BGS15AN16

SP5T Antenna Switch

Data Sheet

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BGS15AN16 SP5T Antenna Switch

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Previous Revision: 2011-05-08, Revision 2.0

Page	Subjects (major changes since last revision)
8,9,10	Updated drawings

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1 Features

Main Features

- 5 high-linearity Rx ports with power handling capability of up to 30 dBm
- All ports fully symmetrical
- No external decoupling components required
- High ESD robustness
- Low harmonic generation
- Low insertion loss
- High port-to-port-isolation
- 0.1 to 3.0 GHz coverage
- Direct connection to battery
- Power down mode
- On-chip control logic supporting logic levels from 1.5 V to Vdd
- Lead and halogen free package (RoHS and WEEE compliant)
- Small leadless package TSNP16 with the size of 2.3 x 2.3 mm² and a maximum height of 0.73 mm.

RoHS

Applications

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

Description

The BGS15AN16 RF MOS switch is specifically designed for WCDMA diversity applications. Any of the 5 ports can be used as termination of the diversity antenna handling up to 30 dBm.

This SP5T offers low insertion loss and high robustness against interferer signals at the antenna port and low harmonic generation in termination mode.

An integrated LDO allows to connect V_{dd} directly to battery, hence no regulated supply voltage is required. A power down mode is implemented to avoid current drain when the device is not in use.

The on-chip controller integrates CMOS logic and level shifters, driven by control inputs from 1.5 V to Vdd. Unlike GaAs technology, external DC blocking capacitors at the RF Ports are only required if DC voltage is applied externally.

The BGS15AN16 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.

The device has a very small size of only 2.3 x 2.3 mm² and a maximum height of 0.73 mm

