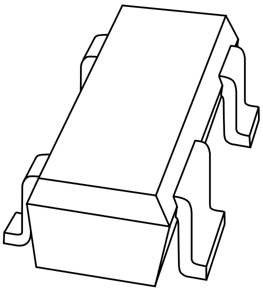
DATA SHEET



BFG25AW; BFG25AW/X

NPN 5 GHz wideband transistors

Product specification
Supersedes data of August 1995

1998 Sep 23

Philips Semiconductors

PHILIPS

FEATURES

- Low current consumption (100 µA to 1 mA)
- Low noise figure
- Gold metallization ensures excellent reliability.

APPLICATIONS

Wideband applications in UHF low power amplifiers, such as pocket telephones and paging systems.

DESCRIPTION

NPN silicon planar epitaxial transistor in a 4-pin dual-emitter SOT343N plastic package.

PINNING

PIN	DESCRIPTION
BFG25AW	
1	collector
2	base
3	emitter
4	emitter
BFG25AW/X	
1	collector
2	emitter
3	base
4	emitter

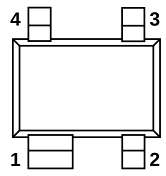


Fig.1 SOT343N.

MARKING

TYPE NUMBER	CODE
BFG25AW	N6
BFG25AW/X	V1

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	–	8	V
V_{CEO}	collector-emitter voltage	open base	–	–	5	V
I_C	collector current (DC)		–	–	6.5	mA
P_{tot}	total power dissipation	$T_s \leq 85$ °C	–	–	500	mW
h_{FE}	DC current gain	I_C = 0.5 mA; V_{CE} = 1 V	50	80	200	
C_{re}	feedback capacitance	I_C = 0; V_{CE} = 1 V; f = 1 MHz	–	0.2	0.3	pF
f_T	transition frequency	I_C = 1 mA; V_{CE} = 1 V; f = 500 MHz; T_{amb} = 25 °C	3.5	5	–	GHz
G_{UM}	maximum unilateral power gain	I_C = 0.5 mA; V_{CE} = 1 V; f = 1 GHz; T_{amb} = 25 °C	–	16	–	dB
F	noise figure	$\Gamma_s = \Gamma_{opt}$; I_C = 1 mA; V_{CE} = 1 V; 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	–	8	V
V_{CEO}	collector-emitter voltage	open base	–	5	V
V_{EBO}	emitter-base voltage	open collector	–	2	V
I_C	collector current (DC)		–	6.5	mA
P_{tot}	total power dissipation	$T_s \leq 85$ °C; see Fig.2; note 1	–	500	mW
T_{stg}	storage temperature		–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	$T_s \leq 85$ °C; note 1	180	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
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100$ μA; $I_E = 0$	–	–	8	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 1$ mA; $I_B = 0$	–	–	5	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 100$ μA; $I_C = 0$	–	–	2	V
I_{CBO}	collector leakage current	open emitter; $V_{CB} = 5$ V; $I_E = 0$	–	–	50	nA
h_{FE}	DC current gain	$I_C = 0.5$ mA; $V_{CE} = 1$ V	50	80	200	
C_{re}	feedback capacitance	$I_C = 0$; $V_{CE} = 1$ V; f = 1 MHz	–	0.2	0.3	pF
f_T	transition frequency	$I_C = 1$ mA; $V_{CE} = 1$ V; f = 1 GHz; $T_{amb} = 25$ °C	3.5	5	–	GHz
G_{UM}	maximum unilateral power gain; note 1	$I_C = 0.5$ mA; $V_{CE} = 1$ V; f = 1 GHz; $T_{amb} = 25$ °C	–	16	–	dB
		$I_C = 0.5$ mA; $V_{CE} = 1$ V; f = 2 GHz; $T_{amb} = 25$ °C	–	8	–	dB
F	noise figure	$\Gamma_s = \Gamma_{opt}$; $I_C = 0.5$ mA; $V_{CE} = 1$ V; f = 1 GHz	–	1.9	–	dB
		$\Gamma_s = \Gamma_{opt}$; $I_C = 1$ mA; $V_{CE} = 1$ V; f = 1 GHz	–	2		dB

