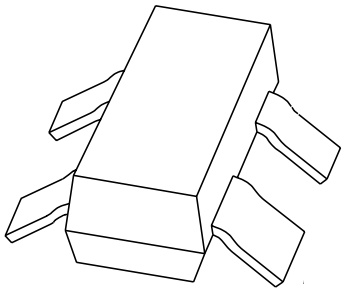
DATA SHEET



BFG92A/X
NPN 5 GHz wideband transistor

Product specification
Supersedes data of 1995 Sep 12

1998 Sep 23

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NPN 5 GHz wideband transistor BFG92A/X

FEATURES

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

APPLICATIONS

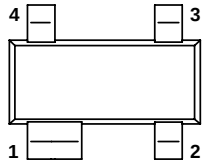
Wideband applications in the UHF and microwave range.

DESCRIPTION

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

PINNING

PIN	DESCRIPTION
1	collector
2	emitter
3	base
4	emitter



Top view MSB014

Marking code: V14.

Fig.1 SOT143B.

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	$T_s \leq 60$ °C	–	–	400	mW
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	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	$\Gamma_s = \Gamma_{opt}$; I_C = 5 mA; V_{CE} = 10 V; T_{amb} = 25 °C; f = 1 GHz	–	2	–	dB

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	$T_s \leq 60$ °C; note 1	–	400	mW
T_{stg}	storage temperature range		–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
$R_{th\ j\text{-}s}$	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	$I_E = 0$; $V_{CB} = 10$ 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	$\Gamma_s = \Gamma_{opt}$; $I_C = 5$ mA; $V_{CE} = 10$ V; $T_{amb} = 25$ °C; f = 1 GHz	–	2	–	dB
		$\Gamma_s = \Gamma_{opt}$; $I_C = 5$ 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 S_{12} is zero and $G_{UM} = 10 \log \frac{|S_{21}|^2}{(1-|S_{11}|^2)(1-|S_{22}|^2)}$ dB.

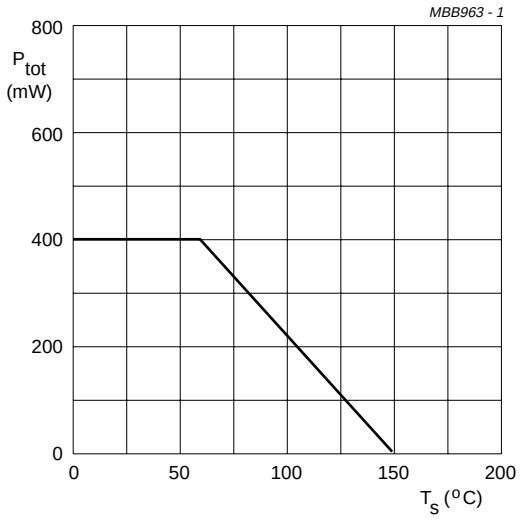
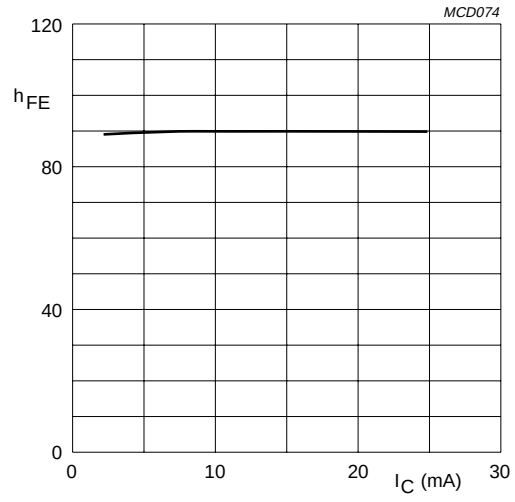
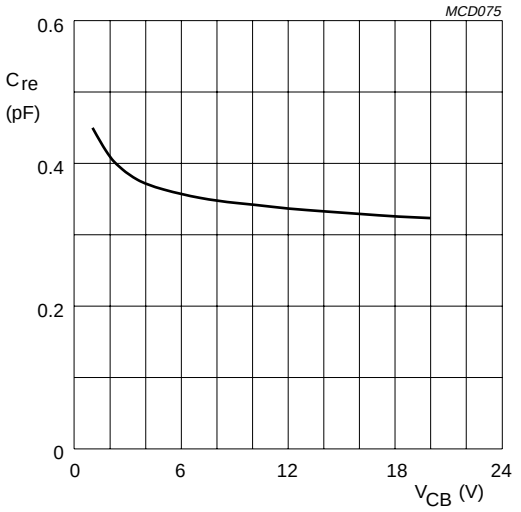


