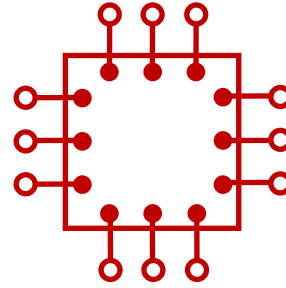


## Model Features

- Broadband (DC to 40GHz)
- Equivalent circuit based
- Multi-pin (32 pin / 64 port) model
- Ansys HFSS Simulation based – measurement validated

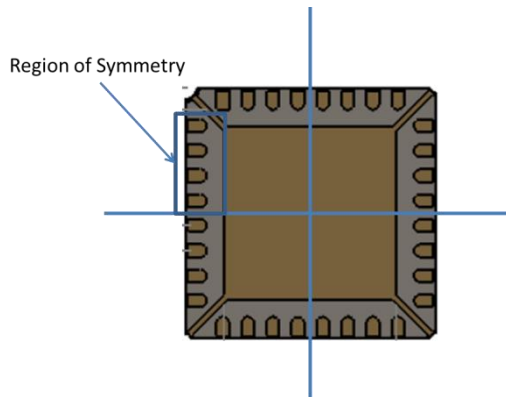


**PKG-BAI-QFN5532-001**  
**QFN-5532-050x**  
**5 mm Package**

## Model Description

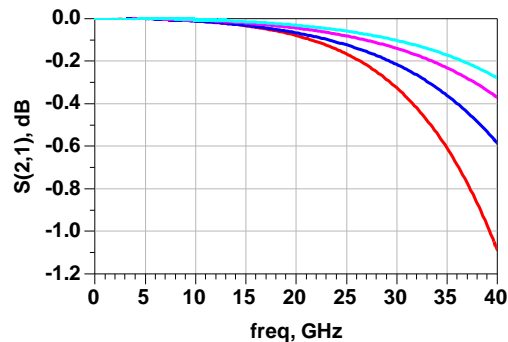
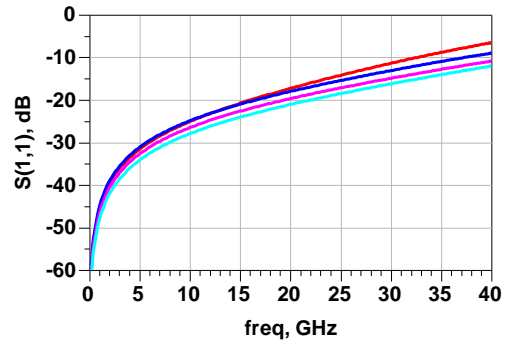
The PKG-BAI-QFN5532-001 is a simulation based equivalent circuit model of Barry Industries P/N QFN-5532-050x molded 5 mm Quad Flat No lead (QFN) surface mount package. Ansys HFSS 3D simulation data was used to create model. Simulation results and model validated against measured data to 40 GHz in multiple measurement environments. Additional package information is available at [www.barryind.com](http://www.barryind.com).

## Device Image



QFN-5532-0502 5 mm package

## Model Pin Performance

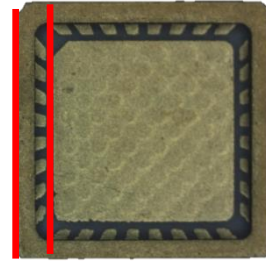


Legend: **RED** - port 1 to port 2 (package pin 1), **BLUE** - port 3 to port 4 (package pin 2), **MAGENTA** - port 5 to port 6 (package pin 3), **TURQUOISE** - port 7 to port 8 (package pin 4). (Shown with Pkg\_mode = 1 - No Higher Order Resonances.)

