

PWR INTF

Owner's Manual

Protected Low-Voltage DC Power Interface Board

For Arduino, ESP32, Raspberry Pi, STM32, CNC controllers, fans, sensors, accessory wiring, and maker power distribution projects.



18-30 VDC INPUT

12 V / 5 V / 3.3 V RAILS

USB-C 5 V OUTPUT ONLY

NO AC MAINS | USB-C OUTPUT ONLY | IN1/IN2 DRY-CONTACT ONLY | A1/A2 MAX 3.3 V

READ THIS FIRST

WARNING - LOW VOLTAGE DC MODULE ONLY

The KI Maker PWR INTF is a bare low-voltage DC electronics module. Use it only for 18-30 VDC systems. Mount it on insulated standoffs, keep it away from conductive surfaces and debris, and remove power before wiring or changing connections.

NOT A CERTIFIED SAFETY DEVICE

This board is not for medical, life-safety, automotive safety, emergency-stop, mains-control, fail-safe, or certified industrial safety applications.

Before wiring or applying power

DC ONLY

18-30 V input

NO AC

No mains anywhere

USB OUT

5 V output only

DRY CONTACT

IN1/IN2 only

A1/A2

0-3.3 V only

Do not connect these



AC mains

No line-voltage anywhere on this PCB.



USB-C input

USB-C is 5 V output only.



Voltage into IN1/IN2

Dry-contact switch inputs only.



5/12/24 V into A1/A2

Analog inputs are 0-3.3 V only.



Backfeeding rails

Do not drive output rails externally.



Relay-style wiring

OUT1/OUT2 are not isolated contacts.

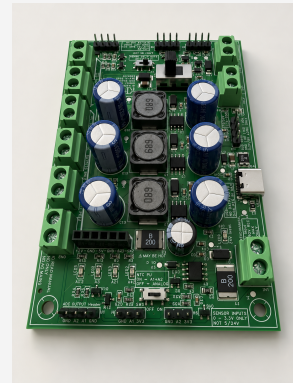
IMPORTANT

The power board makes wiring cleaner, but it does not make projects safe automatically. Verify voltage, polarity, current, load type, and controller pin configuration before use.

Welcome to the KI Maker Family!

Congratulations on acquiring the KI Maker PWR INTF Power Interface Board. This manual is your guide to setting up, wiring, testing, and safely using the board in low-voltage DC maker and interface projects.

This manual is written to be practical: clear wiring rules, honest ratings, realistic warnings, and measurement points you can actually use.



Inside this manual

Getting Started

First safe power-up

Feature Overview

What the board does

Safety Instructions

Avoid misuse

Troubleshooting

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Specifications

Ratings and revision

Support

What to send us

KI MAKER PROMISE

Clear wiring, honest ratings, and maker-friendly documentation. If a rating is not finalized, the manual says so instead of overstating it.

Quick Start: Read This Before Wiring

This section is the short version for first-time users. It does not replace the rest of the manual. Use it to prevent the most common power-interface wiring mistakes before applying power.

1 Place the board on an insulated surface or standoffs.

DC supply only

No AC input

2 Set the fan voltage selector before applying power.

Start with no loads

Measure rails first

3 Connect a current-limited 24 V bench supply to the main input with

4 Leave all external loads disconnected.

USB-C is output

Do not power from USB-C

5 Verify the input and rail LEDs, then measure 24 V, 12 V, 5 V, and

6 Connect one controller signal or one load at a time.

Add one load

Check temperature

7 Re-check voltage and temperature after every added load.

WARNING - POWER OFF BEFORE WIRING

Always remove input power before wiring loads, moving controller connections, changing switch positions, moving fan selections, or attaching probes to uncertain nodes.

Product Overview

The KI Maker PWR INTF Rev-A is a compact low-voltage DC power interface board intended to distribute 24 V-class input power, generate common maker rails, and provide protected connection points for small controllers, fans, sensors, and switched DC loads.

It is designed for maker projects, benchtop systems, enclosure accessories, CNC add-ons, robotics, 3D printer modifications, educational builds, and low-voltage accessory panels.

Primary functions

- Accepts an 18-30 VDC main input supply.
- Distributes a fused 24 V rail for compatible loads and accessories.
- Generates 12 V, 5 V, and 3.3 V rails for mixed-voltage projects.
- Provides USB-C 5 V output for accessory power only.
- Supports a selectable 12 V / 24 V fan output with PWM/TACH connections.
- Provides two low-side switched outputs for small DC loads.
- Provides two dry-contact inputs and two analog/passive NTC input areas.
- Includes labeled status LEDs and test points for commissioning.

