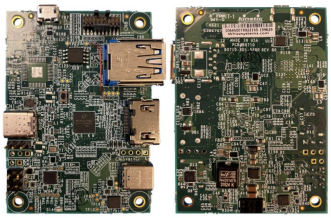
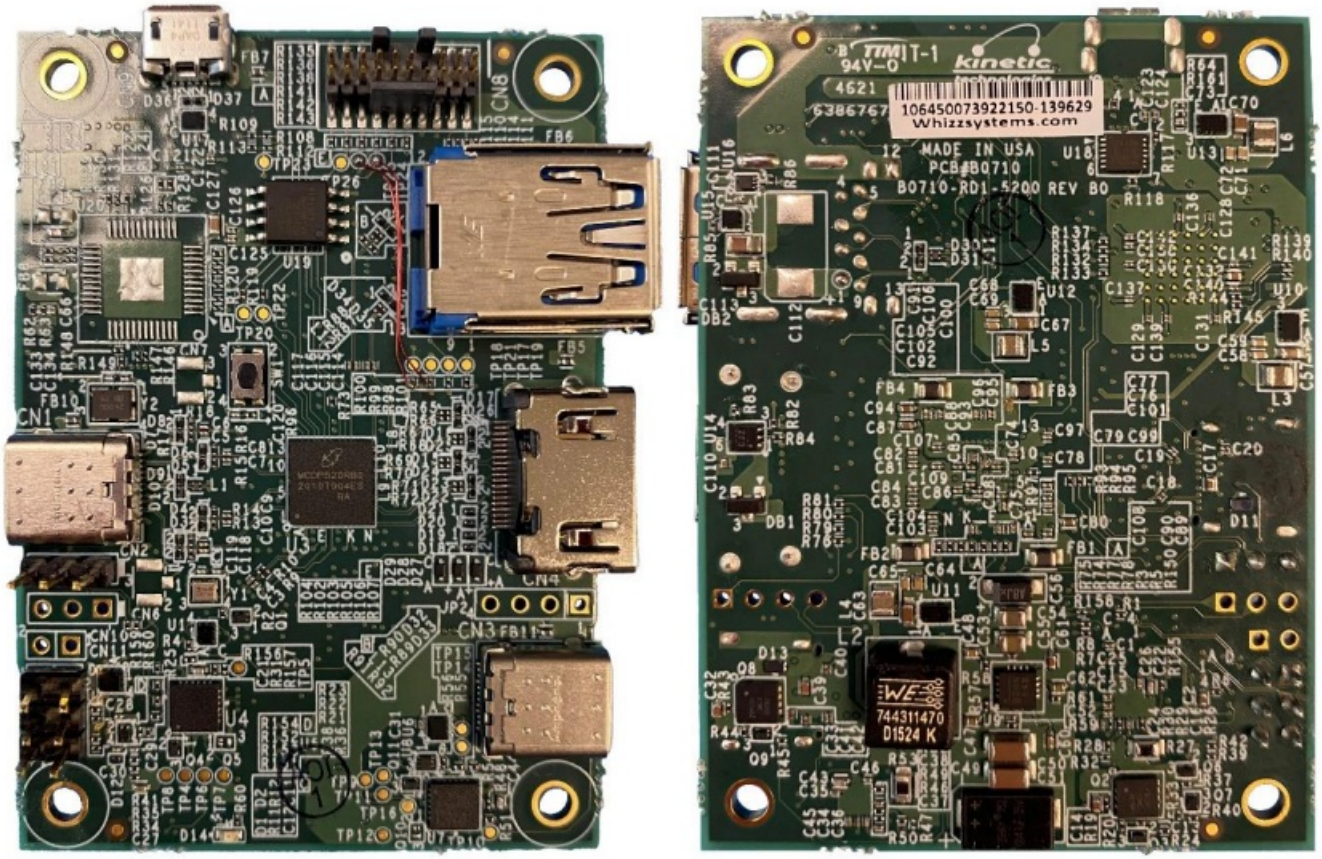


Kinetic MCDP5200 USB Type-C DP Alt Converter User Manual

Kinetic MCDP5200 USB Type-C DP Alt Converter



Contents

General Description

The MCDP5200 is an advanced USB Type-C / DisplayPort1.4a to HDMI converter with an integrated USB type-C de-multiplexer, targeted primarily for Mobile Notebook accessory and display applications. This device functions as a DP to HDMI protocol converter with a HDCP1.x/ HDCP2.x repeater function.
The MCDP5200 has a USB Type C DP Alt mode Upstream Facing Port (UFP), supporting Billboard functionality. The four high speed lanes of UFP can receive DP1.4a MST audio-video and USB3.1 Gen2 data streams simultaneously. The input lane mapping is flexible and meets the USB Type-C connector flip orientation requirements. The incoming DP and USB signals are de-multiplexed, retimed, and transmitted on the Downstream Facing Ports (DFP). The MCDP5200 consists of a USB DFP port with USB3.1 TX and RX pair and an audio-video DFP port configured as DC coupled HDMI/DVI port, each with four high-speed lanes.

