

BUJ303CD

NPN power transistor

8 November 2012

Product data sheet

1. Product profile

1.1 General description

High voltage high speed planar passivated NPN power switching transistor in a SOT428 (DPAK) surface mountable plastic package.

1.2 Features and benefits

- Fast switching
- Low thermal resistance
- Surface mountable package
- Tight DC gain spreads
- 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

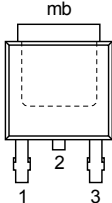
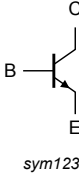
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_C	collector current	Fig. 1 ; Fig. 2 ; Fig. 4	-	-	5	A
P_{tot}	total power dissipation	$T_{mb} \leq 25\text{ °C}$; Fig. 3	-	-	80	W
V_{CESM}	collector-emitter peak voltage	$V_{BE} = 0\text{ V}$	-	-	1050	V
Static characteristics						
h_{FE}	DC current gain	$I_C = 10\text{ mA}$; $V_{CE} = 3\text{ V}$; $T_{mb} = 25\text{ °C}$; Fig. 12	28	34	47	
		$I_C = 250\text{ mA}$; $V_{CE} = 3\text{ V}$; $T_{mb} = 25\text{ °C}$; Fig. 12	35	43	57	
		$I_C = 800\text{ mA}$; $V_{CE} = 3\text{ V}$; $T_{mb} = 25\text{ °C}$; Fig. 12	31	37	48	



2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 DPAK (SOT428)	 sym123
2	C	collector ^[1]		
3	E	emitter		
mb	C	mounting base; connected to collector		

[1] it is not possible to make a connection to pin 2 of the SOT428 (DPAK) package.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUJ303CD	DPAK	plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)	SOT428

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	Fig. 1; Fig. 2; Fig. 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	$T_{mb} \leq 25\text{ °C}$; Fig. 3	-	80	W
T_{stg}	storage temperature		-65	150	°C
T_j	junction temperature		-	150	°C

