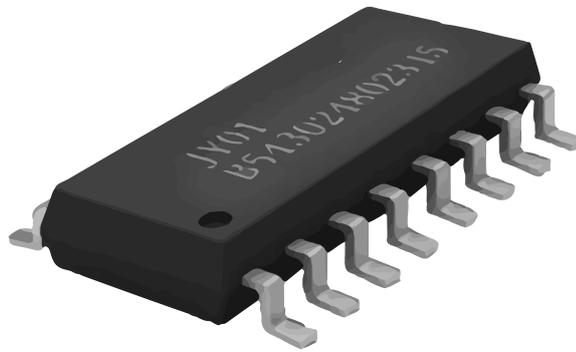


# JY01 brushless DC motor controller IC



**Absorption makes profession, profession makes excellence**

## UPGRADE HISTORY LOG

JY01\_V3.5\_20171020 The sixth edition /Date:20th,Oct,2017

- 1、 Enable status bug solved under Hall sensor motor application.
- 2、 Reliability of the Overload protection increased.
- 3、 FG output status abnormal solved under sensorless motor application,the updated IC offer more reliable FG output for external monitoring and controlling
- 4、 Motor Shaft Lock Protection period changed to 2.5 S instead of 5 S for maximum protection to the motor and circuit.
- 5、 Update the error datas in old version.
- 6、 The updated version is compatible with old version.
- 7、 Improve Starting exception handler.
- 8、 Enhance performance of under load starting.
- 9、 Added Automatic afterflow function.

The new version IC soft start time is 1S,3S and 10S options,3S start time is recommended for vast majority applications,its more protective for motor and power supplying system.

**ID: JY01(1C18)1S ; JY01(6281)3S ; JY01(520F)10S**

## JY01 FEATURES

JY01 is special designed control IC for brushless DC motor driver, applied to Hall sensor BLDC motor or sensorless BLDC motor, its easy to application, peripheral circuit is simple, low costs, SPWM drive mode with low noise, high efficiency, stable quality and professional technical support, JY01 has been quickly approved by many electronic engineers.

## APPLICATIONS

JY01 has been widely used in many fields, such as: brushless DC fan, brushless DC pump, lawn mower, scooter, balanced car, robot, scientific instruments and equipment, auto fuel pump, electric Windows, electric seat adjustment, air-conditioning fan, electric rearview mirror adjustment, such as home appliances such as vacuum cleaners, air conditioning, plumbing equipment, high-end children's toys, model aircraft, model cars, model, etc.; It has also been widely used in handheld tools such as grinding machines, hand drills, engraving machines, electric screwdrivers, etc

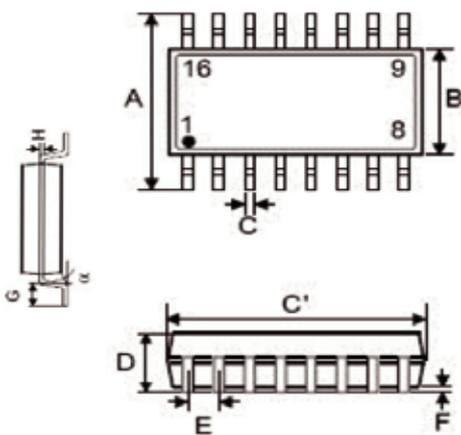


## CHARACTERISTICS

Working voltage: 4.5 v-5.5 V.  
 Working temperature: -40-85 °C  
 Drive mode: SPWM  
 Daul drive mode : With Hall senor or sensorless  
 Adaptive motor: no hall motor/hall motor.  
 Steering control: positive/negative  
 Soft reversing: Yes  
 Speed signal: Yes  
 Overload protection: Yes  
 Current closed loop: Yes  
 Constant current drive: Yes  
 Blocking protection: Yes  
 Soft starting: yes  
 Special technology: JYKJ full condition safety start function  
 Speed adjustment: linear  
 Soft start period:1 S,3 S,10S optional



