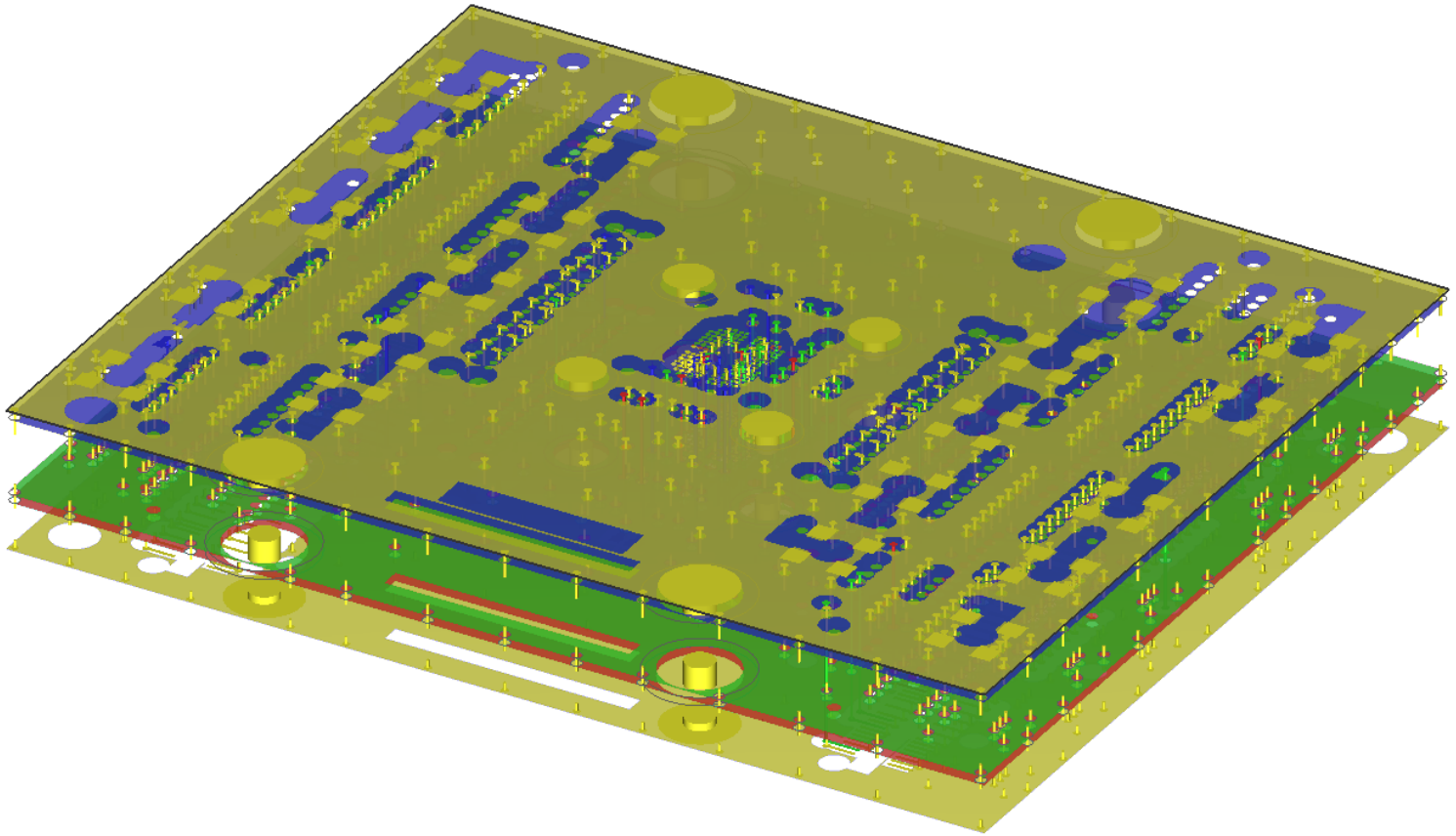
EYE KNOW HOW
HIGH SPEED SIMULATION AND MEASUREMENT



Power Integrity

Simulating an embedded design ?

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How to Qualify/Quantify Power Integrity ?

- Not just Resistance!

Impedance over Frequency!

