



BLDC motor driver

BLD250-C4, RS485, 250watt

BLDC DRIVER

- Surface-mount technology
- Small size, low cost, easy
- Hall sensor commutation
- Set value speed : Volume(2.5Vdc), PWM(open-collector), 4~20mA(current loop)
- Slow start, slow stop
- Brake, Direction and Enable input
- Current limit adjustable (communication mode)
- Motor lock detection : Blockage protection
- Aluminium housing
- Alarm output function at time of error
- FG out

General Description

The BLD-250 series drivers are designed to drive 3-phase brushless DC motors at a high switching frequency.

Driver has enable, direction, and brake input.

In addition, rotation of the motor can be detected by logic output FG.

All models interface with digital controllers or can be used as stand-alone drives.

Driver require only a single regulated DC power supply and a red/green led indicates operating status.

Electrical Data

DC supply voltage V_m
Absolute minimum supply voltage $V_{m \min}$
Absolute maximum supply voltage $V_{m \max}$
Max. output voltage
Peak. Current (1 sec. max., internally limited)
Max. continuous output current
Switching frequency of power stage
Power dissipation at cont. current

BLD250-C4

24 Vdc
 12 Vdc
 28 Vdc
 $V_m - 0.5$
 30 A
 15 A
 25 kHz
 250 W

Input

Set value speed
 Enable
 Brake
 Direction

PWM : Open collector Input, 250Hz
 Volume : 0~2.5Vdc
 Current loop : 4~20mA
 Open collector Input
 Open collector Input
 Open collector Input

Output

FG
 ALARM

Open collector, $V_{ceo} : 80Vdc$, $I_c \max : 50mA$
 Open collector, $V_{ceo} : 80Vdc$, $I_c \max : 50mA$

Voltage outputs

Hall sensor supply voltage $V_{cc \ hall}$

+5.8Vdc $\pm 5\%$, max. output current 20mA

Indicator

Green : LED blink or on(Blinks during motor rotation)
 Red : LED on(Fault), LED blink(board on)
 Yellow : LED on(CCW), LED blink(ACC/DEC conversion)

Trim potentiometers

Set of motor acceleration time (slow start), decelation time (slow stop).

Protective function

Current limit (OCP)
 Blockage protection

20A Typ, The set current limit is adjusted at communication mode.($<99A$)
 Detect a motor lock if motor shaft is blocked for longer than 3 sec.
 Set in communication mode.(2~5sec)

Ambient temperature and humidity

Operation condition
 Storage condition

Dry bulb temp:-10~+50 [$^{\circ}C$], Relative humidity : 0 ~ 90 [%]
 Dry bulb temp:-10~+60 [$^{\circ}C$], Relative humidity : 10 ~ 90 [%]

325 g Typ

131 x 90 x 31.5 mm

Flange for M3-screws

Terminals

Male header (PCB) : SLPH-300R-2P(Power), SLPH-300R-3P(Motor)

Suitable plug : SLPS-300V-2P, SLPS-300V-3P

Male header (PCB) : MOLEX 5268

Suitable plug : MOLEX 5264

Wiring diagram



Pin configuration

VOLUME	Function
DEC	Deceleration time adjustment
ACC	Acceleration time adjustment

CON 6	Function (External speed)
EXT-SPD(ICL)	Control motor speed in current loop mode.(4~20mA)

CON 7	Function (Communication)
+PWR	Driver main power out (+)
PGND	Driver main power out (-)
TXD/DP	RS232C(TXD) / RS485(A)
RXD/DN	RS232C(RXD) / RS485(B)
NC	NC

DIP S/W	Function (Control mode)
EXT-SPD(Vol)	PWM input mode
INT-VOL	Internal Volume mode
EXT-VOL	External Volume mode
EXT-SPD(ICL)	Current loop mode

CON 5	Function (External speed)
EXT-VOL	GND
	0~2.5Vdc input Input speed control with external volume (10kΩ)
	+3.3 Vdc

VOLUME	Function (Internal speed)
INT-VOL	Controls motor speed with internal volume trimmer(10kΩ)



