

DATA SHEET

BFR106

NPN 5 GHz wideband transistor

Product specification
File under Discrete Semiconductors, SC14

September 1995

NPN 5 GHz wideband transistor

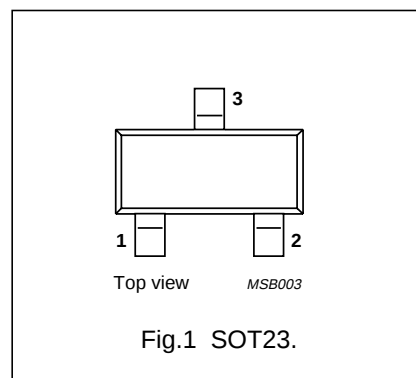
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DESCRIPTION

NPN silicon planar epitaxial transistor in a plastic SOT23 envelope. It is primarily intended for low noise, general RF applications.

PINNING

PIN	DESCRIPTION
Code: R7p	
1	base
2	emitter
3	collector



QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	—	—	20	V
V_{CEO}	collector-emitter voltage	open base	—	—	15	V
I_C	DC collector current		—	—	100	mA
P_{tot}	total power dissipation	up to $T_s = 70\text{ °C}$; note 1	—	—	500	mW
h_{FE}	DC current gain	$I_C = 50\text{ mA}$; $V_{CE} = 9\text{ V}$; $T_{amb} = 25\text{ °C}$	25	80	—	
f_T	transition frequency	$I_C = 50\text{ mA}$; $V_{CE} = 9\text{ V}$; $f = 500\text{ MHz}$; $T_{amb} = 25\text{ °C}$	—	5	—	GHz
G_{UM}	maximum unilateral power gain	$I_C = 30\text{ mA}$; $V_{CE} = 6\text{ V}$; $f = 800\text{ MHz}$; $T_{amb} = 25\text{ °C}$	—	11.5	—	dB
V_o	output voltage	$I_C = 50\text{ mA}$; $V_{CE} = 9\text{ V}$; $R_L = 75\text{ }\Omega$; $T_{amb} = 25\text{ °C}$; $d_{im} = -60\text{ dB}$; $f_{(p+q-r)} = 793.25\text{ MHz}$	—	350	—	mV

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	—	20	V
V_{CEO}	collector-emitter voltage	open base	—	15	V
V_{EBO}	emitter-base voltage	open collector	—	3	V
I_C	DC collector current		—	100	mA
P_{tot}	total power dissipation	up to $T_s = 70\text{ °C}$; note 1	—	500	mW
T_{stg}	storage temperature		-65	150	°C
T_j	junction temperature		—	175	°C

Note

- T_s is the temperature at the soldering point of the collector tab.

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THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j-s}$	thermal resistance from junction to soldering point	up to $T_s = 70\text{ °C}$; note 1	210 K/W

Note

- T_s is the temperature at the soldering point of the collector tab.

CHARACTERISTICS

$T_j = 25\text{ °C}$ unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0$; $V_{CB} = 10\text{ V}$	–	–	100	nA
h_{FE}	DC current gain	$I_C = 50\text{ mA}$; $V_{CE} = 9\text{ V}$	25	80	–	
f_T	transition frequency	$I_C = 50\text{ mA}$; $V_{CE} = 9\text{ V}$; $f = 500\text{ MHz}$; $T_{amb} = 25\text{ °C}$	–	5	–	GHz
C_c	collector capacitance	$I_E = i_e = 0$; $V_{CB} = 10\text{ V}$; $f = 1\text{ MHz}$	–	1.5	–	pF
C_e	emitter capacitance	$I_C = i_c = 0$; $V_{EB} = 0.5\text{ V}$; $f = 1\text{ MHz}$	–	4.5	–	pF
C_{re}	feedback capacitance	$I_C = 0$; $V_{CE} = 10\text{ V}$; $f = 1\text{ MHz}$	–	1.2	–	pF
G_{UM}	maximum unilateral power gain (note 1)	$I_C = 30\text{ mA}$; $V_{CE} = 6\text{ V}$; $f = 800\text{ MHz}$; $T_{amb} = 25\text{ °C}$	–	11.5	–	dB
F	noise figure	$I_C = 30\text{ mA}$; $V_{CE} = 6\text{ V}$; $f = 800\text{ MHz}$; $T_{amb} = 25\text{ °C}$	–	3.5	–	dB
d_2	second order intermodulation distortion	note 2	–	–50	–	dB
V_o	output voltage	note 3	–	350	–	mV

