DATA SHEET

BFR53
NPN 2 GHz wideband transistor

Product specification
Supersedes data of September 1995
File under Discrete Semiconductors, SC14

1997 Oct 28

Philips Semiconductors

PHILIPS

NPN 2 GHz wideband transistor BFR53

FEATURES

- Very low intermodulation distortion
- Very high power gain.

APPLICATIONS

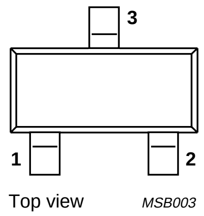
- Thick and thin-film circuits.

DESCRIPTION

NPN wideband transistor in a plastic SOT23 package.

PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector



Marking code: N1.

Fig.1 SOT23.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	18	V
V_{CEO}	collector-emitter voltage	open base	–	10	V
I_{CM}	peak collector current	f > 1 MHz	–	100	mA
P_{tot}	total power dissipation	$T_s \leq 85$ °C	–	250	mW
C_{re}	feedback capacitance	I_C = 2 mA; V_{CE} = 5 V; f = 1 MHz; T_{amb} = 25 °C	0.9	–	pF
f_T	transition frequency	I_C = 25 mA; V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C	2	–	GHz
G_{UM}	maximum unilateral power gain	I_C = 30 mA; V_{CE} = 5 V; f = 800 MHz; T_{amb} = 25 °C	10.5	–	dB

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	18	V
V_{CEO}	collector-emitter voltage	open base	–	10	V
V_{EBO}	emitter-base voltage	open collector	–	2.5	V
I_C	collector current (DC)		–	50	mA
I_{CM}	peak collector current	f > 1 MHz	–	100	mA
P_{tot}	total power dissipation	$T_s \leq 85$ °C (note 1)	–	250	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	150	°C

Note

1. T_s is the temperature at the soldering point of the collector pin.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}s}$	thermal resistance from junction to soldering point	$T_s \leq 85$ °C; note 1	260	K/W

Note

1. T_s is the temperature at the soldering point of the collector pin.

CHARACTERISTICS

$T_j = 25$ °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0$; $V_{CB} = 10$ V	–	–	50	nA
h_{FE}	DC current gain	$I_C = 25$ mA; $V_{CE} = 5$ V; see Fig.2	25	–	–	
		$I_C = 50$ mA; $V_{CE} = 5$ V; see Fig.2	25	–	–	
C_c	collector capacitance	$I_E = i_e = 0$; $V_{CB} = 5$ V; f = 1 MHz; see Fig.3	–	0.9	–	pF
C_e	emitter capacitance	$I_C = i_c = 0$; $V_{EB} = 0.5$ V; f = 1 MHz	–	1.5	–	pF
C_{re}	feedback capacitance	$I_C = 2$ mA; $V_{CE} = 5$ V; f = 1 MHz; $T_{amb} = 25$ °C	–	0.9	–	pF
f_T	transition frequency	$I_C = 25$ mA; $V_{CE} = 5$ V; f = 500 MHz; see Fig.4	–	2	–	GHz
G_{UM}	maximum unilateral power gain (note 1)	$I_C = 30$ mA; $V_{CE} = 5$ V; f = 800 MHz; $T_{amb} = 25$ °C; see Fig.5	–	10.5	–	dB
F	noise figure	$I_C = 2$ mA; $V_{CE} = 5$ V; f = 500 MHz; $T_{amb} = 25$ °C; see Fig.6	–	–	5	dB

Note

1. G_{UM} is the maximum unilateral power gain, assuming S_{12} is zero and $G_{UM} = 10 \log \frac{|S_{21}|^2}{\left(1 - |S_{11}|^2\right)\left(1 - |S_{22}|^2\right)} \text{ dB}$.

