SKYWORKS®

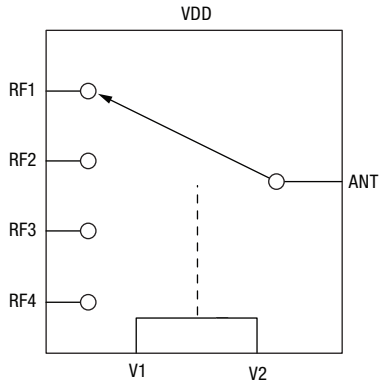
PRELIMINARY DATA SHEET

SKY14151-350LF: High-Power Single Pole Four Throw (SP4T) Switch with Decoder

Features

- Broadband operation (0.1–2.5 GHz)
- Low insertion loss (0.35 dB @ 1GHz, 0.5 dB @ 2 GHz) with high isolation (29 dB @ 1 GHz)
- V_{DD} = 2.5 to 3 V for high-power applications, can be used down to 1.8 V for low-power applications
- High linearity IMD < -110 dBm
- Good harmonic performance: < -80 dBc @ 0.9 GHz
- Low voltage logic compatible(V_{HIGH} Min. = 1.8 V)
- 3 x 3 mm 16-pin QFN, lead (Pb)-free and RoHS-compliant package
- Switch uses state-of-the-art GaAs pHEMT process

Functional Diagram



Description

The SKY14151 is a symmetrical single pole four throw (SP4T) switch designed for broad band, high power switching applications which demand high linearity and low insertion loss. The switch is manufactured using the Skyworks state of the art pHEMT process. This is a general purpose switch that is optimized for a variety of multimode applications such as GSM/WCDMA/EDGE.

The SKY14151 features integrated logic that uses only two control lines for the switch operation. The low current consumption of SKY14151 makes it suitable for battery-operated applications.

This part comes in an industry-standard 3 x 3 mm 16-pin QFN package that is lead (Pb)-free and RoHS-compliant.

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

Preliminary Data Sheet: Based on engineering results. Sampling quantities available. Pin out and package have been determined.

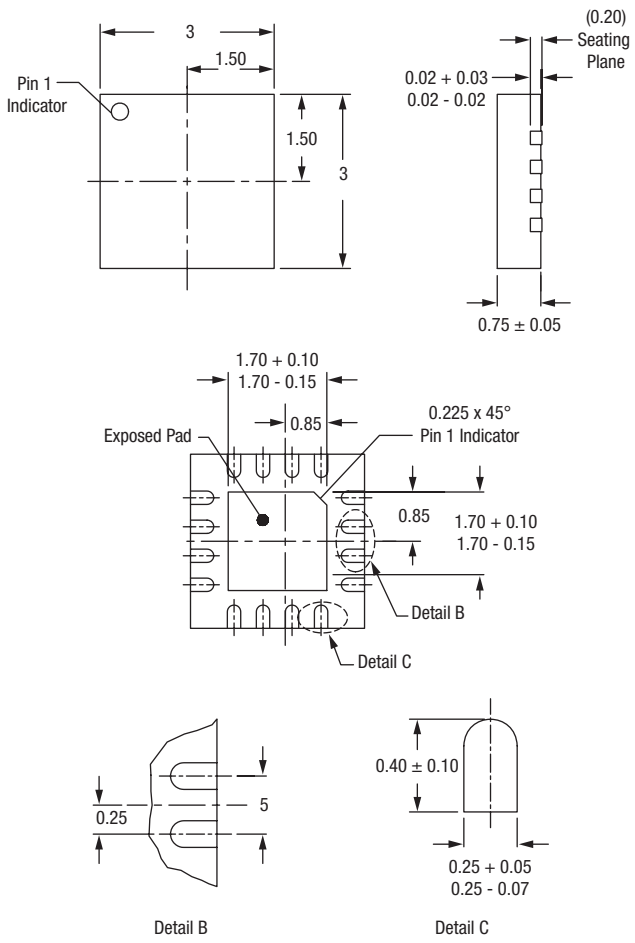
Electrical Specifications

T_A = 25 °C, V_{DD} = 2.5–3 V, V_{HIGH} = V_{DD}, all unused RF ports are terminated in a 50 Ω load, unless otherwise noted