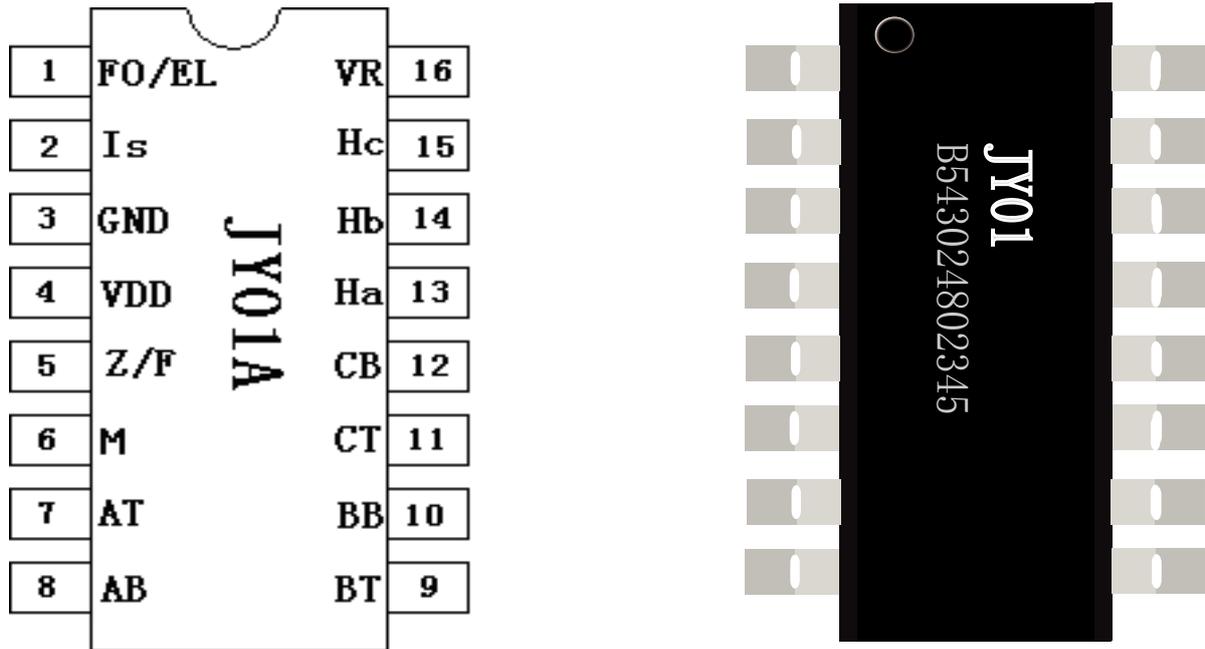
## DIMENSIONS:



SOP16 packaging

| 符号       | 尺寸 (单位: mm) |      |       |
|----------|-------------|------|-------|
|          | 最小          | 正常   | 最大    |
| A        | 5.79        | —    | 6.20  |
| B        | 3.81        | —    | 3.99  |
| C        | 0.30        | —    | 0.51  |
| C'       | 9.80        | —    | 10.21 |
| D        | —           | —    | 1.75  |
| E        | —           | 1.27 | —     |
| F        | 0.10        | —    | 0.25  |
| G        | 0.41        | —    | 1.27  |
| H        | 0.18        | —    | 0.25  |
| $\alpha$ | 0°          | —    | 8°    |

