

DATA SHEET

SKY13386-000: 0.1-4.0 GHz SP3T Switch

Applications

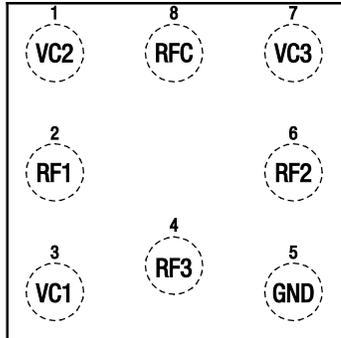
- WLAN b/g

Features

- Broadband frequency range: 0.1 GHz to 4.0 GHz
- Positive control voltages: 2.7 V to 3.6 V
- Low insertion loss: 0.50 dB typical @ 2.5 GHz
- High isolation: 25 dB typical @ 2.5 GHz
- IP0.5dB: +29 dBm typical @ 3 V
- Small CSP (8-bump, 650 x 650 μm) 200 μm ball pitch package

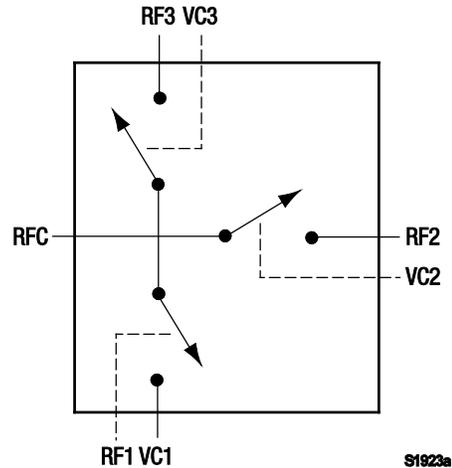


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Figure 2. SKY13386-000 Pinout – 8-Bump CSP (Top View, Bumps Down)



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Figure 1. SKY13386-000 Block Diagram

Description

The SKY13386-000 is a GaAs pHEMT Single-Pole, Triple-Throw (SP3T) switch designed for 2.4 GHz WLAN applications.

The SKY13386-000 is manufactured in a compact, 650 x 650 μm, 8-bump Chip Scale Package (CSP). The small footprint provides the industry's smallest PCB area needed to implement an integrated SP3T switch.

A functional block diagram is shown in Figure 1. The pin configuration and package are shown in Figure 2. Signal pin assignments and functional pin descriptions are provided in Table 1.

Table 1. SKY13386-000 Signal Descriptions

Pin #	Name	Description	Pin #	Name	Description
1	VC2	Switch logic control 2 (see Table 4)	5	GND	Ground
2	RF1	RF output port 1. Must be DC blocked for proper operation.	6	RF2	RF output port 2. Must be DC blocked for proper operation.
3	VC1	Switch logic control 1 (see Table 4)	7	VC3	Switch logic control 3 (see Table 4)
4	RF3	RF output port 3. Must be DC blocked for proper operation.	8	RFC	Antenna. Must be DC blocked for proper operation.

Table 2. SKY13386-000 Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Control voltage	VC1, VC2, VC3		6	V
RF input power	P _{IN}		+35	dBm
Operating temperature	T _{OP}	-40	+85	°C
Storage temperature	T _{STG}	-40	+125	°C

Note: Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

CAUTION: Although this device is designed to be as robust as possible, Electrostatic Discharge (ESD) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions should be used at all times.

Technical Description

Switching is controlled by three control voltage inputs (VC1, VC2, and VC3). Depending on the logic voltage level applied to the control pins, the RFC pin is connected to one of three switched RF outputs (RF1, RF2, or RF3) using a low insertion loss path, while maintaining a high isolation path to the alternate ports.

DC blocking capacitors are required on all four RF ports for proper operation and to determine the lower frequency operation of the switch.

Electrical and Mechanical Specifications

The absolute maximum ratings of the SKY13386-000 are provided in Table 2. Electrical specifications are provided in Table 3.

The state of the SKY13386-000 is determined by the logic provided in Table 4.

