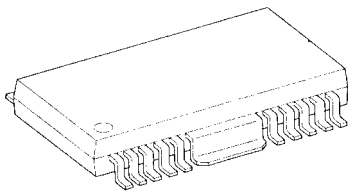
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA8068F

Intelligent Stepping Motor Driver

The TA8068F is a stepping motor driver with a current capacity of 1.5A. Inputs INA and INB are combined to control the four outputs.
Since the inputs are TTL-compatible, this IC can be controlled directly from a CPU or other control system.
The IC also incorporates various protective functions as well as a self-diagnostic function for diagnostic function for diagnostic output.



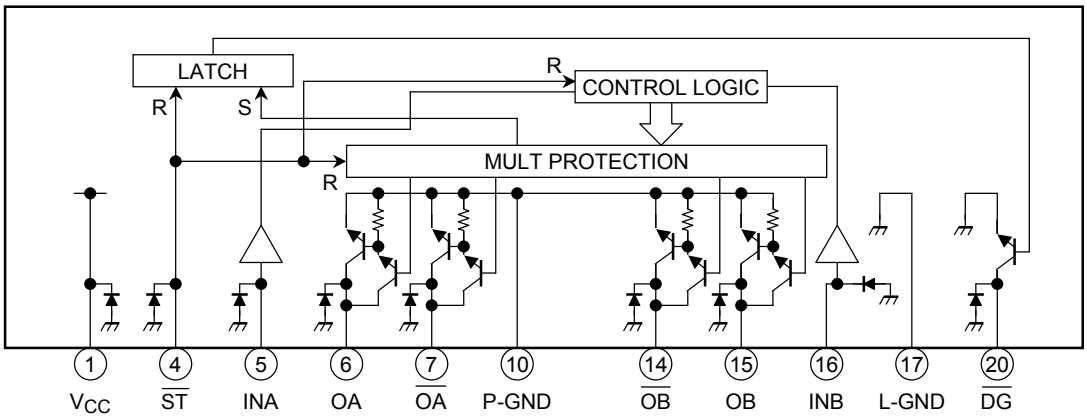
HSOP20-P-450-1.00

Weight: 0.79 g (typ.)

FEATURES

- Output current capacity : 1.5 A (max)
- Low standby current : 0.1 mA (max)
- Built−in Protective Functions : Over-Voltage Protection/ Short-Circuit Protection(latch) / Thermal-Shutdown
- Self−diagnostic Output : On Short-Circuit Detection
- Recommended operating supply voltage range : V_{CC} = 8~16 V
- Separate GND for output and logic control sections
- HSOP20-Pin Power Flat Pakage

