



SKY13582-676LF: 0.4 to 3.8 GHz SP3T Switch

Applications

- Cellular systems
- 3G/4G LTE systems
- Pre- and post-PA switching

Features

- Broadband frequency range: 0.4 to 3.8 GHz
- Very low insertion loss
- High isolation: 25 dB at 2.7 GHz
- Integrated GPIO interface
- No dc blocking capacitors required
- Lead (Pb)-free and RoHS-compliant
- Small QFN (9-pin, 1.1 x 1.1 x 0.5 mm) package
MSL1, 260 °C per JEDEC J-STD-020
- For RoHS and other product compliance information, see the [Skyworks Certificate of Conformance](#).

Description

The SKY13582-676LF is a single-pole, triple-throw (SP3T) switch. No external dc blocking capacitors are required on the RF paths as long as there is no dc voltage on the RF line. The switch can operate over the temperature range of -40 °C to +85 °C.

Switching is controlled by two CMOS/TTL compatible control voltage inputs (VC1 and VC2). Depending on the logic voltage level applied to the control pin, the RFC pin is connected to one of three switched RF outputs (RF1, RF2, or RF3) by using a low insertion loss path, while the path between the RFC pin and the other RF pins is in isolation.

A functional block diagram is shown in Figure 1. The pin configuration and package are shown in Figure 2. Signal pin assignments and functional descriptions are provided in Table 1.

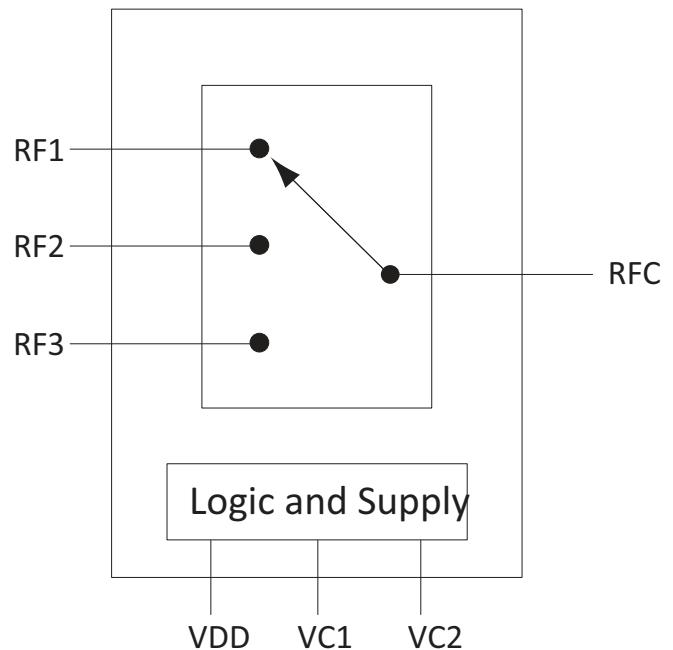


Figure 1. Functional Block Diagram

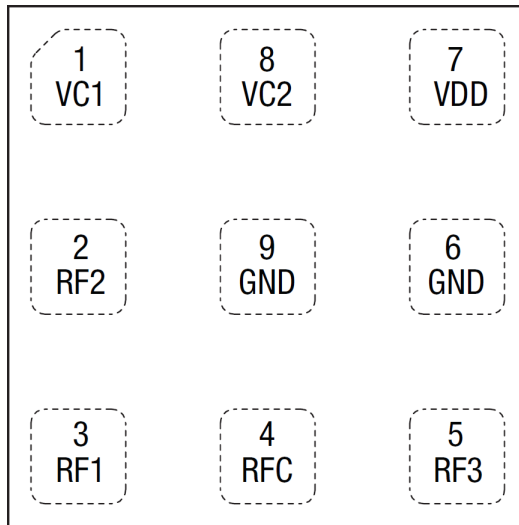


Figure 2. Pinout (Top View)

Table 1. Signal Descriptions¹

Pin	Name	Description
1	VC1	Control voltage 1
2	RF2	RF input/output port 2
3	RF1	RF input/output port 1
4	RFC	RF common port
5	RF3	RF input/output port 3
6	GND	Ground
7	VDD	Supply voltage
8	VC2	Control voltage 2
9	GND	Ground

