

USB Power Delivery ENGINEERING CHANGE NOTICE

Title: Clarification of PDP levels in Sink Capabilities Extended

**Applied to: USB Power Delivery Specification Revision 3.2
Version 1.0**

Brief description of the functional changes proposed:
Clarify the definitions of Sink Minimum PDP, Sink Operational PDP, EPR Sink Minimum PDP, and EPR Sink Nominal PDP

Benefits as a result of the proposed changes:
Better clarity on the meaning of the different power parameters in Sink Capabilities Extended which should lead to better harmonization between different products

An assessment of the impact to the existing revision and systems that currently conform to the USB specification:
No impact

An analysis of the hardware implications:
No impact

An analysis of the software implications:
No impact

An analysis of the compliance testing implications:
No impact

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Actual Change Requested

(a). Section 6.5.13, Page 260, Table 6.66

From Text:

Offset (Byte)	Field	Value	Description	Offset (Byte)	
0	VID	2	Numeric	Vendor ID (assigned by the USB-IF)	
2	PID	2	Numeric	Product ID (assigned by the manufacturer)	
4	XID	4	Numeric	Value provided by the USB-IF assigned to the product	
8	FW Version	1	Numeric	Firmware version number	
9	HW Version	1	Numeric	Hardware version number	
10	SKEDB Version	1	Numeric	SKEDB Version (not the specification Version): Version 1.0 = 1 Values 0 and 2-255 are Reserved and Shall Not be used	
11	Load Step	1	Bit Field		
				Bit	Description
				1...0	00b: 150mA/μs Load Step (default) 01b: 500mA/μs Load Step 11b...10b: Reserved and Shall Not be used
2...7	Reserved and Shall be set to zero				
12	Sink Load Characteristics	2	Bit field		
				Bit	Description
				0...4	Percent overload in 10% increments Values higher than 25 (11001b) are clipped to 250%. 00000b is the default.
				5...10	Overload period in 20ms when bits 0-4 non-zero.
				11.14	Duty cycle in 5% increments when bits 0-4 are non-zero
15	Can tolerate V _{BUS} Voltage droop				
14	Compliance	1	Bit Field		
				Bit	Description
				0	Requires LPS Source when set
				1	Requires PS1 Source when set
				2	Requires PS2 Source when set
3...7	Reserved and Shall be set to zero				

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15	Touch Temp	1	Value	Temperature conforms to: <ul style="list-style-type: none">0 = Not applicable1 = [IEC 60950-1] (default)2 = [IEC 62368-1] TS13 = [IEC 62368-1] TS2 Note: All other values Reserved	
16	Battery Info	1	Byte	Upper Nibble = Number of Hot Swappable Battery Slots (0...4) Lower Nibble = Number of Fixed Batteries (0...4)	
17	Sink Modes	1	Bit field	Bit	Description
				0	1: PPS charging supported
				1	1: V _{BUS} powered
				2	1: Mains powered
				3	1: Battery powered
				4	1: Battery essentially unlimited
				5	1: AVS Supported
				6...7	Reserved and Shall be set to zero
18	Sink Minimum PDP	1	Byte	Bit	Description
				0...6	The Minimum PDP required by the Sink to operate without consuming any power from its Battery(s) if it has one.
				7	Reserved and Shall be set to zero
19	Sink Operational PDP	1	Byte	Bit	Description
				0...6	The PDP the Sink requires to operate normally. For Sinks with a Battery, it is the PDP Rating of the charger supplied with it or recommended for it.
				7	Reserved and Shall be set to zero
20	Sink Maximum PDP	1	Byte	Bit	Description
				0...6	The Maximum PDP the Sink can consume to operate and charge its Battery(s) if it has one.
				7	Reserved and Shall be set to zero
21	EPR Sink Minimum PDP	1	Byte	The Minimum PDP required by the EPR Sink to operate without consuming any power from its Battery(s) if it has one.	
22	EPR Sink Operational PDP	1	Byte	The PDP the EPR Sink requires to operate normally. For Sinks with a Battery, it is the PDP Rating of the charger supplied with it or recommended for it.	
23	EPR Sink Maximum PDP	1	Byte	The Maximum PDP the EPR Sink can consume to operate and charge its Battery(s) if it has one.	

