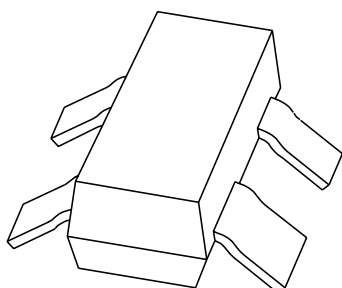


DATA SHEET



BFG93A; BFG93A/X NPN 6 GHz wideband transistors

Product specification
Supersedes data of 1995 Sep 25

1998 Sep 23

NPN 6 GHz wideband transistors

BFG93A; BFG93A/X

FEATURES

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

APPLICATIONS

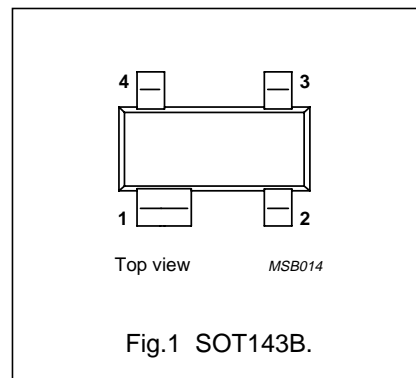
Wideband applications in the UHF and microwave range.

DESCRIPTION

NPN transistor in a 4-pin, dual-emitter SOT143B plastic package.

PINNING

PIN	DESCRIPTION
BFG93A	
1	collector
2	base
3	emitter
4	emitter
BFG93A/X	
1	collector
2	emitter
3	base
4	emitter



MARKING

TYPE NUMBER	CODE
BFG93A	R8
BFG93A/X	V15

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CB0}	collector-base voltage	open emitter	–	–	15	V
V_{CE0}	collector-emitter voltage	open base	–	–	12	V
I_C	collector current (DC)		–	–	35	mA
P_{tot}	total power dissipation	$T_s \leq 85\text{ °C}$	–	–	300	mW
C_{re}	feedback capacitance	$I_C = i_c = 0; V_{CB} = 5\text{ V}; f = 1\text{ MHz}$	–	0.6	–	pF
f_T	transition frequency	$I_C = 30\text{ mA}; V_{CE} = 5\text{ V}; f = 500\text{ MHz}$	4.5	6	–	GHz
G_{UM}	maximum unilateral power gain	$I_C = 30\text{ mA}; V_{CE} = 8\text{ V}; T_{amb} = 25\text{ °C}; f = 1\text{ GHz}$	–	16	–	dB
		$I_C = 30\text{ mA}; V_{CE} = 8\text{ V}; T_{amb} = 25\text{ °C}; f = 2\text{ GHz}$	–	10	–	dB
F	noise figure	$\Gamma_s = \Gamma_{opt}; I_C = 5\text{ mA}; V_{CE} = 8\text{ V}; T_{amb} = 25\text{ °C}; f = 1\text{ GHz}$	–	1.7	–	dB

NPN 6 GHz wideband transistors

BFG93A; BFG93A/X

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	–	15	V
V _{CEO}	collector-emitter voltage	open base	–	12	V
V _{EBO}	emitter-base voltage	open collector	–	2	V
I _C	collector current (DC)		–	35	mA
P _{tot}	total power dissipation	T _s ≤ 85 °C; note 1	–	300	mW
T _{stg}	storage temperature range		–65	+150	°C
T _j	junction operating 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.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

