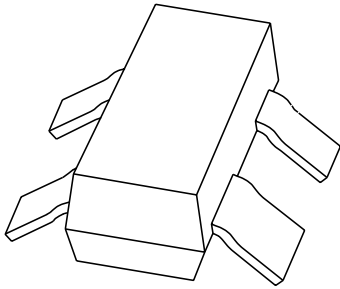


# DATA SHEET



## **BFG505; BFG505/X** NPN 9 GHz wideband transistors

Product specification  
Supersedes data of September 1995

1998 Oct 02

# NPN 9 GHz wideband transistors

# BFG505; BFG505/X

### FEATURES

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

### APPLICATIONS

RF front end applications in the GHz range, such as analog and digital cellular telephones, cordless telephones (CT1, CT2, DECT, etc.), radar detectors, pagers and satellite TV tuners (SATV).

### DESCRIPTION

NPN silicon planar epitaxial transistor in a 4-pin dual-emitter SOT143B plastic package.

### MARKING

TYPE NUMBER	CODE
BFG505	N33
BFG505/X	N39

### PINNING

PIN	DESCRIPTION	
	BFG505	BFG505/X
1	collector	collector
2	base	emitter
3	emitter	base
4	emitter	emitter

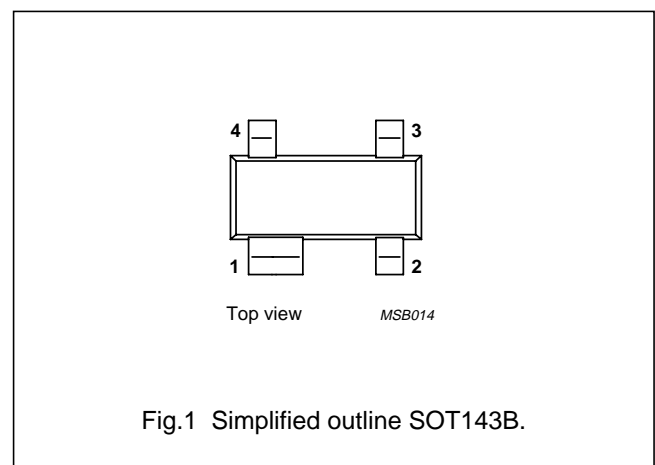


Fig.1 Simplified outline SOT143B.

### 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
$I_C$	collector current (DC)		–	–	18	mA
$P_{tot}$	total power dissipation	$T_s \leq 130\text{ }^\circ\text{C}$	–	–	150	mW
$h_{FE}$	DC current gain	$V_{CE} = 6\text{ V}; I_C = 5\text{ mA}$	60	120	250	
$C_{re}$	feedback capacitance	$V_{CB} = 6\text{ V}; I_C = i_c = 0; f = 1\text{ MHz}$	–	0.2	–	pF
$f_T$	transition frequency	$V_{CE} = 6\text{ V}; I_C = 5\text{ mA}; f = 1\text{ GHz}$	–	9	–	GHz
$G_{UM}$	maximum unilateral power gain	$V_{CE} = 6\text{ V}; I_C = 5\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}; f = 900\text{ MHz}$	–	20	–	dB
		$V_{CE} = 6\text{ V}; I_C = 5\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}; f = 2\text{ GHz}$	–	13	–	dB
$ S_{21} ^2$	insertion power gain	$V_{CE} = 6\text{ V}; I_C = 5\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}; f = 900\text{ MHz}$	16	17	–	dB
F	noise figure	$\Gamma_s = \Gamma_{opt}; V_{CE} = 6\text{ V}; I_C = 1.25\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}; f = 900\text{ MHz}$	–	1.2	1.7	dB
		$\Gamma_s = \Gamma_{opt}; V_{CE} = 6\text{ V}; I_C = 5\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}; f = 900\text{ MHz}$	–	1.6	2.1	dB
		$\Gamma_s = \Gamma_{opt}; V_{CE} = 6\text{ V}; I_C = 1.25\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}; f = 2\text{ GHz}$	–	1.9	–	dB

## NPN 9 GHz wideband transistors

## BFG505; BFG505/X

**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
$I_C$	collector current (DC)		–	18	mA
$P_{tot}$	total power dissipation	$T_s \leq 130\text{ °C}$ ; see Fig.2; note 1	–	150	mW
$T_{stg}$	storage temperature range		–65	150	°C
$T_j$	junction temperature		–	175	°C

**Note**

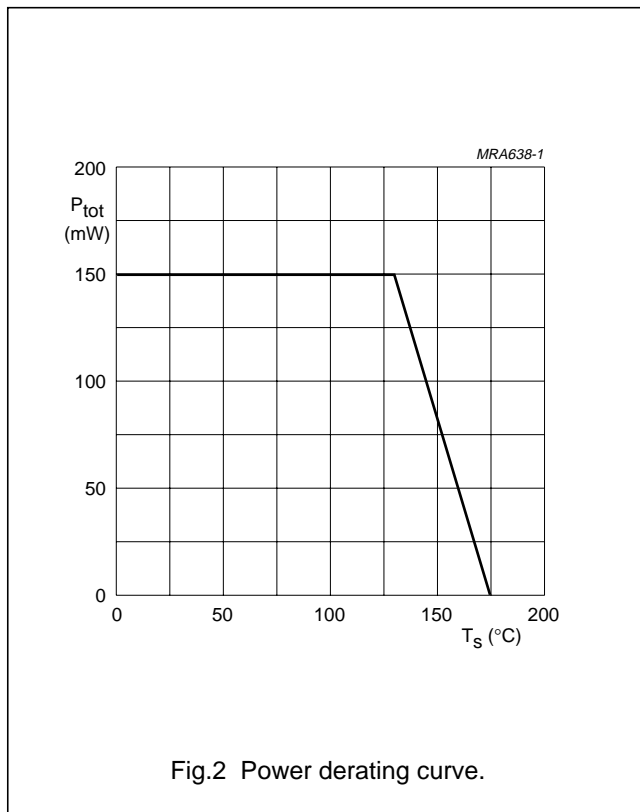
- $T_s$  is the temperature at the soldering point of the collector pin.

