

USB Power Delivery ENGINEERING CHANGE NOTICE

Title: ECR Source transition

Applied to: USB Power Delivery Specification Revision 3.1

Version 1.6

Brief description of the functional changes proposed:
Sink devices don't need to have monotonicity during source voltage transition. This ECN removes the monotonicity requirement and updates the voltage transition figure to more clearly show voltage boundary over time.

Benefits as a result of the proposed changes:
Remove monocity requirement which can be difficult to achieve and is useless for sink systems.

An assessment of the impact to the existing revision and systems that currently conform to the USB specification:
None

An analysis of the hardware implications:
None

An analysis of the software implications:
None

An analysis of the compliance testing implications:
CTS needs to be updated.

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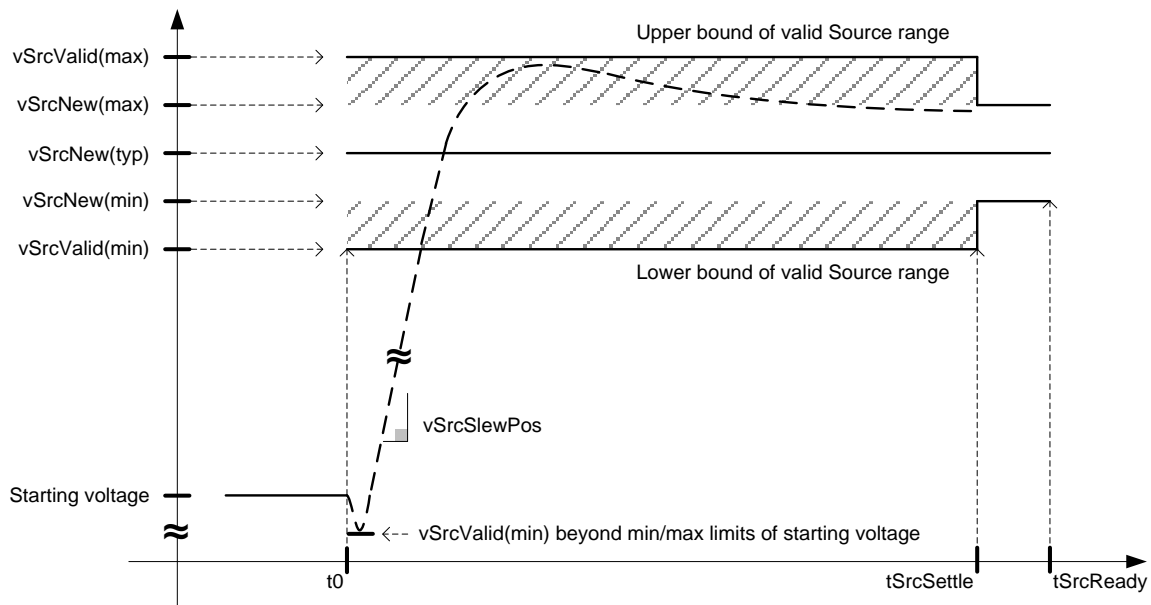
Actual Change Requested (a). Section 7.1.4.1, p.278

From Text:

7.1.4.1.1 Fixed Supply Positive Voltage Transitions

The Source **Shall** transition V_{BUS} from the starting Voltage to the higher new Voltage in a controlled manner. The negotiated new Voltage (e.g., 5V, 9V, 15V, ...) defines the nominal value for $vSrcNew$. During the positive transition the Source **Shall** be able to supply the Sink standby power and the transient current to charge the total bulk capacitance on V_{BUS} . The slew rate of the positive transition **Shall Not** exceed $vSrcSlewPos$. The transitioning Source output Voltage **Shall** settle within $vSrcNew$ by $tSrcSettle$. The Source **Shall** be able to supply the negotiated power level at the new Voltage by $tSrcReady$. The positive Voltage transition **Shall** remain monotonic while the transitioning Voltage is below $vSrcValid$ min and **Shall** remain within the $vSrcValid$ range upon crossing $vSrcValid$ min as shown in Figure 7-2. The starting time, t_0 , in Figure 7-2 starts $tSrcTransition$ after the last bit of the **EOP** of the **GoodCRC** Message has been received by the Source.

