NPN 8 GHz wideband transistor

BFG67; BFG67/X; BFG67R; BFG67/XR

FEATURES

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

DESCRIPTION

The BFG67 is a silicon npn transistor in a 4-pin, dual-emitter plastic SOT143 envelope. It is available as in-line emitter pinning (BFG67) and cross emitter pinning (BFG67/X). Versions with reverse pinning (BFG67R and BFG67/XR) are available upon request.

This transistor is designed for wideband applications in the GHz range, such as satellite TV tuners and portable RF communications equipment.

PINNING

PIN	DESCRIPTION
BFG67 (Fig.1) Code: V3.	
1	collector
2	base
3	emitter
4	emitter
BFG67/X (Fig.1) Code: V12	
1	collector
2	emitter
3	base
4	emitter
BFG67R (Fig.2) Code: V27	
1	collector
2	base
3	emitter
4	emitter
BFG67/XR (Fig.2) Code: V26	
1	collector
2	emitter
3	base
4	emitter

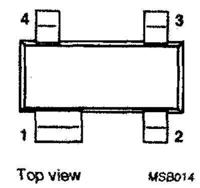


Fig.1 SOT143.

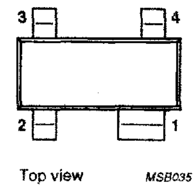


Fig.2 SOT143R.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CEO}	collector-emitter voltage	open base	–	–	10	V
I_C	DC collector current		–	–	50	mA
P_{tot}	total power dissipation	up to T_s = 65 °C (note 1)	–	–	300	mW
C_{re}	feedback capacitance	$I_C = i_c = 0$; V_{CB} = 8 V; f = 1 MHz	–	0.5	–	pF
f_T	transition frequency	I_C = 15 mA; V_{CE} = 8 V; f = 500 MHz	–	8	–	GHz
G_{UM}	maximum unilateral power gain	I_C = 15 mA; V_{CE} = 8 V; T_{amb} = 25 °C; f = 1 GHz	–	17	–	dB
F	noise figure	$\Gamma_s = \Gamma_{opt}$; I_C = 5 mA; V_{CE} = 8 V; T_{amb} = 25 °C; f = 1 GHz	–	1.3	–	dB
		$\Gamma_s = \Gamma_{opt}$; I_C = 5 mA; V_{CE} = 8 V; T_{amb} = 25 °C; f = 2 GHz	–	2.2	–	dB

Note

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

LIMITING VALUES

In accordance with the Absolute Maximum 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	–	10	V
V_{EBO}	emitter-base voltage	open collector	–	2.5	V
I_C	DC collector current		–	50	mA
P_{tot}	total power dissipation	up to T_s = 65 °C (note 1)	–	380	mW
T_{stg}	storage temperature range		–65	150	°C
T_j	junction temperature		–	175	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	THERMAL RESISTANCE
$R_{th\ j\text{-}s}$	from junction to soldering point (note 1)	290 K/W

