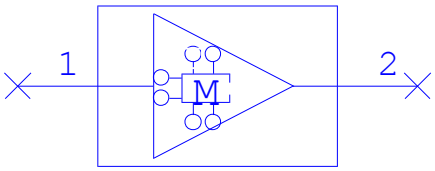
Modelithics®

amplifier behavioral model

Model Features

- Model Type: Behavioral
  - P2D model format
- Broadband S-Parameter Prediction (0.05 - 12GHz)
  - Nonlinear Gain Compression Prediction
- Third Order Intercept Prediction
- Measurement Validations (25C):
  - S-Parameters
  - 50 ohm In/Out fixture



AMP-MCL-PGA105+-001
Low Noise
Flat Gain Amplifier

Model Description

The AMP-MCL-PGA105+-001 is a non-linear behavioral model for the Mini-Circuits PGA-105+ flat gain amplifier in a SOT-89 package. This amplifier is designed for 0.04 – 2.6 GHz applications and offers an excellent dynamic range. A P2D model structure enables the model to predict the broadband small-signal S-parameter as well as large-signal results.

Technical Notes

- The non-linear model is extracted from nonlinear and broadband S-parameter measurements performed.
- Two simulation modes are used in the model to switch between nonlinear and traditional S-Parameter mode (broadband).
- Frequencies for power sweep validation: 200 to 3000 MHz (200 MHz step)
  P2D model based on the following measurements:
  - 200 MHz: -8 to +9 dBm
  - 400 – 1200 MHz: -8 to +10 dBm
  - 1400 – 3000 MHz: -8 to +9 dBm
- Bias conditions: +5V.
- Fixed substrate model developed with device mounted on 10-mil Rogers 4350B.

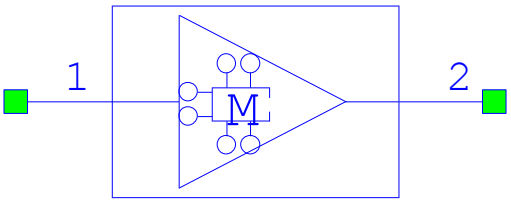
Model Input Parameters

- RF Freq - Frequency of operation for harmonic balance simulations. When simulating in small-signal mode, parameter must be set to "_FREQ" for proper operation.
- sim_mode - "0" selects the use of P2D model recommended for 1-tone/2-tone large signal simulation (recommended) or "1" selects use of small-signal S-parameter.

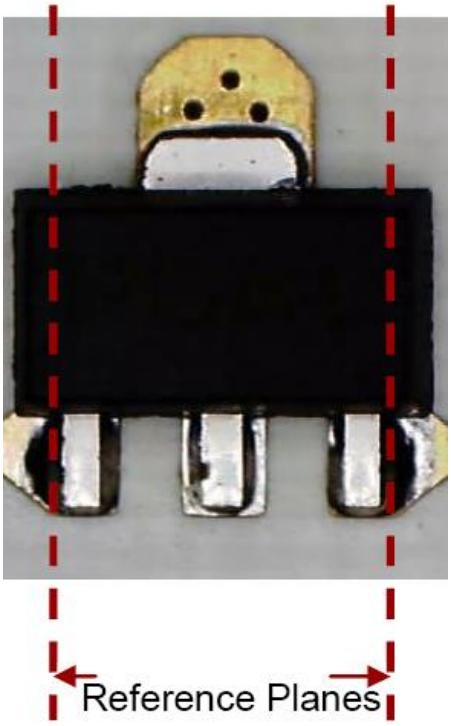
Note - The via effects are included in the model