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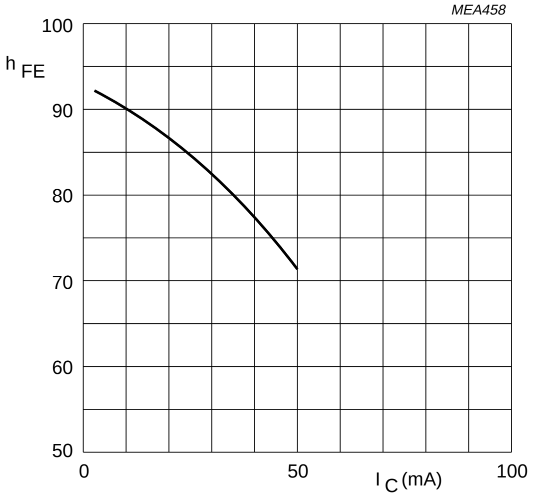
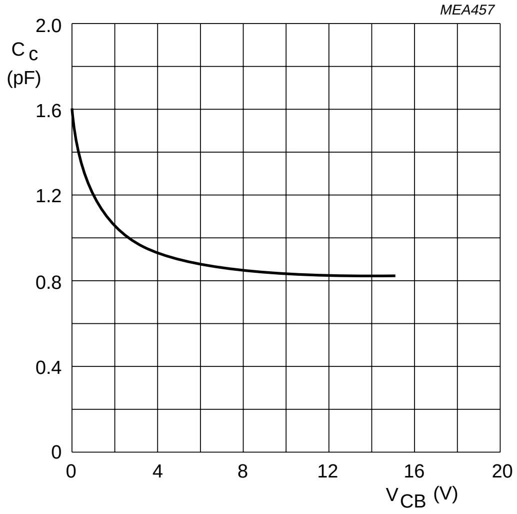


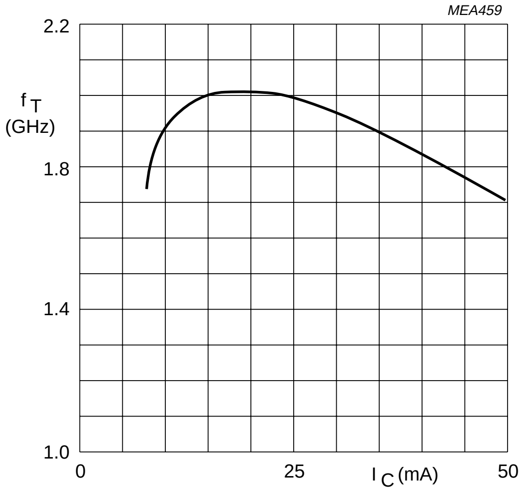
V_{CE} = 5 V; T_j = 25 °C.

Fig.2 DC current gain as a function of collector current; typical values.



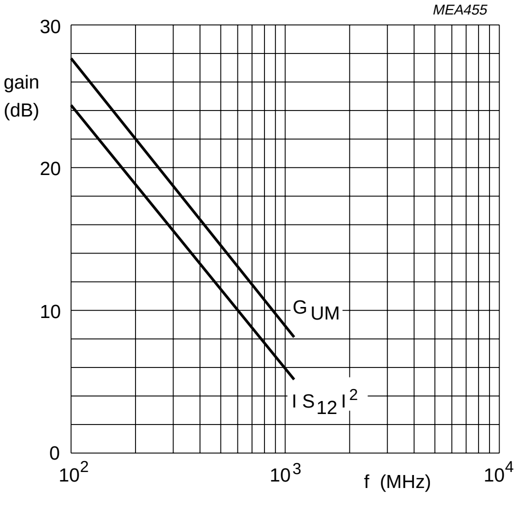
$I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C.

Fig.3 Collector capacitance as a function of collector-base voltage; typical values.



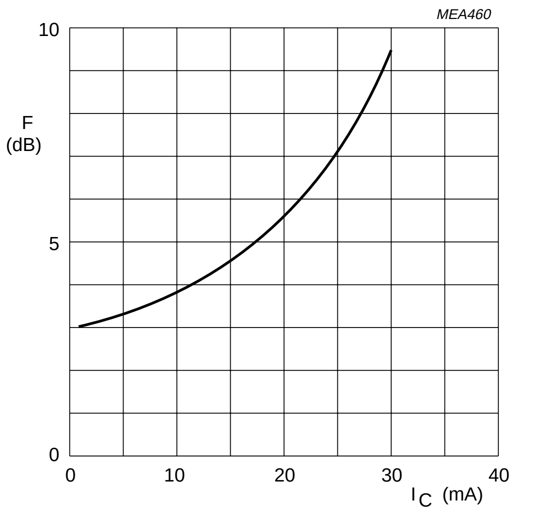
V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C.

