

DATA SHEET

AS214-92LF: PHEMT GaAs IC SPDT Switch 0.1 to 3 GHz

Applications

- T/R switch in WLANs, Bluetooth® and medium-power telecommunication applications

Features

- Low insertion loss (0.4 dB @ 2.4 GHz)
- Isolation 26 dB @ 2.4 GHz
- Low DC power consumption
- PHEMT process
- Operates at 1.8 V control voltage
- Available lead (Pb)-free and RoHS-compliant (MSL-1 @ 260 °C per JEDEC J-STD-020)



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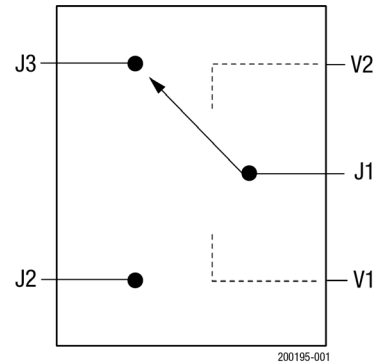


Figure 1. AS214-92LF Block Diagram

Description

The AS214-92LF is a medium-power IC FET SPDT switch in a low-cost miniature SC-70 6-lead plastic package. The AS214-92LF features low insertion loss and positive voltage operation with very low DC power consumption. This general purpose switch can be used in a variety of telecommunications applications.

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.

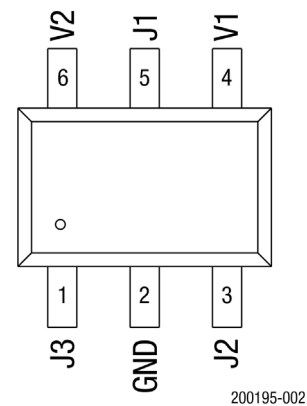


Figure 2. AS214-92LF Pinout (Top View)

Table 1. AS214-92LF Signal Assignments and Functional Descriptions

| Pin | Name | Description | Pin | Name | Description |
|-----|------|------------------------|-----|------|------------------------|
| 1 | J3 | RF output ¹ | 4 | V1 | DC control voltage |
| 2 | GND | Ground | 5 | J1 | RF output ¹ |
| 3 | J2 | RF output 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 AS214-92LF are provided in Table 2. The electrical specifications of the AS214-92LF are provided in Table 3.

Typical performance characteristics are shown in Figures 3, 4, and 5. Table 4 shows the truth table.

Table 2. AS214-92LF Absolute Maximum Ratings¹

| Parameter | Symbol | Minimum | Maximum | Units |
|---|------------------|---------|---------|-------|
| Control voltage | V _{CTL} | -0.2 | +8.0 | V |
| Supply voltage | | | +8.0 | V |
| RF input power (V _{CTL} = 0 to 8 V): | | | | |
| >500 MHz | | | 2 | W |
| <500 MHz | | | 500 | mW |
| Operating temperature | T _{OP} | -40 | +85 | °C |
| Operating temperature (Pin _{max} < +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.

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. AS214-92LF Electrical Specifications¹

($V_{CTL} = 0$ 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 | IL | 0.5 to 1.0 GHz | | 0.3 | 0.5 | dB |
| | | 1.0 to 2.0 GHz | | 0.4 | 0.6 | dB |
| | | 2.0 to 3.0 GHz | | 0.4 | 0.6 | dB |
| Isolation | ISO | 0.5 to 1.0 GHz | 27 | 30 | | dB |
| | | 1.0 to 2.0 GHz | 24 | 27 | | dB |
| | | 2.0 to 3.0 GHz | 22 | 25 | | dB |
| VSWR ³ | VSWR | 0.5 to 1.0 GHz | | 1.1:1 | | |
| | | 1.0 to 2.0 GHz | | 1.1:1 | | |
| | | 2.0 to 3.0 GHz | | 1.4:1 | | |
| 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 20 25 | | ns ns mV |
| 1 dB input compression point: 0.5 to 3.0 GHz 0.5 to 3.0 GHz | IP1dB | $V_{CTL} = 0$ to 1.8 V | | +20 | | dBm |
| | | $V_{CTL} = 0$ to 3 V | | +27 | | dBm |
| Third order intercept point @ 0.5 to 3.0 GHz | IP3 | +5 dBm two-tone input power, $V_{CTL} = 0$ to 3 V | | +40 | | dBm |
| Thermal resistance | | | | 25 | | °C/W |
| Control voltages | | $V_{LOW} = 0$ to 0.2 V @ 20 μ A max. $V_{HIGH} = 2.7$ V @ 100 μ A max. to 5 V @ 200 μ A max. | | | | |