Note

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

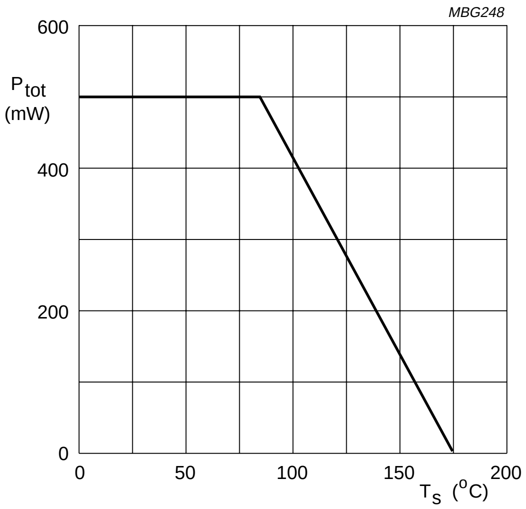
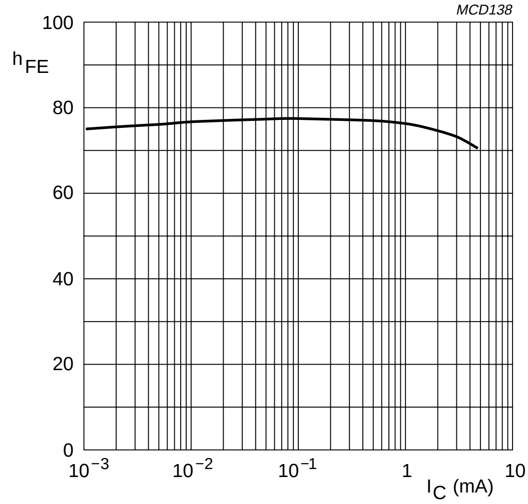
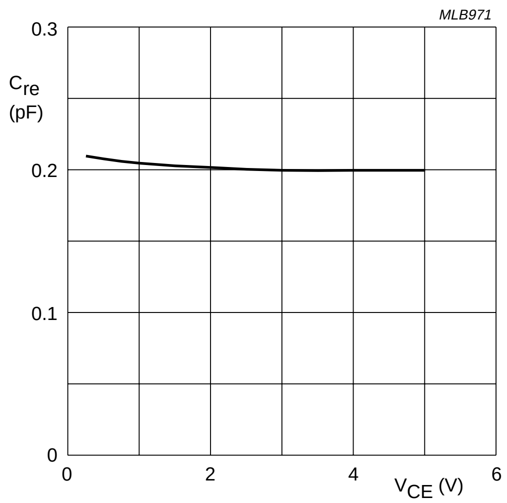


Fig.2 Power derating curve.



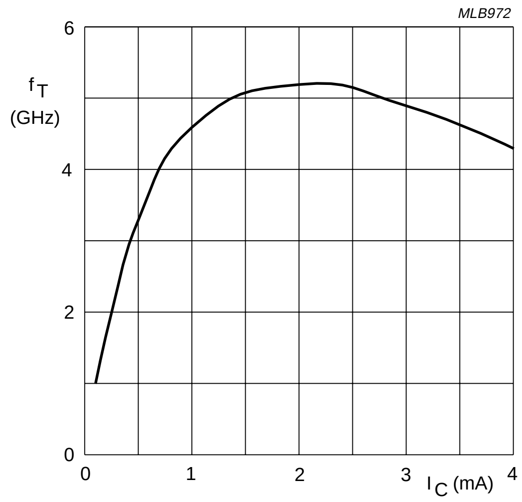
V_{CE} = 1 V.

