

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

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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

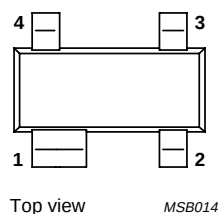


Fig.1 Simplified outline SOT143B.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	—	—	20	V
V_{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 _{CBO}	collector-base voltage	open emitter	–	20	V
V _{CEO}	collector-emitter voltage	open base	–	15	V
V _{EBO}	emitter-base voltage	open collector	–	3	V
I _C	collector current (DC)		–	200	mA
P _{tot}	total power dissipation	T _s ≤ 60 °C; see Fig.2; note 1	–	400	mW
T _{stg}	storage temperature		–65	+150	°C
T _j	junction temperature		–	175	°C

Note

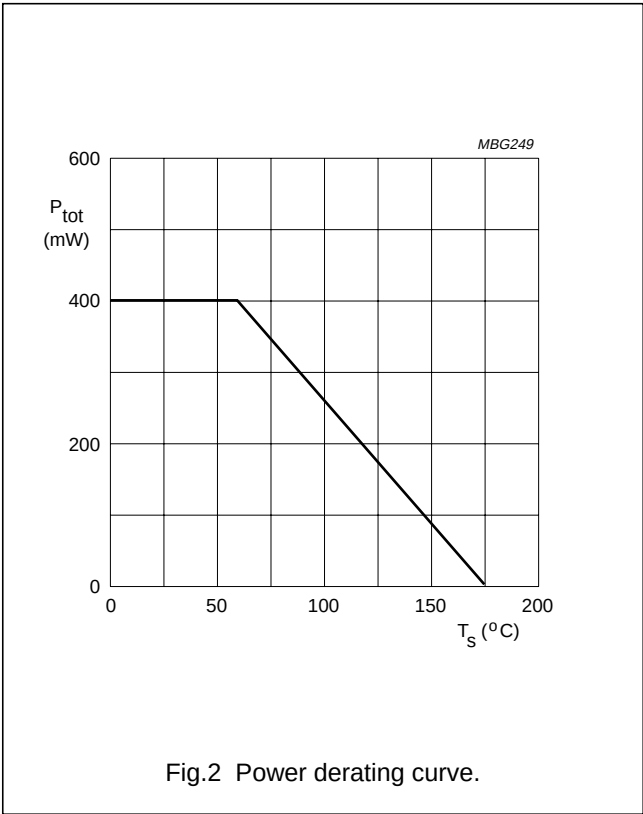
1. T_s is the temperature at the soldering point of the collector pin.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
R _{th j-s}	thermal resistance from junction to soldering point	T _s ≤ 60 °C; 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.

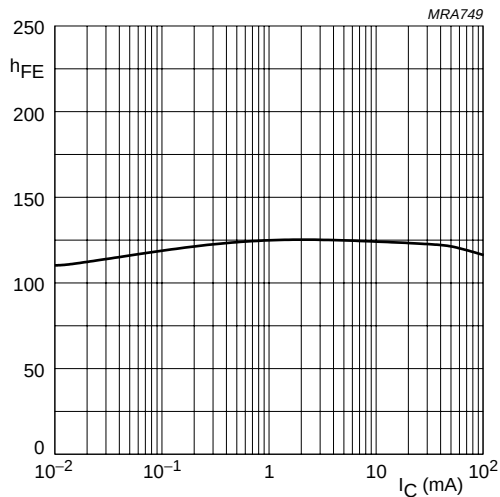
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 0.1\text{ mA}$; $I_E = 0$	20	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 10\text{ mA}$; $I_B = 0$	15	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 0.1\text{ mA}$; $I_C = 0$	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.

