BGS14AN16

RF SP4T Switch

Data Sheet

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Power Management & Multimarket

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Revision History

Previous Version: –	
Page	**Subjects (major changes since last revision)**
	Creation of Document

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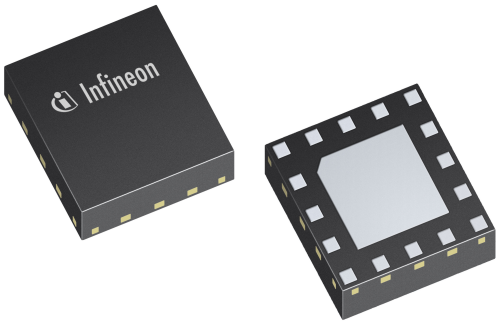
1 Features



- 4 high-linearity Rx paths 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 GHz coverage
- Direct connect to battery
- Power down mode
- On-chip control logic supporting logic levels from 1.5 V to V_{dd}
- Lead and halogen free package (RoHS and WEEE compliant)
- Small leadless package TSNP-16-6 with a size of 2.3 x 2.3 mm^2 and a maximum height of 0.77 mm.

RoHS

Applications

- CDMA/WCDMA Diversity
- Analog and Digital Tuner
- Band Switching
- LTE

2 Product Description

The BGS14AN16 RF MOS switch is specifically designed for WCDMA diversity applications. Any of the 4 ports can be used as termination of the diversity antenna handling up to 30 dBm.

This SP4T 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 V_{dd}. Unlike GaAs technology, external DC blocking capacitors at the RF Ports are only required if DC voltage is applied externally.

The BGS14AN16 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 mm^2 and a maximum height of 0.77 mm.

Table 1: Ordering Information

Product Name	Product Type	Package	Marking
BGS14AN16	SP4T RF Switch	PG-TSNP-16-6	14A

