DATA SHEET

SKY13346-368LF: 0.5-2.5 GHz SP3T Switch

Applications

- 802.11 b/g WLANs
- Bluetooth

Features

- Broadband frequency range: 0.5-2.5 GHz
- Low insertion loss: 0.5 dB @ 2.5 GHz
- High isolation: 25 dB up to 2.5 GHz
- Positive low voltage control: 1.8 to 5.0 V
- Small, QFN (12-pin, 2 x 2 mm) package (MSL1, 260 °C per JEDEC J-STD-020)

NEW

Skyworks Green™ products are RoHS (Restriction of Hazardous Substances)-compliant, conform to the EIA/EICTA/JEITA Joint Industry Guide (JIG) Level A guidelines, are halogen free according to IEC-61249-2-21, and contain <1,000 ppm antimony trioxide in polymeric materials.

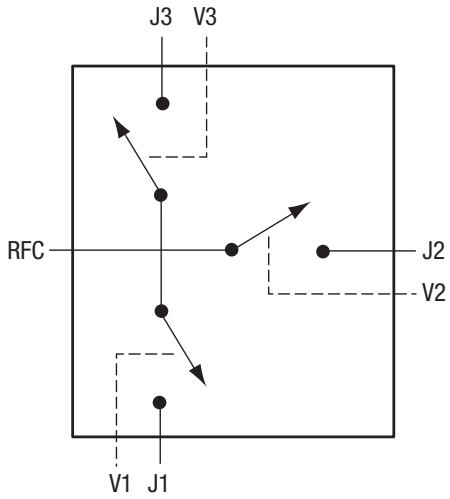


Figure 1. SKY13346-368LF Block Diagram

Description

The SKY13346-368LF is a GaAs pHEMT, single-pole, triple-throw (SP3T) switch. The high linearity performance and low insertion loss makes the device an ideal choice for WLAN (802.11 b/g) and Bluetooth® applications in the 2.4 to 2.5 GHz frequency range.

The SKY13346-368LF SP3T 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.

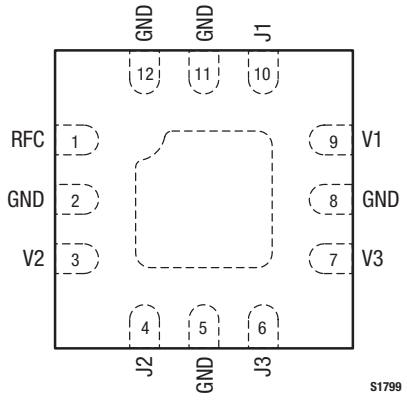


Figure 2. SKY13346-368LF Pinout – 12-Pin QFN (Top View)

Table 1. SKY13346-368LF Signal Descriptions

Pin #	Name	Description	Pin #	Name	Description
1	RFC	RF common (antenna) port. DC blocking capacitor required.	7	V3	DC control voltage 3. Connects RFC to J3 with logic high (1.8 to 5.0 V)
2	GND	Ground	8	GND	Ground
3	V2	DC control voltage 2. Connects RFC to J2 with logic high (1.8 to 5.0 V)	9	V1	DC control voltage 1. Connects RFC to J1 with logic high (1.8 to 5.0 V)
4	J2	RF port 2. DC blocking capacitor required.	10	J1	RF port 1. DC blocking capacitor required.
5	GND	Ground	11	GND	Ground
6	J3	RF port 3.	12	GND	Ground

Note: Exposed pad must be grounded.

Table 2. SKY13346-368LF Absolute Maximum Ratings

Parameter	Symbol	Minimum	Typical	Maximum	Units
Control voltage	V_{CTL}		8		V
Input power (V_{CTL} = 3 to 5 V)	P_{IN}		+33		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.*

Functional Description

Switching is controlled by three control voltage inputs: V1, V2, and V3. Depending on the logic voltage level applied to the control pins, the RFC (RF common) pin is connected to one of three switched RF outputs (J1, J2, or J3) through a low insertion path, while the path between the RFC pin and the other RF pins are in a high isolation state.

