BFU730LX

NPN wideband silicon germanium RF transistor

Rev. 1 — 8 May 2013 **Product data sheet**

1. Product profile

1.1 General description

NPN silicon germanium microwave transistor for high speed, low noise applications in a SOT883C leadless ultra small plastic SMD package.

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.

1.2 Features and benefits

- Leadless ultra small plastic SMD package 1.0 mm × 0.6 mm × 0.34 mm
- Low noise high gain microwave transistor
- Noise figure (NF) = 0.75 dB at 6 GHz
- High maximum power gain ($G_{p(max)}$) of 15.8 dB at 6 GHz
- Excellent linearity in WiFi LNA from 5 GHz to 5.9 GHz:
  - input third-order intercept point ($IP3_i$) = 15 dBm
  - input power at 1 dB gain compression ($P_{i(1dB)}$) = 0 dBm

  See application note *AN11224: Low Noise Fast Turn ON/OFF 5-5.9GHz WiFi LNA with BFU730LX*.
- 110 GHz f_T silicon germanium technology

1.3 Applications

- Wi-Fi / WLAN

  See application notes:
  - *AN11223: Low Noise Fast Turn ON/OFF 2.4-2.5GHz WiFi LNA with BFU730LX*
  - *AN11224: Low Noise Fast Turn ON/OFF 5-5.9GHz WiFi LNA with BFU730LX*
- WiMAX
- LNA for GPS, GLONASS, Galileo and Compass (BeiDou)
- DBS (2nd LNA stage, mixer stage, DRO), SDARS
- RKE, AMR / Zigbee
- LNA for microwave communications systems
- Low current battery equipped applications
- Microwave driver / buffer applications

1.4 Quick reference data

Table 1. Quick reference data

T_j = 25 °C unless otherwise specified.

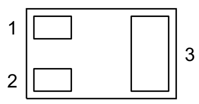
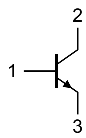
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CB}	collector-base voltage	open emitter		-	-	10.0	V
V_{CE}	collector-emitter voltage	open base		-	-	3.0	V
		shorted base		-	-	10.0	V
V_{EB}	emitter-base voltage	open collector		-	-	1.3	V
I_C	collector current			-	5	30	mA
P_{tot}	total power dissipation	$T_{sp} \leq 110$ °C	[1]	-	-	160	mW
h_{FE}	DC current gain	I_C = 2 mA; V_{CE} = 2 V; T_j = 25 °C		205	380	555	
f_T	transition frequency	I_C = 25 mA; V_{CE} = 3 V; f = 2 GHz; T_{amb} = 25 °C		-	53	-	GHz
$G_{p(max)}$	maximum power gain	I_C = 25 mA; V_{CE} = 3 V; f = 6 GHz; T_{amb} = 25 °C	[2]	-	15.8	-	dB
NF	noise figure	I_C = 5 mA; V_{CE} = 3 V; f = 6 GHz; $\Gamma_S = \Gamma_{opt}$		-	0.75	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	I_C = 25 mA; V_{CE} = 3 V; $Z_S = Z_L$ = 50 Ω; f = 1.8 GHz; T_{amb} = 25 °C		-	11.7	-	dBm

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

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

2. Pinning information

Table 2. Discrete pinning

Pin	Description	Simplified outline	Graphic symbol
1	base	 Transparent top view	 aaa-006018
2	collector		
3	emitter		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BFU730LX	-	leadless ultra small plastic package; 3 terminals; body 1 × 0.6 × 0.34 mm	SOT883C

4. Marking

Table 4. Marking

Type number	Marking
BFU730LX	ZD

5. Design support

Table 5. Available design support

Download from the BFU730LX product page on http://www.nxp.com.

Support item	Available		Remarks
Device models for Agilent EEsof EDA ADS	yes	[1]	Based on Mextram device model
Device models for Agilent EEsof EDA Genesys	yes		Based on Mextram device model
Device models for AWR Microwave Office	planned		Based on Mextram device model
Device models for ANSYS Ansoft designer	planned		Based on Mextram device model
SPICE model	planned		Based on Gummel-Poon device model
S-parameters	yes		
Noise parameters	yes		
Customer evaluation kit	yes		
Gerber files evaluation board	yes		
Reflow soldering footprint	yes		
AN11223: Low Noise Fast Turn ON/OFF 2.4-2.5GHz WiFi LNA with BFU730LX	yes		Application note
AN11224: Low Noise Fast Turn ON/OFF 5-5.9GHz WiFi LNA with BFU730LX	yes		Application note

[1] See http://www.nxp.com/models.html.

