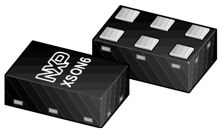


BGU8M1

SiGe:C low-noise amplifier MMIC for LTE

Rev. 3 — 16 January 2017 Product data sheet

1. General description

The BGU8M1 is, also known as the LTE1001M, a Low-Noise Amplifier (LNA) for LTE receiver applications, available in a small plastic 6-pin extremely thin leadless package. The BGU8M1 requires one external matching inductor.

The BGU8M1 adapts itself to the changing environment resulting from co-habitation of different radio systems in modern cellular handsets. It has been designed for low power consumption and optimal performance. At low jamming power levels, it delivers 13 dB gain at a noise figure of 0.8 dB. During high-power levels, it temporarily increases its bias current to improve sensitivity.

The BGU8M1 is optimized for 1805 MHz to 2200 MHz.

2. Features and benefits

- Operating frequency from 1805 MHz to 2200 MHz
- Noise figure = 0.8 dB
- Gain = 13 dB
- High input 1 dB compression point of −2 dBm
- High in band $IP3_i$ of 6 dBm
- Supply voltage 1.5 V to 3.1 V
- Self-shielding package concept
- Integrated supply decoupling capacitor
- Optimized performance at a supply current of 5 mA
- Power-down mode current consumption < 1 μA
- Integrated temperature stabilized bias for easy design
- Require only one input matching inductor
- Output DC decoupled
- ESD protection on all pins (HBM > 2 kV)
- Integrated matching for the output
- Available in a6-pin leadless package 1.1 mm × 0.7 mm × 0.37 mm; 0.4 mm pitch: SOT1232
- 180 GHz transit frequency - SiGe:C technology
- Moisture sensitivity level 1

3. Applications

- LNA for LTE reception in smart phones
- Feature phones
- Tablet PCs
- RF front-end modules

4. Quick reference data

Table 1. Quick reference data

f = 1843 MHz; V_{CC} = 2.8 V; $V_{I(ENABLE)} \geq 0.8$ V; T_{amb} = 25 °C; input matched to 50 Ω using a 3.3 nH inductor; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	supply voltage		1.5	-	3.1	V
I_{CC}	supply current		3.0	5.0	7.0	mA
G_p	power gain	[1]	-	13.5	-	dB
NF	noise figure	[1][2]	-	0.8	-	dB
$P_{i(1dB)}$	input power at 1 dB gain compression	[1]	-	−2	-	dBm
$IP3_i$	input third-order intercept point	[1]	-	4	-	dBm

[1] E-UTRA operating band 3 (1805 MHz to 1880 MHz).

[2] PCB losses are subtracted.

5. Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
BGU8M1	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1.1 × 0.7 × 0.37 mm	SOT1232

6. Marking

Table 3. Marking codes

Type number	Marking code
BGU8M1	E

7. Block diagram

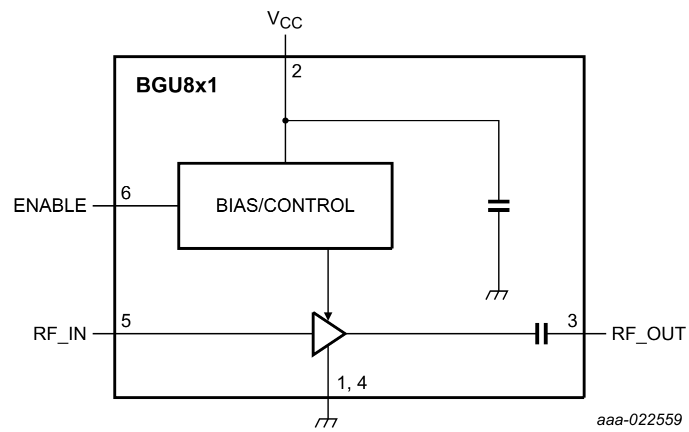


Fig 1. Block diagram

8. Pinning information

8.1 Pinning

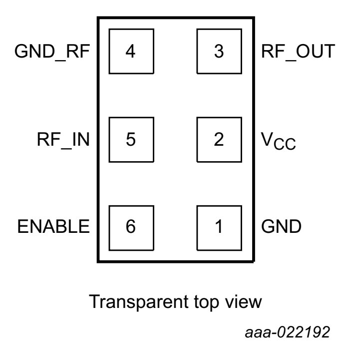


Fig 2. Pin configuration

8.2 Pin description

Table 4. Pin description

Symbol	Pin	Description
GND	1	ground
V_{CC}	2	supply voltage
RF_OUT	3	RF output
GND_RF	4	ground RF
RF_IN	5	RF input
ENABLE	6	enable

9. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).
Absolute maximum ratings are given as limiting values of stress conditions during operation, that must not be exceeded under the worst probable conditions.

