WINSOURCE ELECTRONICS

THE DATASHEET OF

SKYA21070

DATA SHEET

SKYA21070: 0.1 to 6.0 GHz DPDT Switch

Applications

- Automotive WLAN 802.11 a/b/g/n/ac networks
- Antenna Switching
- ISM band radios
- Automotive infotainment
- IoT M2M modules requiring enhanced robustness

Features

- Broadband frequency range: 0.1 to 6.0 GHz
- Positive control voltage range: 1.8 to 5.0 V
- Low insertion loss:
  - 0.65 dB typical @ 2.5 GHz
  - 1.20 dB typical @ 6.0 GHz
- High isolation:
  - 27 dB typical @ 2.5 GHz
  - 25 dB typical @ 6.0 GHz
- P1dB:
  - +31 dBm typical @ 3 V, 2.5 GHz
  - +29 dBm typical @ 3 V, 6.0 GHz
- Automotive Level 3 PPAP available
- IMDS material declaration available
- Independent BOM management to minimize PCN risk
- Small, MLPD (6-pin, 1.5 x 1.5 mm) Pb-free package (MSL1, 260 °C per JEDEC J-STD-020)

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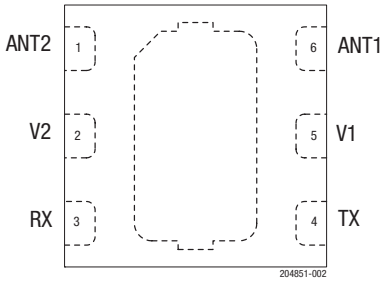


Figure 2. SKYA21070 Pinout (Top View)

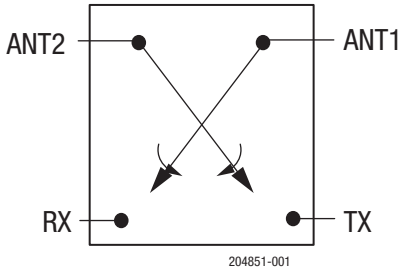


Figure 1. SKYA21070 Block Diagram

Description

The SKYA21070 is a pHEMT GaAs double-pole, double-throw (DPDT) switch designed for applications in the broadband frequency range from 0.1 to 6.0 GHz. The switch provides high-linearity performance, low insertion loss, and high isolation in the broadband frequency band.

Switching is controlled by two voltage inputs (V1 and V2). Depending on the logic voltage level applied to the control pins, the ANT1 and ANT2 pins connect to one of two switched RF outputs (RX or TX) through a low insertion loss path while maintaining a high isolation path to the alternate port.

The switch is manufactured in a compact, 1.5 x 1.5 mm, 6-pin exposed pad plastic Micro Leadframe Package Dual (MLPD) 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. SKYA21070 Signal Descriptions[1]

Pin	Name	Description	Pin	Name	Description
1	ANT2	Antenna 2 RF port. Must be DC-blocked for proper operation.	4	TX	Transmit RF port. Must be DC-blocked for proper operation.
2	V2	DC control voltage 2	5	V1	DC control voltage 1
3	RX	Receive RF port. Must be DC-blocked for proper operation.	6	ANT1	Antenna 1 RF port. Must be DC-blocked for proper operation.

1 Exposed backside ground pad must be properly grounded through a low impedance path.

Electrical and Mechanical Specifications

The absolute maximum ratings of the SKYA21070 are provided in Table 2. Electrical specifications are provided in Table 3.

The state of the SKYA21070 is determined by the logic provided in Table 4. Typical performance characteristics are illustrated in Figures 3 to 9.

Table 2. SKYA21070 Absolute Maximum Ratings[1]

Parameter	Symbol	Minimum	Maximum	Units
Control voltage	V1, V2		6	V
RF input power	P_{IN}		+32	dBm
Storage temperature	T_{STG}	-40	+125	°C
Operating temperature	T_{OP}	-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.

