DATA SHEET

SKYA21002: 0.1 to 3.0 GHz SP3T 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

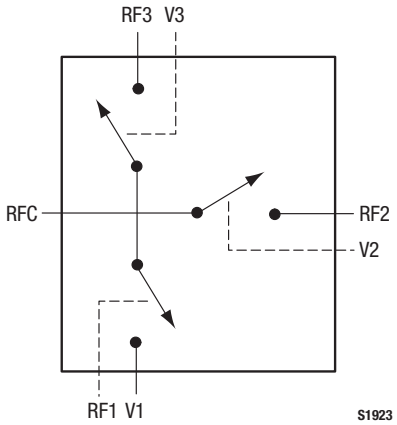


Figure 1. SKYA21002 Block Diagram

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, ultra-thin DFN (8-pin, 2 x 2 mm) package
- AEC-Q100 qualified at 25 °C
- 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.

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.

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

The switch is manufactured in a compact, 2 x 2 mm, 8-pin Dual Flat No-Lead (DFN) 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.

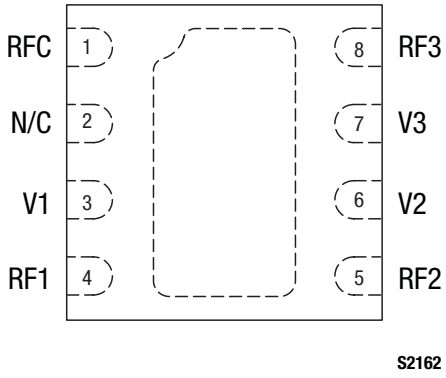


Figure 2. SKYA21002 Pinout (Top View)

Table 1. SKYA21002 Signal Descriptions

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

Electrical and Mechanical Specifications

The absolute maximum ratings of the SKYA21002 are provided in Table 2. Electrical specifications are provided in Table 3.

The state of the SKYA21002 is determined by the logic provided in Table 4. Typical performance characteristics of the SKYA21002 are shown in Figures 3 through 20.

Table 2. SKYA21002 Absolute Maximum Ratings[1]

Parameter	Symbol	Minimum	Maximum	Units
Input power: @ 0/3 V @ 0/5 V	P_{IN}		 +30 +32	 dBm 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**: 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.*

Table 3. SKYA21002 Electrical Specifications[1]
(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 2.4 to 2.5 GHz		 0.60 0.50	 0.75 0.65	 dB dB
Return loss (insertion loss state)	|S11|	RFC to RF1, RF2, RF3: 0.1 to 3.0 GHz 2.4 to 2.5 GHz		 20 20		 dB dB
Isolation	ISO	RFC to RF1, RF2, RF3: 0.1 to 3.0 GHz 2.4 to 2.5 GHz	 22 22	 25 25		 dB dB
Switching speed: Rise time Fall time On time Off time		 10/90% RF 90/10% RF 50% control to 90/10% RF 50% control to 90/10% RF		 50 18 55 20		 ns ns ns ns
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: V_{LOW} = 0 V, V_{HIGH} = 2.1 V V_{LOW} = 0 V, V_{HIGH} = 3.3 V		 +37 +45		 dBm dBm
Control voltage		V_{LOW} = 0 to 0.25 V @ 5 µA typical V_{HIGH} = 2.1 to 5.0 V @ 10 µA typical		0 3.3		V V

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

Table 4. SKYA21002 Truth Table[1]

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)

