

# 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

# 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	%ME
BFG505/X	%MK

### PINNING

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

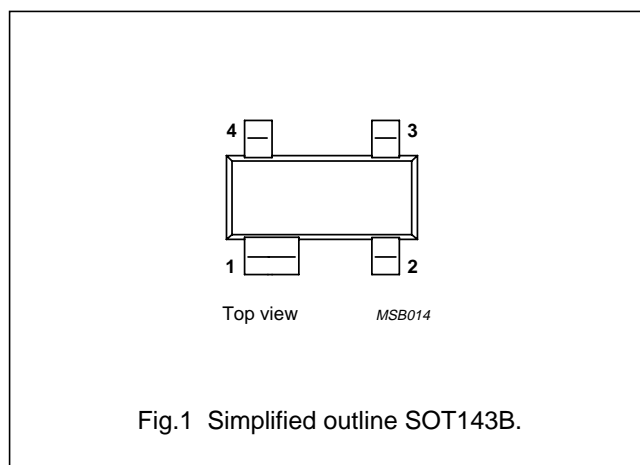


Fig.1 Simplified outline SOT143B.

### 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

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 <sub>CBO</sub>	collector-base voltage	open emitter	–	20	V
V <sub>CES</sub>	collector-emitter voltage	R <sub>BE</sub> = 0	–	15	V
V <sub>EBO</sub>	emitter-base voltage	open collector	–	2.5	V
I <sub>C</sub>	collector current (DC)		–	18	mA
P <sub>tot</sub>	total power dissipation	T <sub>s</sub> ≤ 130 °C; see Fig.2; note 1	–	150	mW
T <sub>stg</sub>	storage temperature range		–65	150	°C
T <sub>j</sub>	junction temperature		–	175	°C

**Note**

1. T<sub>s</sub> is the temperature at the soldering point of the collector pin.

**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
R <sub>th j-s</sub>	thermal resistance from junction to soldering point	note 1	290	K/W

**Note**

1. T<sub>s</sub> is the temperature at the soldering point of the collector pin.

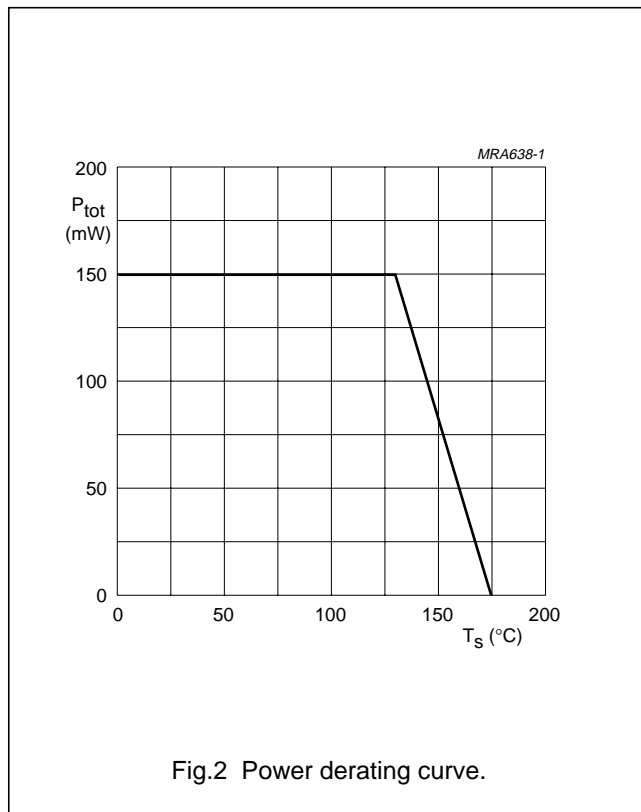


Fig.2 Power derating curve.

