

**DATA SHEET**

# SKY13372-467LF: 0.1 to 6.0 GHz High-Isolation SPDT Absorptive Switch

**Applications**

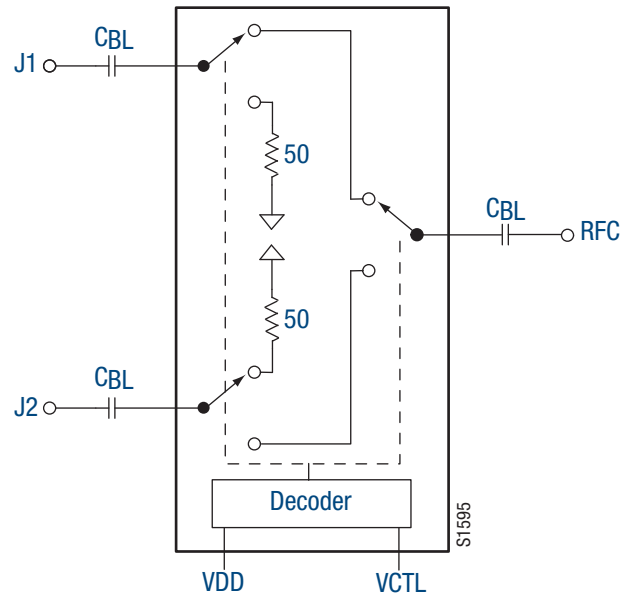
- GSM, PCS, WCDMA base stations
- 2.4 and 5.8 GHz ISM devices
- Wireless local loops

**Features**

- Single, positive voltage control: 0 to 3 and 0 to 5 V
- High isolation 64 dB at 1 GHz and 2 GHz
- Integrated silicon CMOS driver
- Absorptive
- Small, QFN (16-pin, 4 x 4 mm) Pb-free package (MSL1, 260 °C per JEDEC J-STD-020)



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**Figure 1. SKY13372-467LF Block Diagram**

**Description**

The SKY13372-467LF is a GaAs pHEMT FET high-isolation, absorptive switch. The device is an ideal component for base station applications in which synthesizer isolation is critical.

The device is provided in a 4 x 4 mm, 16-pin 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.

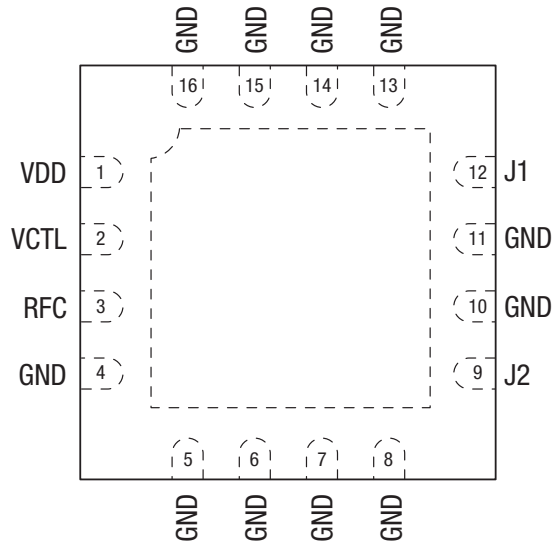


Figure 2. SKY13372-467LF Pinout – 16-Pin QFN (Top View)

Table 1. SKY13372-467LF Signal Descriptions (Note 1)

| Pin | Name | Description  | Pin | Name | Description                      |
|-----|------|--|-----|------|----------------------------------|
| 1   | VDD  | DC power supply  | 9   | J2   | RF output 2. Must be DC blocked. |
| 2   | VCTL | DC switch control pin. Switches insertion loss state from RFC to J1 or J2 (see Table 4). | 10  | GND  | Ground                           |
| 3   | RFC  | RF input. Must be DC blocked.  | 11  | GND  | Ground                           |
| 4   | GND  | Ground   | 12  | J1   | RF output 1. Must be DC blocked. |
| 5   | GND  | Ground   | 13  | GND  | Ground                           |
| 6   | GND  | Ground   | 14  | GND  | Ground                           |
| 7   | GND  | Ground   | 15  | GND  | Ground                           |
| 8   | GND  | Ground   | 16  | GND  | Ground                           |

Note 1: Exposed pad on bottom of package must be grounded.