Notes

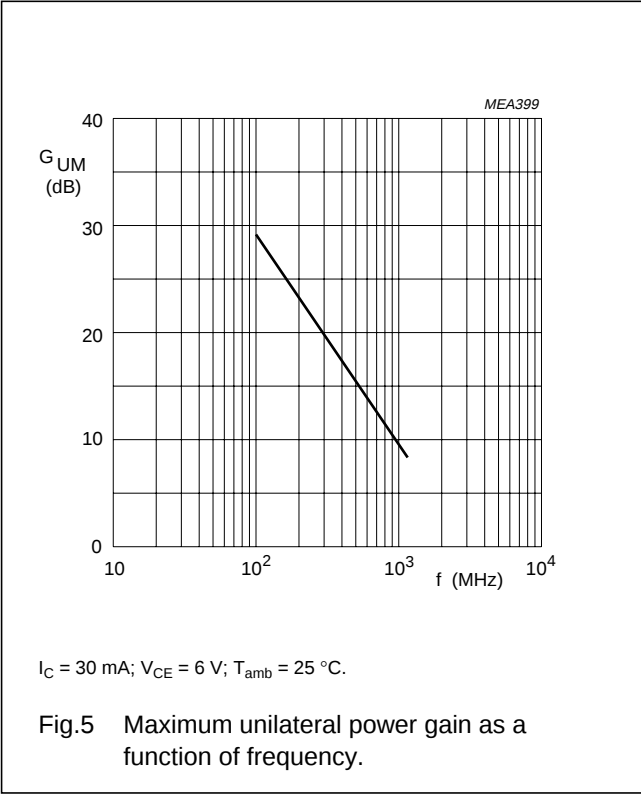
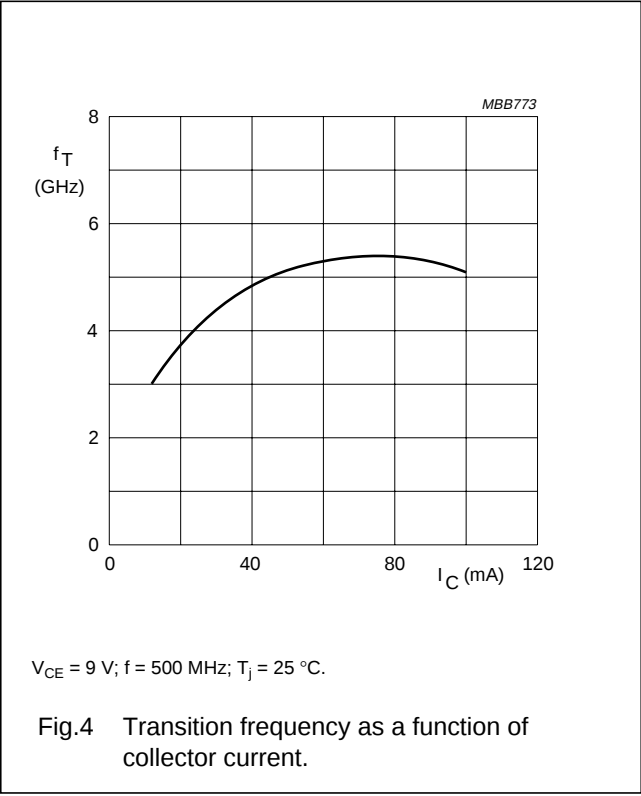
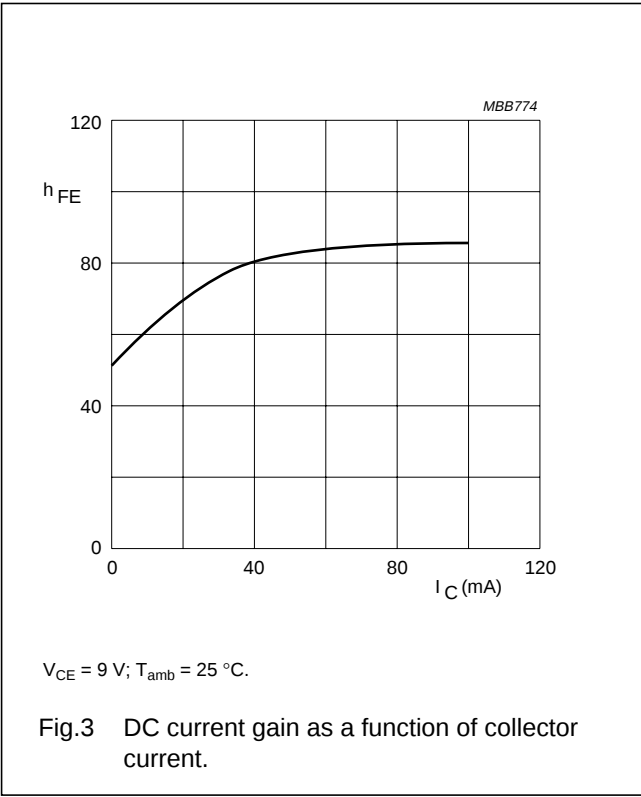
