

TOSHIBA BIPOLAR DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

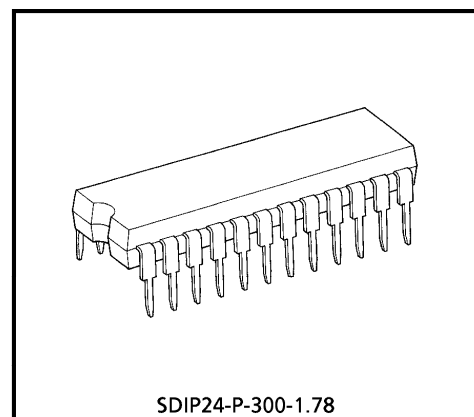
# TD62708N

## 8CH HIGH CURRENT SOURCE DRIVER

The TD62708N is comprised of eight source current output stages and  $\overline{\text{ENABLE}}$  inputs which can gate the outputs.

TD62708N features a large output source current of 1.8A and minimized output voltage change vs output current change. These features make the device optimum for driving the matrix of ink jet printer print heads, LEDs, and the scan side of resistor matrixes.

Before using this device, note the thermal conditions for usage.

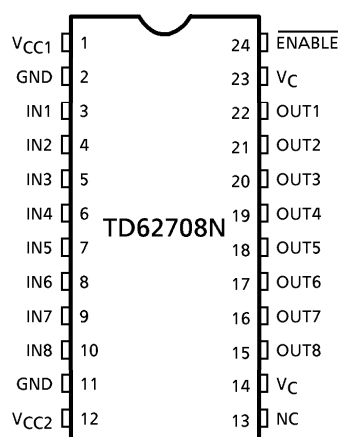


Weight : 1.2g (Typ.)

### FEATURES

- Input terminal : High active
- $\overline{\text{Enable}}$  terminal : Low input output active mode
- Output current :  $I_{\text{OUT}} = 1.8\text{A (MAX)}$
- A little change of output voltage  
:  $\Delta V_{\text{OH1}} \leq 0.45\text{V}$   
(at  $I_{\text{OH}} = 0.18\text{A} \sim 1.44\text{A}$ )
- Package type : DIP24N
- Input compatible with TTL, 5V CMOS

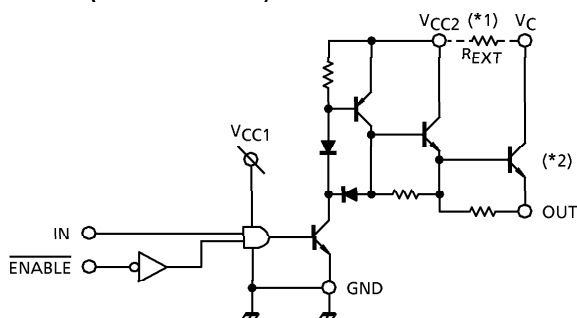
### PIN CONNECTION (TOP VIEW)



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### SCHEMATICS (EACH DRIVER)

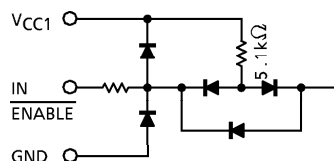


## FUNCTION

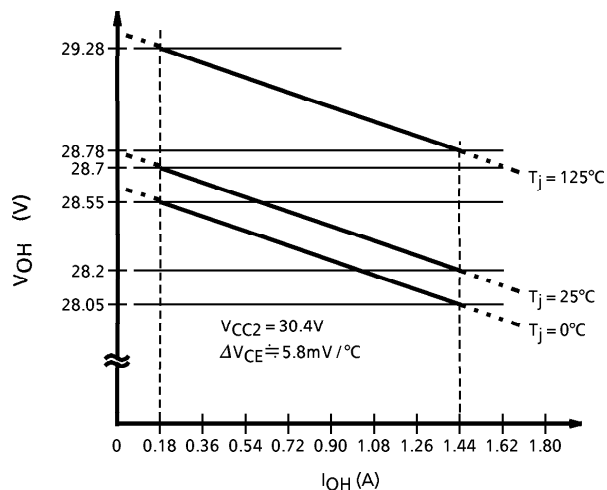
|            |                            |     |
|------------|----------------------------|-----|
| IN         | $\overline{\text{ENABLE}}$ | OUT |
| H          | L                          | ON  |
| L          | L                          | OFF |
| Don't Care | H                          | OFF |