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## BFG505; BFG505/X

## CHARACTERISTICS

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

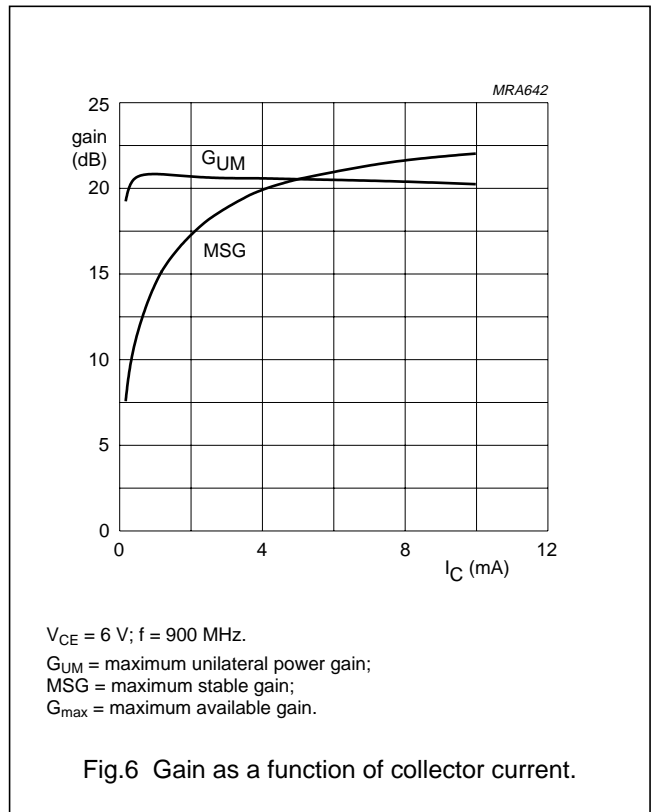
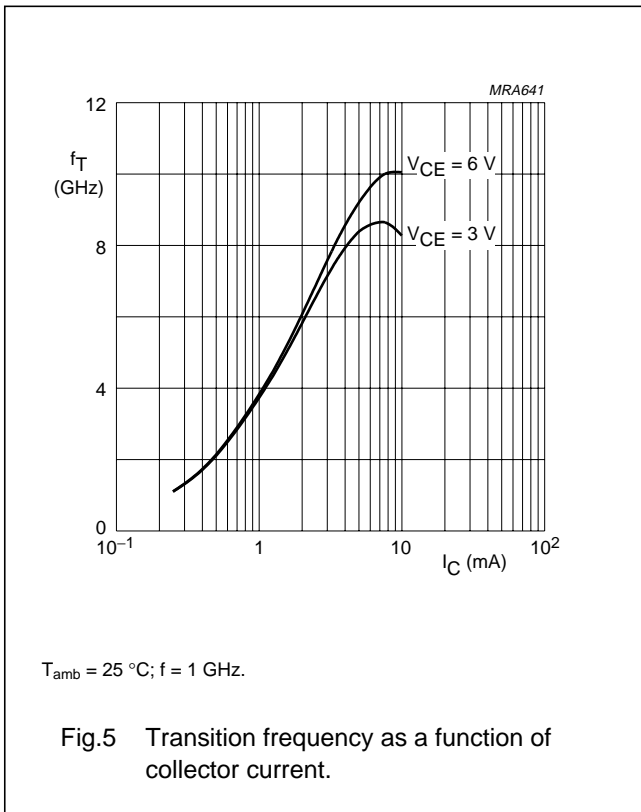
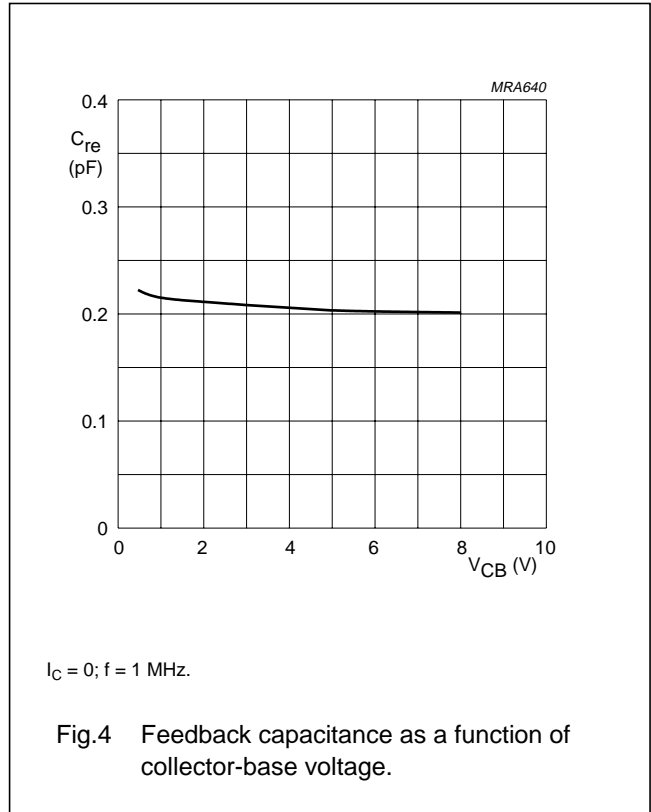
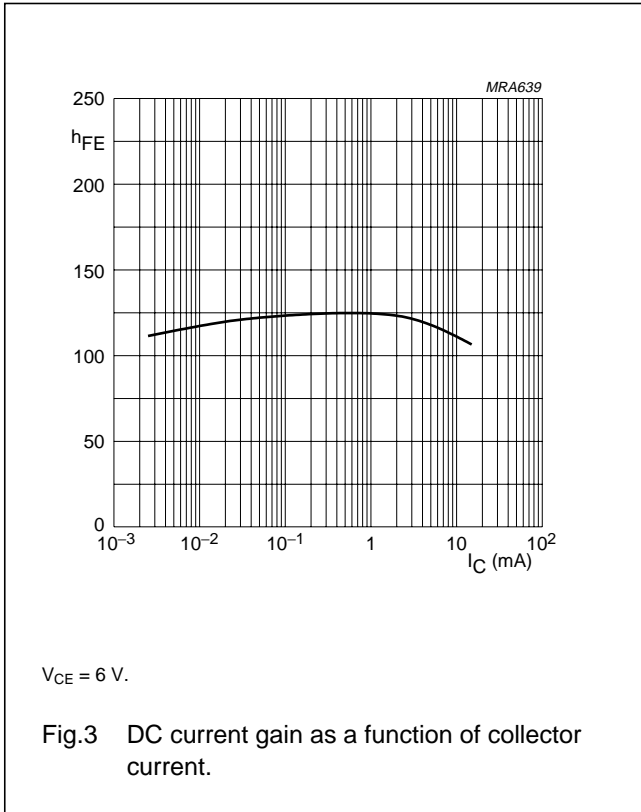
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_{CBO}$	collector cut-off current	$V_{CB} = 6\text{ V}; I_E = 0$	–	–	50	nA
$h_{FE}$	DC current gain	$I_C = 5\text{ mA}; V_{CE} = 6\text{ V};$ see Fig.3	60	120	250	
$C_e$	emitter capacitance	$I_C = I_c = 0\text{ V}; V_{EB} = 0.5\text{ V}; f = 1\text{ MHz}$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

