

BGS13SN8

Wideband RF SP3T Switch

Data Sheet

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Final

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Page	Subjects (major changes since last revision)
8	Insertion Loss, Return Loss and Isolation Table updated

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2 PRODUCT DESCRIPTION

BGS13SN8 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
- Low insertion loss
- Low harmonic generation
- High port-to-port-isolation
- Suitable for Edge / CDMA2000 / LTE / WCDMA applications
- 0.1 to 6 GHz coverage
- No decoupling capacitors required if no DC applied on RF lines
- On-chip control logic including ESD protection
- General Purpose Input-Output (GPIO) Interface
- Small form factor 1.1 mm x 1.1 mm
- No power supply blocking required
- High EMI robustness
- RoHS and WEEE compliant package



2 Product Description

The BGS13SN8 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 1.35 V to VDD. The BGS13SN8 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 1.1 x 1.1 mm² and a maximum height of 0.4 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
BGS13SN8	TSNP-8-1	R

3 MAXIMUM RATINGS

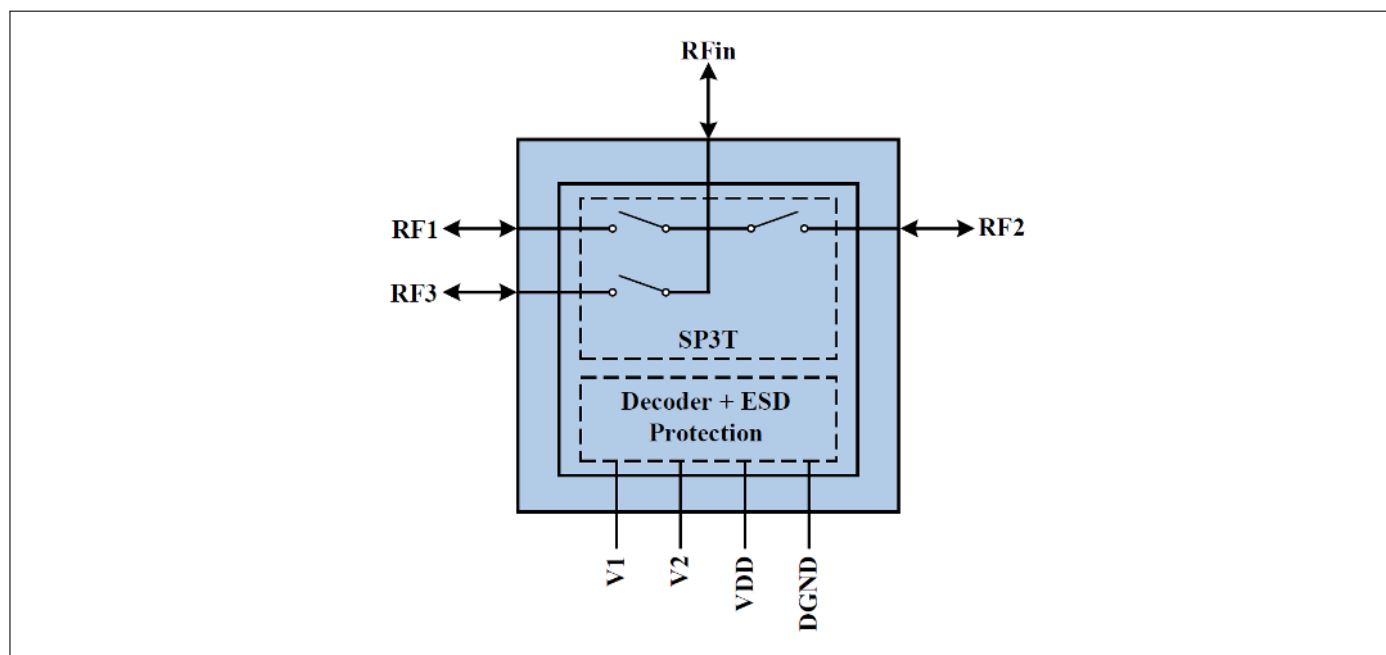


Figure 1: BGS13SN8 Block Diagram

3 Maximum Ratings

Stresses above the maximum 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 2: Maximum Ratings, Table I at $T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Frequency Range	f	0.1	–	6	GHz	¹⁾
Supply voltage	V_{DD}	-0.5	–	3.6	V	–
Storage temperature range	T_{STG}	-55	–	150	$^\circ\text{C}$	–
Junction temperature	T_j	–	–	125	$^\circ\text{C}$	–
RF input power at all Rx ports	P_{RF_Rx}	–	–	32	dBm	CW
ESD capability, CDM ²⁾	V_{ESD_CDM}	-1000	–	+1000	V	All pins
ESD capability, HBM ³⁾	V_{ESD_HBM}	-1000	–	+1000	V	Digital versus RF interface
		-1000	–	+1000	V	RF interface
ESD capability, system level ⁴⁾	V_{ESD_ANT}	-8000	–	+8000	V	ANT versus system GND, with 27 nH shunt inductor

