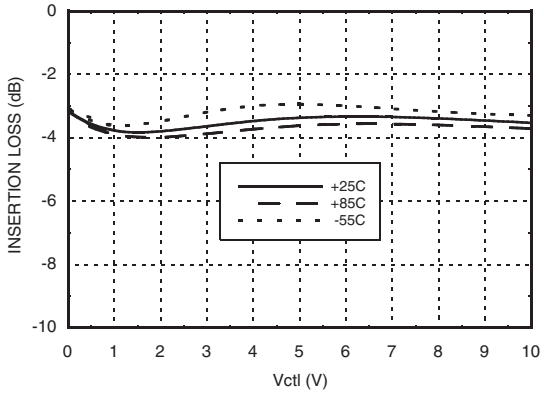
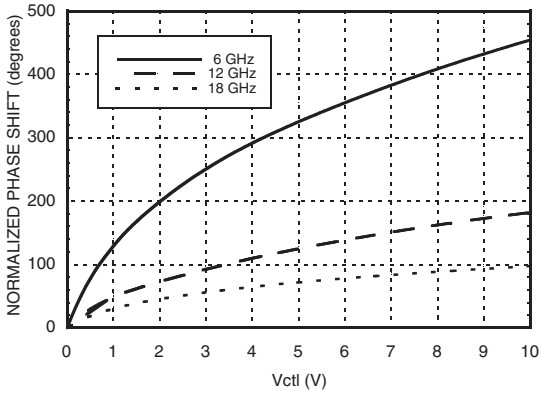
400° ANALOG PHASE SHIFTER 5 - 18 GHz

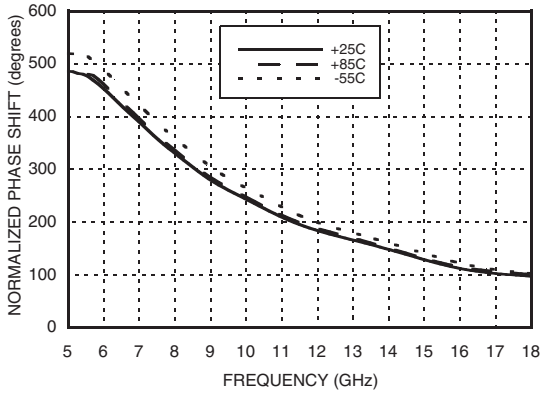
Insertion Loss vs. Control Voltage @ 12 GHz



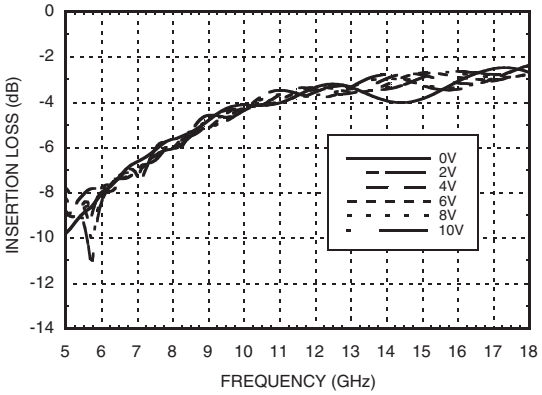
Phase Shift vs. Control Voltage



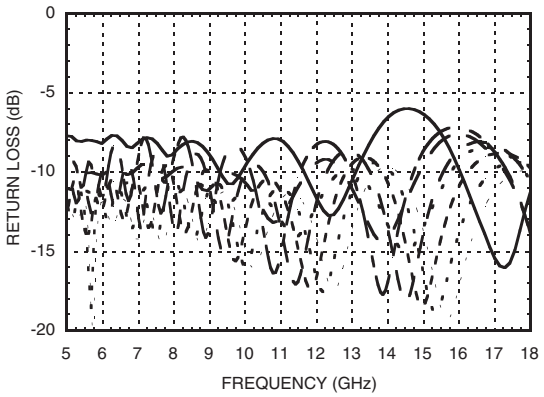
Phase Shift vs. Frequency @ Vctl = 10V (Relative to Vctl = 0V)



