
EIGHTEENTH ANNUAL
BiTS
TM
Burn-in & Test Strategies Workshop
March 5 - 8, 2017
Hilton Phoenix / Mesa Hotel
Mesa, Arizona
Archive – Session 1
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Session 1

Marc Moessinger

Session Chair

BiTS Workshop 2017 Schedule

Performance Day

Monday March 6 - 10:30 am

Driving Performance

"Design for performance and advanced characterization of new contactors"

Markus Wagner – Cohu & Milen Cheshmedjiev – Melexis

"Investigation into Various Via Structures in High Speed Interconnect"

Carol McCuen - R&D Altanova

"Contactor and Package Design Effects on Crosstalk"

Noureen Sajid & Jeff Sherry - Johnstech International

"Contactor Based Final Test at 77 GHz on a Multi-Channel Radar Transceiver Chipset"

Brian Nakai & Jeffrey Finder - NXP Semiconductors

BiTS 2017 Burn-in & Test Strategies Workshop

Contactor and Package Design Effects on Crosstalk

Noureen Sajid and Jeff Sherry
Johnstech International

BiTS Burn-in & Test Strategies Workshop

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Johnstech®

Objective

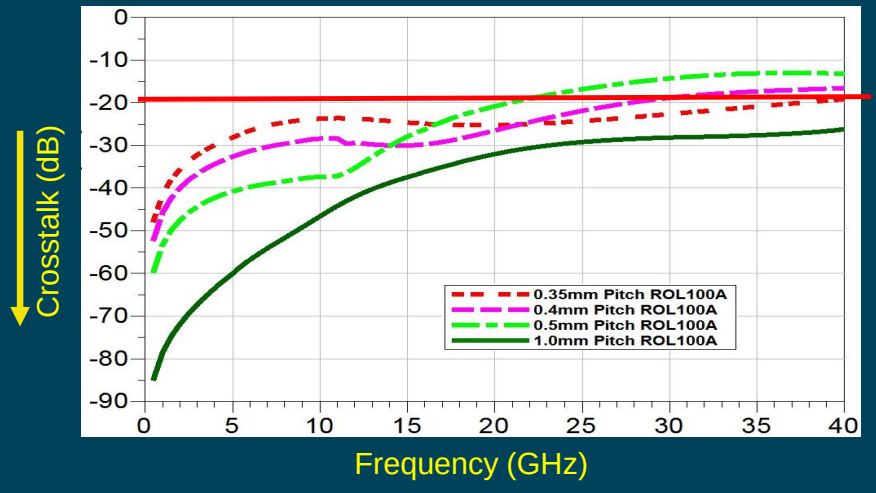
- Provide Crosstalk definition as a function of device packaging features
- Highlight the differences between Crosstalk and Isolation
  - Explain how both phenomena are quantified in test systems
- Present examples of Crosstalk sources through device packaging simulations
  - QFN and LGA devices will be utilized to highlight features which can be varied to control the noise immunity of package lines
- Introduce contactor based strategies for improving the noise immunity of test systems
- Continue to draw attention to the importance of collaborative development of test systems

Contents

- Crosstalk – What, why and how?
  - Difference between Crosstalk and Isolation
  - Effects
- Package descriptions and simulations
- Device parameters which effect Crosstalk
- Conclusion

Crosstalk

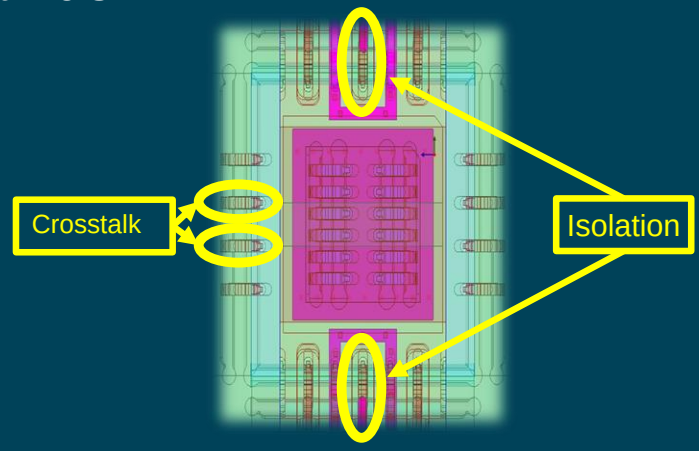
- EMI (Electromagnetic Interference)
- Quantifying specifications – "how is it spec'd?"
  - A -20dB reading signifies that 1/100th of the signal from the aggressor has crossed over to the victim line



Crosstalk and isolation are viewed on the same scale

Crosstalk vs Isolation

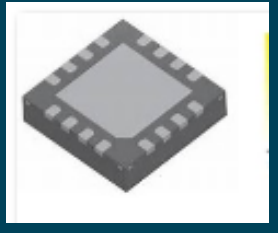
- **Isolation**
  - **Sensitivity of channels to crosstalk from non-adjacent channels**
- **Immunization strategies**
  - **Grounding**
  - **Shielding**
  - **Placement of channels**

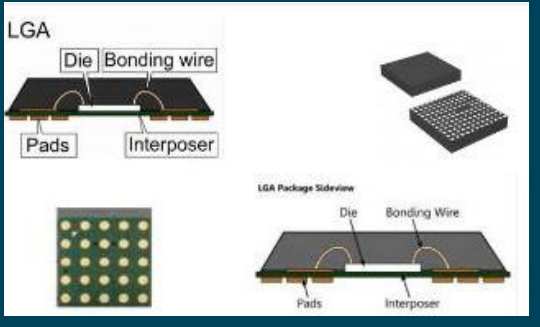


Isolation is a measure of how immune a channel is to distant EM noise

Package Simulations

- QFN Variations shown:
  - Pitch varied from 0.35mm to 1.0mm
  - Loadboard thickness varied from 5 mils to 10 mils
  - Conductive housing vs non-conductive housing
- LGA
  - Number of grounds
  - Placement of grounds

