

Vport ad hoc update January 2007

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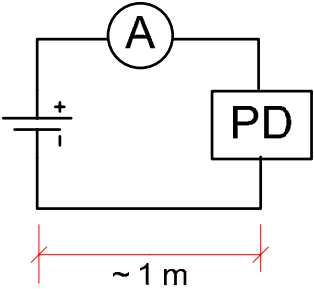
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Agenda

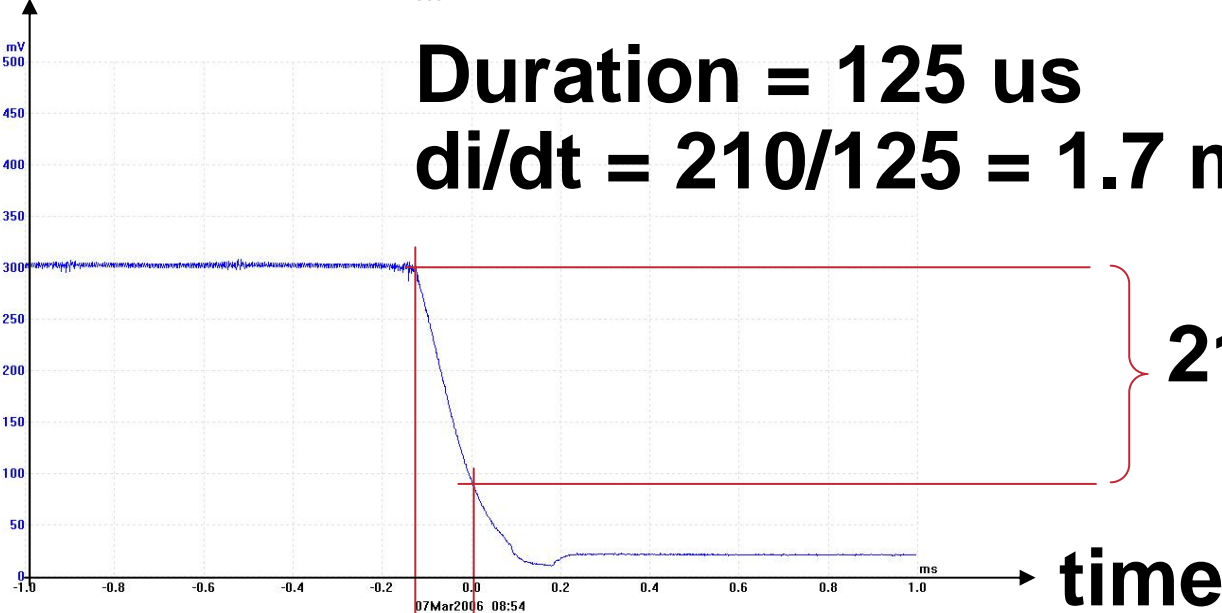
- **Data collected.**
- **Current limits.**
- **An option for dealing with transients.**
- **The need for new current limits and an approach.**
- **Next step.**