CON 4	Function (Control IO)
GND	Grounded
ALARM	FAULT output
FG	Motor speed pulse output
SPEED	Motor speed control input
BRAKE	Motor brake control input
ENABLE	Motor ON/OFF control input
CCW	Motor rotation direction control input

CON 3	Function (Hall sensor)
HALL GND	Hall sensor grounded
HALL VCC	Hall sensor power(5.8Vdc out)
HALL C	Hall sensor C (W)
HALL B	Hall sensor B (V)
HALL A	Hall sensor A (U)

CON 2	Function (Motor phase)
MOTOR W	Motor W phase
MOTOR V	Motor V phase
MOTOR U	Motor U phase

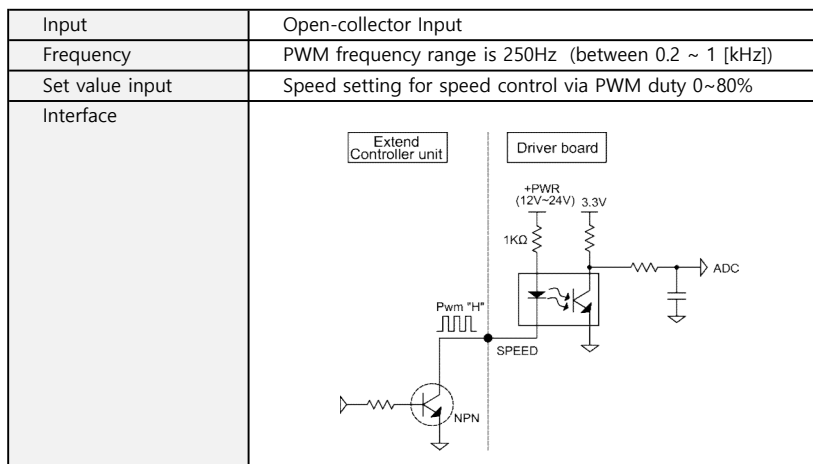
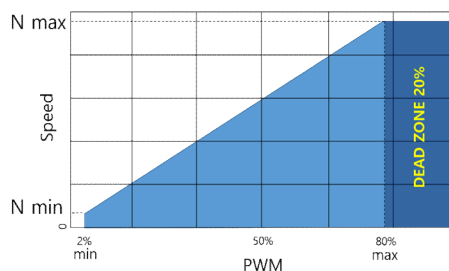
CON 1	Function (Power)
PGND	Power ground
+PWR	+12 ~ 24Vdc supply voltage input

LED	Function
●	BLINK : Board ON
	RED ON : FAULT
●	BLINK : ACC/DEC conversion
	YELLOW ON : Motor direction, CCW
●	GREEN BLINK or ON: Blinks during motor rotation

Inputs and outputs

Control input PWM <SPEED>

Motor speed control input
Pulse Width Modulated input, opto-coupled
Dip-switch no. 4 is turned on.

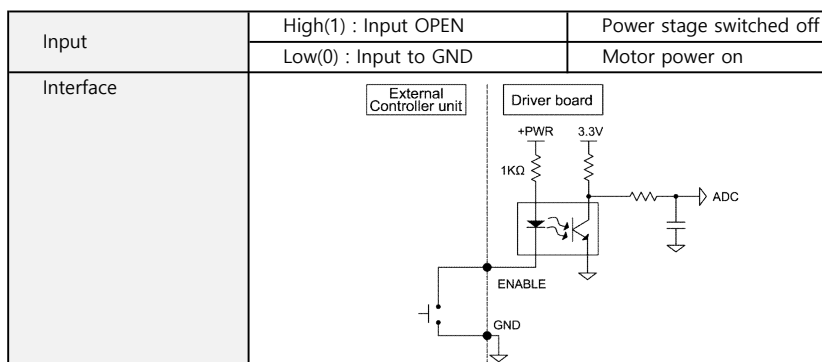


Control input ON/OFF <ENABLE>

Enables or disables the power stage.