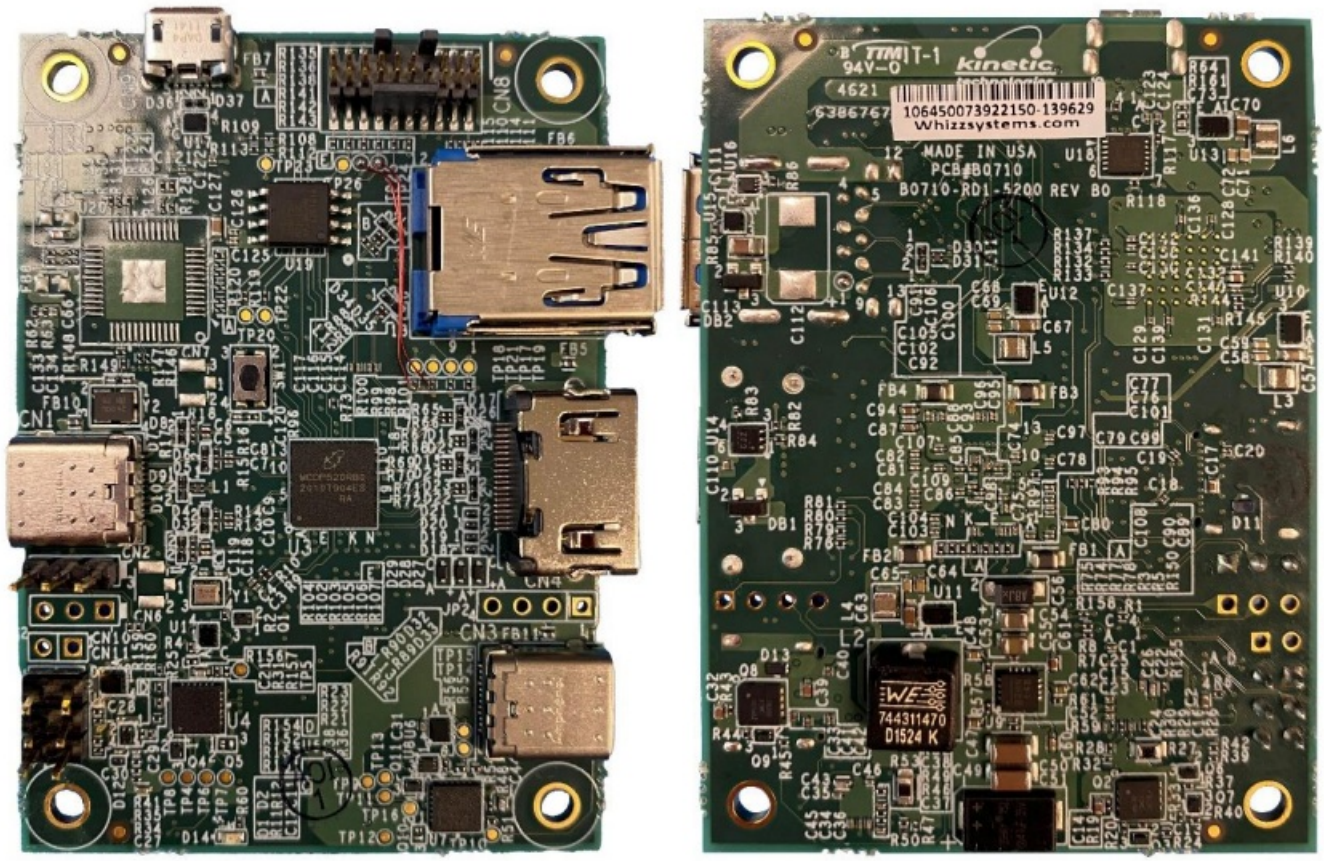
Ordering Information

Part Number	Description	IC Package
RD1-5200	MCDP5200 RD1 Evaluation Kit	LFBGA77-169

Detailed functionality of the IC is described in the MCDP5200 datasheet. Included in the kit are the following items:

