Silicon Diffused Power Transistor — BUJ100B

GENERAL DESCRIPTION

High-voltage, high-speed planar-passivated npn power switching transistor in the SOT54 (TO92) envelope intended for use in high frequency electronic lighting ballast applications, converters and inverters, etc.

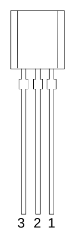
QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_{CESM}	Collector-emitter voltage peak value	V_{BE} = 0 V	-	700	V
V_{CBO}	Collector-Base voltage (open emitter)		-	700	V
V_{CEO}	Collector-emitter voltage (open base)		-	350	V
I_C	Collector current (DC)		-	1.0	A
I_{CM}	Collector current peak value		-	2.0	A
P_{tot}	Total power dissipation	$T_{lead} \leq 25$ ˚C	-	2.0	W
V_{CEsat}	Collector-emitter saturation voltage	I_C = 1.0 A;I_B = 0.2 A	0.27	1.0	V
h_{FE}		I_C = 1.0 A; V_{CE} = 5 V	12	19	
t_{fi}	Fall time (Inductive)	I_C = 1.0 A; I_{B1}= 0.2 A	56	76	ns

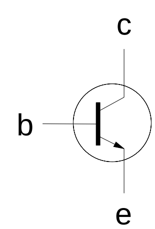
PINNING - SOT54 (TO92)

PIN	DESCRIPTION
1	Base
2	Collector
3	Emitter

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

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 V	-	700	V
V_{CEO}	Collector to emitter voltage (open base)		-	350	V
V_{CBO}	Collector to base voltage (open emitter)		-	700	V
I_C	Collector current (DC)		-	1.0	A
I_{CM}	Collector current peak value		-	2.0	A
I_B	Base current (DC)		-	0.5	A
I_{BM}	Base current peak value		-	1.0	A
P_{tot}	Total power dissipation	$T_{mb} \leq 25$ ˚C	-	2.0	W
T_{stg}	Storage temperature		-65	150	˚C
T_j	Junction temperature		-	150	˚C

THERMAL RESISTANCES

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
$R_{th\ j-lead}$	Thermal resistance junction to lead		-	60	K/W
$R_{th\ j-a}$	Thermal resistance junction to ambient	pcb mounted; lead length = 4 mm	150	-	K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CES},I_{CBO}	Collector cut-off current [1]	V_{BE} = 0 V; V_{CE} = $V_{CESMmax}$	-	0.8	100	µA
I_{CES}		V_{BE} = 0 V; V_{CE} = $V_{CESMmax}$; T_j = 125 ˚C	-	2.0	500	µA
I_{CEO}	Collector cut-off current [1]	V_{CEO} = $V_{CEOMmax}$ (350V)	-	-	100	µA
I_{EBO}	Emitter cut-off current	V_{EB} = 9 V; I_C = 0 A	-	0.05	100	µA
$V_{CEOsust}$	Collector-emitter sustaining voltage	I_B = 0 A; I_C = 10 mA; L = 25 mH	350	-	-	V
V_{CEsat}	Collector-emitter saturation voltage	I_C = 1 A; I_B = 0.2 A	-	0.27	1.0	V
V_{BEsat}	Base-emitter saturation voltage	I_C = 1 A; I_B = 0.2 A	-	1.03	1.3	V
h_{FE}	DC current gain	I_C = 1mA; V_{CE} = 5 V	17	23	-	
h_{FE}		I_C = 100mA; V_{CE} = 5 V	19	30	46	
h_{FE}		I_C = 1.0 A; V_{CE} = 5 V	9	12	19	

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
	Switching times (resistive load)	I_{Con} = 1.0 A; I_{Bon} = -I_{Boff} = 0.2 A; R_L = 75 ohms; V_{BB2} = 4V;			
t_{on}	Turn-on time		1.0	1.28	µs
t_s	Turn-off storage time		1.95	2.61	µs
t_f	Turn-off fall time		0.22	0.30	µs
	Switching times (inductive load)	I_{Con} = 1.0 A; I_{Bon} = 0.2 A; L_B = 1 µH; -V_{BB} = 5 V			
t_{si}	Turn-off storage time		0.55	0.74	µs
t_{fi}	Turn-off fall time		56	76	ns
	Switching times (inductive load)	I_{Con} = 1.0 A; I_{Bon} = 0.2 A; L_B = 1 µH; -V_{BB} = 5 V; T_j = 100 ˚C			
t_{si}	Turn-off storage time		-	1.5	µs
t_{fi}	Turn-off fall time		-	140	ns

