BGB719N7ESD

Low Noise Amplifier MMIC for FM Radio Applications

Data Sheet

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RF & Protection Devices

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BGB719N7ESD, Low Noise Amplifier MMIC for FM Radio Applications

Revision History: 2012-10-30, Revision 1.1

Page	Subjects (changes since previous revision)
	This data sheet replaces the revision from 2011-10-10. 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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1 Product Brief

So-called active antenna modules containing a unique passive structure tailored for FM radio and directly interfaced to appropriate amplifier circuitry are rapidly gaining market acceptance in emerging mobile device applications. High gain, low noise amplifiers with small footprints and high robustness against electrostatic discharge are key components for these active antenna designs. The BGB719N7ESD fulfills all the necessary criteria for such active antennas and is able to solve the main problems in embedded active FM antenna designs for handset devices enhancing the receiver sensitivity and consuming less power and less board space.
The device is based on Infineon Technologies' cost effective Silicon Germanium (SiGe:C) technology and comes in a small leadless green package with visible leads enabling optical inspection of soldering quality.

2 Features

- High performance FM Radio LNA with integrated biasing
- Frequency range: 10 MHz to 1 GHz
- Low external parts count
- Super miniature low profile leadless package TSNP-7-6, 1.26 x 1.4 x 0.37 mm
- High gain at only 2.8 mA current consumption
- Integrated active biasing circuit enables stable operating point against temperature-, supply voltage- and processing-variations
- Integrated ESD protection for all pins (1.5 kV, HBM)
- High input compression point
- High input impedance
- Excellent noise figure from latest SiGe:C technology
- Supply voltage: 1.5 V to 4.0 V
- Power-off function
- Pb-free (RoHS compliant) and halogen-free package
- Qualification report according to AEC-Q101 available

RoHS

HAL

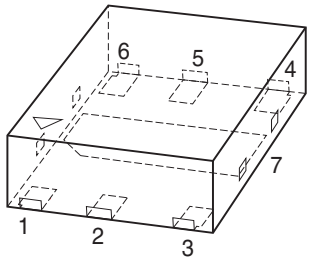
Applications

- Low noise amplifier and active matching for FM reception with small antennas in all kinds of mobile devices such as cell phones, PDAs, portable FM Radio, MP3 players
- Low noise amplifier at 13.56 MHz for Near Field Communication (NFC) applications

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

Product Name	Package	Marking
BGB719N7ESD	TSNP-7-6	AC

3 Pin Configuration



TSNP-7-6

Figure 3-1 Pinning of BGB719N7ESD in TSNP-7-6

Table 3-1 Pinning Table

Pin	Name	Function
1	V_{Ctrl}	On/Off control voltage
2	RF_{IN}	RF input
3	GND_{RF}	RF GND
4	NC	Not connected
5	RF_{OUT}	RF output
6	V_{CC}	Supply voltage
7	GND_{DC}	DC GND

4 Functional Block Diagram

The functional block in **Figure 4-1** shows the principal schematic how the BGB719N7ESD is used in a circuit. The Power On/Off function is controlled by applying V_{Ctrl}. Base- and collector voltages are applied internally.

