BLDC MODULE

SNR8503M

Ver: V1.0

catalog

1. Catalogue

This product is a driver module developed for induction BLDC motors. The main driver chip is SNR8503M, and the chip integrates a dedicated circuit for induction motor drive. It supports a Hall angle of 120 degrees or 60 degrees, with a default of 120 degrees. It has the characteristics of simple peripheral circuits, complete functions, small volume, simple debugging, high driving efficiency, flexible applications, and wide applicability.

SNR8503M is a 32-bit core MCU, which is very convenient for development and simulation debugging. In order to facilitate users to quickly drive Hall BLDC motors, our company has completed the bottom layer of the software core algorithm. Users only need to conduct secondary development on this software foundation to quickly complete product development.

(1) Motor drive bottom code
(2) With Hall start and commutation bottom code
(3) Phase compensation algorithm
(4) Speed closed-loop PID algorithm
(5) Tailwind start algorithm
(6) Forward and reverse switching, parking and braking, potentiometer (PWM) speed regulation, LED motor status indication
(7) Motor protection: MOS power on self check, MOS over temperature protection, locked rotor protection, overcurrent protection, overvoltage and undervoltage protection

1.1 Product Feature

The drive module has a length and width of 78x57mm, a plate thickness of 1.6mm, and a working voltage of 6-80V. It supports anti reverse connection protection and will not damage the module due to reverse connection of the power cord.

The module defaults to a bare board. If the driving current of a motor below 5A does not require forced heat dissipation, only normal ventilation needs to be ensured. If the driving current exceeds 5A, forced heat dissipation must be carried out. The heat dissipation fins provided by our company can work continuously with a current of 20A.

1) 5pin Hall interface for accessing motor Hall signals.
2) On board LED indicators are used for standby, working, error, and other states

3) On board potentiometer (0.5-5V), PWM speed control interface (frequency 1-20KHz), duty cycle 10-100%
4) On board FG speed feedback interface, calculated speed RPM=FG frequency Hz * 60/polar logarithm
5) On board CW/CCW steering interface, suspended for clockwise CW, short circuited GND for counterclockwise CCW steering
6) On board UART serial port, users can control the module through the serial port protocol
7) On board burning interface for updating burning programs

Application fields: pumps, medical equipment, various compressors, various fans/fans, electric screwdrivers, electric curtains, automatic doors, hydraulic oil pumps, air pumps, refrigerator DC brushless compressors, lawn mowers, spray, underwater thrusters, etc

