



UMFT233HPEV-SD Sink Module

Datasheet

Version 1.0

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1 Introduction

UMFT233HPEV-SD Sink Module Board is a high-speed USB Type-C to Multipurpose UART/JTAG/SPI/I2C serial interface module with two Type-C™ USB PD ports. It does not support source power capability as what UMFT233HPEV EVB provides.



Figure 1 - UMFT233HPEV-SD Sink Module

The module has 71mm x 37mm dimensions, with a pair of Type-C power delivery ports incorporated into it. Both ports serve only as sink port (receiving power). PD Port1 is meant for USB data communication with PC host while PD Port2 can support the 5V, 9V, 12V, 15V and 20V power delivery object (PDO) profiles - as defined in revision 3.0 of the USB Power Delivery specification. These profiles may be configured via an external EEPROM memory, with 7 segment LED displaying the PDO profile to be used.

While port1 offers USB data transmission plus power delivery, port2 only has power delivery capabilities. GPIO pins allow indication of the PDO profiles as configured on EEPROM. They are also used to control the load switch.

1.1 Features

1. Two Type-C™ USB PD ports with,
 - a. PD1 is a sink port that supports USB Data transfer which is USB 2.0 compliant.
 - b. PD2 which is a sink-only port.
2. Supports bus-powered operation.
3. Indication of PD profile on PD1 and PD2 through 7 segment LED display.
4. Support PD profile indication on either PD ports based on EEPROM or Vbus monitoring by way of pushbutton switch.
5. LED indicators for PWREN#, SUSPEND# signals and System Power.
6. Test points for power supply voltages, core voltages and CC Voltages.
7. External EEPROM for configurable options.

2 Typical Applications

- Rapid USB integration into existing electronic systems
- Prototyping platform for USB interface on new system
- USB Bridge with Type-C/PD3.0 (chargers and devices).
- Up to 60W power application delivery via USB PD and/or Type-C port.
- USB to multi-port JTAG, SPI and I2C interfaces
- USB to multi-port asynchronous serial interfaces

2.1 Driver Support

The FT233HP requires USB drivers (listed below), available free from <https://www.ftdichip.com>, which are used to make the FT233HP appear as a virtual COM port (VCP). This allows the user to communicate with the USB interface via a standard PC serial emulation port (for example TTY). Another FTDI USB driver, the D2XX driver, can also be used with application software to directly access the FT233HP through a DLL.

Royalty free VIRTUAL COM PORT (VCP) DRIVERS for...

- Windows 11 32,64-bit
- Windows 10 32,64-bit
- Windows 8/8.1 32,64-bit
- Windows 7 32,64-bit
- Windows Server 2008 and server 2012 R2
- Mac OS
- Linux 2.4 and greater

Royalty free D2XX Direct Drivers (USB Drivers + DLL S/W Interface)

- Windows 11 32,64-bit
- Windows 10 32,64-bit
- Windows 8/8.1 32,64-bit
- Windows 7 32,64-bit
- Windows Server 2008 and server 2012 R2
- Mac OS
- Linux 2.4 and greater
- Android(J2xx)

For driver installation, please refer to the installation guides on our website: <https://ftdichip.com/document/installation-guides/>

2.2 USB Bridge Features

For information on USB Bridge features, please refer to [FT233HP Datasheet](#).

3 Electrical Details

The UMFT233HPEV-SD Sink Module Board is a 71mm by 37mm 4-layered printed circuit board. The key features are labelled in Figure 2 and Figure 3 and are detailed in Section 3.1.

