

**DATA SHEET**

# SKYA21001: 20 MHz to 3.0 GHz SPDT Switch

## Automotive Applications

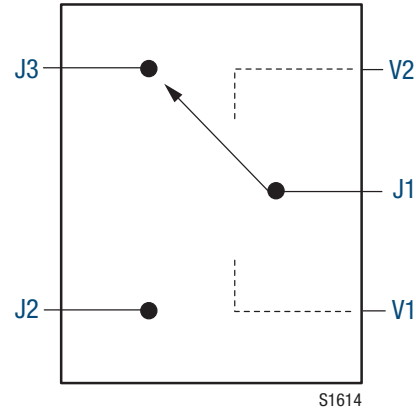
- Infotainment
- Automated toll systems
- Garage door opener
- 802.11 b/g/n WLAN, Bluetooth® systems
- Wireless control systems
- Outdoor lighting control
- Remote keyless entry
- Telematics
- GPS/Navigation

## 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.

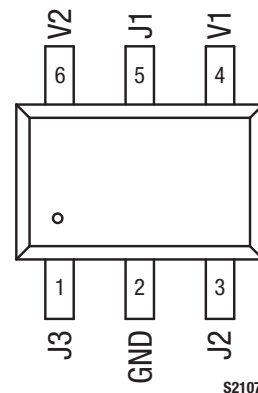


**Figure 1. SKYA21001 Block Diagram**

## 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 – 6-Pin SC-70 (Top View)**

**Table 1. SKYA21001 Signal Descriptions**

Pin	Name	Description	Pin	Name	Description
1	J3	RF output (Note 1)	4	V1	DC control voltage
2	GND	Ground	5	J1	RF output (Note 1)
3	J2	RF output (Note 1)	6	V2	DC control voltage

**Note 1:** A 100 pF blocking capacitor is required for >500 MHz operation. Use larger value capacitors for lower frequency operation.

**Table 2. SKYA21001 Absolute Maximum Ratings (Note 1)**

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 <500 MHz			+36 +27	dBm dBm
Operating temperature	T <sub>OP</sub>	-40	+105	°C
Storage temperature	T <sub>STG</sub>	-65	+150	°C

**Note 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.

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**CAUTION:** 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. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions should be used at all times.

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**Table 3. SKYA21001 Electrical Specifications (Note 1)**  
**( $V_{CTL} = 0$  to 3 V,  $T_{OP} = +25$  °C, Characteristic Impedance = 50  $\Omega$ , Unless Otherwise Noted)**

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Insertion loss (Note 2, Note 3)	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) (Note 4)	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 (Note 3)	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) (Note 4)	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) (Note 4)	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>	10/90% or 90/10% RF, 25°C		90	180	ns
	T <sub>ON</sub>	50% control to 90/10% RF, 25°C		125	250	ns
		bandwidth = 500 MHz, 25°C		25		mV
Switching characteristics (ETC) (Note 4): Rise/fall (ETC)  On/off (ETC)	T <sub>SW</sub>	10/90% or 90/10% RF, -40°C to 105 °C		90	180	ns
	T <sub>ON</sub>	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:  $V_{CTL} = 0$ to 2 V, 25°C	+23	+25		dBm
		$V_{CTL} = 0$ to 3 V, 25°C	+28	+30		dBm
		$V_{CTL} = 0$ to 5 V, 25°C	+31	+34		dBm
1 dB input compression point (ETC) (Note 4)	IP1dB	0.7 to 3.0 GHz:  $V_{CTL} = 0$ to 2 V, 25°C	+18	+20		dBm
		$V_{CTL} = 0$ to 3 V, 25°C	+23	+26		dBm
		$V_{CTL} = 0$ 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:  $V_{CTL} = 0$ to 2 V, 25°C	+36	+49		dBm
		$V_{CTL} = 0$ to 3 V, 25°C	+42	+52		dBm
		$V_{CTL} = 0$ to 5 V, 25°C	+44	+53		dBm
Third order intercept point (ETC) (Note 4)	IP3	$V_{CTL} = 0$ to 2 V, -40°C to 105 °C	+35	+49		dBm
		$V_{CTL} = 0$ to 3 V, -40°C to 105 °C	+39	+50		dBm
		$V_{CTL} = 0$ to 5 V, -40°C to 105 °C	+41	+51		dBm
Control voltage: Low (@ 20 $\mu$ A max) High (@100 $\mu$ A max) High (@ 200 $\mu$ A max)	$V_{CTL\_L}$		0		0.2	V
	$V_{CTL\_H}$				2.0	V
	$V_{CTL\_H}$				5.0	V

