

# DATA SHEET

**BFS520**

NPN 9 GHz wideband transistor

Product specification

September 1995



# NPN 9 GHz wideband transistor

# BFS520

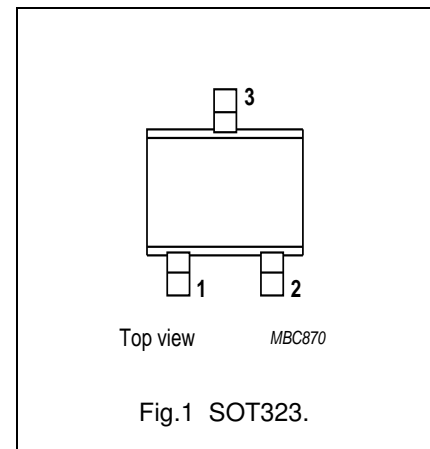
### FEATURES

- High power gain
- Low noise figure
- High transition frequency
- Gold metallization ensures excellent reliability
- SOT323 envelope.

It is intended for wideband applications such as satellite TV tuners, cellular phones, cordless phones, pagers etc., with signal frequencies up to 2 GHz.

### PINNING

PIN	DESCRIPTION
Code: N2	
1	base
2	emitter
3	collector



### DESCRIPTION

NPN transistor in a plastic SOT323 envelope.

### QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{CBO}$	collector-base voltage	open emitter	–	–	20	V
$V_{CES}$	collector-emitter voltage	$R_{BE} = 0$	–	–	15	V
$I_C$	DC collector current		–	–	70	mA
$P_{tot}$	total power dissipation	up to $T_s = 118\text{ °C}$ ; note 1	–	–	300	mW
$h_{FE}$	DC current gain	$I_C = 20\text{ mA}$ ; $V_{CE} = 6\text{ V}$ ; $T_j = 25\text{ °C}$	60	120	250	
$f_T$	transition frequency	$I_C = 20\text{ mA}$ ; $V_{CE} = 6\text{ V}$ ; $f = 1\text{ GHz}$ ; $T_{amb} = 25\text{ °C}$	–	9	–	GHz
$G_{UM}$	maximum unilateral power gain	$I_C = 20\text{ mA}$ ; $V_{CE} = 6\text{ V}$ ; $f = 900\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$	–	15	–	dB
F	noise figure	$I_C = 5\text{ mA}$ ; $V_{CE} = 6\text{ V}$ ; $f = 900\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$	–	1.1	1.6	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	–	20	V
$V_{CES}$	collector-emitter voltage	$R_{BE} = 0$	–	15	V
$V_{EBO}$	emitter-base voltage	open collector	–	2.5	V
$I_C$	DC collector current		–	70	mA
$P_{tot}$	total power dissipation	up to $T_s = 118\text{ °C}$ ; note 1	–	300	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 $T_s = 118\text{ °C}$ ; 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	$I_E = 0$ ; $V_{CE} = 6\text{ V}$	–	–	50	nA
$h_{FE}$	DC current gain	$I_C = 20\text{ mA}$ ; $V_{CE} = 6\text{ V}$	60	120	250	
$C_e$	emitter capacitance	$I_C = I_e = 0$ ; $V_{EB} = 0.5\text{ V}$ ; $f = 1\text{ MHz}$	–	1	–	pF
$C_c$	collector capacitance	$I_E = I_e = 0$ ; $V_{CB} = 6\text{ V}$ ; $f = 1\text{ MHz}$	–	0.5	–	pF
$C_{re}$	feedback capacitance	$I_C = 0$ ; $V_{CB} = 6\text{ V}$ ; $f = 1\text{ MHz}$	–	0.4	–	pF
$f_T$	transition frequency	$I_C = 20\text{ mA}$ ; $V_{CE} = 6\text{ V}$ ; $f = 1\text{ GHz}$ ; $T_{amb} = 25\text{ °C}$	–	9	–	GHz
$G_{UM}$	maximum unilateral power gain (note 1)	$I_C = 20\text{ mA}$ ; $V_{CE} = 6\text{ V}$ ; $f = 900\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$	–	15	–	dB
		$I_C = 20\text{ mA}$ ; $V_{CE} = 6\text{ V}$ ; $f = 2\text{ GHz}$ ; $T_{amb} = 25\text{ °C}$	–	9	–	dB
$ S_{21} ^2$	insertion power gain	$I_C = 20\text{ mA}$ ; $V_{CE} = 6\text{ V}$ ; $f = 900\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$	13	14	–	dB
F	noise figure	$\Gamma_s = \Gamma_{opt}$ ; $I_C = 5\text{ mA}$ ; $V_{CE} = 6\text{ V}$ ; $f = 900\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$	–	1.1	1.6	dB
		$\Gamma_s = \Gamma_{opt}$ ; $I_C = 20\text{ mA}$ ; $V_{CE} = 6\text{ V}$ ; $f = 900\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$	–	1.6	2.1	dB
		$\Gamma_s = \Gamma_{opt}$ ; $I_C = 5\text{ mA}$ ; $V_{CE} = 6\text{ V}$ ; $f = 2\text{ GHz}$ ; $T_{amb} = 25\text{ °C}$	–	1.9	–	dB
$P_{L1}$	output power at 1 dB gain compression	$I_C = 20\text{ mA}$ ; $V_{CE} = 6\text{ V}$ ; $R_L = 50\text{ }\Omega$ ; $f = 900\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$	–	17	–	dBm
ITO	third order intercept point	note 2	–	26	–	dBm

