Data Sheet, Version 1.0, June 2005

BGA615L7

Silicon Germanium
GPS Low Noise Amplifier

Automotive and Industrial
Silicon Discretes

Never stop thinking.

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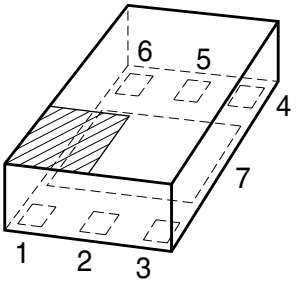
Silicon Germanium
GPS Low Noise Amplifier

BGA615L7

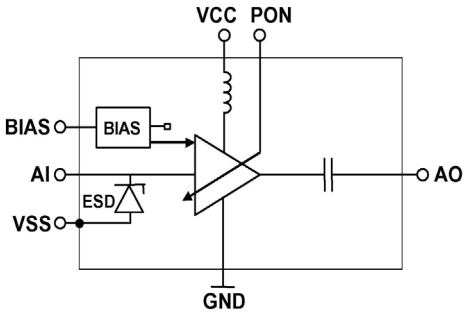
Features

- High Gain: 18 dB
- Low Noise Figure: 0.9 dB
- Power off function
- Operating frequency 1575 MHz
- Supply Voltage: 2.4 V to 3.2 V
- Supply Current: 5.6 mA (ON) and < 3 µA (OFF)
- Tiny P-TSLP-7-1 leadless package
- B7HF Silicon Germanium technology
- RF output internally matched to 50 Ω
- Low external component count
- 1 kV HBM ESD protection (including AI-pin)



Application:

- 1575 MHz GPS



Description

The BGA615L7 is a front-end low noise amplifier for Global Positioning Systems (GPS) applications. The LNA provides 18 dB gain, 0.9 dB noise figure and high linearity performance, allowing it to be used as a first-stage LNA. Current consumption is as low as 5.6 mA. The BGA615L7 is based upon Infineon Technologies' B7HF Silicon Germanium technology. It operates over a 2.4 V to 3.2 V supply range.

ESD: Electrostatic discharge sensitive device, observe handling precaution!

Type	Package	Marking	Chip
BGA615L7	P-TSLP-7-1	BS	T1595

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	Supply control
6	AO	LNA output
7	VSS	Ground

Maximum Ratings

Parameter [1]	Symbol	Limit 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_{VCC}	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	-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

Electrical Characteristics

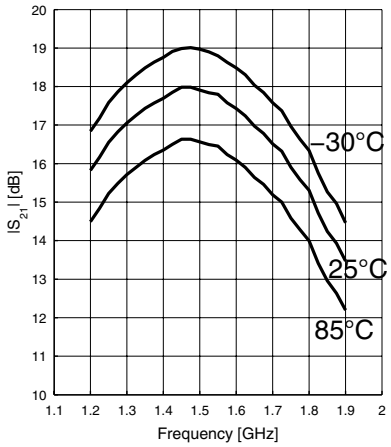
T_A=25°C, V_{CC}=2.8V, $V_{PON,ON}$=2.8V, $V_{PON,OFF}$=0V, frequency=1575MHz, measured on BGA615L7 application board including PCB losses (unless noted otherwise)

Parameter	Symbol	min.	typ.	max.	Unit
Supply voltage	V_{cc}	2.4	2.8	3.2	V
Supply Current	I_{cc}				
ON-Mode		-	5.6	-	mA
OFF-Mode		-	0.2	3	µA
Gain Switch Control Voltage	V_{pon}				
ON-Mode		1.5	-	3.2	V
OFF-Mode		0	-	0.5	
Gain Switch Control Current	I_{pon}				
ON-Mode		-	1.5	3	µA
OFF-Mode		-	0	1	µA
Insertion power gain (High-Gain Mode)	$\|S_{21}\|^2$	-	18	-	dB
Noise figure (Zs = 50Ω) [2)]	NF	-	0.9	-	dB
Input Return Loss	RL_{in}	-	13	-	dB
Output Return Loss	RL_{out}	-	>15	-	dB
Reverse isolation	$1/\|S_{12}\|^2$	-	35	-	dB
Power gain settling time (within 1dB of the final gain)	t_s				
OFF- to ON-Mode		-	2	-	µs
ON- to OFF-Mode		-	20	-	
Inband input 3rd order intercept point f1= 1575MHz, f2= f1 +/-1MHz	IIP_3	-	-1	-	dBm
Inband Input 1dB compression point	IP_{1dB}	-	-10	-	dBm
Out of band Input 1dB compression point (806MHz - 928MHz)	$IP_{1dB,900M}$	-	1	-	dBm
Out of band Input 1dB compression point (1612MHz - 1710MHz)	$IP_{1dB,1650M}$	-	-9	-	dBm
Out of band Input 1dB compression point (1710MHz - 1785MHz, 1850MHz - 1909MHz)	$IP_{1dB,1900M}$	-	-8	-	dBm
Out of band Input 1dB compression point (1909MHz - 2500MHz)	$IP_{1dB,2000M}$	-	-6	-	dBm
Stability (20 MHz-10 GHz)	k	-	>1.5	-	

