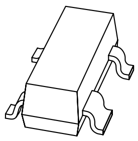

BFG505; BFG505/X

NPN 9 GHz wideband transistors

Rev. 04 — 22 November 2007 Product data sheet

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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

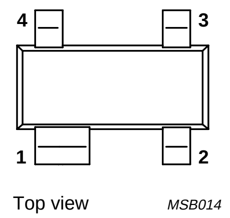


Fig.1 Simplified outline SOT143B.

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

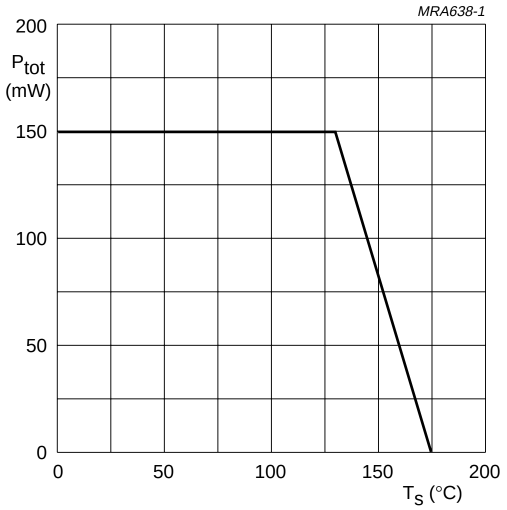


Fig.2 Power derating curve.

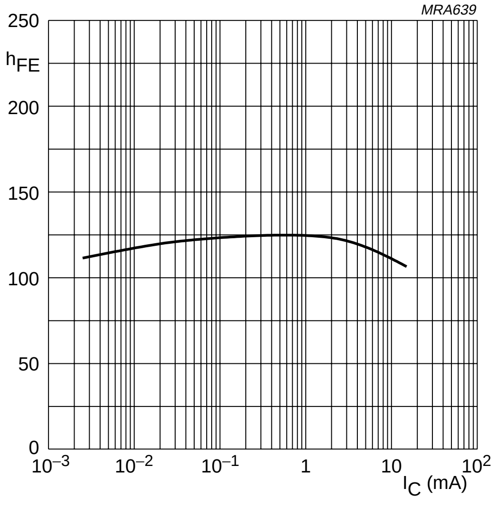
CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

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

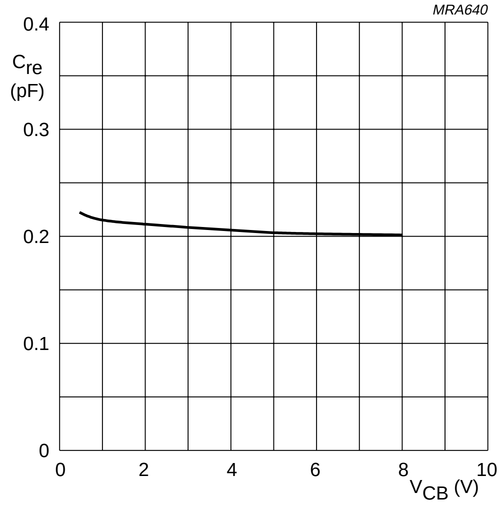
Notes

1. 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.
2. V_{CE} = 6 V; I_C = 5 mA; R_L = 50 Ω; T_{amb} = 25 °C;
   f_p = 900 MHz; f_q = 902 MHz;
   measured at $2f_p - f_q$ = 898 MHz and $2f_q - f_p$ = 904 MHz.



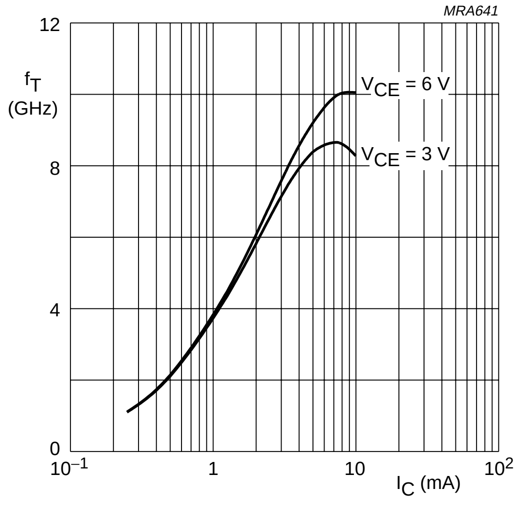
V_{CE} = 6 V.

