IEEE P802.3dj Reference Package Model and Parameters

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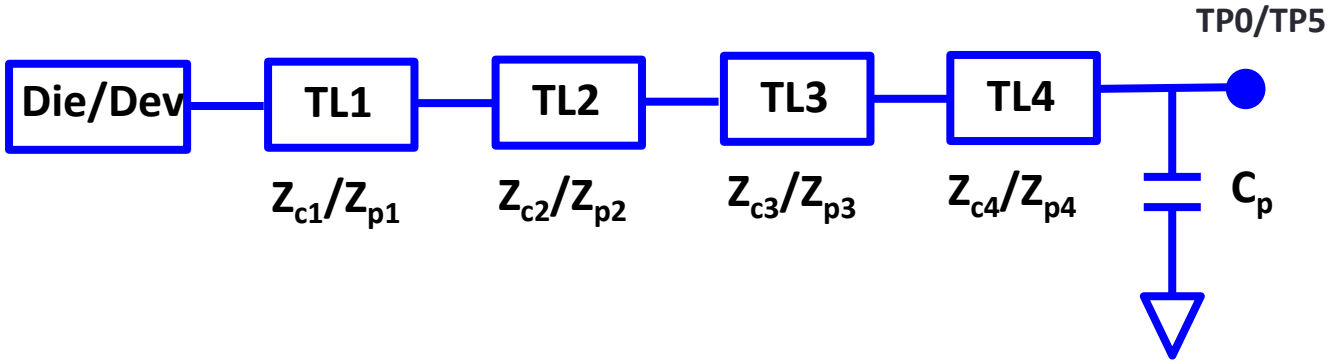
Background and Objectives

- 802.3dj is heading to adopt two classes of reference packages [15]: “Class A”, ([1], [2], [3],[4], [5], [6],[7],[8]) optimized for loss; and “Class B” ([9],[10],[11],[[12],[13],[14]) optimized for high radix applications.
- This presentation intends to present a unified and latest reference package model, and model parameter specifics towards baselines for 802.3dj.

Summary of Key Design/Material Characteristics of “Class A” and “Class B” PKGs

Package Design Specifics	“Class A” PKG Characteristics	“Class B” PKG Characteristics
ABF (Ajinomoto build-up film) material	GL107 Like	GL107 Like
Cross-section	8-2-8, or 10-2-10	6-2-6, to 9-2-9
Core thickness	~1000 µm	800-1200 µm
Trace routing lengths	33 mm max	45 mm max
Surface treatment	CZ8401 Like	CZ8401 Like
BGA ball pitch	0.8 mm	1.0 mm
Skip Layer	Yes (x%)	No
Trace line / space	~30 / 60 / 30 µm	32-45-32 µm
Trace line / space (Skip Layer)	~80 / 80 / 80 µm	NA
Impedance	~87.5 ohms	90-92 ohms
ABF height	35 µm	45 µm

A Unified Reference PKG Model for “Class A” and “Class B”



For “Class A”

