

VER 1.1 **Technical Manual**

**DS-OLBD1-FRS4**



**DINGS'**  
Precision Motion Specialist  
www.dingsmotion.cn

**DS-OLBD1-FRS4**  
BLDC Motor Driver

Input Voltage : 24 ~ 48 VDC  
Output Current : 5 A

LED 0068	GR + GREEN
MOTOR RUN	RD + RED
MOTOR STOP	SOLID GR
OVER CURRENT	GR + GR
SUPPLY VOLTAGE HIGH	1 GR + 1 RD
SUPPLY VOLTAGE LOW	1 GR + 2 RD
OTHER FAILURE	1 GR + 4 RD
	1 GR + 1 RD

RUN/GRN  
 ERR/RD  
 RELAY  
 Output Signal  
 Hall  
 Power & Motor  
 V+ V- 0V GND

## Product Warranty

- If a malfunction occurs within one year of purchasing this product due to reasons other than improper operation, you can send the faulty product back to our company via courier or logistics, and you will enjoy free repair service. Repairs usually take several working days, so please understand.
- If a malfunction occurs due to improper operation or after one year of purchase, repair fees will be charged. You can send the faulty product back to our company via courier or logistics as stated above. Repairs usually take several working days.
- If this product is used in a critically important system, please consider purchasing a spare to ensure system stability.
- Our company is not responsible for any damage caused during transportation if you send the product back to us for repair. Please ensure that sufficient cushioning material is included in the packaging before shipping the product and avoid excessive vibration (less than 0.5G).
- The following services are not included in the product price
  - A) Review and judgment of system compatibility (during design)
  - B) Trial operation and adjustment (the original motor cannot be returned if it needs adjustment)
  - C) On-site fault diagnosis and repair

## Usage Precautions

- Please use this product within the specified ratings and in the environment stated in this manual.
- This product is not designed or manufactured for use in life-critical situations or environments. If you need to purchase this product for special purposes, please notify our sales staff for discussion and confirmation.
- We strive for higher quality and customer trust, but please consider multiple backup designs, fire safety designs, and malfunction prevention designs to avoid personal injury, fire accidents, and other societal damage due to system design failures.
- The specifications of this product may change without prior notice to improve its features.

