1. Catalogue

This product is a driver module developed for non-inductive BLDC motors. The main driver chip is SNR8503M, and the chip integrates a dedicated circuit for non-inductive motor drive. It has the characteristics of simple peripheral circuits, complete functions, small size, simple debugging, high driving efficiency, flexible application, 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 non-inductive 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

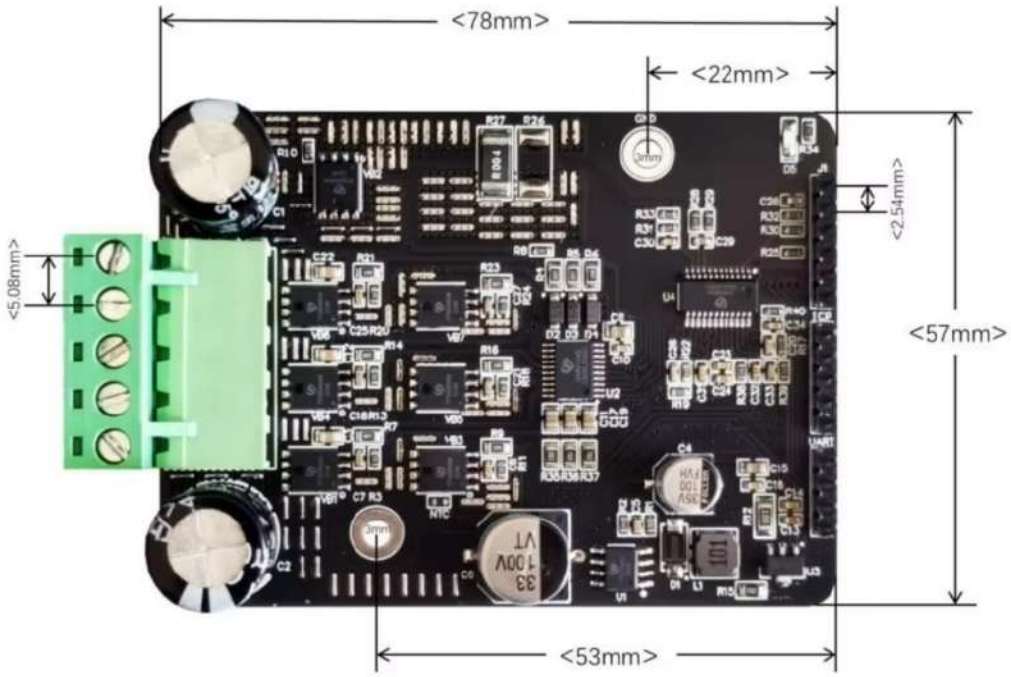
Operating Voltage	6-80V
Continuous working current	20A(with fin)
Max Current	50A
Speed range	<18W RPM
Drive carrier frequency	16KHz
Driving method	Upper arm PWM, lower arm fully open commutation
Hallless observation	Observation of back electromotive force
Potentiometer speed regulation	0.5-5V
PWM speed 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

