Reference Die/Device Model and Parameters for 802.3dj COM Baseline

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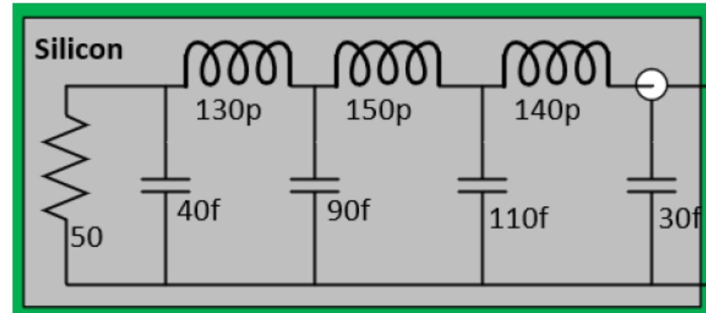
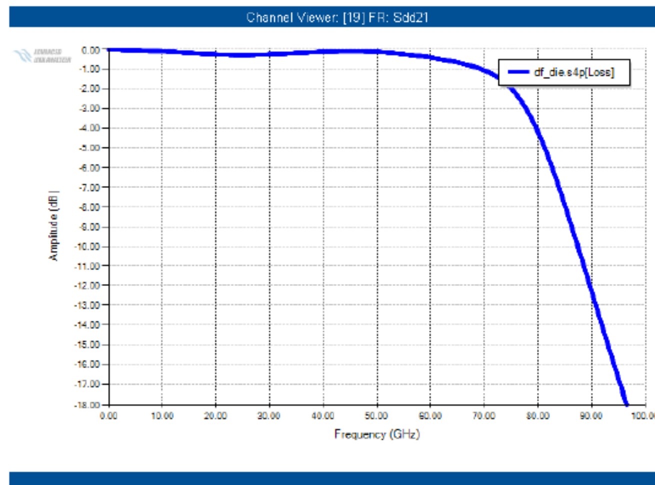
Background, Motivation, and Objective

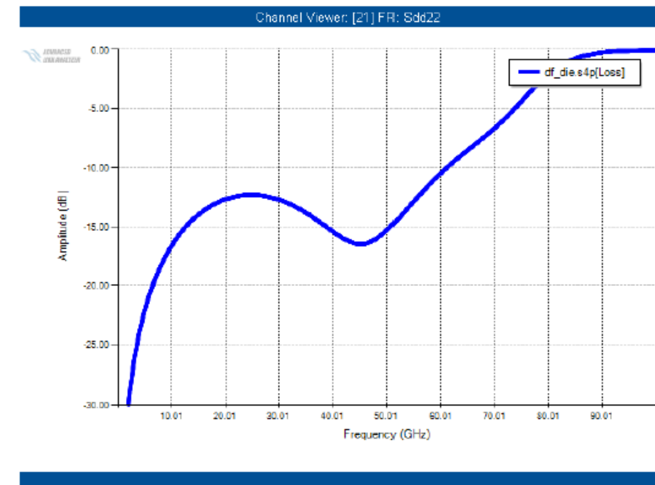
- COM is the specification method for channel compliances for 802.3 and other related standards (e.g., OIF/CEI, FC, JESD204, etc.).
- Reference die/device model and parameters are critical elements of COM.
- 200G/L reference die/device model and parameters had been extracted from the Intel test chips [1], [2], and presented at 802.3df [3] in Mar, 2022.
- COM die/device model had been extended to scalable LC ladder, with three stage LC ladder, and related LC parameters from [3] for 200G/L since COM3.7 [4].
- All the channel and system analysis of 200G/L using COM3.7, 3.9, and 4.0 are based on the die/device model and parameters defined in [3], [4].
- It is time to formally consider adopting the die/device model and parameters defined in [3], [4] after > 1 yr validation, evaluation, and analysis, to enable 802.3dj, and related OIF/CEI, FC, JESD204 specification developments.

