

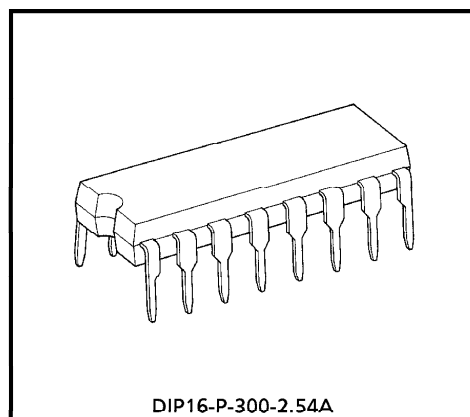
# TA8415P

## STEPPING MOTOR CONTROLLER / DRIVER

The TA8415P is general purpose unipolar stepping motor controller/driver, applicable to 3/4 phase motors and 1, 1-2, 2 phase excitation drive by initial setting of control terminals.

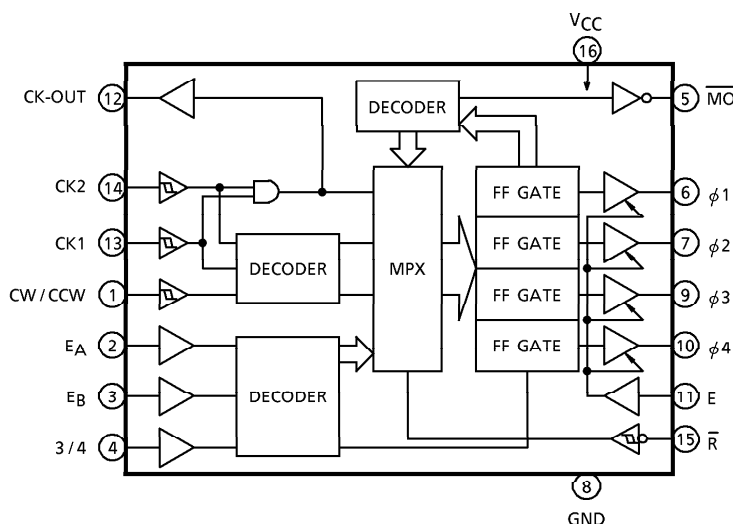
### FEATURES

- 1 chip stepping motor controller / driver.
- 3 or 4 phase and 1, 1-2, 2 phase excitation drive are available.
- CW / CCW rotation and 1 clock or 2 clock drive are available.
- Hysteresis is provided with clock, CW / CCW, reset inputs for noise protection.
- Output enable, initial detect are available.
- Output current up to 400mA (MAX.)



Weight : 1.11g (Typ.)

### BLOCK DIAGRAM



961001EBA2

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## PIN FUNCTION

| PIN No. | SYMBOL          | PIN NAME                        | FUNCTIONAL DESCRIPTION                      |               |
|---------|-----------------|---------------------------------|---------------------------------------------|---------------|
| 1       | CW / CCW        | Clock Wise / Counter Clock Wise | Direction Control Input    Function Table A |               |
| 2       | E <sub>A</sub>  | Excitation A                    | Phase Excitation Mode Input                 | Truth Table B |
| 3       | E <sub>B</sub>  | Excitation B                    |                                             |               |
| 4       | 3 / 4           | 3 Phases / 4 Phases             | Phase Control Input                         |               |
| 5       | $\overline{MO}$ | Monitor Out                     | $\overline{MO}$ = "L" at Initial State      |               |
| 6       | $\phi 1$        | $\phi 1$ Out                    | $\phi 1$ Output                             |               |
| 7       | $\phi 2$        | $\phi 2$ Out                    | $\phi 2$ Output                             |               |
| 8       | GND             | GND                             | GND                                         |               |
| 9       | $\phi 3$        | $\phi 3$ Out                    | $\phi 3$ Output                             |               |
| 10      | $\phi 4$        | $\phi 4$ Out                    | $\phi 4$ Output                             |               |
| 11      | E               | Output Enable                   | Outputs are Enable at E = "H"               |               |
| 12      | CK-OUT          | Clock-Out                       | Clock Output                                |               |
| 13      | CK1             | Clock I <sub>N</sub> -1         | Clock Input 1                               | Truth Table A |
| 14      | CK2             | Clock I <sub>N</sub> -2         | Clock Input 2                               |               |
| 15      | $\overline{R}$  | Reset                           | Reset Input                                 |               |
| 16      | V <sub>CC</sub> | V <sub>CC</sub>                 | V <sub>CC</sub>                             |               |

