

# BGA715L7

Silicon Germanium GPS Low Noise Amplifier

Small Signal Discretes



Never stop thinking

**Edition 2009-10-9**

**Published by  
Infineon Technologies AG  
81726 München, Germany**

**© Infineon Technologies AG 2009.  
All Rights Reserved.**

### **Legal Disclaimer**

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenhheitsgarantie"). With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

### **Information**

For further information on technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies Office ([www.infineon.com](http://www.infineon.com)).

### **Warnings**

Due to technical requirements components may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies Office.

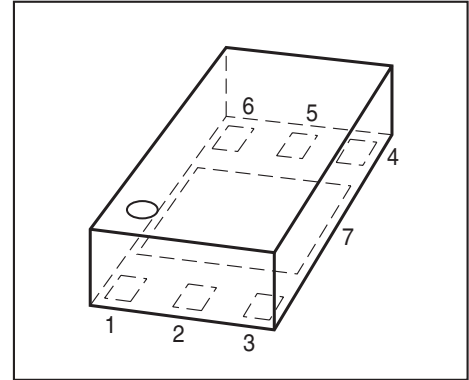
Infineon Technologies Components may only be used in life-support devices or systems with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system, or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body, or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.



# 1 Silicon Germanium GPS Low Noise Amplifier

## Features

- High gain: 20 dB
- Low Noise Figure: 0.7 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
- 2kV 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

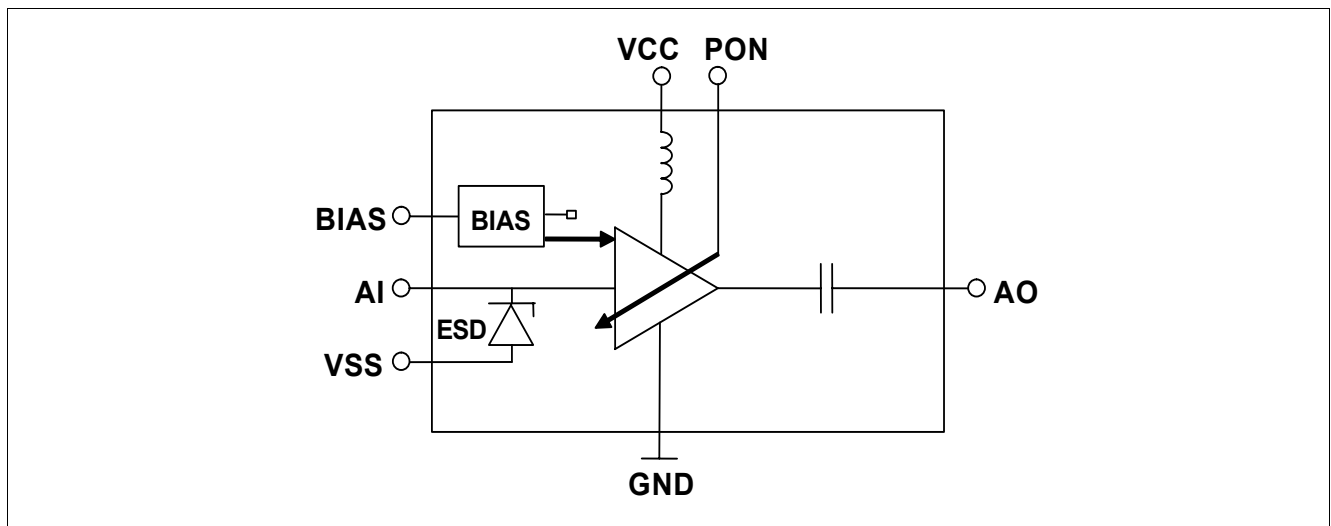


Figure 1 Blockdiagram

## 2 Description

The BGA715L7 is a front-end low noise amplifier for Global Positioning System (GPS) applications. The LNA provides 20 dB gain, 0.7 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	UG

**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 GND	$V_{GND}$	-0.3 ... 0.3	V
Current into pin VCC	$I_{CC}$	10	mA
RF input power	$P_{IN}$	10	dBm
Total power dissipation	$P_{tot}$	36	mW
Junction temperature	$T_J$	150	°C
Ambient temperature range	$T_A$	-40 ... 85	°C
Storage temperature range	$T_{STG}$	-65 ... 150	°C
<sup>2)</sup> Human Body Model ESD capability, all pin to all pin	$V_{ESD\_HBM}$	2000	V
<sup>3)</sup> Machine Model ESD capability, all pin to all pin	$V_{ESD\_MM}$	100	V

1) All voltages refer to VSS-Node.

