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High Performance Probing Interposer with Passive Equalization

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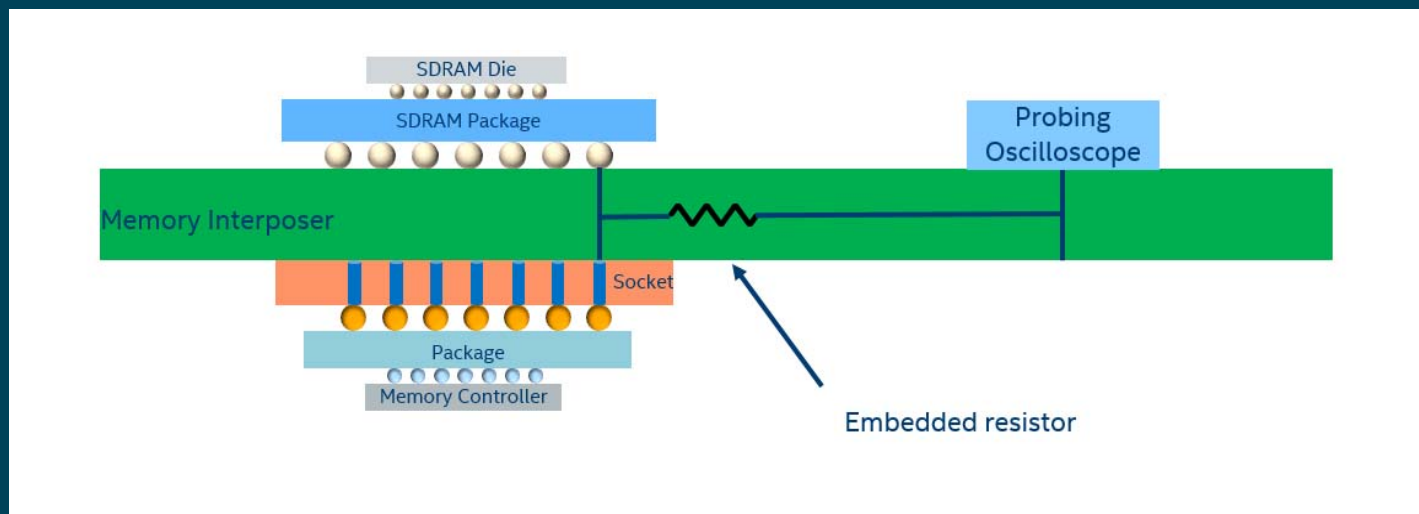
Agenda

- Motivations of probing interposer design
- Traditional probing interposer limitations
- A new implementation architecture
- Performance analysis
- Summary
- Next steps

Motivations of Probing Interposer Design

- An interposer provides an effective way to access signals of device under test.
- Measurement points can be placed far away from the device to meet keep out zone requirements.
- Has minimal impacts on main communication channels.
- It is easy to implement without modifications to existing platform designs.