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# 1. Product Overview

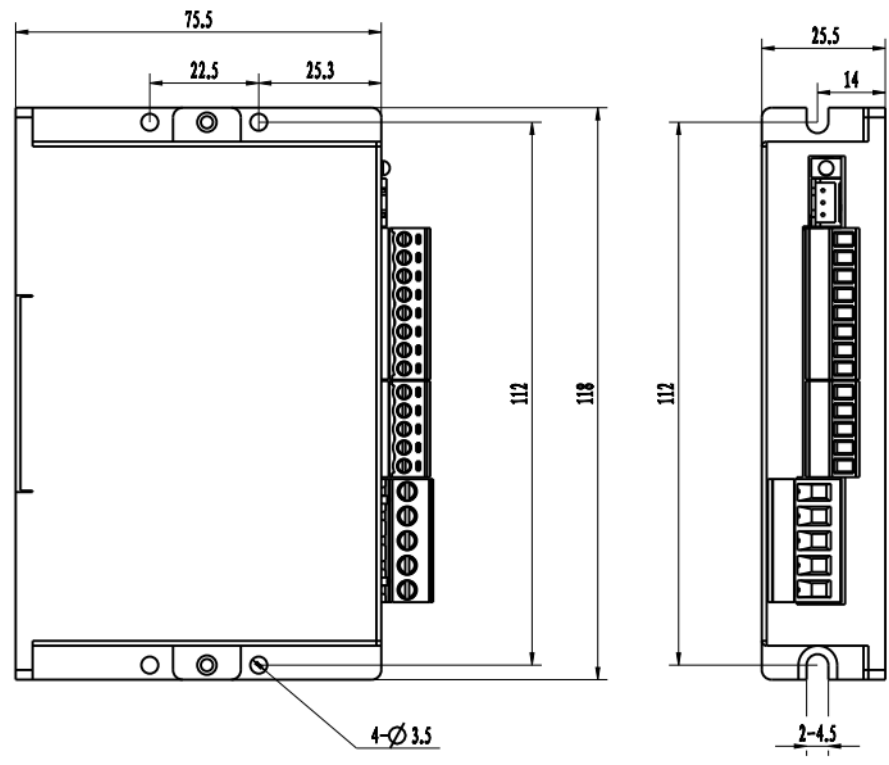
## 1.1 Features

- Input power : DC 12V – 48V
- Maximum Peak Current : 18A, duration  $\leq 2$  seconds
- Includes RS-485 debugging, PID speed, and current dual-loop regulators, FOC algorithm
- Speed Range : 150~10,000 RPM (actual performance depends on motor characteristics)
- Protection Functions : Over-voltage, under-voltage, over-current, illegal Hall signal, and other fault alarms

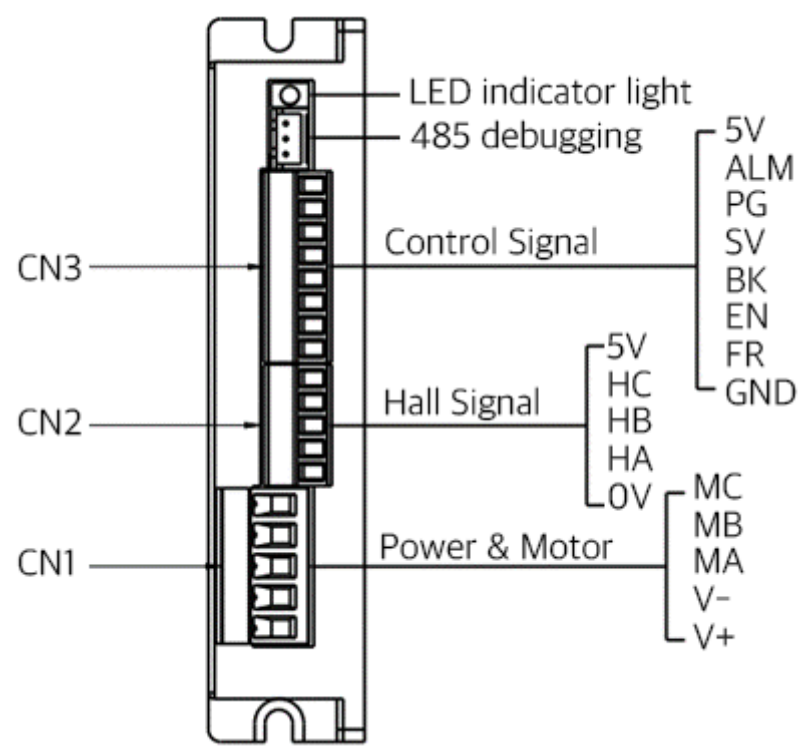
## 1.2 Parameter

Driver Model		DS-OLBD1-FRS4	
Input Power Supply		DC 12V-48V	
Max. Continuous Current		6A	
Max. Peak Current		18A, duration $\leq 2$ seconds	
Overvoltage Protection		60VDC	
Undervoltage Protection		10VDC	
Input Signal		3 Input Signals	
		Forward / Reverse Signal: FR	
		Enable Signal: EN	
		Brake Signal: BK	
Output Signal		2-way Output Signal	
		Motor Speed Pulse Output: PG	
		Alarm Output: ALM	
		OC Gate Output, Maximum Saturation Current: 10 mA	
External Speed Adjustment Input Signal SV		0~5V, $\geq 1$ mA, or external 10K $\Omega$ potentiometer	
Dimensions (excluding wiring connectors)		118 × 75.5 × 25.5 mm	
Weight		200g	
Environment Indicators	Usage environment	Avoid dust, oil mist, and corrosive gases	
	Humidity	<85% RH, no condensation	
	Temperature	-15 ~ 50 °C	
	Heat Dissipation	Install in a ventilated environment	

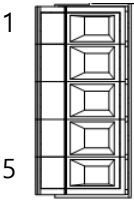
### 1.3 Installation Dimension (mm)



