

SKYA21001: 20 MHz to 3.0 GHz SPDT Switch

Automotive Applications

- Infotainment
- Automated toll systems
- Garage door openers
- 802.11 b/g/n WLAN, Bluetooth® systems
- Wireless control systems
- Outdoor lighting controls
- Remote keyless entry systems
- 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
- AEC-Q100 qualified
- JEDEC (JESD22) qualified at 25 °C
- Lead (Pb)-free and RoHS-compliant
- (MSL-1 @ 260 °C per JEDEC J-STD-020)

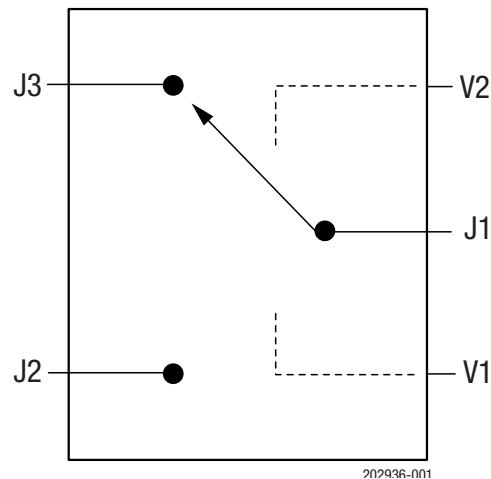


Figure 1. SKYA21001 Block Diagram

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.



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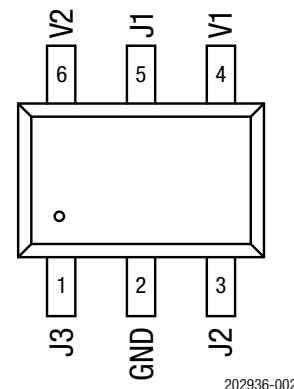


Figure 2. SKYA21001 Pinout (Top View)

Table 1: SKYA21001 Signal Descriptions

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

¹A 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 and 4. The truth table is shown in Table 4.

Table 2: SKYA21001 Absolute Maximum Ratings¹

Parameter	Symbol	Minimum	Maximum	Units
Control voltage	VCTL	-0.2	+8.0	V
RF input power (VCTL = 0 to 7 V):				
>500 MHz			+36	dBm
<500 MHz			+27	dBm
Operating temperature	TOP	-40	+105	°C
Storage temperature	TSTG	-65	+150	°C
Electrostatic discharge:	ESD		250	V
Human Body Model (HBM), Class 1A				
Charged Device Model (CDM), Class C3			1000	

¹Exposure 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.

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

Table 3: SKYA21001 Electrical Specifications¹

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

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

Typical Performance Characteristics

(VCTL = 0 to 3 V, TOP = +25 °C, PIN = 0 dBm, Characteristic Impedance [Zo] = 50 Ω, CBL = 100 pF, Unless Otherwise Noted)

