A 12.5Gb/s Non-Contact Multi Drop Bus System with Impedance-Matched Transmission Line Couplers and Dicode Partial-Response Channel Transceivers


Keio University, Japan
Background

Point-to-Point

- TX1
- TX2
- TX3
- TX4
- TX5
- RX1
- RX2
- RX3
- RX4
- RX5

😊 High link speed (>20Gb/s/ch)
😊 Simple architecture
😊 Large aggregated bandwidth
😊 Wiring complexity

Sad symbols:
😊 Less aggregated bandwidth
😊 Bad signal integrity
😊 Low link speed (~4.8Gb/s/ch)

Multi-Drop Bus

- TX
- RX1
- RX2
- RX3
- RX4
- RX5

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Proposed Non Contact Multi Drop Bus System

▶ Impedance-Matched Transmission Line Coupler (IM-TLC) allows impedance uniformity.
  - Wide-bandwidth, less reflection.

▶ Dicode partial Channel Transceiver enhances the operating speed.
  - In conventional Hysteresis Receiver, latching settling time limits the operating speed.
Impedance-Matched Transmission Line Coupler (IM-TLC)

Cross section view of IM-TLC

Module Board

Mother Board

GND

FR4

300\(\mu\)m

\(d\)

\(d=115\text{mm}\)
\(d=220\text{mm}\)
\(d=325\text{mm}\)

FR4

\(W_m\)

Coupling Gain [dB]

Impedance [Ω]

TLC Line Width \(W_m\) [μm]
Partial Response Signaling with TLC

- TLC has an ideal Dicode $1-z^{-1}$ characteristics.
- $1/(1-z^{-1})$ filter cancels out channel characteristics.
Measurement Setup and Results

- Impedance-Matched TLC realizes good signal integrity.
- Dicode Partial Response Channel Transceiver enhances the receiver operation speed.
- Implemented multi-drop bus system reached 12.5 Gb/s.

- Eye Diagrams of Receiver Input at each port
  - port1
  - port3
  - port5
  - 80psec

- Recovered Data at port3 (2^7-1 PRBS @12.5Gb/s)