

## Technical Report TR102

**Device: BGB741L7ESD**

**Application: WiMAX LNA from 2.3GHz to  
3.7GHz**

**Revision: Rev. 1.2**

**Date: 2009-Aug-14**

RF and Protection Devices



**Never stop thinking**

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

**© Infineon Technologies AG 12/18/09.  
All Rights Reserved.**

#### **Legal Disclaimer**

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenheitsgarantie"). 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. Overview

**Infineon Device:** BGB741L7ESD

**Application:** WiMax LNA for 2.3GHz ... 3.7GHz

## 2. Description:

BGB741L7ESD is a broadband featured RF transistor with integrated active biasing circuit, feedback circuit and ESD protection. Due to Infineon's excellent RF transistor technologies, BGB741L7ESD still owns quite low noise figure of about 1.1 dB at 2.3 GHz and 1.25 dB at 3.7 GHz although a feedback circuit. Therefore BGB741L7ESD is very suitable for WiMAX applications which require well-defined broadband characteristics.

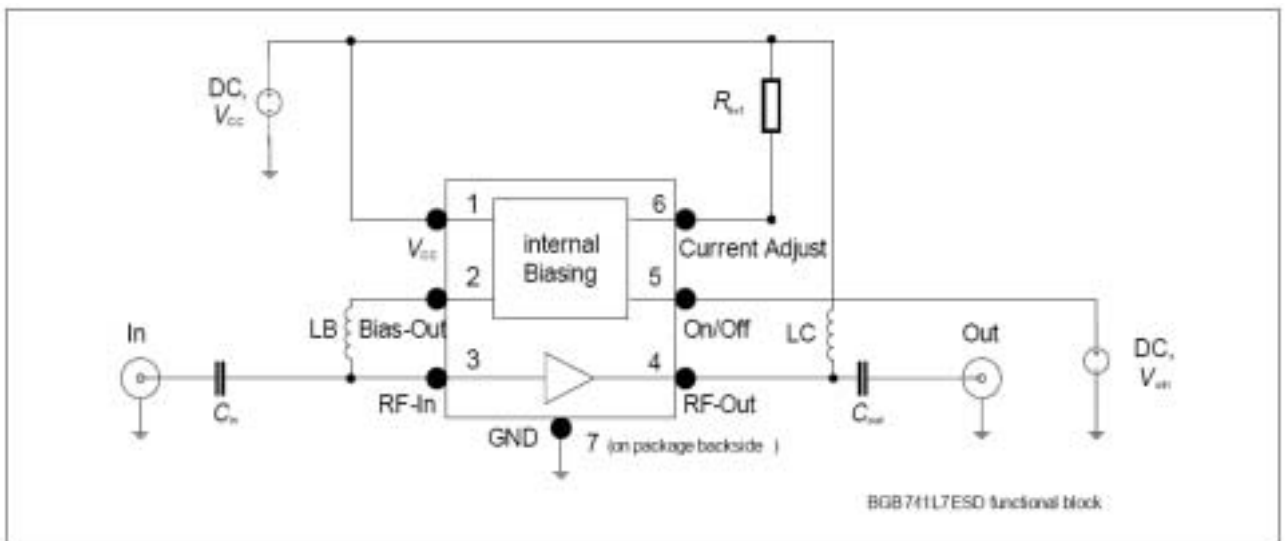


Figure 2-1: Overview of BGB741L7ESD

The Input and output matching are also integrated into the circuit. Therefore no critical matching elements are required in the applications. Through the external resistor  $R_{Ext}$ , it is easy to tune the current consumption of BGB741L7ESD in the range of 6 mA to 12 mA. In this application example, 3.3 k $\Omega$  is used to achieve 11 mA.