PD data collection method



current

300 mA



Duration = 125 us
di/dt = 210/125 = 1.7 mA/us

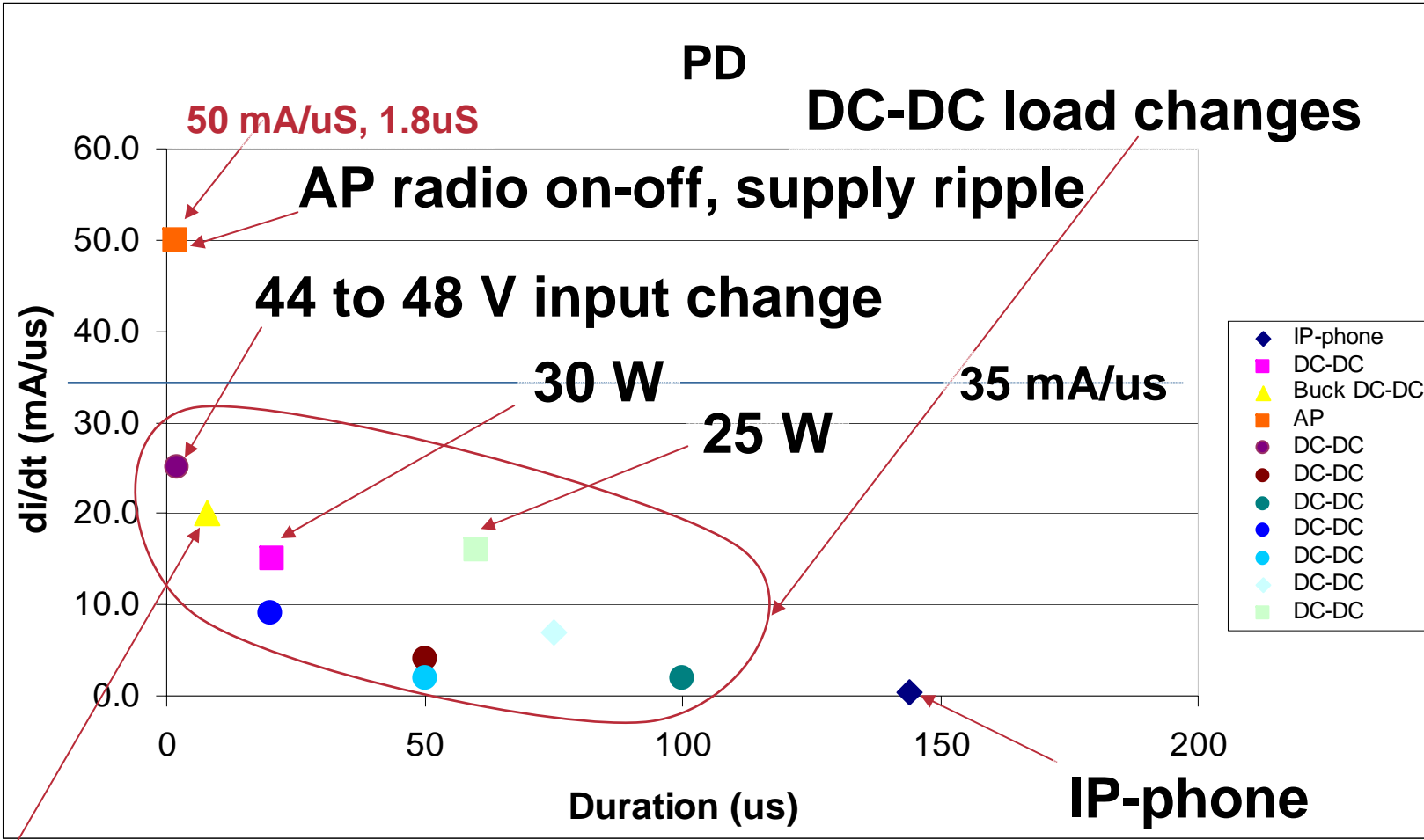
210 mA

time

125 us

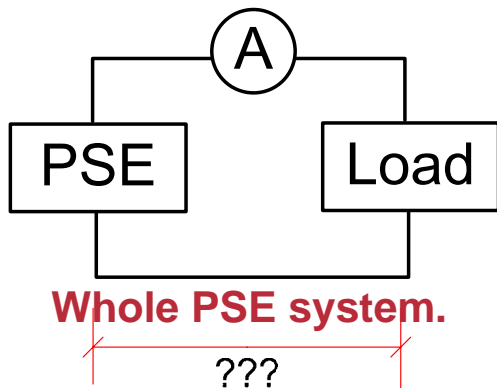
Static supply voltage 48 V.