## DIAGRAM AND PIN FUNCTION DESCRIPTION

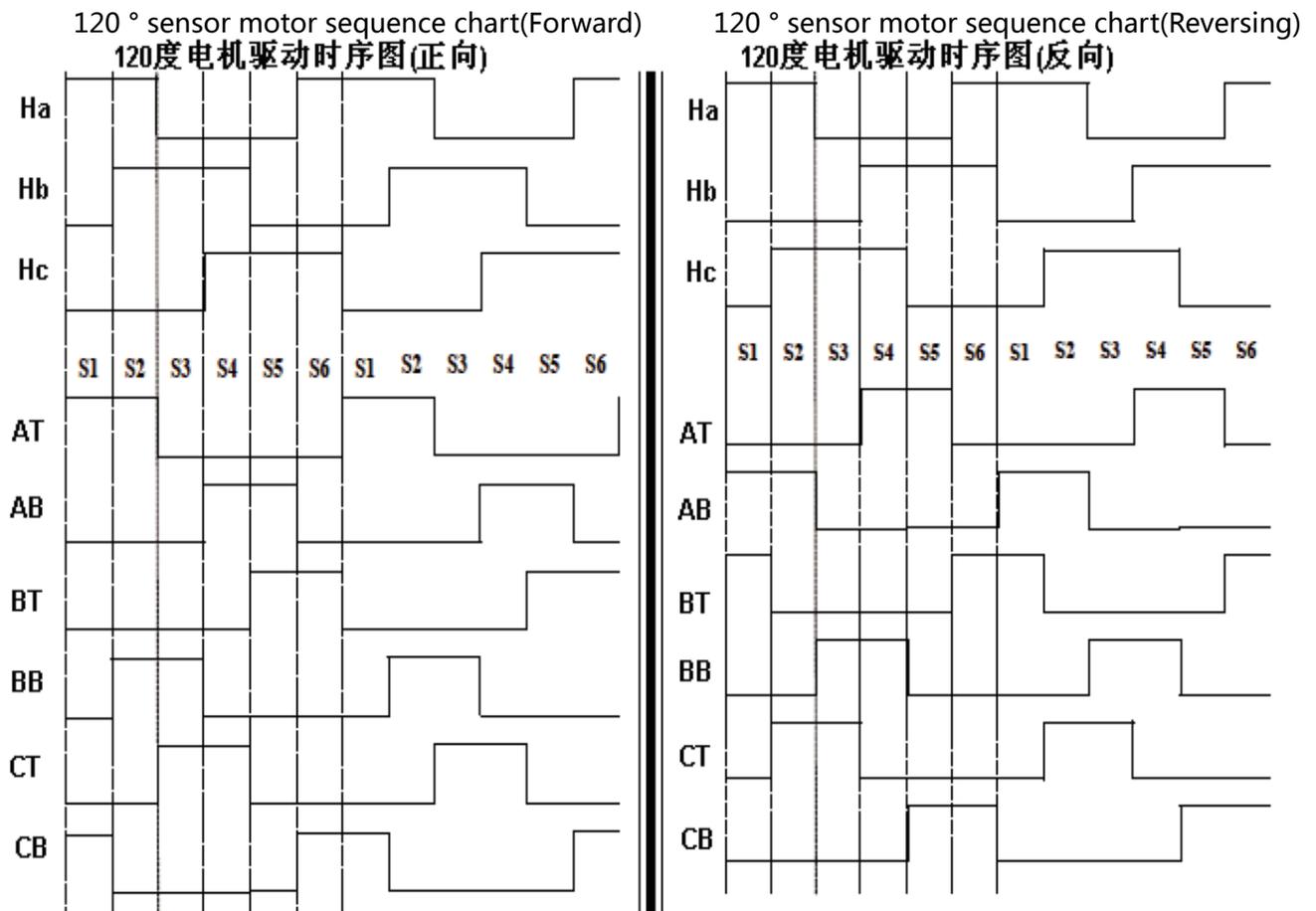


| Pin | Name | Function                      | Remark                          |
|-----|------|-------------------------------|---------------------------------|
| 1   | Brak | brake control                 | Input 0 V-2.5V or 0 V - 5.0V    |
| 2   | Is   | Current signal feedback input | Overload protect :0.1V          |
| 3   | Vss  | Power negative pole 0V        | 0V                              |
| 4   | Vdd  | Power positive pole 5V        | 5V                              |
| 5   | Z/F  | CW or CCW control             | connect Vss or Vdd              |
| 6   | M    | speed signal output           | Pulse signal output             |
| 7   | AT   | MA top drive output           | MA drive top MOSFET H-bridge    |
| 8   | AB   | MA bottom drive output        | MA drive bottoom MOSET H-bridge |
| 9   | BT   | MB top drive output           | MB drive top MOSET H-bridge     |
| 10  | BB   | MB bottom drive output        | MB drive bottoom MOSET H-bridge |
| 11  | CT   | MC top drive output           | MC drive top MOSET H-bridge     |
| 12  | CB   | MC bottom drive output        | MC drive bottoom MOSET H-bridge |
| 13  | Ha   | position sensor input a       | Hall sensor input a             |
| 14  | Hb   | position sensor input b       | Hall sensor input b             |
| 15  | Hc   | position sensor input c       | Hall sensor input c             |
| 16  | VR   | speed control                 | input 0V-2.5V or 0V-5.0V        |

## ELECTRICAL RATINGS

| Symbol | Description                      | Min.value | Typical value | Max.value | Unit | Rating                     |
|--------|----------------------------------|-----------|---------------|-----------|------|----------------------------|
| VDD    | Power inout                      | 4.5       | 5             | 5.5       | V    | VDD to Vss                 |
| VIL    | input IO Low level               | 0         |               | 0.3       | V    | Fwd/Rev IO                 |
| VIH    | input IO High level              | 3         |               | 5.5       | V    | Fwd/Rev IO                 |
| IOL    | Low level sink curren            | 5         |               | 8         | mA   |                            |
| IOH    | High level output curren         | 3         |               | 5         | mA   |                            |
| Vjd    | analog input voltage             | 0         |               | 5         | V    |                            |
| Ijd    | analog input current             |           |               | 100       | nA   |                            |
| Isva   | Overload limit voltage           | 0.095     | 0.1           | 0.105     | V    | Is Pin voltage             |
| Ista   | constant current control voltage | 0.095     | 0.1           | 0.105     | V    | R&l constant current point |
| RPT    | soft start time                  |           | 100           |           | mS   | speed 0-                   |