***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. SKYA21070 Electrical Specifications[1]
(V_{CTL} = 0 V and +3.0 V, T_{OP} = +25 °C, P_{IN} = 0 dBm, Characteristic Impedance [Z_0] = 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
RF Specifications						
Insertion loss	IL	ANT1/ANT2 to RX/TX: 0.1 to 1.0 GHz 1.0 to 2.5 GHz 2.5 to 4.9 GHz 4.9 to 6.0 GHz		 0.50 0.65 1.00 1.20	 0.75 0.9 1.30 1.40	 dB dB dB dB
Isolation	Iso	ANT1/ANT2 to RX/TX: 0.1 to 1.0 GHz 1.0 to 2.5 GHz 2.5 to 4.9 GHz 4.9 to 6.0 GHz	 30 26 23 22	 34 27 24 25		 dB dB dB dB
Isolation	Iso	ANT1 to ANT2, RX to TX: 2.4 to 2.5 GHz 4.9 to 6.0 GHz	 27 24	 31 29		 dB dB
Return loss[2]	|S11|	ANT1/ANT2 to RX/TX, 0.1 to 6.0 GHz		15		dB
1 dB input compression point	IP1dB	0.1 to 2.4 GHz 4.9 to 6.0 GHz		+31 +29		dBm dBm
Input IP3	IIP3	P_{IN} = +20 dBm/tone, Δf = 1 MHz: 2.5 GHz 4.9 to 6.0 GHz		 +54 +52		 dBm dBm
2nd harmonic	2fo	P_{IN} = +20 dBm, 0.1 to 6.0 GHz		+72		dBc
3rd harmonic	3fo	P_{IN} = +20 dBm, 0.1 to 6.0 GHz		+73		dBc
Switching speed		50% V1/V2 to 90/10% RF 90/10% RF or 10/90% RF		160 75		Ns ns
DC Specifications						
Control voltage: High Low	V1, V2		 1.8 -0.2	 3.0 0	 5.0 0.2	 V V
Control current	Icc			5		µA

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

2 Lower frequency return loss is dependent on the DC blocking capacitor value.

Table 4. SKYA21070 Truth Table[1]

V1 (Pin 5)	V2 (Pin 2)	ANT1 (Pin 6) to TX (Pin 4)	ANT1 (Pin 6) to RX (Pin 3)	ANT2 (Pin 1) to TX (Pin 4)	ANT2 (Pin 1) to RX (Pin 3)
High	Low	Isolation state	Insertion loss state	Insertion loss state	Isolation state
Low	High	Insertion loss state	Isolation state	Isolation state	Insertion loss state

1 High = +1.8 V to +5 V. Low = -0.2 V to +0.2 V.

Typical Performance Characteristics

(V_{CTL} = 0 V and +3.0 V, T_{OP} = +25 °C, P_{IN} = 0 dBm, Characteristic Impedance [Z_0] = 50 Ω, Unless Otherwise Noted)

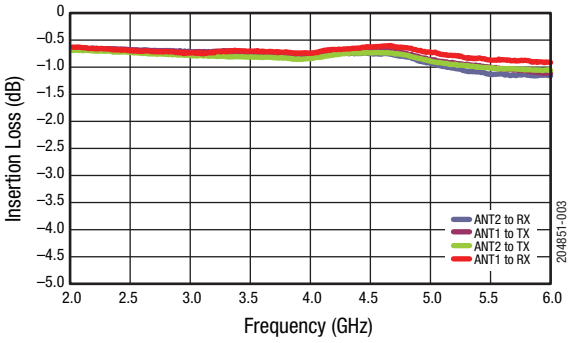


Figure 3. Insertion Loss vs Frequency

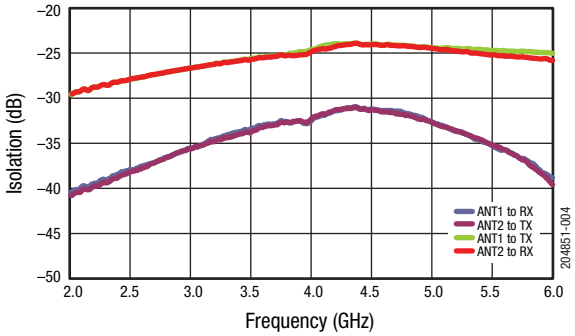


Figure 4. Isolation vs Frequency (ANT1 or ANT2 to TX or RX)

