BGM781N11

GPS Front-End Module

RF & Protection Devices

Never stop thinking

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Oct. 2010

Revision History: GPS Front-End Module, Rev.3.2

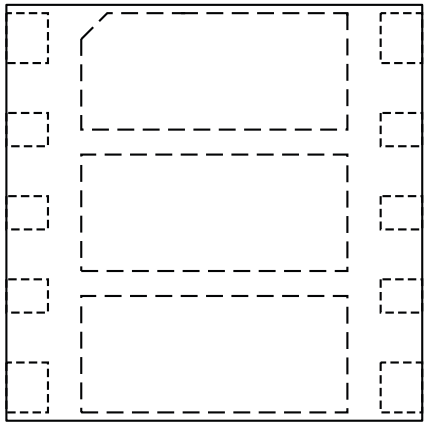
Previous Version: 2009-10-30, Rev.3.1

Page	Subjects (major changes since last revision)
10	Package pin tolerances changed from 35µm to 50µm

1 GPS Front-End Module

Features

- Operating frequency: 1575.42 MHz
- High Gain: 18.6 dB
- Low Noise Figure: 1.7 dB
- Low current consumption: 3.3 mA
- Out-of-band rejection in cellular bands: 80 dBc
- Input compression point in cellular bands: 20 dBm
- Supply voltage: 1.5 V to 3.6 V
- Tiny TSNP-11-2 leadless package
- RF input internally pre-matched to 50 Ω
- RF output internally matched to 50 Ω
- HBM ESD capability of all pins: 2 kV
- IEC ESD contact discharge of RF input pin: 8 kV
- Only 2 external SMD parts
- RoHS compliant package (Pb-free)



TSNP11-2.vsd

TSNP-11-2 Package top view (2.5 x 2.5 x 0.73 mm³)