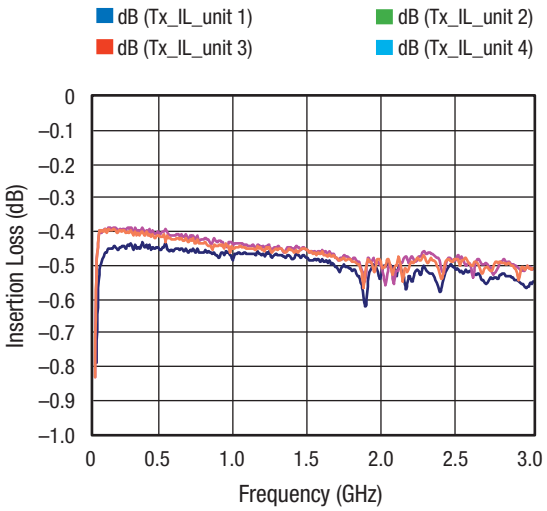


Figure 3. RFC to RF1 Insertion Loss

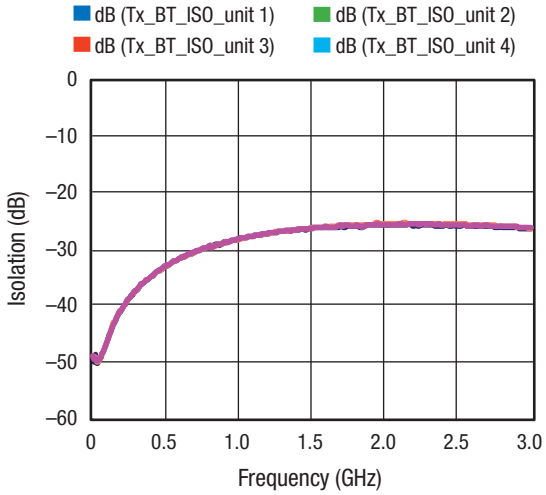


Figure 4. RFC to RF3 Isolation

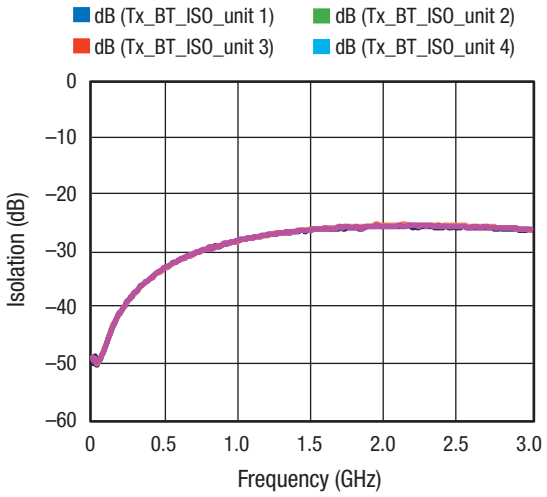


Figure 5. RFC to RF1 Return Loss

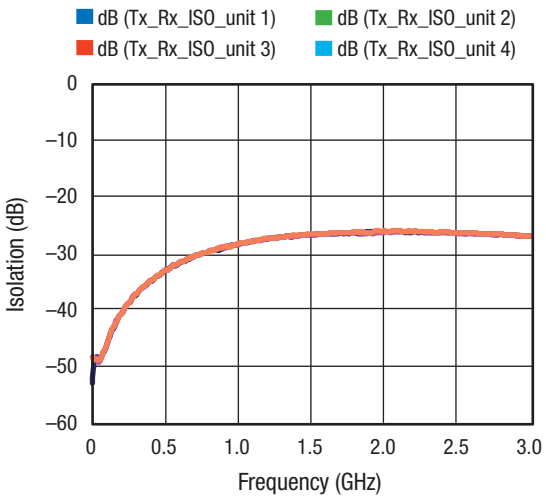


Figure 6. RFC to RF2 Isolation

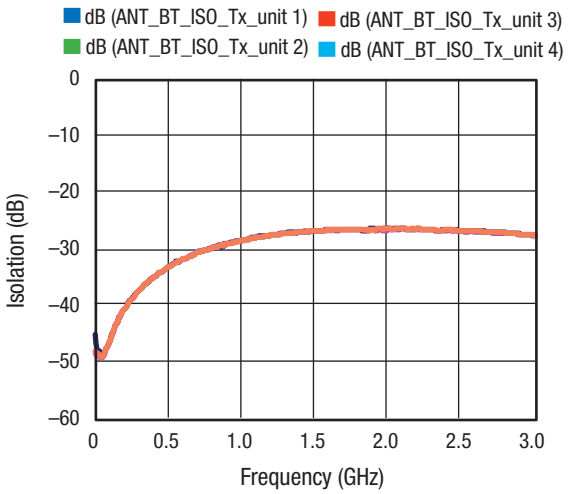


Figure 7. RF1 to RF2 Isolation

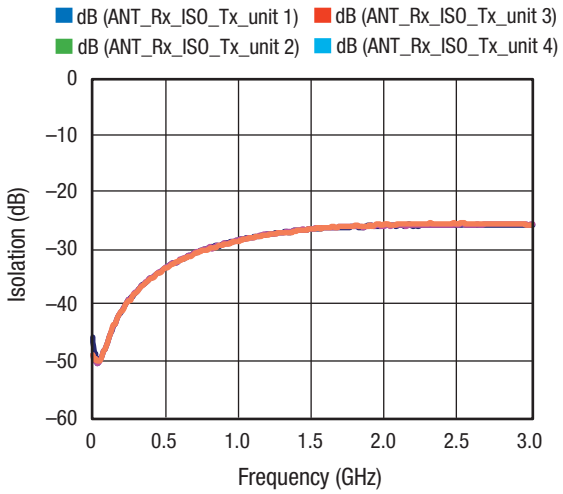


