

# DATA SHEET

**BUJ103AX**

Silicon Diffused Power Transistor

Product specification

August 1998



## Silicon Diffused Power Transistor

## BUJ103AX

## GENERAL DESCRIPTION

High-voltage, high-speed planar-passivated npn power switching transistor in a plastic full-pack envelope intended for use in high frequency electronic lighting ballast applications, converters, inverters, switching regulators, motor control systems, etc.

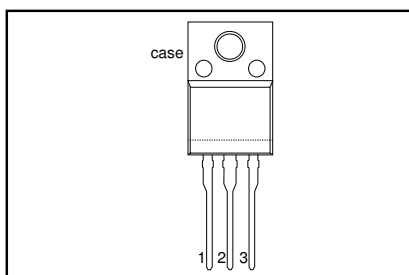
## QUICK REFERENCE DATA

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
$V_{CEO}$	Collector-emitter voltage (open base)		-	400	V
$I_C$	Collector current (DC)		-	4	A
$I_{CM}$	Collector current peak value		-	8	A
$P_{tot}$	Total power dissipation	$T_{hs} \leq 25\text{ °C}$	-	26	W
$V_{CEsat}$	Collector-emitter saturation voltage	$I_C = 3\text{ A}; V_{CE} = 5\text{ V}$	0.25	1.0	V
$h_{FEsat}$	DC current gain	$I_C = 2\text{ A}, I_{B1} = 0.4\text{ A}$	12.5	-	
$t_f$	Fall time		33	80	ns

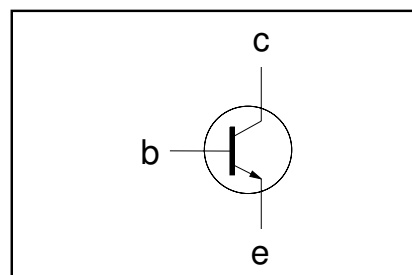
## PINNING - SOT186A

PIN	DESCRIPTION
1	base
2	collector
3	emitter
case	isolated

## 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	$V_{BE} = 0\text{ V}$	-	700	V
$V_{CEO}$	Collector to emitter voltage (open base)		-	400	V
$V_{CBO}$	Collector to base voltage (open emitter)		-	700	V
$I_C$	Collector current (DC)		-	4	A
$I_{CM}$	Collector current peak value		-	8	A
$I_B$	Base current (DC)		-	2	A
$I_{BM}$	Base current peak value		-	4	A
$P_{tot}$	Total power dissipation	$T_{hs} \leq 25\text{ °C}$	-	26	W
$T_{stg}$	Storage temperature		-65	150	°C
$T_j$	Junction temperature		-	150	°C

## THERMAL RESISTANCES

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
$R_{th\ j-hs}$	Junction to heatsink	with heatsink compound	-	4.8	K/W
$R_{th\ j-a}$	Junction to ambient	in free air	55	-	K/W

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## ISOLATION LIMITING VALUE &amp; CHARACTERISTIC

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol}$	R.M.S. isolation voltage from all three terminals to external heatsink	$f = 50\text{--}60\text{ Hz}$ ; sinusoidal waveform; $R.H. \leq 65\%$ ; clean and dustfree	-		2500	V
$C_{isol}$	Capacitance from T2 to external heatsink	$f = 1\text{ MHz}$	-	10	-	pF

