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# BGM681L11

GPS Front-End with high Out-of-Band Attenuation

Small Signal Discretes



Never stop thinking

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Oct. 2008

**Revision History: GPS Front-End with high Out-of-Band Attenuation, Rev.2.2**

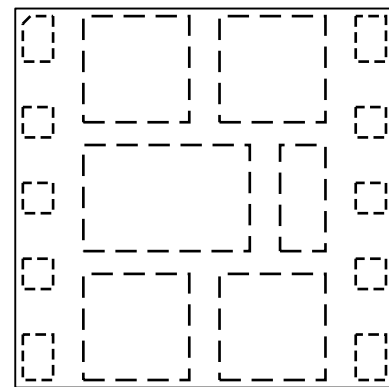
**Previous Version: 2008-10-02, Rev. 2.1**

<b>Page</b>	<b>Subjects (major changes since last revision)</b>
4	Updated Figure 1
8	Updated Figure 2
7	Updated Footnote 3)
7	Updated Gain Switch Control Voltage Max. value
5	Updated Product Description

# 1 GPS Front-End with high Out-of-Band Attenuation

## Features

- Operating frequency: 1575.42 +/- 10 MHz
- High Gain: 17.5 dB
- Low Noise Figure: 1.9 dB
- Power down function
- Input compression point in GSM bands: 24 dBm
- Input compression point in WLAN bands: 24 dBm
- Supply voltage: 2.4 V to 3.6 V
- Tiny TSLP-11-1 leadless package
- RF internally pre-matched
- RF output internally matched to 50 Ω
- RF input to antenna has 1 kV HBM ESD protection
- Minimum need of only 5 external SMD parts
- Attenuation in GSM & UMTS bands > 50 dB
- RoHS compliant package