Recap of 200G/L Die/Device Model and Parameters Extracted from Test Chips[3]

A Proposed Reference Die Model for 802.3df







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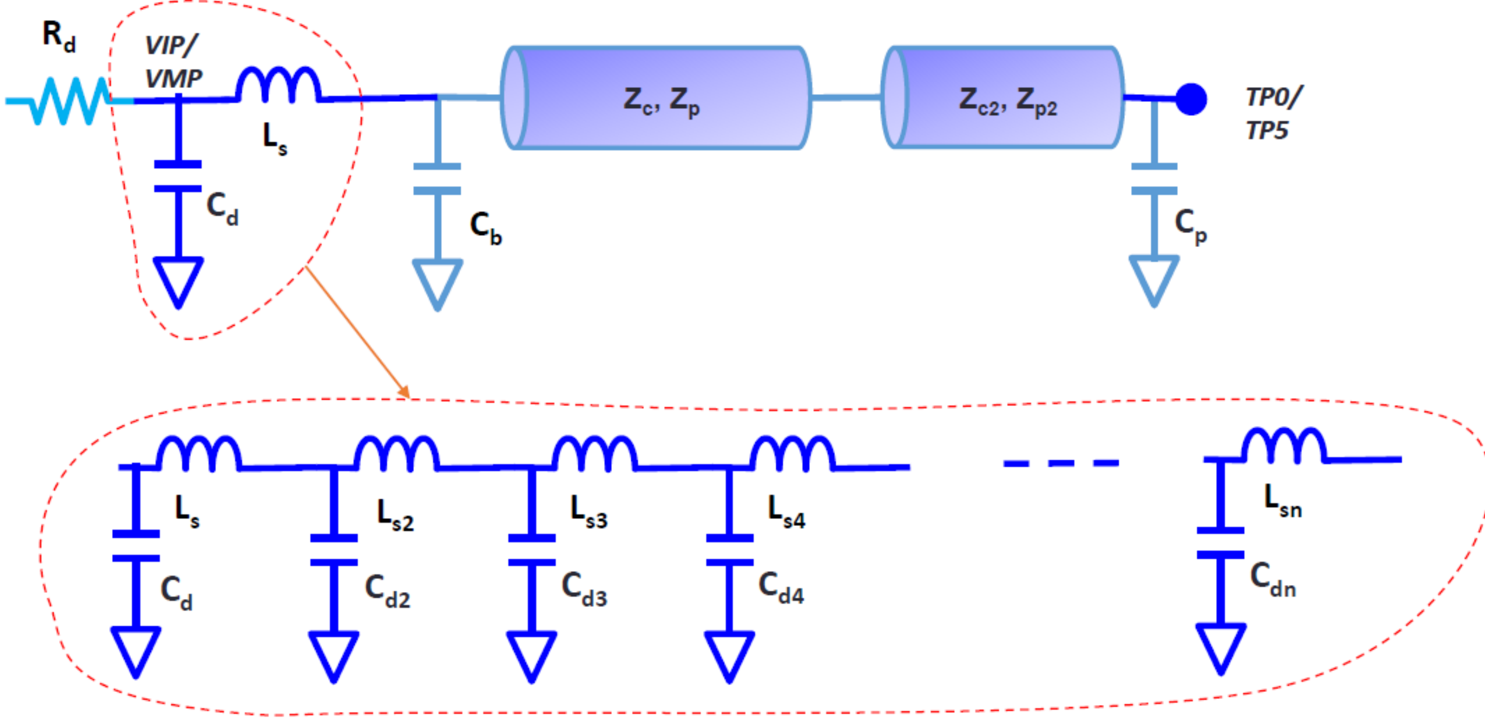
Recap of 200G/L Die/Device Model for Annex 93A/COM [4]

Replace Cd and Ls with a Ladder



C_d	[Cd Cd2 Cd3 Cd4 … Cdn ; Cd Cd2 Cd3 Cd4 … Cdn]	nF	[TX ; RX]
L_s	[Ls Ls2 Ls3 Ls4 … Lsn; Ls Ls2 Ls3 Ls4 … Lsn]	nH	[TX ; RX]

