

DATA SHEET

SKY13317-373LF: 20 MHz to 6.0 GHz pHEMT GaAs SP3T Switch

Applications

- 802.11 a/b/g/n WLAN networks
- Bluetooth® systems

Features

- Positive low voltage control: 0/1.8 to 5.0 V
- Low insertion loss: 0.5 dB @ 2.5 GHz, 0.9 dB @ 6 GHz
- High isolation: 25 dB up to 6 GHz
- Excellent linearity performance: P1dB = +29 dBm
- Miniature, ultra-thin MLP (8-pin, 1.5 x 1.5 mm) package (MSL1, 260 °C per JEDEC J-STD-020)



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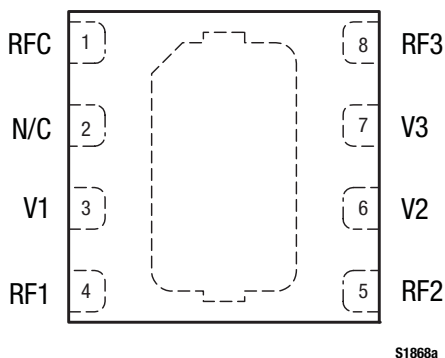


Figure 2. SKY13317-373LF Pinout – 8-Pin MLP (Top View)

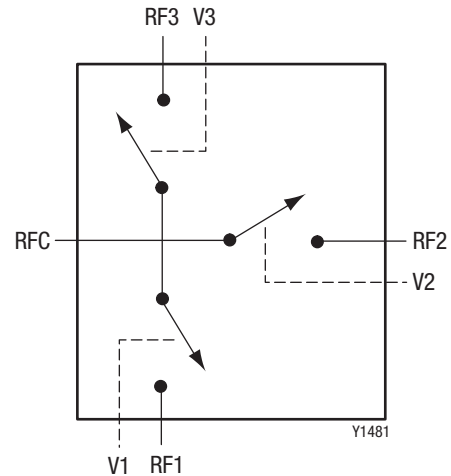


Figure 1. SKY13317-373LF Block Diagram

Description

The SKY13317-373LF is a GaAs pHEMT single-pole, triple-throw (SP3T) antenna switch that operates in the 20 MHz to 6.0 GHz frequency range. Switching between the antenna (RFC signal) and the RF1, RF2, and RF3 ports is accomplished with three control voltages.

The low loss, high isolation, high linearity, small size, and low cost make this switch ideal for all WLAN and Bluetooth systems operating in the 2.4 to 2.5 GHz and 4.9 to 5.9 GHz bands.

The SKY13317-373LF is manufactured in a compact, 1.5 x 1.5 mm, 8-pin Micro Leadframe (MLP) 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. SKY13317-373LF Signal Descriptions

Pin	Name	Description	Pin	Name	Description
1	RFC	Antenna. DC blocking capacitor required.	5	RF2	RF port 2. DC blocking capacitor required.
2	N/C	No connect	6	V2	Switch logic control (see Table 4)
3	V1	Switch logic control (see Table 4)	7	V3	Switch logic control (see Table 4)
4	RF1	RF port 1. DC blocking capacitor required.	8	RF3	RF port 3. DC blocking capacitor required.

Table 2. SKY13317-373LF Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Minimum	Maximum	Units
Input power @ 0/3 V	P _{IN}		+30	dBm
Input power @ 0/5 V	P _{IN}		+30	dBm
Operating voltage	V _{DD}		8	V
Operating temperature	T _{OP}	−40	+100	°C
Storage temperature	T _{STG}	−65	+150	°C

Note 1: 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 SKY13317-373LF are provided in Table 2. Electrical specifications are provided in Table 3.

The state of the SKY13317-373LF is determined by the logic provided in Table 4.

