

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

# TA8083P, TA8083F

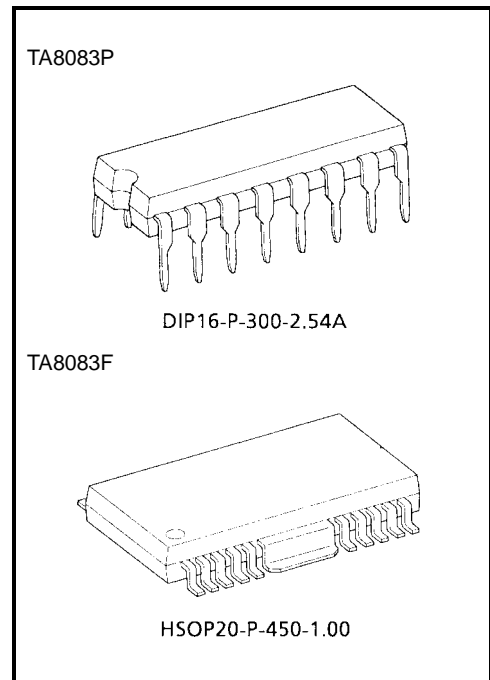
## DUAL DC MOTOR DRIVER

The TA8083P, TA8083F contains two motor driver circuits with a current capacity of 0.5A for directly driving bidirectional DC motors. Inputs DI1 A / B and DI2 A / B 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.

In addition, the IC also has a low standby current function, a self-diagnostic function, and various protective functions.

### FEATURES

- 0.5A bidirectional DC motor driver.
- Two circuits contained (power supply, self-diagnostic, and protective functions provide for each channel)
- Low standby current : 0.1mA (Max.)
- Self-diagnostic output : short-circuit mode (1A Typ.)
- Recommended operating supply voltage range :  $V_{CC} = 8\text{ V to }16\text{ V}$
- Self-diagnostic output : short-circuit mode (1A Typ.)
- Protective functions : Thermal-Shutdown, Short-Circuit Protection, and Over-voltage Shutdown
- Built-in counter electromotive force absorption diodes.
- DIP 16pin plastic package (TA8083P)  
HSOP 20pin power flat package (TA8083F)

