

# BGA715N7

Silicon Germanium Low Noise Amplifier  
for Global Navigation Satellite Systems (GNSS)

## Data Sheet

Revision 1.0, 2013-01-29  
Preliminary

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**Revision History**

Page or Item	Subjects (major changes since previous revision)
<b>Revision 1.0, 2013-01-29</b>	
all	Initial version for new packages TSNP-7-1 / TSNP-7-2

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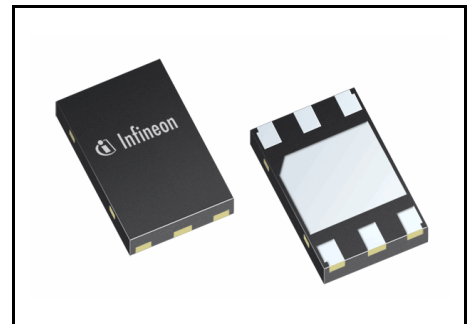
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## Silicon Germanium Low Noise Amplifier for Global Navigation Satellite Systems (GNSS)

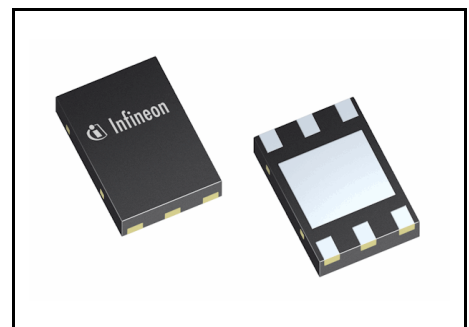
BGA715N7

### Features

- High gain: 20 dB
- Low noise figure: 0.7 dB
- Low current consumption: 3.3 mA
- Supply voltage: 1.5 V to 3.3 V
- High input 1dB-compression point -15.5 dBm at 1.8 V supply
- High input 3<sup>rd</sup>-order intercept point -7 dBm at 1.8 V supply
- B7HFM Silicon Germanium technology
- RF output internally matched to 50  $\Omega$
- Low external part count
- 2kV HBM ESD protection (including AI-pin)
- Tiny TSNP-7-1 / TSNP-7-2 leadless packages
- Moisture sensitivity level: MSL 1
- Pb-free (RoHS compliant) packages



TSNP-7-1



TSNP-7-2

### Application

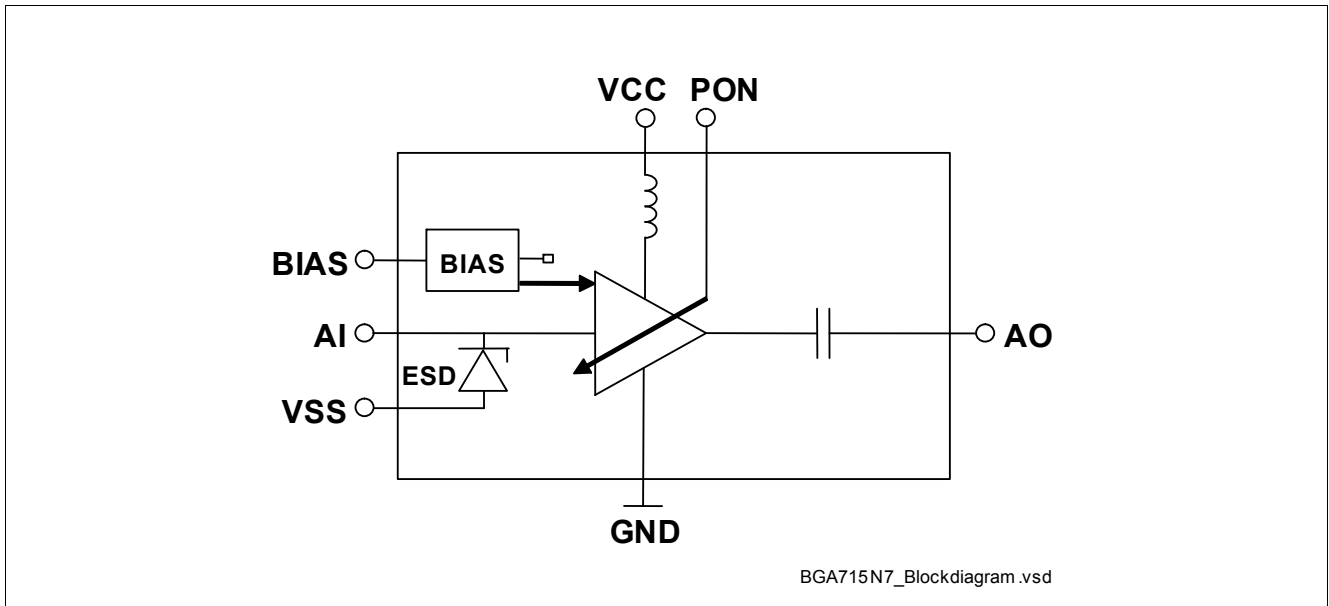
- Ideal for all Global Navigation Satellite Systems (GNSS) like GPS, Galileo, GLONASS, COMPASS and others

