DATA SHEET

SKY13354-368LF: 0.1 to 3.0 GHz Dual SPDT Crossed Switch

Applications

- Cellular infrastructures

Features

- Broadband frequency range: 0.1 GHz to 3.0 GHz
- Positive voltage control: 1.6 V to 5.0 V
- Low insertion loss
- High isolation
- High P0.2dB
- Ultra-miniature, QFN (12-pin, 2 x 2 mm) package (MSL1, 260 °C per JEDEC J-STD-020)

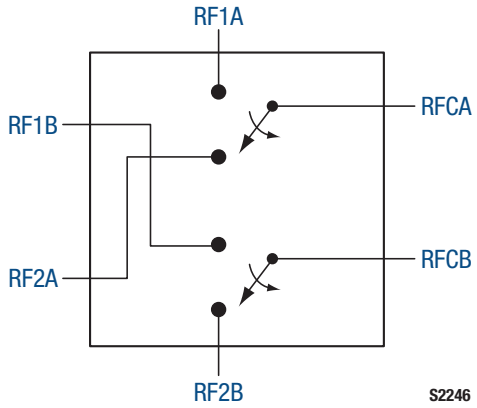


Figure 1. SKY13354-368LF Block Diagram

Skyworks Green™ products are compliant with all applicable legislation and are halogen-free. For additional information, refer to *Skyworks Definition of Green™*, document number SQ04-0074.

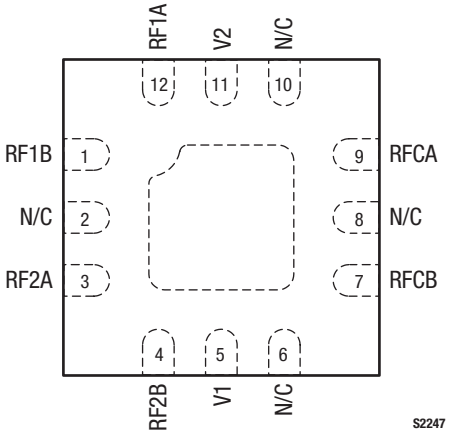


Figure 2. SKY13354-368LF Pinout (Top View)

Description

The SKY13354-368LF is a pHEMT GaAs dual single-pole, double-throw (SPDT) crossed switch designed for cellular infrastructure band switching applications. The internal crossed switch arrangement is designed to switch balanced RF filters.

Switching is controlled by two control voltage inputs (V1 and V2). Depending on the logic voltage level applied to the control pins, the RFCA and RFCB pins are each connected to one of four switched RF outputs (RF1A, RF1B, RF2A, or RF2B) using a low insertion loss path, while maintaining a high isolation path to the alternate port DC blocking capacitors are required on all RF ports. The switch is a “reflective short” on the isolated port.

The switch is manufactured in a compact, 2 x 2 mm, 12-pin exposed pad plastic Quad Flat No-Lead (QFN) package.

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. SKY13354-368LF Signal Descriptions

Pin	Name	Description	Pin	Name	Description
1	RF1B	RF port 1B. Must be DC blocked for proper operation.	7	RFCB	RF common port B (antenna). Must be DC blocked for proper operation.
2	N/C	No connection. May be connected to ground with no change in performance.	8	N/C	No connection. May be connected to ground with no change in performance.
3	RF2A	RF port 2A. Must be DC blocked for proper operation.	9	RFCA	RF common port A (antenna). Must be DC blocked for proper operation.
4	RF2B	RF port 2B. Must be DC blocked for proper operation.	10	N/C	No connection. May be connected to ground with no change in performance.
5	V1	DC control voltage 1. See Table 5.	11	V2	DC control voltage 2. See Table 5.
6	N/C	No connection. May be connected to ground with no change in performance.	12	RF1A	RF port 1A. Must be DC blocked for proper operation.

Note: Bottom ground paddle must be connected to ground through a low impedance path.

