

# DATA SHEET

## **BFG67; BFG67/X; BFG67/XR** NPN 8 GHz wideband transistors

Product specification  
Supersedes data of September 1995

1998 Oct 02

## NPN 8 GHz wideband transistors

## BFG67; BFG67/X; BFG67/XR

### FEATURES

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

### APPLICATIONS

Wideband applications in the GHz range, such as satellite TV tuners and portable RF communications equipment.

### DESCRIPTION

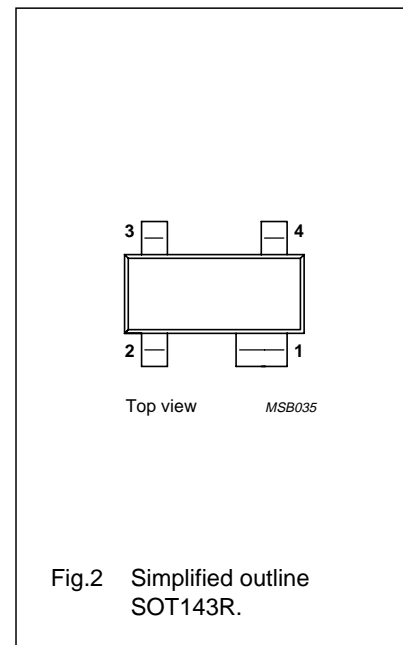
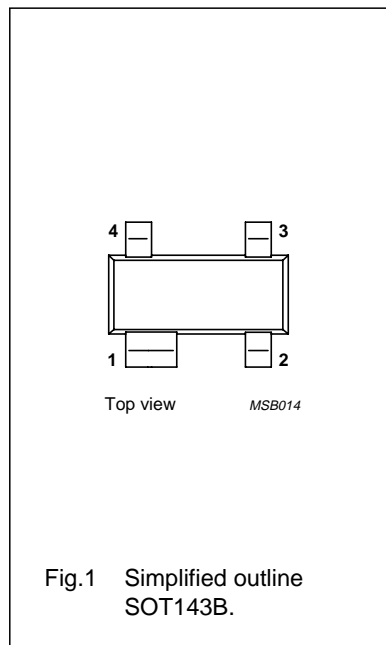
NPN silicon transistor in a 4-pin, dual-emitter SOT143B plastic package. Available with in-line emitter pinning (BFG67) and cross emitter pinning (BFG67/X). Version with reverse pinning (BFG67/XR) also available on request.

### MARKING

TYPE NUMBER	CODE
BFG67 (Fig.1)	V3
BFG67/X (Fig.1)	V12
BFG67/XR (Fig.2)	V26

### PINNING

PIN	DESCRIPTION		
	BFG67	BFG67/X	BFG67/XR
1	collector	collector	collector
2	base	emitter	emitter
3	emitter	base	base
4	emitter	emitter	emitter



### QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
$V_{CE0}$	collector-emitter voltage	open base	–	10	V
$I_C$	collector current (DC)		–	50	mA
$P_{tot}$	total power dissipation	$T_s \leq 65^\circ\text{C}$	–	300	mW
$C_{re}$	feedback capacitance	$I_C = i_c = 0$ ; $V_{CB} = 8\text{ V}$ ; $f = 1\text{ MHz}$	0.5	–	pF
$f_T$	transition frequency	$I_C = 15\text{ mA}$ ; $V_{CE} = 8\text{ V}$ ; $f = 500\text{ MHz}$	8	–	GHz
$G_{UM}$	maximum unilateral power gain	$I_C = 15\text{ mA}$ ; $V_{CE} = 8\text{ V}$ ; $T_{amb} = 25^\circ\text{C}$ ; $f = 1\text{ GHz}$	17	–	dB
F	noise figure	$\Gamma_s = \Gamma_{opt}$ ; $I_C = 5\text{ mA}$ ; $V_{CE} = 8\text{ V}$ ; $T_{amb} = 25^\circ\text{C}$ ; $f = 1\text{ GHz}$	1.3	–	dB
		$\Gamma_s = \Gamma_{opt}$ ; $I_C = 5\text{ mA}$ ; $V_{CE} = 8\text{ V}$ ; $T_{amb} = 25^\circ\text{C}$ ; $f = 2\text{ GHz}$	2.2	–	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	–	10	V
$V_{EBO}$	emitter-base voltage	open collector	–	2.5	V
$I_C$	collector current (DC)		–	50	mA
$P_{tot}$	total power dissipation	$T_s \leq 65^\circ\text{C}$ ; see Fig.3; note 1	–	380	mW
$T_{stg}$	storage temperature range		–65	150	$^\circ\text{C}$
$T_j$	junction temperature		–	175	$^\circ\text{C}$

**Note**

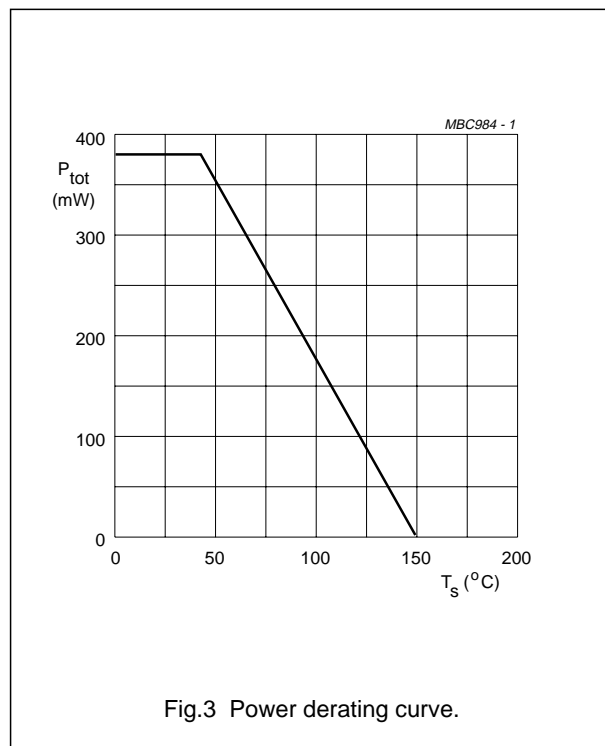
- $T_s$  is the temperature at the soldering point of the collector pin.

**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-s}$	thermal resistance from junction to soldering point	note 1	290	K/W

**Note**

- $T_s$  is the temperature at the soldering point of the collector pin.



