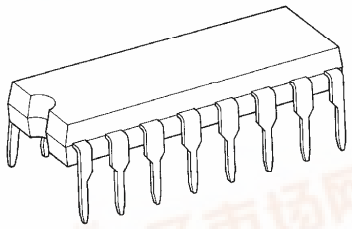
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

# TA7774P, TA7774F

## STEPPING MOTOR DRIVER IC

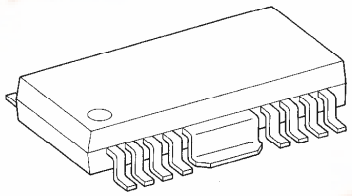
The TA7774P, TA7774F is 2 phase Bipolar stepping motor driver IC designed especially for 3.5 or 5.25 inches FDD head actuator drives.
It consists of TTL compatible input circuit, dual bridge driver outputs with flyback diodes, changing circuit of motor coil drive voltage (Power saving circuit) and stand-by circuit.

TA7774P



DIP16-P-300-2.54A

TA7774F



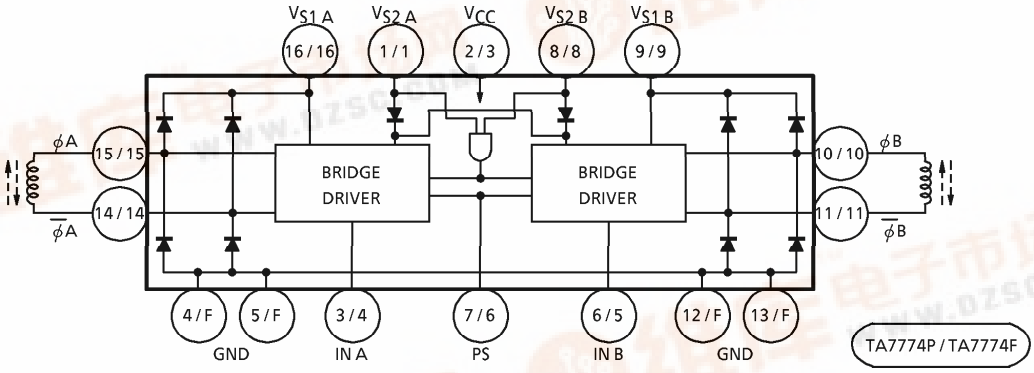
HSOP16-P-300-1.00

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

### FEATURES

- One Chip 2 Phase Bipolar Stepping Motor Driver.
- Power Saving and Stand-by Operation are available.
  I stand-by ($I_{CC3}$) ≦ 115 $\mu$A
- Build-in Punch Through Current Restriction Circuit for System Reliability and Noise Suppression.
- TTL Compatible Inputs
- Surface Mount is available with F Type.
- Output Current up to 0.4 A (peak)

### BLOCK DIAGRAM




(Note) Pin ②, ⑦, ⑫, ⑬ of TA7774F are all NC and Heat Fin is connected to GND.

980910EBA2

**PIN FUNCTION**

| PIN No. | SYMBOL | FUNCTIONAL DESCRIPTION |
|---|---|---|
| 1 / (1) | $V_{S2\ A}$ | Low-voltage power supply terminal |
| 2 / (3) | $V_{CC}$ | Power voltage supply terminal for control |
| 3 / (4) | IN A | A-ch forward rotation / reverse rotation signal input terminal |
| 4 / (F) | GND | GND terminal |
| 5 / (F) | GND | GND terminal |
| 6 / (5) | IN B | B-ch forward rotation / reverse rotation signal input terminal |
| 7 / (6) | PS | Powersave signal input terminal |
| 8 / (8) | $V_{S2\ B}$ | Stand-by signal input terminal |
| 9 / (9) | $V_{S1\ B}$ | High-voltage power supply terminal |
| 10 / (10) | $\phi$B | Output B |
| 11 / (11) | $\phi\overline{B}$ | Output $\overline{B}$ |
| 12 / (F) | GND | GND terminal |
| 13 / (F) | GND | GND terminal |
| 14 / (14) | $\phi\overline{A}$ | Output $\overline{A}$ |
| 15 / (15) | $\phi$A | Output A |
| 16 / (16) | $V_{S1\ A}$ | High-voltage power supply terminal. |