Electrical and Mechanical Specifications

The absolute maximum ratings of the SKY13354-368LF are provided in Table 2. The recommended operating conditions are specified in Table 3 and electrical specifications are provided in Table 4.

Typical performance characteristics of the SKY13354-368LF are illustrated in Figures 3 through 8.

The state of the SKY13354-368LF is determined by the logic provided in Table 5.

Table 2. SKY13354-368LF Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Input power	P_{IN}		+30	dBm
Control voltage	V1, V2		6	V
Storage temperature	T_{STG}	–40	+125	°C
Operating temperature	T_{OP}	–40	+85	°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.*

Table 3. SKY13354-368LF Recommended Operating Conditions

Parameter	Symbol	Minimum	Typical	Maximum	Units
Frequency	f	0.1		3.0	GHz
Control voltage (V1, V2)	V_{CTL}	1.6	3.0	5.0	V

Table 4. SKY13354-368LF Electrical Specifications (Note 1)
(V1 = V2 = 0 V and +2.7 V, T_{OP} = +25 °C, P_{IN} = 0 dBm, Characteristic Impedance [Z_0] = 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
RF Specifications						
Insertion loss	IL	RFCA to RF1A/2A, RFCB to RF1B/2B, V_{CTL} = 1.6 to 5.0 V:				
		0.1 to 1.0 GHz		0.40	0.55	dB
		1.0 to 2.0 GHz		0.50	0.65	dB
		2.0 to 3.0 GHz		0.55	0.90	dB
Isolation	Iso	RFCA to RF1A/2A, RFCB to RF1B/2B, V_{CTL} = 1.6 to 5.0 V:				
		0.1 to 1.0 GHz	24	29		dB
		1.0 to 2.0 GHz	25	30		dB
		2.0 to 3.0 GHz	20	32		dB
Return loss	|S11|	0.1-3.0 GHz, V_{CTL} = 1.6 to 5.0 V	15	22		dB
0.2 dB compression point	P0.2dB	0.1-3.0 GHz:				
		V_{CTL} = 1.6 V		+17		dBm
		V_{CTL} = 1.8 V		+20		dBm
		V_{CTL} = 2.0 V		+23		dBm
		V_{CTL} = 2.7 V		+28		dBm
		V_{CTL} = 5.0 V		+33		dBm
Third order input intercept point	IIP3	0.1-3.0 GHz, Δf = 1 MHZ, P_{IN} = +15 dBm/tone		+55		dBm
Switching speed		50% V_{CTL} to 90/10% RF,		40		ns
		90/10% RF or 10/90% RF		40		ns
DC Specifications						
Control voltage:						
Low	V_{CTL_L}		–0.2	0	+0.2	V
High	V_{CTL_H}		1.6	2.7	5.0	V
Control current	I_{CC}			5		µA

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

Typical Performance Characteristics

(V1 = V2 = 0 V and +1.6 V, T_{OP} = +25 °C, P_{IN} = 0 dBm, Characteristic Impedance [Z_0] = 50 Ω, Unless Otherwise Noted)