### 3. Schematics:

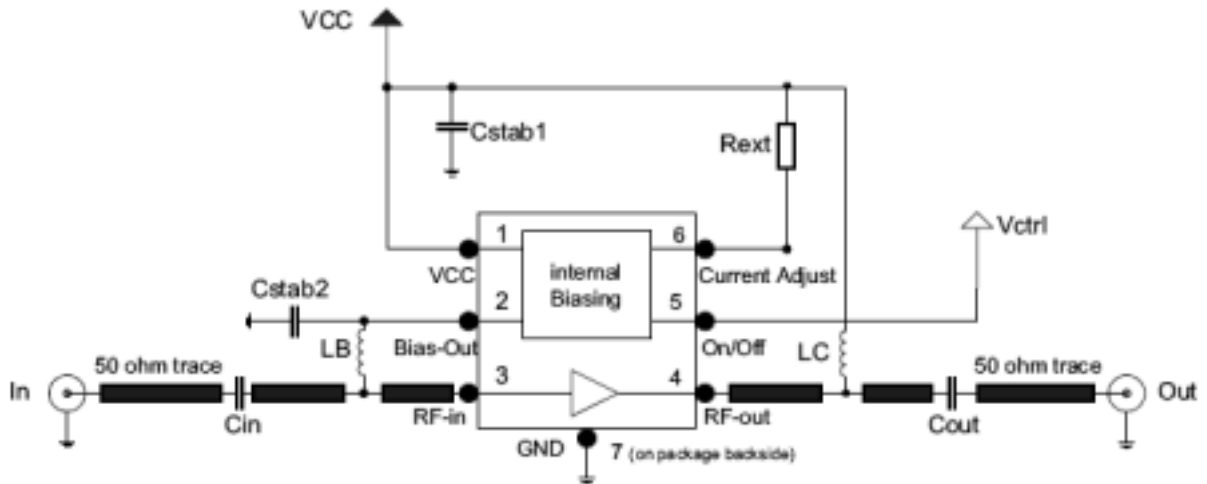


Figure 3-1: Schematics of the application circuit

**Table 3-1: Bill of Materials:**

Symbol	Value	Unit	Size	Supplier	Comment
Cin	47	pF	0402	Various	
Cout	47	pF	0402	Various	
Cstab1	100	nF	0402	Various	
Cstab2	100	nF	0402	Various	
LB	40	nH	0402	Murata	LQW15 series
LC	40	nH	0402	Murata	LQW15 series
Rext	3.3	k $\Omega$	0402	Various	
J1	0	Ohm	0402	Various	not necessary for final PCB design

#### 4. Summary of Data

**Table 4-1: Measurement data at room temperature**

Parameter	Symbol	Value	Unit	Note/Test Condition
Frequency Range	Freq	2.3 – 2.7	GHz	
DC Voltage	Vcc	3.0	V	
DC Current	Icc	10.8	mA	
Gain	G	18.7	dB	
Off-Mode Gain	Goff	-18	dB	Vctrl=0V
Noise Figure	NF	1.1	dB	
Input Return Loss	S11	12	dB	@2.5GHz
Output Return Loss	S22	12	dB	@2.5GHz
Input P1dB	IP1dB	-6.7	dBm	@2.5GHz
Output P1dB	OP1dB	+11	dBm	@2.5GHz
Input IP3	IIP3	+2	dBm	@2.5GHz
Output IP3	OIP3	+20.7	dBm	@2.5GHz
Stability	k	> 1	--	Unconditionally stable

Note: board losses is removed for gain and noise figure.

**Table 4-2: Measurement data at room temperature**

Parameter	Symbol	Value	Unit	Note/Test Condition
Frequency Range	Freq	3.4 – 3.7	GHz	
DC Voltage	Vcc	3.0	V	
DC Current	Icc	10.8	mA	
Gain	G	17	dB	
Off-Mode Gain	Goff	-18.5	dB	Vctrl=0V
Noise Figure	NF	1.25	dB	
Input Return Loss	S11	12	dB	@3.5GHz
Output Return Loss	S22	12	dB	@3.5GHz
Input P1dB	IP1dB	-6.5	dBm	@3.5GHz
Output P1dB	OP1dB	+9.5	dBm	@3.5GHz
Input IP3	IIP3	+3.5	dBm	@3.5GHz
Output IP3	OIP3	+20.5	dBm	@3.5GHz
Stability	k	> 1	--	Unconditionally stable

Note: board losses is removed for gain and noise figure.