- (\*1) For normal use, connect  $V_{CC2}$  and  $V_C$ .  
For applications whose thermal conditions are more demanding, TOSHIBA recommends an external resistor ( $R_{EXT}$  : approx.  $0.9\Omega/2W$ ) be connected between  $V_{CC2}$  and  $V_C$ .
- (\*2) When connecting an external resistor between  $BV_{CC2}$  and  $V_C$ , to avoid parasitic sub currents, set the voltage between  $V_C$  and OUT as 0.3V or more.  
Set the external resistor value so that the voltage between  $V_C$  and OUT is 0.3V or more at the maximum temperature of the operating temperature range.

**INPUT CIRCUIT : IN,  $\overline{\text{ENABLE}}$**



(Note) Since the states of the input pins (pins 3 to 10) are the same as those at high-level input, set the pins for unused channels to GND.



- Output voltage (Temperature characteristic)  
Output Voltage ( $V_{OH}$ ) has a Temperature Characteristic of  $5.8\text{mV}/^{\circ}\text{C}$ , care must be taken to keep Junction Temp ( $T_j$ ) within safety Limits.

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**MAXIMUM RATINGS** (Ta = 25°C)

| CHARACTERISTIC        | SYMBOL           | RATING     | UNIT |
|-----------------------|------------------|------------|------|
| Supply Voltage 1      | V <sub>CC1</sub> | – 0.5~7.0  | V    |
| Supply Voltage 2      | V <sub>CC2</sub> | – 0.5~40   |      |
| Output Current        | I <sub>OUT</sub> | 1.8 (Note) | A    |
| Input Voltage         | V <sub>IN</sub>  | – 0.5~7.0  | V    |
| Input Current         | I <sub>IN</sub>  | ± 4.0      | mA   |
| Power Dissipation     | P <sub>D</sub>   | 1.78       | W    |
| Janction Temperature  | T <sub>j</sub>   | 150        | °C   |
| Operating Temperature | T <sub>opr</sub> | – 40~85    | °C   |
| Storage Temperature   | T <sub>stg</sub> | – 55~150   | °C   |

(Note 1) 1.8A / ch (32μs, Duty ≤ 76%), Each Channel should not be switched on at same time.

(Note 2) When mounting the device on the PC board, and the temperature exceeds 25°C, derate to 14.2mW/°C.

**RECOMMENDED OPERATING CONDITIONS**

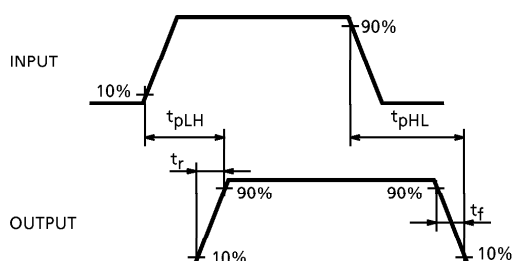
| CHARACTERISTIC        | SYMBOL                 | CONDITION                                    | MIN. | TYP. | MAX.            | UNIT |
|-----------------------|------------------------|----------------------------------------------|------|------|-----------------|------|
| Supply Voltage 1      | V <sub>CC1</sub>       | —                                            | 4.5  | 5.0  | 5.5             | V    |
| Supply Voltage 2      | V <sub>CC2</sub>       | —                                            | —    | —    | 30              |      |
| Output Current        | I <sub>OH</sub> (Note) | —                                            | —    | —    | 1.44            | A    |
| Input Voltage         | V <sub>IN</sub> (H)    | V <sub>IN</sub> = H, V <sub>CC1</sub> = 5.0V | 2.4  | —    | V <sub>CC</sub> | V    |
|                       | V <sub>IN</sub> (L)    | V <sub>IN</sub> = L, V <sub>CC1</sub> = 5.0V | 0    | —    | 0.4             | V    |
|                       | V <sub>EN</sub> (H)    | V <sub>EN</sub> = H, V <sub>CC1</sub> = 5.0V | 2.4  | —    | V <sub>CC</sub> | V    |
|                       | V <sub>EN</sub> (L)    | V <sub>EN</sub> = L, V <sub>CC1</sub> = 5.0V | 0    | —    | 0.4             | V    |
| Operating Temperature | T <sub>opr</sub>       | —                                            | 0    | —    | 70              | °C   |