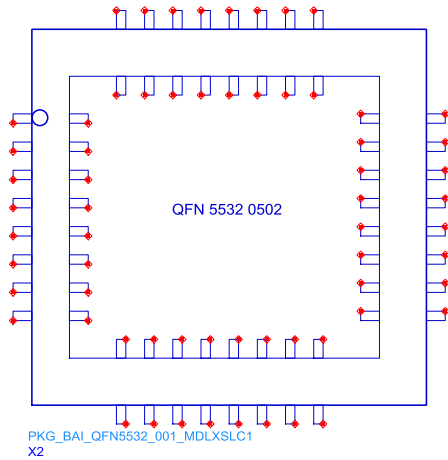
### Technical Notes

- Each package pin accurately modeled and validated in two measurement environments
- Highest frequency for measurement validation: 40 GHz
- Ansys HFSS model simulated with conductive cover on package
- Pkg\_mode allows for the Higher Order Resonances (HOR) to be disabled. Setting to 1 disables HOR, setting to 0 enables HOR.

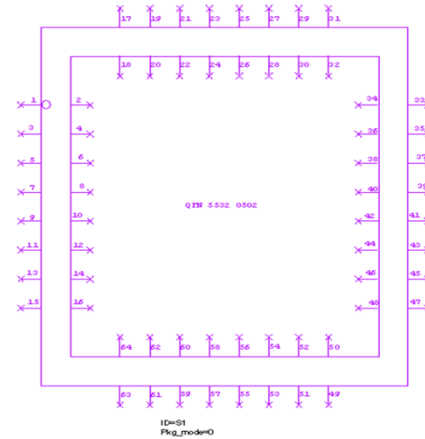
### Model Reference Planes



RED lines indicated model simulation planes.



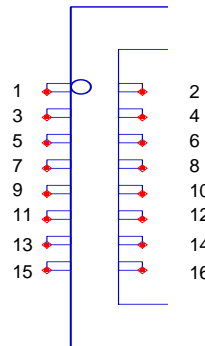
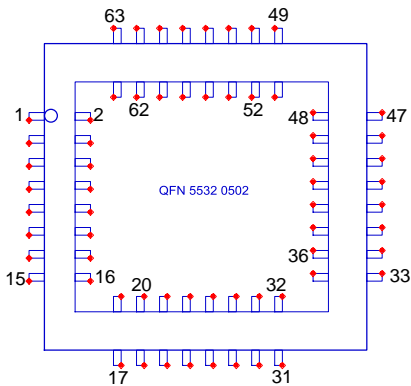
Keysight ADS Model Symbol



NI Microwave Office Model Symbol

Circle on top left port of the Keysight ADS model symbol and the NI Microwave Office model symbol indicates the model's port 1

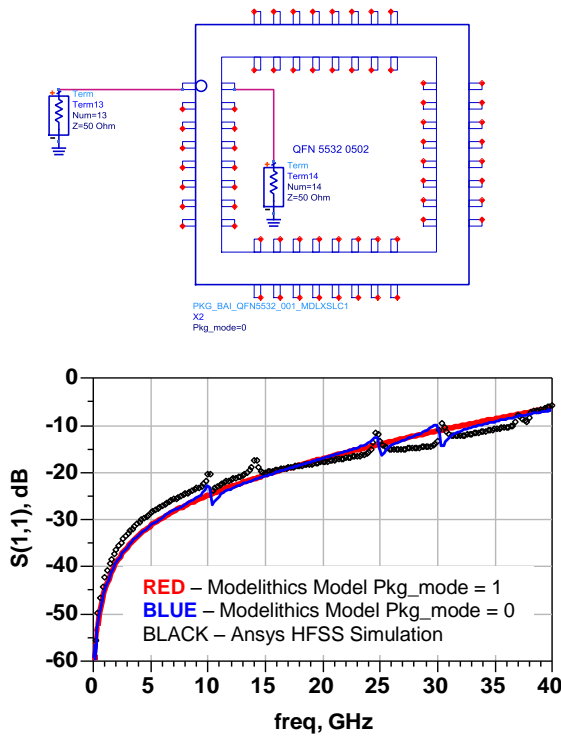
### NOTE concerning model port number convention