¹⁾There is also a DC connection between switched paths. The DC voltage at RF ports V_{RFDC} has to be 0V.

²⁾Field-Induced Charged-Device Model JESD22-C101. Simulates charging/discharging events that occur in production equipment and processes. Potential for CDM ESD events occurs whenever there is metal-to-metal contact in manufacturing.

³⁾Human Body Model ANSI/ESDA/JEDEC JS-001-2012 (R=1.5 k Ω , C=100 pF).

⁴⁾IEC 61000-4-2 (R=330 Ω , C=150 pF), contact discharge.

4 OPERATION RANGES

Table 3: Maximum Ratings, Table II at $T_A = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Maximum DC-voltage on RF-Ports and RF-Ground	V_{RFDC}	0	–	0	V	No DC voltages allowed on RF-Ports

4 Operation Ranges

Table 4: Operation Ranges

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply voltage	V_{DD}	1.65	–	3.4	V	–
Supply current ¹⁾	I_{BAT}	–	80	–	μA	–
GPIO control voltage high	V_{Ctrl_H}	1.35	–	$V_{BAT} + 0.3$	V	–
GPIO control voltage low	V_{Ctrl_L}	-0.3	–	0.45	V	–
GPIO control input capacitance	C_{Ctrl}	–	–	2	pF	Guaranteed by design
Ambient temperature	T_A	-40	25	85	$^{\circ}\text{C}$	–

¹⁾ $T_A = -40\text{ °C} - 85\text{ °C}$, $V_{DD} = 1.65 - 3.4\text{ V}$

Table 5: RF Input Power

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Rx ports (50 Ω)	P_{RF_Rx}	–	–	30	dBm	–

5 RF CHARACTERISTICS

5 RF Characteristics

Table 6: RF Characteristics at $T_A = -40\text{ }^{\circ}\text{C}$ – $85\text{ }^{\circ}\text{C}$, $P_{IN} = 0\text{ dBm}$, Supply Voltage $V_{DD} = 1.65\text{ V}$ – 3.4 V , unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Insertion Loss at $T_A = 25\text{ }^{\circ}\text{C}$						
All Rx Ports	IL	–	0.21	0.30	dB	698–960 MHz
		–	0.27	0.40	dB	1428–1990 MHz
		–	0.36	0.45	dB	1920–2170 MHz
		–	0.45	0.60	dB	2170–2690 MHz
		–	0.53	0.70	dB	3400–3600 MHz
		–	0.55	0.75	dB	3600–3800 MHz
		–	1.30	1.80	dB	5150–5725 MHz
Insertion Loss at $T_A = 85\text{ }^{\circ}\text{C}$						
All Rx Ports	IL	–	0.21	0.45	dB	698–960 MHz
		–	0.27	0.55	dB	1428–1990 MHz
		–	0.36	0.60	dB	1920–2170 MHz
		–	0.45	0.70	dB	2170–2690 MHz
		–	0.53	0.90	dB	3400–3600 MHz
		–	0.55	1.00	dB	3600–3800 MHz
		–	1.30	2.00	dB	5150–5725 MHz
Return Loss						
All Rx Ports	RL	25	29	–	dB	698–960 MHz
		14	21	–	dB	1428–1990 MHz
		12	16	–	dB	1920–2170 MHz
		10	14	–	dB	2170–2690 MHz
		10	13	–	dB	3400–3600 MHz
		10	14	–	dB	3600–3800 MHz
		5	9	–	dB	5150–5725 MHz
Isolation						
All Rx Ports	ISO	34	40	–	dB	698–960 MHz
		23	29	–	dB	1428–1990 MHz
		21	26	–	dB	1920–2170 MHz
		18	24	–	dB	2170–2690 MHz
		14	19	–	dB	3400–3600 MHz
		14	18	–	dB	3600–3800 MHz
		9	12	–	dB	5150–5725 MHz

