DATA SHEET

SKYA21024: 0.01 to 6.0 GHz Single Control SPDT Switch

Applications

- Automotive WLAN 802.11 a/b/g/n/ac
- WLAN repeaters
- ISM band radios
- Low power transmit receive systems
- Automotive infotainment

Features

- Low insertion loss: 0.40 dB @ 2.0 GHz
- High isolation: >25 dB @ 2.0 GHz
- Single bit control
- Automotive Level-3 PPAP available upon request
- IMDS material declaration available at production release
- Extended production life to support automotive requirements
- Independent BOM management to minimize PCN risk
- Small QFN (6-pin, 1 x 1 mm) package (MSL1, 260 °C per JEDEC J-STD-020)

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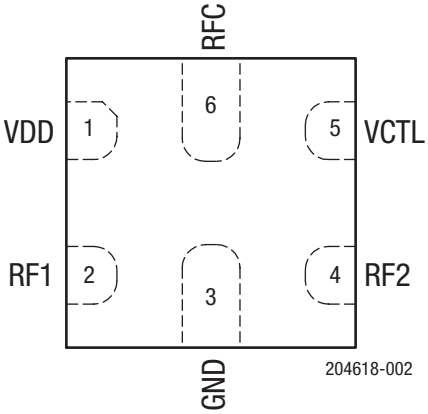


Figure 2. SKYA21024 Pinout (Top View)

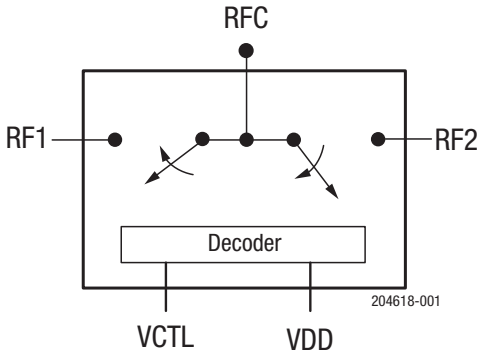


Figure 1. SKYA21024 Block Diagram

Description

The SKYA21024 is a single-pole, double-throw (SPDT) switch intended for mode switching in pre-power amplifier (PA) cellular or WLAN applications. Using advanced switching technologies, the SKYA21024 maintains low insertion loss and high isolation for all switching paths.

The high linearity performance and low insertion loss achieved by the switch make it an ideal choice for mode switching before the PA in cellular applications. Depending on the logic voltage applied to the control pin (VCTL), the RFC pin is connected to one of the two switched RF outputs, RF1 or RF2, using a low insertion loss path, while the path between the RFC pin and the other RF path is in a high isolation state.

The switch is manufactured in a compact, 1 x 1 mm, 6-pin Quad Flat No-Lead (QFN) 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.

Table 1. SKYA21024 Signal Descriptions

Pin	Name	Description	Pin	Name	Description
1	VDD	Supply voltage	4	RF2	RF port 2 (must be DC blocked)
2	RF1	RF port 1 (must be DC blocked)	5	VCTL	DC control voltage
3	GND	Ground	6	RFC	RF common port (must be DC blocked)

Electrical and Mechanical Specifications

The absolute maximum ratings of the SKYA21024 are provided in Table 2. Electrical specifications are provided in Table 3.

The state of the SKYA21024 is determined by the logic provided in Table 4. A timing diagram is shown in Figure 3.

The typical performance characteristics for the SKYA21024 are shown in Figures 4 through 7.

Table 2. SKYA21024 Absolute Maximum Ratings[1]

