

### 33.3.7.2 Input average power

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For Class 6 or Class 8 PDs,  $P_{Class\_PD}$  is the maximum power the PD shall consume when no additional information is available to the PD regarding actual channel DC resistance. If such a PD has additional information and does not cause the PSE to source more than  $P_{Class}$  it may exceed  $P_{Class\_PD}$ .

#### 33.3.7.2.1 Input average power for certain Class 6 and Class 8 PD's

For Class 6 and Class 8 PDs, when additional information is available to the PD regarding actual channel DC resistance between the PSE PI and the PD PI, the PD may consume greater than  $P_{Class\_PD}$  but shall not consume greater than  $P_{Class}$  at the PSE PI.

### 33.3.7.4 Peak operating power

$V_{Overload-2P}$  is the PD PI voltage when the PD is drawing the permissible  $P_{Peak\_PD}$ .

At any static voltage at the PI, and any PD operating condition, with the exception of Class 6 or Class 8 PDs when additional channel DC resistance information is available to the PD described in 33.3.7.4.1, the peak power shall not exceed  $P_{Class\_PD\ max}$  for more than  $T_{CUT-2P\ min}$ , as defined in Table 33-17 and 5% duty cycle. Peak operating power shall not exceed  $P_{Peak\_PD}$ .

For Class 6 and Class 8 PDs, when additional information is available to the PD regarding actual channel DC resistance, in any operating condition with any static voltage at the PI, the peak power shall not exceed  $P_{Class}$  at the PSE PI for more than  $T_{CUT\ 2P\ min}$ , as defined in Table 33-17 and with 5% duty cycle. NOTE—The duty cycle of the peak current is calculated using any sliding window with a width of 1 s.

Ripple current content ( $I_{Port\_ac}$ ) superimposed on the DC current level ( $I_{Port\_dc}$ ) is allowed if the total input power is less than or equal to  $P_{Class\_PD\ max}$ , or  $P_{Class}$  at the PSE PI for Class 6 and Class 8 PDs.

The RMS, DC and ripple current shall be bounded by Equation (33-25):

$$I_{Port} = \{ \sqrt{(I_{Port\_dc})^2 + (I_{Port\_ac})^2} \}_A \quad (33-25)$$

where

$I_{Port}$	is the RMS input current
$I_{Port\_dc}$	is the DC component of the input current
$I_{Port\_ac}$	is the RMS value of the AC component of the input current

The maximum  $I_{Port}$  value for all PDs except those in Class 6 or Class 8, described in 33.3.7.2.1 and 33.3.7.4.1, over the operating VPort\_PD-2P range shall be defined by Equation (33–26):

$$I_{portmax} = \left\{ \frac{P_{Class\_PD}}{V_{Port\_PD-2P}} \right\}_A \quad (33-26)$$

where

$I_{portmax}$	is the maximum DC and RMS input current
$V_{Port\_PD-2P}$	is the minimum specified input voltage at a PD pairset
$P_{Class\_PD}$	is the maximum power, $P_{Class\_PD\ max}$ , as defined in Table 33–28

Peak power is defined in Table 33–28 and depends on the Class assigned by the PSE. The equations in Table 33–28 are used to approximate the ratiometric peak powers of Class 0 through Class 8. These equations may be used to calculate  $P_{Peak\_PD}$  or  $P_{Peak\_PD-2P}$  for Data Link Layer classification and for Autoclass by substituting  $P_{Class\_PD}$  with PDMaxPowerValue and  $P_{Autoclass\_PD}$  respectively.

*(This last sentence is a topic of another comment...)*

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

#### 33.3.7.4.1 Peak operating power for certain Class 6 and Class 8 PD's

For Class 6 and Class 8 PDs, when additional information is available to the PD regarding actual channel DC resistance **between the PSE PI and the PD PI**, in any operating condition with any static voltage at the PI, the peak power shall not exceed  $P_{Class}$  at the PSE PI for more than  $T_{CUT-2P}$  min, as defined in Table 33–17 and with 5% duty cycle.