### Description

The BGA715N7 is a front-end low noise amplifier for Global Navigation Satellite Systems (GNSS) from 1550 MHz to 1615 MHz like GPS, Galileo, GLONASS, COMPASS and others. The LNA provides 20 dB gain, 0.7 dB noise figure and high linearity performance in the application configuration described in [Chapter 3](#). Current consumption is as low as 3.3 mA. The BGA715N7 is based upon Infineon Technologies' B7HFM Silicon Germanium technology. It operates over a 1.5 V to 3.3 V supply range.

If an ultra low noise figure of 0.6 dB is required, please refer to Infineon Application Note AN161.

Product Name	Marking	Package
BGA715N7	UG	TSNP-7-1 / TSNP-7-2



**Figure 1** Block Diagram

**Table 1** 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	DC supply
6	AO	LNA output
7	VSS	DC ground



## 1 Maximum Ratings

**Table 2 Maximum Ratings**

Parameter <sup>1)</sup>	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
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 GND	$V_{GND}$	-0.3	–	0.3	V	–
Current into pin VCC	$I_{CC}$	–	–	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	$T_A$	-40	–	85	°C	–
Storage temperature range	$T_{STG}$	-65	–	150	°C	–
Human Body Model ESD capability, all pin to all pin <sup>2)</sup>	$V_{ESD\_HBM}$	–	–	2000	V	–
Machine Model ESD capability, all pin to all pin <sup>3)</sup>	$V_{ESD\_MM}$	–	–	100	V	–

1) All voltages refer to VSS-Node.

2) According to JEDS22A-114

3) According to JEDS22A-115

**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.**

### 1.1 Thermal Resistance

**Table 3 Thermal resistance**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Junction - soldering point <sup>1)</sup>	$R_{thJS}$	–	159	–	K/W	–

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

## 2 Electrical Characteristics

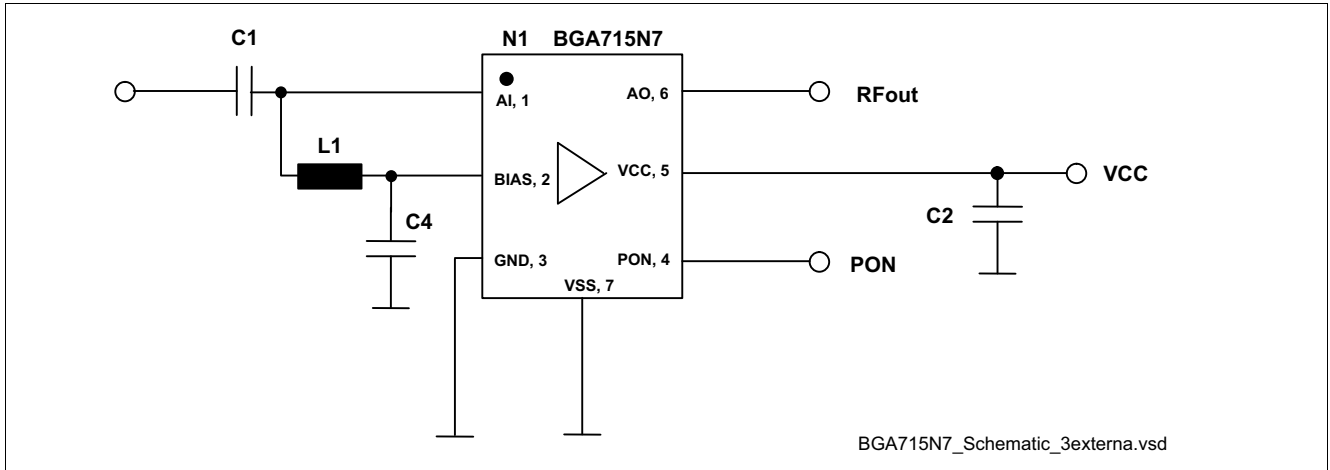
$T_A = 25\text{ °C}$ ,  $V_{CC} = 1.8\text{ V}$ ,  $V_{PON,ON} = 1.8\text{ V}$ ,  $V_{PON,OFF} = 0\text{ V}$ ,  $f = 1550 - 1615\text{ MHz}$  (GPS / Glonass / Beidou / Galileo)

