

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

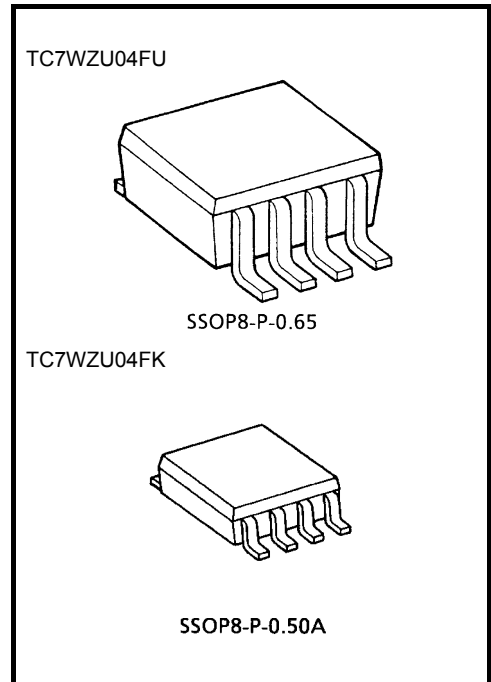
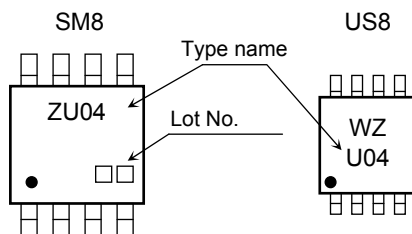
# TC7WZU04FU, TC7WZU04FK

Triple Inverter (Un-Buffer)

## Features

- High output drive:  $\pm 16$  mA (min) at  $V_{CC} = 4.5$  V
- Low quiescent power:  $I_{CC} < 1\mu\text{A}$  (max.)  
at  $V_{CC} = 5.5$  V,  $T_a = 25^\circ\text{C}$
- Operation voltage range:  $V_{CC(\text{opr})} = 1.65\sim 5.5$  V
- 5.5-V tolerant inputs

## Marking

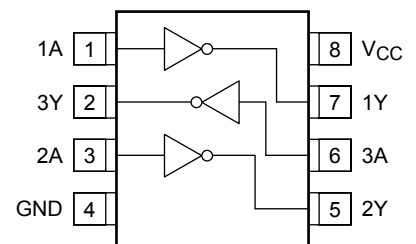


Weight  
 SSOP8-P-0.65 : 0.02 g (typ.)  
 SSOP8-P-0.50A : 0.01 g (typ.)

## Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Rating	Unit
Power supply voltage	$V_{CC}$	-0.5~6	V
DC input voltage	$V_{IN}$	-0.5~6	V
DC output voltage	$V_{OUT}$	-0.5~ $V_{CC} + 0.5V$	V
Input diode current	$I_{IK}$	-20	mA
Output diode current	$I_{OK}$	$\pm 20$	mA
DC output current	$I_{OUT}$	$\pm 50$	mA
DC $V_{CC}$ /ground current	$I_{CC}$	$\pm 50$	mA
Power dissipation	$P_D$	300 (SM8) 200 (US8)	mW
Storage temperature	$T_{stg}$	-65~150	$^\circ\text{C}$
Lead temperature (10s)	$T_L$	260	$^\circ\text{C}$

## Pin Assignment (top view)



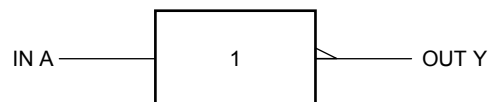
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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).

## Truth Table

A	Y
L	H
H	L

## Logic Diagram



## Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply voltage	V <sub>CC</sub>	1.65~5.5	V
		1.5~5.5 (Note 1)	
Input voltage	V <sub>IN</sub>	0~5.5	V
Output voltage	V <sub>OUT</sub>	0~V <sub>CC</sub>	V
Operating temperature	T <sub>opr</sub>	-40~85	°C

Note 1: Data retention only

## Electrical Characteristics

### DC Characteristics

Characteristics		Symbol	Test Condition		Ta = 25°C			Ta = -40~85°C		Unit		
					V <sub>CC</sub> (V)	Min	Typ.	Max	Min		Max	
Input voltage	High level	V <sub>IH</sub>	—		1.65~2.7	0.85 × V <sub>CC</sub>	—	—	0.85 × V <sub>CC</sub>	—	V	
					3.0~5.5	0.8 × V <sub>CC</sub>	—	—	0.8 × V <sub>CC</sub>	—		
	Low level	V <sub>IL</sub>	—		1.65~2.7	—	—	0.15 × V <sub>CC</sub>	—	0.15 × V <sub>CC</sub>		
					3.0~5.5	—	—	0.2 × V <sub>CC</sub>	—	0.2 × V <sub>CC</sub>		
Output voltage	High level	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IL</sub>	I <sub>OH</sub> = -100 μA	1.65	1.45	1.64	—	1.45	—	V	
					2.3	2.1	2.29	—	2.1	—		
					3.0	2.7	2.99	—	2.7	—		
					4.5	4.0	4.48	—	4.0	—		
			V <sub>IN</sub> = GND	I <sub>OH</sub> = -2 mA	1.65	1.29	1.52	—	1.29	—		
					I <sub>OH</sub> = -4 mA	2.3	1.9	2.19	—	1.9		—
					I <sub>OH</sub> = -8 mA	3.0	2.4	2.82	—	2.4		—
					I <sub>OH</sub> = -12 mA	3.0	2.3	2.73	—	2.3		—
	I <sub>OH</sub> = -16 mA	4.5			3.8	4.24	—	3.8	—			
	—	—			—	—	—	—	—			
	Low level	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub>	I <sub>OL</sub> = 100 μA	1.65	—	0.01	0.2	—	0.2		
					2.3	—	0.01	0.2	—	0.2		
					3.0	—	0.01	0.3	—	0.3		
					4.5	—	0.01	0.5	—	0.5		
			V <sub>IN</sub> = V <sub>CC</sub>	I <sub>OL</sub> = 2 mA	1.65	—	0.08	0.24	—	0.24		
					I <sub>OL</sub> = 4 mA	2.3	—	0.12	0.3	—		0.3
					I <sub>OL</sub> = 8 mA	3.0	—	0.19	0.4	—		0.4
					I <sub>OL</sub> = 12 mA	3.0	—	0.29	0.55	—		0.55
					I <sub>OL</sub> = 16 mA	4.5	—	0.29	0.55	—		0.55
					—	—	—	—	—	—		—
—					—	—	—	—	—	—		
—					—	—	—	—	—	—		
Input leakage current		I <sub>IN</sub>	V <sub>IN</sub> = 5.5 V or GND	0~5.5	—	—	±1	—	±10	μA		
Quiescent supply current		I <sub>CC</sub>	V <sub>IN</sub> = 5.5 V or GND	1.65~5.5	—	—	1	—	10	μA		