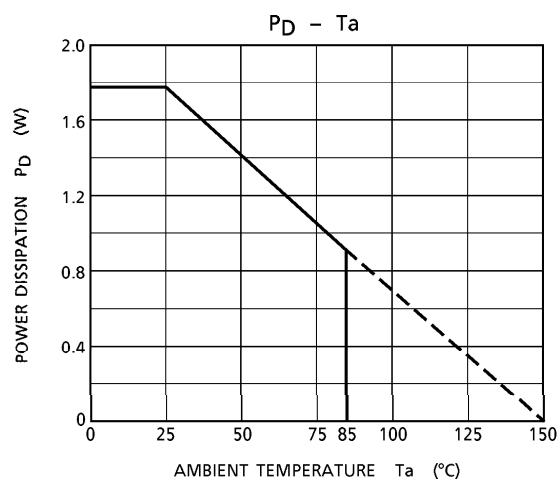
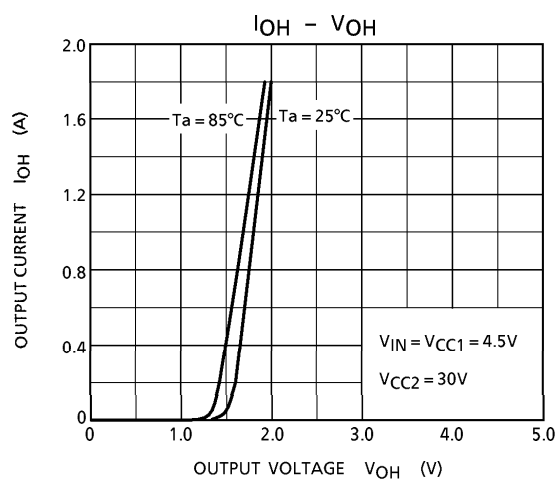
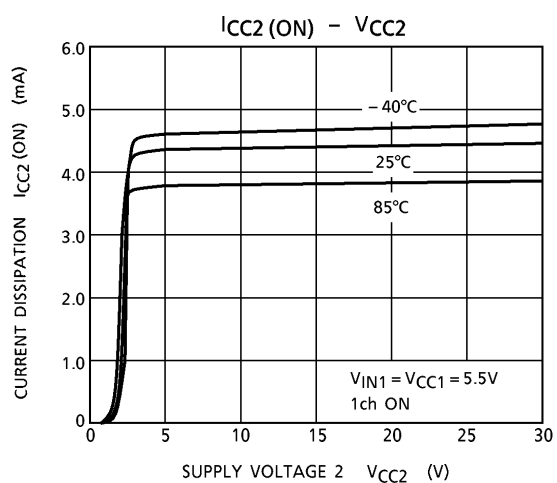
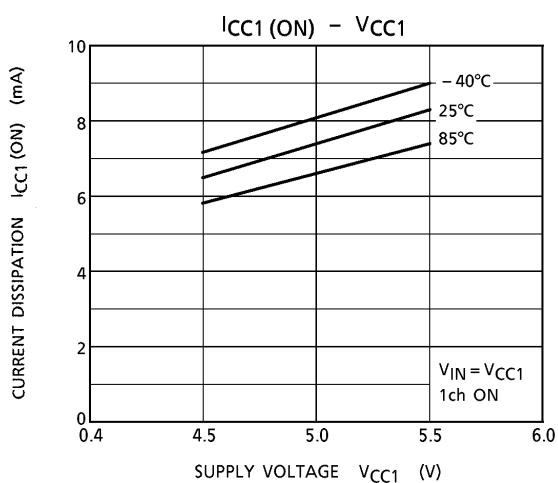
(Note) Each Channel should not be switched on at same time.

