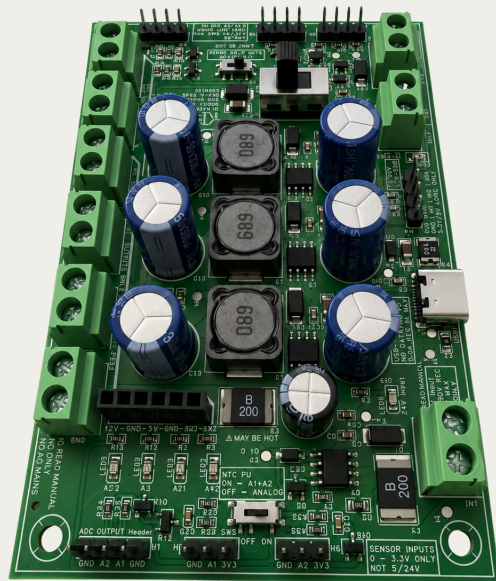


PWR INTF

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 5 V OUTPUT ONLY | IN1/IN2 DRY-CONTACT ONLY | A1/A2 + SENSOR INPUTS 0-3.3 V ONLY

READ THIS FIRST

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 + SENSOR

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; not input, data, or USB-PD.



Voltage into IN1/IN2

IN1/IN2 are dry-contact / switch-to-ground inputs only.



NO 5/12/24 V into A1/A2

A1/A2 and sensor inputs are 0-3.3 V only



Backfeeding rails

Do not drive output rails externally.



Relay-style wiring

OUT1/OUT2 are low-side MOSFET outputs, not isolated relay contacts.

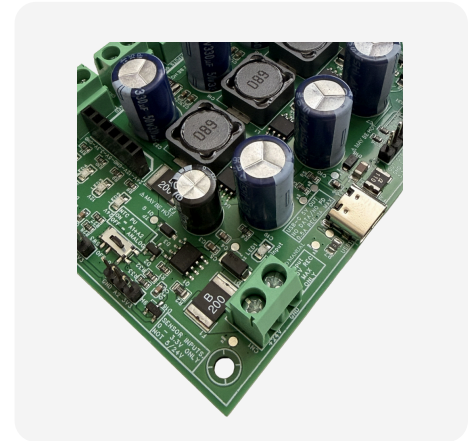
IMPORTANT

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 PowerInterface 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.



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KI MAKER PROMISE

Clear wiring, released customer ratings, and maker-friendly documentation for Rev-B / PCB V1.02.

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.

Connect a current-limited 18–30 VDC supply to the main input with correct polarity. Start with no external loads connected. Verify the input and rail LEDs, then measure the 24 V, 12 V, 5 V, and 3.3 V rails before connecting controllers, sensors, fans, or loads.

- 1 Use DC input only — no AC mains.
- 2 Do not power the board from USB-C.
- 3 Start with no external loads connected.
- 4 Set the fan voltage selector before applying power.
- 5 Connect one controller signal or one load at a time.
- 6 Re-check voltage and temperature after every added load.
- 7 Keep A1/A2 and sensor inputs within 0–3.3 V only.

DC supply only

No AC input

USB-C is output

Do not power from USB-C

Start with no loads

Add one load

Check temperature

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. Re-check polarity and voltage before applying power again.

Product Overview

The KI Maker PWR INTF Rev-B 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 service/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 0-3.3 V analog/sensor 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 Rev-B silkscreen rules for USB-C, sensor inputs, dry-contact inputs, and low-side output behavior.
- ◆ Separated connector groups for power, fan, outputs, inputs, and analog/sensor connections.
- ◆ 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, load type, and thermal limits. USB-C is output-only. IN1/IN2 are dry-contact inputs only. A1/A2 and sensor inputs are 0-3.3 V only. OUT1/OUT2 are low-side MOSFET outputs, not relay contacts.

Typical Users and Boundaries

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 inputs and 0–3.3 V analog/sensor inputs.

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.
- Does not allow external voltage into IN1/IN2, A1/A2, or sensor inputs.

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, dry contacts, 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.
- High-current charging, USB-PD power input, or USB data applications.

RATINGS WARNING

Do not exceed individual output limits or the total board power and thermal limits, and do not assume all rails and outputs can be used at maximum at the same time.

