

## DATA SHEET

# SKYA21001: 20 MHz to 3.0 GHz SPDT Switch

## Automotive Applications

- Infotainment
- Automated toll systems
- Garage door opener
- 802.11 b/g/n WLAN, Bluetooth® systems
- Wireless control systems
- Outdoor lighting control
- Remote keyless entry
- Telematics
- GPS/Navigation

## Features

- IP1dB = +30 dBm typical @ 3 V
- IP3 = +43 dBm typical @ 3 V
- Low insertion loss: 0.3 dB @ 0.9 GHz
- Low DC power consumption
- Ultra-miniature, SC-70 (6-pin, 2.00 x 1.25 mm) package
- Designed and manufactured in an ISO/TS16949-certified facility
- AEC-Q100 qualified
- JEDEC (JESD22) qualified at 25 °C
- Lead (Pb)-free and RoHS-compliant (MSL-1 @ 260 °C per JEDEC J-STD-020)



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

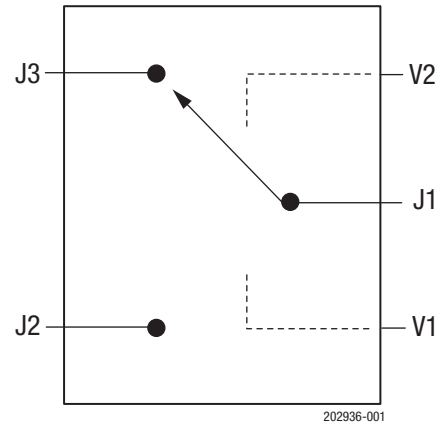


Figure 1. SKYA21001 Block Diagram

## Description

The SKYA21001 is a single-pole, double-throw (SPDT) switch. The device features low insertion loss and positive voltage operation with very low DC power consumption. The SKYA21001 is manufactured in a compact 2.00 x 1.25 mm, 6-pin SC-70 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.

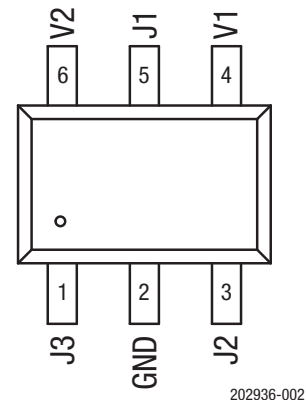


Figure 2. SKYA21001 Pinout (Top View)

**Table 1. SKYA21001 Signal Descriptions**

Pin	Name	Description	Pin	Name	Description
1	J3	RF output <sup>1</sup>	4	V1	DC control voltage
2	GND	Ground	5	J1	RF output <sup>1</sup>
3	J2	RF output <sup>1</sup>	6	V2	DC control voltage

<sup>1</sup> A 100 pF blocking capacitor is required for >500 MHz operation. Use larger value capacitors for lower frequency operation.

## Electrical and Mechanical Specifications

The absolute maximum ratings of the SKYA21001 are provided in Table 2. The electrical specifications of the SKYA21001 are provided in Table 3.

Typical performance characteristics are shown in Figures 3, 4, and 5. Table 4 shows the truth table.

**Table 2. SKYA21001 Absolute Maximum Ratings<sup>1</sup>**

Parameter	Symbol	Minimum	Maximum	Units
Control voltage	V <sub>CTL</sub>	-0.2	+8.0	V
RF input power (V <sub>CTL</sub> = 0 to 7 V):				
>500 MHz			+36	dBm
<500 MHz			+27	dBm
Operating temperature	T <sub>OP</sub>	-40	+105	°C
Storage temperature	T <sub>STG</sub>	-65	+150	°C

<sup>1</sup> 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.

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**ESD HANDLING:** Although this device is designed to be as robust as possible, electrostatic discharge (ESD) can damage this device. This device must be protected at all times from ESD when handling or transporting. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD handling precautions should be used at all times.

