

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

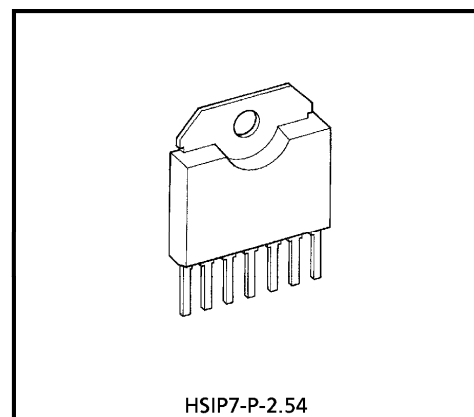
TA8050P

1.5A MOTOR DRIVER WITH BRAKE FUNCTION

The TA8050P is a 1.5A motor driver which directly drives a bidirectional DC motor. Inputs DI1 and DI2 are combined to select one of forward, reverse, stop, and brake modes. Since the inputs are TTL-compatible, this IC can be controlled directly from a CPU or other control system. The IC also has various protective functions.

FEATURES

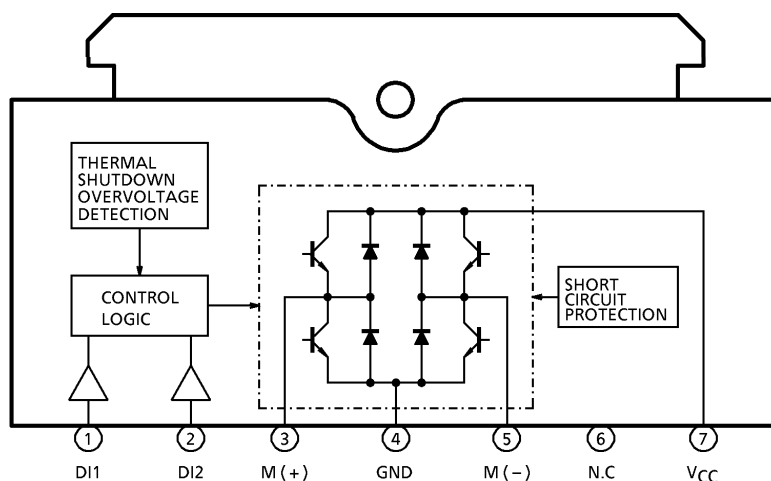
- Bidirectional DC motor driver
- Current capacity : 1.5A
- Four modes : Forward, Reverse, Stop, and Brake
- Protective functions : Thermal Shutdown, Short Circuit Protection, and Overvoltage Shutdown
- Built-in diode for counteracting counter electromotive force
- Plastic HSIP-7 pin



HSIP7-P-2.54

Weight : 1.9g (Typ.)

BLOCK DIAGRAM AND PIN LAYOUT



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PIN DESCRIPTION

PIN No.	SYMBOL	DESCRIPTION
1	DI1	Output status control pin.
2	DI2	Connects to a PNP-type voltage comparator.
3	M (+)	Connects to the DC motor. Both the sink and the source have a current capacity of 1.5A. Diodes for absorbing counter electromotive force are contained on the V _{CC} and GND sides.
4	GND	Grounded
5	M (-)	Connects to the DC motor together with pin 3 and has the same function as pin 3. This pin is controlled by the inputs from pins 1 and 2.
6	(N.C)	Not connected
7	V _{CC}	Power supply pin. This pin has a function to turn off the output when the applied voltage exceeds 27.5V, thus protecting the IC and the load.

TRUTH TABLE

Input		Output	
DI1	DI2	M (+)	M (-)
H	H	L	L
L	H	L	H
H	L	H	L
L	L	OFF (high impedance)	

(Note) (Note)

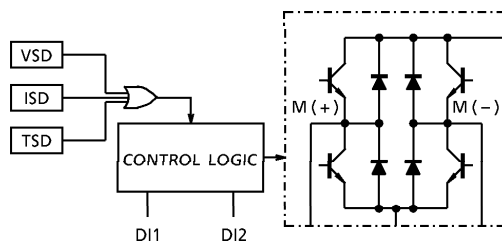
Note : Brake mode comes into effect when both M (+) and M (-) go low ; stop mode comes into effect when both M (+) and M (-) turn OFF.