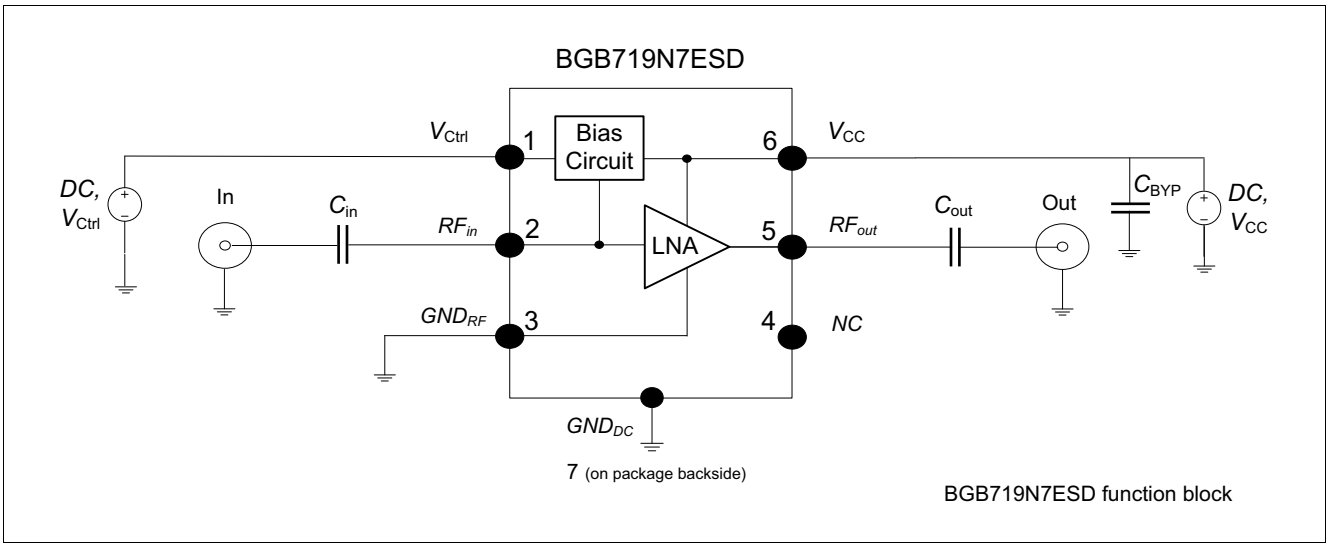


Figure 4-1 Functional Block Diagram

Table 4-1 Bill of Materials

Component	Value	Manufacturer / Type	Function
C_{IN}	330 pF	Various / 0402	DC blocking
C_{OUT}	330 pF	Various / 0402	DC blocking
C_{BYP}	47 nF	Various / 0402	Bypass capacitor

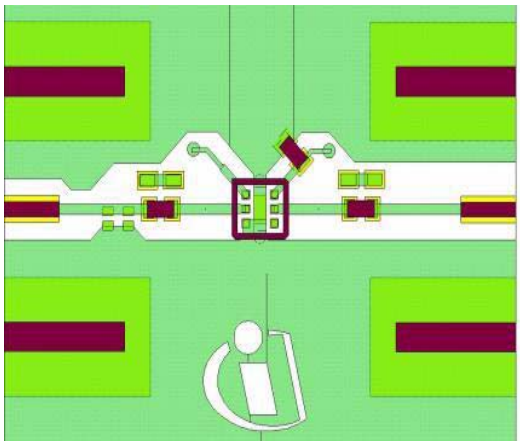


Figure 4-2 Application Board Drawing

5 Maximum Ratings

Table 5-1 Maximum Ratings at T_A = 25 °C

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply voltage	V_{CC}	–	–	4.0	V	–
Supply current at V_{CC} pin	I_{CC}	–	–	25	mA	–
DC current at RF_{IN} Pin	I_B	–	–	3	mA	–
On/Off control voltage	V_{ctrl}	–	–	V_{CC}	V	–
Total power dissipation[1)]	P_{tot}	–	–	100	mW	T_S ≤ 112 °C
Junction temperature	T_J	–	–	150	°C	–
Storage temperature	T_{Stg}	-55	–	150	°C	–

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

Table 5-2 ESD Robustness

Testing Model	Standard	Value	Unit
Human Body Model	JESD22-A114-B	1500	V

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.