Fig.4 Transition frequency as a function of collector current; typical values.



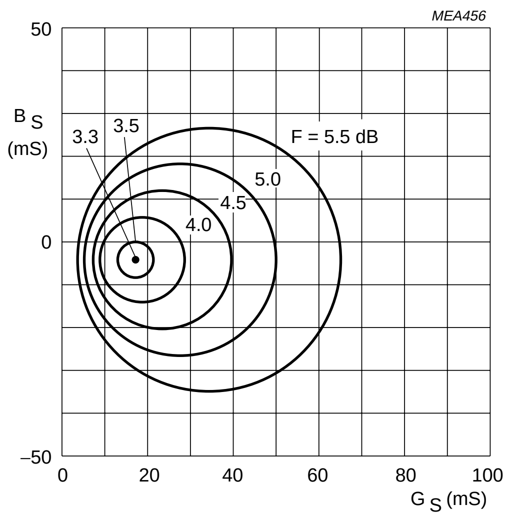
I_C = 30 mA; V_{CE} = 5 V; T_{amb} = 25 °C.

Fig.5 Gain as a function of frequency; typical values.



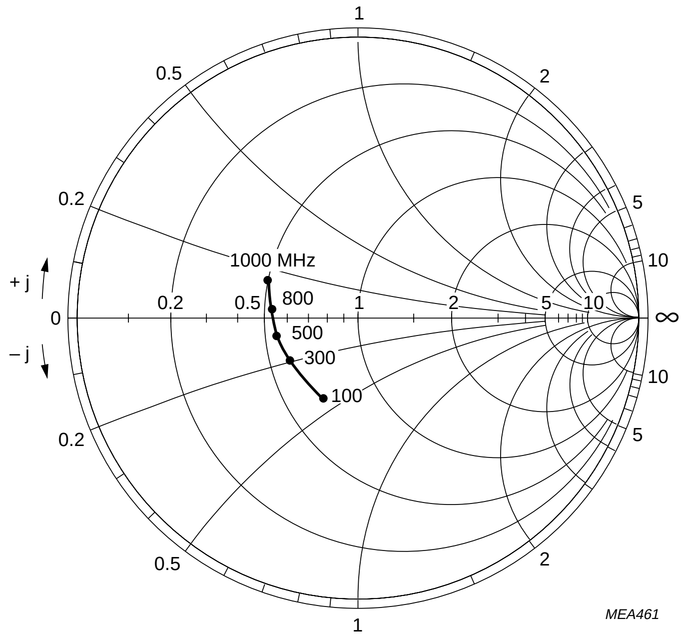
V_{CE} = 5 V; f = 500 MHz; G_S = 20 mS; B_S is tuned; T_{amb} = 25 °C.

Fig.6 Minimum noise figure as a function of collector current; typical values.



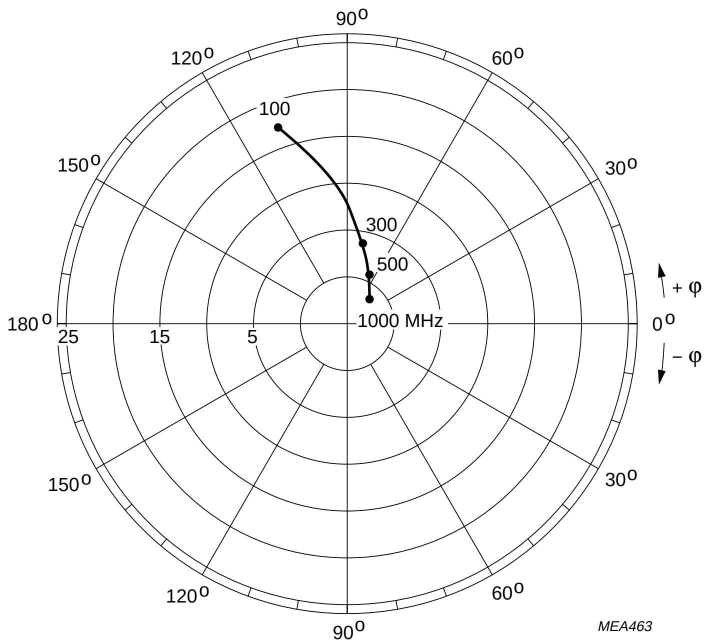
I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C.