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



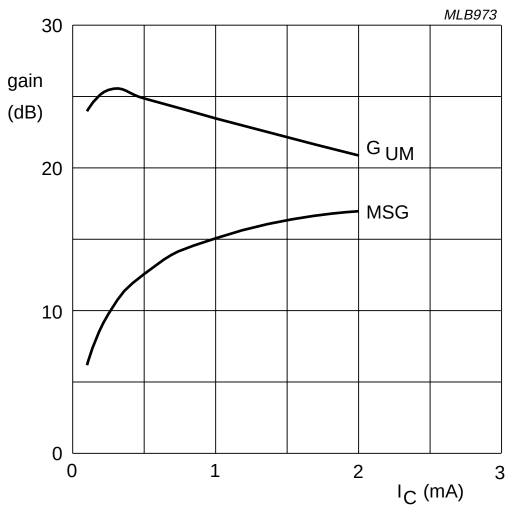
I_C = 0; f = 1 MHz.

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



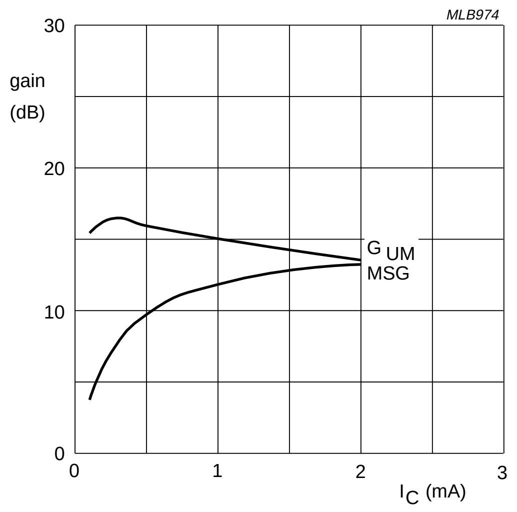
f = 500 MHz; V_{CE} = 1 V; T_{amb} = 25 °C.

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



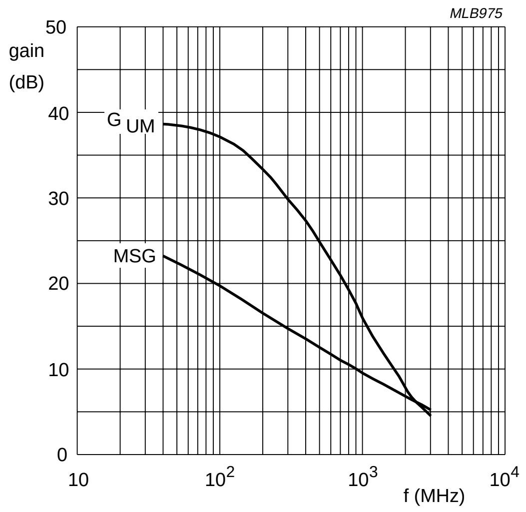
f = 500 MHz; V_{CE} = 1 V.

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



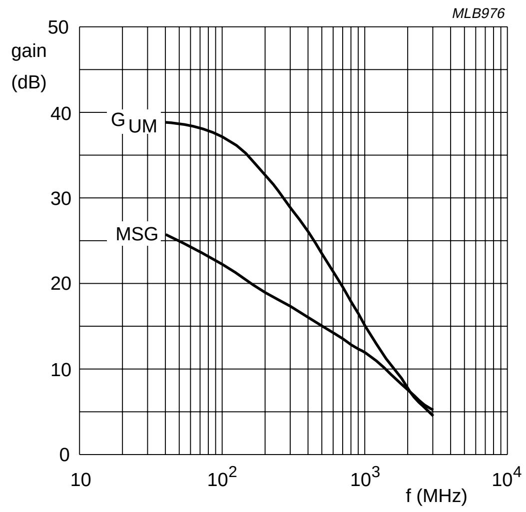
f = 1 GHz; V_{CE} = 1 V.