External DC blocking capacitors are required on the RF paths.

Electrical and Mechanical Specifications

The absolute maximum ratings of the SKY13346-368LF are provided in Table 2. Electrical specifications are provided in Table 3.

The state of the SKY13346-368LF is determined by the logic provided in Table 4.

Typical performance characteristics of the SKY13346-368LF are illustrated in Figures 3 through 11.

Table 3. SKY13346-368LF Electrical Specifications (Note 1)
(V_{CTL} = 0 V to 2.85 V, T_{OP} = +25 °C, P_{IN} = 0 dBm, Characteristic Impedance [Z_0] = 50 Ω, C_{BL} = 56 pF, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Insertion loss (RFC to J1, J2, J3)	IL	0.5 to 1.0 GHz 1.0 to 2.0 GHz 2.0 to 2.5 GHz		0.40 0.45 0.50	0.50 0.55 0.60	dB dB dB
Isolation: RFC to J1, J2, J3 RFC to J1, J2 RFC to J1, J2 RFC to J3 RFC to J3	ISO	 0.5 to 1.0 GHz 1.0 to 2.0 GHz 2.0 to 2.5 GHz 1.0 to 2.0 GHz 2.0 to 2.5 GHz	 25 24 25 22 22	 28 27 28 25 25		 dB dB dB dB dB
Return loss (RFC to J1, J2, J3)	|S11|	0.5 to 2.5 GHz		25		dB
3rd Order Input Intercept Point	IIP3	1, 2, and 2.5 GHz, ΔF = 1 MHz, P_{IN} = +17 dBm/tone		+47		dBm
Input 1 dB compression point	P1dB	1, 2, and 2.5 GHz		+30		dBm
Error Vector Magnitude	EVM	2.4 to 2.5 GHz, 802.11g, 54 Mbps EVM, P_{IN} = +23 dBm		3		%
2nd harmonic	2fo	1, 2, and 2.5 GHz		+63		dBc
3rd harmonic	3fo	1, 2, and 2.5 GHz		+60		dBc
Video feedthrough				50		mV
Switching rise time		10/90% RF		50		ns
Switching fall time		90/10% RF		25		ns
Switching on time		50% control to 10/90% RF		55		ns
Switching off time		50% control to 90/10% RF		30		ns
Power Supply						
Control voltage: High Low	V_{CTL}		 1.8 0		 5 0.2	 V V
Control current: High Low	I_{CTL}	 V_{CTL} = 1.8 to 5.0 V V_{CTL} = 0 to 0.2 V		 10 5		 µA µA

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

Table 4. SKY13346-368LF Truth Table

V1 (Pin 9)	V2 (Pin 3)	V3 (Pin 7)	RFC to J1	RFC to J2	RFC to J3
1	0	0	Insertion loss	Isolation	Isolation
0	1	0	Isolation	Insertion loss	Isolation
0	0	1	Isolation	Isolation	Insertion loss

Note: 1 = 1.8 to 5.0 V
0 = 0 to 0.2 V
Any state other than described in this Table places the switch into an undefined state.

Typical Performance Characteristics

(V_{CTL} = 0 V to 2.85 V, T_{OP} = +25 °C, P_{IN} = 0 dBm, Characteristic Impedance [Z_O] = 50 Ω, C_{BL} = 56 pF, Unless Otherwise Noted)