TRUTH TABLE A

| CK1                                                                                 | CK2                                                                                 | CW / CCW | FUNCTION |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------|----------|
|  | H                                                                                   | L        | CW       |
|  | L                                                                                   | L        | Inhibit  |
| H                                                                                   |  | L        | CCW      |
| L                                                                                   |  | L        | Inhibit  |
|  | H                                                                                   | H        | CCW      |
|  | L                                                                                   | H        | Inhibit  |
| H                                                                                   |  | H        | CW       |
| L                                                                                   |  | H        | Inhibit  |

TRUTH TABLE B

| E <sub>A</sub> | E <sub>B</sub> | 3 / 4 (Note) | FUNCTION                          |                      |
|----------------|----------------|--------------|-----------------------------------|----------------------|
| L              | L              | L            | 4 Phases                          | 1 Phase Excitation   |
| H              | L              | L            |                                   | 2 Phase Excitation   |
| L              | H              | L            |                                   | 1-2 Phase Excitation |
| H              | H              | L            | Test Mode $\phi 1 \sim \phi 4$ ON |                      |
| L              | L              | H            | 3 Phases                          | 1 Phase Excitation   |
| H              | L              | H            |                                   | 2 Phase Excitation   |
| L              | H              | H            |                                   | 1-2 Phase Excitation |
| H              | H              | H            | Test Mode $\phi 1 \sim \phi 4$ ON |                      |

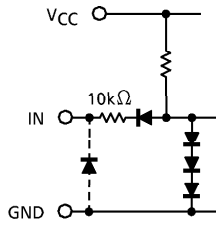
(Note) Conversion of Phase Excitation Mode must be made after the Reset Mode is established.

961001EBA2'

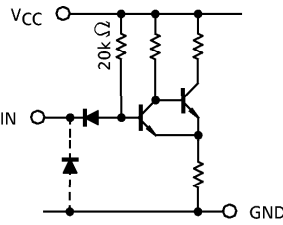
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SCHEMATIC OF INPUTS AND OUTPUTS

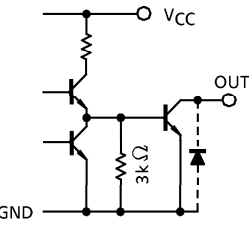
$E_A, E_B, 3/4, E$



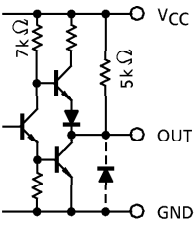
$CK1, CK2, CW/CCW, \bar{R}$



$\phi 1 \sim \phi 4$



$\overline{MO}, CK-OUT$



MAXIMUM RATINGS (Ta = 25°C Unless otherwise noted)

| CHARACTERISTIC                             | SYMBOL                         | RATING                   | UNIT |
|--------------------------------------------|--------------------------------|--------------------------|------|
| Supply Voltage                             | $V_{CC}$                       | $-0.3 \sim 7.0$          | V    |
| Output Sustaining Voltage                  | $V_{CE(SUS)} \phi$             | $-0.3 \sim 28$           | V    |
| Output Current ( $\phi n$ )                | $I_{OUT \phi}$                 | 400                      | mA   |
| Output Current ( $\overline{MO}, CK-OUT$ ) | $I_{OUT \overline{MO} CK-OUT}$ | 10                       | mA   |
| Input Voltage                              | $V_{IN}$                       | $-0.3 \sim V_{CC} + 0.3$ | V    |
| Input Current                              | $I_{IN}$                       | $\pm 1$                  | mA   |
| Power Dissipation                          | $P_D$                          | 1.2                      | W    |
| Operating Temperature                      | $T_{opr}$                      | $-30 \sim 85$            | °C   |
| Storage Temperature                        | $T_{stg}$                      | $-55 \sim 150$           | °C   |

RECOMMENDED OPERATING CONDITIONS (Ta = -30~85°C)

| CHARACTERISTIC                         | SYMBOL             | TEST CONDITION | MIN. | TYP. | MAX.     | UNIT |
|----------------------------------------|--------------------|----------------|------|------|----------|------|
| Supply Voltage                         | $V_{CC}$           | —              | 4.5  | 5.0  | 5.5      | V    |
| Output Sustaining Voltage              | $V_{CE(SUS)} \phi$ | —              | 0    | —    | 26       | V    |
| Output Current $\phi n$ "L" Level      | $I_{OUT \phi}$     | —              | —    | —    | 200      | mA   |
| Output Current $\overline{MO}, CK-OUT$ | "H" Level          | —              | —    | —    | -0.4     | mA   |
|                                        | "L" Level          | —              | —    | —    | 8        |      |
| Input Voltage                          | $V_{IN}$           | —              | 0    | —    | $V_{CC}$ | V    |
| Clock Frequency                        | $f_{CLOCK}$        | —              | 0    | —    | 100      | kHz  |
| Power Dissipation                      | $P_D$              | —              | —    | —    | 0.6      | W    |

## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

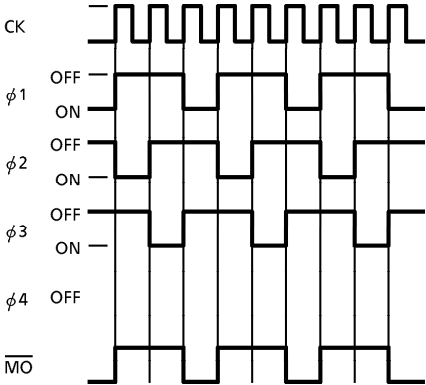
| CHARACTERISTIC                        |           |                                | SYMBOL             | TEST CIR-<br>CUIT                                | TEST CONDITION                                                | MIN. | TYP.  | MAX. | UNIT |
|---------------------------------------|-----------|--------------------------------|--------------------|--------------------------------------------------|---------------------------------------------------------------|------|-------|------|------|
| Input Voltage                         | "H" Level | V <sub>IH</sub>                | —                  | —                                                | 2.0                                                           | —    | —     | V    |      |
|                                       | "L" Level | V <sub>IL</sub>                | —                  | —                                                | —                                                             | —    | 0.8   |      |      |
| Input Current                         | "H" Level | I <sub>IH</sub>                | —                  | V <sub>CC</sub> = 5.5V, V <sub>IH</sub> = 5.5V   | —                                                             | —    | 10    | μA   |      |
|                                       | "L" Level | I <sub>IL</sub>                | —                  | V <sub>CC</sub> = 5.5V, V <sub>IL</sub> = 0.4V   | —                                                             | —    | − 0.4 | mA   |      |
| Hysteresis                            |           |                                | ΔV <sub>T</sub>    | —                                                | —                                                             | 150  | —     | mV   |      |
| Supply Current                        |           |                                | I <sub>CC</sub>    | —                                                | —                                                             | —    | —     | 100  | mA   |
| Output Leakage Current ϕ <sub>n</sub> |           |                                | I <sub>OH</sub> ϕ  | —                                                | V <sub>CC</sub> = 5.5V, V <sub>OUT</sub> = 26V                | —    | —     | 100  | μA   |
| Output Voltage                        | "H" Level | M $\overline{\text{O}}$ CK-OUT | V <sub>OH</sub>    | —                                                | V <sub>CC</sub> = 4.5V, I <sub>OH</sub> = − 0.4mA             | 2.4  | —     | —    | V    |
|                                       |           |                                |                    | V <sub>CC</sub> = 5.0V, I <sub>OH</sub> = − 10μA | 4.0                                                           | —    | —     |      |      |
|                                       | "L" Level | M $\overline{\text{O}}$ CK-OUT | V <sub>OL</sub>    | —                                                | V <sub>CC</sub> = 4.5V, I <sub>OL</sub> = 8mA                 | —    | —     | 0.4  |      |
|                                       |           | ϕ <sub>n</sub>                 | V <sub>OUT</sub> ϕ | —                                                | V <sub>CC</sub> = 4.5V, I <sub>OUT</sub> = 400mA<br>t = 100ms | —    | —     | 1.1  |      |
|                                       |           |                                |                    | —                                                | V <sub>CC</sub> = 4.5V, I <sub>OUT</sub> = 200mA<br>t = 100ms | —    | —     | 0.6  |      |

