

DATA SHEET

BUJ103AX

Silicon Diffused Power Transistor

Product specification

August 2018

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

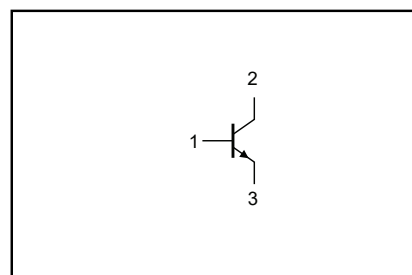
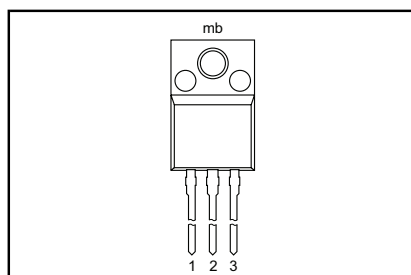
SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_{CESM}	Collector-emitter voltage peak value	$V_{BE} = 0\text{ V}$	-	700	V
V_{CBO}	Collector-Base voltage (open emitter)		-	700	V
V_{CEO}	Collector-emitter voltage (open base)		-	400	V
I_C	Collector current (DC)		-	4	A
I_{CM}	Collector current peak value		-	8	A
P_{tot}	Total power dissipation	$T_{hs} \leq 25\text{ }^{\circ}\text{C}$	-	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 CONFIGURATION

SYMBOL

PIN	DESCRIPTION
1	base
2	collector
3	emitter
mb	isolated



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	$T_{hs} \leq 25\text{ }^{\circ}\text{C}$	-	26	W
T_{stg}	Storage temperature		-65	150	$^{\circ}\text{C}$
T_j	Junction temperature		-	150	$^{\circ}\text{C}$

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 & 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 ¹	$V_{BE} = 0\text{ V}$; $V_{CE} = V_{CESMmax}$	-	-	1.0	mA
I_{CES}		$V_{BE} = 0\text{ V}$; $V_{CE} = V_{CESMmax}$ $T_j = 125\text{ }^{\circ}\text{C}$	-	-	2.0	mA
I_{CBO}	Collector cut-off current ¹	$V_{CBO} = V_{CESMmax}(700\text{V})$	-	-	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}		$I_C = 0.5\text{ A}$; $V_{CE} = 5\text{ V}$	12	20	32	
h_{FEsat}	DC current gain	$I_C = 2\text{ A}$; $V_{CE} = 5\text{ V}$	13.5	16	20	
h_{FEsat}		$I_C = 3\text{ A}$; $V_{CE} = 5\text{ V}$	-	12.5	-	

