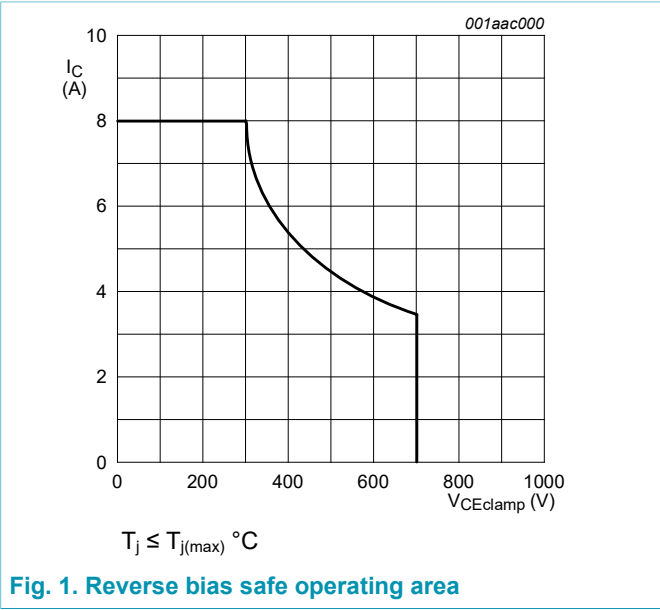
Table 2. Ordering information

Type number	Package		
	Name	Description	Version
BUJD203A	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

6. Limiting values

Table 3. Limiting values
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CESM}	collector-emitter peak voltage	$V_{BE} = 0\text{ V}$		-	850	V
V_{CBO}	collector-base voltage	$I_E = 0\text{ A}$		-	850	V
V_{CEO}	collector-emitter voltage	$I_B = 0\text{ A}$		-	425	V
I_C	collector current	DC; Fig. 1; Fig. 2; Fig. 3		-	4	A
I_{CM}	peak collector current	Fig. 1; Fig. 2; Fig. 3		-	8	A
I_B	base current	DC		-	2	A
I_{BM}	peak base current			-	4	A
P_{tot}	total power dissipation	$T_{mb} \leq 25\text{ }^{\circ}\text{C}$; Fig. 4		-	80	W
T_{stg}	storage temperature			-65	150	$^{\circ}\text{C}$
T_j	junction temperature			-	150	$^{\circ}\text{C}$