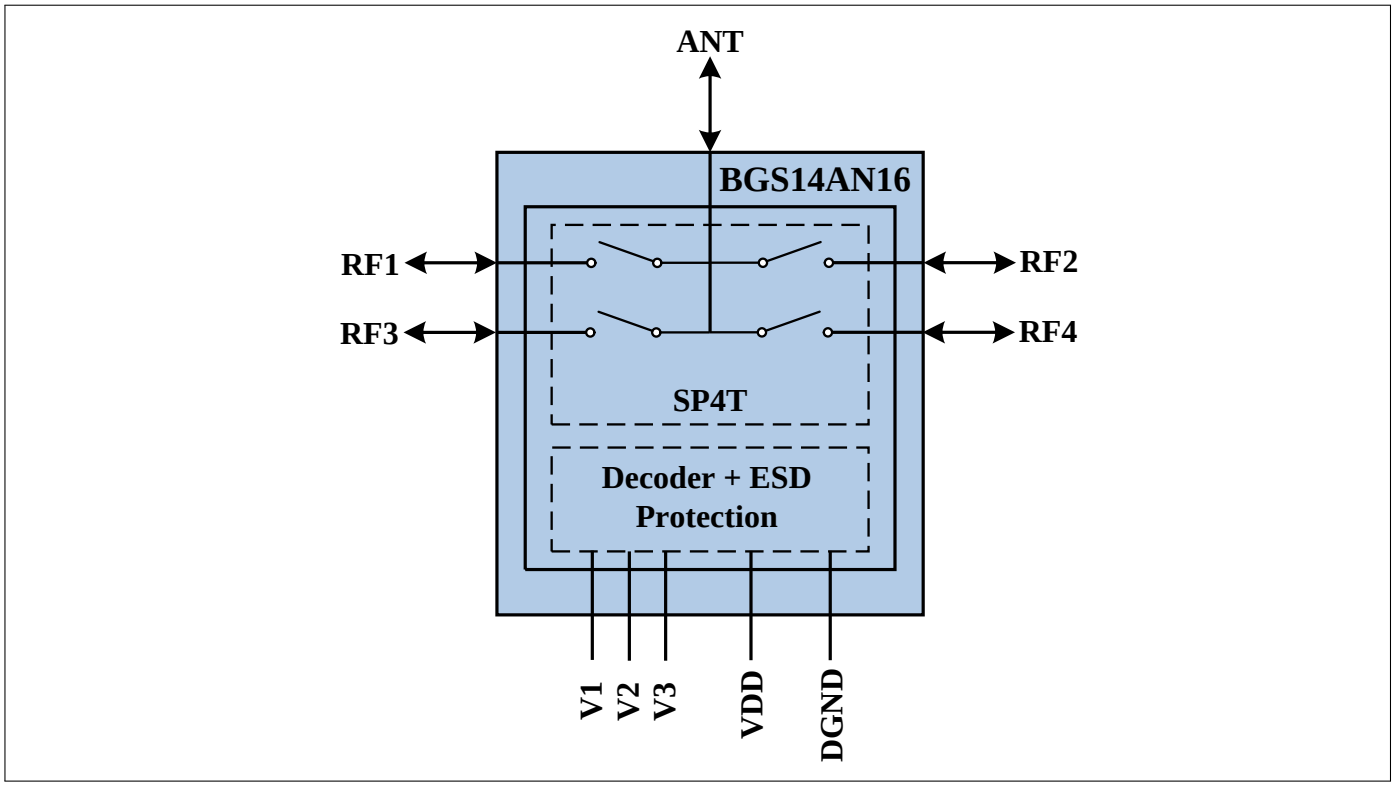


Figure 1: BGS14AN16 Block Diagram

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
Power Down Mode	0	0	0
All Off	1	1	0
All Off	0	1	1

3 Maximum ratings

Table 3: Maximum Ratings at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Storage Temperature Range	T_{STG}	-55	–	150	°C	–
DC Voltage on V_{dd} Pin to GND	V_{DD}	–	–	5.5	V	–
DC Voltage on All Other Pins to GND	V_{DC}	–	–	3.6	V	–
Max, RF Power at Antenna Port, Any RF Port On	P_{Antin_Max}	–	–	+32	dBm	50Ω
Max, Input (Reverse) Power at Antenna Pin	P_{Revin_Max}	–	–	+30	dBm	50 % Duty Cycle, 50Ω

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: ESD Ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
ESD HBM, All Ports	V_{ESD_HBM}	1000	–	–	V	All GND Ports Connected
ESD CDM, All Ports	V_{ESD_CDM}	2000	–	–	V	–
ESD MM, All Ports	V_{ESD_MM}	100	–	–	V	–
ESD Robustness IEC-61000-4-2, antenna port	V_{ESD_Ant}	8000	–	–	V	With external 27nH Inductor

4 Operation Ranges

Table 5: Operation Ranges

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Ambient Temperature	T_A	-30	25	85	°C	–
RF Frequency	f	0.1	–	3	GHz	–
Control Voltage Low	V_{Ctrl_L}	-0.3	–	0.3	V	–
Control Voltage High	V_{Ctrl_H}	1.5	–	V_{DD}	V	V_{DD} < 3.3 V
Supply Voltage	V_{DD}	2.85	–	4.7	V	–

5 RF Characteristics

Table 6: RF Characteristics

Test Conditions (unless otherwise specified):

- Terminating Port Impedance: Z_0 = 50 Ω
- Temperature Range: T_A = -30 ... +85 °C
- Supply Voltage: V_{DD} = 2.85 – 4.7 *V*
- Input Power: P_{IN} = 0 *dBm*
- Across Operating Range of Control Voltages: V_{Ctrl_H} = 1.5...3.5 *V*
- Measured Using External Circuitry Acording Application Note AN259

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Insertion Loss						
824 - 960 MHz	*IL*	–	0.34[1]	0.49	dB	–
1710 - 1980 MHz		–	0.55[1]	0.75	dB	RF1
1710 - 1980 MHz		–	0.50[1]	0.70	dB	RF2, RF3, RF4
1980 - 2170 MHz		–	0.59[1]	0.79	dB	RF1
1980 - 2170 MHz		–	0.55[1]	0.75	dB	RF2, RF3, RF4
2170 - 2690 MHz		–	0.69[1]	0.89	dB	RF1
2170 - 2690 MHz		–	0.65[1]	0.85	dB	RF2, RF3, RF4
Inband Ripple Rx Ports (High Bands)		–	0.05	0.10	dB	–
Inband Ripple Rx Ports (Low Bands)		–	0.03	0.10	dB	–
Return Loss[1)]						
All Ports @ 824 - 915 MHz	*RL*	25	30	–	dB	–
All Ports @ 1710 - 2690 MHz		14	20	–	dB	–
Isolation Ant - RF1,2,3,4						
824 - 915 MHz	*ISO*	35	40	–	dB	–
1710 - 1980 MHz		26	30	–	dB	–
1980 - 2170 MHz		24	30	–	dB	–
2170 - 2690 MHz		24	27	–	dB	–
Isolation RF1,2,3 - RF1,2,3,4						
824 - 915 MHz	*ISO*	32	35	–	dB	–
1710 - 1980 MHz		26	28	–	dB	–
1980 - 2170 MHz		25	28	–	dB	–
2170 - 2690 MHz		21	25	–	dB	–
Isolation RF Ports - V_{DD}, V_{Ctrl}						
900 MHz	*ISO*	40	30	–	dB	–
2000 MHz		20	20	–	dB	–

Note: All electrical characteristics are measured with all RF ports terminated by 50 Ω loads.

