

BFG505; BFG505/X

NPN 9 GHz wideband transistors

Rev. 04 — 22 November 2007

Product data sheet

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NPN 9 GHz wideband transistors

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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	%ME
BFG505/X	%MK

PINNING

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

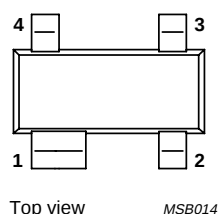


Fig.1 Simplified outline SOT143B.

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

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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 ≤ 130 °C; see Fig.2; note 1	–	150	mW
T _{stg}	storage temperature range		–65	150	°C
T _j	junction temperature		–	175	°C

Note

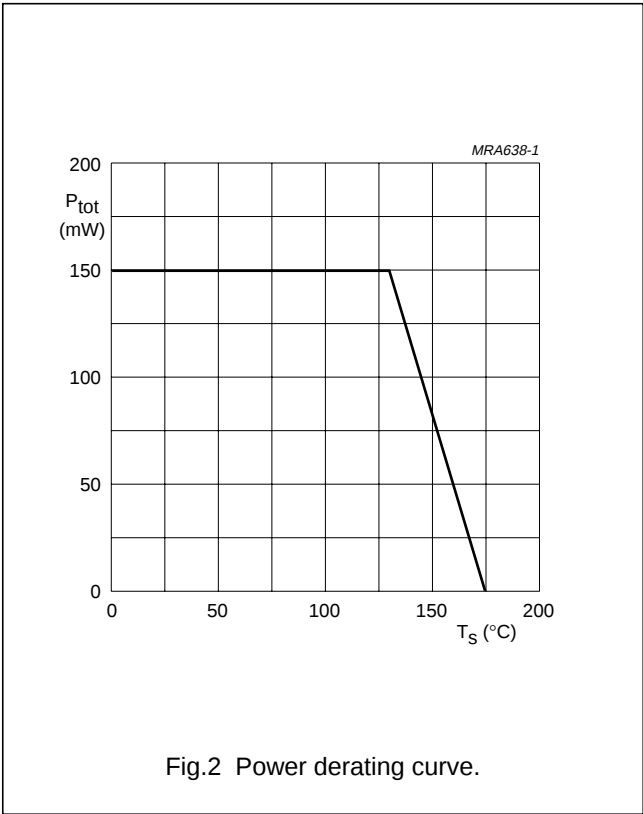
1. T_S is the temperature at the soldering point of the collector pin.

THERMAL CHARACTERISTICS

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

Note

1. T_S is the temperature at the soldering point of the collector pin.



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CHARACTERISTICS

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

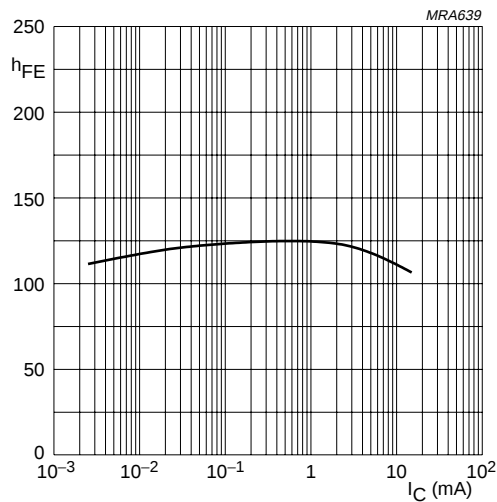
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	$V_{CB} = 6\text{ V}; I_E = 0$	–	–	50	nA
h_{FE}	DC current gain	$I_C = 5\text{ mA}; V_{CE} = 6\text{ V};$ see Fig.3	60	120	250	
C_e	emitter capacitance	$I_C = I_C = 0\text{ V}; V_{EB} = 0.5\text{ V}; f = 1\text{ MHz}$	–	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 $2f_q - f_p = 904\text{ MHz}.$