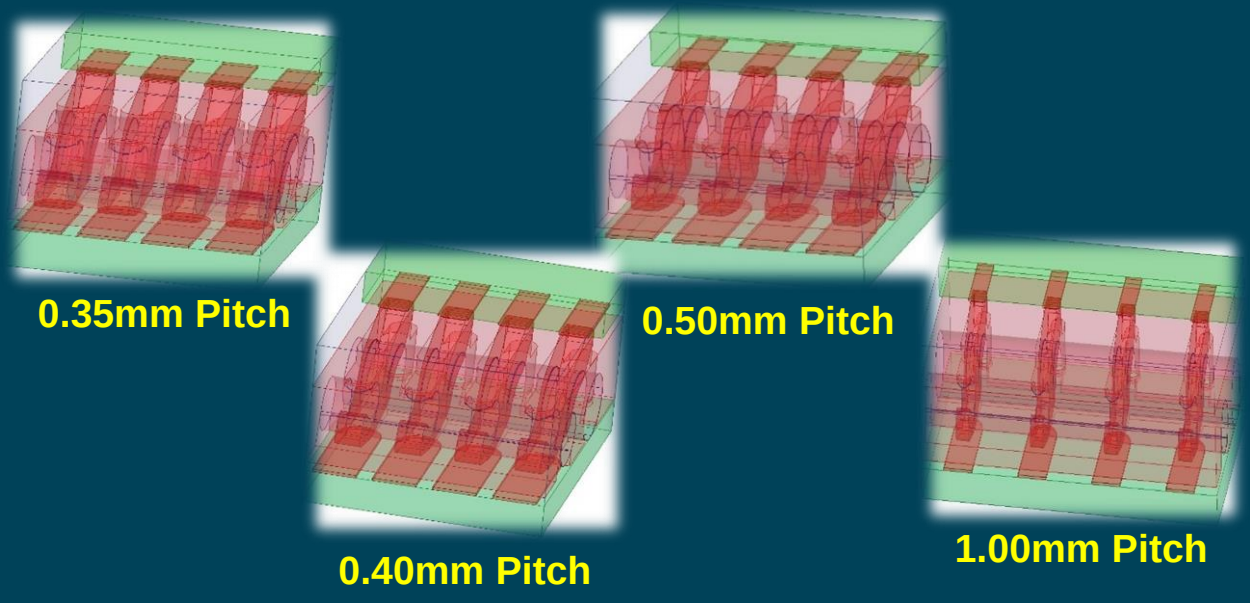




Package features like channel spacing can effect the noise immunity of signals

QFN Package Simulations – Device Pad Pitch Varied

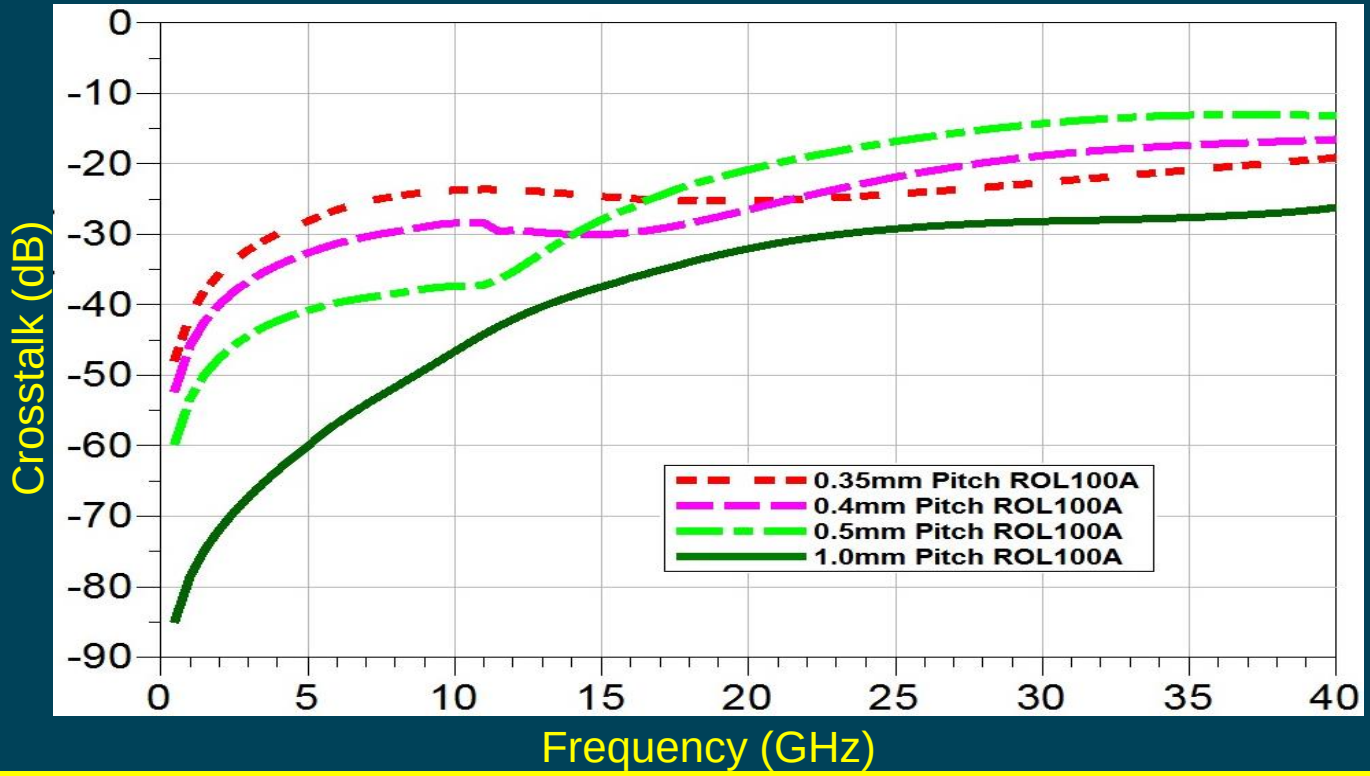
Simulation of Far End crosstalk of high frequency channels in a SSSS setting



