

DATA SHEET

# SKY13267-321, SKY13267-321LF

## GaAs T/R Diversity Switch LF-6 GHz

### Applications

- 802.11a/b/g transmit/receive diversity switch

### Features

- Broadband: LF-6 GHz
- Very low insertion loss: 0.8 dB typ. @ 5.2 GHz
- $P_{1\text{ dB}}$ : +30 dBm typical @ 3 V
- Low distortion: IP3 44 dBm typical @ 3 V
- Low current consumption: < 15  $\mu\text{A}$  @ 3 V
- Miniature QFN-12 package
- Available lead (Pb)-free and RoHS-compliant MSL-1 @ 260 °C per JEDEC J-STD-020

### Description

The SKY13267-321 is a monolithic DPDT switch fabricated using Skyworks proprietary GaAs PHEMTs as the switching elements. This wideband switch operates with RF signals from LF-6 GHz. The RF signal paths within the SKY13267-321 are fully bilateral.

Switching is controlled via two control voltage inputs, which are compatible with CMOS logic levels. Depending upon the logic voltage level applied to the control voltage pins, the Tx input pin is connected to one of two antenna ports (ANT1 or ANT2) via a low insertion loss path, while the path between the Rx pin is connected to the other antenna port. When the control voltages are toggled, the connections between the Tx input and Rx output pins and the antenna ports are toggled as well.

DC power consumption is very low, 15  $\mu\text{A}$  maximum with control voltage of 5 V. The switch can operate over the temperature range of -40 °C to +85 °C.

This part is available in a lead (Pb)-free and RoHS-compliant package as part number SKY13267-321LF.

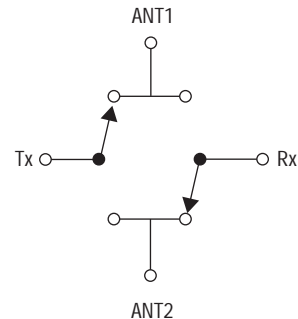
An evaluation board is available upon request.

**NEW**

Skyworks offers lead (Pb)-free, RoHS (Restriction of Hazardous Substances)-compliant packaging.



### Functional Block Diagram



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## Electrical Specifications

$V_{CTL} = 0\text{ V}/3\text{V}$ ,  $T = 25\text{ }^\circ\text{C}$ ,  $P_{INPUT} = 0\text{ dBm}$ ,  $Z_0 = 50\text{ }\Omega$ , unless otherwise noted

| Parameter      | Condition                    | Frequency       | Min. | Typ. | Max. | Unit |
|----------------|------------------------------|-----------------|------|------|------|------|
| Insertion loss | ANT1, ANT2 to Tx, Rx ports   | 2.400–2.500 GHz |      | 0.7  | 1.0  | dB   |
|                |                              | 5.150–5.350 GHz |      | 0.8  | 1.1  | dB   |
|                |                              | 5.725–5.825 GHz |      | 0.9  | 1.2  | dB   |
| Isolation      | ANT1, ANT2 to Tx, Rx ports   | 2.400–2.500 GHz | 30   | 32   |      | dB   |
|                |                              | 5.150–5.350 GHz | 23   | 25   |      | dB   |
|                |                              | 5.725–5.825 GHz | 21   | 23   |      | dB   |
|                | ANT1 to ANT2, Tx to Rx ports | 2.400–2.500 GHz |      | 23   |      | dB   |
|                |                              | 5.150–5.350 GHz |      | 20   |      | dB   |
|                |                              | 5.725–5.825 GHz |      | 20   |      | dB   |
| Return loss    | ANT1, ANT2 to Tx, Rx ports   | 2.400–2.500 GHz |      | 22   |      | dB   |
|                |                              | 5.150–5.350 GHz |      | 19   |      | dB   |
|                |                              | 5.725–5.825 GHz |      | 17   |      | dB   |