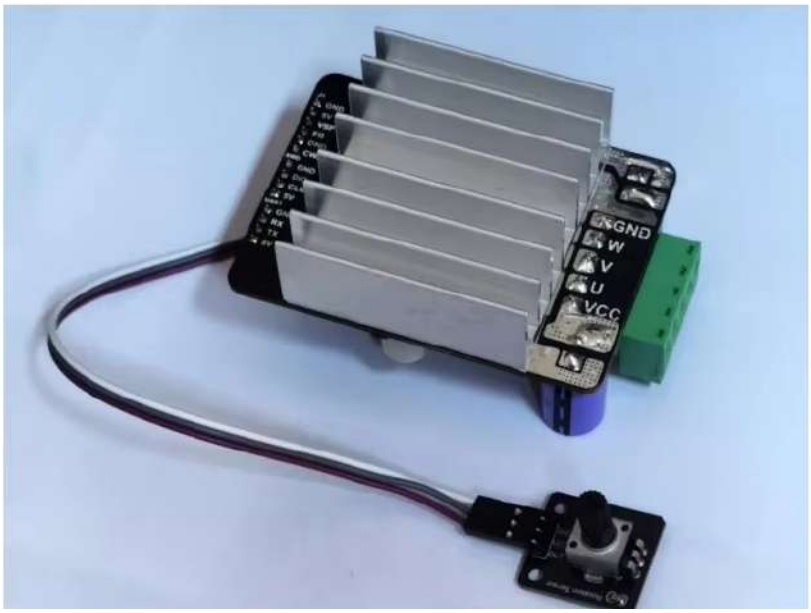
front back

Module appearance drawing



Module dimension drawing

Module dimension drawing



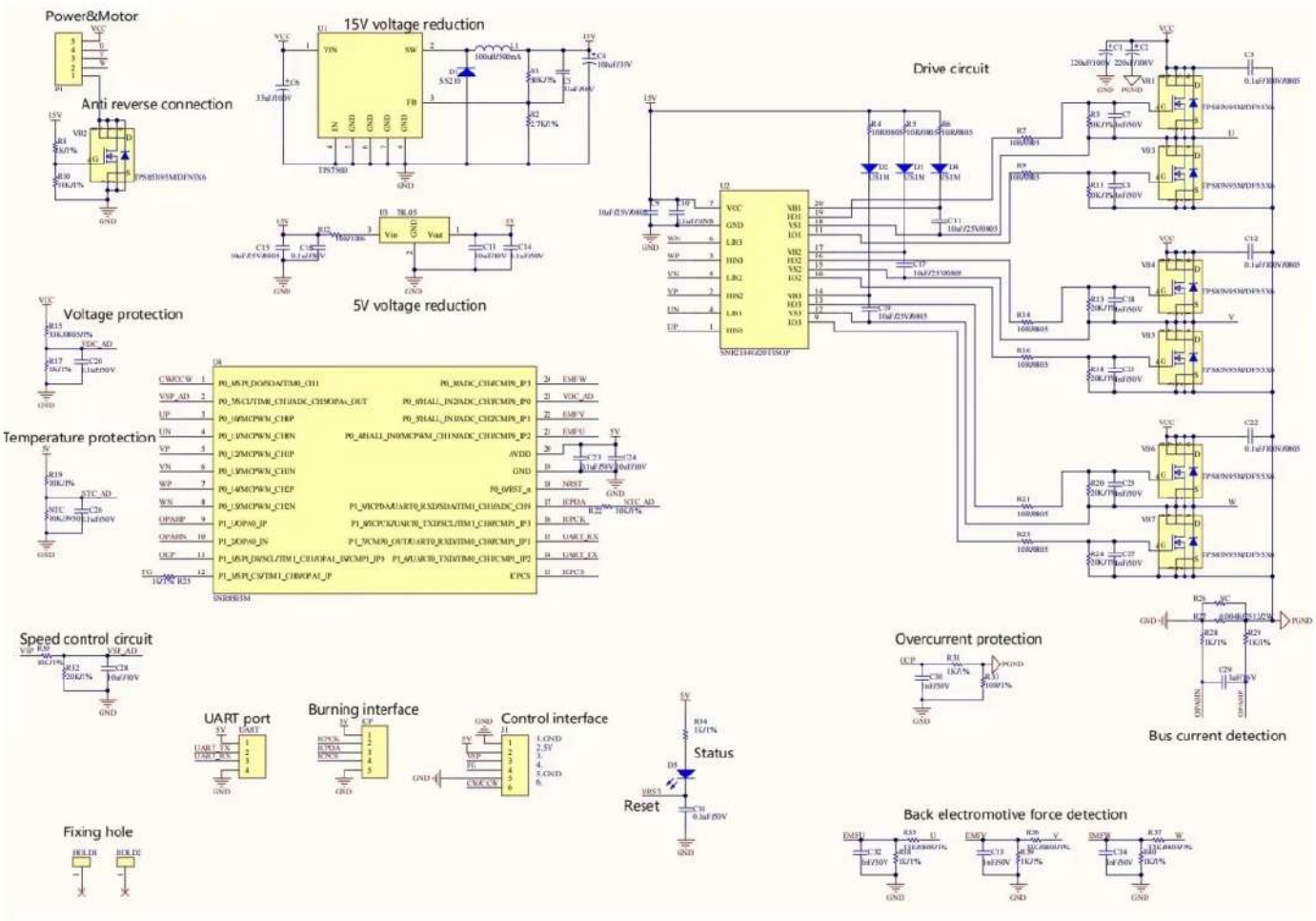
4. Pin Definitions

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
Burn Port					

12	GND	P	-	-	power supply ground
13	ICPCS	IO	5V	-	-
14	ICPDA	IO	5V	-	-
15	ICPCK	IO	5V	-	-
16	5V	P	-	-	5V power supply ground
UART					
17	GND	P	-	-	power supply ground
18	RX	I	5V	High	UART_RX
19	TX	O	5V	High	UART_TX
20	5V	P	-	-	5V power supply ground

