



**THE DATASHEET OF  
BGS13SL9E6327XTSA1**



# BGS13SL9

Wideband RF SP3T Switch

## Data Sheet

Revision 2.4, 2014-05-27

**Edition May 27, 2014**

**Published by  
Infineon Technologies AG  
81726 Munich, Germany**

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## Revision History

**Previous Version:** v2.3, 2014-02-13

Page	Subjects (major changes since last revision)
10	Updated Temperature range (Table 6)
13	Updated Tape Drawing for TSLP-9-3 (Figure 5)

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Last Trademarks Update 2012-12-13

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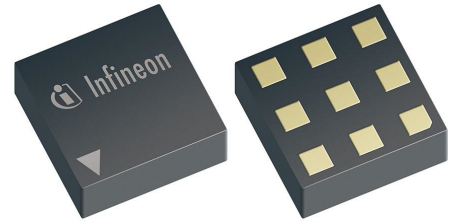
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## BGS13SL9 Wideband RF SP3T Switch

### 1 Features

- 3 high-linearity TRx paths with power handling capability of up to 30 dBm
- High switching speed, ideal for WLAN and Bluetooth applications
- All ports fully bi-directional
- No decoupling capacitors required if no DC applied on RF lines
- Low insertion loss
- Low harmonic generation
- High port-to-port-isolation
- 0.1 to 3 GHz coverage
- High ESD robustness
- On-chip control logic
- Very small leadless and halogen free package TSLP-9-3 (1.15x1.15mm<sup>2</sup>) with super low height of 0.31mm
- RoHS compliant package



### 2 Product Description

The BGS13SL9 RF MOS switch is specifically designed for WLAN and Bluetooth applications. Any of the 3 ports can be used as termination of the diversity antenna handling up to 30 dBm.

This SP3T offers low insertion loss and high robustness against interferer signals at the antenna port and low harmonic generation in termination mode. The on-chip controller integrates CMOS logic and level shifters, driven by control inputs from 1.5 V to  $V_{dd}$ . The BGS13SL9 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 1.15 x 1.15 mm<sup>2</sup> and a maximum height of 0.31 mm.

No decoupling capacitors are required in typical applications as long as no DC is applied to any RF port.