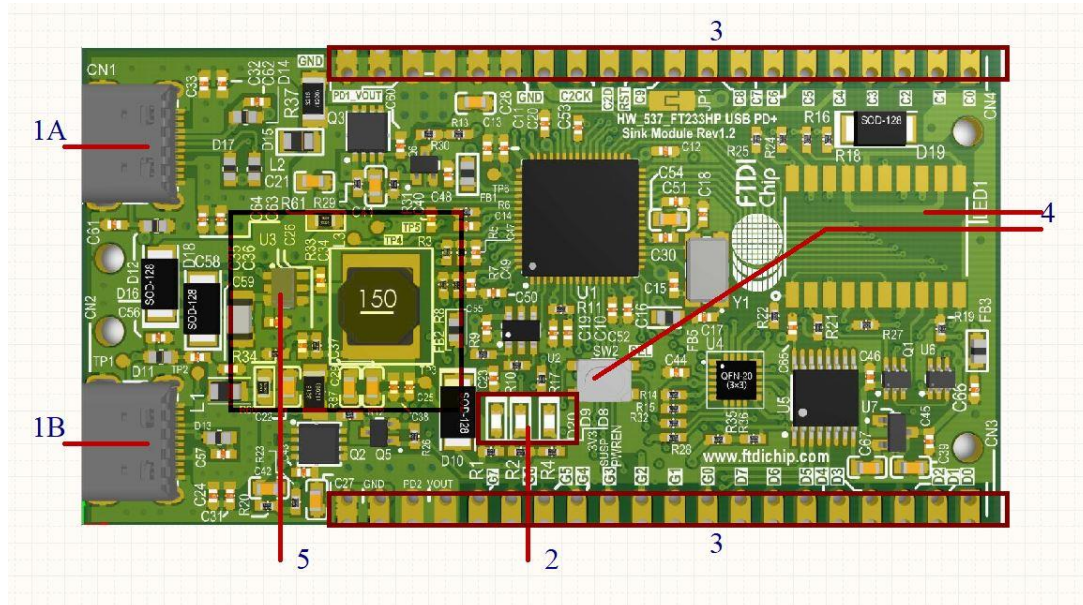


Figure 2 - UMFT233HPEV-SD Sink Module Board - Top View

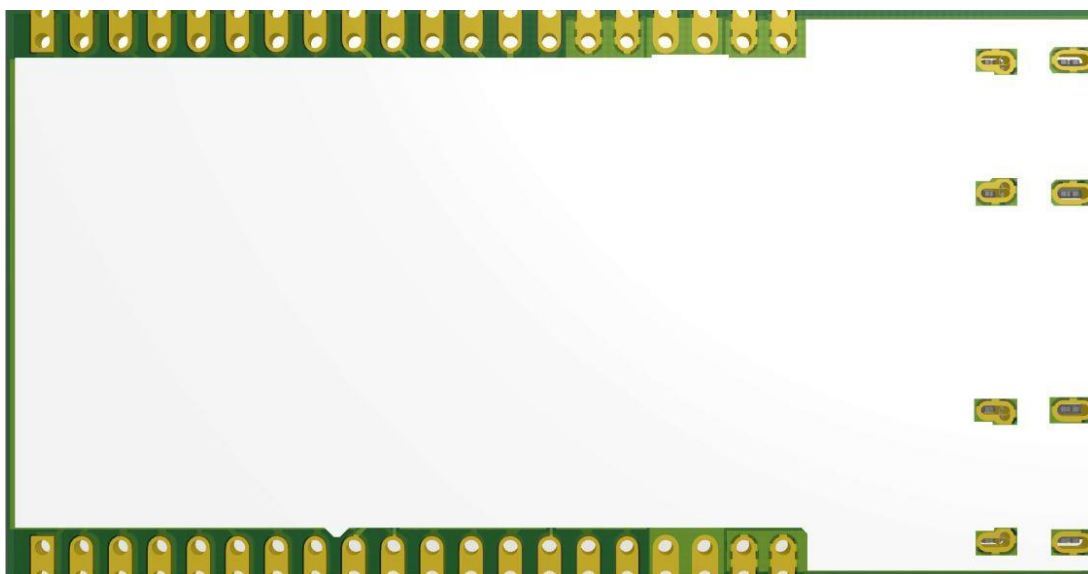


Figure 3 - UMFT233HPEV-SD Sink Module Board - Bottom View

3.1 Key Features

1. 2 PD USB Type-C ports.
 - a. PD Port 1 for sink and USB data transfer.
 - b. PD Port 2 for sink only
2. LEDs indication for the USB and Power Source.
3. Connector for functional interface.
4. 7 segment LED for displaying PD profiles of either PD1 Port or PD2 Port selectable by pushbutton switch
5. DC-DC converters for FT233HPQ and other circuits

3.2 Power

- a) The UMFT233HPEV-SD Sink Module board provides the following power sources: 3.46V for FT233HPQ.
- b) 3.3V for the MCU and decoding logic for 7 segment LED
- c) 2.2V for the 7 segment LED.

The reason why 3.46V is needed for FT233HPQ is due to the addition of schottky diode between VCC_PD/PD1_Vconn and VCC33 to prevent CC leakage during initial attach when the chip is not yet fully powered up. Refer to section 4.15.5 of FT233HPQ datasheet for more detail.

The power source for 3.46V is derived from bus power via PD port 1 or port 2 through DC-DC converter (U3). It provides power to the following:

- a) FT233HPQ
- b) MCU and decoding logic for the 7 segment LED. Schottky diode (D19) is added to lower the power to 3.3V.
- c) DC-DC converter (U7) that is derived from 3.3V to provide 2.2V power to the 7 segment LED.

3.3 GPIO

The GPIOs from FT233HPQ are used to control the load switch as well as setting the PD power profile used during PD negotiation between the charger and the charging device. These profiles can then be decoded by the onboard MCU and displayed on the 7 segment LED.

3.4 Connectors

Connectors CN3 and CN4 for functional interface are detailed in Table 1 and Table 2.

Connector Pin	Name	Description
CN3-1	ADBUS0	FT233HPQ ADBUS0 pin
CN3-2	ADBUS1	FT233HPQ ADBUS1 pin
CN3-3	ADBUS2	FT233HPQ ADBUS2 pin
CN3-4	ADBUS3	FT233HPQ ADBUS3 pin
CN3-5	ADBUS4	FT233HPQ ADBUS4 pin
CN3-6	ADBUS5	FT233HPQ ADBUS5 pin
CN3-7	ADBUS6	FT233HPQ ADBUS6 pin
CN3-8	ADBUS7	FT233HPQ ADBUS7 pin
CN3-9	GPIO0	FT233HPQ GPIO0 pin
CN3-10	GPIO1	FT233HPQ GPIO1 pin
CN3-11	GPIO2	FT233HPQ GPIO2 pin
CN3-12	GPIO3	FT233HPQ GPIO3 pin
CN3-13	GPIO4	FT233HPQ GPIO4 pin
CN3-14	GPIO5	FT233HPQ GPIO5 pin
CN3-15	GPIO6	FT233HPQ GPIO6 pin
CN3-16	GPIO7	FT233HPQ GPIO7 pin
CN3-17	PD2_OUT	Output form PD2 Q2 load switch
CN3-18	PD2_OUT	Output from PD2 Q2 load switch
CN3-19	GND	Ground
CN3-20	GND	Ground