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

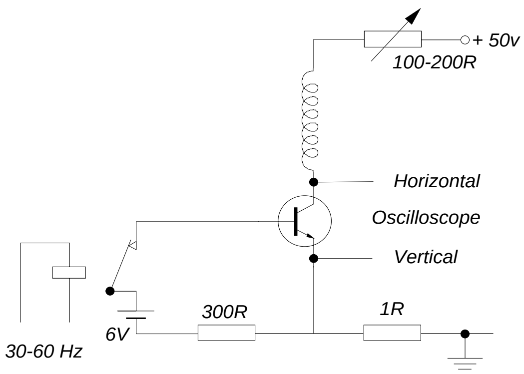


Fig.1. Test circuit for $V_{CEOsust}$.

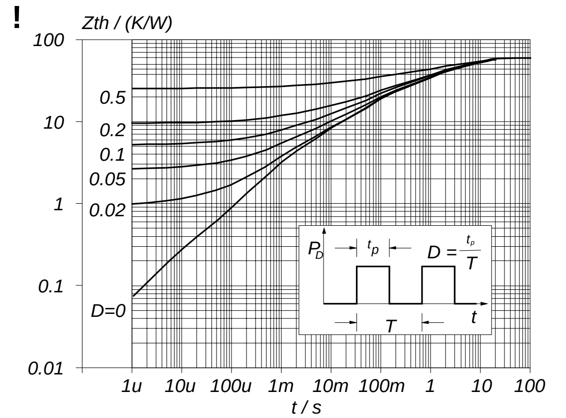


Fig.4. Transient thermal impedance.
$Zth_{j\text{-}lead} = f(t)$; parameter $D = t_p/T$

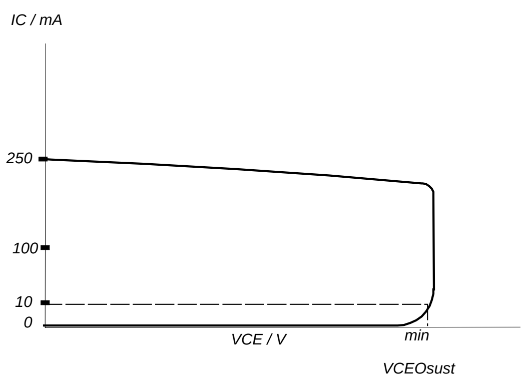


Fig.2. Oscilloscope display for $V_{CEOsust}$.

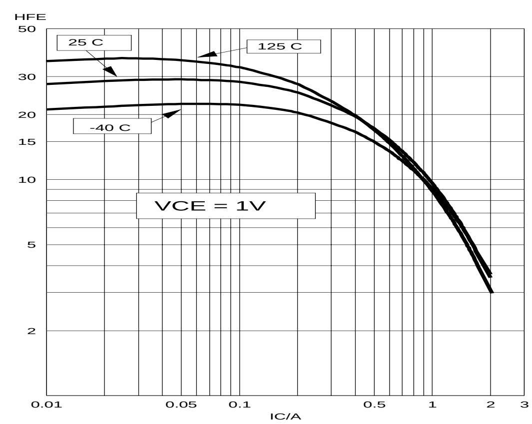


Fig.5. Typical DC current gain. $h_{FE} = f(I_C)$
parameter V_{CE}

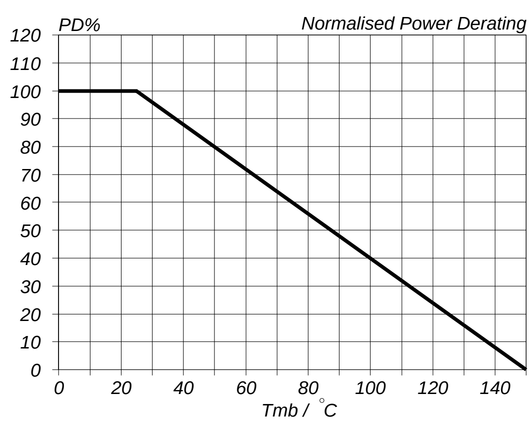


Fig.3. Normalised power dissipation.
$PD\% = 100 \cdot PD/PD_{25^\circ C} = f(T_{mb})$