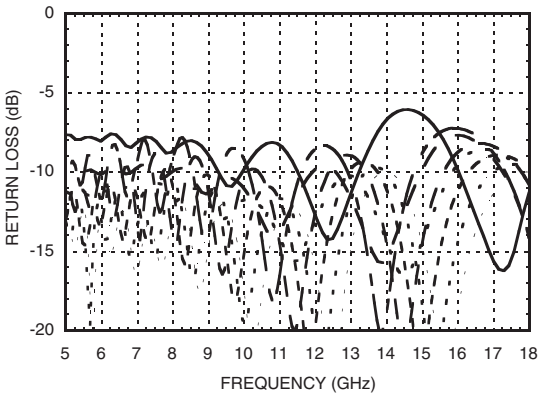
Insertion Loss vs. Frequency



Input Return Loss vs. Frequency, Vctl = 0 to +10V



Output Return Loss vs. Frequency, Vctl = 0 to +10V



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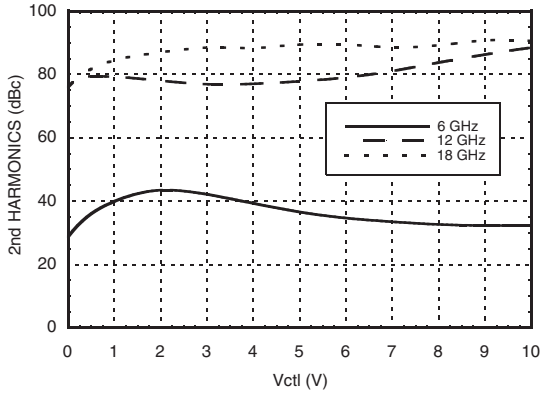
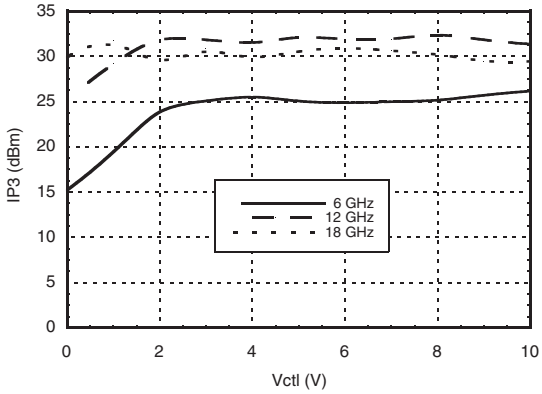
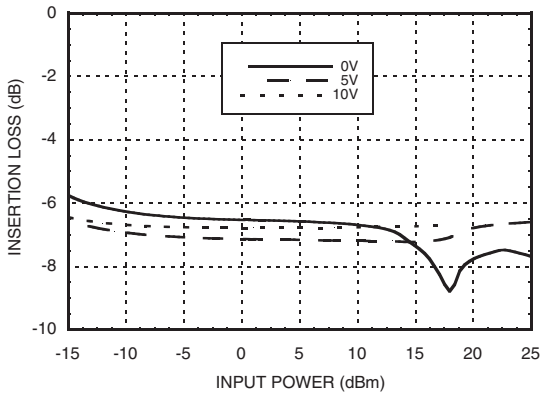
Second Harmonics vs. Control Voltage, Pin = -10 dBm