( ) : TA7774F

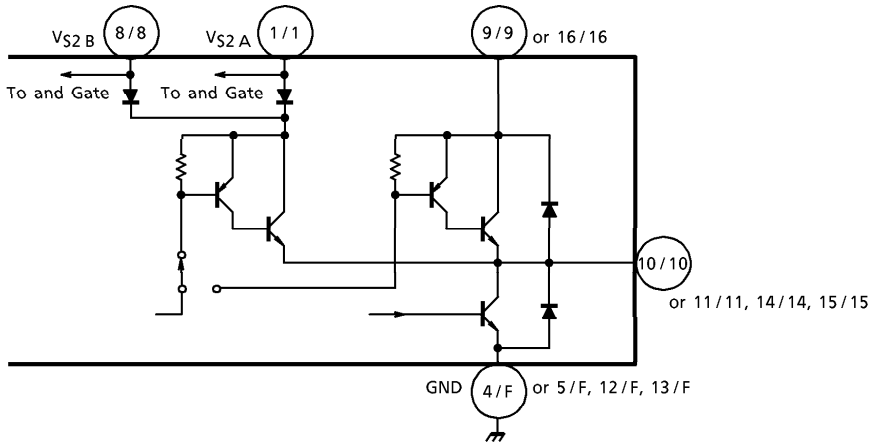
**TRUTH TABLE 1**

| INPUT | | OUTPUT | | |
|---|---|---|---|---|
| PS | IN | $\phi$ | $\overline{\phi}$ | |
| L | L | L | H | Enable $V_{S1}$ |
| L | H | H | L | Enable $V_{S1}$ |
| H | L | L | H | Enable $V_{S2}$ (Power save) |
| H | H | H | L | Enable $V_{S2}$ (Power save) |

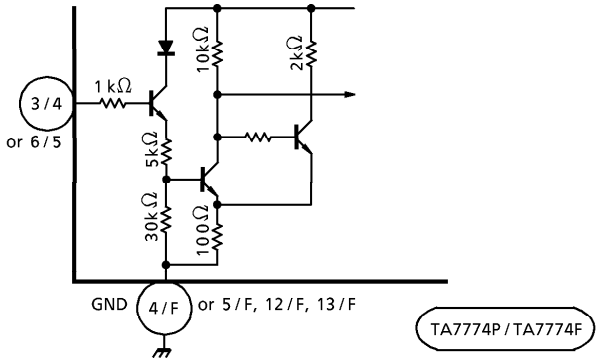
**TRUTH TABLE 2**

| $V_{S2\ B}$ | |
|---|---|
| L | Power Off (stand-by) |
| H | Operation |

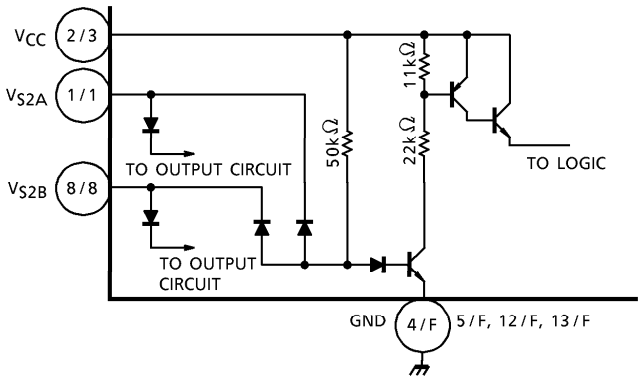
**OUTPUT CIRCUIT**




**INPUT CIRCUIT** IN A, IN B




**INPUT CIRCUIT** $V_{S2\,A}$ or $V_{S2\,B}$




**MAXIMUM RATINGS** (Ta = 25°C)

| CHARACTERISTIC | | SYMBOL | RATING | UNIT |
|---|---|---|---|---|
| Supply Voltage | | $V_{CC}$ | 7.0 | V |
| | | $V_{S1}$ | 17.0 | |
| | | $V_{S2}$ | ~$V_{CC}$ | |
| Output Current | | $I_{O\,(PEAK)}$ | ±400 | mA |
| | | $I_{O\,(START)}$ | ±350 | |
| | | $I_{O\,(HOLD)}$ | ±100 | |
| Input Voltage | | $V_{IN}$ | ~$V_{CC}$ | V |
| Power Dissipation | TA7774P | $P_D$ | (Note 1) 1.4 | W |
| | | | (Note 2) 2.7 | |
| | TA7774F | | (Note 3) 1.4 | |
| Operating Temperature | | $T_{opr}$ | −30~75 | °C |
| Storage Temperature | | $T_{stg}$ | −55~150 | °C |

(Note 1) No heat sink

(Note 2) This value is obtained by 50 × 50 × 0.8 mm PCB mounting occupied copper area in excess of 60%.

