DATA SHEET

SKY13446-374LF: 0.1-6.0 GHz GaAs SPDT Switch

Applications

- Dual-band WLAN systems
- 802.11 a/b/g/n transmit/receive systems

Features

- Positive low voltage control: 0 and 3.0 V
- Low insertion loss: 0.40 dB @ 2.5 GHz and 0.80 dB @ 6.0 GHz
- High isolation: 38 dB @ 2.4 GHz and 30 dB @ 6 GHz
- Excellent linearity performance: P1dB = +32 dBm
- Advanced pHEMT process
- Ultra-thin, miniature MLPD (6-pin, 1.5 x 1.5 x 0.45 mm) package (MSL1, 260 °C per JEDEC J-STD-020)

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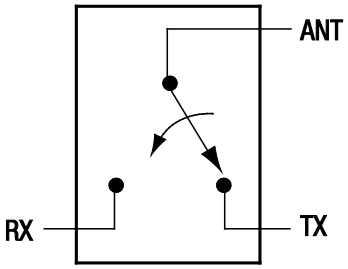


Figure 1. SKY13446-374LF Block Diagram

Description

The SKY13446-374LF is a pHEMT GaAs I/C antenna switch. Switching between the antenna and TX or RX ports is accomplished with two control voltages. The low-loss, high isolation, high linearity, small size and low cost make this switch ideal for all dual-band WLAN systems that operate at 2.4 to 2.5 GHz and 4.9 to 5.9 GHz.

The switch is manufactured in a compact, 1.5 x 1.5 mm, 6-pin exposed pad plastic Micro Leadframe Package Dual (MLPD) 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.

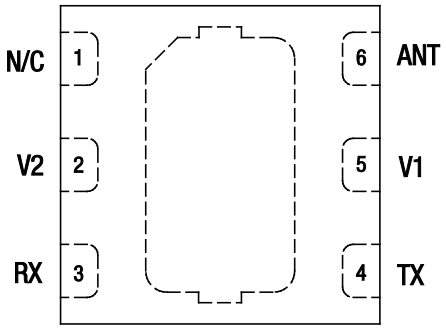


Figure 2. SKY13446-374LF Pinout – 6-Pin MLPD (Top View)

Table 1. SKY13446-374LF Signal Descriptions

Pin #	Name	Description	Pin #	Name	Description
1	N/C	No connection	4	TX	RF port (must be DC blocked)
2	V2	DC control voltage	5	V1	DC control voltage
3	RX	RF port (must be DC blocked)	6	ANT	RF common port (must be DC blocked)

Note: Bottom ground paddle should be connected to ground for best operation.

Table 2. SKY13446-374LF Absolute Maximum Ratings

Parameter	Symbol	Minimum	Typical	Maximum	Units
Input power @ 0 and 3 V	P_{IN}			+33	dBm
Input power @ 0 and 5 V	P_{IN}			+35	dBm
Operating voltage	V_{CTL}			6.0	V
Storage temperature	T_{STG}	–65		+150	°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 SKY13446-374LF are provided in Table 2. Electrical specifications are provided in Table 3.

The state of the SKY13446-374LF is determined by the logic provided in Table 4.

Table 3. SKY13446-374LF Electrical Specifications (Note 1)
(V_{CTL} = 0 V and +3.0 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
Insertion loss, ANT to TX and RX ports		2.4-2.5 GHz 0.1-3.0 GHz 3.0-6.0 GHz		0.4 0.5 0.8	0.6 0.7 1.0	dB dB dB
Isolation, ANT to TX and RX ports		2.4-2.5 GHz 0.1-3.0 GHz 3.0-6.0 GHz	33 32 27	38 38 30		dB dB dB
Return loss (Note 2), ANT to TX and RX ports (insertion loss state)		2.4-2.5 GHz 0.1-3.0 GHz 3.0-6.0 GHz	14 12 10	21 18 15		dB dB dB
Switching characteristics: Rise/fall time On/off time		 10/90% or 90/10% RF 50% V_{CTL} to 90/10% RF		 50 150		 ns ns
Video feedthrough		T_{RISE} = 1 ns @ 500 MHz		50		mV
Input power for 1 dB compression	P1dB	V_{CTL} = 0 and 3.0 V, 2.4-2.5 GHz 4.9-5.9 GHz V_{CTL} = 0 and 1.8 V, 2.4-2.5 GHz 4.9-5.9 GHz		 +33 +32 +26 +23		 dBm dBm dBm dBm
Error Vector Magnitude	EVM	802.11a, 54 Mbps, P_{IN} = <+23 dBm, V_{CTL} = 3 V 802.11g, 54 Mbps, P_{IN} = <+26 dBm, V_{CTL} = 3 V		2.5 2.5		% %
Control voltage: High Low	 V_{CTL_H} V_{CTL_L}		 1.80	 3.30 0	 5.00 0.25	 V V
Leakage current		V_{CTL_H} and V_{CTL_L}		5	50	µA