Ripple current content ( $I_{Port\_ac}$ ) superimposed on the DC current level ( $I_{Port\_dc}$ ) is allowed if the total input power is less than or equal to  $P_{Class\_PD\ max}$ , or  $P_{Class}$  at the PSE PI for Class 6 and Class 8 PDs. The RMS, DC and ripple current shall be bounded by Equation (33–25):

The maximum  $I_{Port}$  value for all PDs in Class 6 or Class 8, over the operating VPort\_PD-2P range shall be defined by Equation (33–27):

$$I_{portmax} = \left\{ \frac{P_{Class}}{V_{PSE}} \right\}_A \quad (33-27)$$

where

$I_{portmax}$	is the maximum RMS input current
$P_{Class}$	is the allocated Class power as defined in 33.2.7 and Equation (33–2)
$V_{PSE}$	is the voltage at the PSE PI as defined in 1.4.426.

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

### 33.3.7.5 Peak transient current

When the input voltage at the PI is static and in the range of  $V_{Port\_PD}$  defined by Table 33–28, the transient current drawn by a single-signature PD shall not exceed 4.70 mA/μs in either polarity. A dual-signature PD shall not exceed 4.70 mA/μs in either polarity per pairset under the same conditions. This limitation applies after inrush has completed (33.3.7.3) and before the PD has disconnected.

Under normal operating conditions when there are no transients applied at the PD PI, ~~Class 6 or Class 8 PDs, shall operate below the PD extended template defined in Figure 33–38.~~ Single-signature PDs, ~~of all other Classes~~ with the exception of those described in 33.3.7.2.1 and 33.3.7.4.1, shall operate below the PD upperbound template defined in Figure 33–38.

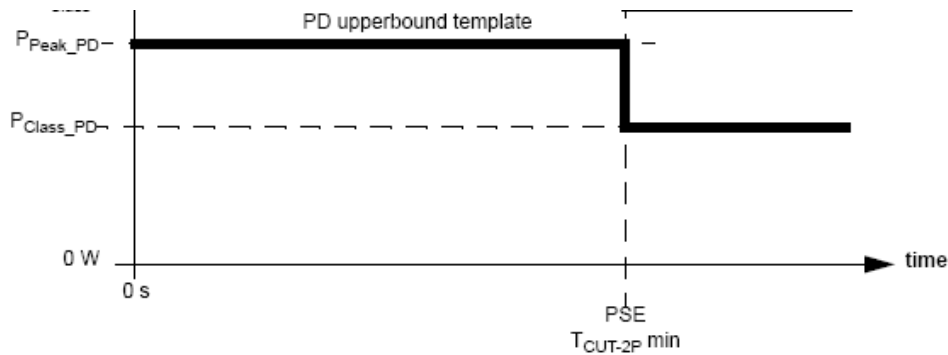


Figure 33–38—Type 1, Type 2, and single-signature PD static operating mask

NOTE—PDs are required to meet Equation (33–2) which results in a slightly lower power and current than results from Figure 33–38, Figure 33–39, Equation (33–27), Equation (33–28) and Equation (33–29).

*(This last line is deleted because PD's must meet  $P_{Class\_PD}$  with or without  $P_{Peak}$  transients...)*

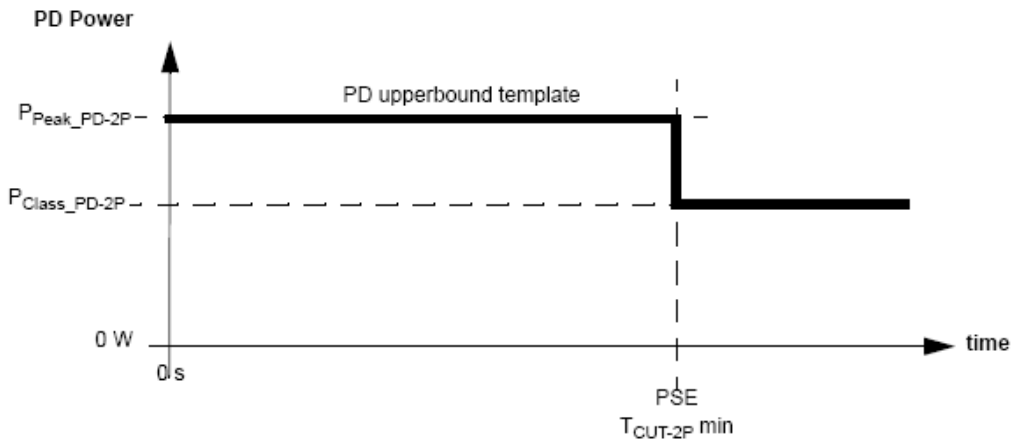
The PD upperbound template in Figure 33–38,  $P_{SSUT}$ , is described by Equation (33–28):

