

# BGB717L7ESD

Low Noise Amplifier MMIC for FM Radio Applications

## Data Sheet

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**BGB717L7ESD, Low Noise Amplifier MMIC for FM Radio Applications**
**Revision History: 2012-11-07, Revision 3.4**

Page	Subjects (changes since previous revision)
	This data sheet replaces the revision from 2010-06-24. The product itself has not been changed and the device characteristics remain unchanged. Only the product description and information available in the data sheet have been expanded and updated.

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Last Trademarks Update 2011-11-11

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## 1 Product Brief

The BGB717L7ESD is an advanced low noise amplifier MMIC with integrated ESD protection and active biasing specifically designed for FM antenna systems requiring high gain, reduced power consumption and very low distortion. The external components determine the gain of the FM amplifier and can also be modified to extend the operating frequency.

The device is based on Infineon Technologies' reliable high volume silicon germanium carbon (SiGe:C) technology and comes in a low profile TSLP-7-1 leadless green package

## 2 Features

- High performance FM radio LNA with integrated biasing
- Worldwide FM band support (76 MHz to 108 MHz)
- Integrated ESD protection for all pins (3 kV for RF input vs. GND, 2 kV for all other pin combinations, HBM)
- Very high gain at low current consumption
- High input compression point
- High input impedance
- Excellent noise figure from latest SiGe:C technology
- Integrated active biasing circuit enables stable operating point against variations in temperature or processing
- Operation voltage: 1.8 V to 4.0 V
- Power-off function
- Very small and leadless package TSLP-7-1, 2.0 x 1.3 x 0.4 mm
- Pb-free (RoHS compliant) and halogen-free package
- Qualification report according to AEC-Q101 available



### Applications

- Active FM antenna systems
- Portable FM radio
- Personal headphone radio
- ISM applications

**Attention: ESD (Electrostatic discharge) sensitive device, observe handling precautions**

Product name	Package	Marking
BGB717L7ESD	TSLP-7-1	AX

### 3 Pin Configuration

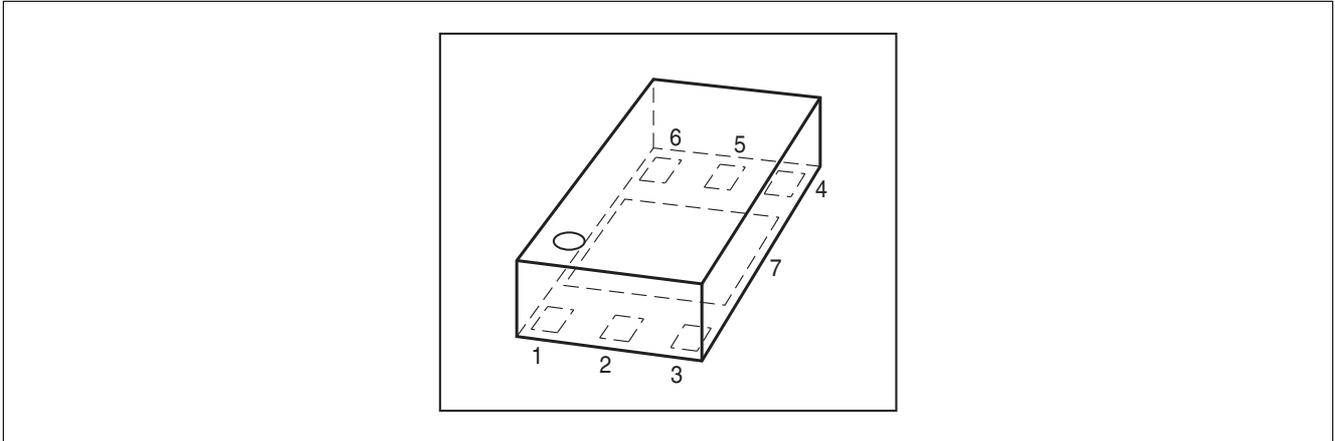


Figure 3-1 Pinning of BGB717L7ESD in TSLP-7-1

Table 3-1 Pinning Table

Pin	Function
1	GND
2	RF-In
3	Bias-Out
4	Ctrl On/Off
5	RF-Out
6	$V_{CC}$
7	GND

## 4 Maximum Ratings

**Table 4-1 Maximum Ratings at  $T_A = 25\text{ °C}$** 

Parameter	Symbol	Value			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply voltage	$V_{CC}$	–	–	4.0 3.5	V	$T_A = 25\text{ °C}$ $T_A = -55\text{ °C}$
Supply current at VCC pin	$I_{CC}$	–	–	25	mA	–
IDC current at RF-In Pin	$I_B$	–	–	3	mA	–
Control On / Off voltage	$V_{ctrl}$	–	–	4.0	V	–
Total power dissipation <sup>1)</sup>	$P_{tot}$	–	–	100	mW	$T_S \leq 112\text{ °C}$
Junction temperature	$T_J$	–	–	150	°C	–
Storage temperature	$T_{Stg}$	-55	–	150	°C	–

