

# BGA729N6

Broadband Low Noise Amplifier for Portable and Mobile TV Applications

## Data Sheet

Revision 3.0, 2015-11-18

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**Revision History**

Page or Item	Subjects (major changes since previous revision)
<b>Revision 3.0, 2015-11-18</b>	
9	Maximum ratings updated (Maximum value for voltage at pin AO)
10	Input return loss updated
<b>Revision 2.0, 2015-09-30</b>	
7	Marking updated
7, 8, 10	Electrical performance updated
11	Bill of materials updated
12	Marking layout drawing updated

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Last Trademarks Update 2011-11-11

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**Features**

- Insertion power gain: 16.3 dB
- Insertion Loss in bypass mode: 4.2 dB
- Low noise figure: 1.05 dB / 4.3 dB in high gain / bypass mode
- Low current consumption: 6.3 mA
- Power off function
- Operating frequency: 70 - 1000 MHz
- Three-state control: OFF-, bypass- and high gain-Mode
- Supply voltage: 1.5 V to 3.3 V
- Ultra small TSNP-6-2 leadless package (footprint: 0.7 x 1.1 mm<sup>2</sup>)
- B7HF Silicon Germanium technology
- No external matching inductor required
- RF input and output internally matched to 50 Ω
- Only 2 external SMD component necessary
- 2 kV HBM ESD protection (including Al-pin)
- Pb-free (RoHS compliant) package