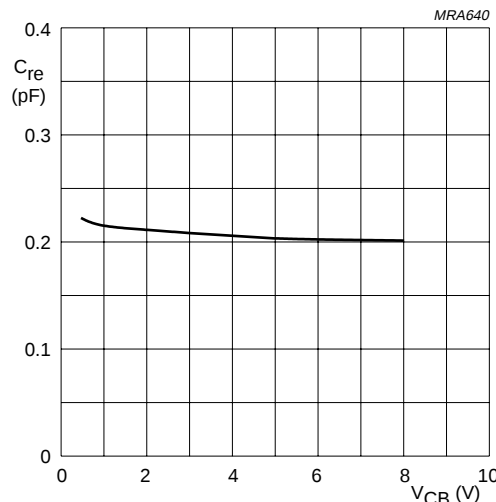
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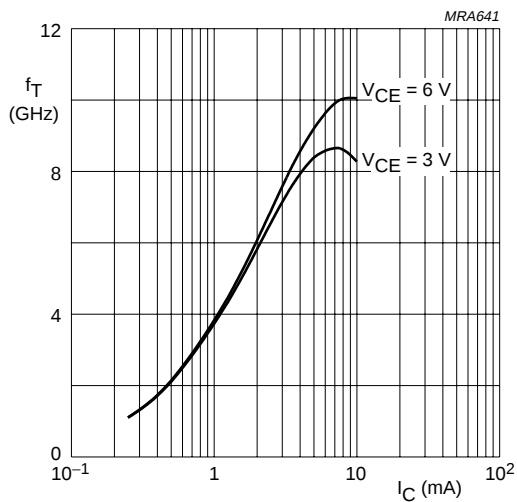
$V_{CE} = 6\text{ V}$.

Fig.3 DC current gain as a function of collector current.



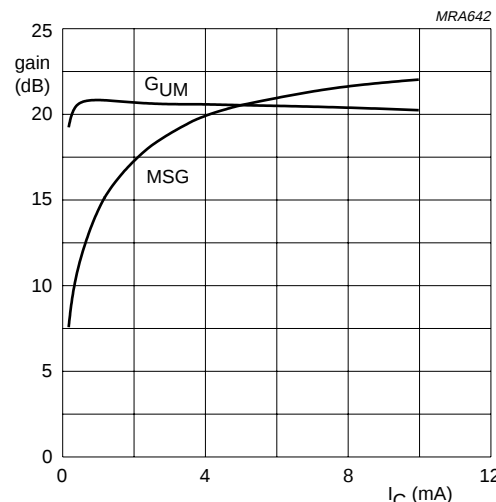
$I_C = 0$; $f = 1\text{ MHz}$.

Fig.4 Feedback capacitance as a function of collector-base voltage.



$T_{amb} = 25\text{ }^{\circ}\text{C}$; $f = 1\text{ GHz}$.

Fig.5 Transition frequency as a function of collector current.



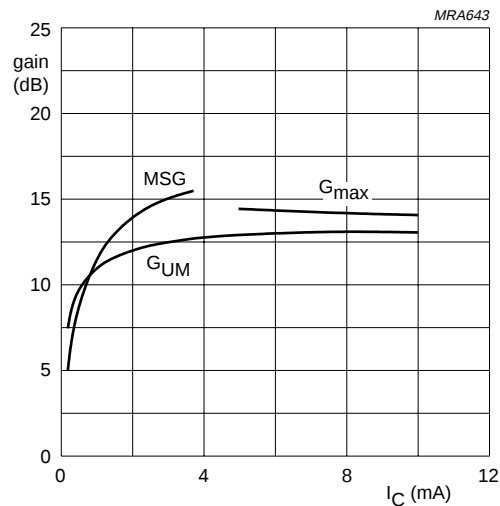
$V_{CE} = 6\text{ V}$; $f = 900\text{ MHz}$.

G_{UM} = maximum unilateral power gain;
 MSG = maximum stable gain;
 G_{max} = maximum available gain.

Fig.6 Gain as a function of collector current.

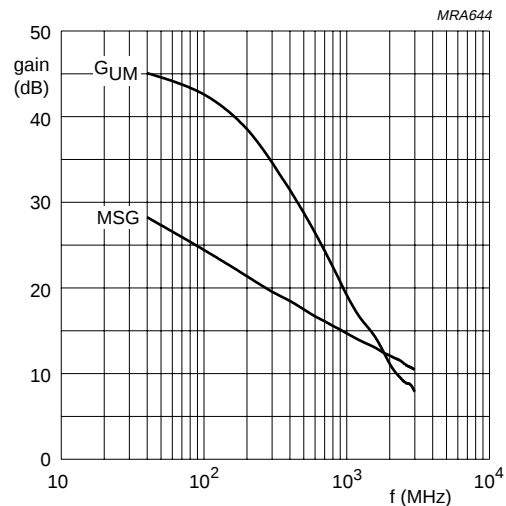
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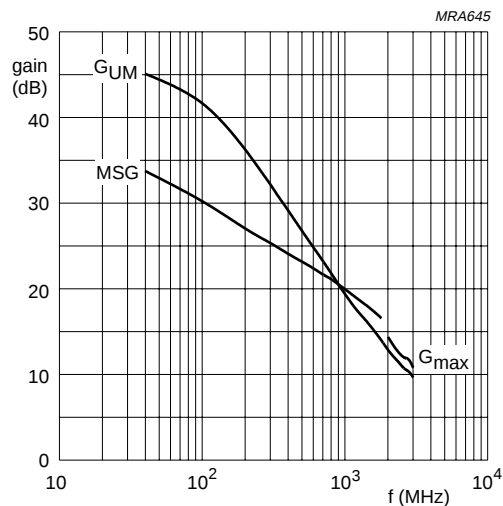
$V_{CE} = 6\text{ V}$; $f = 2\text{ GHz}$.
 G_{UM} = maximum unilateral power gain;
 MSG = maximum stable gain;
 G_{max} = maximum available gain.