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**CHARACTERISTICS**

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

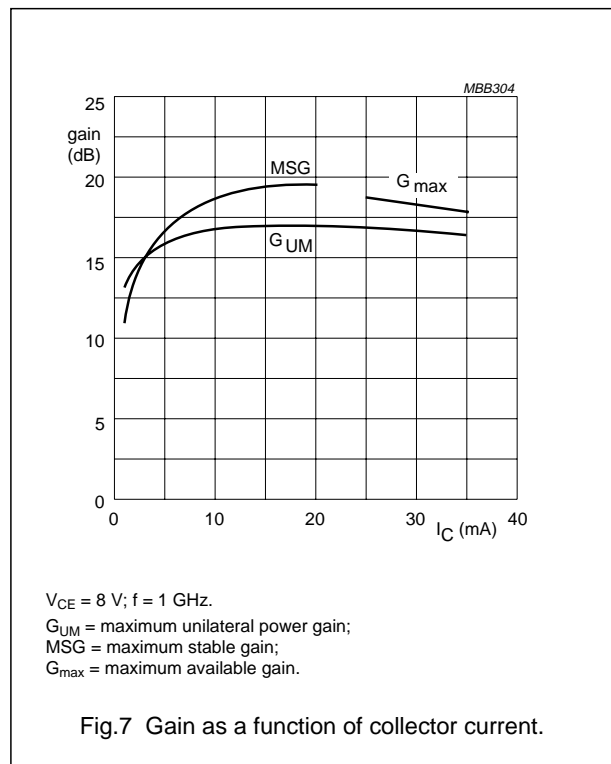
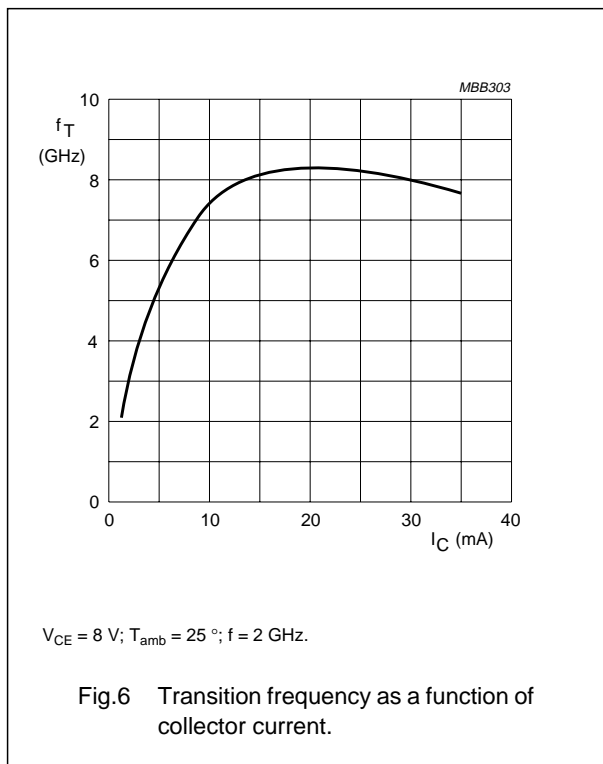
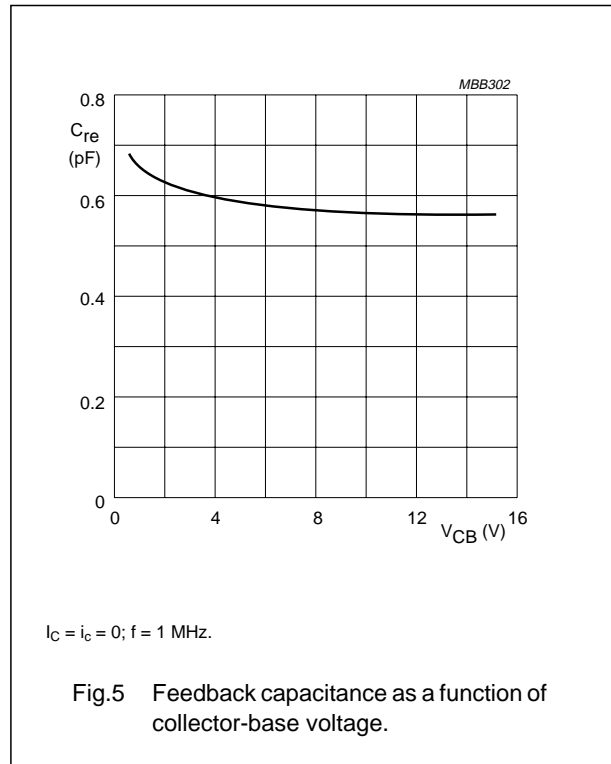
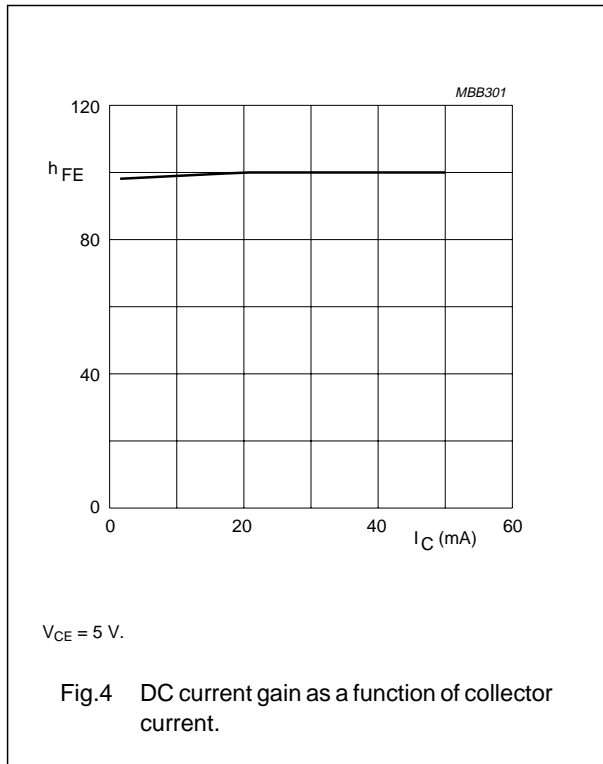
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_{CBO}$	collector leakage current	$V_{CB} = 5\text{ V}; I_E = 0$	–	–	50	nA
$h_{FE}$	DC current gain	$I_C = 15\text{ mA}; V_{CE} = 5\text{ V}$	60	100	–	
$f_T$	transition frequency	$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}; f = 500\text{ MHz}$	–	8	–	GHz
$C_c$	collector capacitance	$I_E = i_e = 0; V_{CB} = 8\text{ V}; f = 1\text{ MHz}$	–	0.7	–	pF
$C_e$	emitter capacitance	$I_C = i_c = 0; V_{EB} = 0.5\text{ V}; f = 1\text{ MHz}$	–	1.3	–	pF
$C_{re}$	feedback capacitance	$I_C = i_c = 0; V_{CB} = 8\text{ V}; f = 1\text{ MHz}$	–	0.5	–	pF
$G_{UM}$	maximum unilateral power gain; note 1	$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}; T_{amb} = 25\text{ °C}; f = 1\text{ GHz}$	–	17	–	dB
		$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}; T_{amb} = 25\text{ °C}; f = 2\text{ GHz}$	–	10	–	dB
F	noise figure	$\Gamma_s = \Gamma_{opt}; I_C = 5\text{ mA}; V_{CE} = 8\text{ V}; T_{amb} = 25\text{ °C}; f = 1\text{ GHz}$	–	1.3	–	dB
		$\Gamma_s = \Gamma_{opt}; I_C = 15\text{ mA}; V_{CE} = 8\text{ V}; T_{amb} = 25\text{ °C}; f = 1\text{ GHz}$	–	1.7	–	dB
		$I_C = 5\text{ mA}; V_{CE} = 8\text{ V}; T_{amb} = 25\text{ °C}; f = 2\text{ GHz}; Z_S = 60\ \Omega$	–	2.5	–	dB
		$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}; T_{amb} = 25\text{ °C}; f = 2\text{ GHz}; Z_S = 60\ \Omega$	–	3	–	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.

