NPN 8 GHz wideband transistors BFG67; BFG67/X; BFG67/XR

FEATURES

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

APPLICATIONS

Wideband applications in the GHz range, such as satellite TV tuners and portable RF communications equipment.

DESCRIPTION

NPN silicon transistor in a 4-pin, dual-emitter SOT143B plastic package. Available with in-line emitter pinning (BFG67) and cross emitter pinning (BFG67/X). Version with reverse pinning (BFG67/XR) also available on request.

MARKING

TYPE NUMBER	CODE
BFG67 (Fig.1)	V3
BFG67/X (Fig.1)	V12
BFG67/XR (Fig.2)	V26

PINNING

PIN	DESCRIPTION		
	BFG67	BFG67/X	BFG67/XR
1	collector	collector	collector
2	base	emitter	emitter
3	emitter	base	base
4	emitter	emitter	emitter

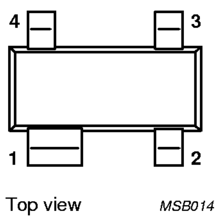


Fig.1 Simplified outline SOT143B.

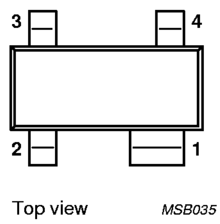


Fig.2 Simplified outline SOT143R.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_{CEO}	collector-emitter voltage	open base	–	10	V
I_C	collector current (DC)		–	50	mA
P_{tot}	total power dissipation	$T_s \leq 65$ °C	–	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

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	–	10	V
V_{EBO}	emitter-base voltage	open collector	–	2.5	V
I_C	collector current (DC)		–	50	mA
P_{tot}	total power dissipation	$T_s \leq 65$ °C; see Fig.3; note 1	–	380	mW
T_{stg}	storage temperature range		–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	note 1	290	K/W

Note

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

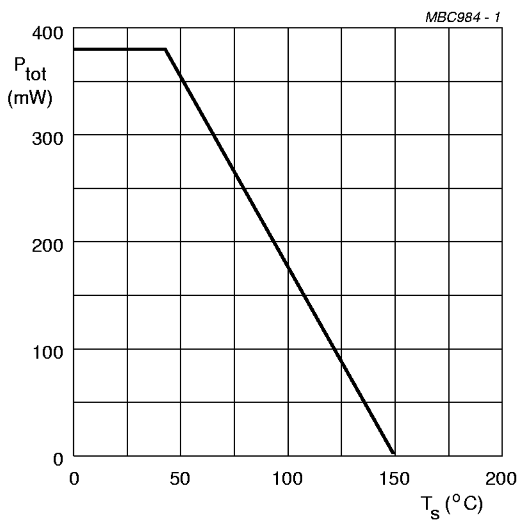


Fig.3 Power derating curve.

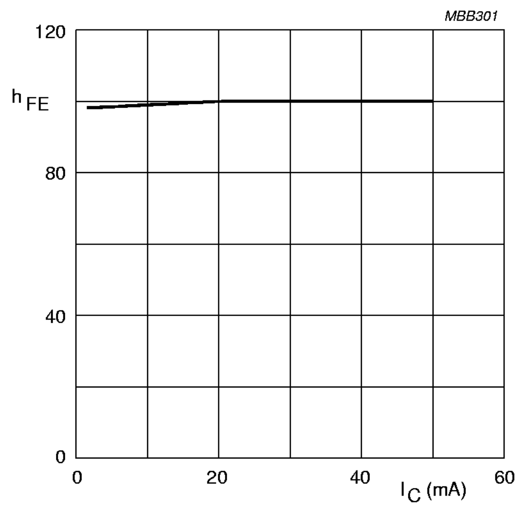
CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector leakage current	V_{CB} = 5 V; I_E = 0	–	–	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 Ω	–	2.5	–	dB
		I_C = 15 mA; V_{CE} = 8 V; T_{amb} = 25 °C; f = 2 GHz; Z_S = 60 Ω	–	3	–	dB