Typical performance characteristics for the SKY13386-000 are illustrated in Figures 3 to 7.

Table 3. SKY13386-000 Electrical Specifications (Note 1)

(VC1 = VC2 = VC3 = 3/0 V, P_{IN} = 0 dBm, T_{OP} = +25 °C, Characteristic Impedance [Z₀] = 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
RF Specifications						
Insertion Loss	IL	0.1 to 1.0 GHz		0.50	0.65	dB
		1.0 to 2.4 GHz		0.65	0.75	dB
		2.4 to 2.5 GHz		0.70	0.80	dB
		2.5 to 4.0 GHz		0.80	1.00	dB
Isolation	Iso	0.1 to 1.0 GHz	26	30		dB
		1.0 to 2.4 GHz	25	38		dB
		2.4 to 2.5 GHz	22	25		dB
		2.5 to 4.0 GHz	19	22		dB
Port-to-Port Isolation		RF1 to RF2, 2.4 to 2.5 GHz	25	29		dB
		RF1 to RF3, 2.4 to 2.5 GHz	23	25		dB
		RF2 to RF3, 2.4 to 2.5 GHz	23	25		dB
Input Return Loss	IS11I	0.1 to 4.0 GHz	20	25		dB
0.5 dB Input Compression Point	IPO.5dB	2.4 to 2.5 GHz, RFC to RF1/RF2/RF3		+29		dBm
3 rd Order Input Intercept Point	IIP3	2.4 to 2.5 GHz, ΔF = 1 MHz, P _{IN} = +17 dBm/tone		+54		dBm
Harmonics	2fo, 3fo	2.4 to 2.5 GHz		-70		dBc
Switching Speed: 50% control voltage to 90/10% RF 90/10% RF or 10/90% RF				50		ns
				40		ns
DC Specifications						
Control Voltage: High Low	V _{HIGH}		+2.7	+3	+3.6	V
	V _{LOW}		-0.2	0	+0.2	V
Control current	I _{CTL}			5		μA

Note 1: Performance is guaranteed only under the conditions listed in this Table.

Table 4. SKY13386-000 Truth Table

VC1 (Pin 3)	VC2 (Pin 1)	VC3 (Pin 7)	RF1 (Pin 2)	RF2 (Pin 6)	RF3 (Pin 4)
1	0	0	On	Off	Off
0	1	0	Off	On	Off
0	0	1	Off	Off	On

Note: "0" = -0.2 V to +0.2 V. "1" = +2.7 V to +3.6 V. "On" = Insertion loss state. "Off" = Isolation state. Any state other than described in this Table places the switch into an undefined state. An undefined state will not damage the device.

Typical Performance Characteristics

($V_{C1} = V_{C2} = V_{C3} = 3/0\text{ V}$, $P_{IN} = 0\text{ dBm}$, $T_{OP} = +25\text{ }^{\circ}\text{C}$, Characteristic Impedance [Z_0] = $50\ \Omega$, Unless Otherwise Noted)