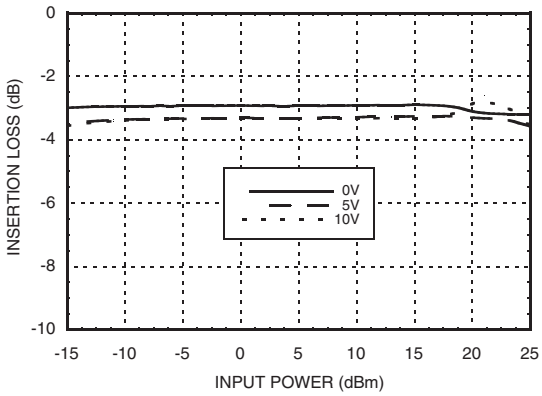
Input IP3 vs. Control Voltage



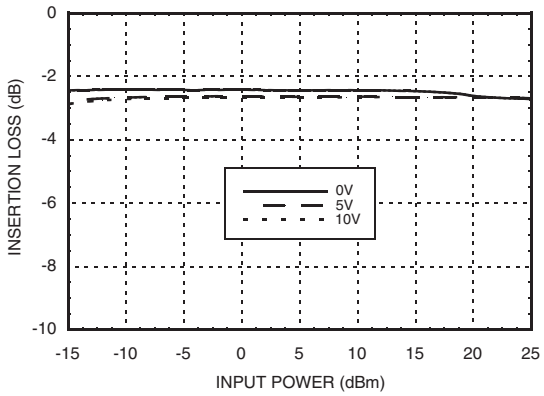
Insertion Loss vs. Pin @ 7 GHz



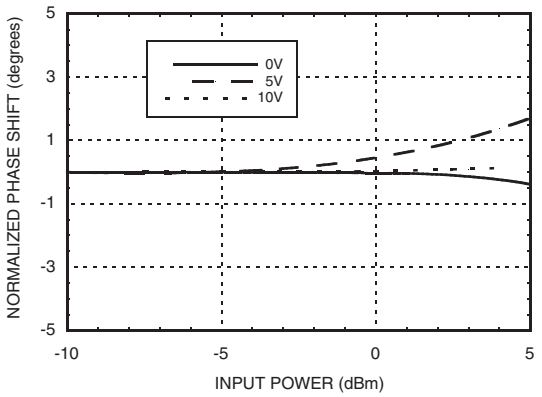
Insertion Loss vs. Pin @ 12 GHz



Insertion Loss vs. Pin @ 18 GHz



Phase Shift vs. Pin @ 7 GHz



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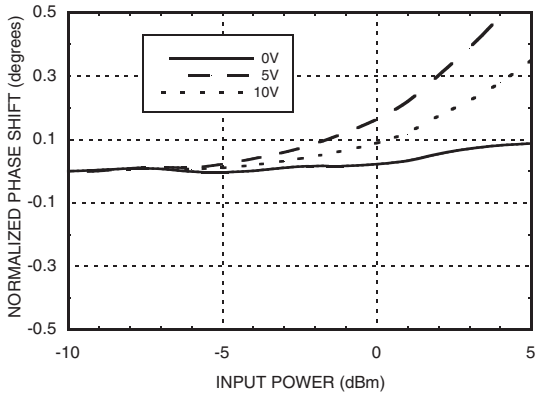
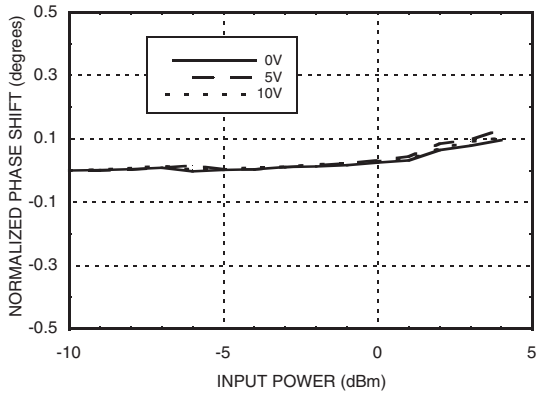
Phase Shift vs. Pin @ 12 GHz



