

# BFG590; BFG590/X

NPN 5 GHz wideband transistors

Rev. 04 — 12 November 2007

Product data sheet

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NXP Semiconductors

# NPN 5 GHz wideband transistors

# BFG590; BFG590/X

### FEATURES

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

### APPLICATIONS

- MATV/CATV amplifiers and RF communications subscriber equipment in the GHz range
- Ideally suitable for use in class-A, (A)B and C amplifiers with either pulsed or continuous drive.

### DESCRIPTION

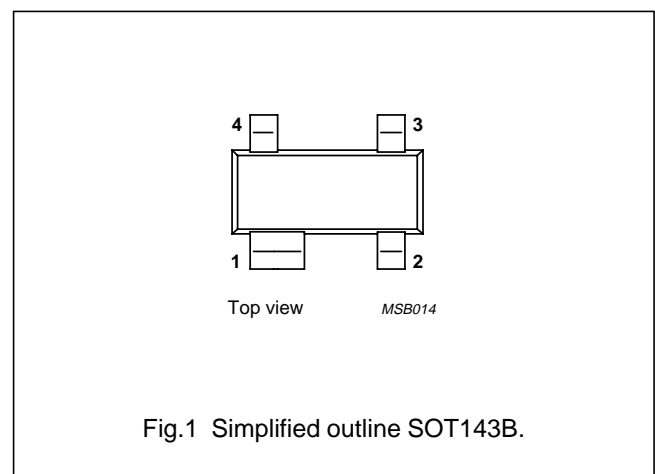
NPN silicon planar epitaxial transistor in a 4-pin dual-emitter SOT143B plastic package.

### MARKING

TYPE NUMBER	CODE
BFG590	%MH
BFG590/X	%MN

### PINNING

PIN	DESCRIPTION	
	BFG590	BFG590/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
$V_{CEO}$	collector-emitter voltage	open base	–	–	15	V
$I_C$	collector current (DC)		–	–	200	mA
$P_{tot}$	total power dissipation	$T_s \leq 60\text{ °C}$	–	–	400	mW
$h_{FE}$	DC current gain	$I_C = 35\text{ mA}; V_{CE} = 8\text{ V}$	50	90	280	
$C_{re}$	feedback capacitance	$I_C = 0; V_{CE} = 8\text{ V}; f = 1\text{ MHz}$	–	0.7	–	pF
$f_T$	transition frequency	$I_C = 80\text{ mA}; V_{CE} = 4\text{ V}; f = 1\text{ GHz}$	–	5	–	GHz
$G_{UM}$	maximum unilateral power gain	$I_C = 80\text{ mA}; V_{CE} = 4\text{ V}; f = 900\text{ MHz}; T_{amb} = 25\text{ °C}$	–	13	–	dB
$ S_{21} ^2$	insertion power gain	$I_C = 80\text{ mA}; V_{CE} = 4\text{ V}; f = 900\text{ MHz}; T_{amb} = 25\text{ °C}$	–	11	–	dB

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**LIMITING VALUES**

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V <sub>CBO</sub>	collector-base voltage	open emitter	–	20	V
V <sub>CEO</sub>	collector-emitter voltage	open base	–	15	V
V <sub>EBO</sub>	emitter-base voltage	open collector	–	3	V
I <sub>C</sub>	collector current (DC)		–	200	mA
P <sub>tot</sub>	total power dissipation	T <sub>s</sub> ≤ 60 °C; see Fig.2; note 1	–	400	mW
T <sub>stg</sub>	storage temperature		–65	+150	°C
T <sub>j</sub>	junction temperature		–	175	°C

