



PCBA Product Manual

IPM1781 Fan Driver PCBA

24 V DC | 125 W | Field-Oriented Control



Ceiling fan application and driver module. Included items are subject to the order.

The IPM1781 PCBA is designed for integration into three-phase BLDC fans and ceiling fans. Customers integrate the motor, power supply, control panel and enclosure. This manual covers product selection, interface identification and prototype commissioning.

Integration essentials: confirm motor parameters, control interfaces and firmware before low-speed and load testing. Validate usable power, temperature rise and performance under actual operating loads.

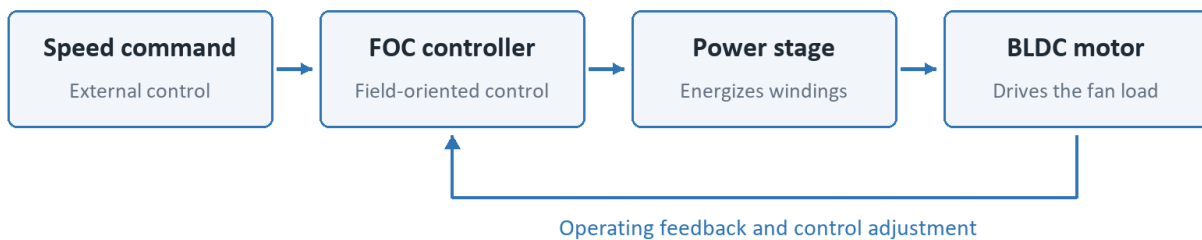
Version V1.0 | October 2026 | InterPower

1 Product Overview and Specifications

The module uses FOC to drive a BLDC motor. System integration requires validation of startup, target speed, fan load and cooling, as well as basic rotation. The motor, firmware and mechanical design must work together with repeatable results.

Item	Specification / Description
Model	IPM1781 BLDC Fan Driver PCBA
Power supply	24 V DC
Power specification	125 W; continuous operation and system temperature rise require application-specific validation.
Control method	FOC (Field-Oriented Control)
Applications	Three-phase BLDC fan motors; ceiling fan applications require motor and system matching.
Components shown	IPM1781 controller; AP07F741 MOSFETs, illustrated TO-252 package version.
Terminal markings	VDD, U, V, W and GND, plus control and debug interfaces.
Mechanical data	Use the approved engineering drawings for board outline, mounting holes, component heights and terminal dimensions.

FOC in the System



Functional concept only — not a board-level circuit schematic

Figure 1. Control commands drive the motor; feedback supports control adjustment.

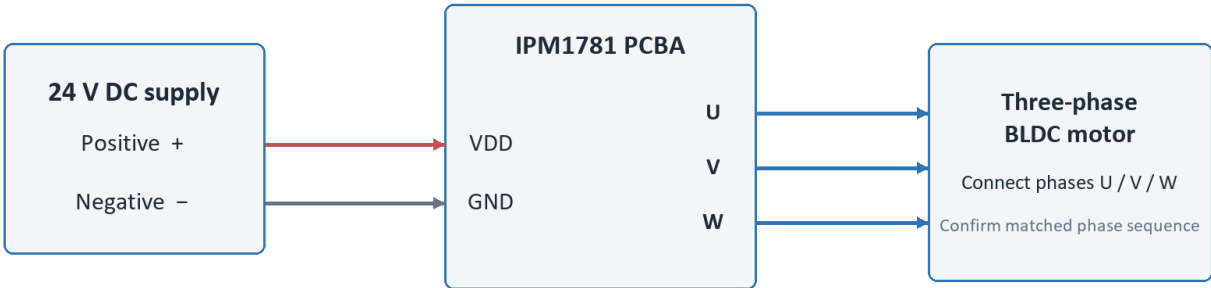
FOC stands for Field-Oriented Control. Motor parameters and control settings affect startup and operation. Two motors rated at 24 V are not necessarily interchangeable.

Selection Checklist

Confirm the supply range and capacity; motor voltage, power, pole pairs and target speed; blade size and load; speed and start/stop controls; installation space and cooling path. Verify signal levels, speed range and protection settings during prototyping.

