

1. General description

High voltage, high speed planar passivated NPN power switching transistor in a SOT186A (TO-220F) "full pack" plastic package.

2. Features and benefits

- Fast switching
- Isolated package
- Low thermal resistance
- Very high voltage capability
- Very low switching and conduction losses

3. Applications

- DC-to-DC converters
- High frequency electronic lighting ballasts
- Inverters
- Motor control systems

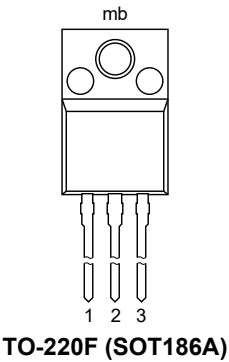
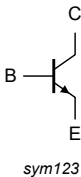
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CM}	peak collector current	Fig. 1 ; Fig. 2 ; Fig. 3	-	-	8	A
P_{tot}	total power dissipation	$T_h \leq 25\text{ °C}$; Fig. 4	-	-	26	W
V_{CESM}	collector-emitter peak voltage	$V_{BE} = 0\text{ V}$	-	-	1050	V
Static characteristics						
h_{FE}	DC current gain	$I_C = 0.1\text{ A}$; $V_{CE} = 5\text{ V}$; $T_h = 25\text{ °C}$; Fig. 11	48	66	100	
		$I_C = 0.8\text{ A}$; $V_{CE} = 3\text{ V}$; $T_h = 25\text{ °C}$; Fig. 12	25	42	50	

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 TO-220F (SOT186A)	
2	C	collector		
3	E	emitter		
mb	n.c.	isolated		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUJ302AX	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack"	SOT186A

7. Limiting values

Table 4. Limiting values
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CESM}	collector-emitter peak voltage	$V_{BE} = 0\text{ V}$		-	1050	V
V_{CEO}	collector-emitter voltage	$I_B = 0\text{ A}$		-	400	V
V_{EBO}	emitter-base voltage	$I_C = 0\text{ A}; I_E = 2\text{ A}; t_p < 10\text{ ms}$		-	24	V
I_C	collector current	Fig. 1; Fig. 2; Fig. 3		-	4	A
I_{CM}	peak collector current			-	8	A
I_B	base current	DC		-	2	A
I_{BM}	peak base current			-	4	A
P_{tot}	total power dissipation	$T_h \leq 25\text{ }^{\circ}\text{C}$; Fig. 4		-	26	W
T_{stg}	storage temperature			-65	150	$^{\circ}\text{C}$
T_j	junction temperature			-	150	$^{\circ}\text{C}$

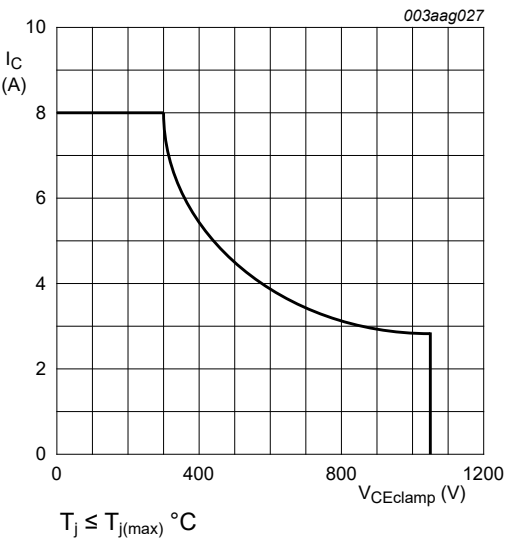
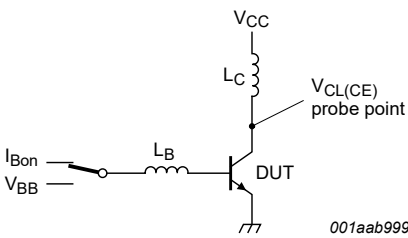


Fig. 1. Reverse bias safe operating area



$V_{CL(CE)} \leq 1000\text{ V}; V_{CC} = 150\text{ V}; V_{BB} = -5\text{ V};$
 $L_B = 1\text{ }\mu\text{H}; L_C = 200\text{ }\mu\text{H}$