## 5. Measured Graphs

### 5.1 High-Gain Mode Characteristics:

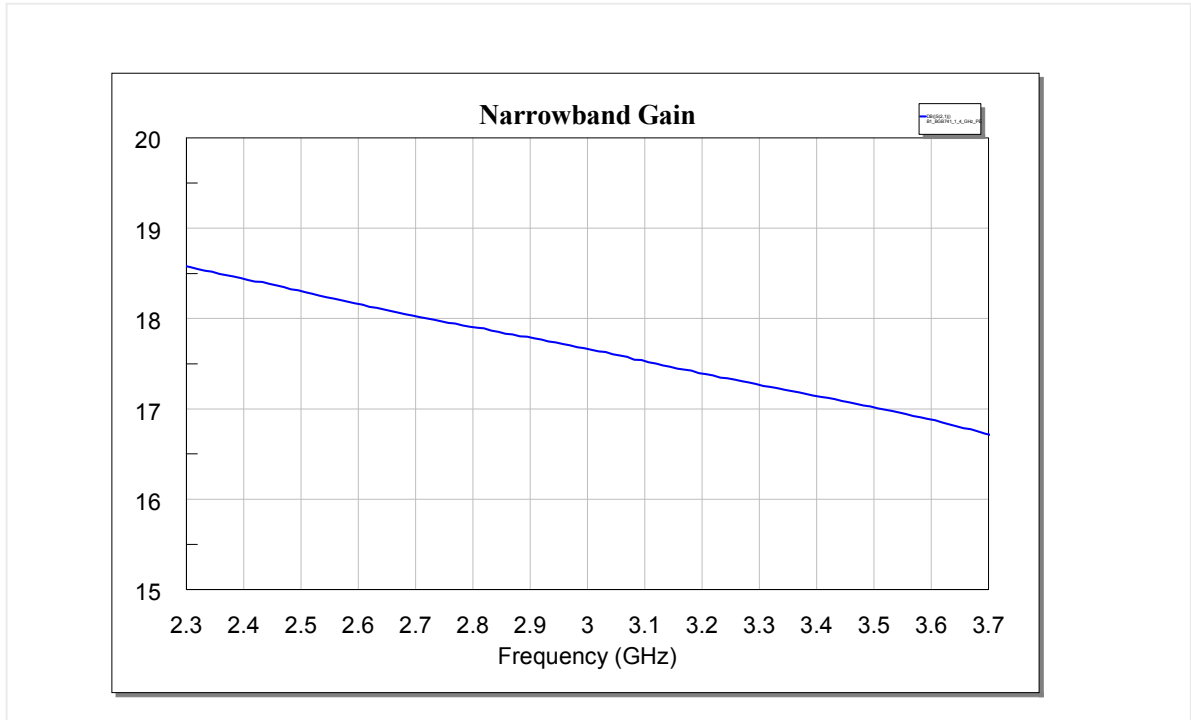


Figure 5-1: Gain curve of BGB741L7 for 2.3GHz to 3.7GHz (line losses not deembedded)