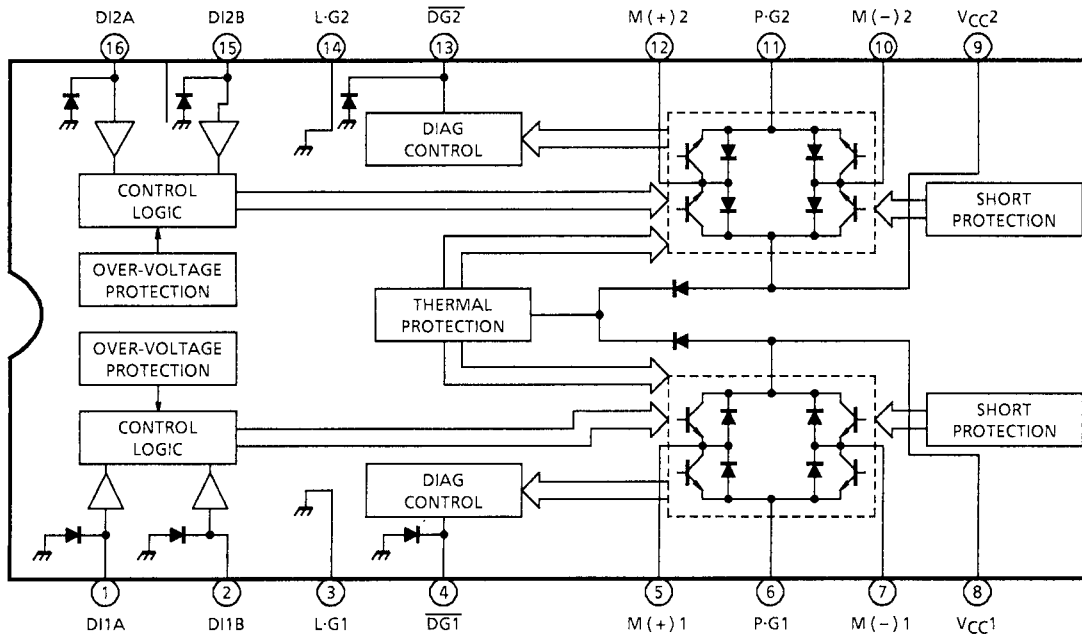


#### Weight

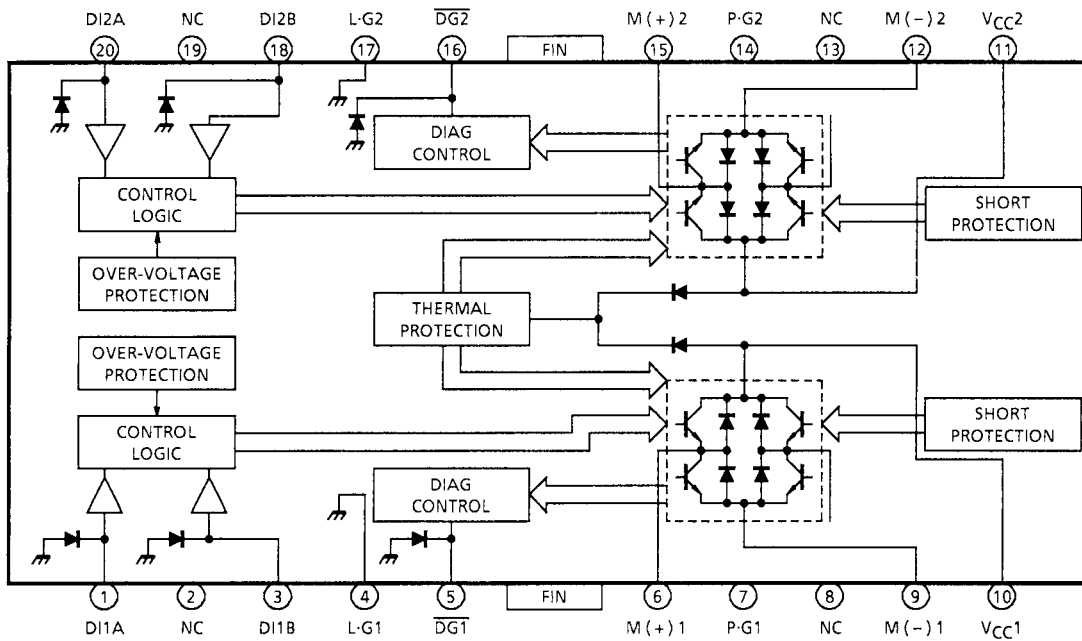
DIP16-P-300-2.54A : 1.0 g (typ.)  
HSOP20-P-450-1.00 : 0.79 g (typ.)

## BLOCK DIAGRAM AND PIN LAYOUT

### TA8083P



### TA8083F



Note: The TA8083P and TA8083F are the same chip; only the packages are different.

## PIN DESCRIPTION

PIN No.				SYMBOL		DESCRIPTION
TA8083P		TA8083F		CH1	CH2	
CH1	CH2	CH1	CH2			
1 2	16 15	1 3	20 18	DI1A DI1B	DI2A DI2B	Input pin. The signal from this pin controls the output state. (see TRUTH TABLE 1.)
3	14	4	17	L·G1	L·G2	Ground terminal for Logic portion.
4	13	5	16	DG1	DG2	Self-diagnosis output pins (See Table 2, Truth Table & Timing Chart.) NPN transistor open-collector output. When output becomes overcurrent, set to on; duty 97% on (low). At normal operation or at the time of STOP, set to open (high).
5	12	6	15	M (+) 1	M (+) 2	Connects to the DC motor. Both the sink and the source have a current capacity of 0.5A. Features overcurrent detection function to protect IC from instantaneous destruction at load short, ground fault, or direct connection to high power. (See section on Multiple Protections below.) Features diodes for absorbing counter electromotive force built into both V <sub>CC</sub> and Gnd sides.
6	11	7	14	P·G1	P·G2	Ground terminal for output portion.
7	10	9	12	M (-) 1	M (-) 2	A motor is connected between this pin and M(+) pin. This pin has the function equivalent to that of M(+) pin, and is controlled by input to the DIA and DIB pin.
8	9	10	11	V <sub>CC1</sub>	V <sub>CC2</sub>	Power supply pin. This pin has a function to turn off the output when the applied voltage exceeds 30V, thus protecting the IC and the motor load.
—		2, 8, 13, 19		NC		Not connected pin. (Electrically, this pin is completely open.)

