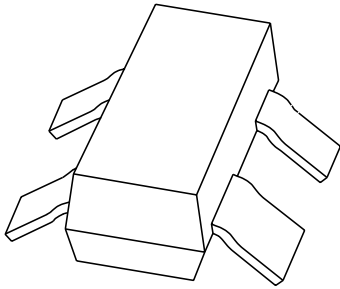


DATA SHEET



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

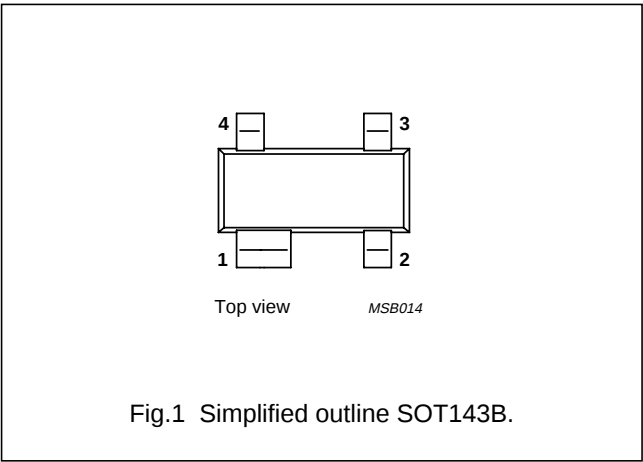
NPN silicon planar epitaxial transistor in a 4-pin dual-emitter SOT143B plastic package.

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



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

Note

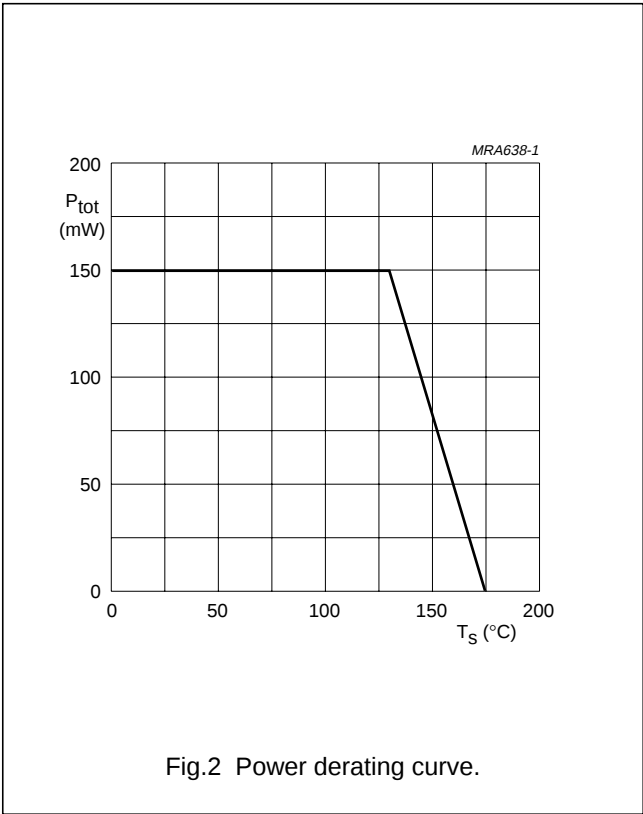
1. T_S is the temperature at the soldering point of the collector pin.

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.



NPN 9 GHz wideband transistors

BFG505; BFG505/X

CHARACTERISTICS

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

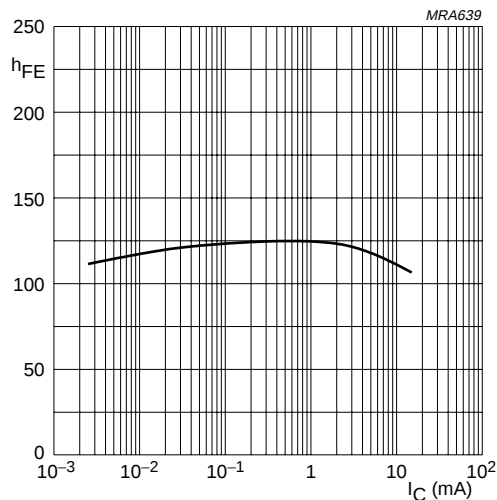
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	$V_{CB} = 6\text{ V}; I_E = 0$	–	–	50	nA
h_{FE}	DC current gain	$I_C = 5\text{ mA}; V_{CE} = 6\text{ V};$ see Fig.3	60	120	250	
C_e	emitter capacitance	$I_C = I_C = 0\text{ V}; V_{EB} = 0.5\text{ V}; f = 1\text{ MHz}$	–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