### Electrical and Mechanical Specifications

The absolute maximum ratings of the SKY13372-467LF are provided in Table 2. Electrical specifications are provided in Table 3.

Typical performance characteristics of the SKY13372-467LF are illustrated in Figures 3 through 7.

The state of the SKY13372-467LF is determined by the logic provided in Table 4.

**Table 2. SKY13372-467LF Absolute Maximum Ratings**

| Parameter                 | Symbol           | Minimum | Typical | Maximum | Units |
|---------------------------|------------------|---------|---------|---------|-------|
| Supply voltage            | V <sub>DD</sub>  | 2.7     |         | 5.5     | V     |
| RF input power @ >500 MHz | V <sub>I</sub>   |         | 1       |         | W     |
| Operating temperature     | T <sub>OP</sub>  | -40     |         | +105    | °C    |
| Storage temperature       | T <sub>STG</sub> | -65     |         | +150    | °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. SKY13372-467LF Electrical Specifications (1 of 2) (Note 1)**

(V<sub>CTL</sub> = 0 V/3 V, V<sub>DD</sub> = 3 V, T<sub>OP</sub> = +25 °C, P<sub>IN</sub> = 0 dBm, Characteristic Impedance [Z<sub>0</sub>] = 50 Ω, Unless Otherwise Noted)

| Parameter   | Symbol | Test Condition | Min | Typical | Max | Units |
|---|--------|----------------|-----|---------|-----|-------|
| <b>RF Specifications</b>  |        |                |     |         |     |       |
| CW insertion loss   | IL     | 0.1 to 2.0 GHz |     | 0.8     | 1.1 | dB    |
|   |        | 2.0 to 3.0 GHz |     | 0.9     | 1.2 | dB    |
|   |        | 3.0 to 4.0 GHz |     | 1.0     | 1.3 | dB    |
|   |        | 4.0 to 6.0 GHz |     | 1.7     | 1.9 | dB    |
| Isolation   | Iso    | 0.1 to 2.0 GHz | 56  | 65      |     | dB    |
|   |        | 2.0 to 3.0 GHz | 53  | 60      |     | dB    |
|   |        | 3.0 to 4.0 GHz | 50  | 55      |     | dB    |
|   |        | 4.0 to 6.0 GHz | 40  | 42      |     | dB    |
| Return loss (insertion loss state)  | RL     | 0.1 to 2.0 GHz |     | 22      |     | dB    |
|   |        | 2.0 to 3.0 GHz |     | 22      |     | dB    |
|   |        | 3.0 to 4.0 GHz |     | 17      |     | dB    |
|   |        | 4.0 to 6.0 GHz |     | 15      |     | dB    |
| Return loss (isolation state)   | RL     | 0.5 to 2.0 GHz |     | 10      |     | dB    |
|   |        | 2.0 to 3.0 GHz |     | 25      |     | dB    |
|   |        | 3.0 to 4.0 GHz |     | 18      |     | dB    |
|   |        | 4.0 to 6.0 GHz |     | 13      |     | dB    |
| 1 dB input compression point<br>(V <sub>DD</sub> = V <sub>CTRL</sub> = 5 V)   | IP1dB  | 0.4 to 1.0 GHz | +27 | +29     |     | dBm   |
|   |        | 1.0 to 2.0 GHz | +28 | +30     |     | dBm   |
|   |        | 2.0 to 3.0 GHz | +28 | +30     |     | dBm   |
|   |        | 3.0 to 4.0 GHz | +26 | +28     |     | dBm   |
| Third order input intercept point<br>(Δf = 1 MHz, P <sub>IN</sub> = +7 dBm/tone)<br>(V <sub>DD</sub> = V <sub>CTRL</sub> = 5 V) | IIP3   | 0.4 to 1.0 GHz | +45 | +48     |     | dBm   |
|   |        | 1.0 to 2.0 GHz | +44 | +47     |     | dBm   |
|   |        | 2.0 to 3.0 GHz | +42 | +45     |     | dBm   |
|   |        | 3.0 to 4.0 GHz | +40 | +43     |     | dBm   |