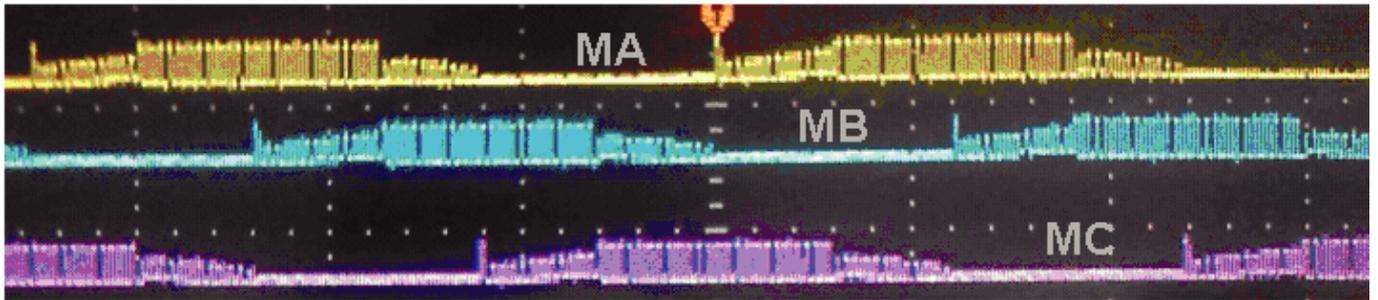
## DRIVE OSCILLOGRAM



**JY01 drive signal is positive polarity output, please take note when choosing MOS drive circuit and power MOS!**

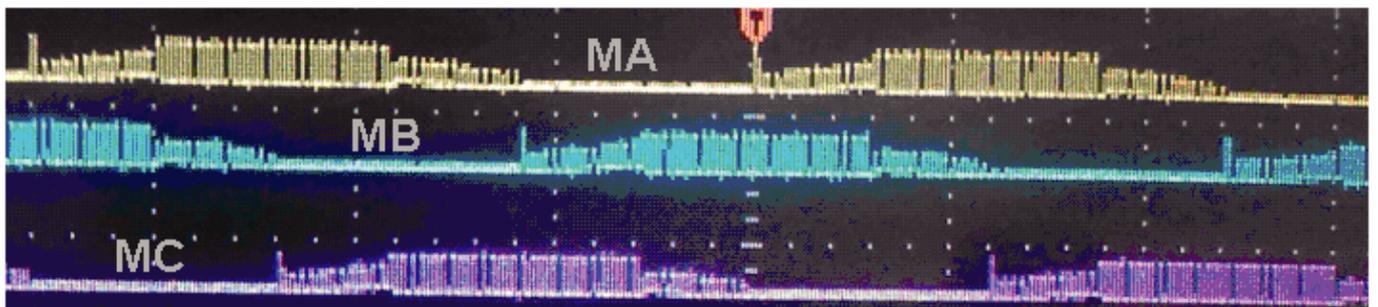
# FORWARD DRIVE OUTPUT OSCILLOGRAM

(SPWM output close to sinusoid,well electromagnetic noise restraint )



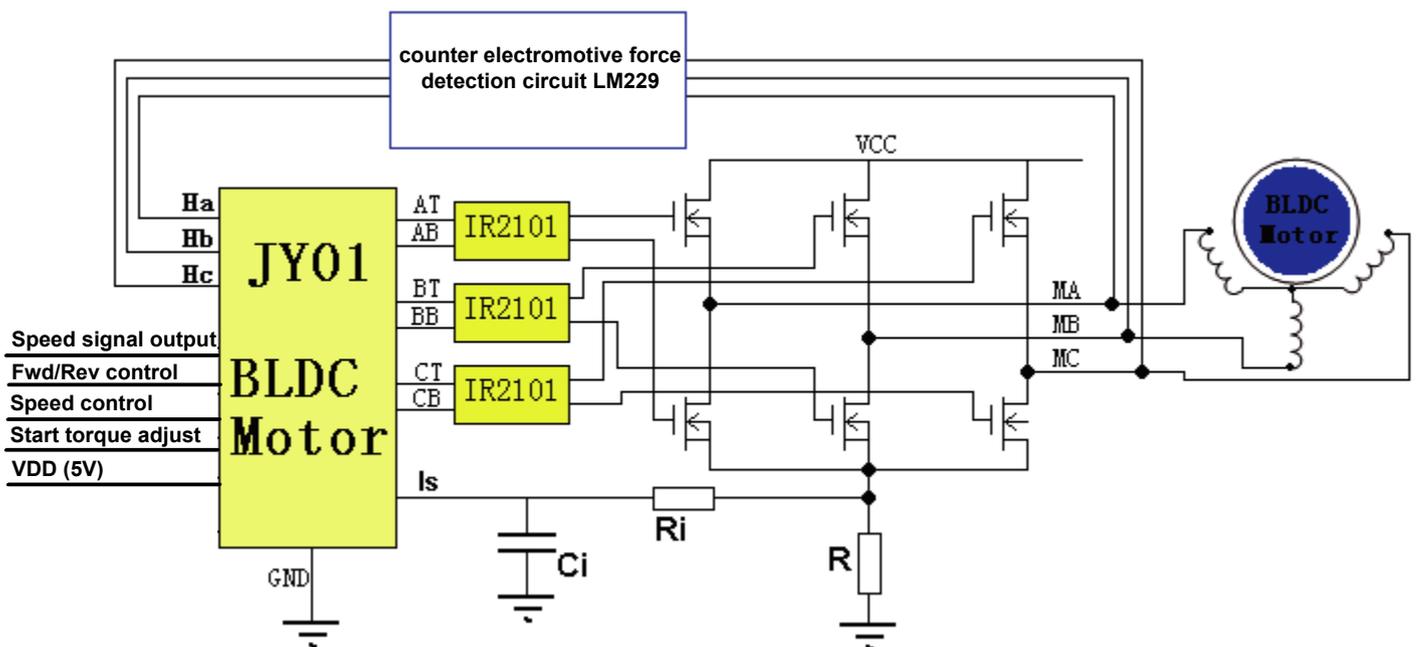
# REVERSING DRIVE OUTPUT OSCILLOGRAM

(SPWM output close to sinusoid,well electromagnetic noise restraint )