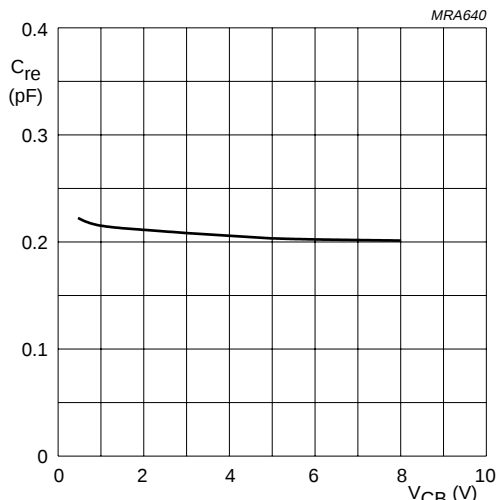
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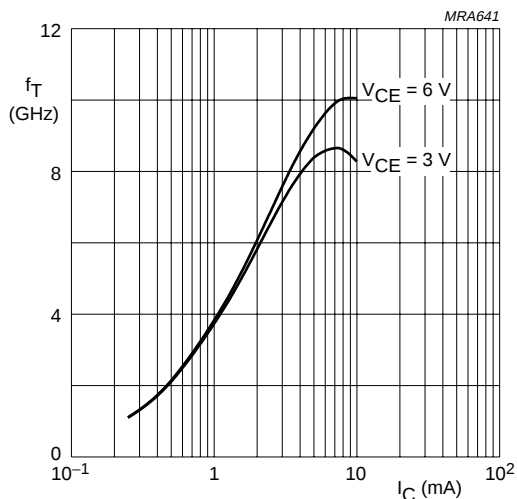
$V_{CE} = 6\text{ V}$.

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



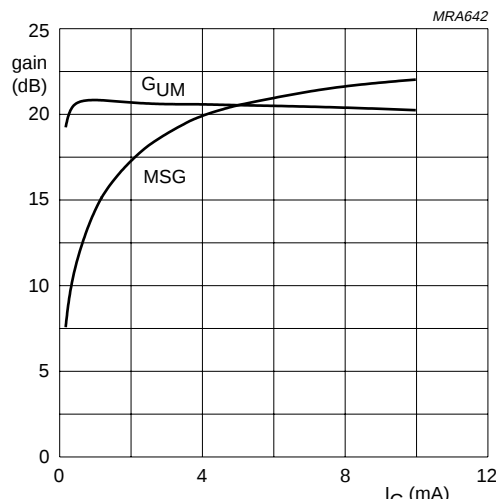
$I_C = 0$; $f = 1\text{ MHz}$.

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.

