DATA SHEET

SKY13586-678LF: 2.4 to 2.5 GHz SP3T Switch

Applications

- 802.11 a/b/g/n/ac WLAN networks
- Bluetooth® systems
- Smartphones
- Connectivity modules

Features

- Positive low voltage control: 0/1.8 to 3.6 V
- Insertion loss: 0.75 dB @ 2.5 GHz (typical)
- High isolation: 35 dB @ 2.5 GHz (typical)
- 1.8 V and 3.3 V logic compatibility
- Wide 3 to 5 V supply voltage range
- Integrated DC blocking capacitors
- Miniature, ultra-thin MLP (8-pin, 1.1 x 1.1 x 0.33 mm) package (MSL1, 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.

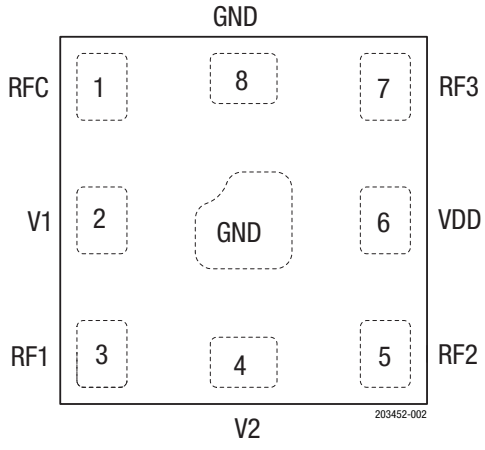


Figure 2. SKY13586-678LF Pinout (Top View)

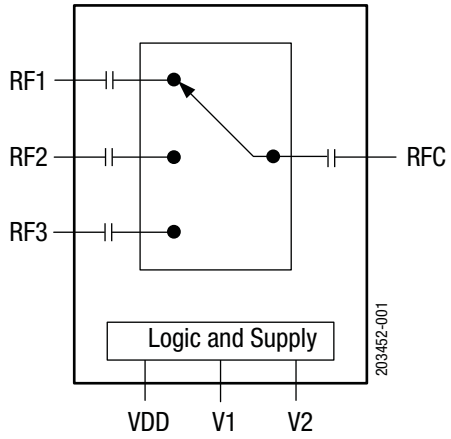


Figure 1. SKY13586-678LF Block Diagram

Description

The SKY13586-678LF is a single-pole, triple-throw (SP3T) antenna switch for 2.4 GHz WiFi applications. Switching between the antenna (RFC signal) and the RF1, RF2, and RF3 ports is accomplished with two control voltages (V1 and V2).

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

The SKY13586-678LF has integrated DC blocking capacitors, so external DC blocking capacitors are not required.

The SKY13586-678LF is manufactured in a compact, 1.1 x 1.1 x 0.33 mm, 8-pin Micro Leadframe package (MLP). 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. SKY13586-678LF Signal Descriptions

Pin	Name	Description	Pin	Name	Description
1	RFC	Antenna	5	RF2	RF port 2
2	V1	Switch logic control (see Table 4)	6	VDD	DC power supply
3	RF1	RF port 1	7	RF3	RF port 3
4	V2	Switch logic control (see Table 4)	8	GND	Ground

[1] Exposed GND pad must be grounded.

Electrical and Mechanical Specifications

The absolute maximum ratings of the SKY13586-678LF are provided in Table 2. Electrical specifications are provided in Table 3.

The state of the SKY13586-678LF is determined by the logic provided in Table 4.

Table 2. SKY13586-678LF Absolute Maximum Ratings[1]

Parameter	Symbol	Minimum	Typical	Maximum	Units
Input power	P_{IN}			+32	dBm
Supply voltage	V_{DD}			6.0	V
Control voltage	V_{CTL}			3.7	V
Storage temperature	T_{STG}	–65		+150	°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. SKY13586-678LF Electrical Specifications[1]
(V_{DD} = 3.3 V, V_{CTL} = 0 V and +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
Insertion loss	IL	2.4 to 2.5 GHz		0.75	0.95	dB
Isolation RFC to RF1/RF2 or RF3	ISO	2.4 to 2.5 GHz	31	35		dB
Isolation RF1 to RF2	ISO	2.4 to 2.5 GHz	35	40		dB
Return loss	RL	2.4 to 2.5 GHz		12		dB
P0.1db compression point	P0.1dB	2.4 to 2.5 GHz		+29		dBm
Harmonics		P_{IN} = +24 dBm, fo = 2.4 GHz: 2fo 3fo		 –50 –32		 dBm dBm
Input IP3	IP3	P_{IN} = +20 dBm/tone, fo = 2.4 GHz		46		dBm
Error vector magnitude	EVM	802.11g, 2.4 GHz, P_{IN} = +24 dBm 802.11g, 2.4 GHz, P_{IN} = +25.5 dBm		–43 –41	–38 –36	dB dB
Startup time	ts	50% V_{DD} to 90% of RF		2	5	µs
Switching speed	tsw	50% V_{CTL} to 90% RF		300	400	ηs
Supply voltage	VDD	Normal test conditions	3	3.3	5	V
Control voltage: High Low	 VCTL_H VCTL_L	Normal test conditions	 1.6	 1.8 0	 3.6 0.4	 V V
Supply current	I_{DD}	Normal test conditions		5	10	µA

