

BUJD105AD

NPN power transistor with integrated diode

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Product data sheet

1. Product profile

1.1 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.

1.2 Features and benefits

- Fast switching
- High voltage capability
- Very low switching and conduction losses

1.3 Applications

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

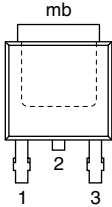
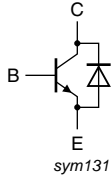
1.4 Quick reference data

Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_C	collector current		-	-	8	A
P_{tot}	total power dissipation	$T_{mb} \leq 25\text{ °C}$; see Figure 3	-	-	80	W
V_{CESM}	collector-emitter peak voltage	$V_{BE} = 0\text{ V}$	-	-	700	V
Static characteristics						
h_{FE}	DC current gain	$V_{CE} = 5\text{ V}$; $I_C = 4\text{ A}$; $T_{mb} = 25\text{ °C}$; see Figure 6 ; see Figure 7	8	13.5	-	

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 <p style="text-align: center;">SOT428 (SC-63; DPAK)</p>	
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		Version
	Name	Description	
BUJD105AD	SC-63; 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	$V_{BE} = 0\text{ V}$	-	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		-	8	A
I_{CM}	peak collector current	see Figure 1 ; see Figure 2	-	16	A
I_B	base current		-	4	A
I_{BM}	peak base current		-	8	A
P_{tot}	total power dissipation	$T_{mb} \leq 25\text{ °C}$; see Figure 3	-	80	W
T_{stg}	storage temperature		-65	150	°C
T_j	junction temperature		-	150	°C

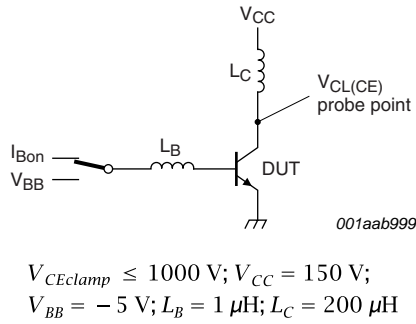
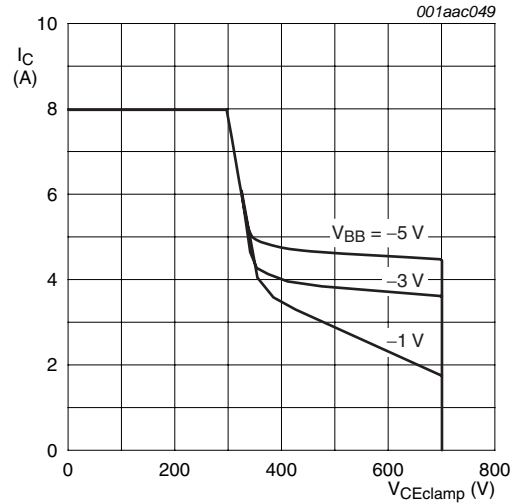
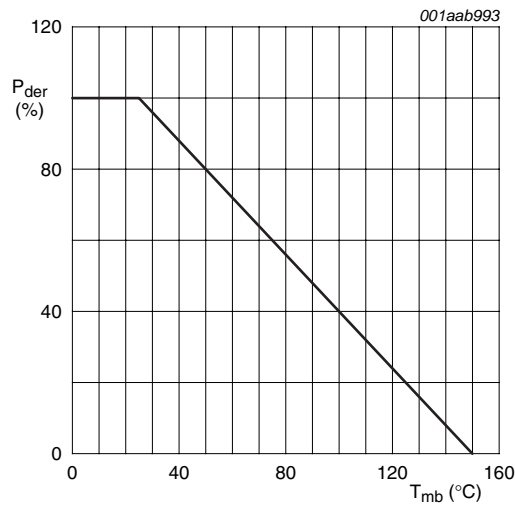


Fig 1. Test circuit for reverse bias safe operating area



$$T_j \leq T_{j(max)} \text{ } ^\circ\text{C}$$

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

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 4	-	-	1.56	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	printed-circuit-board mounted; minimum footprint; see Figure 5	-	75	-	K/W

