

# BGA715L7

Silicon Germanium GPS Low Noise Amplifier

Small Signal Discretes



Never stop thinking

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**BGA715L7**

**Revision History: 2008-05-30, Rev.1.0 (Preliminary Data sheet)**

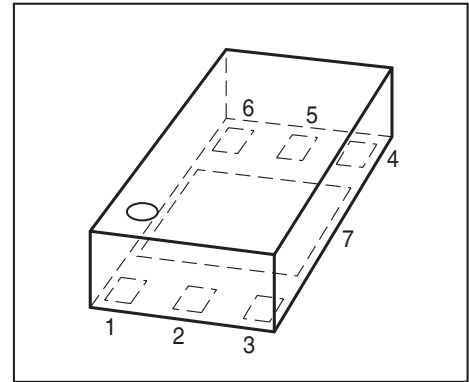
**Previous Version: 2008-01-08, Rev.1.1 (Target Data Sheet)**

<b>Page</b>	<b>Subjects (major changes since last revision)</b>
4,6	Noise Figure has changed from typ. 0.8 dB to 0.75 dB
6	Gain switch control current has changed from typ. 10 $\mu$ A to 5 $\mu$ A
6	Min. gain switch control voltage for ON-mode has changed from 1.2 V to 1.0 V
6	Input return loss has changed from typ. 15 dB to 14 dB
6	Output return loss has changed from typ. 15 dB to 13 dB
6	Reverse isolation has changed from typ. 28 dB to 43 dB
6	Power gain settling time has changed from typ. 20 $\mu$ s to typ. 5 $\mu$ s
6	In band input 3rd order intercept point has changed from -8.0 dBm to -7.0 dBm
7	Application Schematic and Bill of Materials is updated / one additional external capacitor C4 is used
7	Remark "optional" for external capacitor C2 is removed

# 1 Silicon Germanium GPS Low Noise Amplifier

## Features

- High gain: 20 dB
- Low Noise Figure: 0.75 dB
- Low current consumption: 3.3 mA
- Supply voltage: 1.5 V to 3.3 V
- High input compression point -15.5 dBm at 1.8 V supply
- High input 3rd intercept point -7 dBm at 1.8 V supply
- B7HFM Silicon Germanium technology
- RF output internally matched to 50  $\Omega$
- Low external part count
- 1kV HBM ESD protection (including AI-pin)
- Tiny TSLP-7-1 leadless package
- Moisture sensitivity level: MSL 1
- Pb-free (RoHS compliant) package



