

USB Type-C ENGINEERING CHANGE NOTICE FORM

Title: Vconn for Power Adapters

Applied to: USB Type-C Specification Release 1.2

Brief description of the functional changes:

Reduce VCONN power requirements for Sources without SuperSpeed signals to 100mW min.
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Benefits as a result of the changes:

Reduced VCONN power requirements allow more manageable solutions for dedicated USB PD power adapters.

An assessment of the impact to the existing revision and systems that currently conform to the USB specification:
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Existing Active Cables that use more than 100mW from Vconn when SuperSpeed signals are not detected would have to be redesigned. Not too many Active Cables have been designed and so the timing is right for this ECN.

An analysis of the hardware implications:
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No issues for Passive Cables that use less than the existing 75mW max power. Active Cables would need to segment their USB PD functionality and their SuperSpeed functionality so as to consume less than 100mW when their SuperSpeed functionality is not in operation.
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An analysis of the software implications:
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None

An analysis of the compliance testing implications:
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Modify VCONN power requirements depending on whether SuperSpeed signals are present or not
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Actual Change

(a). Section 4.4.3 VCONN

From Text:

VCONN is provided by the DFP to power cables with electronics in the plug. VCONN is provided over the CC pin that is determined not to be connected to the CC wire of the cable.

Initially, VCONN shall be sourced on all DFP USB Type-C receptacles that utilize the SSTX and SSRX pins during specific connection states as described in Section 4.5.2.2. Subsequently, VCONN may be removed under some circumstances as described in Table 4-3. VCONN may also be sourced by USB Type-C receptacles that do not utilize the SSTX and SSRX pins as described in Section 4.5.2.2. [USB PD VCONN_Swap](#) command also provides the DFP a means to request that the attached UFP source VCONN

Table 4-3 USB Type-C Source Port's VCONN Requirements Summary

D+/D-	SSTX/SSRX	> 3 A	VCONN Requirements
No	No	No	Not required to source VCONN
Yes	No	No	Not required to source VCONN
Yes	Yes	No	Required to source 1 W. VCONN power may be removed after the source has read the cable's eMarker and has determined that it is not an active cable.
No	No	Yes	Required to source 1 W. VCONN power may be removed after the source has read the cable's eMarker and has determined the cable's current carrying capacity.
Yes	No	Yes	Required to source 1 W. VCONN power may be removed after the source has read the cable's eMarker and has determined the cable's current carrying capacity.
Yes	Yes	Yes	Required to source 1 W. VCONN power may be removed after the source has read the cable's eMarker and has determined the cable's current carrying capacity and that it is not an active cable.

Table 4-4 provides the voltage and power requirements that shall be met for VCONN. See Section 4.9 for more details about Electronically Marked Cables. See Section 5.1 regarding optional support for an increased VCONN power range in Alternate Modes.

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Table 4-4 VCONN Source Characteristics

	Minimum	Maximum	Notes
Voltage	3.0 V	5.5 V	
Power	1.0 W		Source may latch-off VCONN if excessive power is drawn beyond the specified inrush and mode wattage. Source may disable VCONN per Table 4-3 Alternate modes may require higher power.
Power in USB Suspend	70mW		Minimum power Source must provide in USB Suspend. Source may disable VCONN per Table 4-3
Bulk Capacitance	10 μ F	220 μ F	The VCONN source shall disconnect the bulk capacitance from the receptacle when VCONN is powered off.

To aid in reducing the power associated with supplying VCONN, a Source is allowed to either not source VCONN or turn off VCONN under any of the following conditions:

- [Ra](#) is not detected on the CC pin after [tCCDebounce](#) when the other CC pin is in the [SRC.Rd](#) state
- [Ra](#) is not detected on the CC pin after the [tCCDebounce](#) when the other CC pin is in the [SRC.Open](#) state and supports Vconn-powered accessories
- If there is no GoodCRC response to [USB PD](#) Discover Identity messages

Table 4-5 provides the requirements that shall be met for cables that consume VCONN power.