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

² Insertion loss changes by 0.003 dB/°C.

³ Insertion loss state.

Table 4. AS214-92LF Truth Table

| V ₁ | V ₂ | J ₁ -J ₂ | J ₁ -J ₃ |
|----------------|----------------|--------------------------------|--------------------------------|
| VHIGH | 0 | Isolation | Insertion loss |
| 0 | VHIGH | Insertion loss | Isolation |

Typical Performance Characteristics

($V_{CTL} = 0$ to 3 V, $T_{OP} = +25$ °C, $P_{IN} = 0$ dBm, Characteristic Impedance [Z_0] = 50 Ω , $C_{BL} = 100$ pF, Unless Otherwise Noted)

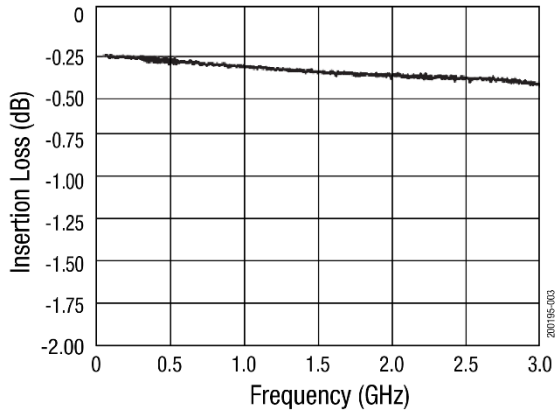


Figure 3. Insertion Loss vs Frequency

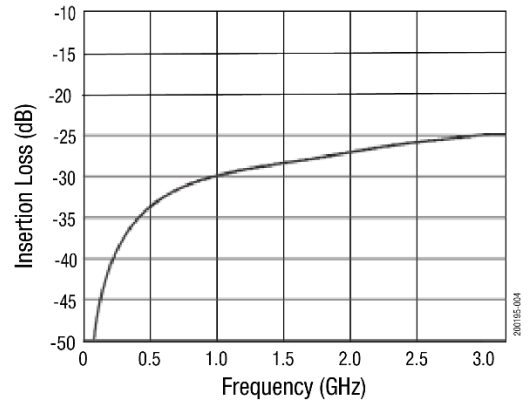


Figure 4. Isolation vs Frequency

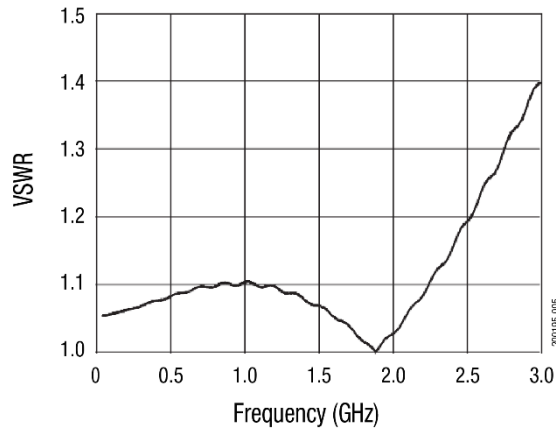
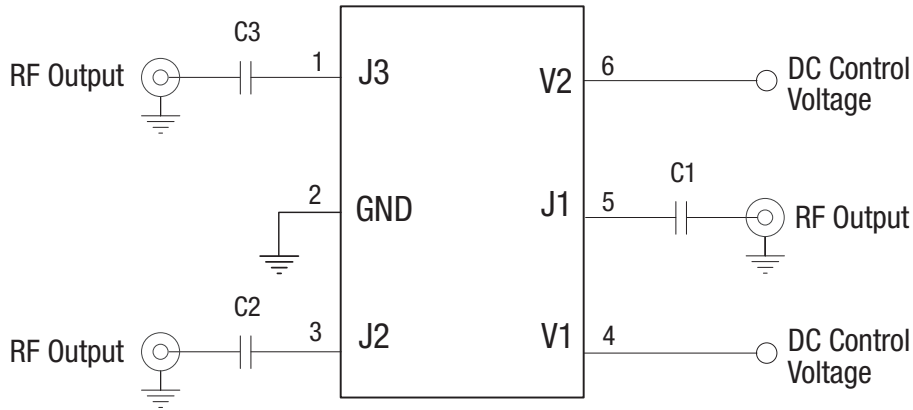


Figure 5. VSWR vs Frequency

Evaluation Board Description