Item #	Description	Quantity
1	Fully assembled printed circuit board	1
1	Reference Design Evaluation kit manual	1

EVAL Kit Photo



Evaluation Board Features

Design Features

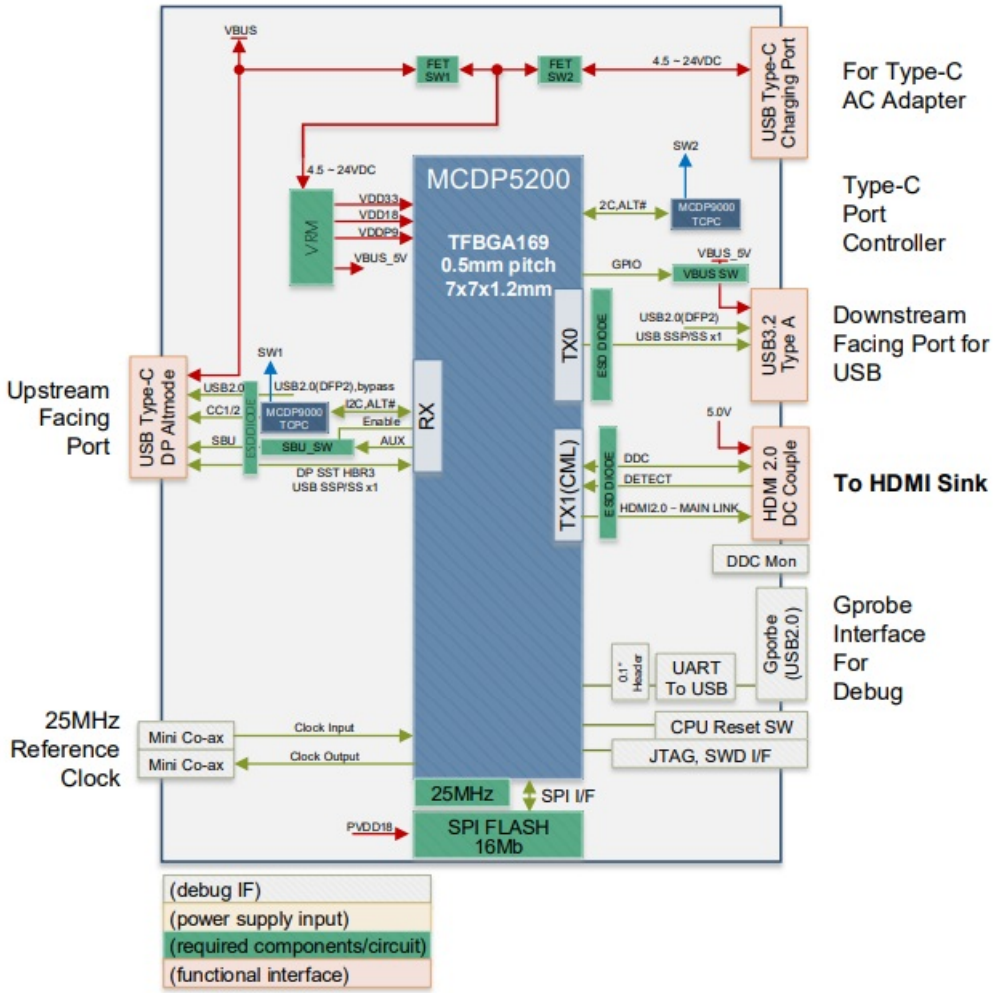
- **DUT: MCDP5200**
- **Board Name: RD1-5200**
- **Power Supply**
  - DC5V Input = Barrel Jack, USB Type-C (5V/3A mode) in alternative use, with over voltage protection (trip voltage 6.2~7.0V)
- **Interfaces**
  - Input: USB Type-C Alt mode support
    - Display Port: 1.62 / 2.74 / 5.4 / 8.1 Gbps, 1 /2 / 4 lane configuration
    - USB3.2 : 5Gbps, 10Gbps x1 operation
    - USB2: (bypassed to DFP)
  - Output: HDMI2.0b with HDMI Type-A Connector as DFP
    - If UFP port is configured as 4L DP mode, then 600 MHz(max) TMDS character clock, 6Gbps(max) can be supported

