

DATA SHEET

BFS25A

NPN 5 GHz wideband transistor

Product specification

December 1997



NPN 5 GHz wideband transistor

BFS25A

FEATURES

- Low current consumption
- Low noise figure
- Gold metallization ensures excellent reliability
- SOT323 envelope.

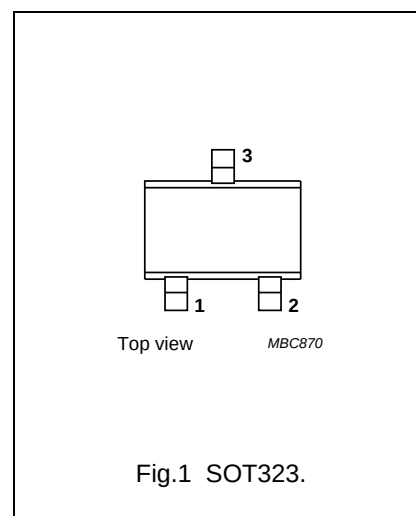
PINNING

PIN	DESCRIPTION
Code: N6	
1	base
2	emitter
3	collector

DESCRIPTION

NPN transistor in a plastic SOT323 envelope.

It is designed for use in RF amplifiers and oscillators in pagers and pocket phones with signal frequencies up to 2 GHz.



QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	—	—	8	V
V_{CEO}	collector-emitter voltage	open base	—	—	5	V
I_C	DC collector current		—	—	6.5	mA
P_{tot}	total power dissipation	up to $T_s = 170\text{ °C}$; note 1	—	—	32	mW
h_{FE}	DC current gain	$I_C = 0.5\text{ mA}$; $V_{CE} = 1\text{ V}$; $T_j = 25\text{ °C}$	50	80	200	
f_T	transition frequency	$I_C = 1\text{ mA}$; $V_{CE} = 1\text{ V}$; $f = 1\text{ GHz}$; $T_{amb} = 25\text{ °C}$	3.5	5	—	GHz
G_{UM}	maximum unilateral power gain	$I_C = 0.5\text{ mA}$; $V_{CE} = 1\text{ V}$; $f = 1\text{ GHz}$; $T_{amb} = 25\text{ °C}$	—	13	—	dB
F	noise figure	$I_C = 0.5\text{ mA}$; $V_{CE} = 1\text{ V}$; $f = 1\text{ GHz}$; $T_{amb} = 25\text{ °C}$	—	1.8	—	dB

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	—	8	V
V_{CEO}	collector-emitter voltage	open base	—	5	V
V_{EBO}	emitter-base voltage	open collector	—	2	V
I_C	DC collector current		—	6.5	mA
P_{tot}	total power dissipation	up to $T_s = 170\text{ °C}$; note 1	—	32	mW
T_{stg}	storage temperature		−65	+150	°C
T_j	junction temperature		—	175	°C

Note

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

NPN 5 GHz wideband transistor

BFS25A

THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j-s}$	thermal resistance from junction to soldering point	up to $T_s = 170\text{ °C}$; note 1	190 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	$I_E = 0$; $V_{CB} = 5\text{ V}$	–	–	50	nA
h_{FE}	DC current gain	$I_C = 0.5\text{ mA}$; $V_{CE} = 1\text{ V}$	50	80	200	
C_{re}	feedback capacitance	$I_C = 0$; $V_{CB} = 1\text{ V}$; $f = 1\text{ MHz}$	–	0.3	0.45	pF
f_T	transition frequency	$I_C = 1\text{ mA}$; $V_{CE} = 1\text{ V}$; $f = 1\text{ GHz}$; $T_{amb} = 25\text{ °C}$	3.5	5	–	GHz
G_{UM}	maximum unilateral power gain (note 1)	$I_C = 0.5\text{ mA}$; $V_{CE} = 1\text{ V}$; $f = 1\text{ GHz}$; $T_{amb} = 25\text{ °C}$	–	13	–	dB
F	noise figure	$\Gamma_s = \Gamma_{opt}$; $I_C = 0.5\text{ mA}$; $V_{CE} = 1\text{ V}$; $f = 1\text{ GHz}$; $T_{amb} = 25\text{ °C}$	–	1.8	–	dB
		$\Gamma_s = \Gamma_{opt}$; $I_C = 1\text{ mA}$; $V_{CE} = 1\text{ V}$; $f = 1\text{ GHz}$; $T_{amb} = 25\text{ °C}$	–	2	–	dB

