

BUJ105AD

www.DataSheet4U.com

Silicon diffused power transistor

Rev. 01 — 14 December 2004

Product data sheet

1. Product profile

1.1 General description

High-voltage, high-speed planar-passivated NPN power switching transistor in a SOT428 (D-PAK) surface mounted package.

1.2 Features

- Low thermal resistance
- Fast switching

1.3 Applications

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

1.4 Quick reference data

- $V_{CESM} \leq 700$ V
- $I_C \leq 8$ A
- $P_{tot} \leq 80$ W
- $h_{FEsat} = 11$ (typ)

2. Pinning information

Table 1: Pinning

Pin	Description	Simplified outline	Symbol
1	base	<p>SOT428 (D-PAK)</p>	<p>sym056</p>
2	collector ^[1]		
3	emitter		
mb	mounting base; connected to collector		

[1] It is not possible to make a connection to pin 2 of the SOT428 (D-PAK) package.

PHILIPS

www.DataSheet4U.com

3. Ordering information

Table 2: Ordering information

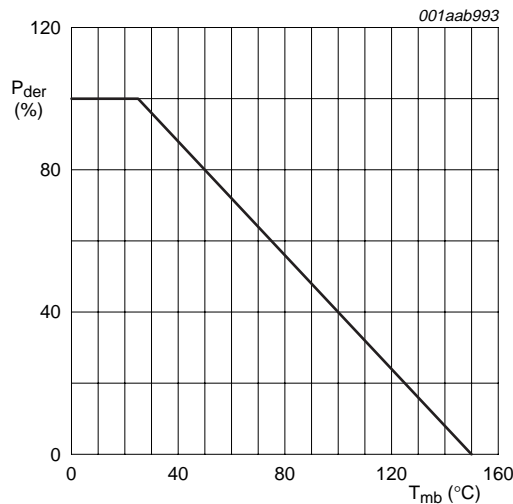
Type number	Package		Version
	Name	Description	
BUJ105AD	D-PAK	plastic single-ended surface mounted package; 3 leads (one lead cropped)	SOT428

4. Limiting values

Table 3: Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CESM}	peak collector-emitter voltage	$V_{BE} = 0\text{ V}$	-	700	V
V_{CEO}	collector-emitter voltage	open base	-	400	V
V_{CBO}	collector-base voltage	open emitter	-	700	V
I_C	collector current (DC)		-	8	A
I_{CM}	peak collector current		-	16	A
I_B	base current (DC)		-	4	A
I_{BM}	peak base current		-	8	A
P_{tot}	total power dissipation	$T_{mb} = \leq 25\text{ }^\circ\text{C}$; see Figure 1	-	80	W
T_{stg}	storage temperature		-65	+150	$^\circ\text{C}$
T_j	junction temperature		-	150	$^\circ\text{C}$



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

Fig 1. Normalized total power dissipation as a function of mounting base temperature

5. Thermal characteristics

Table 4: Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see Figure 2	-	-	1.56	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient		[1]	-	75	K/W