## Operating Characteristics

$V_{CTL} = 0\text{ V}/3\text{V}$ ,  $T = 25\text{ }^\circ\text{C}$ ,  $P_{INPUT} = 0\text{ dBm}$ ,  $Z_0 = 50\text{ }\Omega$ , unless otherwise noted

| Parameter                                   | Condition  | Frequency | Min. | Typ.     | Max. | Unit                      |
|---|--|-----------|------|----------|------|---------------------------|
| Switching characteristics                   |  |           |      |          |      |                           |
| Rise, fall                                  | 10/90% or 90/10% RF  |           |      | 20       |      | ns                        |
| On, off                                     | 50% $V_{CTL}$ to 90/10% RF   |           |      | 40       |      | ns                        |
| Video feedthru                              | $T_{RISE} = 1\text{ ns}$ , $BW = 500\text{ MHz}$   |           |      | 50       |      | mV                        |
| Error vector magnitude                      | 802.11a, OFDM, 64 QAM, 54 MBPS, $P_{IN} \leq 27\text{ dBm}$  | 5.8 GHz   |      | $\leq 1$ |      | %                         |
| Input third order intermodulation intercept | For two input tones. 15 dBm each tone, 5 MHz spacing, $V_{HIGH} = 3\text{ V}$                            | 2.4 GHz   |      | 49       |      | dBm                       |
|   |  | 5.2 GHz   |      | 44       |      | dBm                       |
| Thermal resistance                          |  |           |      | 25       |      | $^\circ\text{C}/\text{W}$ |
| Control voltage                             | $V_{LOW} = 0\text{ V}$ @ 10 $\mu\text{A}$ max.<br>$V_{HIGH} = 3\text{ V}$ to 5 V @ 15 $\mu\text{A}$ max. |           |      |          |      |                           |

## Absolute Maximum Ratings

| Characteristic   | Value   |
|--|---|
| Control voltage range                                  | $-0.2 \leq V_C \leq 8\text{ V}$                             |
| RF input power @ 0/3V                                  | 32 dBm  |
| RF input power @ 0/5V                                  | 34 dBm  |
| Storage temperature range                              | $-65\text{ }^\circ\text{C}$ to $+150\text{ }^\circ\text{C}$ |
| Operating temperature range                            | $-40\text{ }^\circ\text{C}$ to $+85\text{ }^\circ\text{C}$  |
| Electrostatic discharge (ESD) - Human Body Model (HBM) | Class 0   |

Performance is guaranteed only under the conditions listed in the specifications table and is not guaranteed under the full range(s) described by the Absolute Maximum specifications. Exceeding any of the absolute maximum/minimum specifications may result in permanent damage to the device and will void the warranty.

**CAUTION:** Although this device is designed to be as robust as possible, ESD (Electrostatic Discharge) 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 must be employed at all times.

## Recommended Solder Reflow Profiles

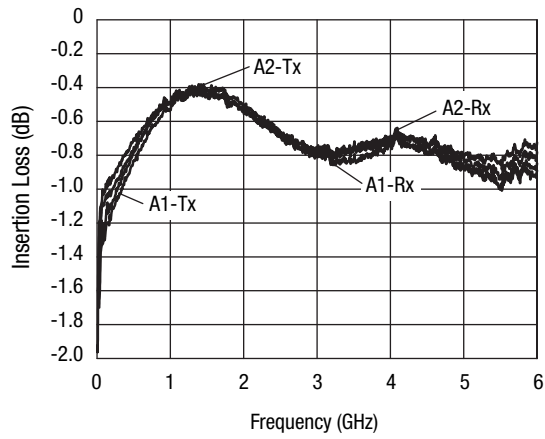
Refer to the [“Recommended Solder Reflow Profile”](#) Application Note.

## Tape and Reel Information

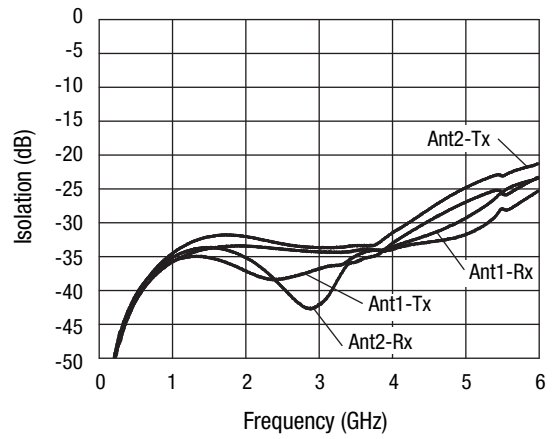
Refer to the [“Discrete Devices and IC Switch/Attenuators Tape and Reel Package Orientation”](#) Application Note.