Application

- 1575.42 MHz GPS, Galileo, GPS phones, personal navigaton devices

RoHS

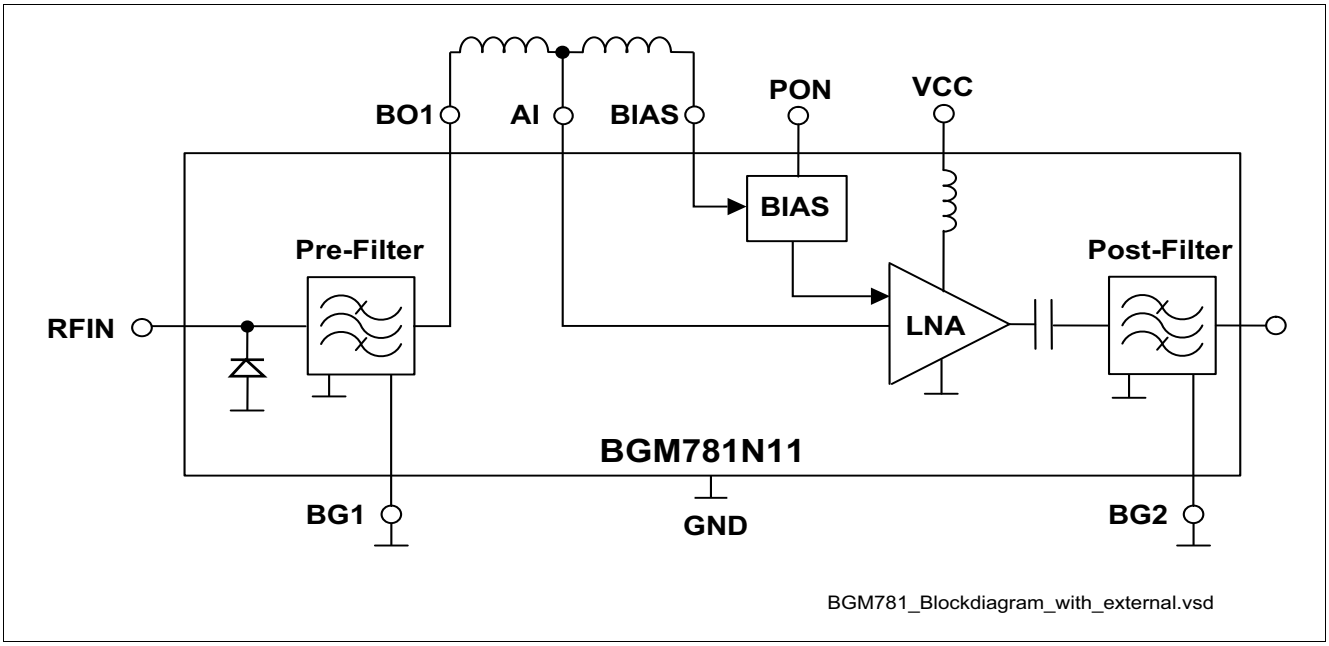


Figure 1 Blockdiagram with main external components

2 Description

The BGM781N11 is a combination of a low-insertion-loss pre-filter with Infineon's high performance low noise amplifier (LNA) and a high-attenuation post-filter for Global Positioning System (GPS) applications. Through the low insertion loss of the filters, the BGM781N11 provides 18.6 dB gain, 1.7 dB noise figure and high linearity performance. In addition BGM781N11 provides very high out-of-band attenuation in conjunction with a high input compression point. Its current consumption is as low as 3.3 mA. It operates over the 1.5 V to 3.6 V supply voltage range.

Type	Package	Marking
BGM781N11	TSNP-11-2	M781

Pin Definition and Function

Table 1 Pin Definition and Function

Pin No.	Symbol	Function
1	BG2	Optional Output-Filter GND
2	PON	Power On/Off
3	VCC	Power Supply
4	n.c.	not used
5	RFIN	RF Input
6	BG1	Input-Filter GND
7	BO1	Input-Filter Output
8	AI	LNA Input
9	BIAS	BIAS
10	RFOUT	RF Output
11	GND	Package Middle Island

Maximum Ratings

Table 2 Maximum Ratings

Parameter[1)]	Symbol	Value	Unit	Note / Test Condition
Voltage at pin BG2 to GND	V_{BG2}	-1...1	V	
Voltage at pin PON to GND	V_{PON}	-0.3...3.6	V	
Voltage at pin VCC to GND	V_{CC}	-0.3...3.6	V	
Voltage at pin RFIN to GND	V_{RFIN}	-3...3	V	
Voltage at pin BG1 to GND	V_{BG1}	-3...3	V	
Voltage at pin B01 to GND	V_{BO1}	-3...3	V	
Voltage at pin AI to GND	V_{AI}	-0.3...0.9	V	
Voltage at pin BIAS to GND	V_{BIAS}	-0.3...0.9	V	
Voltage at pin RFOUT to GND	V_{RFOUT}	-3...3	V	
Current into pin VCC	I_{VCC}	25	mA	
RF input power inband	P_{IN}	3	dBm	Continuous wave signal f = 1575.42 MHz 50 ohm source and load impedances

Table 2 Maximum Ratings (cont'd)

Parameter[1)]	Symbol	Value	Unit	Note / Test Condition
RF input power out of band	$P_{IN,OOB}$	21		Continuous wave signal f = 50 - 1460 MHz and 1710 - 4000 MHz 50 ohm source and load impedances
Total power dissipation	P_{tot}	90	mW	
Junction temperature	T_J	150	°C	
Ambient temperature range	T_A	-40... 85	°C	
Storage temperature range	T_{STG}	-65... 85	°C	
ESD capability HBM of all pins, with pin 6 and GND middle island pin 11 tied together	V_{ESD1}	2	kV	according to JESD22A-114
ESD contact discharge capability of RF input pin 5	V_{ESD2}	8	kV	according to IEC61000-4-2

1) All voltages refer pin-to-pin, unless otherwise specified.