Table 3. SKY13317-373LF Electrical Specifications (Note 1)
($V_{HIGH} = 1.8$ to 5.0 V, $T_{OP} = +25$ °C, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Insertion loss	IL	RFC to RF1, RF2, RF3:				
		0.02 to 1.0 GHz		0.40	0.45	dB
		1.0 to 3.0 GHz		0.60	0.70	dB
		3.0 to 6.0 GHz		0.80	1.20	dB
		2.4 to 2.5 GHz		0.55	0.65	dB
		4.9 to 5.9 GHz		0.80		dB
Isolation	ISO	RFC to RF1, RF2, RF3:				
		0.02 to 1.0 GHz	24	27		dB
		1.0 to 3.0 GHz	22	25		dB
		3.0 to 6.0 GHz	22	25		dB
		2.4 to 2.5 GHz	22	25		dB
		4.9 to 5.9 GHz		25		dB
Return loss (insertion loss state)	IS11l	RFC to RF1, RF2, RF3:				
		0.02 to 1.0 GHz		20		dB
		1.0 to 3.0 GHz		20		dB
		3.0 to 6.0 GHz		15		dB
		2.4 to 2.5 GHz		25		dB
		4.9 to 5.9 GHz		15		dB
Switching speed:						
		Rise time		50		ns
		Fall time		18		ns
		On time				
		Off time				
Video feedthrough		10/90% RF				
		90/10% RF				
		50% control to 90/10% RF		55		ns
		50% control to 90/10% RF		20		ns
1 dB input compression point	IP1dB	900 to 2450 MHz:				
		$V_{LOW} = 0$ V, $V_{HIGH} = 3.3$ V		+29.0		dBm
		$V_{LOW} = 0$ V, $V_{HIGH} = 1.9$ V		+18.5		dBm
		$V_{LOW} = 0$ V, $V_{HIGH} = 1.8$ V		+17.5		dBm
		48 MHz, $V_{LOW} = 0$ V, $V_{HIGH} = 3.3$ V		+26.0		dBm
3 rd Order Input Intercept Point	IIP3	900 to 2450 MHz,				
		$\Delta F = 1$ MHz,				
		$P_{IN} = +17$ dBm/tone				
		$V_{LOW} = 0$ V, $V_{HIGH} = 2.1$ V		+33		dBm
		$V_{LOW} = 0$ V, $V_{HIGH} = 3.3$ V		+50		dBm
Control voltage		$V_{LOW} = 0$ to 0.25 V				
		@ 5 μ A typical		0		V
		$V_{HIGH} = 1.8$ to 5.0 V				
		@ 10 μ A typical		3.3		V

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

Table 4. SKY13317-373LF Truth Table

Low Insertion Loss Path	V1 (Pin 3)	V2 (Pin 6)	V3 (Pin 7)
RFC to RF1	High	Low	Low
RFC to RF2	Low	High	Low
RFC to RF3	Low	Low	High

Note: "High" = 1.8 to 5.0 V. "Low" = 0 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

(RFC to RF1, RF2, RF3 (0, 3.3 V), $T_{OP} = +25^{\circ}\text{C}$, Characteristic Impedance $[Z_0] = 50\ \Omega$, Unless Otherwise Noted)