[1] Device mounted on a printed-circuit board; minimum footprint

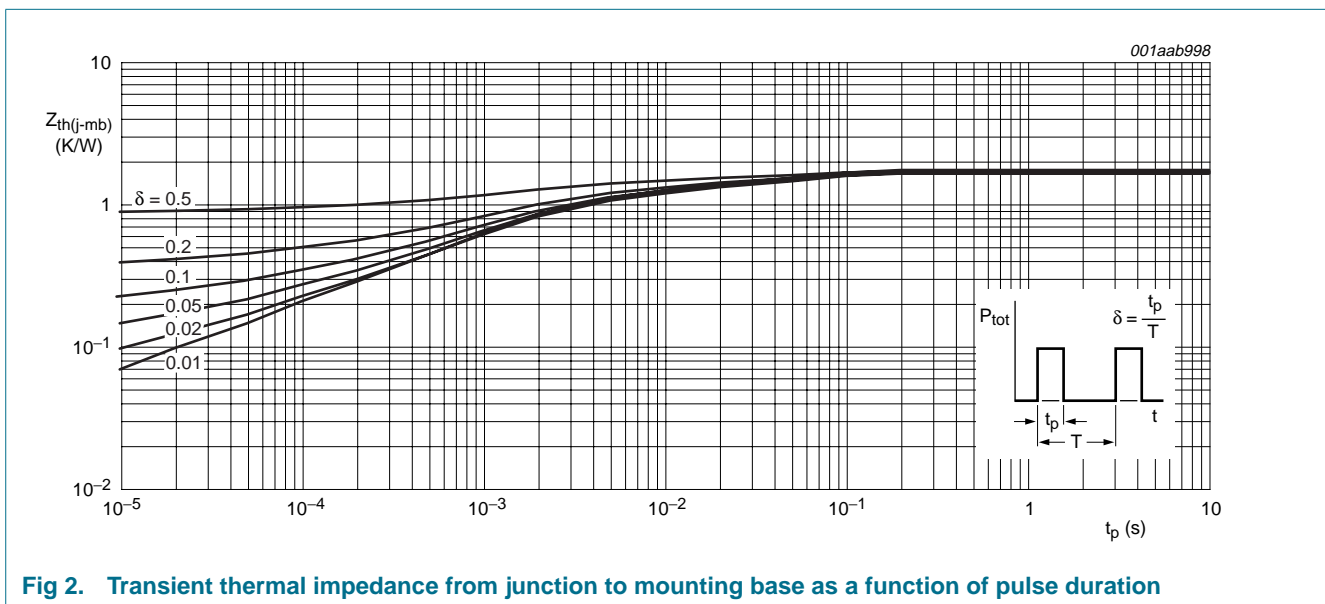


Fig 2. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

Table 5: Characteristics

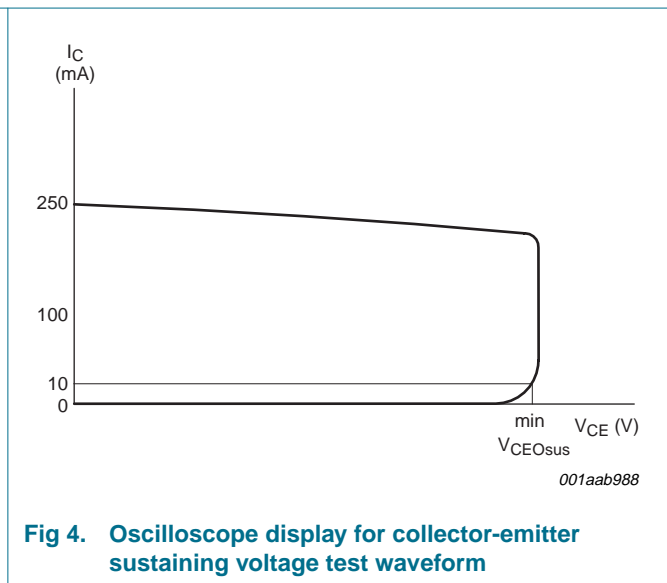
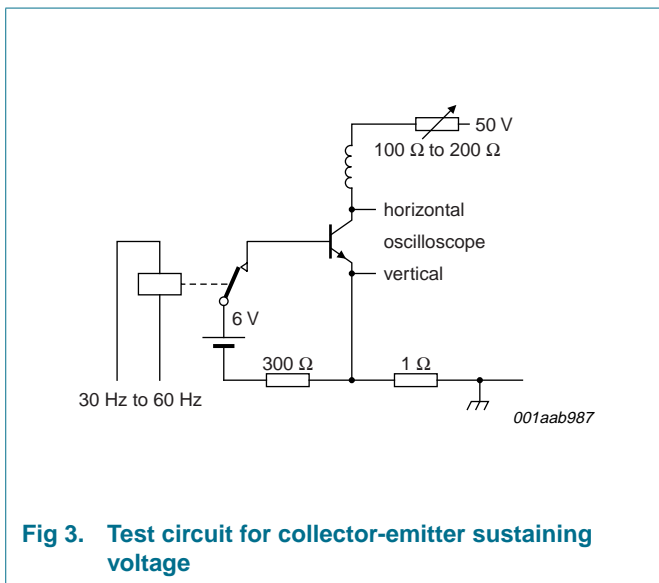
$T_{mb} = 25\text{ }^\circ\text{C}$; unless otherwise specified.