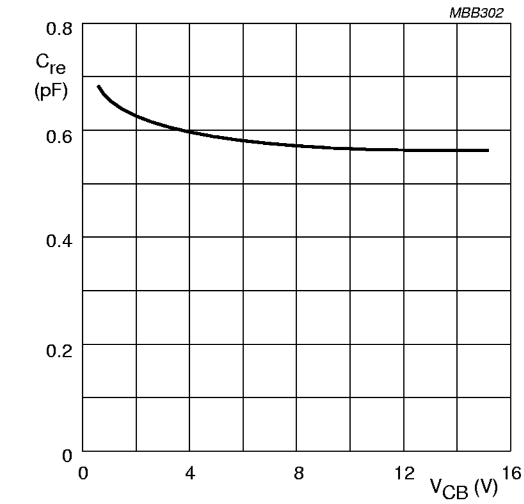
Note

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.



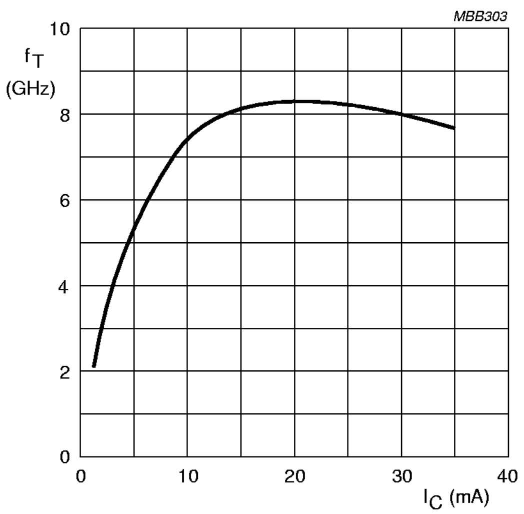
V_{CE} = 5 V.

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



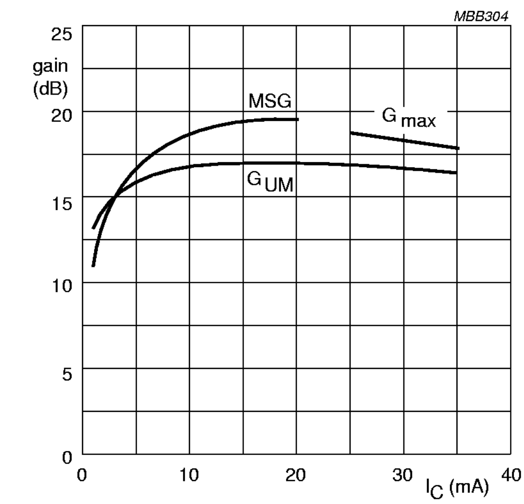
I_C = i_c = 0; f = 1 MHz.

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



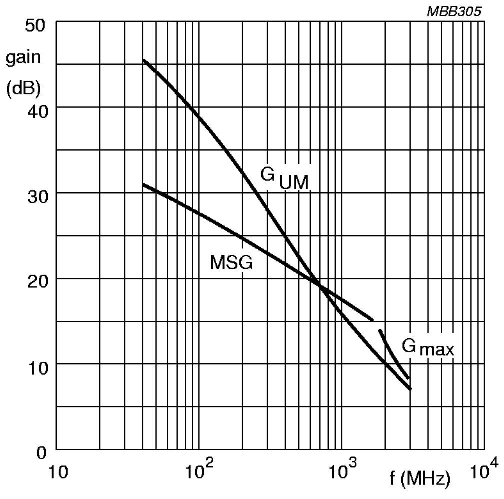
V_{CE} = 8 V; T_{amb} = 25 °; f = 2 GHz.