## 2. Schematic Diagram and Interface Definitions

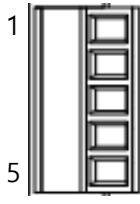


## 2.1 Power and Motor Interface Definition CN1 (Power & Motor)

Terminal number	Diagram	Pin.	Signal name	Details
CN1		1	MC	Motor phase C
		2	MB	Motor phase B
		3	MA	Motor phase A
		4	V-	Power GND
		5	V+	Power VCC

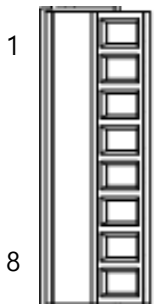
Note 1: Power input and motor output use a 5.08 pitch 5-pin terminal. Please connect the power supply and motor correctly, paying attention to the power polarity during wiring. (For specific wiring methods, refer to [Section 8. Wiring Requirements])

## 2.2 Hall Signal Interface Definition (CN2)

Terminal number	Diagram	Pin.	Signal name	Details
CN2		1	5V	Hall Signal Power 5V
		2	HC	Hall Signal C Phase Input
		3	HB	Hall Signal B Phase Input
		4	HA	Hall Signal A Phase Input
		5	0V	Hall Signal Power GND

Note 2: The Hall signal uses a 3.81 pitch 5-pin right-angle terminal. Please wire correctly (For specific wiring methods, refer to [Section 8. Wiring Requirements])

## 2.3 Control Signal Interface Definition (CN3)

Terminal number	Diagram	Pin.	Signal name	Details
CN3		1	5V	Output 5VDC
		2	ALM	Alarm output
		3	PG	Motor speed pulse output
		4	SV	External signal speed control input signal
		5	BK	Brake signal
		6	EN	Enable signal
		7	FR	Forward / Reverse signal
		8	GND	Common terminal

Note 3: The control signal uses a 3.81 pitch 8-pin right-angle terminal. Please wire correctly. For specific wiring methods, refer to [Section 8. Wiring Requirements])

## 3. LED Indicators

This product has one red-green dual-color LED indicator to display status.

### 3.1 Status Display

Method: Complete the corresponding number of flashes (0.5 seconds low level, 0.5 seconds high level) for different statuses, complete 2 seconds high level, and then repeat.

Status Function	Indicator Light Status	Description
Motor Stop	Green light flashing	Driver offline
Motor Running	Green light steady	Motor in operation

### 3.2 Alarm Display

Method: Complete the corresponding number of flashes (0.5 seconds low level, 0.5 seconds high level) for different statuses, complete 2 seconds high level, and then repeat.

Status Function	Indicator Light Status	Description
Motor Overcurrent	1 green + 1 red	Motor phase current overcurrent or driver fault
Overvoltage	1 green + 3 red	Power input greater than 60V
Undervoltage	1 green + 4 red	Power input less than 11V
Other Faults	1 green + 5 red	Current overload, Hall signal error, other hardware faults

## 4. Speed Control Method

This brushless driver can control the motor speed from 150 to the maximum rated speed (default: 3000 RPM) via an external potentiometer. The maximum rated speed range is from 150 to 10,000 RPM, with actual operation depending on motor characteristics.

Connect the two fixed terminals of the external potentiometer to the GND and the 5V terminals of the driver, respectively, and connect the adjustment terminal to the SV terminal. This allows the use of an external potentiometer (10KΩ) for speed control. Alternatively, speed control can be achieved by inputting an analog voltage to the SV terminal from other control units (such as PLCs, microcontrollers, etc.). The SV terminal accepts a range of DC 0-5V, corresponding to a motor speed of 0 to rated speed.

## 5. Power Supply

### 5.1 Voltage

The driver allows for a maximum operating voltage range of 10 ~ 52V DC, with a recommended supply of 12 ~ 48V DC.