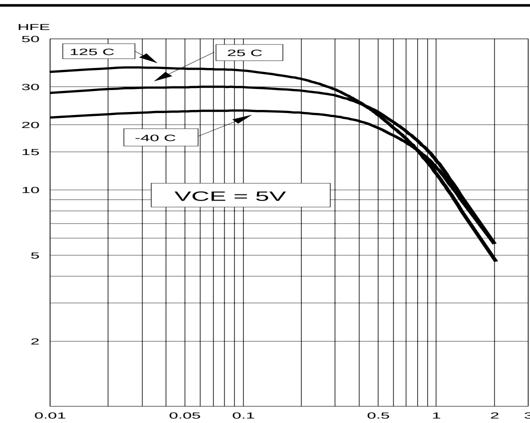


Fig.6. Typical DC current gain. $h_{FE} = f(I_C)$
parameter V_{CE}

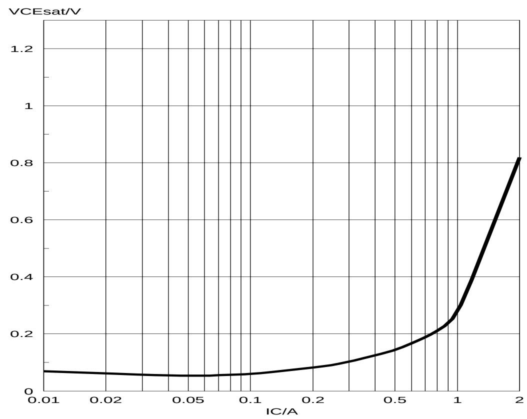


Fig.7. Collector-Emitter saturation voltage.
Solid Lines = typ values, $I_C/I_B = 3$

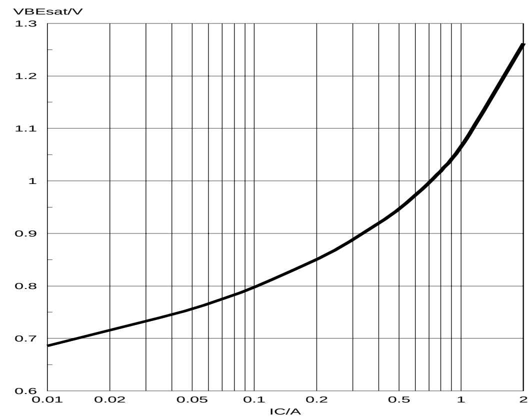


Fig.8. Base-Emitter saturation voltage.
Solid Lines = typ values, $I_C/I_B = 3$

INDUCTIVE SWITCHING

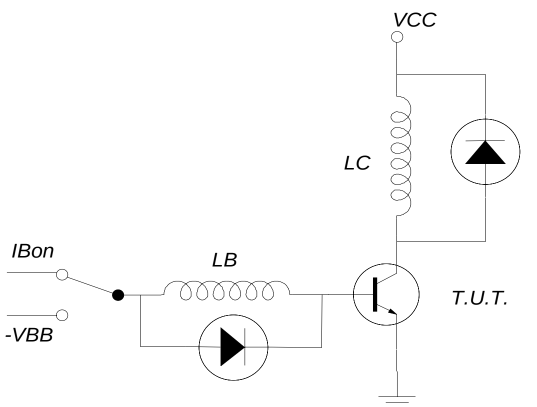


Fig.9. Test circuit inductive load.
V_{CC} = 300 V; -V_{BE} = 5 V, L_C = 200 µH; L_B = 1 µH

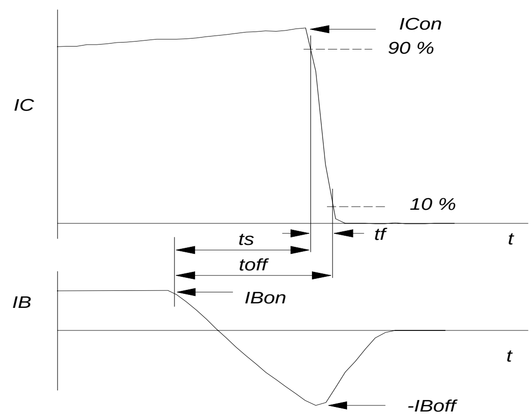


Fig.10. Switching times waveforms with inductive load.

