WPT Charger Main

Version Control

Ver	Rev	Date	Description	Author	Reviewer	Approver
0.1	A	30/07/2024	Informal Release.	M. Ferreira	J. Evia	R. Ercoli
1.0	A	20/08/2024	1.0 Release for the HORNET WPTCharger with custom WPT IC control mechanism.	M. Ferreira	J. Evia	R. Ercoli
1.1	A	27/08/2024	Change neopixel part number due to stock options.	J. Evia	M. Ferreira	R. Ercoli
1.2	A	28/08/2024	Attend RushPCB DFA Comments	J. Evia	M. Ferreira	R. Ercoli

Mechanical & Miscellaneous

ERC reference

Fiducial Markers

BOTTOM

TOP

Mounting holes

- X100 HOLE_UNPLATED_2.3MM
- X101 HOLE_UNPLATED_2.3MM
- X102 HOLE_UNPLATED_2.3MM
- X103 HOLE_UNPLATED_2.3MM

Design Observations

This project contains the WPTCharger compatible with the HORNET IPG version v1.4.A. This PCB implements a nobel approach for controlling the LTC4125 WPT IC using a DAC for increasing the transimssion power.

Page Index

FOCUS

Project: WPTChargerMain.PrjPcb

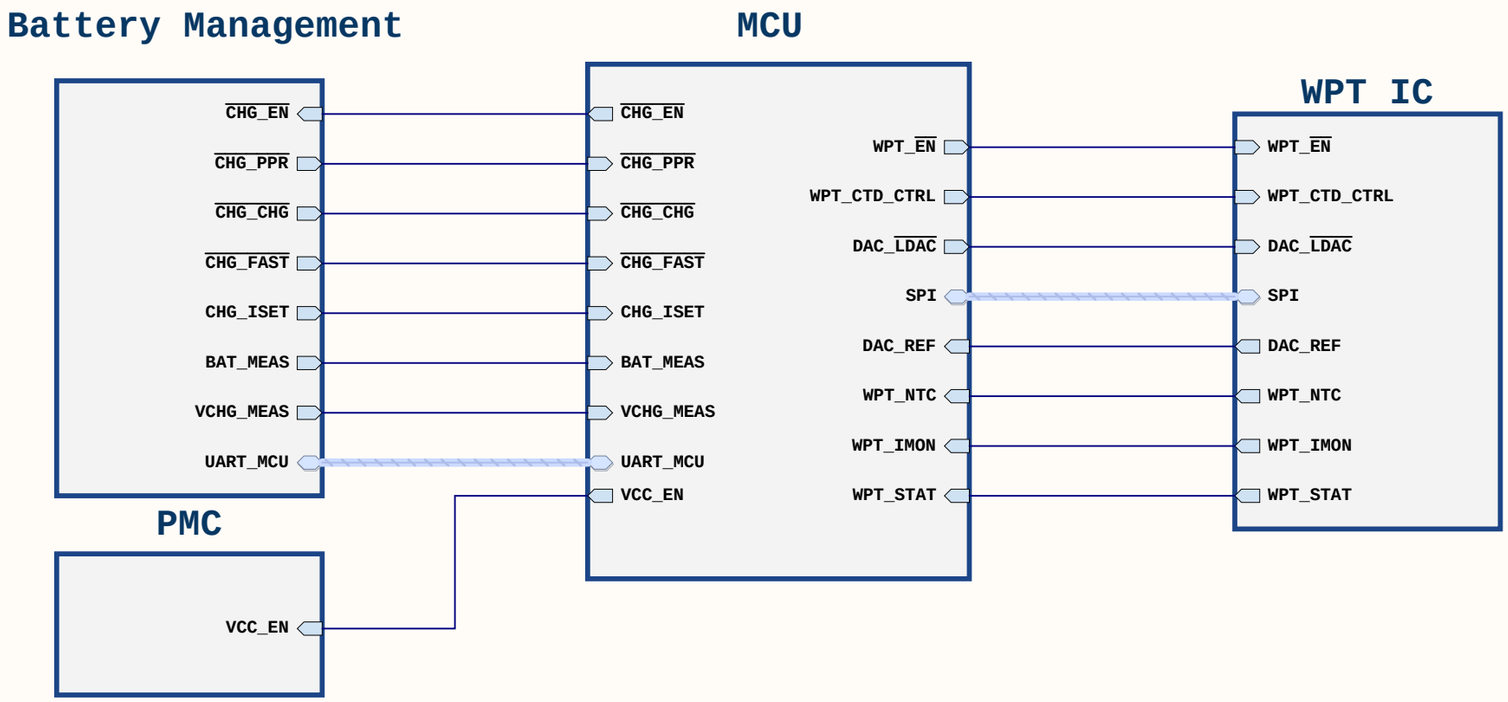
Schematic: **Cover** | Ver: 1.2

Design by: **Mathias Ferreira** | Date: **28/08/2024**

Reviewed by: **Julian Evia** | Date: **28/08/2024**

Comments:

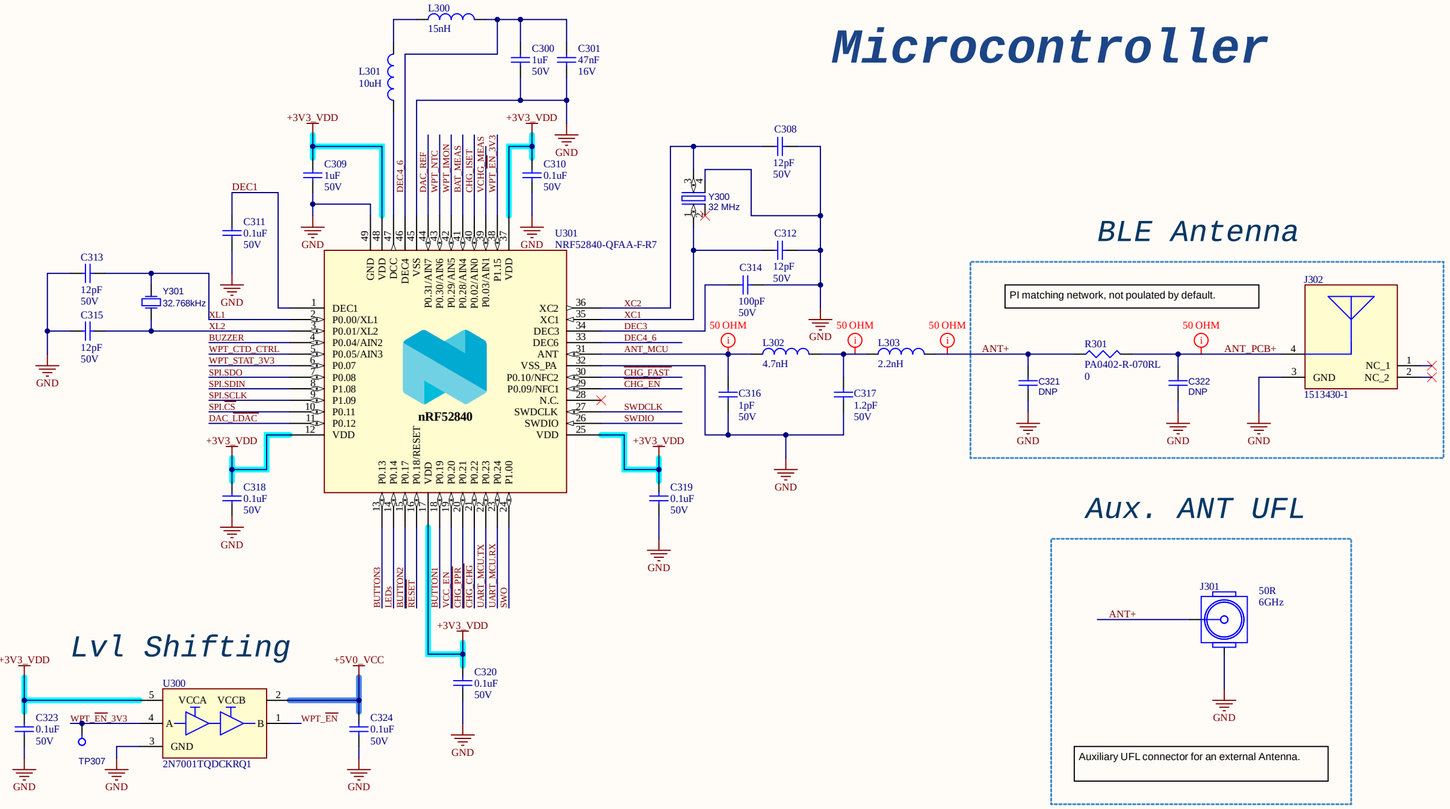
Block Diagram



FOCUS	Project: WPTChargerMain.PrjPcb
Schematic: **Block Diagram**	Ver: 1.2
Design by: **Mathias Ferreira**	Date: **28/08/2024**
Reviewed by: **Julian Evia**	Date: **28/08/2024**
Comments:	

