NPN 6 GHz wideband transistor

BFG92AW
BFG92AW/X; BFG92AW/XR

FEATURES

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

APPLICATIONS

They are intended for wideband applications in the UHF and microwave ranges.

DESCRIPTION

NPN silicon planar epitaxial transistors in plastic, 4-pin dual-emitter SOT343 and SOT343R packages.

MARKING

TYPE NUMBER	CODE
BFG92AW	P8
BFG92AW/X	P9
BFG92AW/XR	P2

PINNING

PIN	DESCRIPTION
BFG92AW (see Fig.1)	
1	collector
2	base
3	emitter
4	emitter
BFG92AW/X (see Fig.1)	
1	collector
2	emitter
3	base
4	emitter
BFG92AW/XR (see Fig.2)	
1	collector
2	emitter
3	base
4	emitter

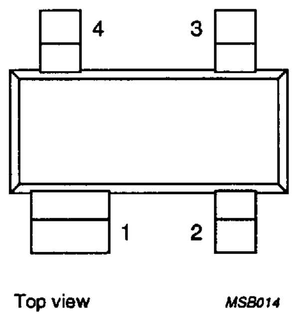


Fig.1 SOT343.

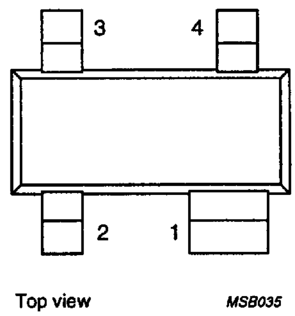


Fig.2 SOT343R.

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)		–	–	25	mA
P_{tot}	total power dissipation	up to T_s = 60 °C	–	–	500	mW
h_{FE}	DC current gain	I_C = 15 mA; V_{CE} = 10 V	40	90	–	
C_{re}	feedback capacitance	I_C = 0; V_{CE} = 10 V; f = 1 MHz	–	0.35	–	pF
f_T	transition frequency	I_C = 15 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	–	6	–	GHz
G_{UM}	maximum unilateral power gain	I_C = 15 mA; V_{CE} = 10 V; f = 1 GHz; T_{amb} = 25 °C	–	15.5	–	dB
		I_C = 15 mA; V_{CE} = 10 V; f = 2 GHz; T_{amb} = 25 °C	–	10	–	dB
F	noise figure	$\Gamma_s = \Gamma_{opt}$; I_C = 5 mA; V_{CE} = 10 V; f = 1 GHz	–	2.1	–	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	up to T_s = 60 °C; see Fig.3; note 1	–	500	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 = 60 °C; note 1	180	K/W

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

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

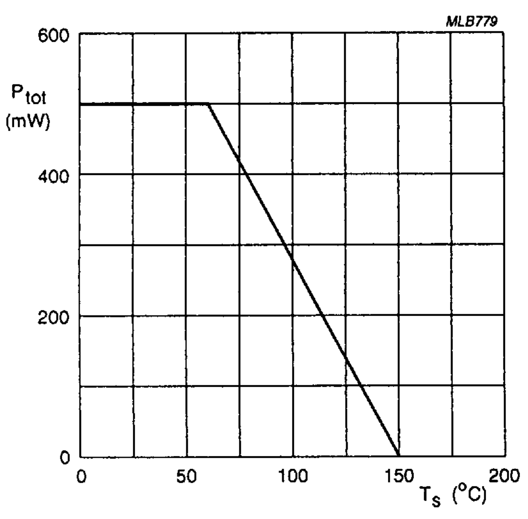


Fig.3 Power derating curve.

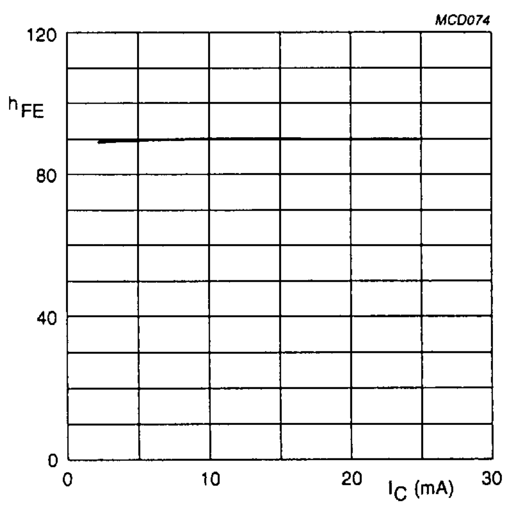
CHARACTERISTICS

T_j = 25 °C (unless otherwise specified).