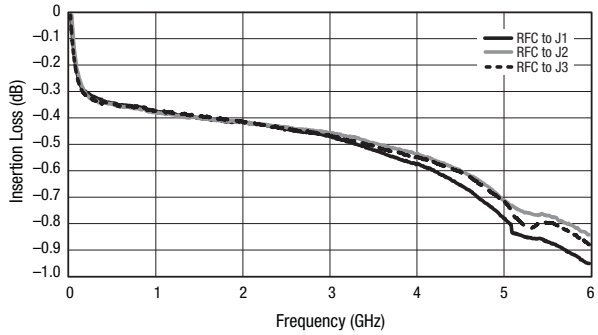


Figure 3. Insertion Loss vs Frequency

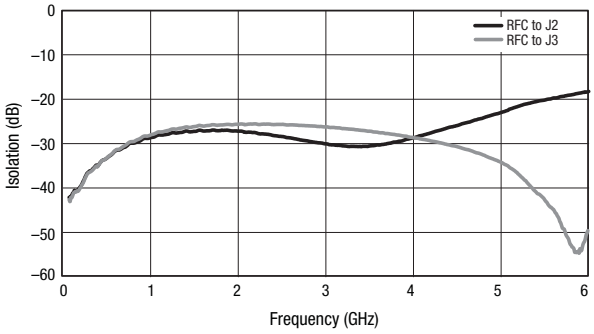


Figure 4. Isolation vs Frequency (RFC to J1 Insertion Loss State)

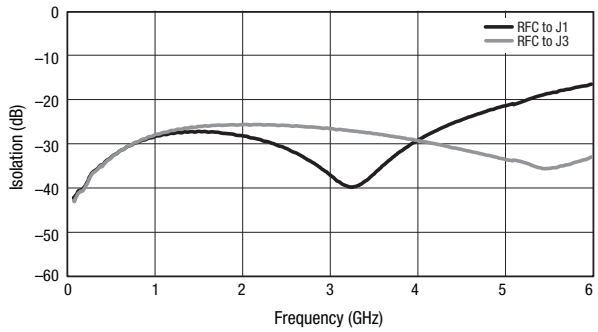


Figure 5. Isolation vs Frequency (RFC to J2 Insertion Loss State)

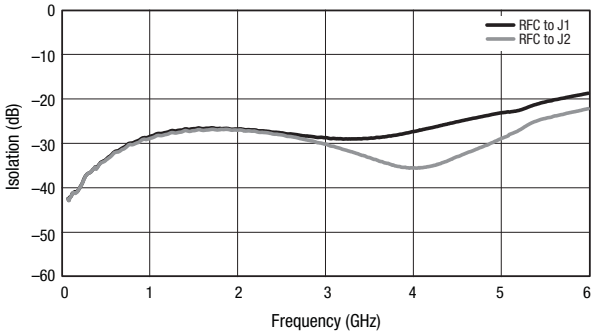


Figure 6. Isolation vs Frequency (RFC to J3 Insertion Loss State)

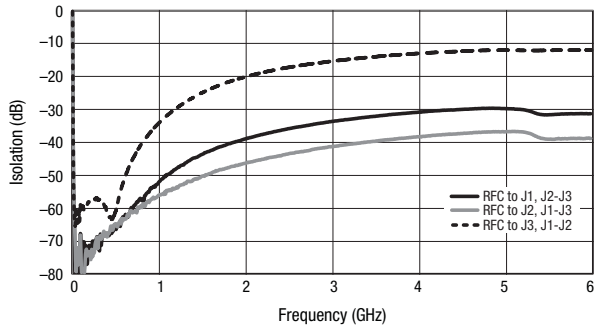


Figure 7. Port to Port Isolation vs Frequency (Off Ports to Off Ports)

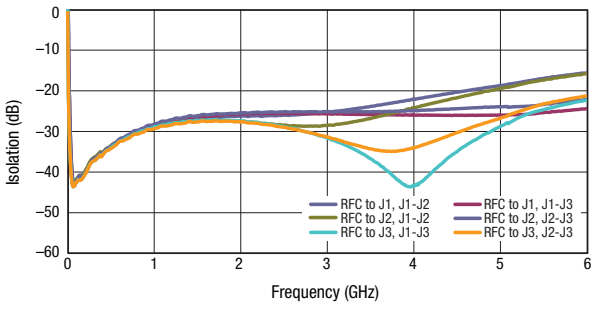


Figure 8. Port to Port Isolation vs Frequency (Insertion Loss Ports to Off Ports)