(Note 3) This value is obtained by 60 × 30 × 1.6 mm PCB mounting occupied copper area in excess of 50%.

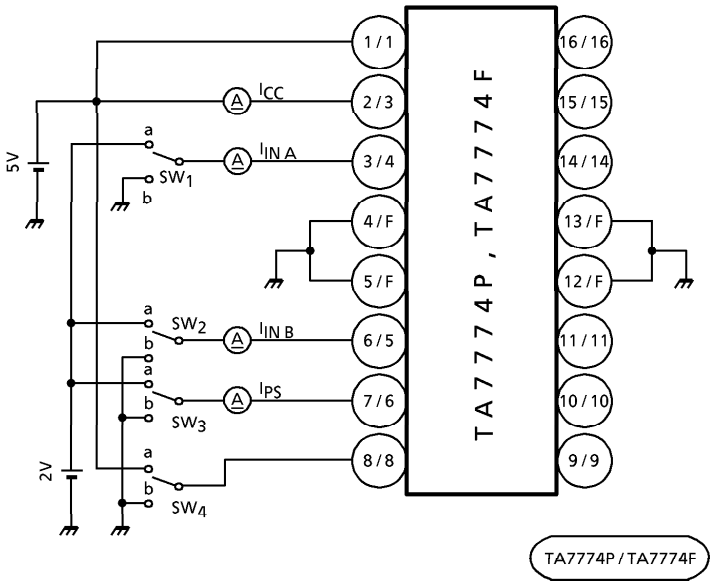
**ELECTRICAL CHARACTERISTICS**
(Unless otherwise specified, Ta = 25°C, $V_{CC}$ = 5 V, $V_{S1}$ = 12 V, $V_{S2A}$ = 5 V)

| CHARACTERISTIC | SYMBOL | TEST CIR-CUIT | TEST CONDITION | | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|---|
| Supply Current | $I_{CC1}$ | 1 | PS : H, $V_{S2}$ : H | | — | 9 | 14 | mA |
| | $I_{CC2}$ | | PS : L, $V_{S2}$ : H | | — | 8.5 | 13 | |
| | $I_{CC3}$ | | $V_{S2}$ : L | | 70 | 90 | 115 | μA |
| Input Voltage | $V_{IN\ H}$ | — | $T_j$ = 25°C<br>$V_{S2}$ : H | Pin ③, ⑥ | 2.0 | — | $V_{CC}$ | V |
| | $V_{IN\ L}$ | | | | GND | — | 0.8 | |
| | $V_{PS\ H}$ | | | Pin ⑦ | 2.0 | — | $V_{CC}$ | |
| | $V_{PS\ L}$ | | | | GND | — | 0.8 | |
| | $V_{S2\ BH}$ | | $T_j$ = 25°C | Pin ⑧ | 3.5 | — | $V_{CC}$ | |
| | $V_{S2\ BL}$ | | | | GND | — | 0.4 | |
| Input Current | $I_{IN}$ | 1 | $T_j$ = 25°C, $V_{S2}$ : H<br>$V_{IN}$ / PS (2 V) : Sink current | Pin ③, ⑥ | — | 2.6 | 30 | μA |
| | $I_{PS}$ | | | Pin ⑦ | — | 2.6 | 30 | |
| Output Saturation Voltage | $V_{SAT\ 1H1}$ | 2 | PS : L, $V_{S2}$ : H | $I_{OUT}$ = 100 mA | — | 0.9 | — | V |
| | $V_{SAT\ 1H2}$ | | | $I_{OUT}$ = 400 mA | — | 1.2 | 1.5 | |
| | $V_{SAT\ 2H1}$ | 3 | PS : H, $V_{S2}$ : H | $I_{OUT}$ = 20 mA | — | 1.6 | — | |
| | $V_{SAT\ 2H2}$ | | | $I_{OUT}$ = 100 mA | — | 1.8 | 2.1 | |
| | $V_{SAT\ L1}$ | | $V_{S2}$ : H | $I_{OUT}$ = 20 mA | — | 0.03 | — | |
| | $V_{SAT\ L2}$ | 2 | | $I_{OUT}$ = 100 mA | — | 0.15 | — | |
| | $V_{SAT\ L3}$ | | | $I_{OUT}$ = 400 mA | — | 0.35 | 0.6 | |
| Diode Forward Voltage | $V_{F\ U}$ | 4 | $I_F$ = 350 mA | | — | 1.5 | — | V |
| | $V_{F\ L}$ | | | | — | 1.0 | — | |
| Delay Time | $t_{pLH}$ | — | IN – $\phi$ | | — | 7 | — | μs |
| | $t_{pHL}$ | | | | — | 2 | — | |
| Operating Voltage | $V_{CC\ (opr.)}$ | — | $V_{CC}$ = ST | | 4.5 | 5.0 | 7.0 | V |

