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**DATA SHEET**

# PS214-315: 1700 – 2800 MHz Voltage-Controlled Phase Shifter

## Applications

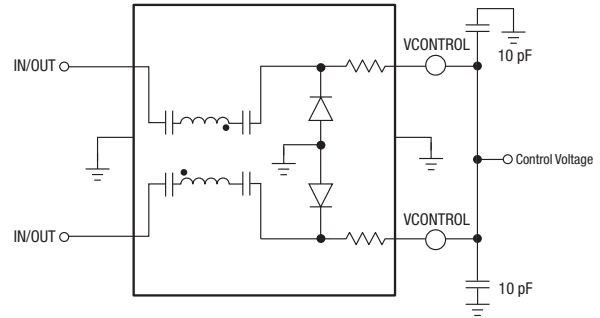
- High power amplifier linearization
- Point-to-point radio
- Radar systems
- RF signal cancellation

## Features

- Wideband frequency operation: 1700 to 2800 MHz
- Phase shift range: 70° to 100°
- Insertion loss variation: 1.1 dB
- IIP3: +33 dBm
- LGA (8-pin, 4.9 x 3.2 mm) package (MSL1, 260 °C per JEDEC J-STD-020)



Skyworks offers lead (Pb)-free, RoHS (Restriction of Hazardous Substances) compliant packaging.



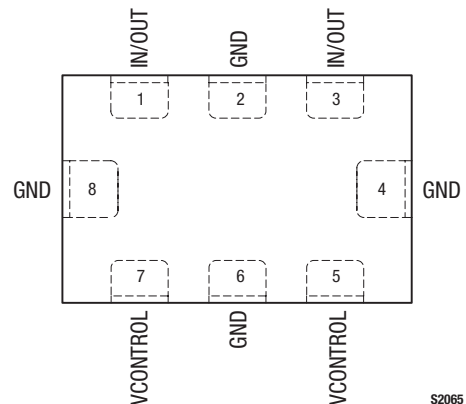
**Figure 1. PS214-315 Block Diagram**

## Description

The PS214-315 is a voltage-controlled phase shifter that uses a monolithic quadrature hybrid varactor diode, and a pair of selected silicon varactor diodes to achieve nominal 100-degree phase shift and low insertion loss.

The device is packaged in a small outline Land Grid Array (LGA) surface mount package with the internal elements affixed to an organic BT substrate.

A block diagram of the PS214-315 is shown in Figure 1. The device package and pinout for the 8-pin LGA are shown in Figure 2.



**Figure 2. PS214-315 Pinout – 8-Pin LGA (Top View)**

**Table 1. PS214-315 Signal Descriptions**

Pin #	Name	Description	Pin #	Name	Description
1	IN/OUT	RF signal in/out (if used as input, pin 3 is used for the phase shifted RF output and vice-versa)	5	VCONTROL	Control voltage input. Control voltage varies phase shift from pin 1 to pin 3 (voltage applied is nominally equal to the voltage applied to pin 8)
2	GND	Ground	6	GND	Ground
3	IN/OUT	RF signal in/out (if used as input, pin 1 is used for the phase shifted RF output and vice-versa)	7	VCONTROL	Control voltage input. Control voltage varies phase shift from pin 1 to pin 3 (voltage applied is nominally equal to the voltage applied to pin 6)
4	GND	Ground	8	GND	Ground

**Table 2. PS214-315 Absolute Maximum Ratings**

Parameter	Symbol	Minimum	Maximum	Units
RF input power	P <sub>IN</sub>		+20	dBm
Control voltage			15	V
Operating temperature	T <sub>A</sub>	-40	+85	°C
Storage temperature	T <sub>STG</sub>	-65	+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. The PS214-315 is rated Class 1B according to Human Body Model (HBM) testing.

### Electrical and Mechanical Specifications

Signal pin assignments and functional pin descriptions are described in Table 1. The absolute maximum ratings of the PS214-315 are provided in Table 2. Electrical specifications are provided in Table 3.

Typical performance characteristics of the PS214-315 are illustrated in Figures 3 through 8.

### Package Dimensions

Package dimensions for the PS214-315 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 PS214-315 is rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C. It can be used for lead or lead-free soldering. For additional information, refer to the Skyworks Application Note, *Solder Reflow Information*, document number 200164.

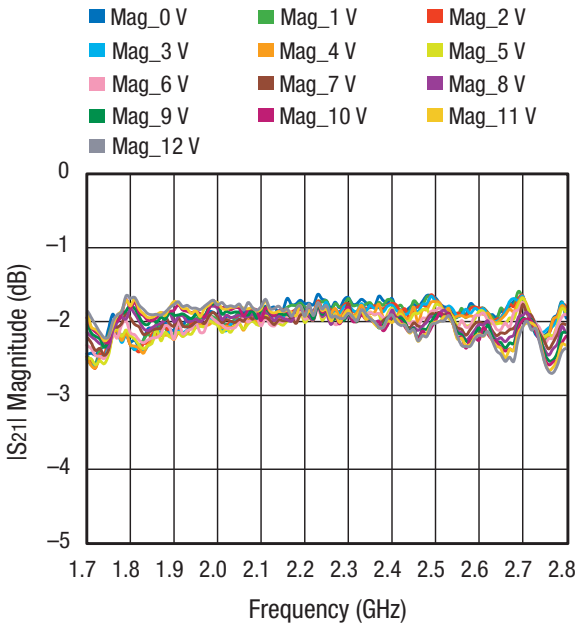
Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. Production quantities of this product are shipped in a standard tape and reel format.

