

DATA SHEET

BFG92A; BFG92A/X; BFG92A/XR NPN 5 GHz wideband transistors

Product specification
Supersedes data of November 1992
File under discrete semiconductors, SC14

1995 Sep 12

NPN 5 GHz wideband transistors

BFG92A; BFG92A/X; BFG92A/XR

FEATURES

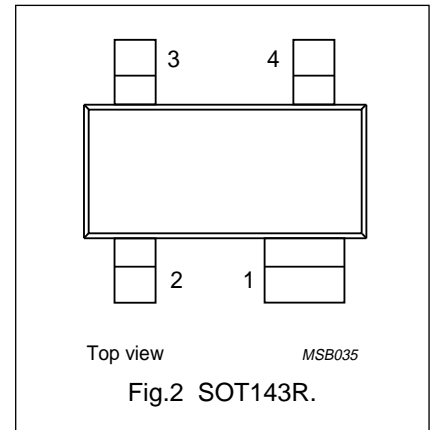
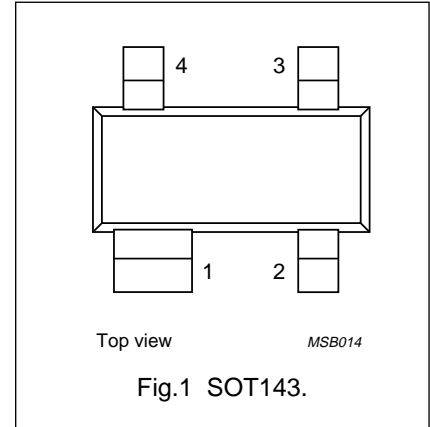
- High power gain
- Low noise figure
- Gold metallization ensures excellent reliability.

DESCRIPTION

The BFG92 is a silicon NPN transistor in a 4-pin, dual-emitter plastic SOT143 envelope. It is primarily intended for wideband applications in the UHF and microwave range.

PINNING

PIN	DESCRIPTION
BFG92A (Fig.1) Code: P8	
1	collector
2	base
3	emitter
4	emitter
BFG92A/X (Fig.1) Code: V14	
1	collector
2	emitter
3	base
4	emitter
BFG92A/XR (Fig.2) Code: V29	
1	collector
2	emitter
3	base
4	emitter



QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage		–	–	20	V
V_{CEO}	collector-emitter voltage		–	–	15	V
I_C	collector current	DC value	–	–	25	mA
P_{tot}	total power dissipation	up to $T_S = 60\text{ °C}$; note 1	–	–	400	mW
C_{re}	feedback capacitance	$I_C = I_c = 0$; $V_{CB} = 10\text{ V}$; $f = 1\text{ MHz}$	–	0.35	–	pF
f_T	transition frequency	$I_C = 15\text{ mA}$; $V_{CE} = 10\text{ V}$; $f = 500\text{ MHz}$	3.5	5	–	GHz
G_{UM}	maximum unilateral power gain	$I_C = 15\text{ mA}$; $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ °C}$; $f = 1\text{ GHz}$	–	16	–	dB
		$I_C = 15\text{ mA}$; $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ °C}$; $f = 2\text{ GHz}$	–	11	–	dB
F	noise figure	$\Gamma_S = \Gamma_{opt}$; $I_C = 5\text{ mA}$; $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ °C}$; $f = 1\text{ GHz}$	–	2.0	–	dB

Note

1. T_S is the temperature at the soldering point of the collector tab.

NPN 5 GHz wideband transistors

BFG92A; BFG92A/X;
BFG92A/XR

LIMITING VALUES

In accordance with the Absolute Maximum 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	–	2	V
I _C	collector current	DC value, continuous	–	25	mA
P _{tot}	total power dissipation	up to T _S = 60 °C; note 1	–	400	mW
T _{stg}	storage temperature range		–65	150	°C
T _j	junction temperature		–	175	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
R _{th j-s}	from junction to soldering point; note 1	290	K/W

Note

1. T_S is the temperature at the soldering point of the collector tab.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