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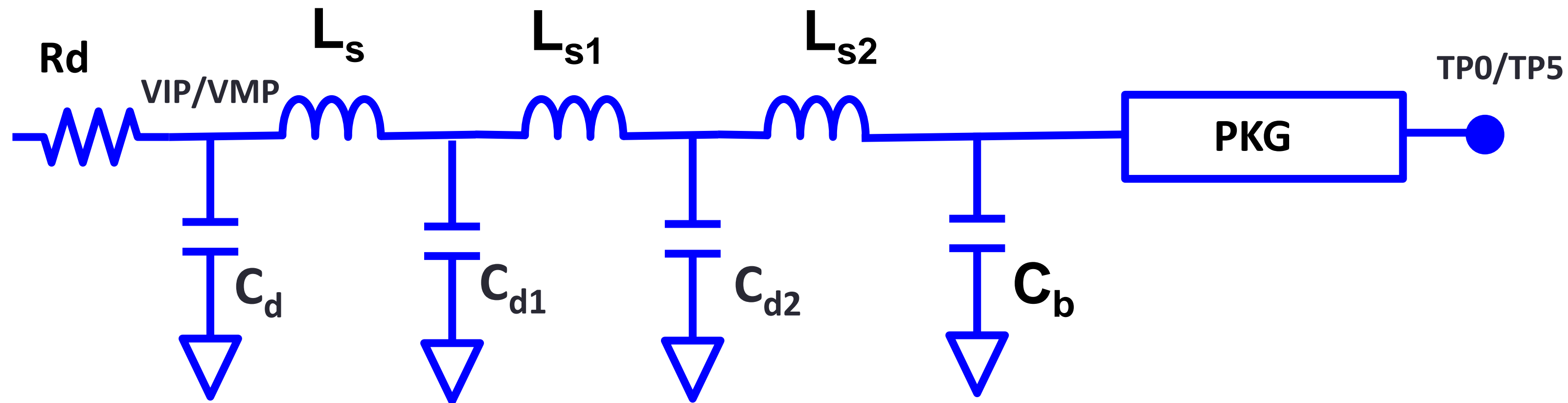
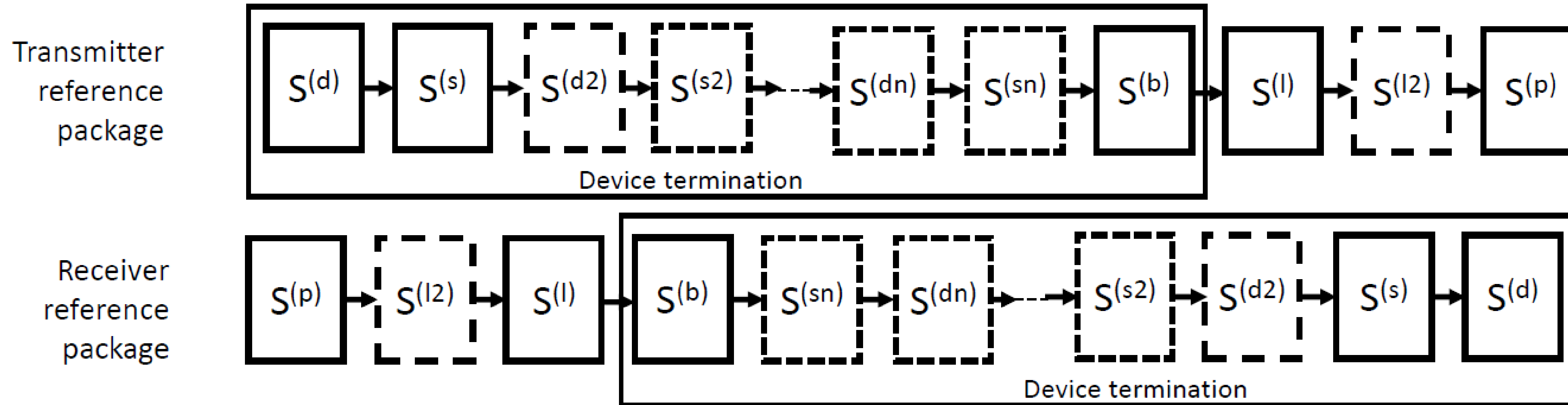
Proposed 200G/L Reference Die/Device Model for Annex 93A/COM



C_d	[Cd Cd1 Cd2; Cd Cd1 Cd2]	nF	[TX ; RX]
L_s	[Ls Ls1 Ls2; Ls Ls1 Ls2]	nH	[TX ; RX]
C_b	[Cb;Cb]	nF	[TX ; RX]

Proposed “Assembly of Transmitter and Receiver Device Package Models” Per Updated Figure 93A-2 for Annex 93A/COM