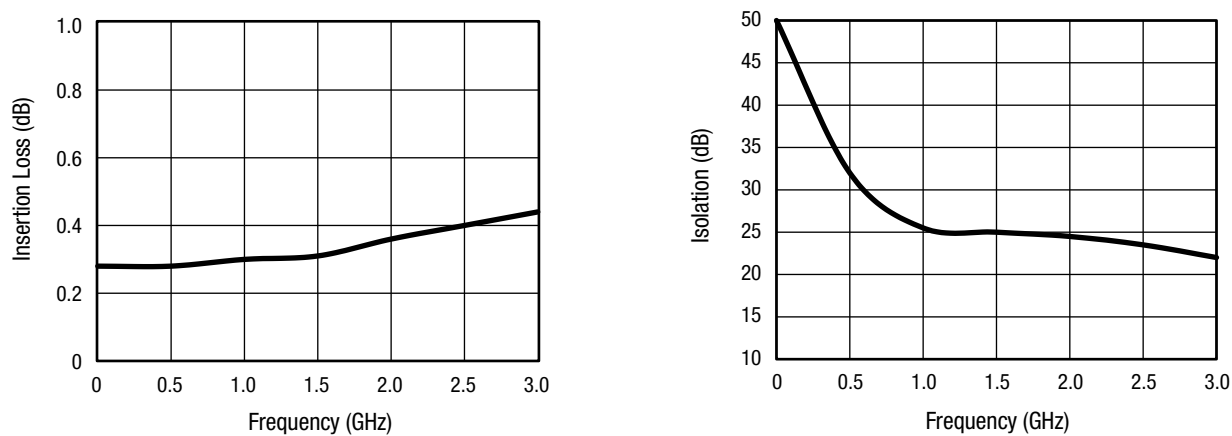


Figure 3. Left: Insertion Loss vs Frequency Right: Isolation vs Frequency

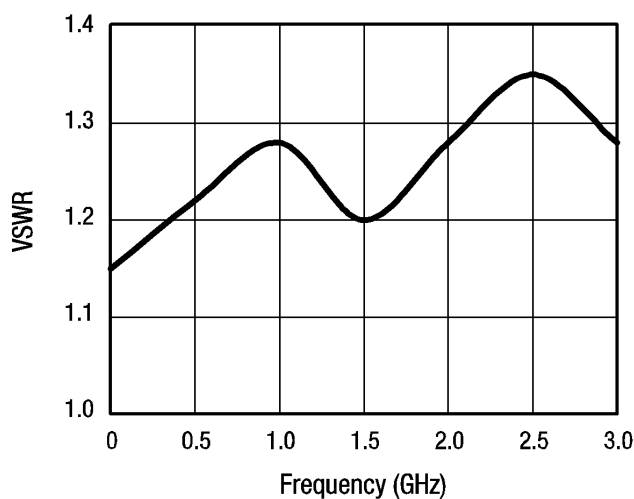


Figure 4. VSWR vs Frequency

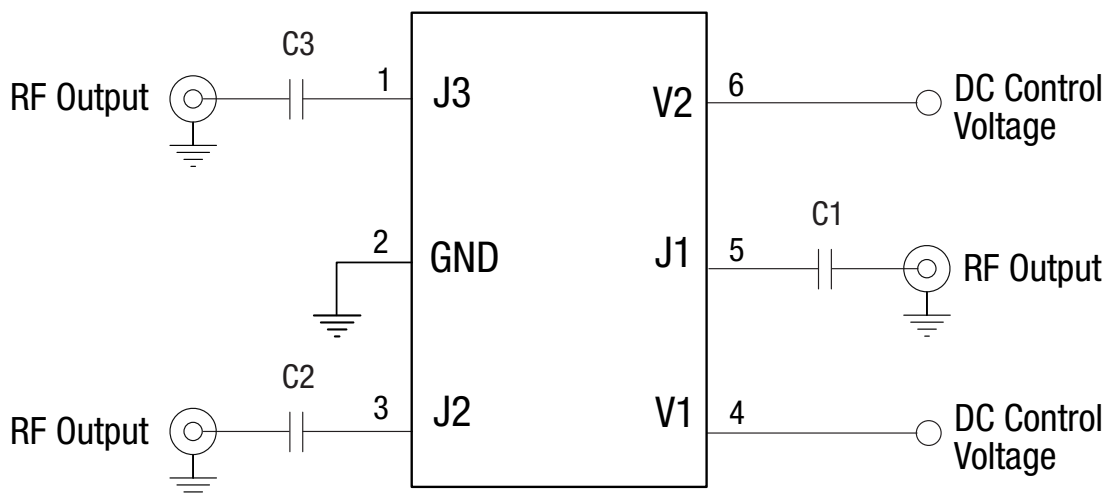
Table 4: Truth Table (VHIGH = 2.0 to 5.0 V, VLOW = -0.2 to +0.2 V)¹

V1	V2	J1-J2	J1-J3
VHIGH	VLOW	Isolation	Insertion loss
VLOW	VHIGH	Insertion loss	Isolation

¹Any 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.