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

Note 2: Low frequency return loss is limited by the value of DC blocking capacitors (22 pF).

Table 4. SKY13446-374LF Truth Table

V1 (Pin 5)	V2 (Pin 2)	ANT to RX Path	ANT to TX Path
1	0	Insertion loss	Isolation
0	1	Isolation	Insertion loss

Note: "1" = +1.8 V to +5.0 V. "0" = 0 V to +0.25 V. Any state other than described in this Table places the switch into an undefined state. An undefined state will not damage the device.

Typical Performance Characteristics

(V_{CTL} = 0 V and +3.0 V, T_{OP} = +25 °C, P_{IN} = 0 dBm, Characteristic Impedance [Z_O] = 50 Ω, Unless Otherwise Noted)

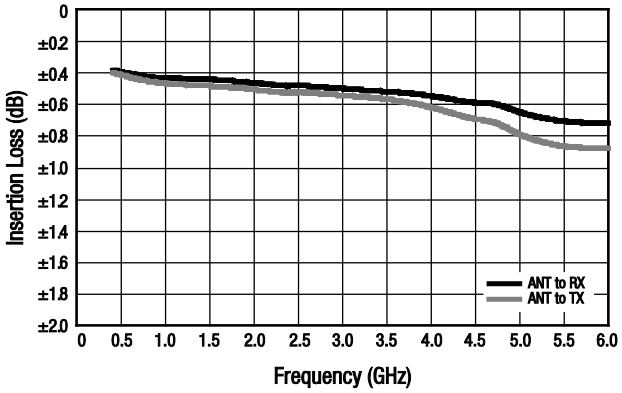


Figure 3. Insertion Loss vs Frequency

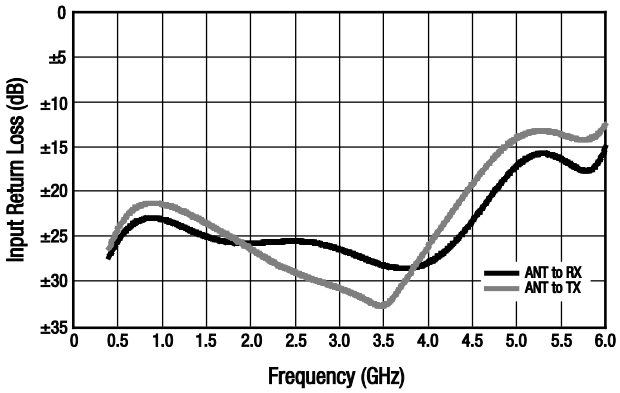


Figure 4. Input Return Loss vs Frequency

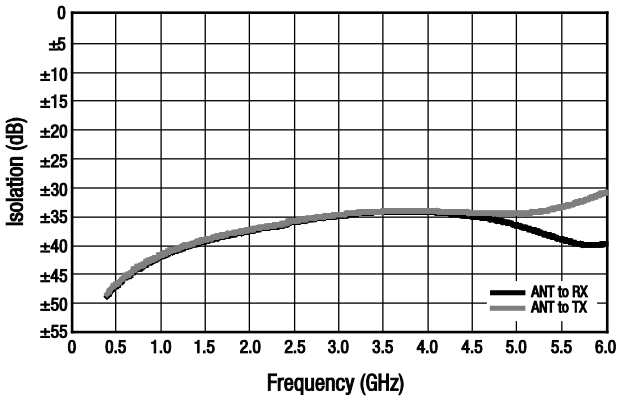


Figure 5. Isolation vs Frequency

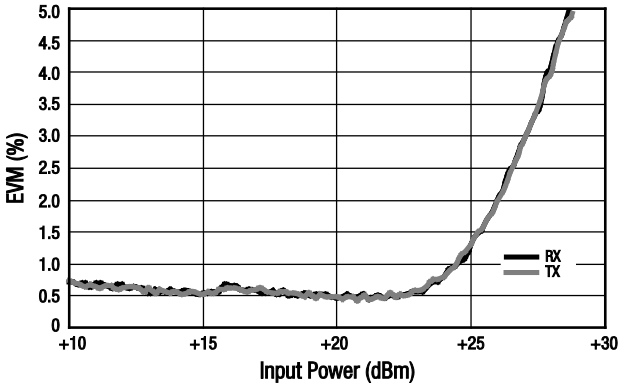


Figure 6. EVM vs Input Power (@ 2.45 GHz, 54 bps)

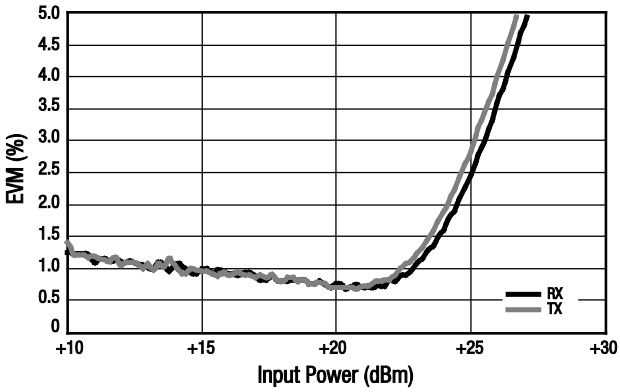


Figure 7. EVM vs Input Power (@ 5.5 GHz, 54 bps)

Evaluation Board Description

The SKY13446-374LF Evaluation Board is used to test the performance of the SKY13446-374LF SPDT Switch. An Evaluation Board schematic diagram is provided in Figure 8. An assembly drawing for the Evaluation Board is shown in Figure 9.

Package Dimensions

The PCB layout footprint for the SKY13446-374LF is provided in Figure 10. Typical case markings are shown in Figure 11. Package dimensions for the 6-pin MLPD are shown in Figure 12, and tape and reel dimensions are provided in Figure 13.

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 SKY13446-374LF 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.

