

# DATA SHEET

## **BU506F; BU506DF** Silicon diffused power transistors

Product specification  
Supersedes data of February 1996  
File under Discrete Semiconductors, SC06

1997 Aug 14

# Silicon diffused power transistors

# BU506F; BU506DF

## DESCRIPTION

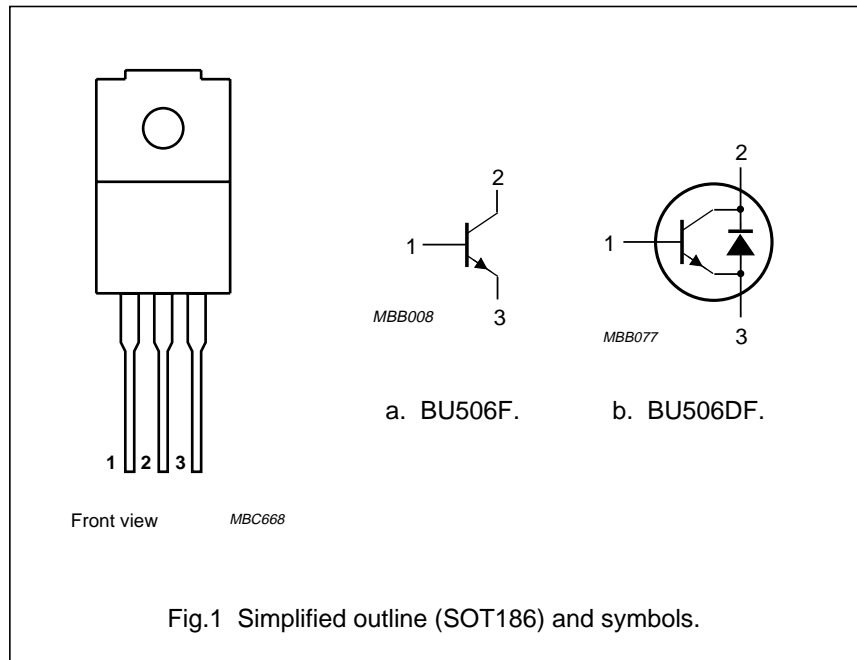
High-voltage, high-speed switching NPN power transistor in a SOT186 package. The BU506DF has an integrated efficiency diode.

## APPLICATIONS

- Horizontal deflection circuits of colour television receivers
- Line-operated switch-mode applications.

## PINNING

PIN <sup>(1)</sup>	DESCRIPTION
1	base
2	collector
3	emitter



## Note

1. All pins electrically isolated from mounting base.

## QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
$V_{CESM}$	collector-emitter peak voltage	$V_{BE} = 0$	–	1500	V
$V_{CEO}$	collector-emitter voltage	open base	–	700	V
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 3\text{ A}$ ; $I_B = 1.33\text{ A}$ ; see Figs 7 and 8	–	1	V
$V_F$	diode forward voltage (BU506DF)	$I_F = 3\text{ A}$	1.5	2.2	V
$I_{Csat}$	collector saturation current		–	3	A
$I_C$	collector current (DC)	see Figs 2 and 3	–	5	A
$I_{CM}$	collector current (peak value)	see Figs 2 and 3	–	8	A
$P_{tot}$	total power dissipation	$T_h \leq 25\text{ °C}$ ; see Fig.4	–	20	W
$t_f$	fall time	inductive load; see Fig.11	0.7	–	$\mu\text{s}$

## THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-h}$	thermal resistance from junction to external heatsink	note 1	6.35	K/W
		note 2	3.85	K/W
$R_{th\ j-a}$	thermal resistance from junction to ambient		55	K/W

## Notes

1. Mounted **without** heatsink compound and  $30 \pm 5\text{ N}$  force on centre of package.
2. Mounted **with** heatsink compound and  $30 \pm 5\text{ N}$  force on centre of package.