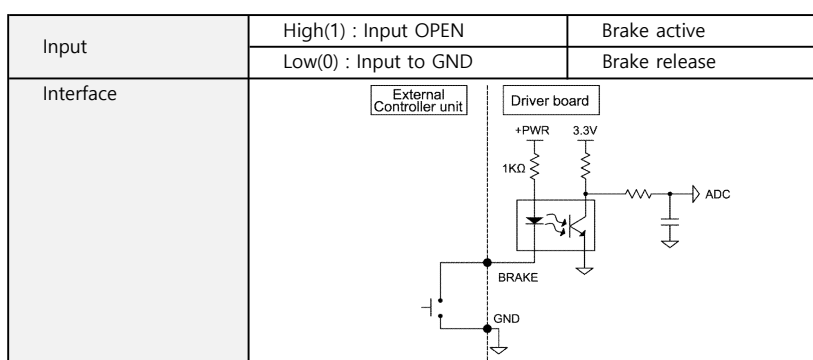
If the <ENABLE> input contacts ground potential, the driver is activated.

If the <ENABLE> input is open, mosfets on the bridge drive turns off and the motor shaft freewheels slows down



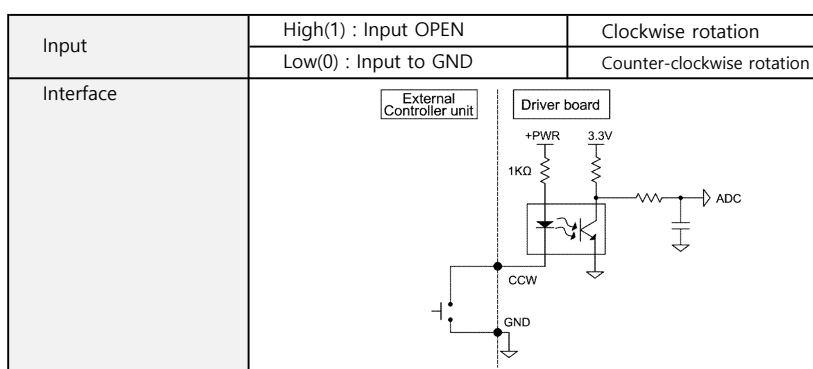
Control input brake <BRAKE>

The motor shaft slows down in an uncontrolled fashion to a standstill by short-circuiting the motor windings.



Control input direction <CCW>

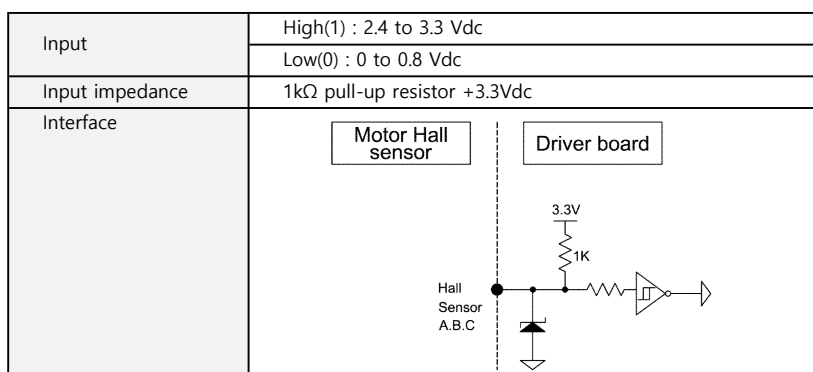
When the level changes, the motor shaft slows down in an uncontrolled fashion to a standstill by short-circuiting the motor windings, and accelerates in the opposite direction, until the nominal speed reaches again.



Hall sensor input <HALL A, B, C>

Hall sensors need for detecting rotor position and actual speed.

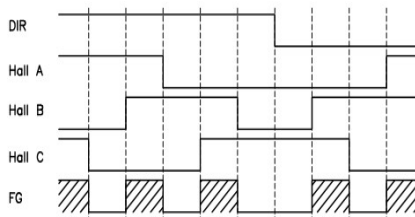
Suitable for Hall effect sensors IC using Schmitt trigger and open collector output.



