BGA628L7

Silicon Germanium Wide Band Low Noise Amplifier

Data Sheet

Revision 1.1, 2009-12-17
Preliminary

RF & Protection Devices

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BGA628L7 Silicon Germanium Wide Band Low Noise Amplifier

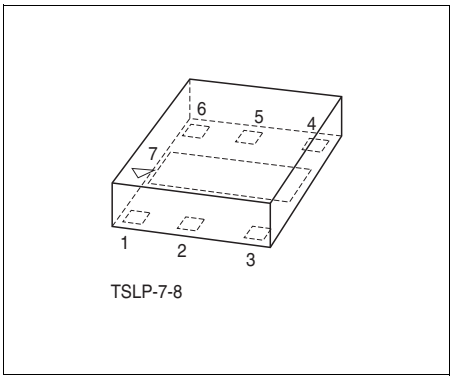
Revision History: 2009-12-17, Revision 1.1

Previous Revision: 2009-08-03, Revision 1.0

Page	Subjects (major changes since last revision)
5	Features and description updated
6	Table “Pin Definition and Function“ added
13	Application Information added

Table of Contents

Features



- Extremely thin and small dimension
  (1.4 mm x 1.26 mm x 0.31 mm only)
- Operating frequency range 0.4 - 6 GHz
- High gain at low current consumption of 5.8 mA
  G_{ma} = 21.5 dB at 1.575 GHz
  G_{ma} = 19.0 dB at 2.4 GHz
- Low noise figure
  NF_{min} = 0.75 dB at 1.575 GHz
  NF_{min} = 0.8 dB at 2.4 GHz
- Typical supply voltage: 2.75 V
- Off mode
- Integrated RF choke on internal bias network
- Input and Output pre-matched on chip
- Low external part count
- 2 kV HBM ESD protection on all pins
- Leadless, Pb-free (RoHS compliant) and halogen-free TSLP-7-8 package

RoHS

Applications

- General Purpose LNA for Bluetooth, GPS, ISDB-T Mobile TV, UMTS, Wi-Fi and WLAN

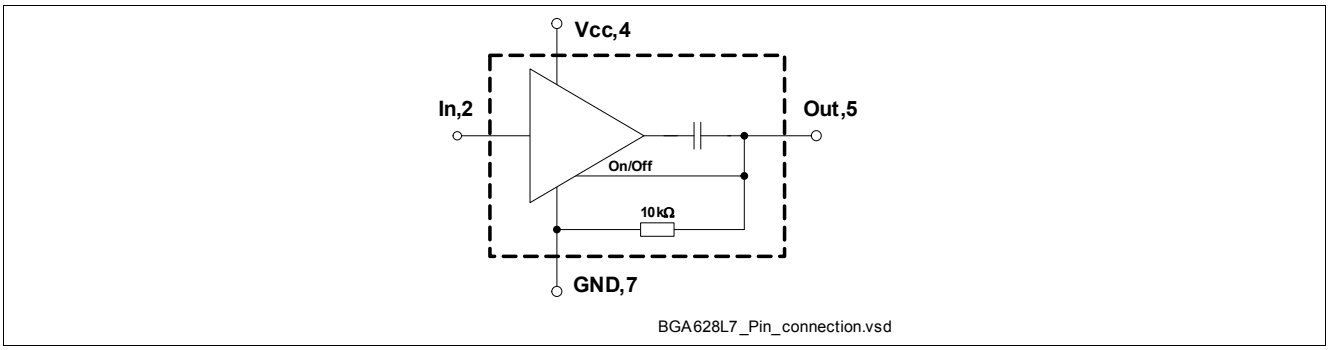


Figure 1 Pin Connection

Note: ***ESD:*** *Electrostatic discharge sensitive device, observe handling precaution*

Product Name	Marking	Package
BGA628L7	BR	TSLP-7-8

Description

The BGA628L7 is a wide band low noise amplifier, based on Infineon Technologies' Silicon Germanium Technology B7HFM. It features extremely small form factor with height of 0.32 mm maximum, and size of 1.4 x 1.26 mm^2 only. Such small dimension, together with the low external part count, has made it ideal for size-critical modules e.g. for WLAN, mobile TV or cellular phones.