Fig. 2. Test circuit for reverse bias safe operating area

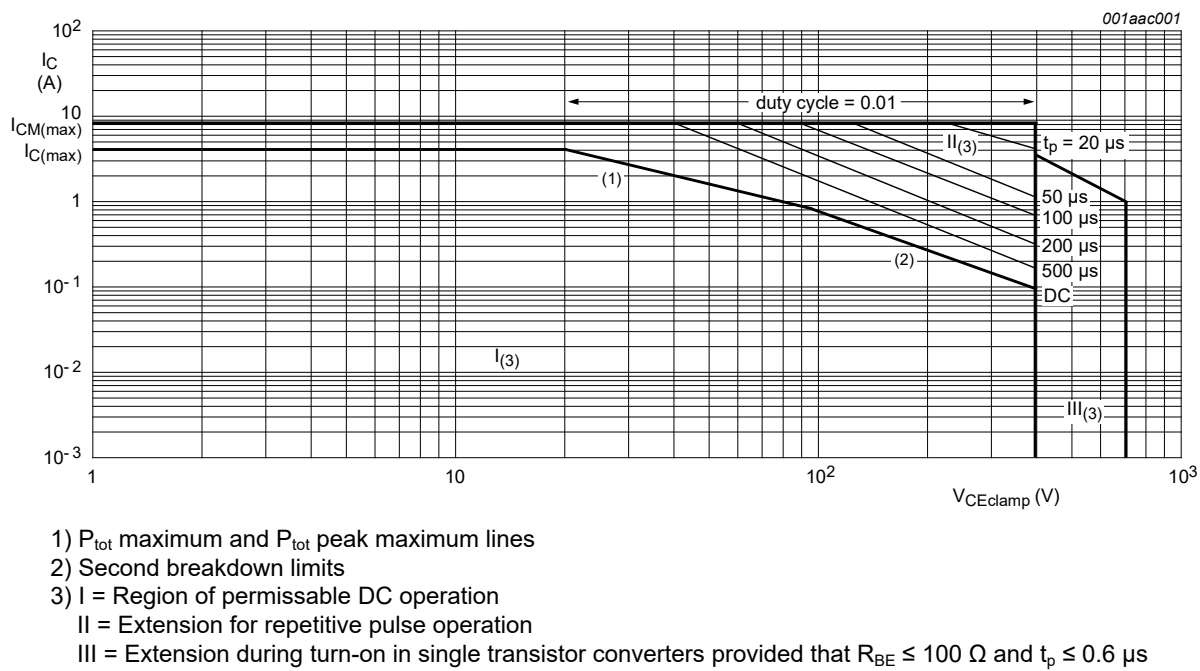


Fig. 3. Forward bias safe operating area for $T_{mb} \leq 25^\circ C$

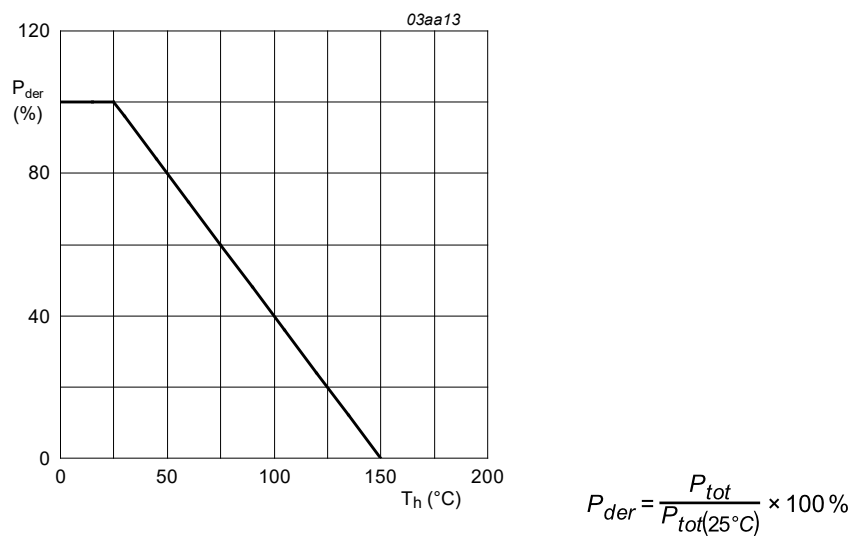


Fig. 4. Normalized total power dissipation as a function of heatsink temperature

8. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	with heatsink compound; Fig. 5	-	-	4.8	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	55	-	K/W