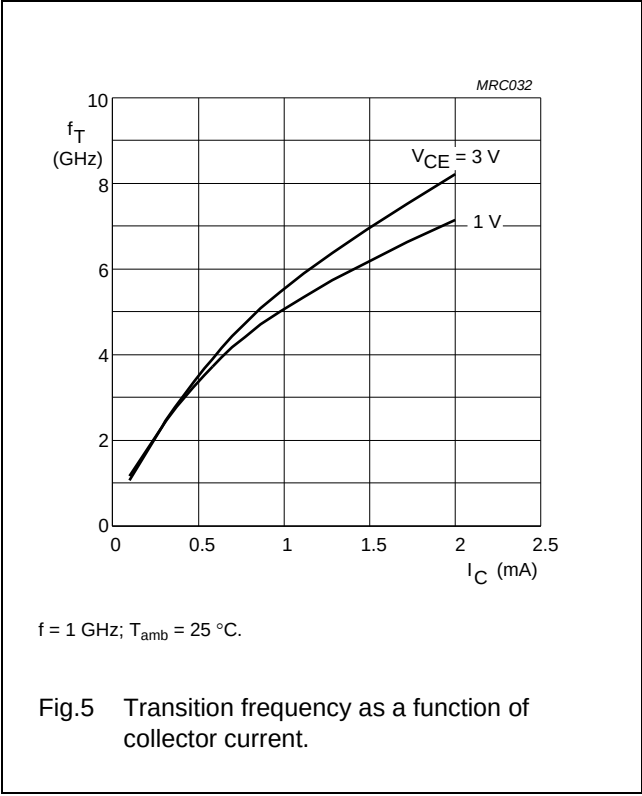
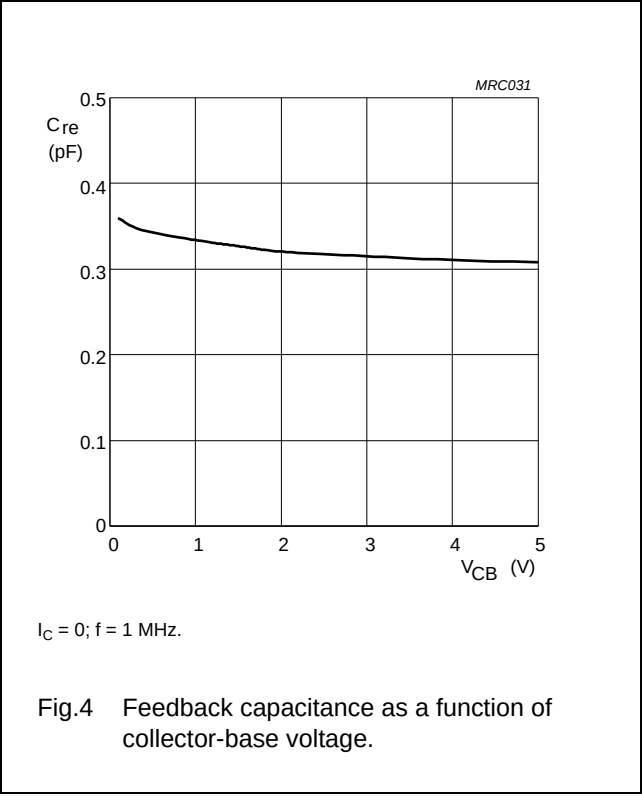
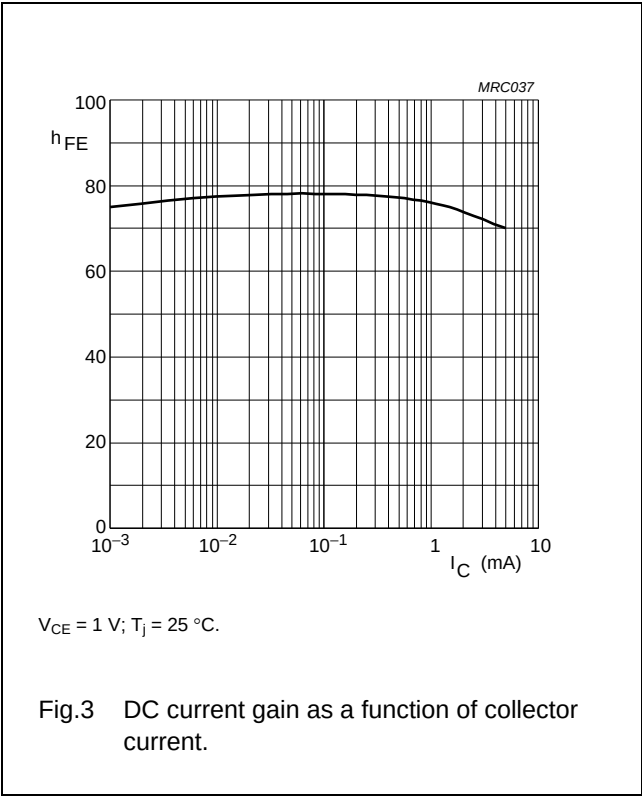
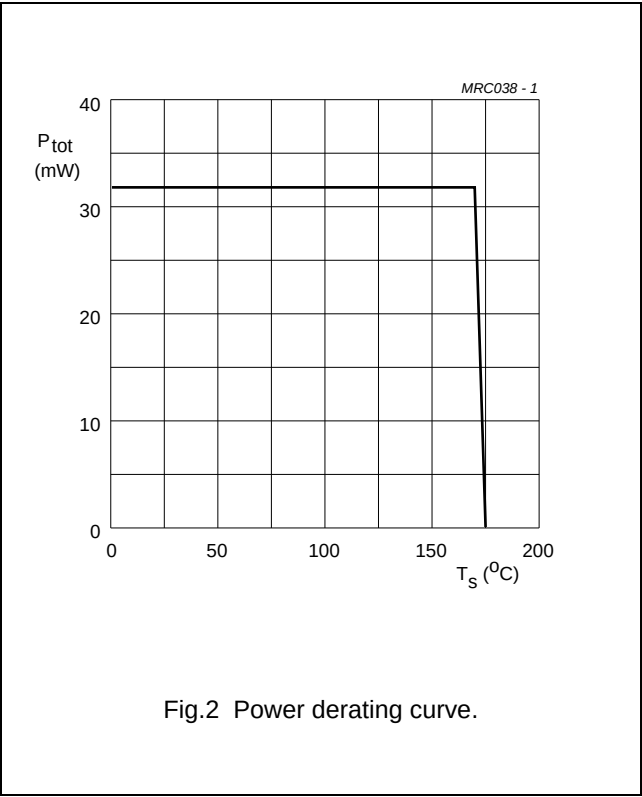
Note

