Application Note

TUSB212 to TUSB216I Transition Guide

ABSTRACT

This document defines pin out and functional differences between the TUSB212 and the new TUSB216I and highlights the schematic bill of materials (BOM) changes needed to convert existing system designs from using the TUSB212 to the TUSB216I.

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1 Pinout Comparison

Table 1-1 lists the changes in the pin definitions of the TUSB212 and TUSB216I devices, and highlights pin configurations that might require change when using the TUSB216I to replace the TUSB212 in an existing system.

Table 1-1. TUSB212 to TUSB216I Schematic BOM Changes

Pin	TUSB212	TUSB216I	Schematic BOM Change Notes
1	D1M	D1M	No change required
2	D1P	D1P	No change required
3	SDA	SDA	GPIO mode: no change required
			I^2C mode: no change required, To enable I2C: add a 4.7 kΩ pullup to 3.3 V (or 2 kΩ pullup to 1.8 V for the TUSB216I) and connect to master SDA.
4	CD	SCL/CD	GPIO Mode: no change required, recommend to connect pin to a test point on the PCB.
			I^2C mode: no change required, To enable I2C: add a 4.7 kΩ pull up to 3.3 V (or 2 kΩ pullup to 1.8 V for the TUSB216I) and connect to master SCL.
5	RSTN	RSTN	No change required
6	EQ	BOOST	**BOM**: pull-down resistor value might need to change for optimal tuning.
7	D2P	D2P	No change required
8	D2M	D2M	No change required
9	DC_BOOST/ENA_HS	RX_SEN/ENA_HS	**BOM**: populated resistor option might need to change for optimal tuning. Recommend to connect pin to a test point on the PCB.
10	GND	GND	No change required
11	VREG	CDP_ENZ	No change required if CDP is not in use. Add 10-K pull-down to enable CDP mode.
12	VCC	VCC	No change required

2 VCC, RSTN, and GND pins

No changes are required for VCC, RSTN, and GND pins. TUSB216I accepts wider VCC range (2.3 V-6.5 V). TUSB212 only supports 3.3 V power supply.

3 USB Data Pins

No changes are required for D1P, D1M, D2P, or D2M pins. Both TUSB212 and TUSB216I require D1P/M to be shorted to D2P/M underneath the device. Ensure that polarity is conserved.

4 EQ vs. BOOST Pins

TUSB216I BOOST function combines the TUSB212 EQ (AC Boost) and DC Boost functionality into one setting. The ideal TUSB216I BOOST setting is dependent upon the signal chain loss characteristics of the target platform. The recommendation is to start evaluation with BOOST level 0, and then increment to BOOST level 1, and so on. For the TUSB216I to recognize any change to the BOOST pin setting, the RSTN pin must be toggled.

Please note that the optimal EQ level on a TUSB212 implementation will not necessarily be the optimal BOOST setting for a TUSB216I implementation.

For both devices, pin 6 is sampled after Power-On Reset or de-assertion of the RSTN pin.

5 DC_BOOST vs. RX Sensitivity (RX_SEN)

The TUSB216I has a 3-level RX_SEN setting (pin 9) to help recover signals in high loss environments. The mid RX_SEN setting is used in most applications with typical USB 2 signal amplitudes. Tuning this setting is recommended when the expected signal as seen at TUSB216I USB data pins amplitude is outside the normal range.

The recommendation is to start with mid RX_SEN setting and then move to high or low settings based on the signal amplitude as measured at the TUSB216I. For example, if the signal amplitude is low after the signal traverses a very long cable, use the high RX_SEN setting. For the TUSB216I to recognize any change to the RX_SEN setting, the RSTN pin must be toggled.

The TUSB212 has a 3-level DC_BOOST function on pin 9. Please note that the optimal DC_BOOST level on a TUSB212 implementation will not necessarily be the optimal RX_SEN setting for a TUSB216I implementation.

For both devices, pin 9 is sampled after Power-On Reset or de-assertion of the RSTN pin and becomes the ENA_HS status output afterwords. TI recommends to connect the ENA_HS signal to a test point on the PCB, so the output can be used for debug if needed.

6 SDA and SCL/CD Pins

The SDA and SCL/CD pins have not changed from the TUSB212 to the TUSB216I. Installing 4.7-kΩ pullups to 3.3 V (or 2-kΩ pullups to 1.8 V for the TUSB216I) enables I2C mode in both TUSB212 and TUSB216I. If the redriver is not configured to use I^2C, these pins can be left unconnected.

TI recommends to connect the SCL/CD signal to a test point on the PCB, so the CD output can be used for debug if needed.

7 VREG vs CDP_ENZ Pins

In TUSB212 the VREG pin requires a 0.1-µF external capacitor to GND to stabilize the 1.8V core. When using TUSB216I, the external capacitor is no longer required. It is still acceptable, however, to connect the external capacitor to the CDP_ENZ pin.

TUSB216I includes an optional feature to enable an internal BC1.2 CDP controller for battery charging applications. If not required this pin can be left unconnected, and TUSB216I's internal 500 kΩ pull-up will disable the BC1.2 controller. To enable BC1.2 CDP mode, use a 10 kΩ pull-down resistor to GND. TUSB216I's CDP_ENZ is sampled after Power-On Reset or de-assertion of the RSTN pin.