[1)] T_A = +25 °C, V_{DD} = 3.5 *V*

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input Intercept Point Requirements - IMD2[1)]						
Tx = 15dBm@Ant, Int = -15dBm@Ant (Tx Freq = 824 - 915 MHz)	P_{IMD2}	–	-110	-104	dB	–
Tx = 10dBm@Ant, Int = -15dBm@Ant (Tx Freq = 1710 - 1980 MHz)		–	-110	-104	dB	–
Input Intercept Point Requirements - IMD3[1)]						
Tx = 15dBm@Ant, Int = -15dBm@Ant (Tx Freq = 824 - 915 MHz)	P_{IMD3}	–	-110	-104	dB	–
Tx = 10dBm@Ant, Int = -15dBm@Ant (Tx Freq = 1710 - 1980 MHz)		–	-110	-104	dB	–
Harmonic Generation RF Ports Up to 12.75 GHz[1)]						
824 - 960 MHz	P_{Harm}	–	–	-46	dB	–
1920 - 1980 MHz		–	–	-46	dB	–
Harmonic Generation RF Ports Up to 12.75 GHz[1)]						
824 - 960 MHz, Third Harmonic	P_{Harm}	–	-50	-42	dB	–
824 - 960 MHz, All Other Harmonics Up to 12.75 GHz		–	-50	-44	dB	–
1920 - 1980 MHz		–	-50	-44	dB	–
Intermodulation Distortion in Rx Band[1)]						
IMD2_Low	P_{IMD2_L}	-125	-115	-110	dBm	–
IMD3	P_{IMD3}	-125	-115	-110	dBm	–
IMD2_High	P_{IMD2_H}	-125	-115	-110	dBm	–
Switching Time and Current Consumption						
On/Off Switching Time (10-90%) RF	$t_{10\%-90\%}$	0.3	1	3	μs	–
Boost Converter Settling Time	t_{Boost}	–	10	25	μs	After Power Down Mode
Current Consumption at V_{DD} Pin	I_{DD}	50	75	100	μA	–
Current Consumption at V_{Ctrl} Pin	I_{Ctrl}	0.1	1	30	μA	–
Current Consumption at Power Down Mode	I_{PD}	–	–	1	μA	–

Note: All electrical characteristics are measured with all RF ports terminated by 50 Ω loads.

