

SKYA21002: 0.1 to 3.0 GHz SP3T Switch

Automotive Applications

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

Features

- Excellent linearity performance:
P1dB = +29 dBm @ 3 V
- Low insertion loss: 0.5 dB @ 2.5 GHz
- High isolation: 25 dB @ 2.5 GHz
- Positive low voltage control: 0/3 V
- Miniature, 2 x 2 mm, 8-pin ultra-thin
Dual Flat No-Lead (DFN) package
- JEDEC (JESD22) qualified at 25 °C
- Lead (Pb)-free and RoHS-compliant
- (MSL-1 @ 260 °C per JEDEC J-STD-020)
- For RoHS and other product compliance
information, see the [Skyworks Certificate
of Conformance](#).

Description

The SKYA21002 is a single-pole, triple-throw (SP3T) antenna switch that operates in the 0.1 to 3.0 GHz frequency range. Switching between the antenna (RFC signal) and the RF1, RF2, and RF3 ports is accomplished with three control voltages.

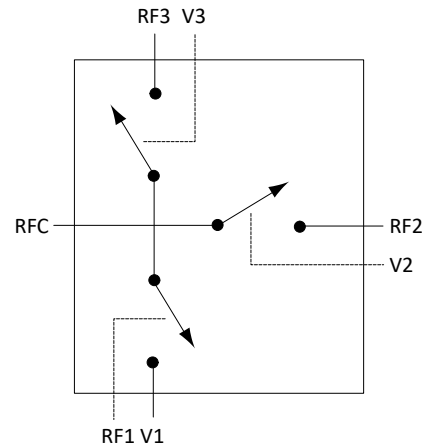


Figure 1. Functional Block Diagram

The low loss, high isolation, high linearity, and small size make this switch ideal for all WLAN and Bluetooth® signals operating in the 2.4 to 2.5 GHz band. 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.

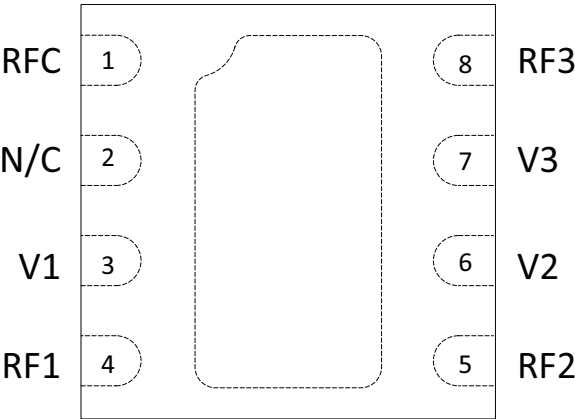


Figure 2. Pinout

Table 1. Signal Descriptions

Pin	Name	Description
1	RFC	Antenna. DC blocking capacitor required.
2	N/C	No connection
3	V1	Switch logic control (see Table 4)
4	RF1	RF port 1. DC blocking capacitor required.
5	RF2	RF port 2. DC blocking capacitor required.
6	V2	Switch logic control (see Table 4)
7	V3	Switch logic control (see Table 4)
8	RF3	RF port 3. DC blocking capacitor required.

Electrical and Mechanical Specifications

Table 2. Absolute Maximum Ratings¹

Parameter	Symbol	Minimum	Maximum	Units
Input power @ 0/3 V @ 0/5 V	P _{IN}		+30 +32	dBm
Operating voltage	V _{DD}		+8.0	V
Operating temperature	T _{OP}	−40	+85	°C
Storage temperature	T _{STG}	−65	+150	°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.

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

Table 3. Electrical Specifications¹

(V_{HIGH} = 2.1 to 5.0 V, T_{OP} = +25 °C, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Insertion loss	IL	RFC to RF1, RF2, RF3				
		0.1 to 3.0 GHz		0.60	0.75	dB
		2.4 to 2.5 GHz		0.50	0.65	
Return loss (insertion loss state)	S11	RFC to RF1, RF2, RF3				
		0.1 to 3.0 GHz 2.4 to 2.5 GHz		20		dB
		0.1 to 3.0 GHz 2.4 to 2.5 GHz		20		
Isolation	ISO	RFC to RF1, RF2, RF3				
		0.1 to 3.0 GHz	22	25		dB
		2.4 to 2.5 GHz	22	25		
Switching speed						
Rise time		10/90% RF		50		ns
Fall time		90/10% RF		18		
On time		50% control to 90/10%		55		
Off time		50% control to 90/10% RF		20		
Video feedthrough				40		mV
1 dB input compression point	IP1dB	@ 2450 MHz, V _{LOW} = 0 V, V _{HIGH} = 3.3 V		+29.0		dBm
Third order input intercept point	IIP3	@ 2450 MHz, two-tone input power @ +17 dBm				dBm
		V _{LOW} = 0 V, V _{HIGH} = 2.1 V		+37		
		V _{LOW} = 0 V, V _{HIGH} = 3.3 V		+45		
Control voltage		V _{LOW} = 0 to 0.25 V @ 5 μA typical		0		V
		V _{HIGH} = 2.1 to 5.0 V @ 10 μA typical		3.3		