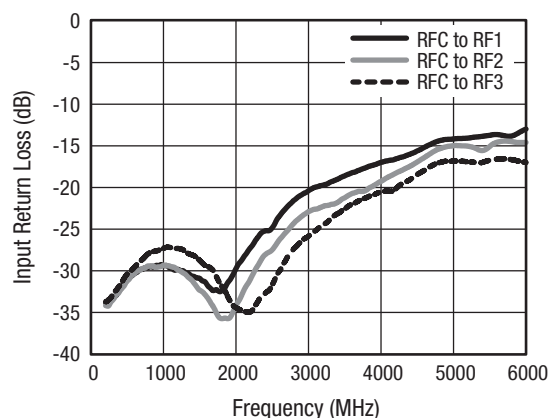


Figure 3. Input Return Loss (Insertion Loss State) vs Frequency

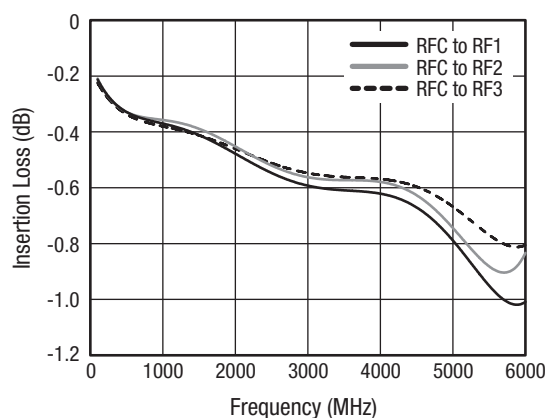


Figure 4. Insertion Loss vs Frequency

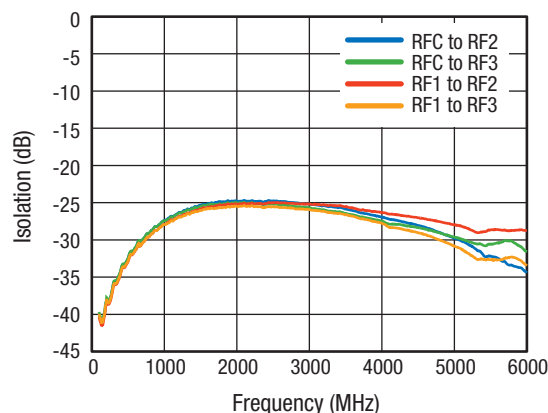


Figure 5. Isolation vs Frequency
(RFC to RF1 Insertion Loss State)

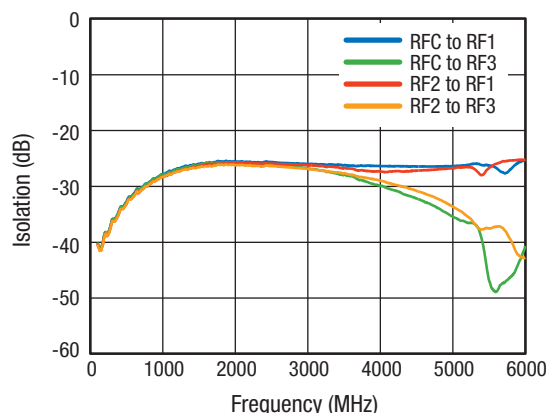


Figure 6. Isolation vs Frequency
(RFC to RF2 Insertion Loss State)

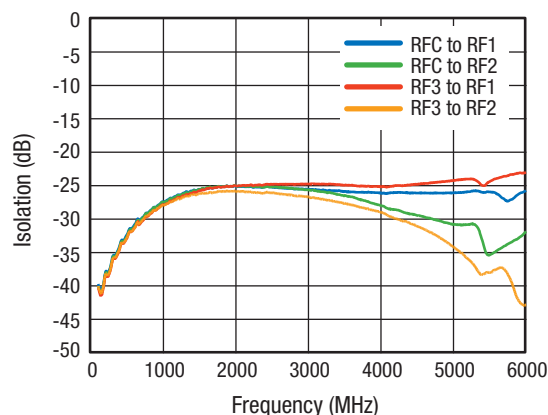


Figure 7. Isolation vs Frequency
(RFC to RF3 Insertion Loss State)

Evaluation Board Description

The SKY13317-373LF Evaluation Board is used to test the performance of the SKY13317-373LF SP3T 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