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

Table 4. SKY13586-678LF Truth Table[1]

VDD	V1	V2	RFC - RF1	RFC - RF2	RFC - RF3
1	1	1	OFF	ON	OFF
1	1	0	ON	OFF	OFF
1	0	1	OFF	ON	OFF
1	0	0	OFF	OFF	ON

[1] "1" indicates V_{DD} = 3 to 5 V, V_{CTL} = 1.6 to 3.6 V.
"0" indicates V_{CTL} = 0 to 0.4 V.
Any state other than described in this table places the switch into an undefined state. An undefined state will not damage the device.

Evaluation Board Description

The SKY13586-678LF Evaluation Board is used to test the performance of the SKY13586-678LF SP3T Switch. An Evaluation Board schematic diagram is provided in Figure 3. An assembly drawing for the Evaluation Board is shown in Figure 4.

Package Dimensions

The PCB layout footprint for the SKY13586-678LF is provided in Figure 5. Typical part markings are shown in Figure 6. Package dimensions are shown in Figure 7, and tape and reel dimensions are provided in Figure 8.

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 SKY13586-678LF 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.

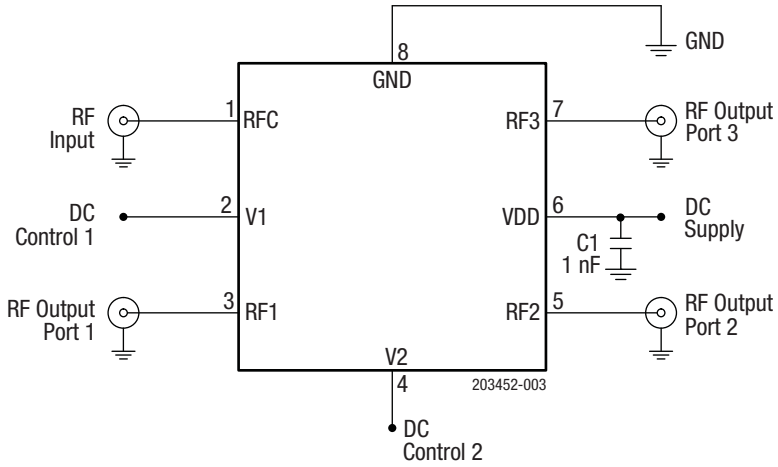


Figure 3. SKY13586-678LF Evaluation Board Schematic

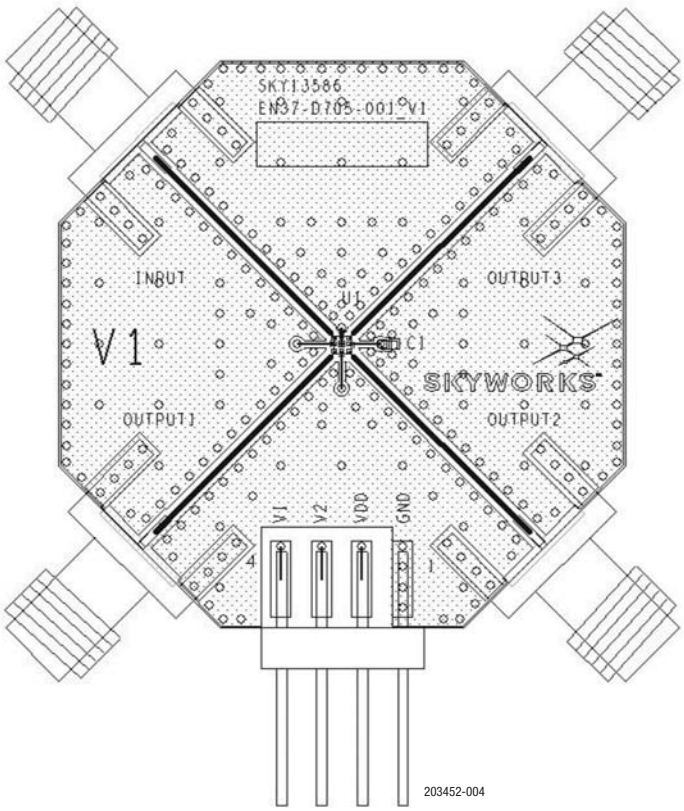


Figure 4. SKY13586-678LF Evaluation Board Assembly Diagram

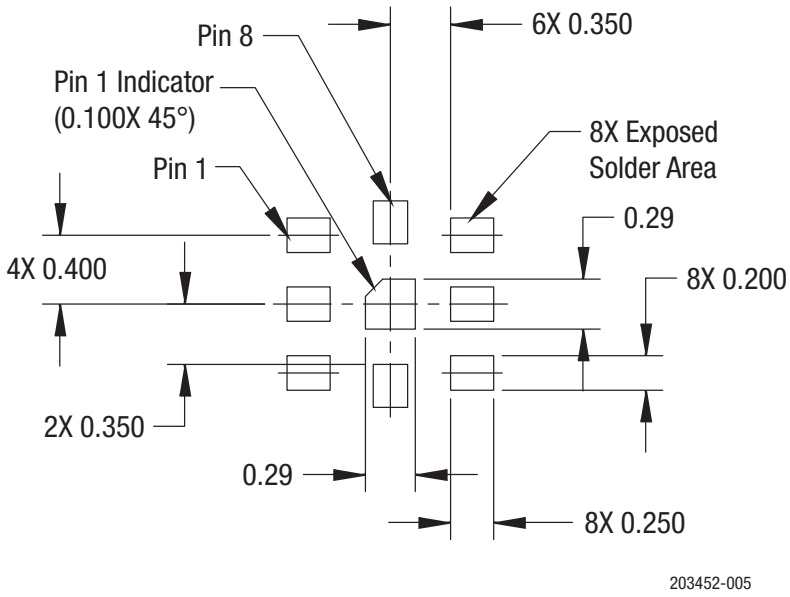


Figure 5. SKY13586-678LF PCB Layout Footprint (Top View)

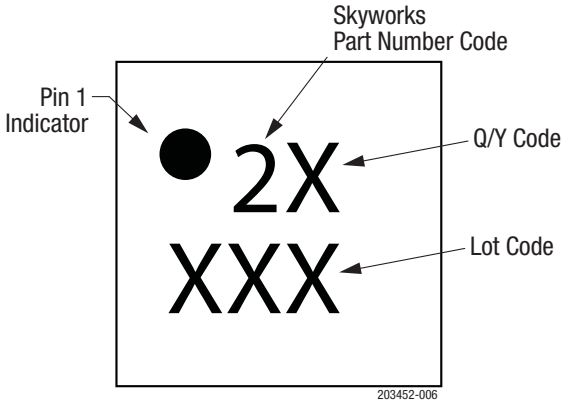
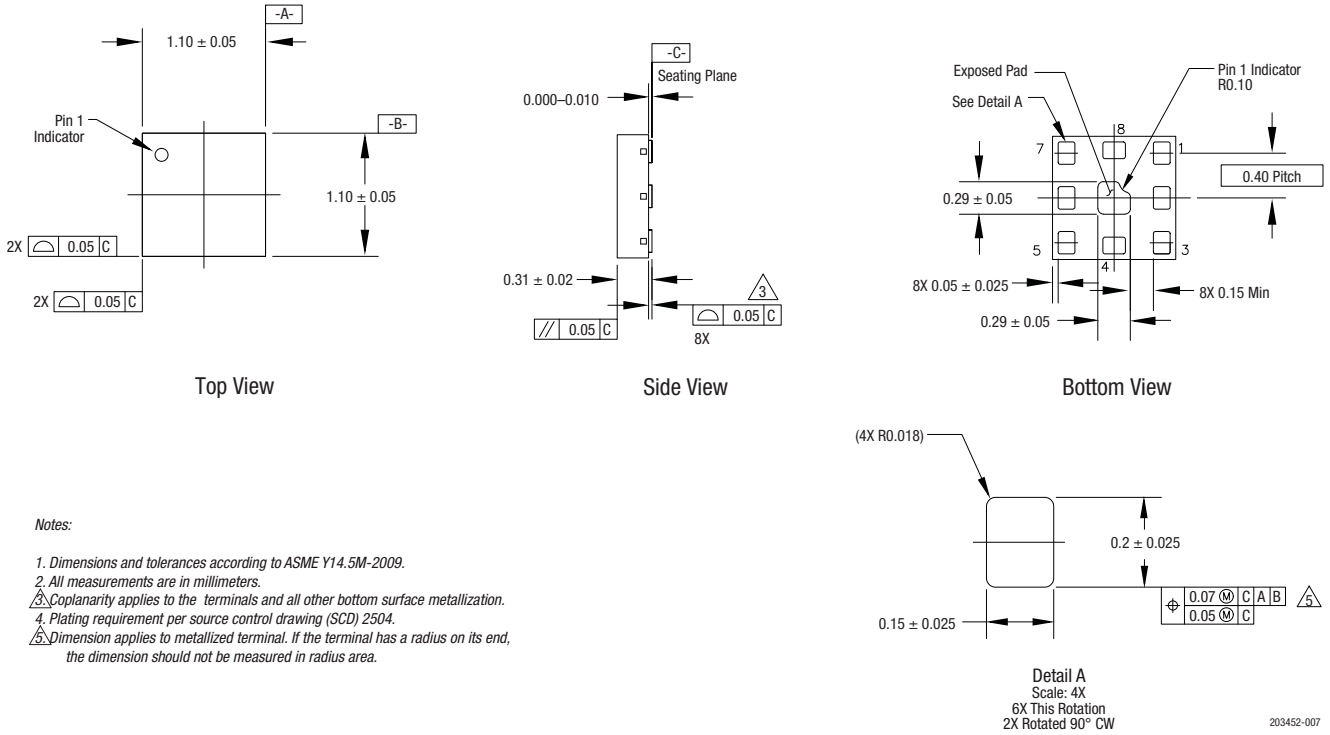