**Note**

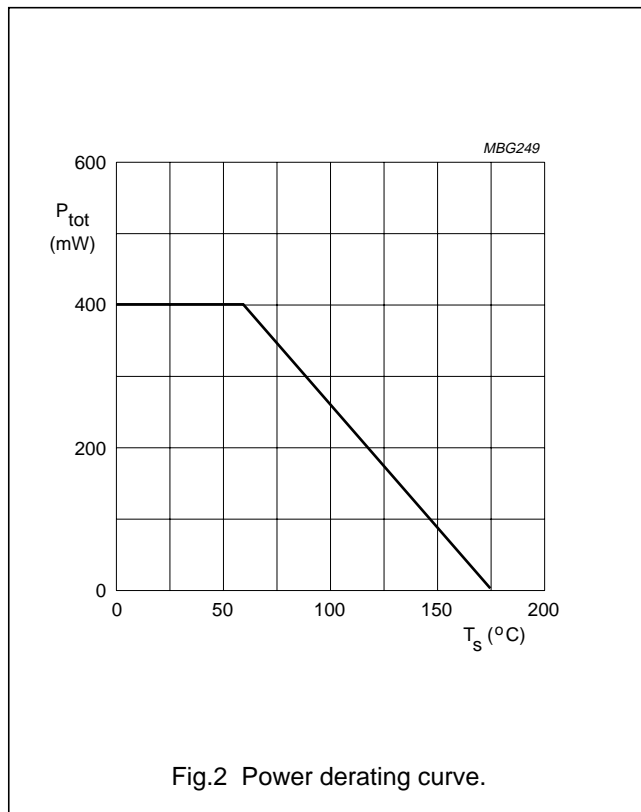
1. T<sub>s</sub> is the temperature at the soldering point of the collector pin.

**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
R <sub>th j-s</sub>	thermal resistance from junction to soldering point	T <sub>s</sub> ≤ 60 °C; note 1	290	K/W