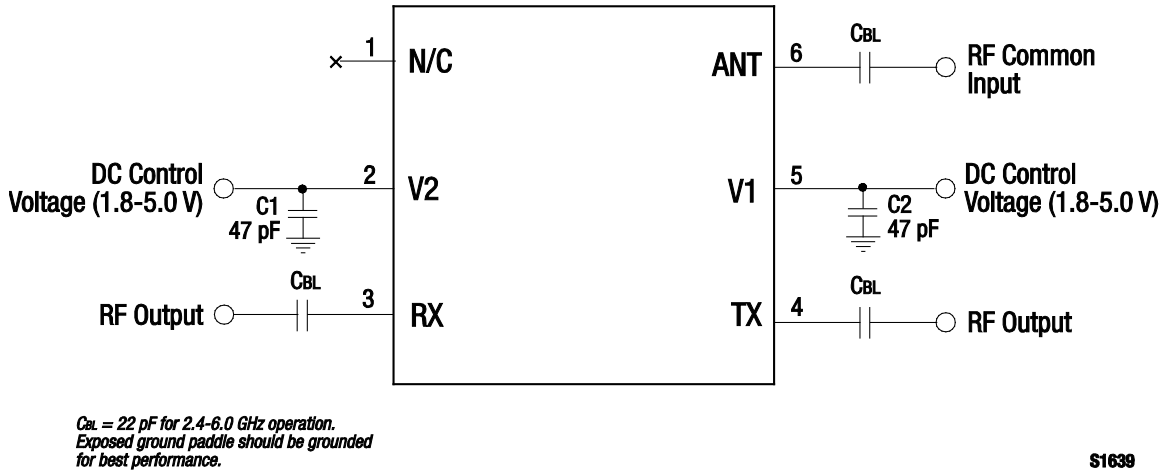
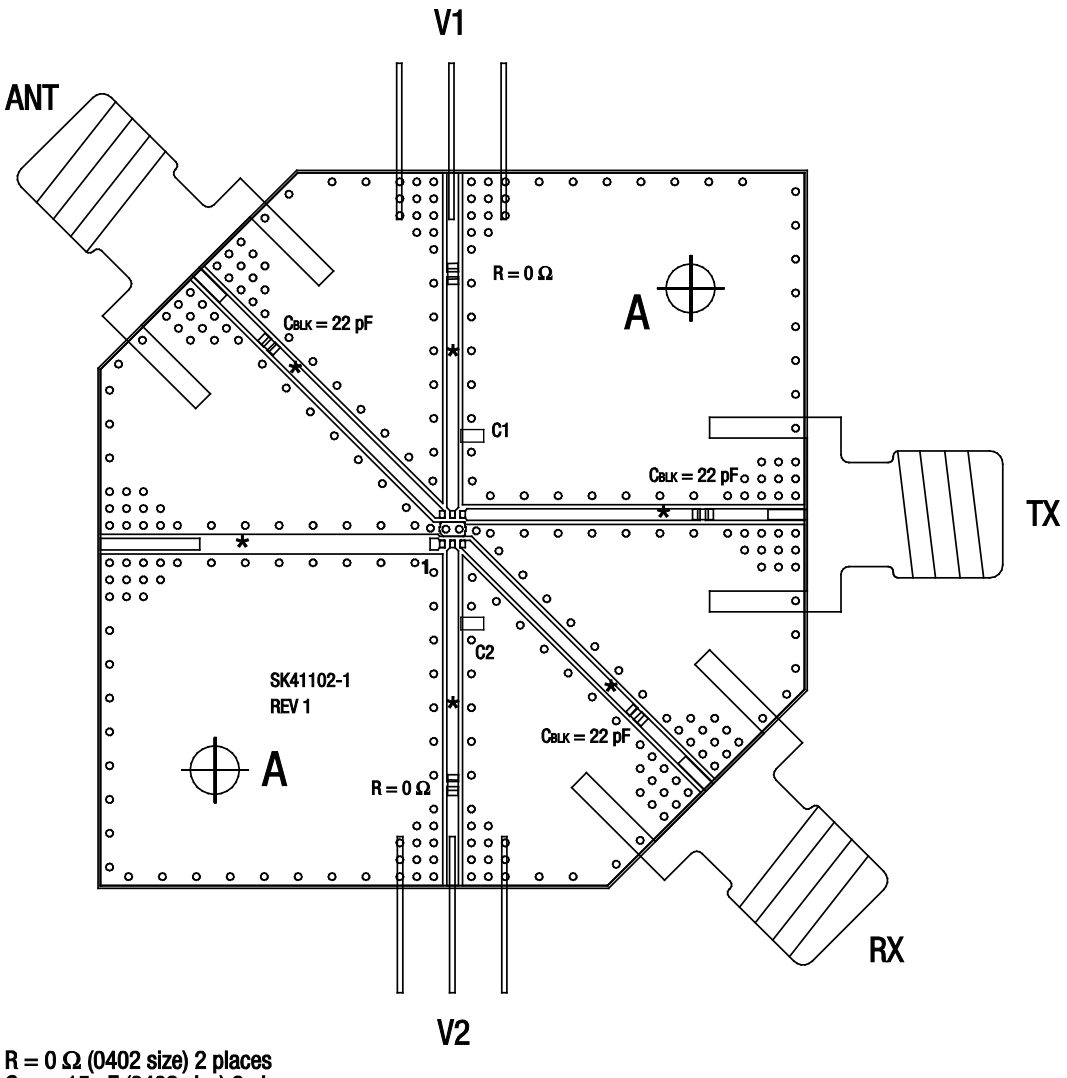


Figure 8. SKY13446-374LF Evaluation Board Schematic



R = 0 Ω (0402 size) 2 places
C_{BLK} = 15 pF (0402 size) 3 places
C1 and C2 = 47 pF (0402 size), 2 places

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Figure 9. SKY13446-374LF Evaluation Board Assembly Diagram

