TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT   SILICON MONOLITHIC
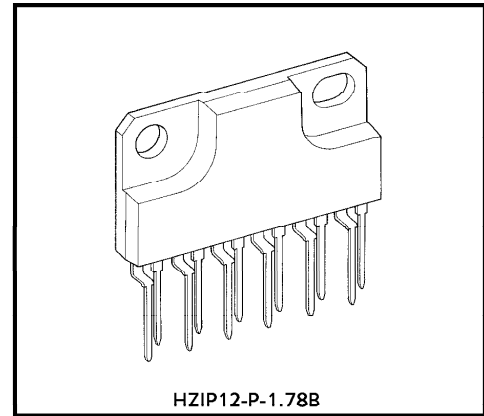
TA8440H

DC MOTOR FULL BRIDGE DRIVER

The TA8440H is a full-bridge driver for selecting the forward and reverse running of a motor with brushes and is able to control 4 modes of forward, reverse, stop and braking.
The motor driving unit and the control unit have a separate power supply line, independently and the TA8440H is also usable as a stepping motor driver.
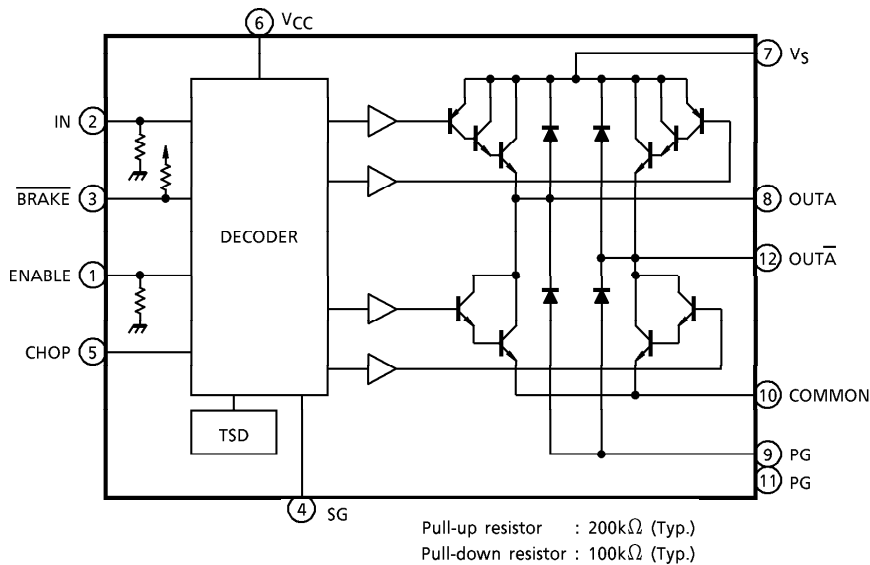
HZIP12-P-1.78B

Weight : 4.04g (Typ.)

FEATURES

● Output current is as large as 1.5A (AVE) and 3.0A (PEAK).

● 4 modes of forward, reverse, stop, and braking are available and a counter-electromotive force absorbing diode has been built-in.

● Thermal shutdown circuit incorporated.

● Input is compatible with CMOS.

● Built-in input pull-up resistor.   BRAKE = 200kΩ (Typ.)

● Built-in input pull-down resistor.   IN, ENABLE = 100kΩ (Typ.)

BLOCK DIAGRAM

Pull-up resistor   : 200kΩ (Typ.)
Pull-down resistor : 100kΩ (Typ.)