MCU

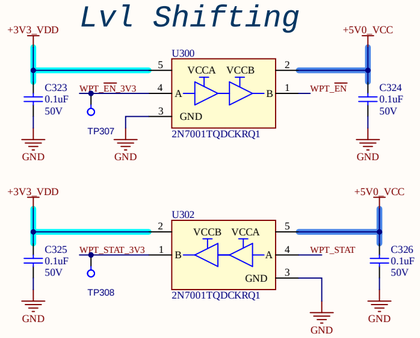
Microcontroller



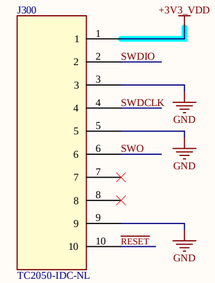
BLE Antenna

Aux. ANT UFL

Lvl Shifting

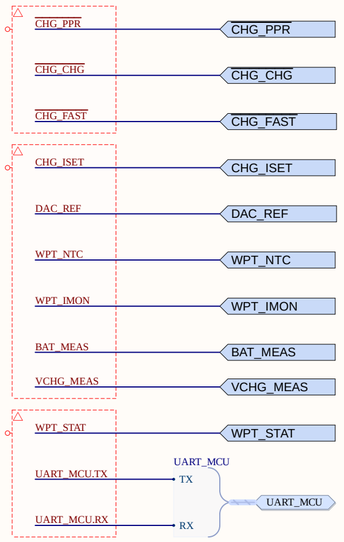


Programmer

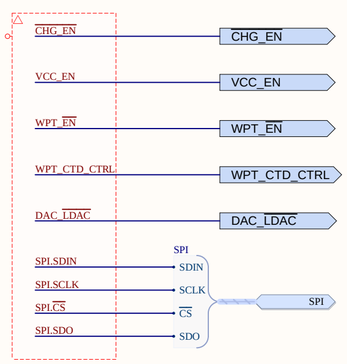


Interconnect

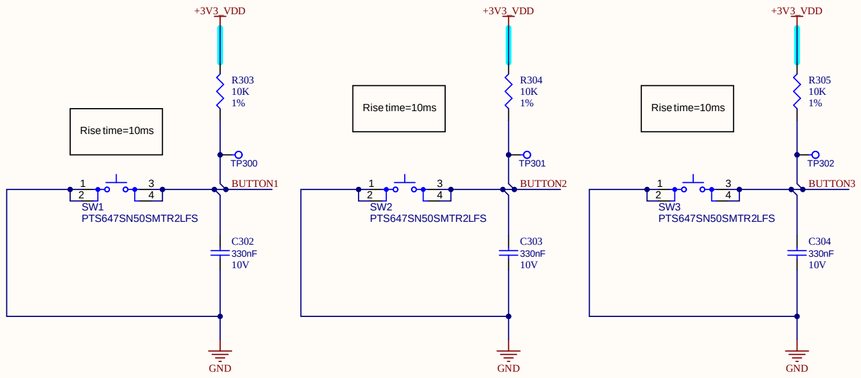
Inputs



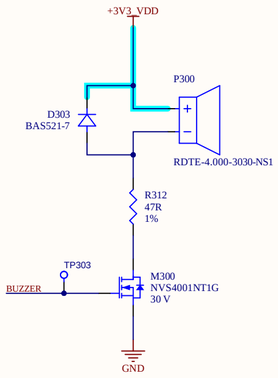
Outputs



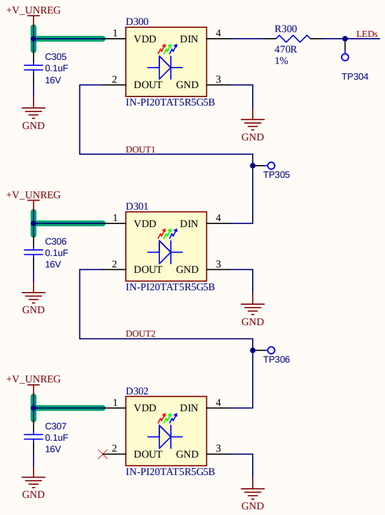
Buttons



Buzzer

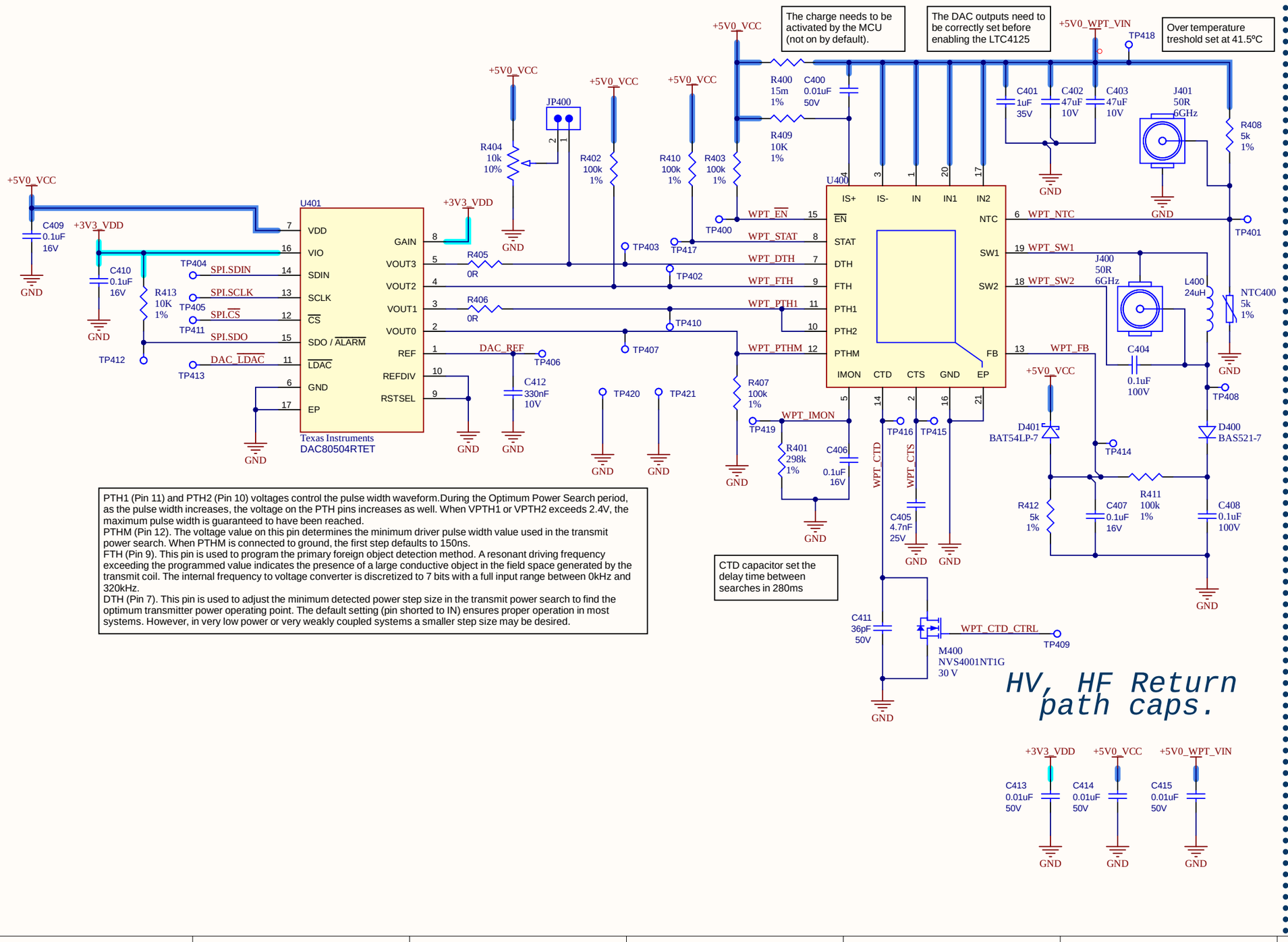


LED indicators



FOCUS	Project: WPTChargerMain.PrjPcb	
Schematic: **MCU**		Ver: 1.2
Design by: **Mathias Ferreira**		Date: **28/08/2024**
Reviewed by: **Julian Evia**		Date: **28/08/2024**
Comments:		

WPT IC



