



SKYA21062: 0.1 to 6.0 GHz SP3T Switch

Applications

- Automotive WLAN 802.11a/b/g/n/ac networks
- WLAN repeaters
- ISM band radios
- Automotive infotainment

Features

- Broadband frequency range: 0.1 to 6.0 GHz
- Low insertion loss: 0.45 dB @ 2.5 GHz
- High isolation: 30 dB up to 2.5 GHz
- No external DC blocking capacitors required
- Positive low voltage control: VCTL = 1.65 to 3.00 V, VDD = 2.5 to 4.8 V
- Automotive Level 3 PPAP available
- IMDS material declaration available
- Independent BOM management to minimize PCN risk
- Small QFN (12-pin, 2 x 2 mm) package (MSL1, 260° C per JEDEC J-STD-020)



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Description

The SKYA21062 is a CMOS silicon-on-insulator (SOI), single-pole, triple-throw (SP3T) switch. The high linearity performance and low insertion loss makes the device an ideal choice for WCDMA handset and data card applications.

The SKYA21062 SP3T switch is provided in a compact Quad Flat No-Lead (QFN) 2 x 2 mm 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.

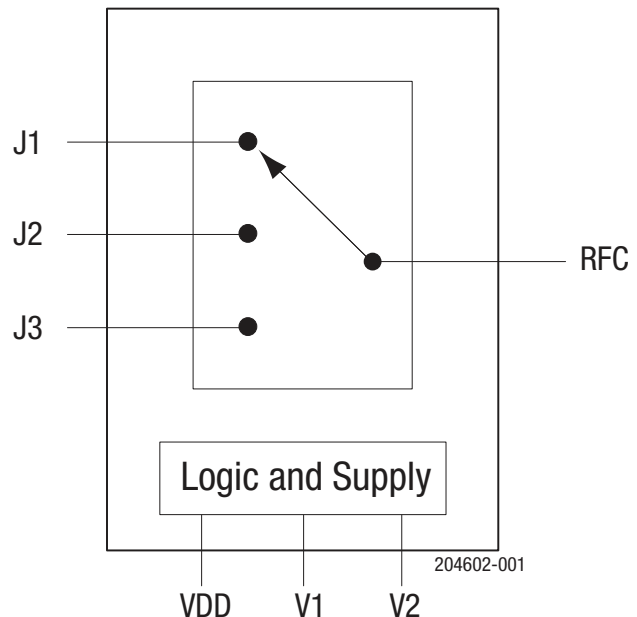


Figure 1. SKYA21062 Block Diagram

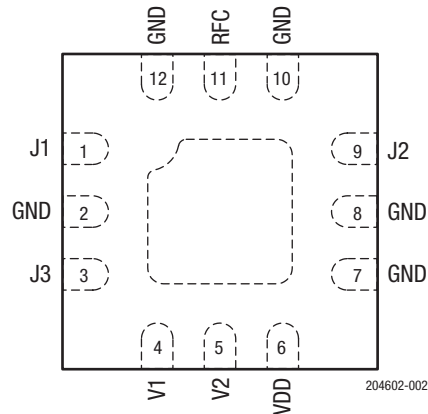


Figure 2. SKYA21062 Pinout (Top View)

Table 1. SKYA21062 Signal Descriptions¹

Pin	Name	Description	Pin	Name	Description
1	J1	RF port 1	7	GND	Ground
2	GND	Ground	8	GND	Ground
3	J3	RF port 3	9	J2	RF port 2
4	V1	DC control voltage 1 (see Table 4)	10	GND	Ground
5	V2	DC control voltage (see Table 4)	11	RFC	RF common (antenna) ports
6	VDD	DC power supply	12	GND	Ground

¹ Exposed pad must be grounded

Functional Description

The SKYA21062 includes an internal negative voltage generator and decoder that eliminate the need for external DC blocking capacitors on the RF ports. No external components are required for proper operation. DC decoupling capacitors may be added on the VDD and control lines if necessary.

Switching is controlled by two control voltage inputs, V1 and V2. Depending on the logic voltage level applied to the control pins, the RFC (RF common) pin is connected to one of three switched RF outputs (J1, J2, or J3) through a low insertion path, while the path between the RFC pin and the other RF pins is in a high isolation state.

