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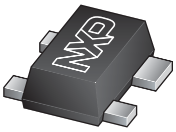


BFG424F

NPN 25 GHz wideband transistor

Rev. 2 — 13 September 2011 **Product data sheet**

1. Product profile

1.1 General description

NPN double polysilicon wideband transistor with buried layer for low voltage applications in a plastic, 4-pin dual-emitter SOT343F package.

CAUTION

This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling.

1.2 Features and benefits

- Very high power gain
- Low noise figure
- High transition frequency
- Emitter is thermal lead
- Low feedback capacitance

1.3 Applications

- Radio Frequency (RF) front end wideband applications such as:
    - analog and digital cellular telephones
    - cordless telephones (Cordless Telephone (CT), Personal Handy-phone System (PHS), Digital Enhanced Cordless Telecommunications (DECT), etc.)
    - radar detectors
    - pagers
    - Satellite Antenna TeleVison (SATV) tuners
    - high frequency oscillators e.g. Dielectric Resonator Oscillator (DRO) for Low Noise Block (LNB)

1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CBO}	collector-base voltage	open emitter		-	-	10	V
V_{CEO}	collector-emitter voltage	open base		-	-	4.5	V
I_C	collector current			-	25	30	mA
P_{tot}	total power dissipation	$T_{sp} \leq 90$ °C	[1]	-	-	135	mW

Table 1. Quick reference data *…continued*

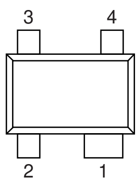
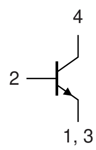
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
h_{FE}	DC current gain	I_C = 25 mA; V_{CE} = 2 V; T_j = 25 °C		50	80	120	
C_{CBS}	collector-base capacitance	V_{CB} = 2 V; f = 1 MHz		-	102	-	fF
f_T	transition frequency	I_C = 25 mA; V_{CE} = 2 V; f = 2 GHz; T_{amb} = 25 °C		-	25	-	GHz
$G_{p(max)}$	maximum power gain	I_C = 25 mA; V_{CE} = 2 V; f = 2 GHz; T_{amb} = 25 °C	[2]	-	23	-	dB
NF	noise figure	I_C = 2 mA; V_{CE} = 2 V; f = 2 GHz; $\Gamma_S = \Gamma_{opt}$		-	1.2	-	dB

[1] T_{sp} is the temperature at the soldering point of the emitter pins.

[2] $G_{p(max)}$ is the maximum power gain, if K > 1. If K < 1 then $G_{p(max)}$ = Maximum Stable Gain (MSG), see Figure 8.

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Symbol
1	emitter		 mbb159
2	base		
3	emitter		
4	collector		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BFG424F	-	plastic surface mounted flat pack package; reverse pinning; 4 leads	SOT343F

4. Marking

Table 4. Marking

Type number	Marking code[1]
BFG424F	NE*

[1] * = p: made in Hong Kong.

5. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter		-	10	V
V_{CEO}	collector-emitter voltage	open base		-	4.5	V
V_{EBO}	emitter-base voltage	open collector		-	1	V
I_C	collector current			-	30	mA
P_{tot}	total power dissipation	$T_{sp} \leq 90$ °C	[1]	-	135	mW
T_{stg}	storage temperature			−65	+150	°C
T_j	junction temperature			-	150	°C

[1] T_{sp} is the temperature at the soldering point of the emitter pins.

6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Typ	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point	$T_{sp} \leq 90$ °C	[1]	340	K/W

[1] T_{sp} is the temperature at the soldering point of the emitter pins.