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



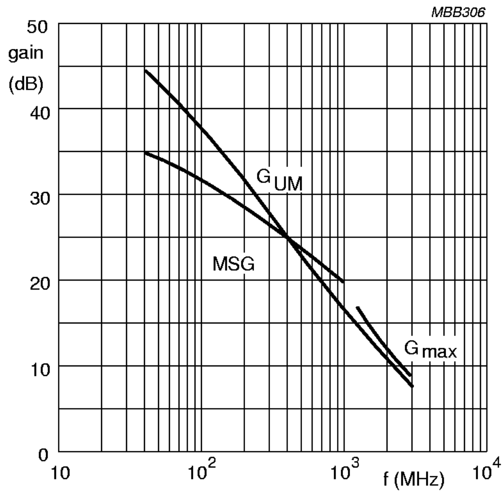
V_{CE} = 8 V; f = 1 GHz.
G_{UM} = maximum unilateral power gain;
MSG = maximum stable gain;
G_{max} = maximum available gain.

Fig.7 Gain as a function of collector current.



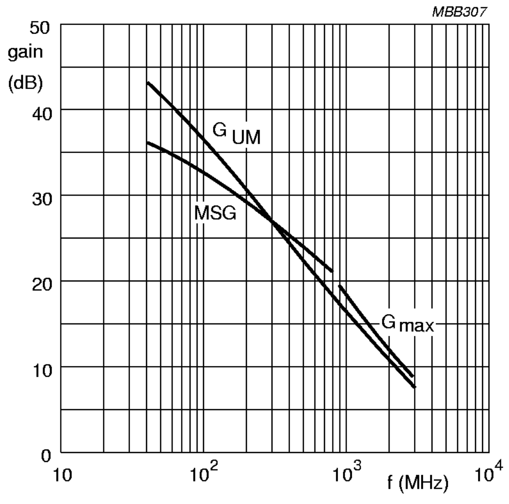
V_{CE} = 8 V; I_C = 5 mA.
G_{UM} = maximum unilateral power gain;
MSG = maximum stable gain;
G_{max} = maximum available gain.

Fig.8 Gain as a function of frequency.



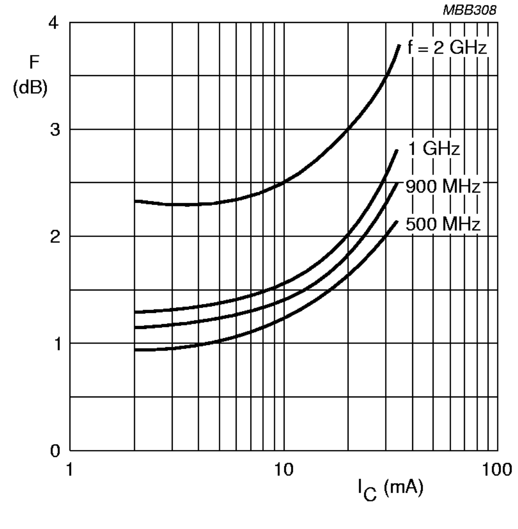
V_{CE} = 8 V; I_C = 15 mA.
G_{UM} = maximum unilateral power gain;
MSG = maximum stable gain;
G_{max} = maximum available gain.

Fig.9 Gain as a function of frequency.



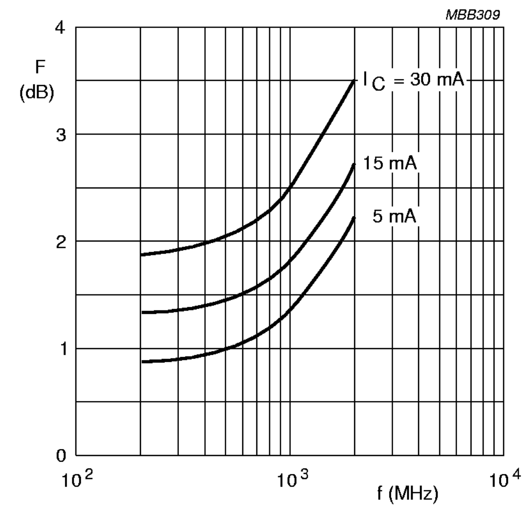
V_{CE} = 8 V; I_C = 30 mA.
G_{UM} = maximum unilateral power gain;
MSG = maximum stable gain;
G_{max} = maximum available gain.