### ESD Capability

Human Body Model JESD22-A114-B	–	–	–	2000	V	–
Machine Model JESD22-A115-A	–	–	–	100	V	–
Charge Device Model JESD22-C101-C	–	–	–	1500	V	–

1)  $T_S$  is the soldering point temperature.  $T_S$  is measured at the GND pin (7) at the soldering point to the pcb

**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.**

## 5 Thermal Characteristics

Table 5-1 Thermal Resistance

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Junction - soldering point <sup>1)</sup>	$R_{thJS}$	–	375	–	K/W	–

1)For the definition of  $R_{thJS}$  please refer to Application Note AN077 (Thermal Resistance Calculation)

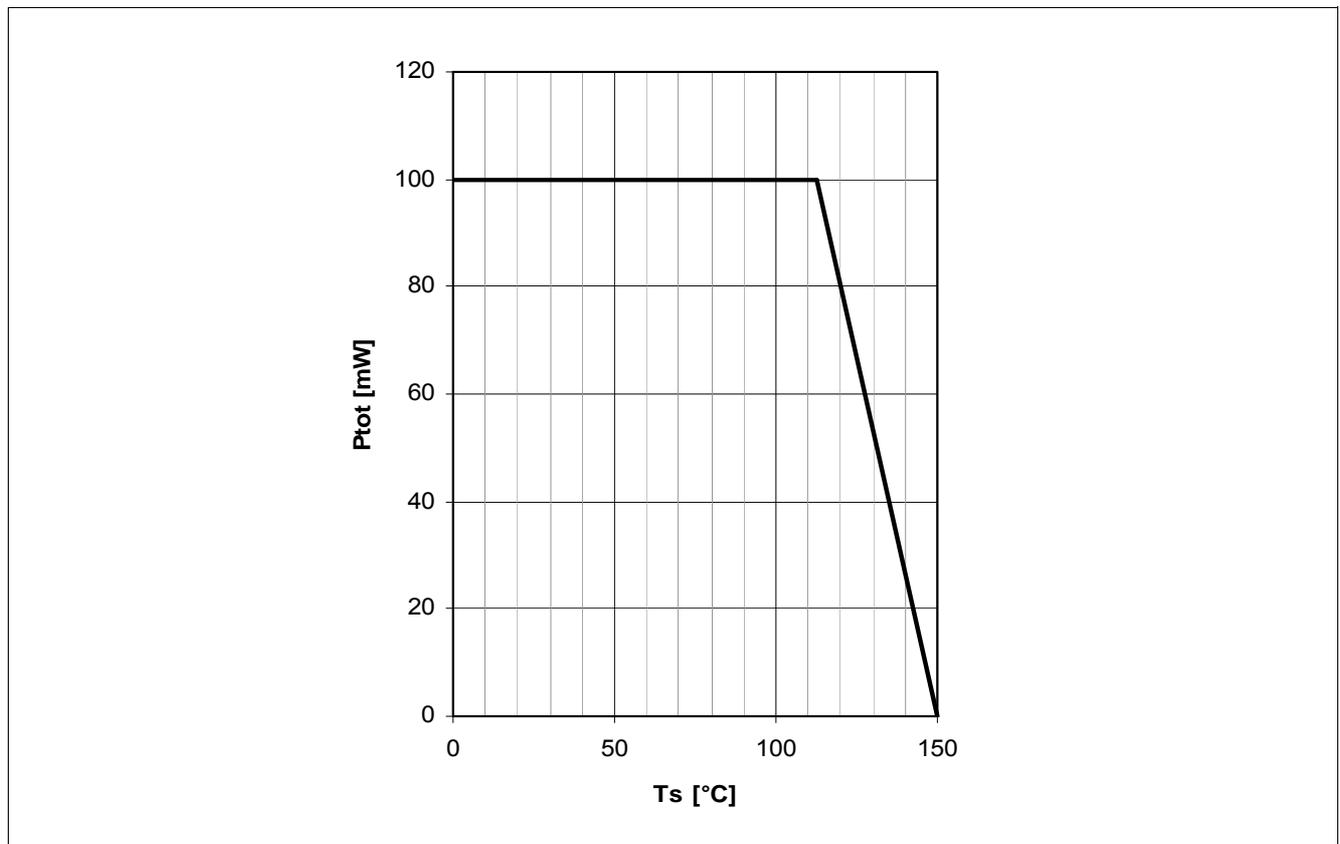


Figure 5-1 Total Power Dissipation  $P_{tot} = f(T_s)$

## 6 Operation Conditions

Table 6-1 Operation Conditions

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply voltage	$V_{CC}$	1.8	3.0	4.0	V	–
Voltage Ctrl On/Off pin in On mode	$V_{ctrl-on}$	1.2	3.0	$V_{CC}$	V	–
Voltage Ctrl On/Off pin in Off mode	$V_{ctrl-off}$	-0.3	0	0.3	V	–

## 7 Electrical Characteristics

### 7.1 DC Characteristics

Table 7-1 DC Characteristics at  $T_A = 25\text{ }^\circ\text{C}$

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply current	$I_{CC}$	2.4	3.0	3.6	mA	$V_{CC} = 3\text{ V}$ $V_{ctrl} = 3\text{ V}$ Small signal operation
Supply current in Off mode	$I_{CC-off}$	–	1	6	$\mu\text{A}$	$V_{CC} = 4.0\text{ V}$ $V_{ctrl} = 0\text{ V}$
Current into Ctrl On/Off pin in On mode	$I_{ctrl-on}$	–	14	20	$\mu\text{A}$	$V_{CC} = 3\text{ V}$ $V_{ctrl} = 3\text{ V}$
Current into Ctrl On/Off pin in Off mode	$I_{ctrl-off}$	–	–	0.1	$\mu\text{A}$	$V_{CC} = 4.0\text{ V}$ $V_{ctrl} = 0\text{ V}$

### 7.2 AC Characteristics

This section presents the AC characteristics of the BGB717L7ESD as measured in a high-ohmic FM radio application circuit using a PCB and a population as described in the application note AN176. Please consult our website to download the application note: [www.infineon.com/rf.appnotes](http://www.infineon.com/rf.appnotes).

The application schematic is shown in Figure 7-1 and the function of each component is explained in Table 7-2.

