

BFG92A/X

NPN 5 GHz wideband transistor

Rev. 06 — 12 March 2008

Product data sheet

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FEATURES

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

APPLICATIONS

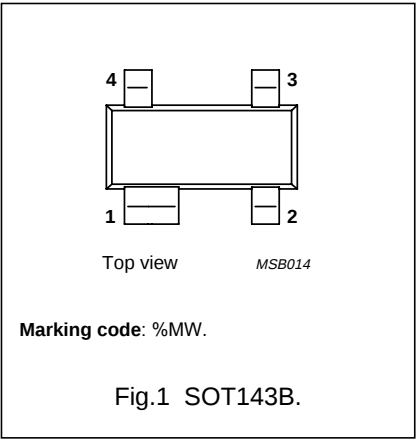
Wideband applications in the UHF and microwave range.

DESCRIPTION

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

PINNING

PIN	DESCRIPTION
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)		–	–	25	mA
P_{tot}	total power dissipation	$T_s \leq 60\text{ }^{\circ}\text{C}$	–	–	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	$I_C = 15\text{ mA}$; $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; $f = 1\text{ GHz}$	–	16	–	dB
		$I_C = 15\text{ mA}$; $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; $f = 2\text{ GHz}$	–	11	–	dB
F	noise figure	$\Gamma_s = \Gamma_{opt}$; $I_C = 5\text{ mA}$; $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; $f = 1\text{ GHz}$	–	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	–	15	V
V_{EBO}	emitter-base voltage	open collector	–	2	V
I_C	collector current (DC)		–	25	mA
P_{tot}	total power dissipation	$T_s \leq 60\text{ °C}$; note 1	–	400	mW
T_{stg}	storage temperature range		–65	150	°C
T_j	junction temperature		–	175	°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.

CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector leakage current	$I_E = 0$; $V_{CB} = 10\text{ V}$	–	–	50	nA
h_{FE}	DC current gain	$I_C = 15\text{ mA}$; $V_{CE} = 10\text{ V}$	65	90	135	
C_c	collector capacitance	$I_E = i_e = 0$; $V_{CB} = 10\text{ V}$; $f = 1\text{ MHz}$	–	0.6	–	pF
C_e	emitter capacitance	$I_C = i_c = 0$; $V_{EB} = 10\text{ V}$; $f = 1\text{ MHz}$	–	0.9	–	pF
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; note 1	$I_C = 15\text{ mA}$; $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ °C}$; $f = 1\text{ GHz}$	–	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	–	dB
		$\Gamma_s = \Gamma_{opt}$; $I_C = 5\text{ mA}$; $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ °C}$; $f = 2\text{ GHz}$	–	3	–	dB

Note

- 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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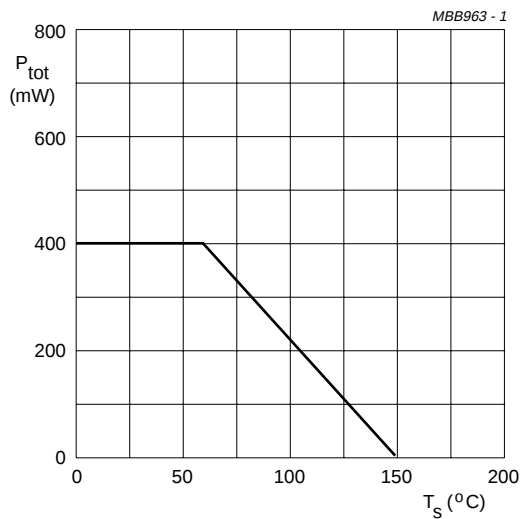
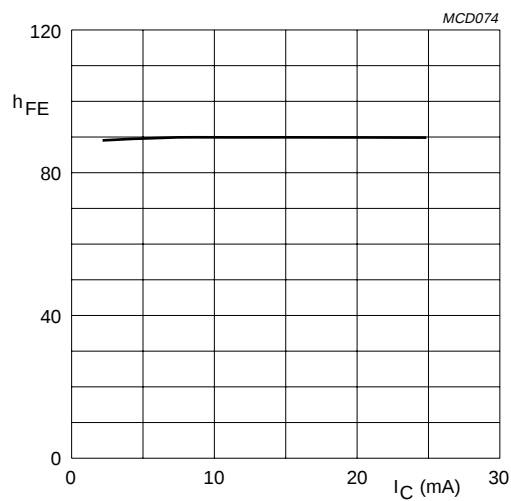
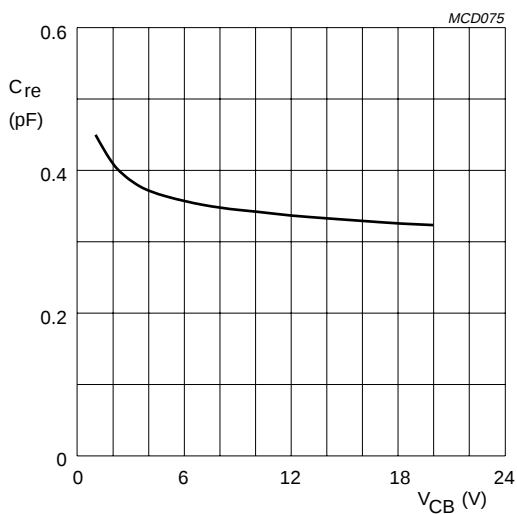