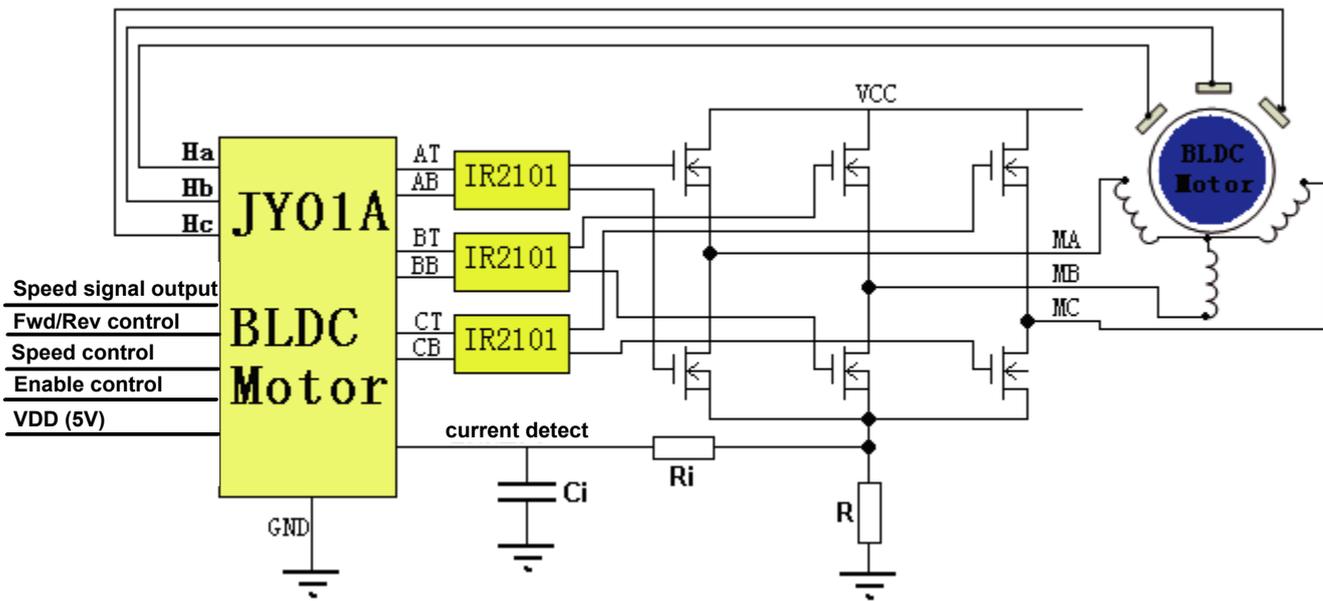


# APPLICATION PRINCIPLE SCHEME

## 1. JY01 apply to sensorless brushless DC motor schematic



## 2. JY01 apply to Hall sensor brushless DC motor schematic



**Note :** Is is the current signal feedback input, Is terminal voltage reaches 0.1V when the system starts the overload monitoring and start the constant current control function, the drive current is no longer increase by VR terminal voltage increases or load increases , this function effectively prevents Due to the load is too large and burn drive MOS power MOS tube problem, and can continue to provide the motor to maintain the maximum drive state, when the accident led to the current continues to increase, Is terminal voltage reaches or exceeds 0.2V, JY01 will immediately enter the protection state , Turn off all output, only when VR drops to 0V or re-power will be released.

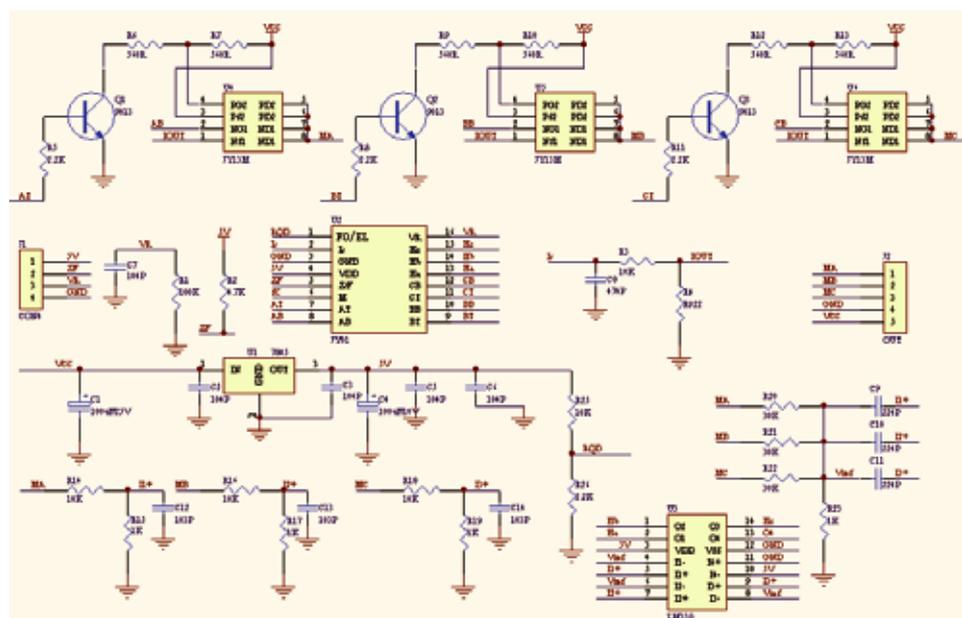
According to Ohm's law, we only need to change the R value to change the value of the protection current, so JY01 in the current protection is very flexible (described in detail later)

## APPLICATION SCHEMATIC

### Application 1. N+P framework small power sensorless motor driver application principle and PCB drawing

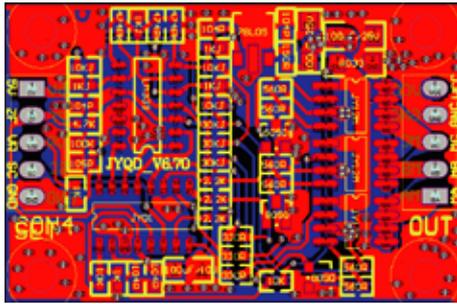


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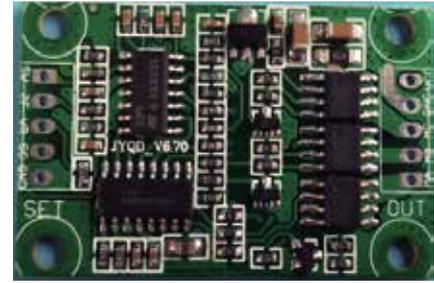
size : L 45 mm\* W 28mm