Protection / usability features

- Input fuse and protected 24 V distribution path.
- Fused regulated rails with indicator LEDs.
- Clear silkscreen rules for USB-C, sensor inputs, and output behavior.
- Separated connector groups for power, fan, outputs, inputs, and analog sensors.
- Test pads to verify rails and important nodes without relying only on connectors.
- Beginner-friendly labeling intended for documentation and troubleshooting.

CUSTOMER-FACING BEHAVIOR

The board is intended to make common low-voltage wiring more organized. It is not an isolated safety barrier, a mains power supply, a USB-PD charger, or a substitute for validating voltage, current, polarity, and thermal limits.

Does

- Accepts 18-30 VDC input.
- Provides fused and regulated low-voltage rails.
- Lets a controller command small MOSFET low-side outputs.
- Lets a controller read dry-contact and analog/passive NTC inputs.

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Does not

- Does not accept AC mains.
- Does not provide isolated relay-contact behavior.
- Does not make wiring safe automatically.
- Does not negotiate USB-PD or provide USB data communication.

Typical users

- Makers building 12 V / 24 V accessory systems.
- Arduino, ESP32, Raspberry Pi, Pico, Teensy, and STM32 users.
- Technicians evaluating low-voltage accessory wiring.
- Educators demonstrating power rails, low-side switching, and sensors.

Not intended for

- AC mains or line-voltage wiring anywhere on the board.
- Medical, life-support, automotive safety, emergency-stop, or fail-safe systems.
- Use without an enclosure in public, child-accessible, dusty, or conductive-debris environments.
- Loads above validated current, voltage, thermal, or duty-cycle limits.

RATINGS WARNING

Do not publish or rely on final load-current ratings until prototype thermal testing confirms fuse, connector, copper, regulator, MOSFET, enclosure, airflow, and duty-cycle behavior.

Specifications

These values describe the Rev-A / PCBV1.01 prototype documentation state. Do not expand current, thermal, USB, or regulator claims until prototype validation confirms real behavior.

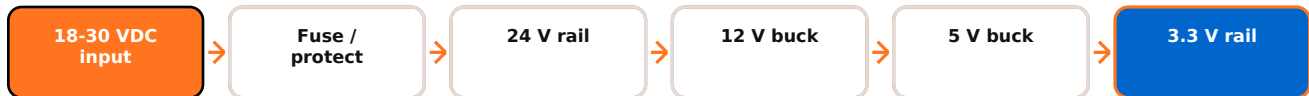
Category	Item	Specification / status
Electrical	Main input	18-30 VDC input only; 24 V nominal expected use
Electrical	24 V rail	Fused/distributed from main input; final current rating pending validation
Electrical	12 V rail	Regulated 12 V output; target ratings pending thermal validation
Electrical	5 V rail	Regulated 5 V output; includes USB-C source-only path
Electrical	3.3 V rail	Low-current logic/sensor rail; use within documented limits
USB	USB-C connector	5 V output only; no USB data, no USB-PD negotiation, do not backfeed
Fan	Fan output	Selectable 12 V / 24 V fan supply with PWM/TACH-related connections
Outputs	OUT1/OUT2	MOSFET low-side switched outputs; not isolated relay contacts
Inputs	IN1/IN2	Dry-contact switch-to-ground inputs only; do not apply external voltage
Analog	A1/A2	0-3.3 V analog or passive NTC input areas only
Mechanical	Board size	68.00 mm x 103.00 mm board outline from Gerber
Mechanical	Mounting	Four M3 mounting holes; 58.00 mm x 93.00 mm center spacing
Environmental	Use condition	Indoor/prototype/maker electronics; protect from conductive debris

CURRENT / THERMAL NOTE

The board is in Rev-A prototype status. Treat current values as validation targets until bench testing and thermal inspection are complete.

How the PWR INTF Board Works

The board starts with an 18-30 VDC input, distributes a protected 24 V-class rail, and generates lower-voltage rails for common maker electronics. Add loads one at a time and measure each rail before connecting sensitive devices.



IMPORTANT WIRING RULE

Output rails are outputs from this board. Do not backfeed 24 V, 12 V, 5 V, or 3.3 V rails from another supply unless a future revision explicitly documents that method.

USB-C 5 V Output

USB-C is a 5 V output only. Do not power the board from USB-C and do not expect USB data or PD negotiation.

Fan Output

Select 12 V or 24 V fan voltage before power-up. Verify fan current, PWM polarity, and tach wiring.