Shutdown mode is enabled by connecting all control pins to logic low. This mode reduces the overall current consumption of the device to 5 μ A, typical. To prevent the switch from accidentally entering shutdown mode during switching, all states must be set to logic low for at least 20 μ s. When exiting shutdown mode, the switch has a 10.5 μ s startup time before switching occurs..

Electrical and Mechanical Specifications

The absolute maximum ratings of the SKYA21062 are provided in Table 2. Electrical specifications are provided in Table 3.

The state of the SKYA21062 is determined by the logic provided in Table 4.

Typical performance characteristics of the SKYA21062 are illustrated in Figures 3 through 6.

Table 2. SKYA21062 Absolute Maximum Ratings¹

Parameter	Symbol	Minimum	Maximum	Units
Supply voltage	VDD	2.5	4.8	V
Control voltage ²	VCTL	1.35	3.30	V
Input power	PIN		+39	dBm
Storage temperature	TSTG	-40	+125	°C
Operating temperature	TOP	-40	+85	°C

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.

² Any bias voltage applied to the V1, V2, or V3 pins may damage the device if there is no bias voltage also present on the VDD pin. Maximum control voltage cannot exceed VDD.

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

Table 3. SKYA21062 Electrical Specifications¹
(VDD = 2.5 V to 4.8 V, V1 = V2 = 0 to 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	0.8 to 1.0 GHz		0.35	0.40	dB
		1.0 to 2.2 GHz		0.40	0.55	
		2.2 to 3.0 GHz		0.50	0.60	
		4.9 to 6.0 GHz		0.80	1.00	
Isolation	ISO	0.8 to 1.0 GHz	35	40		dB
		1.0 to 2.2 GHz	28	33		
		2.2 to 3.0 GHz	25	30		
		4.9 to 6.0 GHz	18	22		
Return loss	S11	0.8 to 6.0 GHz		17		dB
Third order input intercept point	IIP3	0.8 to 3.0 GHz, Δf = 1 MHz, PIN = +20 dBm/tone	+65	+70		dBm
Input 0.1 dB compression point	PO.1dB	0.8 to 6.0 GHz, RFC to J1, J2, and J3		+39		dBm
2 nd Harmonic	2fo	0.8 to 3.0 GHz, PIN = +20 dBm		+85		dBc
3 rd Harmonic	3fo	0.8 to 3.0 GHz, PIN = +20 dBm		+85		dBc
Switching rise time		10/90% RF		250		ns
Switching fall time		90/10% RF		250		ns
Switching on time		50% VCTL to 10/90% RF		1500		ns
Switching off time		50% VCTL to 90/10% RF		1500		ns
Startup time ²		Shutdown state to any RF switch state		20		μs
DC Specifications						
Control voltage: High Low	VCTL_HIGH VCTL_LOW		1.35 0		3.00 ² 0.4	V
Supply voltage	VDD		2.5		4.8	V
Supply current	IDD	VDD = 3.5 V		60		μA
Control current	ICTRL	V1 = V2 = 1.8 V		2		μA
Shutdown mode supply current	IOFF	VDD = 3.5, V1 = V2 = 0 V		5		μA

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

² Startup time refers to the amount of time it takes for the switch to be fully operational when coming out of shutdown mode (EN = 0).

Table 4. SKYA21003 Truth Table¹

V1 (Pin 4)	V2 (Pin 5)	State
0	0	Shutdown
1	0	RFC to J2
0	1	RFC to J1
1	1	RFC to J3

¹ 1 = 1.65 to 3.00 V; 0 = 0 to 0.4 V. Any state other than described in this table places the switch into an undefined state

Typical Performance Characteristics

(V_{DD} = 2.5 V to 4.8 V, V₁ = V₂ = 0 to 1.8 V, TOP = +25 °C, PIN = 0 dBm, Characteristic Impedance [Z₀] = 50 Ω, Unless Otherwise Noted)