JYQD-V6.70



PCB

Product Photo

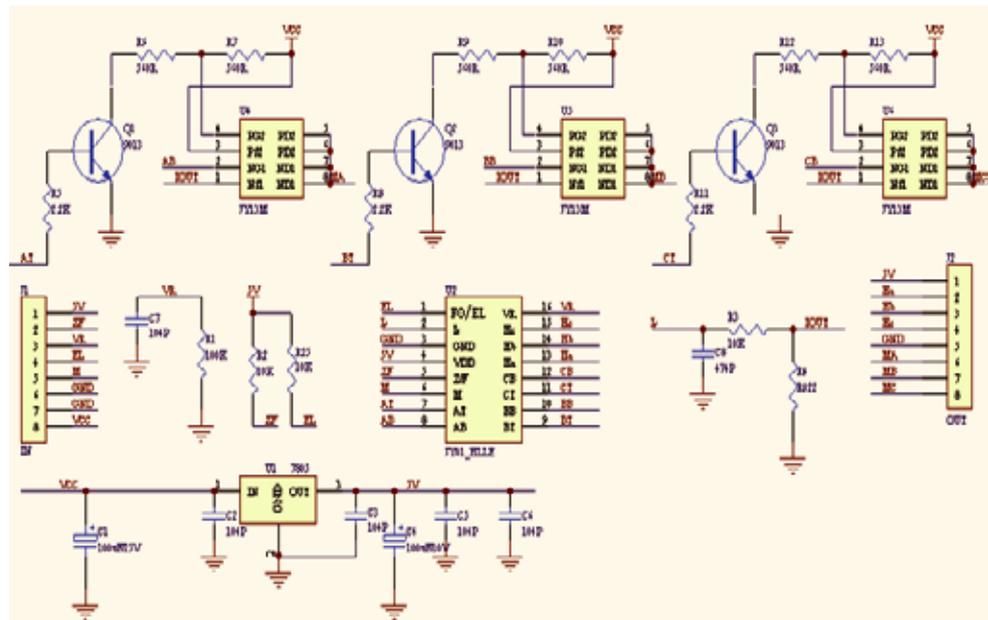


This circuit has been in mass production, product apply to toys, model aircraft, car models, ship models, fans, pumps, electric curtains, DC brushless motors, due to simple circuit after secondary development (mainly dimensional changes ), It has been widely used in the built-in drive of miniature DC brushless sensorless motor.

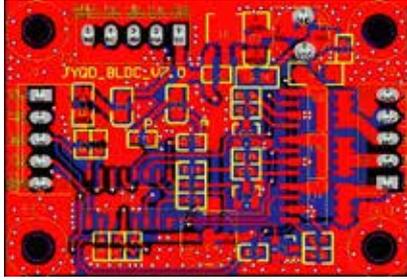
## Application 2. small power Hall sensor motor driver application principle and PCB drawing



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size : L 45 mm\* W 32mm



PCB

Product Photo

JYQD-V7.0

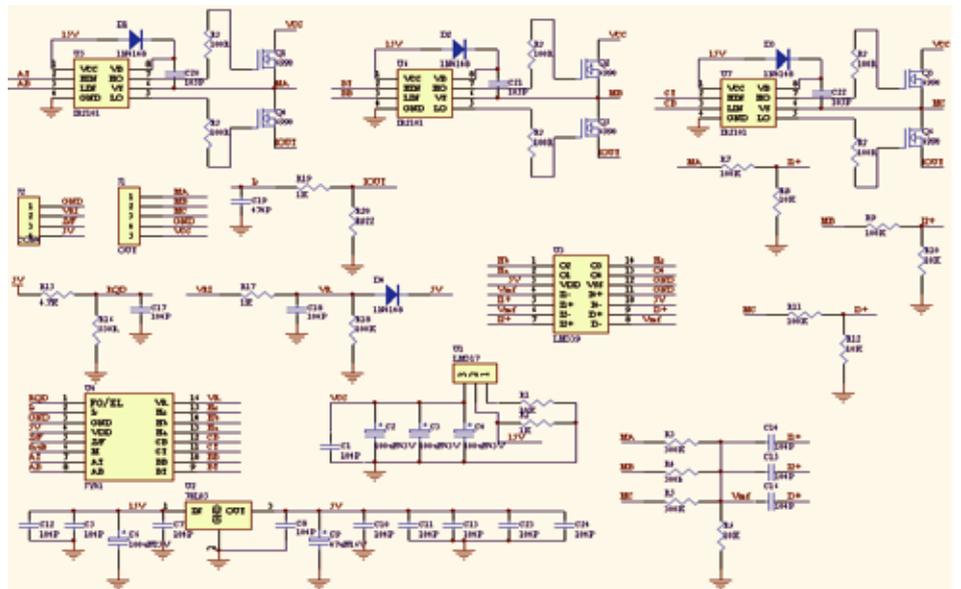


VCC 7.5V-17.5V operating current  $\leq 3A$  All components in a 45mm\*32mm PCB board , N + P (top drive is the P-MOSFET H-bridge, bottom drive is N-MOSFET H-bridge) structure suitable for low-voltage&low-power motor applications, with small size and low costs, N + P circuit in the low-voltage low-power motor external driver or built-in driver has widely application

