

# BGU6104

## Wideband silicon low-noise amplifier MMIC

Rev. 2 — 3 February 2012

Product data sheet

## 1. Product profile

### 1.1 General description

The BGU6104 MMIC is an unmatched wideband MMIC featuring an integrated bias, enable function and wide supply voltage. BGU6104 is part of family of three products (BGU6101, BGU6102 and BGU6104) and is optimized for 4 mA operation.

### 1.2 Features and benefits

- Supply voltage range from 1.5 V to 5 V
- Current range up to 40 mA at 3 V and 50 mA at 5 V supply voltage
- $NF_{min}$  of 0.8 dB
- Applicable between 40 MHz and 4 GHz
- Integrated temperature stabilized bias for easy design
- Bias current configurable with external resistor
- Power-down mode current consumption < 6  $\mu$ A
- ESD protection on all pins up to 3 kV HBM
- Small 6-pin leadless package 2.0 mm  $\times$  1.3 mm  $\times$  0.35 mm

### 1.3 Applications

- FM radio
- Mobile TV, CMMB
- ISM
- Wireless security
- RKE, TPMS
- AMR, ZigBee, Bluetooth
- WiFi, WLAN(2.4 GHz)
- Low current applications

### 1.4 Quick reference data

**Table 1. Quick reference data**

$T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CC} = 3.0\text{ V}$ ;  $I_{CC(tot)} = 6.0\text{ mA}$ ;  $V_{ENABLE} \geq 1.2\text{ V}$  unless otherwise specified. All measurements done on characterization board without matching, de-embedded up to the pins.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$ S_{21} ^2$	insertion power gain	f = 450 MHz	-	22.5	-	dB
		f = 900 MHz	-	18.5	-	dB
		f = 2400 MHz; $I_{CC(tot)} = 12\text{ mA}$	-	12.8	-	dB
$NF_{min}$	minimum noise figure	f = 450 MHz	-	0.8	-	dB
		f = 900 MHz	-	0.8	-	dB
		f = 2400 MHz; $I_{CC(tot)} = 12\text{ mA}$	-	1.1	-	dB



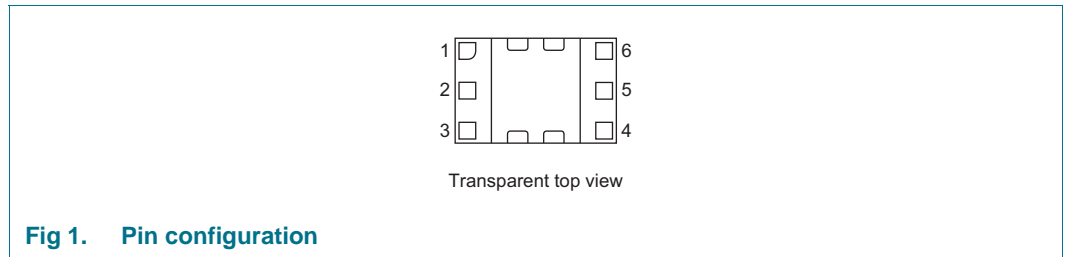
**Table 1. Quick reference data ...continued**

$T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CC} = 3.0\text{ V}$ ;  $I_{CC(tot)} = 6.0\text{ mA}$ ;  $V_{ENABLE} \geq 1.2\text{ V}$  unless otherwise specified. All measurements done on characterization board without matching, de-embedded up to the pins.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(1dB)}$	output power at 1 dB gain compression	f = 450 MHz	-	0.5	-	dBm
		f = 900 MHz	-	0.5	-	dBm
		f = 2400 MHz; $I_{CC(tot)} = 12\text{ mA}$	-	6.5	-	dBm
$IP3_O$	output third-order intercept point	f = 450 MHz	-	11	-	dBm
		f = 900 MHz	-	12	-	dBm
		f = 2400 MHz; $I_{CC(tot)} = 12\text{ mA}$	-	18.5	-	dBm

## 2. Pinning information

### 2.1 Pinning



**Fig 1. Pin configuration**

### 2.2 Pin description

**Table 2. Pin description**

Symbol	Pin	Description
$V_{CC}$	1	supply voltage
n.c.	2	not connected
RF_IN	3	RF in
RF_OUT	4	RF out
ENABLE	5	enable
CUR_ADJ	6	current adjust
GND	GND	ground pad; RF and DC ground

