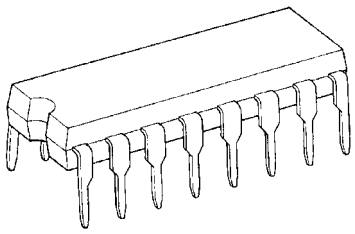
TOSHIBA Bi−CMOS INTEGRATED CIRCUIT SILICON MONOLITHIC

TB6501P

Bridge Driver with Rotation Detector

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



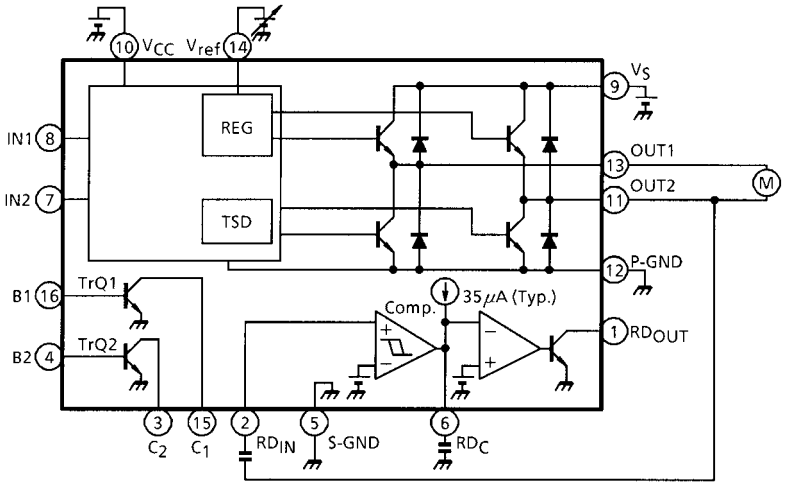
DIP16-P-300-2.54A

Weight: 1.11g (Typ.)

FEATURES

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

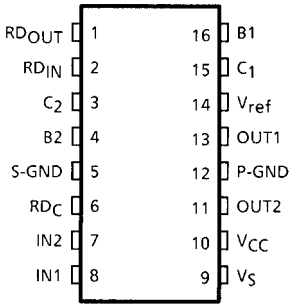
BLOCK DIAGRAM



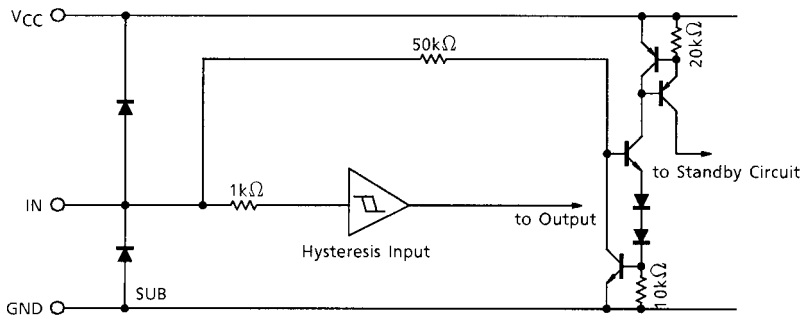
PIN FUNCTION

PIN No.	SYMBOL	FUNCTIONAL DESCRIPTION
1	RD_{OUT}	Rotation detector output terminal
2	RD_{IN}	Rotation detector input terminal
3	C_2	NPN transistor collector terminal
4	B2	NPN transistor base terminal
5	S−GND	Signal GND terminal
6	RD_C	Rotation detector capacitor connection terminal
7	IN2	Input 2 terminal
8	IN1	Input 1 terminal
9	V_S	Power voltage supply terminal for motor driver
10	V_{CC}	Power voltage supply terminal for logic
11	OUT2	Output 2 terminal
12	P−GND	Power GND terminal
13	OUT1	Output 1 terminal
14	V_{ref}	Power voltage supply terminal for controller
15	C_1	NPN transistor collector terminal
16	B1	NPN transistor base terminal

