MICROCHIP USB PD Demo Board User Guide

Contents

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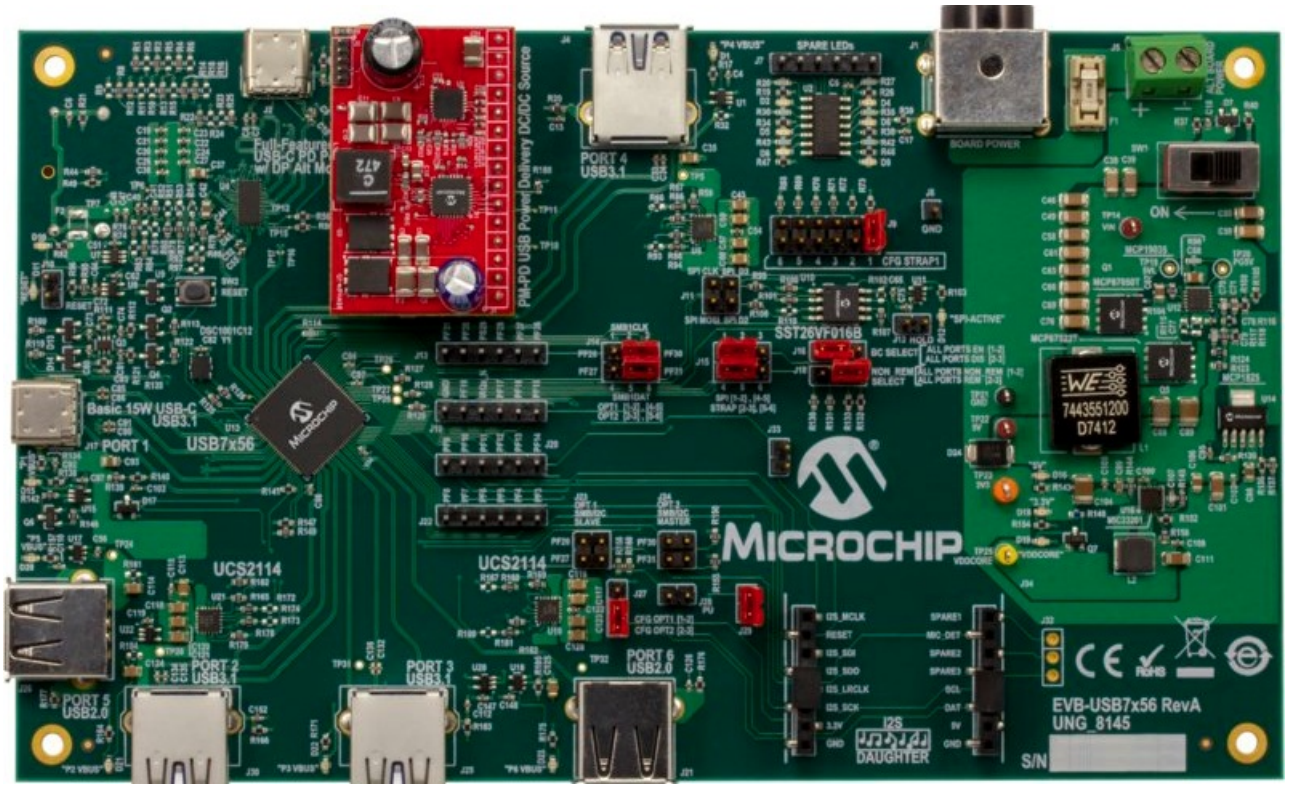
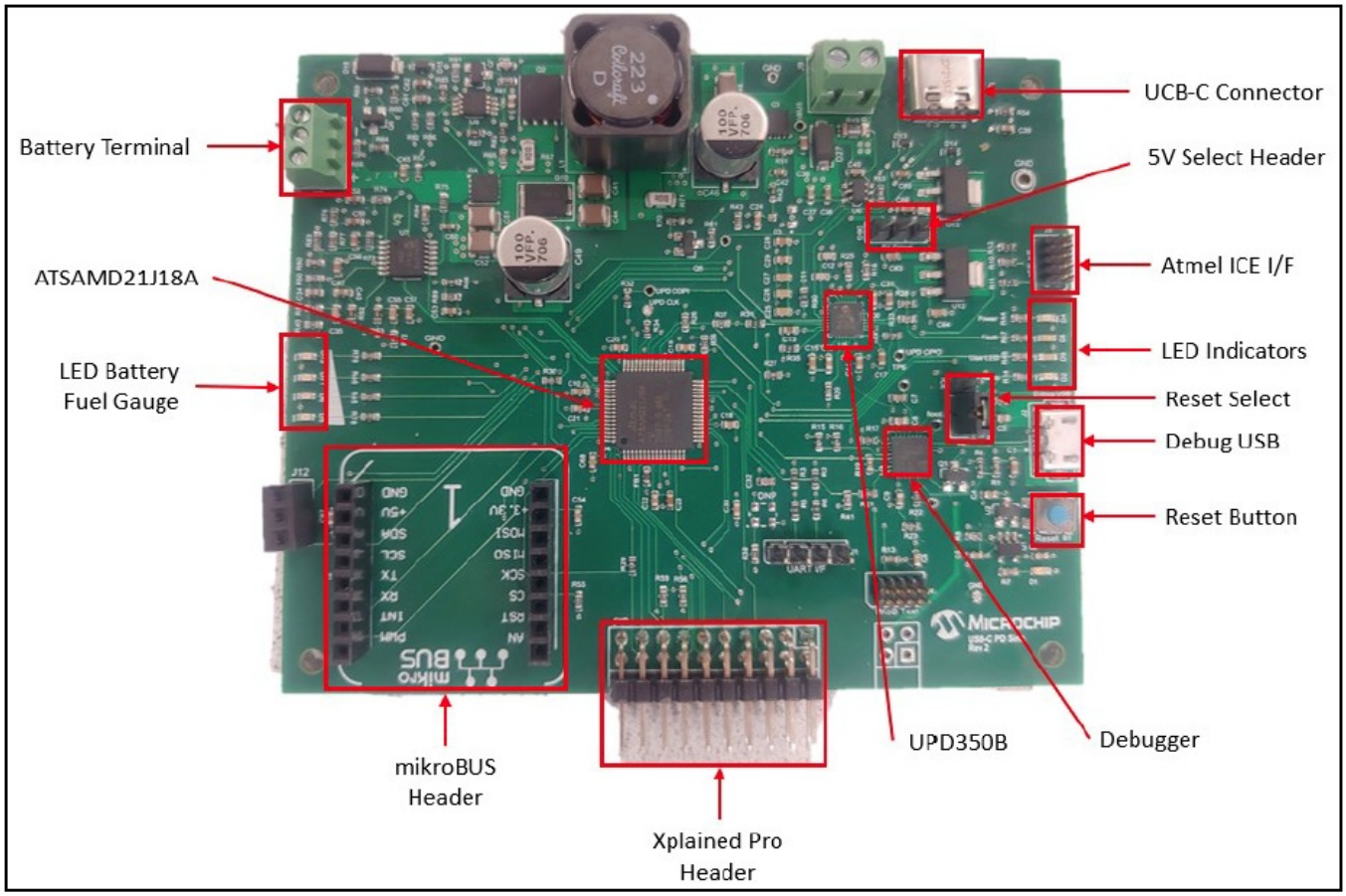


USB PD Demo Board

The USB PD Demo Board is a USB power delivery battery charger demo board featuring the ATSAMD21J18A microcontroller. The board includes a PKoB for USB programming/debugging, along with an Atmel ICE interface.

Board Overview



Two types of expansion headers are supported by the board. There is one Xplained Pro I/O header with a 4-pin Xplained Pro power header, and a mikroBUS click board connector. The battery charger's SEPIC power supply can support the full 20V/5A 100W USB PD specification. The demo code supports the OLED1 Xplained Pro add-on board on extension header 1. This add-on board is optional but is a useful tool for debugging and charger status monitoring. The OLED1 Xplained Pro board can be purchased separately. The USB PD Demo Board is a USB power delivery battery charger demo board featuring the ATSAMD21J18A microcontroller. The board includes a PKoB for USB programming/debugging, along with an Atmel ICE interface. Two types of expansion headers are supported by the board. There is one Xplained Pro I/O header with a 4-pin Xplained Pro power header, and a mikro-BUS click board connector. The battery charger's SEPIC power supply can support the full 20V/5A 100W USB PD specification.