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; I_C = 10 μA; I_E = 0	–	–	20	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; I_C = 10 mA; I_B = 0	–	–	15	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; I_E = 10 μA; I_C = 0	–	–	2	V
I_{CBO}	collector cut-off current	open emitter; V_{CB} = 10 V; I_E = 0	–	–	50	nA
h_{FE}	DC current gain	I_C = 15 mA; V_{CE} = 10 V	40	90	–	
f_T	transition frequency	I_C = 15 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	–	6	–	GHz
C_c	collector capacitance	$I_E = i_e$ = 0; V_{CE} = 10 V; f = 1 MHz	–	0.6	–	pF
C_e	emitter capacitance	$I_C = i_c$ = 0; V_{EB} = 0.5 V; f = 1 MHz	–	0.9	–	pF
C_{re}	feedback capacitance	I_C = 0; V_{CE} = 10 V; f = 1 MHz	–	0.35	–	pF
G_{UM}	maximum unilateral power gain; note 1	I_C = 15 mA; V_{CE} = 10 V; f = 1 GHz; T_{amb} = 25 °C	–	15.5	–	dB
		I_C = 15 mA; V_{CE} = 10 V; f = 2 GHz; T_{amb} = 25 °C	–	10	–	dB
F	noise figure	$\Gamma_s = \Gamma_{opt}$; I_C = 5 mA; V_{CE} = 10 V; f = 1 GHz	–	2.1	–	dB
		$\Gamma_s = \Gamma_{opt}$; I_C = 5 mA; V_{CE} = 10 V; f = 2 GHz	–	3	–	dB

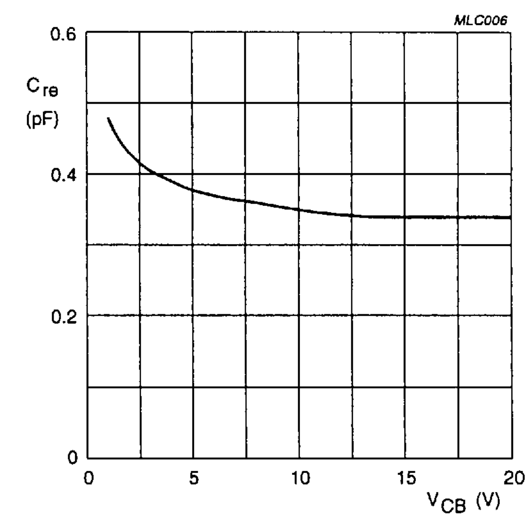
Note

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.



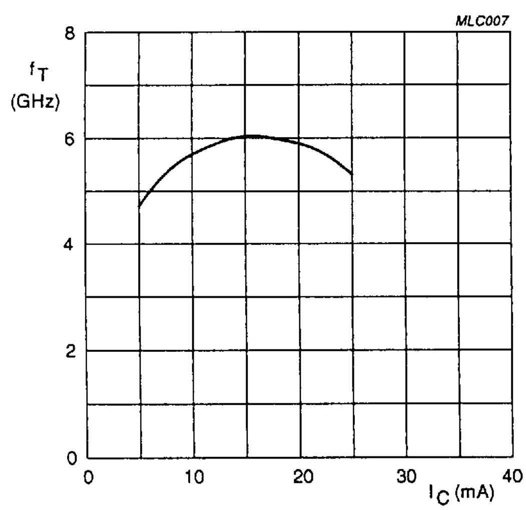
V_{CE} = 10 V.

Fig.4 Current gain (DC) as a function of collector current; typical values.