## Notes

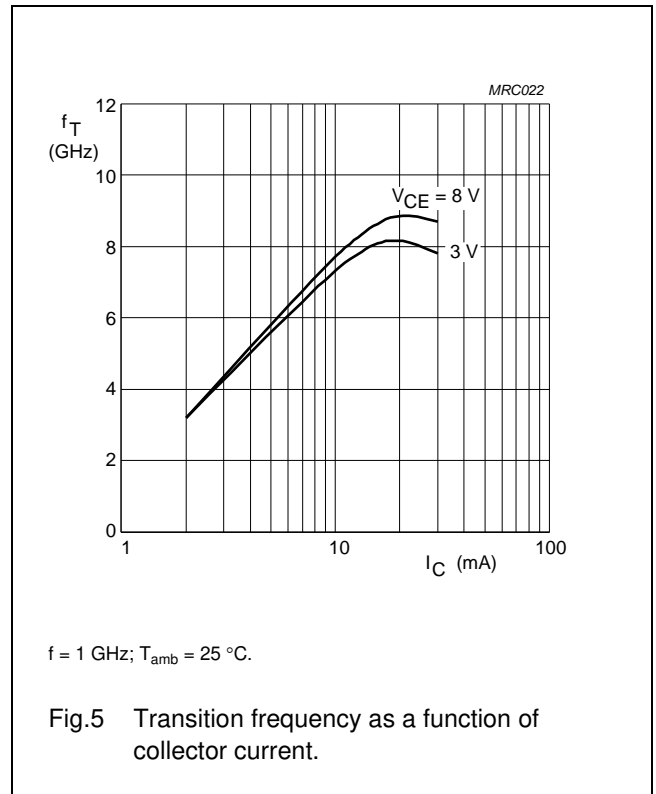
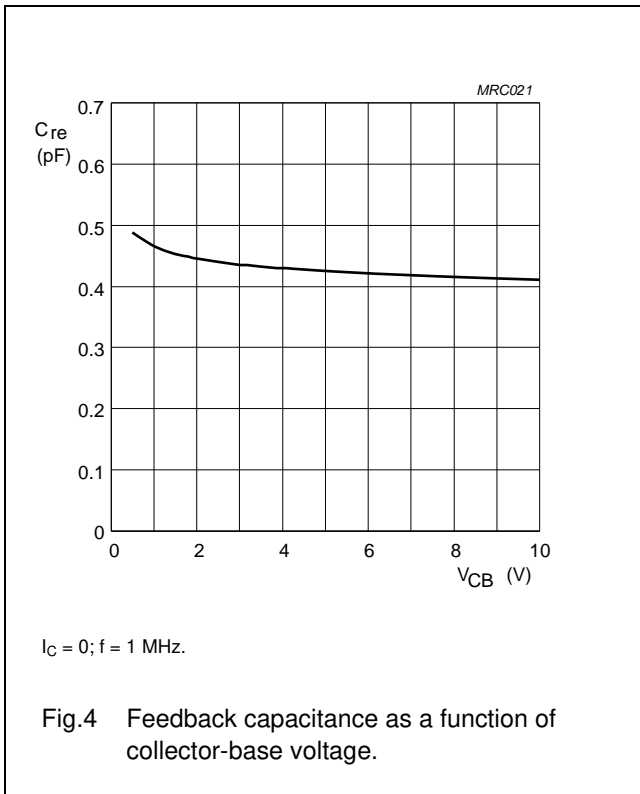
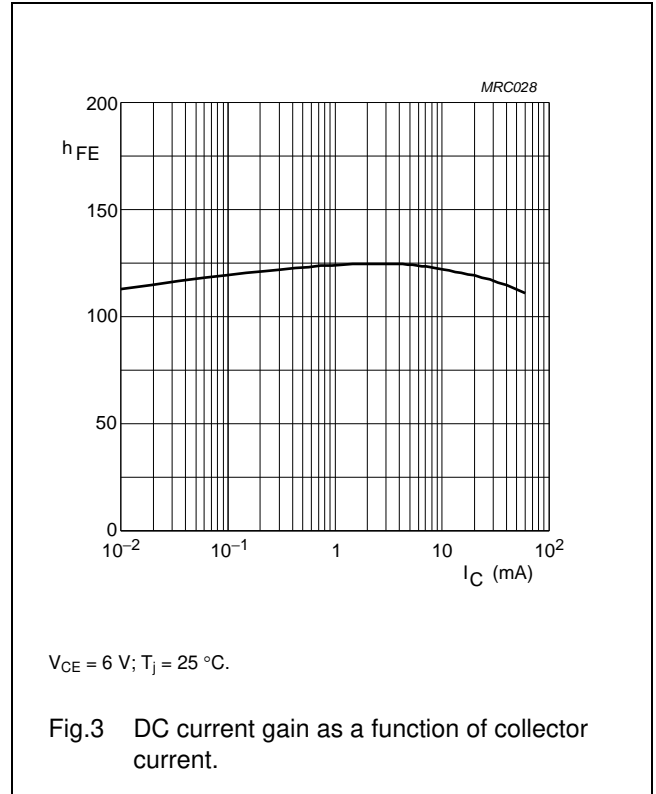
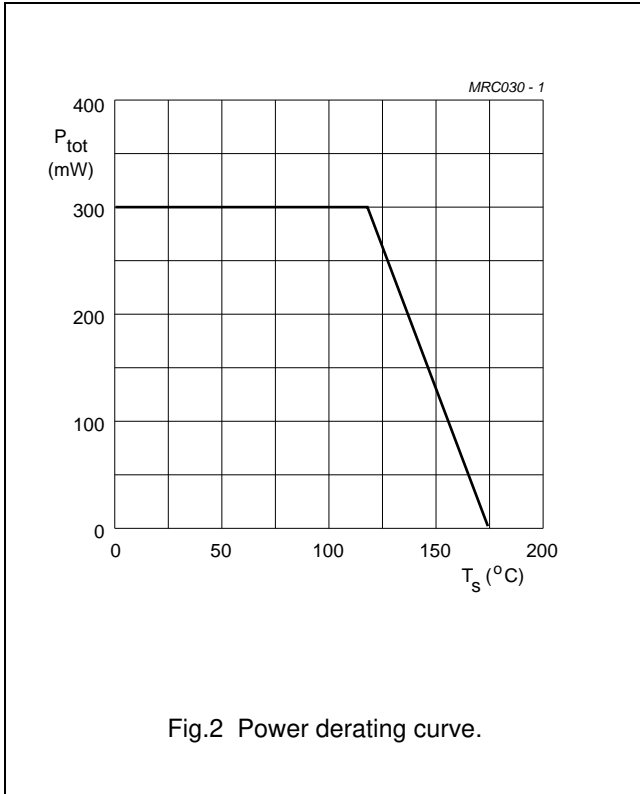
- $G_{UM}$  is the maximum unilateral power gain, assuming  $S_{12}$  is zero and