Schematic Representation

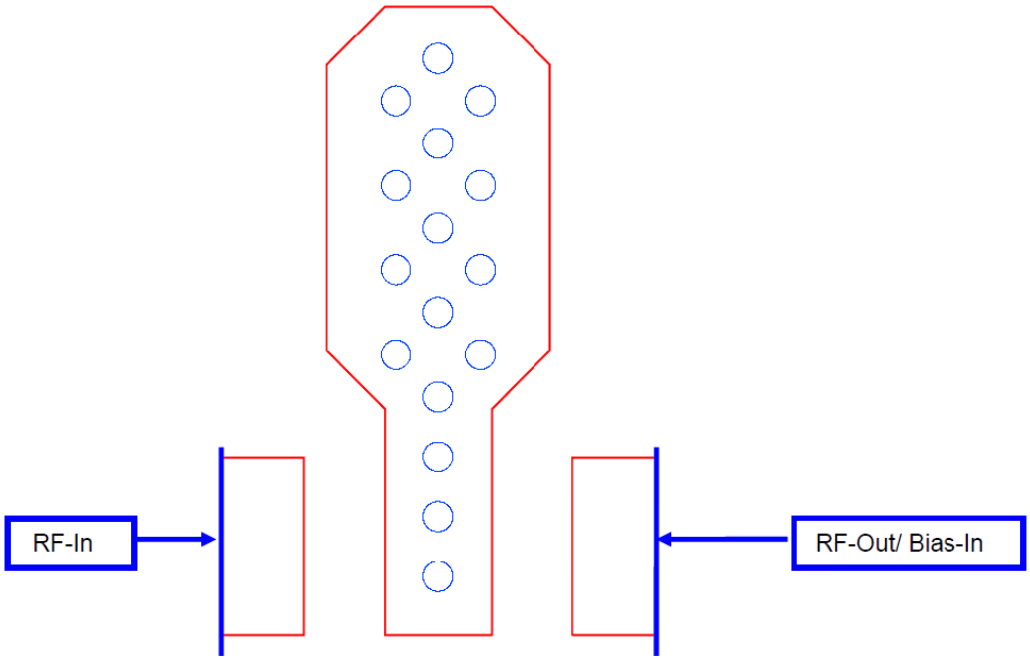
MODampga105plus
ID=X2
RFfreq=_FREQ
Sim_mode=1 - S-Parameter



Mounted Device on PCB



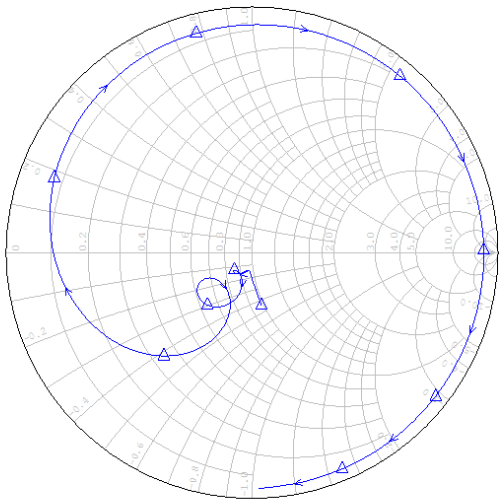
PC Board Footprint



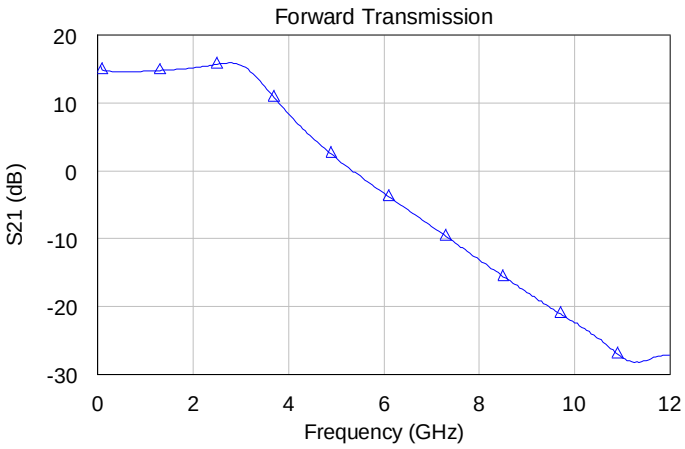
Blue vertical lines indicate the measurement reference plane.
10mil (0.254mm) diameter vias are used on the ground paddle.
3.71mm between Reference Planes.
See Nominal Footprint page for dimensions.