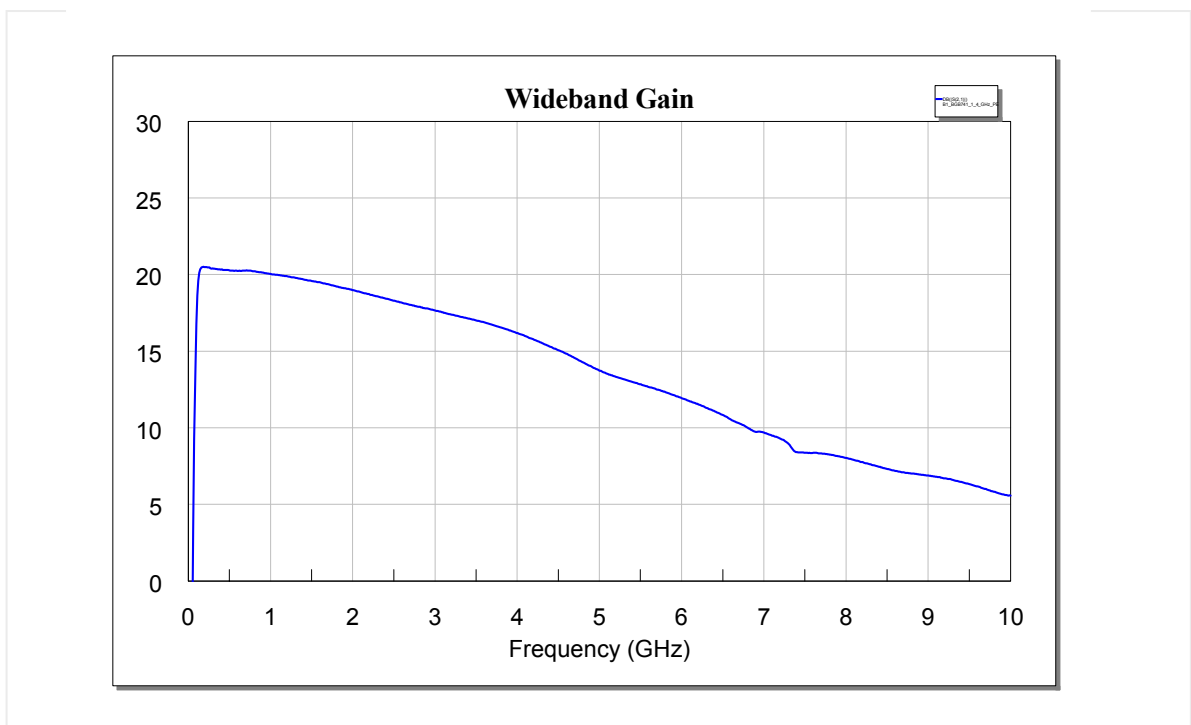


Figure 5-2: Wideband gain curve of BGB741L7

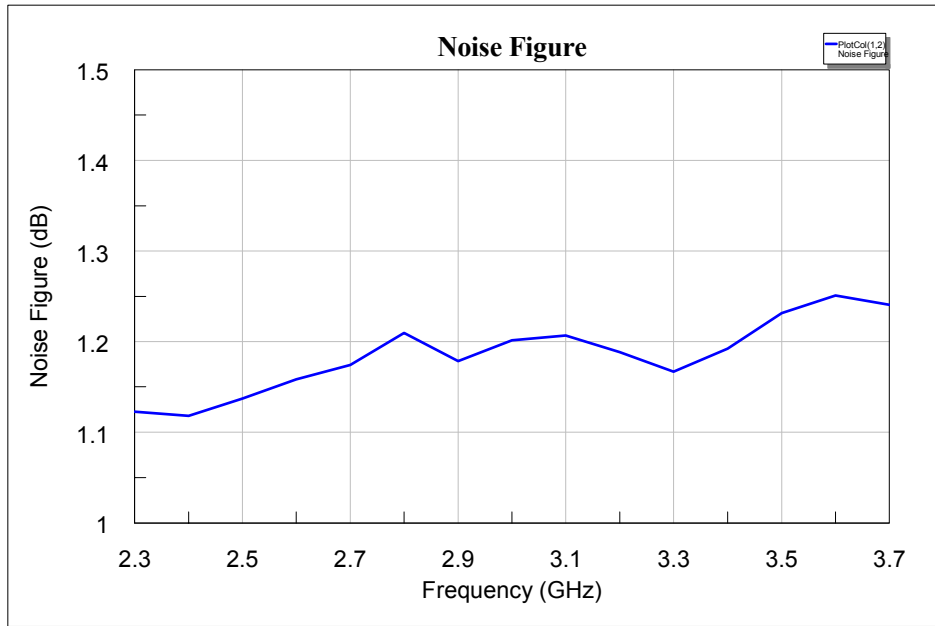


Figure 5-3: Noise figure curve of BGB741L7 for 2.3GHz to 3.7GHz (line loss deembedded)

