

1 Comment #65, #44 (Page 201, Line 8 clause 145.3.8.10)

2 In the text "Single-signature PDs shall not exceed ICon-2P-unb for longer than TCUT-2P min and 5 %  
3 duty cycle, and shall not exceed IPeak-2P-unb, as defined in Table 145-16 on any pair when PD PI  
4 pairs...", there are few problems that makes the spec broken:

- 5 1) IPeak-2P-unb is not defined in Table 145-16. It is defined by Equation 145-12.  
6  
7 2) IPeak-2P-unb is a PSE parameter and not a PD parameter. We need separate parameter name and content  
8 for the PD i.e. IPeak\_PD-2P\_unb for PD (as we did for Icon and named it Icon\_PD for the PD).  
9  
10 3) Equation 145-12 belongs to PSE section and set the actual Ipeak-2P\_unb current which is not the maximum  
11 Ipeak-2P\_unb since it depends on PSE voltage. PDs must be designed to the maximum Ipeak-2P\_ub (and to  
12 the maximum Icon-2P\_unb as we did for PD during last cycle) due to the fact that the PD doesn't control  
13 the actual Ipeak-2P-unb since it doesn't have the knowledge of PSE voltage and more important, they can  
14 be connected to PSE with the minimum voltage which will create the maximum possible current.

15 As a result of the above arguments we need to define new PD parameters name for Icon-2P\_unb and Ipeak-  
16 2P\_unb i.e. Icon\_PD-2P\_unb and Ipeak\_PD-2P\_unb with fixed maximum values that are PD parameters and not  
17 depend on PSE (as we did per the concept we adopt on march for comment #320 from D2.3, see  
18 yseboodt\_08\_0315\_peakunbalance.pdf arguments that has generated the new Equation 145-28 and 145-29).

19 Suggested Remedy

20 ***See next page***

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**[BASELINE STARTS HERE]**

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2 **1. Add the following rows to Table 145-28**

Item	Parameter	Symbol	Unit	Min	Max	PD Type	Additional information
X1	Pairset current continuous including unbalance effect per the assigned Class for a single-signature PDs						
	Class 1 to 4	Icon_PD-2P- unb	A		Icon_PD <sup>a</sup>	3, 4	See 145.3.8.X and 145.3.8.10
	Class 5				0.55	3, 4	
	Class 6				0.682	3, 4	
	Class 7				0.781	4	
	Class 8				0.932	4	
Y1	Pairset peak current including unbalance effect per the assigned Class for a single-signature PDs						
Class 1 to 4	Ipeak_PD- 2P-unb	A		I <sub>Peak_PD</sub>	3, 4	See 145.3.8.X and 145.3.8.10	
Class 5				0.560	3, 4		
Class 6				0.700	3, 4		
Class 7				0.827	4		
Class 8				0.988	4		
Z1			Overload time limit per pairset	T <sub>cut_PD-2P</sub>	ms		

3 <sup>a</sup>The Icon\_PD value is higher than the value for Class 5 as unbalance for Class 4 is not restricted.

4 **2. Make the following changes:**

5 **145.3.8.4 Peak operating power**

6 V<sub>Overload-2P</sub> is the PD PI voltage when the PD is drawing the permissible P<sub>Peak\_PD</sub> for single-signature PDs, or P<sub>Peak\_PD-2P</sub>  
7 for dual-signature PDs.

8 At any static voltage at the PI, and any PD operating condition, with the exception described in 145.3.8.4.1, the peak power  
9 for single-signature PDs shall not exceed P<sub>Class\_PD</sub> for more than  $T_{cut\_PD-2P} \cdot T_{CUT-2P\_min}$ , as defined in [Table 145-16](#) [Table](#)  
10 [145-28](#) -and 5% duty cycle. Peak operating power shall not exceed P<sub>Peak\_PD</sub>.

11 At any static voltage at the PI, and any PD operating condition, with the exception described in 145.3.8.4.1, the peak power  
12 for a dual-signature PD shall not exceed P<sub>Class\_PD-2P</sub> for more than  $T_{cut\_PD-2P} \cdot T_{CUT-2P\_min}$ , as defined in [Table 145-28](#) [Table](#)  
13 [145-16](#) and 5% duty cycle. Peak operating power shall not exceed P<sub>Peak\_PD-2P</sub>.

14 NOTE—The duty cycle of the peak current is calculated using any sliding window with a width of 1 s.

15 Peak power is defined in Table 145-28 and depends on the Class assigned by the PSE. The equations in Table 145-28 are  
16 used to approximate the ratiometric peak powers of Class 1 through Class 8. These equations may be used to calculate  
17 P<sub>Peak\_PD</sub> or P<sub>Peak\_PD-2P</sub> for Data Link Layer classification by substituting P<sub>Class\_PD</sub> or P<sub>Class\_PD-2P</sub> with P<sub>DMaxPowerValue</sub>  
18 and for Autoclass by substituting P<sub>Class\_PD</sub> with P<sub>Autoclass\_PD</sub>.