6 Thermal Characteristics

Table 6-1 Thermal Resistance

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

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

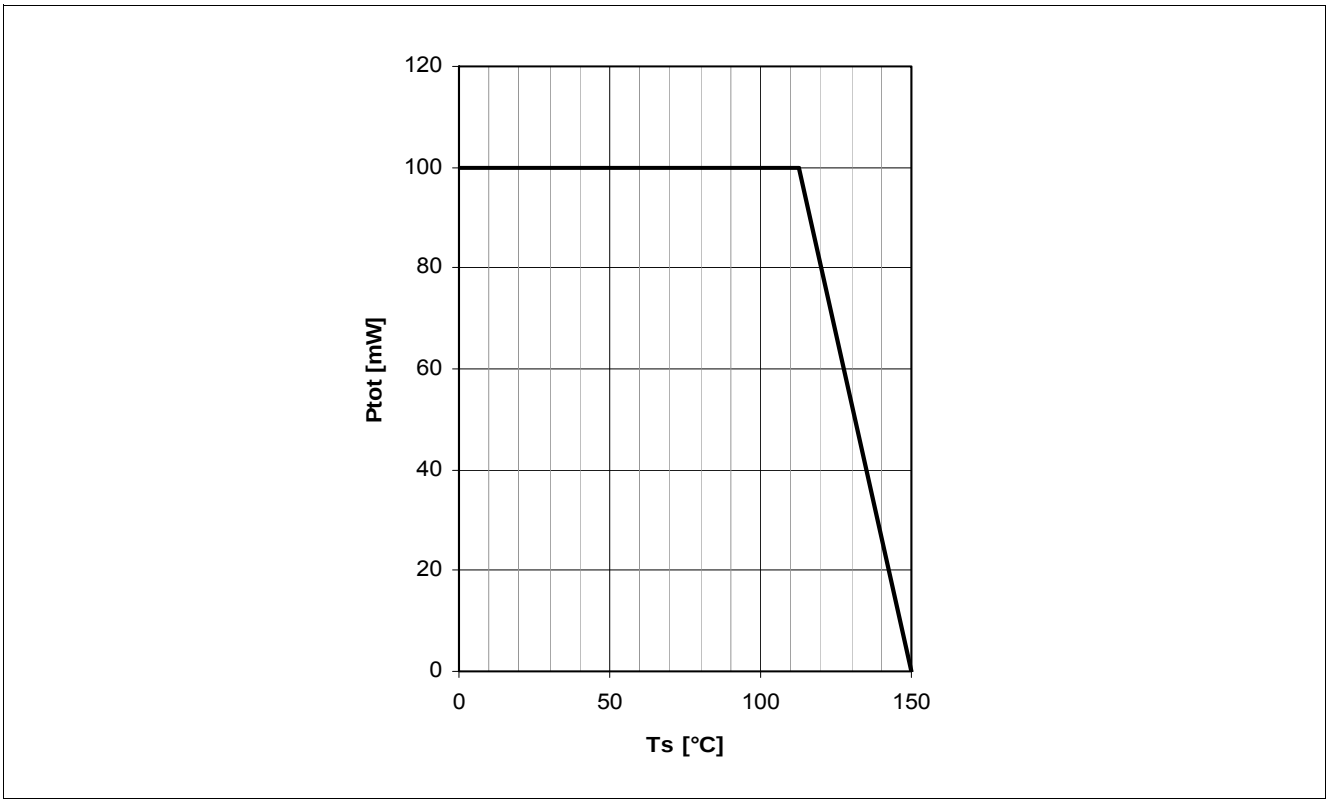


Figure 6-1 Total Power Dissipation $P_{tot} = f(T_S)$

7 Operation Conditions

Table 7-1 Operation Conditions at T_A = 25 °C

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply voltage	V_{CC}	1.5	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	–

8 Electrical Characteristics

8.1 DC Characteristics

Table 8-1 DC Characteristics at T_A = 25 °C

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply current	I_{CC}	2.3	2.8	3.3	mA	V_{CC} = 3 V V_{ctrl} = 3 V Small signal operation
Supply current in Off mode	$I_{CC\text{-}off}$	–	1	6	µA	V_{CC} = 4.0 V V_{ctrl} = 0 V
Current into Ctrl On/Off pin in On mode	$I_{ctrl\text{-}on}$	–	6	9	µA	V_{CC} = 3 V V_{ctrl} = 3 V
Current into Ctrl On/Off pin in Off mode	$I_{ctrl\text{-}off}$	–	–	0.3	µA	V_{CC} = 4.0 V V_{ctrl} = 0 V

8.1.1 Typical DC Characteristic Curves

The measurement Setup is an application circuit according to **Figure 4-1**. T_A= 25 °C

