Never stop thinking

BGS13AL12

SP3T Antenna Switch with Antenna Termination Port

Data Sheet

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Preliminary

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BGS13AL12, SP3T Antenna Switch with Antenna Termination Port

Revision History: 2009-06-25, Revision 1.1

Previous Revision: 2009-05-04, Revision 1.0

Page	Subjects (major changes since last revision)
	Converted to the new IFX FrameMaker Template.
9	Pin13 Pin Description
11,12	Electrical Specifications
13	Application Board, Deembedding Board
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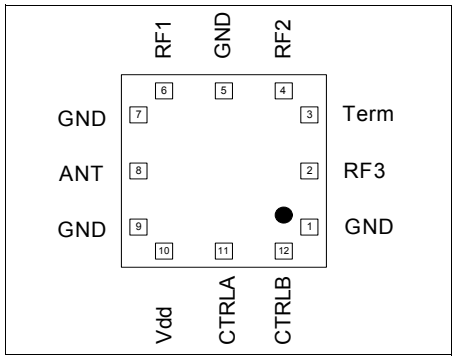
1 Features



Main Features:

- 3 high-linearity Rx ports with power handling capability of up to 30 dBm
- Antenna Termination Port
- No external decoupling components required
- Small leadless package TSLP12
- High ESD robustness
- Low harmonic generation
- Low insertion loss
- High port-to-port-isolation
- 0.1 to 3.0 GHz coverage
- On-chip control logic supporting logic levels from 1.4 V to 3.0 V
- Lead and halogen free package (RoHS and WEEE compliant)

RoHS

Applications

- WCDMA diversity
- CDMA diversity
- Analog and Digital Tuner
- Band Switching

Product Name	Product Type	Package
SP3T RF Switch	BGS13AL12	PG-TSLP-12-3

Description

The BGS13AL12 RF MOS switch is specifically designed for WCDMA diversity applications. An additional 4th port allows proper termination of the antenna when turned off.

This SP3T offers low insertion loss and high robustness against interferer signals at the antenna port, while maintaining a very small size of only 2.0 x 2.0 mm² and a maximum height of only 0.4 mm

The on-chip controller integrates CMOS logic and level shifters, driven by control inputs from 1.4 to 3.0 V. Unlike GaAs technology, external DC blocking capacitors at the RF Ports are only required if DC voltage is applied externally.

The BGS13AL12 RF Switch is manufactured in Infineon's patented MOS technology, offering the performance of GaAs with the economy and integration of conventional CMOS including the inherent higher ESD robustness.