## SWITCHING CHARACTERISTICS (Ta = 25°C)

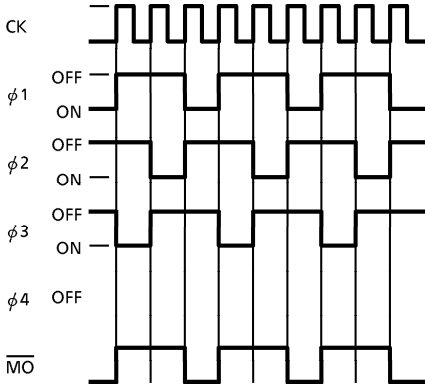
| CHARACTERISTIC                    |           |                           | SYMBOL       | TEST CIR-<br>CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT    |
|-----------------------------------|-----------|---------------------------|--------------|-------------------|----------------|------|------|------|---------|
| Propa-<br>gation<br>Delay<br>Time | “H” Level | CK- $\phi$ n              | $t_{pLH}$    | —                 | —              | —    | 2.0  | —    | $\mu$ s |
|                                   |           | CK-CK-OUT                 |              |                   |                | —    | 1.0  | —    |         |
|                                   |           | CK-MO                     |              |                   |                | —    | 2.8  | —    |         |
|                                   |           | E- $\phi$ n               |              |                   |                | —    | 1.0  | —    |         |
|                                   |           | R- $\phi$ n               |              |                   |                | —    | 2.0  | —    |         |
|                                   | “L” Level | CK- $\phi$ n              | $t_{pHL}$    | —                 | —              | —    | 1.4  | —    |         |
|                                   |           | CK-CK-OUT                 |              |                   |                | —    | 0.7  | —    |         |
|                                   |           | CK-MO                     |              |                   |                | —    | 2.1  | —    |         |
|                                   |           | E- $\phi$ n               |              |                   |                | —    | 1.2  | —    |         |
|                                   |           | $\overline{R}$ - $\phi$ n |              |                   |                | —    | 1.0  | —    |         |
|                                   |           | R-MO                      |              |                   |                | —    | 2.0  | —    |         |
| Maximum Clock Frequency           |           |                           | $f_{max}$    | —                 | —              | —    | 250  | —    | kHz     |
| Set Up Time CK, CW / CCW          |           |                           | $t_{set-up}$ | —                 | —              | —    | 0.1  | —    |         |
| Hold Time CK, CW / CCW            |           |                           | $t_{hold}$   |                   |                | —    | 0.1  | —    |         |
| Minimum Clock Pulse Width         |           |                           | $t_w$ (CK)   | —                 | —              | —    | 1.0  | —    |         |
| Minimum Reset Pulse Width         |           |                           | $t_w$ (R)    | —                 | —              | —    | 1.0  | —    |         |
| Maximum Clock Rise Time           |           |                           | $t_r$ (CK)   | —                 | —              | —    | 10   | —    |         |

