PRELIMINARY DATA SHEET

SKY14153-368LF: 0.1-2.7 GHz SP4T Switch With Integrated Logic Decoder

Applications

- WCDMA/CDMA/LTE front-end/antenna switches
- Diversity receive antenna switches

Features

- Broadband frequency range: 0.1 GHz to 2.7 GHz
- Low insertion loss: 0.60 dB typical @ 2 GHz, 0.68 dB typical @ 2.7 GHz
- High isolation: >30 dB typical @ 0.82 GHz, 23 dB typical @ 2.7 GHz
- V_{DD}: 2.5 to 4.5 V
- IIP3: +63 dBm typical @ 0.90 GHz
- Good harmonic performance <75 dBc @ 0.90 GHz
- Low voltage compatible (V_{HIGH} = 1.8 V)
- No external components required
- Small, QFN (12-pin, 2 x 2 mm) package (MSL1, 260 °C per JEDEC J-STD-020)

NEW

Skyworks offers lead (Pb)-free RoHS (Restriction of Hazardous Substances) compliant packaging.

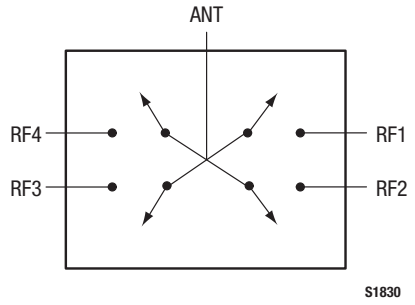


Figure 1. SKY14153-368LF Block Diagram

Description

The SKY14153-368LF is a symmetrical, single-pole, four-throw (SP4T) switch. The device is designed for broadband, medium power switching applications that demand high linearity and low insertion loss. This is a general purpose switch optimized for 3GPP bands from 0.70 to 2.7 GHz.

The switch is manufactured with an industry-leading Silicon-on-Insulator (SOI) process. The SKY14153-368LF features on-chip energy management circuitry that uses only two control lines for the switch operation. The low current consumption makes the device suitable for battery-operated applications.

The SKY14153-368LF SP4T switch is provided in a compact Quad Flat No-Lead (QFN) 2 x 2 mm 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.

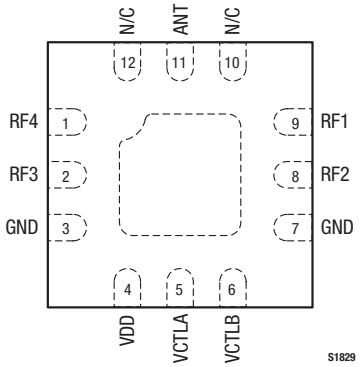


Figure 2. SKY14153-368LF Pinout – 12-Pin QFN (Top View)

Table 1. SKY14153-368LF Signal Descriptions

Pin #	Name	Description	Pin #	Name	Description
1	RF4	RF input 4	7	GND	Ground
2	RF3	RF input 3	8	RF2	RF input 2
3	GND	Ground	9	RF1	RF input 1
4	VDD	DC power supply	10	N/C	No connection (may be grounded with no change in performance)
5	VCTLA	DC control input A (see Table 4)	11	ANT	RF common (antenna) port
6	VCTLB	DC control input B (see Table 4)	12	N/C	No connection (may be grounded with no change in performance)

Note: Exposed pad must be grounded.

Table 2. SKY14153-368LF Absolute Maximum Ratings

Parameter	Symbol	Minimum	Typical	Maximum	Units
Supply voltage	V_{DD}			4.5	V
Control voltage	V_{CTL}			2.2	V
Input power	P_{IN}			+35	dBm
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.*

Electrical and Mechanical Specifications

The absolute maximum ratings of the SKY14153-368LF are provided in Table 2. Electrical specifications are provided in Table 3.

The state of the SKY14153-368LF is determined by the logic provided in Table 4.

Typical performance characteristics of the SKY14153-368LF are illustrated in Figures 3 through 8.