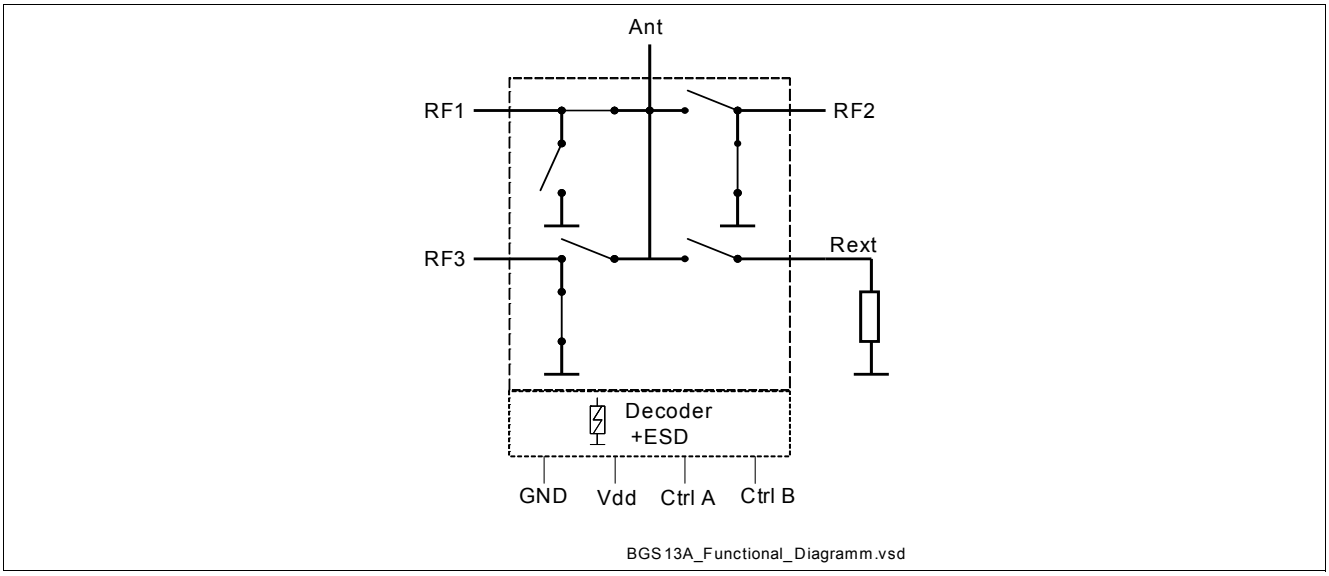


Figure 1 Functional Diagram

2 Signals Description

Table 1 Pin Description (top view)

Pin No.	Name	Pin Type	Buffer Type	Function
1	GND	GND		**Ground**
2	RF3	I/O		**Rx RF port 3**
3	Term	I/O		**Ext. Term Port**
4	RF2	I/O		**Rx RF port 2**
5	GND	GND		**Ground**
6	RF1	I/O		**Rx RF port 1**
7	GND	GND		**Ground**
8	Ant	I/O		**Antenna port**
9	GND	GND		**Ground**
10	Vdd	PWR		**Vdd supply**
11	CTRL A	I		**Control pin A**
12	CTRL B	I		**Control pin B**
13	NC	NC		**For thermal reasons recommended to connect to Ground**

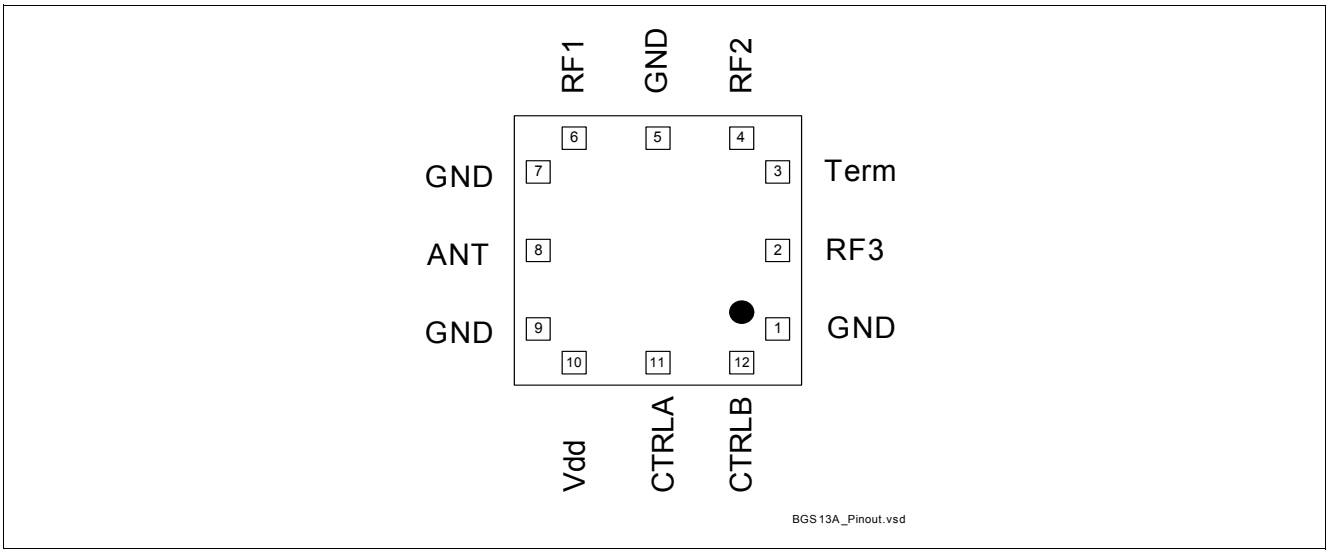


Figure 2 Pin Configuration (top view)

Table 2 Truth Table

Function	Ctrl A	Ctrl B
Ant → RF1	H	H
Ant → RF2	L	H
Ant → RF3	H	L
Ant → Term	L	L

3 Electrical Characteristics

Table 3 Absolute Maximum Ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Storage Temperature Range	T_{stg}	-65	–	150	°C	–
DC Voltage at all pins to GND	V_{DC}	–	–	3.2	V	–
Max RF power at antenna port, any RF port on	$P_{Ant\ IN\ max}$	–	–	32	dBm	–