PTH1 (Pin 11) and PTH2 (Pin 10) voltages control the pulse width waveform.During the Optimum Power Search period, as the pulse width increases, the voltage on the PTH pins increases as well. When VPTH1 or VPTH2 exceeds 2.4V, the maximum pulse width is guaranteed to have been reached.
PTHM (Pin 12). The voltage value on this pin determines the minimum driver pulse width value used in the transmit power search. When PTHM is connected to ground, the first step defaults to 150ns.
FTH (Pin 9). This pin is used to program the primary foreign object detection method. A resonant driving frequency exceeding the programmed value indicates the presence of a large conductive object in the field space generated by the transmit coil. The internal frequency to voltage converter is discretized to 7 bits with a full input range between 0kHz and 320kHz.
DTH (Pin 7). This pin is used to adjust the minimum detected power step size in the transmit power search to find the optimum transmitter power operating point. The default setting (pin shorted to IN) ensures proper operation in most systems. However, in very low power or very weakly coupled systems a smaller step size may be desired.

CTD capacitor set the delay time between searches in 280ms

Interconnect

Inputs

- WPT_$\overline{EN}$ → WPT_$\overline{EN}$
- WPT_CTD_CTRL → WPT_CTD_CTRL
- DAC_$\overline{LDAC}$ → DAC_$\overline{LDAC}$
- SPI.SDIN → SPI.SDIN
- SPI.SCLK → SPI.SCLK
- SPI.$\overline{CS}$ → SPI.$\overline{CS}$
- SPI.SDO → SPI.SDO

