

BFG67; BFG67/X; BFG67/XR

NPN 8 GHz wideband transistors

Rev. 05 — 23 November 2007

Product data sheet

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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)	%MV
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

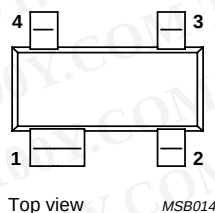


Fig.1 Simplified outline SOT143B.

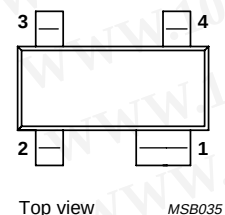


Fig.2 Simplified outline SOT143R.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_{CE0}	collector-emitter voltage	open base	—	10	V
I_C	collector current (DC)		—	50	mA
P_{tot}	total power dissipation	$T_s \leq 65^\circ\text{C}$	—	300	mW
C_{re}	feedback capacitance	$I_C = i_c = 0$; $V_{CB} = 8\text{ V}$; $f = 1\text{ MHz}$	0.5	—	pF
f_T	transition frequency	$I_C = 15\text{ mA}$; $V_{CE} = 8\text{ V}$; $f = 500\text{ MHz}$	8	—	GHz
G_{UM}	maximum unilateral power gain	$I_C = 15\text{ mA}$; $V_{CE} = 8\text{ V}$; $T_{amb} = 25^\circ\text{C}$; $f = 1\text{ GHz}$	17	—	dB
F	noise figure	$\Gamma_s = \Gamma_{opt}$; $I_C = 5\text{ mA}$; $V_{CE} = 8\text{ V}$; $T_{amb} = 25^\circ\text{C}$; $f = 1\text{ GHz}$	1.3	—	dB
		$\Gamma_s = \Gamma_{opt}$; $I_C = 5\text{ mA}$; $V_{CE} = 8\text{ V}$; $T_{amb} = 25^\circ\text{C}$; $f = 2\text{ GHz}$	2.2	—	dB

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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	$T_s \leq 65^\circ\text{C}$; see Fig.3; note 1	–	380	mW
T_{stg}	storage temperature range		–65	150	$^\circ\text{C}$
T_j	junction temperature		–	175	$^\circ\text{C}$

Note

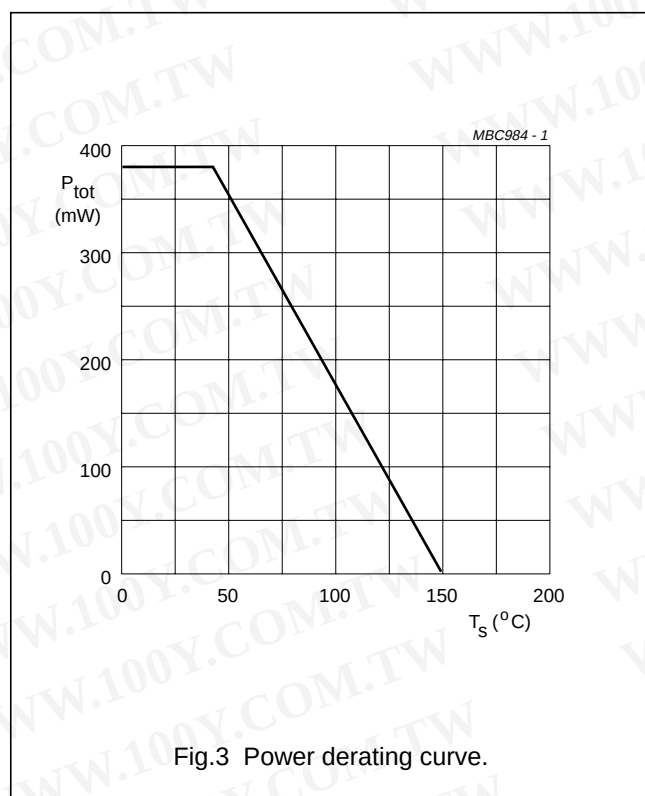
1. T_s is the temperature at the soldering point of the collector pin.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-s}$	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.



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CHARACTERISTICS

$T_j = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector leakage current	$V_{CB} = 5\text{ V}; I_E = 0$	–	–	50	nA
h_{FE}	DC current gain	$I_C = 15\text{ mA}; V_{CE} = 5\text{ V}$	60	100	–	
f_T	transition frequency	$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}; f = 500\text{ MHz}$	–	8	–	GHz
C_c	collector capacitance	$I_E = I_E = 0; V_{CB} = 8\text{ V}; f = 1\text{ MHz}$	–	0.7	–	pF
C_e	emitter capacitance	$I_C = I_C = 0; V_{EB} = 0.5\text{ V}; f = 1\text{ MHz}$	–	1.3	–	pF
C_{re}	feedback capacitance	$I_C = I_C = 0; V_{CB} = 8\text{ V}; f = 1\text{ MHz}$	–	0.5	–	pF
G_{UM}	maximum unilateral power gain; note 1	$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}; f = 1\text{ GHz}$	–	17	–	dB
		$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}; f = 2\text{ GHz}$	–	10	–	dB
F	noise figure	$\Gamma_S = \Gamma_{opt}; I_C = 5\text{ mA}; V_{CE} = 8\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}; f = 1\text{ GHz}$	–	1.3	–	dB
		$\Gamma_S = \Gamma_{opt}; I_C = 15\text{ mA}; V_{CE} = 8\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}; f = 1\text{ GHz}$	–	1.7	–	dB
		$I_C = 5\text{ mA}; V_{CE} = 8\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}; f = 2\text{ GHz}; Z_S = 60\text{ }\Omega$	–	2.5	–	dB
		$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}; f = 2\text{ GHz}; Z_S = 60\text{ }\Omega$	–	3	–	dB