Table 4 Operating Ranges

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Ambient Temperature	T_A	-30	–	85	°C	–
RF Frequency	f	0.1	–	3	GHz	–
Control Voltage low	V_{CtrlL}	-0.3	–	0.3	V	–
Control Voltage high	V_{CtrlH}	1.4	–	V_{dd}	V	–
Supply Voltage	V_{dd}	2.70	–	3.0	V	–
Max. Input (Reverse) Power at antenna pin	Pin	–	–	30	dBm	–

Table 5 ESD Ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Human Body-Model IEC 61340-3-1, all pins	V_{max}	–	–	500	V	–
Human Body-Model IEC 61340-3-1, antenna port	V_{max}	–	–	1000	V	–

ESD robustness of antenna port can be increased to 8 kV IEC-61000-4-2 with external protection circuit.

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.

3.1 Electrical Specification

Test Conditions:

- Termination port impedance: Z_0 = 50 Ω
- Temperature range: T_A = -30 °C...+85 °C
- Supply Voltage: V_{dd} = 2.8 V
- P_{in} = 15 dBm
- Across operating range of control voltages: V_{CtrH} = 1.4...2.8 V

Table 6 Electrical Characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Insertion Loss						
824<f<960 MHz		–	0.45/0.75[1)]	0.65/1.0[1)]	dB	–
1710<f<1980 MHz		–	0.8/0.7[1)]	1.0/0.9[1)]	dB	–
1980<f<2170 MHz		–	0.9/0.8[1)]	1.1/1.0[1)]	dB	–
Inband ripple Rx ports (high bands)		–	–	0.2	dB	–
Inband ripple Rx ports (low bands)		–	–	0.2	dB	–
Return Loss[1)]						
All ports @ 0.9 GHz		14	–	–	dB	–
All ports @ 2 GHz		12	–	–	dB	–
Isolation Ant – RF1,2,3						
0.9 GHz		20	–	–	dB	–
2 GHz		20	–	–	dB	–
Isolation RF1,2,3 – RF1,2,3						
0.9 GHz		20	–	–		–
2 GHz		20	–	–		–
Isolation RF Ports – V_{dd}, V_{ctrl}						
0.9 GHz		20	–	–	dB	–
2 GHz		20	–	–	dB	–

1) With external parallel Inductor (15 nH) at Ant port

Table 7 Electrical Characteristics (cont'd)

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input Intercept Point Requirements - IMD2[1)]						
Tx=10 dBm@ ant port, Int= -15 dBm @ant port (TX Freq = 824 - 915 MHz)		–	-115	-100	dBm	–
Tx=10 dBm@ ant port, Int= -15 dBm @ant port (TX Freq=1710 - 1980 MHz)		–	-110	-100	dBm	–
Input Intercept Point Requirements – IMD3[1)]						
Tx=10 dBm@ ant port, Int= -15 dBm @ant port(TX Freq = 824 - 915 MHz)		–	-110	-107	dBm	–
Tx=10 dBm@ ant port, Int= -15 dBm @ant port (TX Freq=1710 - 1980 MHz)		–	-110	-107	dBm	–
Triple Beat Ratio						
Tx1=21.5 dBm, Tx2=21.5 dBm, Int=-30 dBm (650 MHz - 900 MHz)		–	-83	–	dBc	–
Tx1=21.5 dBm, Tx2=21.5 dBm, Int=-30 dBm (1710 MHz - 2155 MHz)		–	-82	–	dBc	–
Harmonic Generation RF ports up to 12.75 GHz						
Pin (UMTS) = 23 dBm, Duty Cyle = 100%, unused RF pins = any load, VSWR = 4:1		–	–	–	–	–
1 GHz		–	–	-46	dBm	–
2 GHz		–	–	-46	dBm	–
Harmonic Generation Termination port up to 12.75 GHz						
Pin (UMTS) = 30 dBm at low band, 22 dBm at high band, Duty Cycle = 25%		–	–	–	–	–
1 GHz, Second Harmonic		–	–	-40	dBm	–
1 GHz, all other Harmonics up to 12.75GHz		–	–	-46	dBm	
2 GHz		–	–	-44	dBm	–
Switching Time and Current Consumtion						
On/Off Switching Time (10-90%) RF		–	–	5	µs	
Current Consumption at Vdd Pin		–	200	500	µA	–
Current Consumption at Vctrl Pins		–	<1	30	µA	–