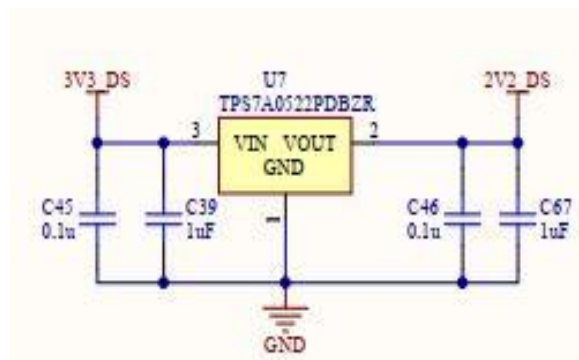
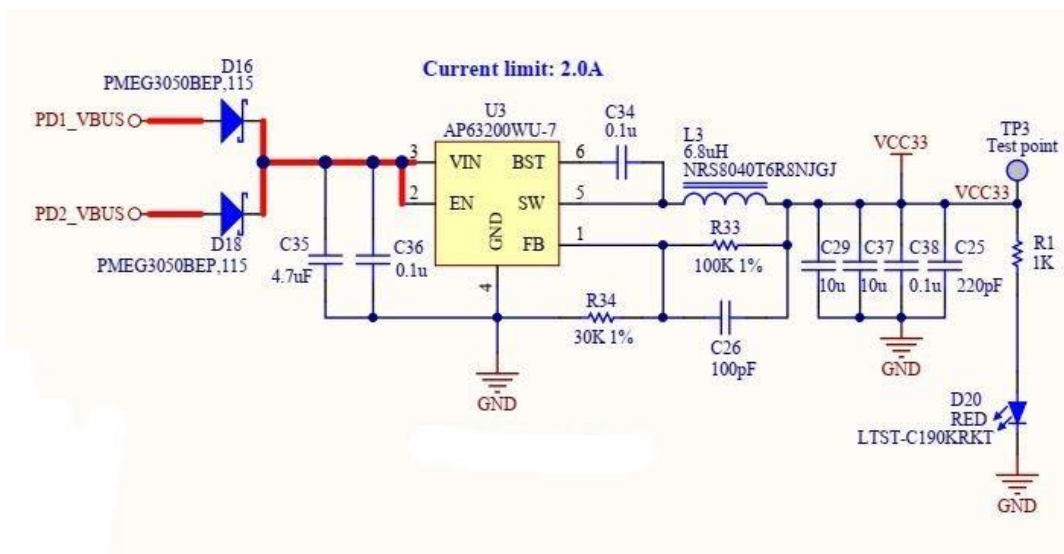
Table 1 - Connector Pin Details of CN3

Connector Pin	Name	Description
CN4-1	ACBUS0	FT233HPQ ACBUS0 pin
CN4-2	ACBUS1	FT233HPQ ACBUS1 pin
CN4-3	ACBUS2	FT233HPQ ACBUS2 pin
CN4-4	ACBUS3	FT233HPQ ACBUS3 pin
CN4-5	ACBUS4	FT233HPQ ACBUS4 pin
CN4-6	ACBUS5	FT233HPQ ACBUS5 pin
CN4-7	ACBUS6	FT233HPQ ACBUS6 pin
CN4-8	ACBUS7	FT233HPQ ACBUS7 pin
CN4-9	ACBUS8	FT233HPQ ACBUS8 pin
CN4-10	ACBUS9	FT233HPQ ACBUS9 pin
CN4-11	RESET#	FT233HPQ RESET# pin
CN4-12	C2D	C2 Data pin of EFM8 MCU
CN4-13	C2CK	C2 clock pin of EFM9 MCU
CN4-14	CN4-14	To provide 3.3V to this pin, short the solder jumper JP1
CN4-15	GND	Ground
CN4-16	GND	Ground
CN4-17	PD1_OUT	Output from PD1 Q3 load switch
CN4-18	PD1_OUT	Output from PD1 Q3 load switch
CN4-19	GND	Ground
CN4-20	GND	Ground

Table 2 - Connector Pin Details of CN6

3.5 Schematics

Figure 4 to Figure 9 shows the various elements of the schematics.