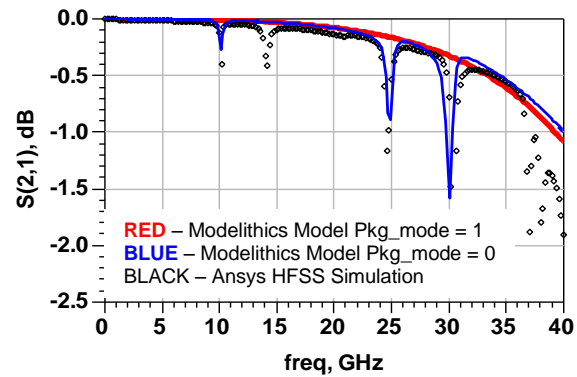
- Circle denotes port 1
- Model symbol's outer ports are odd numbered
- Model symbol's inner ports are even numbered
- Model contains 64 total ports corresponding to 32 package pins

## S Parameter Performance

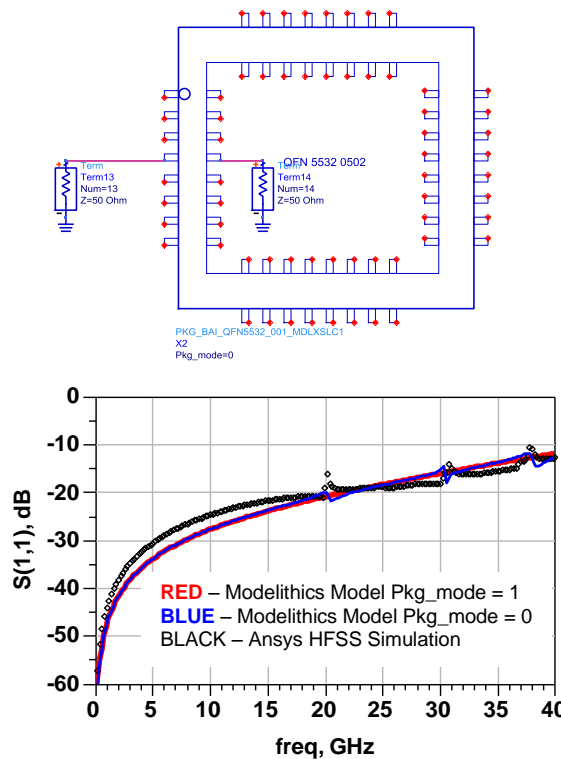
PORT # 1 to PORT # 2 (package corner pin – pin 1)



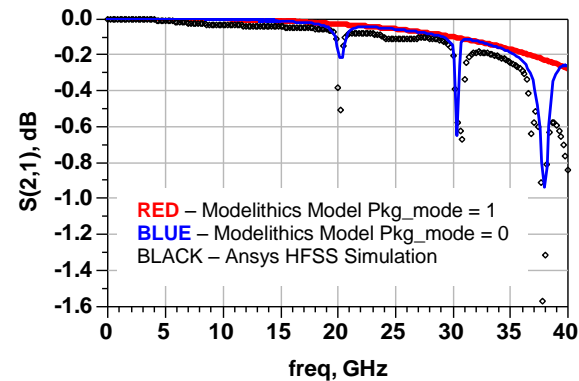
- Keysight ADS simulation of QFN-5532-0502 5 mm package
- Corner pin – port 1 to port 2 (corresponding to package pin 1) simulation compared to Ansys HFSS simulation



PORT # 7 to PORT 8 (package middle pin – pin 4)