DYNAMIC CHARACTERISTICS

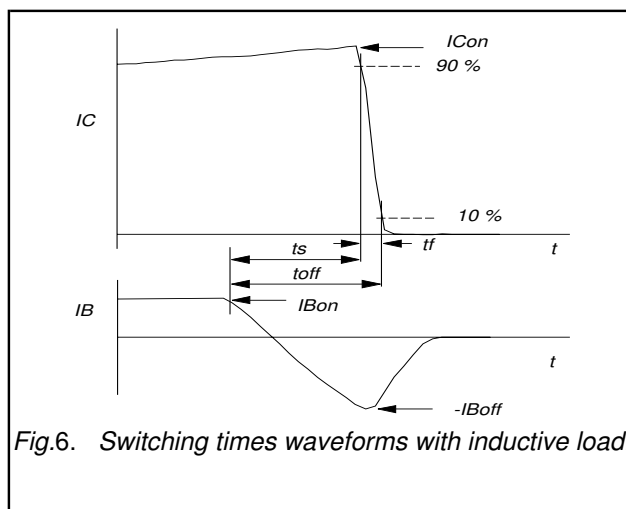
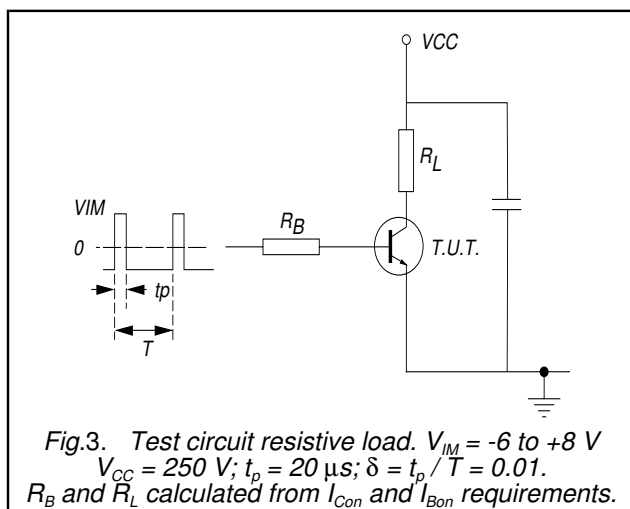
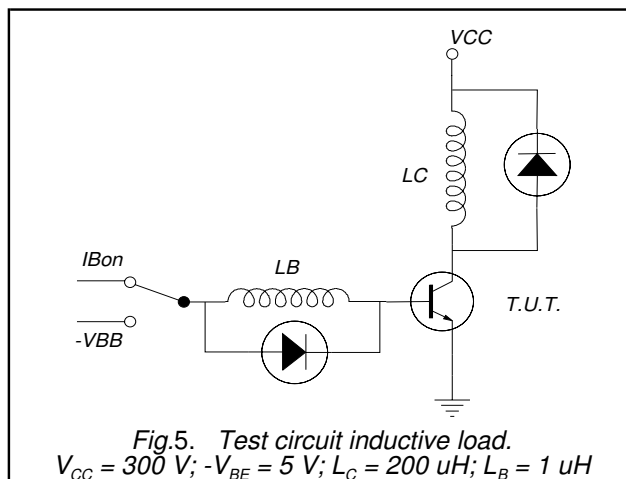
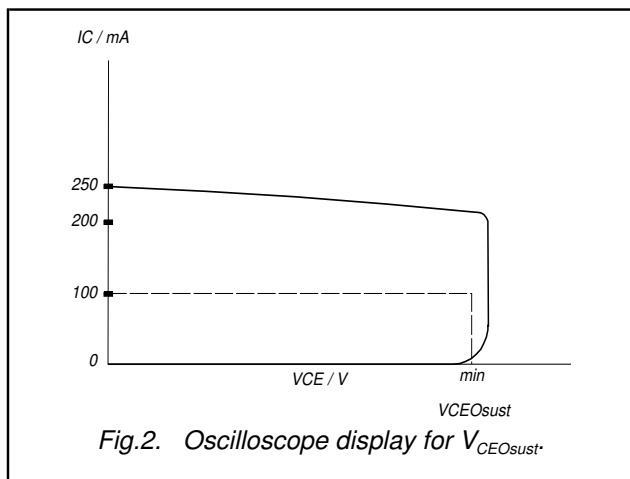
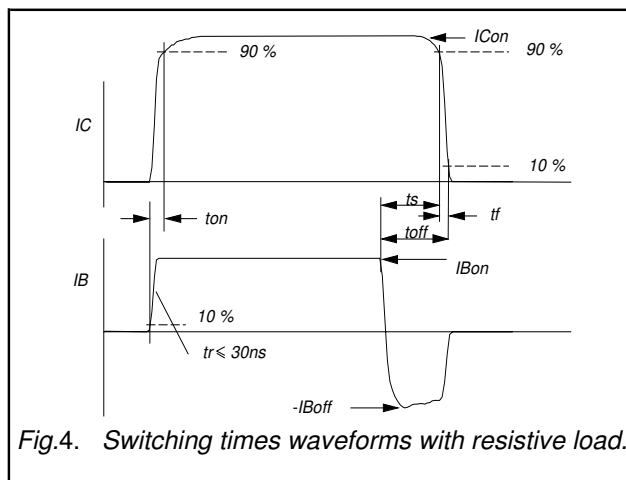
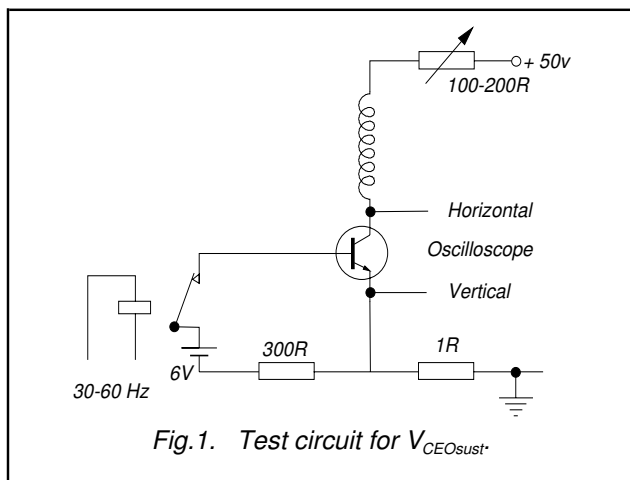
 $T_{hs} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified

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	μs
t_s	Turn-off storage time		2.7	3.2	μs
t_f	Turn-off fall time		0.3	0.43	μs
	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	μs
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	μs
t_f	Turn-off fall time		-	200	ns

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

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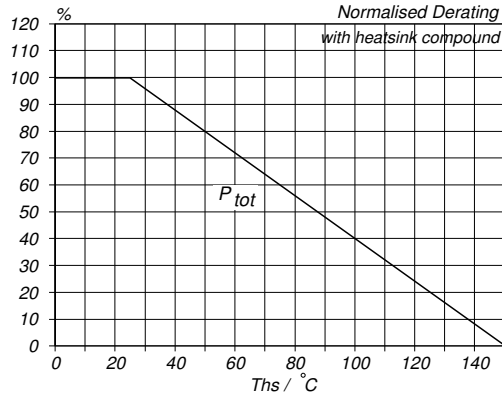


Fig.7. Normalised power dissipation.
 $PD\% = 100 \cdot PD / PD_{25^\circ\text{C}} = f(T_{hs})$

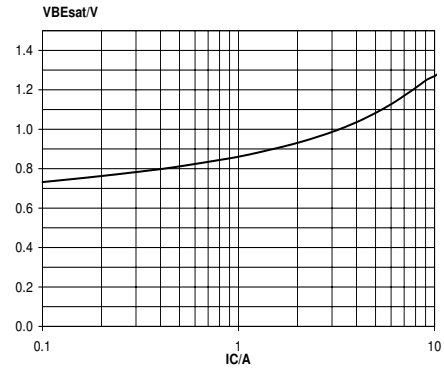


Fig.10. Base-Emitter saturation voltage.
 Solid lines = typ values, $V_{BEsat} = f(I_C)$; at $I_C/I_B = 4$.

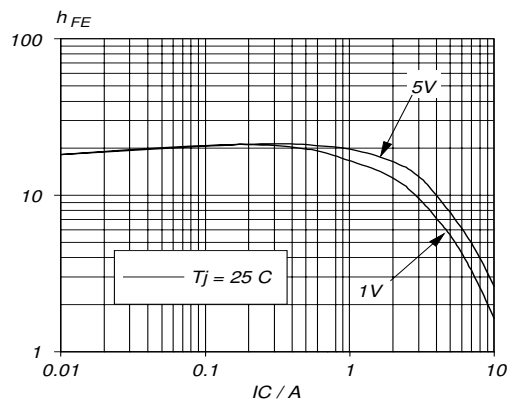


Fig.8. Typical DC current gain. $h_{FE} = f(I_C)$
 parameter V_{CE}

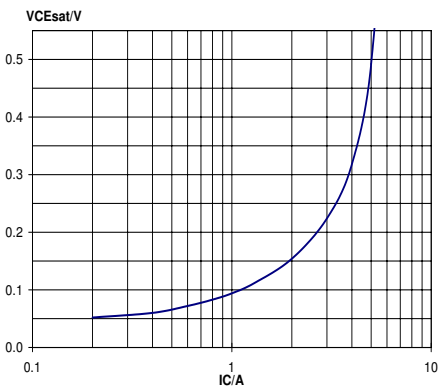


Fig.11. Collector-Emitter saturation voltage.
 Solid lines = typ values, $V_{CEsat} = f(I_C)$; at $I_C/I_B = 4$.

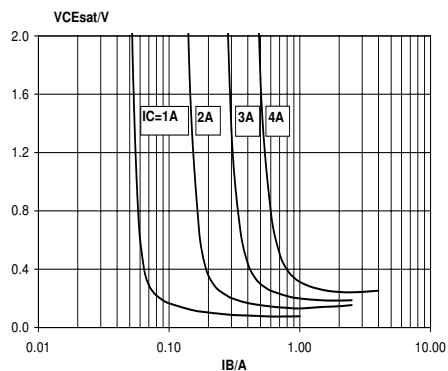


Fig.9. Collector-Emitter saturation voltage.
 Solid lines = typ values, $V_{CEsat} = f(I_B)$; $T_j = 25^\circ\text{C}$.