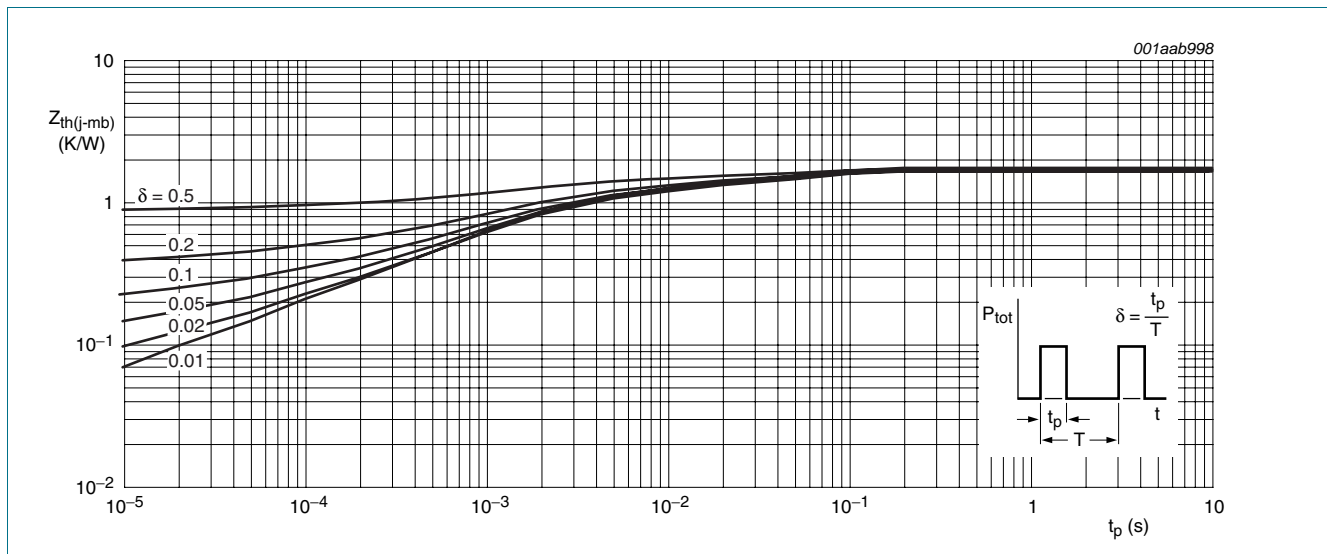


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse width

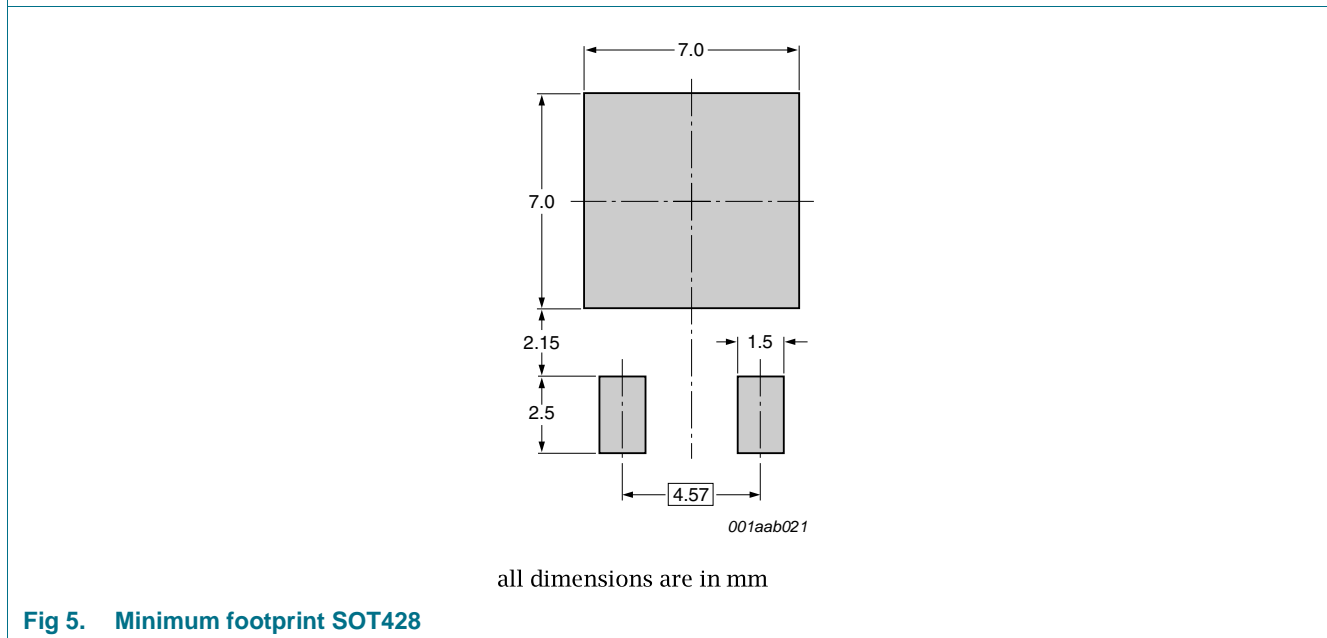


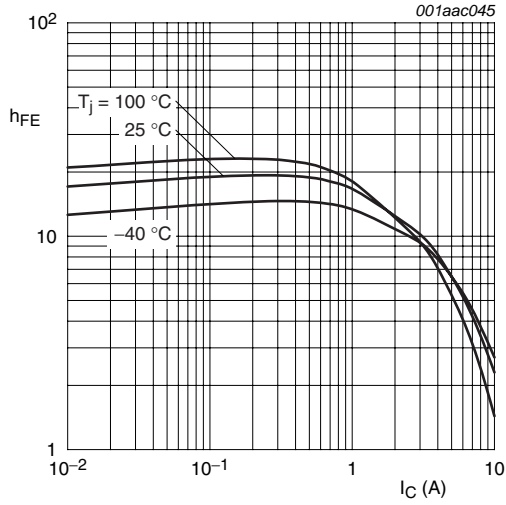
Fig 5. Minimum footprint SOT428

6. Characteristics

Table 6. Characteristics

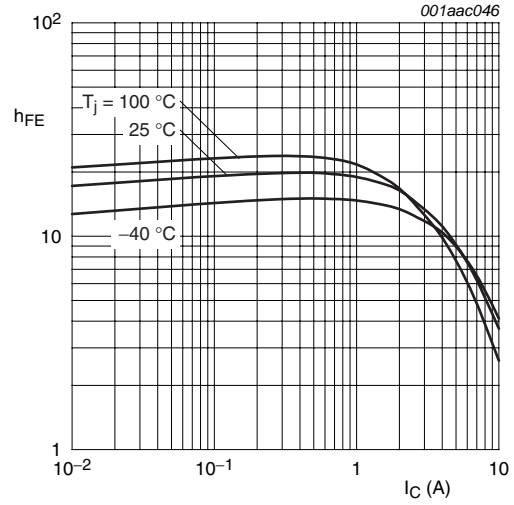
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
h_{FE}	DC current gain	$V_{CE} = 5\text{ V}; I_C = 4\text{ A}; T_{mb} = 25\text{ }^\circ\text{C};$ see Figure 6 ; see Figure 7	8	13.5	-	
		$V_{CE} = 5\text{ V}; I_C = 1\text{ mA}; T_{mb} = 25\text{ }^\circ\text{C}$	10	17	34	
		$V_{CE} = 5\text{ V}; I_C = 500\text{ mA}; T_{mb} = 25\text{ }^\circ\text{C}$	13	23	36	
I_{CBO}	collector-base cut-off current	$I_E = 0\text{ A}; V_{CB} = 700\text{ V}$	[1]	-	0.2	mA
I_{CEO}	collector-emitter cut-off current	$I_B = 0\text{ A}; V_{CE} = 400\text{ V}$	[1]	-	0.1	mA
I_{CES}	collector-emitter cut-off current	$V_{CE} = 700\text{ V}; V_{BE} = 0\text{ V}; T_j = 25\text{ }^\circ\text{C}$	[1]	-	0.2	mA