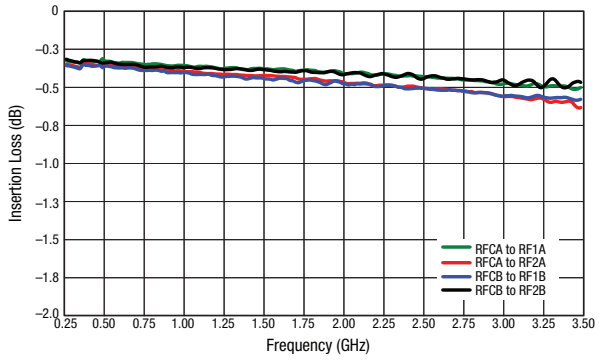


Figure 3. Insertion Loss vs Frequency

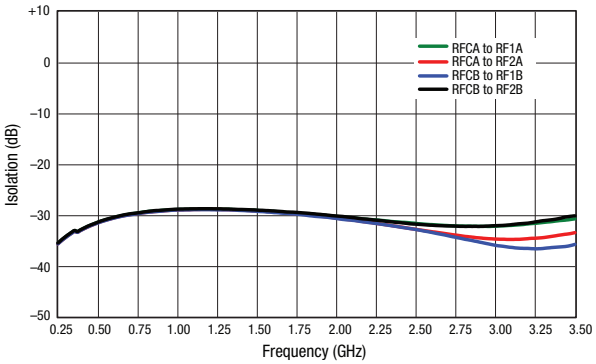


Figure 4. Isolation vs Frequency

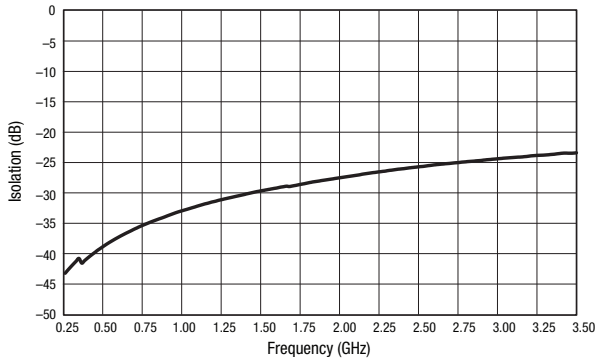


Figure 5. Isolation vs Frequency (RFCA to RFCB)

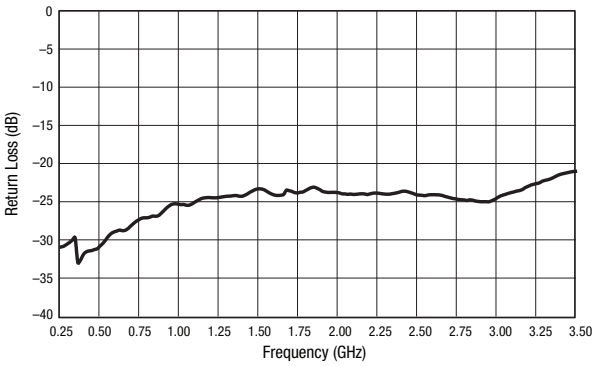


Figure 6. Return Loss vs Frequency

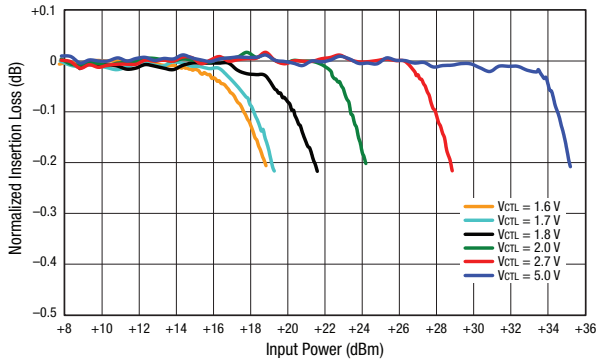


Figure 7. Normalized Insertion Loss vs Input Power

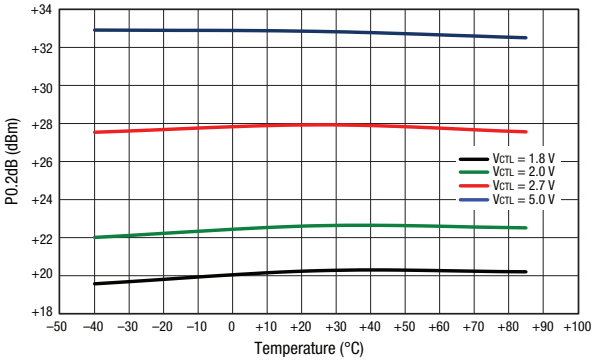


Figure 8. P0.2dB vs Temperature

Table 5. SKY13354-368LF Truth Table

V1 (Pin 5)	V2 (Pin 11)	Insertion Loss Paths
1	0	RFCA to RF1A RFCB to RF1B
0	1	RFCA to RF2A RFCB to RF2B

Note: "1" = +1.6 V to +5 V. "0" = 0 V to +0.2 V. Any state other than described in this table places the switch into an undefined state. An undefined state will not damage the device.