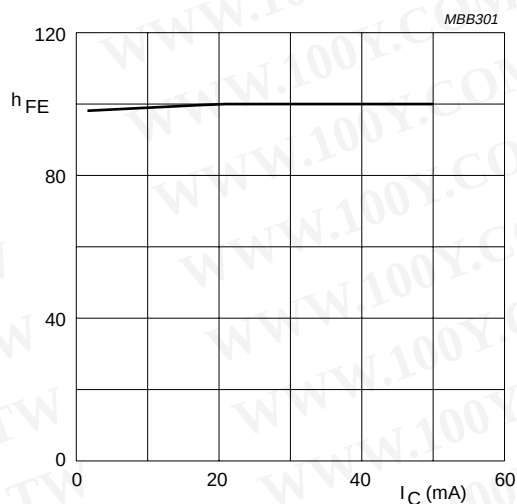
Note

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.

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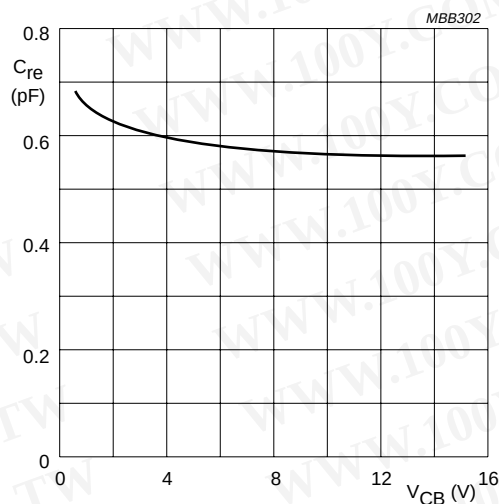
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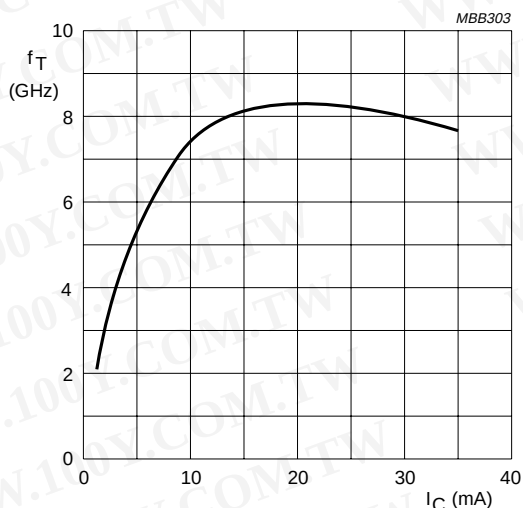
$V_{CE} = 5 \text{ V}$.

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



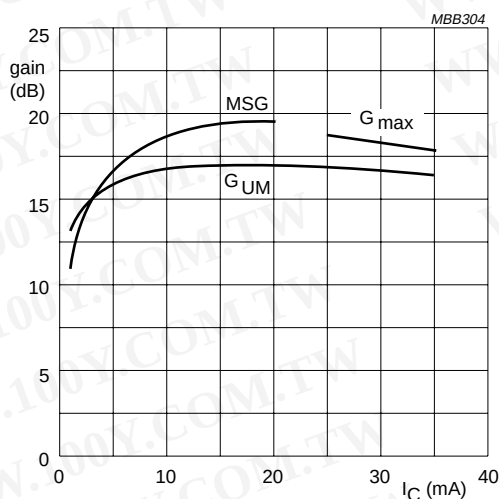
$I_C = i_c = 0$; $f = 1 \text{ MHz}$.

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



$V_{CE} = 8 \text{ V}$; $T_{amb} = 25^\circ$; $f = 2 \text{ GHz}$.

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



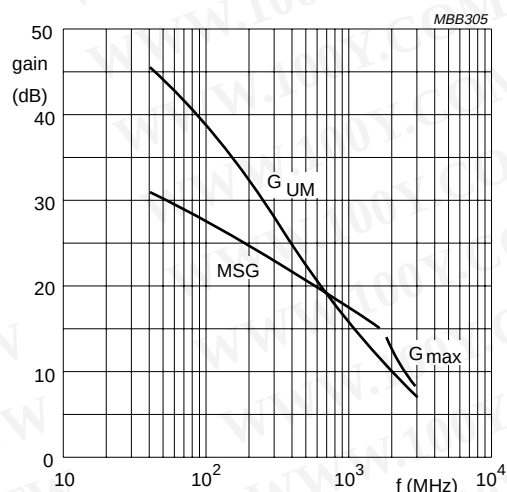
$V_{CE} = 8 \text{ V}$; $f = 1 \text{ GHz}$.

G_{UM} = maximum unilateral power gain;
MSG = maximum stable gain;
 G_{max} = maximum available gain.

Fig.7 Gain as a function of collector current.