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

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

NPN 5 GHz wideband transistor

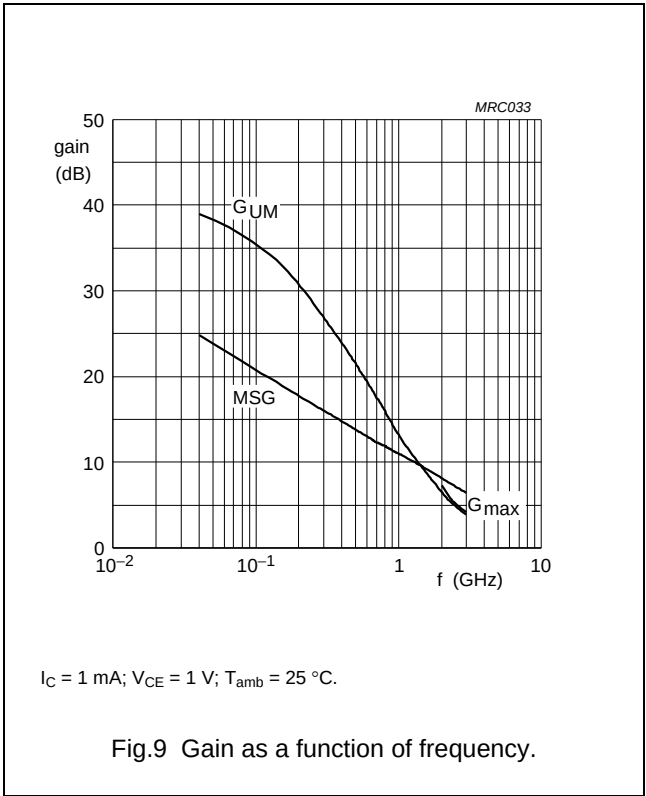
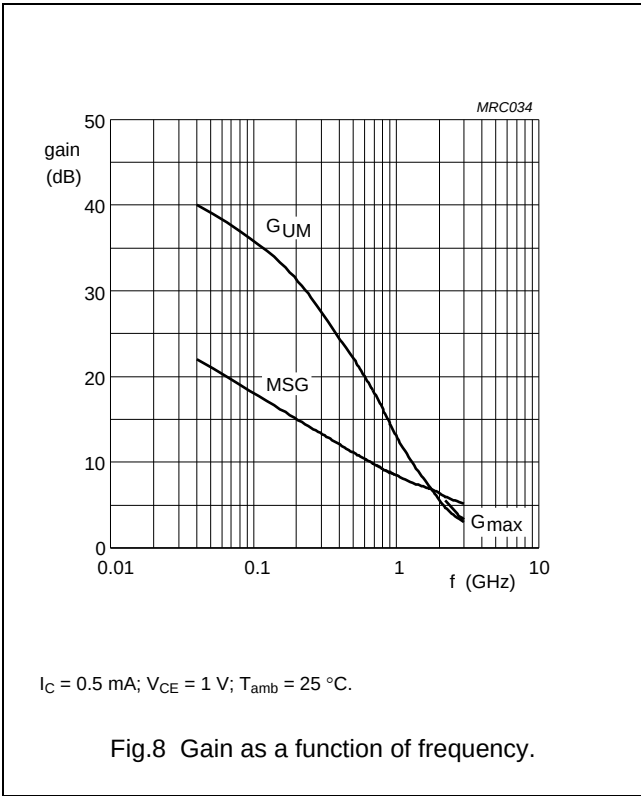
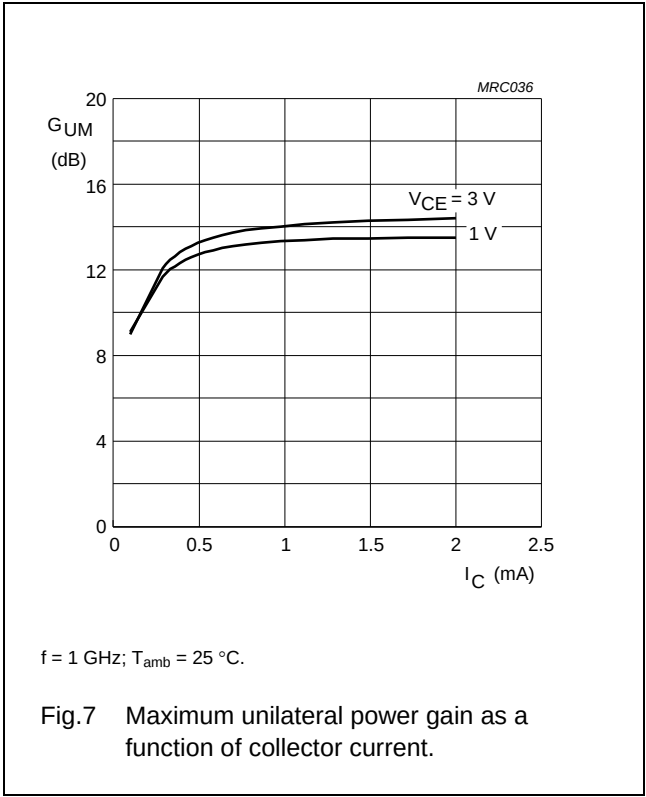
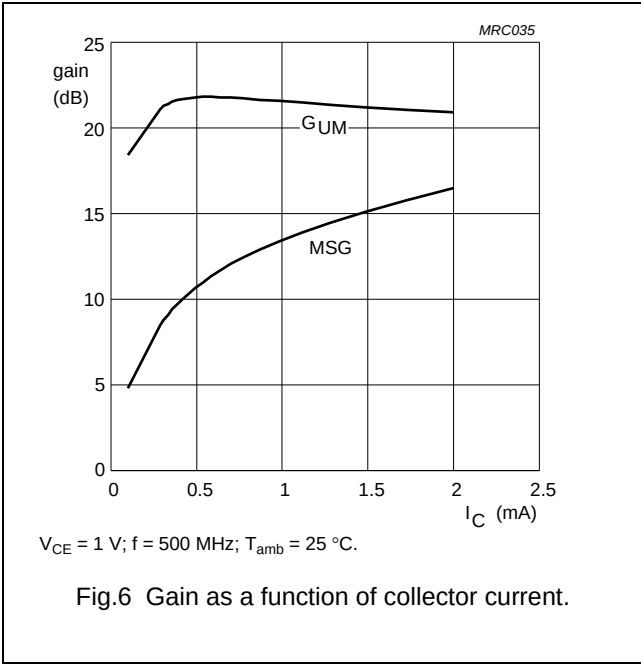
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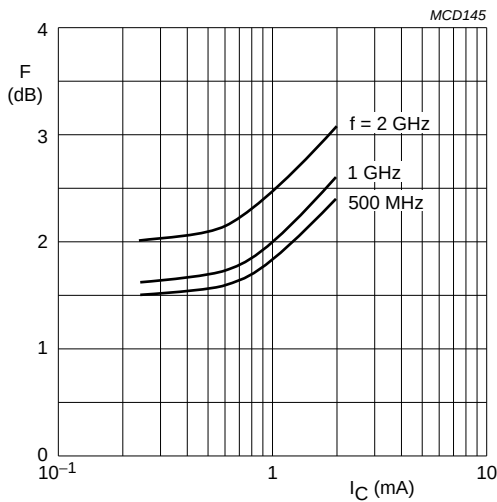
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In Figs 7 to 9, G_{UM} = maximum unilateral power gain; MSG = maximum stable gain; G_{max} = maximum available gain.



