

TOSHIBA Bi-CMOS INTEGRATED CIRCUIT SILICON MONOLITHIC

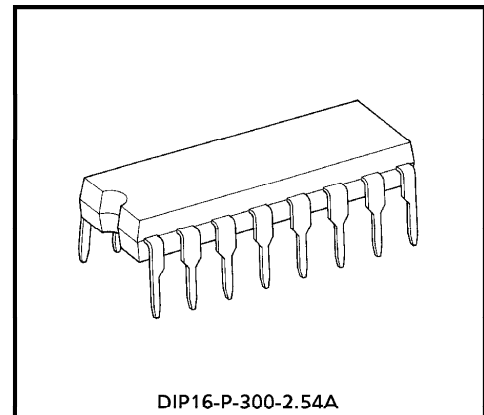
# TB6501P

## Bridge Driver with Rotation Detector

The TB6501P is Bridge Driver.  
Forward Rotation, Reverse Rotation, Stop and Breaking Operations are available.

### FEATURES

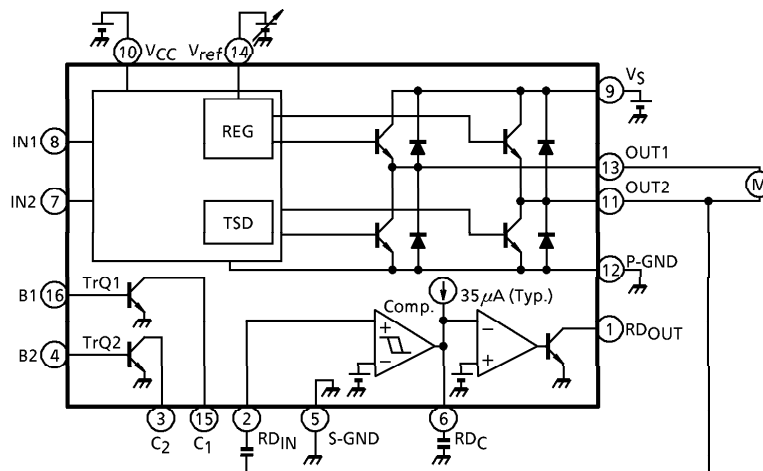
- TB6501P has RD (Rotation Detector).
- Output current up to 0.4A (AVE.) to 1.0A (PEAK).
- Wide Range of Operating Supply Voltage  
 $V_{CC} (opr.) = 4.5 \sim 20V$   
 $V_S (opr.) = 0 \sim 20V$   
 $V_{ref} (opr.) = 0 \sim 20V (V_{ref} \leq V_S)$
- Thermal shutdown, Over current protector, and Standby circuit built in.



DIP16-P-300-2.54A

Weight : 1.11g (Typ.)

### BLOCK DIAGRAM



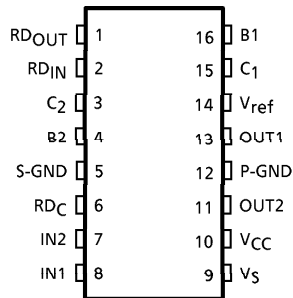
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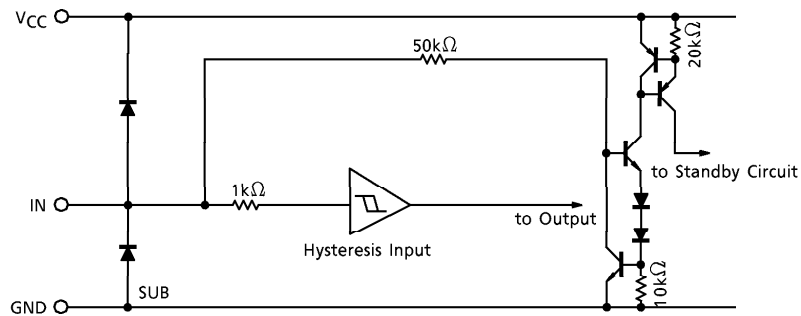
**PIN FUNCTION**

