



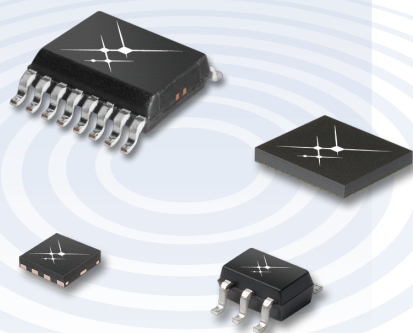
SKYWORKS
BREAKTHROUGH SIMPLICITY

Applications

- Tx/Rx and diversity
 - WLAN/Bluetooth®
 - Energy management
 - RFID
 - UHF/VHF: public safety bands
- WCDMA handsets and data cards
- 3G/4G wireless networks
- LNB/DBS matrix
- Microwave applications up to 8 GHz
- Multi-antenna switching

Features

- Low-insertion loss
- High isolation
- High linearity and low distortion
- High-power handling
- Broad frequency range: 20 MHz to 8 GHz
- Low bias and control-logic voltage
- Low current operation



General Purpose RF Switches

Select RF switches available from stock for prototype or high-volume production

Skyworks Solutions offers a select group of radio frequency (RF) switches from our diverse switch offering that are in stock and ready for immediate design into various markets including handsets, infrastructure, automotive, CATV / Satcom, smart energy, medical, military, RFID, test and measurement, and WLAN / WiMAX / WiFi.

Our select switches portfolio includes the most popular, broad-market SPST, SPDT, SP3T, SP4T and DPDT products readily available to ship from stock. These devices provide excellent performance and value while utilizing Skyworks' proven technology for high reliability⁽¹⁾. The select switches are used in a wide variety of systems, including cellular telephone handsets and base stations, WLAN front-end modules, RF/microwave test instruments, satellite TV receivers and more. All pHEMT switches are broadband by design and require DC blocking capacitors for positive voltage operation. Select switches have been fully characterized for low-frequency applications, covering the UHF and VHF ranges⁽²⁾.

Performance characteristics include broadband operation (VHF to 8 GHz), high-power handling, high isolation, low-insertion loss, and reflective or absorptive ports when they are placed into their high-isolation states. Our lead (Pb)-free, RoHS-compliant and Green™ products are fabricated in our high volume GaAs pHEMT facility. All switches are packaged in industry-standard, plastic surface-mount packages and leverage Skyworks' extensive design knowledge, technical leadership, manufacturing expertise and superior quality.

An application engineering team is available to assist you and with your design efforts. Application notes and block diagrams are accessible on Skyworks' Web site: www.skyworksinc.com.

1. Technology used to fabricate the devices may be either GaAs (Gallium Arsenide) or SOI (Silicon on Insulator).
2. The SOI switches do not require DC blocking capacitors. The SOI switches include circuitry on die to accommodate logic decode function.



Innovation to Go™

Select products and sample/designer kits available for purchase online.

www.skyworksinc.com



Tx/Rx WLAN/Bluetooth® (802.11a,b,g,n)

Description	Frequency (GHz)	Insertion Loss (dB)	Isolation (dB)	Input IP3 (dBm)	Input P _{1dB} (dBm)	Package (mm)	Part Number
SPDT (R)	0.02–3.0	0.40	23.0	43	30	SC-88 6L 2.1 x 2.0 x 0.95	 AS179-92LF
SPDT (R)	0.02–6.0	0.35	24.0	50	30 (0.5 dB)	QFN 6L 1.0 x 1.0 x 0.45	 SKY13351-378LF
SPDT (R)	0.10–2.5	0.55	17.0	56	37	SOT 6L 2.8 x 2.9 x 1.18	AS193-73LF
SPDT (A)	0.50–6.0	0.60–1.0	27–24	52	37	DFN 6L 1.5 x 1.5 x 0.45	 SKY13348-374LF
SPDT (A)	0.50–6.0	0.70–1.15	31–24	55	39	DFN 6L 1.5 x 1.5 x 0.45	 SKY13370-374LF
SP3T (R)	0.02–6.0	0.60	25.0	50	29	QFN 8L 1.5 x 1.5 x 0.45	 SKY13317-373LF
SP3T (R)	0.10–3.5	0.50–0.60	39–25	57	33	QFN 12L 2.0 x 2.0 x 0.5	 SKY13385-460LF
SP4T (R)	0.02–6.0	0.60	26.0	51	30	DFN 10L 2.0 x 3.0 x 0.45	 SKY13322-375LF
DPDT (R)	LF–6.0	0.95	22.0	60	34	QFN 12L 3.0 x 3.0 x 0.75	 SKY13318-321LF
DPDT (R)	0.10–6.0	0.60	23.5	55	33	DFN 6L 1.5 x 1.5 x 0.5	 SKY13355-374LF
DPDT (R)	0.10–6.0	0.60	22.0	62	37	DFN 6L 1.5 x 1.5 x 0.5	 SKY13381-374LF