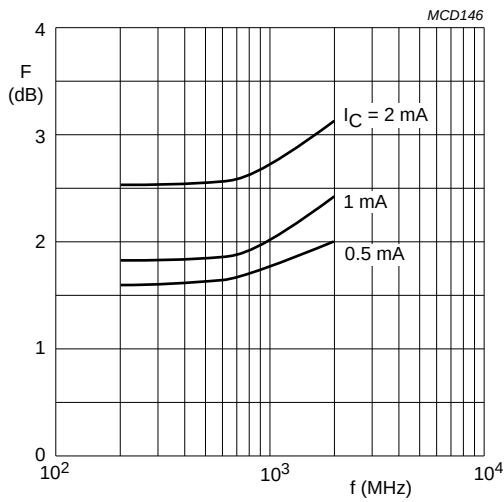
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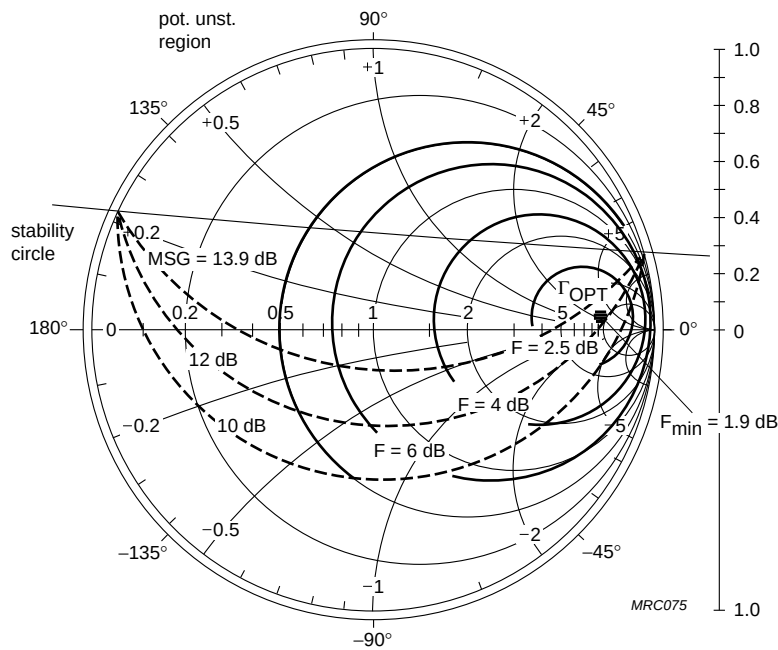
$V_{CE} = 1\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.

Fig.10 Minimum noise figure as a function of collector current.



$V_{CE} = 1\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.

Fig.11 Minimum noise figure as a function of frequency.