Simulations include device pads, contactor and loadboard

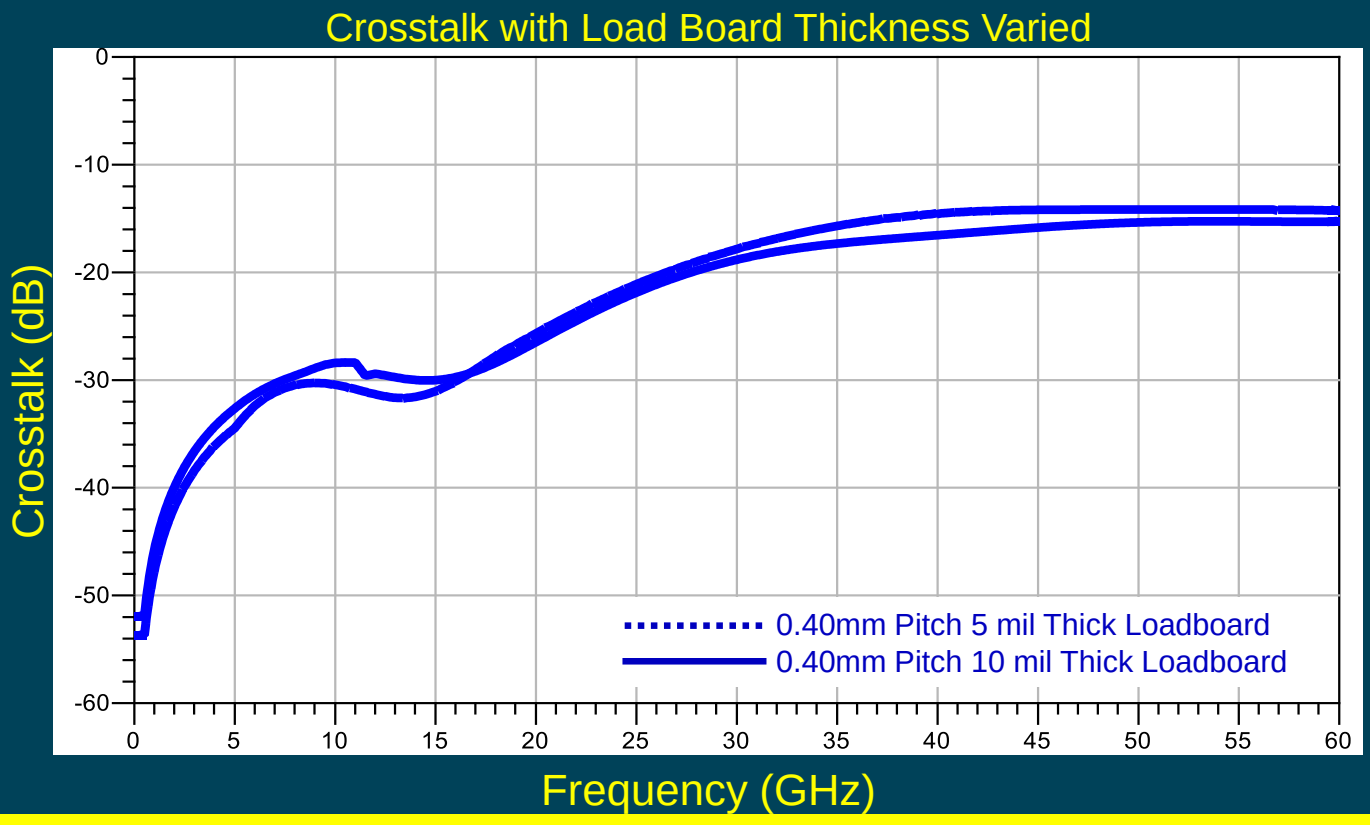
QFN Package Simulations – Device Pad Pitch Varied

Crosstalk With Device Pad Pitch Varied



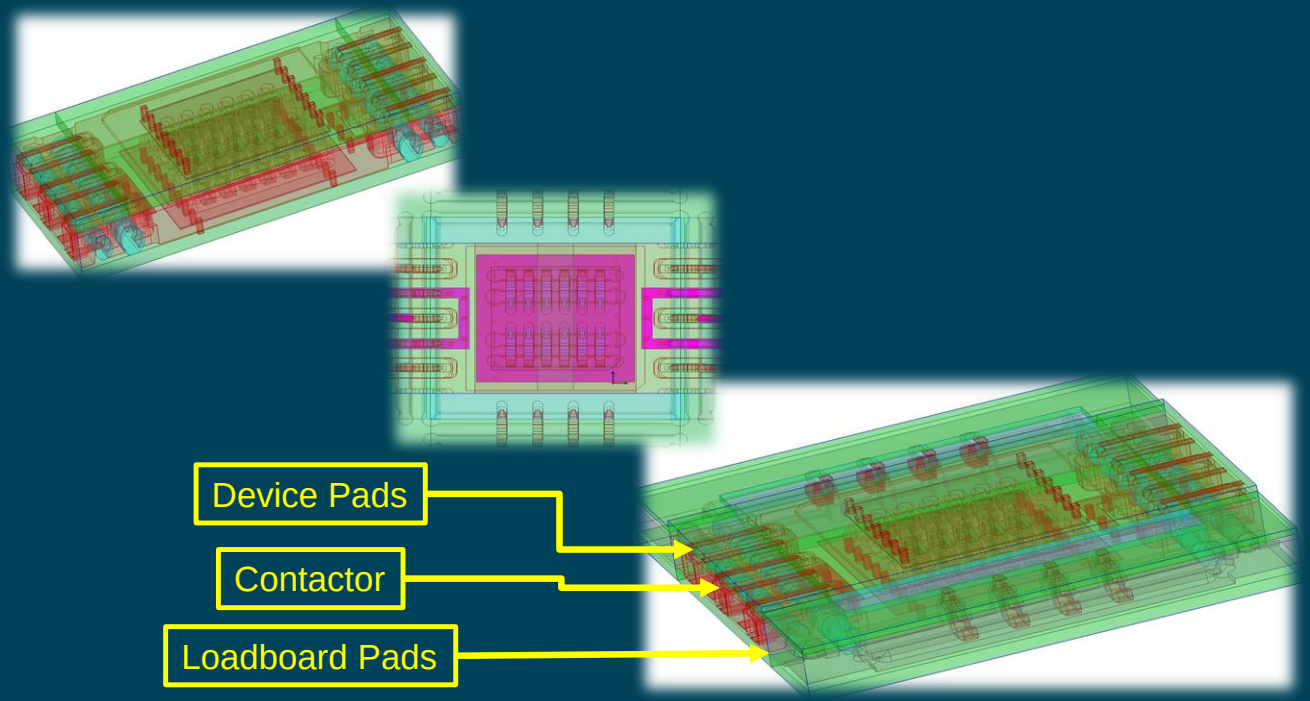
Real estate effects the immunity of a channel to Crosstalk from adjacent channels