Parameter	Conditions	Min.	Typ.	Max.	Unit
Electrical Characteristics					
Insertion loss	f = 1 GHz		0.35		dB
	f = 2 GHz		0.5		dB
	f = 2.5 GHz		0.55		dB
Isolation	f = 1 GHz		29		dB
	f = 2 GHz		25		dB
	f = 2.5 GHz		23		dB
Return loss (worst case)	0.1 – 2.5 GHz				dB
Operating Characteristics					
Second harmonic	$f_{fundamental}$ = 900 MHz, P_{IN} = 34.5 dBm		-80		dBc
	$f_{fundamental}$ = 1.8 GHz, P_{IN} = 31.5 dBm		-80		dBc
Third harmonic	$f_{fundamental}$ = 900 MHz, P_{IN} = 34.5 dBm		-80		dBc
	$f_{fundamental}$ = 1.8 GHz, P_{IN} = 31.5 dBm		-80		dBc
Input 0.1 dB compression point	f = 900 MHz		37		dBm
	f = 1.8 GHz		34		dBm
Imd3	Standard setup		-110		dBm
Power handling under mismatch	f = 900 MHz, VSWR = 20:1		34.5		dBm
	f = 1.8 GHz, VSWR = 20:1		31.5		dBm
Switching speed			5		µs
Startup time			25		µs
DC/Control Specifications					
Supply voltage (V_{BATT})		2.5		4.4	V
Switched supply voltage (V_{DD})		2.5	2.65	3	V
Switched supply current (I_{DD})			0.3		mA
Control voltage	V_{HIGH}	1.8[1]	2.65	3	V
	V_{LOW}		0.2	0.3	V
	Control current, I_{HIGH}		0.5		µA
	Control current, I_{LOW}		0.5		µA

1. For 1.8 V control, V_{DD} must be < 2.65 V.

Package Outline (3 x 3 x 0.75 mm 16 pin QFN)



1. Dimensioning and tolerancing per ASME Y14.5M – 1994.
2. Coplanarity applies to the exposed heat sink slug as well as the terminals.
3. Plating requirement per source control drawing (SCD) 2504.

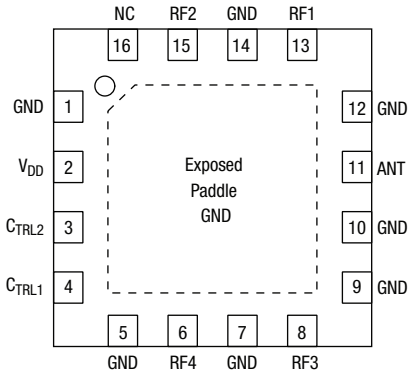
Absolute Maximum Ratings

Characteristic	Value
Switched supply voltage (V_{DD})	3 V
Input power (low frequency to 2.5 GHz, V_{DD} = 2.5–3 V)	36 dBm
Control voltage	3 V
Operating temperature	-30 °C to +85 °C
Storage temperature	-50 °C to +100 °C

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)



Pin Descriptions

Pin #	Pin Name	Description
1, 5, 7, 9, 10, 12, 14	GND	Ground. This pin should be connected to ground via the lowest possible electrical impedance.
2	V_{DD}	Supply voltage input. This voltage may be switched. The switching time must be no longer than the start-up time.
3	C_{TRL2}	Control signal 2. The logic level applied to this pin, along with the logic level applied to pin 4, controls the state of the switch.
4	C_{TRL1}	Control signal 1. The logic level applied to this pin, along with the logic level applied to pin 3, controls the state of the switch.
6	RF4	RF output 4. This pin is either connected directly to or is disconnected from pin 11, depending upon the control voltages applied to pins 3 and 4.
8	RF3	RF output 4. This pin is either connected directly to or is disconnected from pin 11, depending upon the control voltages applied to pins 3 and 4.
11	ANT	Antenna. This pin is connected directly and exclusively to pin 6, 8, 13 or 15, depending upon the control voltages applied to pins 3 and 4.
13	RF1	RF output 4. This pin is either connected directly to or is disconnected from pin 11, depending upon the control voltages applied to pins 3 and 4.
15	RF2	RF output 4. This pin is either connected directly to or is disconnected from pin 11, depending upon the control voltages applied to pins 3 and 4.
16	NC	This pad can be left open.
	Paddle	Exposed paddle. This paddle should be connected to ground via the lowest possible electrical and thermal impedance.

Logic

The switch can operate in one of four states, which are listed in the truth table.