## TRUTH TABLE 1 INPUT / OUTPUT

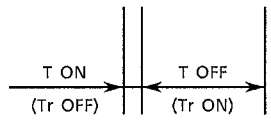
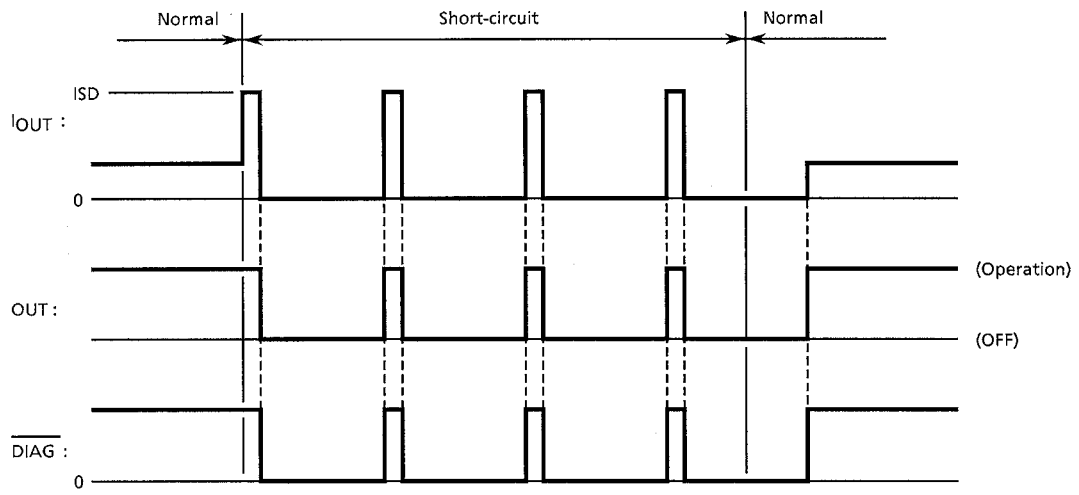
INPUT		OUTPUT		OPERATION MODE
DI1 / 2A	DI1 / 2B	M (+) 1 / 2	M (-) 1 / 2	
H	H	L	L	Brake
L	H	L	H	Reverse (CCW)
H	L	H	L	Forward (CW)
L	L	OFF (High impedance)		Stop (standby)

## TRUTH TABLE 2 SELF-DIAGNOSIS

INPUT		OUTPUT		DIAG
DI1 / 2A	DI1 / 2B	MODE	LOAD	
H	H	Brake	Normal	H
			Short	L*
L / H	H / L	CCW / CW	Normal	H
			Short	L*
L	L	Stop	—	H

\*: See TIMING CHART

**SELF-DIAGNOSIS TIMING CHART**



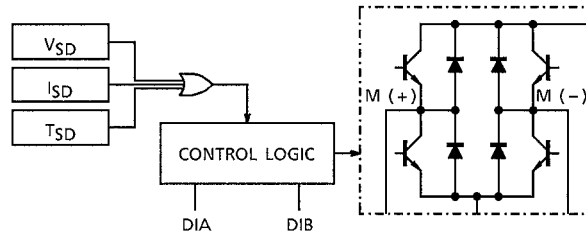
$$\frac{T\ ON}{T\ ON + T\ OFF} = 3\%$$

## DESCRIPTION OF MULTI-PROTECTIVE OPERATION

The TA8083P, TA8083F has functions for protection from over-voltage ( $V_{SD}$ ), over-current ( $I_{SD}$ ), 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. Over-voltage protection ( $V_{SD}$ )

- Basic operation

When the voltage supplied to the VCC pin is up to the VSD detection voltage, the output is controlled by the input signals. However, when the VCC voltage exceeds the detection voltage, the output enters high-impedance state regardless of the input signals.