Sample PD di/dt values

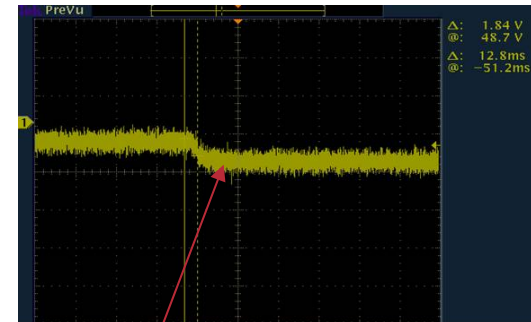
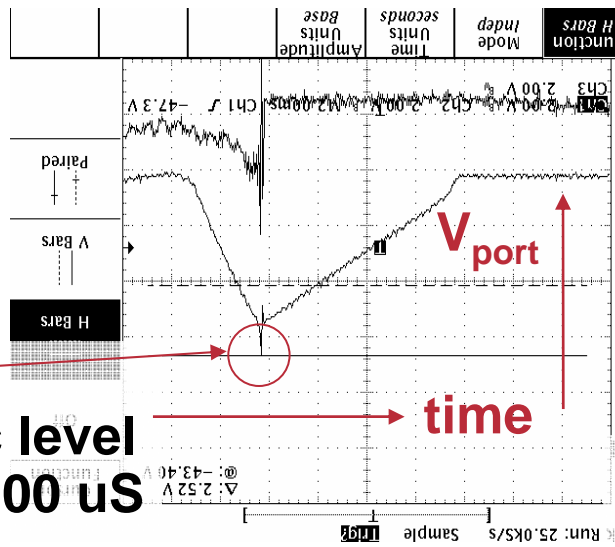
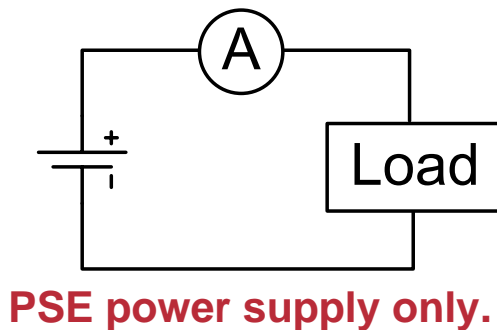


Output capacitor 1/4 of the recommend size

PSE data collection method



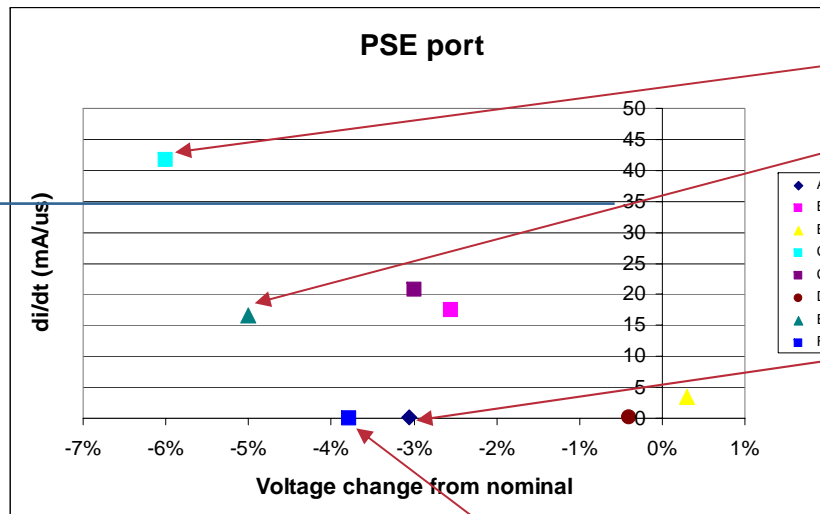
$$PSE_{port} \frac{di}{dt} = \frac{P_{sys}}{V_{PSE} \times (ports) \times (duration)}$$



