DATA SHEET

BFT92W
PNP 4 GHz wideband transistor

Product specification

May 1994

PNP 4 GHz wideband transistor BFT92W

FEATURES

- High power gain
- Gold metallization ensures excellent reliability
- SOT323 (S-mini) package.

APPLICATION

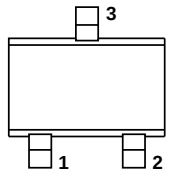
It is intended as a general purpose transistor for wideband applications up to 2 GHz.

DESCRIPTION

Silicon PNP transistor in a plastic, SOT323 (S-mini) package. The BFT92W uses the same crystal as the SOT23 version, BFT92.

PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector



Top view MBC870

Marking code: W1.

Fig.1 SOT323.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	–	–20	V
V_{CEO}	collector-emitter voltage	open base	–	–	–15	V
I_C	collector current (DC)		–	–	–35	mA
P_{tot}	total power dissipation	up to T_s = 93 °C; note 1	–	–	300	mW
h_{FE}	DC current gain	I_C = –15 mA; V_{CE} = –10 V	20	50	–	
C_{re}	feedback capacitance	I_C = 0; V_{CB} = –10 V; f = 1 MHz	–	0.5	–	pF
f_T	transition frequency	I_C = –15 mA; V_{CE} = –10 V; f = 500 MHz	–	4	–	GHz
G_{UM}	maximum unilateral power gain	I_C = –15 mA; V_{CE} = –10 V; f = 500 MHz; T_{amb} = 25 °C	–	17	–	dB
F	noise figure	I_C = –5 mA; V_{CE} = –10 V; f = 500 MHz	–	2.5	–	dB
T_j	junction temperature		–	–	150	°C

Note

1. T_s is the temperature at the soldering point of the collector pin.

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	up to T_s = 93 °C; note 1	–	300	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	150	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}s}$	thermal resistance from junction to soldering point	up to T_s = 93 °C; note 1	190	K/W

Note to the "Limiting values" and "Thermal characteristics"

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 cut-off current	I_E = 0; V_{CB} = –10 V	–	–	–50	nA
h_{FE}	DC current gain	I_C = –15 mA; V_{CE} = –10 V	20	50	–	
f_T	transition frequency	I_C = –15 mA; V_{CE} = –10 V; f = 500 MHz; T_{amb} = 25 °C	–	4	–	GHz
C_c	collector capacitance	$I_E = i_e$ = 0; V_{CB} = –10 V; f = 1 MHz	–	0.65	–	pF
C_e	emitter capacitance	$I_C = i_c$ = 0; V_{EB} = –0.5 V; f = 1 MHz	–	0.75	–	pF
C_{re}	feedback capacitance	I_C = 0; V_{CB} = –10 V; f = 1 MHz	–	0.5	–	pF
G_{UM}	maximum unilateral power gain; note 1	I_C = –15 mA; V_{CE} = –10 V; f = 500 MHz; T_{amb} = 25 °C	–	17	–	dB
		I_C = –15 mA; V_{CE} = –10 V; f = 1 GHz; T_{amb} = 25 °C	–	11	–	dB
F	noise figure	$\Gamma_s = \Gamma_{opt}$; I_C = –5 mA; V_{CE} = –10 V; f = 500 MHz	–	2.5	–	dB
		$\Gamma_s = \Gamma_{opt}$; I_C = –5 mA; V_{CE} = –10 V; f = 1 GHz	–	3	–	dB

Note

1. G_{UM} is the maximum unilateral power gain, assuming s_{12} is zero. $G_{UM} = 10 \log \frac{|s_{21}|^2}{(1-|s_{11}|^2)(1-|s_{22}|^2)}$ dB.