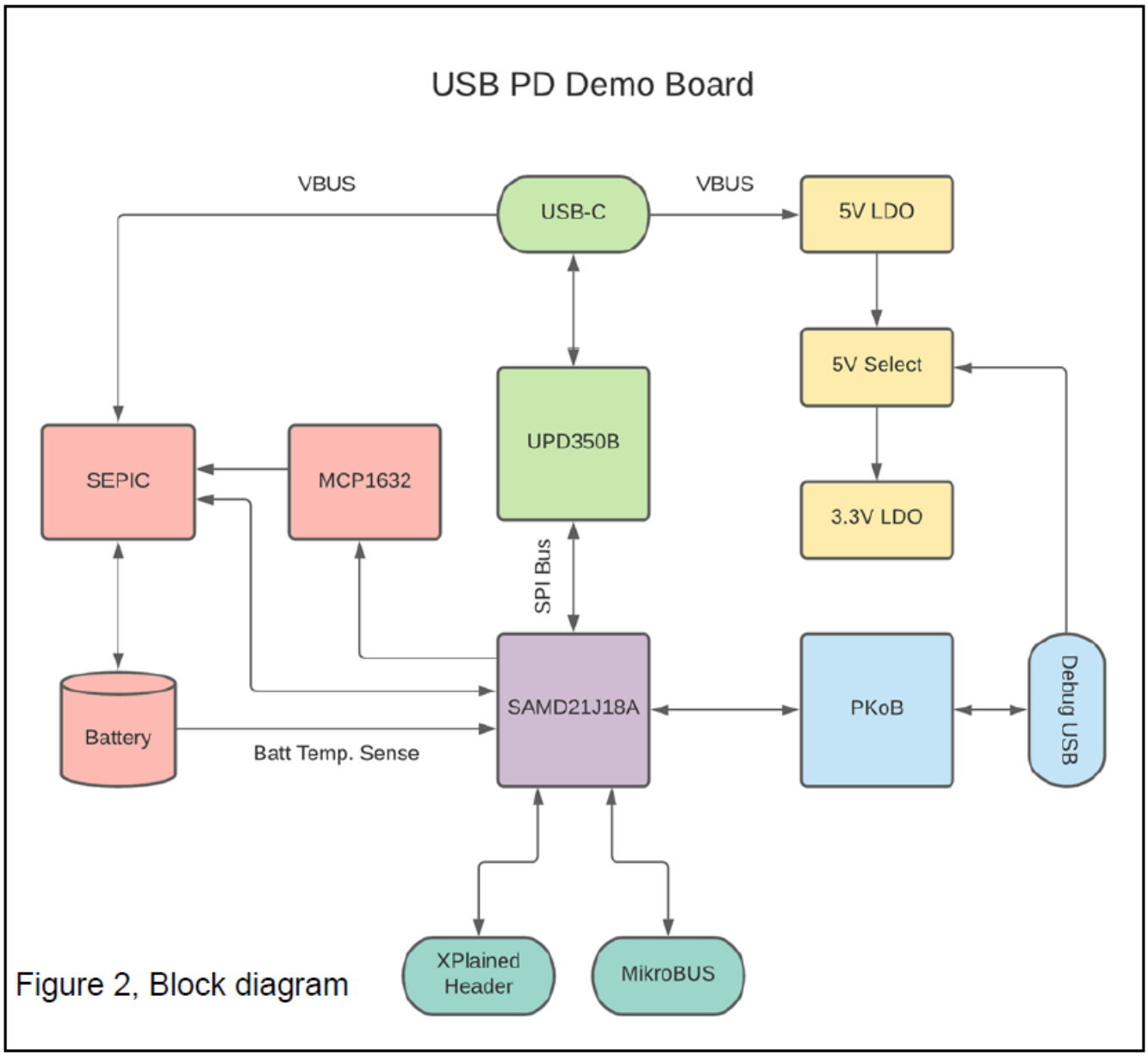


Figure 2, Block diagram

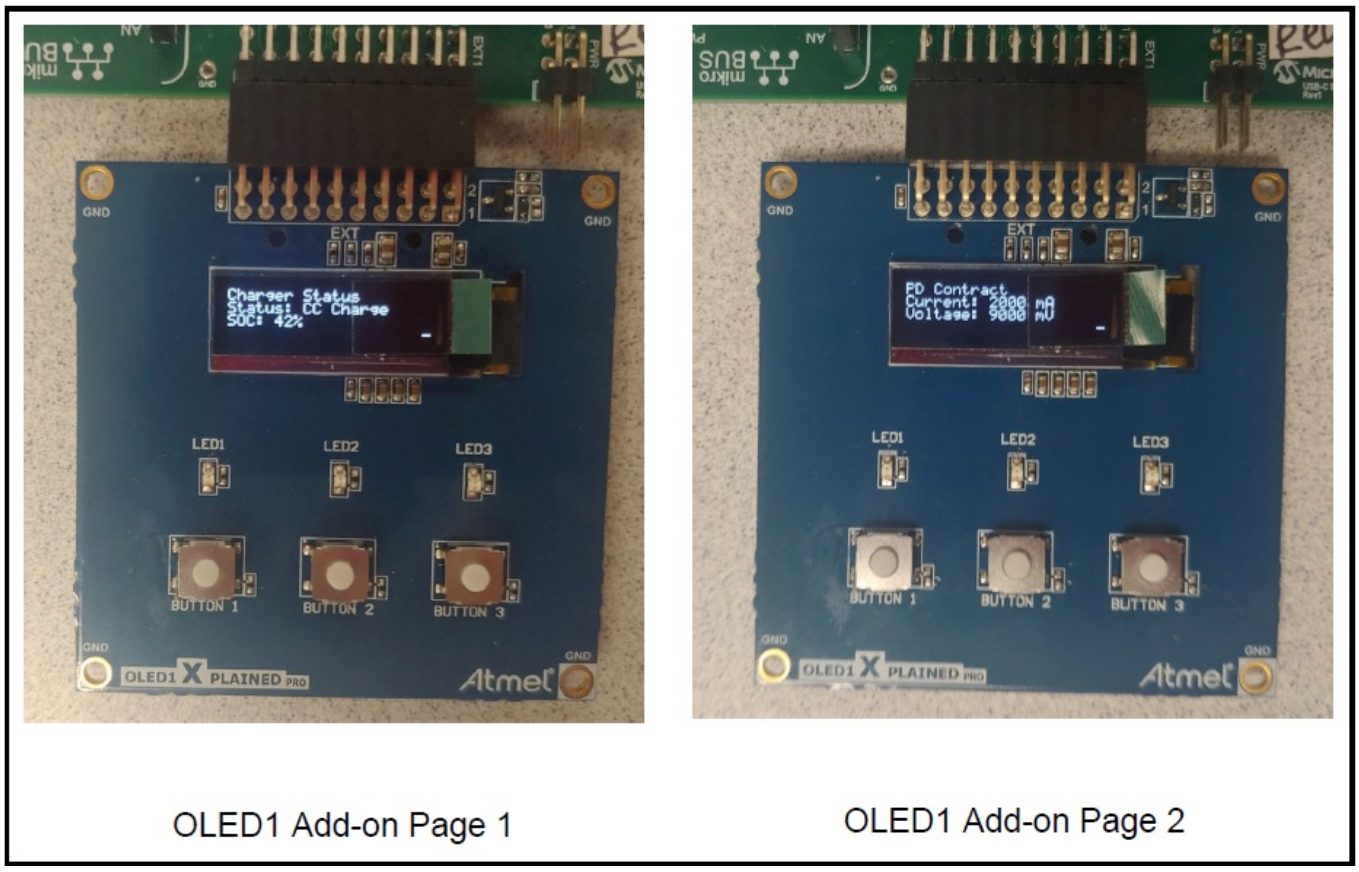
Getting Started

1. Verify the A) 5V Select Header has a jumper on the DBG side and the B) Reset Select has a jumper on the Boot side as shown below:
    1. **A**) Jumper on left side
    2. **B**) Jumper on bottom
2. Download and launch MPLAB X IDE.
3. Plug the debug USB into your computer and check that MPLAB X recognizes that the kit is connected.

4. If the Power LED does not light up, check that the 5V select header is set to the correct source.
5. Download the PSF folder from the GitHub site (**https://github.com/MicrochipTech/PD_Sink_Battery_Charger_Demo**) and unzip the folder.
6. Open MPLAB X and click File > Open Project, then navigate to where you downloaded the file and go to the folder PSF_EVB_Sink > PSF > Demo > PSF_EVB_Sink > firmware and select the project file; PSF_EVB_Sink.x
7. **Select the programming tool**: USB Type-C Demo Board-SN: XXX
8. Build and program the demo code by pressing the  button located on the
9. Connect the positive side of a 12V battery to the battery terminal marked + and the negative side of the battery to the terminal marked -.
10. Connect any USB PD capable charger to the USB-C connector to begin charging.

The demo code supports the OLED1 Xplained Pro add-on board on extension header 1. This add-on board is optional but is a useful tool for debugging and charger status monitoring. The OLED1 Xplained Pro board can be purchased here: OLED1 Xplained Pro Board. Button 3 on the OLED1 board is used to switch between two display pages. On the first page, the battery charger status is shown (either Fault, Pre-condition, CC Mode, CV Mode, or Fully Charged). If a fault has occurred, it will display what type of fault it is. If there is no fault, it will display the battery SOC as a percentage. On page 2, the negotiated PD contract is displayed in terms of negotiated voltage and current.

Note: You may have to press the board reset button after plugging in the OLED1 board if the display does not work initially.



OLED1 Add-on Page 1 OLED1 Add-on Page 2

Figures 5 and 6 detail the different state and fault codes that are recognized by the charger state machine and will be displayed on the OLED1 board. A brief description of what each code means is given

Status Type	Integer Code	Description
FAULT	0	A fault has been detected
PRECONDITIONING	1	Battery voltage is too low for full current charging
CCMODE	2	Constant current charge mode
CVMODE	3	Constant voltage charge mode
CHARGED	4	Battery is fully charged
RECHARGE	5	Battery voltage has fallen since being charge d

Charger state machine status codes

Fault Type	Integer Code	Description
GENERIC	0	Unknown fault
NOSOURCE	1	No PD source is attached
UVLO	2	Battery terminal voltage is too low
OVLO	3	Battery terminal voltage is too high
OVERTEMP	4	Battery temperature is too high
UNDERTEMP	5	Battery temperature is too low

Debug information is output to debug com port for the board. Using a terminal program, Tera Term, set to the correct COM port for the PD EVAL board and 115.2 KBaud, debug information will be printed to the terminal window as shown below.