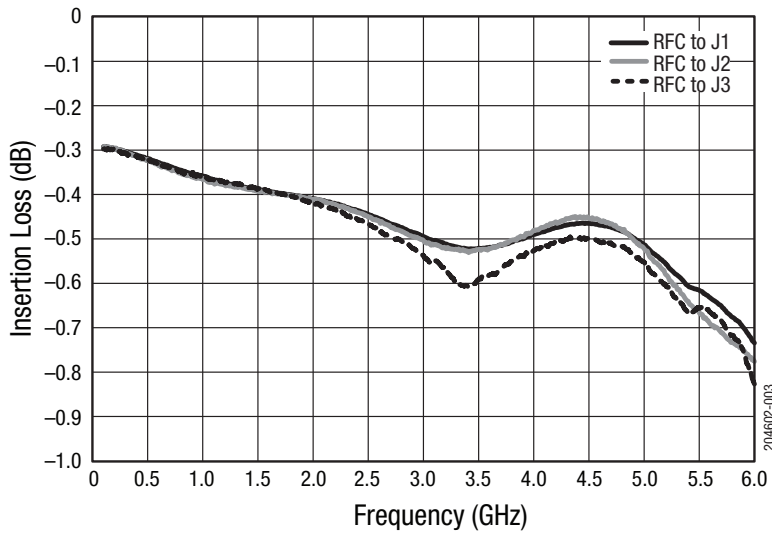


Figure 3. Typical Insertion Loss vs Frequency

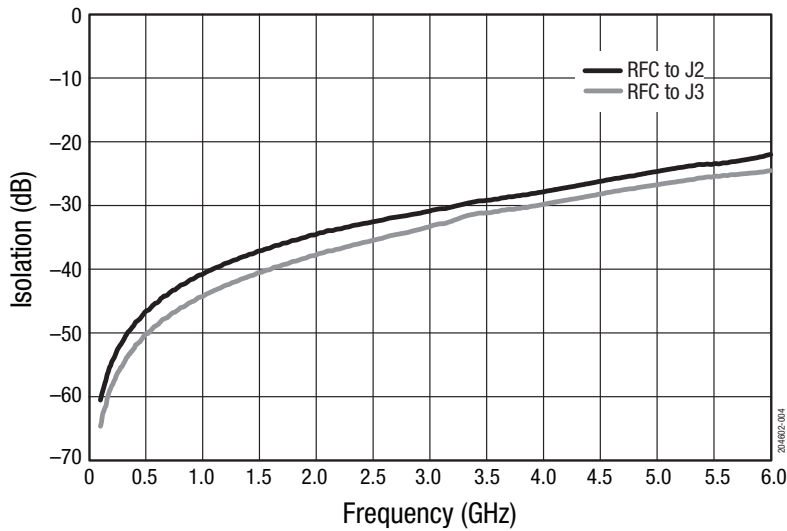


Figure 4. Typical Isolation vs Frequency (RFC to J1 Insertion Loss State)

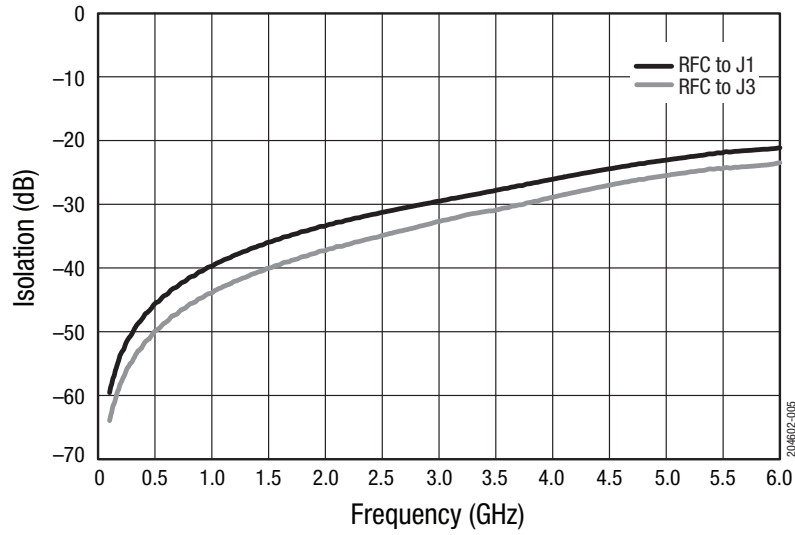


Figure 5. Typical Isolation vs Frequency (RFC to J2 Insertion Loss State)

