

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

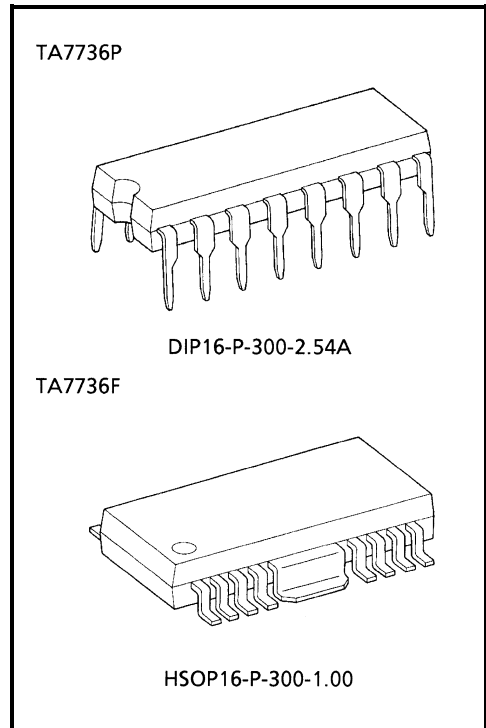
# TA7736P, TA7736F

## DC MOTOR DRIVER IC

The TA7736P is a 3 phase Bi-directional motor driver IC. It designed for use VCR, tape deck, floppy disk and record player motor drivers. It contains output power drivers, position sensing circuits, control amplifier and CW / CCW control circuit.

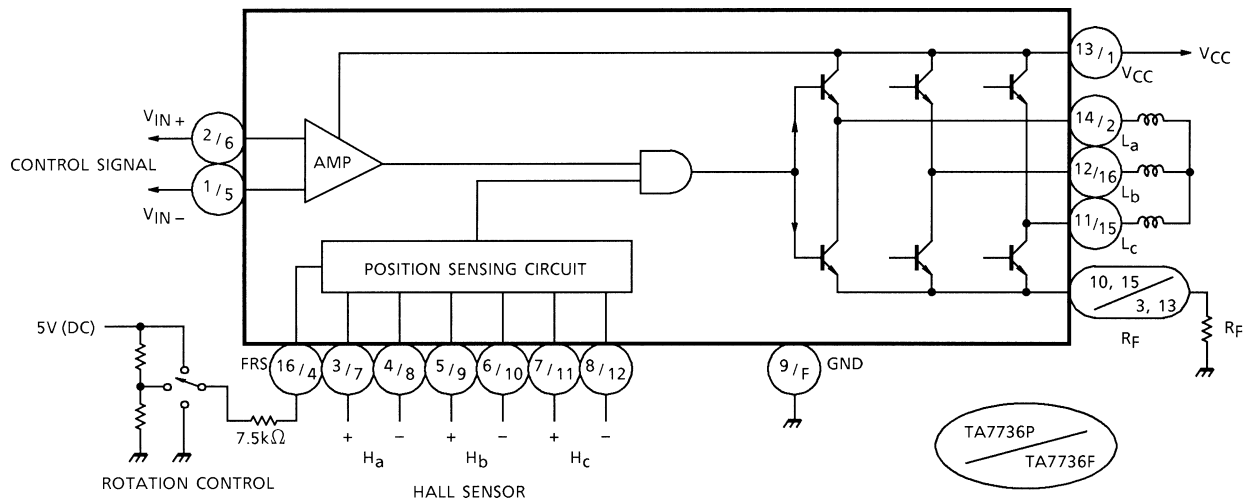
### FEATURES

- 3 Phase Bi-Directional Driver and Output Current Up to 1.0 A.
- Few External Parts Required.
- Wide Operating Supply Voltage Range  
:  $V_{CC (opr)}$  (Min.) = 7~20 V
- Forward and Reverse Rotation is Controlled Simply by Means of a CW / CCW Control Signal Fed Into 16PIN.
- High Sensitivity of Position Sensing Amplifier.  
( $V_H = 10 \text{ mV}_{p-p}$  (Typ.), Recommend to Use TOSHIBA Ga-As Hall Sensor "THS" Series.)
- Surge Protect Diode Connected for All Input Terminals.  
(Position Sensing, Control, CW / CCW Control Inputs.)



Weight  
 DIP16-P-300-2.54A : 1.11g (Typ.)  
 HSOP16-P-300-1.00 : 0.50g (Typ.)

