

BGS13SL9

Wideband RF SP3T Switch

Data Sheet

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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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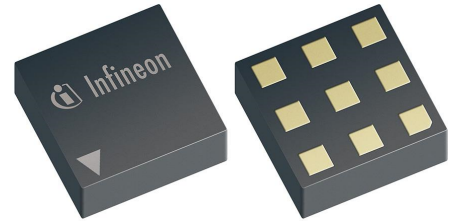
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BGS13SL9 Wideband RF SP3T Switch

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 (1.15x1.15mm²) 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 mm² 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 |

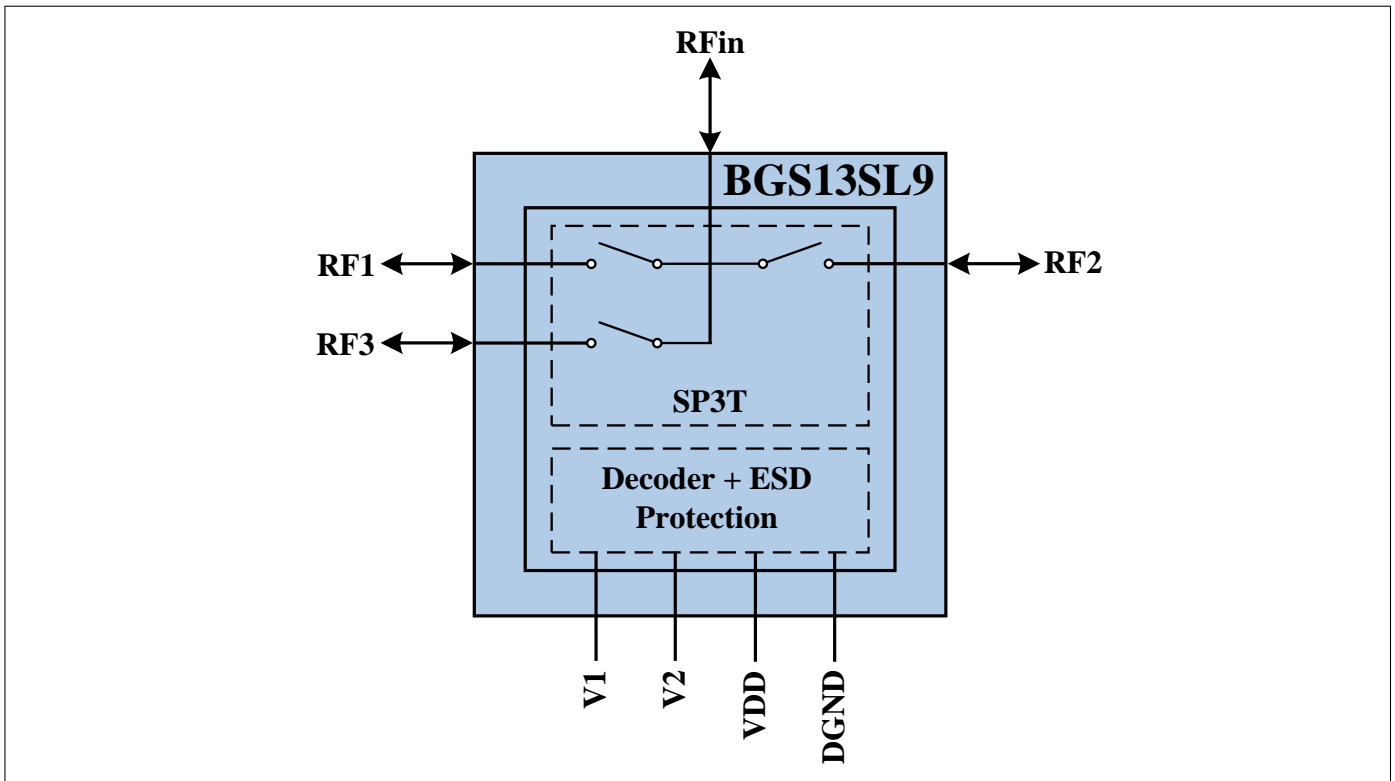


Figure 1: BGS13SL9 Block Diagram

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 | $^\circ\text{C}$ | – |
| ESD Capability | | | | | | |
| Human Body Model ¹⁾ | V_{ESD_HBM} | –1 | – | +1 | kV | – |
| ESD Capability RFin Port ²⁾ | V_{ESD_RFin} | –8 | – | +8 | kV | RFin versus GND, with 27 nH shunt inductor |

