

Change: Type 1 and 2 PD SM variable and references from present_class_sig to present_class_sig_A

33.3.6 PD classifications

A PD may be classified by the PSE based on the Physical Layer classification, Data Link Layer (DLL) classification, or a combination of both provided by the PD. The intent of PD classification is to provide information about the maximum power required by the PD during operation. Additionally, classification is used to establish mutual identification between Type 2, Type 3 and Type 4 PSEs and Type 2, Type 3 and Type 4 PDs.

See 33.2.7 for a general description of classification mechanisms. See 33.2.7.3 and 33.3.6.3 for a general description of the optional Autoclass mechanism.

The requested Class of the PD:

- is the Class a PD advertises during Physical Layer classification when connected to a Type 4, Class 8 PSE.
- is the maximum power that a PD draws across all input voltages and operational modes.
- does not limit the maximum amount of power the PD may request from the PSE during Data Link Layer classification (see 33.5) but continues to limit the maximum power that the PD draws.
- is the maximum power that a Type 3 or Type 4 PD shall draw.

Depending on the number of class events produced by the PSE, the assigned Class is equal to or lower than the requested Class. The PD shall conform to the assigned Class, regardless of its requested Class. After a successful DLL classification, the assigned Class changes depending on the value of PDMaxPowerValue variable, as defined in Table 33–24.

PDs shall provide Physical Layer classification. A Type 1 PD shall implement Single-Event classification using any of the class signatures as defined in 33.3.6.1 and Table 33–25. Type 2, Type 3, and Type 4 PDs shall implement Multiple-Event classification as defined in 33.3.6.2 and Table 33–25.

Type 1 PDs and Type 3 Class 1 to 3 PDs optionally provide Data Link Layer classification (see 33.5). Type 2 PDs, Type 3 Class 4 to 6 PDs, Type 4 PDs, and dual-signature PDs shall provide DLL classification.

Table 33–24—Relation of assigned Class and DLL

| PDMaxPowerValue | Assigned Class | PDMaxPowerValue_mode(M) | Assigned Class |
|-----------------|----------------|-------------------------|----------------|
| 1 to 39 | 1 | 1 to 39 | 1 |
| 40 to 65 | 2 | 40 to 65 | 2 |
| 66 to 130 | 3 | 66 to 130 | 3 |
| 131 to 255 | 4 | 131 to 255 | 4 |
| 256 to 400 | 5 | 256 to 400 | 5 |
| 401 to 510 | 6 | | |
| 511 to 620 | 7 | | |
| 621 to 999 | 8 | | |

PD classification behavior

- shall conform to the state diagram in Figure 33–31, Figure 33–32, and Figure 33–33.
- shall conform to the electrical specifications defined in Table 33–25 and Table 33–28.
- shall return class_sig_A or class_sig_B in accordance with the PD requested Class, as specified in Table 33–26 and Table 33–27, with the corresponding classification signatures specified in Table 33–26 and Table 33–27.

A Type 2 PD that does not successfully observe a Multiple-Event Physical Layer classification or Data Link Layer classification shall conform to Type 1 PD power restrictions and shall provide the user with an active indication if underpowered. A Type 3 or Type 4 PD that is assigned to a Class lower than the Class it requested shall provide the user with an active indication if underpowered. The method of active indication is left to the implementer.

Table 33–25—Classification signature, measured at the PD PI

| Parameter | PD Type | Conditions | Minimum | Maximum | Unit |
|-------------------------------|---------|------------------|---------|---------|------|
| Current for class signature 0 | 1, 2 | 14.5 V to 20.5 V | 0.00 | 4.00 | mA |
| Current for class signature 0 | 3, 4 | | 1.00 | 4.00 | |
| Current for class signature 1 | All | | 9.00 | 12.0 | |
| Current for class signature 2 | | | 17.0 | 20.0 | |
| Current for class signature 3 | | | 26.0 | 30.0 | |
| Current for class signature 4 | 2, 3, 4 | | 36.0 | 44.0 | |

33.3.6.1 Type 1 PD Single-Event class signature

Class 0 is the default for Type 1 PDs. However, to improve power management at the PSE, a Type 1 PD may opt to provide a signature for Class 1 to 3.

Type 1 PDs may choose to implement a Multiple-Event class signature and return Class 0, 1, 2, or 3 in accordance with the maximum power draw, P_{Class_PD} .