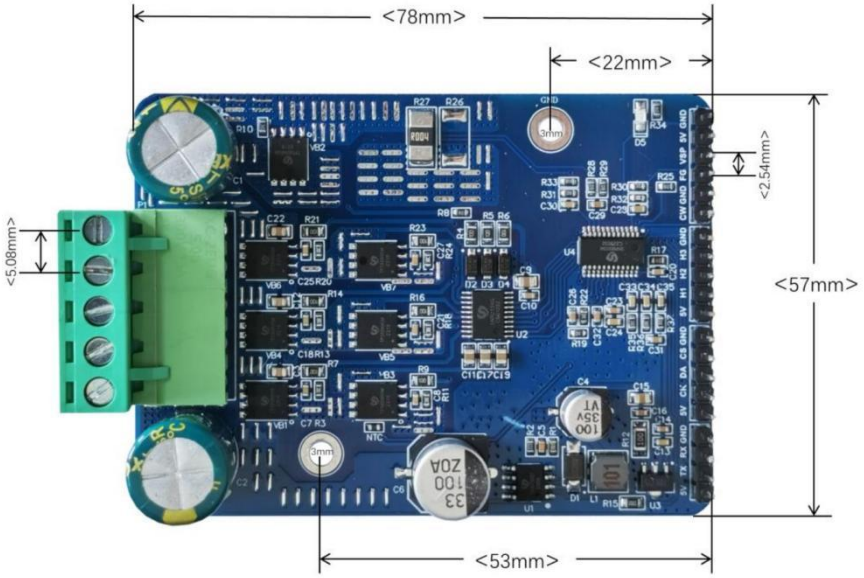
2. Major Parameter

Operating Voltage	6-80V
Continuous working current	20A(with fin)
Max Current	50A
Speed range	<18W RPM
Drive carrier frequency	16KHz
Driving method	Upper arm PWM, lower arm fully open commutation
Hall	120° and 60° Hall commutation
Potentiometer speed regulation	0.5-5V
PWM speed regulation	Frequency 1-20KHz, duty cycle 10-100%
FG speed feedback	Speed RPM=FG Frequency Hz * 60/Polar logarithm
Speed control mode	The default is open loop control, and the closed loop needs to be debugged to enable the function
speed closed loop	Support, you need to debug and turn on the function
Current closed-loop	Support, you need to debug and turn on the function
The wind start	support
UART, serial port control	Support, you need to debug and turn on the function
The CW / CCW steering	support
LED status indicator light	support
Downtime brake	Support, no brake by default, need to debug the open function
Program update	support
MOS power on self test	support
MOS overtemperature protection	Temperature> 95℃ protection (<60℃ recovery)
Block turn protection	support
overcurrent protection	Support, and the max 50A
Overvoltage and undervoltage protection	support
Size	78*57mm
working temperature	-40℃~105℃
Storage temperature	-40℃~125℃