Low-Side Outputs

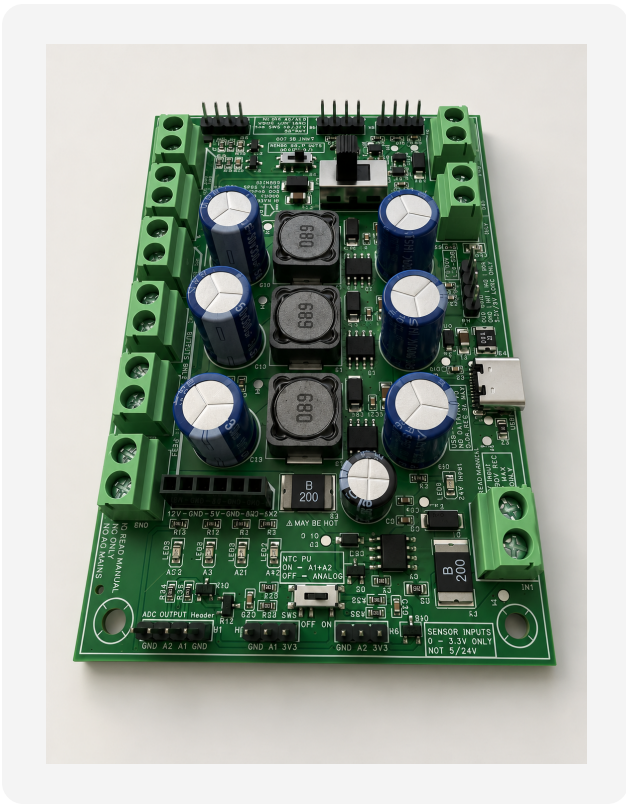
OUT1/OUT2 switch the low side of a load. They are not floating relay contacts.

Inputs and Sensors

IN1/IN2 are dry-contact only. A1/A2 are 0-3.3 V analog or passive NTC only.

Connector Map and Board Labels

Connector names and exact pin labels should follow the final physical PCB silkscreen. Use this page as the functional map for the Rev-A board and verify against the product in your hand before wiring.



Group	Function	Wiring note
Main input	18-30 VDC supply input	Correct polarity; no AC mains
24 V output	Fused 24 V distribution	Use within validated current
12 V output	Regulated 12 V rail	Measure before connecting
5 V output	Regulated 5 V rail and USB-C OUT	Do not backfeed from USB-C
3.3 V output	Logic/sensor rail	Low-current rail only
Fan header	Selectable fan supply + PWM/TACH	Set selector before power
OUT1/OUT2	MOSFET low-side switched outputs	Load positive to rail, load negative to GND
IN1/IN2	Dry-contact inputs	Switch-to-ground only
A1/A2	Analog / passive NTC inputs	0-3.3 V only; no 5/12/24 V

BOARD SILKSCREEN REMINDER

Treat markings such as NO AC MAINS, USB-C OUTPUT ONLY, SENSOR INPUTS, and voltage labels as wiring rules, not decoration.

Connector Pinout Table

Use this table when wiring the board. The functional groups below are written for the Rev-A user manual; final connector labels should be checked against the delivered PCB silkscreen.

Connector / group	Pin / label	Net / function	User connection guidance
Main input	VIN+	DC input positive	Connect to 18-30 VDC supply positive
Main input	GND / VIN-	DC input return	Connect to supply negative / board ground
24 V output	24V / GND	Fused 24 V rail	Power compatible 24 V accessories only
12 V output	12V / GND	Regulated 12 V rail	Power small 12 V accessories within rating
5 V output	5V / GND	Regulated 5 V rail	Power small 5 V controllers/accessories within rating
3.3 V output	3V3 / GND	Regulated 3.3 V rail	Low-current logic/sensor use only
USB-C	VBUS/GND	5 V source-only output	Do not power board from USB-C
Fan	FAN_V/GND/PWM/TACH	Fan supply and control	Select 12 V / 24 V before applying power
OUT1/OUT2	V+ / OUTx	Low-side switched output	Load positive to V+, load negative to OUTx
IN1/IN2	INx / GND	Dry-contact input	Use a plain switch/contact to GND only
A1/A2	Ax / GND / 3V3	Analog/passive NTC input	0-3.3 V only; do not apply 5/12/24 V

CONNECTOR WIRING RULE

When unsure, connect nothing. Power the board alone, measure the relevant rail or test pad, then add one connection at a time.

LEDs and Measurement Points

Use LEDs for quick status, then confirm with a multimeter at the connector or test point. LEDs indicate presence or command state; they are not a substitute for measuring voltage under load.

