

# 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.

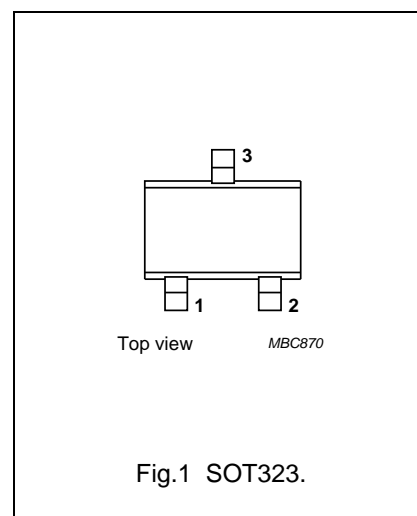
## PINNING

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.

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## THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j-s}$	thermal resistance from junction to soldering point	up to $T_s = 170\text{ °C}$ ; 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

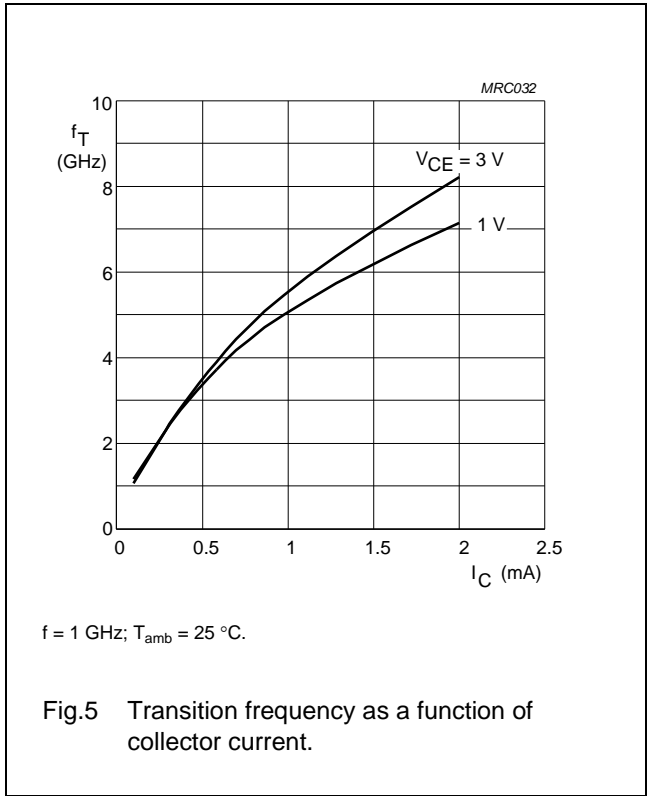
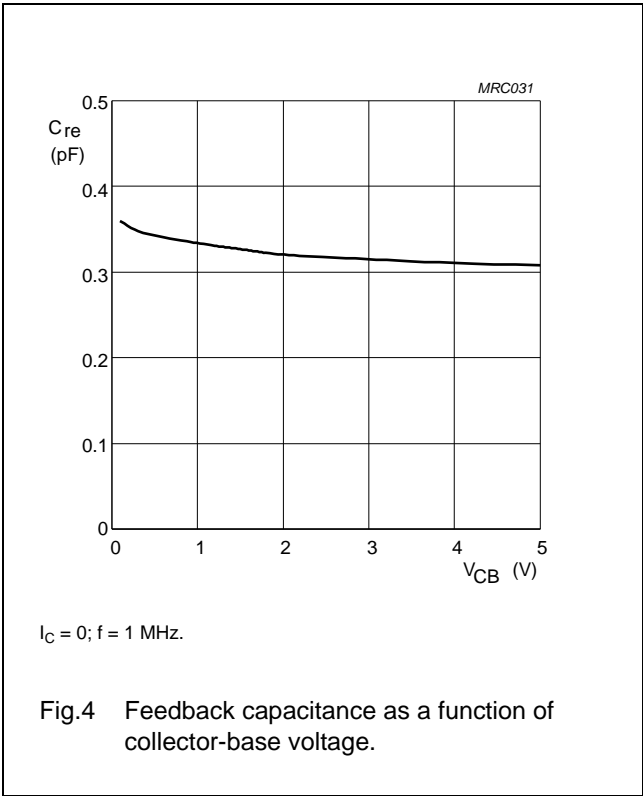
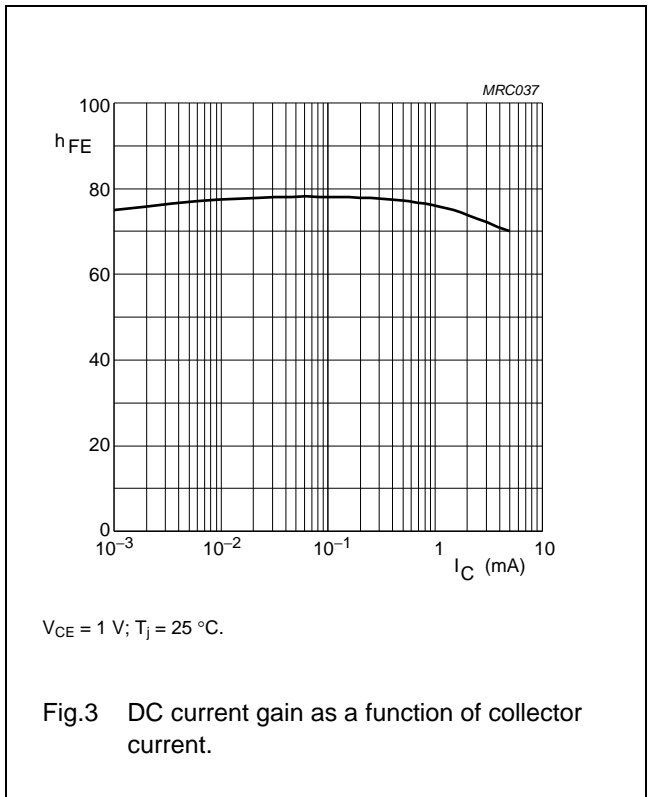
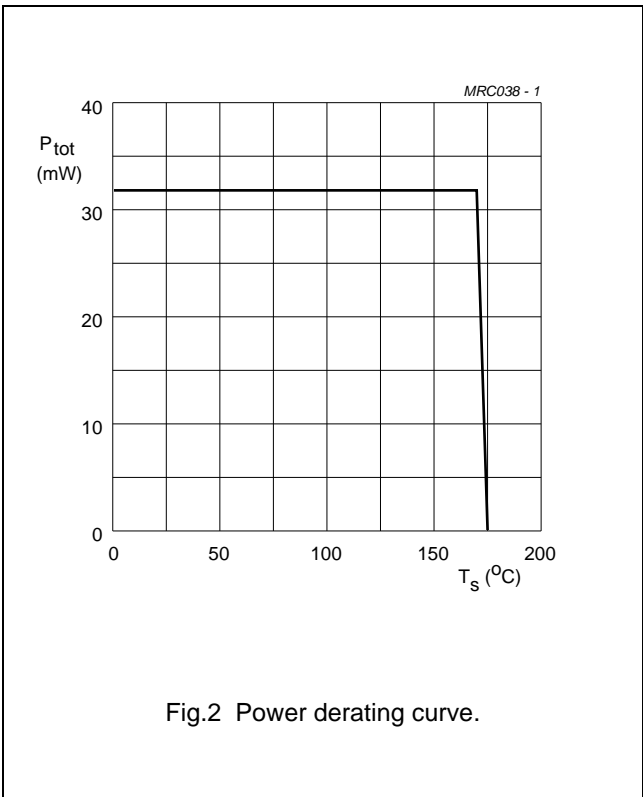
## Note