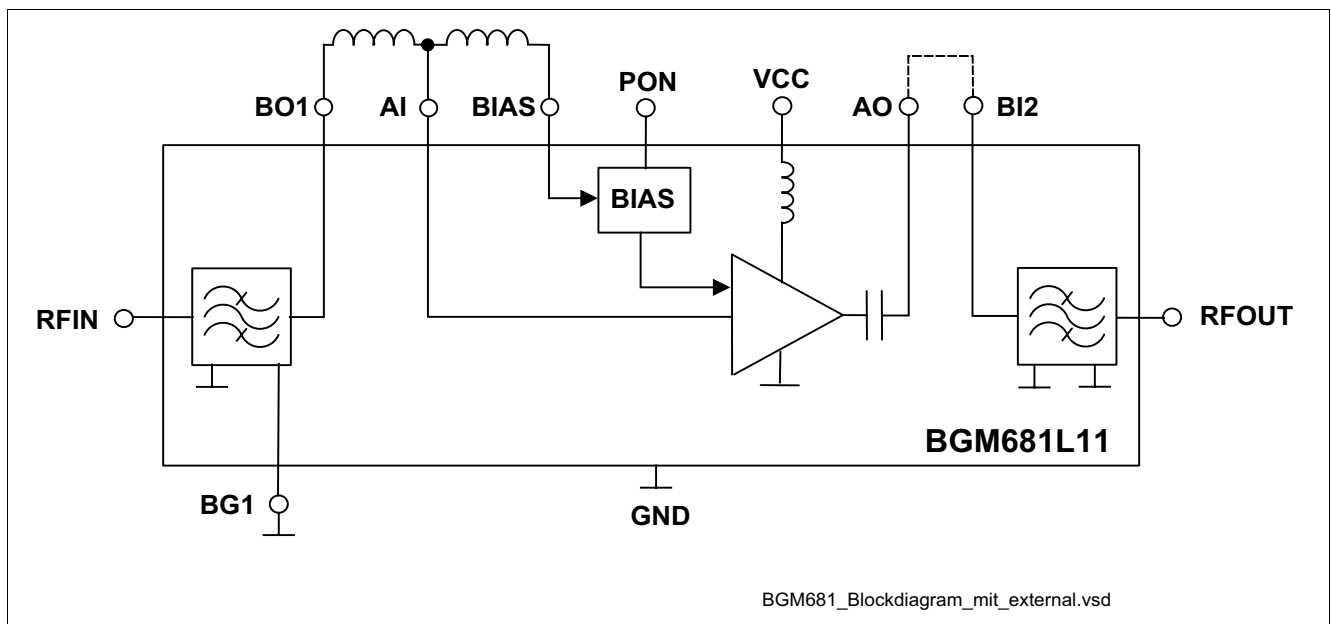
TSLP-11 Topview

TSLP11\_v2.vsd

**TSLP-11-1 Topview**  
(2.5 x 2.5 x 0.6 mm<sup>3</sup>)

## Application

- 1575.42 MHz GPS



BGM681\_Blockdiagram\_mit\_external.vsd

**Figure 1 Blockdiagram with main external SMDs**

## 2 Description

The BGM681L11 is a combination of a low-insertion-loss input filter with Infineon's high performance low noise amplifier BGA615L7 and a high-attenuation output filter for Global Positioning System (GPS) applications. Through the low insertion loss of the filters, the BGM681L11 provides 17.5 dB gain, 1.9 dB noise figure and high linearity performance. In addition BGM681 provides very high out-of-band attenuation in conjunction with a high input compression point. Its current consumption is as low as 5.6 mA. It operates over the 2.4 V to 3.6 V supply voltage range.

Type	Package	Marking
BGM681L11	TSLP-11-1	M681

### Pin Definition and Function

**Table 1 Pin Definition and Function**

Pin No.	Symbol	Function
1	BI2	Output-Filter Input
2	PON	Power On
3	VCC	Power Supply
4	AO	LNA Output
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 <sup>1)</sup>	Symbol	Value	Unit
Voltage at pin BI2 to GND	$V_{BI2}$	-10...10	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 AO to GND	$V_{AO}$	-0.3... $V_{CC} + 0.3$	V
Voltage at pin RFIN to GND	$V_{RFIN}$	-10...10	V
Voltage at pin BG1 to GND	$V_{BG1}$	-10...10	V
Voltage at pin BO1 to GND	$V_{BO1}$	-10...10	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	$V_{RFOUT}$	-10...10	V
Current into pin VCC	$I_{VCC}$	25	mA
RF input power @ 1575 MHz	$P_{IN}$	10	dBm
Total power dissipation	$P_{tot}$	90	mW

**Table 2 Maximum Ratings (cont'd)**

<b>Parameter<sup>1)</sup></b>	<b>Symbol</b>	<b>Value</b>	<b>Unit</b>
Junction temperature	$T_J$	150	°C
Ambient temperature range	$T_A$	-30... 85	°C
Storage temperature range	$T_{STG}$	-65... 150	°C
ESD capability (HBM: JESD22A-114) of all pins except pins 6, 7 and 10	$V_{ESD1}$	1000	V
ESD capability (HBM: JESD22A-114) of pins 7 and 10, with pin 6 and GND Middle Island pin 11 tied together	$V_{ESD2}$	500	V

1) All voltages refer pin-to-pin.

### 3 Electrical Characteristics

For out of band P 1dB Compression Point and IP3, please refer to Infineon Application Note AN162

