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

[Diagram showing a circuit model with capacitors and inductors, labeled with values such as 130p, 150p, 140p, 50, 40f, 90f, 110f, 30f.]

[Graphs showing frequency response curves with labeled axes and data points.]

Replace Cd and Ls with a Ladder

<table>
<thead>
<tr>
<th>C_d</th>
<th>[Cd Cd2 Cd3 Cd4 ... Cd_n ; Cd Cd2 Cd3 Cd4 ... Cd_n]</th>
<th>nF</th>
<th>[TX ; RX]</th>
</tr>
</thead>
<tbody>
<tr>
<td>L_s</td>
<td>[Ls Ls2 Ls3 Ls4 ... Ls_n; Ls Ls2 Ls3 Ls4 ... Ls_n]</td>
<td>nH</td>
<td>[TX ; RX]</td>
</tr>
</tbody>
</table>

IEEE P802.3df 200 Gb/s, 400 Gb/s, 800 Gb/s, and 1.6 Tb/s Ethernet Task Force
Proposed 200G/L Reference Die/Device Model for Annex 93A/COM

<table>
<thead>
<tr>
<th>Component</th>
<th>Values</th>
<th>Unit</th>
<th>TX ; RX</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C_{d}$</td>
<td>[Cd Cd1 Cd2; Cd Cd1 Cd2]</td>
<td>nF</td>
<td></td>
</tr>
<tr>
<td>$L_{s}$</td>
<td>[Ls Ls1 Ls2; Ls Ls1 Ls2]</td>
<td>nH</td>
<td></td>
</tr>
<tr>
<td>$C_{b}$</td>
<td>[Cb;Cb]</td>
<td>nF</td>
<td></td>
</tr>
</tbody>
</table>
Proposed “Assembly of Transmitter and Receiver Device Package Models” Per Updated Figure 93A-2 for Annex 93A/COM

**Diagram Description:**

- **Transmitter Reference Package:**
  - $S^{(d)}$: 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
  - $S^{(dn)}$: Nth device capacitance S-parameter
  - $S^{(sn)}$: Nth 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

- **Receiver Reference Package:**
  - $S^{(p)}$: Package capacitance S-parameter
  - $S^{(l2)}$: Package transmission line 2 S-parameter
  - $S^{(l)}$: Package transmission line S-parameter
  - $S^{(b)}$: Bump 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

<table>
<thead>
<tr>
<th></th>
<th>[0.4e-4 0.9e-4 1.1e-4 ; 0.4e-4 0.9e-4 1.1e-4 ] nF [TX RX]</th>
<th>L_s</th>
<th>[ .13 .15 .14; .13 .15 .14 ] nH [TX RX]</th>
<th>C_b</th>
<th>[ .3e-4 .3e-4] nF [TX RX]</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_d</td>
<td>[0.4e-4 0.9e-4 1.1e-4 ; 0.4e-4 0.9e-4 1.1e-4 ] nF [TX RX]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L_s</td>
<td>[ .13 .15 .14; .13 .15 .14 ] nH [TX RX]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C_b</td>
<td>[ .3e-4 .3e-4] nF [TX RX]</td>
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<td></td>
</tr>
</tbody>
</table>
References


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!