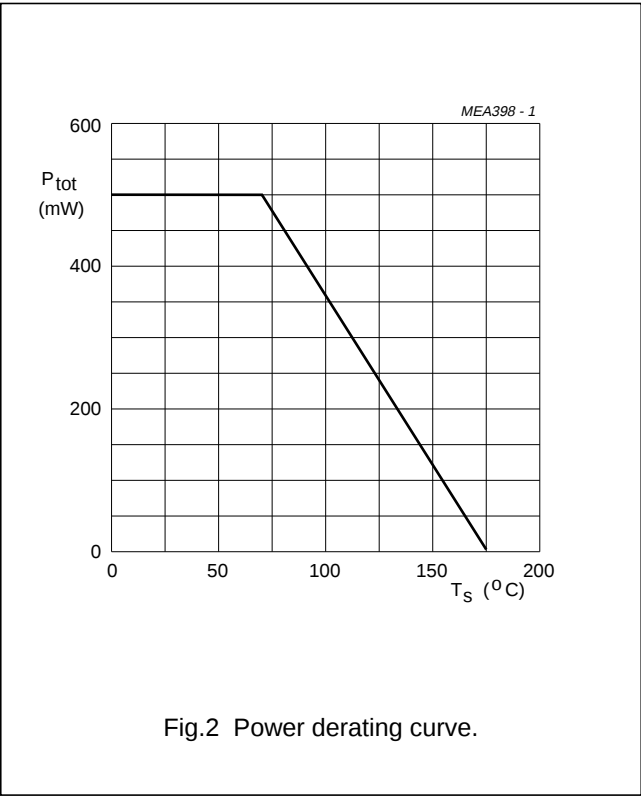
- G_{UM} is the maximum unilateral power gain, assuming S_{12} is zero and