**Table 4 Electrical Characteristics<sup>1)</sup>**

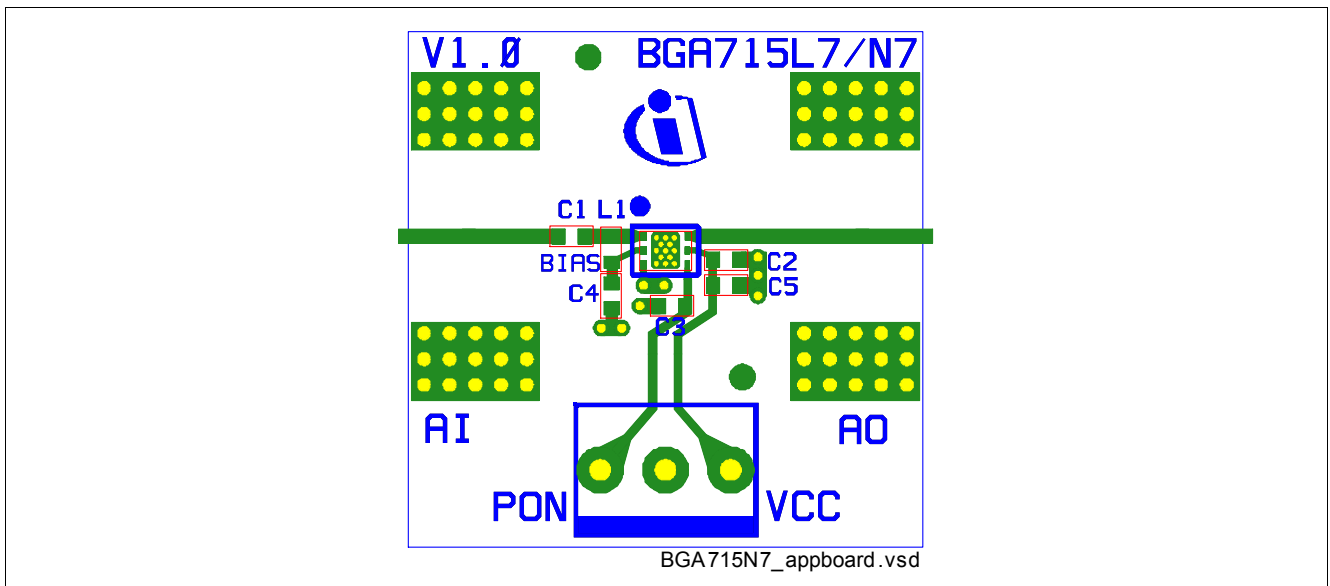
Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply voltage	$V_{CC}$	1.5	1.8	3.6	V	–
Supply current	$I_{CC}$	–	3.3	–	mA	ON-mode
		–	0.2	3	μA	OFF-mode
Gain switch control voltage	$V_{pon}$	1.0	–	$V_{CC}$	V	ON-mode
		0	–	0.4	V	OFF-mode
Gain switch control current	$I_{pon}$	–	5	–	μA	ON-mode
		–	–	1	μA	OFF-mode
Power gain	$ S_{21} ^2$	–	20	–	dB	High-gain Mode
Noise figure <sup>2)</sup>	$NF$	–	0.7	–	dB	$Z_S = 50\ \Omega$
Input return loss	$RL_{in}$	–	14	–	dB	–
Output return loss	$RL_{out}$	–	13	–	dB	–
Reverse isolation	$1/ S_{12} ^2$	–	43	–	dB	–
Power gain settling time <sup>3)</sup>	$t_S$	–	5	–	μs	OFF- to ON-mode
		–	5	–	μs	ON- to OFF-mode
Inband input 1 dB-compression point	$IP_{1dB}$	–	-15.5	–	dBm	–
Inband input 3 <sup>rd</sup> -order intercept point <sup>4)</sup>	$IIP_3$	–	-7	–	dBm	$f_1 = 1575\text{ MHz}$ $f_2 = f_1 \pm 1\text{ MHz}$
Stability	$k$	–	> 1	–		$f = 20\text{ MHz} \dots 20\text{ GHz}$

