Skinny Trace Compensation Methodology for High Speed Serial Interface

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Agenda

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- Skinny Trace Compensation
 - Description
 - Computation
 - Implementation
 - HDMI Channel
 - PCB Layout and Extraction
 - Improvements

TEXAS

STRUMENTS

- Conclusion

Skinny Trace Compensation Technique



$$Z_{0} = \sqrt{\frac{(x / v)(kZ_{0})}{(x / v)} + C_{L}}^{*} \qquad \begin{array}{c} Z_{0}: \\ v: \\ kZ_{0} \end{array}$$

TEXAS

NSTRUMENTS

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- Characteristic impedance of regular transmission line
- Unloaded trace propagation constant
- Z_{I}/Z_{0} : Ratio of impedance for the skinny and the regular segments

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Capacitance of the load

*Johnson, H. and Graham, M., <u>High Speed Signal Propagation—Advanced Black Magic</u>, Prentice-Hall (New York, 2003), pp. 300-302.

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Skinny Trace Implementation





HDMI Channel





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Pre-layout Simulation Setup





Simulated Eye Diagram (pre-layout)





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PCB Layout





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Package and PCB Model Extraction



Package



PCB



Post-layout Circuit Simulation Setup



Detailed spice netlist was used to represent the driver

Pseudo-random bit sources with different seeds were used as inputs to the driver circuits



Simulated Eye diagram (post-layout)





Measurement (Without Skinny Trace Compensation)





Measurement (With Skinny Trace Compensation)





Model / Correlation: Before / After



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Conclusions

- Skinny Trace Compensation is an effective yet simple technique to address excess capacitive impedance in high speed channels.
- System level methodology for a high speed serial interface (HDMI) interface on a highspeed/low power mobile microprocessor SOIC design is presented.
- Excellent correlation between simulated and measured results were obtained.

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