Parameter	Symbol	Minimum	Maximum	Units
Supply voltage	VDD	2.5	3.7	V
Control voltage	VCTL	–0.2	+3.0	V
Input power	P_{IN}		+33	dBm
Storage temperature	T_{STG}	–40	+125	°C
Operating temperature	T_{OP}	–40	+90	°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. SKYA21024 Electrical Specifications[1]
(VDD = 2.8 V, VCTL = 1.8 V, T_{OP} = +25 °C, P_{IN} = 0 dBm, Characteristic Impedance [Z_0] = 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
RF Specifications						
Insertion loss (RFC to RF1/RF2 ports)	IL	0.01 to 1.0 GHz 1.0 to 2.0 GHz 2.0 to 3.0 GHz 4.8 to 6.0 GHz		0.40 0.40 0.45 0.70	0.55 0.55 0.60 0.85	dB dB dB dB
Isolation (RFC to RF1/RF2 ports)	Iso	0.01 to 1.0 GHz 1.0 to 2.0 GHz 2.0 to 3.0 GHz 4.8 to 6.0 GHz	25 25 22	27 27 24 15		dB dB dB dB
Return loss (RFC to RF1/RF2 ports)	|S11|	0.01 to 3.0 GHz 4.8 to 6.0 GHz		23 29		dB dB
0.1 dB input compression point (RF1/RF2 ports)	IP0.1dB	0.7 to 6.0 GHz		+33		dBm
