DISCRETE SEMICONDUCTORS

DATA SHEET

BFQ136
NPN 4 GHz wideband transistor

Product specification
File under Discrete Semiconductors, SC14

September 1995

Philips Semiconductors

PHILIPS

NPN 4 GHz wideband transistor BFQ136

DESCRIPTION

NPN transistor in a four-lead dual-emitter SOT122A envelope with a ceramic cap. All leads are isolated from the stud. Diffused emitter-ballasting resistors and the application of gold sandwich metallization ensure an optimum temperature profile and excellent reliability properties. It features extremely high output voltage capabilities.

It is primarily intended for final stages in UHF amplifiers.

PINNING

PIN	DESCRIPTION
1	collector
2	emitter
3	base
4	emitter

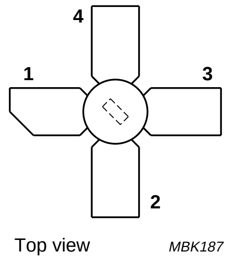


Fig.1 SOT122A.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_{CEO}	collector-emitter voltage	open base	–	18	V
I_C	DC collector current		–	600	mA
P_{tot}	total power dissipation	up to T_c = 100 °C	–	9	W
f_T	transition frequency	I_C = 500 mA; V_{CE} = 15 V; f = 500 MHz; T_j = 25 °C	4.0	–	GHz
G_{UM}	maximum unilateral power gain	I_C = 500 mA; V_{CE} = 15 V; f = 800 MHz; T_{amb} = 25 °C	12.5	–	dB
V_o	output voltage	I_c = 500 mA; V_{CE} = 15 V; d_{im} = –60 dB; R_L = 75 Ω; $f_{(p+q-r)}$ = 793.25 MHz; T_{amb} = 25 °C	2.5	–	V

WARNING
Product and environmental safety - toxic materials
This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	25	V
V_{CEO}	collector-emitter voltage	open base	–	18	V
V_{EBO}	emitter-base voltage	open collector	–	2	V
I_C	DC collector current		–	600	mA
P_{tot}	total power dissipation	up to T_c = 100 °C	–	9	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	THERMAL RESISTANCE
$R_{th\ j\text{-}c}$	thermal resistance from junction to case	11 K/W

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} = 15 V	–	–	75	μA
h_{FE}	DC current gain	I_C = 500 mA; V_{CE} = 15 V	25	75	–	
C_c	collector capacitance	$I_E = i_e$ = 0; V_{CB} = 15 V; f = 1 MHz	–	7.0	–	pF
C_e	emitter capacitance	$I_C = i_c$ = 0; V_{EB} = 0.5 V; f = 1 MHz	–	40	–	pF
C_{re}	feedback capacitance	I_C = 0; V_{CE} = 15 V; f = 1 MHz	–	4.0	–	pF
C_{cs}	collector-stud capacitance	note 1	–	0.8	–	pF
f_T	transition frequency	I_C = 500 mA; V_{CE} = 15 V; f = 500 MHz	–	4.0	–	GHz
G_{UM}	maximum unilateral power gain (note 2)	I_C = 500 mA; V_{CE} = 15 V; f = 800 MHz; T_{amb} = 25 °C	–	12.5	–	dB
V_o	output voltage (see Fig.2)	note 3	–	2.5	–	V

Notes

1. Measured with emitter and base grounded.
2. G_{UM} is the maximum unilateral power gain, assuming S_{12} is zero and

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{\left(1-|S_{11}|^2\right)\left(1-|S_{22}|^2\right)} \text{ dB.}$$

3. d_{im} = –60 dB; I_C = 500 mA; V_{CE} = 15 V; R_L = 75 Ω; T_{amb} = 25 °C;
   $V_p = V_o$ at d_{im} = –60 dB; f_p = 795.25 MHz;
   $V_q = V_o$ –6 dB; f_q = 803.25 MHz;
   $V_r = V_o$ –6 dB; f_r = 805.25 MHz;
   measured at $f_{(p+q-r)}$ = 793.25 MHz.