**Note**

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



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**CHARACTERISTICS**

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

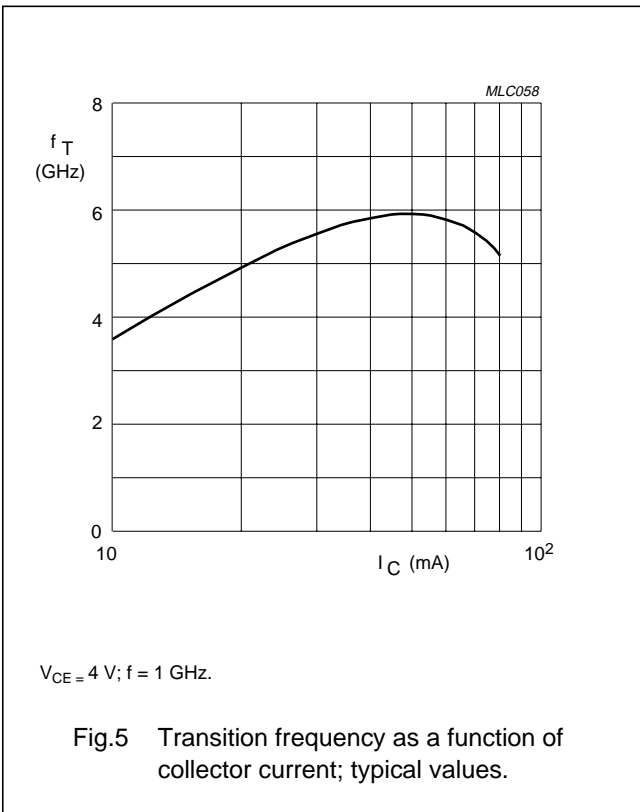
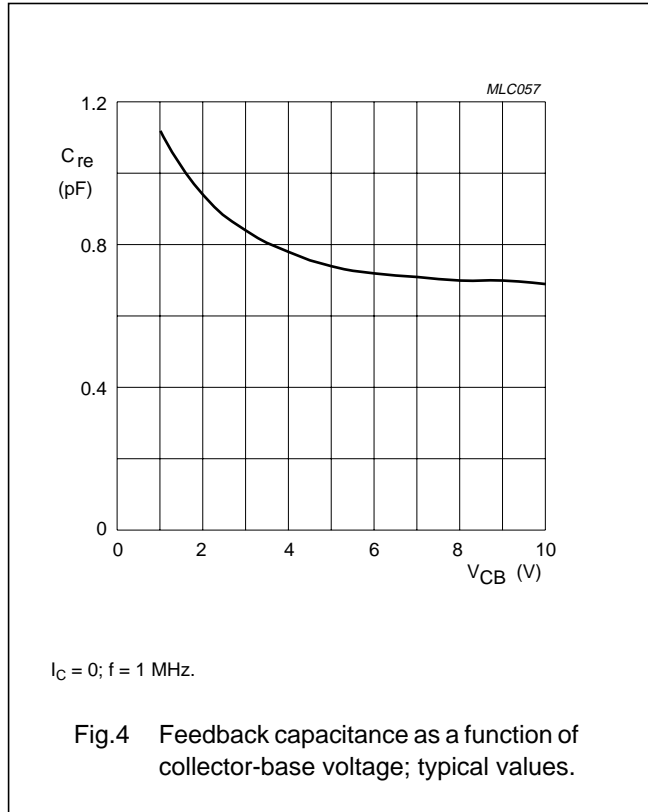
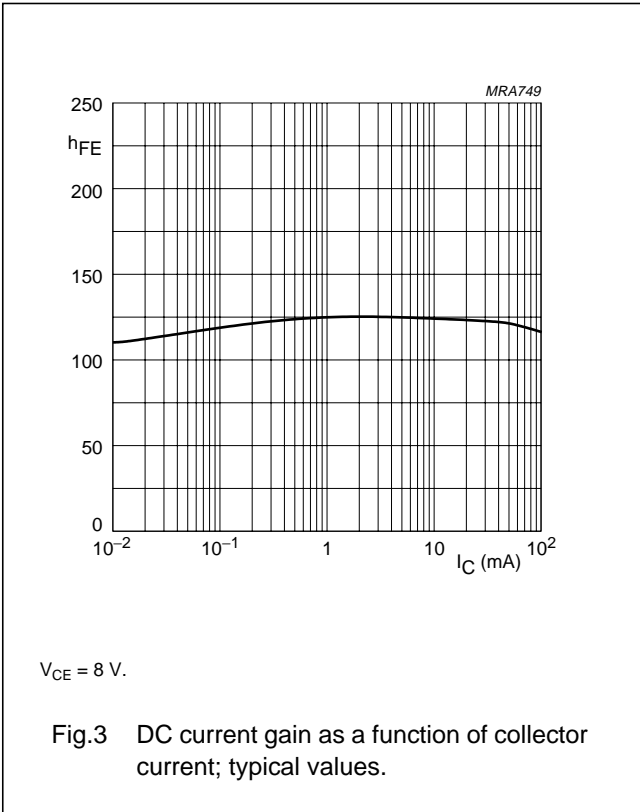
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 0.1\text{ mA}; I_E = 0$	20	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 10\text{ mA}; I_B = 0$	15	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 0.1\text{ mA}; I_C = 0$	3	–	–	V
$I_{CBO}$	collector-base leakage current	$V_{CB} = 10\text{ V}; I_E = 0$	–	–	100	nA
$h_{FE}$	DC current gain	$I_C = 70\text{ mA}; V_{CE} = 8\text{ V}$ ; see Fig.3	60	120	250	
$f_T$	transition frequency	$I_C = 80\text{ mA}; V_{CE} = 4\text{ V}$ ; $f = 1\text{ GHz}$ ; see Fig.5	–	5	–	GHz
$C_{re}$	feedback capacitance	$I_C = 0; V_{CB} = 8\text{ V}; f = 1\text{ MHz}$ ; see Fig.4	–	0.7	–	pF
$G_{UM}$	maximum unilateral power gain; note 1	$I_C = 80\text{ mA}; V_{CE} = 4\text{ V}$ ; $f = 900\text{ MHz}; T_{amb} = 25\text{ °C}$	–	13	–	dB
		$I_C = 80\text{ mA}; V_{CE} = 4\text{ V}; f = 2\text{ GHz}$ ; $T_{amb} = 25\text{ °C}$	–	7.5	–	dB
$ S_{21} ^2$	insertion power gain	$I_C = 80\text{ mA}; V_{CE} = 4\text{ V}$ ; $f = 900\text{ MHz}; T_{amb} = 25\text{ °C}$	–	11	–	dB

**Note**

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.

