Power Coupling Inductance and Droop 2

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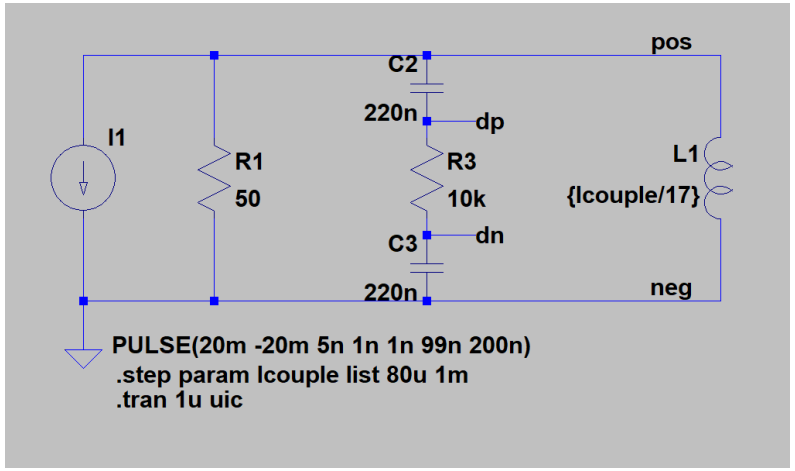
ANALOG DEVICES