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

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

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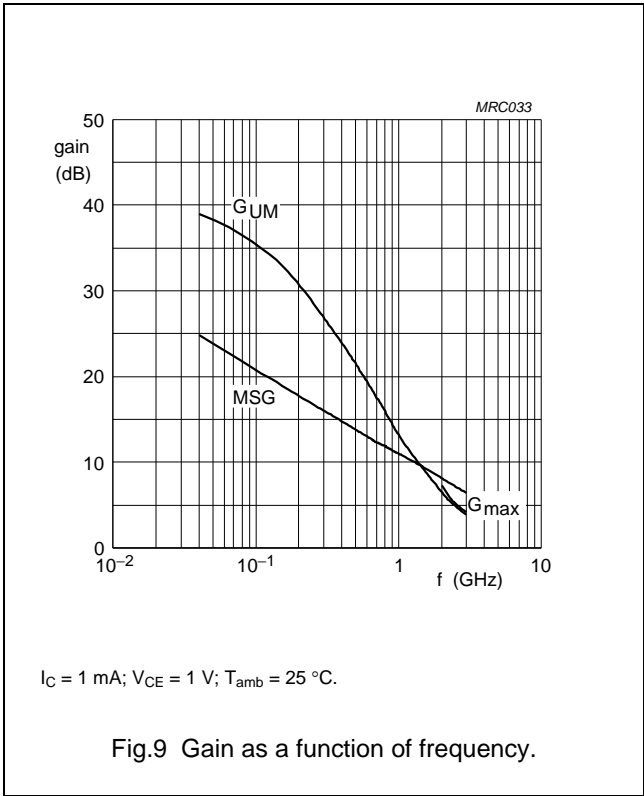
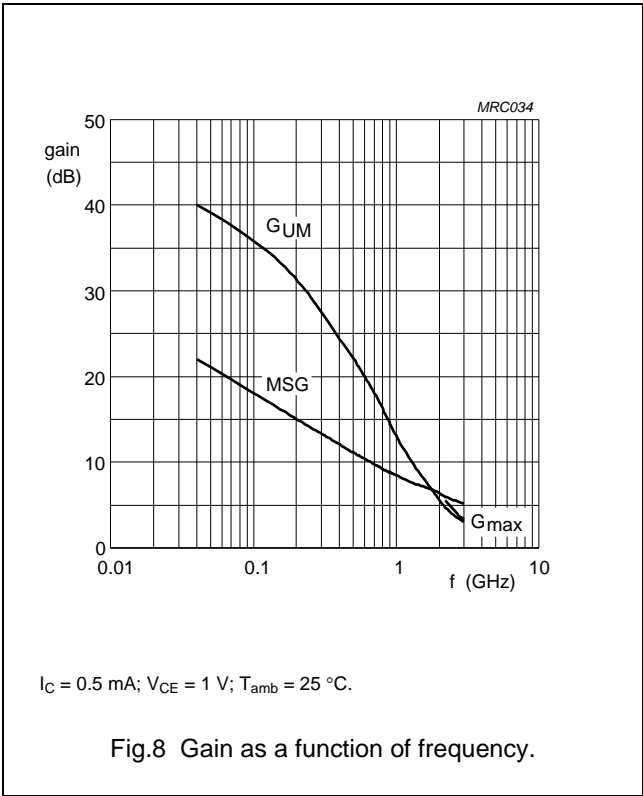
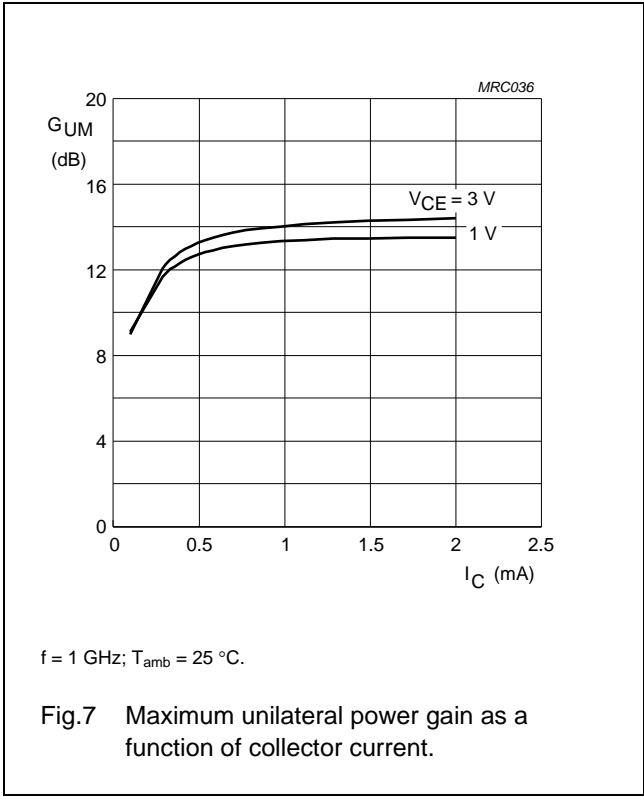
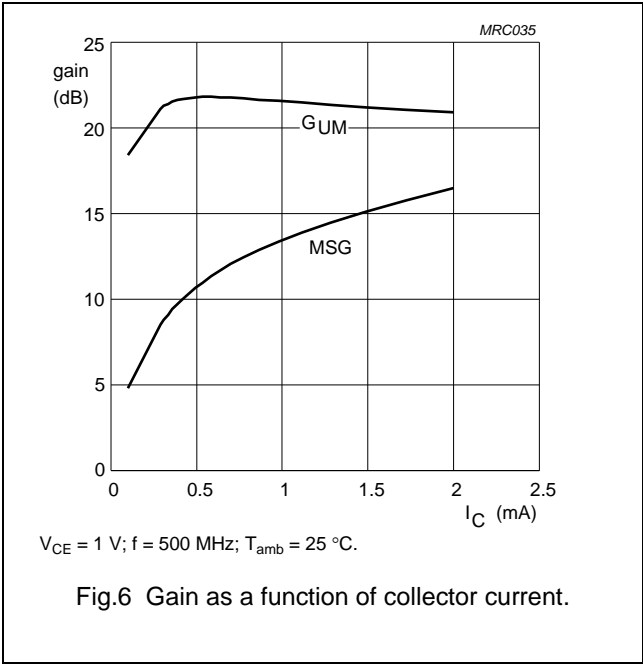
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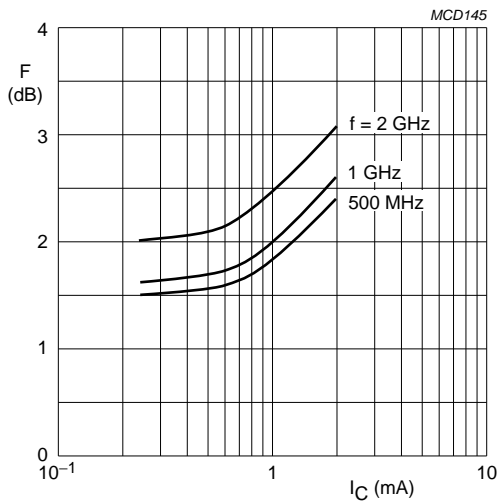
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In Figs 7 to 9,  $G_{UM}$  = maximum unilateral power gain;  $MSG$  = maximum stable gain;  $G_{max}$  = maximum available gain.