Recommendable Operating Voltage $V_{S1\ (opr.)}$ 12 V ± 10%
$V_{S2A\ (opr.)}$ 5 V ± 10%

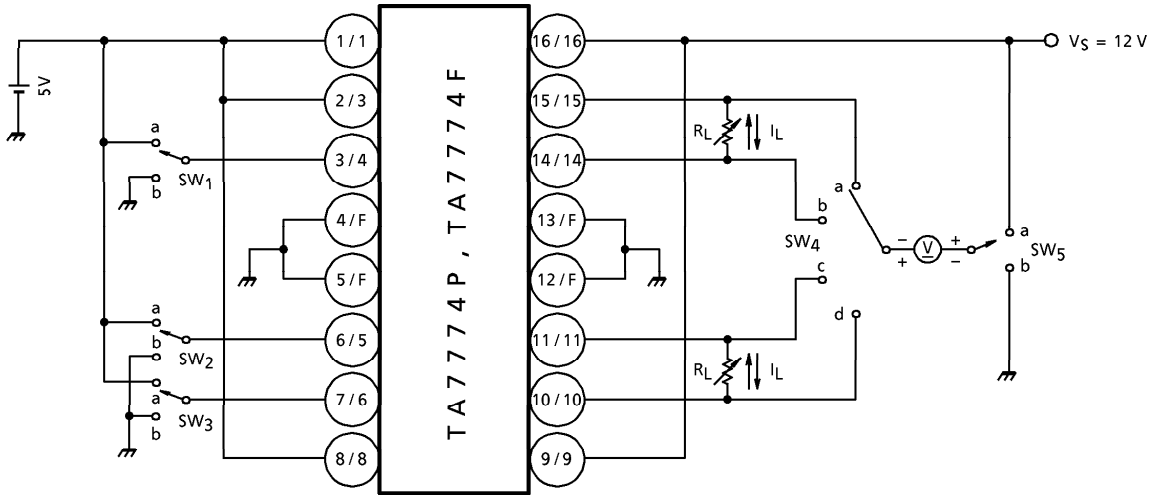
Operating Voltage Restriction $V_{S1} \geqq V_{S2A}$

**TEST CIRCUIT 1** $I_{CC1}$, $I_{CC2}$, $I_{CC3}$, $I_{IN\,A}$, $I_{IN\,B}$, $I_{PS}$




| ITEM | $SW_1$ | $SW_2$ | $SW_3$ | $SW_4$ |
|---|---|---|---|---|
| $I_{CC1}$ | b | b | a | a |
| $I_{CC2}$ | b | b | b | a |
| $I_{CC3}$ | b | b | — | b |
| $I_{IN\,A}$ | a | — | — | a |
| $I_{IN\,B}$ | — | a | — | a |
| $I_{PS}$ | — | — | a | a |