1. Exposed pads must be grounded.

Electrical and Mechanical Specifications

Table 2. Absolute Maximum Ratings¹

Parameter	Symbol	Condition	Min	Max	Units
Supply voltage	V _{DD}	T = 25 °C	2.35	5.5	V
Control voltages	V _{C1} , V _{C2}	T = 25 °C	0	3.1	V
RF input power	RF _{IN}	CW, T = 25 °C; 50 Ω		+35	dBm
Operating case temperature	T _{CASEMAX}		-40	+85	°C
Storage temperature	T _{STG}		-55	+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_{DD} = 2.85 v, T_{OP} = +25 °C, Characteristic Impedance [Z₀] = 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Small Signal						
Insertion loss (RFC to RF1-RF3) ²	IL	400 to 960 MHz 960 to 2170 MHz 2170 to 2700 MHz 2700 to 3800 MHz		0.35 0.40 0.50 0.6	0.5 0.6 0.65 0.8	dB
Isolation (RFC to RF1-RF3)	ISO	400 to 960 MHz 960 to 2170 MHz 2170 to 2700 MHz 2700 to 3800 MHz	32 23 20 18	36 27 25 23		dB
Isolation (TRXx to any off TRXx ports [adjacent])	ISO	400 to 960 MHz 960 to 2170 MHz 2170 to 2700 MHz 2700 to 3800 MHz	32 23 20 15	35 25 23 18		dB
Isolation (TRXx to any off TRXx ports [non-adjacent])	ISO	400 to 960 MHz 960 to 2170 MHz 2170 to 2700 MHz 2700 to 3800 MHz	36 29 25 20	39 32 27 22		dB
Return loss (RFC to RF1-RF3)	RL	400 to 2700 MHz 2700 to 3800 MHz	14 10	20 15		dB
Large Signal						
0.1dB compression point	PO.1dB	Up to 3800 MHz	+34	+35		dBm
LTE/WCDMA harmonic, RF1, RF2 or RF3 to ANT, low band	2fo, 3fo	fo = 824 to 960 MHz, P _{IN} = +26 dBm, VSWR 1:1		-72	-66	dBm
		fo = 824 to 960 MHz, P _{IN} = +26 dBm, VSWR 5:1		-65	-60	dBm
LTE/WCDMA harmonic, RF1, RF2 or RF3 to ANT, mid band	2fo, 3fo	fo = 1710 to 1910 MHz, P _{IN} = +26 dBm, VSWR 1:1		-72	-60	dBm
		fo = 1710 to 1910 MHz, P _{IN} = +26 dBm, VSWR 5:1		-65	-59	dBm

Table 3. Electrical Specifications¹ (Continued)

(V_{DD} = 2.85 v, T_{OP} = +25 °C, Characteristic Impedance [Z₀] = 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
LTE/WCDMA harmonic, RF1, RF2 or RF3 to ANT, high band	2fo, 3fo	f ₀ = 2170 to 2690 MHz, P _{IN} = +26 dBm, VSWR 1:1		-70	-62	dBm
		f ₀ = 2170 to 2690 MHz, P _{IN} = +26 dBm, VSWR 5:1		-65	-59	dBm
		f ₀ = 3400 to 3800 MHz, P _{IN} = +26 dBm, VSWR 1:1		-65	-60	dBm
		f ₀ = 3400 to 3800 MHz, P _{IN} = +26 dBm, VSWR 5:1		-60	-55	dBm
Second order intermodulation product	IIP2	Bands 1, 5, 7, Ftx: +24 dBm, Fbl: -15 dBm	+103	+110		dBm
Third order intermodulation product	IIP3	Bands 1, 5, 7, Ftx: +24 dBm, Fbl: -15 dBm	+61	+66		dBm
Triple beat ratio	TBR	650 to 900 MHz, TX1 = TX2 = +21.5 dBm, block = -30 dBm	+51	+85		dBc
Triple beat ratio	TBR	1710 to 2155 MHz, TX1 = TX2 = +21.5 dBm, block = -30 dBm	+51	+85		dBc
DC Operating						
Supply voltage	V _{DD}	T = 25 °C	2.45	2.85	4.8	V
Control voltage high	V _{C1}	T = 25 °C	1.35	1.8	3	V
Control voltage low	V _{C1}	T = 25 °C	0		0.4	V
Supply current	I _{DD}	T = 25 °C		40	100	μA
Control current	I _{CTL}	T = 25 °C			1	μA
Switching speed	T _{SW}	From one active state to another active state.		2	5	μs
Startup time	t _{ON}	From V _{DD} off to V _{DD} on			20	μs

1. Performance is assured only under the conditions listed in this table.
2. Insertion loss is measured with a series inductor added to the RFC line.