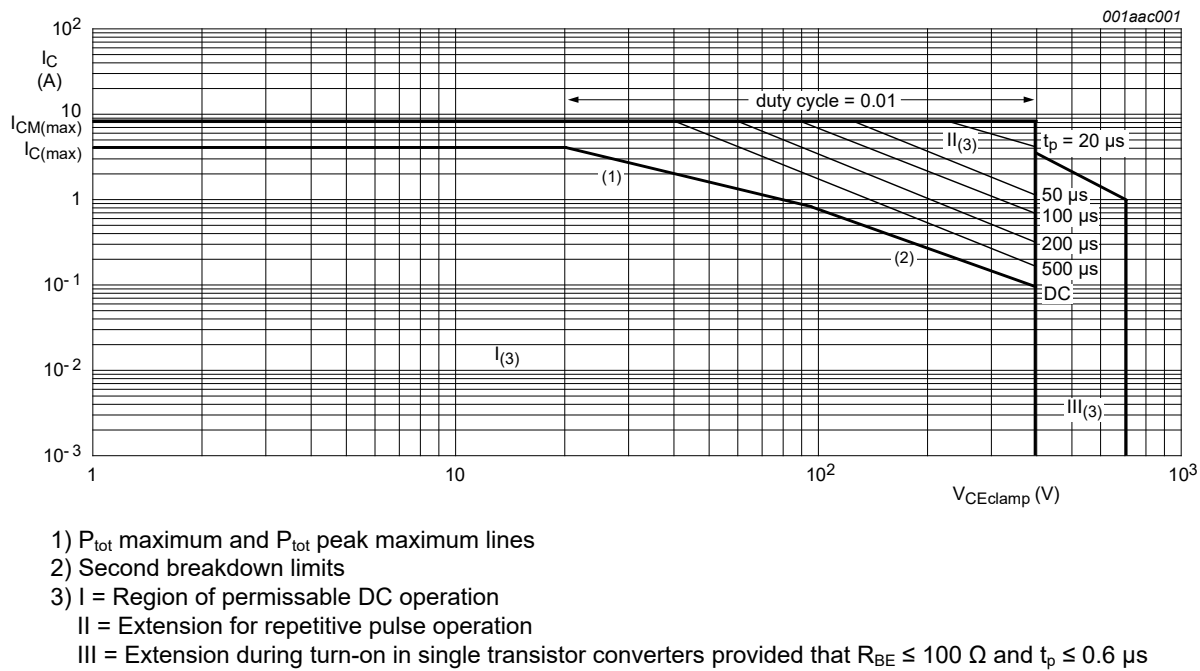


Fig. 3. Forward bias safe operating area for $T_{mb} \leq 25^\circ C$

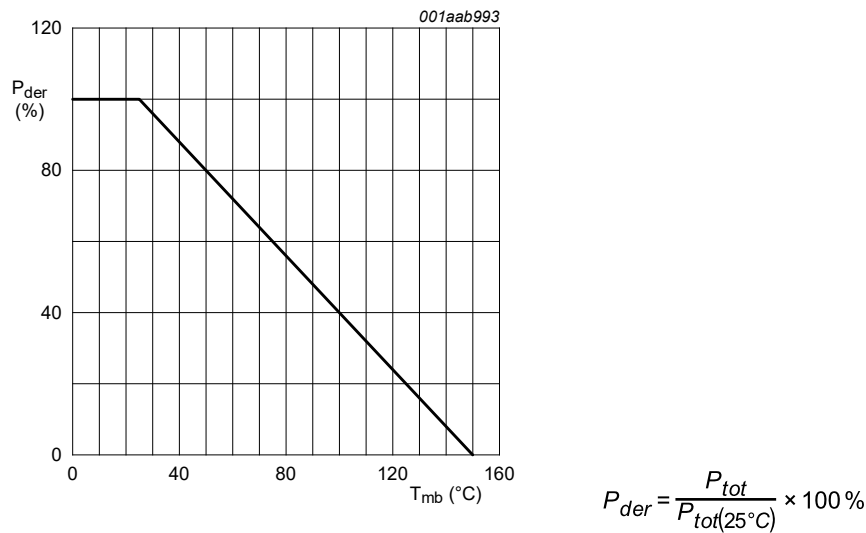


Fig. 4. Normalized total power dissipation as a function of mounting base temperature

7. Thermal characteristics

Table 4. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	Fig. 5	-	-	1.56	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	60	-	K/W