19 **145.3.8.4.1 Peak operating power exceptions**

20 For Class 6 and Class 8 single-signature PDs and for Class 5 dual-signature PDs, when additional information is available to  
21 the PD regarding actual channel DC resistance between the PSE PI and the PD PI, in any operating condition with any static  
22 voltage at the PI, the peak power shall not exceed P<sub>Port\_PD</sub> for single-sig-nature PDs and P<sub>Port\_PD-2P</sub> for dual-signature PDs  
23 at the [PSE PI-PD PI](#) for more than  $T_{cut\_PD-2P} \cdot T_{CUT-2P\_min}$ , as defined in [Table 145-28](#) [Table 145-16](#) and with 5% duty cycle.  
24 Peak operating power shall not exceed  $1.05 \times P_{Port\_PD}$  for single-signature PDs and shall not exceed  $1.05 \times P_{Port\_PD-2P}$  for  
25 dual-signature PDs on each pairset.



1 Operating under 145.3.8.4.1 conditions is allowed if PPeak\_PD and PPeak\_PD-2P requirements are met and the total input  
2 power is less than or equal to PClass or PClass-2P at the PSE PI respectively when calculated over a 1 second interval.

3 **145.3.8.10 PD pair-to-pair current unbalance**

4 .....

5 Single-signature PDs shall not exceed ~~ICon\_2P\_unb~~ ICon\_PD-2P\_unb as defined in Table 145-28, for longer than ~~TCUT-~~  
6 ~~2PTCUT\_PD-2P\_min~~ and 5 % duty cycle, and shall not exceed ~~IPeak\_2P\_unb~~ IPeak\_PD-2P\_unb, as defined in Table 145-16  
7 Table 145-28 -on any pair when PD PI pairs of the same polarity are connected to any voltage in the range of VPort\_PSE-  
8 2P through two common mode resistances, Rsource\_min and Rsource\_max, as defined in Equation (145-27) and shown in  
9 Figure 145-32.

10  
11 Dual-signature PDs shall not exceed ICon\_PD-2P as defined in ~~Equation (145-28)~~ Equation (145-Y8) for longer than  
12 ~~TCUT-2PTCUT\_PD-2P~~ TCUT\_PD-2P as defined in Table 145-28 -min and 5 % duty cycle, ~~as defined in Table 145-16~~, and shall not exceed  
13 IPeak\_PD-2P as defined by Equation (145-Y10) on any pair when PD PI pairs of the same polarity are connected to any  
14 voltage in the range of VPort\_PSE-2P through two common mode resistances, Rsource\_min and Rsource\_max, as defined  
15 in Equation (145-27) and shown in Figure 145-32.

16 NOTE—The duty cycle of the peak current is calculated using any sliding window with a width of 1 second.

$$R_{source\_max} = \left\{ \begin{array}{l} (-0.03 \times R_{source\_min} + 1.324) \times R_{source\_min} \text{ for } (0.145\Omega \leq R_{source\_min} \leq 5.47\Omega) \end{array} \right\} (145-27)$$

17  
18 **Note part of the baseline**

Equations 145-28 and 145-29 were deleted and moved to the new sub clause **145.3.8.X** as Equations 145-Y8 and 145-Y9

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$$I_{Con\_PD-2P} = \left\{ \frac{P_{Class\_PD-2P}}{V_{PD}} \right\}_A \quad (145-28)$$

$$I_{Peak\_PD-2P} = \left\{ \frac{P_{Peak\_PD-2P}}{V_{PD}} \right\}_A \quad (145-29)$$

22  
23 .....

24  
25 RPD\_min, RPD\_max ensures that along with any other parts of the system, i.e., channel (cables and connectors) and the PSE,  
26 the maximum pair current including unbalance does not exceed ~~ICon\_2P\_unb~~ ICon\_PD-2P\_unb as defined in Table 145-16  
27 Table 145-28 during normal operating conditions. See Annex 145A.

28 **3. Add the following text after Table 145-28 and before 145.3.8.10**

29 **Note part of the baseline**

I have used the same concept and text used in the PSE side so the concept is proven and clear. The main changes made to have separate variable names for the PD as done in many cases in the spec to separate PSE variables and PD variables to be independent

30 **145.3.8.X Continuous output current capability in the POWERED state**

31 IPort\_PD-2P and IPort\_PD-2P\_other are the currents on the pairs with the same polarity of the two pairsets and are defined in  
32 Equation (145-Y1) and Equation (145-Y2).



$$I_{Port\_PD-2P} = \left\{ \begin{array}{ll} I_{Port\_PD-2P\_modeA} & \text{for mode } A \\ I_{Port\_PD-2P\_modeB} & \text{for mode } B \end{array} \right\}_A \quad (145-Y5)$$

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$$I_{Port\_PD-2P\_other} = \left\{ \begin{array}{ll} I_{Port\_PD-2P\_modeB} & \text{for mode } B \\ I_{Port\_PD-2P\_modeA} & \text{for mode } A \end{array} \right\}_A \quad (145-Y6)$$

4 IPort\_PD is the total current on both pairs with the same polarity and is defined in Equation (145-Y7).

5

$$I_{Port\_PD} = \left\{ I_{Port\_PD-2P} + I_{Port\_PD-2P\_other} \right\}_A \quad (145-Y7)$$

7 where

8 IPort\_PD-2P is the input current consumed by mode A or mode B

9 IPort\_PD-2P is the input current consumed by mode B or mode A

10

11 PDs shall be able to support ICon\_PD-2P, the current the PD supports on each powered pairset, as defined in Equation (145-Y8).