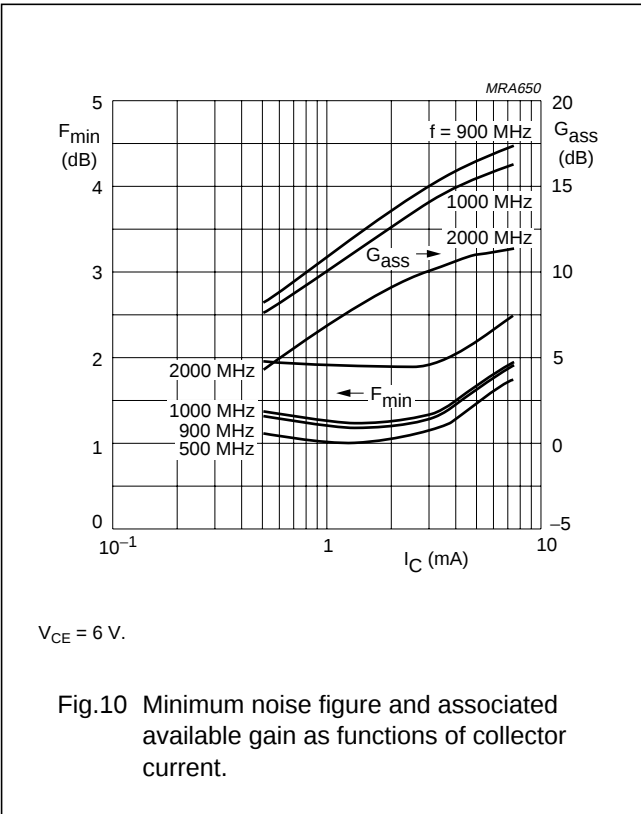
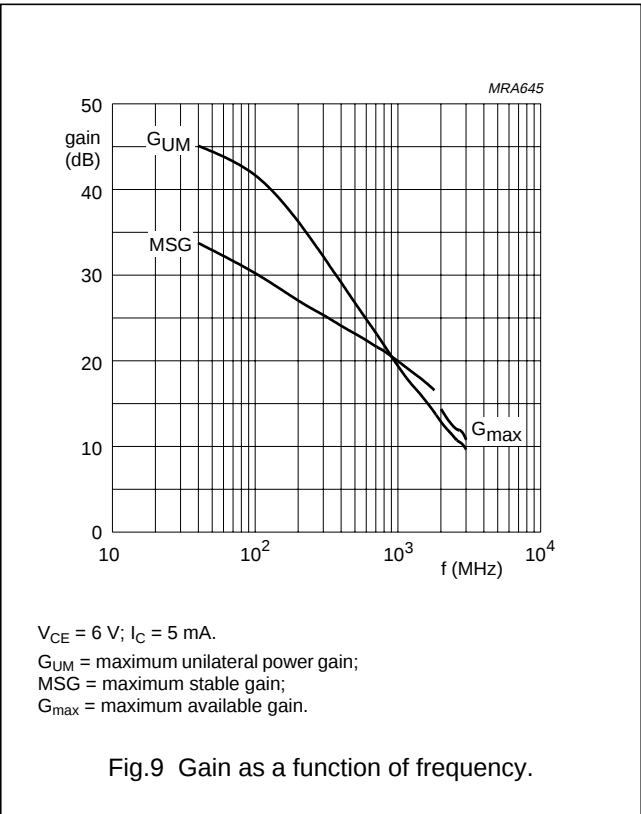
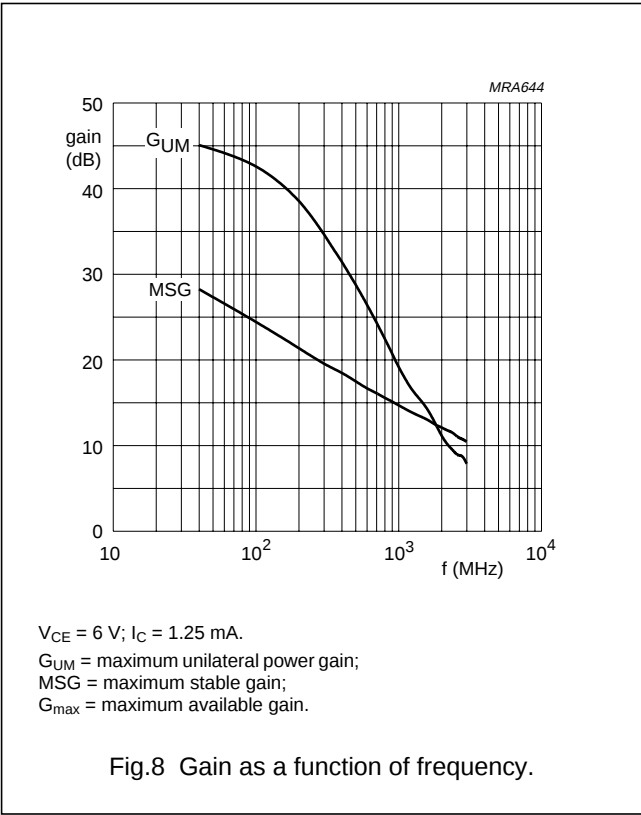
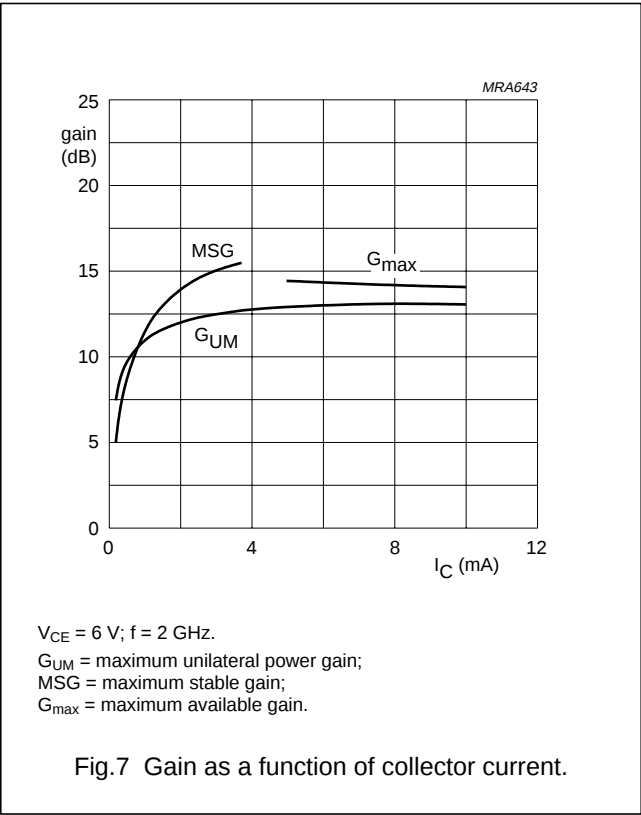


$V_{CE} = 6\text{ V}$; $f = 900\text{ MHz}$.
 G_{UM} = maximum unilateral power gain;
 MSG = maximum stable gain;
 G_{max} = maximum available gain.

Fig.6 Gain as a function of collector current.