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		-	10.0	V
V_{CE}	collector-emitter voltage	open base		-	3.0	V
		shorted base		-	10.0	V
V_{EB}	emitter-base voltage	open collector		-	1.3	V
P_{tot}	total power dissipation	$T_{sp} \leq 110$ °C	[1]	-	160	mW
T_{stg}	storage temperature			–65	+150	°C
T_j	junction temperature			-	150	°C

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

7. Recommended operating conditions

Table 7. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
T_j	junction temperature		–40	-	+125	°C
I_C	collector current		-	-	30	mA

8. Thermal characteristics

Table 8. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point		250	K/W

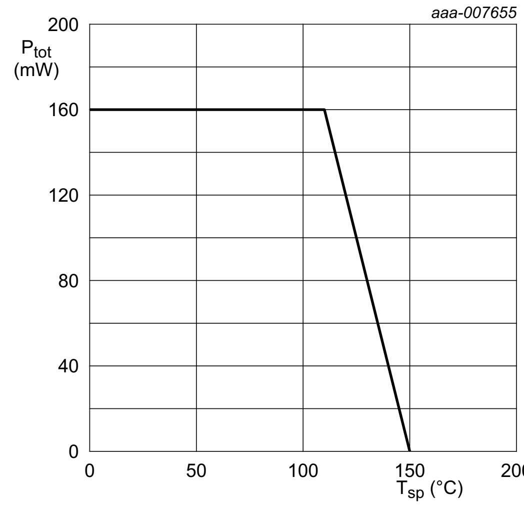


Fig 1. Total supply current as a function of solder point temperature

9. Characteristics

Table 9. Characteristics

T_j = 25 °C unless otherwise specified; measurements done on characterization boards.

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	3.0	-	-	V
I_C	collector current		-	5	30	mA
I_{CBO}	collector-base cut-off current	I_E = 0 mA; V_{CB} = 4.5 V	-	-	100	nA
h_{FE}	DC current gain	I_C = 2 mA; V_{CE} = 2 V	205	380	555	
C_{CE}	collector-emitter capacitance	V_{CE} = 2 V; f = 1 MHz	-	145	-	fF
C_{EB}	emitter-base capacitance	V_{EB} = 0.5 V; f = 1 MHz	-	310	-	fF
C_{CB}	collector-base capacitance	V_{CB} = 2 V; f = 1 MHz	-	84	-	fF
f_T	transition frequency	I_C = 25 mA; V_{CE} = 3 V; f = 2 GHz; T_{amb} = 25 °C	-	53	-	GHz

Table 9. Characteristics *...continued*

T_j = 25 °C unless otherwise specified; measurements done on characterization boards.