Table 3. SKY14153-368LF Electrical Specifications (Note 1)
(V_{DD} = 2.5 to 4.5 V, V_{CTL} = 1.8 V, T_{OP} = +25 °C, All Unused RF Ports are Terminated in a 50 Ω Load, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Insertion loss (ANT to RF1, RF2, RF3, RF4)	IL	0.8 to 1.0 GHz 1.0 to 2.2 GHz 2.2 to 2.7 GHz		0.55 0.60 0.68		dB dB dB
Isolation (ANT to RF1, RF2, RF3, RF4)	ISO	0.8 to 1.0 GHz 1.0 to 2.2 GHz 2.2 to 2.7 GHz		30 25 23		dB dB dB
Input return loss (ANT to RF1, RF2, RF3, RF4)	|S11|	0.8 to 2.7 GHz		25		dB
Harmonics (ANT to RF1, RF2, RF3, RF4)		P_{IN} = +26 dBm 2fo: 0.8 to 1.0 GHz 3fo: 0.8 to 1.0 GHz 2fo: 1.7 to 2.2 GHz 3fo: 1.7 to 2.2 GHz 2fo: 2.5 to 2.7 GHz 3fo: 2.5 to 2.7 GHz		 –75 –77 –77 –77 –79 –87		 dB dB dB dB dB dB
Input 0.1 dB compression point (ANT to RF1, RF2, RF3, RF4)	P0.1dB	0.8 to 2.7 GHz		+33		dBm
3rd Order Input Intercept Point (ANT to RF1, RF2, RF3, RF4)	IIP3			+63		dBm
Control voltage: High Low	V_{CTL}		 1.6 0		 2.2 0.4	 V V
Control current	I_{CTL}			40		µA
Supply current	I_{CC}	V_{DD} = 2.6 V		70		µA
Supply voltage	V_{DD}		2.5		4.5	V
Switching time		RF1, RF2, RF3, RF4: 50% V_{CTL} to 10/90% RF		550		ns

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

Table 4. SKY14153-368LF Truth Table

VCTLB (Pin 6)	VCTLA (Pin 5)	Insertion Loss Path
0	0	RF4
0	1	RF3
1	0	RF1
1	1	RF2

Note: 1 = 1.6 to 2.2 V
0 = 0 to 0.4 V
Any state other than described in this Table places the switch into an undefined state.

Typical Performance Characteristics

(V_{DD} = 2.5 to 4.5 V, V_{CTL} = 1.8 V, T_{OP} = +25 °C, All Unused RF Ports are Terminated in a 50 Ω Load, Unless Otherwise Noted)

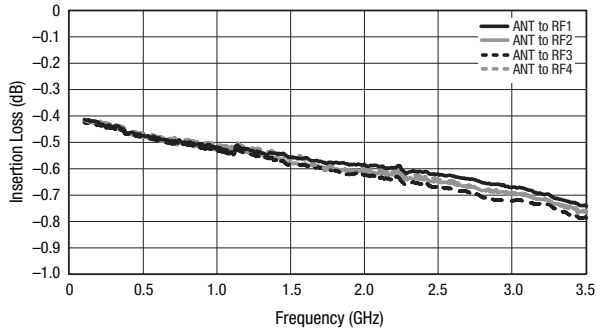


Figure 3. Insertion Loss vs Frequency

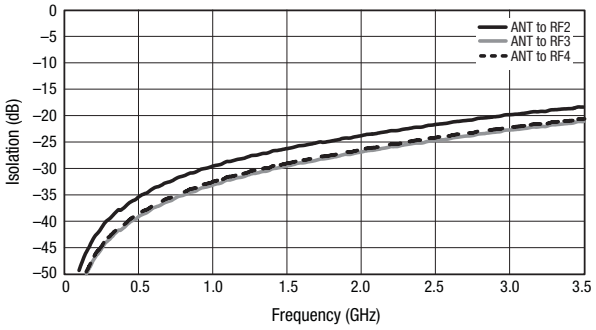


Figure 4. Isolation vs Frequency (ANT to RF1 Insertion Loss State)

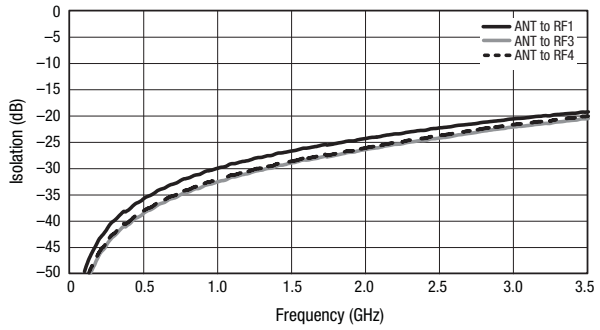


Figure 5. Isolation vs Frequency (RFC to J2 Insertion Loss State)