1) With external parallel Inductor (15 nH) at Ant port

4 Application Board

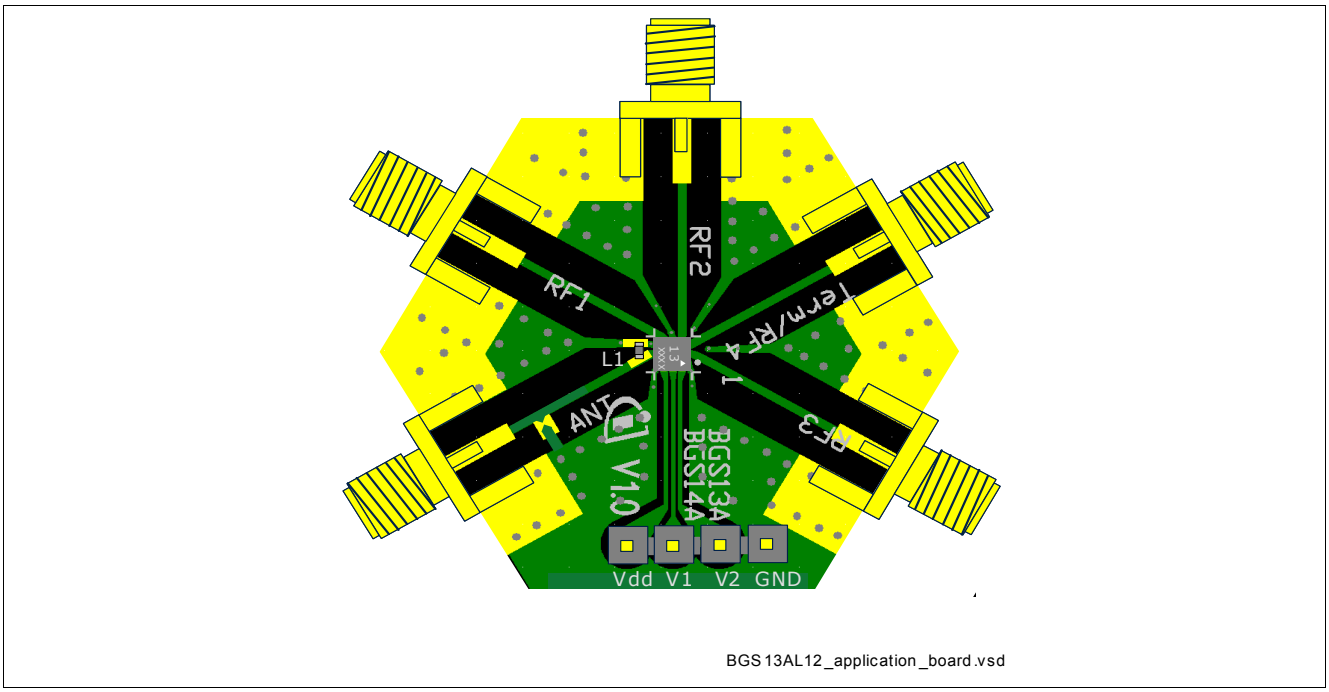


Figure 3 Application Board with External Parallel Inductor L1 (15 nH) at Ant Port