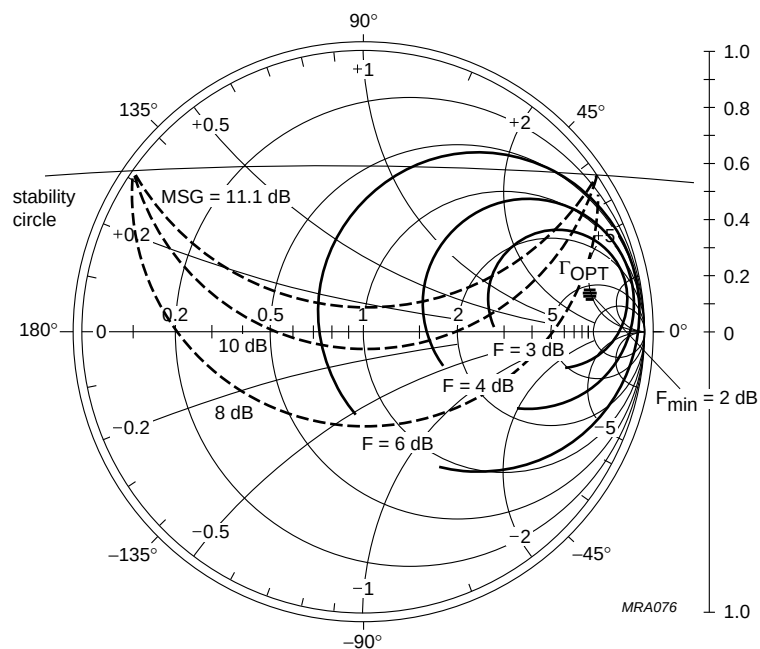


$I_C = 1\text{ mA}$; $V_{CE} = 1\text{ V}$;
 $f = 500\text{ MHz}$; $Z_0 = 50\text{ }\Omega$.

Fig.12 Noise circle.

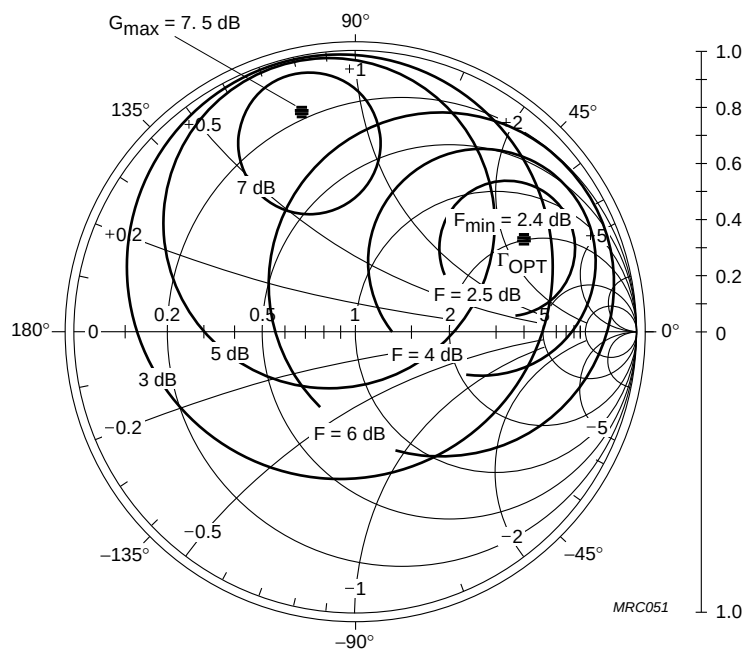
NPN 5 GHz wideband transistor

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$I_C = 1$ mA; $V_{CE} = 1$ V;
 $f = 1$ GHz; $Z_0 = 50 \Omega$.

Fig.13 Noise circle.

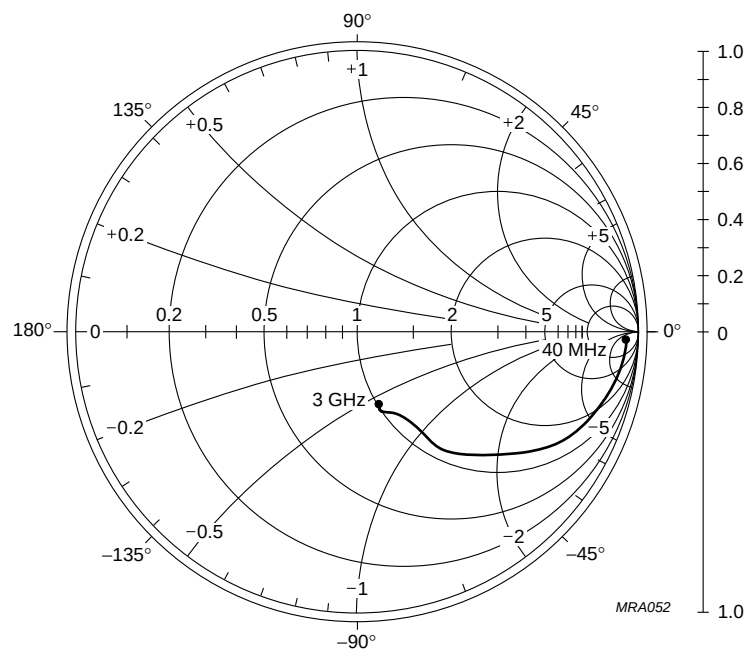


$I_C = 1$ mA; $V_{CE} = 1$ V;
 $f = 2$ GHz; $Z_0 = 50 \Omega$.

Fig.14 Noise circle.