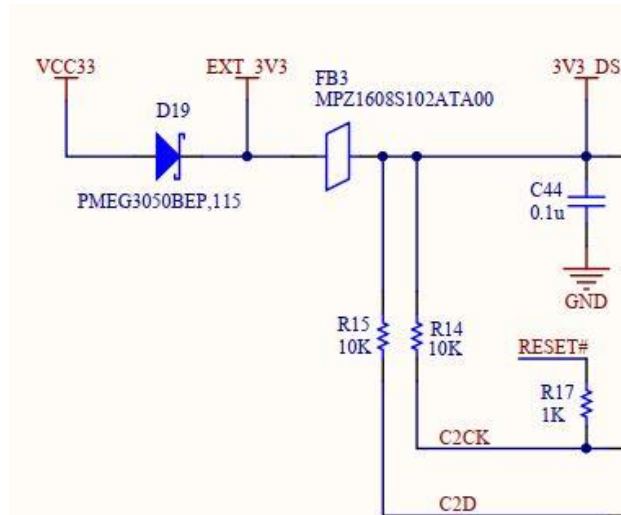


Figure 4 - DC to DC Converter for 3.46V from PD1 or PD2 Vbus and 2.2V from 3.3V

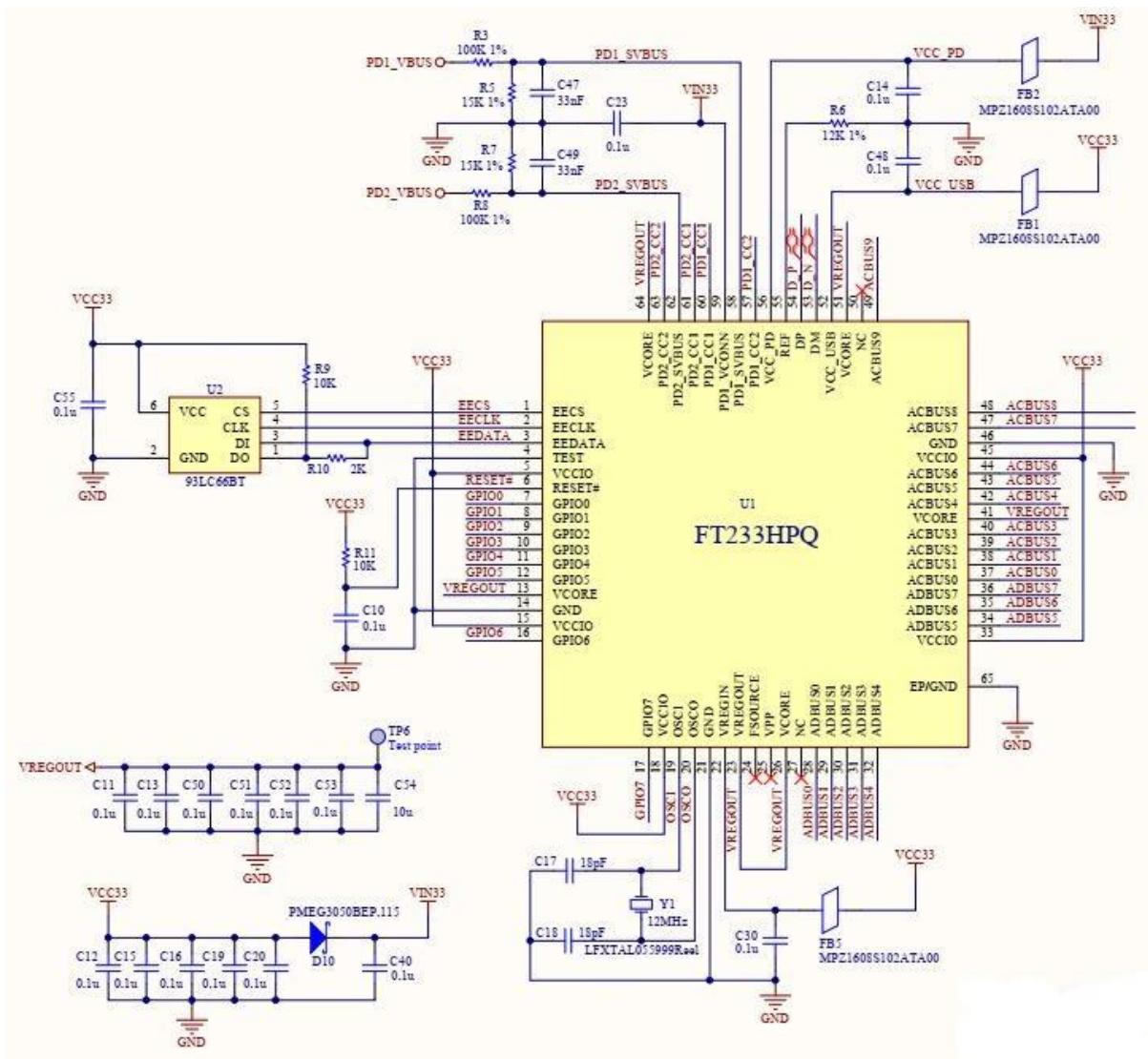


Figure 5 - FT233HPQ IC

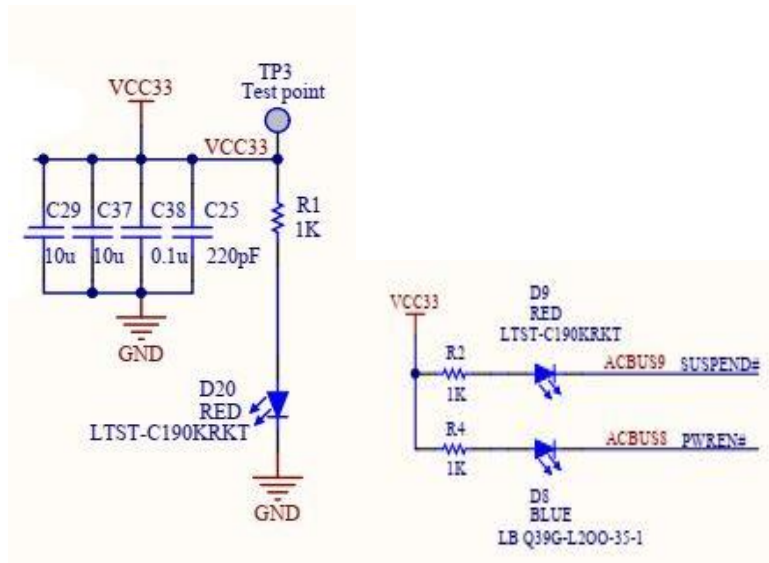


Figure 6 – LED Driver Circuit for Power and USB activity

