IEEE 802.3af DTE Power via MDI
System Considerations - System Modeling

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- Objectives

- Identifying system parameters required to ensure PSE- PD inter-operate with minimum limitations on specific implementations.

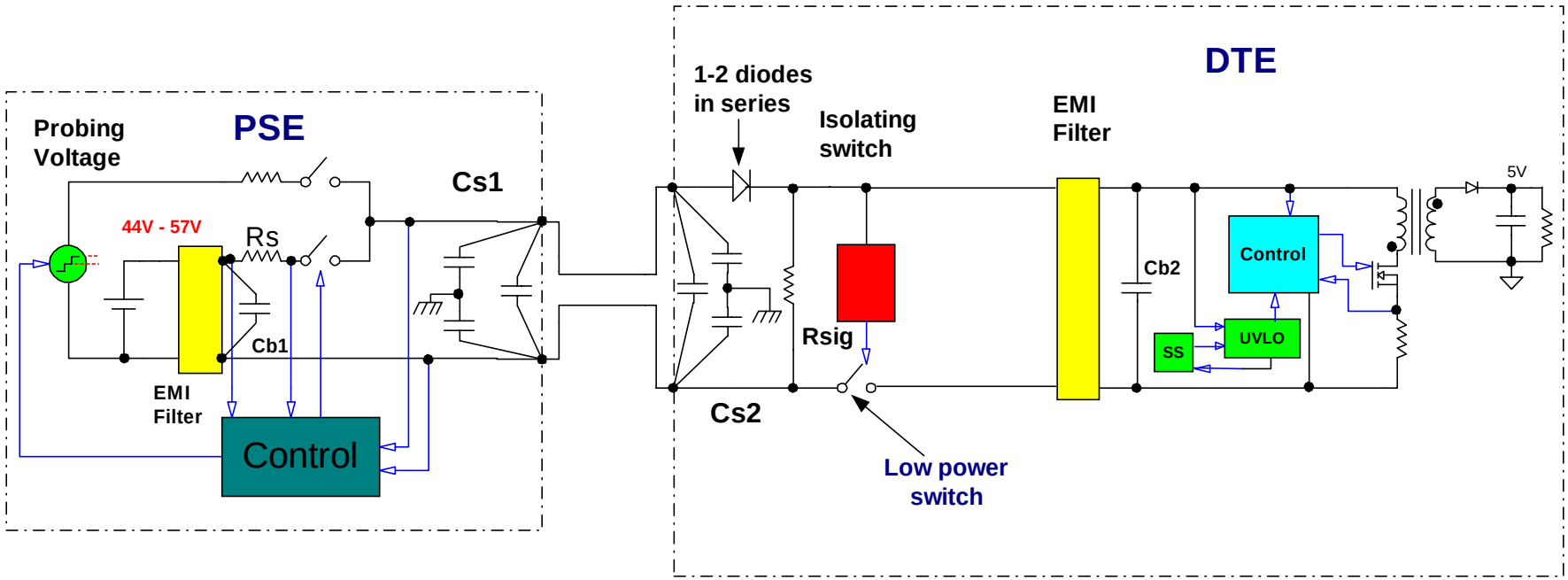
- Strategy

- Derive actual or theoretical models for known system functions
- Analyzing results
- Add / Modify conclusions to system spec.

Topics

- System Powering/Detection functions modeling
- Detection time vs. system parameters
- PD input signature as function of leakage caused by different sources.
- Dynamics between PD power supply and UVLO functions
- System dynamics effects on Imin/Imax requirements
- Where to locate inrush current limited at PSE side or PD?
- PD input port main requirements.