Product Name	Marking	Package
BGA729N6	M	TSNP-6-2

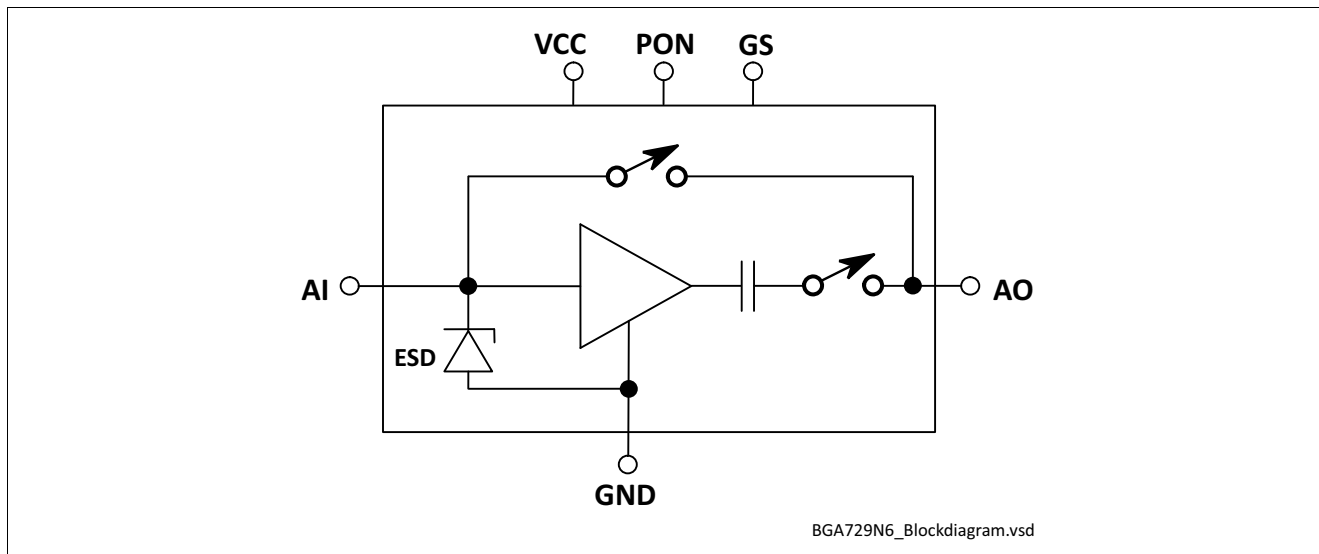


Figure 1 Block Diagram

**Description**

The BGA729N6 is a broadband low power low noise amplifier (LNA) MMIC for portable and mobile TV applications which covers a wide frequency range from 70 MHz to 1000 MHz. The LNA provides 16.3 dB gain and 1.05 dB noise figure at a current consumption of 6.3 mA in the application configuration described in [Chapter 3](#). In bypass mode the LNA provides an insertion loss of 4.2 dB. The bypass mode with much higher linearity enables this LNA to work with much lower current consumption than commonly used TV LNAs. The BGA729N6 is based upon Infineon Technologies' B7HF Silicon Germanium technology. It operates from 1.5 V to 3.3 V supply voltage.

**Pin Definition and Function**

Table 1 Pin Definition and Function

Pin No.	Name	Function
1	GS	High gain / bypass mode control
2	VCC	DC supply
3	AO	LNA output
4	GND	Ground
5	AI	LNA input
6	PON	Power on / off control

**Gain Mode Selection Truth Table**

Table 2 Gain Mode Selection Truth Table

Control Voltage $V_{PON}$	Control Voltage $V_{GS}$	Gain Mode
High	Low	High Gain
High	High	Bypass
Low	High	Bypass
Low	Low	OFF



# 1 Maximum Ratings

**Table 3 Maximum Ratings**

Parameter <sup>1)</sup>	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Voltage at pin VCC	$V_{CC}$	-0.3	–	3.6	V	–
Voltage at pin AI	$V_{AI}$	-0.3	–	0.9	V	–
Voltage at pin AO	$V_{AO}$	-0.3	–	$V_{CC} + 0.3$	V	–
Voltage at pin PON	$V_{PON}$	-0.3	–	$V_{CC} + 0.3$	V	–
Voltage at pin GS	$V_{GS}$	-0.3	–	$V_{CC} + 0.3$	V	–
Voltage at GND pins	$V_{GND}$	-0.3	–	0.3	V	–
Current into pin VCC	$I_{CC}$	–	–	16	mA	–
RF input power	$P_{IN}$	–	–	+2	dBm	–
Total power dissipation, $T_S < tbd. \text{ } ^\circ\text{C}^2)$	$P_{tot}$	–	–	60	mW	–
Junction temperature	$T_J$	–	–	150	$^\circ\text{C}$	–
Ambient temperature range	$T_A$	-40	–	85	$^\circ\text{C}$	–
Storage temperature range	$T_{STG}$	-65	–	150	$^\circ\text{C}$	–
ESD capability all pins	$V_{ESD\_HBM}$	–	–	2000	V	according to JESD22A-114

1) All voltages refer to GND-Node unless otherwise noted  
 2)  $T_S$  is measured on the ground lead at the soldering point

**Attention: Stresses above the max. values listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the integrated circuit.**

## 2 Electrical Characteristics

**Table 4** Electrical Characteristics:<sup>1)</sup>  $T_A = 25\text{ °C}$ ,  $V_{CC} = V_{PON} = 2.8\text{ V}$ ,  $V_{GS} = 0 / 2.8\text{ V}$ ,  $f = 70 - 1000\text{ MHz}$ 

