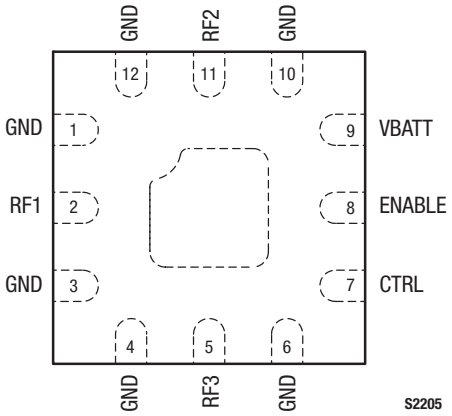


Figure 2. SKY13330-397LF Pinout (Top View)

Table 1. SKY13330-397LF Signal Descriptions[1]

Pin	Name	Description	Pin	Name	Description
1	GND	Ground	7	CTRL	DC control pin. See Table 4.
2	RF1	RF port 1	8	ENABLE	Enable pin. See Table 4.
3	GND	Ground	9	VBATT	DC power supply
4	GND	Ground	10	GND	Ground
5	RF3	RF port 3	11	RF2	RF port 2
6	GND	Ground	12	GND	Ground

1 Exposed pad must be properly grounded using a low impedance path.

Functional Description

The SKY13330-397LF is designed for medium to high power WCDMA handset and data card switching applications. The device can also be used in a variety of other applications that require high performance RF switching such as WLANs (a/b/g/n).

An internal negative voltage generator and decoder eliminate the need for external DC blocking capacitors on the RF ports unless VDC is externally applied.

Switching is controlled by one voltage input (CTRL). Depending on the logic voltage level applied to the control pin, the RF1 pin is connected to one of two switched RF outputs (RF2 or RF3) using a low insertion loss path, while the path between the RF1 pin and the other RF output pin is in a high isolation state.

An internal decoder is used to provide the correct logic to the switch.

Shutdown mode is enabled by connecting the ENABLE pin to logic low. Shutdown mode reduces the overall current consumption of the device to 7 μA, typical.

Electrical and Mechanical Specifications

The absolute maximum ratings of the SKY13330-397LF are provided in Table 2. Electrical specifications are provided in Table 3.

The state of the SKY13330-397LF is determined by the logic provided in Table 4.

Typical performance characteristics of the SKY13330-397LF are illustrated in Figures 3 through 5.

Table 2. SKY13330-397LF Absolute Maximum Ratings[1]

Parameter	Symbol	Minimum	Maximum	Units
Supply voltage	V_{BATT}		5.0	V
Input power	P_{IN}		+40	dBm
Storage temperature	T_{STG}	-40	+125	°C
Operating temperature	T_{OP}	-40	+85	°C

[1] 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.

***ESD HANDLING**: 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 when handling or transporting. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD handling precautions should be used at all times.*

Table 3. SKY13330-397LF Electrical Specifications[1] (1 of 2)
(V_{BATT} = 2.3 V to 4.8 V, CTRL = 0/1.65 V to 2.70 V, T_{OP} = +25 °C, P_{IN} = 0 dBm, Characteristic Impedance [Z_0] = 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
RF Specifications						
Insertion loss	IL	RF1 to RF2/RF3: 0.1 to 1.0 GHz 1.0 to 2.2 GHz 2.2 to 2.5 GHz 2.5 to 5.0 GHz 5.0 to 6.0 GHz		 0.30 0.35 0.35 0.45 0.60	 0.35 0.50 0.50 0.65 0.80	 dB dB dB dB dB
Isolation	Iso	RF1 to RF2/RF3: 0.1 to 1.0 GHz 1.0 to 2.2 GHz 2.2 to 2.5 GHz 2.5 to 5.0 GHz 5.0 to 6.0 GHz	 40 30 30 22 18	 42 34 33 24 21		 dB dB dB dB dB
Return loss	|S11|	RF1 to RF2/RF3, 0.1 to 6.0 GHz		 20		 dB
0.1 dB input compression point	IP0.1dB	RF1 to RF2/RF3, 0.8 to 2.5 GHz		 +38.5		 dBm
Third order intermodulation distortion	IMD3	f_{FND} = 1950 MHz @ +20 dBm, f_{BLK} = 1760 MHz @ -15 dBm		 -110	 -105	 dBm
Switching speed		50% V_{CTL} to 10/90% RF "on" time 50% V_{CTL} to 90/10% RF "off" time 10/90% RF rise time 90/10% RF fall time		1.70 1.24 0.50 1.00		µs µs µs µs
Startup time[2]		Shutdown state to any RF switch state		2		µs

