

TZ5505S

DC Empennage Motor and Steering Engine Motor Drive Circuit

Features

- On-chip single-channel H bridge driver of PMOS/NMOS power switch;
- Has 4 functions (forward /backward /stop/brake);
- Low standby current (typ.0.1uA);
- Wide operational voltage range (2.5V—5.5V), applicable to lithium battery power supply;
- 500mA current output capability (VDD=4V, RL=5Ω);
- TZ5505S on-chip thermal shut-down (TSD) protection with hysteresis;
- CMOS input without the need for additional current-limiting resistor;
- HBM-mode ESD grade 2.5KV
- Uses SOT23-6 miniature package

Typical applications

- Toy DC motor drive
- Remote-controlled toy airplane empennage motor drive
- Remote-controlled toy airplane steering engine motor drive

Descriptions

TZ5505S is an integrated circuit specially designed to drive low-current DC motor. The circuit uses SOT23-6 miniature package, which provides an ideal choice for systems sensitive to space.

The circuit utilizes H bridge structure and on-chip power MOSFET switch. The circuit can achieve control of 4 functions (forward, backward, brake and standby) of load DC motor. Brake function enables load motor to stop brake rapidly, while standby function enables circuit static power dissipation to be extremely low (less than 1uA).

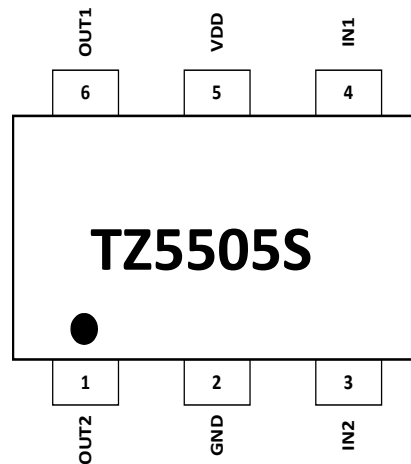
There is an on-chip low-resistance power MOSFET switch. At a load current of 300mA, voltage drop generated by the circuit is 500mV, and power dissipation is 150 mW. In the temperature range allowed by SOT23-6 package, the circuit can work continuously for a long time.

TZ5505S has on-chip thermal shut-down (TSD) protection with hysteresis. At 27°C and VDD=4V, TZ5505S's continuous maximum output current is 550mA. As ambient temperature increases, continuous maximum output current, influenced by heat dissipation potential, must decrease properly.

Ordering guide

| Product model | Package | Operational temperature range |
|---------------|---------|-------------------------------|
| TZ5505S | SOT23-6 | -20°C — 85°C |

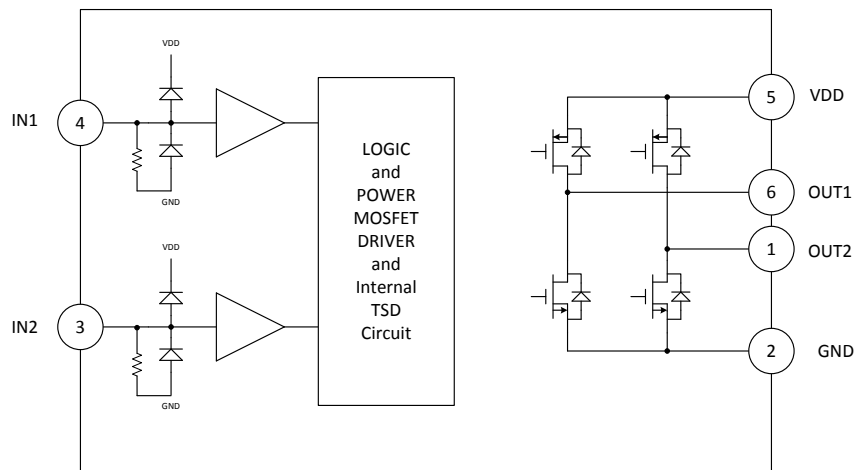
PIN CONFIGURATION



PIN FUNCTION DESCRIPTIONS

| Pin NO. | Mnemonic | Input/output | Pin Function Description |
|---------|----------|--------------|-------------------------------|
| 1 | OUT2 | O | Backward drive output pin |
| 2 | GND | - | Ground |
| 3 | IN2 | I | Backward control signal input |
| 4 | IN1 | I | Forward control signal input |
| 5 | VDD | O | To power supply |
| 6 | OUT1 | O | Forward drive output pin |