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



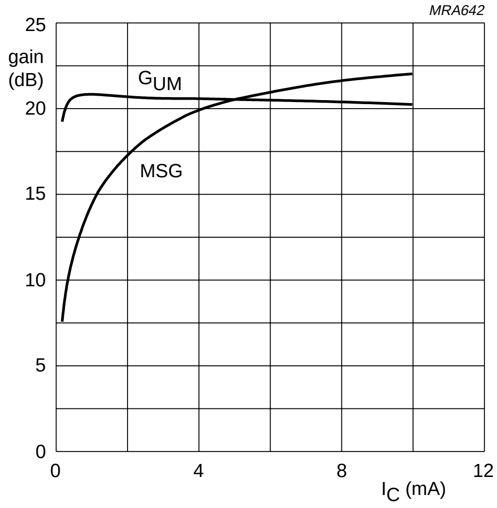
I_C = 0; f = 1 MHz.

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



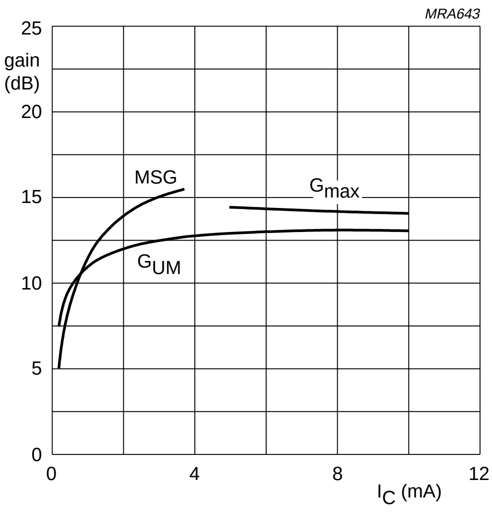
T_{amb} = 25 °C; f = 1 GHz.

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



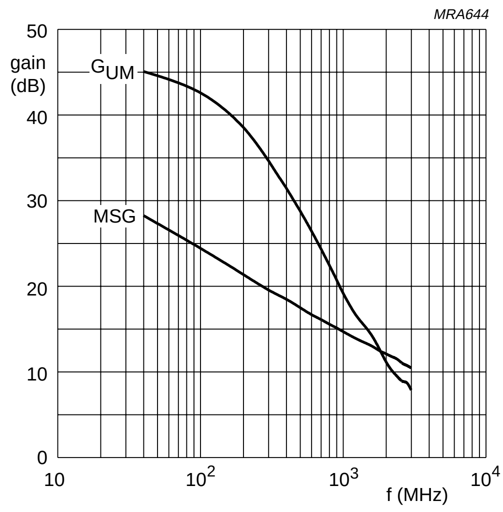
V_{CE} = 6 V; f = 900 MHz.
G_{UM} = maximum unilateral power gain;
MSG = maximum stable gain;
G_{max} = maximum available gain.

Fig.6 Gain as a function of collector current.



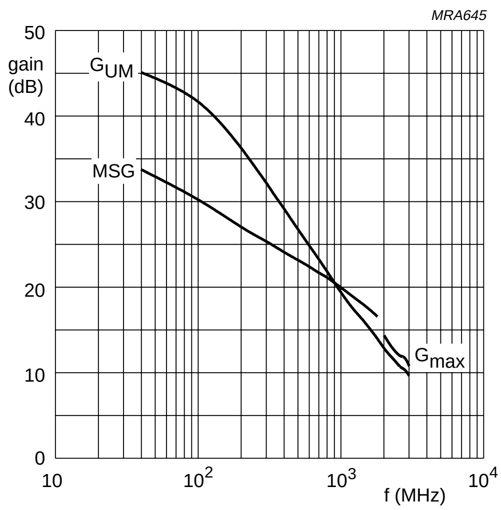
V_{CE} = 6 V; f = 2 GHz.
G_{UM} = maximum unilateral power gain;
MSG = maximum stable gain;
G_{max} = maximum available gain.

Fig.7 Gain as a function of collector current.