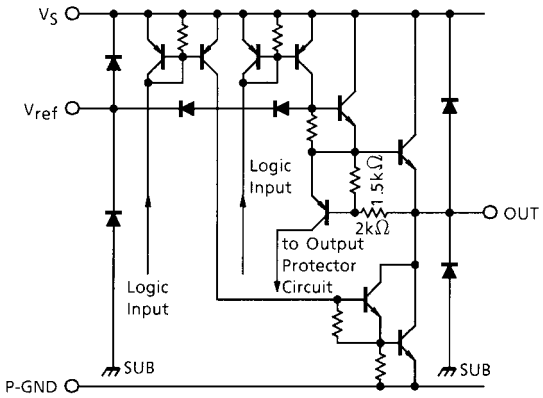
PIN CONNECTION



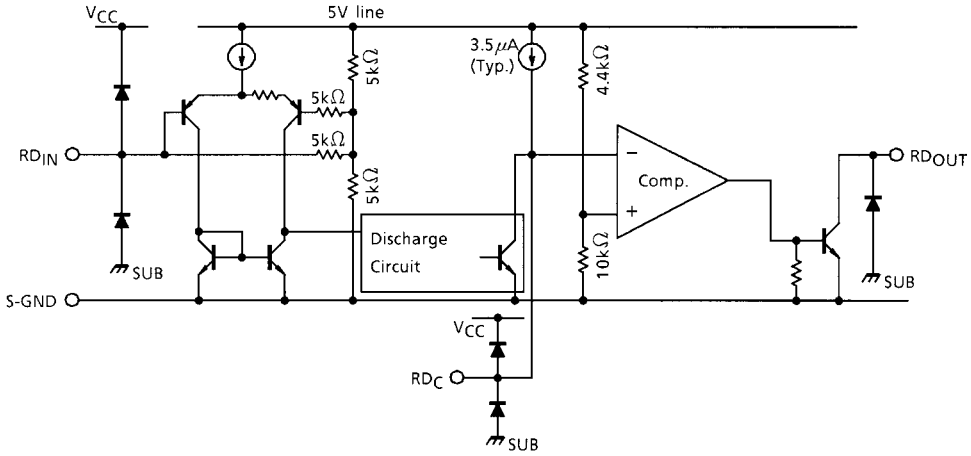
INPUT CIRCUIT



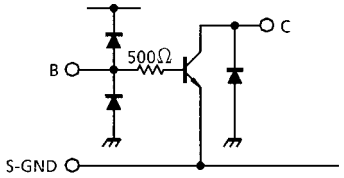
OUTPUT CIRCUIT



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)

CHARACTERISTICS		SYMBOL	RATING	UNIT
Supply Voltage		V_{CC}	25	V
Motor Drive Voltage		V_S	25	V
Reference Voltage		V_{ref}	25	V
Output Current	PEAK	$I_{O\ (PEAK)}$	1.0 (Note)	A
	AVE.	$I_{O\ (AVE.)}$	0.4	
	RD	$I_{RD\ (PEAK)}$	20 (Note)	mA
	TR	$I_{TR\ (PEAK)}$	50 (Note)	
Power Dissipation		P_D	1.2	W
Operating Temperature		T_{opr}	−30~75	°C
Storage Temperature		T_{stg}	−55~150	°C