TSLP-7-1



## Application

- 1575 MHz GPS, Galileo, GPS phone

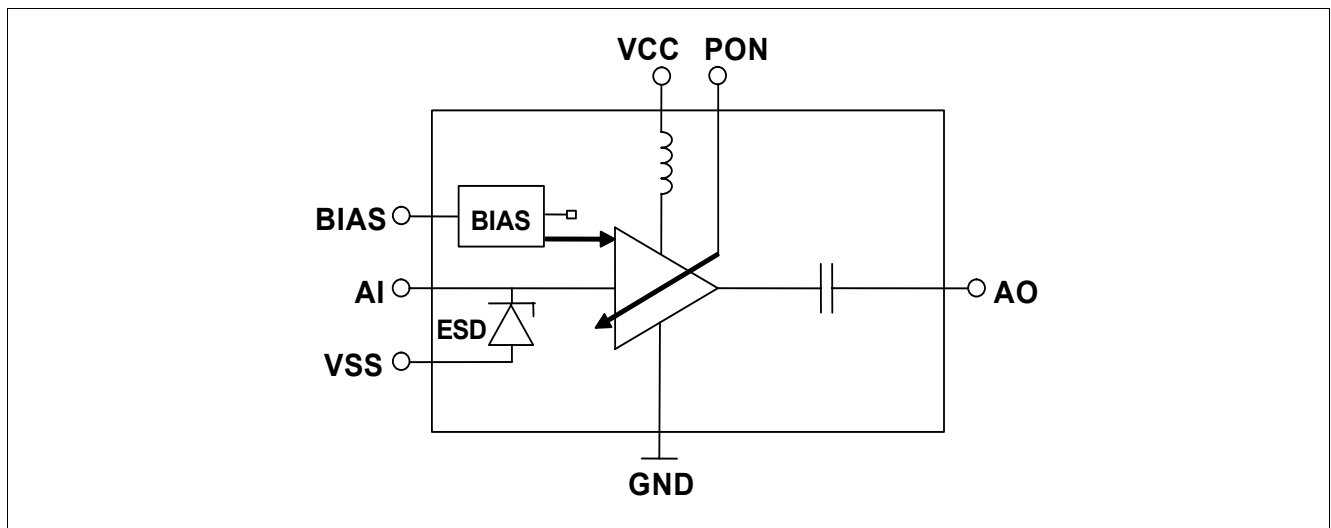


Figure 1 Blockdiagram

## 2 Description

The BGA715L7 is a front-end low noise amplifier for Global Positioning System (GPS) applications. The LNA provides 20 dB gain, 0.75 dB noise figure and high linearity performance in the application configuration described in [Chapter 4](#). Current consumption is as low as 3.3 mA. The BGA715L7 is based upon Infineon Technologies' B7HFM Silicon Germanium technology. It operates over a 1.5 V to 3.3 V supply range.

If an ultra low noise figure of 0.6 dB is required, please refer to Infineon BGA715L7 Application Note AN161.

Type	Package	Marking
BGA715L7	TSLP-7-1	tbd

**Pin Definition and Function**
**Table 1 Pin Definition and Function**

Pin No.	Symbol	Function
1	AI	LNA input
2	BIAS	DC bias
3	GND	RF ground
4	PON	Power on control
5	VCC	DC supply
6	AO	LNA output
7	VSS	DC ground

**Maximum Ratings**
**Table 2 Maximum Ratings**

Parameter <sup>1)</sup>	Symbol	Value	Unit
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 BIAS	$V_{BIAS}$	-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 VSS	$V_{SS}$	-0.3 ... 0.3	V
Current into pin VCC	$I_{CC}$	10	mA
RF input power	$P_{IN}$	0	dBm
Total power dissipation	$P_{tot}$	36	mW
Junction temperature	$T_J$	150	°C
Ambient temperature range	$T_A$	-30 ... 85	°C
Storage temperature range	$T_{STG}$	-65 ... 150	°C
ESD capability all pins (HBM: JESD22A-114)	$V_{ESD}$	1000	V

1) All voltages refer to GND-Node.

**Thermal resistance**
**Table 3 Thermal resistance**

Parameter	Symbol	Value	Unit
Junction - soldering point <sup>1)</sup>	$R_{thJS}$	tbd	K/W

1) For calculation of  $R_{thJA}$  please refer to Application Note Thermal Resistance

### 3 Electrical Characteristics

**Table 4** Electrical Characteristics<sup>1)</sup>:  $T_A = 25\text{ °C}$ ,  $V_{CC} = 1.8\text{ V}$ ,  $V_{PON,ON} = 1.8\text{ V}$ ,  $V_{PON,OFF} = 0\text{ V}$ ,  
 $f = 1575\text{ MHz}$

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply voltage	$V_{CC}$	1.5	1.8	3.3	V	
Supply current	$I_{CC}$	-	3.3	-	mA	ON-mode
		-	0.2	3	$\mu\text{A}$	OFF-mode
Gain switch control voltage	$V_{pon}$	1.0	-	Vcc	V	ON-mode
		0	-	0.4	V	OFF-mode
Gain switch control current	$I_{pon}$	-	5	-	$\mu\text{A}$	ON-mode
		-	-	1	$\mu\text{A}$	OFF-mode
Power gain	$ S_{21} ^2$	-	20	-	dB	High-gain Mode
Noise figure <sup>2)</sup>	$NF$	-	0.75	-	dB	$Z_S = 50\ \Omega$
Input return loss	$RL_{in}$	-	14	-	dB	
Output return loss	$RL_{out}$	-	13	-	dB	
Reverse isolation	$1/ S_{12} ^2$	-	43	-	dB	
Power gain settling time <sup>3)</sup>	$t_S$	-	5	-	$\mu\text{s}$	OFF- to ON-mode
		-	5	-	$\mu\text{s}$	ON- to OFF-mode
Inband input 1dB compression point	$IP_{1dB}$	-	-15.5	-	dBm	
Inband input 3rd order intercept point <sup>4)</sup>	$IIP_3$	-	-7	-	dBm	$f_1 = 1575\text{ MHz}$ $f_2 = f_1 \pm 1\text{ MHz}$
Stability	$k$	-	> 1	-		$f = 20\text{ MHz} \dots 20\text{ GHz}$