Table 3. SKY13330-397LF Electrical Specifications[1] (2 of 2)
(V_{BATT} = 2.3 V to 4.8 V, CTRL = 0/1.65 V to 2.70 V, T_{OP} = +25 °C, P_{IN} = 0 dBm, Characteristic Impedance [Z_0] = 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
DC Specifications						
Control voltage: high low	 V_{CTL_HIGH} V_{CTL_LOW}		 1.65 0		 2.7 0.4	 V V
Supply voltage	V_{BATT}		2.3		4.8	V
Supply current	I_{BATT}	V_{BATT} = 2.3 to 4.8 V		37		µA
Control current	I_{CTRL}	CTRL = 1.8 V		1		µA
Shutdown mode supply current	I_{OFF}	ENABLE = 0 V, V_{BATT} = 2.3 V to 4.8 V		7		µA

1 Performance is guaranteed only under the conditions listed in this table.

2 Startup time refers to the amount of time it takes for the switch to be fully operational when coming out of shutdown mode (EN = 0).

Table 4. SKY13330-397LF Truth Table[1]

CTRL	ENABLE	Mode
1	1	RF1 to RF2
0	1	RF1 to RF3
X	0	Shutdown

1 1 = 1.65 to 2.70 V
0 = -0 to 0.4 V (control voltage must be ≤V_{DD} at all times)
X = don't care
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_{BATT} = 2.3 V to 4.8 V, C_{TRL} = 0/1.65 V to 2.70 V, T_{OP} = +25 °C, P_{IN} = 0 dBm, Characteristic Impedance [Zo] = 50 Ω, Unless Otherwise Noted)

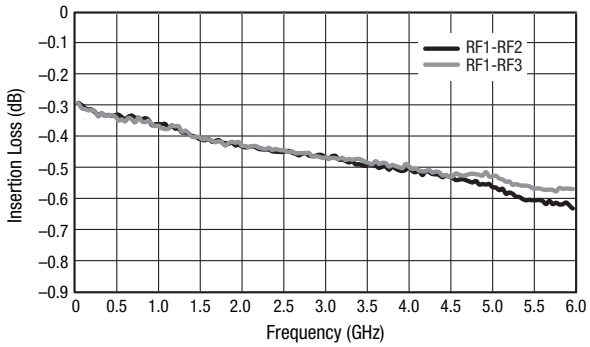


Figure 3. Insertion Loss vs Frequency

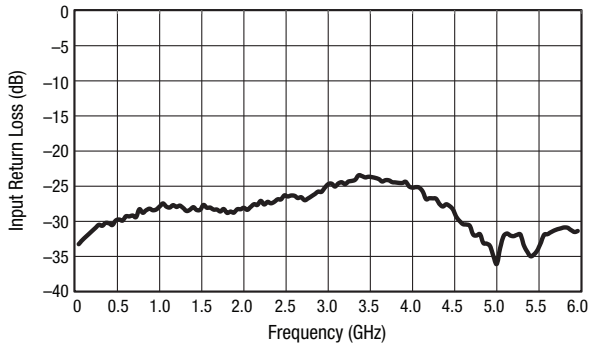


Figure 4. Input Return Loss vs Frequency

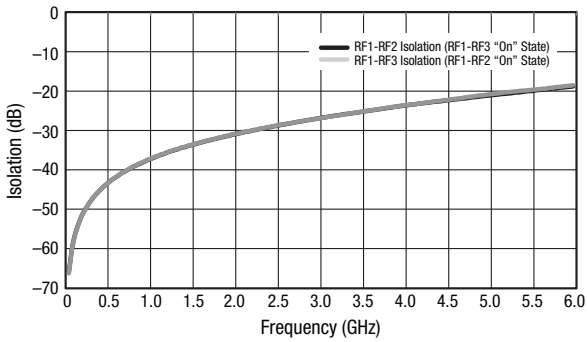


Figure 5. Input to Output Isolation vs Frequency

Evaluation Board Description

The SKY13330-397LF Evaluation Board is used to test the performance of the SKY13330-397LF SP2T Switch.

An Evaluation Board schematic diagram is provided in Figure 6. An assembly drawing for the Evaluation Board is shown in Figure 7.