**Table 3 Electrical Characteristics:  $T_A = 25\text{ °C}$ ,  $V_{CC} = 2.8\text{ V}$ ,  $V_{PON,ON} = 2.8\text{ V}$ ,  $V_{PON,OFF} = 0\text{ V}^{1)}$**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply Voltage	$V_{CC}$	2.4	2.8	3.6	V	
Supply Current	$I_{CC}$	-	5.6	6.3	mA	ON-Mode
		-	0.2	3	$\mu\text{A}$	OFF-Mode
Gain Switch Control Voltage	$V_{pon}$	2.1	-	3.6	V	ON-Mode
		0	-	0.5	V	OFF-Mode
Gain Switch Control Current	$I_{pon}$	-	1.5	3.0	$\mu\text{A}$	ON-Mode
		-	0	1	$\mu\text{A}$	OFF-Mode
Power Gain settling time <sup>2)</sup>	$t_S$	-	5	-	$\mu\text{s}$	OFF- to ON-Mode
		-	5	-	$\mu\text{s}$	ON- to OFF-mode
<b>Passband Parameters @</b>						
$f = 1575.42\text{ MHz}$						
Insertion Power Gain	$ S_{21} ^2$	15	17.5	19	dB	High-Gain Mode
Noise Figure <sup>3)</sup>	$NF$	-	1.9	-	dB	$Z_S = 50\ \Omega$
Input Return Loss	$RL_{in}$	-	10	-	dB	
Output Return Loss	$RL_{out}$	-	10	-	dB	
Reverse Isolation	$1/ S_{12} ^2$	-	25	-	dB	
Inband Input 3rd Order Intercept Point	$IIP_3$	-	-3	-	dBm	$f_1 = 1575\text{ MHz}$ , $f_2 = f_1 \pm 1\text{ MHz}$
Inband Input 1 dB compression point	$IP_{1dB}$	-	-10	-	dBm	$f = 1575\text{ MHz}$
<b>Stopband Parameters</b>						
Attenuation <sup>4)</sup>	$Attn_{900M}$	-	60	-	dB	$f = 806\text{ MHz} - 928\text{ MHz}$
Attenuation <sup>4)</sup>	$Attn_{1800M}$	-	50	-	dB	$f = 1710\text{ MHz} - 1980\text{ MHz}$
Attenuation <sup>4)</sup>	$Attn_{2400M}$	-	40	-	dB	$f = 2400\text{ MHz} - 2500\text{ MHz}$
Attenuation <sup>4)</sup>	$Attn_{>2500M}$	-	30	-	dB	$f = 2500\text{ MHz} - 6000\text{ MHz}$
Stability	$k$	-	>1	-		$f = 10\text{ MHz} - 10\text{ GHz}$

1) Measured on BGM681L11 application board including PCB losses (unless noted otherwise)

2) Within 1 dB of the final gain

3) PCB losses subtracted, verified on AQL base

4) Due to high in-band to out-of-band dynamic range, the out-of-band attenuation value depends strongly on the grounding of the PCB



