

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 $2.0 \text{ mm} \times 1.3 \text{ mm} \times 0.35 \text{ mm}$

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



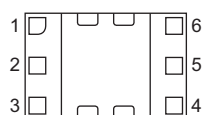
Table 1. Quick reference data ...continued

$T_{amb} = 25\text{ }^{\circ}\text{C}$; $V_{CC} = 3.0\text{ V}$; $I_{CC(tot)} = 6.0\text{ mA}$; $V_{ENABLE} \geq 1.2\text{ V}$ 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



Transparent top view

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
100 MHz frequency						
$ 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 _O	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
150 MHz frequency						
$ 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 _{min}	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 _{L(1dB)}	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 _{3O}	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

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
450 MHz frequency						
$ 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 _{min}	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 _{L(1dB)}	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 _{3O}	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
900 MHz frequency						
$ 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 _{min}	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 _{L(1dB)}	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 _{3O}	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

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
1500 MHz frequency						
$ 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 _{min}	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 _{L(1dB)}	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 _{3O}	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

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
1900 MHz frequency						
$ 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 _{min}	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 _{L(1dB)}	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 _{3O}	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
2400 MHz frequency						
$ 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 _{min}	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 _{L(1dB)}	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 _{3O}	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

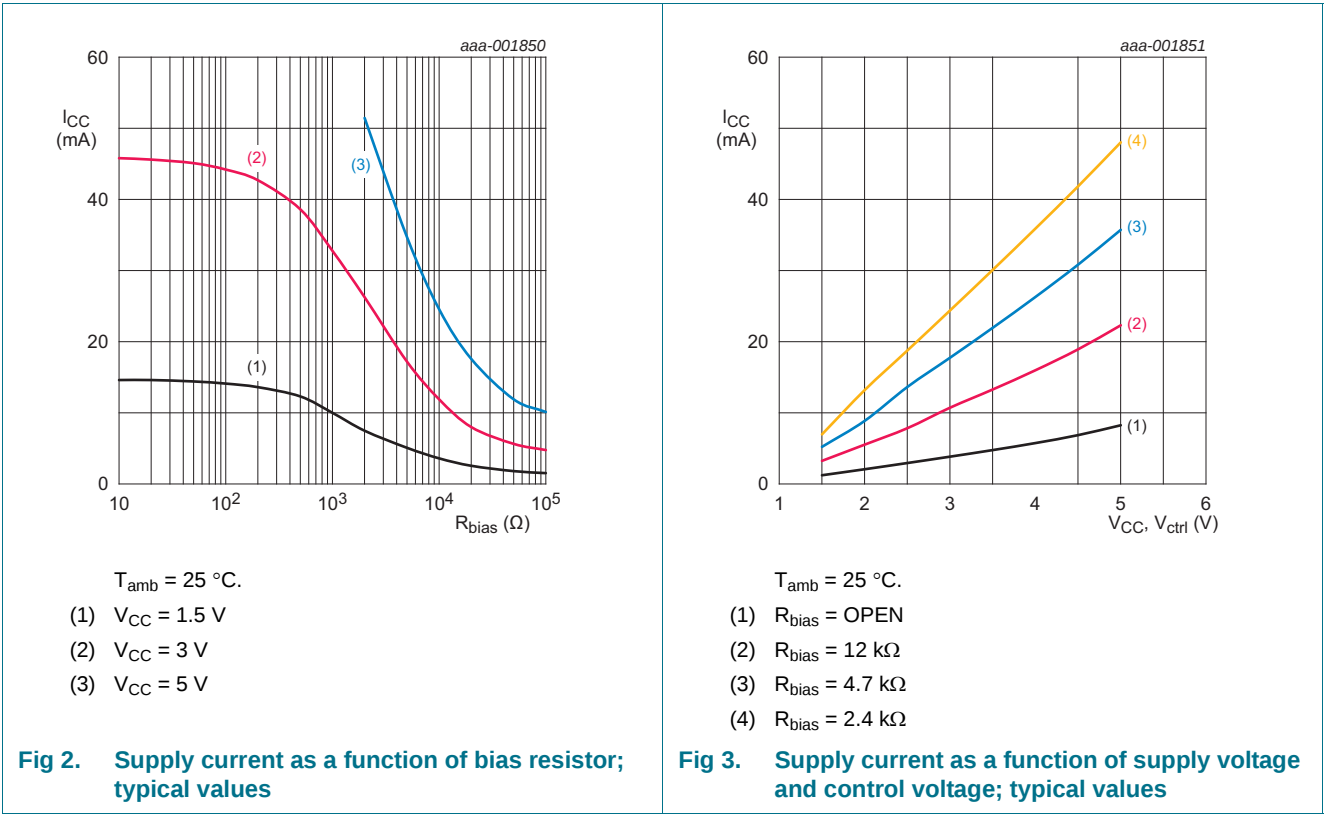
$T_{amb} = 25\text{ }^{\circ}\text{C}$; $V_{CC} = 3.0\text{ V}$; $V_{ENABLE} \geq 1.2\text{ V}$ unless otherwise specified. All measurements done on characterization board without matching, de-embedded up to the pins.