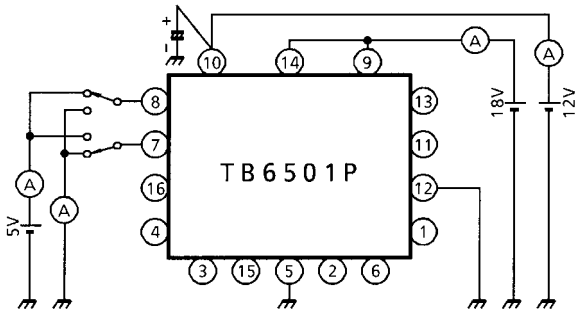
Note: $t = 0.1_S$

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

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Supply Current		I_{CC1}	—	Output open CW / CCW mode	—	8.2	12	mA
		I_{CC2}	—	Output open STOP mode	—	400	750	μA
		I_{CC3}	—	Output open BREAK mode	—	8.2	12	mA
		I_{S1}	—	Output open CW / CCW mode $V_{ref} = V_S$	—	5.2	11	mA
		I_{S2}	—	Output open STOP mode $V_{ref} = V_S$	—	0	50	μA
		I_{S3}	—	Output open BREAK mode $V_{ref} = V_S$	—	6.8	13	mA
Input OperatiLng Voltage	1 (High)	V_{IN1}	—	T_j = 25°C	3.5	—	5.5	V
	2 (Low)	V_{IN2}	—	T_j = 25°C	GND	—	0.8	
Input Current		I_{IN}	—	Sink V_{IN} = 5V	—	37	80	μA
Input Hysteresis Voltage		ΔV_T	—	—	—	0.55	—	V
Saturation Voltage		$V_{SAT\ U-1}$	—	$V_{ref} = V_S$ Output V_S I_O = 0.2 A CW / CCW mode	—	1.6	—	V
		$V_{SAT\ L-1}$	—	$V_{ref} = V_S$ Output GND IO = 0.2 A CW / CCW mode	—	0.8	—	V
		$V_{SAT\ U-2}$	—	$V_{ref} = V_S$ Output V_S I_O = 0.4 A CW / CCW mode	—	1.75	2.3	V
		$V_{SAT\ L-2}$	—	$V_{ref} = V_S$ Output GND I_O = 0.4 A CW / CCW mode	—	0.9	1.3	V
		$V_{SAT\ U-3}$	—	$V_{ref} = V_S$ Output V_S I_O = 1.0 A CW / CCW mode	—	2.25	2.6	V
		$V_{SAT\ L-3}$	—	$V_{ref} = V_S$ Output GND I_O = 1.0 A CW / CCW mode	—	1.2	1.6	V
Output Voltage		$V_{SAT\ U-1'}$	—	V_{ref} = 10 V Output GND I_O = 0.2 A CW / CW mode	9.3	10	10.7	V
		$V_{SAT\ U-2'}$	—	V_{ref} = 10 V Output GND I_O = 0.4 A CW / CCW mode	9.3	10	10.7	V
Leaking Current		I_{LU}	—	V_L = 25 V	—	0	50	μA
		I_{LL}	—	V_L = 25 V	—	0	50	
Diode Forward Voltage	Upper	$V_{F\ U-1}$	—	I_F = 0.4 A	—	1.5	—	V
		$V_{F\ U-2}$	—	I_F = 1 A	—	2.5	—	
	Lower	$V_{F\ L-1}$	—	I_F = 0.4 A	—	1.0	—	
		$V_{F\ L-2}$	—	I_F = 1 A	—	1.3	—	
Reference Current		I_{ref}	—	V_{ref} = 10 V Source Typ.	—	1	—	mA
RD Output Saturation Voltage		$V_{SAT\ RD}$	—	I_{RD} = 5 mA	—	0.18	0.35	V
TR Output Saturation Voltage		$V_{SAT\ TR}$	—	I_{TR} = 10 mA	—	4	0.65	V
RDC Charge Current		I_{RDC}	—	—	21	35	55	μA
RD Detective Sensitivity	Detective Level	$R_{D\ (ON)}$	—	AC coupling sine wave input RDC = 10 μF	14	—	—	mV
	Undetective Level	$R_{D\ (OFF)}$	—		—	—	7	
Thermal Shutdown Operating Temperature		T_{TSD}	—	T_j	160	—	—	°C

