PDNode-600Pro

Rev 1.0.0

PDCard

Variant: 1.0.1

04.02.2026

CONTENT

VERSION:

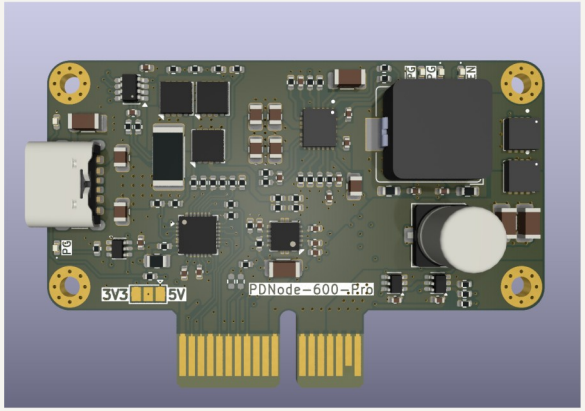
DRAFT - Very early stage of schematic, ignore details.

PRELIMINARY - Close to final schematic.

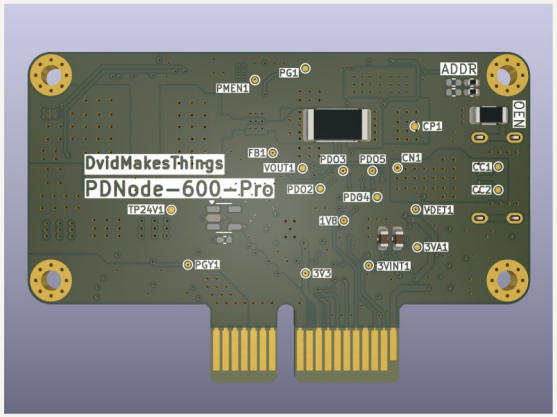
CHECKED - There shouldn't be any mistakes. Contact the engineer if you find any.

RELEASED - A board with this schematic has been sent to production.