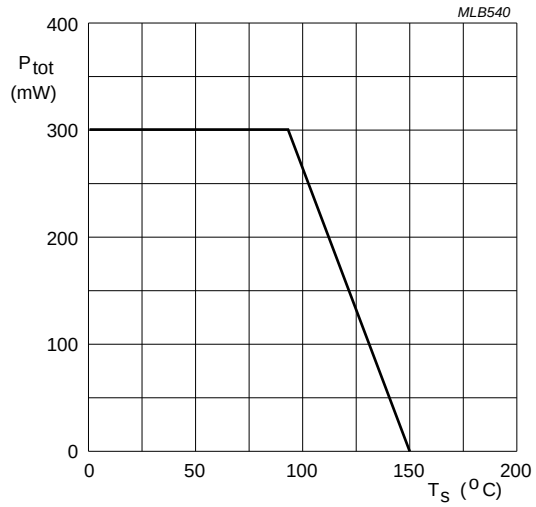
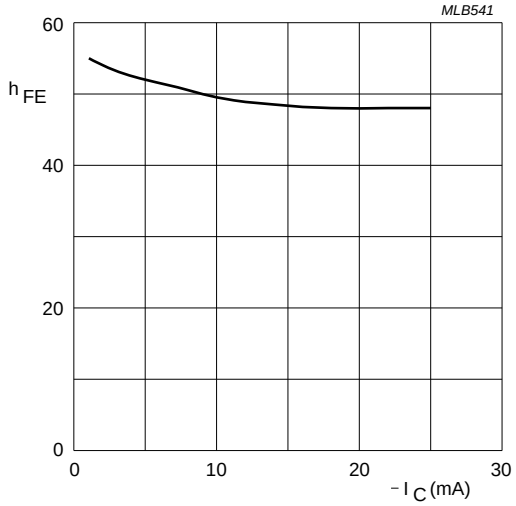
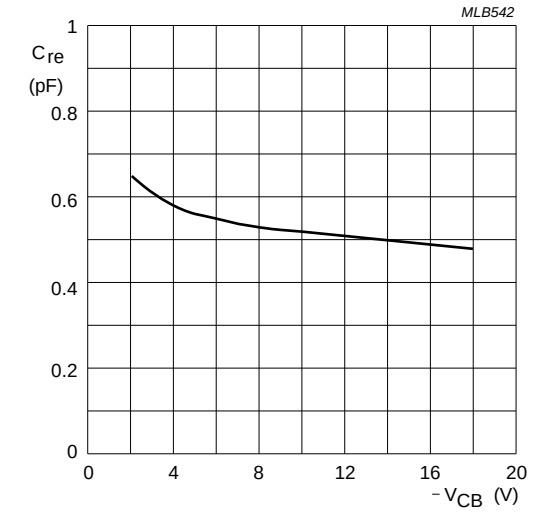


Fig.2 Power derating curve.



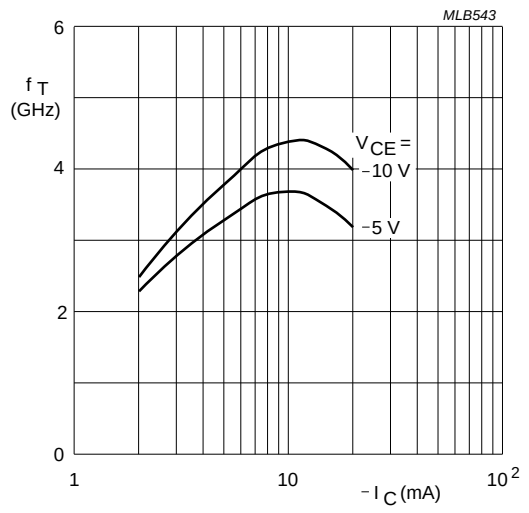
V_{CE} = –10 V; T_j = 25 °C.

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



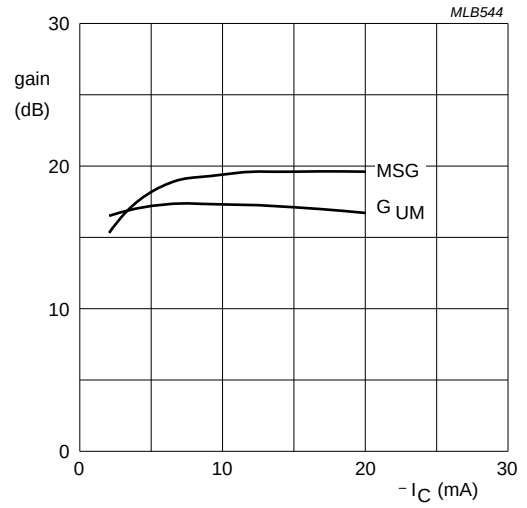
I_C = 0; f = 1 MHz.