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

²⁾ 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 Ω) | 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. | | |
| Insertion Loss | | | | | | |
| 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 |
| Insertion Loss¹ | | | | | | |
| 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 |
| Return Loss | | | | | | |
| 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 |
| Isolation | | | | | | |
| 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 |

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

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|--|-----------------|--------|------|------|---------------|---|
| | | Min. | Typ. | Max. | | |
| Harmonic Generation up to 12.75 GHz | | | | | | |
| Any Path | P_{Harm} | – | -80 | -70 | dBc | $P_{in} = 27 \text{ dBm}$, 50 % Duty Cycle, 50Ω |
| Intermodulation Distortion in Rx Band^{1,2} | | | | | | |
| IMD2 | $IMD2$ | – | -110 | -105 | dBm | Tx = 10 dBm, Interferer = -15 dBm, 50Ω |
| IMD3 | $IMD3$ | – | -115 | -105 | | |
| Switching Time and Current Consumption | | | | | | |
| 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 | μA | – |
| Control Current | I_{Ctrl} | – | 1 | 10 | μA | – |

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

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

² With external shunt L

6 Pin Description and Package Outline

Table 7: Mechanical Data

| Parameter | Symbol | Value | Unit |
|-------------|--------|--------------------|-----------------|
| X-Dimension | X | 1.15 ± 0.05 | mm |
| Y-Dimension | Y | 1.15 ± 0.05 | mm |
| Size | Size | 1.3225 | mm ² |
| 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 |