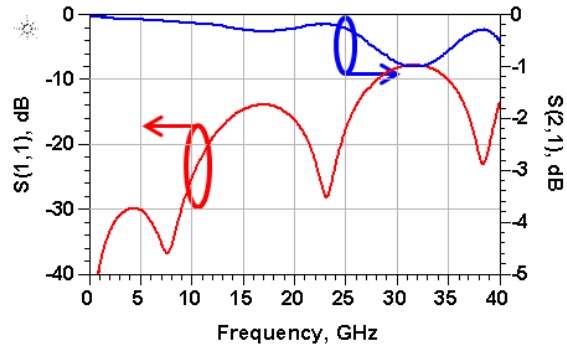
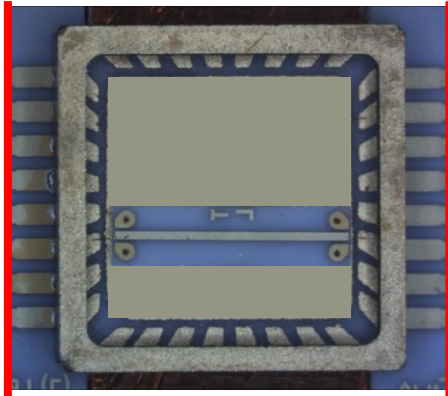


- Keysight ADS simulation of QFN-5532-0502 5 mm package
- Middle pin – port 7 to port 8 (corresponding to package pin 4) simulation compared to Ansys HFSS simulation



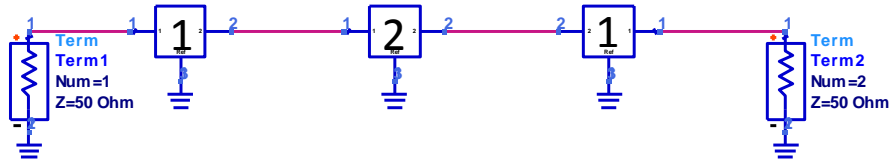
## Measurement Validation

Package Mounted on 5-mil Alumina Alumina Motherboard

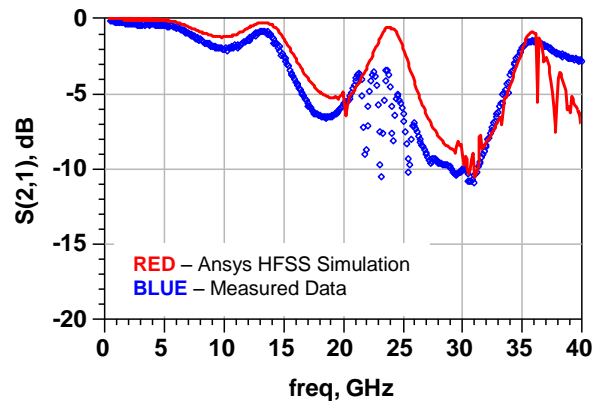
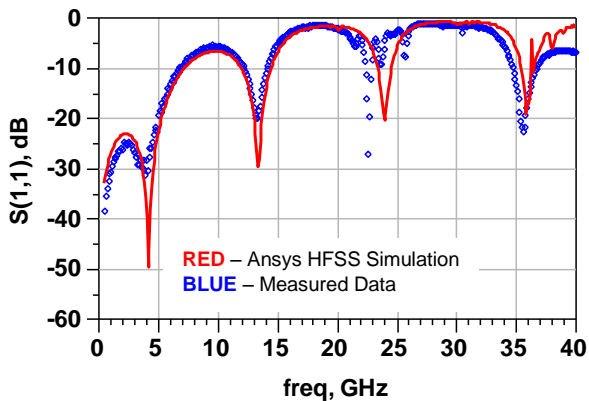


$S_{11}$  and  $S_{21}$  measurement performance of alumina microstrip transmission line. Measurement includes bond wires. This data is used in the model validation below

- Alumina microstrip transmission line mounted inside QFN-5532-0502 5 mm package
- **RED** lines indicate measurement reference planes
- Single bond wires used to connect to inner package pins
- Package mounted on 5-mil alumina motherboard
- Measurement test structures simulated in Ansys HFSS