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



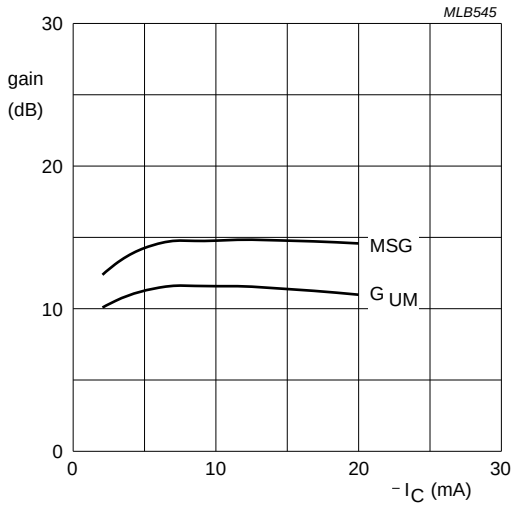
f = 500 MHz; T_{amb} = 25 °C.

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



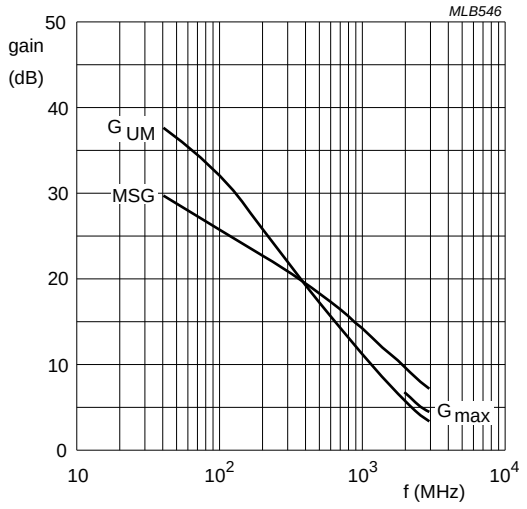
f = 500 MHz; V_{CE} = –10 V.
MSG = maximum stable gain.

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



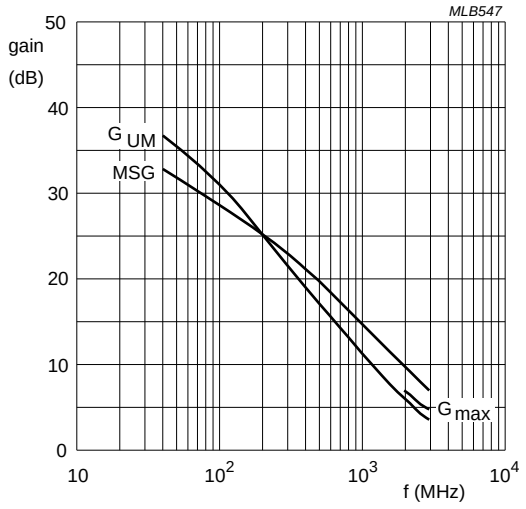
f = 1 GHz; V_{CE} = –10 V.
MSG = maximum stable gain.

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



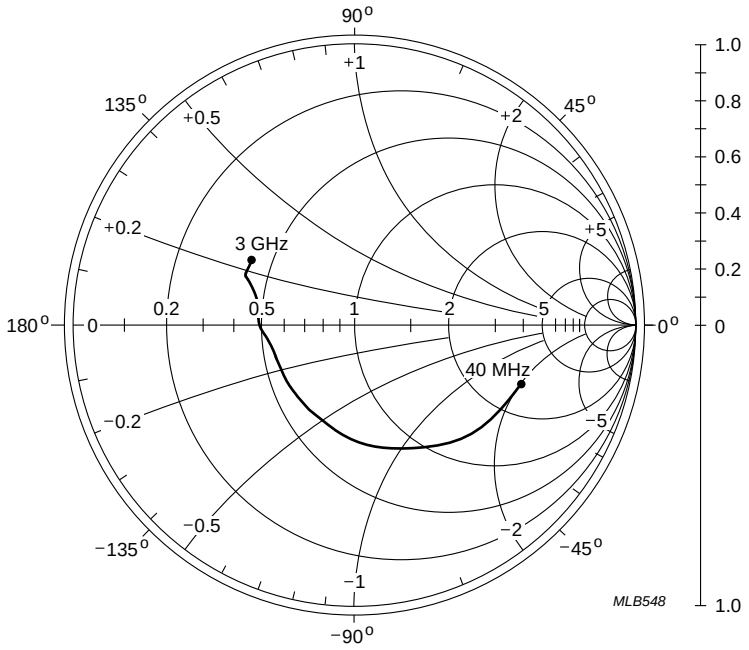
I_C = –5 mA; V_{CE} = –10 V.
MSG = maximum stable gain.