Product Name	Product Type	Package
SP5T RF Switch	BGS15AN16	PG-TSNP-16-6

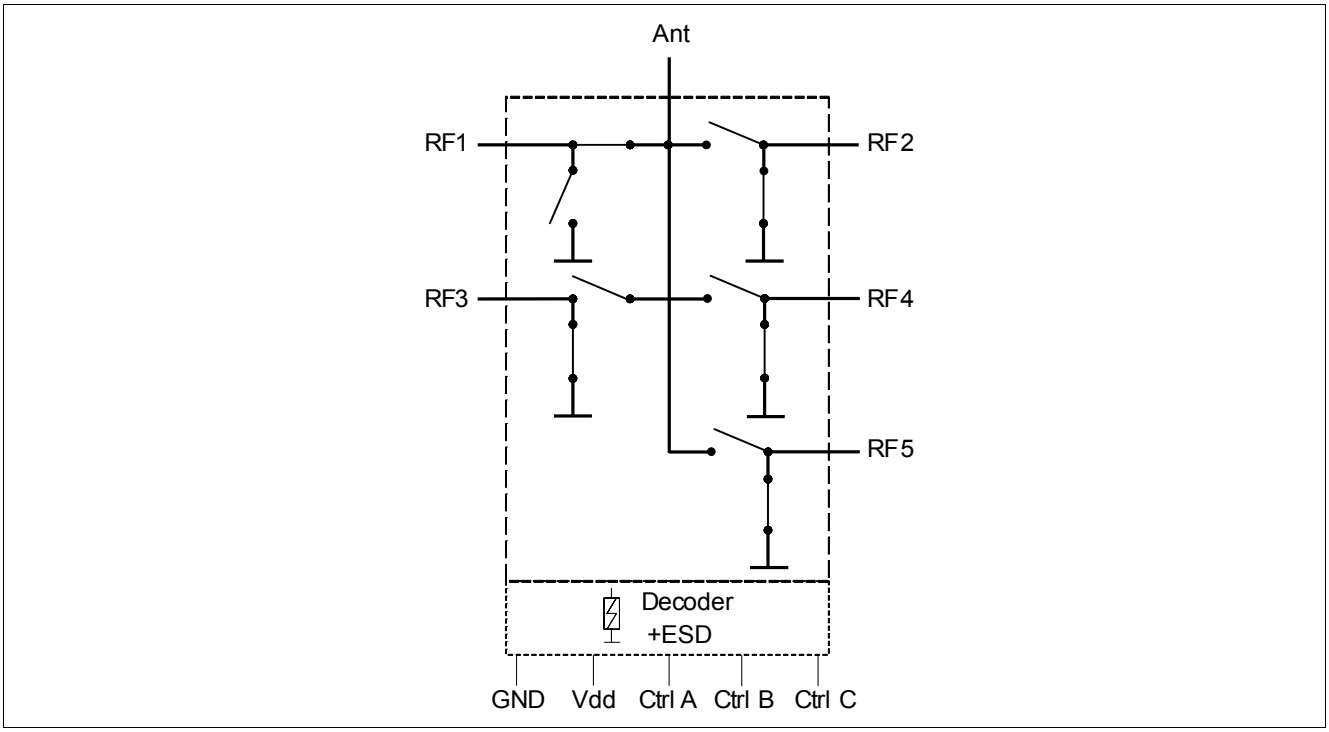


Figure 1 Functional Diagram

2 Signals Description

Table 1 Pin Description (top view)

Pin No.	Name	Pin Type	Buffer Type	Function
1	RX5	RX5		**Rx RF port 5**
2	RX4	I/O		**Rx RF port 4**
3	GND	GND		**Ground**
4	RX3	I/O		**Rx RF port 3**
5	GND	GND		**Ground**
6	RX2	I/O		**Rx RF port 2**
7	GND	GND		**Ground**
8	RX1	I/O		**Rx RF port 1**
9	GND	GND		**Ground**
10	ANT	I/O		**Antenna port**
11	DGND	GND		**Ground**
12	VDD	PWR		**Vdd supply**
13	V3	I		**Control pin 3**
14	V2	I		**Control pin 2**
15	V1	I		**Control pin 1**
16	GND	GND		**Ground**

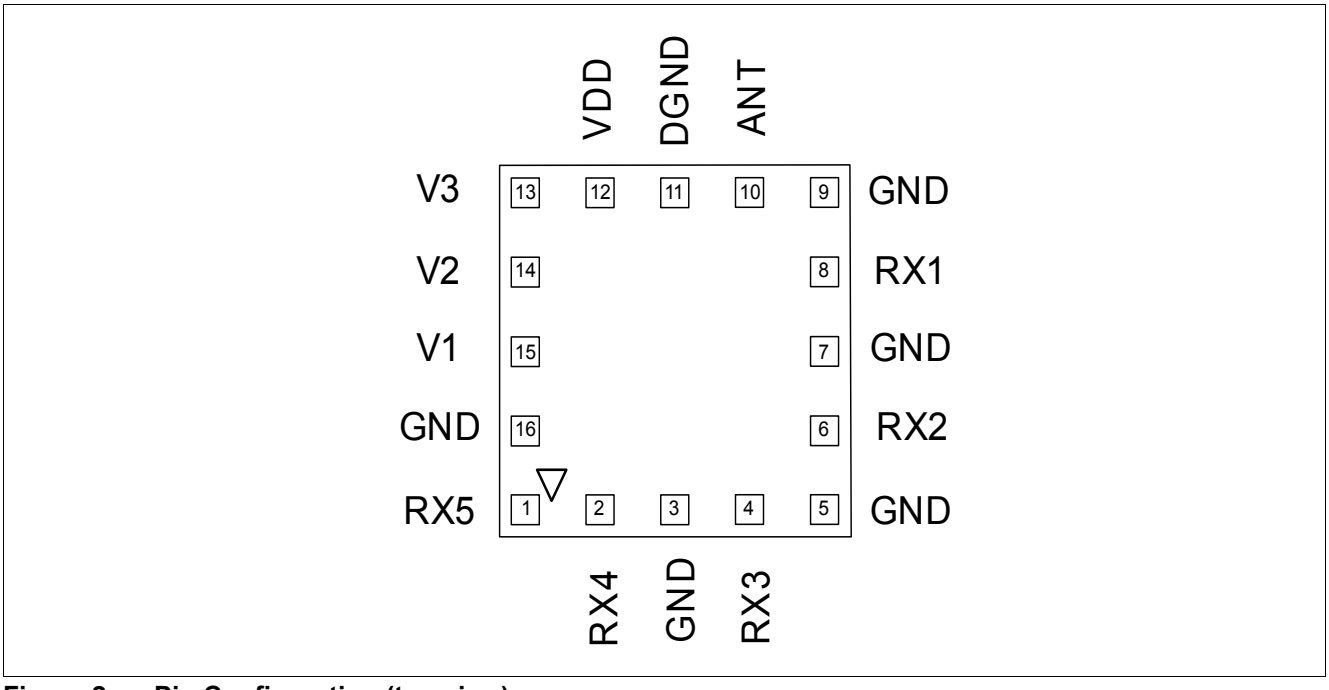


Figure 2 Pin Configuration (top view)