**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-s}$	thermal resistance from junction to soldering point	note 1	290	K/W

**Note**

- $T_s$  is the temperature at the soldering point of the collector pin.



## NPN 9 GHz wideband transistors

## BFG505; BFG505/X

## CHARACTERISTICS

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

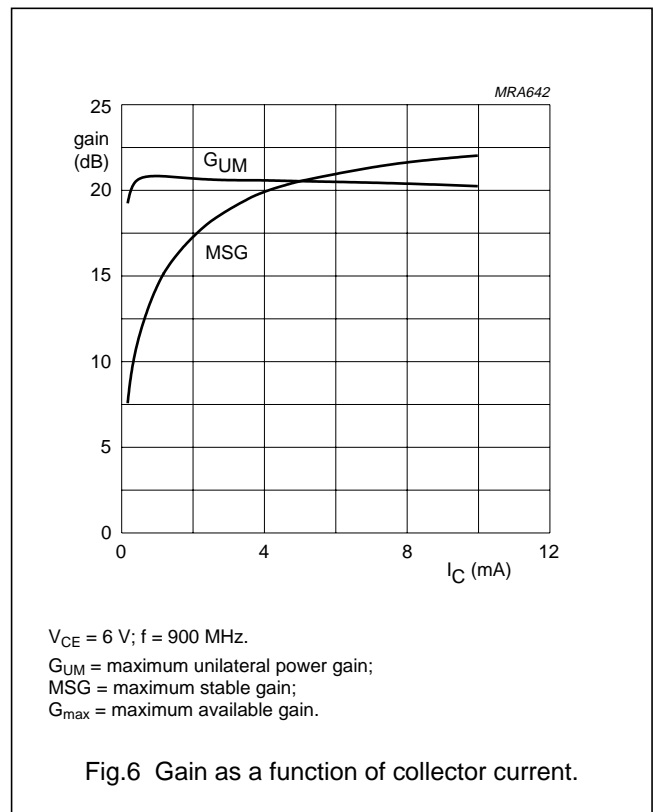
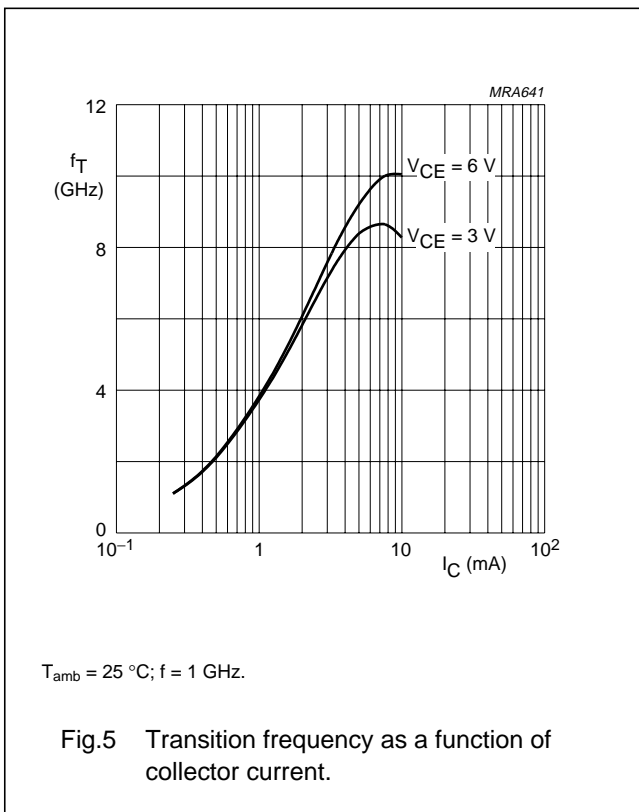
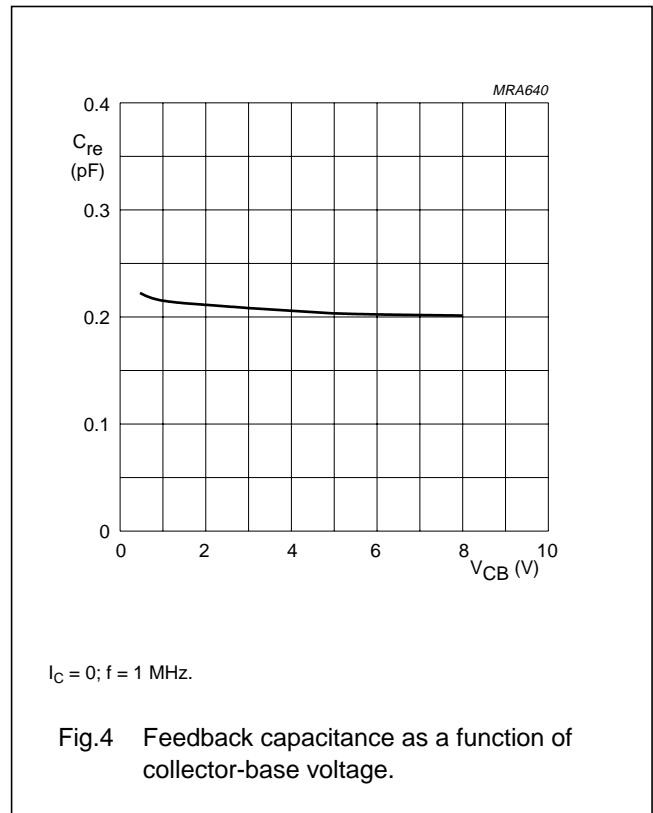
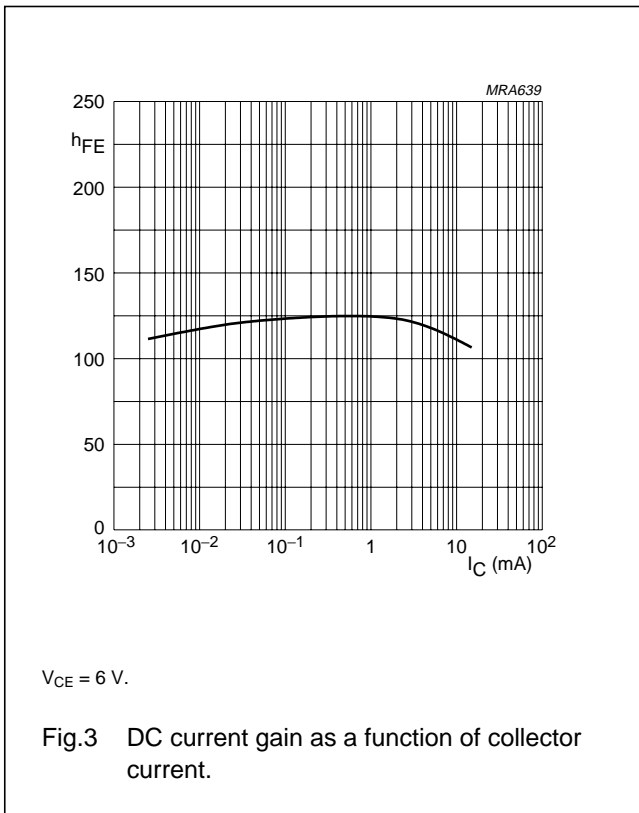
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_{CBO}$	collector cut-off current	$V_{CB} = 6\text{ V}; I_E = 0$	–	–	50	nA
$h_{FE}$	DC current gain	$I_C = 5\text{ mA}; V_{CE} = 6\text{ V};$ see Fig.3	60	120	250	
$C_e$	emitter capacitance	$I_C = I_c = 0\text{ V}; V_{EB} = 0.5\text{ V}; f = 1\text{ MHz}$	–	0.4	–	pF
$C_c$	collector capacitance	$V_{CB} = 6\text{ V}; I_E = I_e = 0; f = 1\text{ MHz}$	–	0.3	–	pF
$C_{re}$	feedback capacitance	$I_C = 0; V_{CB} = 6\text{ V}; f = 1\text{ MHz};$ see Fig.4	–	0.2	–	pF