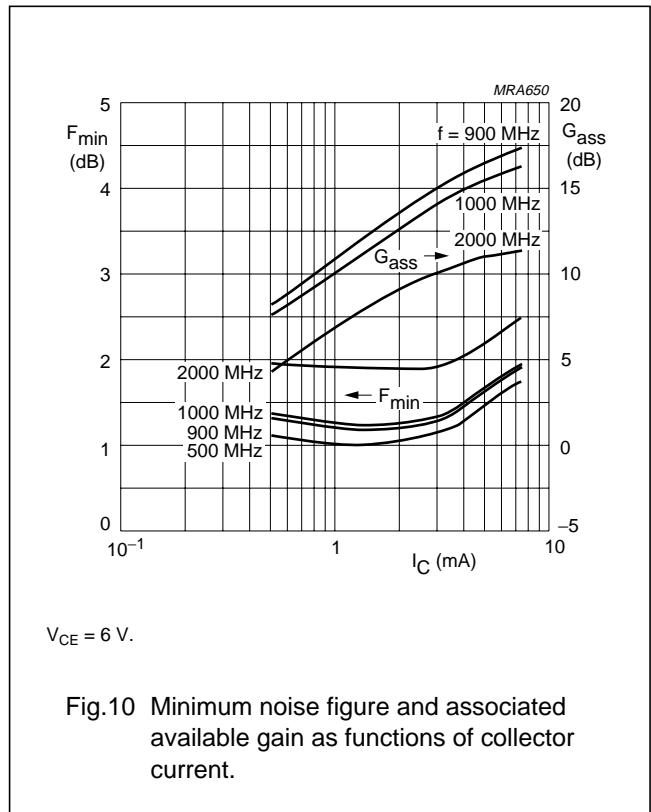
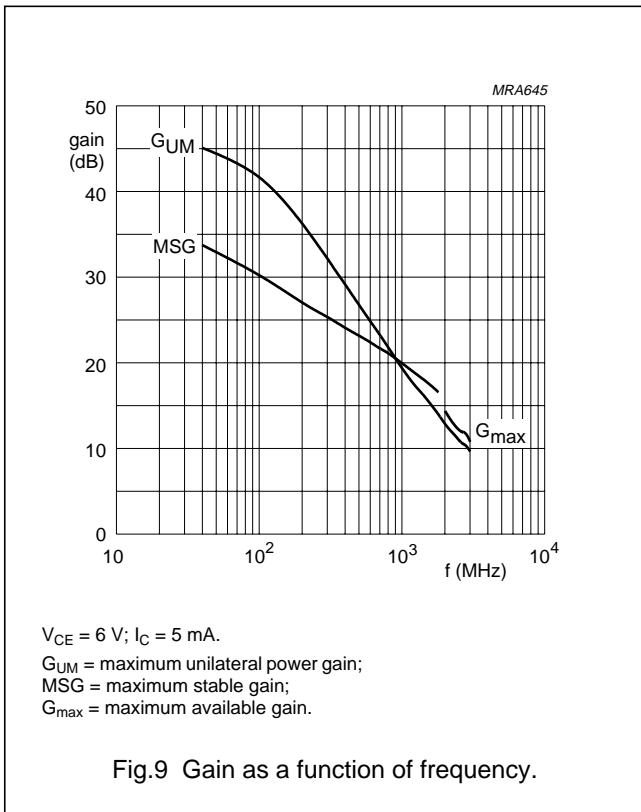
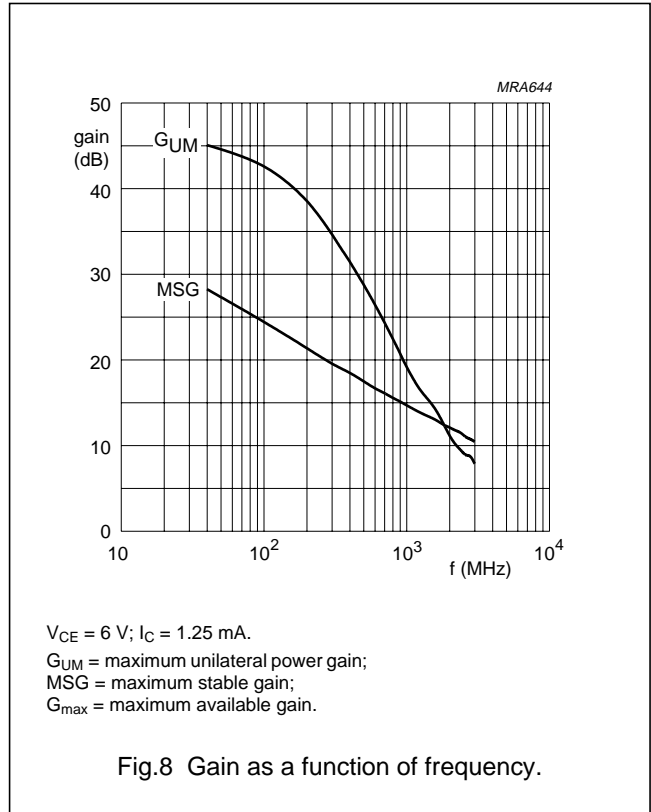
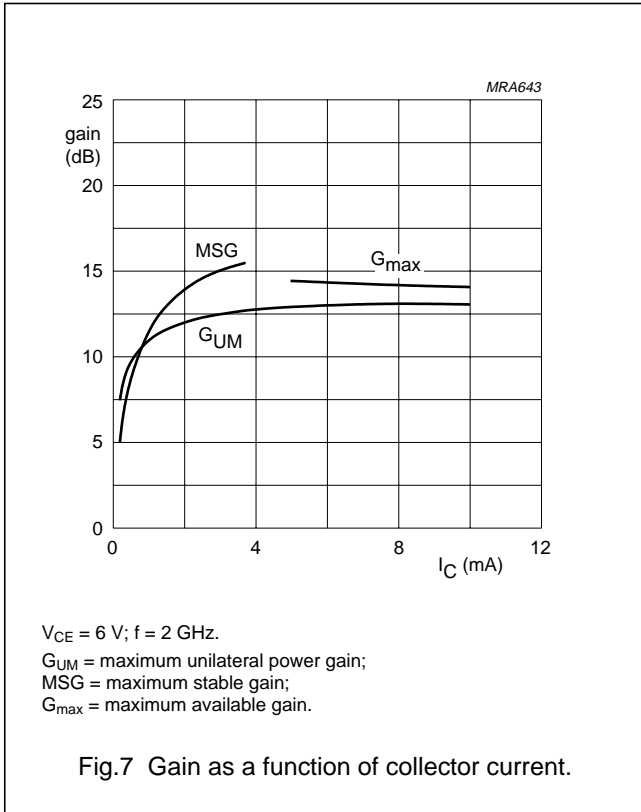
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BFG505; BFG505/X