Table 2 Truth Table

Function	V1	V2	V3
Ant → RF1	1	0	0
Ant → RF2	0	1	0
Ant → RF3	0	0	1
Ant → RF4	1	0	1
Ant → RF5	1	1	1
Power down mode	0	0	0
All off	1	1	0
All off	0	1	1

3 Electrical Characteristics

Table 3 Absolute Maximum Ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Storage Temperature Range	T_{stg}	-55	–	150	°C	–
DC Voltage at V_{dd} pin to GND	V_{DC}	–	–	5.5	V	–
DC Voltage at all other pins to GND	V_{DC}	–	–	3.6	V	–
Max RF power at antenna port, any RF port on	$P_{Ant\ IN\ max}$	–	–	32	dBm	50 Ω
Max. Input (Reverse) Power at antenna pin	P_{in}	–	–	30	dBm	50% duty cycle 50 Ω

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.

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}	1.5	–	V_{dd}	V	V_{dd} < 3.3V
Supply Voltage	V_{dd}	2.85	–	4.7	V	–

Table 5 ESD Ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
ESD HBM, all ports	V_{max}	1	–	–	kV	all GND ports connected
ESD CDM, all ports	V_{max}	2	–	–	kV	–
ESD MM, all ports	V_{max}	100	–	–	V	–
ESD robustness IEC-61000-4-2, antenna port	V_{max}	8	–	–	kV	with external 27nH inductor

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} = 2.85 V...4.7 V
- P_{in} = 0 dBm
- Across operating range of control voltages: V_{CtrH} = 1.5...3.5 V
- Measured using external circuitry according application note AN259.

Table 6 Electrical Characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Insertion Loss						
824<f<960 MHz		–	0.34[1)]	0.49	dB	–
1710<f<1980 MHz		–	0.55[1)]	0.75	dB	RX1, RX5
1710<f<1980 MHz		–	0.5[1)]	0.7	dB	RX 2-4
1980<f<2170 MHz		–	0.59[1)]	0.79	dB	RX1, RX5
1980<f<2170 MHz		–	0.55[1)]	0.75	dB	RX2-4
2170<f<2690 MHz		–	0.69[1)]	0.89	dB	RX1, RX5
2170<f<2690 MHz		–	0.65[1)]	0.85	dB	RX2-4
Inband ripple Rx ports (high bands)		–	0.05	0.1	dB	–
Inband ripple Rx ports (low bands)		–	0.03	0.1	dB	–
Return Loss[1)]						
All ports @ 824 - 915 MHz		25	30	–	dB	–
All ports @ 1.71 - 2.69 GHz		14	20	–	dB	–
Isolation Ant – RF1,2,3,4,5						
824 - 915 MHz		35	40	–	dB	–
1.71 - 1.98 GHz		26	30	–	dB	–
1.98 - 2.17 GHz		24	30	–	dB	–
2.17 - 2.69 GHz		24	27	–	dB	–
Isolation RF1,2,3 – RF1,2,3,4,5						
824 - 915 MHz		32	35	–	dB	–
1.71 - 1.98 GHz		26	28	–	dB	–
1.98 - 2.17 GHz		25	28	–	dB	–
2.17 - 2.69 GHz		21	25	–	dB	–
Isolation RF Ports – V_{dd}, V_{ctrl}						
0.9 GHz		40	30	–	dB	–
2 GHz		20	20	–	dB	–

1)T_A = 25 °C and V_{dd} = 3.5 V

Table 7 Electrical Characteristics (cont'd)