$f_T$	transition frequency	$I_C = 5\text{ mA}; V_{CE} = 6\text{ V}; f = 1\text{ GHz};$ see Fig.5	–	9	–	GHz
$G_{UM}$	maximum unilateral power gain; note 1	$I_C = 5\text{ mA}; V_{CE} = 6\text{ V};$ $T_{amb} = 25\text{ °C}; f = 900\text{ MHz}$	–	20	–	dB
		$I_c = 5\text{ mA}; V_{CE} = 6\text{ V};$ $T_{amb} = 25\text{ °C}; f = 2\text{ GHz}$	–	13	–	dB
$ S_{21} ^2$	insertion power gain	$I_C = 5\text{ mA}; V_{CE} = 6\text{ V};$ $T_{amb} = 25\text{ °C}; f = 900\text{ MHz}$	16	17	–	dB
F	noise figure	$\Gamma_s = \Gamma_{opt}; I_C = 1.25\text{ mA}; V_{CE} = 6\text{ V};$ $T_{amb} = 25\text{ °C}; f = 900\text{ MHz}$	–	1.2	1.7	dB
		$\Gamma_s = \Gamma_{opt}; I_C = 5\text{ mA}; V_{CE} = 6\text{ V};$ $T_{amb} = 25\text{ °C}; f = 900\text{ MHz}$	–	1.6	2.1	dB
		$\Gamma_s = \Gamma_{opt}; I_C = 1.25\text{ mA}; V_{CE} = 6\text{ V};$ $T_{amb} = 25\text{ °C}; f = 2\text{ GHz}$	–	1.9	–	dB
$P_{L1}$	output power at 1 dB gain compression	$I_C = 5\text{ mA}; V_{CE} = 6\text{ V}; R_L = 50\text{ }\Omega;$ $T_{amb} = 25\text{ °C}; f = 900\text{ MHz}$	–	4	–	dBm
ITO	third order intercept point	note 2	–	10	–	dBm