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply voltage	$V_{CC}$	1.5	–	3.3	V	–
Supply current	$I_{CC}$	–	6.3	–	mA	High gain mode
		–	0.55	–	mA	Bypass mode
		–	0.2	5	μA	OFF-mode
Current into PON pin	$I_{PON}$	–	10	–	μA	High gain mode
Current into GS pin	$I_{GS}$	–	60	–	μA	Bypass mode
Insertion power gain $f = 470\text{ MHz}$	$ S_{21} ^2$	–	16.3	–	dB	High gain mode
		–	-4.2	–	dB	Bypass mode
Noise figure <sup>2)</sup> $Z_S = 50\ \Omega$	$NF$	–	1.05	–	dB	High gain mode
		–	4.3	–	dB	Bypass mode
Input return loss $f = 470\text{ MHz}$	$RL_{in}$	–	10	–	dB	High gain mode
		–	15	–	dB	Bypass mode
Output return loss $f = 470\text{ MHz}$	$RL_{out}$	–	17	–	dB	High gain mode
		–	13	–	dB	Bypass mode
Reverse isolation	$1/ S_{12} ^2$	–	28	–	dB	High gain mode
		–	4.2	–	dB	Bypass mode
Power gain settling time <sup>3)</sup>	$t_S$	–	4	–	μs	OFF- to ON-mode
Inband input 1dB-compression point, $f = 470\text{ MHz}$	$IP_{1dB}$	–	-15	–	dBm	High gain mode
		–	+6	–	dBm	Bypass mode
Inband input 3 <sup>rd</sup> -order intercept point <sup>4)</sup> $f_1 = 470\text{ MHz}$ , $f_2 = f_1 + 1\text{ MHz}$	$IIP_3$	–	-6	–	dBm	High gain mode
		–	+20	–	dBm	Bypass mode
Stability	$k$	–	> 1	–		$f = 20\text{ MHz} \dots 10\text{ GHz}$

1) Based on the application described in chapter 3

2) PCB losses are subtracted

3) To be within 1 dB of the final gain

4) High gain mode: Input power = -30 dBm for each tone / Bypass mode: Input power = -10 dBm for each tone

### 3 Application Information

#### Application Board Configuration

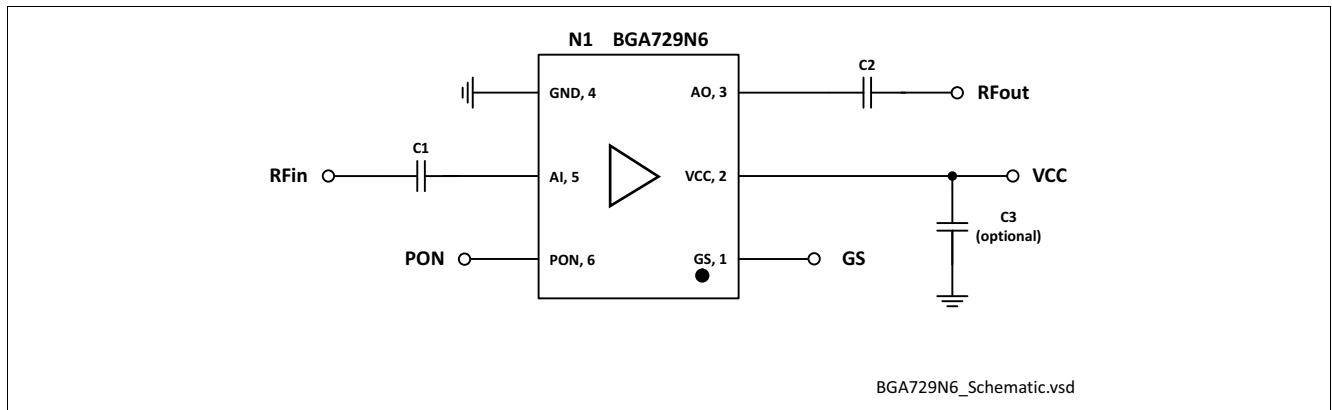


Figure 2 Application Schematic BGA729N6

Table 5 Bill of Materials

Name	Value	Package	Manufacturer	Function
C1	1 nF	0402	Various	DC block <sup>1)</sup>
C2	1 nF	0402	Various	DC block <sup>1)</sup>
C3 (optional)	≥ 1 nF	0402	Various	RF bypass <sup>2)</sup>
N1	BGA729N6	TSNP-6-2	Infineon	SiGe LNA

1) DC block might be necessary due to internal LNA bias voltage @ AI (LNA Analog Input pin). The DC block can be realized with pre-filter (e.g. SAW)

2) RF bypass recommended to mitigate power supply noise

*Note: No external DC blocking capacitor at RFout is required in typical applications as long as no DC is applied.*