        - If UFP port is configured as USB3 + 2L DP mode, then up to 540MHz TMDS character clock can be supported. 4k2k60Hz resolution can be achieved in either reduced blanking, YUV420 or with the DSC functionality
    - Output: USB3.2 SSPx1 operation with USB Type-A Connector as DFP
        - 5Gbps/10Gbps
    - CPU Reset: 1x Push switch
    - Charging Port: USB type-C Receptacle
        - Handling voltage can be up to 20VDC as Power Delivery specification.
        - USB PD: Through UFP USB C and DFP USB C (up to 65W) Dual Role
- **Components**
    - MCDP9000 (USB PD3.0 Type-C Port Controller)
    - Small crystal operation: 25MHz with 2016 size (metric)
    - 16Mbit SPI Flash: MX25R1635FM2IH2 (default) or compatibles1 .
    - Protection Circuit2
        - **ESD Diodes on**
            - RX: High Speed Line and AUX/HPD
            - TX1(HDMI): High Speed Line and DDC
            - TX0(USB3 SSP): High Speed Line
            - Pin header of G-Probe Interface (debug use)
        - **Over current protection**
            - 1.5A@VBUS: USB Type-A(DFP)
            - 0.3A@Trip of poly-fuse (resettable fuse): HDMI +5V power supply
            - 1.0A@Trip of poly-fuse: for external G-Probe card
    - External reference resistor: 5.36kΩ ± 1% ohm
- **VRM Block (Power Distribution Network)**
    - Lower cost components and smaller space
    - DCDC converter circuit compliant with noise requirement (<20mVpp)
    - Self-contained over-current protection circuit
    - Discharging load capacitors
- **Interfaces for debug:**
    - 1x G-Probe Interface on USB Micro-B connector (UART signals can be bypassed to external GProbe card)
    - 1x JTAG(SWD) interface with J-Link 19pin
    - Trace pins of JTAGE interface are option
    - 1x HDMI DDC pins (DC coupled) on DFP
    - 1x Reference clock output with u-coax connector (Hirose U.FL)
    - 1x Reference clock input path with u-coax connector (Hirose U.FL)
    - 1x 6pin connector for TEST mode and VPP(6V) Power Supply
    - 1x Bootstrap pin header

System Overview

Functional Block Diagram

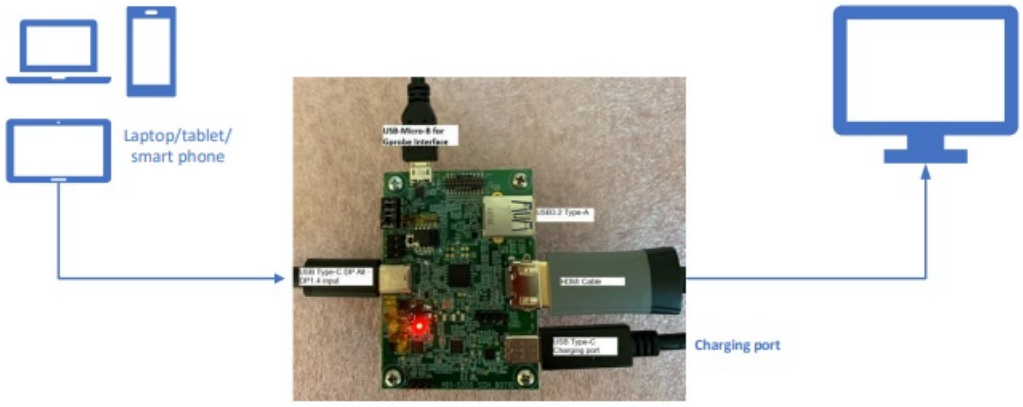
Figure 1. Functional Block Diagram



Connection Setup

1. Connect USB Type C cable
2. Connect HDMI Cable
3. [optional] Connect USB Type C Charging port: MCDP5200 RD1 USB PD (through UFP USB C and DFP USB C Dual Role)
4. [optional]: USB3.2 Type A: Downstream Facing Port for USB supports (USB2.0, USB3.x Gen1/Gen2).
5. USB Type A-to-C cable can also be used to connect to USBC 2.0 / 3.x Gen1/Gen2 devices.