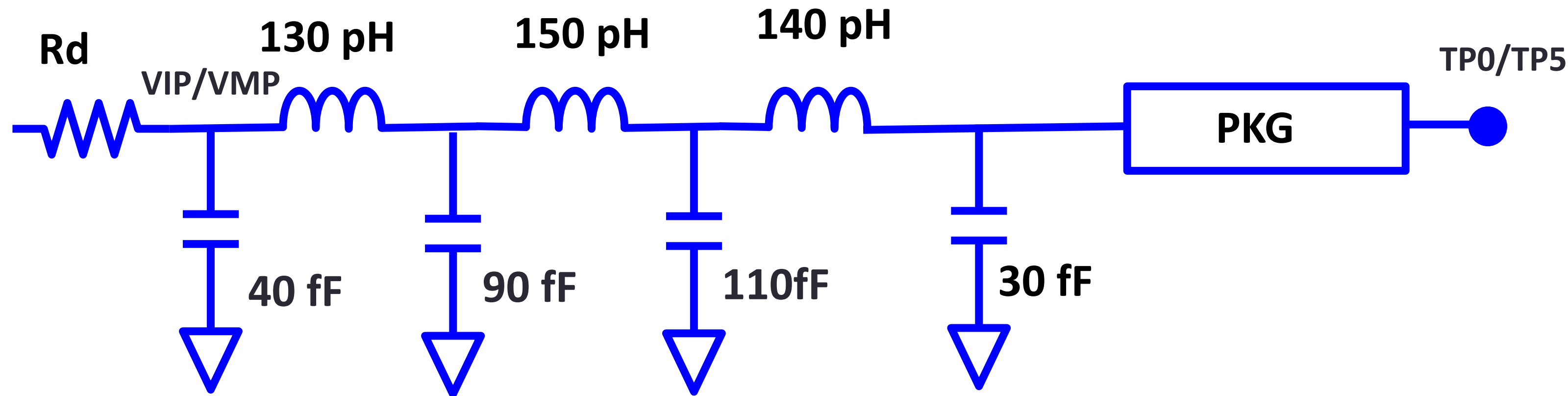
$S^{(d)}$ = device capacitance S-parameter
$S^{(s)}$ = device series inductance S-parameter
$S^{(d2)}$ = device capacitance 2 S-parameter
$S^{(s2)}$ = device series inductance 2 S-parameter
$S^{(dn)}$ = n^{th} device capacitance S-parameter
$S^{(sn)}$ = n^{th} device series inductance S-parameter

$S^{(b)}$ = bump capacitance S-parameter
$S^{(l)}$ = package transmission line S-parameter
$S^{(l2)}$ = package transmission line 2 S-parameter
$S^{(p)}$ = package capacitance S-parameter

Note: PMD calls out which blocks are included in the package model

Updated Figure 93A-2-Reference package Models

Proposed 200G/L Reference Die/Device Model Parameters for COM



C_d	[0.4e-4 0.9e-4 1.1e-4 ; 0.4e-4 0.9e-4 1.1e-4]	nF	[TX RX]
L_s	[.13 .15 .14; .13 .15 .14]	nH	[TX RX]
C_b	[.3e-4 .3e-4]	nF	[TX RX]

References

[1] J. Kim et al, "A 224Gb/s DAC-Based PAM-4 Transmitter with 8-Tap FFE in 10nm CMOS", *ISSCC*, 2021.

[2] A. Khairi "A 1.4 pJ/b 224 Gb/s- PAM4 SERDES Receiver with 31 dB Loss Compensation ", *ISSCC*, 2022.

[3] M. Li et al, "Reference Die and Package Models for 802.3df Host", https://www.ieee802.org/3/df/public/22_03/mli_3df_02a_220316.pdf, 802.3df, 2022.

[4] R. Mellitz et al, "Annex 93A Package/Die Load Proposal and COM 3.70 with Exploratory Features including Package/Die Load Ladder", https://www.ieee802.org/3/df/public/22_03/mellitz_3df_01b_220316.pdf, 802.3df, 2022.

Straw Poll 1

I would support the direction of the 200G/L Die/Device Model changes to Annex 93A (COM) on slides 6 and 7

a) Yes
b) No
c) NMI
d) Abstain

Straw Poll 2

I would support Die/Device model parameters on slide 8 for COM of 200G/Lane KR, CR, AUI chip-to-chip and chip-to-module

a) Yes
b) No
c) NMI
d) Abstain

Thank You!