**Table 1: Ordering Information**

Type	Package	Marking
BGS13SL9	TSLP-9-3	AA

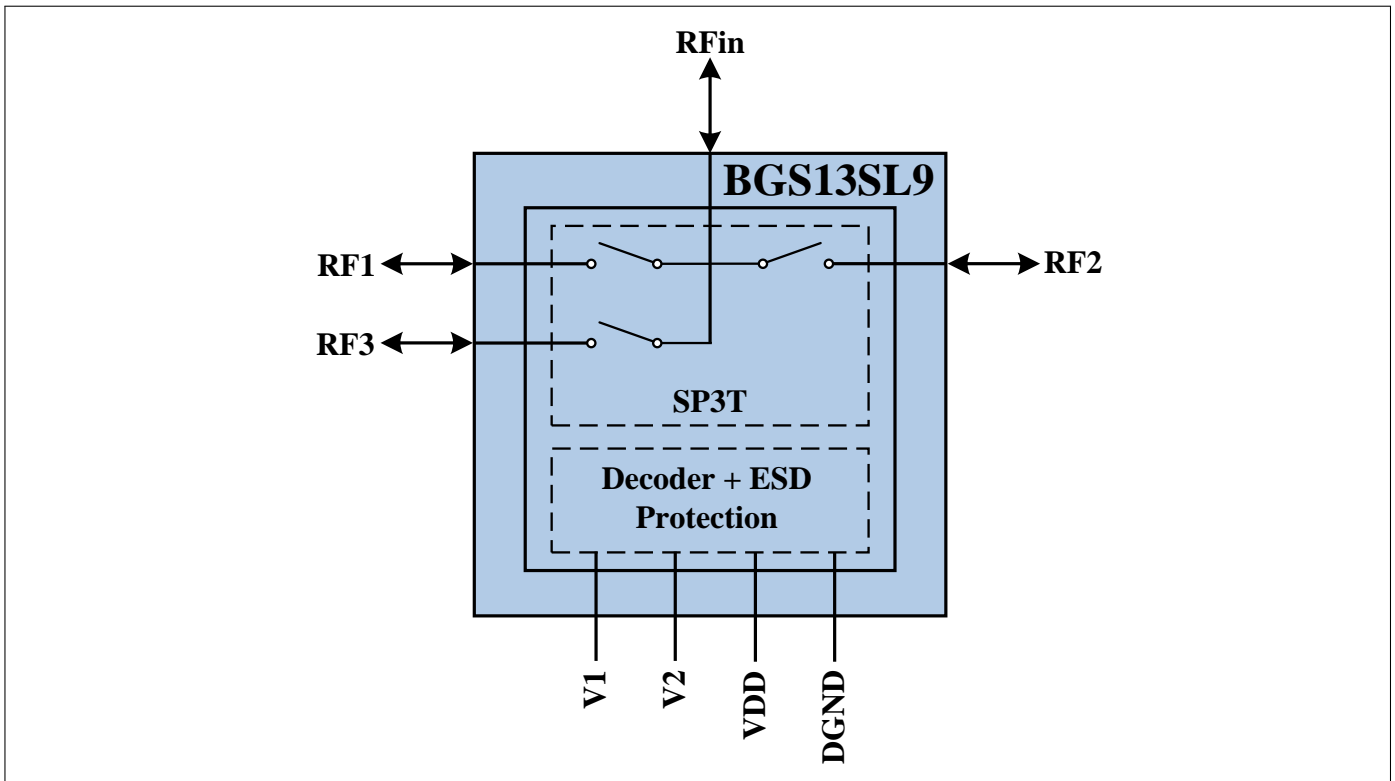


Figure 1: BGS13SL9 Block Diagram

Table 2: Truth Table

Switched Paths	V1	V2
Isolation / All Paths Open	0	0
RFin - RF1	1	0
RFin - RF2	0	1
RFin - RF3	1	1

### 3 Maximum Ratings

**Table 3: Maximum Ratings** at  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply Voltage	$V_{DD}$	-0.5	–	5.5	V	–
Maximum DC-Voltage on Other Pins	$V_{DC}$	-0.3	–	3.6	V	–
Storage Temperature Range	$T_{STG}$	-55	–	150	$^\circ\text{C}$	–
RF Input Power	$P_{RF\_TRx}$	–	–	32	dBm	–
Junction Temperature	$T_j$	–	–	125	$^\circ\text{C}$	–
<b>ESD Capability</b>						
Human Body Model <sup>1)</sup>	$V_{ESD\_HBM}$	–1	–	+1	kV	–
ESD Capability RFin Port <sup>2)</sup>	$V_{ESD\_RFin}$	–8	–	+8	kV	RFin versus GND, with 27 nH shunt inductor

<sup>1)</sup> Human Body Model ANSI/ESDA/JEDEC JS-001-2012 ( $R = 1.5\text{ k}\Omega$ ,  $C = 100\text{ pF}$ ).

<sup>2)</sup> IEC 61000-4-2 ( $R = 330\text{ }\Omega$ ,  $C = 150\text{ pF}$ ), contact discharge.

#### 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.

### 4 Operation Ranges

**Table 4: Operation Ranges**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Ambient Temperature	$T_A$	-40	25	85	$^\circ\text{C}$	–
RF Frequency	$f$	0.1	–	3	GHz	–
Supply Voltage	$V_{DD}$	2.3	–	3.6	V	–
Control Voltage Low	$V_{Ctrl\_L}$	-0.3	–	0.3	V	–
Control Voltage High	$V_{Ctrl\_H}$	1.5	–	$V_{DD}$	V	$V_{DD} < 3.3\text{ V}$

**Table 5: RF Input Power**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
RF Input Power (50 $\Omega$ )	$P_{In}$	–	–	30	dBm	–

## 5 RF Characteristics

**Table 6: RF Characteristics**

Test Conditions (unless otherwise specified):

- Terminating port impedance:  $Z_0 = 50 \Omega$
- Temperature range:  $T_A = -40 \dots +85 \text{ }^\circ\text{C}$
- Supply voltage:  $V_{DD} = 2.3 \dots 3.6 \text{ V}$
- Input power:  $P_{IN} = 0 \text{ dBm}$