Figure 2. Connection Setup



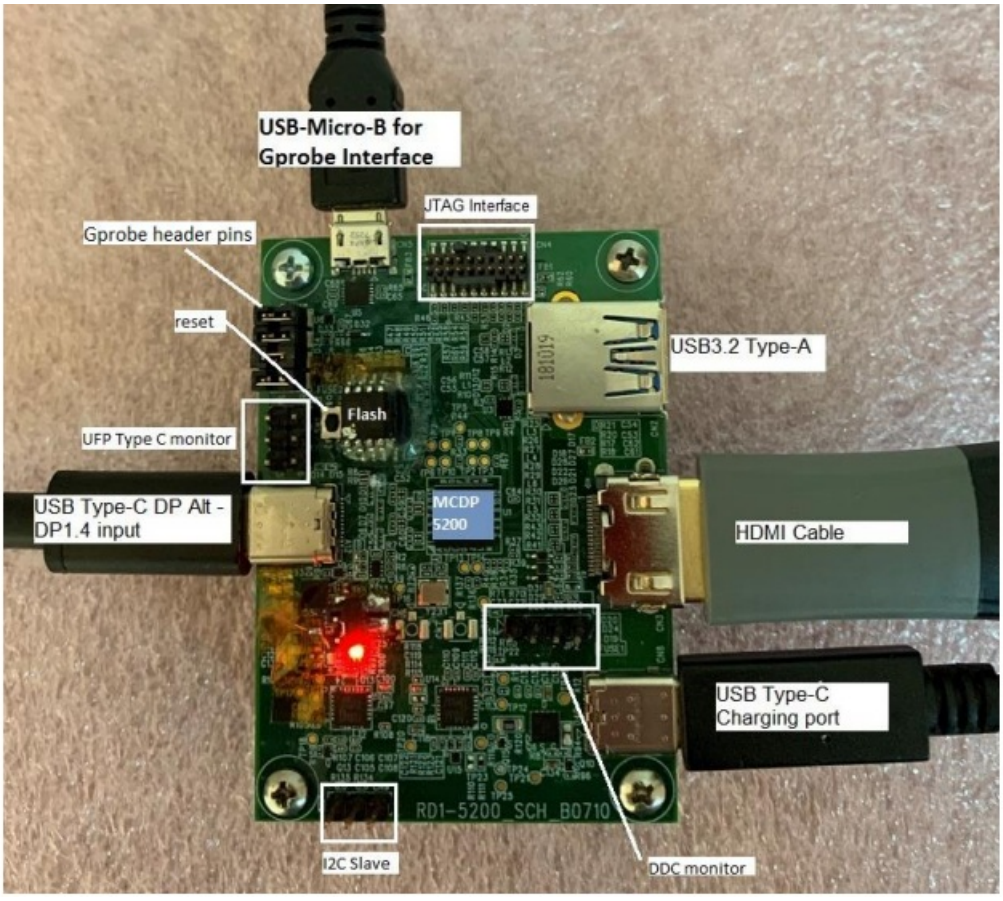
Diagnosis

If the image does not come up, follow the steps below for diagnosis.
Note: The diagnosis requires the Kinetics' GProbe software.

1. Install the GProbe diagnostic tool on a computer and set the baud rate to 115,200.
2. Connect a micro-USB cable to the CN5 connector as shown in figure2-3 (the board has a USB-UART for Gprobe Interface
3. Install the necessary driver FTDI drivers (USB to UART) and connect to the computer with the Gprobe software
4. Hit the Reset button on the board. You will see the firmware version and date of firmware in the GProbe window. This indicates the DP receiver IC is functional. If the message does not appear, contact Kinetic for further assistance.

Connector Layout

Figure 3. Connector Layout



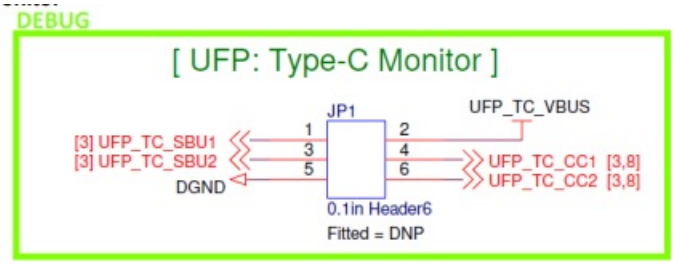
MFP Pin Assignment

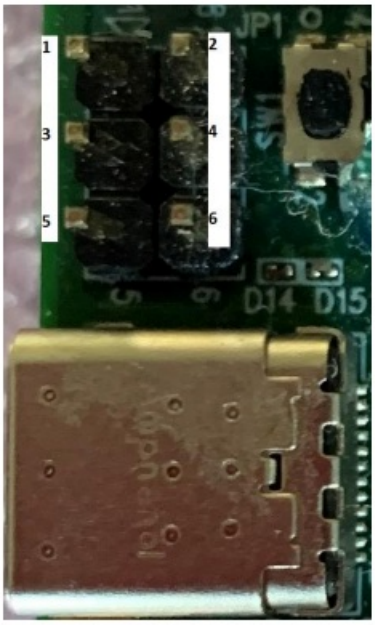
Figure 4. MFP Pin Assignment on the Board Except for High Speed Signal

