

# Towards a Package Model Baseline Proposal

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# Background

- P802.3dj has several BGA-to-BGA channel contributions that require package models to be added for COM analysis
- COM package model and parameter values suitable for high-radix switch devices at 106.25 GBd PAM4 signaling were presented in [benartsi 3df 01a 2211](#)
  - The data was based on [benartsi 3df 01b 2207](#) and refined by multiple offline reviews and a consensus building meeting
  - Surface roughness and additional parameters were discussed among the consensus group and refined to correlate to actual measurements following [ghiasi 3df 01 220927](#)
- Most COM analysis contributions since then have used this model with the suggested parameters.

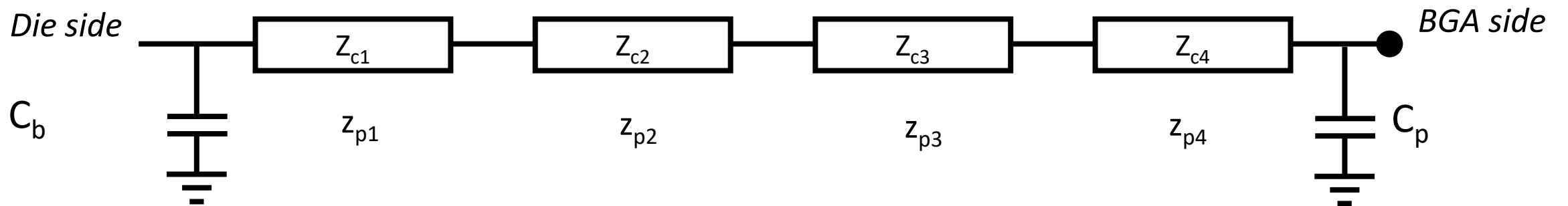
# Characteristics of proposed model

- The model parameter values are fitted to measurements of real packages and material manufacturer models.
- Aggressive but technically feasible assumptions:
  - High radix switch package routing layer constraints (mostly without skip layers)
  - Realistic trace width and loss ( $\sim 0.21$  dB/mm)
  - 90 °C package temperature
- Considered representative of large package products (e.g. high-radix switch).

# Progress in P802.3dj

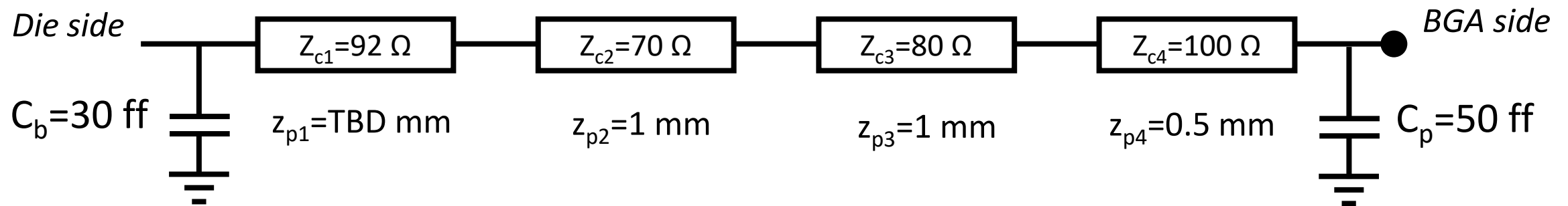
- Discussions of the backplane and copper cable objectives suggests that package main trace length is still an open question.
  - Difference between devices may be substantial
  - Co-design of package and PCB may be mainstream
- However, there seems to be general agreement on the model and its parameters (with trace lengths TBD) for large devices.
- Small devices (e.g., module-side DSP) were not addressed in previous work.
  - These likely need a different set of parameters, but the same model can be used.
  - Requires additional contributions.
- Formal adoption of the package model and the agreed parameters would be an important step forward.
  - Changes and refinements can be done later if necessary.

# Proposed package model



# Proposed model parameters for large devices

Table 93A–3 parameters		
Parameter	Setting	Units
package_tl_gamma0_a1_a2	[0 0.0008455 0.000340225]	
package_tl_tau	0.00644805	ns/mm
package_Z_c	[92 92 ; 70 70; 80 80; 100 100]	Ohm



# Proposed model parameters for small devices

Table 93A–3 parameters		
Parameter	Setting	Units
package_tl_gamma0_a1_a2	[0 0.0008455 0.000340225]	
package_tl_tau	0.00644805	ns/mm
package_Z_c	[92 92 ; 70 70; 80 80; 100 100]	Ohm

Items in magenta need further work, initial guesses are provided.