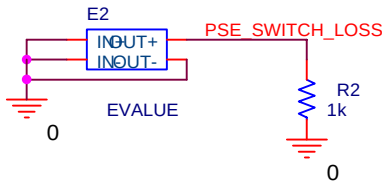
System Powering/Detection Functions



PSE Main Functions

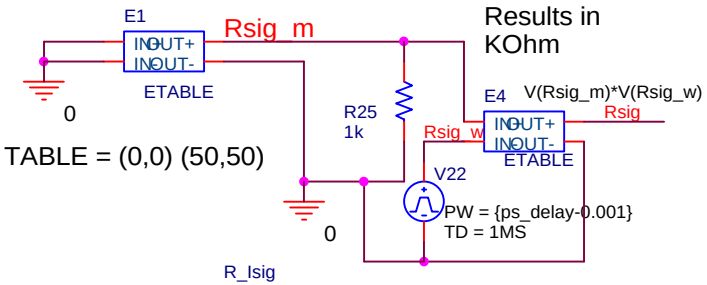
Measuring PSE switch power loss

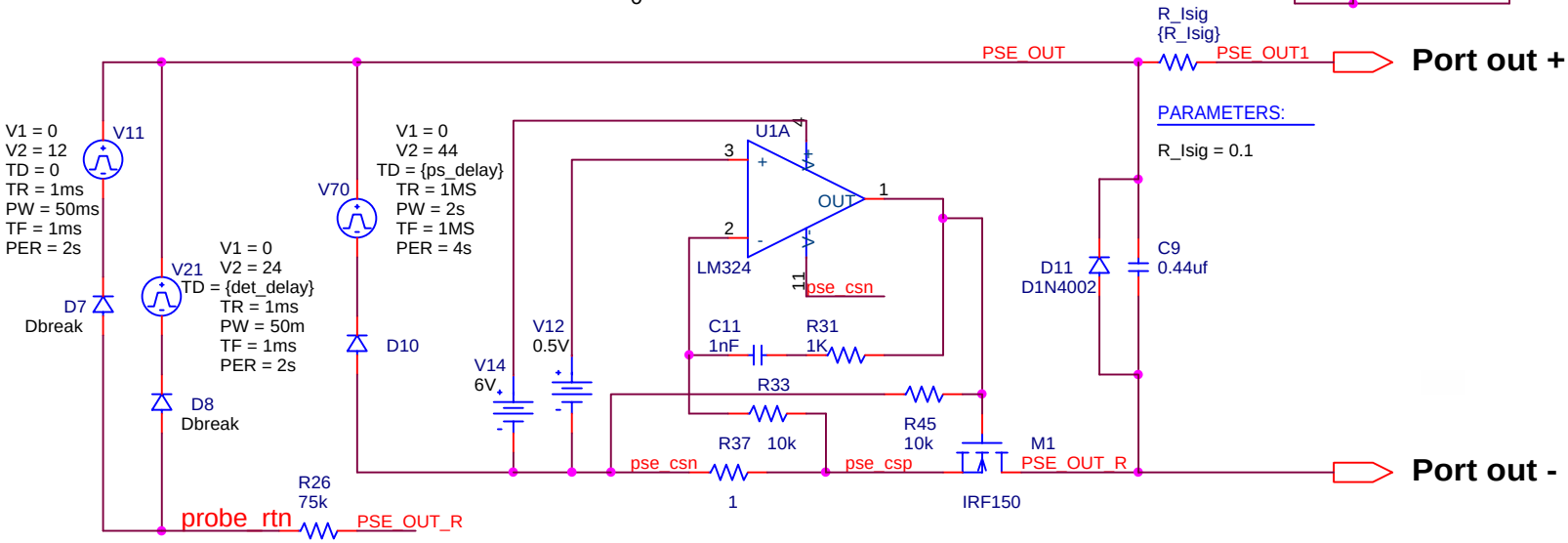
v(pse_csp,pse_csn)*v(PSE_OUT_R,pse_csp)