**Table 3. SKY13372-467LF Electrical Specifications (2 of 2) (Note 1)**  
**( $V_{CTL} = 0\text{ V}/3\text{ V}$ ,  $V_{DD} = 3\text{ V}$ ,  $T_{OP} = +25\text{ }^{\circ}\text{C}$ ,  $P_{IN} = 0\text{ dBm}$ , Characteristic Impedance [ $Z_0$ ] =  $50\text{ }\Omega$ , Unless Otherwise Noted)**

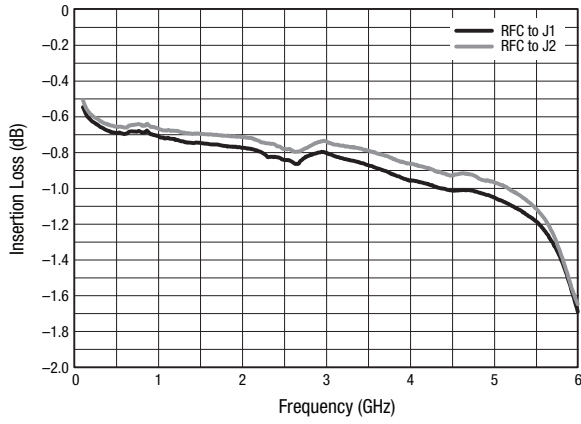
| Parameter  | Symbol      | Test Condition   | Min  | Typical | Max                                 | Units         |
|--|-------------|--|--|---------|-------------------------------------|---------------|
| <b>RF Specifications (continued)</b>                                       |             |  |  |         |                                     |               |
| Switching rise time  | $T_{RISE}$  | 10% to 90% RF  |  | 40      |                                     | ns            |
| Switching fall time  | $T_{FALL}$  | 90% to 10% RF  |  | 40      |                                     | ns            |
| Switching on time  | $T_{ON}$    | 50% $V_{CTL}$ to 90% RF  |  | 100     |                                     | ns            |
| Switching off time   | $T_{OFF}$   | 50% $V_{CTL}$ to 10% RF  |  | 100     |                                     | ns            |
| Switching on time  | $T_{ON}$    | 50% $V_{CTL}$ to 98% RF,<br>$T_{OP} = -40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$  |  | 1       | 2                                   | $\mu\text{s}$ |
| Switching off time   | $T_{OFF}$   | 50% $V_{CTL}$ to 2% RF,<br>$T_{OP} = -40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$   |  | 100     | 300                                 | ns            |
| Insertion loss settling time   | $\Delta IL$ | Insertion loss in dB measured @ $1\text{ }\mu\text{s}$<br>(referenced to a rising 10% RF level on<br>J1 and J2) minus the CW insertion loss in<br>dB.<br>Freq = 2 GHz, $T_{OP} = -40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ ,<br>$V_{CTL} = 5\text{ V}$ , pulse width = 1.15 ms,<br>50% duty cycle. |  |         | 0.25                                | dB            |
| <b>DC Specifications</b>   |             |  |  |         |                                     |               |
| Control voltage:<br>Low<br>High  | $V_{CTL}$   |  | -1<br>$0.7 \times V_{DD}$ ; 3.0<br>for $V_{DD} > 4.0\text{ V}$ |         | $0.3 \times V_{DD}$<br><br>$V_{DD}$ | V<br><br>V    |
| Control current  | $I_{CTL}$   |  |  |         | 5                                   | $\mu\text{A}$ |
| Supply voltage   | $V_{DD}$    |  | 2.7  |         | 5.0                                 | V             |
| Supply current   | $I_{DD}$    |  |  |         | 100                                 | $\mu\text{A}$ |
| Supply voltage:<br>$V_{DD} = 5.0$ and $V_{CTL} = 2.7\text{ V}$<br>(Note 2) |             |  |  |         |                                     |               |