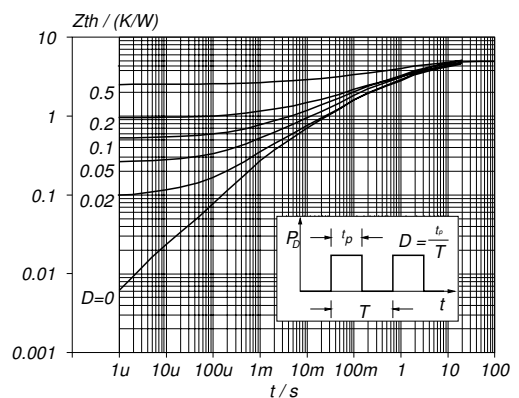


Fig.12. Transient thermal impedance.
 $Z_{th j-hs} = f(t)$; parameter $D = t_p/T$

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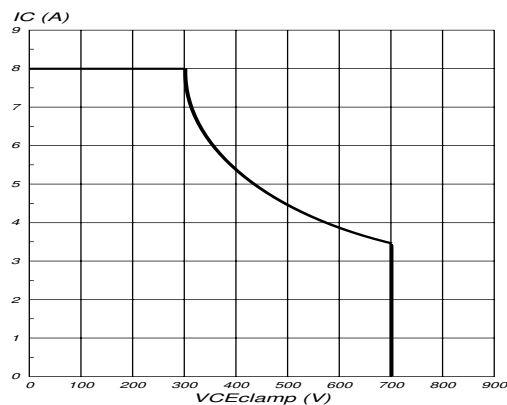


Fig.13. Reverse bias safe operating area. $T_j \leq T_{jmax}$

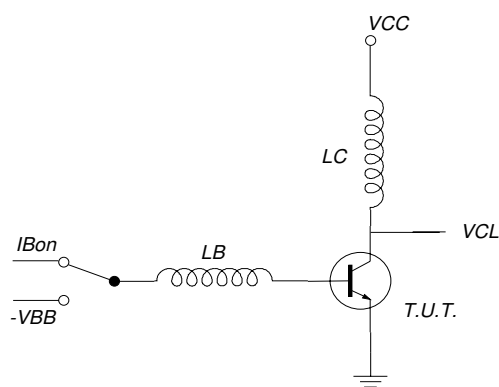


Fig.14. Test circuit for reverse bias safe operating area.
 $V_{cl} \leq 1000V$; $V_{cc} = 150V$; $V_{BB} = -5V$; $L_B = 1\mu H$;
 $L_c = 200\mu H$

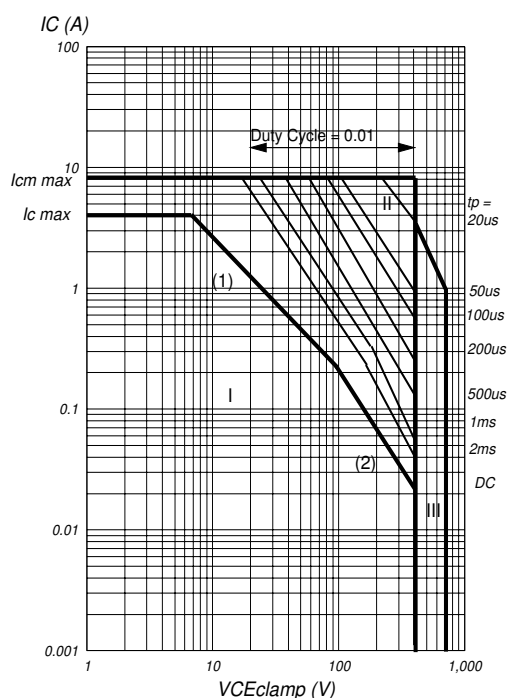


Fig.15. Forward bias safe operating area. $T_{hs} \leq 25^\circ C$

- (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 ± 5 newton force on the centre of the envelope.