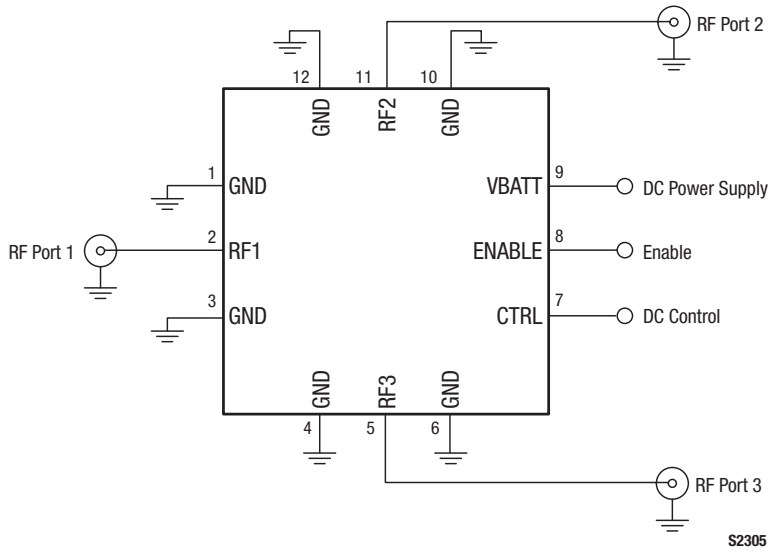


Figure 6. SKY13330-397LF Evaluation Board Schematic

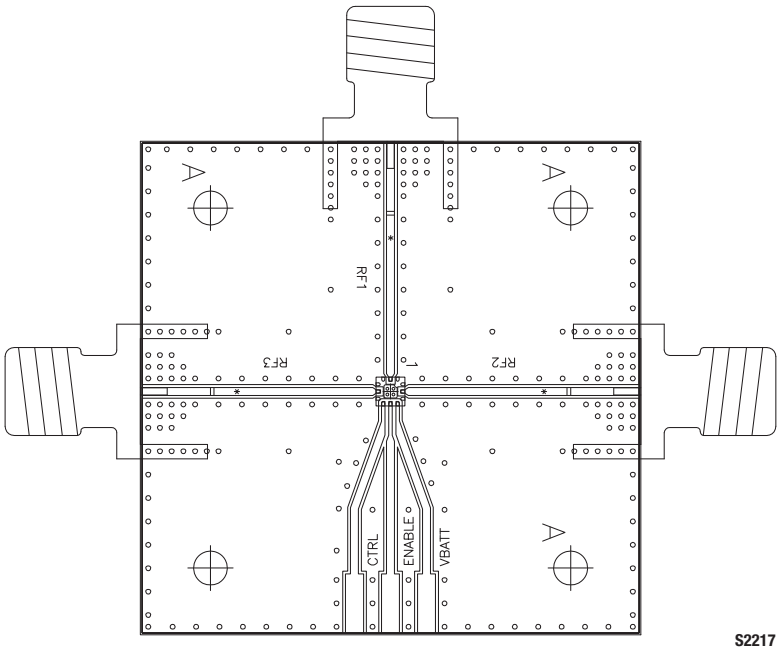


Figure 7. SKY13330-397LF Evaluation Board Assembly Diagram

Package Dimensions

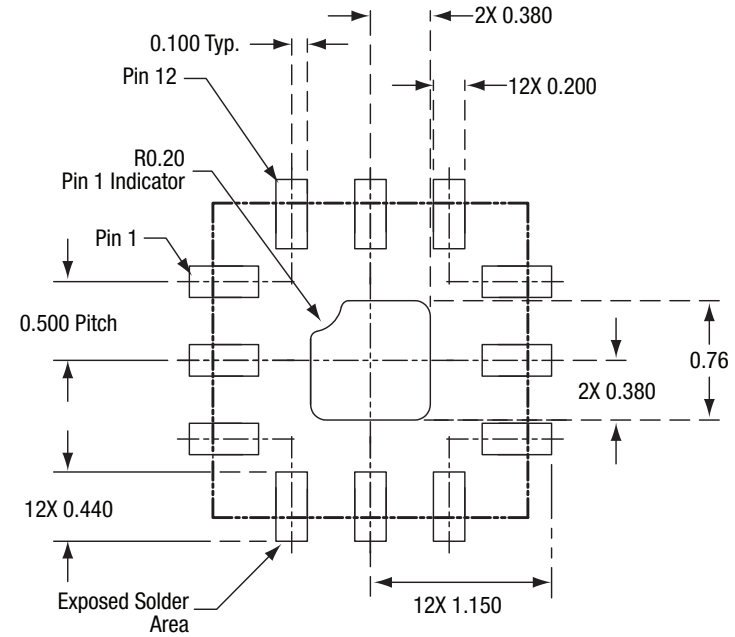
The PCB layout footprint for the SKY13330-397LF is provided in Figure 8. Typical part markings are shown in Figure 9. Package dimensions are shown in Figure 10, and tape and reel dimensions are provided in Figure 11.