QFN Package Simulations – Load Board Thickness Varied



Signals traveling through the substrate can also be a source of Crosstalk

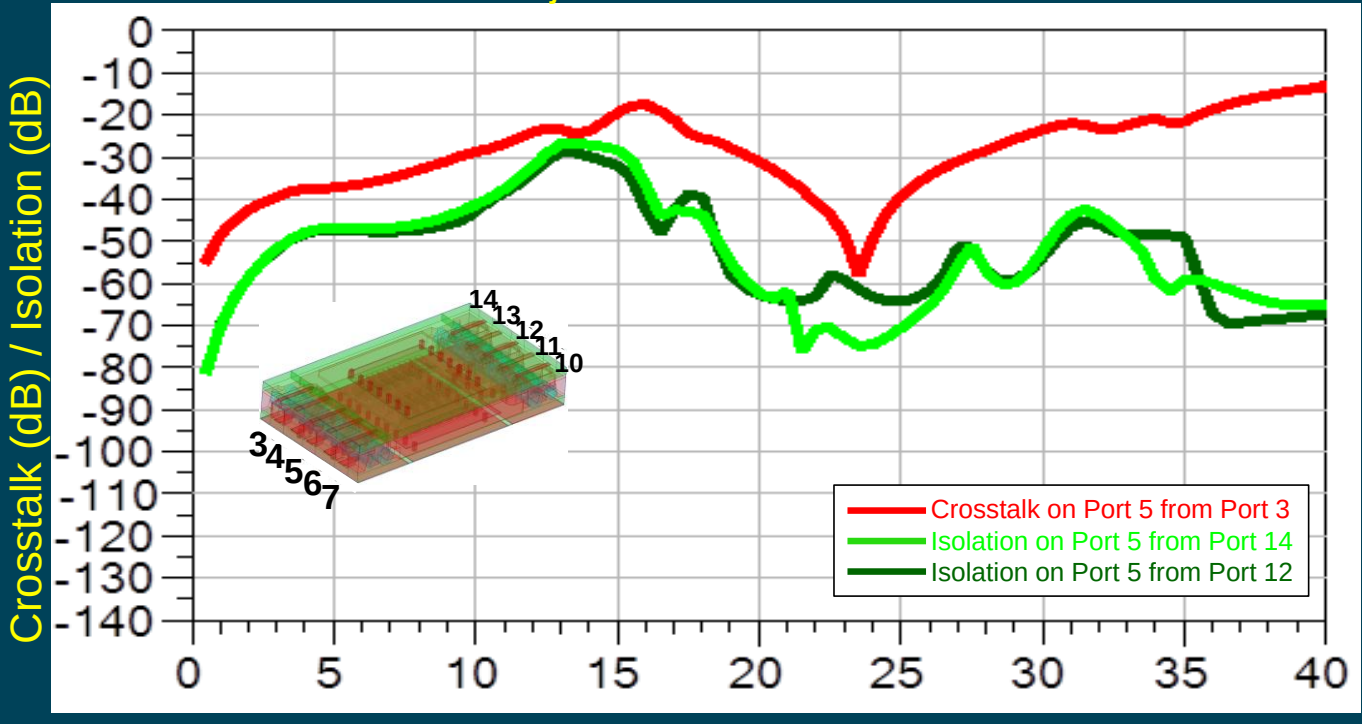
QFN Package Simulations – Conductive vs Non-Conductive Housing



Crosstalk with Non-Conductive Housing vs Conductive Housing

QFN Package Simulations – Non - Conductive Housing

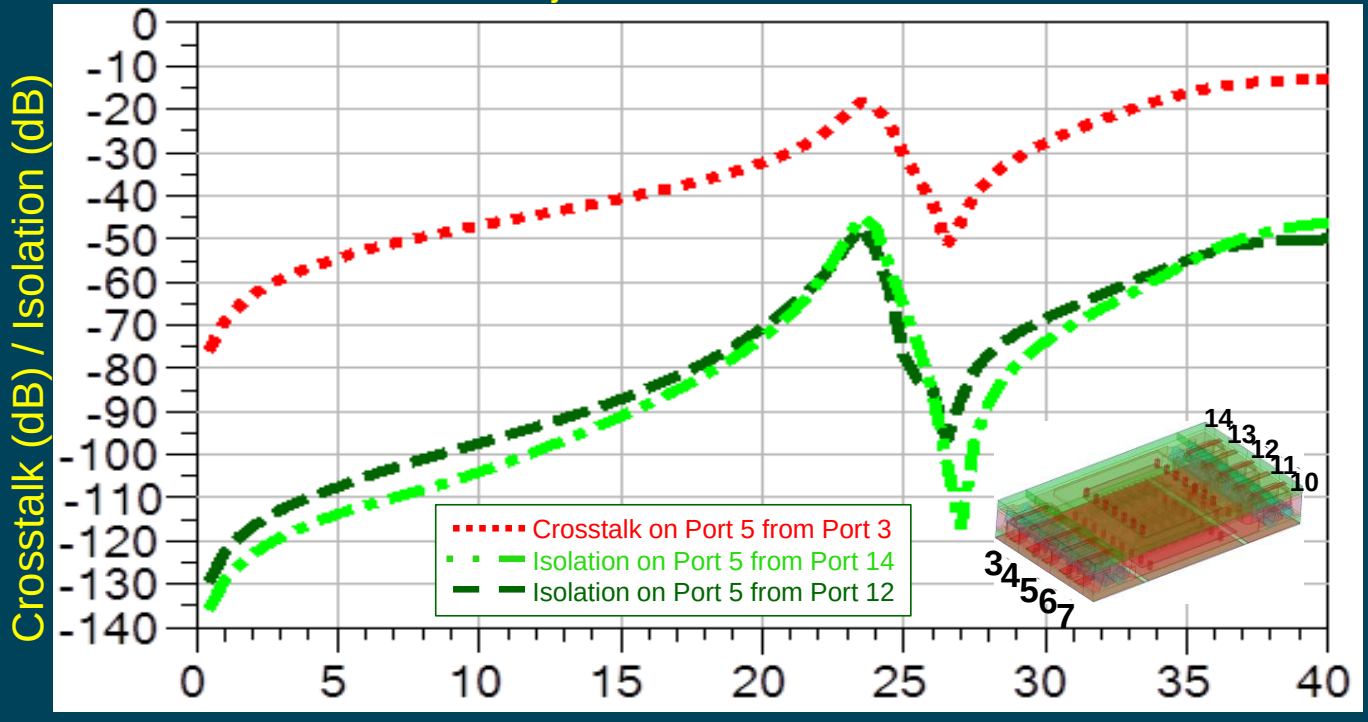
Isolation Between Adjacent Inserts and Insert Across Device



