

# 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

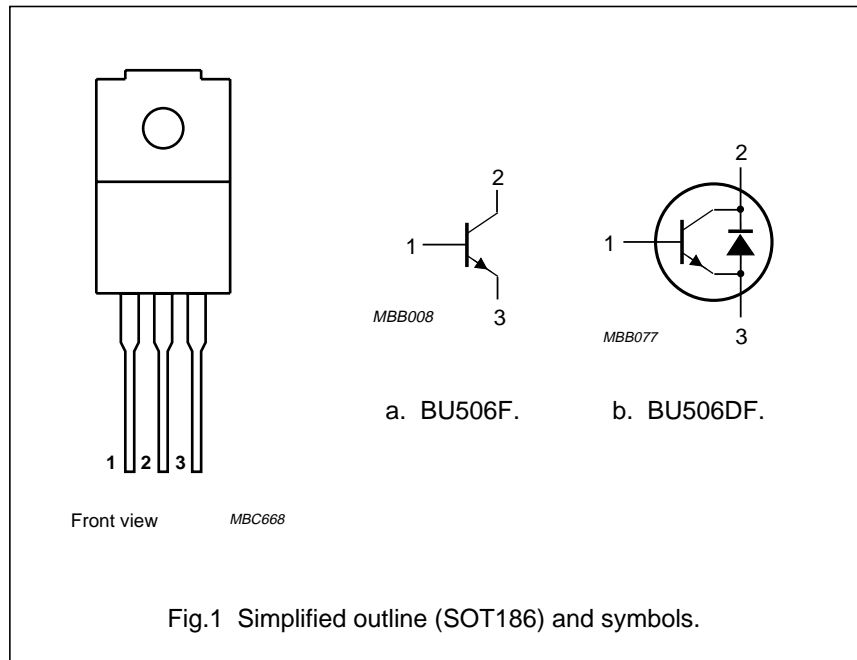
High-voltage, high-speed switching NPN power transistor in a SOT186 package. The BU506DF has an integrated efficiency diode.

## 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	$T_h \leq 25\text{ }^\circ\text{C}$ ; 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**

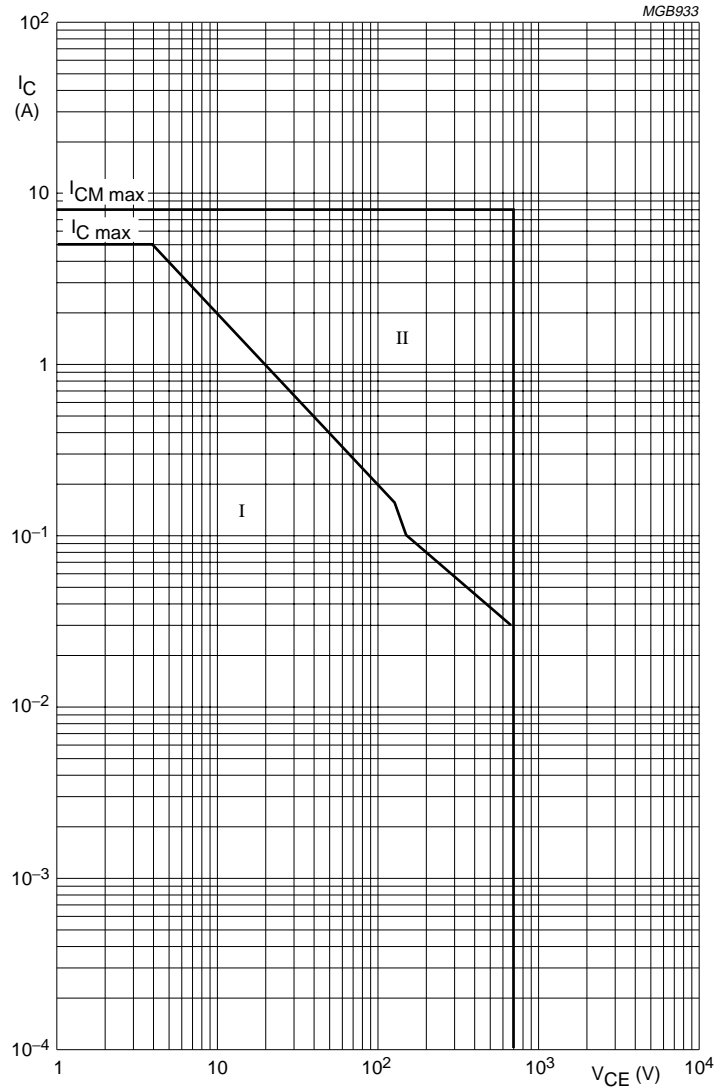
SYMBOL	PARAMETER	TYP.	MAX.	UNIT
$V_{isolM}$	isolation voltage from all terminals to external heatsink (peak value)	–	1500	V
$C_{isol}$	isolation capacitance from collector to external heatsink	12	–	pF