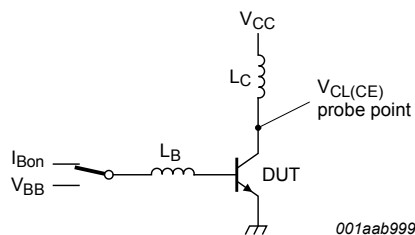


Fig. 1. Test circuit for reverse bias safe operating area

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

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

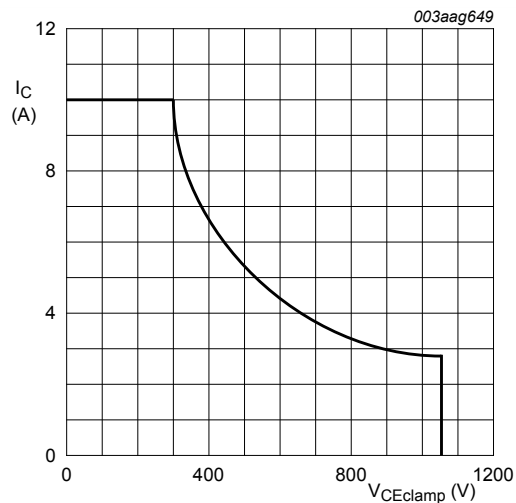


Fig. 2. Reverse bias safe operating area

$$T_j \leq T_{j(max)}$$

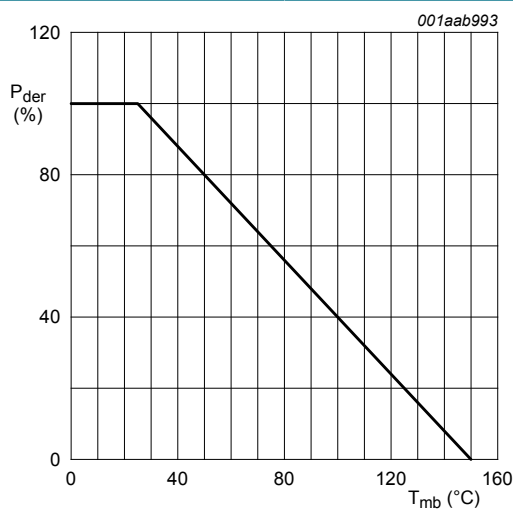
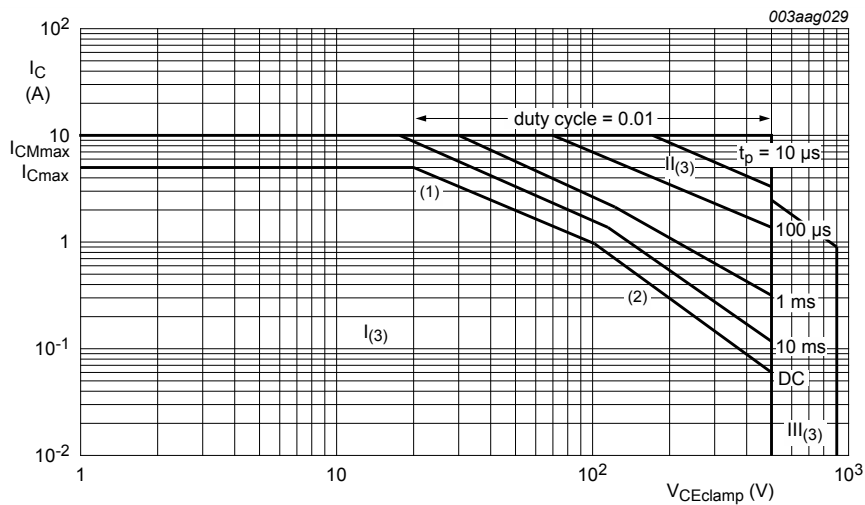


Fig. 3. Normalized total power dissipation as a function of mounting base temperature

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



- (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	Fig. 6	-	-	1.56	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	printed circuit board (FR4) mounted; minimum footprint; Fig. 5	-	75	-	K/W