		$V_{CE} = 700\text{ V}; V_{BE} = 0\text{ V}; T_j = 125\text{ }^\circ\text{C}$	[1]	-	0.5	mA
I_{EBO}	emitter-base cut-off current	$I_C = 0\text{ A}; V_{EB} = 9\text{ V}$	-	-	10	mA
V_{BEsat}	base-emitter saturation voltage	$I_C = 4\text{ A}; I_B = 0.8\text{ A};$ see Figure 8	-	1	1.5	V
V_{CEOsus}	collector-emitter sustaining voltage	$I_B = 0\text{ A}; L_C = 25\text{ mH}; I_C = 10\text{ mA};$ see Figure 9 ; see Figure 10	400	-	-	V
V_{CEsat}	collector-emitter saturation voltage	$I_B = 0.8\text{ A}; I_C = 4\text{ A};$ see Figure 11 ; see Figure 12	-	0.3	1	V
V_F	forward voltage	$I_F = 4\text{ A}$	-	1.07	1.5	V
Dynamic characteristics						
t_f	fall time	$I_C = 5\text{ A}; I_{B(on)} = 1\text{ A}; V_{BB} = -5\text{ V}; L_B = 1\text{ }^\mu\text{H};$ inductive load; $T_{mb} = 25\text{ }^\circ\text{C};$ see Figure 13 ; see Figure 14	-	20	50	ns
		$I_C = 5\text{ A}; I_{B(on)} = 1\text{ A}; V_{BB} = -5\text{ V}; L_B = 1\text{ }^\mu\text{H};$ inductive load; $T_{mb} = 100\text{ }^\circ\text{C}$	-	25	100	ns