PIN No.	SYMBOL	FUNCTIONAL DESCRIPTION
1	RD <sub>OUT</sub>	Rotation detector output terminal
2	RD <sub>IN</sub>	Rotation detector input terminal
3	C <sub>2</sub>	NPN transistor collector terminal
4	B <sub>2</sub>	NPN transistor base terminal
5	S-GND	Signal GND terminal
6	RD <sub>C</sub>	Rotation detector capacitor connection terminal
7	IN <sub>2</sub>	Input 2 terminal
8	IN <sub>1</sub>	Input 1 terminal
9	V <sub>S</sub>	Power voltage supply terminal for motor driver
10	V <sub>CC</sub>	Power voltage supply terminal for logic
11	OUT <sub>2</sub>	Output 2 terminal
12	P-GND	Power GND terminal
13	OUT <sub>1</sub>	Output 1 terminal
14	V <sub>ref</sub>	Power voltage supply terminal for controller
15	C <sub>1</sub>	NPN transistor collector terminal
16	B <sub>1</sub>	NPN transistor base terminal

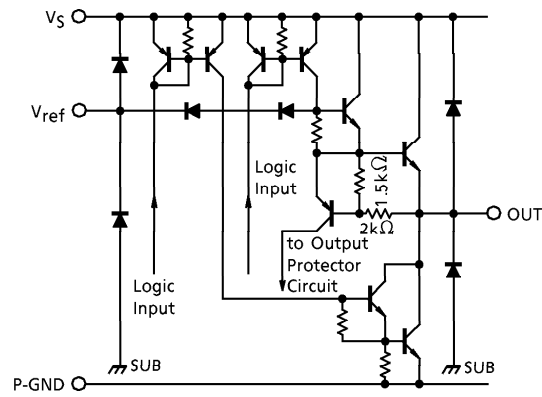
**PIN CONNECTION**



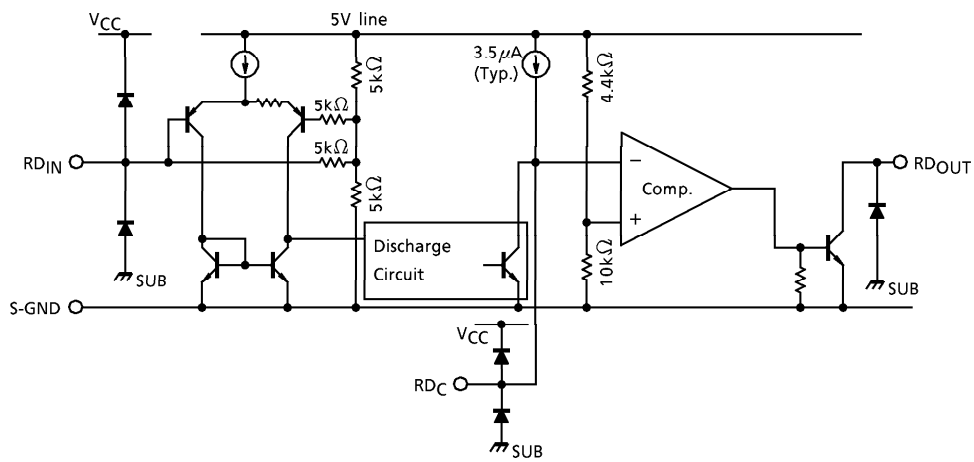
**INPUT CIRCUIT**



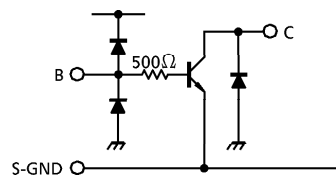
OUTPUT CIRCUIT



ROTATION DETECTOR CIRCUIT



TrQ1, TrQ2 CIRCUIT



**FUNCTION**

INPUT		OUTPUT		MODE
IN1	IN2	OUT1	OUT2	MOTOR
0	0	∞	∞	STOP
1	0	H	L	CW / CCW
0	1	L	H	CCW / CW
1	1	L	L	BRAKE

∞ : High Impedance

(Note) Inputs are all high active type.