## STATIC CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_{CES}$	Collector cut-off current <sup>1</sup>	$V_{BE} = 0\text{ V}$ ; $V_{CE} = V_{CESMmax}$	-	-	1.0	mA
$I_{CES}$		$V_{BE} = 0\text{ V}$ ; $V_{CE} = V_{CESMmax}$	-	-	2.0	mA
$I_{CBO}$	Collector cut-off current <sup>1</sup>	$V_{CBO} = V_{CESMmax}(700\text{V})$	-	-	0.1	mA
$I_{CEO}$		$V_{CEO} = V_{CEOMmax}(400\text{V})$	-	-	0.1	mA
$I_{EBO}$	Emitter cut-off current	$V_{EB} = 7\text{ V}$ ; $I_C = 0\text{ A}$	-	-	0.1	mA
$V_{CEOsust}$	Collector-emitter sustaining voltage	$I_B = 0\text{ A}$ ; $I_C = 10\text{ mA}$ ; $L = 25\text{ mH}$	400	-	-	V
$V_{CEsat}$	Collector-emitter saturation voltage	$I_C = 3.0\text{ A}$ ; $I_B = 0.6\text{ A}$	-	0.25	1.0	V
$V_{BEsat}$	Base-emitter saturation voltage	$I_C = 3.0\text{ A}$ ; $I_B = 0.6\text{ A}$	-	0.97	1.5	V
$h_{FE}$	DC current gain	$I_C = 1\text{ mA}$ ; $V_{CE} = 5\text{ V}$	10	17	32	
$h_{FE}$	DC current gain	$I_C = 0.5\text{ A}$ ; $V_{CE} = 5\text{ V}$	12	20	32	
$h_{FEsat}$		$I_C = 2\text{ A}$ ; $V_{CE} = 5\text{ V}$	13.5	16	20	
		$I_C = 3\text{ A}$ ; $V_{CE} = 5\text{ V}$	-	12.5	-	