## 4 Application Information

### 4.1 Application Circuit

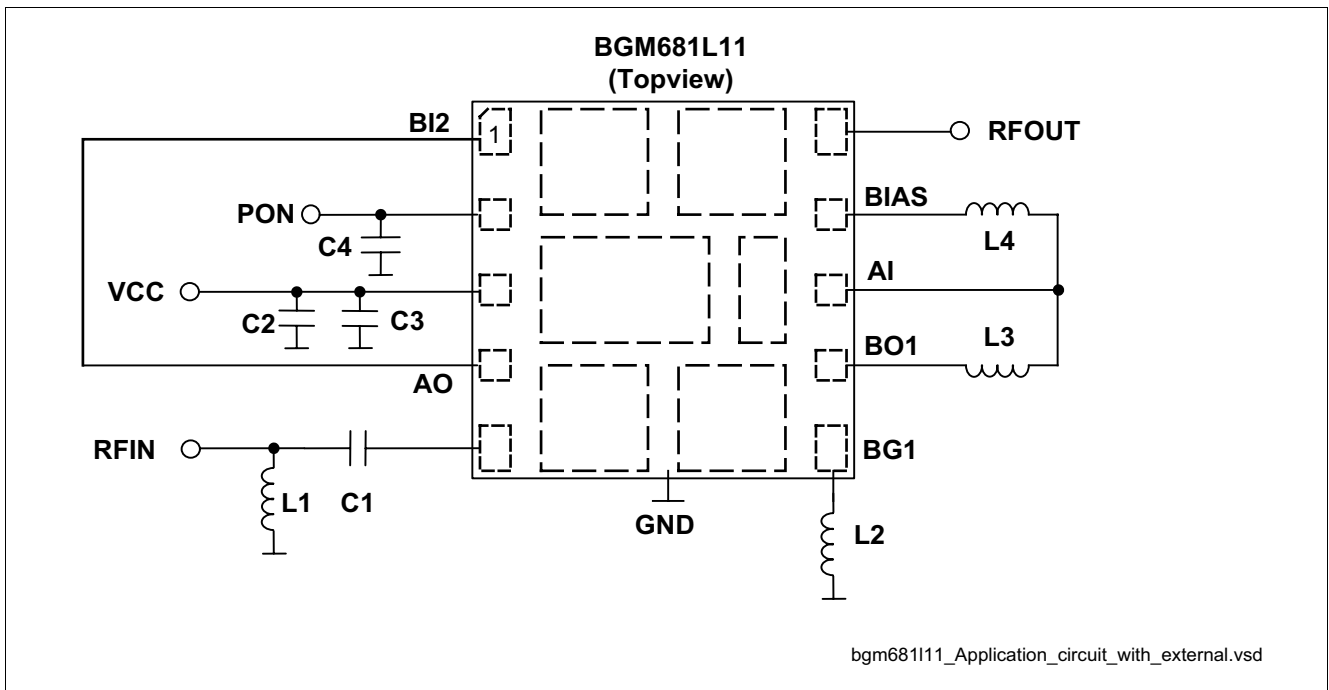


Figure 2 Application Circuit with external components

Table 4 Bill of Materials

Name	Value	Package	Manufacturer	Function
C1	2.2 pF	0402	Various	Input matching
C2	2.2 nF	0402	Various	Supply voltage filtering (optional)
C3	100 pF	0402	Various	Supply voltage filtering
C4	10 pF	0402	Various	Control voltage filtering
L1	4.7 nH	0402	muRata LQW15A	Input matching / ESD protection
L2	3.3 nH	0402	muRata LQW15A	Attenuation and Linearity improvement at 1710 - 1980 MHz (optional)
L3	2.9 nH	0402	muRata LQW15A	Input matching
L4	68 nH	0402	muRata LQW15A	Bias
N1	BGM681L11	TSLP-11-1	Infineon	GPS FE System