Figure 8. RF1 to RF3 Isolation

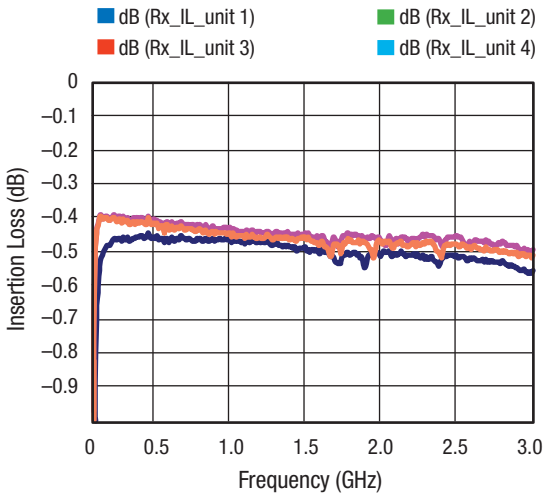


Figure 9. RFC to RF2 Insertion Loss

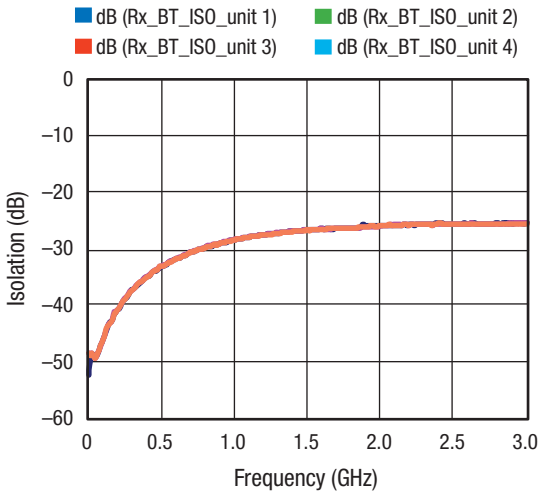


Figure 10. RFC to RF2 Isolation

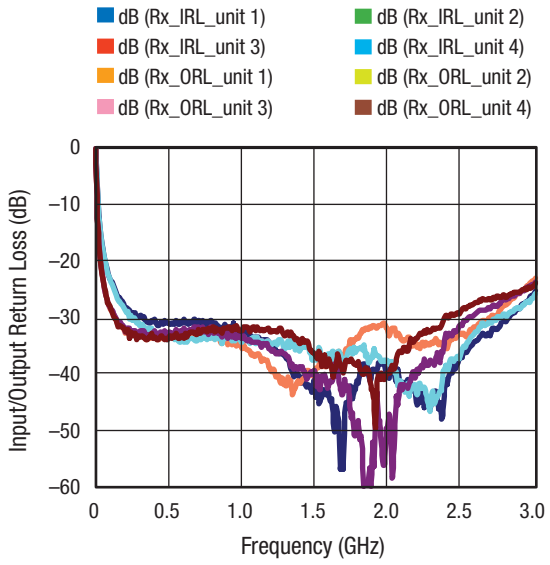


Figure 11. RFC to RF2 Return Loss

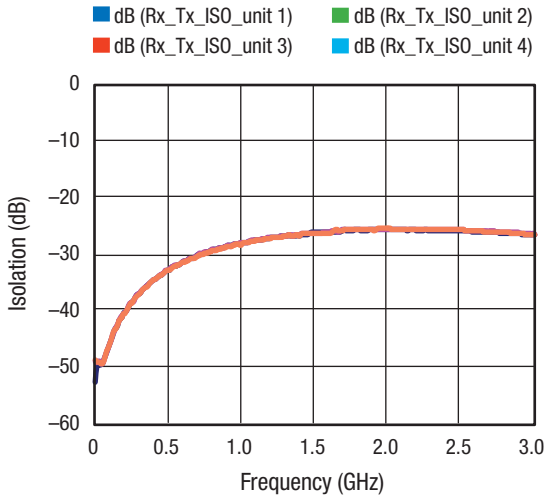


Figure 12. RFC to RF3 Isolation

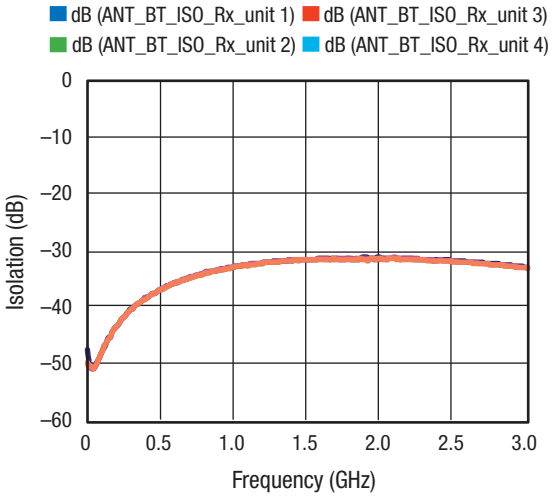


Figure 13. RF2 to RF3 Isolation