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



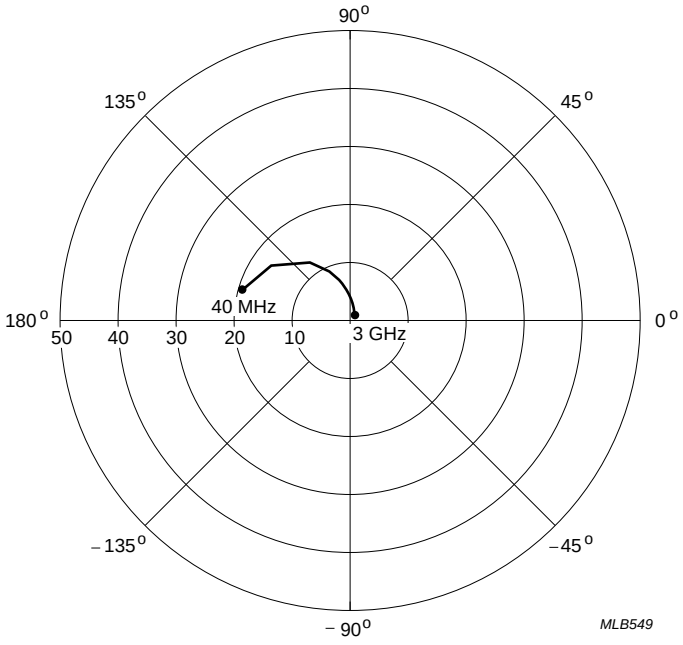
I_C = –15 mA; V_{CE} = –10 V.
MSG = maximum stable gain.

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



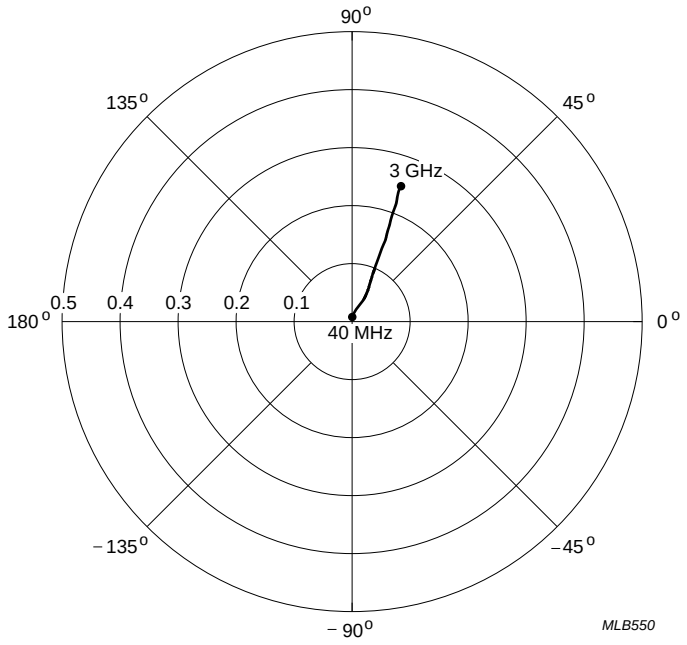
V_{CE} = −10 V; I_C = −15 mA.

Fig.10 Common emitter input reflection coefficient (s_{11}), typical values.



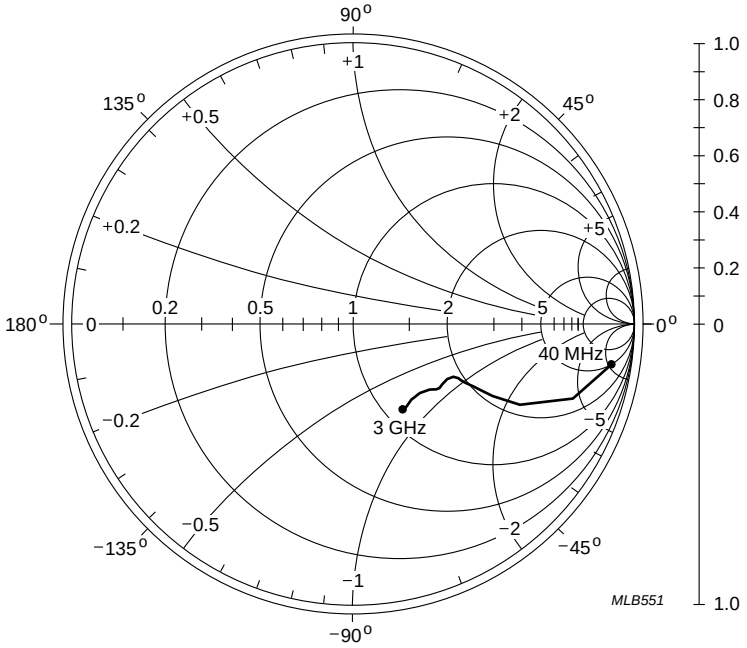
V_{CE} = −10 V; I_C = −15 mA.