Table 4. Logic Truth Table

Path	VDD	VC1	VC2
RFC to RF1	H	H	L
RFC to RF2	H	H	H
RFC to RF3	H	L	H
Isolation	H	L	L

Table 5. Isolation Matrix ANT to OFF Arms

Antenna to OFF Arm	Frequency (MHz)	RF1	RF2	RF3
ANT	960		-51	-36
ANT	2170		-40	-29
ANT	2690		-37	-27
ANT	3800		-31	-23
ANT	960	-38		-34
ANT	2170	-30		-26
ANT	2690	-27		-24
ANT	3800	-23		-21
ANT	960	-34	-40	
ANT	2170	-27	-33	
ANT	2690	-25	-31	
ANT	3800	-22	-27	

Table 6. Isolation Matrix ON Arms to OFF Arms

Throw	Frequency (MHz)	RF1	RF2	RF3
RF1	960		-35	-48
RF1	2170		-28	-38
RF1	2690		-26	-35
RF1	3800		-23	-30
RF2	960	-37		-53
RF2	2170	-29		-41
RF2	2690	-26		-38
RF2	3800	-22		-32
RF3	960	-52	-49	
RF3	2170	-39	-40	
RF3	2690	-36	-38	
RF3	3800	-29	-33	

Evaluation Board

An evaluation board is used to test the performance of the SKY13582-676LF switch. A schematic diagram is provided in Figure 3, and an assembly drawing is shown in Figure 4.