Note

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

CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	open emitter; $I_E = 0$; $V_{CB} = 5$ V	–	–	50	nA
h_{FE}	DC current gain	$I_C = 15$ mA; $V_{CE} = 5$ V	60	100	–	
f_T	transition frequency	$I_C = 15$ mA; $V_{CE} = 8$ V; f = 500 MHz	–	8	–	GHz
C_c	collector capacitance	$I_E = i_e = 0$; $V_{CB} = 8$ V; f = 1 MHz	–	0.7	–	pF
C_e	emitter capacitance	$I_C = i_c = 0$; $V_{EB} = 0.5$ V; f = 1 MHz	–	1.3	–	pF
C_{re}	feedback capacitance	$I_C = i_c = 0$; $V_{CB} = 8$ V; f = 1 MHz	–	0.5	–	pF
G_{UM}	maximum unilateral power gain (note 1)	$I_C = 15$ mA; $V_{CE} = 8$ V; $T_{amb} = 25$ °C; f = 1 GHz	–	17	–	dB
		$I_C = 15$ mA; $V_{CE} = 8$ V; $T_{amb} = 25$ °C; f = 2 GHz	–	10	–	dB
F	noise figure	$\Gamma_s = \Gamma_{opt}$; $I_C = 5$ mA; $V_{CE} = 8$ V; $T_{amb} = 25$ °C; f = 1 GHz	–	1.3	–	dB
		$\Gamma_s = \Gamma_{opt}$; $I_C = 15$ mA; $V_{CE} = 8$ V; $T_{amb} = 25$ °C; f = 1 GHz	–	1.7	–	dB
		$I_C = 5$ mA; $V_{CE} = 8$ V; $T_{amb} = 25$ °C; f = 2 GHz; $Z_S = 60\ \Omega$	–	2.5	–	dB
		$I_C = 15$ mA; $V_{CE} = 8$ V; $T_{amb} = 25$ °C; f = 2 GHz; $Z_S = 60\ \Omega$	–	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.

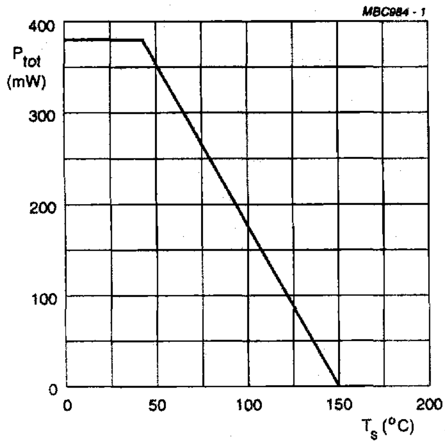
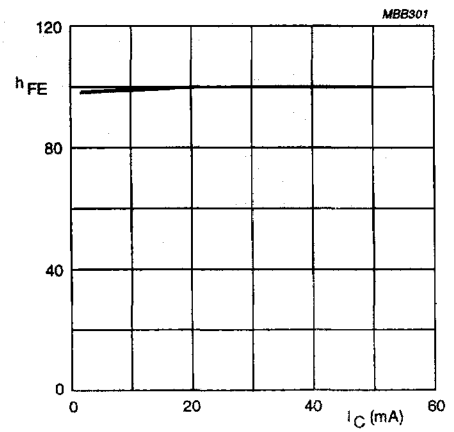
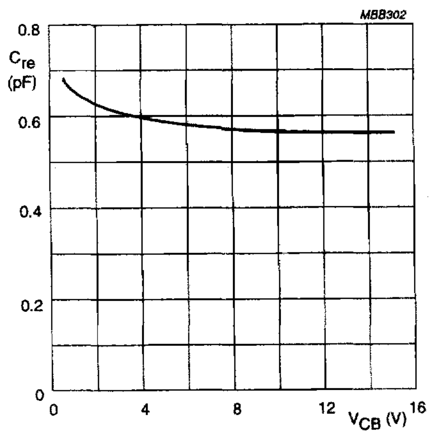


Fig.3 Power derating curve.



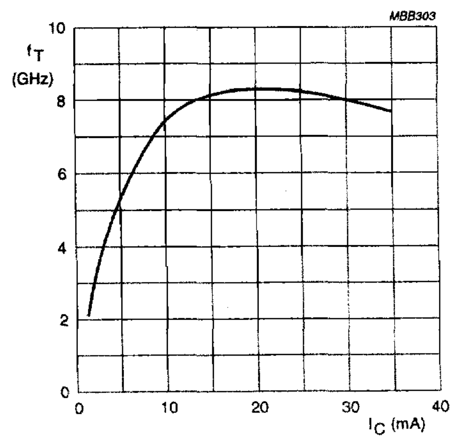
V_{CE} = 5 V.

Fig.4 DC current gain as a function of collector current.