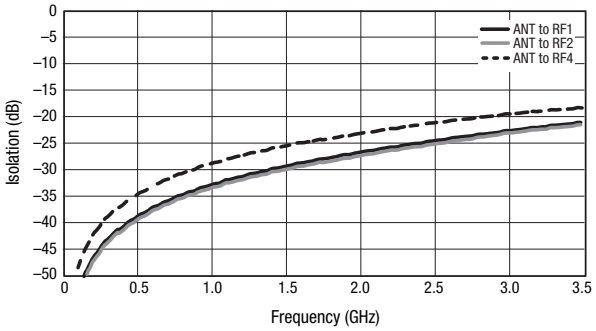


Figure 6. Isolation vs Frequency (ANT to RF3 Insertion Loss State)

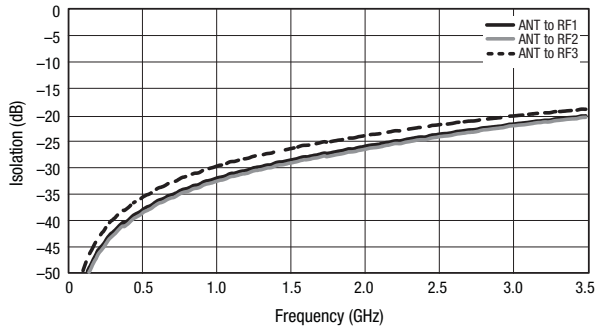


Figure 7. Isolation vs Frequency (ANT to RF4 Insertion Loss State)

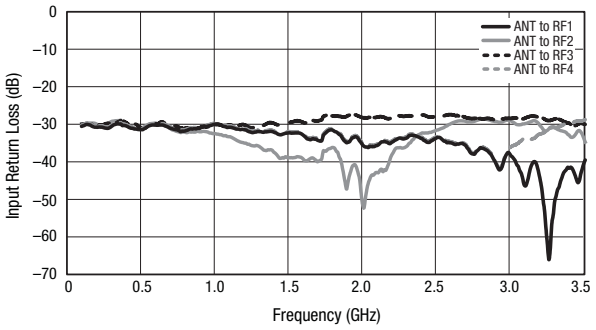


Figure 8.Input Return Loss vs Frequency

Evaluation Board Description

The SKY14153-368LF Evaluation Board is used to test the performance of the SKY14153-368LF SP4T 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 SKY14153-368LF is provided in Figure 11. Typical case markings are shown in Figure 12. Package dimensions for the 12-pin QFN 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 SKY14153-368LF is rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C. It can be used for lead or lead-free soldering.

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.