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

Table 4. Truth Table¹

V1 (Pin 3)	V2 (Pin 6)	V3 (Pin 7)	Low Insertion Loss Path
High	Low	Low	RFC to RF1
Low	High	Low	RFC to RF2
Low	Low	High	RFC to RF3

1. High = 2.1 V to 5.0 V.
Low = 0 V to 0.25 V.
Any state other than described in this table places the switch into an undefined state.
An undefined state will not damage the device.

Typical Performance Characteristics

($V_{DD} = 0/3.3$ V, $T_{OP} = +25$ °C, Unless Otherwise Noted)

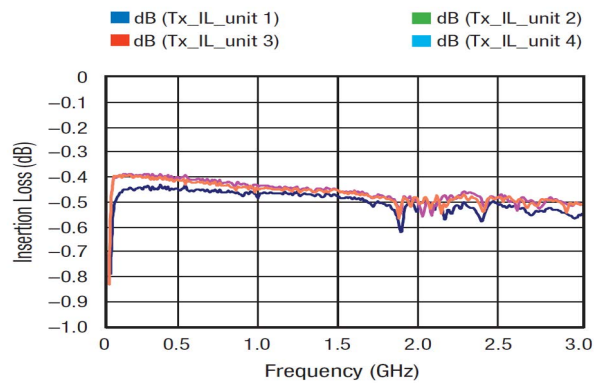