Typical S–Parameters for Amplifier:

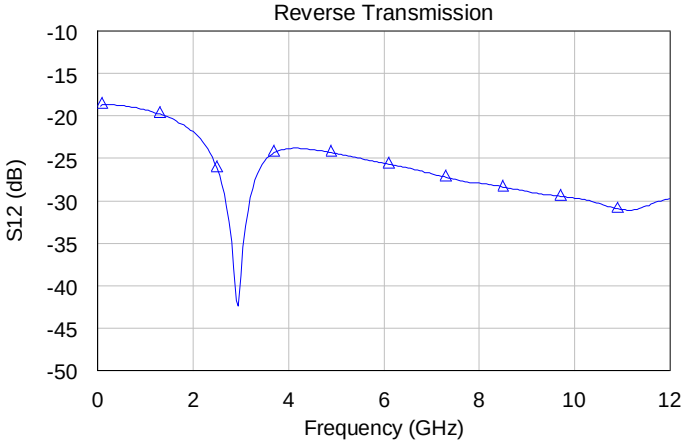
S11



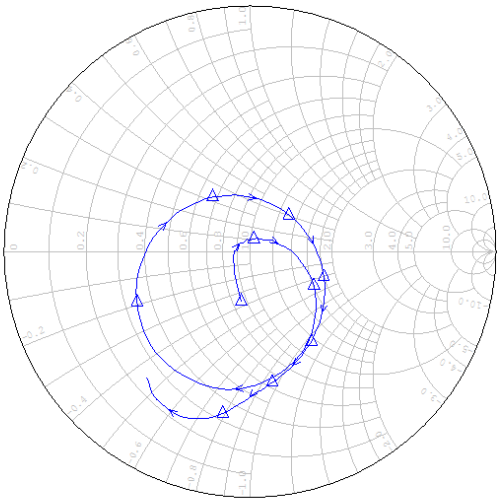
Forward Transmission



Reverse Transmission



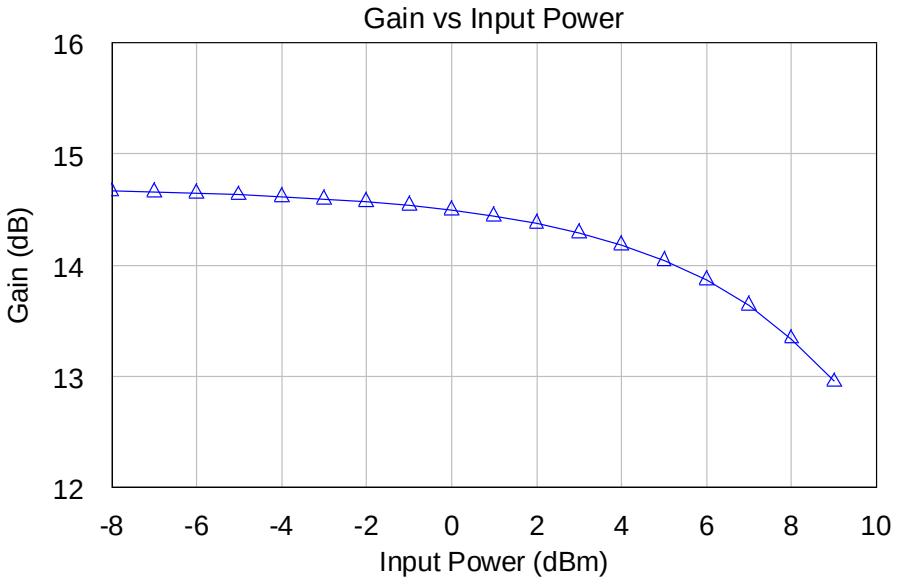
S22

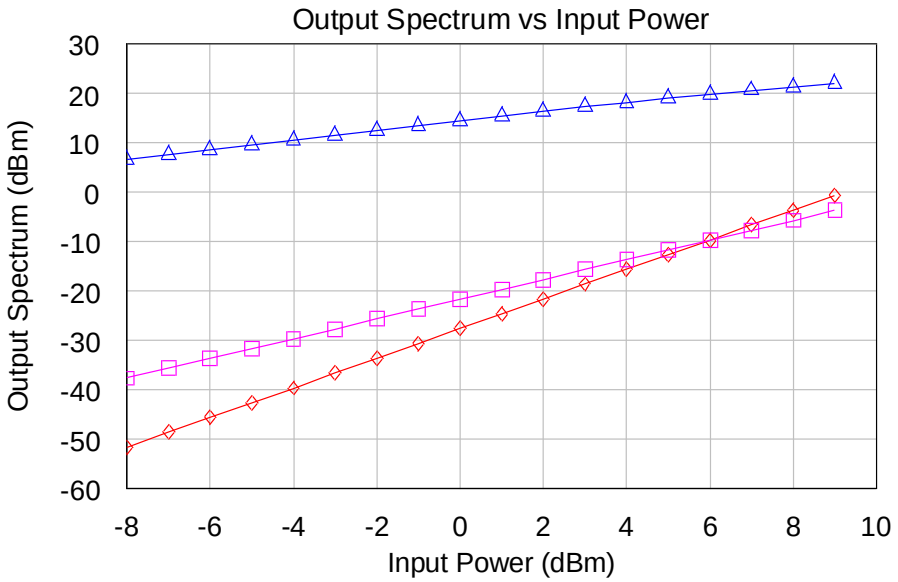


Legend:
Blue Line – 10mil Rogers 4350B validated from 50 MHz – 12 GHz.
DC Voltage: +5V, sim_mode=1 used.

Swept Power Simulation Results (200 MHz)