## DYNAMIC CHARACTERISTICS

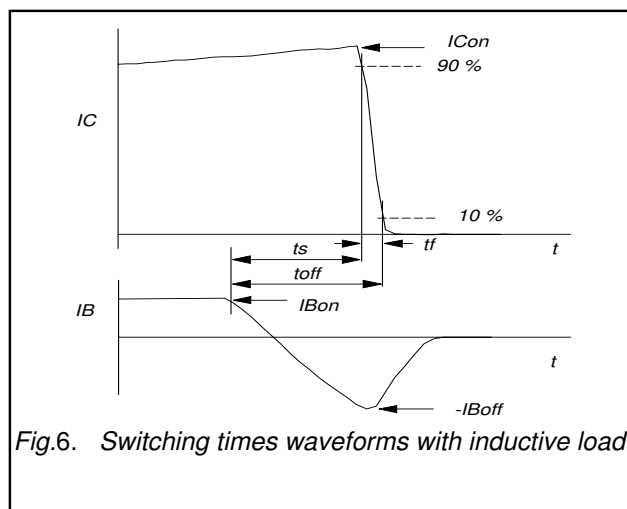
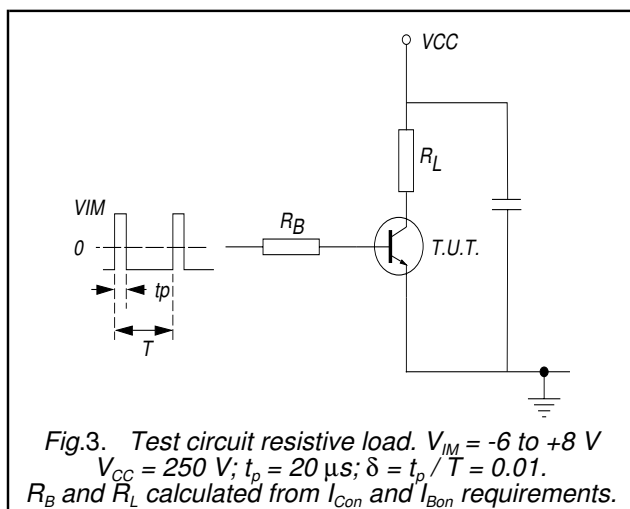
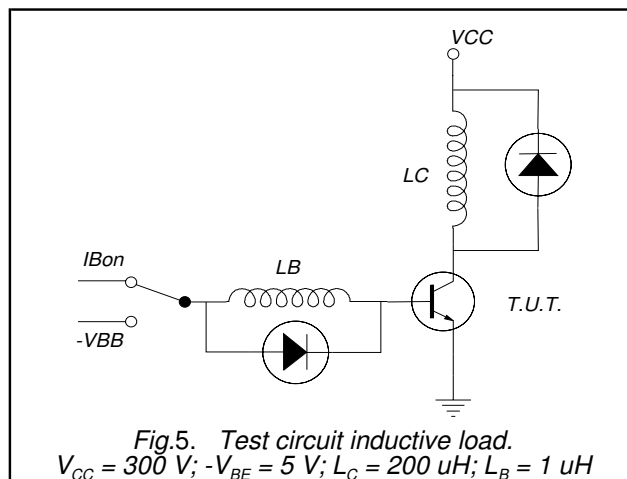
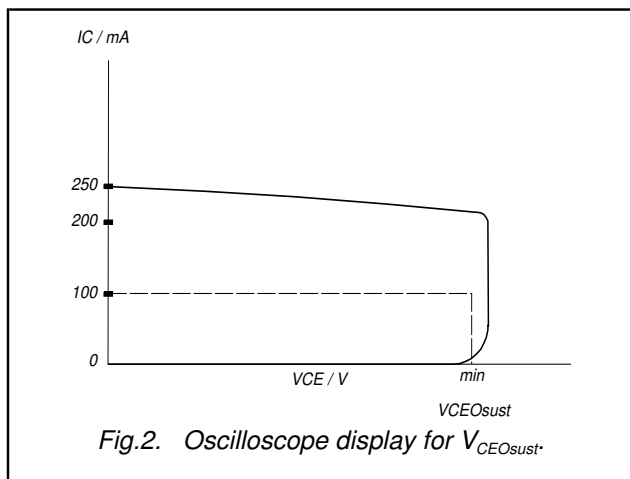
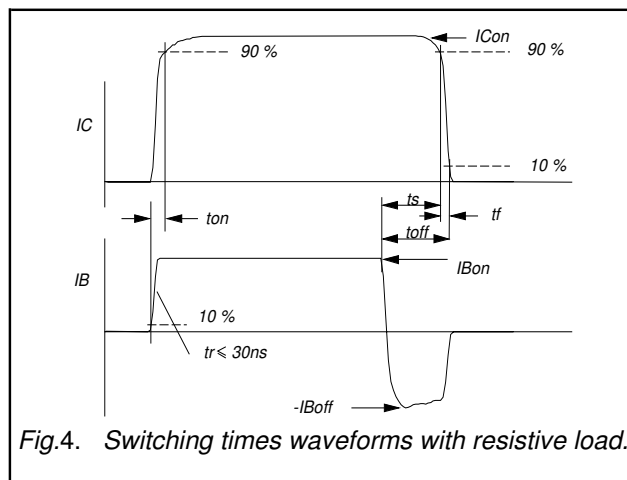
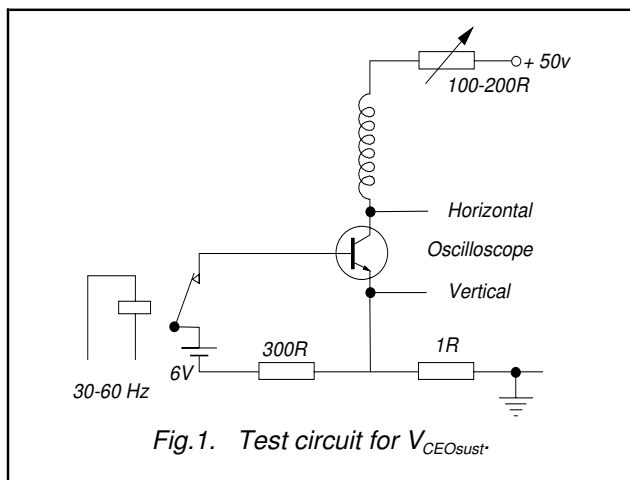
 $T_{hs} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
	Switching times (resistive load)	$I_{Con} = 2.5\text{ A}$ ; $I_{Bon} = -I_{Boff} = 0.5\text{ A}$ ; $R_L = 75\text{ ohms}$ ; $V_{BB2} = 4\text{ V}$ ;			
$t_{on}$	Turn-on time		0.52	0.6	$\mu\text{s}$
$t_s$	Turn-off storage time		2.7	3.2	$\mu\text{s}$
$t_f$	Turn-off fall time		0.3	0.43	$\mu\text{s}$
	Switching times (inductive load)	$I_{Con} = 2\text{ A}$ ; $I_{Bon} = 0.4\text{ A}$ ; $L_B = 1\text{ }\mu\text{H}$ ; $-V_{BB} = 5\text{ V}$			
$t_s$	Turn-off storage time		1.2	1.33	$\mu\text{s}$
$t_f$	Turn-off fall time		33	80	ns
	Switching times (inductive load)	$I_{Con} = 2\text{ A}$ ; $I_{Bon} = 0.4\text{ A}$ ; $L_B = 1\text{ }\mu\text{H}$ ; $-V_{BB} = 5\text{ V}$ ; $T_j = 100\text{ }^{\circ}\text{C}$			
$t_s$	Turn-off storage time		-	1.8	$\mu\text{s}$
$t_f$	Turn-off fall time		-	200	ns

<sup>1</sup> Measured with half sine-wave voltage (curve tracer).