Figure 3. RFC to RF1 Insertion Loss

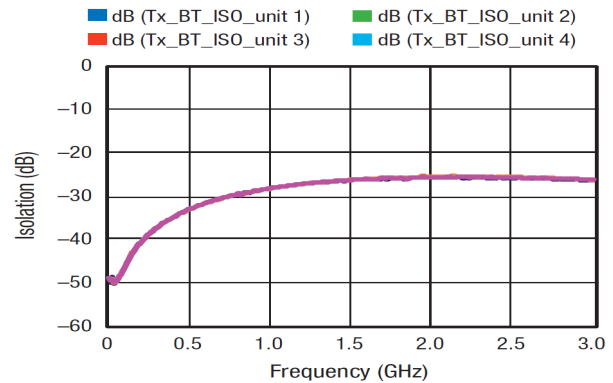


Figure 4. RFC to RF3 Isolation

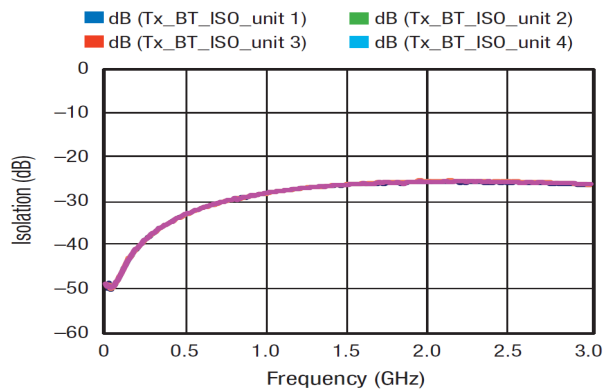


Figure 5. RFC to RF1 Return Loss

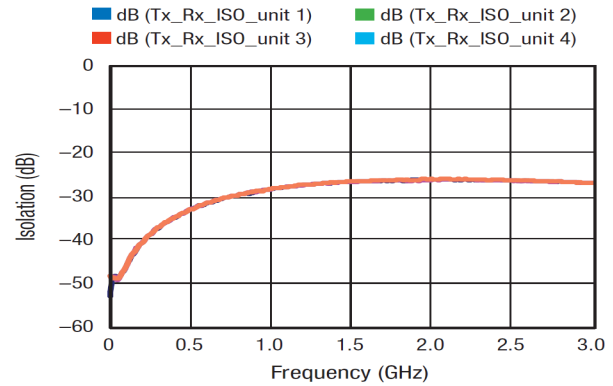


Figure 6. RFC to RF2 Isolation

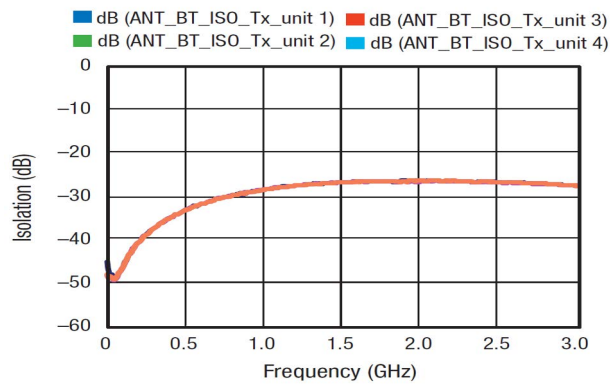


Figure 7. RF1 to RF2 Isolation

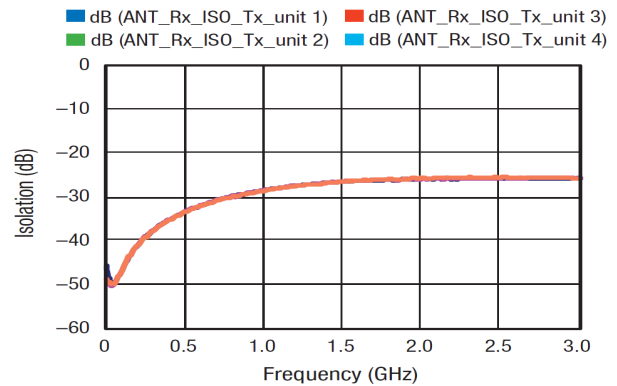


Figure 8. RF1 to RF3 Isolation

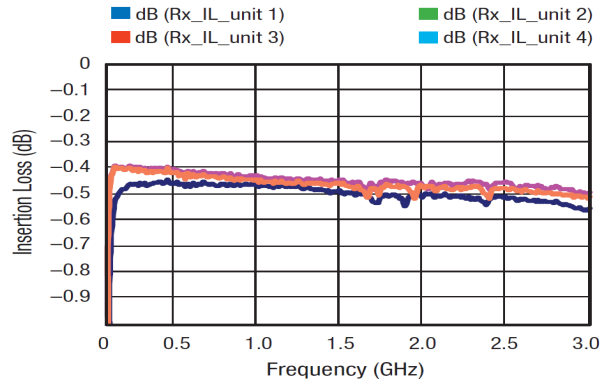


Figure 9. RFC to RF2 Insertion Loss

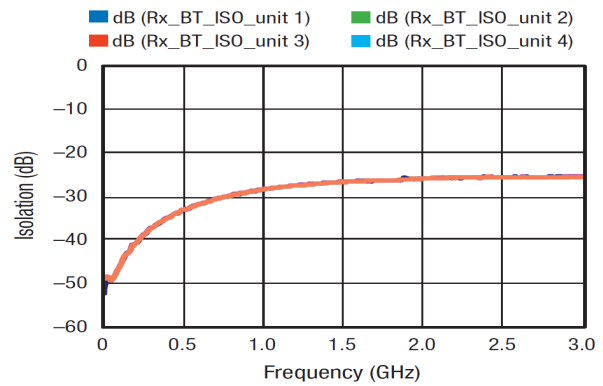