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

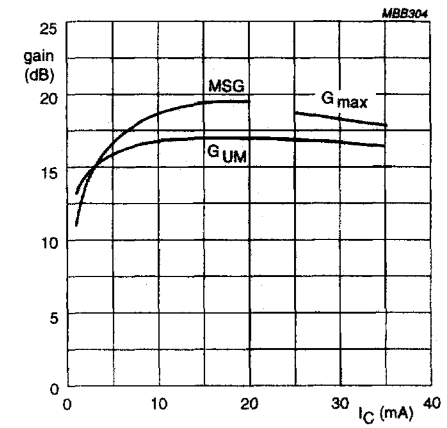
Fig.5 Feedback capacitance as a function of collector-base voltage.



V_{CE} = 8 V; T_{amb} = 25 °C; f = 2 GHz.

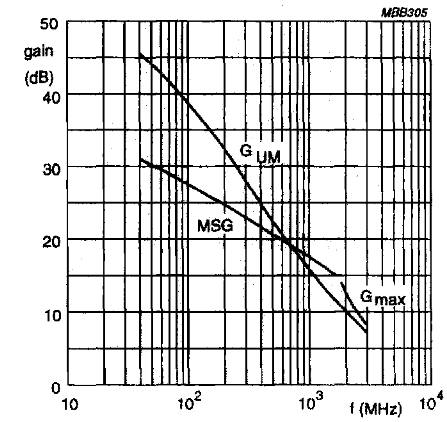
Fig.6 Transition frequency as a function of collector current.

In Figs 7 to 10, G_{UM} = maximum unilateral power gain; MSG = maximum stable gain; G_{max} = maximum available gain.



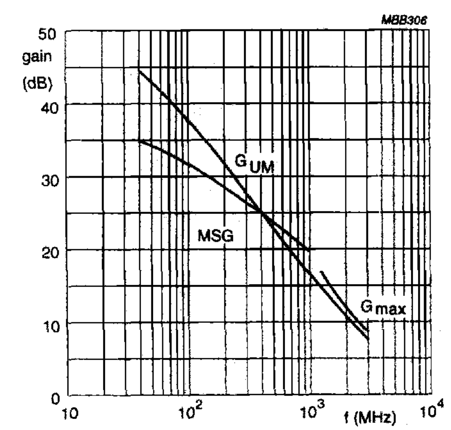
V_{CE} = 8 V; f = 1 GHz.

Fig.7 Gain as a function of collector current.



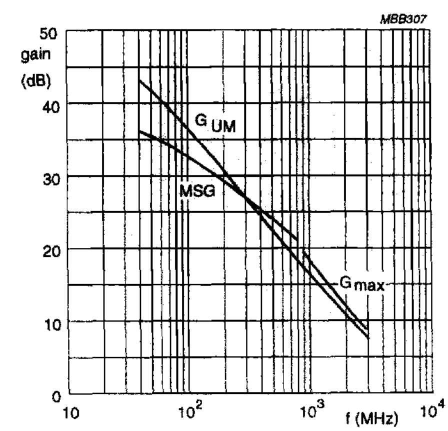
V_{CE} = 8 V; I_C = 5 mA.

Fig.8 Gain as a function of frequency.



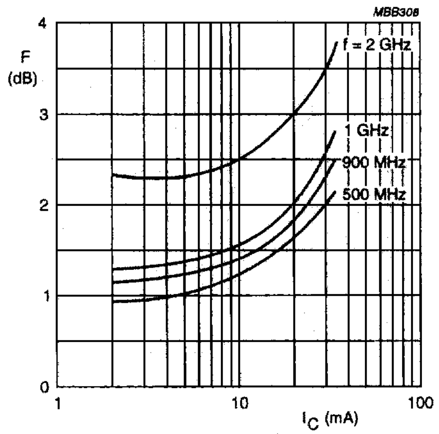
V_{CE} = 8 V; I_C = 15 mA.