		$I_C = 5\text{ A}; I_{B(on)} = 1\text{ A}; I_{B(off)} = -1\text{ A}; R_L = 75\text{ }^\Omega;$ resistive load; $T_j = 25\text{ }^\circ\text{C};$ see Figure 15 ; see Figure 16	-	0.3	0.5	μs
t_{on}	turn-on time	$I_C = 5\text{ A}; I_{B(on)} = 1\text{ A}; I_{B(off)} = -1\text{ A}; R_L = 75\text{ }^\Omega;$ $T_j = 25\text{ }^\circ\text{C};$ resistive load	-	0.65	1	μs
t_s	storage time	$I_C = 5\text{ A}; I_{B(on)} = 1\text{ A}; I_{B(off)} = -1\text{ A}; R_L = 75\text{ }^\Omega;$ resistive load; $T_j = 25\text{ }^\circ\text{C}$	-	1.8	2.5	μs
		$I_C = 5\text{ A}; I_{B(on)} = 1\text{ A}; R_L = 75\text{ }^\Omega;$ inductive load; $T_j = 25\text{ }^\circ\text{C}; L_B = 1\text{ }^\mu\text{H}; V_{BB} = -5\text{ V}$	-	1.2	1.7	μs
		$I_C = 5\text{ A}; I_{B(on)} = 1\text{ A}; I_{B(off)} = -1\text{ A};$ inductive load; $T_j = 100\text{ }^\circ\text{C}; L_B = 1\text{ }^\mu\text{H}; V_{BB} = -5\text{ V}$	-	1.4	1.9	μs

