



Clause 169

DV/DT and DI/DT

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Problem Statement

Power and data share the same transmission medium

Power occupies the DC band

Data occupies the band $> 2\text{MHz}$

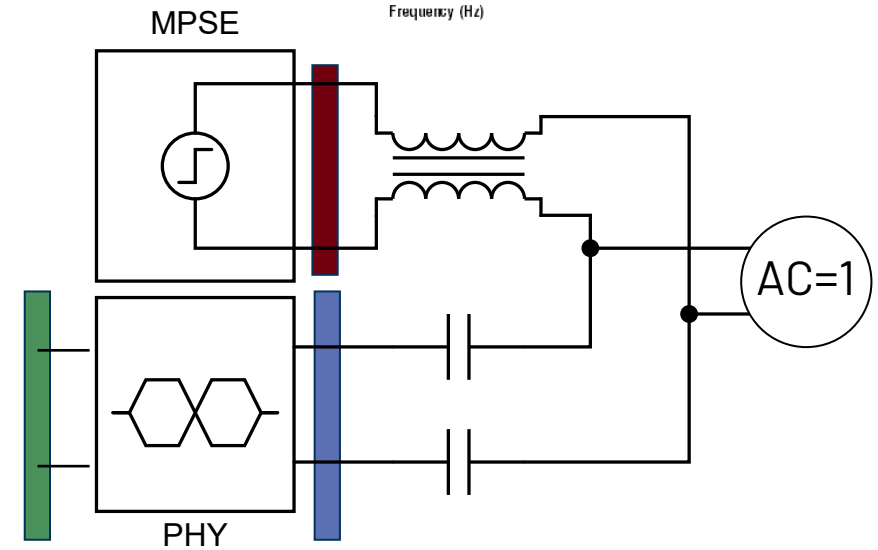
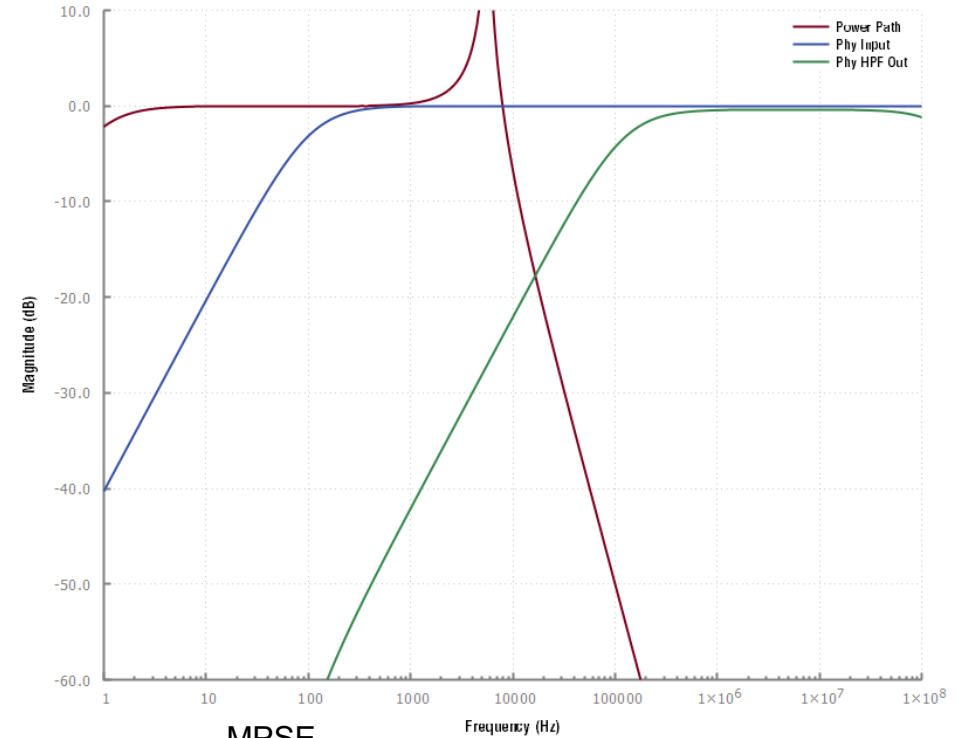
Data coupling network has HPF corner $\sim 300\text{Hz}$

