TB6585FG functional description

General description

TB6585FG is a three-phase full-wave motor controller with sine-wave operation.

1. Power supply voltage and output current

Characteristic	Symbol	Operating voltage range	Unit
Power supply voltage	V_M	4.5 to 42	V
Output current	I_{OUT}	～1.8	A

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

1) Input method

The RES, CW/CCW, LA, and ML input signals should be open or low, until VM has settled.

2) Vsp input

Vsp input voltage range is zero to Vrefout (V). Voltage can be energized regardless of VM condition.

3. Oscillation circuit

1) Operating range

Characteristic	Condition	Operating voltage range	Unit
Carrier frequency	OSC/C=150pF、OSC/R=16kΩ	18~22	kHz

2) Connection

Place the oscillator'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.

Fo s c = 1/ {(2×Vth×C/I)＋Tdelay}　　・・・・・・・　I=Vi×G/R

= 1/ {2×Vth×C/(Vi×G/R)＋Tdelay}

C=Exterior condenser (150pF)
R=Exterior resistance (16kΩ)
Vth=Triangle-wave slesh voltage　(Design value : 0.4V)
Vi=Current switch reference voltage (Design value : 1V)
G=Constant current amp rate (Design value : 13)
Tdelay＝Circuit delay　(50nsec)

Carrier frequency is determined by the equation below.
Carrier frequency＝Fosc／252

OSC/C and OSC/R is recommended to be set by case (1). Please judge the applied value after evaluating the mounting variability because there is a possibility that the oscillation frequency changes depending on the mounting condition. Shipping test is carried by applying the above setting constant number. So, when other setting constant number is adopted, please judge the result by yourself. The range of the oscillation frequency should be set from 4 to 6 MHz.

4. Anti-lock capability

When the operation mode is not properly switched as configured from 120° commutation mode of startup operation to 180° commutation mode, the motor is deemed to be locked and output transistors are turned off. The restart operation can be selected from the automatic restart, the power cycling, or the back on Vsp. In case of the restart operation by the back on Vsp, Vsp must be kept below 1V (typ.).

Capacitor connecting terminal of TR terminal (10pin)

The time required for the motor-lock detection and the time while the motor driving signal is inactive can be adjusted by the external capacitor $C_{1\ of}$ TR terminal. (These periods are set to be the same.) The value of 180pF is recommended for C1. Setting range is from 100pF to 390pF. Please apply these values after evaluating enough.

Time setting $T = \frac{C_1 \times V_{th}}{I} \times 1024(s)$ $I = 0.72\mu A$, $V_{th} = 2\ V$

Example: When C_1 = 180 pF, T ≈ 500 ms (typ.).

<Automatic Restart (ML = High)>

When the Hall signal frequency is kept below 2.5 Hz for at least 500 ms (typ.), the TB6585FG becomes active and inactive periodically every 500 ms (typ.). The protection is disabled when the Hall signal frequency reaches 2.5 Hz and the operation mode is switched to 180° commutation mode.

Note) When anti-lock protection is not used, connect the TR terminal to GND. Anti-lock capability is invalid regardless of ML.

5. Hall element input

Please use this function within phase input voltage range. Hall IC acceptance is impossible.

V_{CMRH} = 1.5v～3.5v

6. Rise in heat

Temperature of the TB6585FG may exceeds the maximum rating (Tj=150℃) depending on the usage condition because it incorporates the driver. So, please design the device not to exceed the Tj of 150℃. Though it incorporates over-heat protection to abnormal states, it can not protect all functions because it works in condition of over rating.

Calculating of Tj (example)

Conditions: Board: Resistance of saturated heat = 39℃/W), Ambient temperature = 60℃max

P : Power consumption of IC, Actual variability of output Ron:20%.

ON resistance of output : Ron(H+L)	
Typ	Max
0.7×1.2	1.0×1.2

In case the motor steady current is 0.8A (rms),

Pd(max) = VM×IM+[Ron(H+L)Max]×0.8×0.8×2 = 24×0.014 + 1.0×1.2×0.8×0.8×2 = 1.872(W)

Junction temperature is calculated below,

Tjmax = Ta(max)＋rth× Pd = 60℃＋39×1.872 = 133℃

When the board (Rth(j-a) = 39℃/W) is used, the limit of actual motor current is around 0.8A.

（For your reference : Measured on a board (140 mm × 70 mm × 1.6 mm, Cu 50%: 39°C/W))