3 Power and Motor Connections

Disconnect power and check terminal markings before wiring. Connect the 24 V supply to VDD and GND, and the three motor phases to U, V and W. Connect control signals only after confirming signal levels and firmware definitions.



Connect controls separately; confirm logic levels and active states for the supplied firmware.

Functional diagram, not physical terminal positions. Never connect directly to AC mains.

Figure 4. Functional connections between the power supply, driver and three-phase motor.

Marking	Connection	Wiring Notes
VDD	24 V DC positive	Keep clearly distinguished from supply negative and motor phases.
GND	DC supply negative	Reference terminal for the main power circuit.
U	Motor phase U	Connect with V and W to the three motor windings.
V	Motor phase V	Wire according to the validated motor configuration.
W	Motor phase W	Power off before rewiring; recheck direction and operation.

Wiring and Mounting

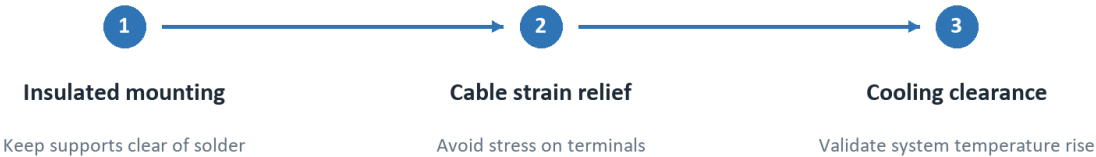


Figure 5. Provide insulation, cable strain relief and cooling clearance.

Select wiring and a supply suitable for the actual current, cable length and ambient temperature. Secure cables to the enclosure to avoid stress on solder joints or terminals. Check for loose strands and possible contact with adjacent terminals before power-up.

Do not connect AC mains or the 24 V main supply to low-level interfaces such as 5V, SPEED, FNR, BREAK, STOP, RXD or TXD.

4 Control and Debug Interfaces

The diagram follows the markings in the rear-view photo. Labels identify interfaces; use the project interface specification for input/output direction, permitted levels, active states, timing and firmware support.

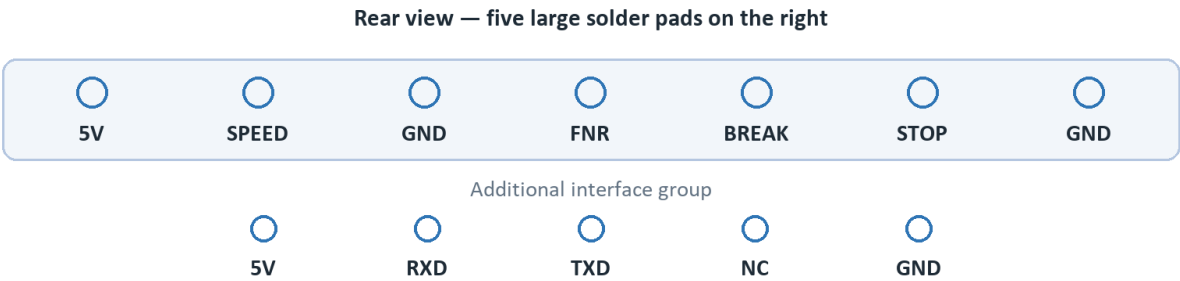


Figure 6. Control and debug markings. BREAK is reproduced exactly as printed on the board.

Marking	Identification and Integration Notes
5V	5 V marked terminal. Confirm input/output direction and available current; not a main power terminal.
SPEED	Speed-control marking. Confirm analog, PWM or other input mode and its range.
GND	Signal reference ground. Follow the interface plan for grounding to the external controller.
FNR	Direction-control marking. Confirm active level and whether changes during operation are allowed.
BREAK	Brake-control marking. Confirm trigger state, braking method and release conditions.
STOP	Stop-control marking. Confirm active state and restart conditions.

Additional Interfaces and Debugging

Marking	Usage Notes
RXD TXD	Receive and transmit markings. Confirm protocol, baud rate and signal levels in the project documents.
NC	Reserved / no-connect marking. Leave unconnected unless specified otherwise.
5V GND	Power-related marking and reference ground. Do not apply external power to 5V until its direction is confirmed.