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

- $I_C = 20\text{ mA}$ ;  $V_{CE} = 6\text{ V}$ ;  $R_L = 50\text{ }\Omega$ ;  $f = 900\text{ MHz}$ ;  $T_{amb} = 25\text{ °C}$ ;  
 $f_p = 900\text{ MHz}$ ;  $f_q = 902\text{ MHz}$ ; measured at  $f_{(2p-q)} = 898\text{ MHz}$  and at  $f_{(2q-p)} = 904\text{ MHz}$ .

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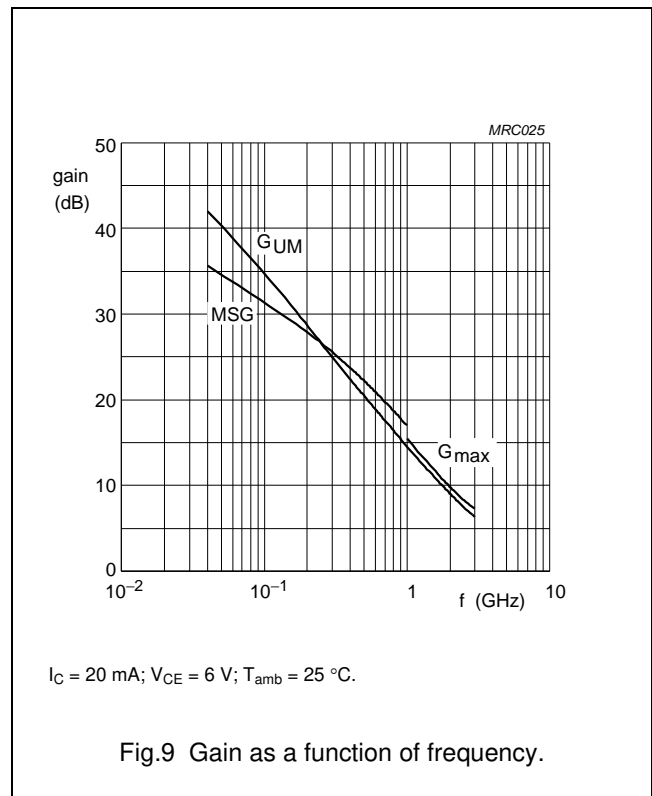
