

DATA SHEET

BUJ105AB

Silicon Diffused Power Transistor

Product specification

October 2001



Silicon Diffused Power Transistor

BUJ105AB

GENERAL DESCRIPTION

High-voltage, high-speed planar-passivated npn power switching transistor in SOT404 (D²-PAK) surface-mount package intended for use in high frequency electronic lighting ballast applications, converters, inverters, switching regulators, motor control systems, etc.

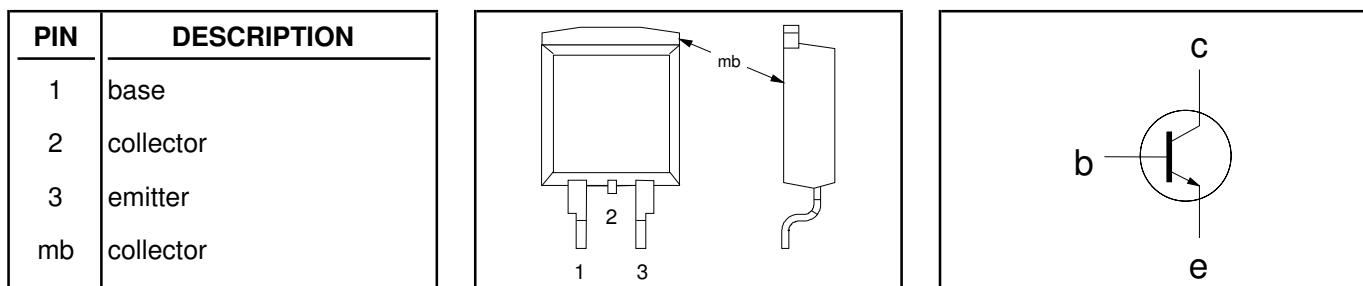
QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_{CESM}	Collector-emitter voltage peak value	$V_{BE} = 0 \text{ V}$	-	700	V
V_{CBO}	Collector-Base voltage (open emitter)	-	700	V	V
V_{CEO}	Collector-emitter voltage (open base)	-	400	V	V
I_C	Collector current (DC)	-	8	A	A
I_{CM}	Collector current peak value	-	16	A	A
P_{tot}	Total power dissipation	$T_{mb} \leq 25 \text{ }^\circ\text{C}$	-	125	W
V_{CEsat}	Collector-emitter saturation voltage	$I_C = 4.0 \text{ A}; I_B = 0.8 \text{ A}$	0.3	1.0	V
h_{FEsat}		$I_C = 4.0 \text{ A}; V_{CE} = 5 \text{ V}$	11	15	V
t_f	Fall time	$I_C = 5 \text{ A}; I_B = 1 \text{ A}$	20	50	ns

PINNING - SOT404

PIN CONFIGURATION

SYMBOL

LIMITING VALUES⁸

Limiting values in accordance with the Absolute Maximum Rating System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CESM}	Collector to emitter voltage	$V_{BE} = 0 \text{ V}$	-	700	V
V_{CEO}	Collector to emitter voltage (open base)	-	400	V	V
V_{CBO}	Collector to base voltage (open emitter)	-	700	V	V
I_C	Collector current (DC)	-	8	A	A
I_{CM}	Collector current peak value	-	16	A	A
I_B	Base current (DC)	-	4	A	A
I_{BM}	Base current peak value	-	8	A	A
P_{tot}	Total power dissipation	$T_{mb} \leq 25 \text{ }^\circ\text{C}$	-	125	W
T_{stg}	Storage temperature	-	-65	150	°C
T_j	Junction temperature	-	-	150	°C

THERMAL RESISTANCES

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
$R_{th j-mb}$	Thermal resistance junction to mounting base		-	1.0	K/W
$R_{th j-a}$	Thermal resistance junction to ambient	minimum footprint, FR4 board	55	-	K/W

