UPD301B Basic Source AE Demo Read Me

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0.92	25-May-2021	Initial version

Table of Contents

1 Software License Agreement

2 Terms and Abbreviations

Term	Definition
PSF	Universal Serial Bus Power Delivery Software Framework
EVB	Evaluation Board
PD	Power Delivery
IDE	Integrated Development Environment
PDO	Power Data Object
PM-PD	Power Module-USB Power Delivery
LED	Light Emitting Diode
GPIO	General Purpose Input Output

3 Introduction

Microchip's USB Power Delivery Software Framework (PSF) is a configurable USB PD solution that is compliant to USB-PD 3.0 specification.

UPD301B Basic Source Demo includes PD Source functionality with the support for Boot time configuration parameters and GPIO based DC-DC controller for port power control. This document is intended to guide a user on setting up the USB-PD Basic Source to work properly with UPD301B Basic Source Demo along with a demonstration of a PD device attached to the EVB.

4 Prerequisites

Hardware:

1) Microchip USB-PD Basic Source Board

Figure 4.1 Microchip USB-PD Basic Source Board

2) Microchip UNG 8122 Rev D PM-PD Cards

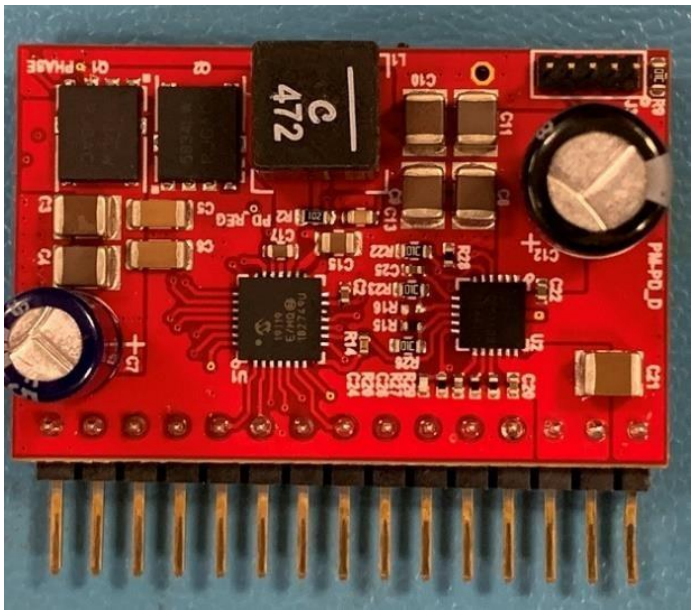

Figure 4.2 Microchip UNG 8122 Rev D PM-PD Card

2) 150W Power Adapter with 24V, 6.25A output

Figure 4.3 Power Adapter with 24V, 6.25A output capacity

3) USB-C to USB-C cable

4) Atmel ICE Debugger kit

Figure 4.4 Atmel-ICE Debugger Kit

5) USB Power Delivery capable Phones or Laptops

5 Setting up the USB-PD Basic Source board for "UPD301B_Basic_Source_AE"

1. Connect PM-PD cards on J4 in correct orientation as shown in Figure 5.1

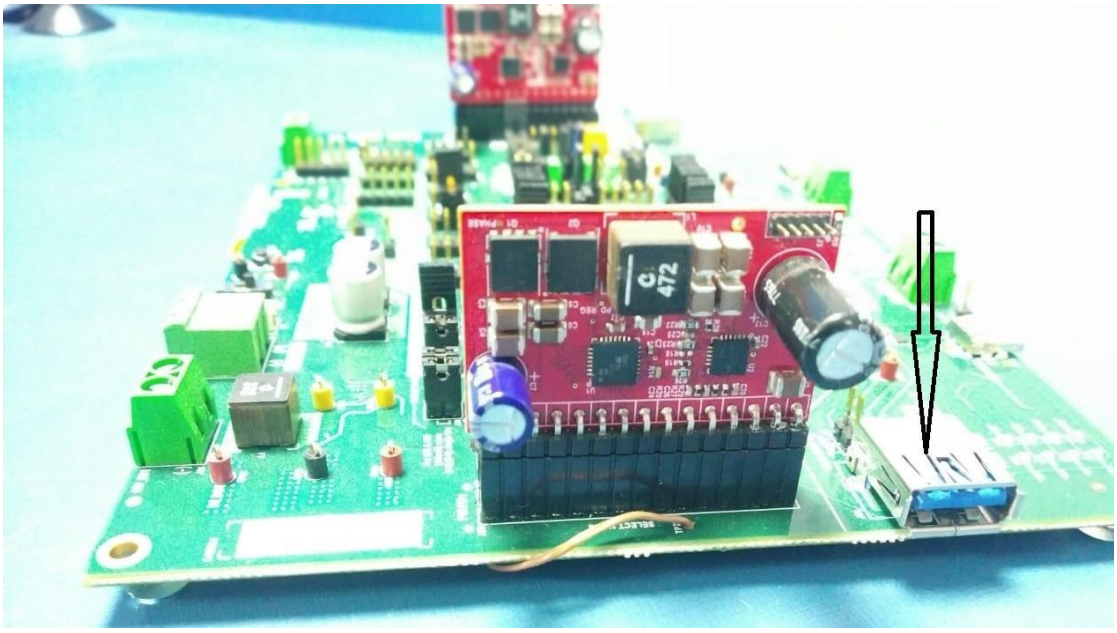

Figure 5.1 PM-PD Orientation

2. Connect the power adapter

3. Connect one end of Atmel ICE to PC using USB Micro-B cable and the other end to J5 of USB-PD Basic Source. A dot(encircled in image) will be present in Atmel ICE Adapter board which gives an indication that this pin should be connected to 3v3 of J5. The right way to connect is,