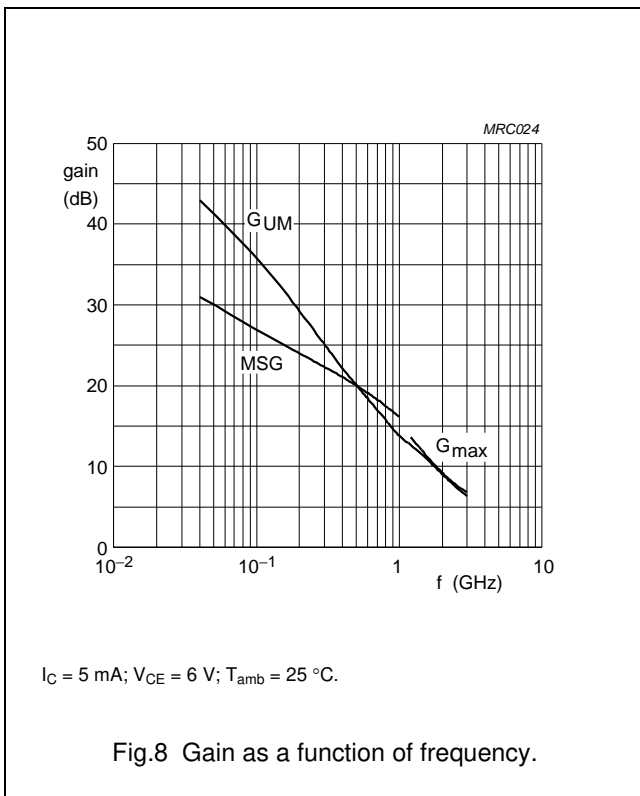
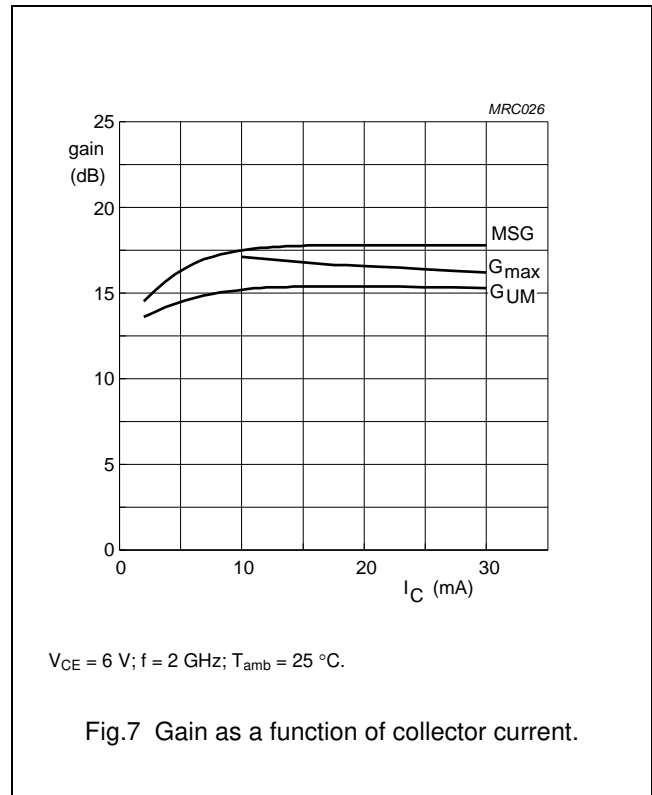
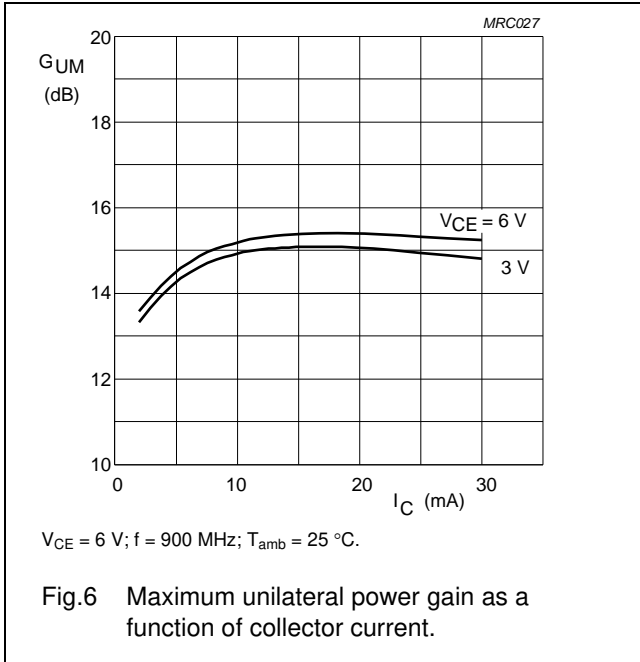
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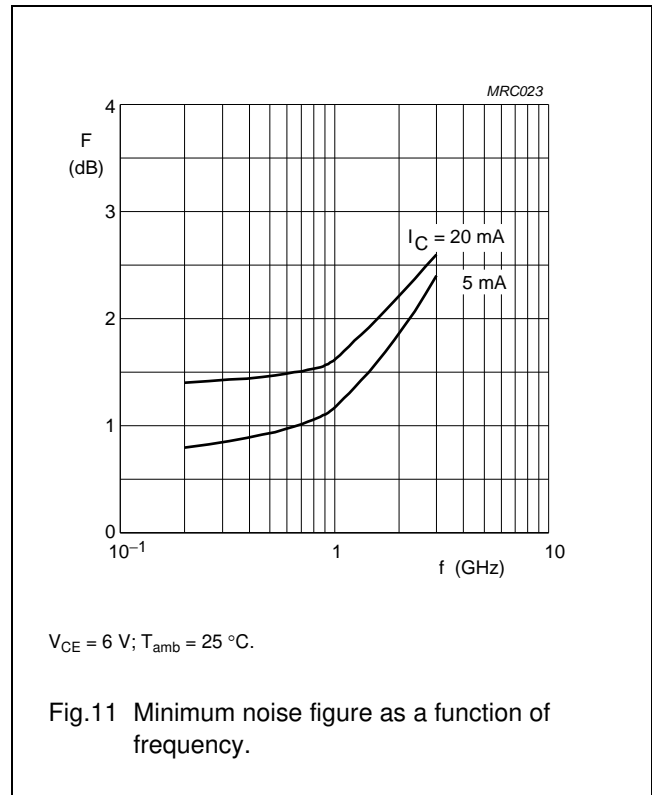
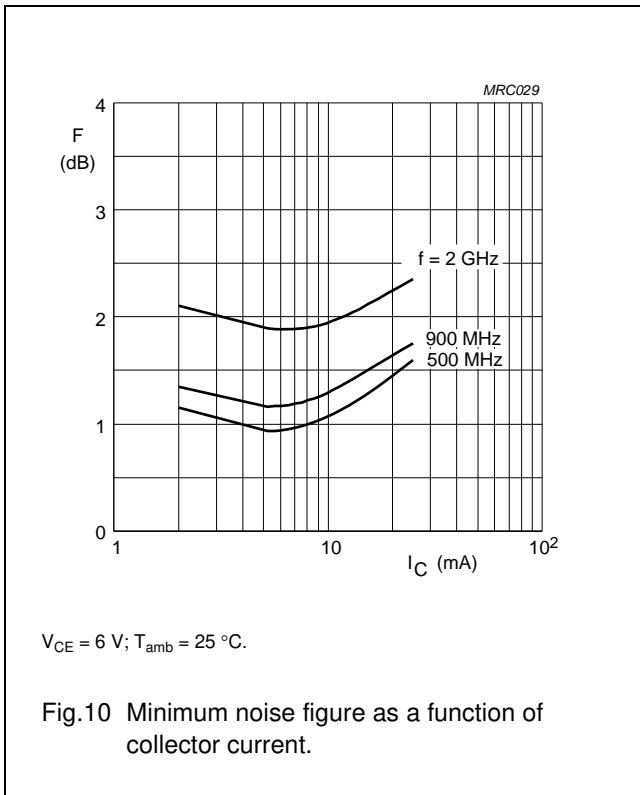
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In Figs 6 to 9,  $G_{UM}$  = maximum unilateral power gain;  $MSG$  = maximum stable gain;  $G_{max}$  = maximum available gain.