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



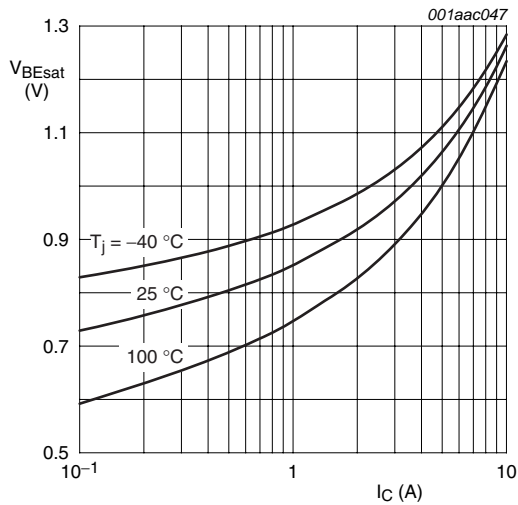
$V_{CE} = 1$ V

Fig 6. DC current gain as a function of collector current; typical values



$V_{CE} = 5$ V

Fig 7. DC current gain as a function of collector current; typical values



$I_C / I_B = 4$

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

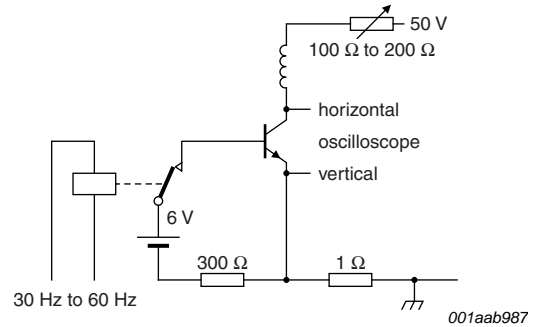


Fig 9. Test circuit for collector-emitter sustaining voltage

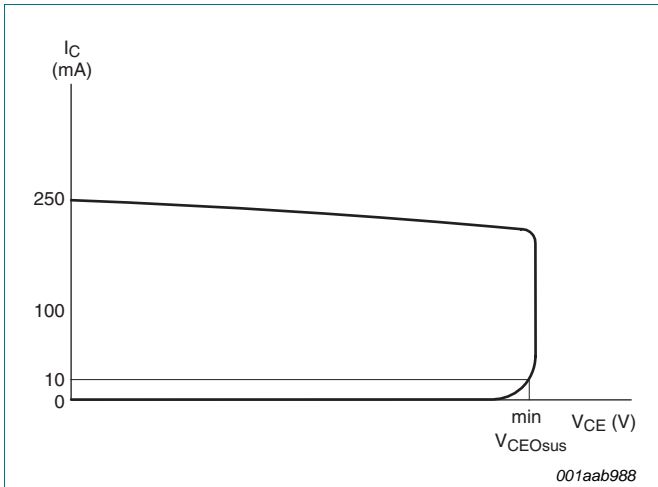
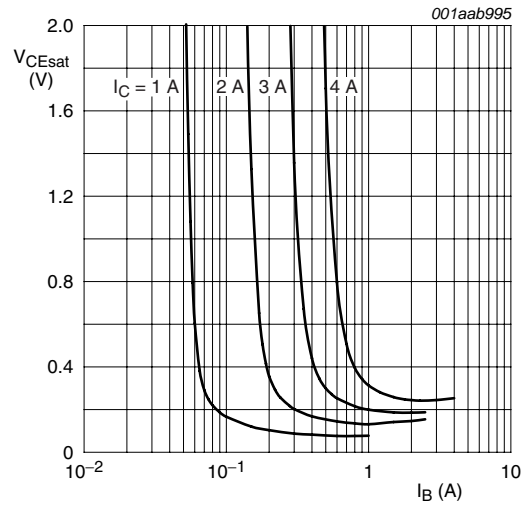
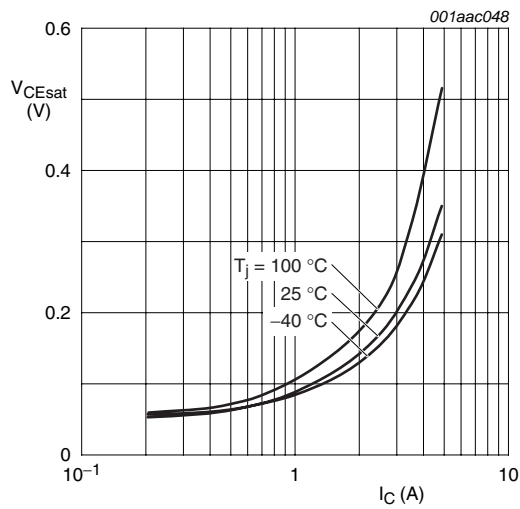


