

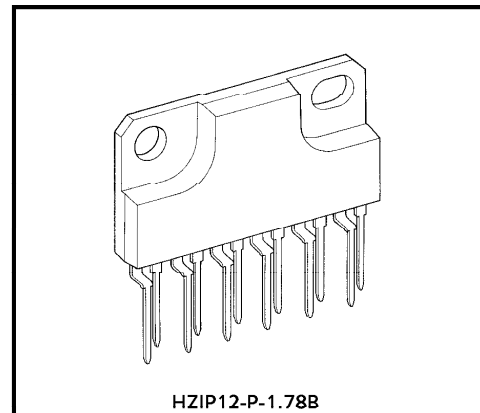
TA8051P

3A MOTOR DRIVER WITH BRAKE FUNCTION

The TA8051P is a bidirectional DC motor driver with a current capacity of 3A. Inputs DI1 and DI2 are combined to select one of forward, reverse, stop, and brake modes. The inputs are TTL-compatible, and separate power supplies are provided for the logic and output sections. The IC also incorporates standby and various protective functions.

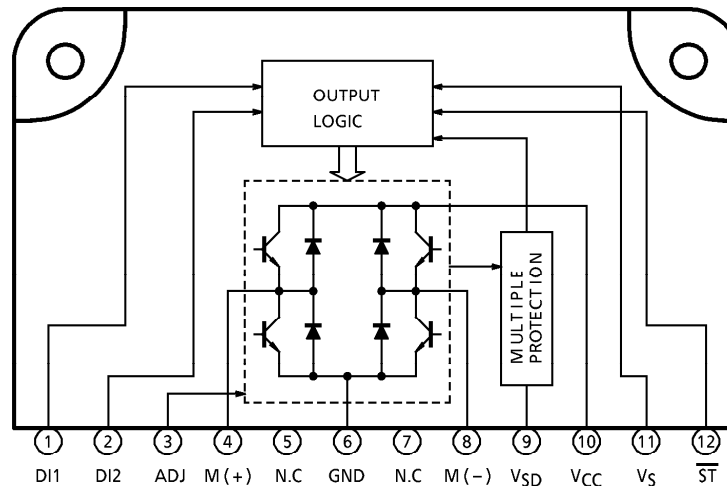
FEATURES

- Output current capacity : 3A (max.)
- Small standby current consumption : 100 μ A (max.)
- Separate V_{CC} supplies for output and logic control sections
- Four modes : Forward, reverse, stop, and brake
- Multiple protective functions : Short-circuit protection, thermal shutdown, and overvoltage shutdown
- Built-in diode for counteracting counter electromotive force
- Plastic package HZIP-12 pin



Weight : 4.0g (Typ.)

BLOCK DIAGRAM AND PIN LAYOUT



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PIN DESCRIPTION

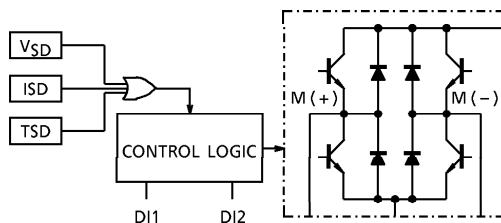
PIN No.	SYMBOL	DESCRIPTION
1	DI1	Output status control pin.
2	DI2	Connects to a PNP-type voltage comparator.
3	Adj	Overcurrent detection current setup pin. When this pin is grounded, the ISD value is increased by 1A (typically) .
4	M (+)	Connects to the DC motor. Both the sink and the source have a current capacity of 3A. Diodes for absorbing counter electromotive force are contained on the V _{CC} and GND sides.
5	N·C	Not connected
6	GND	Grounded
7	N·C	Not connected
8	M (–)	Connects to the DC motor together with pin 4 and has the same function as pin 4. This pin is controlled by the inputs from pins 1 and 2.
9	V _{SD}	Overvoltage detection pin. When a voltage higher than 27.5V (typically) is applied to this pin, the output turns off (enters stop mode) . Generally, the pin is directly connected to the V _{CC} pin (pin 10) . If overvoltage protection is not needed, the pin is opened or grounded.
10	V _{CC}	Power supply pin for the output section
11	V _S	Power supply pin for the control section. This pin is completely separated from the V _{CC} pin.
12	$\overline{ST}$	When this pin is opened or grounded, the output turns off to reduce the current consumption below 100 μ A. If standby mode is not needed, the pin connected to V _{CC} .