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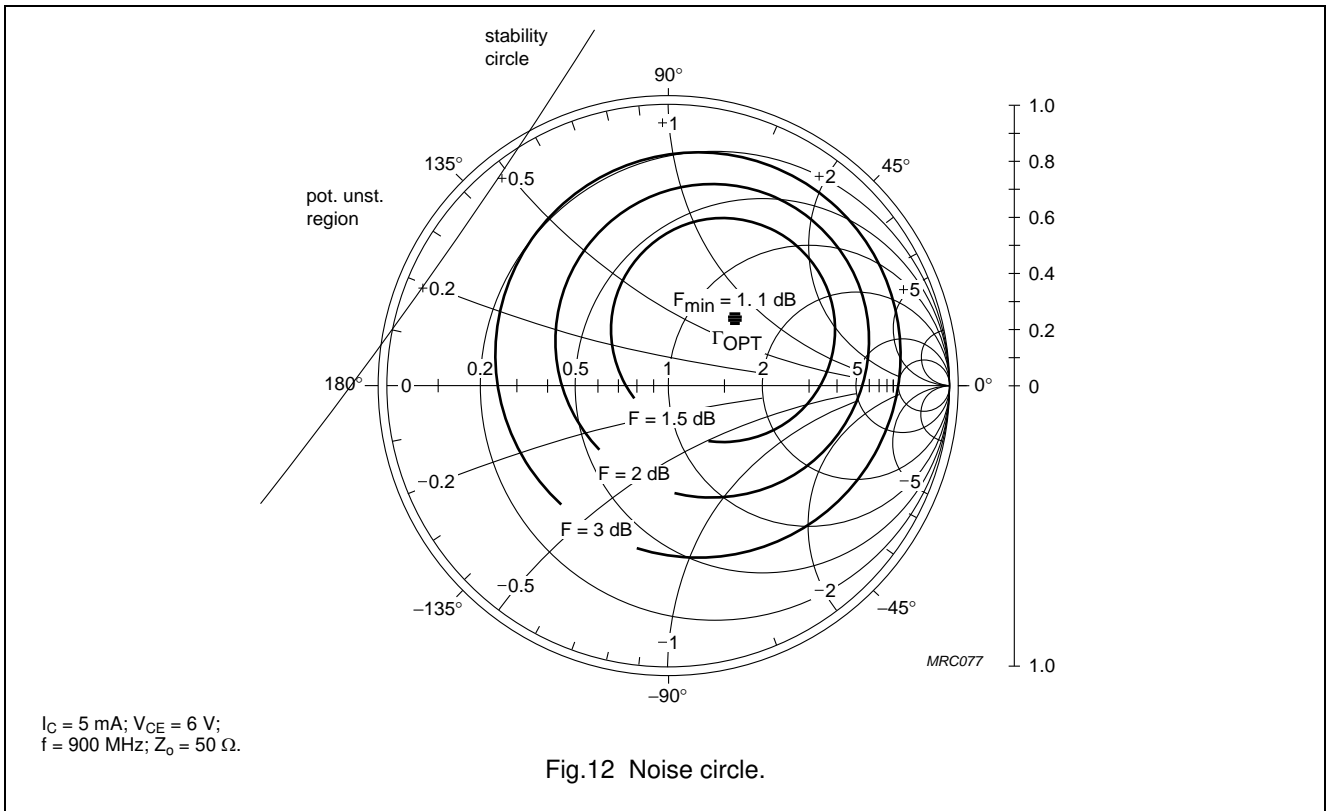


Fig.12 Noise circle.