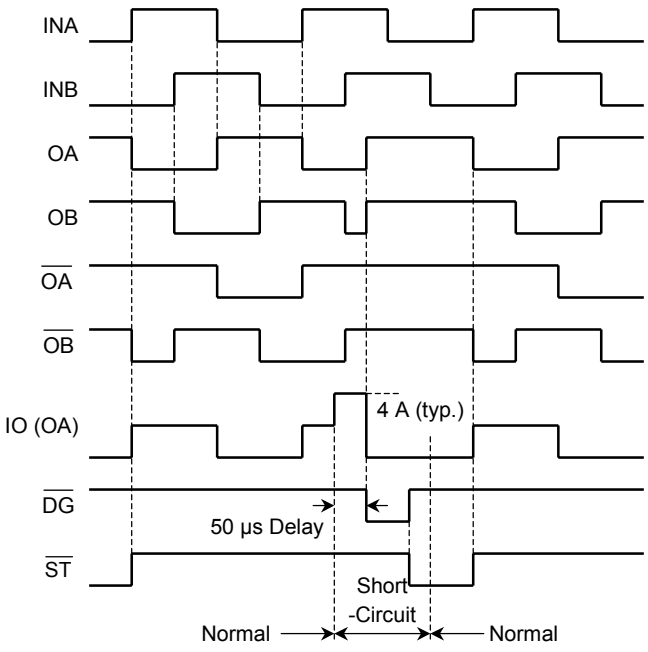
BLOCK DIAGRAM AND PIN LAYOUT



PIN DESCRIPTION

PIN No.	SYMBOL	DESCRIPTION
1	V_{CC}	Power supply pin. This pin has a function to turn off the output when the applied voltage exceeds 30V (Typ.), thus protecting the IC and the motor load.
4	$\overline{ST}$	When this pin is opened or grounded, the output turns off, thus reducing the current consumption to 100μA or less. If standby mode is not needed, the pin is connected to V_{CC}.
5	INA	This is input terminal which controls output condition of pin 6 and pin 7. PNP-type voltage comparator is built in.
6	OA	PNP-type complementary output pin with a current capacity of 1.5A. This pin is controlled by the input from pin 5. When the output is supplied with a current exceeding the detection current (4A Typ.) because of load short-circuit, the output is latched to the OFF state after a 50μs (Typ.) delay in order to protect the IC.
7	$\overline{OA}$	Output pin of the inversion of pin 6. This terminal has the same function as pin 6 and is controlled by pin 5.
10	P-GND	Ground terminal of output section which is usually connected with pin 17.
14	$\overline{OB}$	Output pin of the inversion of pin 15. This terminal has the same function as pin 6 and is controlled by pin 16.
15	OB	This terminal has the same function as pin 6 and is controlled by pin 16.
16	INB	This is input terminal which controls output condition of pin 14 and pin 15. PNP-type voltage comparator is built in.
17	L-GND	Ground terminal of logic control section which is usually connected with pin 10.
20	$\overline{DG}$	Self-diagnostic output pin. This signal goes low when the output is short-circuited while the input is on (high). The output will be latched after a 50μs (Typ.) delay when the load is short-circuited.This pin supplies an NPN open-collector output.
2, 3, 8, 9, 11, 12, 13, 18, 19	N.C	Not connected. (Electrically, this pin is completely open.)

TIMING CHART



TRUTH TABLE INPUT / OUTPUT

INPUT			OUTPUT				
INA	INB	$\overline{ST}$	OA	$\overline{OA}$	OB	$\overline{OB}$	$\overline{DG}$
L	L	H	OFF	ON	OFF	ON	OFF
L	H	H	OFF	ON	ON	OFF	OFF
H	L	H	ON	OFF	OFF	ON	OFF
H	H	H	ON	OFF	ON	OFF	OFF
—	—	L	OFF	OFF	OFF	OFF	OFF
—	—	OPEN	OFF	OFF	OFF	OFF	OFF

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	30	V
	V_{CC}	60 (1s)	
Input Voltage	V_{IN}	−0.3~7	V
Output Voltage	V_{OUT}	−0.3~V_{CC}	V
Output Current	I_O·AVE	1.5 (*1)	A
Power Dissipation	P_D	2.0 (*2)	W
Operation Temperature	T_{opr}	−40~110	°C
Storage Temperature	T_{stg}	−55~150	°C
Lead Temperature−Time	T_{sol}	260 (10s)	°C

Note *1: Maximum current value when an infinite heat sink is used. Please refer to the table “MAXIMUM OUTPUT CURRENT (RECOMMENDED VALUES FOR APPLICATION)” when designing an application circuit.

Note *2: 50 × 50 × 1.6 mm 50% Cu mounted

HSOP20-P-450-1.00 THERMAL RESISTANCE DATA (Ta = 25°C)

CHARACTERISTIC	TEST CONDITION	RATING	UNIT
$R_{\theta\ j\text{-}a}$	—	125	°C/W
$R_{\theta\ j\text{-}c}$	—	13	°C/W
P_{D1}	Without radiation board	9.6	W
P_{D2}	50 × 50 × 1.0 mm Iron board mounted	3.2	W
P_{D3}	50 × 50 × 1.6 mm 50% Cu mounted	2.0	W
P_{D4}	Without radiation board	1.0	W

MAXIMUM OUTPUT CURRENT (RECOMMENDED VALUES FOR APPLICATION)

Ambient Temperature Ta (°C)	Heat Radiation Condition	Allowable Rating (DC)		Allowable Power Dissipation (pulse: 10 sec)	
		Power dissipation (W)	Output current (mA)	Power dissipation (W)	Output current (mA)
25	IC itself	1.0	330	2.9	1000
	Using a board (P_{D3})	2.0	720	3.9	1040
85	IC itself	0.52	50	1.5	550
	Using a board (P_{D3})	1.04	350	2.0	720
105	IC itself	0.36	0	1.0	330
	Using a board (P_{D3})	0.72	150	1.4	500