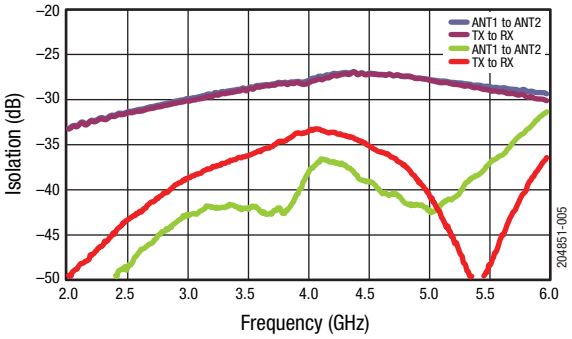


Figure 5. Isolation vs Frequency (ANT1 to ANT2 and TX to RX)

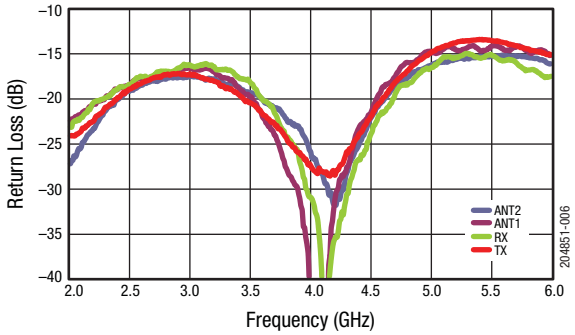


Figure 6. Return Loss vs Frequency (ANT2 to TX, ANT1 to RX Active)

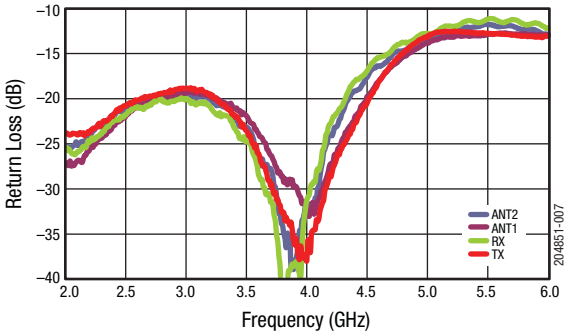


Figure 7. Return Loss vs Frequency (ANT2 to RX, ANT1 to TX Active)

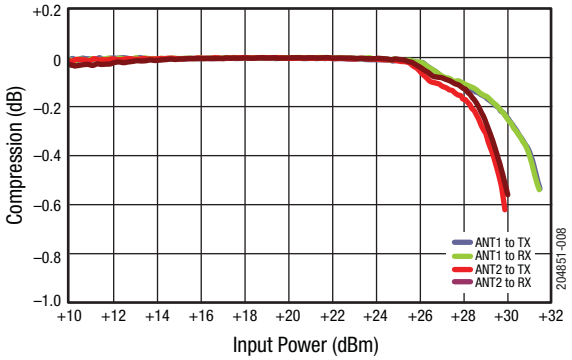


Figure 8. Compression vs Input Power @ 2.50 GHz and 3 V

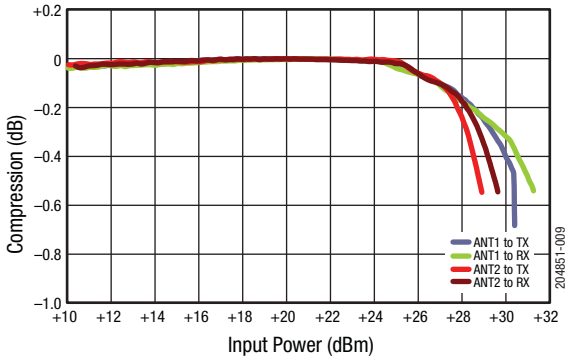


Figure 9. Compression vs Input Power @ 4.85 to 6.00 GHz and 3 V

Evaluation Board Description

The SKYA21070 Evaluation Board is used to test the performance of the SKYA21070 DPDT Switch. An Evaluation Board schematic diagram is provided in Figure 10.

The Bill of Materials (BOM) for components on the Evaluation Board are listed in Table 5. An assembly drawing for the Evaluation Board is shown in Figure 11.