Smart Energy, Broadband, Cellular Infrastructure, Test & Measurement, Military (COTS)

Description	Frequency (GHz)	Insertion Loss (dB)	Isolation (dB)	Input IP3 (dBm)	Input P _{1dB} (dBm)	Package (mm)	Part Number
SPDT (R)	0.0003–2.5	0.3–0.4	25–24	48	30	SOT-23 6L 2.8 x 2.9 x 1.18	AS169-73LF
SPDT (R)	0.1–2.5	0.3–0.55	30–17	56	37 (0.1 dB)	SC-88 2.1 x 2.0 x 0.95	 SKY13270-92LF
SPDT (A)	0.1–6.0	0.8–1.5	62–42	46	30	QFN 16L 4.0 x 4.0 x 0.9	 SKY13286-359LF
SPDT (R)	3.0–8.0	0.7–0.9	25–22	47	26	QFN 8L 2.0 x 2.0 x 0.9	 SKY13298-360LF
SP3T (A)	0.5–2.5	0.9–1.2	62–55	43	30	QFN 20L 4.0 x 4.0 x 0.9	SKY13277-355LF
SP4T (A)	0.5–3.0	0.4–0.9	45–25	40	26	SSOP 16L 6.0 x 4.9 x 1.6	AS204-80LF

SPDT = Single pole double throw
 SP3T = Single pole three throw
 SP4T = Single pole four throw

DPDT = Double pole double throw
 R = Reflective
 A = Absorptive (terminated)

 Skyworks Green™ products are compliant to all applicable materials legislation and are halogen-free.
 For additional information, refer to Skyworks Definition of Green™, document number SQ04-0074.

DBS/LNB 4 x 2 Matrix Switch

Description	Frequency (GHz)	Insertion Loss (dB)	Isolation (dB)	Input P _{1dB} (dBm)	Package (mm)	Part Number
LNB/DBS (A)	0.25–2.15	7.5–8.5	40–31	15	QFN 20L 4 x 4 x 0.75	 SKY13272-340LF

UHF/VHF

Description	Insertion Loss f = 48 MHz (dB)	Isolation f = 48 MHz (dB)	Input P _{1dB} f = 48 MHz (dBm)	Insertion Loss f = 1 GHz (dB)	Isolation f = 1 GHz (dB)	Input P _{1dB} f = 1 GHz (dBm)	Package (mm)	Part Number
SPDT (R)	0.15	56	29	0.3	25	34	SC-88 6L 2.1 x 2.0 x 0.95	 AS179-92LF
SPDT (R)	0.2	55	28	0.35	24	30 (0.5 dB)	QFN 6L 1.0 x 1.0 x 0.45	 SKY13351-378LF
SPDT (R)	0.3	47	33	0.45	24	37 (0.1 dB)	SC-88 2.1 x 2.0 x 0.95	 SKY13270-92LF
SPDT (R)	0.3	42	38.5 (0.1 dB)	0.4	29	38.5 (0.1 dB)	QFN 12L 3.0 x 3.0 x 0.75	SKY13299-321LF
SPDT (R)	0.3	44	39.8 (0.8 dB)	0.45	23	40.5 (0.1 dB)	QFN 6L 2.0 x 3.0 x 1.0	 SKY13290-313LF
SP3T (R)	0.3	49	26	0.45	27	29	QFN 8L 1.5 x 1.5 x 0.45	 SKY13317-373LF
SP4T (R)	0.3	49	26	0.6	28	30	QFN 10L 2.0 x 3.0 x 0.45	 SKY13322-375LF
SP4T (R)	0.3	54	41	0.45	24	38 (0.1 dB)	QFN 16L 3.0 x 3.0 x 0.75	 SKY14151-350LF