- Normally below static level
- Normally duration < 500 μ S

Sample PSE load change effects

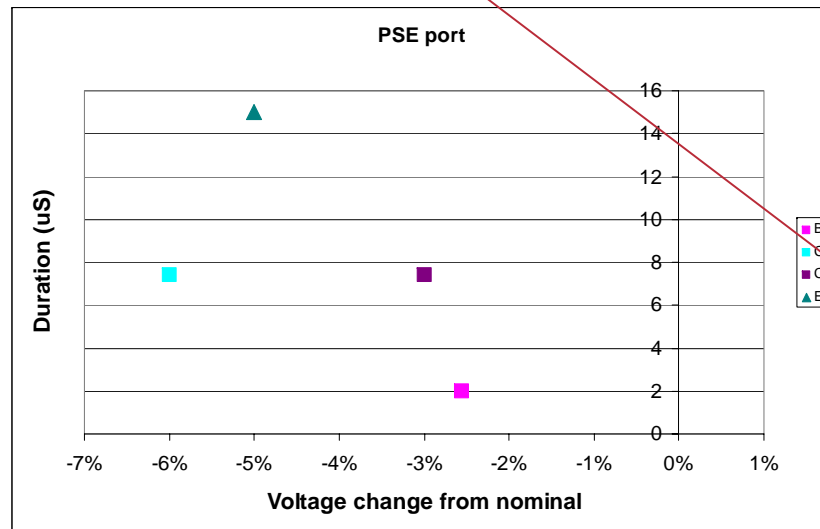
35 mA/uS



No load to 400W.

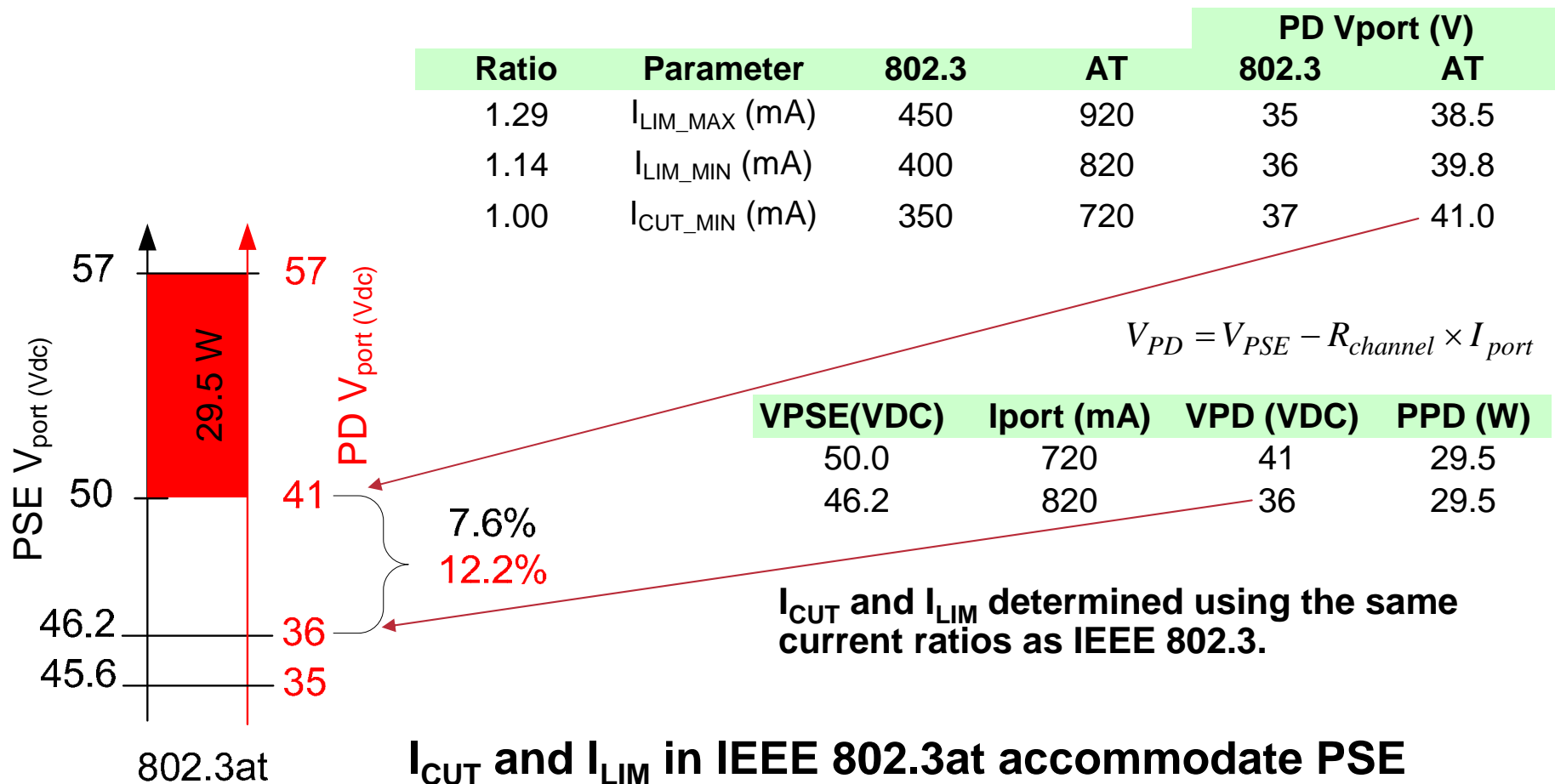
Switch from AC to DC, 500W.