Having an On/Off switch on-chip, the LNA's Out pin is simutaneously used for RF Out and On/Off switch. This functionality can be accessed using a RF-Choke at the Out pin, where a DC level of 0 V or an open switches the device on and a DC level of V_{CC} switches off.

Please refer to the product website (**www.infineon.com**) for various application examples, application notes and technical reports.

Pin Definition and Function

Table 1 Pin Definition and Function

Pin No.	Symbol	Function
1	n.c.	not connected
2	In	RF input
3	n.c.	not connected
4	Vcc	DC supply
5	Out	RF output and On/Off switch
6	n.c.	not connected
7	GND	Ground

1 Maximum Ratings

Table 2 Maximum Ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Voltage at pin V_{CC}	V_{CC}	–	–	3.5	V	–
Voltage at pin Out	V_{out}	–	–	4	V	–
Current into pin In	I_{in}	–	–	0.1	mA	–
Current into pin Out	I_{out}	–	–	1	mA	–
Current into pin V_{CC}	I_{Vcc}	–	–	10	mA	–
RF input power	P_{in}	–	–	6	dBm	–
Total power dissipation, T_S < 138 °C[1)]	P_{tot}	–	–	35	mW	–
Junction temperature	T_J	–	–	150	°C	–
Ambient temperature range	T_A	65	–	150	°C	–
Storage temperature range	T_{STG}	65	–	150	°C	–
ESD capability all pins (HBM: JESD22-A114)	V_{ESD}	–	–	2000	V	–

1) T_S is measured on the ground lead at the soldering point

Note: All Voltages refer to GND-Node

Thermal Resistance

Table 3 Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point[1)]	R_{thJS}	330	K/W

1) For calculation of R_{thJA} please refer to Application Note Thermal Resistance

2 Electrical Characteristics

2.1 DC Characteristics

Table 4 DC Characteristics at T_A = 25 °C

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Total device on current	I_{tot-on}	–	5.8	–	mA	V_{CC} = 2.75 V
Total device off current	$I_{tot-off}$	–	260	–	µA	V_{CC} = 2.75 V, V_{out} = V_{CC}
On / Off switch control voltage	V_{on}	0	–	0.8	V	V_{CC} = 2.75 V ON-Mode: V_{out} = V_{on}
	V_{off}	2.0	–	3.5	V	V_{CC} = 2.75 V OFF-Mode: V_{out} = V_{off}

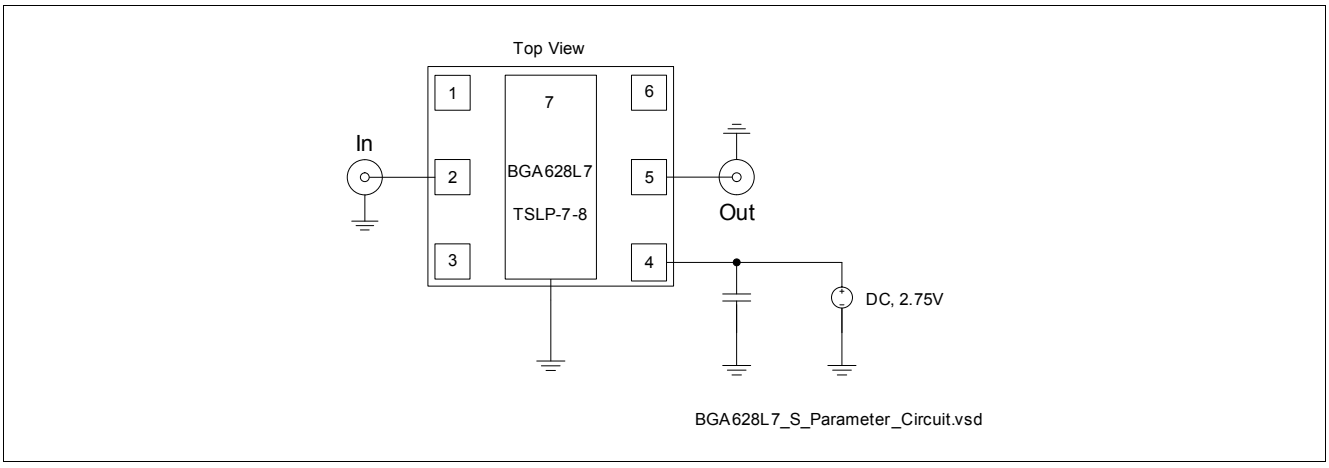


Figure 2 S-Parameter Test Circuit (loss-free microstrip line)

