

1. General description

High voltage, high speed, planar passivated NPN power switching transistor with integrated anti-parallel E-C diode in a SOT428 (DPAK) surface mountable plastic package.

2. Features and benefits

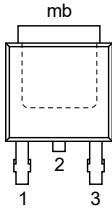
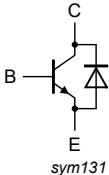
- Fast switching
- High voltage capability
- Integrated anti-parallel E-C diode
- Surface mountable package
- Very low switching and conduction losses

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	 DPAK (SOT428)	 sym131
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

5. Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
BUJD103AD	DPAK	plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)	SOT428

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	$V_{BE} = 0\text{ V}$		-	700	V
V_{CBO}	collector-base voltage	$I_E = 0\text{ A}$		-	700	V
V_{CEO}	collector-emitter voltage	$I_B = 0\text{ A}$		-	400	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	$^{\circ}\text{C}$

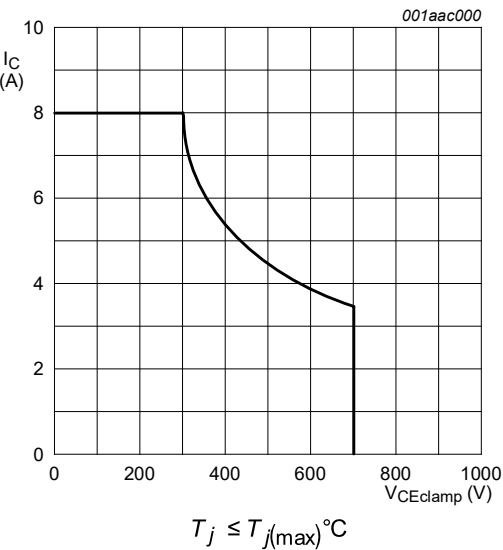


Fig. 1. Reverse bias safe operating area

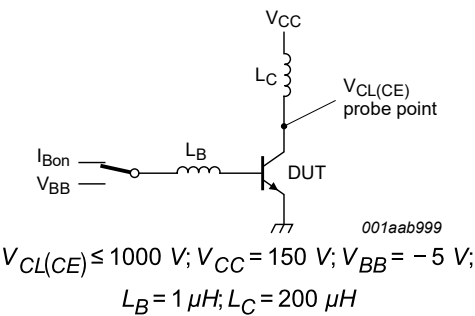
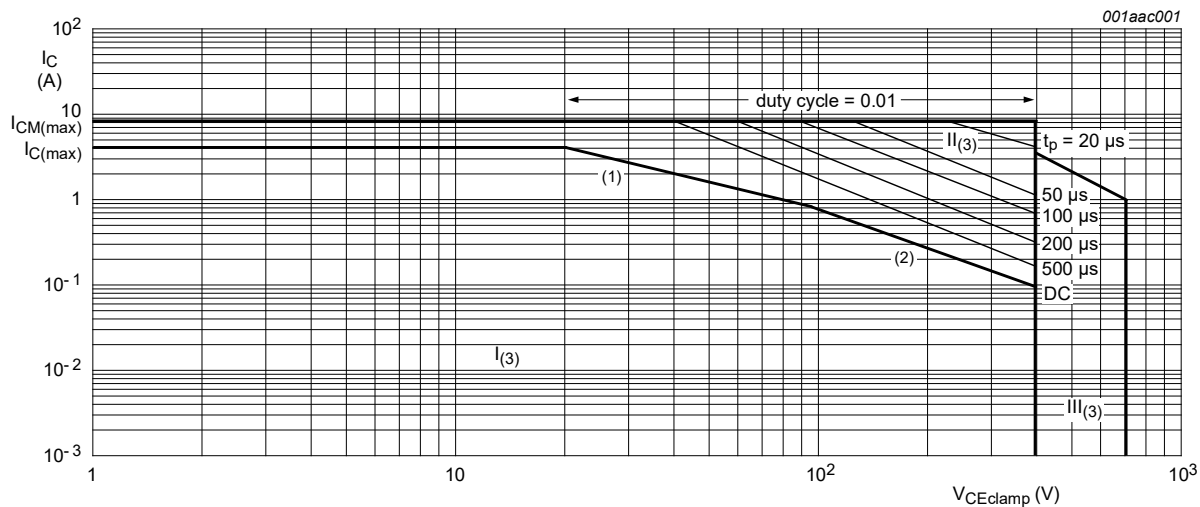
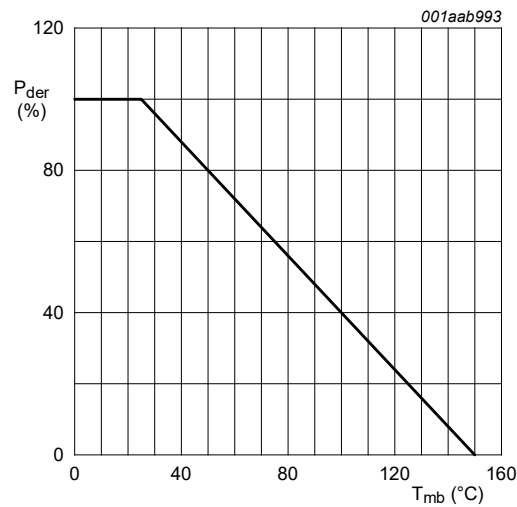