<FG> out

1FG is put into toggle-operation in which the logic reverses every time when excitation phase is switched by hall input.

$$* \text{ SPEED} = (\text{ Pole - Pairs }) \times 3$$

**<ALARM> out**

Driver fault output.

This open collector output is active low during one or more of the following conditions : Invalid Sensor input code, Enable input at logic 0, over current, motor rock detection, and Thermal shutdown.

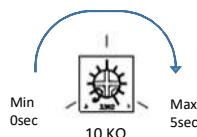
* Reset : Enable, Power off

Hall sensor voltage out

+5.8Vdc @ 20mA

Adjusting the potentiometers

Motor acceleration time, deceleration time can be adjusted using 1-turn potentiometers.

**Dip switch**

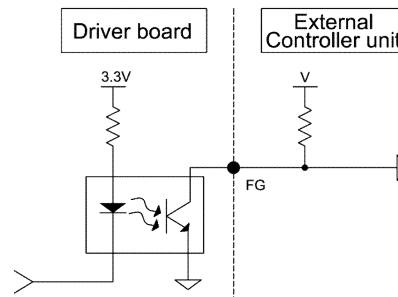
Setting of motor speed control mode

Open collector output

$U_{CEO} = 80 \text{ Vdc}$

$U_{ECO} = 7 \text{ Vdc}$

$I_{cmax} = 50 \text{ mA}$



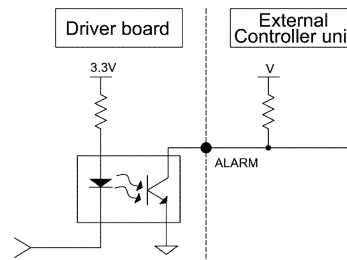
You need to pull up for 1FG terminal, so that the terminal is NPN open-collector output.

Open collector output

$U_{CEO} = 80 \text{ Vdc}$

$U_{ECO} = 7 \text{ Vdc}$

$I_{cmax} = 50 \text{ mA}$



You need to pull up for alarm terminal, so that the terminal is NPN open-collector output.

An internal voltage of +5.8 Vdc is provided for powering the hall sensors.

Output voltage 5.8 Vdc \pm 5%

Max. output current 20mA (short-circuit protection)

Pre-adjustment

With pre-adjustment, the potentiometers are set in a preferred position.

Pre-adjustment of potentiometers

ACC	Set the acceleration time of the motor. (0 or 1~5 sec)
DEC	Set the deceleration time of the motor. (0 or 1~5 sec)

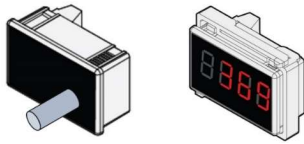
No	DIP switch	Function	Discription
1		EXT-SPD(ICL)	External current loop mode - Input to connector 6
2		EXT-VOL	External Volume control mode - Input to connector 5
3		INT-VOL	Internal Volume control mode - Controlled by internal volume control
4		EXT-SPD(VOL)	External PWM input mode - Input to Connector 4 <SPEED> Note. If the <SPEED> pwm input is open, the motor rotates at full speed.

Current loop 4 ~ 20mA <EXT-SPD(ICL)>

Motor speed control input

Dip-switch no. 1 is turned on.

Optional Products



It could be controlled for the speed on motors to use converters of output the electric current sending the signal on 4~20[mA] through electric current loop without POWER.