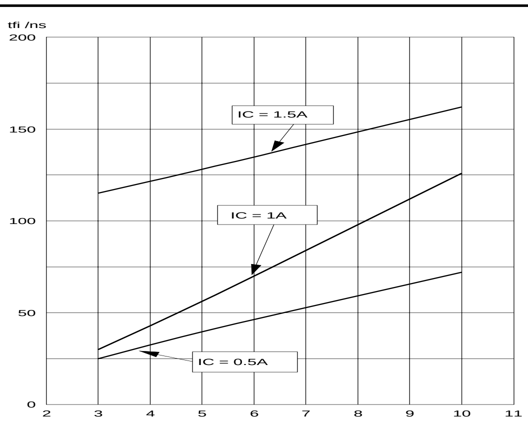


Fig.11. Inductive switching.
tfi = f(h_{FE})

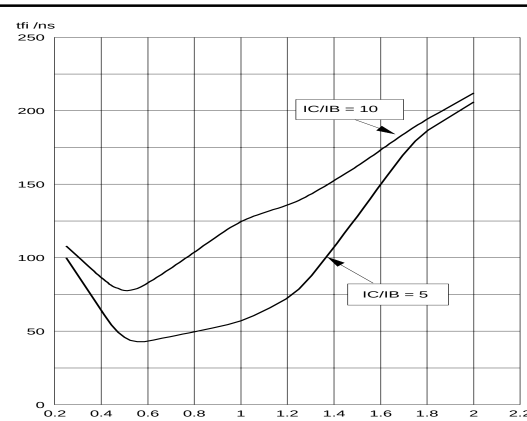


Fig.12. Inductive switching.
tfi = f(I_C)

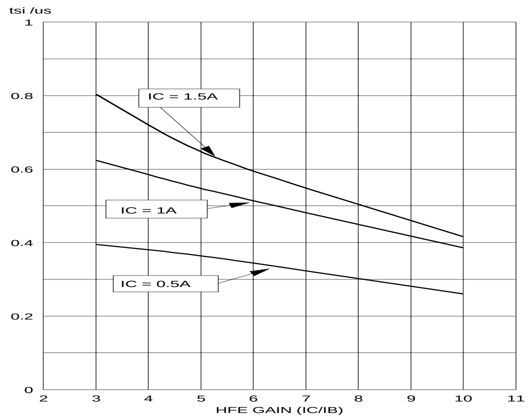


Fig.13. Inductive switching.
tsi = f(h_{FE})

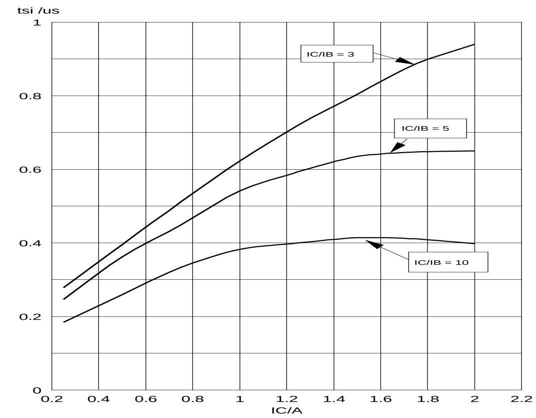


Fig.14. Inductive switching.
tsi = f(I_C)

RESISTIVE SWITCHING

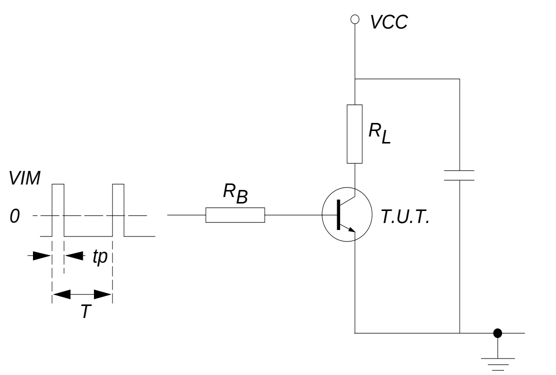


Fig.15. Test circuit resistive load. V_{IM} = -6 to +8 V
V_{CC} = 250 V; t_p = 20 μs; δ = t_p / T = 0.01.
R_B and R_L calculated from I_{Con} and I_{Bon} requirements.