**MAXIMUM RATINGS (Ta = 25°C)**

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V <sub>CC</sub>	25	V
Motor Drive Voltage	V <sub>S</sub>	25	V
Reference Voltage	V <sub>ref</sub>	25	V
Output Current	PEAK	I <sub>O</sub> (PEAK)	(Note) 1.0
	AVE.	I <sub>O</sub> (AVE.)	0.4
	RD	I <sub>RD</sub> (PEAK)	(Note) 20
	TR	I <sub>TR</sub> (PEAK)	(Note) 50
Power Dissipation	P <sub>D</sub>	1.2	W
Operating Temperature	T <sub>opr</sub>	- 30~75	°C
Storage Temperature	T <sub>stg</sub>	- 55~150	°C

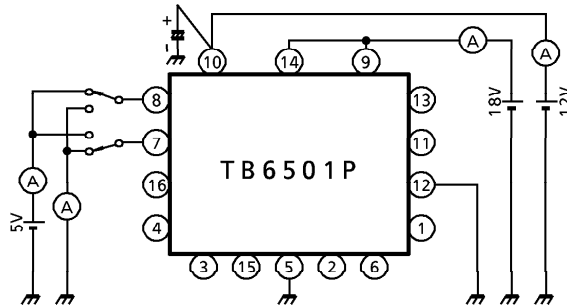
(Note) t = 0.1s

ELECTRICAL CHARACTERISTICS (Ta = 25°C, VCC = 12V, VS = 18V)

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current		ICC1	—	Output open CW / CCW mode	—	8.2	12	mA
		ICC2	—	Output open STOP mode	—	400	750	μA
		ICC3	—	Output open BREAK mode	—	8.2	12	mA
		IS1	—	Output open CW / CCW mode Vref = VS	—	5.2	11	mA
		IS2	—	Output open STOP mode Vref = VS	—	0	50	μA
		IS3	—	Output open BREAK mode Vref = VS	—	6.8	13	mA
Input Operating Voltage	1 (High)	VIN1	—	Tj = 25°C	3.5	—	5.5	V
	2 (Low)	VIN2	—	Tj = 25°C	GND	—	0.8	
Input Current		IIN	—	シンク VIN = 5V	—	37	80	μA
Input Hysteresis Voltage		ΔVT	—	—	—	0.55	—	V
Saturation Voltage		VSAT U-1	—	Vref = VS IO = 0.2A Output VS CW / CCW mode	—	1.6	—	V
		VSAT L-1	—	Vref = VS IO = 0.2A Output GND CW / CCW mode	—	0.8	—	V
		VSAT U-2	—	Vref = VS IO = 0.4A Output VS CW / CCW mode	—	1.75	2.3	V
		VSAT L-2	—	Vref = VS IO = 0.4A Output GND CW / CCW mode	—	0.9	1.3	V
		VSAT U-3	—	Vref = VS IO = 1.0A Output VS CW / CCW mode	—	2.25	2.6	V
		VSAT L-3	—	Vref = VS IO = 1.0A Output GND CW / CCW mode	—	1.2	1.6	V
Output Voltage		VSAT U-1'	—	Vref = 10V IO = 0.2A Output GND CW / CCW mode	9.3	10	10.7	V
		VSAT U-2'	—	Vref = 10V IO = 0.4A Output GND CW / CCW mode	9.3	10	10.7	V
Leaking Current		ILU	—	VL = 25V	—	0	50	μA
		ILL	—	VL = 25V	—	0	50	
Diode Forward Voltage	Upper	VF U-1	—	IF = 0.4A	—	1.5	—	V
		VF U-2	—	IF = 1A	—	2.5	—	
	Lower	VF L-1	—	IF = 0.4A	—	1.0	—	
		VF L-2	—	IF = 1A	—	1.3	—	
Reference Current		Iref	—	Vref = 10V Source Typ.	—	1	—	mA
RD Output Saturation Voltage		VSAT RD	—	IRD = 5mA	—	0.18	0.35	V
TR Output Saturation Voltage		VSAT TR	—	ITR = 10mA	—	4	0.65	V
RDC Charge Current		IRDC	—	—	21	35	55	μA
RD Detective Sensitivity	Detective Level	RD (ON)	—	AC coupling sine wave input RDC = 10μF	14	—	—	mV
	Undetective Level	RD (OFF)	—		—	—	7	
Thermal Shutdown Operating Temperature		TTSD	—	Tj	160	—	—	°C