PCB TOP VIEW



PCB BOTTOM VIEW



NOTES

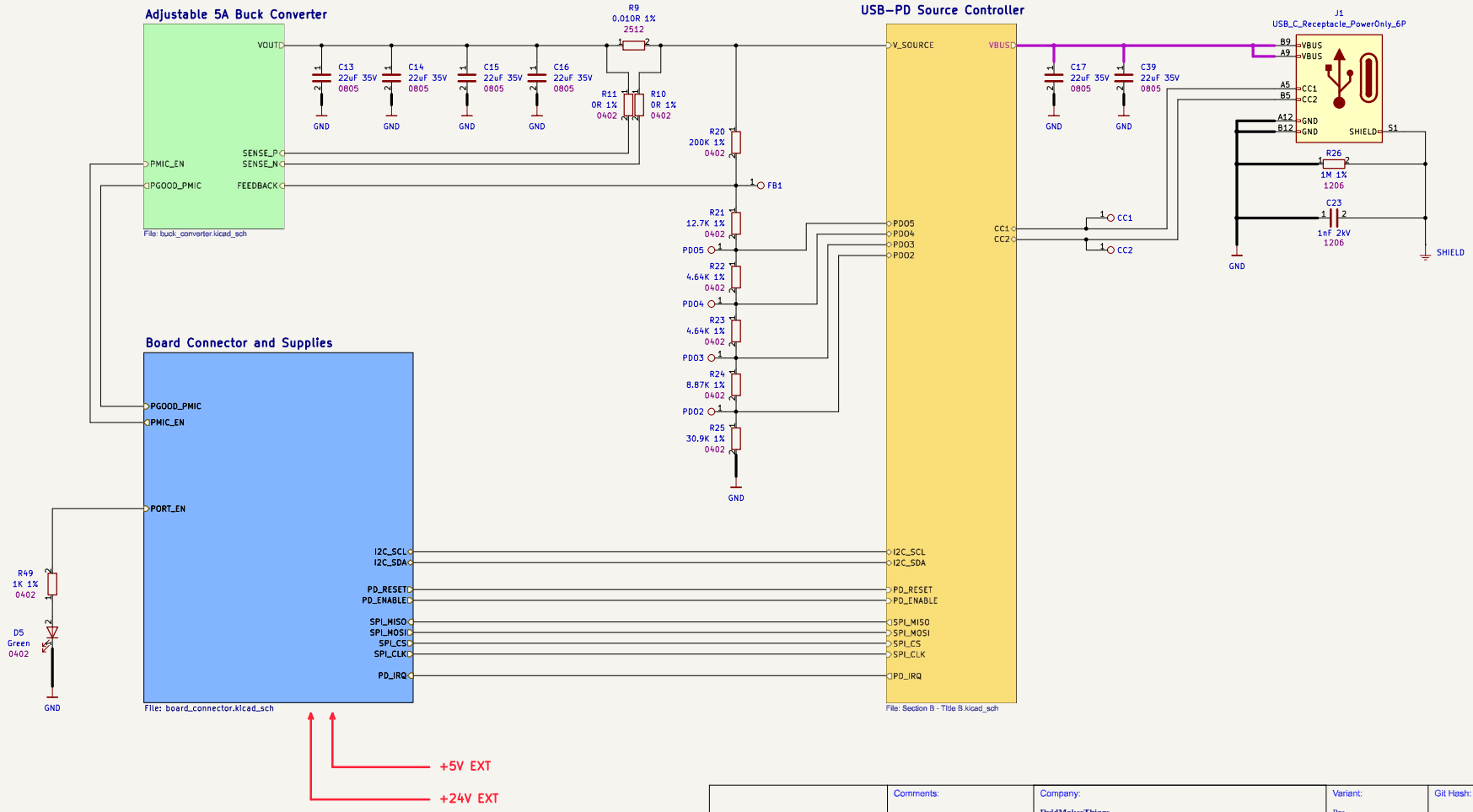
Not fitted components are marked as ✗

Comments:	Company: DvidMakesThings		Variant: Pro	Git Hash:
	Board Name: Board Name		Project Name: PDNode-600 - PDCard	
Sheet Title:	File Name: PDNode-600.kicad_sch	Designer: David Sipos	Date: 2025-01-12	Revision: 1.0.0
Sheet Path: /		Reviewer:	Size: A3	Sheet: 1 of 6

Block Diagram File: Project Architecture.kicad_sch

Revision History File: Revision History.kicad_sch

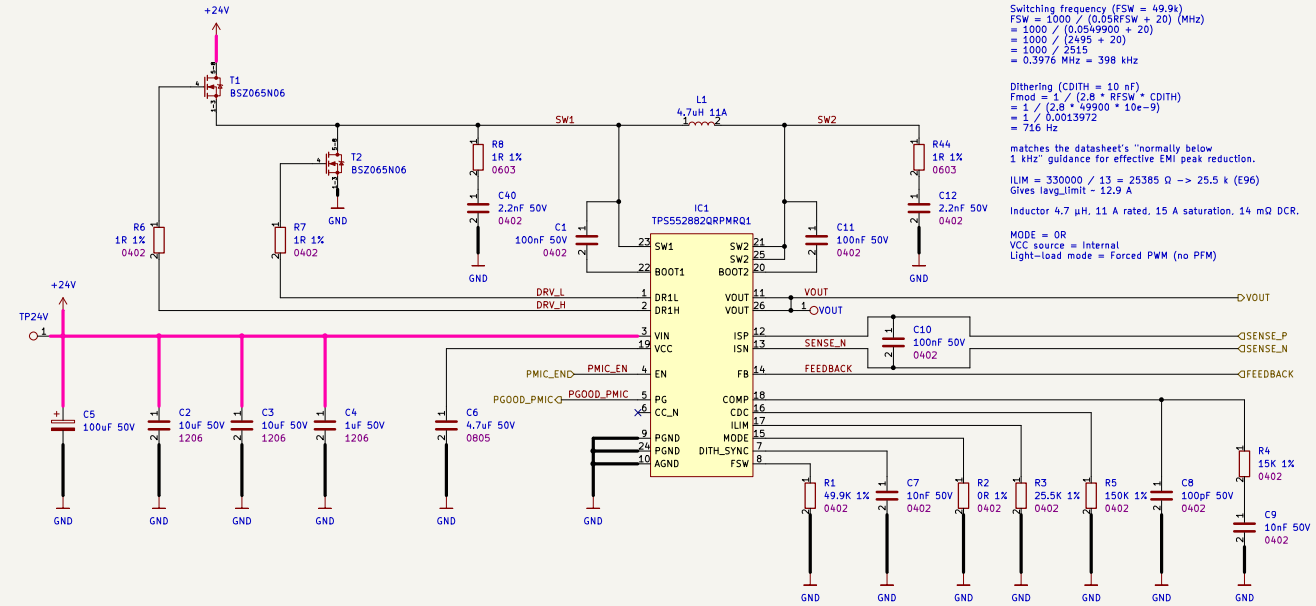
Block Diagram



Comments:	Company: DvidMakesThings		Variant: Pro	Git Hash:
	Board Name: **Board Name**		Project Name: **PDNode-600 - PDCard**	
Sheet Title: Project Architecture	File Name: Project Architecture.kicad_sch	Designer: David Sipos	Date: 2025-01-12	Revision: 1.0.0
Sheet Path: /Block Diagram/		Reviewer:	Size: A3	Sheet: 2 of 6