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



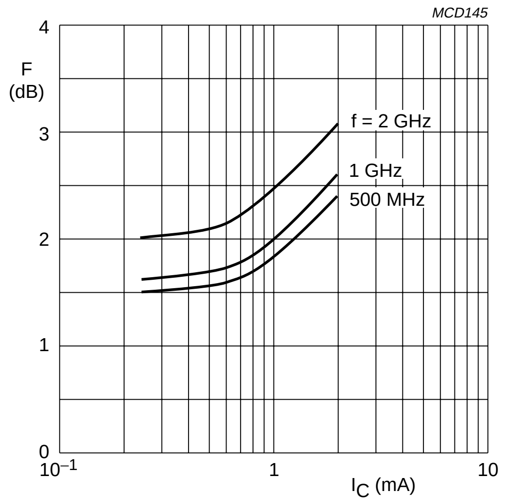
I_C = 0.5 mA; V_{CE} = 1 V.

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



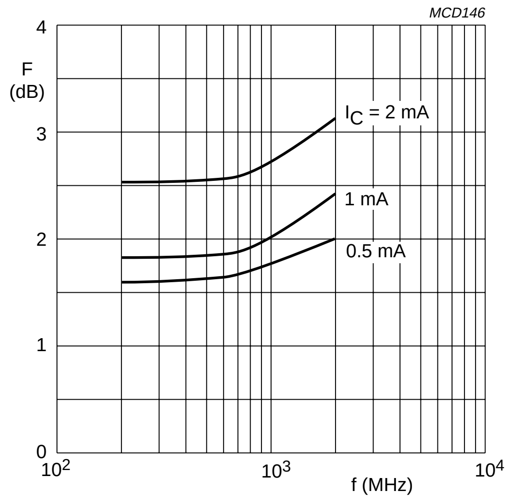
I_C = 1 mA; V_{CE} = 1 V.

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



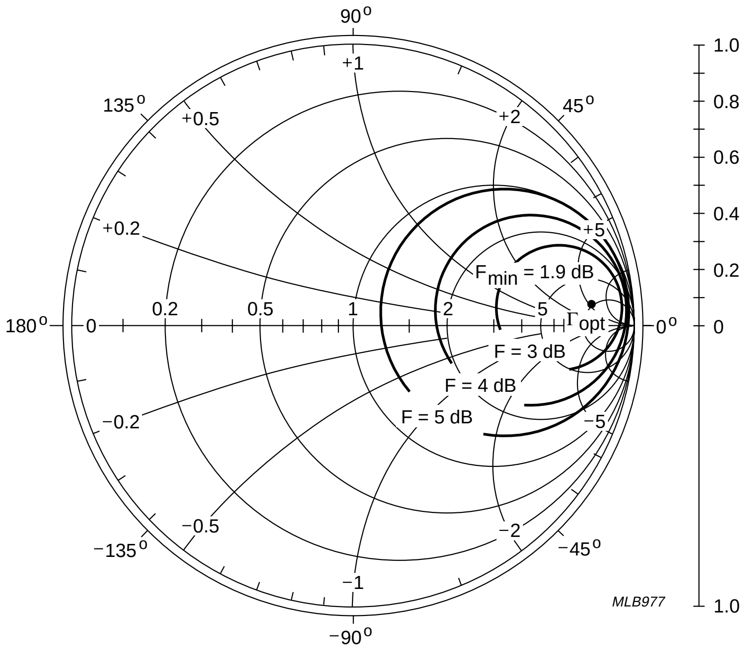
V_{CE} = 1 V.

