AS179-92LF: 20 MHz to 4.0 GHz GaAs SPDT Switch

Applications

- General purpose medium-power switches in telecommunication applications
- Transmit/receive switches in 802.11 b/g WLAN Bluetooth® systems

Features

- IP1dB = +30 dBm typical @ 3 V
- IP3 = +43 dBm typical @ 3 V
- Low insertion loss, 0.3 dB @ 0.9 GHz
- Low DC power consumption
- Ultra-miniature, SC-70 (6-pin, 2.00 x 1.25 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.
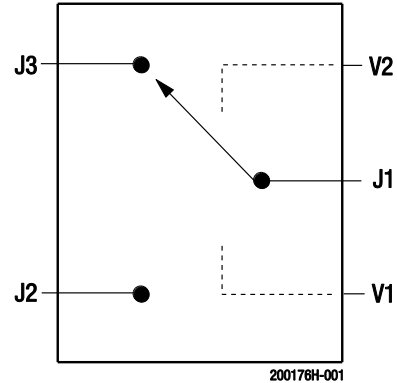

Figure 1. AS179-92LF Block Diagram

Description

The AS179-92LF is a pHEMT GaAs FET single-pole, double-throw (SPDT) switch. The device features low insertion loss and positive voltage operation with very low DC power consumption. The AS179-92LF is manufactured in a compact, low-cost 2.00 x 1.25 mm, 6-pin SC-70 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.
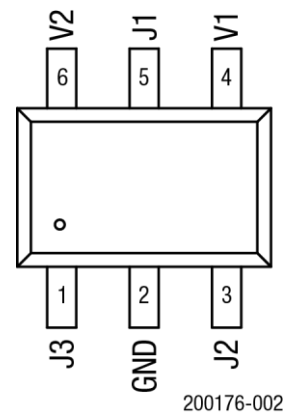

Figure 2. AS179-92LF Pinout (Top View)

Skyworks Solutions, Inc. • Phone [781] 376-3000 • Fax [781] 376-3100 • sales@skyworksinc.com • www.skyworksinc.com

200176J • Skyworks Proprietary Information • Products and Product Information are Subject to Change Without Notice • March 10, 2022   1

Table 1. AS179-92LF Signal Descriptions[1]

Pin	Name	Description	Pin	Name	Description
1	J3	RF output (Note 1)	4	V1	DC control voltage
2	GND	Ground	5	J1	RF output (Note 1)
3	J2	RF output (Note 1)	6	V2	DC control voltage

[1] A 100 pF blocking capacitor is required for >500 MHz operation. Use larger value capacitors for lower frequency operation.

Electrical and Mechanical Specifications

The absolute maximum ratings of the AS179-92LF are provided in Table 2. Electrical specifications are provided in Table 3. Typical performance characteristics are shown in Figures 3, 4, and 5.

Table 2. AS179-92LF Absolute Maximum Ratings[1]

Parameter	Symbol	Minimum	Maximum	Units
Control voltage	V_{CTL}	−1.2	+8.0	V
RF input power (V_{CTL} = 0 to 7 V): >500 MHz <500 MHz			6 500	W mW
Operating temperature	T_{OP}	−40	+85	°C
Operating temperature (Pinmax < +32 dBm for T_{OP} = 105 °C)	T_{OP}	−40	+105	°C
Storage temperature	T_{STG}	−65	+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.

CAUTION: Industry-standard ESD handling precautions must be adhered to at all times to avoid damage to this device.