A debug interface does not imply direct compatibility with a PC serial port. If interface parameters or functions are unconfirmed, establish basic power and motor matching first, then connect control signals as instructed.

5 Installation and Commissioning

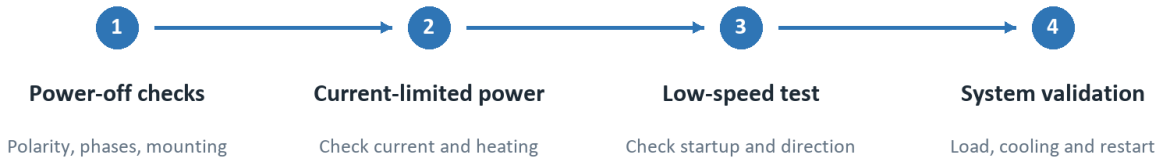


Figure 7. Inspect with power off, apply current-limited power, test at low speed, then validate the system.

Checks Before and During Operation

Power-off inspection: check VDD/GND polarity, phase connections and terminal tightness. Mounting supports must not touch rear solder joints. Secure the motor and blades; keep cables and foreign objects clear of rotating parts.

Initial power-up: use a current-limited test supply with settings appropriate to the motor and drive configuration. Check idle current and abnormal heating before issuing the approved low-speed command. Stop immediately if judder, unusual noise or abnormal current occurs.

Gradual load testing: confirm direction and low-speed operation before testing target speed and the actual fan load. Record supply voltage, input current, speed and power-device temperature rise. Base continuous operating conditions on system validation.

Troubleshooting

Symptom	Check First	Next Action
No response at power-up	Supply polarity, voltage and terminal contact	Check enable controls and firmware settings.
Startup judder or failure	Motor phases, mechanical binding and supply voltage drop	Stop repeated attempts; verify motor parameters.
Incorrect rotation	FNR settings and approved phase sequence	Power off, then adjust to the validated configuration.
Excessive heating under load	Load, supply, wiring and cooling clearance	Record temperature rise, reduce test load and review.
Speed-control or communication issue	Signal ground, levels, input mode and protocol	Measure each item against the interface specification.

Recheck After Enclosure Assembly

The enclosure, airflow path, cable length and blades affect performance. After assembly, repeat start/stop, low-speed, target-speed, temperature-rise and power-cycle tests. Perform any stall, abnormal-supply or other protection tests only under an agreed procedure and safe test conditions.

Overcurrent, stall, overtemperature and undervoltage protection are not presented as verified features in this manual. Availability, trigger and recovery conditions depend on the supplied hardware and firmware configuration.

6 Integration, Delivery and Contact

Responsibilities and Required Inputs

Our Supply and Support	Customer Inputs and Confirmation
IPM1781 PCBA hardware and agreed documentation	Motor specifications, samples and intended application
Agreed control configuration and prototype commissioning	Supply, speed control, start/stop and direction requirements
Support for board interface and hardware troubleshooting	Blades, enclosure, cables, mounting and cooling design
Delivery to the approved revision and acceptance criteria	System validation, target-market requirements and production plan

Motor, complete ceiling fan, supply, cables and enclosure are included only as agreed in the order. Confirm PCBA and firmware revisions, control interfaces, quantity and acceptance criteria before delivery.

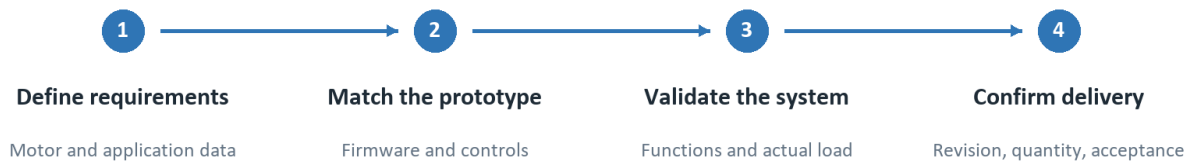


Figure 8. Integration workflow from application requirements to approved delivery.

Contact InterPower

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For inquiries, provide the estimated quantity, motor ratings and target speed, supply conditions, control method, available space and project schedule. Motor photos or a datasheet help us assess compatibility more quickly.

Revision history: V1.0 | October 2026 | Initial release: product overview, interfaces and commissioning.