961001EBA2

PIN FUNCTION

PIN No.	SYMBOL	FUNCTIONAL DESCRIPTION
1	ENABLE	ENABLE terminal
2	IN	Forward rotation / reverse rotation switch terminal
3	$\overline{BRAKE}$	BRAKE terminal
4	SG	Signal GND
5	CHOP	PWM signal input terminal
6	V_{CC}	Power voltage supply terminal for control
7	V_S	Power voltage supply terminal for motor driver
8	OUTA	Output terminal
9	PG	Power GND
10	COMMON	COMMON terminal
11	PG	Power GND
12	$OUT\overline{A}$	Output terminal

FUNCTION

INPUT				OUTPUT		MODE
IN	$\overline{BRAKE}$	ENABLE	CHOP	OUTA	$OUT\overline{A}$	MOTOR
H	H	H	L	H	L	CW / CCW
L	H	H	L	L	H	CCW / CW
(*)	(*)	L	(*)	∞	∞	Stop
(*)	L	H	(*)	L	L	Brake
H	H	H	H	∞	L	Chop
L	H	H	H	L	∞	Chop

(*) Don't care   (∞) High impedance

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Supply Voltage		V_{CC}	7	V
		V_S	50	
Input Voltage		V_{IN}	− 0.3~V_{CC}	V
Output Current	AVE.	I_O (AVE.)	1.5	A
	PEAK	I_O (PEAK)	3.0 (Note 1)	A
Power Dissipation		P_D	2.52 (Note 2)	W
			25.0 (Note 3)	
Operating Temperature		T_{opr}	− 30~75	°C
Storage Temperature		T_{stg}	− 55~150	°C

(Note 1)   t = 100ms
(Note 2)   No heat sink
(Note 3)   Tc = 75°C

961001EBA2'

ELECTRICAL CHARACTERISTICS (V$_{CC}$ = 5V, V$_S$ = 24V, Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Input Voltage	High	V$_{IN}$ (H)	1	IN, CHOP, ENABLE, $\overline{BRAKE}$		3.5	—	V$_{CC}$	V
	Low	V$_{IN}$ (L)				GND	—	1.5	
Input Current	High	I$_{IN-1}$ (H)	1	CHOP	V$_{IN}$ = 5V	—	5	52	µA
		I$_{IN-2}$ (H)		IN, ENABLE		—	40	60	
		I$_{IN-3}$ (H)		$\overline{BRAKE}$		—	0	5.5	
Input Current	Low	I$_{IN-1}$ (L)		CHOP	V$_{IN}$ = 0V Source type	—	0	5.5	
		I$_{IN-2}$ (L)		IN, ENABLE		—	0	5.5	
		I$_{IN-3}$ (L)		$\overline{BRAKE}$		—	25	52	
Current Consumption (I)		I$_{CC1}$	2	Stop		—	6	10.5	mA
		I$_{CC2}$		Forward / reverse		—	10	14.5	
		I$_{CC3}$		Brake		—	14	18.5	
Current Consumption (II)		I$_{S1}$	2	Stop		—	2	4.2	mA
		I$_{S2}$		Forward / reverse		—	3.5	5.0	
		I$_{S3}$		Brake		—	2.5	3.7	
Output Saturation Voltage	Upper Side	V$_{sat-U1}$	3	I$_{OUT}$ = 1.5A		1.5	2.0	2.7	V
	Under Side	V$_{sat-L1}$				0.7	1.25	1.9	
	Upper Side	V$_{sat-U2}$		I$_{OUT}$ = 3.0A		2.7	3.0	3.9	
	Under Side	V$_{sat-L2}$				1.7	2.0	2.9	
Diode Forward Orientation Voltage	Upper Side	V$_{F-U1}$	—	I$_{OUT}$ = 1.5A		—	3.5	—	V
	Under Side	V$_{F-L1}$				—	1.3	—	
Output Leakage Current	Upper Side	I$_{OH}$	4	V$_S$ = 30V		—	—	200	µA
	Under Side	I$_{OL}$				—	—	100	
Shut Down Temperature		T$_{SD}$	—	—		—	170	—	°C
Transfer Time		t$_{pLH}$	—	IN-OUT		—	2.7	—	µs
		t$_{pHL}$				—	1.2	—	
		t$_{pLH}$		CHOP-OUT		—	0.7	—	
		t$_{pHL}$				—	2.5	—	
		t$_{pLH}$		ENABLE-OUT		—	2.9	—	
		t$_{pHL}$				—	1.1	—	
		t$_{pLH}$		$\overline{BRAKE}$-OUT		—	45	—	
		t$_{pHL}$				—	45	—	