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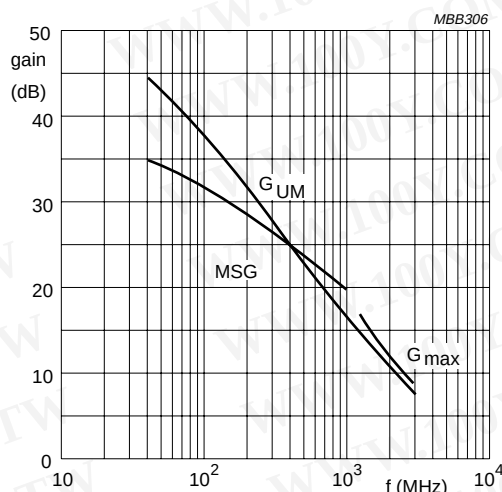
$V_{CE} = 8\text{ V}$; $I_C = 5\text{ mA}$.

G_{UM} = maximum unilateral power gain;

MSG = maximum stable gain;

G_{max} = maximum available gain.

Fig.8 Gain as a function of frequency.



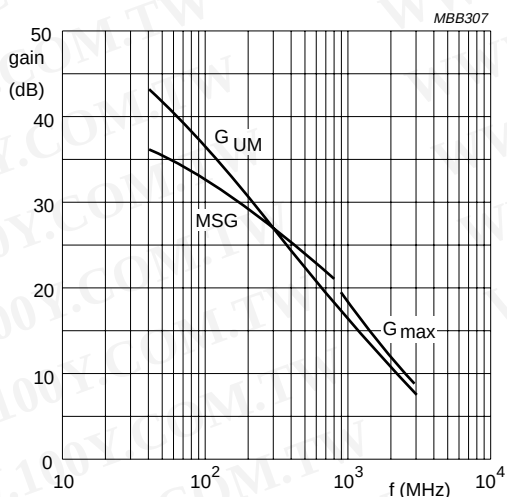
$V_{CE} = 8\text{ V}$; $I_C = 15\text{ mA}$.

G_{UM} = maximum unilateral power gain;

MSG = maximum stable gain;

G_{max} = maximum available gain.

Fig.9 Gain as a function of frequency.



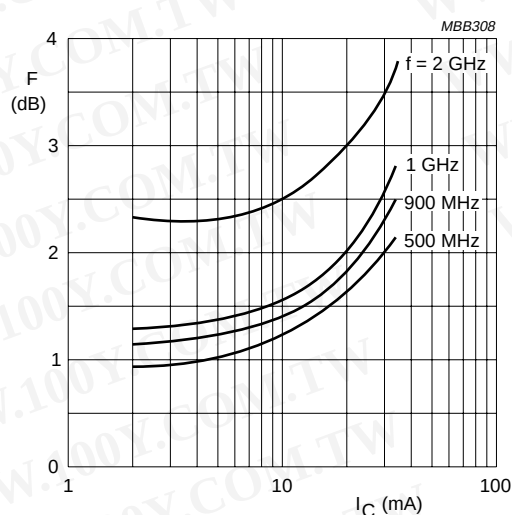
$V_{CE} = 8\text{ V}$; $I_C = 30\text{ mA}$.

G_{UM} = maximum unilateral power gain;

MSG = maximum stable gain;

G_{max} = maximum available gain.

Fig.10 Gain as a function of frequency.

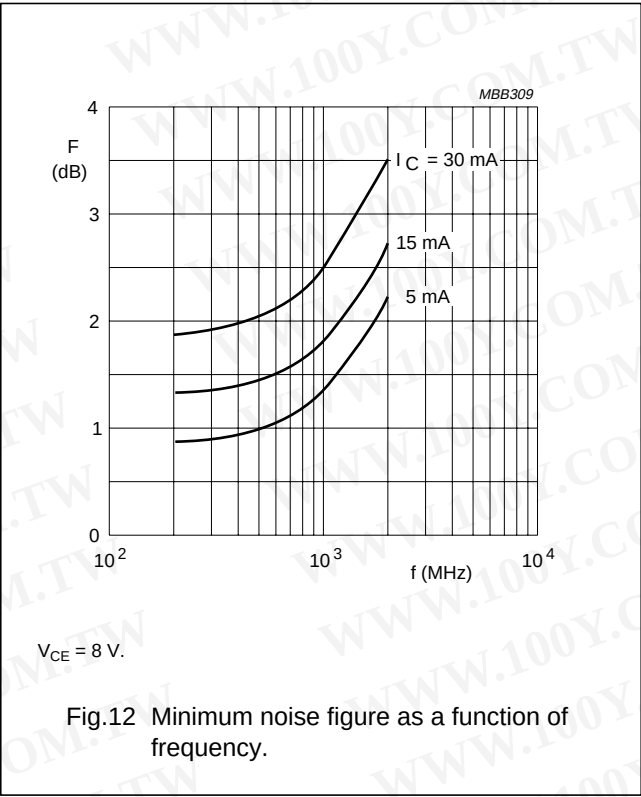


$V_{CE} = 8\text{ V}$.