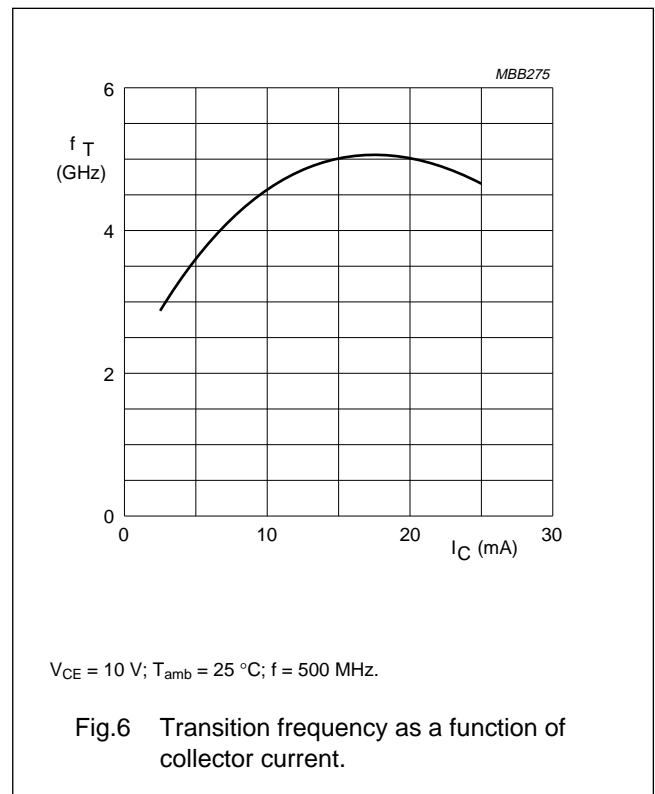
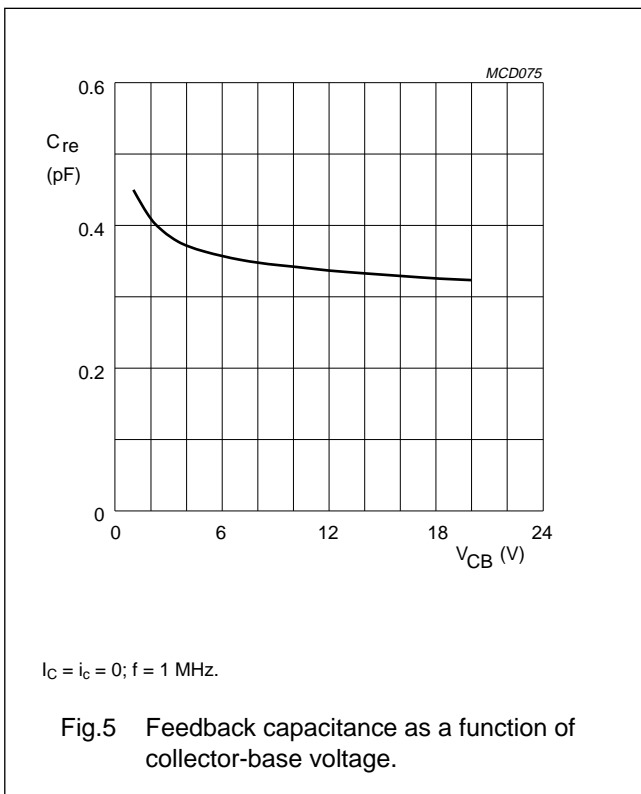
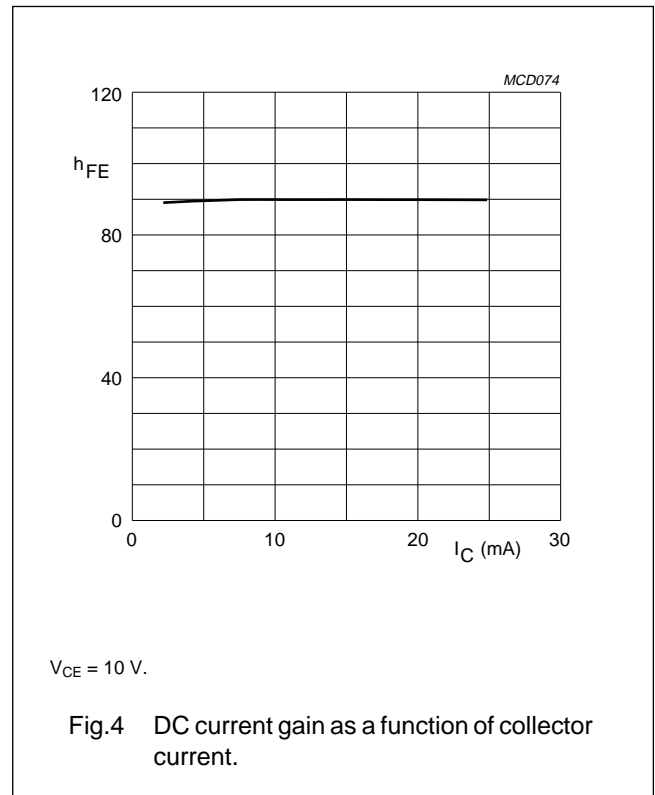
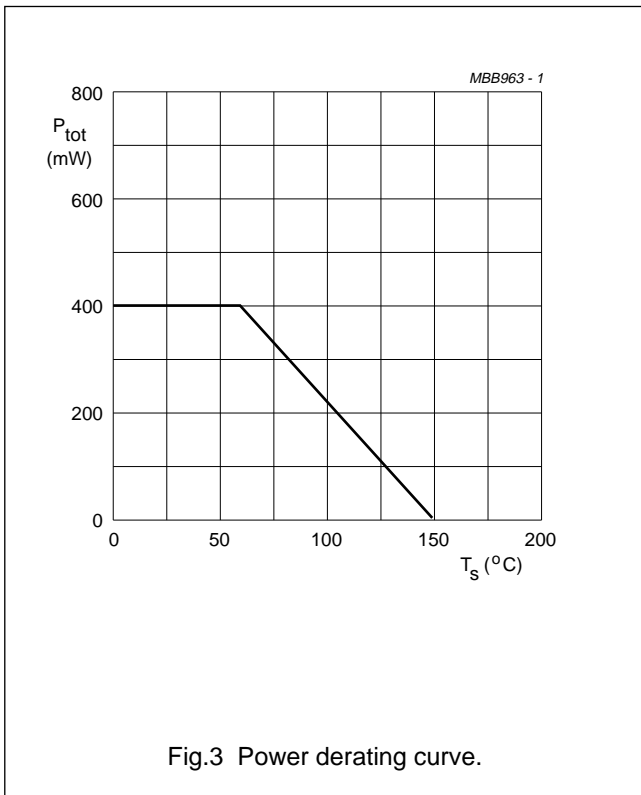
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I _{CBO}	collector leakage current	I _E = 0; V _{CB} = 10 V	–	–	50	nA
h _{FE}	DC current gain	I _C = 15 mA; V _{CE} = 10 V	40	90	–	
C _c	collector capacitance	I _E = i _e = 0; V _{CB} = 10 V; f = 1 MHz	–	0.6	–	pF
C _e	emitter capacitance	I _C = i _c = 0; V _{EB} = 10 V; f = 1 MHz	–	0.9	–	pF
C _{re}	feedback capacitance	I _C = i _c = 0; V _{CB} = 10 V; f = 1 MHz	–	0.35	–	pF
f _T	transition frequency	I _C = 15 mA; V _{CE} = 10 V; f = 500 MHz	3.5	5	–	GHz
G _{UM}	maximum unilateral power gain; note 1	I _C = 15 mA; V _{CE} = 10 V; T _{amb} = 25 °C; f = 1 GHz	–	16	–	dB
		I _C = 15 mA; V _{CE} = 10 V; T _{amb} = 25 °C; f = 2 GHz	–	11	–	dB
F	noise figure	Γ _s = Γ _{opt} ; I _C = 5 mA; V _{CE} = 10 V; T _{amb} = 25 °C; f = 1 GHz	–	2.0	–	dB
		Γ _s = Γ _{opt} ; I _C = 5 mA; V _{CE} = 10 V; T _{amb} = 25 °C; f = 2 GHz	–	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.