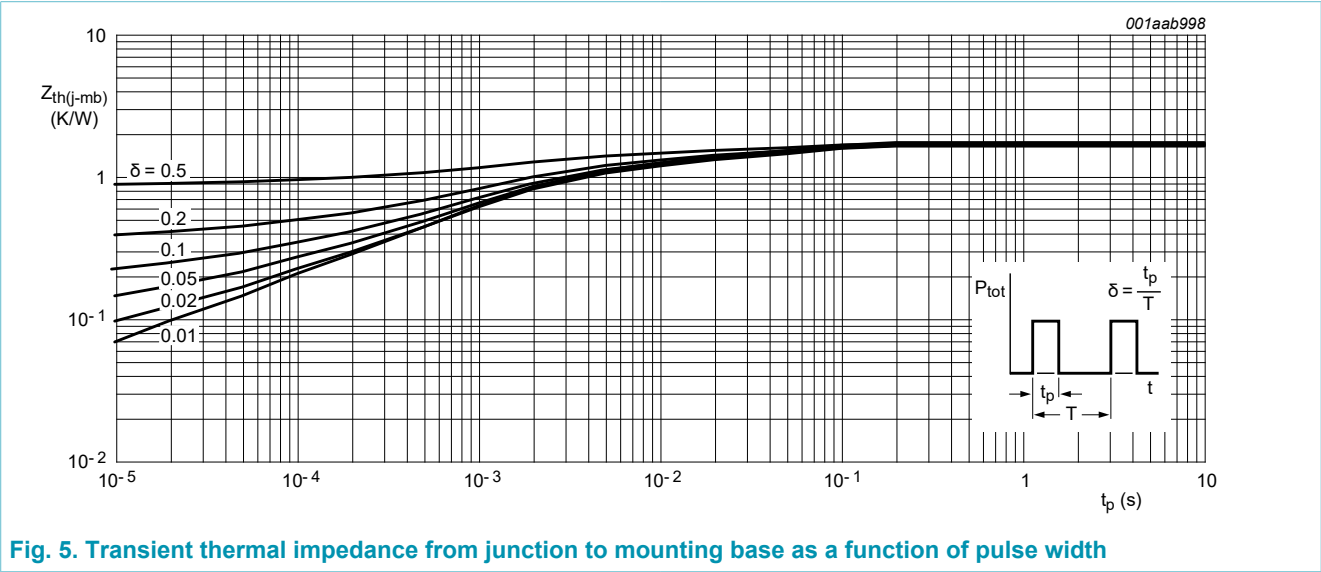


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse width

8. Characteristics

Table 5. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I _{CES}	collector-emitter cut-off current (base shorted)	V _{BE} = 0 V; V _{CE} = 850 V; T _j = 125 °C	[1]	-	-	2	mA
		V _{BE} = 0 V; V _{CE} = 850 V; T _j = 25 °C	[1]	-	-	1	mA
I _{CBO}	collector-base cut-off current (emitter open)	V _{CB} = 850 V; I _E = 0 A	[1]	-	-	1	mA
I _{CEO}	collector-emitter cut-off current (base open)	V _{CE} = 425 V; I _B = 0 A	[1]	-	-	0.1	mA
I _{EBO}	emitter-base cut-off current (collector open)	V _{EB} = 7 V; I _C = 0 A		-	-	10	mA
V _{CEOsus}	collector-emitter sustaining voltage (base open)	I _B = 0 A; I _C = 10 mA; L _C = 25 mH; Fig. 6; Fig. 7		400	450	-	V
V _{CEsat}	collector-emitter saturation voltage	I _C = 3 A; I _B = 0.6 A; Fig. 8; Fig. 9		-	0.29	1	V
V _{BEsat}	base-emitter saturation voltage	I _C = 3 A; I _B = 0.6 A; Fig. 10		-	0.99	1.5	V
V _F	forward voltage	I _F = 2 A; T _j = 25 °C		-	1.04	1.5	V
h _{FE}	DC current gain	I _C = 1 mA; V _{CE} = 5 V; T _{mb} = 25 °C; Fig. 11		10	15	32	
		I _C = 500 mA; V _{CE} = 5 V; T _j = 25 °C; Fig. 11		13	21	32	
		I _C = 2 A; V _{CE} = 5 V; T _{mb} = 25 °C; Fig. 11		11	16	22	
		I _C = 3 A; V _{CE} = 5 V; T _{mb} = 25 °C; Fig. 11		-	12.5	-	
Dynamic characteristics							
t _{on}	turn-on time	I _C = 2.5 A; I _{Bon} = 0.5 A; I _{Boff} = -0.5 A; R _L = 75 Ω; T _j = 25 °C; resistive load; Fig. 12; Fig. 13		-	0.52	0.6	μs
t _s	storage time	I _C = 2 A; I _{Bon} = 0.4 A; V _{BB} = -5 V; L _B = 1 μH; T _j = 25 °C; inductive load; Fig. 14; Fig. 15		-	2.7	3.3	μs
		I _C = 2 A; I _{Bon} = 0.4 A; V _{BB} = -5 V; L _B = 1 μH; T _j = 25 °C; inductive load; Fig. 14; Fig. 15		-	1.2	1.4	μs
		I _C = 2 A; I _{Bon} = 0.4 A; V _{BB} = -5 V; L _B = 1 μH; T _j = 100 °C; inductive load; Fig. 14; Fig. 15		-	-	1.8	μs
t _f	fall time	I _C = 2.5 A; I _{Bon} = 0.5 A; I _{Boff} = -0.5 A; R _L = 75 Ω; resistive load; Fig. 12; Fig. 13		-	0.3	0.35	μs
		I _C = 2 A; I _{Bon} = 0.4 A; V _{BB} = -5 V; L _B = 1 μH; inductive load; Fig. 14; Fig. 15		-	-	0.12	μs
		I _C = 2 A; I _{Bon} = 0.4 A; V _{BB} = -5 V; L _B = 1 μH; inductive load; Fig. 14; Fig. 15		-	0.03	0.06	μs