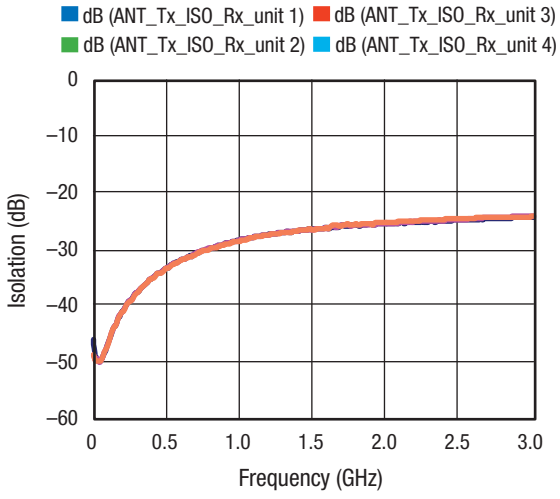


Figure 14. RF2 to RF1 Isolation

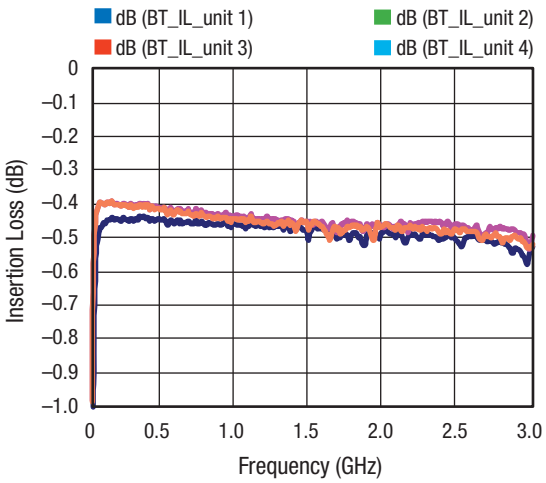


Figure 15. RFC to RF3 Insertion Loss

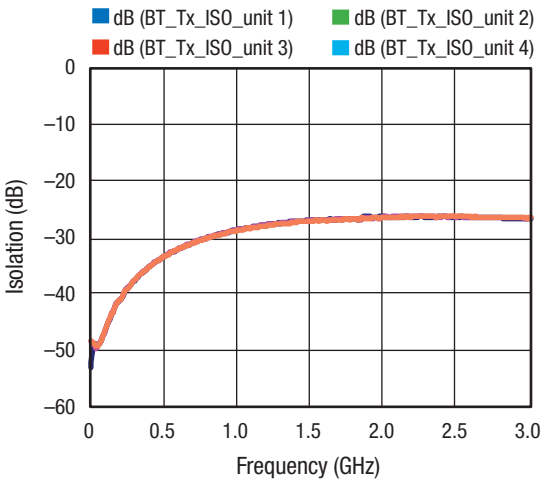


Figure 16. RFC to RF1 Isolation

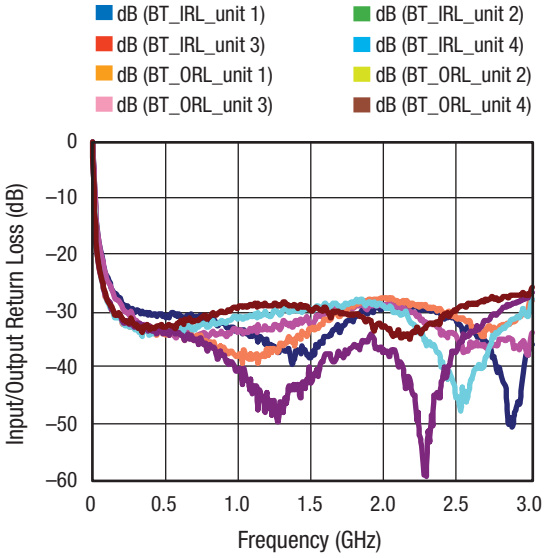


Figure 17. RFC to RF3 Return Loss

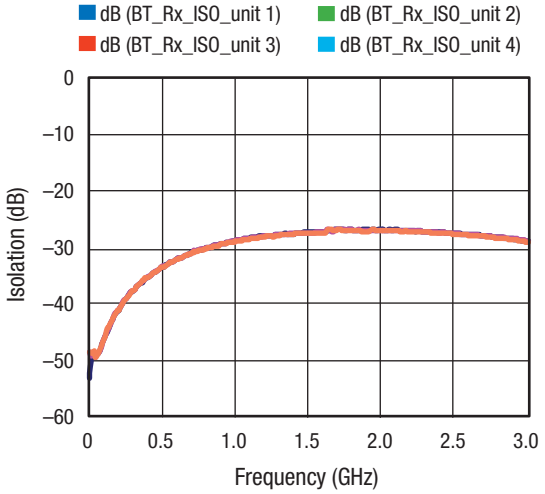


Figure 18. RFC to RF2 Isolation

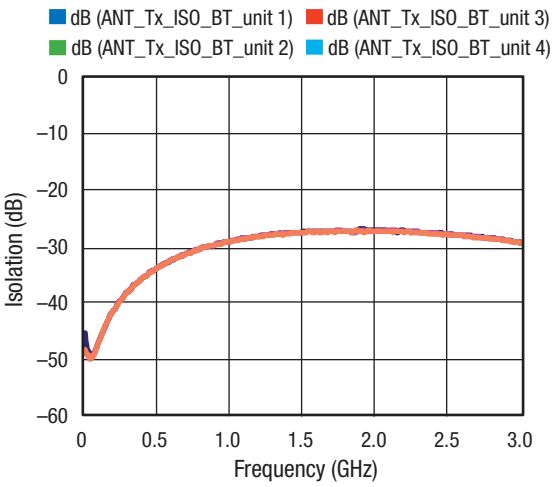


Figure 19. RF3 to RF1 Isolation