FUNCTIONAL BLOCK DIAGRAM



Functional description

Logic truth table

| IN1 | IN2 | OUT1 | OUT2 | Function |
|-----|-----|------|------|--------------------------|
| L | L | Z | Z | Standby (stop) |
| H | L | H | L | Forward rotation |
| L | H | L | H | Backward rotation |
| H | H | L | L | Brake |

Absolute maximum ratings (T_A=25°C)

| Parameter | Symbol | Value | Unit |
|--|---------------------|-------------|------|
| Supply voltage | V _{DDMAX} | 5.5 | V |
| Maximum external output voltage | V _{OUTMAX} | VDD | V |
| Maximum external input voltage | V _{INMAX} | VDD | V |
| Peak output current | I _{OUTMAX} | 0.8 | A |
| Maximum continuous output current | I _{OUTC} | 0.55 | A |
| Maximum power dissipation | SOT23-6 | 0.6 | W |
| Junction-to-ambient thermal resistance θ _{JA} | SOT23-6 | 220 | °C/W |
| Operational temperature range | T _{opr} | -20~+85 | °C |
| Junction temperature | T _J | 150 | °C |
| Storage temperature | T _{stg} | -55~150 | °C |
| Welding temperature | T _{LED} | 260°C, 10 秒 | |

Notes:

- In the course of using the circuit, exceeding the foregoing the absolute maximum ratings may result in issues such as circuit breakdown, burnout, etc.
- Maximum power dissipation of the circuit is different at different ambient temperatures. The higher ambient temperature is, the lower maximum power dissipation of the circuit is. Formula for maximum power dissipation at different ambient temperatures is

$$P_{DMAX}=(150-T_A)/220$$

Where T_A is temperature at operational ambient. Unit of power dissipation obtained by the formula is W.

- After obtaining maximum power dissipation allowed, maximum current allowed I can be obtained by

$$I^2R=P_{DMAX}$$

Where R is circuit output impedance.

Recommended operational conditions (T_A=25°C)

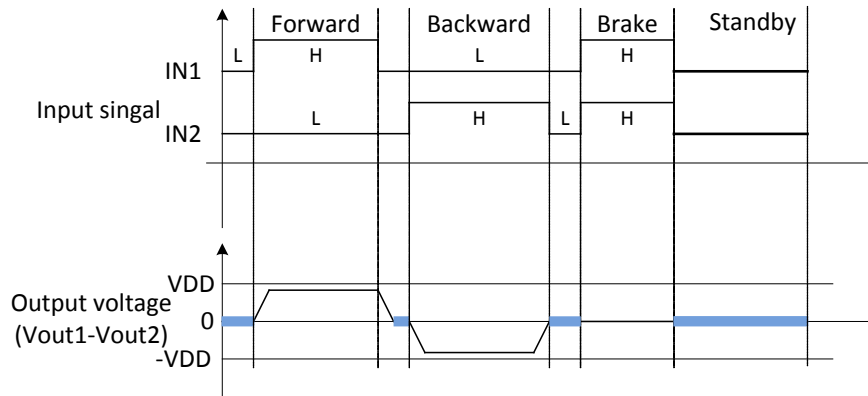
| Parameter | Symbol | Mini | Typ | Maxi | Unit |
|--|-----------------|------|------|------|------|
| Supply voltage | VDD | 2.5 | | 5 | V |
| Input voltage | VIN | 0 | | VDD | V |
| OUT1-to-OUT2 continuous output current | I _{oc} | | ±300 | ±500 | mA |

