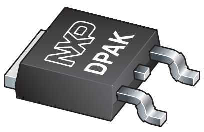


BUJ302AD

NPN power transistor

Rev. 01 — 28 March 2011 | 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 mounted package.

1.2 Features and benefits

- Fast switching
- High voltage capability
- Low thermal resistance
- Surface-mountable package

1.3 Applications

- DC-to-DC converters
- High-frequency electronic lighting ballast applications
- Inverters
- Motor control systems

1.4 Quick reference data

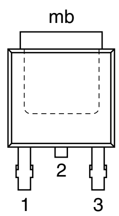
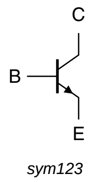
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_C	collector current	see Figure 1; see Figure 2; see Figure 4	-	-	4	A
P_{tot}	total power dissipation	$T_{mb} \leq 25$ °C; see Figure 3	-	-	80	W
V_{CESM}	collector-emitter peak voltage	$V_{BE} = 0$ V	-	-	1050	V
Static characteristics						
h_{FE}	DC current gain	$I_C = 0.1$ A; $V_{CE} = 5$ V; $T_{mb} = 25$ °C; see Figure 11 [1]	48	66	100	
		$I_C = 0.8$ A; $V_{CE} = 3$ V; $T_{mb} = 25$ °C; see Figure 12 [1]	25	42	50	

[1] Pulse test: pulse duration ≤ 300 µs, duty cycle ≤ 2 %

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 SOT428 (DPAK)	
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
BUJ302AD	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 V	-	1050	V
V_{CEO}	collector-emitter voltage	I_B = 0 A	-	400	V
I_C	collector current	see Figure 1; see Figure 2; see Figure 4	-	4	A
I_{CM}	peak collector current		-	8	A
I_B	base current		-	2	A
I_{BM}	peak base current		-	4	A
P_{tot}	total power dissipation	$T_{mb} \leq 25$ °C; see Figure 3	-	80	W
T_{stg}	storage temperature		-65	150	°C
T_j	junction temperature		-	150	°C
V_{EBO}	emitter-base voltage	I_C = 0 A; I_E = 2 A; t_p < 10 ms	-	24	V

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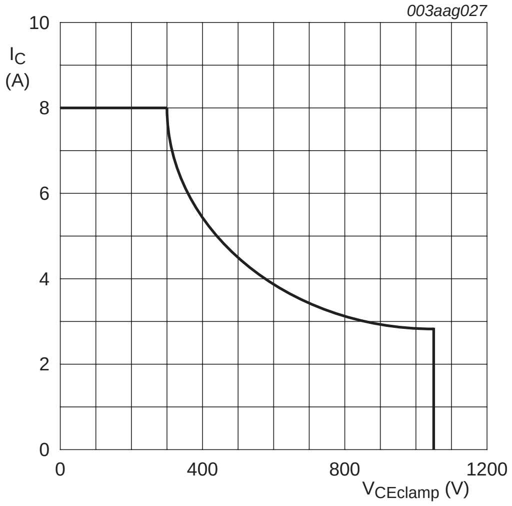
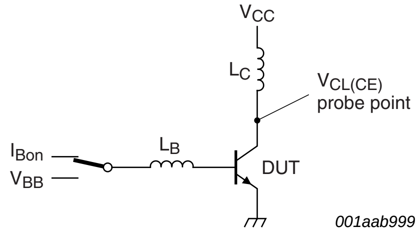


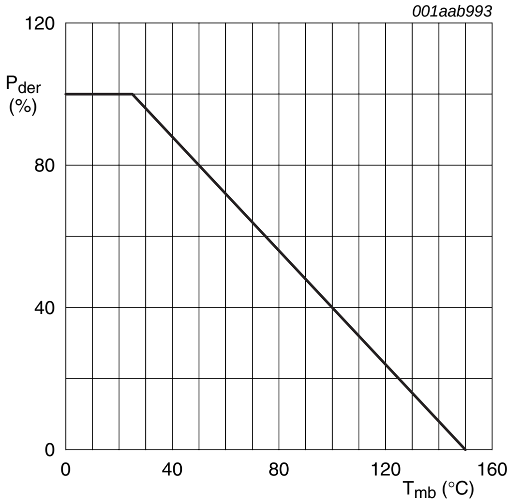
$T_j \leq T_{j(max)}$ °C

Fig 1. Reverse bias safe operating area



$$V_{CL(CE)} \leq 1000\ V; V_{CC} = 150\ V; V_{BB} = -5\ V;$$
$$L_B = 1\ \mu H; L_C = 200\ \mu H$$