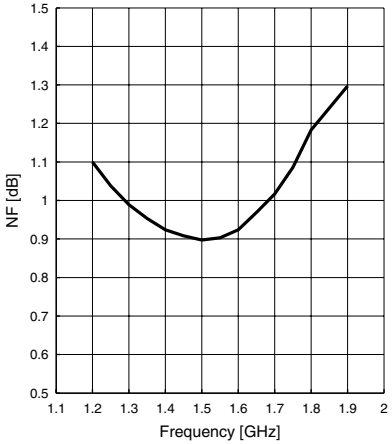
[2)] PCB losses subtracted

Typical Measurement Results ON Mode; T_A = 25°C

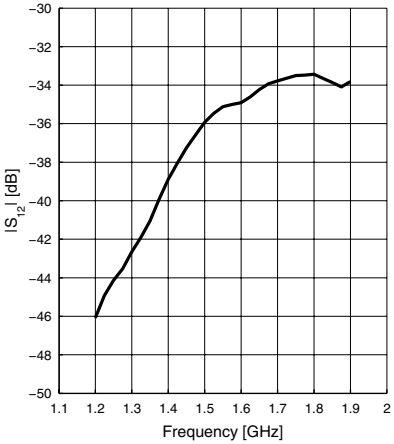
Gain $|S_{21}| = f(f)$
V_{CC} = 2.8V



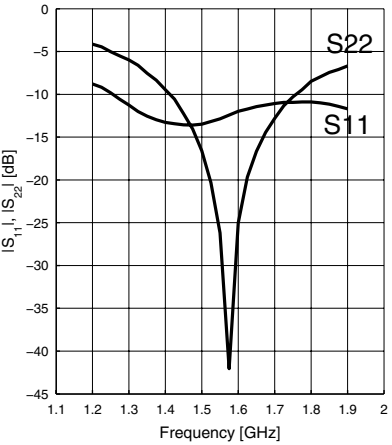
Noise Figure[3] NF = f(f)
V_{CC} = 2.8V



Reverse Isolation $|S_{12}| = f(f)$
V_{CC} = 2.8V



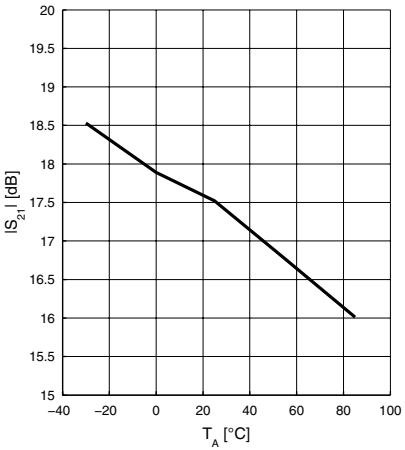
Matching $|S_{11}|, |S_{22}| = f(f)$
V_{CC} = 2.8V



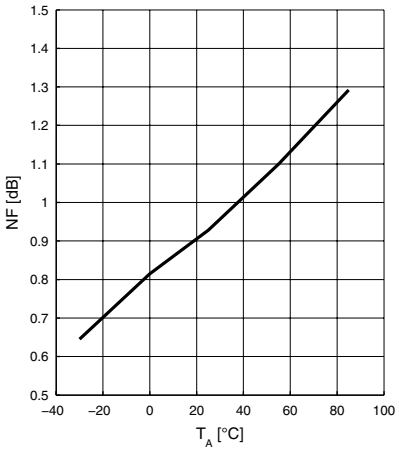
[3] PCB losses subtracted

Typical Measurement Results ON Mode over Temperature

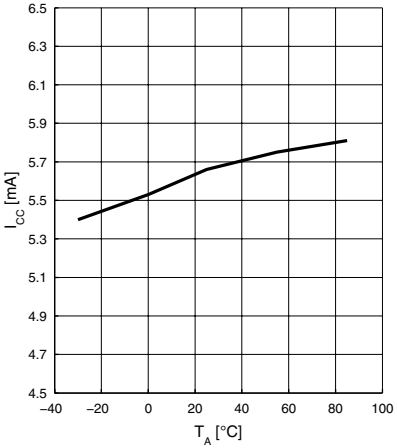
Power Gain $|S_{21}| = f(T_A)$
$V_{CC} = 2.8V$