**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.

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

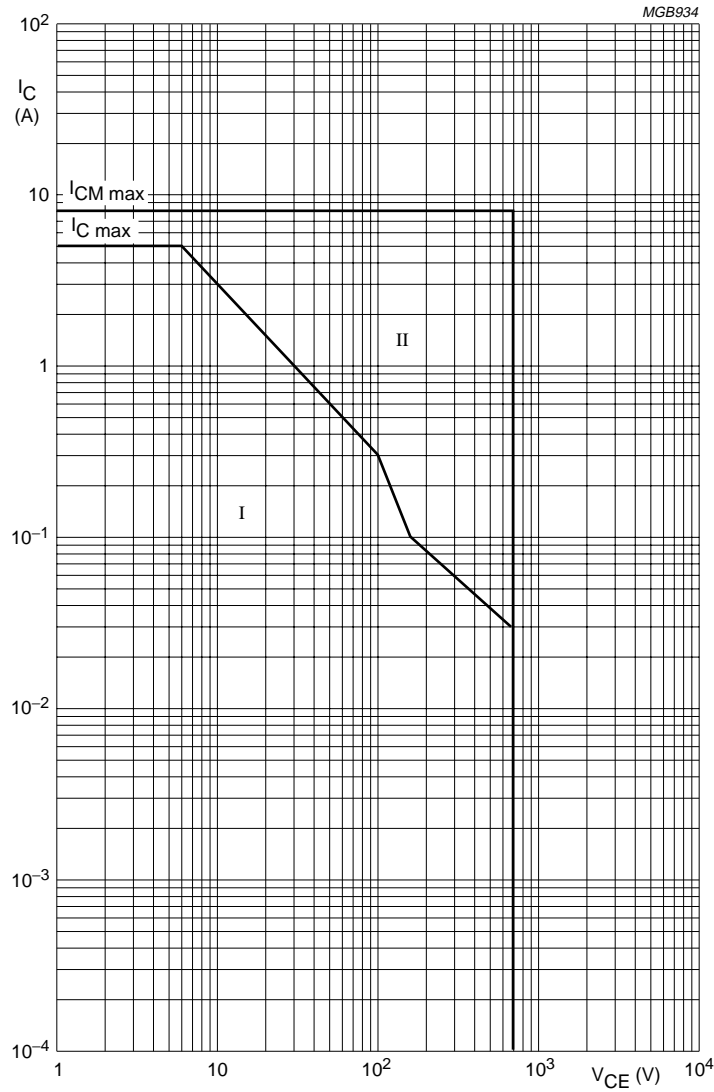
I - Region of permissible DC operation.

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.

