OHM pd-1

3S–6S LiPo power distribution board with 12 V, 5 V / 3 A and 3.3 V rails and a usb-c power port

1 features

- input: one 3S–6S LiPo battery, 11.1 V to 22.2 V nominal, 9.0 V to 25.2 V operating
- XT60 battery connector plus BAT+ / BAT− solder pads
- 5 V rail: switching step-down (buck) converter, 3 A
- 3.3 V rail: linear regulator, 800 mA, supplied from the 5 V rail
- 12 V rail: SEPIC converter, 2.5 A, regulated with the battery above or below 12 V
- usb-c 5 V / 3 A (15 W) source port, power only
- JST-XH 4-pin expansion header
- solder-pad outputs for 12 V, 5 V, 3.3 V and GND
- one indicator LED per output rail
- over-current, short-circuit and thermal protection on every rail; input under-voltage lockout (section 6)
- hand-solderable surface-mount and through-hole construction

2 applications

- battery-powered mobile robots
- single-board computers and microcontrollers
- sensor and peripheral power on LiPo-powered platforms
- laboratory and teaching test rigs

3 description

OHM pd-1 is a two-layer power distribution board that turns a single 3S–6S LiPo battery into three supply rails for robotics electronics. A step-down converter makes the 5 V rail, which also feeds the usb-c source port and a linear regulator for the 3.3 V rail. A separate SEPIC converter makes the 12 V rail, so it stays regulated whether the battery is above or below 12 V. Each rail has an indicator LED, and each regulator has built-in protection.

This datasheet covers board revision A. Values marked **C** are calculated from the fitted component values; values marked **D** are from the regulator manufacturers' datasheets. Board-level performance (efficiency, ripple, load regulation, temperature rise) has not yet been characterised.

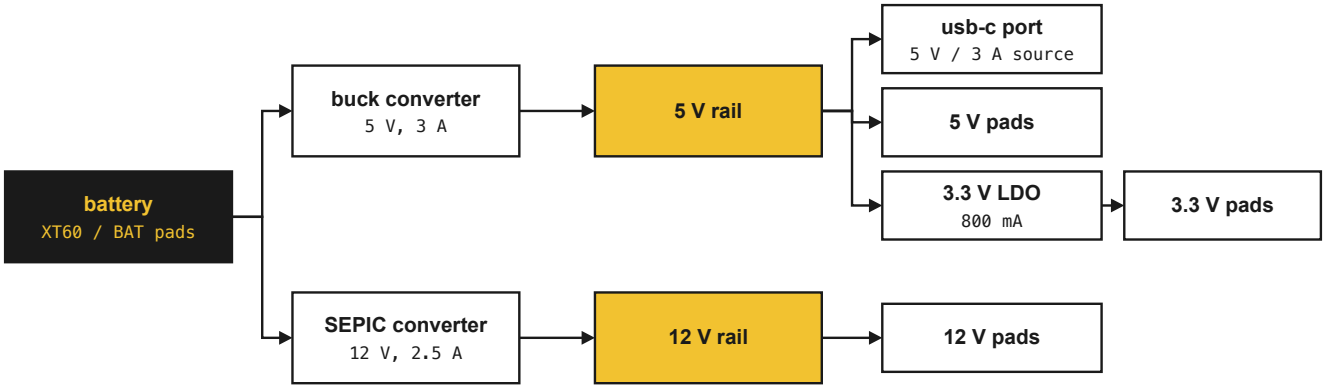


figure 1. simplified power path

> **important usage limits.** use 3S, 4S, 5S or 6S packs only (25.2 V maximum). The 5 V rail is limited to 3 A in total: power your load from **either** the 5 V pads (up to 3 A) **or** the usb-c port (up to 15 W). Using both at the same time is not recommended. Fit an external fuse in the battery lead.

4 connector and pad functions

label	type	function
BATT (XT60)	XT60 female, through-hole	battery input, 3S–6S
BAT+, BAT−	solder pads	battery input pads
12V, GND	solder pads	12 V rail output
5V, GND	solder pads	5 V rail output
3.3V, GND	solder pads	3.3 V rail output
usb-c	Type-C receptacle, power only (VBUS, GND, CC1, CC2)	5 V / 3 A source. No data lines, no USB Power Delivery.
JST receptacle	JST-XH, 4-pin, 2.5 mm pitch	expansion header
LEDs	green, one per rail	rail indicators: 12 V, 5 V, 3.3 V

5 specifications

5.1 absolute maximum ratings

Stresses beyond these limits may cause permanent damage. They are not operating conditions; see 5.2.