## Notes

- $G_{UM}$  is the maximum unilateral power gain, assuming  $S_{12}$  is zero and  $G_{UM} = 10 \log \frac{|S_{21}|^2}{(1 - |S_{11}|^2)(1 - |S_{22}|^2)}$  dB.
- $V_{CE} = 6\text{ V}; I_C = 5\text{ mA}; R_L = 50\text{ }\Omega; T_{amb} = 25\text{ °C};$   
 $f_p = 900\text{ MHz}; f_q = 902\text{ MHz};$   
measured at  $2f_p - f_q = 898\text{ MHz}$  and  $2f_q - f_p = 904\text{ MHz}.$

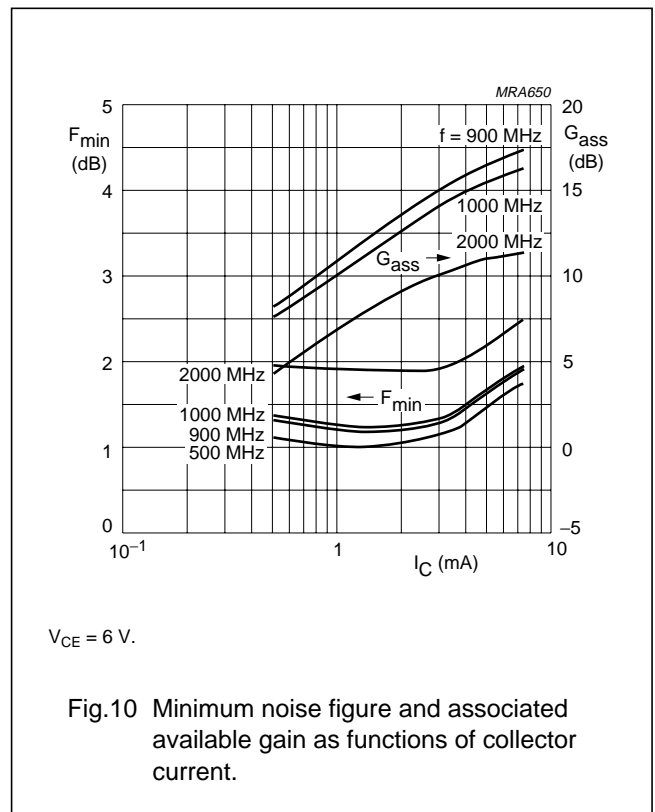
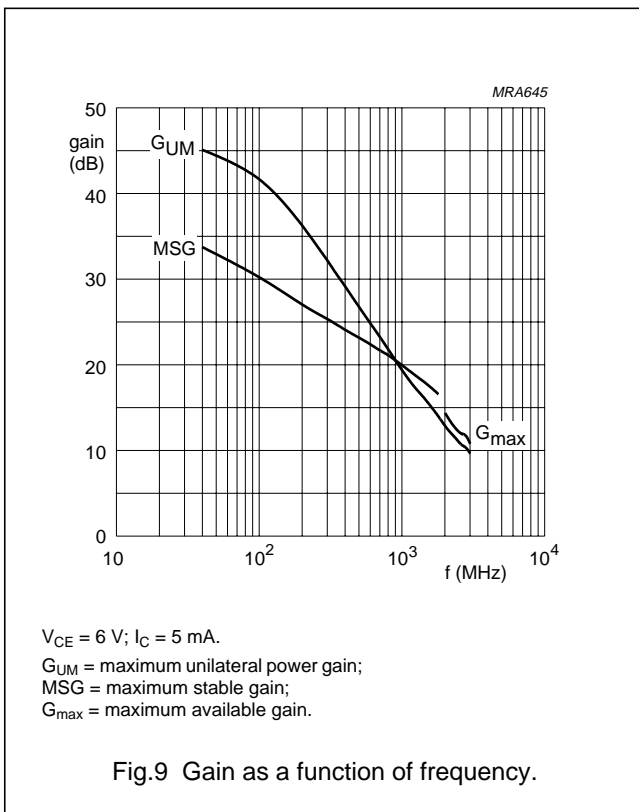
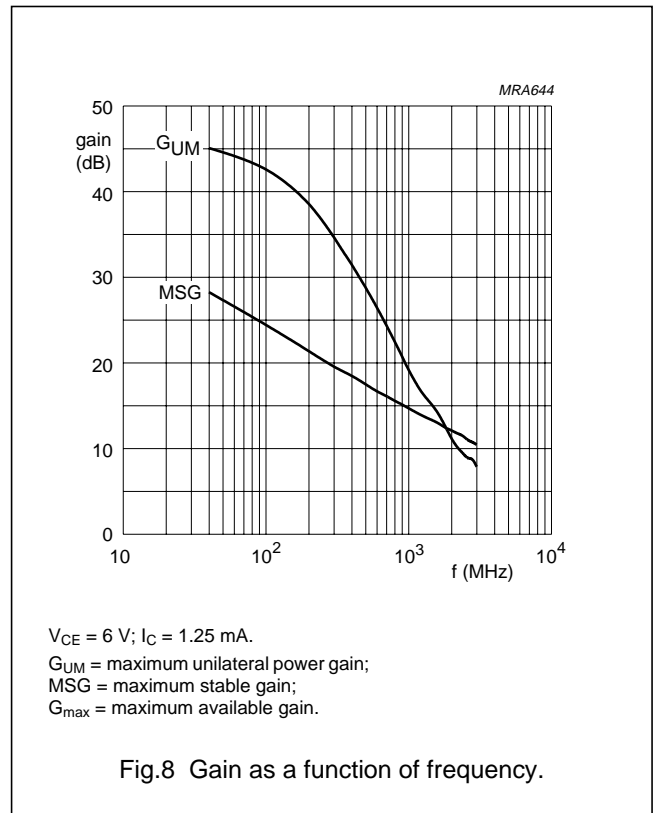
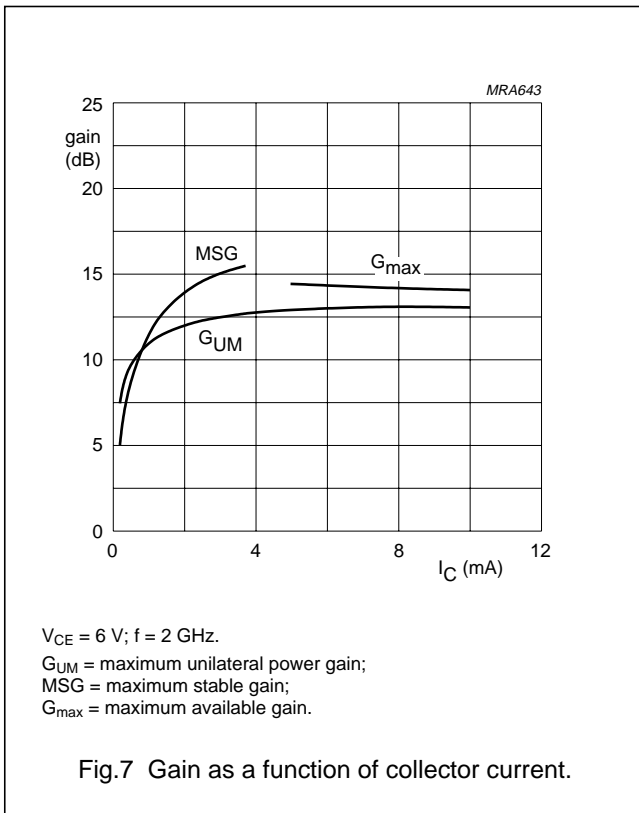
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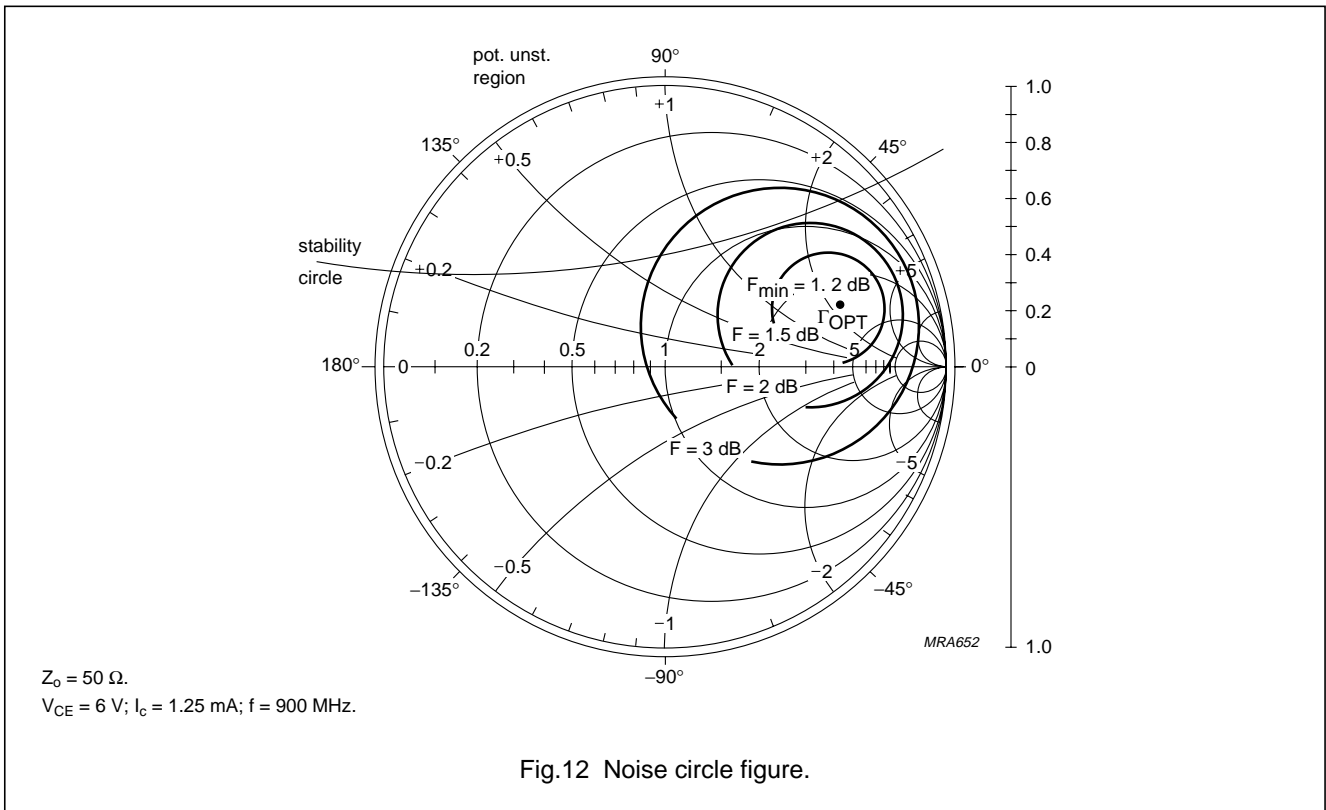
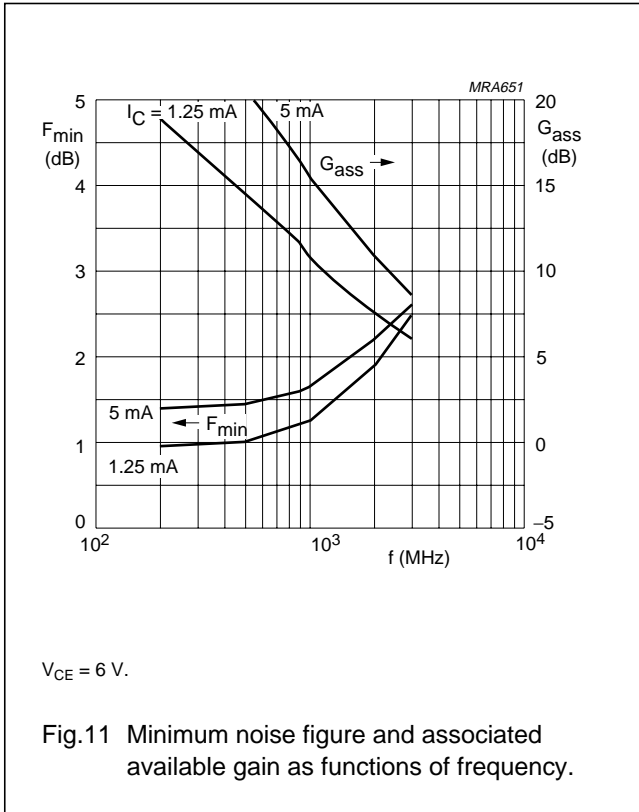
NPN 9 GHz wideband transistors