- Detailed explanation

The VSD voltage is detected by comparing the Zener voltage with the voltage obtained by dividing VCC 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 DIA and DIB.

### 2. Overheat protection ( $T_{SD}$ )

- Basic operation

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

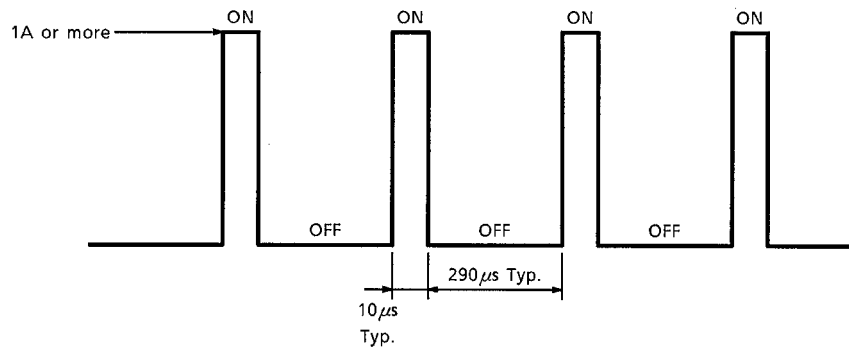
- Detailed explanation

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 DIA and DIB.

### 3. Over-current protection (ISD)

- Basic operation

When the output current (M (+) or M (-),  $I_{\text{sink}}$  or  $I_{\text{source}}$ ) is up to the ISD 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 sense resistance. One detection circuit connects to one of the circuits (CH1 or CH2) and leads to the short-circuit protection circuit. When a current exceeding the ISD detection current flows through one of the four output transistors, the short-circuit protection circuit is activated. This circuit contains a timer. When over-current condition continues for  $10\mu\text{s}$  (typically), the protection circuit places the output in high-impedance mode and,  $290\mu\text{s}$  (typically) later, returns the IC to ON mode. The switching-waveform output is repeated until over-current condition is no longer present.

- Caution for application

The overcurrent protection is used to protect the IC from instantaneous destruction due to short circuits. If overcurrent continues, configure a system which changes the IC to standby mode using the self diagnosis signal.

Note that the time required for switching the IC from output short (overcurrent detection) to standby must be 1s or less.

## MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Power 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> +0.3	V
Output Current	I <sub>O</sub> · AVE	0.5	A
Power Dissipation	P <sub>D</sub>	1.4 / 2	W
Operating 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