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input Intercept Point Requirements - IMD2[1)]						
Tx=15 dBm@ ant port, Int= -15 dBm @ant port (TX Freq = 824 - 915 MHz)		–	-110	-104	dBm	–
Tx=10 dBm@ ant port, Int= -15 dBm @ant port (TX Freq=1710 - 1980 MHz)		–	-110	-104	dBm	–
Input Intercept Point Requirements – IMD3[1)]						
Tx=15 dBm@ ant port, Int= -15 dBm @ant port(TX Freq = 824 - 915 MHz)		–	-110	-104	dBm	–
Tx=10 dBm@ ant port, Int= -15 dBm @ant port (TX Freq=1710 - 1980 MHz)		–	-110	-104	dBm	–
Harmonic Generation RF ports up to 12.75 GHz[1)]						
Pin (UMTS) = 23 dBm, Duty Cyle = 100%, unused RF pins = any load, VSWR = 4:1		–	–	–	–	–
824 to 960 MHz		–	–	-46	dBm	–
1920 to 1980 MHz		–	–	-46	dBm	–
Harmonic Generation RF port up to 12.75 GHz[1)]						
Pin = 30 dBm at low band, 22 dBm at high band, Duty Cycle = 25%		–	–	–	–	–
824 to 960 MHz, Third Harmonic		–	-50	-42	dBm	–
824 to 960 MHz, all other Harmonics up to 12.75 GHz		–	-50	-44	dBm	–
1920 to 1980 MHz		–	-50	-44	dBm	–
Switching Time and Current Consumtion						
On/Off Switching Time (10-90%) RF		0.3	1	3	µs	–
Boost Converter Settling Time		–	10	25	µs	after power down mode
Current Consumption at Vdd Pin		50	75	100	µA	–
Current Consumption at Vctrl Pins		0.1	1	30	µA	–
Current Consumption at power down mode		–	–	1	µA	–