3 Electrical Characteristics

Table 3 Electrical Characteristics: T_A = 25 °C, V_{CC} = 1.8 V, $V_{PON,ON}$ = 1.8 V, $V_{PON,OFF}$ = 0 V[1)]

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
Power On Control Voltage	V_{pon}	1.0	-	Vcc	V	ON-Mode
		0	-	0.4	V	OFF-Mode
Power On Control Current	I_{pon}	-	5	-	µA	ON-Mode
		-	-	1	µA	OFF-Mode
Power Gain Settling Time[2)]	t_S	-	5	-	µs	OFF- to ON-Mode
		-	5	-	µs	ON- to OFF-mode
Passband Parameters @ f = 1575.42 MHz						
Insertion Power Gain	$\|S_{21}\|^2$	17.1	18.6	-	dB	
Noise Figure[3)]	NF	-	1.7	2.3	dB	Z_S = 50 Ω
Input Return Loss	RL_{in}	-	12	-	dB	
Output Return Loss	RL_{out}	-	15	-	dB	
Reverse Isolation	$1/\|S_{12}\|^2$	-	40	-	dB	
Inband Input 3rd Order Intercept Point	IIP_3	-	-7	-	dBm	f_1 = 1575.42 MHz $f_2 = f_1$ + 1 MHz
Inband Input 1 dB Compression Point	IP_{1dB}	-	-15	-	dBm	f_1 = 1575.42 MHz
Out-of-band Input 1 dB Compression Point	IP_{1dB_900M}	-	20	-		f_1 = 900 MHz
Out-of-band Input 1 dB Compression Point	IP_{1dB_1710M}	-	20	-		f_1 = 1710 MHz
Stopband Parameters						
Rejection[4)]	Rej_{900M}	-	90	-	dBc	f = 806 MHz - 928 MHz
Rejection[4)]	Rej_{1800M}	-	80	-	dBc	f = 1710 MHz - 1980 MHz
Rejection[4)]	Rej_{2400M}	-	72	-	dBc	f = 2400 MHz - 2500 MHz
Stability	k	-	>1	-		f = 20 MHz - 20 GHz

1) Specification based on performance as measured on BGM781N11application board shown in Figure 3 and including PCB losses (unless noted otherwise)

2) 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

3) PCB and connector losses subtracted, verified on AQL base

4) Rejection=|(1/$|S_{21}|^2$ at stopband frequency)|+|(1/$|S_{21}|^2$ at 1575.42 MHz)|