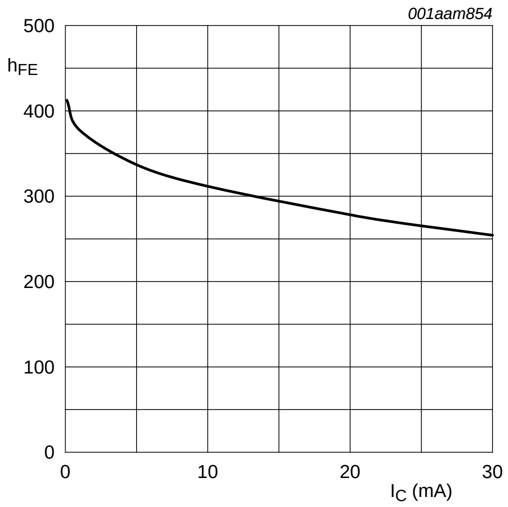
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$G_{p(max)}$	maximum power gain	I_C = 5 mA; V_{CE} = 3 V; T_{amb} = 25 °C	[1]				
		f = 1.8 GHz		-	22.0	-	dB
		f = 6 GHz		-	15.0	-	dB
		I_C = 10 mA; V_{CE} = 3 V; T_{amb} = 25 °C	[1]				
		f = 1.8 GHz		-	23.6	-	dB
		f = 6 GHz		-	15.7	-	dB
		I_C = 25 mA; V_{CE} = 3 V; T_{amb} = 25 °C	[1]				
		f = 1.8 GHz		-	24.5	-	dB
		f = 6 GHz		-	15.8	-	dB
$\|s_{21}\|^2$	insertion power gain	I_C = 5 mA; V_{CE} = 3 V; T_{amb} = 25 °C					
		f = 1.8 GHz		-	19.3	-	dB
		f = 6 GHz		-	11.1	-	dB
		I_C = 10 mA; V_{CE} = 3 V; T_{amb} = 25 °C					
		f = 1.8 GHz		-	21.3	-	dB
		f = 6 GHz		-	12.0	-	dB
		I_C = 25 mA; V_{CE} = 3 V; T_{amb} = 25 °C					
		f = 1.8 GHz		-	22.3	-	dB
		f = 6 GHz		-	12.5	-	dB
NF_{min}	minimum noise figure	I_C = 5 mA; V_{CE} = 3 V; $\Gamma_S = \Gamma_{opt}$; T_{amb} = 25 °C					
		f = 1.8 GHz		-	0.55	-	dB
		f = 6 GHz		-	0.75	-	dB
		I_C = 10 mA; V_{CE} = 3 V; $\Gamma_S = \Gamma_{opt}$; T_{amb} = 25 °C					
		f = 1.8 GHz		-	0.7	-	dB
		f = 6 GHz		-	0.9	-	dB
		I_C = 25 mA; V_{CE} = 3 V; $\Gamma_S = \Gamma_{opt}$; T_{amb} = 25 °C					
		f = 1.8 GHz		-	1.1	-	dB
		f = 6 GHz		-	1.2	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	I_C = 5 mA; V_{CE} = 3 V; $Z_S = Z_L$ = 50 Ω; T_{amb} = 25 °C					
		f = 1.8 GHz		-	–3.7	-	dBm
		f = 6 GHz		-	–1.6	-	dBm
		I_C = 10 mA; V_{CE} = 3 V; $Z_S = Z_L$ = 50 Ω; T_{amb} = 25 °C					
		f = 1.8 GHz		-	3.5	-	dBm
		f = 6 GHz		-	5.4	-	dBm
		I_C = 25 mA; V_{CE} = 3 V; $Z_S = Z_L$ = 50 Ω; T_{amb} = 25 °C					
		f = 1.8 GHz		-	11.7	-	dBm
		f = 6 GHz		-	12.7	-	dBm

Table 9. Characteristics *...continued*

T_j = 25 °C unless otherwise specified; measurements done on characterization boards.

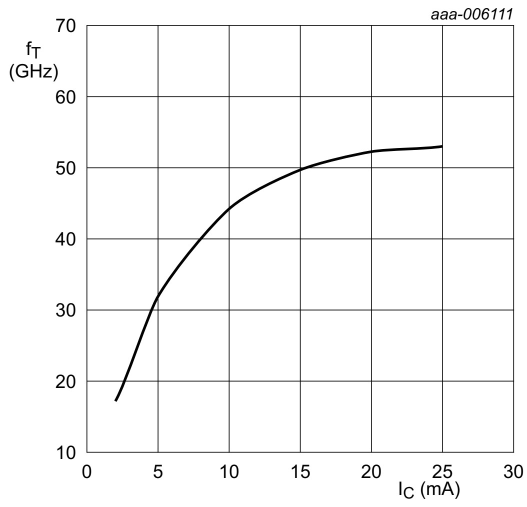
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$IP3_o$	output third-order intercept point	I_C = 5 mA; V_{CE} = 3 V; Z_S = Z_L = 50 Ω; T_{amb} = 25 °C				
		f = 1.8 GHz	-	14.7	-	dBm
		f = 6 GHz	-	19.0	-	dBm
		I_C = 10 mA; V_{CE} = 3 V; Z_S = Z_L = 50 Ω; T_{amb} = 25 °C				
		f = 1.8 GHz	-	23.8	-	dBm
		f = 6 GHz	-	25.3	-	dBm
		I_C = 25 mA; V_{CE} = 3 V; Z_S = Z_L = 50 Ω; T_{amb} = 25 °C				
		f = 1.8 GHz	-	25.5	-	dBm
		f = 6 GHz	-	26.9	-	dBm

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



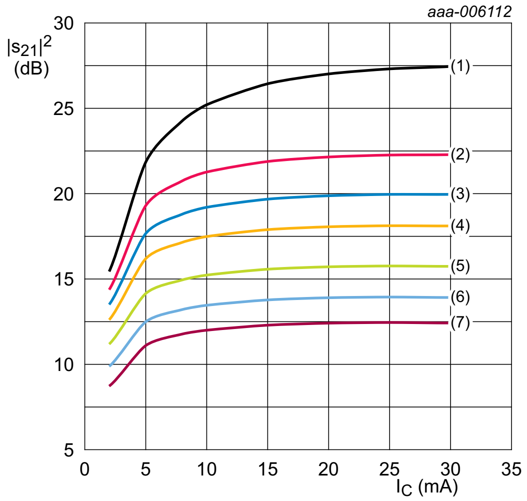
V_{CE} = 2 V; T_{amb} = 25 °C.