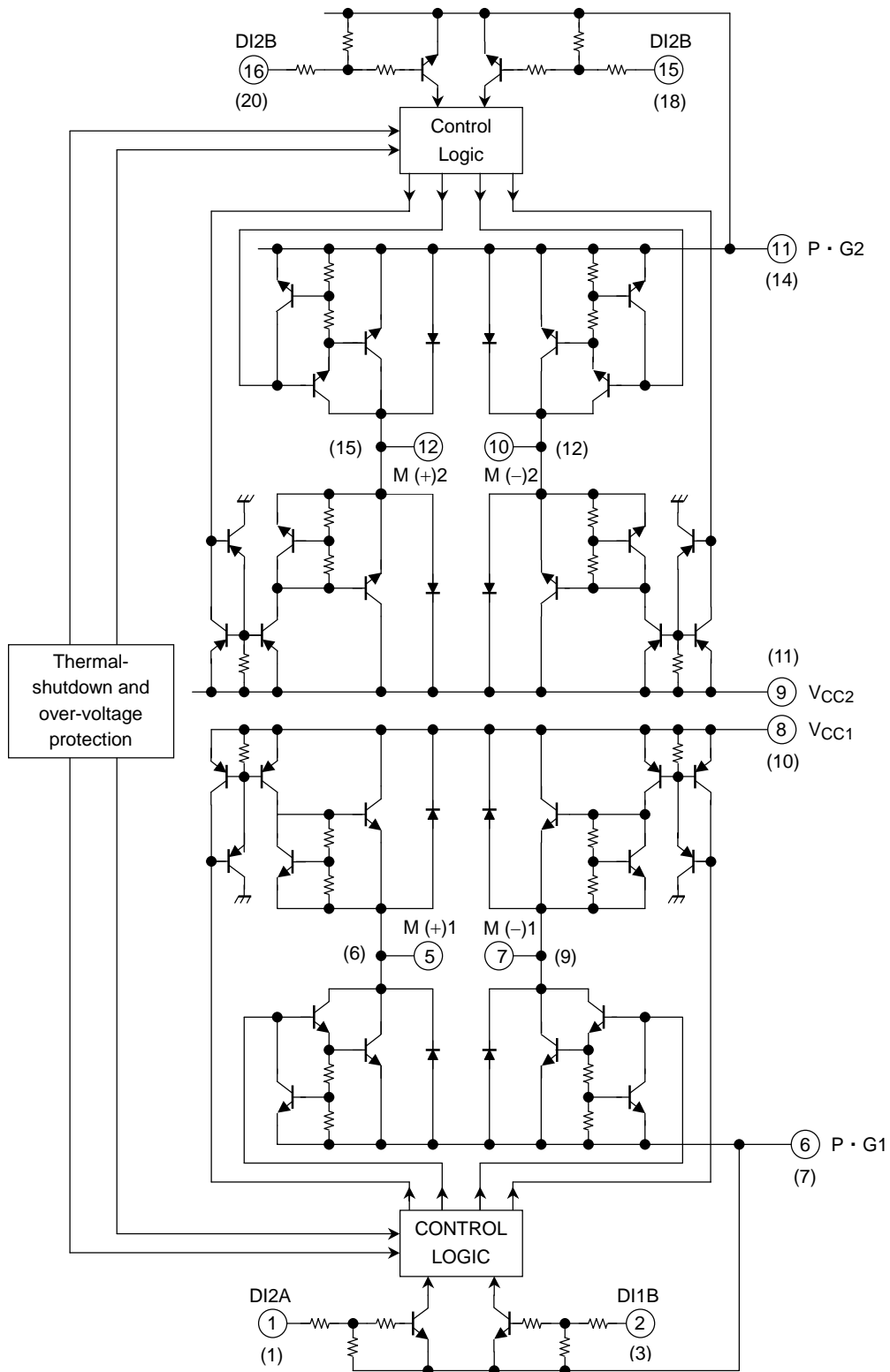
Note: P<sub>D</sub> : TA8083P / TA8083F  
 TA8083F : on Board condition. (50 × 50 × 1.6 mm 50% Cu)