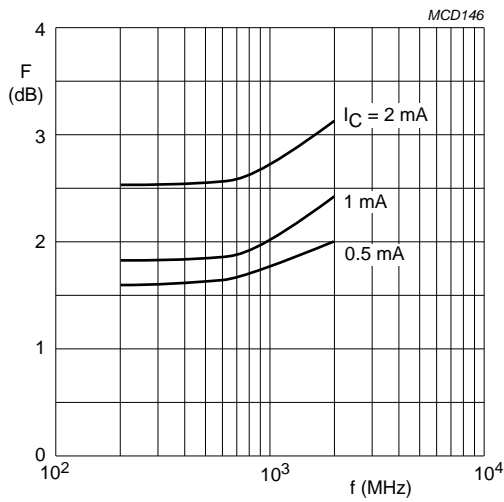
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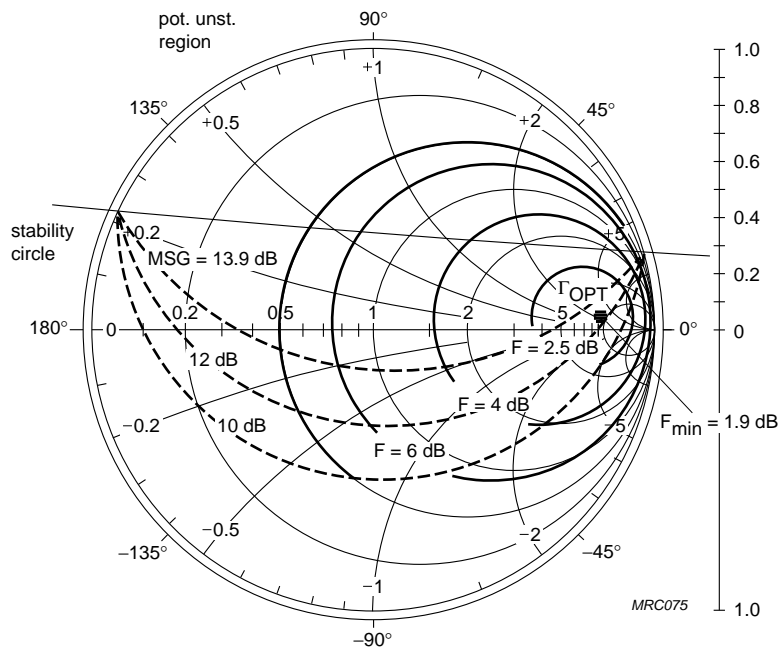
$V_{CE} = 1$  V;  $T_{amb} = 25$  °C.