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

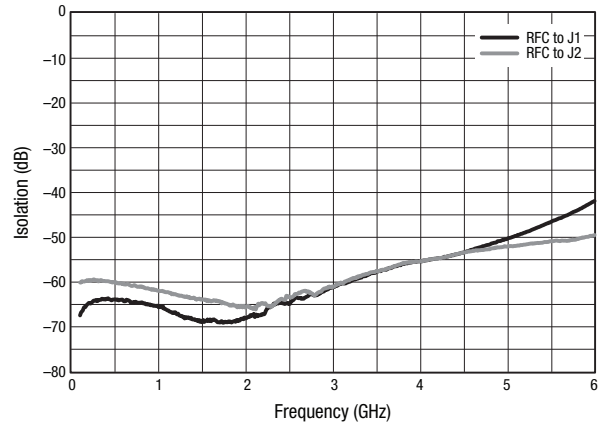
**Note 2:** For lowest possible  $I_{DD}$ ,  $V_{CTL}$  should be as close as possible to  $V_{DD}$ .

### Typical Performance Characteristics

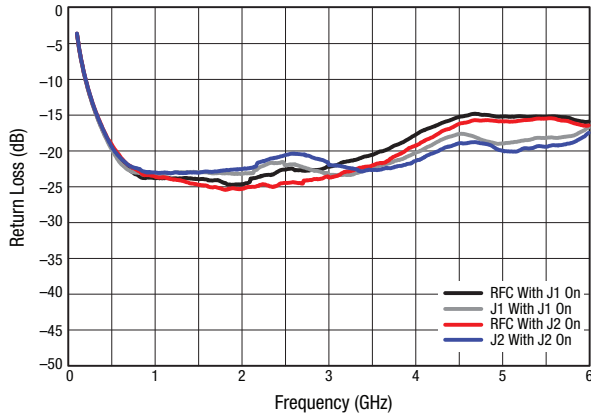
( $V_{CTL} = 0$  V/3 V,  $V_{DD} = 3$  V,  $T_{OP} = +25$  °C,  $P_{IN} = 0$  dBm, Characteristic Impedance [ $Z_0$ ] = 50  $\Omega$ , Unless Otherwise Noted)



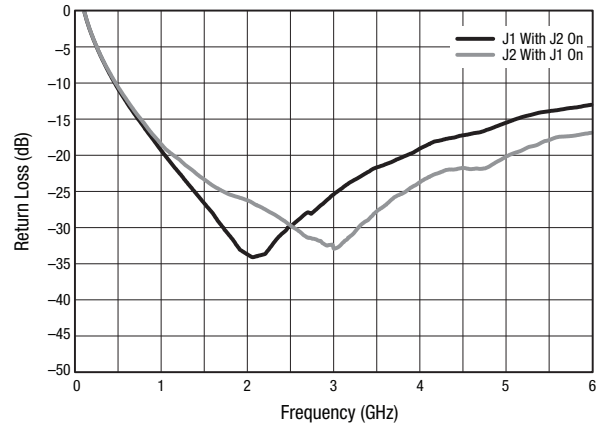
**Figure 3. Insertion Loss vs Frequency**



