



# BGU8L1

SiGe:C Low Noise Amplifier MMIC for LTE

Rev. 1 — 3 June 2014

Product data sheet

## 1. Product profile

### 1.1 General description

The BGU8L1 is a Low Noise Amplifier (LNA) for LTE receiver applications, available in a small plastic 6-pin extremely thin leadless package. The BGU8L1 requires one external matching inductor.

The BGU8L1 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 14 dB gain at a noise figure of 0.7 dB. During high power levels, it temporarily increases its bias current to improve sensitivity.

The BGU8L1 is optimized for 728 MHz to 960 MHz.

### 1.2 Features and benefits

- Operating frequency from 728 MHz to 960 MHz
- Noise figure (NF) = 0.7 dB
- Gain = 14 dB
- High input 1 dB compression point of -3 dBm
- High in band IP<sub>3i</sub> of 2 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 4.6 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 6-pins 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 of 1

### 1.3 Applications

- LNA for LTE reception in smart phones, feature phones, tablet PCs and RF front-end modules.



### 1.4 Quick reference data

**Table 1. Quick reference data**

$f = 882 \text{ MHz}$ ;  $V_{CC} = 2.8 \text{ V}$ ;  $V_{I(ENABLE)} \geq 0.8 \text{ V}$ ;  $T_{amb} = 25 \text{ }^\circ\text{C}$ ; input matched to  $50 \text{ }\Omega$  using a  $15 \text{ nH}$  inductor; unless otherwise specified.

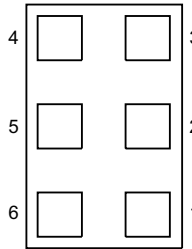
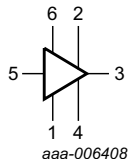
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CC}$	supply voltage		1.5	-	3.1	V
$I_{CC}$	supply current		-	4.6	-	mA
$G_p$	power gain	[1]	-	14.5	-	dB
NF	noise figure	[1][2]	-	0.7	-	dB
$P_{i(1dB)}$	input power at 1 dB gain compression	[1]	-	-3	-	dBm
$IP3_i$	input third-order intercept point	[1]	-	2	-	dBm

[1] E-UTRA operating band 5 (869 MHz to 894 MHz).

[2] PCB losses are subtracted.

## 2. Pinning information

**Table 2. Pinning**

Pin	Description	Simplified outline	Graphic symbol
1	GND	 <p>Transparent top view</p>	 <p>aaa-006408</p>
2	$V_{CC}$		
3	RF_OUT		
4	GND_RF		
5	RF_IN		
6	ENABLE		

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
BGU8L1	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body $1.1 \times 0.7 \times 0.37 \text{ mm}$	SOT1232

## 4. Marking

**Table 4. Marking codes**

Type number	Marking code
BGU8L1	D

## 5. 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 <sub>CC</sub>	supply voltage	RF input AC coupled [1]	-0.5	+5.0	V
V <sub>I(ENABLE)</sub>	input voltage on pin ENABLE	V <sub>I(ENABLE)</sub> < V <sub>CC</sub> + 0.6 V [1][2]	-0.5	+5.0	V
V <sub>I(RF_IN)</sub>	input voltage on pin RF_IN	DC, V <sub>I(RF_IN)</sub> < V <sub>CC</sub> + 0.6 V [1][2]	-0.5	+5.0	V
V <sub>I(RF_OUT)</sub>	input voltage on pin RF_OUT	DC, V <sub>I(RF_OUT)</sub> < V <sub>CC</sub> + 0.6 V [1][2][3]	-0.5	+5.0	V
P <sub>i</sub>	input power	[1]	-	10	dBm
P <sub>tot</sub>	total power dissipation	T <sub>sp</sub> ≤ 130 °C	-	55	mW
T <sub>stg</sub>	storage temperature		-65	+150	°C
T <sub>j</sub>	junction temperature		-	150	°C
V <sub>ESD</sub>	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 200 ms in duration.

[2] Warning: due to internal ESD diode protection, the applied DC voltage shall not exceed V<sub>CC</sub> + 0.6 V and shall not exceed 5.0 V in order to avoid excess current.

