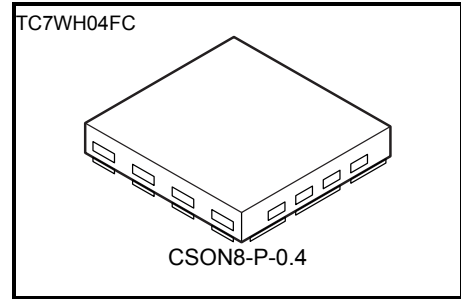


# TC7WH04FC

## Triple Inverter

### Features

- High-speed : $t_{pd} = 3.8ns$  (Typ.) at  $V_{CC} = 5V$
- Low power dissipation : $I_{CC} = 2\mu A$  (Max.) at  $T_a = 25^\circ C$
- High noise immunity : $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (Min.)
- Operation voltage range : $V_{CC(opr.)} = 2 \sim 5.5V$
- 5.5-V Tolerant inputs.



Weight: 0.002g (typ.)

### Maximum Ratings ( $T_a = 25^\circ C$ )

| Characteristics          | Symbol    | Rating                       | Unit       |
|--------------------------|-----------|------------------------------|------------|
| Power supply voltage     | $V_{CC}$  | -0.5~7.0                     | V          |
| DC input voltage         | $V_{IN}$  | -0.5~7.0                     | V          |
| DC output voltage        | $V_{OUT}$ | -0.5~ $V_{CC} + 0.5$ (Note1) | V          |
| Input diode current      | $I_{IK}$  | -20                          | mA         |
| Output diode current     | $I_{OK}$  | $\pm 20$ (Note2)             | mA         |
| DC output current        | $I_{OUT}$ | $\pm 25$                     | mA         |
| DC $V_{CC}$ /GND current | $I_{CC}$  | $\pm 50$                     | mA         |
| Power dissipation        | $P_D$     | 150 (Note3)                  | mW         |
| Storage temperature      | $T_{stg}$ | -65~150                      | $^\circ C$ |

Note1 : High or Low State.

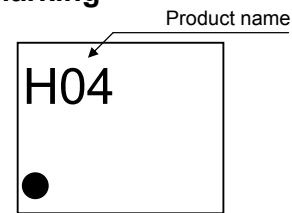
$I_{OUT}$  absolute maximum rating must be observed.

Note2 :  $V_{OUT} < GND$ ,  $V_{OUT} > V_{CC}$

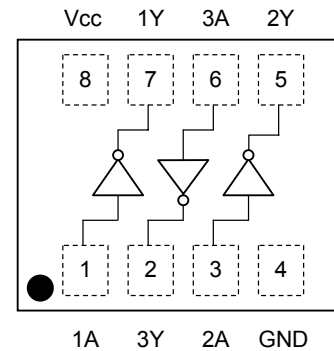
Note3 : Mounted on an FR4 board.

(25.4 mm  $\times$  25.4 mm  $\times$  1.6 t, Cu Pad: 11.56 mm<sup>2</sup>)

### Marking



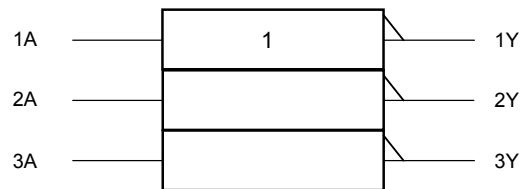
### Pin Assignment (top view)



### Truth Table

| A | Y |
|---|---|
| L | H |
| H | L |

### IEC Logic Diagram



## Recommended Operating Conditions

| Characteristics          | Symbol    | Rating                               | Unit |
|--------------------------|-----------|--------------------------------------|------|
| Power supply voltage     | $V_{CC}$  | 2.0~5.5                              | V    |
| Input voltage            | $V_{IN}$  | 0~5.5                                | V    |
| Output voltage           | $V_{OUT}$ | 0~ $V_{CC}$                          | V    |
| Operating temperature    | $T_{opr}$ | -40~85                               | °C   |
| Input rise and fall time | dt/dv     | 0~100 ( $V_{CC} = 3.3 V \pm 0.3 V$ ) | ns/V |
|                          |           | 0~20 ( $V_{CC} = 5 V \pm 0.5 V$ )    |      |