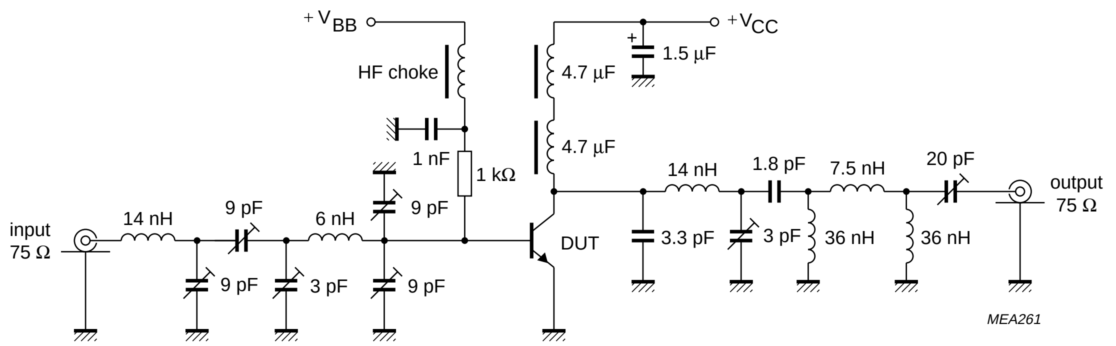
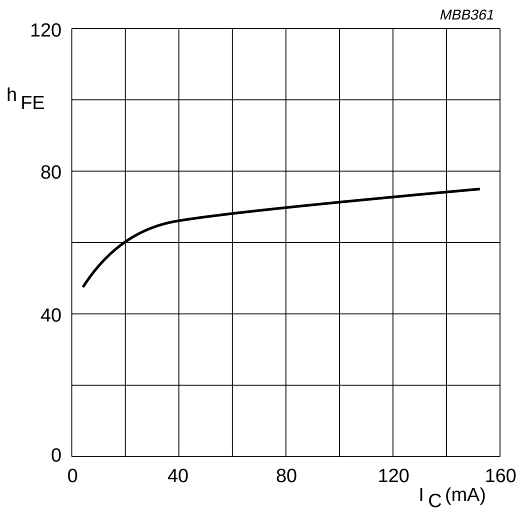
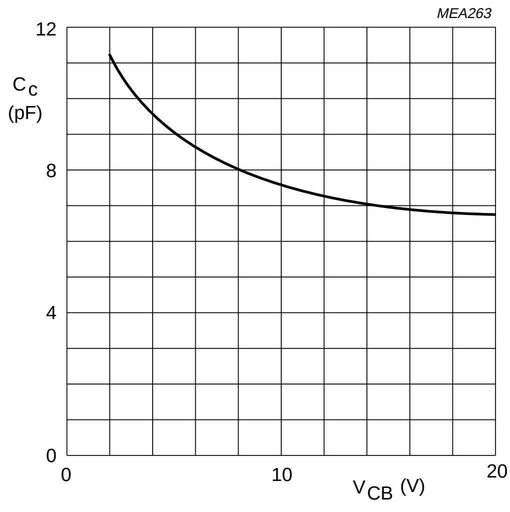


Fig.2 Intermodulation distortion MATV test circuit.



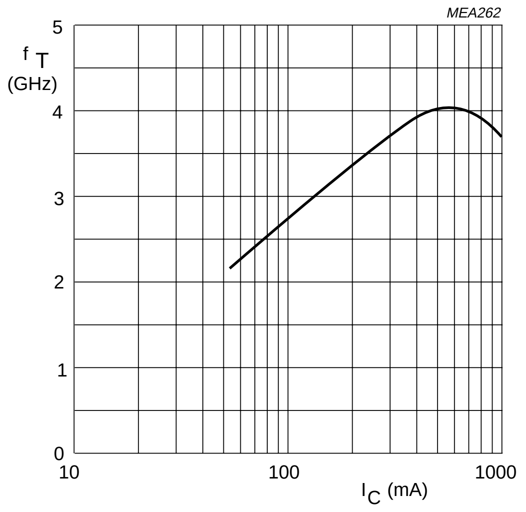
V_{CE} = 15 V; T_j = 25 °C.