## 4.2 Application Board

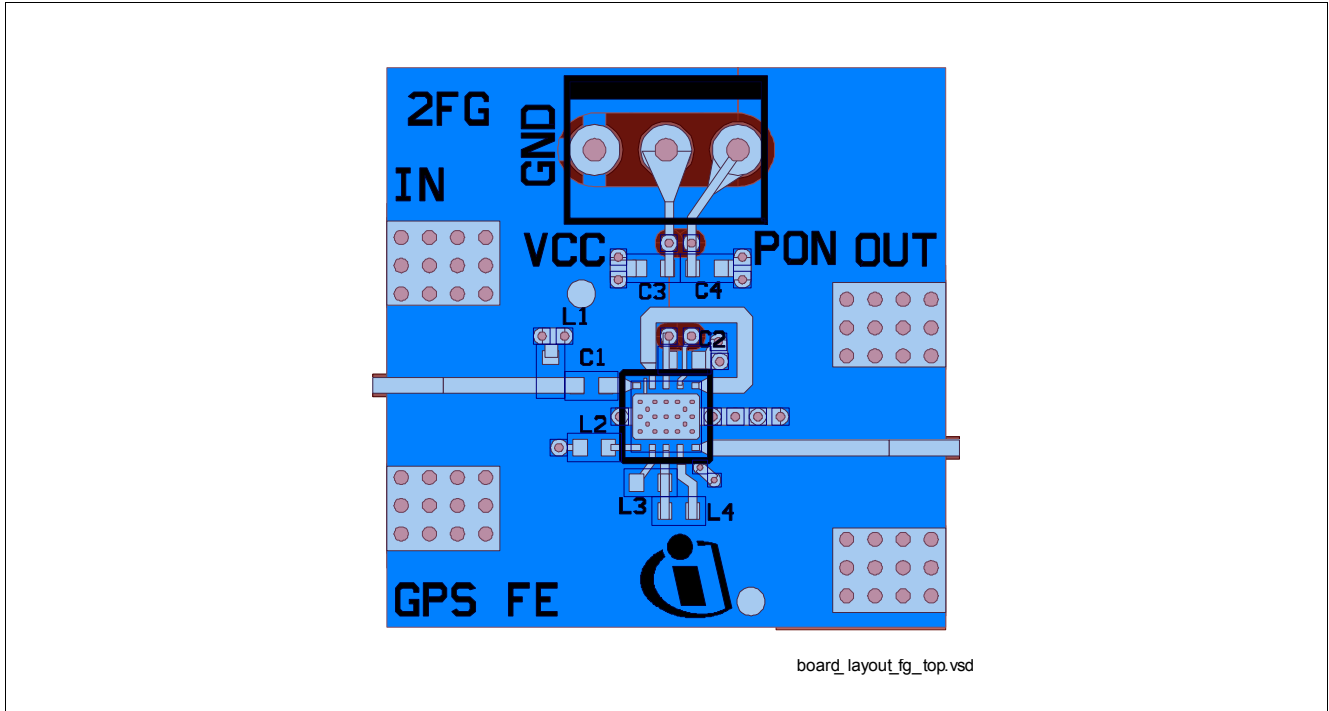


Figure 3 Top View of Application board

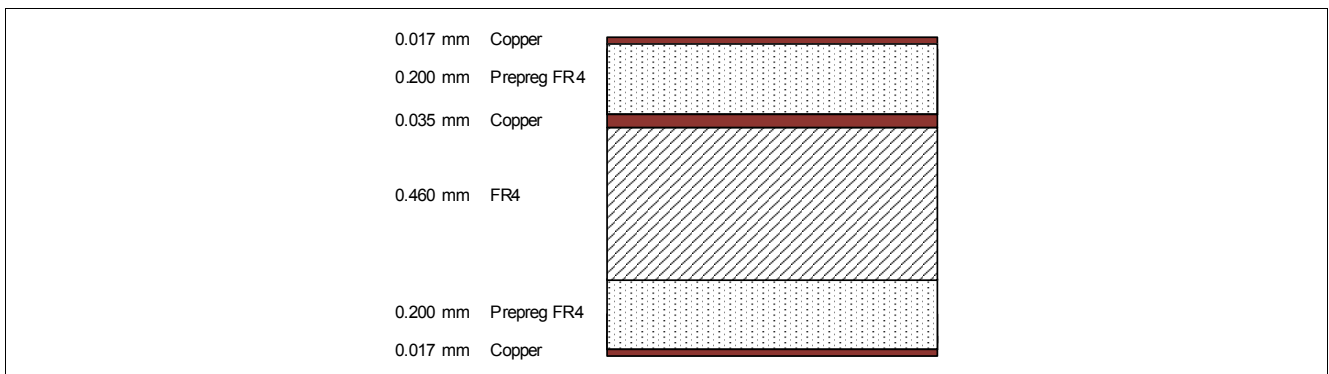