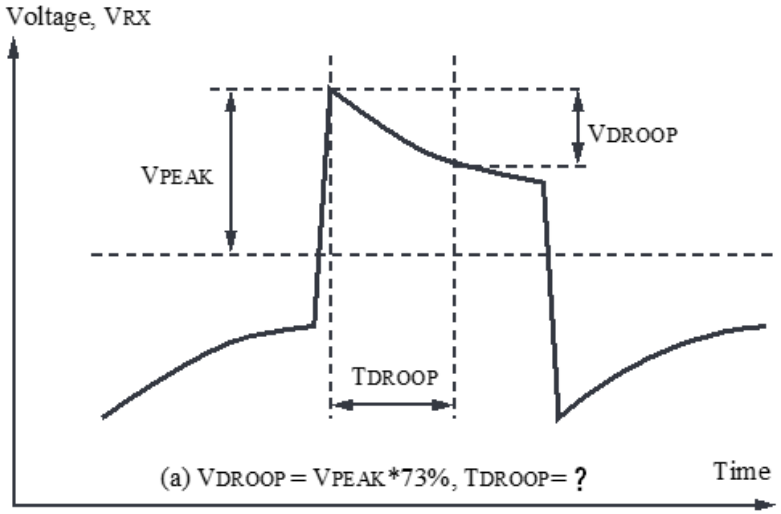
AHEAD OF WHAT'S POSSIBLE™

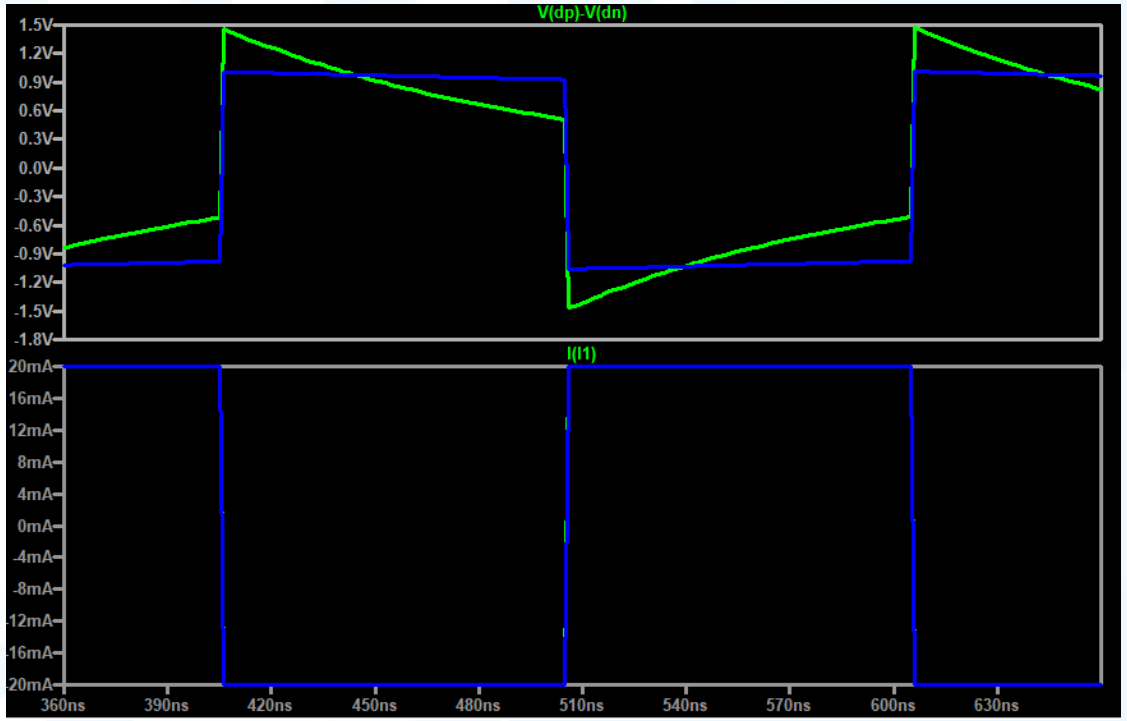
Critical Power Parameters

- Several critical system parameters should be resolved to move power specification forward
  - **L_{PD} – Affects economic feasibility and classification timing**
  - **N (num PDs) – Affects Inductor Size L_{PD}**
  - **Droop (V_{DROOP}, T_{DROOP})– Determines L_{PD}**
  - **Baud Rate - Determines L_{PD}**
- Optimize L_{PD} to minimize cost and size
  - Allow high-power PDs to use lower L_{PD} since fewer high-power devices can be connected

Simple Model For Droop w/ 16 PDs + 1 PSE (80uH/node and 1000uH/node)







- Can we specify a T_{DROOP} and V_{DROOP}?