Fig 2. Test circuit for reverse bias safe operating area



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

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

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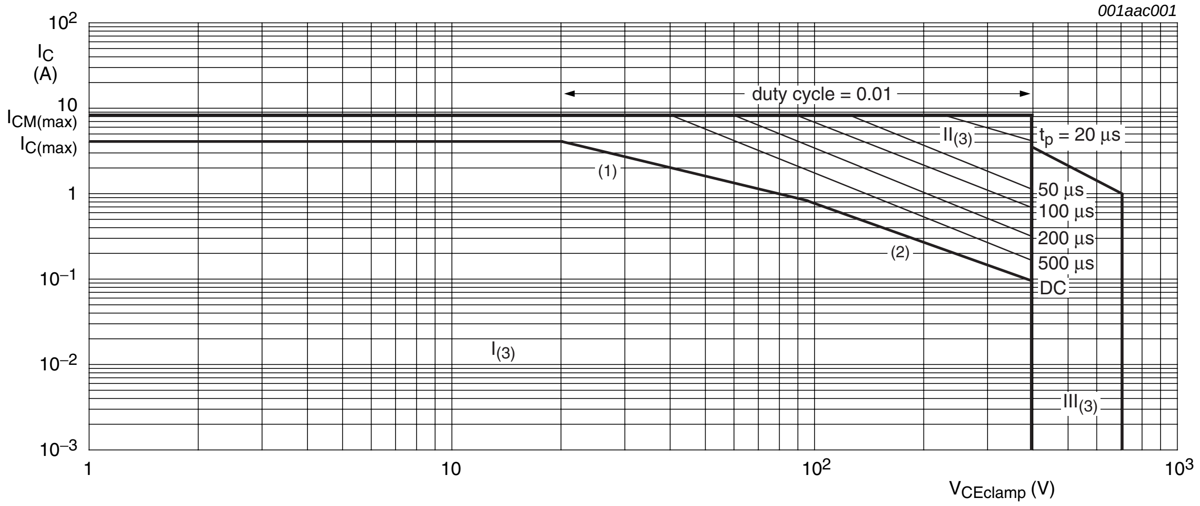

1)Ptot maximum and Ptot peak maximum lines

2)Second breakdown limits

3) I = Region of permissable DC operation

II = Extension for repetitive pulse operation

III = Extension during turn-on in single transistor converters provided that RBE ≤ 100 Ω and tp ≤ 0.6 µs

Fig 4. Forward bias safe operating area for Tmb ≤ 25 °C

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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 5	-	-	1.56	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	60	-	K/W