Slow 0 to 100% load change.
~160us transient.



900 W load change.
This is a change in static port voltage.

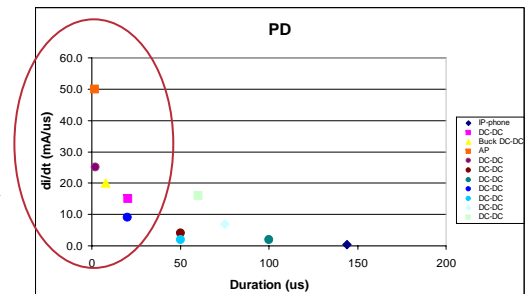
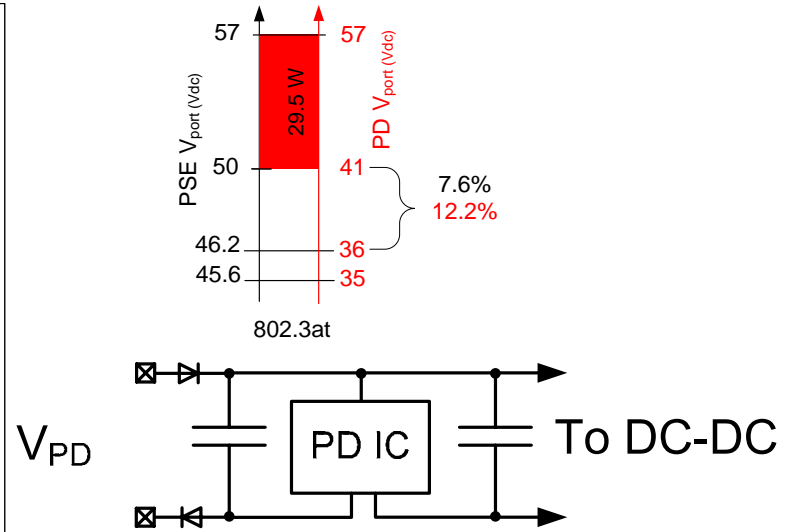
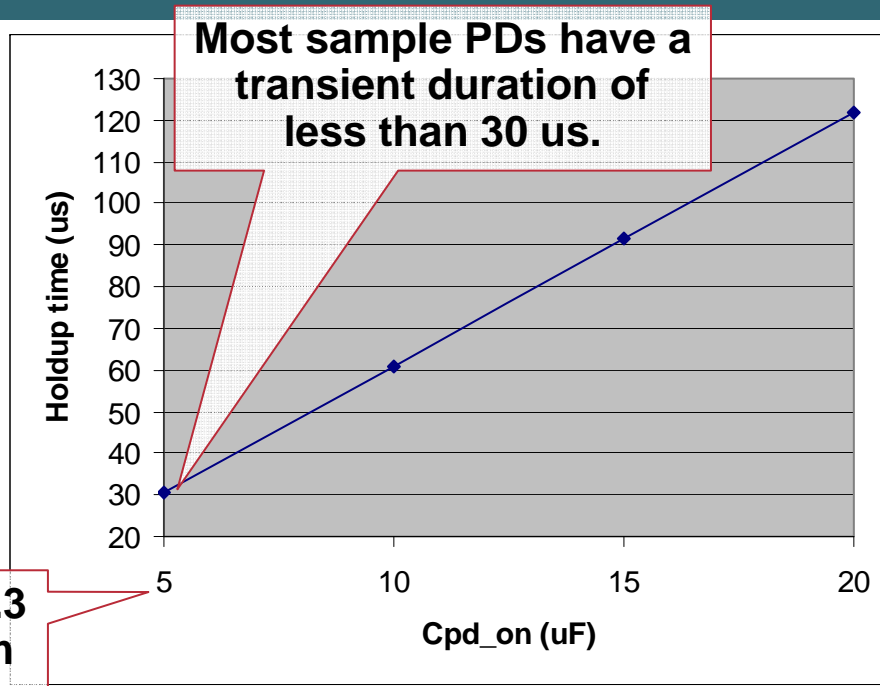
29.5 W PD