DESCRIPTION OF MULTI-PROTECTIVE OPERATION

The TA8050P has functions for protection from overvoltage (V_{SD}), overcurrent (I_{SD}), and overheat (T_{SD}). These functions protect the IC (and the motor load in some cases) from deterioration or destruction due to power-related overstress.

The three functions work independently.

Each function is explained below.



1. Overvoltage protection (V_{SD})

● Basic operation

When the voltage supplied to the V_{CC} pin is up to the V_{SD} detection voltage, the output is controlled by the input signals. However, when the V_{CC} voltage exceeds the detection voltage, the output enters high-impedance state regardless of the input signals.

● Detailed explanation

The V_{SD} voltage is detected by comparing the Zener voltage with the voltage obtained by dividing V_{CC} with a resistor. When the center voltage of the resistor is higher than the Zener voltage, a transistor-off instruction is issued to the control logic. When it is lower than the Zener voltage, the logic is controlled by the input signals from pins 1 and 2.

2. Overheat protection (T_{SD})

● Basic operation

When the junction (chip) temperature is up to the T_{SD} detection temperature, the output is controlled by the input signals. When it exceeds the T_{SD} detection temperature, the output enters high-impedance state regardless of the input signals.

● Detailed explanation

The temperature is detected by monitoring V_F of a diode on the chip. When the diode V_F is lower than the internal reference voltage, an output transistor-off instruction is issued to the control logic. When it is higher than the internal reference voltage, the logic is controlled by the input signals from pins 1 and 2.

3. Overcurrent protections (I_{SD})

● Basic operation

When the output current (pin 3 or 5, I sink or I source) is up to the I_{SD} detection current, the output is controlled by the input signals. When it exceeds the detection current, the output assumes a switching waveform as shown in Fig.1.