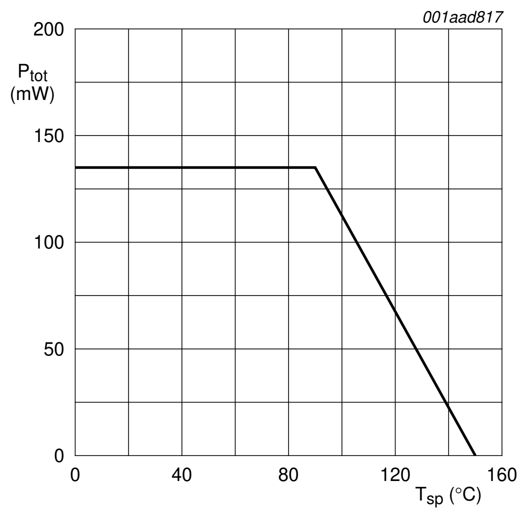


Fig 1. Power derating curve

7. Characteristics

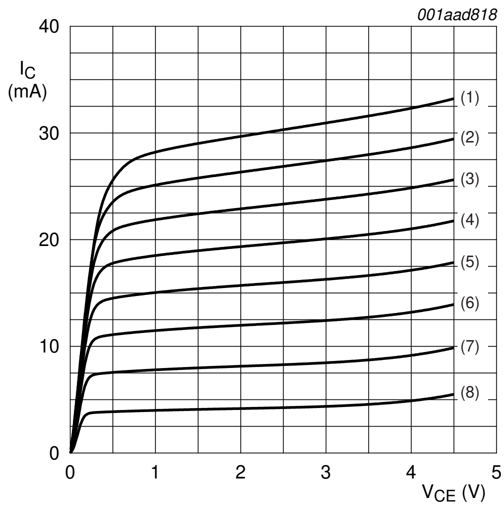
Table 7. Characteristics

T_j = 25 °C; unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 2.5 μA; I_E = 0 mA		10	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 1 mA; I_B = 0 mA		4.5	-	-	V
$V_{(BR)EBO}$	open-collector emitter-base breakdown voltage	I_E = 2.5 μA; I_C = 0 mA		1	-	-	V
I_{CBO}	collector-base cut-off current	I_E = 0 mA; V_{CB} = 4.5 V		-	-	15	nA
h_{FE}	DC current gain	I_C = 25 mA; V_{CE} = 2 V		50	80	120	
C_{CES}	collector-emitter capacitance	V_{CB} = 2 V; f = 1 MHz		-	363	-	fF
C_{EBS}	emitter-base capacitance	V_{EB} = 0.5 V; f = 1 MHz		-	475	-	fF
C_{CBS}	collector-base capacitance	V_{CB} = 2 V; f = 1 MHz		-	102	-	fF
f_T	transition frequency	I_C = 25 mA; V_{CE} = 2 V; f = 2 GHz; T_{amb} = 25 °C		-	25	-	GHz
$G_{p(max)}$	maximum power gain	I_C = 25 mA; V_{CE} = 2 V; f = 2 GHz; T_{amb} = 25 °C	[1]	-	23	-	dB
$\|s_{21}\|^2$	insertion power gain	I_C = 25 mA; V_{CE} = 2 V; f = 2 GHz; T_{amb} = 25 °C		-	18.5	-	dB
NF	noise figure	I_C = 2 mA; V_{CE} = 2 V; f = 900 MHz; $\Gamma_S = \Gamma_{opt}$		-	0.8	-	dB
		I_C = 2 mA; V_{CE} = 2 V; f = 2 GHz; $\Gamma_S = \Gamma_{opt}$		-	1.2	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	I_C = 25 mA; V_{CE} = 2 V; f = 2 GHz; $Z_S = Z_{S(opt)}$; $Z_L = Z_{L(opt)}$	[2]	-	12	-	dBm
IP3	third-order intercept point	I_C = 25 mA; V_{CE} = 2 V; f = 2 GHz; $Z_S = Z_{S(opt)}$; $Z_L = Z_{L(opt)}$	[2]	-	22	-	dBm

[1] $G_{p(max)}$ is the maximum power gain, if K > 1. If K < 1 then $G_{p(max)}$ = MSG, see Figure 8.

[2] Z_S is optimized for noise; Z_L is optimized for gain.



(1) I_B = 400 μA

(2) I_B = 350 μA

(3) I_B = 300 μA

(4) I_B = 250 μA

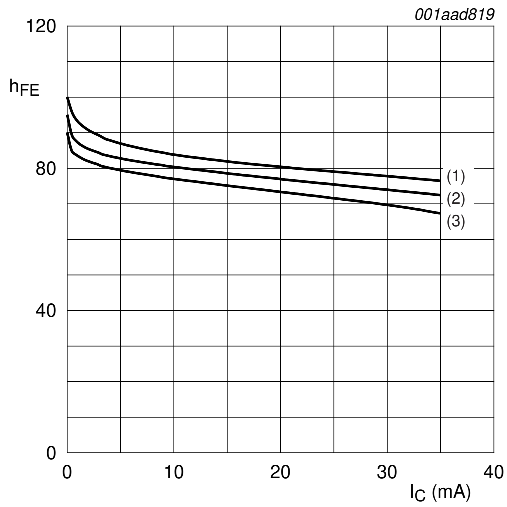
(5) I_B = 200 μA

(6) I_B = 150 μA

(7) I_B = 100 μA

(8) I_B = 50 μA

Fig 2. Collector current as a function of collector-emitter voltage; typical values