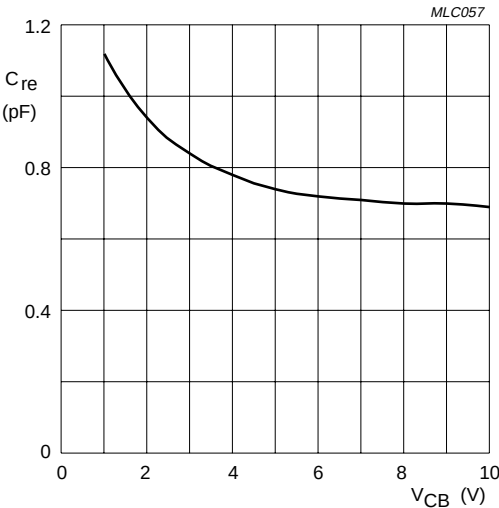
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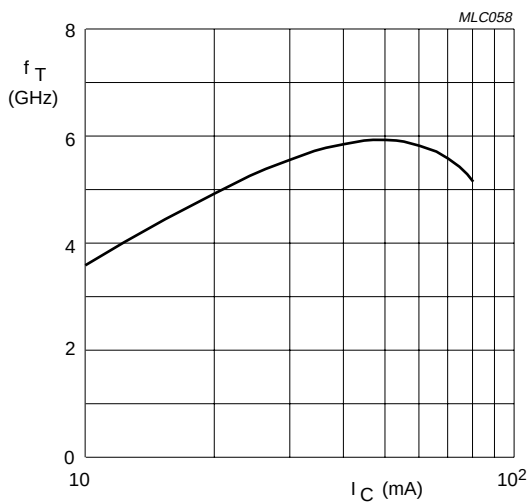
$V_{CE} = 8\text{ V}$.

Fig.3 DC current gain as a function of collector current; typical values.