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STATIC CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CES}, I_{CBO} I_{CES}	Collector cut-off current ¹	$V_{BE} = 0 \text{ V}; V_{CE} = V_{CESMmax}$ $V_{BE} = 0 \text{ V}; V_{CE} = V_{CESMmax};$ $T_j = 125^\circ\text{C}$	-	-	0.2 0.5	mA mA
I_{CEO} I_{EBO} $V_{CEO}sust$	Collector cut-off current Emitter cut-off current Collector-emitter sustaining voltage	$V_{CEO} = V_{CEOMmax} (400\text{V})$ $V_{EB} = 9 \text{ V}; I_C = 0 \text{ A}$ $I_B = 0 \text{ A}; I_C = 10 \text{ mA};$ $L = 25 \text{ mH}$	- - 400	- - -	0.1 1 -	mA mA V
V_{CEsat} V_{BEsat} h_{FE} h_{FE} h_{FEsat}	Collector-emitter saturation voltage Base-emitter saturation voltage DC current gain	$I_C = 4.0 \text{ A}; I_B = 0.8 \text{ A}$ $I_C = 4.0 \text{ A}; I_B = 0.8 \text{ A}$ $I_C = 1 \text{ mA}; V_{CE} = 5 \text{ V}$ $I_C = 500 \text{ mA}; V_{CE} = 5 \text{ V}$ $I_C = 4.0 \text{ A}; V_{CE} = 5 \text{ V}$	- - 10 13 8	0.3 1.0 14 23 11	1.0 1.5 34 36 15	V V V

DYNAMIC CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
t_{on} t_s t_f	Switching times (resistive load) Turn-on time Turn-off storage time Turn-off fall time	$I_{Con} = 5 \text{ A}; I_{Bon} = -I_{Boff} = 1 \text{ A};$ $R_L = 75 \text{ ohms}; V_{BB2} = 4 \text{ V};$	0.65 1.8 0.3	1 2.5 0.5	μs μs μs
t_s t_f	Switching times (inductive load) Turn-off storage time Turn-off fall time	$I_{Con} = 5 \text{ A}; I_{Bon} = 1 \text{ A}; L_B = 1 \mu\text{H};$ $-V_{BB} = 5 \text{ V}$	1.2 20	1.7 50	μs ns
t_s t_f	Switching times (inductive load) Turn-off storage time Turn-off fall time	$I_{Con} = 5 \text{ A}; I_{Bon} = 1 \text{ A}; L_B = 1 \mu\text{H};$ $-V_{BB} = 5 \text{ V}; T_j = 100^\circ\text{C}$	1.4 25	1.9 100	μs ns

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

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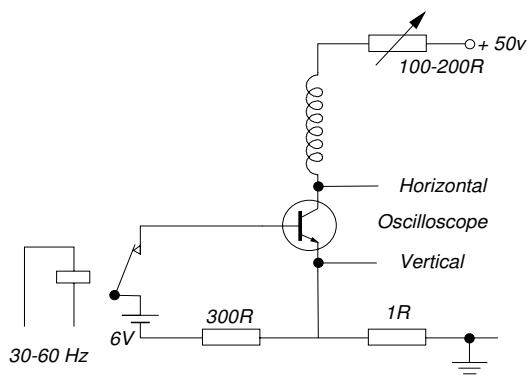
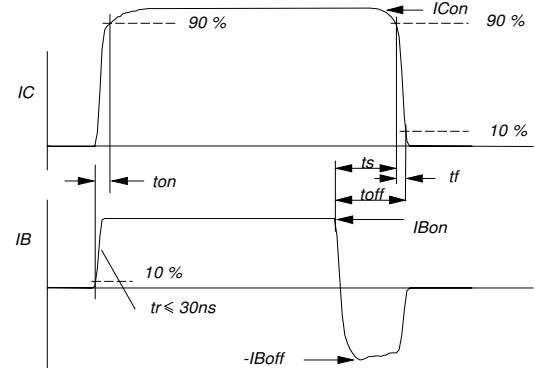
Fig.1. Test circuit for V_{CEO}^{sust} .

Fig.4. Switching times waveforms with resistive load.