***** TBD *****

Figure 9. SKY14153-368LF Evaluation Board Schematic

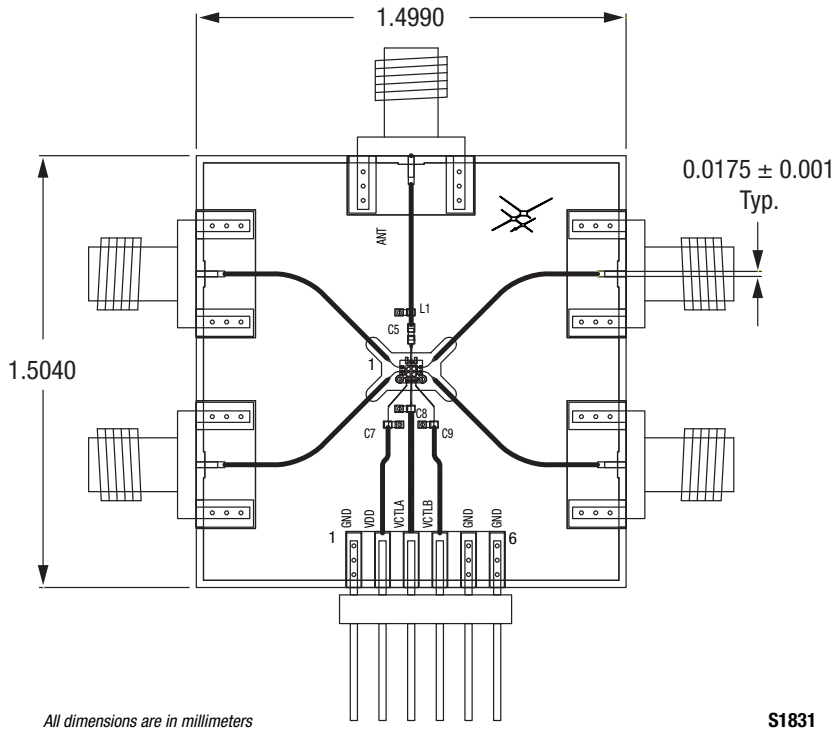


Figure 10. SKY14153-368LF Evaluation Board Assembly Diagram

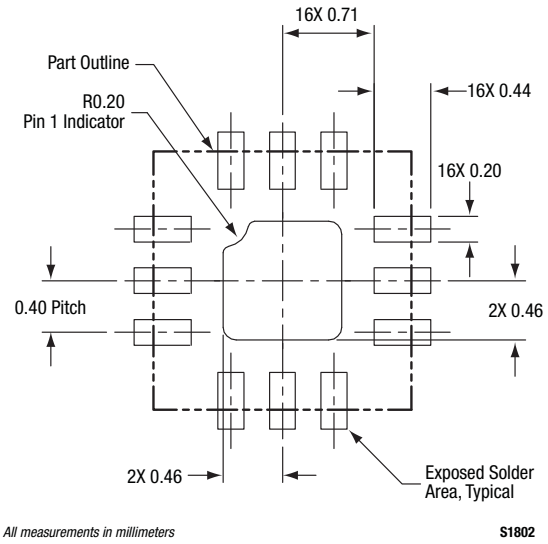
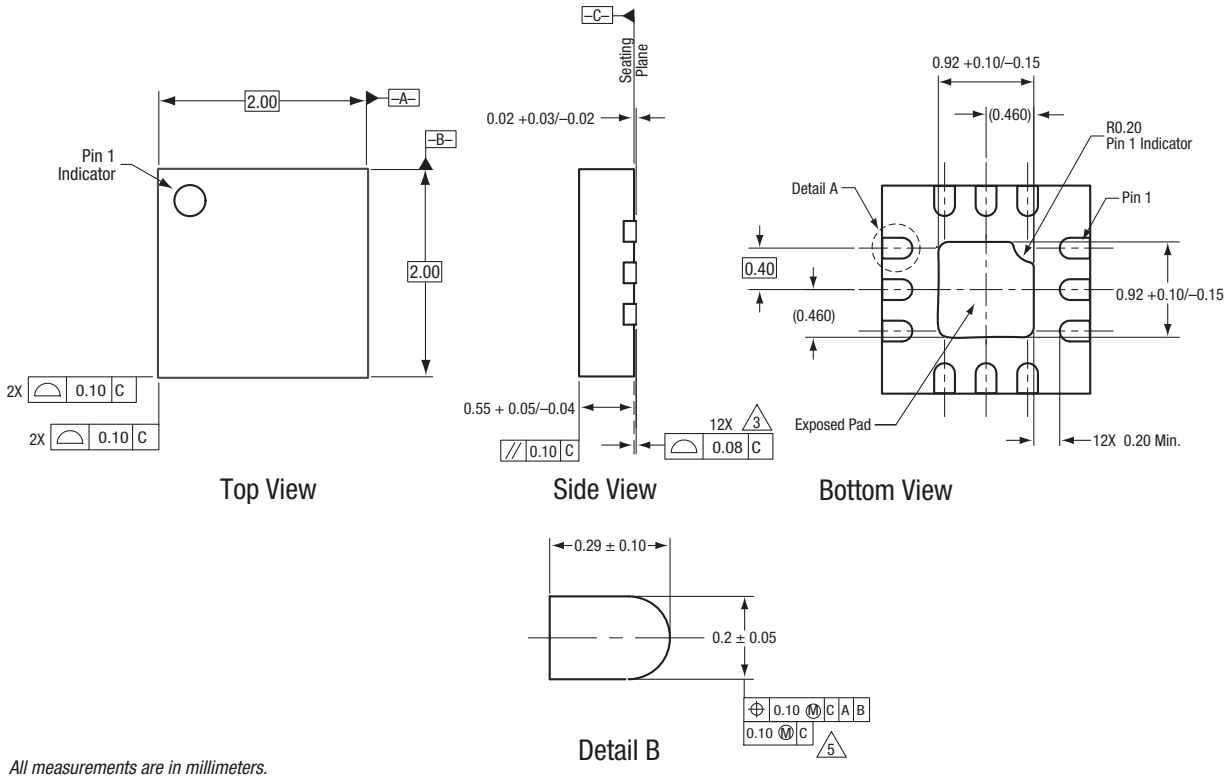