Mustang - pin definitions for board design -						RD1 (TC to HDMI/USB-A + Charge) 2019/4/25				
			MUSTANG B0	MUSTANG B0						
Original List #	Functional List #	GPIO Sort	Mustang Ballout V07.xls Internal Name	Mustang Ballout V07.xls External Name		Primary Function (Default Function)	Secondary Function	Internal PD/PU change for primary	DIR change for primary	Description
92	2	H1	GPIO1_I2C_SCL	I2C_SCL_GPIO1	DIGITAL3.3V / 5V TOLLERANT OPEN-DRAIN I/O	MCDP9000-UFP.SCL (PU to 3.3V(A0)&1.8V(B0))		PU	OUT	MCDP9000 VDDIO=3.3V(A0),3.3V(B0)
80	3	G2	GPIO2_HPD_OUT	UFP_HPD_OUT	DIGITAL 1.8V I/O	SBU Isolation Switch	-			
79	4	G1	GPIO3_PCONF0	I2CM_SDA_PCONF0	DIGITAL3.3V / 5V TOLLERANT OPEN-DRAIN I/O	MCDP9000-UFP.Alert#				MCDP9000 VDDIO=3.3V(A0),1.8V(B0)
66	5	F1	GPIO4_PCONF1	I2CM_SCL_PCONF1	DIGITAL3.3V / 5V TOLLERANT OPEN-DRAIN I/O	MCDP9000-CHG.Alert# (Level-shifter, 3.3(A0)&1.8(B0)) and used for PU bias of I2C				MCDP9000 VDDIO=3.3V(A0),1.8V(B0) Wake enabled, & I2C Master Pup bias.
53	6	E1	GPIO5_PPOL	ALERTN_PPOL	DIGITAL3.3V / 5V TOLLERANT OPEN-DRAIN I/O	MCDP9000-UFP.Enable			OUT (LOW guaranteed pin)	MCDP9000 VDDIO=3.3V(A0),3.3V(B0)
76	7	F11	GPIO6_SIO0	DBUG0_GPIO6	DIGITAL 1.8V I/O	JTAG.SWCLK_TCK				
91	8	G13	GPIO7_SIO1	DBUG1_GPIO7	DIGITAL 1.8V I/O	JTAG.SWDIO_TMS				
78	9	F13	GPIO8_URX	URX_GPIO8	DIGITAL 1.8V I/O	UART.RX	JTAG.TDI			
77	10	F12	GPIO9_UTX	UTX_GPIO9	DIGITAL 1.8V I/O	BS5:.UART.TX	JTAG.SWO_TDO			
119	11	K2	GPIO10_DFP_CEC	CEC_GPIO10	DIGITAL3.3V / 5V TOLLERANT OPEN-DRAIN I/O	HDMITX.CEC (27K PU)	-			
90	12	G12	DFP_CONFIG1	DFP_CONFIG1	DIGITAL3.3V / 5V TOLLERANT OPEN-DRAIN I/O	CONFIG1 (PU for HDMI)				
104	13	H13	GPIO12	GPIO12	DIGITAL 1.8V I/O	DFP TA_VBUS SWITCH			OUT	Enable when retimer is ready.
103	14	H12	GPIO13	GPIO13	DIGITAL 1.8V I/O					
117	15	J13	GPIO14	GPIO14	DIGITAL 1.8V I/O	MCDP9000-CHG.SDA (PU to 3.3V(A0)&1.8V(B0))		DISABLE		MCDP9000 VDDIO=3.3V(A0),1.8V(B0)
116	16	J12	GPIO15	GPIO15	DIGITAL 1.8V I/O	MCDP9000-CHG.SCL (PU to 3.3V(A0)&1.8V(B0))	JTAG.TRCLK	DISABLE		MCDP9000 VDDIO=3.3V(A0),1.8V(B0)
130	17	K13	GPIO16	GPIO16	DIGITAL 1.8V I/O	BS6:.JTAG.TRD0	JTAG.TRD0			
129	18	K12	GPIO17	GPIO17	DIGITAL 1.8V I/O		JTAG.TRD1			
143	19	L13	GPIO18	GPIO18	DIGITAL 1.8V I/O	BS8:.JTAG.TRD2	JTAG.TRD2			
142	20	L12	GPIO19	GPIO19	DIGITAL 1.8V I/O	MCDP9000-CHG.Enable	JTAG.TRD3		OUT	MCDP9000 VDDIO=3.3V(A0),1.8V(B0)
26	21	B13	SPI_HOLD_SIO3	SPI_HOLD	DIGITAL 1.8V I/O	SPI_HOLD				
64	22	E12	SPI_WPN_SIO2	SPI_WPN	DIGITAL 1.8V I/O	SPI_WPN				
51	23	D12	SPI_MISO_SIO1	SPI_DI	DIGITAL 1.8V I/O	SPI_DI				
52	24	D13	SPI_MOSI_SIO0	SPI_DO	DIGITAL 1.8V I/O	BS4: SPI_DO	-			
38	25	C12	SPI_CSN	SPI_CSN	DIGITAL 1.8V I/O	SPI_CSN				
39	26	C13	SPI_CLK	SPI_CLK	DIGITAL 1.8V I/O	BS2: SPI_CLK	-			
105	27	J1	DFP_DDC_SDA	DFP_DDC_SDA	DIGITAL3.3V / 5V TOLLERANT OPEN-DRAIN I/O	HDMITX.DDC_SDA				
118	28	K1	DFP_DDC_SCL	DFP_DDC_SCL	DIGITAL3.3V / 5V TOLLERANT OPEN-DRAIN I/O	HDMITX.DDC_SCL				
120	29	K3	DFP_HPD_IN	DFP_HPD_IN	DIGITAL3.3V / 5V TOLLERANT OPEN-DRAIN I/O	HDMITX.DETECT (47K PD)				
89	30	G11	TEST	TEST	DIGITAL 1.8V I/O	GND as datasheet				