## ELECTRICAL CHARACTERISTICS (Ta = 0~70°C)

| CHARACTERISTIC                            | SYMBOL            | TEST CIRCUIT | TEST CONDITION                                                                                                |                          | MIN.      | TYP. | MAX.                  | UNIT |   |
|-------------------------------------------|-------------------|--------------|---------------------------------------------------------------------------------------------------------------|--------------------------|-----------|------|-----------------------|------|---|
| Leakage Current                           | I <sub>L1</sub>   | —            | V <sub>CC1</sub> = 7.0V, IN = L, EN = H                                                                       |                          | —         | —    | 100                   | μA   |   |
|                                           | I <sub>L2</sub>   |              | V <sub>CC2</sub> = 30V, IN = L, EN = H                                                                        |                          | —         | —    | 100                   |      |   |
|                                           | I <sub>L3</sub>   |              | V <sub>C</sub> = 30V, IN = L, EN = H                                                                          |                          | —         | —    | 100                   |      |   |
| Input Current                             | I <sub>IN1</sub>  | —            | V <sub>CC1</sub> = 5.0V, V <sub>IN</sub> = 5.0V                                                               |                          | —         | 0    | 10                    | μA   |   |
|                                           | I <sub>IN2</sub>  |              | V <sub>CC1</sub> = 5.0V, V <sub>IN</sub> = 0V                                                                 |                          | 0.55      | 0.8  | 1.1                   | mA   |   |
|                                           | I <sub>EN1</sub>  |              | V <sub>CC1</sub> = 5.0V, V <sub>EN</sub> = 5.0V                                                               |                          | —         | 0    | 10                    | μA   |   |
|                                           | I <sub>EN2</sub>  |              | V <sub>CC1</sub> = 5.0V, V <sub>EN</sub> = 0V                                                                 |                          | 0.55      | 0.8  | 1.1                   | mA   |   |
| Input Voltage                             | V <sub>INH</sub>  | —            | V <sub>CC1</sub> = 5.0V                                                                                       |                          | 2.0       | —    | V <sub>CC</sub> + 0.4 | V    |   |
|                                           | V <sub>INL</sub>  |              | V <sub>CC1</sub> = 5.0V                                                                                       |                          | GND – 0.4 | —    | 0.8                   |      |   |
|                                           | V <sub>ENH</sub>  |              | V <sub>CC1</sub> = 5.0V                                                                                       |                          | 2.0       | —    | V <sub>CC</sub> + 0.4 |      |   |
|                                           | V <sub>ENL</sub>  |              | V <sub>CC1</sub> = 5.0V                                                                                       |                          | GND – 0.4 | —    | 0.8                   |      |   |
| Output Voltage                            | V <sub>OH1</sub>  | —            | I <sub>OH</sub> = 1.44A                                                                                       | V <sub>CC2</sub> = 30V   | 27.0      | 27.5 | —                     | V    |   |
|                                           | V <sub>OH2</sub>  |              | I <sub>OH</sub> = 0.18A                                                                                       |                          | 27.5      | 28.0 | —                     |      |   |
| Change Of Output Voltage                  | ΔV <sub>OH1</sub> | —            | V <sub>OH1</sub> – V <sub>OH2</sub> (T <sub>j</sub> = 25°C)                                                   |                          |           | —    | 0.3                   | 0.45 | V |
| Output Voltage Temperature Characteristic | ΔV <sub>CE2</sub> | —            | V <sub>OH</sub> (T <sub>j</sub> = 105°C) – V <sub>OH</sub> (T <sub>j</sub> = 25°C)<br>I <sub>OH</sub> = 0.18A |                          |           | —    | 0.5                   | —    | V |
| Propagation Delay Time                    | t <sub>pLH1</sub> | —            | V <sub>CC1</sub> = V <sub>IN</sub> = 4.5V<br>V <sub>CC2</sub> = 30V                                           | I <sub>OUT</sub> = 0.18A | —         | 0.1  | 1.0                   | μs   |   |
|                                           | t <sub>pLH2</sub> |              |                                                                                                               | I <sub>OUT</sub> = 1.44A | —         | 0.2  | 1.0                   |      |   |
|                                           | t <sub>pHL1</sub> |              |                                                                                                               | I <sub>OUT</sub> = 0.18A | —         | 1.0  | 3.5                   |      |   |
|                                           | t <sub>pHL2</sub> |              |                                                                                                               | I <sub>OUT</sub> = 1.44A | —         | 1.5  | 3.5                   |      |   |
| Rise Time                                 | t <sub>r1</sub>   | —            | V <sub>CC1</sub> = V <sub>IN</sub> = 4.5V<br>V <sub>CC2</sub> = 30V                                           | I <sub>OUT</sub> = 0.18A | —         | 0.05 | 0.5                   | μs   |   |
|                                           | t <sub>r2</sub>   |              |                                                                                                               | I <sub>OUT</sub> = 1.44A | —         | 0.1  | 0.5                   |      |   |
| Fall Time                                 | t <sub>f1</sub>   | —            | V <sub>CC1</sub> = V <sub>IN</sub> = 4.5V<br>V <sub>CC2</sub> = 30V                                           | I <sub>OUT</sub> = 0.18A | —         | 0.3  | 2.0                   |      |   |
|                                           | t <sub>f2</sub>   |              |                                                                                                               | I <sub>OUT</sub> = 1.44A | —         | 0.3  | 2.0                   |      |   |