Fig 10. Oscilloscope display for collector-emitter sustaining voltage test waveform



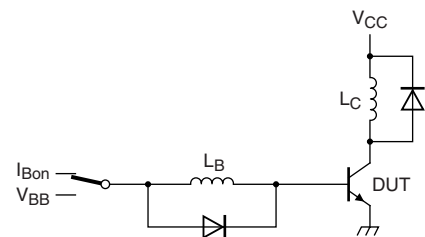
$T_j = 25\text{ }^\circ\text{C}$

Fig 11. Collector-emitter saturation voltage as a function of base current; typical values



$I_C / I_B = 4$

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



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

Fig 13. Test circuit for inductive load switching

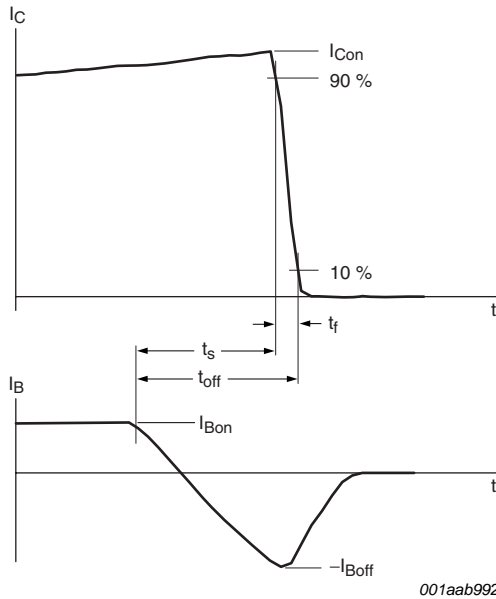
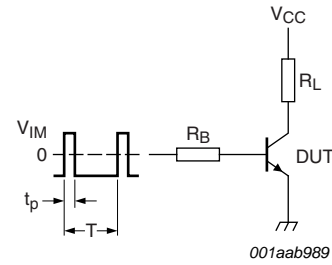


Fig 14. Switching times waveforms for inductive load



$V_{IM} = -6\text{ V to }+8\text{ V}; V_{CC} = 250\text{ V};$

$t_p = 20\ \mu\text{s}; \delta = t_p/T = 0.01$

R_B and R_L calculated from I_{Con} and I_{Bon} requirements

Fig 15. Test circuit for resistive load switching

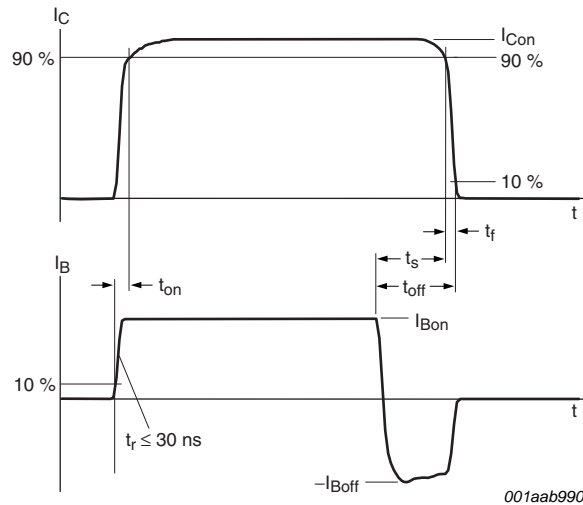


Fig 16. Switching times waveforms for resistive load

7. Package outline

Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)

