TB6586FG/AFG

Usage considerations

Summary

The TB6586FG and TB6586AFG are controllers IC for three-phase DC brushless motor drive applications. They can drive a motor on a 150 degree commutation system in either of two directions. To change the direction of the motor, first stop the motor rotation before changing the control signals. The rotational direction should not be changed while the motor is rotating. The TB6586FG and TB6586AFG are products intended to be used for fans.
TB6586FG and TB6586AFG have different output pulse per revolution.

- TB6586FG: 1 pulse/ electrical angle
- TB6586AFG: 3 pulses/ electrical angle

Table of Contents

1. Power supply voltage

Power supply voltage usage range

Characteristic	Symbol	Operating voltage range	Unit
Power supply for control block	V_{cc}	6.5 to 16.5	V
Output supply	VM	4.5 to 16.5	

2. Control inputs (RES, CW/CCW, VSP, LA)

(1) Input method
The RES, CW/CCW, and LA input signals should be open or low, until Vcc has settled.
Settle VM after Vcc is settled.

(2) VSP input
Vsp input voltage range is zero to 7 V. Voltage can be energized regardless of Vcc condition.

3. Oscillation circuit

(1) Operating oscillation range

Item	Condition	Operating voltage range	Unit
Carrier frequency	OSC/C=560 pF, OSC/R=6.2 kΩ	18 to 22	kHz
	OSC/C=470 pF, OSC/R=8.2 kΩ	16.2 to 19.8	

(2) Connection
Place the capacitor and resister's GND as close as possible to the IC's GND pin.

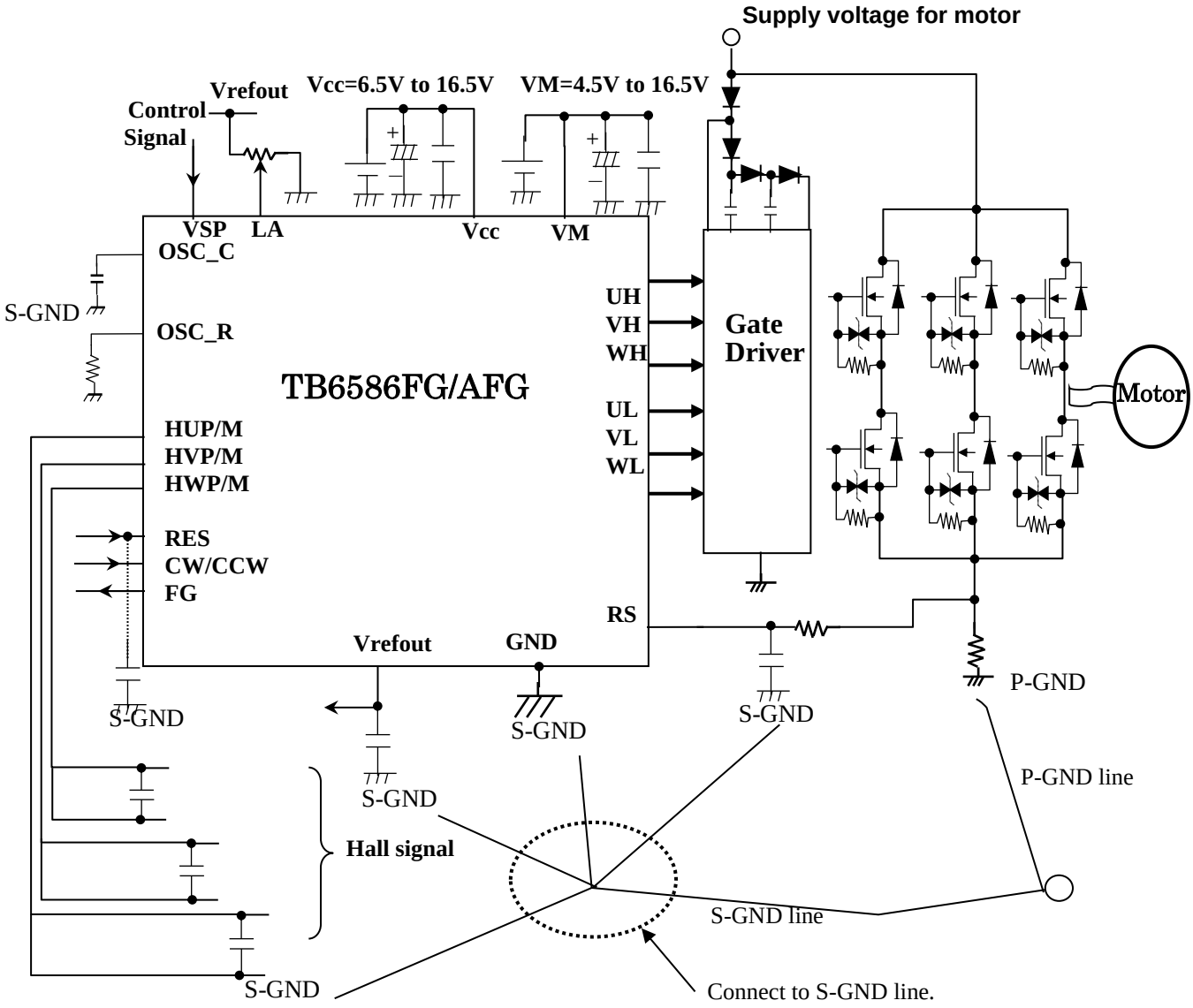
(3) Calculation formula
Typical oscillation frequency can be calculated by the equations below.