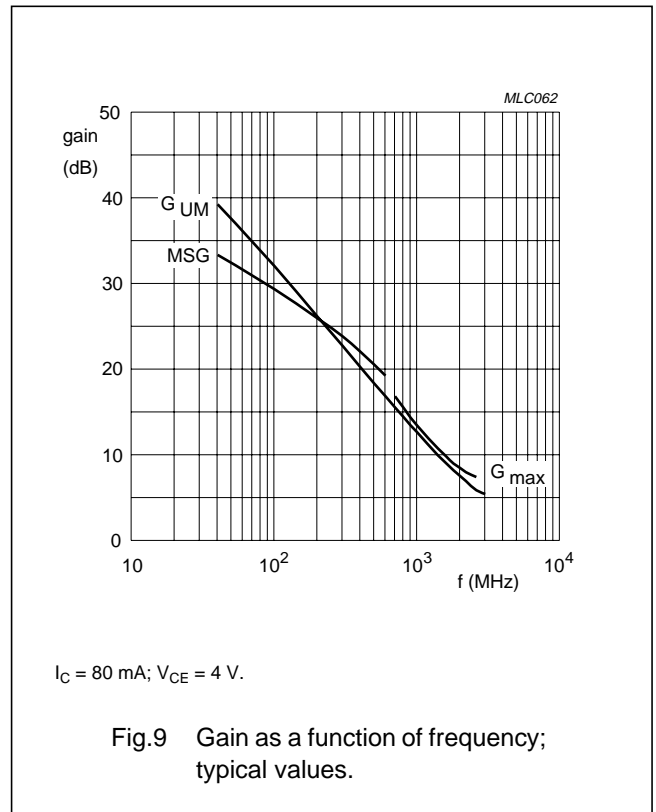
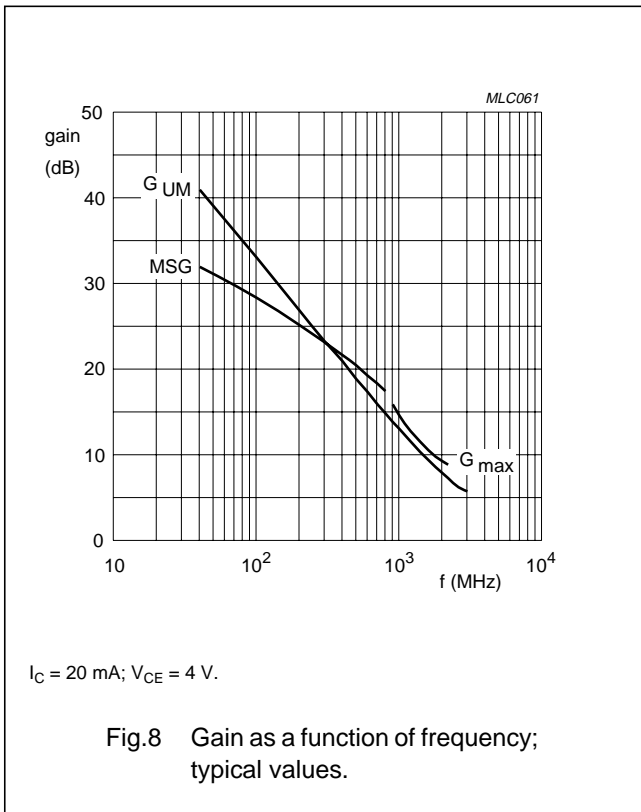
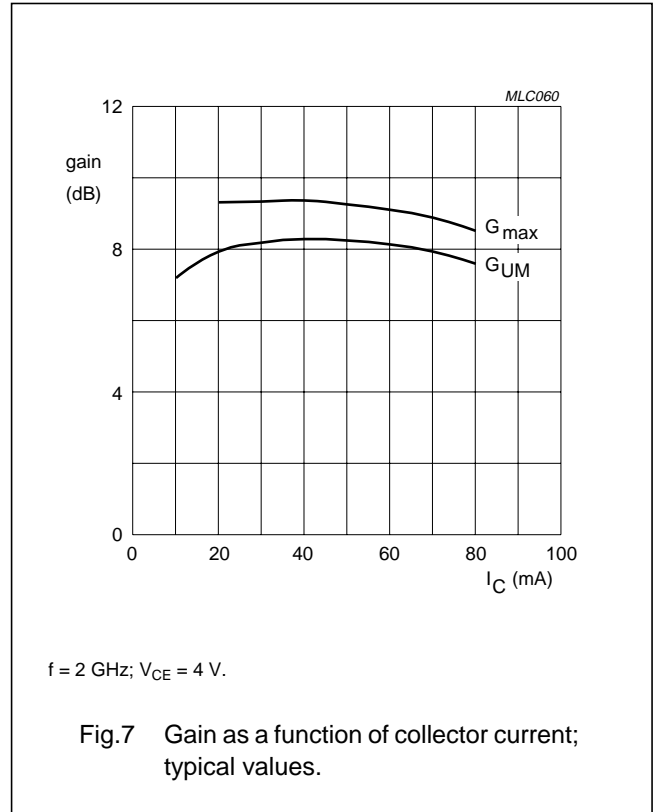
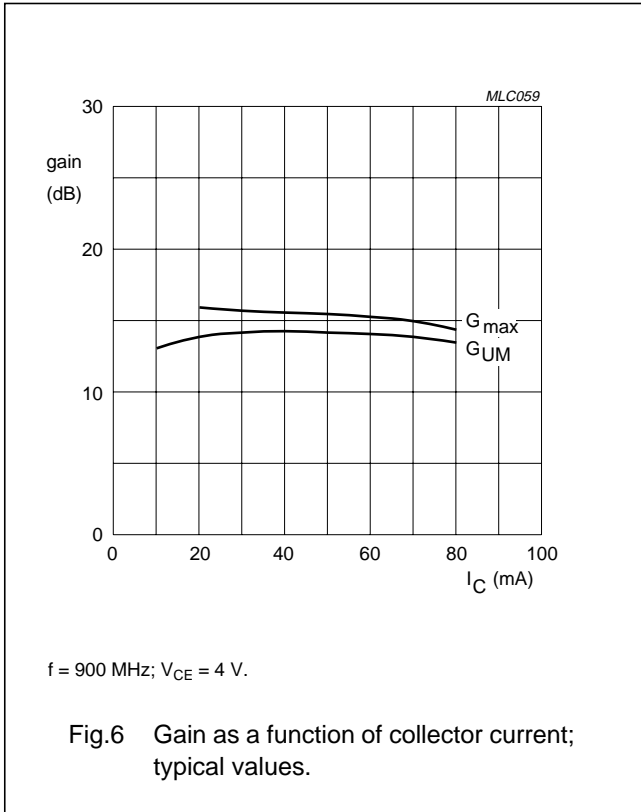
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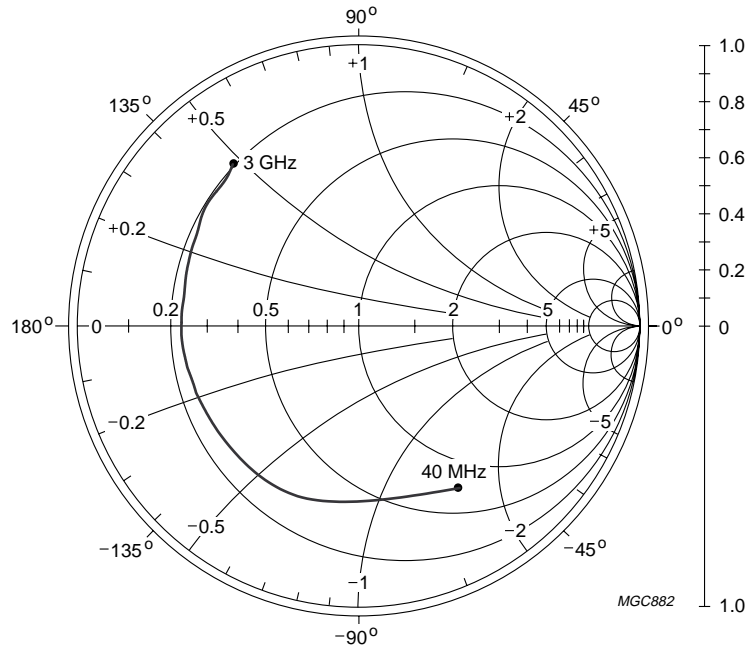