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

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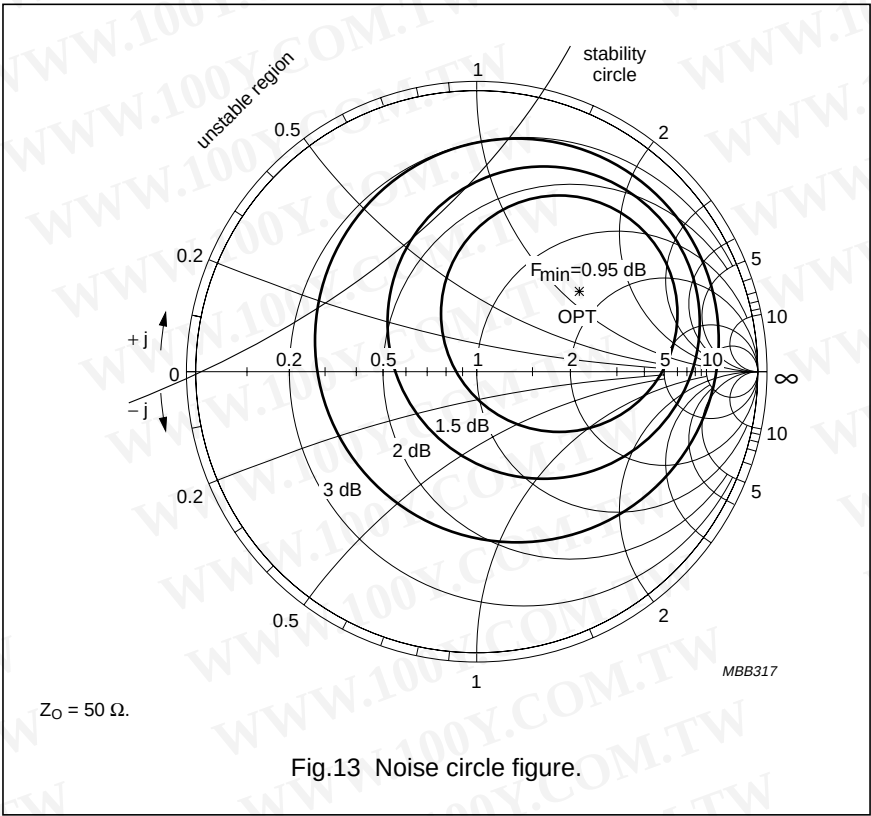
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BFG67/X

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



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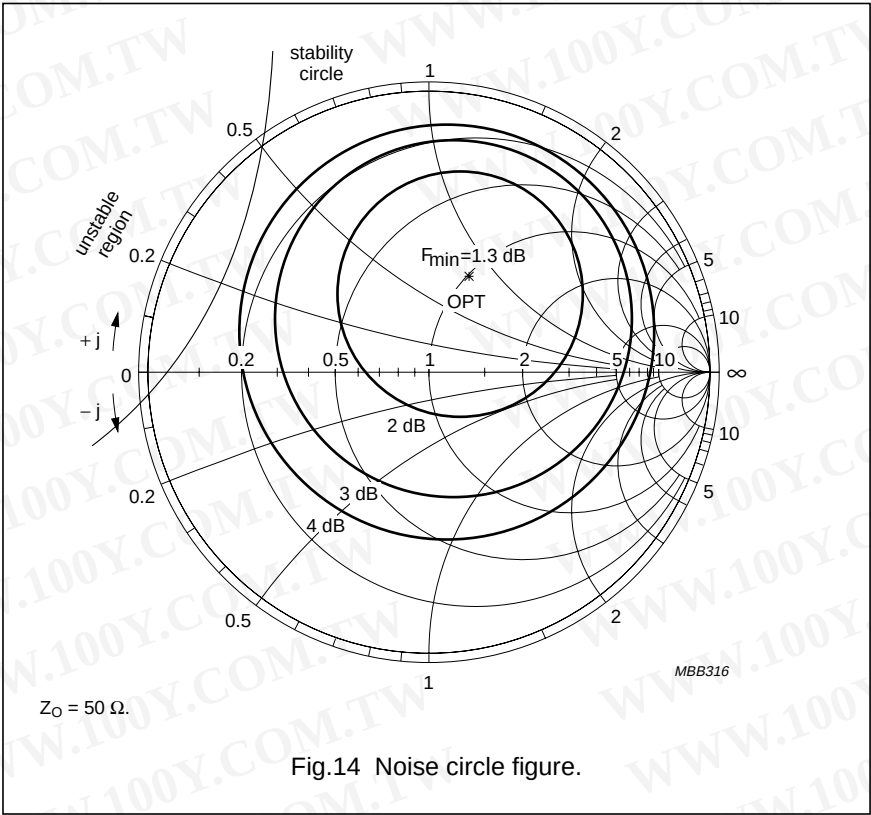
BFG67/X

