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DATA SHEET

SKY13251-349, SKY13251-349LF: SP3T Switch for Bluetooth® and 802.11b, g

Applications

- 802.11b, g
- Bluetooth®
- Zigbee™
- TDMA/GSM/EDGE CDMA/WCDMA
- Other short-range wireless applications

Features

- Positive low voltage control (0/+2.4 V)
- Low insertion loss (<0.5 dB @ 2.5 GHz)
- High isolation RF2, RF3 paths (29 dB @ 2.5 GHz and 27 dB @ 2.5 GHz)
- Miniature QFN-8 lead exposed paddle 2 x 2 mm
- PHEMT process
- Available lead (Pb)-free and RoHS-compliant MSL-1 @ 260 °C per JEDEC J-STD-020

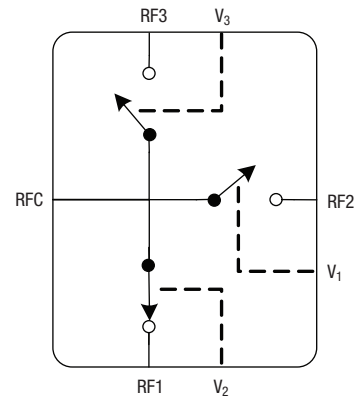
Description

The SKY13251-349 is a PHEMT GaAs IC SP3T switch in a 2 x 2 mm QFN-8E package. The high isolation, low loss, small size and low cost features make this switch ideal for isolating Bluetooth® from 802.11b, g and designs that require combining TDMA, GSM, EDGE, CDMA, WCDMA with other short-range wireless applications. This switch is also available in a lead (Pb)-free package that is fully compliant with current RoHS requirements.

The SKY12351-349 employs an asymmetrical design for improved performance as a transmit-receive switch. The path between the RF common (RFC) and RF1 is optimized for low loss transmit use, while the remaining two paths, RFC to RF2 and RFC to RF3, are optimized to produce higher isolation in receiver signal paths.

A fully populated evaluation board is available.

Simplified Block Diagram



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

Electrical Specifications at 25 °C (0, +3 V)

$Z_0 = 50 \Omega$, unless otherwise noted

| Parameter | Condition | Frequency | Min. | Typ. | Max. | Unit |
|---------------------------------------|--------------|-------------|------|------|------|------|
| Insertion loss | RFC-RF1 | LF-1.0 GHz | | 0.35 | 0.40 | dB |
| | | 1.0-2.0 GHz | | 0.40 | 0.50 | dB |
| | | 2.0-3.0 GHz | | 0.45 | 0.60 | dB |
| | RFC-RF2, RF3 | LF-1.0 GHz | | 0.35 | 0.40 | dB |
| | | 1.0-2.0 GHz | | 0.50 | 0.60 | dB |
| | | 2.0-3.0 GHz | | 0.60 | 0.70 | dB |
| Isolation | RFC-RF1 | LF-1.0 GHz | 22 | 24 | | dB |
| | | 1.0-2.0 GHz | 15 | 18 | | dB |
| | | 2.0-3.0 GHz | 12 | 15 | | dB |
| | RFC-RF2, RF3 | LF-1.0 GHz | 25 | 29 | | dB |
| | | 1.0-2.0 GHz | 23 | 27 | | dB |
| | | 2.0-3.0 GHz | 23 | 27 | | dB |
| Return loss (insertion loss state) | RFC-RF1 | LF-1.0 GHz | | 24 | | dB |
| | | 1.0-2.0 GHz | | 25 | | dB |
| | | 2.0-3.0 GHz | | 25 | | dB |
| | RFC-RF2, RF3 | LF-1.0 GHz | | 22 | | dB |
| | | 1.0-2.0 GHz | | 19 | | dB |
| | | 2.0-3.0 GHz | | 20 | | dB |

LF = low frequency.

The low frequency limit is set by the value of the DC blocking capacitors used external to the part.

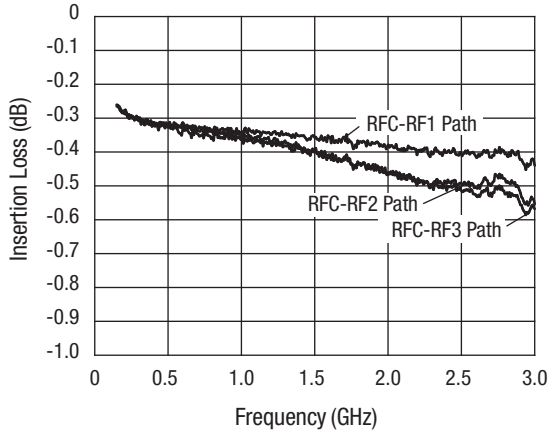
Operating Characteristics at 25 °C (0, +3 V)