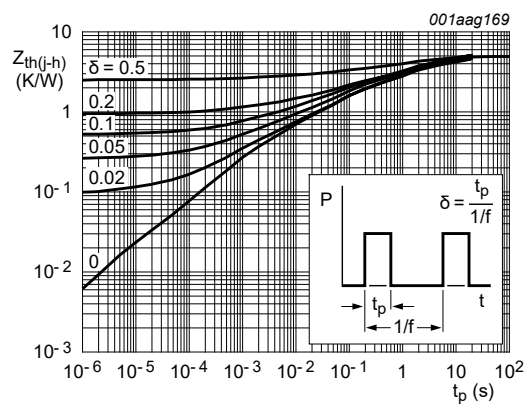


Fig. 5. Transient thermal impedance from junction to heatsink as a function of pulse duration

9. Isolation characteristics

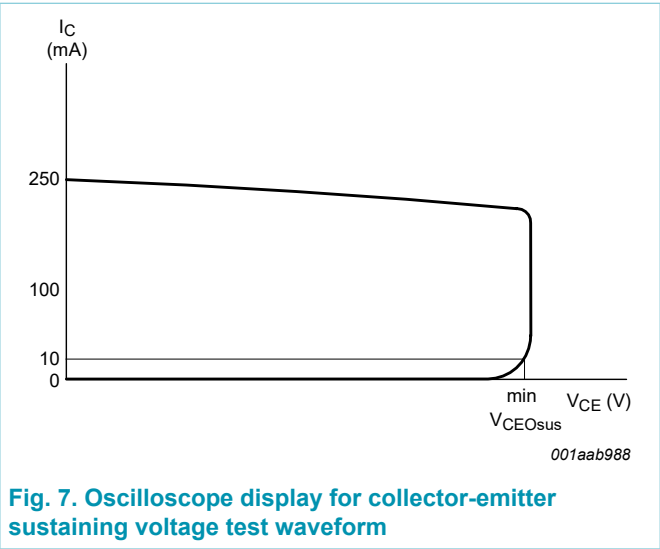
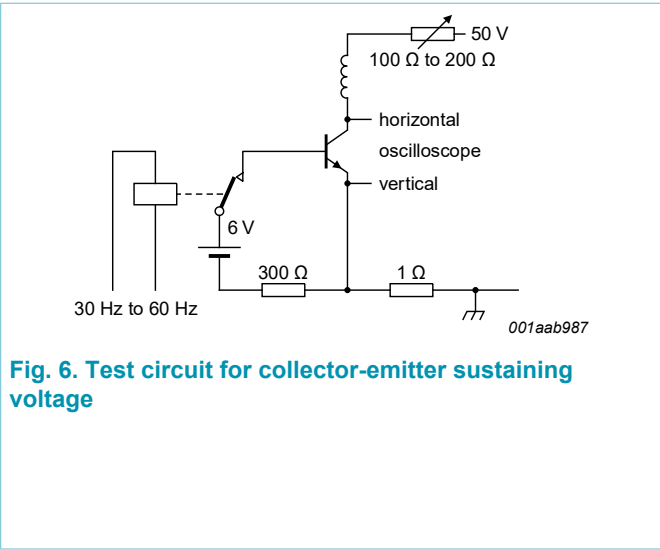
Table 6. Isolation characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{isol(RMS)}$	RMS isolation voltage	50 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; $T_h = 25\text{ °C}$; from all terminals to external heatsink; clean and dust free	-	-	2500	V
C_{isol}	isolation capacitance	from collector to external heatsink; f = 1 MHz; $T_h = 25\text{ °C}$	-	10	-	pF

