

DATA SHEET

BFT92W

PNP 4 GHz wideband transistor

Product specification
File under Discrete Semiconductors, SC14

May 1994

Philips Semiconductors



PHILIPS

PNP 4 GHz wideband transistor

BFT92W

FEATURES

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

APPLICATION

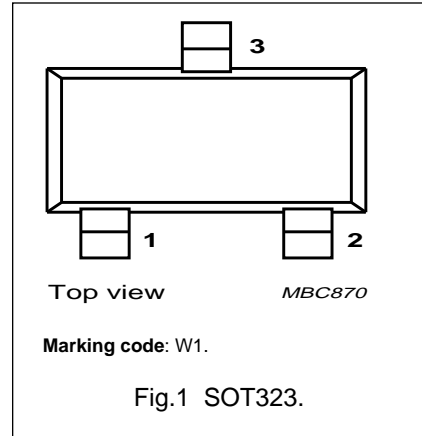
It is intended as a general purpose transistor for wideband applications up to 2 GHz.

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



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 $T_s = 93\text{ °C}$; note 1	–	–	300	mW
h_{FE}	DC current gain	$I_C = -15\text{ mA}$; $V_{CE} = -10\text{ V}$	20	50	–	
C_{re}	feedback capacitance	$I_C = 0$; $V_{CB} = -10\text{ V}$; $f = 1\text{ MHz}$	–	0.5	–	pF
f_T	transition frequency	$I_C = -15\text{ mA}$; $V_{CE} = -10\text{ V}$; $f = 500\text{ MHz}$	–	4	–	GHz
G_{UM}	maximum unilateral power gain	$I_C = -15\text{ mA}$; $V_{CE} = -10\text{ V}$; $f = 500\text{ MHz}$; $T_{amb} = 25\text{ °C}$	–	17	–	dB
F	noise figure	$I_C = -5\text{ mA}$; $V_{CE} = -10\text{ V}$; $f = 500\text{ MHz}$	–	2.5	–	dB
T_j	junction temperature		–	–	150	°C

Note

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

PNP 4 GHz wideband transistor

BFT92W

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

THERMAL CHARACTERISTICS

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

Note to the “Limiting values” and “Thermal characteristics”