## BLOCK DIAGRAM

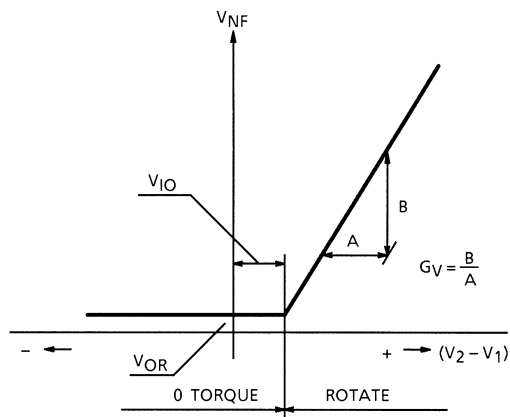


## PIN FUNCTION

PIN No.		SYMBOL	FUNCTION DESCRIPTION
P	F		
1	5	$V_{IN}^-$	Control Amp. negative terminal
2	6	$V_{IN}^+$	Control Amp. positive terminal
3	7	$H_a^+$	a-phase Hall Amp. positive input terminal
4	8	$H_a^-$	a-phase Hall Amp. negative input terminal
5	9	$H_b^+$	b-phase Hall Amp. positive input terminal
6	10	$H_b^-$	b-phase Hall Amp. negative input terminal
7	11	$H_c^+$	c-phase Hall Amp. positive input terminal
8	12	$H_c^-$	c-phase Hall Amp. negative input terminal
9	FIN	GND	GND terminal
10	3	$R_F$	Output current detection terminal
11	15	$L_c$	c-phase drive output terminal
12	16	$L_b$	b-phase drive output terminal
13	1	$V_{CC}$	power supply input terminal
14	2	$L_a$	a-phase drive output terminal
15	13	$R_F$	Output current detection terminal
16	4	FRS	Forward rotation / Reverse rotation switch terminal

F: (14) Pin: No connection

**INPUT VS OUTPUT**

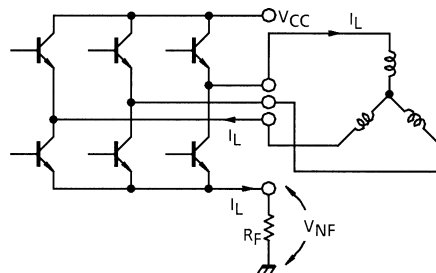


$V_{NF}$  shows voltage drop at  $R_F$ .

This is in the case of star connection, when coil current is  $I_L$

$$V_{NF} = R_F \cdot I_L$$

See the following circuit.



Further, if inputs (pin (1), (5), pin (2), (6)) are shorted or  $V_1 \geq V_2$ , torque at the circuit, becomes zero. However, this zero torque state also can be obtained by setting FRS input (pin (16), (4)) to specified voltage or by placing the circuit in open state and this is rather advantageous as current consumption is less.

## FUNCTION

FRS (PIN (16), (4))	POSITION SENSING INPUT			COIL OUTPUT		
	H <sub>a</sub>	H <sub>b</sub>	H <sub>c</sub>	L <sub>a</sub>	L <sub>b</sub>	L <sub>c</sub>
L	1	0	1	H	L	M
	1	0	0	H	M	L
	1	1	0	M	H	L
	0	1	0	L	H	M
	0	1	1	L	M	H
	0	0	1	M	L	H
H	1	0	1	L	H	M
	1	0	0	L	M	H
	1	1	0	M	L	H
	0	1	0	H	L	M
	0	1	1	H	M	L
	0	0	1	M	H	L
M	1	0	1	High Impedance		
	1	0	0			
	1	1	0			
	0	1	0			
	0	1	1			
	0	0	1			

Note: "1" of Hole element input means that voltage above + 10 mV is applied to the positive side of each hall element from the negative side and "0" means that voltage above +10 mV is applied to the negative side from the positive side. In this case, needless to say, DC potential must be within the specified common mode voltage range of hall element input.

Further, "H", "M" and "L" of output mean  $V_{CC} - V_{SAT1} \approx \frac{1}{2} V_{CC}$  and  $V_{SAT2}$ , respectively, and "L", "H" and

"M" of FRS input mean application of voltage within specified values of  $V_F$ ,  $V_R$  and  $V_S$ , respectively.

Further, by applying required voltage for control input ( $V_{IN+}$ ,  $V_{IN-}$ ), measure the circuit in operating state.