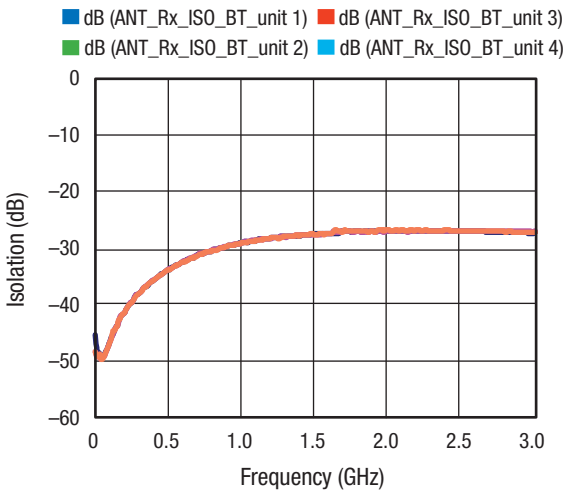
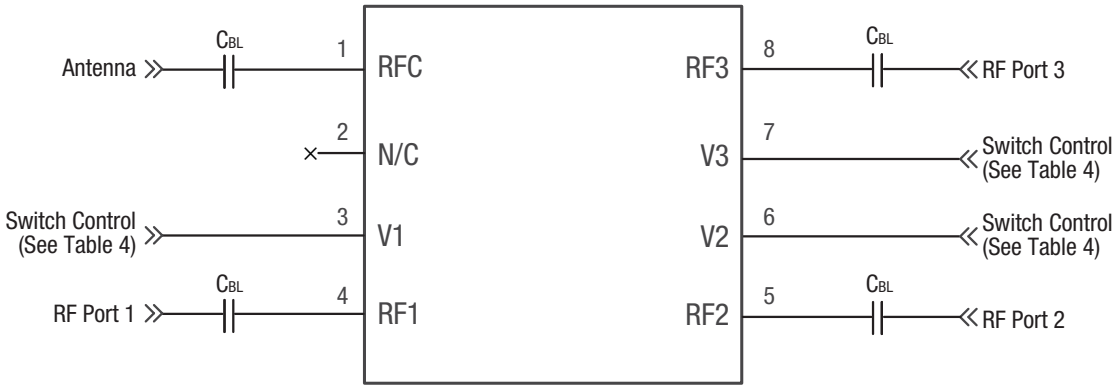


Figure 20. RF3 to RF2 Isolation

Evaluation Board Description

The SKYA21002 Evaluation Board is used to test the performance of the SKYA21002 SPDT Switch. An Evaluation Board schematic diagram is provided in Figure 21.

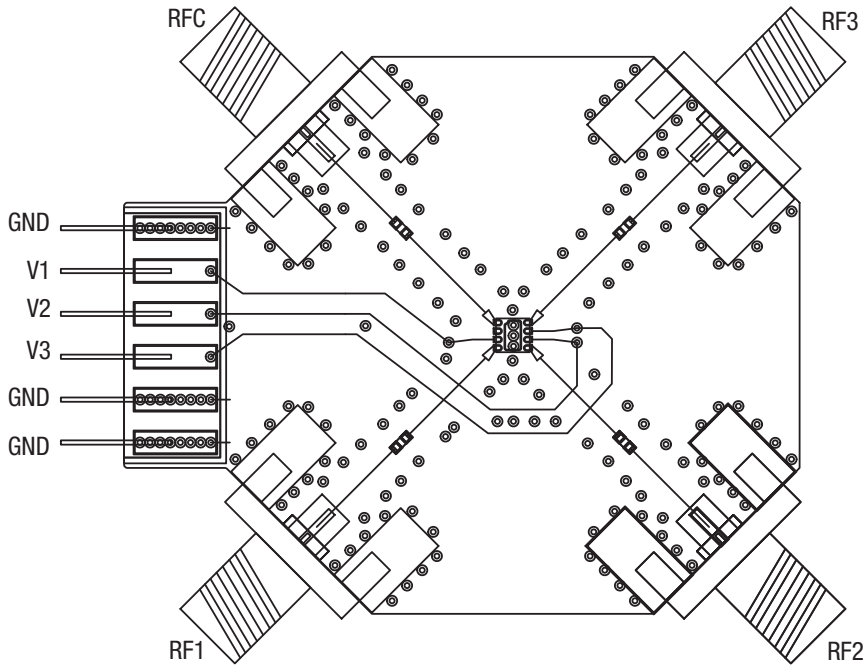
An assembly drawing for the Evaluation Board is shown in Figure 22.



Note: C_{BL} = 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.

S1925a

Figure 21. SKYA21002 Evaluation Board Schematic



S2163

Figure 22. SKYA21002 Evaluation Board Assembly Diagram

Package Dimensions

The PCB layout footprint for the SKYA21002 is provided in Figure 23. Typical part markings are shown in Figure 24. Package dimensions are shown in Figure 25, and tape and reel dimensions are provided in Figure 26.