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

CHARACTERISTICS

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

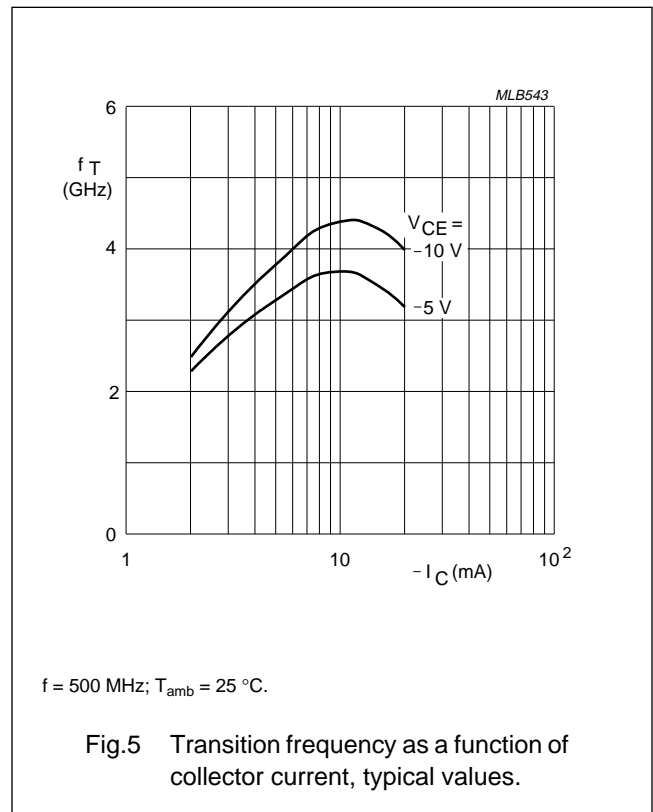
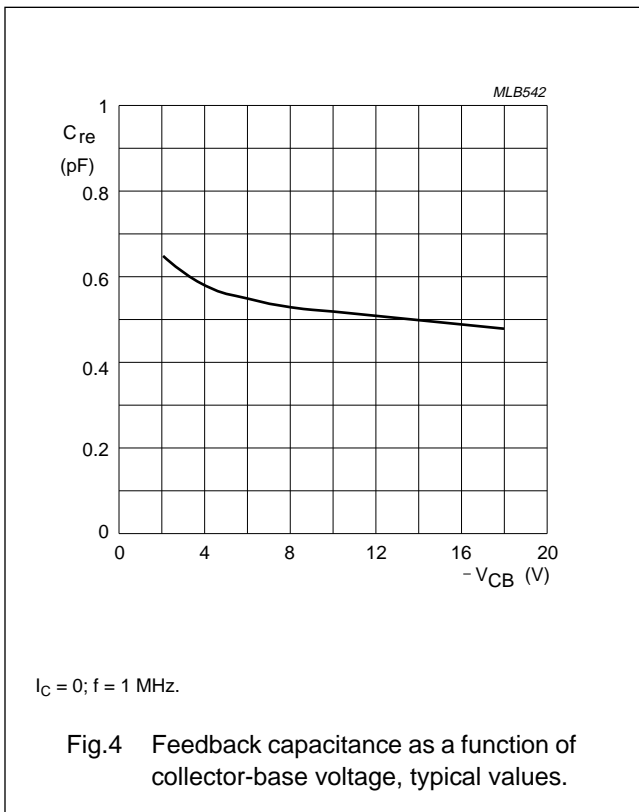
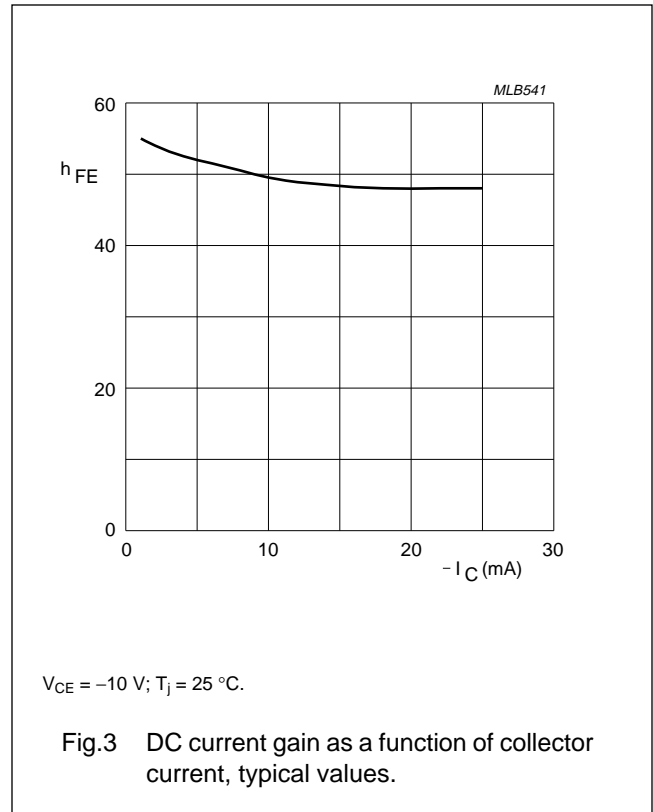
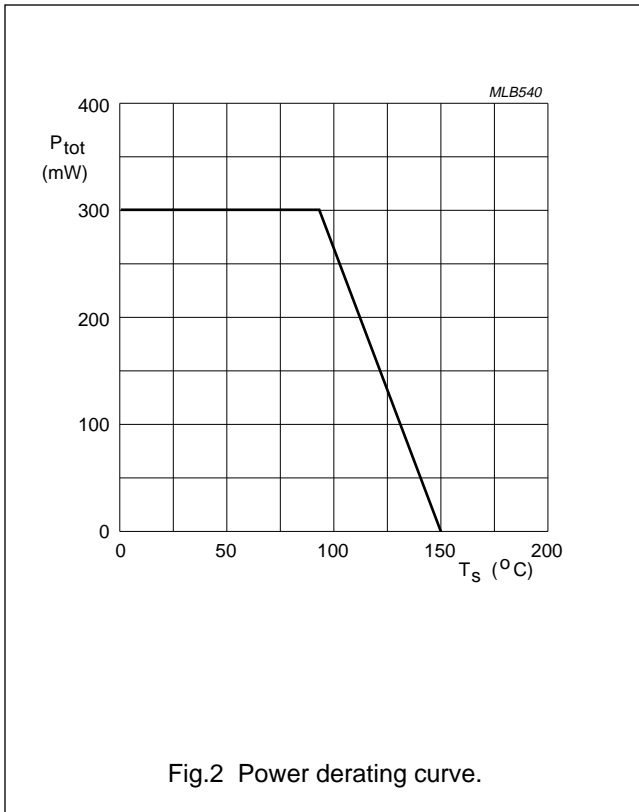
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0$; $V_{CB} = -10\text{ V}$	–	–	–50	nA
h_{FE}	DC current gain	$I_C = -15\text{ mA}$; $V_{CE} = -10\text{ V}$	20	50	–	
f_T	transition frequency	$I_C = -15\text{ mA}$; $V_{CE} = -10\text{ V}$; $f = 500\text{ MHz}$;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

Note

- 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.