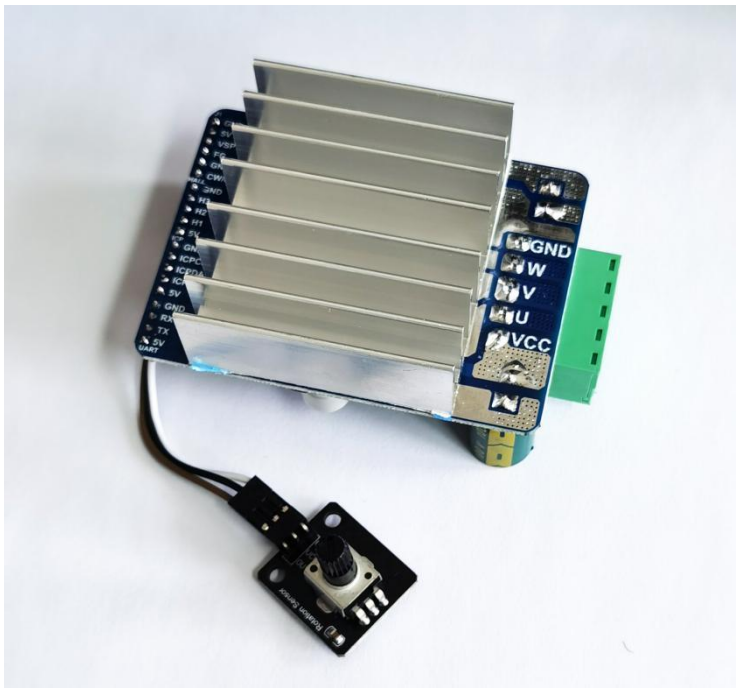
3. External Dimension

front back

Module appearance drawing

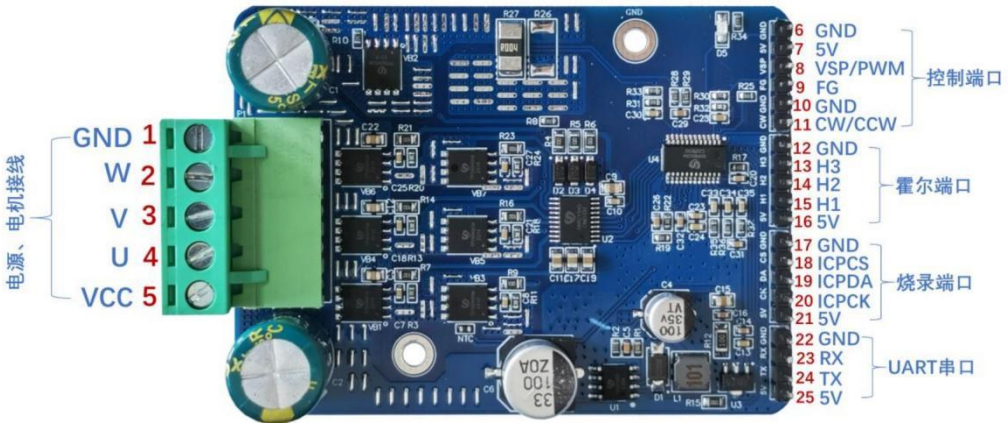


Module dimension drawing



Module dimension drawing

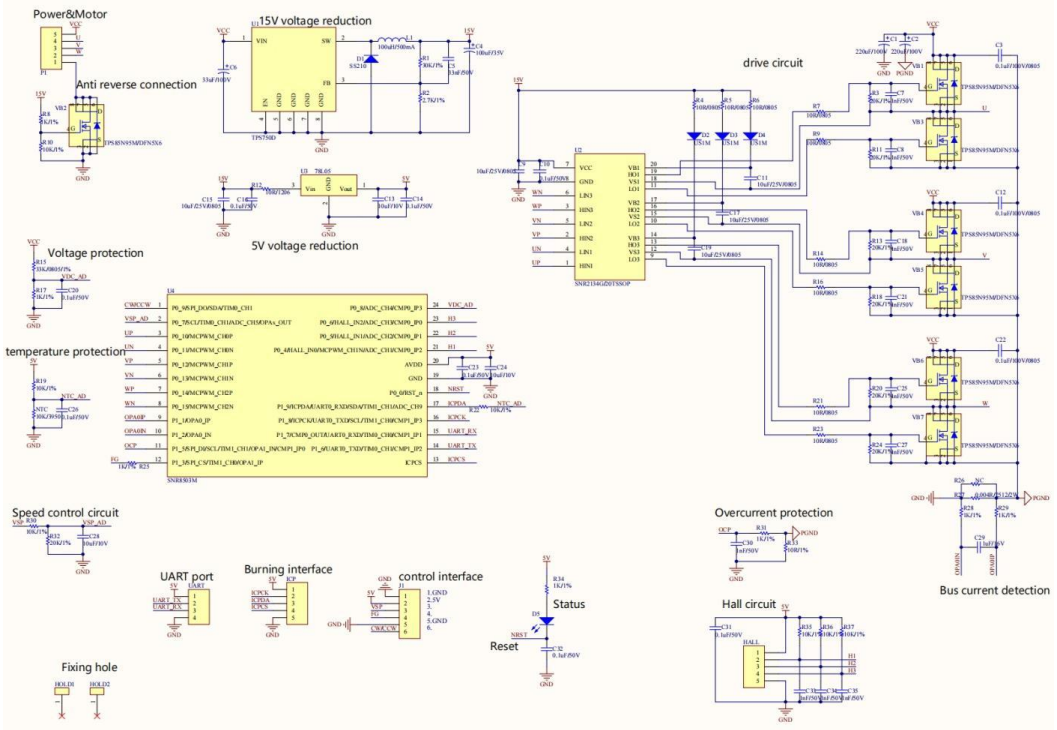
4. Pin Definitions



No.	Name.	Type	IO-REG	Default power-on status	function definition
Power supply and motor wiring					
1	GND	P	-	-	Power supply ground
2	U	O	-	-	Motor phase line
3	V	O	-	-	Motor phase line
4	W	O	-	-	Motor phase line
5	VCC	P	-	-	6-80V power supply (recommended power supply access)
Control port					
6	GND	P	-	-	Power supply ground
7	5V	P	-	-	5V power supply (Power supply not recommended)
8	VSP/PWM	I	5V	Low	VSP speed regulation: 0.5~5V PWM speed regulation: 1 ~ 20 KHz, 10~100%
9	FG	O	5V	Low	FG rotational speed feedback: rotational speed RPM = FG frequency Hz * 60 / polar log
10	GND	P	-	-	Power supply ground
11	CW/CCW	I	5V	High	Steering control: suspended is clockwise CW short GND is

					counterclockwise CCW
Hall port					
12	GND	P	-	-	Hall power supply ground
13	H3	I	5V	High	The Hall signal line H3
14	H2	I	5V	High	The Hall signal line H2
15	H1	I	5V	High	The Hall signal line H1
16	5V	P	-	-	Hall 5V power supply
Burn Port					
17	GND	P	-	-	power supply ground
18	ICPCS	IO	5V	-	-
19	ICPDA	IO	5V	-	-
20	ICPCK	IO	5V	-	-
21	5V	P	-	-	5V power supply ground
UART					
22	GND	P	-	-	power supply ground
23	RX	I	5V	High	UART_RX
24	TX	O	5V	High	UART_TX
25	5V	P	-	-	5V power supply ground