2nd harmonics	2fo	P_{IN} = +20 dBm: 0.8 to 2.7 GHz 4.8 to 6.0 GHz	 +74 +75	 +85 +85		 dBc dBc
3rd harmonics	3fo	P_{IN} = +20 dBm: 0.8 to 2.7 GHz 4.8 to 6.0 GHz	 +75 +75	 +85 +85		 dBc dBc
Third order input intercept point (RF1/RF2)	IIP3	P_{IN} = +17 dBm/tone, Δf = 1 MHz: 2.450 GHz, 5.8 GHz	 +50 +50	 +57 +56		 dBm dBm
Error vector magnitude	EVM	802.11a, 54 Mbps, P_{IN} ≤ +27 dBm 802.11g, 54 Mbps, P_{IN} ≤ +27 dBm		2.5 2.5		% %
Switching speed		@ 2.45 GHz: 50% VCTL to 10/90% RF on time 50% VCTL to 90/10% RF off time 10/90% RF rise time 90/10% RF fall time		 650 650 500 500		 ns ns ns ns
DC Specifications						
Control voltage: Low High	 V_{CTL_L} V_{CTL_H}	Note 2	 0 1.35	 1.8	 0.45 3.0	 V V
Supply voltage	VDD		2.5		3.5	V
Supply current	I_{DD}	VDD = 2.8 V		3	10	µA
Control current	I_{CTL}	VCTL = 1.8 V		1		µA
Leakage control current	I_{CTL_LKG}	VCTL = 1.8 V, VDD = 0 V			0.5	µA

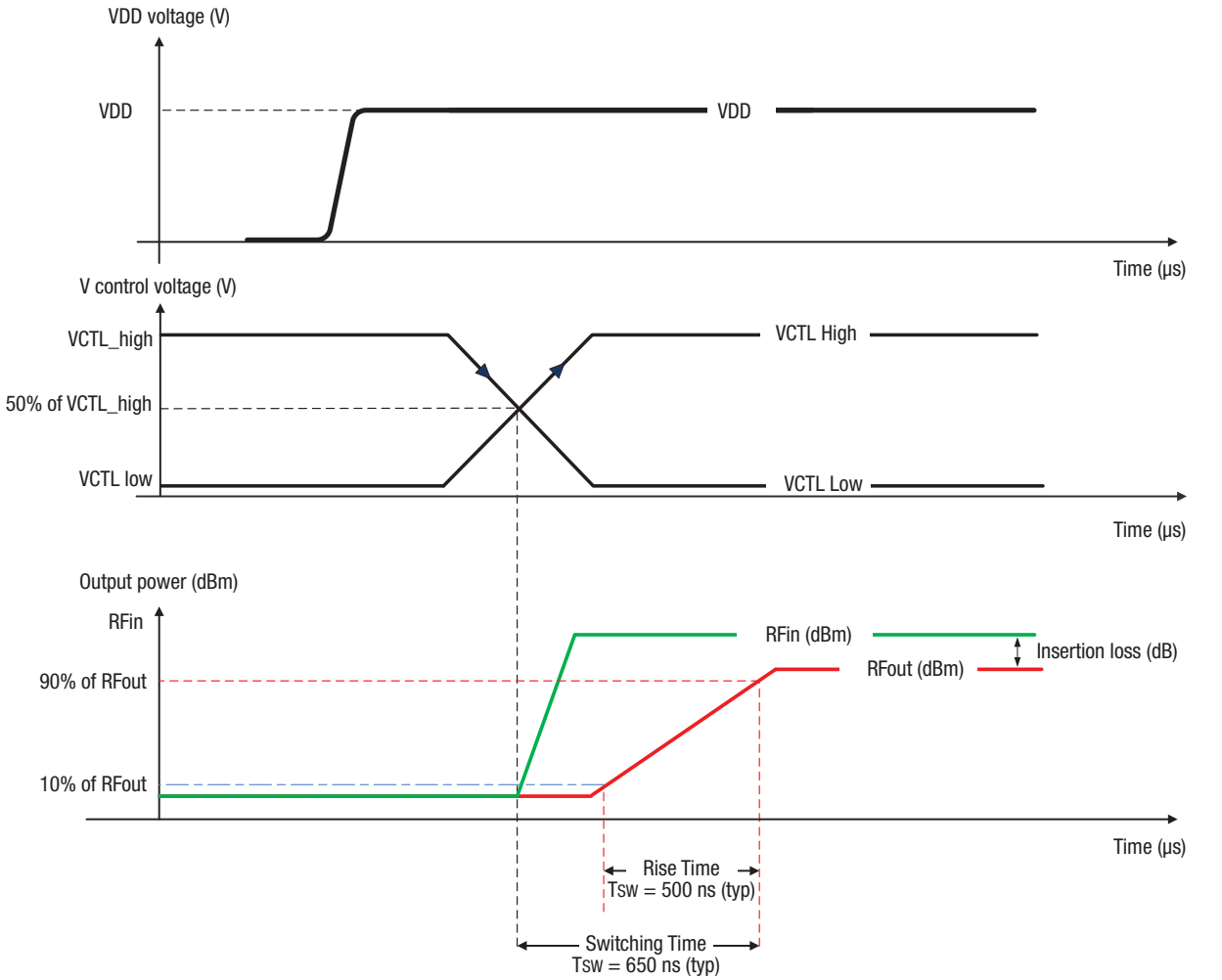
1 Performance is guaranteed only under the conditions listed in this table.