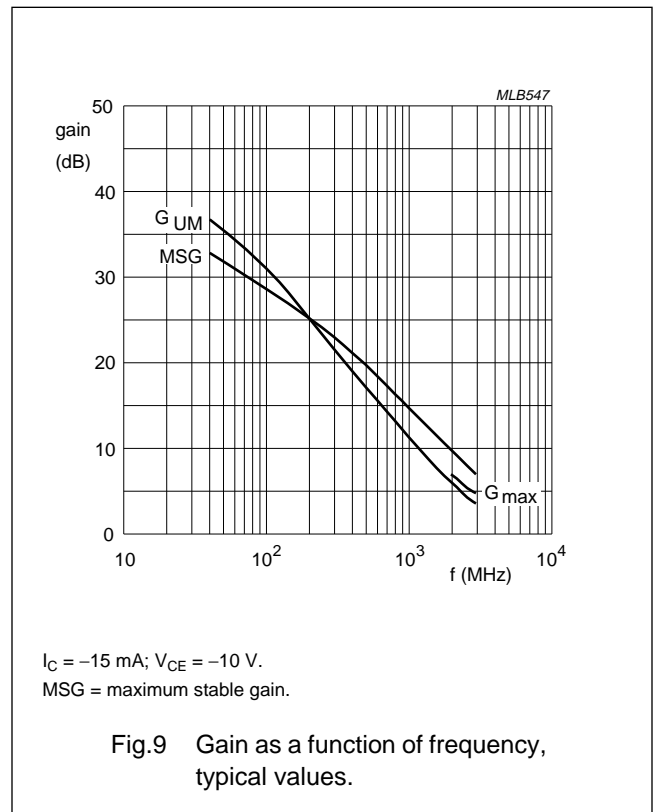
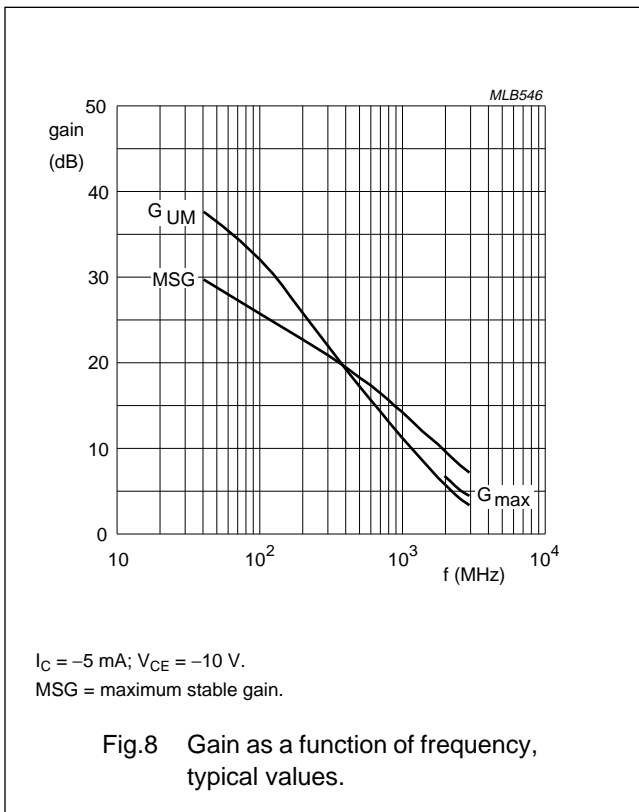
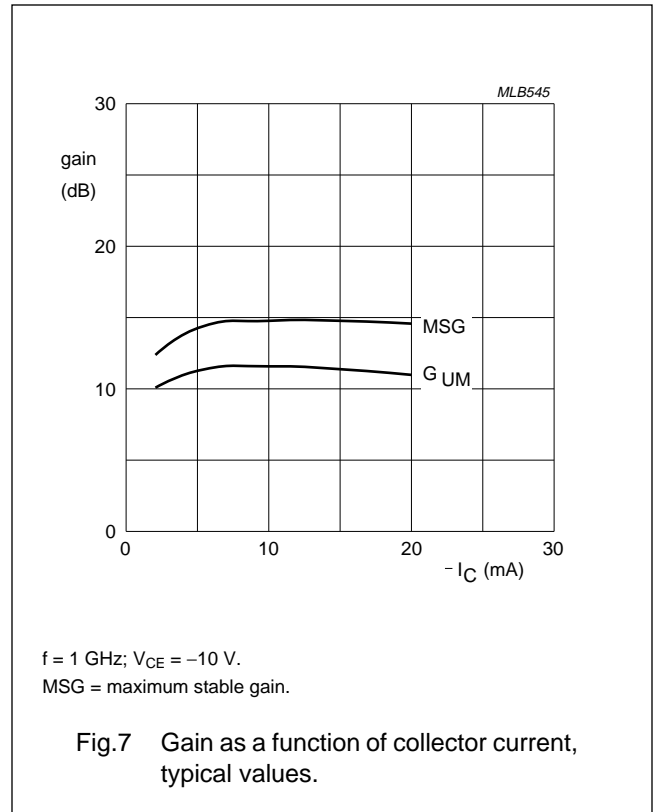
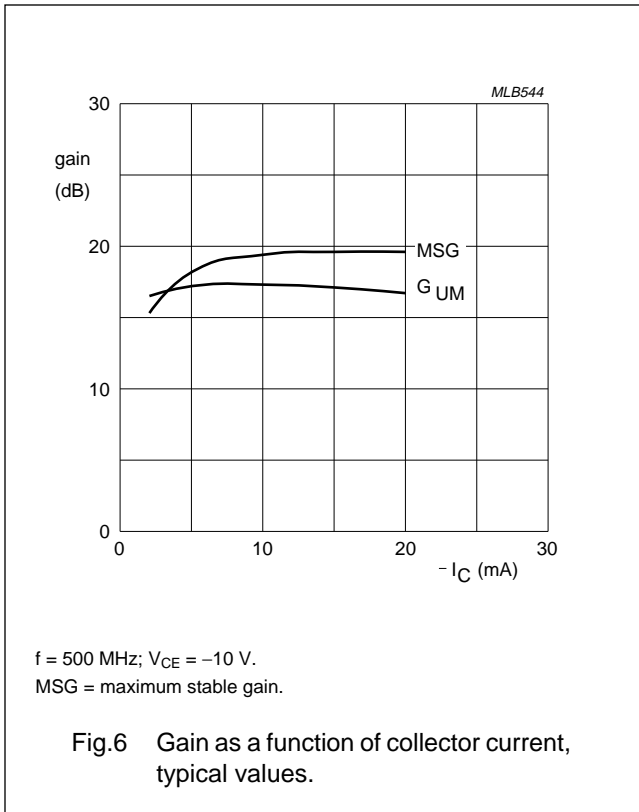
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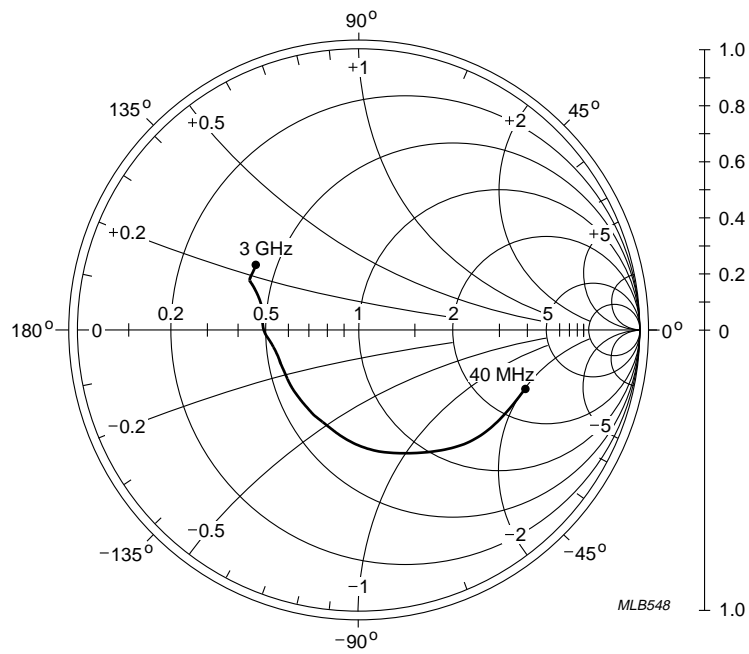