Fig.2 Power derating curve.



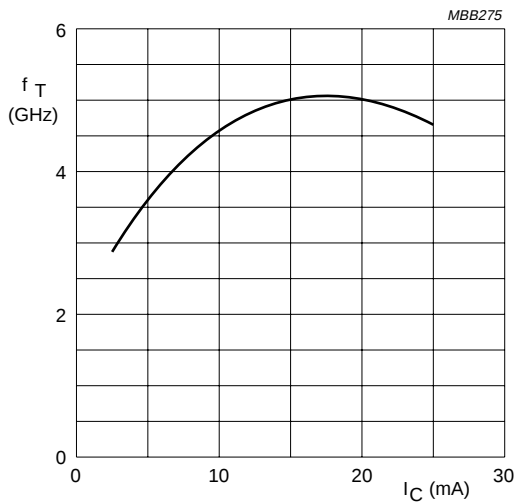
$V_{CE} = 10$ V.

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



$I_C = i_c = 0$; $f = 1$ MHz.

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

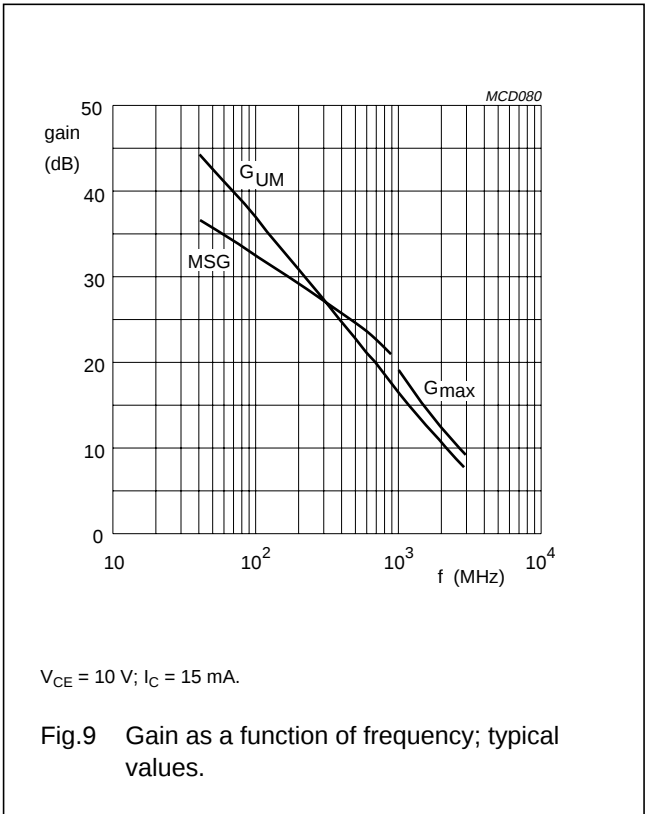
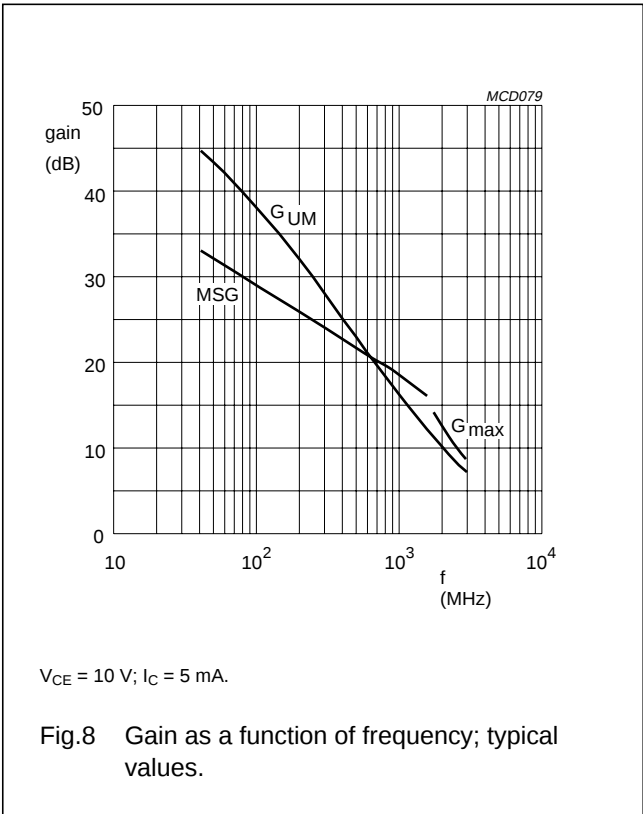
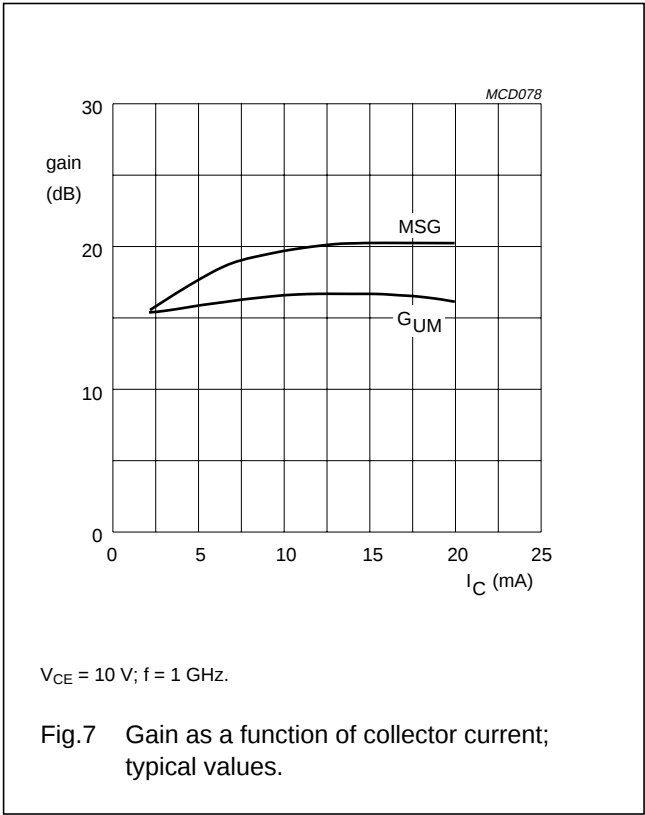
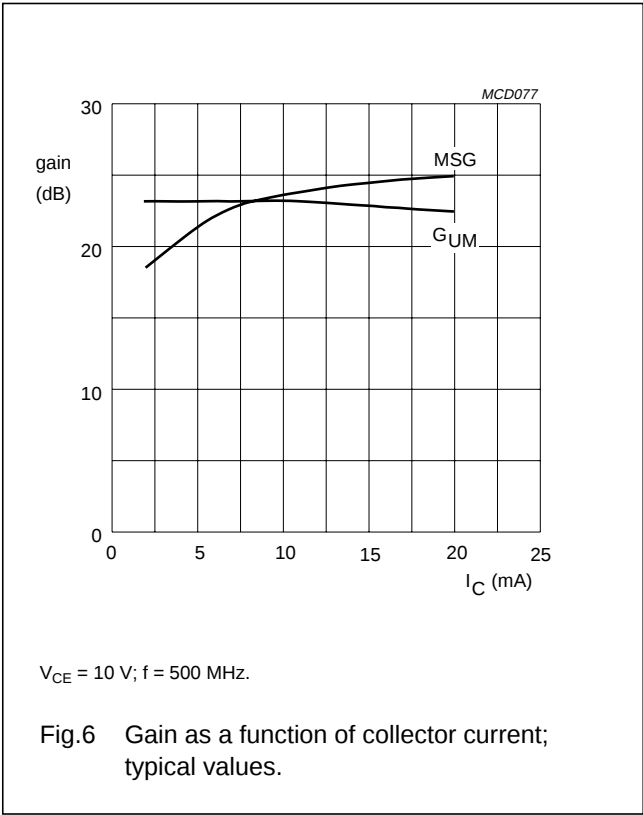