Placing channels relative to other high frequency channels impacts Crosstalk and Isolation

QFN Package Simulations – Conductive Housing

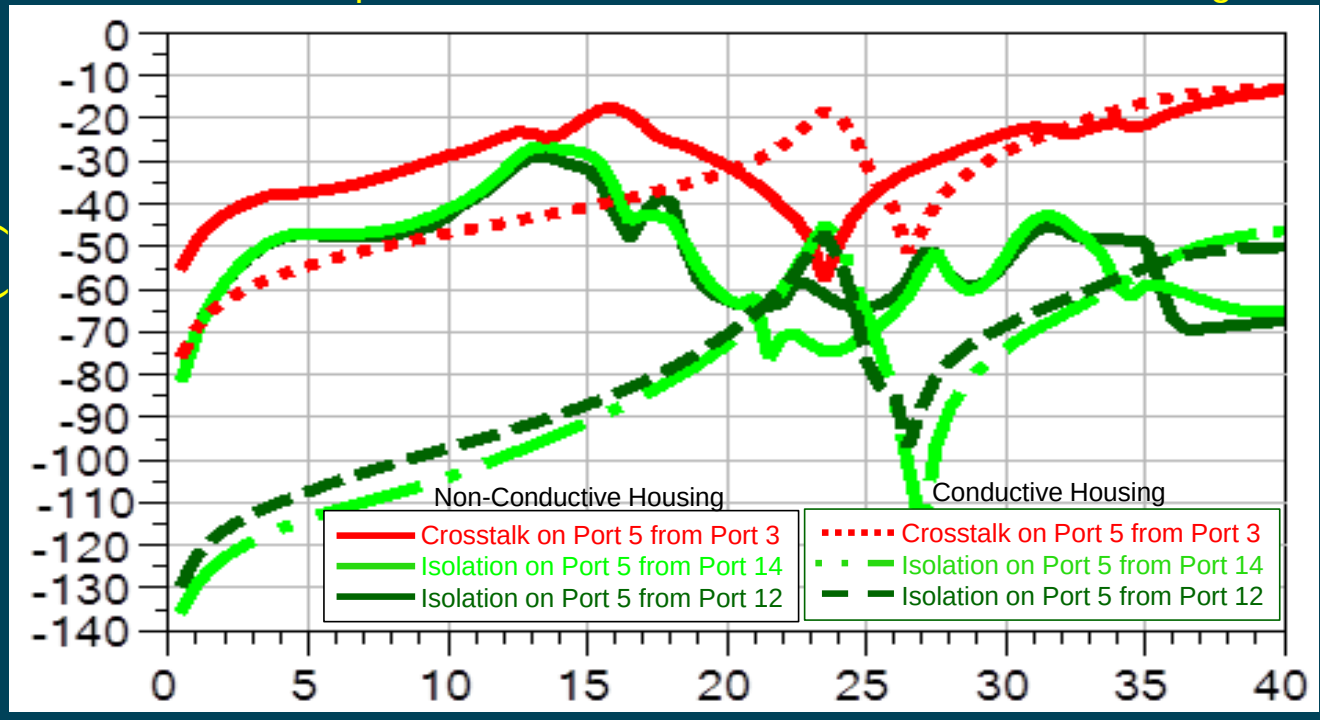
Isolation Between Adjacent Inserts and Insert Across Device