The AS214-92LF Evaluation Board is used to test the performance of the AS214-92LF SPDT switch. An Evaluation Board schematic

diagram is provided in Figure 6. An assembly drawing for the Evaluation Board is shown in Figure 7.



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.

S2108

Figure 6. AS214-92LF Evaluation Board Schematic

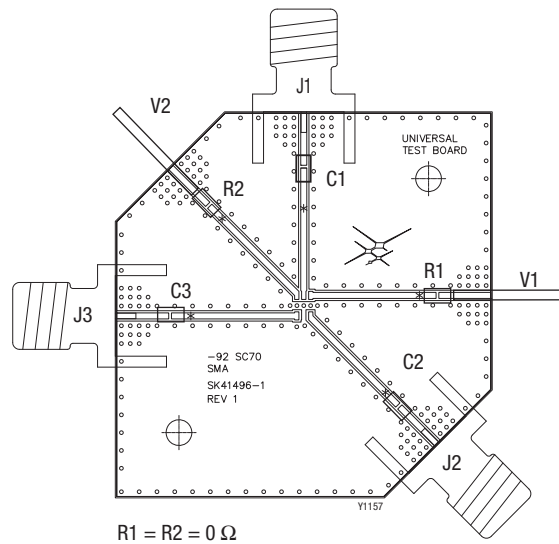


Figure 7. AS214-92LF Evaluation Board Assembly Diagram

Package Dimensions

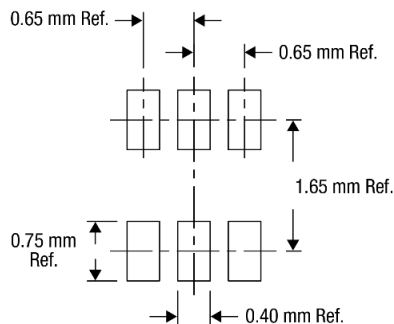
The PCB layout footprint is shown in Figure 8. Package dimensions are shown in Figure 9, and tape and reel dimensions are provided in Figure 10.

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.

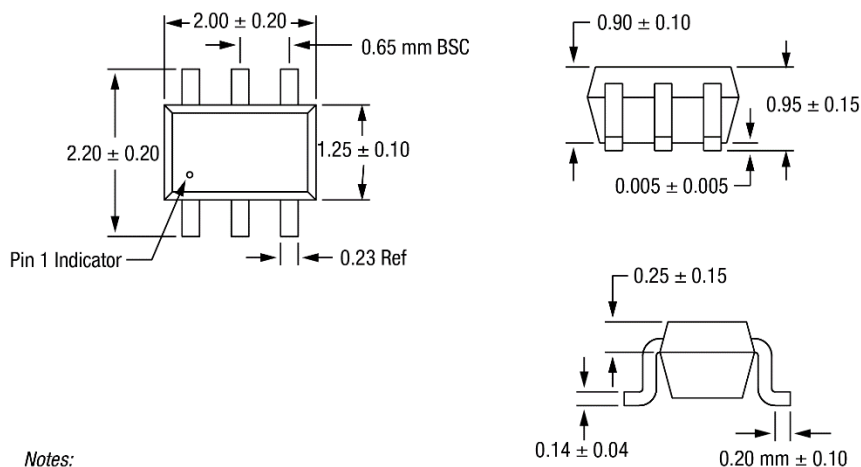
The AS214-92LF is rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C. It can be used for lead or lead-free soldering.

