



SKYWORKS®

DATA SHEET

SKYA21039: 2.4 to 2.5 GHz SP3T Switch

Applications

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

Features

- AEC-Q100 grade 2 qualified
- Fast switching speed for Wi-Fi/BT applications: 300 ns typical
- Positive low voltage control: 0/1.8 to 3.6 V
- 1.8 V and 3.3 V logic compatibility
- Wide 3 to 5 V supply voltage range
- Integrated DC blocking capacitors
- Miniature ultra-thin MLP (8-pin, 1.1 x 1.1 x 0.5 mm) package (MSL1, 260 °C per JEDEC J-STD-020)



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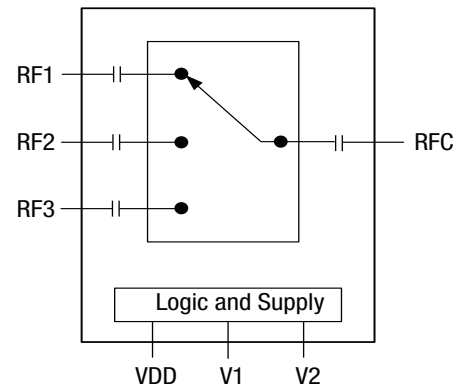
Description

The SKYA21039 is a single-pole, triple-throw (SP3T) antenna switch that operates in the 2.4 to 2.5 GHz frequency range. Switching between the antenna (RFC signal) and the RF1, RF2, and RF3 ports is accomplished with two control voltages (V1 and V2).

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 band.

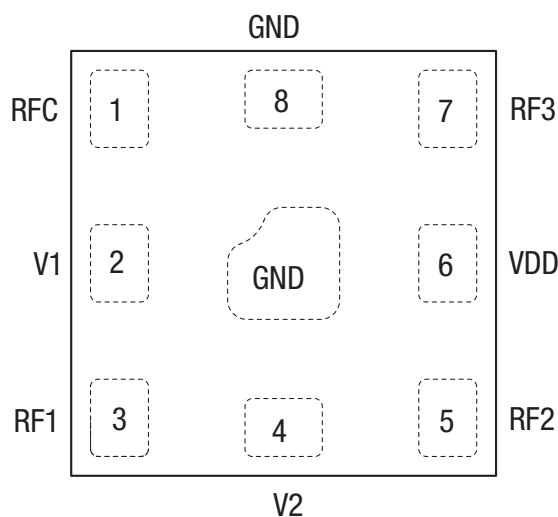
The SKYA21039 has integrated DC blocking capacitors, so external DC blocking capacitors are not required.

The SKYA21039 is manufactured in a compact, 1.1 x 1.1 x 0.5 mm (typical), 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.



203526-001

Figure 1. SKYA21039 Block Diagram



203526-002

Figure 2. SKYA21039 Pinout (Top View)

Table 1. SKYA21039 Signal Descriptions

Pin	Name	Description	Pin	Name	Description
1	RFC	Antenna	5	RF2	RF port 2
2	V1	Switch logic control (see Table 4)	6	VDD	DC power supply
3	RF1	RF port 1	7	RF3	RF port 3
4	V2	Switch logic control (see Table 4)	8	GND	Ground

Electrical and Mechanical Specifications

The absolute maximum ratings of the SKYA21039 are provided in Table 2. Electrical specifications are provided in Table 3. The state of the SKYA21039 is determined by the logic provided in Table 4.

Table 2. SKYA21039 Absolute Maximum Ratings¹

Parameter	Symbol	Minimum	Typical	Maximum	Units
Input power				+32	dBm
Supply voltage				6.0	V
Control voltage				3.7	V
Storage temperature				+150	°C
Operating temperature				+105	°C
Electrostatic discharge:					
— Charged Device Model (CDM), Class C3	ESD			1000	V
— Human Body Model (HBM), Class 1C				1000	V

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.

ESD Handling: Industry-standard ESD handling precautions must be adhered to at all times to avoid damage to this device.