Fig.2 Power derating curve.



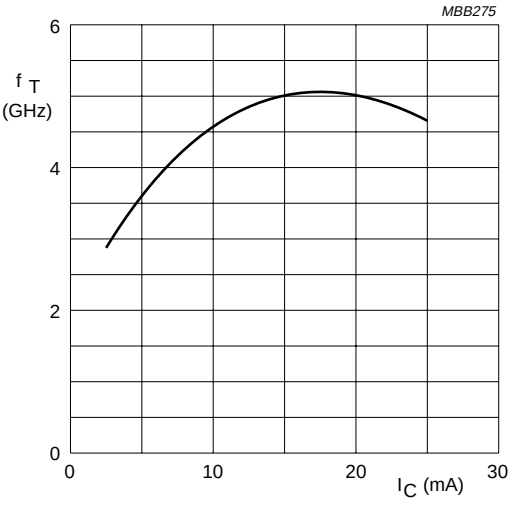
V_{CE} = 10 V.

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



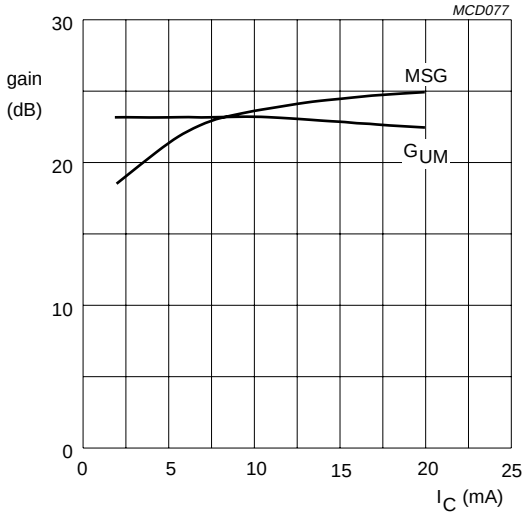
$I_C = i_c = 0$; f = 1 MHz.

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



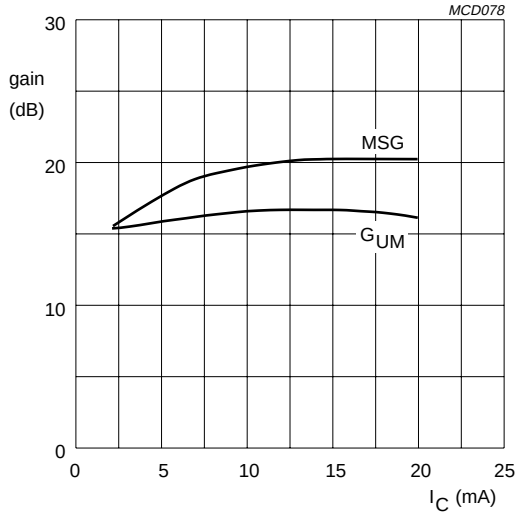
V_{CE} = 10 V; T_{amb} = 25 °C; f = 500 MHz.