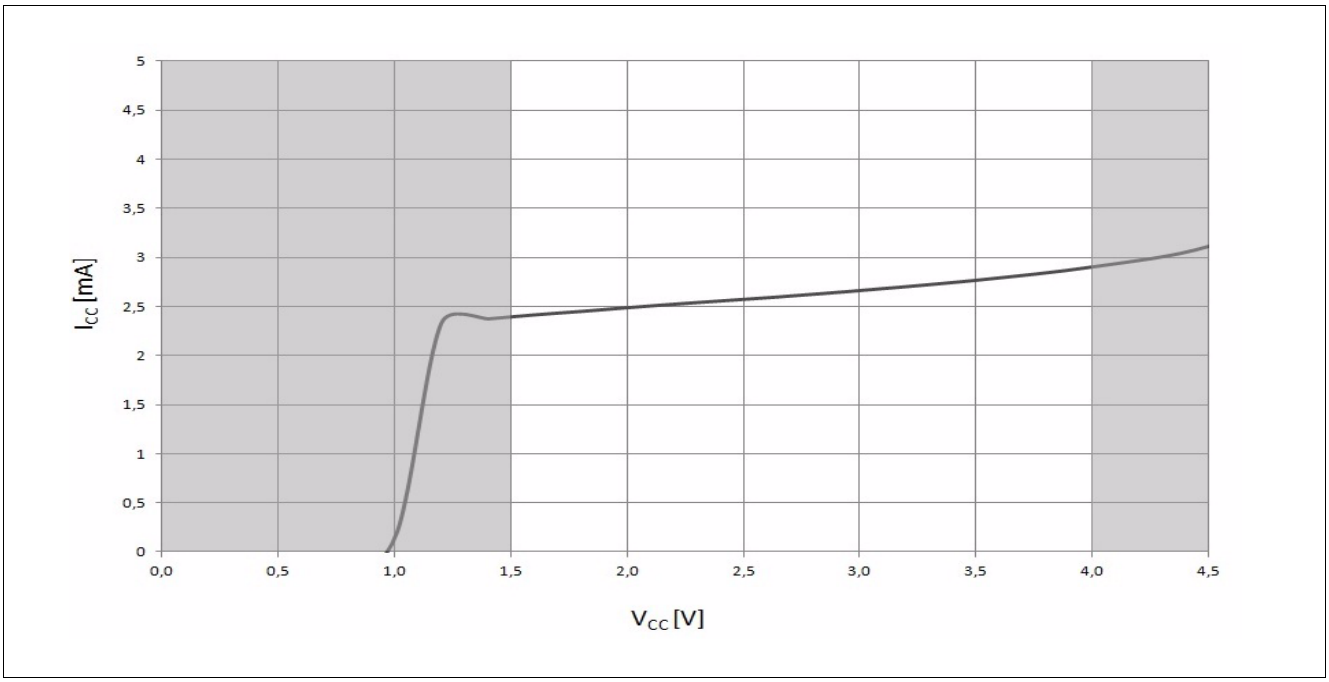


Figure 8-1 I_{CC} as a function of V_{CC}, V_{Ctrl} = 3 V

8.2 AC Characteristics

Table 8-2 AC characteristics in the FM Radio LNA Application[1)]

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Insertion power gain	$\|S_{21}\|^2$		13.5		dB	–
Input return loss[2)]	RL_{IN}	–	0.5[3)]	–	dB	–
Output return loss[2)]	RL_{OUT}	–	11	–	dB	–
Noise figure[4)]	NF_{50}	–	1.2	–	dB	Z_S = 50 Ω
Input 1dB gain compression point[2)]	IP_{-1dB}	–	-6	–	dBm	–
Input 3rd Order Intercept Point[2)]	IIP_3	–	-14	–	dBm	P_{RFIN} = -30 dBm

1) As described in AN255, T_A= 25 °C, V_{CC} = 3 V, V_{Ctrl} = 3 V, f = 100 MHz
2) Verified by random sampling
3) High LNA input impedance leads to power matching with high ohmic antennas
4) A low pass filter prevents radio broadcast signals from distorting the NF measurement

8.2.1 Typical AC Characteristic Curves

The measurement Setup is an application circuit according to **Figure 4-1**. T_A = 25 °C