Indicator	Meaning	Normal behavior
VIN / 24 V LED	Main/fused input rail present	ON when input path is powered correctly
12 V LED	12 V rail present	ON when 12 V regulator/output is active
5 V LED	5 V rail present	ON when 5 V regulator/output is active
3.3 V LED	3.3 V rail present	ON when 3.3 V rail is active
OUT1 / OUT2 LED	Output command/status	ON when matching output is commanded/active
Fan / logic LEDs	Fan/control status if populated	Use silkscreen labels for exact function

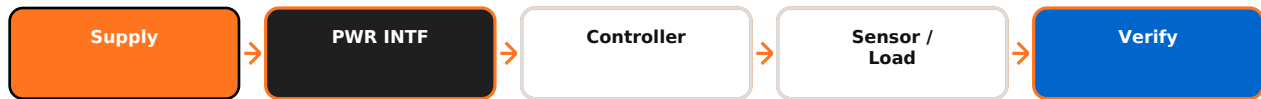
Point	Use
VIN_RAW	Measure incoming DC input before protection/fuse path
AFTER_F1	Measure voltage after main input fuse
+24V_AFTER_Q1	Measure switched/fused 24 V output rail
+12V_PRE_FUSE	Measure regulated 12 V before output fuse
+5V_PRE_FUSE	Measure regulated 5 V before output fuse
+3.3V_PRE_FUSE	Measure regulated 3.3 V before output fuse
USB_VBUS	Measure USB-C 5 V output voltage
FAN_V / PWM / TACH	Verify fan supply and signal behavior
OUT1_GATE / OUT2_GATE	Pro troubleshooting of MOSFET gate command
IN1_NODE / IN2_NODE	Verify dry-contact input nodes
A1_NODE / A2_NODE	Verify analog or NTC input nodes

METER RULE

Measure voltage between the target point and the correct GND reference. Start with input power only and no external loads installed.

Step-by-Step Hookup Examples

All examples use the same safe pattern: power the board first, measure the rails, then connect one load or signal at a time. The diagrams below are simplified functional hookups.



Power a microcontroller

1. Connect 18-30 VDC input.
2. Measure 5 V and/or 3.3 V rail.
3. Connect controller V+ to the selected rail.
4. Connect controller GND to board GND.

Run a 12 V / 24 V fan

1. Set fan selector before power-up.
2. Connect fan + to FAN_V.
3. Connect fan - to GND.
4. Connect PWM/TACH only if your controller supports them.

Switch a small DC load

1. Connect load + to compatible V+ rail.
2. Connect load - to OUT1 or OUT2.
3. Connect controller ground.
4. Command output and check temperature.

Read a dry contact

1. Connect switch/contact between IN1 or IN2 and its GND reference.
2. Do not apply voltage to IN1/IN2.
3. Verify status with meter/controller input.

Read an NTC or analog sensor

1. Confirm sensor output is 0-3.3 V or passive NTC.
2. Connect to A1/A2 area as documented.
3. Measure node before connecting sensitive ADC pins.

Use with KI Maker ecosystem

PWR INTF provides rails and interface points. IN-4 reads field inputs. OUT-4 switches larger DC loads. Validate each board independently first.

INDUCTIVE LOAD NOTE

Solenoids, relays, pumps, fans, and motors can create voltage spikes and high startup current. Verify flyback protection, stall current, duty cycle, and temperature before continuous use.

Troubleshooting

Issue	What to check first
No input/rail LEDs	Check supply voltage, polarity, current limit, fuse state, and GND connection.
24 V present, lower rails missing	Measure regulator input/output and check rail fuses/load shorts.
USB-C output missing	Measure 5 V rail and USB_VBUS. Confirm you are not backfeeding from USB-C.
Controller resets	Check supply capacity, ground reference, load inrush, and inductive spikes.
Fan does not run	Check fan selector, FAN_V voltage, fan polarity, and fan current.
OUT1/OUT2 not switching	Check controller ground, input command, gate test point, load wiring, and supply path.
IN1/IN2 not reading	Confirm dry contact to GND only; do not apply external voltage.
A1/A2 reading wrong	Confirm 0-3.3 V range, sensor wiring, and ADC reference.
Board gets hot	Remove power. Check overload, shorted load, backfeeding, wrong input, or regulator overcurrent.

Troubleshooting order

- Power off first, then visually inspect wiring.
- Power the board with no external loads and confirm rail LEDs.
- Measure VIN, fused 24 V, 12 V, 5 V, and 3.3 V.
- Connect one controller signal or one load at a time.
- After every added load, check voltage drop and temperature.