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

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BFG67/X

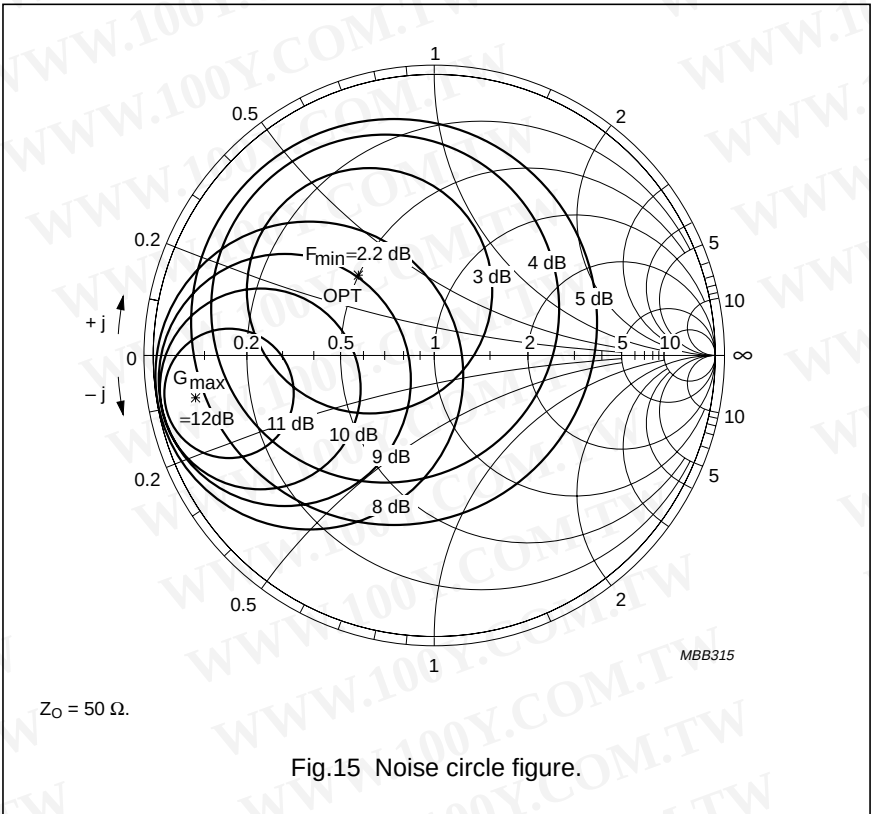
f (MHz)	V _{CE} (V)	I _C (mA)
2000	8	5

Noise Parameters

F _{min} (dB)	Gamma (opt)		R _n /50
	(mag)	(ang)	
2.2	0.391	136.5	0.184

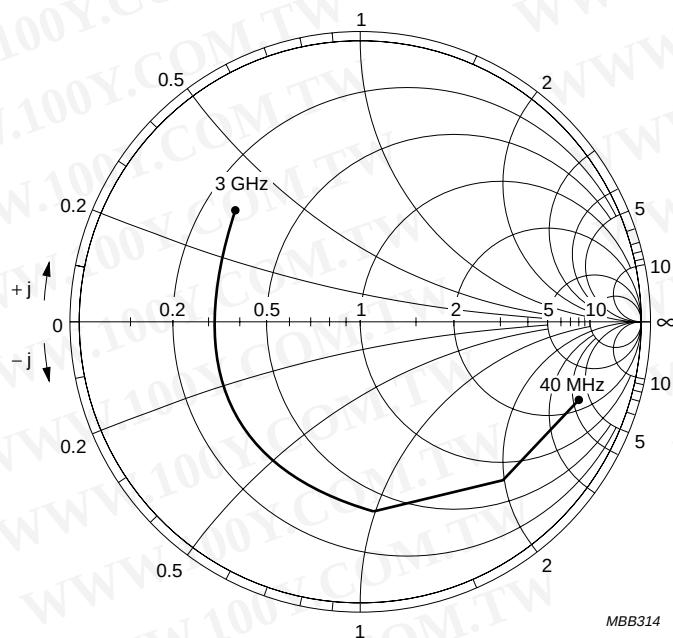
Average Gain Parameters

G _{MAX} (dB)	Gamma (max)	
	(mag)	(ang)
12	0.839	-170



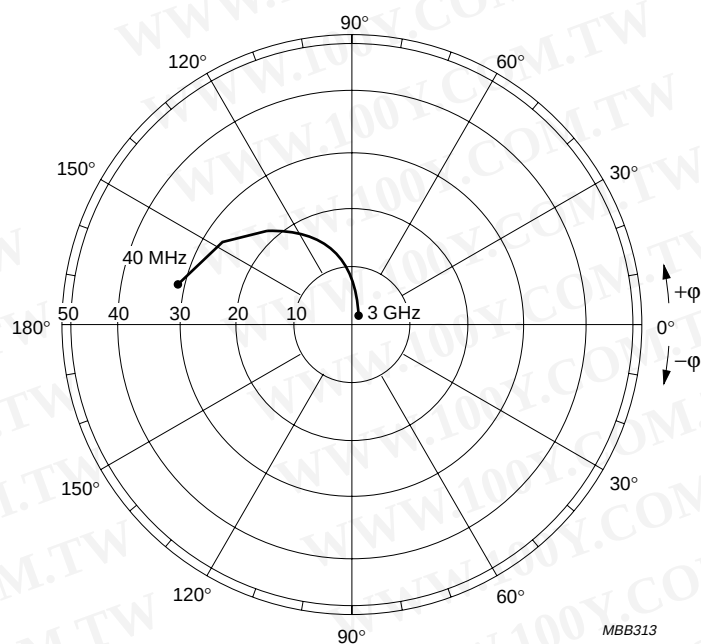
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$V_{CE} = 8\text{ V}$; $I_C = 15\text{ mA}$; $Z_O = 50\ \Omega$.