Phase Shift vs. Pin @ 18 GHz



Absolute Maximum Ratings

Control Voltage (Vctl)	+11 Vdc
Reverse Current	5 mA
Input Power (RFin)	+30 dBm
Channel Temperature (Tc)	150 °C
Continuous Pdiss (T = 85 °C) (derate 28 mW/°C above 85 °C)	1.83 W
Thermal Resistance (junction to die bottom)	35.6 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-55 to +85 °C

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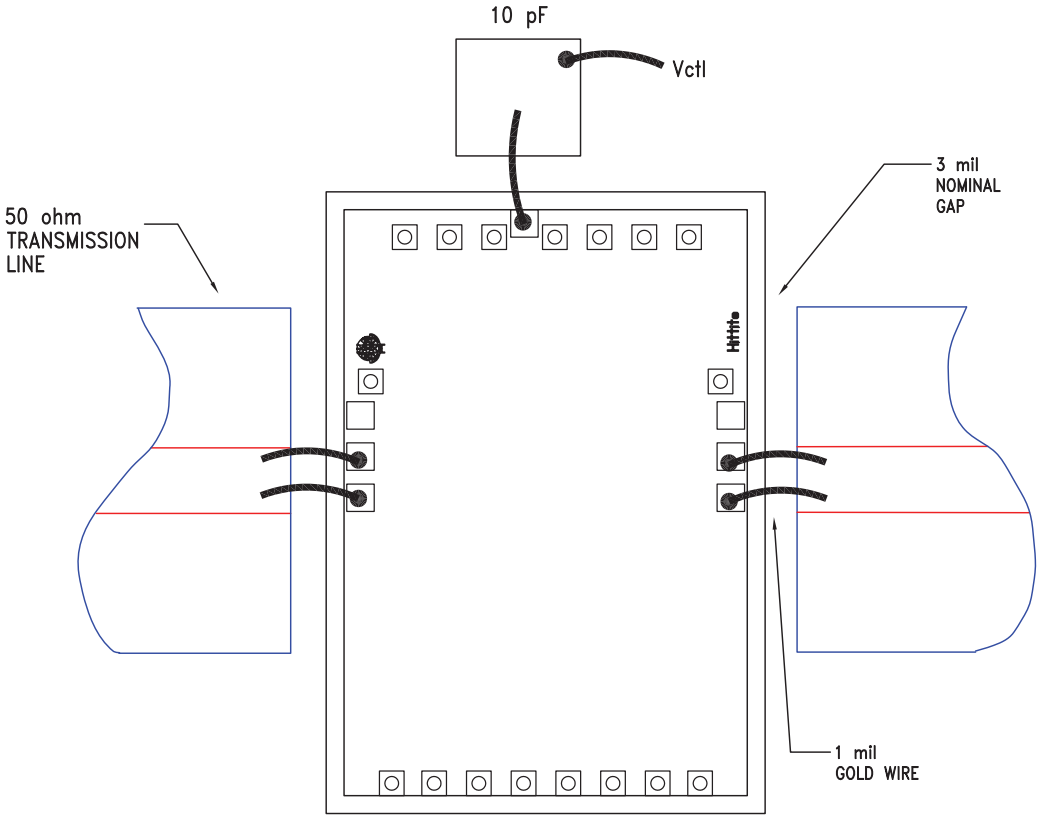
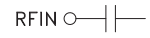
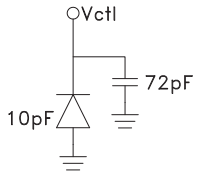
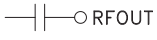
Assembly Diagram



Pad Descriptions

Pad Number	Function	Description	Interface Schematic
1, 2	RFIN	Port is DC blocked.	
3	Vctl	Phase shift control pin. Application of voltage between 0 and 10 volts causes the transmission phase to change. The DC equivalent circuit is a series connected diode resistor	
4, 5	RFOUT	Port is DC blocked.	
	GND	The backside of the die must be connected to RF / DC ground.	

