

TB6549FG/PG/HQ Usage Considerations

1. Supply Voltage

(1) Operating Supply Voltage Range

Characteristic	Symbol	Operating Voltage Range	Unit
Supply voltage	V _{CC}	10 to 27	V

The absolute maximum supply voltage is 30 V. The operating supply voltage should be kept below 27 V.

(2) Power-On and Power-Off

V_{CC} should be turned on and off with both IN1 and IN2 being Low.

2. Control Inputs

(1) PWM Input

The TB6549 allows direct PWM control. The duty signal is applied from the PWM input. To disable direct PWM control, the PWM input should be held High.

(2) Standby (SB) Input

The charge pump is also disabled in standby mode.

Note that if a PWM signal is applied to the SB input, the IC may be permanently damaged. At least, 50-ms interval is required between entering and exiting standby mode.

3. Overcurrent Detection

The overcurrent detection circuitry of the TB6549 is not intended to provide definite protection against overcurrent under any circumstances. The TB6549 must be used within the specified operating ranges.

4. Output Current

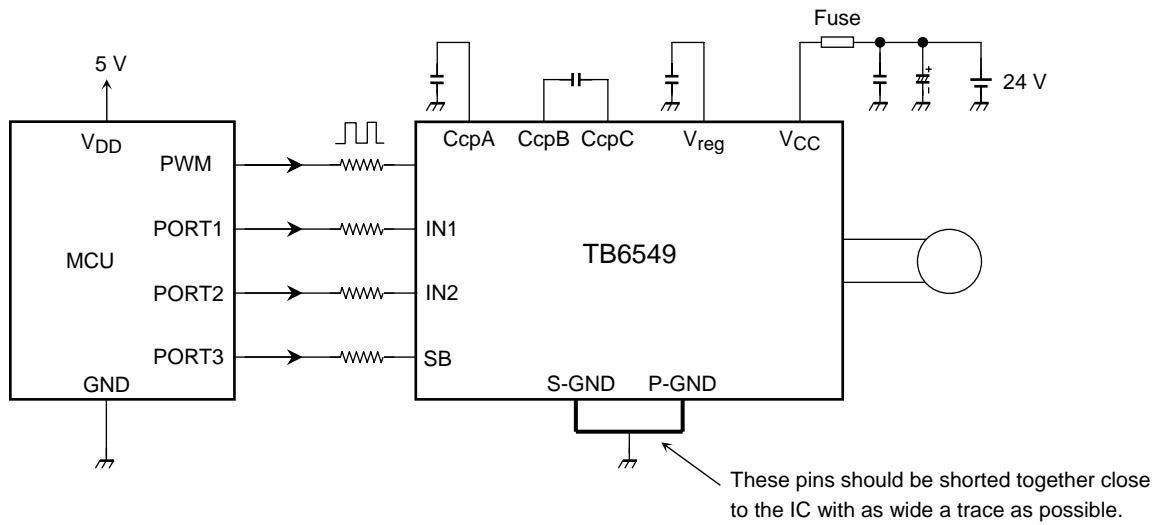
(1) TB6549FG/PG

The maximum rated I_o (pulsed) is 3.5 A. The output current should not exceed 3.5 A even instantaneously. Although the rated I_o (DC) is 2.0 A, it may be limited by the total power dissipation of the IC. See the Pd-Ta curves in the datasheet.

(2) TB6549HQ

The maximum rated I_o (pulsed) is 4.5 A. The output current should not exceed 3.5 A even instantaneously. Although the rated I_o (DC) is 3.5 A, it may be limited by the total power dissipation of the IC. See the Pd-Ta curves in the datasheet.

5. Application Circuit Example



(1) Power Supply Capacitors

Capacitors should be added between the VCC and GND pins as close to the IC as possible.

Recommended Capacitances

Characteristic	Recommended Value	Remarks
VCC – GND	10 μ F to 100 μ F	Electrolytic capacitor
VCC – GND	0.1 μ F to 1 μ F	Ceramic capacitor

(2) Vreg Capacitor

A capacitor should be added between the Vreg and GND pins as close to the IC as possible.

Recommended Capacitances

Characteristic	Recommended Value	Remarks
Vreg – GND	0.1 μ F to 1.0 μ F	Ceramic capacitor

(3) Charge Pump Capacitors

The appropriate values of charge pump capacitors vary with VCC. As a guide, it should be determined empirically that the voltage at the CcpA pin becomes greater than VCC + 5 V (typ.).

Recommended Capacitances

Characteristic	Recommended Value	
	VCC = 10 V to 20 V	VCC = 20 V to 27 V
CcpA – GND	0.22 μ F	0.22 μ F
CcpB – CcpC	0.01 μ F to 0.047 μ F	0.01 μ F

(4) Overcurrent Detection

To sense supply and output currents via external resistors, they should be inserted to the VCC line, not between the P-GND and GND lines.

(5) Fuse

It is strongly encouraged to insert an external fuse along the VCC line to avoid any primary and secondary damage to the IC.

If the IC is damaged due to some reason, excessive current could flow into the IC continuously. Without a fuse this might result in fire or smoke.

(6) GND

S-GND and P-GND must be shorted together as close to the IC as possible on the pc board. The board trace between these pins should be as wide as possible.

6. Fin Heat Sink and Thermal Dissipation**TB6549FG:**

A fin heatsink is attached on the bottom of the IC. It should be connected to GND. A large land area for the fin helps improve thermal dissipation.

TB6549PG:

Pins 5, 6, 12 and 13 are bonded to the die attach paddle and thus have thermal paths from the bottom of the IC.

Therefore, these pins should be connected to GND. Large land areas for these pins help improve thermal dissipation.

TB6549HQ:

A heat spreader should be attached as necessary.

7. Power Dissipation

The power dissipation of the IC is calculated as follows:

$$P = V_{CC} \times I_{CC} + I_O^2 \times R_{on} \text{ (sum of high-side and low-side drivers)}$$

The higher the ambient temperature, the lower the power dissipation. The Pd-Ta curves should be taken into account for appropriate thermal design.

The junction temperature, Tj, is calculated as follows. Tj must be kept below 150°C.

$$T_j = P \times R_{th(j-a)} + T_a$$

*: R_{th(j-a)}: Junction-to-ambient thermal resistance

*: T_a: Ambient temperature

Keep in mind that R_{th(j-a)} varies with the use environment such as the pc board.

The fin temperature gives an approximate indication of the junction temperature:

$$T_j = P \times R_{th(j-c)} + T_{fin}$$

*: T_{fin}: Fin temperature (S-GND pin for TB6549P)

*: R_{th(j-c)}: Junction-to-fin thermal resistance

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