FR-4 Definition III

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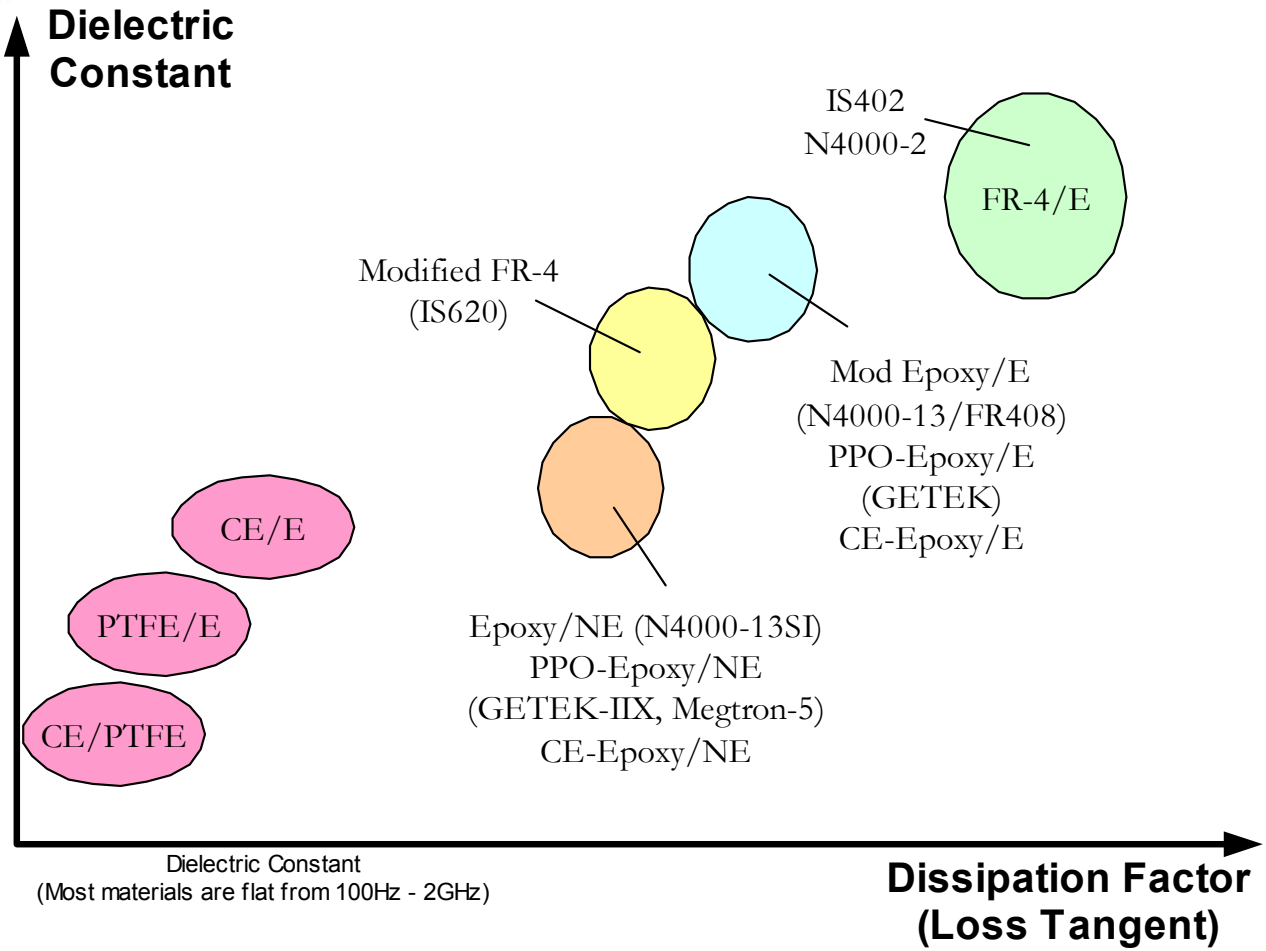
Subject : IEEE 802.3ap Backplane Ethernet

Abstract : This presentation is an update to the one given at the May2004 IEEE Interim and examines the proposed constants to the implied definition of 'Improved FR-4'.

Outline

- Discuss Materials
- IPC Investigation
- Show the Dk/Df sheet that was agreed upon by straw poll at the May04 meeting.
- Show Changes to Dk/Df values.

Materials in Perspective



- Graph provided by Zhi Wong zwong@altera.com

IPC

- Membership
- Started inquiry into material testing
- Started inquiry into material classification

My Thoughts on 'Improved FR-4' in reference to IEEE802.3ap

- Improved FR-4 (Mid Resolution Signal Integrity):
  - 100Mhz: Dk ≤ 3.60; Df ≤ .0092
  - 1Ghz: Dk ≤ 3.60; Df ≤ .0092
  - 2Ghz: Dk ≤ 3.50; Df ≤ .0115
  - 5Ghz: Dk ≤ 3.50; Df ≤ .0115
  - 10Ghz: Dk ≤ 3.40; Df ≤ .0125
  - 20Ghz: Dk ≤ 3.20; Df ≤ .0140
- Temperature and Humidity Tolerance (0-55degC, 10-90% non-condensing):
  - Dk:+/- .04
  - Df: +/- .001
- Resin Tolerance (standard +/-2%):
  - Dk:+/- .02
  - Df: +/- .0005

Changes to 'Improved FR-4' in reference to IEEE802.3ap

- Improved FR-4 (Mid Resolution Signal Integrity):
  - 100Mhz: Dk ≤ 3.60; Df ≤ .0092
  - 1Ghz: Dk ≤ 3.60; Df ≤ .0092
  - 2Ghz: Dk ≤ 3.50; Df ≤ .0115
  - 5Ghz: Dk ≤ 3.50; Df ≤ .0115
  - 10Ghz: ***Dk ≤ 3.50***; Df ≤ .0125
  - 20Ghz: ***Dk ≤ 3.40***; Df ≤ .0140
- Temperature and Humidity Tolerance (0-55degC, 10-90% non-condensing):
  - Dk:+/- .04
  - Df: +/- .001
- Resin Tolerance (standard +/-2%):
  - Dk:+/- .02
  - Df: +/- .0005

Dk/Df Changes

- Adjust the 10Ghz Dk value to 3.5. This opens the door for more of the lower cost, improved fr-4 materials.
- Adjust the 20Ghz Dk value to 3.4. This opens the door for more of the lower cost, improved fr-4 materials.
- Df values are good.
- Without these Dk/Df constraints, it will be easy to design a fab using advanced -13SI or IS640 material that won't meet the channel model.