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



$V_{CE} = 1$  V;  $T_{amb} = 25$  °C.

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



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

Fig.12 Noise circle.

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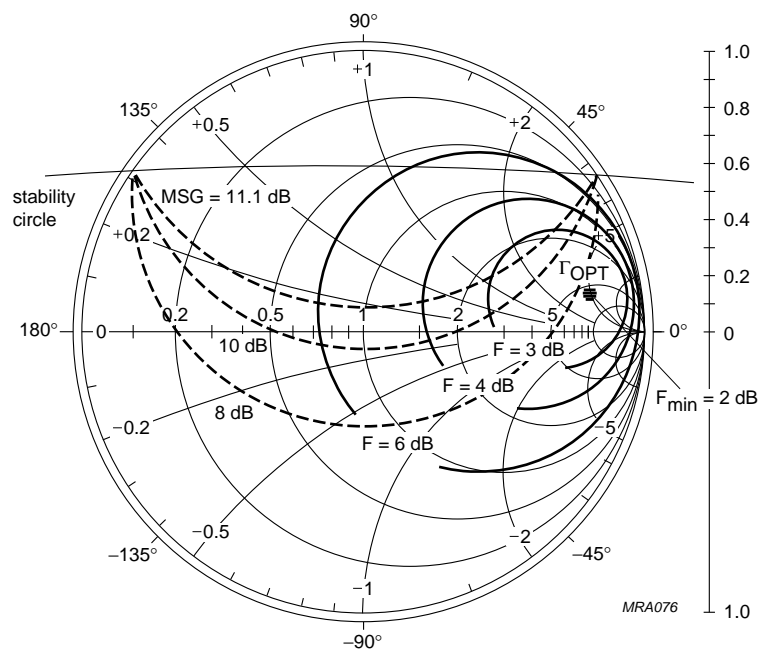


Fig.13 Noise circle.