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



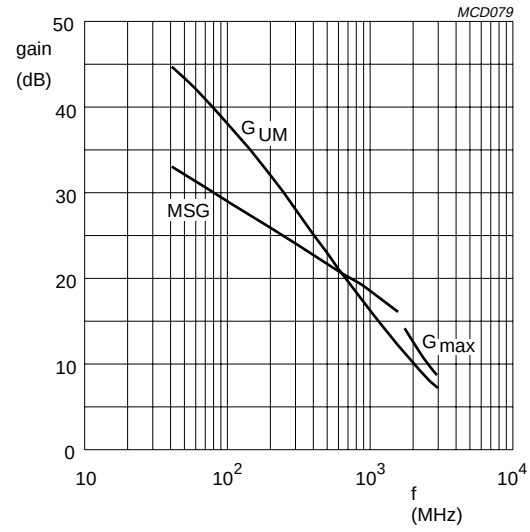
V_{CE} = 10 V; f = 500 MHz.

Fig.6 Gain as a function of collector current; typical values.



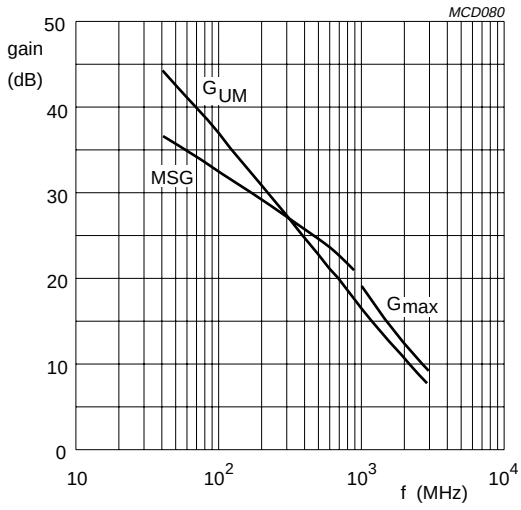
V_{CE} = 10 V; f = 1 GHz.

Fig.7 Gain as a function of collector current; typical values.



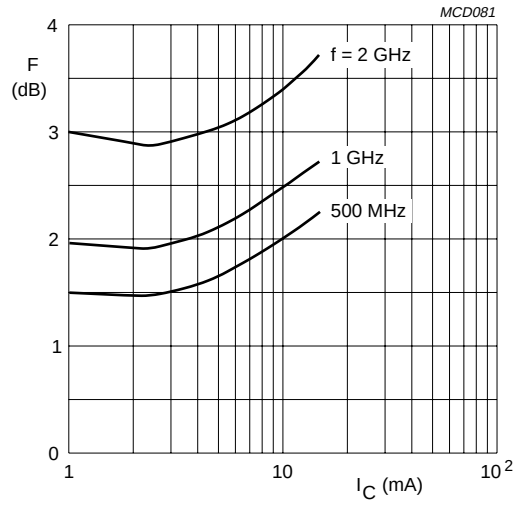
V_{CE} = 10 V; I_C = 5 mA.

Fig.8 Gain as a function of frequency; typical values.



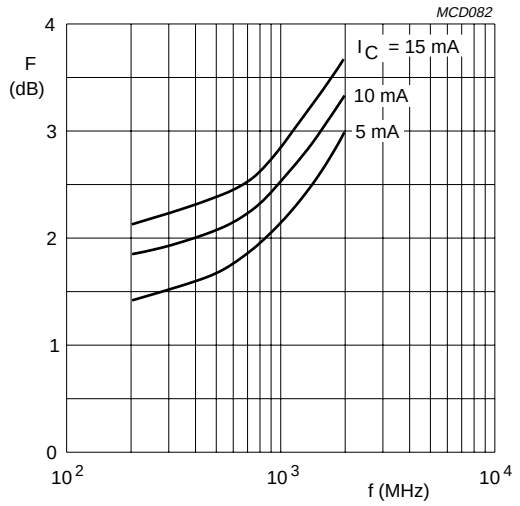
V_{CE} = 10 V; I_C = 15 mA.

Fig.9 Gain as a function of frequency; typical values.