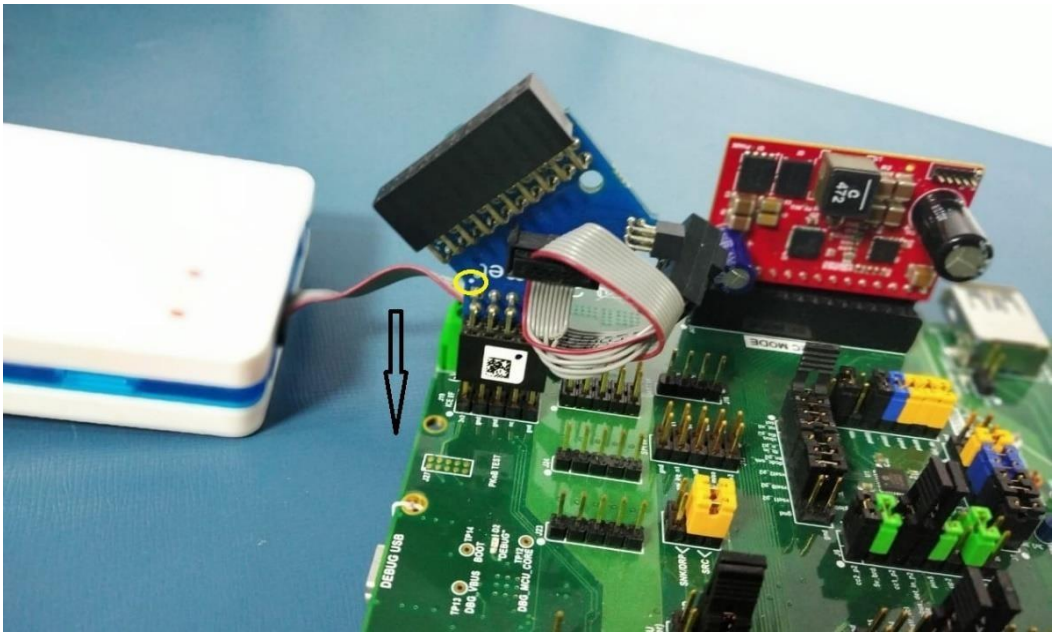

Figure 5.2 Connecting Atmel-ICE Debugger to J5

4. The whole connection looks like,

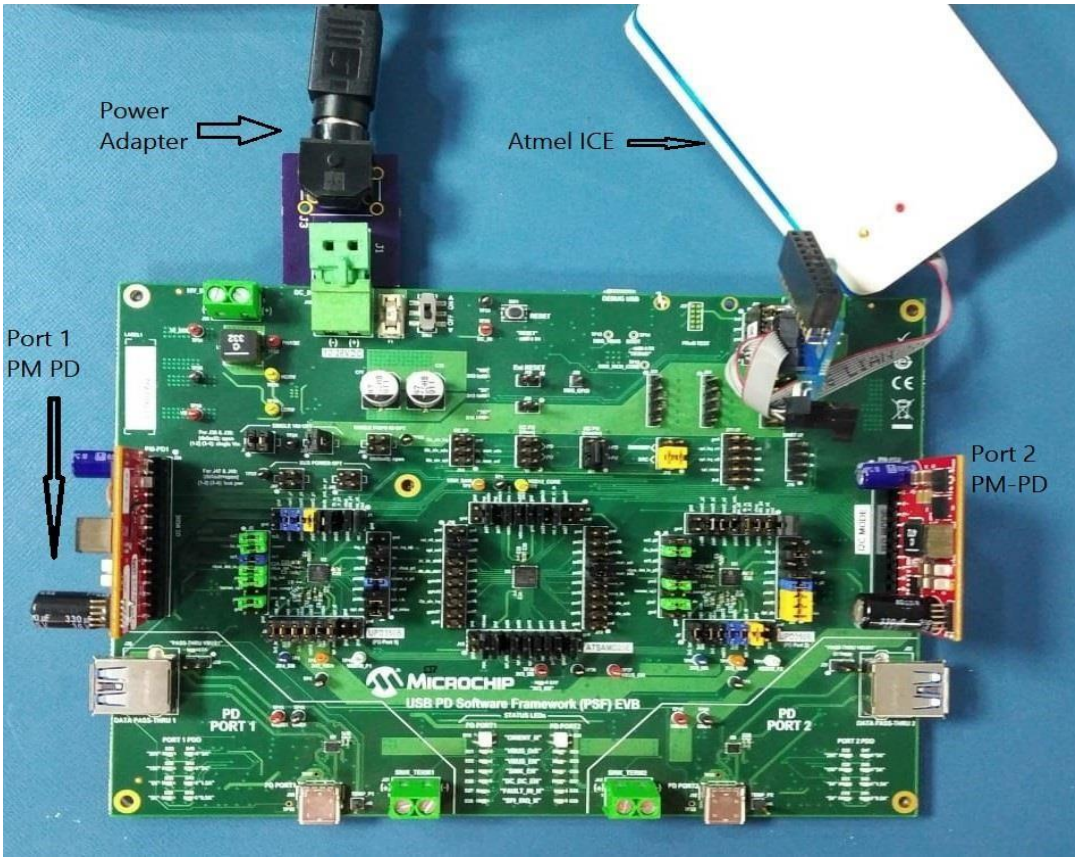

Figure 5.4 PSF-EVB Full Setup

6 Running the demo

Refer Getting Started with PSF document for the detailed steps on setting up the build environment, building the Basic Source project and programming the hex file in the USB-PD Basic Source.

Refer Appendix 8.2 of Getting Started with PSF to change any SAMD20 Harmony configuration. Refer 'Boot time Configuration' of PSF User Guide to change any configuration parameters.

1. Ensure all the jumpers are in place and Power on the USB-PD Basic Source.

2. Program the UPD301B_Basic_Source_AE.X.production.hex file by following the steps mentioned in section 8 of Getting Started with PSF

3. Connect a PD device to Type C Port of USB-PD Basic Source using a USB-C to USB-C cable.

4. The image demonstrates a scenario where a Google Pixel 2 phone has been connected to Port 1 and Samsung Galaxy S8 phone has been connected to Port 2