2.2 AC Characteristics

2.2.1 Electrical Characteristics at f = 450 MHz

Table 5 Electrical Characteristics at T_A = 25 °C (measured according to Figure 2), V_{CC} = 2.75 V, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Maximum available power gain	G_{ma}	–	24.5	–	dB	–
Insertion power gain	$\|S_{21}\|^2$	–	18.8	–	dB	–
Insertion power gain (Off-State)	$\|S_{21}\|^2$	–	-42	–	dB	V_{out} = 2.75 V
Input return loss	RLin	–	2	–	dB	–
Output return loss	RL_{out}	–	11	–	dB	–
Minimum noise figure	NF_{min}	–	0.65	–	dB	$Z_S = Z_{Sopt}$
Noise figure in 50 Ω System	$NF_{50\Omega}$	–	0.8	–	dB	$Z_S = Z_L$ =50 Ω
Input third order intercept point[1)] (On-State)	$IIP3$	–	-13	–	dBm	Δf = 1 MHz, P_{IN} = -28 dBm
Input power at 1 dB gain compression	P_{-1dB}	–	-24.5	–	dBm	–

1) IP_3 values depends on termination of all intermodulation frequency components. Termination used for this measurement is 50 Ω from 0.1 to 6 GHz

2.2.2 Electrical Characteristics at f = 900 MHz

Table 6 Electrical Characteristics at T_A = 25 °C (measured according to Figure 2), V_{CC} = 2.75 V, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Maximum available power gain	G_{ma}	–	23	–	dB	–
Insertion power gain	$\|S_{21}\|^2$	–	18.8	–	dB	–
Insertion power gain (Off-State)	$\|S_{21}\|^2$	–	-34	–	dB	V_{out} = 2.75 V
Input return loss	RLin	–	3	–	dB	–
Output return loss	RL_{out}	–	14	–	dB	–
Minimum noise figure	NF_{min}	–	0.7	–	dB	$Z_S = Z_{Sopt}$
Noise figure in 50 Ω System	$NF_{50\Omega}$	–	0.8	–	dB	$Z_S = Z_L$ =50 Ω
Input third order intercept point[1)] (On-State)	$IIP3$	–	-10	–	dBm	Δf = 1 MHz, P_{IN} = -28 dBm
Input power at 1 dB gain compression	P_{-1dB}	–	-24	–	dBm	–

1) IP_3 values depends on termination of all intermodulation frequency components. Termination used for this measurement is 50 Ω from 0.1 to 6 GHz

2.2.3 Electrical Characteristics at f = 1.575 GHz

Table 7 Electrical Characteristics at T_A = 25 °C (measured according to Figure 2), V_{CC} = 2.75 V, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Maximum available power gain	G_{ma}	–	21.5	–	dB	–
Insertion power gain	$\|S_{21}\|^2$	–	18	–	dB	–
Insertion power gain (Off-State)	$\|S_{21}\|^2$	–	-27	–	dB	V_{out} = 2.75 V
Input return loss	RLin	–	4	–	dB	–
Output return loss	RL_{out}	–	11	–	dB	–
Minimum noise figure	NF_{min}	–	0.75	–	dB	$Z_S = Z_{Sopt}$
Noise figure in 50 Ω System	$NF_{50\Omega}$	–	0.85	–	dB	$Z_S = Z_L$ =50 Ω
Input third order intercept point[1] (On-State)	$IIP3$	–	-2	–	dBm	Δf = 1 MHz, P_{IN} = -28 dBm
Input power at 1 dB gain compression	P_{-1dB}	–	-20.5	–	dBm	–

1) IP_3 values depends on termination of all intermodulation frequency components. Termination used for this measurement is 50 Ω from 0.1 to 6 GHz