5 RF CHARACTERISTICS

Table 7: RF Characteristics at $T_A = -40\text{ }^\circ\text{C}$ – $85\text{ }^\circ\text{C}$, $P_{IN} = 0\text{ dBm}$, Supply Voltage $V_{DD} = 1.65\text{ V}$ – 3.4 V , unless otherwise specified

P0.1 dB Compression Point, Extrapolated

All Rx Ports ¹⁾	$P_{0.1\text{dB}}$	34	–	–	dBm	824–960 MHz
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Harmonic Generation up to 12.75 GHz

H2	P_{Harm}	–	-90	-75	dBc	23 dBm, 50 Ω , CW mode
H3	P_{Harm}	–	-95	-80	dBc	23 dBm, 50 Ω , CW mode

Intermodulation Distortion in Rx Band ²⁾ ($T_A = 25\text{ }^\circ\text{C}$)

IMD2, low	IMD2_{low}	–	–	-105	dBm	Tx = 10 dBm, Interferer = -15 dBm, 50 Ω
IMD3	IMD3	–	–	-115	dBm	
IMD2, high	$\text{IMD2}_{\text{high}}$	–	–	-105	dBm	

Switching Time

RF Rise Time ³⁾	$t_{\text{on/off}}$	–	90	150	ns	90 % OFF to 90 % ON; 90 % ON to 90 % OFF
Ctrl to RF Time ³⁾	$t_{\text{Ctrl-RF}}$	–	500	1000	ns	50 % of Ctrl Signal to 90 % of RF Signal

¹⁾Guaranteed by design.

²⁾On application board with shunt inductor, Min/Max-values measured with phase shifter.

³⁾Guaranteed by characterization.

6 GPIO Specification

Table 8: Modes of Operation (Truth Table)

State	Mode	Control Inputs	
		V1	V2
1	Isolation	0	0
2	RFin - RF1	1	0
3	RFin - RF2	0	1
4	RFin - RF3	1	1

7 Pin Definition and Package Outline

Table 9: Pin Configuration

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

Table 10: Mechanical Data

Parameter	Symbol	Value	Unit
X-Dimension	X	1.1 ± 0.05	mm
Y-Dimension	Y	1.1 ± 0.05	mm
Size	Size	1.21	mm ²
Height	H	0.375	mm