DESCRIPTION OF MULTI-PROTECTIVE OPERATION

The TA8051P 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 (VSD)

- 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 4 or 8, 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.

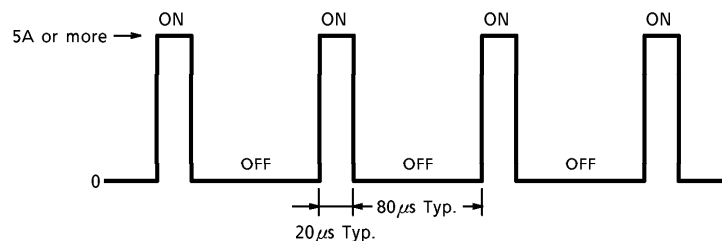


Fig.1 Basic Operation

- 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 $20\mu s$ (typically), the protection circuit places the output in high-impedance mode and, $80\mu s$ (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)

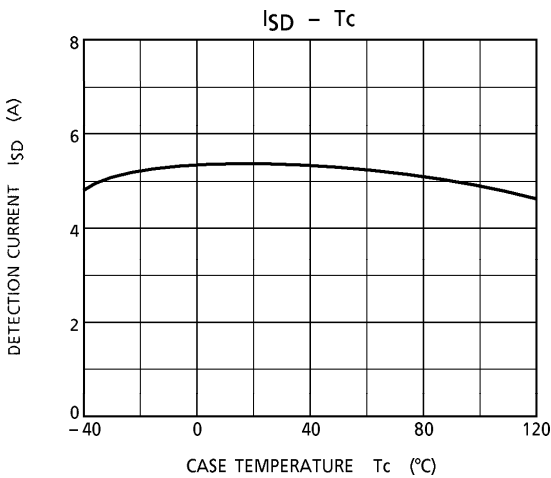
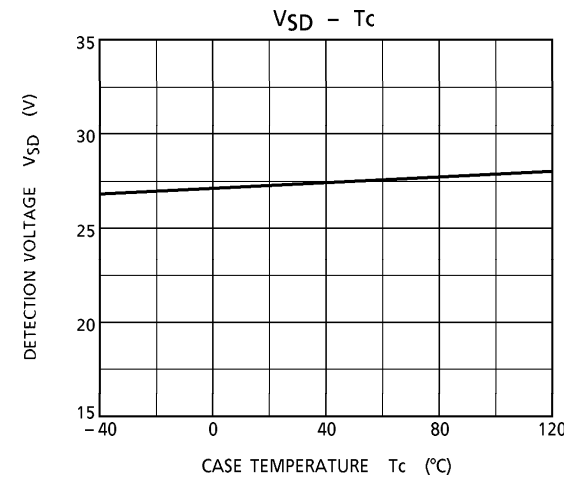
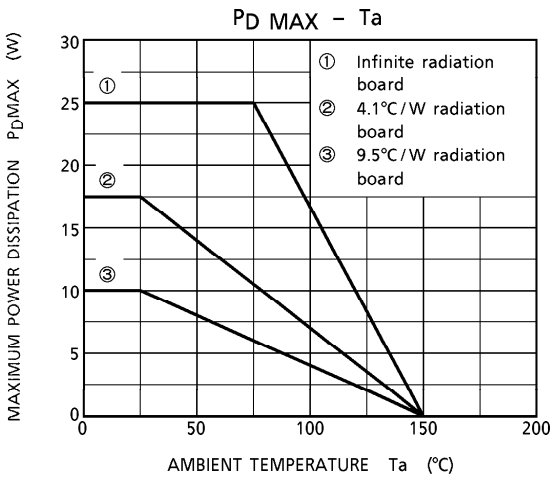
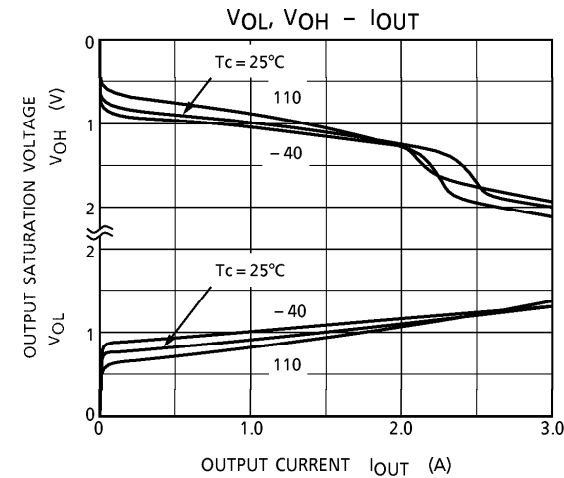
CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V _{CC}	30	V
	V _{CC}	60 (1s)	
Input Voltage	V _{IN}	-0.3 to V _{CC}	V
Output Current	I _{O AVE}	3.0	A
Operation Temperature	T _{opr}	-40 to 110	°C
Storage Temperature	T _{stg}	-55 to 150	°C
Power Dissipation	P _D	25	W
Lead Temperature-time	T _{sol}	260 (10s)	°C