[1)] T_A = +25 °C, V_{DD} = 3.5 V

6 Pin Configuration and Package Outline

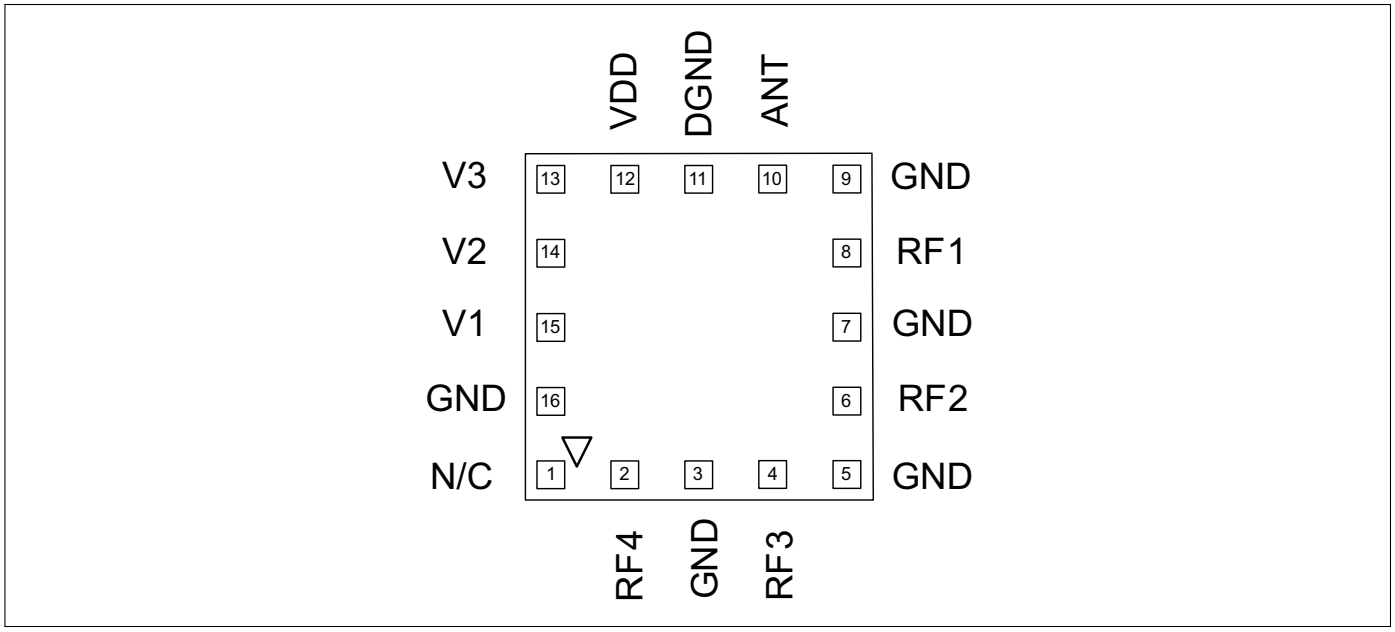


Figure 2: Pin Configuration

Table 7: Pin Description

Pin No.	Name	Pin Type	Buffer Type	Function
1	N/C	–	–	Not Connected
2	RF4	I/O	–	RF Port 4
3	GND	GND	–	Ground
4	RF3	I/O	–	RF Port 3
5	GND	GND	–	Ground
6	RF2	I/O	–	RF Port 2
7	GND	GND	–	Ground
8	RF1	I/O	–	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

