DATA SHEET

BU505F; BU505DF
Silicon diffused power transistors

Product specification
Supersedes data of December 1991
File under Discrete Semiconductors, SC06

1997 Aug 13

Philips
Semiconductors

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Silicon diffused power transistors BU505F; BU505DF

DESCRIPTION

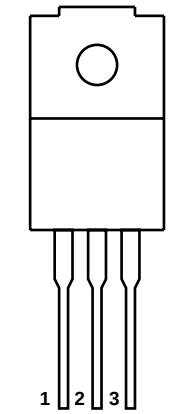
High-voltage, high-speed, glass-passivated NPN power transistor in a SOT186 package with electrically isolated mounting base. The BU505DF has an integrated efficiency diode.

APPLICATIONS

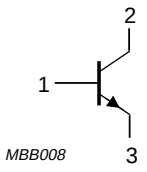
- Horizontal deflection circuits of colour television receivers.

PINNING

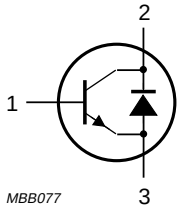
PIN	DESCRIPTION
1	base
2	collector
3	emitter
mb	mounting base; electrically isolated from all pins



Front view MBC668



a. BU505F.



b. BU505DF.

Fig.1 Simplified outline (SOT186) and symbols.

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 = 2 A; I_B = 900 mA; see Fig.8	–	1	V
V_F	diode forward voltage (BU505DF)	I_F = 2 A	–	1.8	V
I_{Csat}	collector saturation current		–	2	A
I_C	collector current (DC)	see Figs 4 and 5	–	2.5	A
I_{CM}	collector current (peak value)	see Figs 4 and 5	–	4	A
P_{tot}	total power dissipation	$T_h \leq 25$ °C; see Fig.2	–	20	W
t_f	fall time	inductive load; see Fig.10	0.7	–	µs

THERMAL CHARACTERISTICS

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

Notes

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

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

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		–	2	A
I_C	collector current (DC)	see Figs 4 and 5	–	2.5	A
I_{CM}	collector current (peak value)	see Figs 4 and 5	–	4	A
I_B	base current (DC)		–	2	A
I_{BM}	base current (peak value)		–	4	A
P_{tot}	total power dissipation	$T_h \leq 25$ °C; see Fig.2	–	20	W
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	150	°C

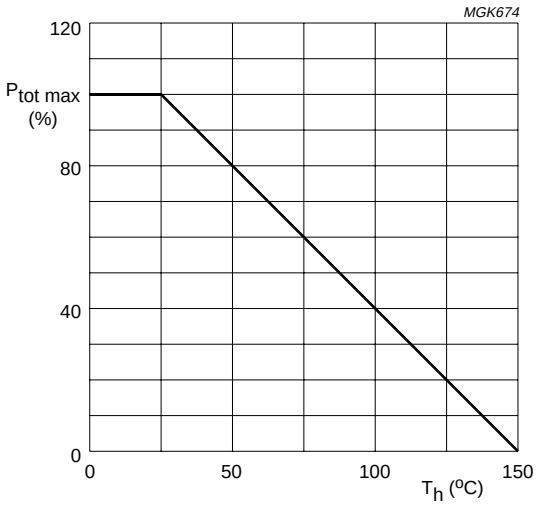
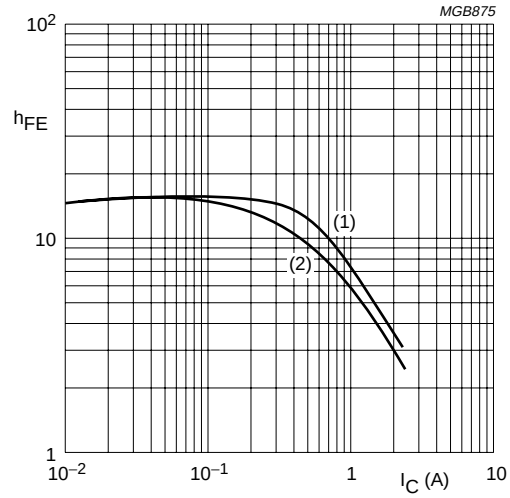


Fig.2 Power derating curve.



T_j = 25 °C.
(1) V_{CE} = 5 V.
(2) V_{CE} = 1 V.

Fig.3 DC current gain; typical values.