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.



200195-008

Figure 8. AS214-92LF PCB Layout Footprint

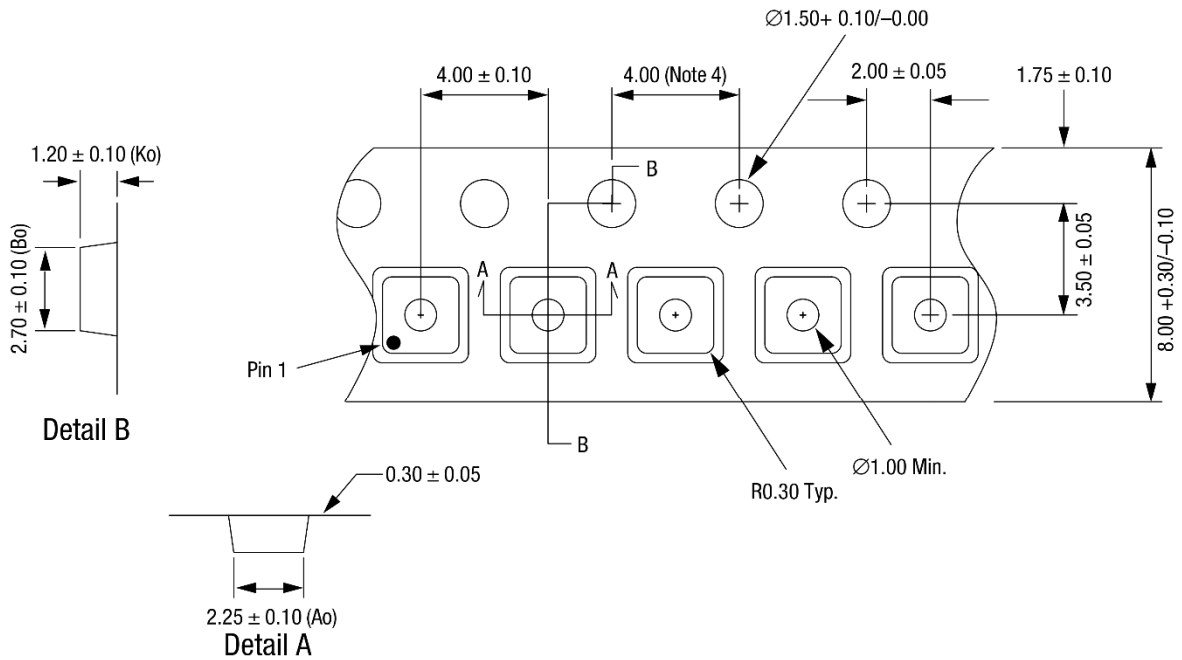


Notes:

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

200195-008

Figure 9. AS214-92LF Package Dimensions



Notes:

1. Carrier tape: black conductive polystyrene.
2. Cover tape material: transparent conductive HSA.
3. Cover tape size: 5.40 mm width.
4. Ten sprocket hole pitch cumulative tolerance ± 0.20 mm.
5. All measurements are in millimeters.

200195-009

Figure 10. AS214-92LF Tape and Reel Dimensions

Ordering Information

| Part Number | Product Description | Evaluation Board Part Number |
|-------------|-------------------------------|------------------------------|
| AS214-92LF | 20 MHz to 3.0 GHz SPDT Switch | AS214-92LF-EVB |

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