4 Application Information

4.1 Application Circuit

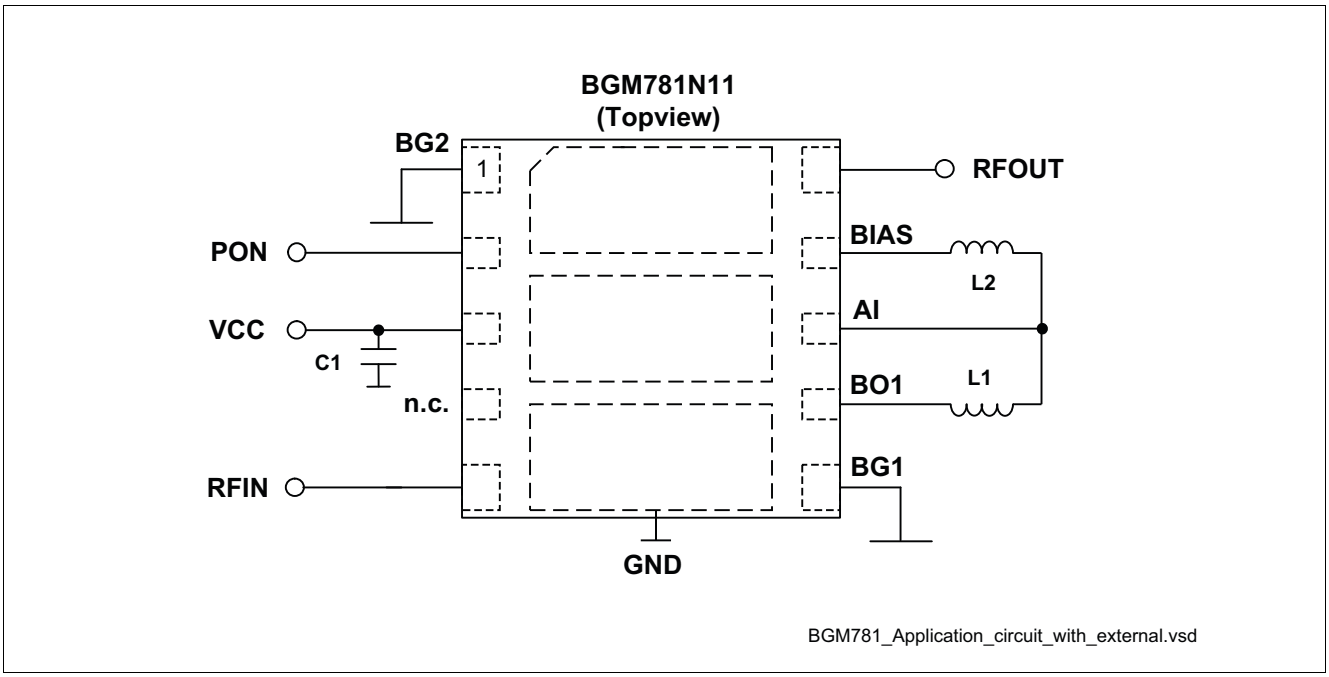


Figure 2 Application circuit with external components

Table 4 Bill of Materials

Name	Value	Package	Manufacturer	Function
C1	1 µF	0402	Various	Supply voltage filtering (optional)
L1	3.6 nH	0402	muRata LQG15HS	Input matching
L2	33 nH	0402	muRata LQG15HS	Bias
N1	BGM781N11	TSNP-11-2	Infineon	GPS FE Module