## AC Characteristics (unless otherwise specified, Input: $t_r = t_f = 3$ ns)

Characteristics	Symbol	Test Condition	Ta = 25°C			Ta = -40~85°C		Unit	
			V <sub>CC</sub> (V)	Min	Typ.	Max	Min		Max
Propagation delay time	t <sub>pLH</sub>	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1 MΩ	1.8 ± 0.15	1.5	4.6	8.1	1.5	8.9	ns
			2.5 ± 0.2	1.2	3.3	5.7	1.2	6.3	
			3.3 ± 0.3	0.8	2.7	4.1	0.8	4.5	
			5.0 ± 0.5	0.5	2.2	3.3	0.5	3.6	
	t <sub>pHL</sub>	C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω	3.3 ± 0.3	1.2	4.0	6.4	1.2	7.0	
			5.0 ± 0.5	0.8	3.4	5.6	0.8	6.2	
Input capacitance	C <sub>IN</sub>	—	0~5.5	—	5.4	—	—	pF	
Power dissipation capacitance	C <sub>PD</sub>	(Note 2)	3.3	—	9.8	—	—	—	pF
			5.5	—	22	—	—	—	

Note 2: C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

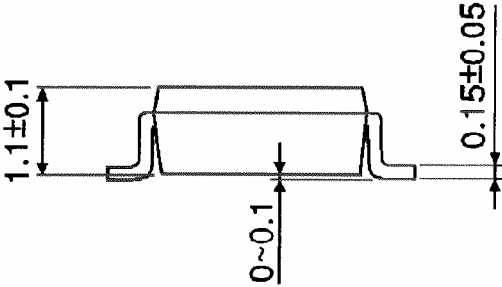
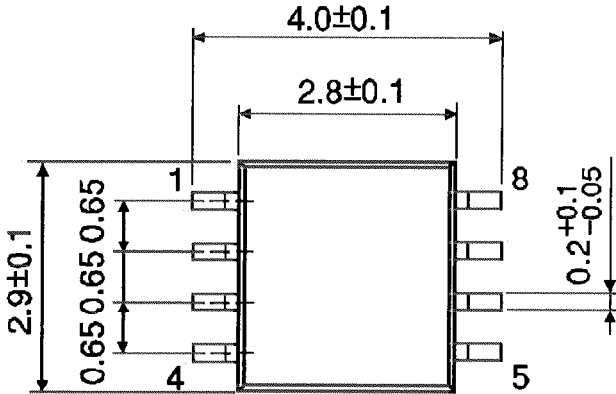
Average operating current can be obtained by the equation:

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

**Package Dimensions**

SSOP8-P-0.65

Unit : mm

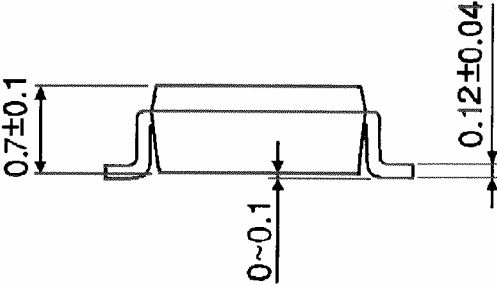
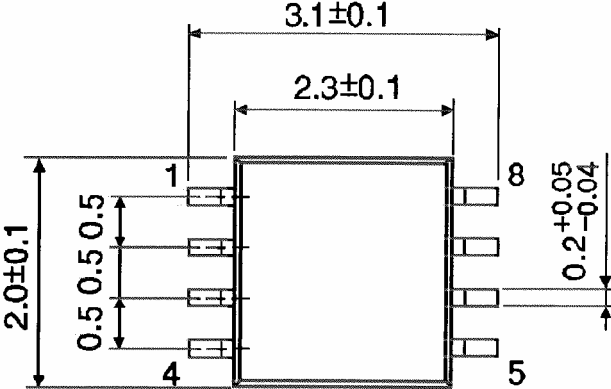


Weight: 0.02 g (typ.)

Package Dimensions

SSOP8-P-0.50A

Unit : mm



Weight: 0.01 g (typ.)

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20070701-EN GENERAL

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