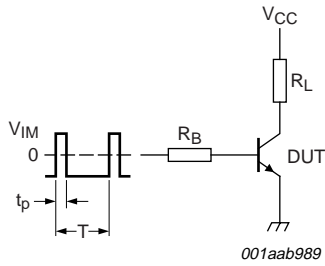
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{CES}	collector-emitter cut-off current	$V_{BE} = 0\text{ V}; V_{CE} = V_{CESMmax}$	[1]	-	-	0.2 mA
		$V_{BE} = 0\text{ V}; V_{CE} = V_{CESMmax}; T_j = 125\text{ }^\circ\text{C}$	[1]	-	-	0.5 mA
I_{CBO}	collector-base cut-off current	$V_{BE} = 0\text{ V}; V_{CE} = V_{CESMmax}$	[1]	-	-	0.2 mA
I_{CEO}	collector-emitter cut-off current	$V_{CEO} = V_{CEOMmax} = 400\text{ V}$	[1]	-	-	0.1 mA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 9\text{ V}; I_C = 0\text{ A}$	-	-	-	1 mA
V_{CE0sus}	collector-emitter sustaining voltage	$I_B = 0\text{ A}; I_C = 10\text{ mA}; L = 25\text{ mH}$; see Figure 3 and 4	400	-	-	V
V_{CEsat}	collector-emitter saturation voltage	$I_C = 4.0\text{ A}; I_B = 0.8\text{ A}$; see Figure 11	-	0.3	1.0	V
V_{BEsat}	base-emitter saturation voltage	$I_C = 4.0\text{ A}; I_B = 0.8\text{ A}$; see Figure 12	-	1.0	1.5	V
h_{FE}	DC current gain	$I_C = 1\text{ mA}; V_{CE} = 5\text{ V}$	10	14	34	
		$I_C = 500\text{ mA}; V_{CE} = 5\text{ V}$; see Figure 10	13	23	36	
h_{FEsat}	DC saturation current gain	$I_C = 4.0\text{ A}; V_{CE} = 5\text{ V}$	8	11	15	

Table 5: Characteristics ...continued
 $T_{mb} = 25\text{ }^{\circ}\text{C}$; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Dynamic characteristics						
Switching times (resistive load); see Figure 5 and 6						
t_{on}	turn-on time	$I_{Con} = 5\text{ A}$; $I_{Bon} = -I_{Boff} = 1\text{ A}$; $R_L = 75\text{ }\Omega$	-	0.65	1	μs
t_{stg}	storage time		-	1.8	2.5	μs
t_f	fall time		-	0.3	0.5	μs
Switching times (inductive load); see Figure 7 and 8						
t_{stg}	storage time	$I_{Con} = 5\text{ A}$; $I_{Bon} = 1\text{ A}$; $L_B = 1\text{ }\mu\text{H}$;	-	1.2	1.7	μs
t_f	fall time	$V_{BB} = -5\text{ V}$	-	20	50	ns
Switching times (inductive load); see Figure 7 and 8						
t_{stg}	storage time	$I_{Con} = 5\text{ A}$; $I_{Bon} = 1\text{ A}$; $L_B = 1\text{ }\mu\text{H}$;	-	1.4	1.9	μs
t_f	fall time	$V_{BB} = -5\text{ V}$; $T_j = 100\text{ }^{\circ}\text{C}$	-	25	100	ns