Table 3. SKYA21039 Electrical Specifications¹
(VDD = 3.3 V, VCTL = 0 V and +1.8 V, TOP = +25 °C, PIN = 0 dBm,
Characteristic Impedance [Zo] = 50 Ω, unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Insertion loss	IL	2.4 to 2.4 GHz		0.75	1.05	dB
Isolation RFC to RF1/RF2 or RF3	ISO	2.4 to 2.4 GHz	31	35		dB
Isolation RF1 to RF2	ISO	2.4 to 2.4 GHz	35	40		dB
Return loss	RL	2.4 to 2.4 GHz		12		dB
P0.1 dB compression point	P0.1dB	2.4 to 2.4 GHz		+29		dBm
Harmonics		PIN = +24 dBm, f0 = 2.4 GHz:				
		— 2f0		−50		dBm
		— 3f0		−32		dBm
Input IP3	IP3	PIN = +20 dBm/tone, f0 = 2.4 GHz		46		dBm
Error vector magnitude	EVM	802.11g, 2.4 GHz, PIN = +24 dBm		−38	−36	dB
		802.11g, 2.4 GHz, PIN = +25.5 dBm		−36	−34	dB
Startup time	ts	50% VDD to 90% of RF		2	5	μs
Switching speed	tsw	50% VCTL to 90% RF		300	400	ns
Supply voltage	VDD	Normal test conditions	3	3.3	5	V
Control voltage high	VCTL_H	Normal test conditions	1.6	1.8	3.6	V
Control voltage low	VCTL_L	Normal test conditions		0	0.4	V
Supply current	IDD	Normal test conditions		5	10	μA

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

Table 4. SKYA21039 Electrical Specifications¹
(VDD = 3.3 V, VCTL = 0 V and +1.8 V, TOP = −40 °C, PIN = 0 dBm,
Characteristic Impedance [Zo] = 50 Ω, unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Insertion loss	IL	2.4 to 2.4 GHz		0.75	1.05	dB
Isolation RFC to RF1/RF2 or RF3	ISO	2.4 to 2.4 GHz	31	35		dB
Isolation RF1 to RF2	ISO	2.4 to 2.4 GHz	35	40		dB
Return loss	RL	2.4 to 2.4 GHz		12		dB
P0.1 dB compression point	P0.1dB	2.4 to 2.4 GHz		+29		dBm
Harmonics		PIN = +24 dBm, f0 = 2.4 GHz:				
		— 2f0		−50		dBm
		— 3f0		−32		dBm
Input IP3	IP3	PIN = +20 dBm/tone, f0 = 2.4 GHz		46		dBm
Error vector magnitude	EVM	802.11g, 2.4 GHz, PIN = +24 dBm		−38	−36	dB
		802.11g, 2.4 GHz, PIN = +25.5 dBm		−36	−34	dB
Startup time	ts	50% VDD to 90% of RF		2	5	μs
Switching speed	tsw	50% VCTL to 90% RF		300	400	ns
Supply voltage	VDD	Normal test conditions	3	3.3	5	V
Control voltage high	VCTL_H	Normal test conditions	1.6	1.8	3.6	V
Control voltage low	VCTL_L	Normal test conditions		0	0.4	V
Supply current	IDD	Normal test conditions		5	10	μA

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

Table 5. SKYA21039 Electrical Specifications¹
(VDD = 3.3 V, VCTL = 0 V and +1.8 V, TOP = +105 °C, PIN = 0 dBm,
Characteristic Impedance [Zo] = 50 Ω, unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Insertion loss	IL	2.4 to 2.4 GHz		0.75	1.1	dB
Isolation RFC to RF1/RF2 or RF3	ISO	2.4 to 2.4 GHz	31	35		dB
Isolation RF1 to RF2	ISO	2.4 to 2.4 GHz	35	40		dB
Return loss	RL	2.4 to 2.4 GHz		12		dB
P0.1 dB compression point	P0.1dB	2.4 to 2.4 GHz		+29		dBm
Harmonics		PIN = +24 dBm, f0 = 2.4 GHz:				
		— 2f0		−50		dBm
		— 3f0		−32		dBm
Input IP3	IP3	PIN = +20 dBm/tone, f0 = 2.4 GHz		46		dBm
Error vector magnitude	EVM	802.11g, 2.4 GHz, PIN = +24 dBm		−38	−36	dB
		802.11g, 2.4 GHz, PIN = +25.5 dBm		−36	−34	dB
Startup time	ts	50% VDD to 90% of RF		2	5	μs
Switching speed	tsw	50% VCTL to 90% RF		300	410	ns
Supply voltage	VDD	Normal test conditions	3	3.3	5	V
Control voltage high	VCTL_H	Normal test conditions	1.6	1.8	3.6	V
Control voltage low	VCTL_L	Normal test conditions		0	0.4	V
Supply current	IDD	Normal test conditions		5	20	μA

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

Table 6. SKYA21039 Truth Table¹

VDD	V1	V2	RFC – RF1	RFC – RF2	RFC – RF3
1	1	1	OFF	ON	OFF
1	1	0	ON	OFF	OFF
1	0	1	OFF	ON	OFF
1	0	0	OFF	OFF	ON

¹ “1” indicates VCC = 3 to 5 V, VCTL = 1.6 to 3.6 V.
“0” indicates VCTL = 0 to 0.4 V.
Any state other than described in this table places the switch into an undefined state. Undefined state will not damage the device.