Impedance Verification

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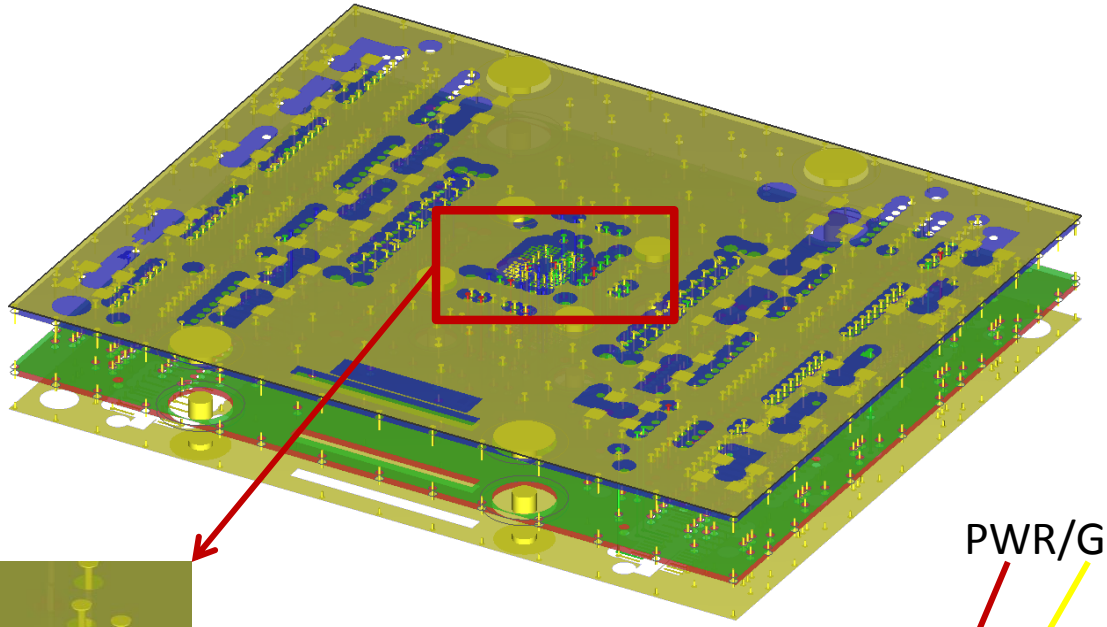
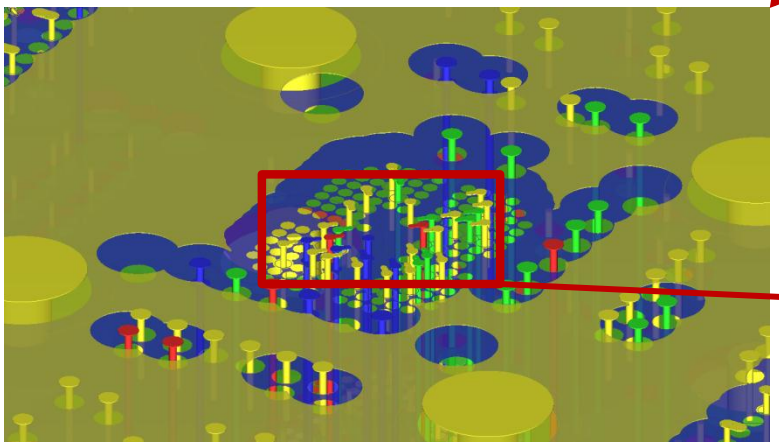
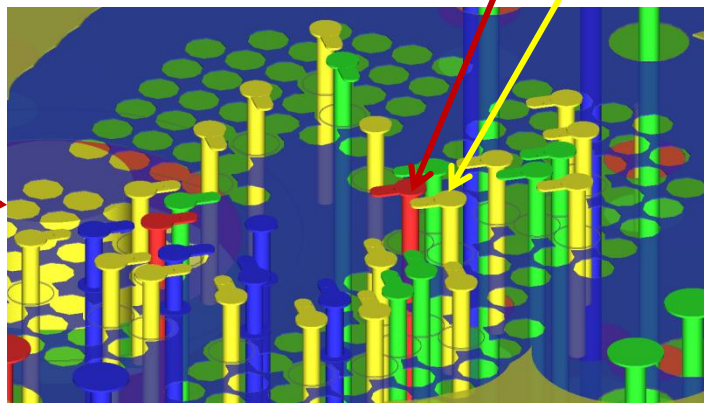
Calculate the impedance seen by the device !

- Device “looks” out of the package into the Power Shapes
- Calculate Impedance over Frequency (min. up to 400MHz)
  - Most packages will not transmit higher frequencies on the supply shapes
- Frequency dependent impedance is defined by supply shapes and bypass capacitors!