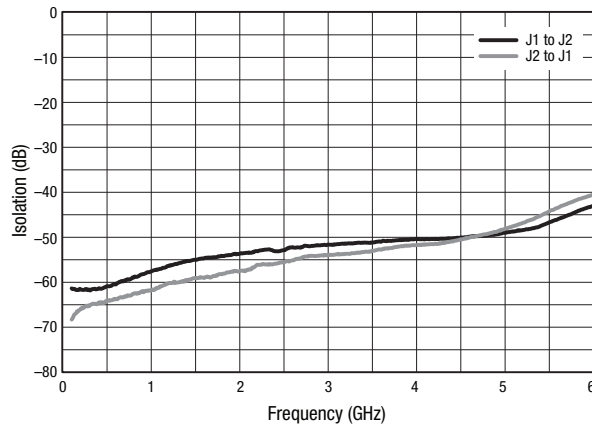
**Figure 4. Isolation vs Frequency**



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



**Figure 6. Return Loss vs Frequency (Isolation State)**



**Figure 7. Output to Output Isolation vs Frequency**

**Table 4. SKY13372-467LF Truth Table**

| VCTL | RFC to J1      | RFC to J2      |
|------|----------------|----------------|
| 0    | Insertion loss | Isolation      |
| 1    | Isolation      | Insertion loss |

### Evaluation Board Description

The SKY13372-467LF Evaluation Board is used to test the performance of the SKY13372-467LF SPDT absorptive switch. An assembly drawing for the Evaluation Board is shown in Figure 8.

### Package Dimensions

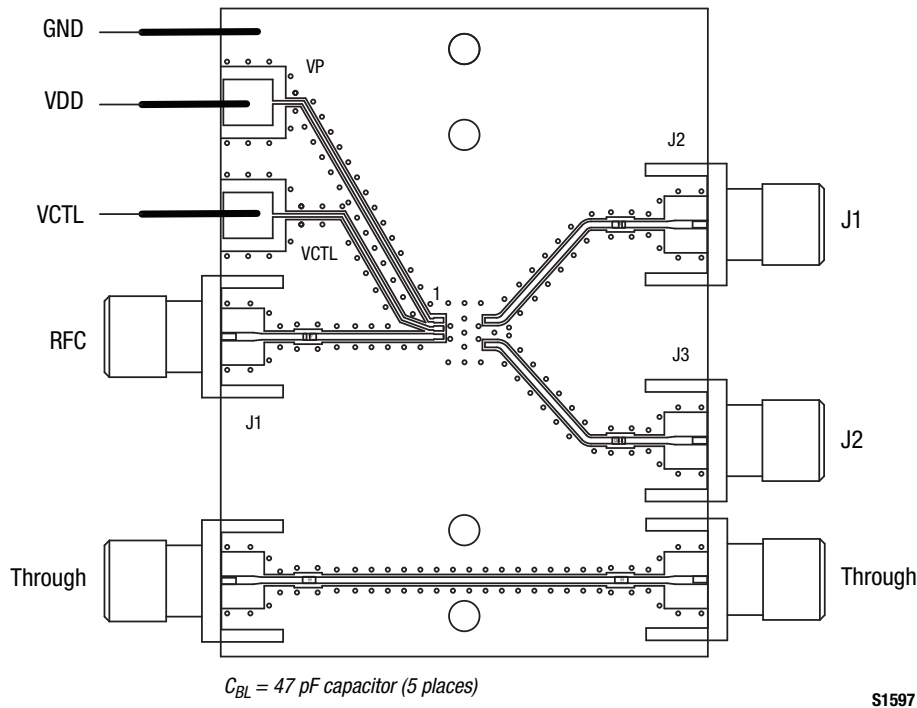
The PCB layout footprint for the SKY13372-467LF is shown in Figure 9. Typical part markings are noted in Figure 10. Package dimensions for the 16-pin QFN are shown in Figure 11, and tape and reel dimensions are provided in Figure 12.