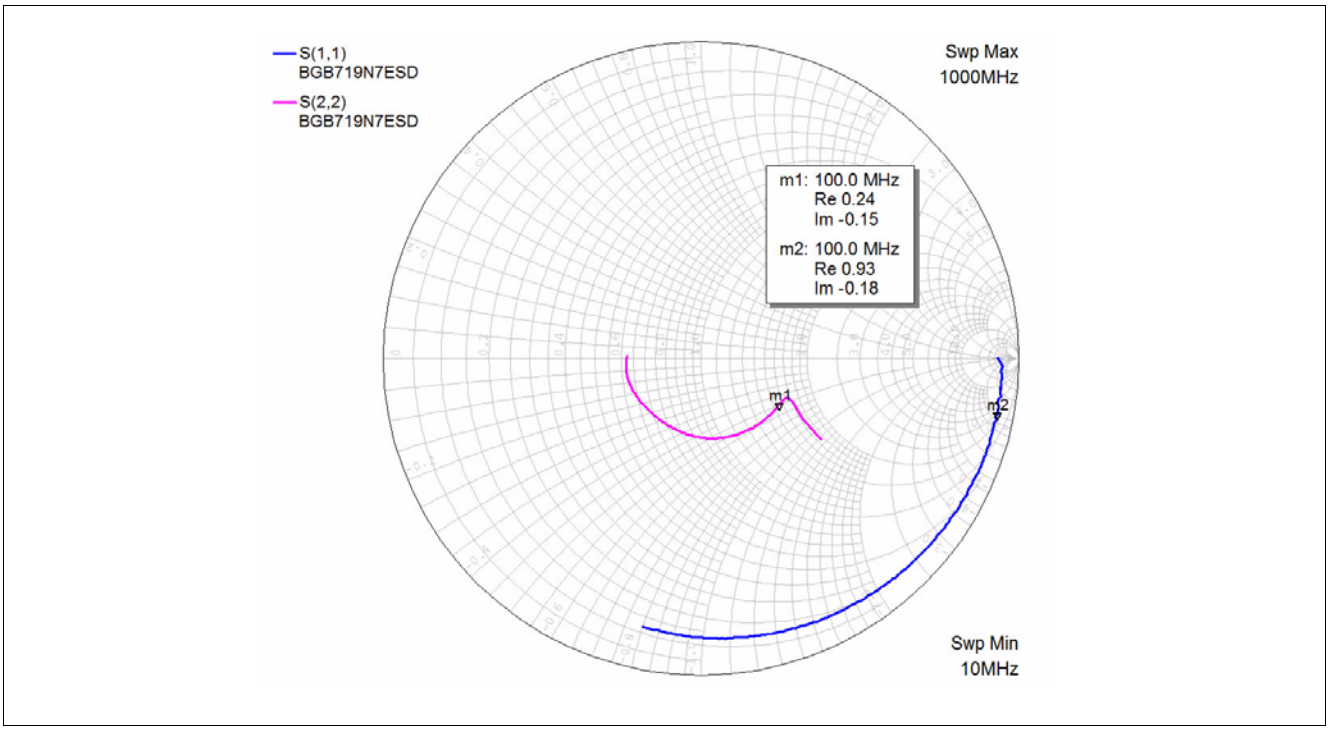


Figure 8-2 Input and Output matching curves

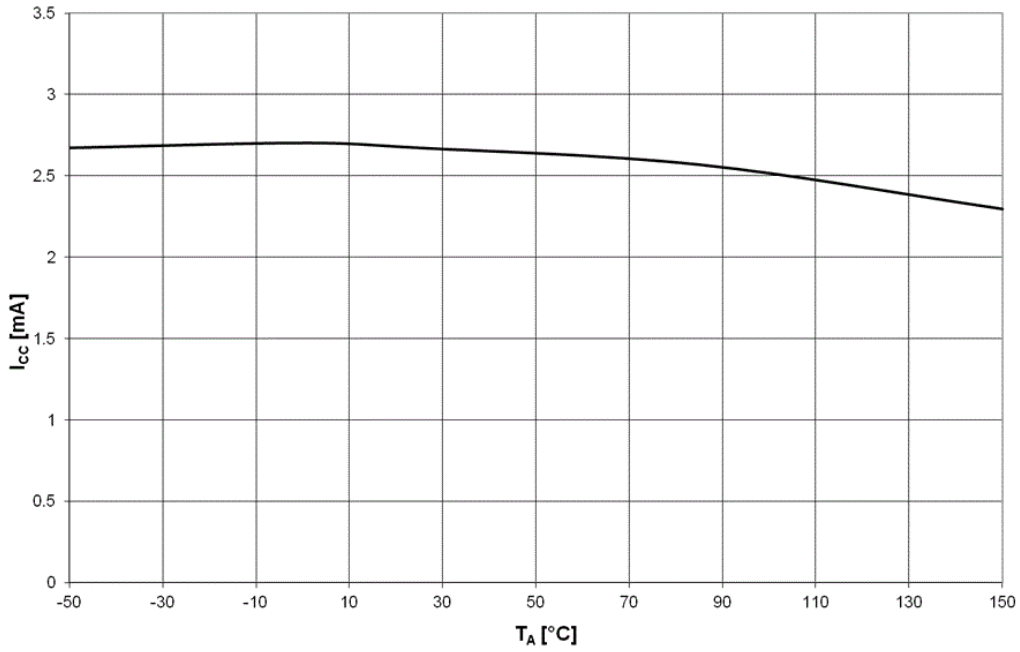


Figure 8-3 I_{CC} as a function of T_A

9 Package Information TSNP-7-6