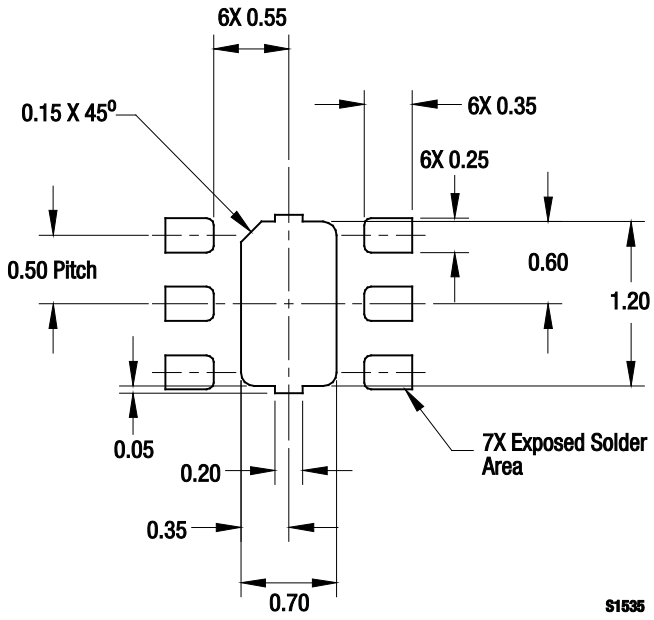


Figure 10. SKY13446-374LF PCB Layout Footprint (Top View)

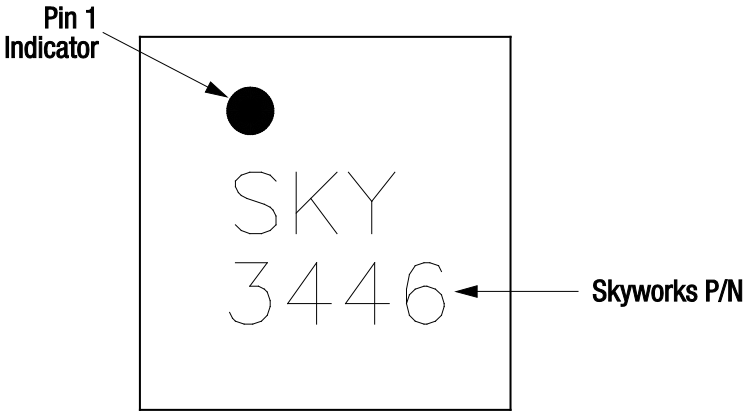
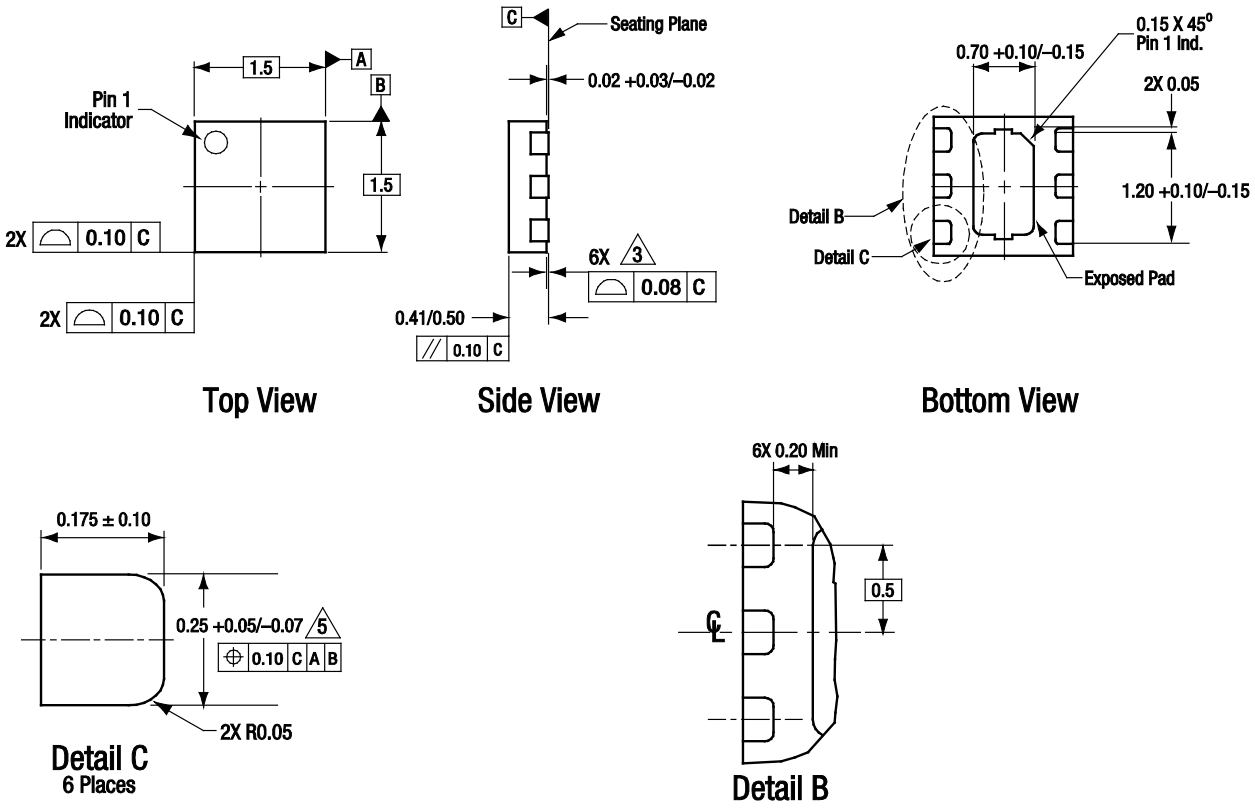