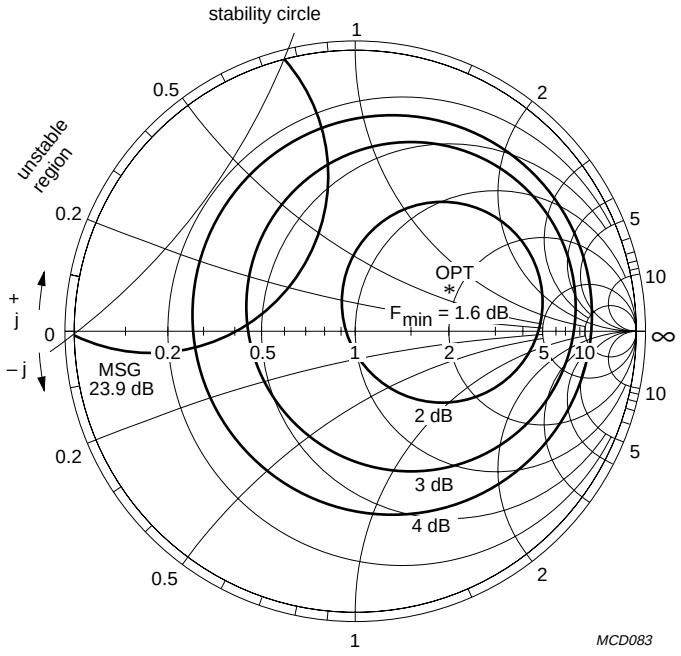
V_{CE} = 10 V.

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



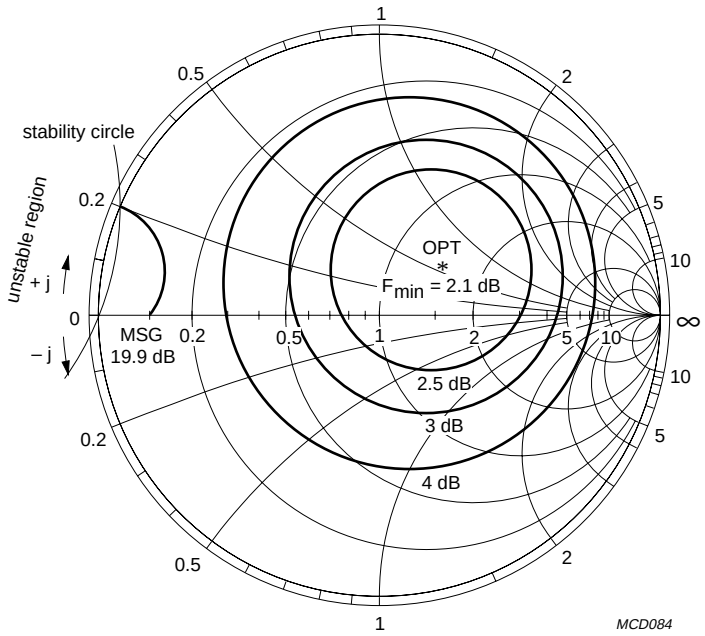
V_{CE} = 10 V.

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



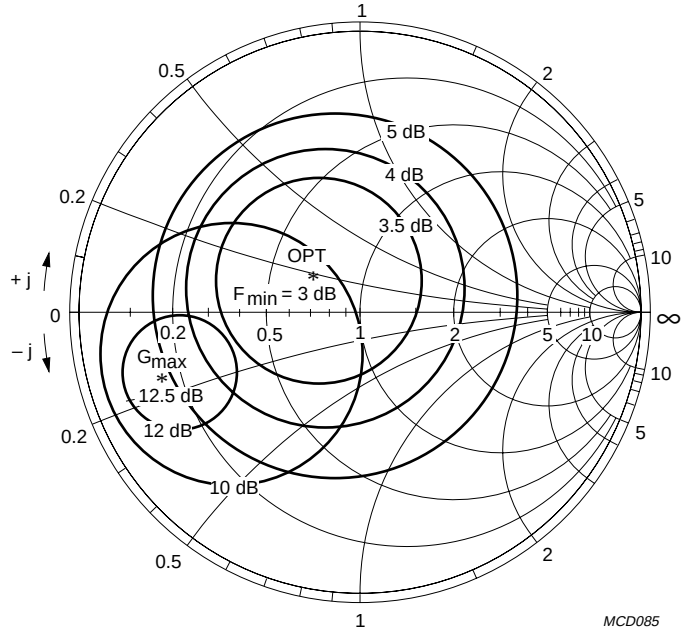
Z_o = 50 Ω.
Maximum stable gain = 23.9 dB.