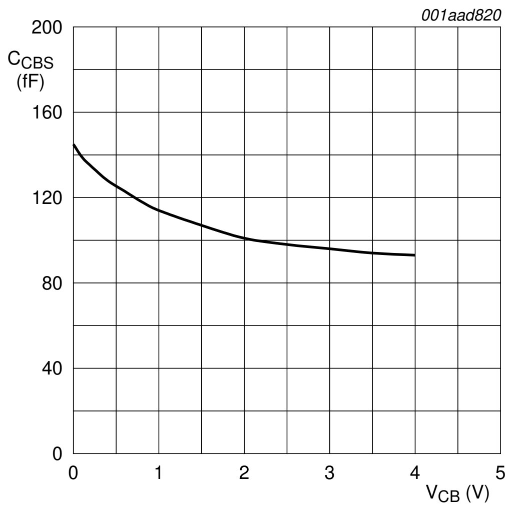


(1) V_{CE} = 3 V

(2) V_{CE} = 2 V

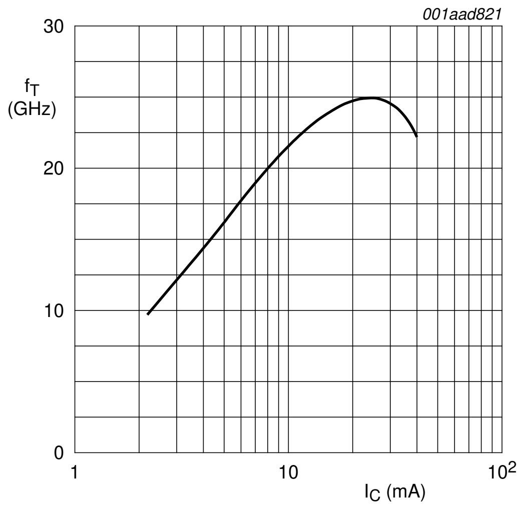
(3) V_{CE} = 1 V

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



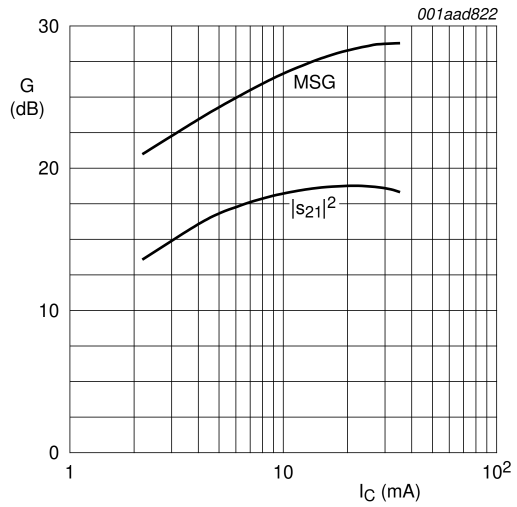
f = 1 MHz

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



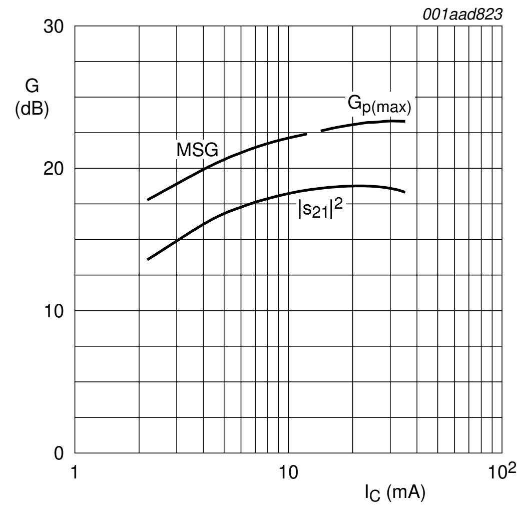
V_{CE} = 2 V; f = 2 GHz; T_{amb} = 25 °C