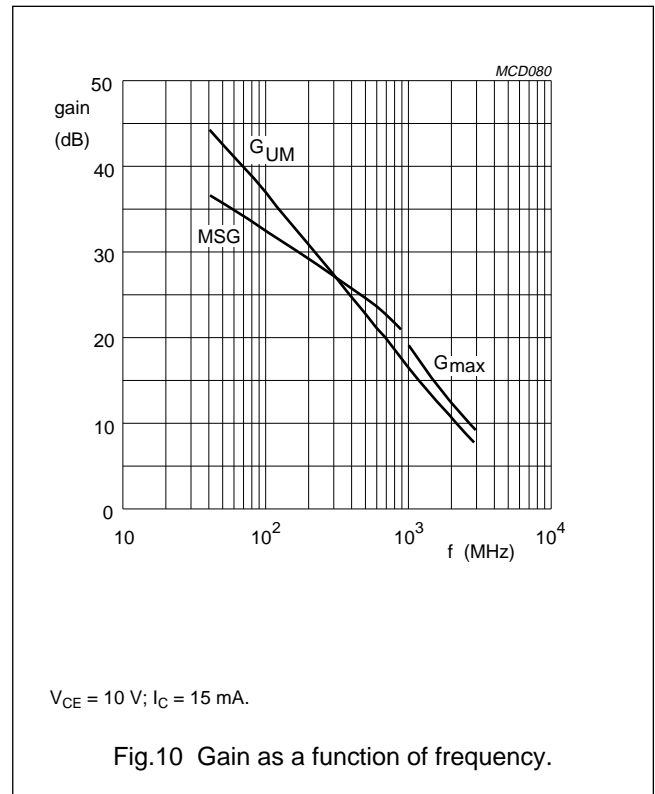
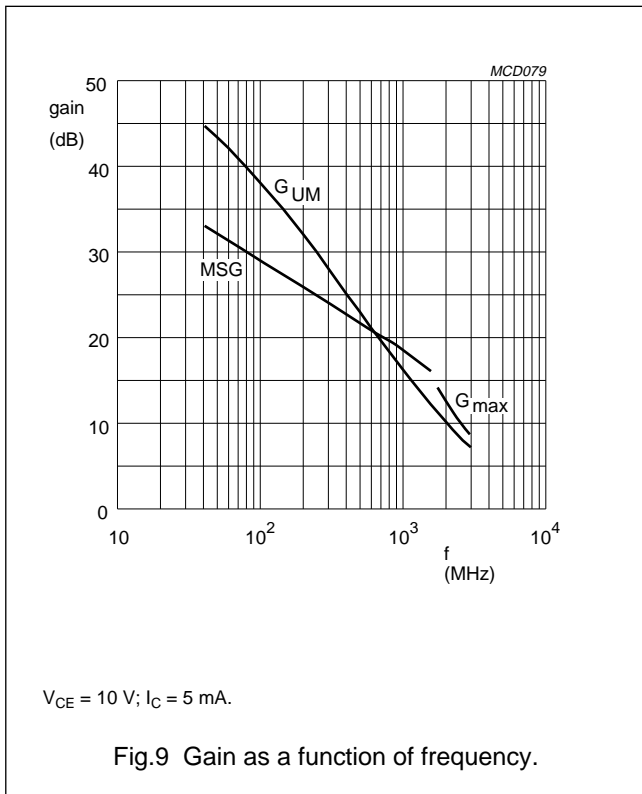
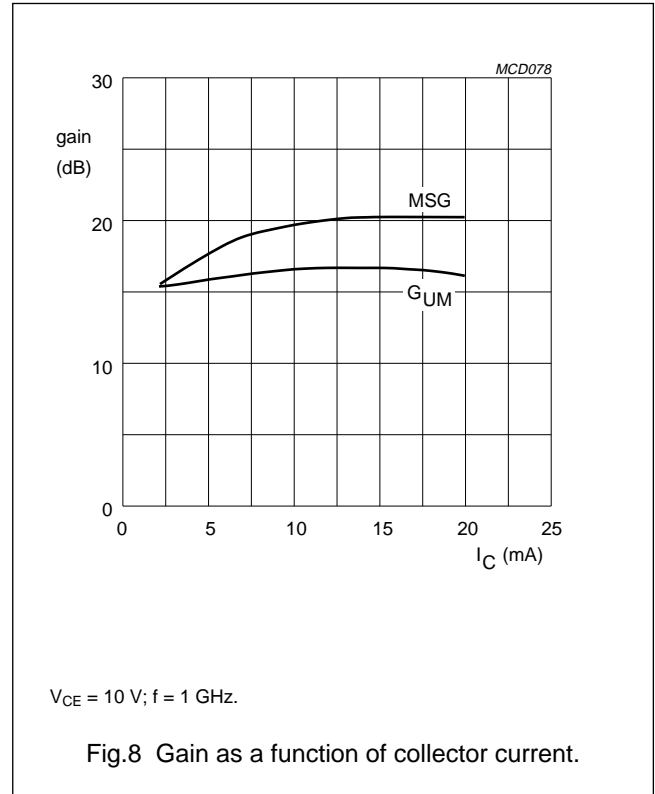
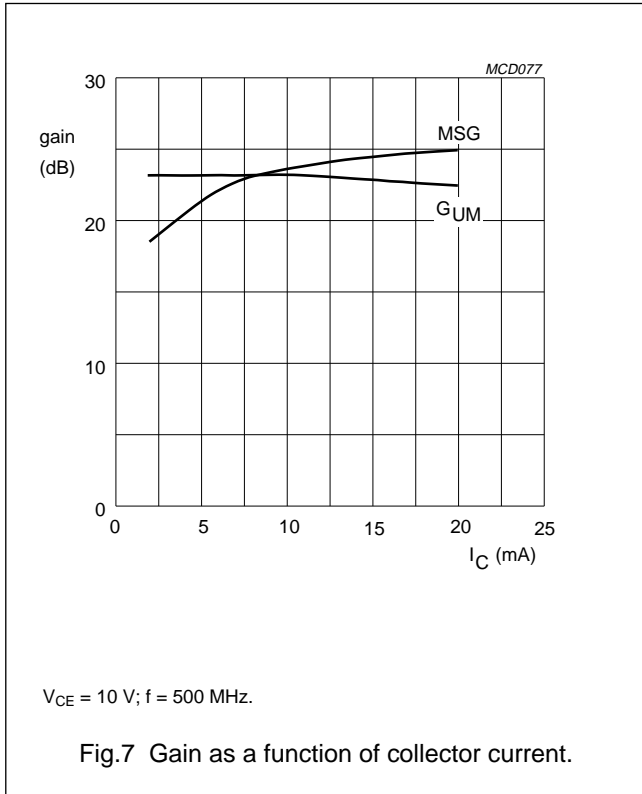
NPN 5 GHz wideband transistors