7 PIN DEFINITION AND PACKAGE OUTLINE

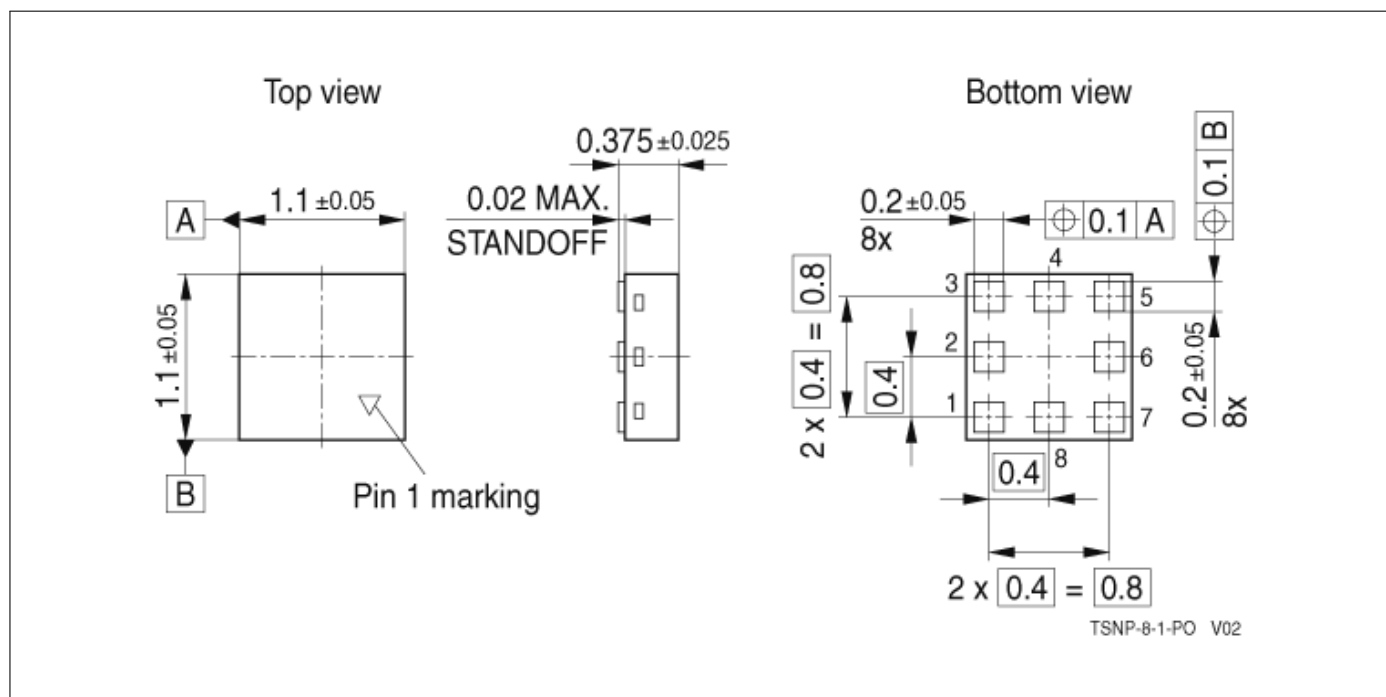


Figure 2: Package Outline (bottom and side view)