Fig.9 Gain as a function of frequency.



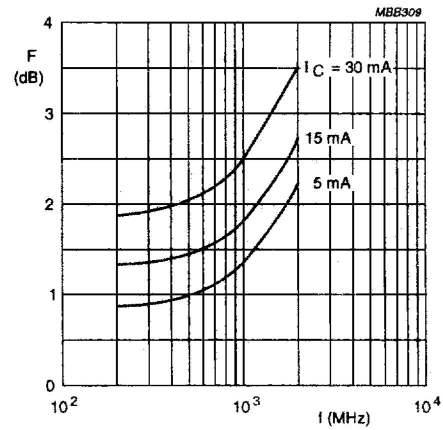
V_{CE} = 8 V; I_C = 30 mA.

Fig.10 Gain as a function of frequency.



V_{CE} = 8 V.

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



V_{CE} = 8 V.

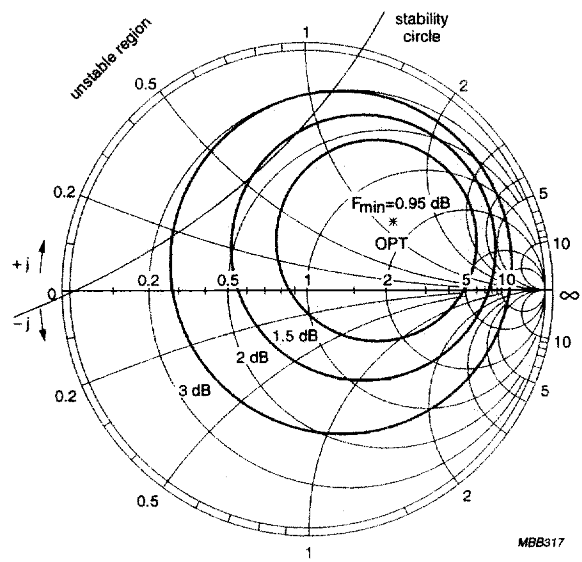
Fig.12 Minimum noise figure as a function of frequency.

BFG67/X

f (MHz)	V_{CE} (V)	I_C (mA)
500	8	5

Noise Parameters

F_{min} (dB)	Gamma (opt)		$R_n/50$
	(mag)	(ang)	
0.95	0.455	33.8	0.288



Z_O = 50 Ω.

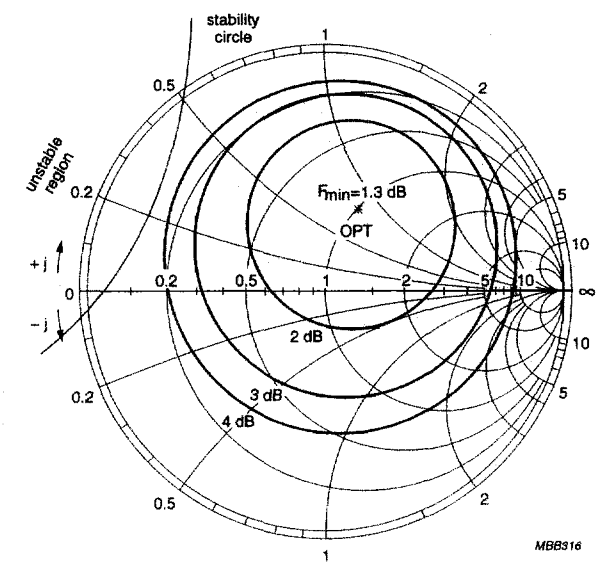
Fig.13 Noise circle figure.

BFG67/X

f (MHz)	V_{CE} (V)	I_C (mA)
1000	8	5

Noise Parameters

F_{min} (dB)	Gamma (opt)		$R_n/50$
	(mag)	(ang)	
1.3	0.375	65.9	0.304



$Z_O = 50\ \Omega$.