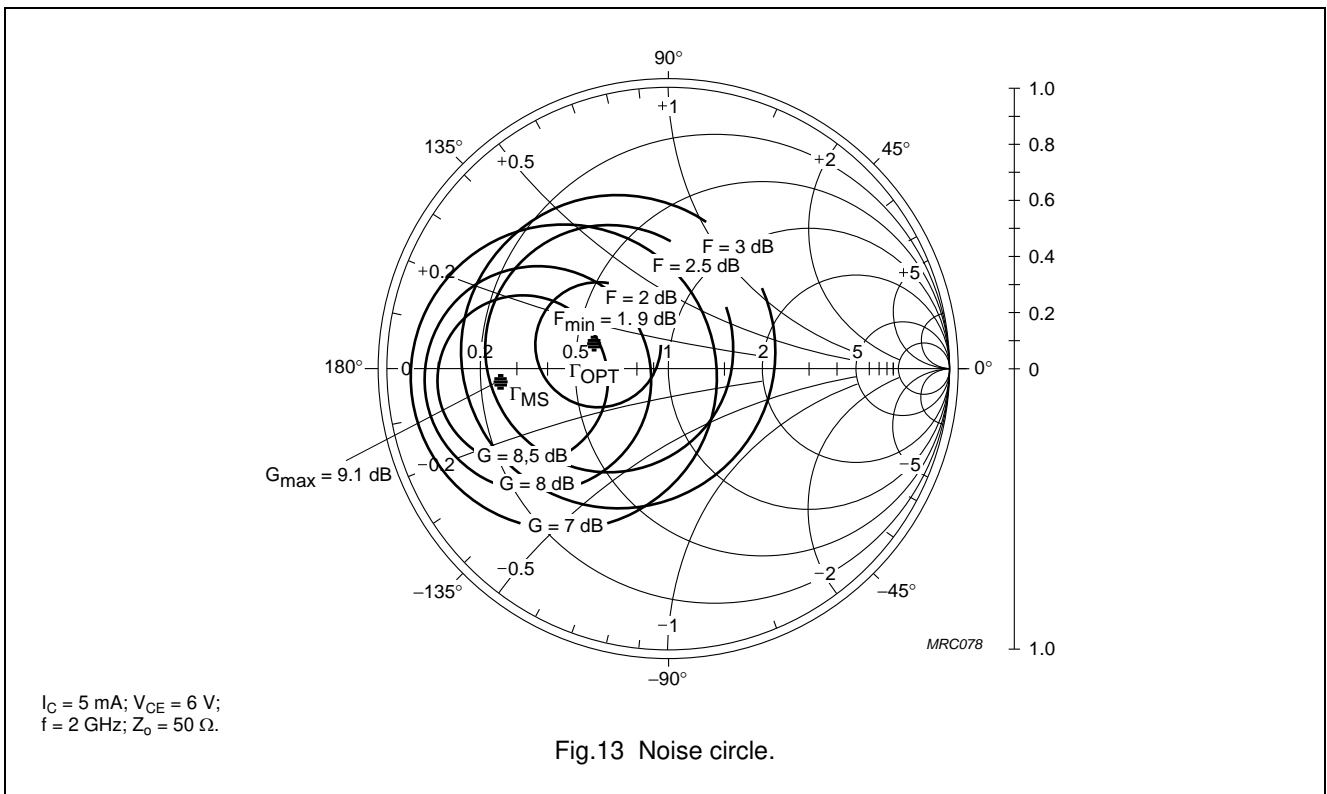
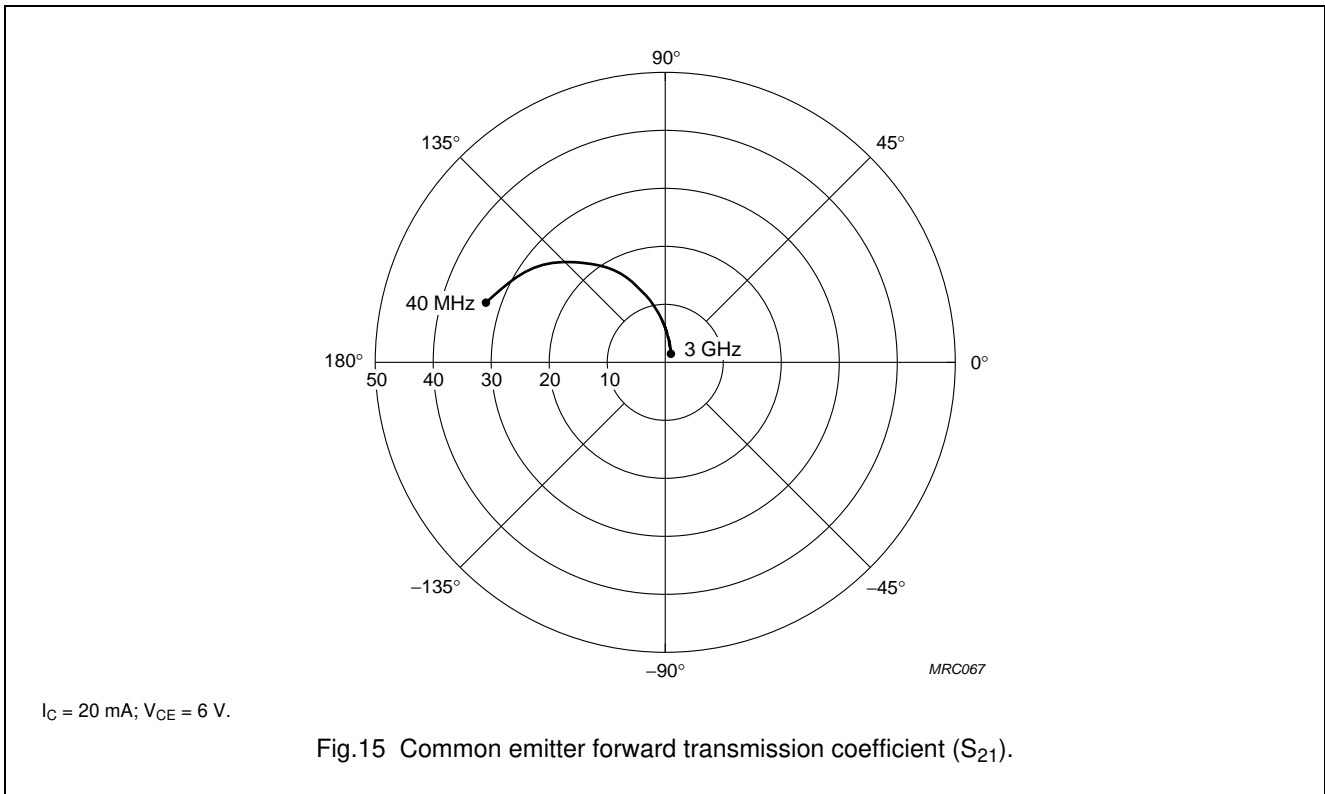