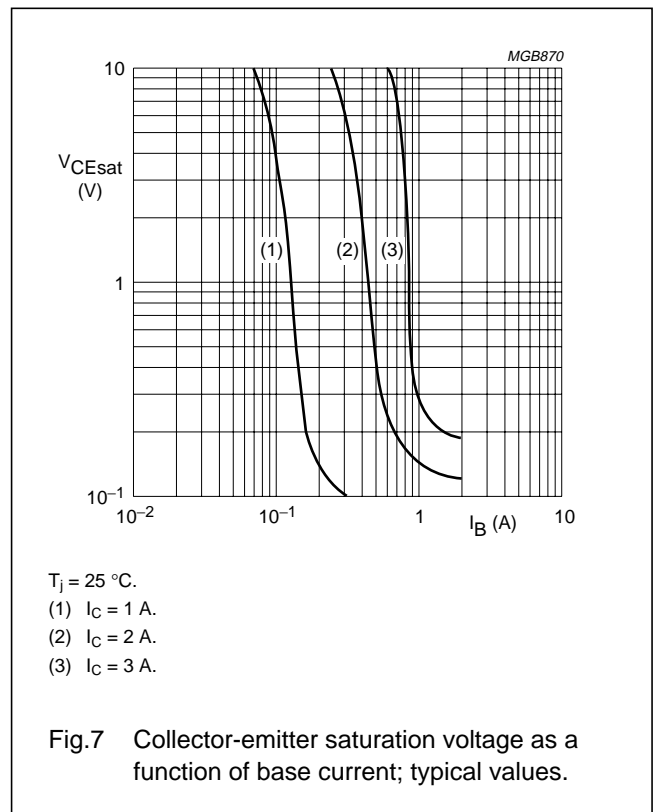
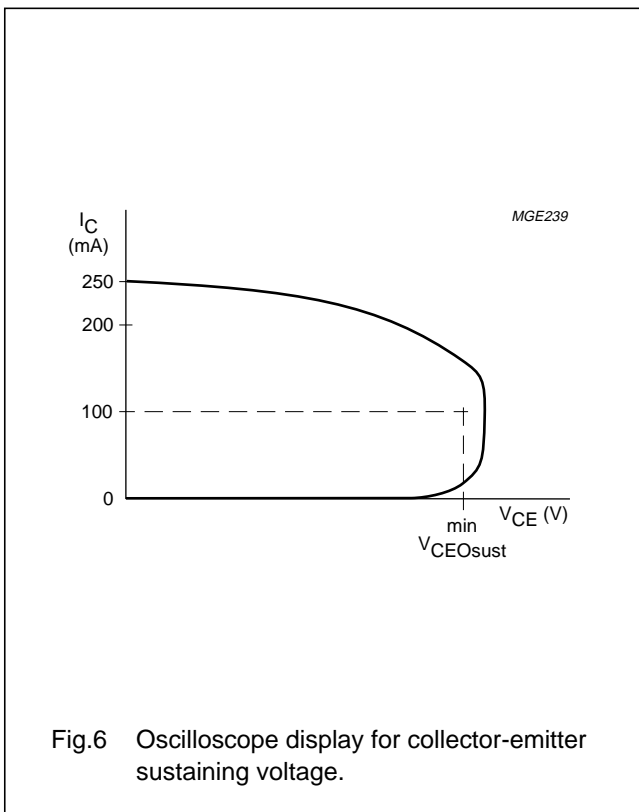