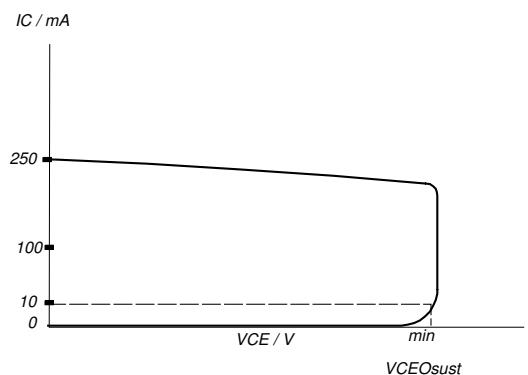
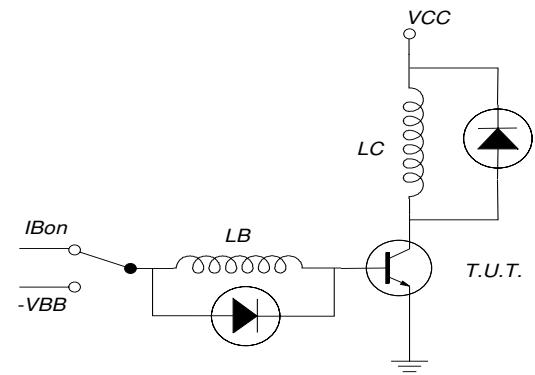
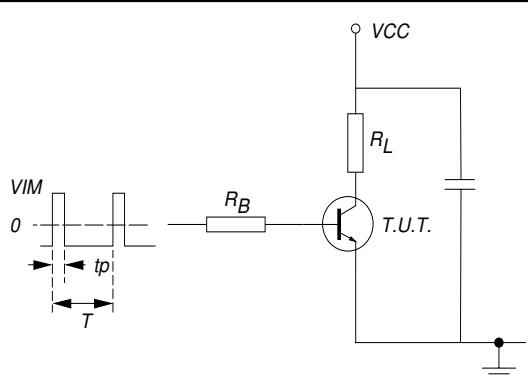
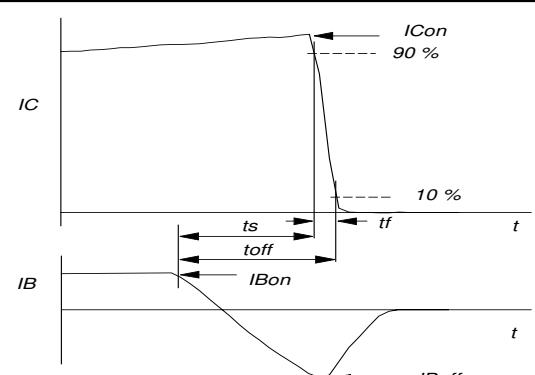
Fig.2. Oscilloscope display for V_{CEO}^{sust} .Fig.5. Test circuit inductive load.
 $V_{CC} = 300 \text{ V}$; $-V_{BE} = 5 \text{ V}$; $L_C = 200 \mu\text{H}$; $L_B = 1 \mu\text{H}$ Fig.3. Test circuit resistive load. $V_{IM} = -6 \text{ to } +8 \text{ V}$
 $V_{CC} = 250 \text{ V}$; $t_p = 20 \mu\text{s}$; $\delta = t_p/T = 0.01$.
 R_B and R_L calculated from I_{Con} and I_{Bon} requirements.

Fig.6. Switching times waveforms with inductive load.

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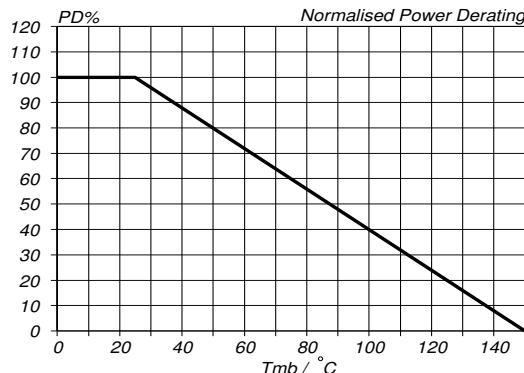


Fig.7. Normalised power dissipation.
 $PD\% = 100 \cdot PD/PD_{25^\circ C} = f(T_{mb})$

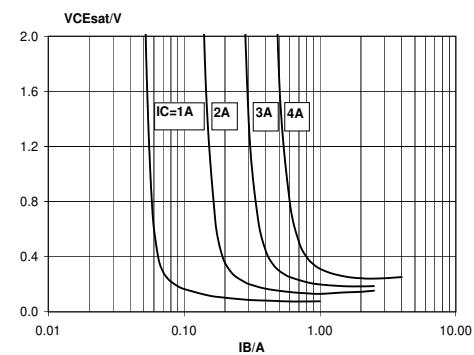


Fig.10. Collector-Emitter saturation voltage.
Solid lines = typ values, $V_{CEsat} = f(IB)$; $T_j=25^\circ C$.