Keep total inductance > 40uH

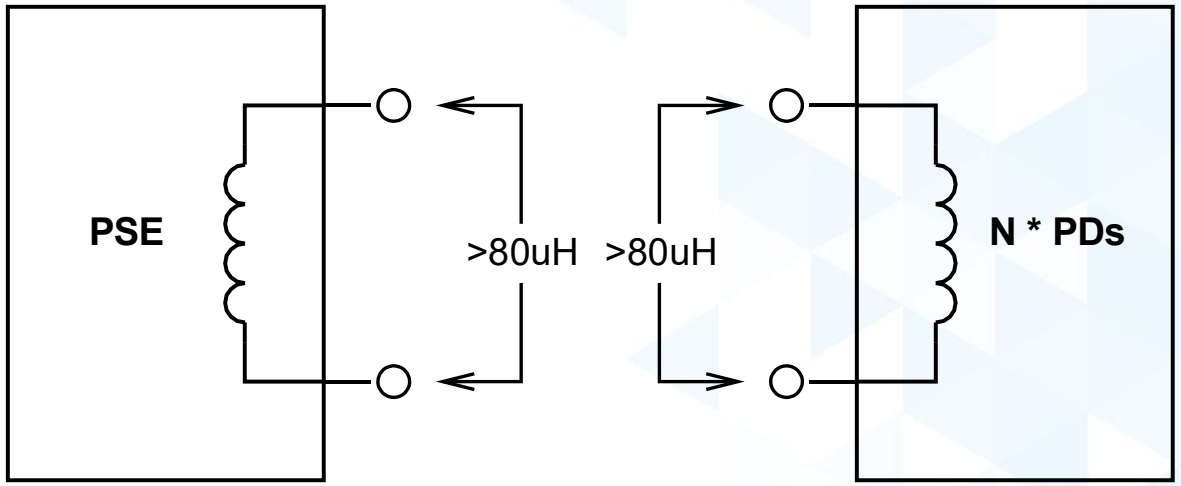
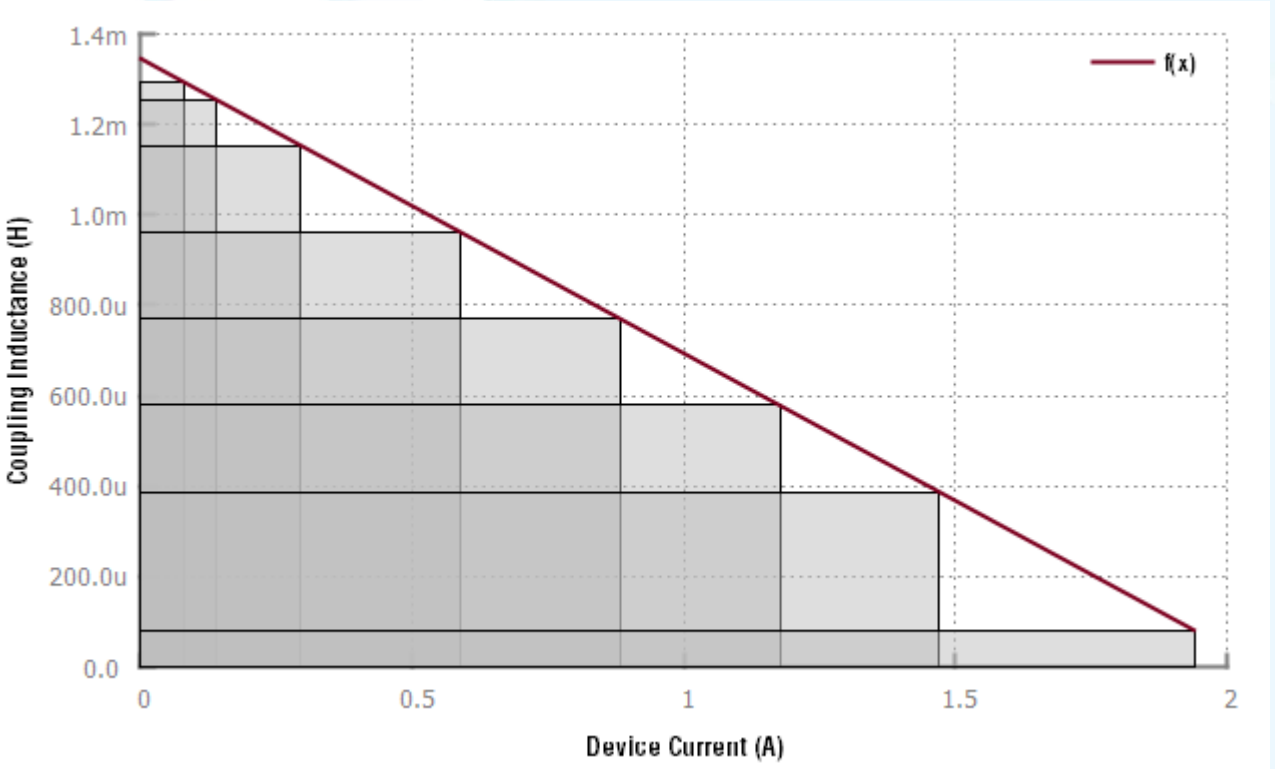


Table 147–4—MDI impedance limit parameters

Parameter name	Unit of measure	Minimum value	Maximum value
R	kW	10	—
L	µH	80	—
C_{tot}	pF	—	180
C_{node}	pF	—	15

Choose Coupling Inductance By Class

- Using 802.3bt classes as an example
- L_{CLASS} = 80uH * (#Nodes / Class)
- Highest power class uses 80uH or 160uH?
  - If 160uH a 2nd device can be added w/o causing droop
  - But demoted or not allowed to power up
- Lowest class needs 1280uH per device
  - 80uH * 16 Nodes
- What is optimal division of classes?



Continuing work

- Agree on minimum total inductance for the system
  - Trade off inductor size/cost with phy complexity
- Choose classes
- Set power coupling inductance for each class (L_{CLASS})
- Verify C_{NODE} Estimation
- Update Models