Fig. 2. Test circuit for reverse bias safe operating area



- 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} ≤ 100 Ω and t_p ≤ 0.6 μs

Fig. 3. Forward bias safe operating area for T_{mb} ≤ 25 °C



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

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	printed circuit board (FR4) mounted; minimum footprint; Fig. 6		-	75	-	K/W

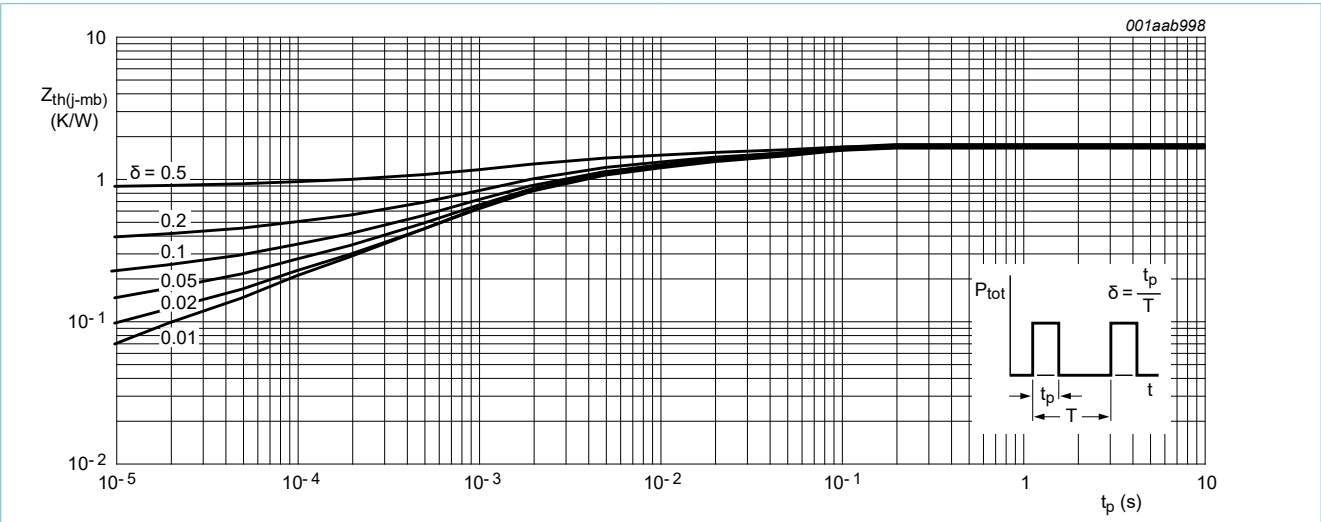


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse width

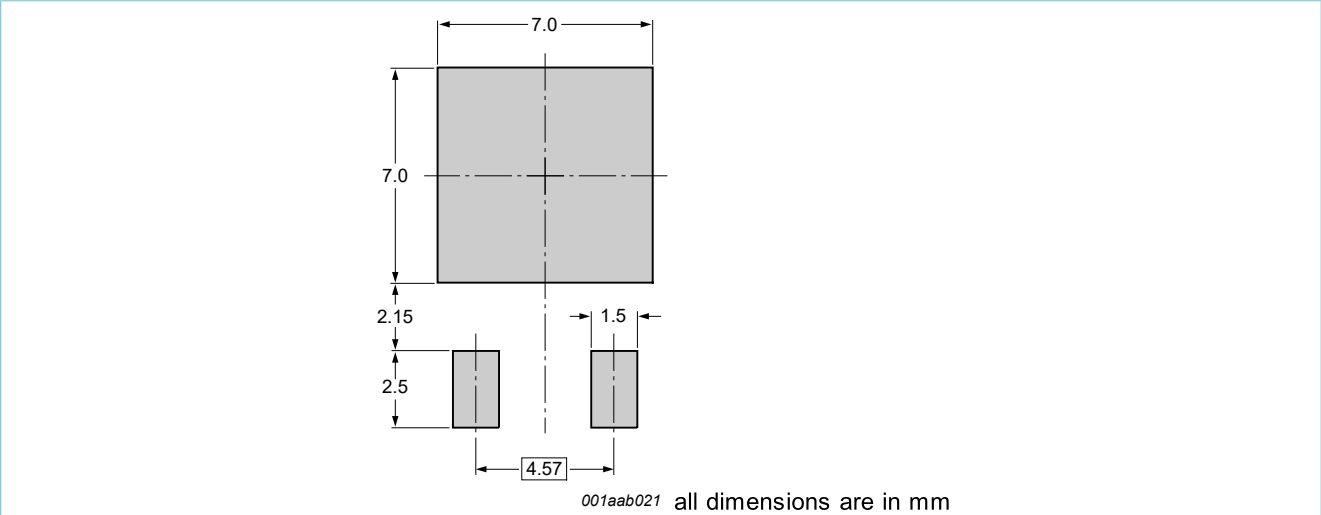


Fig. 6. Minimum footprint SOT428

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} = 700 V; T _j = 125 °C	[1]	-	-	2	mA
		V _{BE} = 0 V; V _{CE} = 700 V; T _j = 25 °C	[1]	-	-	1	mA
I _{CBO}	collector-base cut-off current (emitter open)	V _{CB} = 700 V; I _E = 0 A	[1]	-	-	1	mA
I _{CEO}	collector-emitter cut-off current (base open)	V _{CE} = 400 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 _{CEsat}	collector-emitter saturation voltage	I _C = 3 A; I _B = 0.6 A; Fig. 7 ; Fig. 8		-	0.29	1	V
V _{BEsat}	base-emitter saturation voltage	I _C = 3 A; I _B = 0.6 A; Fig. 9		-	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. 10		10	15	32	