2 VCTL_H should always be lower than or equal to VDD.

Table 4. SKYA21024 Truth Table[1]

VDD (Pin 1)	VCTL (Pin 5)	Insertion Loss Path
H	H	RFC to RF1
H	L	RFC to RF2

1 "H" = +1.35 V to +3.0 V. "L" = 0 V to +0.45 V. Any state other than described in this table places the switch into an undefined state. An undefined state will not damage the device.



Scenario 1: Power-Up Sequence:

1. Set VDD
2. Set VCTL
3. Apply RF signal

Scenario 2: Power-Down Sequence:

1. Turn off RF signal
2. Turn off VCTL
3. Turn off VDD

Scenario 3: Switching Ports:

1. Turn off RF signal
2. Change VCTL state
3. Turn on RF signal

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Figure 3. SKYA21024 Timing Diagram

Typical Performance Characteristics

(V_{DD} = 2.8 V, V_{CTL} = 1.8 V, T_{OP} = +25 °C, P_{IN} = 0 dBm, Characteristic Impedance [Zo] = 50 Ω, Unless Otherwise Noted)

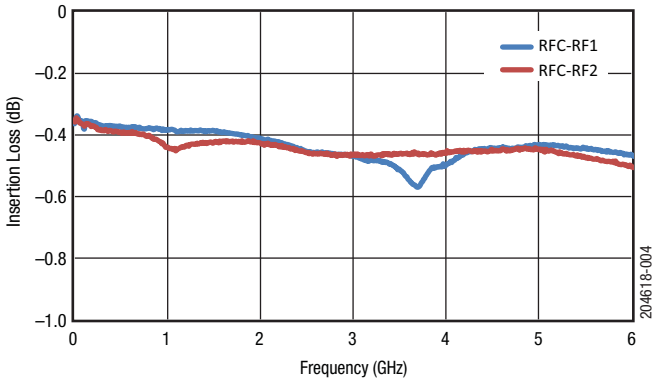


Figure 4. Insertion Loss vs Frequency

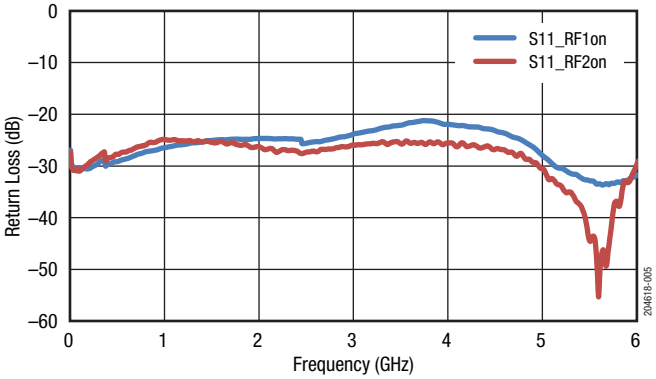


Figure 5. Return Loss vs Frequency

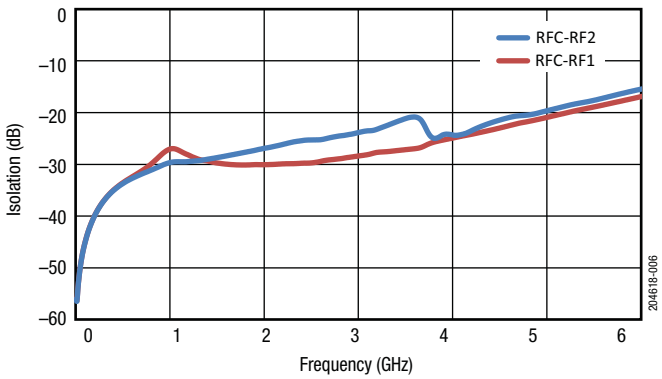


Figure 6. Isolation vs Frequency

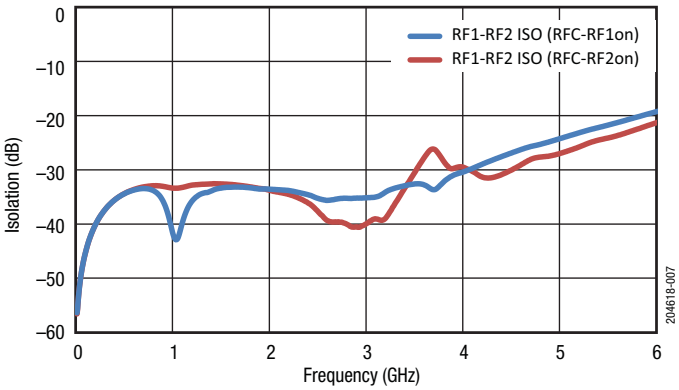


Figure 7. Isolation vs Frequency

Evaluation Board Description

The SKYA21024 Evaluation Board is used to test the performance of the SKYA21024 SP2T Switch. An Evaluation Board schematic diagram is provided in Figure 8. An assembly drawing for the Evaluation Board is shown in Figure 9.

Package Dimensions

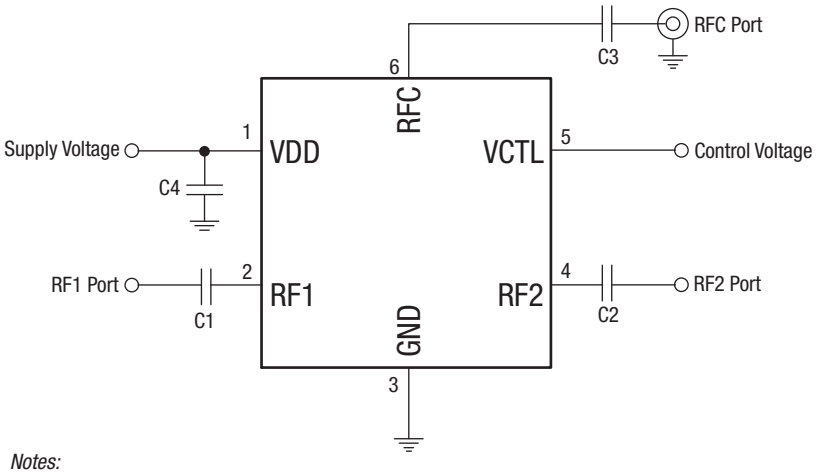
The PCB layout footprint for the SKYA21024 is provided in Figure 10. Typical part markings are shown in Figure 11. Package dimensions are shown in Figure 12, and tape and reel dimensions are provided in Figure 13.