5. Schematic Diagram



Module circuit diagram

6. Application Design Guide

6.1 Onboard LED indication, FG feedback signal

Module state	LED indication	FG feedback
Standby	Flashing at 1Hz frequency	low
The motor is in normal operation	Light	Speed RPM=FG Frequency Hz * 60/Polar logarithm
Short-circuit fault	Flashing on once, then off for 2 seconds	1 low level pulse of 200ms, followed by a high level pulse of 2s
Under voltage fault	Flashing on twice, then off for 2 seconds	2 low level pulse of 200ms, followed by a high level pulse of 2s
Overvoltage fault	Flashing on 3 times, then off for 2 seconds	3 low level pulse of 200ms, followed by a high level pulse of 2s
Locked rotor fault	Flashing on 4 times, then off for 2 seconds	4 low level pulse of 200ms, followed by a high level pulse of 2s
System bias fault	Flashing on 5 times, then off for 2 seconds	5 low level pulse of 200ms, followed by a high level pulse of 2s
MOS over temperature fault	Flashing on 6 times, then off for 2 seconds	6 low level pulse of 200ms, followed by a high level pulse of 2s
MOS low temperature fault	reserve	reserve
Battery over temperature fault	reserve	reserve
Battery low temperature fault	reserve	reserve
Overcurrent fault	Flashing on 10 times, then off for 2 seconds	10 low level pulse of 200ms, followed by a high level pulse of 2s
Phase failure	reserve	reserve
MOS self test failure	Flashing on 12 times, then off for 2 seconds	12 low level pulse of 200ms, followed by a high level pulse of 2s

6.2 Hall sensor usage

1、Before use, please confirm that the three-phase DC brushless motor has Hall. Generally, motors with Hall have 8 wires (applicable), while motors without Hall only have 3 wires (not applicable, please choose our company's non-inductive drive module).

2、The module can support a Hall angle of 120 degrees or 60 degrees, with a default of 120 degrees. If you need to switch, please contact our company for assistance.

3、For motors with Hall, there are 5 Hall wires, of which 2 are Hall power wires and 3 are Hall signal wires. They should be distinguished according to the specifications or colors provided by the motor manufacturer, and the wiring should not be mistaken. Note: Distinguish between motor wires, Hall signal wires, and Hall power wires.

4、Please try the following method to define the relationship between Hall line and phase line:

(1) 1. Set the power supply to low voltage to limit small current output;

(2) 2. Connect 5 Hall wires first, and do not change them after connection (note that the Hall power cord should not be connected incorrectly);

(3) 3. Assuming the colors of the three-phase wires of the motor are red, black, and white, they are respectively connected to the U, V, and W of the PCB board.

According to the following table, there are 6 different combinations of arrangements for testing. If it can operate smoothly or has the best performance, it proves that the wiring is correct. Out of the 6 combinations, only 1 is correct.