2.2.4 Electrical Characteristics at f = 1.9 GHz

Table 8 Electrical Characteristics at T_A = 25 °C (measured according to Figure 2), V_{CC} = 2.75 V, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Maximum available power gain	G_{ma}	–	21.0	–	dB	–
Insertion power gain	$\|S_{21}\|^2$	–	17.5	–	dB	–
Insertion power gain (Off-State)	$\|S_{21}\|^2$	–	-26	–	dB	V_{out} = 2.75 V
Input return loss	RLin	–	5	–	dB	–
Output return loss	RL_{out}	–	10	–	dB	–
Minimum noise figure	NF_{min}	–	0.8	–	dB	$Z_S = Z_{Sopt}$
Noise figure in 50 Ω System	$NF_{50\Omega}$	–	0.9	–	dB	$Z_S = Z_L$ =50 Ω
Input third order intercept point[1]	$IIP3$	–	-1	–	dBm	Δf = 1 MHz, P_{IN} = -28 dBm
Input power at 1 dB gain compression	P_{-1dB}	–	-20	–	dBm	–

1) IP_3 values depends on termination of all intermodulation frequency components. Termination used for this measurement is 50 Ω from 0.1 to 6 GHz

2.2.5 Electrical Characteristics at f = 2.14 GHz

Table 9 Electrical Characteristics at T_A = 25 °C (measured according to Figure 2), V_{CC} = 2.75 V, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Maximum available power gain	G_{ma}	–	20	–	dB	–
Insertion power gain	$\|S_{21}\|^2$	–	17	–	dB	–
Insertion power gain (Off-State)	$\|S_{21}\|^2$	–	-24	–	dB	V_{out} = 2.75 V
Input return loss	RL_{in}	–	5	–	dB	–
Output return loss	RL_{out}	–	10	–	dB	–
Minimum noise figure	NF_{min}	–	0.8	–	dB	$Z_S = Z_{Sopt}$
Noise figure in 50 Ω System	$NF_{50\Omega}$	–	0.9	–	dB	$Z_S = Z_L$ =50 Ω
Input third order intercept point[1] (On-State)	IIP_3	–	0	–	dBm	Δf = 1 MHz, P_{IN} = -28 dBm
Input power at 1 dB gain compression	P_{-1dB}	–	-18.5	–	dBm	–

1) IP_3 values depends on termination of all intermodulation frequency components. Termination used for this measurement is 50 Ω from 0.1 to 6 GHz

2.2.6 Electrical Characteristics at f = 2.4 GHz

Table 10 Electrical Characteristics at T_A = 25 °C (measured according to Figure 2), V_{CC} = 2.75 V, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Maximum available power gain	G_{ma}	–	19	–	dB	–
Insertion power gain	$\|S_{21}\|^2$	–	16	–	dB	–
Insertion power gain (Off-State)	$\|S_{21}\|^2$	–	-24	–	dB	V_{out} = 2.75 V
Input return loss	RLin	–	6	–	dB	–
Output return loss	RL_{out}	–	9	–	dB	–
Minimum noise figure	NF_{min}	–	0.8	–	dB	$Z_S = Z_{Sopt}$
Noise figure in 50 Ω System	$NF_{50\Omega}$	–	0.95	–	dB	$Z_S = Z_L$ =50 Ω
Input third order intercept point[1]	IIP3	–	2	–	dBm	Δf = 1 MHz, P_{IN} = -28 dBm
Input power at 1 dB gain compression	P_{-1dB}	–	-17.5	–	dBm	–

1) IP_3 values depends on termination of all intermodulation frequency components. Termination used for this measurement is 50 Ω from 0.1 to 6 GHz

2.2.7 Electrical Characteristics at f = 3.5 GHz

Table 11 Electrical Characteristics at T_A = 25 °C (measured according to Figure 2), V_{CC} = 2.75 V, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Maximum available power gain	G_{ma}	–	16	–	dB	–
Insertion power gain	$\|S_{21}\|^2$	–	13.5	–	dB	–
Insertion power gain (Off-State)	$\|S_{21}\|^2$	–	-22	–	dB	V_{out} = 2.75 V
Input return loss	RLin	–	7	–	dB	–
Output return loss	RL_{out}	–	8	–	dB	–
Minimum noise figure	NF_{min}	–	0.9	–	dB	$Z_S = Z_{Sopt}$
Noise figure in 50 Ω System	$NF_{50\Omega}$	–	1.0	–	dB	$Z_S = Z_L$ =50 Ω
Input third order intercept point[1)]	$IIP3$	–	5	–	dBm	Δf = 1 MHz, P_{IN} = -28 dBm
Input power at 1 dB gain compression	P_{-1dB}	–	-14.5	–	dBm	–