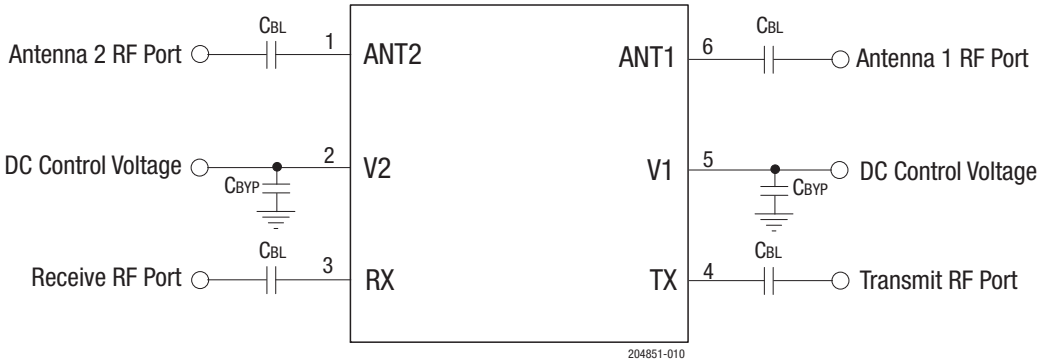


Figure 10. SKYA21070 Evaluation Board Schematic

Table 5. SKYA21070 Evaluation Board Bill of Materials

Component	Value	Size	Manufacturer	Description
CBL	47 pF	0402	Murata GRM Series	DC blocking capacitor
CBYP	10 pF	0402	Murata GRM Series	Decoupling capacitor

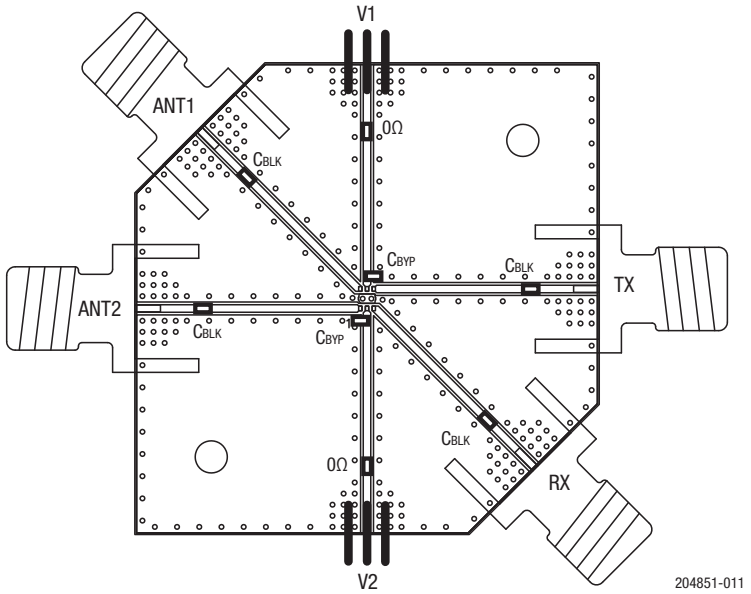


Figure 11. SKYA21070 Evaluation Board Assembly Diagram

Package Dimensions

The PCB layout footprint for the SKYA21070 is provided in Figure 12. Typical part markings are shown in Figure 13. Package dimensions are shown in Figure 14, and tape and reel dimensions are provided in Figure 15.

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 SKYA21070 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.