Fig.3 DC current gain as a function of collector current.



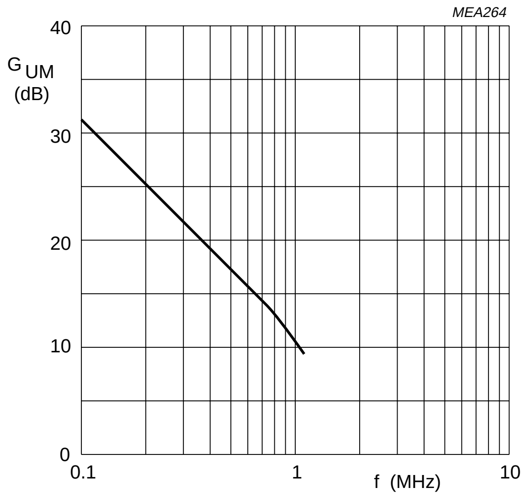
$I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C

Fig.4 Collector capacitance as a function of collector-base voltage.



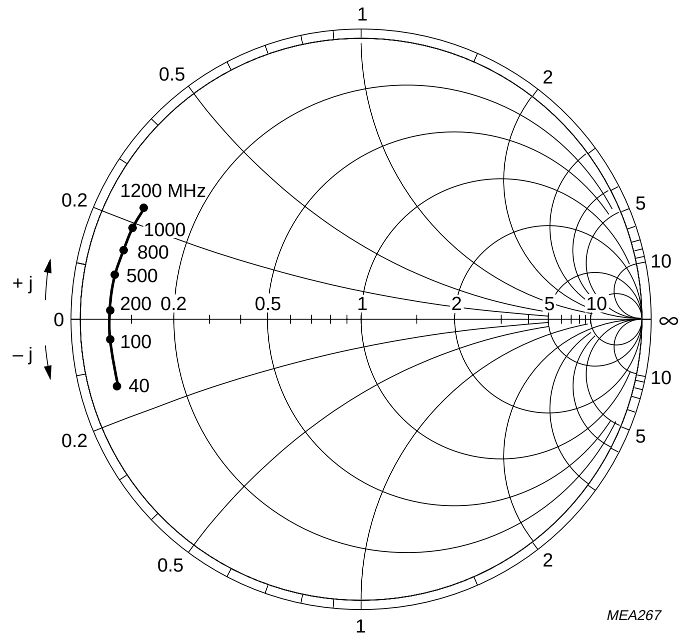
V_{CE} = 15 V; f = 500 MHz; T_j = 25 °C

Fig.5 Transition frequency as a function of collector current.



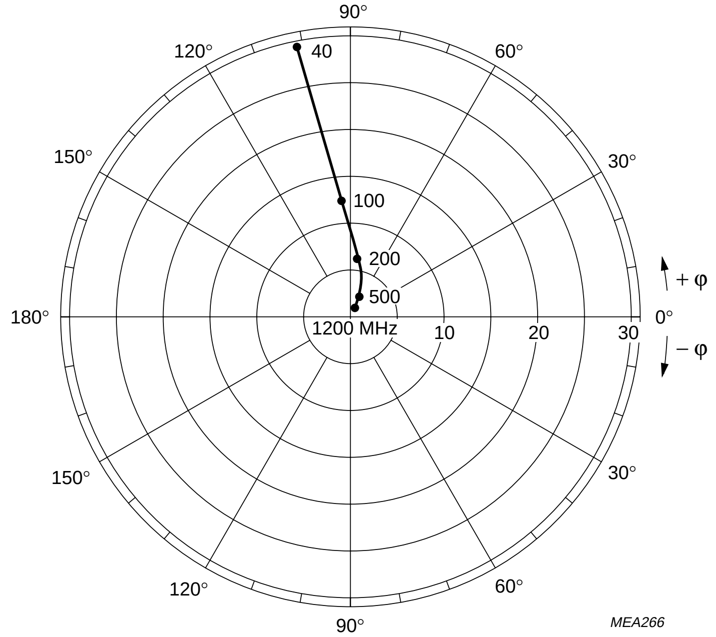
I_C = 500 mA; V_{CE} = 15 V; T_{amb} = 25 °C.

