

**Temporary  
Specifications**

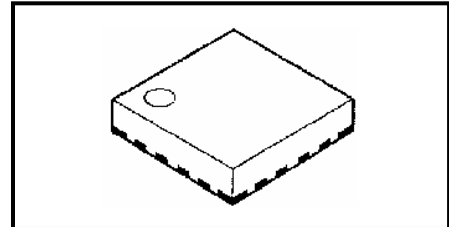
TOSHIBA BiCD Integrated Circuit Silicon Monolithic

# T B 6 5 9 0 F T G

## Dual DC Motor Driver

The TB6590FTG is a Dual DC motor driver IC making use of LDMOS components.

4 modes – namely CW, CCW, Short brake and Stop – can be selected depending on the two input signals IN1 and IN2.



Weight

P-VQON16-P-0303-0.50: 0.01g (typ.)

### Features

- Supply voltage ;  $V_M=6V$  ( Max. )
- Output current ;  $I_{out}=0.5A$  (Max)
- Low ON resistor ; 1.5 (Upper + Lower sides compounded, typical values for  $V_M = 5V$ )
- Standby function ( Power save )
- CW / CCW / Short brake / Stop modes
- Built-in thermal shutdown circuit ( TSD ) + Low-voltage detection circuit
- Employs a small-shaped layout package ( VQON16 : 0.5mm pitch )
- Adapted to lead-free layout

This product makes use of MOS-structure components and therefore is highly sensible to static electricity, and as such it is strongly recommended to employ earth-grounding or an isolating mat when handling the product. Furthermore, the user is strongly advised to remove any ionizing apparel and to take great care of the temperature and humidity.

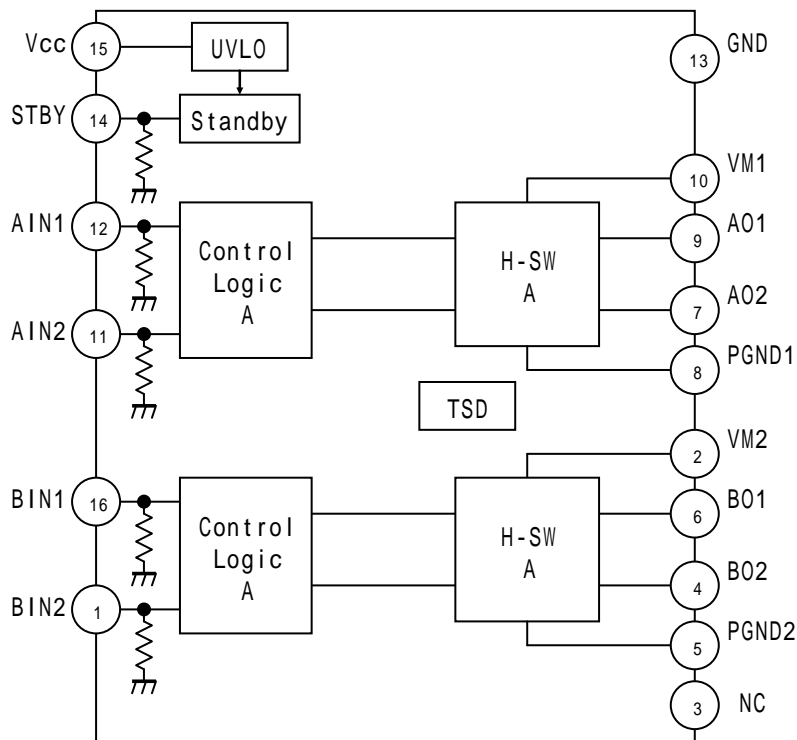
Solder has been checked for under the following conditions:

- (1) When using Sn-63Pb solder:  
Solder temperature 230 , dip time 5 seconds (one dip), R type ( Uses flux)
- (2) When using Sn-3.0Ag-0.5Cu solder:  
Solder temperature 245 , dip time 5 seconds (one dip), R type ( Uses flux)