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 SKYA21024 is rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C. It can be used for lead or lead-free soldering. 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.



Notes:

C1, C2, and C3 = 10 nF for low frequency applications (less than 100 MHz)

C4 = 10 nF

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Figure 8. SKYA21024 Evaluation Board Schematic

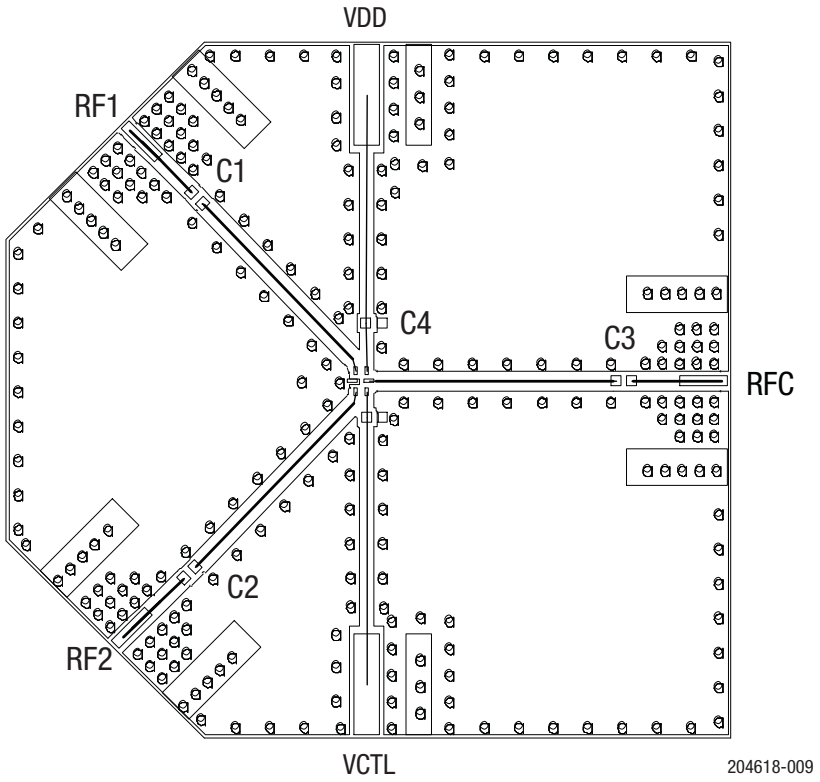


Figure 9. SKYA21024 Evaluation Board Assembly Diagram

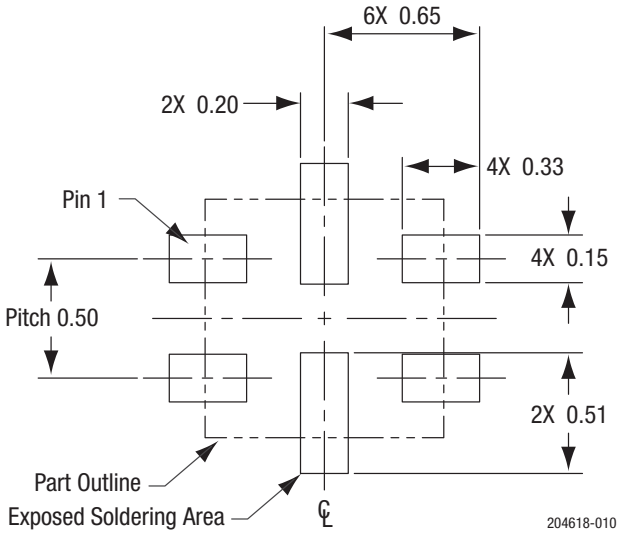


Figure 10. SKYA21024 PCB Layout Footprint (Top View)

