DATA SHEET

AS225-313LF: PHEMT GaAs IC 1 W Low Loss 0.1 to 6 GHz SPDT Switch

Applications

- WLAN 802.11a/b/g

Features

- Positive low voltage control (0/3 V)
- Low insertion loss (0.6 dB, 0.1 to 6 GHz)
- High linearity (IIP3 = 53 dBm @ 3 V)
- Miniature QFN-6 pin plastic package (2 mm x 3 mm)
- PHEMT process
- MSL-1 @ 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.

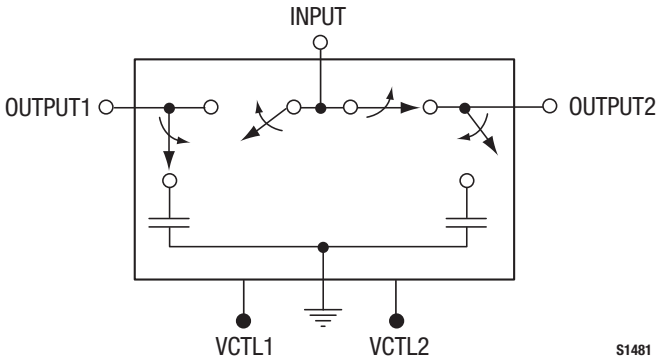


Figure 1. AS225-313LF Functional Block Diagram

Description

The AS225-313LF is a 0.1 to 6 GHz PHEMT GaAs IC sinlge-pole, double-throw (SPDT) antenna switch. Designed for WLAN applications, this device is capable of switching 1 W microwave signals with 3 V control voltage while maintaining high-linearity performance. The switch covers the entire 802.11a, b, and g frequency ranges. The low-loss, high-isolation, high-inearity and low-cost features make this switch ideal for Wireless LAN systems.

Figure 1 shows the functional block diagram of the AS225-313LF.

Electrical and Mechanical Specifications

The absolute maximum ratings for the AS225-313LF are shown in Table 1. Electrical specifications are provided in Tables 2 and 3.

The state of the AS225-313LF is determined by the logic provided in Table 4.

Typical performance characteristics are shown in Figures 2, 3, and 4.

Table 1. AS225-313LF Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Minimum	Maximum	Units
Input power @ 0/3 V			+32	dBm
Input power @ 0/5 V			+35	dBm
Operating voltage			8	V
Operating temperature	T_A	–40	+85	°C
Storage temperature	T_{STG}	–65	+150	°C

Note 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.

***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.*

Table 2. AS225-313LF Electrical Specifications (Note 1)
(Z_O = 50 Ω, V_{CTRL} = 0/3 V, C_{BLOCK} = 15 pF, T_A = 25 °C, Unless Otherwise Noted)

Parameter	Test Condition	Frequency	Minimum	Typical	Maximum	Units
Insertion loss	J_1–J_2, J_1–J_3	0.10 to 6.00 GHz 2.40 to 2.50 GHz 5.15 to 5.85 GHz		0.60 0.50 0.60	0.75 0.65 0.70	dB dB dB
Isolation	J_1–J_2, J_1–J_3	0.10 to 6.00 GHz 2.40 to 2.50 GHz 5.15 to 5.85 GHz	18 18 19	20 20 21		dB dB dB
Return loss	J_1–J_2, J_1–J_3	0.10 to 6.00 GHz 2.40 to 2.50 GHz 5.15 to 5.85 GHz	18 23 21	20 25 23		dB dB dB

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

Table 3. AS225-313LF Electrical Characteristics (Note 1)
(Z_0 = 50 Ω, V_{CTRL} = 0/3 V, C_{BLOCK} = 15 pF, T_A = 25 °C, Unless Otherwise Noted)

Parameter	Condition	Frequency	Minimum	Typical	Maximum	Units
Switching characteristics:						
Rise, fall	10/90% or 90/10% RF			20		ns
On, off	50% CTL to 90/10% RF			35		ns
P1dB	@ 3 V	5200 MHz		+30		dBm
	@ 5 V	5200 MHz		+34		dBm
2nd harmonic	P_{IN} = +22 dBm, VC = 3 V	2450 MHz		+70		dBc
	V_C = 5 V	2450 MHz		+75		dBc
3rd harmonic	P_{IN} = +22 dBm, VC = 3 V	2450 MHz		+68		dBc
	V_C = 5 V	2450 MHz		+70		dBc
Input IP3	Two-tone 15 dBm, 5 MHz spacing:					
	V_{CTL} = 0/3 V	5200 MHz		+53		dBm
	V_{CTL} = 0/5 V	5200 MHz		+55		dBm
Control voltage	$V_{C\ HIGH}$		2.5	3.00	5.00	V
	$V_{C\ LOW}$			–0.25	0.25	V
Gate leakage	V_C = 3 V			10	100	µA
	V_C = 5 V			15	200	µA