Figure 11. SKY14153-368LF PCB Layout Footprint (Top View)

***** TBD *****

Figure 12. Typical Case 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.
Plating requirement per source control drawing (SCD) 2504.
Dimension applies to metalized terminal and is measured between 0.15 and 0.30 mm from terminal tip.

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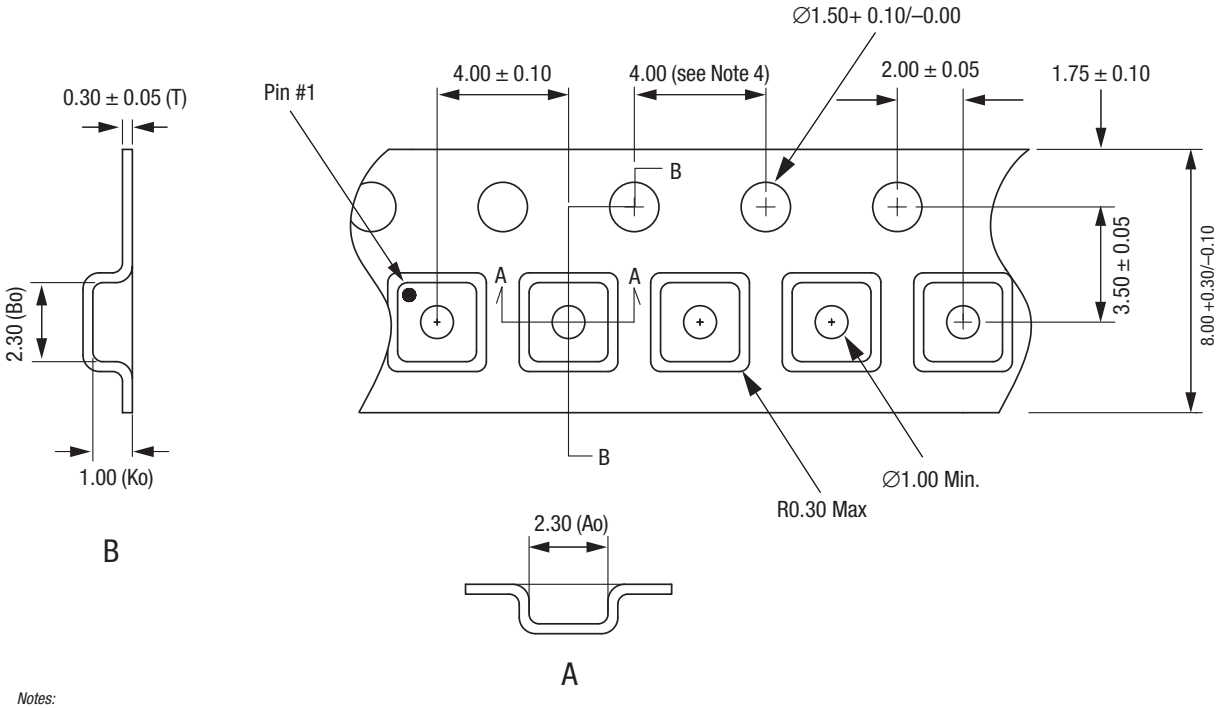
Figure 13. SKY14153-368LF 12-Pin QFN Package Dimensions



Notes:
1. *Carrier tape: black conductive polystyrene.*
2. *Cover tape material: transparent conductive HSA.*
3. *Cover tape size: 5.40 mm width.*
4. *Ten sprocket hole pitch cumulative tolerance = ±0.20 mm.*
5. *All measurements are in millimeters.*

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Figure 14. SKY14153-368LF Tape and Reel Dimensions

Ordering Information

Model Name	Manufacturing Part Number	Evaluation Kit Part Number
SKY14153-368LF SP4T Switch	SKY14153-368LF	SK41154, rev. 1