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



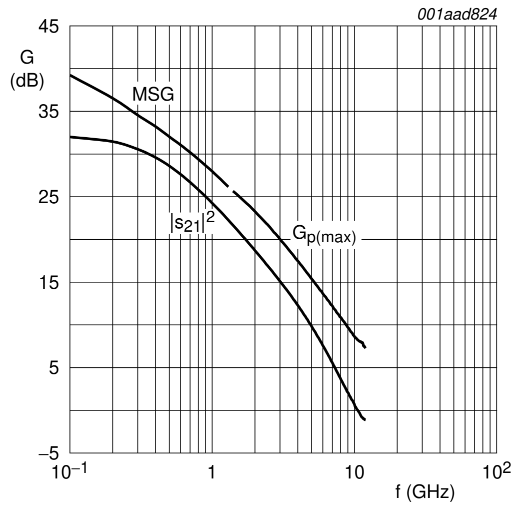
V_{CE} = 2 V; f = 0.9 GHz; T_{amb} = 25 °C

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



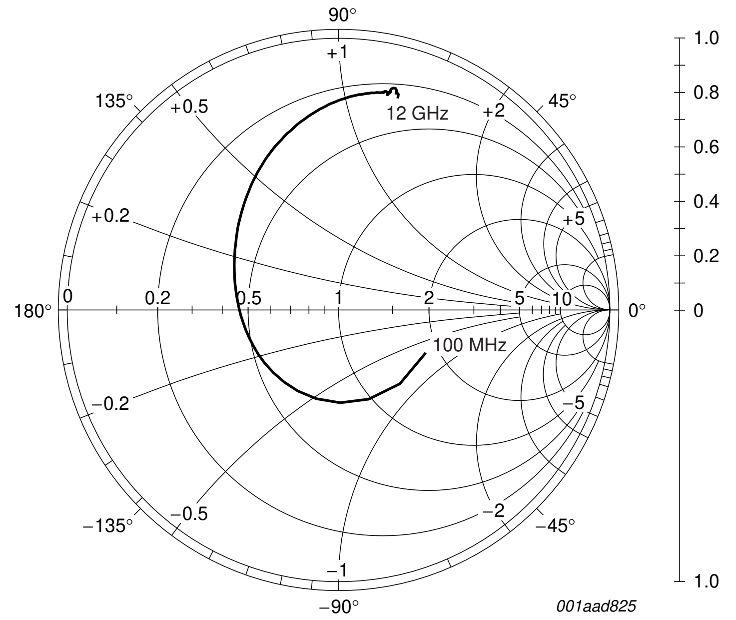
V_{CE} = 2 V; f = 2 GHz; T_{amb} = 25 °C

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



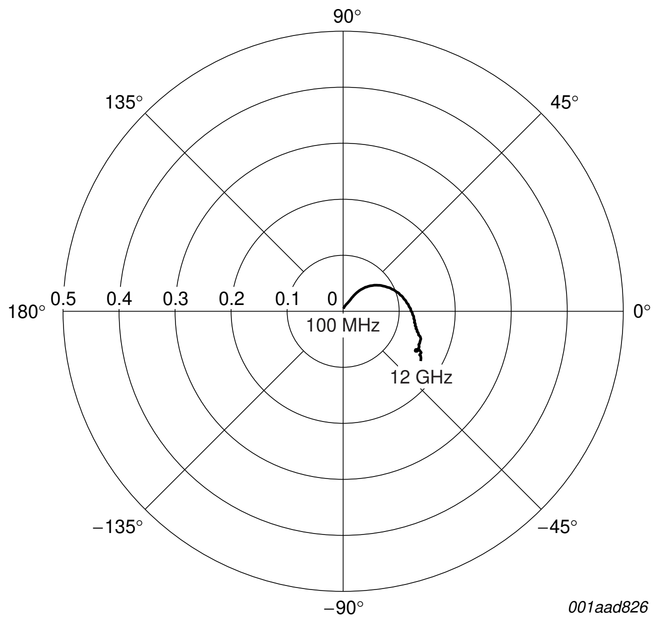
V_{CE} = 2 V; I_C = 25 mA; T_{amb} = 25 °C