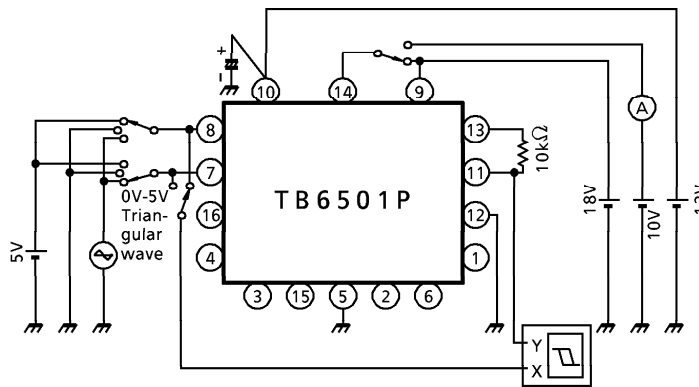
**TEST CIRCUIT 1**

$I_{CC1}$ ,  $I_{CC2}$ ,  $I_{CC3}$ ,  $I_{IN}$ ,  $I_{S1}$ ,  $I_{S2}$ ,  $I_{S3}$



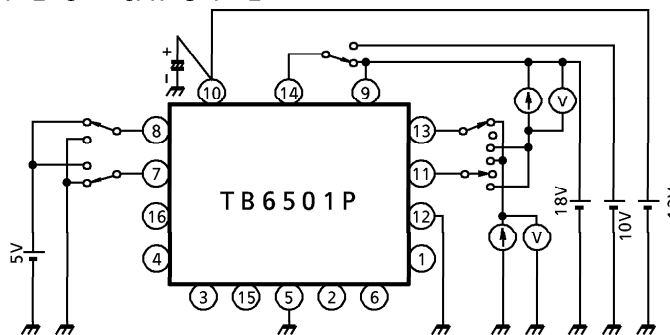
**TEST CIRCUIT 2**

$V_{IN1}$ ,  $V_{IN2}$ ,  $\Delta V_T$



**TEST CIRCUIT 3**

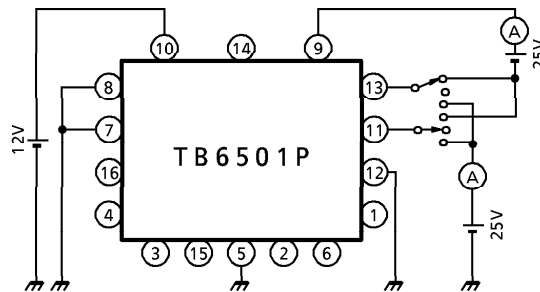
$V_{SAT U-1, 2, 3}$   $V_{SAT L-1, 2, 3}$   $V_{SAT U-1', 2'}$



(Note) Calibrate  $I_O$  to 0.2/0.4/1.0A by  $R_L$ .

