USB4 1.0 ENGINEERING CHANGE NOTICE FORM

Title: Sideband Electrical Requirements Update
Applied to: USB4 Specification Version 1.0

Brief description of the functional changes:

1) Separate the SBTX/SBRX max voltage target between steady-state and transaction modes
2) Added max target for rise-time/fall-time (65ns)
3) Extend SBX_UI range from 1000 ± 20ns to 1000 ± 30ns
4) General clarifications

Benefits as a result of the changes:

In correspondence to the above description:

1) The maximum allowed SBTX voltage is only 5mV larger than 3.3V supply + 5% variation which is common in many platforms. The intention is to allow some margin during transaction mode without impacting the reliability considerations (since the transaction mode duration is negligible compared to the steady-state mode)
2) Added max rise-time target for better defining the valid range for reliable sampling
3) Slightly relaxing the SBX_UI spec

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:

None

USB4 1.0 ENGINEERING CHANGE NOTICE FORM

Actual Change

(a). Table 3-1 SBTX and SBRX Specifications, Page 76

From Text:

Symbol	Description	Min	Max	Units	Conditions
$SBTX_{VOH}$	SBTX High Voltage	2.4	3.47	Volts	SBTXIOH = −600 µA (set by 3.4 V/0.5 MΩ). See Note 1.
$SBTX_{VOL}$	SBTX Low Voltage	−0.05	0.4	Volts	SBTXIOL = 600 µA (set by 3.4 V/ 10 KΩ). See Note 1.
$SBRX_{VIH}$	SBRX High Voltage Detection	2.0	3.72	Volts	See Note 2, Note 6.
$SBRX_{VIL}$	SBRX Low Voltage Detection	−0.3	0.65	Volts	See Note 7.
$SBRX_{IIH}$	SBRX High input current	--	25	µA	Vin = VDD.
$SBRX_{IIL}$	SBRX Low input current	--	0.4	µA	Vin = 0 V.
SBX_{TRTF}	SBTX/SBRX 10-90% Rise/Fall time	3.5	--	ns	Minimum to reduce crosstalk and EMI. See Note 3.
$SBTX_{PULL\_UP\_RES}$	SBTX pull-up resistor	7.0K	10.5K	Ω	See Note 4.
$SBRX_{PULL\_DOWN\_RES}$	SBRX pull-down resistor	0.70M	1.05M	Ω	See Note 5.
$SBTX_{SOURCE\_IMPEDANCE}$	SBTX output impedance	25	90	Ω	
SBRX_Cin	SBRX Input Capacitance	--	8	pF	
SBX_UI	UI duration	980	1020	ns	

Notes:

1. This parameter shall be verified in both transaction and steady state. The steady state condition shall be measured with a continuous high or low level. The transaction state condition shall be measured when sending SBX data. Over/undershoot shall be ignored.
2. A buffer may be used between the connector and the Router to meet these logic levels. When present, this buffer shall meet SBRXVIH and SBRXVIL as defined above.
3. Verify this parameter in transaction and not from power down to power up. The minimum is specified to control crosstalk and EMI.
4. A Router shall terminate the SBTX signal to 3.3 V nominal power.
5. A Router shall terminate the SBRX signal to GND.
6. Logical high maps to VIH.
7. Logical low maps to VIL.

To Text:

Symbol	Description	Min	Max	Units	Conditions
$SBTX_{VOH}$	SBTX High Voltage	2.4	3.47 (max1) 3.52 (max2)	Volts	~~SBTXIOH = −600 µA (set by 3.4 V/0.5 MΩ).~~ See Notes 1, 2.
$SBTX_{VOL}$	SBTX Low Voltage	−0.05	0.4	Volts	~~SBTXIOL = 600 µA (set by 3.4 V/ 10 KΩ).~~ See Notes 1, 2.
$SBRX_{VIH}$	SBRX High Voltage Detection	2.0	3.72 (max1) 3.77 (max2)	Volts	See Note 1, 2~~, Note 6.~~
$SBRX_{VIL}$	SBRX Low Voltage Detection	−0.3	0.65	Volts	See Note 2 ~~Note 7.~~
$SBRX_{IIH}$	SBRX High input current	--	25	µA	Vin = ~~VDD~~3.3 V See Note 3~~.~~
$SBRX_{IIL}$	SBRX Low input current	--	0.4	µA	Vin = 0 V~~.~~ See Note 4
SBX_{TRTF}	SBTX/SBRX 10-90% Rise/Fall time	3.5	65	ns	~~Minimum to reduce crosstalk and EMI.~~ See Note ~~3~~5.
$SBTX_{PULL\_UP\_RES}$	SBTX pull-up resistor	7.0K	10.5K	Ω	See Note ~~4~~6.
$SBRX_{PULL\_DOWN\_RES}$	SBRX pull-down resistor	0.70M	1.05M	Ω	See Note ~~5~~7.
$SBTX_{SOURCE\_IMPEDANCE}$	SBTX output impedance	25	90	Ω	
SBRX_Cin	SBRX Input Capacitance	--	8	pF	Note ~~8~~8
SBX_UI	UI duration	~~980~~970	~~1020~~1030	ns	Note ~~9~~9

Notes:

1. This parameter shall be verified in both transaction and steady state. $SBTX_{VOH}$ and $SBRX_{VIH}$ (min, max1) shall be measured in ~~The~~ steady state condition ~~shall be measured~~ with ~~a~~ continuous high ~~or low~~ level, and (min, max2) shall be measured in transaction mode.~~ The transaction state condition shall be measured when sending SBX data.~~ Over/undershoot shall be ignored.
2. A buffer may be used between the connector and the ~~Router~~ SBU transceiver to meet the required ~~se logic~~ voltage levels. ~~When present, this buffer shall meet SBRXVIH and SBRXVIL as defined above.~~
3. Intended to limit the voltage drop on the SBRX input due to current through the SBTX pull-up resistor
4. Intended to limit the voltage on the SBRX pull-down resistor when the cable is disconnected

~~3.~~5. Verify this parameter in transaction and not from power down to power up. The minimum is specified to control crosstalk and EMI.

~~4.~~6. A Router shall terminate the SBTX signal to 3.3 V nominal power.

~~5.~~7. A Router shall terminate the SBRX signal to GND.

~~6. Logical high maps to VIH.~~

~~Logical low maps to VIL.~~

8. When operating with a Bi-directional Re-timer or linear re-driver in a TBT3 Active Cable, the SBTX will be loaded by ~~22~~*SBRx_Cin. One Cin on the Router SBRX and ~~one~~one in the legacy TBT3 Active Cable or the Linear re-driven Active Cable. See Figure 13-1.

~~7.~~9. SBX_UI corresponds to the instantaneous period of the ~~of the~~ SBU signal and not to the average period.