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**LIMITING VALUES**

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CESM}$	collector-emitter peak voltage	$V_{BE} = 0$	–	1500	V
$V_{CEO}$	collector-emitter voltage	open base	–	700	V
$I_{Csat}$	collector saturation current	$V_{CE} = 5\text{ V}$	–	3	A
$I_C$	collector current (DC)	see Figs 2 and 3	–	5	A
$I_{CM}$	collector current (peak value)	see Figs 2 and 3	–	8	A
$I_B$	base current (DC)		–	3	A
$I_{BM}$	base current (peak value)		–	5	A
$P_{tot}$	total power dissipation	$T_h \leq 25\text{ °C}$ ; see Fig.4	–	20	W
$T_{stg}$	storage temperature		–65	+150	°C
$T_j$	junction temperature		–	150	°C

**ISOLATION CHARACTERISTICS**

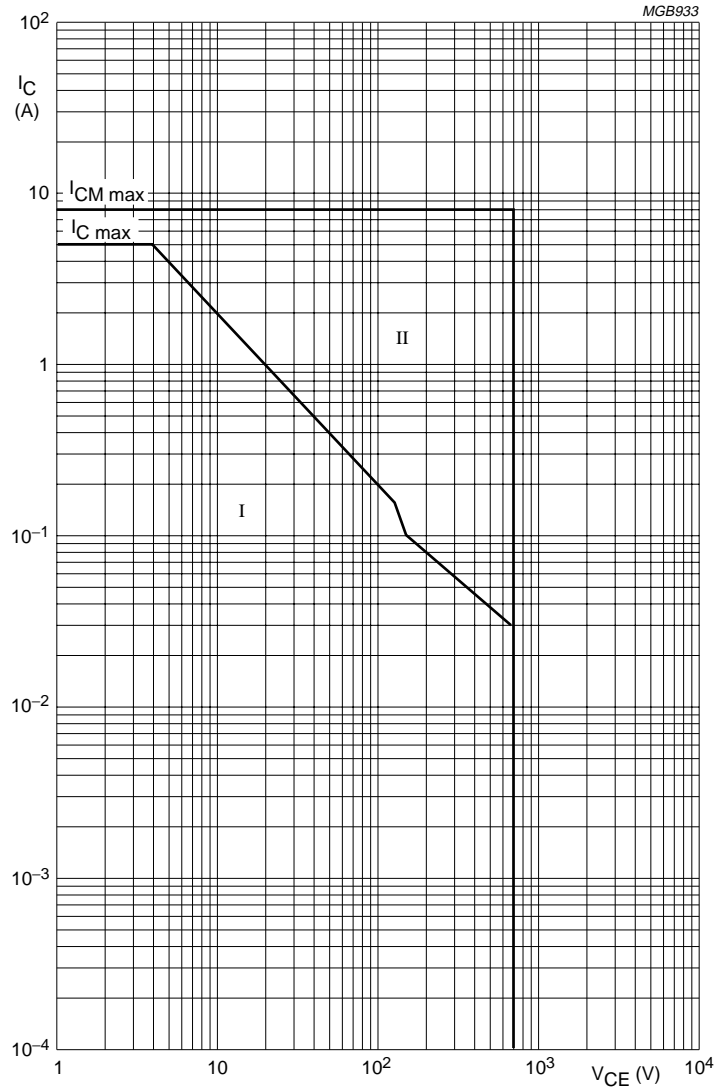
SYMBOL	PARAMETER	TYP.	MAX.	UNIT
$V_{isolM}$	isolation voltage from all terminals to external heatsink (peak value)	–	1500	V
$C_{isol}$	isolation capacitance from collector to external heatsink	12	–	pF