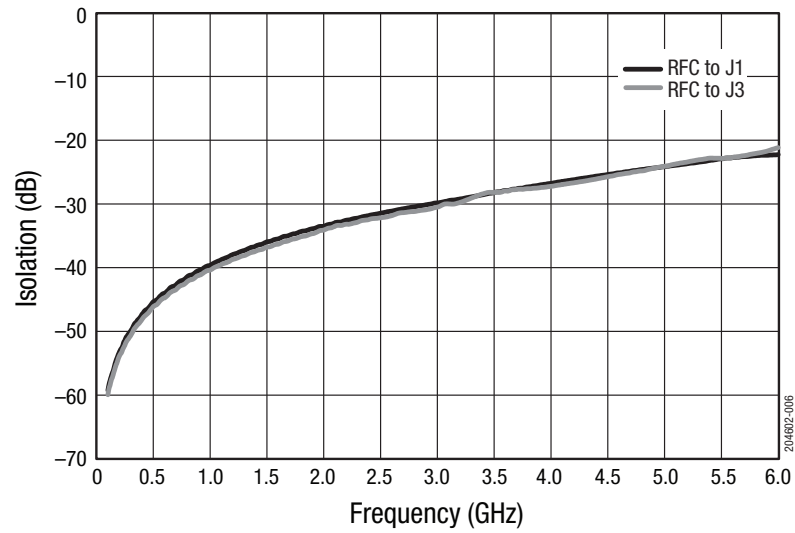


Figure 6. Typical Isolation vs Frequency (RFC to J3 Insertion Loss State)

Evaluation Board Description

The SKYA21062 Evaluation Board is used to test the performance of the SKYA21062 SP3T Switch. The board is made from a two-layer construction with ½ oz. copper cladding on top and bottom. The first layer material is 12-mil Rogers 4003C. The second layer material is 49-mil of FR4 for a total board thickness of about 62 mils. The impedance of all RF traces is 50 Ω.

An Evaluation Board schematic diagram is provided in Figure 7. An assembly drawing for the Evaluation Board is shown in Figure 8.

Package Dimensions

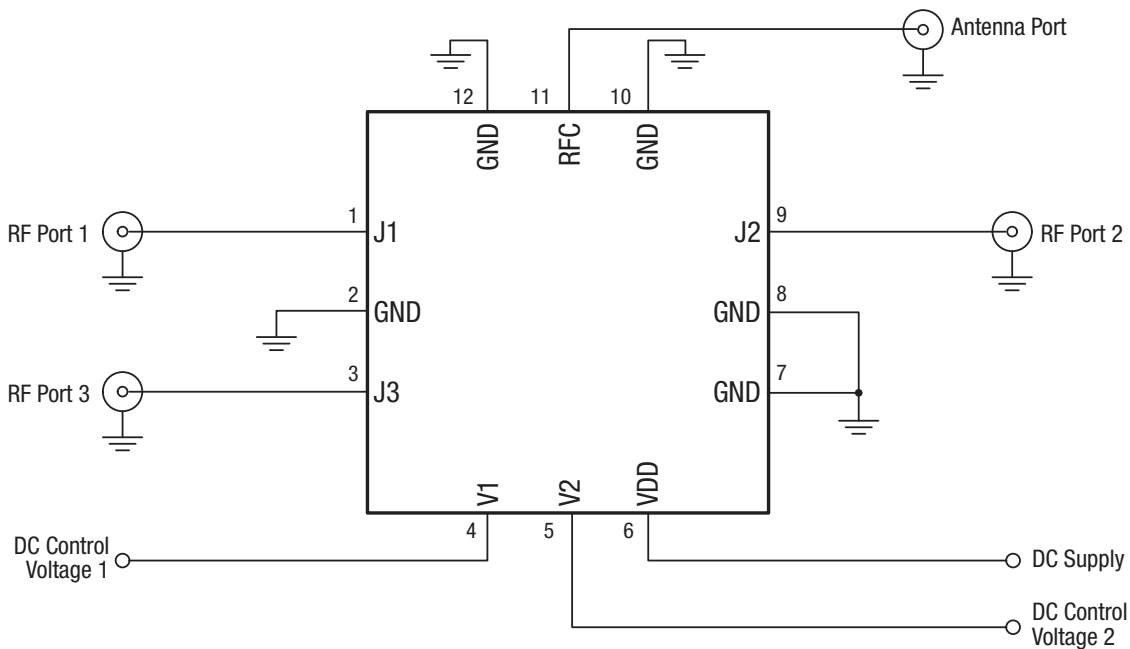
The PCB layout footprint for the SKYA21062 is provided in Figure 9. Typical part markings are shown in Figure 10. Package dimensions are shown in Figure 11, and tape and reel dimensions are provided in Figure 12.