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

Table 4. AS225-313LF Truth Table (Notes 1 and 2)

V1	V2	J_1–J_2	J_1–J_3
0	V_{HIGH}	Isolation	Insertion loss
V_{HIGH}	0	Insertion loss	Isolation

Note 1: All other conditions not recommended.

Note 2: V_{HIGH} = 2.5 to 5 V.

Typical Performance Characteristics
(Z_0 = 50 Ω, V_{CTRL} = 0/3 V, C_{BLOCK} = 15 pF, Unless Otherwise Noted)

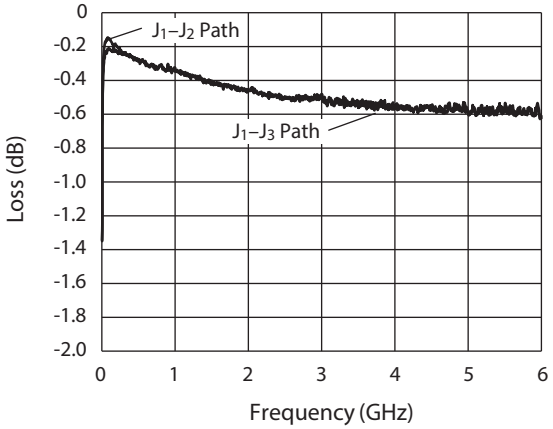


Figure 2. Insertion Loss vs Frequency

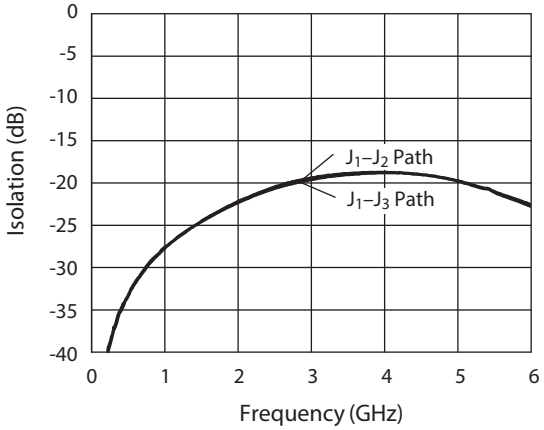


Figure 3. Isolation vs Frequency

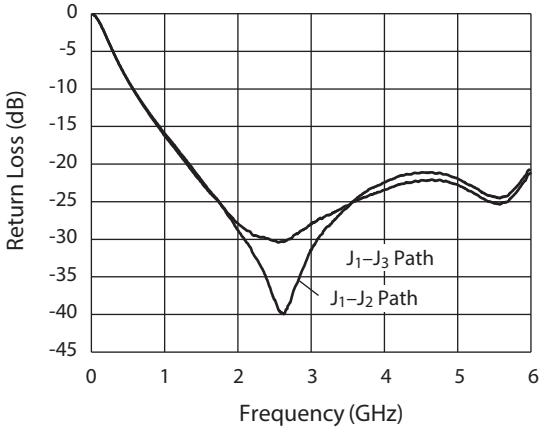


Figure 4. Return Loss vs Frequency

Evaluation Board and Package Dimensions

The AS225-313LF Evaluation Board is used to test the performance of the AS225-313LF SPDT switch. An assembly drawing for the Evaluation Board is shown in Figure 6.

The PCB layout footprint for the AS225-313LF is shown in Figure 7. The typical part marking is shown in Figure 8. Package dimensions for the 6-pin QFN are shown in Figure 9. The 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 AS225-313LF is rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C for 5 seconds. They 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.

For additional information, refer to the *Discrete Devices and IC Switch/Attenuators Tape and Reel Package Orientation* Application Note.