I_{CUT} and I_{LIM} in IEEE 802.3at accommodate PSE voltage transients and PD current transients.

The largest droop for the sample PSEs is 6%.

Fast transients

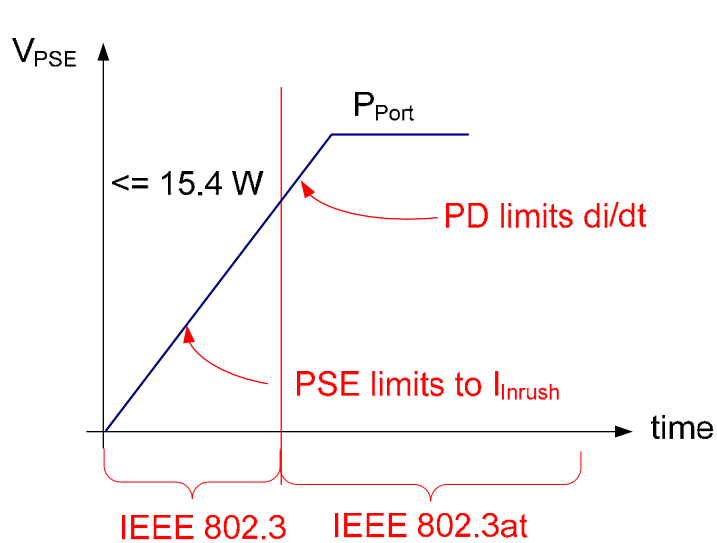


When the PD bridge is reverse biased the PD bulk capacitance provides the PD power.

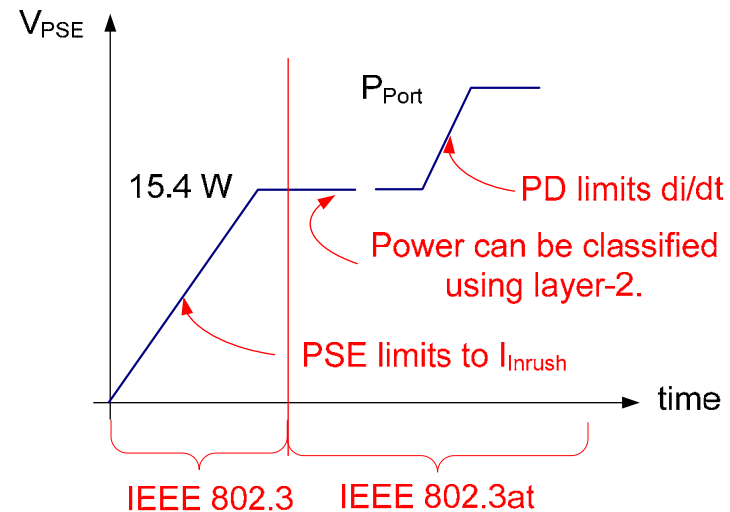
Sample PDs with durations 50 uS or longer have a di/dt of less than 10 mA/us and this current draw rate result in less than a 4% V_{PSE} change for PSEs in the sample set.