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



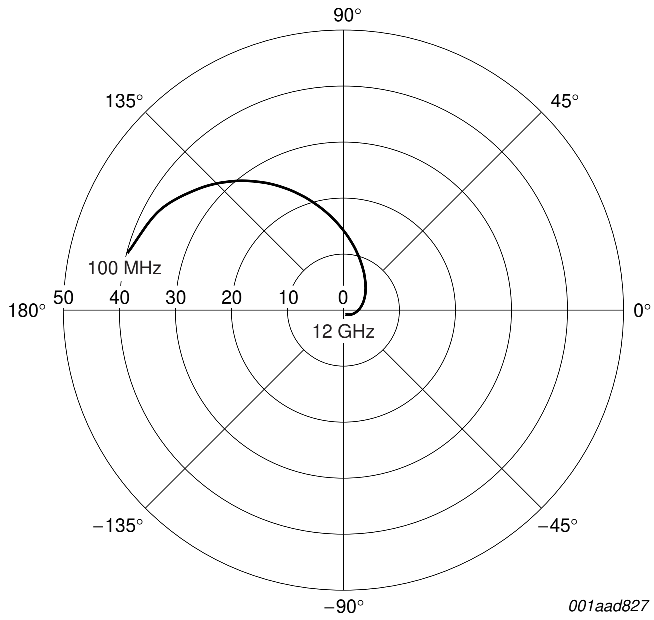
V_{CE} = 2 V; I_C = 25 mA; Z_o = 50 Ω

Fig 9. Common emitter input reflection coefficient (s_{11}); typical values



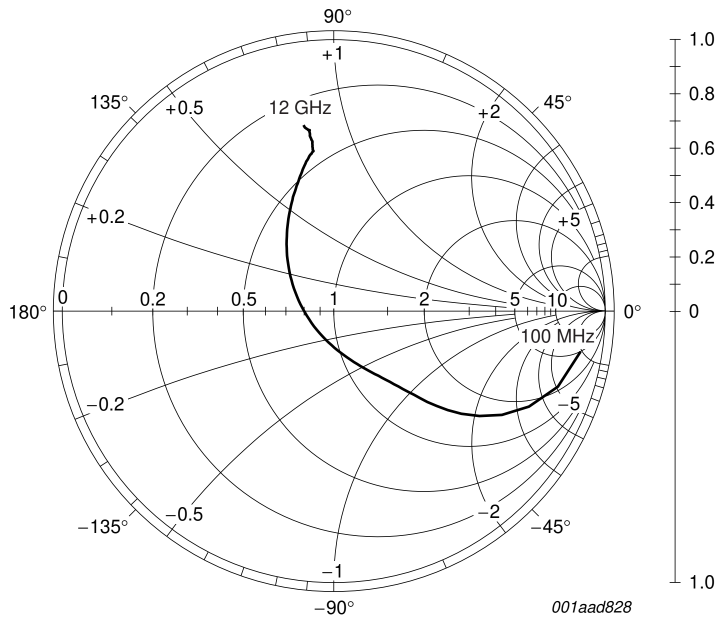
V_{CE} = 2 V; I_C = 25 mA

Fig 10. Common emitter reverse transmission coefficient (s_{12}); typical values



V_{CE} = 2 V; I_C = 25 mA

Fig 11. Common emitter forward transmission coefficient (s_{21}); typical values



V_{CE} = 2 V; I_C = 25 mA; Z_o = 50 Ω

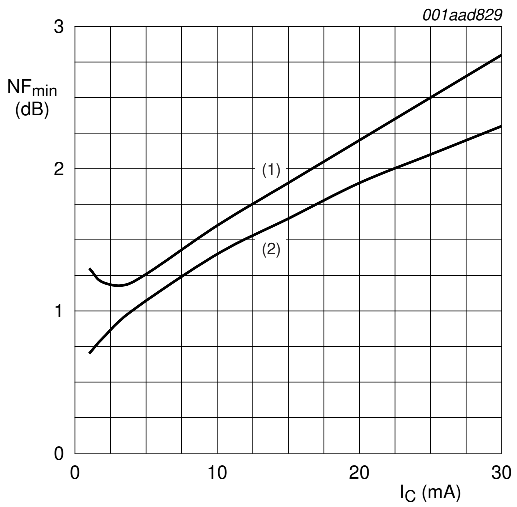
Fig 12. Common emitter input reflection coefficient (s_{22}); typical values

7.1 Noise data

Table 8. Noise data

V_{CE} = 2 V; typical values.

f (MHz)	I_C (mA)	NF_{min} (dB)	Γ_{opt} ratio	Γ_{opt} (deg)	r_n (Ω)
900	1	0.7	0.67	19.1	0.40
	2	0.81	0.48	17.8	0.27
	4	1	0.28	11.7	0.24
	10	1.4	0.02	−63.9	0.19
	15	1.65	0.11	−162.4	0.18
	20	1.9	0.19	−165.5	0.18
	25	2.1	0.25	−166.3	0.19
	30	2.3	0.29	−166.5	0.19
2000	1	1.3	0.56	57.5	0.36
	2	1.2	0.43	57.2	0.25
	4	1.2	0.22	60.8	0.18
	10	1.6	0.06	137.4	0.19
	15	1.9	0.13	−162.1	0.20
	20	2.2	0.17	−155.5	0.20
	25	2.5	0.22	−152.2	0.21
	30	2.8	0.27	−150.8	0.25