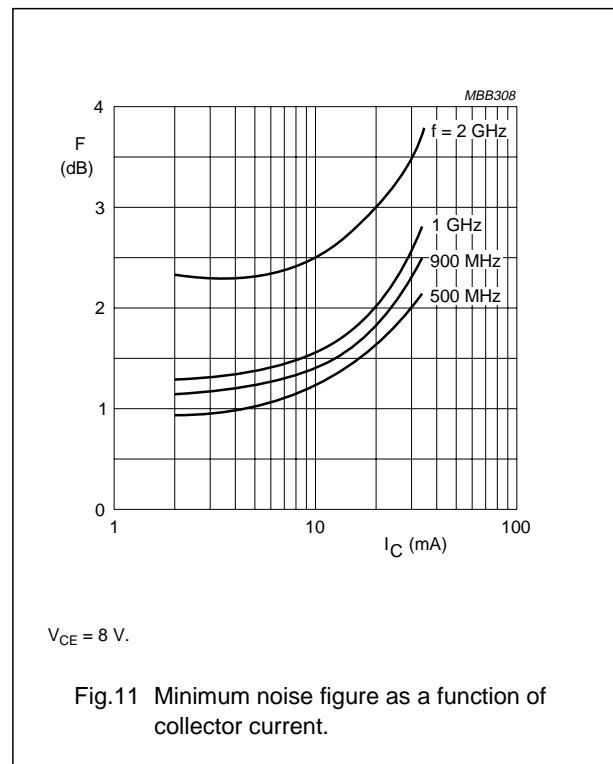
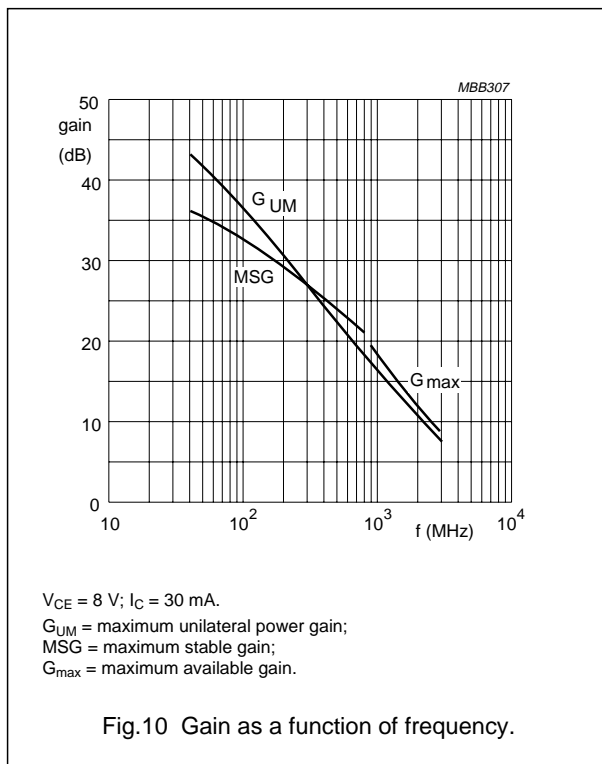
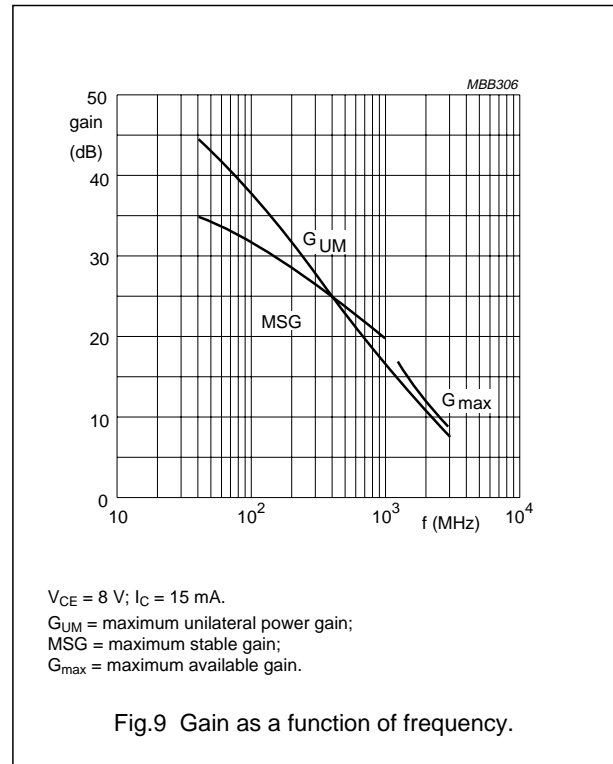
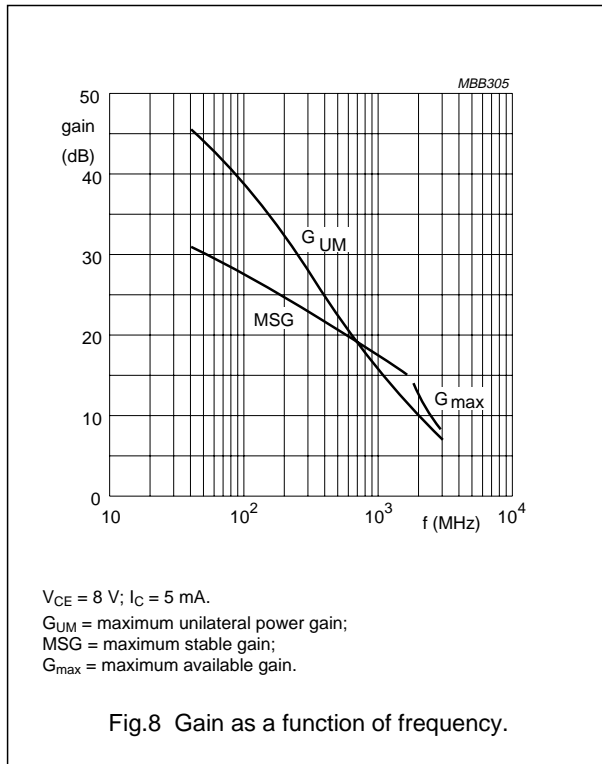
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BFG67; BFG67/X; BFG67/XR