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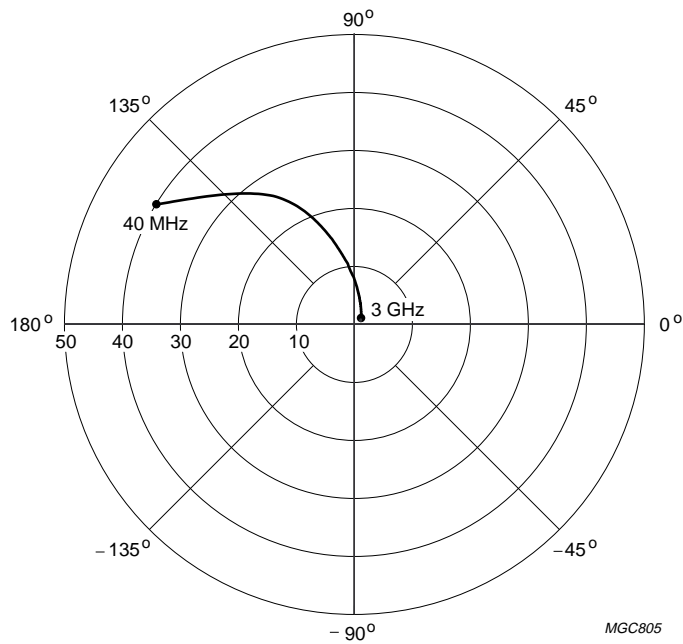
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$I_C = 80 \text{ mA}$ ;  $V_{CE} = 4 \text{ V}$ ;  $Z_o = 50 \Omega$ .