$$P_{SSUT}(t) = \left\{ \begin{array}{l} P_{Peak\_PD} \text{ for } (0 \leq t < T_{CUT-2P} \text{ min}) \\ P_{Class\_PD} \text{ for } (T_{CUT-2P} \text{ min} \leq t) \end{array} \right\}_W \quad (33-28)$$

where

- $t$  is the duration in seconds that the PD sinks  $I_{Port}$
- $P_{Peak\_PD}$  is the peak operating power,  $P_{Peak\_PD} \text{ max}$ , as defined in Table 33–28
- $P_{Class\_PD}$  is the maximum power,  $P_{Class\_PD} \text{ max}$ , as defined in Table 33–28
- $T_{CUT-2P} \text{ min}$  is  $T_{CUT-2P} \text{ min}$ , as defined in Table 33–17

Dual-signature PDs shall operate below the PD upperbound template defined in Figure 33–39. See 33.3.7.2 for details on Class 6 and Class 8 PD allowances.



**Figure 33-39—Dual-signature PD static operating mask**

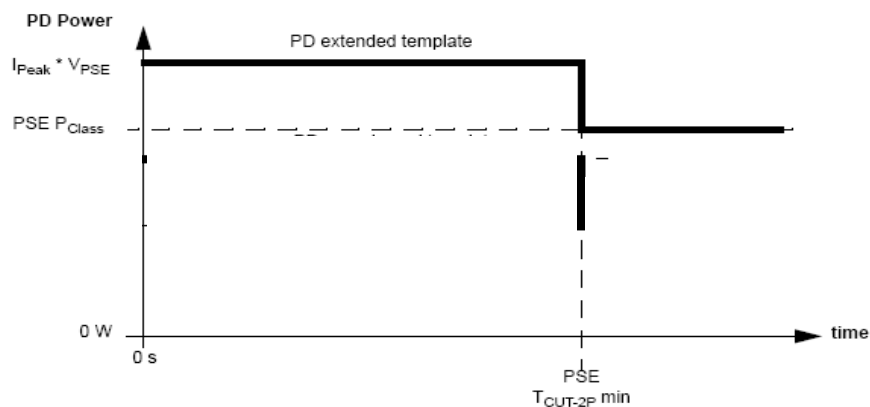
The PD upperbound template in Figure 33-39,  $P_{DSUT}$ , is described by Equation (33-30):

$$P_{DSUT}(t) = \left\{ \begin{array}{l} P_{Peak\_PD-2P} \text{ for } (0 \leq t < T_{CUT-2P \text{ min}}) \\ P_{Class\_PD-2P} \text{ for } (T_{CUT-2P \text{ min}} \leq t) \end{array} \right\}_W \quad (33-30)$$

where

- $t$  is the duration in seconds that the PD sinks  $I_{Port-2P}$
- $P_{Peak\_PD-2P}$  is the peak operating power on a pairset as defined in Table 33-28
- $P_{Class\_PD-2P}$  is the maximum average input power on a pairset as defined in Table 33-25
- $T_{CUT-2P \text{ min}}$  is  $T_{CUT-2P \text{ min}}$ , as defined in Table 33-17

PSE's described in 33.3.7.2.1 and 33.3.7.4.1 shall operate below the PD upperbound template defined in Figure 33-40.



**Figure 33-40 – Class 6 and Class 8 PD's Described in 33.3.7.4.1**

The PD extended template in Figure 33–40, PSSET, is described by Equation (33–29):

$$P_{\text{SSET}}(t) = \left\{ \begin{array}{ll} I_{\text{Peak}} \times V_{\text{PSE}} & \text{for } (0 \leq t < T_{\text{CUT-2P min}}) \\ P_{\text{Class}} & \text{for } (T_{\text{CUT-2P min}} \leq t) \end{array} \right\}_{\text{W}} \quad (33-29)$$

where

$t$	is the duration in seconds that the PD sinks $I_{\text{Port}}$
$I_{\text{Peak}}$	is the peak operating current, $I_{\text{Peak max}}$ , as defined in Equation (33–12)
$V_{\text{PSE}}$	is the voltage at the PSE.
$P_{\text{Class}}$	is the minimum power output by the PSE, as defined in Table 33–11, and 33.2.7.
$T_{\text{CUT-2P min}}$	is $T_{\text{CUT-2P min}}$ , as defined in Table 33–17