

# 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

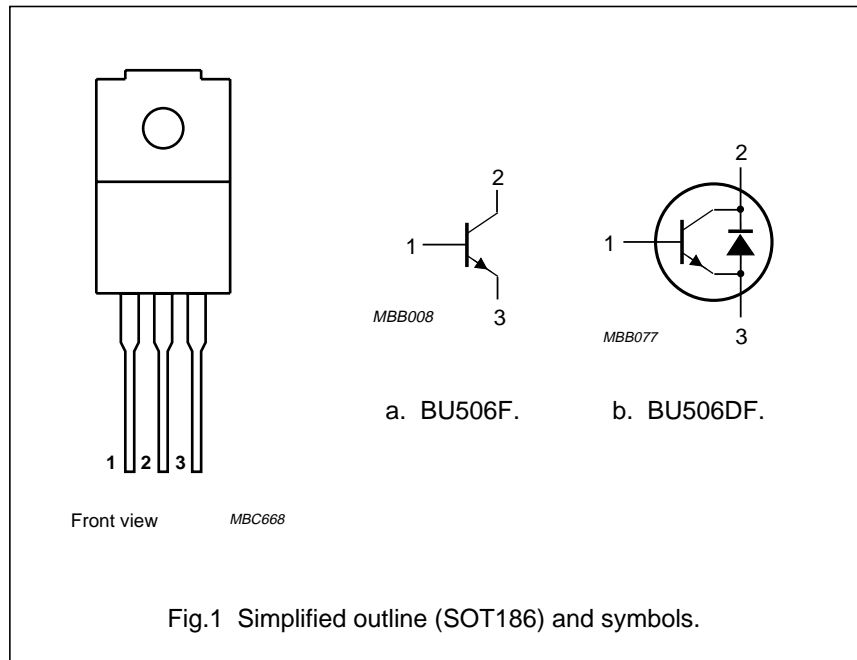
High-voltage, high-speed switching NPN power transistor in a SOT186 package. The BU506DF has an integrated efficiency diode.

## 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**

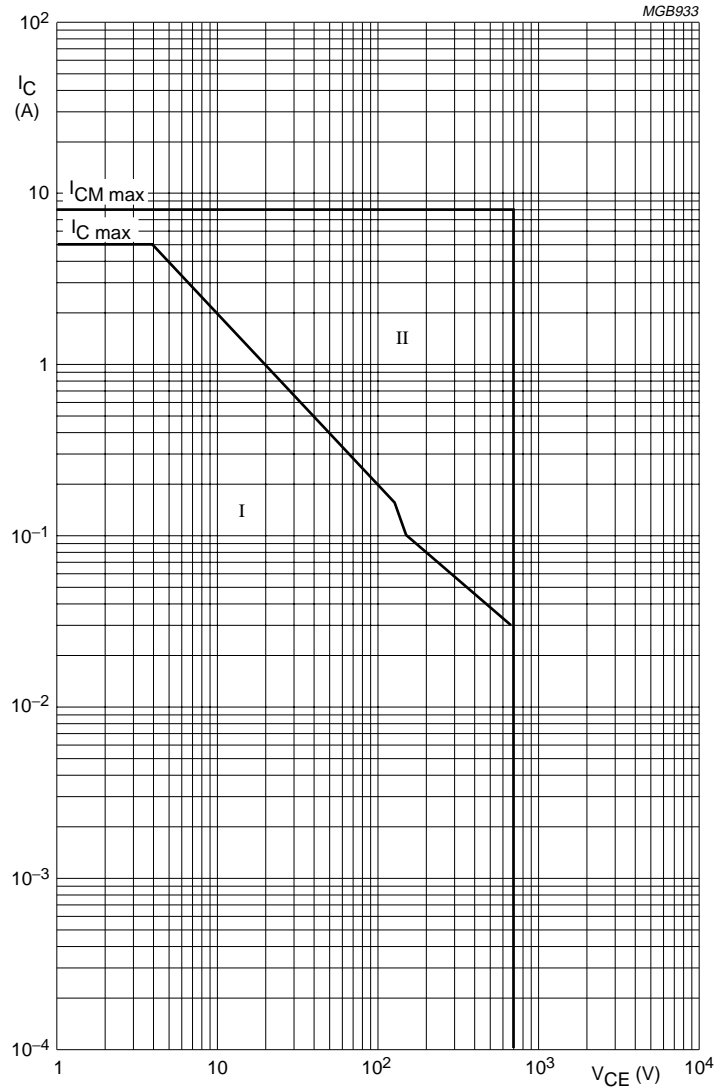
SYMBOL	PARAMETER	TYP.	MAX.	UNIT
$V_{isolM}$	isolation voltage from all terminals to external heatsink (peak value)	–	1500	V
$C_{isol}$	isolation capacitance from collector to external heatsink	12	–	pF