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
BGU6104	HXSON6	plastic thermal enhanced super thin small outline package; no leads; 6 terminals; body 2 x 1.3 x 0.35 mm	SOT1209

## 4. Marking

**Table 4. Marking**

Type number	Marking	Description
BGU6104	1C*	* = p : made in Hong Kong * = t : made in Malaysia * = W : made in China

## 5. Limiting values

**Table 5. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage	RF input AC coupled	-	5.5	V
$V_{ENABLE}$	voltage on pin ENABLE		[1] -0.5	$V_{CC} + 1.8$	V
$V_{RF\_IN}$	voltage on pin IN	DC	[2] -0.5	0.9	V
$V_{RF\_OUT}$	voltage on pin RF_OUT	DC	-0.5	$V_{CC} + 1.8$	V
$I_{CC(tot)}$	total supply current	$V_{CC} = 5.0$ V	-	50	mA
$T_{stg}$	storage temperature		-55	+150	°C
$T_j$	junction temperature		-	+150	°C
$V_{ESD}$	electrostatic discharge voltage	Human Body Model (HBM); According JEDEC standard 22-A114E	-	3000	V
		Charged Device Model (CDM); According JEDEC standard 22-C101B	-	500	V

[1] Due to internal ESD diode protection, the applied voltage should not exceed the specified maximum in order to avoid excess current.

[2] The RF input is directly coupled to the base of the RF transistor.

## 6. Thermal characteristics

**Table 6. Thermal characteristics**

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point		110	K/W

## 7. Static characteristics

**Table 7. Static characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CC}$	supply voltage	RF input AC coupled	1.5	-	5.0	V
$I_{CC(tot)}$	total supply current	$V_{CC} = 3.0\text{ V}$	[1][2] 3.7	-	40	mA
		$V_{ENABLE} \leq 0.4\text{ V}$	[1] -	-	0.01	mA
$T_{amb}$	ambient temperature		-40	+25	+85	°C

[1]  $I_{CC(tot)} = I_{CC} + I_{RF\_OUT} + I_{R\_BIAS}$ .

[2] Configurable with external resistor.

## 8. Dynamic characteristics

**Table 8. Dynamic characteristics**

$T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CC} = 3.0\text{ V}$ ;  $V_{ENABLE} \geq 1.2\text{ V}$  unless otherwise specified. All measurements done on characterization board without matching, de-embedded up to the pins.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>100 MHz frequency</b>						
$ S_{21} ^2$	insertion power gain	f = 100 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	21.5	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	25.0	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	29.5	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	32.0	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	35.0	-	dB
MSG	maximum stable gain	f = 100 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	29.5	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	31.0	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	33.5	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	35.5	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	37.5	-	dB
$NF_{min}$	minimum noise figure	f = 100 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	0.8	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	0.8	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	0.8	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	0.9	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	1.2	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	f = 100 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	-1.0	-	dBm
		$I_{CC(tot)} = 6\text{ mA}$	-	1.0	-	dBm
		$I_{CC(tot)} = 12\text{ mA}$	-	6.0	-	dBm
		$I_{CC(tot)} = 20\text{ mA}$	-	9.5	-	dBm
		$I_{CC(tot)} = 40\text{ mA}$	-	15.0	-	dBm
IP3 <sub>O</sub>	output third-order intercept point	f = 100 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	9.5	-	dBm
		$I_{CC(tot)} = 6\text{ mA}$	-	11.5	-	dBm
		$I_{CC(tot)} = 12\text{ mA}$	-	16.0	-	dBm
		$I_{CC(tot)} = 20\text{ mA}$	-	19.5	-	dBm
		$I_{CC(tot)} = 40\text{ mA}$	-	26.0	-	dBm