parameter	max	unit
battery input voltage, V_{BAT}	35	V
5 V rail total output current	3.0	A
3.3 V rail output current	1.0	A
usb-c VBUS current	3.0	A
battery connector current	30	A
indicator LED forward current	20	mA
regulator junction temperature	125	°C

5.2 recommended operating conditions

parameter	min	max	unit	note
battery voltage, V_{BAT}	9.0	25.2	V	3S at 3.0 V/cell to 6S at 4.2 V/cell. 11.1–22.2 V nominal.
5 V rail total load	0	3.0	A	5 V pads + usb-c + 3.3 V rail input, combined
usb-c output	0	3.0	A	15 W at 5 V. Use instead of, not together with, the 5 V pads
3.3 V rail load	0	0.8	A	0.5 A or less recommended (section 7.2)
12 V rail load	0	2.5	A	

5.3 electrical characteristics

T_A = 25 °C. Src: D = regulator datasheet, C = calculated from fitted values.

parameter	test conditions	min	typ	max	unit	src
5 V rail						
output voltage	V_{BAT} 9.0–25.2 V	4.90	5.00	5.10	V	C
output current				3.0	A	D
12 V rail						
output voltage	V_{BAT} 9.0–25.2 V (note 1)	11.84	12.20	12.56	V	C
switching frequency		144	180	253	kHz	D
maximum duty cycle			90		%	D
3.3 V rail						
output voltage	I_{OUT} = 10 mA	3.250	3.300	3.349	V	D
output voltage, full temperature range	T_J = −40 to 125 °C	3.235		3.365	V	D
dropout voltage	I_{OUT} = 800 mA		1.10	1.30	V	D
quiescent current			5	10	mA	D
usb-c port						

parameter	test conditions	min	typ	max	unit	src
VBUS voltage	from 5 V rail	4.90	5.00	5.10	V	C
advertised source current	CC pull-ups to 5 V		3.0		A	C

Note 1: the 12 V rail is a SEPIC converter. It regulates with the battery above or below its set-point, so the 12 V pads stay at 12 V across the full 3S–6S range.

6 protection features

Each regulator has built-in protection, as specified by its manufacturer.

protection	5 V rail	12 V rail	3.3 V rail
over-current limit	cycle-by-cycle switch limit, 3.6 A min, 4.5 A typ	switch current limit, 5 A typ	internal current limit
short-circuit	output short-circuit protection	through switch current limit	through current limit
feedback fault	feedback-short protection	–	–
thermal shutdown	137 °C typ, 13 °C hysteresis	yes	yes
input under-voltage lockout	3.8 V typ falling, 400 mV hysteresis	yes	–
over-voltage	–	switch-node over-voltage protection	–
soft-start	internal	internal	–
start-up	start-up current run-away protection	–	–

6.1 board-level protection

- battery polarity: the XT60 connector is mechanically keyed. The BAT+ / BAT− solder pads are not keyed; check polarity before soldering.
- 3.3 V rail: fed from the regulated 5 V rail, so it never sees battery voltage.
- not fitted: fuse, TVS surge diode, eFuse. Fit an external fuse in the battery lead, sized for the total load.

7 application information

7.1 using the 5 V rail and usb-c port

The 5 V pads, the usb-c port and the 3.3 V rail all draw from one 3 A step-down converter. Choose one 5 V output for your main load:

- 5 V pads: up to 3 A, for wired loads such as a single-board computer powered through its header.
- usb-c port: up to 15 W (5 V, 3 A), for a device powered through its usb-c input.

Using the pads and the usb-c port at the same time is not recommended. If you do, keep the combined 5 V load, including the 3.3 V rail, at or below 3 A.

7.2 3.3 V regulator power dissipation

$P = (V_{5V} - V_{3V3}) \times I_{OUT} = 1.7\ V \times I_{OUT}$

I_{OUT} (A)	0.1	0.25	0.5	0.8
P (W)	0.17	0.43	0.85	1.36

7.3 battery and wiring

- use 3S, 4S, 5S or 6S LiPo packs only. A fully charged 6S pack is 25.2 V.
- fit an inline fuse close to the battery.
- disconnect the battery when the board is not in use.

8 revision history

datasheet rev	date	change
1.2	November 2026	published as OHM pd-1. 12 V rail is a SEPIC; input range 3S–6S (9.0–25.2 V); 12 V rail 2.5 A; 3.3 V rail 800 mA recommended.
1.1	November 2026	added 5 V / usb-c usage limit, full protection section and usage notice. Removed component part numbers.
1.0	October 2026	initial release for board revision A.