$V_{CE} = 10$ V; $T_{amb} = 25$ °C; $f = 500$ MHz.

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

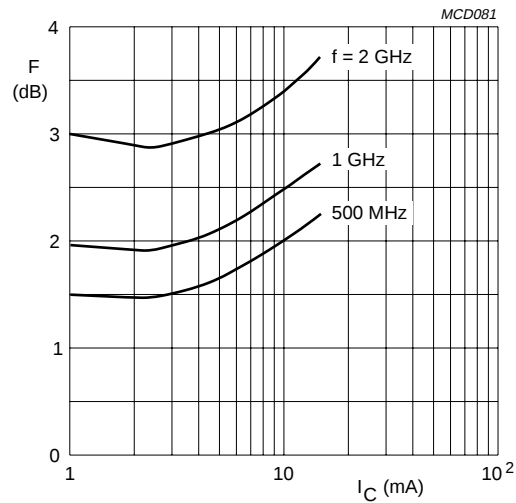
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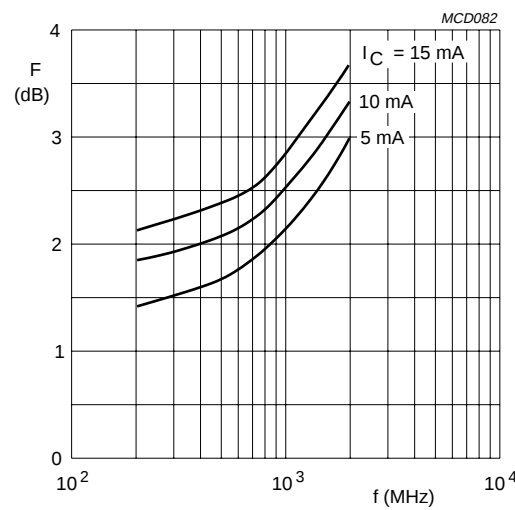
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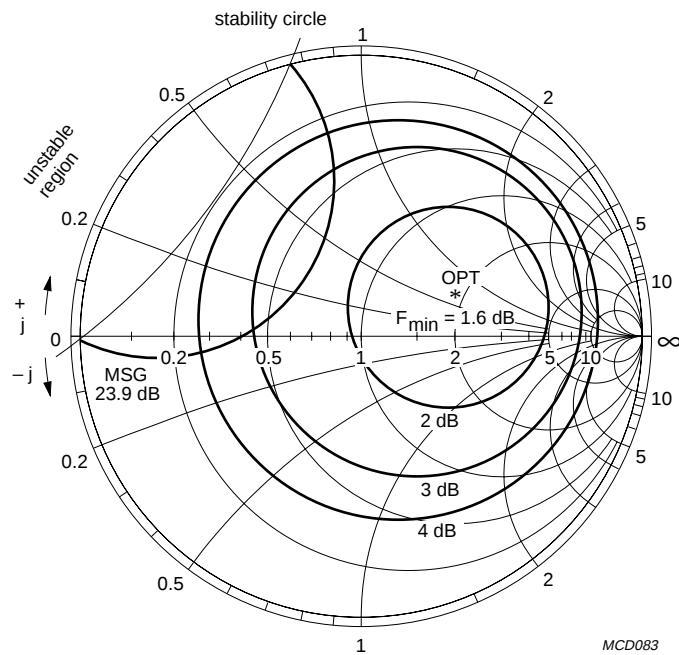
$V_{CE} = 10$ V.