A list of all application notes is available at <http://www.infineon.com/ltelna>

## 4 Package Information

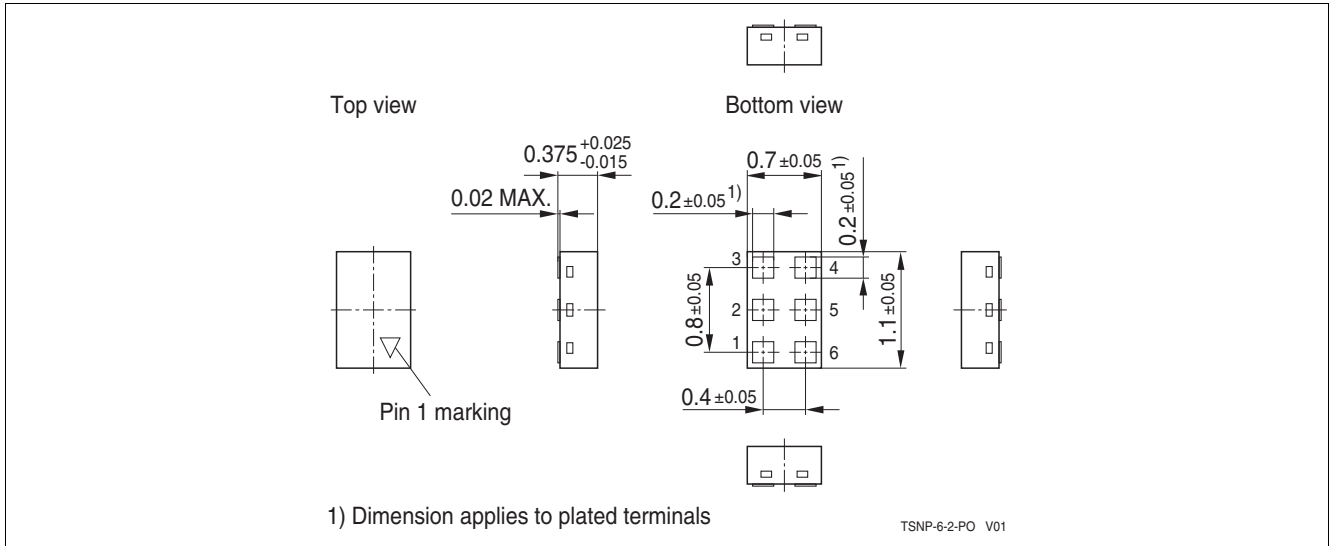


Figure 3 TSNP-6-2 Package Outline (top, side and bottom views)