ADJUSTABLE 5A BUCK CONVERTER

TPS552882QRPMRQ1 ADJUSTABLE 5A BUCK



Switching frequency (FSW = 49.9k)
FSW = 1000 / (0.05RFSW + 20) (MHz)
= 1000 / (0.0549900 + 20)
= 1000 / (2495 + 20)
= 1000 / 2515
= 0.3976 MHz = 398 kHz

Dithering (CDITH = 10 nF)
Fmod = 1 / (2.8 * RFSW * CDITH)
= 1 / (2.8 * 49900 * 10e-9)
= 1 / 0.0013972
= 716 Hz

matches the datasheet's "normally below 1 kHz" guidance for effective EMI peak reduction.

ILIM = 330000 / 13 = 25385 Ω -> 25.5 k (E96)
Gives Iavg_limit ~ 12.9 A

Inductor 4.7 µH. 11 A rated. 15 A saturation. 14 mΩ DCR.

MODE = 0R
VCC source = Internal
Light-load mode = Forced PWM (no PFM)

Given:
- RFSW = 49.9k -> fsw = 398 kHz
- L = 4.7 uH
- VIN = 24 V

Buck-mode inductor ripple current (from Eq. 9)

DeltaIL_pp = (VIN - VOUT) * VOUT / (L * fsw * VIN)

Compute the common denominator:
L * fsw * VIN = 4.7e-6 * 398e3 * 24
4.7e-6 * 398e3 = 1.8706
1.8706 * 24 = 44.8944

A) VOUT = 12 V (this is where ripple is worst, about VIN/2)
Numerator = (24 - 12) * 12 = 144
DeltaIL_pp = 144 / 44.8944 = 3.21 A

B) VOUT = 20 V (max PD voltage)
Numerator = (24 - 20) * 20 = 80
DeltaIL_pp = 80 / 44.8944 = 1.78 A

Inductor peak current (Eq. 13)

IL_peak = IL_DC + DeltaIL_pp/2

In buck mode, IL_DC is approximately IOUT.

A) VOUT = 20 V, IOUT = 5 A
IL_peak = 5 + 1.78/2 = 5 + 0.89 = 5.89 A

B) VOUT = 12 V, IOUT = 5 A
IL_peak = 5 + 3.21/2 = 5 + 1.605 = 6.61 A

So even at the worst ripple point, peak inductor current is around 6.6 A for a 5 A load. That is far below the ILIM (~13 A with 25.5k) and far below the inductor saturation rating (15 A).

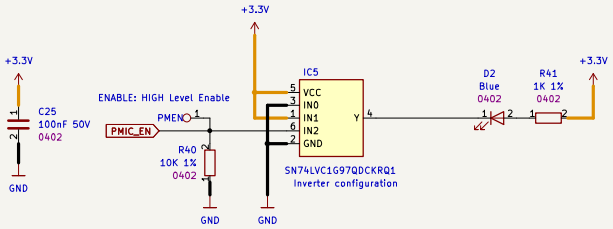
Input capacitor RMS current (Eq. 14)

ICIN_RMS = IOUT * sqrt(VOUT*(VIN - VOUT) / (VIN*VIN))

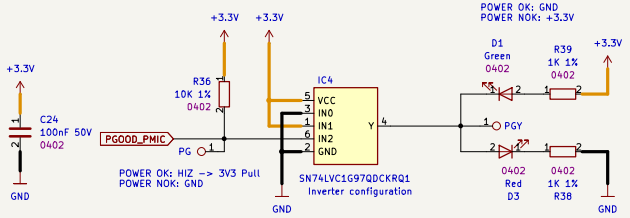
A) VIN = 24 V, VOUT = 12 V, IOUT = 5 A
sqrt(12*12 / 24^2) = sqrt(144/576) = sqrt(0.25) = 0.5
ICIN_RMS = 5 * 0.5 = 2.5 A

B) VIN = 24 V, VOUT = 20 V, IOUT = 5 A
sqrt(20*4 / 24^2) = sqrt(80/576) = sqrt(0.1389) = 0.372
ICIN_RMS = 5 * 0.372 = 1.86 A