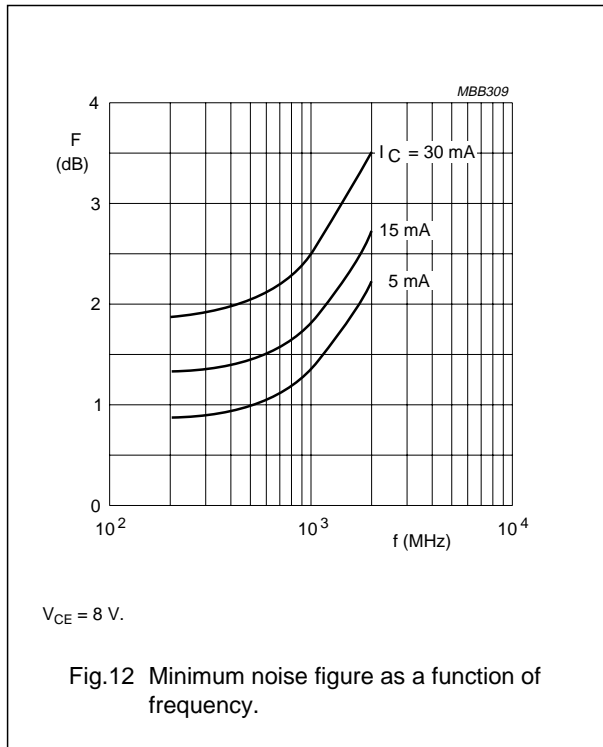
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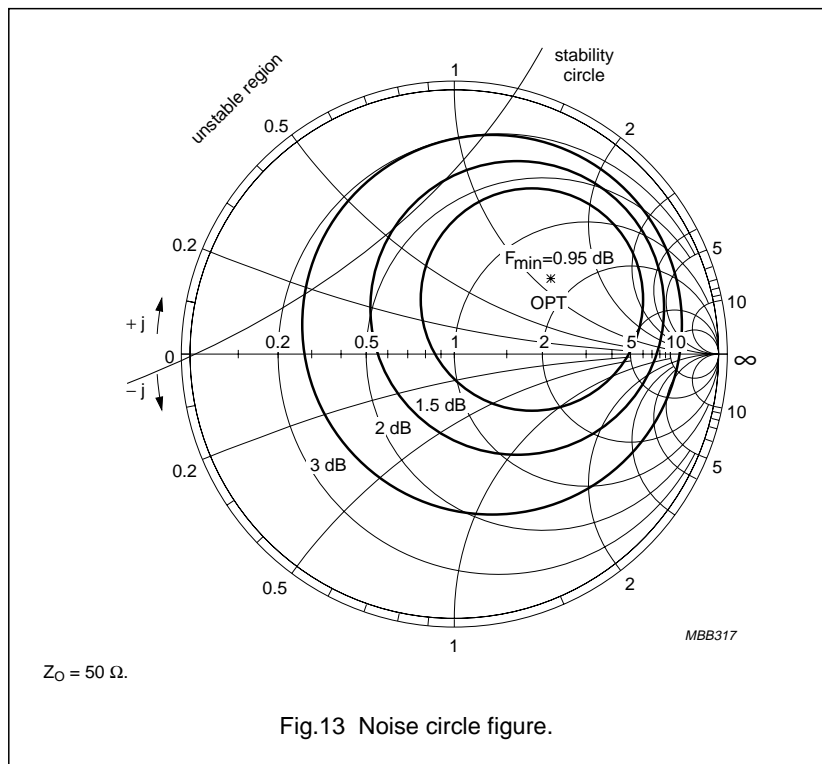


**BFG67/X**

f (MHz)	V <sub>CE</sub> (V)	I <sub>C</sub> (mA)
500	8	5

**Noise Parameters**

F <sub>min</sub> (dB)	Gamma (opt)		R <sub>n</sub> /50
	(mag)	(ang)	
0.95	0.455	33.8	0.288