Specifications

These values describe the Rev-B / PCB V1.02 customer-facing documentation state. Use the board within the ratings below and verify temperature during first use with real loads.

Category	Item	Specification / status
Electrical	Main input	18–30 VDC input only; 24 V nominal expected use.
Electrical	24 V rail / OUT1	Fused 24 V distribution with OUT1 low-side switched output. OUT1 rated up to 1 A continuous in open-air use.
Electrical	12 V rail / OUT2	Regulated 12 V rail with OUT2 low-side switched output. OUT2 rated up to 1 A continuous in open-air use and shares 12V rail budget
Electrical	5 V rail	Regulated 5 V output. 1 A continuous
Electrical	3.3 V rail	Regulated 3.3 V logic/sensor rail. 500 mA continuous
USB	USB-C connector	5 V output-only service/accessory power up to 0.5 A. No USB data, no USB-PD negotiation, and do not backfeed.
Fan	Fan output	Selectable 12 V / 24 V fan supply with PWM/TACH-related connections. Set selector before applying power.
Outputs	OUT1/OUT2	MOSFET low-side switched outputs; not isolated relay contacts. Connect load positive to the matching positive rail and load negative to OUTx.
Inputs	IN1/IN2	Dry-contact / switch-to-ground inputs only. Do not apply external voltage.
Analog	A1/A2 and H5/H6	0–3.3 V analog or passive sensor/NTC input areas only. Not 5 V, 12 V, or 24 V tolerant.
Mechanical	Board size	68.00 mm x 103.00 mm board outline.
Mechanical	Mounting	Four M3 mounting holes; 58.00 mm x 93.00 mm center spacing.
Environmental	Use condition	Indoor low-voltage maker electronics use. Protect from conductive debris, moisture, shorts, and uncontrolled mechanical contact.

CURRENT / THERMAL NOTE

OUT1 and OUT2 are rated up to 1 A continuous in open-air use. For OUT1/OUT2 loads above 500 mA, check board temperature during first use. Cooling / airflow is recommended when operating near maximum current, especially in elevated ambient temperatures, enclosed installations, or near other heat sources. Do not exceed individual output limits or the total board power and thermal limits.

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

Fan Output

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

Low-Side Outputs

OUT1/OUT2 switch the low side of a load. They are not floating relay contacts and do not switch the positive rail. Connect the load positive to the matching positive rail and the load negative to OUTx.

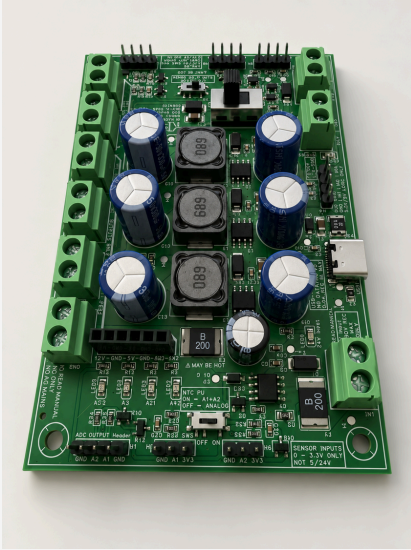
Inputs and Sensors

IN1/IN2 are dry-contact / switch-to-ground inputs only. Do not apply external voltage to IN1 or IN2.

A1/A2 and sensor inputs are 0–3.3 V only. Do not connect 5 V, 12 V, 24 V, FAN_V, VIN, or USB-C VBUS to analog/sensor pins.

Connector Map and Board Labels

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



Group	Function	Wiring note
Main input	18-30 VDC supply input	Correct polarity only; no AC mains.
24 V output / OUT1	Fused 24 V dist. and OUT1 low-side	OUT1 = 24 V low-side output.
12 V output / OUT2	Regulated 12 V rail and OUT2 low-side	OUT2 = 12 V low-side output.
5 V output	Regulated 5 V rail and USB-C 5 V out	Do not backfeed from USB-C.
3.3 V output	Logic/sensor reference rail	Low-current logic/sensor use only.
Fan header	Selectable 12/24 V fan + PWM/TACH	Set voltage selector before power.
OUT1/OUT2	MOSFET low-side switched outputs	Not relay contacts; low-side only.
IN1/IN2	Dry-contact / switch-to-ground inputs	Do not apply 12 V or 24 V.
A1/A2 and H5/H6	0-3.3 V analog/sensor input areas	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 0-3.3 V ONLY, IN1/IN2 DRY CONTACT, OUT1 24 V, OUT2 12 V, and voltage labels as wiring rules, not decoration.