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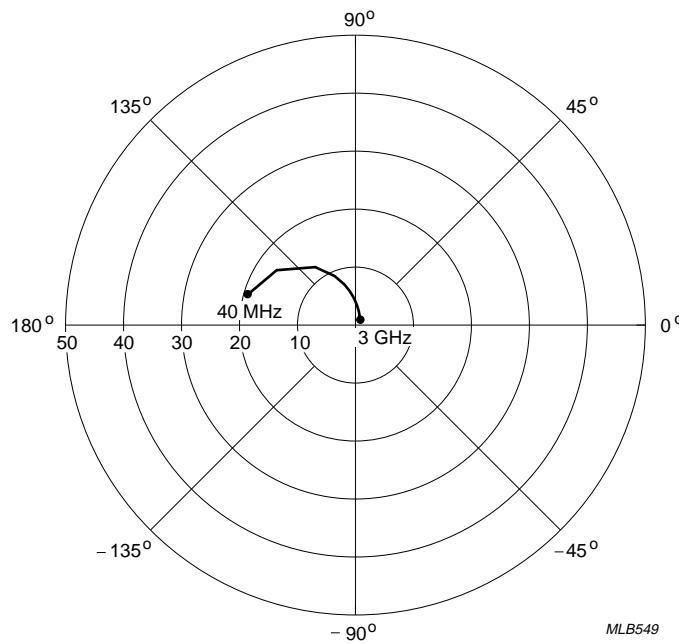
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$V_{CE} = -10\text{ V}; I_C = -15\text{ mA}$.