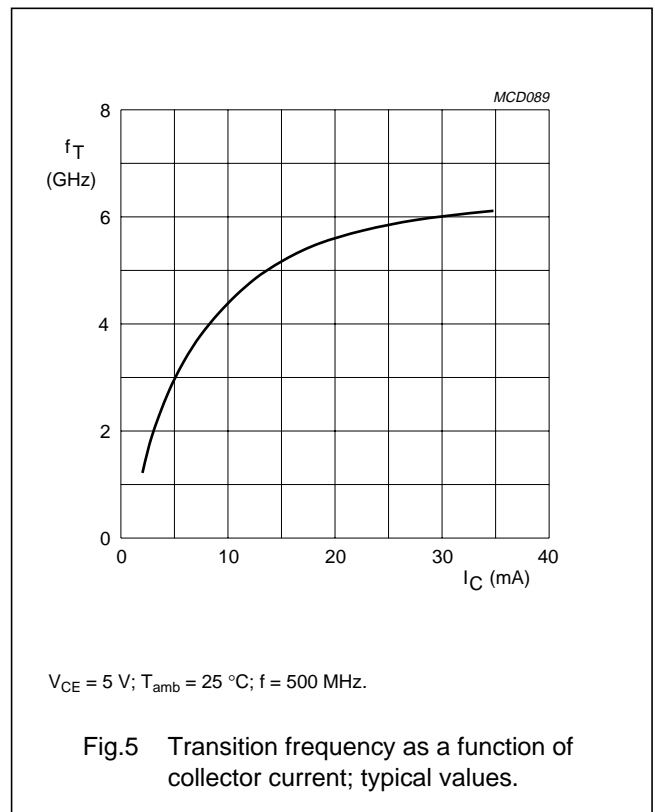
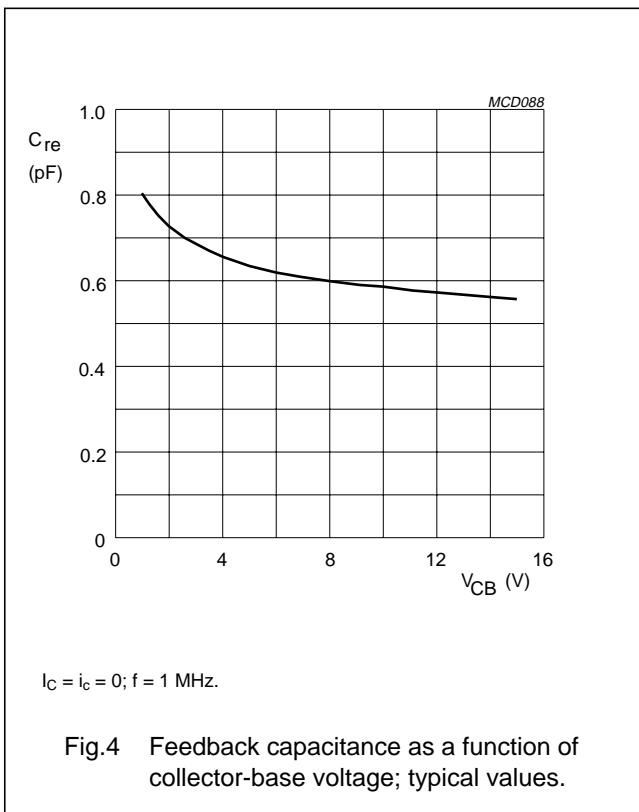
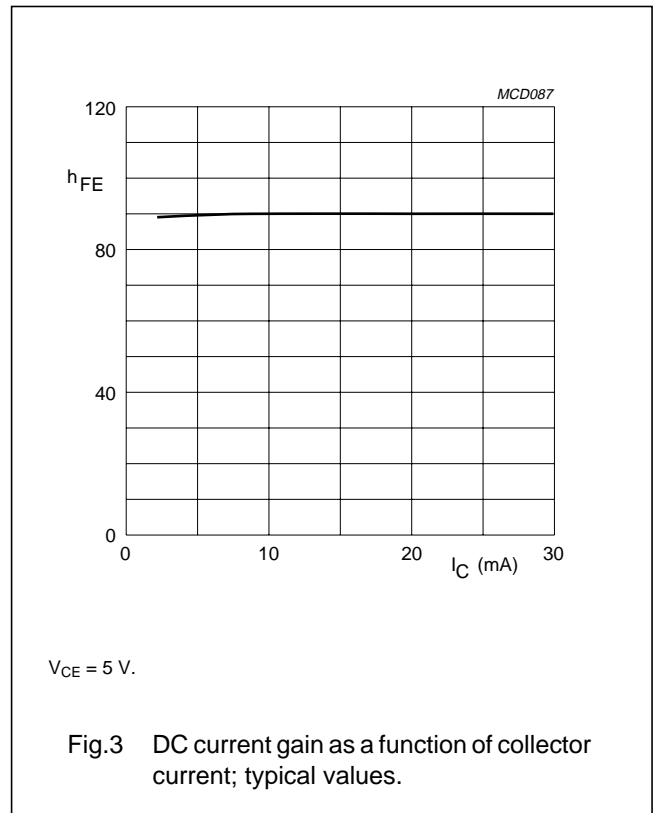
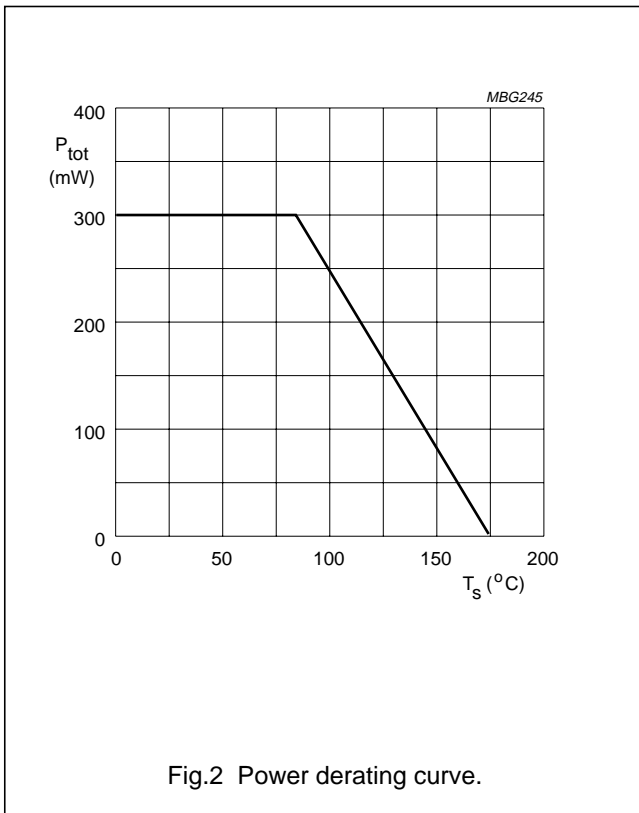
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I _{CBO}	collector leakage current	I _E = 0; V _{CB} = 5 V	–	–	50	nA
h _{FE}	DC current gain	I _C = 30 mA; V _{CE} = 5 V	40	90	–	
C _c	collector capacitance	I _E = i _e = 0; V _{CB} = 5 V; f = 1 MHz	–	0.9	–	pF
C _e	emitter capacitance	I _C = i _c = 0; V _{EB} = 5 V; f = 1 MHz	–	1.9	–	pF
C _{re}	feedback capacitance	I _C = i _c = 0; V _{CB} = 5 V; f = 1 MHz	–	0.6	–	pF
f _T	transition frequency	I _C = 30 mA; V _{CE} = 5 V; f = 500 MHz	4.5	6	–	GHz
G _{UM}	maximum unilateral power gain; note 1	I _C = 30 mA; V _{CE} = 8 V; T _{amb} = 25 °C; f = 1 GHz	–	16	–	dB
		I _C = 30 mA; V _{CE} = 8 V; T _{amb} = 25 °C; f = 2 GHz	–	10	–	dB
F	noise figure	Γ _s = Γ _{opt} ; I _C = 5 mA; V _{CE} = 8 V; T _{amb} = 25 °C; f = 1 GHz	–	1.7	–	dB
		Γ _s = Γ _{opt} ; I _C = 5 mA; V _{CE} = 8 V; T _{amb} = 25 °C; f = 2 GHz	–	2.3	–	dB

Note

1. G_{UM} is the maximum unilateral power gain, assuming S₁₂ is zero and $G_{UM} = 10 \log \frac{|S_{21}|^2}{(1 - |S_{11}|^2)(1 - |S_{22}|^2)}$ dB.

