

## DATA SHEET

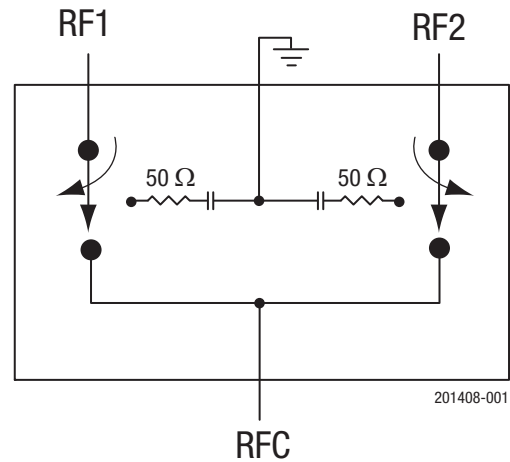
# SKY13370-374LF: 0.5 to 6.0 GHz SPDT Switch, 50 $\Omega$ Terminated

## Applications

- WiMAX 802.16
- Dual-band WLANs (802.11 a/b/g/n)
- LTE/4G systems

## Features

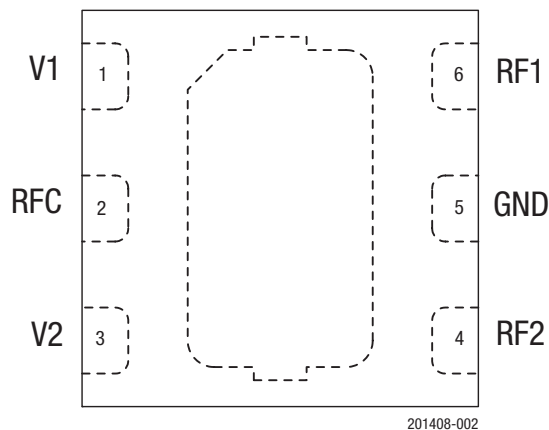
- 50  $\Omega$  matched RF ports in all states
- Low insertion loss: 0.7 dB @ 2.5 GHz
- High isolation: 31 dB @ 2.5 GHz
- IP1dB: +39 dBm
- Small DFN (6-pin, 1.5 x 1.5 mm) package (MSL1, 260 °C per JEDEC J-STD-020)



**Figure 1. SKY13370-374LF 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. SKY13370-374LF Pinout  
(Top View)**

## Description

The SKY13370-374LF is a GaAs pHEMT single-pole, double-throw (SPDT) high power switch with 50  $\Omega$  terminated outputs. The high-linearity performance and low insertion loss achieved by the SKY13370-374LF make it an ideal choice for WiMAX and higher power WLAN applications such as access points.

The switch is manufactured in a compact, 1.5 x 1.5 mm, 6-pin Dual Flat No-Lead (DFN) 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. SKY13370-374LF Signal Descriptions**

| Pin | Name | Description   | Pin | Name | Description  |
|-----|------|---|-----|------|--|
| 1   | V1   | DC control voltage. A logic high voltage enables an insertion loss path between the RFC and RF1 pins. | 4   | RF2  | RF output: 50 $\Omega$ terminated when in isolation state. Must be DC blocked. |
| 2   | RFC  | RF common input. Must be DC blocked.  | 5   | GND  | Ground   |
| 3   | V2   | DC control voltage. A logic high voltage enables an insertion loss path between the RFC and RF2 pins. | 6   | RF1  | RF output: 50 $\Omega$ terminated when in isolation state. Must be DC blocked. |

## Functional Description

Switching is controlled by two control voltage inputs, V1 and V2 (pins 1 and 3, respectively). Depending on the logic voltage level applied to the control pins, the RFC pin is connected to one of the two switched RF outputs, RF1 or RF2, using a low insertion loss path, while the path between the RFC pin and the other RF pin is in a high isolation state.