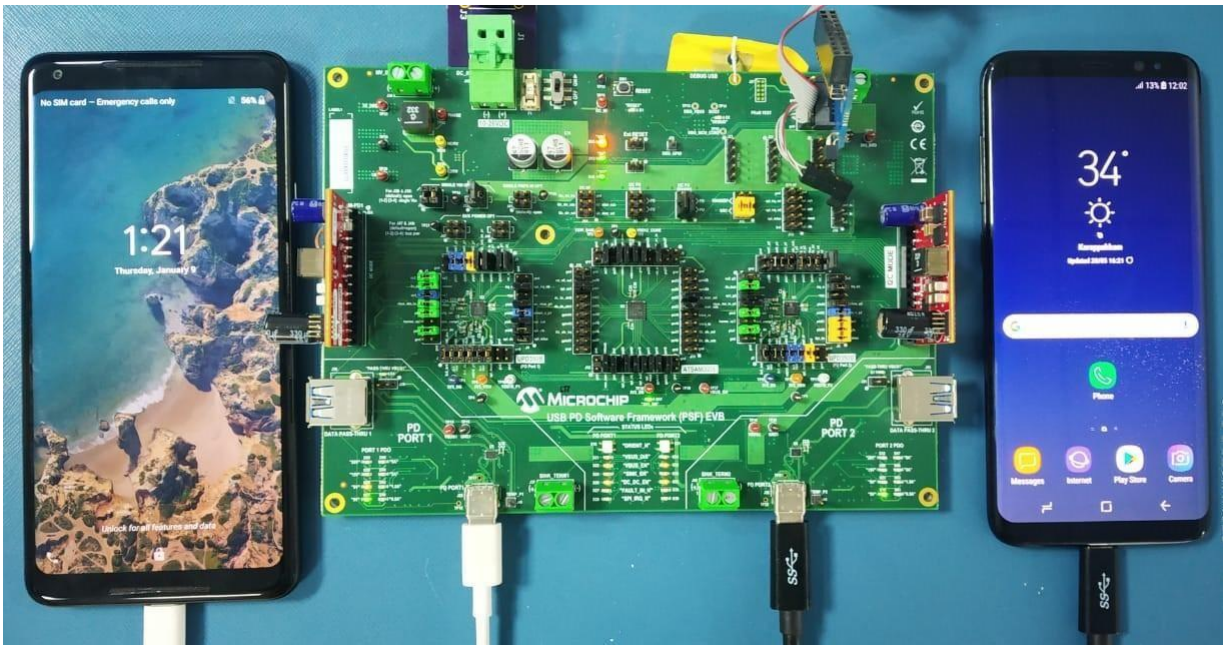

Figure 6.1 Two PD Devices connected to each PD port

7 Expected Results

1. Once the hex file is programmed, the SPI_IRQ_N LEDs in both the ports flash and then tum off. DC_DC_EN LEDs will also turn on.

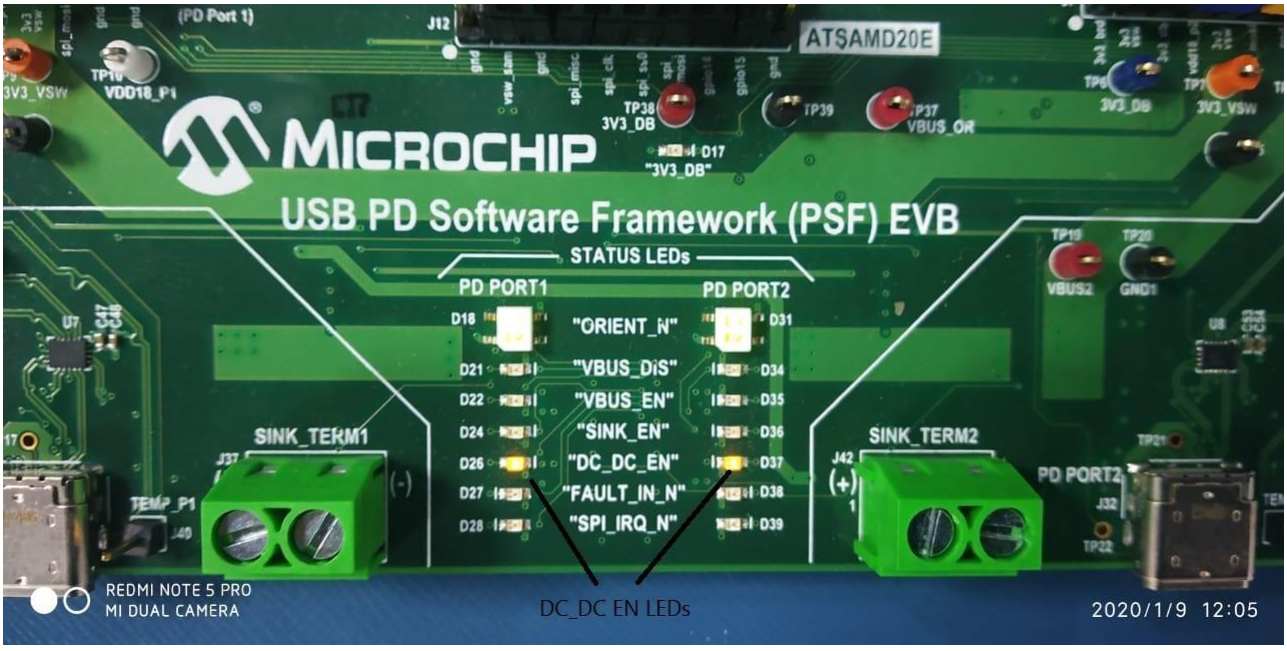

Figure 7.1 Status of DC_DC_EN LEDs after power on

2. Once a PD Device is attached to a PD port, Source capabilities will be advertised by the PSF, followed by a PDO request from the device.