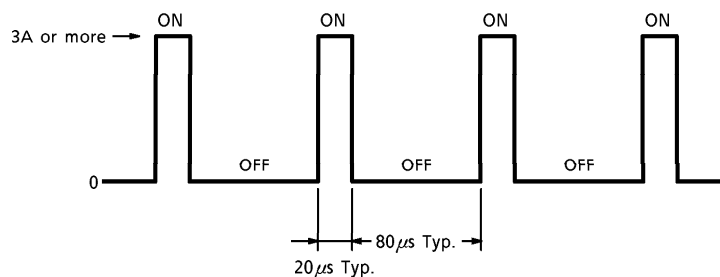


Fig.1 Basic Operation

● Detailed explanation

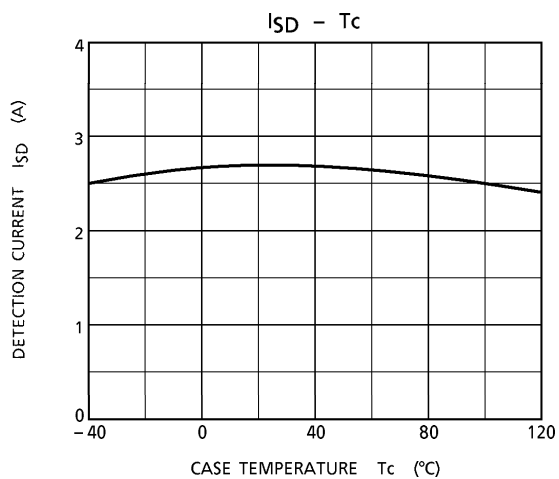
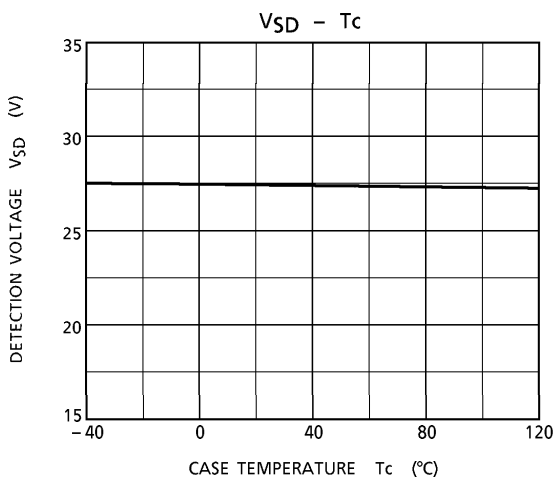
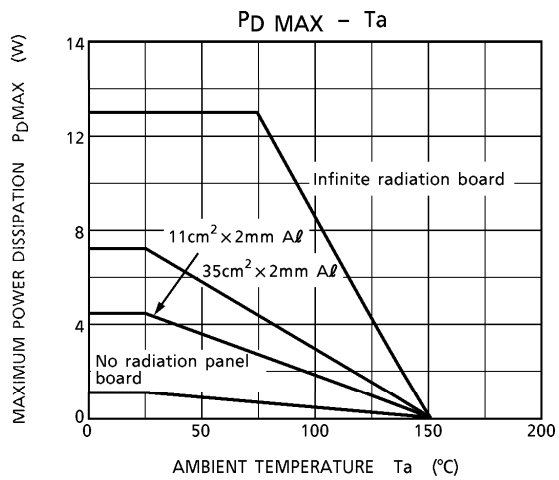
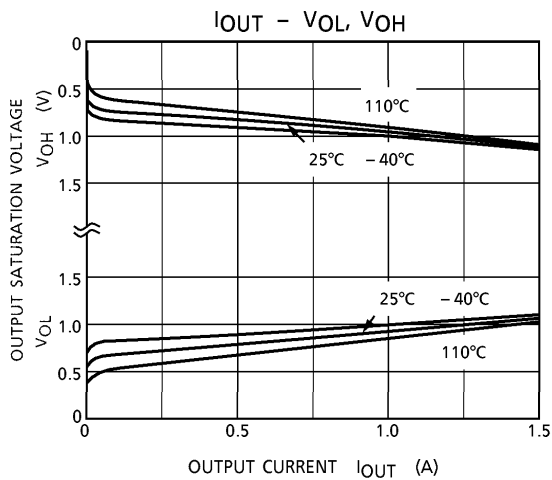
The output current is detected by monitoring the V_{BE} from each output transistor. One detection circuit connects to one of the output transistors and leads to the short-circuit protection circuit. When a current exceeding the I_{SD} detection current flows through one of the four output transistors, the short-circuit protection circuit is activated. This circuit contains a timer. When overcurrent condition continues for 20 μs (typically), the protection circuit places the output in high-impedance mode and, 80 μs (typically) later, returns the IC to ON mode. The switching-waveform output is repeated until overcurrent condition is no longer present.

MAXIMUM RATINGS (Ta = 25°C)