Fig 2. DC current gain as a function of collector current; typical values



V_{CE} = 2.5 V; f = 2 GHz; T_{amb} = 25 °C.

Fig 3. Transition frequency as a function of collector current; typical values



V_{CE} = 3 V; T_{amb} = 25 °C.

(1) f = 0.9 GHz

(2) f = 1.8 GHz

(3) f = 2.4 GHz

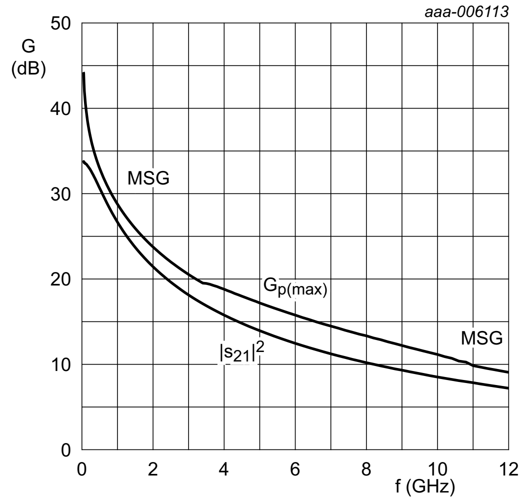
(4) f = 3.0 GHz

(5) f = 4.0 GHz

(6) f = 5.0 GHz

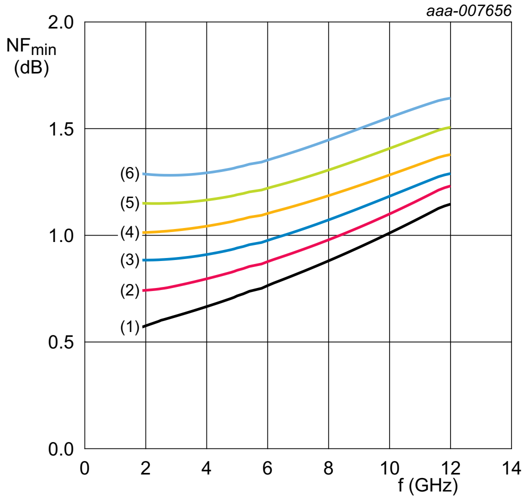
(7) f = 6.0 GHz

Fig 4. Insertion power gain as a function of collector current; typical value



I_C = 25 mA; V_{CE} = 3 V; T_{amb} = 25 °C.

Fig 5. Gain as a function of frequency; typical values



V_{CE} = 3 V; T_{amb} = 25 °C.

(1) I_C = 5 mA

(2) I_C = 10 mA

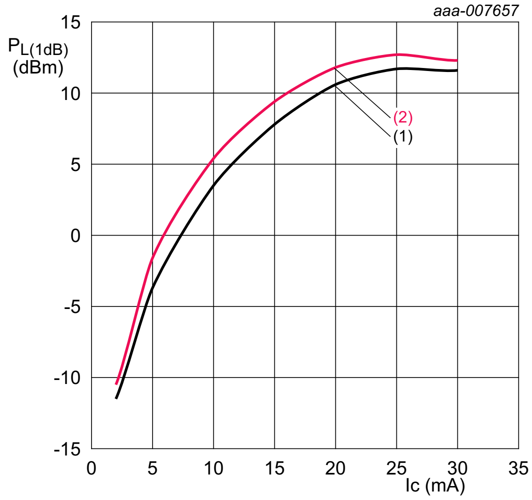
(3) I_C = 15 mA

(4) I_C = 20 mA

(5) I_C = 25 mA

(6) I_C = 30 mA

Fig 6. Minimum noise figure as a function of frequency; typical values



V_{CE} = 3 V; T_{amb} = 25 °C.