TEST CIRCUIT 1. $V_{IN (H)}$, $V_{IN (L)}$, $I_{IN (H)}$, $I_{IN (L)}$
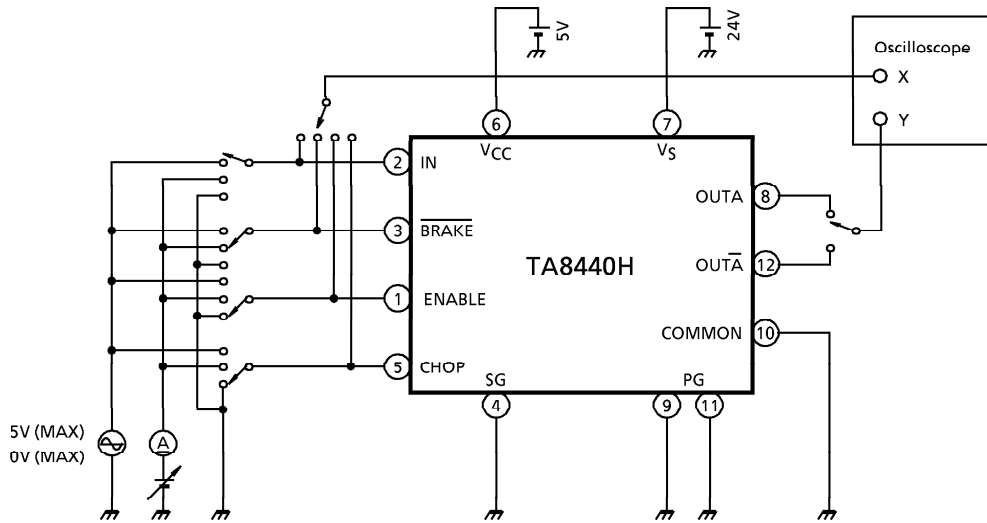
TEST CIRCUIT 2. I_{CC1}, I_{CC2}, I_{CC3}, I_{S1}, I_{S2}, I_{S3}
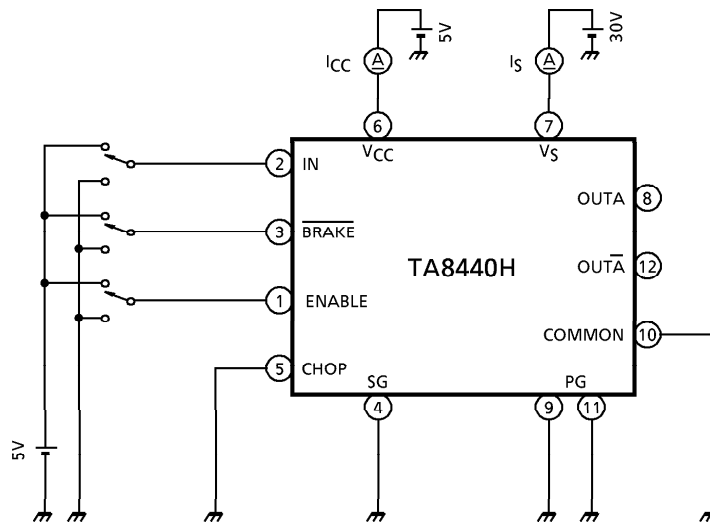