Measuring Rsig at PSE output port

0.001*(75000)*V(PSE_OUT,PSE_OUT_R)/(v(PSE_OUT,probe_rtn)-v(PSE_OUT,PSE_OUT_R)+1

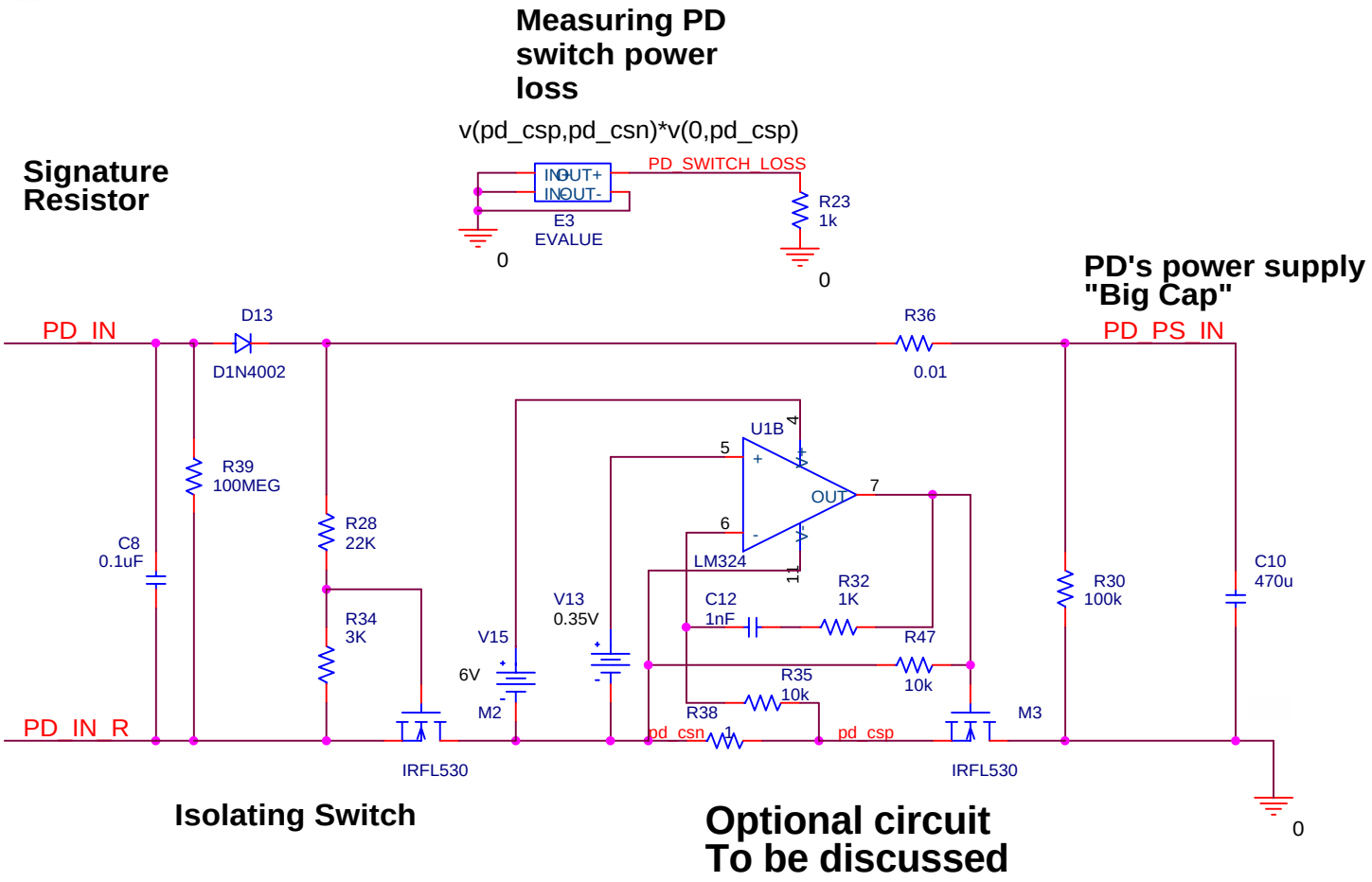




Detection probing source

Part of PSE over current/current limiter circuit.

