TB6551FG Usage Considerations

TB6551FG is a three-phase full-wave brushless motor controller with sine-wave current. It is for a fan motor. It can not be applied to the motor which changes the rotation direction between forward and reverse.

1. Power Supply Voltage

Power supply voltage usage range

Characteristic	Symbol	Operating Voltage Range	Unit
Power supply for control block	V_{CC}	6 to 10	V

2. Control Inputs (RES, CW/CCW, Ve, LA, OS and Td)

(1) Input method

When V_{CC} is switched off, the RES, CW/CCW, OS, Ve, and Td input signals should be open or low, until V_{CC} has settled.

(2) Ve and LA input

If the input voltage exceeds Vrefout, this voltage is clamped to a 5 V (typ.) level (= Vrefout)
Input voltage should be less than V_{CC}.

3. Oscillation Circuit

(1) Operating oscillation range

Characteristic	Symbol	Operating Range	Unit
Oscillation frequency	fosc	2 to 8	MHz

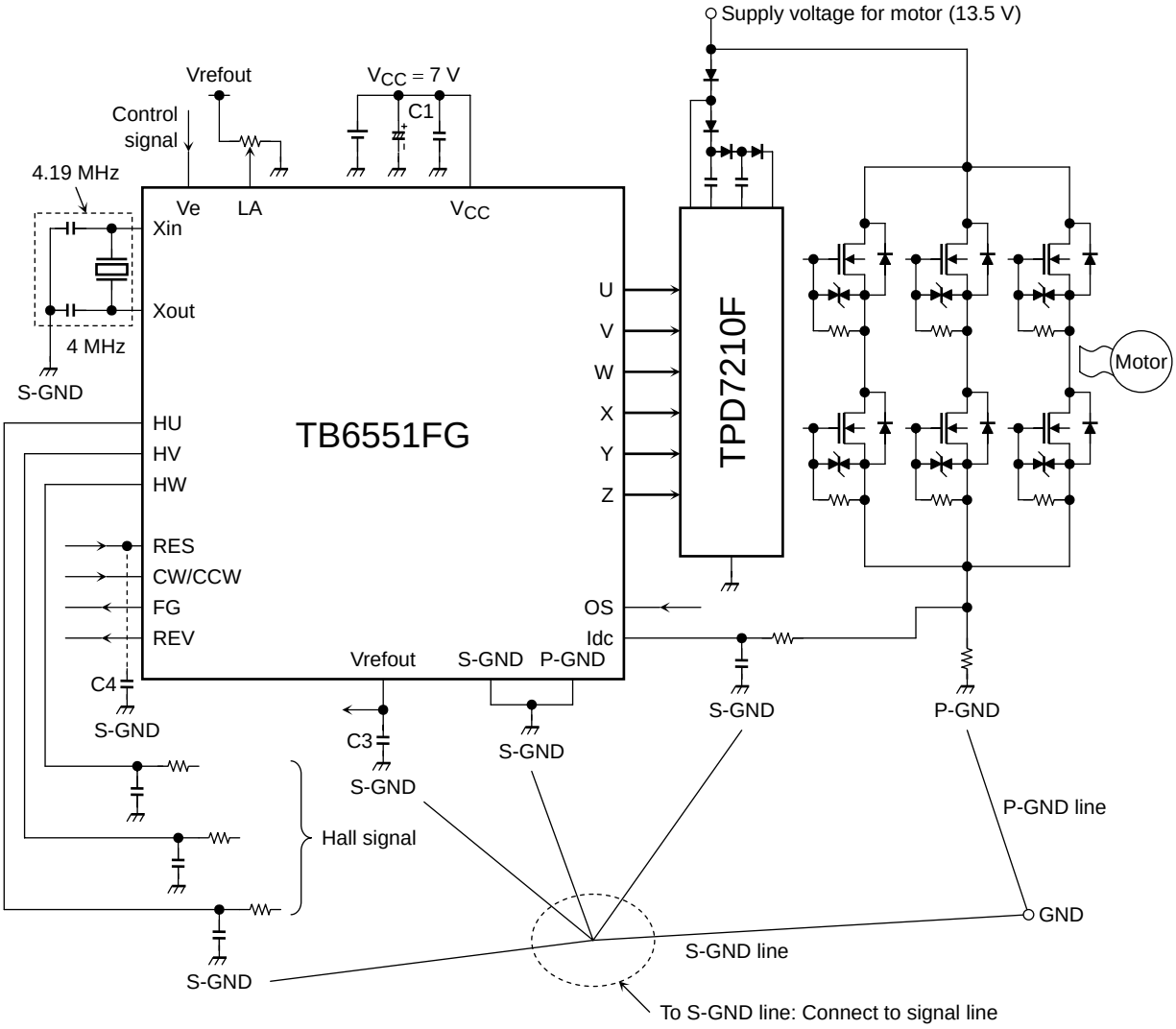
(2) Recommended oscillator

Ceramic Oscillator: CSTLS4M19G56-B0 (Murata manufacturing Co. Ltd)
Ceramic Resonator: FCR4.19MC5 (TDK Corporation)