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

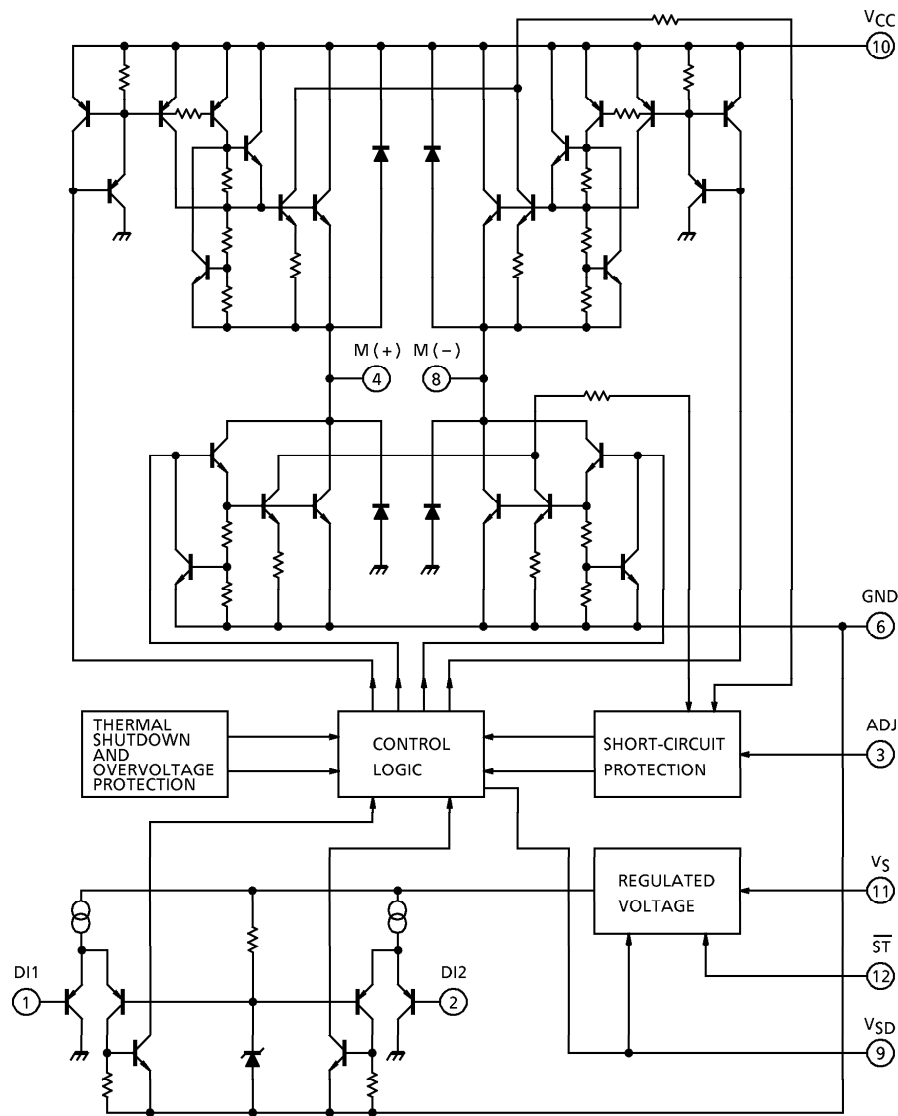
CHARACTERISTIC	SYMBOL	PIN	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Current Consumption (I)	I _{S1}	V _S	—	Stop	—	6	12	mA
	I _{S2}		—	Forward / Reverse	—	20	40	
	I _{S3}		—	Brake	—	20	40	
Current Consumption (II)	I _{CC1}	V _{CC}	—	Stop	—	3	6	mA
	I _{CC2}		—	Forward / Reverse	—	16	40	
	I _{CC3}		—	Brake	—	3	6	
Input Voltage	V _{IL}	DI1	—	—	—	—	0.8	V
	V _{IH}	/ DI2	—	—	2.0	—	—	
Input Current	I _{IL}	DI1	—	V _{IN} = 0.4	—	—	-20	μA
	I _{IH}	/ DI2	—	V _{IN} = V _{CC}	—	—	10	
Input Voltage	V _{IL}	$\overline{ST}$	—	—	—	—	0.5	V
	V _{IH}		—	—	2.0	—	—	
Input Current	I _{IL}	$\overline{ST}$	—	V _{IN} = 0.4	—	—	10	μA
	I _{IH}		—	V _{IN} = V _{CC}	—	—	1	
Output Saturation Voltage	V _{sat (total)}	M (+)	—	I _O = 1.5A	—	2.1	2.8	V
		/ M (-)	—	I _O = 3.0A	—	3.3	4.1	
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 = 3.0A	—	5.0	—	V
	V _{F-L}	/ M (-)	—	I _F = 3.0A	—	1.5	—	
Overcurrent Detection	I _{SD}	—	—	—	3.5	5	6.5	A
		—	—	Adj = GND	—	6	—	
Shutdown Temperature	T _{SD}	—	—	—	—	150	—	°C
Overvoltage Detection	V _{SD}	—	—	—	25	27.5	30	V
Standby Current	I _S	V _{CC} + V _S	—	—	—	—	100	μA
Thermal Resistance	R _{θj-c}	—	—	—	—	3	—	°C / W
Transfer Delay Time	t _{pLH}	—	—	—	—	1	10	μs
	t _{pHL}	—	—	—	—	1	10	