Figure 11. Typical Part Markings (Top View)



All measurements are in millimeters.
Dimensioning and tolerancing according to ASME Y14.5M-1994.
Coplanarity applies to the exposed heat sink slug as well as the terminals..
Plating requirement per source control drawing (SCD) 2504.
Dimension applies to metalized terminal and is measured between 0.15 mm and 0.30 mm from terminal tip.

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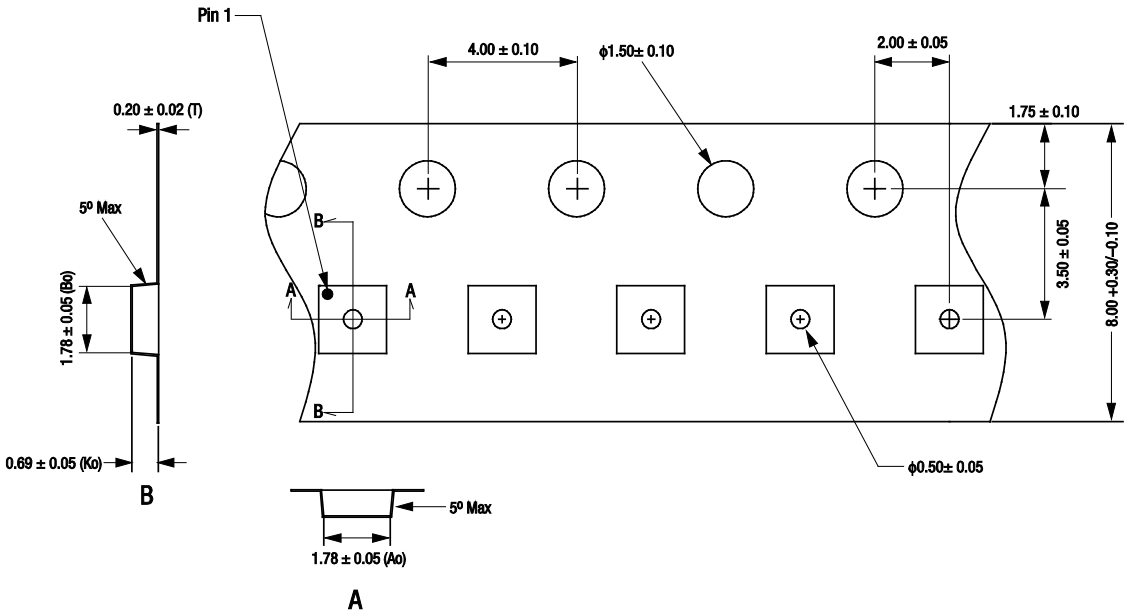
Figure 12. SKY13446-374LF 6-Pin MLPD Package Dimensions



Notes:
1. *Carrier tape: black conductive polycarbonate or polystyrene.*
2. *Cover tape material: transparent conductive PSA.*
3. *Cover tape size: 5.4 mm width.*
4. *All measurements are in millimeters.*

S1382a

Figure 13. SKY13446-374LF Tape and Reel Dimensions

Ordering Information

Model Name	Manufacturing Part Number	Evaluation Board Part Number
SKY13446-374LF SPDT Switch	SKY13446-374LF	SKY13446-374LF-EVB

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