BFG92A; BFG92A/X;
BFG92A/XR



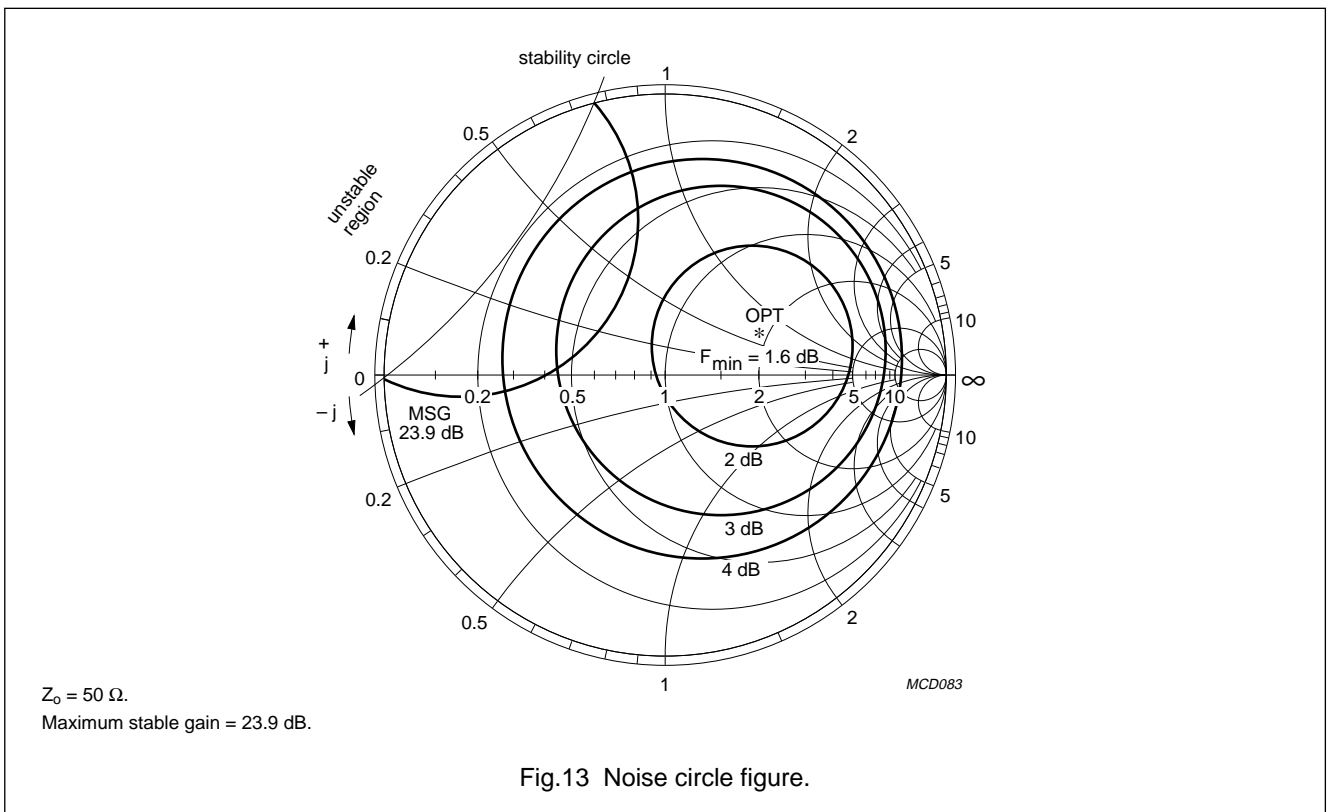
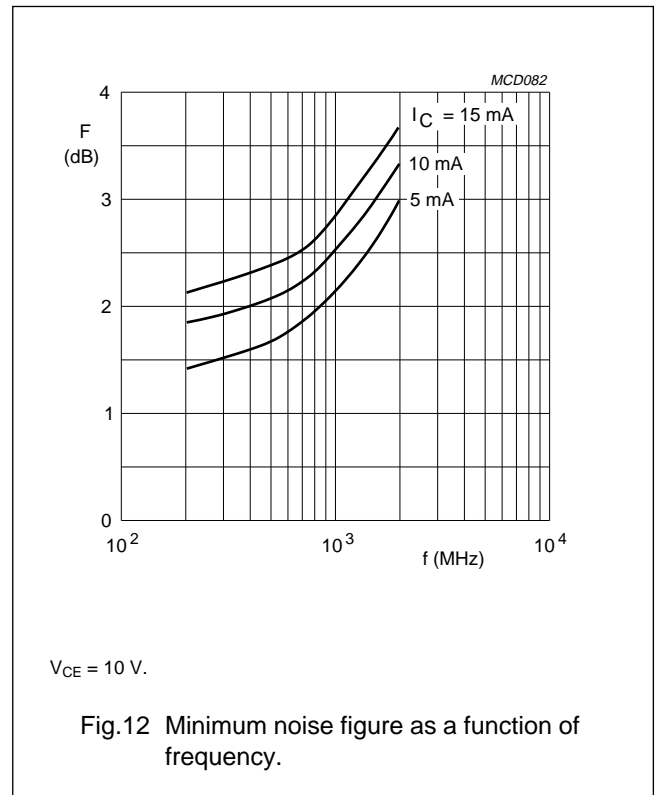
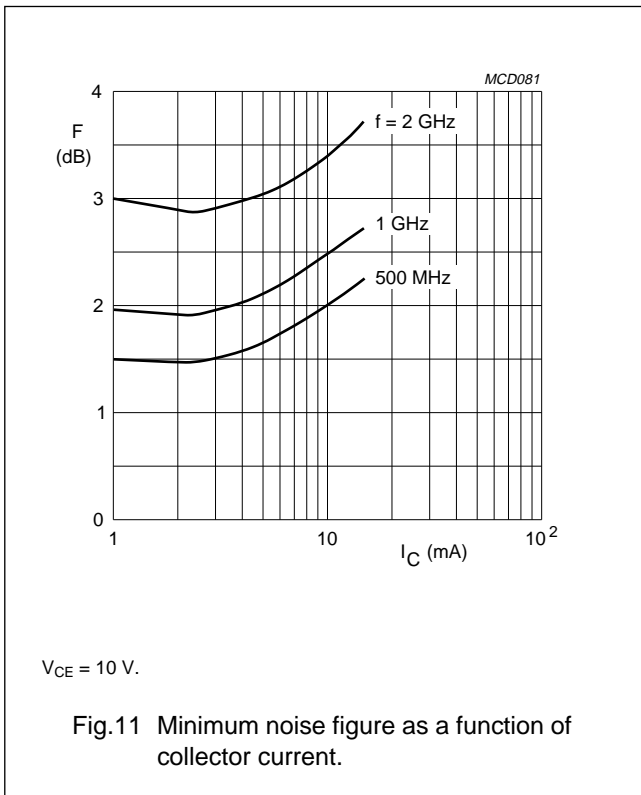
NPN 5 GHz wideband transistors

