

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

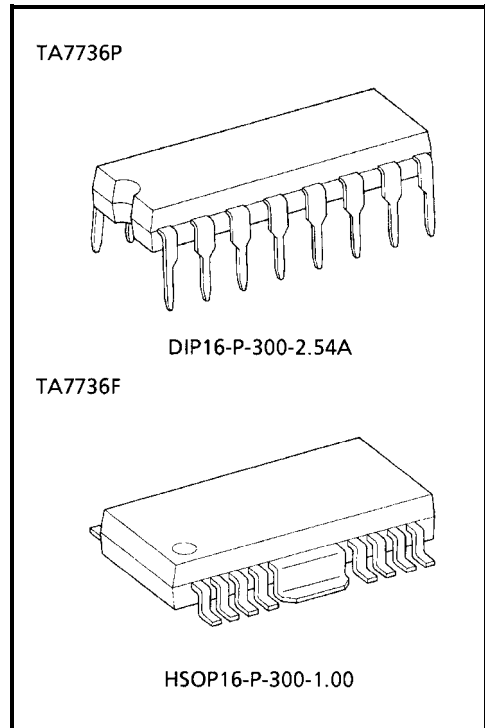
TA7736P, TA7736F

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.

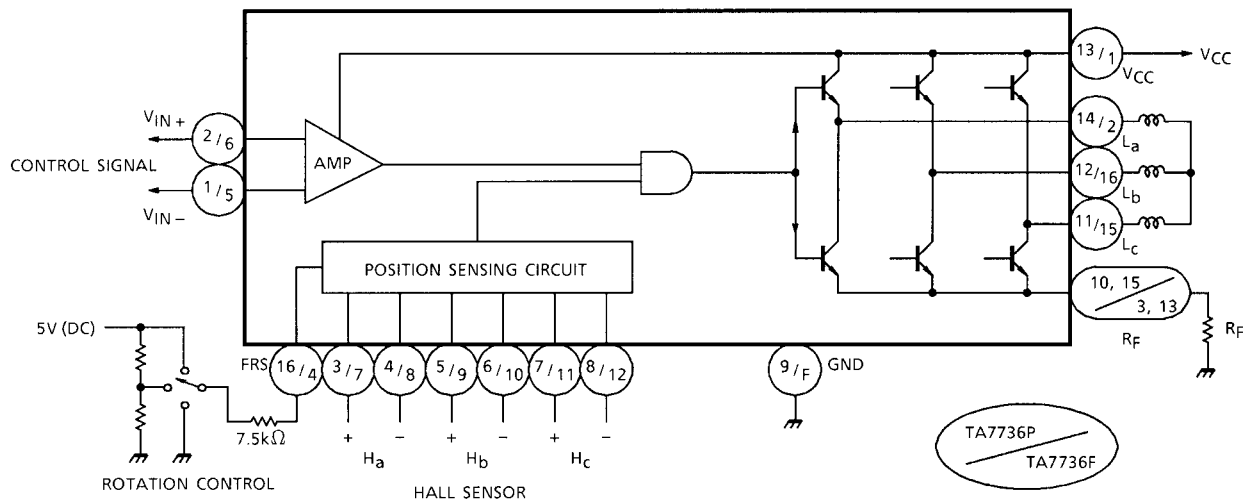
FEATURES

- 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

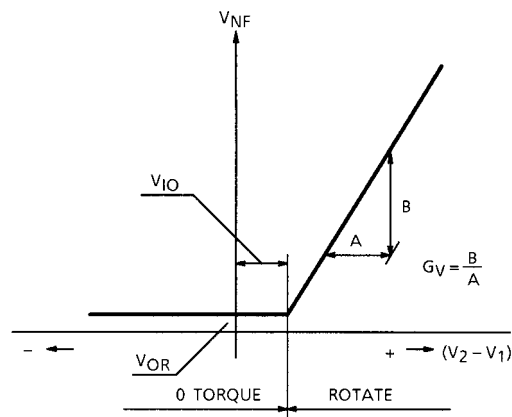


PIN FUNCTION

| 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

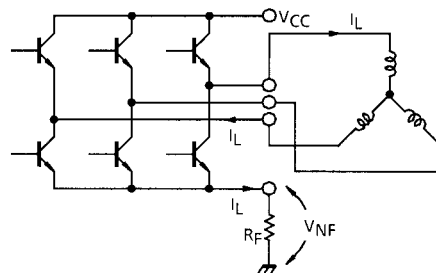


V_{NF} shows voltage drop at R_F .