Fig.14 Noise circle figure.

BFG67/X

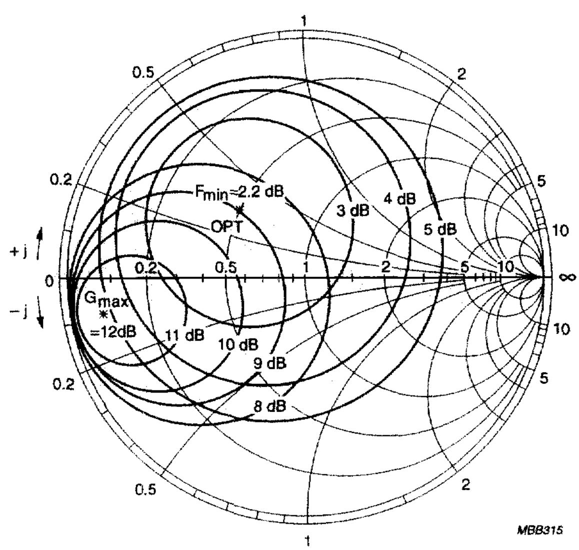
f (MHz)	V_{CE} (V)	I_C (mA)
2000	8	5

Noise Parameters

F_{min} (dB)	Gamma (opt)		$R_n/50$
	(mag)	(ang)	
2.2	0.391	136.5	0.184

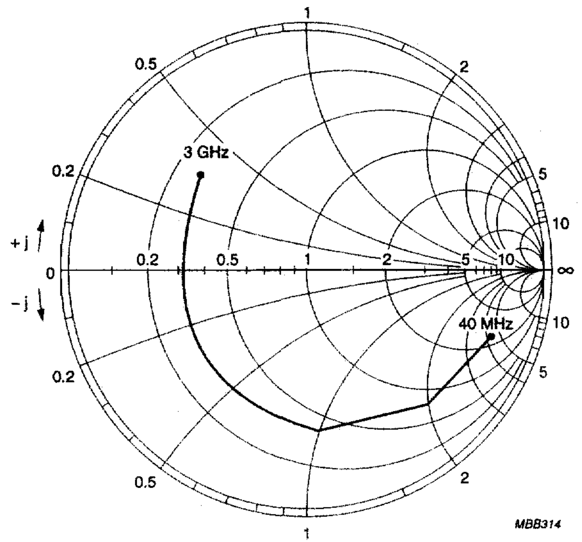
Average Gain Parameters

G_{MAX} (dB)	Gamma (max)	
	(mag)	(ang)
12	0.839	−170



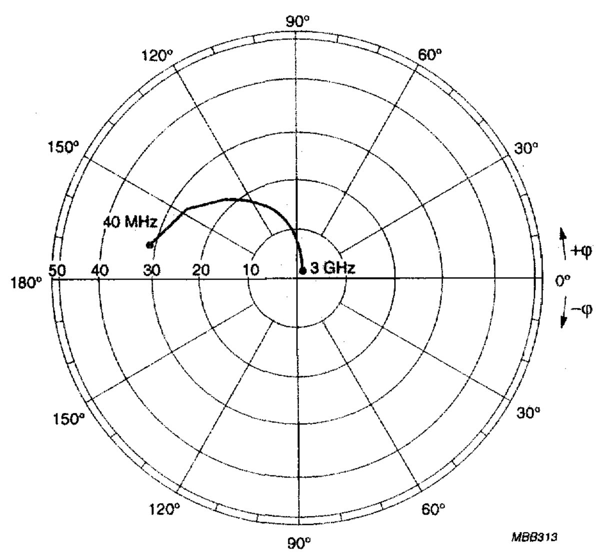
$Z_O = 50\ \Omega$.

Fig.15 Noise circle figure.