1) T_A = 25 °C and V_{dd} = 3.5 V

4 Package Outline

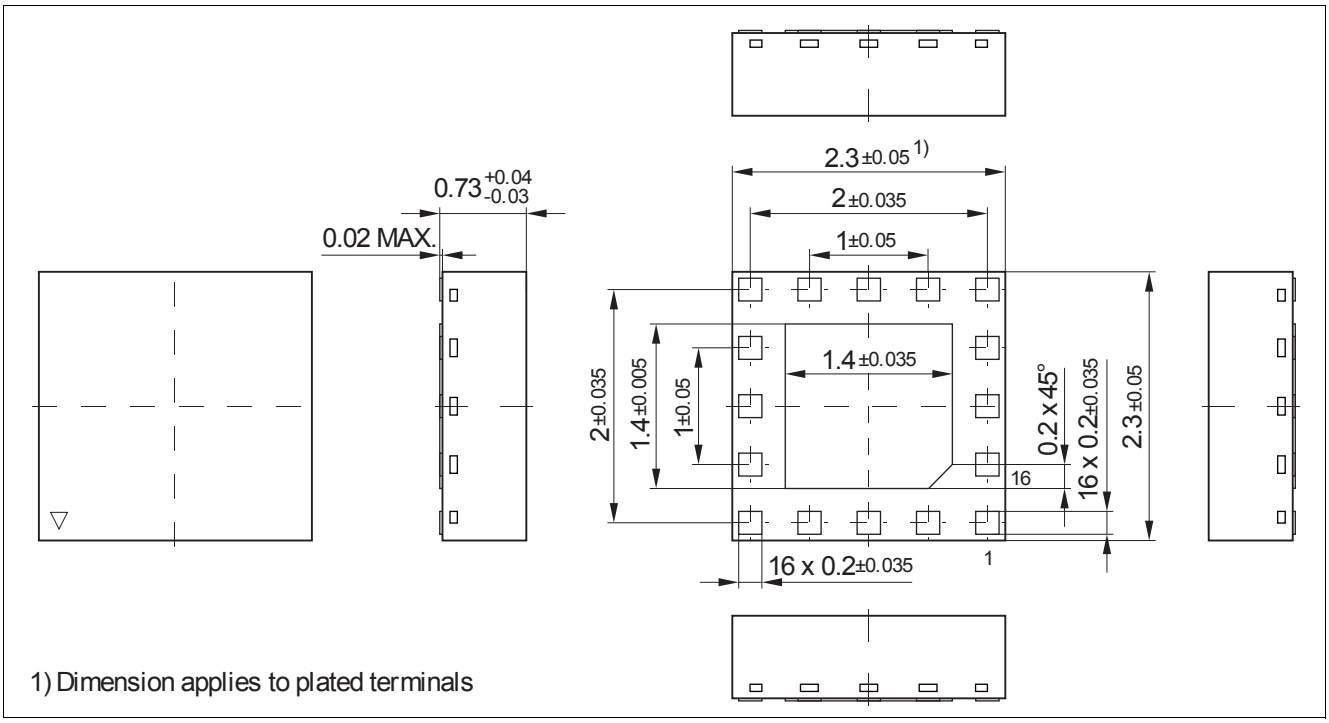


Figure 3 Package Outline

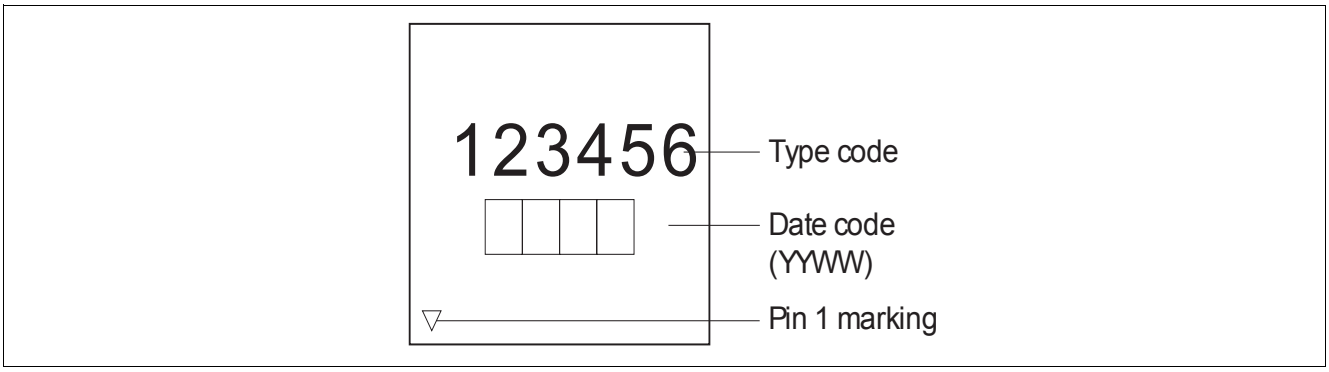


Figure 4 Pin Marking