Example Layout







Power Integrity: Impedance of Power Delivery

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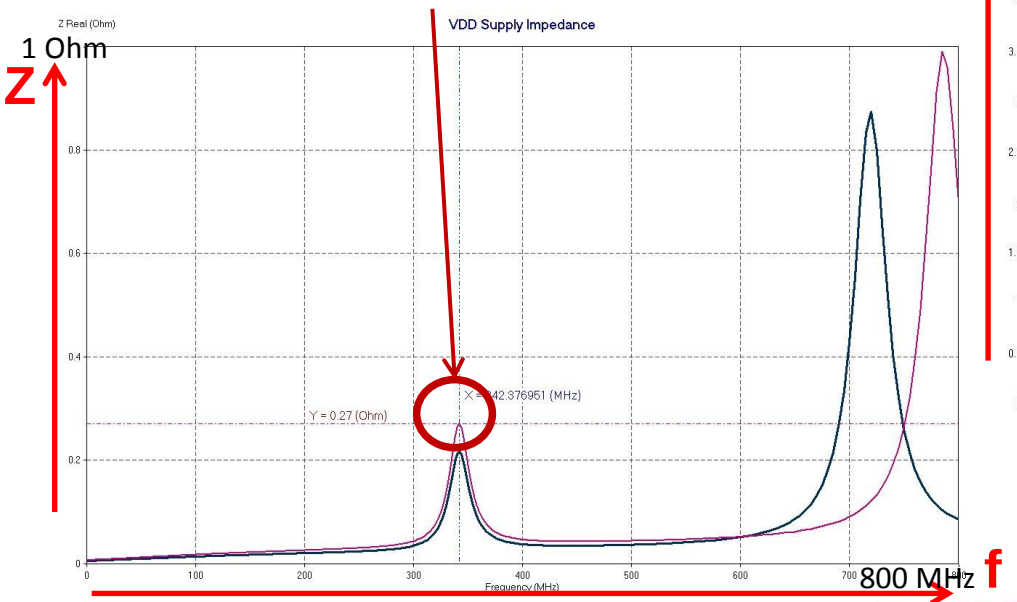
- Simulate PDN (Power delivery network) Impedance over Frequency

Positive Example

First Resonance @ 340MHz

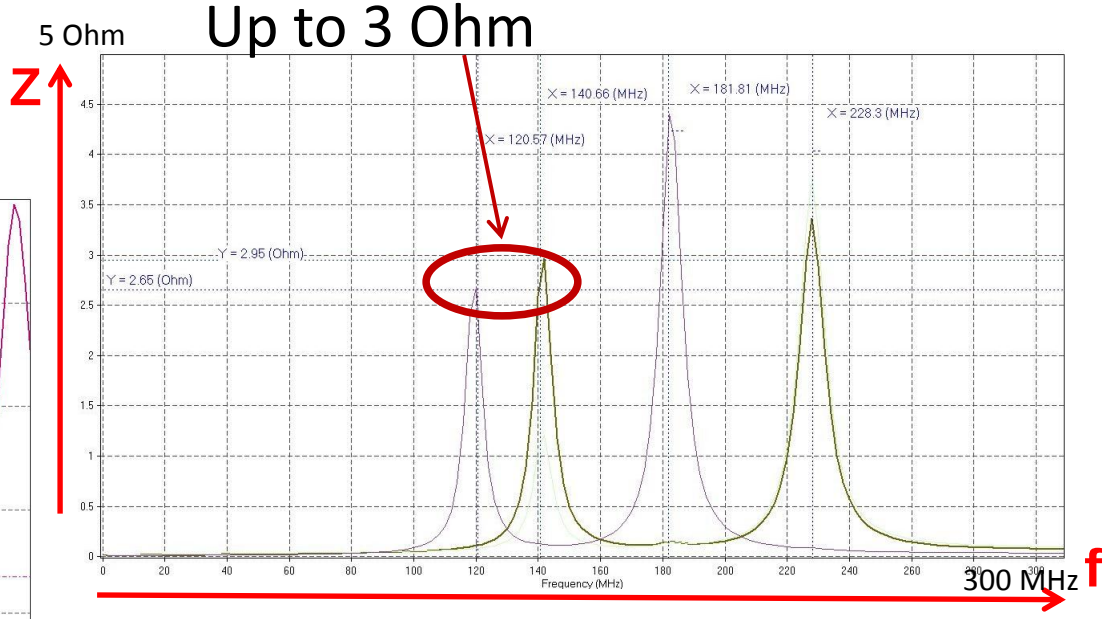
Only 0.25 Ohm



Negative Example

First Resonances @ 120 – 150 MHz

Up to 3 Ohm



Impedance Verification and Optimization

- **If PDN is stimulated at frequency with impedance peak large supply noise will happen!**
- **AC Resistance dependency**
  - Supply shape geometry
  - Bypass capacitor values
  - Bypass capacitor parasitics
- **Supply Impedance optimization**
  - Optimize decoupling capacitor matrix
  - Optimize supply shapes