Fig.10 Minimum noise figure as a function of collector current; typical values.



$V_{CE} = 10$ V.

Fig.11 Minimum noise figure as a function of frequency; typical values.



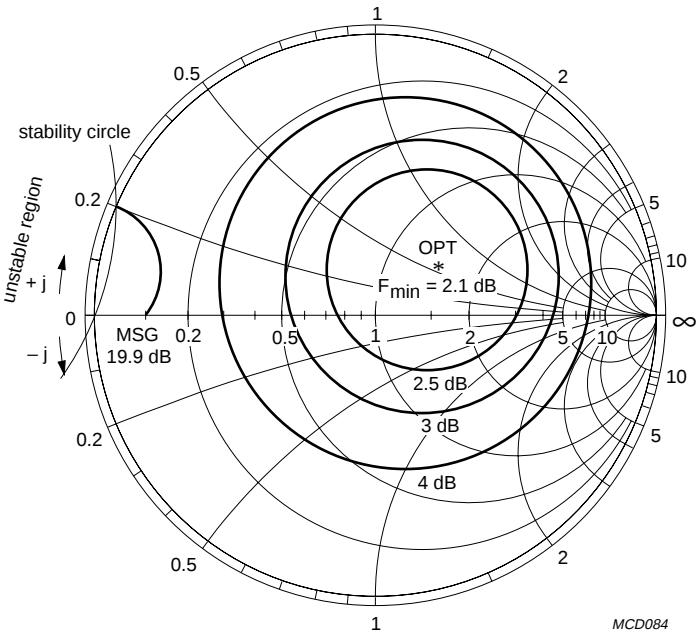
$Z_0 = 50 \Omega$.

Maximum stable gain = 23.9 dB.

Fig.12 Common emitter noise figure circles; typical values.

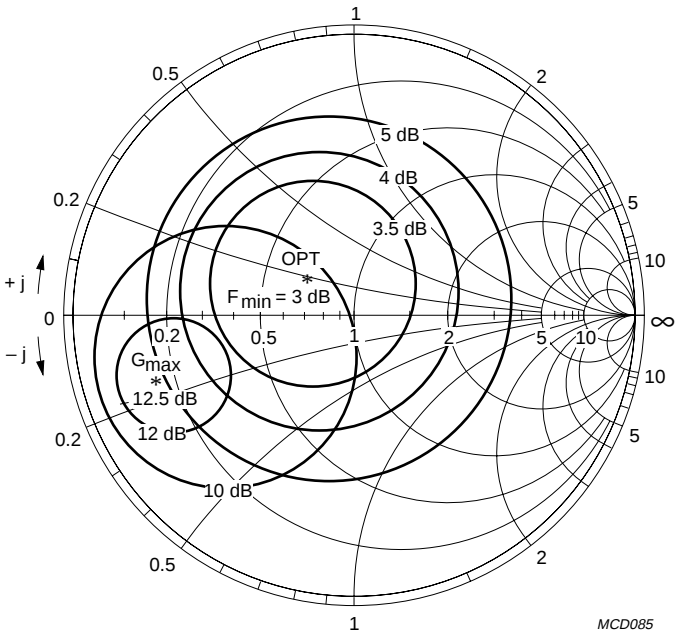
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$Z_0 = 50 \Omega$.
Maximum stable gain = 19.9 dB.