Product Number : **MTD-0420C**

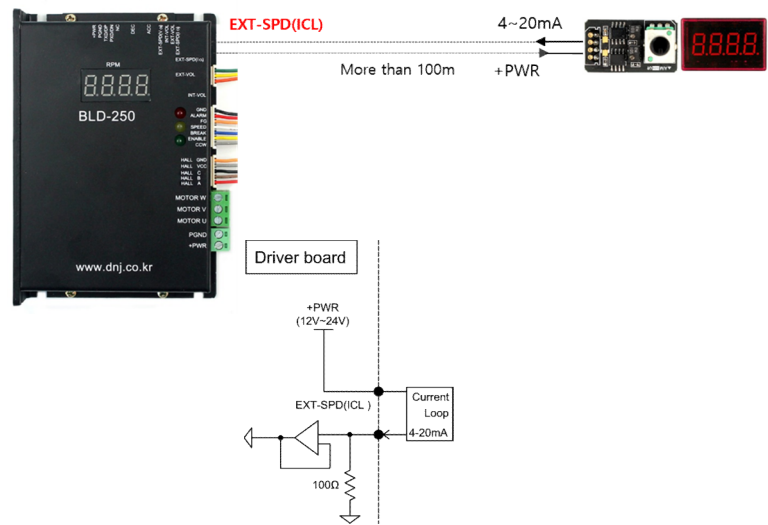
It is possible to display the order for the speed on motors in long distance using the current loop in real time.

Product Number : **DP-0420C**

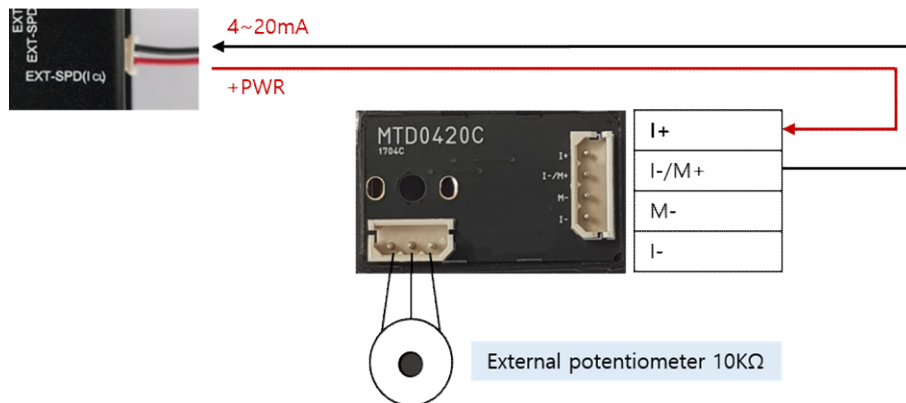
The control of speed on motors uses electric current loop.

It could be controlled by supplying flow of electricity on 4~20[mA] for the speed on motors.

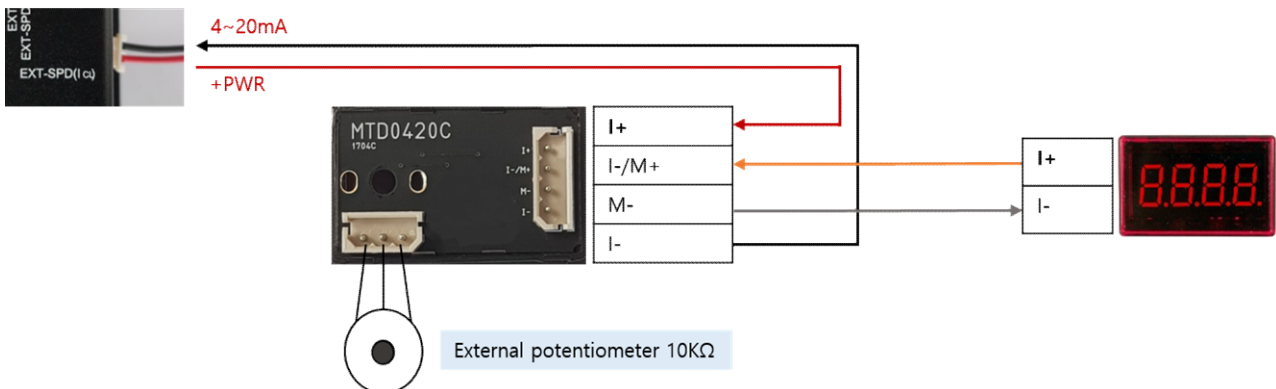
It sets on 0[rpm] under 4[mA] and maximum speed on 20[mA] as it changes by 1[rpm].