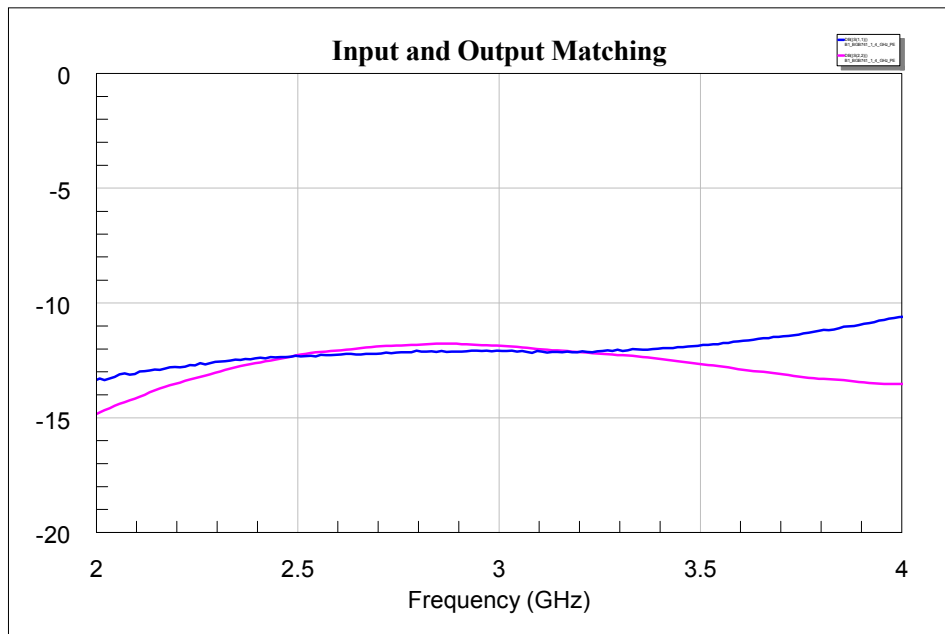


Figure 5-4: Input matching (blue line) and output matching (red line) of BGB741L7 over frequencies.

5.2 Off-Mode Characteristics:

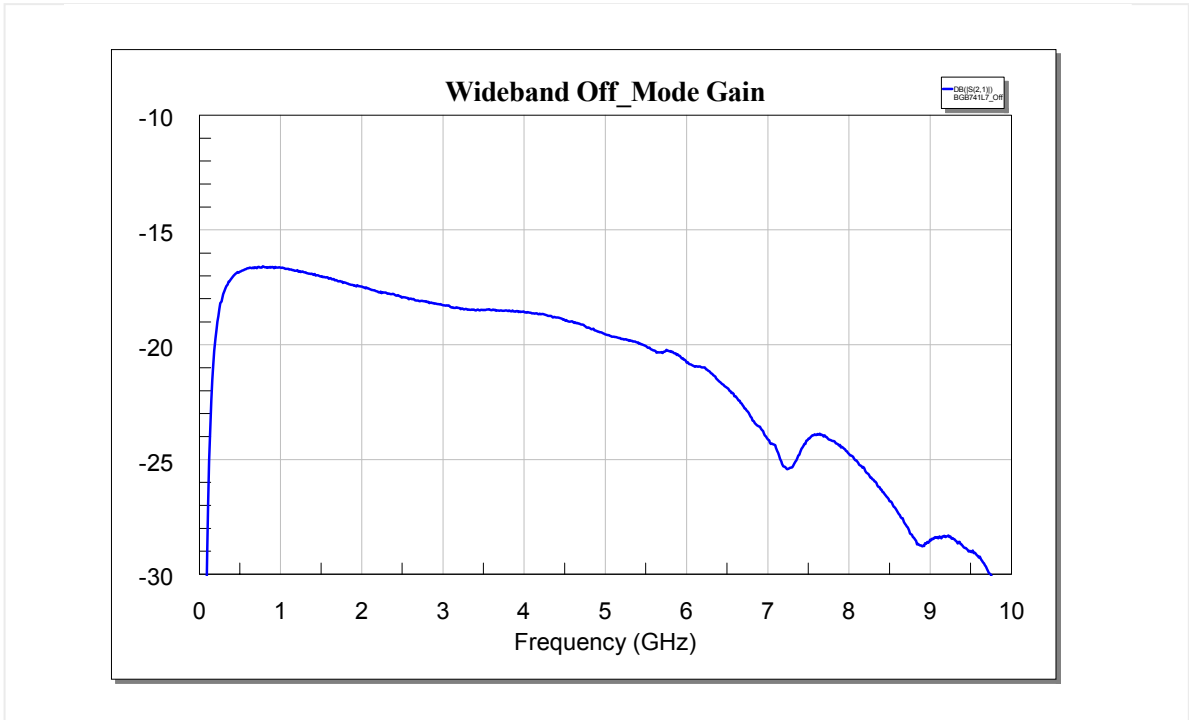


Figure 5-5: Wireband S21 curve of BGB741L7 in the off-mode (Vcc=3V, Vctrl=0V)