SOT428

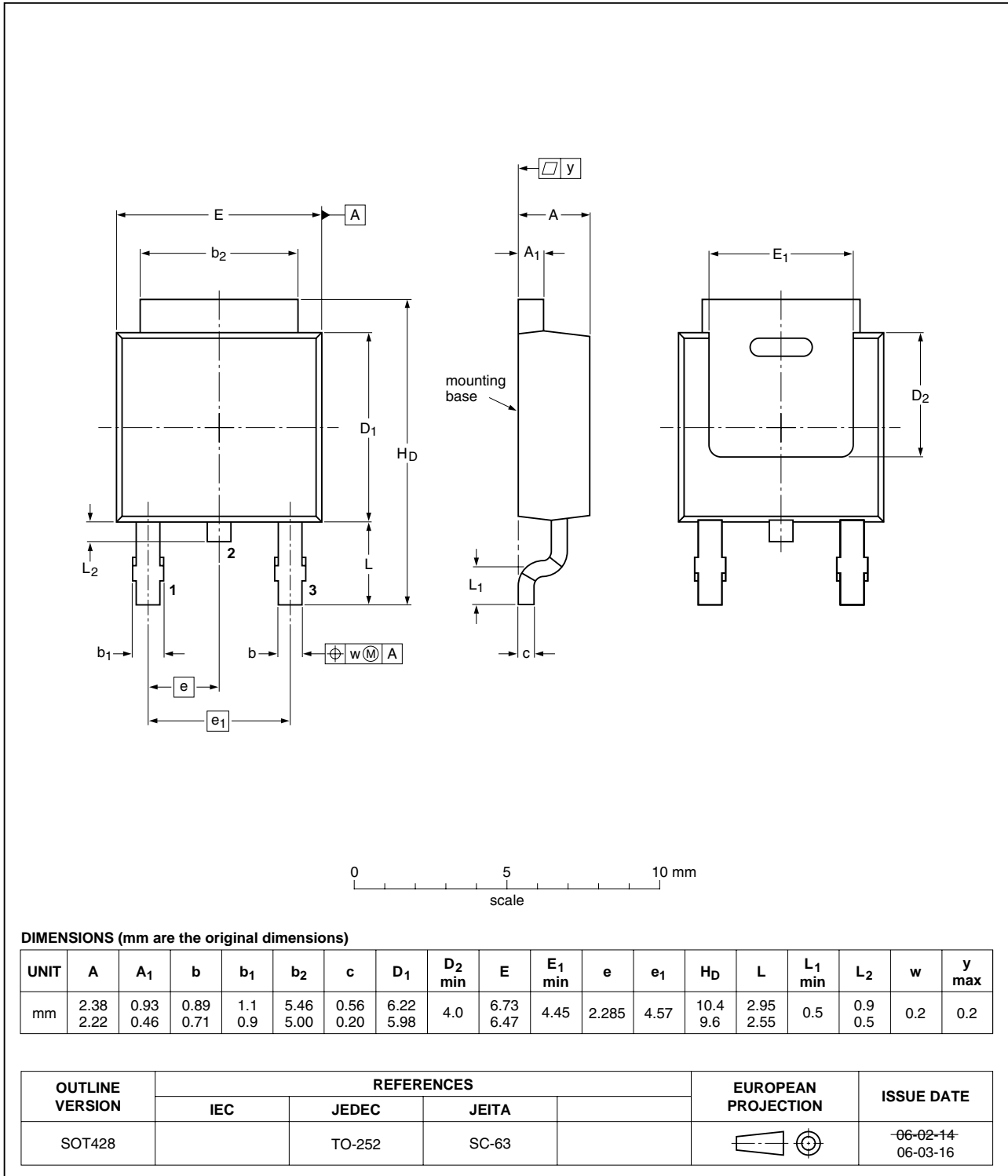


Fig 17. Package outline SOT428 (DPAK)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUJD105AD_1	20090508	Product data sheet	-	-

9. Legal information

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.

[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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