1) IP_3 values depends on termination of all intermodulation frequency components. Termination used for this measurement is 50 Ω from 0.1 to 6 GHz

2.2.8 Electrical Characteristics at f = 5.5 GHz

Table 12 Electrical Characteristics at T_A = 25 °C (measured according to Figure 2), V_{CC} = 2.75 V, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Maximum available power gain	G_{ma}	–	10	–	dB	–
Insertion power gain	$\|S_{21}\|^2$	–	8	–	dB	–
Insertion power gain (Off-State)	$\|S_{21}\|^2$	–	-23	–	dB	V_{out} = 2.75 V
Input return loss	RLin	–	8	–	dB	–
Output return loss	RL_{out}	–	6	–	dB	–
Minimum noise figure	NF_{min}	–	1.1	–	dB	$Z_S = Z_{Sopt}$
Noise figure in 50 Ω System	$NF_{50\Omega}$	–	1.3	–	dB	$Z_S = Z_L$ =50 Ω
Input third order intercept point[1)]	$IIP3$	–	9	–	dBm	Δf = 1 MHz, P_{IN} = -28 dBm
Input power at 1 dB gain compression	P_{-1dB}	–	-11	–	dBm	–

1) IP_3 values depends on termination of all intermodulation frequency components. Termination used for this measurement is 50 Ω from 0.1 to 6 GHz

3 Application Information

A list of all application notes is available at **http://goto.infineon.com/smallsignaldiscretes-appnotes**.