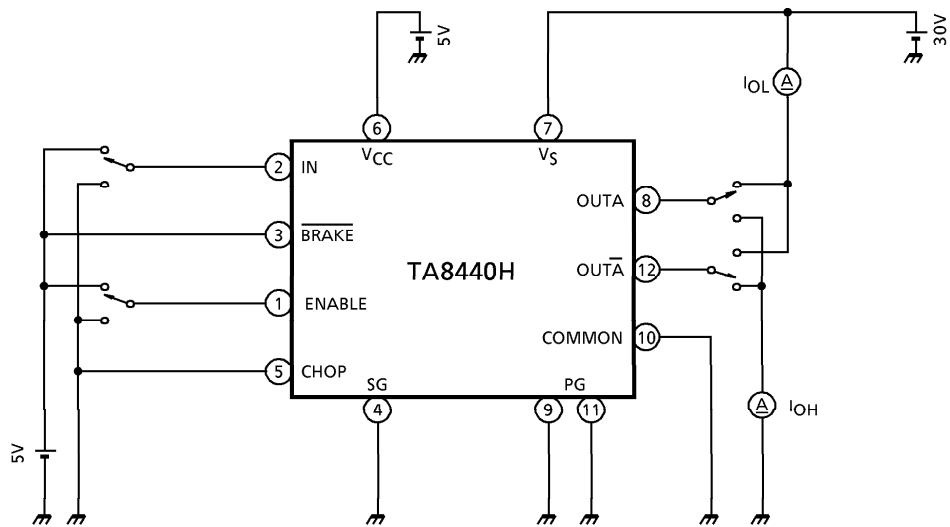
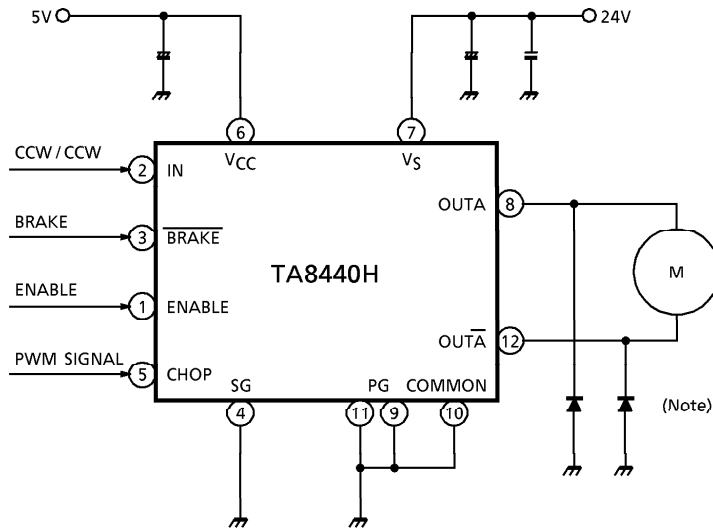**TEST CIRCUIT 3.** V_{sat-L}, V_{sat-U}
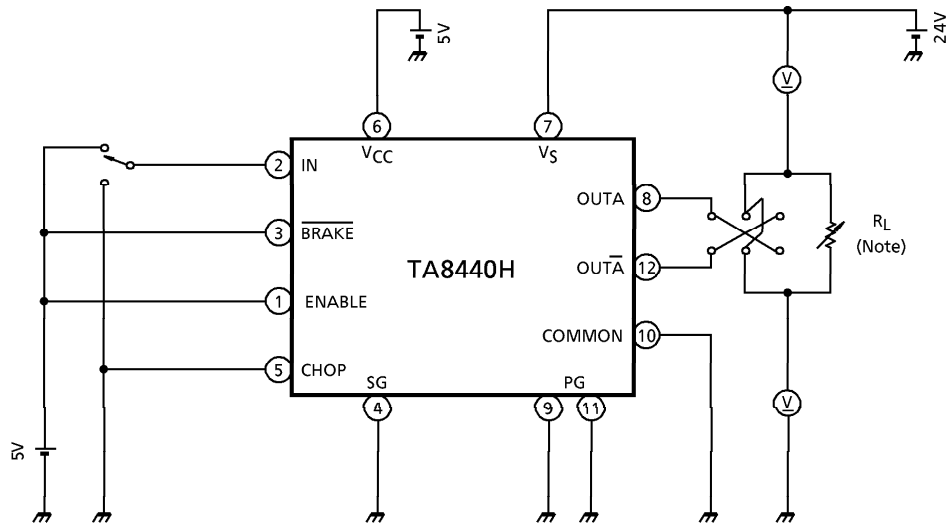
(Note) Calibrate I_{OUT} to 1.5 / 3.0A by R_L.