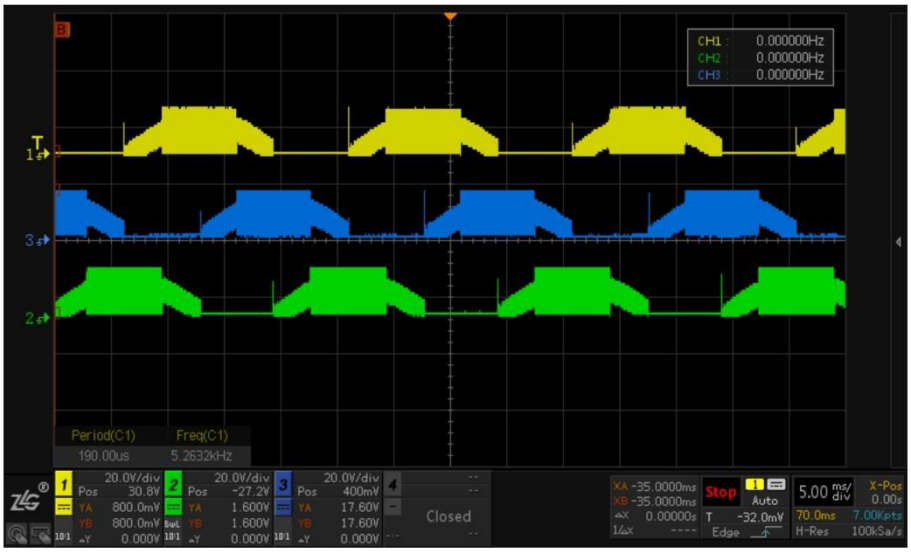
	U	V	W
1	Red	Black	White
2	Red	White	Black
3	White	Red	Black
4	White	Black	Red
5	Black	Red	White
6	Black	White	Red

5、Before finding the correct relationship, avoid using high voltage and high current, otherwise the module may be damaged and the relationship may not be normal There are the following phenomena:

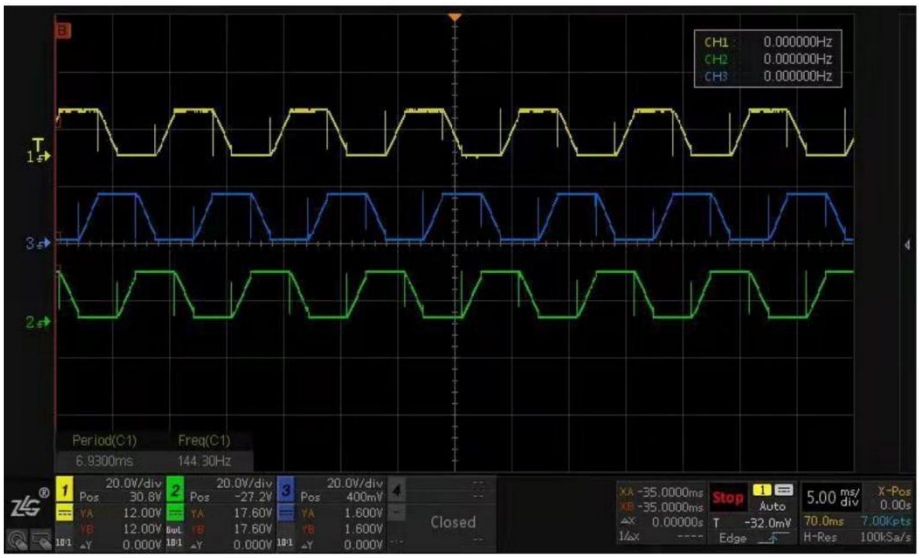
1) After being powered on, the motor cannot start normally, has no response, or cannot rotate normally due to shaking during startup. It has entered theCurrent protection or locked rotor protection;
2) It is difficult to start due to slight shaking, and sometimes it requires manual rotation to start;

3) The motor can rotate in one direction, but cannot rotate in the other direction, and some may have slight noise;
4) The motor stars with large shaking, weakness, noise, high current, and severe heating of the power tube6、When designing the baseboard or mainboard of a module, place a capacitor with a capacity of no less than 100uF at the 5V power input of the module. Make sure that the SPK cable is as short and thick as possible. No other cable straddling is allowed in the cable area.
5) If the correct relationship has been found, the motor runs smoothly after starting, with stable starting and high torque, and the driving waveform is normal. Please refer to the following figure.

The standard driving waveform of the motor is shown in the figure below for reference only. Please observe it with an oscilloscope.