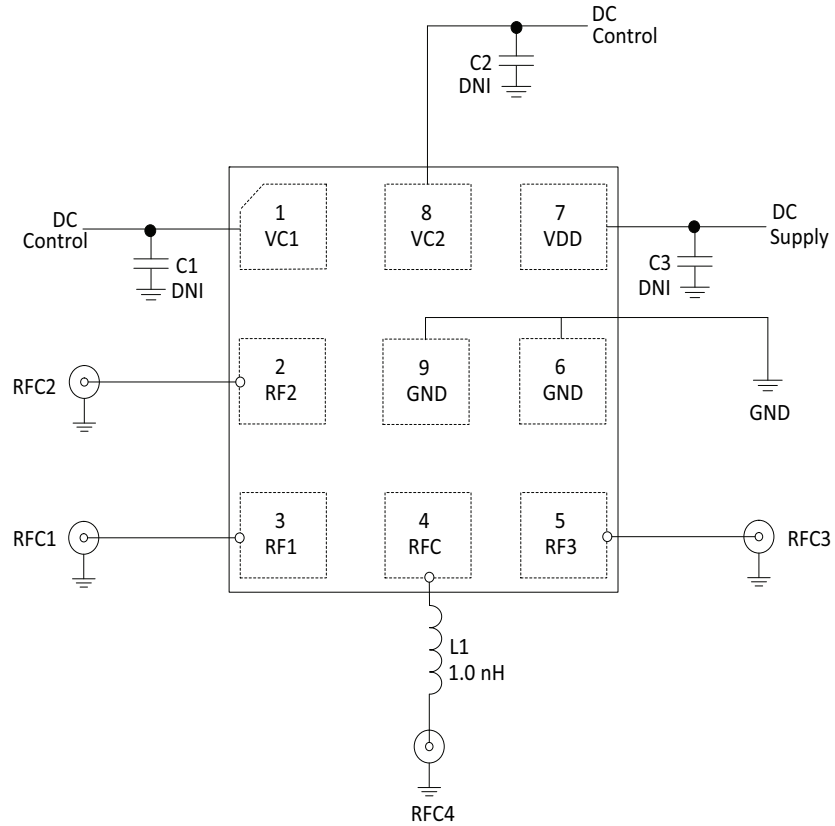


Figure 3. Evaluation Board Schematic

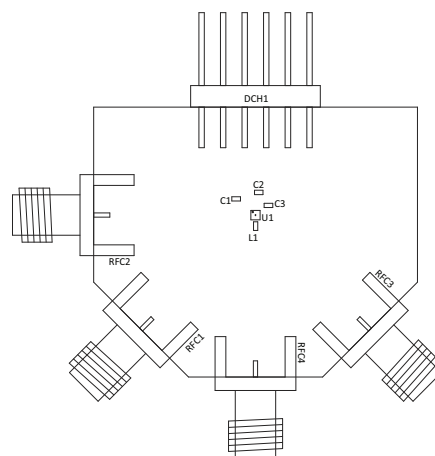


Figure 4. Evaluation Board Assembly Diagram