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

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

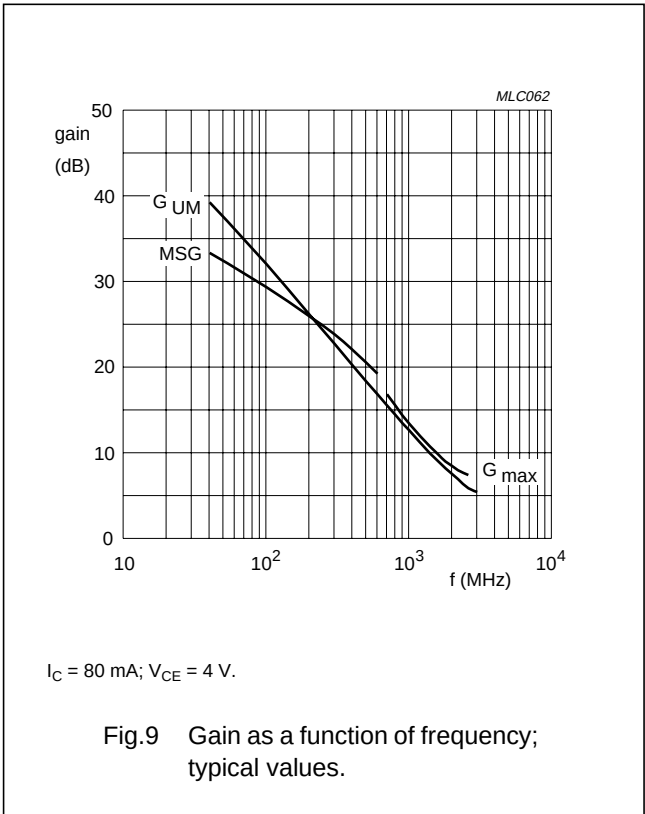
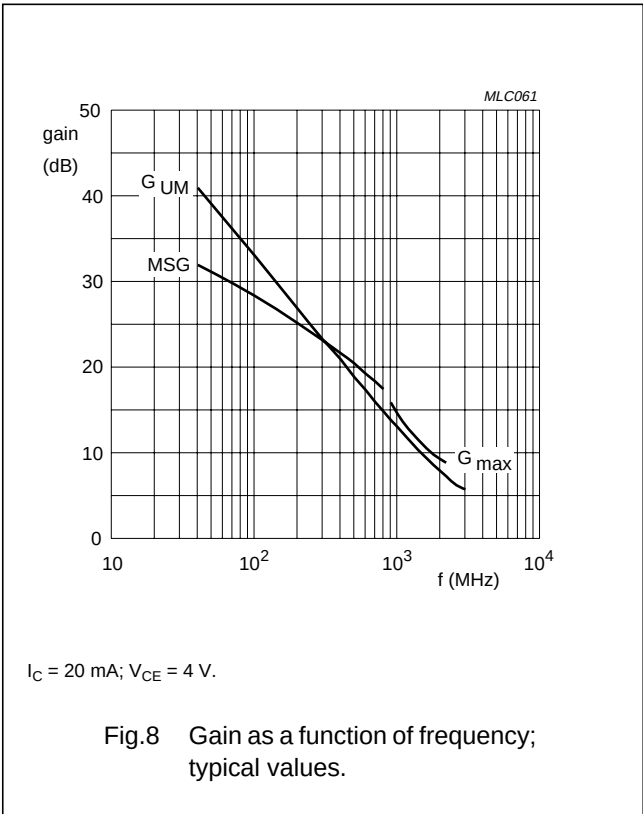
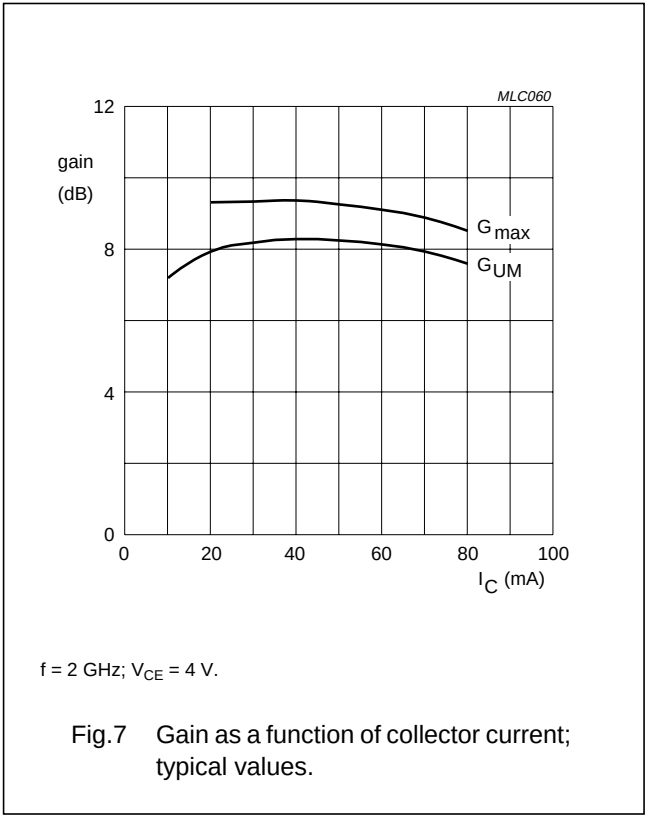
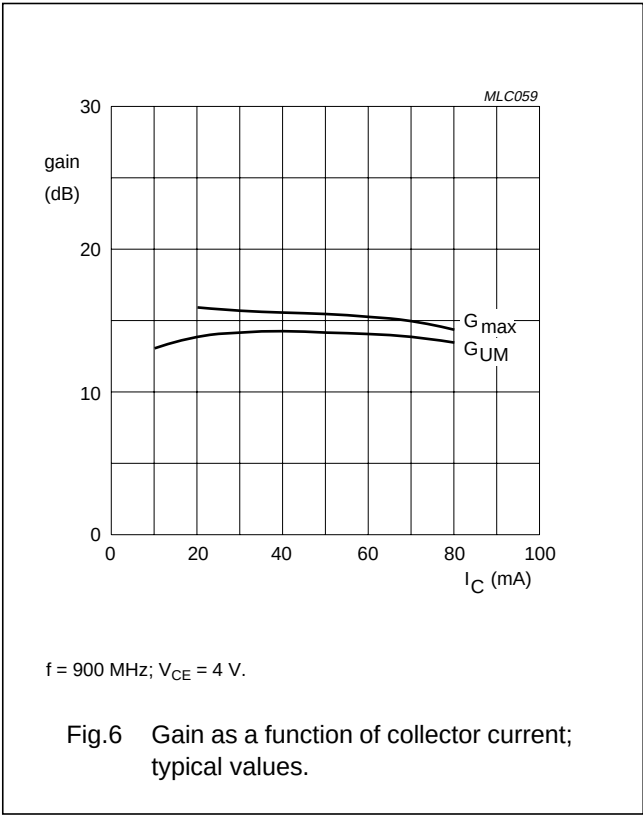


