

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

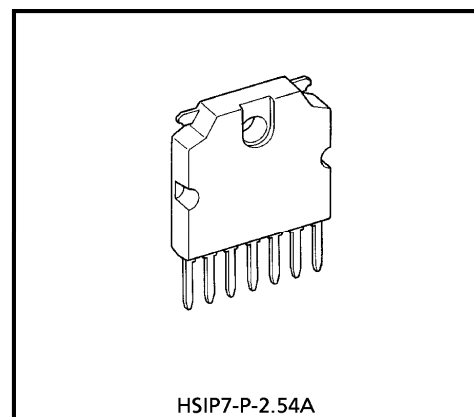
# TA8050AK

## 1.5A MOTOR DRIVER WITH BRAKE FUNCTION

The TA8050AK is a 1.5A bi-directional DC motor driver and it can switch forward, reverse, stop and brake mode with input DI1 and DI2. Protective functions are built in to protect IC and load from destruction caused of over stress.

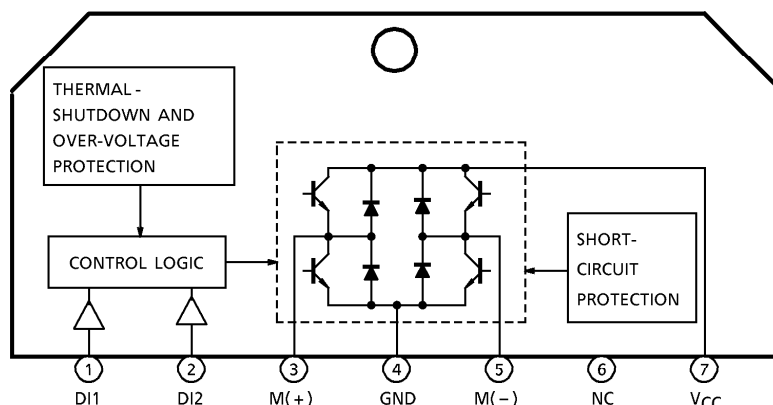
### FEATURES

- Bi-directional DC Motor Driver
- 1.5A Current Capacity
- Low standby current : 100 $\mu$ A (Max.)
- 4 Operation mode of forward, Reverse, Stop and Brake
- Built-in Protective Functions : Thermal-Shutdown  
Short-Circuit Protection  
Over-Voltage Protection
- Built-in Counter Electromotive Force Absorption Diodes
- HSIP 7 Pin Bushless Package



Weight : 2.2g (Typ.)

### BLOCK DIAGRAM AND PIN LAYOUT



961001EBA2

- TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.
- The products described in this document are subject to foreign exchange and foreign trade control laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.

**PIN DESCRIPTION**

PIN No.	SYMBOL	DESCRIPTION
1 2	DI1 DI2	This terminal controls output condition.
3	M (+)	DC motor is connected to this terminal. The output current capacity is 1.5A. Diodes for counter electromotive force absorption are built in.
4	GND	Ground Terminal.
5	M (-)	Motor is connected between 3 pin and this terminal. This terminal has the same function as 3 pin and is controlled by 1 pin and 2 pin.
6	(NC)	Non connection.
7	V <sub>CC</sub>	Power supply terminal. When the voltage higher than 30.0V is supplied, the output becomes OFF to protect the IC and load.

**TRUTH TABLE**

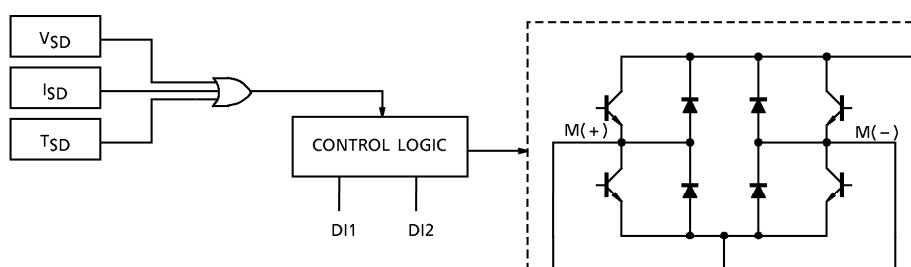
Input		Output		
DI1	DI2	M (+)	M (-)	
H	H	L	L	(Note)
L	H	L	H	
H	L	H	L	
L	L	OFF (High impedance)		(Note)