## MAXIMUM RATINGS (Ta = 25°C)

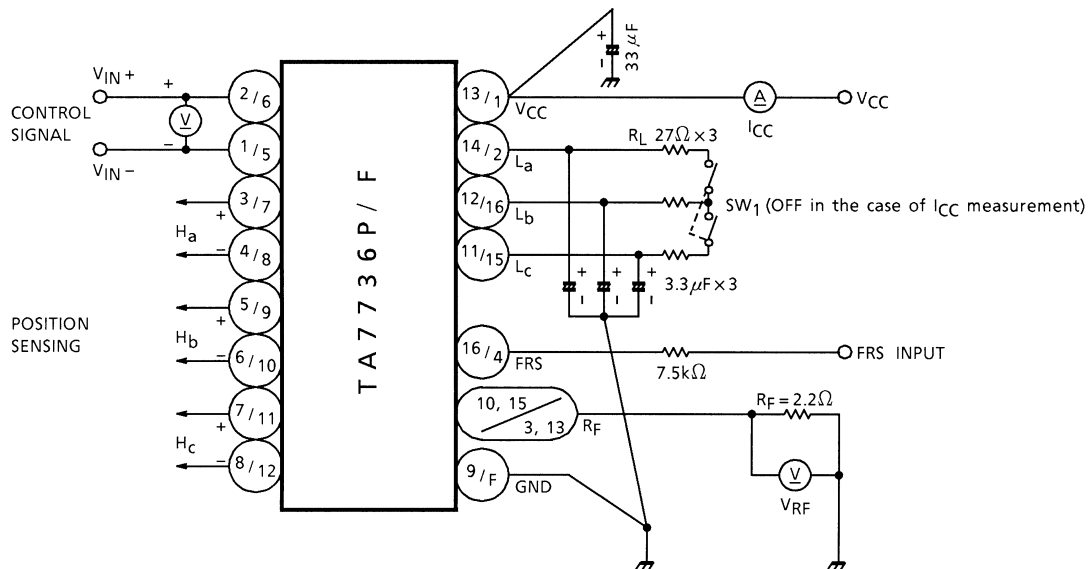
CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	$V_{CC}$	26	V
Output Current	$I_O$	1.0	A
Power Dissipation	TA7736P	$P_D$ (Note)	W
	TA7736F		
Operating Temperature	$T_{opr}$	-30~75	°C
Storage Temperature	$T_{stg}$	-55~150	°C

Note: No heat sink

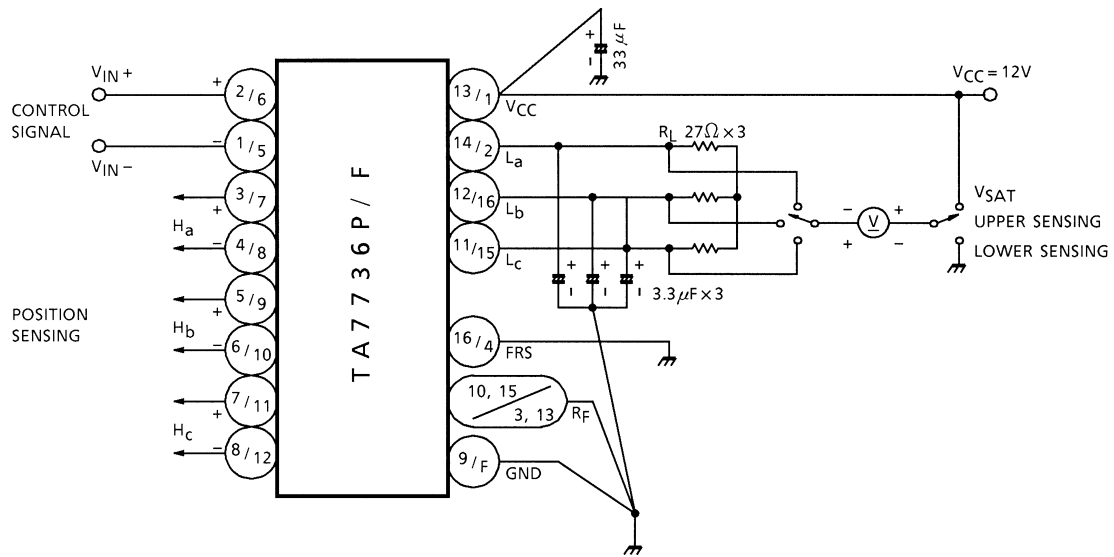
## ELECTRICAL CHARACTERISTICS (Unless otherwise specified, $V_{CC} = 12\text{ V}$ , $T_a = 25^\circ\text{C}$ )