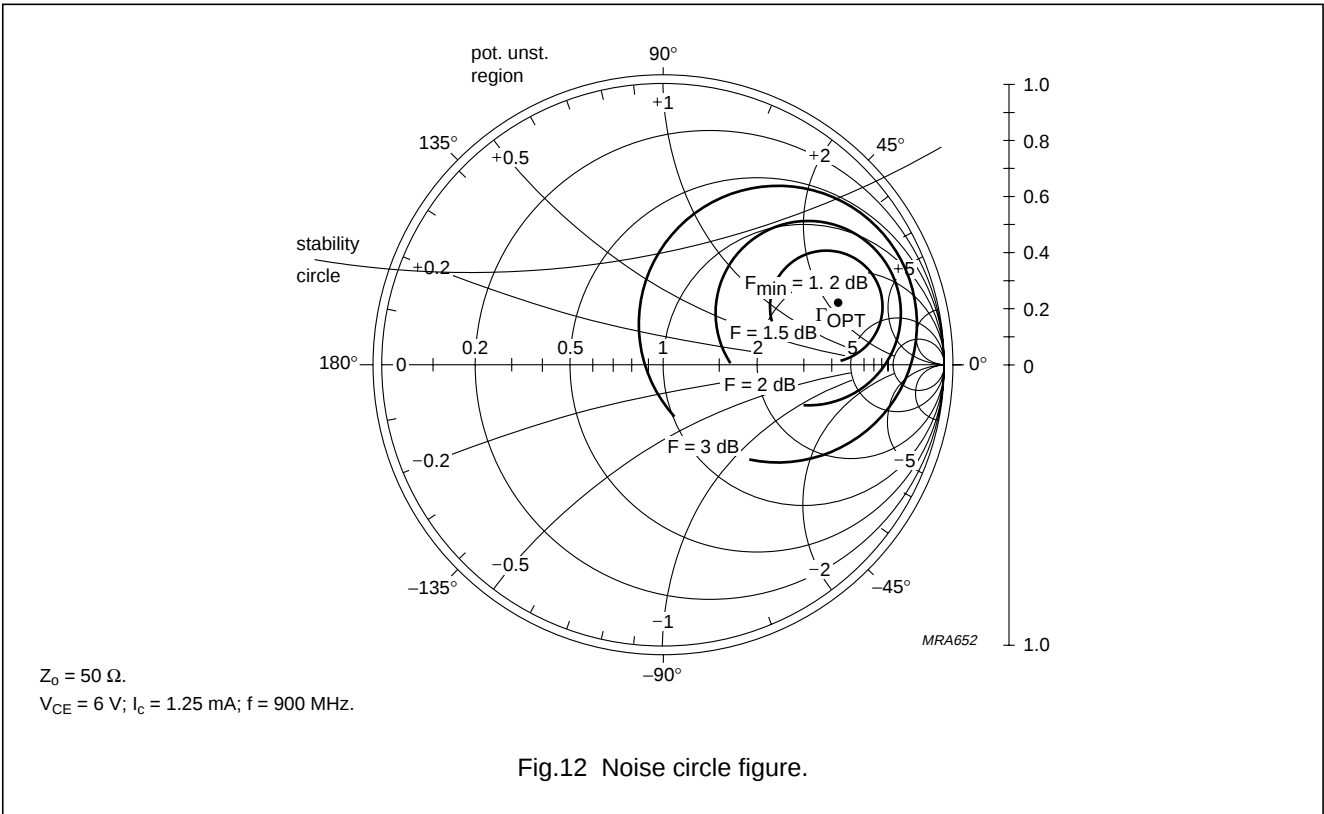
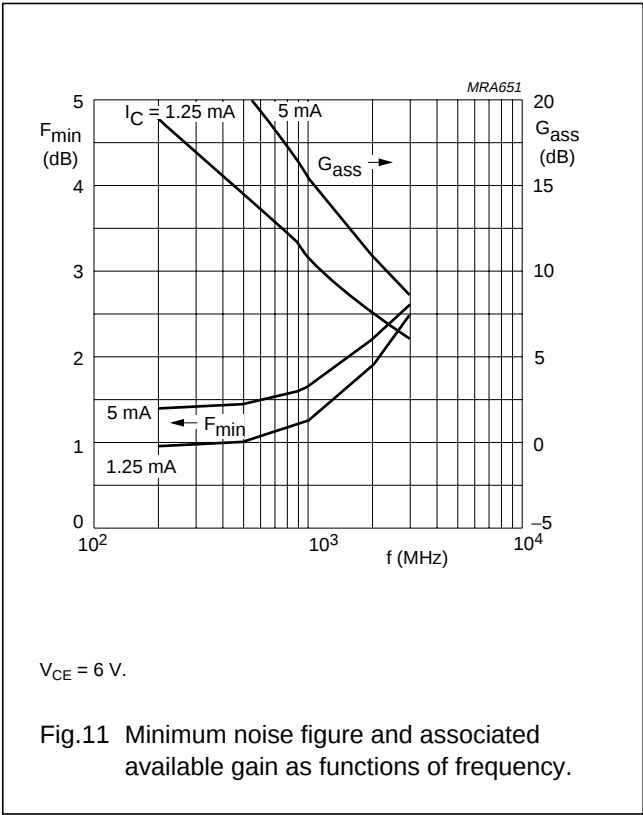