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

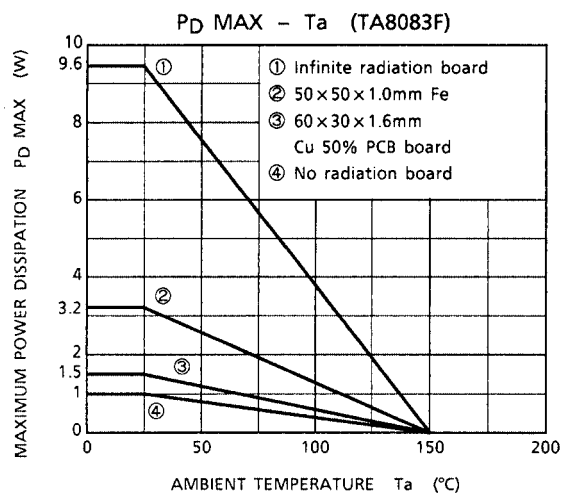
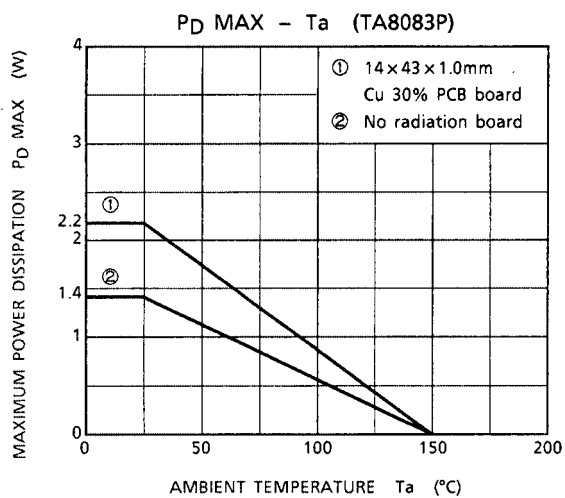
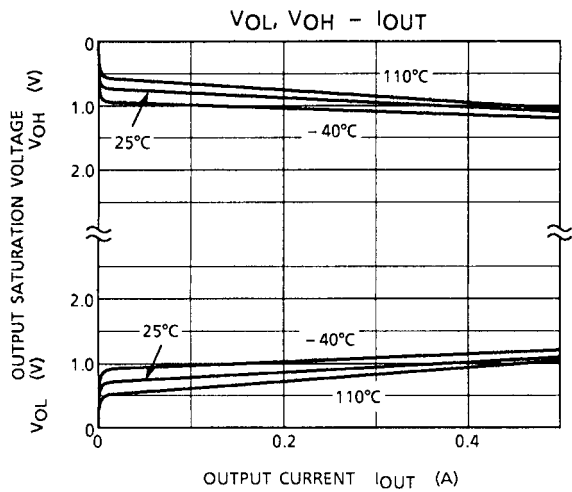
CHARACTERISTIC	SYMBOL	PIN	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Power Supply Current	I <sub>CC1</sub>	V <sub>CC1</sub> / V <sub>CC2</sub>	—	CH1+CH 2: Stop	—	—	0.1	mA
	I <sub>CC2</sub>		—	CH1 or CH 2: CW or CCW	—	20	30	
	I <sub>CC3</sub>		—	CH1+CH 2: CW or CCW	—	40	60	
	I <sub>CC4</sub>		—	CH1+CH 2: Brake	—	20	32	
Input Voltage	V <sub>IL</sub>	DI1A / B / DI2A / B	—		—	—	0.8	V
	V <sub>IH</sub>		—		2.0	—	—	
Input Current	V <sub>IL</sub>	DI1A / B / DI2A / B	—	V <sub>IN</sub> =0.4 V	—	10	20	μA
	V <sub>IH</sub>		—	V <sub>IN</sub> =5 V	—	300	600	
Output Saturation Voltage	V <sub>SAT</sub> (total)	M (+) / (-) 1 / M (+) / (-) 2	—	I <sub>O</sub> =0.4 A, T <sub>c</sub> =25°C	—	1.8	2.5	V
			—	I <sub>O</sub> =0.4 A, T <sub>c</sub> =110°C	—	1.7	2.4	
Output Leakage Current	I <sub>LEAK- U</sub>	M (+) / (-) 1 / M (+) / (-) 2	—	V <sub>OUT</sub> =0 V	-10	—	—	μA
	I <sub>LEAK- L</sub>		—	V <sub>OUT</sub> =V <sub>CC</sub>	—	—	10	
Diode Forward Voltage	V <sub>F- U</sub>	M (+) / (-) 1 / M (+) / (-) 2	—	I <sub>F</sub> =0.4 A	—	1.5	—	V
	V <sub>F- L</sub>		—		—	1.5	—	
Output Voltage	V <sub>OL</sub>	DIAG 1 / 2	—	I <sub>OL</sub> =3 mA	—	—	0.5	V
Output Leakage Current	I <sub>LEAK</sub>	DIAG 1 / 2	—	V <sub>OUT</sub> =V <sub>CC</sub>	—	—	10	μA
Over-current Detection	I <sub>SD</sub>		—		—	1.0	—	A
Shutdown Temperature	T <sub>SD</sub>		—		—	150	—	°C
Over-voltage Detection	V <sub>SD</sub>		—		—	30	—	V
Transfer Delay Time	t <sub>pLH</sub>		—	—	—	1	10	μs
	t <sub>pHL</sub>		—	—	—	1	10	