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

**Note 2:** Insertion loss changes by 0.003 dB/°C.

**Note 3:** Insertion loss state.

**Note 4:** ETC = Extreme Test Conditions ( $V_{CTL} = 0$  to 5 V,  $T_{OP} = -40$  °C to +105 °C).

### Typical Performance Characteristics

( $V_{CTL} = 0$  to  $3$  V,  $T_{OP} = +25$  °C,  $P_{IN} = 0$  dBm, Characteristic Impedance [ $Z_0$ ] =  $50 \Omega$ ,  $C_{BL} = 100$  pF, Unless Otherwise Noted)

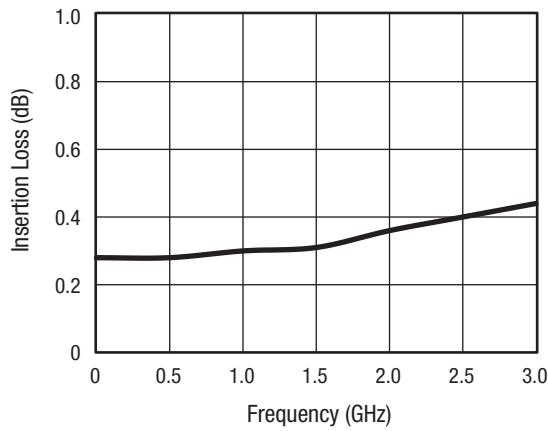


Figure 2. Insertion Loss vs Frequency

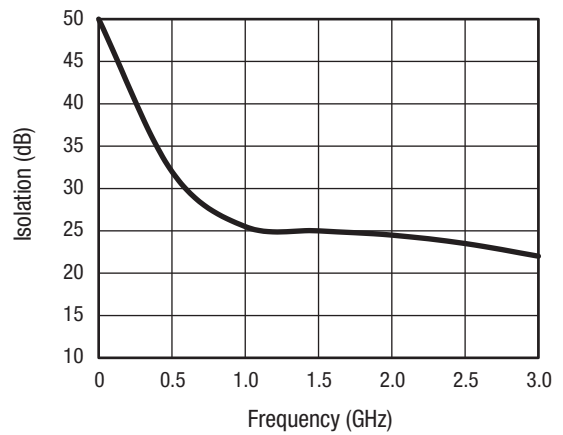


Figure 3. Isolation vs Frequency

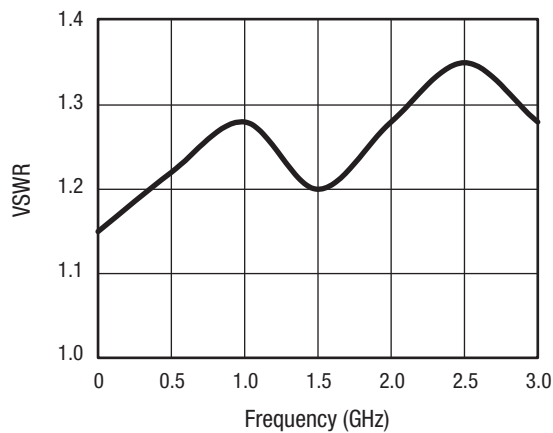


Figure 4. VSWR vs Frequency

Table 4. Truth Table ( $V_{HIGH} = 2.0$  to  $5.0$  V,  $V_{LOW} = -0.2$  to  $+0.2$  V) (Note 1)

V1	V2	J1-J2	J1-J3
$V_{HIGH}$	$V_{LOW}$	Isolation	Insertion loss
$V_{LOW}$	$V_{HIGH}$	Insertion loss	Isolation

Note 1: 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 5. An assembly drawing for the Evaluation Board is shown in Figure 6.

### Package Dimensions

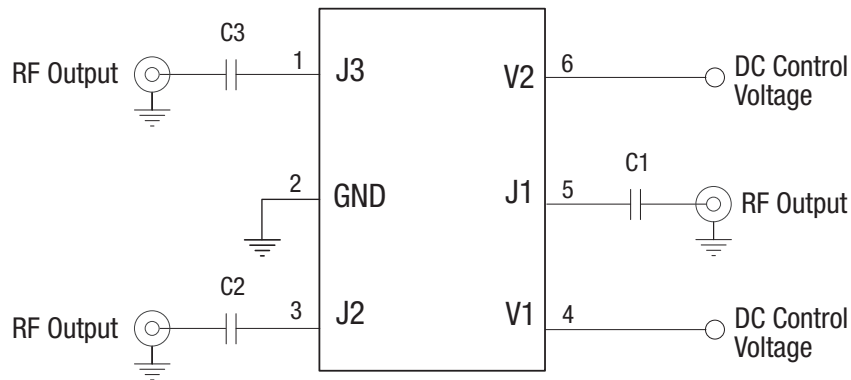
Package dimensions for the 6-pin SC-70 are shown in Figure 7, and tape and reel dimensions are provided in Figure 8.