### Package and Handling Information

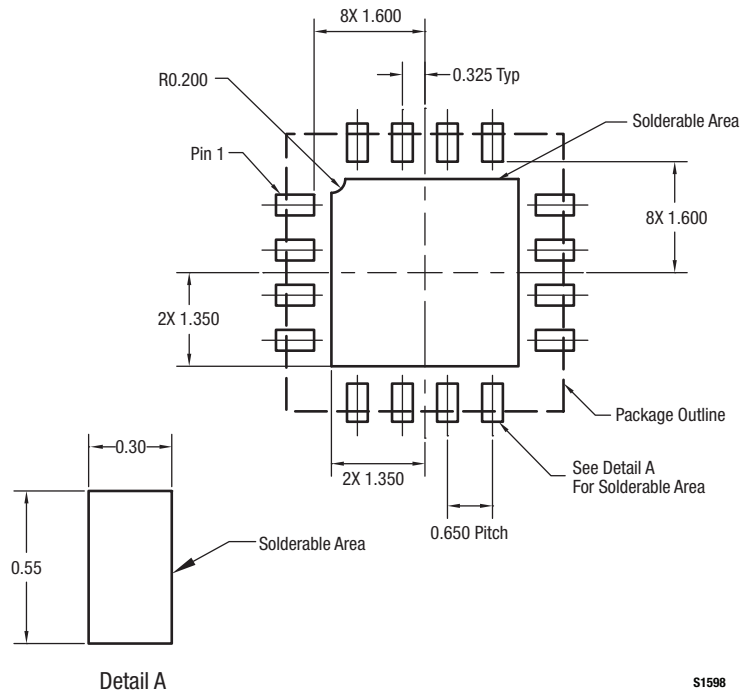
Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The SKY13372-467LF 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.

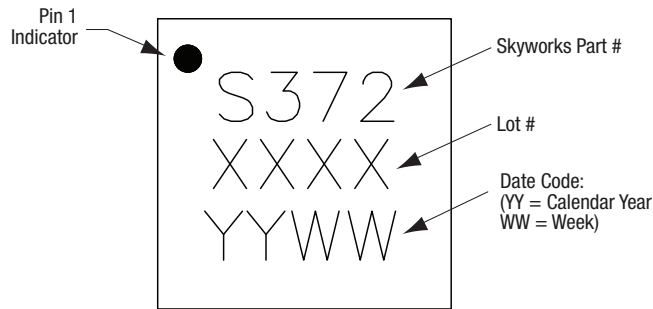
Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. Production quantities of this product are shipped in a standard tape and reel format.



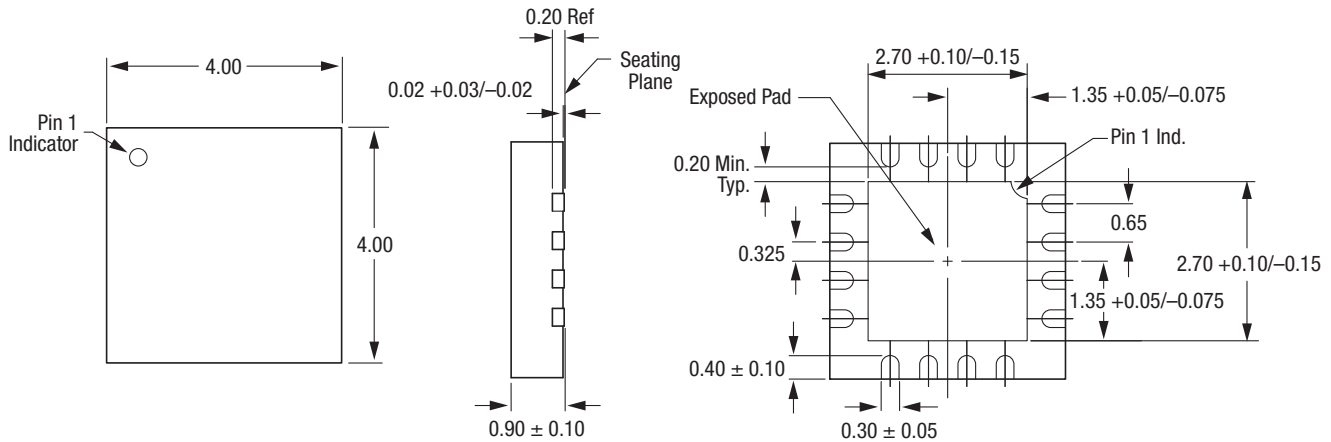
**Figure 8. SKY13372-467LF Evaluation Board Assembly Diagram**