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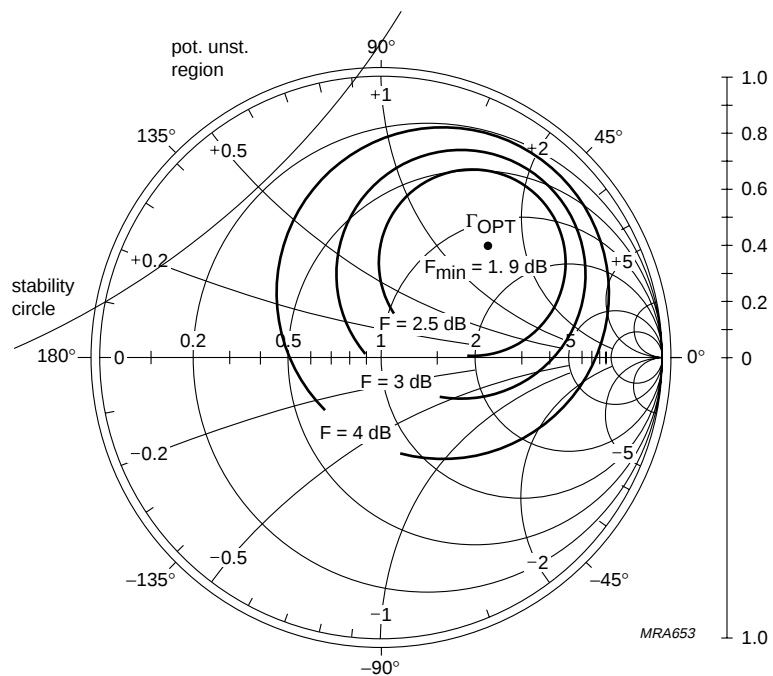
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