**Table 8. Dynamic characteristics ...continued**

$T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CC} = 3.0\text{ V}$ ;  $V_{ENABLE} \geq 1.2\text{ V}$  unless otherwise specified. All measurements done on characterization board without matching, de-embedded up to the pins.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>150 MHz frequency</b>						
$ S_{21} ^2$	insertion power gain	f = 150 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	21.5	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	24.5	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	29.0	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	31.5	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	34.0	-	dB
MSG	maximum stable gain	f = 150 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	27.5	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	29.0	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	32.0	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	33.5	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	35.5	-	dB
NF <sub>min</sub>	minimum noise figure	f = 150 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	0.8	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	0.8	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	0.8	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	0.9	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	1.2	-	dB
P <sub>L(1dB)</sub>	output power at 1 dB gain compression	f = 150 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	-1.0	-	dBm
		$I_{CC(tot)} = 6\text{ mA}$	-	1.0	-	dBm
		$I_{CC(tot)} = 12\text{ mA}$	-	5.5	-	dBm
		$I_{CC(tot)} = 20\text{ mA}$	-	9.0	-	dBm
		$I_{CC(tot)} = 40\text{ mA}$	-	15.0	-	dBm
IP <sub>3O</sub>	output third-order intercept point	f = 150 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	9.5	-	dBm
		$I_{CC(tot)} = 6\text{ mA}$	-	11.5	-	dBm
		$I_{CC(tot)} = 12\text{ mA}$	-	16.0	-	dBm
		$I_{CC(tot)} = 20\text{ mA}$	-	19.5	-	dBm
		$I_{CC(tot)} = 40\text{ mA}$	-	26.0	-	dBm

**Table 8. Dynamic characteristics ...continued**

$T_{amb} = 25\text{ °C}$ ;  $V_{CC} = 3.0\text{ V}$ ;  $V_{ENABLE} \geq 1.2\text{ V}$  unless otherwise specified. All measurements done on characterization board without matching, de-embedded up to the pins.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>450 MHz frequency</b>						
$ S_{21} ^2$	insertion power gain	f = 450 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	20.0	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	22.5	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	25.5	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	27.5	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	28.5	-	dB
MSG	maximum stable gain	f = 450 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	23.0	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	24.5	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	27.0	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	29.0	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	30.5	-	dB
NF <sub>min</sub>	minimum noise figure	f = 450 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	0.8	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	0.8	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	0.8	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	0.9	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	1.2	-	dB
P <sub>L(1dB)</sub>	output power at 1 dB gain compression	f = 450 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	-2.0	-	dBm
		$I_{CC(tot)} = 6\text{ mA}$	-	0.5	-	dBm
		$I_{CC(tot)} = 12\text{ mA}$	-	5.5	-	dBm
		$I_{CC(tot)} = 20\text{ mA}$	-	10.0	-	dBm
		$I_{CC(tot)} = 40\text{ mA}$	-	15.5	-	dBm
IP <sub>3O</sub>	output third-order intercept point	f = 450 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	9.0	-	dBm
		$I_{CC(tot)} = 6\text{ mA}$	-	11.0	-	dBm
		$I_{CC(tot)} = 12\text{ mA}$	-	17.0	-	dBm
		$I_{CC(tot)} = 20\text{ mA}$	-	20.5	-	dBm
		$I_{CC(tot)} = 40\text{ mA}$	-	26.0	-	dBm

**Table 8. Dynamic characteristics ...continued**

$T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CC} = 3.0\text{ V}$ ;  $V_{ENABLE} \geq 1.2\text{ V}$  unless otherwise specified. All measurements done on characterization board without matching, de-embedded up to the pins.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>900 MHz frequency</b>						
$ S_{21} ^2$	insertion power gain	f = 900 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	16.5	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	18.5	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	21.0	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	22.5	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	23.0	-	dB
MSG	maximum stable gain	f = 900 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	20.0	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	21.5	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	24.0	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	25.5	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	27.5	-	dB
NF <sub>min</sub>	minimum noise figure	f = 900 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	0.9	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	0.8	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	0.8	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	0.9	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	1.1	-	dB
P <sub>L(1dB)</sub>	output power at 1 dB gain compression	f = 900 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	-2.0	-	dBm
		$I_{CC(tot)} = 6\text{ mA}$	-	0.5	-	dBm
		$I_{CC(tot)} = 12\text{ mA}$	-	6.0	-	dBm
		$I_{CC(tot)} = 20\text{ mA}$	-	10.5	-	dBm
		$I_{CC(tot)} = 40\text{ mA}$	-	16.0	-	dBm
IP <sub>3O</sub>	output third-order intercept point	f = 900 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	9.5	-	dBm
		$I_{CC(tot)} = 6\text{ mA}$	-	12.0	-	dBm
		$I_{CC(tot)} = 12\text{ mA}$	-	18.0	-	dBm
		$I_{CC(tot)} = 20\text{ mA}$	-	21.5	-	dBm
		$I_{CC(tot)} = 40\text{ mA}$	-	24.0	-	dBm

