

# Coming to Grips with -2p

Dave Dwelley

Linear Technology

Bonita Springs FL 9/15

# The Problem

- Several parameters had -2p added to their names to emphasize that there may be differences in values from pair to pair
  - This makes sense for some parameters
    - Currents where current is limited on a per-pair basis
    - Voltages at the PD inputs when currents are mismatched
  - This doesn't make sense for some other parameters
    - PD total current or power
    - PSE voltage where mismatch is limited by the Vdiff parameter
    - Timers where the parameters are limits
- -2p labels aren't always the most intuitive
  - Do they refer to a pair or a pairset?
- -2p labels break continuity with previous revisions of the spec

# Parameters with -2p Added

- $I_{CON-2P}$  (and variants  $I_{con-2p-unb}$ , and  $I_{cont-*}$ )
- $V_{PORT\_PSE-2P}$  (and related  $V_{pse-2p}$ )
- $V_{PORT\_PD-2P}$  (and related  $V_{pd-2p}$ )
- $I_{PORT-2P}$ ,  $I_{LIM-2P}$ ,  $I_{CUT-2P}$ ,  $T_{LIM-2P}$ ,  $T_{CUT-2P}$
- $I_{PEAK-2P}$ ,  $P_{PEAK-2P}$
- $I_{INRUSH-2P}$ ,  $I_{INRUSH\_PD-2P}$ ,  $T_{INRUSH-2P}$ ,  $T_{DELAY-2P}$
- $P_{PEAK\_PD-2P}$
- Several other minor parameters:
  - $V_{TRAN\_LO-2P}$ ,  $V_{OVERLOAD-2P}$
  - $I_{PESIT-2P}$ ,  $I_{PSEUT-2P}$ ,  $I_{PSELT-2P}$
  - $pse_{ILIM-2P}$ ,  $mdi_{ILIM-2P}$

# $I_{\text{PORT-2P}}$ : Pairset Current

- $I_{\text{PORT}}$  is the actual current in a pairset (defined on p211 as a state machine variable): -2p is technically correct
- **$I_{\text{PAIR}}$  might be better (new term, not used now)**
- Best continuity with AF/AT could be achieved by using  $I_{\text{PORT}}$  for total port current and  $I_{\text{PAIR}}$  for pairset current
- Baseline text document uses  $I_{\text{PORT-2P}}$
- $I_{\text{PORT}}$  (without -2p) appears in 33.3.4, 33.3.7.2.1, 33.3.7.4, 33.3.7.5
  - Replace with  $I_{\text{PAIR}}$  in 33.3.4 if we use the  $I_{\text{PORT}}/I_{\text{PAIR}}$  solution
  - Add new  $I_{\text{PAIR}}$  definition to p211

## $V_{\text{PORT\_PSE}}$ , $V_{\text{PSE}}$ : PSE Output Voltage

- PSE pairs should match to within  $V_{\text{PORT\_PSE\_DIFF}}$
- PSE port voltage is therefore effectively a 4P spec
- I suggest removing -2P and converting to  $V_{\text{PSE}}$  throughout
  - It comes up in a lot of places...
- This parameter has had several names:
  - $V_{\text{PORT}}$  in AF
  - $V_{\text{PORT\_PSE}}$  in AT
  - $V_{\text{PSE}}$  in Clause 1 and parts of AT and BT
- I prefer  $V_{\text{PSE}}$  (as used in 33.3.7.1), so the baseline text uses  $V_{\text{PSE}}$ 
  - All parameters are measured at the port
  - Should be uniform ( $V_{\text{PSE}}$  or  $V_{\text{PORT\_PSE}}$ ) in any case

## $V_{\text{PORT\_PD}}$ , $V_{\text{PD}}$ : PD Input Voltage

- This one is trickier since a dual-sig PD that draws unbalanced loads may see different voltages on each pair at the PD port
- Current language mixes  $V_{\text{PORT\_PD}}$ ,  $V_{\text{PD}}$ , and  $V_{\text{PORT\_PD-2P}}$  liberally
- I suggest reverting to  $V_{\text{PD}}$  throughout and rewriting 33.3.7.1 and 33.3.7.4 to make clear that a dual-signature PD must treat each pairset independently – see baseline text on p268

# $I_{CON}$ , $I_{CON-2P}$ : Maximum Operating Current

- We changed  $I_{CON-2P}$  to  $I_{CON}$  in Waikoloa in Table 33-11 to accommodate Type 1 and 2 systems
- $I_{CON-2P-UNB}$  was kept (33-11 4a) but not carried into 33.2.7.4
- I suggest replacing  $I_{CON-2P-UNB}$  with  $I_{CON-2P}$  (which includes unbalance effects as explained in 33.2.7.4)
  - Could also use  $I_{CON\_PAIR}$
  - $I_{CON-2P} = I_{CON}/2 + \text{unbalance}$ ,  $I_{CON-2P}$  is always  $\geq I_{CON}/2$
- This gives:
  - $I_{CON}$  = total PD current for all types
  - $I_{CON-2P}$  = maximum current any pair must carry for Class 5 and up
  - $I_{CON-2P}$  specs the maximum current a transformer must carry in a 4P system
- Baseline text document uses  $I_{CON-2P}$



$I_{\text{INRUSH}}$ ,  $I_{\text{INRUSH\_PD}}$

- These are unclear – it depends how we define inrush current limits
- Leave unchanged for now

$T_{LIM}$ ,  $T_{CUT}$ ,  $T_{INRUSH}$ ,  $T_{DELAY}$

- These are used to define maximum time intervals, not actual durations
- Because they represent time limits that apply to all pairs, -2p is not appropriate
  - Where needed, the “-2p” is carried by the current spec (I<sub>port-2p</sub>, for example)
- Baseline text removes -2p from all
- $T_{DELAY-2P}$  makes some sense in Table 33-18, but the values of  $T_{DELAY}$  and  $T_{DELAY-2P}$  are identical so I removed -2p here too

# Minor Parameters

- $V_{\text{TRAN\_LO-2P}}$ ,  $V_{\text{OVERLOAD-2P}}$ : defined but never used
  - Do we need these symbols at all? I removed both
- $I_{\text{PESUT-2P}}$ ,  $I_{\text{PSEIT-2P}}$ ,  $I_{\text{PSELT-2P}}$ : defined and used locally only
- $P_{\text{PEAK\_PD-2P}}$ : defined and used locally only (OK as is)
- $pse_{\text{ILIM-2P}}$ ,  $mdi_{\text{ILIM-2P}}$ : defined and used locally only
  - What does equation 33-14 do? It came from AT...
- Baseline text removes -2p from all these symbols except  $P_{\text{PEAK\_PD-2P}}$  and modifies definition text as required

# Baseline Text

- See marked-up draft: [dwelley\\_2\\_0915.pdf](#)