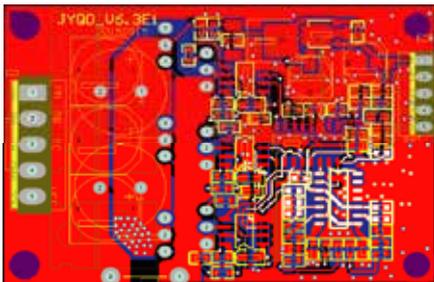
### Application 3. N+N framework middle-sized power sensorless motor driver application principle and PCB drawing



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size : L 63 mm\* W 43mm



PCB

Product Photo

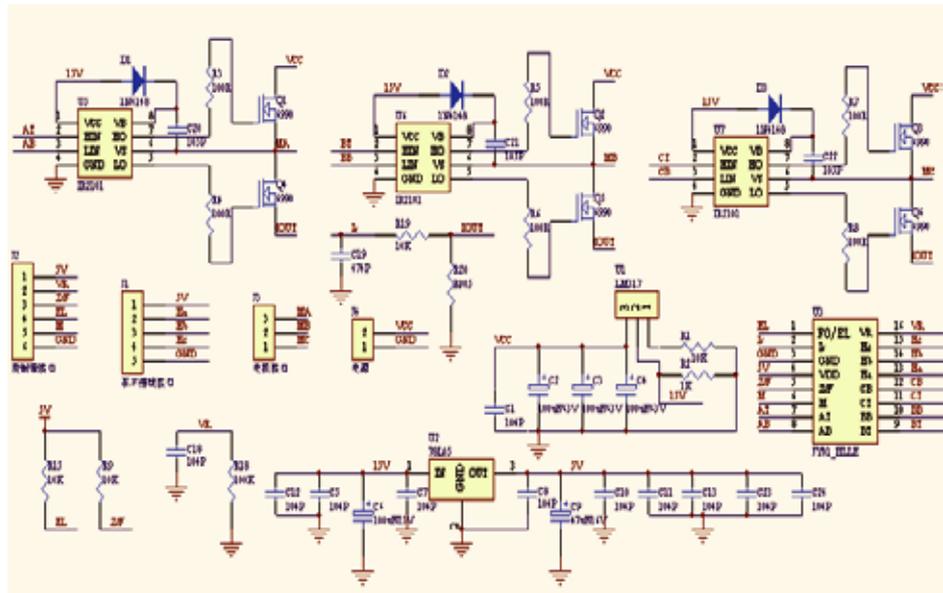
JYQD-V6.3E1



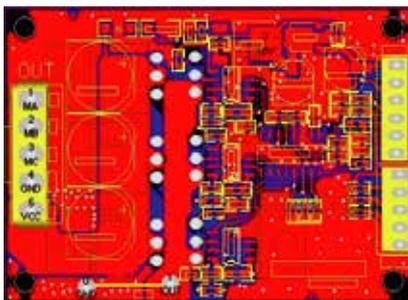
## Application 4. Middle-sized power Hall sensor brushless motor driver application principle and PCB drawing



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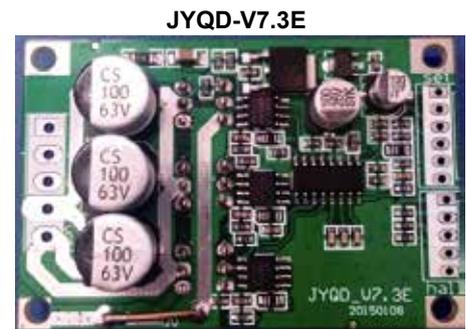


size : L 63 mm\* W 43mm



PCB

Product Photo



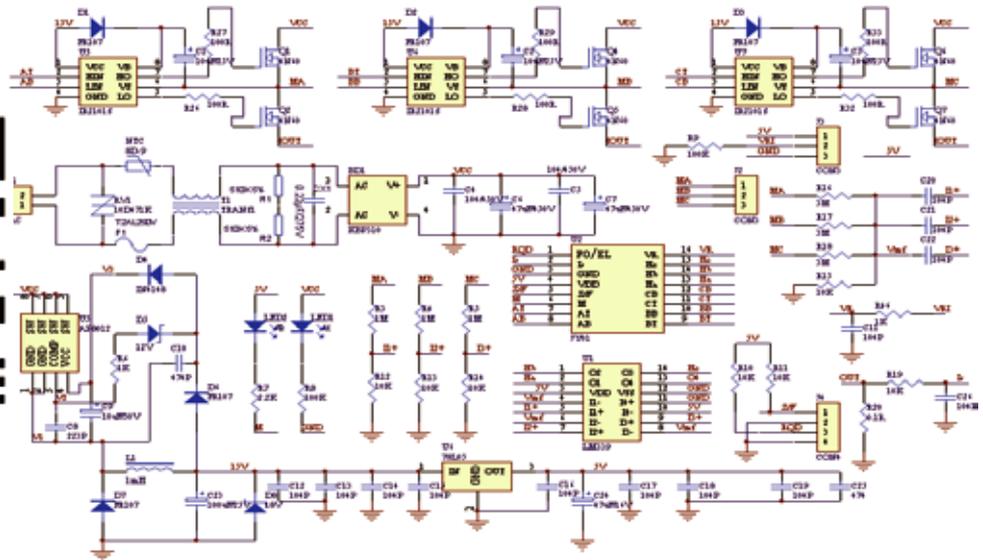
JY01 composed of medium-power Hall and sensorless brushless DC motor controller board, 6 pcs TO-220 packed of high-power MOSFET mounted on the back of the PCB, the VCC control board voltage in the range of 12V - 48V, Maximum operating current up to 20A (plus appropriate heatsink), this kind of circuits have been successfully used in such as DC brushless fan motor, brushless DC motor pump, scooter motor, handheld devices, etc.