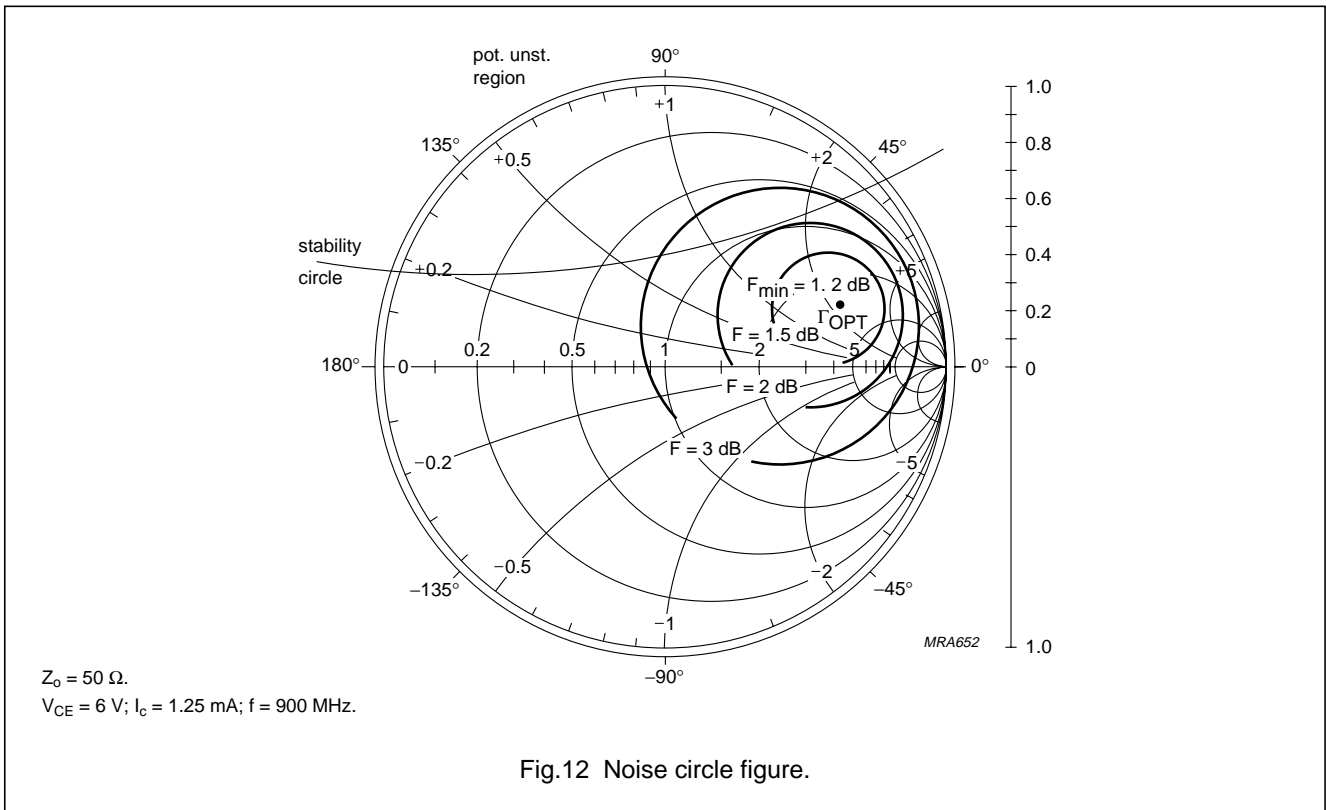
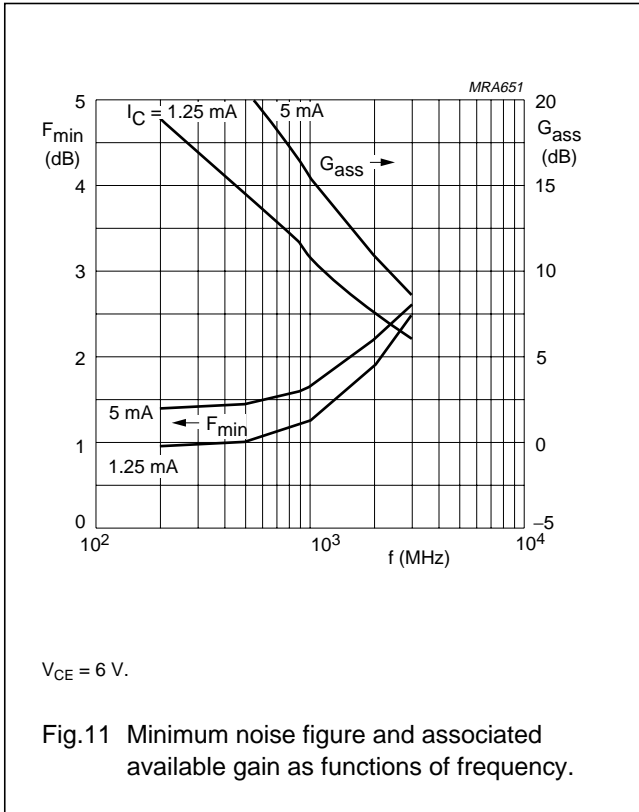