F_{OSC} = 1/ {(2×Vth×C/I)+Tdelay} .....I=Vi×G/R
= 1/ {2×Vth×C/(Vi×G/R)+Tdelay}

C = External capacitor (470 pF)
R = External resistance (8.2 kΩ)
Vth = Triangle-wave slesh voltage (Design value: 0.28 V)
Vi = Current switch reference voltage (Design value: 1 V)
G = Constant current amp rate (Design value: 11)
Tdelay = Circuit delay (25 ns)

Carrier frequency is determined by the equation below.
Carrier frequency=Fosc / 252
OSC/C, OSC/R is recommended to be set by case (1).

4. Application circuit



(1) Capacitors for power supply
Connect capacitors between Vcc and GND as near the IC as possible.

<Recommended value>

Characteristic	Recommended value	Remarks
Vcc - GND:	10 μF to 33 μF	Electrolytic capacitor
	0.001 μF to 0.22 μF	Ceramic capacitor

(2) Capacitor for Vrefout
Connect capacitors between Vrefout and GND as near the IC as possible.

<Recommended value>

Characteristic	Recommended value	Remarks
Vrefout - GND:	0.22 μF to 1.0 μF	Ceramic capacitor

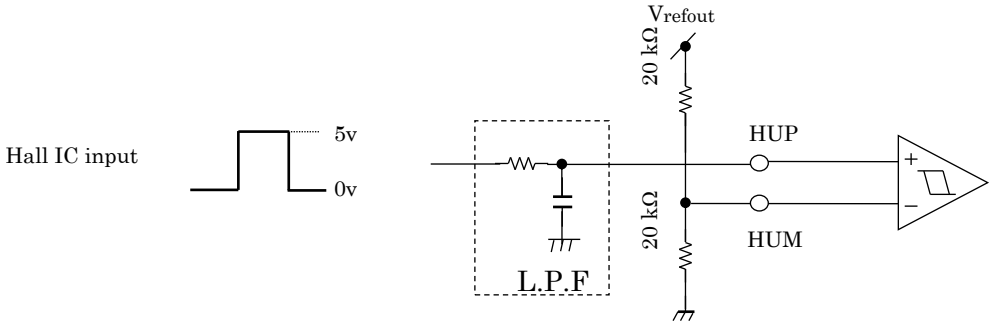
Vrefout pin line is used as the reference power supply of the IC internal circuit. To prevent parasitic oscillation, be sure to connect a capacitor whether the Vrefout power supply is used or not used. Place the negative side of the capacitor as close as possible to the IC's S-GND.

(3) Capacitors between hall signals
The hall input pin is susceptible to noise because it has high impedance. To prevent malfunction, connect a condenser between upper and under side pins. The capacitance is recommended 0.001 μF to 0.1 μF.

When the hall signal is detected less than 5 Hz, 120°energization and 150°energization is switched. The 5-Hz detection is detected by each hall amplifier output and the edge width, which are judged the upper and lower value of 5 Hz /6 = 33 ms. If the value is less than 33 ms, 150°energization is selected. When the motor starts driving, the noise pulse enters to the hall amplifier output, the driving output according to the pulse width is output with 150°energization if 5 Hz is detected. The noise should not be entered to the hall signals.

(4) Position detection signal
Position detection by three-phase hall device or IC can be available with this position detection signal.

When 5 V of square wave is input from hall IC, fix minus pin to Vrefout / 2.



*) Along with V and W phases.

(5) 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.

(6) Filter RS pin
The RS pin includes a 200 kΩ + 5 pF filter. However, connect a C, R filters from the external IC pin in order to prevent this pin from being affected by noise. Determine the C, R filter values by the noise frequencies to be filtered. Place the negative side of the capacitor as close as the IC's S-GND pin.

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

Notes on Contents

1. Block Diagrams
   Some of the functional blocks, circuits, or constants in the block diagram may be omitted or simplified for explanatory purposes.

2. Equivalent Circuit
   The equivalent circuit diagrams may be simplified or some parts of them may be omitted for explanatory purposes.

3. Timing Charts
   Timing charts may be simplified for explanatory purposes.

4. Application Circuits
   The application circuits shown in this document are provided for reference purposes only. Thorough evaluation is required, especially at the mass-production design stage.
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IC Usage Considerations

Notes on handling of ICs

(1) The absolute maximum ratings of a semiconductor device are a set of ratings that must not be exceeded, even for a moment. Do not exceed any of these ratings. Exceeding the rating(s) may cause device breakdown, damage or deterioration, and may result in injury by explosion or combustion.

(2) Do not insert devices in the wrong orientation or incorrectly. Make sure that the positive and negative terminals of power supplies are connected properly.
Otherwise, the current or power consumption may exceed the absolute maximum rating, and exceeding the rating(s) may cause device breakdown, damage or deterioration, and may result in injury by explosion or combustion.
In addition, do not use any device inserted in the wrong orientation or incorrectly to which current is applied even just once.

Points to remember on handling of ICs

Heat Radiation Design
When using an IC with large current flow such as power amp, regulator or driver, design the device so that heat is appropriately radiated, in order not to exceed the specified junction temperature (TJ) at any time or under any condition. These ICs generate heat even during normal use. An inadequate IC heat radiation design can lead to decrease in IC life, deterioration of IC characteristics or IC breakdown. In addition, when designing the device, take into consideration the effect of IC heat radiation with peripheral components.

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