$Z_0 = 50 \Omega$, unless otherwise noted

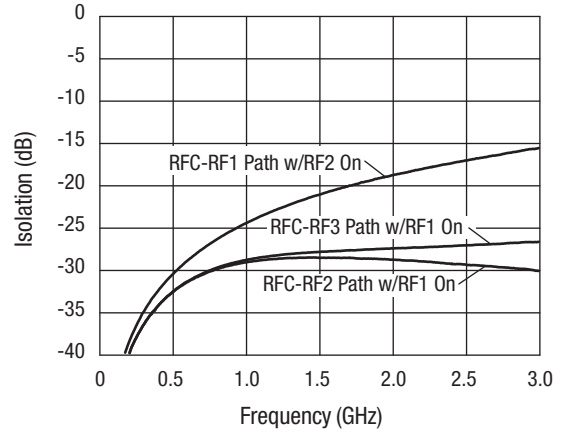
| Parameter | Condition | Frequency | Min. | Typ. | Max. | Unit |
|---------------------------------------|---|-----------|------|------|-----------|--------------------|
| Switching characteristics | | | | | | |
| Rise | 10% to 90% RF | | | 50 | | ns |
| Fall | 90% to 10% RF | | | 25 | | ns |
| On | 50% V_{CTL} to 90% RF | | | 50 | | ns |
| Off | 50% V_{CTL} to 10% RF | | | 50 | | ns |
| Input power for -1.0 dB compression | $V_{CTL} = 0/3 V$ | 0.5-3 GHz | | 25 | | dBm |
| Intermodulation intercept point (IP3) | Two-tones 900 MHz, 5 MHz spacing +10 dBm each tone | 0.5-3 GHz | | 46 | | dBm |
| Control voltages | | | | | | |
| High | | | 2.3 | | 5.5 | V |
| Low | | | 0 | | 0.2 | V |
| Control port input current | $V_{CTL} = 3 V$ $V_{CTL} = 0 V$ | | | | 100 20 | μA μA |

Typical Performance Data

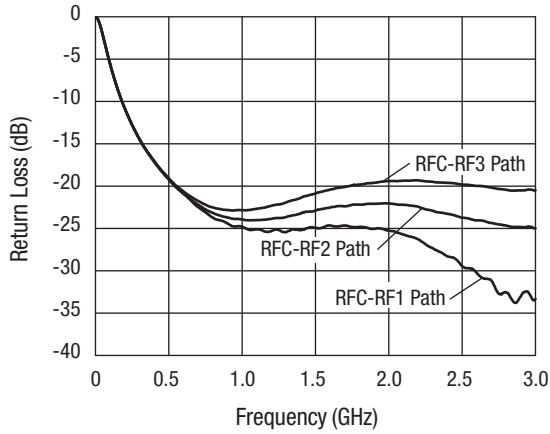
$Z_0 = 50 \Omega$, $T_A = 25^\circ\text{C}$, unless otherwise noted



Insertion Loss vs. Frequency



Isolation vs. Frequency



Return Loss vs. Frequency

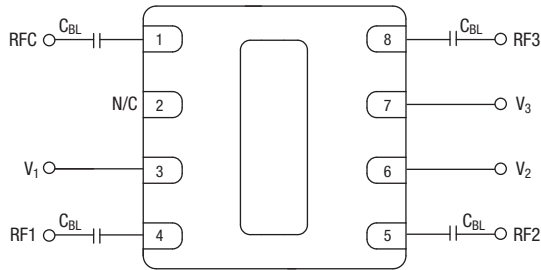
Absolute Maximum Ratings

| Characteristic | Value |
|---|--|
| RF input power ($V_{CTL} = 0/7\text{ V}$) | 1 W, $f > 500\text{ MHz}$ 0.5 W, $f < 500\text{ MHz}$ |
| Control voltage | -0.2 V, +8 V |
| Operating temperature | -40 °C to +85 °C |
| Storage temperature | -65 °C to +150 °C |
| Θ_{JC} | 45 °C/W |

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.

Pin Out (Top View)



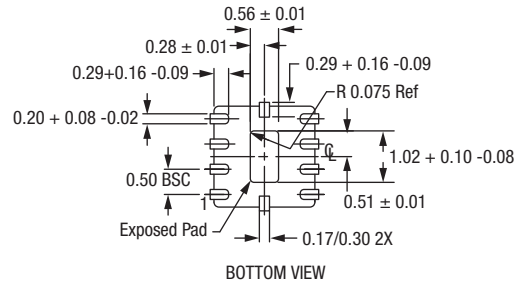
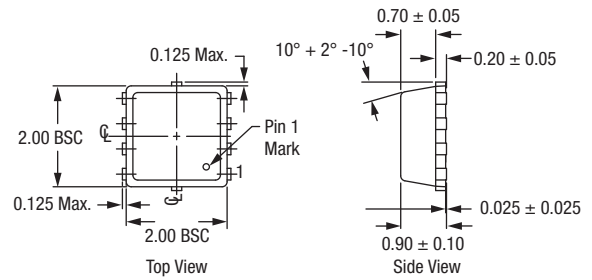
$C_{BL} = 47$ pF for operation >500 MHz.
Exposed paddle must be grounded.

Truth Table

| V_1 | V_2 | V_3 | RFC-RF1 | RFC-RF2 | RFC-RF3 |
|-------|-------|-------|----------------|----------------|----------------|
| 1 | 0 | 0 | Isolation | Insertion loss | Isolation |
| 0 | 1 | 0 | Insertion loss | Isolation | Isolation |
| 0 | 0 | 1 | Isolation | Isolation | Insertion loss |

All other logic conditions put the switch in an undefined state.
"0" = 0 to 0.2 V.
"1" = 2.3 to 5.5 V.

QFN 8E 2 x 2 (-349)



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.

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