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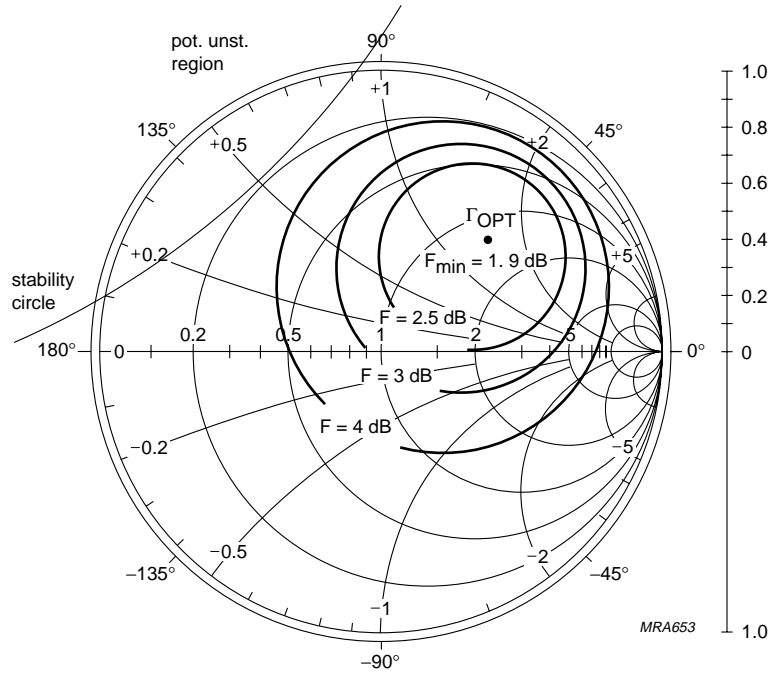
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