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I _{CES}	collector-emitter cut-off current (base shorted)	V _{BE} = 0 V; V _{CE} = 1050 V; T _j = 25 °C		-	0.2	10	μA
I _{CEO}	collector-emitter cut-off current (base open)	V _{CE} = 400 V; I _B = 0 A; T _h = 25 °C		-	10	250	μA
V _{(BR)EBO}	emitter-base breakdown voltage (collector open)	I _B = 1 mA; I _C = 0 A; T _h = 25 °C		15	19	-	V
V _{CEOsus}	collector-emitter sustaining voltage (base open)	I _B = 0 A; I _C = 10 mA; L _C = 25 mH; T _h = 25 °C; Fig. 6 ; Fig. 7		400	470	-	V
V _{CEsat}	collector-emitter saturation voltage	I _C = 1 A; I _B = 0.2 A; T _h = 25 °C; Fig. 8 ; Fig. 9		-	0.15	0.5	V
		I _C = 3.5 A; I _B = 1 A; T _h = 25 °C; Fig. 8 ; Fig. 9		-	0.6	1.5	V
V _{BEsat}	base-emitter saturation voltage	I _C = 3.5 A; I _B = 1 A; T _h = 25 °C; Fig. 10		-	1.1	1.5	V
h _{FE}	DC current gain	I _C = 0.1 A; V _{CE} = 5 V; T _h = 25 °C; Fig. 11		48	66	100	
		I _C = 0.8 A; V _{CE} = 3 V; T _h = 25 °C; Fig. 12		25	42	50	
Dynamic characteristics							
t _s	storage time	I _C = 2.5 A; I _{Bon} = 0.5 A; I _{Boff} = -0.5 A; R _L = 60 Ω; V _{BB} = -5 V; T _h = 25 °C; resistive load; t _p = 300 μs; Fig. 13 ; Fig. 14		-	-	3.5	μs
t _f	fall time			-	-	500	ns



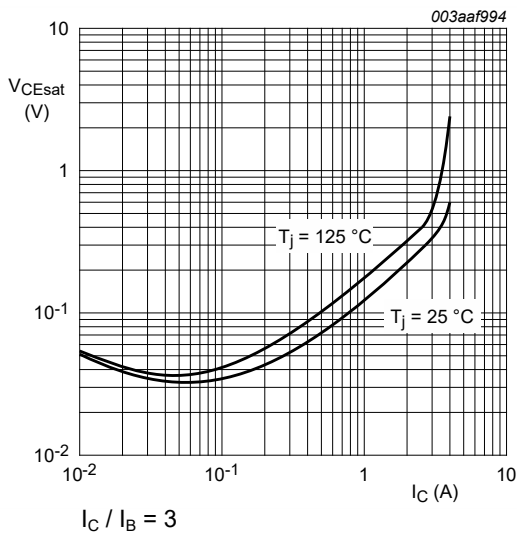


Fig. 8. Collector-emitter saturation voltage as a function of collector current; typical values

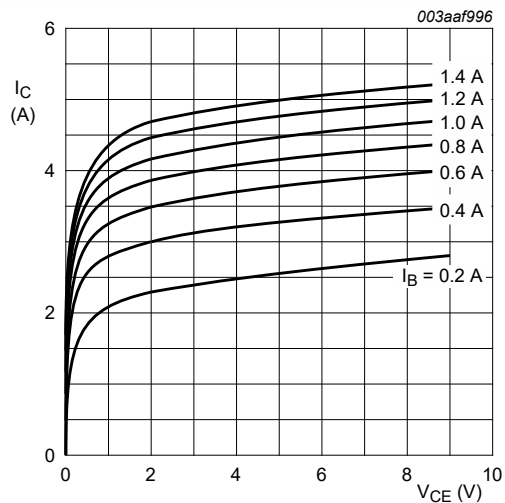


Fig. 9. Collector current as a function of collector-emitter voltage; typical values