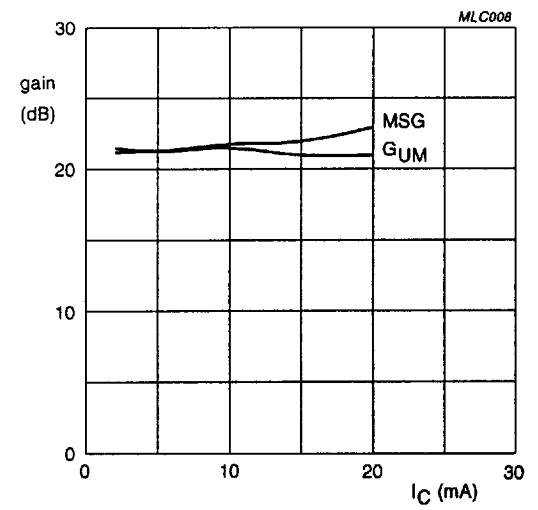
I_C = 0; f = 1 MHz.

Fig.5 Feedback capacitance as a function of collector-base voltage; typical values.



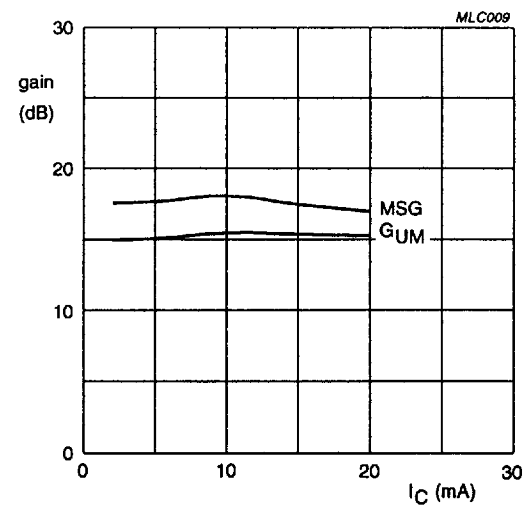
f = 500 MHz; V_{CE} = 10 V; T_{amb} = 25 °C.

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



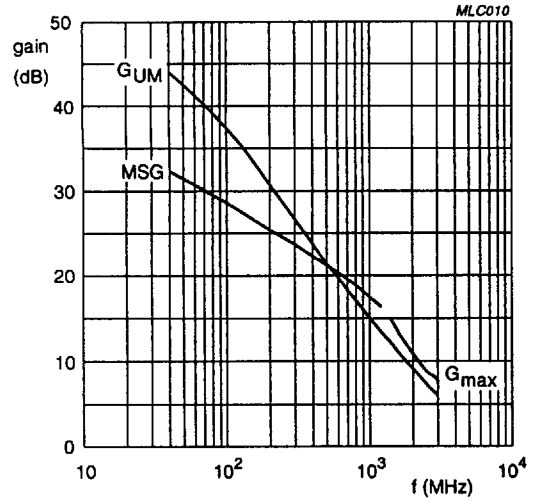
f = 500 MHz; V_{CE} = 10 V.

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



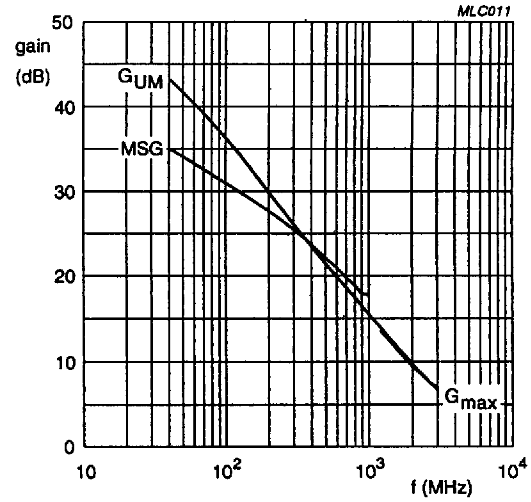
f = 1 GHz; V_{CE} = 10 V.

Fig.8 Gain as a function of collector current; typical values.