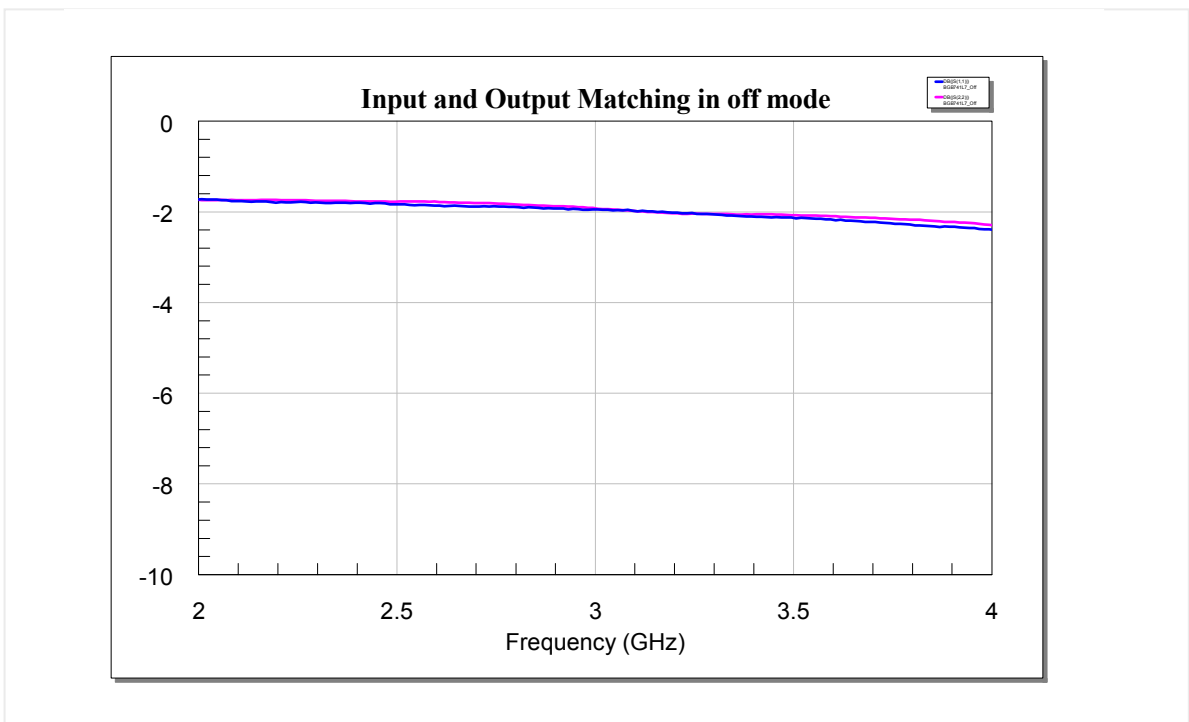


Figure 5-6: Input matching (blue line) and output matching (red line) of BGB741L7 over frequencies in the off mode (Vcc=3V, Vctrl=0V).