Traditional Probing Interposer

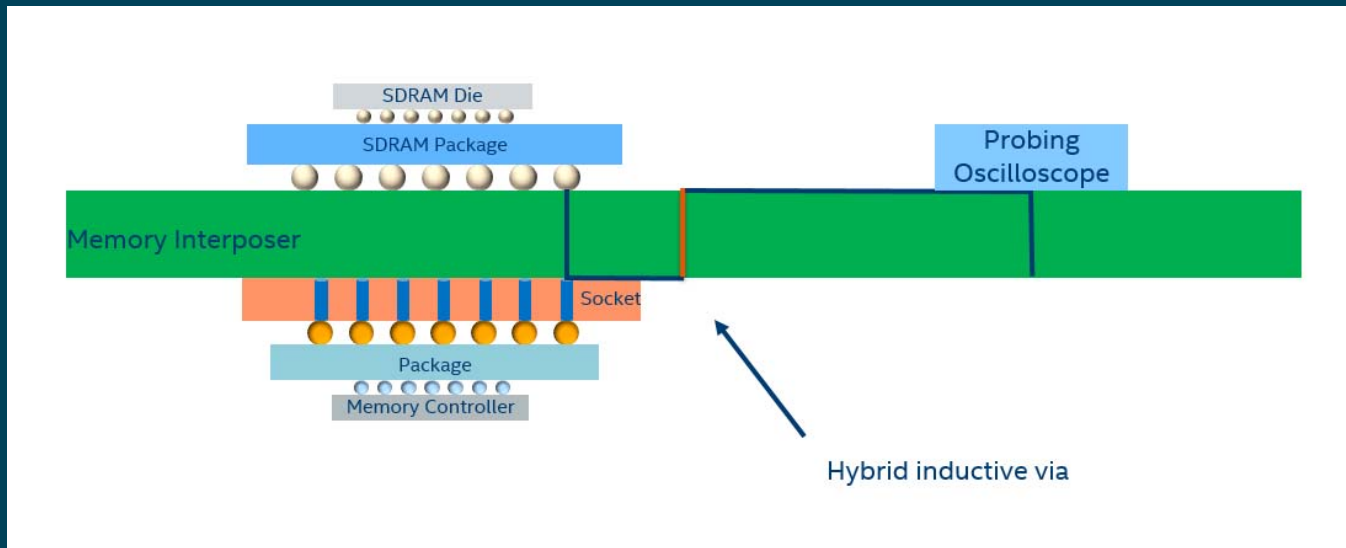


A PCB interposer is used to probe data channels between memory and controller at a testing point far away from the device under test. In order to minimize signal reflections, a resistor is embedded into PCB for each data channel to provide isolation between main and probing channels.

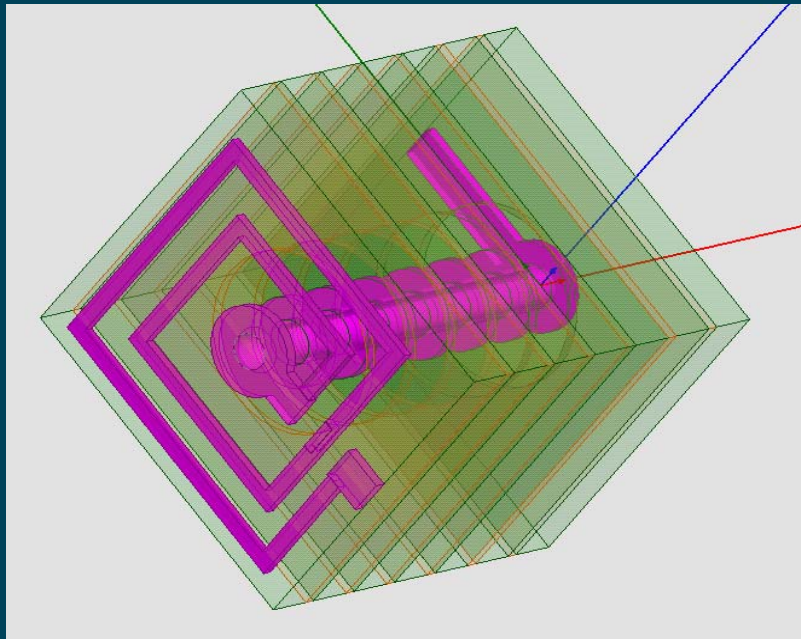
Traditional Probing Interposer Limitations

- High cost to implement embedded resistors
- Large manufacture variations
- Resistor values vary greatly between channels
- Performance degradations

A New Interposer Design



A Hybrid Inductive Via



A hybrid inductive via layout model

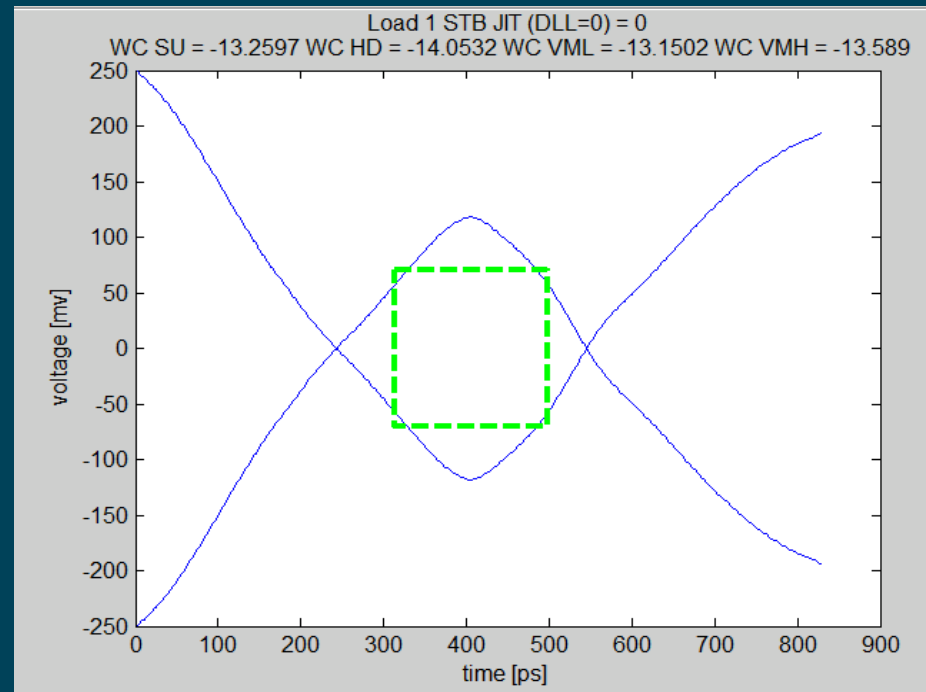
Layer	Cu Weight			
1	.5 oz		Top Layer	Copper
			Prepreg	Pre-preg
2	0.5 oz		GND	Copper
			Core	Core FR4
3	0.5 oz		Signal	Copper
			Prepreg	Pre-preg
4	0.5 oz		Power	Copper
			Core	Core FR4
5	0.5 oz		Power	Copper
			Prepreg	Pre-preg
6	.5 oz		Signal	Copper
			Core	Core FR4
7	0.5 oz		GND	Copper
			Prepreg	Pre-preg
8	0.5 oz		Bottom Layer	Copper