### Typical Performance Data

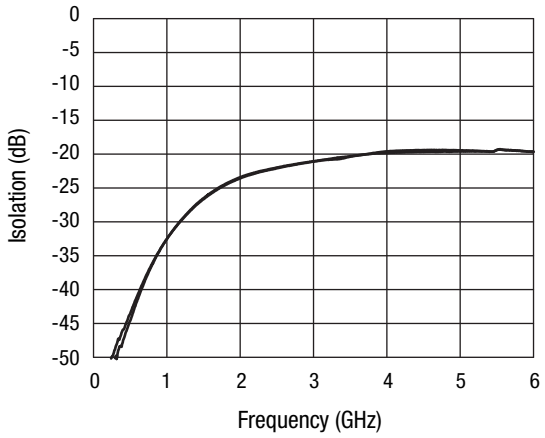
$V_{CTL} = 0\text{ V}/3\text{ V}$ ,  $T = 25\text{ }^\circ\text{C}$ ,  $P_{INPUT} = 0\text{ dBm}$ ,  $Z_0 = 50\text{ }\Omega$ , unless otherwise noted



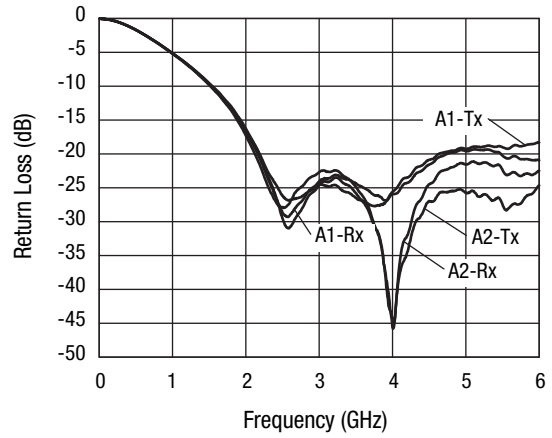
**Insertion Loss vs. Frequency**



**Isolation vs. Frequency**

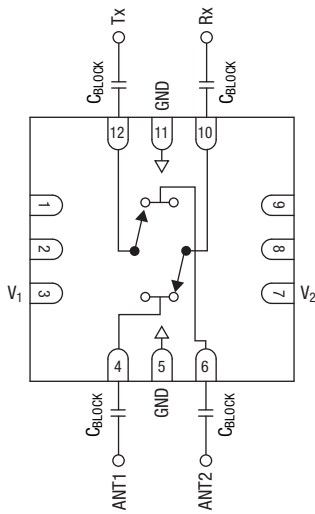


**Isolation, Tx - Rx/Ant1 - Ant2 vs. Frequency**



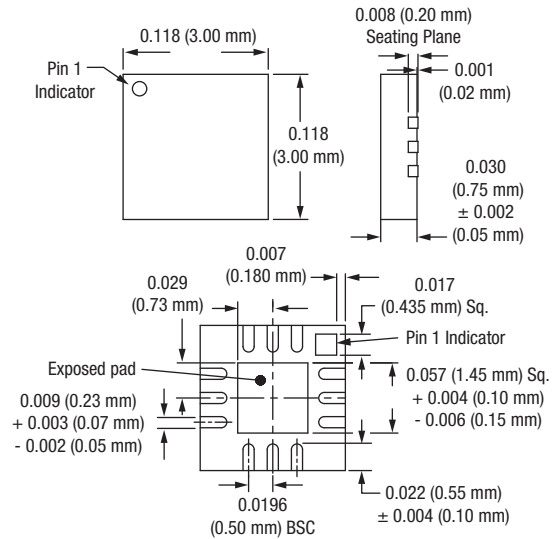
**Return Loss vs. Frequency**

### Pin Out Top View



C<sub>BLOCK</sub> = 4.7 pF

### QFN-12 Package Outline



### Truth Table

| V <sub>1</sub>    | V <sub>2</sub>    | Low Insertion Loss Paths |
|-------------------|-------------------|--------------------------|
| V <sub>LOW</sub>  | V <sub>HIGH</sub> | ANT1 - Tx, ANT2 - Rx     |
| V <sub>HIGH</sub> | V <sub>LOW</sub>  | ANT2 - Tx, ANT1 - Rx     |
| V <sub>LOW</sub>  | V <sub>LOW</sub>  | Not allowed              |
| V <sub>HIGH</sub> | V <sub>HIGH</sub> | Not allowed              |

V<sub>LOW</sub> = 0 V to 0.2 V.  
V<sub>HIGH</sub> = 3 V to 5 V.

### Pin Descriptions

| Pin Number | Pin Name       | Description   |
|------------|----------------|---|
| 1, 2, 8, 9 |                | Not connected   |
| 3          | V <sub>1</sub> | Control voltage 1 – Control voltage input #1. The logic level voltage applied to this pin, along with the level voltage applied to pin 7, determines the states of the RF paths between the Tx, Rx, ANT1 and ANT2 ports |
| 4          | ANT1           | RF input/output – RF input/output port which is either connected via a low insertion loss path to the Tx or Rx port, according to the logic levels applied to V <sub>1</sub> and V <sub>2</sub>                         |