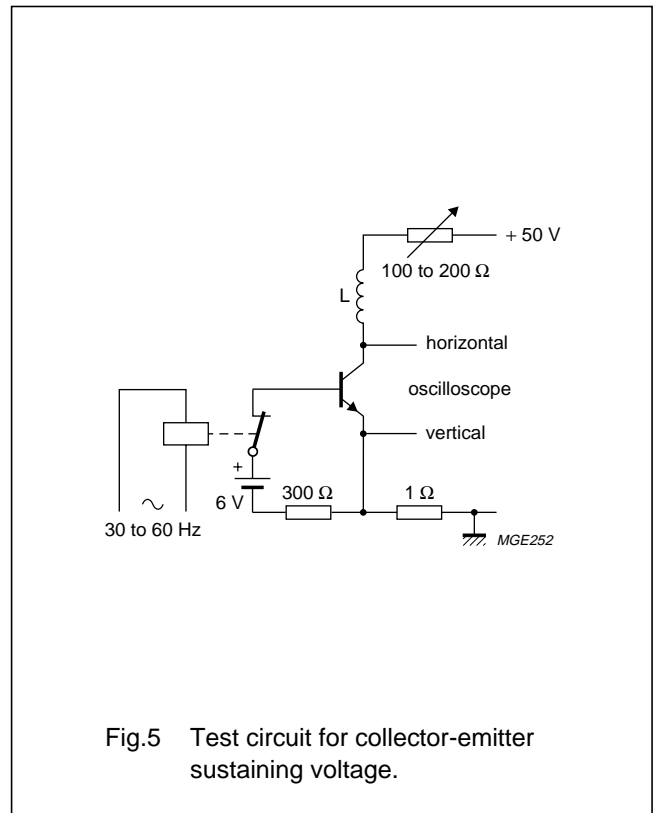
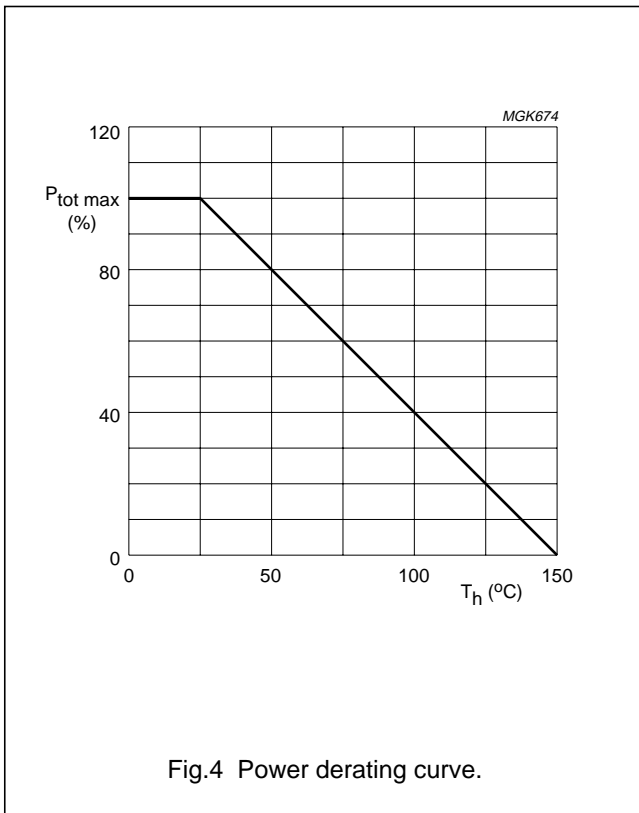
I - Region of permissible DC operation.