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.

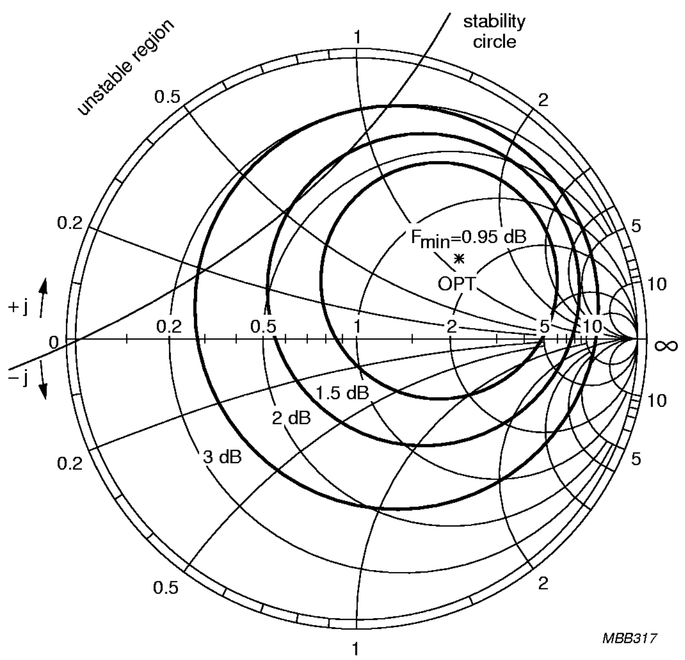
Fig.12 Minimum noise figure as a function of frequency.

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.

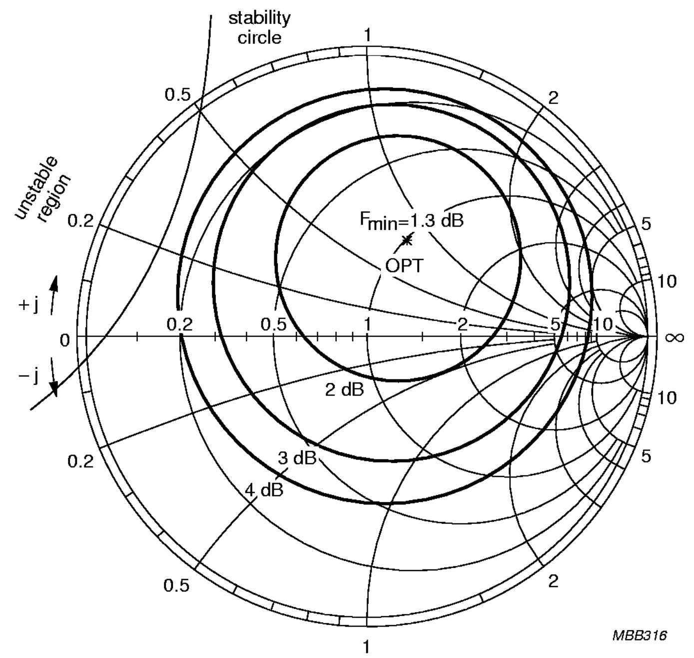
Fig.13 Noise circle figure.

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 Ω.

Fig.14 Noise circle figure.