Evaluation Board Description

The SKYA21039 Evaluation Board is used to test the performance of the SKYA21039 SP3T switch. An Evaluation Board schematic diagram is provided in Figure 3. An assembly drawing for the Evaluation Board is shown in Figure 4.

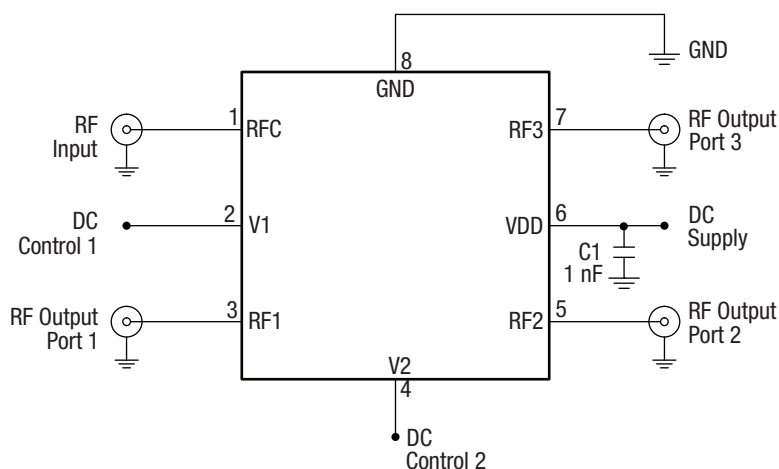
Package Dimensions

The PCB layout footprint for the SKYA21039 is provided in Figure 5. Typical part markings are shown in Figure 6. Package dimensions are shown in Figure 7, and tape and reel dimensions are provided in Figure 8.

Package and Handling Information

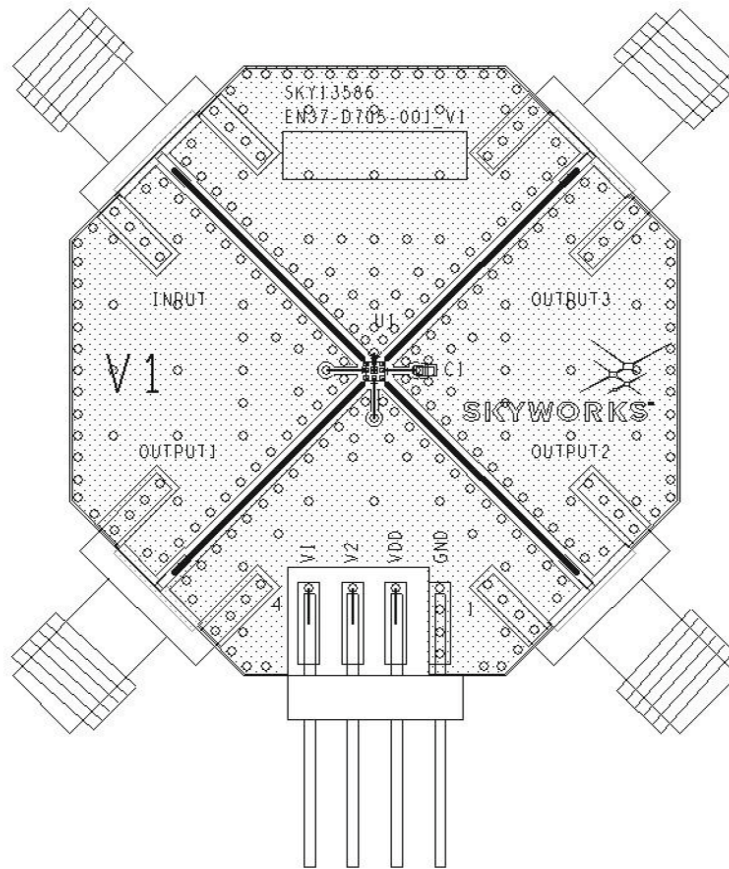
Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The SKYA21039 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.