DC blocking capacitors are required on all RF ports of the switch. The value of the capacitors determines the low frequency operation. The isolated RF output is internally terminated to 50  $\Omega$ .

## Electrical and Mechanical Specifications

The absolute maximum ratings of the SKY13370-374LF are provided in Table 2. Electrical specifications are provided in Table 3.

Typical performance characteristics of the SKY13370-374LF are illustrated in Figures 3 through 6.

The state of the SKY13370-374LF is determined by the logic provided in Table 4.

**Table 2. SKY13370-374LF Absolute Maximum Ratings<sup>1</sup>**

| Parameter             | Symbol           | Minimum | Maximum | Units |
|-----------------------|------------------|---------|---------|-------|
| Control voltage       | V <sub>CTL</sub> |         | 6       | V     |
| Input power           | P <sub>IN</sub>  |         | +40     | dBm   |
| Storage temperature   | T <sub>STG</sub> | -40     | +125    | °C    |
| Operating temperature | T <sub>OP</sub>  | -40     | +85     | °C    |

<sup>1</sup> 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. SKY13370-374LF Electrical Specifications<sup>1</sup>****( $V_{CTL} = 0\text{ V}$  and  $+3.0\text{ V}$ ,  $T_{OP} = +25\text{ }^{\circ}\text{C}$ ,  $P_{IN} = 0\text{ dBm}$ , Characteristic Impedance  $[Z_0] = 50\text{ }\Omega$ ,  $C_{BLK} = 47\text{ pF}$ , Unless Otherwise Noted)**

| Parameter                         | Symbol    | Test Condition  | Min                          | Typ                             | Max                  | Units                           |
|-----------------------------------|-----------|---|------------------------------|---------------------------------|----------------------|---------------------------------|
| <b>RF Specifications</b>          |           |   |                              |                                 |                      |                                 |
| Insertion loss                    | IL        | RFC to RF1 or RF2:<br>0.50 to 2.70 GHz<br>2.70 to 3.80 GHz<br>3.80 to 5.85 GHz  |                              | 0.70<br>0.80<br>1.15            | 0.80<br>0.95<br>1.30 | dB<br>dB<br>dB                  |
| Isolation                         | Iso       | RFC to RF1 or RF2:<br>0.50 to 2.40 GHz<br>2.40 to 2.50 GHz<br>2.50 to 3.80 GHz<br>3.80 to 5.85 GHz                              | 29.0<br>29.0<br>26.0<br>18.0 | 31.0<br>31.0<br>29.0<br>24.0    | 32.5                 | dB<br>dB<br>dB<br>dB            |
| Input return loss ("on" state)    | IS11I     | RFC or RF1 or RF2,<br>0.5 to 6.0 GHz  | 11                           | 14                              |                      | dB                              |
| Input return loss ("off" state)   | IS11I     | Isolated output RF1 or RF2:<br>2.30 to 2.70 GHz<br>3.30 to 3.80 GHz<br>4.90 to 5.85 GHz   |                              | 12<br>15<br>15                  |                      | dB<br>dB<br>dB                  |
| 1 dB input compression point      | IP1dB     | 500 to 6000 MHz:<br>$V_{CTL} = 1.8\text{ V}$<br>$V_{CTL} = 3.0\text{ V}$  |                              | +36<br>+39                      |                      | dBm<br>dBm                      |
| Third order input intercept point | IIP3      | $P_{IN} = +25\text{ dBm/ tone}$ ,<br>$\Delta F = 1\text{ MHz}$ ,<br>$V_{CTL} = 3.0\text{ V}$ :<br>2.4 GHz<br>3.8 GHz<br>5.8 GHz |                              | 55<br>55<br>55                  |                      | dB<br>dB<br>dB                  |
| 2 <sup>nd</sup> harmonic          | 2fo       | $P_{IN} = +25\text{ dBm}$ ,<br>$V_{CTL} = 3.0\text{ V}$ :<br>0.9 GHz<br>1.8 GHz<br>2.4 GHz<br>3.8 GHz<br>5.8 GHz                |                              | +75<br>+75<br>+75<br>+75<br>+75 |                      | dBc<br>dBc<br>dBc<br>dBc<br>dBc |
| 3 <sup>rd</sup> harmonic          | 3fo       | $P_{IN} = +25\text{ dBm}$ ,<br>$V_{CTL} = 3.0\text{ V}$ :<br>0.9 GHz<br>1.8 GHz<br>2.4 GHz<br>3.8 GHz<br>5.8 GHz                |                              | +75<br>+75<br>+75<br>+75<br>+75 |                      | dBc<br>dBc<br>dBc<br>dBc<br>dBc |
| Switching speed                   |           | 50% $V_{CTL}$ to 90/10% RF<br>90/10% RF or 10/90% RF  |                              | 100<br>100                      | 250<br>250           | ns<br>ns                        |
| <b>DC Specifications</b>          |           |   |                              |                                 |                      |                                 |
| Control voltage                   | $V_{CTL}$ |   | 1.8                          | 3.0                             | 5.0                  | V                               |
| Control current                   | $I_{CC}$  |   |                              | 45                              | 85                   | $\mu\text{A}$                   |