Low speed motor - yellow: U-phase voltage; Blue: V phase voltage; Green: W-phase voltage



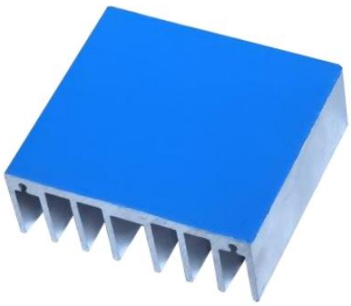
Motor full speed - yellow: U-phase voltage; Blue: V phase voltage; Green: W-phase voltage

6. 3 Add heat dissipation device

The module defaults to a bare board, and if the motor is driven below 5A current, there is no need for forced cooling, only normal ventilation needs to be ensured

If the driving current exceeds 5A, forced heat dissipation must be carried out. Heat dissipation fins should be attached to the back of the module, and attention should be paid to the insulation with the driver board. It is recommended to use heat dissipation fins with insulation backing adhesive as shown in the figure below, which should be placed as close as possible to the back of the module behind the MOS tube to achieve better heat dissipation effect.

If the current exceeds 20A, it is necessary to increase the area of the heat sink or fan heat dissipation. If the user is unsure whether to add a heat dissipation device, first drive the motor. If the over temperature module will automatically protect it, it indicates the need for additional heat dissipation.



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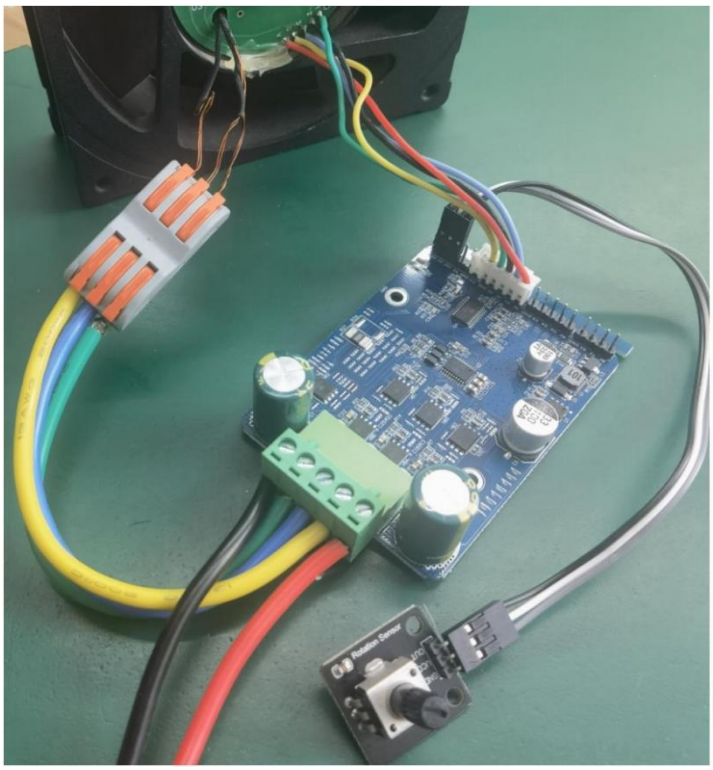
7. Method Of Application

7. 1 power-on test

- ✓ Connect the power supply, Hall motor (8 wires), potentiometer, and module to the wires, as shown in the following figure:



process flow diagram

- ✓ Turn the potentiometer counterclockwise to the minimum, turn on the power, and the red LED indicator light on the module will flash, indicating normal power supply. At this time, slowly turn the potentiometer clockwise, and the LED light will remain on. The motor will slowly rotate, indicating successful driving.
- ✓ If there is a drive failure, it indicates that the Hall relationship of the motor has not been found. Please refer to Section 6.2 to find the relationship before wiring and testing.

8. The link of purchase

Modules can be purchased from the link below:

https://www.aliexpress.us/item/3256805923716927.html?gatewayAdapt=glo2usa4itemAdapt

9. Business Relation

For technical support, business docking and other services, please scan and add wechat QR code to contact:

Business Relation	account number	link
FaceBook	Snanertoys	https://www.facebook.com/profile.php?id=100082034667544
Instagram	Snanertoys	
Skype	Snanertoys	https://join.skype.com/invite/JlwGWrobetd9
Twitter	@Snanertoys	https://twitter.com/Snanertoys?s=09