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 _a | H _b | H _c | L _a | L _b | L _c |
| 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)

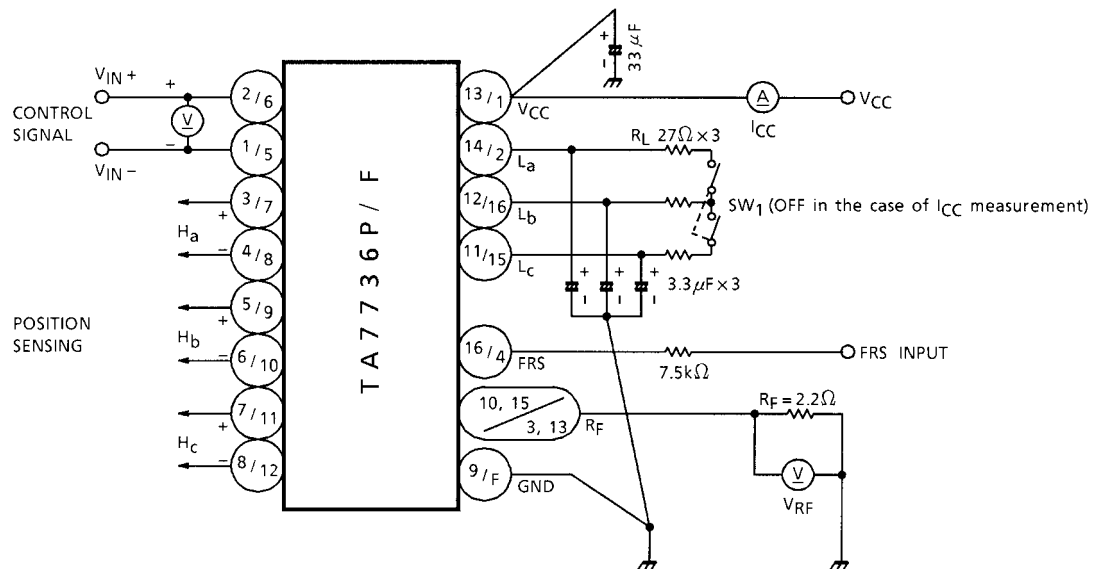
| CHARACTERISTIC | SYMBOL | RATING | UNIT |
|-----------------------|-----------|--------------|------|
| Supply Voltage | V_{CC} | 26 | V |
| Output Current | I_O | 1.0 | A |
| Power Dissipation | TA7736P | P_D (Note) | W |
| | TA7736F | | |
| Operating Temperature | T_{opr} | -30~75 | °C |
| Storage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