BFG67/X

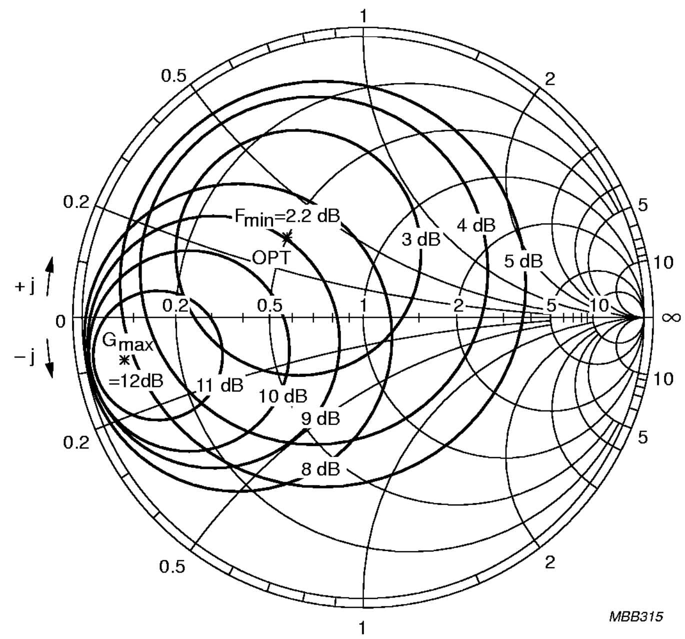
f (MHz)	V_{CE} (V)	I_C (mA)
2000	8	5

Noise Parameters

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

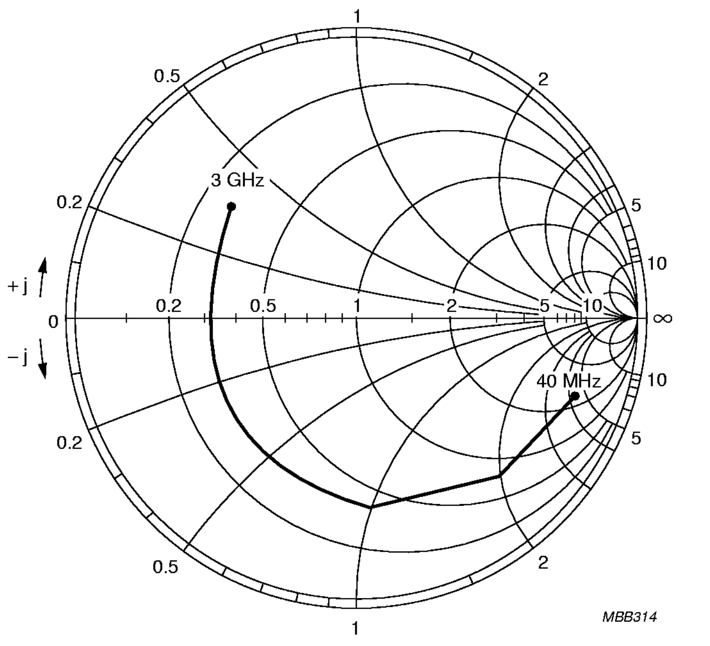
Average Gain Parameters

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



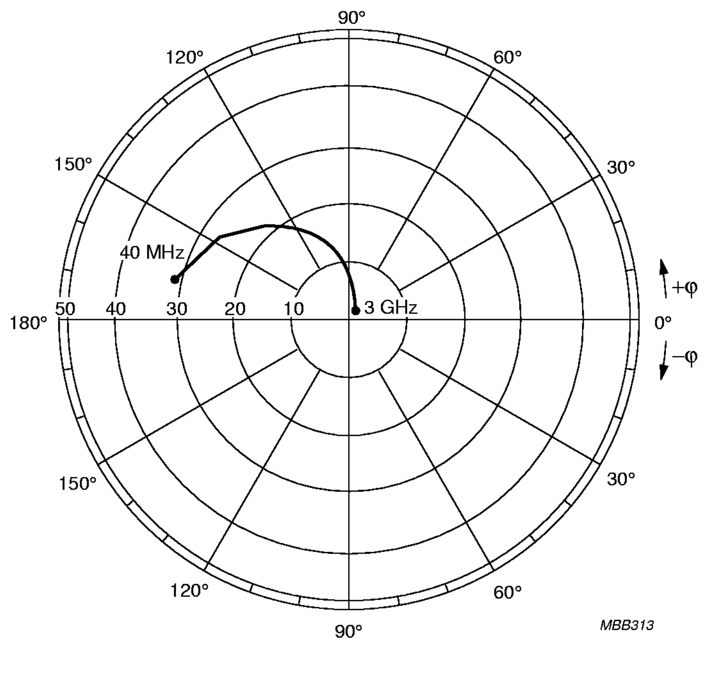
Z_O = 50 Ω.