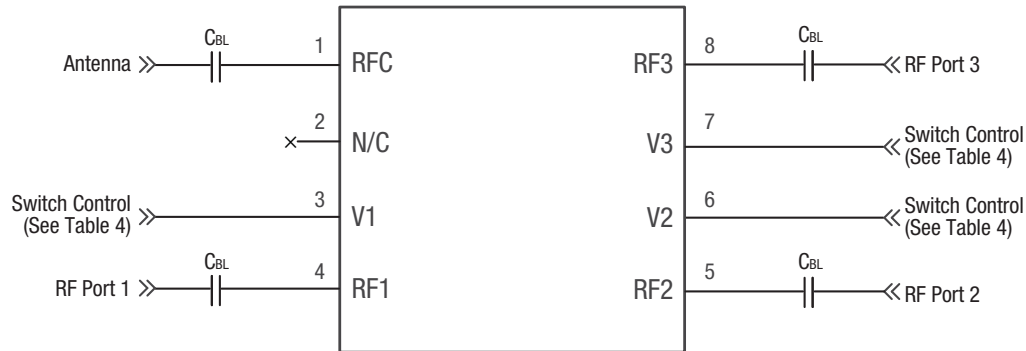
The PCB layout footprint for the SKY13317-373LF is provided in Figure 10. Typical case markings are shown in Figure 11. Package dimensions for the 8-pin MLP are shown in Figure 12, and tape and reel dimensions are provided in Figure 13.

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 SKY13317-373LF 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.



Note: $C_{BL} = 47 \text{ pF}$ for >500 MHz operation; 220 pF for 50 to 500 MHz operation.
Higher values recommended for lower frequency operation.
Exposed paddle must be grounded.

Use 10 nF blocking capacitors (C_{BL}) for <50 MHz operation.