2) According to JEDEC22A-114

3) According to JEDEC22A-115

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

Parameter	Symbol	Value	Unit
Junction - soldering point <sup>1)</sup>	$R_{thJS}$	159	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	3.6	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	-	$V_{CC}$	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>	$NF$	-	0.7	-	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

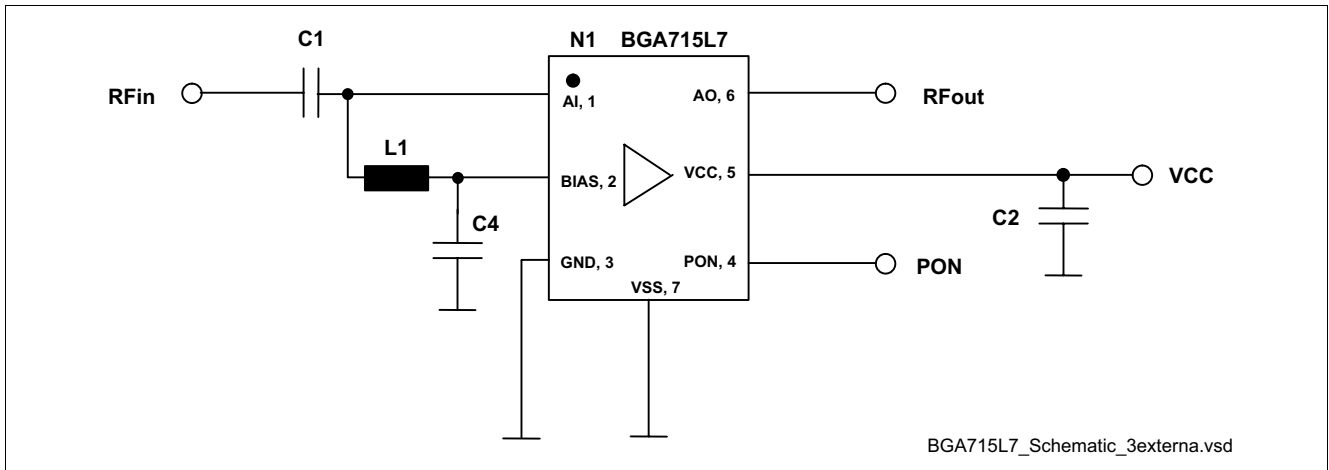