Debug information shown below of the charging of the battery.

*PD_Sync_terminal_dump.txt - Notepad

File Edit Format View Help

```
PDPWRÈ
pwm value: 0
battV: 9002 mV - chgI: 0 mA - status: 0
pwm value: 0
battV: 8990 mV - chgI: 0 mA - status: 0
pwm value: 853
battV: 8642 mV - chgI: 0 mA - status: 1
pwm value: 856
battV: 8977 mV - chgI: 0 mA - status: 1
pwm value: 883
battV: 9039 mV - chgI: 0 mA - status: 2
pwm value: 886
battV: 9139 mV - chgI: 6 mA - status: 2
pwm value: 916
battV: 9126 mV - chgI: 18 mA - status: 2
pwm value: 934
battV: 9163 mV - chgI: 94 mA - status: 2
pwm value: 937
battV: 9163 mV - chgI: 101 mA - status: 2
pwm value: 1021
battV: 9399 mV - chgI: 435 mA - status: 2
pwm value: 1024
battV: 9424 mV - chgI: 448 mA - status: 2
pwm value: 1060
battV: 9536 mV - chgI: 593 mA - status: 2
pwm value: 1096
battV: 9648 mV - chgI: 732 mA - status: 2
pwm value: 1159
battV: 9859 mV - chgI: 991 mA - status: 2
pwm value: 1198
battV: 9983 mV - chgI: 1136 mA - status: 2
pwm value: 1240
battV: 10132 mV - chgI: 1307 mA - status: 2
pwm value: 1243
battV: 10144 mV - chgI: 1313 mA - status: 2
```

Calibration Procedure

Refer to page 7 of the user guide for calibration procedure details. An optional calibration procedure can be done to improve the accuracy of the charger current sense readings. A multimeter will be required for this process.

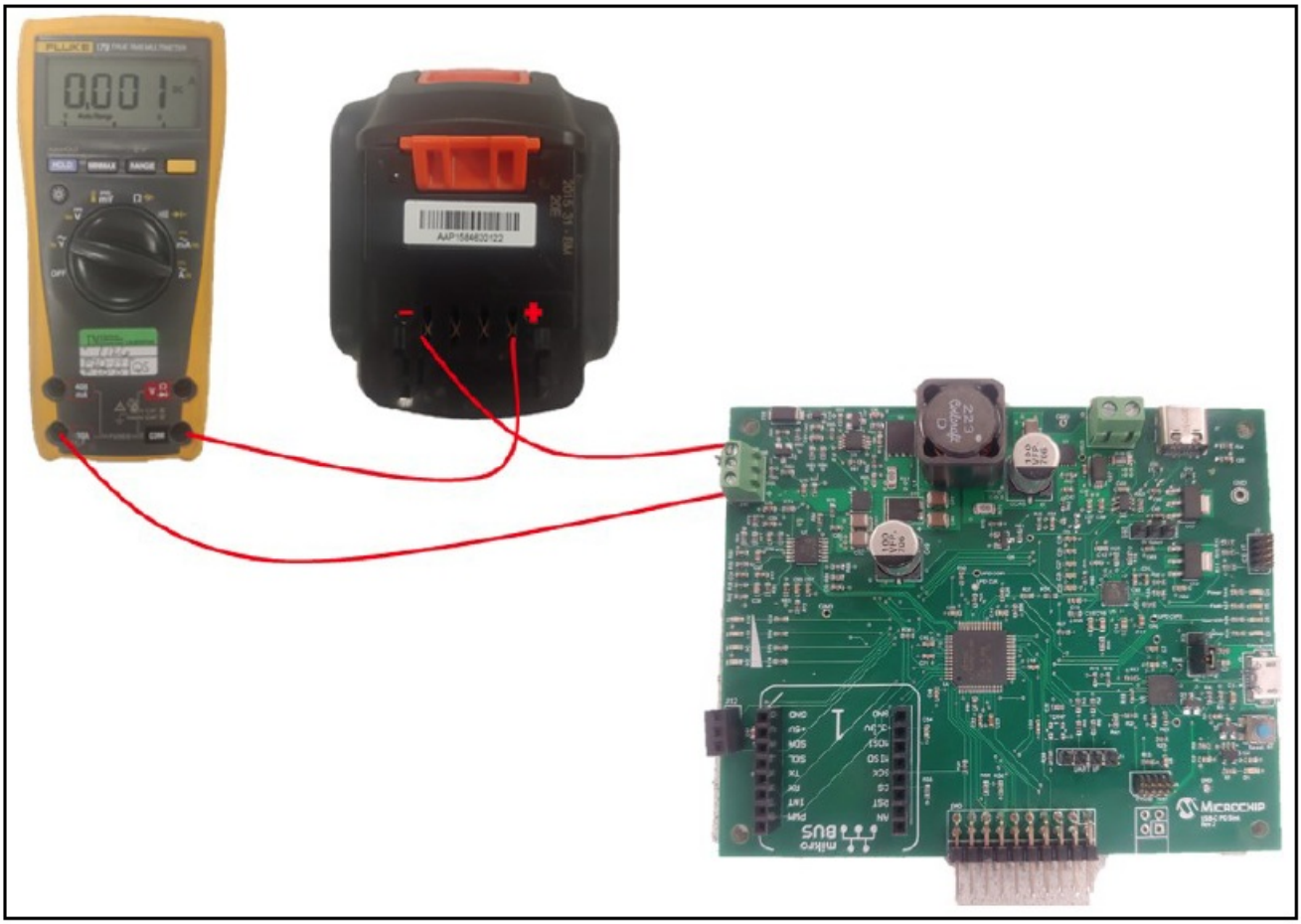
Steps to calibrate current readings:

1. Construct the circuit shown in the diagram below.
2. In the code file “SEPIC_CTRL.c” change the CALEN variable to 1 and reprogram the board to enable the calibration.

```
#define CALEN 1    //calibration mode enable, 0 = off, 1 = on
```

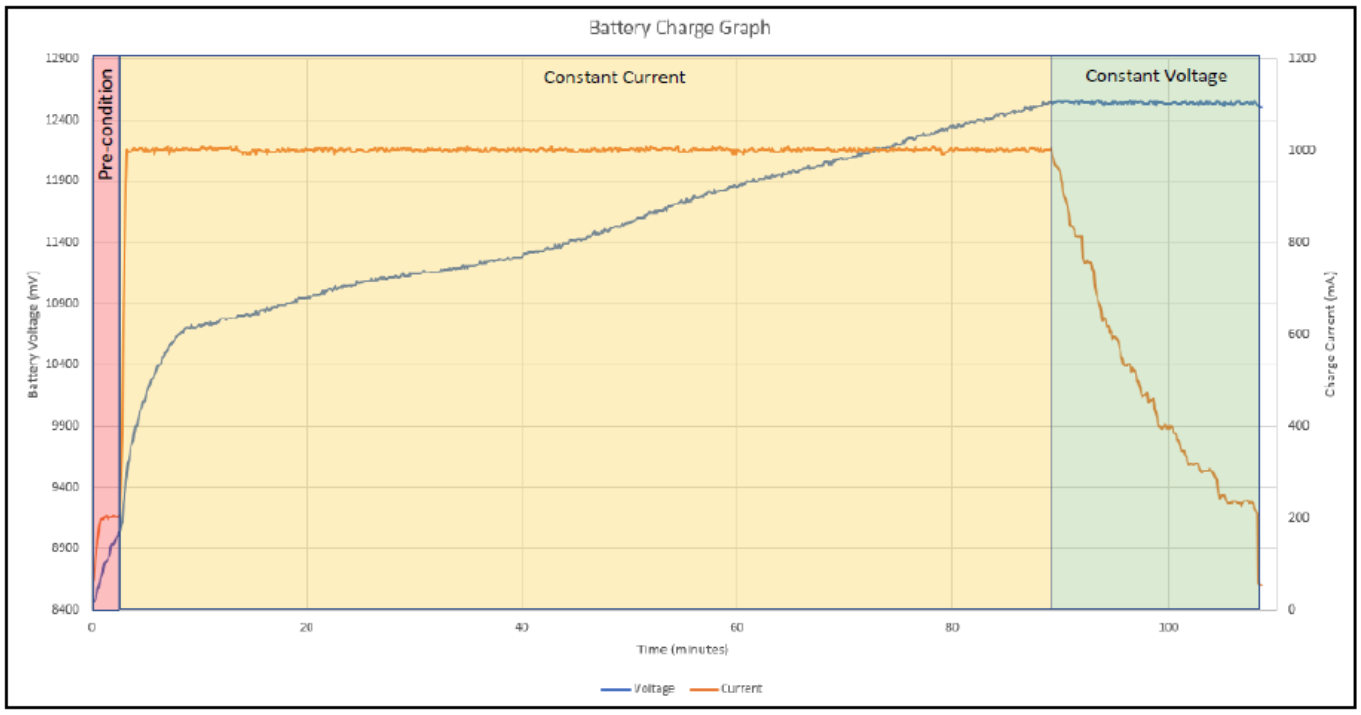
3. Plug a PD power source in to the USB-C connector (not depicted below).
4. Using the data visualizer in MPLAB X, enter the current (in mA) displayed on the multimeter. Doing this for two different values will enable us to calculate the necessary calibration parameters.
5. These values are stored in EEPROM and the calibration only needs to be done once. You will have to repeat

the calibration if you reprogram the board.