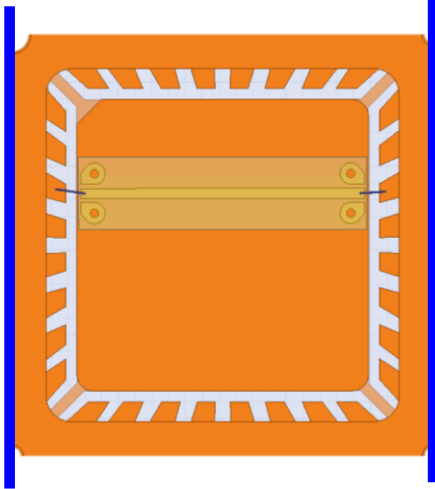


Keysight ADS schematic setup for Ansys HFSS simulation vs measurement validation. Blocks numbered 1 contain Ansys HFSS simulation data of Barry package pins. Block 2 contains measured data for the 5 mil alumina microstrip transmission line with bond wires.

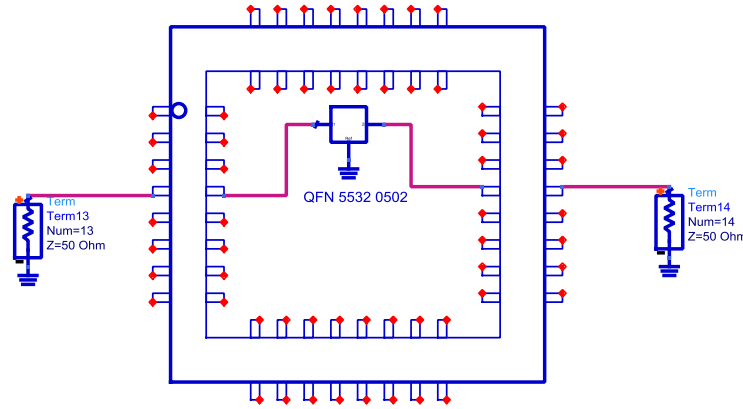


## Model Validation

### Comparison to HFSS Simulation Data

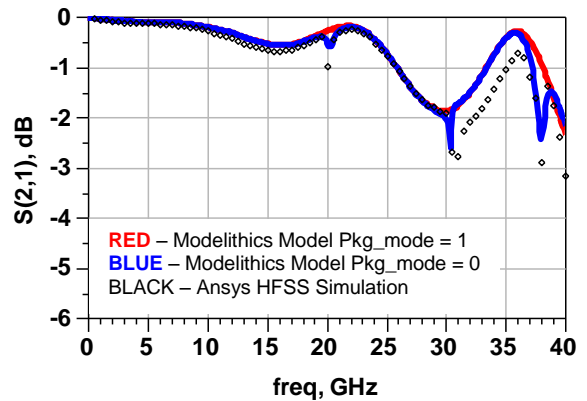
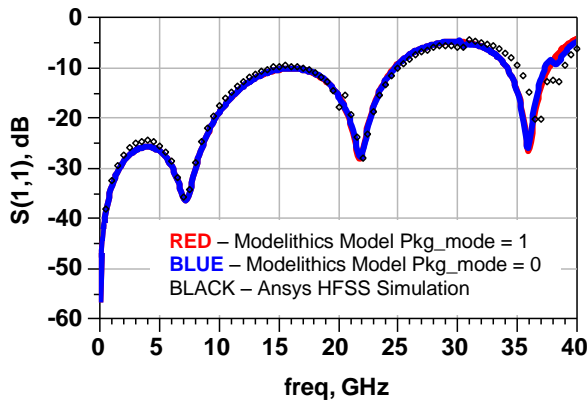


- Alumina microstrip transmission line mounted inside QFN-5532-0502 5 mm package
- Reference planes set to edge of package (BLUE lines)
- Ansys HFSS simulated data compared to model results
- Bond wires and alumina transmission line represented by measured data



PKG\_BAI\_QFN5532\_001\_MDLXSLC1  
X2  
Pkg\_mode=0

Model validation setup in Keysight ADS. s2p block contains measured data of the 5 mil alumina microstrip transmission line with bond wires.



## Model and Datasheet Revision Notes

05/07/2015

Original model and datasheet development

PKG-BAI-QFN5532-001