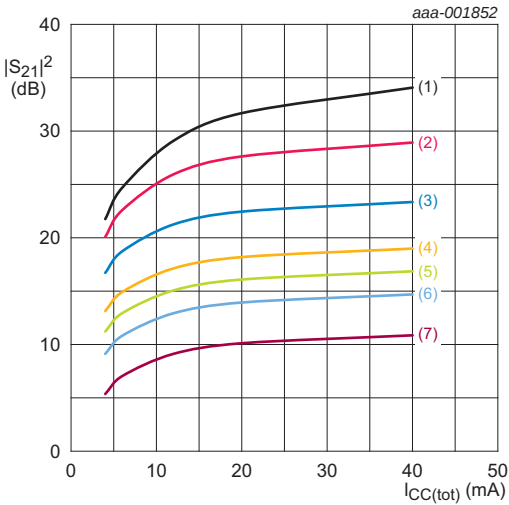
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
3500 MHz frequency						
$ S_{21} ^2$	insertion power gain	f = 3500 MHz				
		$I_{CC(tot)} = 4\text{ mA}$	-	5.0	-	dB
		$I_{CC(tot)} = 6\text{ mA}$	-	7.0	-	dB
		$I_{CC(tot)} = 12\text{ mA}$	-	9.0	-	dB
		$I_{CC(tot)} = 20\text{ mA}$	-	10.0	-	dB
		$I_{CC(tot)} = 40\text{ mA}$	-	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 _{min}	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 _{L(1dB)}	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 _{3O}	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 °C ≤ T_{amb} ≤ +85 °C

V _{ENABLE} (V)	State
≤ 0.4	OFF
≥ 1.2	ON

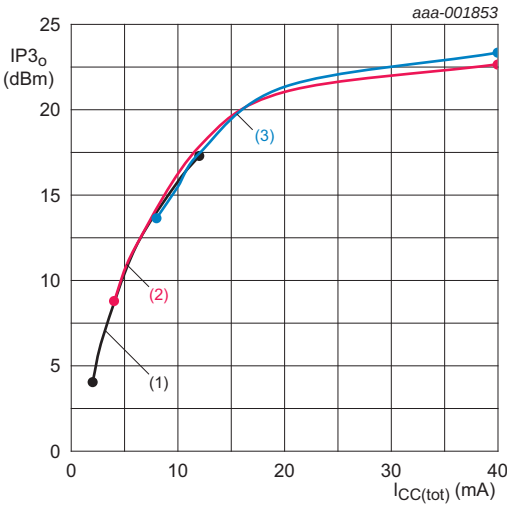




$T_{amb} = 25\text{ }^{\circ}\text{C}$; $V_{CC} = 3\text{ V}$; $P_i = -30\text{ dBm}$.