Note: No heat sink

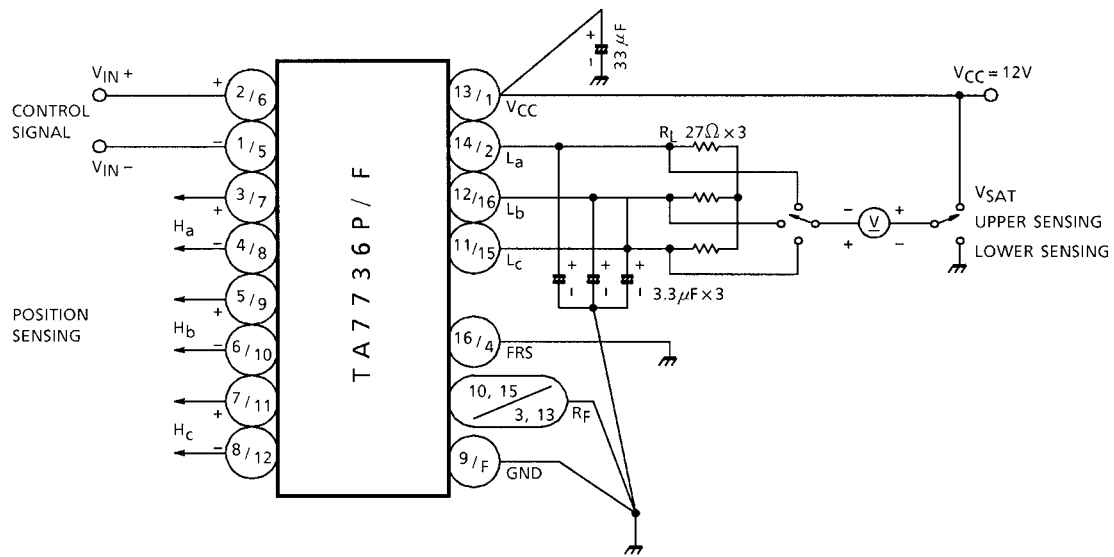
ELECTRICAL CHARACTERISTICS (Unless otherwise specified, $V_{CC} = 12\text{ V}$, $T_a = 25^\circ\text{C}$)

| 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 | μA |
| | 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 |