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





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

Fig 5. Test circuit for resistive load switching

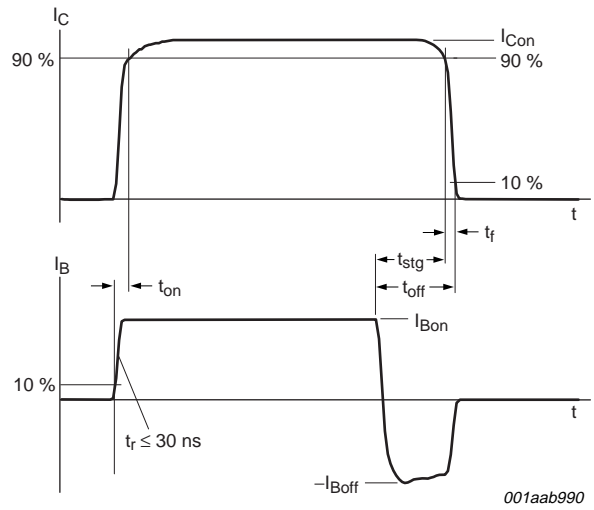
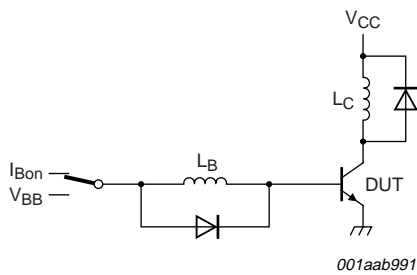


Fig 6. Switching times waveforms for resistive load



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

Fig 7. Test circuit for inductive load switching

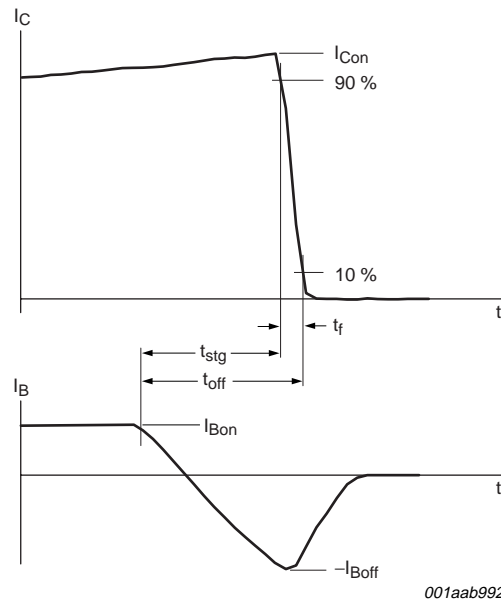


Fig 8. Switching times waveforms for inductive load

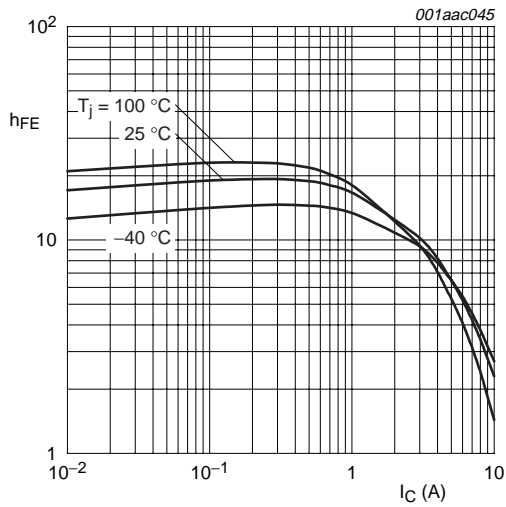


Fig 9. DC current gain as a function of collector current; typical values at $V_{CE} = 1\text{ V}$

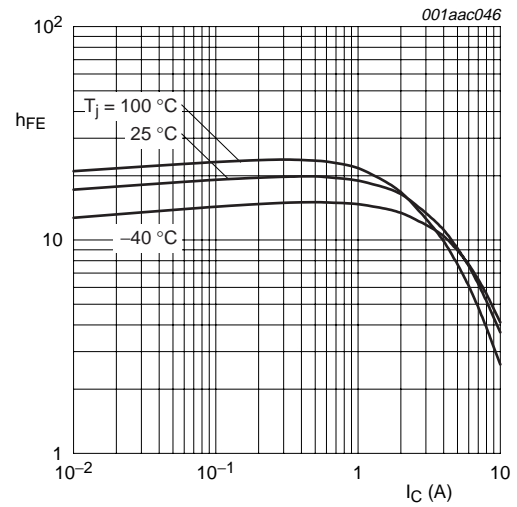


Fig 10. DC current gain as a function of collector current; typical values at $V_{CE} = 5\text{ V}$