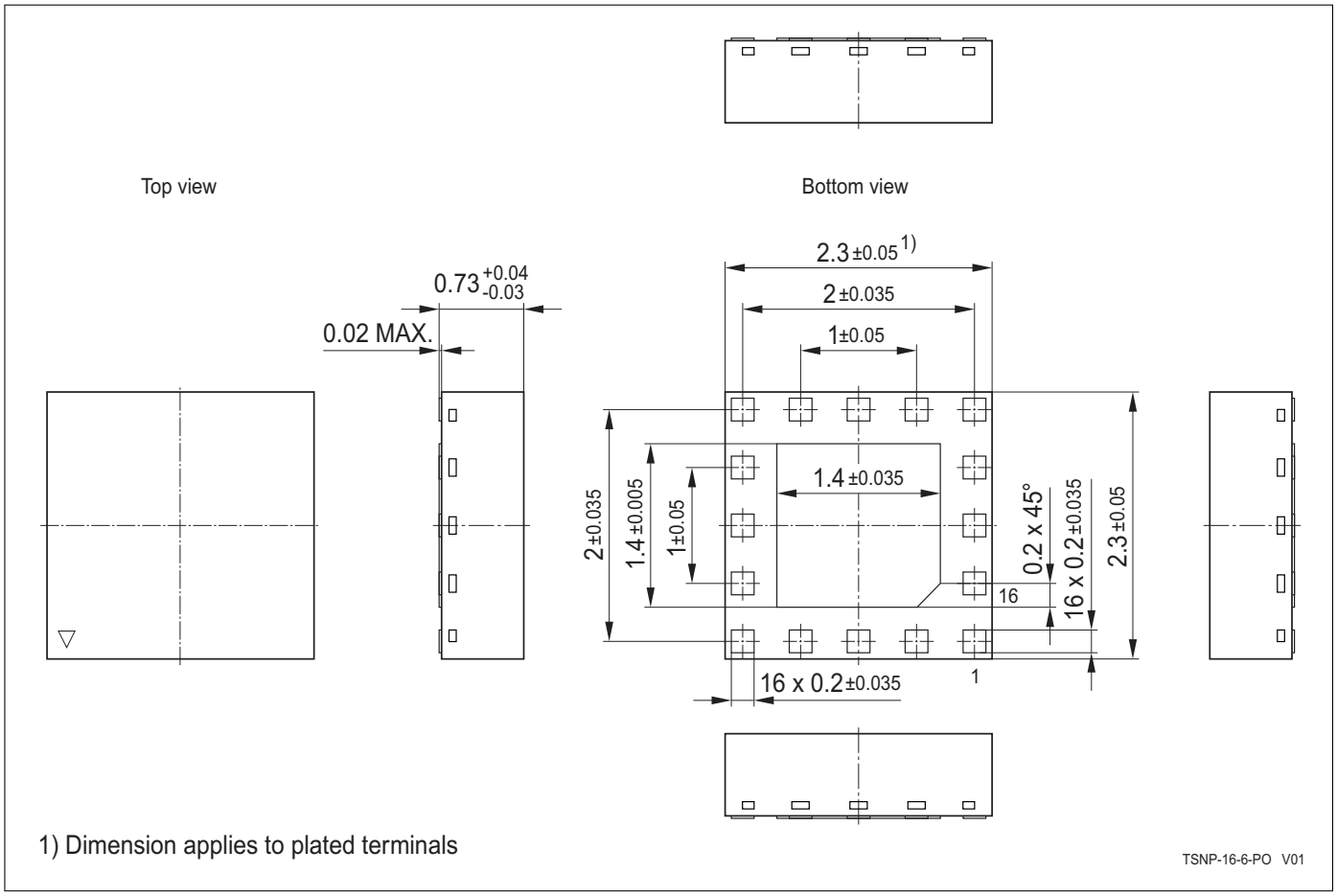


Figure 3: Package Outline

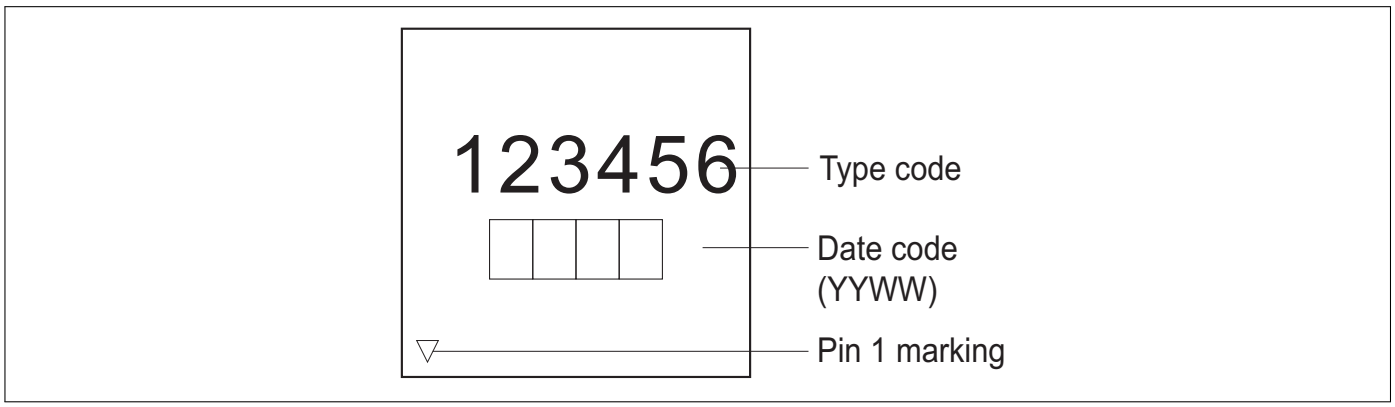


Figure 4: Pin Marking

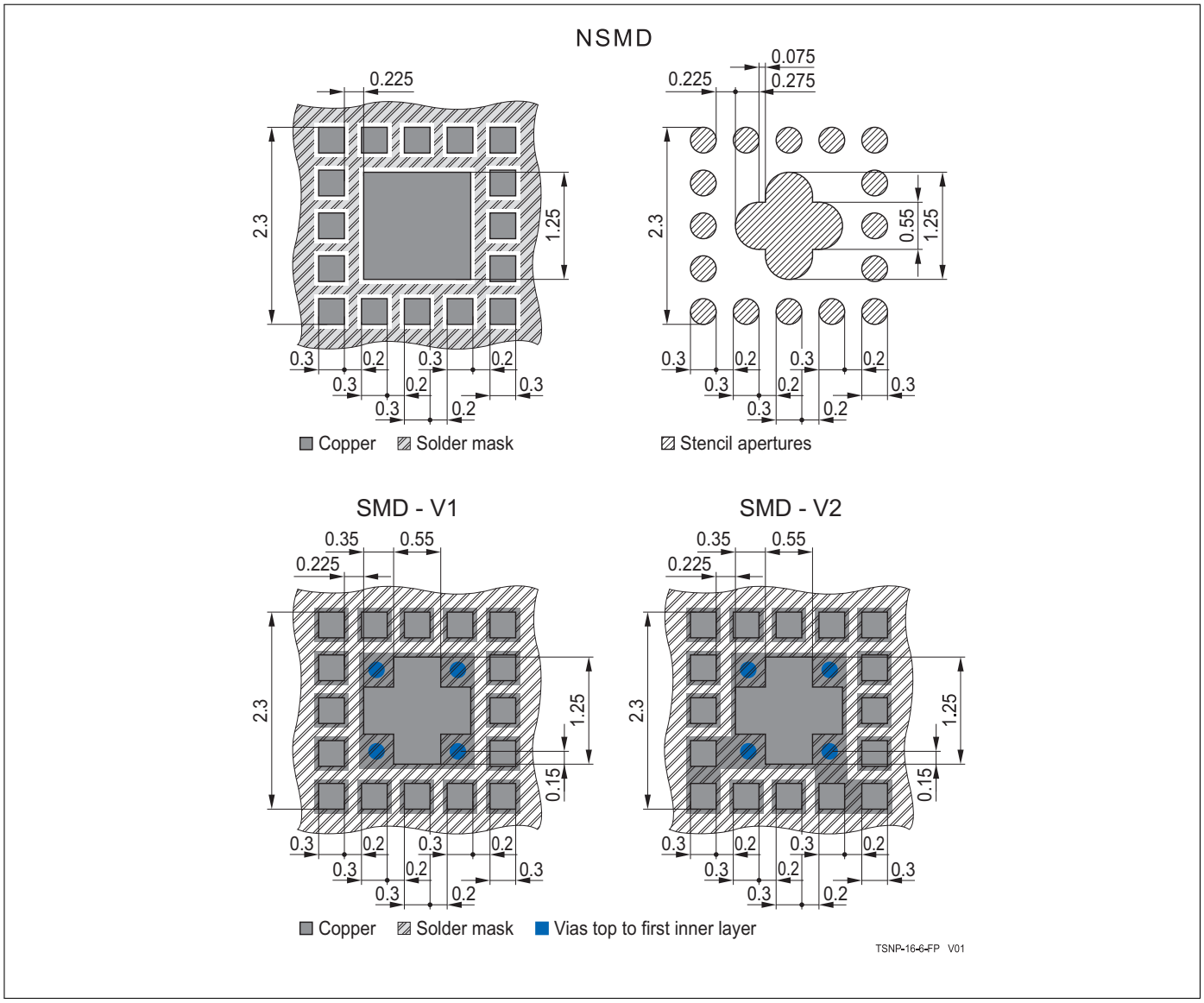