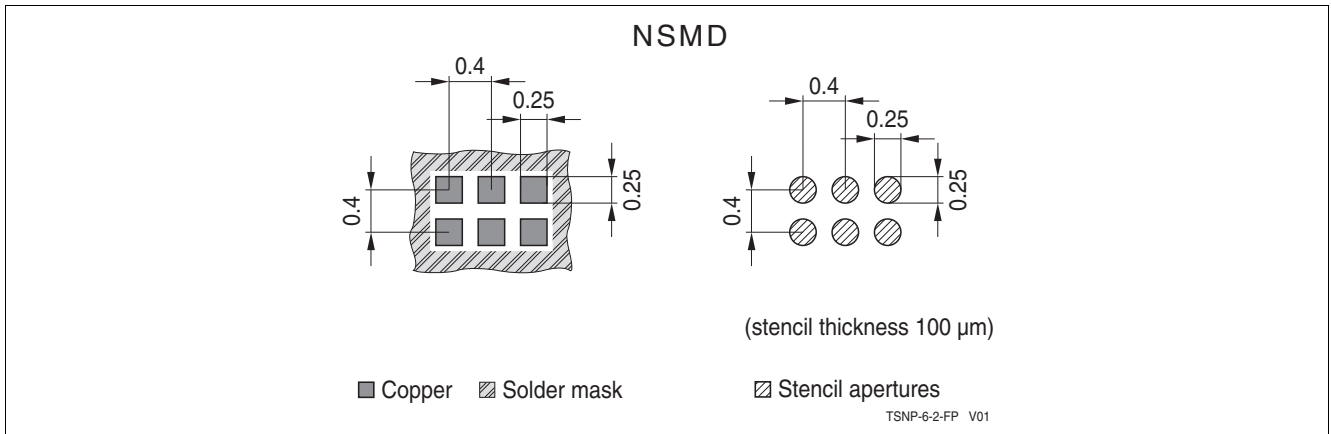


Figure 4 Footprint Recommendation TSNP-6-2

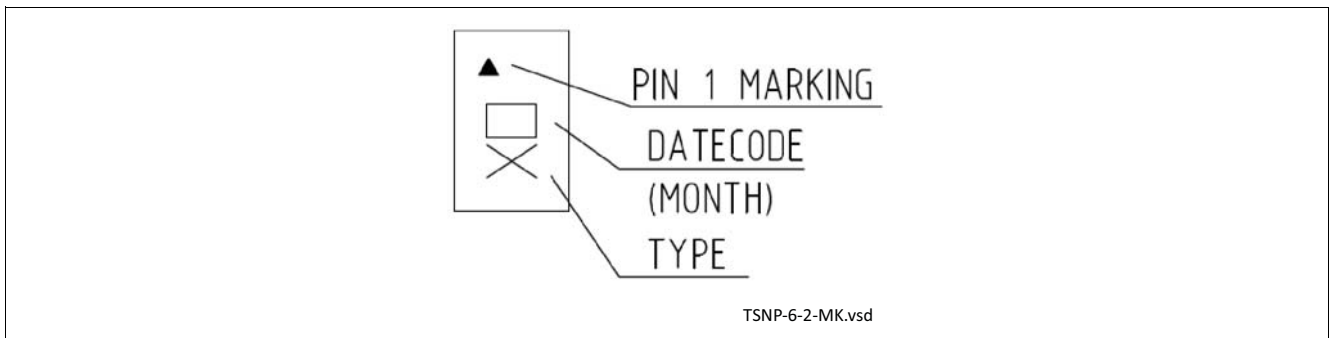


Figure 5 Marking Layout (top view)

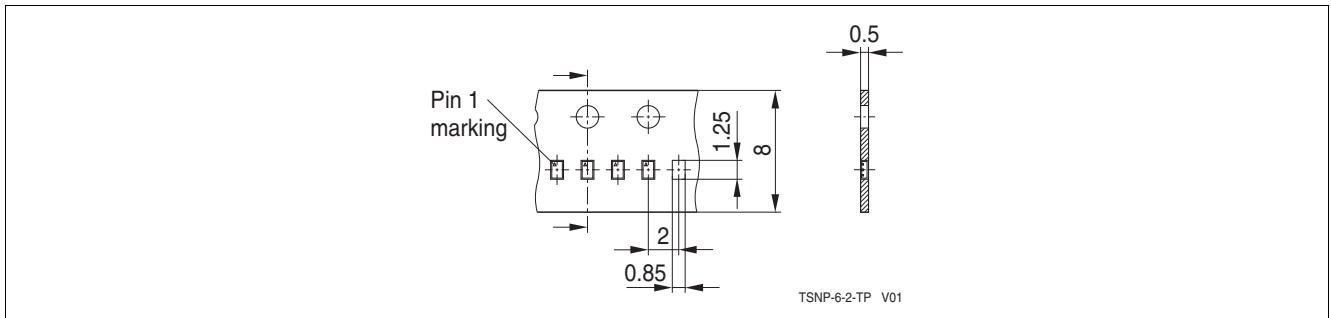


Figure 6 Tape & Reel Dimensions (reel diameter 180 mm, pieces/reel 15000)

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