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Quiescent Current		$I_{CC1}$	1	FRS = Open	2	4	7	mA
		$I_{CC2}$		FRS = 5 V	2	5	9	
		$I_{CC3}$		$V_{CC} = 22\text{ V}$ , FRS = GND	2	5	9	
Input Offset Voltage		$V_{IO}$	1		—	40	—	mV
Residual Output Voltage		$V_{OR}$	1	$V_1 = V_2 = 7\text{ V}$	—	0	10	mV
Voltage Gain		$G_V$	1	$R_{NF} = 2.2\ \Omega$	—	15.0	—	
Saturation Voltage	Upper	$V_{SAT1}$	2	$I_L = 400\text{ mA}$	—	1.0	1.5	V
	Lower	$V_{SAT2}$		$I_L = 400\text{ mA}$	—	0.4	1.0	
Cut-off Current	Upper	$I_{OC1}$	—	$V = 20\text{ V}$	—	—	20	$\mu\text{A}$
	Lower	$I_{OC2}$		$V = 20\text{ V}$	—	—	20	
Position Sensing Input Sensitivity		$V_H$	1		—	10	—	mV
Maximum Position Sensing Input Voltage		$V_H\text{ MAX.}$	1		—	—	400	mV
Input Operating Voltage	Position	$CMR_H$	1		2.0	—	$V_{CC} - 2.5$	V
	Control	$CMR_C$	1		2.0	—	$V_{CC} - 2.5$	V
Rotation Control Input Voltage	CW	$V_F$	1		—	0	0.4	V
	STOP	$V_S$	1		2.2	2.7	3.2	V
	CCW	$V_R$	1		4.8	5.0	5.8	V