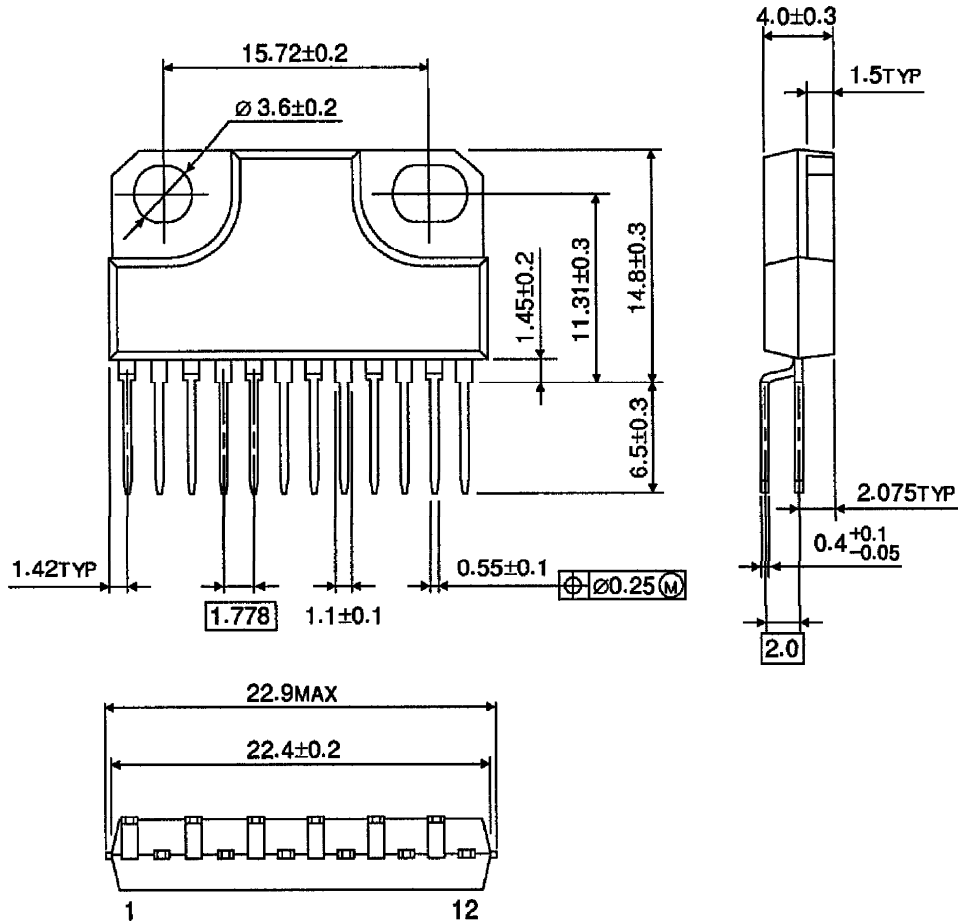**TEST CIRCUIT 4.** I_{OH}, I_{OL}

APPLICATION CIRCUIT

(Note 1)   Schottky diode (2GWJ42) to be connected additionally between each output (pin 16 / 19 / 20 / 23) and GND for preventing Punch-Through Current.

(Note 2)   Utmost care is necessary in the design of the output line, V_S and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.

OUTLINE DRAWING
HZIP12-P-1.78B   Unit : mm

15.72±0.2
Ø 3.6±0.2
4.0±0.3
1.5TYP
1.45±0.2
11.31±0.3
14.8±0.3
6.5±0.3
2.075TYP
0.4 +0.1 −0.05
1.42TYP
0.55±0.1
⊕ Ø0.25 Ⓜ
1.778
1.1±0.1
2.0

22.9MAX
22.4±0.2
1   12

Weight : 4.04g (Typ.)