## AC TEST CIRCUIT





- Thermal calculation

Where, power dissipation =  $(V_{CC1} \times I_{CC1}) + (V_{CC2} \times I_{CC2} \times ch \times Duty) + (V_{OH} \times I_{OH} \times ch \times Duty)$   
and the transient thermal resistance of DIP24N  $(R + h) = 70^\circ\text{C} / \text{W}$ , the junction temperature ( $T_j$ ) is :

$$T_j (\text{MAX}) \geq (P_D \times R + h) + T_a (\text{MAX}) \cdots \cdots \text{expression (A)}$$

Conditions :  $V_{CC1} = 5\text{V}$  ( $I_{CC1} = \text{approx. } 8\text{mA}$ ),  $V_{CC2} = 30\text{V}$  ( $I_{CC2} = \text{approx. } 5\text{mA}$ ), 1ch on  
 $V_{OH} = \text{approx. } 2.0\text{V}$ ,  $I_{OH} = 1.44\text{A}$ ,  
 $T_j (\text{MAX}) = 120^\circ\text{C}$ , ambient temperature (MAX) :  $T_a = 70^\circ\text{C}$

(1) When  $V_{CC2}$  and  $V_C$  are connected :

Due to expression (a), for designs without cooling fins, duty = approx. 20% is required, as the following calculation shows :

$$\begin{aligned} P_D &= (5\text{V} \times 8\text{mA}) + (30\text{V} \times 5\text{mA} \times 1\text{ch} \times 0.2) + (2.0\text{V} \times 1.44\text{A} \times 1\text{ch} \times 0.2) \\ &= 40\text{mW} + 30\text{mW} + 576\text{mW} \\ &= 646\text{mW} \end{aligned}$$

$$T_j (\text{MAX}) \geq (646\text{mW} \times 70^\circ\text{C} / \text{W}) + 70^\circ\text{C} = \text{approx. } 115^\circ\text{C} \cdots \cdots \text{OK}$$

(2) When an external resistor ( $R_{EXT} = 0.9\Omega$ ) is connected between  $V_{CC2}$  and  $V_C$  :