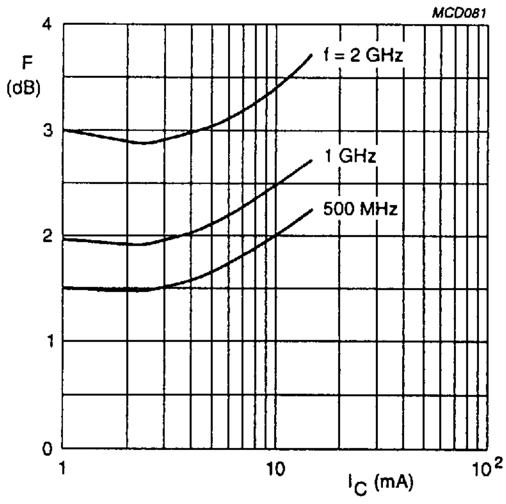
I_C = 5 mA; V_{CE} = 10 V.

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



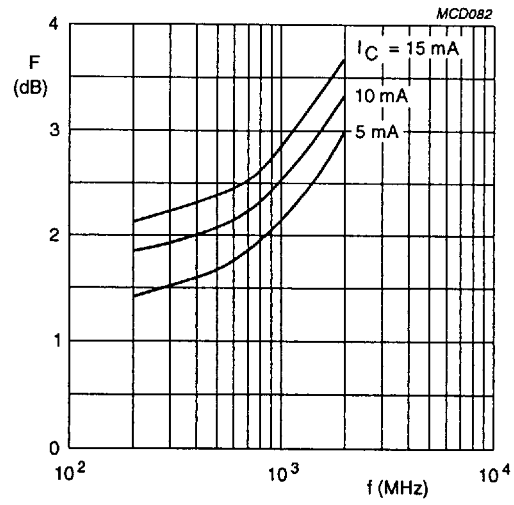
I_C = 15 mA; V_{CE} = 10 V.

Fig.10 Gain as a function of frequency; typical values.



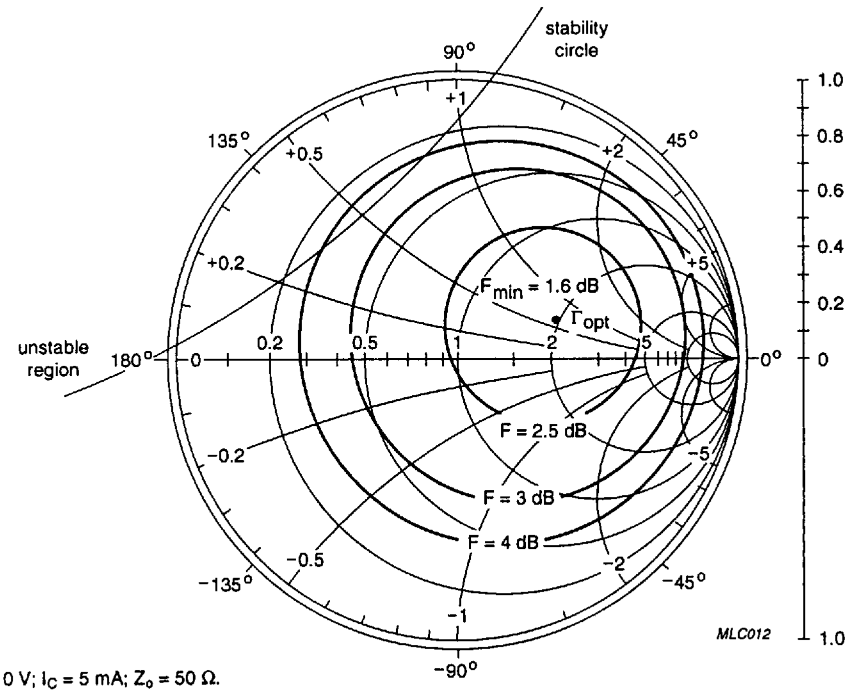
V_{CE} = 10 V.