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 SKY13582-676LF 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.

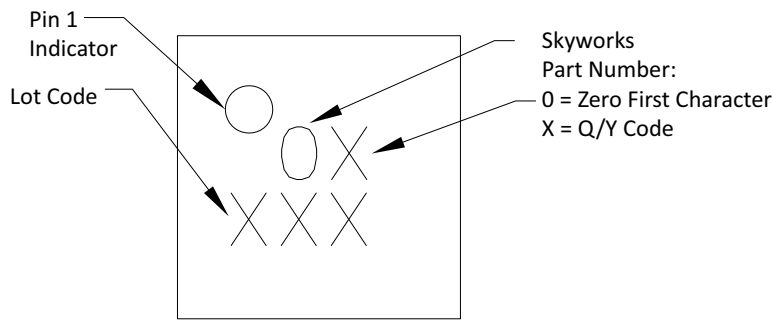
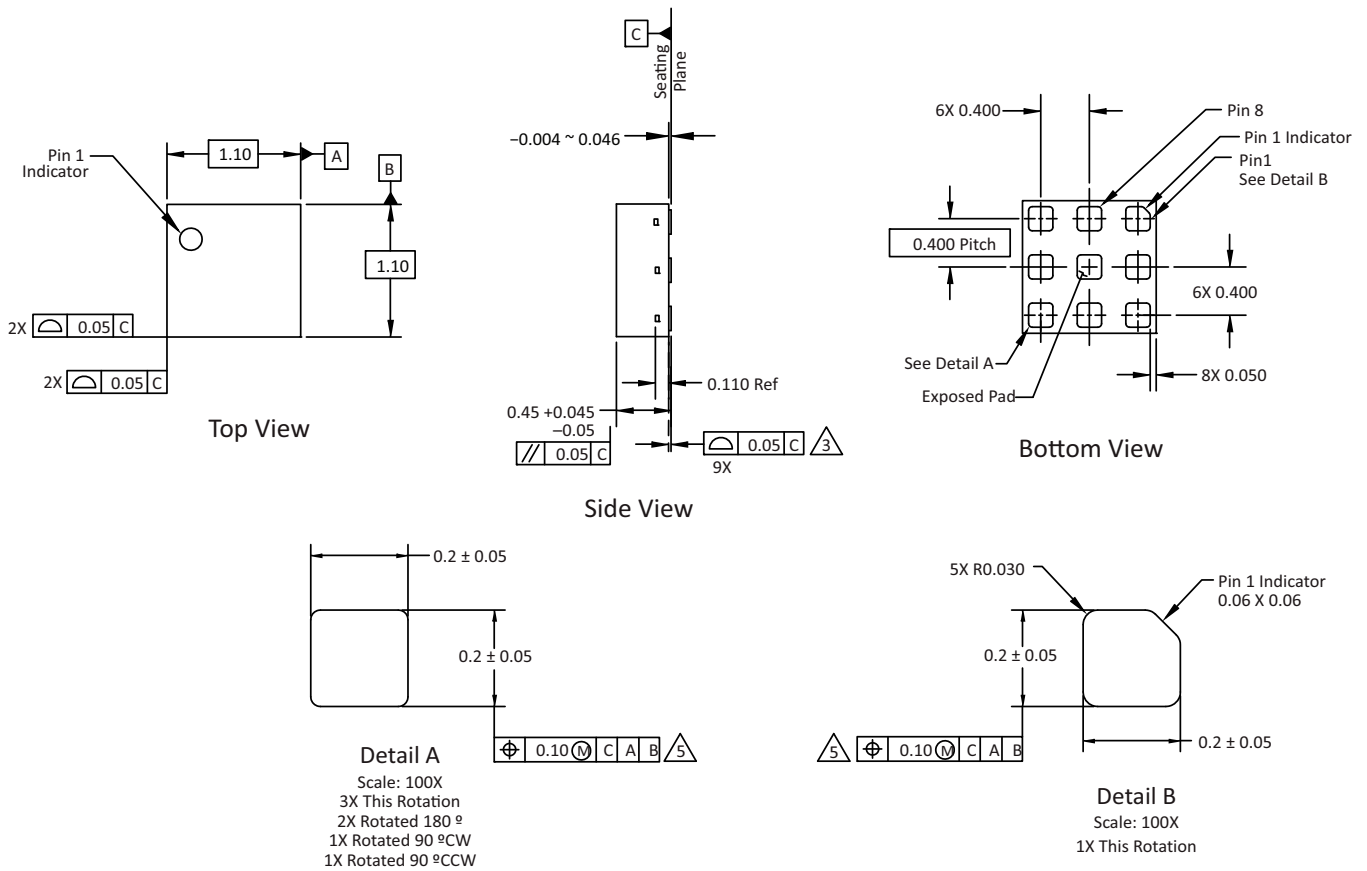