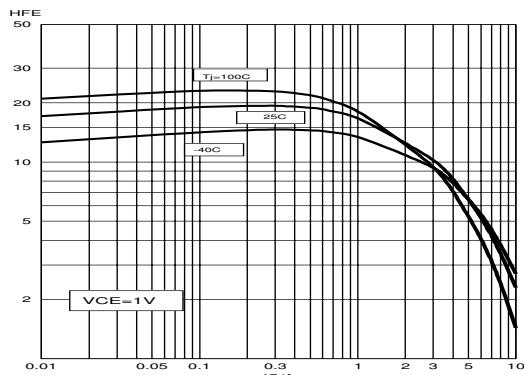


Fig.8. Typical DC current gain. $h_{FE} = f(I_C)$
parameter $V_{CE} = 1V$

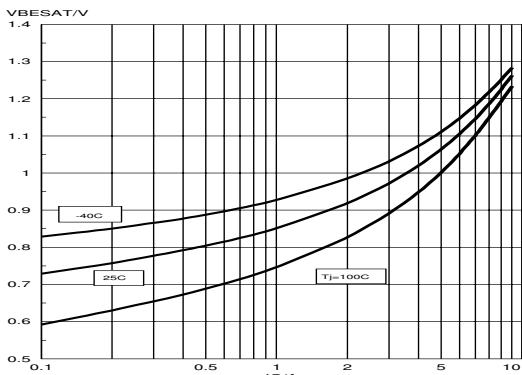


Fig.11. Base-Emitter saturation voltage.
Solid lines = typ values, $V_{BEsat} = f(IC)$; at $IC/IB = 4$.

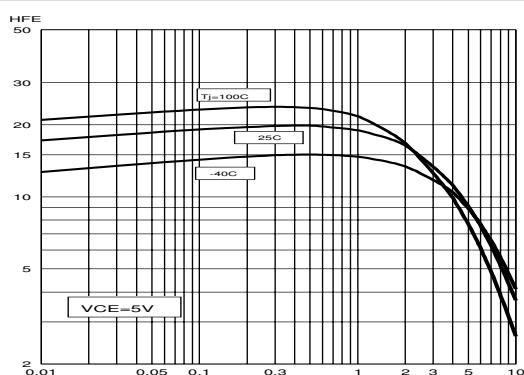


Fig.9. Typical DC current gain. $h_{FE} = f(I_C)$
parameter $V_{CE} = 5V$

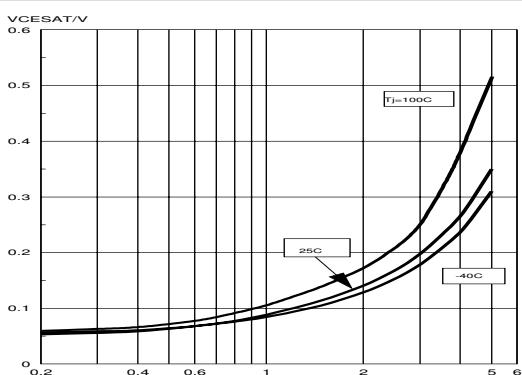


Fig.12. Collector-Emitter saturation voltage.
Solid lines = typ values, $V_{CEsat} = f(IC)$; at $IC/IB = 4$.

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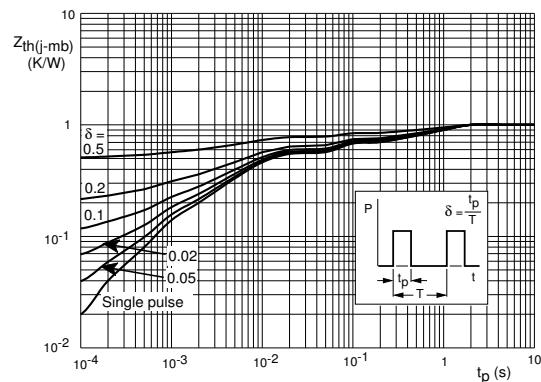


Fig.13. Transient thermal impedance.
 $Z_{th(j\text{-mb})} = f(t)$; parameter $\delta = t_p/T$

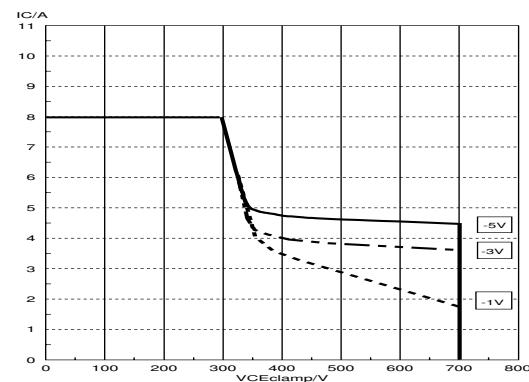


Fig.15. Reverse bias safe operating area ($T_j < T_{jmax}$)
for $-V_{BE} = 5V, 3V$ & $1V$.