PD - Main Functions



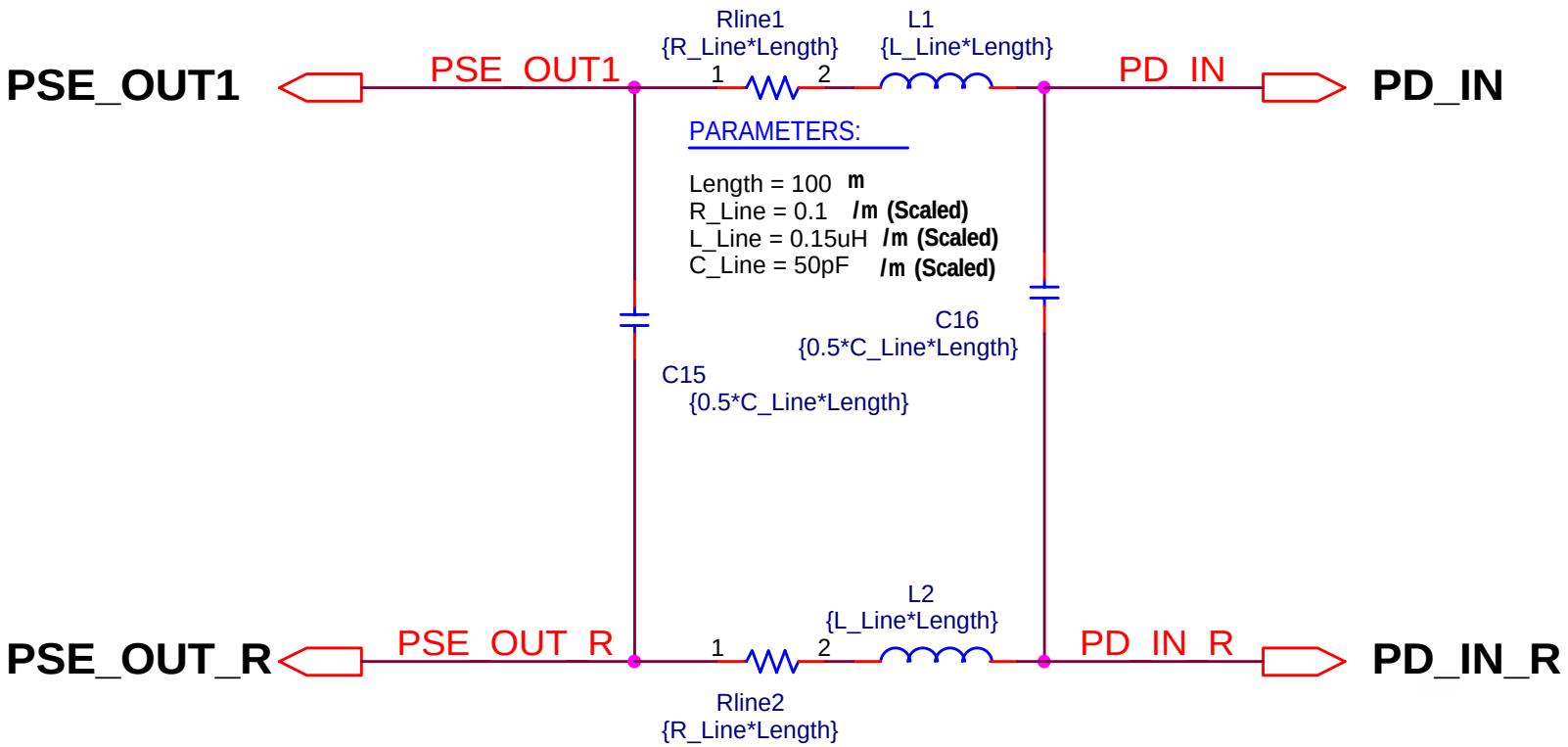
Isolating Switch and PD inrush current limiter may be integrated to one circuit

Part off PD inrush current limiter circuit.

PSE/PD Model Can check the following:

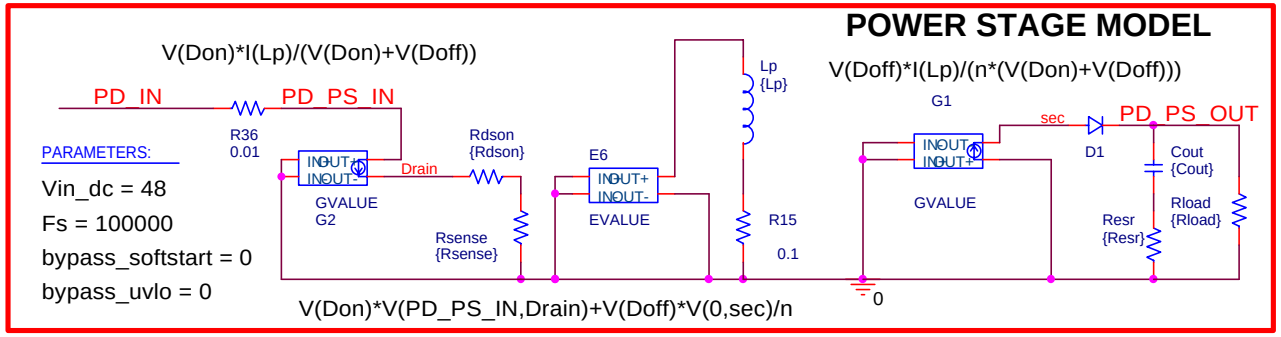
- Current limit time response
- Power Dissipation during startup for a given PD
- Optimizing startup requirements
- Power dissipation at steady state
- Power dissipation at dynamic load operation
- Detection timings and reflected Signature value
- Possible sources of leakage current affecting Signature tolerance.