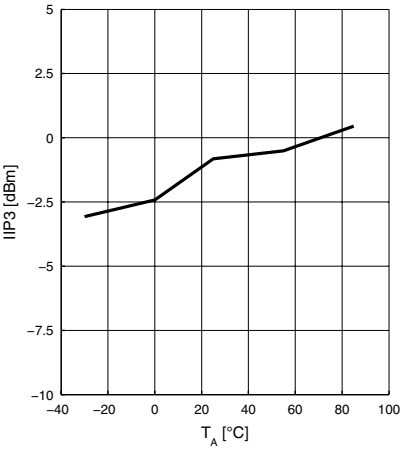
Noise Figure[4] $NF = f(T_A)$
$V_{CC} = 2.8V$



Supply current $I_{CC} = f(T_A)$
$V_{CC} = 2.8V$



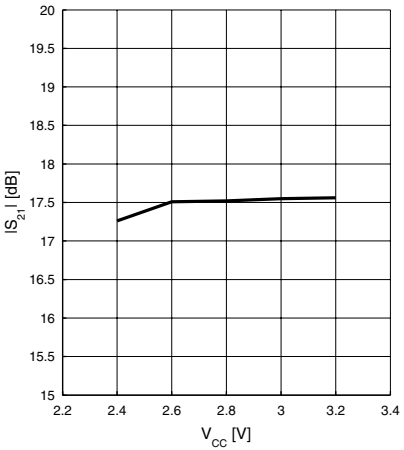
Intercept Point 3rd O. $IIP3 = f(T_A)$
$V_{CC} = 2.8V$



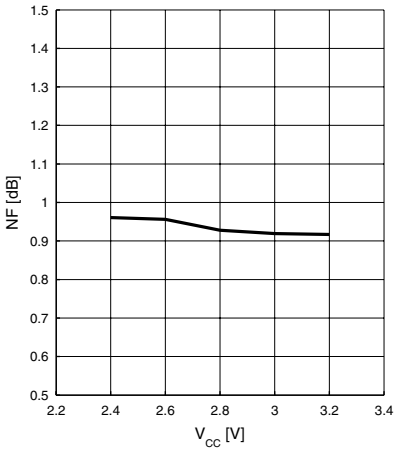
[4] PCB losses subtracted

Typical Measurement Results ON Mode over Supply Voltage

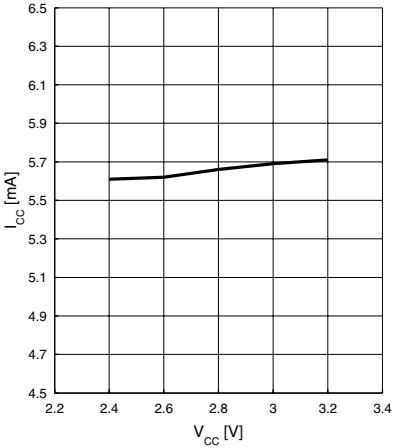
Power Gain $|S_{21}| = f(V_{CC})$
$T_A = 25°C$



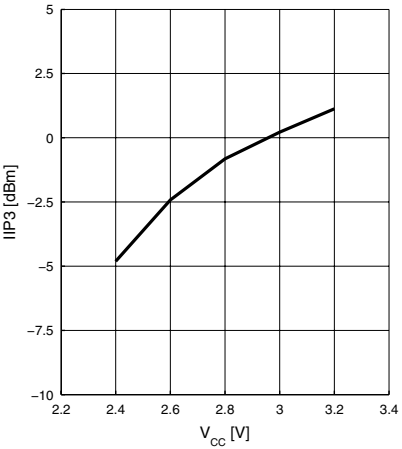
Noise Figure[5] $NF = f(V_{CC})$
$T_A = 25°C$