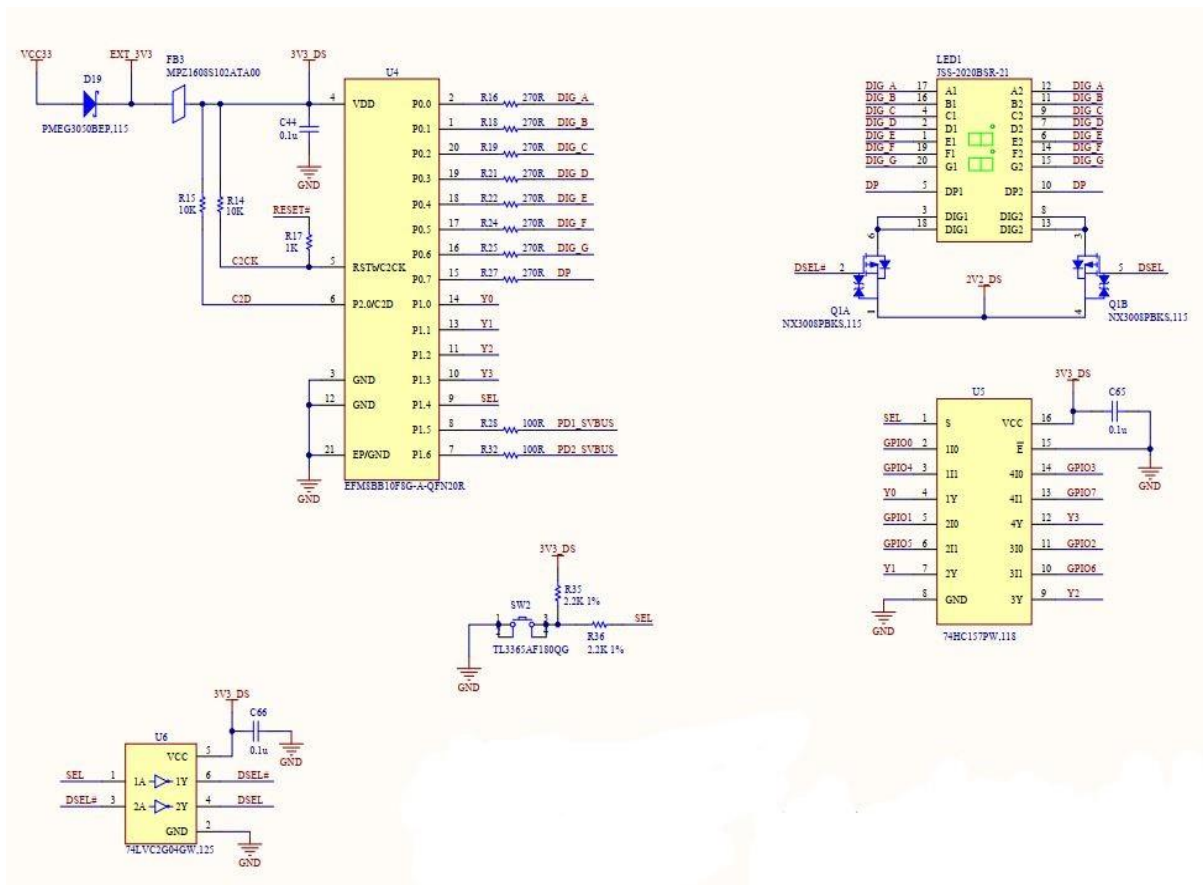


Figure 7 – MCU and Decoding Logic for PD Profile Display

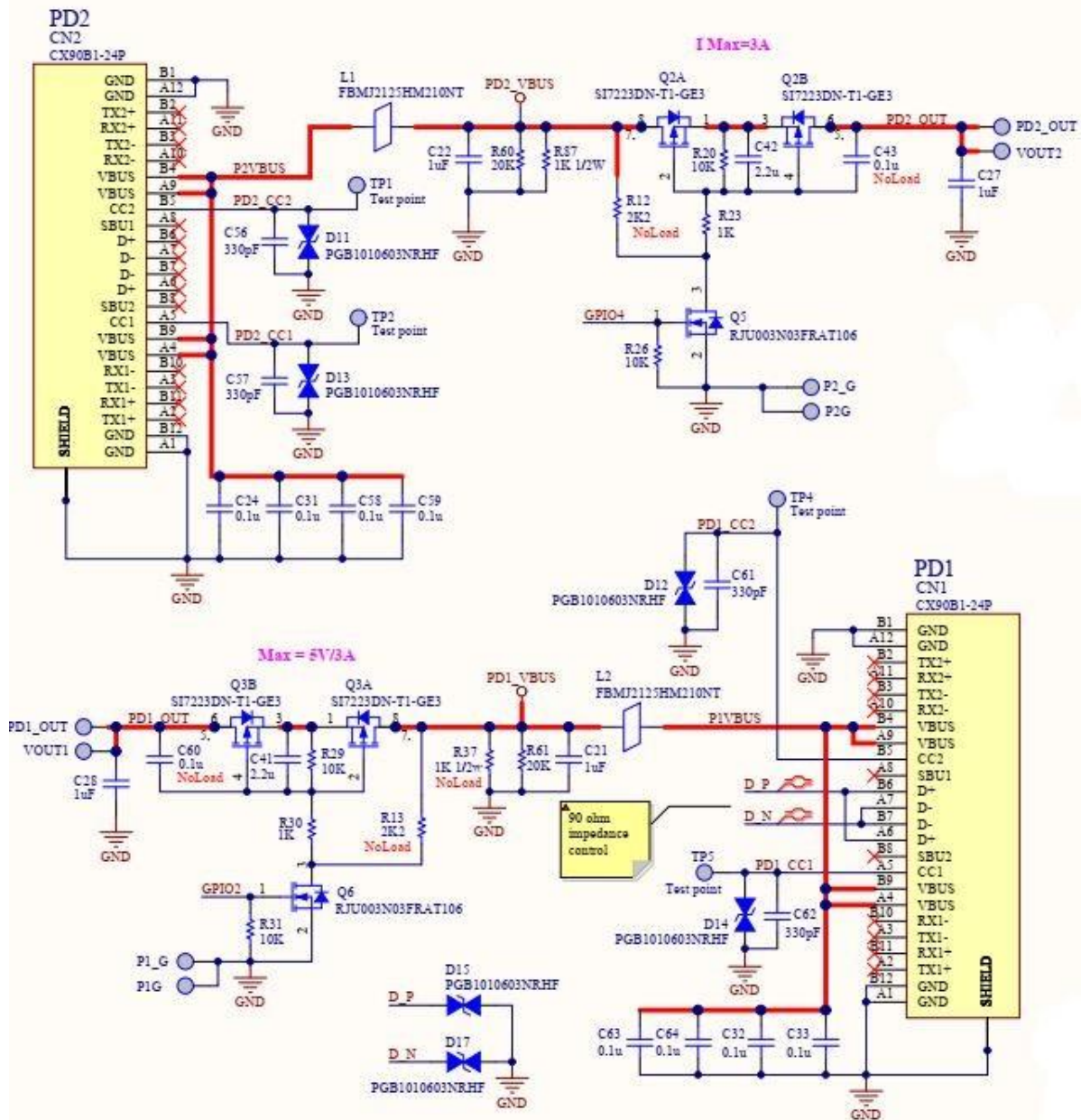
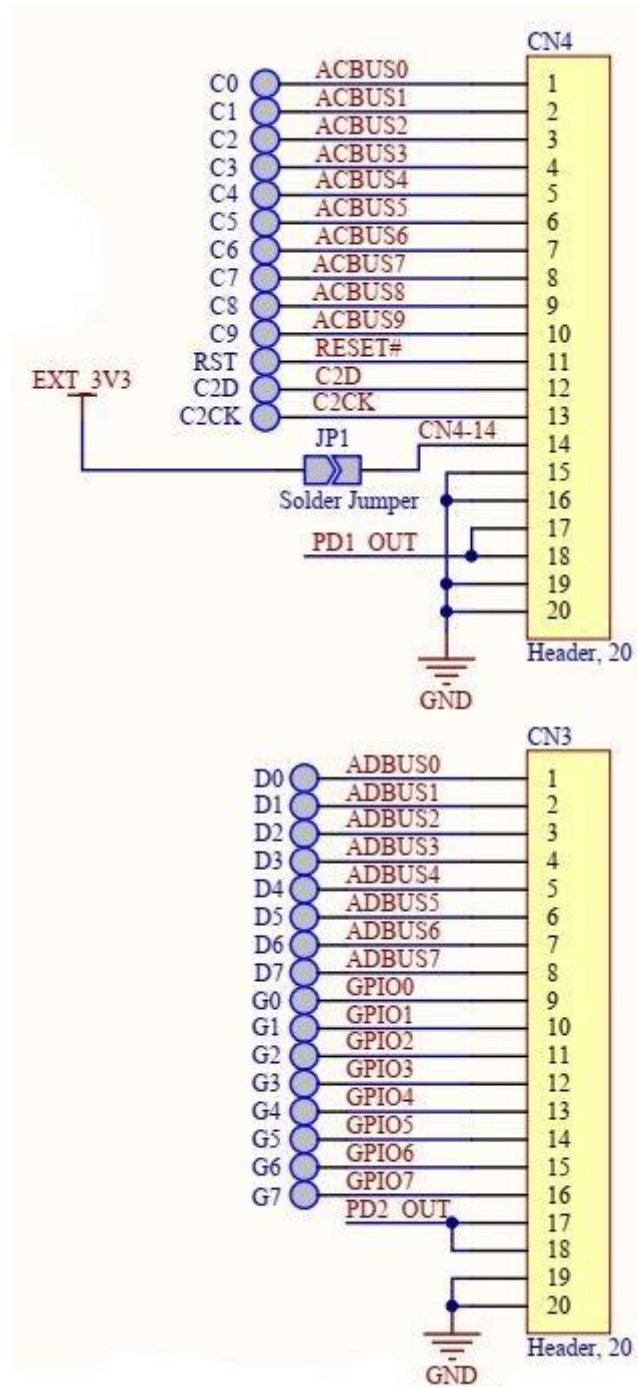


Figure 8 – PD1/PD2 Ports and Load Switches


Figure 9 – Interface and Connectors

4 Power Delivery Functional Configuration

4.1 Sink

Sink is a feature where the PD2 or PD1 port can be configured as sink mode when attached to a PD charger or other PD devices to provide power to the modules connected to the board. Figure 10 illustrates the use case of sink configuration in UMFT233HPEV-SD.