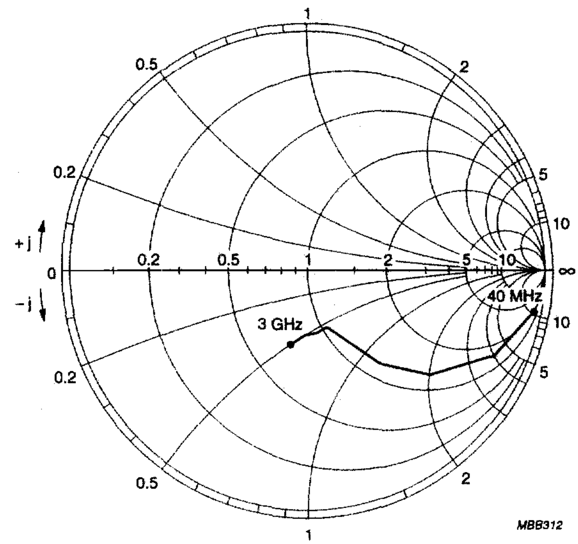
V_{CE} = 8 V; I_C = 15 mA; Z_O = 50 Ω.

Fig.16 Common emitter input reflection coefficient (S_{11}).



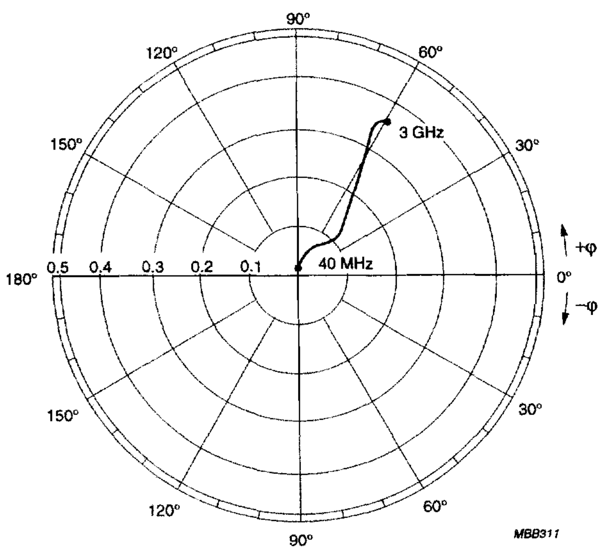
V_{CE} = 8 V; I_C = 15 mA; Z_O = 50 Ω.

Fig.17 Common emitter forward transmission coefficient (S_{21}).



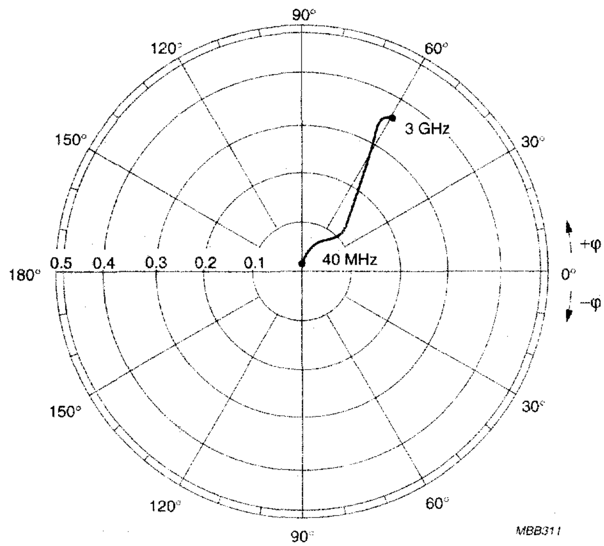
V_{CE} = 8 V; I_C = 15 mA.

Fig.18 Common emitter reverse transmission coefficient (S_{12}).



V_{CE} = 8 V; I_C = 15 mA.

Fig.19 Common emitter output reflection coefficient (S_{22}).



V_{CE} = 8 V; I_C = 15 mA.

Fig.35 Common emitter output reflection coefficient (S_{22}).