Table 4-5 Cable VCONN Sink Characteristics

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	Minimum	Maximum	Notes
Voltage	3.0	5.5V	Voltage range at which this Table applies
Inrush Capacitance		10 μ F	A cable shall not present more than the equivalent inrush capacitance to the VCONN source. The active cable is responsible for discharging its capacitance.
Power for Electronically Marked Passive Cables		20mW	See Section 4.9 Measured with no USB PD traffic at least 500ms after VCONN applied Note: 75mW max allowed for the first 500ms after VCONN applied.
Power for Active Cables		1.0 W	See Section 5.2
Power for Active Cables in USB Suspend		70mW	Maximum power for active cables in USB suspend. Measured with no USB PD traffic at least 500ms after VCONN applied
.tVCONNDischarge		230ms	Time from cable disconnect to vVCONNDischarge met.
vVCONNDischarge		800mV	VCONN voltage after tVCONNDischarge
vRaReconnect	800mV		Voltage at which the cable shall reapply Ra on the falling edge of VCONN.

The cable shall remove or weaken Ra when VCONN is in the valid voltage range. The cable shall reapply Ra when VCONN falls below vRaReconnect as defined in Table 4-5. The cable shall discharge VCONN to below vVCONNDischarge on a cable disconnect. The cable shall take into account the VCONN capacitance present in the cable when discharging VCONN.

Implementation Note: Increasing Ra to 20KOhm will meet both the power dissipation for Electronically Marked Passive Cables and discharge 10uF to less than vVCONNDischarge in tVCONNDischarge.

The maximum power consumption while in an Alternate Mode is defined by the Alternate Mode.

Table 4-6 VCONN Powered Accessory Sink Characteristics

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	Minimum	Maximum	Notes
Voltage	3.0V	5.5V	Voltage range at which this Table applies
Inrush Capacitance		10 μ F	An accessory shall not present more than the equivalent inrush capacitance to the VCONN source. The accessory is responsible for discharging its capacitance when detached from a port.
Power before Alternate Mode Entry		35mW	Maximum power in USB suspend Note: Power shall be reduced 5s after VCONN is applied if no Alternate Mode Entry has occurred. A VCONN power cycle may be required to re-enable USB-PD communication.
tVCONNDischarge		230ms	Time from cable disconnect to vVCONNDischarge met.
vVCONNDischarge		800mV	VCONN voltage after tVCONNDischarge
vRaReconnect	800mV		Voltage at which the cable shall reapply Ra on the falling edge of VCONN.

The VCONN powered accessory shall remove or weaken Ra when VCONN is in the valid voltage range. The VCONN powered accessory shall reapply Ra when VCONN falls below vRaReconnect as defined in Table 4-6. The VCONN powered accessory shall take into account the VCONN capacitance present in the accessory when discharging VCONN.

The maximum power consumption while in an Alternate Mode is defined by the Alternate Mode.

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To Text:

VCONN is provided by the **Source** to power cables with electronics in the plug. VCONN is provided over the CC pin that is determined not to be connected to the CC wire of the cable.

Initially, VCONN shall be sourced on all **Source** USB Type-C receptacles that utilize the SSTX and SSRX pins during specific connection states as described in Section 4.5.2.2. Subsequently, VCONN may be removed under some circumstances as described in Table 4-3. VCONN may also be sourced by USB Type-C receptacles that do not utilize the SSTX and SSRX pins as described in Section 4.5.2.2. [USB PD VCONN_Swap](#) command also provides the **Source** a means to request that the attached **Sink** source VCONN

Table 4-3 USB Type-C Source Port's VCONN Requirements Summary

D+/D-	SSTX/SSRX	> 3A	VCONN Requirements
No	No	No	Not required to source VCONN
Yes	No	No	Not required to source VCONN
Yes	Yes	No	Required to source 1W. VCONN power may be removed after the source has read the cable's eMarker and has determined that it is not an active cable.
No	No	Yes	Required to source 100mW . VCONN power may be removed after the source has read the cable's eMarker and has determined the cable's current carrying capacity.
Yes	No	Yes	Required to source 100mW . VCONN power may be removed after the source has read the cable's eMarker and has determined the cable's current carrying capacity.
Yes	Yes	Yes	Required to source 1W. VCONN power may be removed after the source has read the cable's eMarker and has determined the cable's current carrying capacity and that it is not an active cable.

Table 4-4 provides the voltage and power requirements that shall be met for VCONN. See Section 4.9 for more details about Electronically Marked Cables. See Section 5.1 regarding optional support for an increased VCONN power range in Alternate Modes.