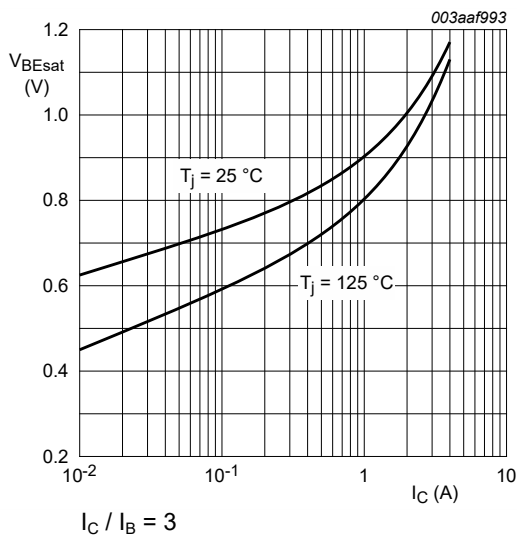


Fig. 10. Base-emitter saturation voltage as a function of collector current; typical values

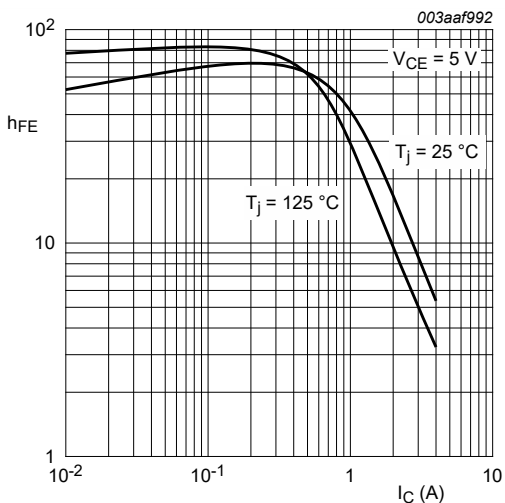


Fig. 11. DC current gain as a function of collector current; typical values

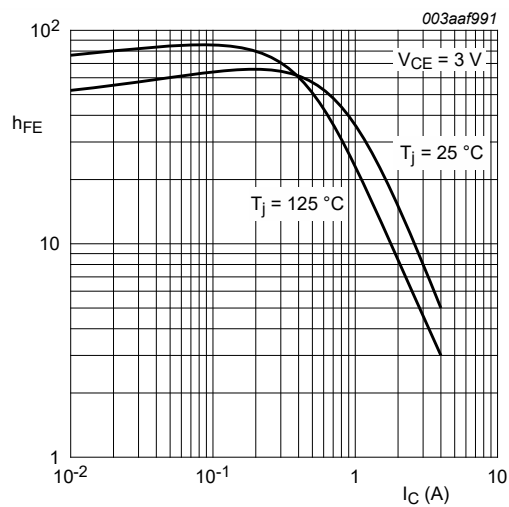
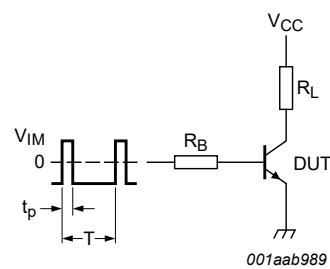