BFG92A; BFG92A/X; BFG92A/XR



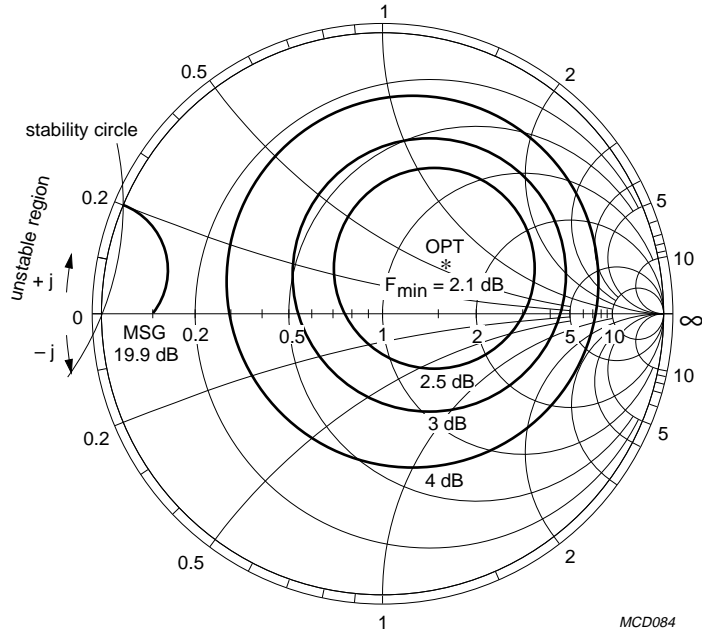
NPN 5 GHz wideband transistors

BFG92A; BFG92A/X;
BFG92A/XR



NPN 5 GHz wideband transistors

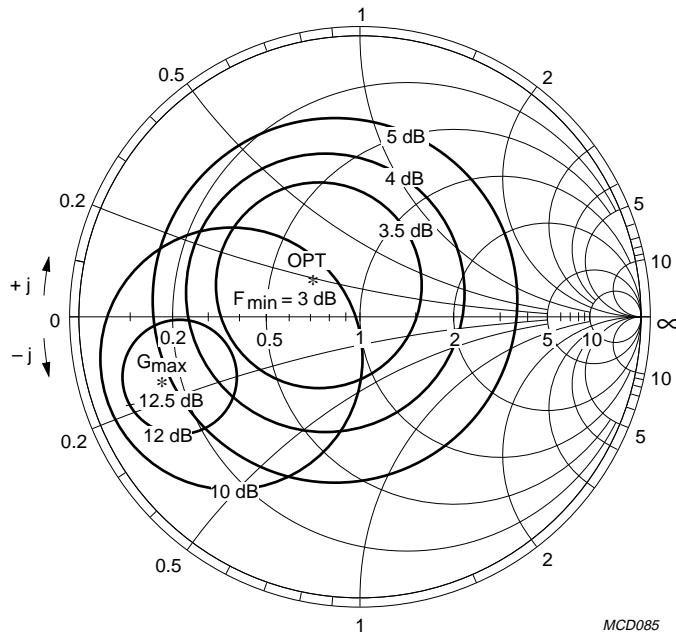
BFG92A; BFG92A/X;
BFG92A/XR



$Z_0 = 50 \Omega$.
Maximum stable gain = 19.9 dB.

