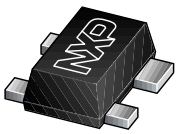


BFU910F

NPN wideband silicon germanium RF transistor

Rev. 2 — 16 January 2015 Product data sheet

1. Product profile

1.1 General description

NPN silicon germanium RF transistor for high speed, low noise applications in a plastic, 4-pin dual-emitter SOT343F package.

The BFU910F is suitable for small signal applications up to 20 GHz.

1.2 Features and benefits

- Low noise high gain microwave transistor
- Minimum noise figure (NF_{min}) = 0.65 dB at 12 GHz
- Maximum stable gain 14.2 dB at 12 GHz
- 90 GHz f_T SiGe technology

1.3 Applications

- K_u band DBS Low-Noise blocks

1.4 Quick reference data

Table 1. Quick reference data

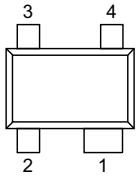
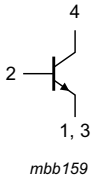
T_{amb} = 25 °C unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CE}	collector-emitter voltage	$R_{BE} \leq 1$ MΩ	-	2.0	3.0	V
I_C	collector current		-	10	15	mA
P_{tot}	total power dissipation	$T_{sp} \leq 90$ °C [1]	-	-	300	mW
h_{FE}	DC current gain	I_C = 6 mA; V_{CE} = 2 V	-	1900	-	
C_{CBS}	collector-base capacitance	V_{CB} = 2 V; f = 1 MHz	-	35	-	fF
f_T	transition frequency	I_C = 6 mA; V_{CE} = 2 V	-	90	-	GHz
MSG	maximum stable gain	I_C = 6 mA; V_{CE} = 2 V; f = 12 GHz	-	14.2	-	dB
NF_{min}	minimum noise figure	I_C = 6 mA; V_{CE} = 2 V; f = 12 GHz; $\Gamma_S = \Gamma_{opt}$	-	0.65	-	dB
G_{ass}	associated gain	I_C = 6 mA; V_{CE} = 2 V; f = 12 GHz; $\Gamma_S = \Gamma_{opt}$	-	13.0	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	I_C = 10 mA; V_{CE} = 2 V; f = 12 GHz; $Z_S = Z_L$ = 50 Ω	-	2	-	dBm

[1] T_{sp} is the temperature at the solder point of the emitter lead.

2. Pinning information

Table 2. Discrete pinning

Pin	Description	Simplified outline	Graphic symbol
1	emitter		
2	base		
3	emitter		
4	collector		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BFU910F	-	plastic surface-mounted flat pack package; reverse pinning; 4 leads	SOT343F

4. Marking

Table 4. Marking

Type number	Marking	Description
BFU910F	F1*	* = t : made in Malaysia
		* = w : made in China

5. Design support

Table 5. Available design support

Download from the BFU910F product information page on http://www.nxp.com.

Support item	Available	Remarks
Device models for Agilent EEsof EDA ADS	Q1 2015	Based on Mextram device model.
SPICE model	Q1 2015	Based on Gummel-Poon device model.
S-parameters	yes	
Noise parameters	yes	
Solder pattern	yes	
Application notes	yes	

6. Limiting values

Table 6. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CB}	collector-base voltage	open emitter	-	9.5	V
V_{CE}	collector-emitter voltage	open base	-	2.0	V
		shorted base	-	9.5	V
V_{EB}	emitter-base voltage	open collector	-	1.5	V
T_{stg}	storage temperature		–65	+150	°C

7. Recommended operating conditions

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CE}	collector-emitter voltage	$R_{BE} \leq 1$ MΩ	-	2.0	3.0	V
V_{EB}	emitter-base voltage	open collector	-	-	1.0	V
I_C	collector current		-	-	15	mA
P_i	input power	$Z_S = 50$ Ω	-	-	0	dBm
T_j	junction temperature		–40	-	+150	°C
P_{tot}	total power dissipation	$T_{sp} \leq 90$ °C [1]	-	-	300	mW

[1] T_{sp} is the temperature at the solder point of the emitter lead.

8. Thermal characteristics

Table 8. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point	[1][2]	202	K/W

[1] T_{sp} is the temperature at the solder point of the collector lead.
T_{sp} has the following relation to the ambient temperature T_{amb}: $T_{sp} = T_{amb} + P \times R_{th(sp-amb)}$
with P the power dissipation and $R_{th(sp-amb)}$ the thermal resistance between the solder point and ambient.
$R_{th(sp-amb)}$ is determined by the heat transfer properties in the application.
The heat transfer properties are set by the application board materials, the board layout and the environment e.g. housing.