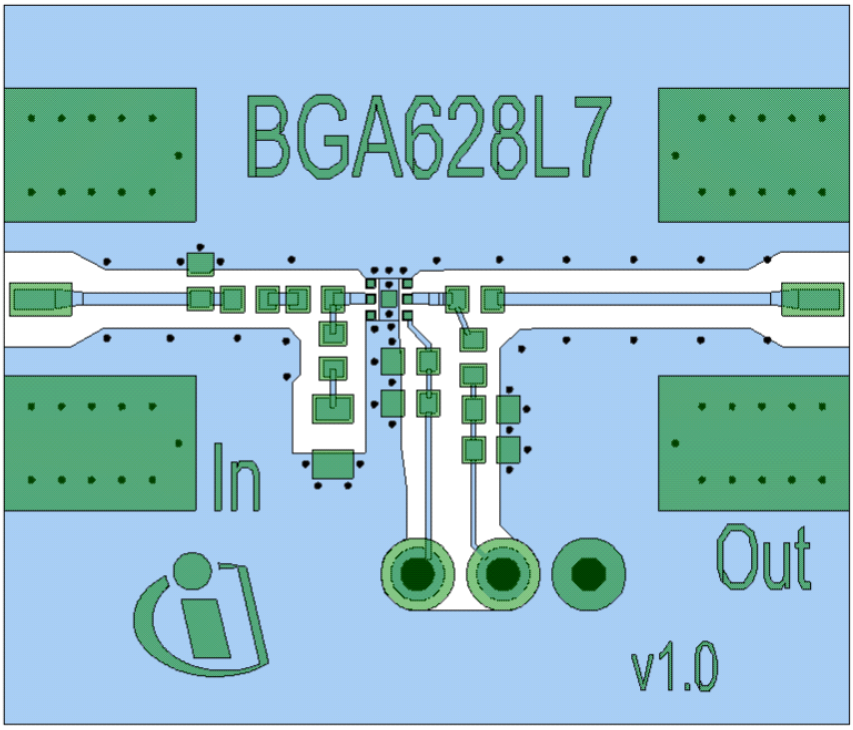


Figure 3 Drawing of Application Board

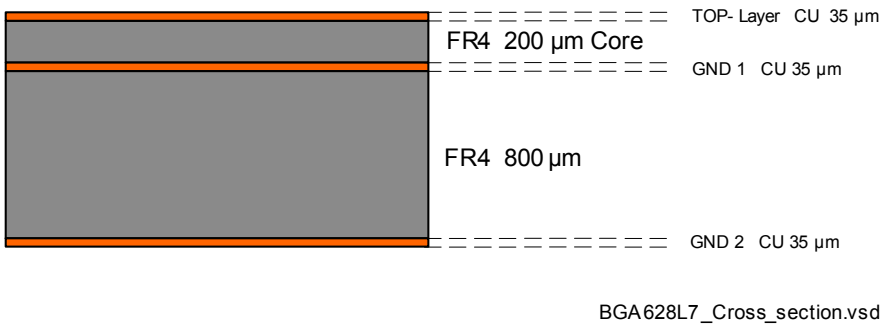


Figure 4 Cross-section of Application Board

4 Package Information

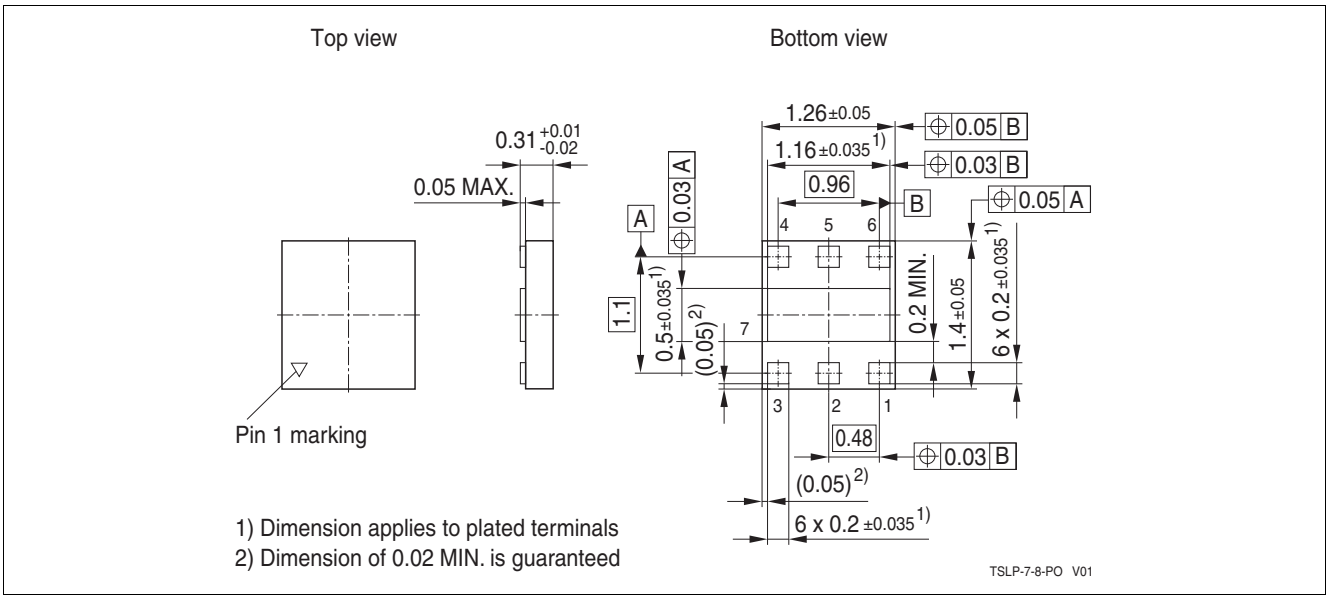


Figure 5 Package Dimensions for TSLP-7-8

