

DATA SHEET

SKY13434-002: 0.1 – 6.0 GHz SP3T/SPDT Wire-Bondable GaAs Die

Applications

- 802.11 a/b/g/n/ac WLAN networks
- Embedded modules

Features

- SP3T (2.5 GHz) and SPDT (5.0 GHz) switches with Bluetooth® capability
- Positive voltage control: 2.7 to 3.6 V
- Low insertion loss
- High isolation
- IP1dB: +33 dBm typical @ 2.4 GHz and 3 V
- Small GaAs die (60 micron square bond pads, 80 micron minimum pitch), 875 x 500 x 127 μm



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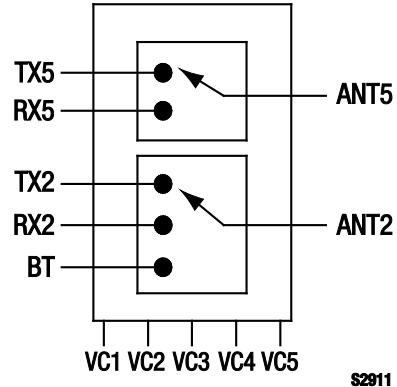


Figure 1. SKY13434-002 Block Diagram

Description

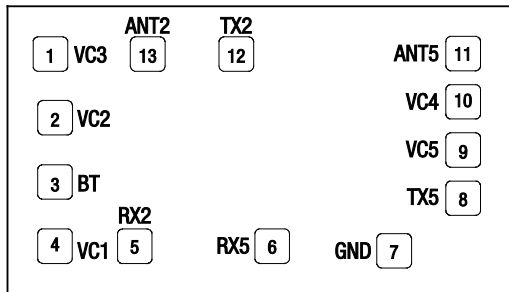
The SKY13434-002 is a GaAs pHEMT wire-bondable die. The device includes a Single-Pole, Triple-Throw (SP3T) antenna switch for 2.5 GHz transmit, receive, and Bluetooth operations, and a Single-Pole, Double-Throw (SPDT) antenna switch for 5 GHz transmit and receive operation.

Any of the RF ports can be used for any RF function regardless of the pad/signal name. Both of the antenna switches are fabricated on the same substrate.

The active path is selected using five positive voltage control lines: two control lines set the 5 GHz switch states and three control lines set the 2.5 GHz switch states. The switch requires external DC blocking capacitors on all RF paths.

The SKY13434-002 is provided as a bare die in an ultra-compact 875 x 500 x 127 μm design. Bond pad openings are 60 microns with a minimum pad pitch of 80 microns.

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.



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Figure 2. SKY13434-002 Pinout (Top View)

Table 1. SKY13434-002 Signal Descriptions

Pin #	Name	Description	Pin #	Name	Description
1	VC3	Switch logic control 3 (see Table 4)	8	TX5	5.0 GHz transmit port
2	VC2	Switch logic control 2 (see Table 4)	9	VC5	Switch logic control 5 (see Table 4)
3	BT	Bluetooth RF port	10	VC4	Switch logic control 4 (see Table 4)
4	VC1	Switch logic control 1 (see Table 4)	11	ANT5	5.0 GHz antenna port
5	RX2	2.5 GHz receive port	12	TX2	2.5 GHz transmit port
6	RX5	5.0 GHz receive port	13	ANT2	2.5 GHz antenna port
7	GND	Ground			

Table 2. SKY13434-002 Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Digital control voltage @ room temperature, normal operating power	V _{CTL}	-0.5	+5.0	V
RF input power, 2.5 GHz SP3T switch, OFDM modulated	P _{IN_2G}		+33	dBm
RF input power, 5.0 GHz SPDT switch, OFDM modulated	P _{IN_5G}		+29	dBm
RF input power, 5.0 GHz SPDT switch, CW, 1/8 duty cycle	P _{IN_5G_CW}		+30	dBm
Storage temperature	T _{STG}	-55	+150	°C

Note: 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.

CAUTION: 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. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions should be used at all times.

Electrical and Mechanical Specifications

The absolute maximum ratings of the SKY13434-002 are provided in Table 2. Electrical specifications are provided in Table 3.

The state of the SKY13434-002 is determined by the logic provided in Table 4.