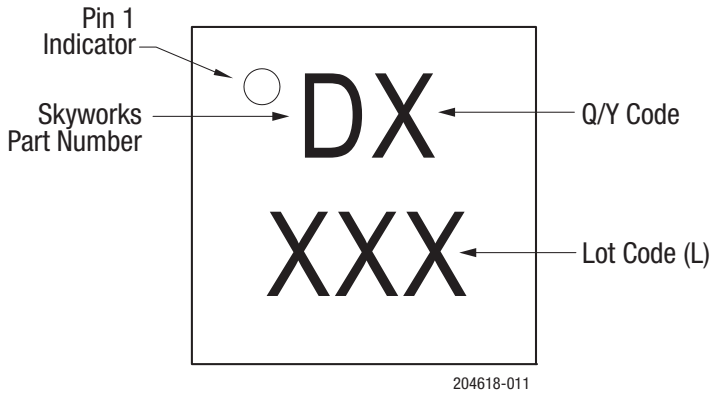
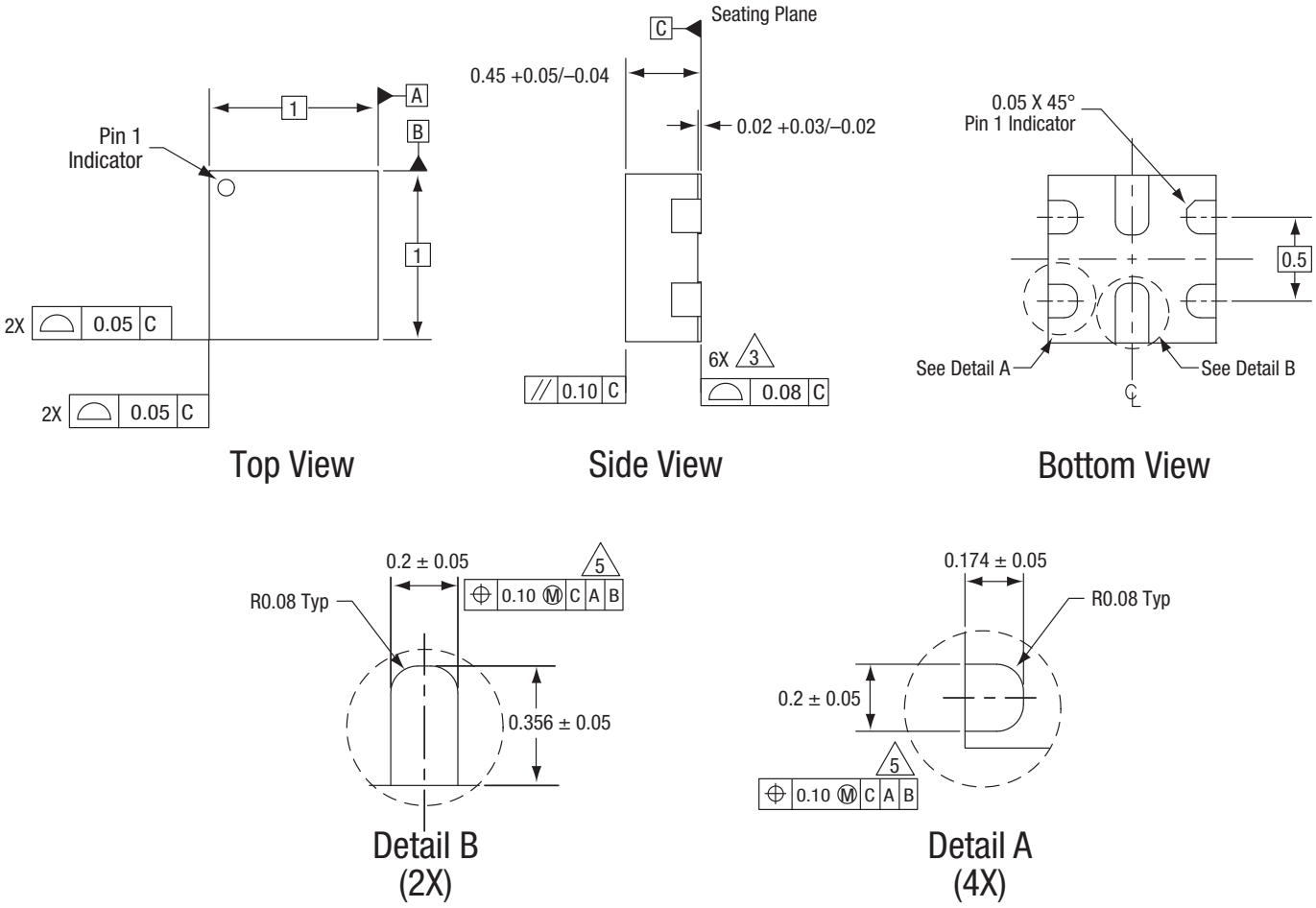