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To Text:

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23	EPR Sink Maximum PDP	1	Byte	The maximum PDP that the EPR Sink can will ever request to operate and charge its Battery(s) if it has one.
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(b). Section 6.5.13.13, Page 263

From Text:

Sink Minimum PDP

The Sink Minimum PDP field **shall** contain the minimum power required by the Sink, rounded up to the next integer, to operate all its functional modes except charging its battery if present. The Sink Minimum PDP field **shall** be less than or equal to the Sink Operational PDP. The value is used by the Source to determine whether or not it has sufficient power to minimally support the attached Sink. If the Sink is EPR capable and is unable to operate at PDPs less than 100W, it **shall** set this field to zero.

To Text:

Sink Minimum PDP

The Sink Minimum PDP field **shall** contain the Source PDP needed required by the Sink, rounded up to the next integer, to operate all at its lowest level of functionality modes except charging without requiring power from its battery, if present. Battery charging may be an opportunistic feature, however this PDP **should** be designed for basic functionality, not for charging. The Sink Minimum PDP field **shall** be less than or equal to the Sink Operational PDP. The value is used by the Source to determine whether or not it has sufficient power to minimally support the attached Sink. If the Sink is EPR capable and is unable to operate at PDPs less than 100W, it **shall** set this field to zero the minimum power to sustain PD communication.

If the Sink is self-powered, such that it doesn't need power from a Source, then it **shall** set this field to zero.

The Sink Minimum PDP is used to indicate to Shared Capacity Chargers the power that **should** be delivered to the Sink to guarantee at least basic functionality for the end user.

Possible examples of Sink Minimum PDP could be:

- The minimum power a wireless Charger would require in order to detect, and deliver the minimum required amount of power to the attached device.
- The power required to have basic functionality by a Batteryless Sink,
- On a device with a Battery, it can power the minimum functionality of the device

(c). Section 6.5.13.14, Page 263

From Text:

Sink Operational PDP

The Sink Operational PDP field **shall** contain the manufacturer recommended PDP of the Sink, rounded up to the next integer. This corresponds to the PDP Rating of Sources that the Sink is designed to operate with (See Section 10.3.2 "Normative Sink Rules"). The Sink Operational PDP **shall** be sufficient to operate all the Sink's functional modes normally AND charge the Sink's battery if present. For Sinks with a battery(s), it **shall** correspond to the PDP Rating of the charger shipped with the Sink or the recommended charger's PDP Rating. If the Sink is EPR capable and is unable to operate at PDPs less than 100W, it **shall** set this field to zero.

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To Text:

Sink Operational PDP

The Sink Operational PDP field **shall** contain the manufacturer recommended PDP of the Sink, rounded up to the next integer

The Sink Operational PDP field **shall** contain the manufacturer recommended Source PDP that of the Sink manufacturer recommends for the normal functionality of the Sink, rounded up to the next integer. This corresponds to the PDP Rating of Sources that the Sink is designed to operate with (See [Section 10.3.2 “Normative Sink Rules”](#)). The Sink Operational PDP **shall** be sufficient to operate all the Sink’s functional modes normally AND charge the Sink’s battery if present. For Sinks with a battery(s), it **shall** correspond to the PDP Rating of the charger shipped with the Sink or the recommended charger’s PDP Rating. If the Sink is EPR capable and is unable to operate at PDPs less than 100W, it **shall** set this field to zero the minimum power to sustain PD communication.

If the Sink is self-powered, such that it doesn't need power from a Source, then it **shall** set this field to zero.

The Sink Operational PDP is used to indicate to Shared Capacity Chargers that at this power level the user is not expected to receive any performance warning related to the power being supplied to the Sink.

(d). Section 6.5.13.16, Page 264

From Text:

Sink Maximum PDP

The Sink Maximum PDP **shall** be highest amount of power the Sink consumes under any operating condition, rounded up to the next integer, including charging its battery if present. The Sink Maximum PDP field **shall Not** be less than the Sink Operational PDP, but **May** be the same. The value is used by the Source to determine the maximum amount of power it has to budget for the attached Sink. If the Sink is EPR capable and is unable to operate at PDPs less than 100W, it **shall** set this field to zero.

To Text:

Sink Maximum PDP

The Sink Maximum PDP **shall** be highest amount of power PDP the Sink will ever request consumes under any operating condition, rounded up to the next integer, including charging its battery if present. The Sink Maximum PDP field **shall Not** be less than the Sink Operational PDP, but **May** be the same. The value is used by the Source to determine the maximum amount of power it has to budget for the attached Sink. If the Sink is EPR capable and is unable to operate at PDPs less than 100W, it **shall** set this field to zero the minimum power to sustain PD communication.