**TIMING CHART**  
**3 PHASES METHOD**

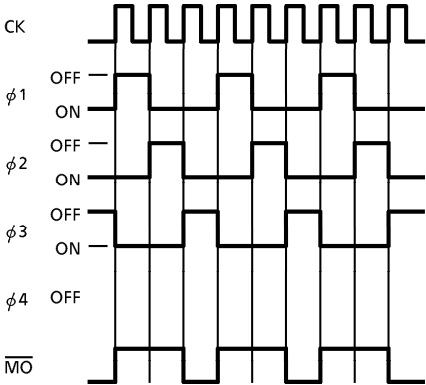
1 PHASE EXCITATION CW



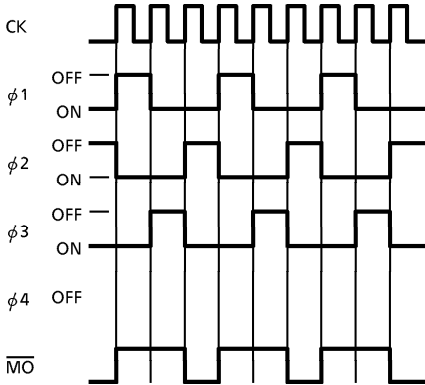
1 PHASE EXCITATION CCW



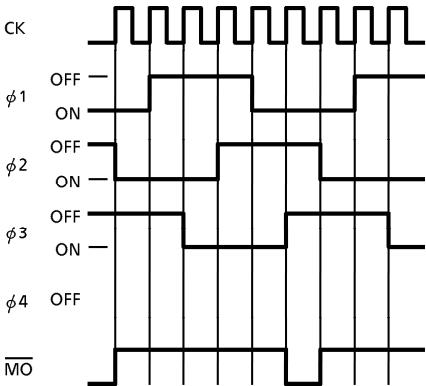
2 PHASE EXCITATION CW



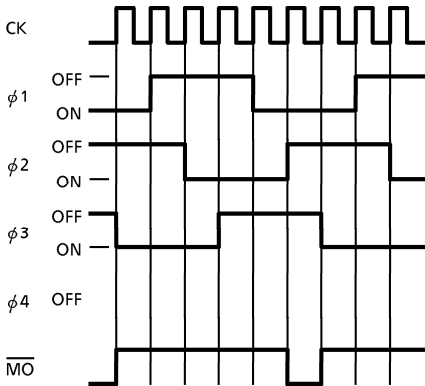
2 PHASE EXCITATION CCW



1-2 PHASE EXCITATION CW

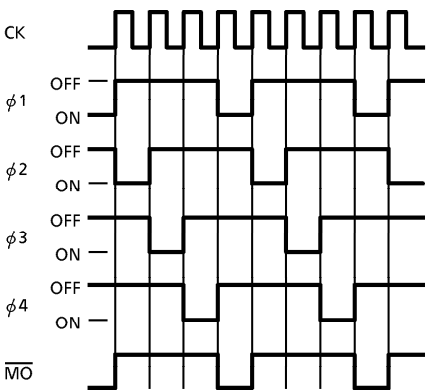


1-2 PHASE EXCITATION CCW