N+N framework applications can achieve the needs of high voltage and high current, so it is widely used in many DC brushless motor control which needs higher working voltage or higher working current. This circuit are one of more mature circuits. Circuit due to high stability, easy production and processing, the costs is low and can be facilitated for modular production.

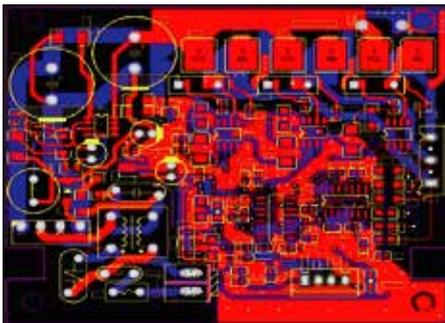
## Application 5. 220V AC input sensorless brushless motor driver application principle and PCB drawing



Scan for HD file



size:L 84mm \*W 70mm \*H 31mm



PCB

Product Photo



As shown above is a high-voltage DC brushless sensorless motor driver circuit, 220VAC power supply produce 310V DC by the rectifier filter, and then JY01 control three-output to drive high-voltage DC brushless motor, according to the schematic parameters can drive up to 100W Of the motor, this circuit has been successfully used in air-conditioning unit, high efficiency energy-saving exhaust fan, bladeless fan, air blower and other high voltage DC sensorless brushless motor.

# JY01 APPLICATION SETTING

JY01 is integrated 2 in 1 control IC for Hall or sensorless brushless DC motor, which makes it very easy to application in use, please pay attention before circuit design and application.

- 1: JY01 for Hall sensor motor driver, connect Pin 1 to Vss or connect 5V while power on, JY01 will drive as Hall way.
- 2: JY01 for Sensorless motor driver, offer 0.1V -4V to Pin 1, JY01 will drive as Sensorless way.

Pin 1 is multi-function pin, there are three operational states:

- 1: JY01 in application settings when power on.
- 2: This pin is a Enable control pin under Hall way,High-level voltage is normal drive,Low-level voltage is forbidden-drive (no output)
- 3: This pin is Start torque adjustment pin under Sensorless way,voltage range:0.1V-2V.

**Please confirm the application state of JY01 before the design.**

## FUNCTION DESCRIPTION AND PRECAUTIONS.

a) Start torque setting:The Start torque setting is important for sensoless motor starting,the Start torque is related with the motor performance. the motor will not start or hard to start if the start torque is small,the motor will shake or reversing if the Start torque is too high.

Initial application debugging according to the motor load, follow the steps as follow:

- i.Connect a 20K potentiometer to 0 V and 5 V ,the middle pin connect to JY01 IC I pin.
- ii.Adjust the potentiometer to 0 V (Start torque 0) when power on.
- iii.Input speed regulation signal to VR pin from 0V to 5V,and check the motor start or not
- iv.If the motor can not start or start abnormal,can add the potentiometer value to 0.1 V then repeat Step iii, if the motor still not start,then add to 0.2V/0.3V/0.4V of the potentiometer and repeat Step iii till the motor start.
- v.If the motor reversing when start,it means the Start torque is high,it should reduce the Start torque for normal start, Otherwise long time reversing will damage the motor and MOSFET.

b) Overload protection and current sampling resistance setting : JY01 has perfect overload protection function , it has overload protection and abnormal current protection function when the current sampling resistor value R is correct set. When Is pin voltage meet to 0.1V,overload monitoring will start,and turn to Constant current state,the drive current will not change, no matter the VR voltage getting higher or lower and the load getting bigger or less.In this state,JY01 will keep offering constant drive power to motor. if the Is pin voltage meet to 0.2V or more ,the protection will activated in 4.5  $\mu$ s.

R value selection method

R value formula  $I = 0.1/R$

I : value of constant current (unit:Amp)

0.1: JY01 Is pin voltage

R:current limit resistance(unit:Ohm)

For example:working current:3A , set the safety constant current to 5A , when the current meet to 5A or more,the programme will keep the current at 5A.so according to formula  $I=0.1/R$ ,  $R=0.1/5=0.02$  Ohm,so Overload protection and current sampling power resistor should be 20 mOhm

c) Blocking protection:the blocking protection will activated and stop output if the motor not start normal in 3 second, reduce the VR voltage to 0 to quit the protection, rise the VR voltage to restart the motor.