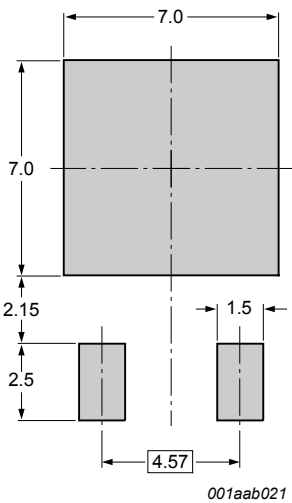


Fig. 5. Minimum footprint SOT428

all dimensions are in mm

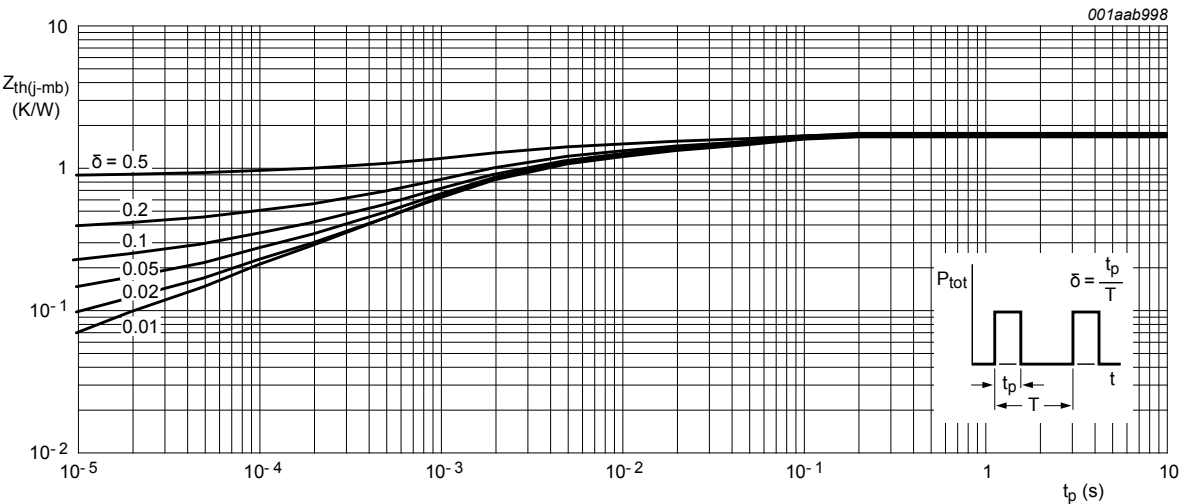


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse width

6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I _{CES}	collector-emitter cut-off current	V _{BE} = 0 V; V _{CE} = 1050 V; T _{mb} = 25 °C	[1]	-	-	1	mA
		V _{BE} = 0 V; V _{CE} = 1050 V; T _j = 125 °C	[1]	-	-	2	mA
I _{CBO}	collector-base cut-off current	V _{CB} = 1050 V; I _E = 0 A; T _{mb} = 25 °C	[1]	-	-	1	mA
I _{CEO}	collector-emitter cut-off current	V _{CE} = 400 V; I _B = 0 A; T _{mb} = 25 °C	[1]	-	-	0.1	mA

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
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; Fig. 7 ; Fig. 8		400	-	-	V
V _{CEsat}	collector-emitter saturation voltage	I _C = 1 A; I _B = 0.2 A; T _{mb} = 25 °C; Fig. 9 ; Fig. 10		-	-	0.5	V
		I _C = 3 A; I _B = 1 A; T _{mb} = 25 °C; Fig. 9 ; Fig. 10		-	0.25	1.5	V
V _{BEsat}	base-emitter saturation voltage	I _C = 3 A; I _B = 1 A; T _{mb} = 25 °C; Fig. 11		-	1	1.5	V
h _{FE}	DC current gain	I _C = 10 mA; V _{CE} = 3 V; T _{mb} = 25 °C; Fig. 12		28	34	47	
		I _C = 250 mA; V _{CE} = 3 V; T _{mb} = 25 °C; Fig. 12		35	43	57	
		I _C = 800 mA; V _{CE} = 3 V; T _{mb} = 25 °C; Fig. 12		31	37	48	
Dynamic Characteristics (switching times - resistive load)							
t _{on}	turn-on time	I _C = 2.5 A; I _{Bon} = 0.5 A; I _{Boff} = -1 A; R _L = 100 Ω; V _{CC} = 250 V; T _j = 25 °C; Fig. 13 ; Fig. 14		-	1	-	ms
t _s	turn-off delay time			-	2.5	-	ms
t _f	fall time			-	0.3	-	ms
Dynamic Characteristics (switching times - inductive load)							
t _s	turn-off delay time	I _C = 2.5 A; I _{Bon} = 0.5 A; V _{CC} = 350 V; V _{BB} = -5 V; L _B = 1 μH; T _j = 25 °C; Fig. 15 ; Fig. 16		-	2	-	ms
t _s	turn-off delay time	I _C = 2.5 A; I _{Bon} = 0.5 A; V _{CC} = 350 V; V _{BB} = -5 V; L _B = 1 μH; T _j = 100 °C; Fig. 15 ; Fig. 16		-	3	-	ms
t _f	fall time	I _C = 2.5 A; I _{Bon} = 0.5 A; V _{CC} = 350 V; V _{BB} = -5 V; L _B = 1 μH; T _j = 25 °C; Fig. 15 ; Fig. 16		-	200	-	ns
		I _C = 2.5 A; I _{Bon} = 0.5 A; V _{CC} = 350 V; V _{BB} = -5 V; L _B = 1 μH; T _j = 100 °C; Fig. 15 ; Fig. 16		-	300	-	ns