Package and Handling Information

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.

The SKY13330-397LF is rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C. It can be used for lead or lead-free soldering. For additional information, refer to the Skyworks Application Note, *Solder Reflow Information*, document number 200164.

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 in a standard tape and reel format.



All measurements in millimeters **S2511**

Figure 8. SKY13330-397LF PCB Layout Footprint (Top View)

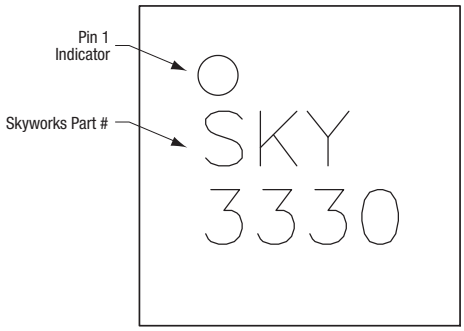
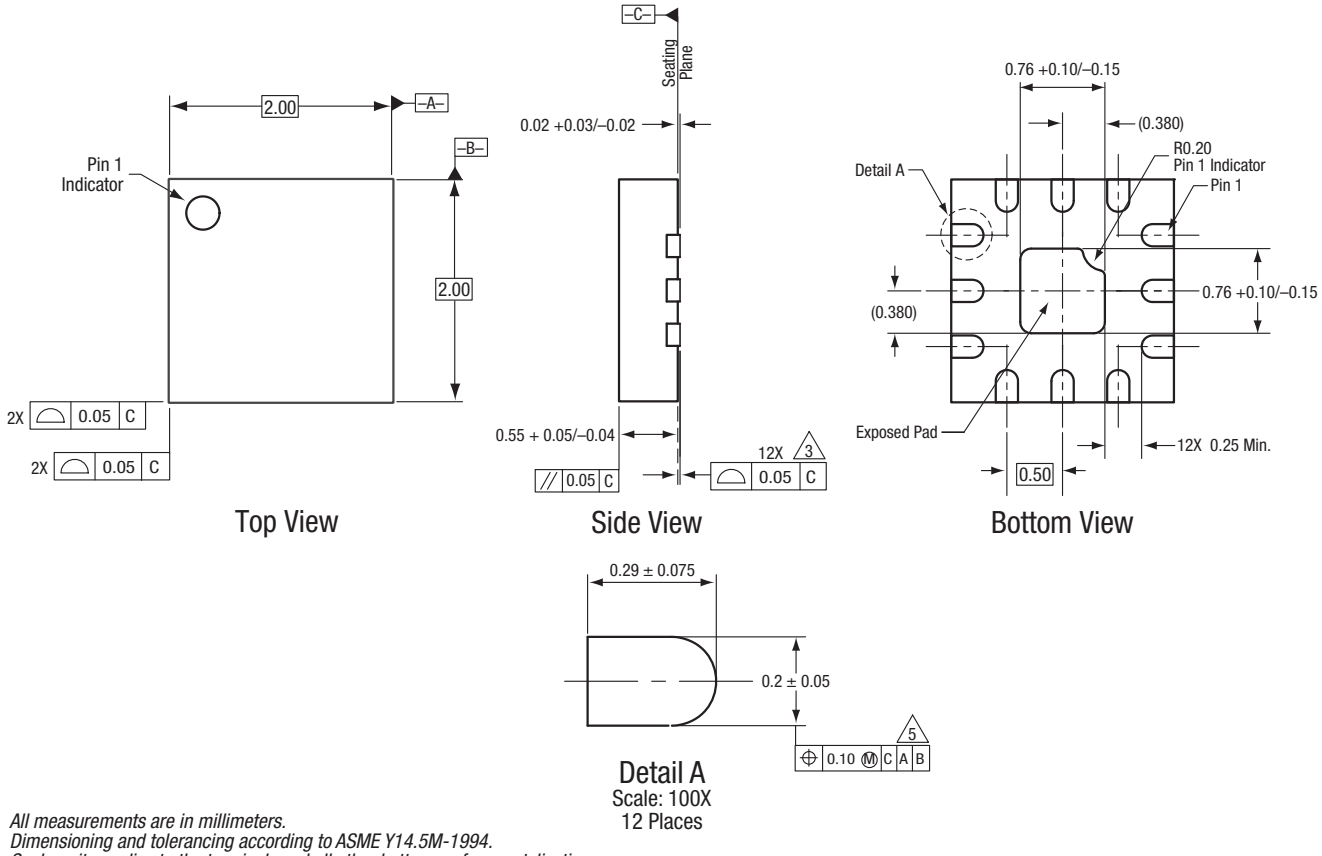