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



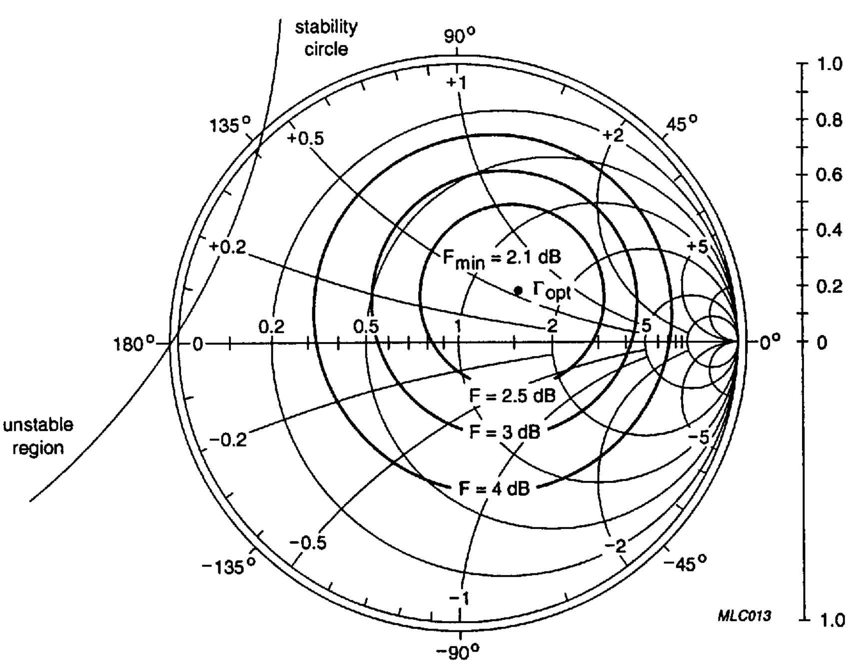
V_{CE} = 10 V.

Fig.12 Minimum noise figure as a function of frequency; typical values.



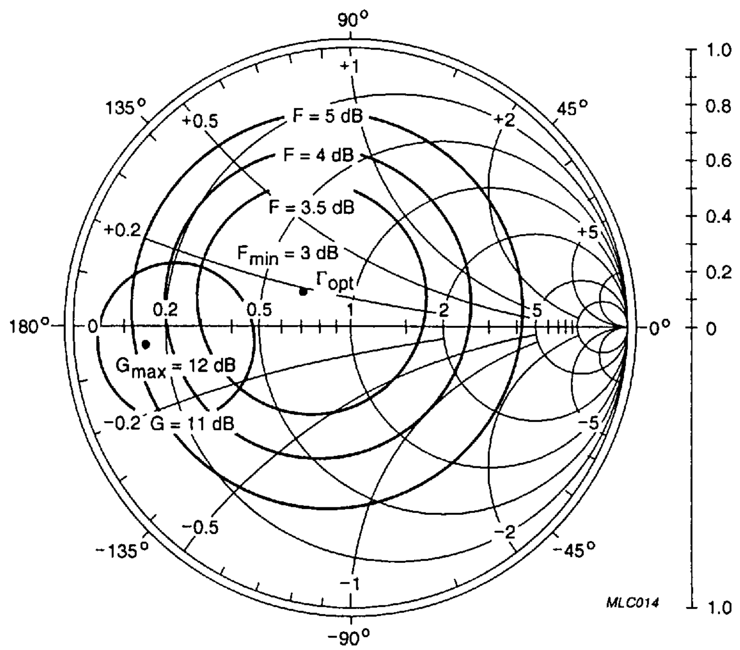
f = 500 MHz; V_{CE} = 10 V; I_C = 5 mA; Z_o = 50 Ω.