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

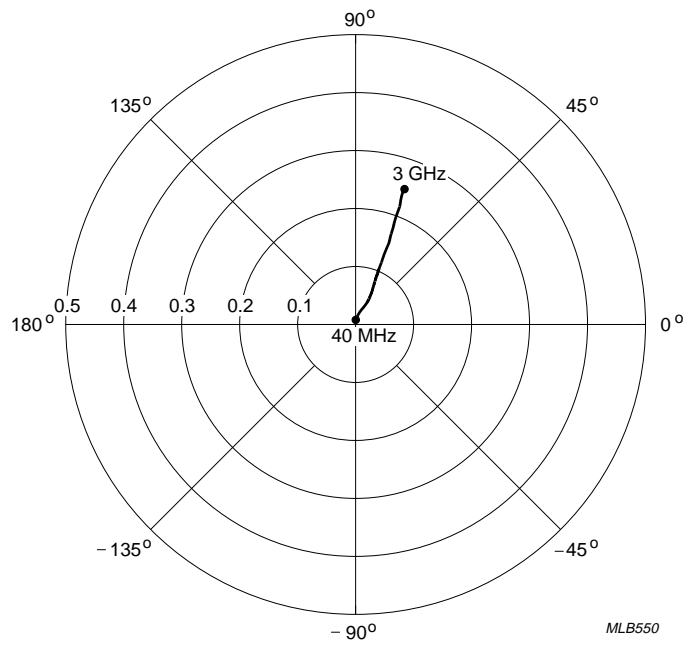


$V_{CE} = -10\text{ V}; I_C = -15\text{ mA}$.

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

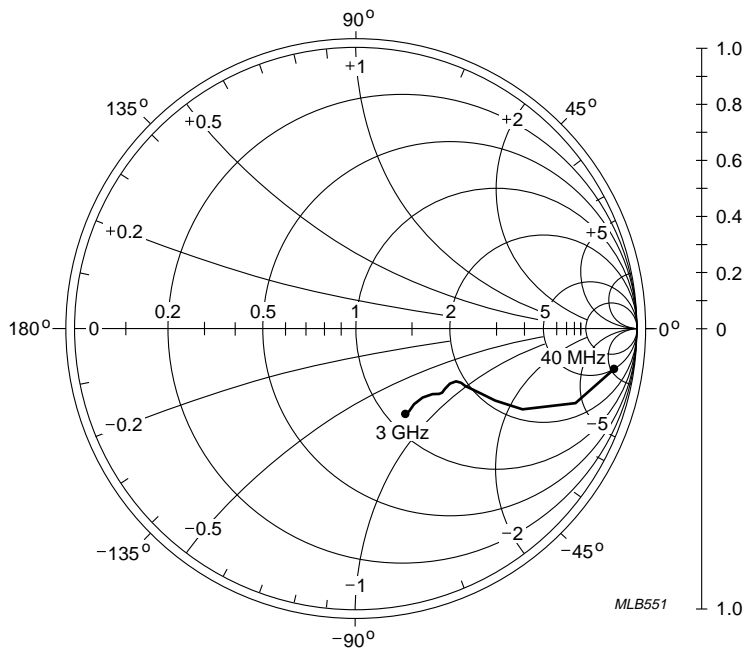
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$V_{CE} = -10\text{ V}; I_C = -15\text{ mA}$.