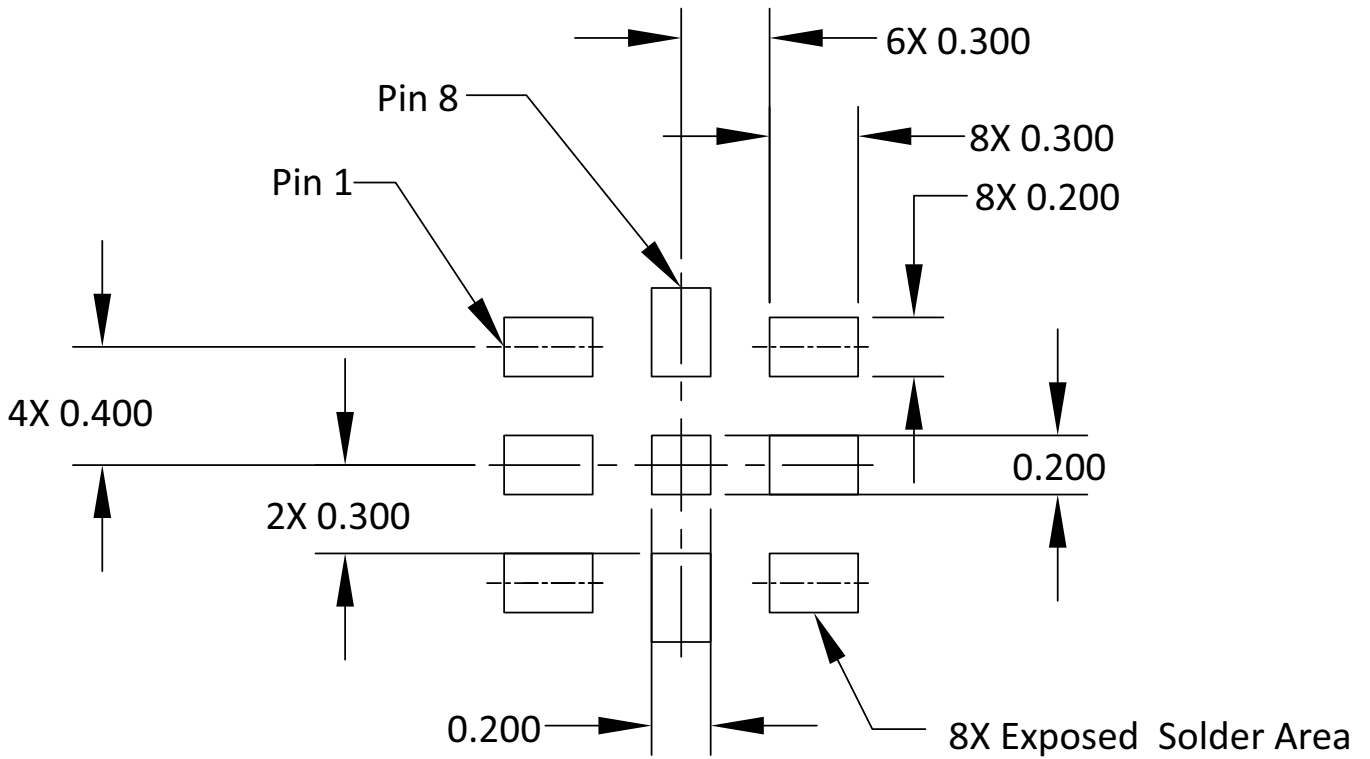
Figure 5. Typical Part Marking



Notes:

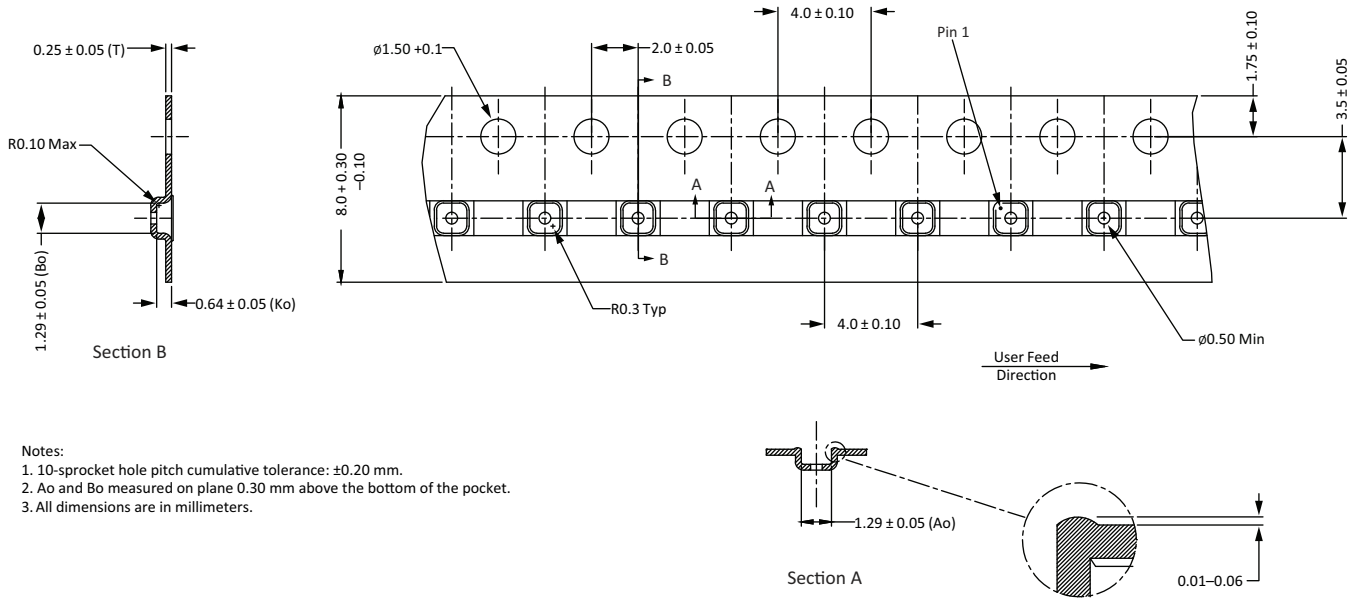
1. Dimensions and tolerances per ASME Y14.5-1994.
2. All dimensions are in millimeters unless otherwise specified.
3. Coplanarity applies to the terminals and all other bottom surface metallization.

Figure 6. Package Dimensions



All dimensions are in millimeters.

Figure 7. PCB Layout Footprint



Notes:

1. 10-sprocket hole pitch cumulative tolerance: ± 0.20 mm.
2. Ao and Bo measured on plane 0.30 mm above the bottom of the pocket.
3. All dimensions are in millimeters.

Figure 8. Tape and Reel Information

Ordering Information

Part Number	Description	Evaluation Board Part Number
SKY13582-676LF	0.4 to 3.8 GHz SP3T Switch	SKY13582-676-EVB

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