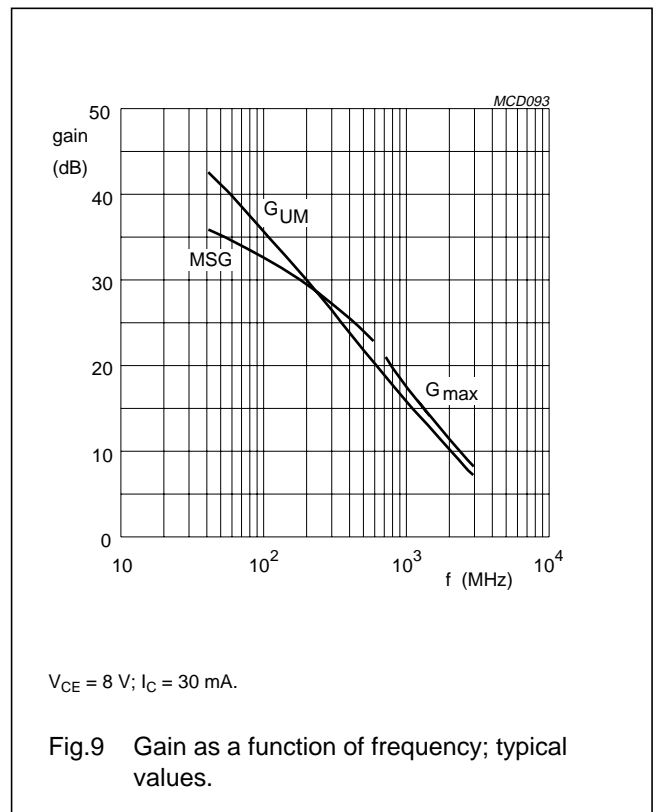
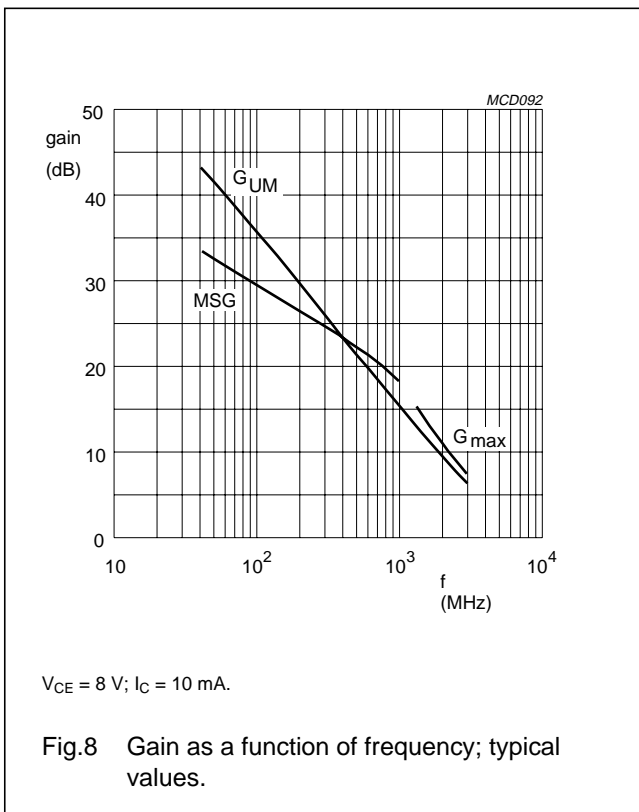
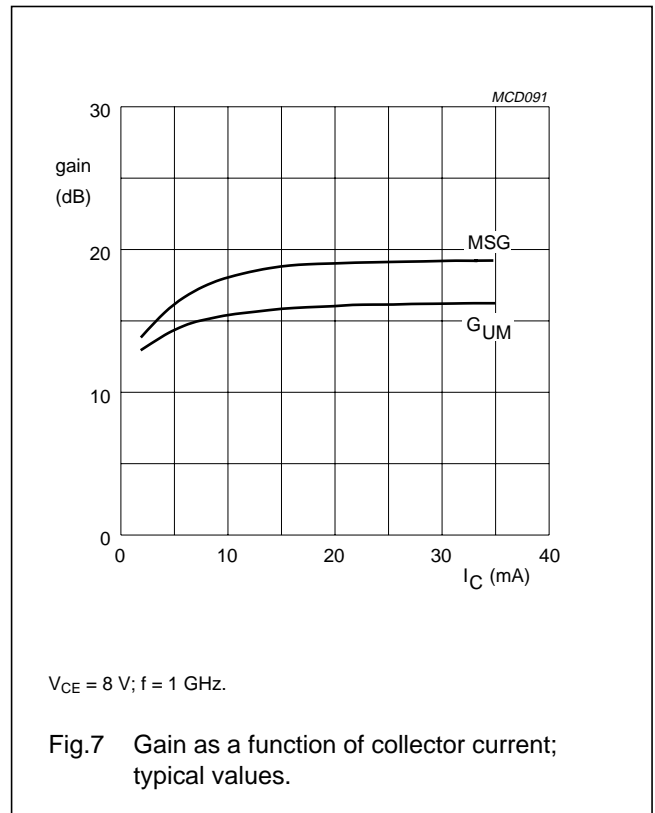
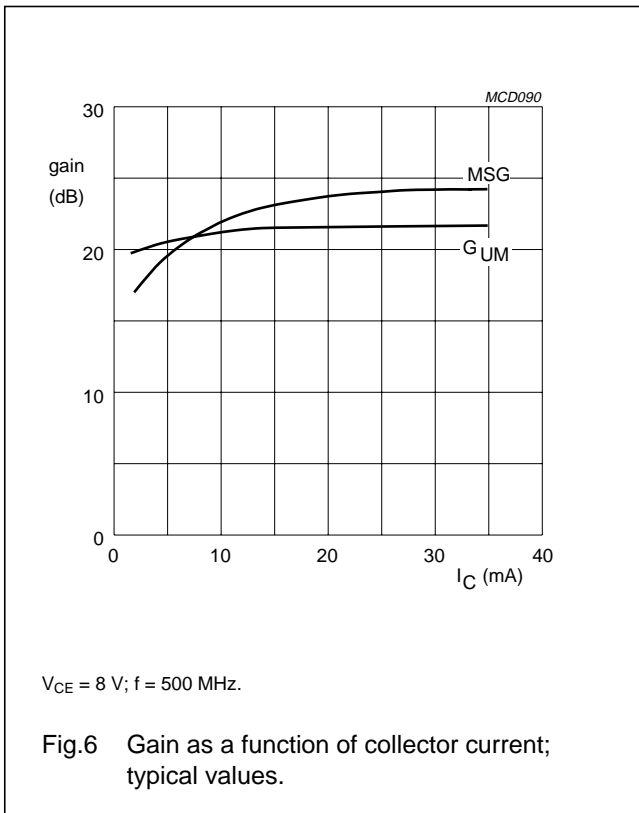
NPN 6 GHz wideband transistors