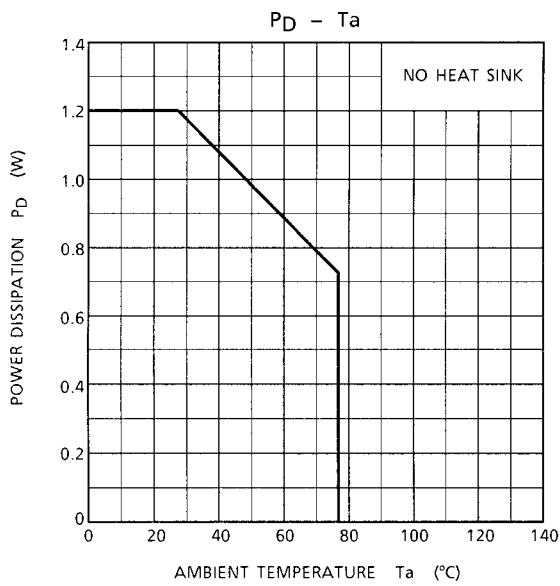
TEST CIRCUIT 1



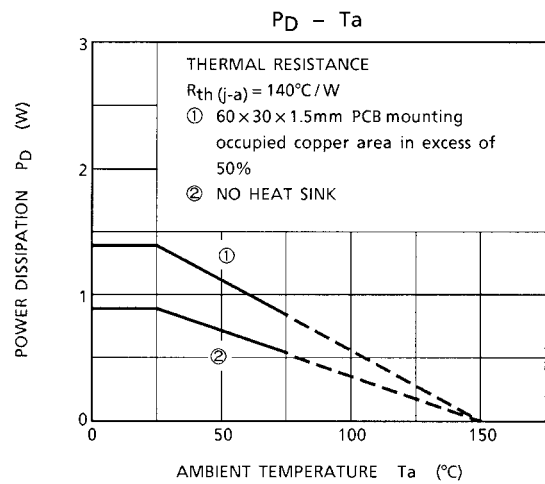
TEST CIRCUIT 2



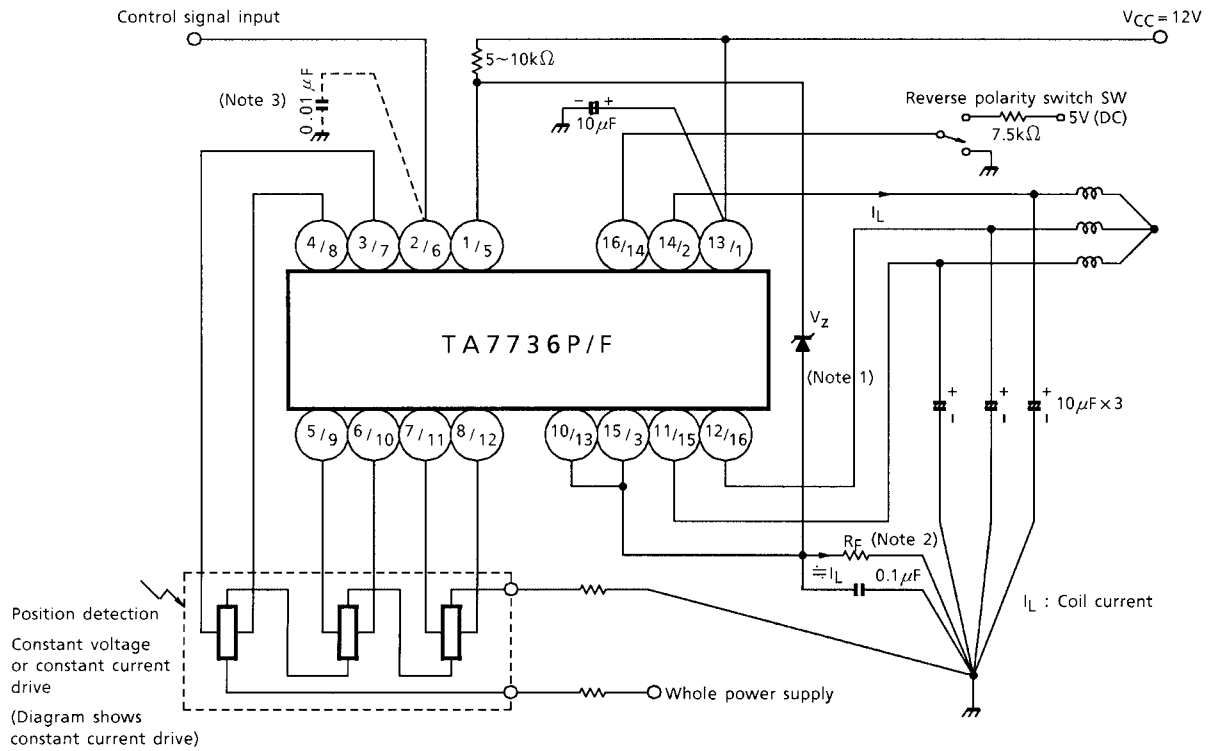
TA7736P



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 $V_Z + R_F \cdot I_L$.)

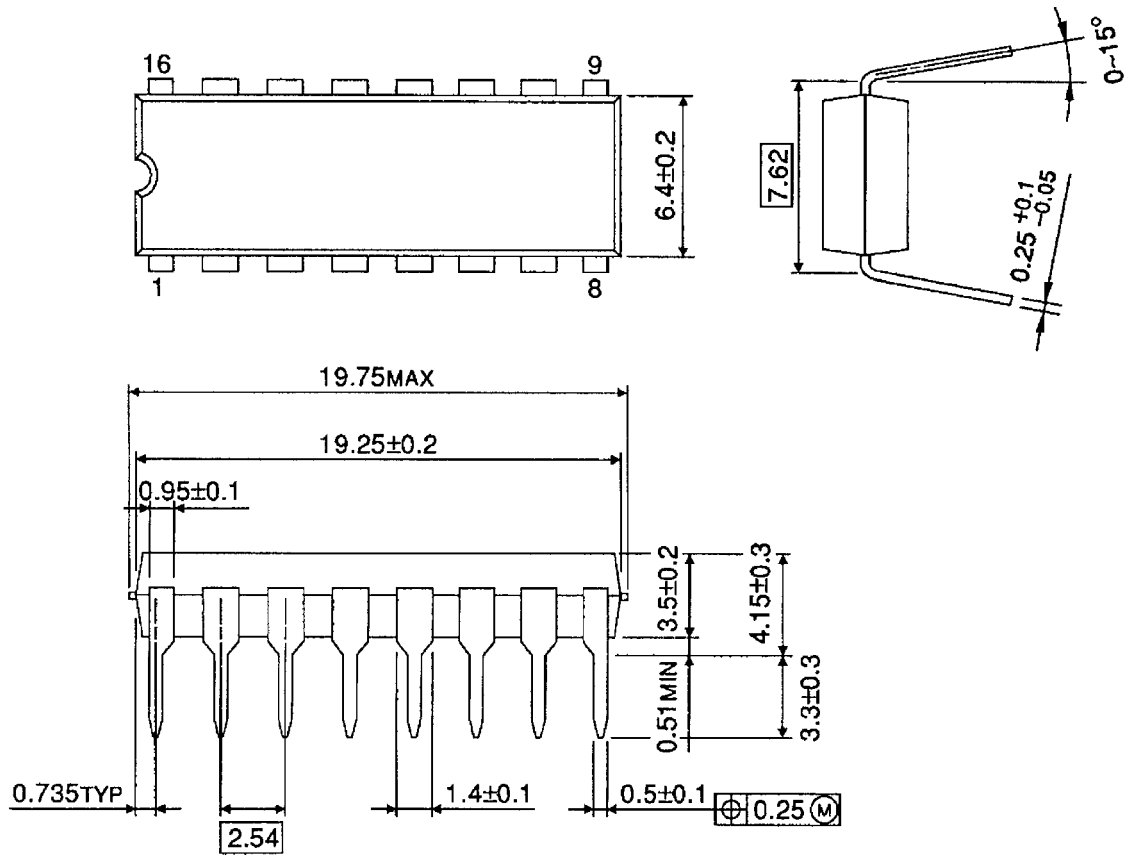
Note 2: R_F is set depending on the coil impedance, F / V transfer voltage (control input) and required starting torque. Set between 0.3 and 5 Ω.