**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.

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

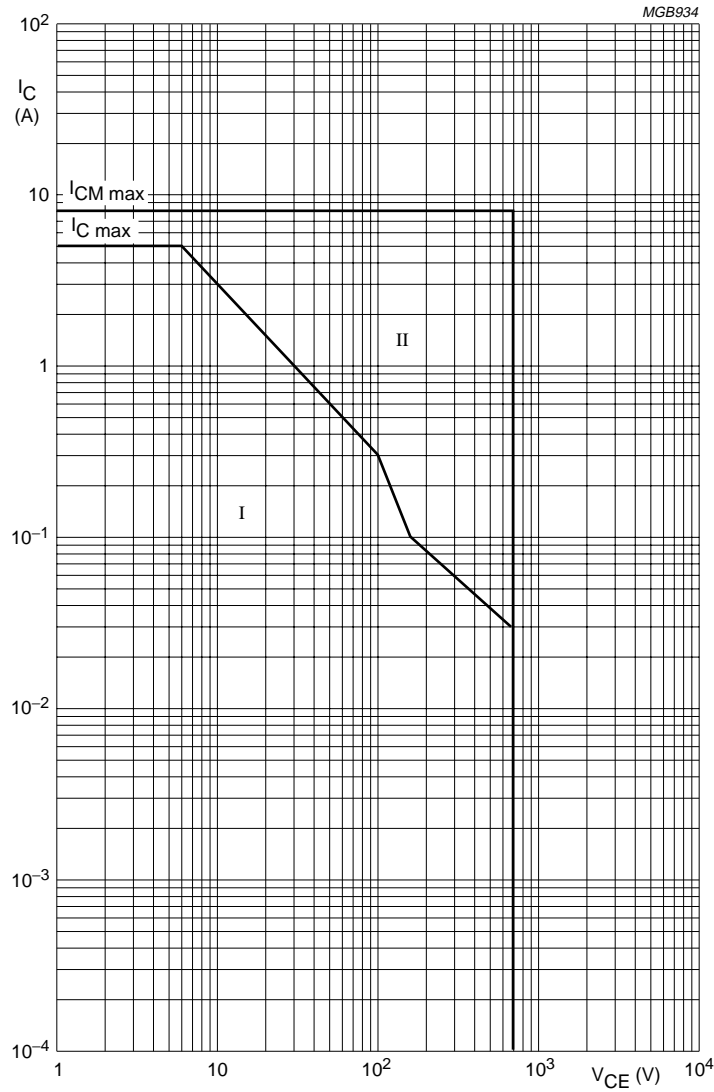
I - Region of permissible DC operation.

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 ±5 N force on centre of package.

T<sub>mb</sub> = 25 °C.