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Table 4-4 VCONN Source Characteristics

	Minimum	Maximum	Notes
Voltage	3.0 V	5.5 V	
Power for Sources with SuperSpeed Signals	1.0 W		Source may latch-off VCONN if excessive power is drawn beyond the specified inrush and mode wattage Source may disable VCONN per Table 4-3 Alternate modes may require higher power.
Power for Sources in USB Suspend or without SuperSpeed Signals	100mW		Minimum power Source must provide in USB Suspend or without SuperSpeed signals Source may disable VCONN per Table 4-3
Bulk Capacitance	10 μ F	220 μ F	The VCONN source shall disconnect the bulk capacitance from the receptacle when VCONN is powered off.

To aid in reducing the power associated with supplying VCONN, a Source is allowed to either not source VCONN or turn off VCONN under any of the following conditions:

- [Ra](#) is not detected on the CC pin after [tCCDebounce](#) when the other CC pin is in the [SRC.Rd](#) state
- [Ra](#) is not detected on the CC pin after the [tCCDebounce](#) when the other CC pin is in the [SRC.Open](#) state and supports Vconn-powered accessories
- If there is no GoodCRC response to [USB PD](#) Discover Identity messages

Table 4-5 provides the requirements that shall be met for cables that consume VCONN power.

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Table 4-5 Cable VCONN Sink Characteristics

	Minimum	Maximum	Notes
Voltage	3.0	5.5V	Voltage range at which this Table applies
Inrush Capacitance		10 μ F	A cable shall not present more than the equivalent inrush capacitance to the VCONN source. The active cable is responsible for discharging its capacitance.
Power for Electronically Marked Passive Cables		20mW	See Section 4.9 Measured with no USB PD traffic at least 500ms after VCONN applied Note: 75mW max allowed for the first 500ms after VCONN applied.
Power for Active Cables When Connected to a Source with SuperSpeed Signals		1.0 W	See Section 5.2
Power for Active Cables When Connected to a Source without SuperSpeed Signals or in USB Suspend		70mW	Maximum power for active cables in USB suspend or when connected to a Source without SuperSpeed signals Measured with no USB PD traffic at least 500ms after VCONN applied Note: 100mW max allowed for the first 500ms after VCONN applied.
tVCONNDischarge		230ms	Time from cable disconnect to vVCONNDischarge met.
vVCONNDischarge		800mV	VCONN voltage after tVCONNDischarge
vRaReconnect	800mV		Voltage at which the cable shall reapply Ra on the falling edge of VCONN.

The cable shall remove or weaken Ra when VCONN is in the valid voltage range. The cable shall reapply Ra when VCONN falls below vRaReconnect as defined in Table 4-5. The cable shall discharge VCONN to below vVCONNDischarge on a cable disconnect. The cable shall take into account the VCONN capacitance present in the cable when discharging VCONN.

Implementation Note: Increasing Ra to 20KOhm will meet both the power dissipation for Electronically Marked Passive Cables and discharge 10uF to less than vVCONNDischarge in tVCONNDischarge.

The maximum power consumption while in an Alternate Mode is defined by the Alternate Mode.

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Table 4-6 VCONN Powered Accessory Sink Characteristics

	Minimum	Maximum	Notes
Voltage	3.0V	5.5V	Voltage range at which this Table applies
Inrush Capacitance		10 μ F	An accessory shall not present more than the equivalent inrush capacitance to the VCONN source. The accessory is responsible for discharging its capacitance when detached from a port.
Power before Alternate Mode Entry		35mW	Maximum power in USB suspend Note: Power shall be reduced 5s after VCONN is applied if no Alternate Mode Entry has occurred. A VCONN power cycle may be required to re-enable USB-PD communication.
tVCONNDischarge		230ms	Time from cable disconnect to vVCONNDischarge met.
vVCONNDischarge		800mV	VCONN voltage after tVCONNDischarge
vRaReconnect	800mV		Voltage at which the cable shall reapply Ra on the falling edge of VCONN.

The VCONN powered accessory shall remove or weaken Ra when VCONN is in the valid voltage range. The VCONN powered accessory shall reapply Ra when VCONN falls below vRaReconnect as defined in Table 4-6. The VCONN powered accessory shall take into account the VCONN capacitance present in the accessory when discharging VCONN.

The maximum power consumption while in an Alternate Mode is defined by the Alternate Mode.