BFG93A; BFG93A/X



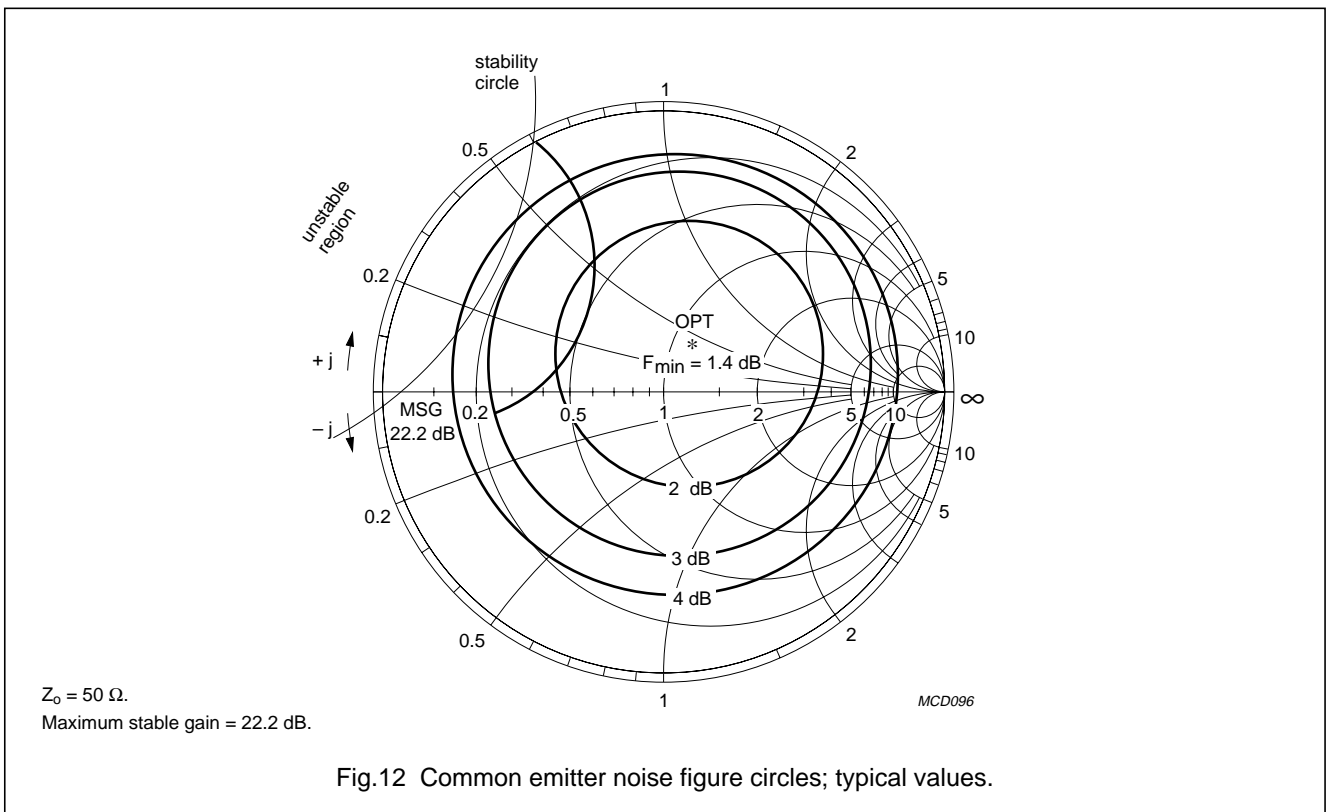
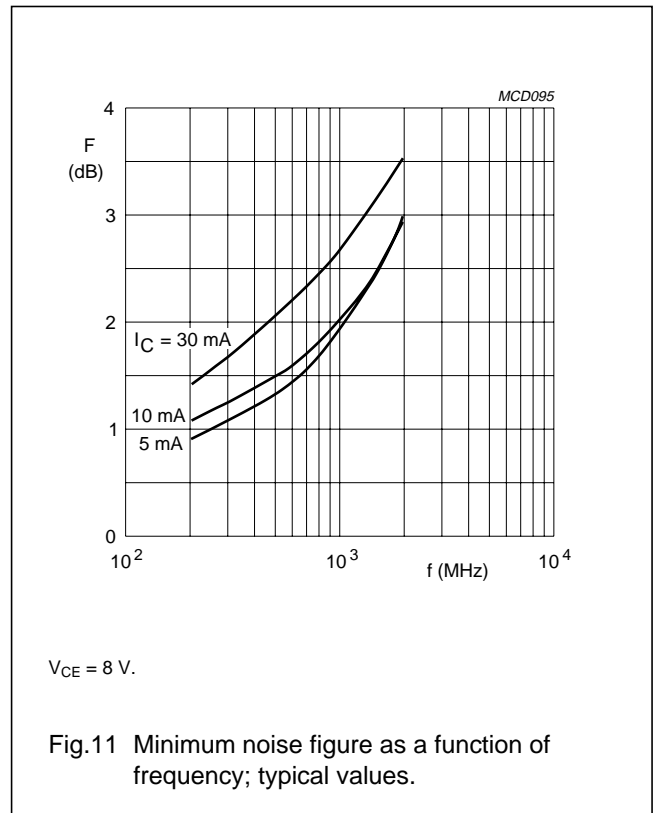
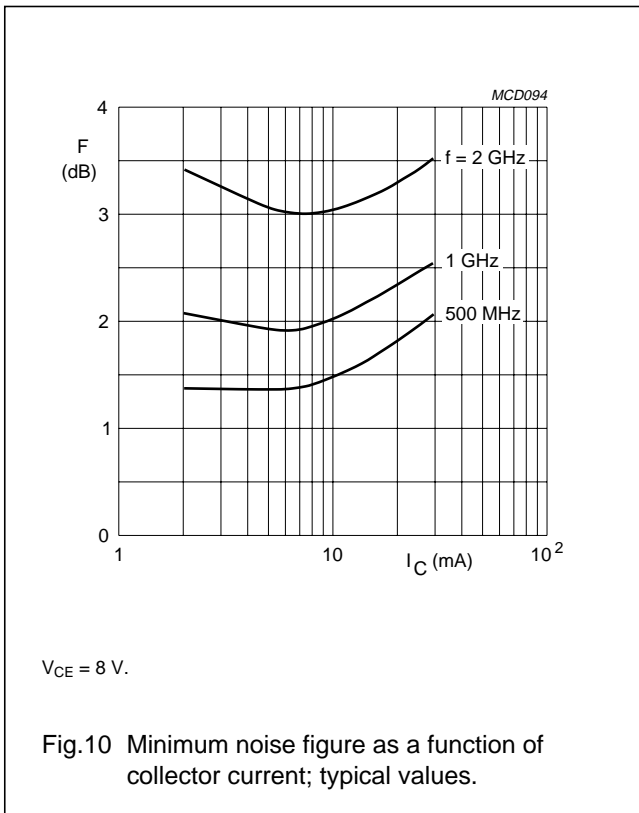
NPN 6 GHz wideband transistors