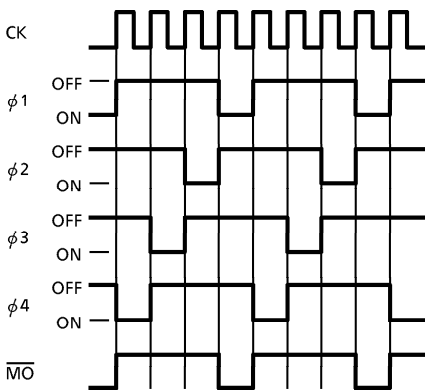


4 PHASES METHOD

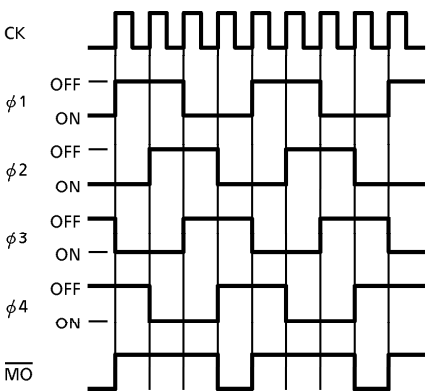
1 PHASE EXCITATION CW



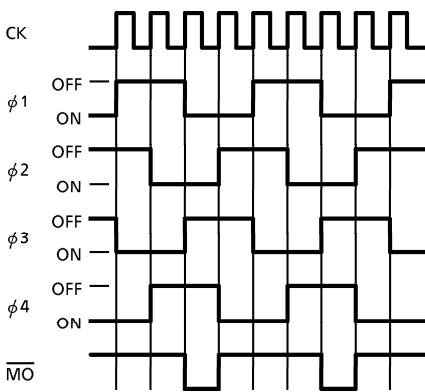
1 PHASE EXCITATION CCW



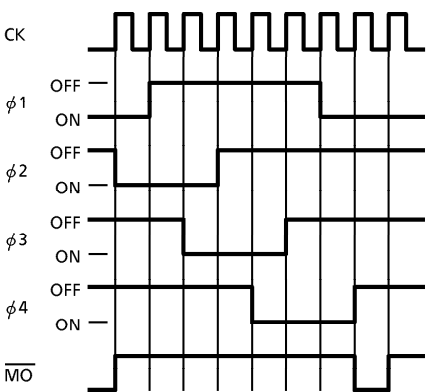
2 PHASE EXCITATION CW



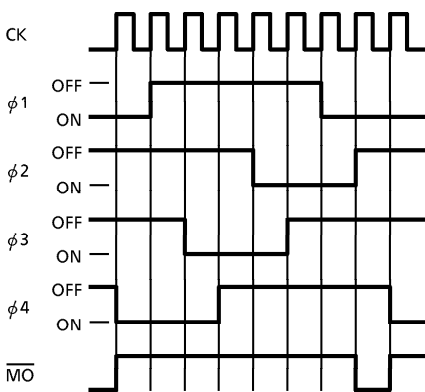
2 PHASE EXCITATION CCW

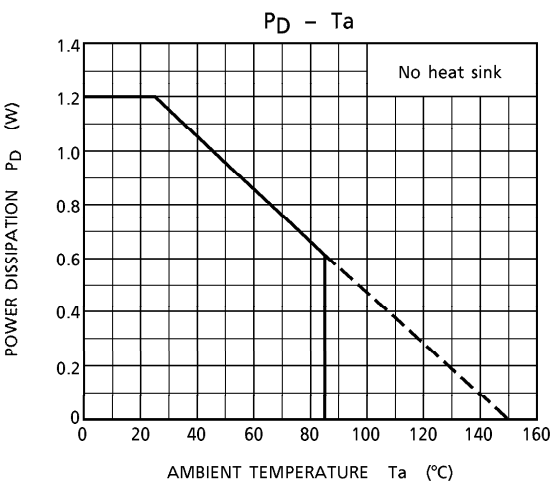
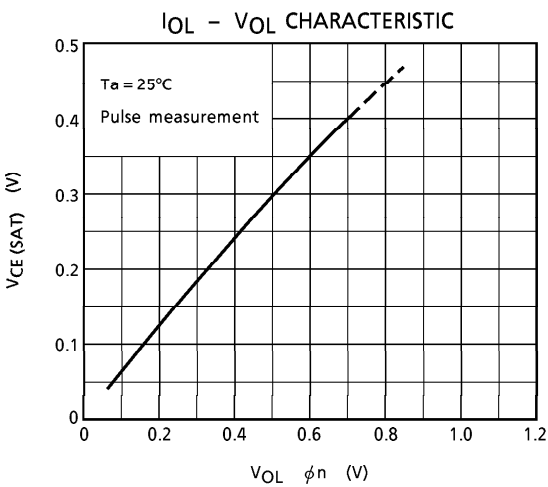