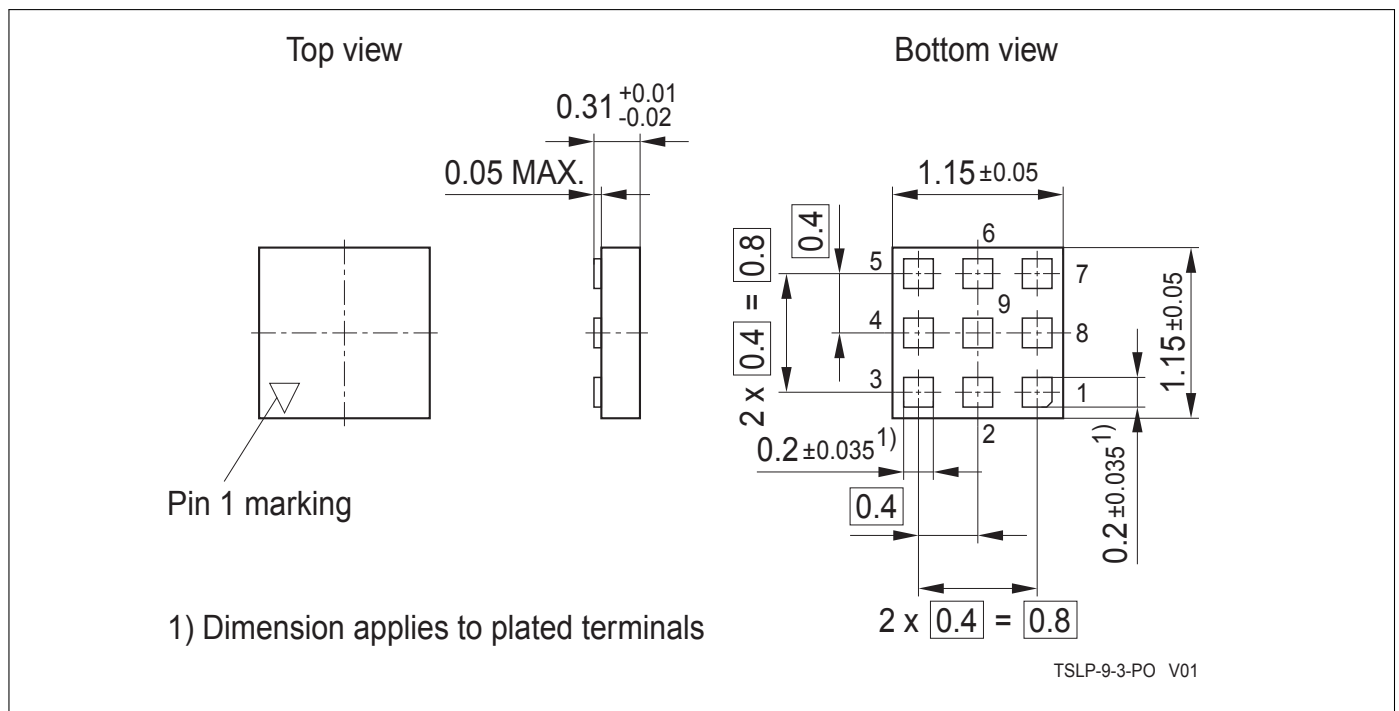


Figure 2: Package Outline

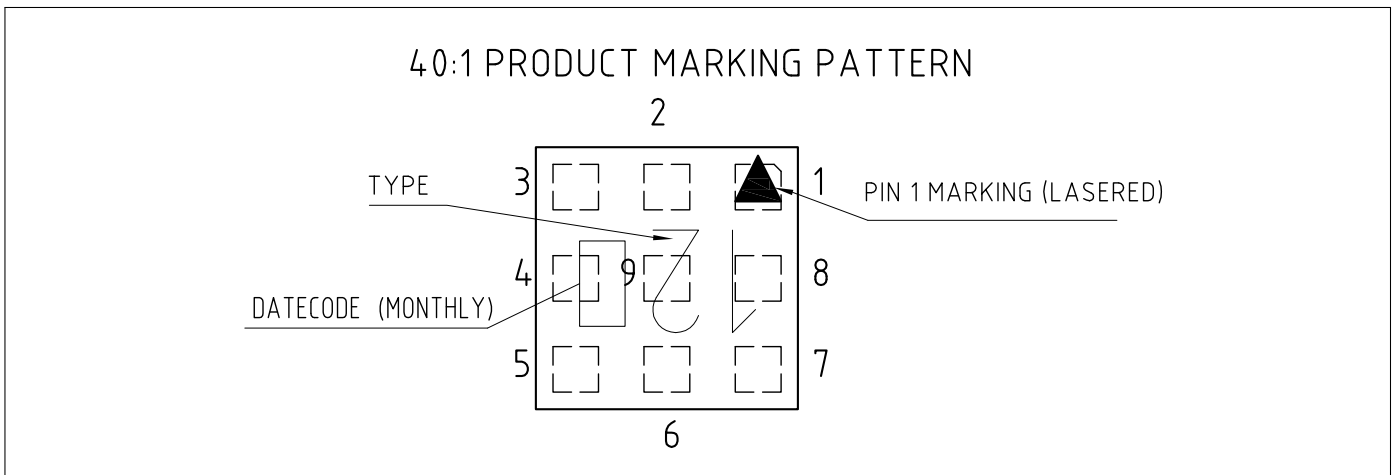


Figure 3: Pin 1 Marking (top view)