Figure 10. RFC to RF2 Isolation

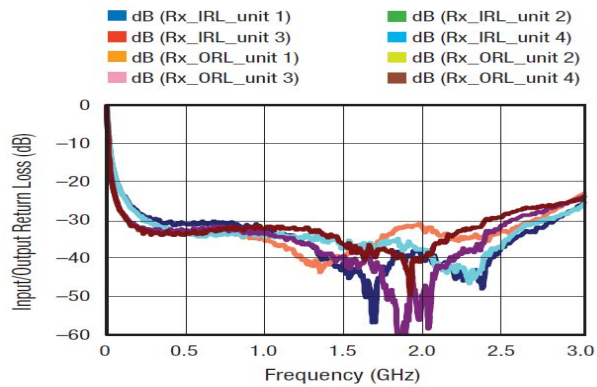


Figure 11. RFC to RF2 Return Loss

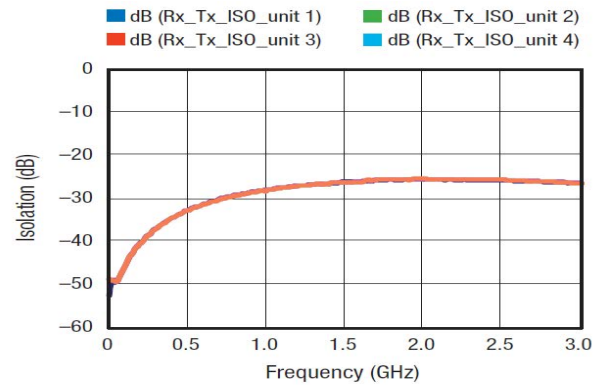


Figure 12. RFC to RF3 Isolation

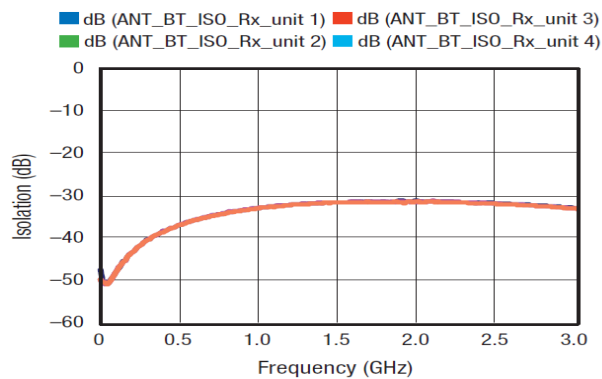


Figure 13. RF2 to RF3 Isolation

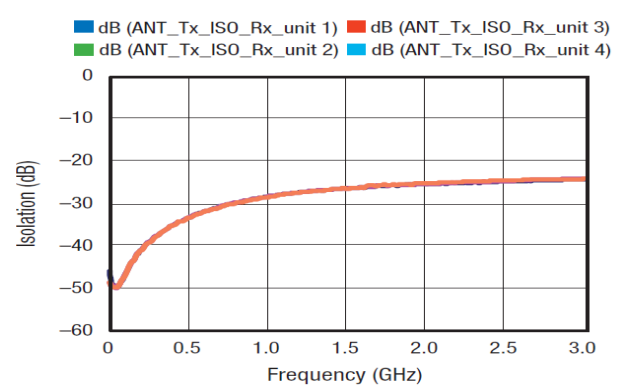


Figure 14. RF2 to RF1 Isolation

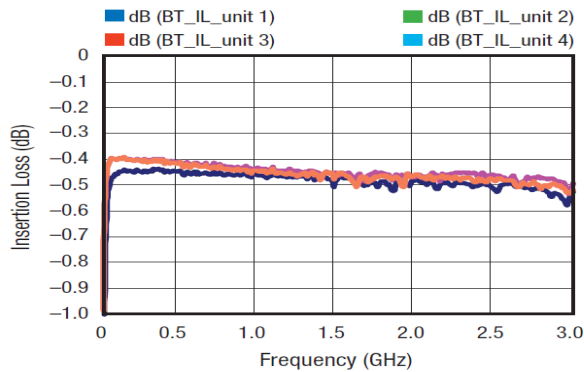


Figure 15. RFC to RF3 Insertion Loss

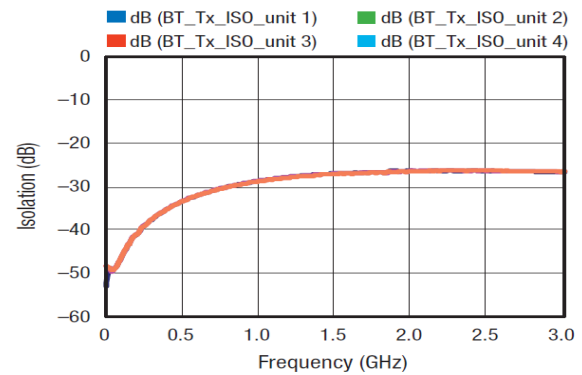


Figure 16. RFC to RF1 Isolation