BFG93A; BFG93A/X



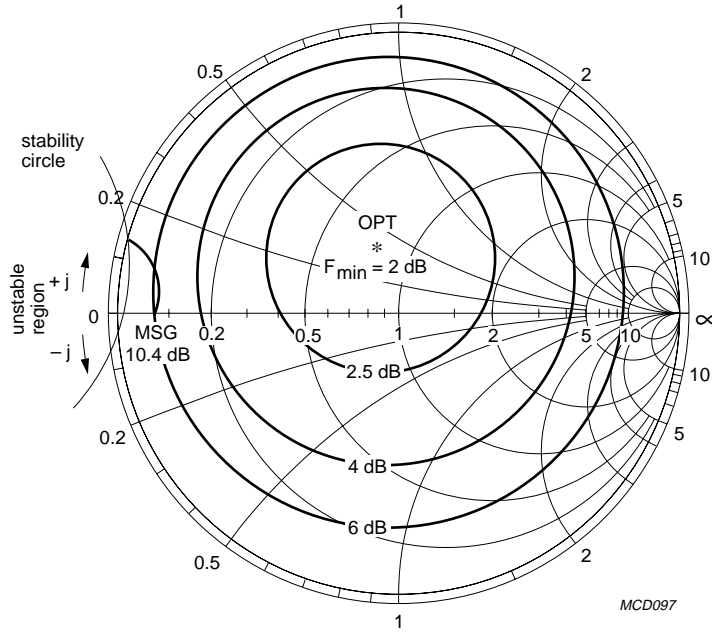
NPN 6 GHz wideband transistors

BFG93A; BFG93A/X



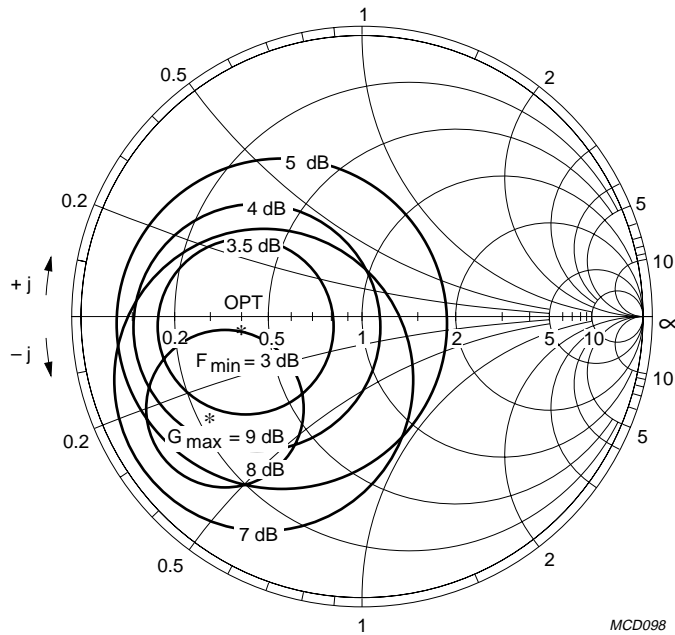
NPN 6 GHz wideband transistors

BFG93A; BFG93A/X



$Z_0 = 50 \Omega$.
Maximum stable gain = 10.4 dB.

Fig.13 Common emitter noise figure circles; typical values.

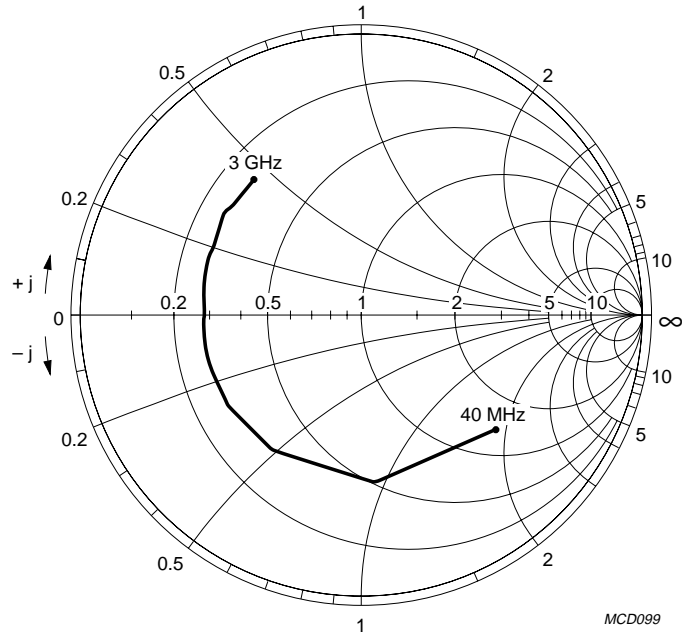


$Z_0 = 50 \Omega$.

Fig.14 Common emitter noise figure circles; typical values.

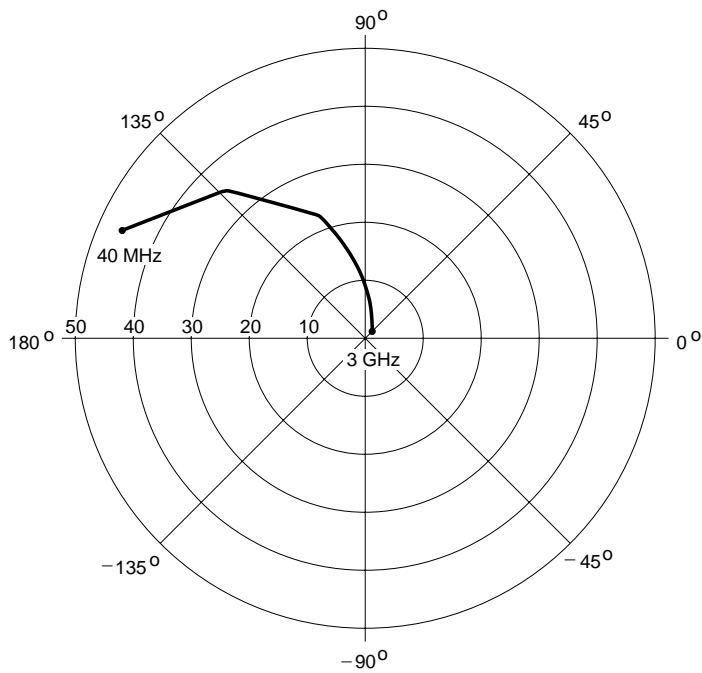
NPN 6 GHz wideband transistors

BFG93A; BFG93A/X



$V_{CE} = 8\text{ V}; I_C = 30\text{ mA}; Z_o = 50\ \Omega.$

Fig.15 Common emitter input reflection coefficient (S_{11}).



$V_{CE} = 8\text{ V}; I_C = 30\text{ mA}; R_{max} = 50\ \Omega.$

Fig.16 Common emitter forward transmission coefficient (S_{21}).