How to Use the Key Features

Power Rails

The board accepts 18–30 VDC input and provides fused or regulated low-voltage rails for maker projects. Measure each rail before connecting controllers or loads. The 24 V rail is intended for compatible 24 V accessories, the 12 V rail for small 12 V loads, the 5 V rail for 5 V accessories/controllers, and the 3.3 V rail for low-current logic or sensor reference use.

OUT1 / OUT2 Low-Side Outputs

OUT1 and OUT2 are MOSFET low-side switched outputs, not relay contacts. Connect the load positive wire to the matching positive rail and the load negative wire to OUTx. OUT1 is the 24 V switched output. OUT2 is the 12 V switched output. OUT1 and OUT2 are rated up to 1 A continuous in open-air use. For loads above 500 mA, check temperature during first use. Cooling / airflow is recommended when operating near maximum current, especially in elevated ambient temperatures or enclosed installations. Do not exceed individual output limits or the total board power and thermal limits.

USB-C 5 V Output

The USB-C connector provides 5 V output-only service/accessory power up to 0.5 A. It is not a power input, not a USB data port, and does not support USB-PD negotiation. Do not power the board from USB-C and do not backfeed the 5 V rail from another USB source.

Inputs and Sensors

IN1 and IN2 are dry-contact / switch-to-ground inputs only. Use them with plain switches, relay contacts, pushbuttons, reed switches, float switches, or limit switches. Do not apply 12 V or 24 V field voltage to IN1 or IN2. A1/A2 and H5/H6 sensor inputs are 0–3.3 V only. Do not connect 5 V, 12 V, 24 V, FAN_V, VIN, or USB-C VBUS to analog or sensor pins.

Fan Header

The fan header supports a selectable 12 V or 24 V fan supply with PWM/TACH-related connections. Set the fan voltage selector before applying power. Verify fan voltage, current, polarity, PWM compatibility, and tach wiring before use.

WIRING RULE

Wiring rule: when unsure, connect nothing. Power the board alone, measure the rail or test point, then add one connection at a time. OUT1/OUT2 switch the low side. IN1/IN2 are dry-contact only. A1/A2 and sensor inputs are 0–3.3 V only.

LEDs and Measurement Points

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

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

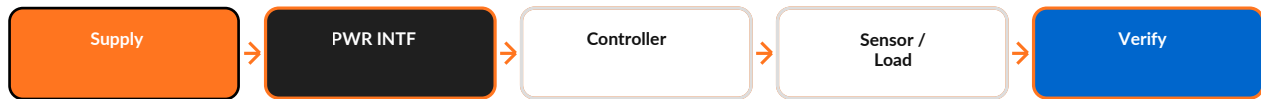
Point	Use
VIN_RAW	Measure incoming DC input before the protection/fuse path.
AFTER_F1	Measure voltage after the main input fuse.
+24V_AFTER_Q1	Measure the protected 24 V rail feeding 24 V distribution and OUT1.
+12V_PRE_FUSE	Measure regulated 12 V before the 12 V output fuse/path.
+5V_PRE_FUSE	Measure regulated 5 V before the 5 V output fuse/path.
+3.3V_PRE_FUSE	Measure regulated 3.3 V before the 3.3 V output fuse/path.
USB_VBUS	Measure USB-C 5 V output voltage. USB-C is output-only.
FAN_V / PWM / TACH	Verify selected fan voltage and fan signal behavior.
OUT1_GATE / OUT2_GATE	Advanced troubleshooting of MOSFET gate command behavior.
OUT1_SW / OUT2_SW	Verify low-side switched output behavior under load.
IN1_NODE / IN2_NODE	Verify dry-contact input nodes. Do not apply external voltage.
A1_NODE / A2_NODE	Verify analog/sensor input nodes. 0–3.3 V only.

METER RULE

Measure voltage between the target point and the correct GND reference. Start with input power only and no external loads installed. Add one load or signal at a time, then re-check voltage and temperature. Do not probe uncertain nodes with power applied unless you know the expected voltage range.

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 examples below are simplified functional hookups. Always verify voltage, polarity, current, load type, and temperature during first use.