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 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.

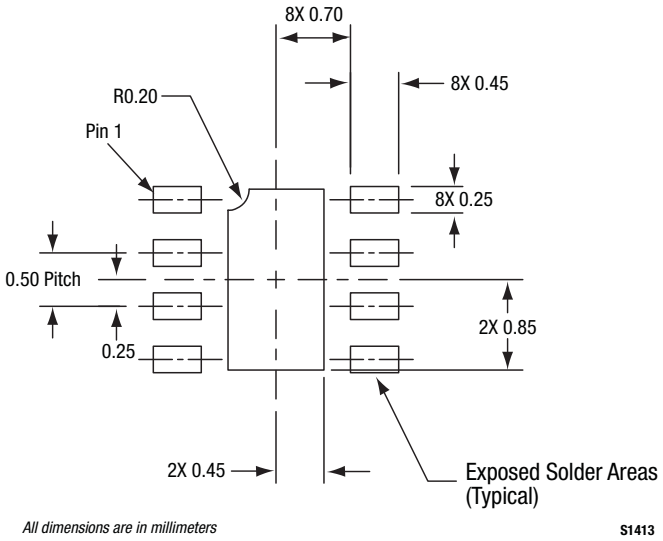


Figure 23. SKYA21002 PCB Layout Footprint (Top View)

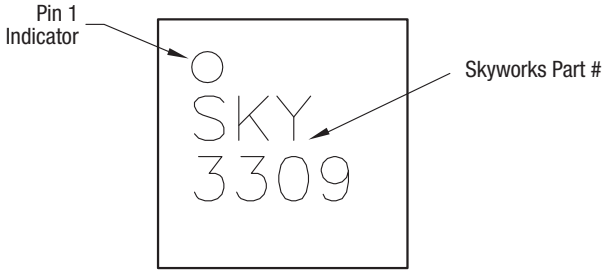
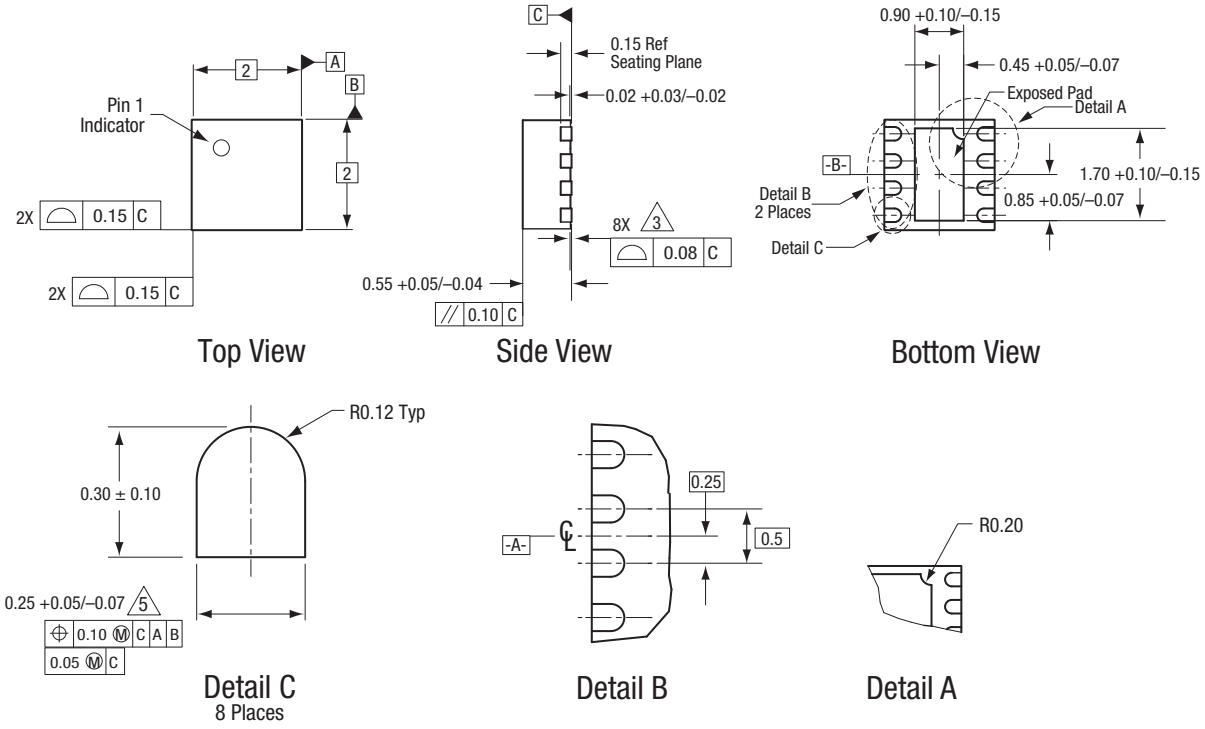