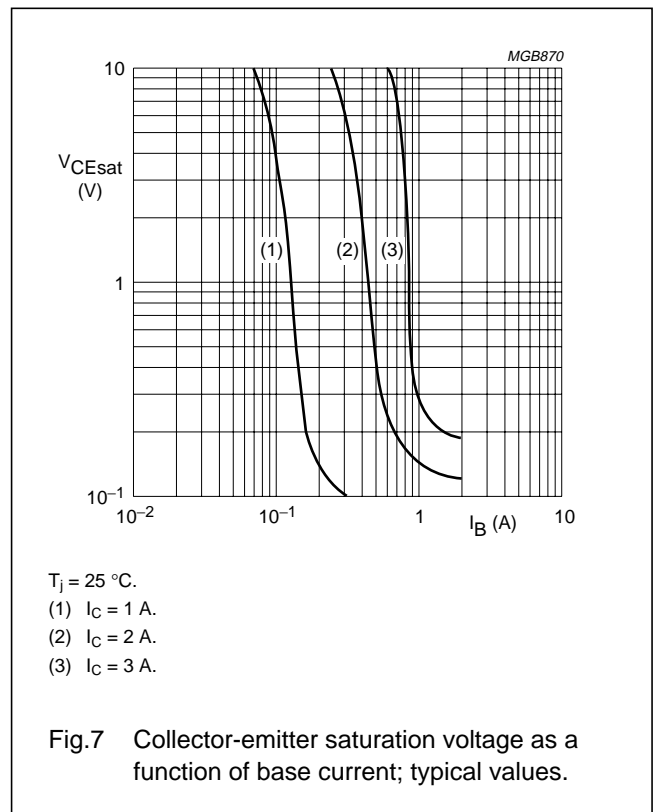
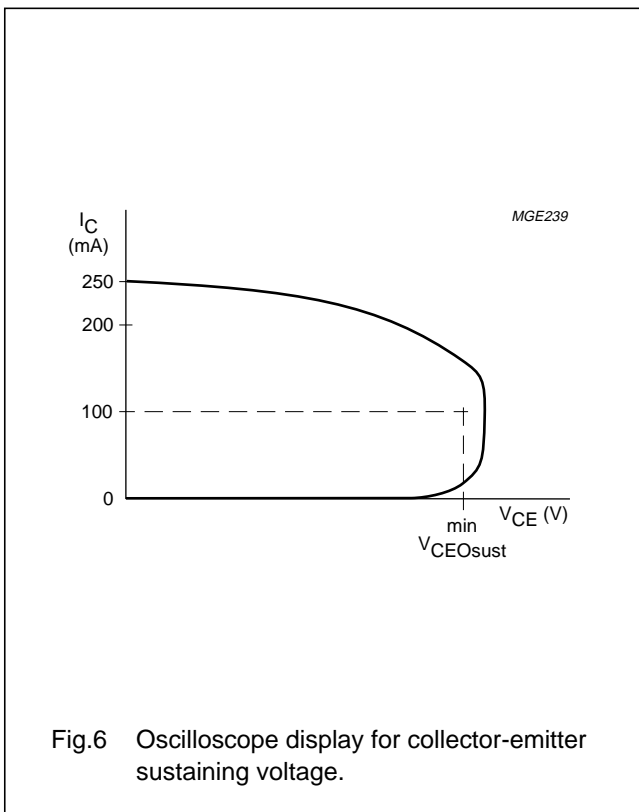