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



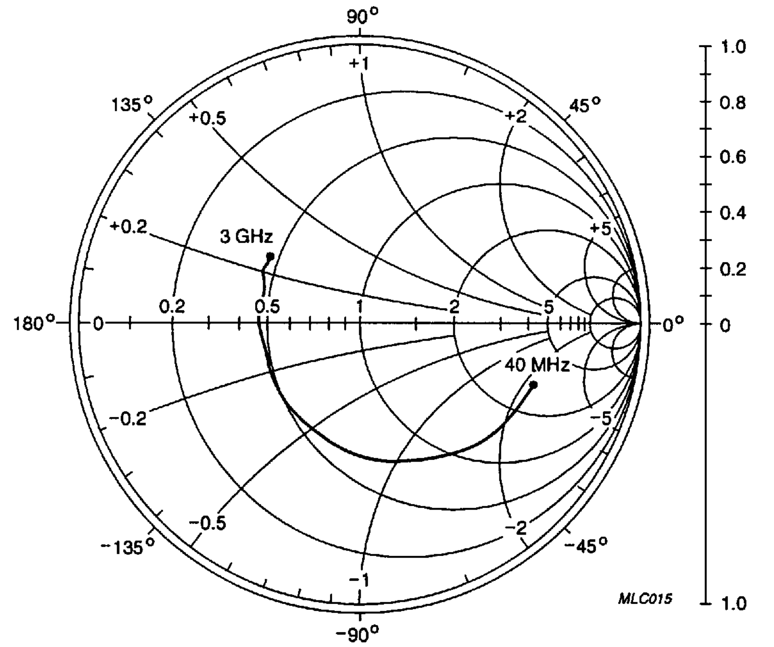
f = 1 GHz; V_{CE} = 10 V; I_C = 5 mA; Z_o = 50 Ω.

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



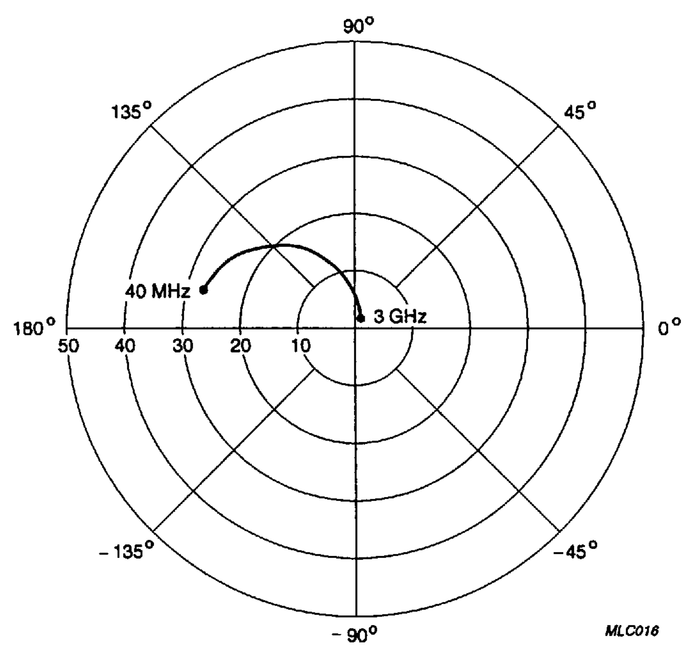
f = 2 GHz; V_{CE} = 10 V; I_C = 5 mA; Z_o = 50 Ω.

Fig.15 Common emitter noise figure circles; typical values.



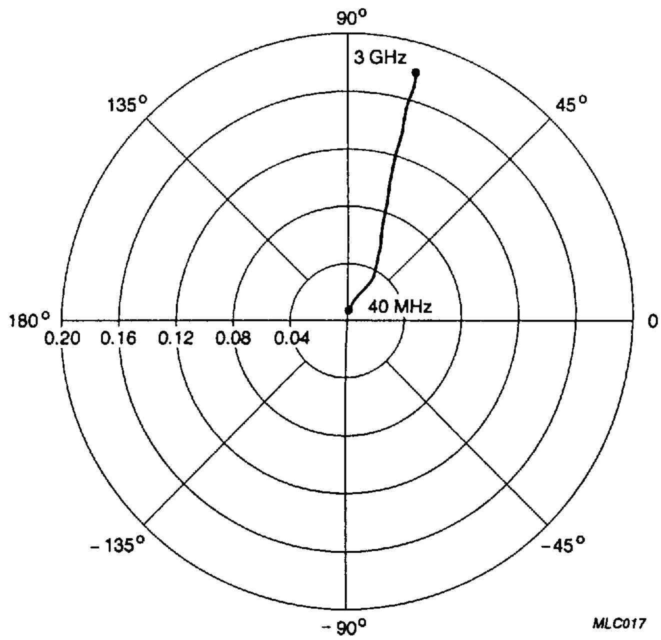
V_{CE} = 10 V; I_C = 15 mA; Z_o = 50 Ω.