| 6          | ANT2           | RF input/output – RF input/output port which is either connected via a low insertion loss path to the Tx or Rx port, according to the logic levels applied to V <sub>1</sub> and V <sub>2</sub>                         |
| 5, 11      | GND            | Equipotential point - Internal circuit common, which must be connected to the pcb ground or common via the lowest possible impedance  |
| 7          | V <sub>2</sub> | Control voltage 2 – Control voltage input #2. The logic level voltage applied to this pin, along with the level voltage applied to pin 3, determines the states of the RF paths between the Tx, Rx, ANT1 and ANT2 ports |
| 10         | Rx             | RF output – RF output port which is typically connected to the input of a receiver signal path  |
| 12         | Tx             | RF input – RF input port which is typically connected to the output of a transmitter signal path  |

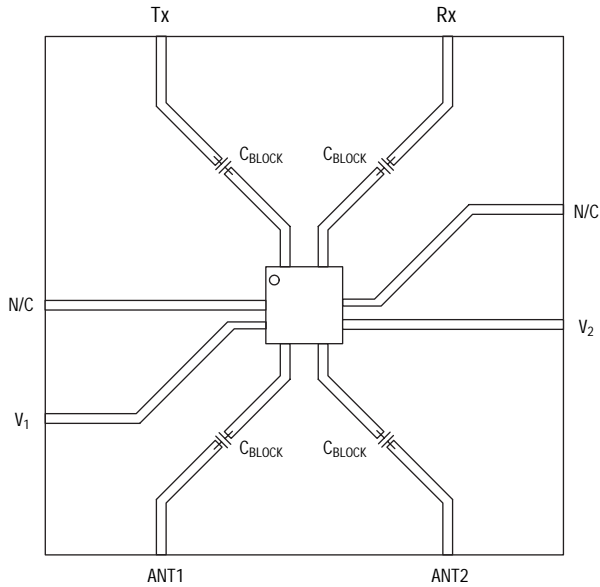
### Evaluation Board

The evaluation board for SKY13267-321 allows the part to be fully exercised. Note that blocking capacitors are required on each RF port (Tx, Rx, ANT1 and ANT2).

The state of the SKY13267-321 is controlled by applying the appropriate logic level voltages to ports V<sub>1</sub> and V<sub>2</sub> (see Truth Table in this document).

### Evaluation Board Components

| Component          | Description                            | Default           |
|--------------------|--|-------------------|
| C <sub>BLOCK</sub> | DC blocking capacitor                  | 4.7 pF, size 0402 |
| U1                 | SKY13267-321 GaAs T/R-diversity switch |                   |
| Tx, Rx, ANT1, ANT2 | SMA connectors                         |                   |



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