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13

**Note part of the baseline**

We could use PClass\_PD/VPD instead of ICon\_PD in Equation 145-7a however the requirements for 4-pairs are better understood with the next introduction using ICon\_PD and ICon\_PD-2P\_unb.

14

15 When powering a single-signature PD over 4 pairs, a PD supports:

16 — A total current of ICon\_PD, defined in Equation (145-Y7a), over both pairs with the same polarity;

17 — A minimum current of ICon\_PD-2P\_unb over one of the pairs of the same polarity under maximum unbalance condition

18 (see 145.3.8.10) in the POWERED state.

$$I_{Con\_PD} = \left\{ \frac{P_{Class\_PD}}{V_{PD}} \right\}_A \quad (145-Y7a)$$

20

21 where

22 PClass\_PD is PClass\_PD as defined in Table 145-28

23 VPD is the voltage on the pairset at the PD PI as defined in 145.1.3.

24

25

$$I_{Con\_PD-2P} = \left\{ \begin{array}{ll} I_{Con\_PD} & \text{when in 2-pair mode} \\ \min \left( I_{Con\_PD} - I_{Port\_PD-2P\_other}, I_{Con\_PD-2P\_unb} \right) & \text{when a single-signature PD is powered in 4-pair mode-2P} \\ \frac{P_{Class\_PD-2P}}{V_{PD}} & \text{when a dual-signature PD is powered in 4-pair mode} \end{array} \right\}_A \quad (145-Y8)$$

27

28 where

29 ICon\_PD is the total current a PD is able to consume as defined in Equation (145-Y7a)

30 VPD is the voltage on the pairset at the PD PI as defined in 145.1.3.

31 IPort\_PD-2P\_other is the output current on the other pairset as defined in Equation (145-Y6).

32 ICon\_PD-2P\_unb is the minimum current due to unbalance effects that a PD must support on a pairset when powering a single-signature PD over 4 pairs as defined in Table 145-28

34 PClass\_PD-2P is PClass\_PD-2P as defined in Table 145-28.

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37 The PD shall support the AC current waveform parameter IPeak\_PD-2P, defined in Equation (145-Y9), on each powered pairset, while within the operating voltage range of VPort\_PD-2P, for a minimum of TCUT\_PD-2P and a duty cycle of at least 5%.

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1 
$$I_{Peak\_PD-2P} = \left\{ \begin{array}{ll} P_{Peak\_PD} / V_{pd} & \text{when in 2-pair mode} \\ \min(P_{Peak\_PD} / V_{pd} - I_{Port\_PD-2P\_other}, I_{Peak\_PD-2P\_unb}) & \text{when a single-signature PD is powered in 4-pair mode} \\ P_{Peak\_PD-2P} / V_{pd} & \text{when a dual-signature PD is powered in 4-pair mode} \end{array} \right\}_A \quad (145-Y9)$$

2

3 where

- 4  $P_{peak\_PD}$  is the total peak power a PD may consume per Table 145-28  
 5  $I_{Port\_PD-2P\_other}$  is the output current on the other pairset as defined in Equation (145-Y6).  
 6  $I_{Peak\_PD-2P\_unb}$  is the minimum current due to unbalance effects a PD must support on a pairset as defined in Table  
 7 145-28 during peak operating power condition. See 145.3.8.4.  
 8  $V_{PD}$  is the voltage on the pairset at the PD PI as defined in 145.1.3.  
 9  $P_{Peak\_PD-2P}$  is the peak power a dual-signature PD may draw per its assigned Class on a pair-set; see Table 145-28

10  
 11  $I_{Peak}$ , defined in Equation (145-Y10), is the total current of the powered pairs with the same polarity that a PD supports,  
 12 when powering a PD over 2-pairs or powering a single-signature PD over 4 pairs.  
 13

14 
$$I_{Peak\_PD} = \left\{ \frac{P_{Peak\_PD}}{V_{PD}} \right\}_A \quad (145-Y10)$$

15

16 where

- 17  $V_{PD}$  is the voltage on the pairset at the PD PI as defined in 145.1.3.  
 18  $P_{Peak\_PD}$  is the total peak power a PD may draw for its Class; see Table 145-28

20 **4. Replace  $T_{cut-2P}$  with  $T_{cut\_PD-2P}$  in the following locations:**

21  **$PD50, PD51, PD52, PD56, PD69$  and  $PD70$ .**

23 **5. Replace the reference to Table 16 with Table 28 in the following locations:  $PD51$  and  $PD56$**

24