Cable - Low Frequency Parameters



•Low frequency model

PD Power Supply Model



PARAMETERS:

Cout = 2200uF Resr = 0.1

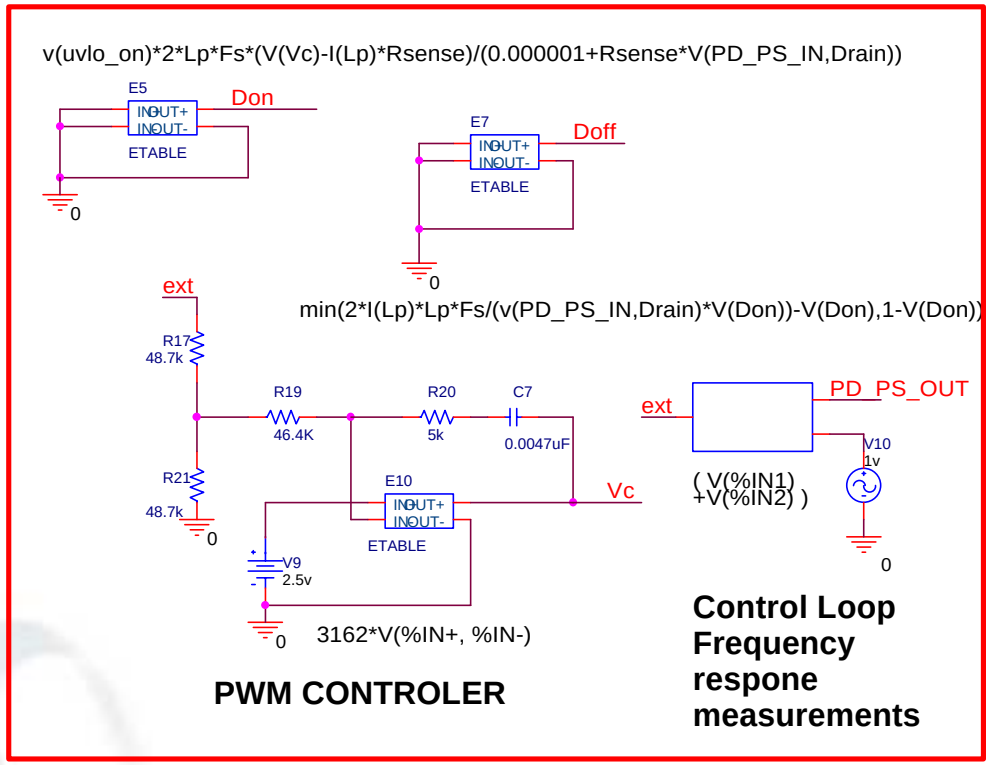
n = 0.527 Lp = 200u

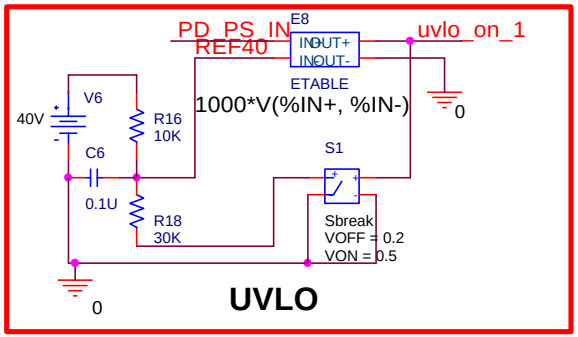
Rdson = 0.18 Rsense = 0.8

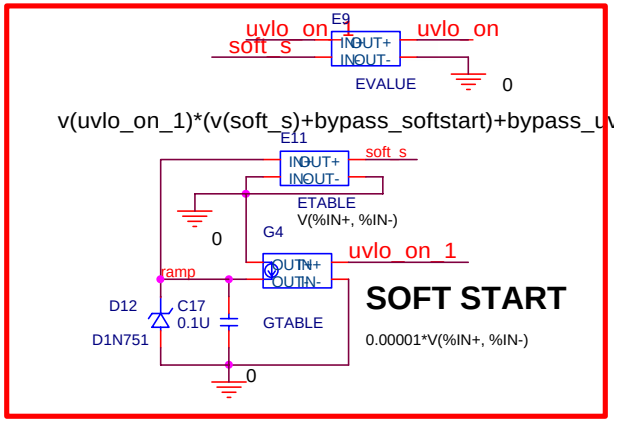
Rload = 2.5

ps_delay = 100ms

det_delay = 50ms







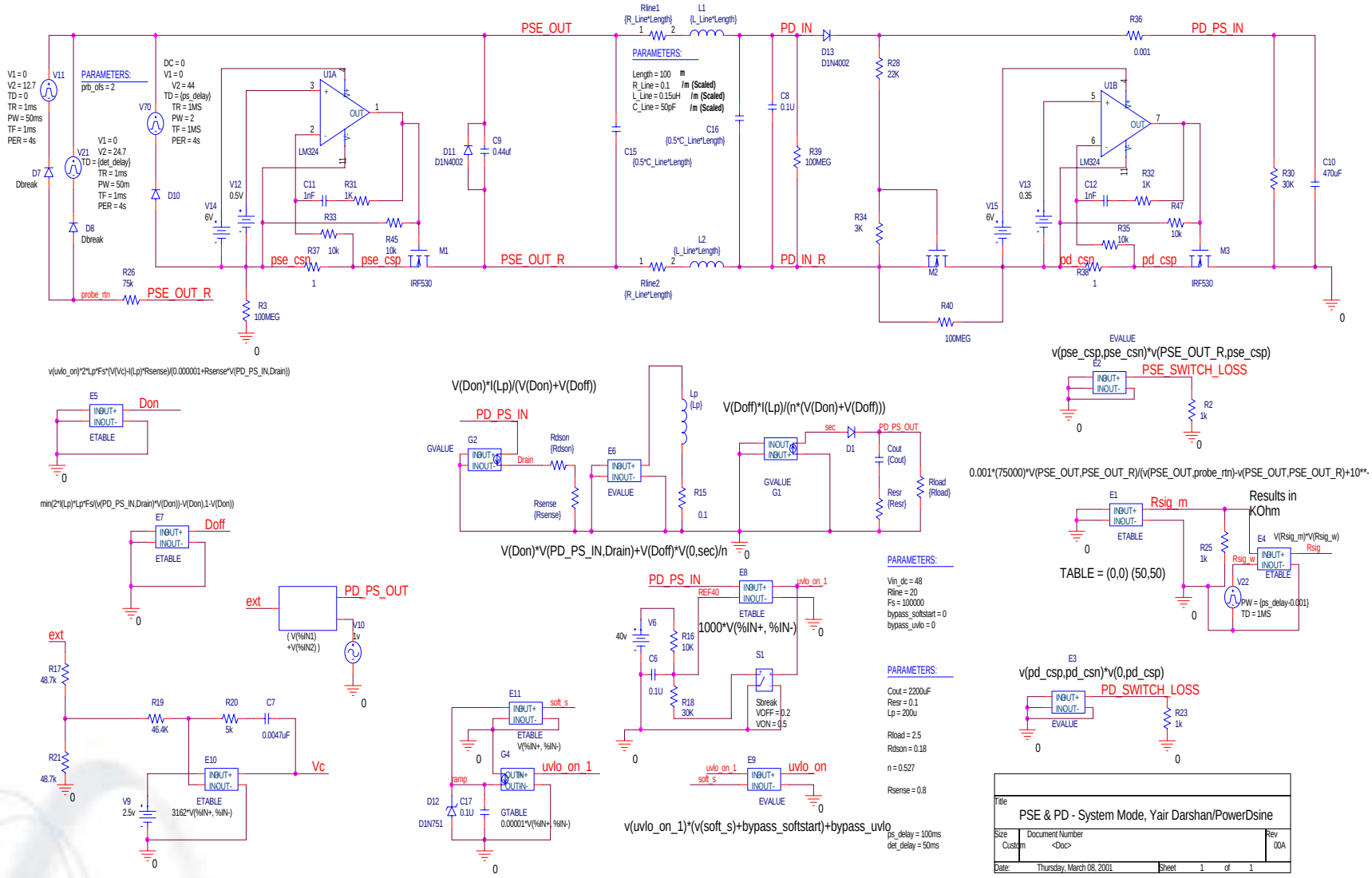
PD Power supply model description

- Topology: Flyback converter.
  - Chosen for exhibits the worst case dynamic response.
- Automatic operation at Continuous and Discontinuous Conduction Current operating modes (CCM and DCM)
- Can be operate at Voltage or Current mode control concept
- Fast and Accurate simulation technique based on Average Behavioral Modeling concept.
- Includes:
  - Open and Closed loop analysis tools
  - Pulse by Pulse current limit block
  - UVLO function
  - Soft Start function

PD Power supply model Capabilities

- Can be used to:
  - Analyze Dynamics of Startup and Powering modes
  - Optimizing System Parameters requirements
  - Optimizing PD requirements
  - Help finding pitfalls in system definition

All functions together



Summary

- The proposed system model can be used for:
  - System dynamics analysis
  - System Stability
  - Performance-Requirements analysis
  - The system model is specified for Powering and detection functions