NPN 8 GHz wideband transistors

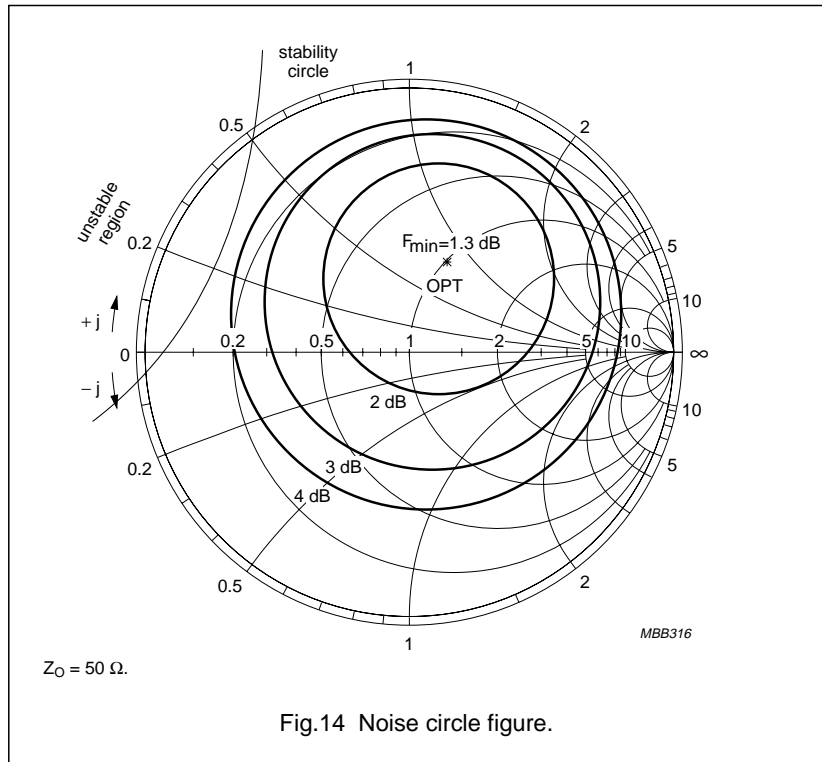
BFG67; BFG67/X; BFG67/XR

**BFG67/X**

f (MHz)	V <sub>CE</sub> (V)	I <sub>C</sub> (mA)
1000	8	5

**Noise Parameters**

F <sub>min</sub> (dB)	Gamma (opt)		R <sub>n</sub> /50
	(mag)	(ang)	
1.3	0.375	65.9	0.304



**BFG67/X**

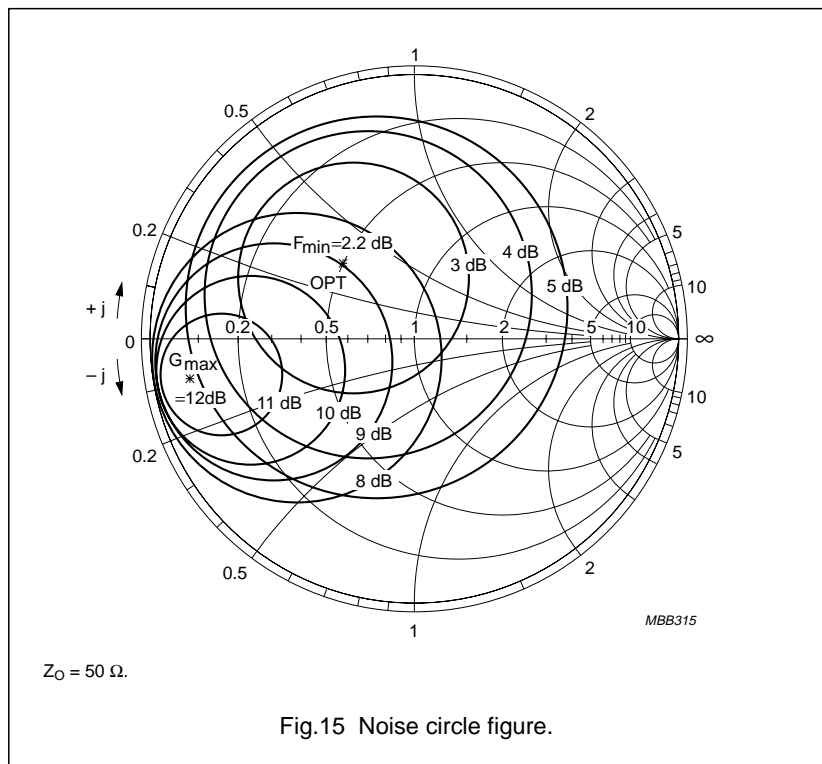
f (MHz)	V <sub>CE</sub> (V)	I <sub>C</sub> (mA)
2000	8	5

**Noise Parameters**

F <sub>min</sub> (dB)	Gamma (opt)		R <sub>n</sub> /50
	(mag)	(ang)	
2.2	0.391	136.5	0.184