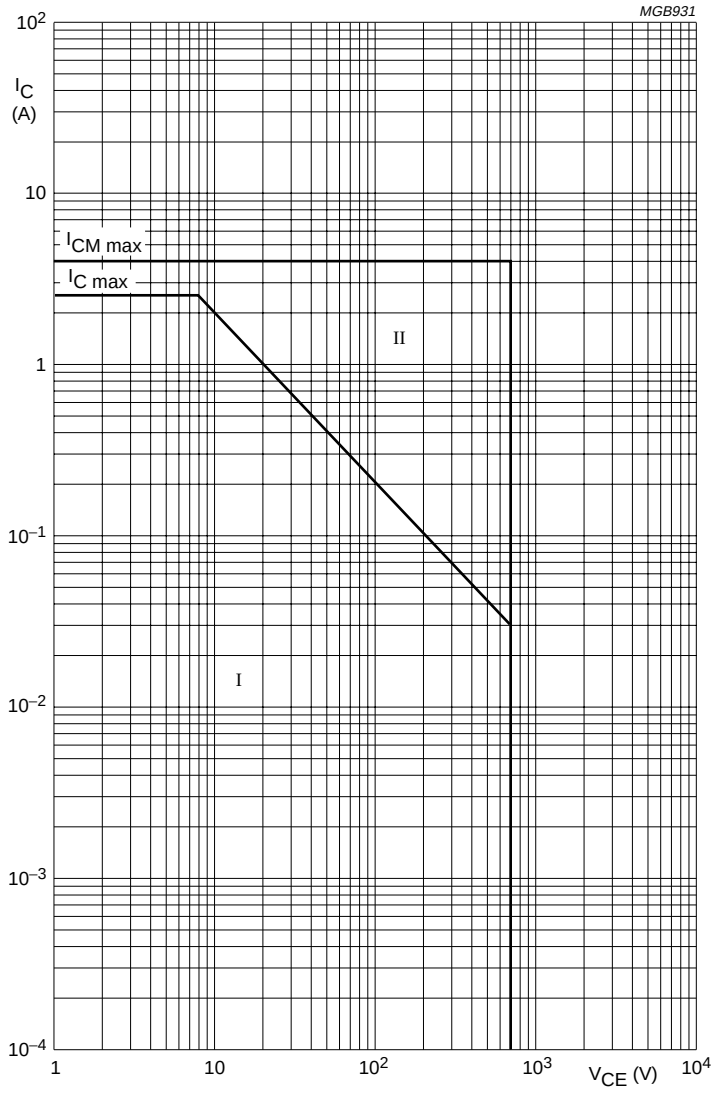
CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{CEOsust}$	collector-emitter sustaining voltage	I_C = 0.1 A; I_B = 0; L = 25 mH; see Figs 6 and 7	700	–	–	V
V_{CEsat}	collector-emitter saturation voltage	I_C = 2 A; I_B = 900 mA; see Fig.8	–	–	1	V
V_{BEsat}	base-emitter saturation voltage	I_C = 2 A; I_B = 900 mA; see Fig.9	–	–	1.3	V
V_F	diode forward voltage (BU505DF)	I_F = 2 A	–	–	1.8	V
I_{CES}	collector-emitter cut-off current	$V_{CE} = V_{CESmax}$; V_{BE} = 0; note 1	–	–	0.15	mA
		$V_{CE} = V_{CESmax}$; V_{BE} = 0; T_j = 125 °C; note 1	–	–	1	mA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0	–	–	1	mA
h_{FE}	DC current gain	see Fig.3				
		V_{CE} = 5 V; I_C = 2 A	2.22	–	–	
		V_{CE} = 5 V; I_C = 100 mA	6	13	30	
f_T	transition frequency	V_{CE} = 5 V; I_C = 100 mA; f = 1 MHz	–	7	–	MHz
C_c	collector capacitance	V_{CB} = 10 V; $I_E = i_e$ = 0; f = 1 MHz	–	65	–	pF
Switching times in horizontal deflection circuit (see Fig.4)						
t_s	storage time	I_{CM} = 2 A; $I_{B(end)}$ = 900 mA; V_{dr} = –4 V				
		L_B = 10 µH	–	6.5	–	µs
		L_B = 15 µH	–	7.5	–	µs
		L_B = 25 µH	–	9.5	–	µs
t_f	fall time	I_{CM} = 2 A; $I_{B(end)}$ = 900 mA; V_{dr} = –4 V				
		L_B = 10 µH	–	0.9	–	µs
		L_B = 15 µH	–	0.9	–	µs
		L_B = 25 µH	–	0.85	–	µs