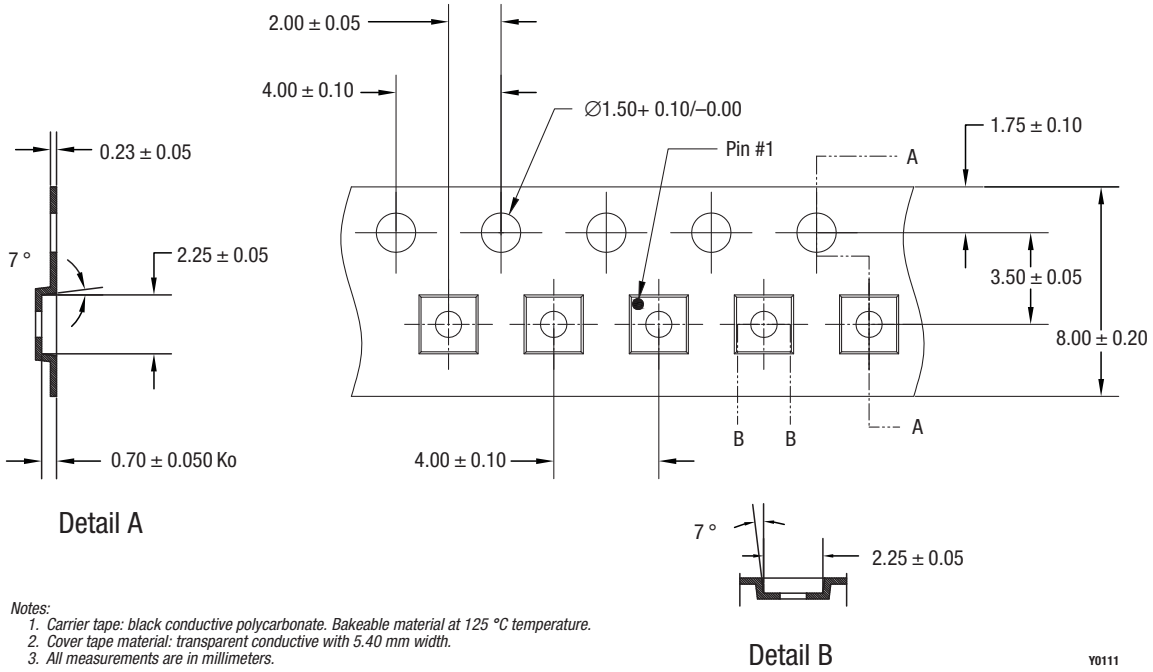
Figure 24. Typical Part Markings (Top View)



All measurements are in millimeters.
Dimensioning and tolerancing according to ASME Y14.5M-1994.
Coplanarity applies to the exposed heat sink slug as well as the terminals..
Plating requirement per source control drawing (SCD) 2504.
Dimension applies to metalized terminal and is measured between 0.15 mm and 0.30 mm from terminal tip.

S1755

Figure 25. SKYA21002 Package Dimensions



Notes:
1. *Carrier tape: black conductive polycarbonate. Bakeable material at 125 °C temperature.*
2. *Cover tape material: transparent conductive with 5.40 mm width.*
3. *All measurements are in millimeters.*

Y0111

Figure 26. SKYA21002 Tape and Reel Dimensions