A voltage stabilizing capacitor can absorb current spikes on the power line, preventing mis protection of the driver. When using the driver at low voltage, it is recommended to parallel a larger stabilizing capacitor at the power input to prevent low voltage alarms caused by unstable power supply voltages. It is not recommended to use the driver when the supply voltage is below 10V, as the operation may be unreliable. When the driver is powered by a regulated power supply and the supply voltage is close to 52V, it is advisable to employ voltage clamping measures at the power input to prevent the driver from overvoltage alarms and stopping operation due to supply voltage exceeding 52V. When using an unregulated power supply, ensure that the no-load output voltage of the power supply does not exceed 52V DC.

### 5.2 Current

The maximum supply current should be the sum of the two-phase currents. Typically, the required current depends on the motor model, voltage, speed, and load conditions. The actual power current value is significantly lower than this maximum current because the driver uses a switching amplifier to convert a high voltage, low current signal into a low voltage, high current signal through power switching. The rated voltage of the motor windings is often very low; the higher the driver's supply voltage above the motor winding's rated voltage, the smaller the power input current required by the driver.

### 5.3 Regenerative Current

When the motor slows down, it converts the kinetic energy of the load into electrical energy like a generator. Some energy will be consumed by the driver and motor. If your application has a large load running at high speed, a considerable amount of kinetic energy will be converted into electrical energy. It is easy to cause driver alarms (overvoltage) and may even cause damage to the driver.

## 6. Signal Input

### 6.1 Forward/Reverse Signal: FR

The motor rotation direction can be controlled by inputting a signal to the control terminal FR. When FR is not connected to a signal, the motor runs clockwise (facing the motor shaft). Conversely, the motor runs counterclockwise. To avoid damaging the driver, stop the motor before changing the rotation direction. If this function is not needed, the forward/reverse signal terminal can be left unconnected.



## 6.2 Enable Signal: EN

The motor operation and stop can be controlled by inputting a signal to the control terminal EN. When the terminal is connected, the motor runs; otherwise, the motor stops. Using the run/stop terminal to stop the motor results in a natural stop, which is related to the load inertia. If this function is not needed, the enable signal terminal can be left unconnected.

## 6.3 Brake Signal: BK

The motor braking can be controlled by inputting a signal to the control terminal BK. When the control terminal BK is not connected to a signal, the motor runs normally; when the terminal is connected, the motor stops quickly. The braking stop is faster than the natural stop, and the specific stop time depends on the load inertia of the user system. Braking stop impacts both electrical and mechanical systems. If there are no special stop requirements, natural stop should be used. If this function is not needed, the brake signal terminal can be left unconnected.

# 7. Signal Output

## 7.1 Motor Speed Pulse Output: PG

Speed pulse output; this port is an OC output,  $\leq 10\text{mA}$ . To obtain a signal, a  $3\text{K}\Omega$  to  $10\text{K}\Omega$  pull-up resistor should be connected between this terminal and the power supply. The number of output pulses per motor revolution is  $3 \times N$ , where  $N$  is the number of pole pairs of the motor. For example, a four-pole motor (2 pole pairs) outputs 6 pulses per revolution. At a motor speed of 500 RPM, the terminal PG outputs 3000 pulses.

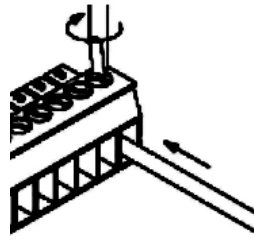
## 7.2 Alarm Output: ALM

Driver alarm output; this port is an OC output,  $\leq 10\text{mA}$ . To obtain a signal, a  $3\text{K}\Omega$  to  $10\text{K}\Omega$  pull-up resistor should be connected between this terminal and the power supply. These terminal conducts when there is no alarm.

# 8. Wiring Requirements

## 8.1 Wiring Method

After stripping the wire, insert it into the terminal until it touches the terminal block. Tighten the screw clockwise to secure the wire.