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

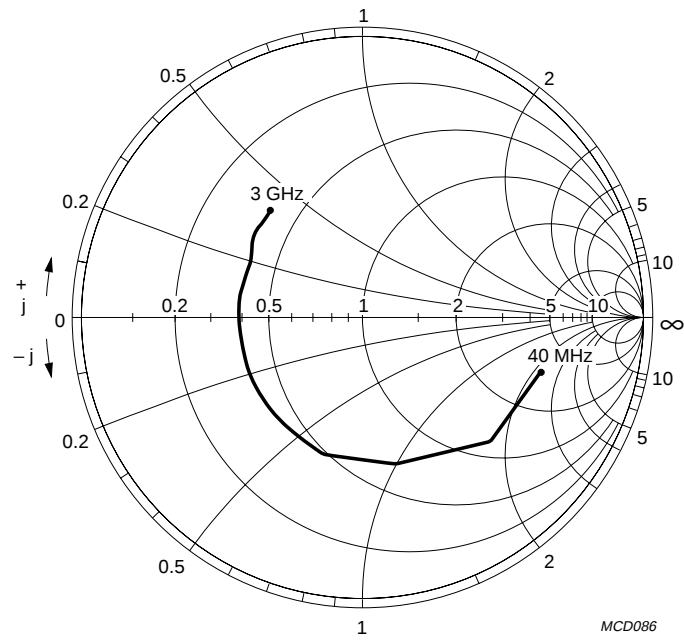


$Z_0 = 50 \Omega$.

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

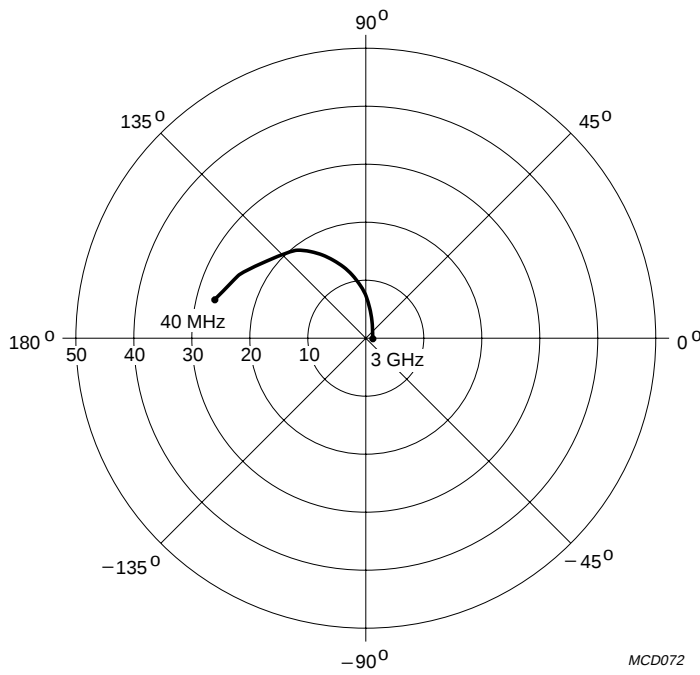
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$V_{CE} = 10\text{ V}; I_C = 15\text{ mA}.$