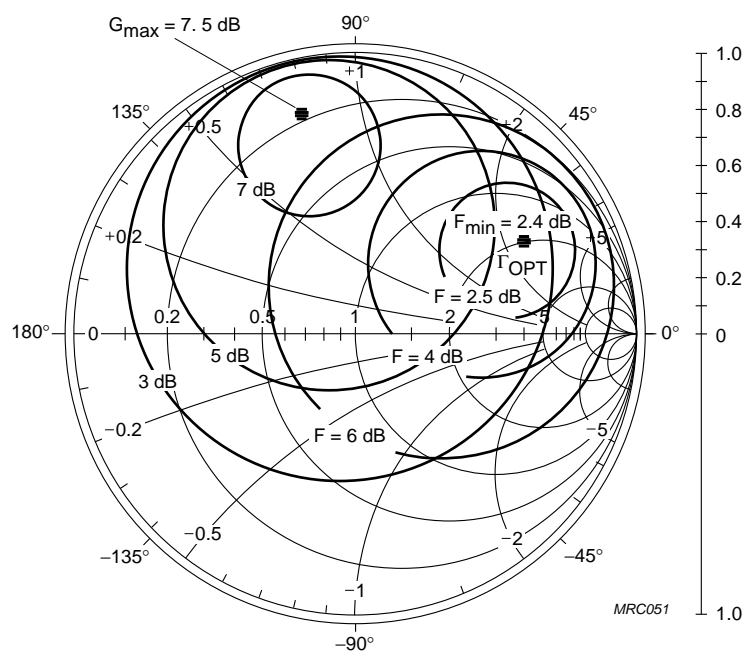
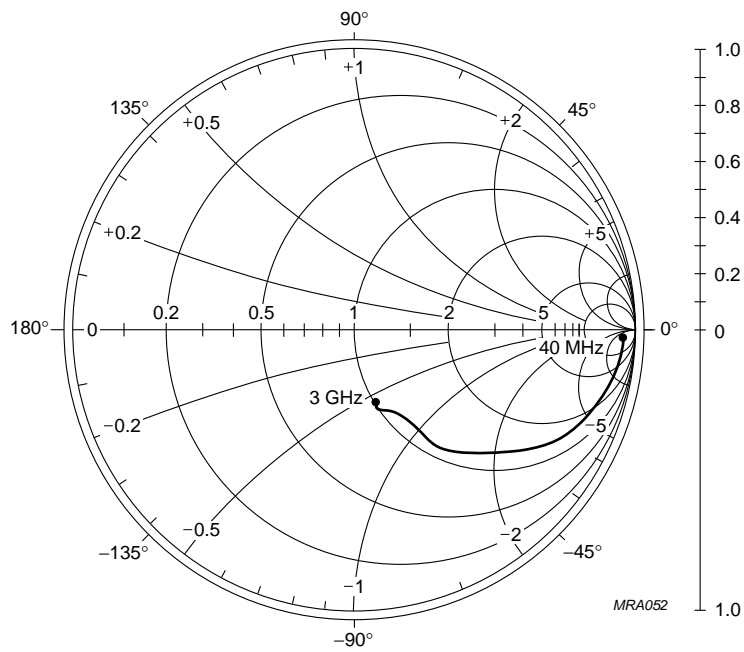


Fig.14 Noise circle.