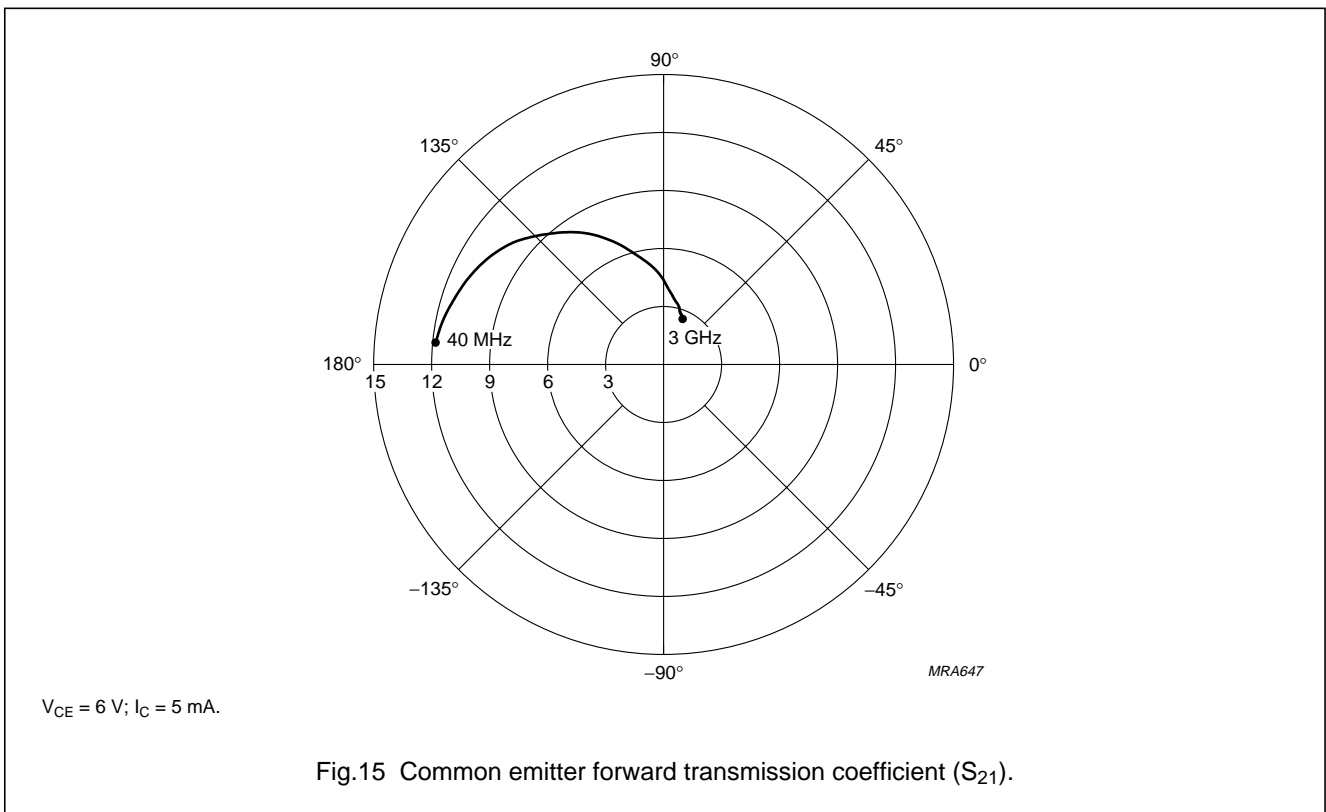
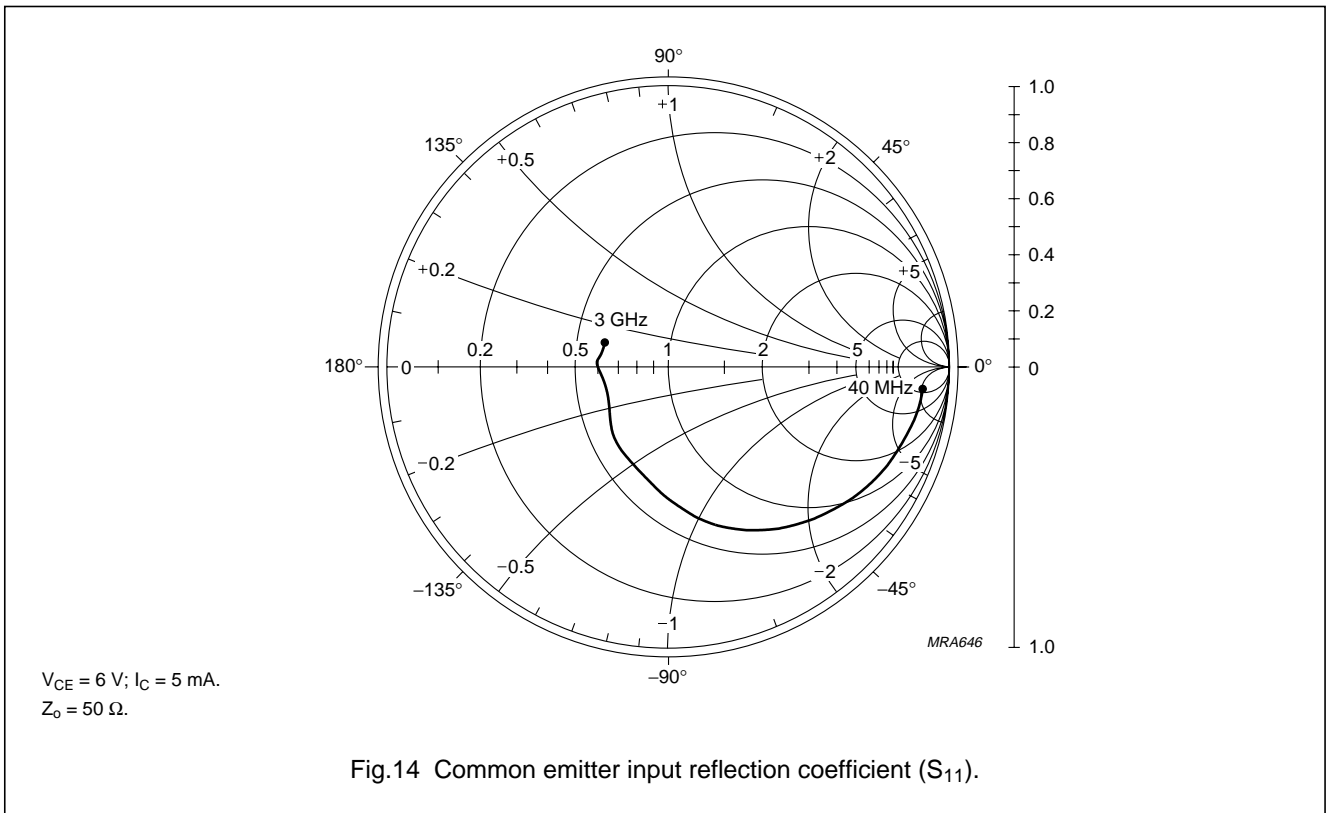