Conductive housings house the signals in non-conductive inserts

QFN Package Simulations – Non - Conductive vs Conductive

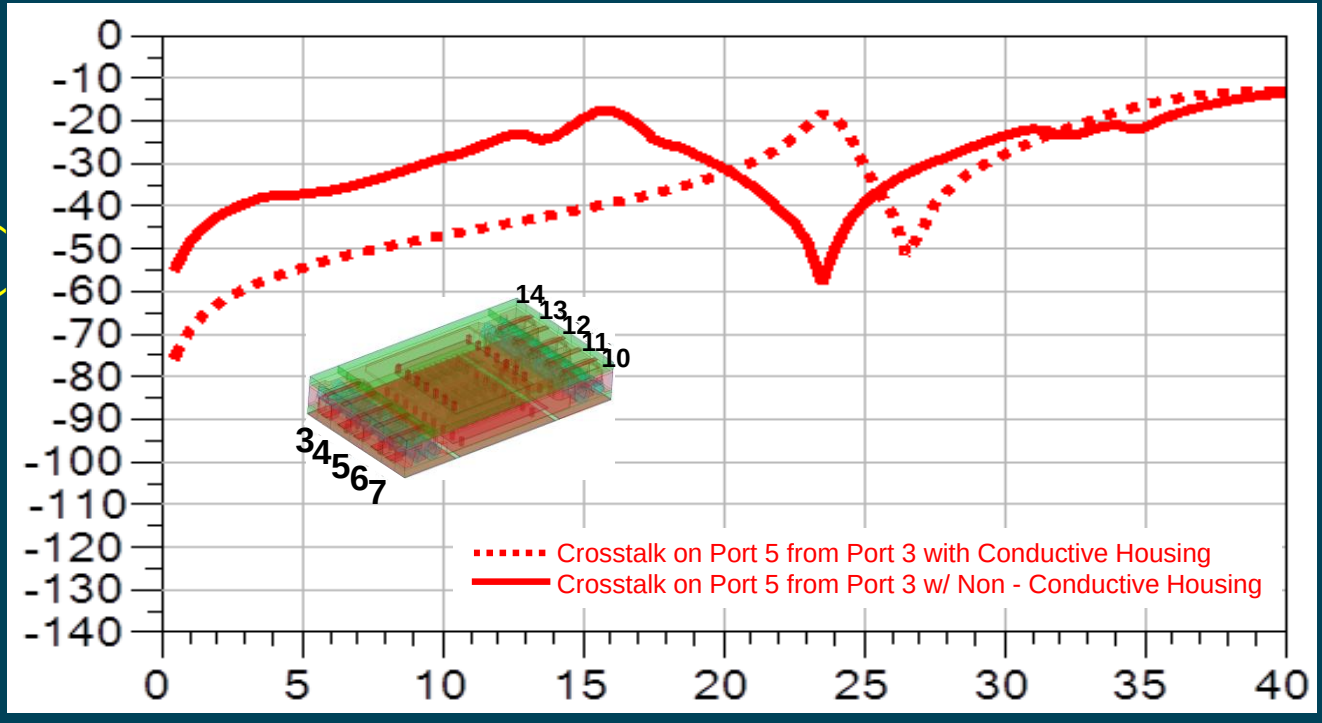
Crosstalk Comparison of Conductive vs Non-Conductive Housing



Conductive housings reduce noise by creating a grounding effect

QFN Package Simulations – Non - Conductive vs Conductive

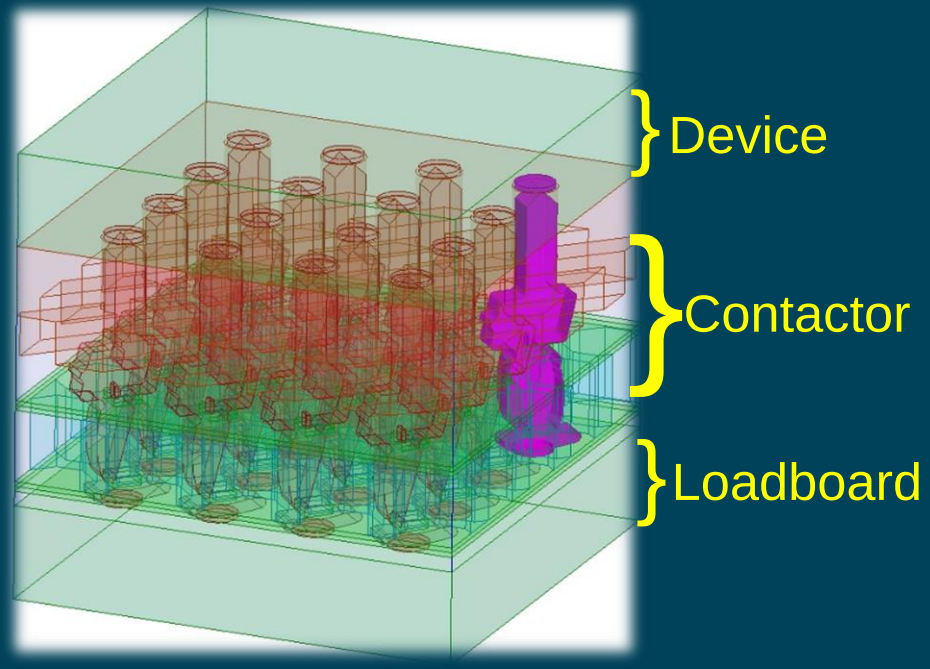
Crosstalk Comparison of Conductive vs Non-Conductive Housing



Conductive housings provide improved shielding between tightly spaced signals

LGA Package Simulations

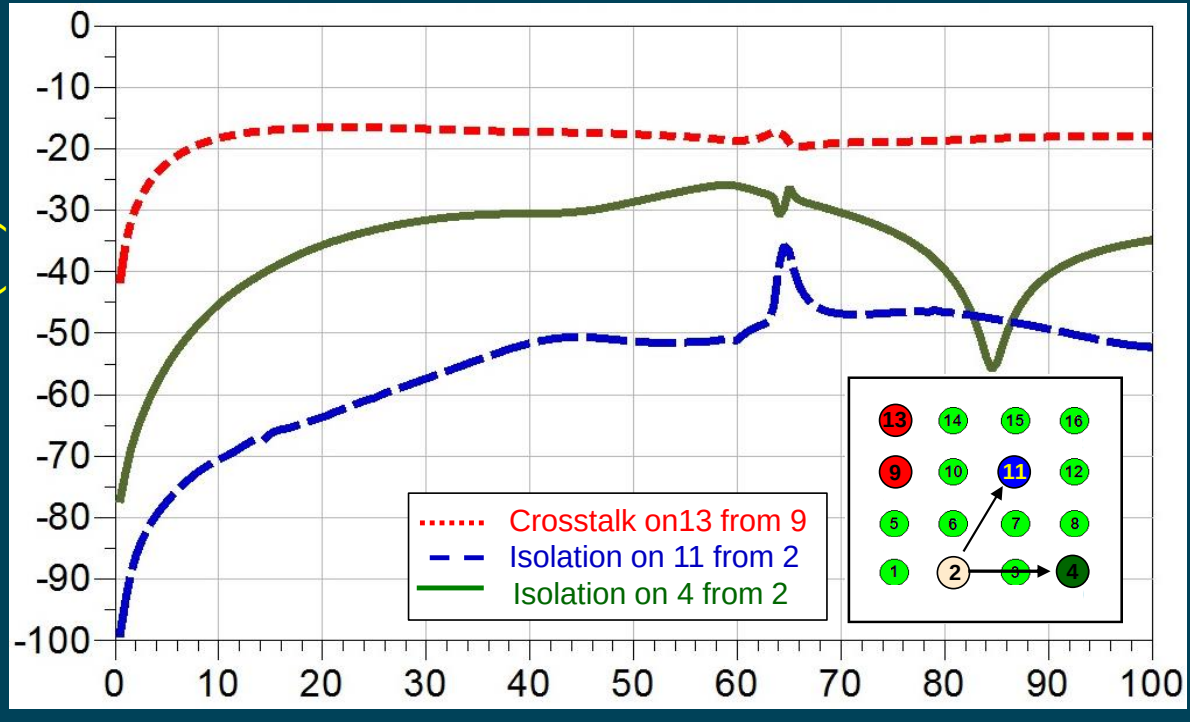
- **LGA package pads simulated with contactor and Loadboard pads**
  - Pitch maintained at 0.5mm
  - 16 pads simulated using a 4x4 array
  - Simulations show a variety of ground and signal combinations
- Simulations show Far End crosstalk