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CC}	supply voltage	RF input AC coupled	[1]	–0.5	+5.0	V
$V_{I(ENABLE)}$	input voltage on pin ENABLE	$V_{I(ENABLE)} < V_{CC} + 0.6$ V	[1][2]	–0.5	+5.0	V
$V_{I(RF\_IN)}$	input voltage on pin RF_IN	DC; $V_{I(RF\_IN)} < V_{CC} + 0.6$ V	[1][2]	–0.5	+5.0	V
$V_{I(RF\_OUT)}$	input voltage on pin RF_OUT	DC; $V_{I(RF\_OUT)} < V_{CC} + 0.6$ V	[1][2][3]	–0.5	+5.0	V
P_i	input power		[1]	-	26	dBm
P_{tot}	total power dissipation	$T_{sp} \leq 130$ °C		-	55	mW
T_{stg}	storage temperature			–65	+150	°C
T_j	junction temperature			-	150	°C
V_{ESD}	electrostatic discharge voltage	Human Body Model (HBM) according to ANSI/ESDA/JEDEC standard JS-001		-	±2	kV
		Charged Device Model (CDM) according to JEDEC standard JESD22-C101C		-	±1	kV

[1] Stressed with pulses of 1 s in duration. V_{CC} connected to a power supply of 2.8 V with 500 mA current limit.

[2] Warning: Due to internal ESD diode protection, to avoid excess current, the applied DC voltage must not exceed V_{CC} + 0.6 V or 5.0 V.

[3] The RF output is AC coupled through internal DC blocking capacitors.

10. Recommended operating conditions

Table 6. Operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	supply voltage		1.5	-	3.1	V
T_{amb}	ambient temperature		–40	+25	+85	°C
$V_{I(ENABLE)}$	input voltage on pin ENABLE	OFF state	-	-	0.3	V
		ON state	0.8	-	-	V

11. Thermal characteristics

Table 7. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point		225	K/W

12. Characteristics

Table 8. Characteristics at V_{CC} = 1.8 V

1805 MHz ≤ f ≤ 2200 MHz; V_{CC} = 1.8 V; $V_{I(ENABLE)}$ ≥ 0.8 V; T_{amb} = 25 °C; input matched to 50 Ω using a 3.3 nH inductor; unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CC}	supply current	$V_{I(ENABLE)}$ ≥ 0.8 V		2.7	4.7	6.7	mA
		$V_{I(ENABLE)}$ ≤ 0.3 V		-	-	1	μA
G_p	power gain	f = 1843 MHz	[1]	-	13.5	-	dB
		f = 1960 MHz	[2]	11.0	13.0	15.0	dB
		f = 2140 MHz	[3]	-	12.5	-	dB
RL_{in}	input return loss	f = 1843 MHz	[1]	-	7	-	dB
		f = 1960 MHz	[2]	-	8	-	dB
		f = 2140 MHz	[3]	-	8	-	dB
RL_{out}	output return loss	f = 1843 MHz	[1]	-	20	-	dB
		f = 1960 MHz	[2]	-	20	-	dB
		f = 2140 MHz	[3]	-	18	-	dB
ISL	isolation	f = 1843 MHz	[1]	-	20	-	dB
		f = 1960 MHz	[2]	-	20	-	dB
		f = 2140 MHz	[3]	-	20	-	dB
NF	noise figure	f = 1843 MHz	[1][4]	-	0.8	-	dB
		f = 1960 MHz	[2][4][5]	-	0.8	1.4	dB
		f = 2140 MHz	[3][4]	-	0.9	-	dB
$P_{i(1dB)}$	input power at 1 dB gain compression	f = 1843 MHz	[1]	-	–8	-	dBm
		f = 1960 MHz	[2][5]	–12	–8	-	dBm
		f = 2140 MHz	[3]	-	–7	-	dBm
$IP3_i$	input third-order intercept point	f = 1843 MHz	[1]	-	0	-	dBm
		f = 1960 MHz	[2][5]	–4	+1	-	dBm
		f = 2140 MHz	[3]	-	2	-	dBm
K	Rollett stability factor			1	-	-	-
t_{on}	turn-on time	time from $V_{I(ENABLE)}$ ON to 90 % of the gain		-	-	4	μs
t_{off}	turn-off time	time from $V_{I(ENABLE)}$ OFF to 10 % of the gain		-	-	1	μs

[1] E-UTRA operating band 3 (1805 MHz to 1880 MHz).