3. PSF checks if the PDO requested by the device is within the range of its capabilities. If so, it accepts the request and starts driving the requested voltage in the VBUS.

4. Once an explicit power contract negotiation is in place, the device starts charging. VBUS_EN LED will turn on along with the PDO status LEDs indicating the negotiated voltage as shown in Figure 7.2

PDO	Status LED
5V	D1
9V	D2
15V	D3
20V	D4

Table 8.1 PDO Status LEDs

Example : If 5V is negotiated by the device, D1 LED will glow. If 9V is negotiated, then LEDs D1 and D2 will glow. In case of 15V, LEDs in D1, D2 and D3 will glow. If 20V is negotiated, all the LEDs will glow.

5. In our case, Google Pixel connected in Port 1 has requested 9V and Samsung Galaxy in Port 2 has requested 5V. The status of VBUS_EN and PDO status LEDs is shown in Figure 7.2

Figure 7.2 VBUS_EN and PDO Status LEDs after device attach

6. One more scenario is shown where a HP Elite book laptop is connected to PD port 2. It has requested for 20V. After PD negotiation, the laptop starts charging. All the PDO status LEDs glow which indicates that 20V is negotiated.

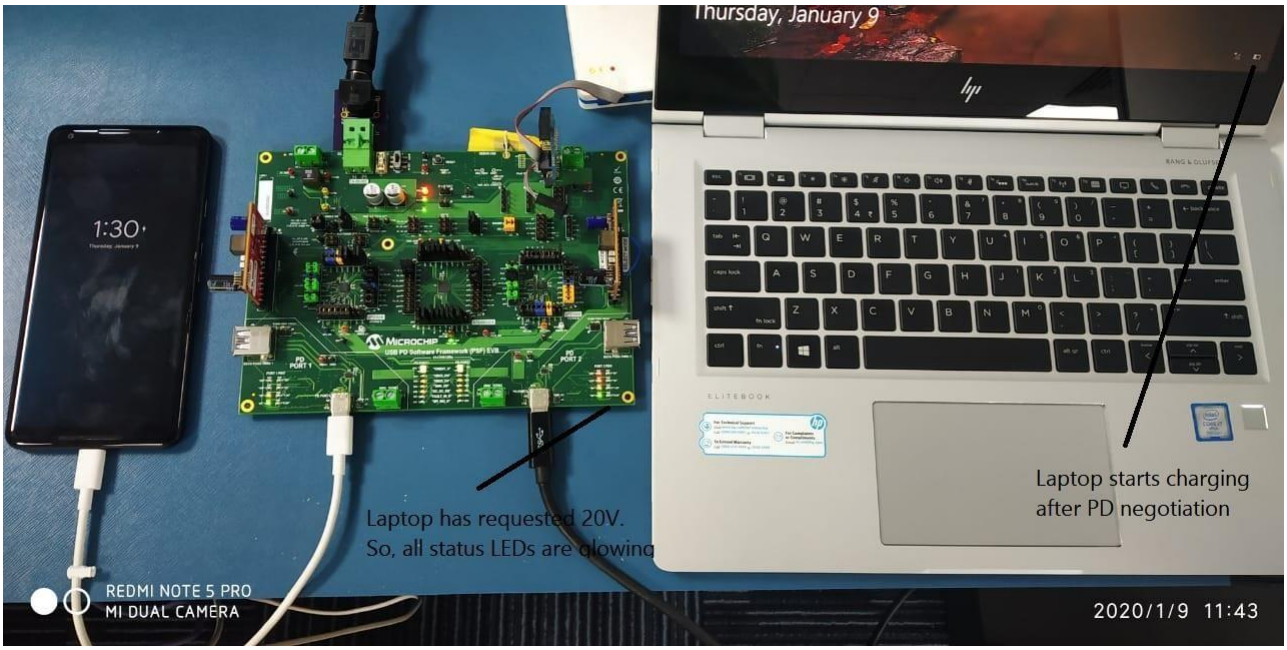

Figure 7.3 20V negotiation with HP Elite book connected to PD Port 2