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



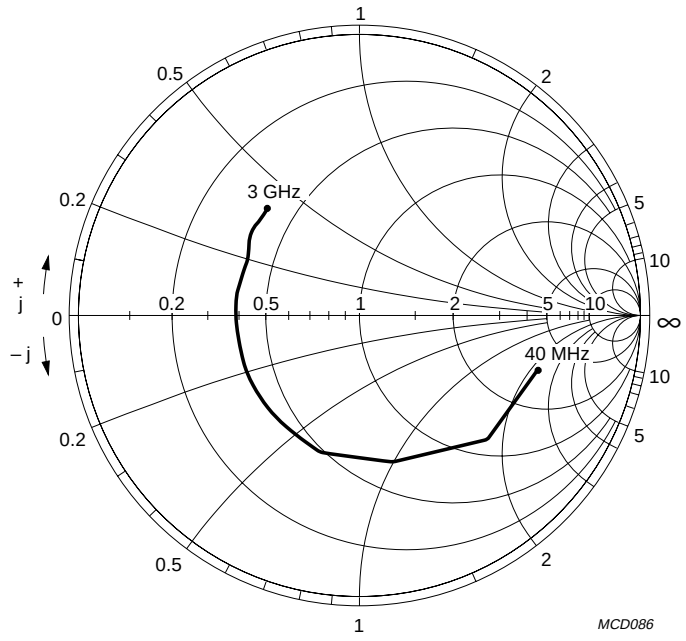
Z_o = 50 Ω.
Maximum stable gain = 19.9 dB.

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



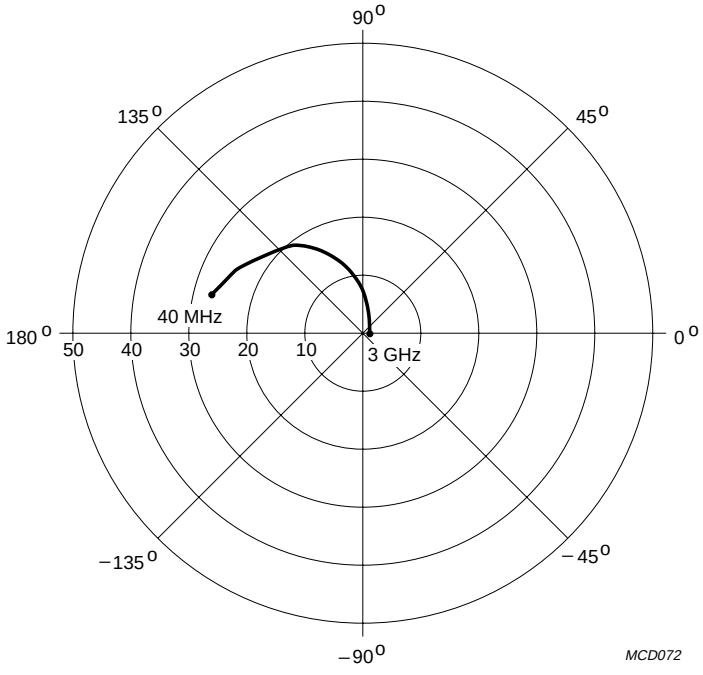
Z_o = 50 Ω.