(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 TA8050AK has 3 protective functions of over voltage ( $V_{SD}$ ), over current ( $I_{SD}$ ), and thermal shut down ( $T_{SD}$ ). The purpose of these functions is to protect IC (including motor load) from destruction caused of over stress. These functions operate independently.

Description of these functions is shown below.



### 1. Over-Voltage Protection ( $V_{SD}$ )

- Basic Operation

When the supplied voltage to  $V_{CC}$  terminal is lower than the  $V_{SD}$  detection voltage, the output is controlled by the input signal and when this voltage is higher than the detection voltage, the output becomes high impedance unrelated to the input signal.

- Detail Description

$V_{SD}$  voltage detection is performed by comparing the voltage of zener and  $V_{CC}$ .

When the  $V_{CC}$  voltage 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 DI1 and DI2.

### 2. Thermal-Shutdown ( $T_{SD}$ )

- Basic Operation

When the junction temperature (chip temperature) is lower than the  $T_{SD}$  detection temperature, the output is controlled by the input signal and when it is higher, the output becomes high impedance unrelated to the input signal.

- Detail Description

Temperature detection is performed by watching  $V_F$  of an element (diode) on the chip.

When the  $V_F$  of the diode is lower than the inside reference voltage, the output is ordered to be OFF and when it is higher, the output is controlled by the input signal of 1 pin and 2 pin.

### 3. Over-Current Protection ( $I_{SD}$ )

- Basic Operation

When the output current (3 pin or 5 pin,  $I_{sink}$  or  $I_{source}$ ) is lower than the  $I_{SD}$  detection current, the output is controlled by the input signal and when it is higher, the output current flows intermittently as shown in Fig.1.

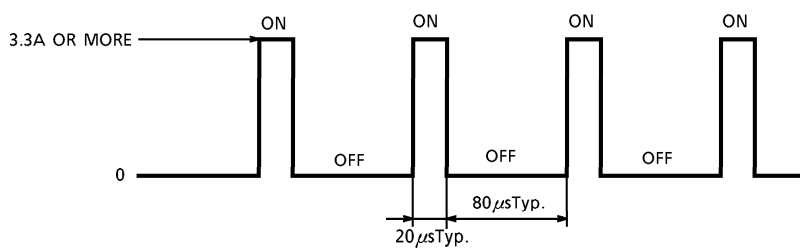


Fig. 1 Basic Operation

The short protective circuit operates when the current, higher than the  $I_{SD}$  detection current, flows.

- Detail Description

Output current detection is performed by watching the  $V_{BE}$  of the output transistors.

An element for the detection is connected to each output Transistor and then connected to the short protective circuit operates.

This circuit has a timer and when the over current condition is continued for  $20\mu s$  (Typ.), the output becomes high impedance mode and after  $80\mu s$  (Typ.) it becomes ON again. At this time, if the over current condition is still continued, this switching mode is repeated until the over current condition is disappeared.