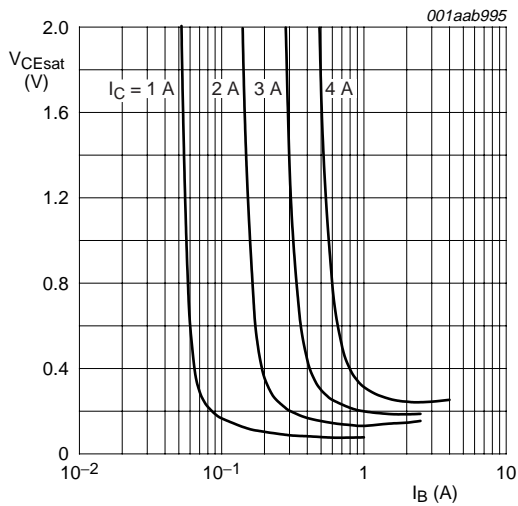


Fig 11. Collector-emitter saturation voltage as a function of base current; typical values
 $T_j = 25\text{ °C}$.

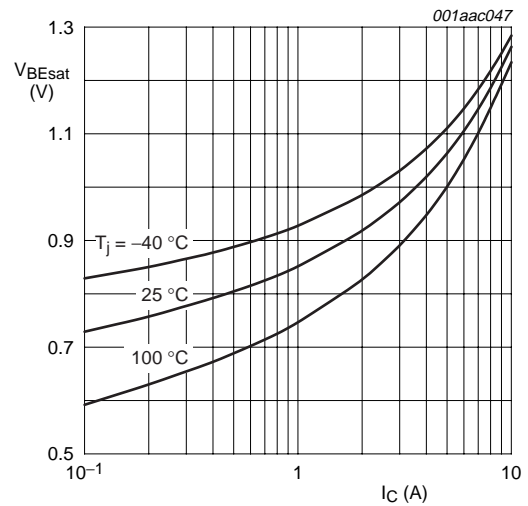
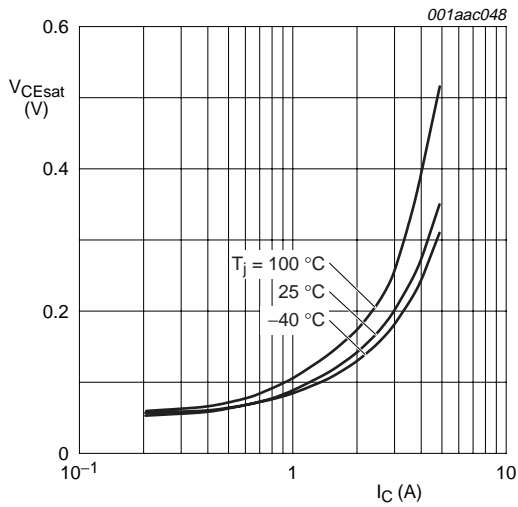
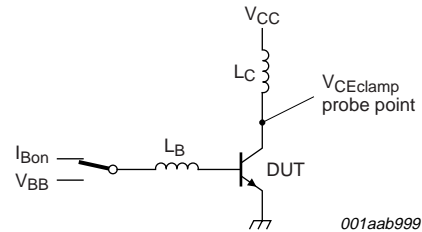


Fig 12. Base-emitter saturation voltage as a function of collector current; typical values
 $I_C/I_B = 4$.



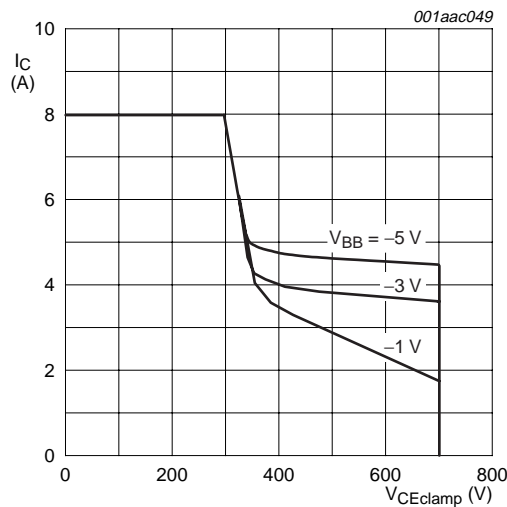
$I_C/I_B = 4$.