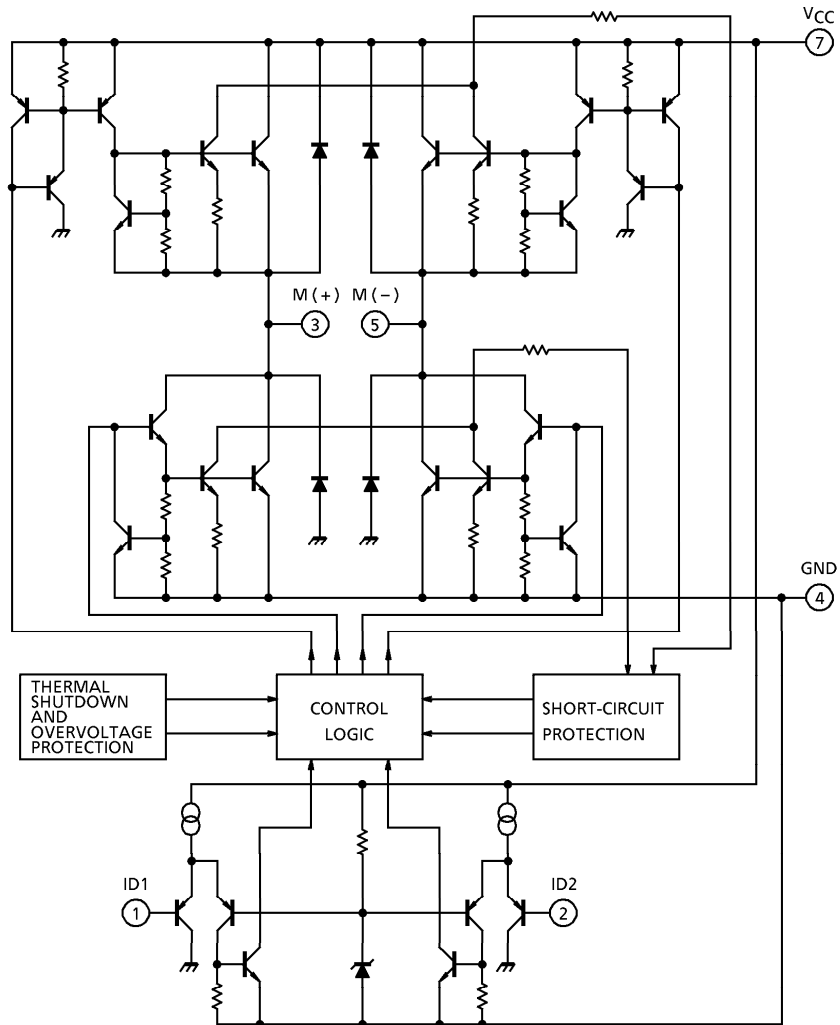
CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V _{CC}	30	V
	V _{CC}	60 (1s)	
Input Voltage	V _{IN}	-0.3 to V _{CC}	V
Output Current	I _{O·AVE}	1.5	A
Operation Temperature	T _{opr}	-40 to 110	°C
Storage Temperature	T _{stg}	-55 to 150	°C
Power Dissipation	P _D	12.5	W
Lead Temperature-time	T _{sol}	260 (10s)	°C

ELECTRICAL CHARACTERISTICS (V_{CC} = 6 to 16V, T_c = -40 to 110°C)

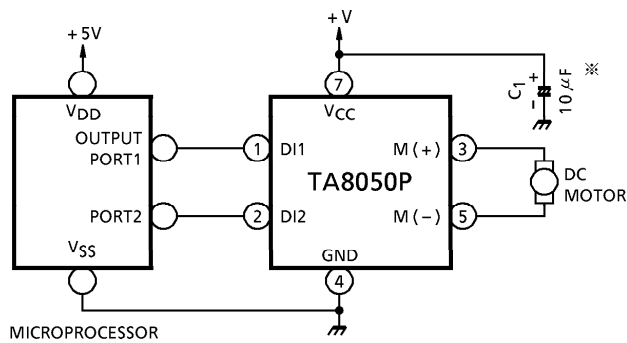
CHARACTERISTIC	SYMBOL	PIN	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Current Consumption	I _{CC1}	V _{CC}	—	Stop	—	8	15	mA
	I _{CC2}		—	Forward / Reverse	—	27	50	
	I _{CC3}		—	Brake	—	16	30	
Input Voltage	V _{IL}	DI1	—	—	—	—	0.8	V
	V _{IH}	/ DI2	—	—	2.0	—	—	
Input Current	I _{IL}	DI1	—	V _{IN} = 0.4V	—	—	-100	μA
	I _{IH}	/ DI2	—	V _{IN} = V _{CC}	—	—	100	
Output Saturation Voltage	V _{sat} (total)	M (+)	—	I _O = 1.5A, T _c = 25°C	—	2.2	2.9	V
		/ M (-)	—	I _O = 1.5A, T _c = 110°C	—	2.2	2.8	
Output Leakage Current	I _{LEAK·U}	M (+)	—	V _O = 0V	—	—	-100	μA
	I _{LEAK·L}	/ M (-)	—	V _O = V _{CC}	—	—	100	
Diode Forward Voltage	V _{F·U}	M (+)	—	I _F = 1.5A	—	2.6	—	V
	V _{F·L}	/ M (-)	—		—	1.5	—	
Overcurrent Detection	I _{SD}	—	—	—	1.8	3	4	A
Shutdown Temperature	T _{SD}	—	—	—	—	150	—	°C
Overvoltage Detection	V _{SD}	—	—	—	25	27.5	30	V
Thermal Resistance	R _{θj-c}	—	—	—	—	4	—	°C/W
Transfer Delay Time	t _{pLH}	—	—	—	—	1	10	μs
	t _{pHL}	—	—	—	—	1	10	