Fig.15 Noise circle figure.



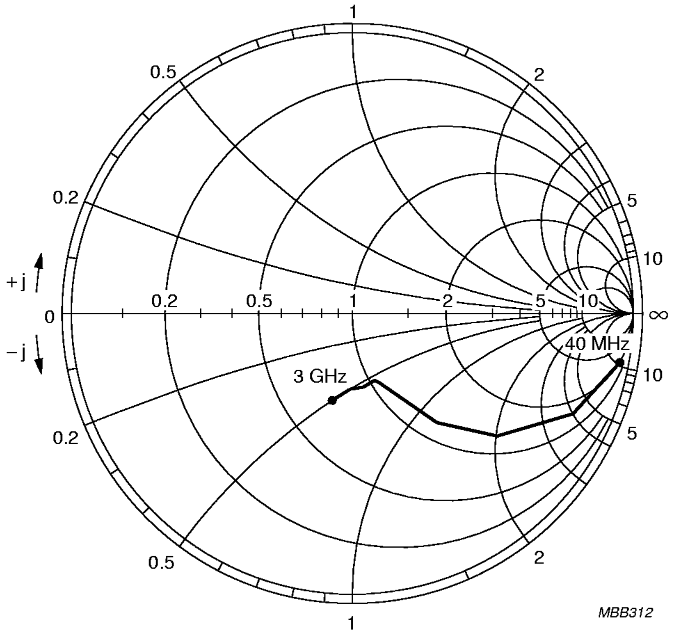
V_{CE} = 8 V; I_C = 15 mA; Z_O = 50 Ω.

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



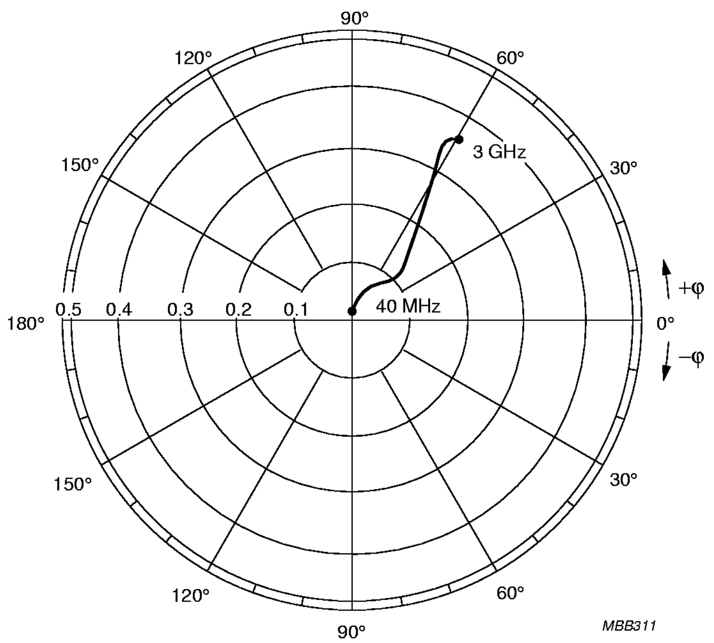
V_{CE} = 8 V; I_C = mA; Z_O = 50 Ω.

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}).