Evaluation Board Description

The SKY13354-368LF Evaluation Board is used to test the performance of the SKY13354-368LF Dual SPDT Switch. An Evaluation Board schematic diagram is provided in Figure 9. An assembly drawing for the Evaluation Board is shown in Figure 10.

Package Dimensions

The PCB layout footprint for the SKY13354-368LF is provided in Figure 11. Typical part markings are shown in Figure 12. Package dimensions are shown in Figure 13, and tape and reel dimensions are provided in Figure 14.

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 SKY13354-368LF 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.

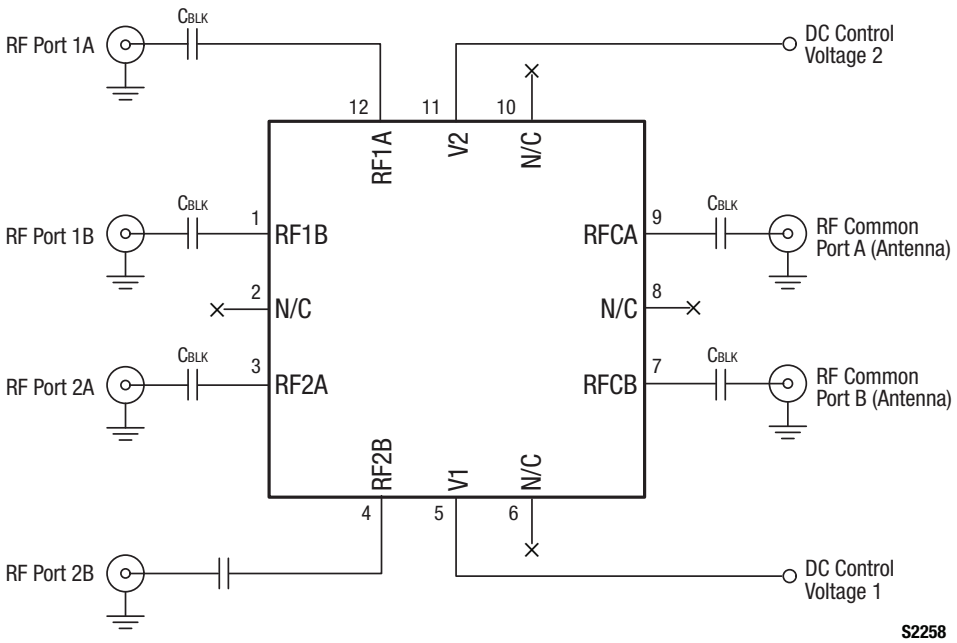


Figure 9. SKY13354-368LF Evaluation Board Schematic

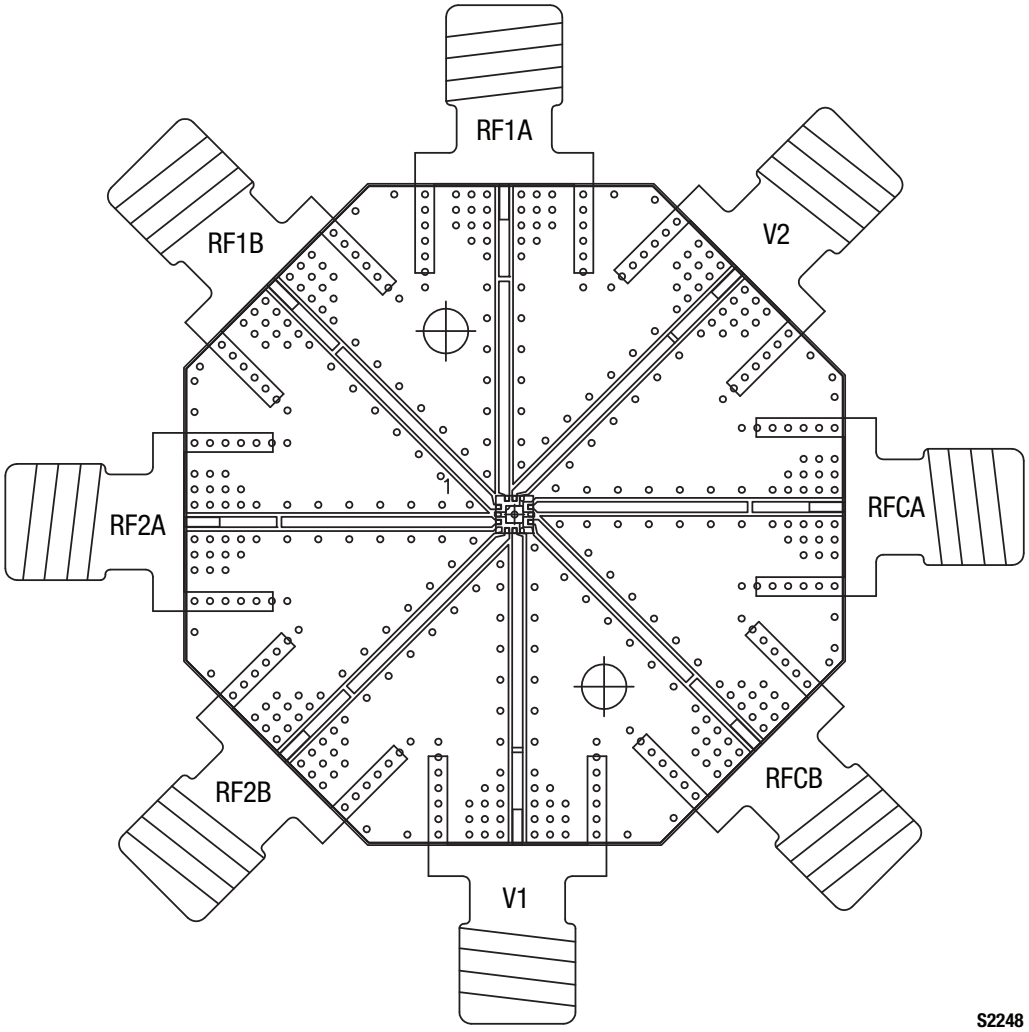


Figure 10. SKY13354-368LF Evaluation Board Assembly Diagram

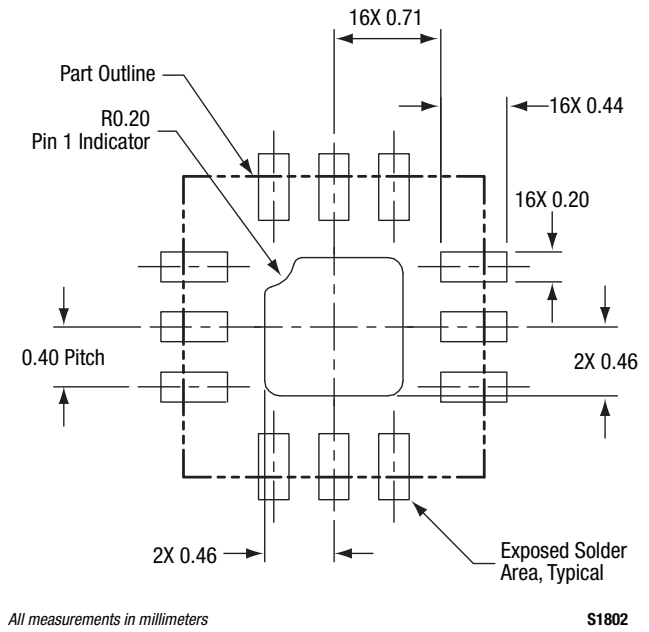


Figure 11. SKY13354-368LF PCB Layout Footprint (Top View)