Power supplies can switch in $100\text{kHz} - 5\text{MHz}$ band

+ produce higher frequency harmonics

Set rules to prevent power interfering with data

..while keeping power supplies cost effective to build



dV/dt Requirements

dV/dt specs are for power sources (MPSEs)

dV/dt specs will limit :

- Power supply ripple

- HF noise

- Slew Rate

- ...**any** repetitive HF phenomenon

Cannot apply during:

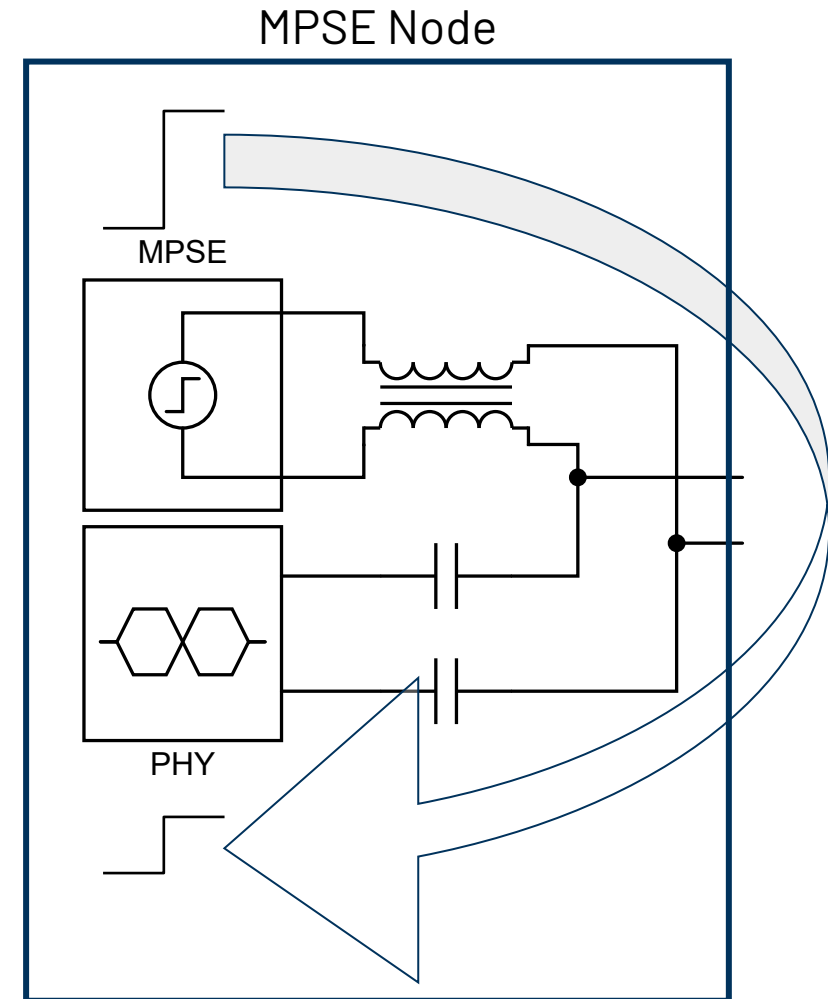
- Surge

- Fault – Short Circuit Recovery

- T1M System is required to accept data loss in these extraordinary circumstances