$V_{CE} = 4\text{ V}$; $f = 1\text{ GHz}$.

Fig.5 Transition frequency as a function of collector current; typical values.

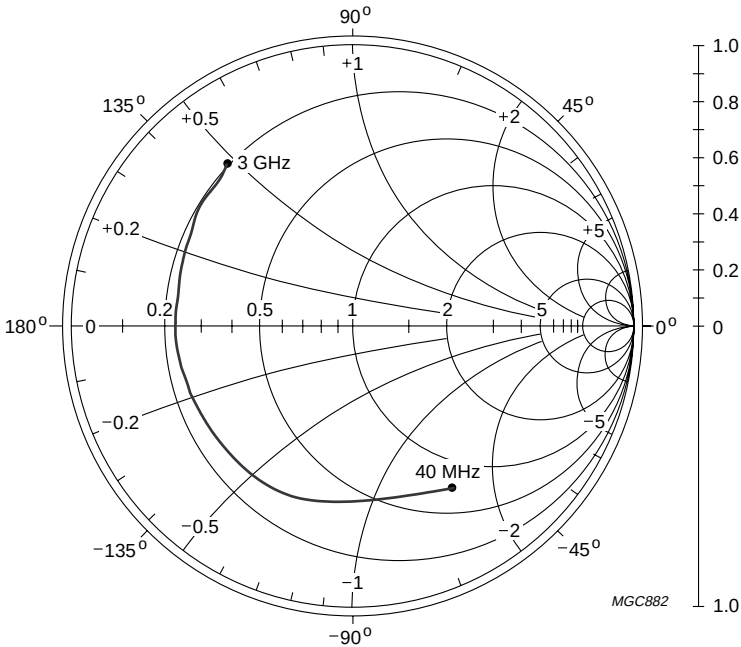
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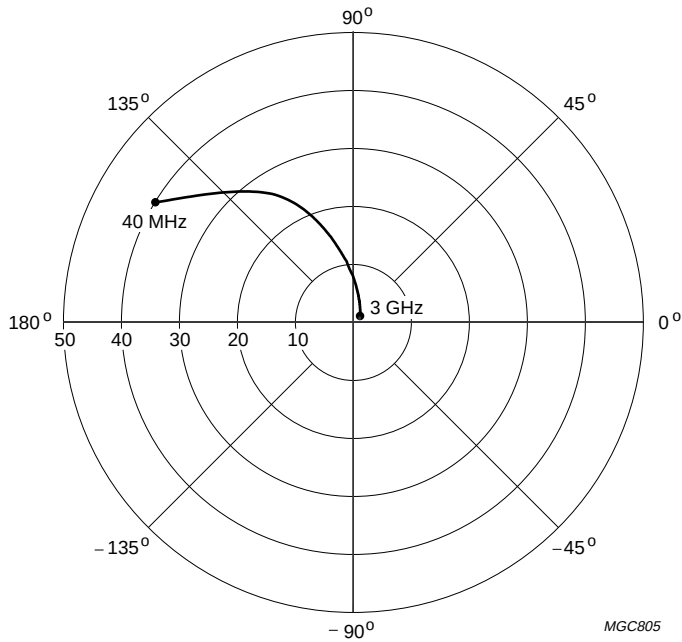
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$I_C = 80 \text{ mA}$; $V_{CE} = 4 \text{ V}$; $Z_0 = 50 \Omega$.