NPN 6 GHz wideband transistors

BFG93A; BFG93A/X

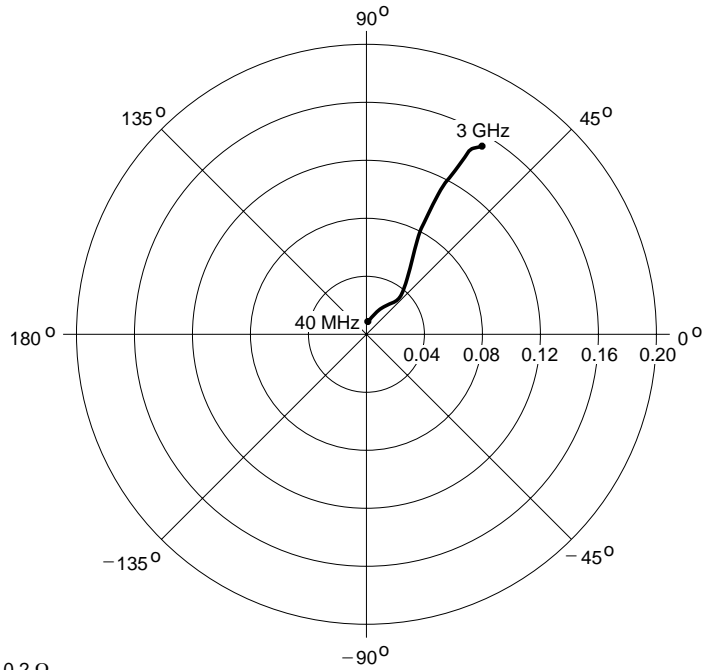


Fig.17 Common emitter reverse transmission coefficient (S_{12}).

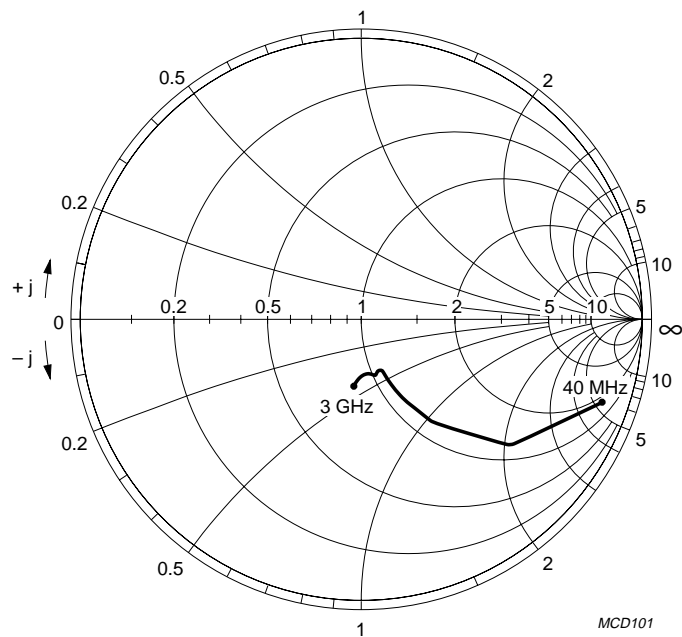


Fig.18 Common emitter output reflection coefficient (S_{22}).

NPN 6 GHz wideband transistors

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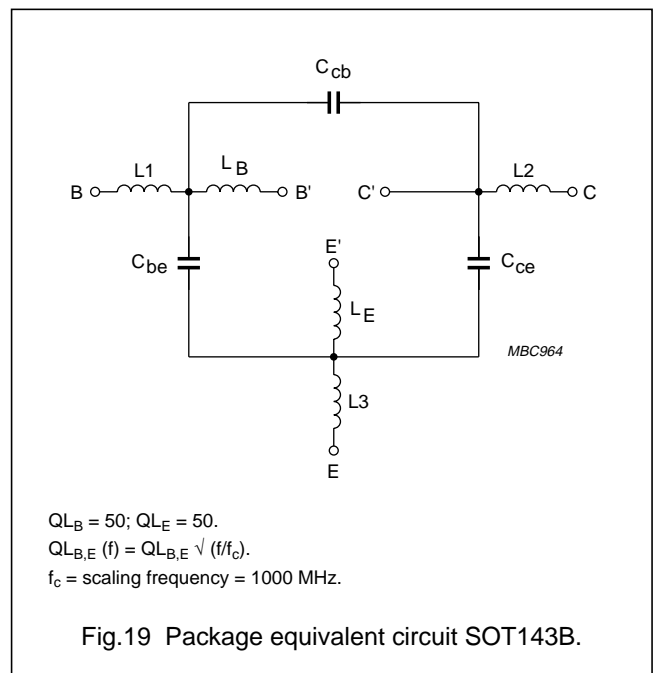
SPICE parameters for BFR91A(X) die

SEQUENCE No.	PARAMETER	VALUE	UNIT
1	IS	1.328	fA
2	BF	102.0	–
3	NF	1.000	–
4	VAF	51.90	V
5	IKF	8.155	A
6	ISE	13.90	fA
7	NE	15.12	–
8	BR	17.69	–
9	NR	994.0	m
10	VAR	3.280	V
11	IKR	10.00	A
12	ISC	1.043	aA
13	NC	1.189	–
14	RB	10.00	Ω
15	IRB	1.000	μA
16	RBM	10.00	Ω
17	RE	763.6	mΩ
18	RC	9.000	Ω
19 (note 1)	XTB	0.000	–
20 (note 1)	EG	1.110	EV
21 (note 1)	XTI	3.000	–
22	CJE	2.032	pF
23	VJE	600.0	mV
24	MJE	290.0	m
25	TF	6.557	ps
26	XTF	38.97	–
27	VTF	10.93	V
28	ITF	521.0	mA
29	PTF	0.000	deg
30	CJC	1.003	pF
31	VJC	340.8	mV
32	MJC	194.2	m
33	XCJC	120.0	m
34	TR	3.073	ns
35 (note 1)	CJS	0.000	F

SEQUENCE No.	PARAMETER	VALUE	UNIT
36 (note 1)	VJS	750.0	mV
37 (note 1)	MJS	0.000	–
38	FC	800.0	m

Note

1. These parameters have not been extracted, the default values are shown.



List of components (see Fig.19)