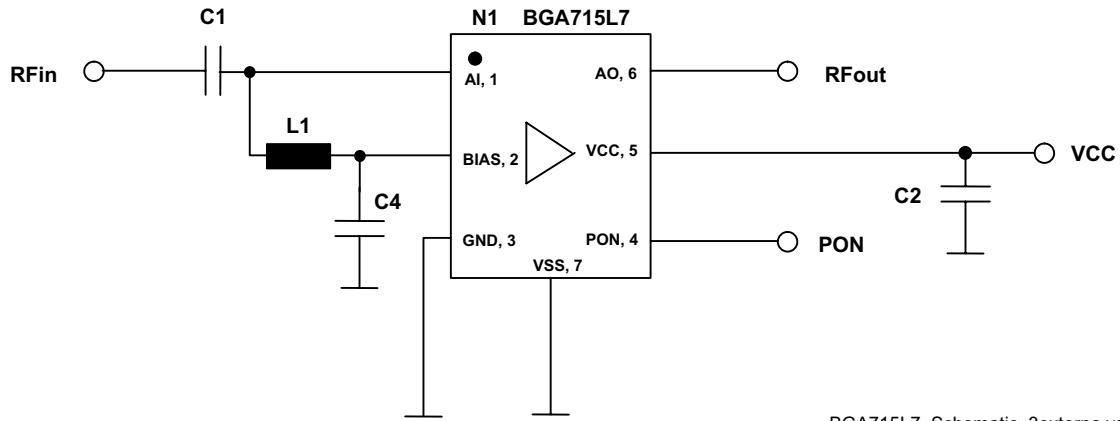
1) Measured on BGA715L7 application board according to application schematic on page 7, including PCB losses (unless noted otherwise)

2) PCB transmission line- and connector losses of 0.05dB are subtracted

3) To be within 1 dB of the final gain OFF- to ON-mode; to be within 3 dB of the final gain ON- to OFF-mode

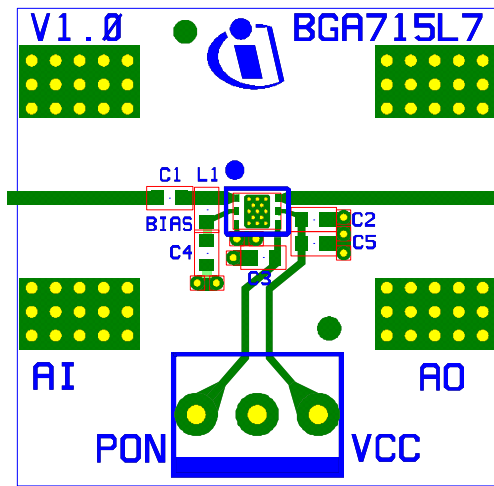
4) Input Power = -30 dBm for each tone

## 4 Application Information



BGA715L7\_Schematic\_3externa.vsd

Figure 2 Application Schematic BGA715L7



BGA715L7\_appboard.vsd

Figure 3 Application Board Drawing BGA715L7

Table 5 Bill of Materials

Name	Value	Package	Manufacturer	Function
C1	1.8 pF	0402	Various	DC blocking and input matching
C2	1 $\mu$ F	0402	Various	RF block
C4	15 pF	0402	Various	RF block
L1	4.7 nH LQW15A series	0402	Murata	Bias feed and input matching
N1	BGA715L7	TSLP-7-1	Infineon	SiGe LNA

A list of all application notes is available at <http://goto.infineon.com/smallsignaldiscretes-appnotes>.