Power a Microcontroller

1. Connect 18–30 VDC input to the PWR INTF board.
2. Measure the 5 V and/or 3.3 V rail before connecting the controller.
3. Connect controller V+ to the selected rail.
4. Connect controller GND to board GND.
5. Keep controller current within the published rail rating.

Run a 12 V / 24 V Fan

1. Set the fan voltage 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.
5. Verify fan voltage, current, polarity, PWM behavior, and tach signal before continuous use.

Switch a 24 V Load with OUT1

1. Connect the load positive wire to OUT1 24V+.
2. Connect the load negative wire to OUT1_SW.
3. Connect controller GND to board GND.
4. Command OUT1 ON from the controller.
5. Check board temperature during first use. OUT1 is rated up to 1 A continuous in open-air use. Cooling / airflow is recommended when operating near maximum current, especially in elevated ambient temperatures or enclosed installations.

Read a Dry Contact

1. Connect the switch/contact between IN1 or IN2 and its GND reference.
2. Use only a plain contact, switch, reed switch, relay contact, float switch, limit switch, or pushbutton.
3. Do not apply 12 V or 24 V field voltage to IN1 or IN2.
4. Verify the input state with a meter or controller input.

Read an NTC or Analog Sensor

1. Confirm the sensor output is 0–3.3 V or a compatible passive NTC circuit.
2. Connect the sensor to the A1/A2 or H5/H6 area as documented.
3. Measure the analog node before connecting sensitive controller ADC pins.
4. Do not connect 5 V, 12 V, 24 V, FAN_V, VIN, or USB-C VBUS to analog/sensor 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, then connect them together one signal or load at a time.

INDUCTIVE LOAD NOTE

Solenoids, relays, pumps, fans, and motors can create voltage spikes and high startup current. Verify flyback protection, stall current, duty cycle, wire size, and temperature before continuous use. OUT1/OUT2 are low-side MOSFET outputs, not relay contacts.

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 or load shorts.
USB-C output missing	Measure the 5 V rail and USB_VBUS. Confirm USB-C is not being used as an input and is not being backfed.
Controller resets	Check supply capacity, ground reference, controller rail voltage, load inrush, and inductive spikes.
Fan does not run	Check fan voltage selector, FAN_V voltage, fan polarity, fan current, and whether the fan is 12 V or 24 V.
OUT1/OUT2 not switching	Confirm load wiring uses low-side switching: load + to the matching positive rail and load – to OUTx_SW. Check controller ground, command signal, gate test point, load current, and supply path.
IN1/IN2 not reading	Confirm dry contact to GND only. Do not apply 12 V or 24 V field voltage to IN1/IN2.
A1/A2 or sensor reading wrong	Confirm 0–3.3 V range, sensor wiring, ADC reference, and SW3 pull-up setting if using passive NTC/sensor mode. Do not apply 5 V, 12 V, 24 V, FAN_V, VIN, or USB-C VBUS.
Board gets hot	Remove power. Check overload, shorted load, backfeeding, wrong input, regulator overcurrent, inductive loads, enclosure airflow, and OUT1/OUT2 current above 500 mA.

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.
- ◆ For OUT1/OUT2 loads above 500 mA, verify temperature during first use and consider cooling / airflow, especially in elevated ambient temperatures or enclosed installations.