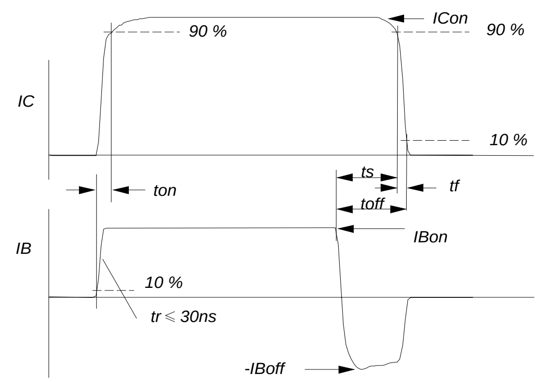


Fig.16. Switching times waveforms with resistive load.

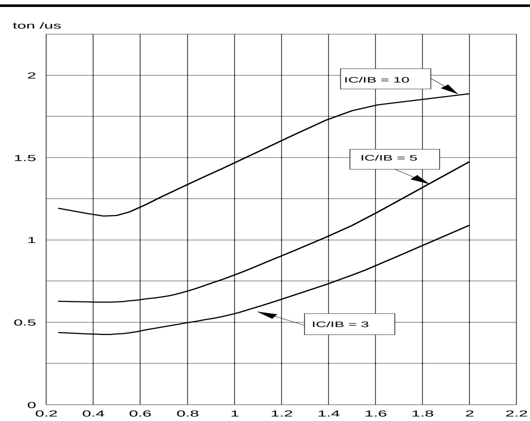


Fig.17. Resistive switching.
ton = f(I_C)

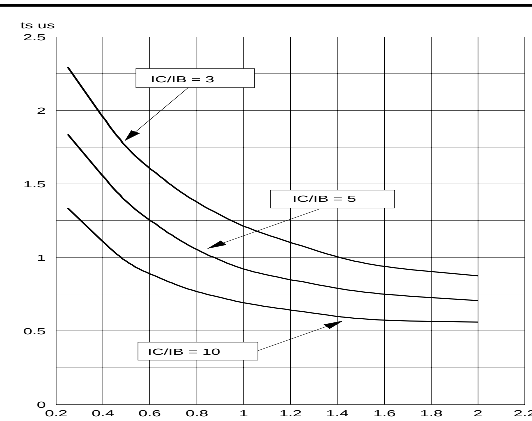


Fig.18. Resistive switching.
ts = f(I_C)

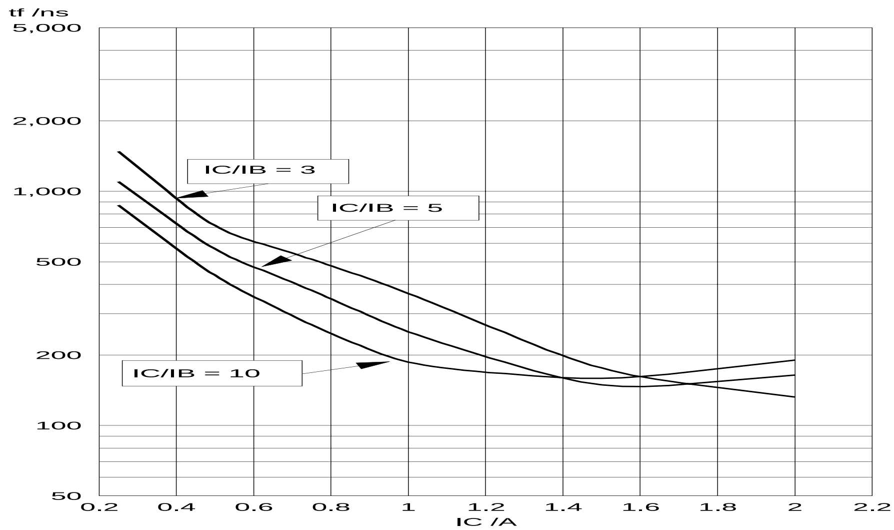


Fig.19. Resistive switching.
tf = f(I_C)

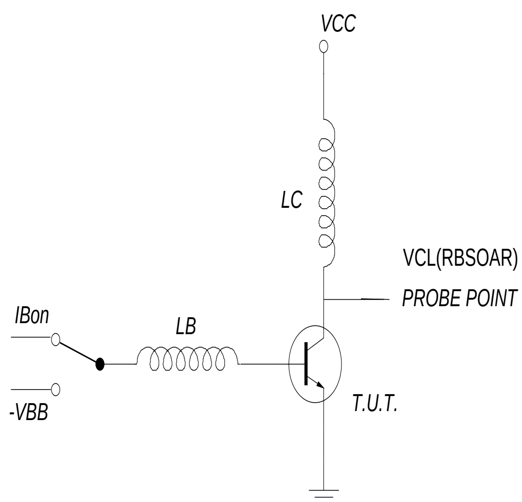


Fig.20. Test Circuit for the RBSOA test.
$V_{cl} \leq 700V$; $V_{cc} = 150V$; $L_B = 1\mu H$; $L_c = 200\mu H$