4.2 Application Board

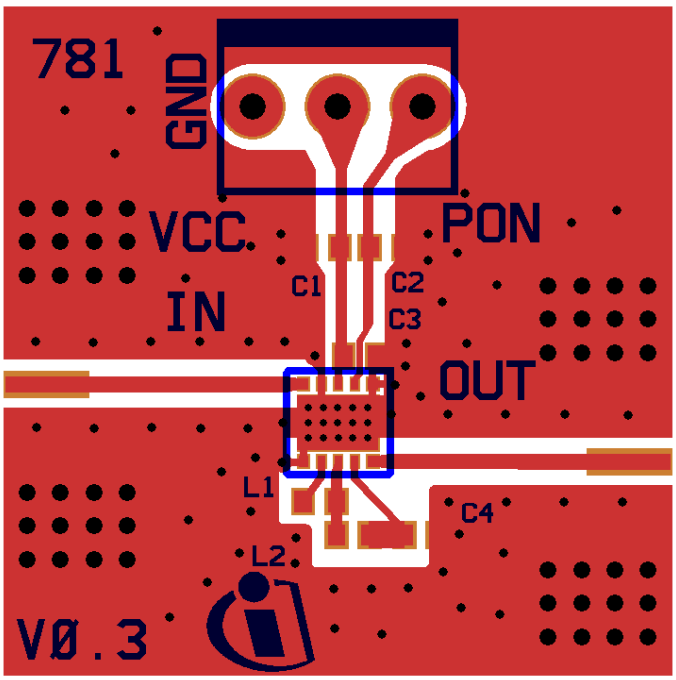


Figure 3 Top view of application board

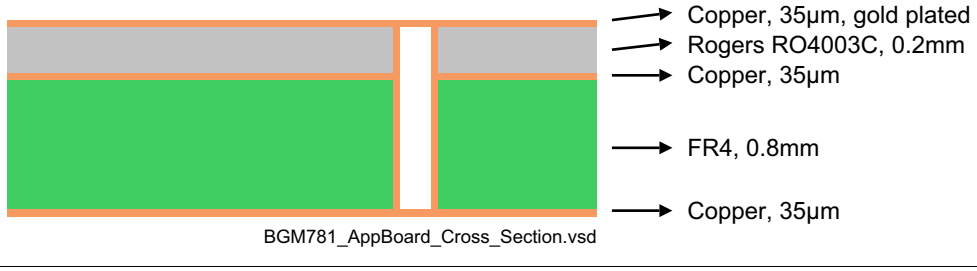


Figure 4 Cross section view of application board

5 Package Information

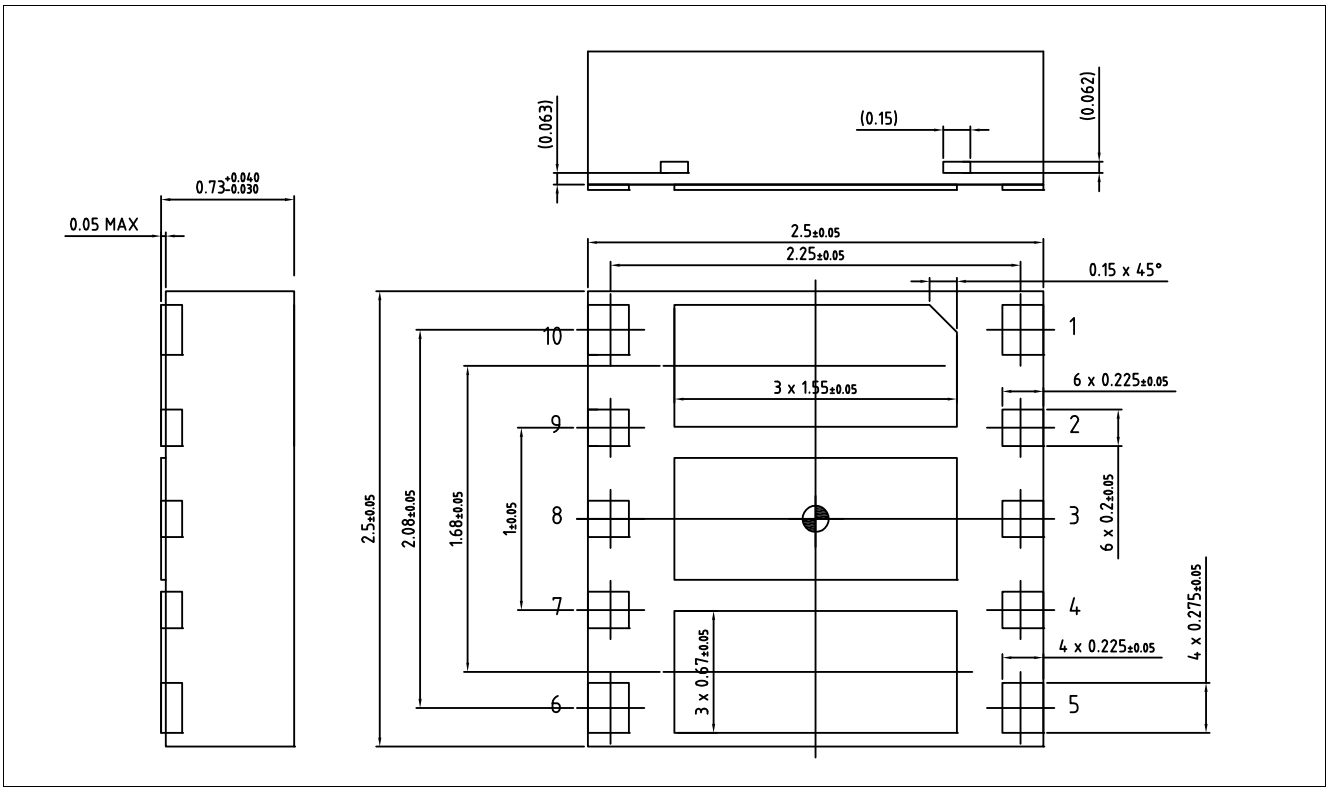
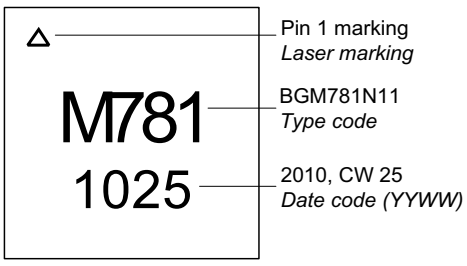