1-2 PHASE EXCITATION CW

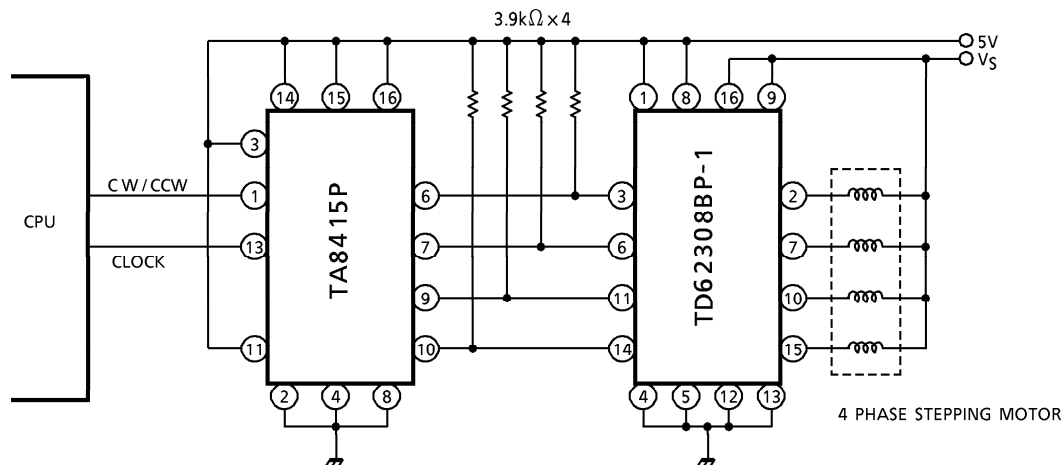


1-2 PHASE EXCITATION CCW

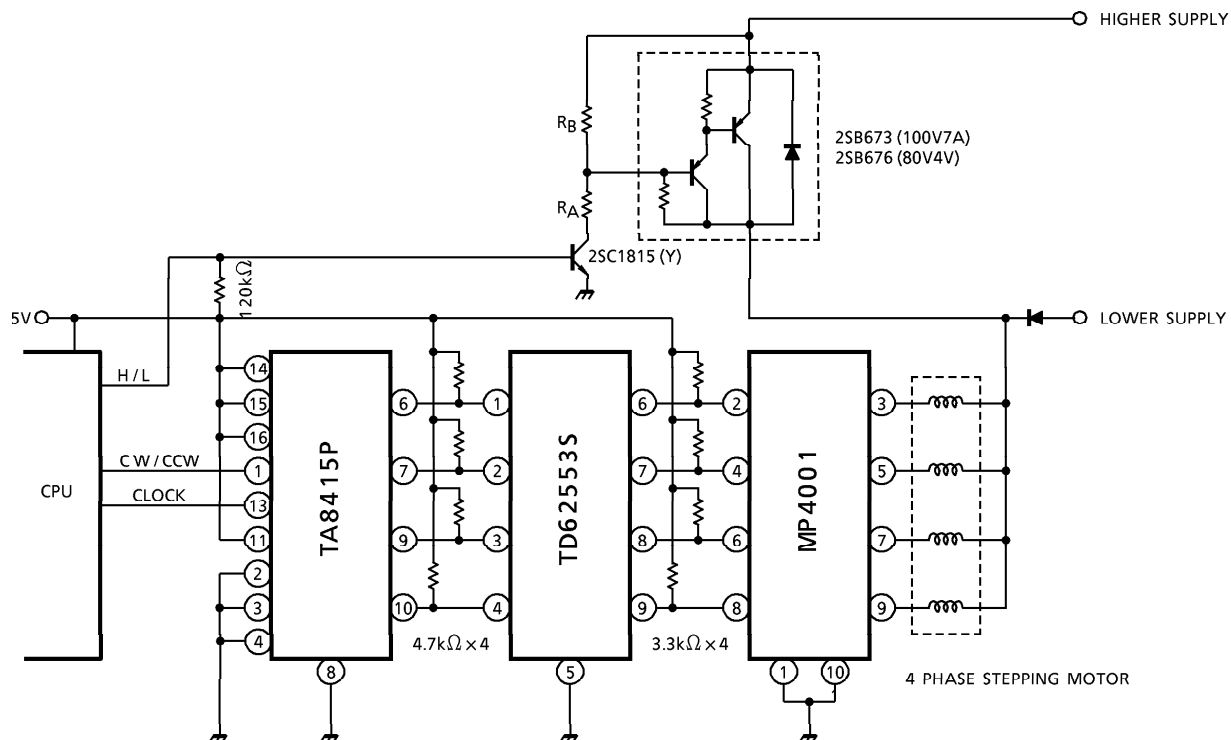




(TA8415P + TD62308BP 4 phase stepping motor driver circuit)