(3) Connection

Place the oscillator's GND as close as possible to the IC's S-GND pin.

4. Application Circuit (example for motor voltage of ≤ 18 V)



(1) Capacitors for power supply

Connect capacitors between V_{CC} and GND, and between VM and GND as near the IC as possible.

Recommended values

Characteristic	Recommended Value	Remarks
Between V_{CC} and GND: C1	10 μF to 33 μF	Electrolytic capacitor
	0.001 μF to 0.22 μF	Ceramic capacitor

(2) Capacitor for Vrefout

Recommended values

Characteristic	Recommended Value	Remarks
Between Vrefout and GND: C3	0.1 μF to 1.0 μF	Ceramic capacitor

To prevent parasitic oscillation, connect a capacitor to Vrefout. Place the negative side of the capacitor as close as possible to the IC's S-GND. Recommended values above are actual values for fan motors of air conditioner. So, when the board and the usage environment are different from these conditions, the capacitor to stabilize the motor operation changes. Please determine the capacitor by confirming the state of Vrefout terminal with an oscilloscope whether the voltage is stabilized under the usage environment.

(3) Filter for hall signal

The hall input pin is susceptible to noise because it has a high impedance. To prevent malfunction, connect a C,R filter to each hall input pin.

The appropriate values of the C,R filter can vary according to the noise frequency: the resistor should be 1 kΩ, and the capacitance should be 0.001 μF – 0.1 μF. Connect C,R as near the IC as possible.

(4) Capacitor for RES

The RES pin is susceptible to noise because it has a high impedance. To prevent malfunction, connect a capacitor to the RES pin when necessary. Place the load side of the capacitor as close as possible to the IC's S-GND pin.