**Table 3. PS214-315 Electrical Specifications (Note 1)**  
**(Characteristic Impedance [Z<sub>0</sub>] = 50 Ω, Unless Otherwise Noted)**

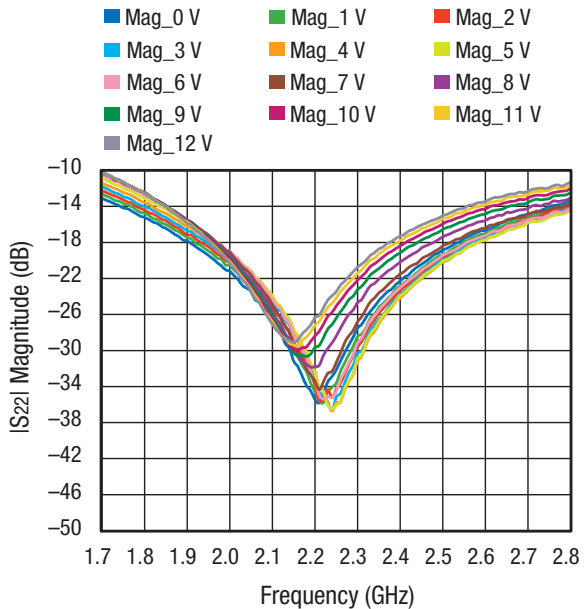
Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Phase shift		VCONTROL = 12 V, 2110 to 2170 MHz	75			Deg
Control voltage	VCONTROL		0		12	V
Control current		VCONTROL = 12 V			1	μA
Insertion loss in bandwidth		VCONTROL = 0 V, 2110 to 2170 MHz			2.5	dB
Insertion loss deviation in bandwidth		VCONTROL = 0 to 12 V, 2110 to 2170 MHz			1.2	dB
Return loss in bandwidth		1700 to 2800 MHz	10			dB
3 <sup>rd</sup> Order Input Intercept Point	IIP3	P <sub>M</sub> = +8 dBm/tone, F1 = 2.140 GHz, F2 = 2.145 GHz, VCONTROL = 0 V	+33			dBm