**CHARACTERISTICS** $T_j = 25\text{ °C}$  unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{CEO_{sust}}$	collector-emitter sustaining voltage	$I_C = 100\text{ mA}$ ; $I_B = 0$ ; $L = 25\text{ mH}$ ; see Figs 5 and 6	700	–	–	V
$V_{CE_{sat}}$	collector-emitter saturation voltage	$I_C = 3\text{ A}$ ; $I_B = 1.33\text{ A}$ ; see Figs 7 and 8	–	–	1	V
$V_{BE_{sat}}$	base-emitter saturation voltage	$I_C = 3\text{ A}$ ; $I_B = 1.33\text{ A}$ ; see Fig.9	–	–	1.3	V
$V_F$	diode forward voltage (BU506DF)	$I_F = 3\text{ A}$	–	1.5	2.2	V
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = V_{CES_{max}}$ ; $V_{BE} = 0$	–	–	0.5	mA
		$V_{CE} = V_{CES_{max}}$ ; $V_{BE} = 0$ ; $T_j = 125\text{ °C}$	–	–	1	mA
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 6\text{ V}$ ; $I_C = 0$	–	–	10	mA
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}$ ; $I_C = 3\text{ A}$ ; see Fig.10	2.25	–	–	
		$V_{CE} = 5\text{ V}$ ; $I_C = 100\text{ mA}$ ; see Fig.10	6	13	30	
<b>Switching times in horizontal deflection circuit (see Fig.11)</b>						
$t_s$	storage time	$I_{Csat} = 3\text{ A}$ ; $L_B = 12\text{ }\mu\text{H}$ ; $I_{B(end)} = 1\text{ A}$ ; $dl_B/dt = -0.33\text{ A}/\mu\text{s}$	–	6.5	–	$\mu\text{s}$
$t_f$	fall time	$I_{Csat} = 3\text{ A}$ ; $L_B = 12\text{ }\mu\text{H}$ ; $I_{B(end)} = 1\text{ A}$ ; $dl_B/dt = -0.33\text{ A}/\mu\text{s}$	–	0.7	–	$\mu\text{s}$

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Mounted **without** heatsink compound and 30 ±5 N force on centre of package.

$T_{mb} = 25\text{ }^{\circ}\text{C}$ .

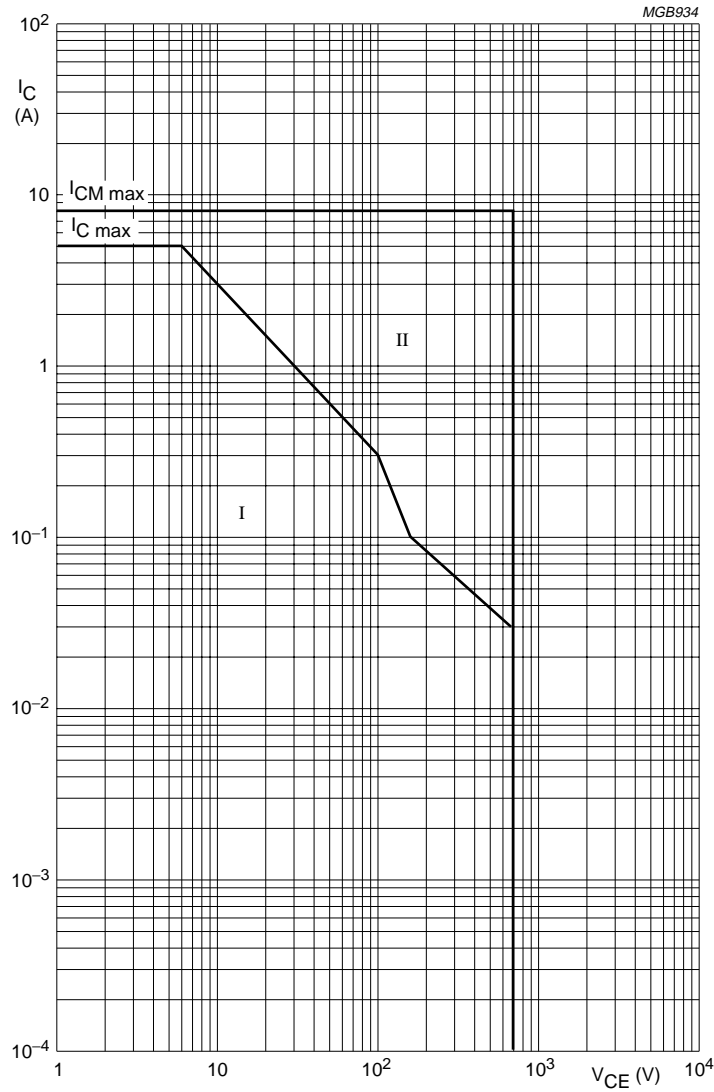
I - Region of permissible DC operation.

II - Permissible extension for repetitive pulse operation.

Fig.2 Forward bias SOAR (no heatsink compound).

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Mounted **with** heatsink compound and  $30 \pm 5$  N force on centre of package.

$T_{mb} = 25$  °C.