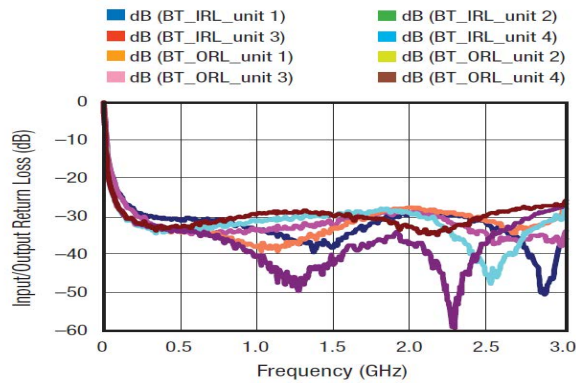


Figure 17. RFC to RF3 Return Loss

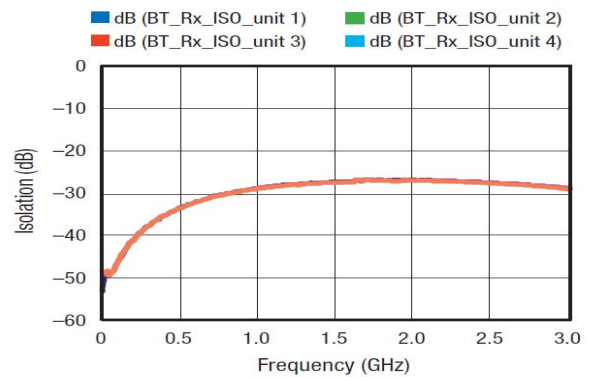


Figure 18. RFC to RF2 Isolation

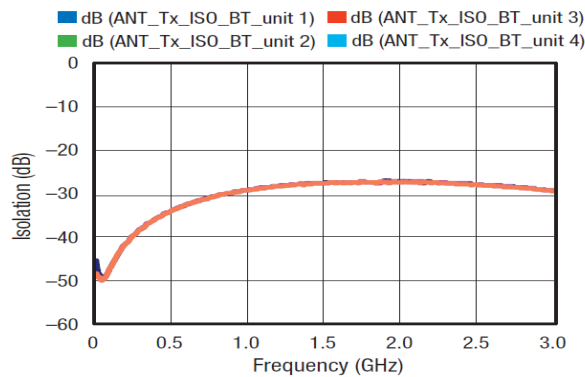


Figure 19. RF3 to RF1 Isolation

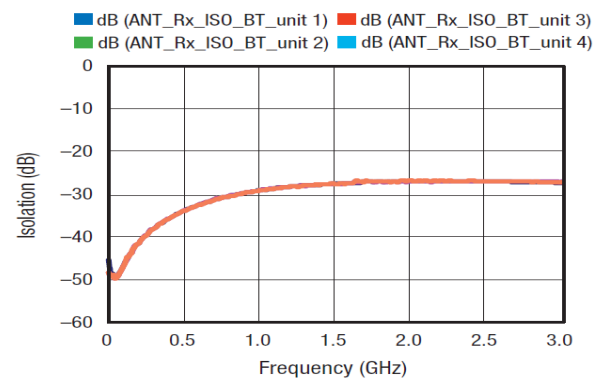
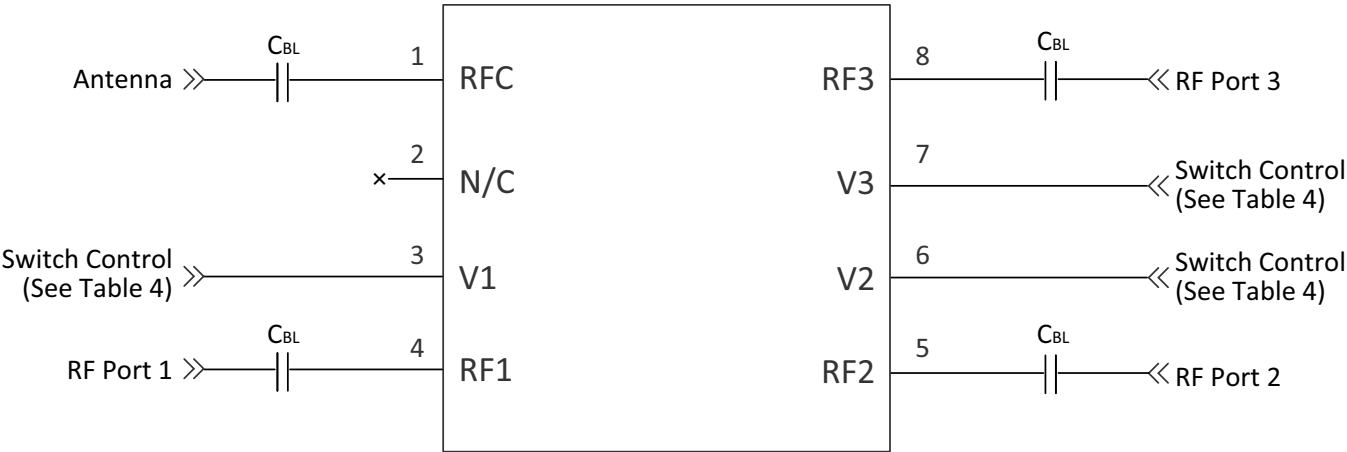


Figure 20. RF3 to RF2 Isolation

Evaluation Board

An evaluation board is used to test the performance of the SKYA21002 SPDT switch. A schematic diagram is provided in Figure 21, and an assembly drawing is shown in Figure 22.