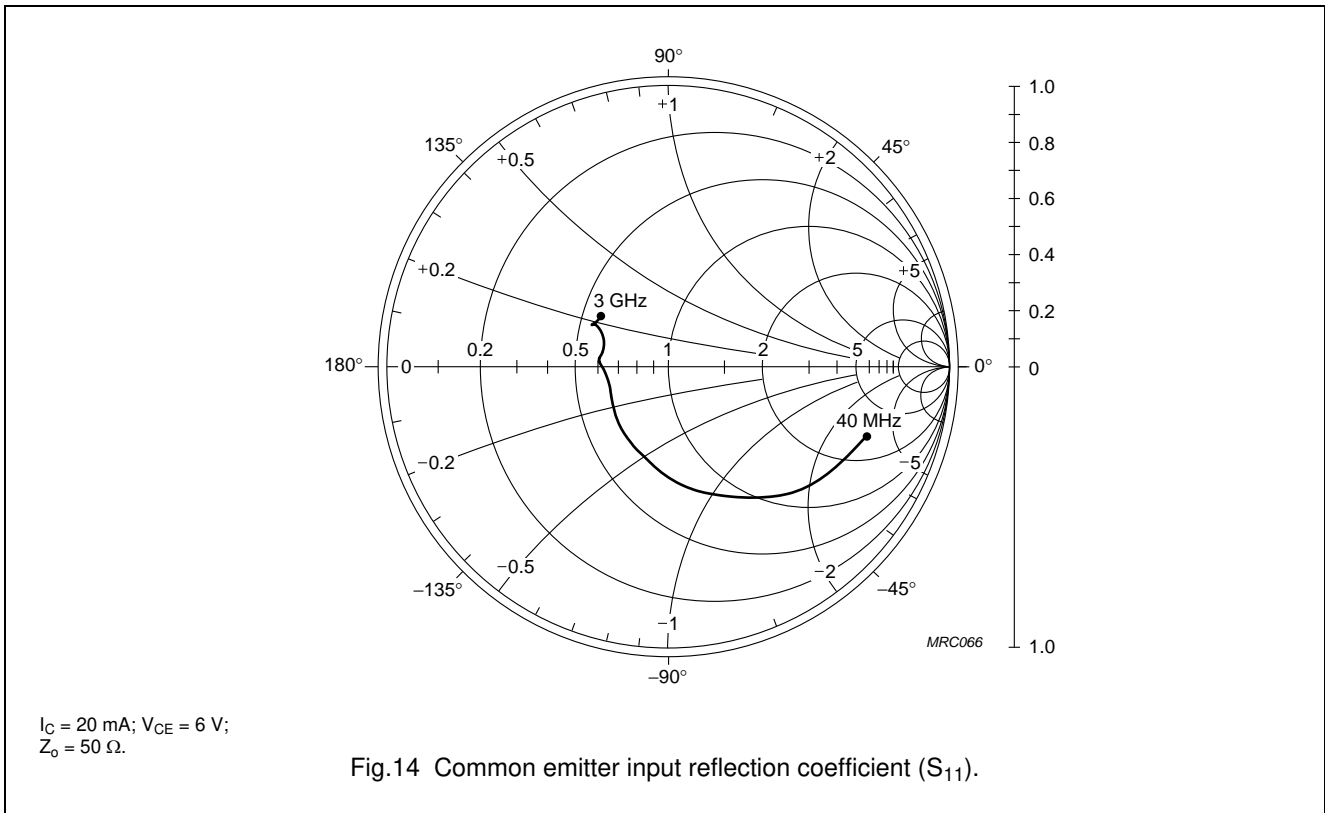