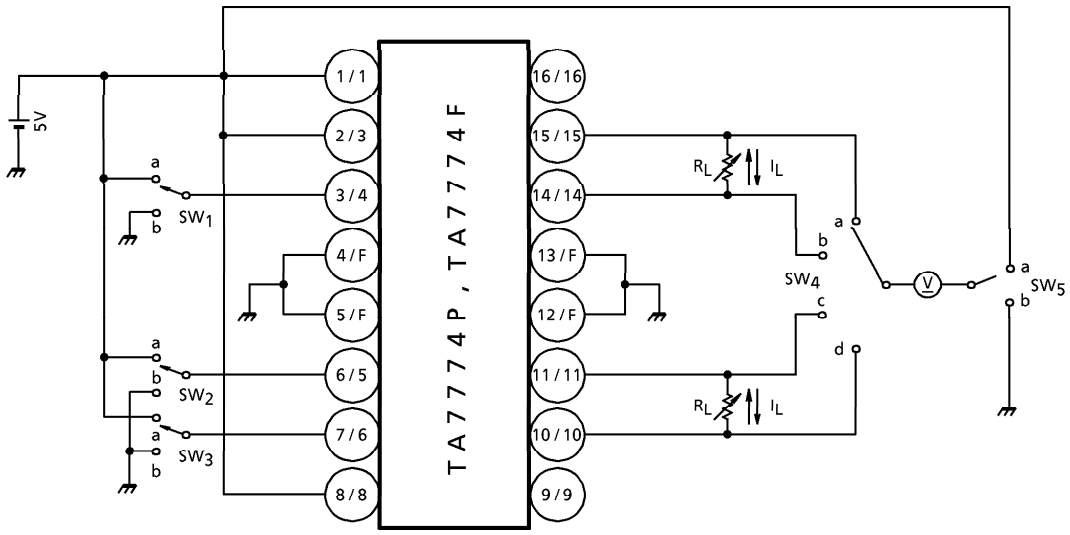
**TEST CIRCUIT 2** $V_{SAT\ 1H1}$, $V_{SAT\ 1H2}$, $V_{SAT\ L2}$, $V_{SAT\ L3}$




(*) Calibrate $I_L$ to 0.4 / 0.1 A by $R_L$.

| ITEM | $SW_1$ | $SW_2$ | $SW_3$ | $SW_4$ | $SW_5$ | $I_L$ (mA) |
|---|---|---|---|---|---|---|
| $V_{SAT\ 1H1}$ | a | — | b | a | a | 100 |
| | b | — | | b | | |
| | — | a | | d | | |
| | — | b | | c | | |
| $V_{SAT\ 1H2}$ | a | — | b | a | a | 400 |
| | b | — | | b | | |
| | — | a | | d | | |
| | — | b | | c | | |
| $V_{SAT\ L2}$ | a | — | — | b | b | 100 |
| | b | — | | a | | |
| | — | a | | c | | |
| | — | b | | d | | |
| $V_{SAT\ L3}$ | a | — | b | b | b | 400 |
| | b | — | | a | | |
| | — | a | | c | | |
| | — | b | | d | | |

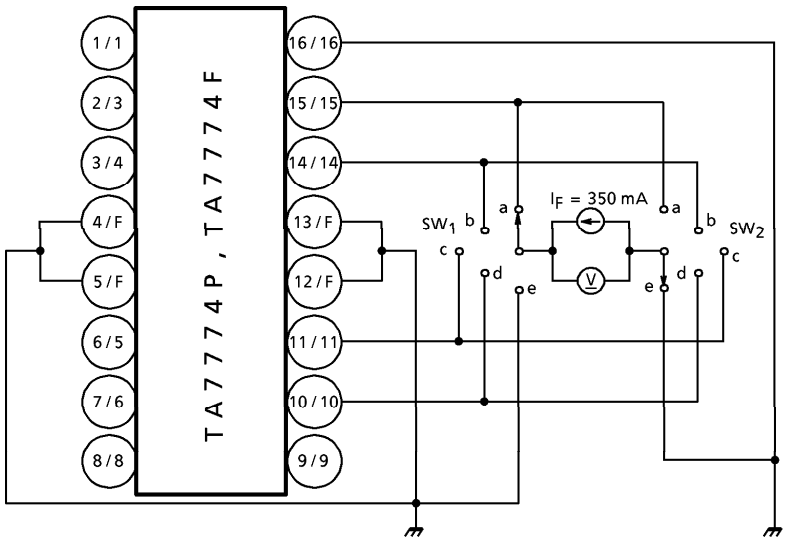
**TEST CIRCUIT 3** $V_{SAT\ 2H1}$, $V_{SAT\ 2H2}$, $V_{SAT\ L1}$




(*) Calibrate $I_L$ to 20 / 100 mA by $R_L$.