$Z_o = 50 \Omega$ .  
 $V_{CE} = 6 V$ ;  $I_c = 1.25 mA$ ;  $f = 2000 MHz$ .

Fig.13 Noise circle figure.

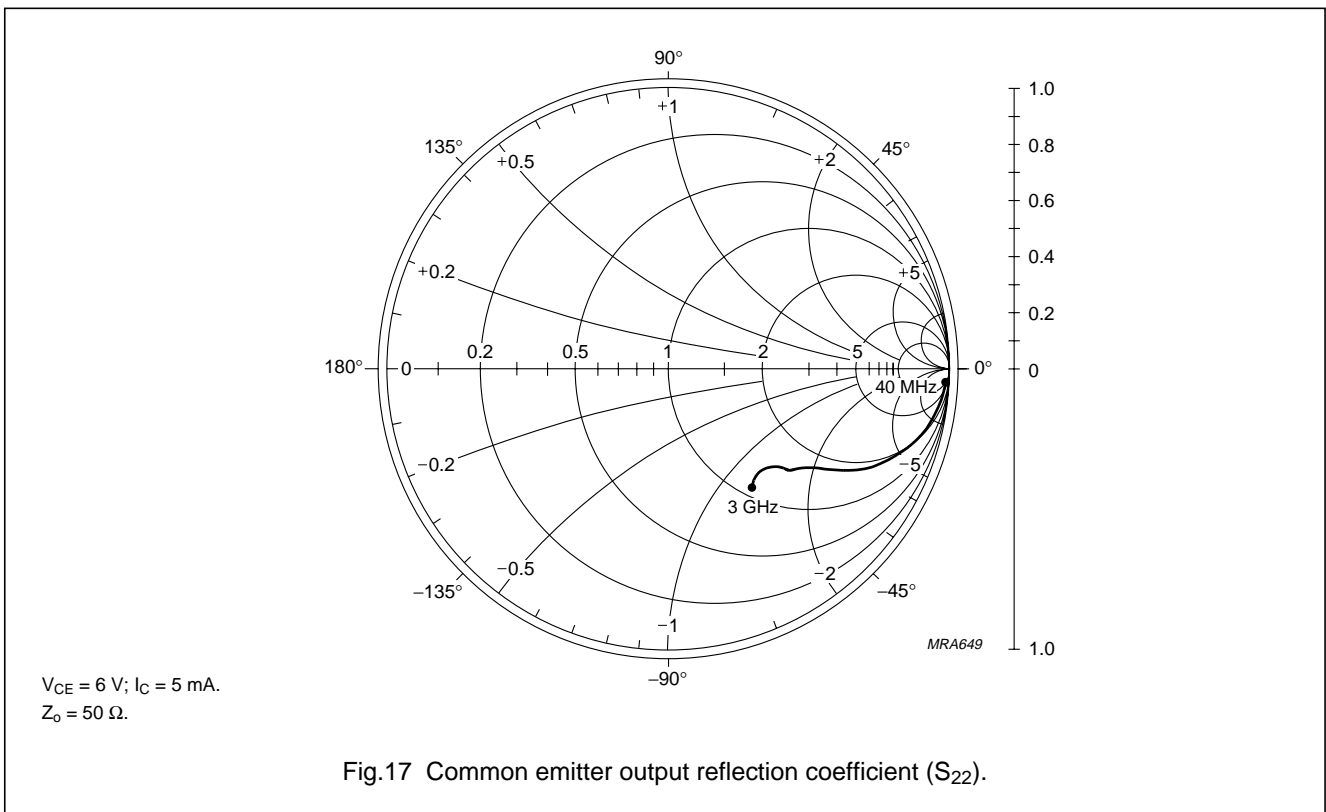
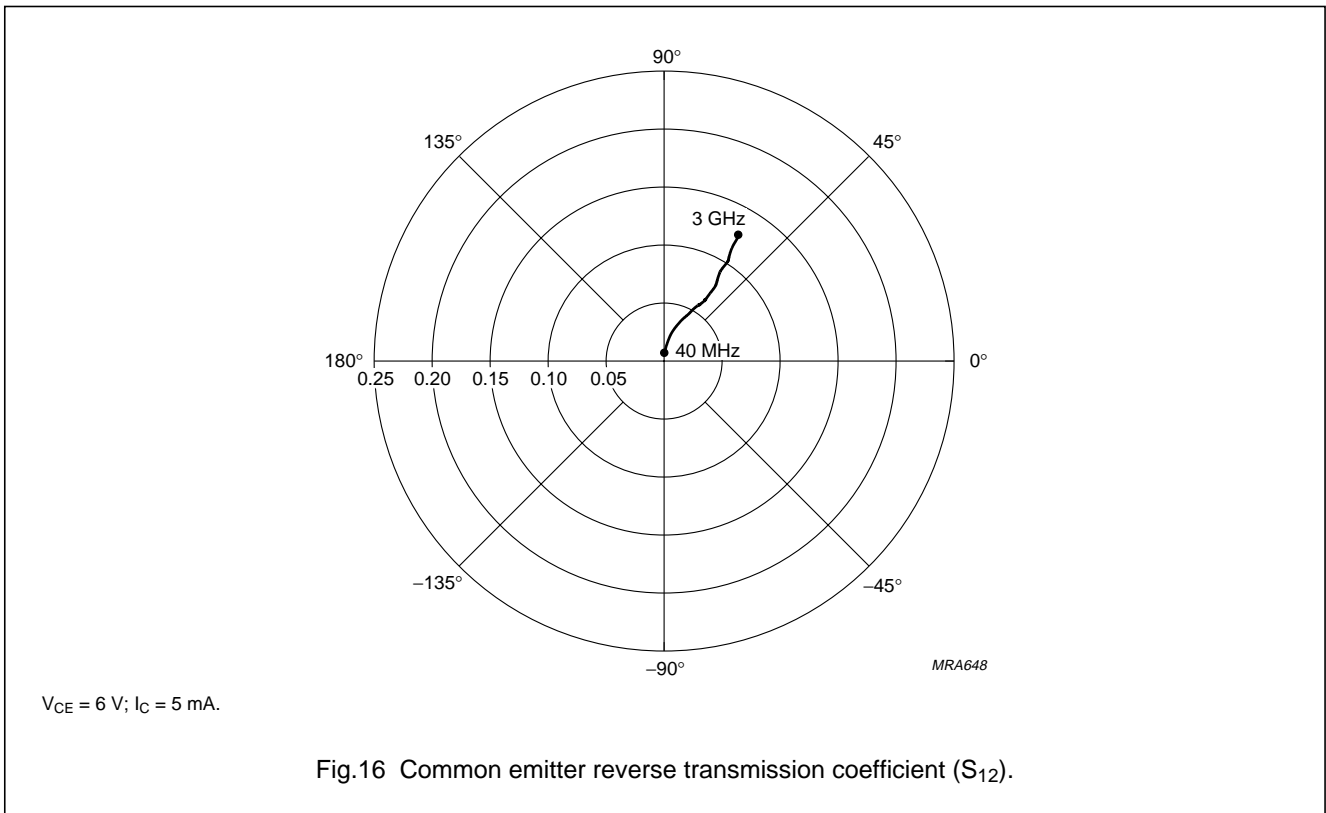
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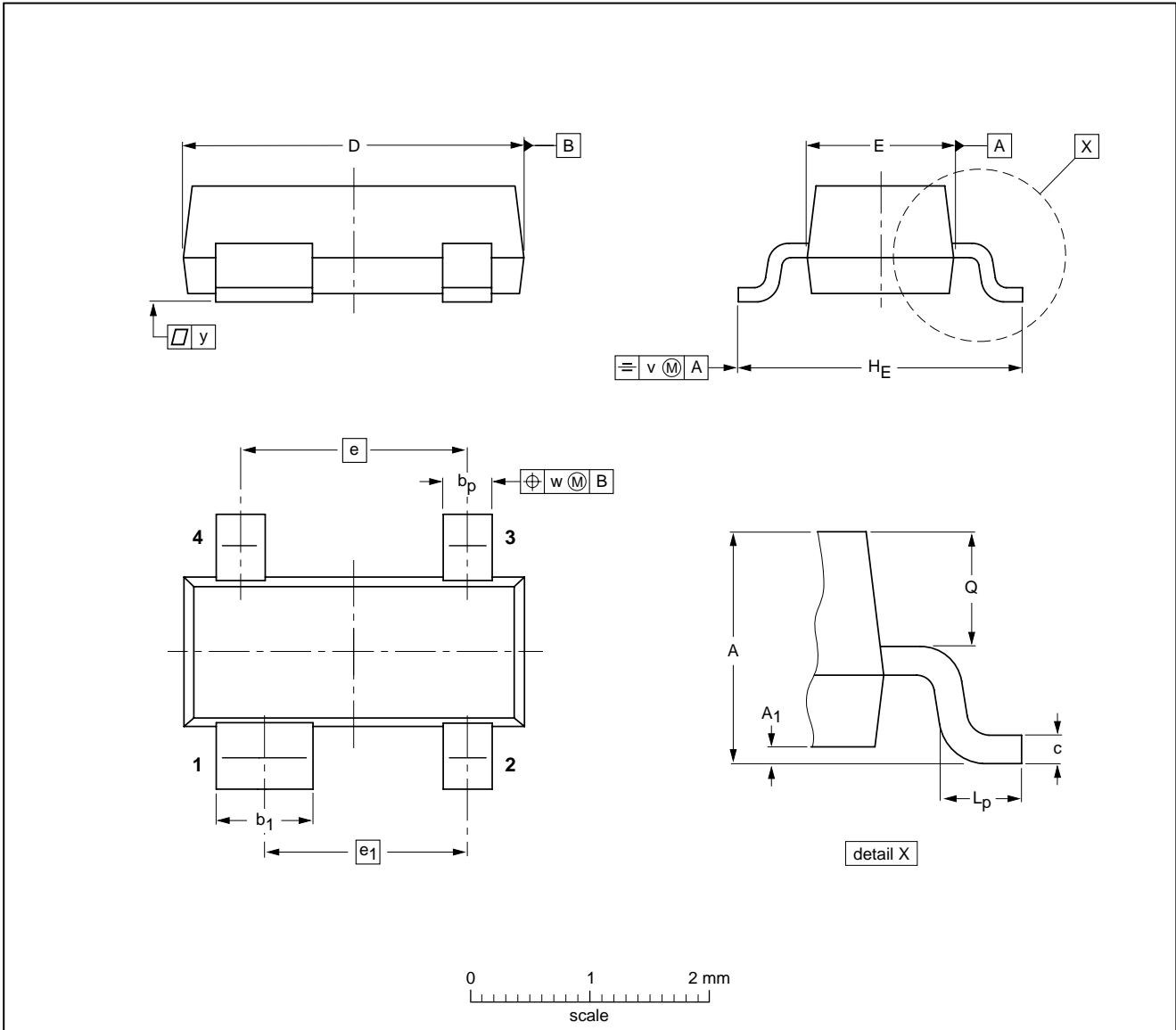
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PACKAGE OUTLINE

Plastic surface mounted package; 4 leads

SOT143B



DIMENSIONS (mm are the original dimensions)

UNIT	A	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

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### Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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