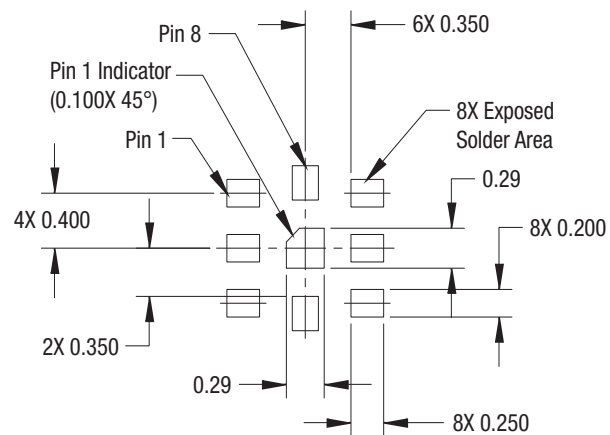
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Figure 3. SKYA21039 Evaluation Board Schematic



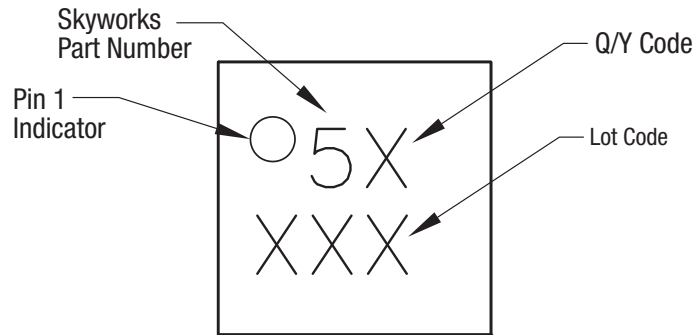
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Figure 4. SKYA21039 Evaluation Board Assembly Diagram



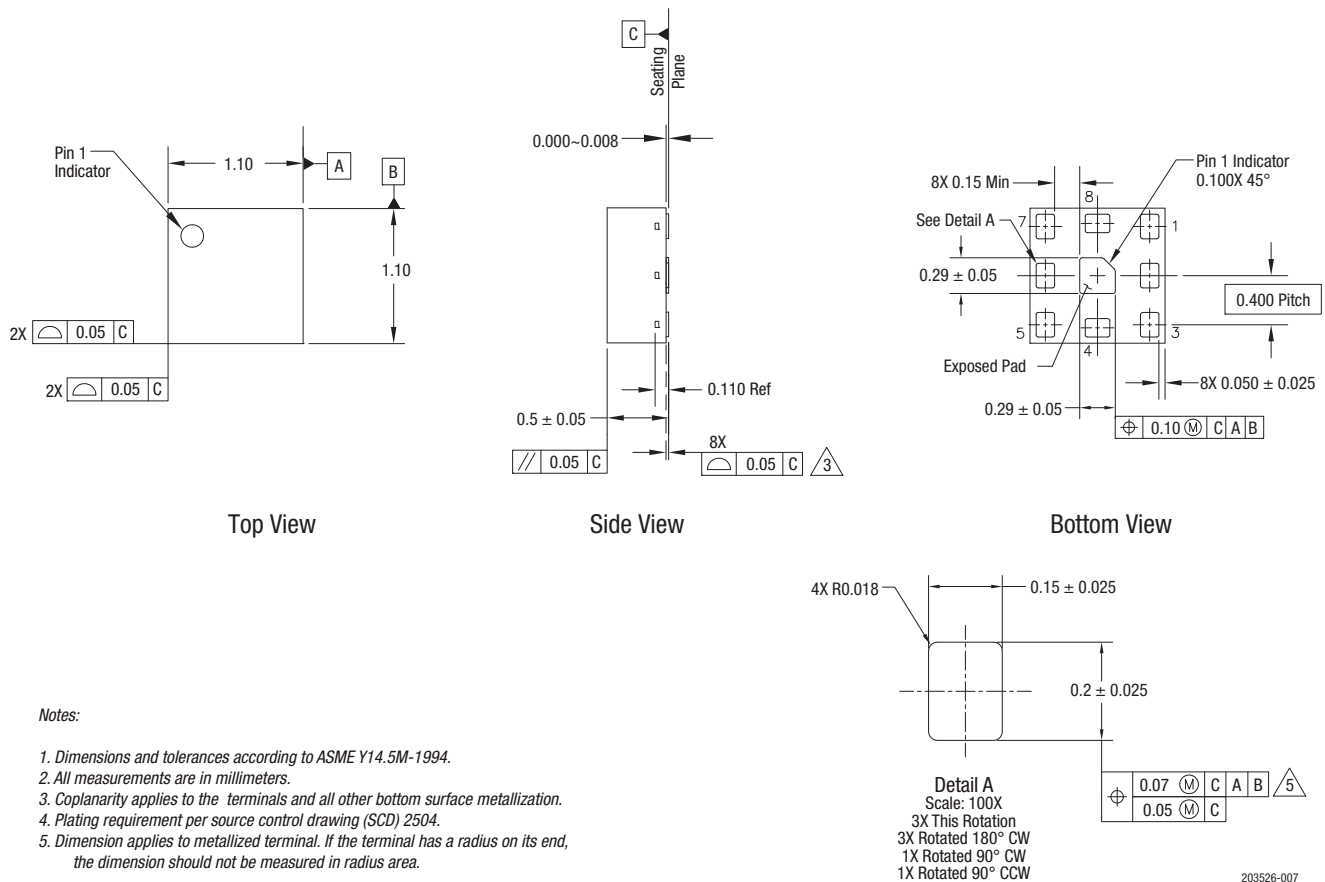
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Figure 5. SKYA21039 PCB Layout Footprint (Top View)