Table 3. AS179-92LF Electrical Specifications[1] (1 of 2)
(V_{CTL} = 0 to 3 V, T_{OP} = +25 °C, Characteristic Impedance = 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Insertion loss[2,3]	IL	0.02 to 1.0 GHz 1.0 to 2.0 GHz 2.0 to 3.0 GHz 3.0 to 4.0 GHz		0.3 0.4 0.4 0.5	0.4 0.5 0.6 0.7	dB dB dB dB
Isolation[3]	ISO	0.02 to 1.0 GHz 1.0 to 2.0 GHz 2.0 to 3.0 GHz	22 22 20	25 25 23		dB dB dB
Return loss[3,4]	RL	0.02 to 1.0 GHz 1.0 to 2.0 GHz 2.0 to 3.0 GHz 3.0 to 4.0 GHz	15 15 14 13		20 20 17 15	dB dB dB dB
Switching characteristics: Rise/fall On/off Video feedthrough		10/90% or 90/10% RF 50% control to 90/10% RF t_R = 1 ns, bandwidth = 500 MHz		10 100 25		ns ns mV

Table 3. AS179-92LF Electrical Specifications[1] (2 of 2)
(V_{CTL} = 0 to 3 V, T_{OP} = +25 °C, Characteristic Impedance = 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
1 dB input compression point	IP1dB	@ 0.5 to 3.0 GHz V_{CTL} = 0 to 2 V V_{CTL} = 0 to 3 V V_{CTL} = 0 to 5 V @ 48 MHz V_{CTL} = 0 to 3 V V_{CTL} = 0 to 5 V @ 3.0 to 4.0 GHz V_{CTL} = 0 to 3 V V_{CTL} = 0 to 5 V		+26 +30 +34 +28.9 +29.5 +29 +32		dBm dBm dBm dBm dBm dBm dBm
Third order intercept point	IP3	+5 dBm two-tone input power @ 0.5 to 3.0 GHz V_{CTL} = 0 to 2 V V_{CTL} = 0 to 3 V V_{CTL} = 0 to 5 V +5 dBm two-tone input power @3.0 to 4.0 GHz V_{CTL} = 5 V		 +43 +43 +50 +45		 dBm dBm dBm dBm
Thermal resistance				25		°C/W

Control voltage:
    Low (@ 20 µA max)
    High (@100 µA max)
    High (@ 200 µA max)
	
	V_{CTL_L}
	V_{CTL_H}
	V_{CTL_H}
			
			0
					
					0.2
					2.0
					5.0
						
						V
						V
						V

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

[2] Insertion loss changes by 0.003 dB/°C.

[3] Typical performance maintained with V_{CTL} = 0.2 V.

[4] Insertion loss state.

Typical Performance Characteristics

(V_{CTL} = 0 to 3 V, T_{OP} = +25 °C, P_{IN} = 0 dBm, Characteristic Impedance [Zo] = 50 Ω, C_{BL} = 100 pF, Unless Otherwise Noted)
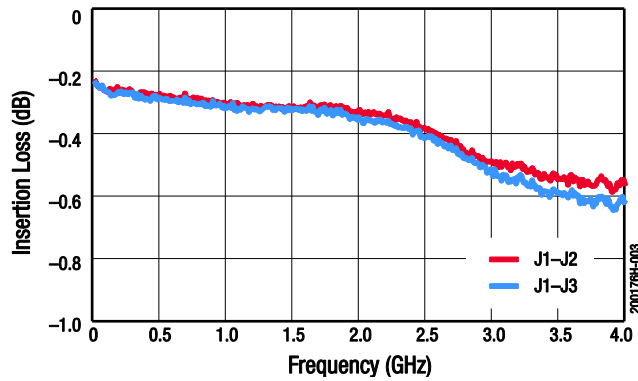
Figure 3. Insertion Loss vs Frequency
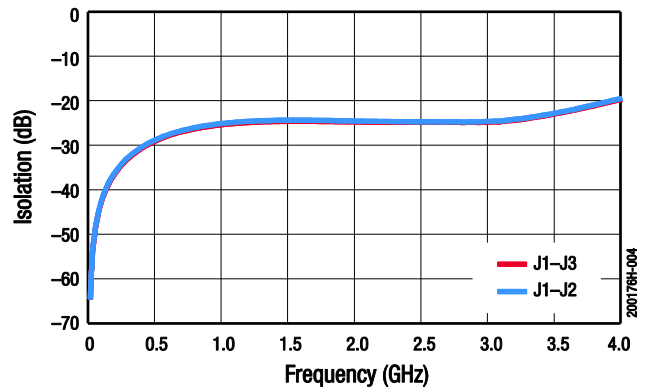
Figure 4. Isolation vs Frequency
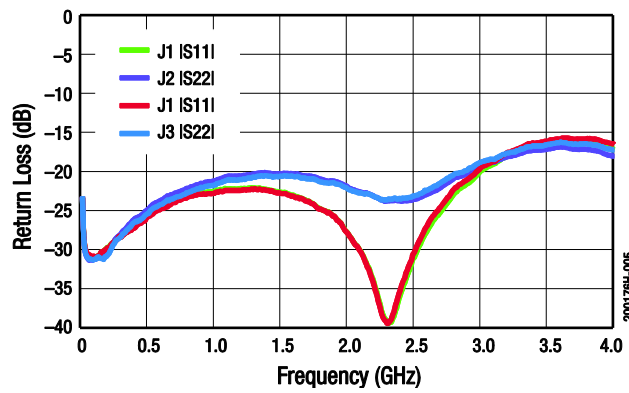
Figure 5. Return Loss vs Frequency