Fig.7 Gain as a function of collector current.



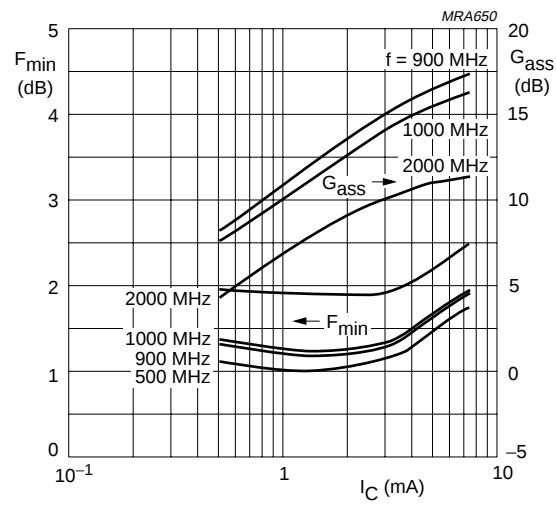
$V_{CE} = 6\text{ V}$; $I_C = 1.25\text{ mA}$.
 G_{UM} = maximum unilateral power gain;
 MSG = maximum stable gain;
 G_{max} = maximum available gain.

Fig.8 Gain as a function of frequency.



$V_{CE} = 6\text{ V}$; $I_C = 5\text{ mA}$.
 G_{UM} = maximum unilateral power gain;
 MSG = maximum stable gain;
 G_{max} = maximum available gain.

Fig.9 Gain as a function of frequency.