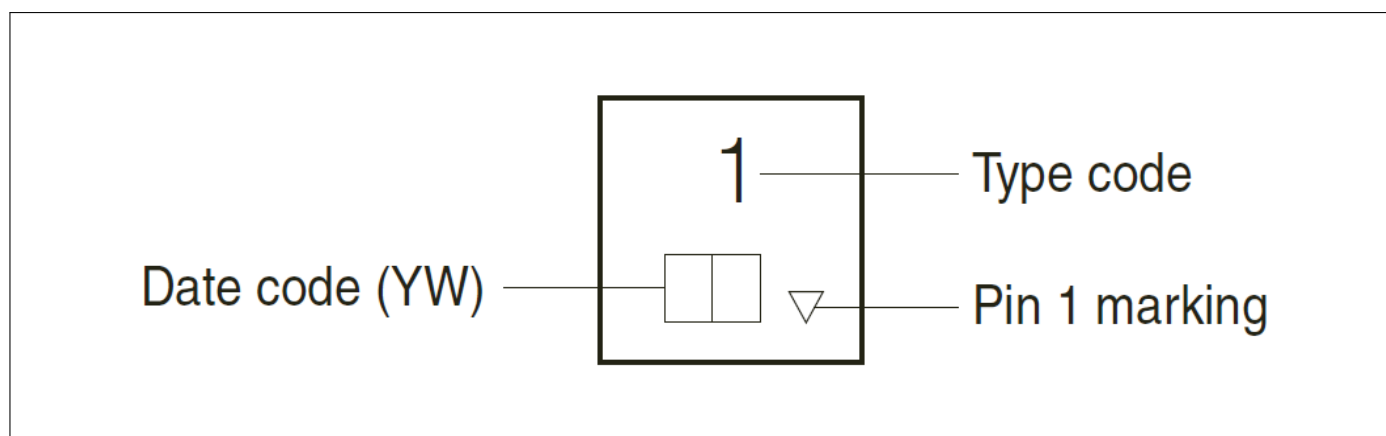


Figure 3: Marking Pattern

7 PIN DEFINITION AND PACKAGE OUTLINE

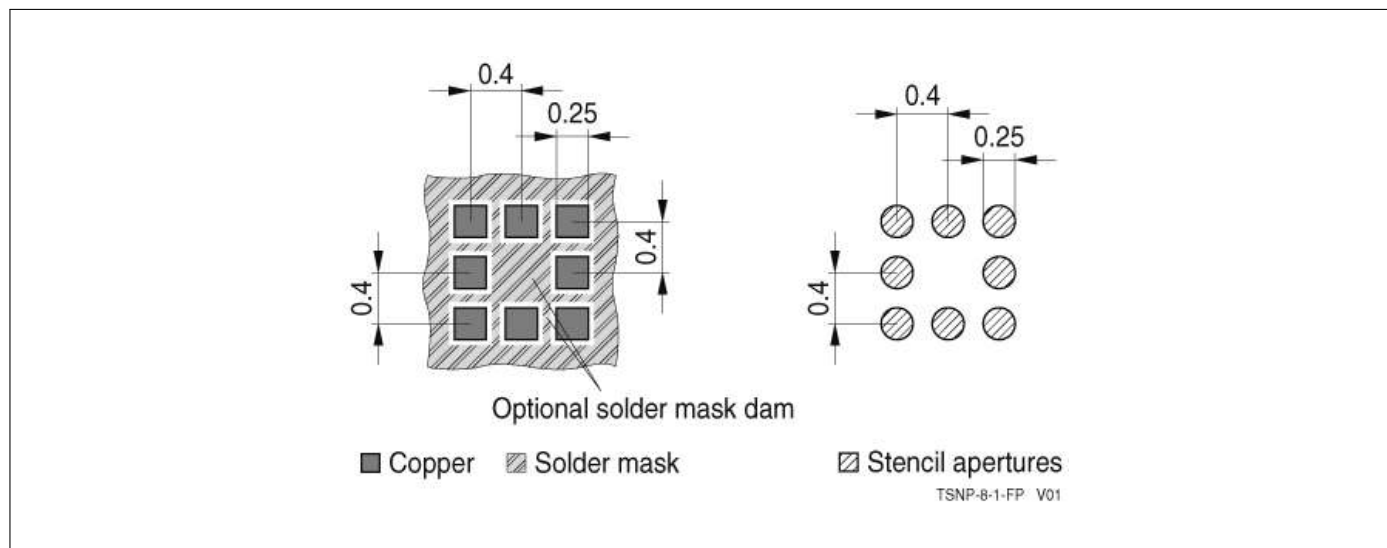


Figure 4: Land pattern and stencil mask

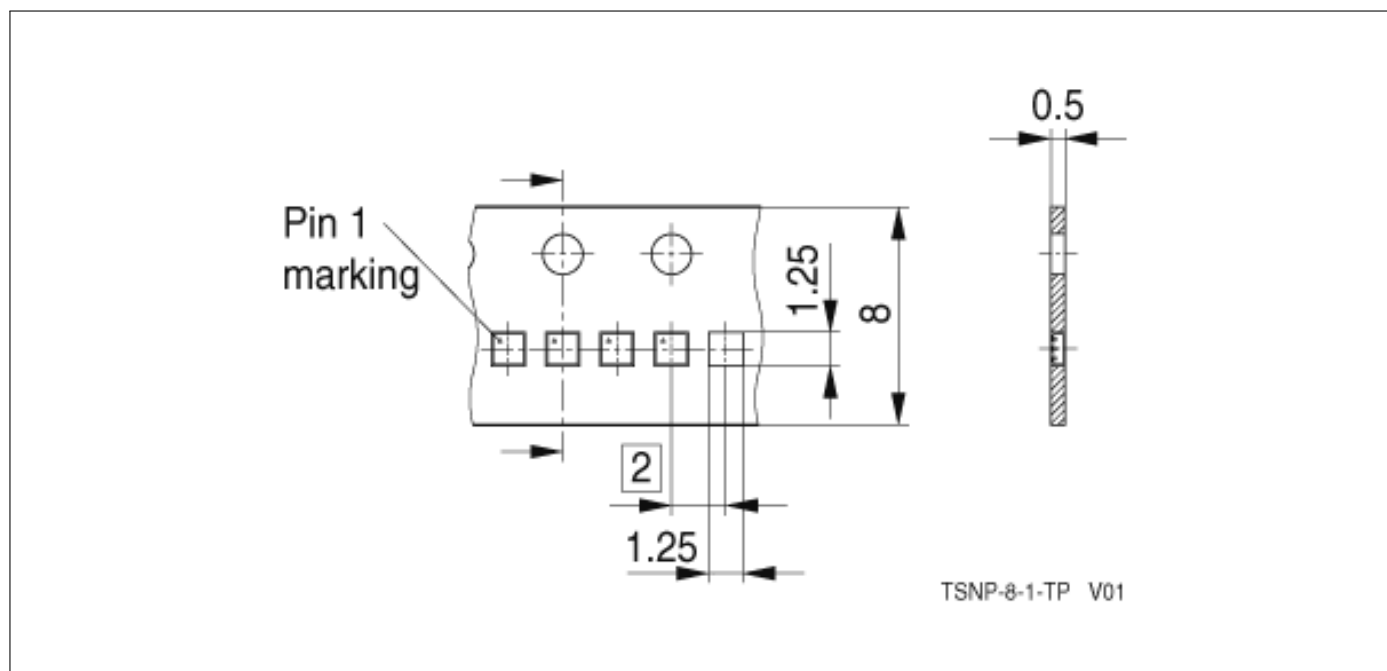


Figure 5: Packing (Tape)

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