Fig.13 Noise circle.

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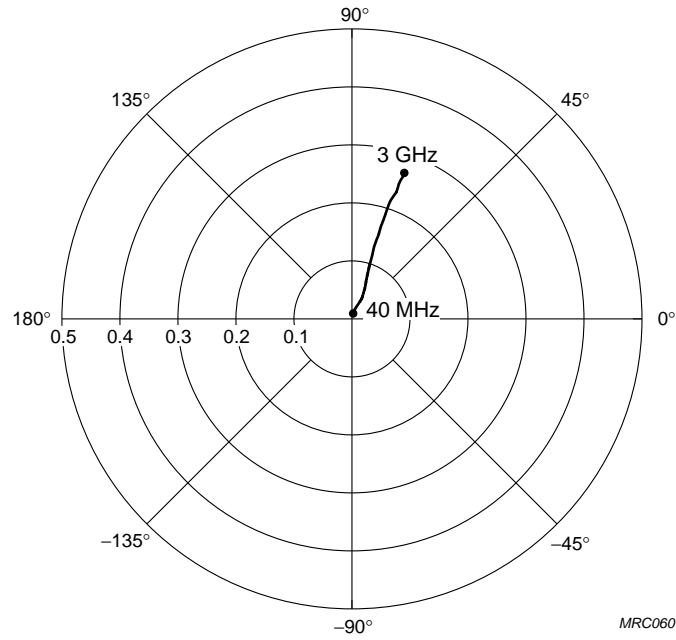
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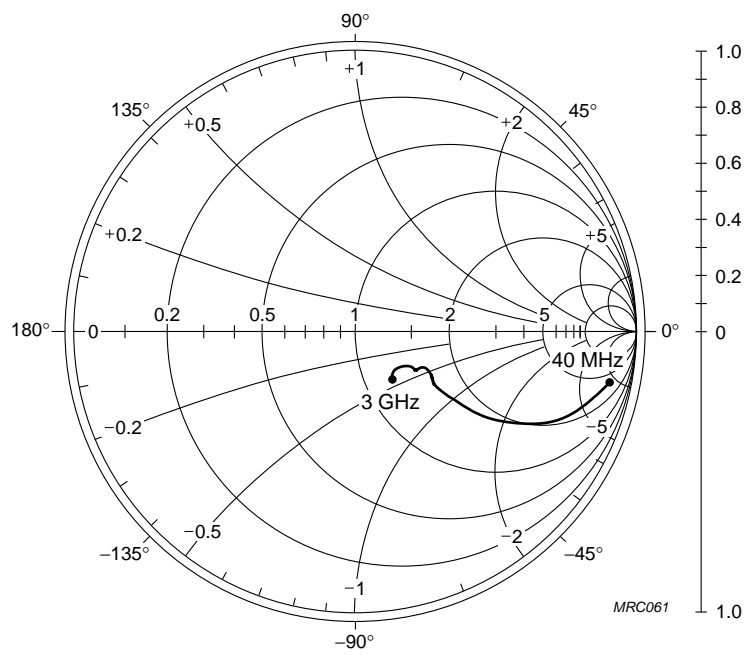
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$I_C = 20 \text{ mA}; V_{CE} = 6 \text{ V}.$

MRC060

Fig.16 Common emitter reverse transmission coefficient ( $S_{12}$ ).



$I_C = 20 \text{ mA}; V_{CE} = 6 \text{ V}; Z_0 = 50 \Omega.$

MRC061

Fig.17 Common emitter output reflection coefficient ( $S_{22}$ ).

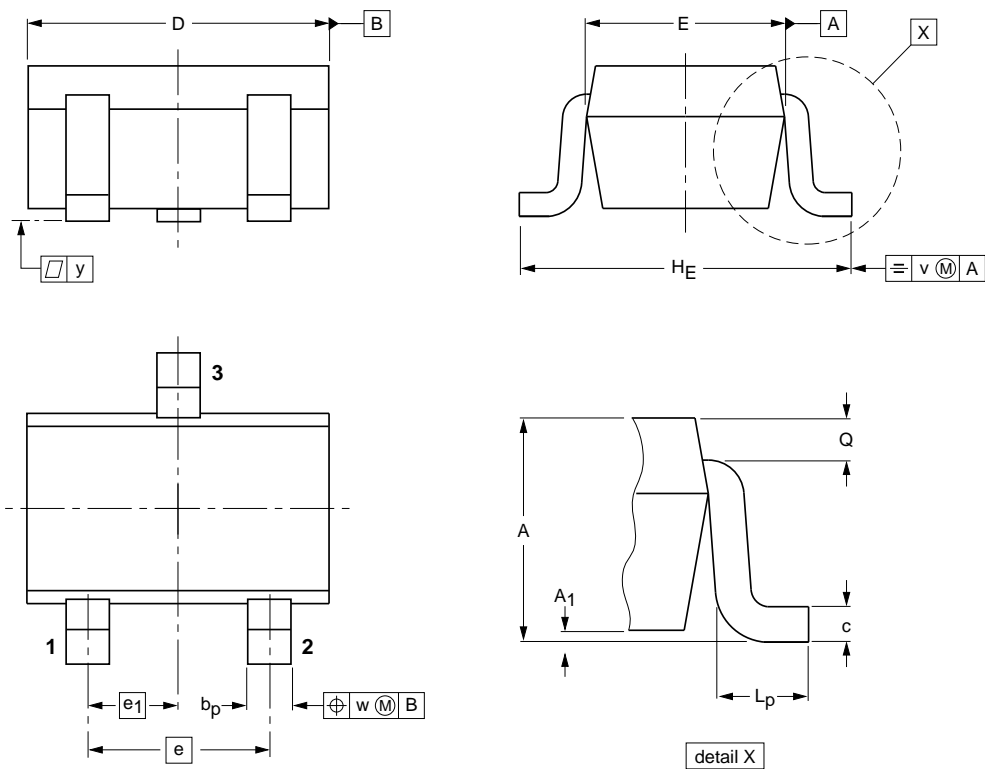
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PACKAGE OUTLINE

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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