## 6. Evaluation Board and Layout Information

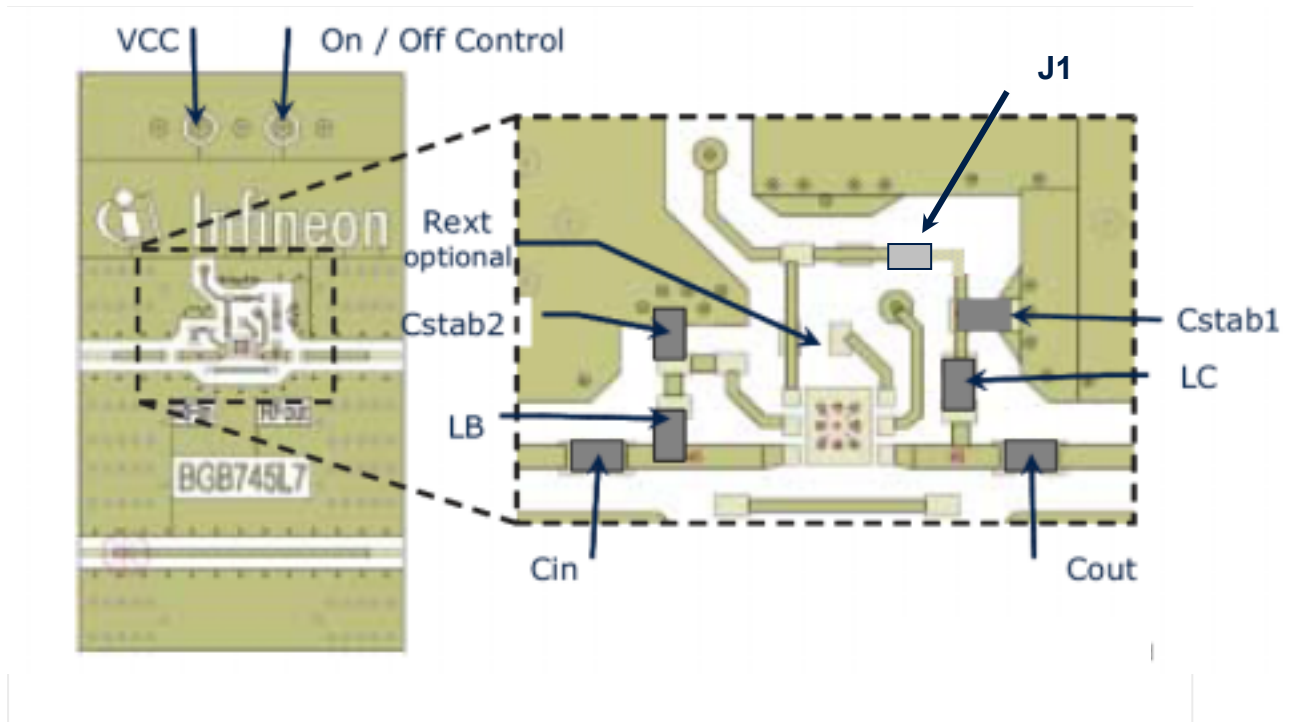


Figure 6-1: PCB Overview (PCB ID-No: BGB7-Family, TSLP-7-1)

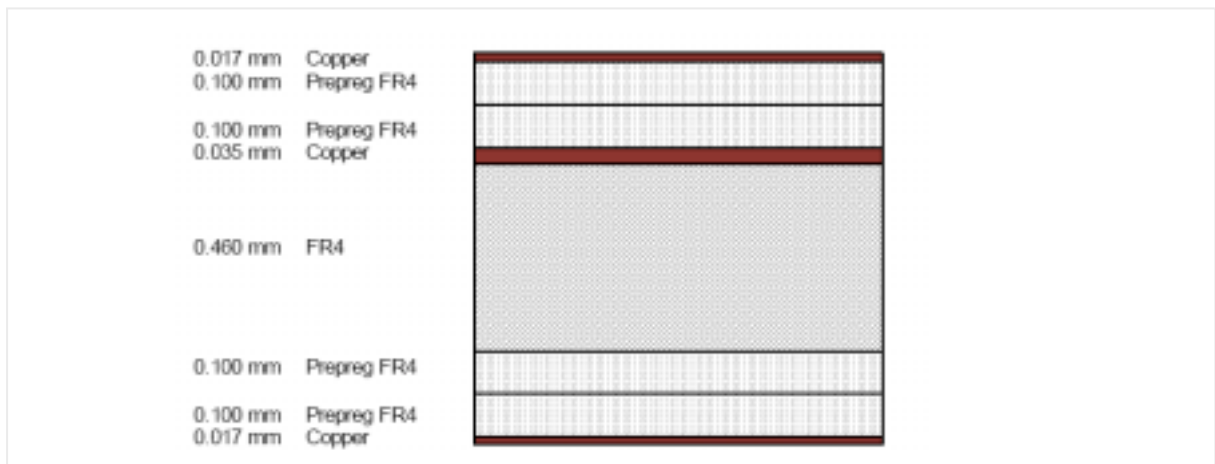


Figure 6-2: Layout Information