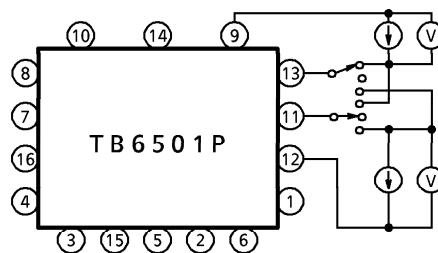
TEST CIRCUIT 4

$I_{LU}, I_{LL}$



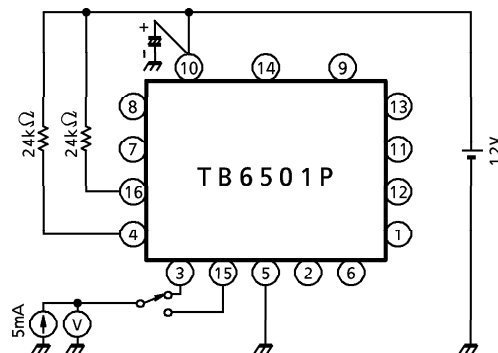
TEST CIRCUIT 5

$V_F U-1, 2 \quad V_F L-1, 2$



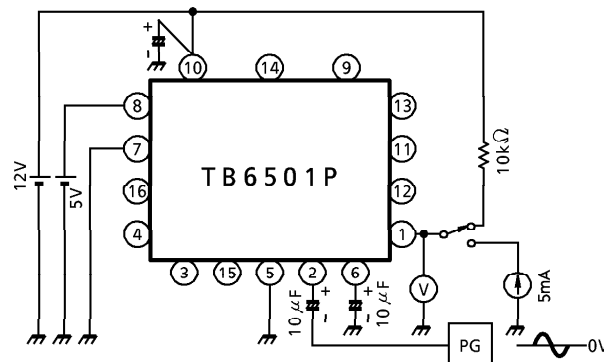
TEST CIRCUIT 6

$V_{SAT TR.}$



TEST CIRCUIT 7

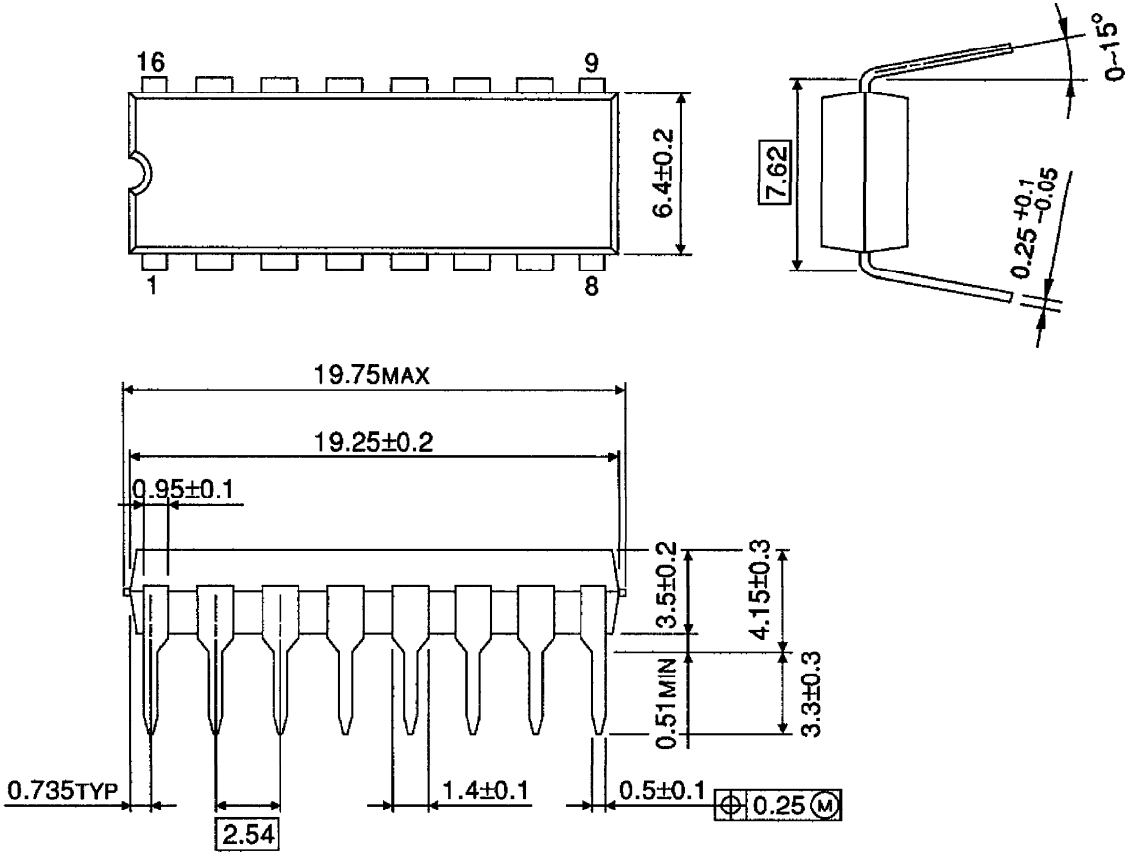
$V_{SAT RD} \quad RD \text{ Sensitivity}$



(Note) Utmost care is necessary in the design of the output line,  $V_S$ ,  $V_{CC}$  and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.

OUTLINE DRAWING  
DIP16-P-300-2.54A

Unit : mm



Weight : 1.11g (Typ.)