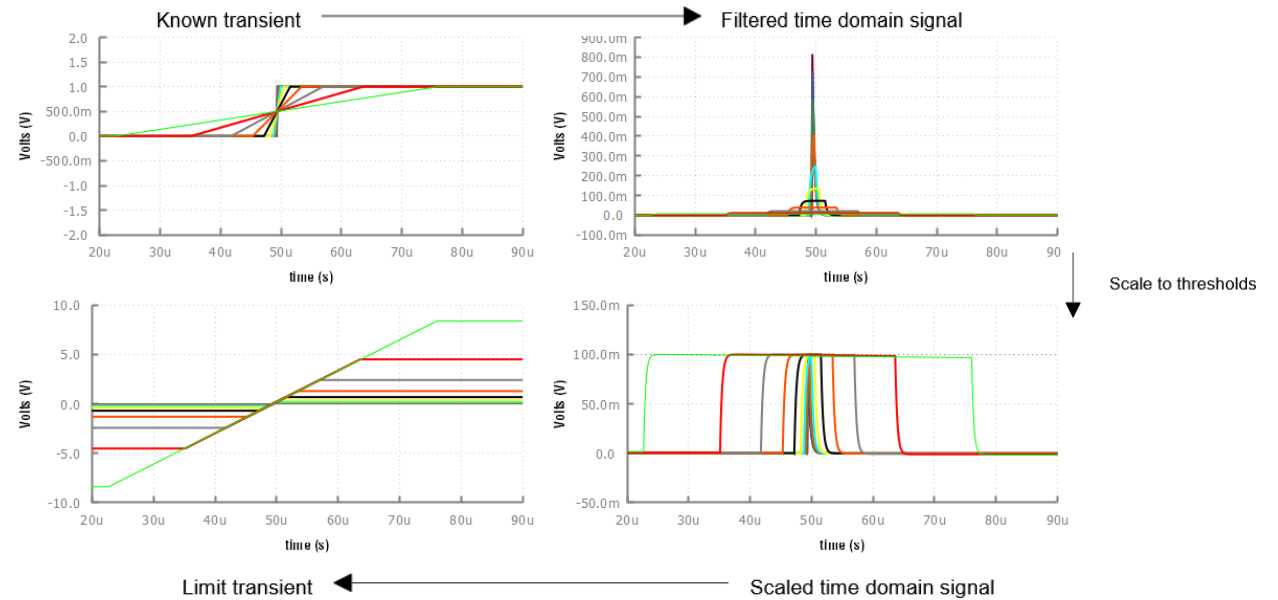
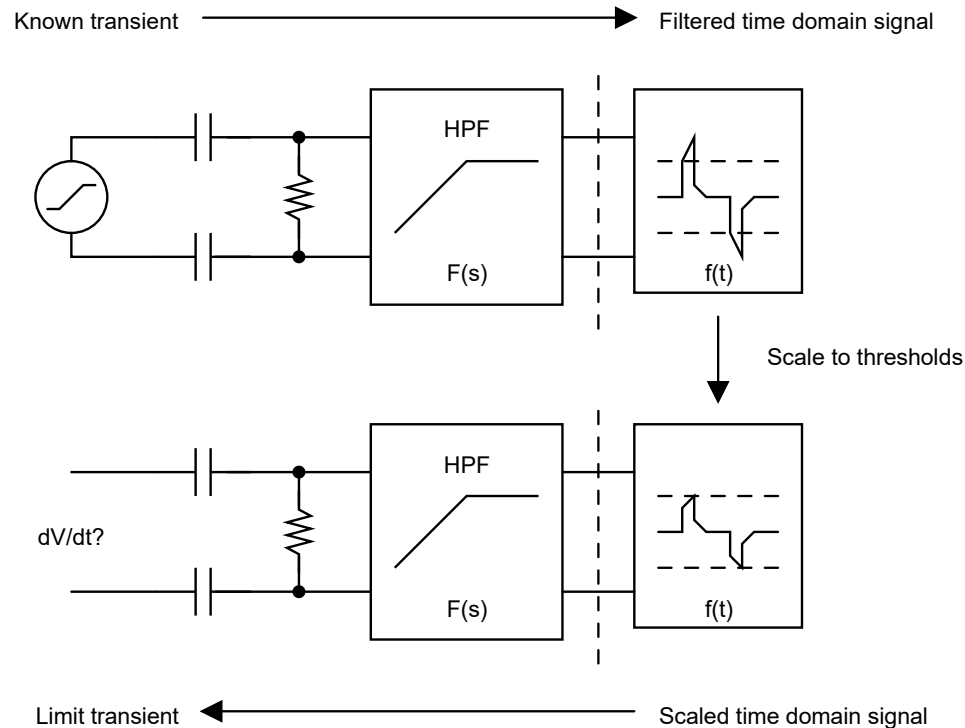
Self-interference is best way to analyze the sensitivity