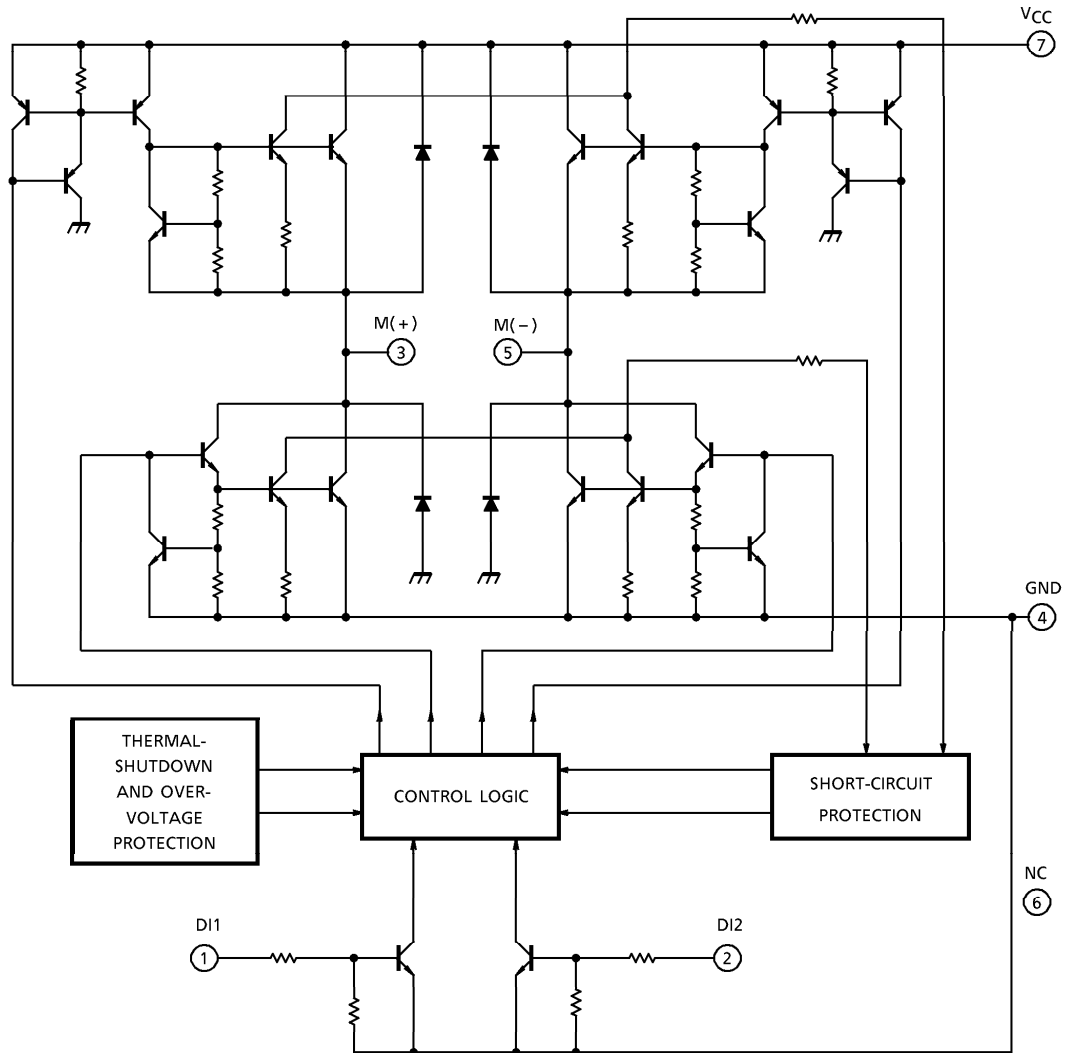
## MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V <sub>CC</sub>	30	V
	V <sub>CC</sub>	60 (1s)	
Input Voltage	V <sub>IN</sub>	-0.3~V <sub>CC</sub>	V
Output Current	I <sub>O-AVE</sub>	1.5	A
Power Dissipation	P <sub>D</sub>	12.5	W
Operation Temperature	T <sub>opr</sub>	-40~110	°C
Storage Temperature	T <sub>stg</sub>	-55~150	°C
Lead Temperature Time	T <sub>sol</sub>	260 (10s)	°C