SPDT = Single pole double throw
 SP3T = Single pole three throw
 SP4T = Single pole four throw

DPDT = Double pole double throw
 R = Reflective
 A = Absorptive (terminated)

 Skyworks Green™ products are compliant to all applicable materials legislation and are halogen-free.
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GaAs RF Switch Fundamentals

A switching field effect transistor (FET) functions as a three port device, where the source and drain ports form a conduction path or channel for the RF signal and the gate port controls whether the channel is opened or closed. A DC control voltage applied to the gate is required to create this function. Most switching FETs use a depletion mode configuration, which means that the channel is normally in its low resistance state with no voltage applied and in its high resistance state when a negative voltage is applied to the gate with respect to the drain and source. For positive control voltage operation, RF ground connections must be floated by inserting a DC block between the FET and ground. Also, DC blocks are required on the RF ports (see Figure 1).

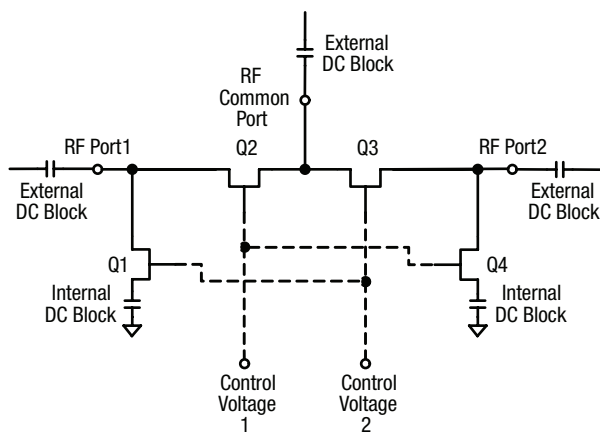


Figure 1. Typical SP2T with Series-Shunt Configuration

A complete switch can be fabricated by arranging FETs in various configurations depending upon the performance requirements of the end application. Figure 1 shows a typical single pole two-throw (SP2T) switch comprised of series and shunt FETs. In the isolation state, the shunt FET (e.g., Q1) is biased to produce a very low resistance, thus its input impedance is a reflective short. The series

FET (e.g., Q2) in the same arm is biased to produce a very high resistance. In the low insertion loss state, the converse is true: the shunt FET is biased to produce a very large resistance, while its series FET is biased to produce very low resistance. Please refer to the "Published Articles" section available on Skyworks' Web site (www.skyworksinc.com/Press_Published_Articles.aspx) for more information about FET switch topologies and properties:

- Ultra-Miniature High Linearity SPDT Switch for WLAN Applications
- Top Considerations When Buying or Specifying an RF Switch
- RF/Microwave Solid State Switches: Part 1
- Solid State RF/Microwave Switch Technology: Part 2

Skyworks also offers switches with a 50 Ω absorptive termination connected between the shunt FET(s) and AC ground. In Table 1, Skyworks switches are designated with "R" for reflective and "A" for absorptive.

Figure 2 illustrates the error vector magnitude (EVM) performance of low, medium, and high power switches. EVM is a typical specification to measure the amplitude and phase distortion with modulated signals such as WLAN 802.11a,b,g,n with a 10 dB peak to average ratio.

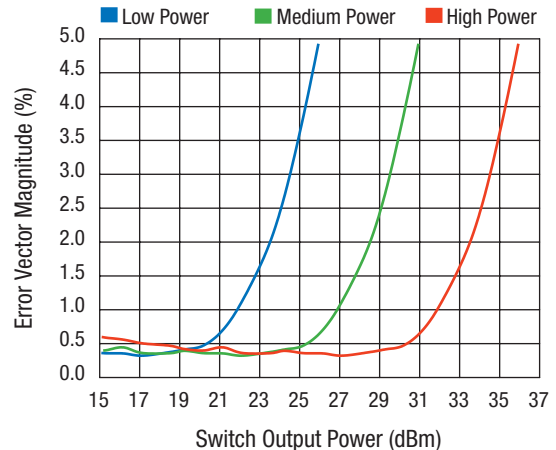


Figure 2. Typical GaAs Switch Performance. Error Vector Magnitude of Typical Low, Medium and High Power Switches