Electrical characteristics

(T_A=25°C, VDD =3V unless otherwise stated)

| Parameter | Symbol | Conditions | Mini | Typ | Maxi | Unit |
|----------------------------------|--------|--|--------|------|--------|------|
| VDD standby current | IVDDST | INA=INB=L | | | 10 | uA |
| VDD static current | IVDD | INA=H, INB=L or INA=L, INB=H or INA=H, INB=H No-load output | | 72 | | uA |
| Input high-level current | IVINH | VIN=3V | | 1.4 | | uA |
| Input pull-down resistance | RIN | VIN=3V | | 2.14 | | MΩ |
| Input minimum high-level voltage | VINH | VDD=3V | 0.7VDD | | | V |
| Input maximum low-level voltage | VINL | VDD=3V | | | 0.2VDD | V |
| Output resistance | RON1 | IO=±100mA | | 1.5 | | Ω |
| | RON2 | IO=±200mA | | 1.6 | | Ω |
| | RON3 | IO=±300mA | | 1.7 | | Ω |
| Protection temperature | TSD | | | 160 | | °C |
| TSD with hysteresis | TSDH | | | 25 | | °C |

Typical waveform



Important application information

1、Thermal shut down (TSD)

When junction temperature normally reaches 160°C, the switching-off circuit will switch off all outputs. The reason for this is to prevent burnout of circuit due to over-high junction temperature. TSD has hysteresis of about 25°C.

2、Schematic diagram of remote controlled airplane empennage and steering engine DC motor drive application circuit

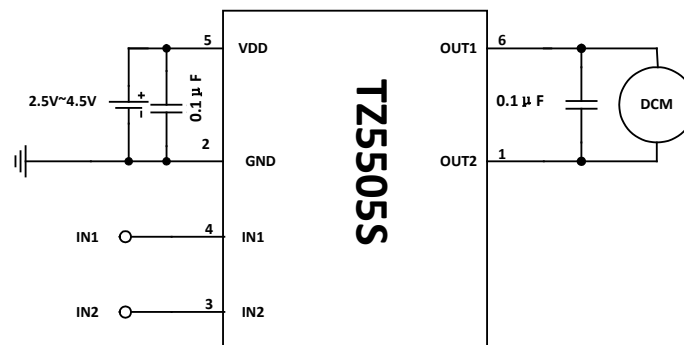


Fig. 1 Schematic diagram of TZ5505S typical application in SOT23-6 package

3、Schematic diagram of application circuit for steering motor drive of 2-3 batteries operated remote controlled toy car

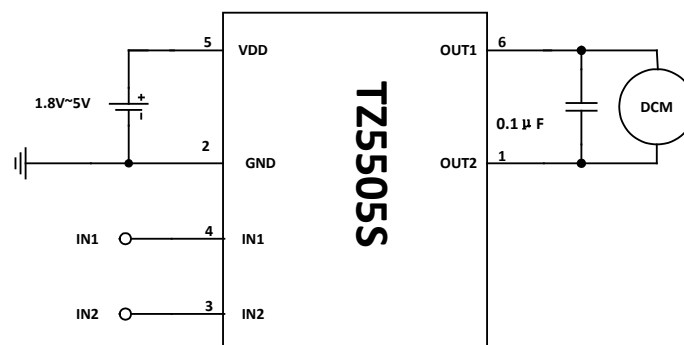


Fig. 2 Schematic diagram of application circuit for front-wheel steering motor drive in 2-3 batteries operated remote-controlled toy car

When TZ5505S is used for steering motor drive in remote-controlled toy car, locked-rotor current cannot exceed 550mA. TZ5505S can share power supply-to-ground capacitor with rear-wheel drive circuit TZ6808S/TZ6813D. If TZ5505S is used separately for front-wheel drive, then rear-wheel drive does not use TZ6808S/TZ6813D, and so TZ5505S power supply-to-ground must connect with a an electrolytic capacitor of 100uF-300uF relative to ground, which can be selected according to actual applications.