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**Table 3. SKYA21001 Electrical Specifications<sup>1</sup>****(V<sub>CTL</sub> = 0 to 3 V, T<sub>OP</sub> = +25 °C, Characteristic Impedance = 50 Ω, Unless Otherwise Noted)**

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Insertion loss <sup>2,3</sup>	IL	0.7 to 1.0 GHz, 25°C		0.3	0.4	dB
		1.0 to 2.0 GHz, 25°C		0.4	0.5	dB
		2.0 to 3.0 GHz, 25°C		0.4	0.6	dB
Insertion loss (ETC) <sup>4</sup>	IL	0.7 to 1.0 GHz, -40°C to 105 °C		0.35	0.45	dB
		1.0 to 2.0 GHz, -40°C to 105 °C		0.41	0.55	dB
		2.0 to 3.0 GHz, -40°C to 105 °C		0.46	0.7	dB
Isolation <sup>3</sup>	ISO	0.7 to 1.0 GHz, 25°C	22	25		dB
		1.0 to 2.0 GHz, 25°C	22	25		dB
		2.0 to 3.0 GHz, 25°C	20	23		dB
Isolation (ETC) <sup>4</sup>	ISO	0.7 to 1.0 GHz, -40°C to 105 °C	22	24		dB
		1.0 to 2.0 GHz, -40°C to 105 °C	22	23.5		dB
		2.0 to 3.0 GHz, -40°C to 105 °C	20	23		dB
Voltage standing wave ratio	VSWR	0.7 to 1.0 GHz, 25°C		1.2:1	1.4:1	
		1.0 to 2.0 GHz, 25°C		1.2:1	1.4:1	
		2.0 to 3.0 GHz, 25°C		1.3:1	1.45:1	
Voltage standing wave ratio (ETC) <sup>4</sup>	VSWR	0.7 to 1.0 GHz, -40°C to 105 °C		1.2:1	1.4:1	
		1.0 to 2.0 GHz, -40°C to 105 °C		1.2:1	1.4:1	
		2.0 to 3.0 GHz, -40°C to 105 °C		1.3:1	1.45:1	
Switching characteristics: Rise/fall On/off Video feedthrough	T <sub>SW</sub> T <sub>ON</sub>	10/90% or 90/10% RF, 25°C		90	180	ns
		50% control to 90/10% RF, 25°C		125	250	ns
		bandwidth = 500 MHz, 25°C		25		mV
Switching characteristics (ETC): <sup>4</sup> Rise/fall (ETC)  On/off (ETC)	T <sub>SW</sub> T <sub>ON</sub>	10/90% or 90/10% RF, -40°C to 105 °C		90	180	ns
		50% control to 90/10% RF, -40°C to 105 °C		150	250	ns
1 dB input compression point	IP1dB	0.7 to 3.0 GHz:  V <sub>CTL</sub> = 0 to 2 V, 25°C	+23	+25		dBm
		V <sub>CTL</sub> = 0 to 3 V, 25°C	+28	+30		dBm
		V <sub>CTL</sub> = 0 to 5 V, 25°C	+31	+34		dBm
1 dB input compression point (ETC) <sup>4</sup>	IP1dB	0.7 to 3.0 GHz:  V <sub>CTL</sub> = 0 to 2 V, 25°C	+18	+20		dBm
		V <sub>CTL</sub> = 0 to 3 V, 25°C	+23	+26		dBm
		V <sub>CTL</sub> = 0 to 5 V, 25°C	+26	+30		dBm
Third order intercept point	IP3	+5 dBm two-tone input power @ 0.7 to 3.0 GHz:  V <sub>CTL</sub> = 0 to 2 V, 25°C	+36	+49		dBm
		V <sub>CTL</sub> = 0 to 3 V, 25°C	+42	+52		dBm
		V <sub>CTL</sub> = 0 to 5 V, 25°C	+44	+53		dBm
Third order intercept point (ETC) <sup>4</sup>	IP3	V <sub>CTL</sub> = 0 to 2 V, -40°C to 105 °C	+35	+49		dBm
		V <sub>CTL</sub> = 0 to 3 V, -40°C to 105 °C	+39	+50		dBm
		V <sub>CTL</sub> = 0 to 5 V, -40°C to 105 °C	+41	+51		dBm
Control voltage: Low (@ 20 μA max) High (@100 μA max) High (@ 200 μA max)	V <sub>CTL_L</sub> V <sub>CTL_H</sub> V <sub>CTL_H</sub>		0		0.2 2.0 5.0	V V V

<sup>1</sup> Performance is guaranteed only under the conditions listed in this table.<sup>2</sup> Insertion loss changes by 0.003 dB/°C.<sup>3</sup> Insertion loss state.<sup>4</sup> ETC = Extreme Test Conditions (V<sub>CTL</sub> = 0 to 5 V, T<sub>OP</sub> = -40 °C to +105 °C).