## 5 Package Information

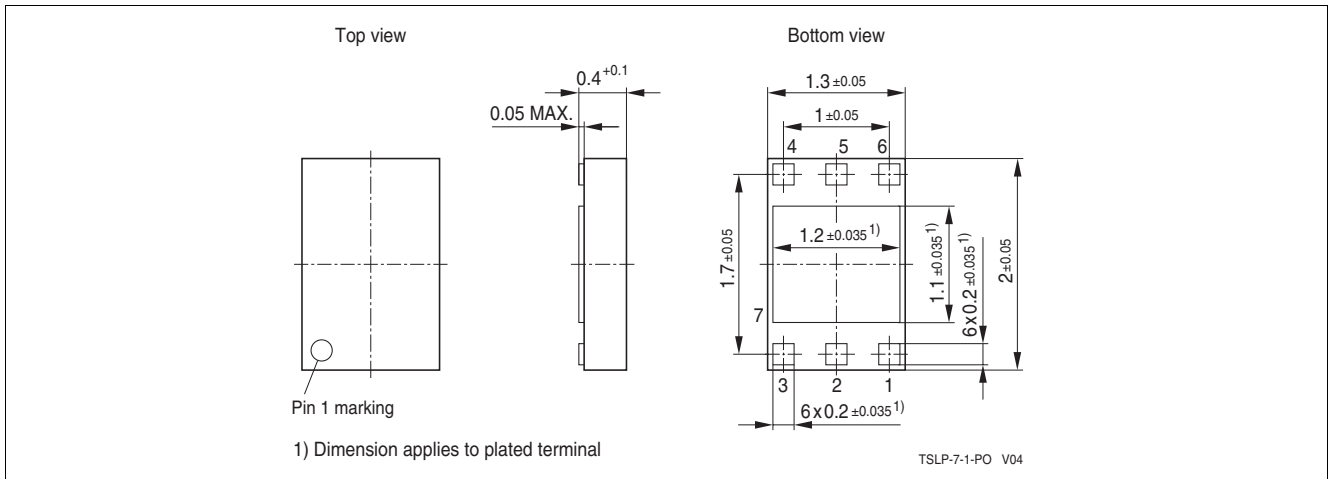


Figure 4 Package Dimensions for TSLP-7-1

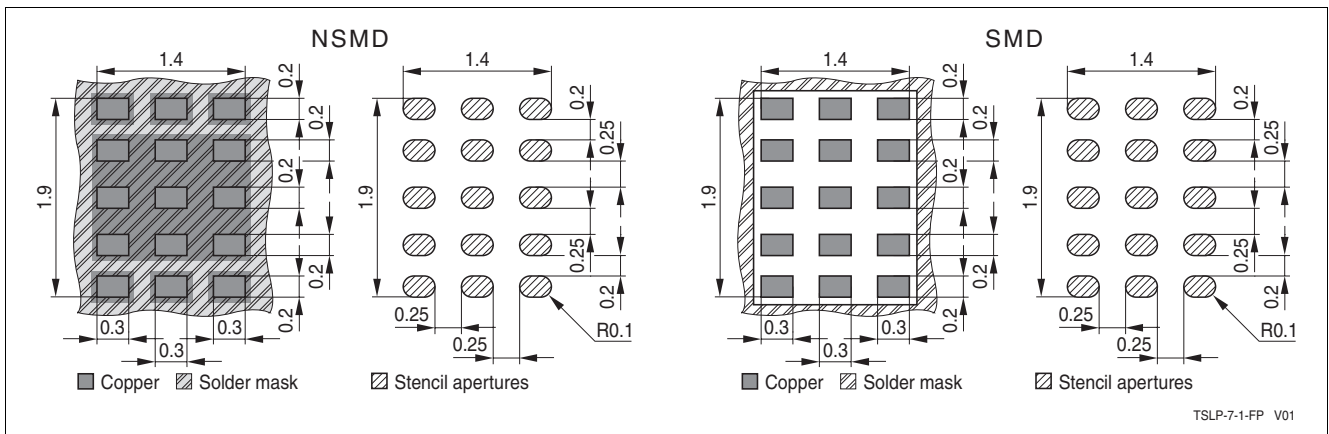


Figure 5 Footprint TSLP-7-1

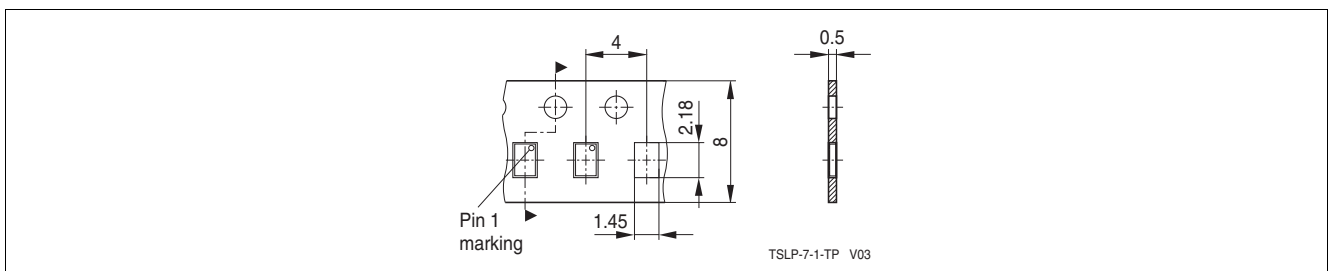


Figure 6 Tape & Reel Dimensions (Ø reel 180, pieces/reel 7500)