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

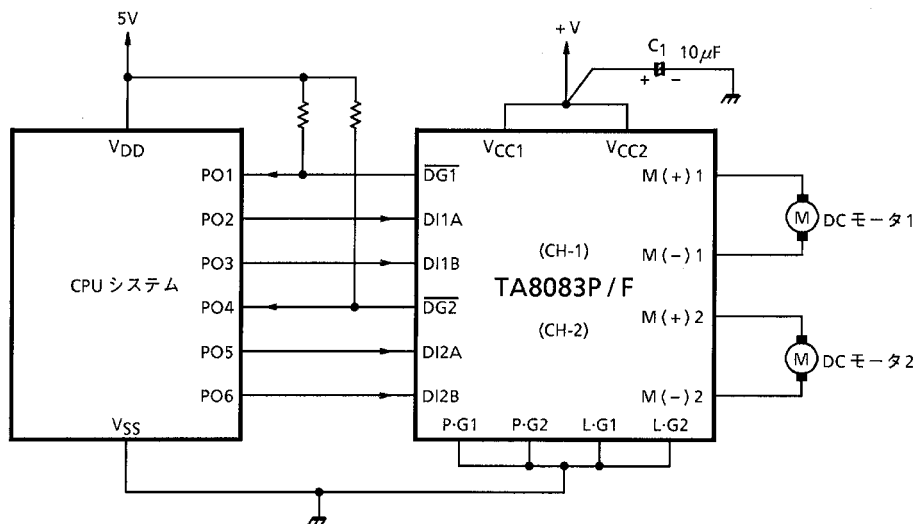
**I / O EQUIVALENT CIRCUIT (Number in ○ show pin number of the TA8083P, those in ( ) show pin number of the TA8083F.)**







APPLICATION CIRCUIT

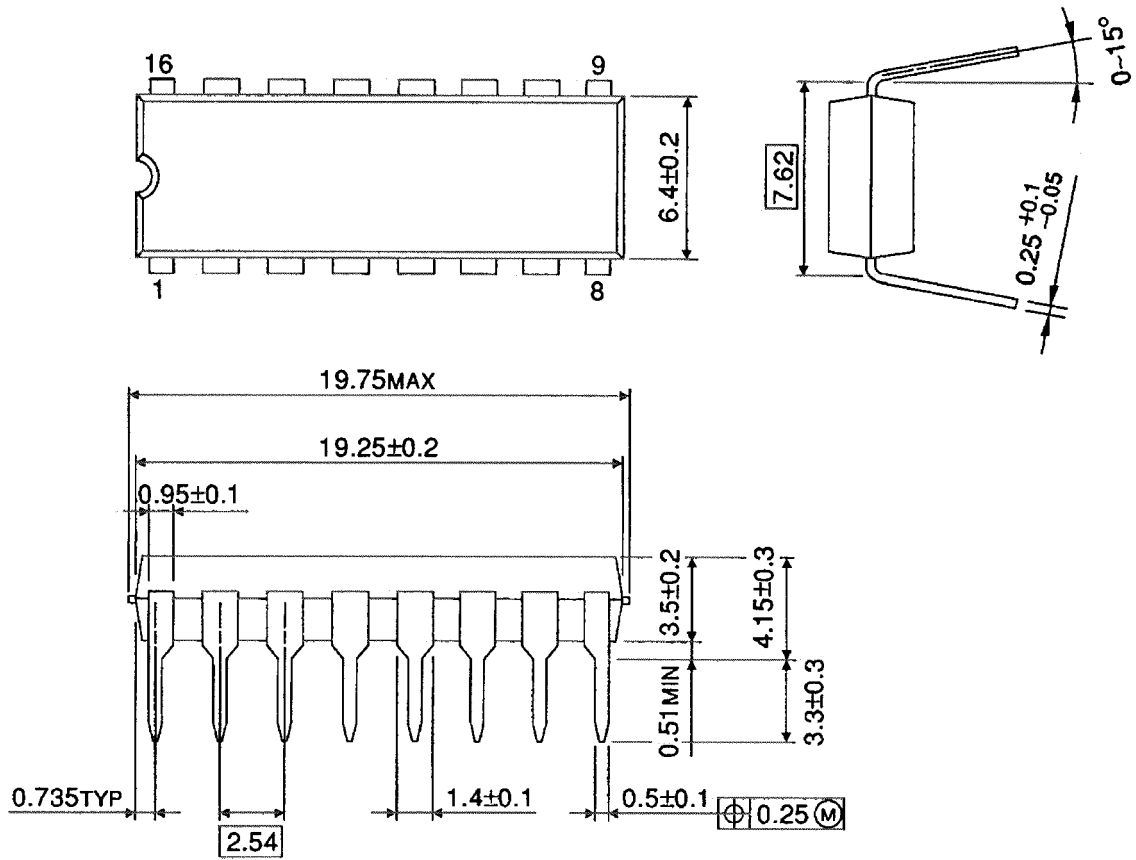


Cautions for wirings  
 C<sub>1</sub> is for absorbing disturbance, noise, etc.  
 Connect it as close to the IC as possible.