Typical Performance Characteristics

(V<sub>CTL</sub> = 0 to 3 V, T<sub>OP</sub> = +25 °C, P<sub>IN</sub> = 0 dBm, Characteristic Impedance [Z<sub>0</sub>] = 50 Ω, C<sub>BL</sub> = 100 pF, Unless Otherwise Noted)

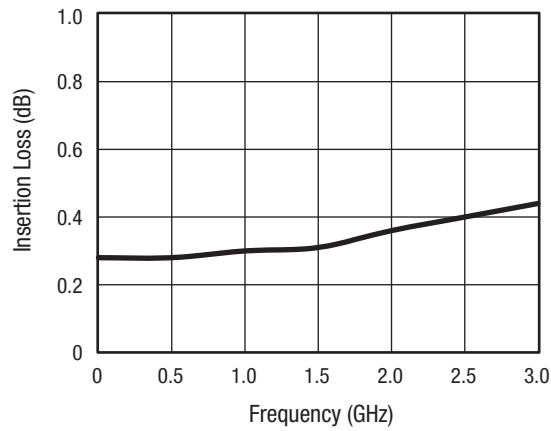


Figure 3. Insertion Loss vs Frequency

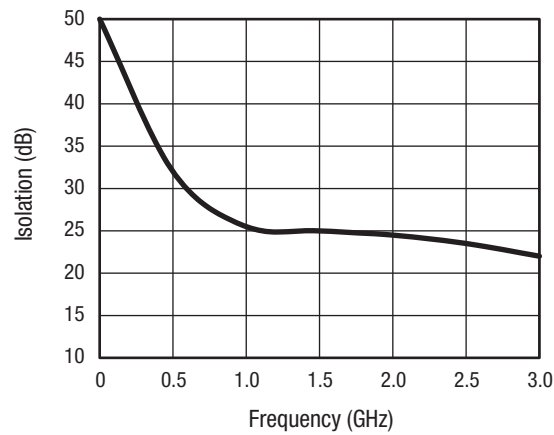


Figure 4. Isolation vs Frequency

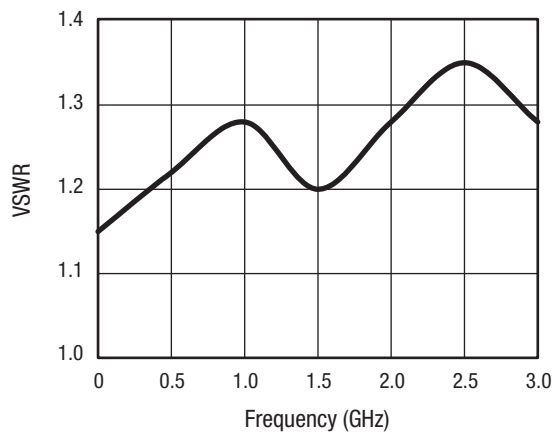


Figure 5. VSWR vs Frequency

Table 4. Truth Table (V<sub>HIGH</sub> = 2.0 to 5.0 V, V<sub>LOW</sub> = -0.2 to +0.2 V) <sup>1</sup>

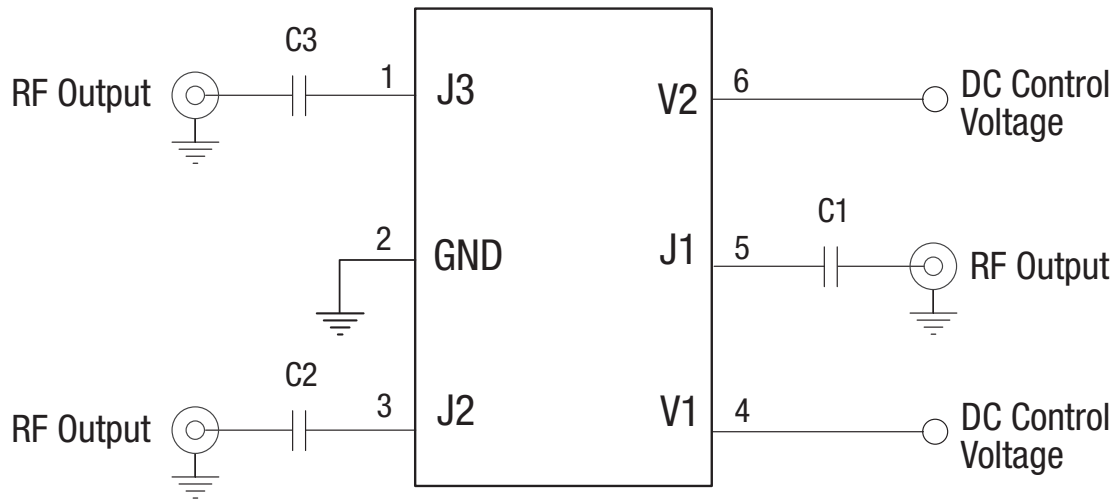
V1	V2	J1-J2	J1-J3
V <sub>HIGH</sub>	V <sub>LOW</sub>	Isolation	Insertion loss
V <sub>LOW</sub>	V <sub>HIGH</sub>	Insertion loss	Isolation