**Table 8. Dynamic characteristics ...continued**

$T_{amb} = 25\text{ °C}$ ;  $V_{CC} = 3.0\text{ V}$ ;  $V_{ENABLE} \geq 1.2\text{ V}$  unless otherwise specified. All measurements done on characterization board without matching, de-embedded up to the pins.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>1500 MHz frequency</b>						
$ S_{21} ^2$	insertion power gain	f = 1500 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	13.0	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	14.5	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	17.0	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	18.0	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	19.0	-	dB
MSG	maximum stable gain	f = 1500 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	18.0	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	19.5	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	22.0	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	23.0	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	24.5	-	dB
NF <sub>min</sub>	minimum noise figure	f = 1500 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	0.9	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	0.9	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	0.9	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	1.0	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	1.1	-	dB
P <sub>L(1dB)</sub>	output power at 1 dB gain compression	f = 1500 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	-1.5	-	dBm
		$I_{CC(tot)} = 6\text{ mA}$	-	1.0	-	dBm
		$I_{CC(tot)} = 12\text{ mA}$	-	6.5	-	dBm
		$I_{CC(tot)} = 20\text{ mA}$	-	11.0	-	dBm
		$I_{CC(tot)} = 40\text{ mA}$	-	16.5	-	dBm
IP <sub>3O</sub>	output third-order intercept point	f = 1500 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	10.0	-	dBm
		$I_{CC(tot)} = 6\text{ mA}$	-	13.0	-	dBm
		$I_{CC(tot)} = 12\text{ mA}$	-	18.5	-	dBm
		$I_{CC(tot)} = 20\text{ mA}$	-	20.0	-	dBm
		$I_{CC(tot)} = 40\text{ mA}$	-	22.0	-	dBm

**Table 8. Dynamic characteristics ...continued**

$T_{amb} = 25\text{ °C}$ ;  $V_{CC} = 3.0\text{ V}$ ;  $V_{ENABLE} \geq 1.2\text{ V}$  unless otherwise specified. All measurements done on characterization board without matching, de-embedded up to the pins.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>1900 MHz frequency</b>						
$ S_{21} ^2$	insertion power gain	f = 1900 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	11.0	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	12.5	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	15.0	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	16.0	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	16.5	-	dB
MSG	maximum stable gain	f = 1900 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	17.0	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	18.5	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	20.5	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	22.0	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	23.0	-	dB
NF <sub>min</sub>	minimum noise figure	f = 1900 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	1.1	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	1.0	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	1.0	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	1.0	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	1.2	-	dB
P <sub>L(1dB)</sub>	output power at 1 dB gain compression	f = 1900 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	-1.5	-	dBm
		$I_{CC(tot)} = 6\text{ mA}$	-	1.5	-	dBm
		$I_{CC(tot)} = 12\text{ mA}$	-	7.0	-	dBm
		$I_{CC(tot)} = 20\text{ mA}$	-	11.5	-	dBm
		$I_{CC(tot)} = 40\text{ mA}$	-	16.5	-	dBm
IP <sub>3O</sub>	output third-order intercept point	f = 1900 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	9.5	-	dBm
		$I_{CC(tot)} = 6\text{ mA}$	-	12.5	-	dBm
		$I_{CC(tot)} = 12\text{ mA}$	-	18.0	-	dBm
		$I_{CC(tot)} = 20\text{ mA}$	-	20.0	-	dBm
		$I_{CC(tot)} = 40\text{ mA}$	-	21.0	-	dBm

**Table 8. Dynamic characteristics ...continued**

$T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CC} = 3.0\text{ V}$ ;  $V_{ENABLE} \geq 1.2\text{ V}$  unless otherwise specified. All measurements done on characterization board without matching, de-embedded up to the pins.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>2400 MHz frequency</b>						
$ S_{21} ^2$	insertion power gain	f = 2400 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	9.0	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	10.5	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	12.5	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	13.5	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	14.5	-	dB
MSG	maximum stable gain	f = 2400 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	16.0	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	17.5	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	19.5	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	20.5	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	21.0	-	dB
NF <sub>min</sub>	minimum noise figure	f = 2400 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	1.4	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	1.2	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	1.1	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	1.2	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	1.4	-	dB
P <sub>L(1dB)</sub>	output power at 1 dB gain compression	f = 2400 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	-1.5	-	dBm
		$I_{CC(tot)} = 6\text{ mA}$	-	1.0	-	dBm
		$I_{CC(tot)} = 12\text{ mA}$	-	6.5	-	dBm
		$I_{CC(tot)} = 20\text{ mA}$	-	11.0	-	dBm
		$I_{CC(tot)} = 40\text{ mA}$	-	16.0	-	dBm
IP <sub>3O</sub>	output third-order intercept point	f = 2400 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	9.0	-	dBm
		$I_{CC(tot)} = 6\text{ mA}$	-	11.0	-	dBm
		$I_{CC(tot)} = 12\text{ mA}$	-	18.5	-	dBm
		$I_{CC(tot)} = 20\text{ mA}$	-	20.0	-	dBm
		$I_{CC(tot)} = 40\text{ mA}$	-	21.0	-	dBm