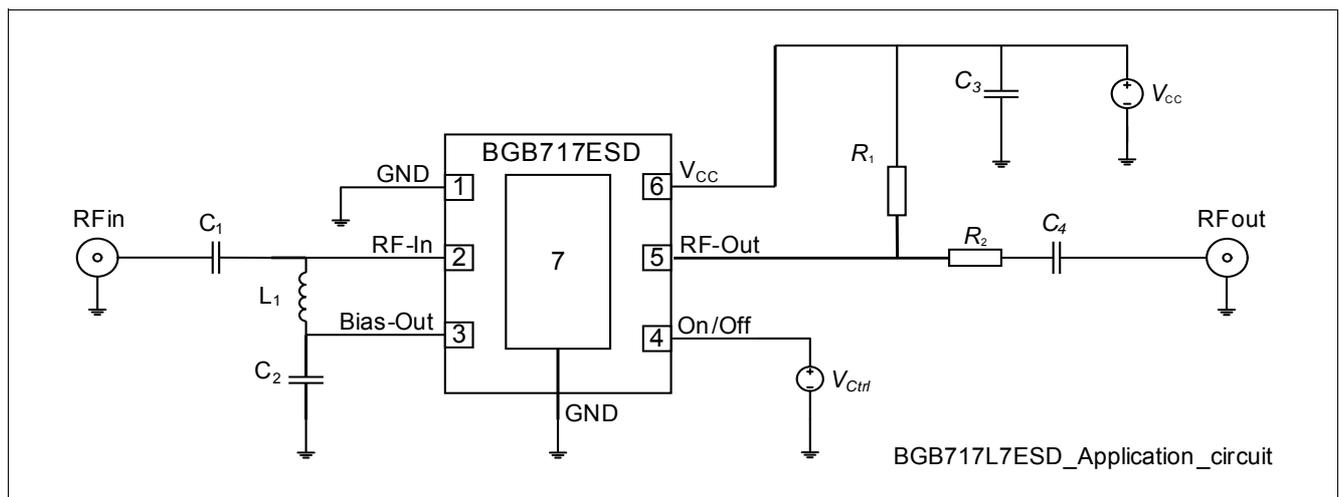


Figure 7-1 FM Radio Testing Circuit

**Table 7-2 Bill of Material**

Component	Value	Manufacturer / Type	Function
C <sub>1</sub>	330 pF	Various / 0402	DC blocking
C <sub>2</sub>	47 nF	Various / 0402	DC stabilization
C <sub>3</sub>	47 nF	Various / 0402	DC stabilization
C <sub>4</sub>	330 pF	Various / 0402	DC blocking
R <sub>1</sub>	56 Ω	Various / 0402	For biasing, output matching and stabilization
R <sub>2</sub>	10 Ω	Various / 0402	For output matching and stabilization
L <sub>1</sub>	470 nH	Taiyo Yuden LK1608R47K-T / 0603	RF choke

The following table gives an overview on the performance of the FM radio LNA application circuit. All data were measured in a 50 Ω system.

**Table 7-3 AC Characteristics in the FM Radio LNA Application<sup>1)</sup>**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Insertion power gain	$ S_{21} ^2$	10	12	14	dB	–
Input return loss <sup>2)</sup>	$RL_{IN}$	0	0.5 <sup>3)</sup>	3	dB	–
Output return loss <sup>2)</sup>	$RL_{OUT}$	13	16 <sup>4)</sup>	19	dB	–
Noise figure <sup>5)</sup>	$NF_{50}$	–	1.0	1.5	dB	$Z_s = 50 \Omega$
Input 1dB gain compression point <sup>2)</sup>	$IP_{-1dB}$	-8.0	-5.5	–	dBm	–
Input 3 <sup>rd</sup> Order Intercept Point <sup>2)</sup>	$IIP_3$	-15.5	-12.5	–	dBm	$P_{RFIN} = -40 \text{ dBm}$

1) As described in AN176,  $T_A = 25 \text{ °C}$ ,  $V_{CC} = 3 \text{ V}$ ,  $V_{ctrl} = 3 \text{ V}$ ,  $I_{CC} = 3 \text{ mA}$ ,  $f = 100 \text{ MHz}$

2) Verified by random sampling

3) High LNA input impedance leads to power matching with high ohmic antennas

4) Output matching is accomplished by the external resistors R1 and R2

5) An aggressive low pass filter prevents radio broadcast signals from distorting the NF measurement