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## Block diagram



## Pin table

Pin NO.	Symbol	Characteristics	Remarks
1	BIN2	Input B2	<ul style="list-style-type: none"> <li>• TTL level inter face compatible</li> <li>• 200k pull-down at internal</li> </ul>
2	VM2	VM supply2	VM(opr.)=2.2V~5.5V
3	NC	Non Connection	
4	BO2	Output B2	
5	PGND2	Power GND2	
6	BO1	Output B1	
7	AO2	Output A2	
8	PGND1	Power GND1	
9	AO1	Output A1	
10	VM1	VM supply1	VM(opr.)=2.2V~5.5V
11	AIN2	Input A2	<ul style="list-style-type: none"> <li>• TTL level inter face compatible</li> <li>• 200k pull-down at internal</li> </ul>
12	AIN1	Input A1	<ul style="list-style-type: none"> <li>• TTL level inter face compatible</li> <li>• 200k pull-down at internal</li> </ul>
13	GND	Small signal GND	
14	STBY	Standby signal input	"L"=standby / 200k pull-down at internal
15	Vcc	Vcc supply	Vcc(opr.)=2.7V~5.5V
16	BIN1	Input B1	<ul style="list-style-type: none"> <li>• TTL level inter face compatible</li> <li>• 200k pull-down at internal</li> </ul>

### Maximal values ( Ta=25 )

	Symbol	Value	Unit	Remarks
Supply voltage	VM	6	V	
	Vcc	6		
Input voltage	VIN	-0.2 ~ 6	V	AIN1, AIN2, BIN1, BIN2, STBY Pins
Output voltage	Vout	6	V	AO1, AO2, BO1, BO2 Pins
Output current	Iout	0.5	A	
Allowed loss	PD	0.275	W	See below note
Operating temperature	Topr	-20 ~ 85		
Storage temperature	Tstg	-55 ~ 150		

Note : When operating above Ta=25 , for each 1 a decrease of 2.2mW is to be expected.

### Allowed operating values ( Ta=-20 ~ 85 )

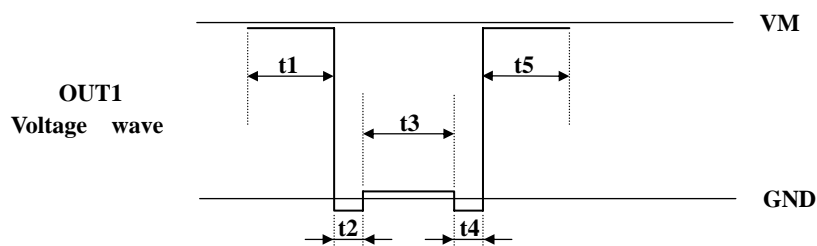
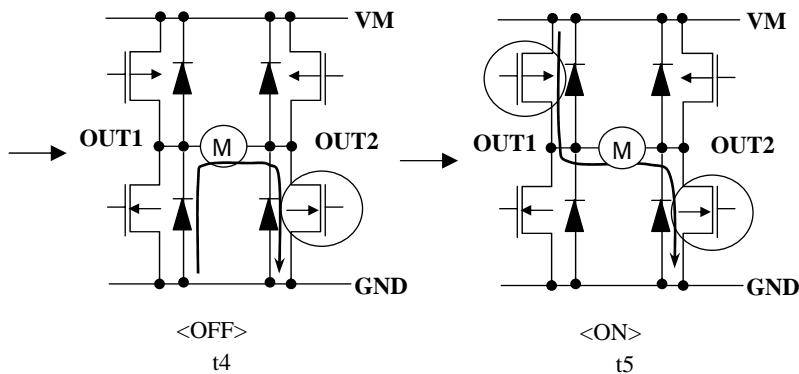
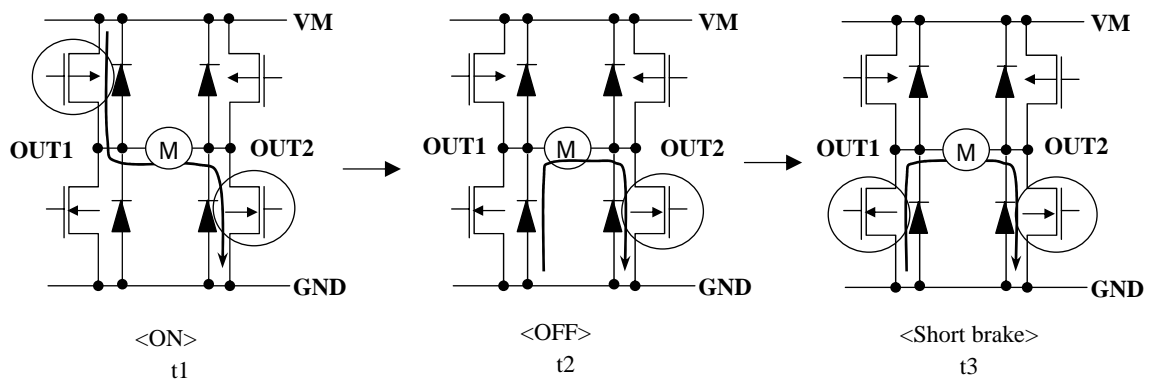
	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	Vcc	2.7	3	5.5	V
	VM	2.2	5	5.5	V
Output current	Iout	---	---	0.4	A
PWM frequency	fPWM	---	---	200	k H z