**Table 8. Dynamic characteristics ...continued**

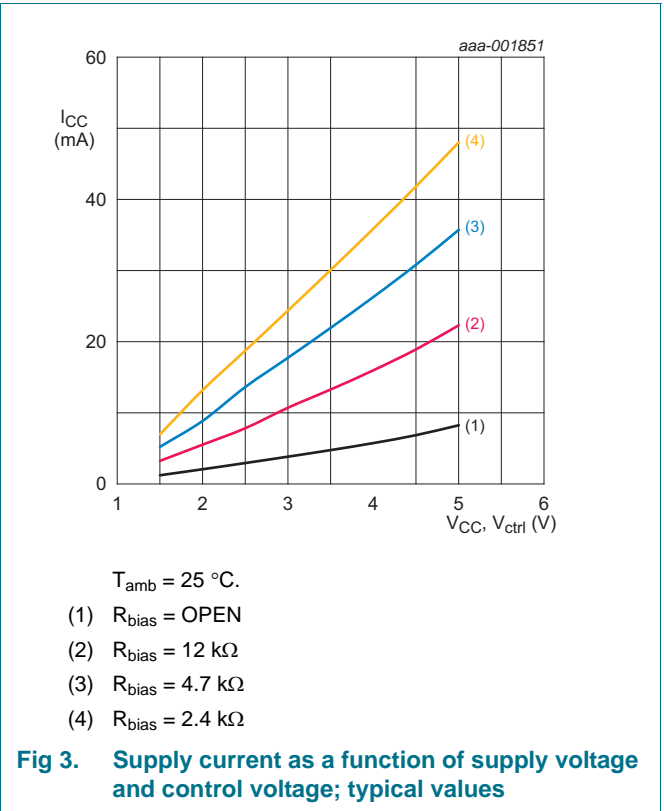
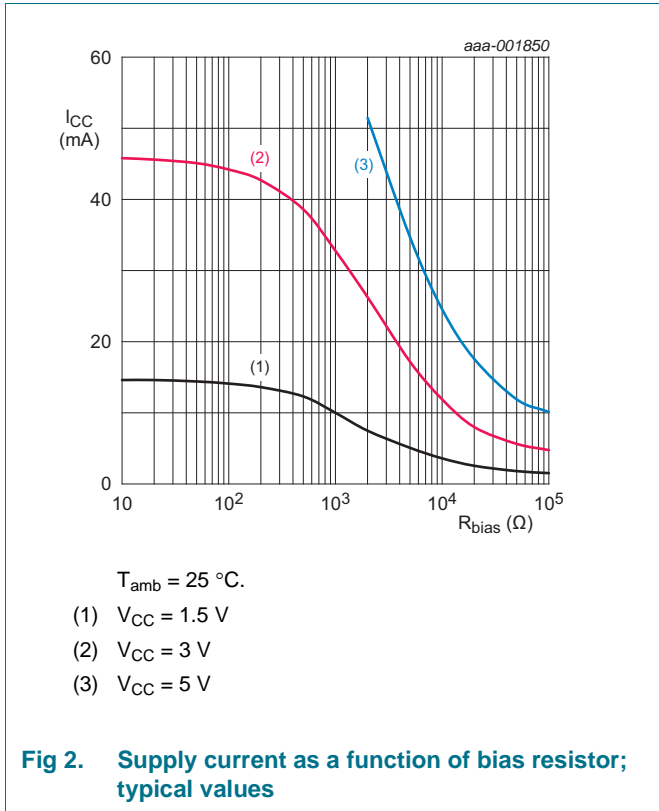
$T_{amb} = 25\text{ °C}$ ;  $V_{CC} = 3.0\text{ V}$ ;  $V_{ENABLE} \geq 1.2\text{ V}$  unless otherwise specified. All measurements done on characterization board without matching, de-embedded up to the pins.