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

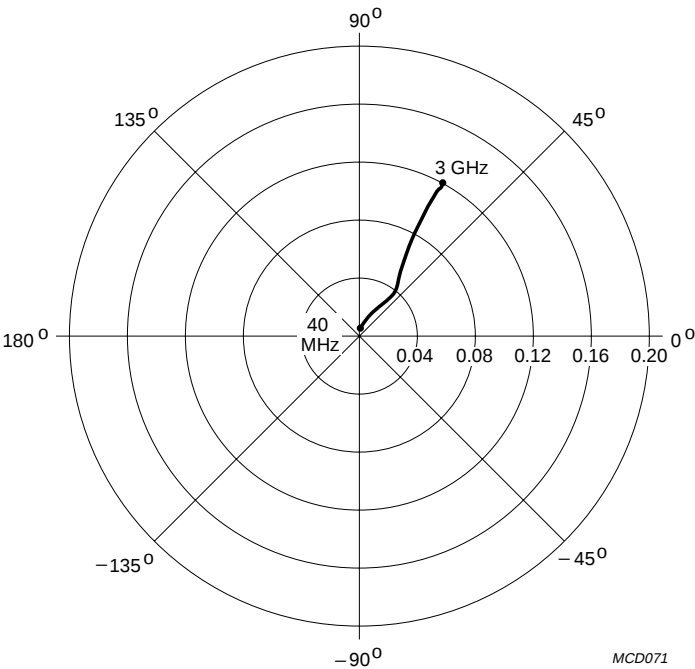


$V_{CE} = 10\text{ V}; I_C = 15\text{ mA}.$

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

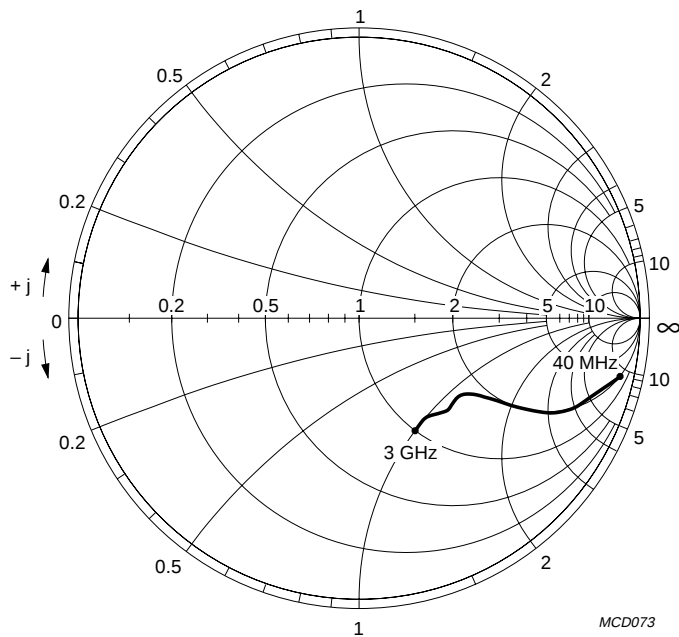
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$V_{CE} = 10\text{ V}$; $I_C = 15\text{ mA}$.

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



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

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

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SPICE parameters for BFR90A/X die

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	μ A
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

SEQUENCE No.	PARAMETER	VALUE	UNIT
36 (note 1)	VJS	750.0	mV
37 (note 1)	MJS	0.000	—
38	FC	850.0	m

Note

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

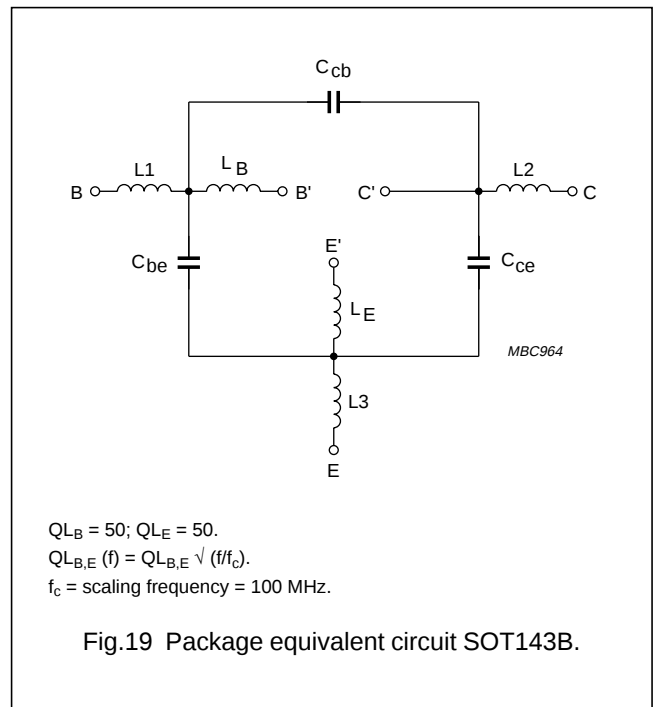


Fig.19 Package equivalent circuit SOT143B.