Fig.16 Common emitter input reflection coefficient (s_{11}); typical values.



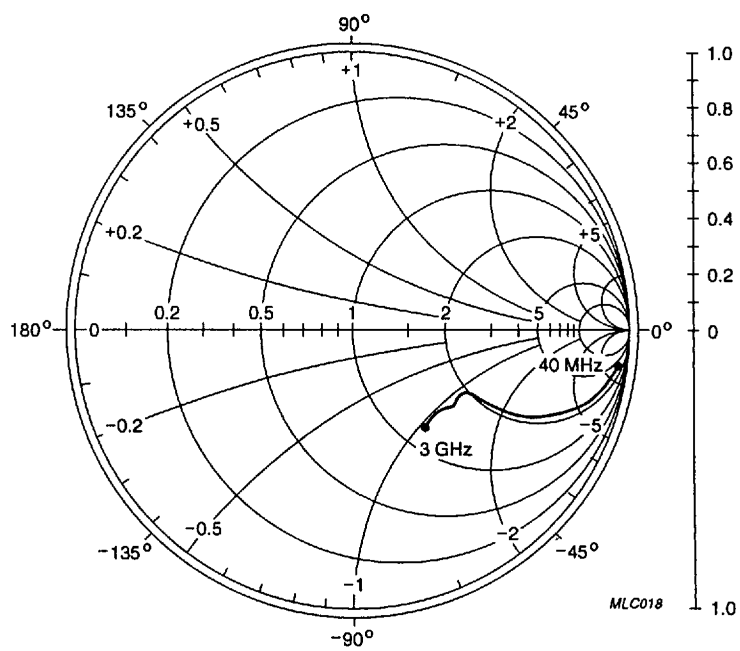
V_{CE} = 10 V; I_C = 15 mA.

Fig.17 Common emitter forward transmission coefficient (s_{21}); typical values.



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

Fig.18 Common emitter reverse transmission coefficient (s_{12}); typical values.



V_{CE} = 10 V; I_C = 15 mA; Z_o = 50 Ω.

Fig.19 Common emitter output reflection coefficient (s_{22}); typical values.

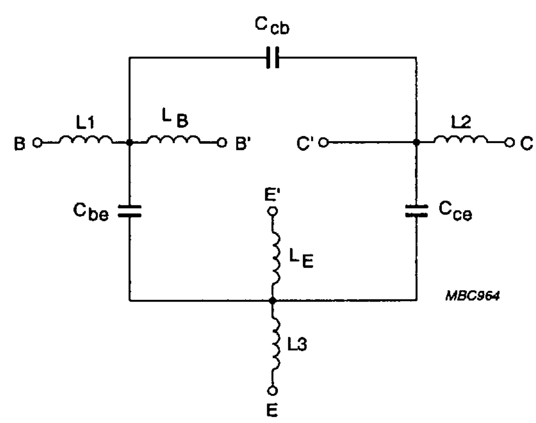
SPICE parameters for the BFG92AW crystal

SEQUENCE No.	PARAMETER	VALUE	UNIT
1	IS	411.8	aA
2	BF	102.6	–
3	NF	0.997	–
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	0.996	–
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 (1)	XTB	0.000	–
20 (1)	EG	1.110	eV
21 (1)	XTI	3.000	–
22	CJE	890.5	fF
23	VJE	600.0	mV
24	MJE	0.258	–
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	0.202	–
33	XCJC	0.150	–
34	TR	5.618	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	0.850	–