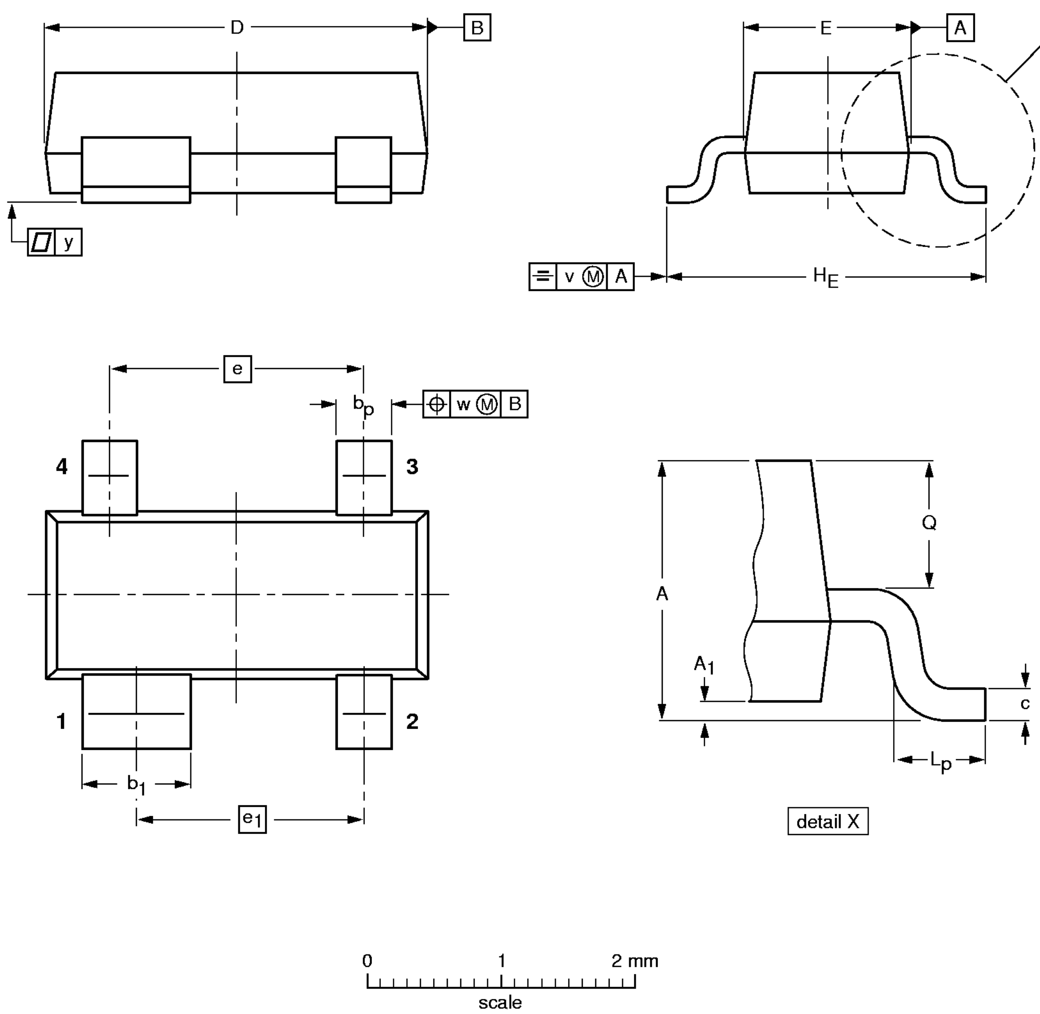


V_{CE} = 8 V; I_C = 15 mA.