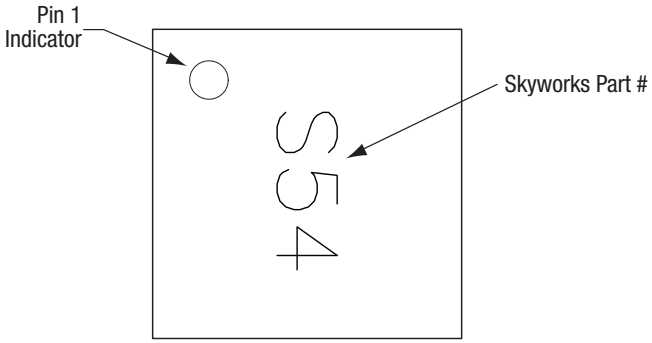
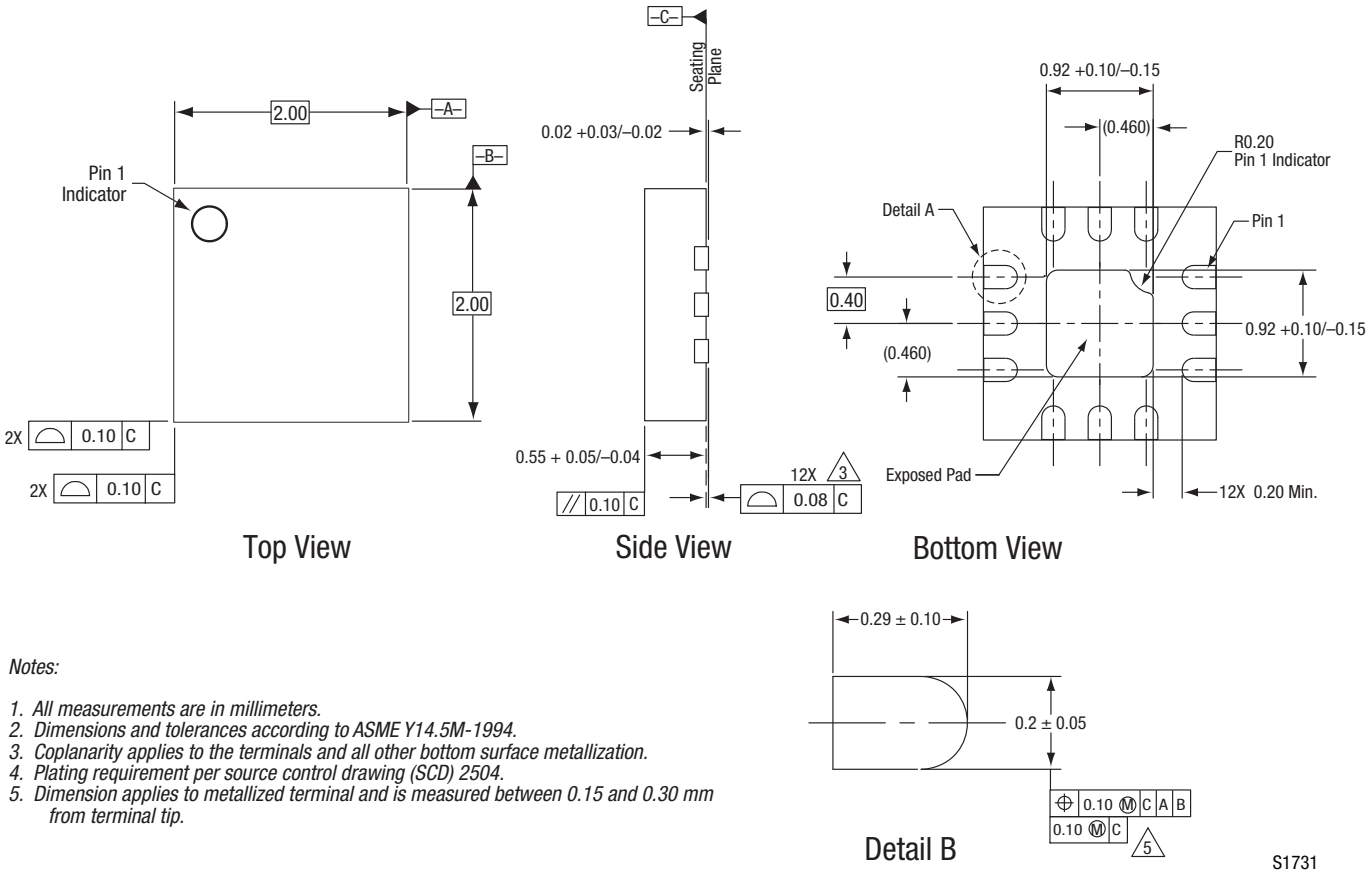