BFG505; BFG505/X



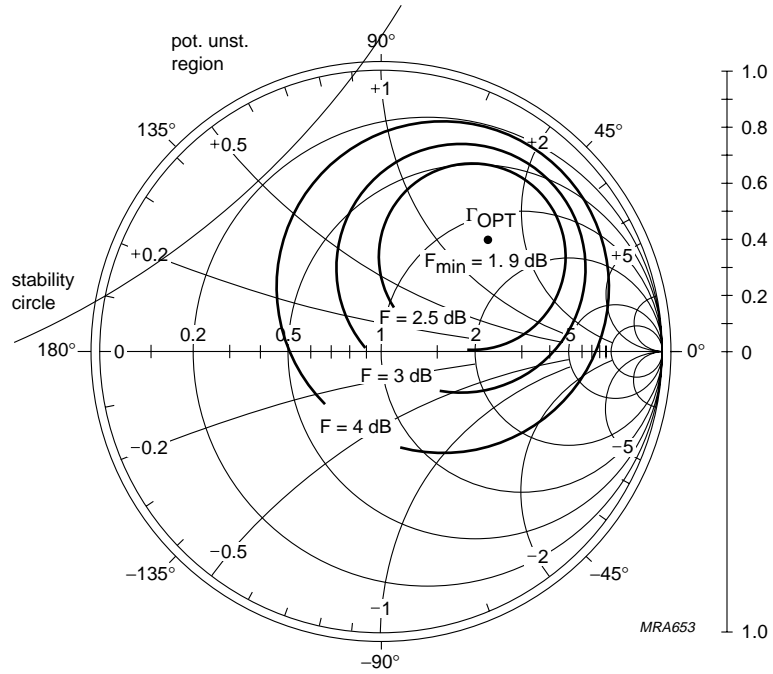
NPN 9 GHz wideband transistors

BFG505; BFG505/X



NPN 9 GHz wideband transistors

BFG505; BFG505/X