II - Permissible extension for repetitive pulse operation.

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

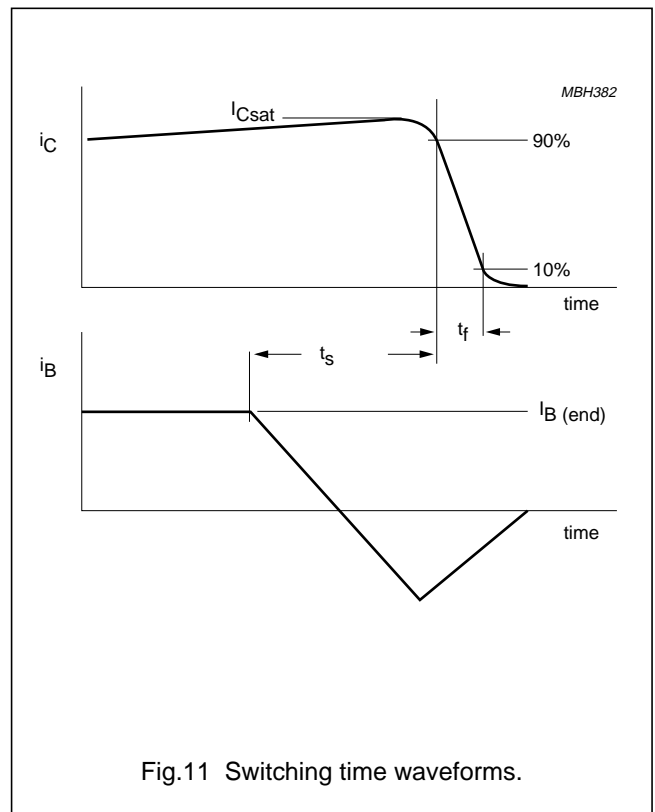
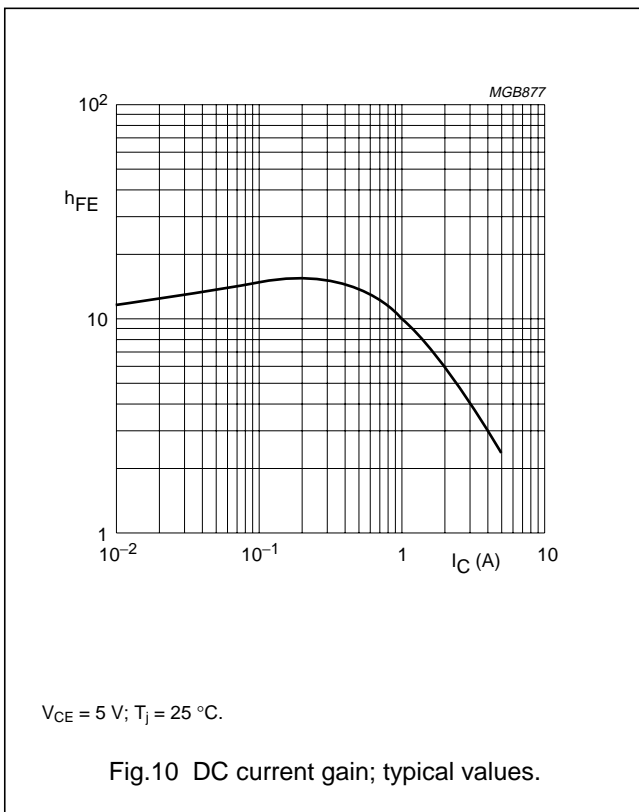
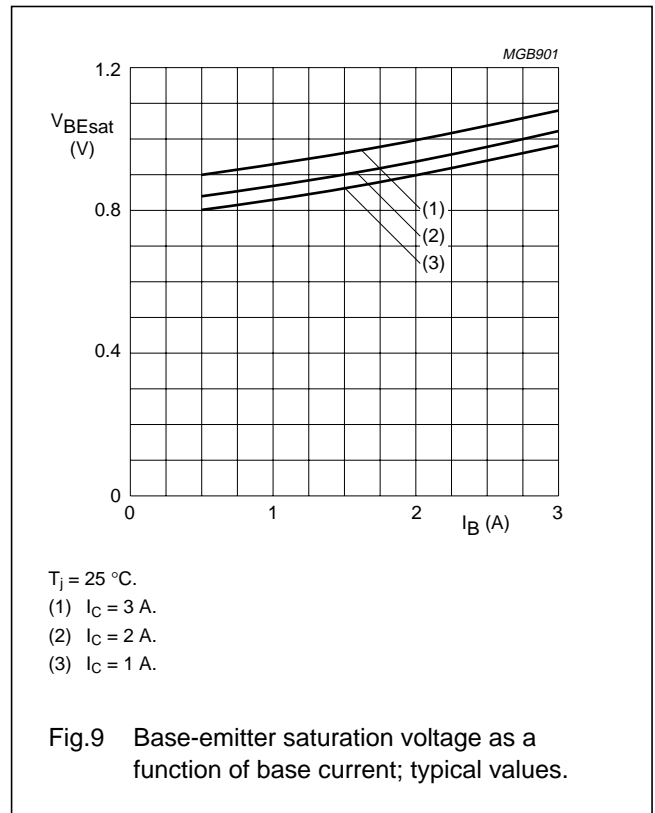
