

TUSB1046-DCI Schematic Checklist

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ABSTRACT

The TUSB1046-DCI, a VESA USB Type-C™ Alt Mode redriving switch supporting USB 3.0 Gen 2 data rates up to 10 Gbps and DisplayPort 1.4 up to 8.1 Gbps for downstream facing port (Host). The device is used for configurations C, D, E, and F from the VESA DisplayPort Alt Mode on USB Type-C Standard Version 1.1. This schematic checklist shows a brief explanation of each device pin. This schematic checklist gives the recommended configuration of the device pin for default operation in a USB 3.0 Gen 2 + DisplayPort Application. Use this information to check the connectivity for each TUSB1046-DCI on a system schematic.

This document aids design at the system level for general applications. It should not be the only resource used. In addition to this list, customers are advised to use the information in the TUSB1046-DCI datasheet, TUSB1046-DCI EVM User's Guide and associated documents to gain a full understanding of device functionality. Project collateral discussed in this application report can be downloaded from the following URL: www.ti.com/lit/zip/SLLA401.

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1 TUSB1046-DCI Schematic Checklist

Table 1. TUSB1046-DCI Schematic Checklist

Pin Name	Pin Number(s)	Pin Description	Recommendation
Power Pins			
VCC	1, 6, 20, 28	3.3 V (±10%) Positive Power Supply	Single 100nF decoupling capacitor on each VCC pin (pins 1, 6, 20, 28) to GND.
GND	THERMAL PAD	Ground	Connected to Ground.
Configuration Pins			
EQ0	38	I2C_EN = 0, Control pin for USB 3.1 Downstream Facing Ports equalization. 4 level input pin.	I2C_EN = 0, Connect 1 KΩ (±5%) pull-down resistor to GND for 0.2 dB of gain at 2.5GHz. See Table 7 of datasheet for additional configurations.
EQ1	35		
DPEQ0/A1	14	4 level input pin. I2C_EN = 0, Control pin for DisplayPort Lanes equalization, used with DPEQ1. I2C_EN != 0, Sets the TUSB1046-DCI I2C address.	I2C_EN = 0, Connect 1 KΩ (±5%) pull-down resistor to GND for 1.0 dB of gain at 4.05 GHz. See Table 7 of datasheet for additional configurations. I2C_EN != 0, Leave pin floating for I2C slave address 0x12.
DPEQ1	2	4 level input pin. I2C_EN = 0, Control pin for DisplayPort Lanes equalization, used with DPEQ0/A1.	I2C_EN = 0, Connect 1 KΩ (±5%) pull-down resistor to GND for 1.0 dB of gain at 4.05 GHz. See Table 7 of datasheet for additional configurations.
SSEQ0/A0	11	4 level input pin. I2C_EN = 0, Control pin for USB 3.1 Upstream Facing Port equalization, used with SSEQ1. I2C_EN != 0, Sets the TUSB1046-DCI I2C address.	I2C_EN = 0, Leave pin floating for 0.5 dB of gain at 2.5 GHz. I2C_EN != 0, Leave pin floating for I2C slave address 0x12.
SSEQ1	3	4 level input pin. Control pin for USB Upstream Facing Port equalization, used with SSEQ0/A0.	I2C_EN = 0, Connect 1 KΩ (±5%) pull-down resistor to GND for 0.5 dB of gain at 2.5 GHz.
FLIP/SCL	21	Failsafe pin. 2 level input pin. I2C_EN = 0, Flip control pin. I2C_EN != 0, I2C clock pin.	I2C_EN = 0, Connect 1 KΩ (±5%) pull-down resistor to GND for No flip configuration or Connect to orientation control on PD controller. I2C_EN != 0, Connect 2 KΩ (±5%) pull-up to I2C master's VCC I2C supply.
CTL0/SDA	22	Failsafe pin. 2 level input pin. I2C_EN = 0, USB3.1 Switch control pin. I2C_EN != 0, I2C data pin.	I2C_EN = 0, Connect 1 KΩ (±5%) pull-up resistor to VCC to enable One Port USB 3.1 capability or connectUSB3.1 Enable control on PD controller. See Table 2 in datasheet for more configurations. I2C_EN != 0, Connect 2 KΩ (±5%) pull-up to I2C master's VCC I2C supply.

Table 1. TUSB1046-DCI Schematic Checklist (continued)