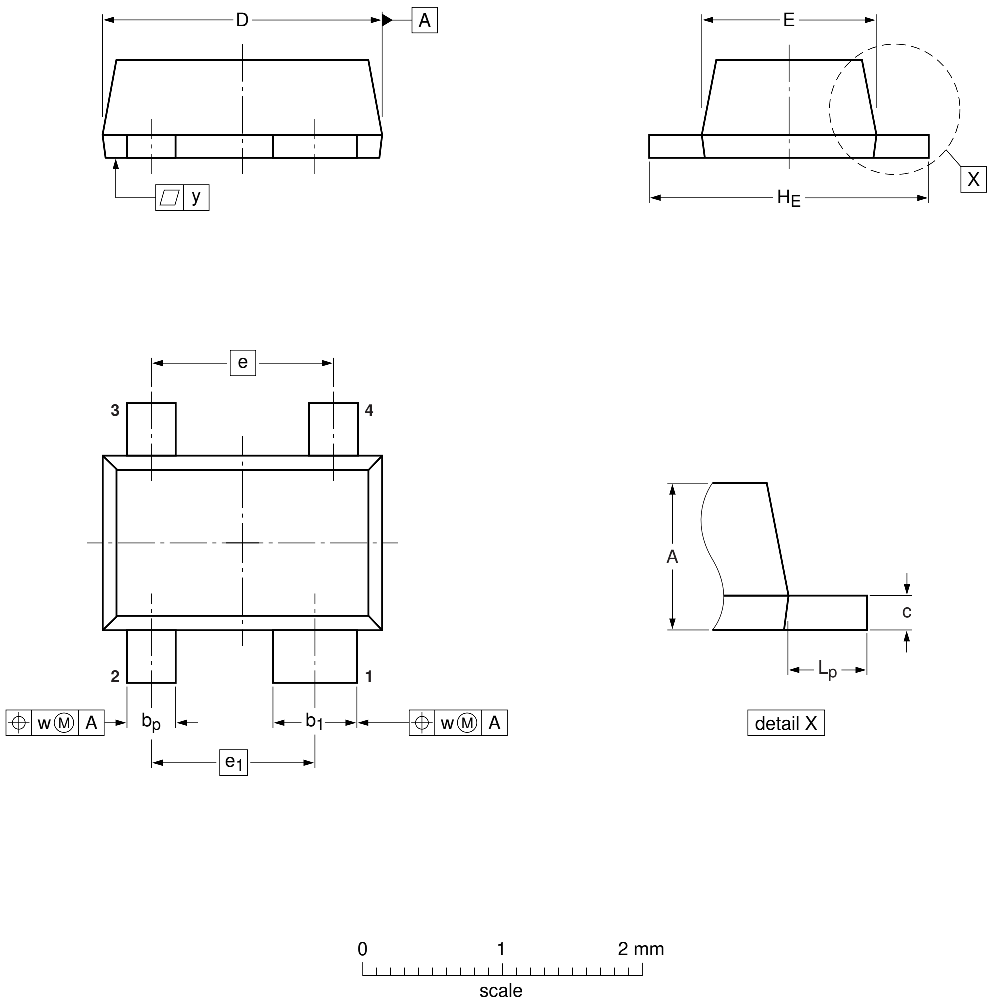
(1) f = 2 GHz

(2) f = 900 MHz

Fig 13. Minimum noise figure as a function of collector current; typical values

8. Package outline

Plastic surface-mounted flat pack package; reverse pinning; 4 leads **SOT343F**



DIMENSIONS (mm are the original dimensions)

UNIT	A max	b_p	b_1	c	D	E	e	e_1	H_E	L_p	w	y
mm	0.75 0.65	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	0.48 0.38	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT343F						~~05-07-12~~ 06-03-16

Fig 14. Package outline SOT343F

9. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BFG424F v.2	20110913	Product data sheet	-	BFG424F v.1
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate.			
BFG424F v.1	20060321	Product data sheet	-	-

10. Legal information

10.1 Data sheet status

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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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11. Contact information

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For sales office addresses, please send an email to: **salesaddresses@nxp.com**

12. Contents

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