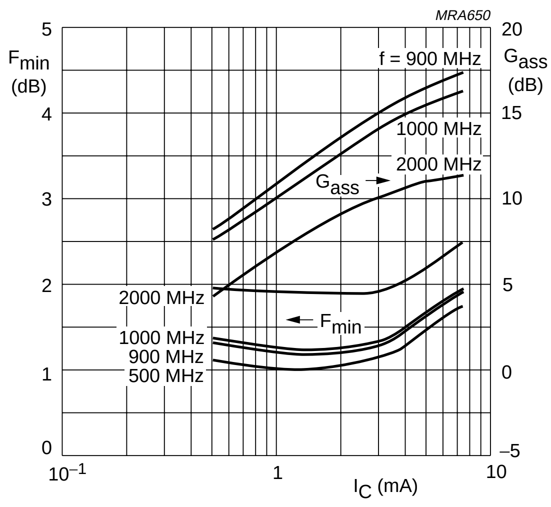
V_{CE} = 6 V; I_C = 1.25 mA.
G_{UM} = maximum unilateral power gain;
MSG = maximum stable gain;
G_{max} = maximum available gain.

Fig.8 Gain as a function of frequency.



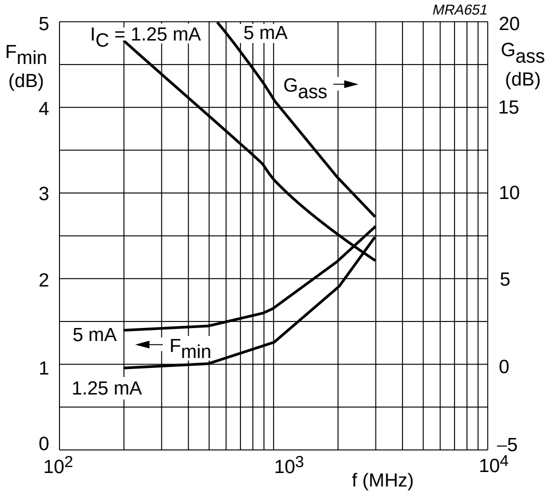
V_{CE} = 6 V; I_C = 5 mA.
G_{UM} = maximum unilateral power gain;
MSG = maximum stable gain;
G_{max} = maximum available gain.

Fig.9 Gain as a function of frequency.



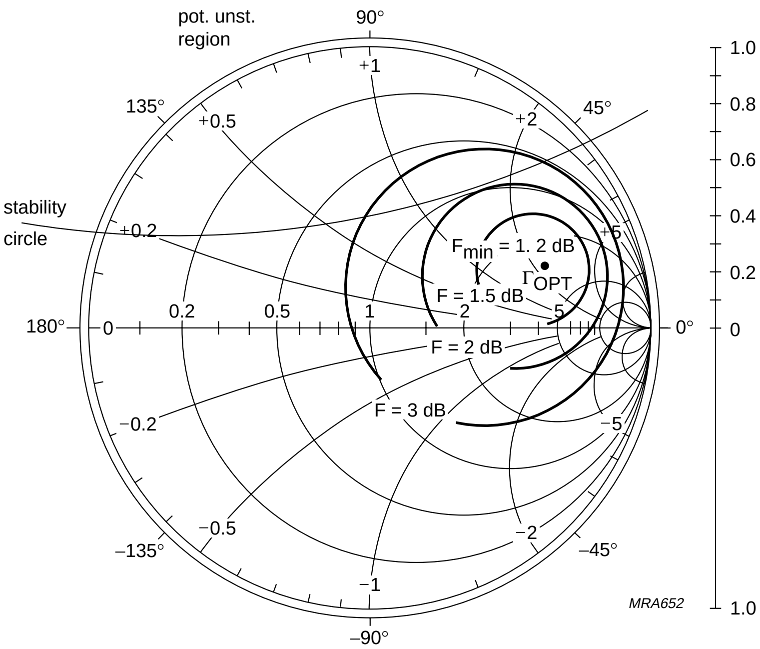
V_{CE} = 6 V.