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 SKYA21062 is rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C. It can be used for lead or lead-free soldering. For additional information, refer to the Skyworks Application Note, Solder Reflow Information, document number 200164.

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. SKYA21062 Evaluation Board Schematic

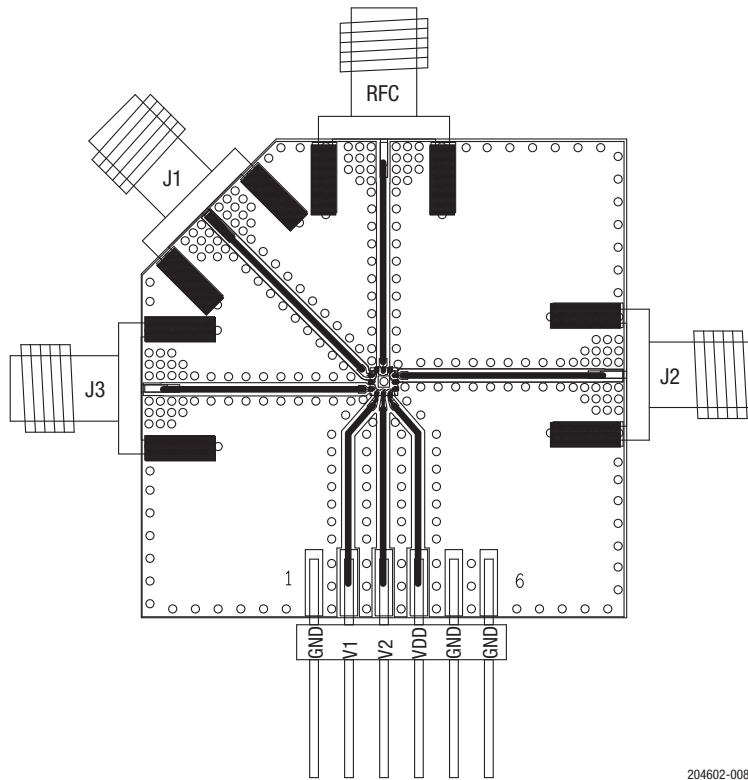
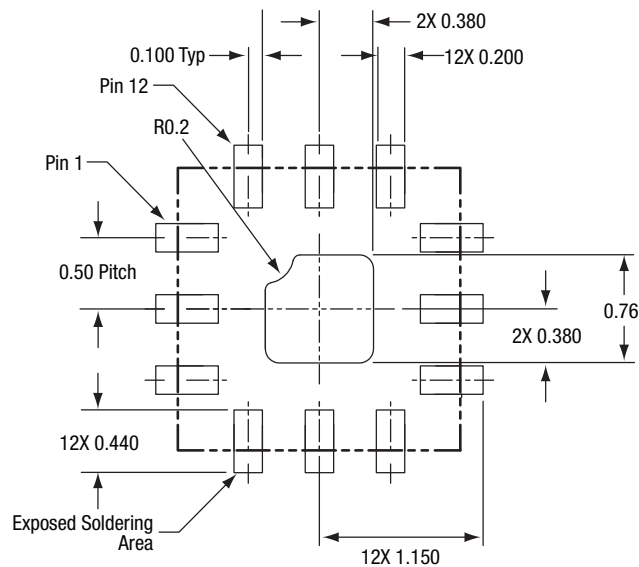


Figure 8. SKYA21062 Evaluation Board Assembly Diagram



All measurements in millimeters

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Figure 9. SKYA21062 PCB Layout Footprint (Top View)