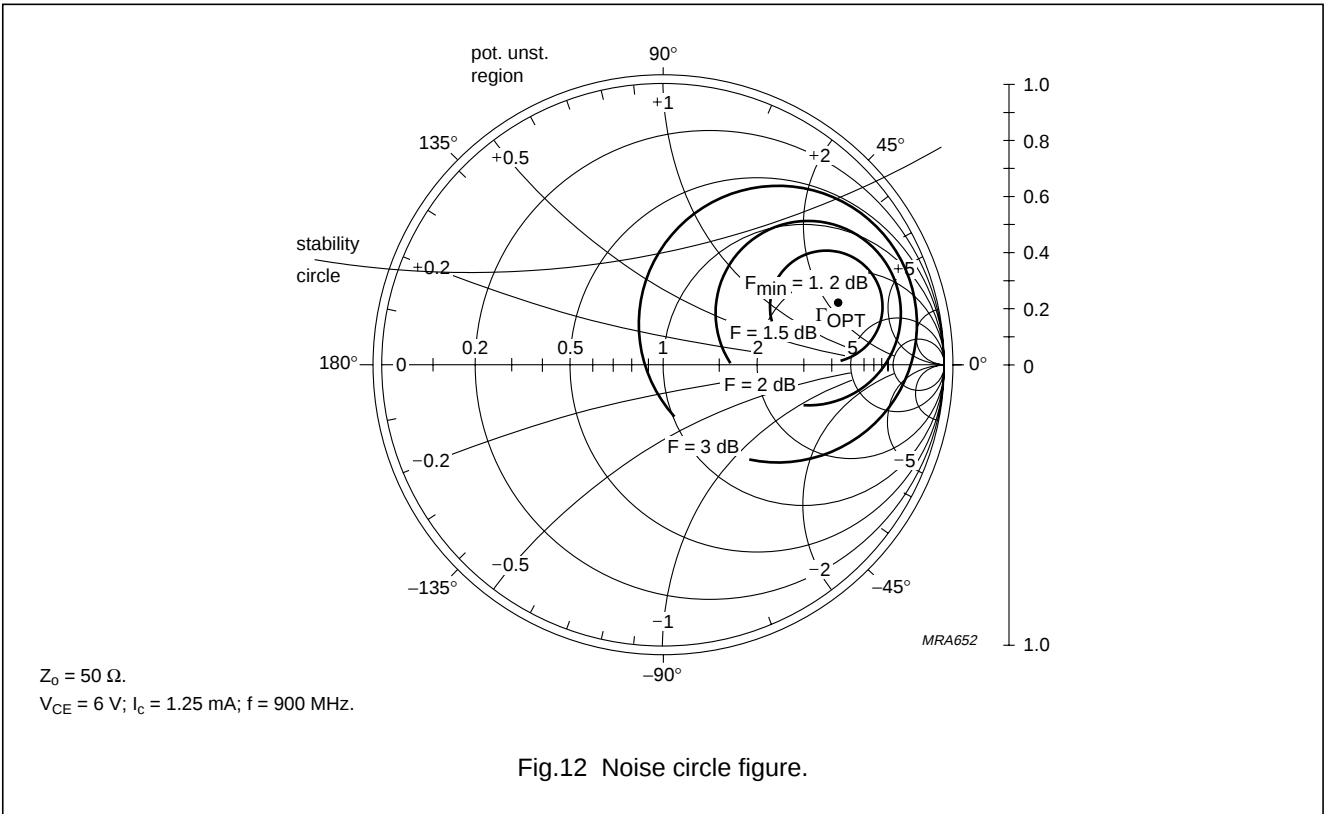
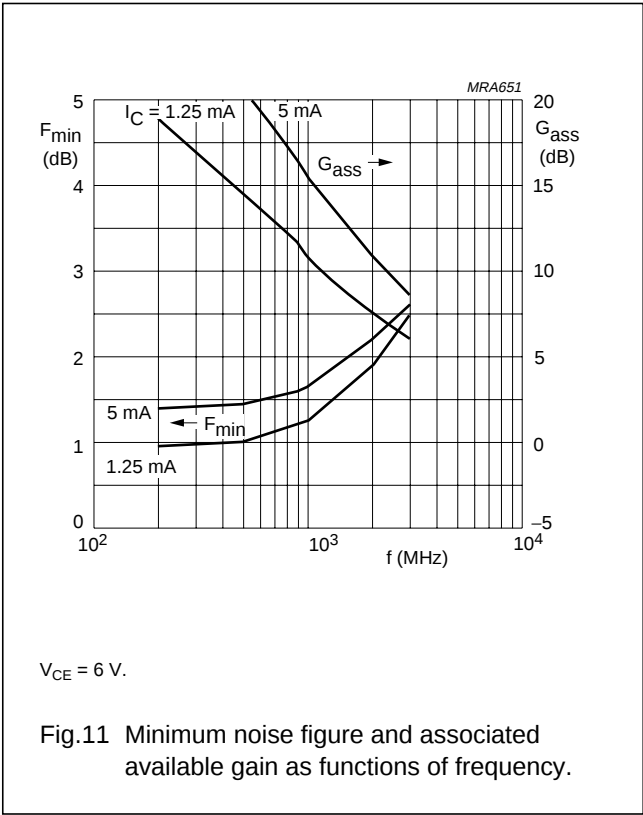


$V_{CE} = 6\text{ V}$.

Fig.10 Minimum noise figure and associated available gain as functions of collector current.