Figure 7-1 Transition Envelope for Positive Voltage Transitions



At the start of the positive Voltage transition the V_{BUS} Voltage level **Shall Not** droop $vSrcValid$ min below either $vSrcNew$ (i.e., if the starting V_{BUS} Voltage level is not $vSafe5V$) or $vSafe5V$ as applicable. Section 7.1.14 lists transitions that are exempt from the $vSrcSlewPos$ limit.

To Text:

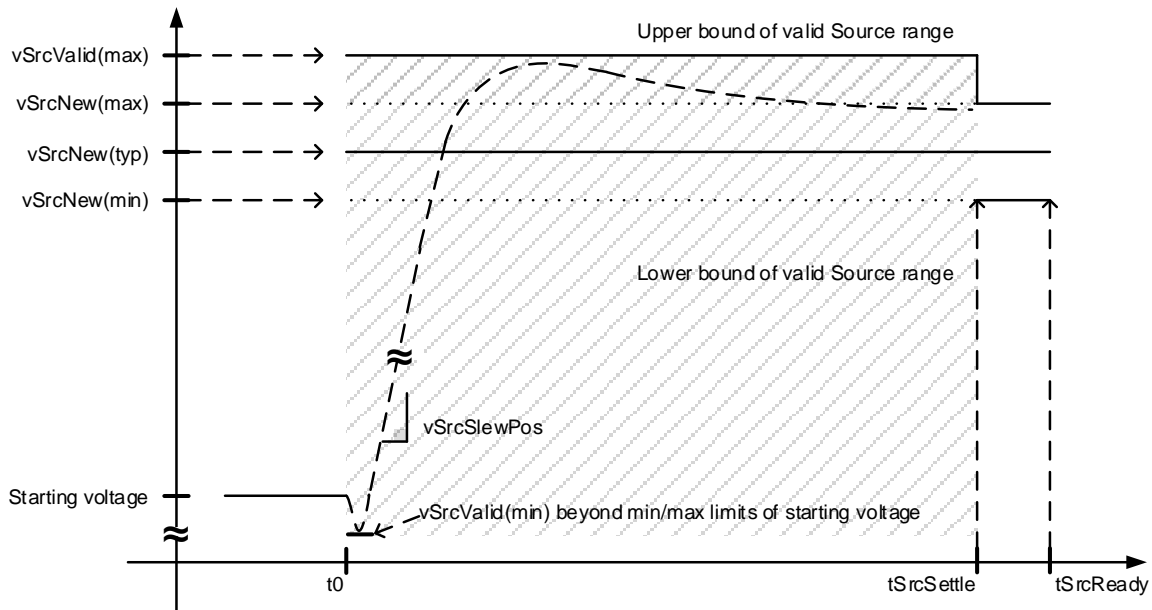
7.1.4.1.1 Fixed Supply Positive Voltage Transitions

The Source **Shall** transition V_{BUS} from the starting Voltage to the higher new Voltage in a controlled manner. The negotiated new Voltage (e.g., 5V, 9V, 15V, ...) defines the nominal value for $vSrcNew$. During the positive transition the Source **Shall** be able to supply the Sink standby power to charge the total bulk capacitance on V_{BUS} . The slew rate of the positive transition **Shall Not** exceed $vSrcSlewPos$. The transitioning Source output Voltage **Shall** settle within $vSrcNew$ by $tSrcSettle$. The Source **Shall** be able to supply the negotiated power level at the new Voltage by $tSrcReady$. The positive Voltage transition **Shall** remain monotonic while the transitioning Voltage is below above $vSrcValid$ min of the previous contract and below $vSrcValid$ max of the new contract

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(figure 7-2) The voltage **Shall** settle to **vSrcNew** within **tSrcSettle**. The starting time, t_0 , in Figure 7-2 starts **tSrcTransition** after the last bit of the **EOP** of the **GoodCRC** Message has been received by the Source.