Figure 5: Land Pattern and Stencil Mask

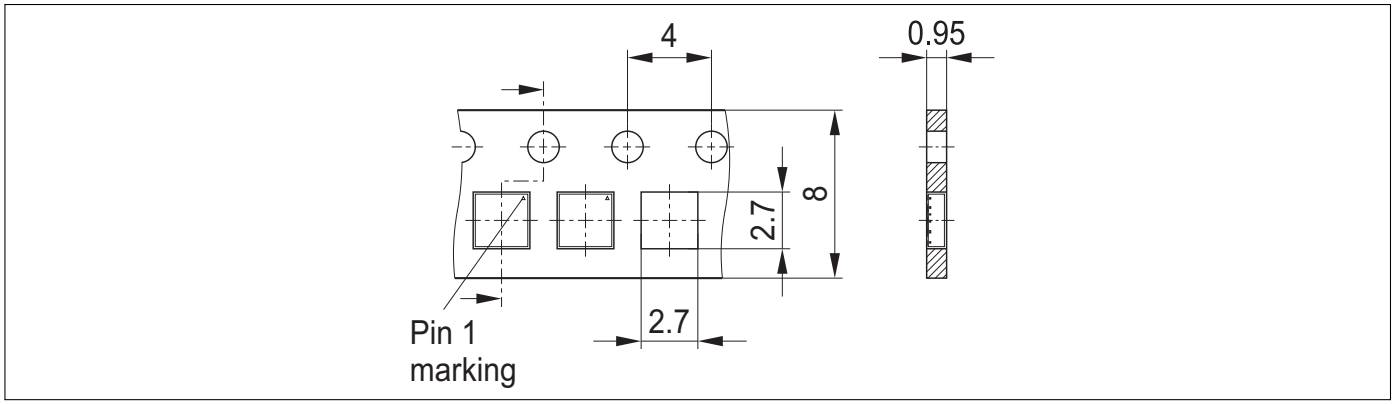


Figure 6: Tape Drawing for TSNP-16-6

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