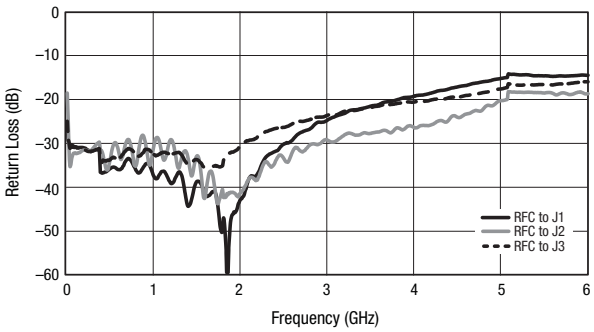


Figure 9. Input Return Loss vs Frequency

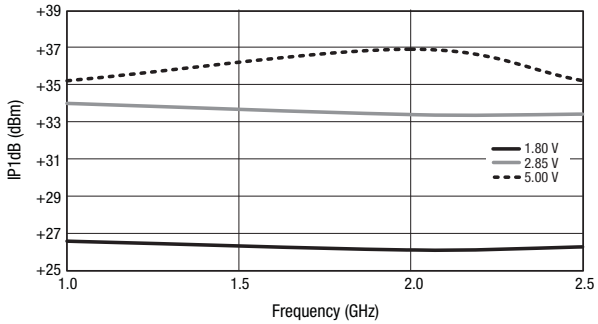


Figure 10. Input 1dB Compression Point vs Frequency

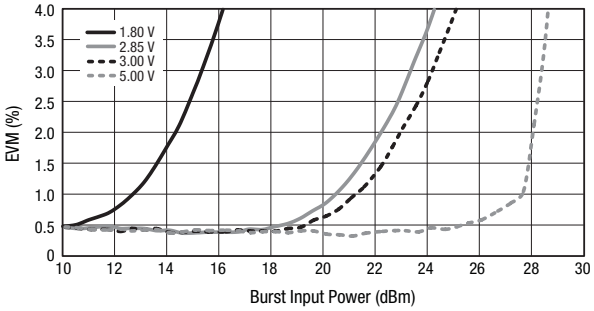


Figure 11. EVM vs Burst Input Power Over Voltage (F = 2.5 GHz, 802.11g, 54 Mbps, 64 QAM)

Evaluation Board Description

The SKY13346-368LF Evaluation Board is used to test the performance of the SKY13346-368LF SP3T Switch. An Evaluation Board schematic diagram is provided in Figure 12. Table 5 provides the Bill of Materials (BOM) list for Evaluation Board components. An assembly drawing for the Evaluation Board is shown in Figure 13.

Package Dimensions

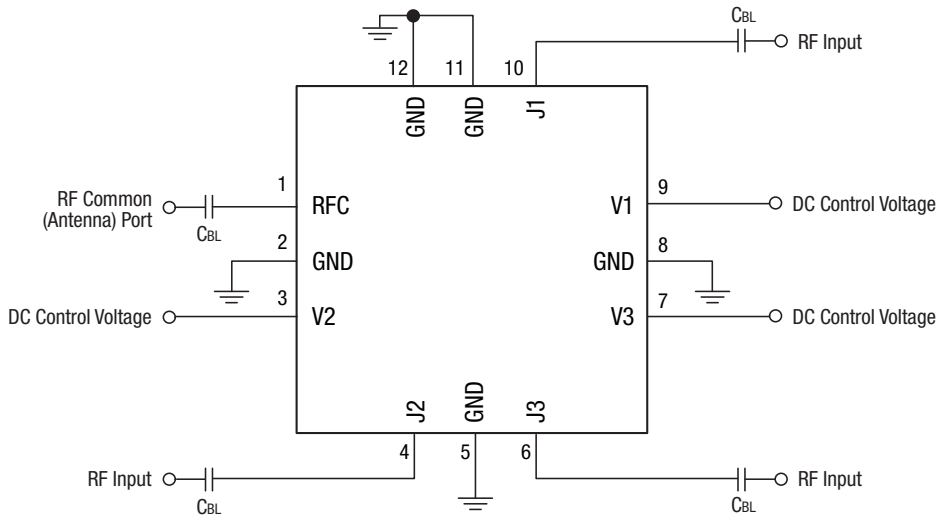
The PCB layout footprint for the SKY13346-368LF is provided in Figure 14. Typical case markings are shown in Figure 15. Package dimensions for the 12-pin QFN are shown in Figure 16, and tape and reel dimensions are provided in Figure 17.