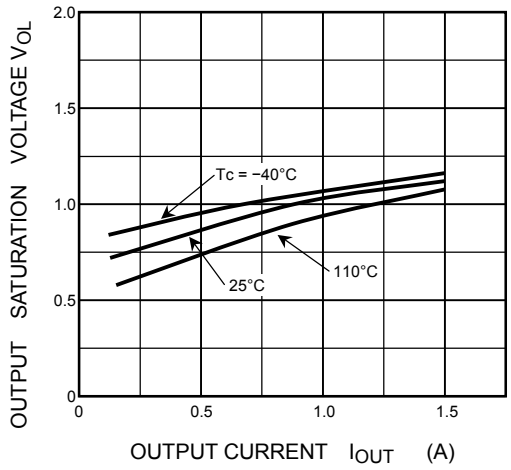
V_{CC} = 16 V. Output current is defined by the maximum current in one channel.

ELECTRICAL CHARACTERISTICS (V_{CC} = 8~16 V, Tc = −40~110°C,unless otherwise specified)

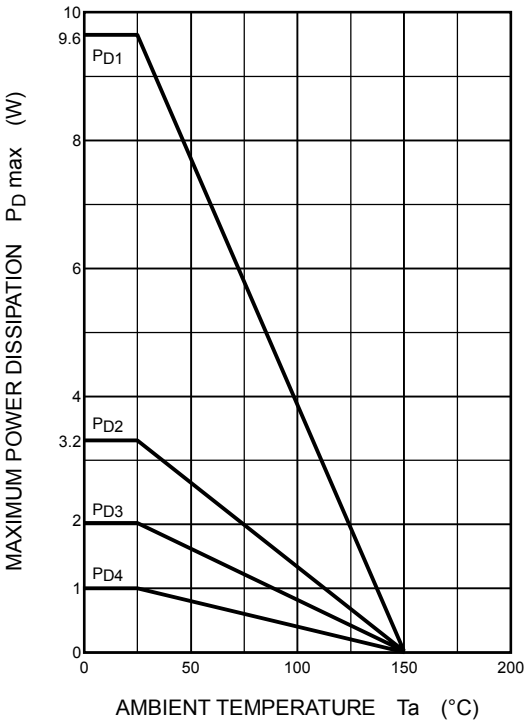
CHARACTERISTIC	SYMBOL	PIN	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Current Consumption	I_{CC}	V_{CC}	—	—	12	25	40	mA
Input Voltage	V_{IL}	INA/INB	—	—	—	—	0.8	V
	V_{IH}		—	—	2.4	—	—	
Input Current	I_{IL}	INA/INB	—	V_{IN} = 0.4 V	−50	—	—	μA
	I_{IH}		—	V_{IN} = 5 V	—	—	10	
Input Voltage	V_{IL}	$\overline{ST}$	—	—	—	—	0.8	V
	V_{IH}		—	—	3.0	—	—	
Output Saturation Voltage	V_{SAT}	OA, $\overline{OA}$ OB, $\overline{OB}$	—	I_O = 1.5 A/Ta = 25°C	—	1.25	1.5	V
Output Leakage Current	I_{LEAK}	OA, $\overline{OA}$ OB, $\overline{OB}$	—	V_O = V_{CC}	—	—	10	μA
Output Voltage	V_{OL}	$\overline{DG}$	—	I_{OL} = 3 mA	—	—	0.3	V
Output Leakage Current	I_{LEAK}		—	V_O = V_{CC}	—	—	10	μA
Over-current Detection	ISD	—	—	—	1.8	4	6	A
Shutdown Temperature	TSD-H	—	—	OUT = ON → OFF	—	160	—	°C
	TSD-L	—	—	OUT = OFF → ON	—	130	—	
Over-voltage Detection	V_{SD}	—	—	—	27.5	30	33	V
Standby Current	IST	V_{CC}	—	$\overline{ST}$ = GND	—	—	100	μA
Transfer Delay Time	t_{pLH}	—	—	—	—	1	10	μs
	t_{pHL}	—	—	—	—	1	10	

Note: The parameter values above are guaranteed in the operating voltage rage of 8 V to 16 V. If the guaranteed range is exceeded in practical use, make sure that the IC operates normally in application.