Placing signals on an LGA is dependent on the level of crosstalk shielding needed for a channel

LGA Package Simulations – Placement of Grounds

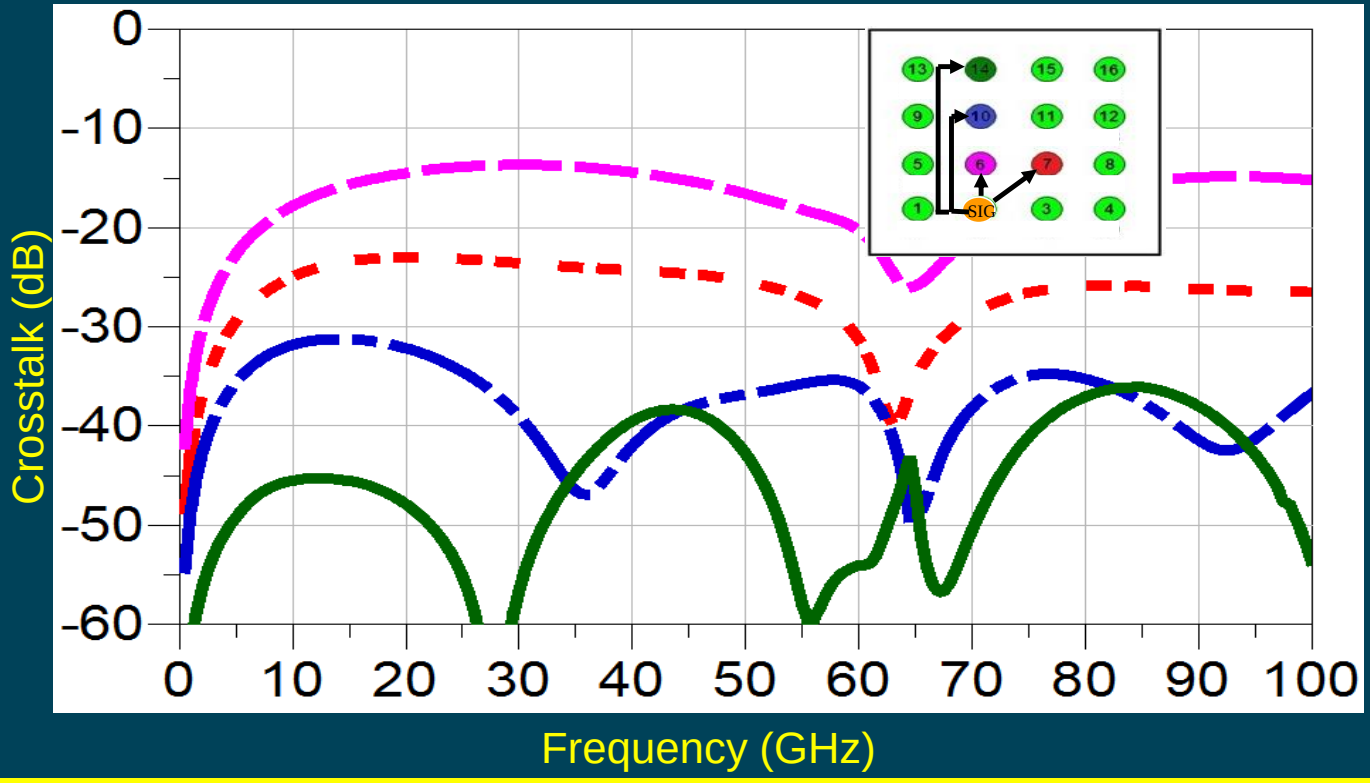
Crosstalk of LGA Package with Different Ground Configurations