Table 4. Truth Table (V_{HIGH} = 2 to 5 V)[1]

V1	V2	J1–J2	J1–J3
V_{HIGH}	0	Isolation	Insertion loss
0	V_{HIGH}	Insertion loss	Isolation

[1] Any state other than described in this table places the device in an undefined state. An undefined state does not damage the device.

Evaluation Board Description

The AS179-92LF Evaluation Board is used to test the performance of the AS179-92LF SPDT switch. An Evaluation Board schematic diagram is provided in Figure 6. An assembly drawing for the Evaluation Board is shown in Figure 7.

Package Dimensions

Package dimensions are shown in Figure 8, and tape and reel dimensions are provided in Figure 9.

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 AS179-92LF 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.
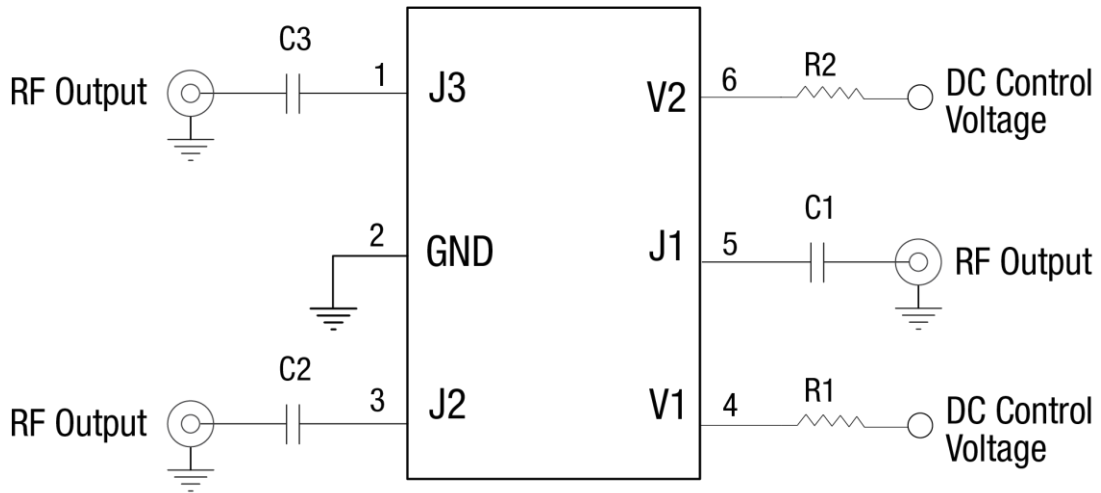
Note: Use 100 pF blocking capacitors (C1, C2, C3) for >500 MHz operation. Higher values recommended for lower frequency operation. Exposed paddle must be grounded.