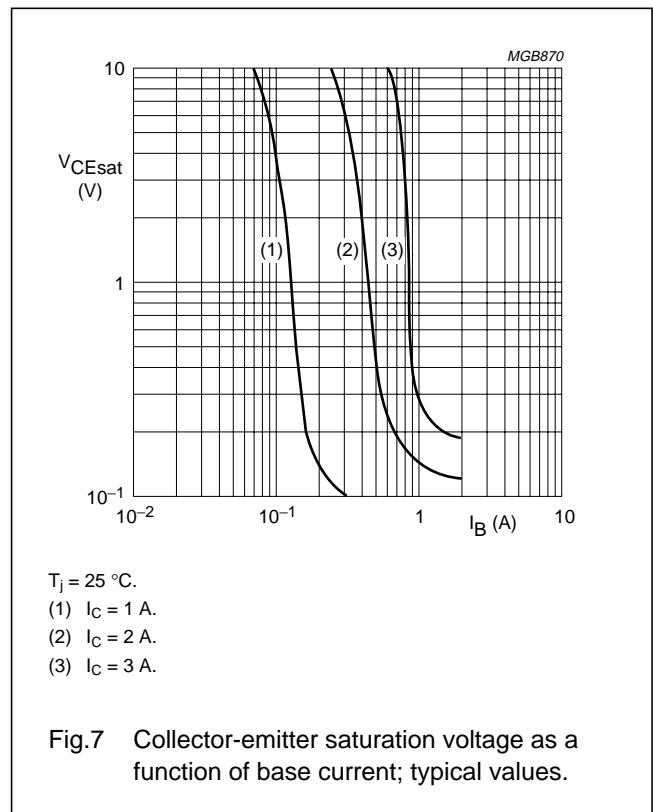
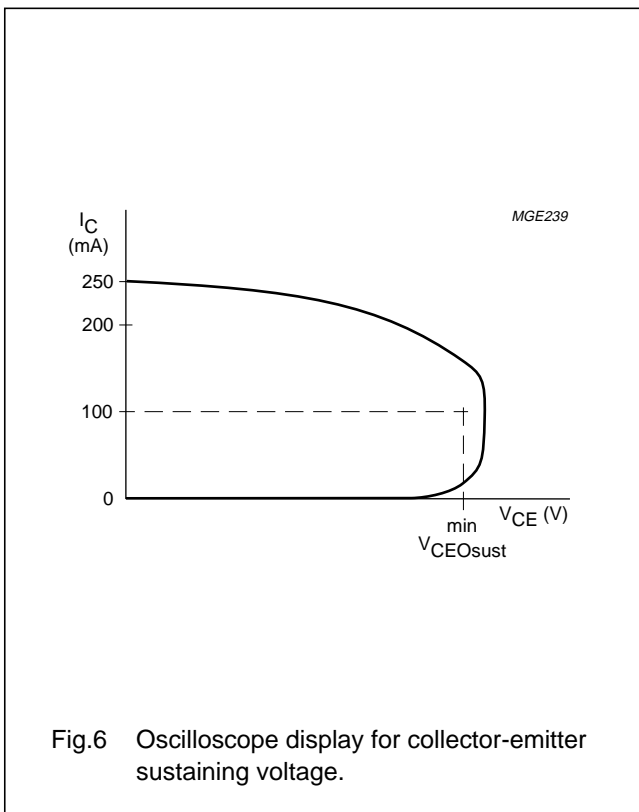