4.1 Deembedding Board

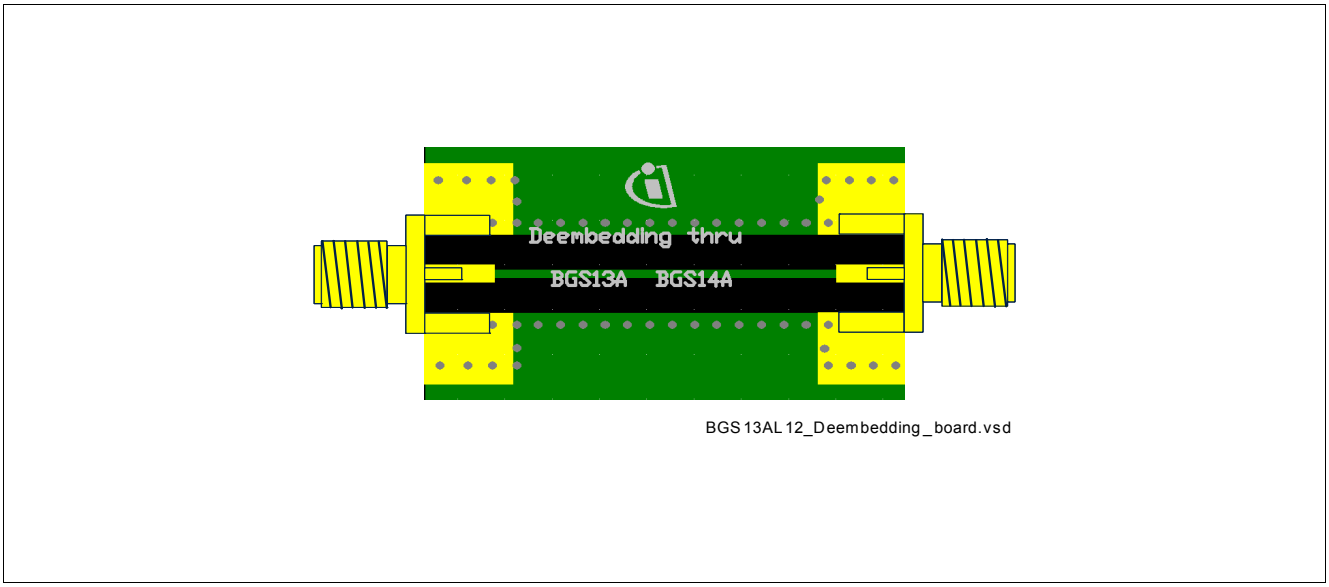


Figure 4 Deembedding Board

5 Package Outlines

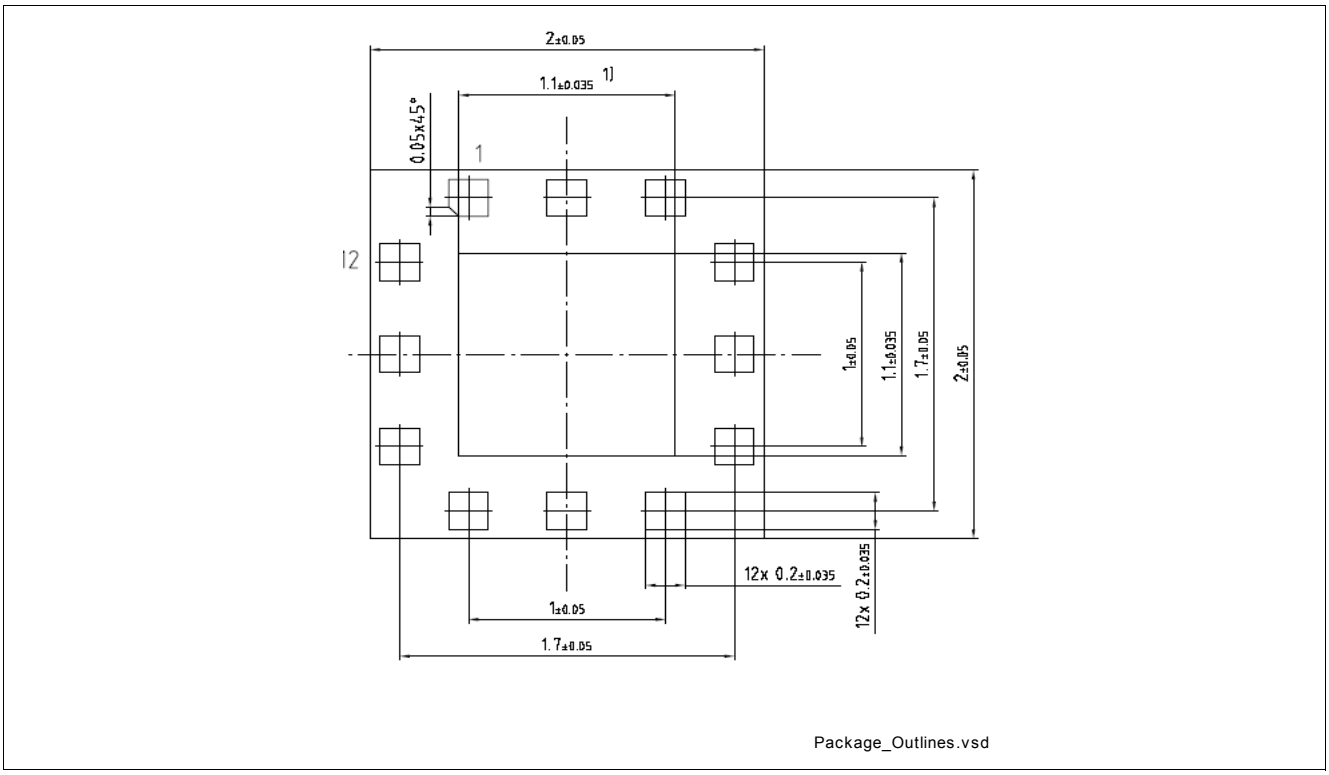


Figure 5 Package Outlines