		I _C = 500 mA; V _{CE} = 5 V; T _{mb} = 25 °C; Fig. 10		13	21	32	
		I _C = 2 A; V _{CE} = 5 V; T _{mb} = 25 °C; Fig. 10		11	16	22	
		I _C = 3 A; V _{CE} = 5 V; T _{mb} = 25 °C; Fig. 10		-	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. 11 ; Fig. 12		-	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. 13 ; Fig. 14		-	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. 13 ; Fig. 14		-	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. 13 ; Fig. 14		-	-	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. 11 ; Fig. 12		-	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. 13 ; Fig. 14		-	-	0.12	μs
		I _C = 2 A; I _{Bon} = 0.4 A; V _{BB} = -5 V; L _B = 1 μH; inductive load; Fig. 13 ; Fig. 14		-	0.03	0.06	μs

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

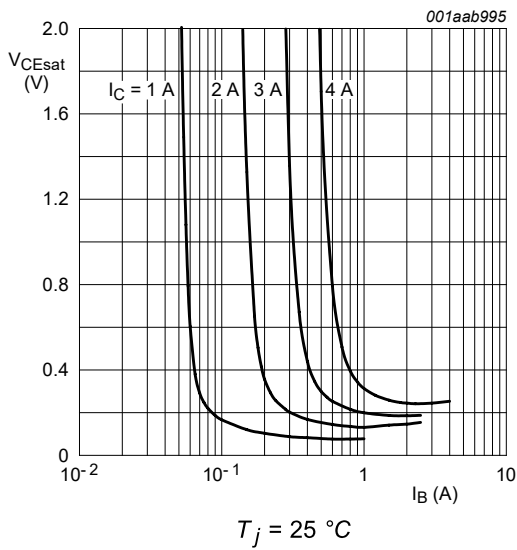


Fig. 7. Collector-emitter saturation voltage as a function of base current; typical values

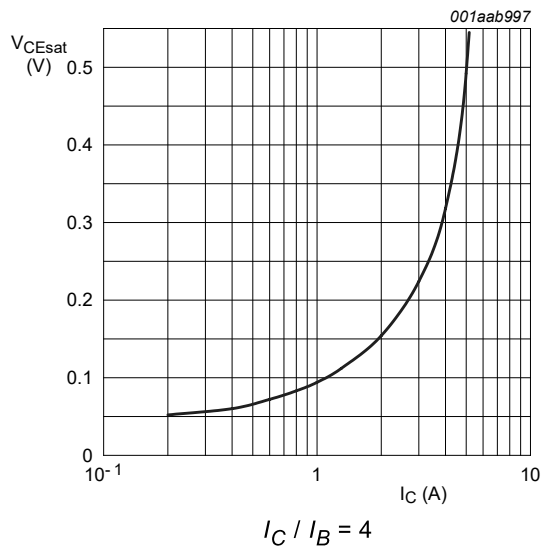


Fig. 8. Collector-emitter saturation voltage as a function of collector current; typical values