Note

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



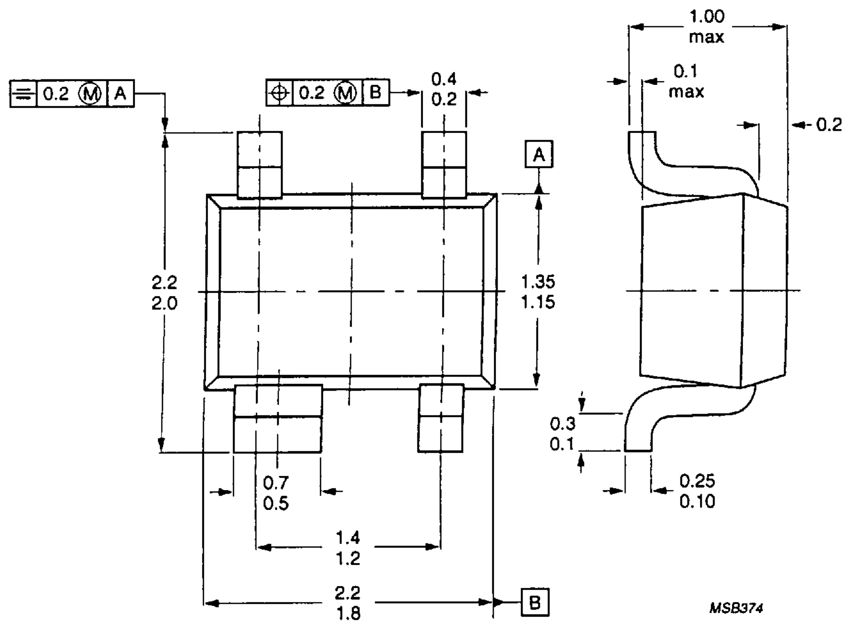
$QL_B = 50$; $QL_E = 50$; $QL_{B,E}(f) = QL_{B,E}\sqrt{(f/f_c)}$;
f_c = scaling frequency = 1 GHz.

Fig.20 Package equivalent circuit SOT343; SOT343R.

List of components (see Fig.20)

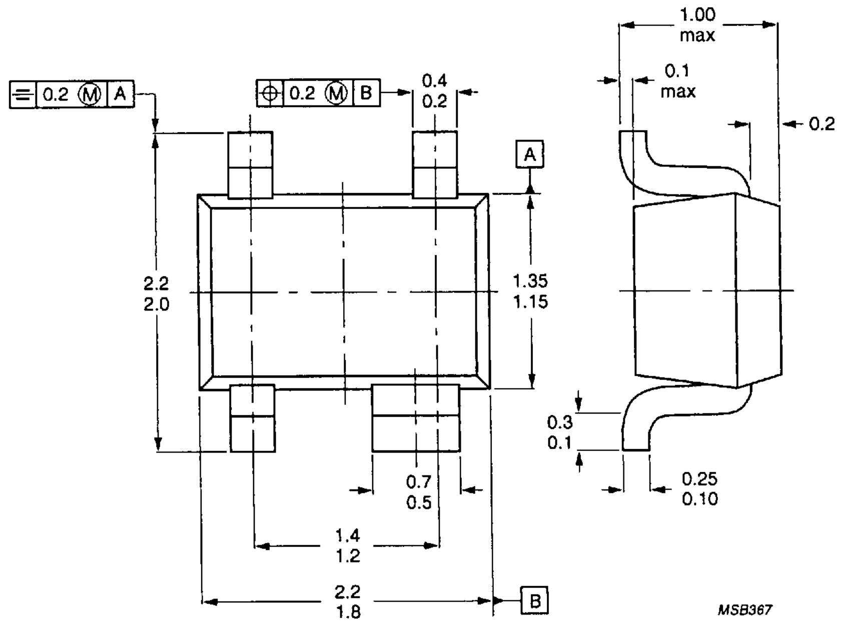
DESIGNATION	VALUE	UNIT
C_{be}	70	fF
C_{cb}	50	fF
C_{ce}	115	fF
L1	0.34	nH
L2	0.10	nH
L3	0.25	nH
L_B	0.40	nH
L_E	0.40	nH

PACKAGE OUTLINES



Dimensions in mm.

Fig.21 SOT343.



Dimensions in mm.

Fig.22 SOT343R.

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.	

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.