50 ohm In/Out

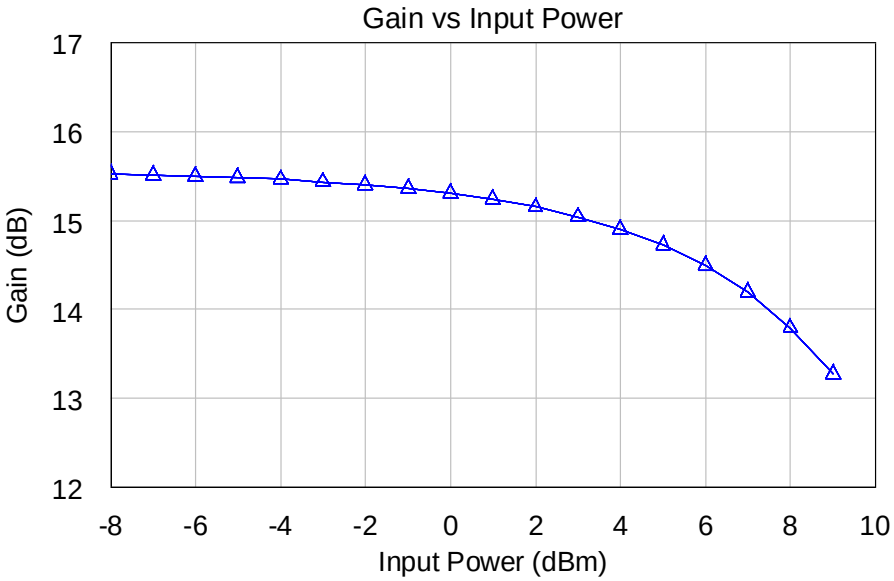


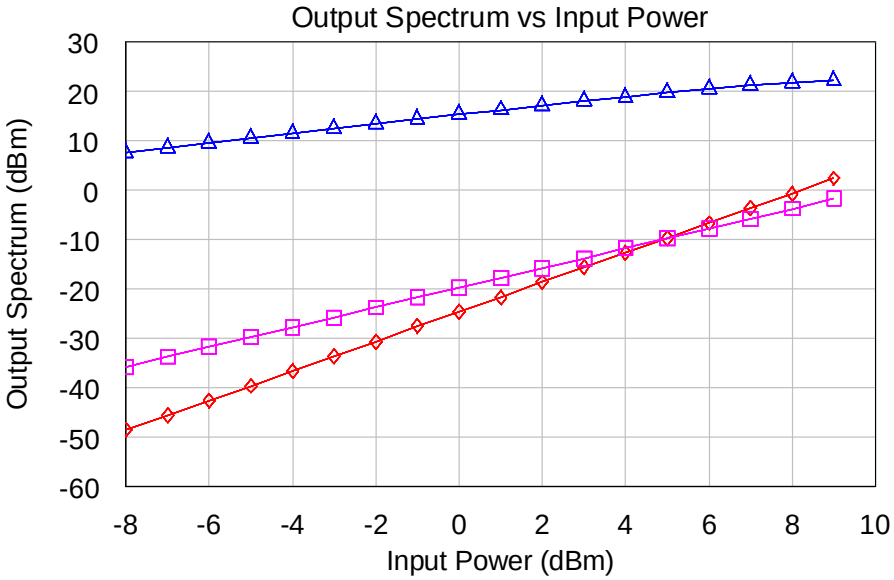


Legend: Blue Line – Fundamental, Magenta Line – 2nd Harmonic, Red Line – 3rd Harmonic
Top Plot shows Gain
Bottom Plot shows Output Spectrum
DC Voltage: +5V, **sim_mode=0 used**.

Swept Power Simulation Results (3 GHz)

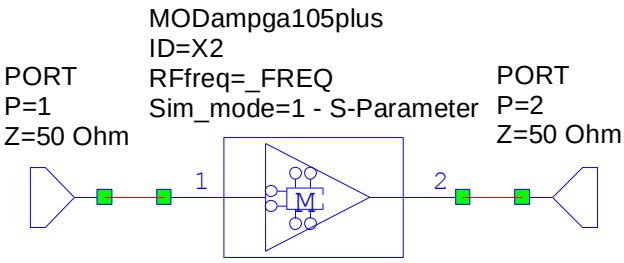
50 ohm In/Out



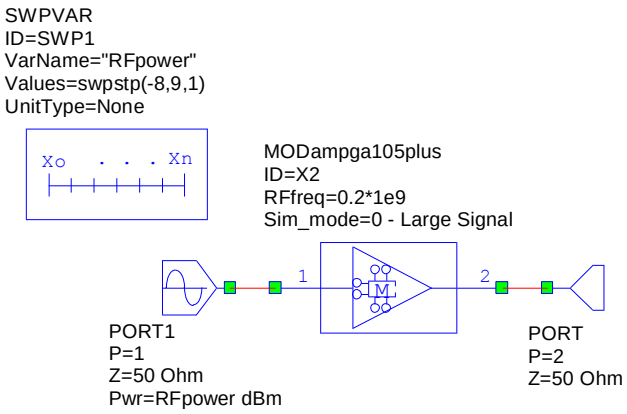


Legend: Blue Line – Fundamental, Magenta Line – 2nd Harmonic, Red Line – 3rd Harmonic
Top Plot shows Gain
Bottom Plot shows Output Spectrum
DC Voltage: +5V, **sim_mode=0 used**.

Example S-Parameter Schematic:



Example Nonlinear Simulation Schematic:



For Nonlinear simulations sim_mode=0 is used

The Nonlinear model is based on the following measurements:

200 MHz	-8 to +9 dBm
400 – 1200 MHz	-8 to +10 dBm
1400 – 3000 MHz	-8 to +9 dBm

Model and Datasheet Revision Notes

05/05/2017	Original model and datasheet development

Notice: Modelithics models represent as-measured characteristics of sample devices using specific testing and fixture configurations. The accuracy of models may vary as a result of differing device characteristics, test fixtures, or test conditions. No liability shall be assumed by Modelithics for use of its models, or for any infringement of rights of third parties that may result from their use. Modelithics reserves the right to revise its models and its product line without prior notice.