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

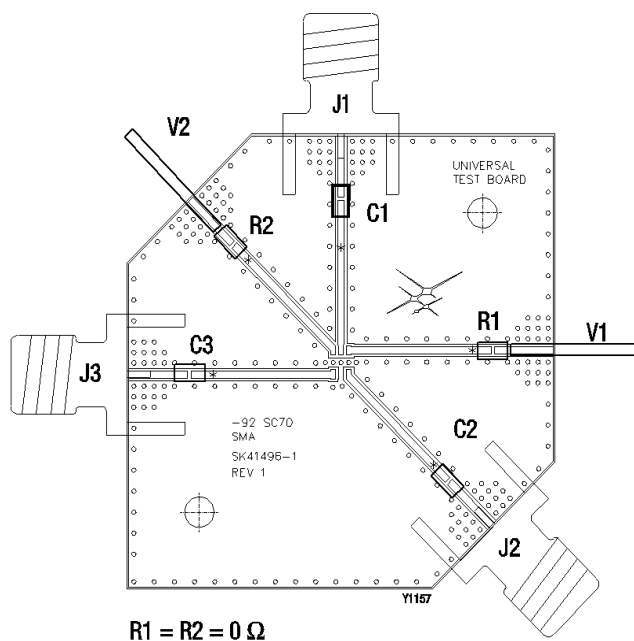


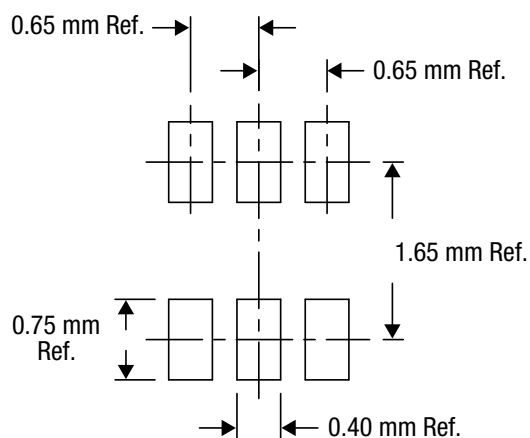
Figure 6. SKYA21001 Evaluation Board Assembly Diagram

Package Dimensions

The PCB layout footprint for the SKYA21001 is shown in Figure 7. Package dimensions are shown in Figure 8, and tape and reel dimensions are provided in Figure 9.

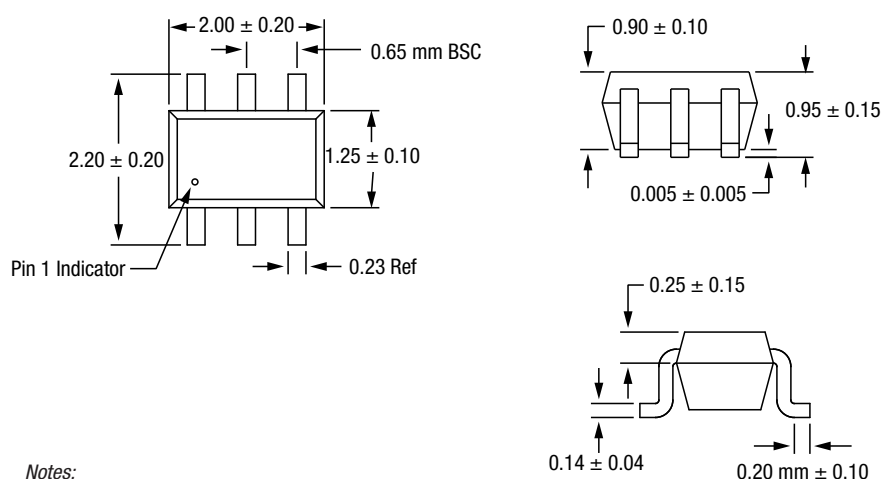
Package and Handling Information

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 7. SKYA21001 PCB Layout Footprint