Use 10 nF blocking capacitors (C1, C2, C3) for <50 MHz operation.

Use 0 Ohm for R1, R2.

200176-006

Figure 6. AS179-92LF Evaluation Board Schematic
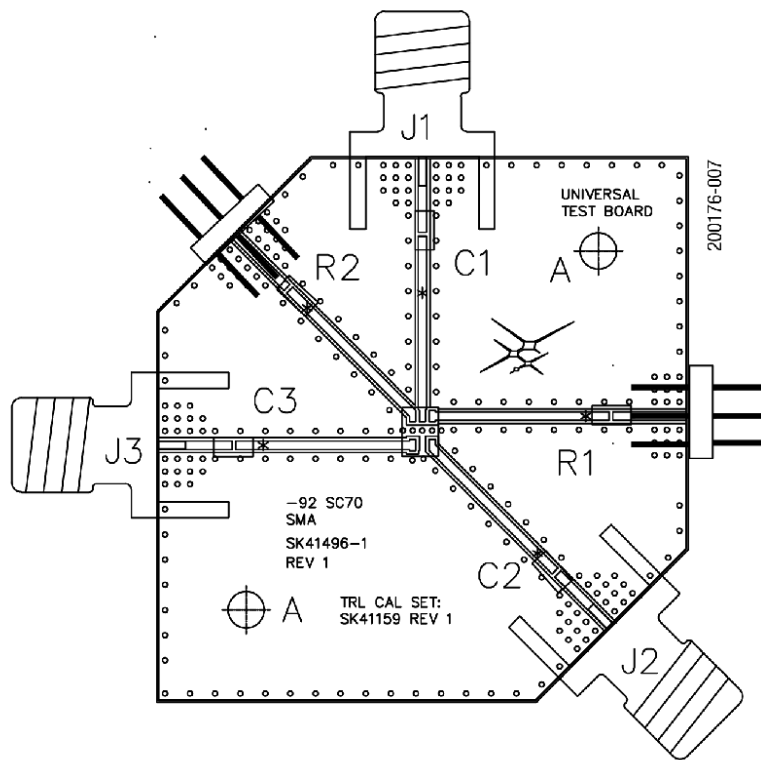
Figure 7. AS179-92LF Evaluation Board Assembly Diagram

Notes:

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

200176-008
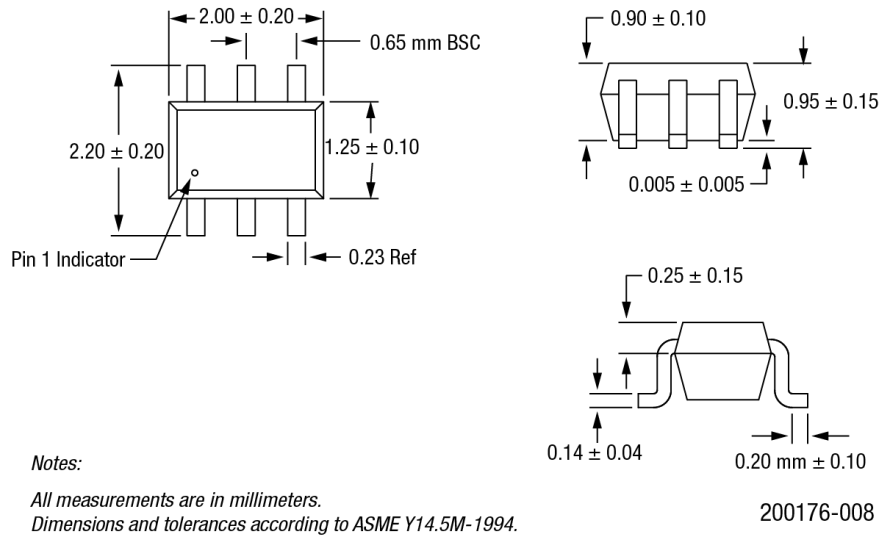
Figure 8. AS179-92LF Package Dimensions