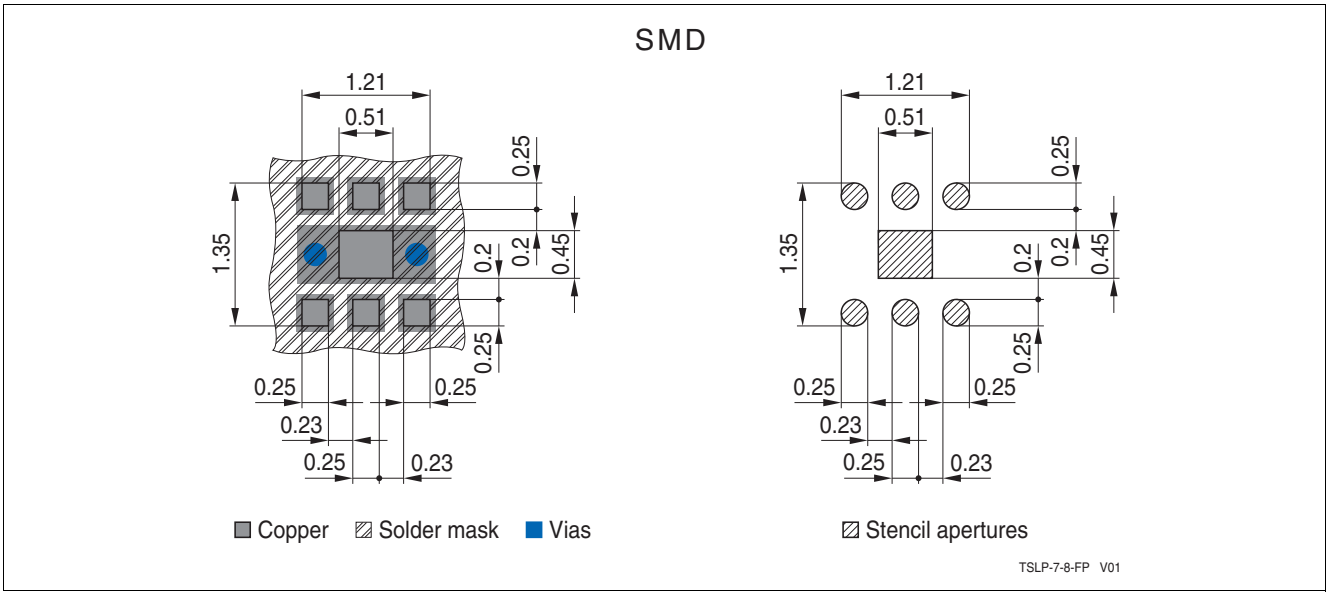


Figure 6 Footprint TSLP-7-8

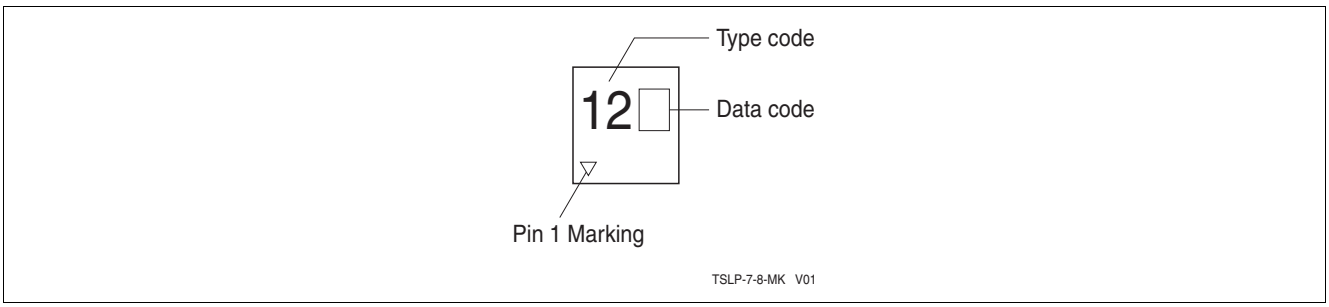


Figure 7 Marking Layout

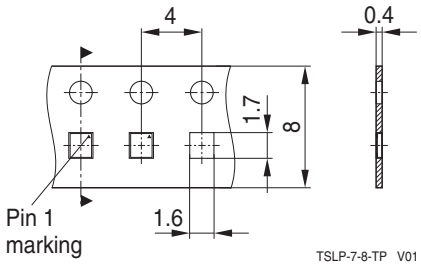


Figure 8 Tape & Reel Dimensions (Ø reel 180 mm, pieces/reel 7500)

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