<sup>1</sup> Any state other than described in this table places the device in an undefined state. An undefined state does not damage the device.

## Evaluation Board Description

The SKYA21001 Evaluation Board is used to test the performance of the SKYA21001 SPDT switch. An Evaluation Board schematic

diagram is provided in Figure 6. An assembly drawing for the Evaluation Board is shown in Figure 7.

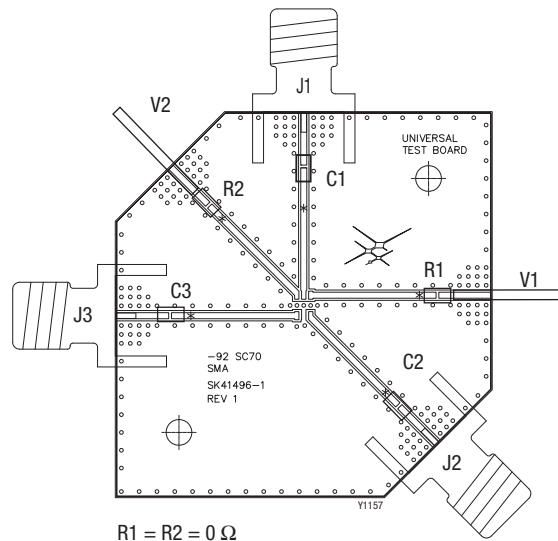


*Note: Use 100 pF blocking capacitors (C1, C2, C3) for >500 MHz operation. Higher values recommended for lower frequency operation. Exposed paddle must be grounded.*

*Use 10 nF blocking capacitors (C1, C2, C3) for <50 MHz operation.*

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**Figure 6. SKYA21001 Evaluation Board Schematic**



**Figure 7. SKYA21001 Evaluation Board Assembly Diagram**

## Package Dimensions

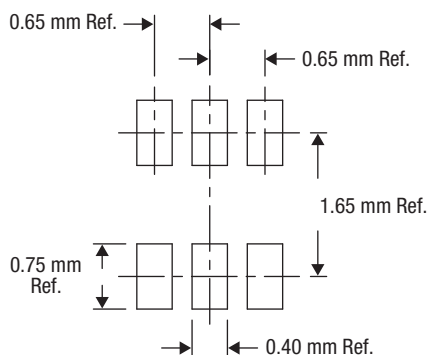
The PCB layout footprint for the SKYA21001 is shown in Figure 8. Package dimensions are shown in Figure 9, and tape and reel dimensions are provided in Figure 10.

## 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.

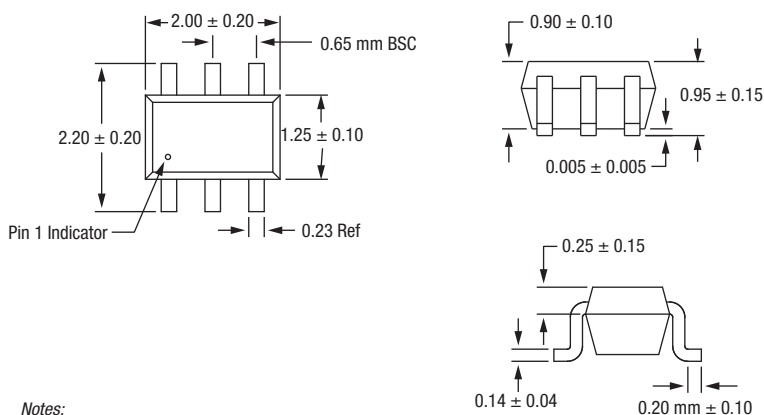
The SKYA21001 is rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C. It can be used for lead or lead-free soldering.