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

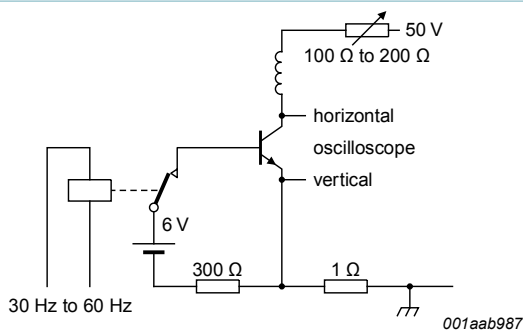


Fig. 7. Test circuit for collector-emitter sustaining voltage

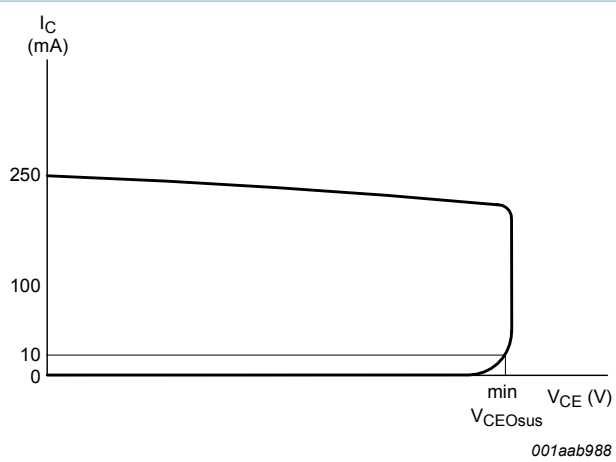


Fig. 8. Oscilloscope display for collector-emitter sustaining voltage test waveform

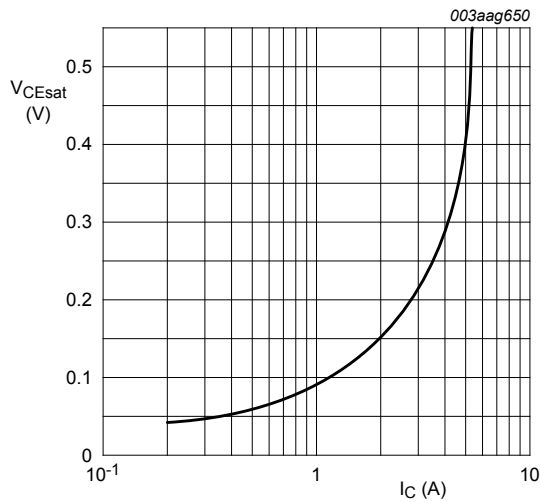


Fig. 9. Collector-emitter saturation voltage as a function of collector current; typical values

$I_C/I_B = 4$

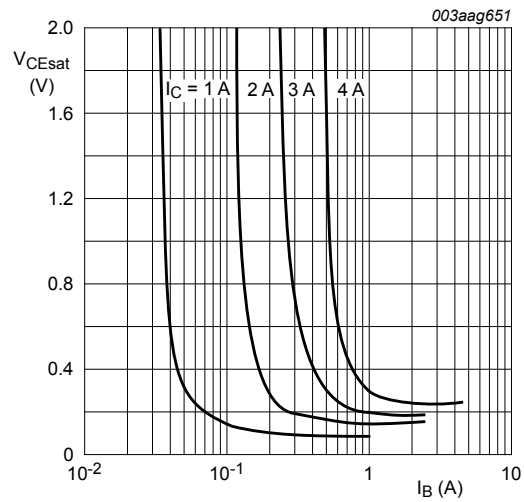


Fig. 10. Collector-emitter saturation voltage as a function of base current; typical values

$T_J = 25\text{ }^{\circ}\text{C}$

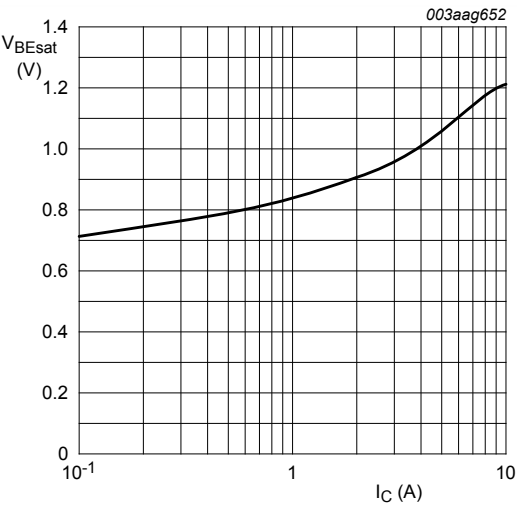


Fig. 11. Base-emitter saturation voltage as a function of collector current; typical values