Fig.7 Circles of constant noise figure; typical values.



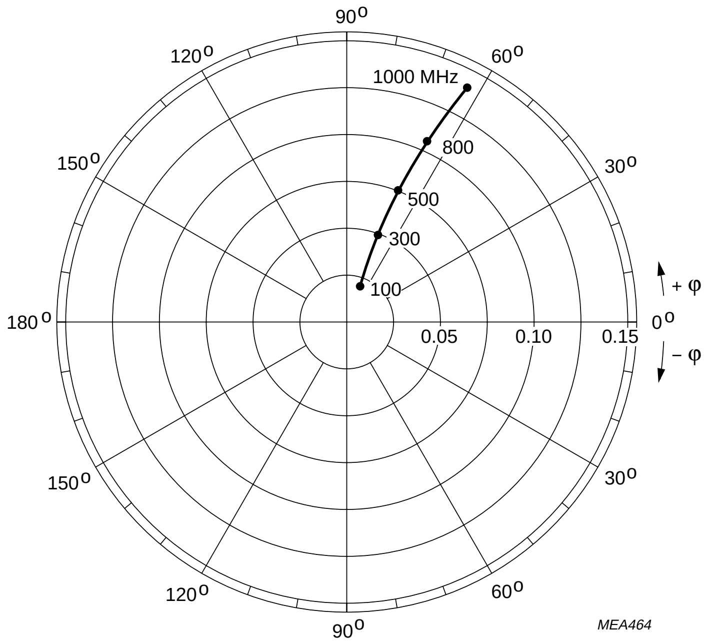
I_C = 30 mA; V_{CE} = 5 V; Z_o = 50 Ω; T_{amb} = 25 °C.

Fig.8 Common emitter input reflection coefficient (S_{11}).



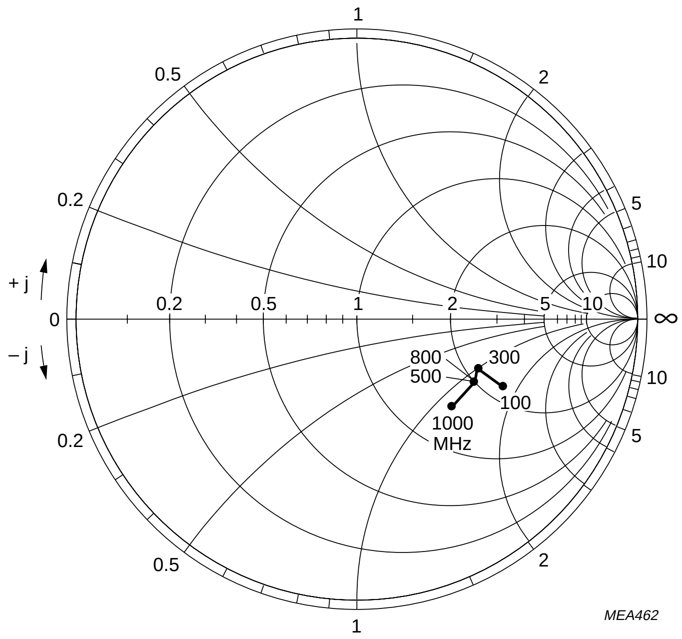
I_C = 30 mA; V_{CE} = 5 V; T_{amb} = 25 °C.

Fig.9 Common emitter forward transmission coefficient (S_{21}).



I_C = 30 mA; V_{CE} = 5 V; T_{amb} = 25 °C.