<sup>1</sup> Performance is guaranteed only under the conditions listed in this table.

## Typical Performance Characteristics

( $V_{CTL} = 0\text{ V}$  and  $+3.0\text{ V}$ ,  $T_{OP} = +25\text{ }^{\circ}\text{C}$ ,  $P_{IN} = 0\text{ dBm}$ , Characteristic Impedance [ $Z_0$ ] =  $50\text{ }\Omega$ ,  $C_{BLK} = 47\text{ pF}$ , Unless Otherwise Noted)

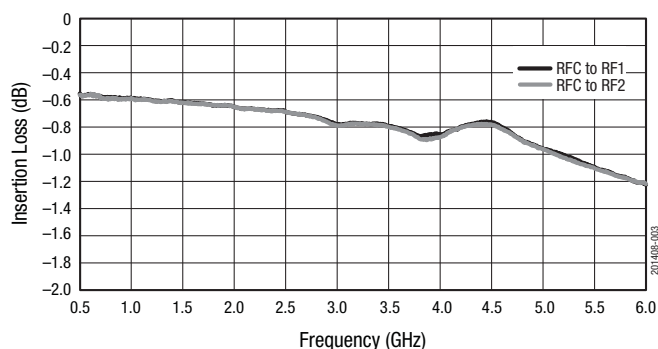


Figure 3. Typical Insertion Loss vs Frequency

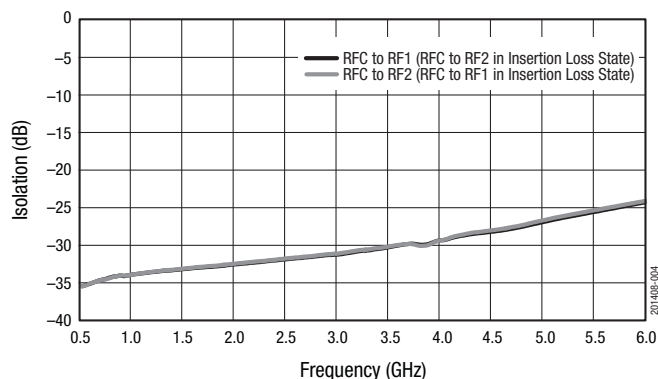


Figure 4. Typical Isolation vs Frequency

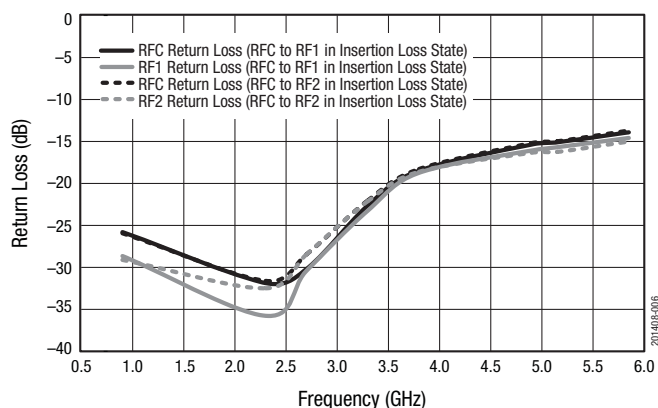


Figure 5. Return Loss vs Frequency  
(Insertion Loss State)