TRUTH TABLE

Input		Output			Output Mode
DI1	DI2	$\overline{ST}$	M (+)	M (-)	
H	H	H	L	L	BRAKE
L	H	H	L	H	REVERSE
H	L	H	H	L	FORWARD
L	L	H	OFF (high impedance)		STOP
H / L	H / L	L	OFF (high impedance)		STAND-BY

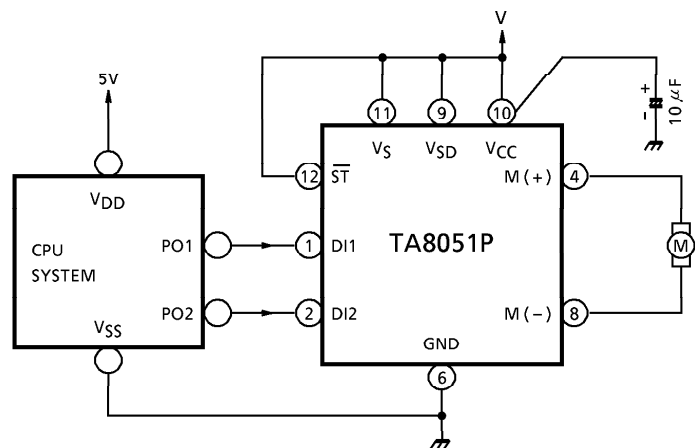


I/O EQUIVALENT CIRCUIT