Fig.11 Common emitter forward transmission coefficient (s_{21}), typical values.



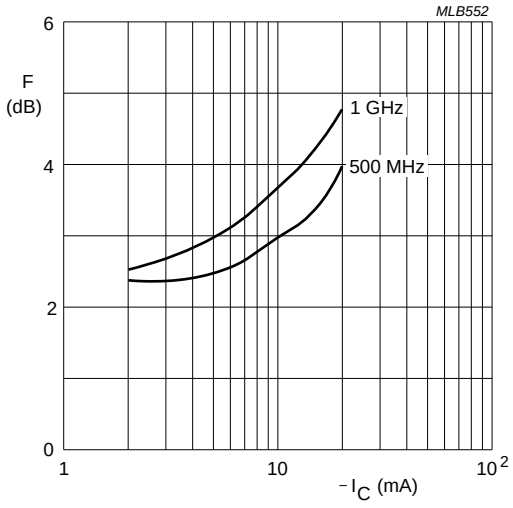
V_{CE} = −10 V; I_C = −15 mA.

Fig.12 Common emitter reverse transmission coefficient (s_{12}), typical values.



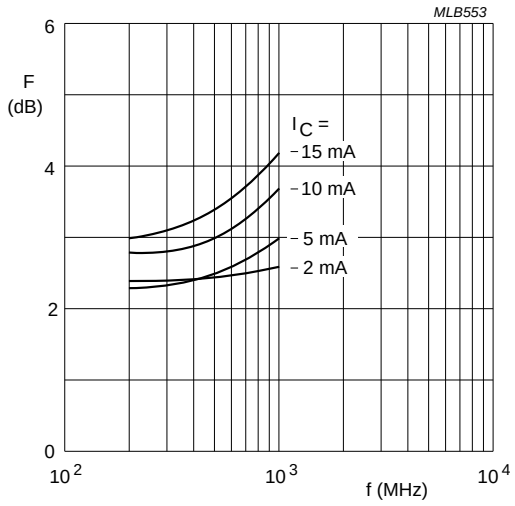
V_{CE} = −10 V; I_C = −15 mA.

Fig.13 Common emitter output reflection coefficient (s_{22}), typical values.



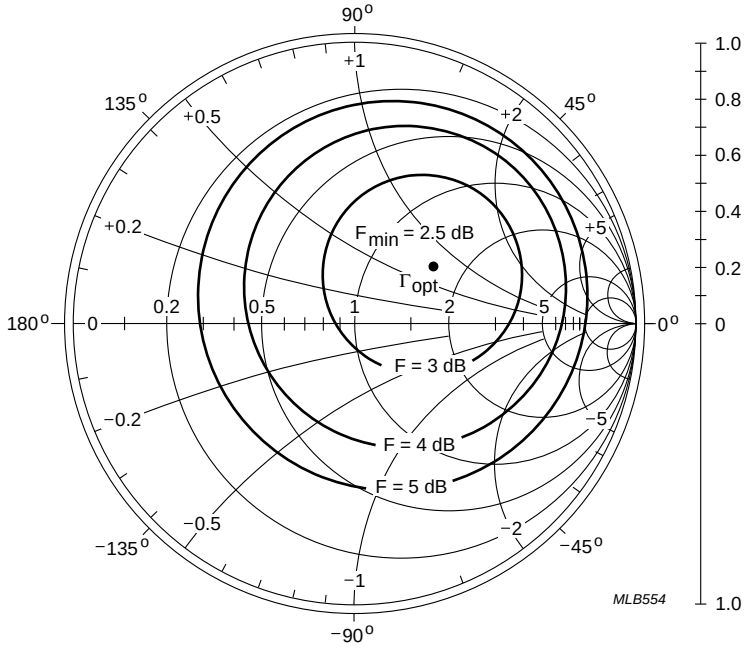
V_{CE} = −10 V.