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

## 6. Recommended operating conditions

**Table 6. Operating conditions**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CC</sub>	supply voltage		1.5	-	3.1	V
T <sub>amb</sub>	ambient temperature		-40	+25	+85	°C
V <sub>I(ENABLE)</sub>	input voltage on pin ENABLE	OFF state	-	-	0.3	V
		ON state	0.8	-	-	V

## 7. Thermal characteristics

**Table 7. Thermal characteristics**

Symbol	Parameter	Conditions	Typ	Unit
R <sub>th(j-sp)</sub>	thermal resistance from junction to solder point		225	K/W

## 8. Characteristics

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

$728 \text{ MHz} \leq f \leq 960 \text{ MHz}$ ;  $V_{CC} = 1.8 \text{ V}$ ;  $V_{I(ENABLE)} \geq 0.8 \text{ V}$ ;  $T_{amb} = 25 \text{ }^\circ\text{C}$ ; input matched to  $50 \text{ } \Omega$  using a  $15 \text{ nH}$  inductor; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CC}$	supply current	$V_{I(ENABLE)} \geq 0.8 \text{ V}$	-	4.2	-	mA
		$V_{I(ENABLE)} \leq 0.3 \text{ V}$	-	-	1	$\mu\text{A}$
$G_p$	power gain	$f = 740 \text{ MHz}$ [1]	-	14.5	-	dB
		$f = 882 \text{ MHz}$ [2]	-	14.5	-	dB
		$f = 943 \text{ MHz}$ [3]	-	14.0	-	dB
$RL_{in}$	input return loss	$f = 740 \text{ MHz}$ [1]	-	9	-	dB
		$f = 882 \text{ MHz}$ [2]	-	13	-	dB
		$f = 943 \text{ MHz}$ [3]	-	11	-	dB
$RL_{out}$	output return loss	$f = 740 \text{ MHz}$ [1]	-	12	-	dB
		$f = 882 \text{ MHz}$ [2]	-	20	-	dB
		$f = 943 \text{ MHz}$ [3]	-	20	-	dB
ISL	isolation	$f = 740 \text{ MHz}$ [1]	-	25	-	dB
		$f = 882 \text{ MHz}$ [2]	-	25	-	dB
		$f = 943 \text{ MHz}$ [3]	-	25	-	dB
NF	noise figure	$f = 740 \text{ MHz}$ [1][4]	-	0.7	-	dB
		$f = 882 \text{ MHz}$ [2][4]	-	0.7	-	dB
		$f = 943 \text{ MHz}$ [3][4]	-	0.8	-	dB
$P_{i(1dB)}$	input power at 1 dB gain compression	$f = 740 \text{ MHz}$ [1]	-	-11	-	dBm
		$f = 882 \text{ MHz}$ [2]	-	-10	-	dBm
		$f = 943 \text{ MHz}$ [3]	-	-9	-	dBm
IP3 <sub>i</sub>	input third-order intercept point	$f = 740 \text{ MHz}$ [1]	-	-5	-	dBm
		$f = 882 \text{ MHz}$ [2]	-	-3	-	dBm
		$f = 943 \text{ MHz}$ [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	$\mu\text{s}$
$t_{off}$	turn-off time	time from $V_{I(ENABLE)}$ OFF, to 10 % of the gain	-	-	1	$\mu\text{s}$

[1] E-UTRA operating band 17 (734 MHz to 746 MHz).

[2] E-UTRA operating band 5 (869 MHz to 894 MHz).

[3] E-UTRA operating band 8 (925 MHz to 960 MHz).

[4] PCB losses are subtracted

**Table 9. Characteristics at  $V_{CC} = 2.8\text{ V}$**

$728\text{ MHz} \leq f \leq 960\text{ MHz}$ ;  $V_{CC} = 2.8\text{ V}$ ;  $V_{I(ENABLE)} \geq 0.8\text{ V}$ ;  $T_{amb} = 25\text{ }^\circ\text{C}$ ; input matched to  $50\ \Omega$  using a  $15\text{ nH}$  inductor; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CC}$	supply current	$V_{I(ENABLE)} \geq 0.8\text{ V}$	-	4.6	-	mA
		$V_{I(ENABLE)} \leq 0.3\text{ V}$	-	-	1	$\mu\text{A}$
$G_p$	power gain	f = 740 MHz [1]	-	14.5	-	dB
		f = 882 MHz [2]	-	14.5	-	dB
		f = 943 MHz [3]	-	14	-	dB
$RL_{in}$	input return loss	f = 740 MHz [1]	-	9	-	dB
		f = 882 MHz [2]	-	14	-	dB
		f = 943 MHz [3]	-	12	-	dB
$RL_{out}$	output return loss	f = 740 MHz [1]	-	12	-	dB
		f = 882 MHz [2]	-	20	-	dB
		f = 943 MHz [3]	-	20	-	dB
ISL	isolation	f = 740 MHz [1]	-	26	-	dB
		f = 882 MHz [2]	-	26	-	dB
		f = 943 MHz [3]	-	26	-	dB
NF	noise figure	f = 740 MHz [1][4]	-	0.7	-	dB
		f = 882 MHz [2][4]	-	0.7	-	dB
		f = 943 MHz [3][4]	-	0.8	-	dB
$P_{i(1dB)}$	input power at 1 dB gain compression	f = 740 MHz [1]	-	-5	-	dBm
		f = 882 MHz [2]	-	-3	-	dBm
		f = 943 MHz [3]	-	-3	-	dBm
IP3 <sub>i</sub>	input third-order intercept point	f = 740 MHz [1]	-	1	-	dBm
		f = 882 MHz [2]	-	2	-	dBm
		f = 943 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	$\mu\text{s}$
$t_{off}$	turn-off time	time from $V_{I(ENABLE)}$ OFF, to 10 % of the gain	-	-	1	$\mu\text{s}$

[1] E-UTRA operating band 17 (734 MHz to 746 MHz).