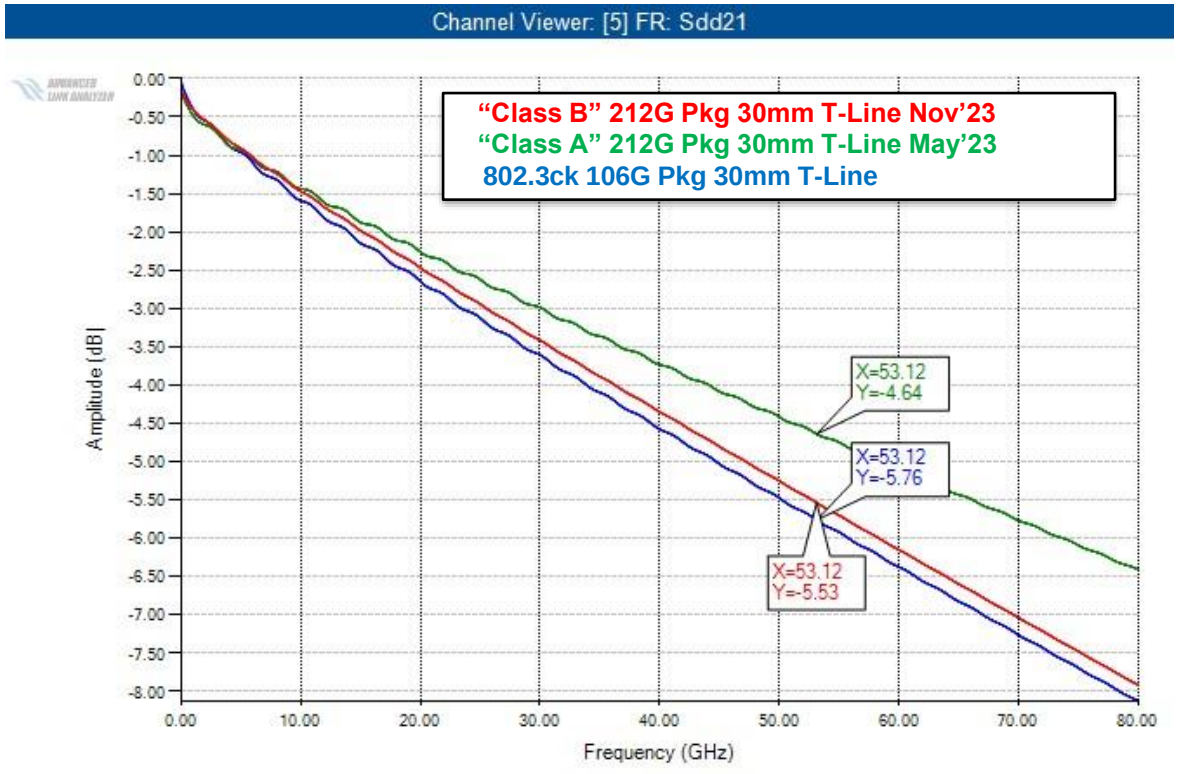
- Only TL1 (i.e., horizontal trace) and TL2 (vertical PTH) will to be used.

For “Class B”

- All four TLs will be used.

Summary of Ref PKG Performance for the Proposed “Class A” and “Class B” (1/2)

Param	802.3ck PKG T-Line Model Param	Prop 802.3dj “Class A” PKG T-Line Model Param ([8])	Prop 802.3dj “Class B” PKG T-Line Model Param ([14])
Z_p	30 mm	30 mm	30 mm
γ_0	0 /mm	5e-4 /mm	5e-4 /mm
τ	6.141e-3 ns/mm	6.141e-3 ns/mm	6.141e-3 ns/mm
a_1	9.909e-4 $ns^{1/2}$/mm	8.9e-4 $ns^{1/2}$/mm	6.5e-4 $ns^{1/2}$/mm
a_2	2.772e-4 ns/mm	2.0e-4 ns/mm	3.0e-4 ns/mm
Z_{c1}	87.5 Ω	87.5 Ω	92 Ω
R_o	50 Ω	50 Ω	50 Ω