Note

1. Measured with a half-sinewave voltage (curve tracer).



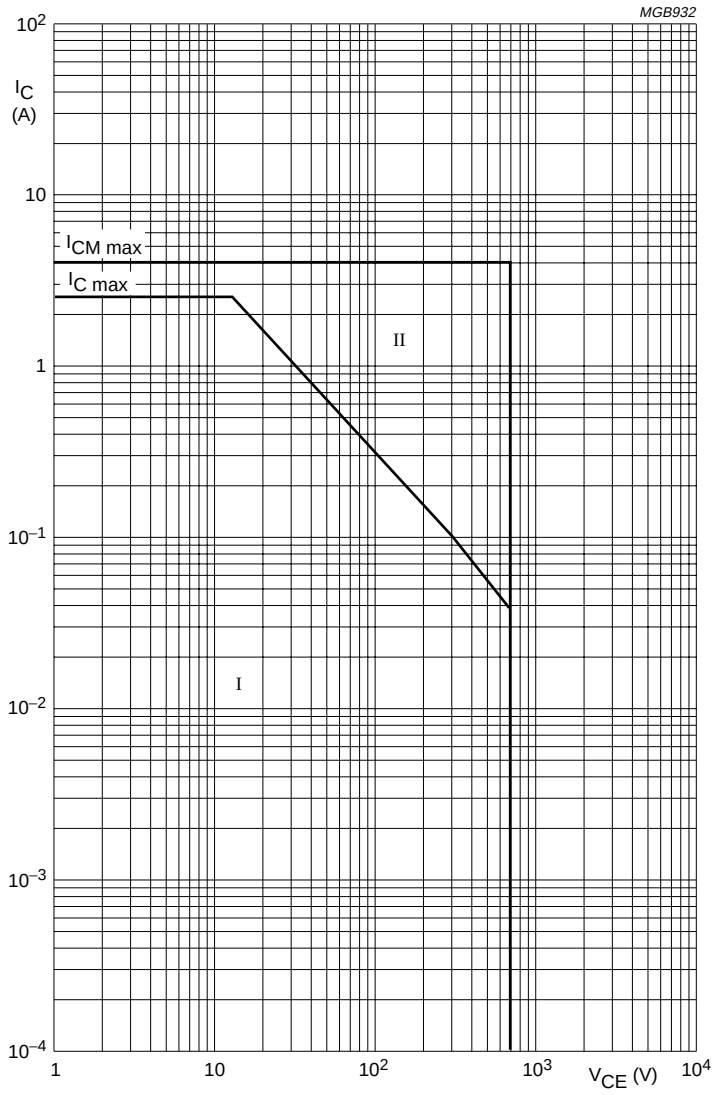
Mounted **without** heatsink compound and 30 ±5 N force on centre of package.

T_h = 25 °C.

I - Region of permissible DC operation.

II - Permissible extension for repetitive pulse operation.

Fig.4 Forward bias SOAR.



Mounted **with** heatsink compound and 30 ±5 N force on centre of package.

T_h = 25 °C.

I - Region of permissible DC operation.

II - Permissible extension for repetitive pulse operation.

Fig.5 Forward bias SOAR.

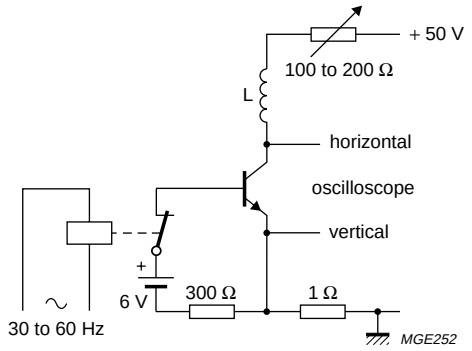


Fig.6 Test circuit for collector-emitter sustaining voltage.

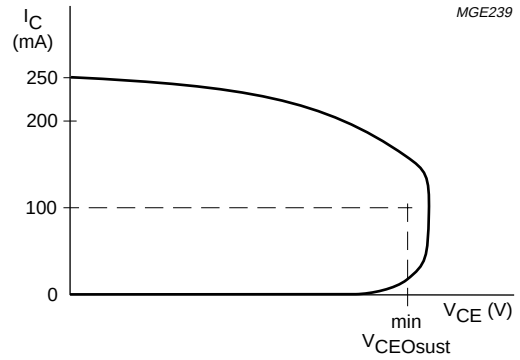
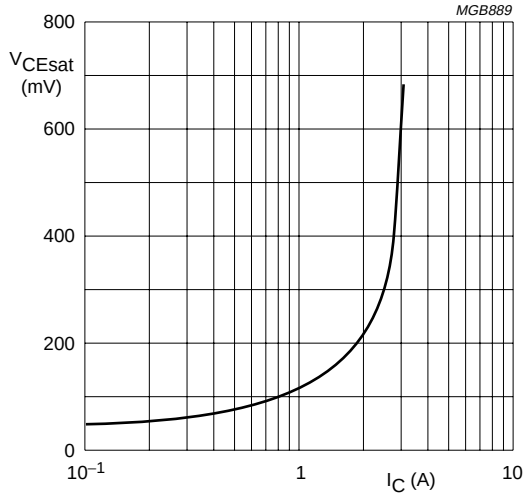
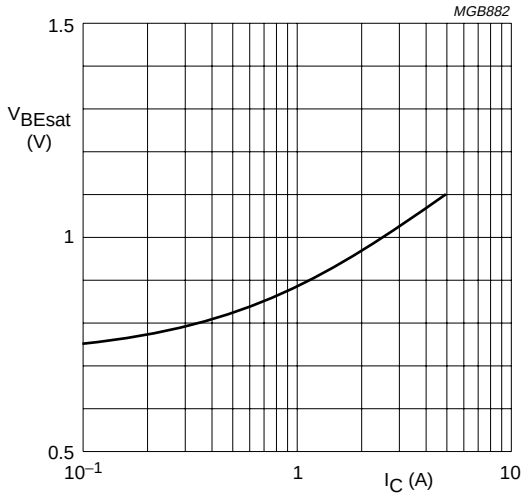