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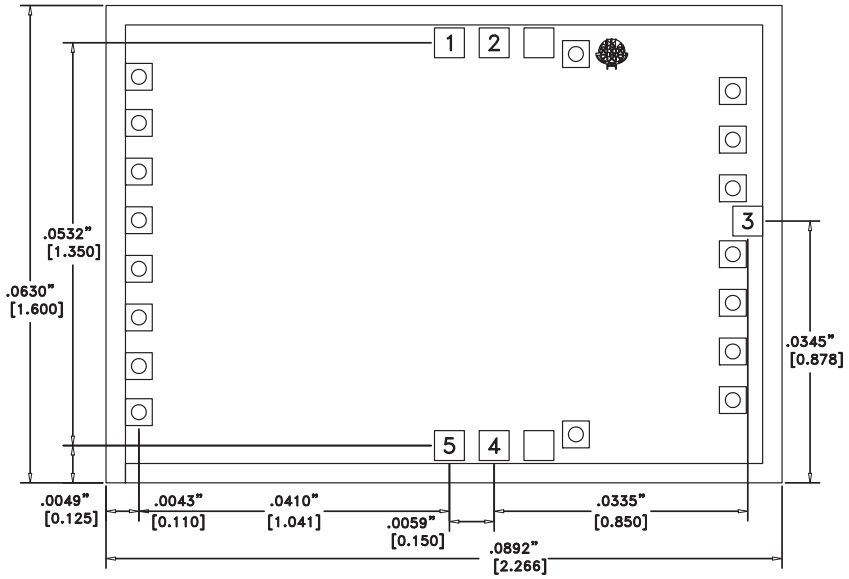
Outline Drawing



Die Packaging Information [1]

Standard	Alternate
WP-4 (Waffle Pack)	[2]

[1] Refer to the "Packaging Information" section for die packaging dimensions.
[2] For alternate packaging information contact Hittite Microwave Corporation.

1. ALL DIMENSIONS ARE IN INCHES [MM]
2. TIE ALL UNLABLED BOND PADS TO GROUND.
3. DIE THICKNESS IS .004"
4. TYPICAL BOND PAD IS .004" SQUARE.
5. BACKSIDE METALIZATION: GOLD.
6. BOND PAD METALIZATION: GOLD.

Handling Precautions

Follow these precautions to avoid permanent damage.

Storage: All bare die are placed in either Waffle or Gel based ESD protective containers, and then sealed in an ESD protective bag for shipment. Once the sealed ESD protective bag has been opened, all die should be stored in a dry nitrogen environment.

Cleanliness: Handle the chips in a clean environment. DO NOT attempt to clean the chip using liquid cleaning systems.

Static Sensitivity: Follow ESD precautions to protect against ESD strikes.

Transients: Suppress instrument and bias supply transients while bias is applied. Use shielded signal and bias cables to minimize inductive pick-up.

General Handling: Handle the chip along the edges with a vacuum collet or with a sharp pair of bent tweezers. The surface of the chip has fragile air bridges and should not be touched with vacuum collet, tweezers, or fingers.

Mounting

The chip is back-metallized and can be die mounted with electrically conductive epoxy. The mounting surface should be clean and flat.

Epoxy Die Attach: Apply a minimum amount of epoxy to the mounting surface so that a thin epoxy fillet is observed around the perimeter of the chip once it is placed into position. Cure epoxy per the manufacturer's schedule.

Wire Bonding

Ball or wedge bond with 0.025mm (1 mil) diameter pure gold wire. Thermosonic wirebonding with a nominal stage temperature of 150 deg. C and a ball bonding force of 40 to 50 grams or wedge bonding force of 18 to 22 grams is recommended. Use the minimum level of ultrasonic energy to achieve reliable wirebonds. Wirebonds should be started on the chip and terminated on the package or substrate. All bonds should be as short as possible <0.31mm (12 mils).

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