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

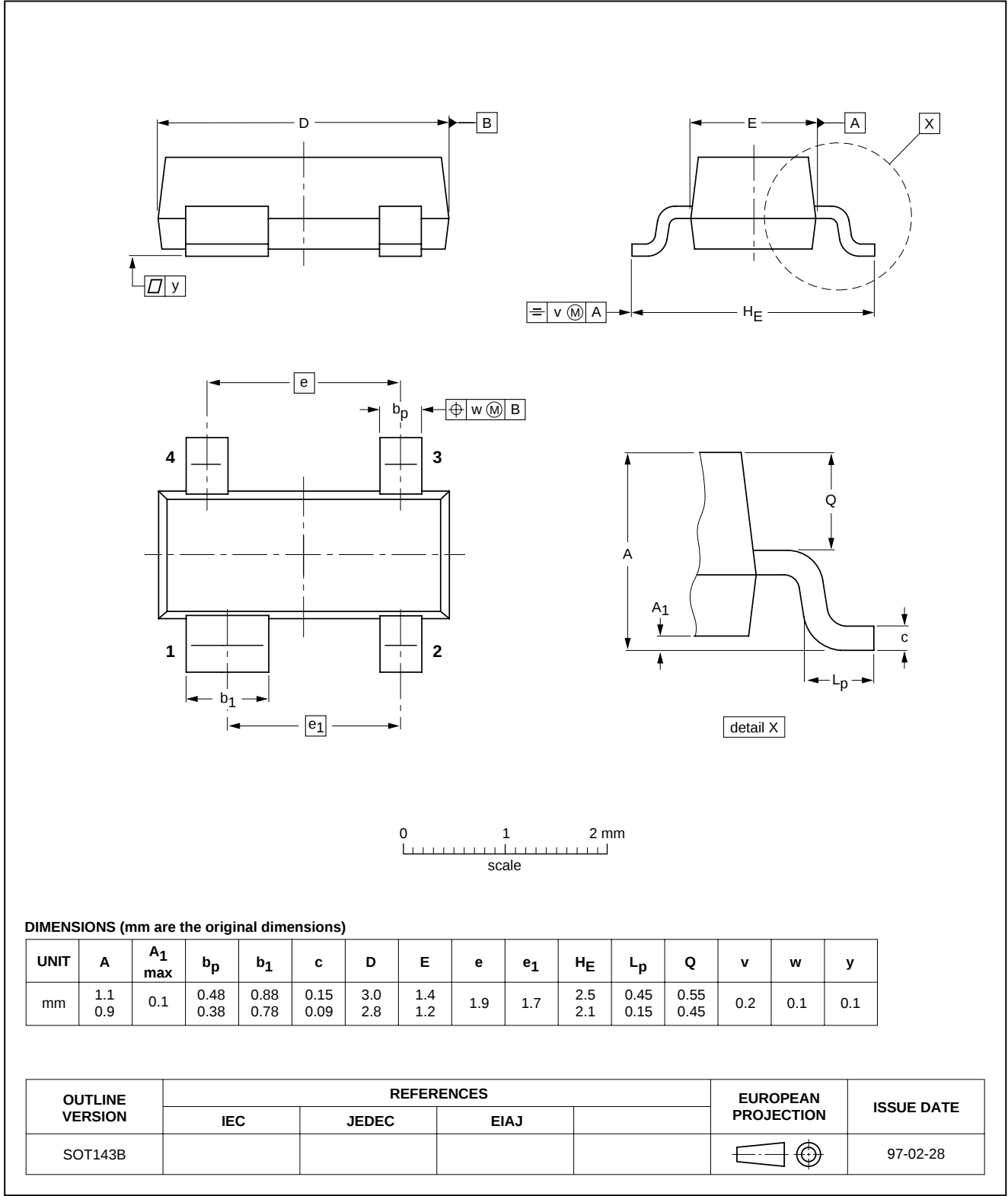
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PACKAGE OUTLINES

Plastic surface mounted package; 4 leads

SOT143B



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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.
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[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
BFG92AX_N_6	20080312	Product data sheet	-	BFG92AX_N_5
Modifications: Characteristics Table; DC current gain value changed				
BFG92AX_N_5	20071126	Product data sheet	-	BFG92AX_4
BFG92AX_4 (9397 750 04344)	19980923	Product specification	-	BFG92SERIES_3
BFG92SERIES_3	19950912	Product specification	-	BFG92SERIES_2
BFG92SERIES_2	19921101	Product specification	-	BFG92_SERIES_1
BFG92_SERIES_1	-	-	-	-

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