Table 3. SKY13434-002 Electrical Specifications (Note 1)
(V_{CTL} = 3 V, T_{OP} = +25 °C, Characteristic Impedance [Z₀] = 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
DC Specifications						
Control voltage: Low High	V _{CTL}		-0.2 2.7	0 3.0	+0.4 3.6	V V
Current leakage	I _{LEAK}			1	10	μA
RF Specifications, 2 GHz SP3T						
Insertion loss	IL	2.4 to 2.5 GHz, ANT2 to RX2, TX2, and BT pads		0.6	0.8	dB
Return loss (insertion loss state)	RL	2.4 to 2.5 GHz, ANT2 to RX2, TX2, and BT pads	15	18		dB
Isolation	ISO	2.4 to 2.5 GHz, ANT2 to RX2, TX2, and BT pads, one path closed	20	24		dB
Antenna isolation	ANT _{iso}	ANT2 to ANT5 pads: One 2 GHz path closed, 2.4 to 2.5 GHz TX2 path closed, 4.8 to 5.0 GHz	38 27	40 30		dB dB
Switching speed		50% control to 90/10% RF steady state power		100		ns
2 nd and 3 rd harmonics	2fo, 3fo	P _M = +20 dBm, CW signal		-50	-48	dBm
0.5 dB Input Compression Point	IP0.5dB	@ 2.5 GHz	+28	+30		dBm
RF Specifications, 5 GHz SPDT						
Insertion loss	IL	4.9 to 5.9 GHz, ANT5 to RX5, and TX5 pads		0.7	1.0	dB
Return loss (insertion loss state)	RL	4.9 to 5.9 GHz, ANT5 to RX2, TX2, and BT pads	15	18		dB
Isolation	ISO	4.9 to 5.9 GHz, ANT5 to RX5 pads or ANT2 to TX5 pads, one path closed	20	24		dB
Antenna isolation	ANT _{iso}	4.8 to 5.9 GHz, ANT2 to ANT5 pads, one 5 GHz path closed	27	30		dB
Switching speed		50% control to 90/10% RF steady state power		100		ns
2 nd and 3 rd harmonics	2fo, 3fo	P _M = +20 dBm, CW signal		-50	-48	dBm
0.5 dB Input Compression Point	IP0.5dB	@ 2.5 GHz	+26	+28		dBm

Note 1: Performance is guaranteed only under the conditions listed in this Table.

Table 4. SKY13434-002 Truth Table

State	Function	VC1 (Pad 4)	VC2 (Pad 2)	VC3 (Pad 1)	VC4 (Pad 10)	VC5 (Pad 9)	ANT2 to BT	ANT2 to TX2	ANT2 to RX2	ANT5 to RX5	ANT5 to TX5
1	ANT2 to BT	1	0	0	0	0	Insertion loss	Isolation	Isolation	Isolation	Isolation
2	ANT2 to TX2	0	1	0	0	0	Isolation	Insertion loss	Isolation	Isolation	Isolation
3	ANT2 to RX2	0	0	1	0	0	Isolation	Isolation	Insertion loss	Isolation	Isolation
4	ANT5 to RX5	0	0	0	1	0	Isolation	Isolation	isolation	Insertion loss	Isolation
5	ANT5 to TX5	0	0	0	0	1	Isolation	Isolation	Isolation	Isolation	Insertion loss
6	ANT2 to BT ANT5 to RX5	1	0	0	1	0	Insertion loss	Isolation	Isolation	Insertion loss	Isolation
7	ANT2 to BT ANT5 to TX5	1	0	0	0	1	Insertion loss	Isolation	Isolation	Isolation	Insertion loss
8	ANT2 to TX2 ANT5 to RX5	0	1	0	1	0	Isolation	Insertion loss	Isolation	Insertion loss	Isolation
9	ANT2 to TX2 ANT5 to TX5	0	1	0	0	1	Isolation	Insertion loss	Isolation	Isolation	Insertion loss
10	ANT2 to RX2 ANT5 to RX5	0	0	1	1	0	Isolation	Isolation	Insertion loss	Insertion loss	Isolation
11	ANT2 to RX2 ANT5 to TX5	0	0	1	0	1	Isolation	Isolation	Insertion loss	Isolation	Insertion loss

Note: "1" = 2.7 V to 3.6 V. "0" = -0.2 V to +0.4 V. Any state other than described in this Table places the switch into an undefined state. An undefined state does not damage the device.