SUPPORT HINT

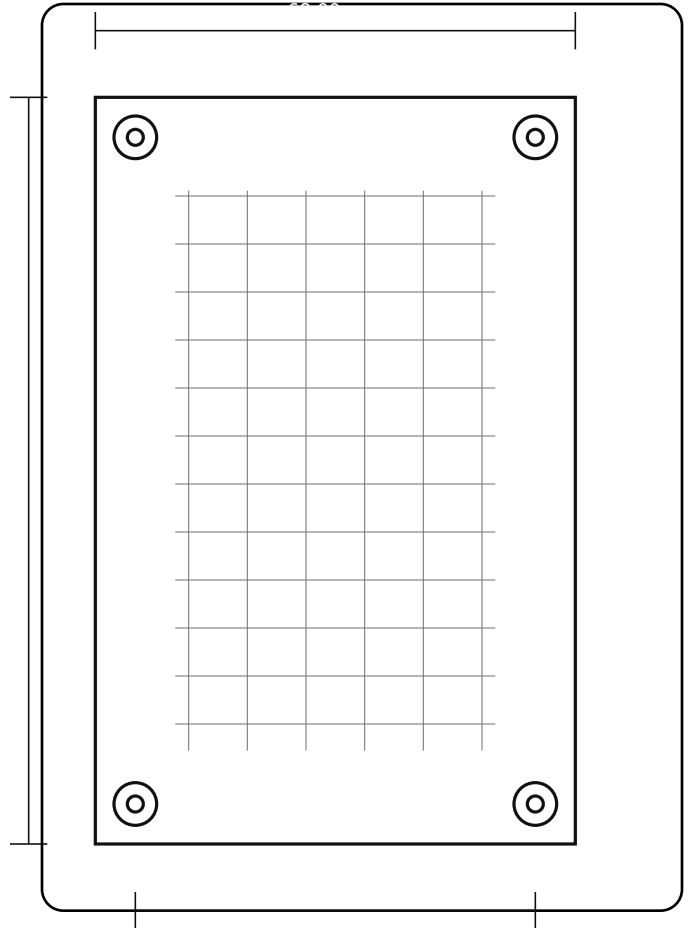
Clear photos of the wiring, connector labels, LED state, supply voltage, and meter readings usually solve issues faster than text descriptions alone.

Mechanical and Board Dimensions

Use the mechanical drawing for enclosure planning and standoff placement. Verify against the final fabrication drawing before ordering drilled panels or machined enclosures.

Dimensions

- Total board size: 68.00 mm x 103.00 mm.
- Mounting-hole spacing: 58.00 mm horizontal center-to-center.
- Mounting-hole spacing: 93.00 mm vertical center-to-center.
- Mounting holes: 3.20 mm drill / M3 standoffs recommended.
- Mounting method: insulated standoffs only; do not mount directly to conductive metal.
- Board orientation: keep screw terminals accessible and allow screwdriver access.



Mounting guidance

- Use the four M3 mounting holes with insulated standoffs.
- Keep wiring strain off the screw terminals.
- Use an enclosure for public, child-accessible, dusty, or conductive-debris environments.
- Check board temperature during first load testing and after enclosure installation.

ENCLOSURE PLANNING NOTE

The drawing shows board outline and mounting-hole center spacing, not a full enclosure cutout template. Keep clearance around screw terminals, wire bend radius, standoff heads, and any cover or lid.

Revision History and Support

Revision history

Item	Value
Product	KI Maker PWR INTF Power Interface Board
Model	KI-MPB-RevA
Board Revision	Rev-A
PCB Version	PCBV1.01
Manual Revision	v2.0 Draft
Manual Date	06/03/2026
Manual status	Prototype documentation; final current and thermal ratings pending testing.

When asking for support, include

Item	What to send
Wiring photo	Show main input, rails, USB-C, fan, outputs, inputs, and controller wiring
Supply voltage	Measured at main input under load
Rail readings	Measured 24 V, 12 V, 5 V, and 3.3 V rails
LED behavior	Which LEDs are ON/OFF before and after connecting loads
Load details	Type, voltage, current, startup/stall current, duty cycle
Controller type	Arduino, ESP32, Raspberry Pi, STM32, PLC-style output, etc.
Sensor details	Dry contact, analog sensor, passive NTC, fan tach, PWM source

SUPPORT CHECKLIST

Include clear photos of your wiring, supply, load type, controller type, LED behavior, and voltage readings at the relevant connectors or test pads. This helps identify wiring and load issues faster.

LOW-VOLTAGE DC ONLY | NOT FOR AC MAINS | USB-C OUTPUT ONLY | VERIFY LOAD CURRENT