# USB 3.1 ENGINEERING CHANGE NOTICE FORM

## Title: TSEQ Clarifications
## Applied to: USB3.1

| **Brief description of the functional changes:** |
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| Clarification of transmit equalization measurement method. Clarification only; no functional change. |

| **Benefits as a result of the changes:** |
| --- |
| The change minimizes risk of incorrect TxEQ designs and/or interpretations of compliance testing results. |

| **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:** |
| --- |
| Minimizes risk of incorrect TxEQ designs and/or interpretations of compliance testing results. |

| **An analysis of the software implications:** |
| --- |
| No impact. |

| **An analysis of the compliance testing implications:** |
| --- |
| Minimizes risk of incorrect TxEQ designs and/or interpretations of compliance testing results. |

# USB 3.1 ENGINEERING CHANGE NOTICE FORM

## Actual Change

### (a) From Text (and location): In section 6.7.5.2

**Table** Error! No text of specified style in document.**-1. Gen 2 Transmitter Equalization Settings**

| Parameter | Value | Comments |
|---|---|---|
| Preshoot (dB) | 2.2±1.0 | Normative requirement |
| De-emphasis (dB) | -3.1±1.0 | Normative requirement |
| $C_{-1}$ | -0.083 | Informative – for reference only |
| $C_1$ | -0.125 | Informative – for reference only |
| Nominal Boost (dB) | 4.7 | Informative – for reference only |
| Va/Vd | 0.834 | Informative – for reference only |
| Vb/Vd | 0.584 | Informative – for reference only |
| Vc/Vd | 0.750 | Informative – for reference only |

Measurement of the preshoot and de-emphasis is done using CP13, CP14 and CP15. Va, Vc and Vb are obtained using CP13, CP14 and CP15 as shown in Figure 6-23. Preshoot and de-emphasis are calculated using equations (10) and (11).

(10) $$preshoot = 20\log_{10}\left(V_{CP14}/V_{CP15}\right) = 20\log_{10}\left(\frac{-C_{-1}+C_0+C_1}{C_{-1}+C_0+C_1}\right)$$

(11) $$deemphasis = 20\log_{10}\left(V_{CP15}/V_{CP13}\right) = 20\log_{10}\left(\frac{C_{-1}+C_0+C_1}{C_{-1}+C_0-C_1}\right)$$

# USB 3.1 ENGINEERING CHANGE NOTICE FORM

## (a) To Text (and location): In section 6.7.5.2

**Table** Error! No text of specified style in document.**-2. Gen 2 Transmitter Equalization Settings**

| Parameter | Value | Comments |
|---|---|---|
| Preshoot (dB) | 2.2±1.0 | Normative requirement |
| De-emphasis (dB) | -3.1±1.0 | Normative requirement |
| $C_{-1}$ | -0.083 | Informative – for reference only |
| $C_1$ | -0.125 | Informative – for reference only |
| Nominal Boost (dB) | 4.7 | Informative – for reference only |
| Va/Vd | 0.834 | Informative – for reference only |
| Vb/Vd | 0.584 | Informative – for reference only |
| Vc/Vd | 0.750 | Informative – for reference only |

It is not possible to obtain a direct measurement of Va and Vc, because these portions of the waveform are 1 UI wide and therefore subject to attenuation by the interconnect channel. Instead the Va and Vc values are obtained by transmitting compliance patterns where the desired Va or Vc voltage occurs during the Vb interval. The compliance patterns CP13, CP14 and CP15 are used to obtain Va, Vc and Vb, respectively, as shown in Figure 6-23. Preshoot and de-emphasis are calculated using equations (10) and (11).

(10) $$preshoot = 20\log_{10}\left(V_{CP14}/V_{CP15}\right) = 20\log_{10}\left(\frac{-C_{-1}+C_0+C_1}{C_{-1}+C_0+C_1}\right)$$

(11) $$deemphasis = 20\log_{10}\left(V_{CP15}/V_{CP13}\right) = 20\log_{10}\left(\frac{C_{-1}+C_0+C_1}{C_{-1}+C_0-C_1}\right)$$