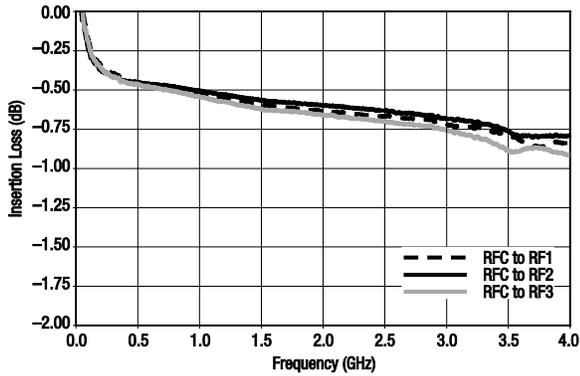


Figure 3. Insertion Loss vs Frequency

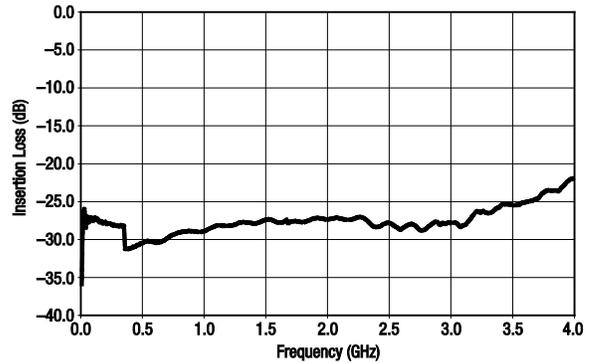


Figure 4. Input Return Loss vs Frequency

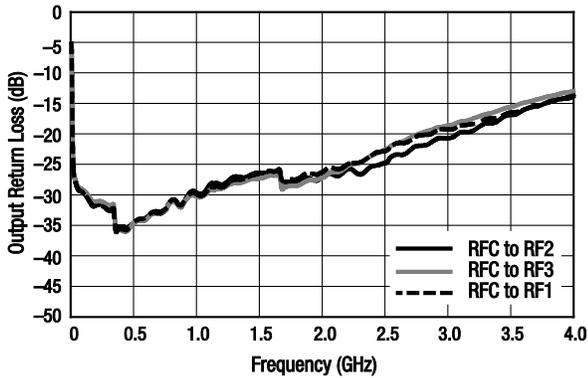


Figure 5. Output Return Loss vs Frequency

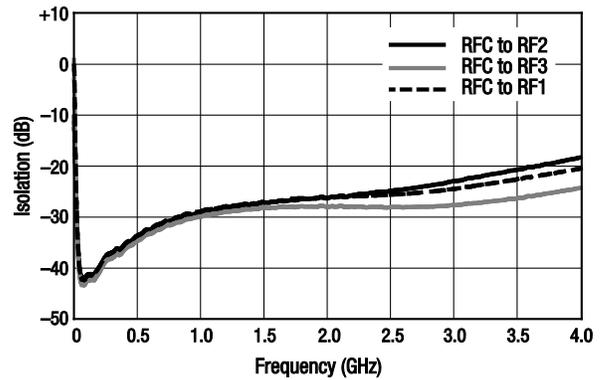


Figure 6. Isolation vs Frequency

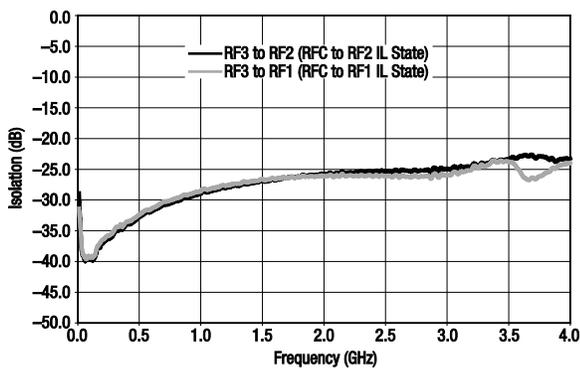


Figure 7. Port-to-Port Isolation vs Frequency

Evaluation Board Description

The SKY13386-000 Evaluation Board is used to test the performance of the SKY13386-000 SP3T Switch. An Evaluation Board schematic diagram is provided in Figure 8. An assembly drawing for the Evaluation Board is shown in Figure 9.