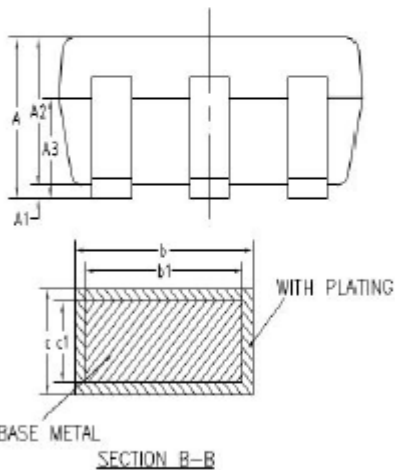
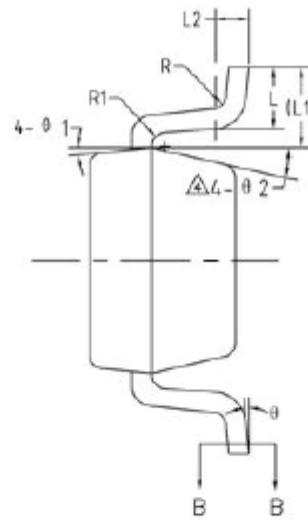
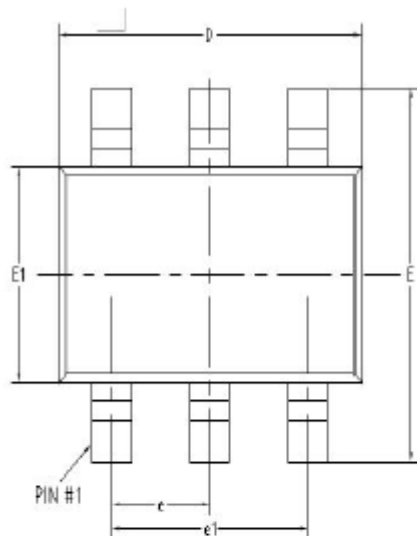
Important notes

TZ5505S input port is not allowed to be open. At high temperature, in reversely biased junction there is a week leakage current. When the leakage current flows through pull-down resistor, the leakage current will change the input of the open pin from low level to high level, causing the circuit to output an incorrect signal.

When TZ5505S is applied to front-wheel steering drive in remote-controlled toy car, it can only be used in the case of application where locked-rotor current is lower than 550mA. If the locked-rotor current exceeds 550mA, TZ5505S would easily go into the state of overheating, affecting normal toy operation.

Outline dimensions of package

SOT23-6



| | MIN | NOM | MAX |
|---------|-------|--------|--------|
| A | - | - | 1.300 |
| A1 | 0.040 | 0.070 | 0.100 |
| A2 | 1.050 | 1.100 | 1.150 |
| A3 | 0.625 | 0.650 | 0.675 |
| b | 0.360 | | 0.500 |
| b1 | 0.360 | 0.380 | 0.450 |
| c | 0.140 | | 0.200 |
| c1 | 0.140 | 0.150 | 0.160 |
| D | 2.865 | 2.870 | 2.875 |
| E | 2.650 | 2.800 | 2.950 |
| E1 | 1.600 | 1.620 | 1.640 |
| e | 0.925 | 0.950 | 0.975 |
| e1 | 1.850 | 1.900 | 1.950 |
| L | 0.400 | 0.450 | 0.500 |
| L1 | - | 0.590 | - |
| L2 | - | 0.250 | - |
| P | 0.100 | - | - |
| P1 | 0.100 | - | 0.200 |
| theta | 3.000 | - | 7.000 |
| theta 1 | 7.000 | 9.000 | 11.000 |
| theta 2 | 8.000 | 10.000 | 12.000 |

Version history

Rev1.0 Initial version

Rev1.01 Recommended operational conditions input voltage VDD 2.5V –5V .