## PACKAGE DIMENSIONS

DIP16-P-300-2.54A

Unit : mm

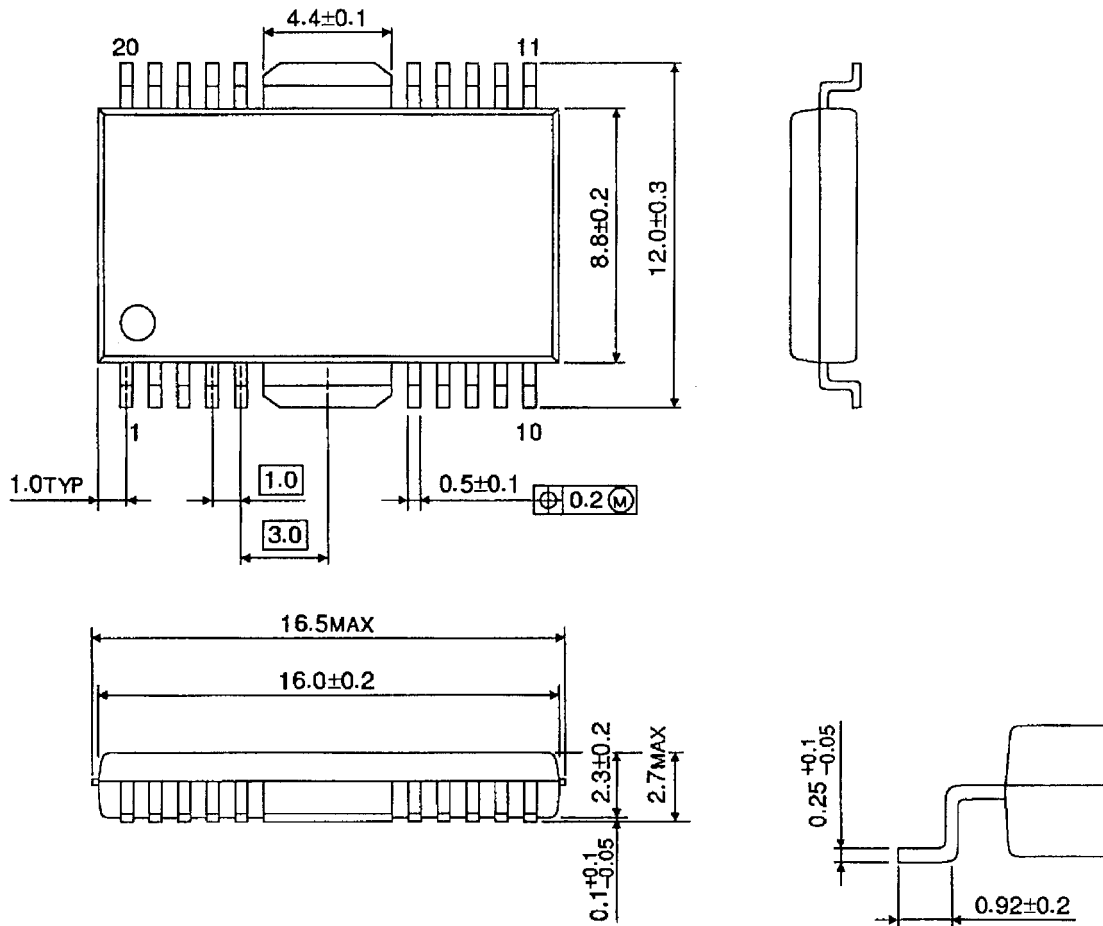


Weight: 1.0 g (Typ.)

## 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.