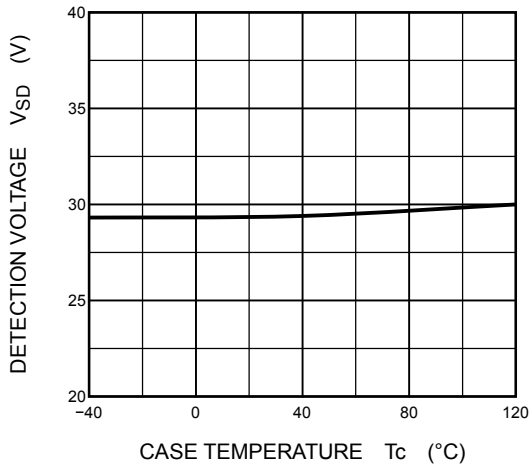
V_{OL} – I_{OUT}



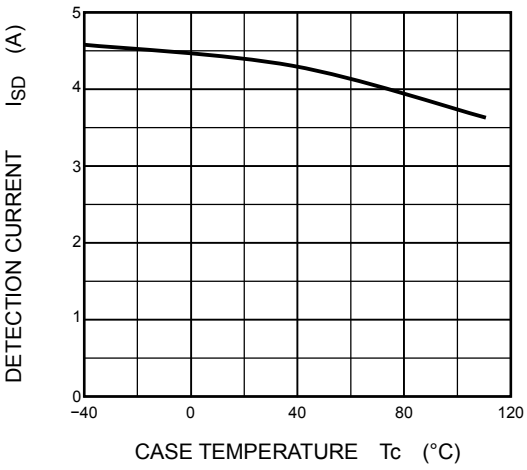
P_D max – Ta



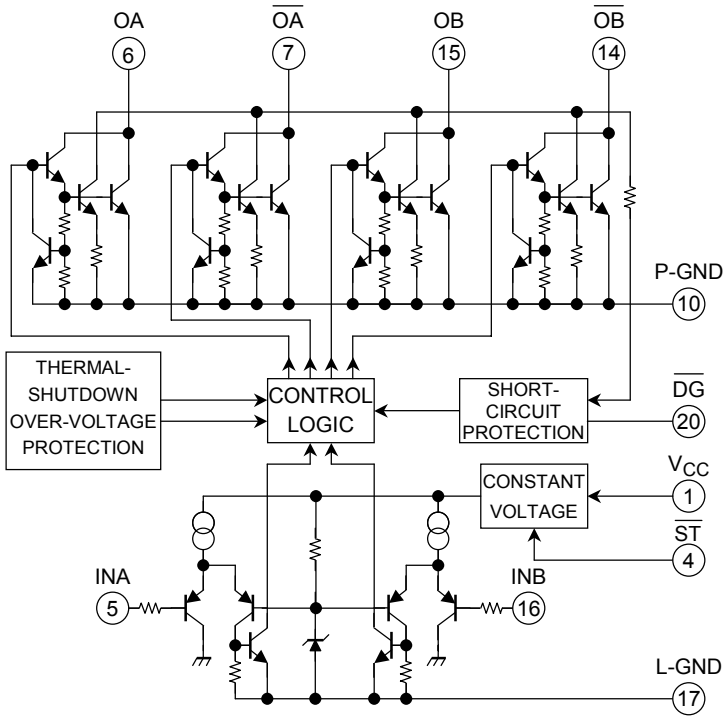
V_{SD} – Tc



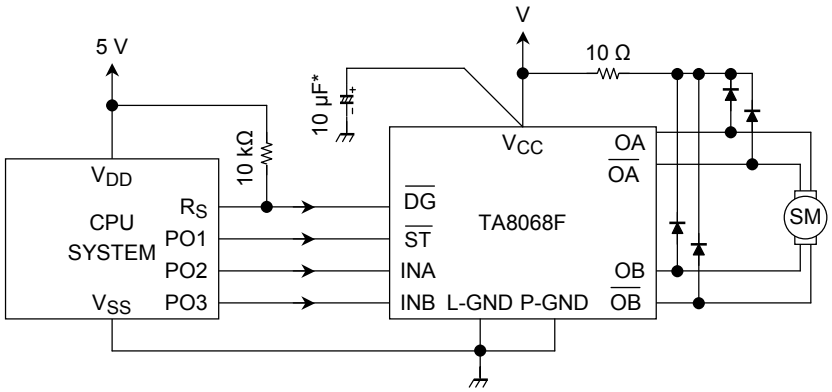
I_{SD} – Tc



EQUIVALENT CIRCUIT



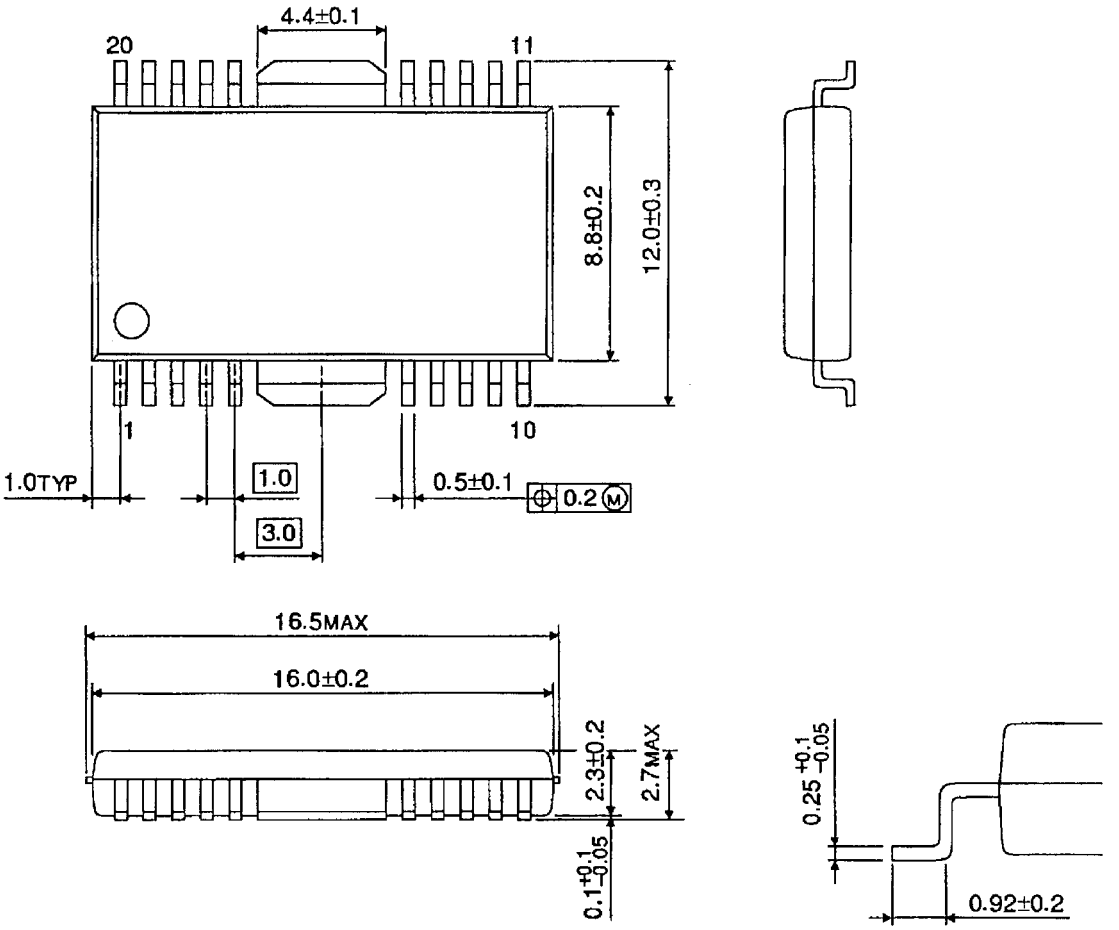
APPLICATION CIRCUIT



*: Connect this capacitor as close to the IC as possible

PACKAGE DIMENSIONS

HSOP20-P-450-1.00 Unit : mm



Weight: 0.79 g (Typ.)

RESTRICTIONS ON PRODUCT USE

000707EAA_S

- TOSHIBA is continually working to improve the quality and 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 comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products 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 TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the “Handling Guide for Semiconductor Devices,” or “TOSHIBA Semiconductor Reliability Handbook” etc..
- 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.