Figure 4 Cross section View of Application board

## 5 Package Information

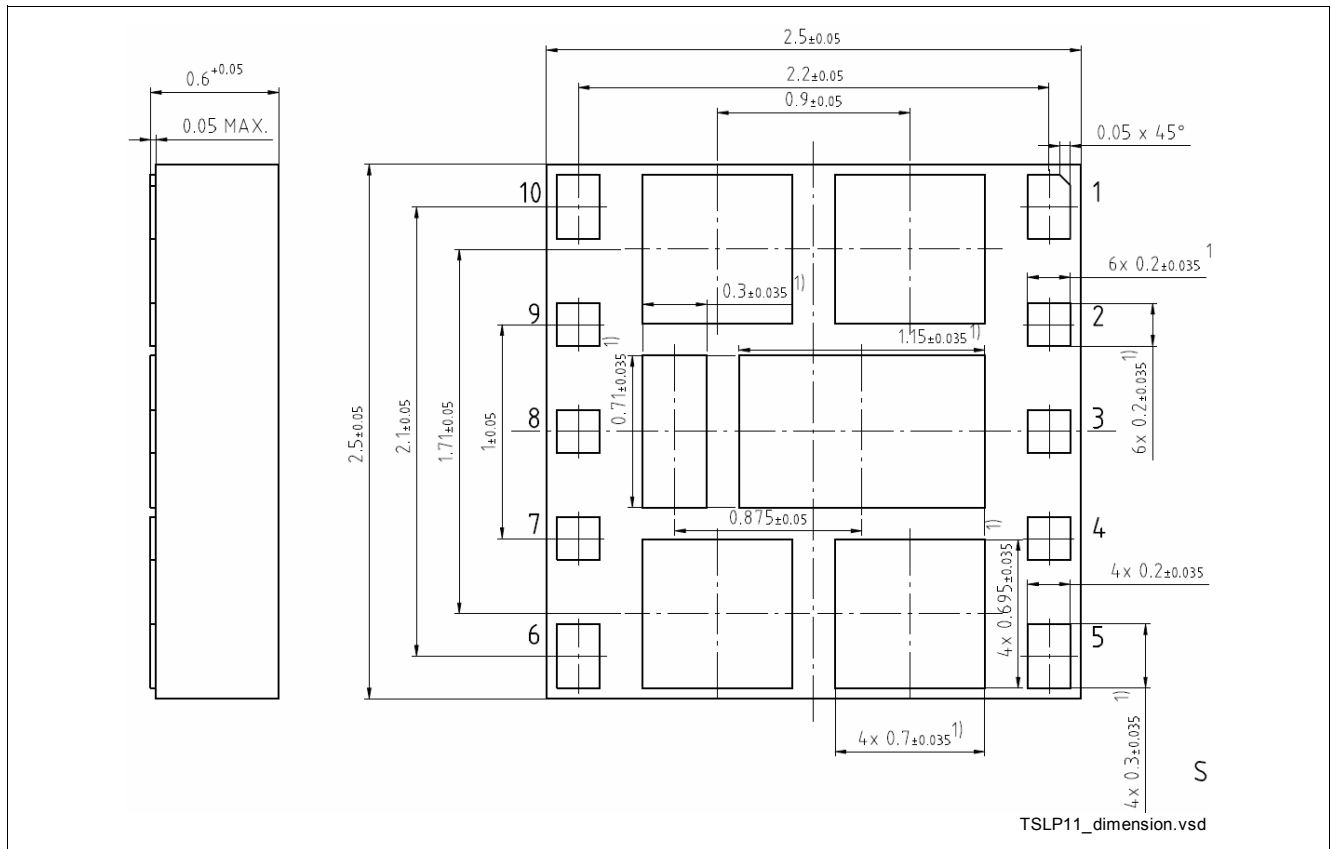


Figure 5 TSLP-11-1 Side View and Bottom View