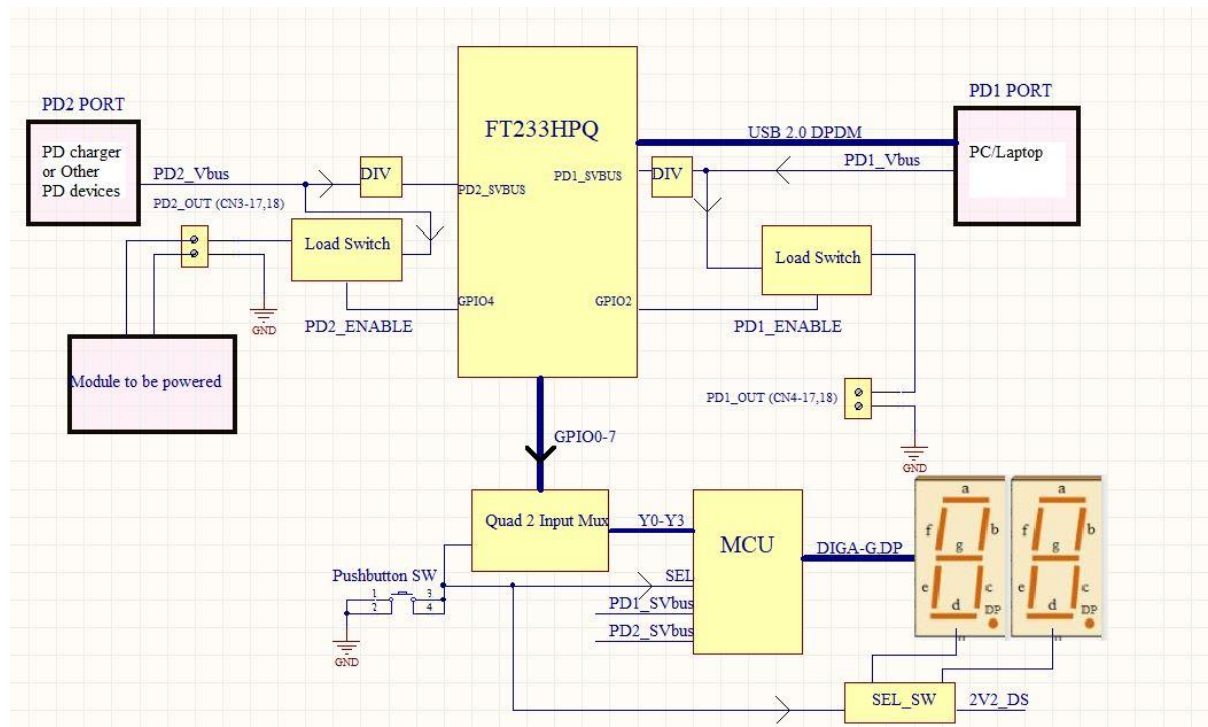


Figure 10 - Sink Block Diagram (PD1 port as USB to Host PC, PD2 Port sink power into the module from charger)

Sink Configuration

Figure 10 shows PD1 port acting as USB data port to PC host, while PD2 sink power when connected to PD charger. The PD2 sink power profiles are configurable in EEPROM. The load switch when turned on after PD negotiation will route the sink power from PD2 to CN3 (pin17, 18) to power the external module. The pushbutton switch SW2 acts as a display mode selection that enables the onboard MCU to drive the 7 segment LED to provide indication of PD profiles from either PD1 or PD2. There are in total 4 PD display modes whereby each mode is set by pressing the pushbutton switch as shown below in Table 3.

PD Display Mode	Description
1	MCU read PD2 voltage level through PD2_Vbus monitoring
2	MCU read PD1 voltage level through PD1_Vbus monitoring
3	MCU read PD2 voltage based on GPIO profile in the EEPROM
4	MCU read PD1 voltage based on GPIO profile in the EEPROM

Table 3 - Description of the PD Display Mode

Pressing of SW2 will enable the MCU to obtain the negotiated PD profile either from monitoring of Vbus level or GPIO profiles in the EEPROM.

Table 4 shows the expected PD profile on the 7 segment LED based on the following states of the 2 PD ports when SW2 is pressed.

State of SW2	PD1	PD2	Profile Displayed on LED1 (7 segment LED)	PD Display Mode
Button not pressed	Connect to PC host	Not connected	0	1
Button pressed	Connect to PC host	Not connected	5	2
Button pressed	Connect to PC host	Connect to PD charger	Display the negotiated PD2 profile	3
Button pressed	Connect to PC host	Connect to PD charger	5	4
Button pressed	Connect to PC host	Connect to PD charger	Display the negotiated PD2 profile	1
Button pressed	Not connected	Connect to PD charger	0	2
Button pressed	Not connected	Connect to PD charger	Display the negotiated PD2 profile	3
Button pressed	Not connected	Connected to PD charger	0	4

Table 4 – Expected PD profile displayed on 7 segment LED when push button SW2 is pressed