4~20mA volume controller (current loop)



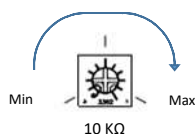
4~20mA volume controller + digital panel-meter (external unit)



Internal Volume<INT-VOL>

Motor speed control input

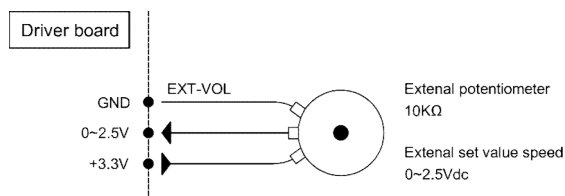
Dip-switch no. 3 is turned on.



External Volume<EXT-VOL>

Motor speed control input

Dip-switch no. 2 is turned on.



RPM Display

Led 4 channel 7 segment display

Default : 4 pole BLDC

The speed of the 4-pole, 3-phase BLDC motor is displayed as a 4-digit, 7-segment.

In order to display the motor speeds of other poles, it is possible to change in the communication mode.

- It is possible to directly change the number of motor for RS485 communication of BLD250-C4 products.
- For BLD250-DR products, please request the desired number of motor poles.

Above 10,000 RPM, the decimal point is displayed in place of 1.

Ex) Motor speed : 14,000 rpm

Display indication: 1400(1400 * 10 = 14,000 with 14,400*10=14,000)

rpm : 3,500 rpm

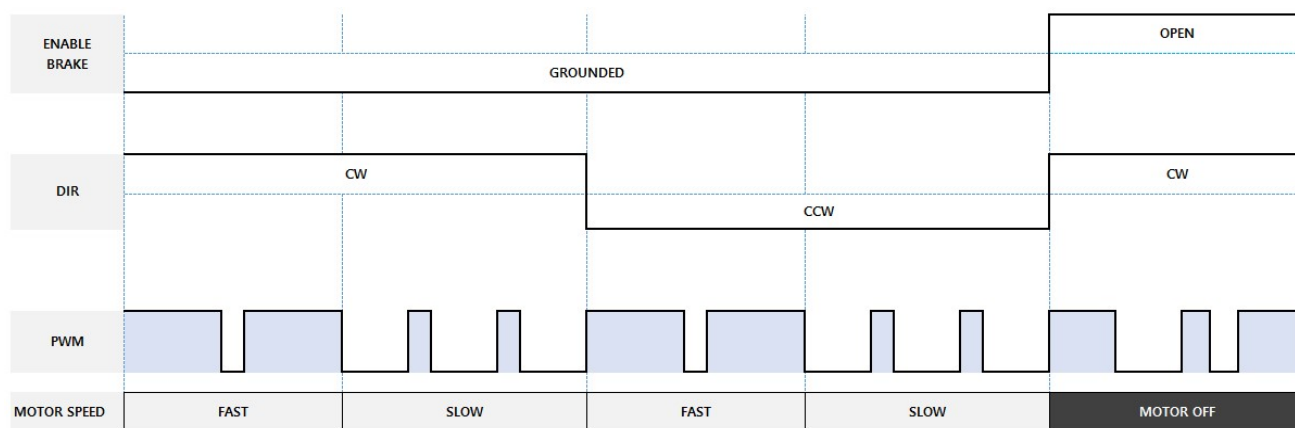


rpm : 14,000 rpm



Driver protection

No	Item	Specification	Note
1	Current limit	20 [A] Typ	<p>The continuous current limit level can be set using RS485 communication.</p> <p>It can be released by setting the current limit level to 99A.</p>
2	Thermal shutdown	160±10 [°C]	<p>When the driver IC reaches the defined temperature, the motor current automatically cuts off. The highest rating temperature of IC is 160 [°C]</p> <p>Component reliability can't be ensured when motor is used in exceeded 160 [°C]. There is no guarantee of proper operation when thermal shutdown motor is reused.</p>
3	Motor lock detection	3 sec	<p>When the motor locks, the motor current automatically cuts off within the defined time.</p> <p>You can set the lock detection time using RS485 communication (2 ~ 60 seconds).</p>



Dimension Drawing

[mm]