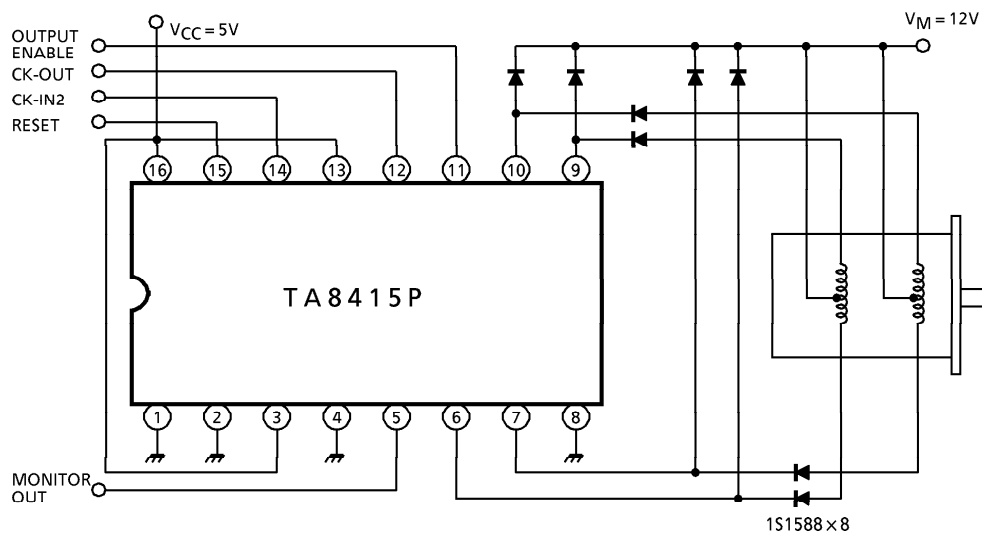


## (TA8415P + TD62553S + MP4001 high efficiency stepping motor driver circuit)



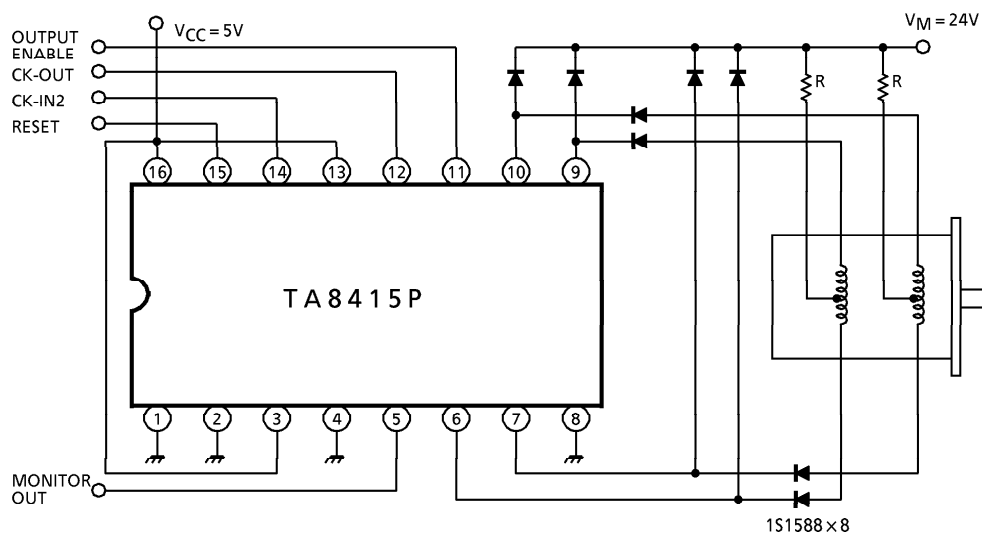
## APPLICATION CIRCUIT 3

4 phase motor 1-2 phase excitation drive I.



## APPLICATION CIRCUIT 4

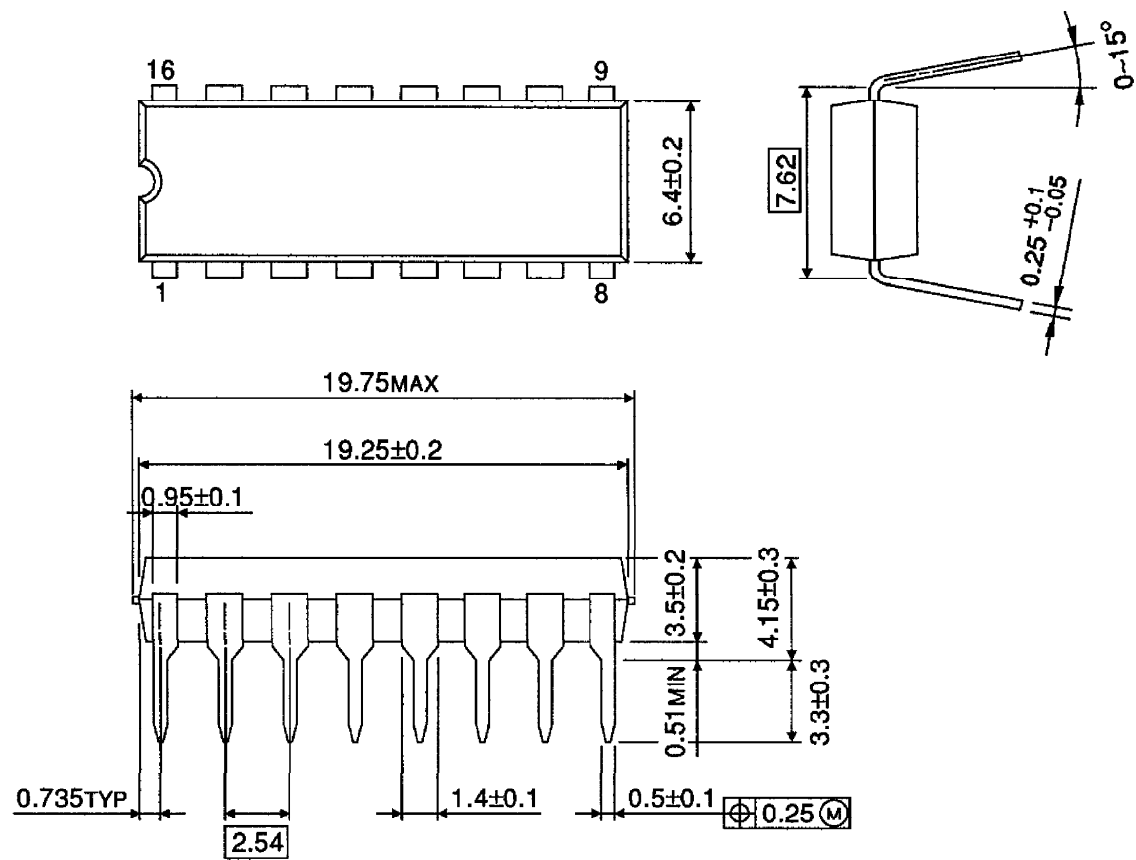
4 phase motor 1-2 phase excitation drive II.



(Note) Utmost care is necessary in the design of the output line, power supply 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 : 1.11g (Typ.)