Fig.14 Minimum noise figure as a function of collector current, typical values.



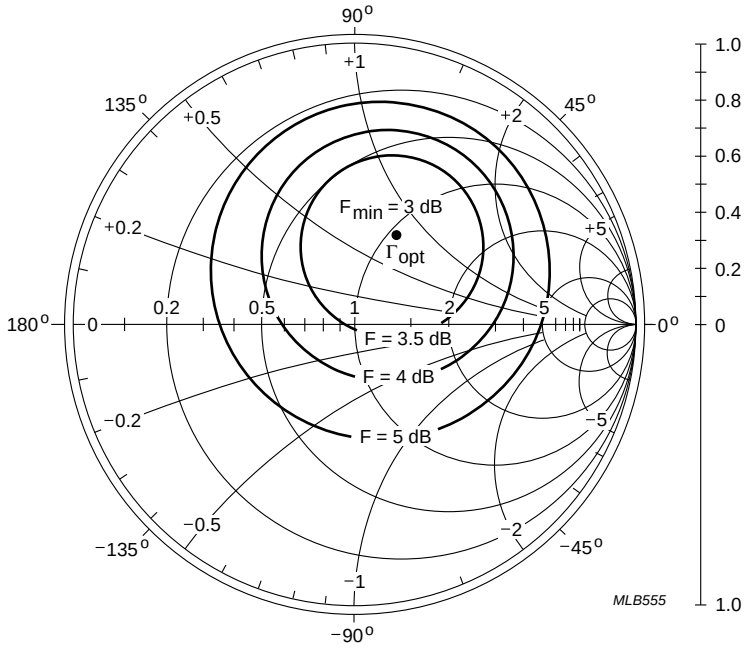
V_{CE} = −10 V.

Fig.15 Minimum noise figure as a function of frequency, typical values.



f = 500 MHz; V_{CE} = −10 V; I_C = −5 mA; Z_o = 50 Ω.

Fig.16 Common emitter noise figure circles, typical values.



f = 1 GHz; V_{CE} = −10 V; I_C = −5 mA; Z_o = 50 Ω.

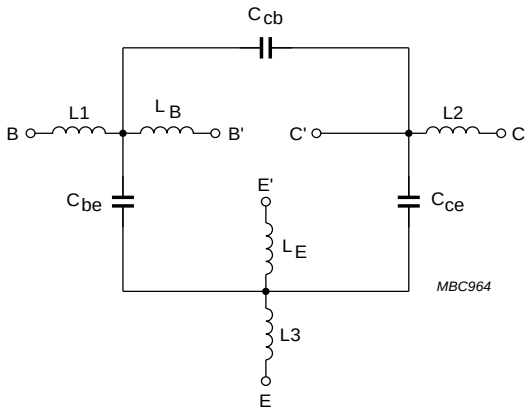
Fig.17 Common emitter noise figure circles, typical values.

SPICE parameters for the BFT92W crystal

SEQUENCE No.	PARAMETER	VALUE	UNIT
1	IS	437.5	aA
2	BF	33.58	–
3	NF	1.009	–
4	VAF	23.39	V
5	IKF	99.53	mA
6	ISE	87.05	fA
7	NE	1.943	–
8	BR	4.947	–
9	NR	1.002	–
10	VAR	3.903	V
11	IKR	5.281	mA
12	ISC	35.88	fA
13	NC	1.393	–
14	RB	5.000	Ω
15	IRB	1.000	μA
16	RBM	5.000	Ω
17	RE	1.000	Ω
18	RC	10.00	Ω
19(1)	XTB	0.000	–
20(1)	EG	1.110	eV
21(1)	XTI	3.000	–
22	CJE	746.6	fF
23	VJE	600.0	mV
24	MJE	0.357	–
25	TF	17.49	ps
26	XTF	1.354	–
27	VTF	155.6	mV
28	ITF	1.000	mA
29	PTF	45.00	deg
30	CJC	937.1	fF
31	VJC	396.4	mV
32	MJC	0.200	–
33	XCJC	0.106	–
34	TR	8.422	ns
35(1)	CJS	0.000	F
36(1)	VJS	750.0	mV
37(1)	MJS	0.000	–
38	FC	0.768	–

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 = 1 GHz.