Ao = 2.30
Bo = 2.52
Ko = 1.20

NOTES:
1. 10 SPROCKET HOLE PITCH CUMULATIVE TOLERANCE ±0.2
2. CAMBER IN COMPLIANCE WITH EIA 481
3. POCKET POSITION RELATIVE TO SPROCKET HOLE MEASURED
   AS TRUE POSITION OF POCKET, NOT POCKET HOLE
4. Ao AND Bo ARE CACULATED ON A PLANE AT A DISTANCE "R"
   ABOVE THE BOTTOM OF THE POCKET.

200176-009
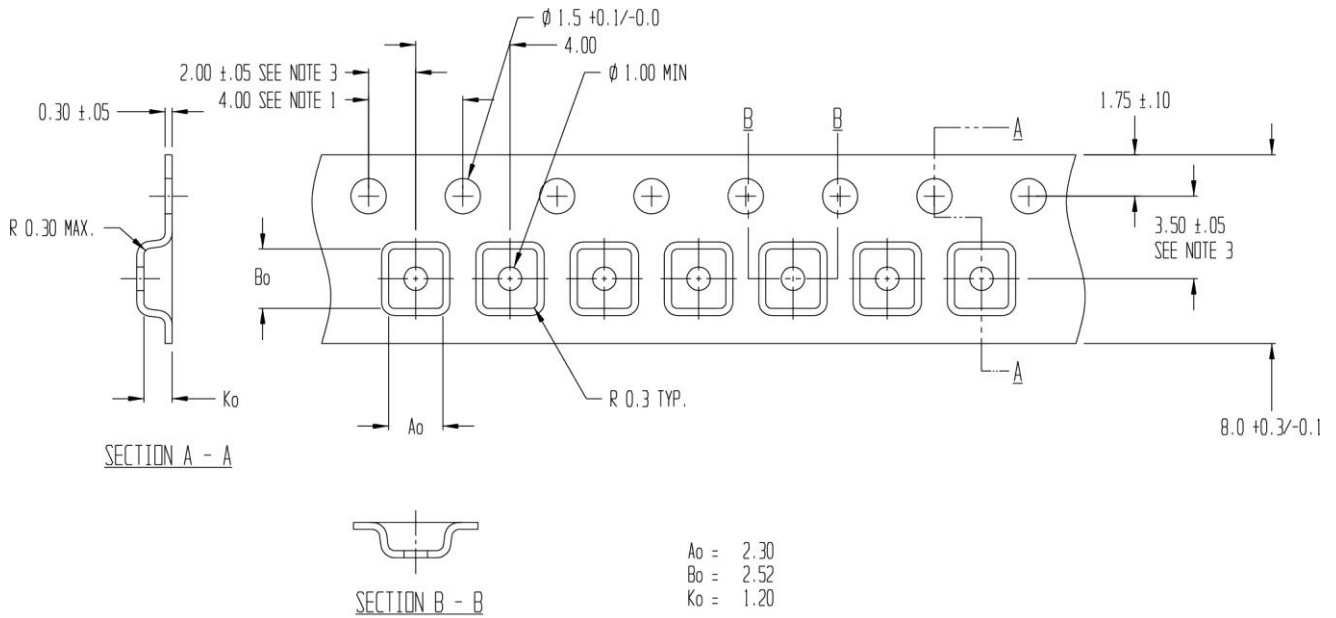
Figure 9. AS179-92LF Tape and Reel Dimensions

Ordering Information

Model Name	Manufacturing Part Number	Evaluation Board Part Number
AS179-92LF: SPDT Switch	AS179-92LF	AS179-92LF-EVB