MCD084

Fig.14 Noise circle figure.



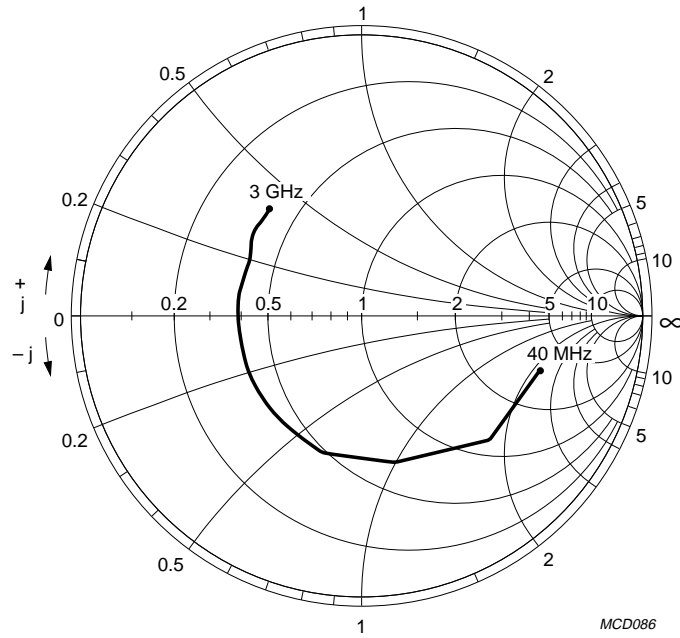
$Z_0 = 50 \Omega$.

MCD085

Fig.15 Noise circle figure.

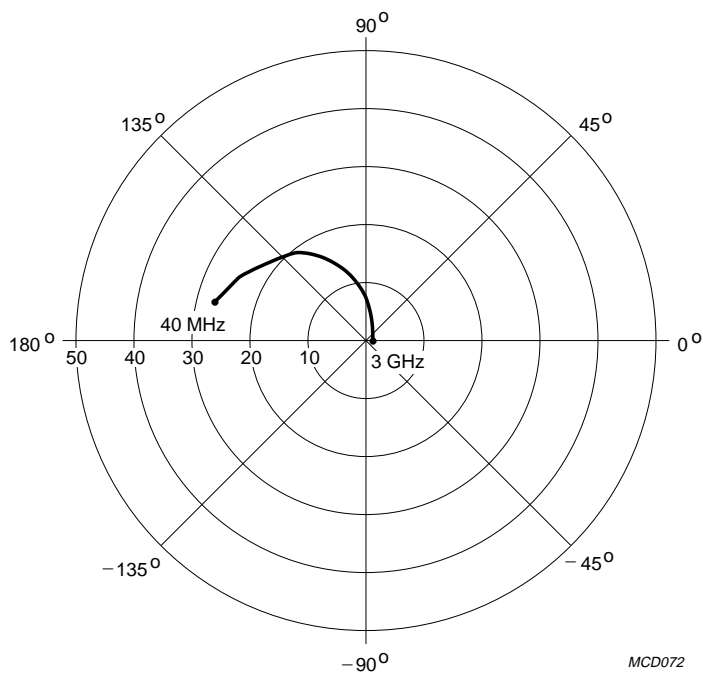
NPN 5 GHz wideband transistors

BFG92A; BFG92A/X;
BFG92A/XR



$V_{CE} = 10\text{ V}; I_C = 15\text{ mA}$.

Fig.16 Common emitter input reflection coefficient (S_{11}).

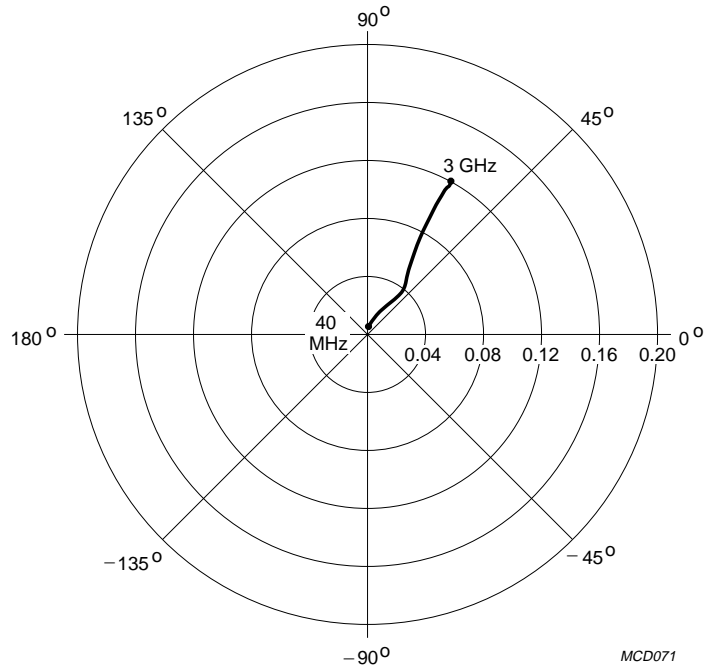


$V_{CE} = 10\text{ V}; I_C = 15\text{ mA}$.

Fig.17 Common emitter forward transmission coefficient (S_{21}).

