

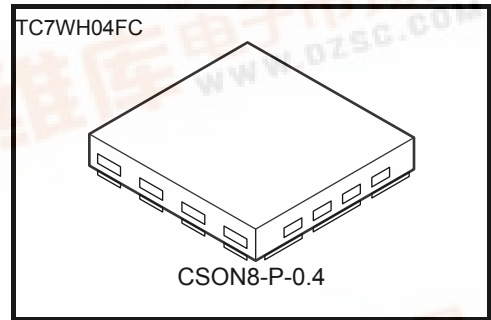
TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

# 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.)

### Absolute 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	$^\circ C$

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges. Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note1 : High or Low State.

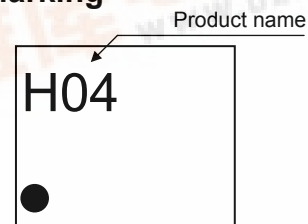
$I_{OUT}$  absolute maximum rating must be observed.

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

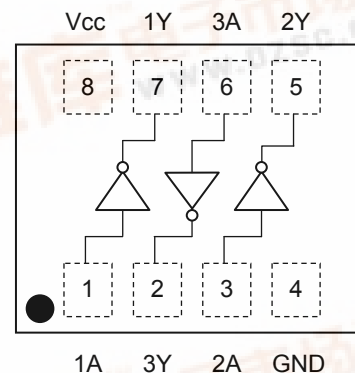
Note3 : Mounted on an FR4 board.

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

### Marking



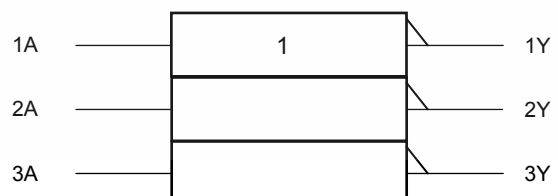
### Pin Assignment (top view)



### Truth Table

A	Y
L	H
H	L

### IEC Logic Diagram



## Operating Ranges

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 ( $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$ )	ns/V
		0~20 ( $V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$ )	

## 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	—	V		
			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		—
				4.5	4.4	4.5	—	4.4		—
			$I_{OH} = -4 \text{ mA}$	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	—	V	
				3.0	—	0.0	0.1	—		0.1
				4.5	—	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	—	—	$\pm 0.1$	—	$\mu\text{A}$		
Quiescent supply current	$I_{CC}$	$V_{IN} = V_{CC}$ 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.

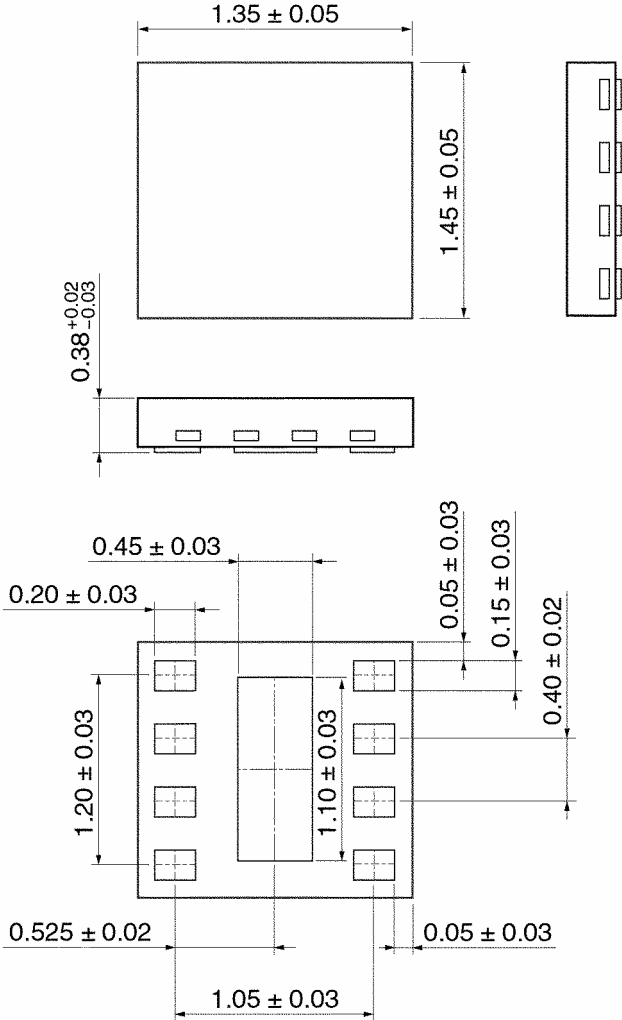
Average operating current can be obtained by the equation:

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

Package Dimensions

CSON8-P-0.4

Unit: mm



Weight : 0.002 g (Typ.)

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20070701-EN GENERAL

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