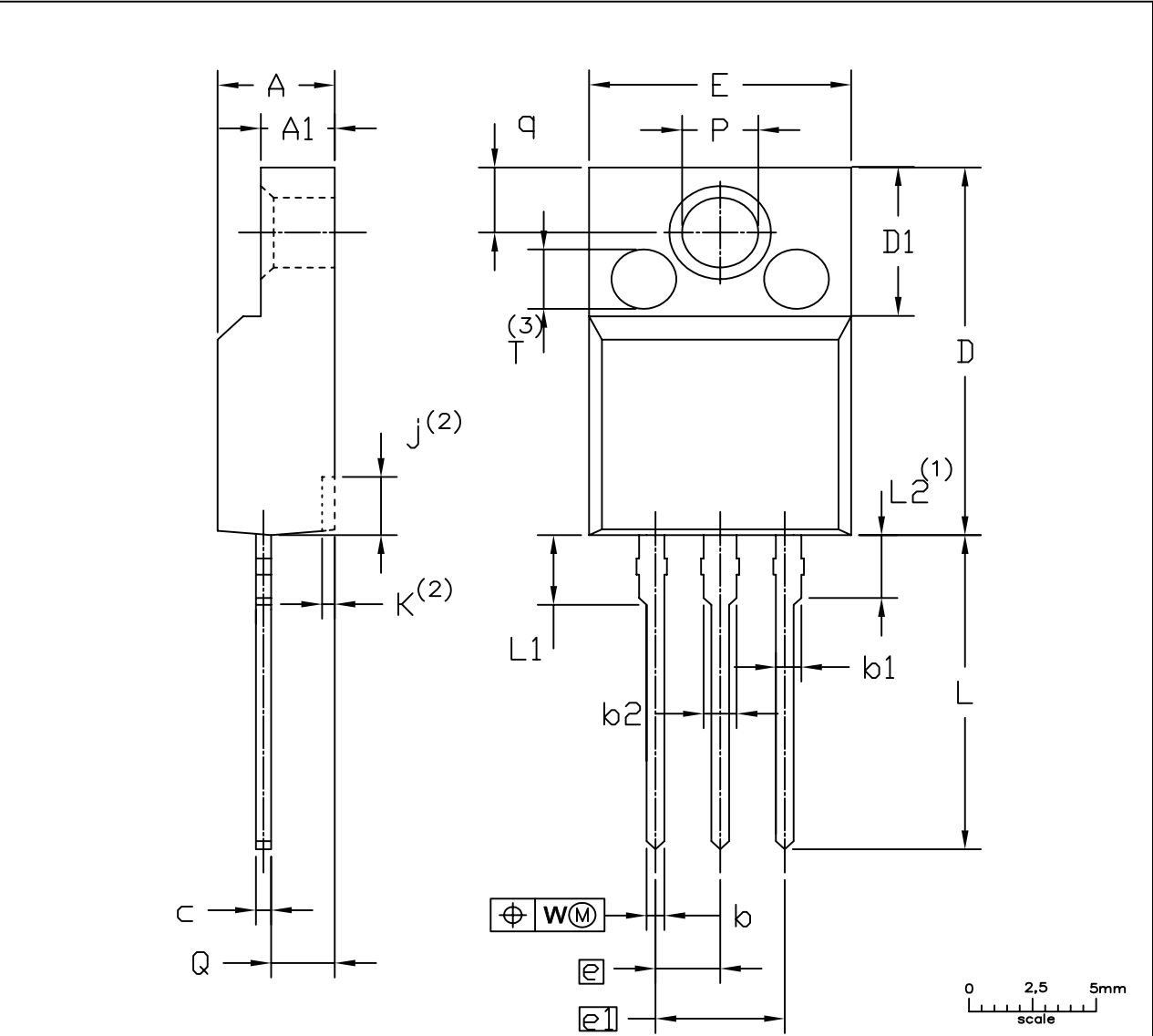
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MECHANICAL DATA

Plastic single-ended package;isolated heatsink mounted;1 mounting hole;3-lead TO-220 "full pack"

SOT186A



UNIT	A	A1	b	b1	b2	c	D	D1	E	e	e1	j ⁽²⁾	k ⁽²⁾	L	L1	L2 ⁽¹⁾ max.	P	Q	q	W	T ⁽³⁾
mm	4.6	2.9	0.9	1.1	1.4	0.7	15.8	6.5	10.3	2.54	5.08	2.7	0.6	14.4	3.30	3	3.2	2.6	3.0	0.4	2.5
	4.0	2.5	0.7	0.9	1.0	0.4	15.2	6.3	9.7			1.7	0.4	13.5	2.79		3.0	2.3	2.6		

- Notes
- 1. Terminal dimensions within this zone are uncontrolled
 - 2. Dot lines area designs may vary
 - 3. Eject pin mark is for reference only

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT186A		3 LEADS TO220F				2013-11-14

Legal information

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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.

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