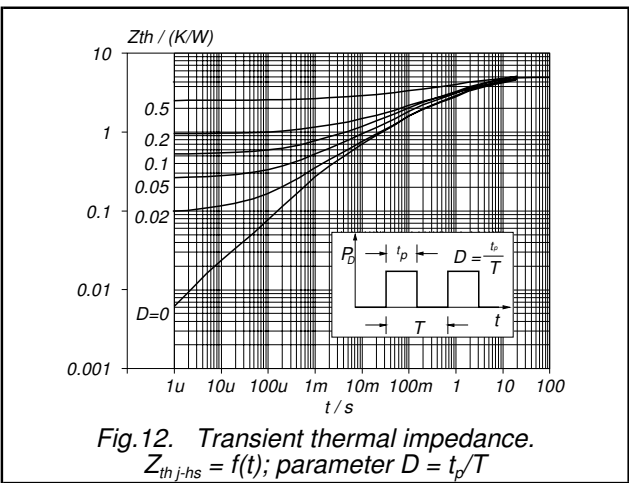
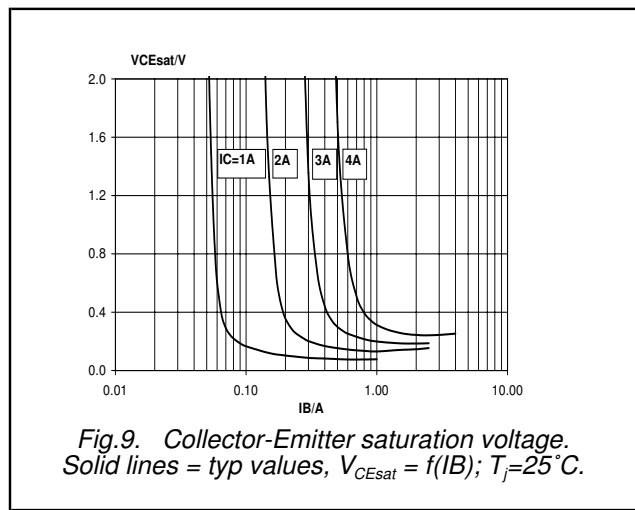
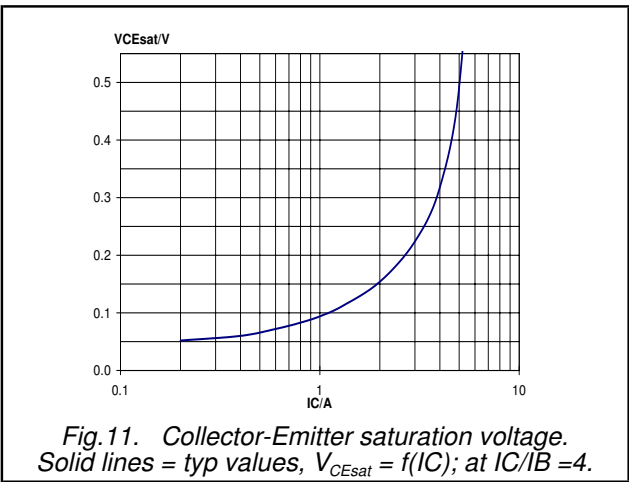
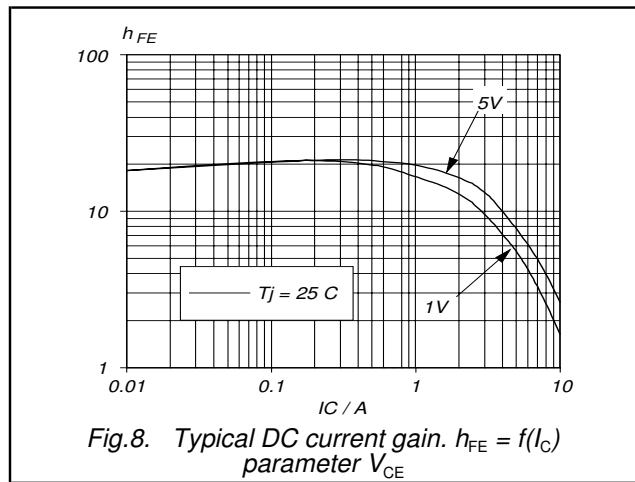
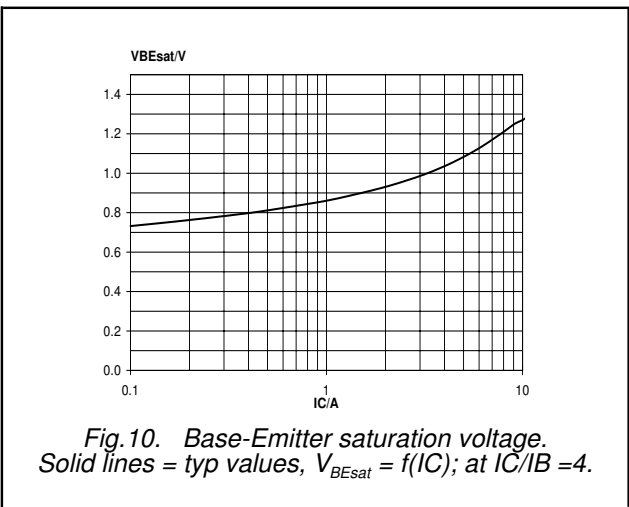
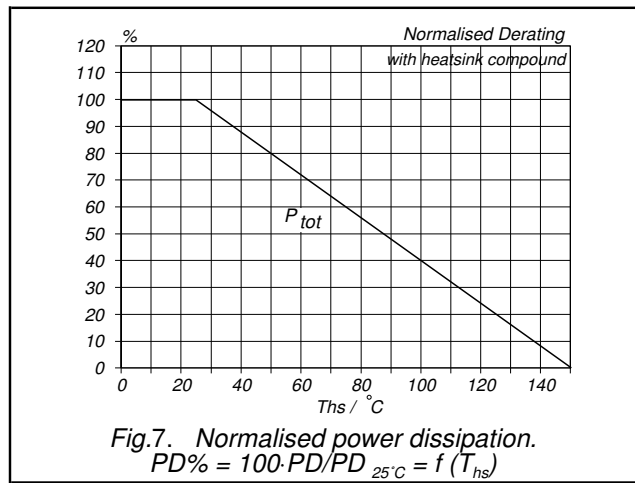
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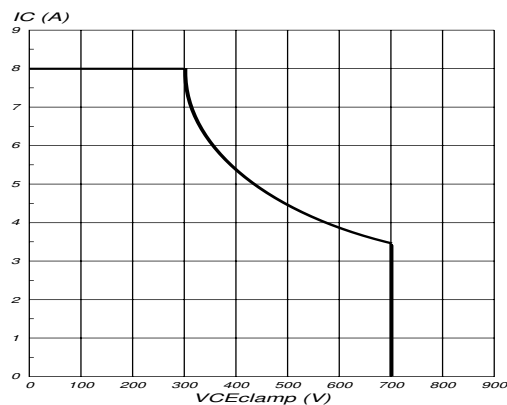