[2] Based on simulation.

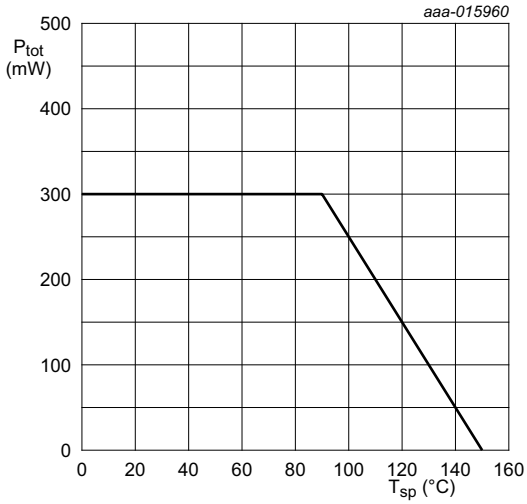


Fig 1. Power derating curve

9. Characteristics

Table 9. Characteristics

T_{amb} = 25 °C unless otherwise specified

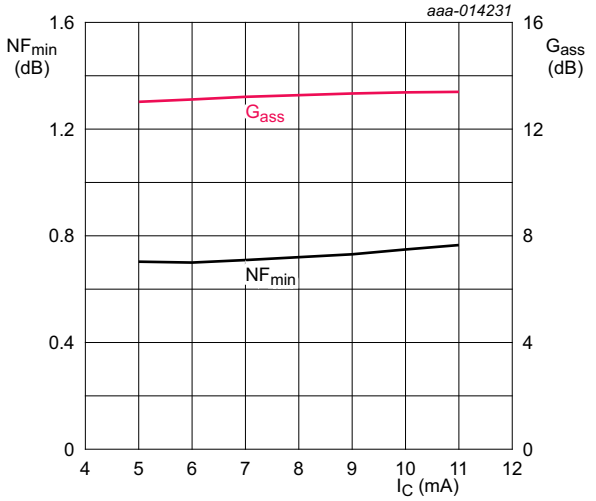
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 10 μA; I_E = 0 μA	9.5	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 10 μA; I_B = 0 μA	2.0	-	-	V
I_C	collector current		-	6	15	mA
h_{FE}	DC current gain	I_C = 1.5 mA; V_{CE} = 1.5 V	1200	2200	3300	
		I_C = 6 mA; V_{CE} = 2 V	-	1900	-	
C_{CES}	collector-emitter capacitance	V_{CE} = 2 V; f = 1 MHz	-	215	-	fF
C_{EBS}	emitter-base capacitance	V_{EB} = 0.5 V; f = 1 MHz	-	300	-	fF
C_{CBS}	collector-base capacitance	V_{CB} = 2 V; f = 1 MHz	-	35	-	fF
f_T	transition frequency	I_C = 5 mA; V_{CE} = 2 V	-	90	-	GHz
MSG	maximum stable gain	f = 10.7 GHz; V_{CE} = 2 V				
		I_C = 6 mA	-	15.2	-	dB
		I_C = 10 mA	-	15.5	-	dB
		f = 12 GHz; V_{CE} = 2 V				
		I_C = 6 mA	-	14.2	-	dB
		I_C = 10 mA	-	14.5	-	dB
		f = 12.75 GHz; V_{CE} = 2 V				
		I_C = 6 mA	-	14.2	-	dB
		I_C = 10 mA	-	14.5	-	dB