Note: CBL = 47 pF for >500 MHz operation; 220 pF for operation down to 50 MHz.
Higher values recommended for lower frequency operation.
Exposed paddle must be grounded.

Figure 21. Evaluation Board Schematic

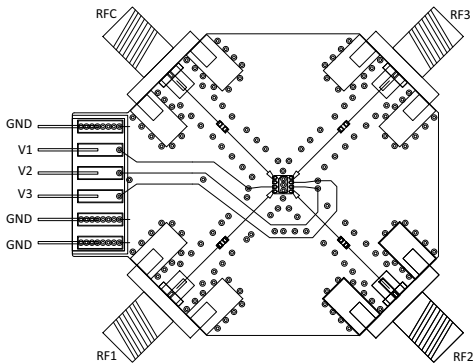


Figure 22. Evaluation Board Assembly Diagram

Package and Handling Information

Since the device package is sensitive to moisture absorption, it is baked and vacuum packed before shipping. 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 SKYA21002 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.

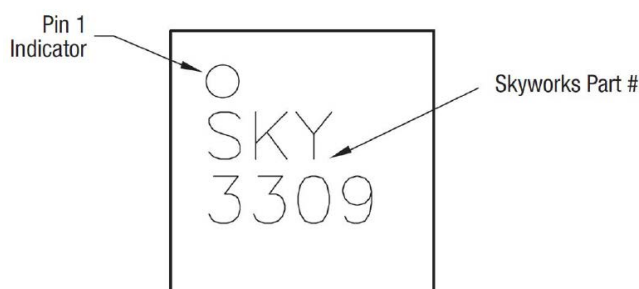


Figure 23. Typical Part Marking

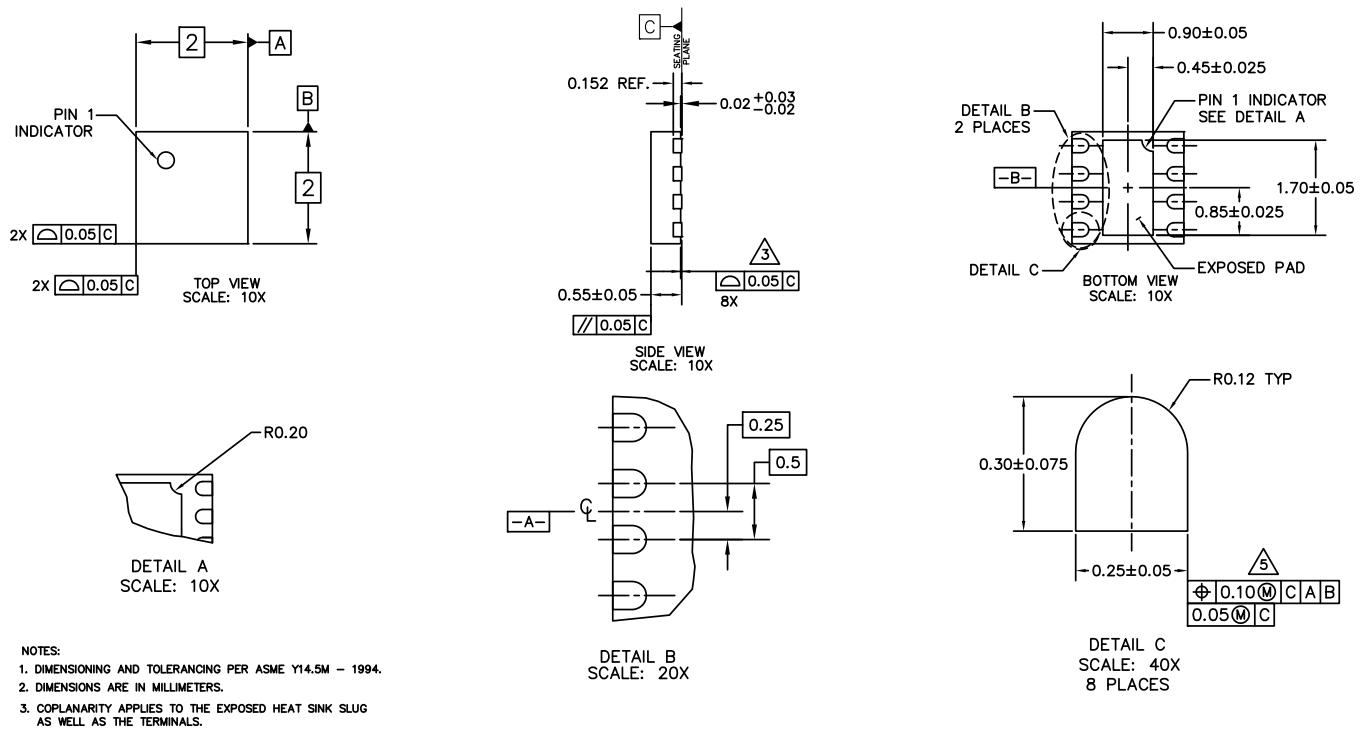