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
<b>Insertion Loss</b>						
All RF Ports	$IL$	0.24	0.35	0.55	dB	824 - 915 MHz
		0.28	0.44	0.65	dB	1710 - 1910 MHz
		0.30	0.50	0.80	dB	2170 - 2500 MHz
		0.35	0.54	0.90	dB	2700 MHz
<b>Insertion Loss<sup>1</sup></b>						
All RF Ports	$IL$	0.30	0.35	0.40	dB	824 - 915 MHz
		0.37	0.44	0.50	dB	1710 - 1910 MHz
		0.40	0.50	0.60	dB	2170 - 2500 MHz
		0.44	0.54	0.70	dB	2700 MHz
<b>Return Loss</b>						
All RF Ports	$RL$	21	25	28	dB	824 - 915 MHz
		15	18	24	dB	1710 - 1910 MHz
		12	16	22	dB	2170 - 2500 MHz
		12	14	20	dB	2700 MHz
<b>Isolation</b>						
RFin to RF1/RF2/RF3	$ISO_{In-RFx}$	32	37	44	dB	824 - 915 MHz
		22	27	33	dB	1710 - 1910 MHz
		19	24	29	dB	2170 - 2500 MHz
		18	22	27	dB	2700 MHz
RF1 to RF2 / RF2 to RF1 RF1 to RF3 / RF3 to RF1 RF2 to RF3 / RF3 to RF2	$ISO_{Port-Port}$	32	42	49	dB	824 - 915 MHz
		24	31	36	dB	1710 - 1910 MHz
		21	27	32	dB	2170 - 2500 MHz
		20	26	31	dB	2700 MHz

<sup>1</sup>  $T_A = +25 \text{ }^\circ\text{C}$ ,  $V_{DD} = 3 \text{ V}$

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
<b>Harmonic Generation up to 12.75 GHz</b>						
Any Path	$P_{Harm}$	–	-80	-70	dBc	$P_{in} = 27\text{ dBm}$ , 50 % Duty Cycle, $50\Omega$
<b>Intermodulation Distortion in Rx Band<sup>1,2</sup></b>						
IMD2	$IMD2$	–	-110	-105	dBm	Tx = 10 dBm, Interferer = -15 dBm, $50\Omega$
IMD3	$IMD3$	–	-115	-105	dBm	
<b>Switching Time and Current Consumption</b>						
RF Rise Time	$t_{10\%-90\%}$	–	23	90	ns	10% - 90% of RF Signal
Ctrl to RF Time	$t_{Ctrl-RF}$	–	95	250	ns	50% of Ctrl Signal to 90% of RF Signal
Supply Current	$I_{DD}$	–	140	270	$\mu\text{A}$	–
Control Current	$I_{Ctrl}$	–	1	10	$\mu\text{A}$	–

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

<sup>1</sup>  $T_A = +25^\circ\text{C}$ ,  $V_{DD} = 3\text{ V}$

<sup>2</sup> With external shunt L

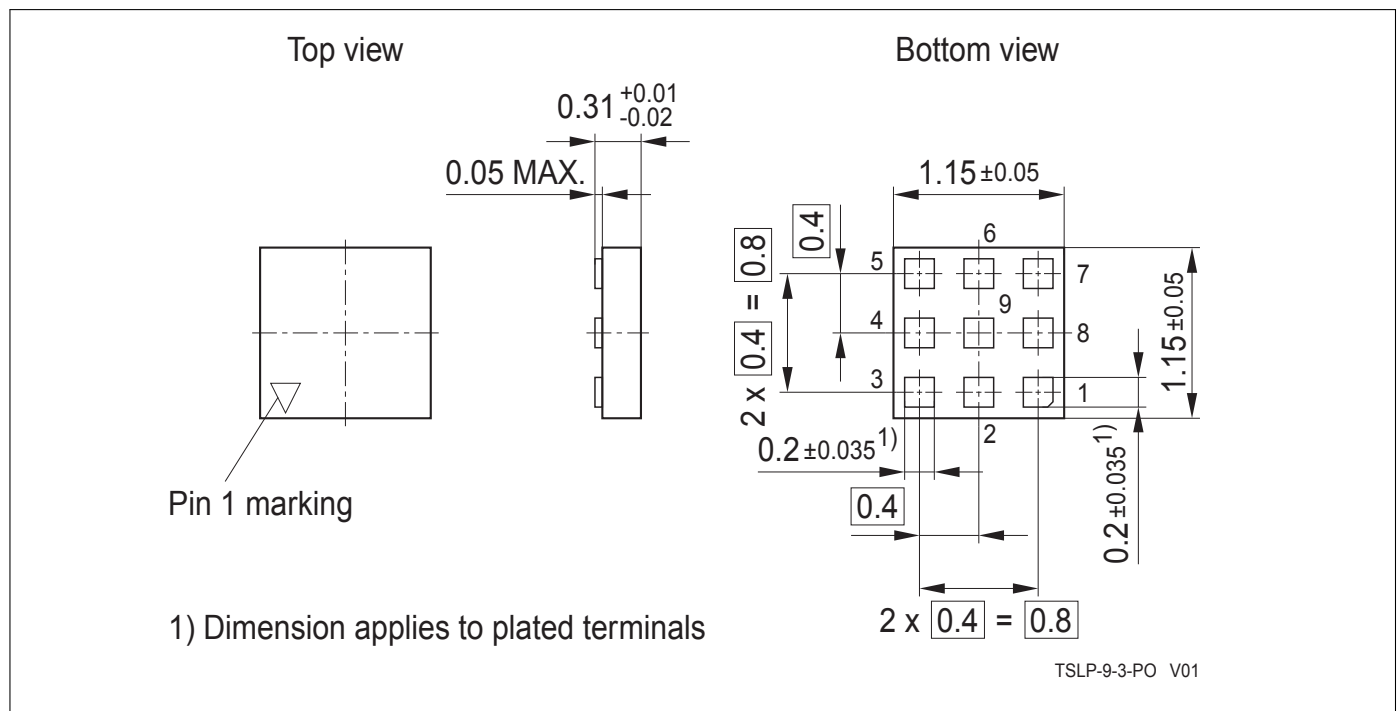
## 6 Pin Description and Package Outline