**Average Gain Parameters**

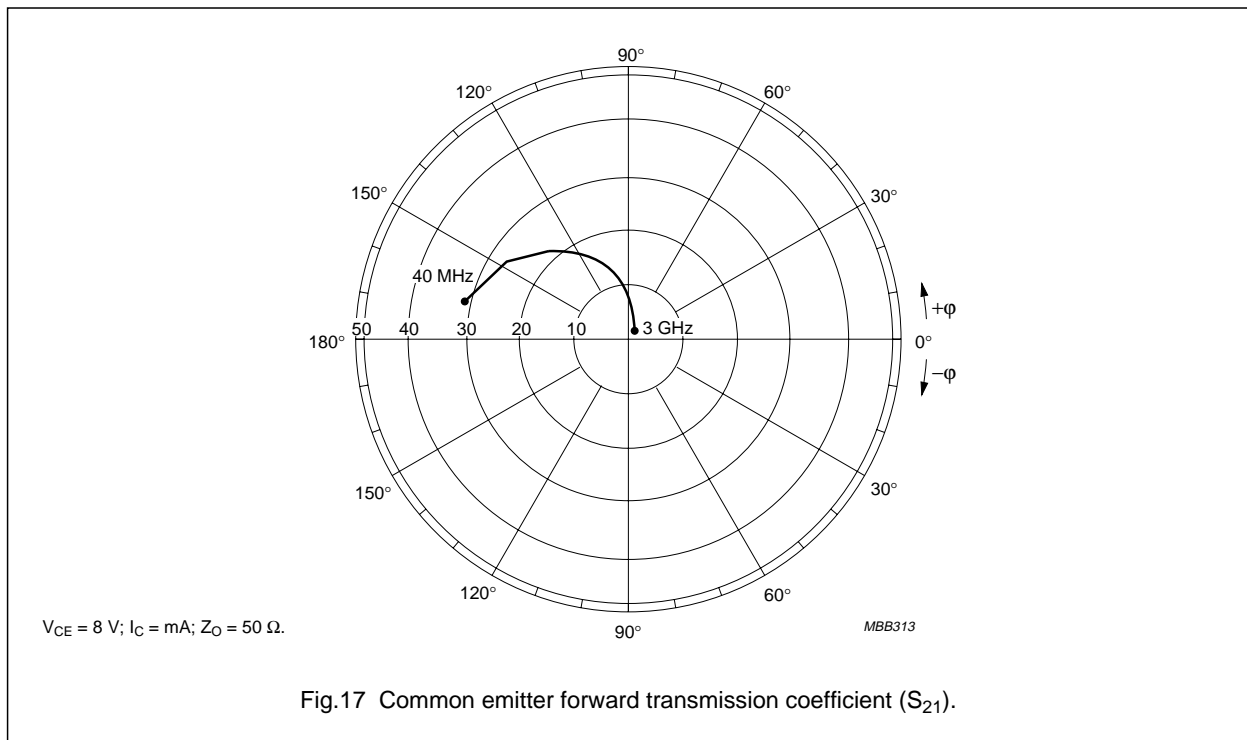
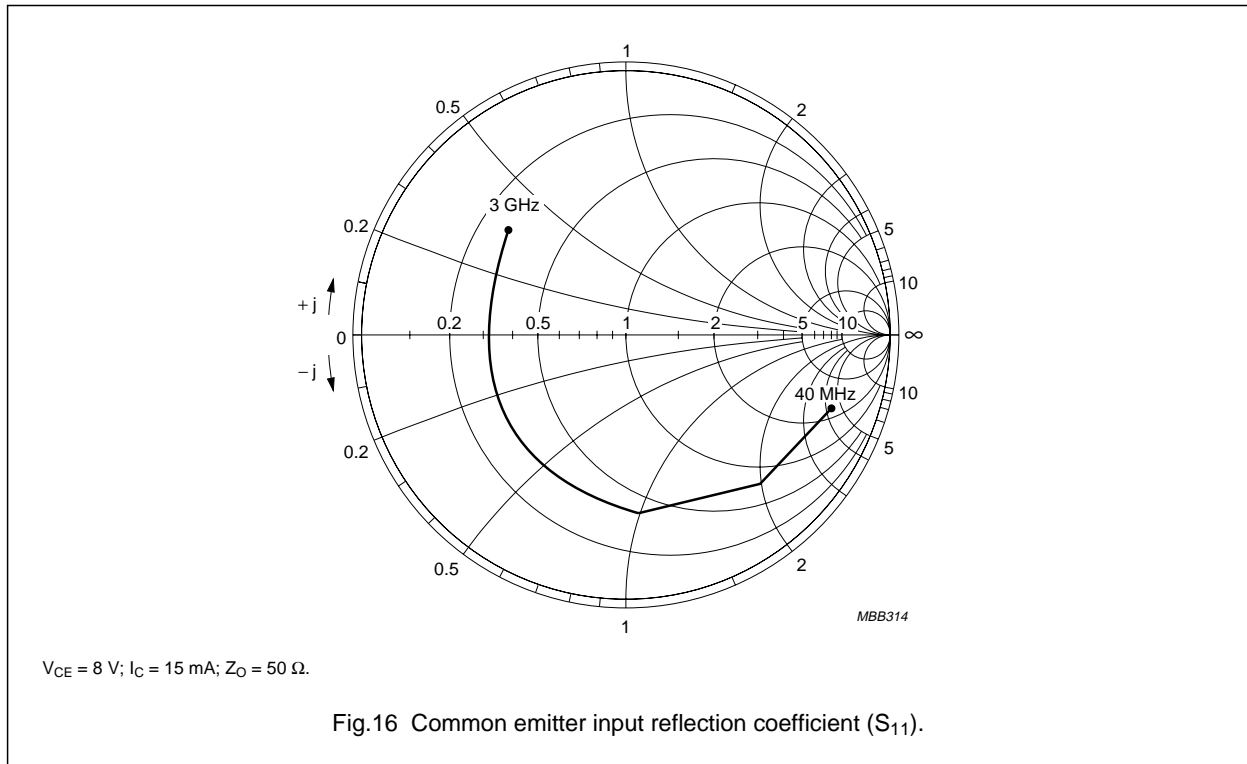
G <sub>MAX</sub> (dB)	Gamma (max)	
	(mag)	(ang)
12	0.839	-170