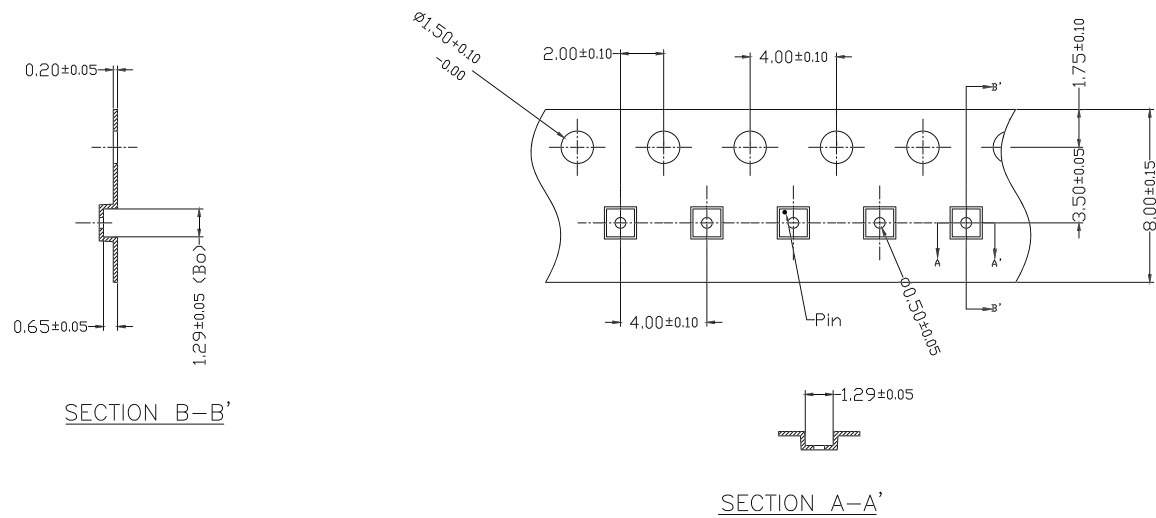
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Figure 6. SKYA21039 Typical Part Markings (Top View)



203526-007

Figure 7. SKYA21039 Package Dimensions



1. CARRIER TAPE MUST MEET ALL SKYWORKS REQUIREMENTS OF GP01-D233
PROCUREMENT SPEC FOR TAPE AND REEL
2. CARRIER TAPE SHALL BE BLACK CONDUCTIVE POLYCARBONATE.
3. COVER TAPE SHALL BE TRANSPARENT CONDUCTIVE MATERIAL
4. ESD-SURFACE RESISTIVITY SHALL MEET GP01-D233
5. 10 SPROCKET HOLE PITCH CUMULATIVE TOLERANCE : $\pm 0.20\text{mm}$
6. A0 & B0 MEASURED ON PLANE 0.30mm ABOVE THE BOTTOM OF THE POCKET.
7. ALL DIMENSIONS ARE IN MILLIMETERS.

203526-008

Figure 8. SKYA21039 Tape and Reel Dimensions

Ordering Information

Part Number	Part Description	Evaluation Board Part Number
SKYA21039	2.4 to 2.5 GHz SP3T Switch	SKYA21039-EVB

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