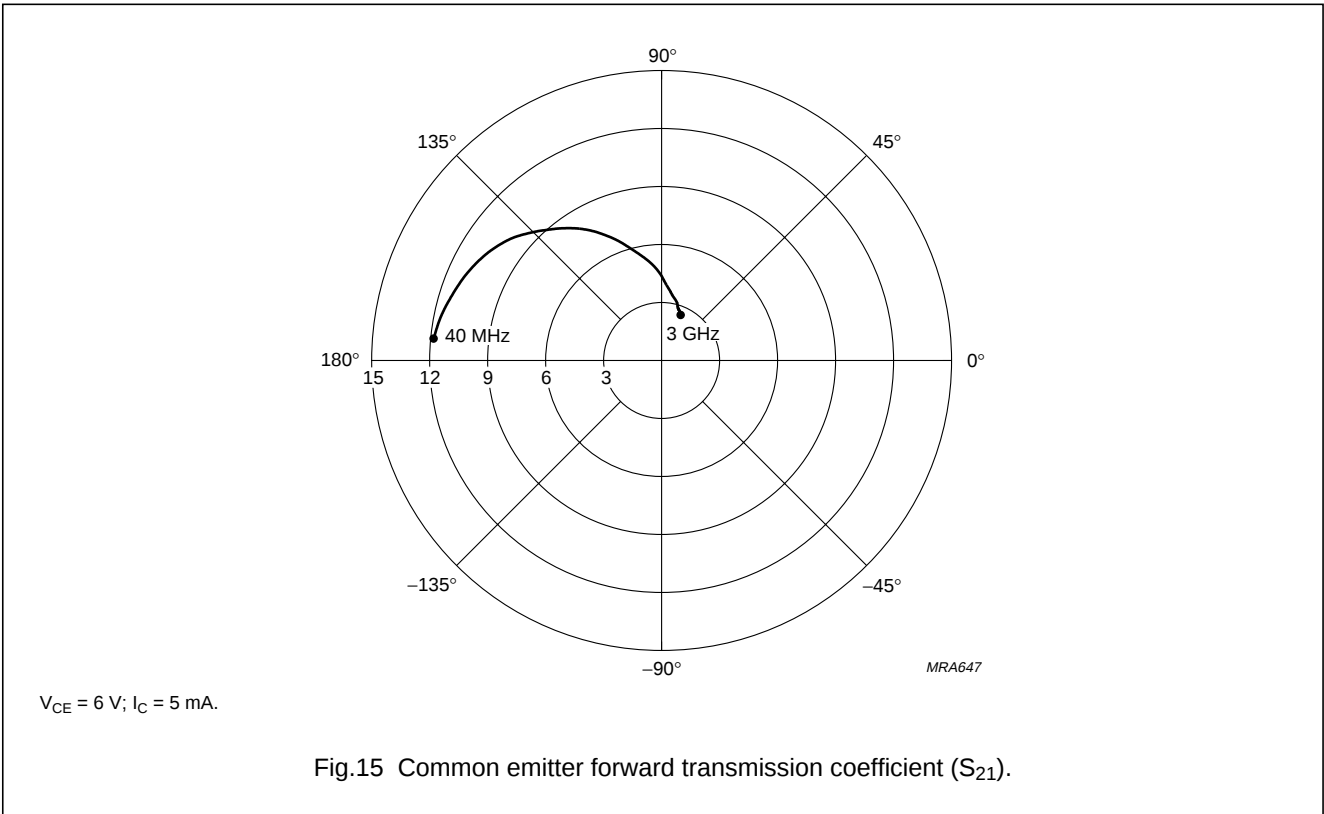
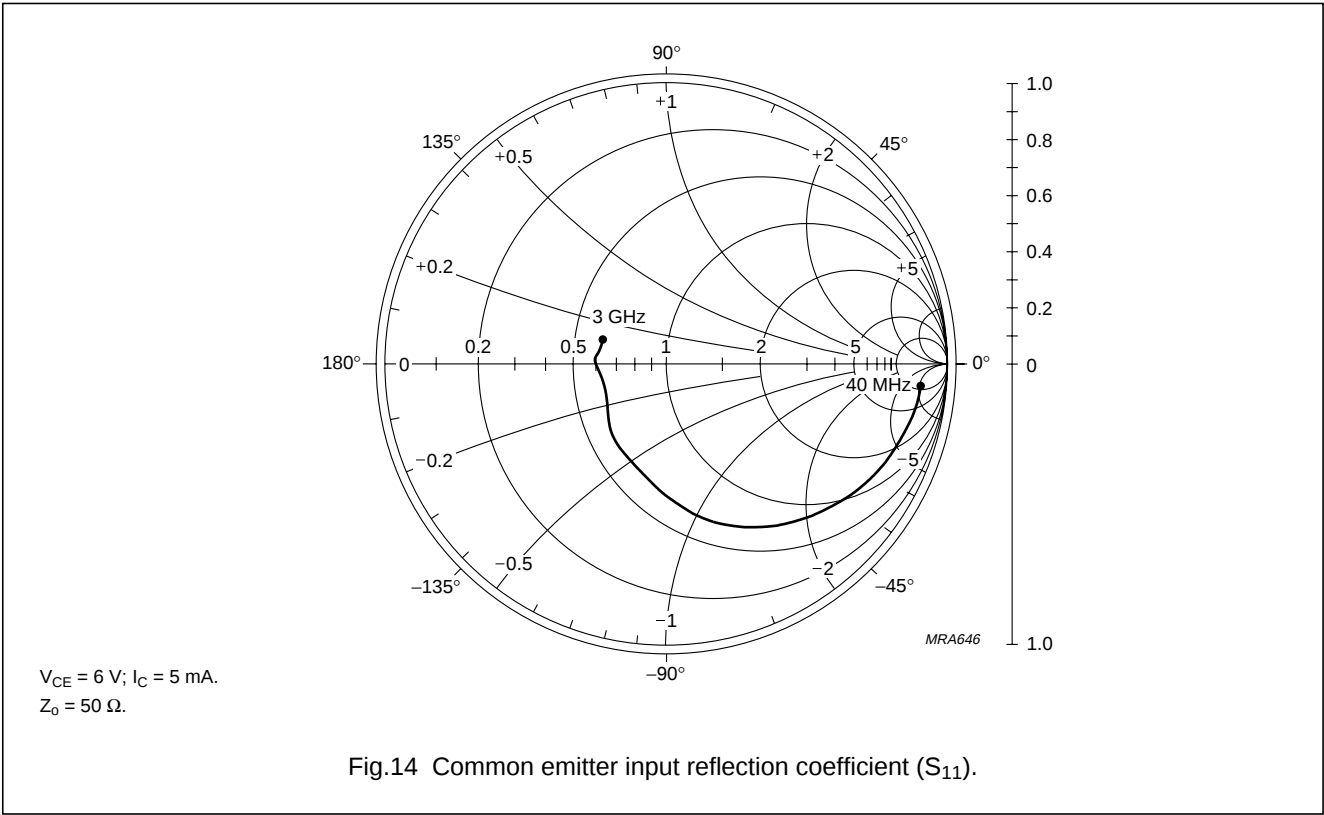