If sink is self-powered, such that it doesn't need power from a source, then it **shall** set this field to zero.

(e). Section 6.5.13.16, Page 264

From Text:

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EPR Sink Minimum PDP

The EPR Sink Minimum PDP field **shall** contain the minimum power required by an EPR Sink, rounded up to the next integer, to operate all its functional modes except charging its battery if present. The EPR Sink Minimum PDP field **shall** be less than or equal to the EPR Sink Operational PDP. The value is used by the Source to determine whether or not it has sufficient power to minimally support the attached Sink. If the Sink is not EPR capable, this field **shall** be set to zero.

To Text:

EPR Sink Minimum PDP

The EPR Sink Minimum PDP field **shall** contain the **Source PDP needed required** by the Sink, rounded up to the next integer, to operate **all at its lowest level of functionality modes except charging without requiring power from** its battery, if present. **Battery charging may be an opportunistic feature, however this PDP should be designed for basic functionality, not for charging.** The EPR Sink Minimum PDP field **shall** be less than or equal to the EPR Sink Operational PDP. The value is used by the Source to determine whether or not it has sufficient power to minimally support the attached Sink. If the Sink is not EPR capable, **or if the Sink is self-powered, such that it doesn't need power from a Source**, this field **shall** be set to zero.

The EPR Sink Minimum PDP is used to indicate to Shared Capacity Chargers the power that Should be delivered to the Sink to guarantee at least basic functionality for the end user.

Possible examples of EPR Sink Minimum PDP could be:

- The power required to have basic functionality by a Batteryless Sink.**
- On a device with a Battery, it can power the minimum functionality of the device.**

Note: EPR Sink Minimum PDP can be the same as its Sink Minimum PDP.

(f). Section 6.5.13.17, Page 264

From Text:

EPR Sink Operational PDP

The EPR Sink Operational PDP field **shall** contain the manufacturer recommended PDP of the Sink, rounded up to the next integer. This corresponds to the PDP Rating of EPR Sources that the Sink is designed to operate with (See [Section 10.3.2 “Normative Sink Rules”](#)). The EPR Sink Operational PDP **shall** be sufficient to operate all the Sink’s functional modes normally AND charge the Sink’s battery if present. For Sinks with a battery(s), it **shall** correspond to the PDP Rating of the charger shipped with the EPR Sink or the recommended charger’s PDP Rating. If the Sink is not EPR capable, this field **shall** be set to zero.

To Text:

EPR Sink Operational PDP

The EPR Sink Operational PDP field **shall** contain the **manufacturer recommended Source PDP that of the Sink manufacturer recommends for the normal functionality of the Sink**, rounded up to the next integer. This corresponds to the PDP Rating of EPR Sources that the Sink is designed to operate with (See [Section 10.3.2 “Normative Sink Rules”](#)). The EPR Sink Operational PDP **shall** be sufficient to operate all the Sink’s functional modes normally AND charge the Sink’s battery if present. For Sinks with a battery(s), it **shall** correspond to the PDP Rating of the charger shipped with the EPR Sink or the recommended charger’s PDP

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Rating. If the Sink is not EPR capable, or if the Sink is self-powered, such that it doesn't need power from a Source, this field **Shall** be set to zero.

The **EPR Sink Operational PDP** is used to indicate to *Shared Capacity Chargers* that at this power level the user is not expected to receive any performance warning related to the power being supplied to the Sink.

(g). Section 6.5.13.18

From Text:

EPR Sink Maximum PDP

The EPR Sink Maximum PDP **Shall** be highest amount of power the EPR Sink consumes under any operating condition, rounded up to the next integer, including charging its battery if present. The EPR Sink Maximum PDP field **Shall Not** be less than the EPR Sink Operational PDP, but **May** be the same. The value is used by the Source to determine the maximum amount of power it has to budget for the attached Sink. If the Sink is not EPR capable, this field **Shall** be set to zero.

To Text:

EPR Sink Maximum PDP

The EPR Sink Maximum PDP **Shall** be highest amount of power PDP the EPR Sink will ever request consumes under any operating condition, rounded up to the next integer, including charging its battery if present. The EPR Sink Maximum PDP field **Shall Not** be less than the EPR Sink Operational PDP, but **May** be the same. The value is used by the Source to determine the maximum amount of power it has to budget for the attached Sink. If the Sink is not EPR capable, or if the Sink is self-powered, such that it doesn't need power from a Source, this field **Shall** be set to zero.