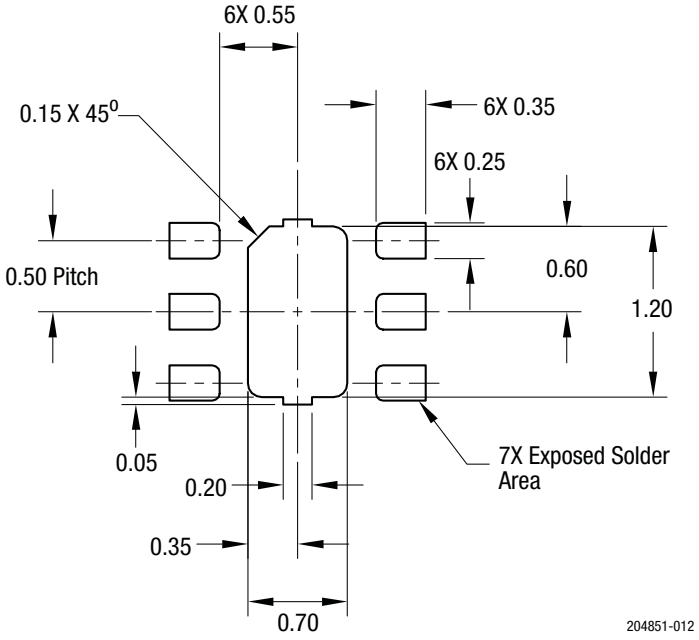


Figure 12. SKYA21070 PCB Layout Footprint (Top View)

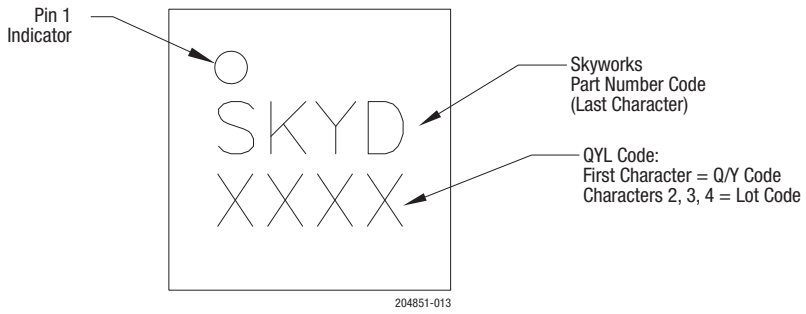


Figure 13. Typical Part Markings (Top View)