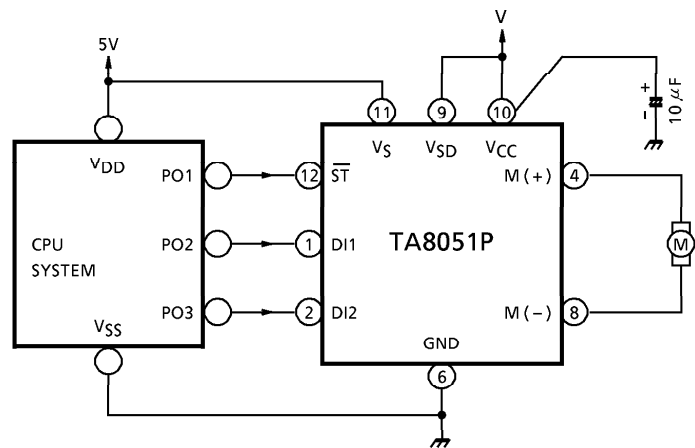


EXAMPLE OF APPLICATION CIRCUIT

1. Standard Circuit

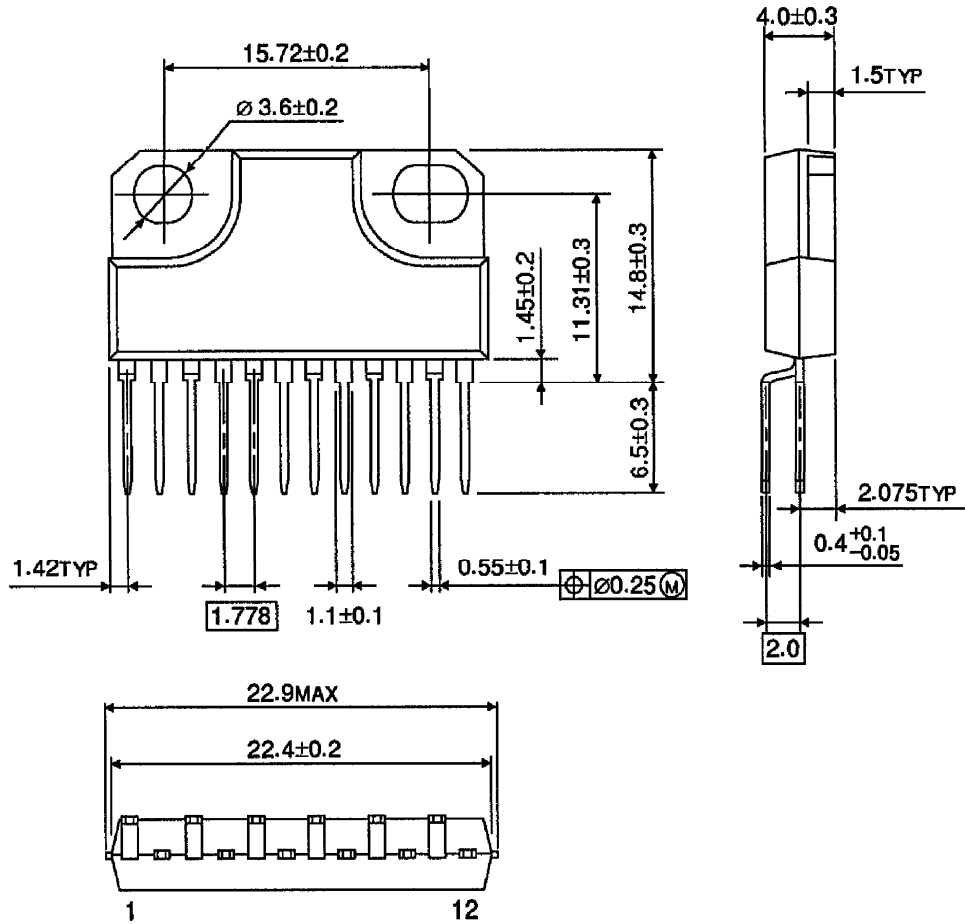


2. Power Supply Separation and Standby Functions



OUTLINE DRAWING
HZIP12-P-1.78B

Unit : mm



Weight : 4.0g (Typ.)