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

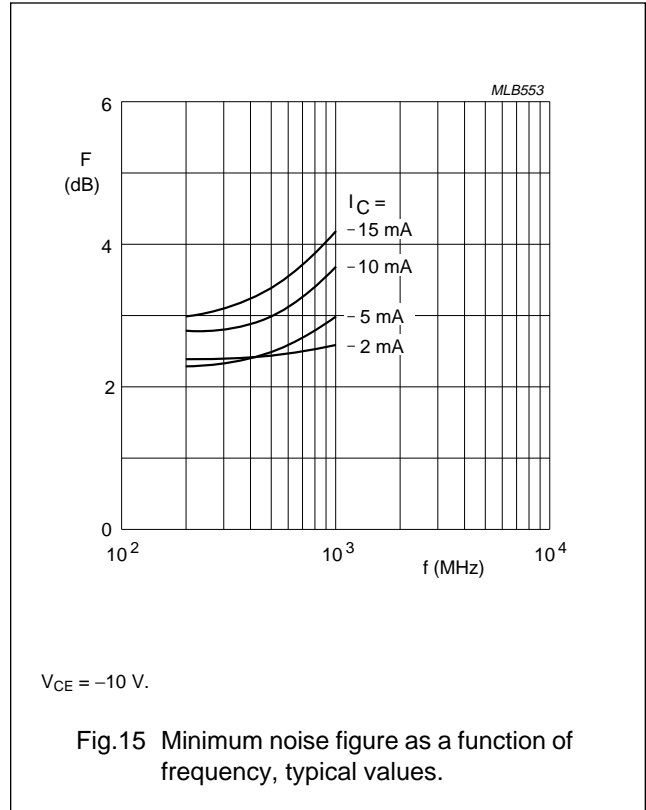
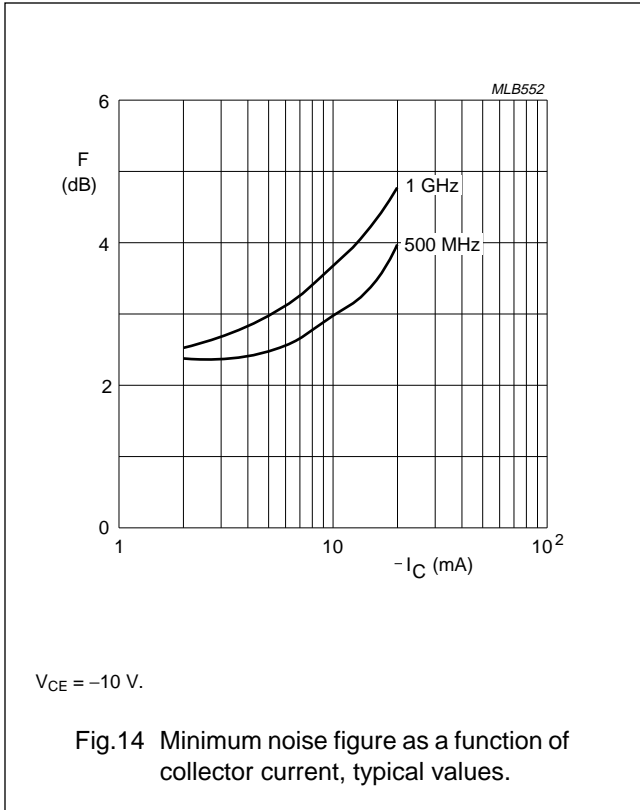


$V_{CE} = -10\text{ V}; I_C = -15\text{ mA}$.