Figure 5 Side and bottom views of TSNP-11-2 package



TSNP11_Marking_Layout_BGM781.vsd

Figure 6 Marking layout

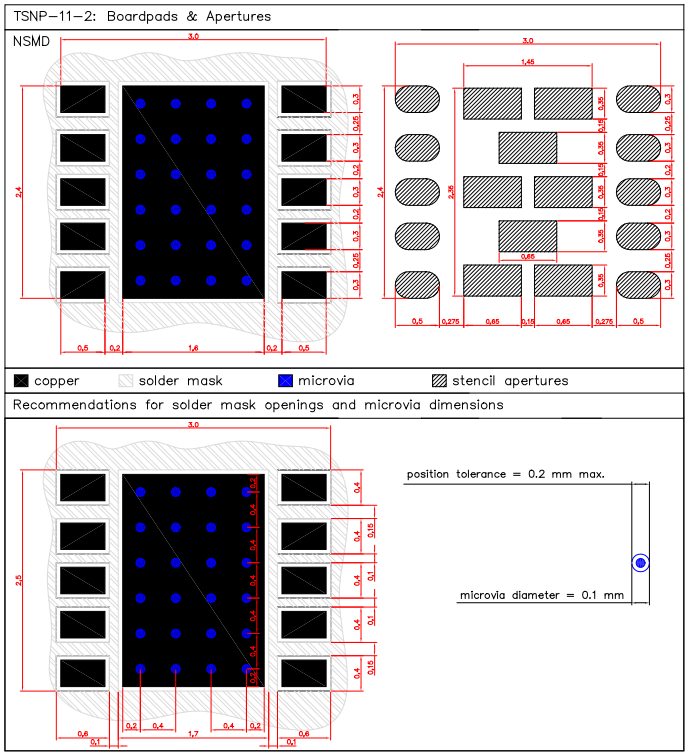


Figure 7 Recommended TSNP-11-2 footprint for optimum RF performance

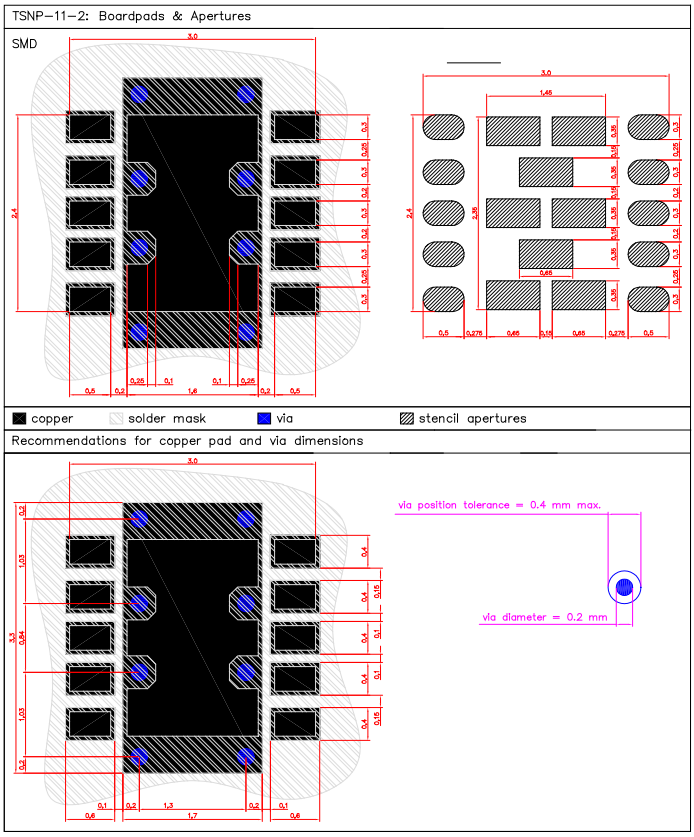