Figure 11. Typical Part Markings (Top View)



Notes:

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

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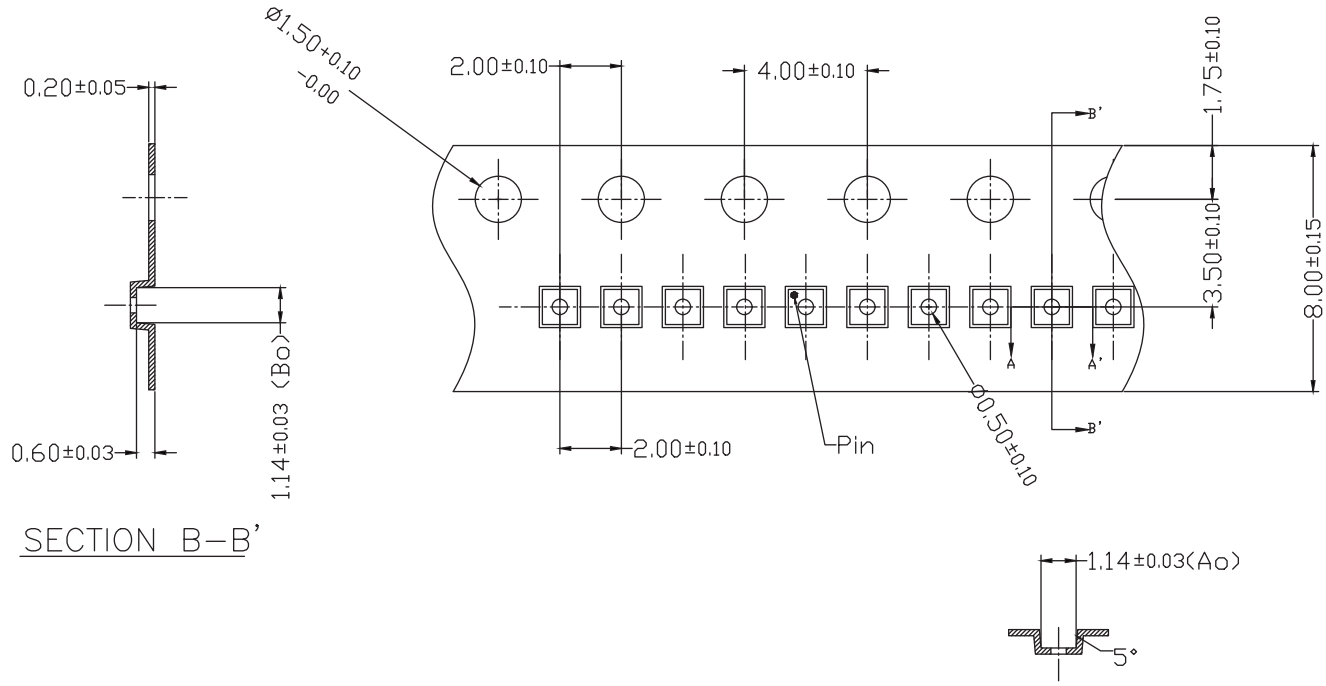
Figure 12. SKYA21024 Package Dimensions



1. CARRIER TAPE MUST MEET ALL SKYWORKS REQUIREMENTS OF GP01-D233 PROCUREMENT SPEC FOR TAPE AND REEL
2. CARRIER TAPE SHALL BE BLACK CONDUCTIVE POLYCARBONATE.
3. COVER TAPE SHALL BE TRANSPARENT CONDUCTIVE MATERIAL
4. ESD-SURFACE RESISTIVITY SHALL MEET GP01-D233
5. 10 SPROCKET HOLE PITCH CUMULATIVE TOLERANCE : ±0.20mm
6. Ao & Bo MEASURED ON PLANE 0.30mm ABOVE THE BOTTOM OF THE POCKET.
7. ALL DIMENSIONS ARE IN MILLIMETERS.

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Figure 13. SKYA21024 Tape and Reel Dimensions

Ordering Information

Model Name	Manufacturing Part Number	Evaluation Board Part Number
SKYA21024: SPDT Switch	SKYA21024	SKYA21024-EVB

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