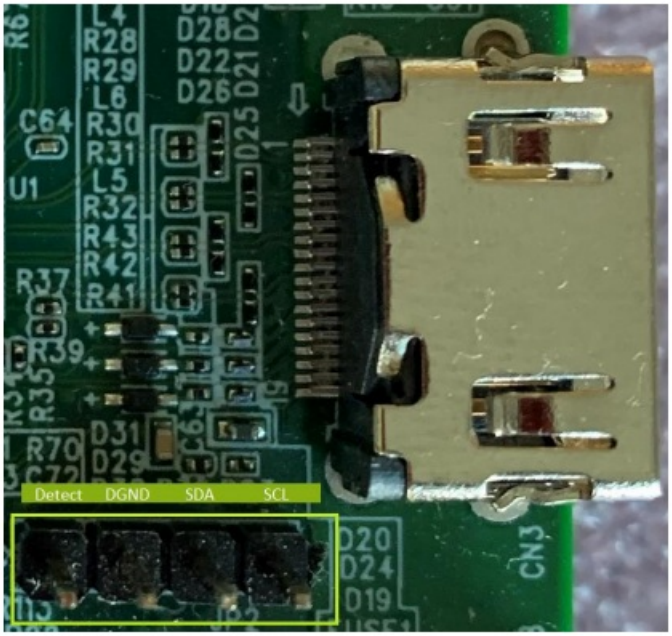
Selected Pin Usage and Assignment

UFP Type-C Monitor

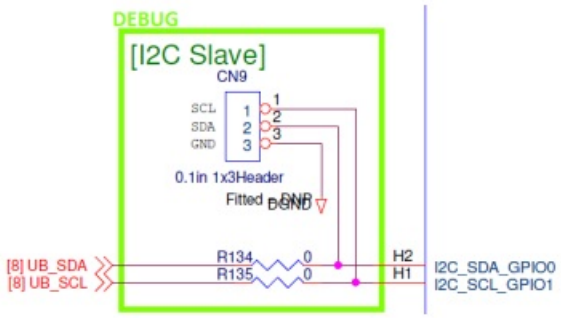


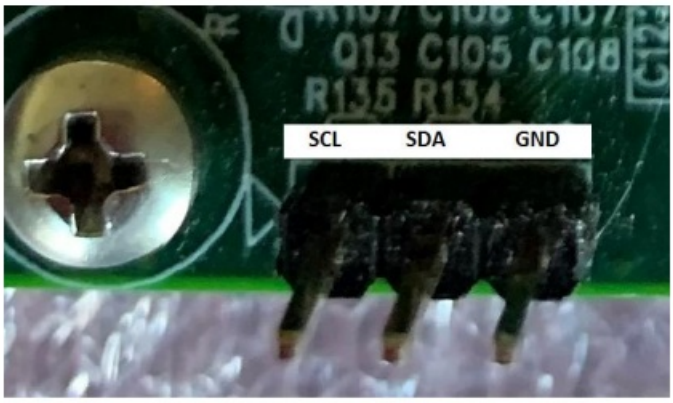


DDC Monitor for HDMI TX

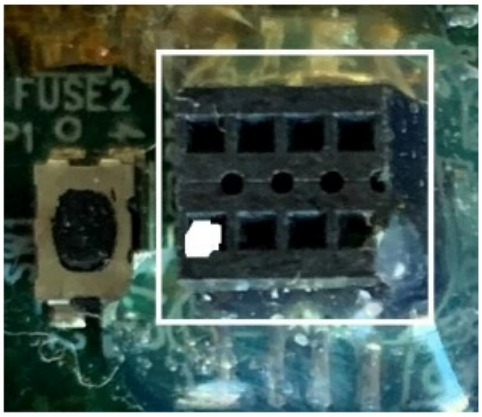


I2C Slave

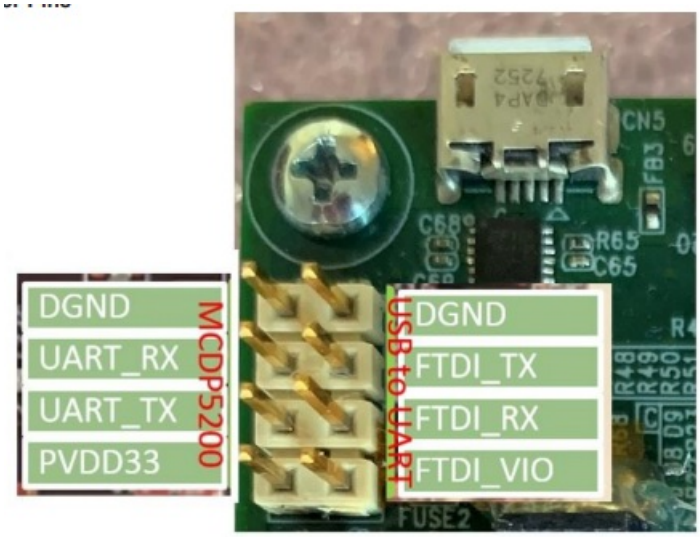




SPI Flash & Reset4



Gprobe Header Pins



Recommended Accessories

AC Adapters

This list is a list for your convenience.

Table 1.Recommended AC Adapter List

Application	Manufacturer	Model	Description		Where to Buy
DC5V Input Barrel Plug	CUI Inc	SMI36-5-V- P5		5V/5A 25W AC/DC External Wall Mount Adapter Multi - Blade (Included) Input	https://goo.gl/2VEPF1
USB Type-C Power Adapter	Qualtek	QFWC-60- 20 USCR		5V, 9V, 12V, 15V, 20V 60 W AC/DC External Wall Mount (Class II) Adapter Fixed Blade Input	https://www.digikey.com/short/z4jndz

Cables

This is a list for your convenience.

As of 2018/9/24, we have confirmed highest data rate with these cables.

Table 2. Recommended Cable List

Application	Manufacturer	Model	Description		Where to Buy