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

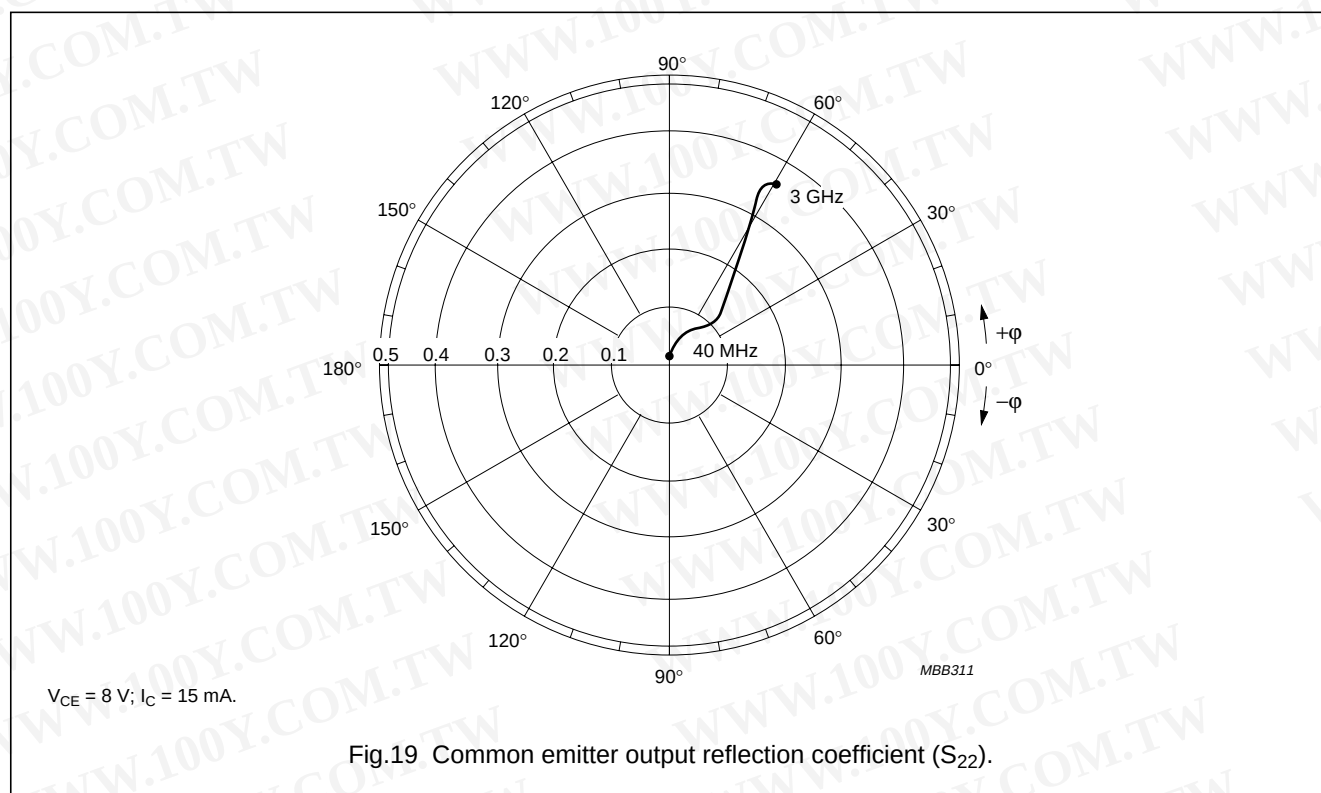
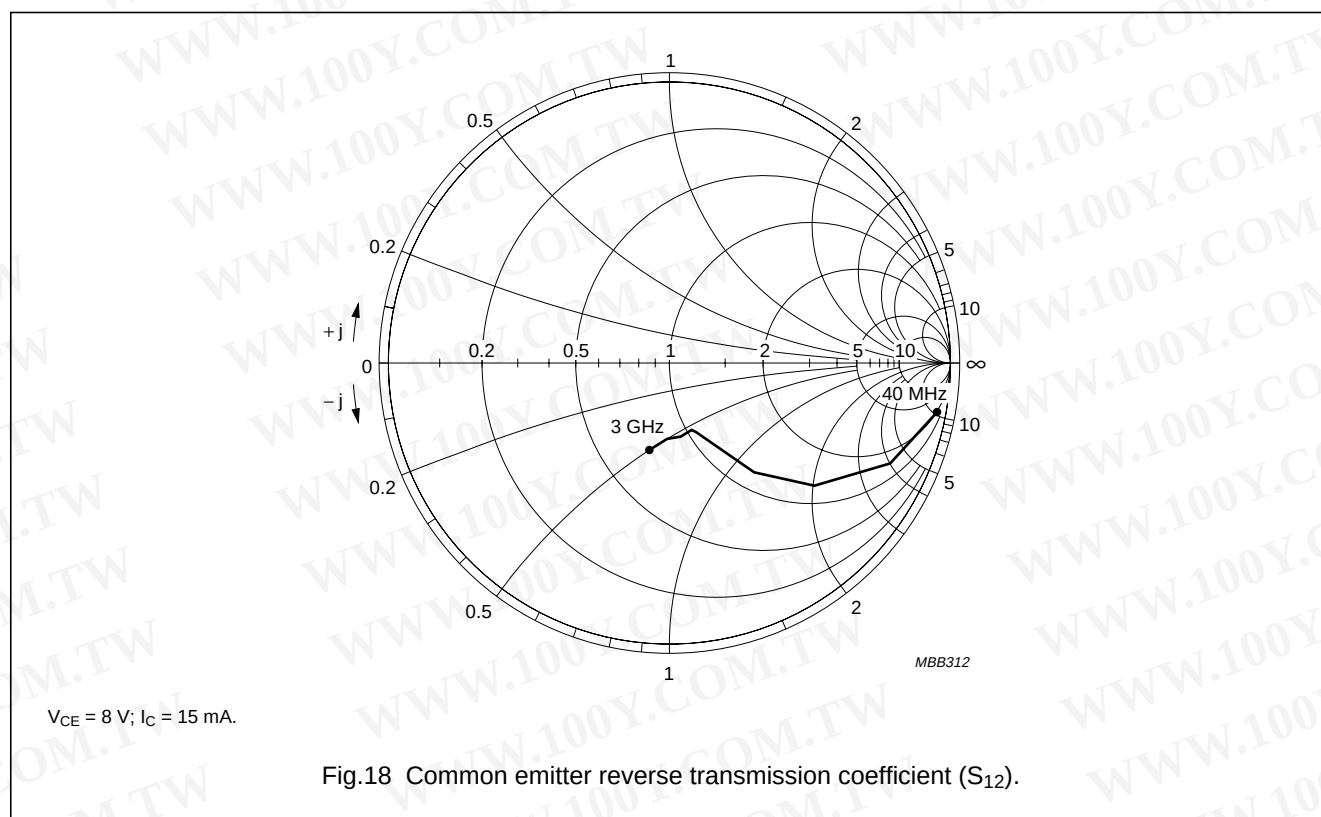