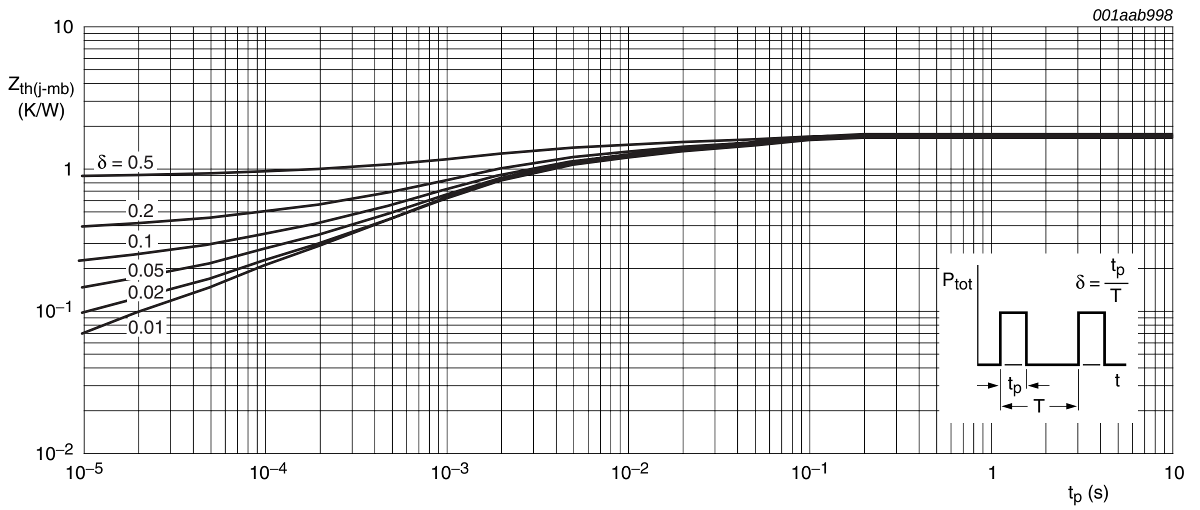

Fig 5. Transient thermal impedance from junction to mounting base as a function of pulse width

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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		-	0.2	10	µA
I_{CEO}	collector-emitter cut-off current	V_{CE} = 400 V; I_B = 0 A; T_{mb} = 25 °C		-	10	250	mA
$V_{(BR)EBO}$	open-collector emitter-base breakdown voltage	I_B = 1 mA; I_C = 0 A; T_{mb} = 25 °C		15	19	-	V
V_{CEOsus}	collector-emitter sustaining voltage	I_B = 0 A; I_C = 10 mA; L_C = 25 mH; T_{mb} = 25 °C; see Figure 6; see Figure 7	[1]	400	470	-	V
V_{CEsat}	collector-emitter saturation voltage	I_C = 1 A; I_B = 0.2 A; T_{mb} = 25 °C; see Figure 8; see Figure 9	[1]	-	0.15	0.5	V
		I_C = 3.5 A; I_B = 1 A; T_{mb} = 25 °C; see Figure 8; see Figure 9	[1]	-	0.6	1.5	V
V_{BEsat}	base-emitter saturation voltage	I_C = 3.5 A; I_B = 1 A; T_{mb} = 25 °C; see Figure 10	[1]	-	1.1	1.5	V
h_{FE}	DC current gain	I_C = 0.1 A; V_{CE} = 5 V; T_{mb} = 25 °C; see Figure 11	[1]	48	66	100	
		I_C = 0.8 A; V_{CE} = 3 V; T_{mb} = 25 °C; see Figure 12	[1]	25	42	50	
Dynamic characteristics							
t_s	storage time	I_C = 2.5 A; I_{Bon} = 0.5 A; I_{Boff} = -0.5 A; R_L = 60 Ω; V_{BB} = -5 V; T_{mb} = 25 °C; resistive load; t_p = 300 µs; see Figure 13; see Figure 14		-	-	3.5	µs
t_f	fall time			-	-	500	ns