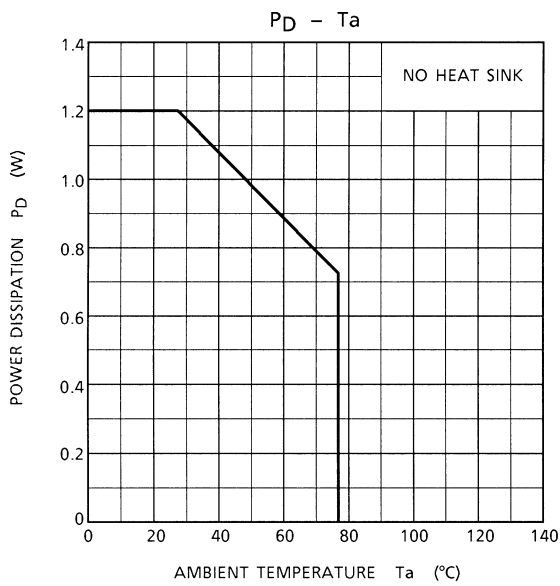
## TEST CIRCUIT 1



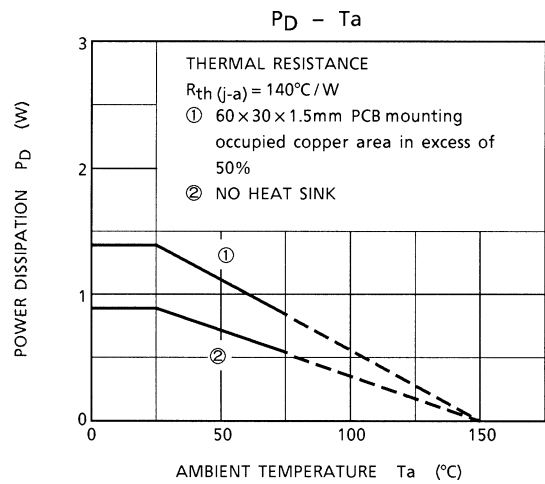
## TEST CIRCUIT 2



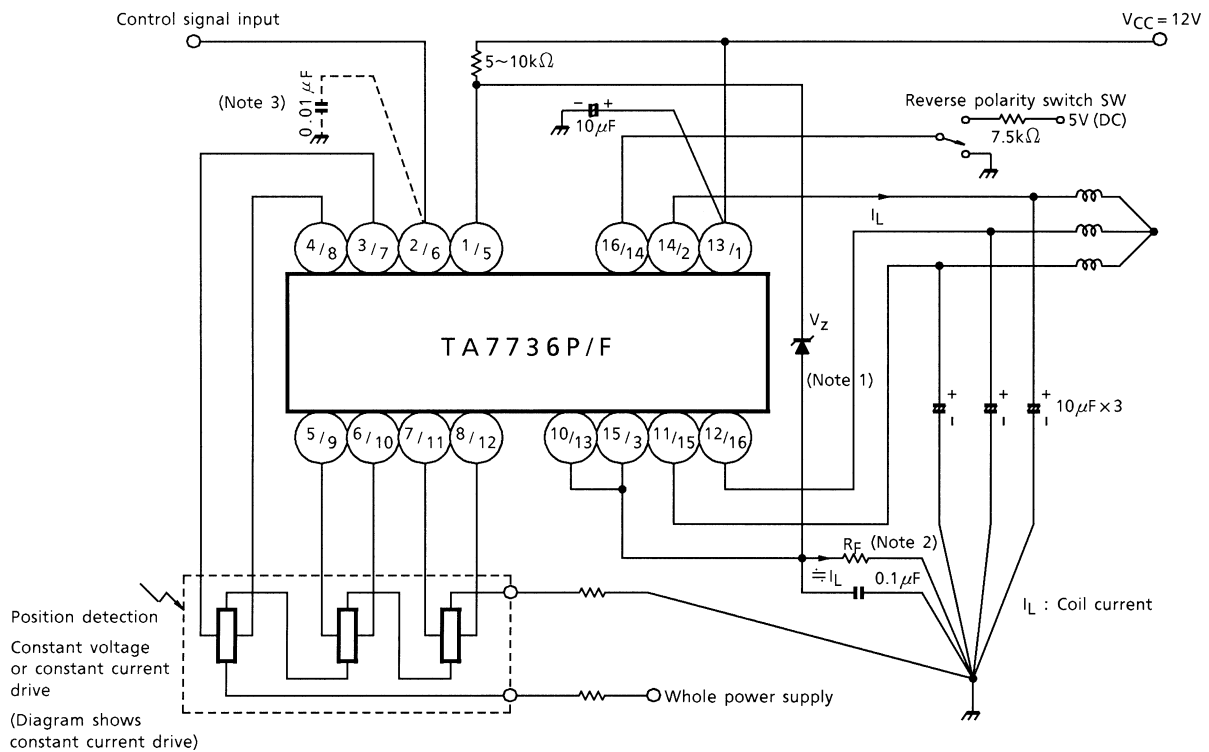
TA7736P



TA7736F



## APPLICATION CIRCUIT 1 (Basic application circuit)



Note 1: Set the Zener diode  $V_Z$  to the control signal input DC level.

( $V_Z$  setting recommended at 2.5 to 9.0 V; 5.0 V depending on temperature characteristics. With load control input pins (1) and (5), the DC electric potential becomes  $V_Z + R_F \cdot I_L$ .)