S1925

Figure 8. SKY13317-373LF Evaluation Board Schematic

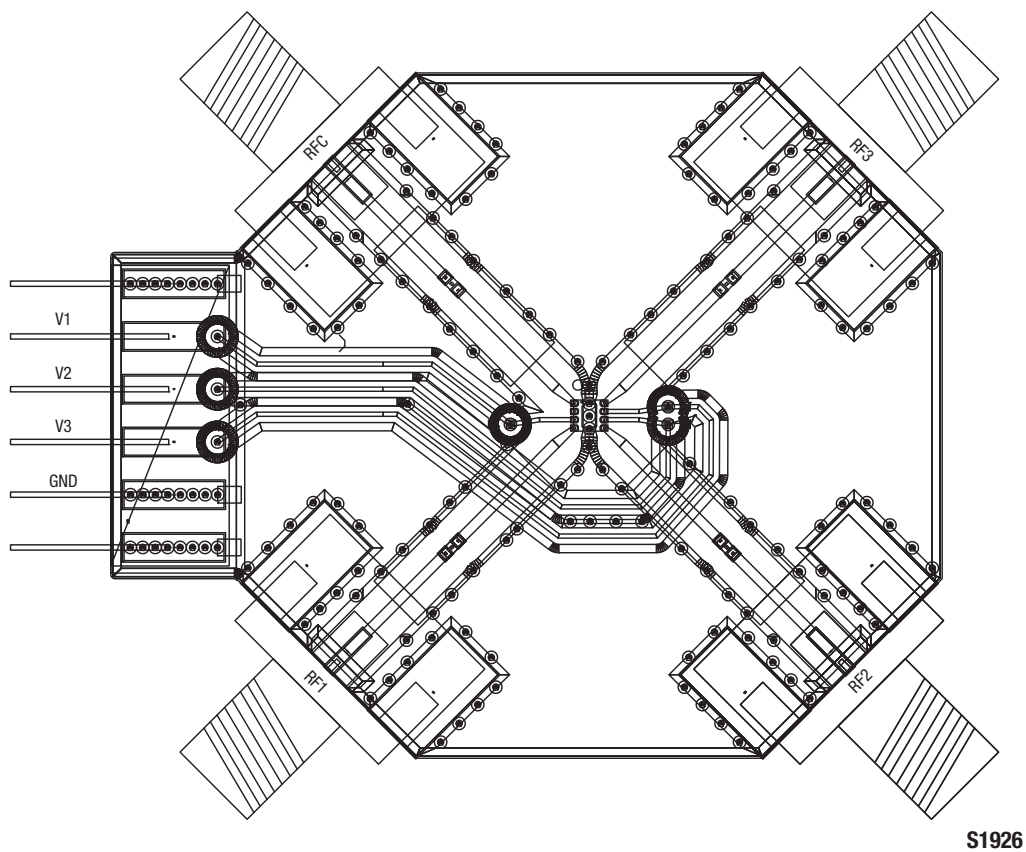


Figure 9. SKY13317-373LF Evaluation Board Assembly Diagram

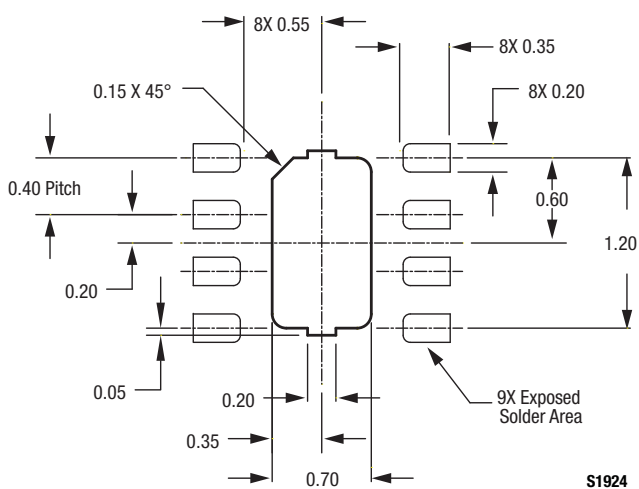
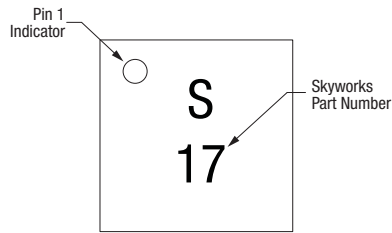
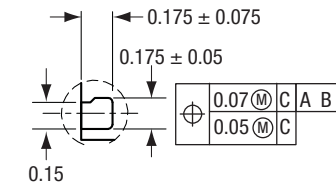
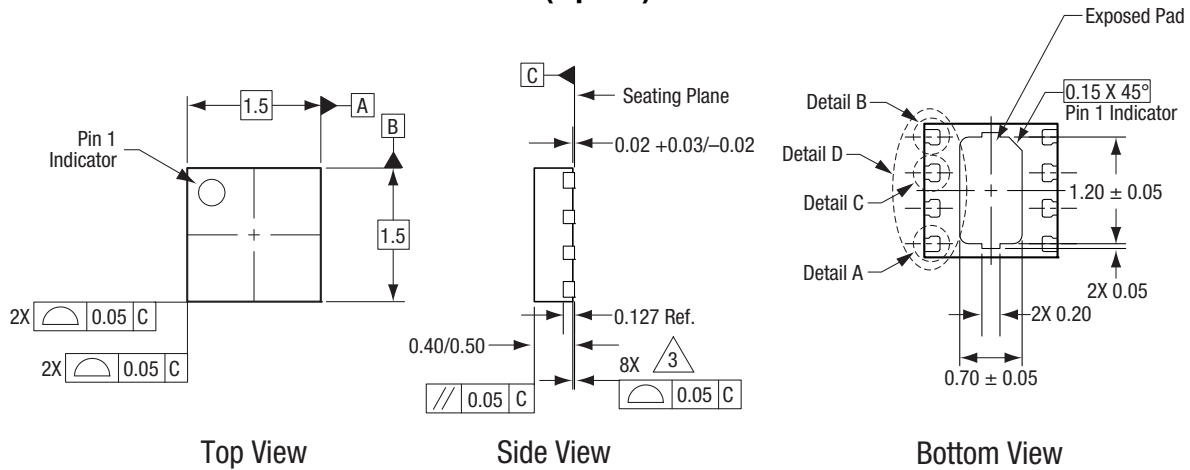


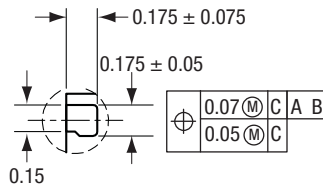
Figure 10. SKY13317-373LF PCB Layout Footprint (Top View)