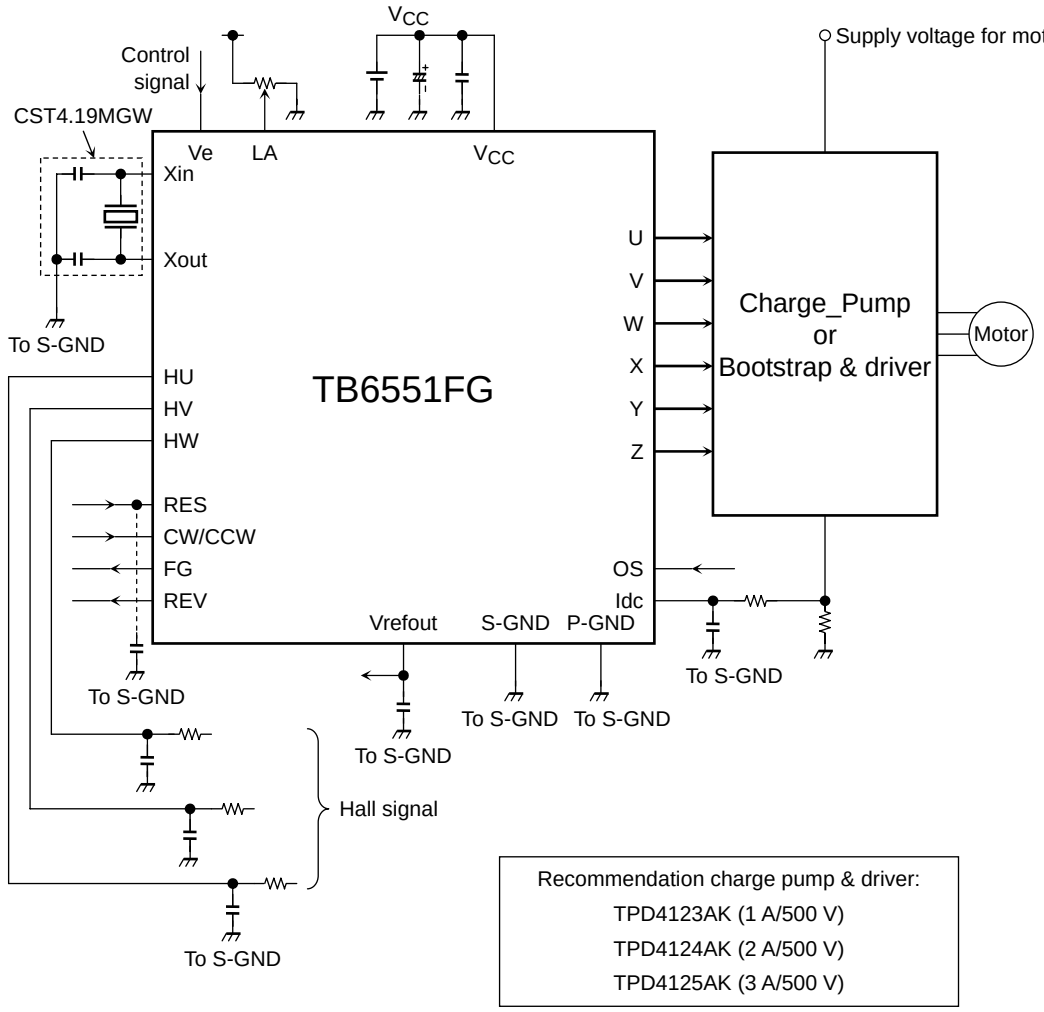
(5) Filter for Idc

The Idc pin includes a 200 kΩ + 5 pF filter. However, connect a C,R filter from the outside to the Idc pin in order to prevent this pin from being affected by noise. Determine the C,R filter value by the noise frequencies to be filtered. Place the negative side of the capacitor as close as the IC's P-GND pin.

(6) GND pattern

Connect the IC's S-GND and P-GND pins to the signal GND line. Avoid connecting it to the driver's P-GND line (passed through the motor) with a common impedance.

(7) Another application (example for 30 V over)



5. Operating Temperature Range

Ta = –30 to 115°C is guaranteed for operation. The high-temperature operation is limited because of the usage condition for IC setting. The acceptable loss differs for each package, thereby changing the operating temperature range.

Calculate the Pd value (W) by the equation below.

$Pd = V_{CC} \times I_{CC} + (V_{CC} - Vrefout) \times Irefout + Iout \times (Vout\ (H) + Vout\ (L)) \times 2$

For board installation, Rth (j-a) = 139°C/W (50 × 50 × 1.6 mm: Cu30%)
The acceptable ambient temperature (max) is Ta = 150°C – (Pd × 139°C/W)

6. Others

- About FG & REV function

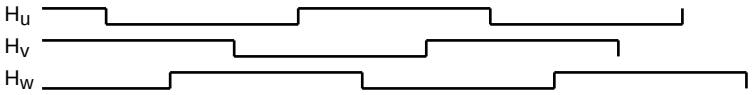
  If there is the input of the Hall signal, FG and REV terminal always output it. It is necessary for V_{CC} power supply and Reset to be High.

- About sine wave drive or square wave drive

  A change of sine wave drive and square wave drive is controlled with a hall signal and CW/CCW terminal.

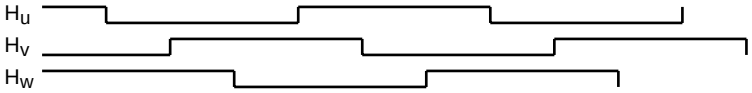
The condition that Motor driven a sine wave

In case of CW = Low: A motor drives it with a sine wave When a hall signal was input by the following timings



(5 Hz over)

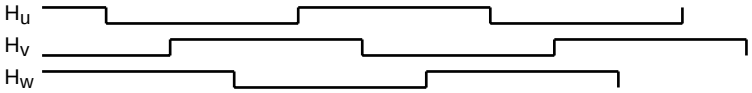
In case of CW = High: A motor drives it with a sine wave When a hall signal was input by the following timings



(5 Hz over)

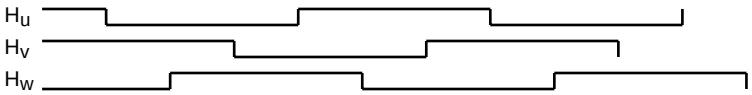
The condition that Motor driven a Square wave

In case of CW = Low: A motor drives it with a square wave When a hall signal was input by the following timings



(5 Hz over or less)

In case of CW = High: A motor drives it with a square wave When a hall signal was input by the following timings



(5 Hz over or less)

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