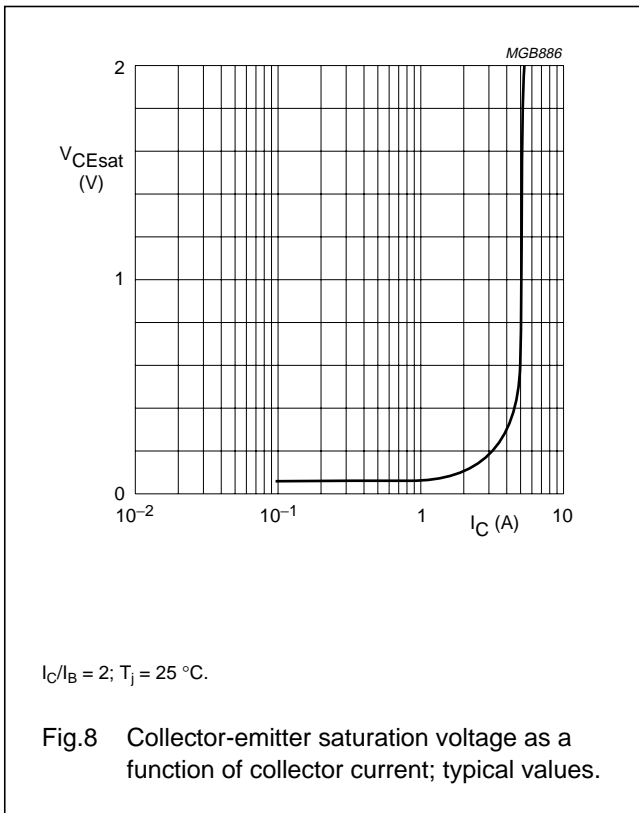
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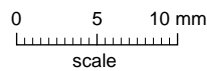
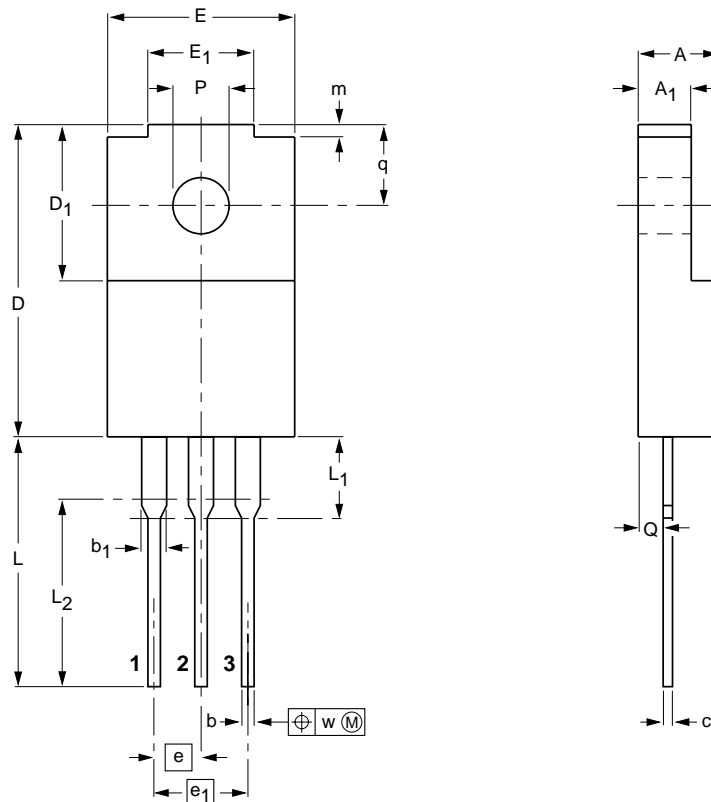
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PACKAGE OUTLINE