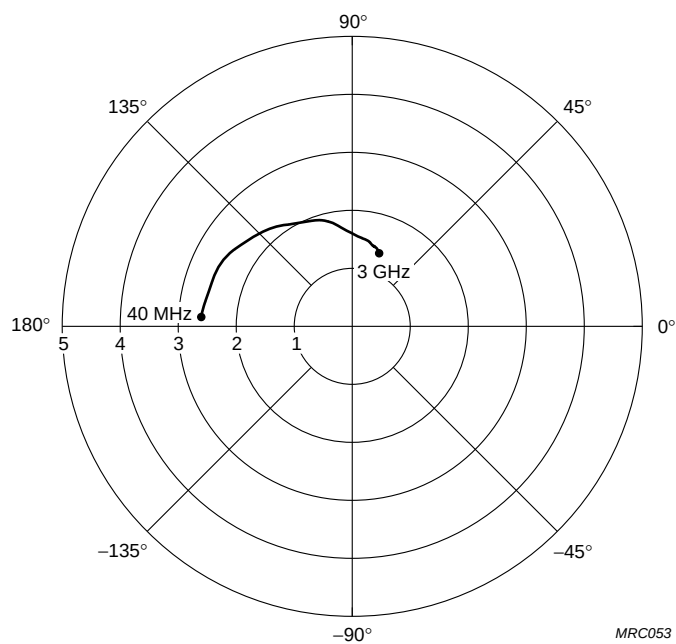
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$I_C = 1 \text{ mA}$; $V_{CE} = 1 \text{ V}$;
 $Z_0 = 50 \Omega$.

Fig.15 Common emitter input reflection coefficient (S_{11}).

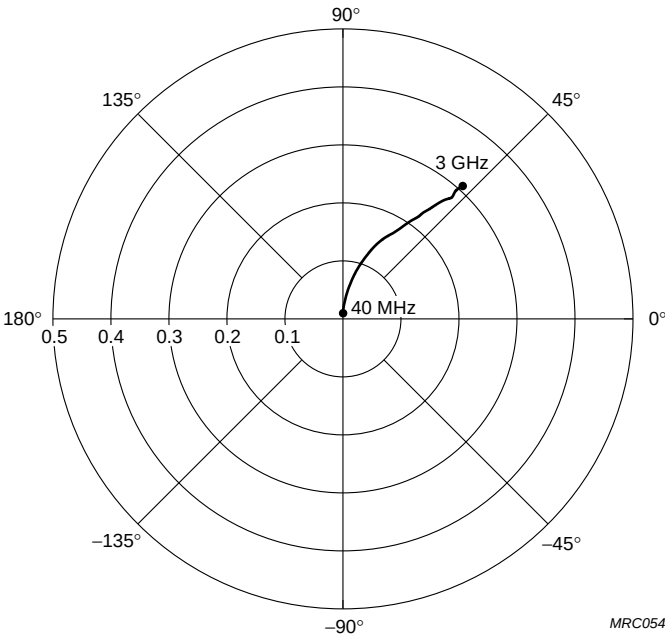


$I_C = 1 \text{ mA}$; $V_{CE} = 1 \text{ V}$.

Fig.16 Common emitter forward transmission coefficient (S_{21}).

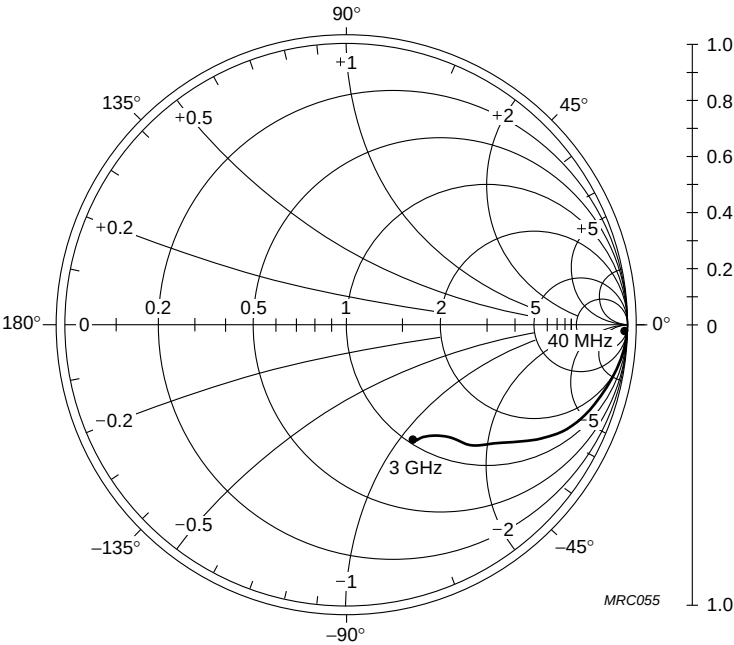
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BFS25A



$I_C = 1\text{ mA}$; $V_{CE} = 1\text{ V}$.