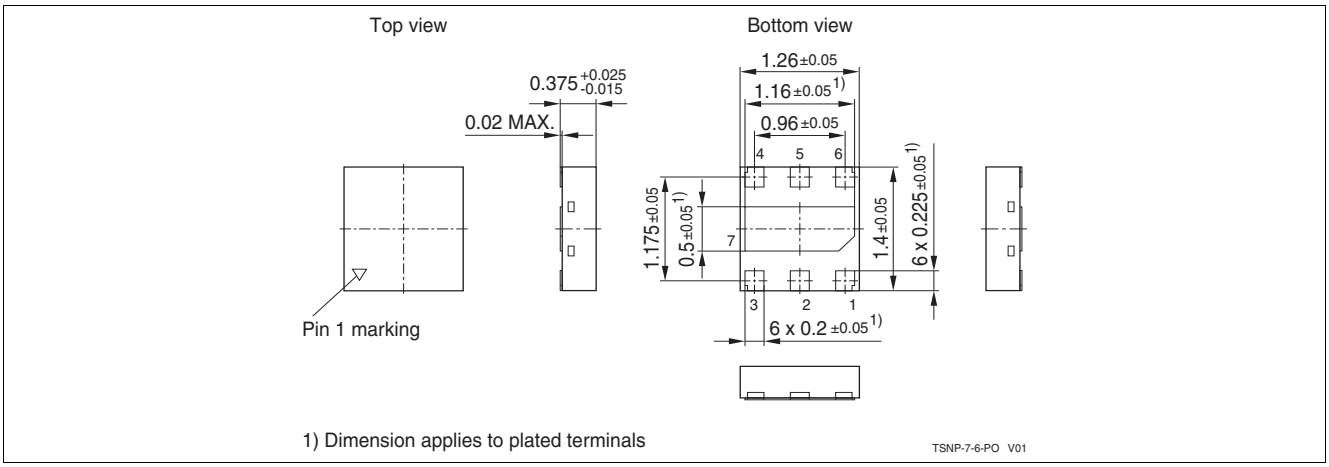


Figure 9-1 Package Outline

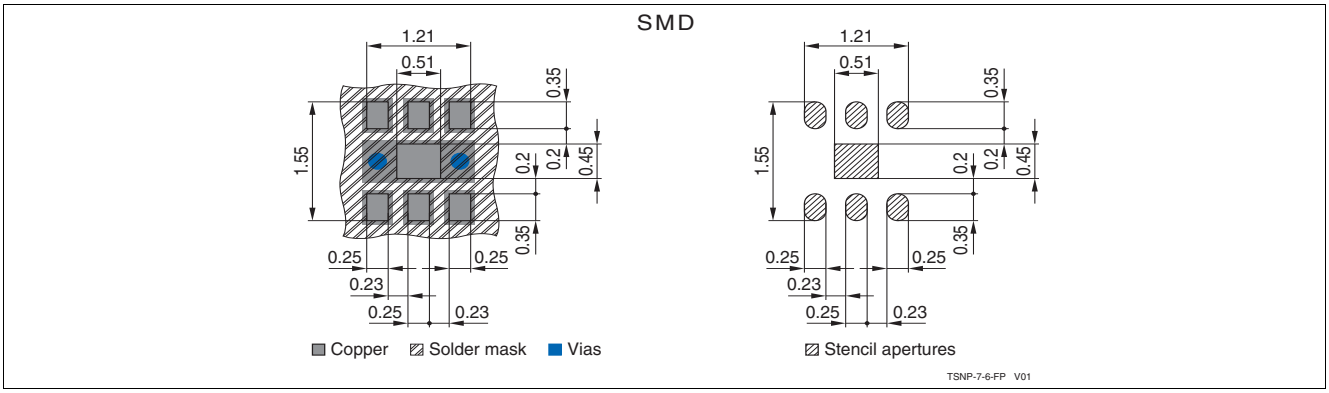


Figure 9-2 Package Footprint

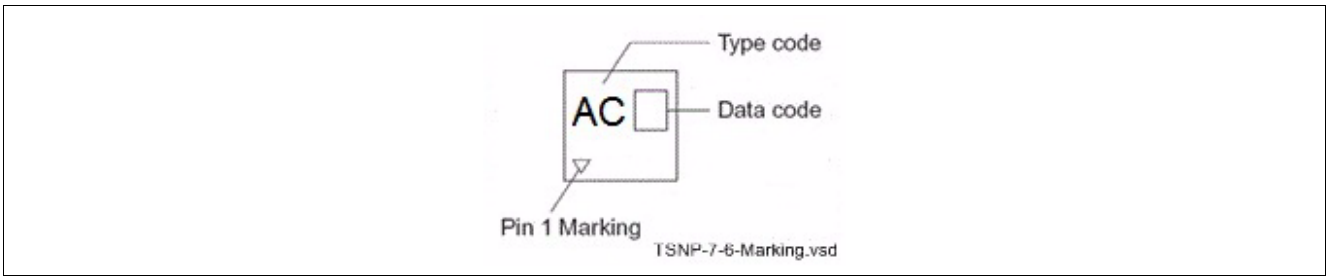