Table 9. Characteristics *...continued*

T_{amb} = 25 °C unless otherwise specified

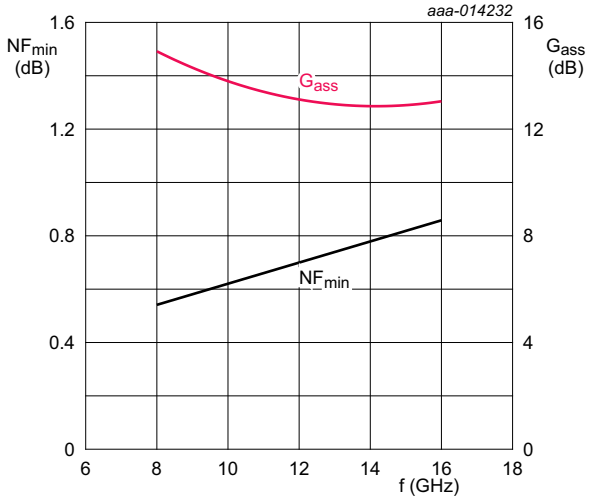
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$\|s_{21}\|^2$	insertion power gain	f = 10.7 GHz; V_{CE} = 2 V				
		I_C = 6 mA	-	13.0	-	dB
		I_C = 10 mA	-	13.5	-	dB
		f = 12 GHz; V_{CE} = 2 V				
		I_C = 6 mA	-	12.0	-	dB
		I_C = 10 mA	-	12.5	-	dB
		f = 12.75 GHz; V_{CE} = 2 V				
		I_C = 6 mA	-	12.0	-	dB
		I_C = 10 mA	-	12.5	-	dB
NF_{min}	minimum noise figure	f = 10.7 GHz; V_{CE} = 2 V; $\Gamma_S = \Gamma_{opt}$				
		I_C = 6 mA	-	0.6	-	dB
		I_C = 10 mA	-	0.65	-	dB
		f = 12 GHz; V_{CE} = 2 V; $\Gamma_S = \Gamma_{opt}$				
		I_C = 6 mA	-	0.65	0.85	dB
		I_C = 10 mA	-	0.7	-	dB
		f = 12.75 GHz; V_{CE} = 2 V; $\Gamma_S = \Gamma_{opt}$				
		I_C = 6 mA	-	0.65	-	dB
		I_C = 10 mA	-	0.7	-	dB
G_{ass}	associated gain	f = 10.7 GHz; V_{CE} = 2 V; $\Gamma_S = \Gamma_{opt}$				
		I_C = 6 mA	-	13.5	-	dB
		I_C = 10 mA	-	14.0	-	dB
		f = 12 GHz; V_{CE} = 2 V; $\Gamma_S = \Gamma_{opt}$				
		I_C = 6 mA	-	13.0	-	dB
		I_C = 10 mA	-	13.5	-	dB
		f = 12.75 GHz; V_{CE} = 2 V; $\Gamma_S = \Gamma_{opt}$				
		I_C = 6 mA	-	13.0	-	dB
		I_C = 10 mA	-	13.5	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	f = 12 GHz; V_{CE} = 2 V; $Z_S = Z_L$ = 50 Ω; I_C = 10 mA	-	2	-	dBm
$IP3_o$	output third-order intercept point	f_1 = 12.000 GHz; f_2 = 12.025 GHz; V_{CE} = 2 V; $Z_S = Z_L$ = 50 Ω; I_C = 10 mA	-	12.5	-	dBm

9.1 Graphs



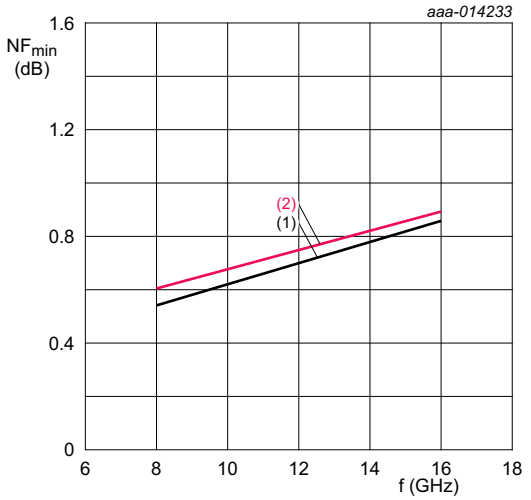
f = 12 GHz; V_{CE} = 2 V; T_{amb} = 25 °C.

Fig 2. Minimum noise figure and associated gain as function of collector current; typical values



I_C = 6 mA; V_{CE} = 2 V; T_{amb} = 25 °C.

Fig 3. Minimum noise figure and associated gain as function of frequency; typical values

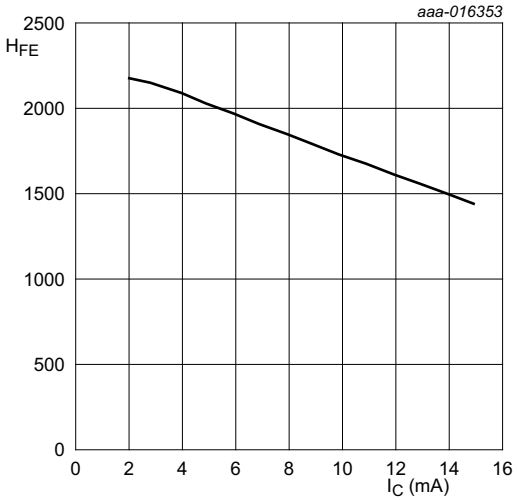


V_{CE} = 2 V; T_{amb} = 25 °C.