[1] Pulse test: pulse duration ≤ 300 µs, duty cycle ≤ 2 %

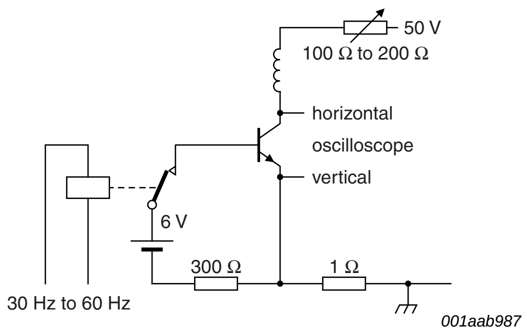


Fig 6. Test circuit for collector-emitter sustaining voltage

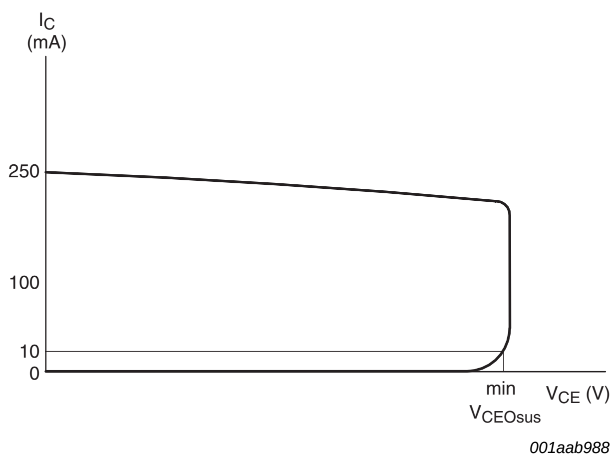
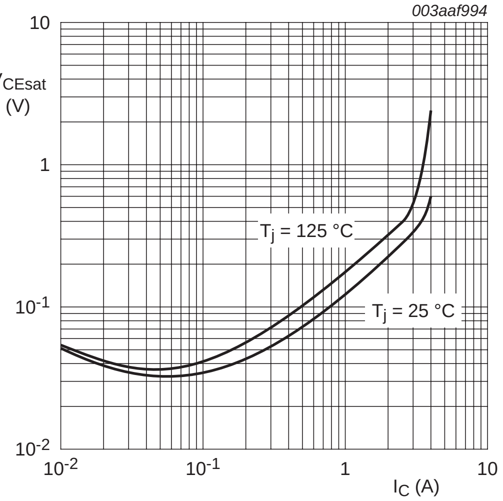


Fig 7. Oscilloscope display for collector-emitter sustaining voltage test waveform



$I_C / I_B = 3$

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

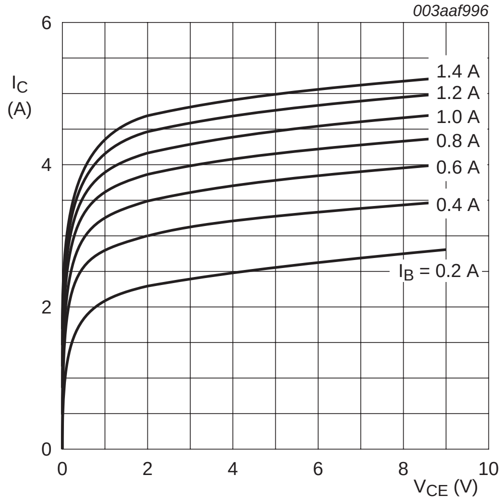
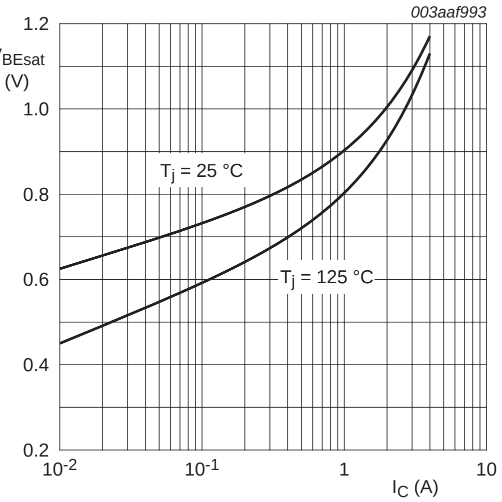


Fig 9. Collector current as a function of collector-emitter voltage; typical values