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 SKY13346-368LF 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. For packaging details, refer to the Skyworks Application Note, *Discrete Devices and IC Switch/Attenuators Tape and Reel Package Orientation*, document number 200083.



CBL = 56 pF for operation > 1 GHz
Higher values recommended for lower frequency operation.
Exposed paddle must be grounded.

Figure 12. SKY13346-368LF Evaluation Board Schematic

Table 5. SKY13346-358LF Evaluation Board Bill of Materials

Component	Value	Size	Manufacturer/Part Series
CBL	56 pF	0402	Murata GRM Series

Note: Blocking capacitors are required on all RF ports for proper functionality. Value of DC blocking capacitor determines lower frequency operation.

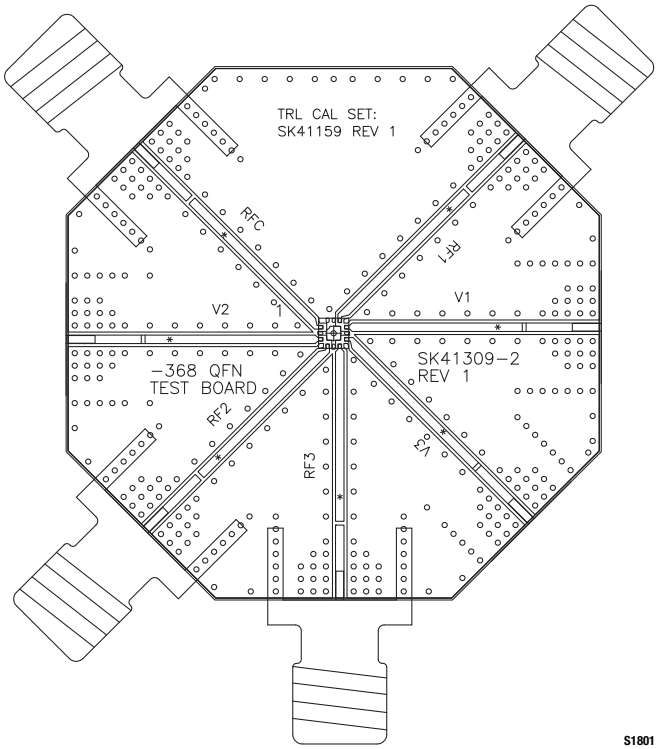


Figure 13. SKY13346-368LF Evaluation Board Assembly Diagram

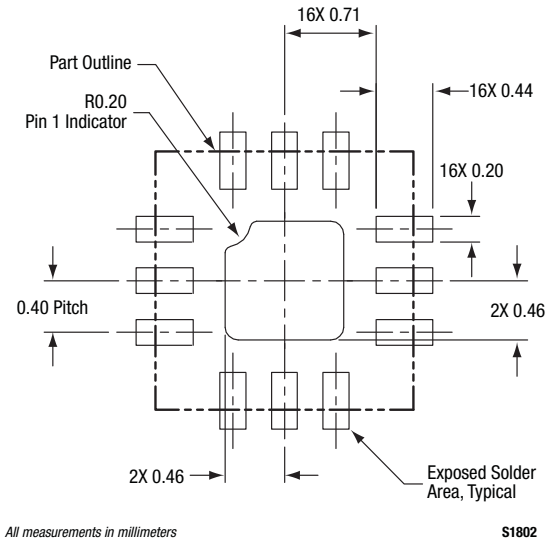


Figure 14. SKY13346-368LF PCB Layout Footprint (Top View)