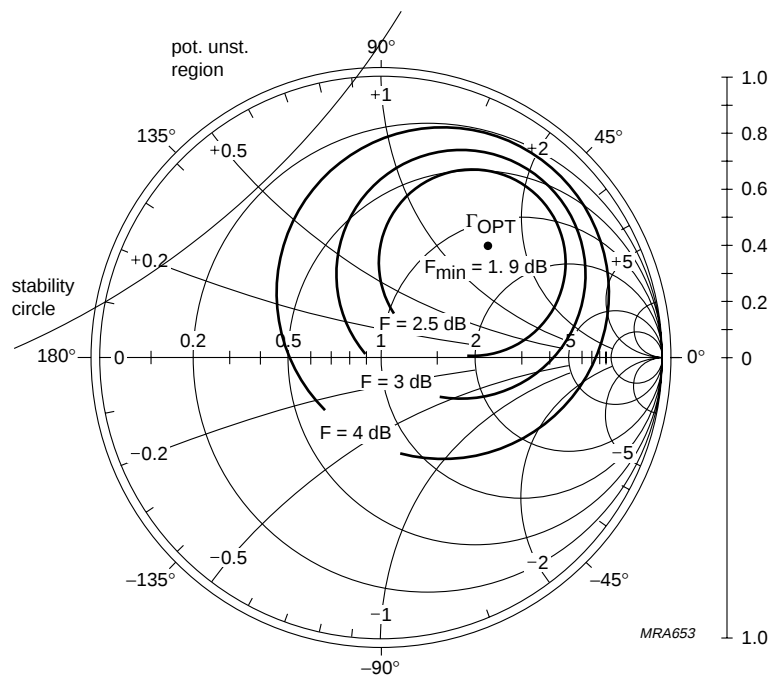
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