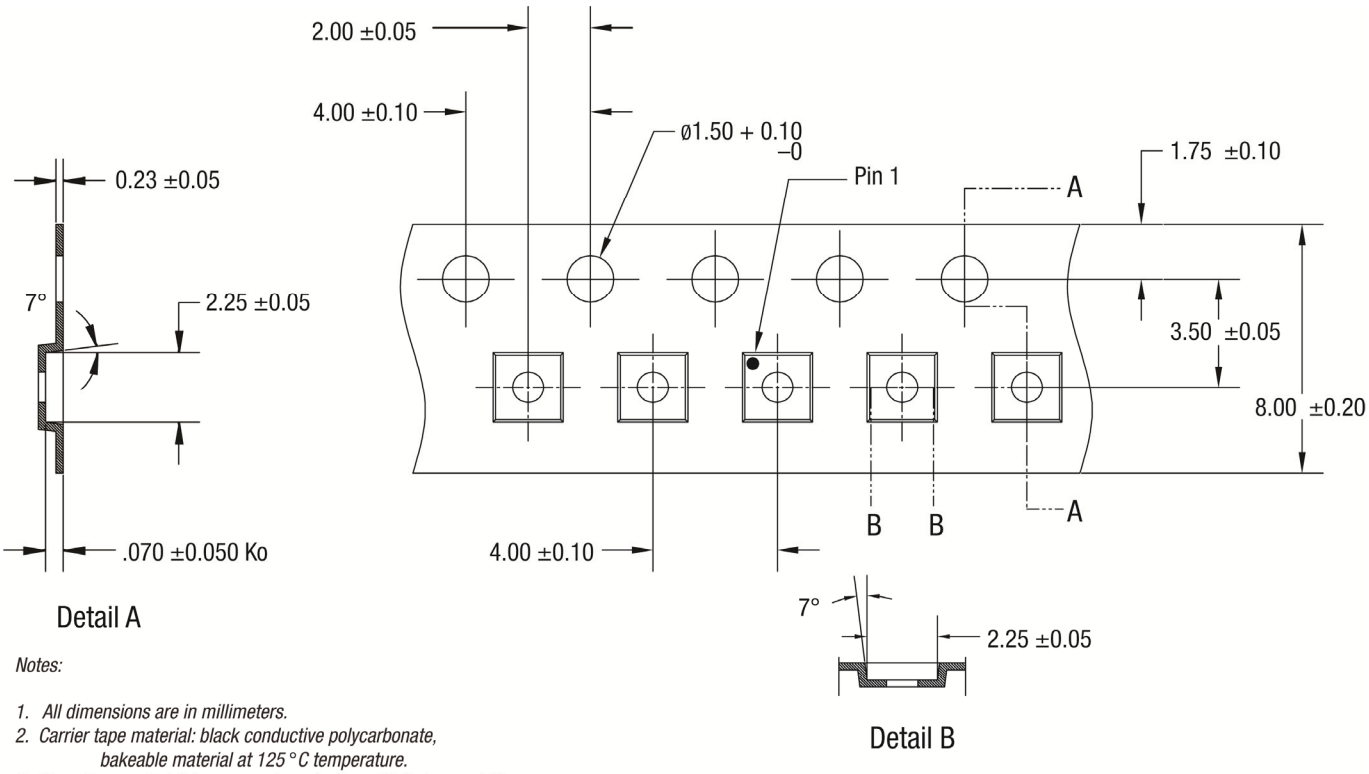
Figure 9. Typical Part Markings (Top View)



All measurements are in millimeters.
Dimensioning and tolerancing according to ASME Y14.5M-1994.
Coplanarity applies to the terminals and all other bottom surface metalization.
Dimension applies to metalized terminal. If the terminal has a radius on its end, the width dimension should not be measured in that radius area.
Contact areas are NiPdAu.

S2512

Figure 10. SKY13330-397LF Package Dimensions



Notes:

1. *All dimensions are in millimeters.*
2. *Carrier tape material: black conductive polycarbonate, bakeable material at 125 °C temperature.*
3. *Cover tape material: transparent conductive with 5.4 mm width.*
4. *ESD surface resistivity must meet all ESD requirements of Skyworks specified on GP01-D233.*

201407-011

Figure 11. SKY13330-397LF Tape and Reel Dimensions

Ordering Information

Part Number	Product Description	Evaluation Board Part Number
SKY13330-397LF	0.1 to 6.0 GHz SPDT Switch	SKY13330-397LF-EVB