### 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 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.



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 5. SKYA21001 Evaluation Board Schematic

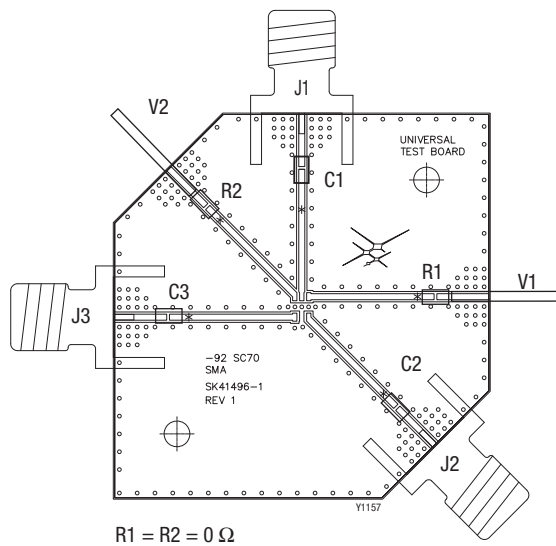
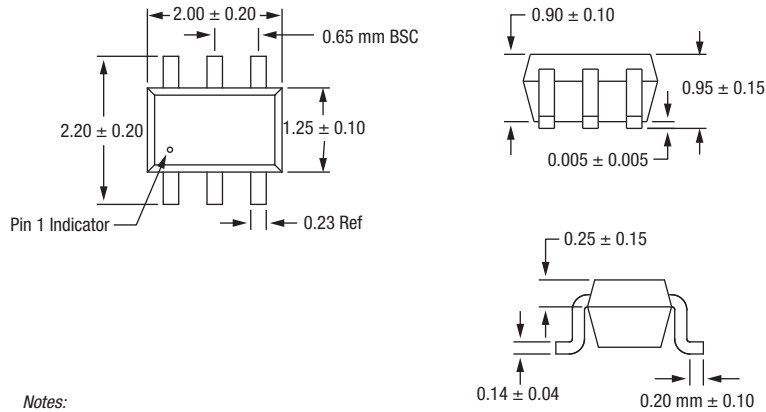


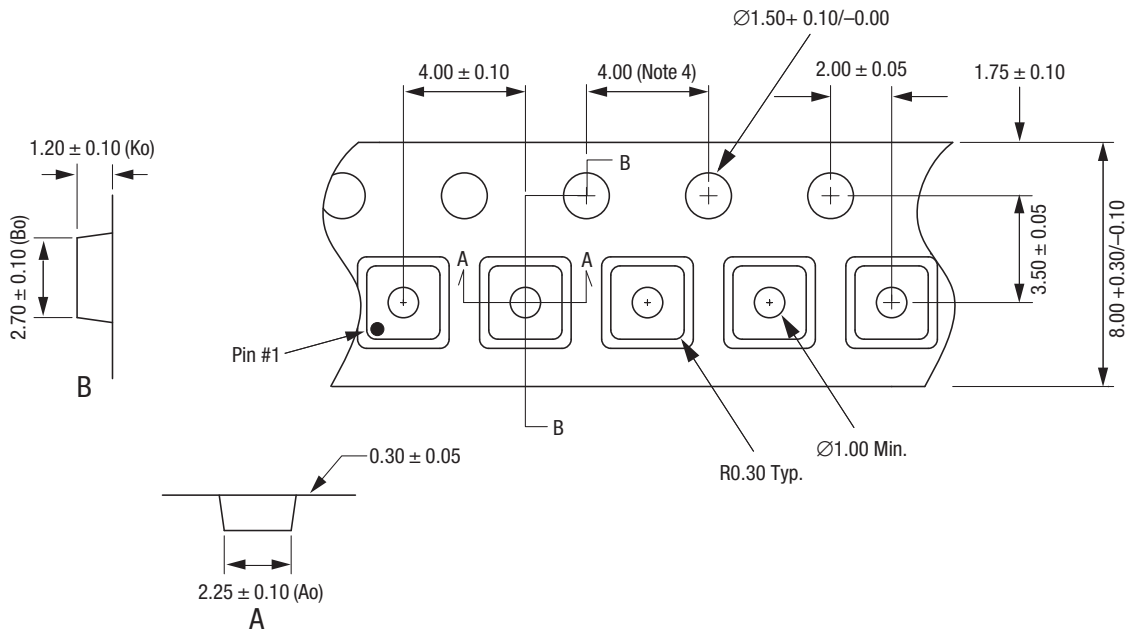
Figure 6. SKYA21001 Evaluation Board Assembly Diagram



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

Y2125

Figure 7. SKYA21001 6-Pin SC-70 Package Dimensions



- Notes:
1. Carrier tape: black conductive polystyrene.
  2. Cover tape material: transparent conductive HSA.
  3. Cover tape size: 5.40 mm width.
  4. Ten sprocket hole pitch cumulative tolerance  $\pm 0.20$  mm.
  5. All measurements are in millimeters.

S1581

Figure 8. 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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