SOI Switch Fundamentals

SOI (silicon on insulator) switch transistors operate in a similar manner to GaAs devices. The channel between the drain and source can be either a low resistance or a high resistance based on the voltage on the gate. The SOI transistor requires a positive voltage on the gate to turn the FET “on” and requires a negative bias to turn the FET “off”. To make it easy for the user of the switch, a negative voltage is generated on chip and distributed to the proper FET’s based on a logic decode function that is also integrated on die. Since the gates are on an insulator, the switch does not need to be floated above ground potential for positive voltage operation. This also prevents a voltage from being developed on the RF line and therefore the switch does not require DC blocking capacitors. However, voltages from other portions of a circuit should be blocked from the SOI switch. To achieve higher power handling, SOI FETs are stacked to divide the RF voltage across them. The periphery is adjusted accordingly to maintain low insertion loss. FETs are configured in series and shunt orientation the same way they are for GaAs switches. By configuring elements in this manner, the optimum insertion loss and isolation can be achieved as a function of frequency. By designing with the proper number of stacked FETs and the correct periphery, SOI switches have excellent linearity. An example of EVM performance is shown in Figure 3.

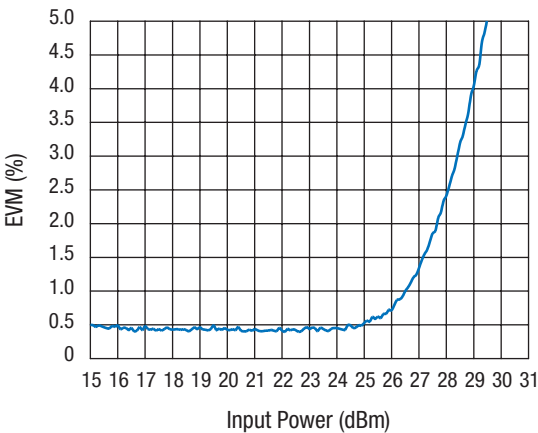


Figure 3. SKY13385-460LF SOI SP3T Switch 802.11g EVM

Transmit-Receive Switch

A SPDT switch can be used as a transmit-receive (Tx/Rx) switch, to alternately connect a transmitter and a receiver to a common single antenna in a single duplex system, as shown in Figure 4.

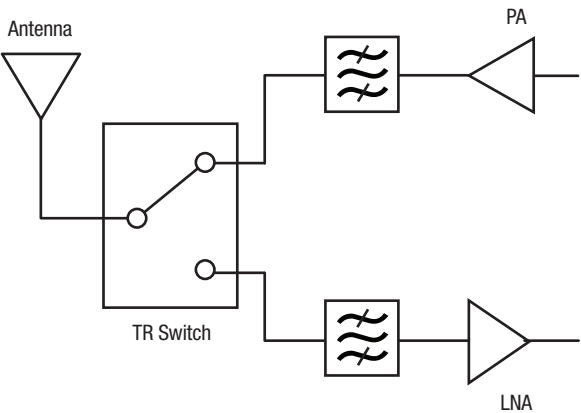


Figure 4. Simplified TR Switching Block Diagram



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Application Notes

For additional information, please refer to the following Application Notes and Published Articles.

Positive Voltage Operation of GaAs Control ICs

Published Articles

Ultra-Miniature High Linearity SPDT Switch for WLAN Applications

Top Considerations When Buying or Specifying an RF Switch

RF/Microwave Solid State Switches: Part 1

Solid State RF/Microwave Switch Technology: Part 2



Green Initiative™

Through our Green Initiative™, we are committed to manufacturing products that comply with global government directives and industry requirements.

Skyworks is continuously innovating RF, analog and mixed-signal ICs. For the latest product introductions and information about Skyworks, visit our Web site at www.skyworksinc.com

For additional information on our broad overall product portfolio, please contact your local sales office or email us at sales@skyworksinc.com.

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