Fig.10 Common emitter reverse transmission coefficient (S_{12}).

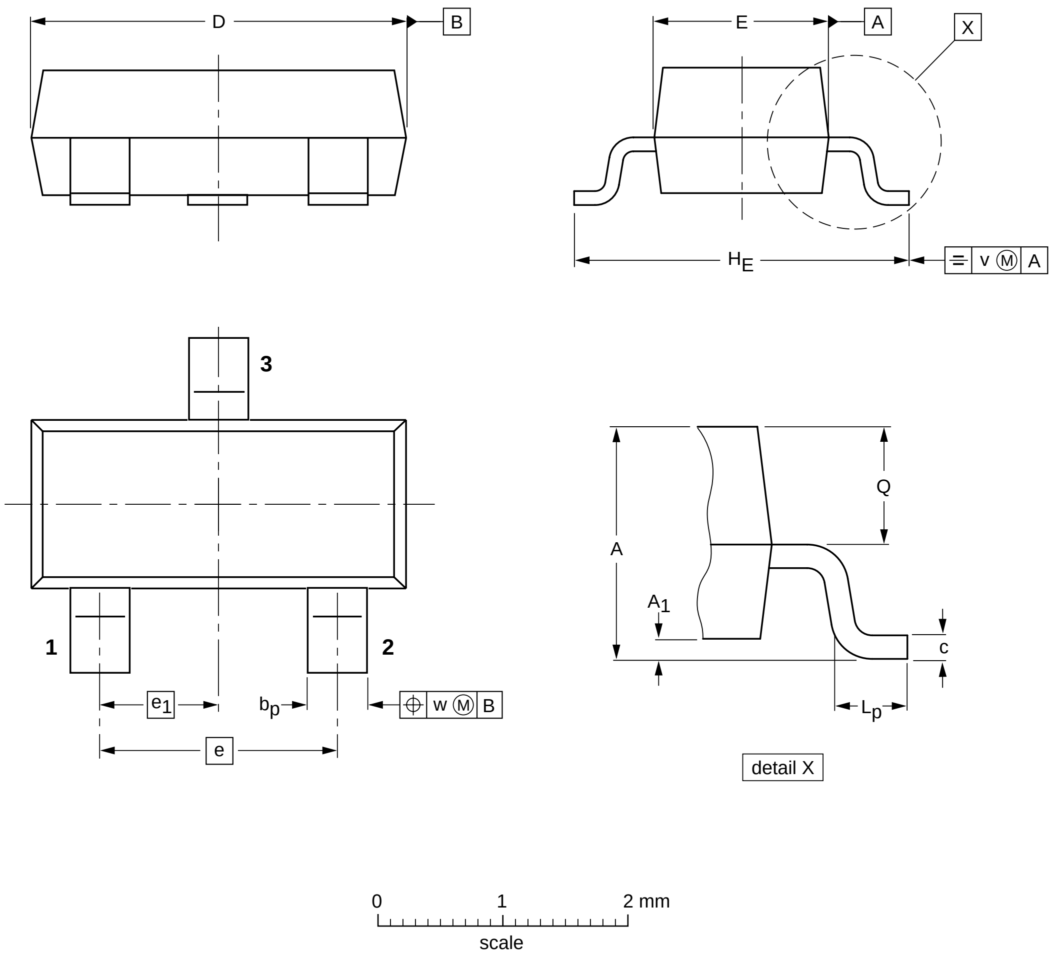


I_C = 30 mA; V_{CE} = 5 V; Z_o = 50 Ω; T_{amb} = 25 °C.

Fig.11 Common emitter output reflection coefficient (S_{22}).

PACKAGE OUTLINES

Plastic surface mounted package; 3 leads **SOT23**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1 max.	b_p	c	D	E	e	e_1	H_E	L_p	Q	v	w
mm	1.1 0.9	0.1	0.48 0.38	0.15 0.09	3.0 2.8	1.4 1.2	1.9	0.95	2.5 2.1	0.45 0.15	0.55 0.45	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT23						97-02-28

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.
Short-form specification	The data in this specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.
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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