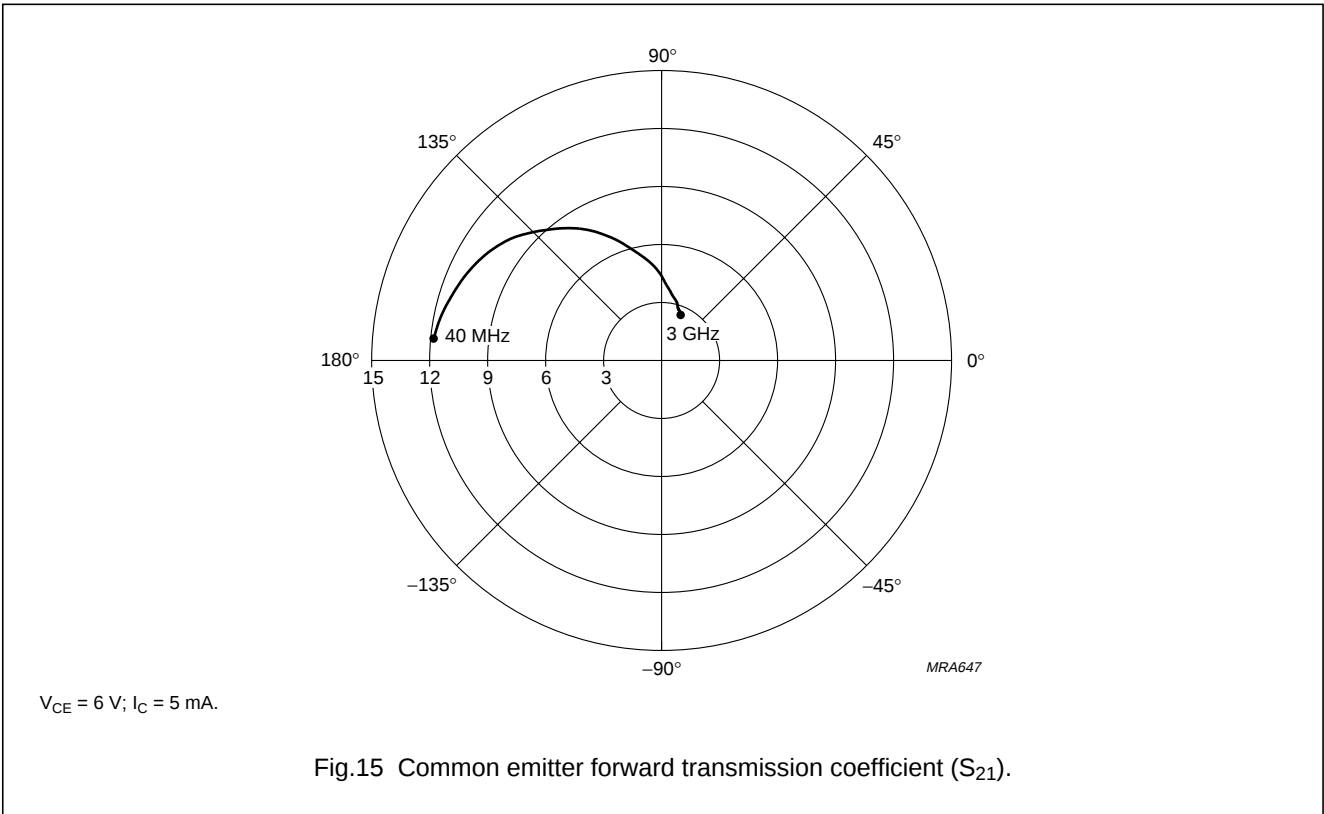
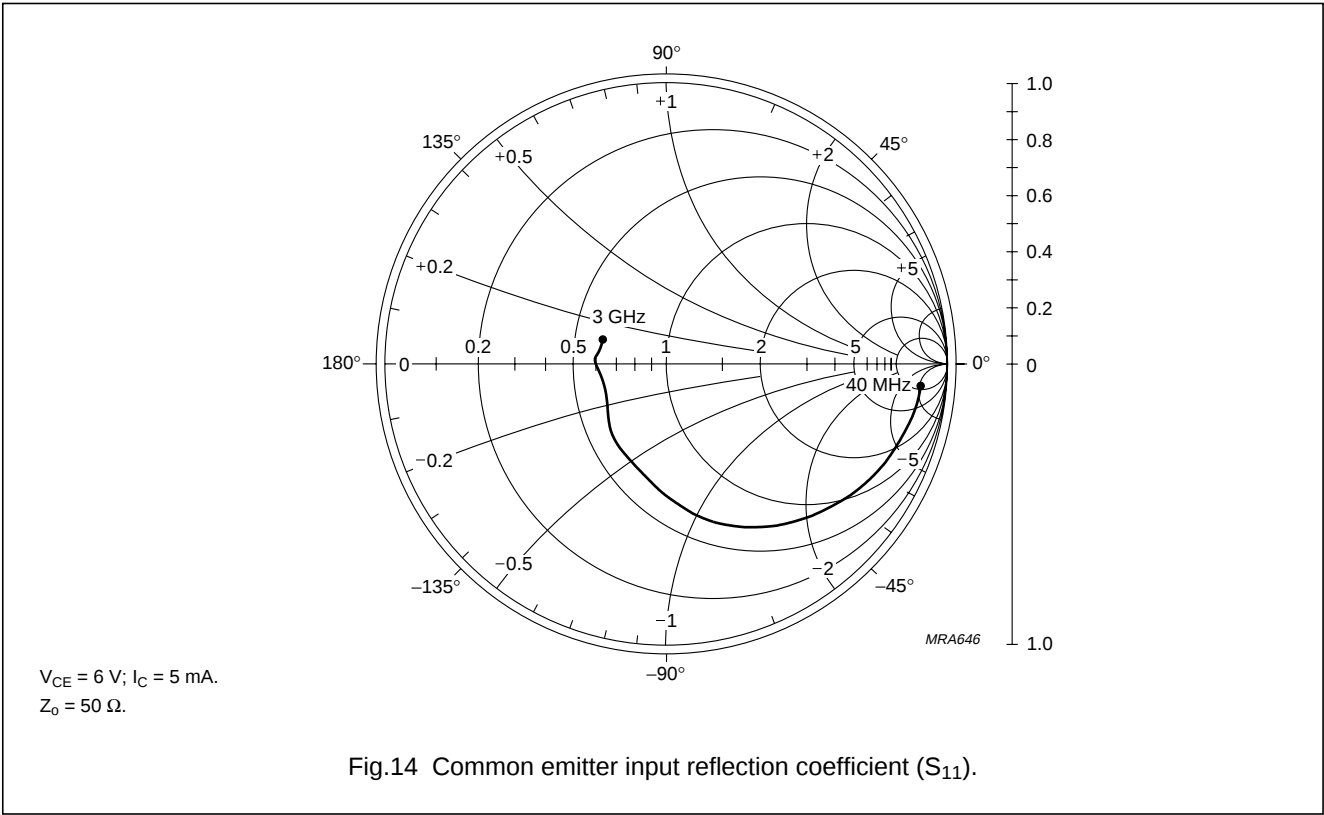
$Z_0 = 50 \Omega$.