ENABLE STATUS

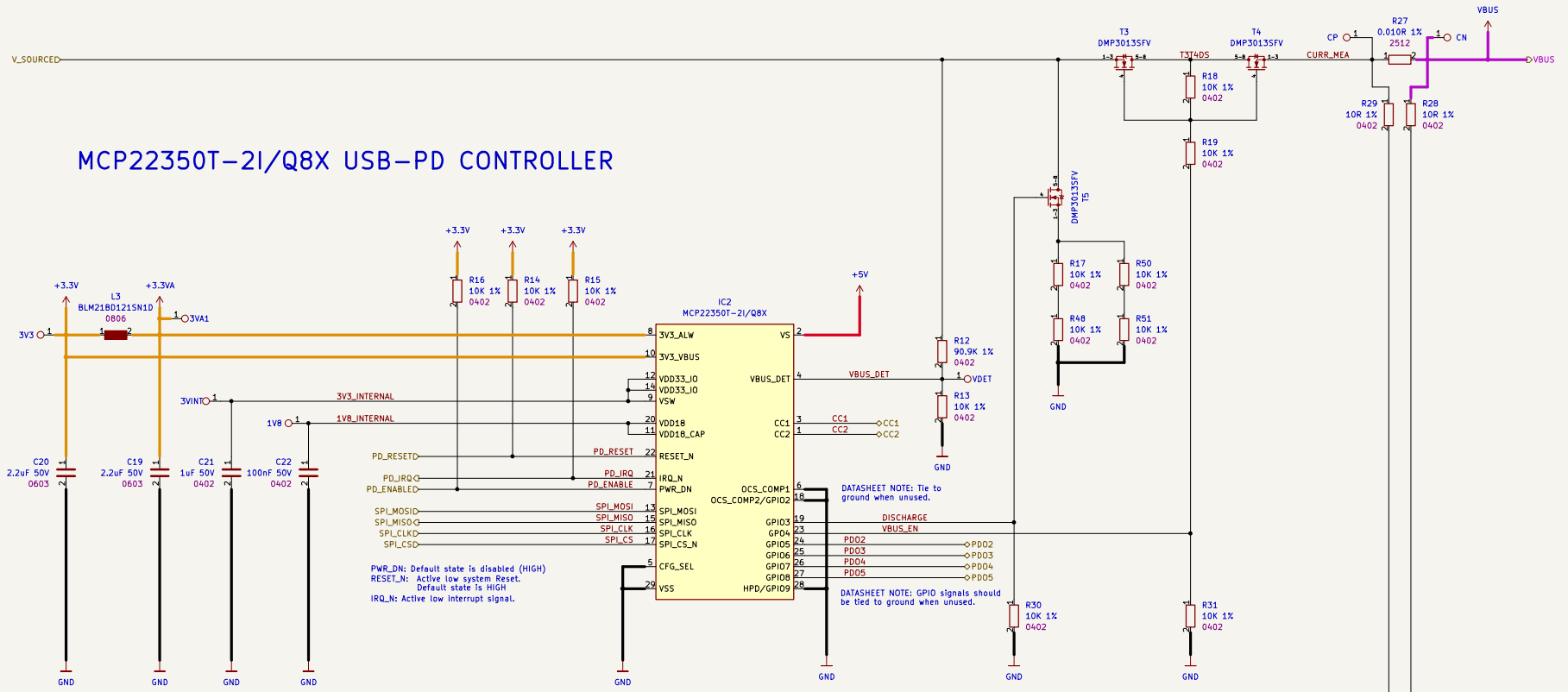


PGOOD STATUS



Comments:	Company: DvidMakesThings		Variant: Pro	Git Hash:
	Board Name: Board Name		Project Name: PDNode-600 - PDCard	
Sheet Title: Sheet Title A	File Name: buck_converter.kicad_sch	Designer: David Sipos	Date: 2025-01-12	Revision: 1.0.0
Sheet Path: /Block Diagram/Adjustable 5A Buck Converter/		Reviewer:	Size: A3	Sheet: 3 of 6