“Class B” 212G Pkg 30mm T-Line Nov’23

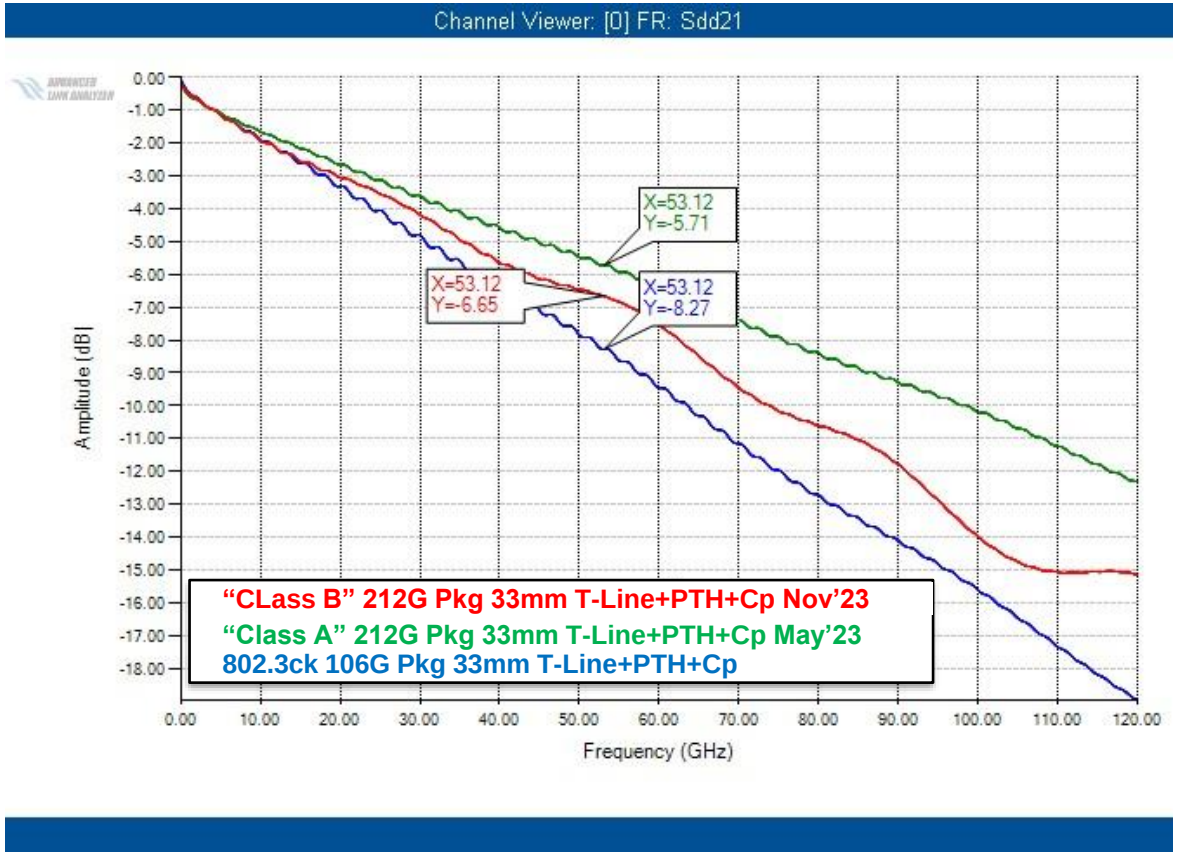
“Class A” 212G Pkg 30mm T-Line May’23

802.3ck 106G Pkg 30mm T-Line

- “Class A” temp at 90C
- “Class B” temp at 90C

Summary of Ref PKG Performance for the Proposed "Class A" and "Class B" (2/2)

Param	802.3ck PKG T-Line Model Param	Prop 802.3dj "Class A" PKG T-Line Model Param ([8])	Prop 802.3dj "Class B" PKG T-Line Model Param ([14])
Z_p	33 mm	33 mm	33mm
γ_0	0 /mm	5e-4 /mm	5e-4 /mm
τ	6.141e-3 ns/mm	6.141e-3 ns/mm	6.141e-3 ns/mm
a_1	9.909e-4 $ns^{1/2}$/mm	8.9e-4 $ns^{1/2}$/mm	6.5e-4 $ns^{1/2}$/mm
a_2	2.772e-4 ns/mm	2.0e-4 ns/mm	3.0e-4 ns/mm
Z_{c1}	87.5 Ω	87.5 Ω	92 Ω
Z_{p2}	1.8 mm	1.8 mm	1/1/0.5 mm
Z_{c2}	92.5 Ω	92.5 Ω	70/80/100 Ω
R_o	50 Ω	50 Ω	50 Ω
Cp	87 fF	40 fF	40 fF