[2] E-UTRA operating band 2 (1930 MHz to 1990 MHz).

[3] E-UTRA operating band 1 (2110 MHz to 2170 MHz).

[4] PCB losses are subtracted.

[5] Guaranteed by device design; not tested in production.

Table 9. Characteristics at V_{CC} = 2.8 V

1805 MHz ≤ f ≤ 2200 MHz; V_{CC} = 2.8 V; $V_{I(ENABLE)}$ ≥ 0.8 V; T_{amb} = 25 °C; input matched to 50 Ω using a 3.3 nH inductor; unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CC}	supply current	$V_{I(ENABLE)}$ ≥ 0.8 V		3.0	5.0	7.0	mA
		$V_{I(ENABLE)}$ ≤ 0.3 V		-	-	1	μA
G_p	power gain	f = 1843 MHz	[1]	-	13.5	-	dB
		f = 1960 MHz	[2]	11.5	13.5	15.5	dB
		f = 2140 MHz	[3]	-	13	-	dB
RL_{in}	input return loss	f = 1843 MHz	[1]	-	8	-	dB
		f = 1960 MHz	[2]	-	8	-	dB
		f = 2140 MHz	[3]	-	9	-	dB
RL_{out}	output return loss	f = 1843 MHz	[1]	-	20	-	dB
		f = 1960 MHz	[2]	-	20	-	dB
		f = 2140 MHz	[3]	-	20	-	dB
ISL	isolation	f = 1843 MHz	[1]	-	20	-	dB
		f = 1960 MHz	[2]	-	20	-	dB
		f = 2140 MHz	[3]	-	20	-	dB
NF	noise figure	f = 1843 MHz	[1][4]	-	0.8	-	dB
		f = 1960 MHz	[2][4][5]	-	0.8	1.4	dB
		f = 2140 MHz	[3][4]	-	0.9	-	dB
$P_{i(1dB)}$	input power at 1 dB gain compression	f = 1843 MHz	[1]	-	–2	-	dBm
		f = 1960 MHz	[2][5]	–6	–2	-	dBm
		f = 2140 MHz	[3]	-	–2	-	dBm
$IP3_i$	input third-order intercept point	f = 1843 MHz	[1]	-	4	-	dBm
		f = 1960 MHz	[2][5]	0	5	-	dBm
		f = 2140 MHz	[3]	-	6	-	dBm
K	Rollett stability factor			1	-	-	-
t_{on}	turn-on time	time from $V_{I(ENABLE)}$ ON to 90 % of the gain		-	-	4	μs
t_{off}	turn-off time	time from $V_{I(ENABLE)}$ OFF to 10 % of the gain		-	-	1	μs

[1] E-UTRA operating band 3 (1805 MHz to 1880 MHz).

[2] E-UTRA operating band 2 (1930 MHz to 1990 MHz).