**Table 7: Mechanical Data**

Parameter	Symbol	Value	Unit
X-Dimension	X	$1.15 \pm 0.05$	mm
Y-Dimension	Y	$1.15 \pm 0.05$	mm
Size	Size	1.3225	mm <sup>2</sup>
Height	H	$0.31 +0.01/-0.02$	mm

**Table 8: Pin Description**

Pin No.	Name	Pin Type	Buffer Type	Function
1	V1	I		Control Pin 1
2	RF3	I/O		RF-Port 3
3	RF1	I/O		RF-Port 1
4	RFin	I/O		RF Input
5	RF2	I/O		RF-Port 2
6	DGND	GND		Digital Ground
7	VDD	PWR		Power Supply
8	V2	I		Control Pin 2
9	GND	GND		Ground



**Figure 2: Package Outline**

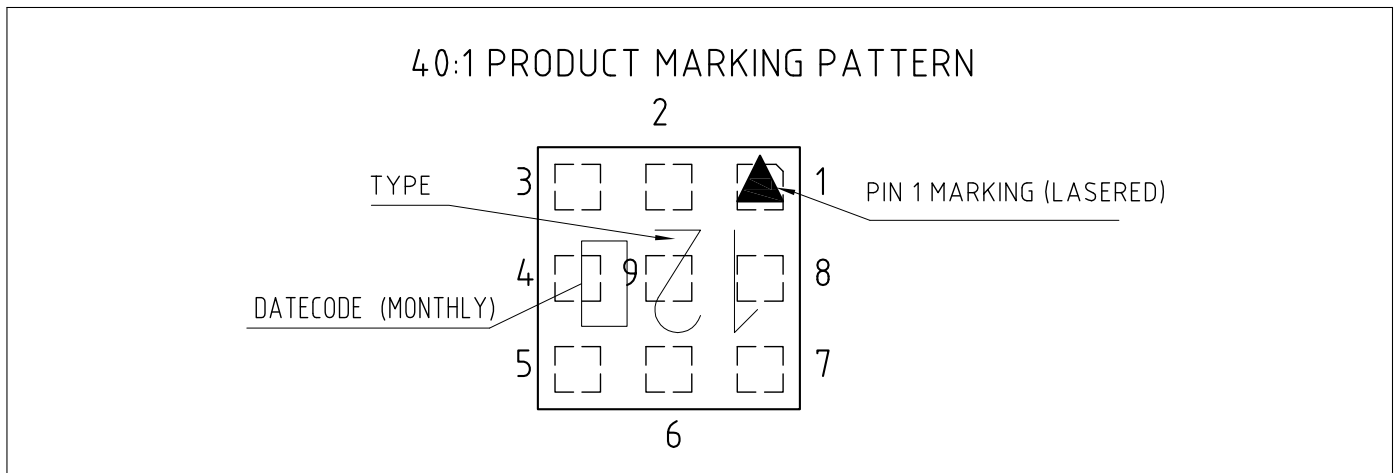


Figure 3: Pin 1 Marking (top view)