Fig.10 Common emitter input reflection coefficient ( $S_{11}$ ); typical values.

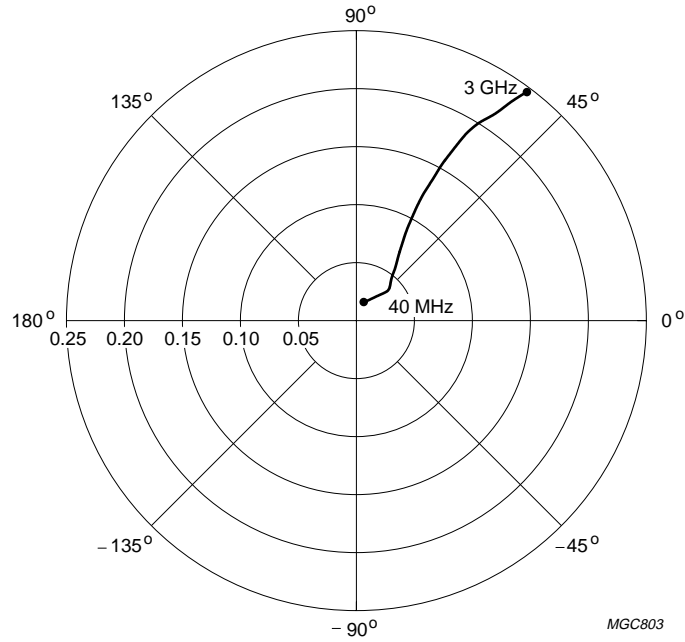


$I_C = 80 \text{ mA}$ ;  $V_{CE} = 4 \text{ V}$ .

Fig.11 Common emitter forward transmission coefficient ( $S_{21}$ ); typical values.

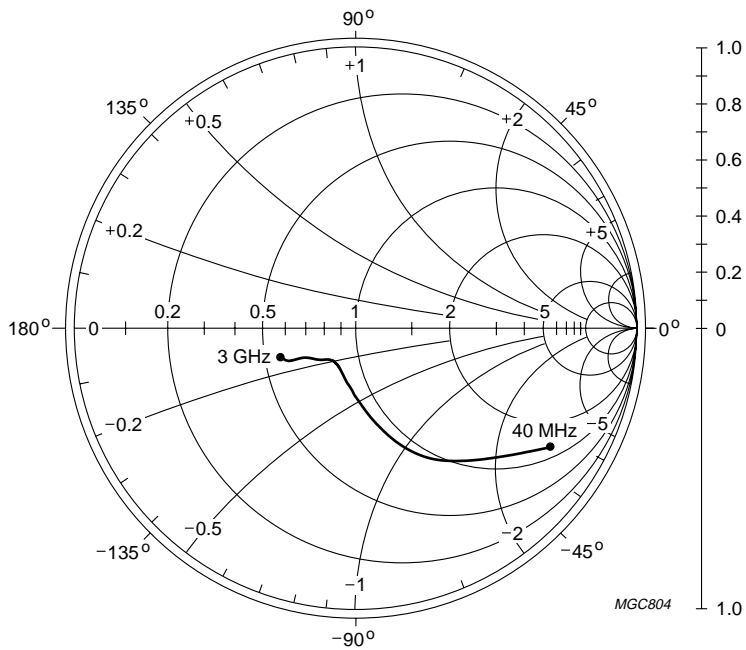
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$I_C = 80 \text{ mA}$ ;  $V_{CE} = 4 \text{ V}$ .

Fig.12 Common emitter reverse transmission coefficient ( $S_{12}$ ); typical values.



$I_C = 80 \text{ mA}$ ;  $V_{CE} = 4 \text{ V}$ ;  $Z_0 = 50 \Omega$ .

Fig.13 Common emitter output reflection coefficient ( $S_{22}$ ); typical values.