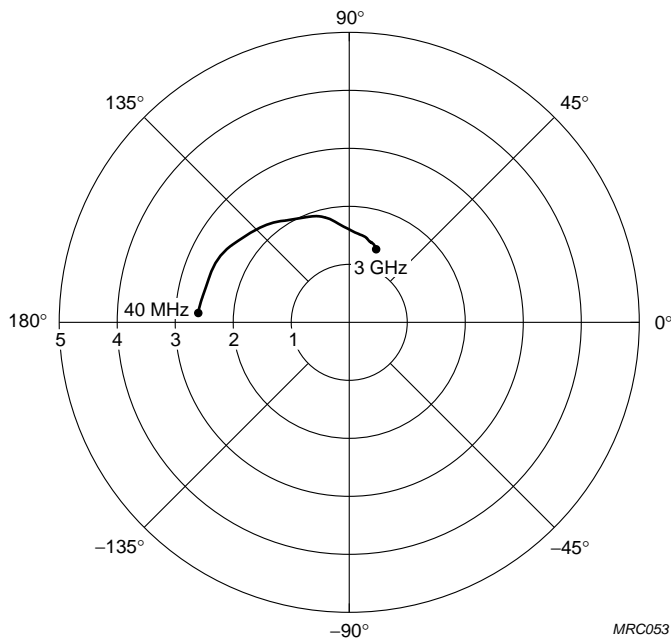
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$I_C = 1 \text{ mA}$ ;  $V_{CE} = 1 \text{ V}$ ;  
 $Z_o = 50 \Omega$ .

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



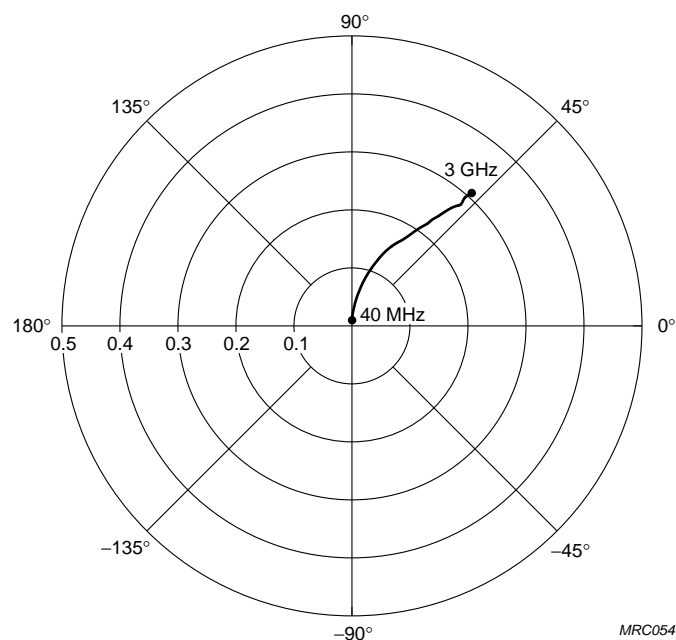
$I_C = 1 \text{ mA}$ ;  $V_{CE} = 1 \text{ V}$ .

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



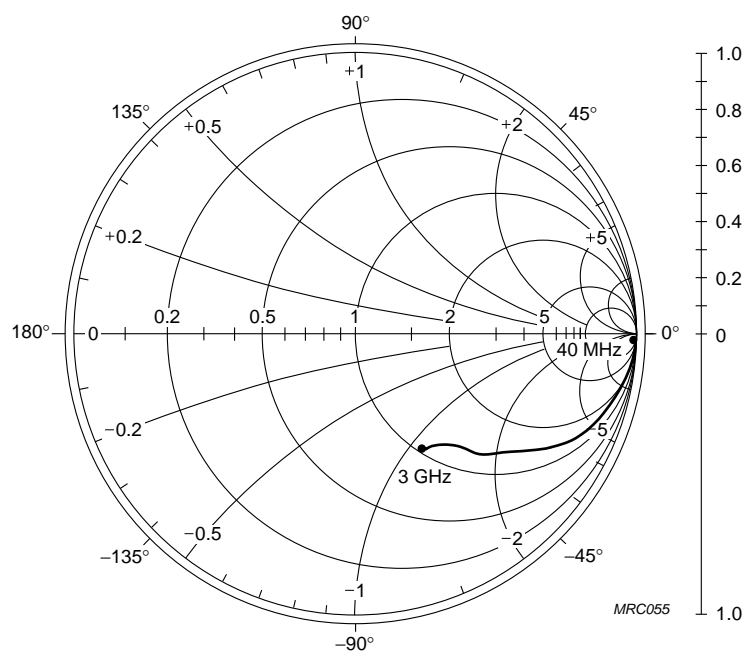
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$I_C = 1 \text{ mA}$ ;  $V_{CE} = 1 \text{ V}$ .