Wiring diagram

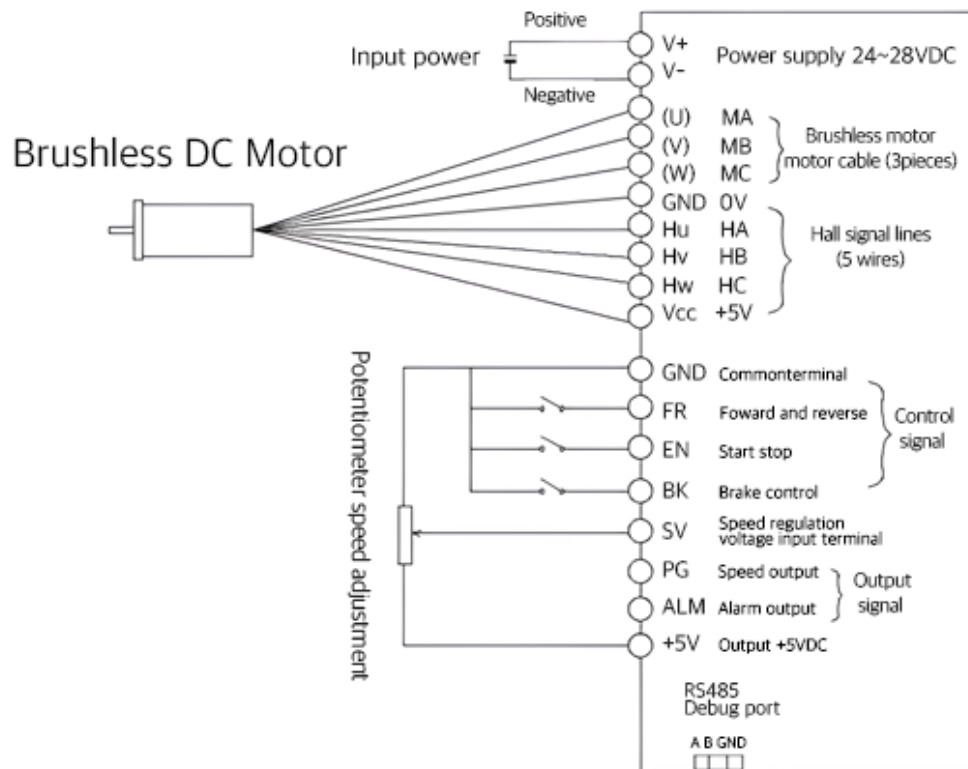
## 8.2 Precautions

- (1) Please correctly connect the power supply and motor, paying attention to the polarity of the power supply.
- (2) When stripping the wires, do not pre-tin the ends with solder, as this may prevent proper connection.
- (3) To prevent interference to the driver, it is recommended to use shielded cable for control signals and to short the shield layer to the ground wire. Unless specifically required, the shield of the control signal cable should be grounded at one end only: the ground connection should be at the upper machine end of the shield, with the driver end of the shield left floating. Within the same machine, grounding should only be done at one point. If it is not a true ground wire, severe interference may occur, and the shield should not be connected.
- (4) If one power supply is used for multiple drivers, use parallel connections at the power source. Do not connect in a daisy-chain manner from one driver to another.
- (5) It is strictly forbidden to plug or unplug the power terminals of the driver (motor and power supply) while they are energized, as high current can still flow through the coils when the energized motor is stopped. Plugging or unplugging power terminals can cause a huge instantaneous induced electromotive force that may damage the driver.
- (6) It is strictly forbidden to insert tinned wire ends into the terminal blocks, as this may increase contact resistance and cause overheating, damaging the terminals.
- (7) Wiring ends must not be exposed outside the terminal block to prevent accidental short circuits that could damage the driver.
- (8) Please use specialized tools to tighten the terminal connections.

## 9. Motor Connection

When connecting the motor to the driver, first ensure that the driver's power is turned off. Verify that the unused motor leads are not short-circuited with any other objects. Do not disconnect the motor during the time the driver is powered. Do not connect motor leads to the ground or power supply.

## 9.1 Motor connection method



Connection diagram of the driver to the brushless motor

## 9.2 Precautions

Different motors have different wire colors; refer to the motor's documentation for proper usage.

The above motor connection method is typical and for reference only. Please refer to the motor's specification manual for specific wiring methods.

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