Charger Characteristics

Refer to page 8 of the user guide for charger characteristics details. The charger uses a constant current/constant voltage charge algorithm. There are three main states that the charger operates in, pre-condition, constant current charge, and constant voltage charge. The charger will enter pre-condition mode if it detects the battery voltage is too low to safely charge at full current. In this mode, charge current is limited to a few hundred milliamps. Once the charger detects the battery voltage is above the pre-charge cutoff threshold, it will ramp up current to the maximum allowed charge current. This value can be hard-coded by the user or can be set to automatically calculate based on the negotiated PD contract. The charger will continue to charge at constant current until the battery voltage nears its maximum voltage at which point it will enter constant voltage mode. In this mode, the charger checks the battery voltage every 500ms. If the voltage is above the maximum battery voltage, it will decrement current until it is at or slightly below that voltage threshold. This will maintain the battery voltage at a constant level. This process will continue until the charge current is below a specified cutoff current. At this point the charger will shutoff but will continue monitoring the battery and topping off the charge as needed.



The parameters for charger state thresholds can be tuned in the “SEPIC_CTRL.c” file. Several defines are used to establish battery parameters and desired thresholds/cutoffs

```
//set battery parameters
#define CELLVMIN 2700 //inidivual cell min voltage in mV
#define CELLVMAX 4200 //inidivual cell max voltage in mV
#define BATTIMAX 3000 //max charge current in mA
#define NUMCELLS 3 //number of series cells
#define UCLO 150 //charge cutoff current in mA
#define BATTVMAX (NUMCELLS * CELLVMAX) //total battery maximum voltage
#define BATTVMIN (NUMCELLS * CELLVMIN) //total battery minimum voltage (UVLO value)
#define RECHARGETHRESH 4100*NUMCELLS //threshold for trickle charge engage
#define MINCCCHARGETHRESH 3000*NUMCELLS //threshold for full speed cc charging
#define CVTHRESH 4180*NUMCELLS //threshold to swtich from CC to CV charge
```

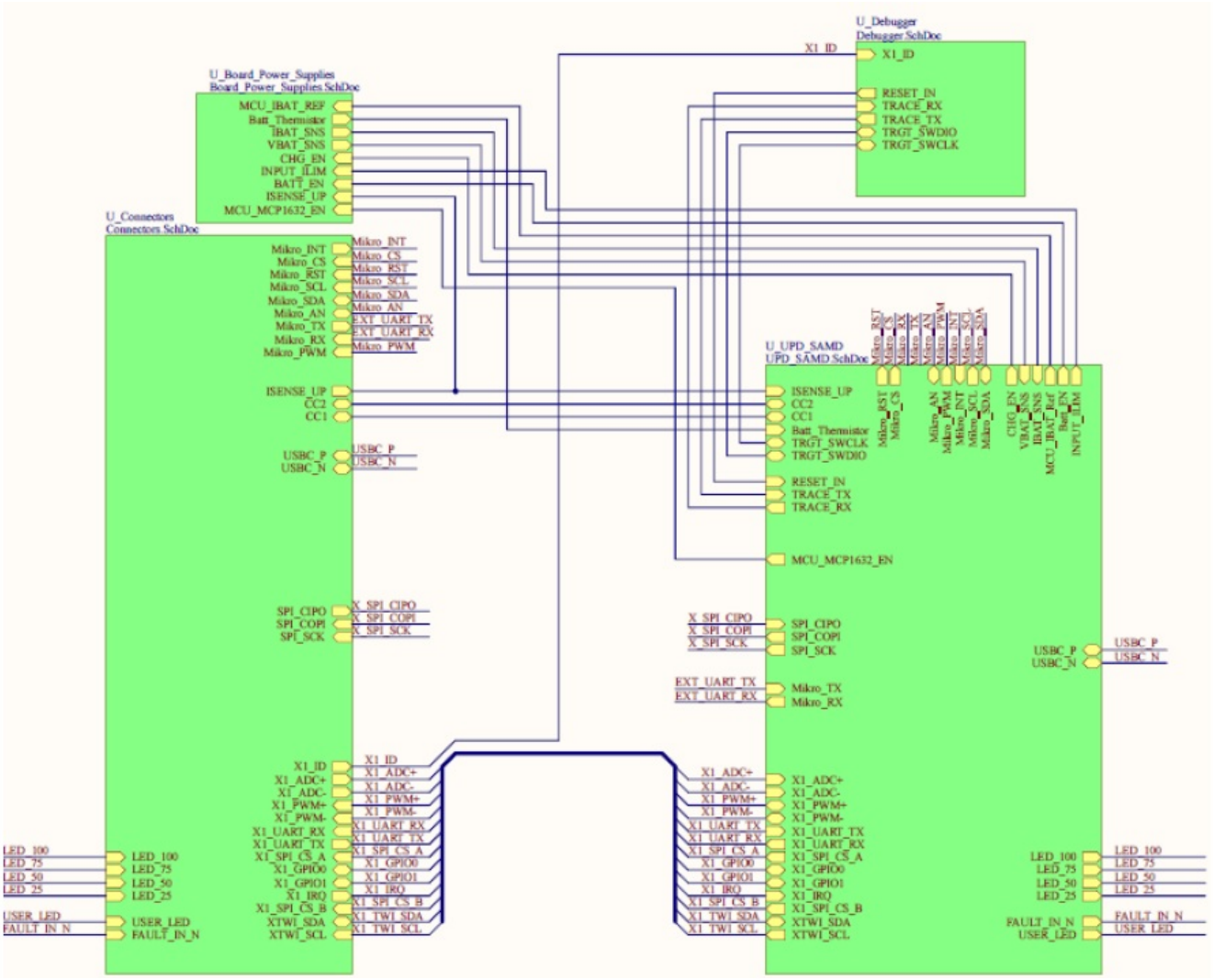
Additionally, the preferred charge current can be manually or automatically determined by modifying the code shown below.

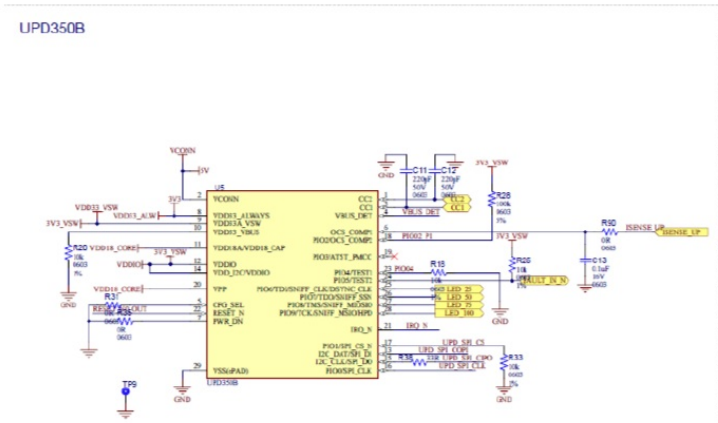
```
320     uint16_t maxcurrent = gasCfgStatusData.sPerPortData[0].u16NegoCurrentInmA;
321     //set this value for a manual max charge current limit,
322     //otherwise comment this line to use the PD negotiated current
323     maxcurrent = 1000;
```

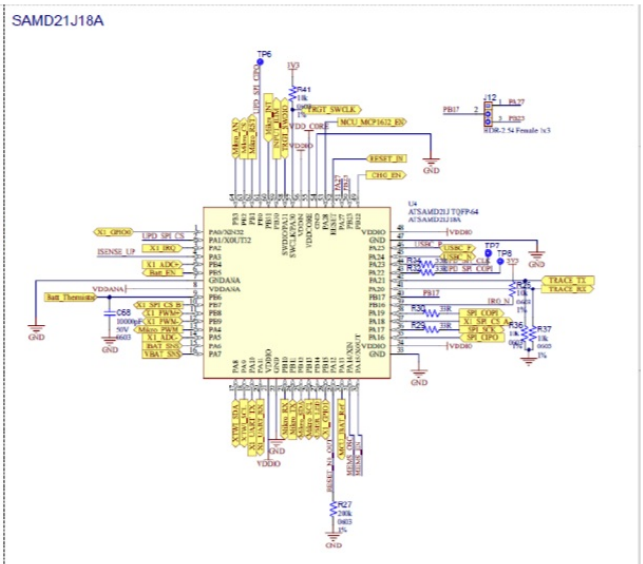
Schematics

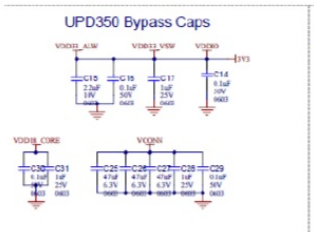
Schematics and Bill of Materials

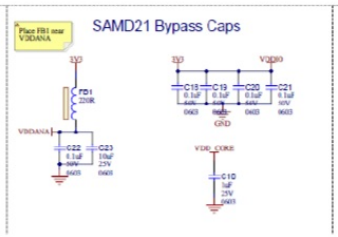
Refer to pages 11-17 of the user guide for schematics and bill of materials details.