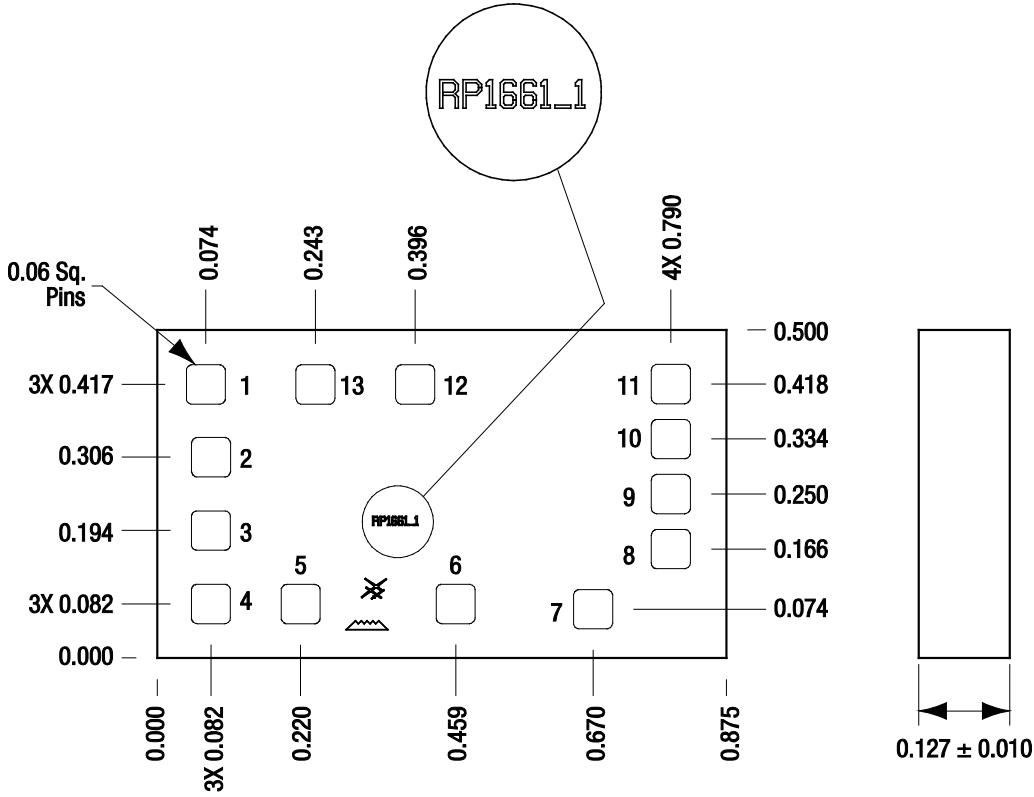
Package Dimensions

Package dimensions for the SKY13434-002 die are shown in Figure 3. The SKY13434-002 is shipped on a grip ring as illustrated in Figure 4.

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.

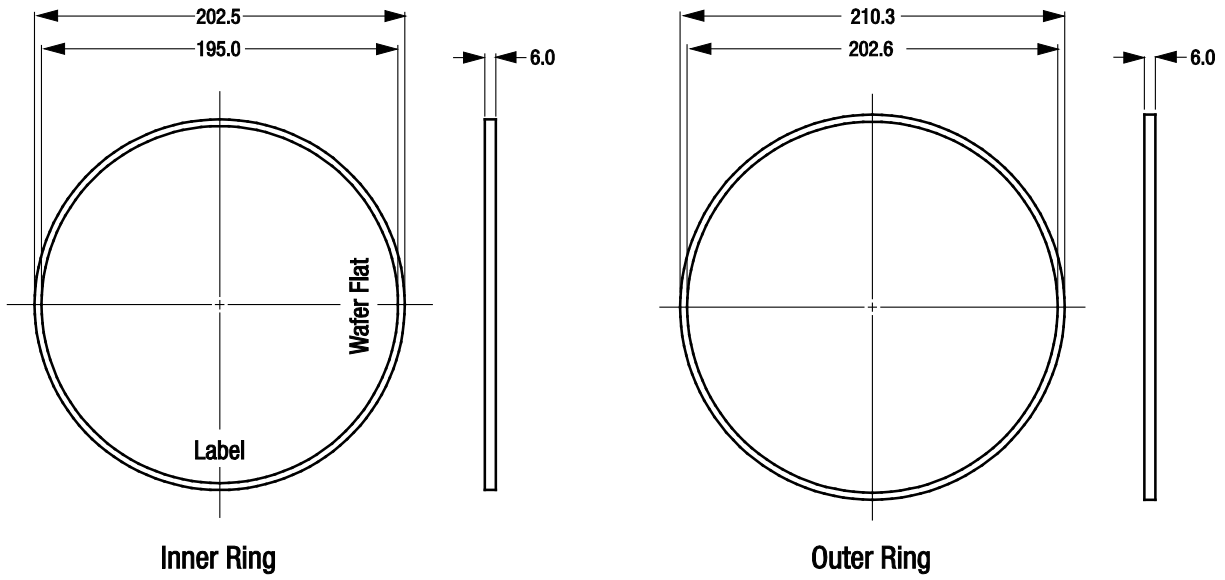
The SKY13434-002 has no backside metal and must be attached using conductive or non-conductive epoxy.



- Notes:**
 1. Bond pad metallization: Gold
 2. Backside metallization: None
 3. All measurements are in millimeters

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Figure 3. SKY13434-002 Die Dimensions



- Notes:**
1. All dimensions in millimeters.
2. Tape material: exposed UV tape.
3. Tape adhesion: ≤ 30 gm/in.

Grip Ring Number: GRP-2620-6

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Figure 4. SKY13434-002 Grip Ring Dimensions

Ordering Information

Model Name	Manufacturing Part Number
SKY13434-002 0.1-6.0 GHz SP3T/SPDT Wire-Bondable GaAs Die	SKY13434-002

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