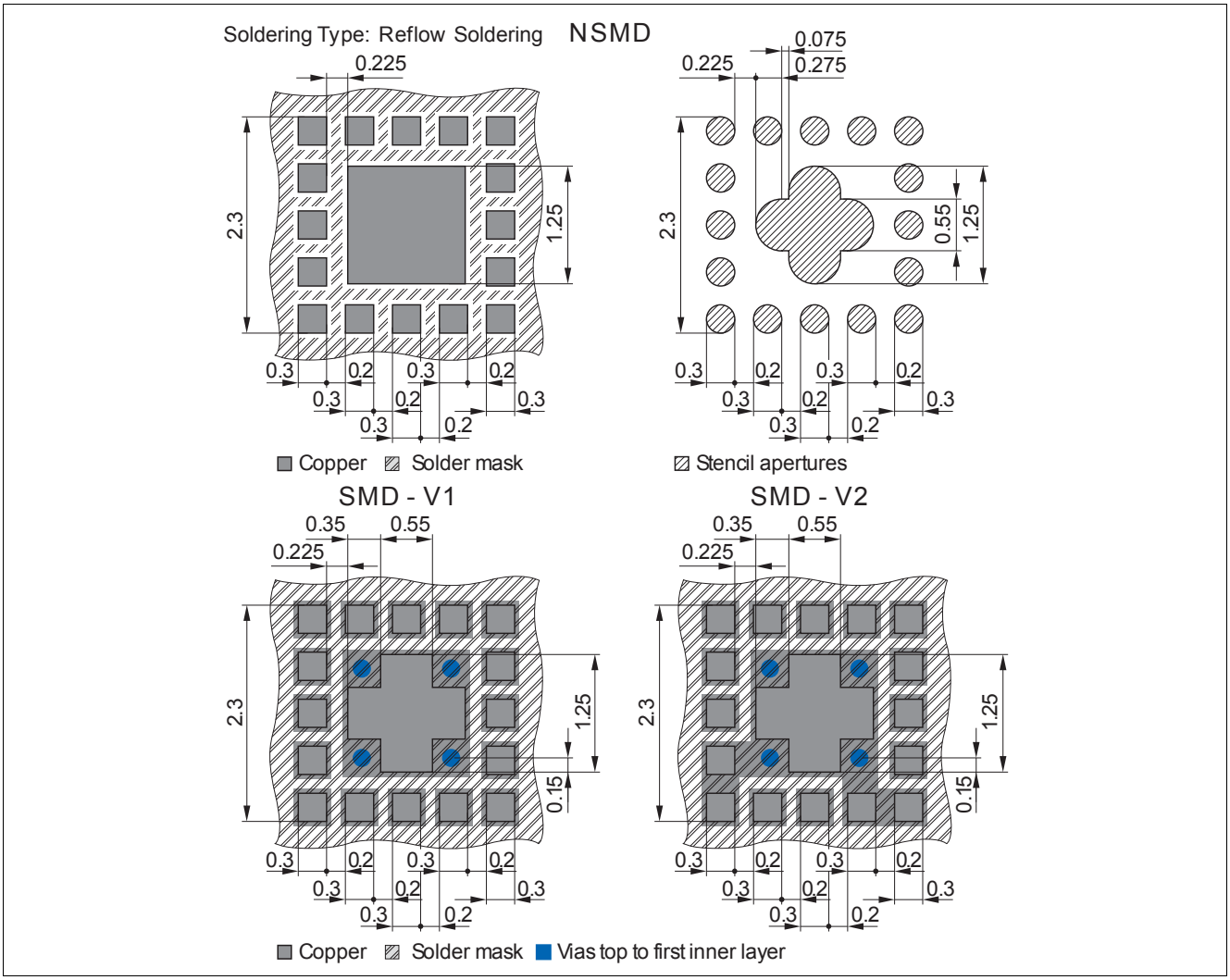


Figure 5 Land Pattern and Stencil Mask

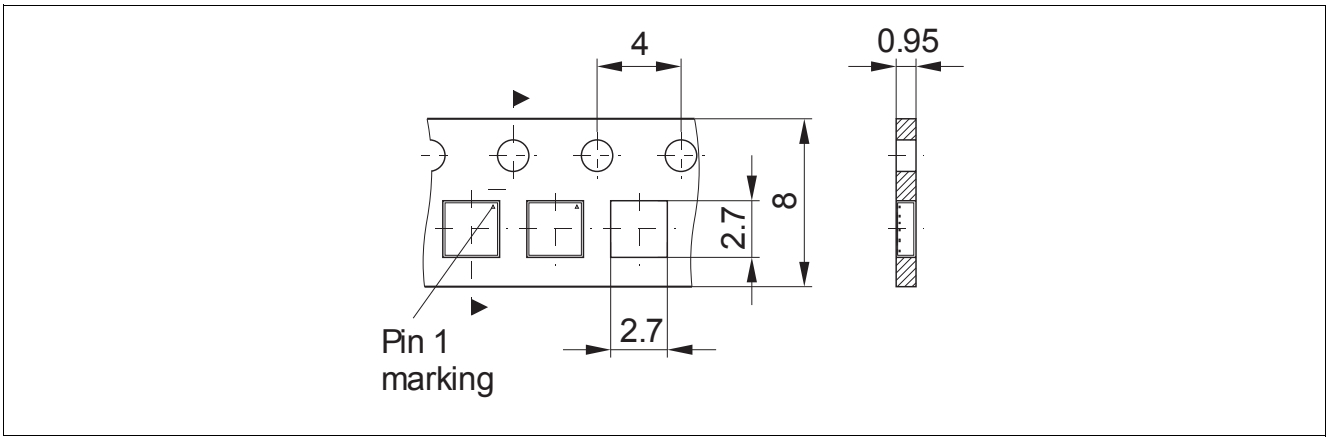


Figure 6 Tape Drawing for PG-TSNP-16-6

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