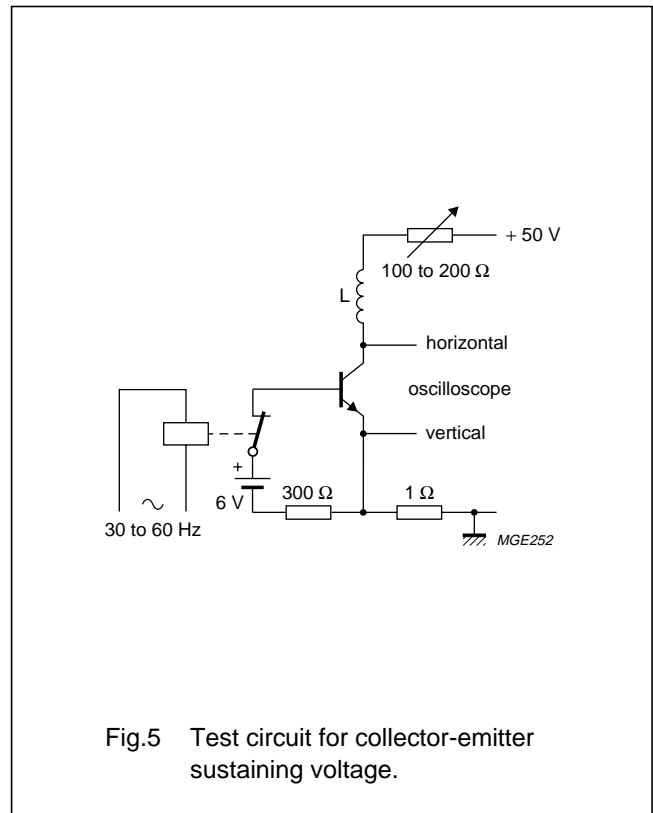
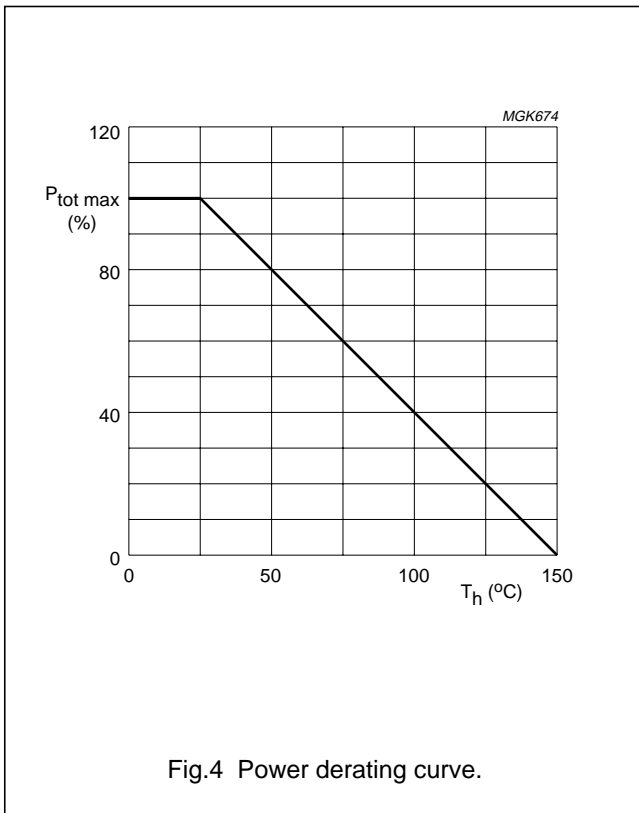
I - Region of permissible DC operation.