$$Z_0 = 50 \, \Omega.$$

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

Fig.13 Noise circle figure.

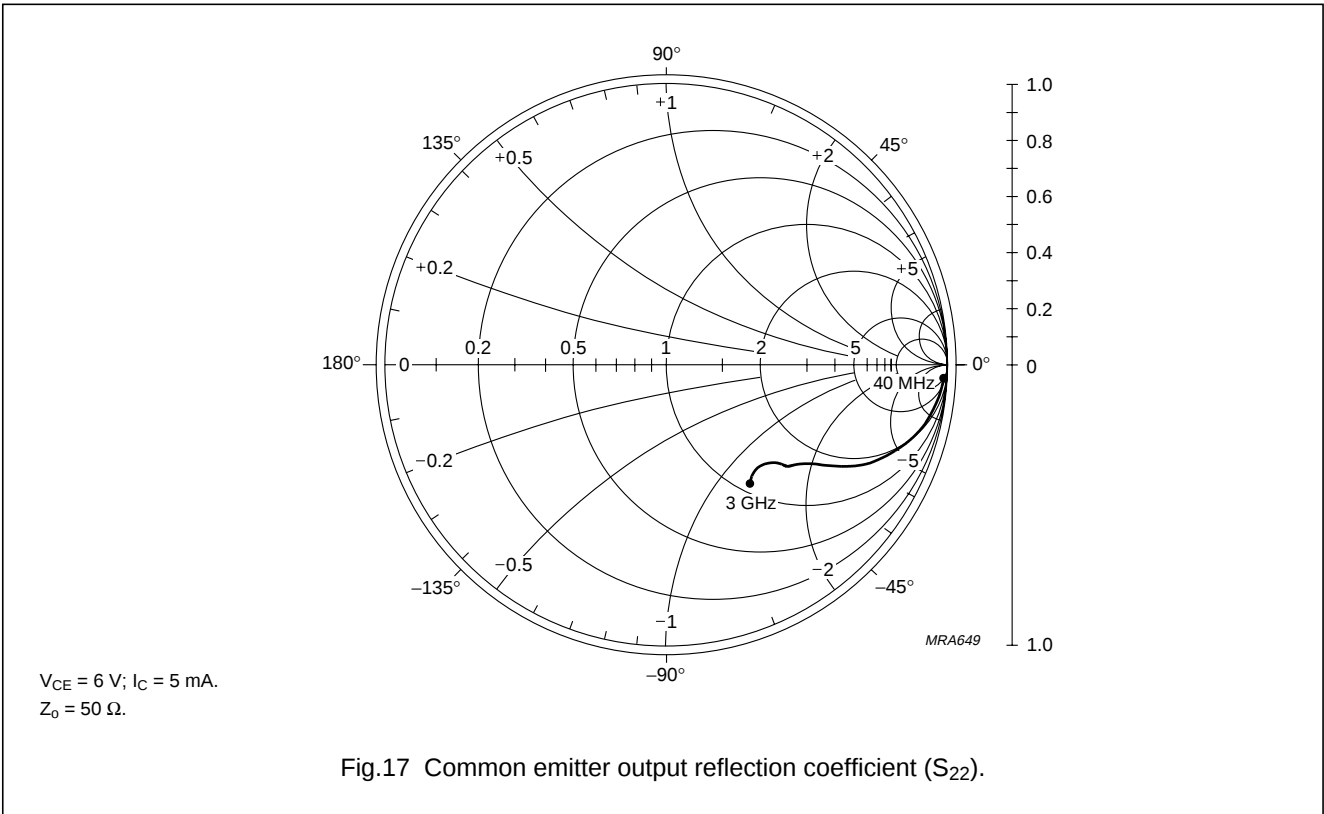
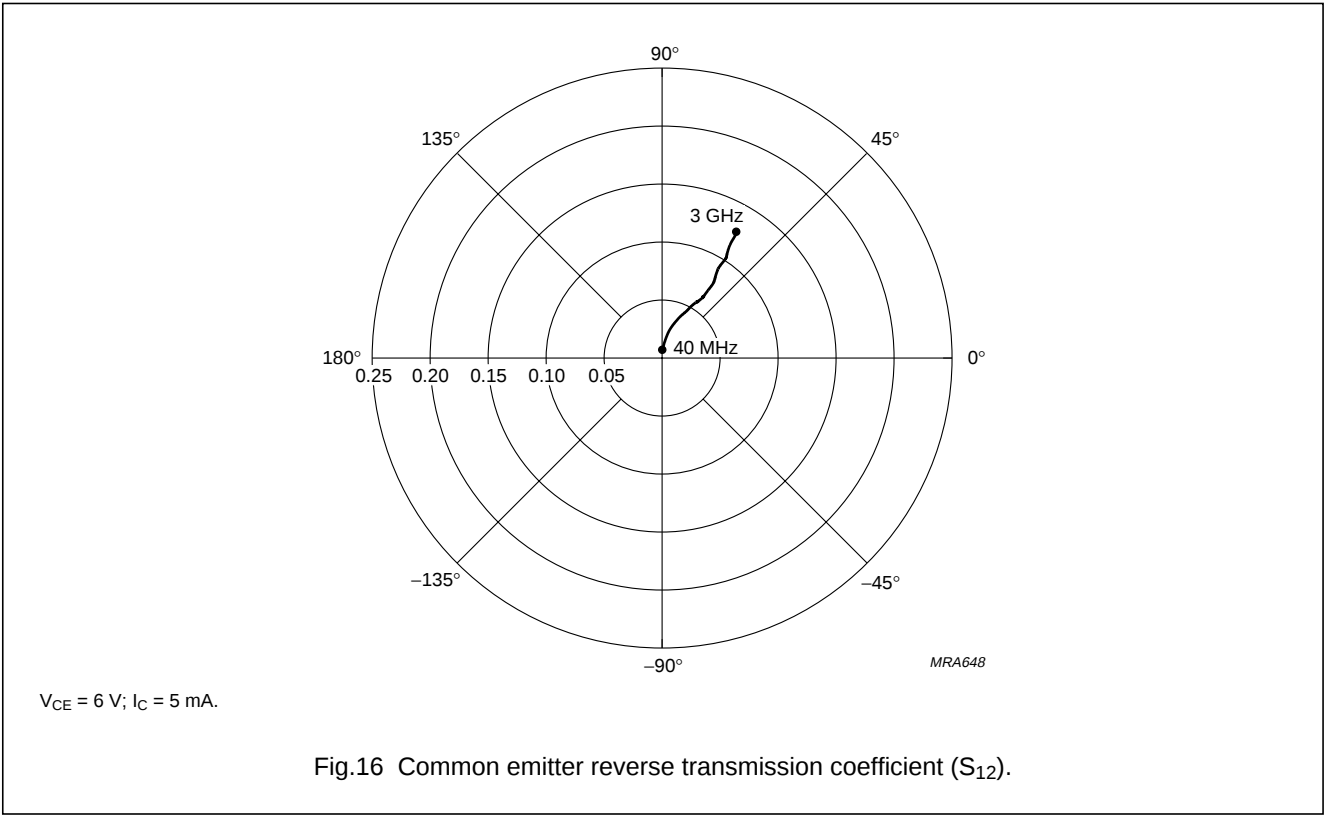
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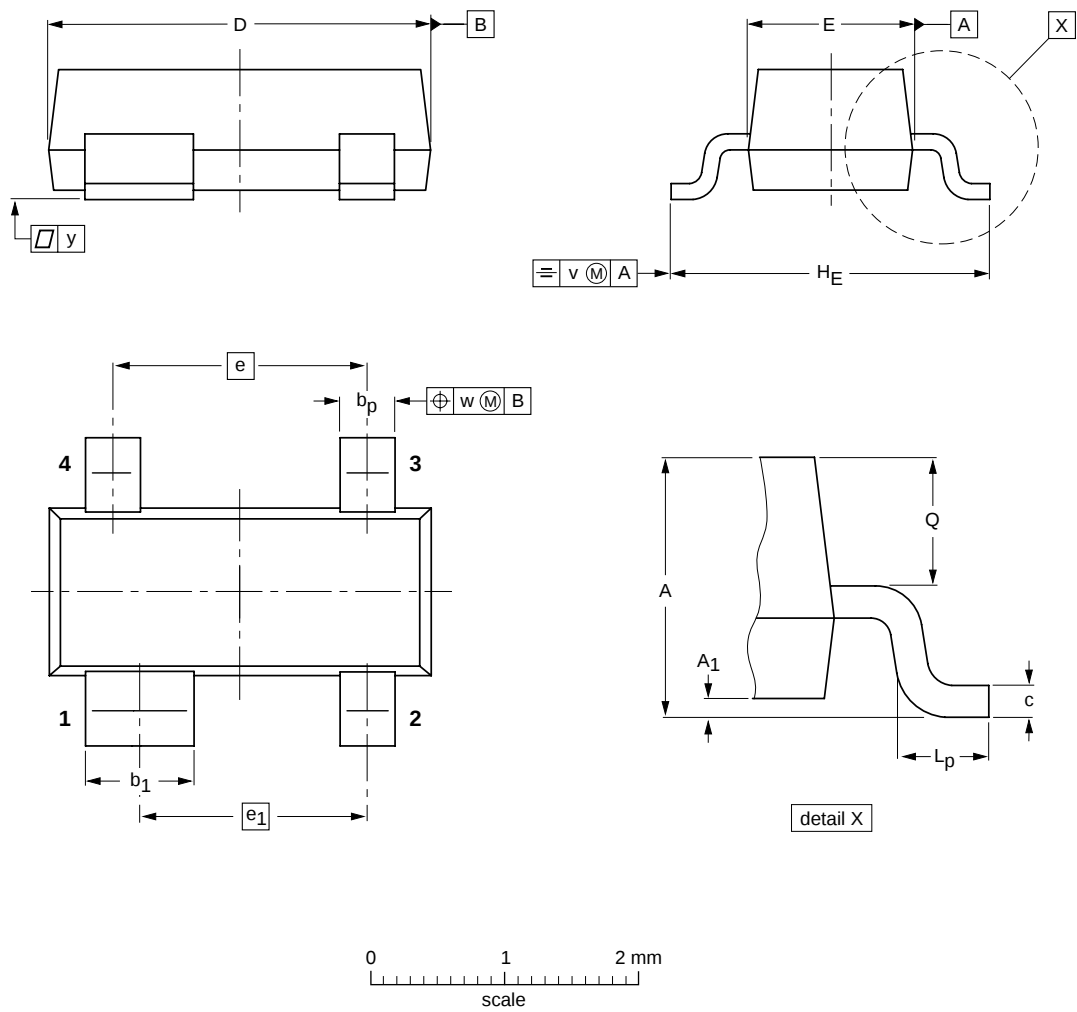
NPN 9 GHz wideband transistors

BFG505; BFG505/X

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

NPN 9 GHz wideband transistorsBFG505; BFG505/X

DEFINITIONS

Data Sheet Status	
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.
Limiting values	
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.	
Application information	
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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Printed in The Netherlands

125104/00/03/pp16

Date of release: 1998 Oct 02

Document order number: 9397 750 04348

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