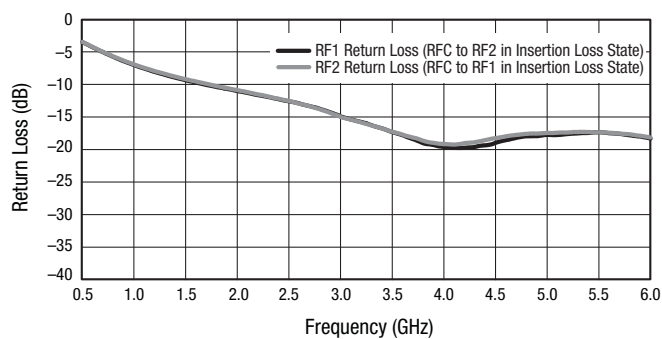


Figure 6. Return Loss vs Frequency  
(Isolation State)

**Table 4. SKY13370-374LF Truth Table<sup>1</sup>**

| V1 (Pin 1) | V2 (Pin 3) | Insertion Loss State |
|------------|------------|----------------------|
| 1          | 0          | RFC to RF1           |
| 0          | 1          | RFC to RF2           |

<sup>1</sup> "1" = +1.8 V to +5.0 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 SKY13370-374LF Evaluation Board is used to test the performance of the SKY13370-374LF SPDT Switch. An Evaluation Board schematic diagram is provided in Figure 7. An assembly drawing for the Evaluation Board is shown in Figure 8.

## Package Dimensions

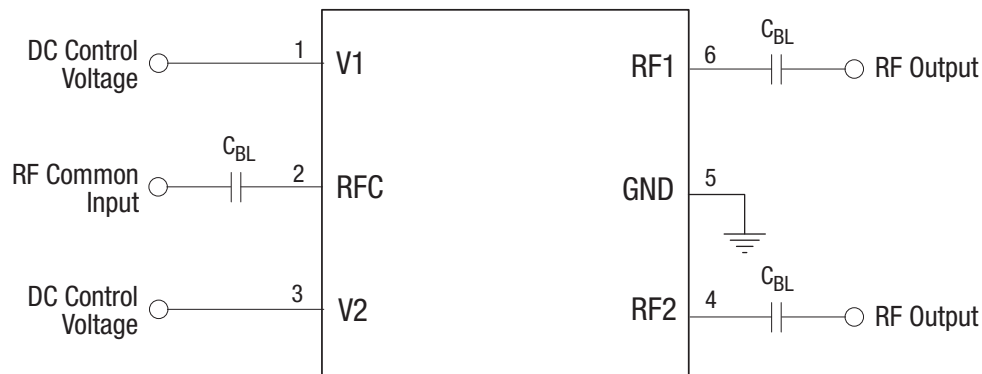
The PCB layout footprint for the SKY13370-374LF is provided in Figure 9. Typical part markings are shown in Figure 10. Package dimensions are shown in Figure 11, and tape and reel dimensions are provided in Figure 12.

## 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 SKY13370-374LF 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.