- (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) $f = 3500\text{ MHz}$

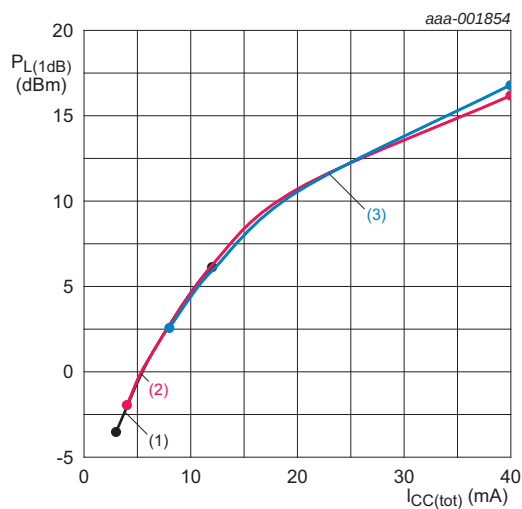
Fig 4. Insertion power gain ($|S_{21}|^2$) as a function of total supply current; typical values



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

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

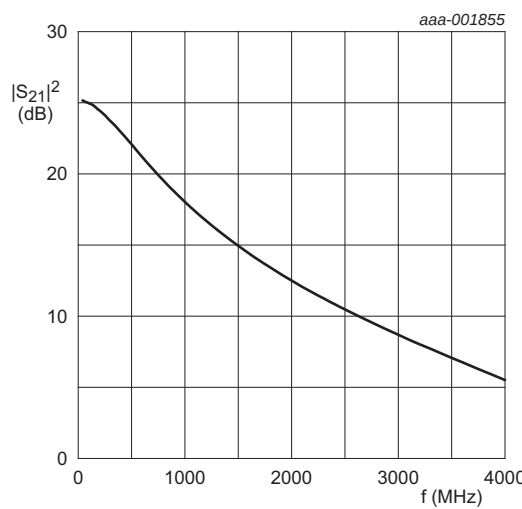
Fig 5. Output third-order intercept point as a function of total supply current; typical values



$T_{amb} = 25\text{ }^{\circ}\text{C}$; $f = 900\text{ MHz}$.

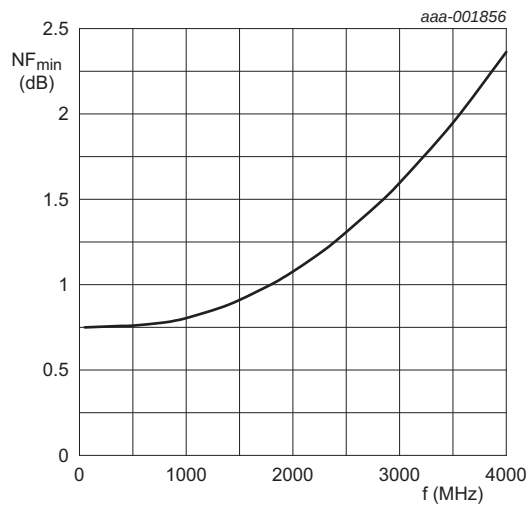
- (1) $V_{CC} = 1.5\text{ V}$
- (2) $V_{CC} = 3\text{ V}$
- (3) $V_{CC} = 5\text{ V}$