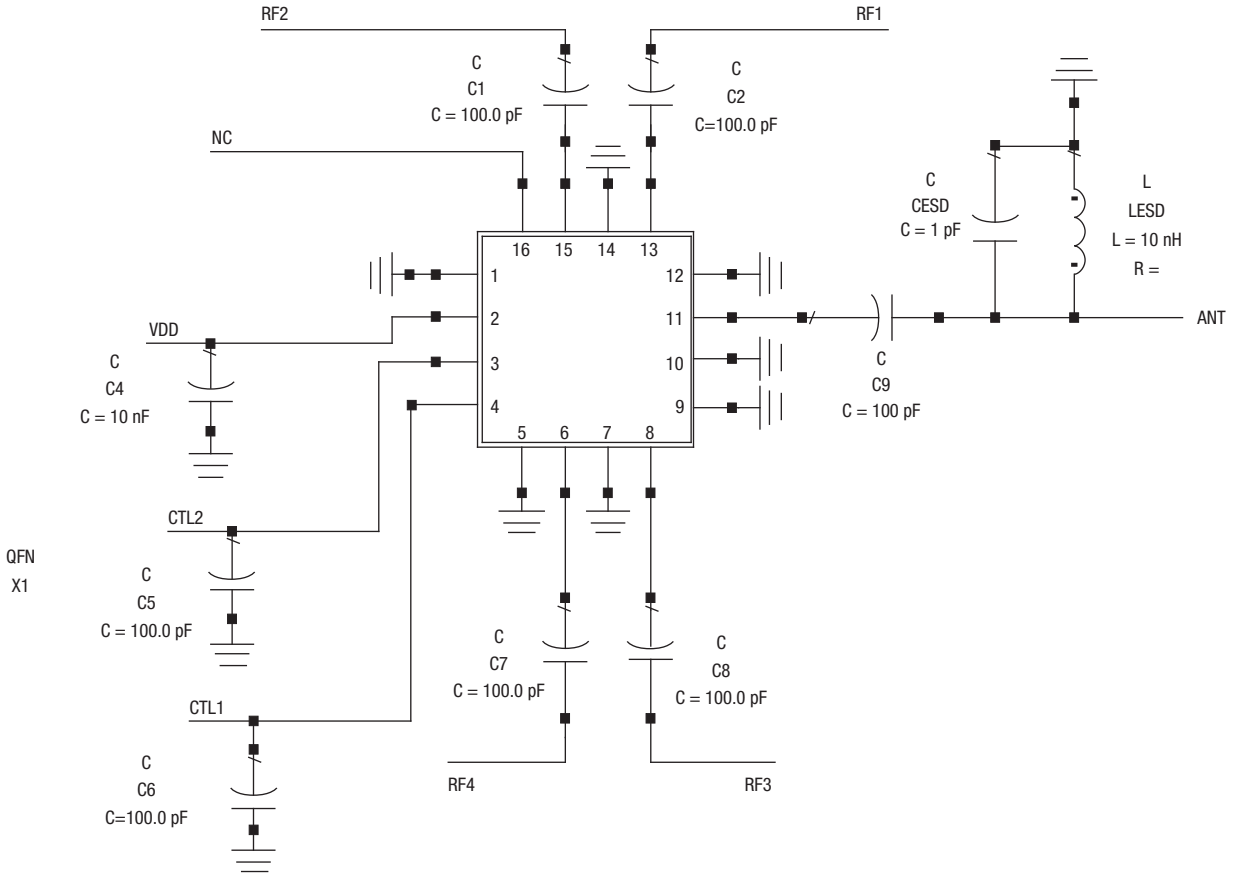
The switch may be used in the active or standby mode. The modes are controlled by the voltage which is applied to pin 2, V_{DD}. The switch is active when the V_{DD} is high and in standby mode when V_{DD} is low, in which case all paths are in the isolation state.