## 8 Package Information TSLP-7-1

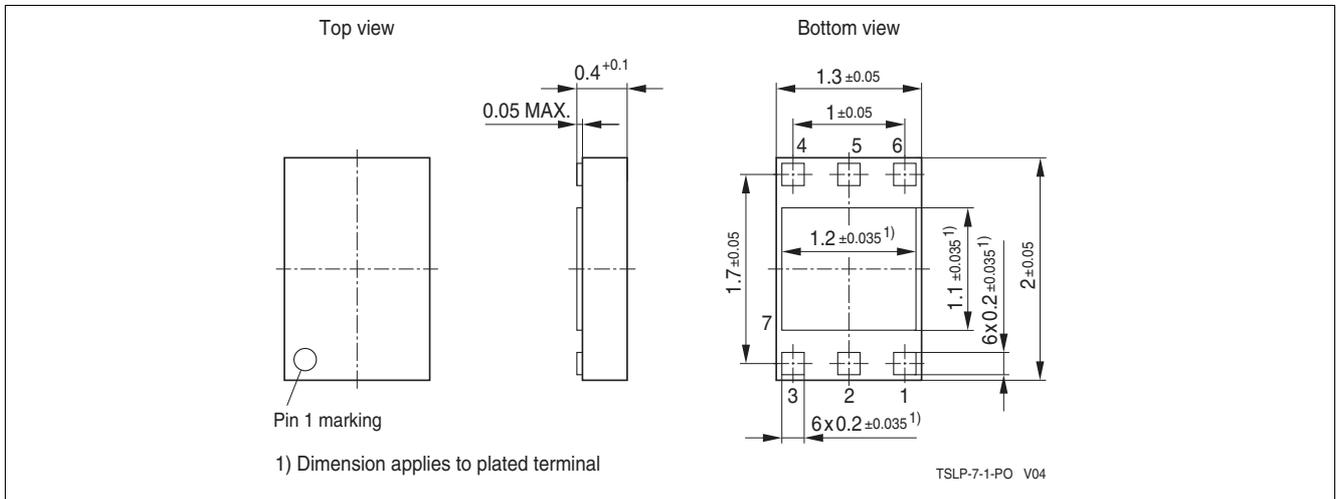


Figure 8-1 Package Outline

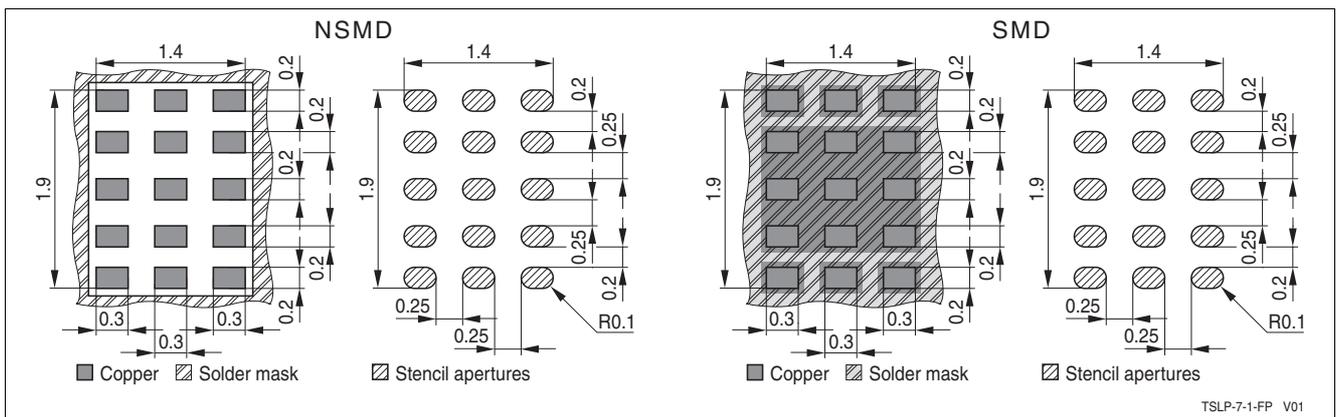


Figure 8-2 Package Footprint