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



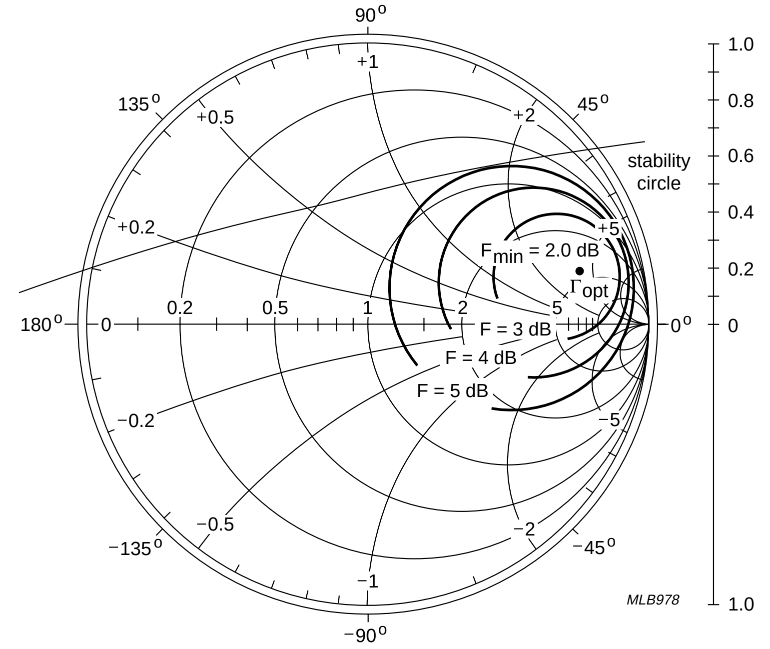
V_{CE} = 1 V.

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



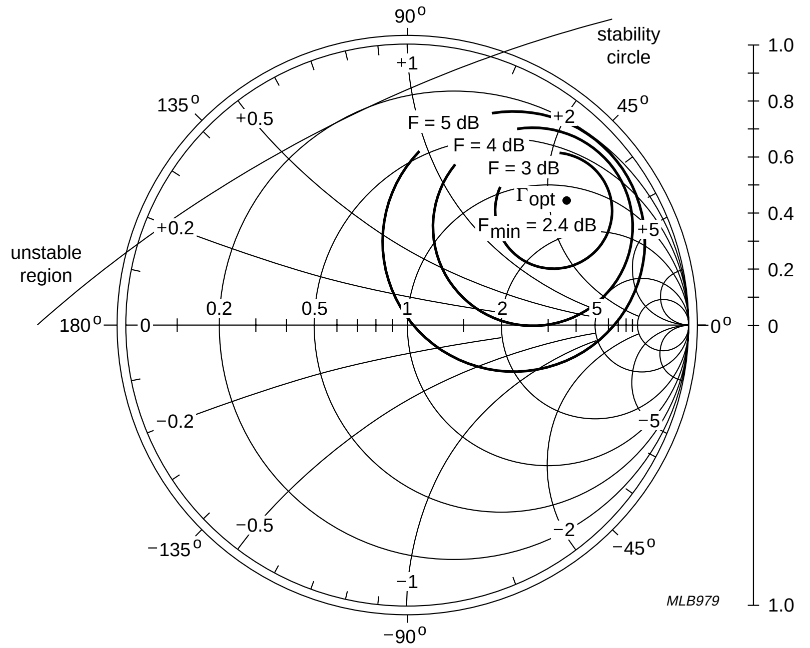
f = 500 MHz; V_{CE} = 1 V; I_C = 1 mA; Z_0 = 50 Ω.

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



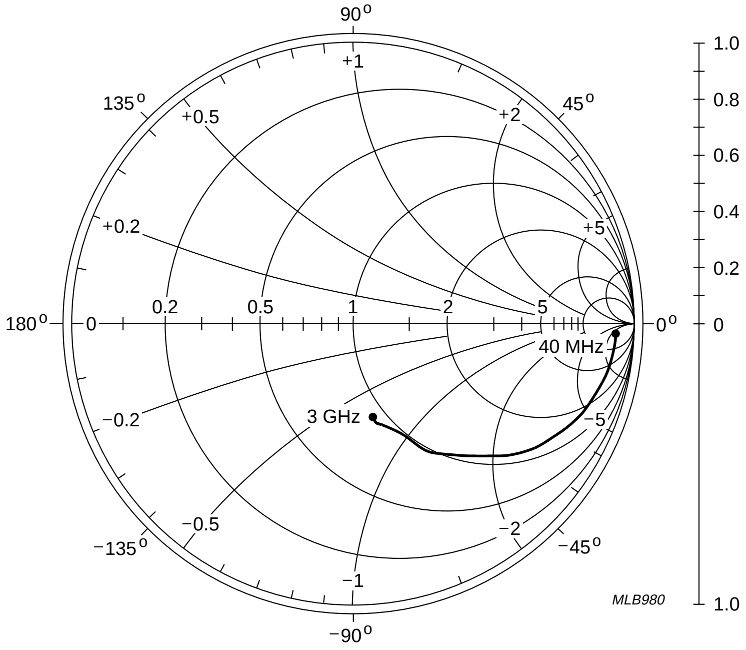
f = 1 GHz; V_{CE} = 1 V; I_C = 1 mA; Z_o = 50 Ω.