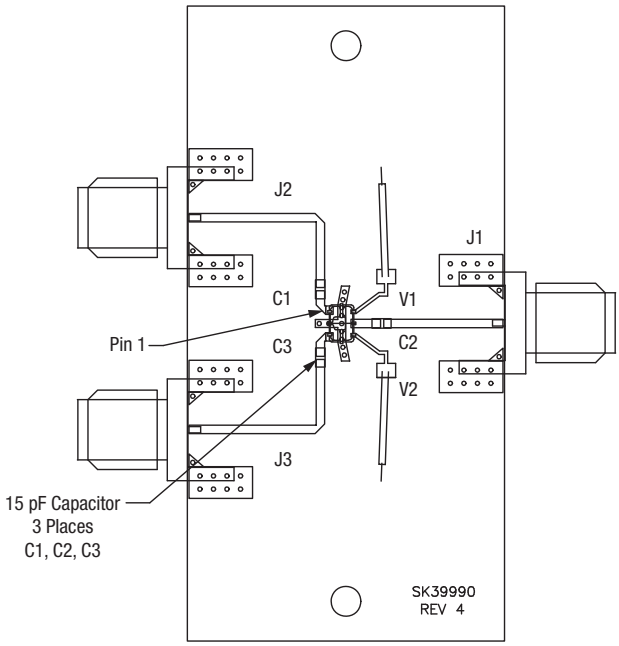


Figure 6. AS225-313LF Evaluation Board Assembly Drawing

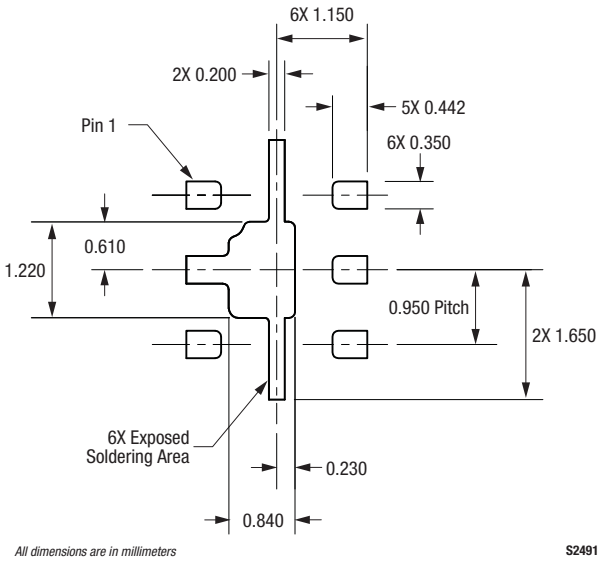


Figure 7. AS225-313LF PCB Layout Footprint (Top View)

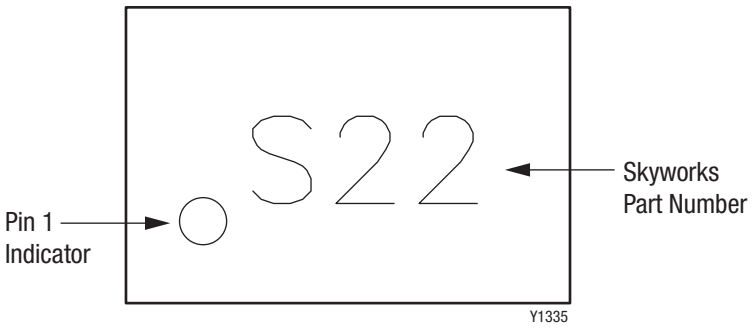
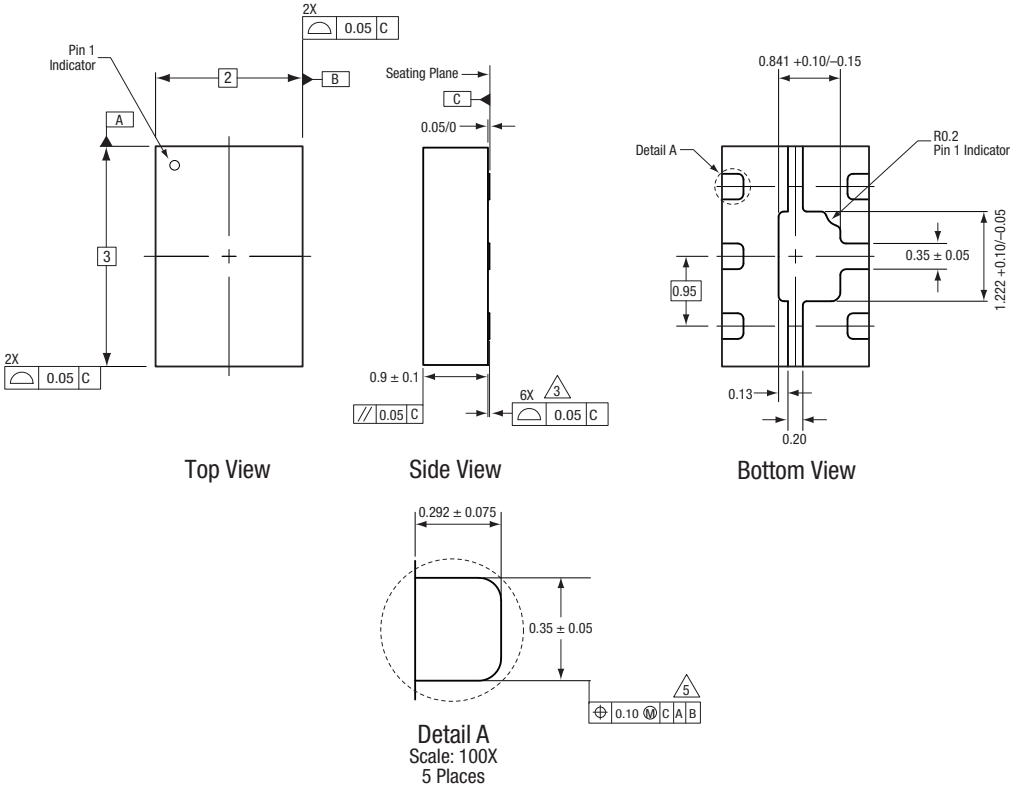