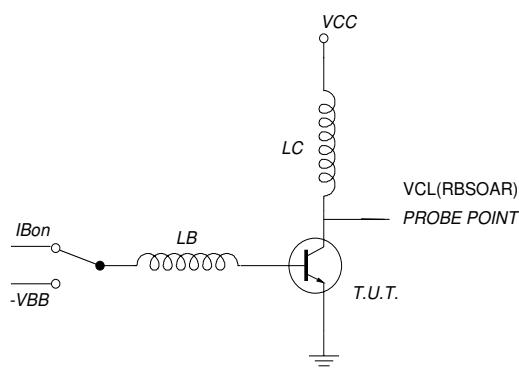


Fig.14. Test circuit for reverse bias safe operating area.

$V_{clamp} < 700V$; $V_{cc} = 150V$; $-V_{be} = 5V, 3V$ & $1V$;
 $L_B = 1\mu H$; $L_C = 200\mu H$.

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MECHANICAL DATA

Dimensions in mm

Net Mass: 1.4 g

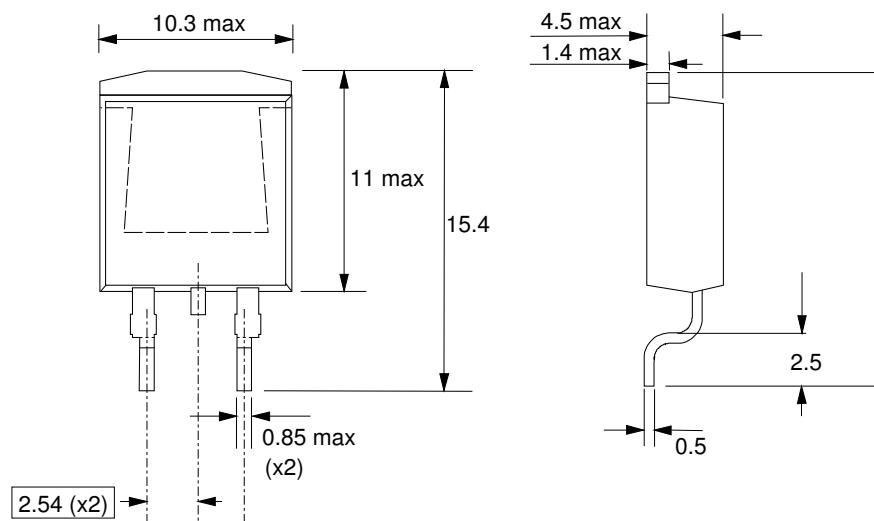


Fig.16. SOT404 : centre pin connected to mounting base.

MOUNTING INSTRUCTIONS

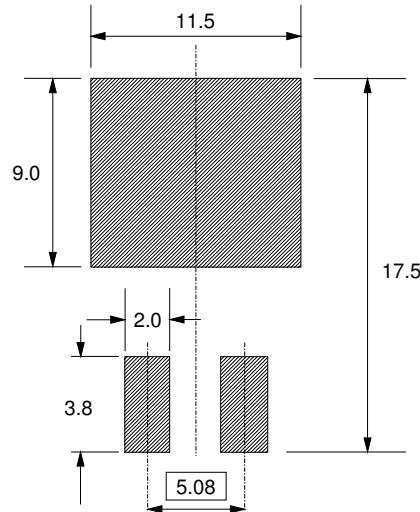
Dimensions in mm

Fig.17. SOT404 : soldering pattern for surface mounting.

Notes

1. Plastic meets UL94 V0 at 1/8".

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DATA SHEET STATUS

DOCUMENT STATUS ⁽¹⁾	PRODUCT STATUS ⁽²⁾	DEFINITION
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Preliminary data sheet	Qualification	This document contains data from the preliminary specification.
Product data sheet	Production	This document contains the product specification.

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