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

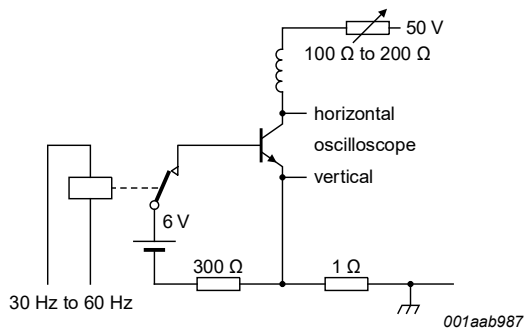


Fig. 6. Test circuit for collector-emitter sustaining voltage

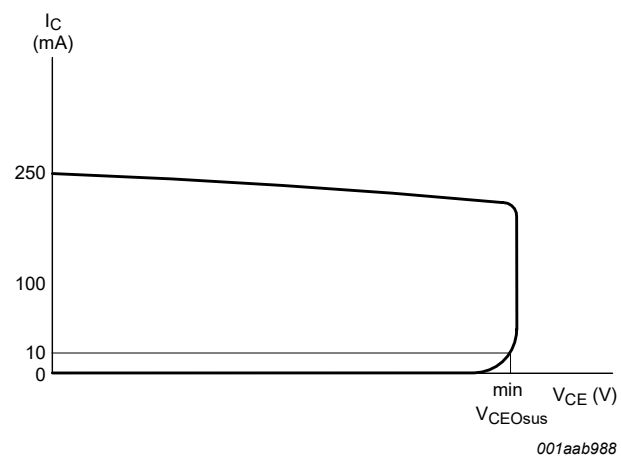


Fig. 7. Oscilloscope display for collector-emitter sustaining voltage test waveform

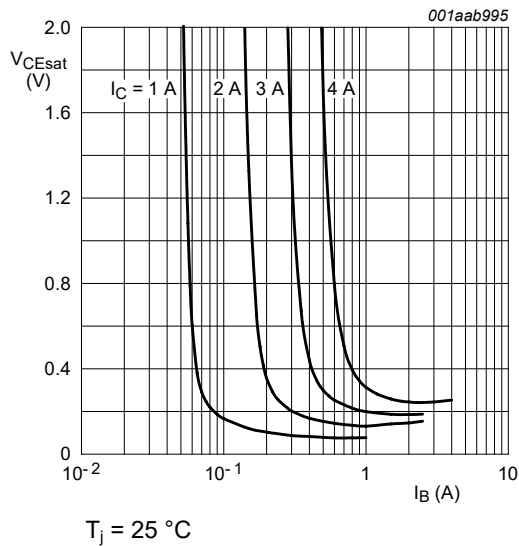


Fig. 8. Collector-emitter saturation voltage as a function of base current; typical values

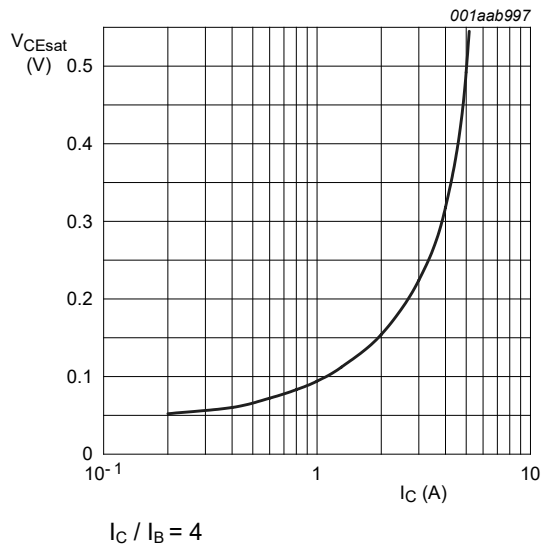


Fig. 9. Collector-emitter saturation voltage as a function of collector current; typical values