$V_{CE} = 8\text{ V}$; $I_C = \text{mA}$; $Z_O = 50\ \Omega$.

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

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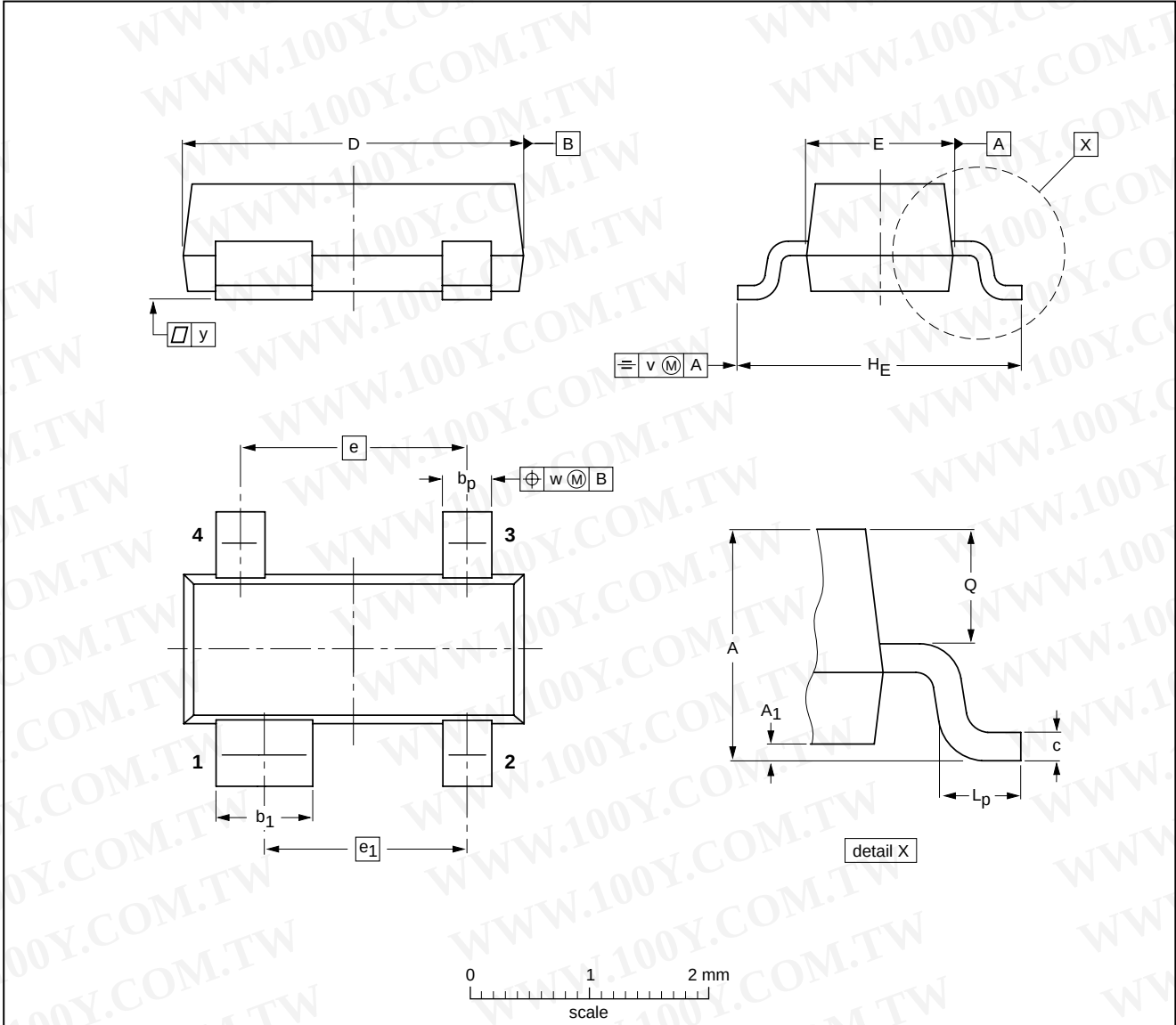
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PACKAGE OUTLINES