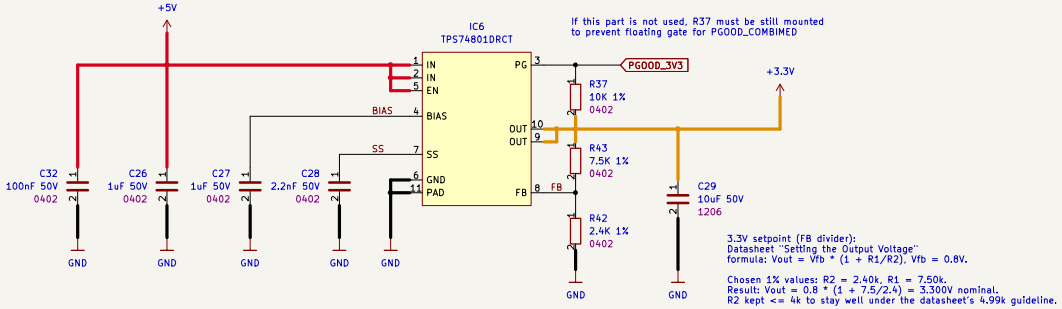
USB-PD SOURCE CONTROLLER



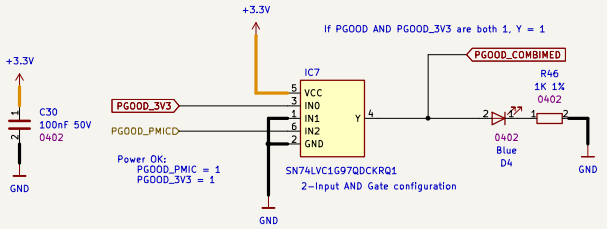
Comments:	Company: DvidMakesThings		Variant: Pro	Git Hash:
	Board Name: Board Name			Project Name: PDNode-600 - PDCard
Sheet Title: Sheet Title B	File Name: Section B - Title B.kicad_sch	Designer: David Sipos	Date: 2025-01-12	Revision: 1.0.0
Sheet Path: /Block Diagram/USB-PD Source Controller/		Reviewer:	Size: A3	Sheet: 4 of 6

BOARD CONNECTOR AND SUPPLIES

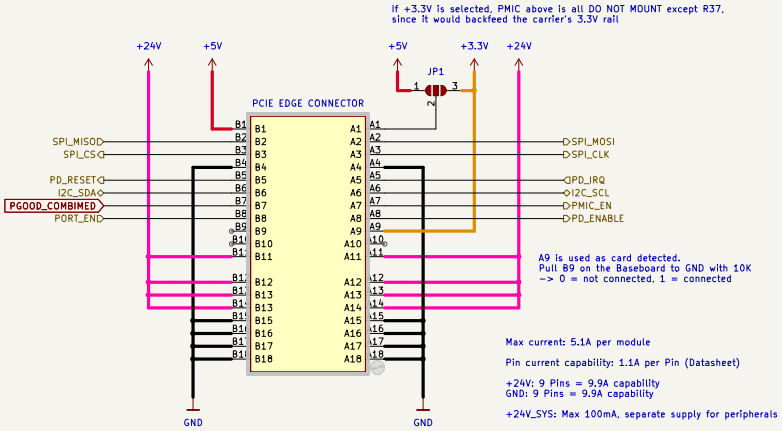
+5V to 3.3V PMIC



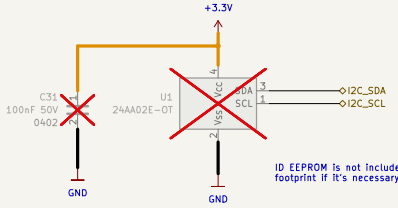
PGOOD LOGIC



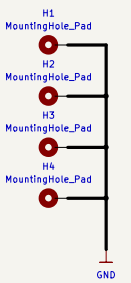
PCIE-X1 BOARD EDGE CONNECTOR



DEVICE ID EEPROM



MOUNTING HOLES



Comments:	Company: DvidMakesThings		Variant: Pro	Git Hash:
	Board Name: Board Name		Project Name: PDNode-600 - PDCard	
Sheet Title:	File Name: board_connector.kicad_sch	Designer: David Sipos	Date: 2025-01-12	Revision: 1.0.0
Sheet Path: /Block Diagram/Board Connector and Supplies/		Reviewer:	Size: A3	Sheet: 5 of 6

Revision History

DATE	REVISION	RESPONSIBLE	CHANGE
16.01.2026	1.0.0	DMT	INITIAL CREATION
03.02.2026	1.0.1	DMT	24V to 5V and 3.3V PMIC removed for cost reduction

Comments:	Company: DvidMakesThings		Variant: Pro	Git Hash:
	Board Name: Board Name		Project Name: PDNode-600 - PDCard	
Sheet Title: Revision History	File Name: Revision History.kicad_sch	Designer: David Sipos	Date: 2025-01-12	Revision: 1.0.0
Sheet Path: /Revision History/		Reviewer:	Size: A4	Sheet: 6 of 6