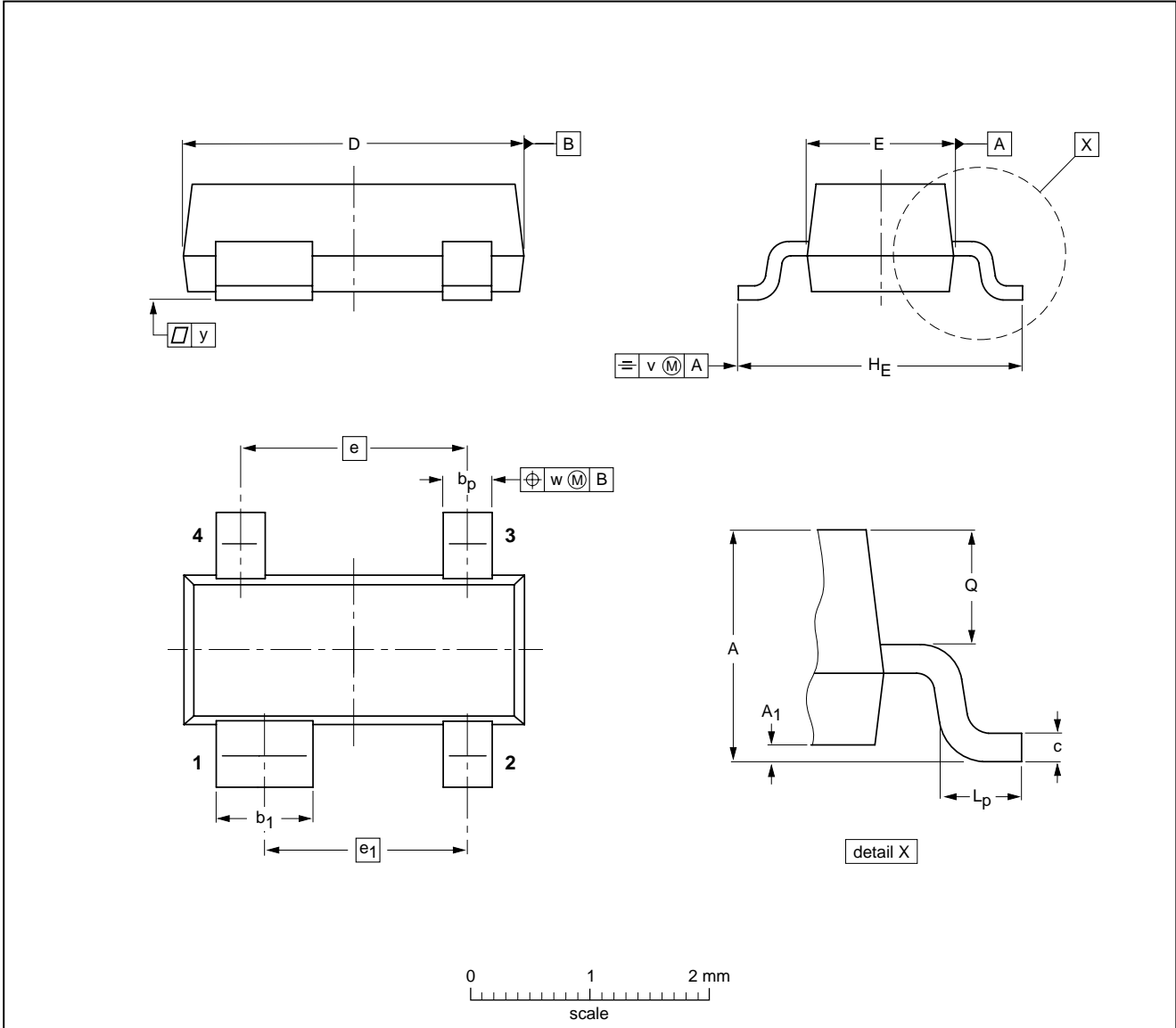
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PACKAGE OUTLINE

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
BFG590_X_N_4	20071112	Product data sheet	-	BFG590_X_3
Modifications:	<ul style="list-style-type: none"> <li>• Fig. 1 and 2 on page 2; Figure note changed</li> </ul>			
BFG590_X_3 (9397 750 04346)	19981002	Product specification	-	BFG590XR_2
BFG590XR_2	19950919	Product specification	-	BFG590XR_1
BFG590XR_1	19921101	Preliminary specification	-	-

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