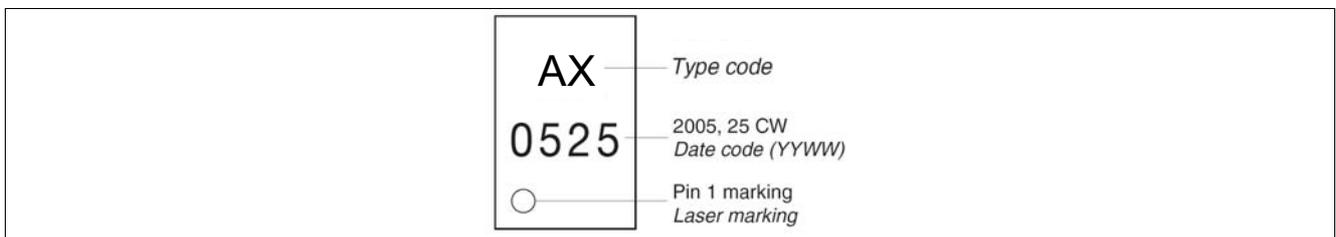


Figure 8-3 Marking Example (Marking BGB717L7ESD: AX)

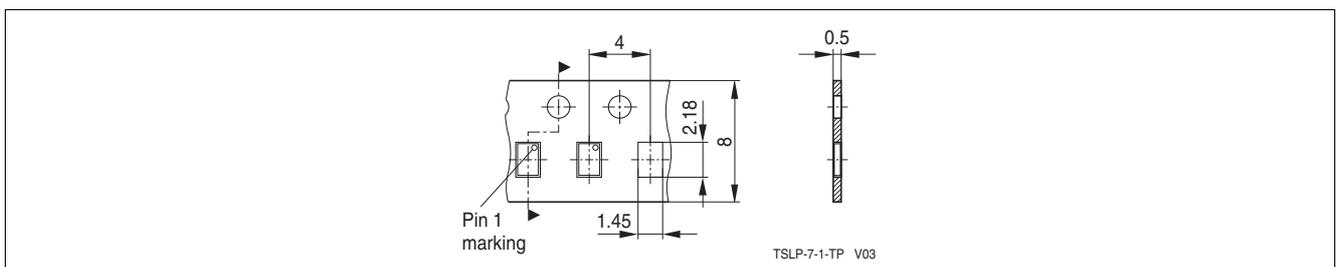


Figure 8-4 Tape Dimensions

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