Change the above condition :

$$\begin{aligned} V_{OH} &= 2.0\text{V} - (0.9\Omega \times 1.44\text{A}) \\ &= 0.7\text{V} \end{aligned}$$

$P_D$  when substituted in expression (a) :

$$\begin{aligned} P_D &= (5\text{V} \times 8\text{mA}) + (30\text{V} \times 5\text{mA} \times 1 \times 0.2) + (0.7\text{V} \times 1.44\text{A} \times 1 \times 0.2) \\ &= 40\text{mW} + 30\text{mW} + 202\text{mW} \\ &= 272\text{mW} \end{aligned}$$

$$T_j (\text{MAX}) \geq (272\text{mW} \times 70^\circ\text{C} / \text{W}) + 70^\circ\text{C} = \text{approx. } 89^\circ\text{C}$$

when  $T_j (\text{MAX}) = 120^\circ\text{C}$

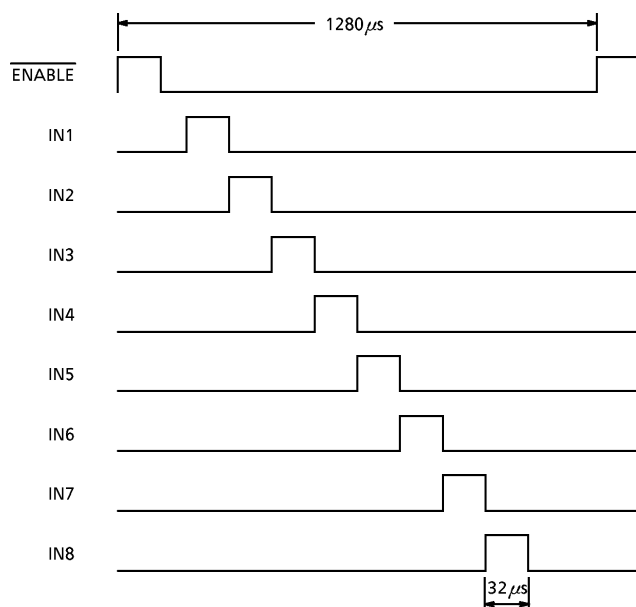
⋮ (calculation omitted)

Duty can be approx. 58%.

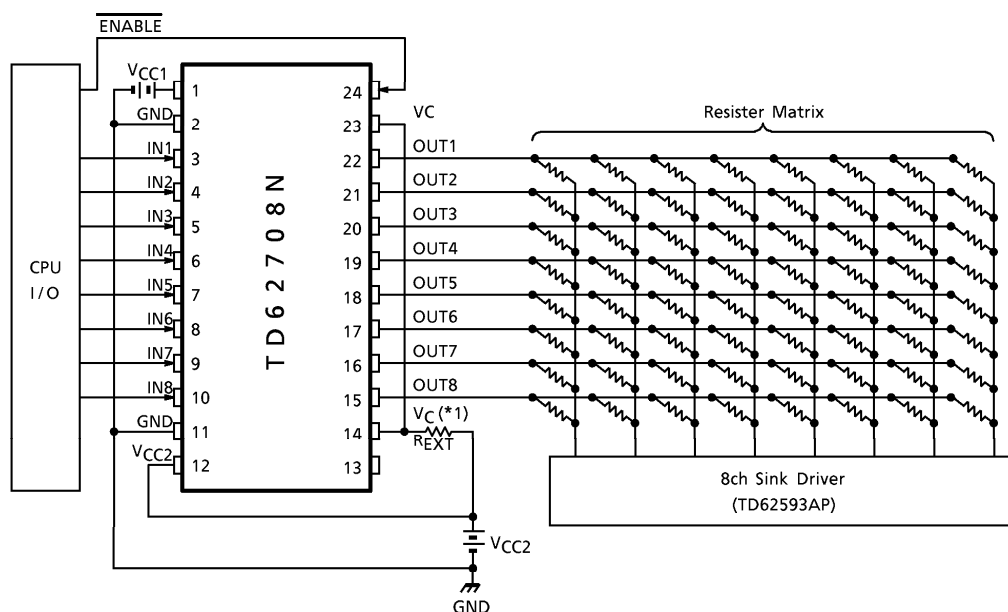
- Duty (when duty = 20%)

