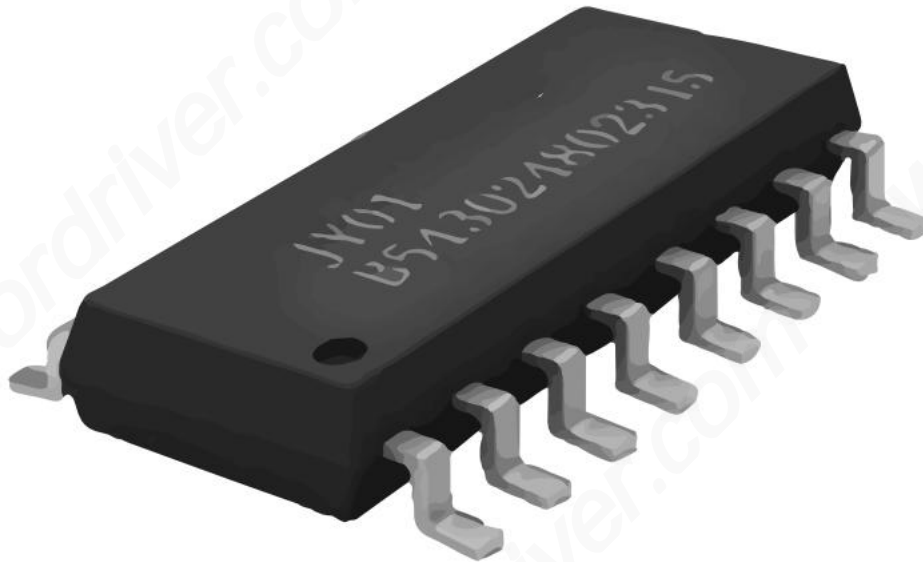


JY01 brushless DC motor controller IC

(Brushless motor control IC for balance car and scooter)



Because we focus, we do better

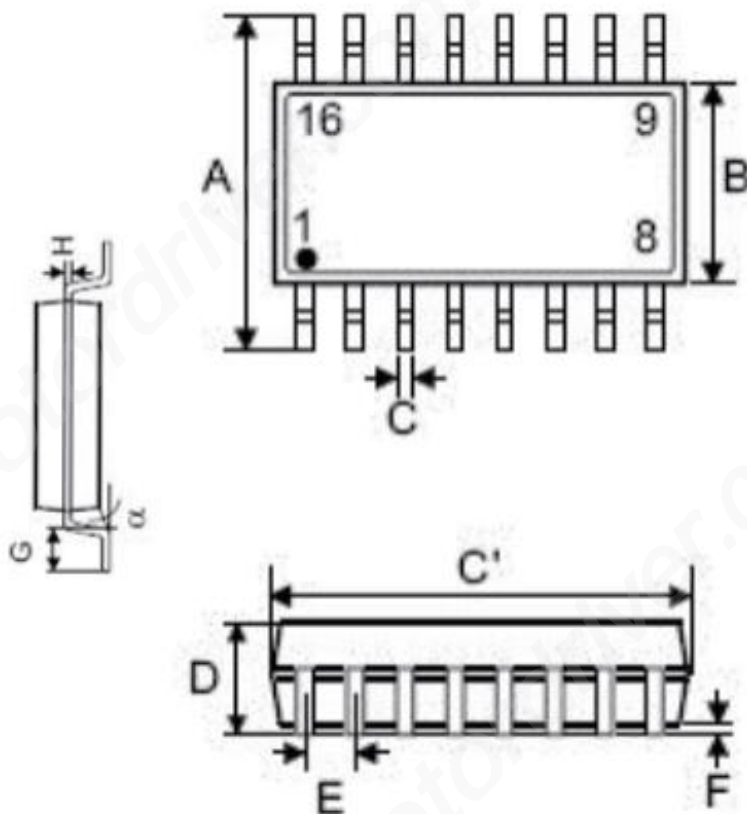
Product birth

After years of research and testing, the technicians of Shanghai Juyi Electronic Technology Development Co., Ltd. finally developed a DC brushless motor control solution for balance cars and scooters based on the JY01 DC brushless motor driver IC. After practical application, JY01 (for balance cars) has excellent performance in DC brushless motor driving for balance cars and scooters, with fast response speed, strong explosive power, gapless hard commutation, good speed regulation linearity, flexible braking control, linear controllable braking force, open-loop driving mode, easy external expansion function, and simple peripheral circuit. It has been unanimously praised by electronic engineers at home and abroad over the years.