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

- $I_C = 30\text{ mA}$; $V_{CE} = 6\text{ V}$; $R_L = 75\text{ }\Omega$; $T_{amb} = 25\text{ °C}$; $f_{(p+q)} = 810\text{ MHz}$; $V_o = 100\text{ mV}$.
- $d_{im} = -60\text{ dB}$ (DIN 45004B); $I_C = 50\text{ mA}$; $V_{CE} = 9\text{ V}$; $R_L = 75\text{ }\Omega$; $T_{amb} = 25\text{ °C}$; $f_{(p+q-r)} = 793.25\text{ MHz}$.

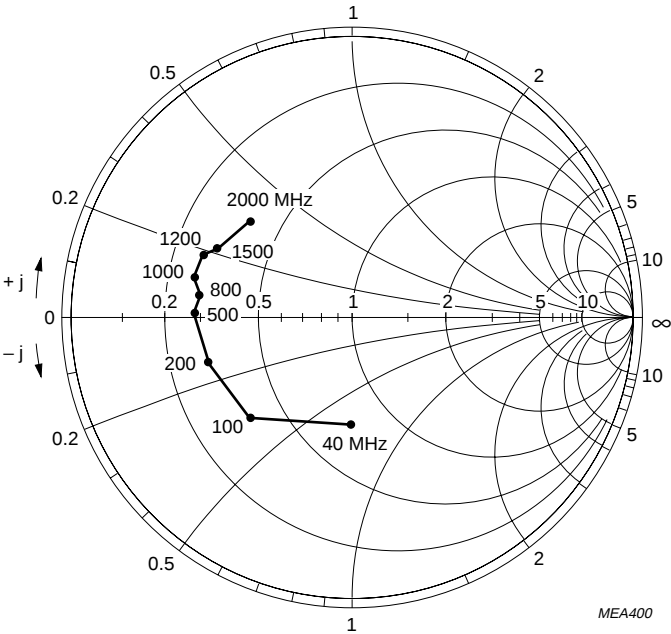
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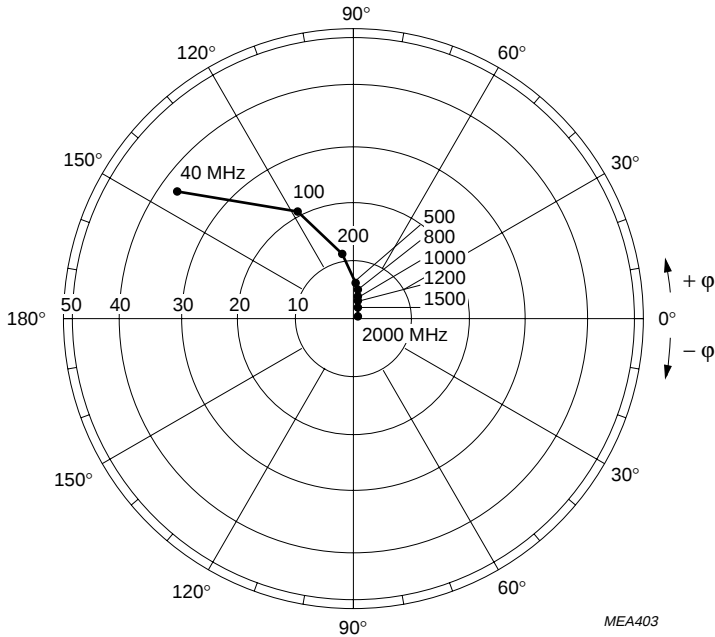
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$I_C = 30\text{ mA}$; $V_{CE} = 6\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.
 $Z_0 = 50\text{ }\Omega$.

Fig.6 Common emitter input reflection coefficient (S_{11}).

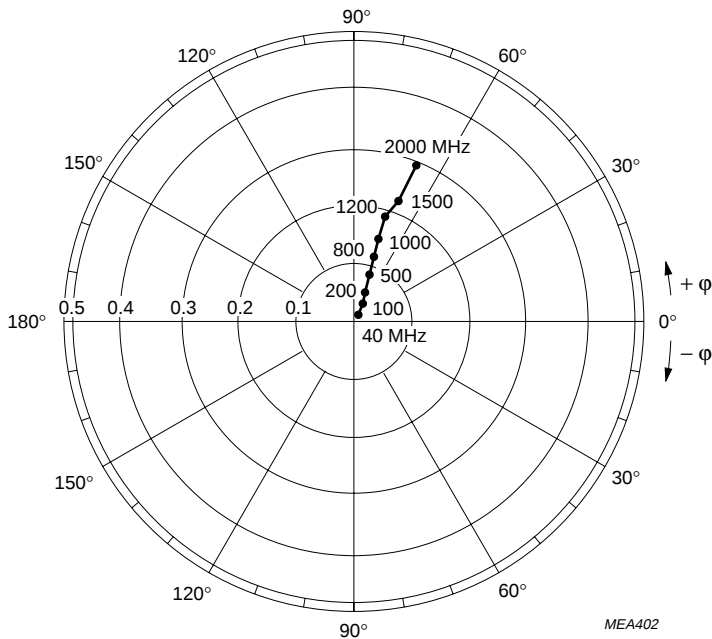


$I_C = 30\text{ mA}$; $V_{CE} = 6\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.

Fig.7 Common emitter forward transmission coefficient (S_{21}).