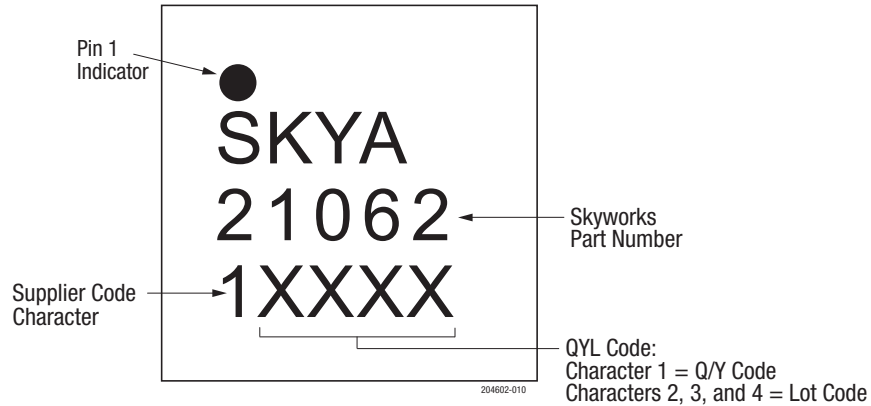
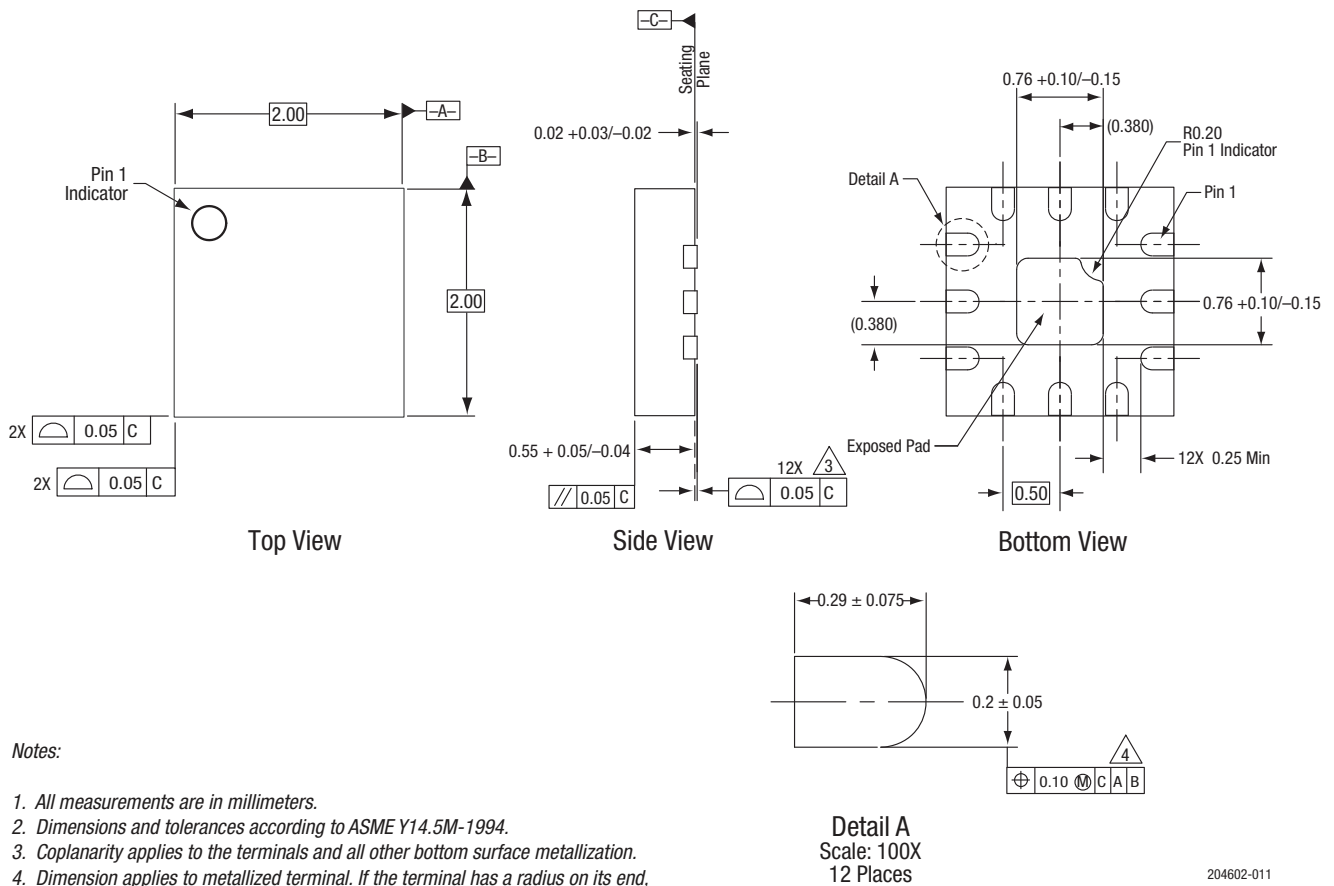