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



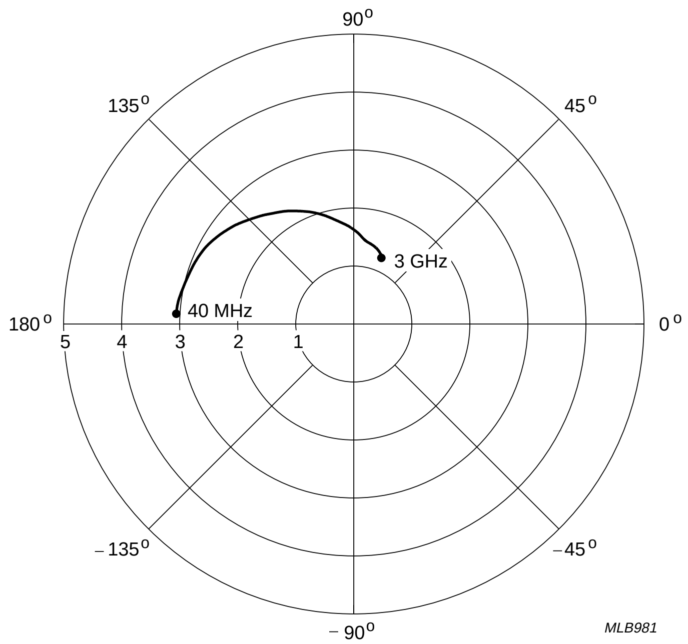
f = 2 GHz; V_{CE} = 1 V; I_C = 1 mA; Z_o = 50 Ω.

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



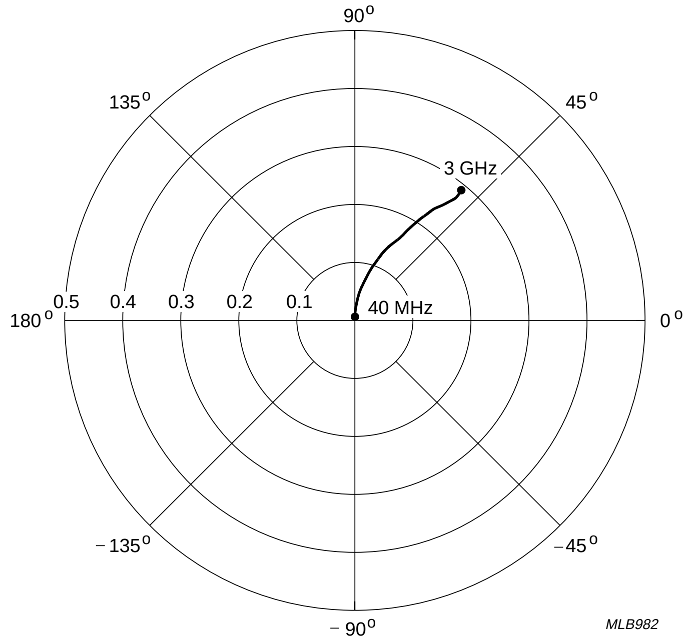
V_{CE} = 1 V; I_C = 1 mA; Z_o = 50 Ω..