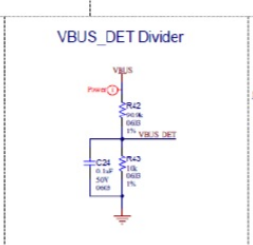

U_Debugger
Debugger.SchDoc
X1_ID
RESET_IN
TRACE_RX
TRACE_TX
TRGT_SWDIO
TRGT_SWCLK
U_Board_Power_Supplies
Board_Power_Supplies.SchDoc
MCU_IBAT_REF
Batt_Thermistor
IBAT_SNS
VBAT_SNS
CHG_EN
INPUT_ILIM
BATT_EN
ISENSE_UP
MCU_MCP1632_EN
U_Connectors
Connectors.SchDoc
Mikro_INT
Mikro_CS
Mikro_RST
Mikro_SCL
Mikro_SDA
Mikro_AN
EXT_UART_TX
EXT_UART_RX
Mikro_PWM
CC2
CC1
USBC_P
USBC_N
SPI_CIPO
SPI_COPI
SPI_SCK
X_SPI_CIPO
X_SPI_COPI
X_SPI_SCK
X1_ID
X1_ADC+
X1_ADC-
X1_PWM+
X1_PWM-
X1_UART_RX
X1_UART_TX
X1_SPI_CS_A
X1_GPIO0
X1_GPIO1
X1_IRQ
X1_SPI_CS_B
XTWI_SDA
XTWI_SCL
LED_100
LED_75
LED_50
LED_25
USER_LED
FAULT_IN_N
U_UPD_SAMD
UPD_SAMD.SchDoc
Batt_Thermistor
TRGT_SWCLK
TRGT_SWDIO
MCU_MCP1632_EN
Mikro_TX
Mikro_RX