DESIGNATION	VALUE	UNIT
C_{be}	84	fF
C_{cb}	17	fF
C_{ce}	191	fF
L1	0.12	nH
L2	0.21	nH
L3	0.06	nH
L_B	0.95	nH
L_E	0.40	nH

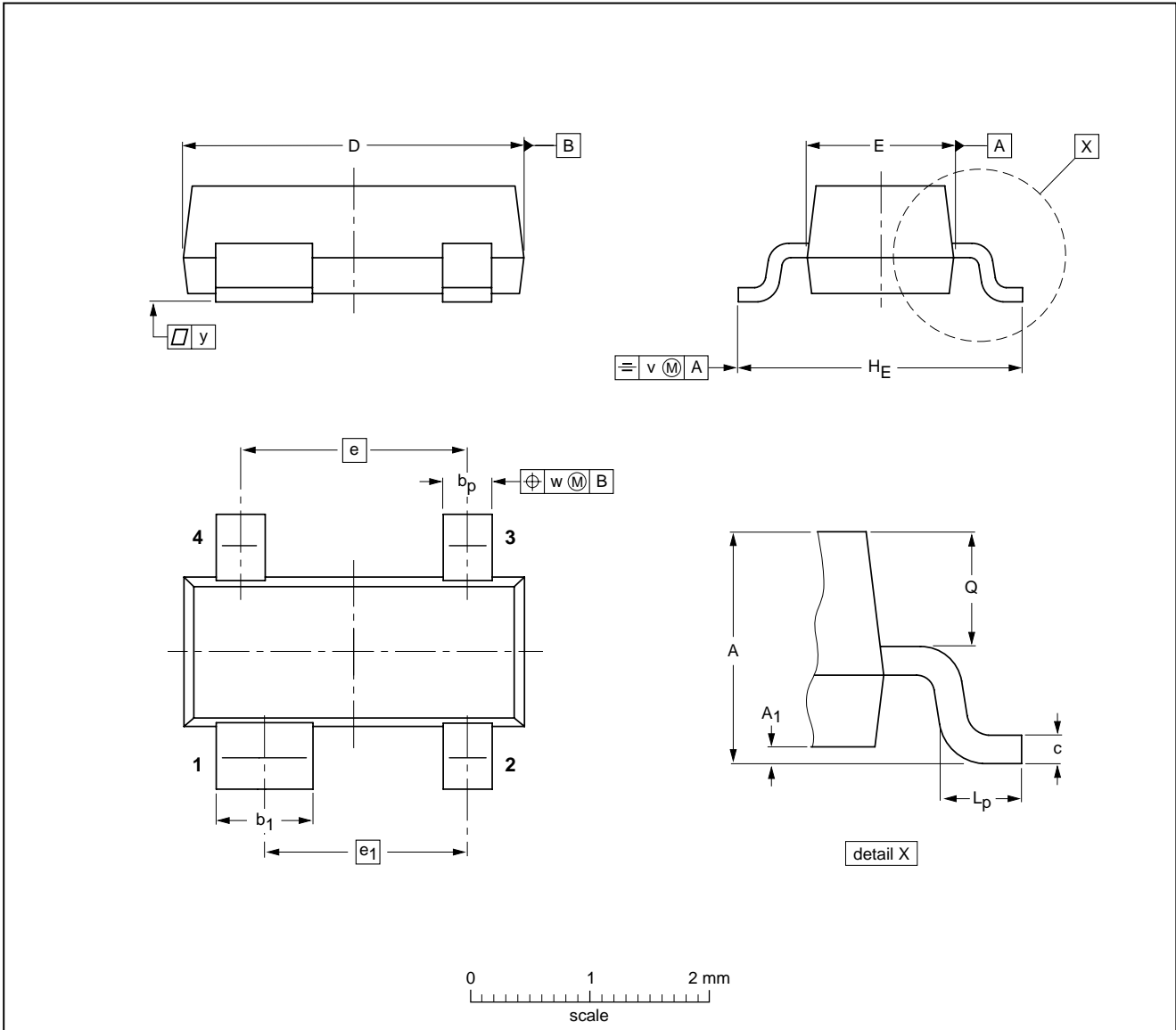
NPN 6 GHz wideband transistors

BFG93A; BFG93A/X

PACKAGE OUTLINES

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 6 GHz wideband transistors

BFG93A; BFG93A/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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NOTES

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微波光电部专业代理经销高频、微波、光纤、光电元器件、组件、部件、模块、整机；电磁兼容元器件、材料、设备；微波 CAD、EDA 软件、开发测试仿真工具；微波、光纤仪器仪表。欢迎国外高科技微波、光纤厂商将优秀产品介绍到中国、共同开拓市场。长期大量现货专业批发高频、微波、卫星、光纤、电视、CATV 器件：晶振、VCO、连接器、PIN 开关、变容二极管、开关二极管、低噪晶体管、功率电阻及电容、放大器、功率管、MMIC、混频器、耦合器、功分器、振荡器、合成器、衰减器、滤波器、隔离器、环行器、移相器、调制解调器；光电子元件和组件：红外发射管、红外接收管、光电开关、光敏管、发光二极管和发光二极管组件、半导体激光二极管和激光器组件、光电探测器和光接收组件、光发射接收模块、光纤激光器和光放大器、光调制器、光开关、DWDM 用光发射和接收器件、用户接入系统光收发器件与模块、光纤连接器、光纤跳线/尾纤、光衰减器、光纤适配器、光隔离器、光耦合器、光环行器、光复用器/转换器；无线收发芯片和模组、蓝牙芯片和模组。

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