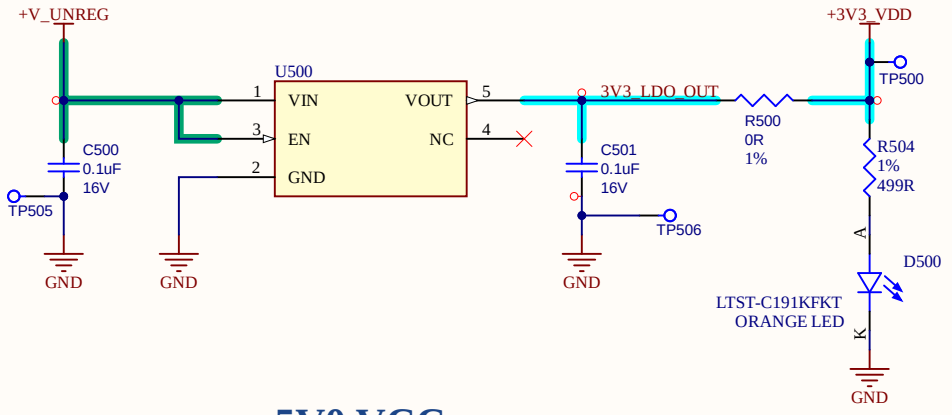
Outputs

- DAC_REF → DAC_REF
- WPT_NTC → WPT_NTC
- WPT_IMON → WPT_IMON
- WPT_STAT → WPT_STAT

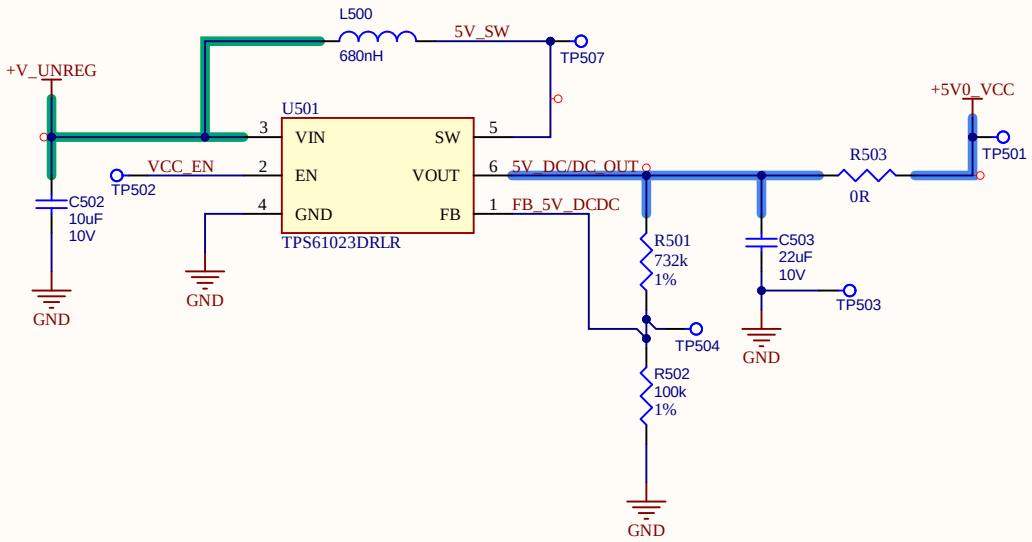
FOCUS	Project: WPTChargerMain.PrjPcb
Schematic: **WPT-IC**	Ver: 1 .2
Design by: **Mathias Ferreira**	Date: **28/08/2024**
Reviewed by: **Julian Evia**	Date: **28/08/2024**
Comments:	

PMC

3V3 VDD



5V0 VCC



Interconnect

Inputs

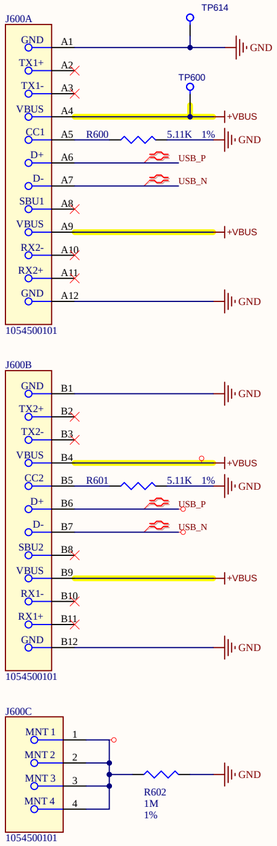
VCC_EN → VCC_EN

Outputs

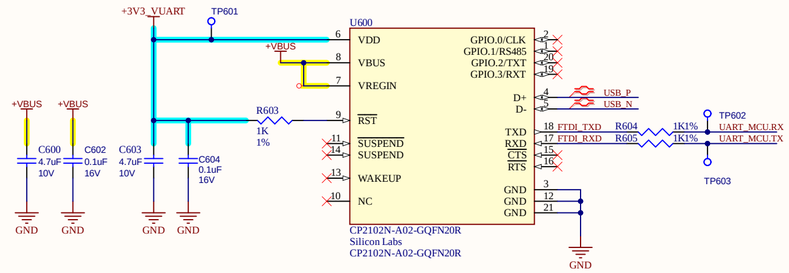
FOCUS	Project: WPTChargerMain.PrjPcb
Schematic: **PMC**	Ver: 1 .2
Design by: **Mathias Ferreira**	Date: **28/08/2024**
Reviewed by: **Julian Evia**	Date: **28/08/2024**
Comments:	