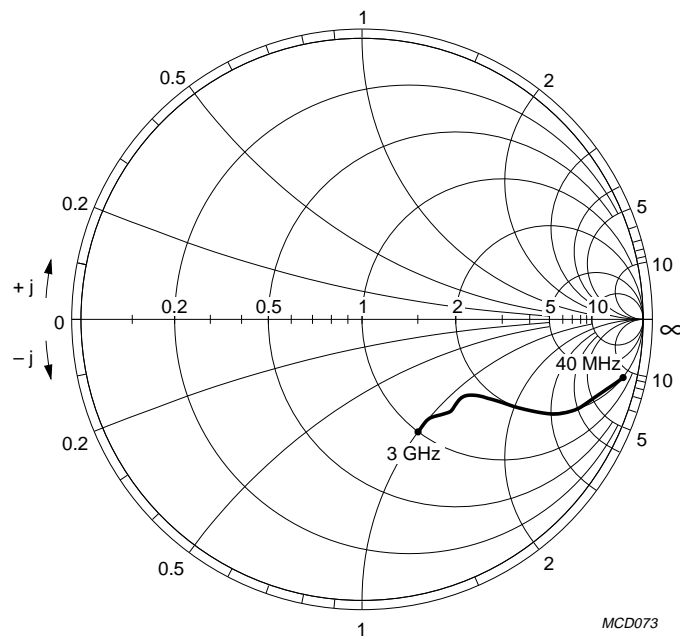
NPN 5 GHz wideband transistors

BFG92A; BFG92A/X;
BFG92A/XR



$V_{CE} = 10 \text{ V}; I_C = 15 \text{ mA}.$

Fig.18 Common emitter reverse transmission coefficient (S_{12}).



$V_{CE} = 10 \text{ V}; I_C = 15 \text{ mA}.$

Fig.19 Common emitter output reflection coefficient (S_{22}).

NPN 5 GHz wideband transistors

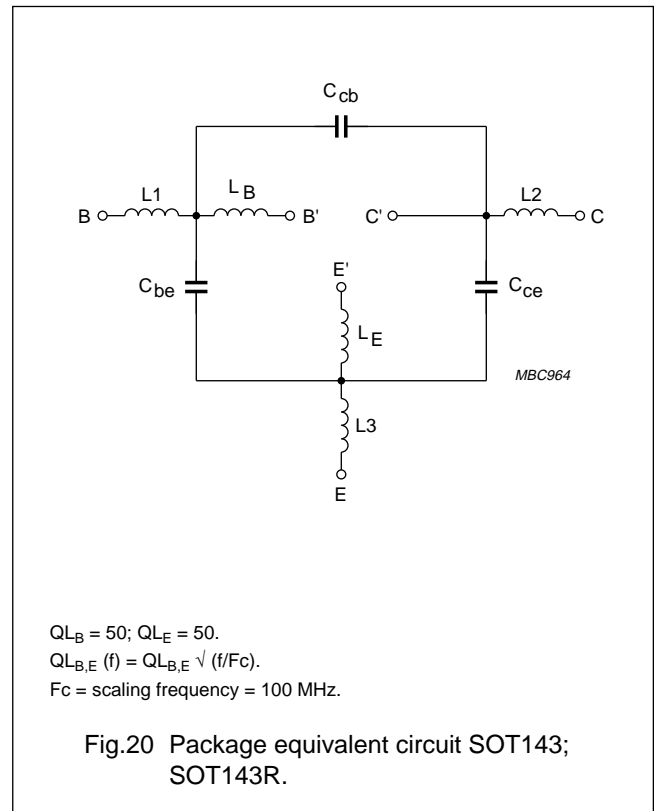
BFG92A; BFG92A/X;
BFG92A/XR

SPICE parameters for BFR90A crystal

SEQUENCE No.	PARAMETER	VALUE	UNIT
1	IS	411.8	aA
2	BF	102.6	–
3	NF	997.2	m
4	VAF	62.67	V
5	IKF	3.200	A
6	ISE	4.010	fA
7	NE	1.577	–
8	BR	18.10	–
9	NR	996.2	m
10	VAR	3.369	V
11	IKR	1.281	A
12	ISC	279.9	aA
13	NC	1.075	–
14	RB	10.00	Ω
15	IRB	1.000	μA
16	RBM	10.00	Ω
17	RE	1.164	Ω
18	RC	2.320	Ω
19 (note 1)	XTB	0.000	–
20 (note 1)	EG	1.110	EV
21 (note 1)	XTI	3.000	–
22	CJE	890.5	fF
23	VJE	600.0	mV
24	MJE	258.5	m
25	TF	15.49	ps
26	XTF	39.14	–
27	VTF	2.152	V
28	ITF	213.7	mA
29	PTF	0.000	deg
30	CJC	546.5	fF
31	VJC	380.8	mV
32	MJC	202.9	m
33	XCJC	150.0	m
34	TR	5.618	ns
35 (note 1)	CJS	0.000	F
36 (note 1)	VJS	750.0	mV
37 (note 1)	MJS	0.000	–
38	FC	850.0	m