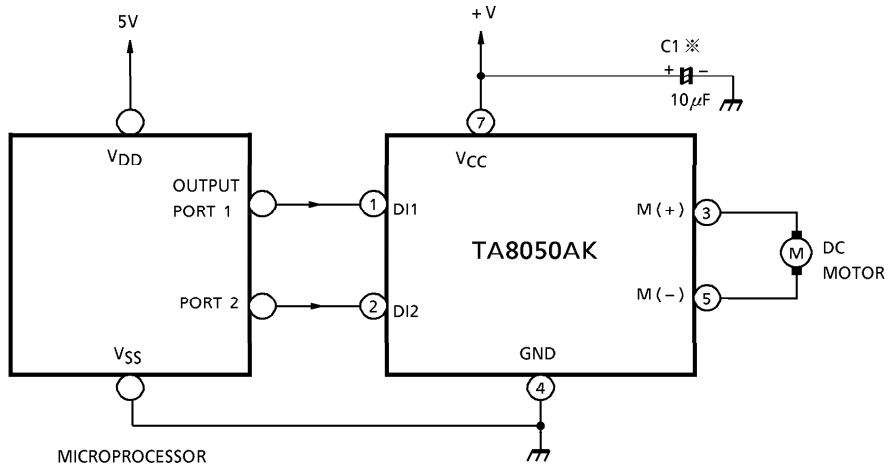
ELECTRICAL CHARACTERISTICS (V<sub>CC</sub> = 8~16V, T<sub>c</sub> = -40~110°C)

CHARACTERISTIC	SYMBOL	PIN	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Power Supply Current	I <sub>CC1</sub>	V <sub>CC</sub>	—	STOP (STANDBY)	—	—	0.1	mA
	I <sub>CC2</sub>			FORWARD / REVERSE	—	40	60	
	I <sub>CC3</sub>			BRAKE	—	27	40	
Input Voltage	V <sub>IL</sub>	DI1 /	—	—	—	—	0.8	V
	V <sub>IH</sub>	DI2		—	2.4	—	—	
Input Current	I <sub>IL</sub>	DI1	—	V <sub>IN</sub> = 0.4V	—	10	20	μA
	I <sub>IH</sub>	/ DI2		V <sub>IN</sub> = 5V	80	170	350	
Output Saturation Voltage	V <sub>sat</sub> (total)	M (+) / M (-)	—	I <sub>O</sub> = 1.5A, T <sub>c</sub> = 25°C	—	2.2	2.9	V
				I <sub>O</sub> = 1.5A, T <sub>c</sub> = 110°C	—	2.2	2.8	
Output Leakage Current	I <sub>LEAK-U</sub>	M (+) / M (-)	—	V <sub>OUT</sub> = 0V	—	—	-10	μA
	I <sub>LEAK-L</sub>			V <sub>OUT</sub> = V <sub>CC</sub>	—	—	10	
Diodes Forward Voltage	V <sub>F-U</sub>	M (+) / M (-)	—	I <sub>F</sub> = 1.5A	—	2.6	—	V
	V <sub>F-L</sub>				—	1.5	—	
Over-Current Detection	I <sub>SD</sub>	—	—	—	2.4	3.3	4.2	A
Shutdown Temperature	T <sub>SD</sub>	—	—	—	—	160	—	°C
Over-Voltage Detection	V <sub>SD</sub>	—	—	—	27	30	33	V
Thermal Resistance	R <sub>θj-c</sub>	—	—	—	—	4	—	°C/W
Transfer Delay Time	t <sub>pLH</sub>	—	—	—	—	1	10	μs
	t <sub>pHL</sub>	—	—	—	—	1	10	