- Transients are attenuated at other nodes



Determining dV/dt limits

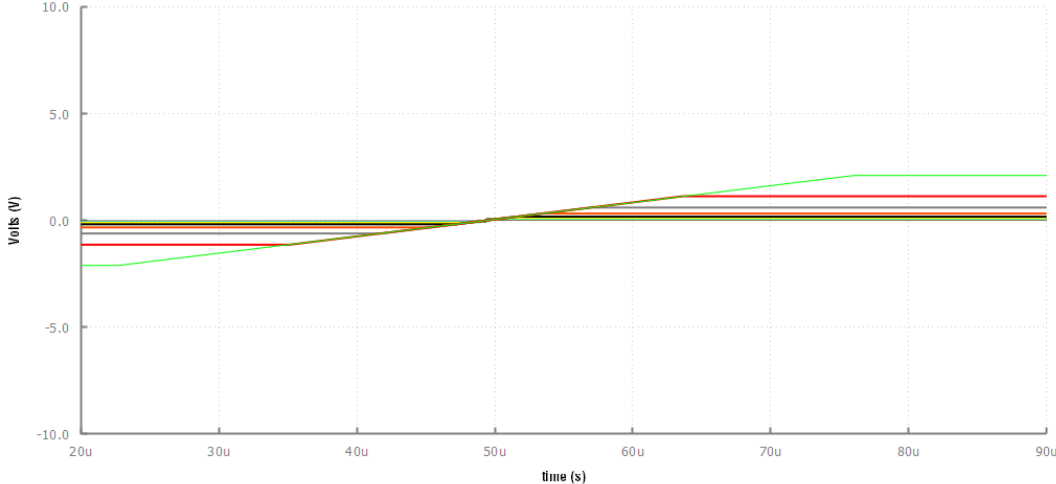
Determine phy sensitivity to lower frequency changes at the TCI
 Main controlling factors are HPF and Maximum RX ED thresholds