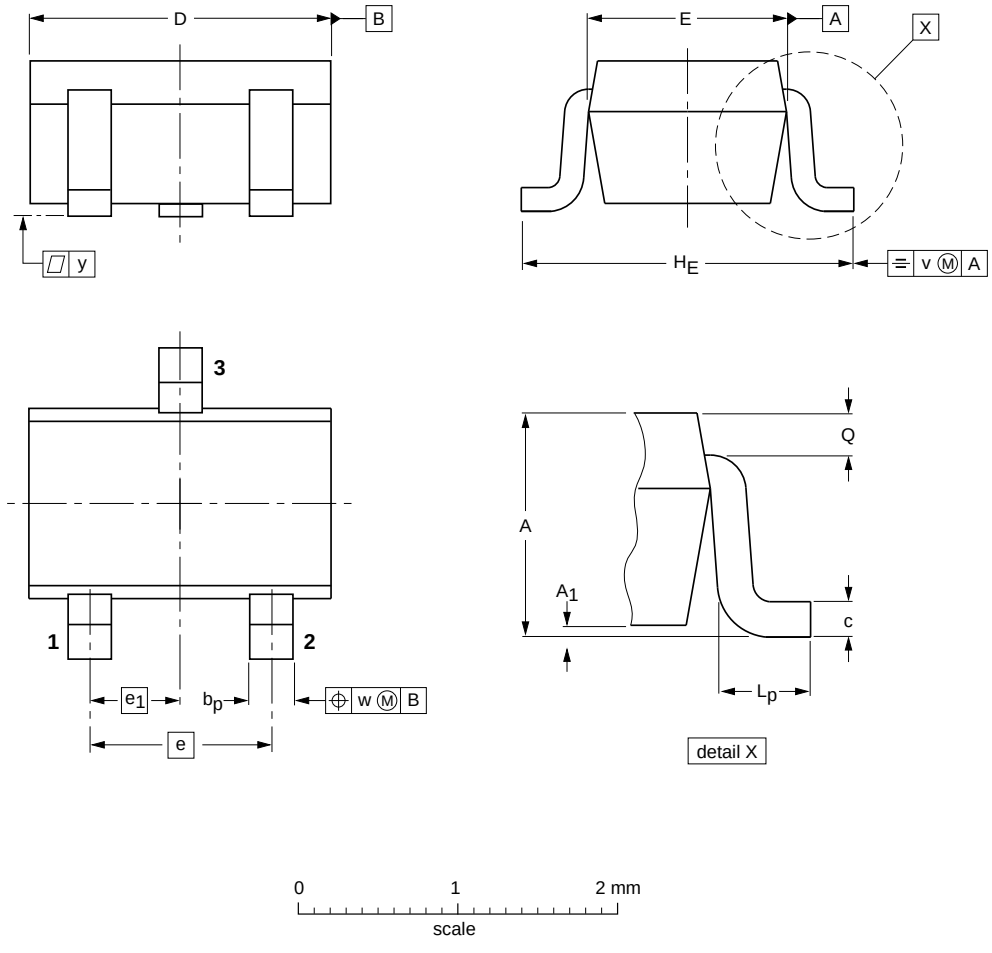
Fig.18 Package equivalent circuit SOT323.

List of components (see Fig.18)

DESIGNATION	VALUE	UNIT
C_{be}	2	fF
C_{cb}	100	fF
C_{ce}	100	fF
L1	0.34	nH
L2	0.10	nH
L3	0.34	nH
L_B	0.60	nH
L_E	0.60	nH

PACKAGE OUTLINE

Plastic surface-mounted package; 3 leads **SOT323**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1 max	b_p	c	D	E	e	e_1	H_E	L_p	Q	v	w
mm	1.1 0.8	0.1	0.4 0.3	0.25 0.10	2.2 1.8	1.35 1.15	1.3	0.65	2.2 2.0	0.45 0.15	0.23 0.13	0.2	0.2

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT323			SC-70			~~04-11-04~~ 06-03-16

DATA SHEET STATUS

DOCUMENT STATUS[1]	PRODUCT STATUS[2]	DEFINITION
Objective data sheet	Development	This document contains data from the objective specification for product development.
Preliminary data sheet	Qualification	This document contains data from the preliminary specification.
Product data sheet	Production	This document contains the product specification.

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This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content, except for package outline drawings which were updated to the latest version.

Contact information

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