$I_C/I_B = 4$

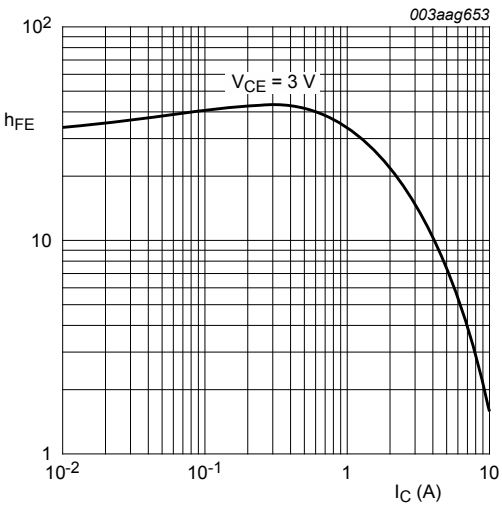


Fig. 12. DC current gain as a function of collector current; typical values

$T_j = 25\text{ }^{\circ}\text{C}$

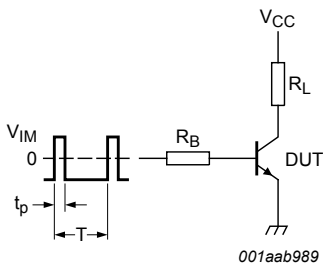


Fig. 13. Test circuit for resistive load switching

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

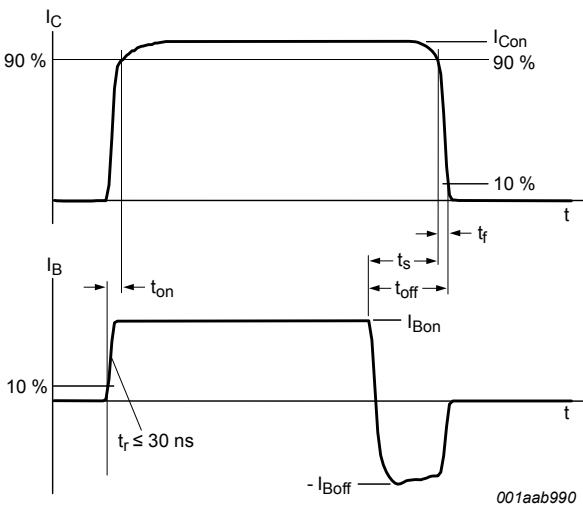


Fig. 14. Switching times waveforms for resistive load