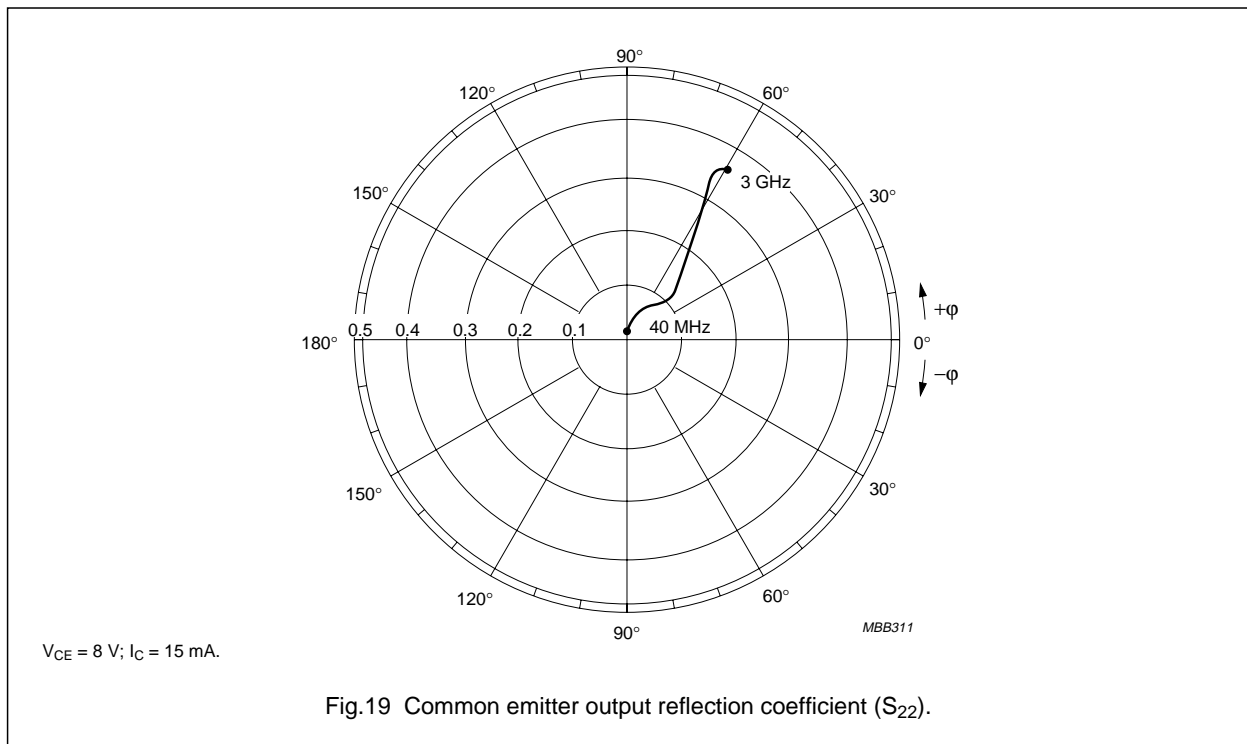
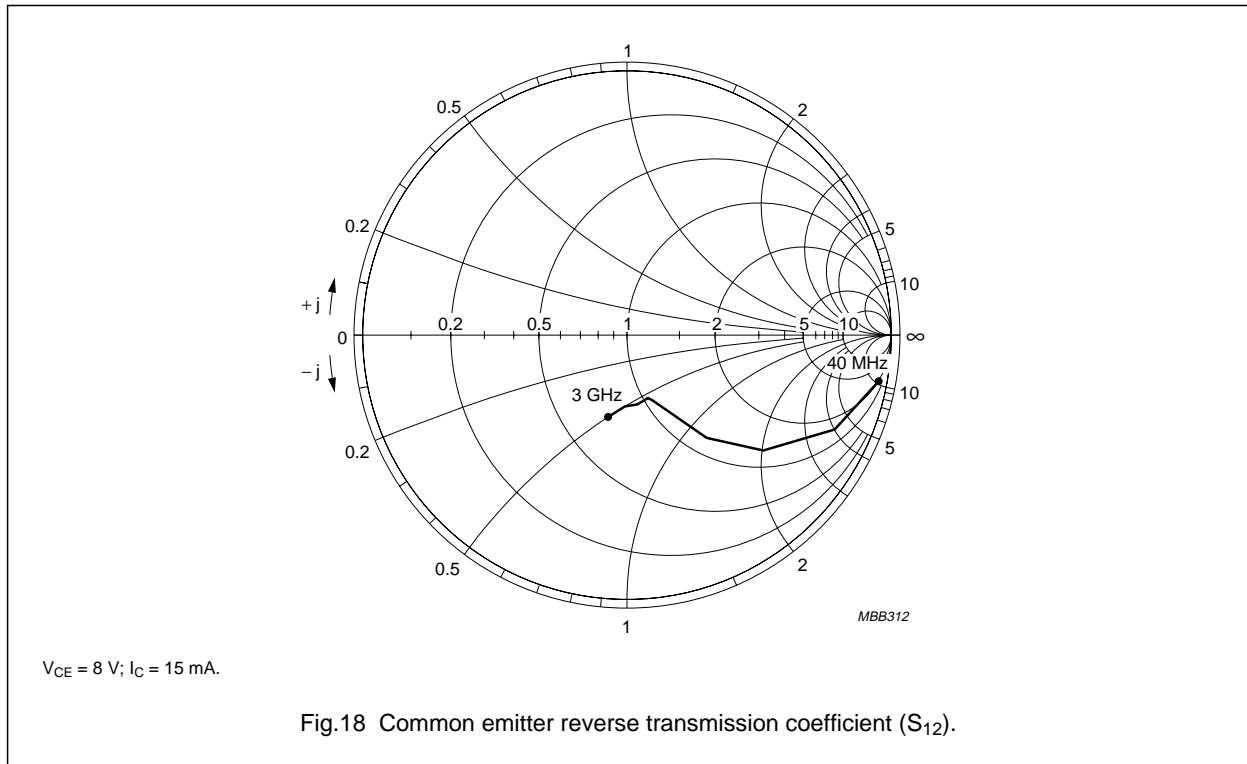
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NPN 8 GHz wideband transistors

