Toshiba Bi-CMOS Linear Integrated Circuit Silicon Monolithic

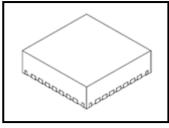
TB9051FTG

PWM type single channel H-Bridge DC brushed motor driver for automotive use

1. Outline

This product is a motor driver IC which incorporates the output driver for the direct drive of a DC brushed motor intended for the automotive use.

The motor drive output can be highly efficient operation by the PWM control which realizes low-on resistance.



P-QFN28-0606-0.65-001

Forward / Reverse / brake mode can be selected according to PWM1 signal and PWM2 signal, and the motor operation mode and stop mode can be selected by ENABLE pin.

Moreover, the output current capacity is 5A (max), it is suitable for various automotive applications such as a throttle and valve control, various engine bulbs, storing of door mirrors, and a seat positioning.

2. Application

Automotive applications such as a throttle and valve control, various engine bulbs, and storing of door mirrors

3. Feature

 Motor driver block: Single channel H-Bridge driver (Ron(Pch+Nch))<0.45 Ω (Max @Tj = 150°C, V Over-current detection, over-temperature detection) 	letection, VBAT
	letection, VBAT
• Abnormality detection function: Over-current detection, over-temperature de	
	detection, and
undervoltage detection, VCC undervoltage d	,
VCC high voltage detection	
• Built-in initial diagnosis function: Power supply abnormality detection circuit ((VBAT
undervoltage, VCC undervoltage and VCC h	
Output type: PWM control output	0
Motor operation: Forward /Reverse/ Brake	
• Current limitation control: Current limiter with chopper type	
• Output high-side current monitoring function (OCM pin)	
• DIAG output	
Built-in the through current prevention circuit	
• Operating voltage range: VBAT = 4.5 to 28 V (Maximum ratings of por	ower supply
voltage 40V (max): 0.5 sec.)	FF J
• Operating temperature range: Ta = -40°C to 125°C	
• Compact type flat package: P-QFN28-0606-0.65-001	
 AEC-Q100 Qualified 	

• If the label of shipping box is indicated to be "[[G]]/RoHS COMPATIBLE2", "[[G]]/RoHS [[Chemical symbol(s) of controlled substance(s)", and "RoHS COMPATIBLE" or "RoHS COMPATIBLE, [[Chemical symbol(s) of controlled substance(s)]]>MCV", this product is compliant with the EU RoHS Directive (2011 / 65 / EU) in the meaning of the statement.

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- Note 1: Some of the functional blocks, circuits in the block diagram may be omitted or simplified for explanatory purposes.
- Note 2: Do not insert devices in the wrong orientation or incorrectly. Otherwise, it may cause device breakdown, damage and/or deterioration.
- Note 3: The application circuits shown in this document are provided for reference purposes only. Thorough evaluation is required, especially at the mass production design stage. Toshiba does not grant any license to any industrial property rights by providing these examples of application circuits.
- Note 4: Careful attention should be paid to the layout of the output line, VBAT, VCC and GND line since IC may be destroyed due to short-circuit between outputs, to the power supply, or to the ground.
- Note 5: For the board design, it is necessary to consider the solid pattern of AGND and PGND.