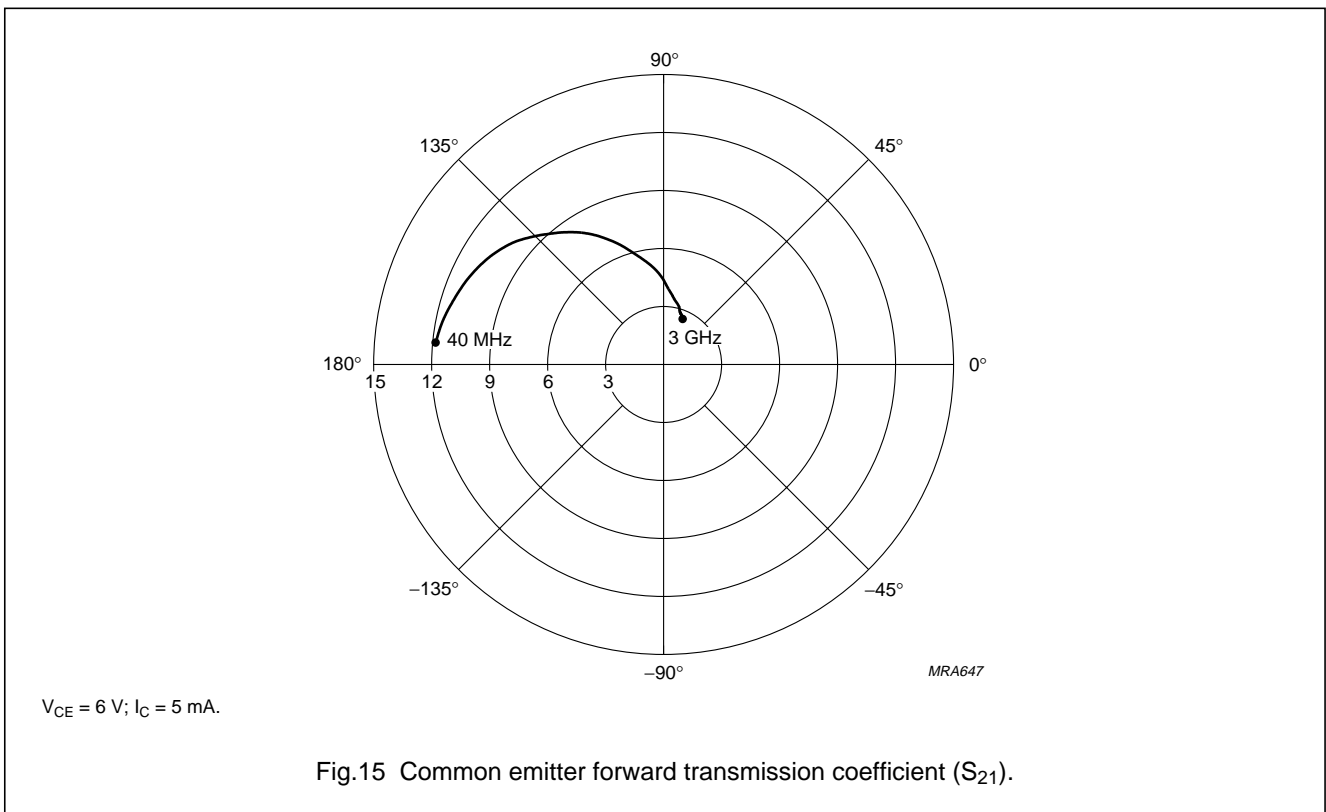
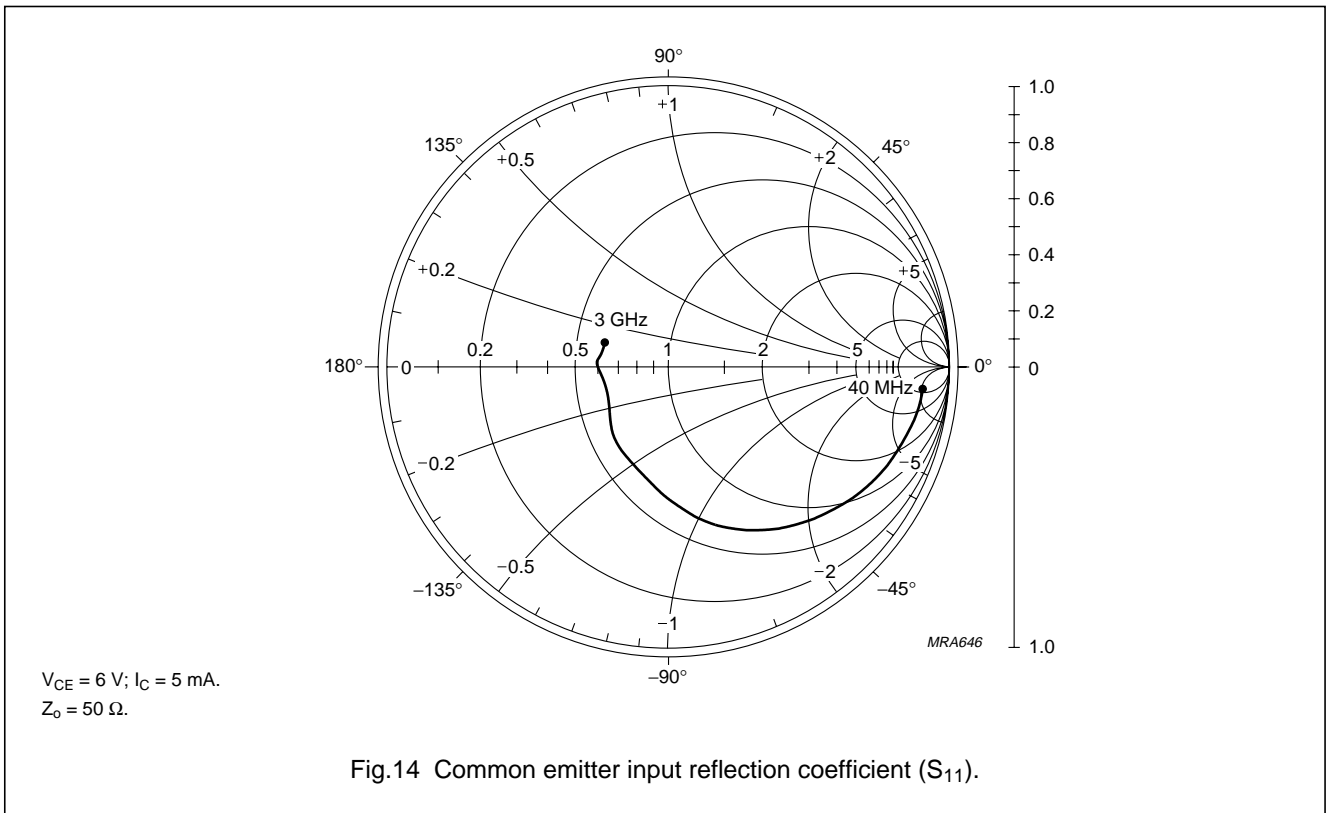
$Z_o = 50 \Omega$ .  
 $V_{CE} = 6 V$ ;  $I_c = 1.25 mA$ ;  $f = 2000 MHz$ .