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 8. SKYA21001 PCB Layout Footprint**

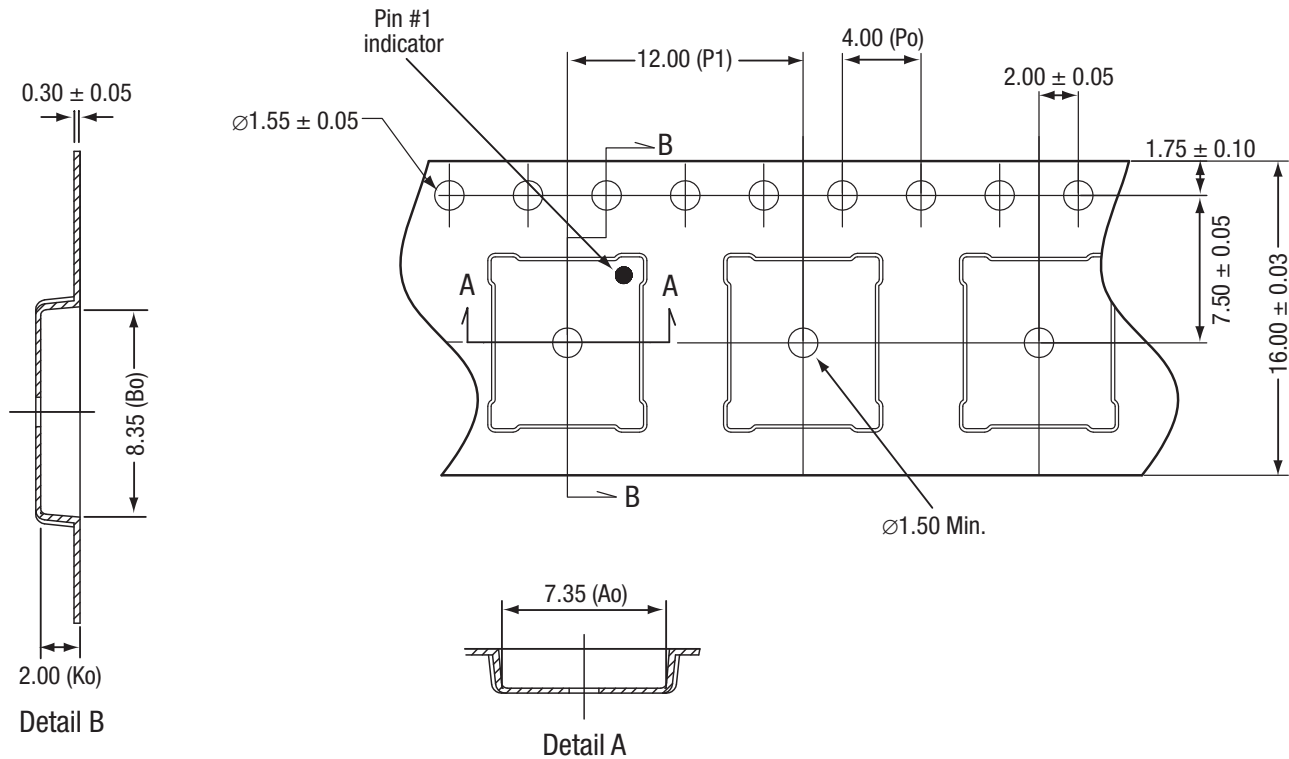


Notes:

1. All measurements are in millimeters.
2. Dimensions and tolerances according to ASME Y14.5M-1994.

202936-009

**Figure 9. SKYA21001 Package Dimensions**



## Notes:

1. Carrier tape material: black conductive polystyrene
2. Cover tape material: transparent conductive PSA
3. Cover tape size: 13.3 mm width
4. Ao and Bo measurement point to be 0.30 from bottom pocket.
4. All measurements are in millimeters

202936-010

**Figure 10. SKYA21001 Tape and Reel Dimensions**

## Ordering Information

Model Name	Manufacturing Part Number	Evaluation Board Part Number
SKYA21001: SPDT Switch	SKYA21001	SKYA21001-EVB

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