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



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

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

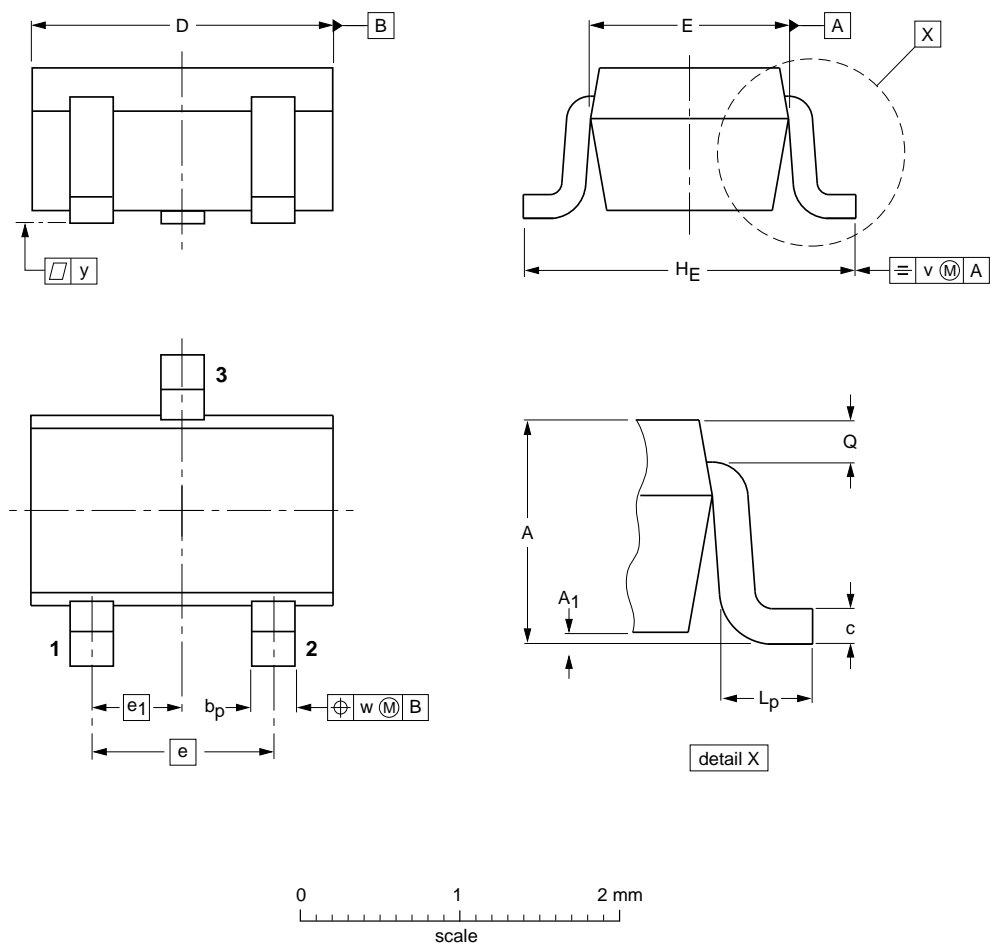
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PACKAGE OUTLINE

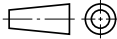
Plastic surface-mounted package; 3 leads

SOT323



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub> max	b <sub>p</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	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			<del>04-11-04</del> 06-03-16

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## DATA SHEET STATUS

DOCUMENT STATUS <sup>(1)</sup>	PRODUCT STATUS <sup>(2)</sup>	DEFINITION
Objective data sheet	Development	This document contains data from the objective specification for product development.
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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