Figure 10. Typical Part Markings (Top View)



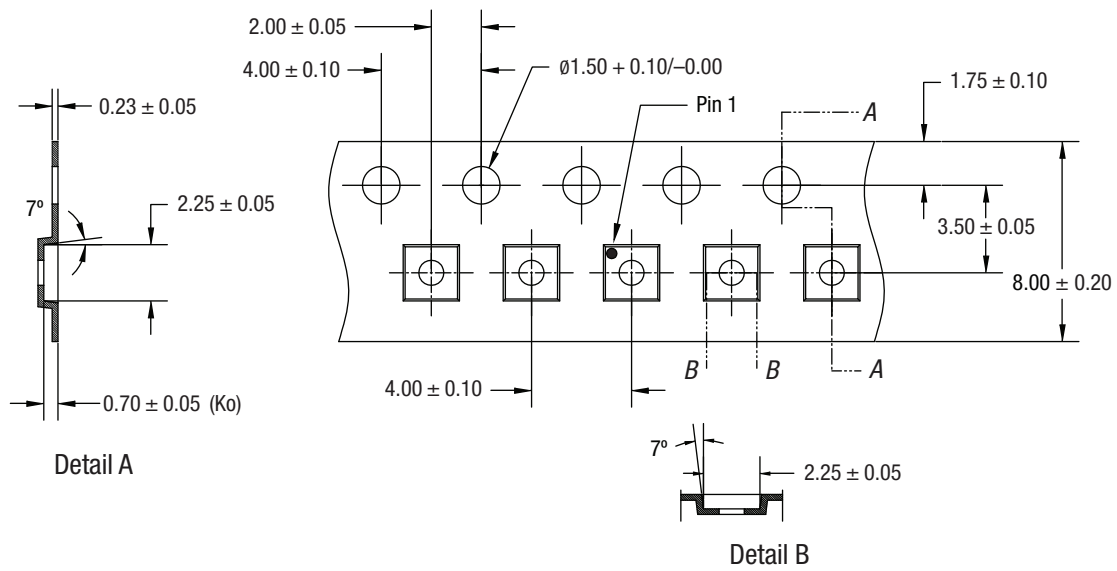
Notes:

1. All measurements are in millimeters.
2. Dimensions and tolerances according to ASME Y14.5M-1994.
3. Coplanarity applies to the terminals and all other bottom surface metallization.
4. Dimension applies to metallized terminal. If the terminal has a radius on its end, the width dimension should not be measured in that radius area.

Detail A
Scale: 100X
12 Places

204602-011

Figure 11. SKYA21062 Package Dimensions



Notes:

1. Carrier tape must meet all requirements of Skyworks GP01-D232 procurement spec for tape and reel shipping.
2. Carrier tape shall be black conductive polycarbonate bakeable material at 125 °C temperature.
3. Cover tape shall be transparent conductive with 5.40 mm width.
4. ESD-surface resistivity must meet all ESD requirements of Skyworks specified on GP01-D232.
5. All measurements are in millimeters.

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Figure 12. SKYA21062 Tape and Reel Dimensions

Ordering Information

Part Number	Part Description	Evaluation Board Part Number
SKYA21062	0.1 to 6.0 GHz SP3T Switch	SKYA21062-EVB

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