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

PACKAGE OUTLINES

Plastic surface mounted package; 4 leads **SOT143B**

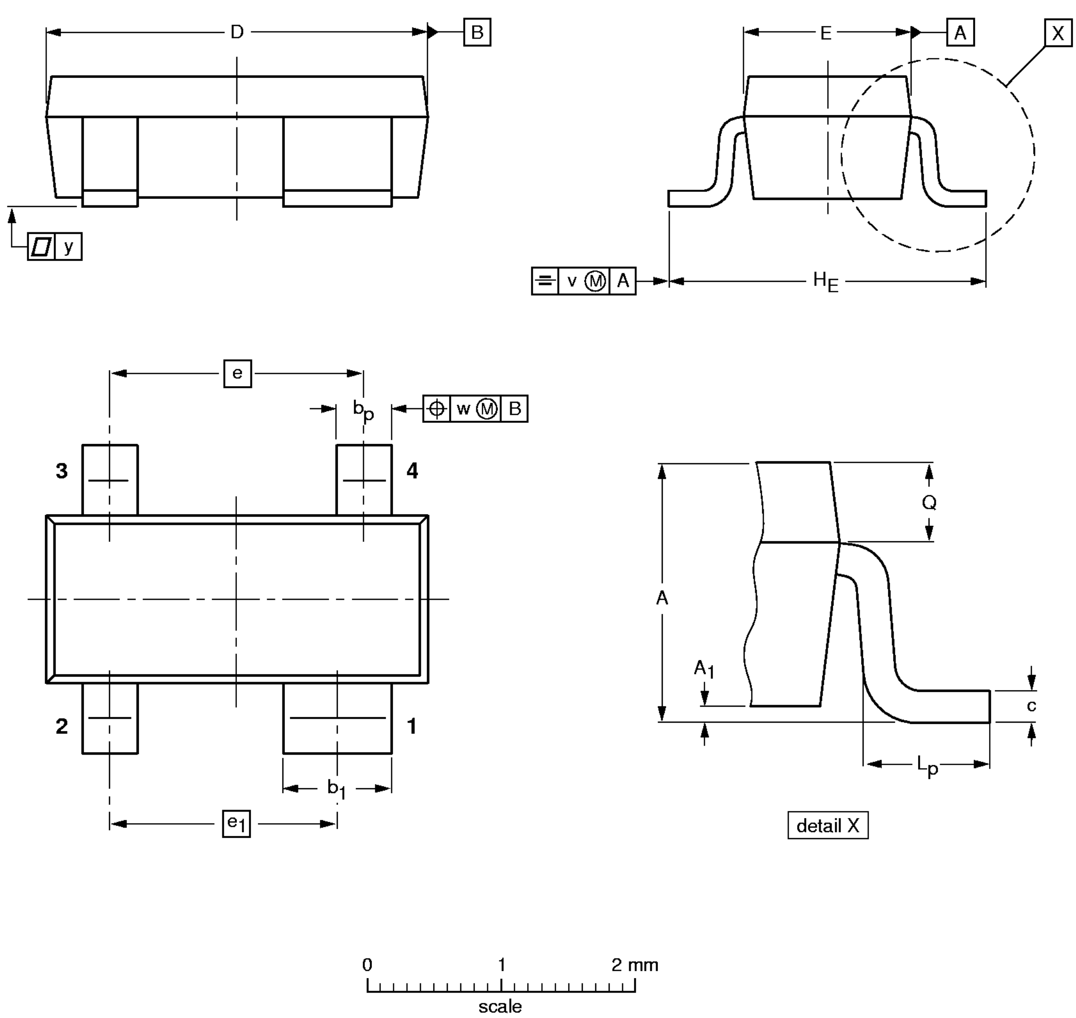


DIMENSIONS (mm are the original dimensions)

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 0.9	0.1	0.48 0.38	0.88 0.78	0.15 0.09	3.0 2.8	1.4 1.2	1.9	1.7	2.5 2.1	0.45 0.15	0.55 0.45	0.2	0.1	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT143B						97-02-28

Plastic surface mounted package; reverse pinning; 4 leads **SOT143R**



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 0.9	0.1	0.48 0.38	0.88 0.78	0.15 0.09	3.0 2.8	1.4 1.2	1.9	1.7	2.5 2.1	0.55 0.25	0.45 0.25	0.2	0.1	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT143R						97-03-10