BFG67; BFG67/X; BFG67/XR



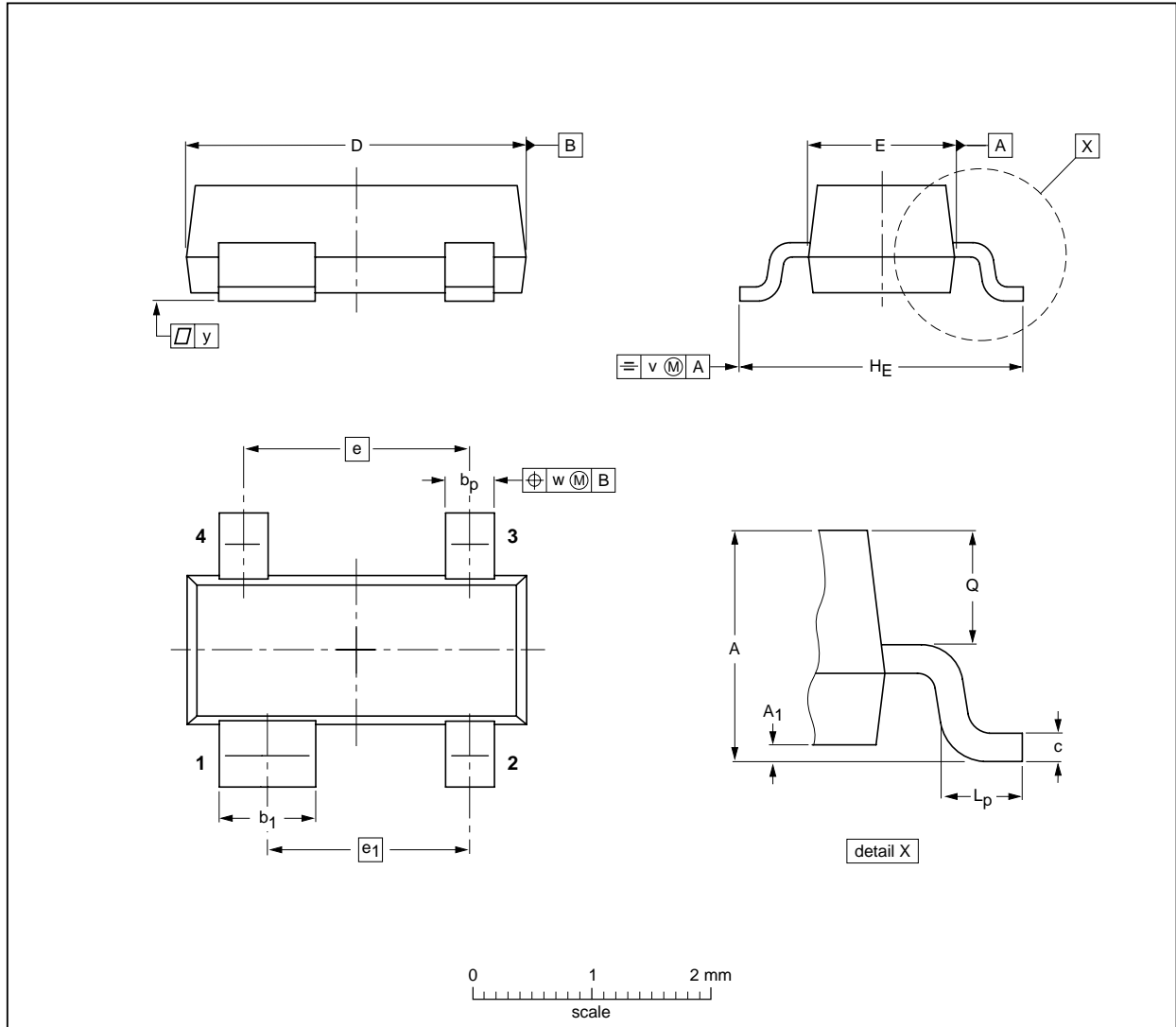
NPN 8 GHz wideband transistors

BFG67; BFG67/X; BFG67/XR

PACKAGE OUTLINES

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

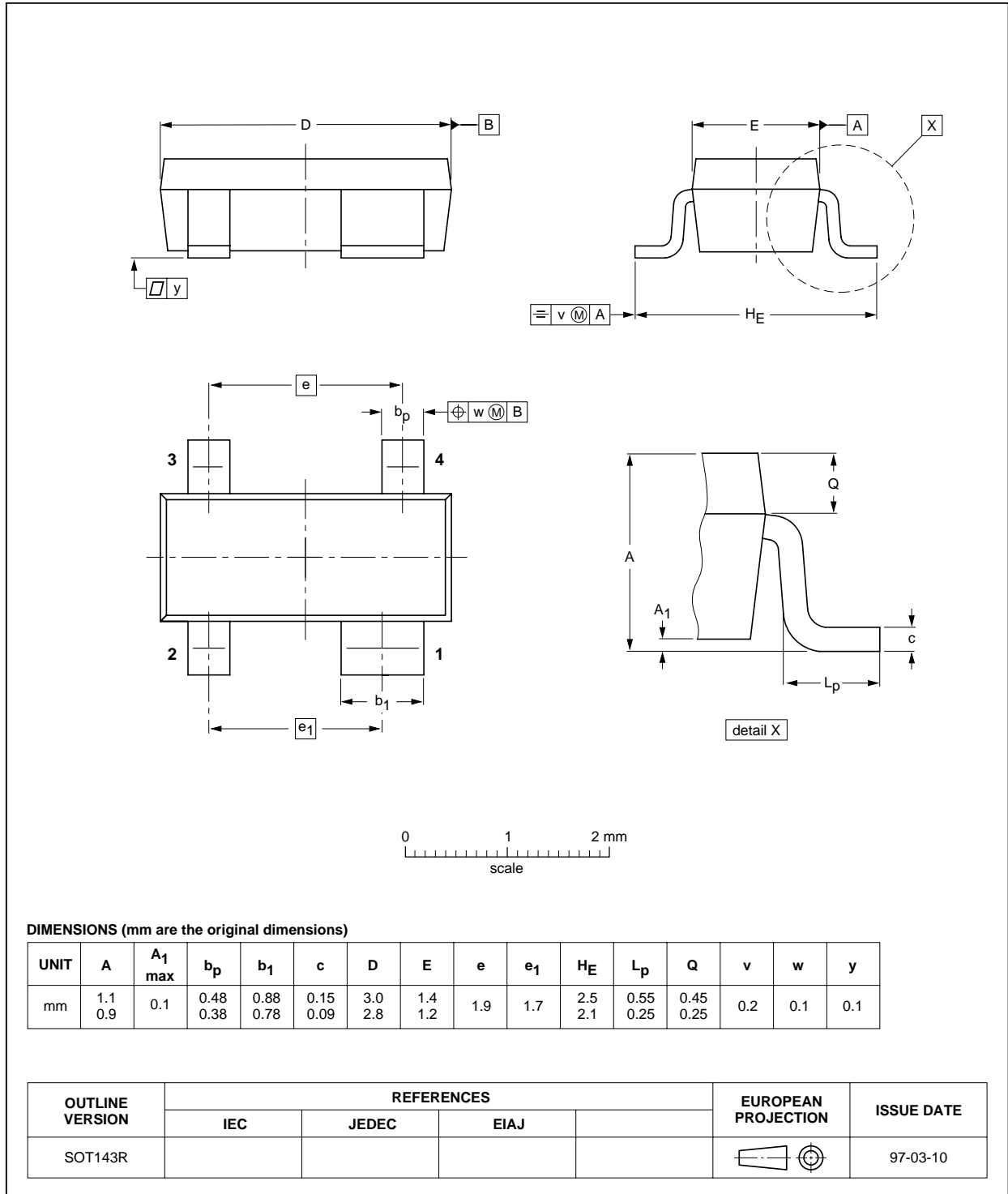
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT143B						97-02-28

NPN 8 GHz wideband transistors

BFG67; BFG67/X; BFG67/XR

Plastic surface mounted package; reverse pinning; 4 leads

SOT143R



## NPN 8 GHz wideband transistors

## BFG67; BFG67/X; BFG67/XR

**DEFINITIONS**

<b>Data Sheet Status</b>	
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.
<b>Limiting values</b>	
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.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

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These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

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NPN 8 GHz wideband transistors

BFG67; BFG67/X; BFG67/XR

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**NOTES**

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**NOTES**

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