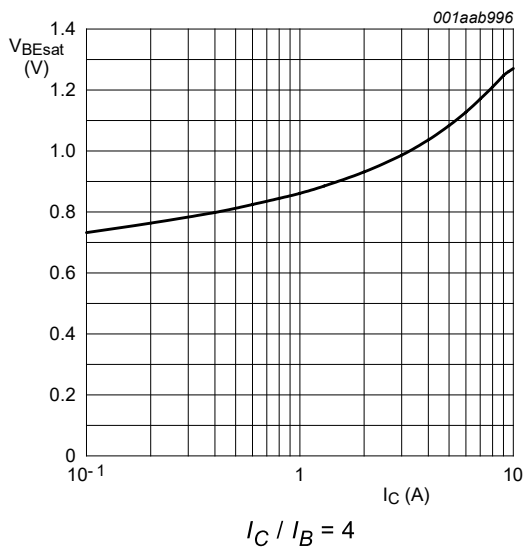


Fig. 9. Base-emitter saturation voltage as a function of collector current; typical values

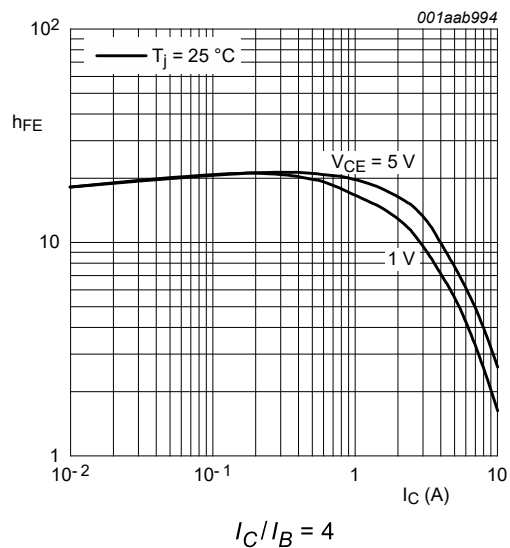
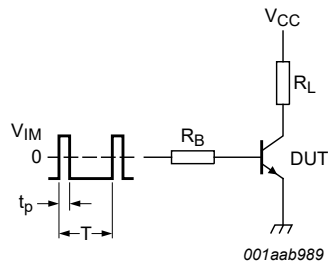


Fig. 10. DC current gain as a function of collector current; typical values



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

Fig. 11. Test circuit for resistive load switching

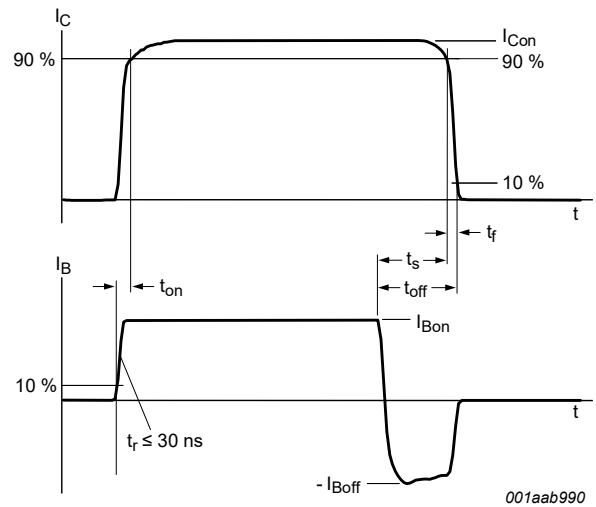
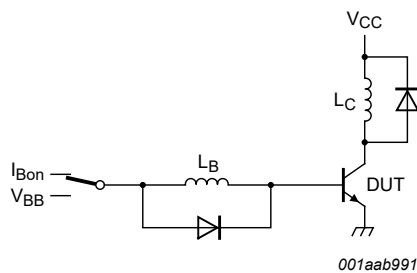