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



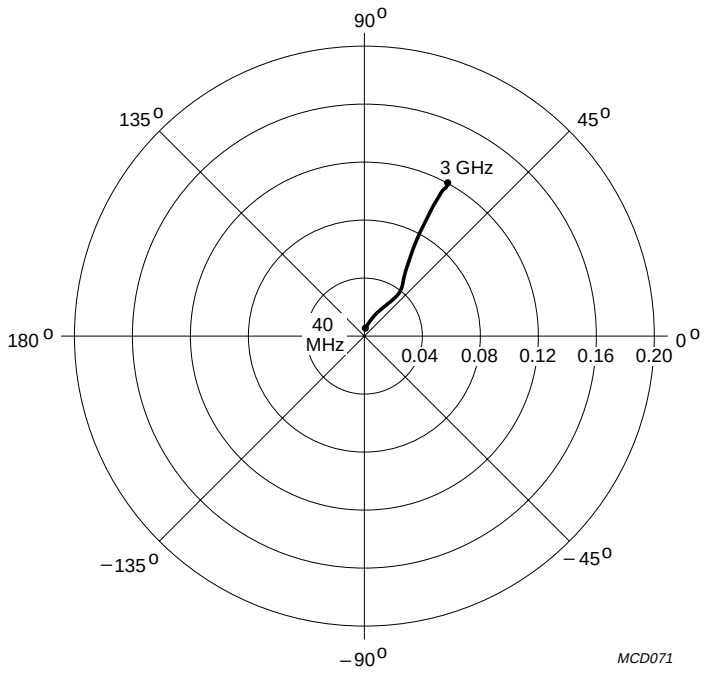
V_{CE} = 10 V; I_C = 15 mA.

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



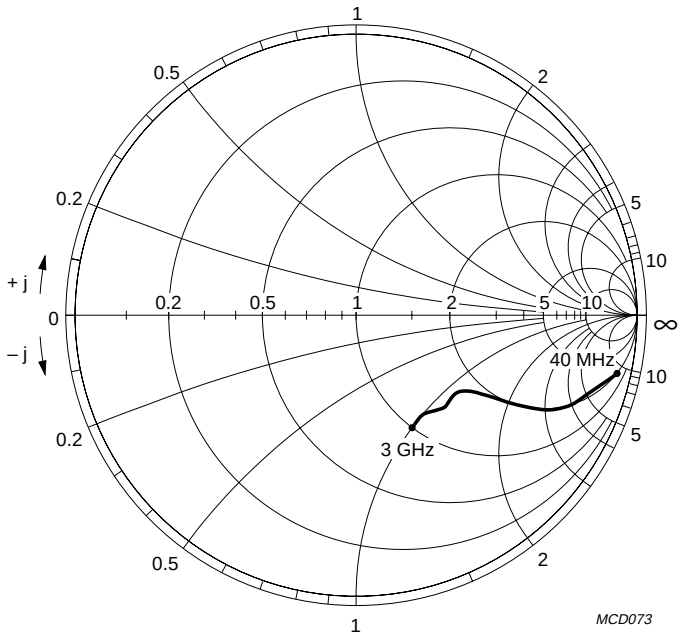
V_{CE} = 10 V; I_C = 15 mA.

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



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

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



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

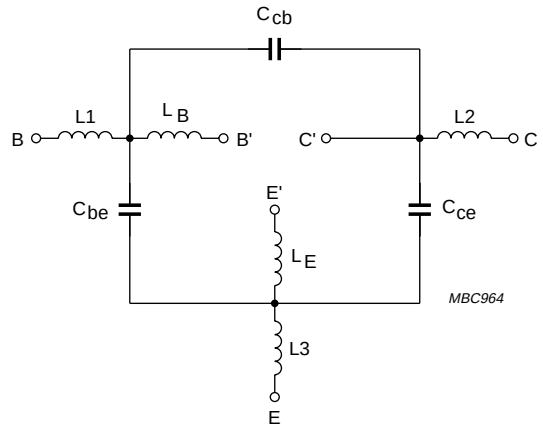
Fig.18 Common emitter output reflection coefficient (S_{22}); typical values.