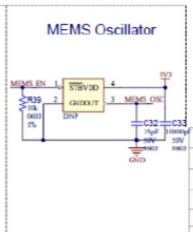

UPD350B
UPD350B

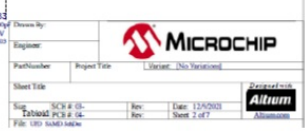

SAMD21J18A
ATSAMD21J18A

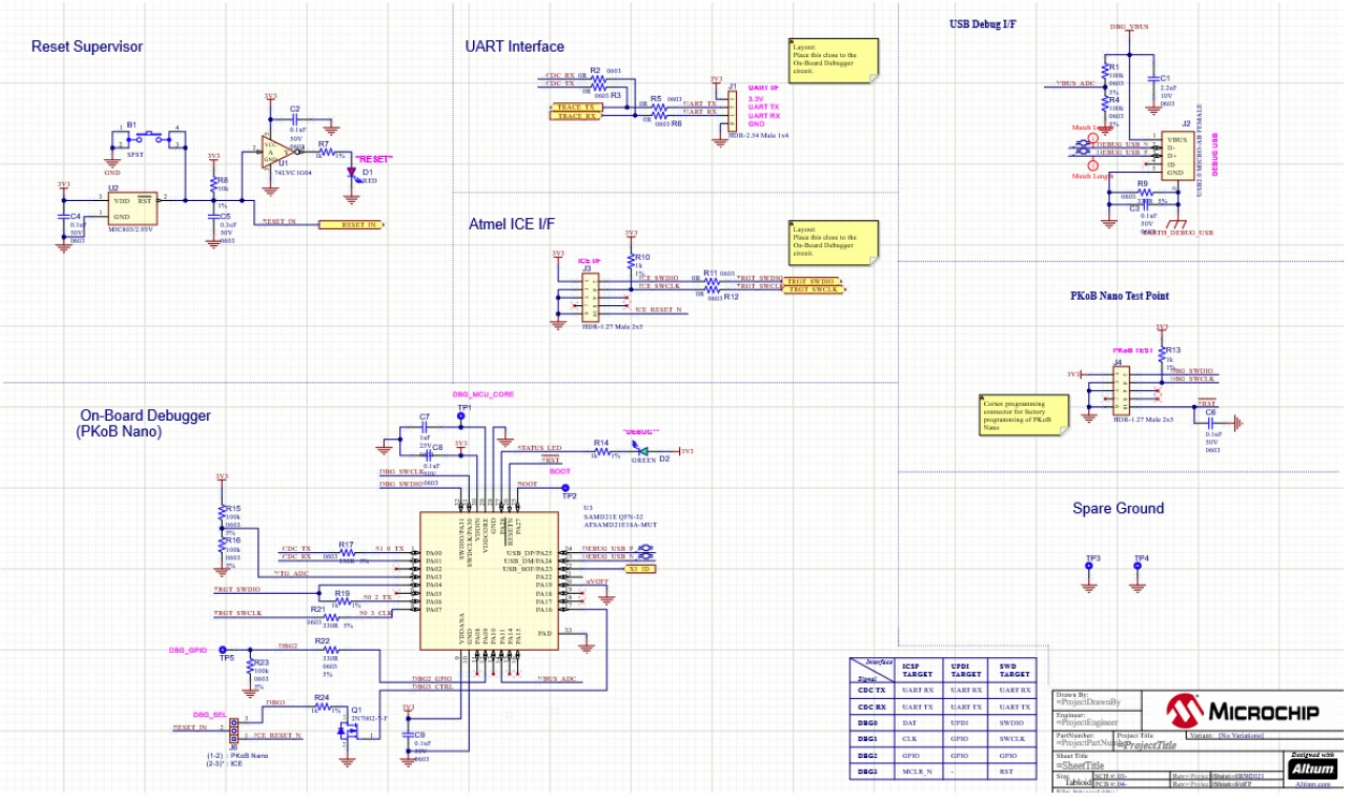

UPD350 Bypass Caps

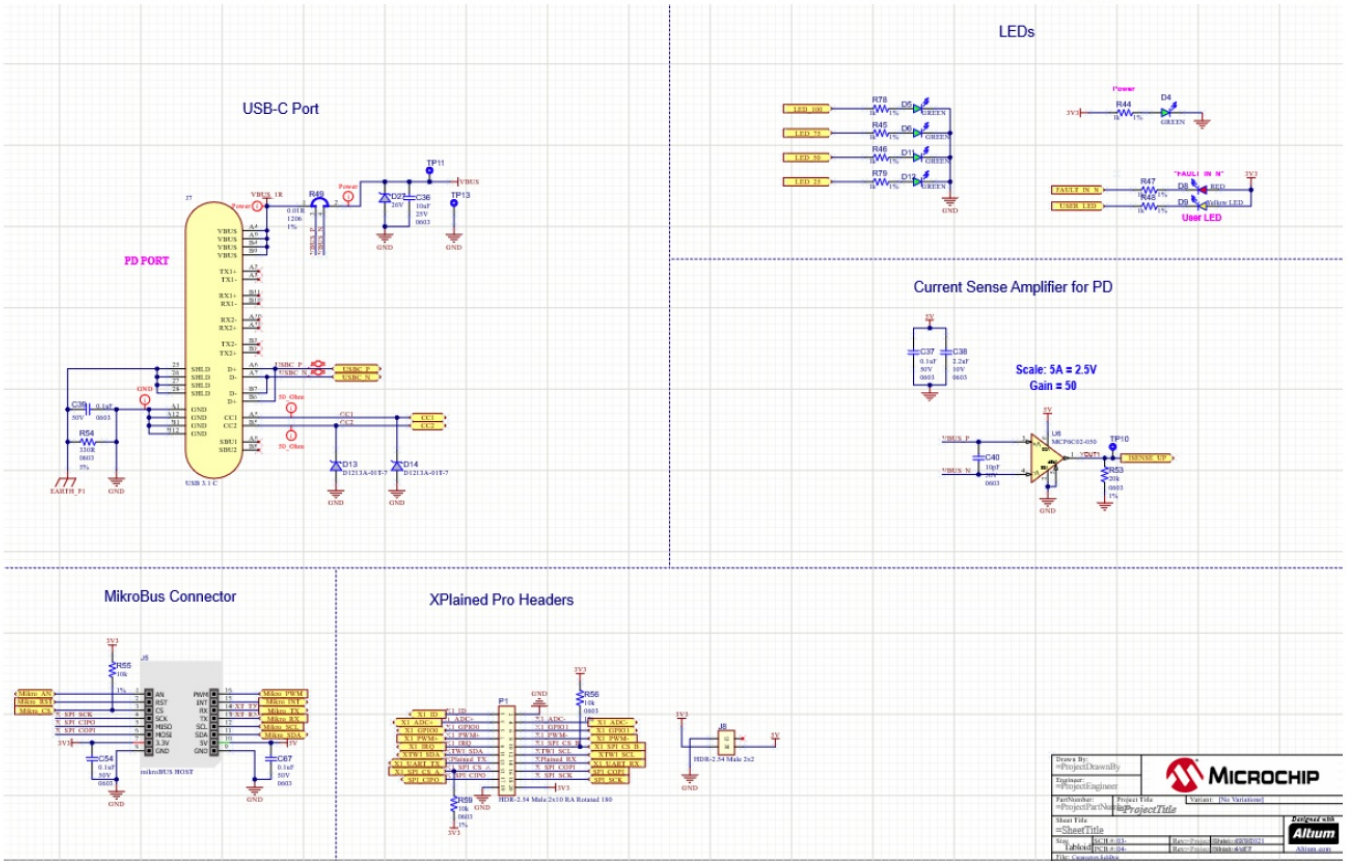

SAMD21 Bypass Caps


VBUS_DET Divider

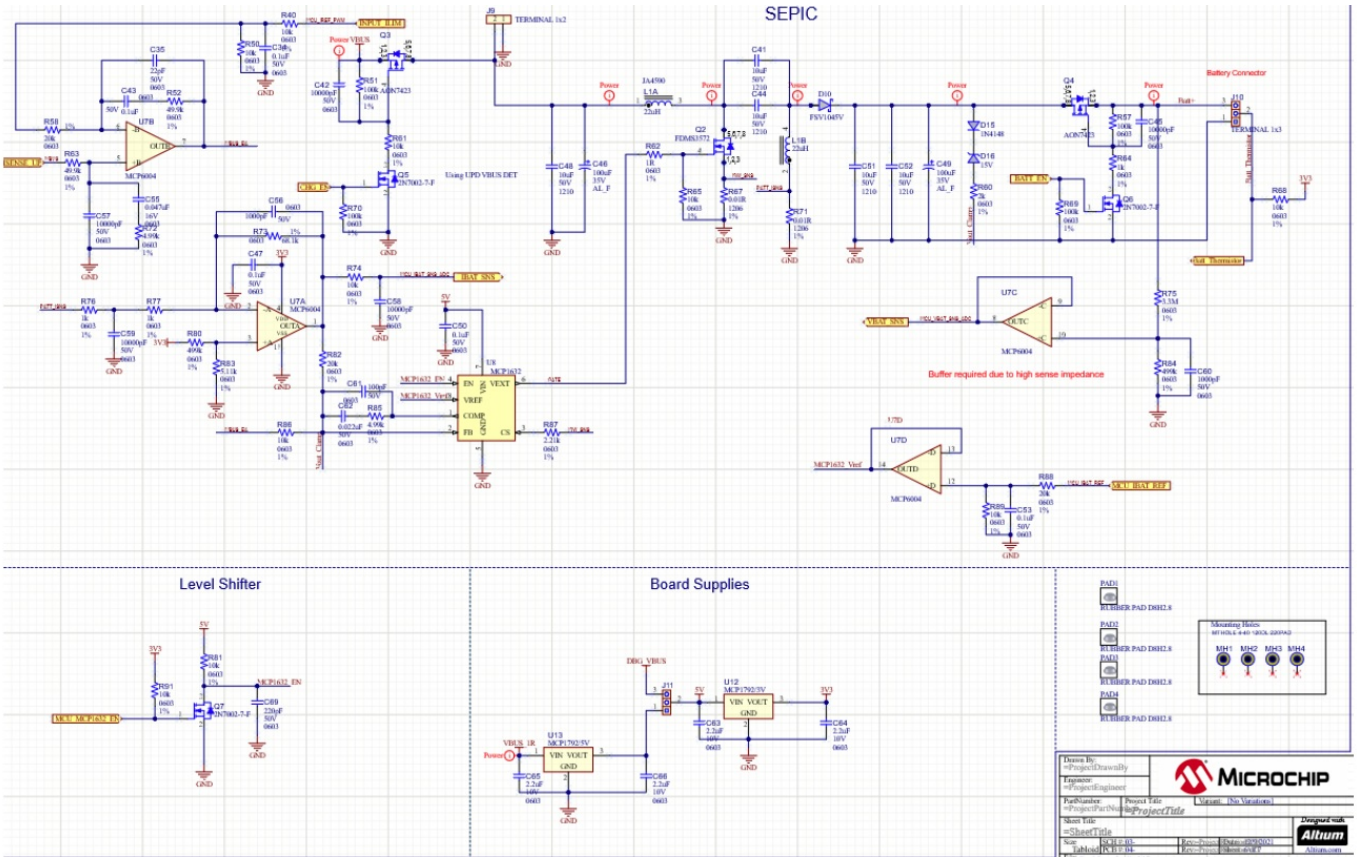

MEMS Oscillator


MICROCHIP
Altium

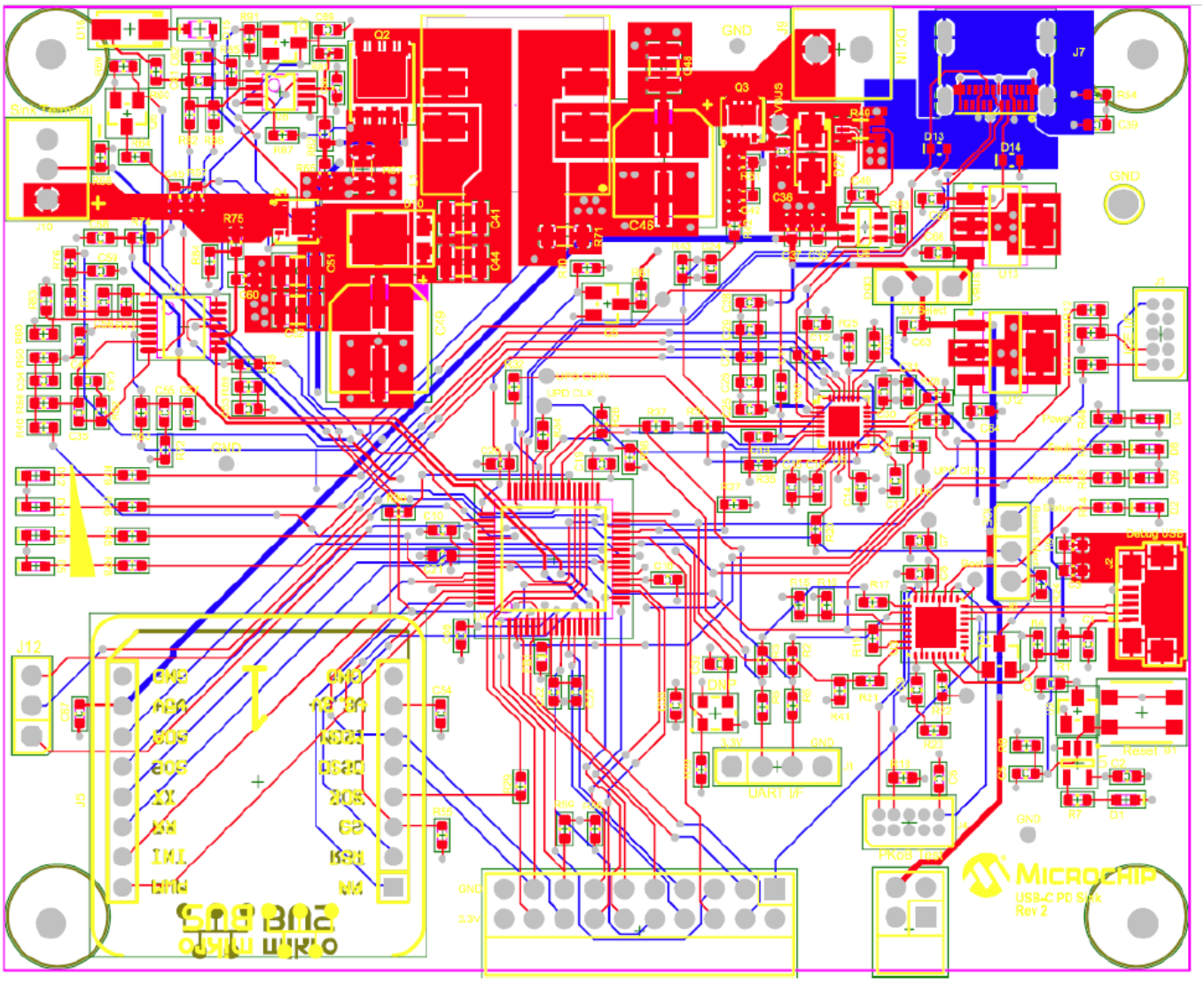

Reset Supervisor
UART Interface
USB Debug I/F
Atmel ICE I/F
PKoB Nano Test Point
On-Board Debugger
(PKoB Nano)
Spare Ground
ICSP TARGET
UPDI TARGET
SWD TARGET
CDC TX
CDC RX
DBG0
DBG1
DBG2
DBG3
MICROCHIP


USB-C Port
PD PORT
LEDs
Current Sense Amplifier for PD
Scale: 5A = 2.5V
Gain = 50
User LED

MikroBus Connector
XPlained Pro Headers
MICROCHIP


SEPIC
Level Shifter
Board Supplies
Buffer required due to high sense impedance
MICROCHIP