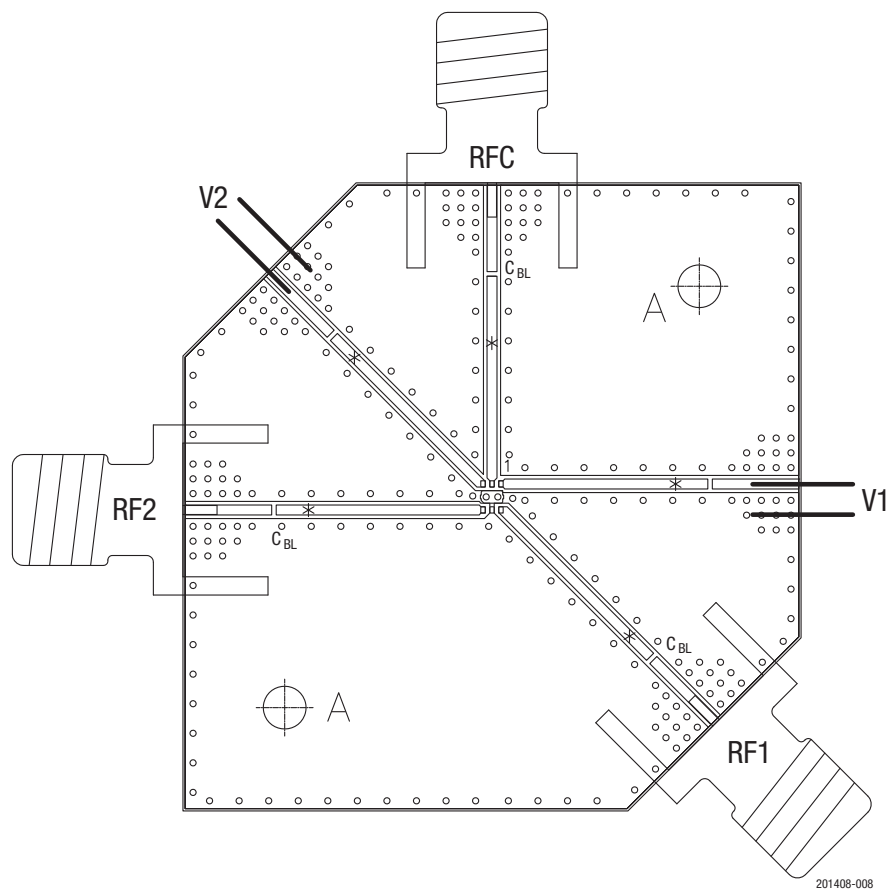


$C_{BL} = 47 \text{ pF}$  for >1 GHz operation. Increase value for lower frequency operation.

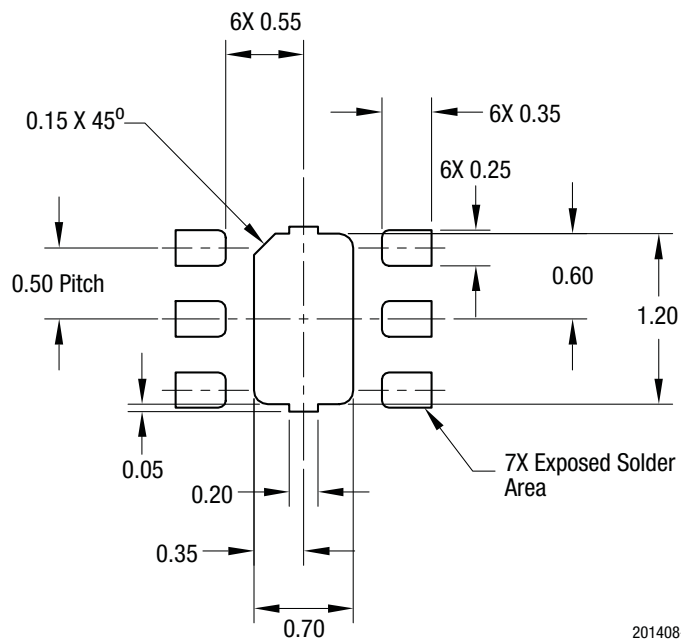
Exposed ground paddle should be grounded for best performance.