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

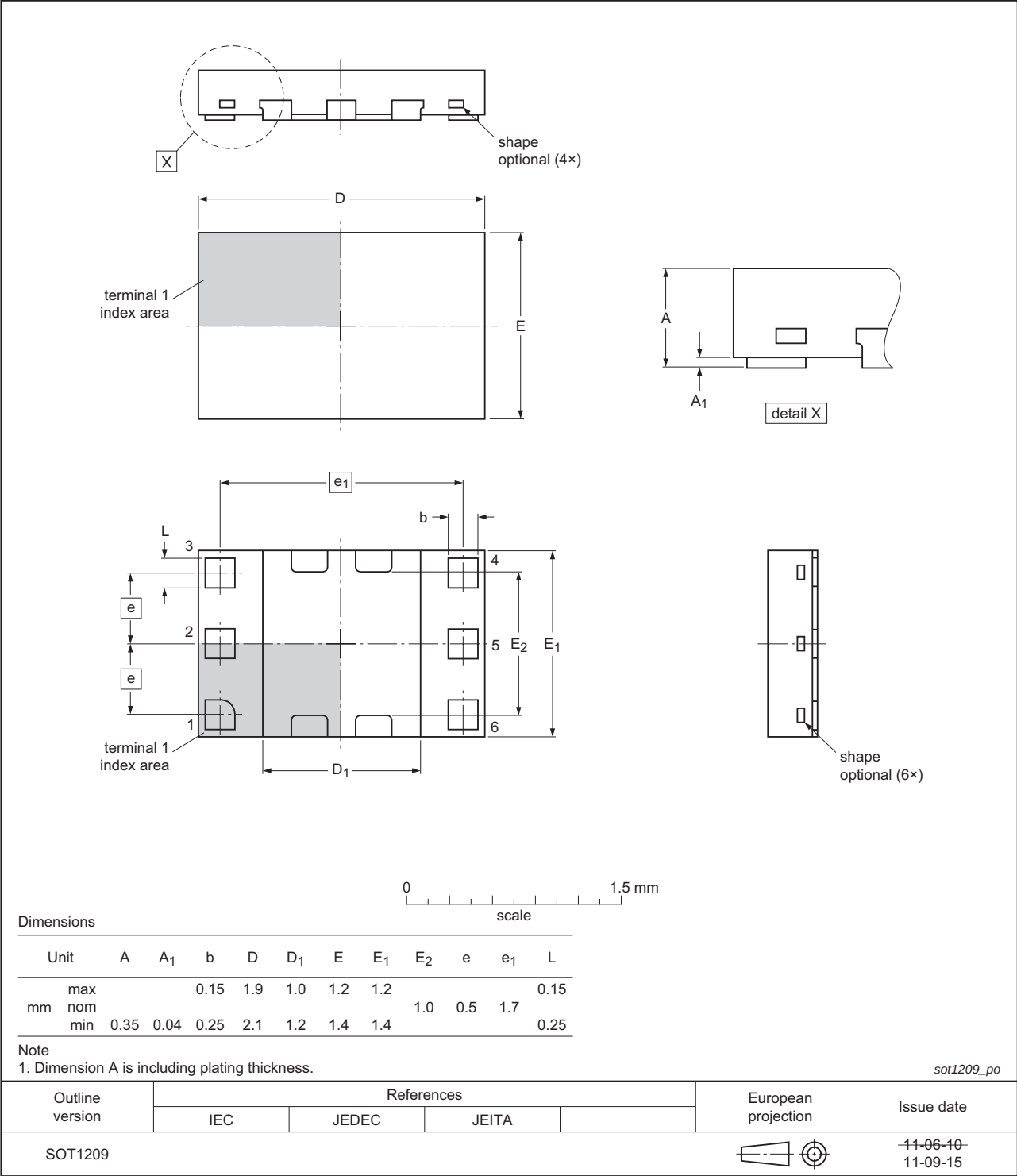


Fig 9. Package outline SOT1209

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:	Section 1 on page 1, Table 2 on page 2, Table 3 on page 2, Table 5 on page 3, Table 8 on page 5: Updated Section 9 on page 13: Added figures			
BGU6104 v.1	20110921	Preliminary 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".

[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>.

13.2 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local NXP Semiconductors sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

Product specification — The information and data provided in a Product data sheet shall define the specification of the product as agreed between NXP Semiconductors and its customer, unless NXP Semiconductors and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the NXP Semiconductors product is deemed to offer functions and qualities beyond those described in the Product data sheet.

13.3 Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. NXP Semiconductors takes no responsibility for the content in this document if provided by an information source outside of NXP Semiconductors.

In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the *Terms and conditions of commercial sale* of NXP Semiconductors.

Right to make changes — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors and its suppliers accept no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and conditions of commercial sale — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nxp.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. NXP Semiconductors hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NXP Semiconductors products by customer.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Non-automotive qualified products — Unless this data sheet expressly states that this specific NXP Semiconductors product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. NXP Semiconductors accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NXP Semiconductors' warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any

liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' product specifications.

Quick reference data — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

Translations — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

13.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

14. Contact information

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: salesaddresses@nxp.com

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	1
2	Pinning information	2
2.1	Pinning	2
2.2	Pin description	2
3	Ordering information	2
4	Marking	3
5	Limiting values	3
6	Thermal characteristics	3
7	Static characteristics	4
8	Dynamic characteristics	5
9	Enable control	13
10	Package outline	16
11	Abbreviations	17
12	Revision history	17
13	Legal information	18
13.1	Data sheet status	18
13.2	Definitions	18
13.3	Disclaimers	18
13.4	Trademarks	19
14	Contact information	19
15	Contents	20

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

© NXP B.V. 2012.

All rights reserved.

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: salesaddresses@nxp.com

Date of release: 3 February 2012

Document identifier: BGU6104