Supply current $I_{CC} = f(V_{CC})$
$T_A = 25°C$

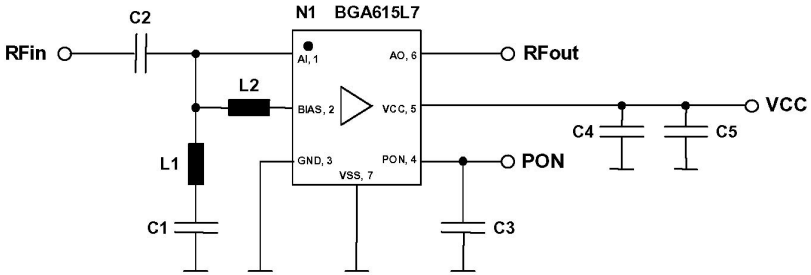


Intercept Point 3rd O. $IIP3 = f(V_{CC})$
$T_A = 25°C$



[5] PCB losses subtracted

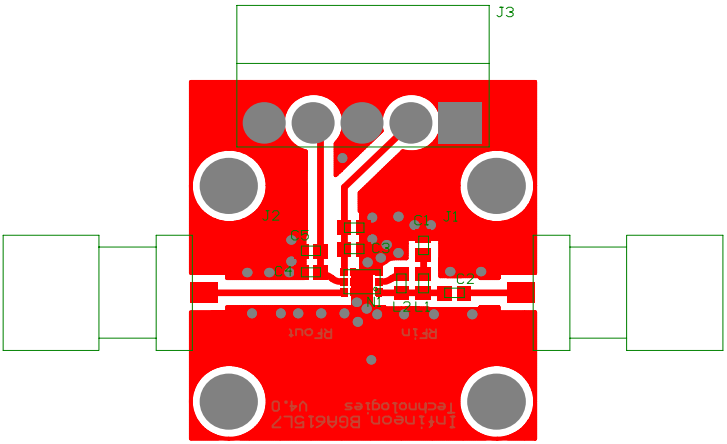
PCB Board Configuration



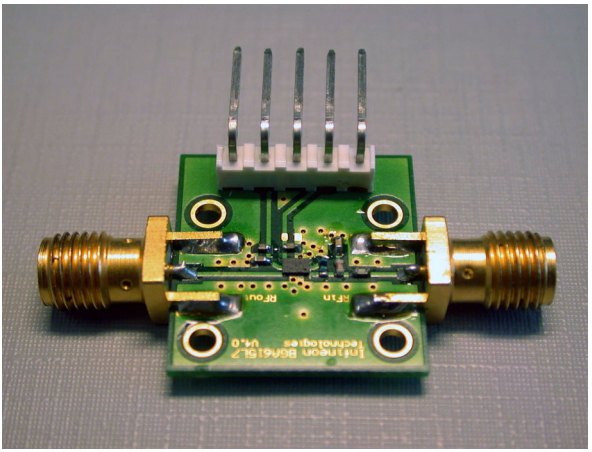
Bill of Materials

Name	Value	Package	Manufacturer	Function
C1	10 nF	0402	various	LF trap
C2	5 pF	0402	various	DC block
C3	10 pF	0402	various	control voltage filtering optional
C4	100 pF	0402	various	supply filtering optional
C5	2.2 nF	0402	various	supply filtering
L1	3.3 nH	0402	various	LF trap & input matching
L2	100 nH	0402	various	biasing
N1	BGA615L7	P-TSLP-7-1	Infineon	SiGe LNA

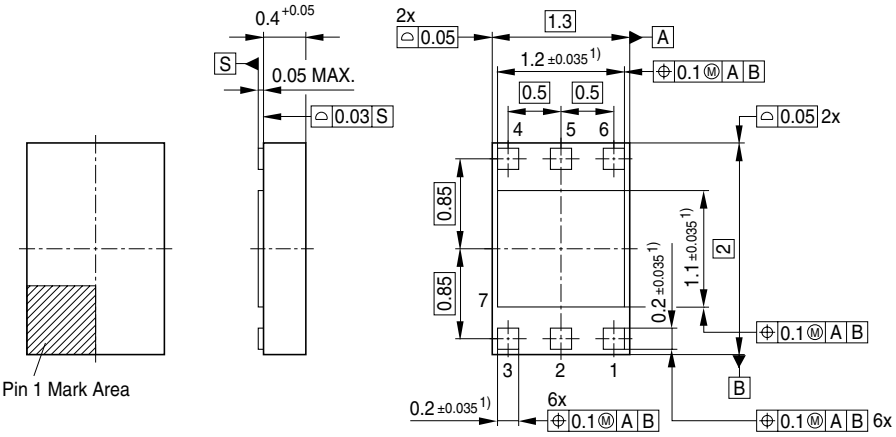
Application Board, Top View



Photograph of Application Board



Package Outline



1) Dimension applies to plated terminals

Tape & Reel Outline