8 layer FR4 stackup

Advantages of New Architecture

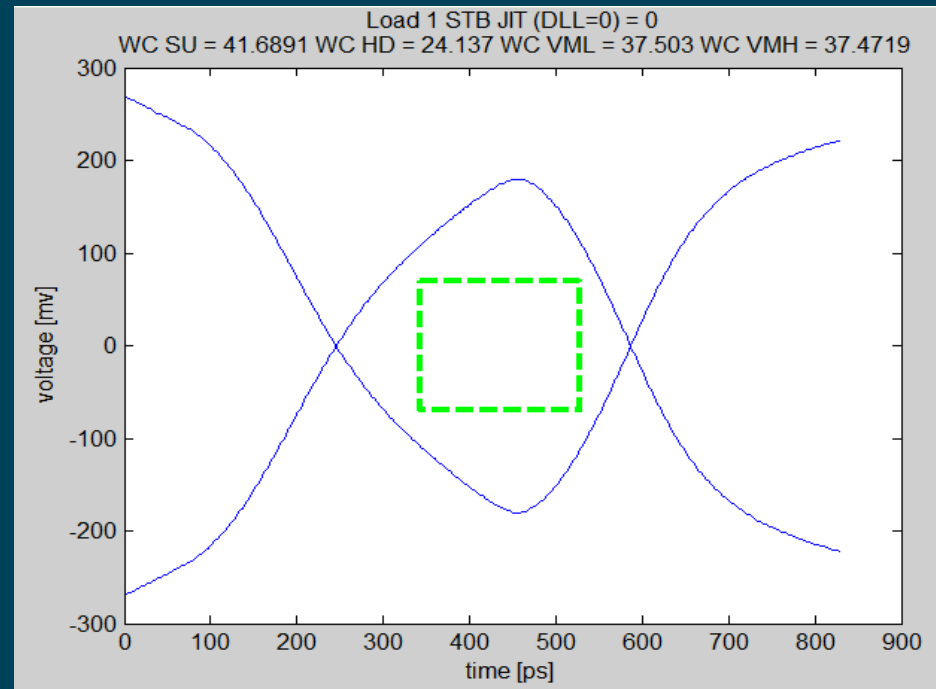
- No additional cost to PCB design.
- Channel performance is more consistent.
- Provide additional channel equalization.
- Improved probing signal performance.

Performance Analysis of Traditional Interposer



Embedded resistor based interposer LPDDR4 SDRAM DQ eye diagram at 2400 MT/s with eye mask in green.

Performance Analysis of New Interposer



Proposed interposer with equalization LPDDR4 SDRAM DQ eye diagram at 2400 MT/s with eye mask in green.

Performance Analysis of New Interposer

- A hybrid via provides good isolation to the main channel.
- No loss of signal energy compared with using embedded resistors.
- It also enables additional inductive peaking at high frequencies.
- This equalizes the channel and reduces inter symbol interference.
- These help to improve eye margins at probing location.

Summary

- The traditional interposer is expensive with low performance.
- A hybrid via based new interposer is easy to implement.
- There is no additional cost added to the platform.
- The LPDDR4 probing data show better performance.

Next Steps

- Apply this enabler to higher speed memory probing
- Structure minimization and optimization
- Stackup material sensitivity analysis
- Interconnect performance improvement