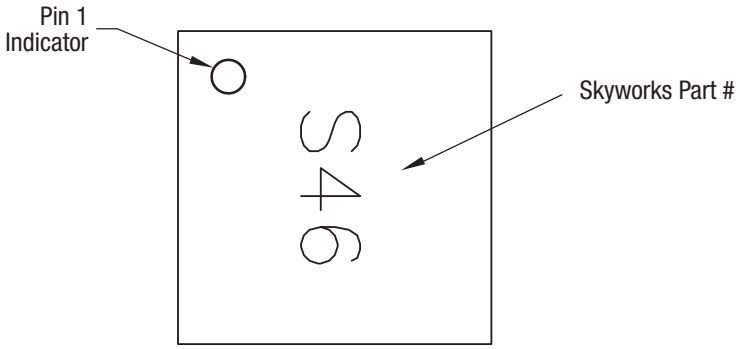
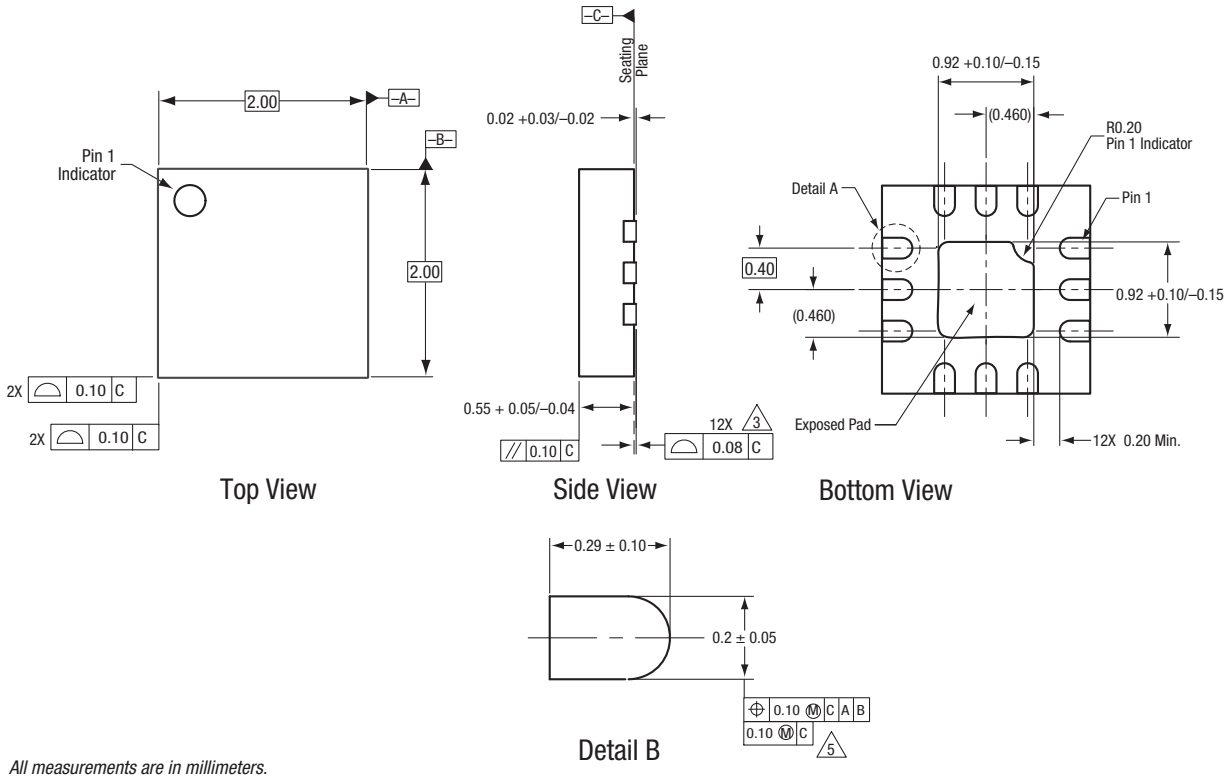