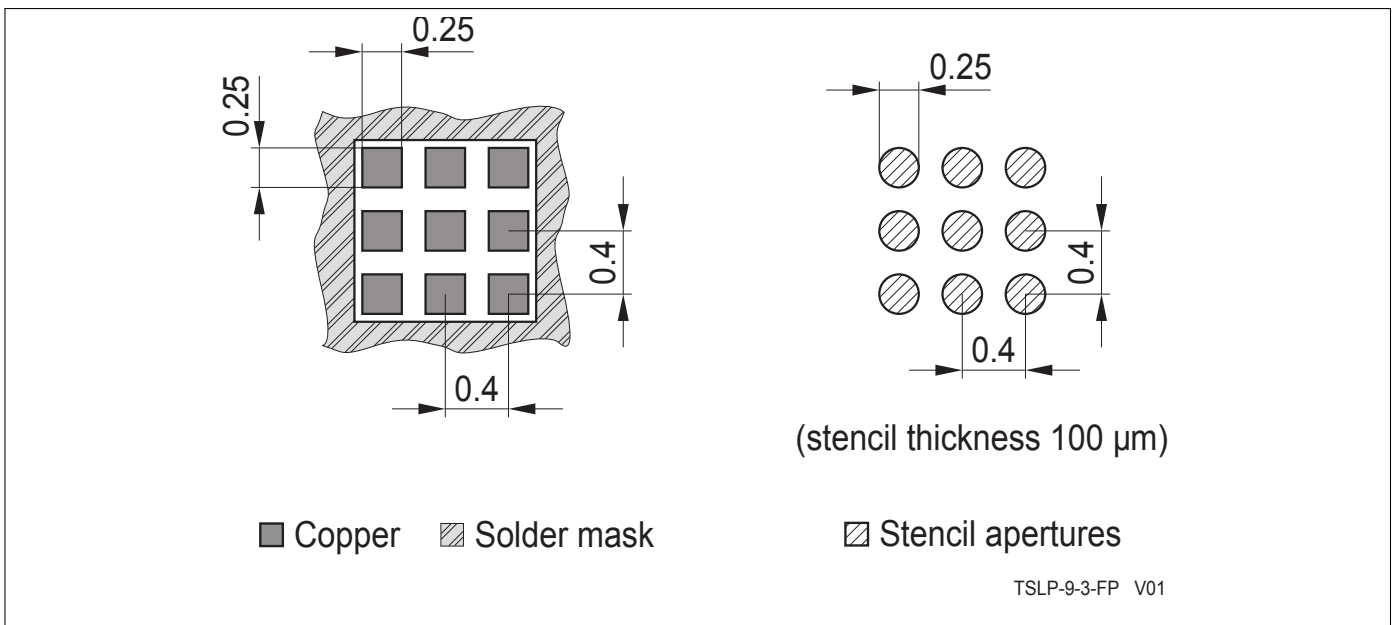


Figure 4: Footprint TSLP-9-3

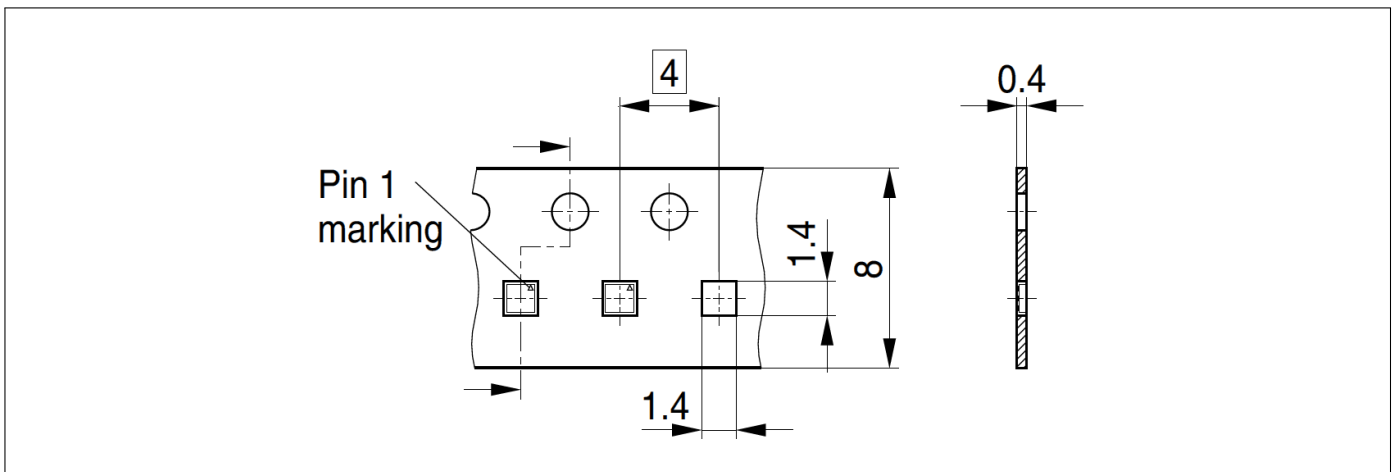


Figure 5: Tape Drawing for TSLP-9-3

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