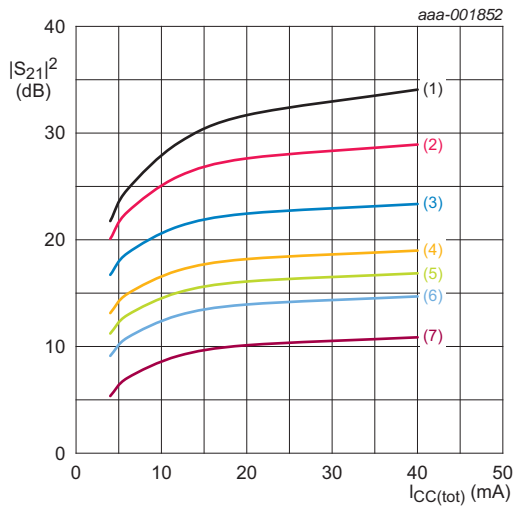
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>3500 MHz frequency</b>						
$ S_{21} ^2$	insertion power gain	f = 3500 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	5.0	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	7.0	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	9.0	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	10.0	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	10.5	-	dB
MSG	maximum stable gain	f = 3500 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	15.0	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	16.0	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	16.0	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	16.0	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	16.5	-	dB
NF <sub>min</sub>	minimum noise figure	f = 3500 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	2.2	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	2.1	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	1.9	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	1.9	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	2.0	-	dB
P <sub>L(1dB)</sub>	output power at 1 dB gain compression	f = 3500 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	-2.5	-	dBm
		$I_{CC(tot)} = 6\text{ mA}$	-	0.0	-	dBm
		$I_{CC(tot)} = 12\text{ mA}$	-	5.0	-	dBm
		$I_{CC(tot)} = 20\text{ mA}$	-	9.0	-	dBm
		$I_{CC(tot)} = 40\text{ mA}$	-	13.0	-	dBm
IP <sub>3O</sub>	output third-order intercept point	f = 3500 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	9.0	-	dBm
		$I_{CC(tot)} = 6\text{ mA}$	-	12.0	-	dBm
		$I_{CC(tot)} = 12\text{ mA}$	-	17.0	-	dBm
		$I_{CC(tot)} = 20\text{ mA}$	-	18.0	-	dBm
		$I_{CC(tot)} = 40\text{ mA}$	-	22.0	-	dBm

9. Enable control

**Table 9. ENABLE (pin 5)**  
 $-40\text{ }^{\circ}\text{C} \leq T_{amb} \leq +85\text{ }^{\circ}\text{C}$

$V_{ENABLE}$ (V)	State
$\leq 0.4$	OFF
$\geq 1.2$	ON

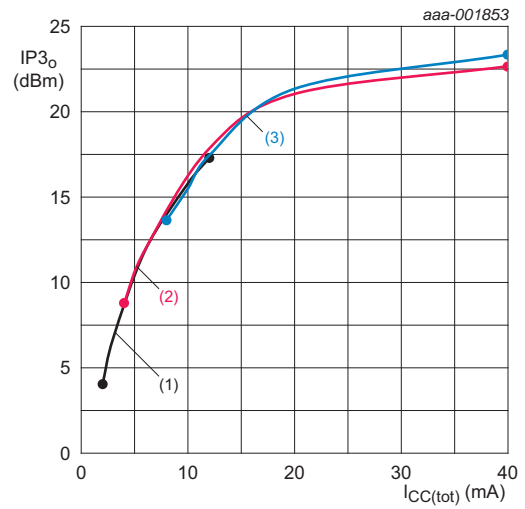




$T_{amb} = 25\text{ }^\circ\text{C}$ ;  $V_{CC} = 3\text{ V}$ ;  $P_i = -30\text{ dBm}$ .

- (1)  $f = 150\text{ MHz}$
- (2)  $f = 450\text{ MHz}$
- (3)  $f = 900\text{ MHz}$
- (4)  $f = 1500\text{ MHz}$
- (5)  $f = 1900\text{ MHz}$
- (6)  $f = 2400\text{ MHz}$
- (7)  $f = 3500\text{ MHz}$