DP Alt mode	StarTech.com	CDP2DPMM1MB		USB-C to DisplayPort 4K 60 Hz Cable – 1m (3.3 ft.)	https://goo.gl/KqGoQZ
	Plugable	USBC-DP		USB-C to DisplayPort Cable – 1.8m (6.0 ft.)	https://goo.gl/Vxta53
	Cable Matters	201036		USB-C to DisplayPort 4K 60 Hz Cable, 1m (3.3 ft.)	https://goo.gl/mK9bwi

Application	Manufacturer	Model	Description		Where to Buy
USB3.1Gen2	StarTech.com	USB31AC1M		USB-A to USB-C Cable – USB-IF Certified USB 3.1 (10Gbps) 1m (3ft)	https://goo.gl/2nXNgG
		USB31C5C1M		USB-C Cable with Power Delivery (5A) – M/M – USB-IF Certified USB 3.1 (10Gbps) 1m (3ft)	https://goo.gl/2nXNgG
		USB31CC1M		USB-C Cable – M/M – USB 3.1 (10Gbps) – USB-IF Certified 1m (3ft)	https://goo.gl/2nXNgG
		USB31CUB50CM		USB-C to Micro-B Cable – M/M – USB 3.1 (10Gbps) 0.5m (1.6ft)	https://goo.gl/2nXNgG

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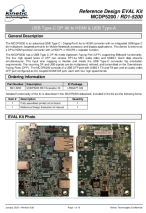
Documents / Resources

	Kinetic MCDP5200 USB Type-C DP Alt Converter [pdf] User Manual MCDP5200 USB Type-C DP Alt Converter, MCDP5200, USB Type-C DP Alt Converter, DP Alt Converter, Alt Converter, Converter