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



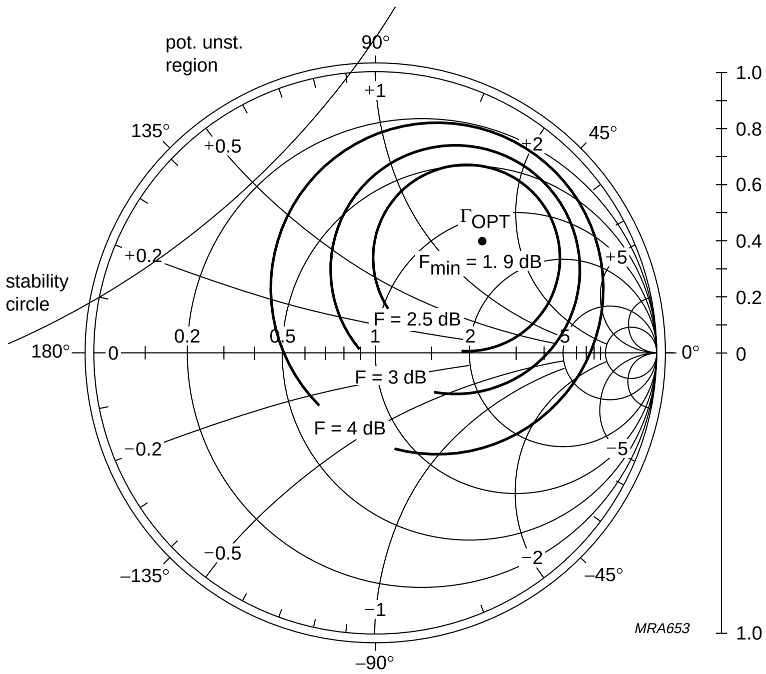
V_{CE} = 6 V.

Fig.11 Minimum noise figure and associated available gain as functions of frequency.



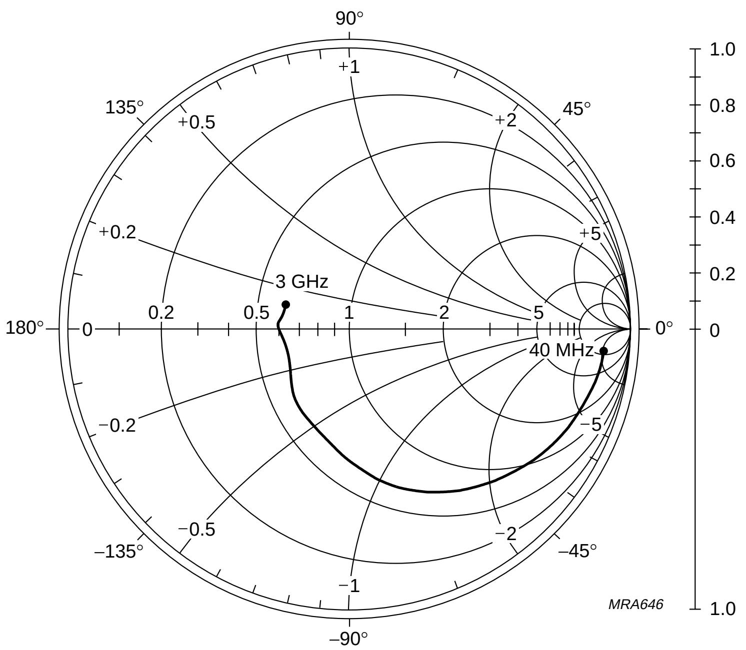
Z_o = 50 Ω.
V_{CE} = 6 V; I_c = 1.25 mA; f = 900 MHz.

Fig.12 Noise circle figure.