Figure 7-2 Transition Envelope for Positive Voltage Transitions



At the start of the positive Voltage transition the V_{BUS} Voltage level **Shall Not** droop **vSrcValid** min below either **vSrcNew** (i.e., if the starting V_{BUS} Voltage level is not **vSafe5V**) or **vSafe5V** as applicable. Section 7.1.14 lists transitions that are exempt from the **vSrcSlewPos** limit.

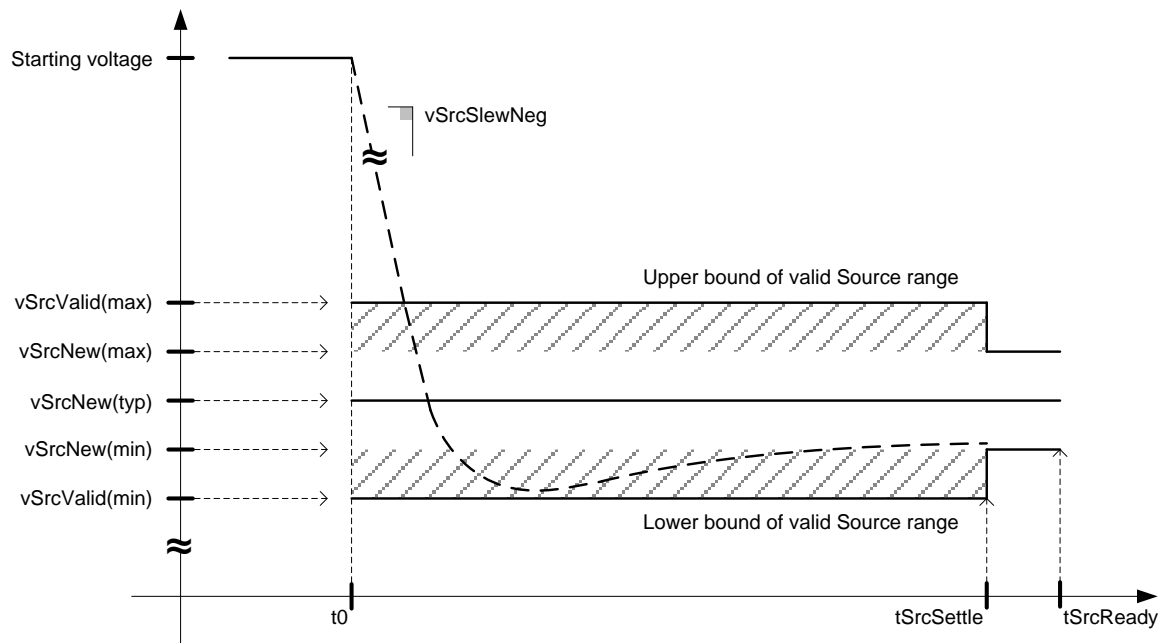
From Text:

7.1.4.1.2 Fixed Supply Negative Voltage Transitions

Negative Voltage transitions are defined as shown in Figure 7-3 and are specified in a similar manner to positive Voltage transitions. Figure 7-3 does not apply to **vSafe0V** transitions. The slew rate of the negative transition **Shall Not** exceed **vSrcSlewNeg**. The negative Voltage transition **Shall** remain monotonic while the transitioning Voltage is above **vSrcValid** max and **Shall** remain within the **vSrcValid** range upon crossing **vSrcValid** max as shown in Figure 7-3. The starting time, t_0 , in Figure 7-3 starts **tSrcTransition** after the last bit of the **EOP** of the **GoodCRC** Message has been received by the Source.