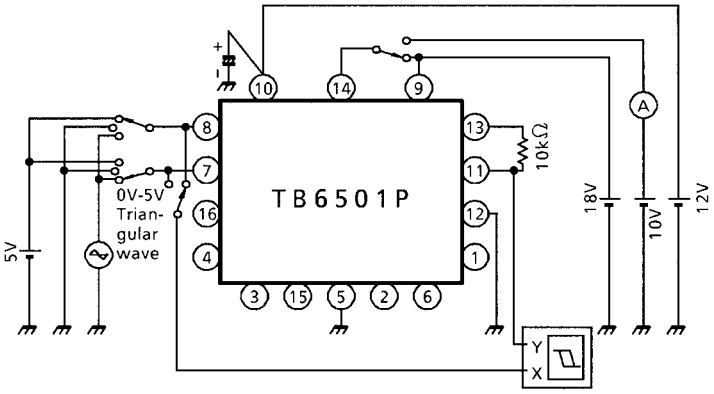
TEST CIRCUIT 1

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



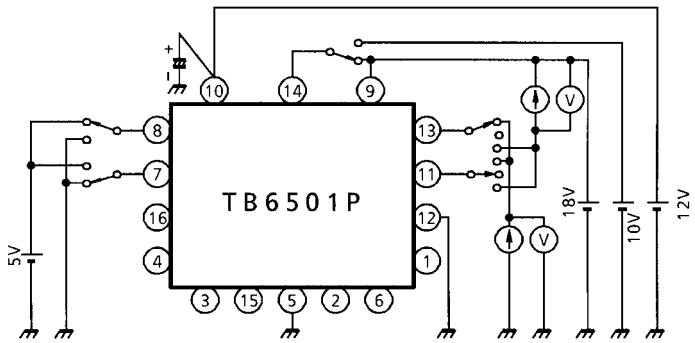
TEST CIRCUIT 2

V_{IN1}, V_{IN2}, ΔV_T



TEST CIRCUIT 3

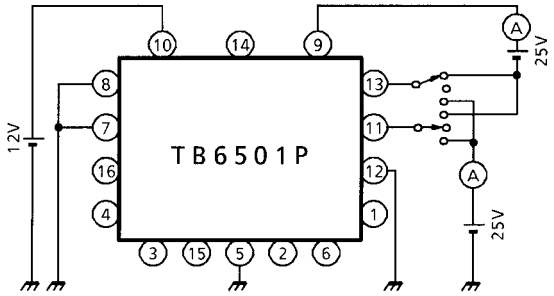
$V_{SAT\ U-1,\ 2,\ 3}$ $V_{SAT\ L-1,\ 2,\ 3}$ $V_{SAT\ U-1',\ 2'}$



Note: Calibrate I_O to 0.2 / 0.4 / 1.0 A by R_L.