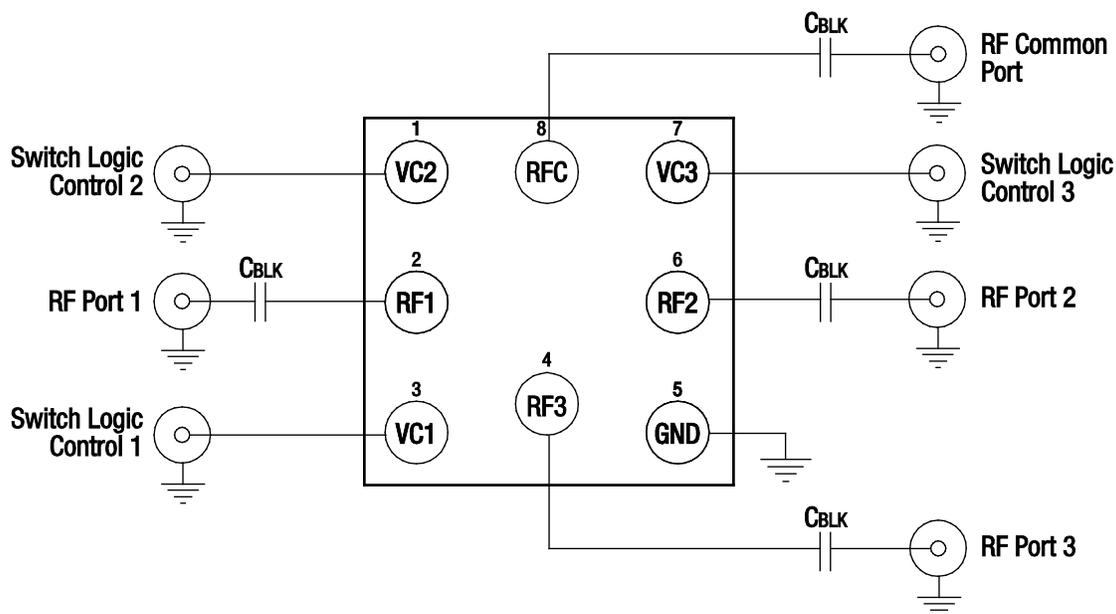
Package Dimensions

Package dimensions for the 8-bump CSP are shown in Figure 10.

Package and Handling Information

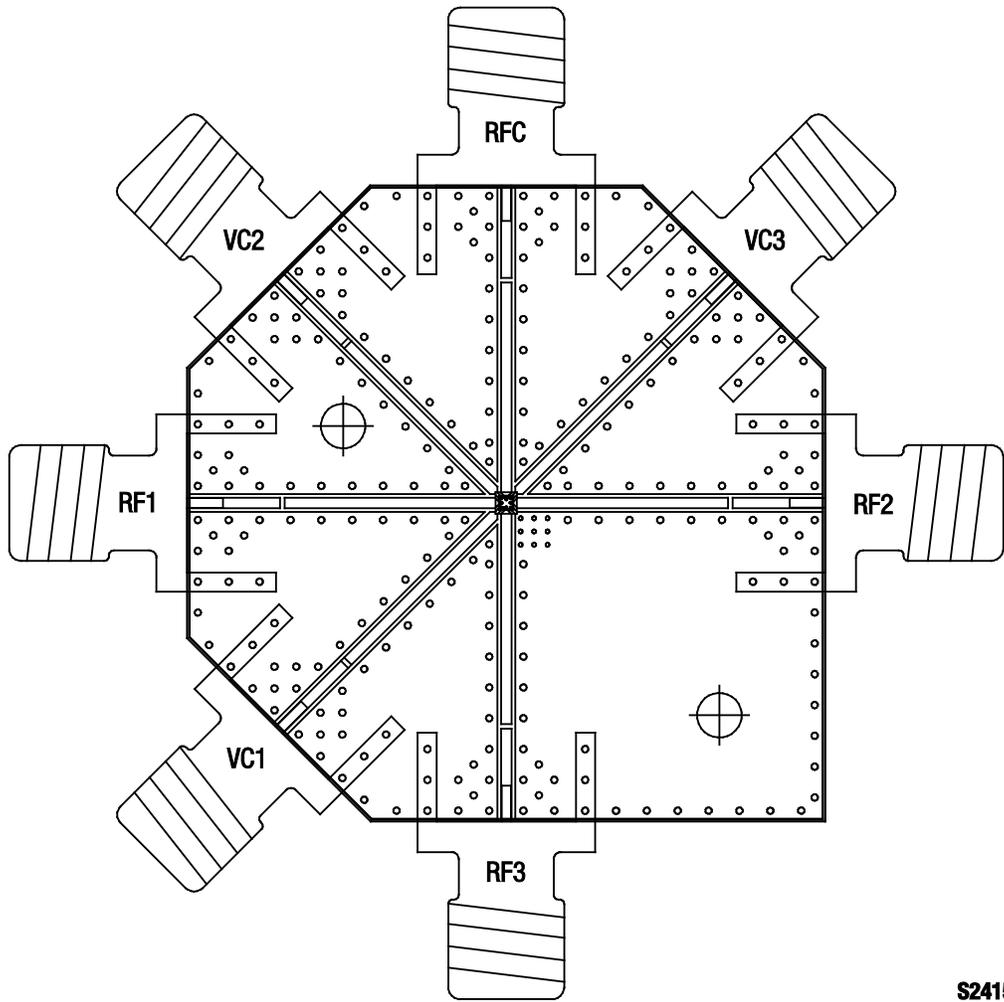
Since the package is sensitive to moisture absorption, it is baked and vacuum packed before shipping. Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. Production quantities of this product are shipped on film frame.