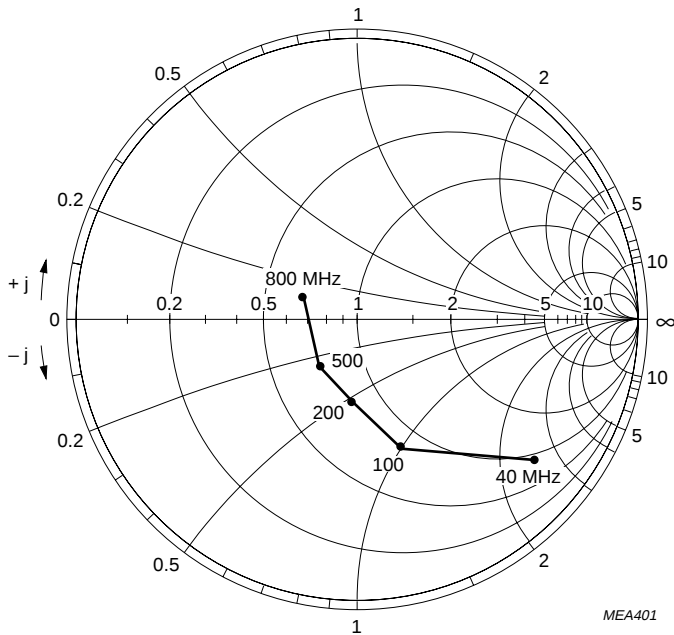
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$I_C = 30\text{ mA}$; $V_{CE} = 6\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.

Fig.8 Common emitter reverse transmission coefficient (S_{12}).



$I_C = 30\text{ mA}$; $V_{CE} = 6\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.
 $Z_0 = 50\text{ }\Omega$.

Fig.9 Common emitter output reflection coefficient (S_{22}).

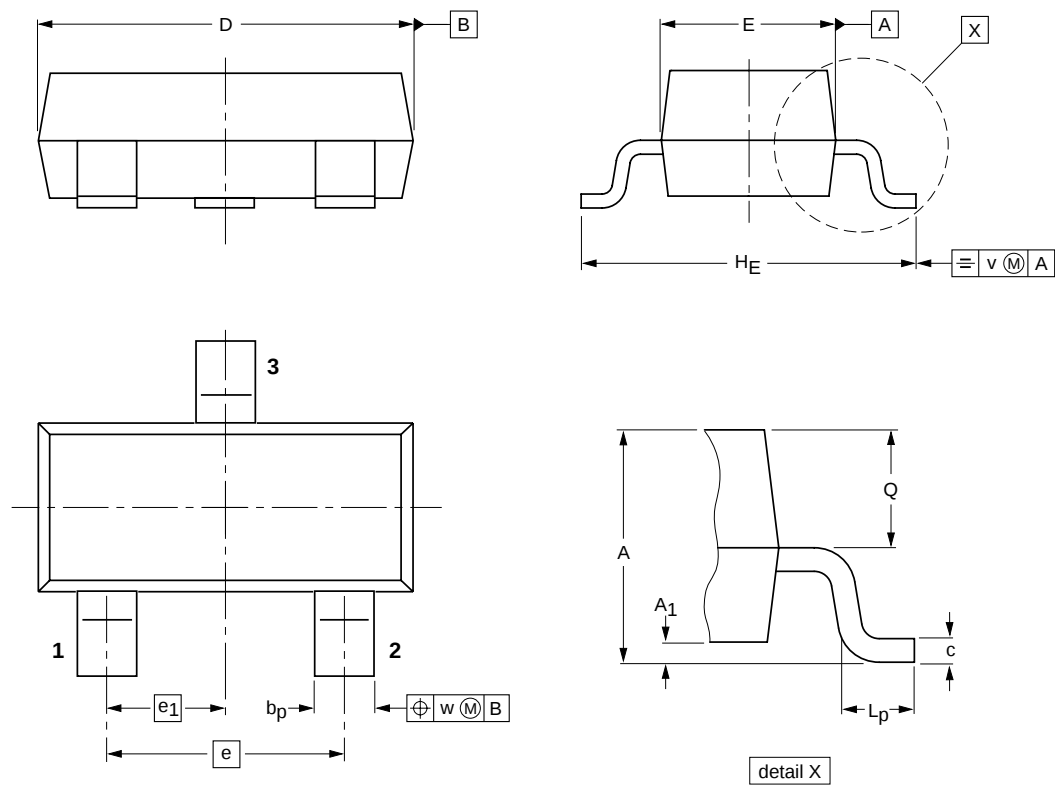
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PACKAGE OUTLINE

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

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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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