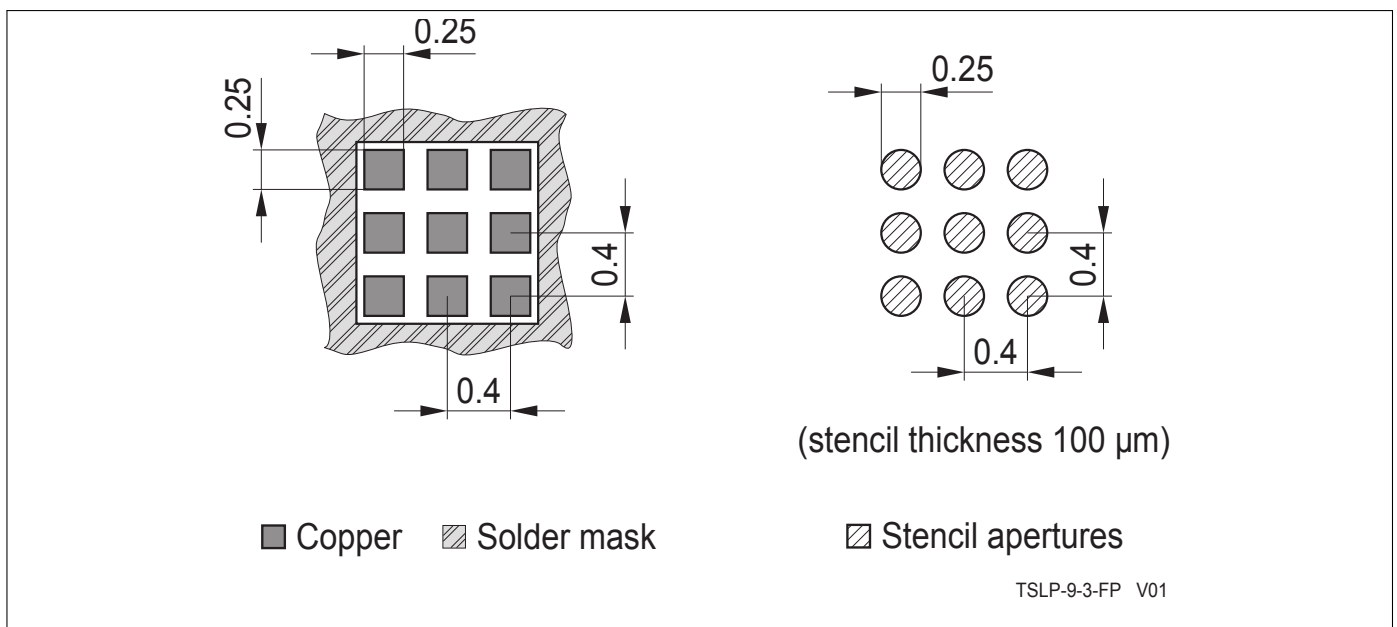


Figure 4: Footprint TSLP-9-3

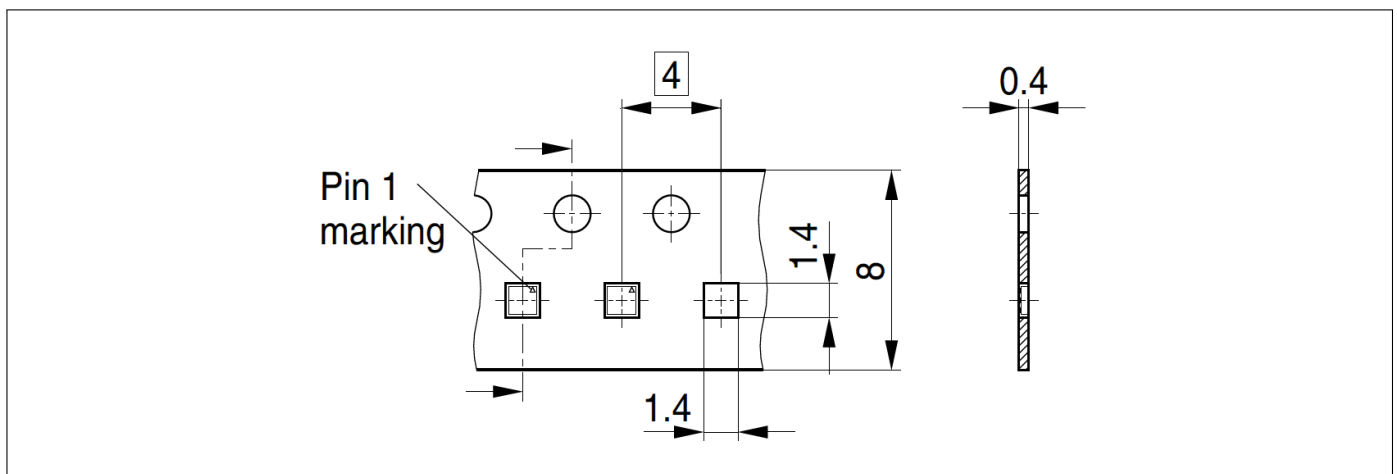




Figure 5: Tape Drawing for TSLP-9-3

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