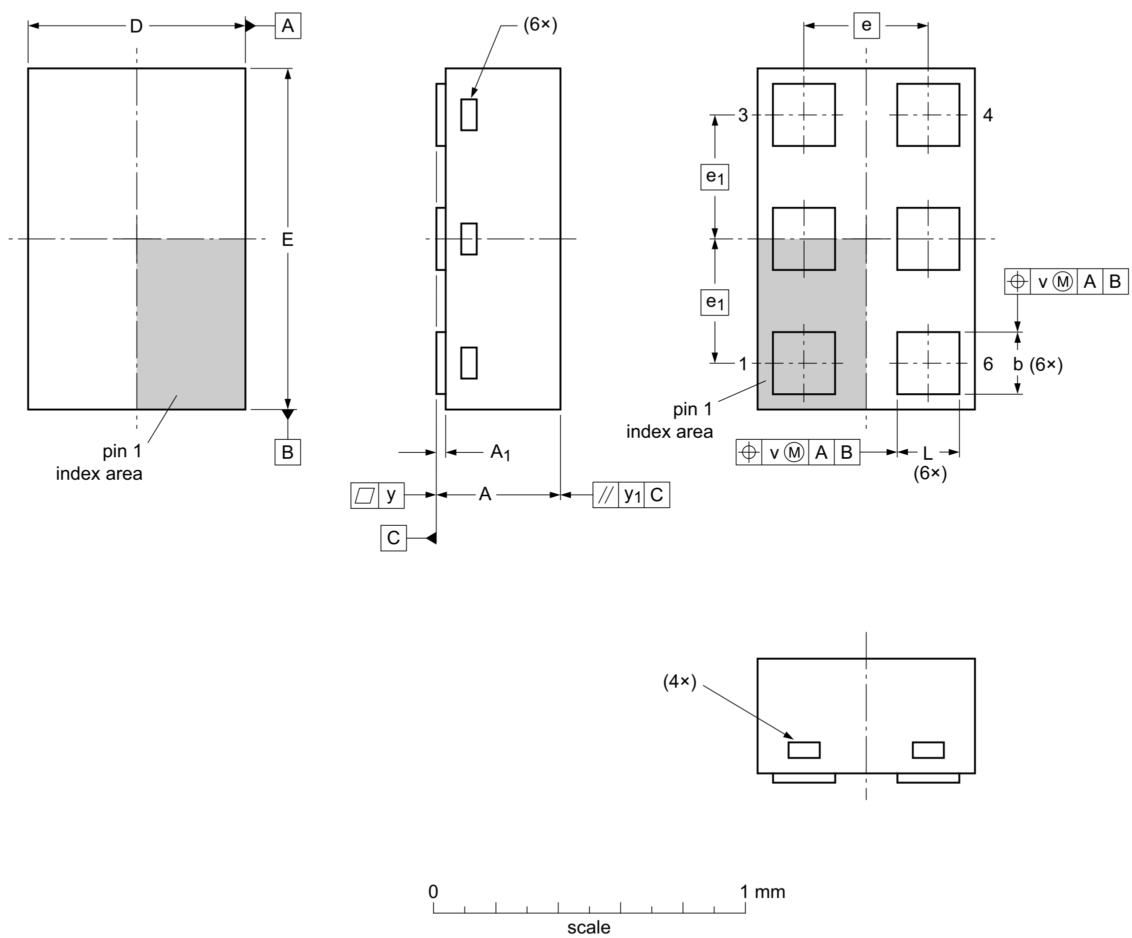
[3] E-UTRA operating band 1 (2110 MHz to 2170 MHz).

[4] PCB losses are subtracted.

[5] Guaranteed by device design; not tested in production.

13. Package outline

XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1.1 x 0.7 x 0.37 mm **SOT1232**



Dimensions (mm are the original dimensions)

Unit		A	A_1	D	E	e_1	e	b	L	V	Y	Y_1
	min	0.34		0.65	1.05			0.17	0.17			
mm	nom	0.37		0.70	1.10	0.4	0.4	0.20	0.20	0.1	0.05	0.1
	max	0.40	0.04	0.75	1.15			0.25	0.25			

Note
1. Dimension A is including plating thickness.

sot1232_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1232						~~13-04-12~~ 13-11-08

Fig 3. Package outline SOT1232 (XSON6)

14. 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.

15. Abbreviations

Table 10. Abbreviations

Acronym	Description
ESD	ElectroStatic Discharge
E-UTRA	Evolved UMTS Terrestrial Radio Access
HBM	Human Body Model
LNA	Low-Noise Amplifier
LTE	Long Term Evolution
MMIC	Monolithic Microwave Integrated Circuit
PCB	Printed-Circuit Board
SiGe:C	Silicon Germanium Carbon

16. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BGU8M1 v.3	20170116	Product data sheet		BGU8M1 v.2
Modifications:	• Section 1: added LTE1001M according to our new naming convention			
BGU8M1 v.2	20160404	Product data sheet	-	BGU8M1 v.1
Modifications:	• Table 5: updated input power			
	• Table 8: updated			
	• Table 9: updated			
BGU8M1 v.1	20140603	Product data sheet	-	-

17. Legal information

17.1 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.
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19. Contents

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Date of release: 16 January 2017

Document identifier: BGU8M1

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