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

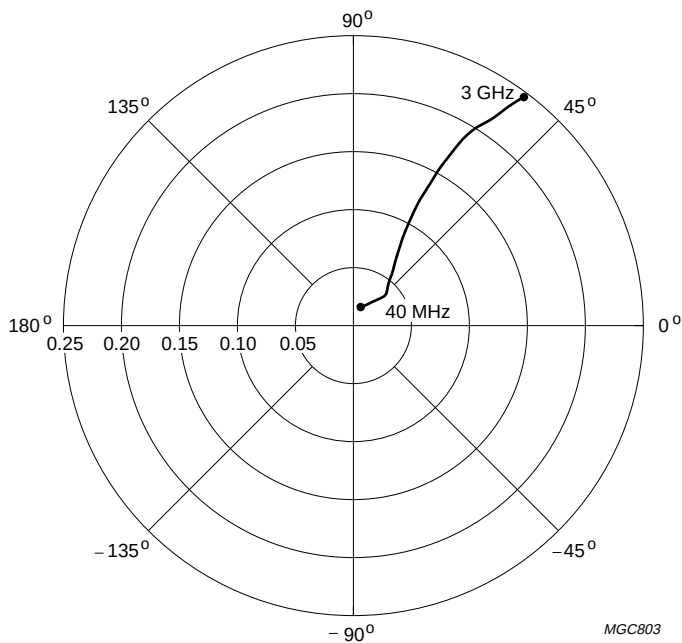


$I_C = 80 \text{ mA}$; $V_{CE} = 4 \text{ V}$.

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

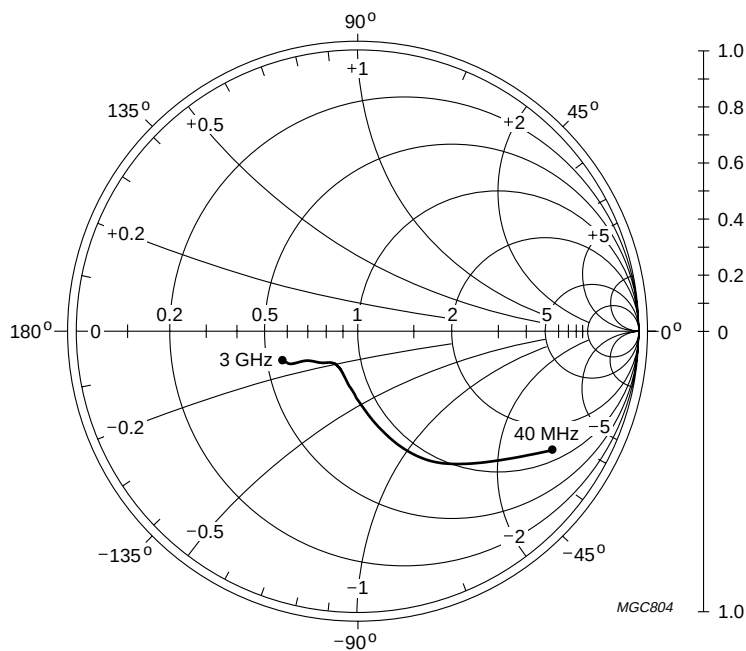
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$I_C = 80\text{ mA}$; $V_{CE} = 4\text{ V}$.