**Figure 9. SKY13372-467LF PCB Layout Footprint**



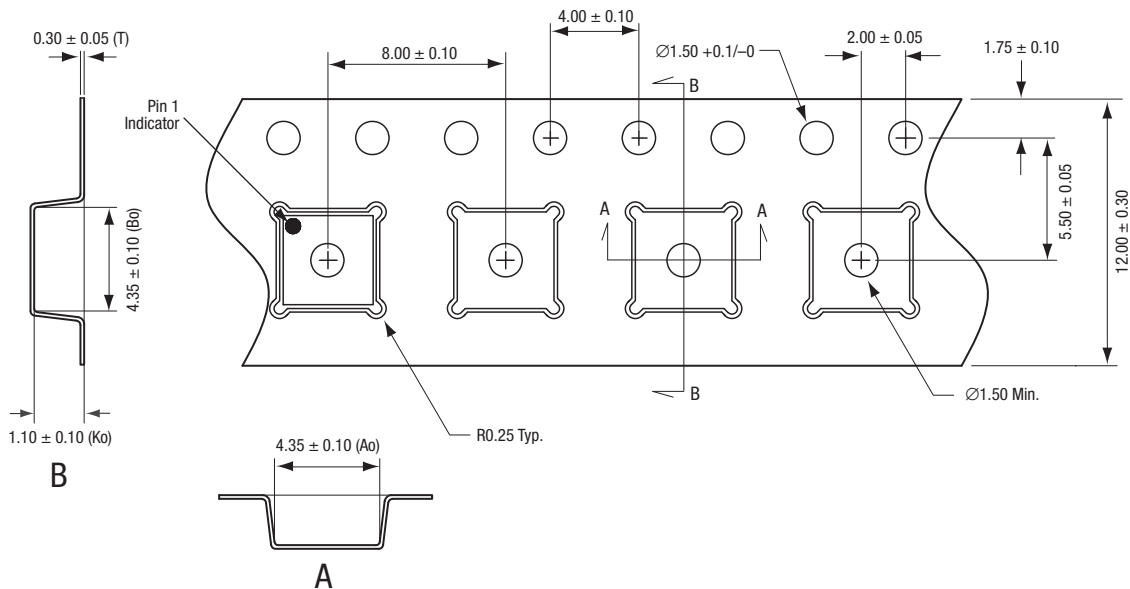
**Figure 10. Typical Part Markings**



All dimensions are in millimeters

S1596

Figure 11. SKY13372-467LF 16-Pin QFN Package Dimensions



Notes:

1. Carrier tape material: black conductive polystyrene, non-bakeable
2. Cover tape material: transparent conductive HSA
3. Cover tape size: 9.2 mm width
4. ESD surface resistivity is  $\geq 1 \times 10^9 \sim \leq 1 \times 10^{10}$  Ohms/square per EIA, JEDEC TNR Specification.
5. All measurements are in millimeters

S1846

Figure 12. SKY13372-467LF Tape and Reel Dimensions



## Ordering Information

| Model Name                            | Manufacturing Part Number | Evaluation Board Part Number |
|---------------------------------------|---------------------------|------------------------------|
| SKY13372-467LF SPDT Absorptive Switch | SKY13372-467LF            | SKY13372-467LF-EVB           |

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