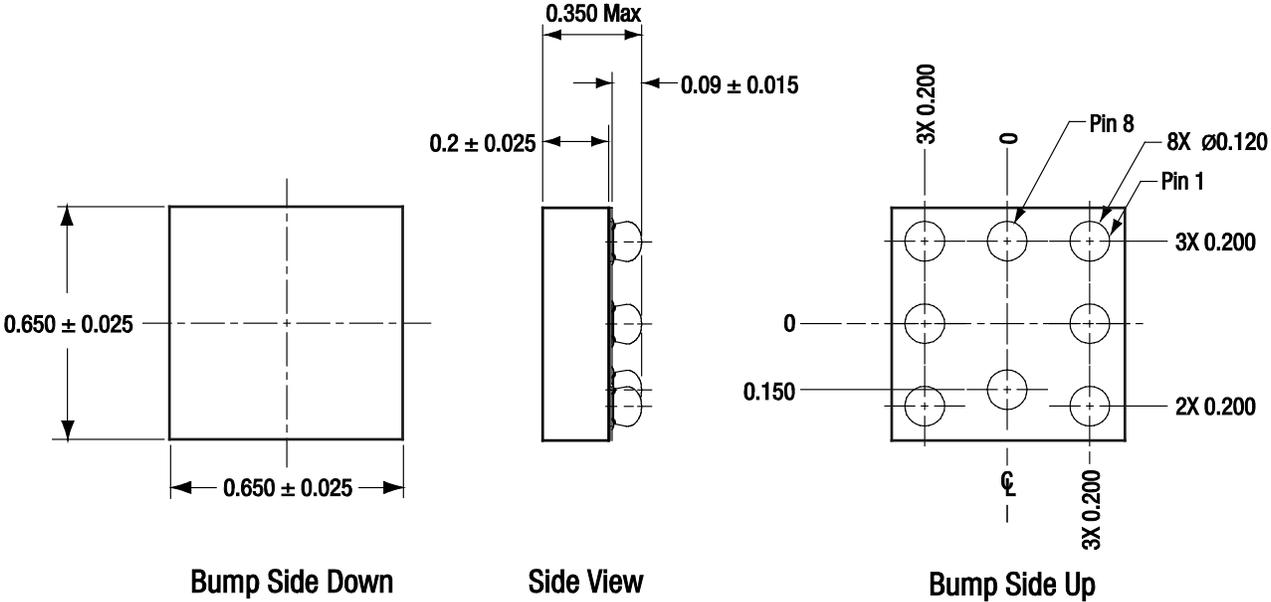
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Figure 8. SKY13386-000 Evaluation Board Schematic



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Figure 9. SKY13386-000 Evaluation Board Assembly Diagram



All measurements are in millimeters.

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Figure 10. SKY13386-000 8-Bump CSP Package Dimensions

Ordering Information

Model Name	Manufacturing Part Number	Evaluation Board Part Number
SKY13386-000 SP3T Switch	SKY13386-000	SKY13386-000-EVB

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