Fig 13. Collector-emitter saturation voltage as a function of collector current; typical values



$V_{CEclamp} < 700\text{ V}$; $V_{CC} = 150\text{ V}$; $V_{BB} = -5\text{ V}$, -3 V and -1 V ; $L_B = 1\ \mu\text{H}$; $L_C = 200\ \mu\text{H}$.

Fig 14. Test circuit for reverse bias safe operating area



$T_j < T_{j(max)}$.

Fig 15. Reverse bias safe operating area

7. Package information

Epoxy meets requirements of UL94 V-0 at $1/8$ inch.

8. Package outline

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

SOT428

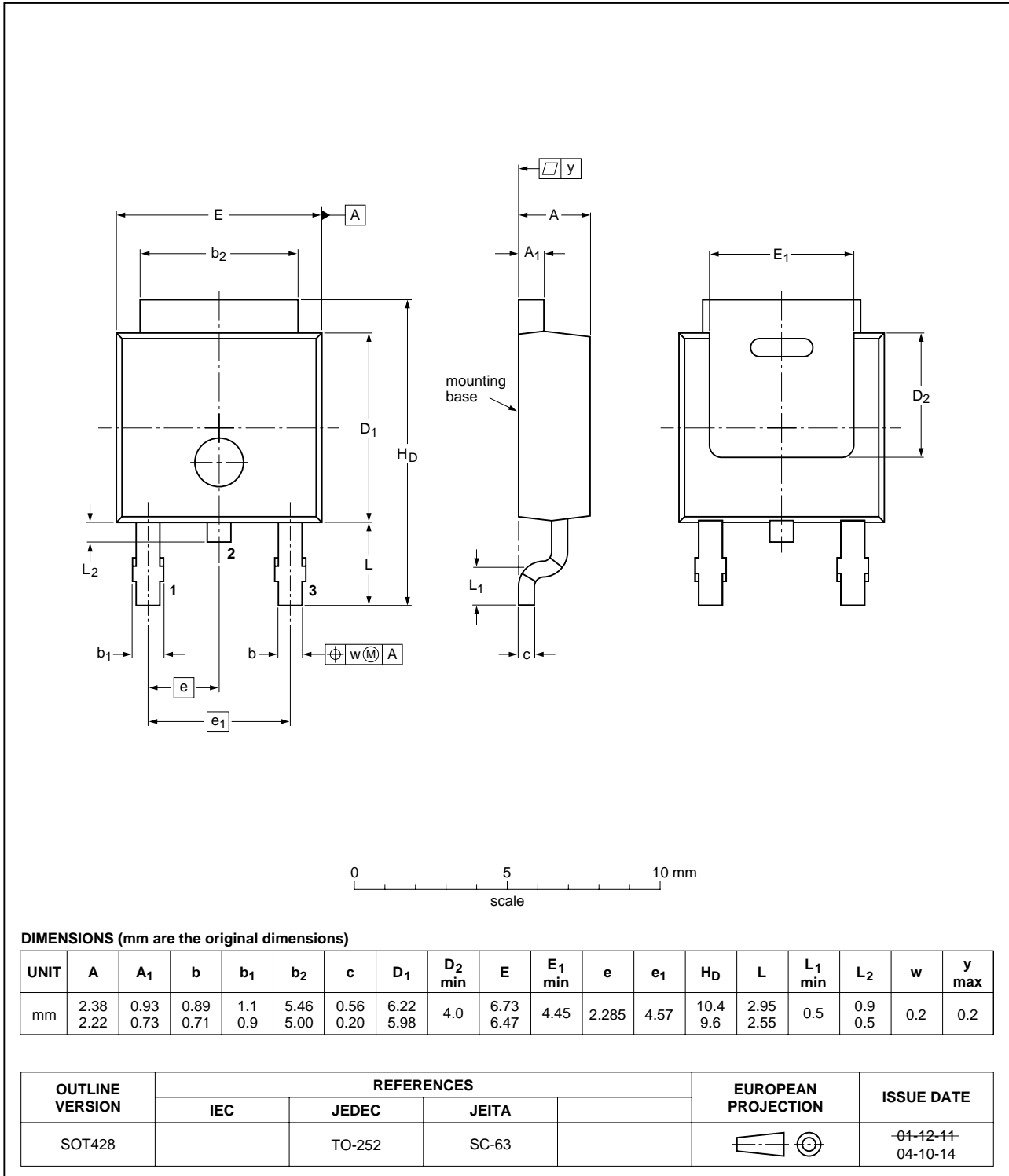
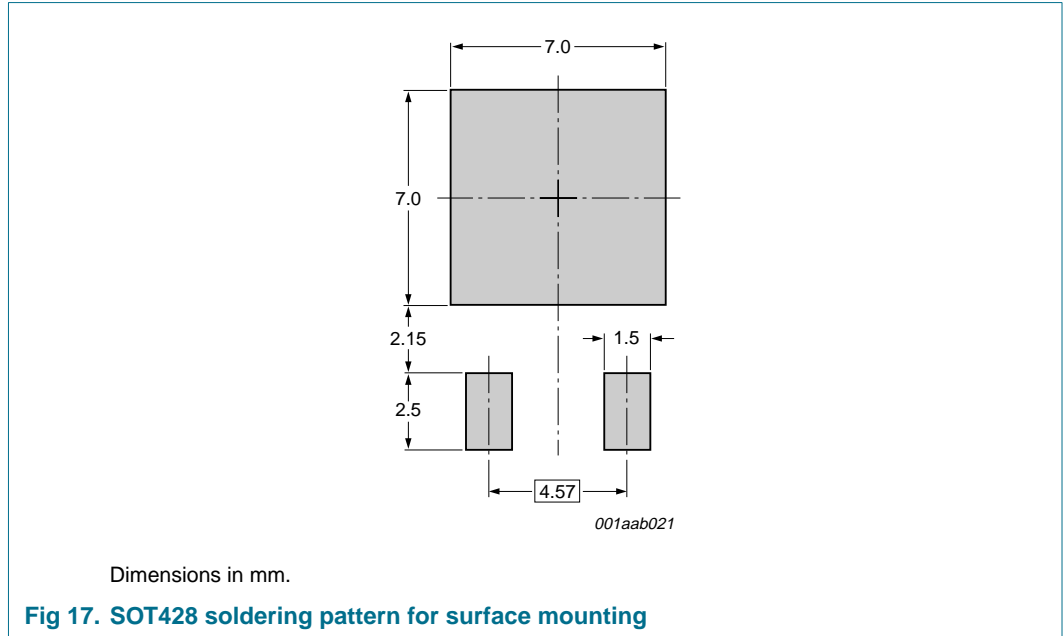