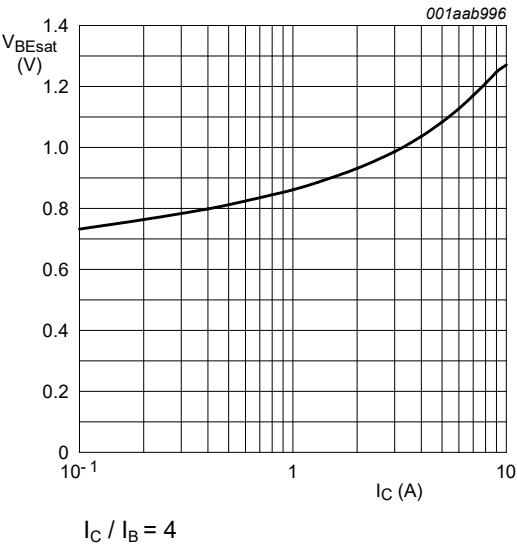


Fig. 10. Base-emitter saturation voltage as a function of collector current; typical values

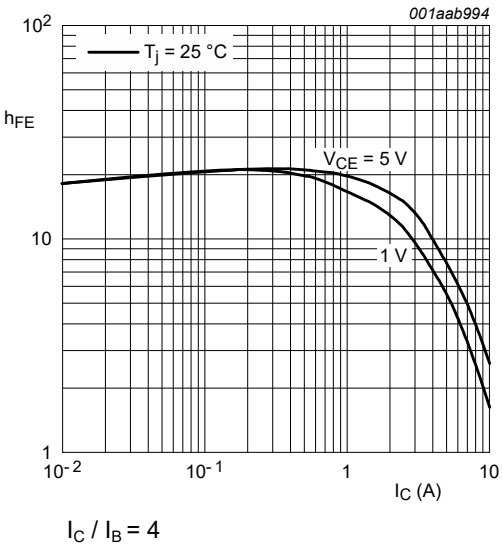
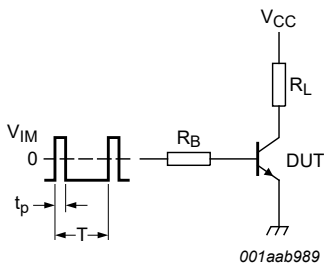


Fig. 11. DC current gain as a function of collector current; typical values



$V_{IM} = -6$ 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. 12. Test circuit for resistive load switching

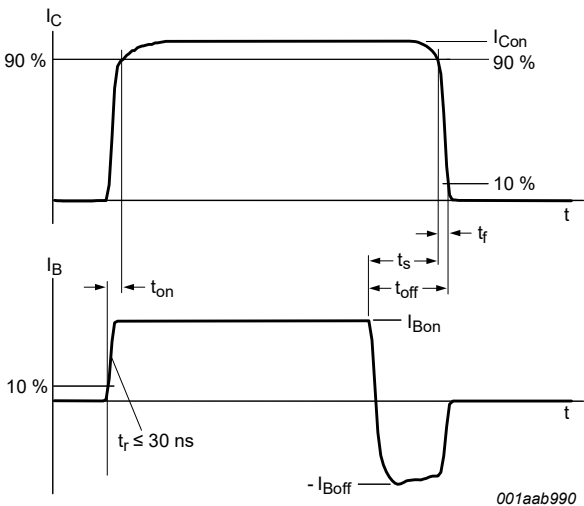
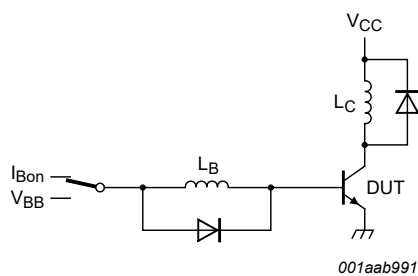