[2] E-UTRA operating band 5 (869 MHz to 894 MHz).

[3] E-UTRA operating band 8 (925 MHz to 960 MHz).

[4] PCB losses are subtracted

9. Package outline

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

SOT1232

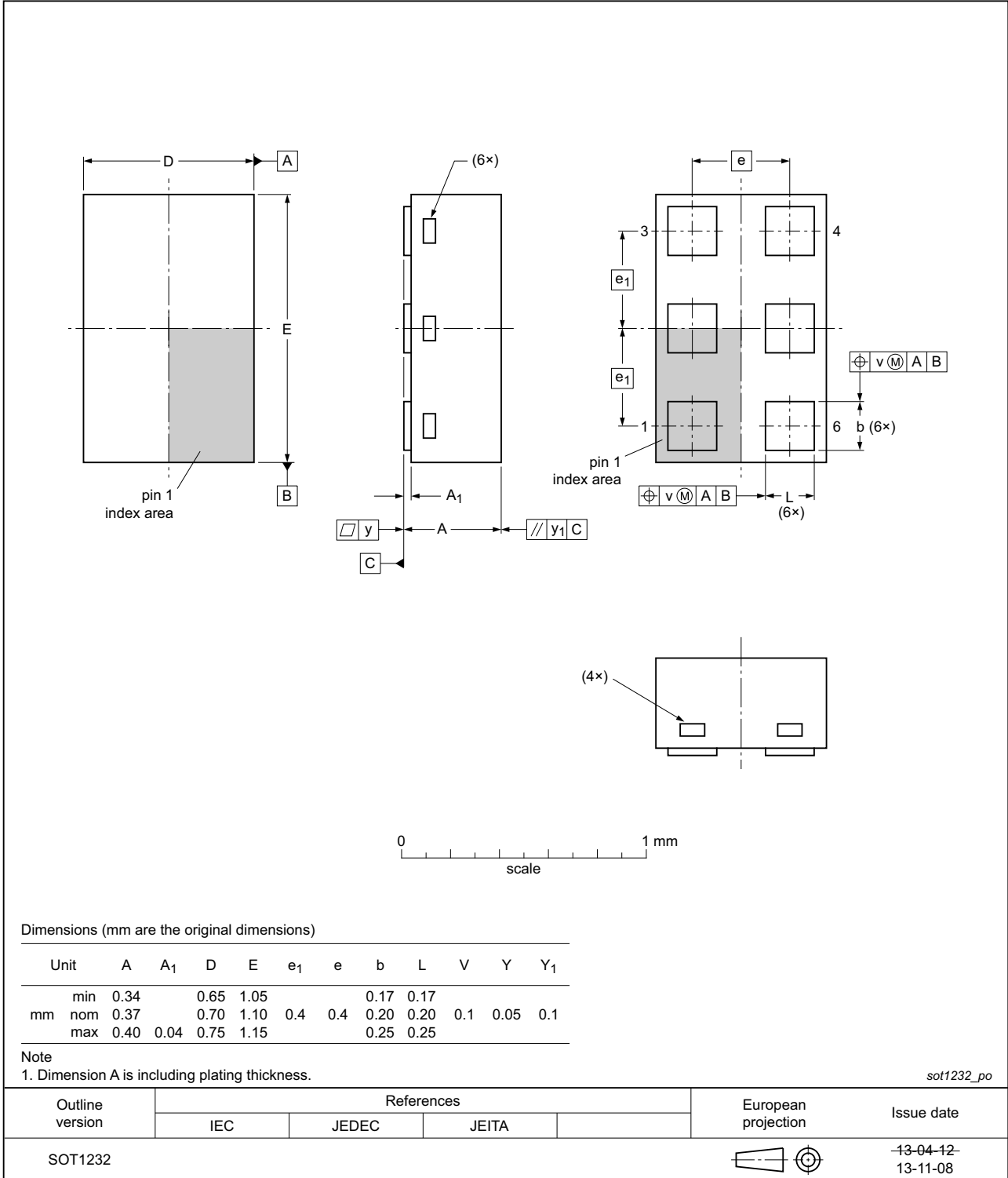


Fig 1. Package outline SOT1232 (XSON6)

## 10. 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.

## 11. Abbreviations

Table 10. Abbreviations

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

## 12. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BGU8L1 v.1	20140603	Product data sheet	-	-

## 13. Legal information

### 13.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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