$dt = CdV/I, I = I_{LIM_MIN} = 820 \text{ mA}, \text{ at this current a } 29.5 \text{ W, PD has at least } 36 \text{ V at its input.}$

System Power-on



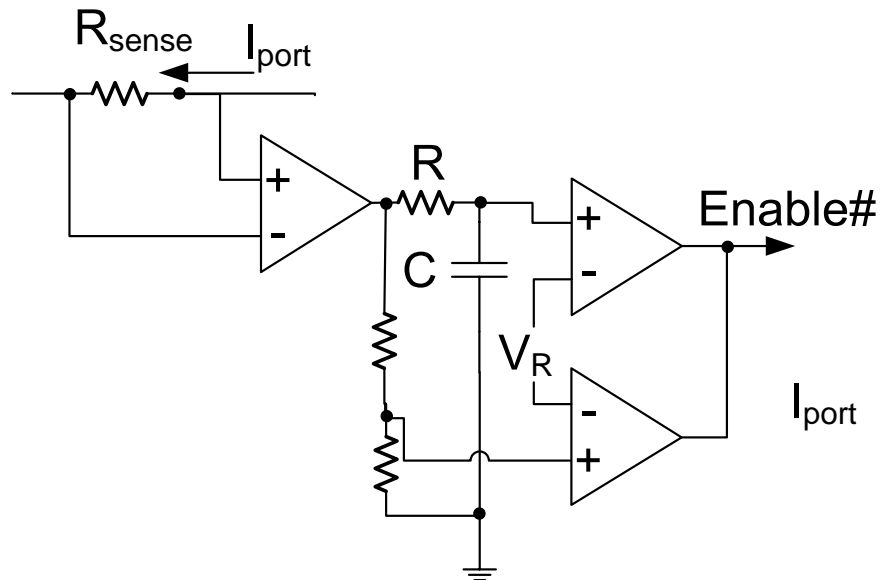
MOSFET Off/On/Linear Off/On
Layer-1 classification



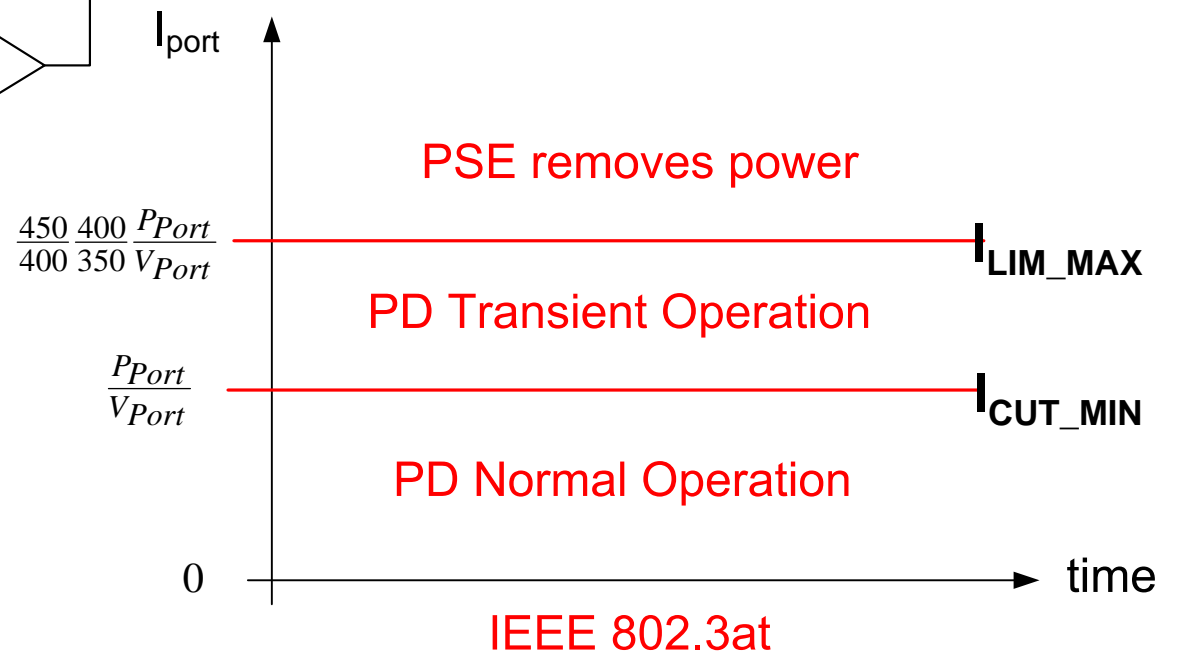
MOSFET Off/On/Linear Off/On
Layer-2 classification