5. Schematic Diagram



Module circuit diagram

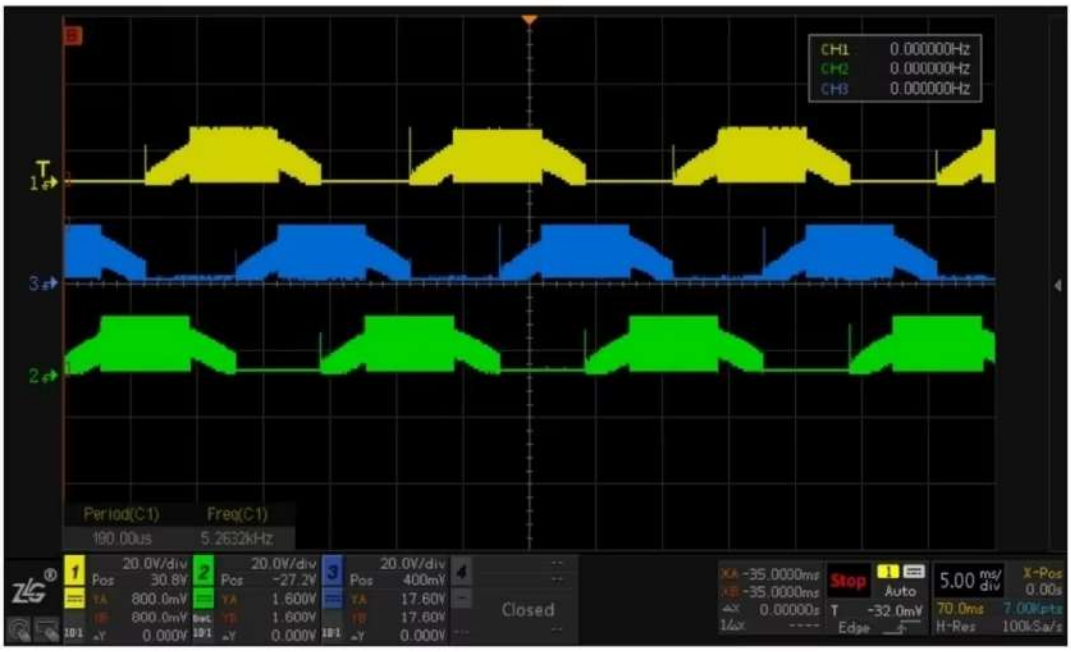
6. Application Design Guide

6. 1 Onboard LED indication, FG feedback signal

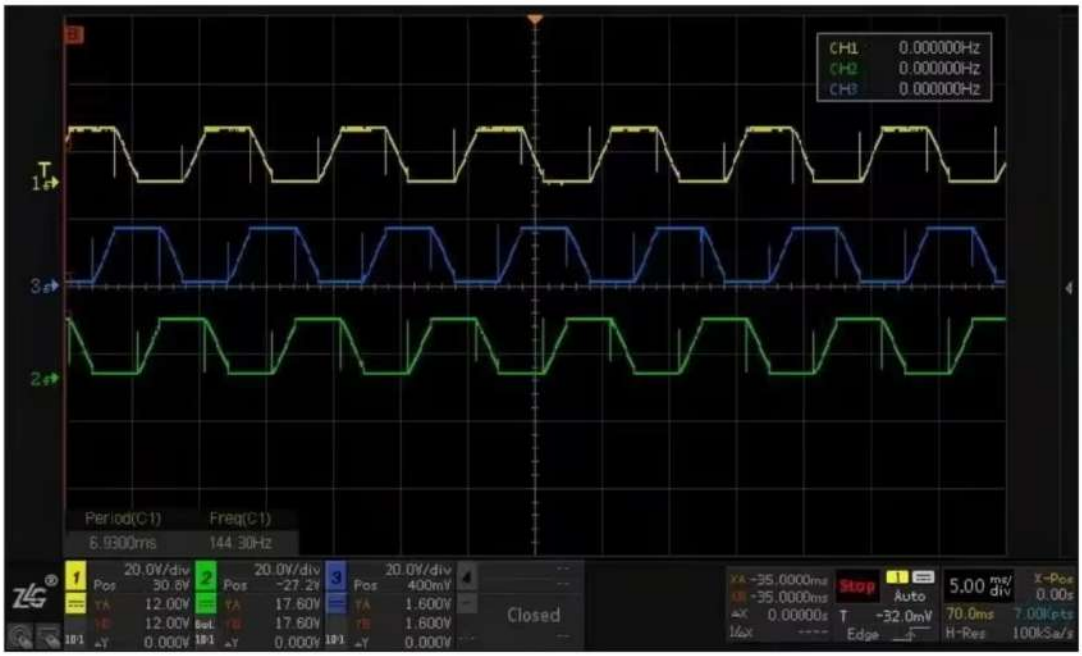
Module state	LED indication	FG feedback
Standby	Flashing at 1Hz frequency	low
The motor is in normal operation	Light	Speed RPM=FG Frequency Hz * 60/Polar logarithm
Short-circuit fault	Flashing on once, then off for 2 seconds	1 low level pulse of 200ms, followed by a high level pulse of 2s
Under voltage 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

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.

Fin

6.4 Starting problem of non-inductive motor

There are many factors that affect the starting effect of an induction less BLDC motor, such as the commutation angle of the motor, the phase resistance/inductance of the motor, and the size of the starting load, all of which can affect the starting effect of the DC brushless induction motor.

If there is shaking during user testing startup, startup failure, startup reports of blocked rotor, overcurrent, etc., please contact our company for specific adjustments, or users can adjust parameters on their own development software.

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 the rotation direction of the motor does not match the demand, simply switch the wiring of two motors at will, and it will be opposite to the original rotation direction.