Fig.13 Noise circle figure.



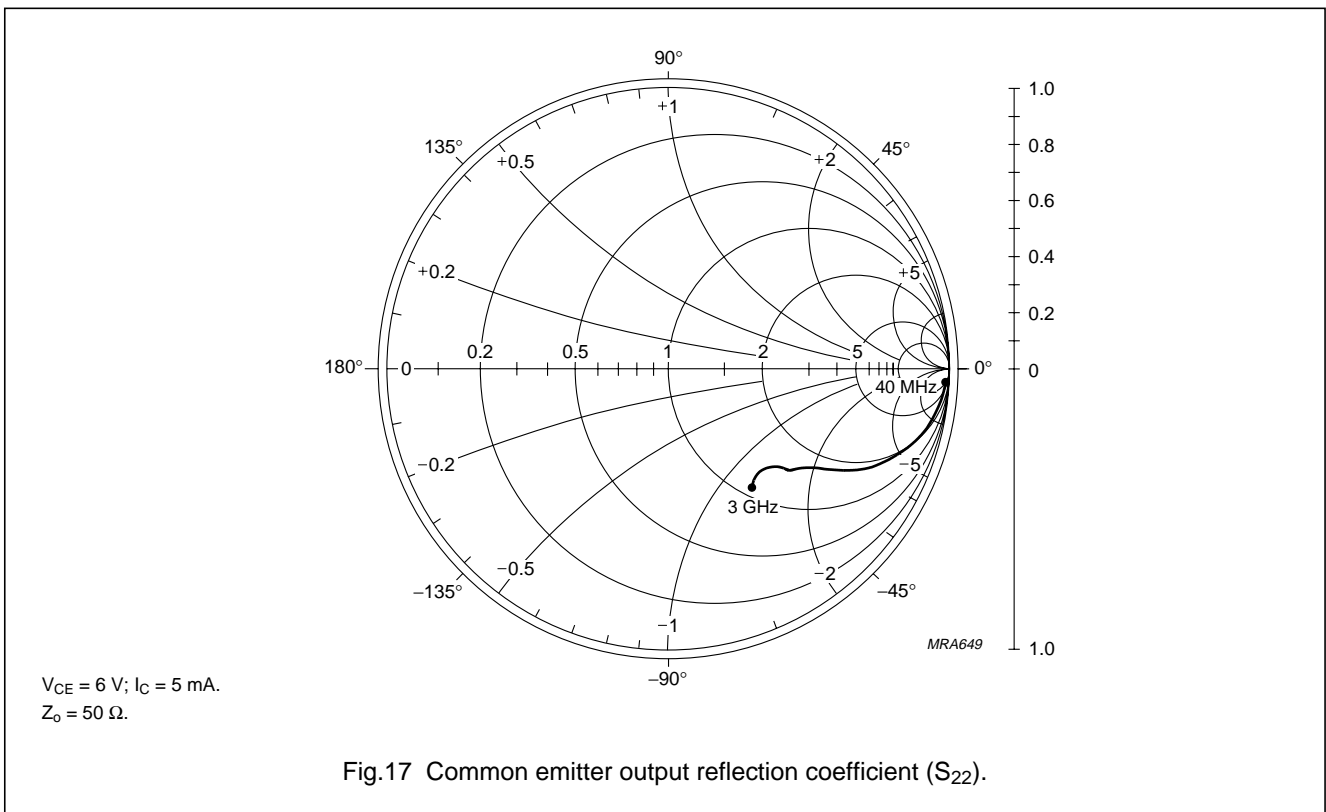
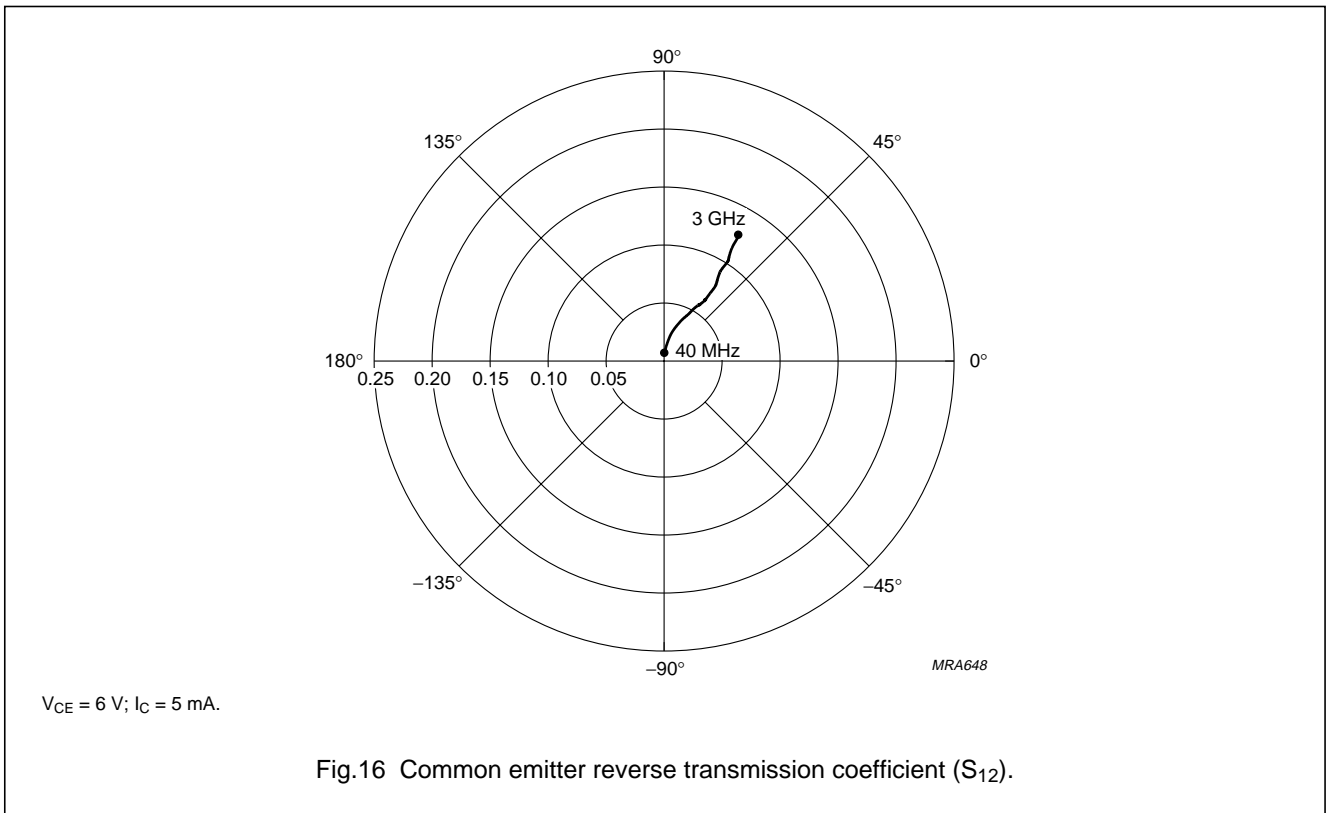
NPN 9 GHz wideband transistors

BFG505; BFG505/X



NPN 9 GHz wideband transistors

BFG505; BFG505/X



NPN 9 GHz wideband transistors

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PACKAGE OUTLINE

Plastic surface mounted package; 4 leads

SOT143B



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub> max	b <sub>p</sub>	b <sub>1</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	Q	v	w	y
mm	1.1 0.9	0.1	0.48 0.38	0.88 0.78	0.15 0.09	3.0 2.8	1.4 1.2	1.9	1.7	2.5 2.1	0.45 0.15	0.55 0.45	0.2	0.1	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT143B						97-02-28

## NPN 9 GHz wideband transistors

## BFG505; BFG505/X

**DEFINITIONS**

<b>Data Sheet Status</b>	
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.
<b>Limiting values</b>	
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.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

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**NOTES**

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**NOTES**

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