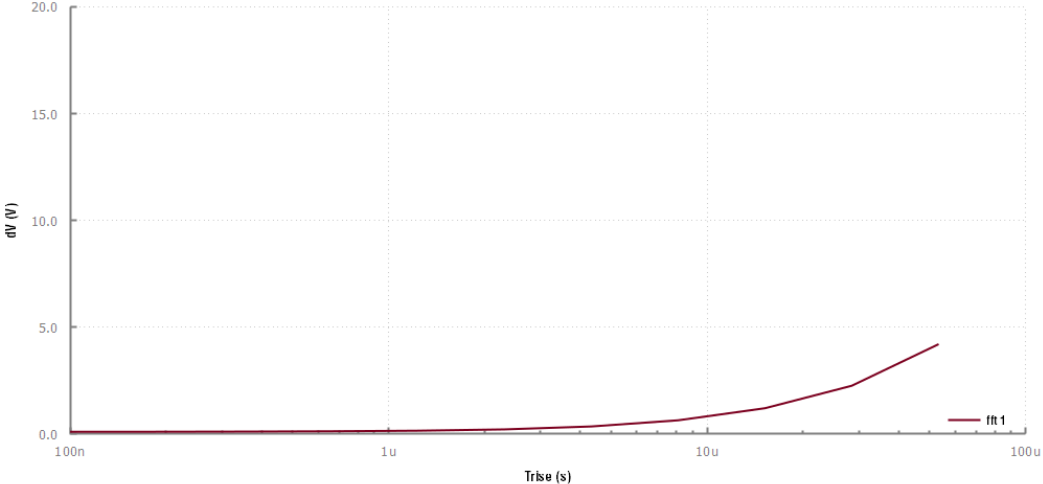
Sensitivity to HPF 500kHz

500kHz HPF

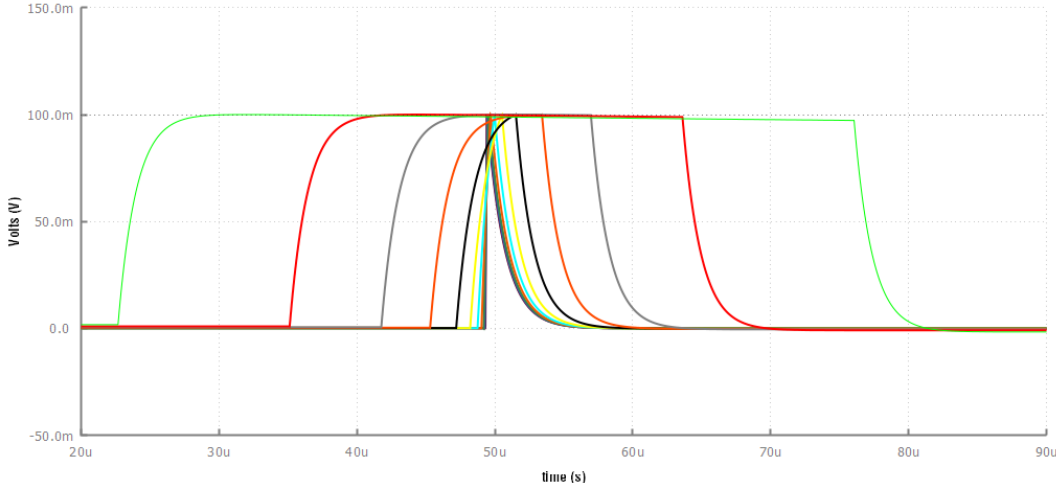
Scaled Time Domain Signal



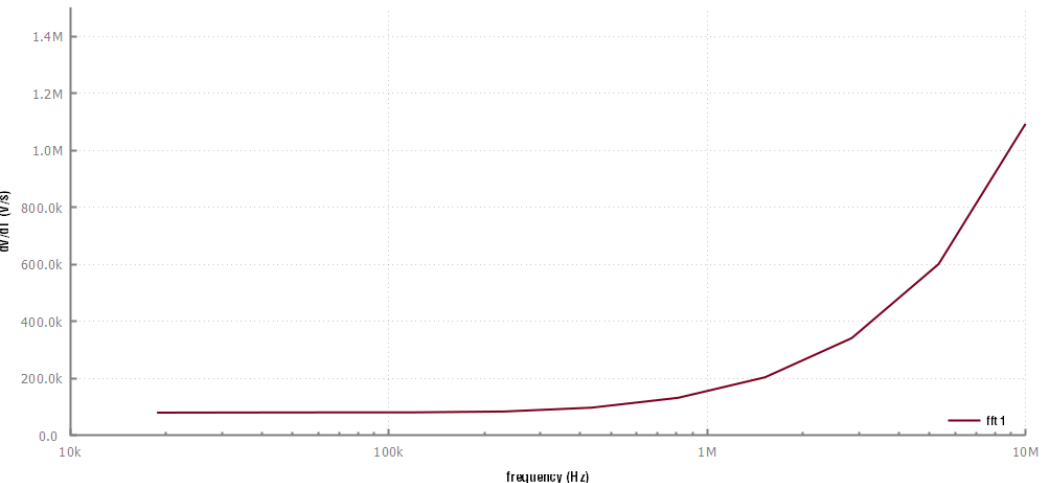
dV/dt limit



Limit Transient



dV/dt limit



Conclusion – dV/dt

dV / dt limits for MPSEs depend on:

- Filter shape before RX slicers

- ED threshold values

To fill in dV/dt spec for MPSEs we may need to agree on these two values

Propose 80kV/s dV/dt for now

80kV/s number includes noise from all potential sources

- Alien cross talk

- Noise

- CW interference

- Power / Data crosstalk

- Bulk Current Injection

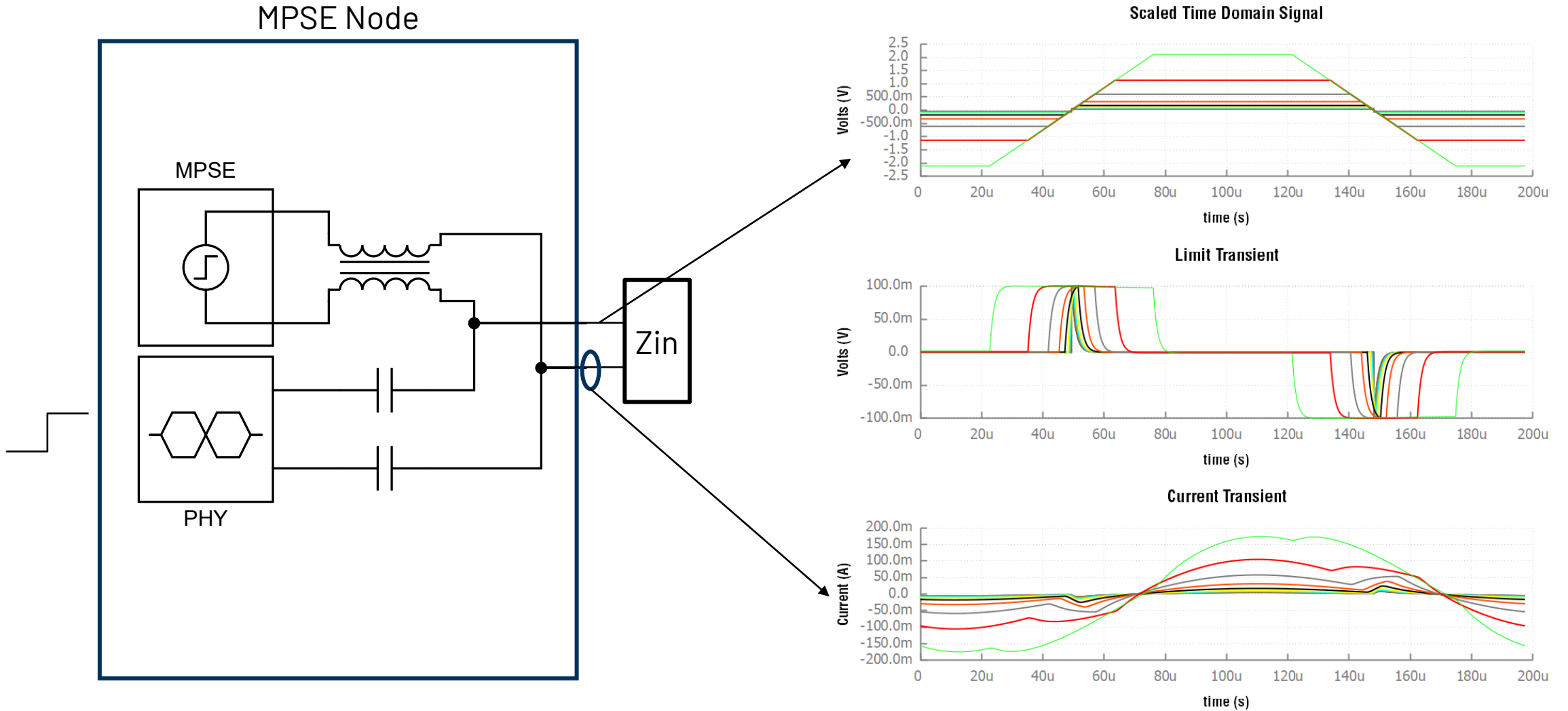
- etc...

MPD dl/dt

di/dt

Knowing dv/dt limit and waveform, back calculate di/dt based on “worst case” input impedance for an MPD

Example Current Transients from our typical "Worst Case" network



Conclusion - dl/dt

Proceed with dl/dt analysis based on acceptance of dV/dt analysis

Will require a table item for MPDs

Areas needing work:

- Worst case input impedance

- How does the dl/dt budget get divided between MPDs

- How does dl/dt budget change with different unit load levels

Propose we discuss further in an Ad-hoc.