Pin Name	Pin Number(s)	Pin Description	Recommendation
CTL1/HPDIN	23	Failsafe pin. 2 level input pin. I2C_EN = '0', this pin enables or disables DisplayPort functionality. I2C_EN != 0, DisplayPort functionality is enabled and disabled through I2C registers.	I2C_EN = 0, Connect 1 K Ω (\pm 5%) pull-up resistor to VCC to enable Displayport capability or connect to DisplayPort Enable control on PD controller. See Table 2 in datasheet for more configurations. I2C_EN != 0, Connect to HPD pin on sink Displayport connector.
CAD_SNK/RSVD1	29	I2C_EN = 0, this pin is CAD_SNK. I2C_EN != 0, this pin is reserved. Leave open if not used.	I2C_EN = 0, Connect 1 K Ω (\pm 5%) pull-down resistor to VCC to enable AUX snoop. I2C_EN != 0, this pin is reserved, leave no connected.
HPDIN/RSVD2	32	I2C_EN = 0, this pin is an input for Hot Plug Detect received from DisplayPort sink. I2C_EN != 0, this pin is reserved.	I2C_EN = 0, Connect to HPD pin on sink Displayport connector. I2C_EN != 0, this pin is reserved, leave no connected.
I2C_EN	17	I2C Programming Mode or GPIO Programming Select. 4 level input pin.	Connect 1 K Ω (\pm 5%) pull-down resistor to GND to enable GPIO mode. Connect 1 K Ω (\pm 5%) pull-up resistor to VCC to enable I2C (3.3V) mode. See datasheet for other pin options.
USB Data Lines			
RX1p	30	Differential output pair for DisplayPort or differential input pair for USB3.1 Downstream Facing port.	No AC coupling capacitor on RX1p/n. See Table 4 in datasheet for Input to Output Mapping based on CTL1, CTL0, FLIP pins.
RX1n	31		
TX1p	33	Differential output pair for DisplayPort or USB3.1 downstream facing port.	220 nF AC coupling capacitor to USB Type-C Receptacle TX1p/n. See Table 4 in datasheet for Input to Output Mapping based on CTL1, CTL0, FLIP pins.
TX1n	34		
RX2p	40	Differential output pair for DisplayPort or differential input pair for USB3.1 Downstream Facing port.	No AC coupling capacitor on RX2p/n. See Table 4 in datasheet for Input to Output Mapping based on CTL1, CTL0, FLIP pins.
RX2n	39		
TX2p	37	Differential output pair for DisplayPort or USB3.1 downstream facing port.	220 nF AC coupling capacitor to USB Type-C Receptacle TX2p/n. See Table 4 in datasheet for Input to Output Mapping based on CTL1, CTL0, FLIP pins.
TX2n	36		
SSRXp	5	Differential output pair for USB3.1 upstream facing port	220 nF AC coupling capacitor to USB 3.1 Host SSRXp/n. See Table 4 in datasheet for Input to Output Mapping based on CTL1, CTL0, FLIP pins.
SSRXn	4		
SSTXp	8	Differential input pair for USB3.1 upstream facing port.	220 nF AC coupling capacitor to USB 3.1 Host SSTXp/n. See Table 4 in datasheet for Input to Output Mapping based on CTL1, CTL0, FLIP pins.
SSTXn	7		
Displayport Data Lines			
DP0p	9	DP Differential input pair for DisplayPort Lane 0	220 nF AC coupling capacitor to DisplayPort source DP_ML0p/n. See Table 4 in datasheet for Input to Output Mapping based on CTL1, CTL0, FLIP pins.
DP0n	10		
DP1p	12	DP Differential input pair for DisplayPort Lane 1	220 nF AC coupling capacitor to DisplayPort source DP_ML1p/n. See Table 4 in datasheet for Input to Output Mapping based on CTL1, CTL0, FLIP pins.
DP1n	13		
DP2p	15	DP Differential input pair for DisplayPort Lane 2	220 nF AC coupling capacitor to DisplayPort source DP_ML2p/n. See Table 4 in datasheet for Input to Output Mapping based on CTL1, CTL0, FLIP pins.
DP2n	16		
DP3p	18	DP Differential input pair for DisplayPort Lane 3	220 nF AC coupling capacitor to DisplayPort source DP_ML3p/n. See Table 4 in datasheet for Input to Output Mapping based on CTL1, CTL0, FLIP pins.
DP3n	19		
Additional Data Lines			
SBU1	27	Side Band Use (SBU) used for Alternative Mode operation	DC couple to the SBU1/2 pin on the Type-C receptacle with 2-M Ω resistor to GND.
SBU2	26		
AUXp	24	DisplayPort AUX positive channel. This pin along with AUXn is used by the TUSB1046-DCI for AUX snooping and is routed to SBU1/2 based on the orientation of the Type-C.	Connected to the DisplayPort source via 100 nF AC coupling capacitor with a 100K resistor to GND between TUSB1046-DCI and AC coupling capacitor.
AUXn	25	DisplayPort AUX negative channel. This pin along with AUXp is used by the TUSB1046-DCI for AUX snooping and is routed to SBU1/2 based on the orientation of the Type-C.	Connected to the DisplayPort source via 100 nF AC coupling capacitor with a 100K resistor to DP_PWR (3.3V) between TUSB1046 and AC coupling capacitor.
Notes: Routing through ESD or common mode choke before receptacle is allowed and recommended. Common mode chokes placed as close as possible to the USB connectors. Verify the pinout of the USB connectors. Verify pin-out of TUSB1046-DCI matches datasheet. Always refer to the datasheet of this device for complete descriptions of each pin.			

2 References

- [TUSB1046-DCI USB Type-C™ DisplayPort™ ALT Mode 10 Gbps Linear Redriver Crosspoint datasheet](#)
- [TUSB1046 USB Type-C™ Enabler Evaluation Module](#)
- [Alternate Mode for USB Type-C™: Going Beyond USB](#)
- [Strengthening the USB Type-C signal chain through redrivers](#)

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