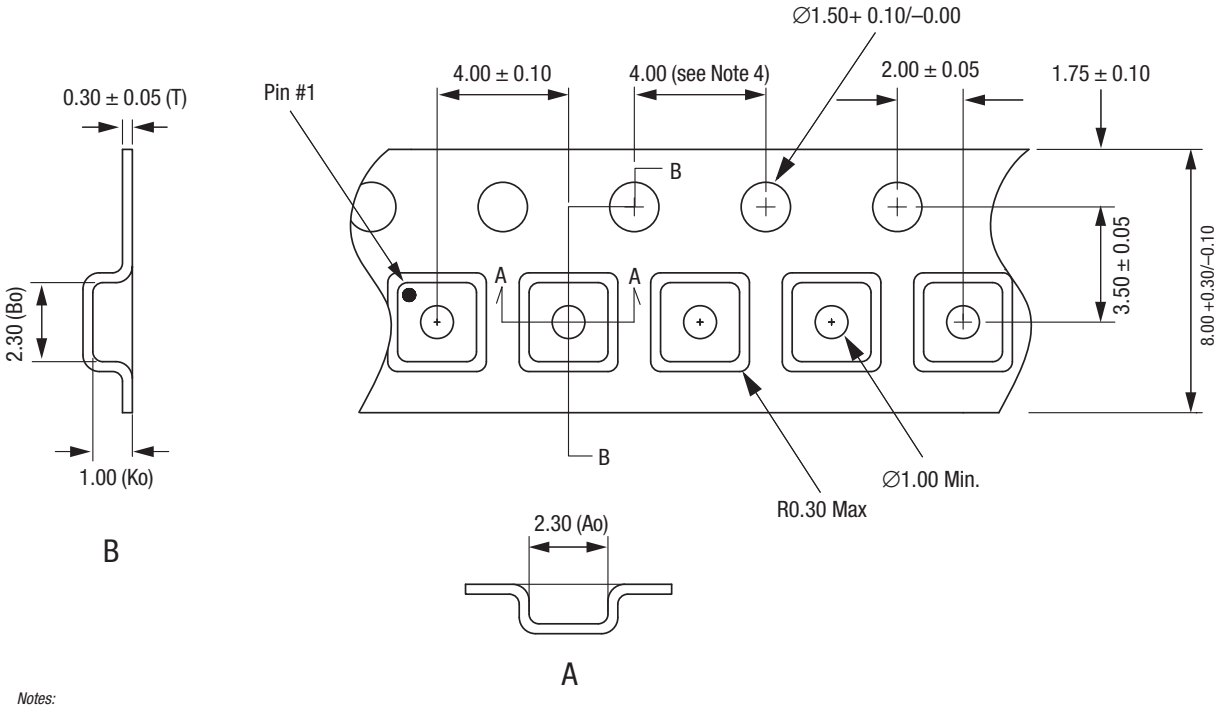
Figure 15. Typical Case Markings (Top View)



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.

S1731

Figure 16. SKY13346-368LF 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 17. SKY13346-368LF Tape and Reel Dimensions

Ordering Information

Model Name	Manufacturing Part Number	Evaluation Kit Part Number
SKY13346-368LF SP3T Switch	SKY13346-368LF (Pb-free and Green package)	SK41309-2, rev. 1