33.3.6.2 Type 2, Type 3 and Type 4 PD Multiple-event class signature

PDs implementing Multiple-Event Physical Layer classification shall present class_sig_A during DO_CLASS_EVENT1 and DO_CLASS_EVENT2 and class_sig_B during DO_CLASS_EVENT3, DO_CLASS_EVENT4, DO_CLASS_EVENT5 and DO_CLASS_EVENT6, as defined in Table 33–26 and Table 33–27. PDs implementing Autoclass shall present class_sig_0 during DO_CLASS_EVENT_AUTO as defined in 33.3.6.3

Type 2 and single-signature Type 3 and Type 4 PDs shall advertise class signatures according to the PD Type and PD requested Class, based on PD Type, as defined in Table 33-26.

Table 33–26—Physical Layer Classifications and Multiple Event Responses for single-signature PDs

| PD Type | PD Requested | class_sig_A | class_sig_B | P _{Class_PD} (W) ^a |
|---------|--------------|-------------|-------------|--|
| | Class | | | |
| 1 | 0 | 0 | 0 | 13.0 |
| | 1 | 1 | 1 | 3.84 |
| | 2 | 2 | 2 | 6.49 |
| | 3 | 3 | 3 | 13.0 |
| 2 | 4 | 4 | 4 | 25.5 |
| 3 | 1 | 1 | 1 | 3.84 |
| | 2 | 2 | 2 | 6.49 |
| | 3 | 3 | 3 | 13.0 |
| | 4 | 4 | 4 | 25.5 |
| | 5 | 4 | 0 | 40.0 |
| | 6 | 4 | 1 | 51.0 |
| 4 | 7 | 4 | 2 | 62.0 |
| | 8 | 4 | 3 | 71.3 |

NOTE—See Table 33–25 for definition of class signatures 0 to 4.

^aPDs may be assigned to a lower Class than their requested Class, which results in a lower value of P_{Class_PD}.

Dual-signature Type 3 and Type 4 PDs shall advertise class signatures according to the PD Type and PD requested Class on each pairset, as defined in Table 33-27. The requested Class on a pairset is the maximum amount of power requested by the PD on that pairset. Dual-signature PDs may advertise different class signatures on each pairset. A Type 3 or Type 4 dual-signature PD that is powered over only one pairset shall present a valid classification signature on the unpowered pairset.

Table 33–27—Physical Layer Classifications and Multiple Event Responses for dual-signature PDs

| PD Type | PD Requested Class Per Pairset | class_sig_A | class_sig_B | $P_{Class_PD-2P} (W)^a$ |
|---------|--------------------------------|-------------|-------------|--------------------------|
| 3 | 1 | 1 | 0 | 3.84 |
| | 2 | 2 | 0 | 6.49 |
| | 3 | 3 | 0 | 13.0 |
| | 4 | 4 | 0 | 25.5 |
| 4 | 5 | 4 | 3 | 35.6 |

NOTE—See Table 33–25 for definition of class signatures 0 to 4.

^a PDs may be assigned to a lower Class than their requested Class, which results in a lower value of P_{Class_PD-2P} .

A Type 3 and Type 4 single-signature PD shall identify the PSEs assigned Class, as defined in Table 33–13. The default value of `pse_power_level` is 3, which corresponds with one class event. After a successful Multiple-Event Physical Layer classification has completed, the `pse_power_level` variable is set to either 3, 4, 6 or 8. Based on the value of `pse_power_level` and the PDs requested Class, `pd_req_class`, the assigned Class is derived in the variable `pd_max_power`.

A Type 3 and Type 4 dual-signature PD shall identify the PSEs assigned Class, as defined in Table 33–13. The default value of `pse_power_level_mode(M)` is 3, which corresponds with one class event. After a successful Multiple-Event Physical Layer classification has completed, the `pse_power_level_mode(M)` variable is set to either 3, 4, or 5. Based on the value of `pse_power_level_mode(M)` and the PDs requested Class, `pd_req_class_mode(M)`, the assigned Class is derived in the variable `pd_max_power_mode(M)`.

Table 33–28—Multiple-Event Physical Layer classification electrical requirements

| Item | Parameter | Symbol | Units | Min | Max | Additional information |
|-------------|--------------------------------|-----------------|--------------|------------|------------|-------------------------------|
| 1 | Class event voltage | V_{Class} | V | 14.5 | 20.5 | |
| 2 | Mark event voltage | V_{Mark} | V | 6.90 | 10.1 | |
| 3 | Mark event current | I_{Mark} | mA | 0.250 | 4.00 | See 33.3.6.2.1 |
| 4 | Mark event threshold | V_{Mark_th} | V | 10.1 | 14.5 | See 33.3.6.2.1 |
| 5 | Classification reset threshold | V_{Reset_th} | V | 2.81 | 6.90 | See 33.3.6.2.1 |
| 6 | Classification reset voltage | V_{Reset} | V | 0 | 2.81 | See 33.3.6.2.1 |
| 7 | Long first class event timing | T_{LCE_PD} | ms | 75.5 | 87.5 | See 33.3.9 |