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	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.



$QL_B = 50$; $QL_E = 50$.
$QL_{B,E}(f) = QL_{B,E} \sqrt{(f/f_c)}$.
f_c = scaling frequency = 100 MHz.

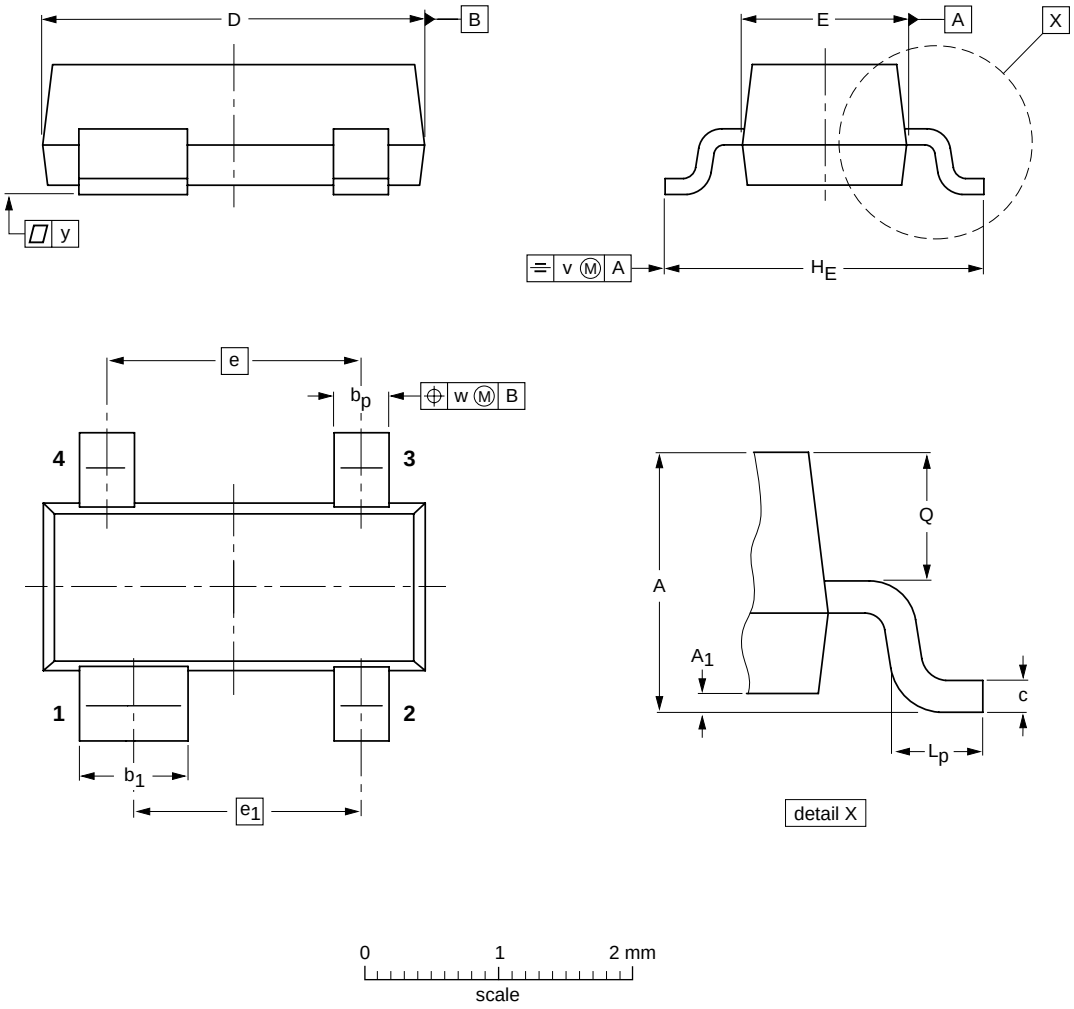
Fig.19 Package equivalent circuit SOT143B.

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

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

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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