



Type 3/4 PSEs Inrush_max value with Type 1/2 PDs
IEEE802.3bt
July 2015
Rev 001

Yair Darshan

Objectives

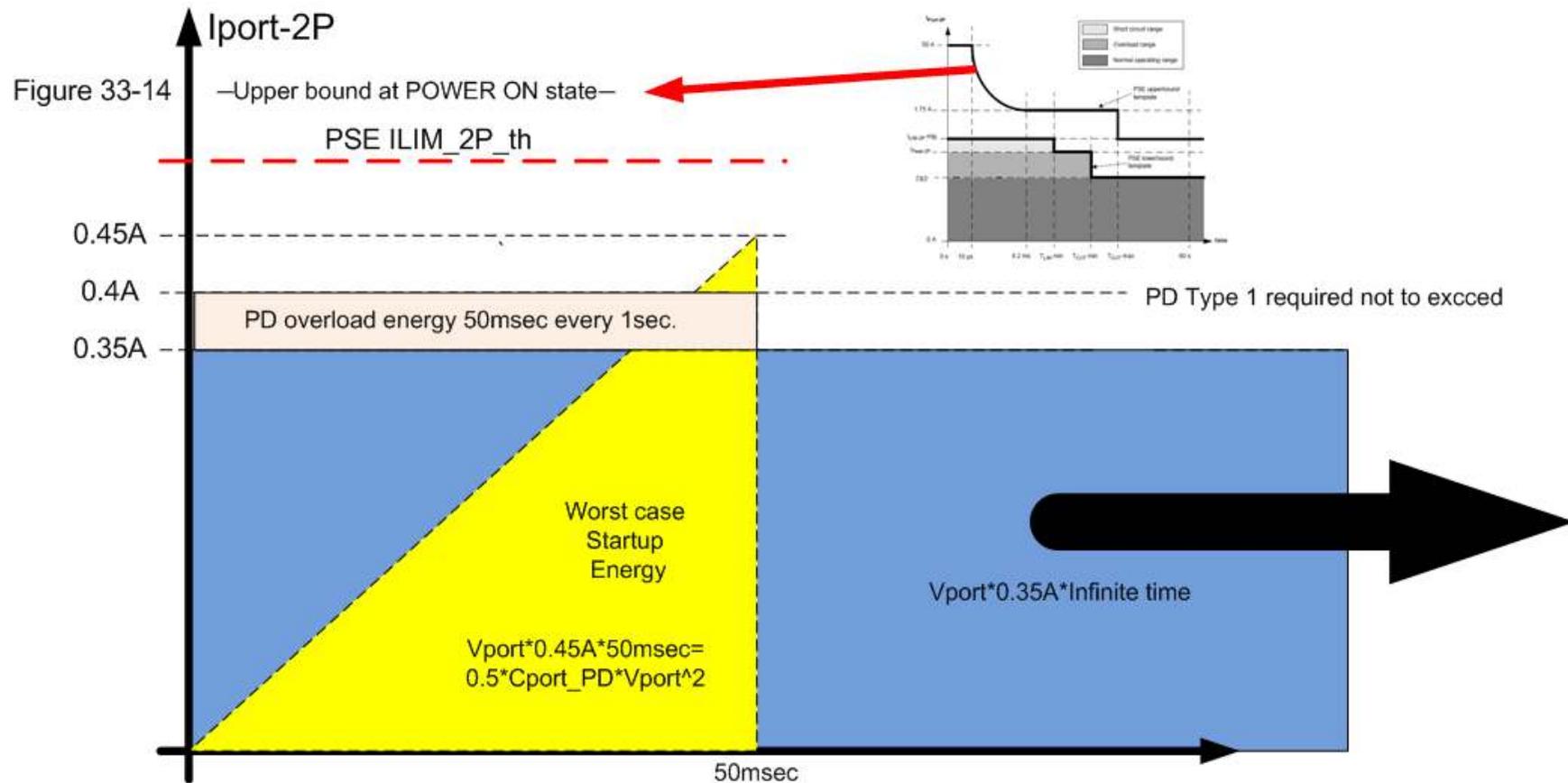
- To show that Type 1 PD when connected to Type 3 or 4 PSE can handle and must handle Type 3 and 4 inrush max.
- Moreover: a PD that can't do the above, violates the following standards:
 - IEEE requirements
 - Violates UL requirements
 - Practical considerations in system level.
- To show that if we keep 0.4A to 0.45A per pair set, we are good with all PSE-PD Types combinations.

Background

- PD Type 1 or 2 works with PSE Type 1/2 with Inrush=0.4A to 0.45A.
- When Type 3 or 4 PSE is connected to Type 1 and 2 PDs with inrush capability of 0.4 to 0.45A per pair set (Total 0.8A to 0.9A if both pair sets are ON together):
 - The stress on the components stays the same due to the fact that over each pair set we will have the same inrush (neglecting the E2EP2P_lunb which has little effect on POWERON state therefore for POWER UP state as well).
 - ~Same peak current through components
 - Same total energy on all components
 - Half of the Inrush time
- What if during operation a **pair set** is disconnected?
 - Nothing happen. It is similar to Type 1/2 system. Same currents.
- What if during operation only a pair is disconnected?
 - One diode bridge and one transformer will see 0.9A for maximum 25msec.
 - Same energy stress for shorter time. No issues.
 - Moreover : In POWER ON the currents are higher for longer time (until system shuts off) which is worsen than the previous case → No issues.

Type 3/4 PSE connected to Type 1/2 PD

- If we keep Type 3 and 4 PSEs with 0.4A to 0.45A inrush per pair set, we have no issues when Type 1 / 2 PDs are connected to Type 3 and 4 PSEs.



What a PD need to do for its own protection?

- Type 1 and 2 PD
- **IEEE:** Not to consume more that 0.4A for more than 50msec.
 - Need to be guaranteed by design.
- **UL:** Not to to cause fire hazard or damage to infrastructure if has in internal short circuit when connected to any power source with any current capability.
 - Consider possible scenario:
 - PD is connected to a PSE multiport system with 1KW main power supply. One of the PSE port controller is permanently ON due to a fault in PSE. No PD sees 1KW power source
 - PD is tested in the LAB with lab power supply that is not PoE current limited or LPS limited.
 - All of the above considered single fault condition in the tested device.
- The above is true for all PD types as well.

Summary

- PDs has to be internally protected from PoE currents that are much higher than the maximum inrush current values.
- As a result if PD is exposed to higher level of inrush it shouldn't affect the PD reliability nor performance.
- It is required by IEEE that functionality will not be affected (0.4A for 50msec maximum consumption).
- It is required by UL not to cause damage and safety hazard.

- As a result, Type 3 and 4 PSEs with 0.8A to 0.45A per pair set can be connected to Type 1 and 2 PDs without additional requirements for PSE or PD.



THANK YOU

Annex A: PD POWERUP Tinrush affecting parameters.