Light green I/O are defined as ground, Colored I/O are defined as signals

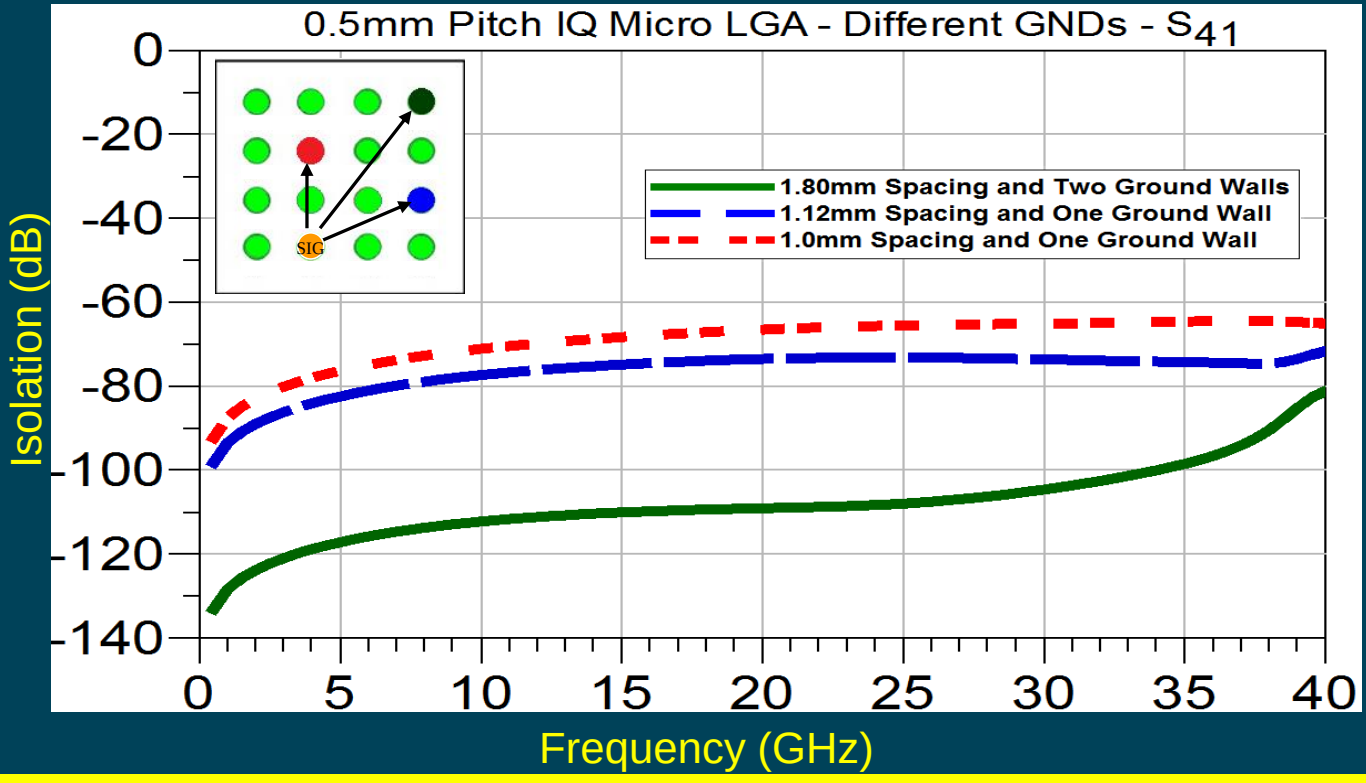
0.5mm Pitch LGA Package Simulations – Placement of Signals

Crosstalk of LGA Package with Different Ground Configurations



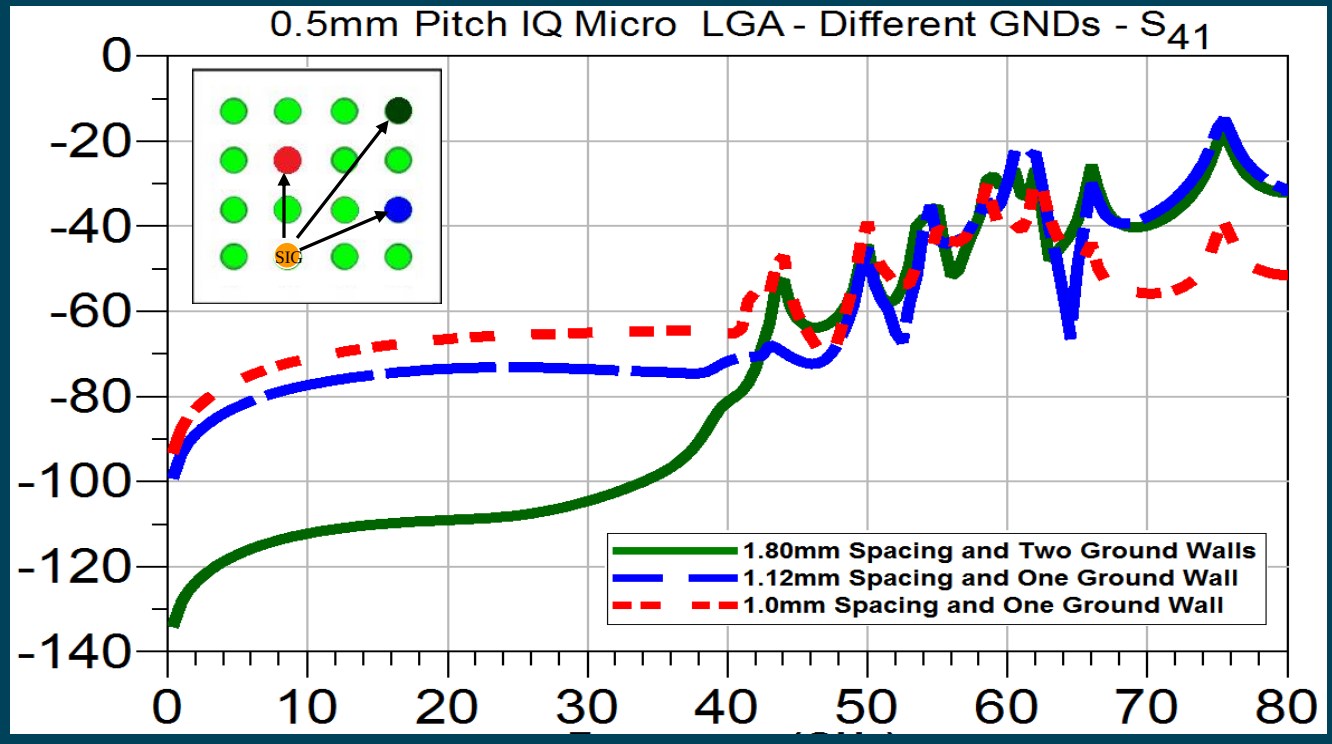
Light green I/O are defined as ground. Crosstalk is better the farther away signal is from aggressor.

0.5 mm Pitch IQtouch Micro LGA – Isolation vs. Distance and Number of Grounds



Spacing and ground placement is important for desired isolation

0.5 mm Pitch IQtouch Micro LGA – Isolation vs. Distance and Number of Grounds



At higher frequencies crosstalk can vary pertaining to additional parasitics

Conclusion

- Crosstalk can be reduced using techniques like:
  - Pitch: Increase distance between adjacent signals
  - Grounds: Increase number of grounds between signals
  - Quantity of Grounds: Surround signals with grounds
  - Length of channels: Limit the length of channels
- Crosstalk can effect the integrity of the signal being transmitted by:
  - Causing signal loss from the aggressor line
  - Adding noise on the victim line
- Grounding mechanisms incorporated within a contactor assist in managing the effects of crosstalk from the device
- Simulating package with contactor determines expected test performance and identifies problems earlier to lower cost