Figure 9-3 Marking Description (Marking BGB719N7ESD: AC)

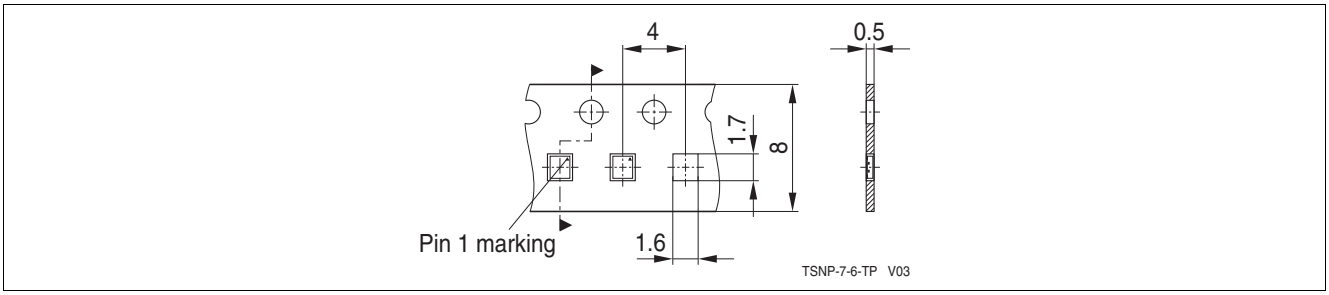


Figure 9-4 Tape Dimensions

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