## DC Electrical Characteristics

| Characteristic            | Symbol   | Test condition                   | $T_a = 25^\circ\text{C}$   |                     |      | $T_a = -40\sim 85^\circ\text{C}$ |                     | unit                |               |   |
|---------------------------|----------|----------------------------------|----------------------------|---------------------|------|----------------------------------|---------------------|---------------------|---------------|---|
|                           |          |                                  | $V_{CC}$ (V)               | Min.                | Typ. | Max.                             | Min.                |                     | Max.          |   |
| High-level input voltage  | $V_{IH}$ | —                                | 2.0                        | 1.5                 | —    | —                                | 1.5                 | —                   | V             |   |
|                           |          |                                  | 3.0~5.5                    | $V_{CC} \times 0.7$ | —    | —                                | $V_{CC} \times 0.7$ | —                   |               |   |
| Low-level input voltage   | $V_{IL}$ | —                                | 2.0                        | —                   | —    | 0.5                              | —                   | 0.5                 |               |   |
|                           |          |                                  | 3.0~5.5                    | —                   | —    | $V_{CC} \times 0.3$              | —                   | $V_{CC} \times 0.3$ |               |   |
| High-level output voltage | $V_{OH}$ | $V_{IN} = V_{IL}$                | $I_{OH} = -50 \mu\text{A}$ | 2.0                 | 1.9  | 2.0                              | —                   | 1.9                 | —             | V |
|                           |          |                                  |                            | 3.0                 | 2.9  | 3.0                              | —                   | 2.9                 | —             |   |
|                           |          |                                  | $I_{OH} = -4 \text{ mA}$   | 3.0                 | 2.58 | —                                | —                   | 2.48                | —             |   |
|                           |          |                                  |                            | 4.5                 | 3.94 | —                                | —                   | 3.80                | —             |   |
| Low-level output voltage  | $V_{OL}$ | $V_{IN} = V_{IH}$                | $I_{OL} = 50 \mu\text{A}$  | 2.0                 | —    | 0.0                              | 0.1                 | —                   | 0.1           |   |
|                           |          |                                  |                            | 3.0                 | —    | 0.0                              | 0.1                 | —                   | 0.1           |   |
|                           |          |                                  | $I_{OL} = 4 \text{ mA}$    | 3.0                 | —    | —                                | 0.36                | —                   | 0.44          |   |
|                           |          |                                  |                            | 4.5                 | —    | —                                | 0.36                | —                   | 0.44          |   |
| Input leakage current     | $I_{IN}$ | $V_{IN} = 5.5 \text{ V or GND}$  | 0~5.5                      | —                   | —    | $\pm 0.1$                        | —                   | $\pm 1.0$           | $\mu\text{A}$ |   |
| Quiescent supply current  | $I_{CC}$ | $V_{IN} = V_{CC} \text{ or GND}$ | 5.5                        | —                   | —    | 2.0                              | —                   | 20.0                | $\mu\text{A}$ |   |

**AC Electrical Characteristics ( Input :  $t_r = t_f = 3 \text{ ns}$  )**

| Characteristic                | Symbol           | Test condition      |                     | Ta = 25°C |      |      | Ta = -40~85°C |      | Unit |
|-------------------------------|------------------|---------------------|---------------------|-----------|------|------|---------------|------|------|
|                               |                  | V <sub>CC</sub> (V) | C <sub>L</sub> (pF) | Min.      | Typ. | Max. | Min.          | Max. |      |
| Propagation delay time        | t <sub>pLH</sub> | 3.3 ± 0.3           | 15                  | —         | 5.0  | 7.1  | 1.0           | 8.5  | ns   |
|                               |                  |                     | 50                  | —         | 7.5  | 10.6 | 1.0           | 12.0 |      |
|                               | t <sub>pHL</sub> | 5.0 ± 0.5           | 15                  | —         | 3.8  | 5.5  | 1.0           | 6.5  |      |
|                               |                  |                     | 50                  | —         | 5.3  | 7.5  | 1.0           | 8.5  |      |
| Input capacitance             | C <sub>IN</sub>  |                     |                     | —         | 4    | 10   | —             | 10   | pF   |
| Power dissipation capacitance | C <sub>PD</sub>  | (Note 4)            |                     | —         | 18   | —    | —             | —    | pF   |

Note 4 : C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

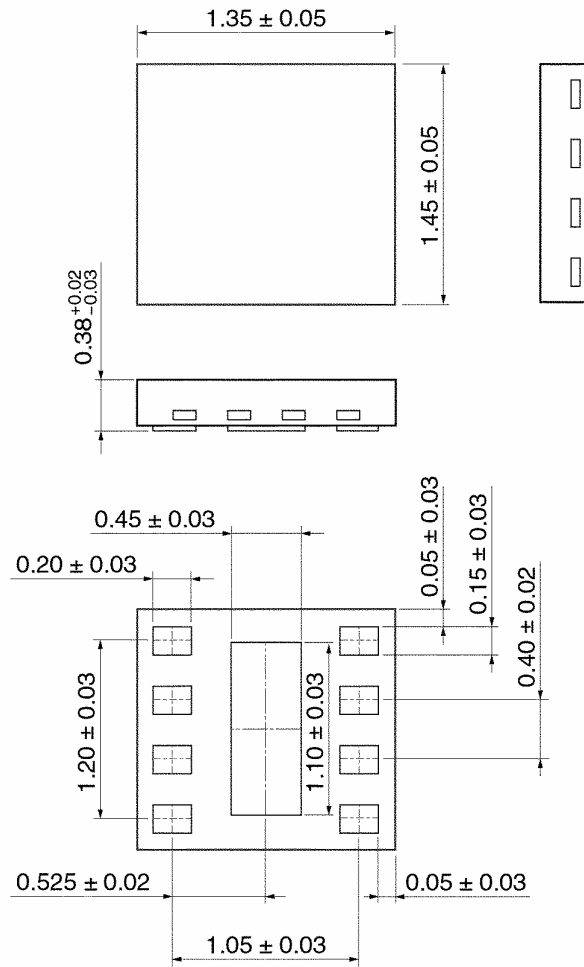
Average operating current can be obtained by the equation:

$$I_{CC (opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/3$$

## Package Dimensions

CSON8-P-0.4

Unit: mm



Weight : 0.002 g (Typ.)

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