- 1) Measured on BGA715N7 application board according to application schematic on page 7, including PCB losses (unless noted otherwise)
- 2) PCB transmission line- and connector losses of 0.05 dB are subtracted
- 3) To be within 1 dB of the final gain OFF- to ON-mode to be within 3 dB of the final gain ON- to OFF-mode
- 4) Input Power = -30 dBm for each tone

### 3 Application Information



**Figure 2** Application Schematic BGA715N7



**Figure 3** Application Board Drawing BGA715N7

**Table 5** Bill of Materials

Name	Value	Package	Manufacturer	Function
C1	1.8 pF	0402	Various	DC blocking and input matching
C2	1 $\mu$ F	0402	Various	RF block
C4	15 pF	0402	Various	RF block
L1	4.7 nH LQW15A series	0402	Murata	Bias feed and input matching
N1	BGA715N7	TSNP-7-1 / TSNP-7-2	Infineon	SiGe LNA

A list of all application notes is available at <http://www.infineon.com/gpsIna.appnotes>.

## 4 Package Information

### 4.1 TSNP-7-1

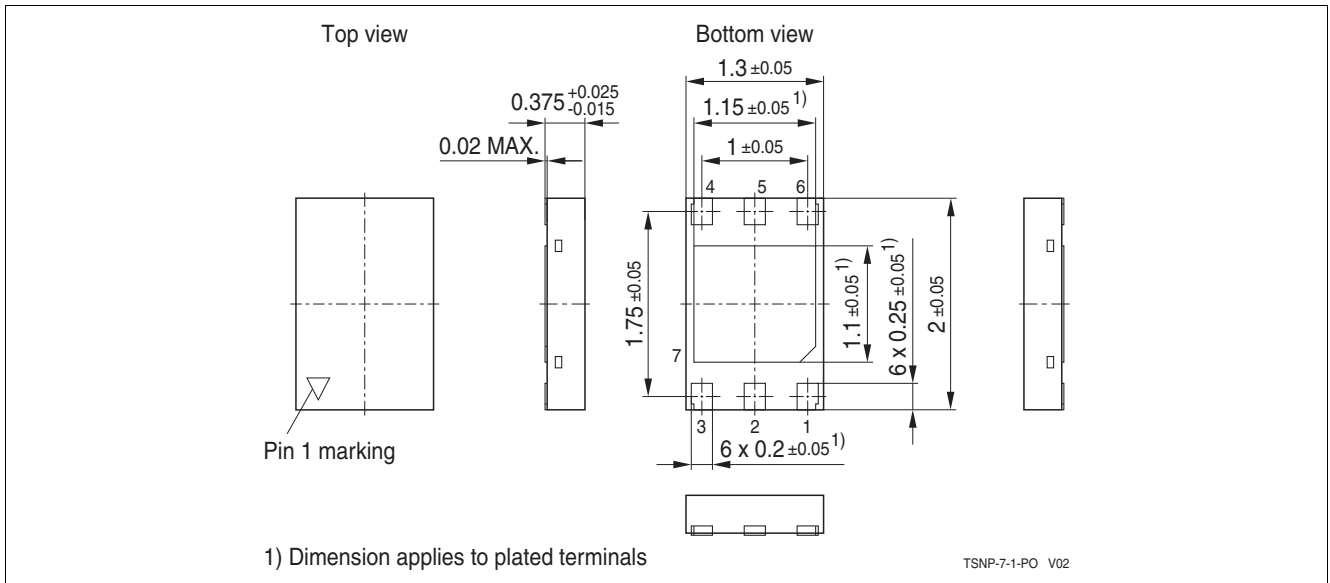


Figure 4 Package Dimensions for TSNP-7-1

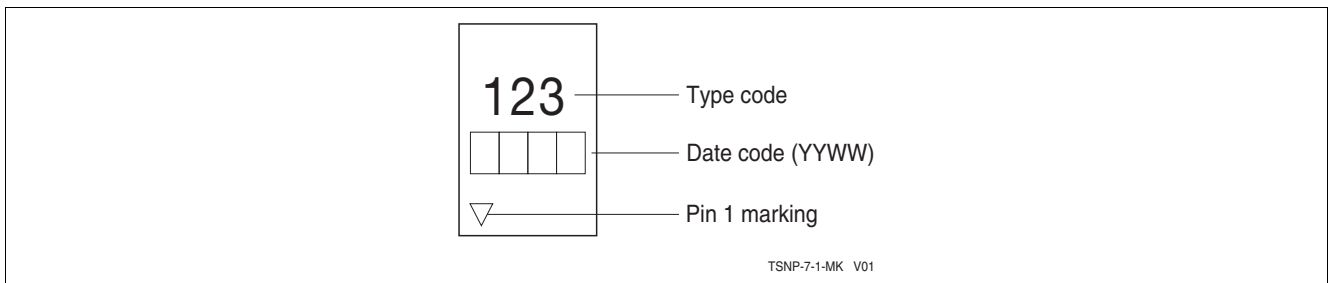


Figure 5 Marking Layout TSNP-7-1 (top view)

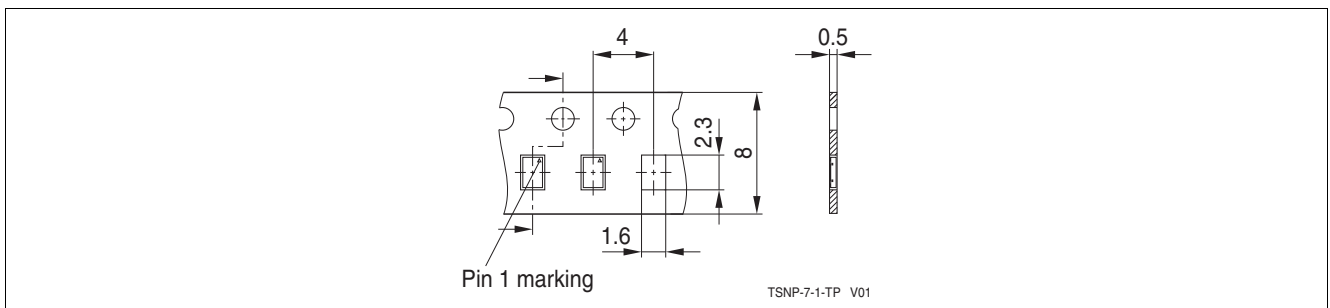
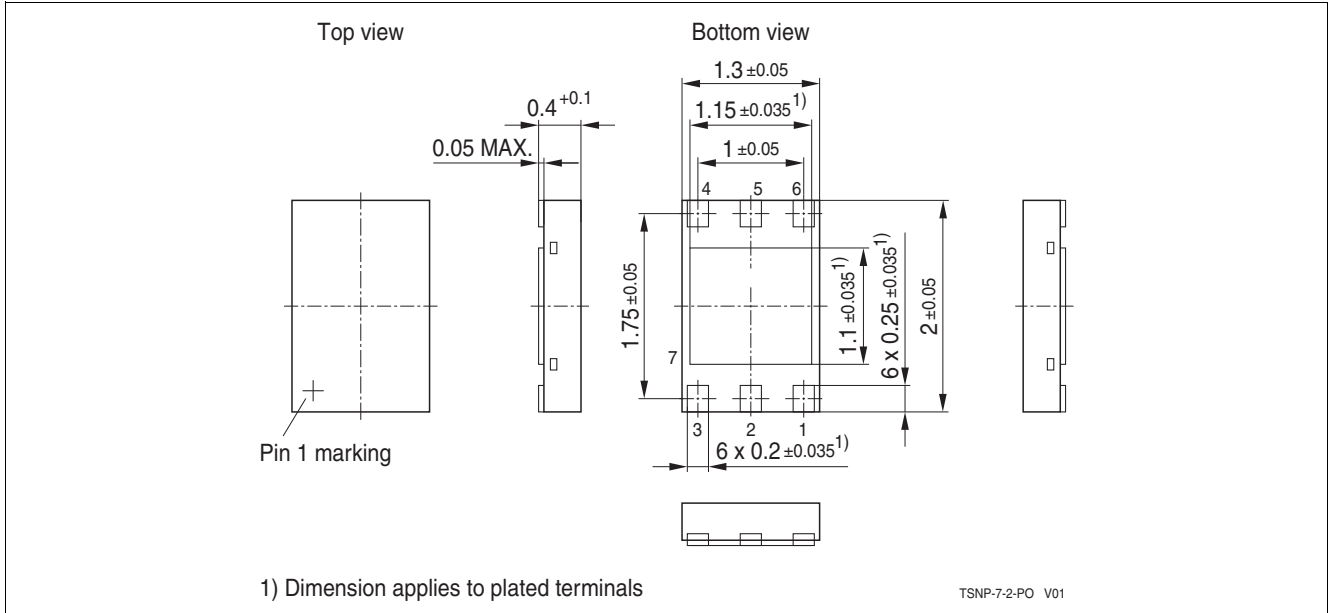
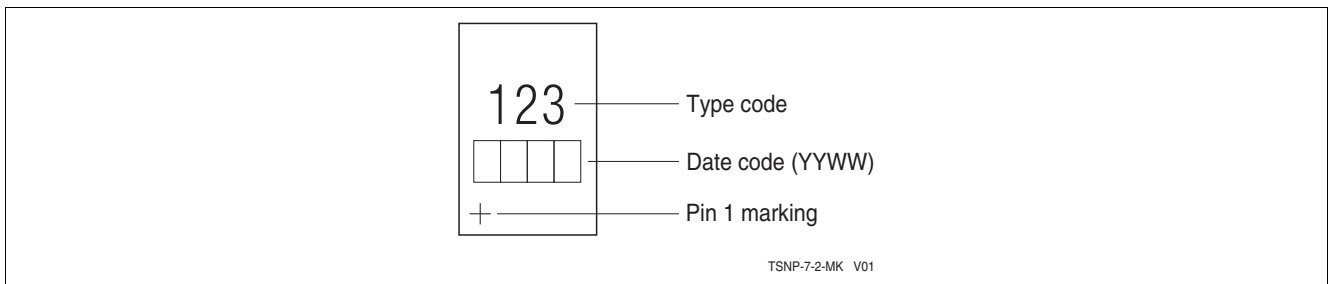