Fig.6 Maximum unilateral power gain as a function of frequency.



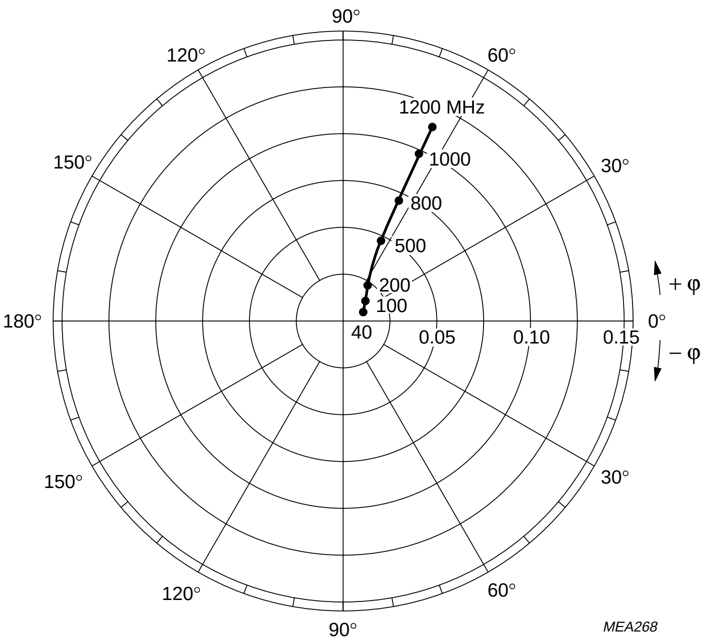
I_C = 500 mA; V_{CE} = 15 V; T_{amb} = 25 °C.
Z_o = 50 Ω.

Fig.7 Common emitter input reflection coefficient (S_{11}).



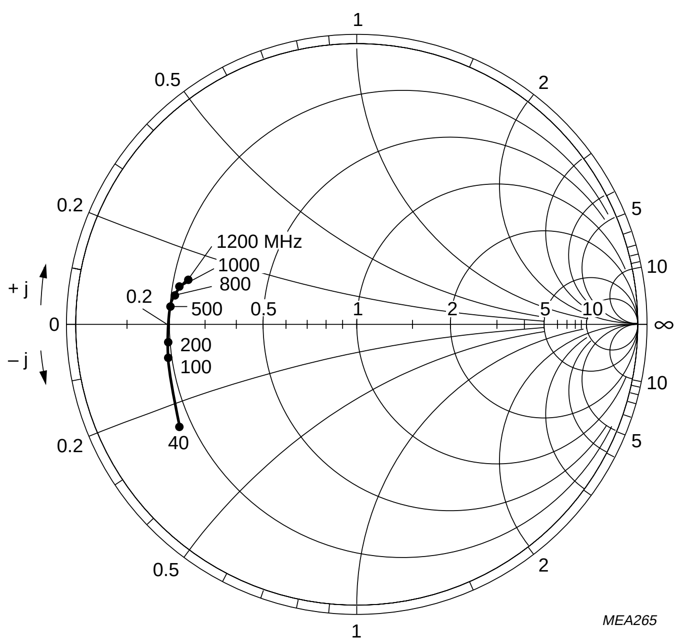
I_C = 500 mA; V_{CE} = 15 V; T_{amb} = 25 °C.

Fig.8 Common emitter forward transmission coefficient (S_{21}).



I_C = 500 mA; V_{CE} = 15 V; T_{amb} = 25 °C.

Fig.9 Common emitter reverse transmission coefficient (S_{12}).