SUPPORT HINT

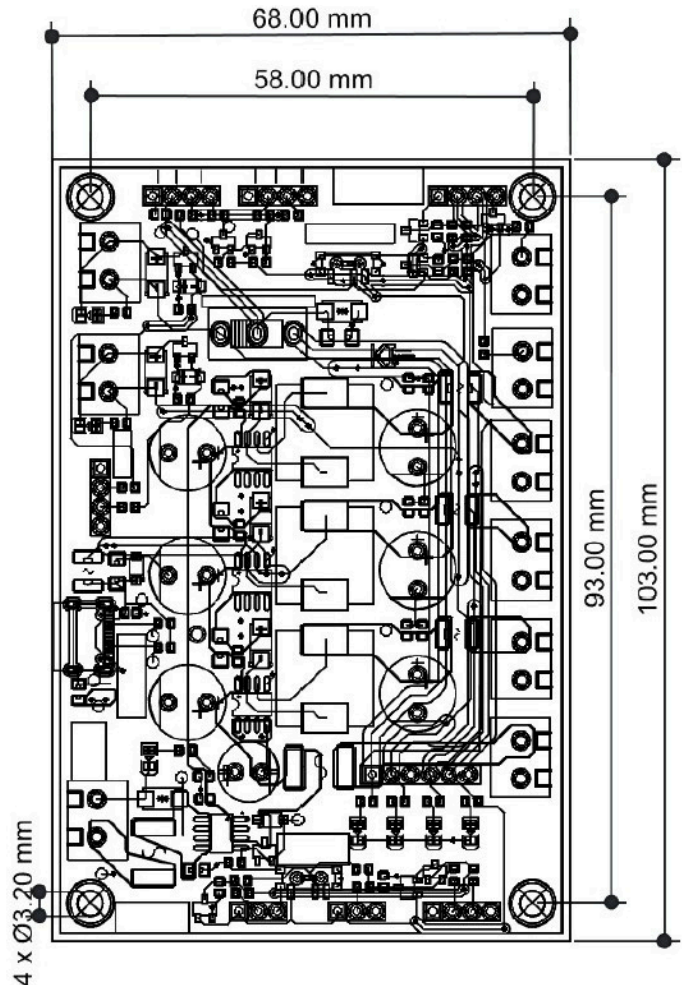
Clear photos of the wiring, connector labels, LED state, supply voltage, load type, controller connection, and meter readings usually solve issues faster than text descriptions alone. Include whether the issue involves USB-C, OUT1/OUT2, IN1/IN2, A1/A2, H5/H6, or the fan header.

Mechanical and Board Dimensions

Use the mechanical drawing for enclosure planning and standoff placement. Verify against the final Rev-B fabrication drawing before ordering drilled panels, machined enclosures, or custom mounting plates.

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.
- Keep clearance around connectors, wires, standoff heads, and enclosure covers.
- Use an enclosure for public, child-accessible, dusty, or conductive-debris environments.
- ◆ Check board temperature during first load testing and again after enclosure installation.
- ◆ For OUT1/OUT2 loads above 500 mA, airflow or a cooling fan is recommended, especially inside an enclosure.

ENCLOSURE PLANNING NOTE

The drawing shows board outline and mounting-hole center spacing, not a full enclosure cutout template. Keep clearance for screw-terminal access, wire bend radius, airflow, standoff hardware, and any lid or cover. Verify temperature with the actual enclosure and load configuration before continuous use.

Revision and Support Information

Revision information

Item	Value
Product	KI Maker PWR INTF Power Interface Board
Model	KI-MPB-RevB
Board Revision	Rev-B
PCB Version	PCBV1.02
Manual Revision	RevB 1.02
Manual Date	06/23/2026
Manual Status	Rev-B owner's manual with released customer ratings, wiring limits, and thermal-use guidance.

Support information

Include	Details
Board revision	Rev-B as marked on the board silkscreen
PCB version	PCBV1.02 as marked on the board
Manual revision	RevB 1.02 (this manual)
Power supply voltage	Measured at main input under load
Load voltage/current	Type, voltage, current for each connected load
Runtime	How long the board ran before the issue appeared
Enclosure/airflow	Enclosure type, ventilation, ambient temperature

SUPPORT HINT

For support, include the board revision, PCB version, manual revision, power supply voltage, load voltage, load current, runtime, enclosure condition, airflow condition, and a clear description of the issue. Include clear photos of the full board wiring, the affected connector area, power supply settings, LED states, meter readings, load or controller wiring, and any thermal concern or damaged component. For OUT1/OUT2 issues, include which output is used, the load voltage, the load current, whether the load positive wire is connected to the matching rail, and whether the load negative wire is connected to OUTx_SW. For IN1/IN2 issues, confirm the input is a dry contact to GND only and that no external voltage is applied. For A1/A2 or H5/H6 issues, confirm the measured signal stays within 0-3.3 V only.

LOW-VOLTAGE DC ONLY | NOT FOR AC MAINS | USB-C OUTPUT ONLY | IN1/IN2 DRY-CONTACT ONLY | A1/A2 AND SENSOR INPUTS 0-3.3 V ONLY |
VERIFY LOAD CURRENT AND TEMPERATURE

Thank you for choosing KI Maker. Build carefully, measure first, and add one connection at a time.