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

Fig.13 Noise circle figure.

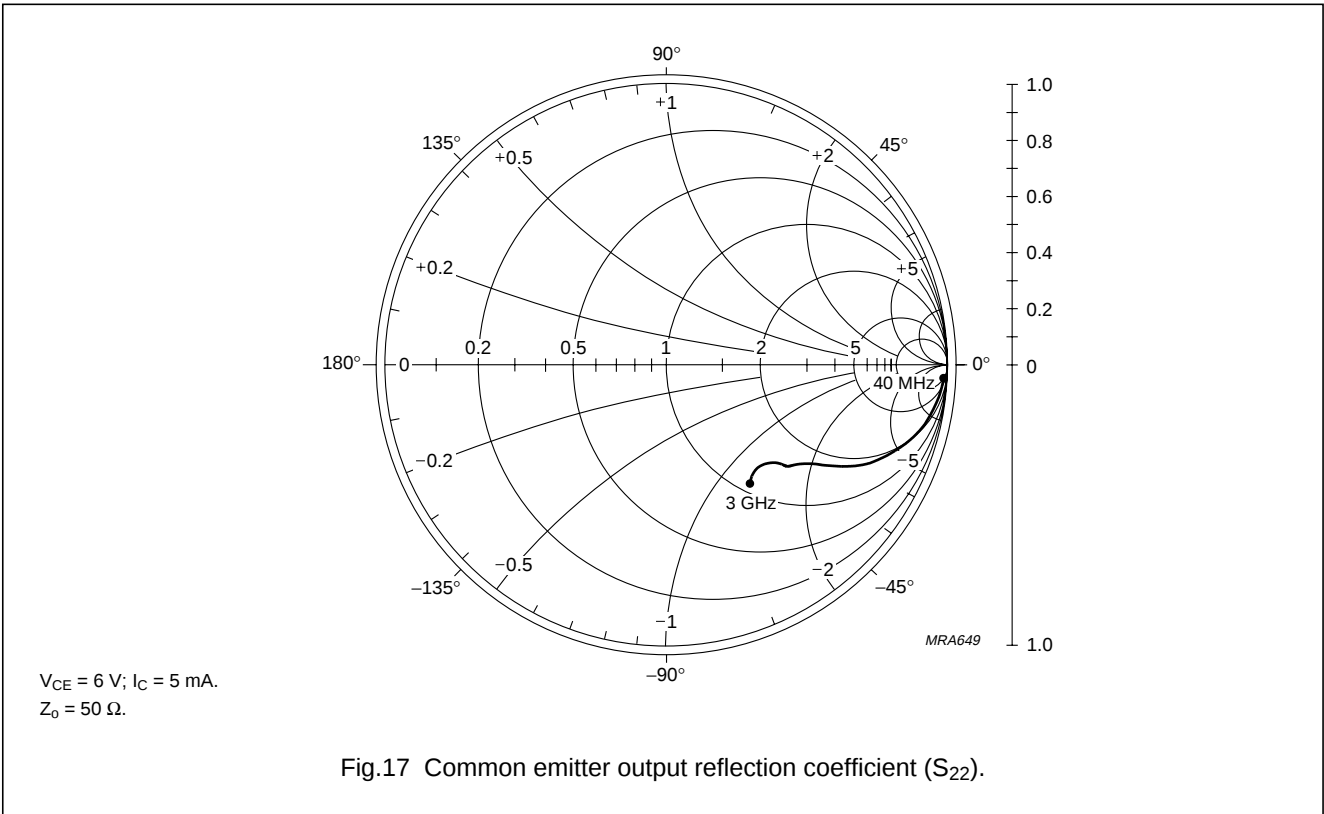
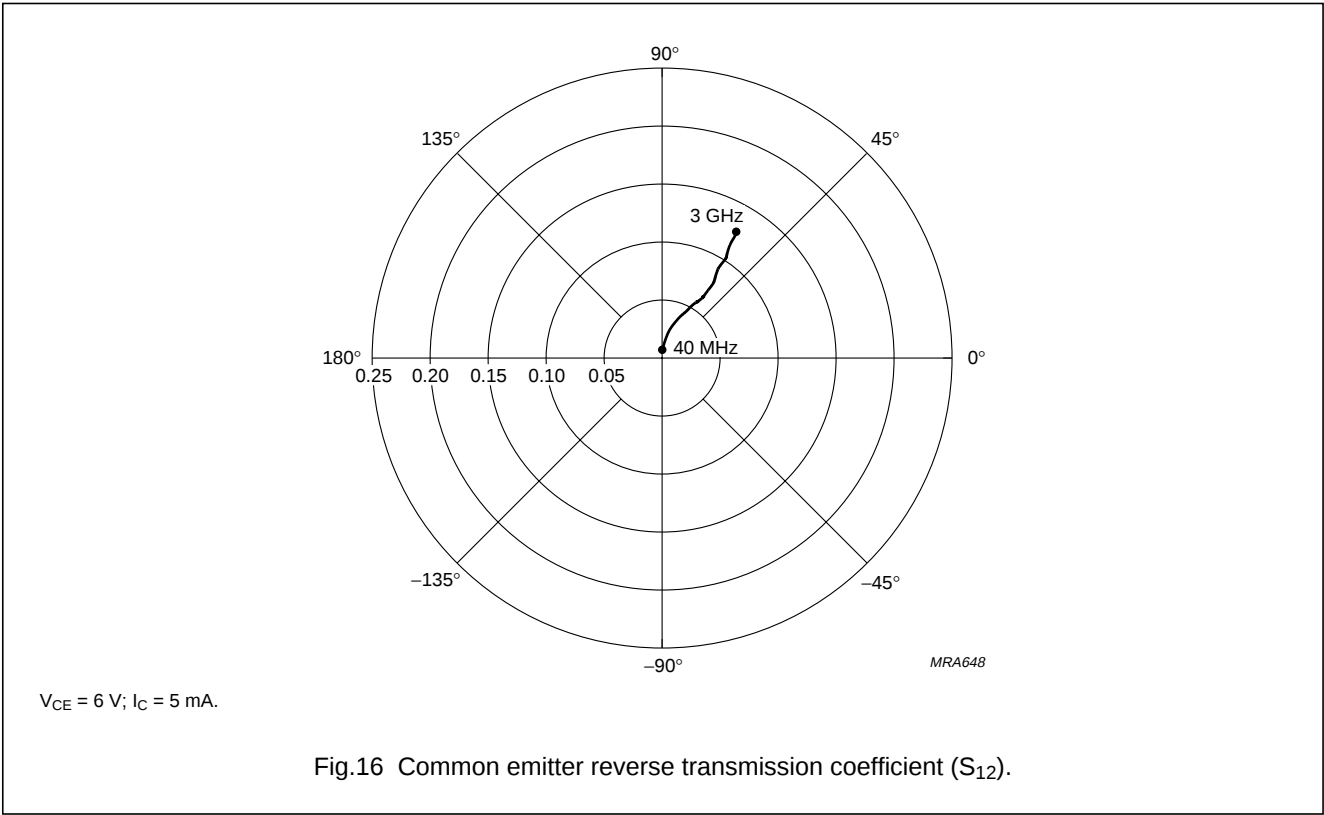
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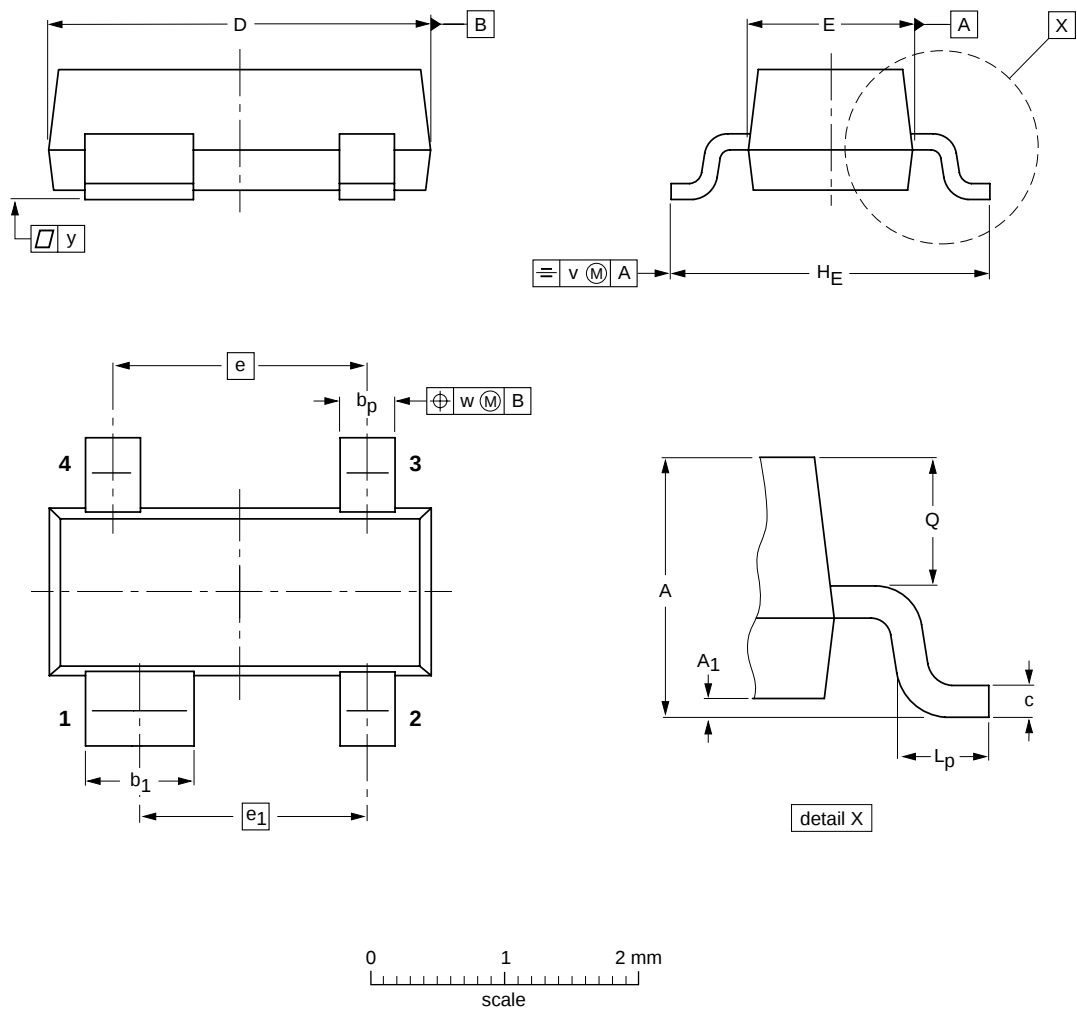
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PACKAGE OUTLINE

Plastic surface mounted package; 4 leads

SOT143B



DIMENSIONS (mm are the original dimensions)

UNIT	A	A1max	bp	b1	c	D	E	e	e1	HE	Lp	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

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Data sheet status

Document status ^{[1][2]}	Product status ^[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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Revision history

Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BFG505_X_N_4	20071122	Product data sheet	-	BFG505_X_3
Modifications: Marking table on page 2; changed code				
BFG505_X_3 (9397 750 04348)	19981002	Product specification	-	BFG505XR_CNV_2
BFG505XR_CNV_2	19950901	Product specification	-	BFG505XR_1
BFG505XR_1	19921101	Product specification	-	-

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