(1) I_C = 6 mA

(2) I_C = 10 mA

Fig 4. Minimum noise figure as a function of frequency; typical values

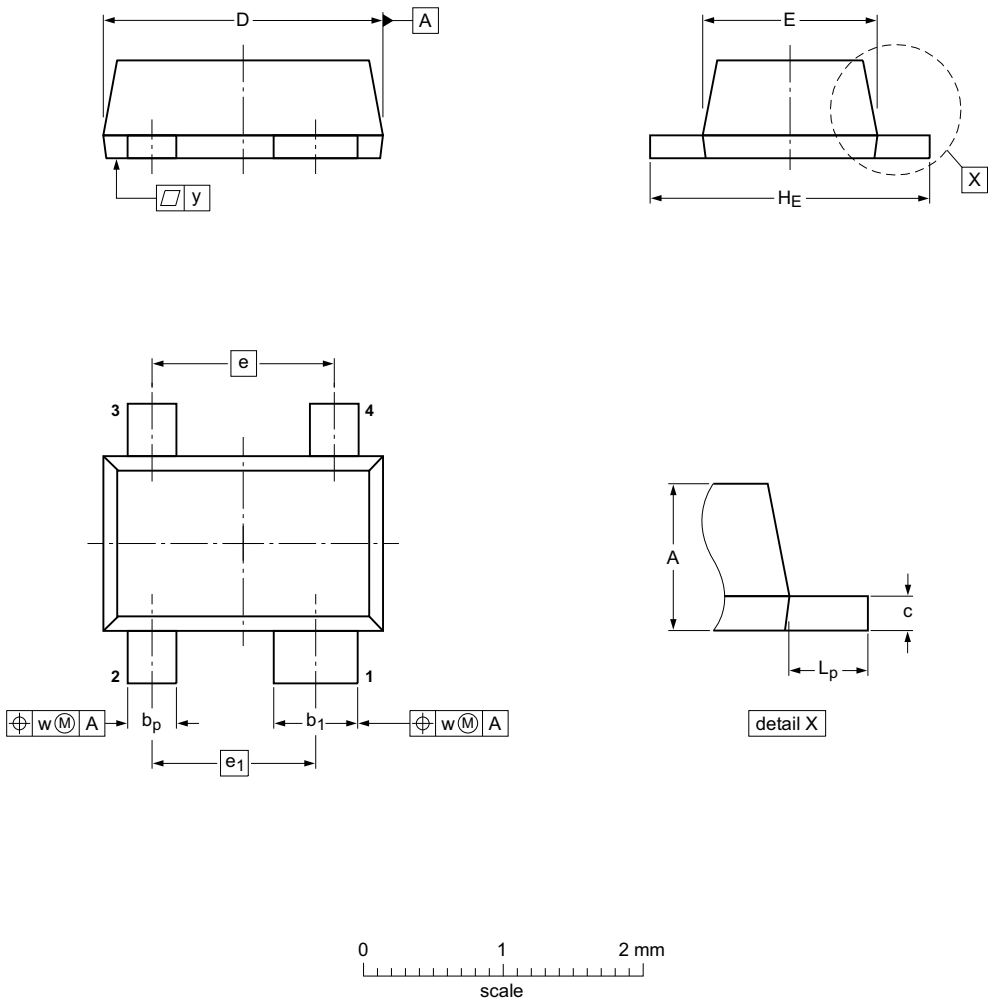


V_{CE} = 2 V; T_{amb} = 25 °C.

Fig 5. DC current gain as a function of collector current; typical values

10. 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 6. Package outline SOT343F

11. Handling information

CAUTION

This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices.

Such precautions are described in the *ANSI/ESD S20.20*, *IEC/ST 61340-5*, *JESD625-A* or equivalent standards.

12. Abbreviations

Table 10. Abbreviations

Acronym	Description
DBS	Direct Broadcast Satellite
K_u band	K-under band
NPN	Negative-Positive-Negative
SiGe	Silicon Germanium

13. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BFU910F v.2	20150116	Product data sheet	-	BFU910F v.1
Modifications	• The status of this document has been changed to “Product data sheet”. • The title has been changed to “NPN wideband silicon germanium RF transistor”. • Section 1.1 on page 1: the wording of this section has been changed. • Table 1 on page 1: Some changes have been made. • Table 6 on page 3: The maximum value for V_{CE},open base has been changed. • Table 7 on page 3: The typical value for V_{CE} has been changed. • Table 9 on page 4: the conditions for $V_{(BR)CBO}$ and $V_{(BR)CEO}$ have been changed. • Figure 5 on page 6: the figure has been added.			
BFU910F v.1	20141128	Preliminary data sheet	-	-

14. Legal information

14.1 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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16. Contents

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