Fig.17 Common emitter reverse transmission coefficient (S_{12}).



$I_C = 1\text{ mA}$; $V_{CE} = 1\text{ V}$;
 $Z_0 = 50\text{ }\Omega$.

Fig.18 Common emitter output reflection coefficient (S_{22}).

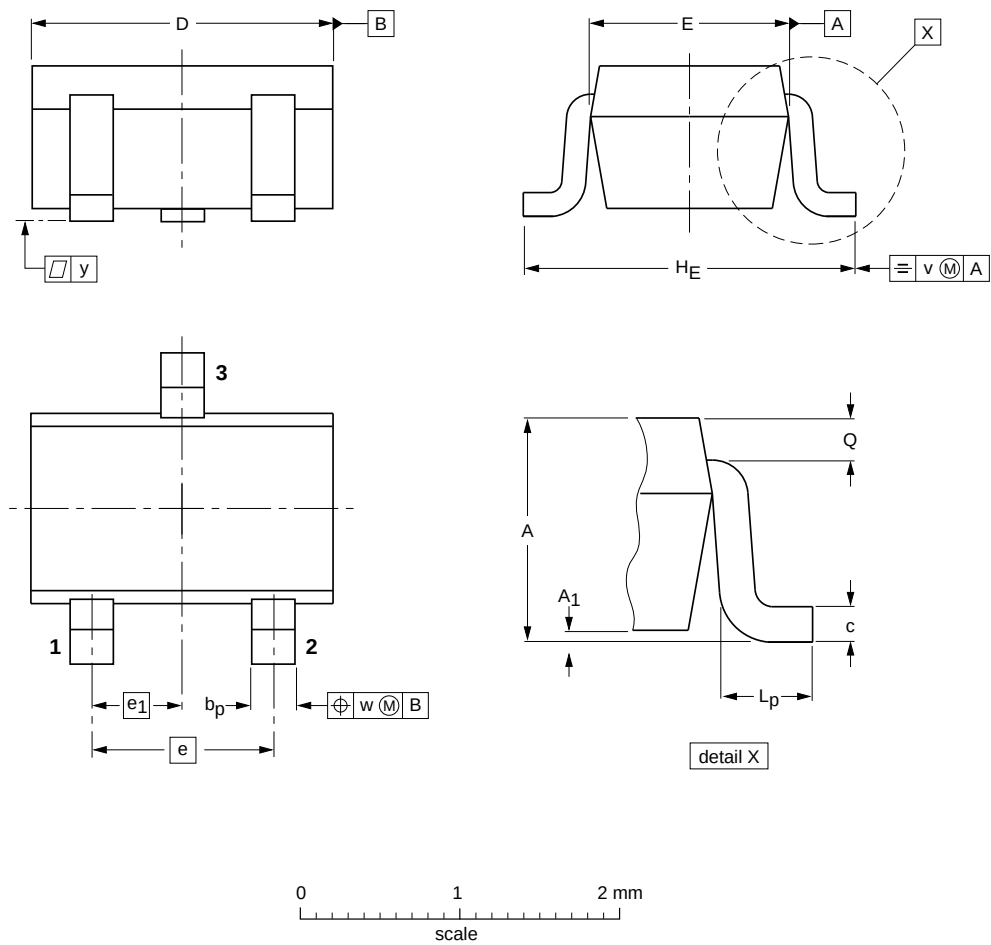
NPN 5 GHz wideband transistor

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PACKAGE OUTLINE

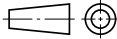
Plastic surface-mounted package; 3 leads

SOT323



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 0.8	0.1	0.4 0.3	0.25 0.10	2.2 1.8	1.35 1.15	1.3	0.65	2.2 2.0	0.45 0.15	0.23 0.13	0.2	0.2

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT323			SC-70			04-11-04 06-03-16

NPN 5 GHz wideband transistor

BFS25A

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DOCUMENT STATUS ⁽¹⁾	PRODUCT STATUS ⁽²⁾	DEFINITION
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Preliminary data sheet	Qualification	This document contains data from the preliminary specification.
Product data sheet	Production	This document contains the product specification.

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NPN 5 GHz wideband transistor

BFS25A

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