Fig 16. Package outline SOT428 (SC-63)

9. Mounting





10. Revision history

Table 6: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
BUJ105AD_1	20041214	Product data sheet	-	9397 750 14196	-

11. Data sheet status

Level	Data sheet status ^[1]	Product status ^[2] ^[3]	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
III	Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN).

[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

12. Definitions

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

Application information — Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors make no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

13. Disclaimers

Life support — These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Semiconductors customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors for any damages resulting from such application.

Right to make changes — Philips Semiconductors reserves the right to make changes in the products - including circuits, standard cells, and/or software - described or contained herein in order to improve design and/or performance. When the product is in full production (status 'Production'), relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN). Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no license or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified.

14. Contact information

For additional information, please visit: <http://www.semiconductors.philips.com>

For sales office addresses, send an email to: sales.addresses@www.semiconductors.philips.com

15. Contents

1	Product profile	1
1.1	General description	1
1.2	Features	1
1.3	Applications	1
1.4	Quick reference data	1
2	Pinning information	1
3	Ordering information	2
4	Limiting values	2
5	Thermal characteristics	3
6	Characteristics	3
7	Package information	7
8	Package outline	8
9	Mounting	9
10	Revision history	10
11	Data sheet status	11
12	Definitions	11
13	Disclaimers	11
14	Contact information	11



© Koninklijke Philips Electronics N.V. 2004

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Date of release: 14 December 2004
Document number: 9397 750 14196

Published in The Netherlands