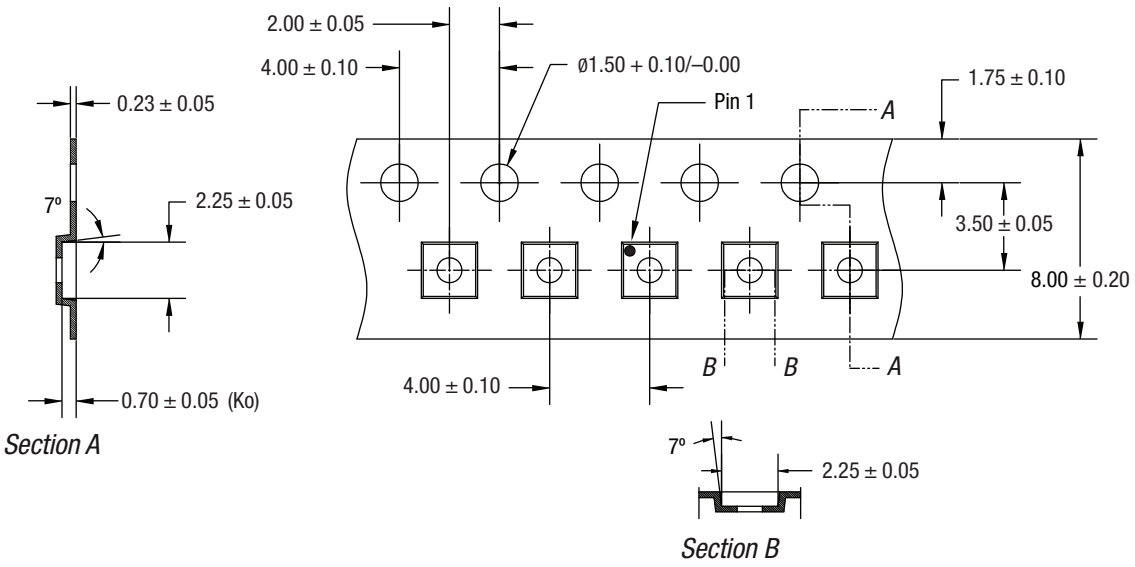
Figure 12. Typical Part Markings (Top View)



Notes:

1. *All measurements are in millimeters.*
2. *Dimensions and tolerances according to ASME Y14.5M-1994.*
3. *Coplanarity applies to the terminals and all other bottom surface metallization.*
4. *Plating requirement per source control drawing (SCD) 2504.*
5. *Dimension applies to metallized terminal and is measured between 0.15 and 0.30 mm from terminal tip.*

Figure 13. SKY13354-368LF 12-Pin QFN Package Dimensions



Notes:

1. *Carrier tape must meet all requirements of Skyworks GP01-D232 procurement spec for tape and reel shipping.*
2. *Carrier tape shall be black conductive polycarbonate bakeable material at 125 °C temperature.*
3. *Cover tape shall be transparent conductive with 5.40 mm width.*
4. *ESD-surface resistivity must meet all ESD requirements of Skyworks specified on GP01-D232.* ts737
5. *All measurements are in millimeters.*

Figure 14. SKY13354-368LF Tape and Reel Dimensions

Ordering Information

Model Name	Manufacturing Part Number	Evaluation Board Part Number
SKY13354-368LF Dual SPDT Crossed Switch	SKY13354-368LF	SKY13354-368LF-EVB