Condition : pulse width =  $32\mu\text{s}$  (cycle =  $1280\mu\text{s}$ )

Duty =  $(32\mu\text{s} \times 8\text{ch}) \div 1280\mu\text{s} = 20\%$



## APPLICATION CIRCUIT



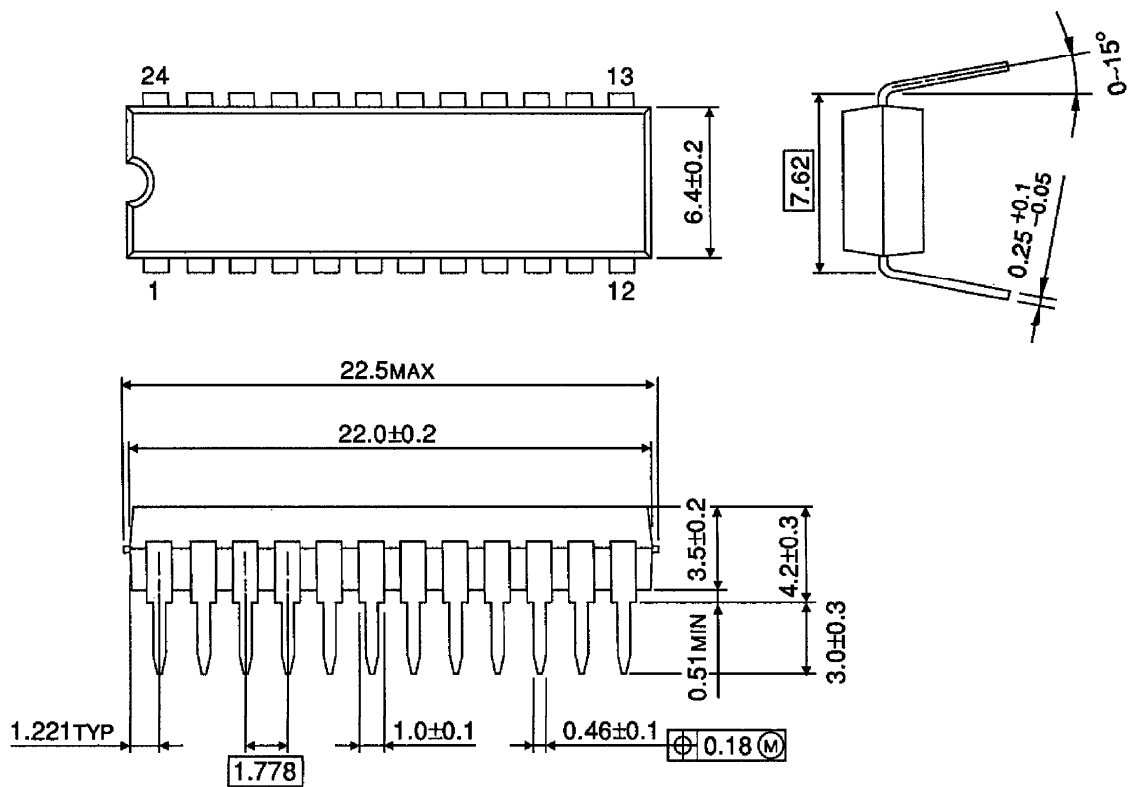
(Note 1) TOSHIBA recommends external resistor  $R_{EXT}$  (approx.  $0.9\Omega / 2W$ ) be connected between  $V_{CC2}$  and  $V_C$ .

## PRECAUTIONS for USING

Utmost care is necessary in the design of the output line,  $V_{CC}$  ( $V_{CC1}$ ,  $V_{CC2}$ ,  $V_C$ ) and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.

**OUTLINE DRAWING**  
SDIP24-P-300-1.78

Unit : mm



Weight : 1.2g (Typ.)