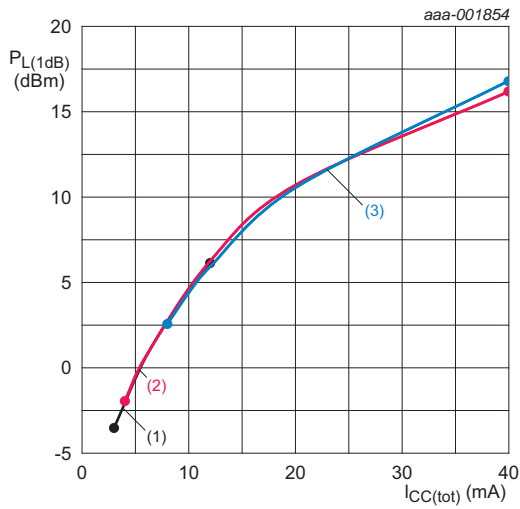
**Fig 4. Insertion power gain ( $|S_{21}|^2$ ) as a function of total supply current; typical values**



$T_{amb} = 25\text{ }^\circ\text{C}$ ;  $f_1 = 900\text{ MHz}$ ;  $f_2 = 900.2\text{ MHz}$ ;  $P_i = -30\text{ dBm}$ .

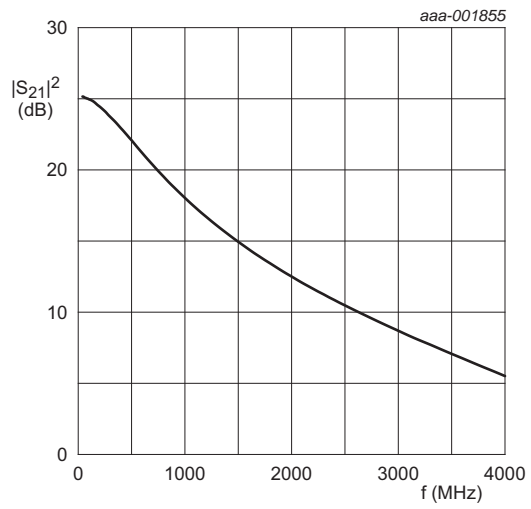
- (1)  $V_{CC} = 1.5\text{ V}$
- (2)  $V_{CC} = 3\text{ V}$
- (3)  $V_{CC} = 5\text{ V}$

**Fig 5. Output third-order intercept point as a function of total supply current; typical values**



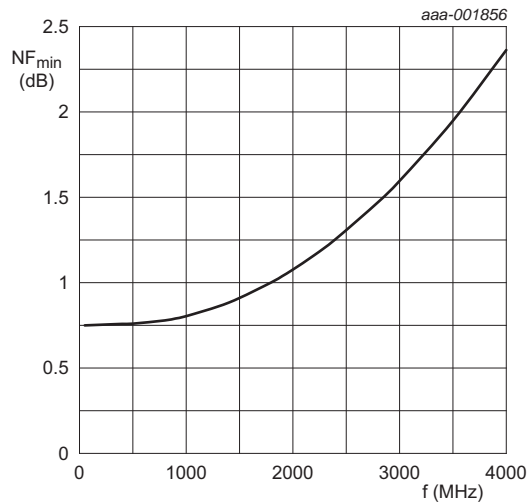
$T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $f = 900\text{ MHz}$ .  
 (1)  $V_{CC} = 1.5\text{ V}$   
 (2)  $V_{CC} = 3\text{ V}$   
 (3)  $V_{CC} = 5\text{ V}$

**Fig 6. Output power at 1 dB gain compression as a function of total supply current; typical values**



$T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $I_{CC(tot)} = 6\text{ mA}$ ;  $V_{CC} = 3\text{ V}$ ;  $P_i = -30\text{ dBm}$ .

**Fig 7. Insertion power gain ( $|S_{21}|^2$ ) as a function of frequency; typical values**



$T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $I_{CC(tot)} = 6\text{ mA}$ ;  $V_{CC} = 3\text{ V}$ .

**Fig 8. Minimum noise figure as a function of frequency; typical values**

### 10. Package outline

HXSON6: plastic thermal enhanced super thin small outline package; no leads; 6 terminals; body 2 x 1.3 x 0.35 mm