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

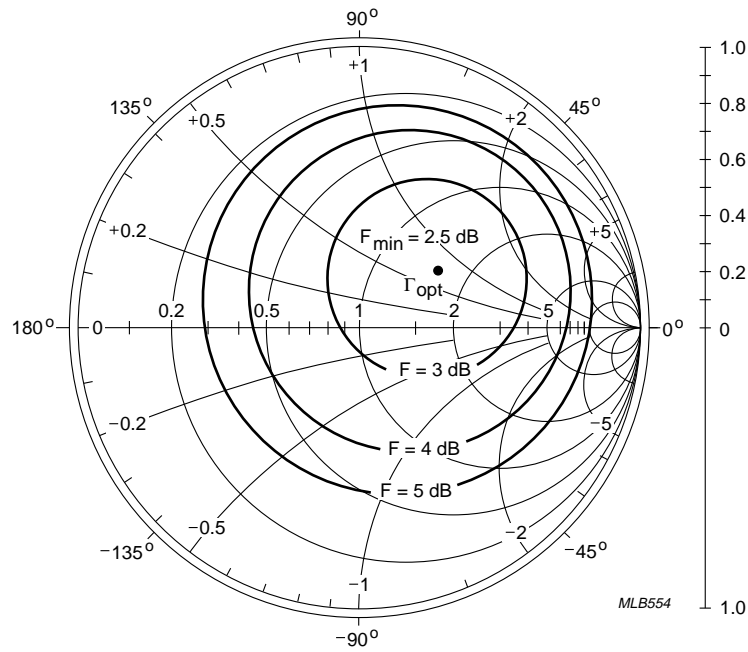
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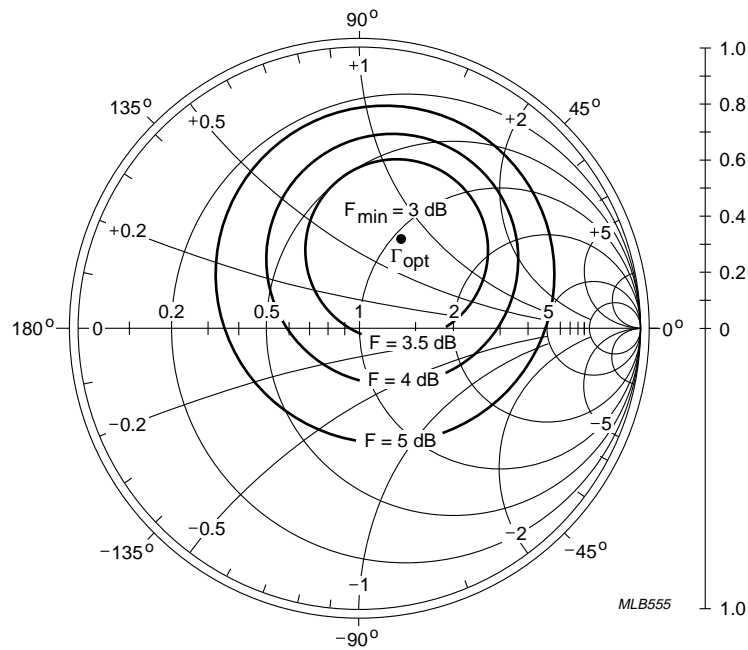
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$f = 500 \text{ MHz}; V_{CE} = -10 \text{ V}; I_C = -5 \text{ mA}; Z_o = 50 \Omega.$

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



$f = 1 \text{ GHz}; V_{CE} = -10 \text{ V}; I_C = -5 \text{ mA}; Z_o = 50 \Omega.$

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

PNP 4 GHz wideband transistor

BFT92W

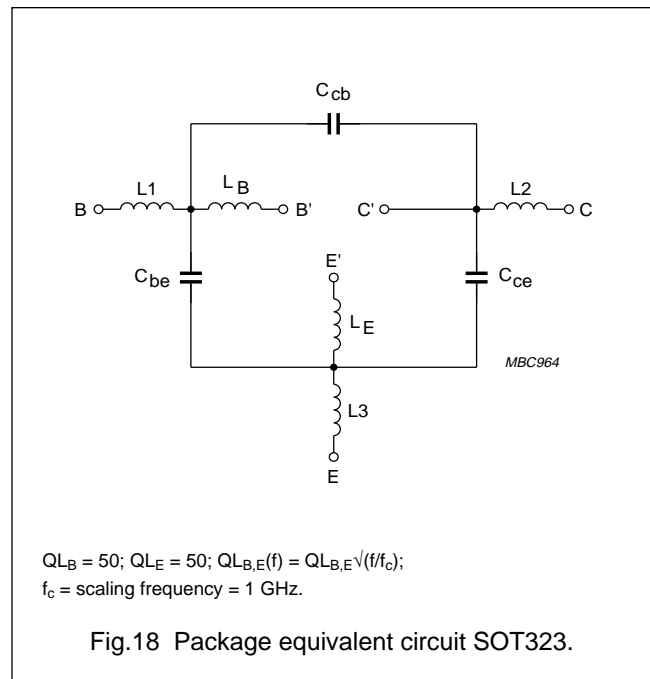
SPICE parameters for the BFT92W crystal

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

SEQUENCE No.	PARAMETER	VALUE	UNIT
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.