I/O EQUIVALENT CIRCUIT



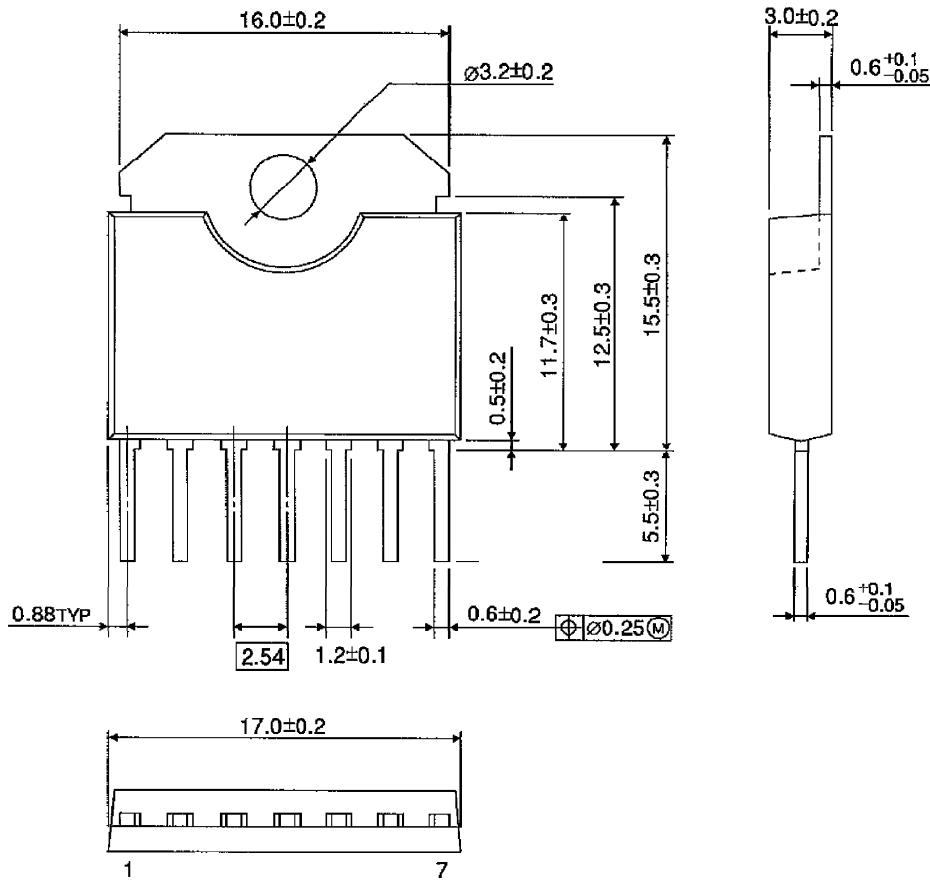
EXAMPLE OF APPLICATION CIRCUIT



※ Connect this capacitor as close to the IC as possible.

OUTLINE DRAWING
HSIP7-P-2.54

Unit : mm



Weight : 1.9g (Typ.)