II - Permissible extension for repetitive pulse operation.

Fig.3 Forward bias SOAR (with heatsink compound).

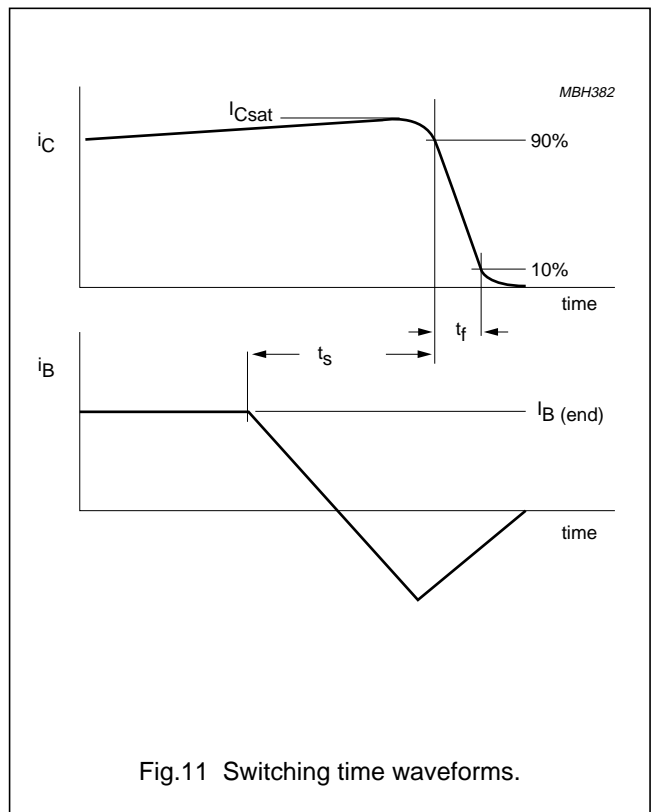
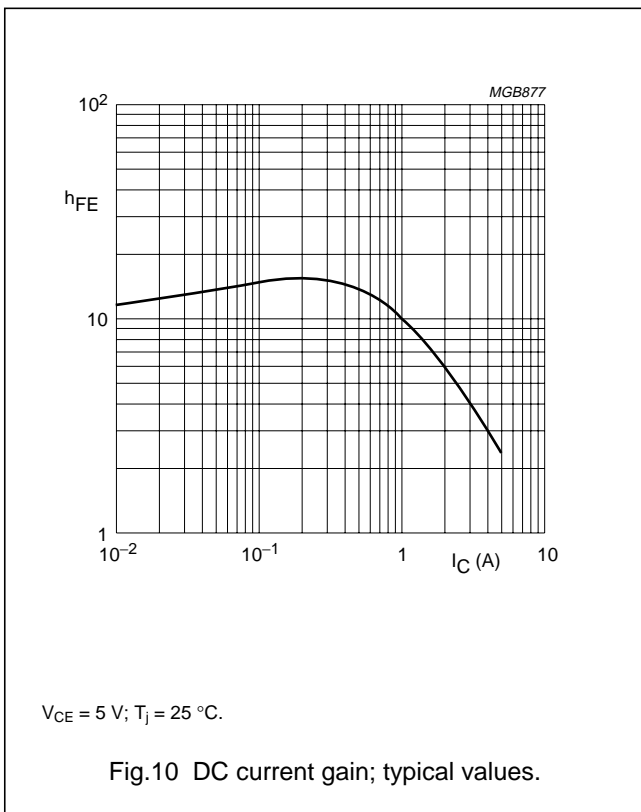
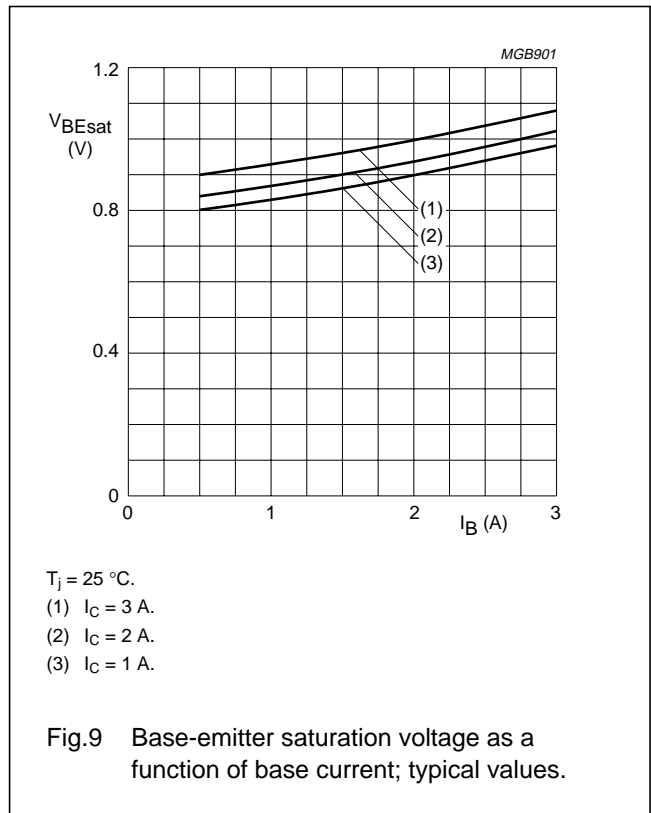
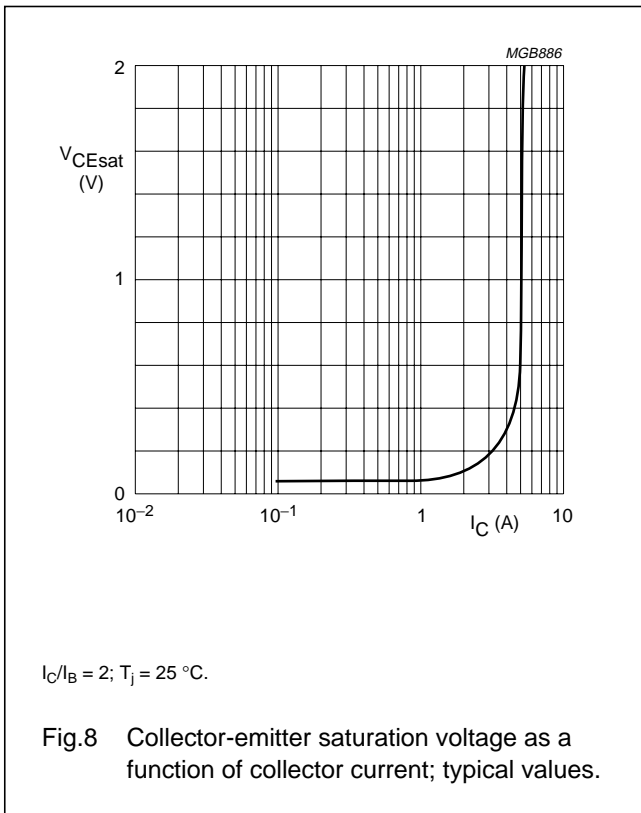
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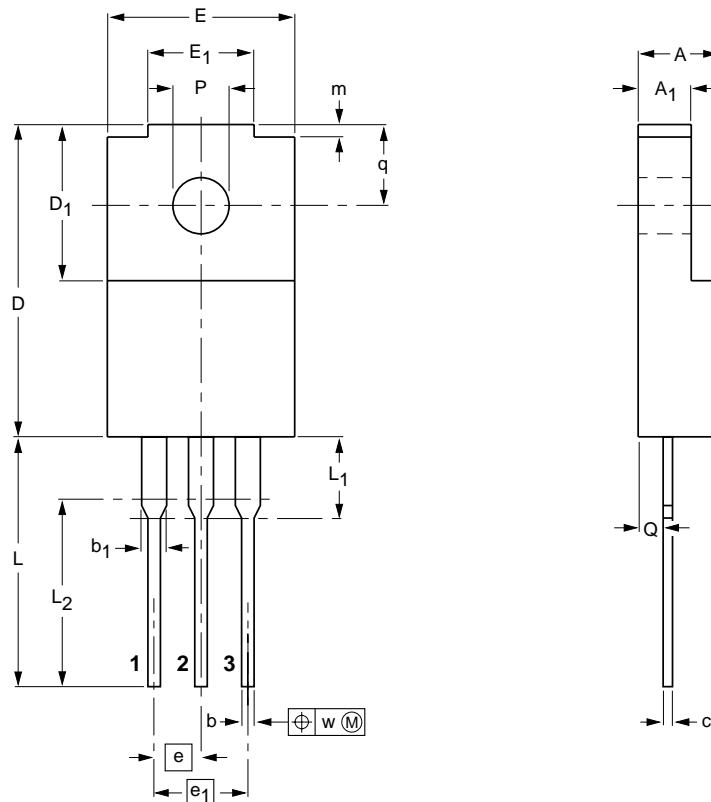
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PACKAGE OUTLINE

Plastic single-ended package; isolated heatsink mounted;  
1 mounting hole; 3 lead TO-220 exposed tabs

SOT186



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub>	b	b <sub>1</sub>	c	D	D <sub>1</sub>	E	E <sub>1</sub>	e	e <sub>1</sub>	L	L <sub>1</sub> <sup>(1)</sup>	L <sub>2</sub>	m	P	Q	q	w
mm	4.4 4.0	2.9 2.5	0.9 0.7	1.5 1.3	0.55 0.38	17.0 16.4	7.9 7.5	10.2 9.6	5.7 5.3	2.54	5.08	14.3 13.5	4.8 4.0	10	0.9 0.5	3.2 3.0	1.4 1.2	4.4 4.0	0.4

Note

1. Terminal dimensions within this zone are uncontrolled. Terminals in this zone are not tinned.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT186		TO-220				97-06-11



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Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
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**NOTES**

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Printed in The Netherlands

137067/00/01/pp12

Date of release: 1997 Aug 14

Document order number: 9397 750 02712

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