## H-SW Control Function

Input			Output		Function mode
IN1	IN2	STBY	OUT1	OUT2	
H	H	H	L	L	Short brake
L	H	H	L	H	C C W
H	L	H	H	L	C W
L	L	H	OFF (High impedance)		Stop
H / L	H / L	L	OFF (High impedance)		Standby

## H-SW Operation Outline

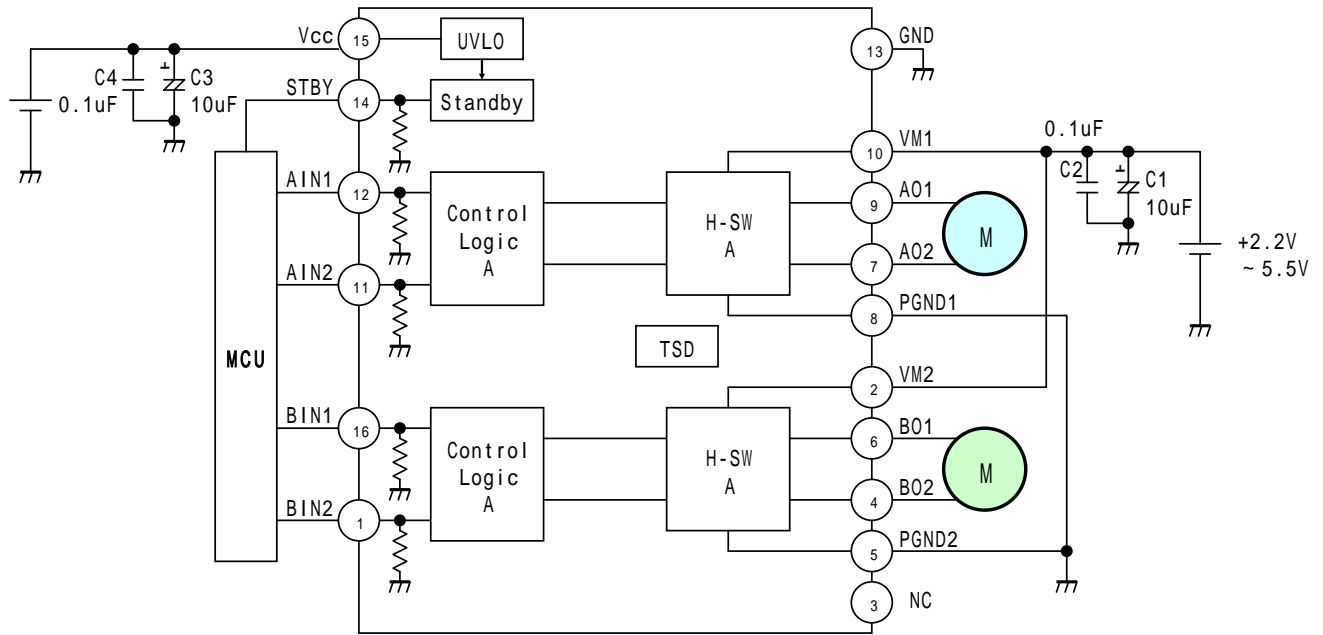
- To prevent current penetration when switching between modes, the dead times  $t_2$  and  $t_4$  have been settled.



Electrical characteristics ( Except when indicated otherwise,  $V_{CC}=3V$ ,  $V_M=5V$ ,  $T_a=25$  )

	Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Supply voltage	$I_{CC}$	STBY= $V_{CC}$	---	(0.3)	(0.6)	m A
	$I_{CC}(STB)$	STBY=0V	---	---	10	$\mu$ A
	$I_M(STB)$		---	---	1	
Control input voltage	$V_{IH}$		2	---	$V_{CC}+0.2$	V
	$V_{IL}$		-0.2	---	0.8	
Control input current	$I_{IH}$	VIN=3V	5	15	25	$\mu$ A
	$I_{IL}$	VIN=0V	---	---	1	
Standby input voltage	$V_{IH}(STB)$		2	---	$V_{CC}+0.2$	V
	$V_{IL}(STB)$		-0.2	---	0.8	
Standby input current	$I_{IH}(STB)$	VIN=3V	5	15	25	$\mu$ A
	$I_{IL}(STB)$	VIN=0V	---	---	1	
Output saturation voltage	$V_{sat(U+L)}$	$I_o=0.2A$	---	(0.5)	(0.7)	V
Output saturation current	$I_L(U)$	$V_M=V_{out}=6V$	---	---	1	$\mu$ A
	$I_L(L)$	$V_M=6V, V_{out}=0V$	-1	---	---	
Diode forward voltage	$V_F(U)$	IF=0.4A	---	0.9	---	V
	$V_F(L)$	( not tested )	---	0.9	---	
Low-voltage detection	$U_{VLD}$	( not tested )	---	2.2	---	V
Return voltage	$U_{VLC}$		---	2.4	---	
Thermal shutdown temperature	$T_{SD}$	( not tested )	---	170	---	
Thermal shutdown hysteresis	$T_{SD}$		---	20	---	
Response characteristics	$t_r$	RL=100 ( not tested )	---	10	---	n s
	$t_f$		---	10	---	
	$t_{PLH}$		---	50	---	
	$t_{PHL}$		---	50	---	
Penetrating current prevention time	$t_{dead}$	( not tested )	---	100	---	

## An example of application circuit



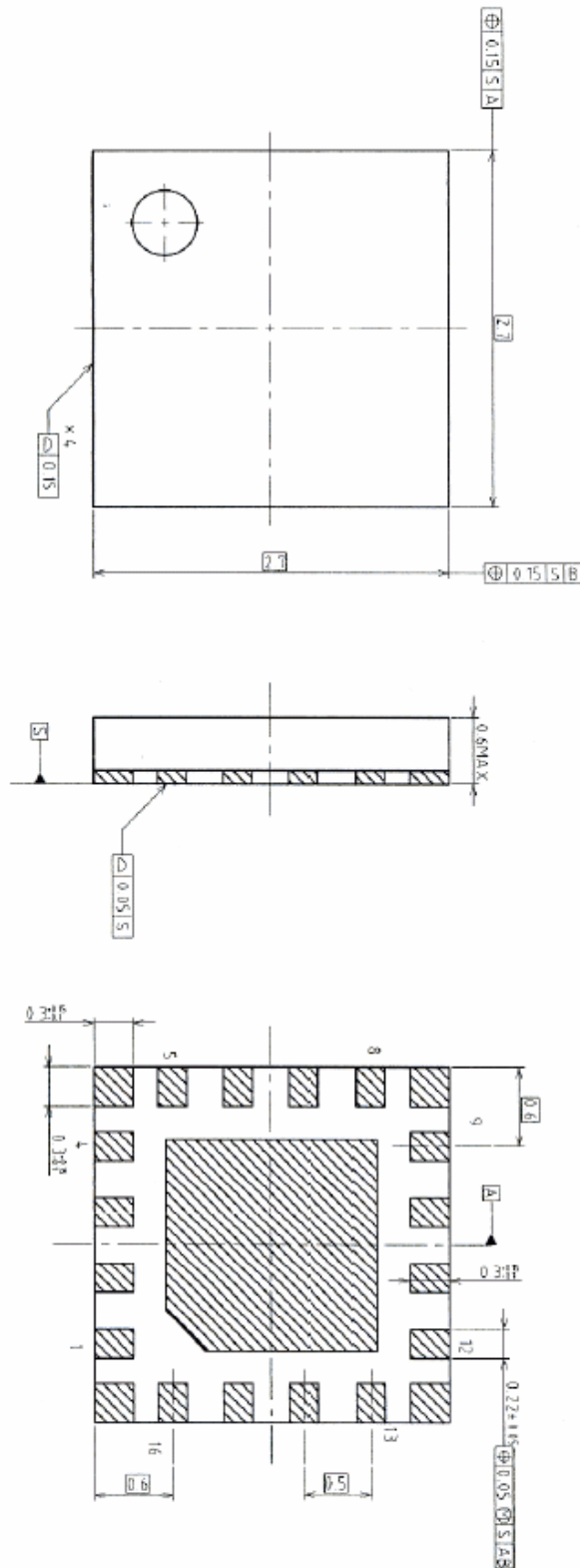
**Note:** Please connect the noise-absorbing condensers C1, C2, C3, C4 the closest you can to the IC pins.

**Warning:** Please keep in mind the risk of discrepancy or breakdown of the supply pins (Vcc, VM) ~ GND and the output pins due to power overload in case of earth-grounding, short-circuit.

## External view diagram

P-VQON16-P-0303-0.50

Unit: mm



Weight: 0.01 g (Typ.)

Note : The  $\pm 0.15$  of the side part of the package is set to 0.15Max according to the projected length of the package upper part.

**RESTRICTIONS ON PRODUCT USE**

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