| ITEM | $SW_1$ | $SW_2$ | $SW_3$ | $SW_4$ | $SW_5$ | $I_L$ (mA) |
|---|---|---|---|---|---|---|
| $V_{SAT\ 2H1}$ | a | — | a | a | a | 20 |
| | b | — | | b | | |
| | — | a | | c | | |
| | — | b | | d | | |
| $V_{SAT\ 2H2}$ | a | — | a | a | a | 100 |
| | b | — | | b | | |
| | — | a | | c | | |
| | — | b | | d | | |
| $V_{SAT\ L1}$ | a | — | a | b | b | 20 |
| | b | — | | a | | |
| | — | a | | c | | |
| | — | b | | d | | |

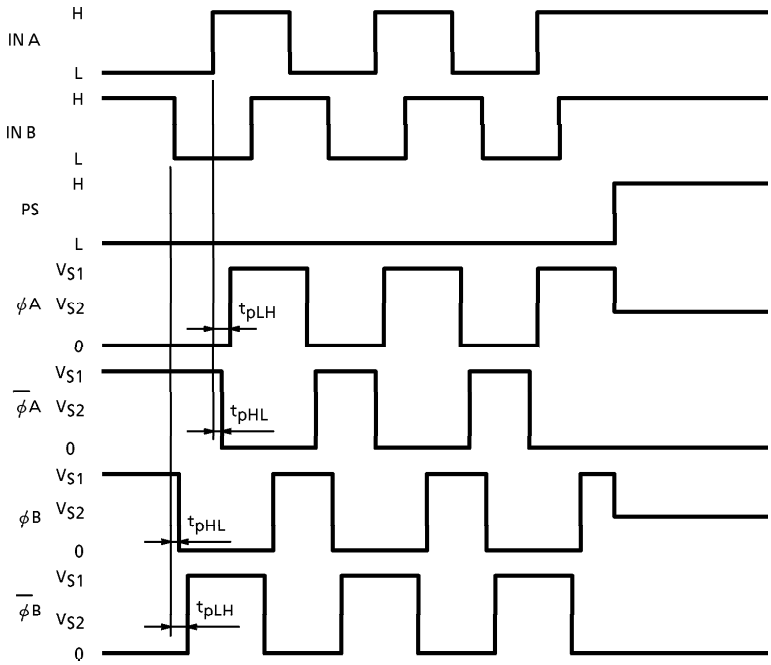
**TEST CIRCUIT 4** $V_{F\,U}$, $V_{F\,L}$




**MEASURING METHOD**

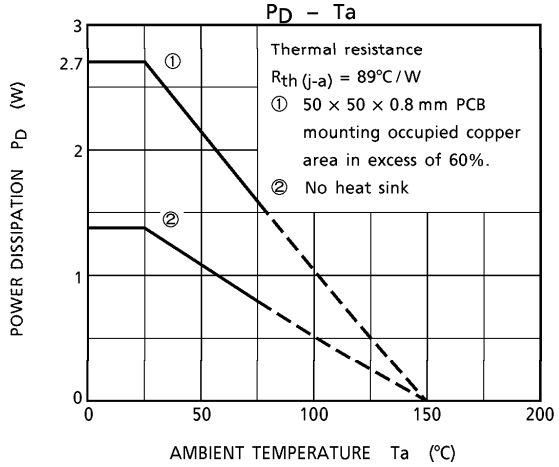
| ITEM | $SW_1$ | $SW_2$ |
|---|---|---|
| $V_{F\,U}$ | a | e |
| | b | |
| | c | |
| | d | |
| $V_{F\,L}$ | e | a |
| | | b |
| | | c |
| | | d |

**TIMING CHART** (2 phase excitation)

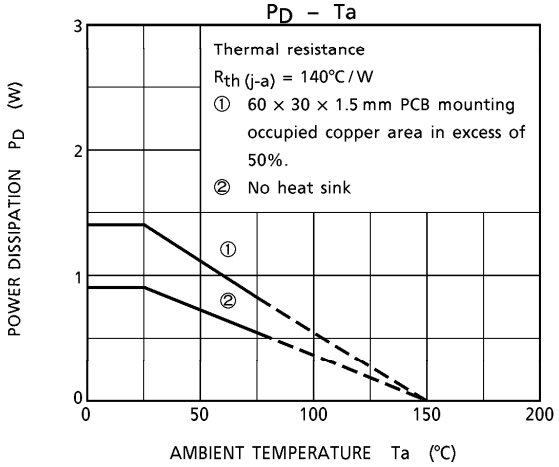



$t_{pLH}$ : 7 μs (Typ.)
$t_{pLH}$ : 2 μs (Typ.)