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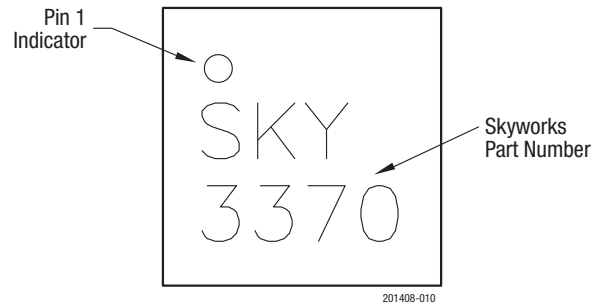
**Figure 7. SKY13370-374LF Evaluation Board Schematic**



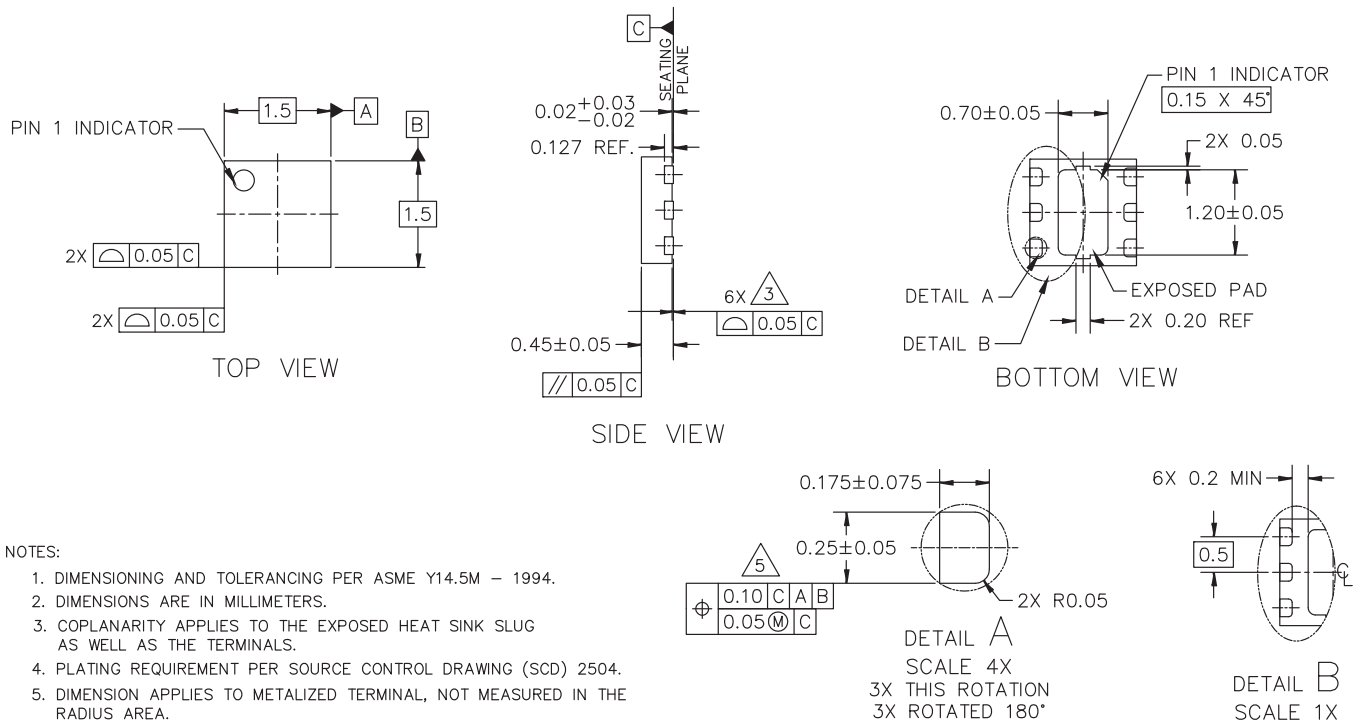
**Figure 8. SKY13370-374LF Evaluation Board Assembly Diagram**