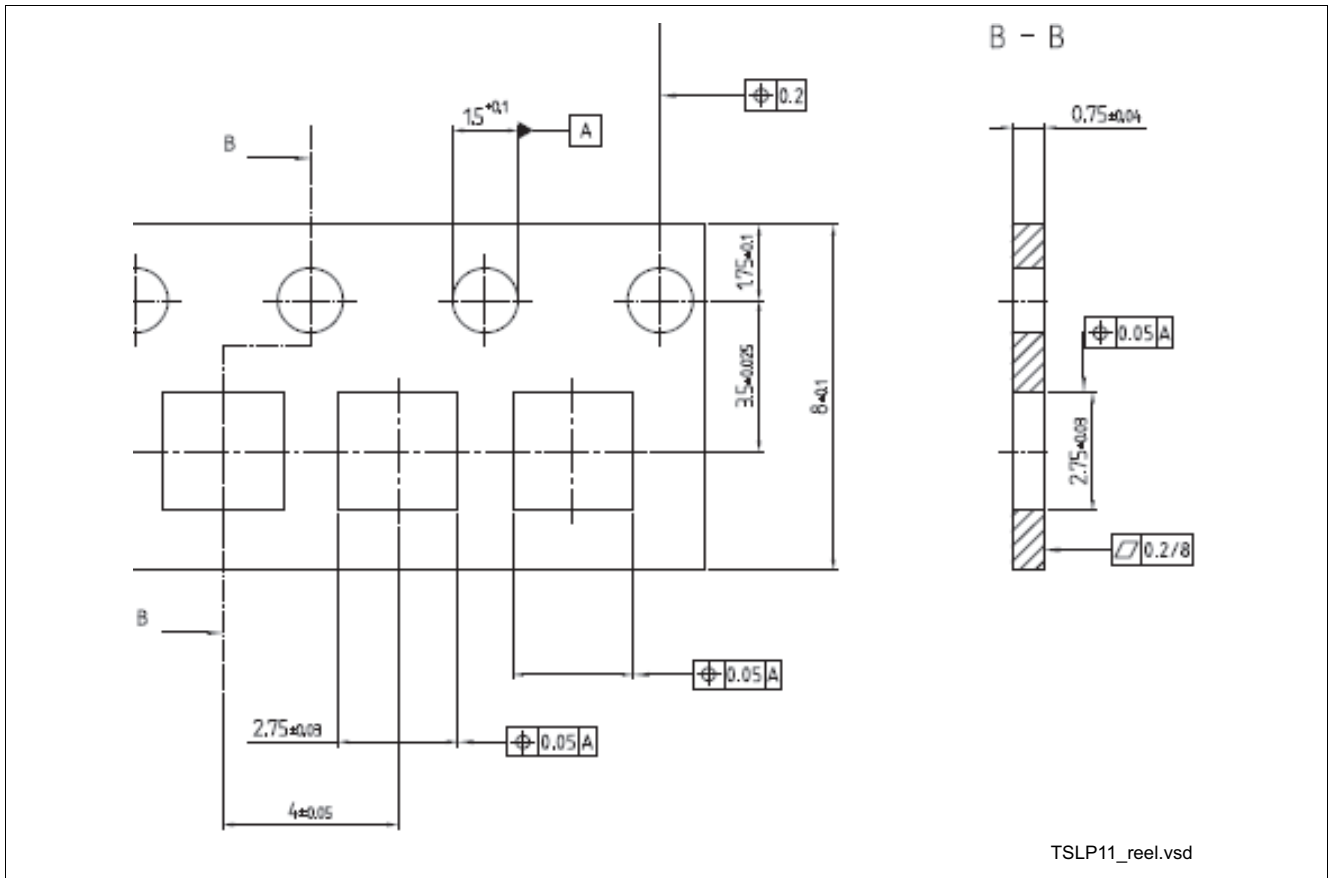


Figure 6 TSLP-11-1 tape

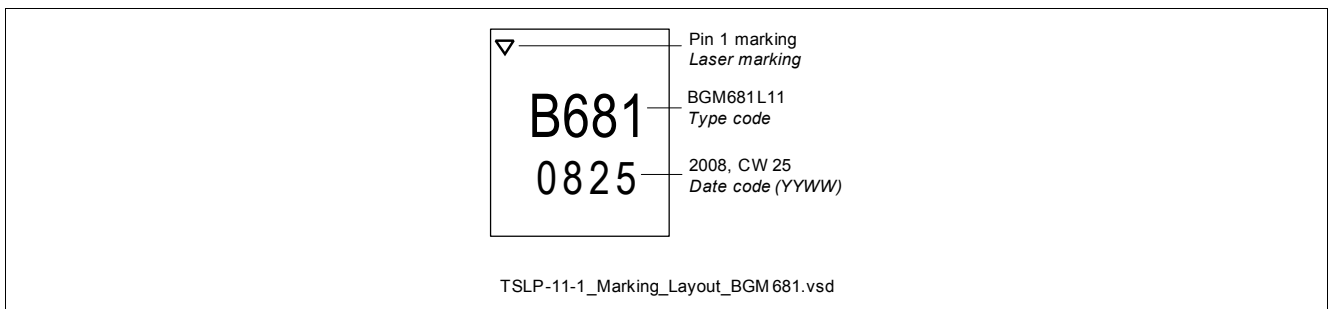


Figure 7 Marking Layout