Parameter		802.3	802.3at
I_{LIM}	max.	$\frac{450}{400} \frac{400}{350} \frac{P_{Port}}{V_{Port}}$	New
	min.	$\frac{400}{350} \frac{P_{Port}}{V_{Port}}$	
I_{CUT}	max.	$\frac{P_{Port}}{V_{Port}}$	
	min.		

Proposed PSE current monitor



Energy based limit.



I_{LIM} purpose in IEEE 802.3

- The power-on inrush current is supported by I_{Inrush} .
- A PD can draw no more than I_{LIM_MIN} .
- A PSE limits the current to I_{LIM} while its port voltage is above 30 V.
- A PD can turn off below 36 V and shall be off by 30V.
- A functioning system will never place a PSE in current limit. This current limit serves no useful purpose.
- None of the sample PDs crossed I_{CUT} or I_{LIM} thresholds.

Existing Constraints: Current Demand

- **PSE 33.2.8.2 Load Regulation**

$dv/dt \leq 3.5 \text{ V/us}$ @ $di/dt \leq 35 \text{ mA/us}$

- **History:**

45%
Margin

Common mode voltage noise of 795 mV @ 7 MHz affects 100BASE-T Ethernet at 145 m cable lengths.

900%
Margin

An additional 20 dB margin results in a common mode constraint of dv/dt of 3.5V/uS.

This constraint was imposed when common mode current rate is 35mA/uS for a resistive (100 ohms) PD drawing 12.95W that is subject to a 3.5V/us slew rate.

- **Concern:**

This is a dv/dt “shall” for the PSE and not a PD “shall” for di/dt .

This effort was focused on preserving data and not on the ability of power supply to meet these demands.

PD di/dt limits

- **Most PSE data was measured below a 35 mA/uS rate. All PD rates are below 25 mA/uS.**
- **PSEs in the data set near this current rate have a 5% to 6% transient.**
- **The IEEE provides a single port system specification that test house use to check compliance on multi-port systems.**
power supply di/dt = (ports) x (port di/dt) ???
- **Need a consensus value for PD di/dt limits. Expect 802.3at rates will be lower than 35 mA/us.**

Review of what was just covered.

- **Voltage transients of 6% below V_{static_min} keep the PD voltage above 36 V and permit all data set PSE to be in specification as tested.**
- **A PD di/dt of 20 mA/ μ S covers all PD current demands (due to the PD need) and ensures that a multipoint PSE voltage transient is below 6%.**

Next Step

- **Recommend the PD di/dt limits should be.**
- **Recommend the PSE transient value.**
- **Review current thresholds and their purpose.**
- **Review and expand details on the proposed current monitor.**

Based on V12 Spreadsheet.