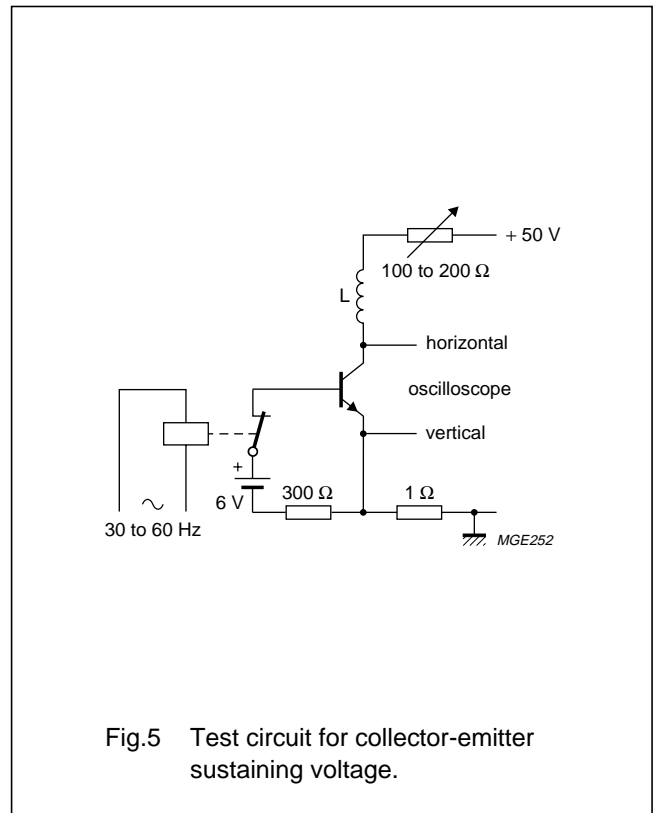
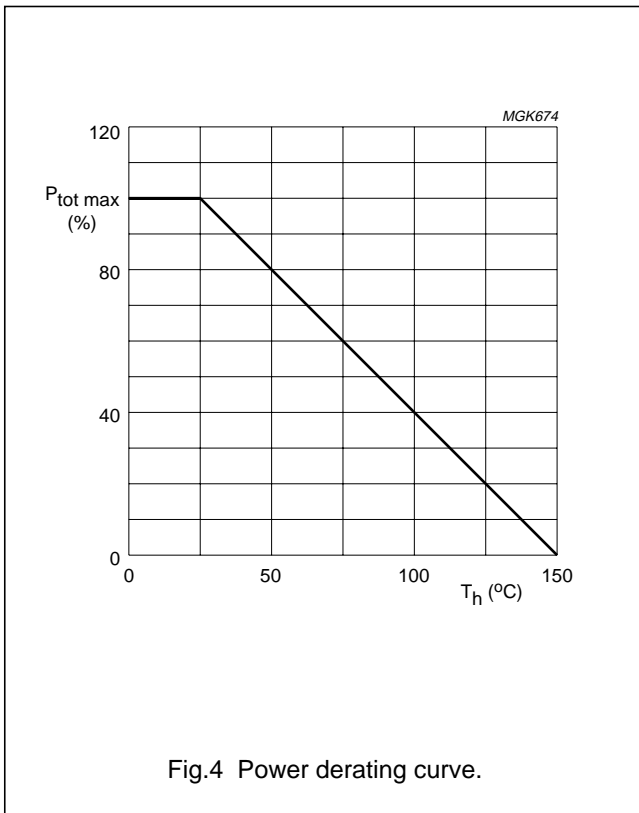
I - Region of permissible DC operation.