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

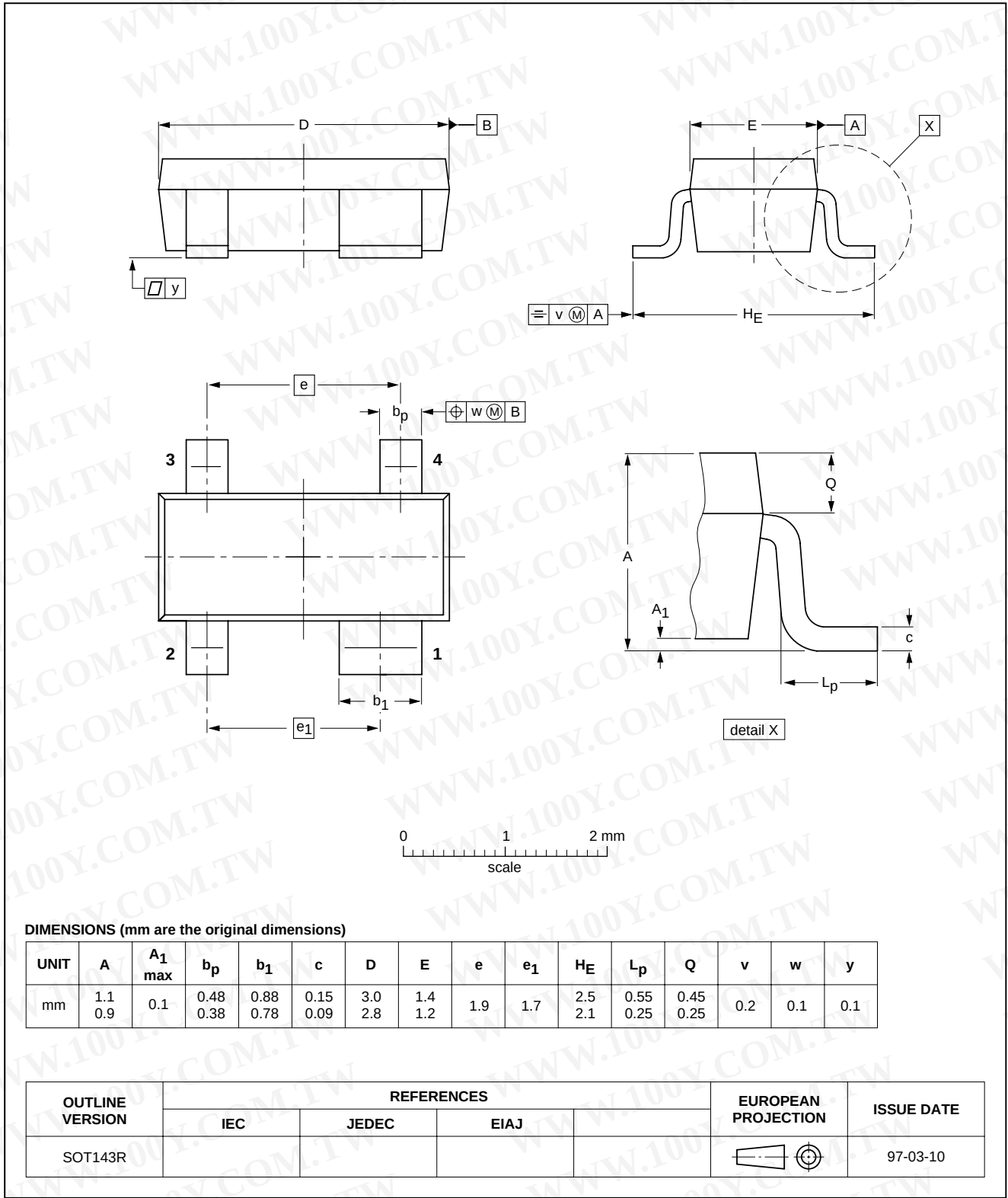
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NPN 8 GHz wideband transistors

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Plastic surface mounted package; reverse pinning; 4 leads

SOT143R



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Document status ^{[1][2]}	Product status ^[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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Revision history

Table 1. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BFG67_X_XR_N_5	20071123	Product data sheet	-	BFG67_X_XR_4
Modifications: Page 2; Table Marking code; row 1 and 2 code changed				
BFG67_X_XR_4 (9397 750 04349)	19981002	Product specification	-	BFG67_SERIES_3
BFG67_SERIES_3	19950901	Product specification	-	BFG67_SERIES_2
BFG67_SERIES_2	-	Product specification	-	BFG67_SERIES_1
BFG67_SERIES_1	-	-	-	-

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Date of release: 23 November 2007

Document identifier: BFG67_X_XR_N_5