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



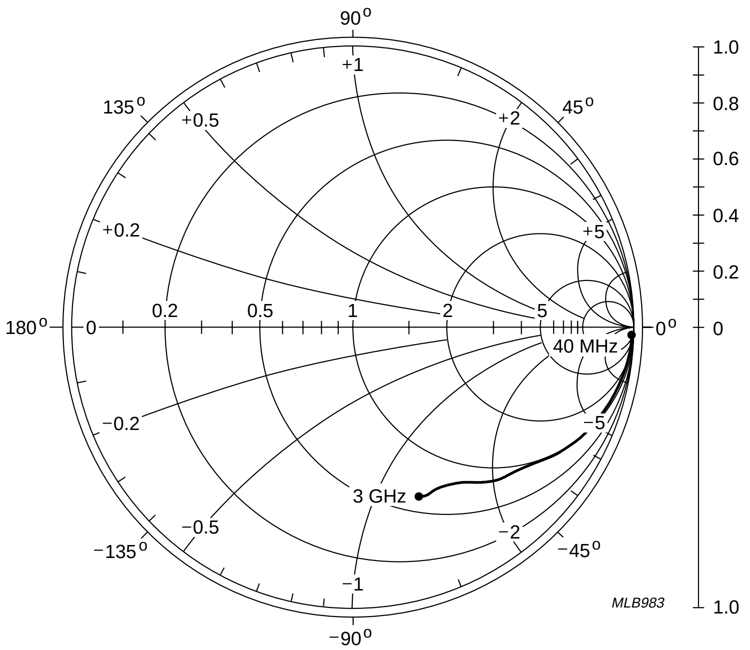
V_{CE} = 1 V; I_C = 1 mA.

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



V_{CE} = 1 V; I_C = 1 mA.

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



V_{CE} = 1 V; I_C = 1 mA; Z_o = 50 Ω.

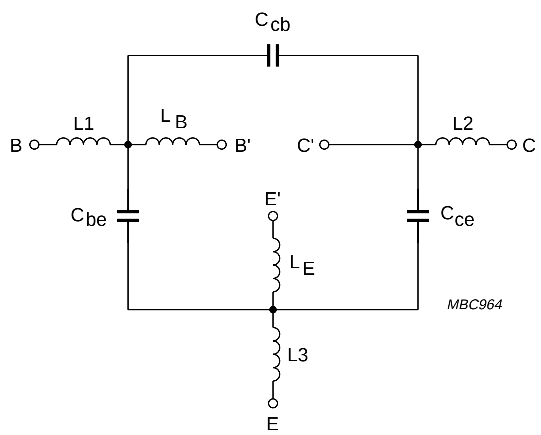
Fig.18 Common emitter output reflection coefficient (S_{22}); typical values.

SPICE parameters for the BFG25W crystal

SEQUENCE No.	PARAMETER	VALUE	UNIT
1	IS	13.77	aA
2	BF	85.65	–
3	NF	0.980	–
4	VAF	50.80	V
5	IKF	10.00	A
6	ISE	2.199	fA
7	NE	1.857	–
8	BR	16.97	–
9	NR	0.986	–
10	VAR	2.491	V
11	IKR	188.0	mA
12	ISC	205.1	aA
13	NC	1.107	–
14	RB	80.00	Ω
15	IRB	1.000	µA
16	RBM	80.00	Ω
17	RE	7.911	Ω
18	RC	5.300	Ω
19(1)	XTB	0.000	–
20(1)	EG	1.110	eV
21(1)	XTI	3.000	–
22	CJE	223.0	fF
23	VJE	669.7	mV
24	MJE	0.060	–
25	TF	5.112	ps
26	XTF	7.909	–
27	VTF	1.338	V
28	ITF	5.662	mA
29	PTF	15.37	deg
30	CJC	229.0	fF
31	VJC	394.7	mV
32	MJC	0.043	–
33	XCJC	0.050	–
34	TR	13.26	ns
35 (1)	CJS	0.000	F
36(1)	VJS	750.0	mV
37(1)	MJS	0.000	–
38	FC	0.988	–

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.

