33.3.6 PD classifications

See 33.2.7 for a general description of classification mechanisms.

The Physical Layer classification of the PD is the maximum power that a Type 1 or Type 2 PD draws across all input voltages and operational modes. The Class requested by the PD during Physical Layer classification is the maximum power that a Type 3 or Type 4 PD shall draw.

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.

The method of classification depends on the Type of the PD and the Type of the attached PSE.

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

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.

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.

The requested Class of the PD is the maximum amount of power the PD requests from the PSE, as defined in 33.3.6.1 and 33.3.6.2. 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 the Class it requested.

After a successful DLL classification, the assigned Class may change depending on the value of PDMaxPowerValue variable, as defined in Table 33–24.

PDs shall provide the characteristics of a classification signature as specified in Table 33–25 and Table 33–28.

PD classification behavior conforms to the state diagram in Figure 33–31, Figure 33–32 and Figure 33–33.

PDs 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 and the responses specified in Table 33–26 and Table 33–27.

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		

33.3.6.1 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.

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			36.0	44.0	

33.3.6.2 PD Multiple-Event class signature

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}.

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.

The PD's classification behavior shall conform to the electrical specifications defined by Table 33–28.

Type 2 and single-signature Type 3 and Type 4 PDs shall advertise class signatures according to the PD requested Class 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	class_sig_A	class_sig_B	P_{Class_PD} (W) [a]
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.

[a] P_{Class_PD} assumes the assigned Class matches the PD requested Class.

Dual-signature PDs shall advertise a class signature according to the PD requested Class on each pairset as defined in Table 33–27. The Class requested on each pairset is the 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	$P_{Class\_PD\text{-}2P}$ (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] $P_{Class\_PD\text{-}2P}$ assumes the assigned Class matches the PD requested Class.

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