PCB Print

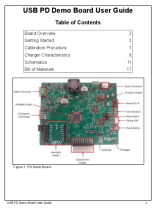


Bill of Materials

Quantity	Designator	Description	Manufacturer 1	Manufacturer Part Number 1	Supplier 1	Supplier Part Number 1	Supplier Unit Price	Price /1 Board	Populated	Quantity	Quantity Override	Status	MCHP-ID
1	B1	SWITCH TACT SPST 16V 100mA 7914G-1-032E SMD	Bourns	7914G-1-032E	Digi-Key	7914G-1-032ECT-ND	$0.8700	$0.8700	YES	1	1	MCL Desig	SWITCH1134
7	C1, C15, C38, C63, C64, C65, C66	CAP CER 2.2uF 10V 20% Y5V SMD 0603	Murata	GRM188F51A225ZE01D	Digi-Key	490-1586-1-ND		$0.0000	Yes	7	1	MCL Desig	CAP0367
26	C2, C3, C4, C5, C6, C8, C9, C14, C16, C18, C19, C20, C21, C22, C24, C29, C30, C34, C37, C39, C43, C47, C50, C53, C54, C67	CAP CER 0.1uF 50V 20% Y5V SMD 0603	Kyocera AVX	06035G104ZAT2A	Digi-Key	478-3724-1-ND		$0.0000	Yes	26	1	MCL Desig	CAP0455
5	C7, C10, C17, C28, C31	CAP CER 1uF 25V 20% X5R SMD 0603	Panasonic	ECJ-1V41E105M	Digi-Key	PCC2354CT-ND	$0.1300	$0.6500	Yes	5	1	MCL Desig	CAP0489
3	C11, C12, C69	CAP CER 220pF 50V 5% NP0 SMD 0603	KEMET	C0603C221J5GACTU	Digi-Key	399-1066-1-ND		$0.0000	Yes	3	1	MCL Desig	CAP0552
1	C13	CAP CER 0.1uF 16V 10% X7R SMD 0603	Taiyo Yuden	EMK107B7104KA-T	Digi-Key	587-1240-1-ND	$0.1000	$0.1000	YES	1	1	MCL Desig	CAP0011
2	C23, C36	CAP CER 10uF 25V 20% X5R SMD 0603	Murata	GRM188R61E106MA73	Digi-Key	490-7202-1-ND	$0.3400	$0.6800	YES	2	1	MCL Desig	CAP1461
3	C25, C26, C27	CAP CER 47uF 6.3V 20% X5R SMD 0603	Murata	GRM188R60J476ME15	Digi-Key	490-13247-1-ND	$0.4900	$1.4700	YES	3	1	MCL Desig	CAP1661
1	C32	CAP CER 15pF 50V 5% NP0 SMD 0603	Yageo	CC0603JRNPO9BN150	Digi-Key	311-1060-1-ND	$0.1000	$0.1000	Yes	1	1	MCL Desig	CAP0121
7	C33, C42, C45, C57, C58, C59, C68	CAP CER 10nF 50V 10% X7R SMD 0603 AEC-Q200, CAP CER 10000pF 50V 20% X7R SMD 0603	Kyocera AVX	06035C103K4T2A,	Digi-Key	478-7927-1-ND, 478-122	$0.1300	$0.9100	YES	7	1	MCL Desig	CAP2186, CAP
1	C35	CAP CER 22pF 50V 5% NP0 SMD 0603	Cal-Chip	GMC10CG220J50NTLF	Cal-Chip	GMC10CG220J50NTLF	$0.1000	$0.1000	Yes	1	1	MCL Desig	CAP0074
1	C40	CAP CER 10pF 50V 5% NP0 SMD 0603	KEMET	C0603C100J5GACTU	Digi-Key	399-1049-2-ND		$0.0000	Yes	1	1	MCL Desig	CAP0142
5	C41, C44, C48, C51, C52	CAP CER 10uF 50V 20% X7R SMD 1210	TDK	C3225X7R1H106M250A	Digi-Key	445-14933-1-ND	$0.9400	$4.7000	YES	5	1	MCL Desig	CAP1298
2	C46, C49	CAP ALU 100uF 35V 20% SMD	Panasonic	EEE-FP1V101AP	Digi-Key	PCE4442CT-ND	$0.9200	$1.8400	YES	2	1	MCL Desig	CAP1322
1	C55	CAP CER 0.047uF 16V 10% X7R SMD 0603	Murata	GRM188R71C473KA01	Digi-Key	490-1529-1-ND		$0.0000	YES	1	1	MCL Desig	CAP1145
2	C56, C60	CAP CER 1000pF 50V 20% X7R SMD 0603	TDK	C1608X7R2A102K080A	Digi-Key	445-1298-1-ND	$0.1000	$0.2000	YES	2	1	MCL Desig	CAP0001
1	C61	CAP CER 100pF 50V 5% NP0 SMD 0603	Cal-Chip	GMC10CG101J50NTLF	Cal-Chip	GMC10CG101J50NTLF	$0.1000	$0.1000	Yes	1	1	MCL Desig	CAP0035
1	C62	CAP CER 0.022uF 50V 5% X7R SMD 0603	Kyocera AVX	06035C223JAT2A	Digi-Key	478-3722-2-ND		$0.0000	YES	1	1	MCL Desig	CAP0625
2	D1, D8	DIO LED RED 2V 30mA 2mcd Clear SMD 0603	Vishay Lite-On	LTST-C190EKT	Digi-Key	160-1182-1-ND	$0.2600	$0.5200	YES	2	1	MCL Desig	DIODE1058
6	D2, D4, D5, D6, D11, D12	DIO LED GREEN 2V 30mA 35mcd Clear SMD 0603	Vishay Lite-On	LTST-C191KGKT	Digi-Key	160-1446-1-ND	$0.2600	$1.5600	YES	6	1	MCL Desig	DIODE1155
1	D9	LED YELLOW DIFFUSED 1608 SMD	Rohm	SML-D12Y1WT86	Digi-Key	SML-D12Y1WT86CT-ND	$0.2100	$0.2100	YES	1	1	MCL Desig	DIODE1547
1	D10							$0.0000		1			
2	D13, D14	DIO TVS D1213-01 3.3V SMD SOD-523 AEC-Q101	Diodes	D1213A-01T-7	Digi-Key	D1213A-01T-7DICT-ND	$0.4000	$0.8000	YES	2	1	MCL Desig	DIODE1502
1	D15	DIO RECT 1N4148 855mV 300mA 75V SOD-323	Diodes	1N4148WS-7-F	Digi-Key	1N4148WS-FDICT-ND	$0.1900	$0.1900	Yes	1	1	MCL Desig	DIODE0096
1	D16	DIO ZENER BZG03C15 G 15V 1.5W SMD DO-214AC SMA	ON Semiconductor	BZG03C15G	Digi-Key	BZG03C15GOSCT-ND	$0.4400	$0.4400	YES	1	1	MCL Desig	DIODE1097
1	D27	DIO TVS SMAJ26A 26V 400W DO-214AC SMA	Littelfuse	SMAJ26A	Digi-Key	SMAJ26ALFCT-ND	$0.3800	$0.3800	Yes	1	1	MCL Desig	DIODE0188