Fig. 13. Switching times waveforms for resistive load



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

Fig. 14. Test circuit for inductive load switching

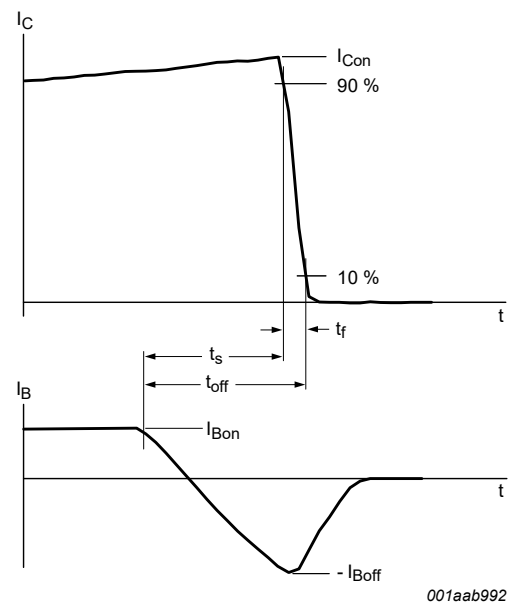


Fig. 15. Switching times waveforms for inductive load

9. Package outline

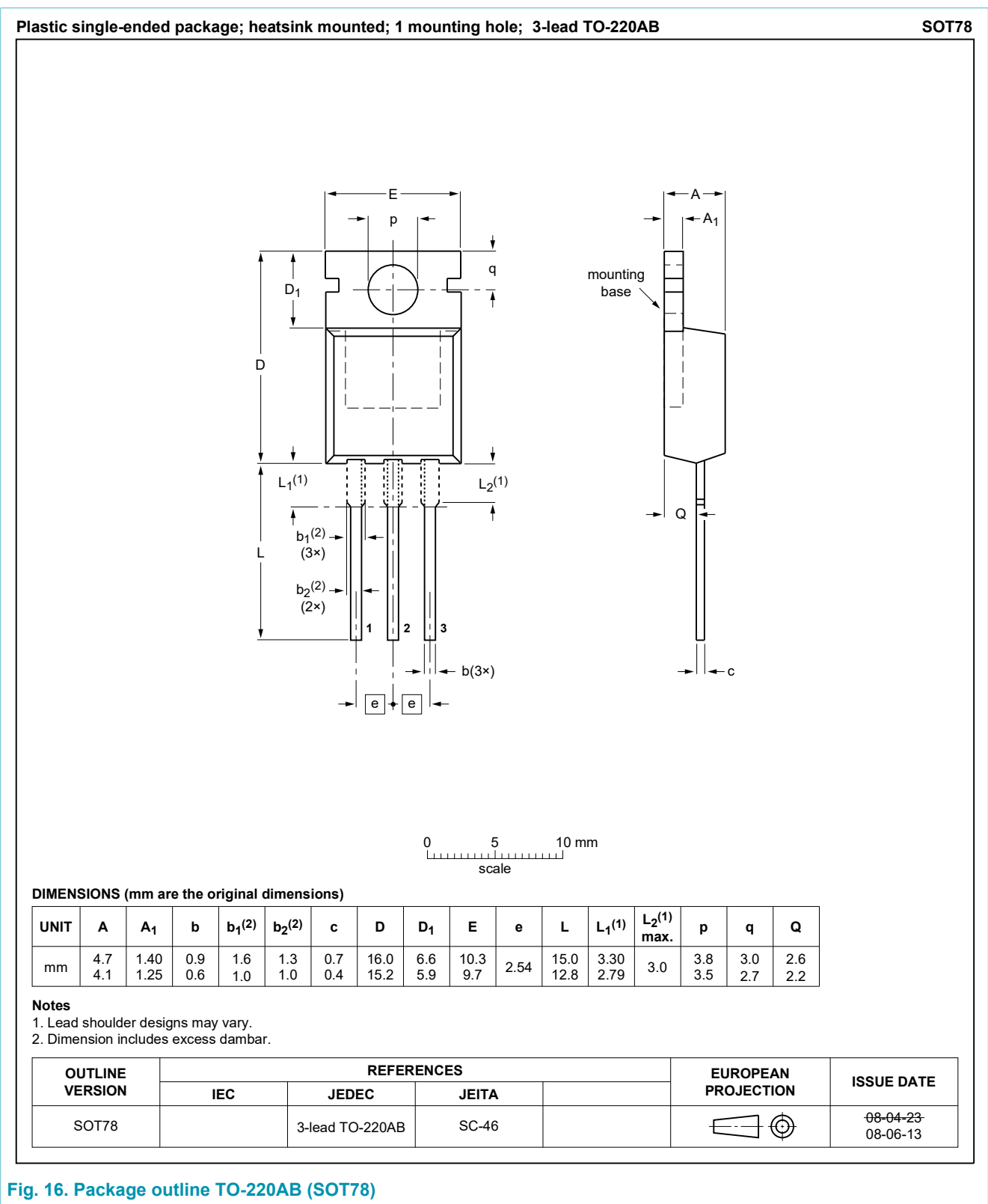


Fig. 16. Package outline TO-220AB (SOT78)

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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.
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