Note

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



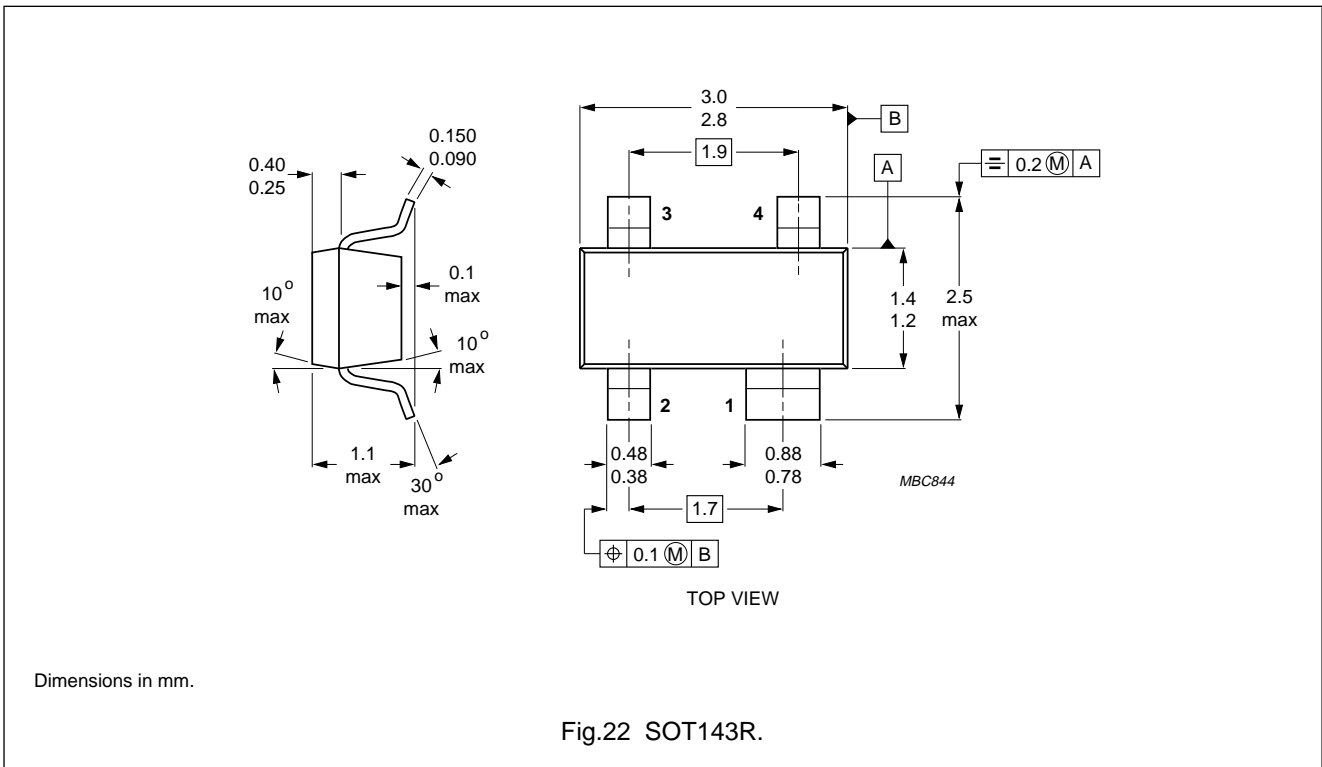
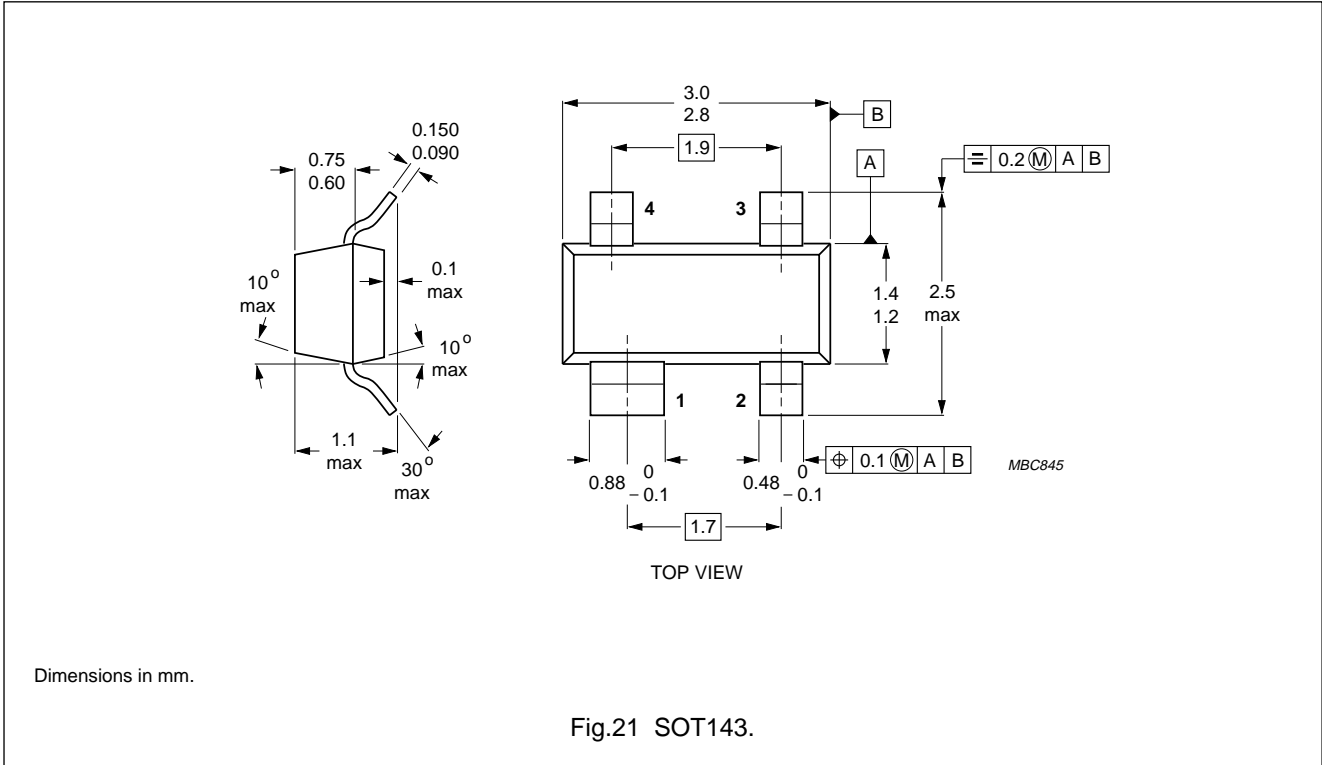
List of components (see Fig.20)

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 5 GHz wideband transistors

BFG92A; BFG92A/X;
BFG92A/XR

PACKAGE OUTLINES



NPN 5 GHz wideband transistors

BFG92A; BFG92A/X;
BFG92A/XR**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.	

LIFE SUPPORT APPLICATIONS

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.