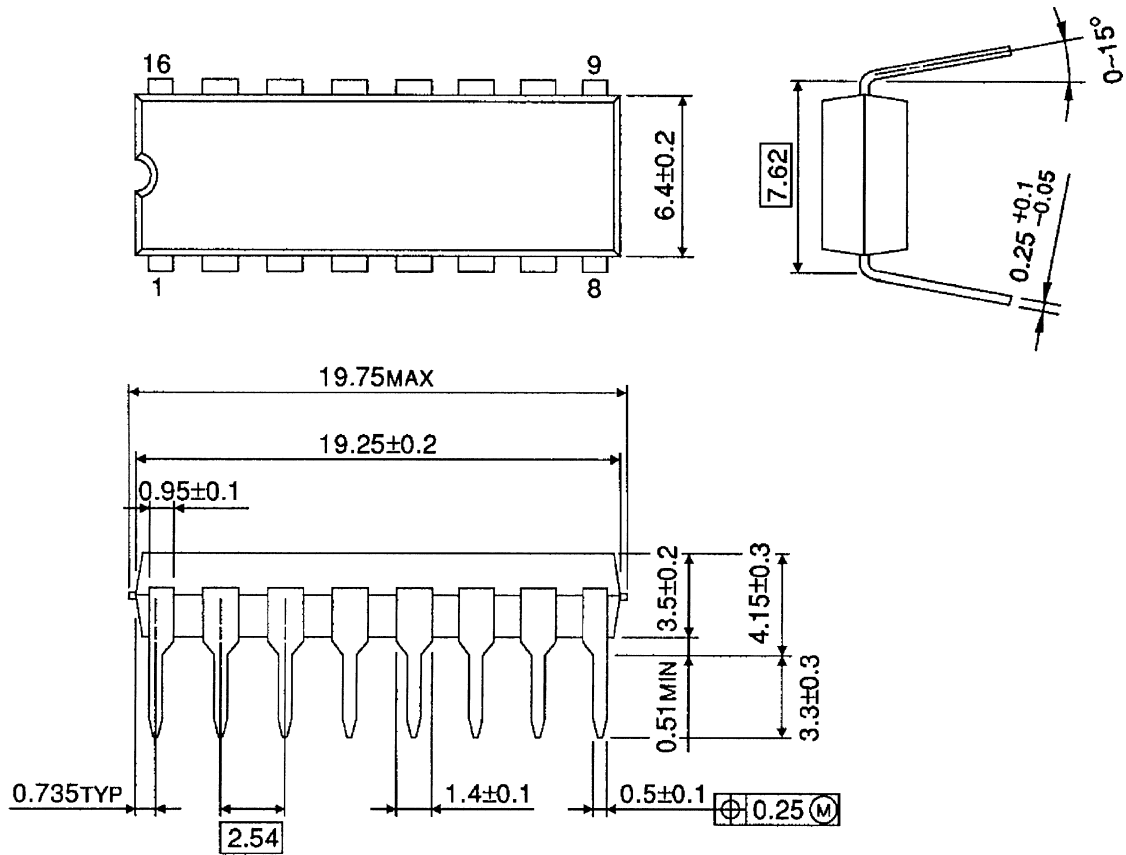
Note 2:  $R_F$  is set depending on the coil impedance, F / V transfer voltage (control input) and required starting torque. Set between 0.3 and 5 Ω.

Note 3: Connect when dive to control input occurs.

## PACKAGE DIMENSIONS

DIP16-P-300-2.54A

Unit: mm



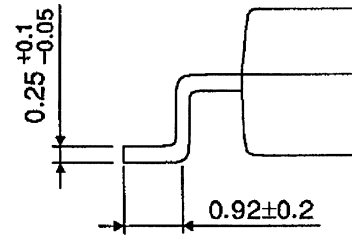
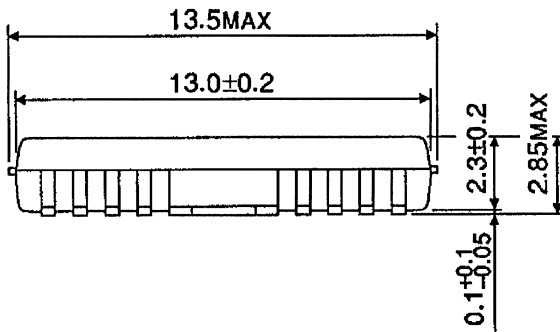
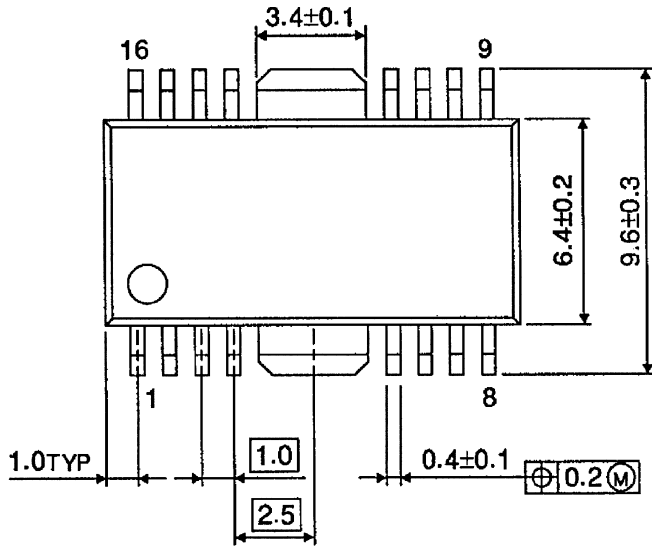
Weight: 1.11 g (Typ.)



## PACKAGE DIMENSIONS

HSOP16-P-300-1.00

Unit: mm



Weight: 0.50 g (Typ.)

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000707EBA

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