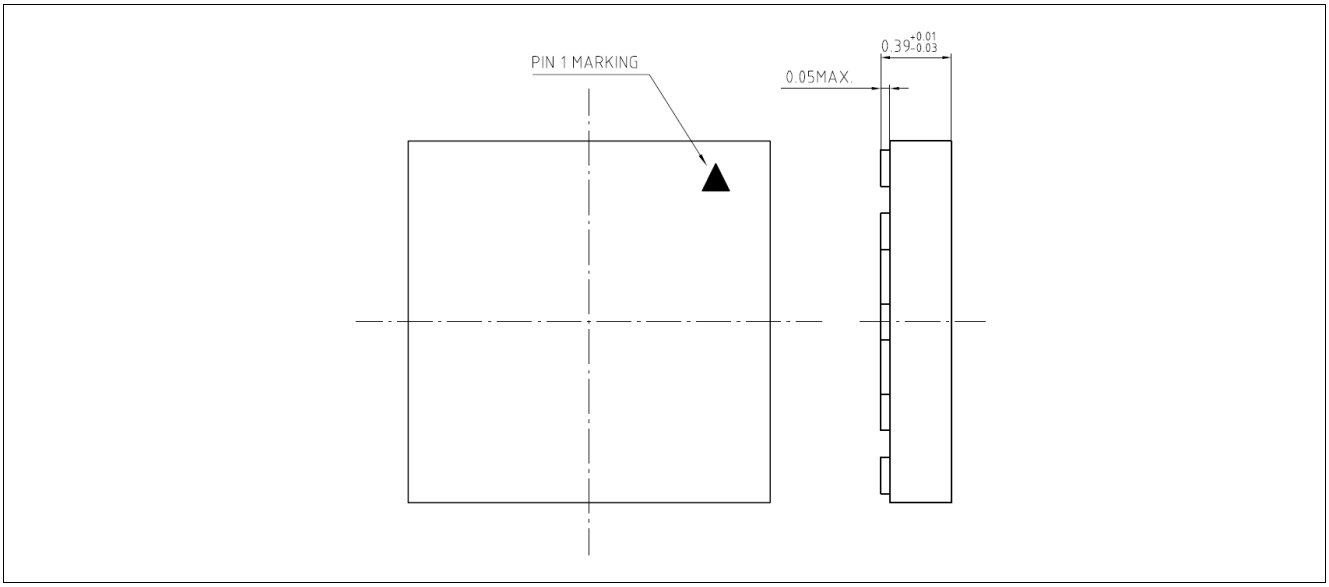


Figure 6 Pin Marking

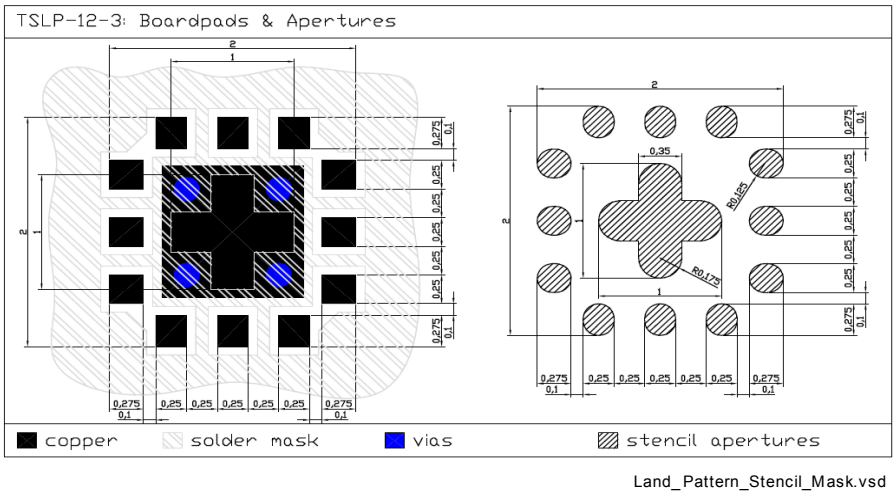


Figure 7 Land Pattern and Stencil Mask

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