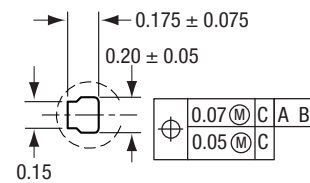
**Figure 11. Typical Case Markings
(Top View)**



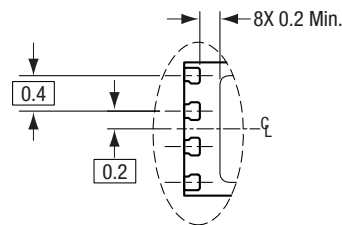
Detail A
Scale: 2X
1X This Rotation
1X Rotated 180°



Detail B
Scale: 2X
1X This Rotation
1X Rotated 180°



Detail C
Scale: 2X
2X This Rotation
2X Rotated 180°

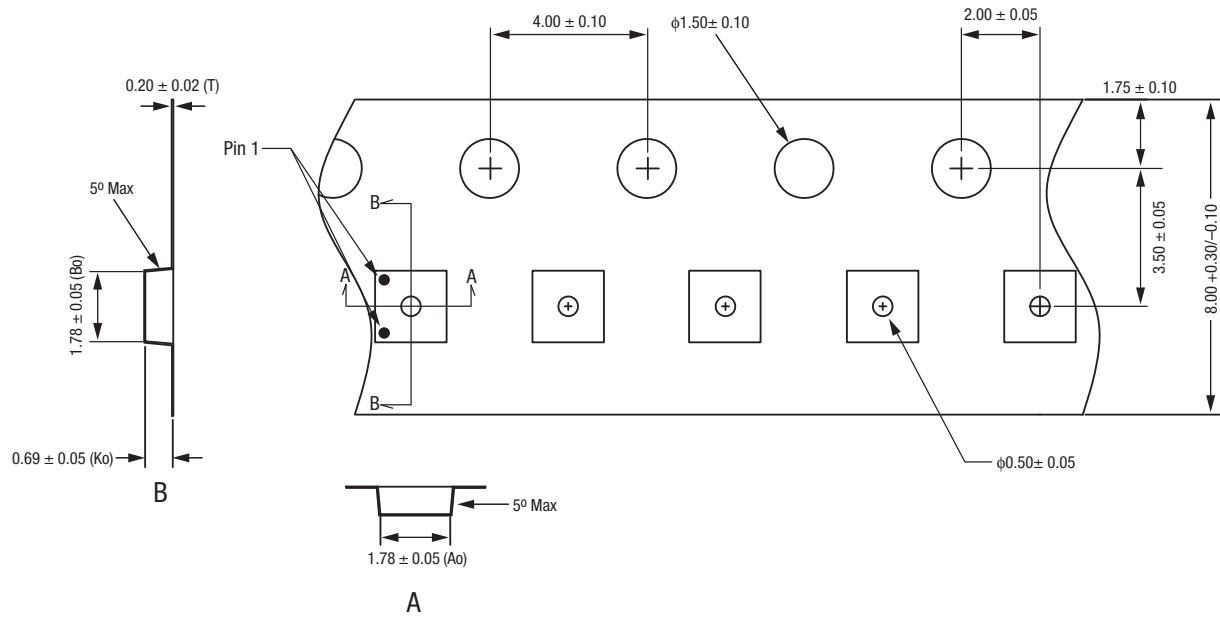


Detail D
Scale: 1X

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, not measured in radius area.

S3450

Figure 12. SKY13317-373LF 8-Pin MLP 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.
5. 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.

S1382a

Figure 13. SKY13317-373LF Tape and Reel Dimensions

Ordering Information

Model Name	Manufacturing Part Number	Evaluation Board Part Number
SKY13317-373LF: SP3T Switch	SKY13317-373LF	SKY13317-373LF-EVB

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