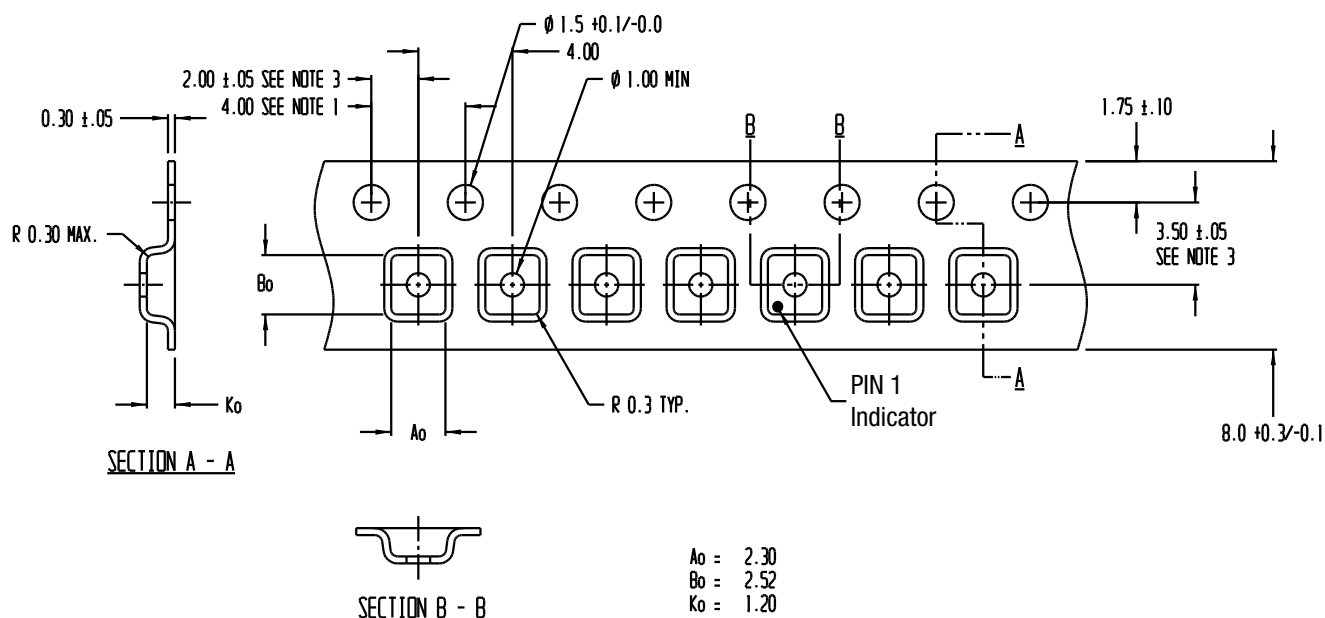


Notes:

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

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Figure 8. SKYA21001 Package Dimensions



NOTES:

1. 10 SPROCKET HOLE PITCH CUMULATIVE TOLERANCE ± 0.2
2. CAMBER IN COMPLIANCE WITH EIA 481
3. POCKET POSITION RELATIVE TO SPROCKET HOLE MEASURED AS TRUE POSITION OF POCKET, NOT POCKET HOLE
4. Ao AND Bo ARE CALCULATED ON A PLANE AT A DISTANCE "R" ABOVE THE BOTTOM OF THE POCKET.

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Figure 9. SKYA21001 Tape and Reel Dimensions

Ordering Information

Part Number	Part Description	Evaluation Board Part Number
SKYA21001	20 MHz to 3.0 GHz SPDT Switch	SKYA21001-EVB

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