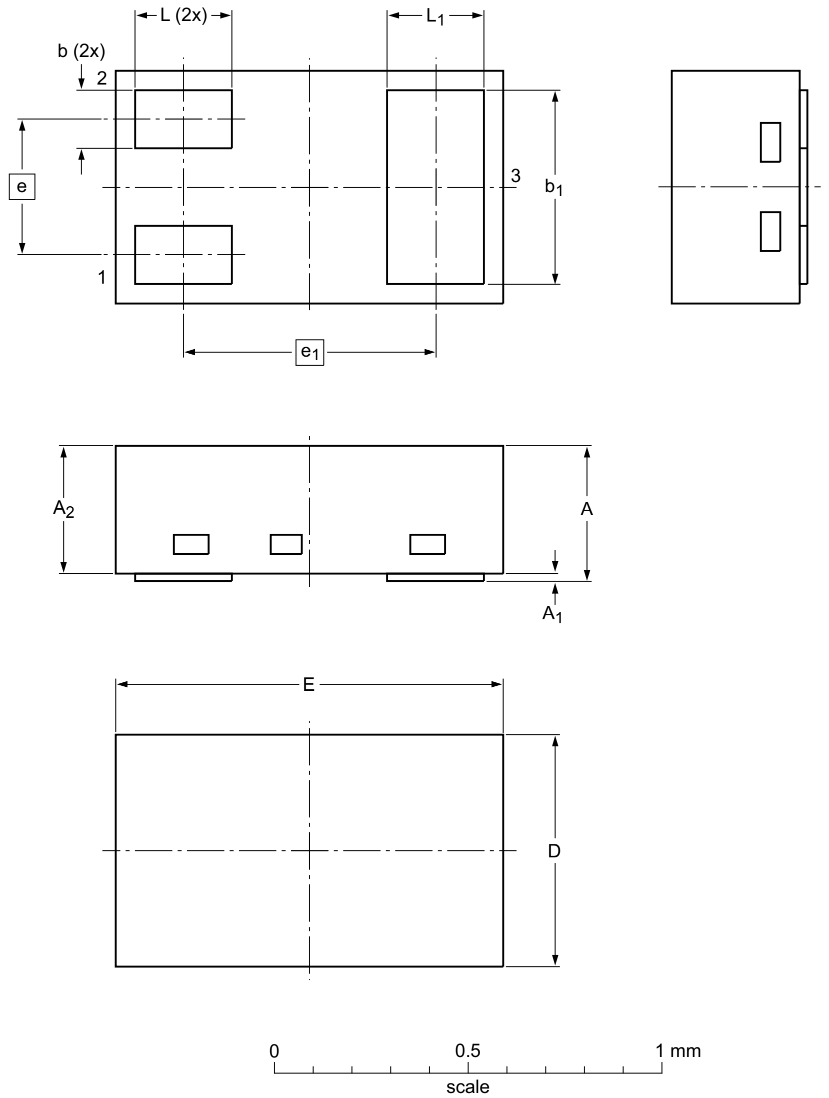
(1) f = 1.8 GHz

(2) f = 6 GHz

Fig 7. Output power at 1 dB gain compression as a function of collector current; typical values

10. Package outline

Leadless ultra small plastic package; 3 solder lands; body 1.0 x 0.6 x 0.34 mm **SOT883C**



Dimensions (mm are the original dimensions)

Unit		A(1)	A_1	A_2	E	D	e	e_1	b	b_1	L	L_1
mm	max	0.35	0.04	0.33	1.05	0.65			0.20	0.55	0.30	0.30
	nom	0.34			1.00	0.60	0.35	0.65	0.15	0.50	0.25	0.25
	min	0.32		0.31	0.95	0.55			0.12	0.47	0.22	0.22

Notes

1. Including plating thickness.

sot883c_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT883C		MO-252				~~12-11-28~~ 13-04-09

Fig 8. Package outline SOT883C

11. Abbreviations

Table 10. Abbreviations

Acronym	Description
AMR	Automatic Meter Reading
DBS	Direct Broadcast Satellite
DRO	Dielectric Resonator Oscillator
GLONASS	GLObal NAvigation Satellite System
GPS	Global Positioning System
LNA	Low Noise Amplifier
LNB	Low Noise Block
NPN	Negative-Positive-Negative
RKE	Remote Keyless Entry
SDARS	Satellite Digital Audio Radio Service
SMD	Surface-Mounted Device
WiMAX	Worldwide Interoperability for Microwave Access
WLAN	Wireless Local Area Network

12. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BFU730LX v.1	20130508	Product data sheet	-	-

13. Legal information

13.1 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".

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14. Contact information

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15. Contents

1 Product profile 1
1.1 General description 1
1.2 Features and benefits 1
1.3 Applications 1
1.4 Quick reference data 2
2 Pinning information 2
3 Ordering information 2
4 Marking 3
5 Design support 3
6 Limiting values 3
7 Recommended operating conditions 4
8 Thermal characteristics 4
9 Characteristics 4
10 Package outline 9
11 Abbreviations 10
12 Revision history 10
13 Legal information 11
13.1 Data sheet status 11
13.2 Definitions 11
13.3 Disclaimers 11
13.4 Trademarks 12
14 Contact information 12
15 Contents 13

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