Note 3: Connect when dive to control input occurs.

PACKAGE DIMENSIONS

DIP16-P-300-2.54A

Unit: mm

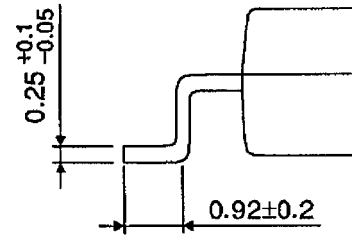
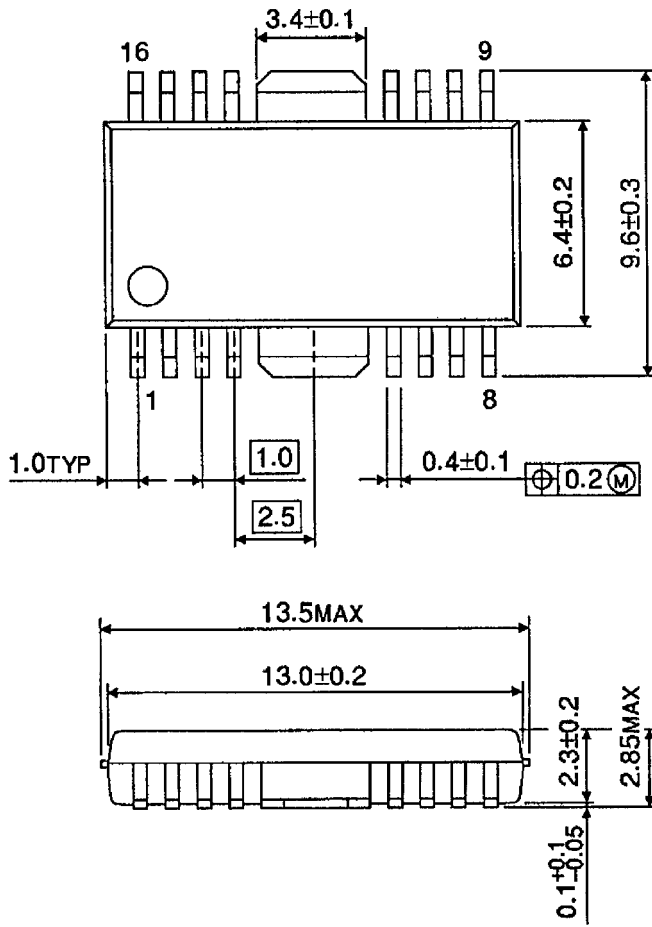


Weight: 1.11 g (Typ.)

PACKAGE DIMENSIONS

HSOP16-P-300-1.00

Unit: mm



Weight: 0.50 g (Typ.)

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000707EBA

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