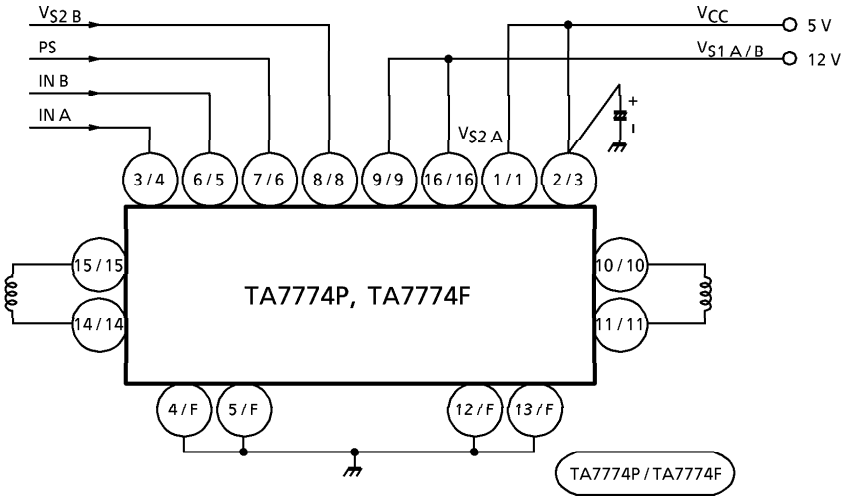
TA7774P




TA7774F




## APPLICATION CIRCUIT

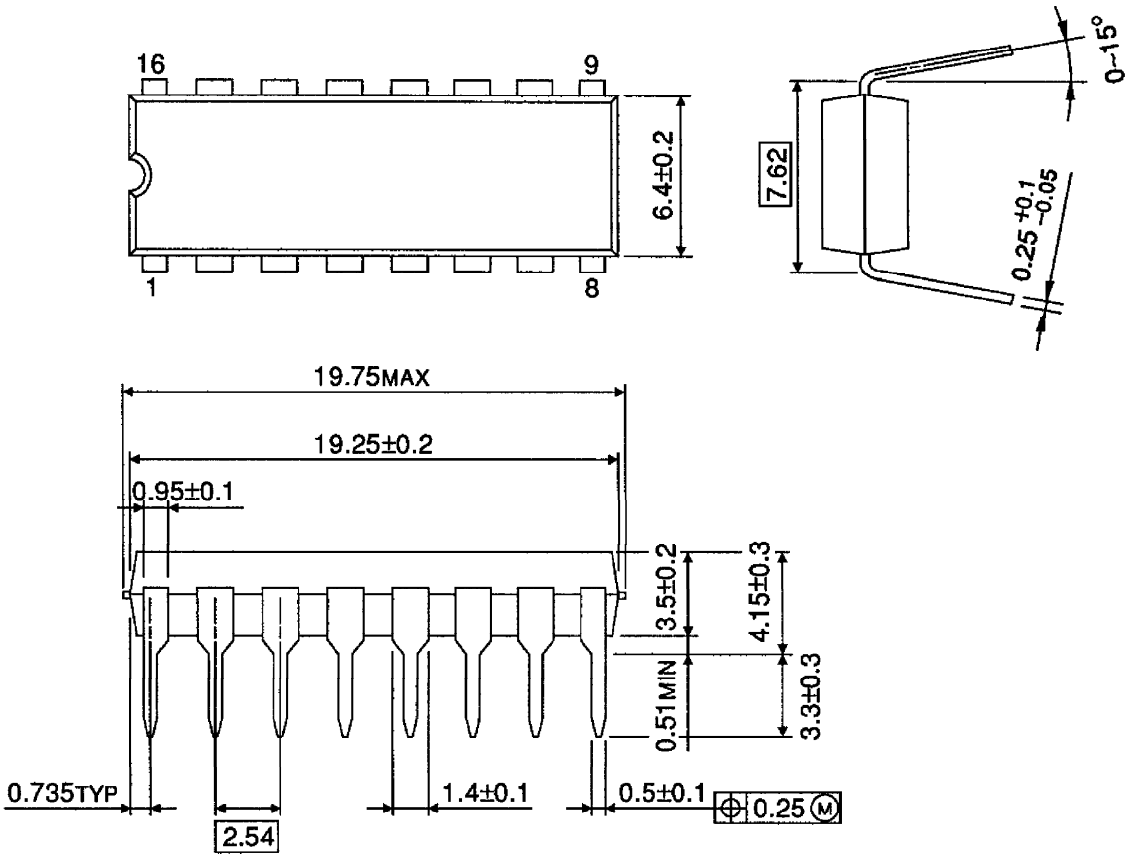



(Note) Utmost care is necessary in the design of the output line, $V_S$ and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.

**OUTLINE DRAWING**

DIP16-P-300-2.54A

Unit : mm

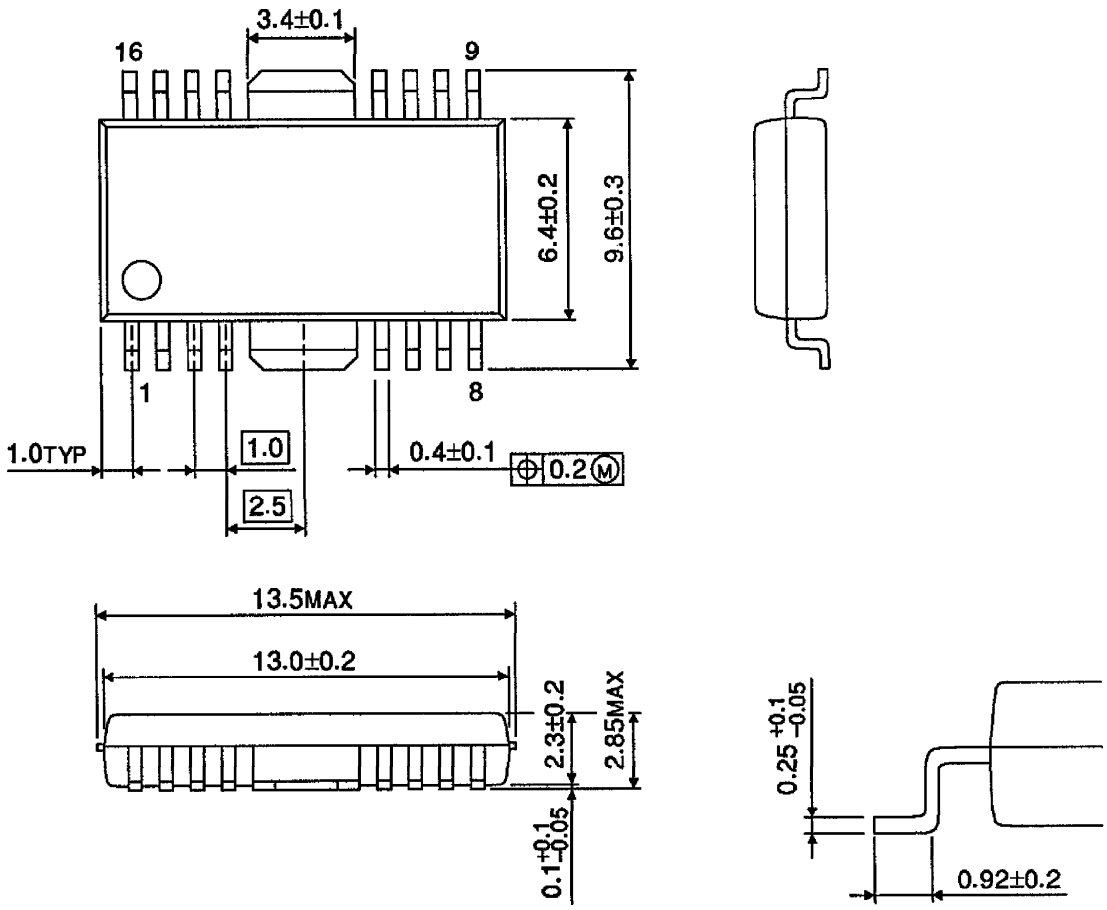



Weight : 1.11 g (Typ.)

**OUTLINE DRAWING**

HSOP16-P-300-1.00

Unit : mm




Weight : 0.50 g (Typ.)