Fig.13. Reverse bias safe operating area.  $T_j \leq T_{jmax}$

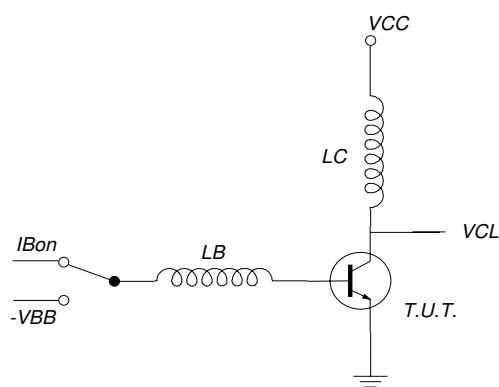


Fig.14. Test circuit for reverse bias safe operating area.  
 $V_{cl} \leq 1000V$ ;  $V_{cc} = 150V$ ;  $V_{BB} = -5V$ ;  $L_B = 1\mu H$ ;  
 $L_c = 200\mu H$

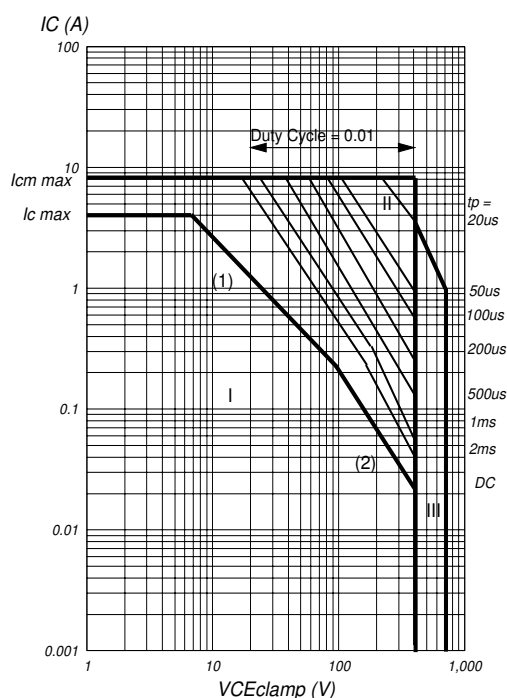


Fig.15. Forward bias safe operating area.  $T_{hs} \leq 25^\circ C$

- (1)  $P_{tot}$  max and  $P_{tot}$  peak max lines.
- (2) Second breakdown limits.
- I Region of permissible DC operation.
- II Extension for repetitive pulse operation.
- III Extension during turn-on in single transistor converters provided that  $R_{BE} \leq 100 \Omega$  and  $t_p \leq 0.6 \mu s$ .

NB: Mounted with heatsink compound and  $30 \pm 5$  newton force on the centre of the envelope.

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## MECHANICAL DATA

Dimensions in mm

Net Mass: 2 g

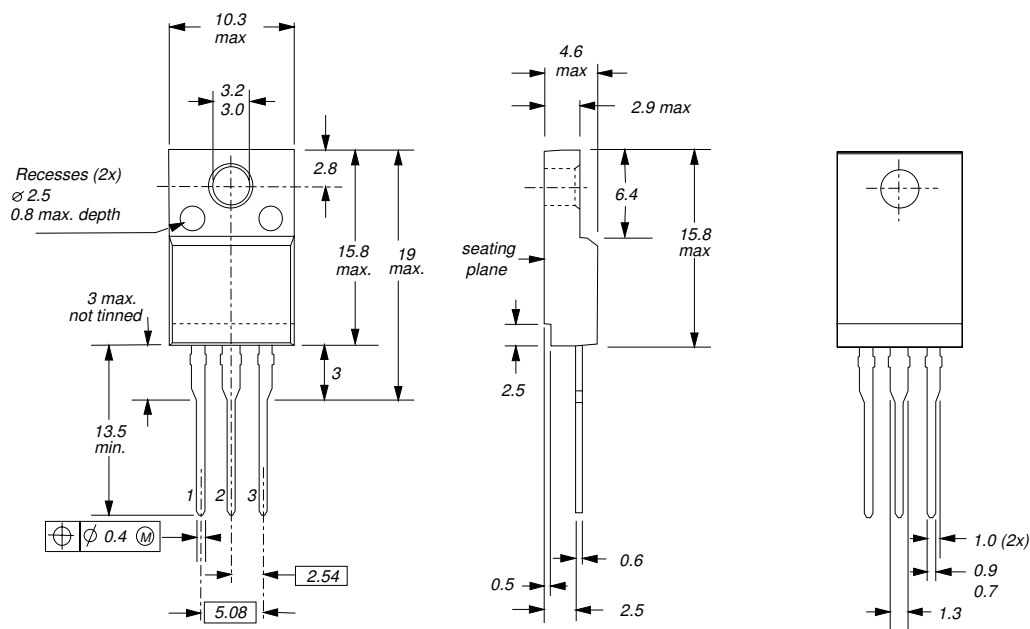


Fig. 16. SOT186A; The seating plane is electrically isolated from all terminals.

## Notes

1. Refer to mounting instructions for F-pack envelopes.
2. Epoxy meets UL94 V0 at 1/8".

## Legal information

### DATA SHEET STATUS

DOCUMENT STATUS <sup>(1)</sup>	PRODUCT STATUS <sup>(2)</sup>	DEFINITION
Objective data sheet	Development	This document contains data from the objective specification for product development.
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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