Truth Table

State	C_{TRL1}	C_{TRL2}	RF Path
1	V_{LOW}	V_{LOW}	Ant – RF1
2	V_{LOW}	V_{HIGH}	Ant – RF2
3	V_{HIGH}	V_{LOW}	Ant – RF3
4	V_{HIGH}	V_{HIGH}	Ant – RF4

V_{DD} = High

Evaluation Board Schematic

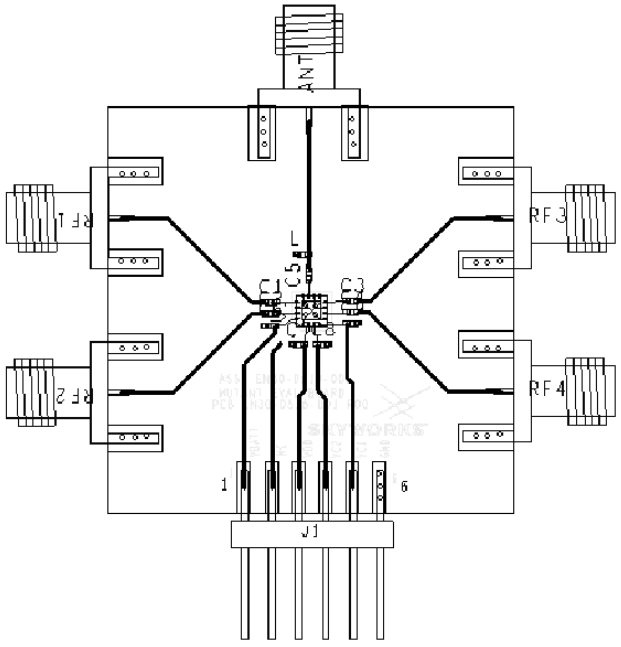


Applications

An LESD and a CESD comprise the ESD filter. This topology and these component values may vary according to the ESD requirement and acceptable insertion loss for a specific application.

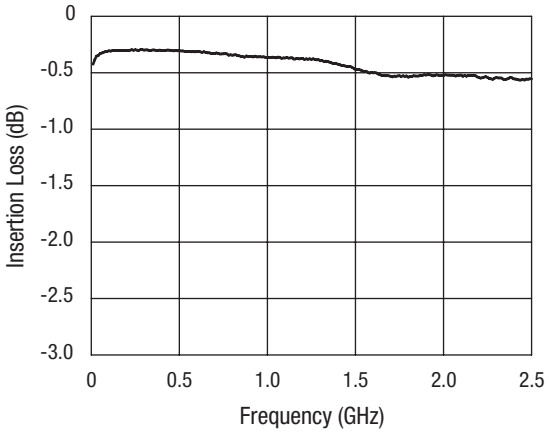
Components LESD and CESD constiture an ESD filter. Decoupling capacitors (C3 through C6) are recommended for suppressing noise and preventing RF leakage into the DC control circuits."

Evaluation Board

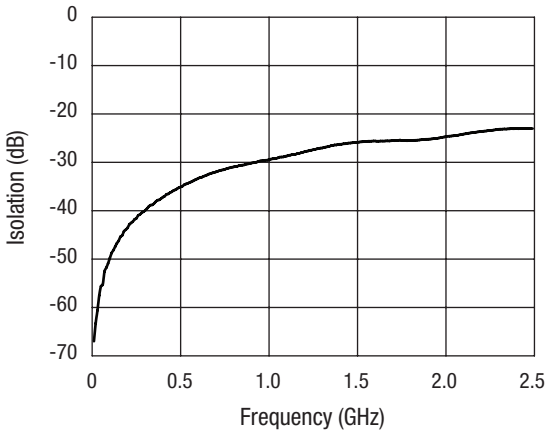


Typical Performance Data

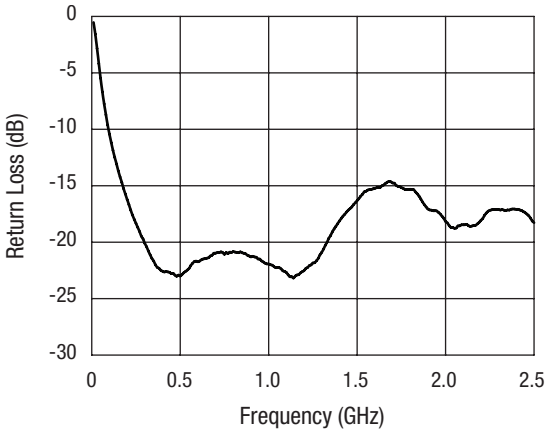
T_A = 25 °C, V_{DD} = 2.5–3 V, V_{HIGH} = V_s, all unused RF ports are terminated in a 50 Ω load, unless otherwise noted



Insertion Loss



Isolation



Return Loss