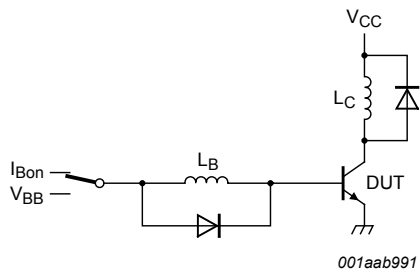


Fig. 15. Test circuit for inductive load switching

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

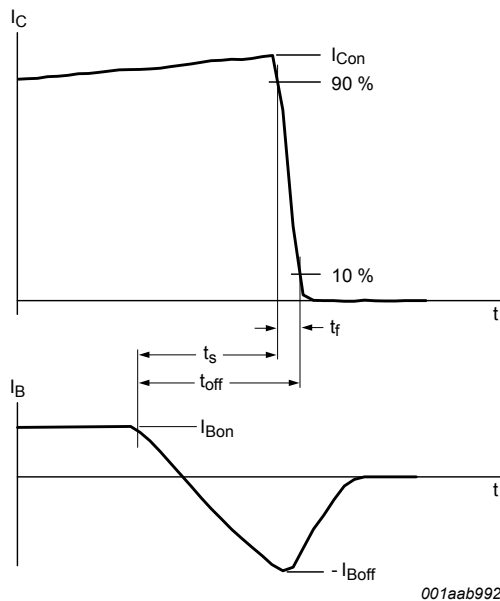


Fig. 16. Switching times waveforms for inductive load

7. Package outline

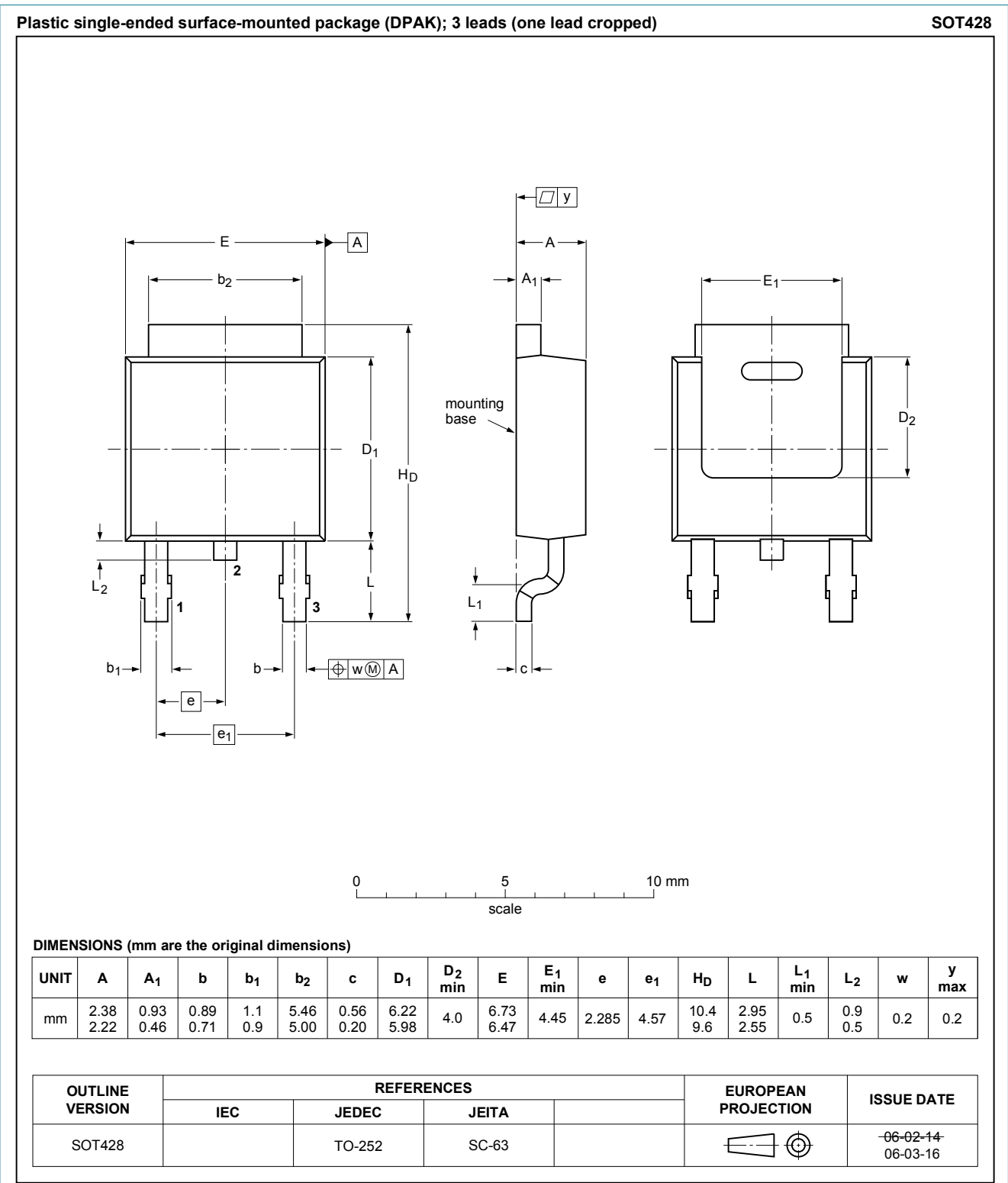


Fig. 17. Package outline DPAK (SOT428)

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Date of release: 8 November 2012