Figure 8. AS225-313LF Typical Part Marking (Top View)



All measurements are in millimeters.
Dimensioning and tolerancing according to ASME Y14.5M-1994.
Coplanarity applies to the terminals and all other bottom surface metalization.
Dimension applies to metalized terminal. If the terminal has a radius on its end, the width dimension should not be measured in that radius area.

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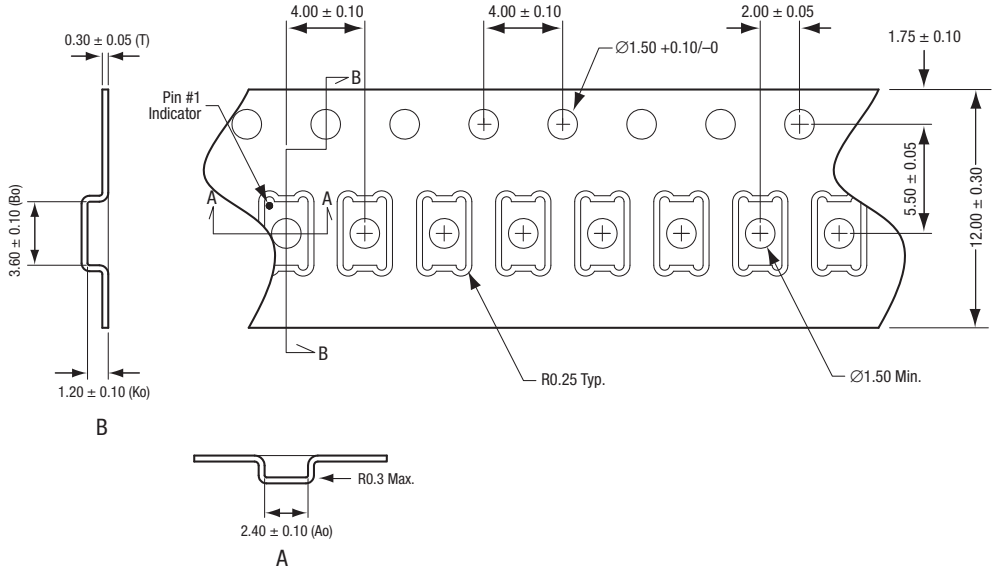
Figure 9. AS225-313LF Package Dimensions



Notes:
1. *Carrier tape: black conductive polystyrene, non-bakeable material.*
2. *Cover tape material: transparent conductive HSA with 9.20 mm width.*
3. *ESD-surface resistivity is ≥1 x 10^5 ~ ≤1 x 10^{10} Ohms/square per EIA, JEDEC TNR Specification.*
4. *All measurements are in millimeters.*

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Figure 10. AS225-313LF Tape and Reel Dimensions