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Figure 7-3 Transition Envelope for Negative Voltage Transitions



If the newly negotiated Voltage is **vSafe5V**, then the **vSrcValid** limits **Shall** determine the transition window and the transitioning Source **Shall** settle within the **vSafe5V** limits by **tSrcSettle**. Section 7.1.14 lists transitions that are exempt from the **vSrcSlewNeg** limit.

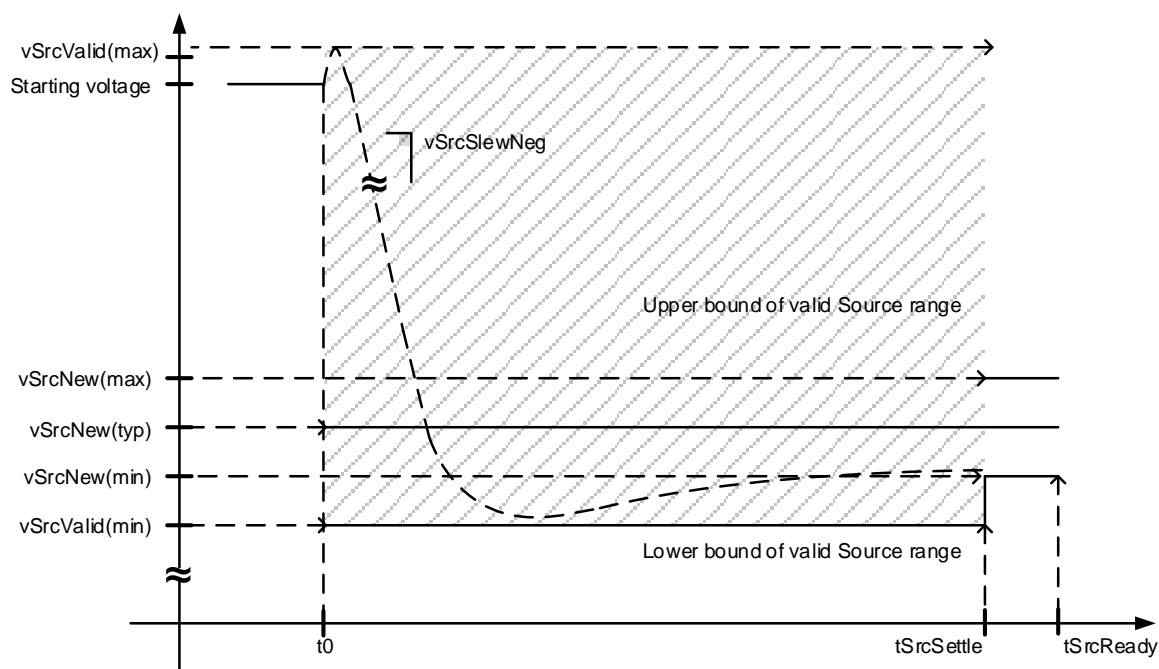
To Text:

7.1.4.1.2 Fixed Supply Negative Voltage Transitions

Negative Voltage transitions are defined as shown in Figure 7-3 and are specified in a similar manner to positive Voltage transitions. Figure 7-3 does not apply to **vSafe0V** transitions. The slew rate of the negative transition **Shall Not** exceed **vSrcSlewNeg**. The negative Voltage transition **Shall** remain monotonic while the transitioning Voltage is above **vSrcValid-max** and **Shall** remain below **vSrcValid** max of the previous contract and above **vSrcValid** min of the new contract, as shown in Figure 7-3. The transitioning Source output Voltage **Shall** settle to **vSrcNew** within **tSrcSettle**. The starting time, t_0 , in Figure 7-3 starts **tSrcTransition** after the last bit of the **EOP** of the **GoodCRC** Message has been received by the Source.

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Figure 7-4 Transition Envelope for Negative Voltage Transitions



If the newly negotiated Voltage is **vSafe5V**, then the **vSrcValid** limits **Shall** determine the transition window and the transitioning Source **Shall** settle within the **vSafe5V** limits by **tSrcSettle**. Section 7.1.14 lists transitions that are exempt from the **vSrcSlewNeg** limit.