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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**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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**Argentina:** see South America

**Australia:** 34 Waterloo Road, NORTH RYDE, NSW 2113,  
Tel. +61 2 9805 4455, Fax. +61 2 9805 4466

**Austria:** Computerstr. 6, A-1101 WIEN, P.O. Box 213, Tel. +43 160 1010,  
Fax. +43 160 101 1210

**Belarus:** Hotel Minsk Business Center, Bld. 3, r. 1211, Volodarski Str. 6,  
220050 MINSK, Tel. +375 172 200 733, Fax. +375 172 200 773

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**Bulgaria:** Philips Bulgaria Ltd., Energoproject, 15th floor,  
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**China/Hong Kong:** 501 Hong Kong Industrial Technology Centre,  
72 Tat Chee Avenue, Kowloon Tong, HONG KONG,  
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**Colombia:** see South America

**Czech Republic:** see Austria

**Denmark:** Prags Boulevard 80, PB 1919, DK-2300 COPENHAGEN S,  
Tel. +45 32 88 2636, Fax. +45 31 57 0044

**Finland:** Sinikalliontie 3, FIN-02630 ESPOO,  
Tel. +358 9 615800, Fax. +358 9 61580920

**France:** 4 Rue du Port-aux-Vins, BP317, 92156 SURESNES Cedex,  
Tel. +33 1 40 99 6161, Fax. +33 1 40 99 6427

**Germany:** Hammerbrookstraße 69, D-20097 HAMBURG,  
Tel. +49 40 23 53 60, Fax. +49 40 23 536 300

**Greece:** No. 15, 25th March Street, GR 17778 TAVROS/ATHENS,  
Tel. +30 1 4894 339/239, Fax. +30 1 4814 240

**Hungary:** see Austria

**India:** Philips INDIA Ltd, Band Box Building, 2nd floor,  
254-D, Dr. Annie Besant Road, Worli, MUMBAI 400 025,  
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**Indonesia:** see Singapore

**Ireland:** Newstead, Clonskeagh, DUBLIN 14,  
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**Israel:** RAPAC Electronics, 7 Kehilat Saloniki St, PO Box 18053,  
TEL AVIV 61180, Tel. +972 3 645 0444, Fax. +972 3 649 1007

**Italy:** PHILIPS SEMICONDUCTORS, Piazza IV Novembre 3,  
20124 MILANO, Tel. +39 2 6752 2531, Fax. +39 2 6752 2557

**Japan:** Philips Bldg 13-37, Kohnan 2-chome, Minato-ku, TOKYO 108,  
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**Mexico:** 5900 Gateway East, Suite 200, EL PASO, TEXAS 79905,  
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**Middle East:** see Italy

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**New Zealand:** 2 Wagener Place, C.P.O. Box 1041, AUCKLAND,  
Tel. +64 9 849 4160, Fax. +64 9 849 7811

**Norway:** Box 1, Manglerud 0612, OSLO,  
Tel. +47 22 74 8000, Fax. +47 22 74 8341

**Philippines:** Philips Semiconductors Philippines Inc.,  
106 Valero St. Salcedo Village, P.O. Box 2108 MCC, MAKATI,  
Metro MANILA, Tel. +63 2 816 6380, Fax. +63 2 817 3474

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**South America:** Rua do Rocio 220, 5th floor, Suite 51,  
04552-903 São Paulo, SÃO PAULO - SP, Brazil,  
Tel. +55 11 821 2333, Fax. +55 11 829 1849

**Spain:** Balmes 22, 08007 BARCELONA,  
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**Turkey:** Talatpasa Cad. No. 5, 80640 GÜLTEPE/ISTANBUL,  
Tel. +90 212 279 2770, Fax. +90 212 282 6707

**Ukraine:** PHILIPS UKRAINE, 4 Patrice Lumumba str., Building B, Floor 7,  
252042 KIEV, Tel. +380 44 264 2776, Fax. +380 44 268 0461

**United Kingdom:** Philips Semiconductors Ltd., 276 Bath Road, Hayes,  
MIDDLESEX UB3 5BX, Tel. +44 181 730 5000, Fax. +44 181 754 8421

**United States:** 811 East Arques Avenue, SUNNYVALE, CA 94088-3409,  
Tel. +1 800 234 7381

**Uruguay:** see South America

**Vietnam:** see Singapore

**Yugoslavia:** PHILIPS, Trg N. Pasica 5/v, 11000 BEOGRAD,  
Tel. +381 11 625 344, Fax. +381 11 635 777

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