Fig.7 Oscilloscope display for collector-emitter sustaining voltage.



$I_C/I_B = 2$; $T_j = 25$ °C.

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



$I_C/I_B = 2$; $T_j = 25$ °C.

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

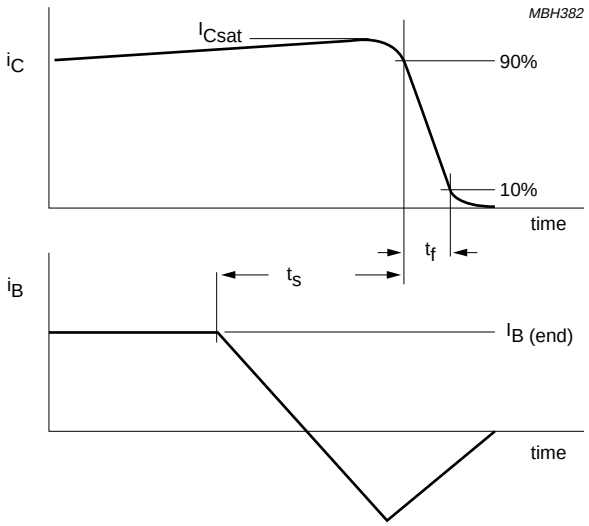
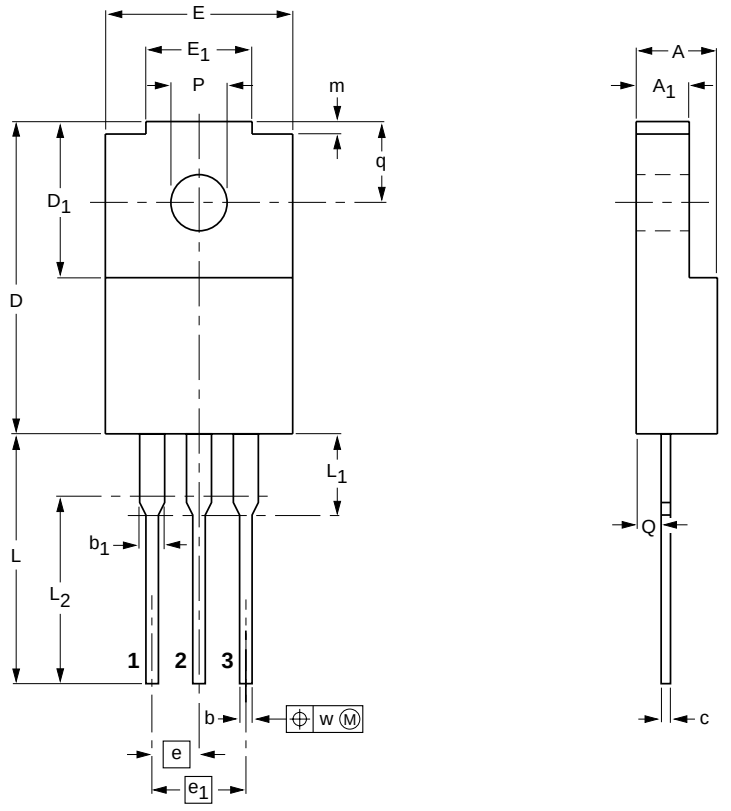


Fig.10 Switching time waveforms.

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_1	b	b_1	c	D	D_1	E	E_1	e	e_1	L	L_1(1)	L_2	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

DEFINITIONS

Data sheet status	
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.
Limiting values	
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.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

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Printed in The Netherlands 137067/00/01/pp12 Date of release: 1997 Aug 13 Document order number: 9397 750 02709

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