Features

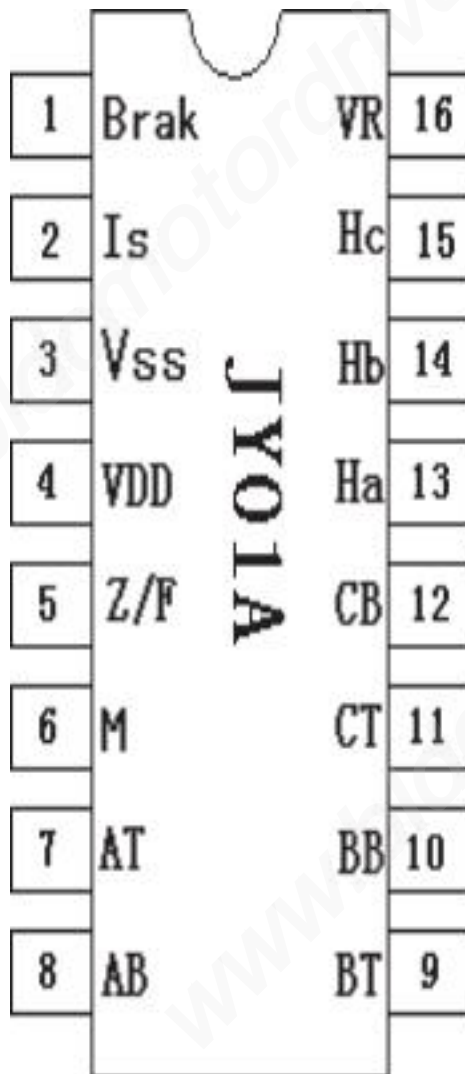
- Working voltage: 4.5 v-5.5 V.
- Working temperature: -40-85 °C
- Drive mode: SPWM
- Break Mathod : Braking force is linear and controllable
- Adaptive motor: hall motor of 120-degree
- Shock-free hard commutation
- Steering control: positive/negative
- Intelligent control of brake curve
- Hard change steering : Yes
- Speed signal: Yes
- Overload protection: Yes
- Current closed loop: Yes
- Constant current drive: Yes
- Blocking protection: Yes
- VR&Brak operating voltage: 2.5V and 5V
- Speed adjustment: linear
- Braking type: Reactive type

Package size



| 符号 | 尺寸 (单位: mm) | | |
|----------|-------------|-------------|-----------|
| | 最小 (Min.) | 正常 (Normal) | 最大 (Max.) |
| 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 |
| α | 0° | — | 8° |

Pin assignment



Pin Function Description

- 1.Brake pin: analog signal control (0-2.5V/0-5.0V), reactive braking, braking force 0%-100%, highest braking priority.
- 2.IS pin: current signal sampling, threshold voltage 0.1V, voltage across the current sampling resistor.
- 3.Vss pin: negative end of power supply 0V
- 4.Vdd pin: Vdd power positive terminal 4.5V-5.5V
- 5.Z/F pin: Direction control signal input connected to Vdd or Vss
- 6.M pin: outputs a pulse signal, and the driver outputs a pulse each time the phase is changed.
- 7.AT pin: upper arm drive signal output (forward output)
- 8.AB pin: lower arm drive signal output (forward output)
- 9.BT pin: upper arm drive signal output (forward output)
- 10.BB pin: lower arm drive signal output (forward output)
- 11.CT pin: upper arm drive signal output (forward output)
- 12.CB pin: lower arm drive signal output (forward output)
- 13.Ha pin: Hall signal input a
- 14.Hb pin: Hall signal input b
- 15.Hc pin: Hall signal input c
- 16.VR pin: Motor speed control voltage input pin (0-2.5V/0—5V)

NOTES:The JY01 drive signal is a positive polarity output, so please pay attention when selecting MOS drive circuit and power MOS!

DC electrical characteristics

| 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&I constant current point |
| RPT | soft start time | | 100 | | mS | Speed 0-100% VR=5V |

Application function description and precautions

A) Overload protection and current sampling resistance value setting:

JY01 has a relatively complete overload protection function. When the current sampling resistor R is properly selected, JY01 has overload protection and current abnormality protection functions. When the voltage of the Is foot reaches 0.1V, the overload monitoring starts and enters the constant current state to keep the driving current constant. At this time, the driving current will no longer increase with the increase of the voltage at the VR terminal, nor will it increase with the increase of the load. In this state, JY01 will continue to provide continuous and constant drive for the motor, keeping the motor running at maximum power without shutting down to prevent overcurrent protection from causing people to fall.

The following is a detailed example of the R value selection method:

R value $I = 0.1/R$

I in the formula is the protection current, the unit is "A"; 0.1 is the threshold constant; R is the current limiting resistor, the unit is Ω .

Taking a controller with a working current of 20A as an example, when the current reaches or exceeds 20A, the system maintains the current at 20A. From the formula $I = 0.1/R$, after substitution $R = 0.1/20$ $R = 0.005 \Omega$. It is calculated that the current sampling resistor should use a 5 milliohm power resistor (generally, the current sampling resistor uses cement resistors and constantan wire)

B) Reversing Z/F:

The 5th pin Z/F of JY01 is the steering control pin, which can be connected to Vdd and Vss to realize the switching control. In order to achieve a good balance effect, the JY01 dedicated to the balance car is hard switching, which can be switched from one direction to another at any time, with fast response and strong explosive force. Due to special treatment, even at the highest speed, the switching will not damage the MOS tube due to the back electromotive force generated by the motor.