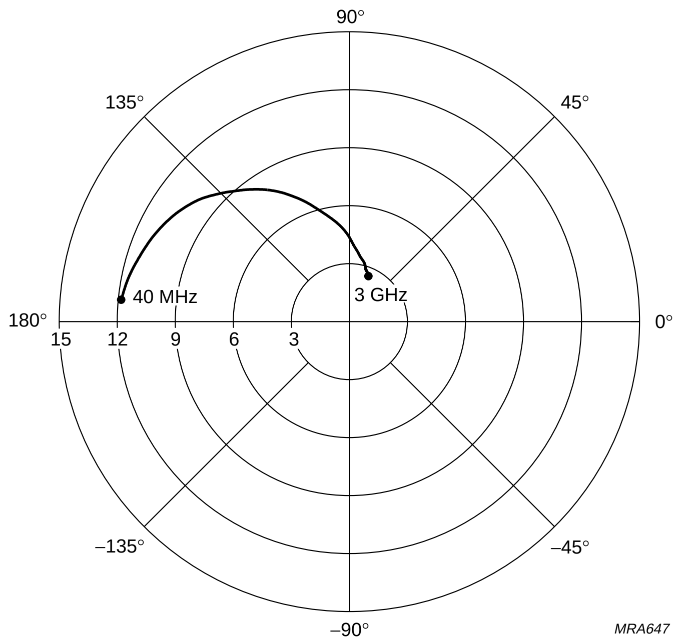
$Z_o = 50\ \Omega$.
$V_{CE} = 6$ V; $I_c = 1.25$ mA; f = 2000 MHz.

Fig.13 Noise circle figure.



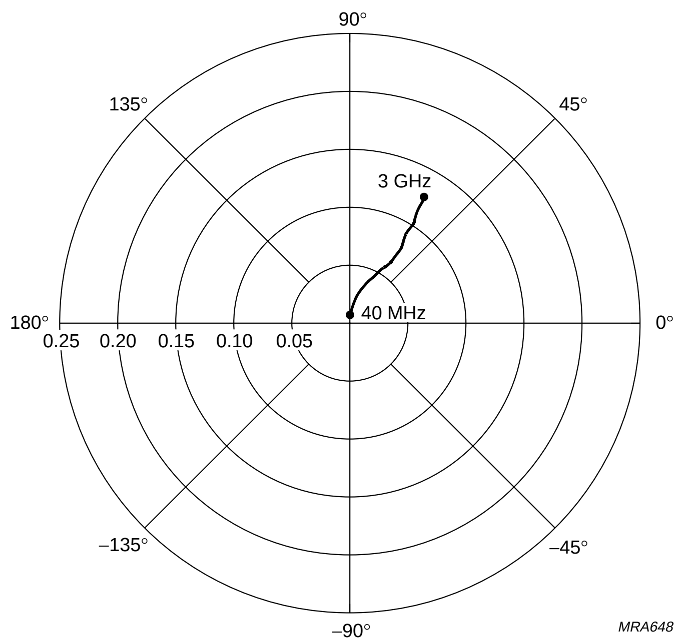
V_{CE} = 6 V; I_C = 5 mA.
Z_o = 50 Ω.

Fig.14 Common emitter input reflection coefficient (S_{11}).



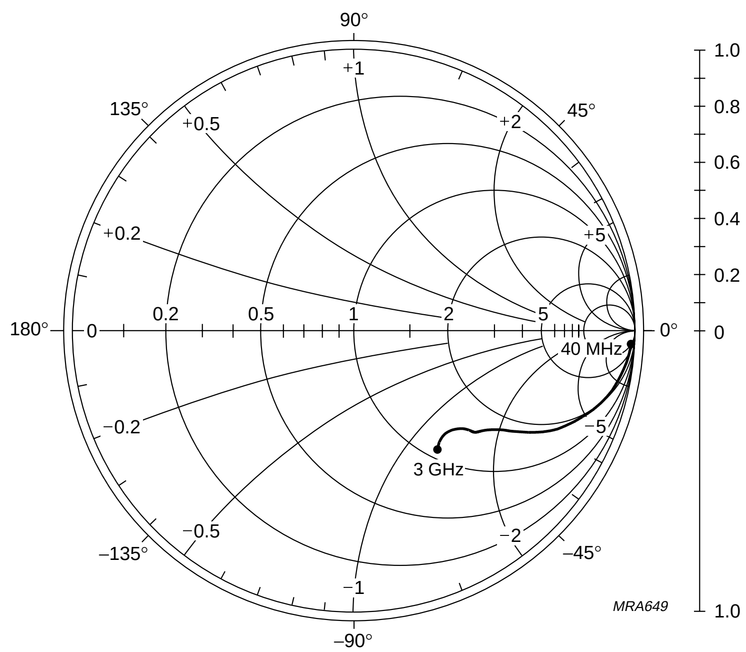
V_{CE} = 6 V; I_C = 5 mA.