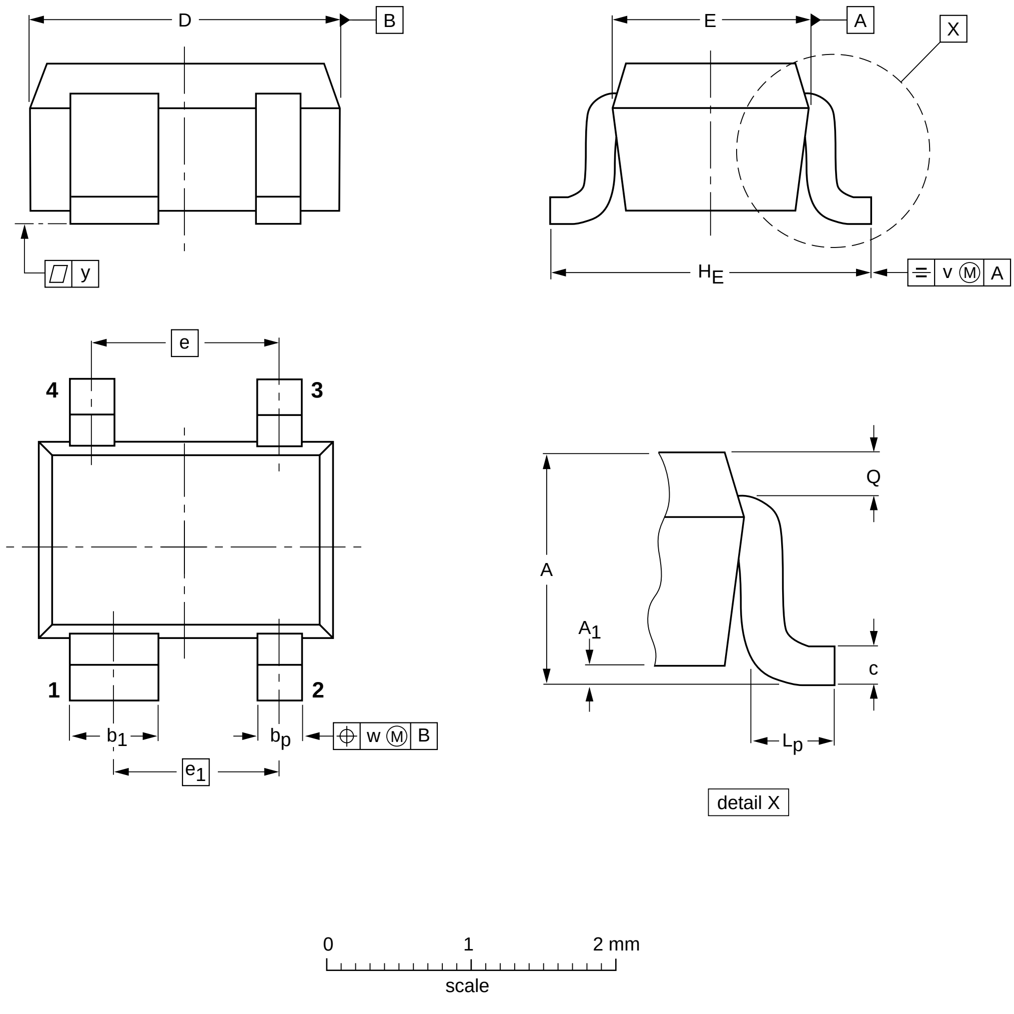
Fig.19 Package equivalent circuit SOT343N.

List of components (see Fig.19)

DESIGNATION	VALUE	UNIT
C_{be}	70	fF
C_{cb}	50	fF
C_{ce}	115	fF
L1	0.34	nH
L2	0.10	nH
L3	0.25	nH
L_B	0.40	nH
L_E	0.40	nH

PACKAGE OUTLINES

Plastic surface mounted package; 4 leads **SOT343N**



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 0.8	0.1	0.4 0.3	0.7 0.5	0.25 0.10	2.2 1.8	1.35 1.15	1.3	1.15	2.2 2.0	0.45 0.15	0.23 0.13	0.2	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT343N						97-05-21

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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