II - Permissible extension for repetitive pulse operation.

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

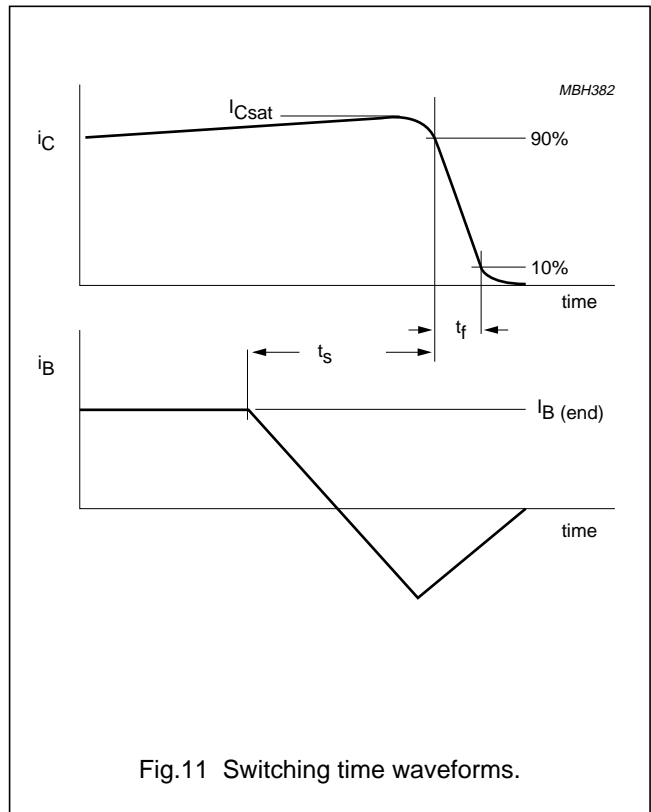
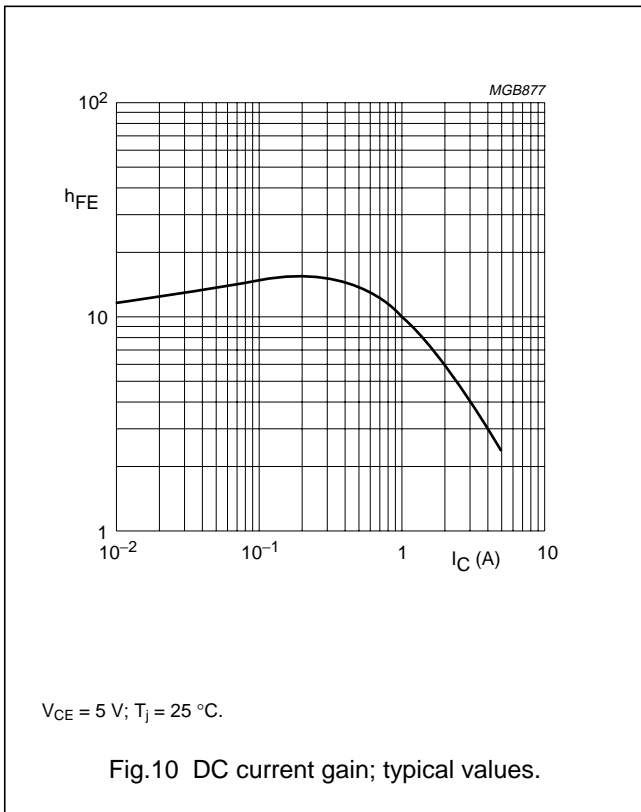
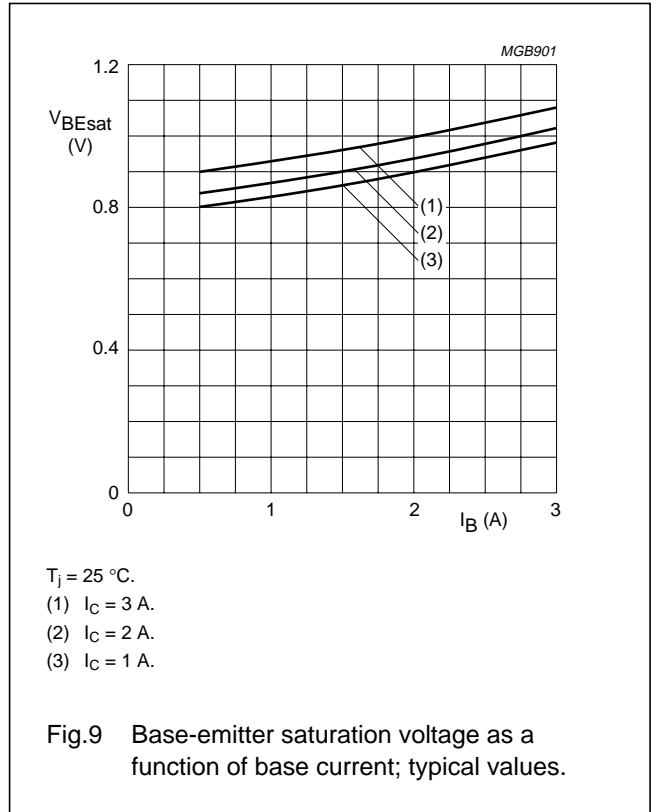
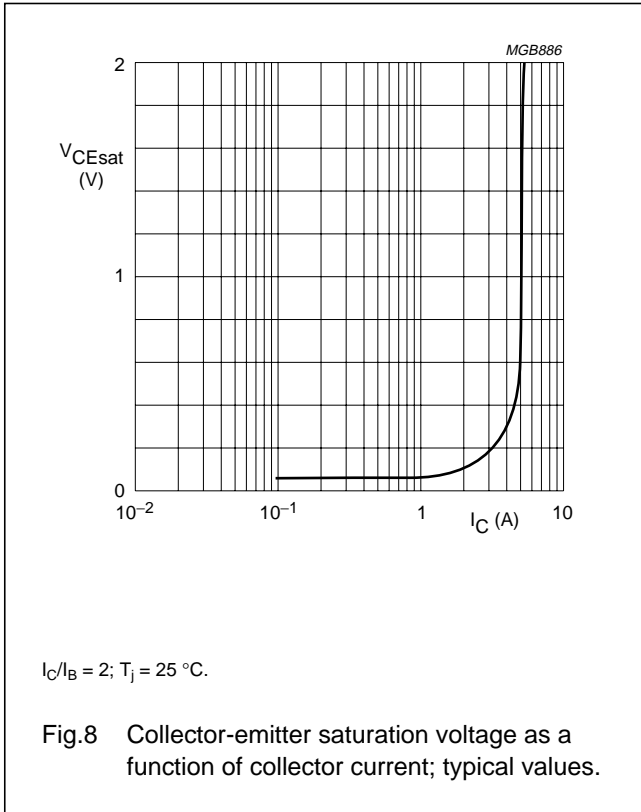
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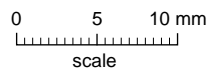
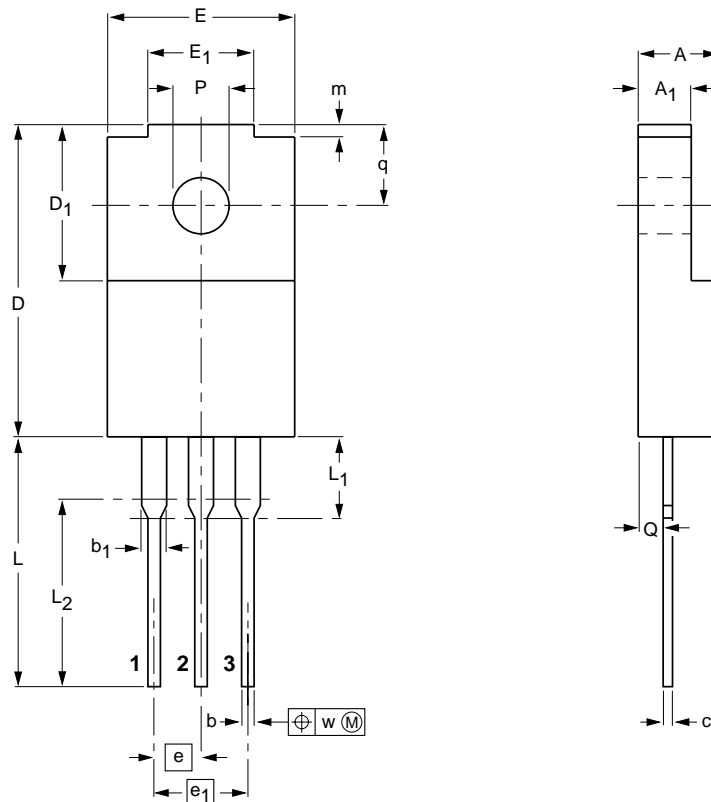
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PACKAGE OUTLINE

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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**DEFINITIONS**

<b>Data sheet status</b>	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
<b>Limiting values</b>	
Limiting values given are 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 the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

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**NOTES**

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