Fig. 12. DC current gain as a function of collector current; typical values



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

Fig. 13. Test circuit for resistive load switching

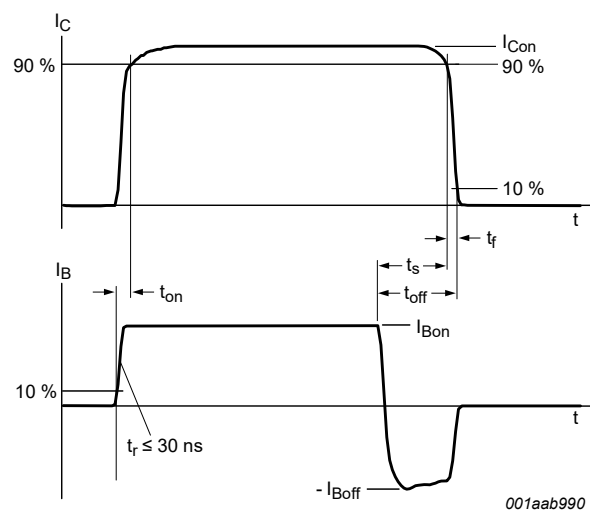


Fig. 14. Switching times waveforms for resistive load

11. Package outline

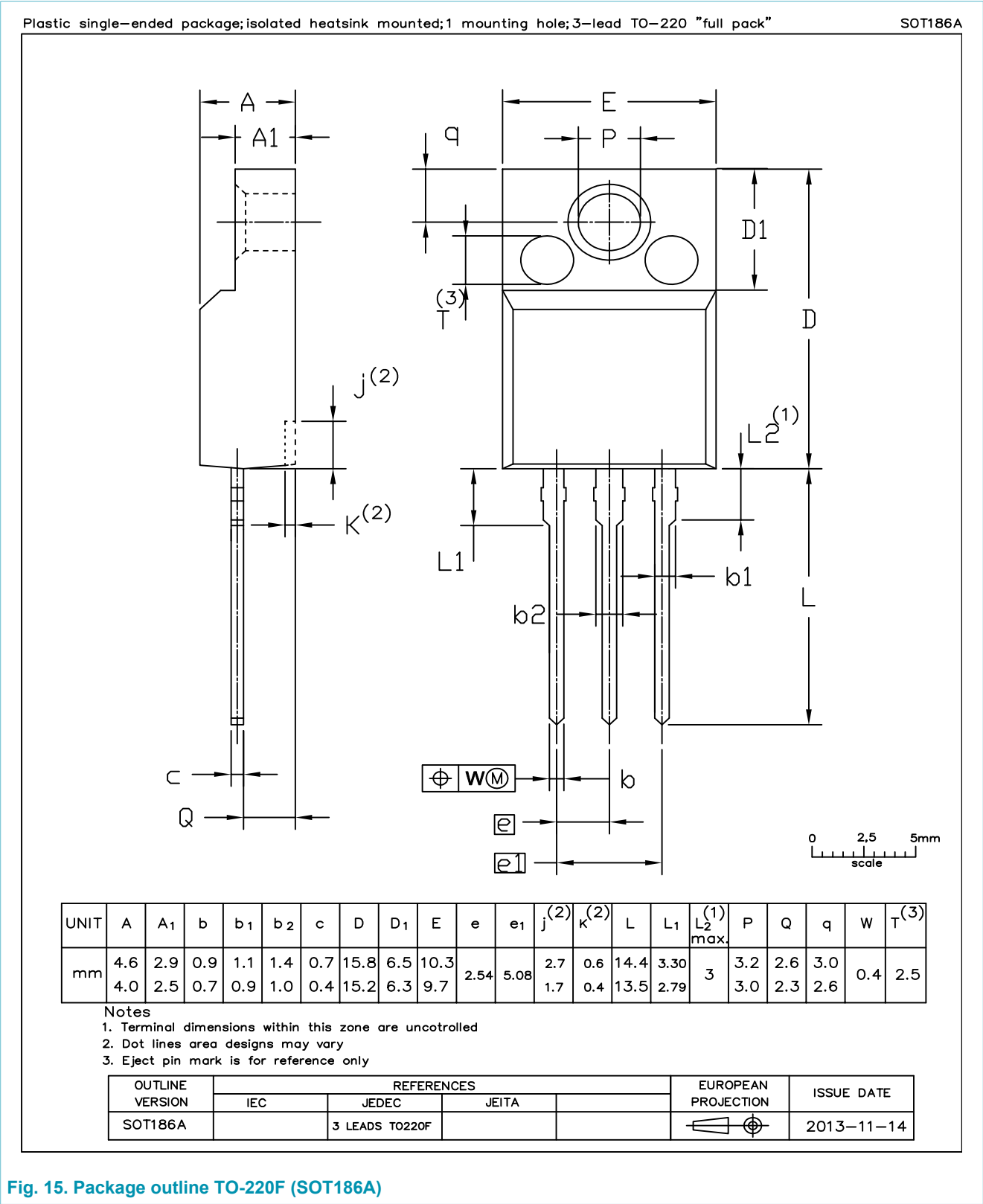


Fig. 15. Package outline TO-220F (SOT186A)

12. Legal information

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Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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