SOT1209

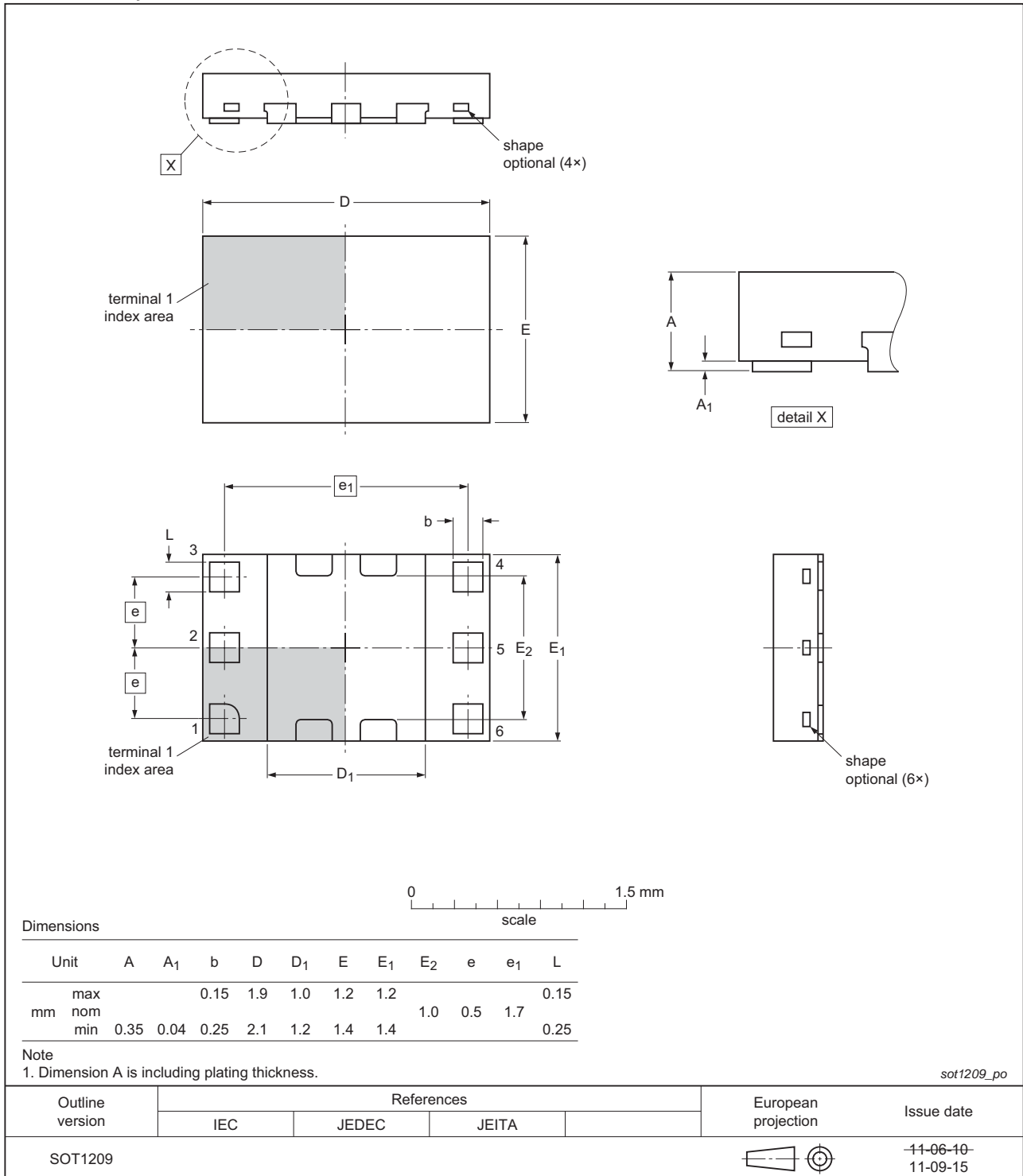


Fig 9. Package outline SOT1209

## 11. Abbreviations

**Table 10. Abbreviations**

Acronym	Description
AC	Alternating Current
AMR	Automated Meter Reading
CMMB	China Mobile Multimedia Broadcasting
DC	Direct Current
ESD	ElectroStatic Discharge
FM	Frequency Modulation
ISM	Industrial Scientific Medical
MMIC	Monolithic Microwave Integrated Circuit
RF	Radio Frequency
RKE	Remote Keyless Entry
TPMS	Tire-Pressure Monitoring System
WLAN	Wireless Local Area Network

## 12. Revision history

**Table 11. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BGU6104 v.2	20120203	Product data sheet	-	BGU6104 v.1
Modifications:	<ul style="list-style-type: none"> <li><a href="#">Section 1 on page 1</a>, <a href="#">Table 2 on page 2</a>, <a href="#">Table 3 on page 2</a>, <a href="#">Table 5 on page 3</a>, <a href="#">Table 8 on page 5</a>: Updated</li> <li><a href="#">Section 9 on page 13</a>: Added figures</li> </ul>			
BGU6104 v.1	20110921	Preliminary 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.
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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