Figure 2 Application Schematic BGA715L7

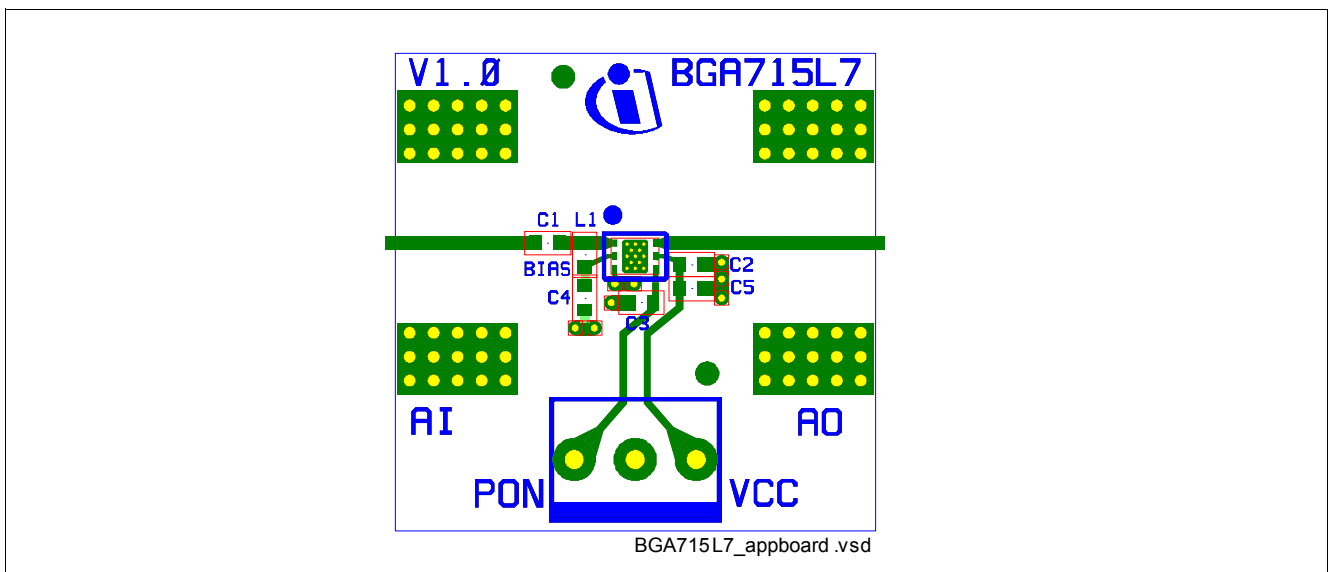


Figure 3 Application Board Drawing BGA715L7

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

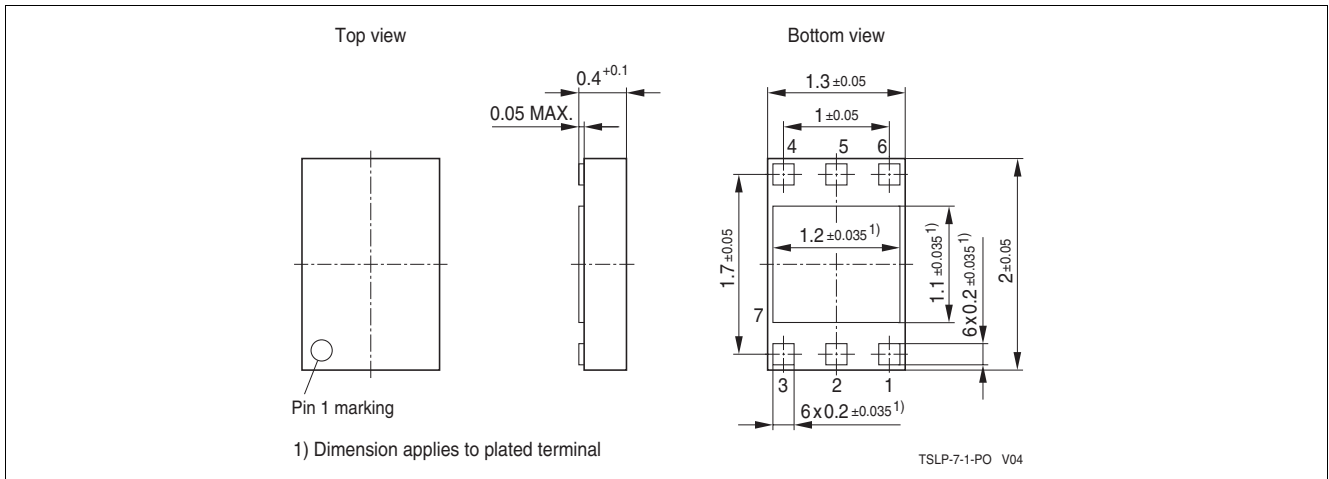


Figure 4 Package Dimensions for TSLP-7-1

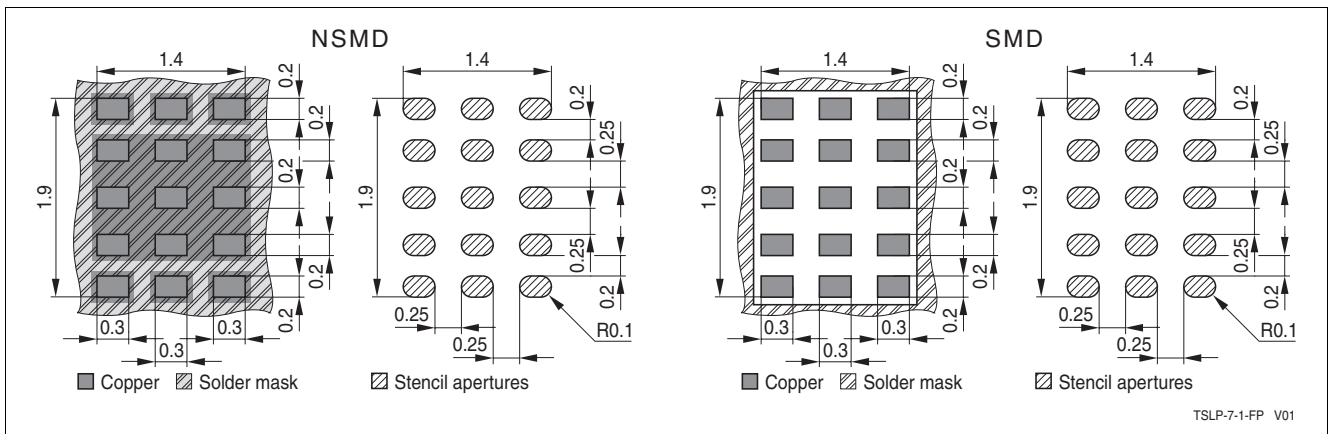


Figure 5 Footprint TSLP-7-1

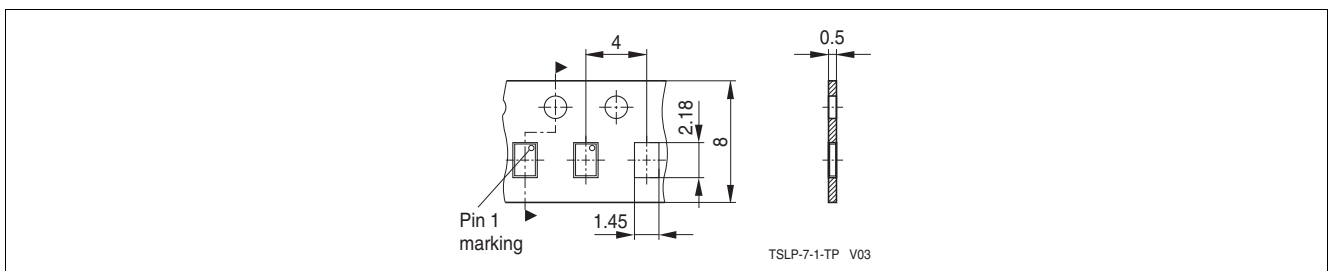


Figure 6 Tape & Reel Dimensions (Ø reel 180, pieces/reel 7500)