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

**Typical Performance Characteristics**  
**(Characteristic Impedance [Z<sub>0</sub>] = 50 Ω, Unless Otherwise Noted)**



**Figure 3. S21 Magnitude vs Frequency and Control Voltage**



**Figure 4. S22 Magnitude vs Frequency and Control Voltage**

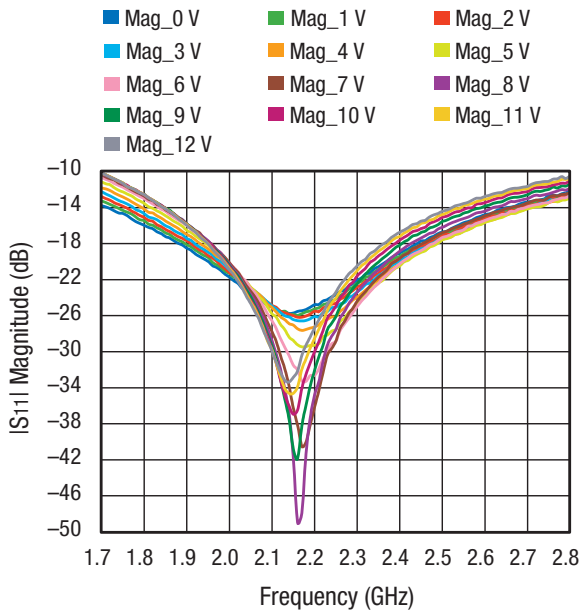


Figure 5. S11 Magnitude vs Frequency and Control Voltage

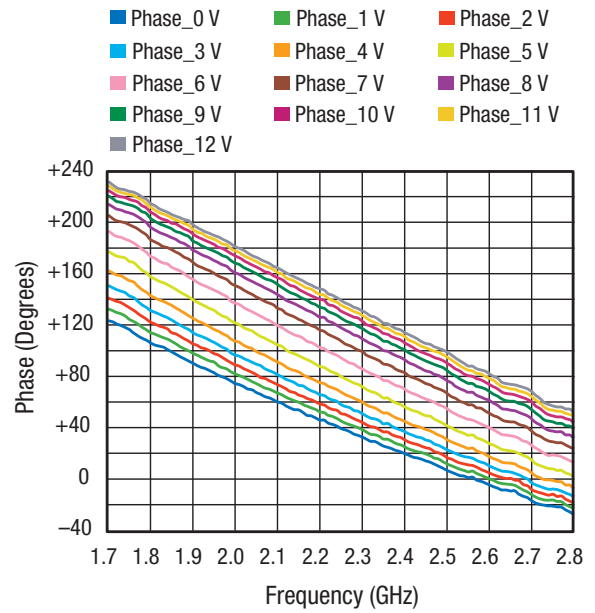


Figure 6. Phase Shift vs Frequency and Control Voltage

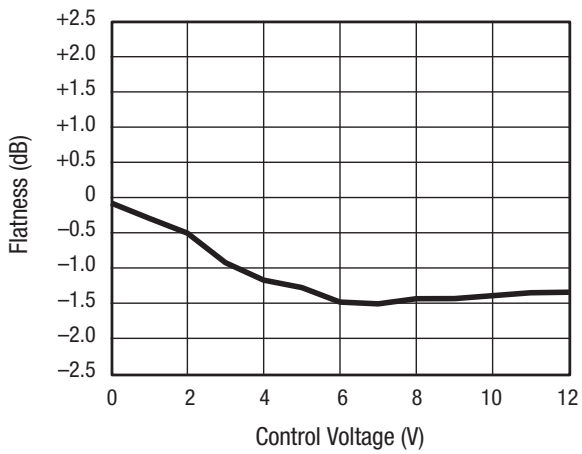


Figure 7. Phase Flatness vs Control Voltage

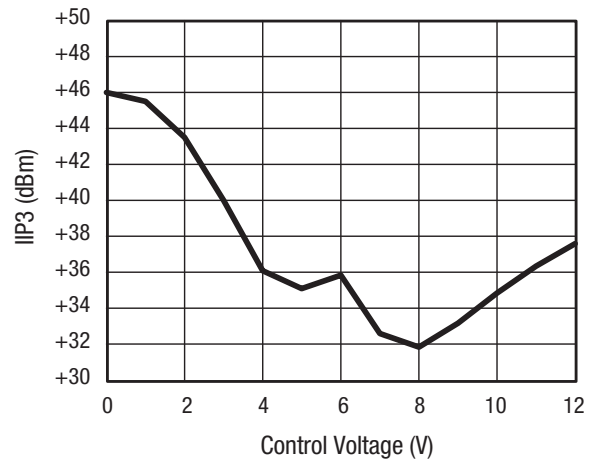
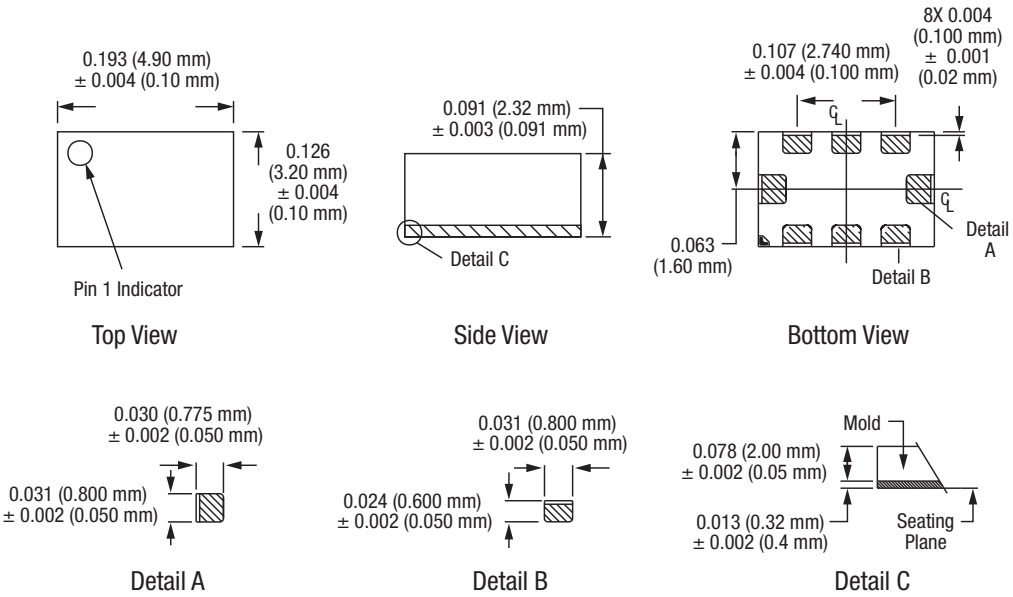


Figure 8. IIP3 vs Control Voltage  
(RF Frequencies = 2.140 GHz and 2.145 GHz @ P<sub>IN</sub> = +8 dBm)



S2064

Figure 9. PS214-315 4.9 x 3.2 mm LGA Package Dimensions

## Ordering Information

Model Name	Manufacturing Part Number
PS214-315 1700-2800 MHz Voltage Controlled Phase Shifter	PS214-315

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