Battery Management

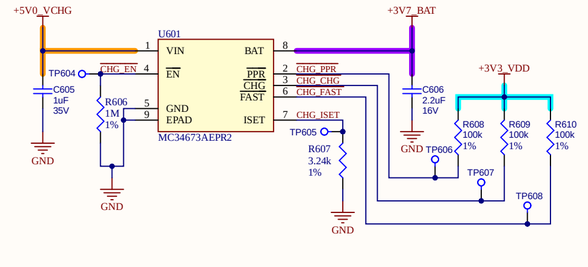
USB-C Connector



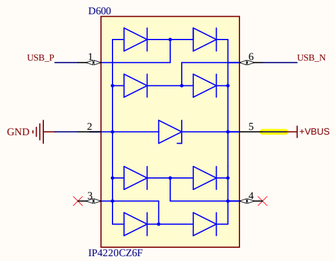
USB to Serial adaptor



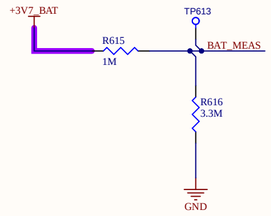
Battery charger



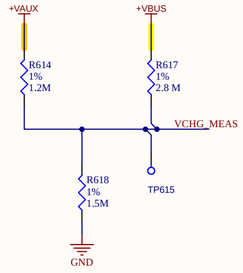
ESD Protections



Battery Measurement

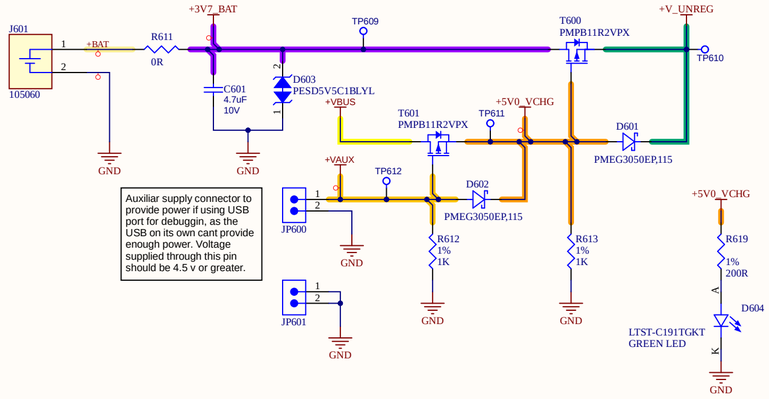


VBUS/VAUX Detect



Voltage supply

M600 is configured in reverse orientation to M601 to prevent leakage currents towards the battery when the 5V supply is connected.



Auxiliar supply connector to provide power if using USB port for debuggin, as the USB on its own cant provide enough power. Voltage supplied through this pin should be 4.5 v or greater.

USB Connected	VAUX Connected	VCHG_MEAS	VCHG_MEAS_MIN	VCHG_MEAS_AVG	VCHG_MEAS_MAX
0	0	X	X	X	X
0	1	VAUX*1.5/(2.7)	2.48 V	2.78 V	2.94 V
1	0	VBUS*1.5/(4.3)	1.55 V	1.74 V	1.83 V
1	1	(VAUX*4.2+VBUS*1.8)/(9.36)	2.00 V	2.24 V	2.38 V

Note: to compute minimum and maximum VCHG_MEAS values, it was supposed that VAUX and VBUS varied between 4.5 up to 5.25 V, with an average value of 5 V.

Interconnect

Inputs

Outputs