$I_C / I_B = 3$

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

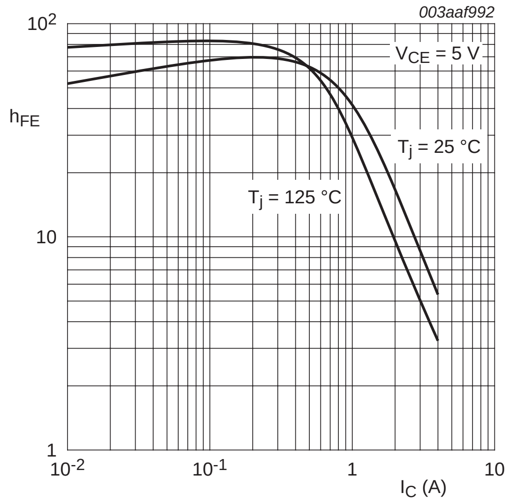


Fig 11. DC current gain as a function of collector current; typical values

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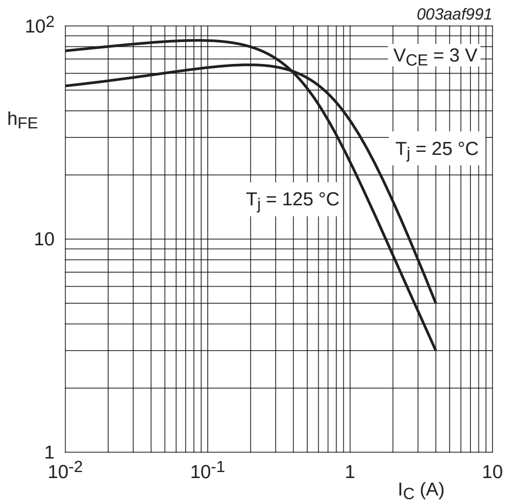
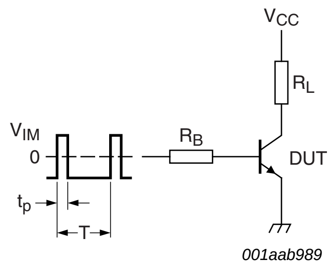


Fig 12. DC current gain as a function of collector current; typical values



$V_{IM} = -6$ to $+8$ V; $V_{CC} = 250$ V; $t_p = 20$ μs; $\delta = \frac{t_p}{T} = 0.01$

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

Fig 13. Test circuit for resistive load switching

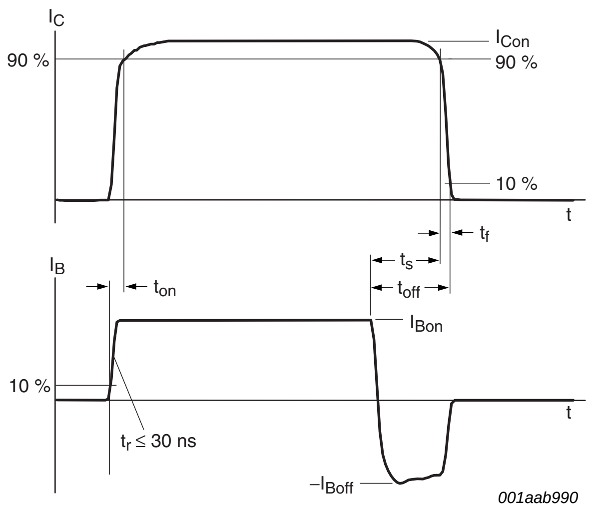


Fig 14. Switching times waveforms for resistive load

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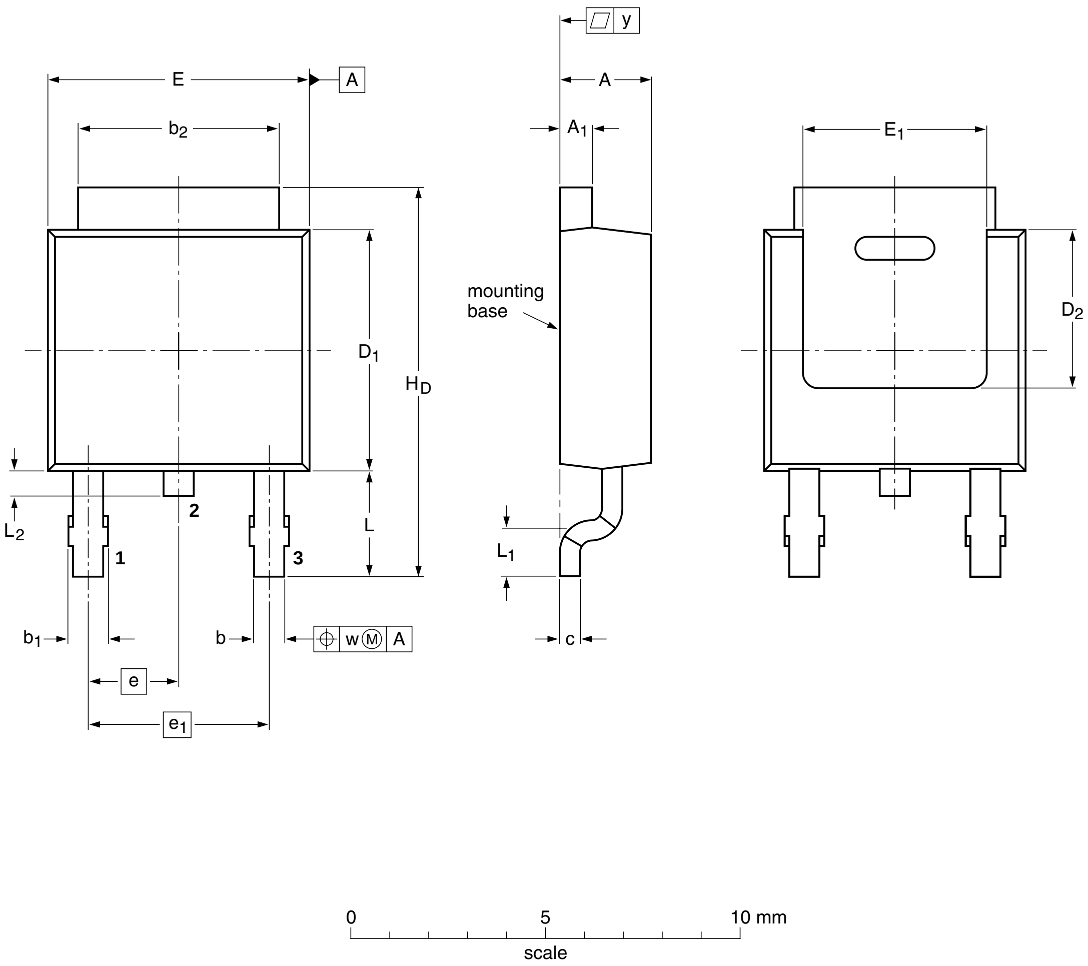
7. Package outline

Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped) **SOT428**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	b_1	b_2	c	D_1	D_2 min	E	E_1 min	e	e_1	H_D	L	L_1 min	L_2	w	y max
mm	2.38 2.22	0.93 0.46	0.89 0.71	1.1 0.9	5.46 5.00	0.56 0.20	6.22 5.98	4.0	6.73 6.47	4.45	2.285	4.57	10.4 9.6	2.95 2.55	0.5	0.9 0.5	0.2	0.2

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT428		TO-252	SC-63			~~06-02-14~~ 06-03-16

Fig 15. Package outline SOT428 (DPAK)

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8. Soldering

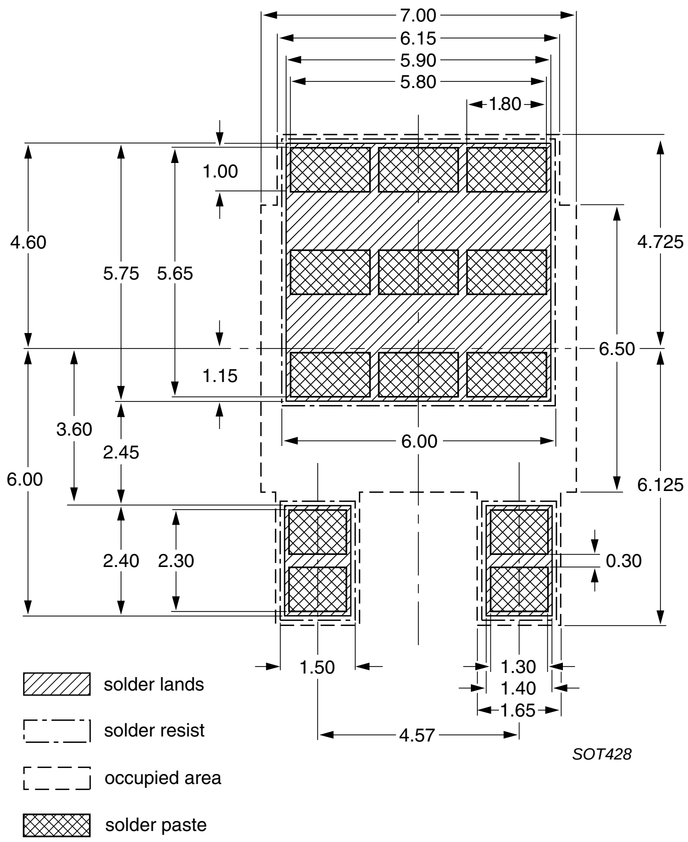

Fig 16. Reflow soldering footprint for SOT428 (DPAK)

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9. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BUJ302AD v.1	20110328	Product data sheet	-	-

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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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Date of release: 28 March 2011

Document identifier: BUJ302AD