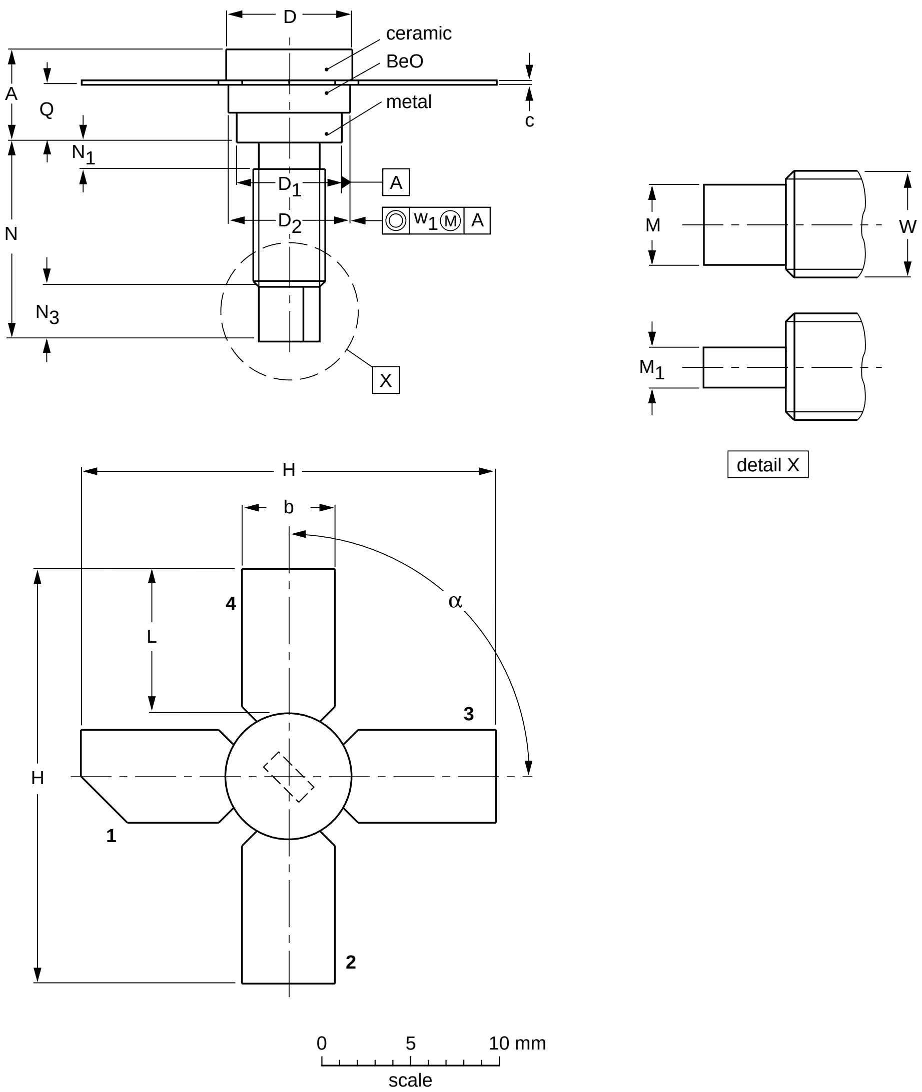


I_C = 500 mA; V_{CE} = 15 V; T_{amb} = 25 °C.
Z_o = 50 Ω.

Fig.10 Common emitter output reflection coefficient (S_{22}).

PACKAGE OUTLINE

Studded ceramic package; 4 leads **SOT122A**



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	b	c	D	D_1	D_2	H	L	M_1	M	N	N_1 max.	N_3	Q	W	w_1	α
mm	5.97 4.74	5.85 5.58	0.18 0.14	7.50 7.23	6.48 6.22	7.24 6.93	27.56 25.78	9.91 9.14	3.18 2.66	1.66 1.39	11.82 11.04	1.02	3.86 2.92	3.38 2.74	8-32 UNC	0.381	90°

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT122A						97-04-18

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.	

LIFE SUPPORT APPLICATIONS

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