Figure 6 Tape & Reel Dimensions TSNP-7-1 (Ø reel 180, pieces/reel 7500)

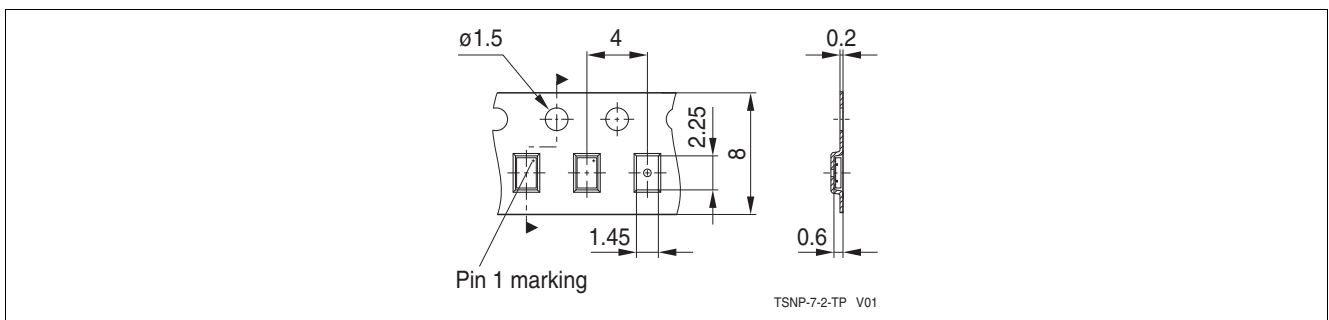
**4.2 TSNP-7-2**



**Figure 7 Package Dimensions for TSNP-7-2**



**Figure 8 Marking Layout TSNP-7-2 (top view)**



**Figure 9 Tape & Reel Dimensions TSNP-7-2 (Ø reel 180, pieces/reel 6000)**

### 4.3 Footprint Recommendation

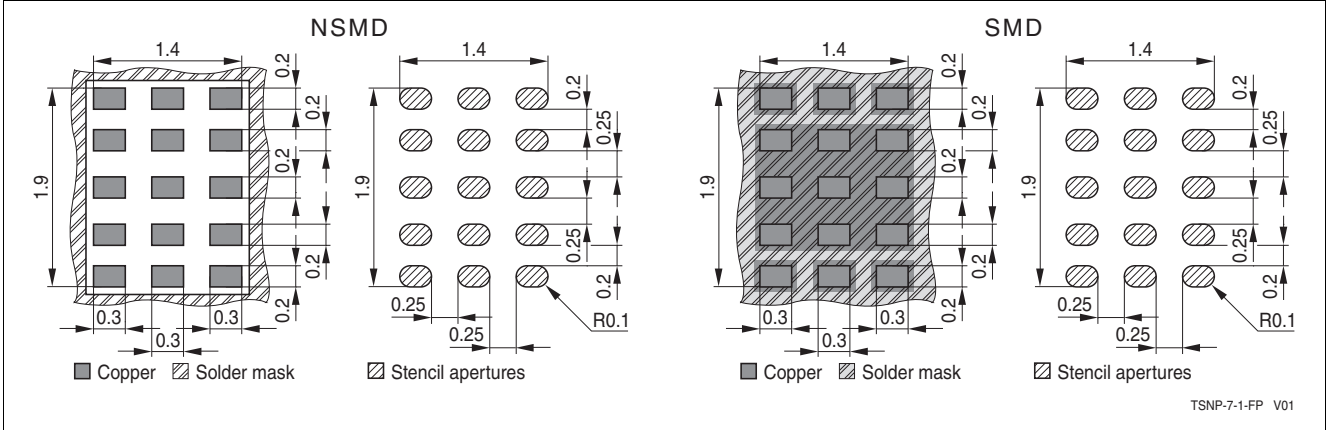


Figure 10 Footprint Recommendation 1 for TSNP-7-1 / TSNP-7-2

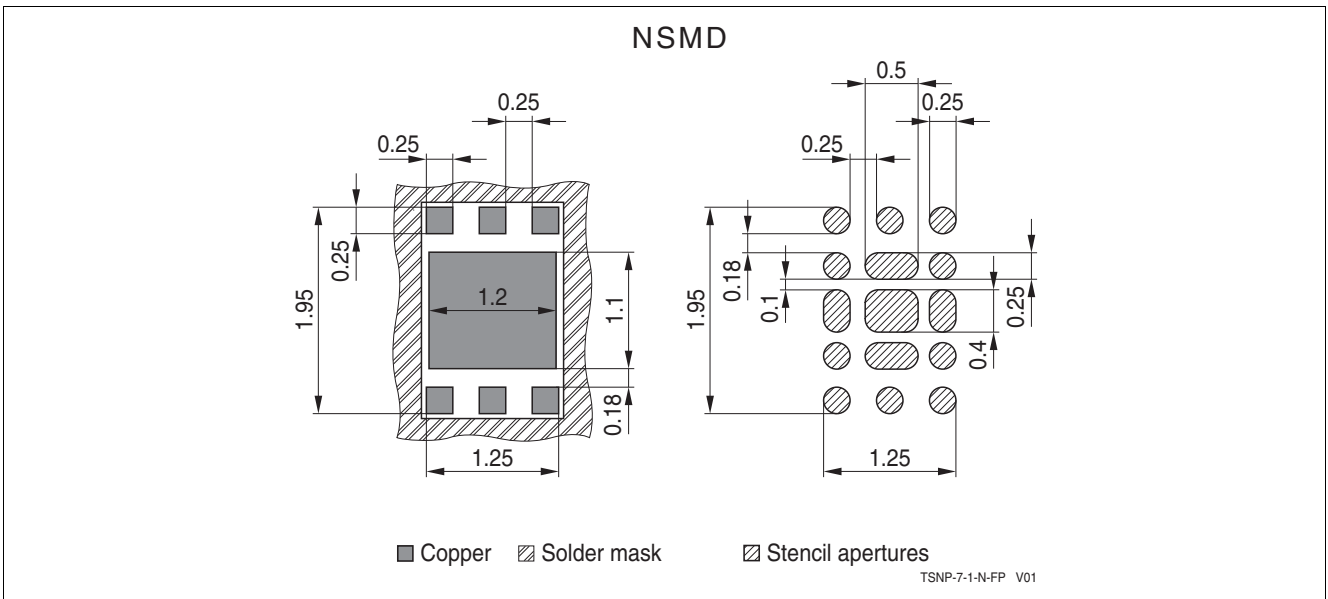


Figure 11 Footprint Recommendation 2 for TSNP-7-1 / TSNP-7-2