**Figure 9. SKY13370-374LF PCB Layout Footprint (Top View)**

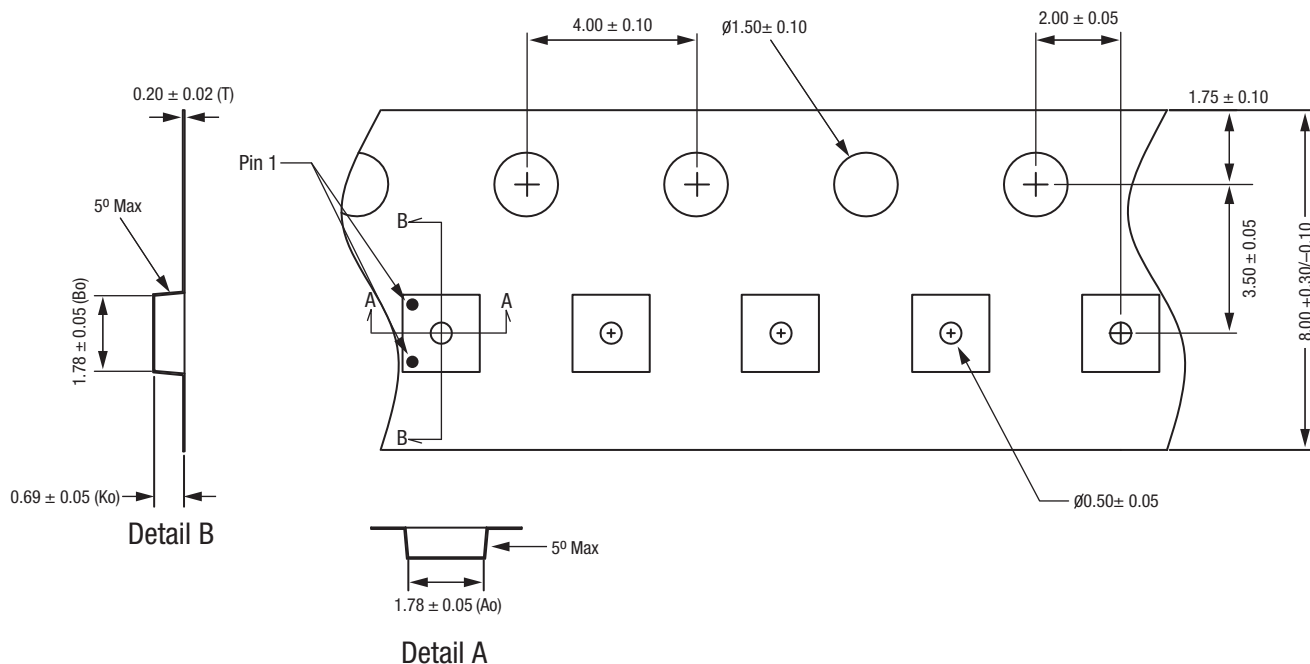


**Figure 10. Typical Part Markings  
(Top View)**



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**Figure 11. SKY13370-374LF 6-Pin DFN Package Dimensions**



*Notes:*

- Carrier tape: black conductive polycarbonate or polystyrene.
- Cover tape material: transparent conductive PSA.
- Cover tape size: 5.4 mm width.
- All measurements are in millimeters.
- Pin 1 orientation is in lower left corner for SOT-666 packages.  
Pin 1 orientation is in upper left corner for 1.5 x 1.5 mm  
MLPD, QFN, and DFN packages.

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### Figure 12. SKY13370-374LF Tape and Reel Dimensions



## Ordering Information

| Product Description         | Product Part Number | Evaluation Board Part Number |
|-----------------------------|---------------------|------------------------------|
| SKY13370-374LF: SPDT Switch | SKY13370-374LF      | SKY13370-374LF-EVB           |

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