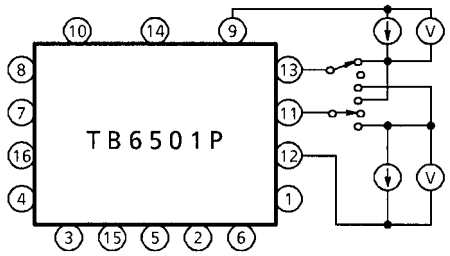
TEST CIRCUIT 4

I_{LU}, I_{LL}



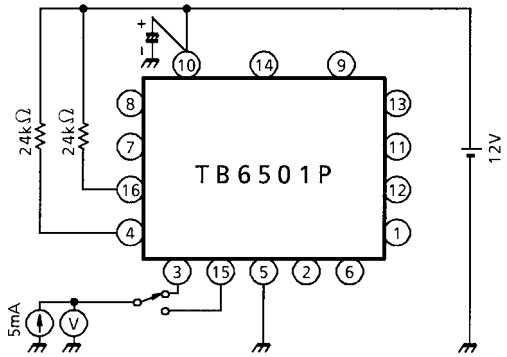
TEST CIRCUIT 5

$V_{F\ U-1,\ 2}$ $V_{F\ L-1,\ 2}$



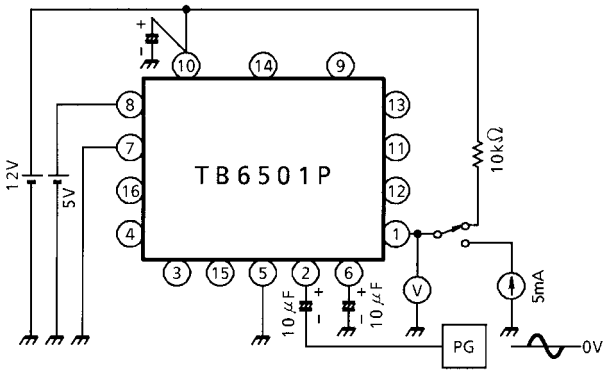
TEST CIRCUIT 6

$V_{SAT\ TR.}$



TEST CIRCUIT 7

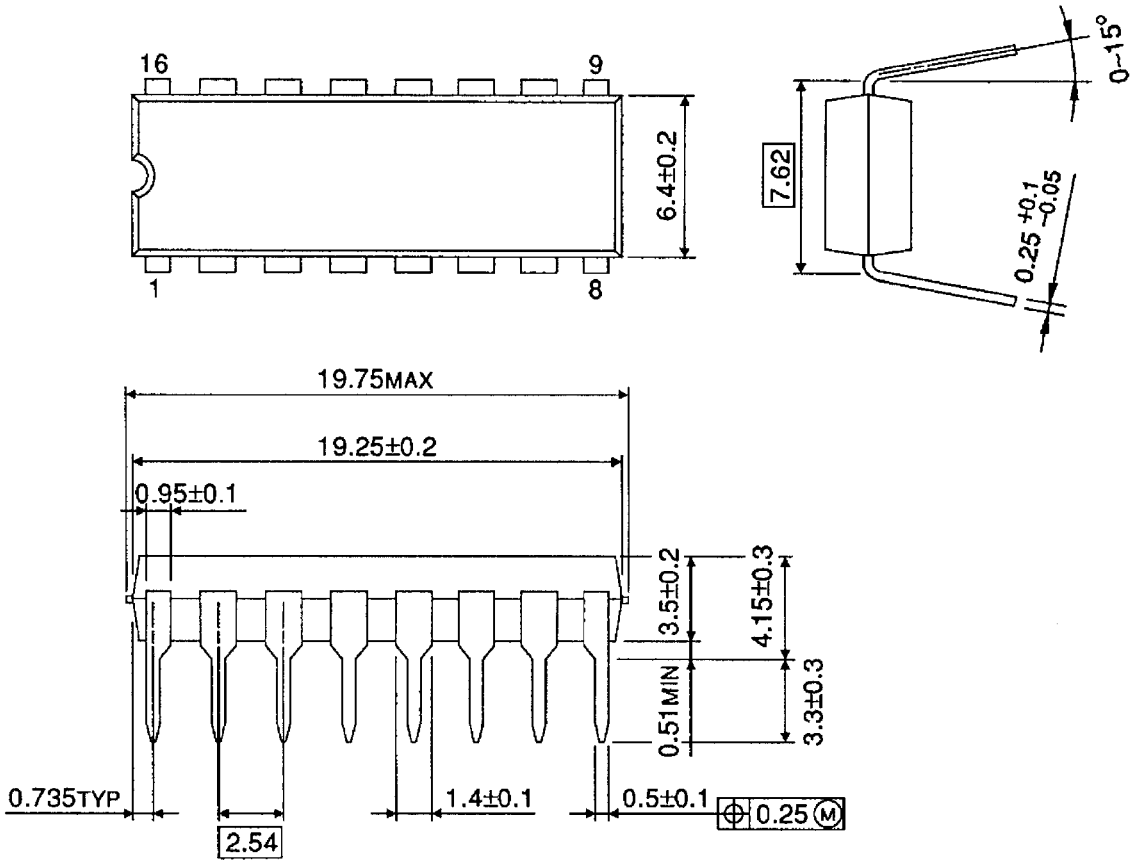
$V_{SAT\ RD}$ RD Sensitivity



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.

PACKAGE DIMENSIONS

DIP16−P−300−2.54A Unit: mm



Weight: 1.11 g (Typ.)

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000707EBA

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