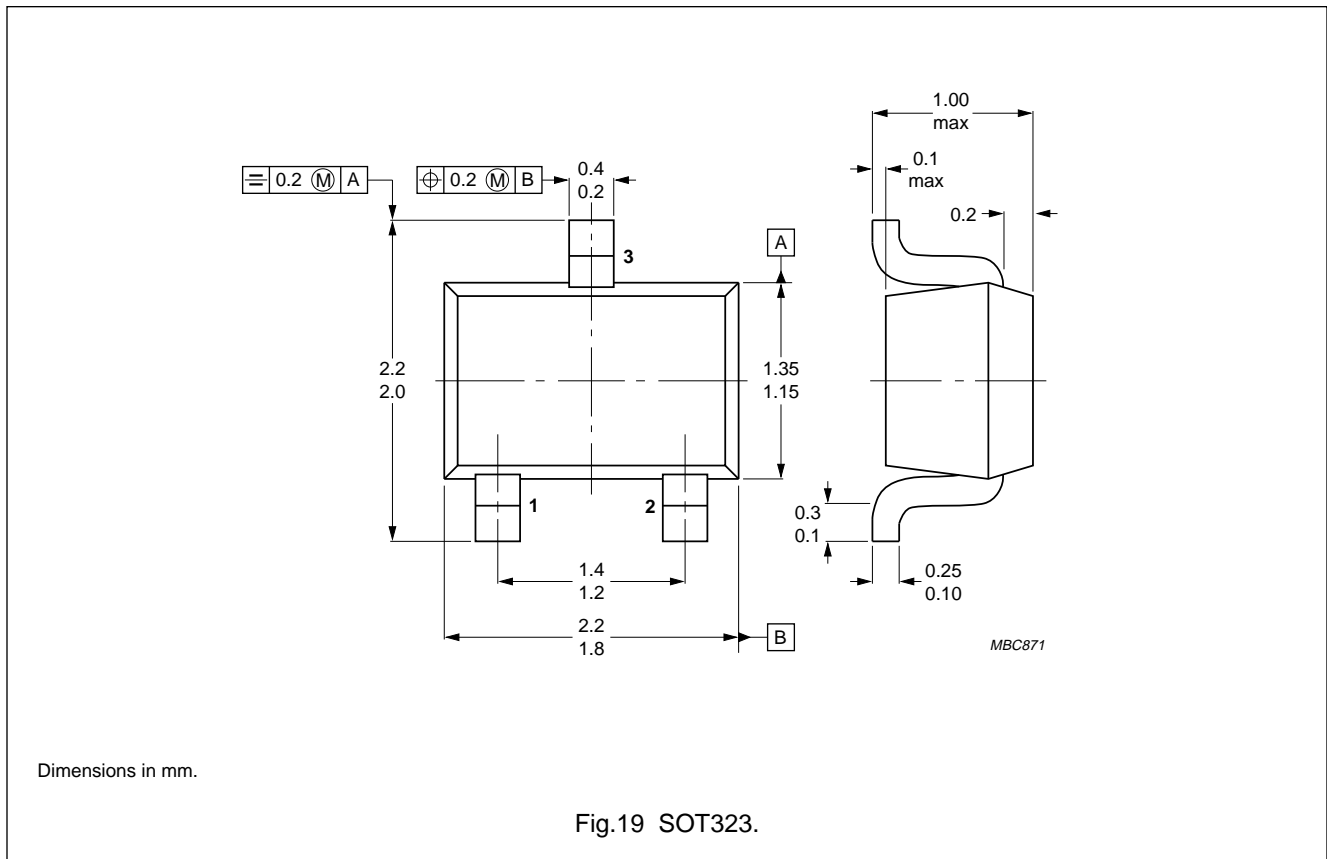
List of components (see Fig.18)

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

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PACKAGE OUTLINE



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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