1	FB1	FERRITE 220R@100MHz 500mA SMD 0603	Murata	BLM18AG221SN1D	Digi-Key	490-1012-1-ND	$0.1000	$0.1000	YES	1	1	MCL Desi	FB1014	
1	J1	CON HDR-2.54 Male 1x4 Gold 5.84MH TH VERT	Wurth Electronics	61300411121	Digi-Key	732-5317-ND	$0.1900	$0.1900	Yes	1	1	MCL Desi	CON0148	
1	J2	CON USB2.0 MICRO-AB FEMALE SMD R/A	Hirose	ZX62-AB-5PA(31)	Digi-Key	H125279CT-ND		$0.0000	YES	1	1	MCL Desi	CON0436	
2	J3, J4	CON HDR-1.27 Male 2x5 Gold 3.05MH TH VERT	Amphenol ICC / FCI	20021111-00010T4LF	Digi-Key	609-3712-ND	$0.7700	$1.5400	YES	2	1	MCL Desi	CON1497	
2	J5	SOCKET mikroBUS HOST DIP 16 TH	Sullins	PPTC081LFBN-RC	Digi-Key	S7006-ND	$0.6500	$1.3000	YES	1	2	MCL Desi	SKT1042	
2	J6, J11	CON HDR-2.54 Male 1x3 Tin 5.84MH TH VERT	Samtec	TSW-103-07-T-S	Digi-Key	SAM1035-03-ND	$0.2400	$0.4800	Yes	2	1	MCL Desi	CON0465	
1	J7	CON USB3.1-C Female SMD RA	Molex	105450-0101	Digi-Key	WM12856CT-ND	$2.1900	$2.1900	YES	1	1	MCL Desi	CON1642	
1	J8	CON HDR-2.54 Male 2x2 Gold 6.75MH TH R/A	Molex	0901220761	Digi-Key	WM5008-02-ND	$0.4900	$0.4900	YES	1	1	MCL Desi	CON1527	
1	J9	CON TERMINAL 3.81mm 1x2 Female 16-24 AWG 10A TH R/A	Amphenol	YO02215000000G	Digi-Key	609-3918-ND		$0.0000	YES	1	1	MCL Desi	CON1037	
1	J10	CON TERMINAL 2.54mm 1x3 Female 20-30 AWG 6A TH R/A	On-Shore Technology	OSTVN03A150	Digi-Key	ED10562-ND	$1.0900	$1.0900	YES	1	1	MCL Desi	CON1303	
1	J12	CON HDR-2.54 Female 1x3 Gold 8.64MH TH VERT	TE Connectivity	5-534237-1	Digi-Key	A32904-ND	$1.4700	$1.4700	YES	1	1	MCL Desi	CON1425	
1	L1	INDUCTOR DUAL 22uH 2.45A 20% SMD L12.5W12.5H8.5	Wurth Electronics	744870220	Digi-Key	732-2327-1-ND	$2.9000	$2.9000	YES	1	1	MCL Desi	IND1405	
1	P1	CON HDR-2.54 Male 2x10 Rotated 180Degrees Gold TH RT ANGLE	Sullins	PBC10DBAN	Digi-Key	S2111E-10-ND	$1.9300	$1.9300	YES	1	1	MCL Desi	CON1547	
4	PAD1, PAD2, PAD3, PAD4	MECH HW RUBBER PAD Cylindrical flat top D8H2.8 Black	3M	SJ5076 BLACK	Farnell	1165061	$4.7800	$19.1200	MECH	4	1	MCL Desi	MECH0087	
4	Q1, Q5, Q6, Q7	TRANS FET N-CH 2N7002-7-F 60V 170mA 370mW SOT-23-3	Diodes	2N7002-7-F	Digi-Key	2N7002-FDICT-ND	$0.2100	$0.8400	YES	4	1	MCL Desi	TRA 1102	
1	Q2	TRANS FET N-CH FDMS3572 80V 22A 2.5W Power56-8	ON Semiconductor / Fai	FDMS3572	Digi-Key	FDMS3572TR-ND		$0.0000	YES	1	1	MCL Desi	TRA 1019	
2	Q3, Q4	TRANS FET P-CH AON7423 20V 28A 6.2W 8-PowerWDFN	Alpha & Omega Semico	AON7423	Digi-Key	785-1310-2-ND		$0.0000	YES	2	1	MCL Desi	TRA 1080	
10	R1, R4, R15, R16, R23, R28, R51, R57, R69, R70	RES TKF 100k 5% 1/10W SMD 0603 (Don't Use, Duplicate, Use RSMT0028), RES TF 100k 1% 1/8W SMD 0603	Panasonic, Vishay Beyt	ERJ-3GEYJ104V, MCT0	Digi-Key	P100KGCT-ND, MCT060	$0.0370	$0.3700	Yes	10	1	MCL Desi	RES1115, RES	
9	R2, R3, R5, R6, R11, R12, R31, R35, R90	RES TKF 0R 1/10W AEC-Q200 SMD 0603	Panasonic	ERJ-3GEY0R00V	Digi-Key	P0.0GCT-ND	$0.1000	$0.9000	YES	9	1	MCL Desi	RES2360	
16	R7, R10, R13, R14, R19, R24, R44, R45, R46, R47, R48, R64, R76, R77, R78, R79	RES TKF 1k 1% 1/10W AEC-Q200 SMD 0603	Panasonic	ERJ3EKF1001V	Digi-Key	P1.00KHCT-ND	$0.0360	$0.5800	YES	16	1	MCL Desi	RES2457	
24	R8, R18, R20, R25, R26, R33, R36, R37, R39, R40, R41, R43, R50, R55, R56, R59, R61, R65, R68, R74, R81, R86, R89, R91	RES TF 10k 1% 1/16W SMD 0603	TE Connectivity	5-1879837-9	Digi-Key	A102203CT-ND	$0.1650	$3.9120	YES	24	1	MCL Desi	RES1368	
5	R9, R17, R21, R22, R54	RES TKF 330R 5% 1/10W SMD 0603	Rohm	MCR03EZPJ331	Digi-Key	RHM330GCT-ND		$0.0000	Yes	5	1	MCL Desi	RES0195	
1	R27	RES TKF 200k 1% 1/10W SMD 0603	Vishay	CRCW0603200KFKEA	Digi-Key	541-200KHCT-ND		$0.0000	Yes	1	1	MCL Desi	RES1140	
5	R29, R30, R32, R34, R38	RES TKF 33R 1% 1/10W SMD 0603	Rohm	MCR03EZPFX33R0	Digi-Key	RHM33.0HCT-ND		$0.0000	Yes	5	1	MCL Desi	RSMT0701	
1	R42	RES TKF 90.9k 1% 1/10W SMD 0603	Panasonic	ERJ-3EKF9092V	Digi-Key	P90.9KHTR-ND		$0.0000	Yes	1	1	MCL Desi	RSMT0365	
1	R49	RES SHUNT 0.01R 1% 1/4W 1206	Yageo	PF1206FRF070R01L	Digi-Key	311-0.01AJCT-ND	$0.4700	$0.4700	YES	1	1	MCL Desi	RSMT1231	
2	R52, R63	RES TKF 49.9k 1% 1/10W SMD 0603	Yageo	RC0603FR-0749K9L	Digi-Key	311-49.9KHRCT-ND	$0.1000	$0.2000	YES	2	1	MCL Desi	RES2498	
4	R53, R58, R82, R88	RES TKF 20k 1% 1/10W SMD 0603	Panasonic	ERJ3EKF2002V	Digi-Key	P20.0KHCT-ND	$0.1000	$0.4000	Yes	4	1	MCL Desi	RSMT0309	
1	R60	RES TKF 2k 1% 1/10W SMD 0603	Panasonic	ERJ-3EKF2001V	Digi-Key	P2.00KHTR-ND	$0.1000	$0.1000	Yes	1	1	MCL Desi	RSMT0382	
1	R62	RES TKF 1R 1% 1/10W SMD 0603	Yageo	RC0603FR-071RL	Digi-Key	311-1.00HRCT-ND	$0.1000	$0.1000	YES	1	1	MCL Desi	RES1399	
2	R67, R71	RES SHUNT MF 0.01R 1% 1W SMD 1206	Bourns	CRF1206-FX-R010ELF	Digi-Key	CRF1206-FX-R010ELFCT-ND		$0.0000	YES	2	1	MCL Desi	RSMT1228	
2	R72, R85	RES TKF 4.99k 1% 1/10W SMD 0603	Panasonic	ERJ-3EKF4991V	Digi-Key	P4.99KHCT-ND		$0.0000	Yes	2	1	MCL Desi	RSMT0185	
1	R73	RES TKF 68.1k 1% 1/10W SMD 0603	Yageo	RC0603FR-0768K1L	Digi-Key	311-68.1KHRCT-ND	$0.1000	$0.1000	Yes	1	1	MCL Desi	RSMT1041	
1	R75	RES TKF 3.3M 1% 1/8W SMD 0603	Stackpole Electronics	RMCF0603FT3M30	Digi-Key	RMCF0603FT3M30CT-ND		$0.0000	Yes	1	1	MCL Desi	RES1156	
2	R80, R84	RES TKF 499k 1% 1/10W SMD 0603	Panasonic	ERJ-3EKF4993V	Digi-Key	P499KHCT-ND	$0.1000	$0.2000	Yes	2	1	MCL Desi	RES1191	
1	R83	RES TKF 5.11k 1% 1/10W SMD 0603	Yageo	RC0603FR-075K11L	Digi-Key	311-5.11KHRCT-ND	$0.1000	$0.1000	YES	1	1	MCL Desi	RES1639	
1	R87	RES TKF 2.21k 1% 1/10W SMD 0603 AEC-Q200	Vishay	CRCW06032K21FKEA	Digi-Key	541-2.21KHCT-ND	$0.1000	$0.1000	YES	1	1	MCL Desi	RES2487	
1	U1	IC LOGIC 74LVC1G04 SOT-23-5	Texas Instruments	SN74LVC1G04DBVR	Digi-Key	296-11599-1-ND	$0.3400	$0.3400	YES	1	1	MCL Desi	IC00353	
1	U2	MCHP ANALOG SUPERVISOR 2.93V MIC803-29D4VM3-TR SOT-23-3	Microchip	MIC803-29D4VM3-TR	Digi-Key	576-3806-1-ND	$0.3900	$0.3900	YES	1	1	MCL Desi	MIC7416	
1	U3	MCHP MCU 32-BIT 48MHz 256Kb 32Kb ATSAMD21E18A-MUT QFN-32	Microchip	ATSAMD21E18A-MUT	Digi-Key	ATSAMD21E18A-MUTC	$3.9600	$3.9600	YES	1	1	MCL Desi	MIC8641	
1	U4	MCHP MCU 32-BIT 48MHz 256kB 32kB ATSAMD21J18A-AU TQFP-64	Microchip Technology	ATSAMD21J18A-AU	Microchip Tech	ATSAMD21J18A-AU		$0.0000	YES	1	1	MCL Desi	MIC8796	
1	U5	MCHP INTERFACE UPD350B USB Type C PD PORT CONTROLLER, SPI, DB, QFN-28	Microchip	UPD350B-I/Q8X	Digi-Key	UPD350B-I/Q8X-ND	$1.7400	$1.7400	YES	1	1	MCL Desi	MIC8374	
1	U6	MCHP ANALOG CURRENT SENSE AMP MCP6C02T-050E/CHY SOT-23-6	Microchip	MCP6C02T-050E/CHY	Digi-Key	MCP6C02T-050E/CHYCT-ND		$0.0000	YES	1	1	MCL Desi	MIC7900	
1	U7	MCHP ANALOG OPAMP 4-Ch 1MHz MCP6004T-E/ST TSSOP-14	Microchip	MCP6004T-E/ST	Microchip	MCP6004T-E/ST		$0.0000	Yes	1	1	MCL Desi	MIC2947	
1	U8	MCHP ANALOG PWM CONTROLLER 300kHz MCP1632T-AAE/MS MSOP-8	Microchip	MCP1632T-AAE/MS	Digi-Key	MCP1632T-AAE/MS-ND		$0.0000	YES	1	1	MCL Desi	MIC6117	
1	U12	MCHP ANALOG LDO 3V MCP1792 SOT-223-3	Microchip Technology	MCP1792-3302H/DB	Microchip Tech	MCP1792-3302H/DB		$0.0000	YES	1	1	MCL Desi	MIC8751	
1	U13	MCHP ANALOG LDO 5V MCP1792 SOT-223-3	Microchip Technology	MCP1792-5002H/DB	Microchip Tech	MCP1792-5002H/DB		$0.0000	YES	1	1	MCL Desi	MIC8805	

Documents / Resources

	MICROCHIP USB PD Demo Board [pdf] User Guide USB PD Demo Board, PD Demo Board, Demo Board, Board

References

- GitHub: Let's build from here · GitHub
- GitHub - MicrochipTech/PD_Sink_Battery_Charger_Demo: Demo project for the PD Sink battery charger board