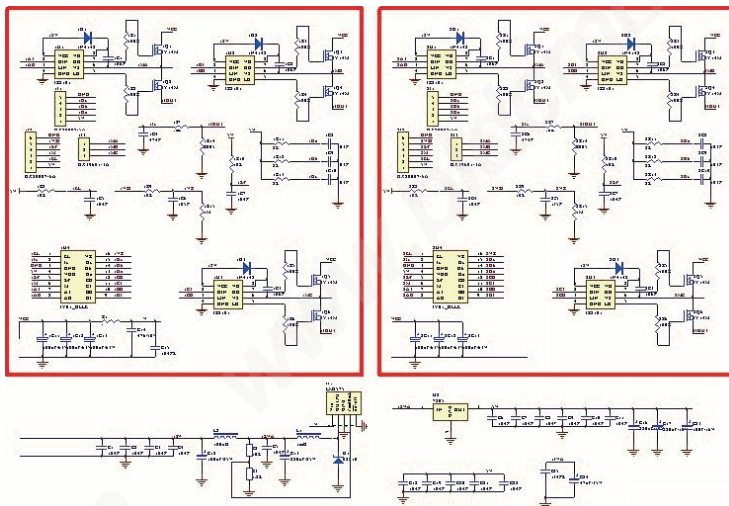
C) Speed signal M:

When the motor rotates, the M terminal will output pulses. The number of pulses output per rotation is related to the number of pole pairs of the motor.

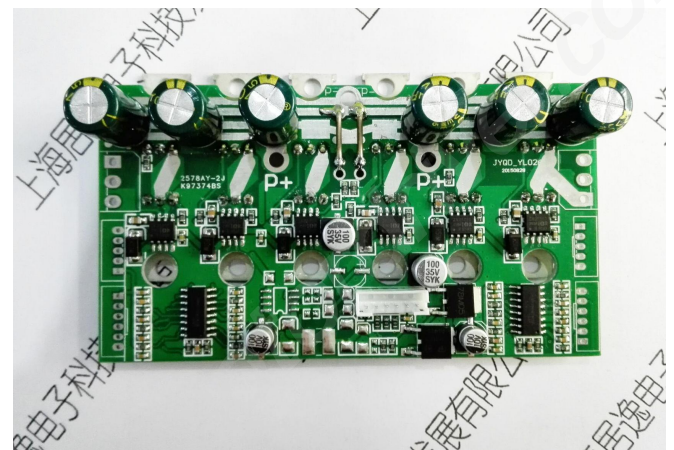
D) Brake control:

The brake of JY01 for balancing car is linear brake. The voltage goes from low to high, and the braking force goes from 0%-100%, which is controlled by the voltage added to foot 1. JY01 uses reactive brake, so the brake does not work when the motor is not rotating. The faster the motor rotates, the stronger the braking force. This needs to be paid attention to in use.

Practical application data



The above picture is the circuit schematic diagram used by the balance car. If you need a high-definition picture, please contact us via the Email: jiangxinle@juyitech.com, thanks.



This drive module is a dual drive board for balancing vehicles. After a long period of optimization and testing, it has been qualified for mass production.

Version update record

version number: **V1.2 20151212**

In order to prevent the motor from starting accidentally, a safety lock function is added. Before starting the motor for the first time after power is turned on, the brake end must give a pulse before the motor can start normally, otherwise the motor cannot run. The specific operations are as follows:

When the circuit is powered on, a positive pulse signal is given to the first pin of JY01, and the width of the high level of the pulse is not less than 10mS.

version number: **V1.3.0 20161104**

Compared with the previous version, this version has made great improvements, mainly in the following aspects:

1. Improved the braking curve to make braking operation more balanced and safer.
2. Added high torque ultra-low speed constant drive function, more humane.
3. Added locked rotor protection function to prevent the motor or controller from burning out due to the blocking.
4. Eliminates the magnetic resistance problem when the motor is not driving, and the battery life is longer.
5. Improved safety lock reliability.
6. Improved the starting safety performance and effectively protected the safety of drivers and passengers.

version number: **V1.4.0 20170323**

1. The brake 5S reset function is released.
2. Improved the safety unlocking function from starting after power-on braking to starting after VR reset.
3. The new ID peripheral hardware and normal operation are fully compatible with the previous version and can be directly replaced.

version number: **V1.4.1 20170420**

1. In this version, the two direct start types have been optimized for acceleration and deceleration.
2. Check the places where the ID marking is incorrect before the update.
3. Safety start type----original with safety lock type.
4. Direct start type - original type without safety lock.

Latest ICID code table

JY01-P1-2.5V(C737) ---- Safety start type, speed regulation and brake voltage range 0-2.5V

JY01-P1-5V(99F2) ---- Safety start type, speed regulation and brake voltage range 0-5V

JY01-P0-2.5V(457E) ---- Direct start type, speed regulation and brake voltage range 0-2.5V

JY01-P0-5V(8559) ---- Direct start type, speed regulation and brake voltage range 0-5V

NOTE: The LOGOs of the above 4 chip specifications are unified as JY01. Please remember the 4 digits in the brackets of your ID during testing.