"Class B" 212G Pkg 33mm T-Line+PTH+Cp Nov'23

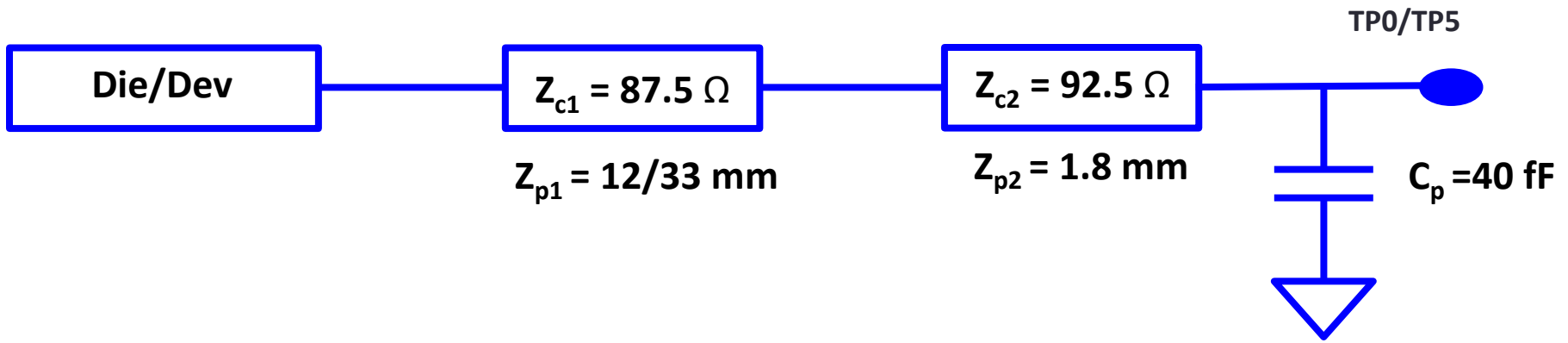
"Class A" 212G Pkg 33mm T-Line+PTH+Cp May'23

802.3ck 106G Pkg 33mm T-Line+PTH+Cp

- "Class A" temp at 90C
- "Class B" temp at 90C

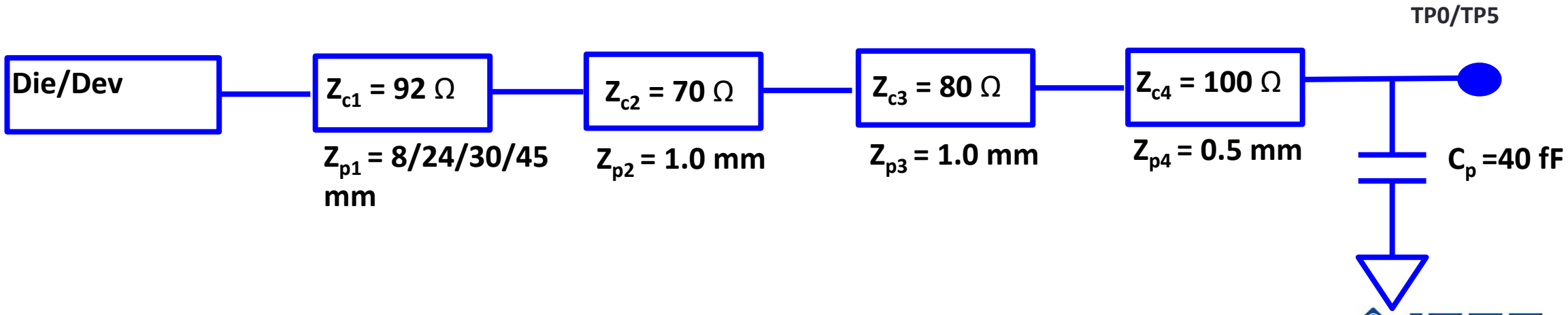
Recap of Proposed “Class A” PKG Model Parameters

Parameter	Setting	Units
package_tl_gamma0_a1_a2	[0.0005 0.00089 0.0002]	
package_tl_tau	0.006141	ns/mm



Recap of Proposed “Class B” PKG Model Parameters

Parameter	Setting	Units
package_tl_gamma0_a1_a2	[0.0005 0.00065 0.0003]	
package_tl_tau	0.006141	ns/mm



Summary

- “Class A” and “Class B” reference package model and parameters are reviewed and corresponding performances are highlighted.
- “Class A” and “Class B” model parameter specifics are proposed towards baselines for 802.3dj

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Thank You!