Fig. 12. Switching times waveforms for resistive load



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

Fig. 13. Test circuit for inductive load switching

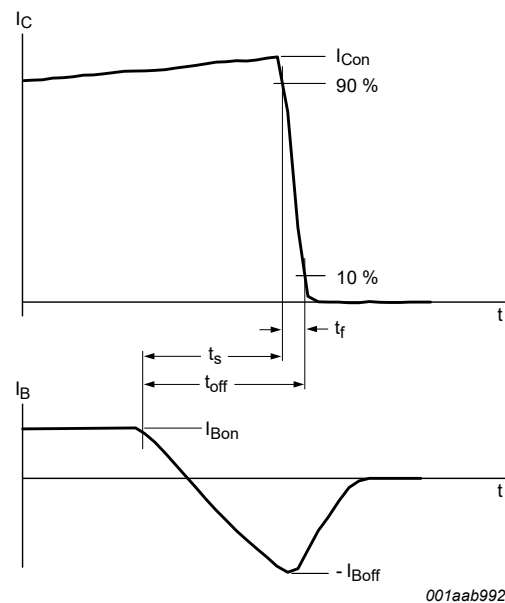


Fig. 14. Switching times waveforms for inductive load

9. Package outline

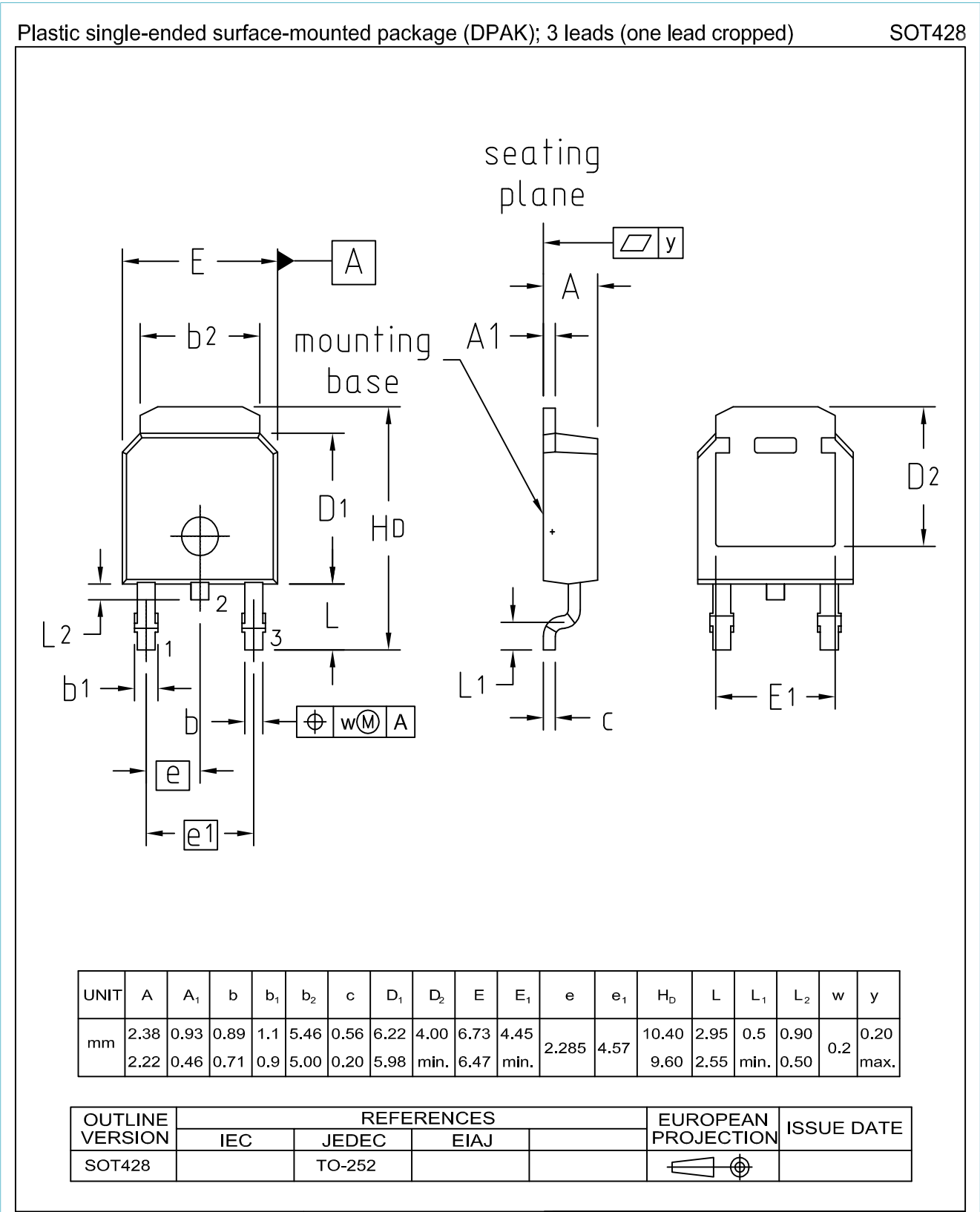


Fig. 15. Package outline DPAK (SOT428)

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Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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