Fig.15 Common emitter forward transmission coefficient (S_{21}).



V_{CE} = 6 V; I_C = 5 mA.

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

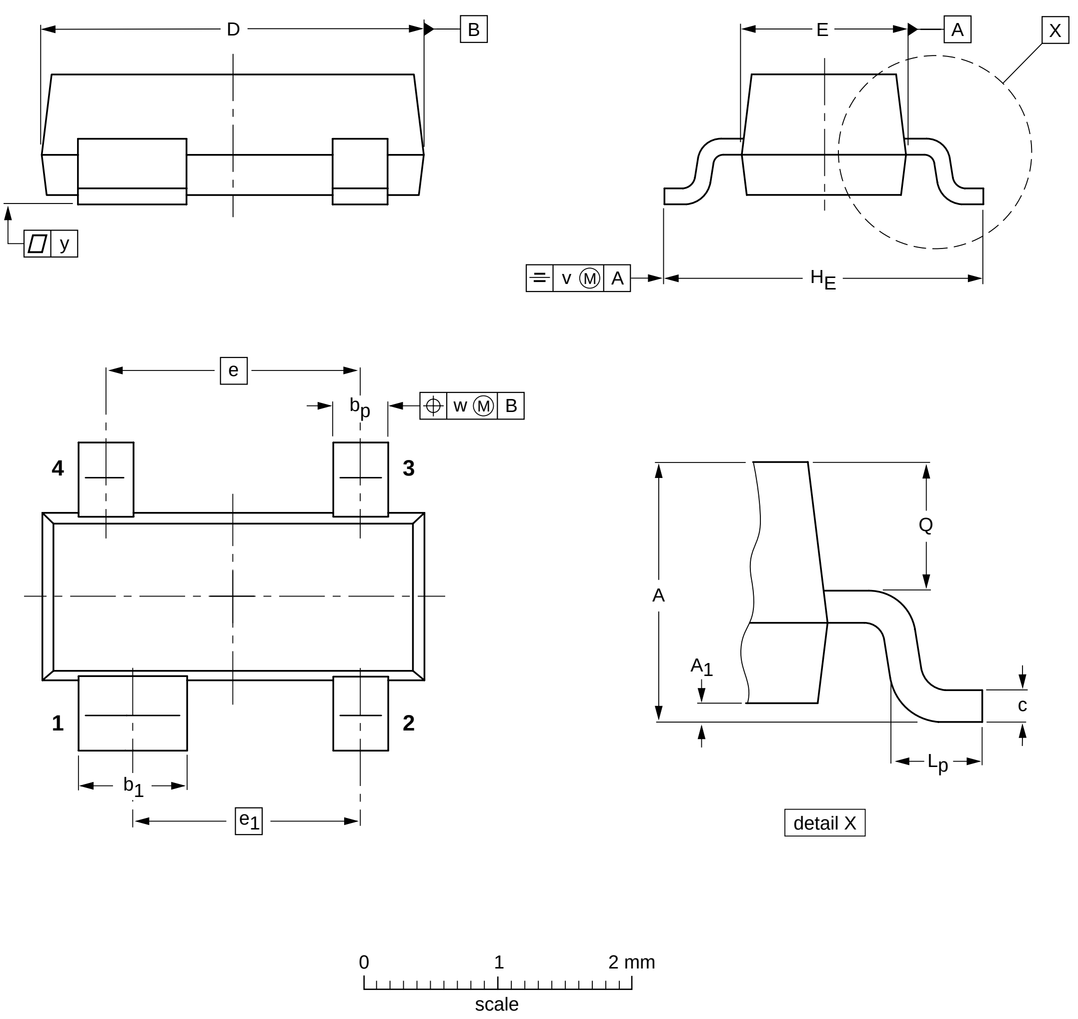


V_{CE} = 6 V; I_C = 5 mA.
Z_o = 50 Ω.

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

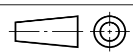
PACKAGE OUTLINE

Plastic surface mounted package; 4 leads **SOT143B**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1 max	b_p	b_1	c	D	E	e	e_1	H_E	L_p	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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Document status[1][2]	Product status[3]	Definition
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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	-	-

Date of release: 22 November 2007
Document identifier: BFG505_X_N_4