5 Mechanical Details

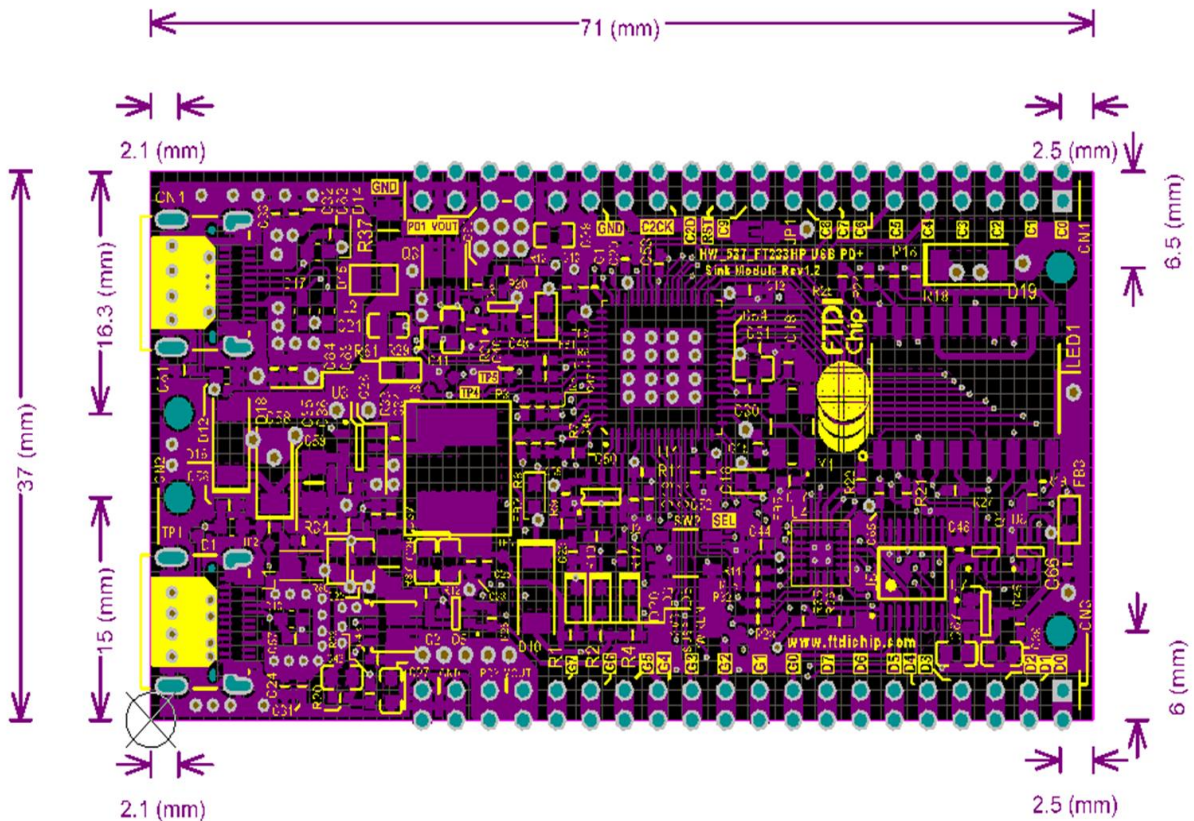


Figure 11 - UMFT233HPEV-SD Sink Module Board – Mechanical Diagram – Top View

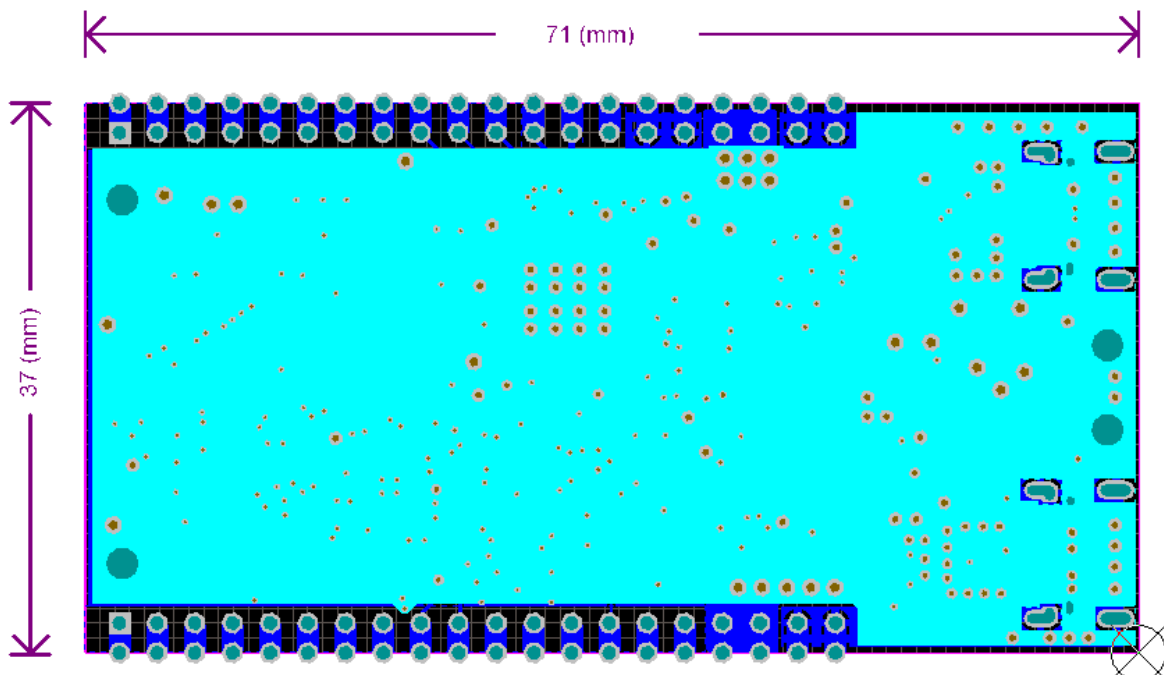


Figure 12 - UMFT233HPEV-SD Sink Module Board – Mechanical Diagram – Bottom View

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Appendix A – References

Document References

AN_448 [FT4233HP FT2233HP FT233HP Configuration Guide](#)

AN_449 [FT4233HP FT2233HP FT233HP FT4232HP FT2232HP FT232HP DCDC Power Delivery Application Note](#)

[FT233HP Datasheet](#)

Acronyms and Abbreviations

Terms	Description
EEPROM	Electrically Erasable Programmable Read-Only Memory
GPIO	General Purpose Input Output
PD	Power Delivery
USB	Universal Serial Bus
USB-IF	USB Implementer Forum

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Appendix C – Revision History

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Revision	Changes	Date
1.0	Initial Release	01-12-2021