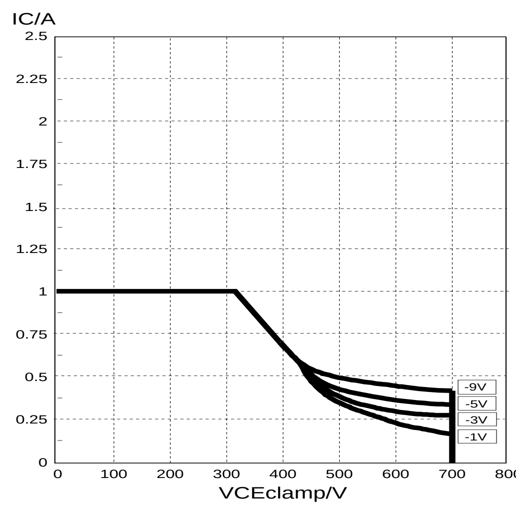
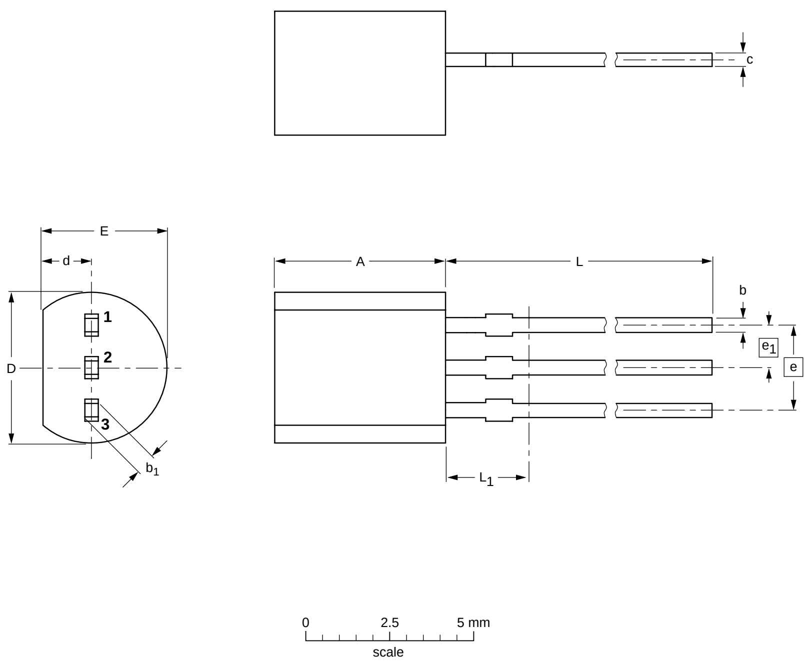


Fig.21. Reverse bias safe operating area $T_j \leq T_{jmax}$
for $-V_{BE}$ = 9V, 5V,3V & 1V

MECHANICAL DATA

Plastic single-ended leaded (through hole) package; 3 leads **SOT54**



DIMENSIONS (mm are the original dimensions)

UNIT	A	b	b_1	c	D	d	E	e	e_1	L	L_1(1)
mm	5.2 5.0	0.48 0.40	0.66 0.56	0.45 0.40	4.8 4.4	1.7 1.4	4.2 3.6	2.54	1.27	14.5 12.7	2.5

Note

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT54		TO-92	SC-43			97-02-28

Fig.22. TO92 ; plastic envelope; Net Mass: 0.2 g

Notes

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

DEFINITIONS

DATA SHEET STATUS		
DATA SHEET STATUS[2]	**PRODUCT STATUS**[3]	**DEFINITIONS**
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
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 ordere to improve the design and supply the best possible product
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. Changes will be communicated according to the Customer Product/Process Change Notification (CPCN) procedure SNW-SQ-650A

Limiting values

Limiting values are given in accordance with the Absolute Maximum Rating System (IEC 134). 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 this specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

Application information

Where application information is given, it is advisory and does not form part of the specification.

LIFE SUPPORT APPLICATIONS

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

2 Please consult the most recently issued datasheet before initiating or completing a design.

3 The product status of the device(s) described in this datasheet may have changed since this datasheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.