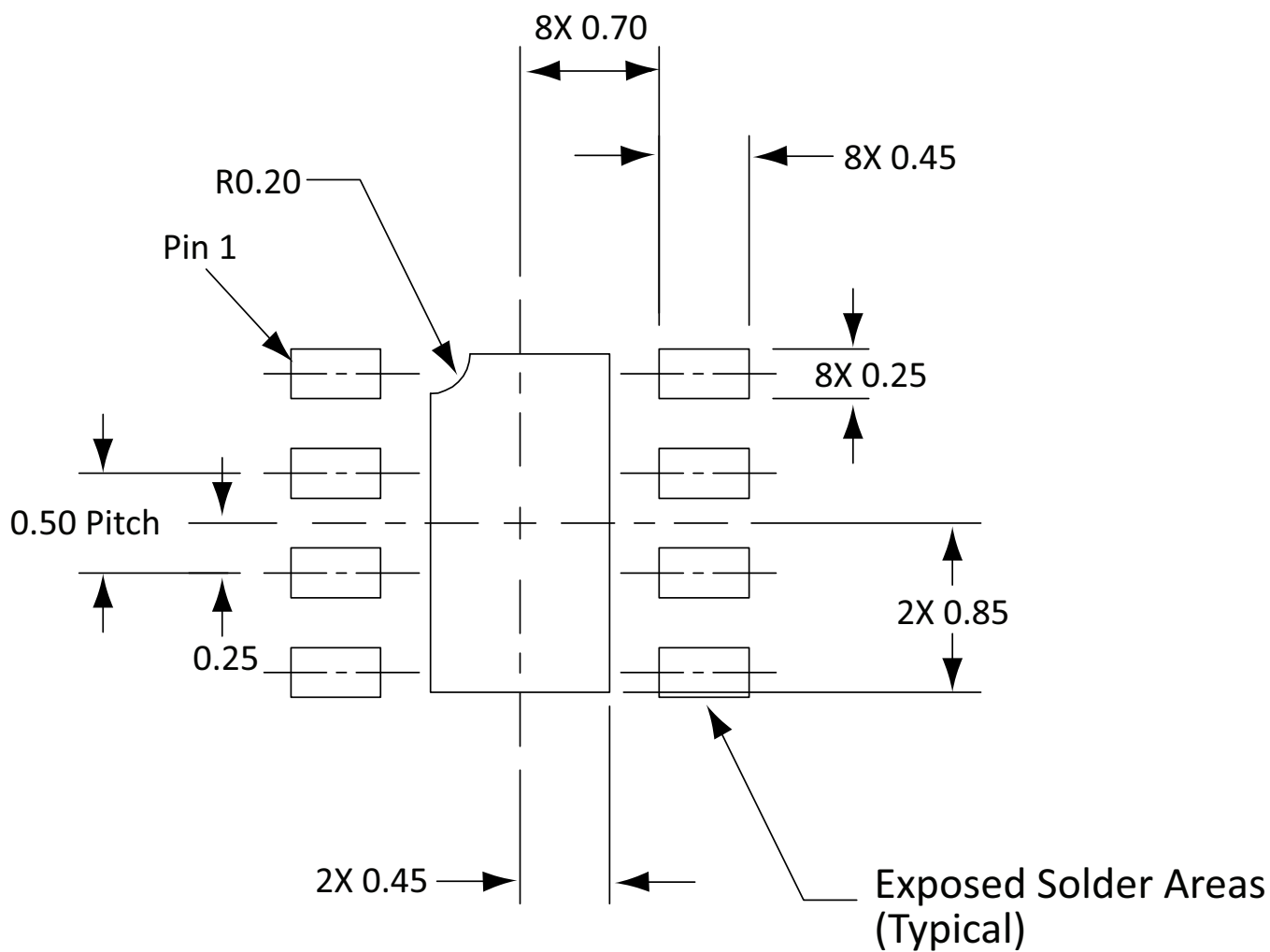
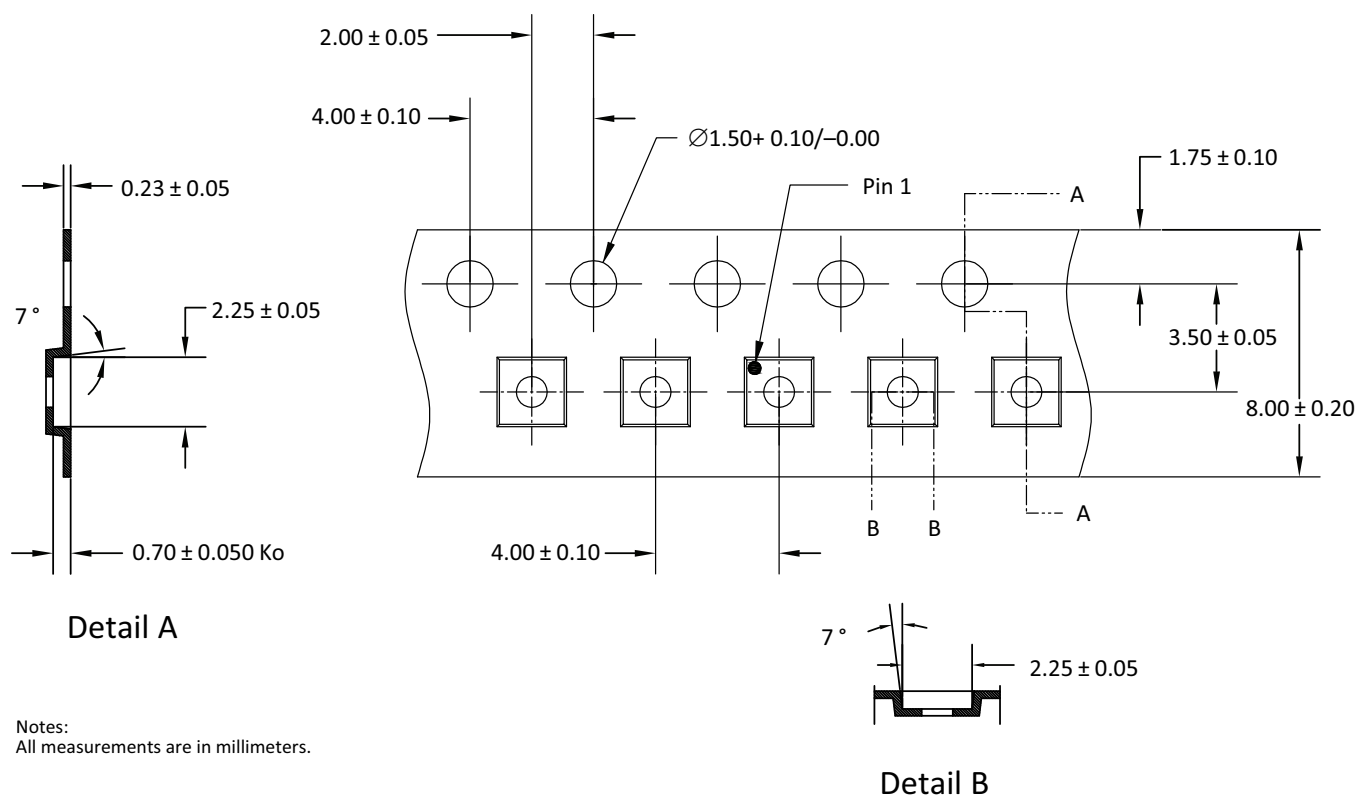


Figure 24. Package Dimensions



All dimensions are in millimeters

Figure 25. PCB Layout Footprint



Ordering Information

Part Number	Description	Evaluation Board Part Number
SKYA21002	0.1 to 3.0 GHz SP3T Switch	SKYA21002-EK1

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