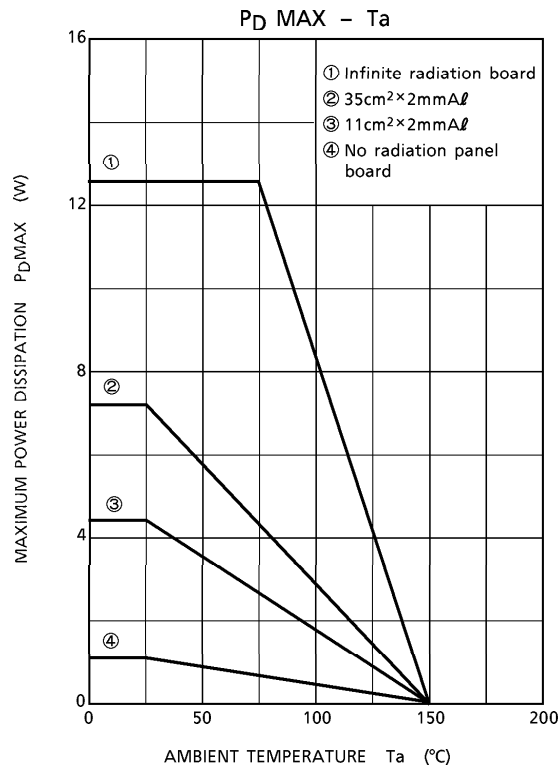
EQUIVALENT CIRCUIT



**APPLICATION CIRCUIT**

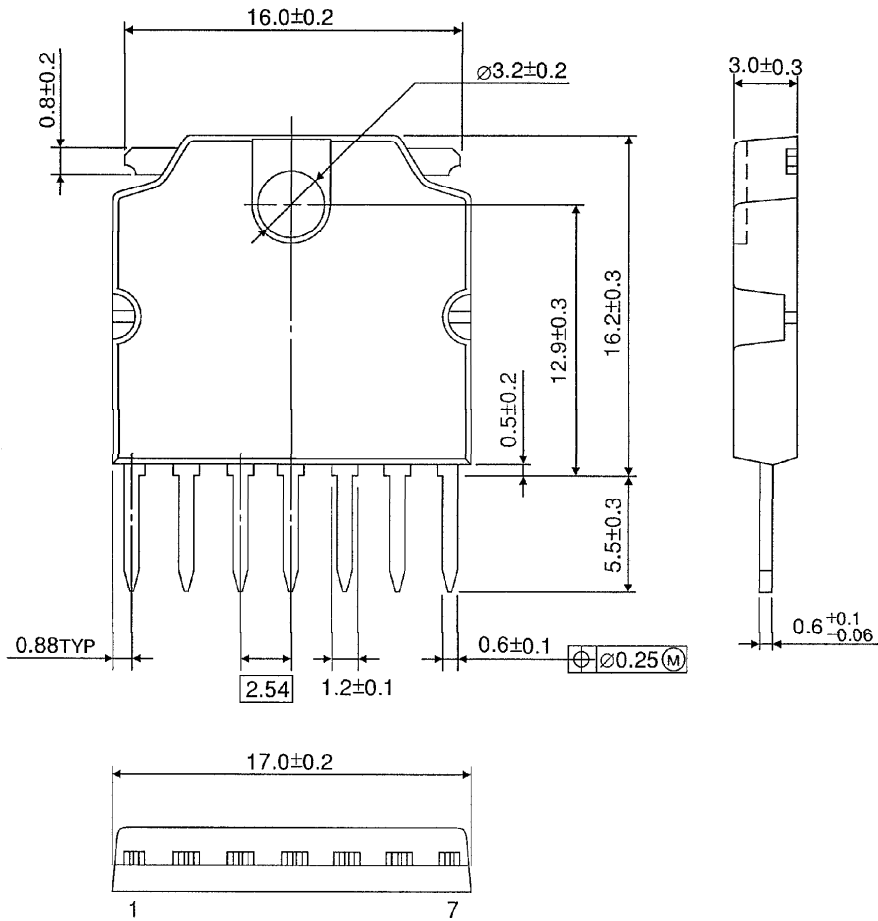


- \* **Cautions for Wiring**  
 C1 is for absorbing disturbance, noise, etc.  
 Connect it as close to IC as possible.



**OUTLINE DRAWING**  
**HSIP7-P-2.54A**

Unit : mm



Weight : 2.2g (Typ.)