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



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

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

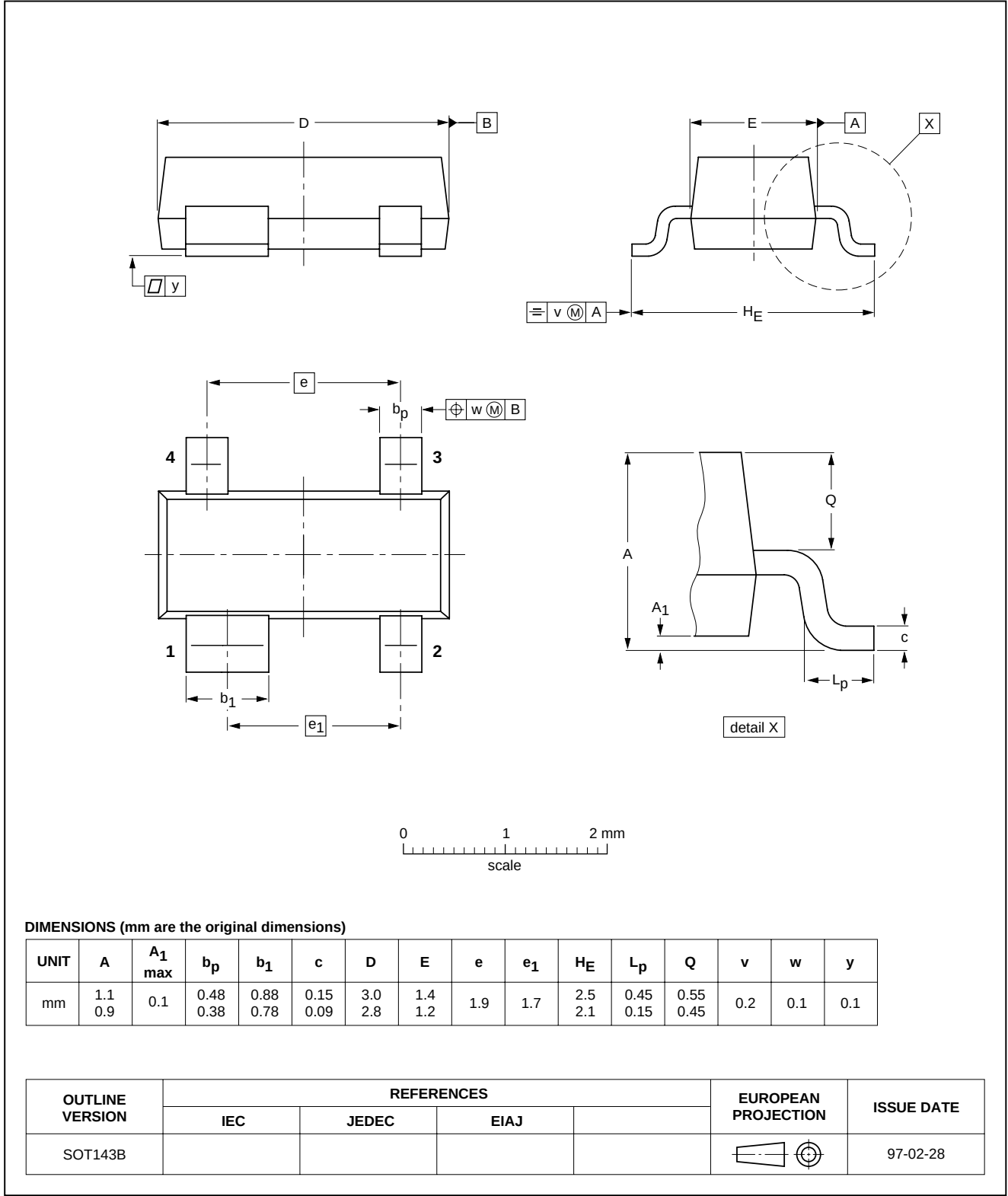
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PACKAGE OUTLINE

Plastic surface mounted package; 4 leads

SOT143B



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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.

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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:	• Fig. 1 and 2 on page 2; Figure note changed			
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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