Back-EMF

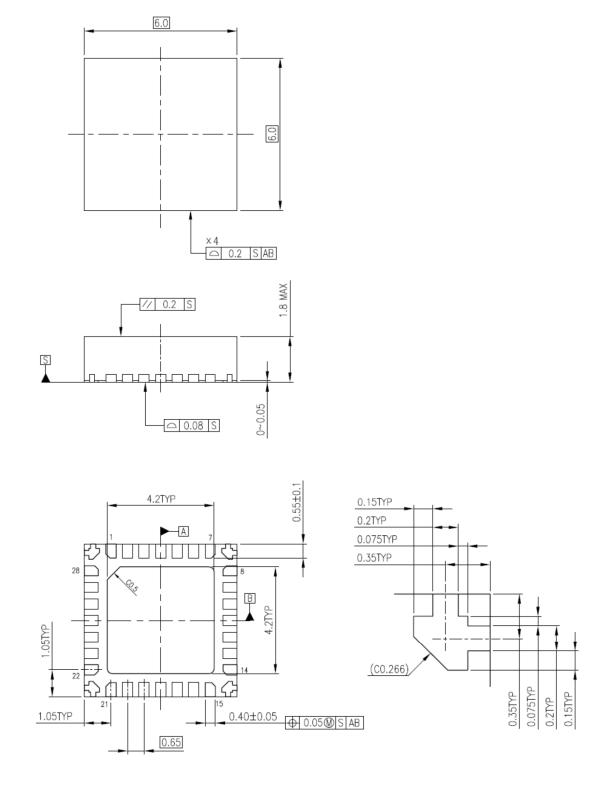
While a motor is rotating, there is a timing at which power is fed back to the power supply. At that timing, the motor current is fed back to the power supply owing to the effect of the motor back-EMF. If the power supply does not have enough sink capability, the power supply and output pins of the device might rise above the rated voltages. The magnitude of the motor back-EMF varies with usage conditions and motor characteristics. It must be fully verified that there is no risk that this product or other components will be damaged or fail owing to the motor back-EMF.

13. Package

13.1. Package dimensions

Package dimensions

P-QFN28-0606-0.65-001



Weight: 0.22g (Typ.)

Table 13.1 Package dimensions

"Unit:mm"

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13.2. Mark Design



- Toshiba logo mark 1.
- Product name (Part number: TB9051FTG) 2.
- Lot code (e.g.613QA11) 3.
- Country/Region of origin (JAPAN) 4.

* Lot code description Example.

- (1) Last number of calendar year (Example shows "6" of 2016)
- (2) Week code (Example shows 13th week)
 (3) Product sight code (Q)

(4) Toshiba management code (3 digits at maximum)

14. IC Usage Considerations

14.1. 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 the device breakdown, damage or deterioration, and may result injury by explosion or combustion
- (2) Use an appropriate power supply fuse to ensure that a large current does not continuously flow in case of over-current and/or IC failure. The IC will fully break down when used under conditions that exceed its absolute maximum ratings, when the wiring is routed improperly or when an abnormal pulse noise occurs from the wiring or load, causing a large current to continuously flow and the breakdown can lead smoke or ignition. To minimize the effects of the flow of a large current in case of breakdown, appropriate settings, such as Fast-blow fuse capacity, fusing time and insertion circuit location, are required.

14.2. Points of Remember on Handling of ICs

(1) Over-current Protection Circuit

Over-current protection circuits (referred to as current limiter circuits) do not necessarily protect ICs under all circumstances. If the Over-current protection circuits operate against the over-current, clear the over-current status immediately.

Depending on the method of use and usage conditions, such as exceeding absolute maximum ratings can cause the over-current protection circuit to not operate properly or IC breakdown before operation. In addition, depending on the method of use and usage conditions, if over-current continues to flow for a long time after operation, the IC may generate heat resulting in breakdown.

(2) Thermal Shutdown Circuit

Thermal shutdown circuits do not necessarily protect ICs under all circumstances. If the thermal shutdown circuits operate against the over temperature, clear the heat generation status immediately.

Depending on the method of use and usage conditions, such as exceeding absolute maximum ratings can cause the thermal shutdown circuit to not operate properly or IC breakdown before operation.

Notes on Handling of ICs

(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 Circuits

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) Absolute Maximum

The absolute maximum ratings of a semiconductor device are a set of ratings that must not be exceeded, even for a moment.

(5) 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 the device breakdown, damage or deterioration, and may result injury by explosion or combustion.

In addition, do not use any device that is applied the current with inserting in the wrong orientation or incorrectly even just one time.

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