Figure 8 Alternative TSNP-11-2 footprint for low cost PCB designs

6 Packing Information

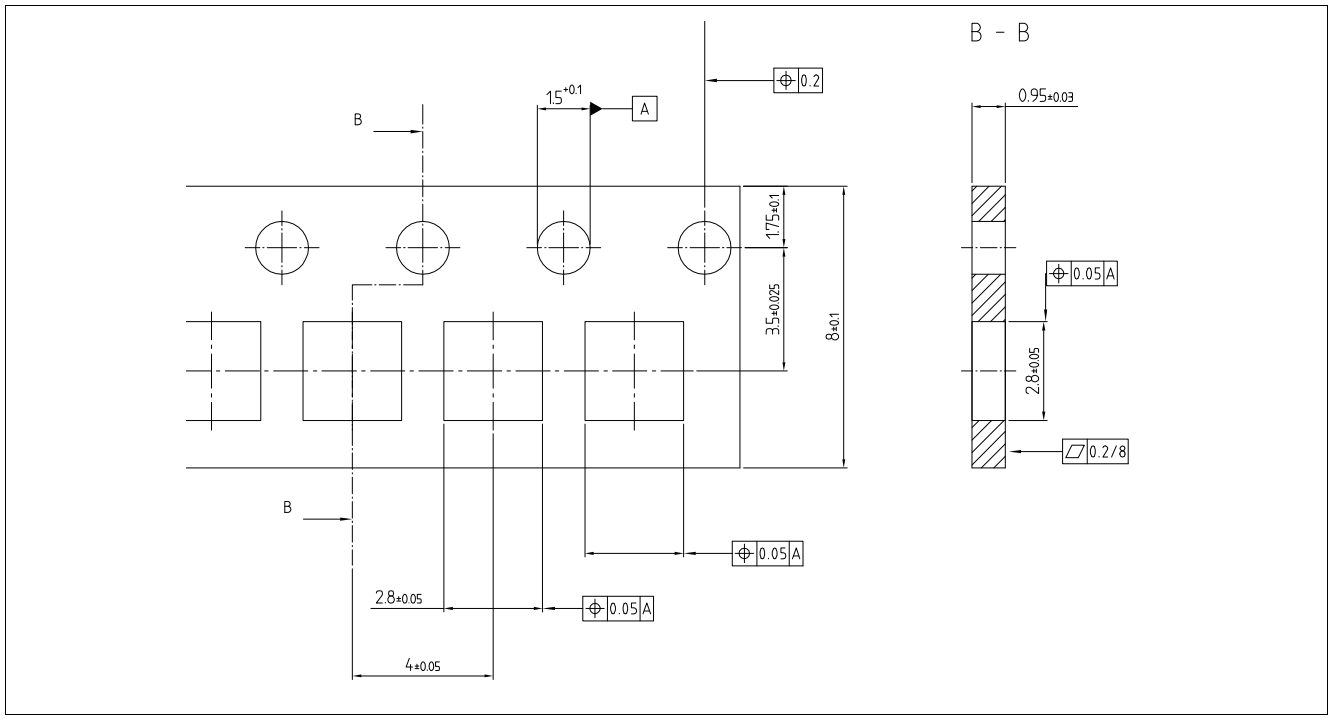


Figure 9 TSNP-11-2 carrier tape

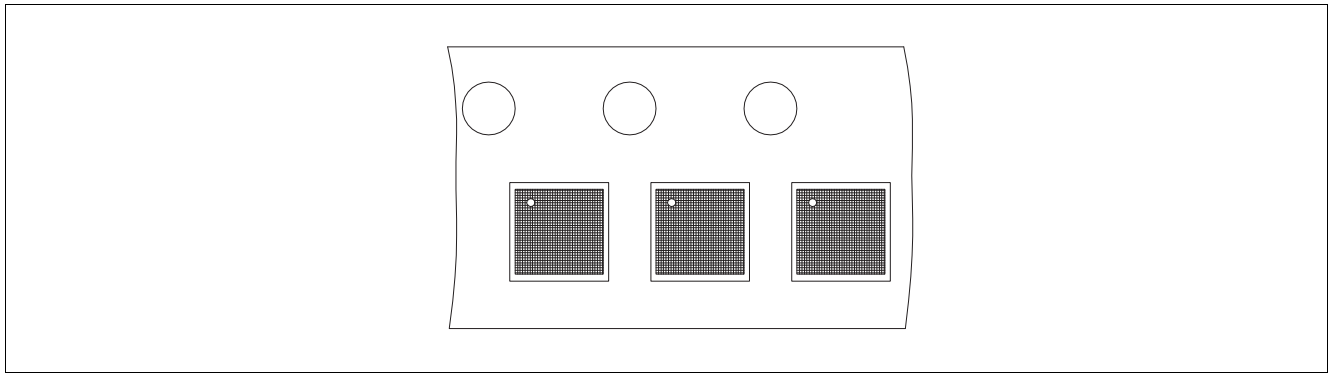


Figure 10 TSNP-11-2 pin 1 orientation in tape