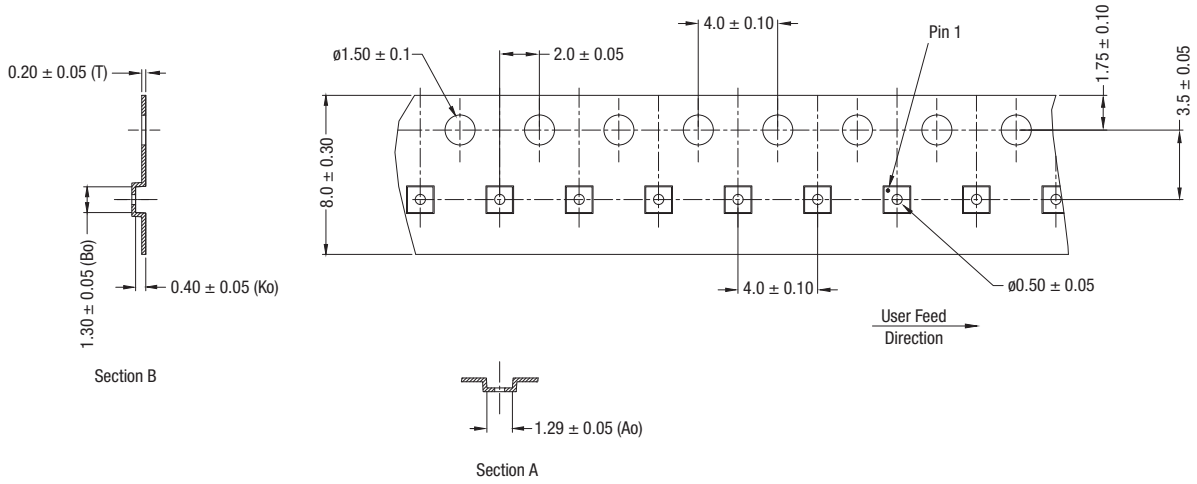
Figure 6. Typical Part Markings (Top View)



Notes:

1. Dimensions and tolerances according to ASME Y14.5M-2009.
2. All measurements are in millimeters.
3. Coplanarity applies to the terminals and all other bottom surface metallization.
4. Plating requirement per source control drawing (SCD) 2504.
5. Dimension applies to metallized terminal. If the terminal has a radius on its end, the dimension should not be measured in radius area.

Figure 7. SKY13586-678LF Package Dimensions



Notes:

1. Carrier tape must meet all requirements of Skyworks GP01-D233 procurement spec for tape and reel shipping.
2. Carrier tape: black conductive polycarbonate or polystyrene.
3. Cover tape material: transparent conductive material.
4. ESD surface resistivity shall be ≤ 1 x 10^{10} Ohms/square per EIA, JEDEC TNR specification.
5. 10-sprocket hole pitch cumulative tolerance: ±0.20 mm
6. All measurements are in millimeters.

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Figure 8. SKY13586-678LF Tape and Reel Dimensions

Ordering Information

Model Name	Manufacturing Part Number	Evaluation Board Part Number
SKY13586-678LF: SP3T Switch	SKY13586-678LF	SKY13586-678LF-EVB