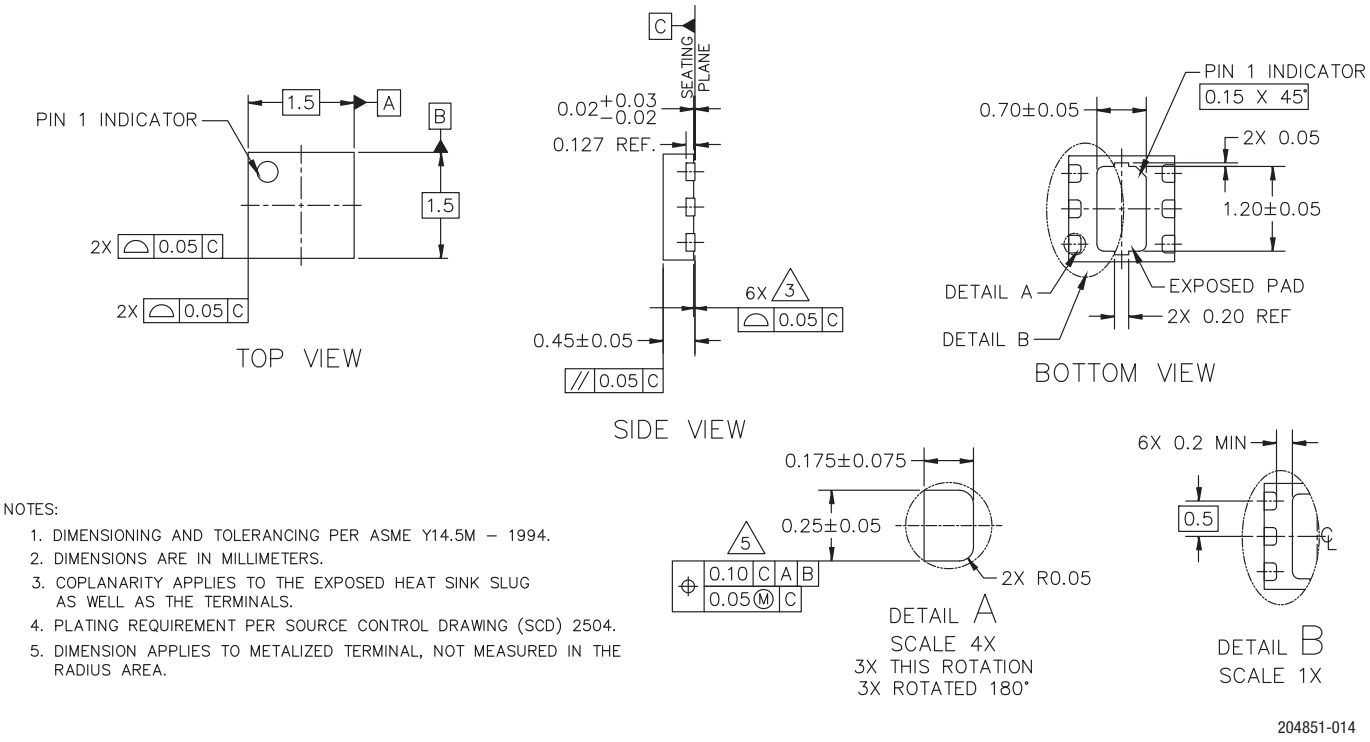
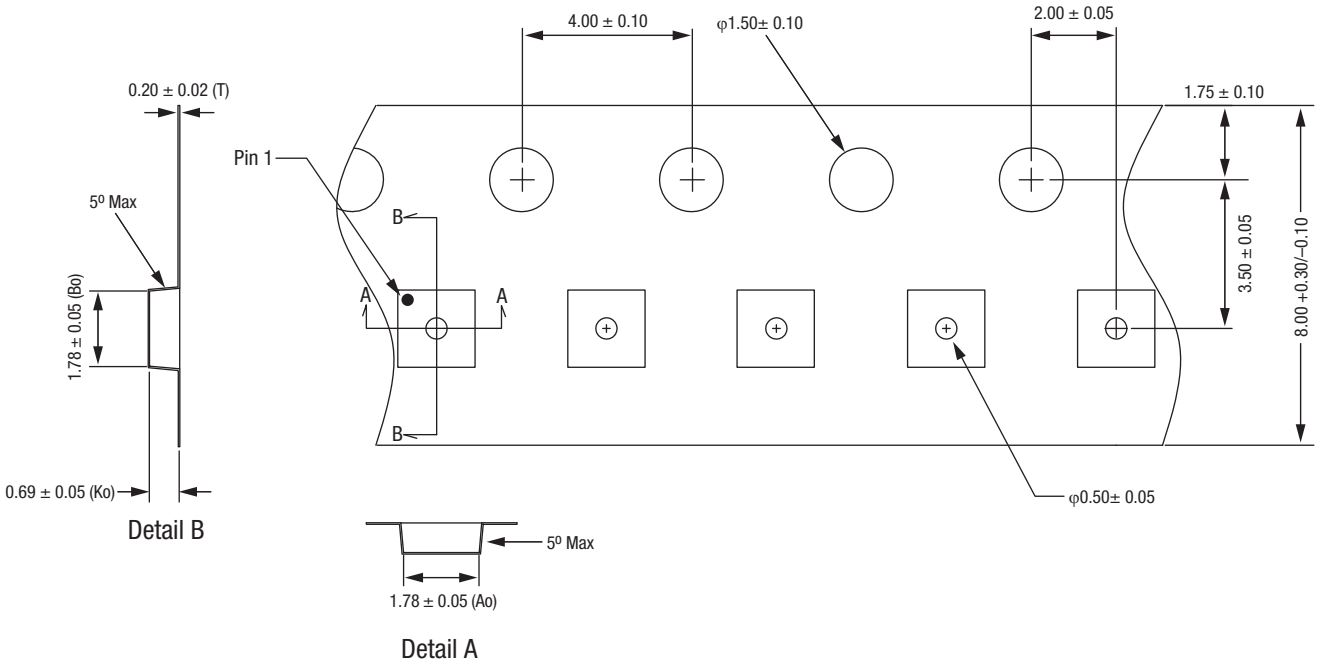


Figure 14. SKYA21070 Package Dimensions



Notes:

1. *Carrier tape: black conductive polycarbonate or polystyrene.*
2. *Cover tape material: transparent conductive PSA.*
3. *Cover tape size: 5.4 mm width.*
4. *All measurements are in millimeters.*

204851-015

Figure 15. SKYA21070 Tape and Reel Dimensions

Ordering Information

Product Description	Product Part Number	Evaluation Board Part Number
SKYA21070: DPDT Switch	SKYA21070	SKYA21070EK1

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