

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

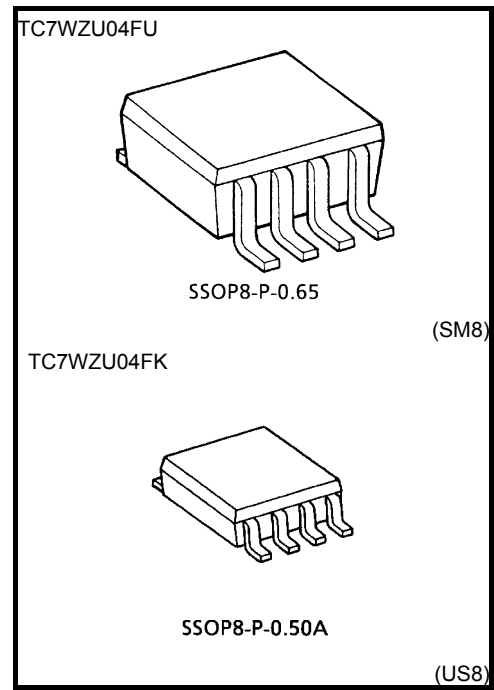
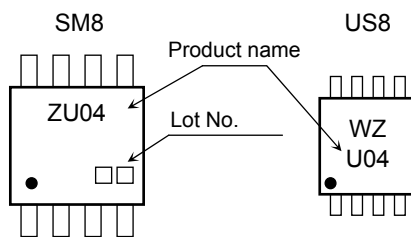
## TC7WZU04FU, TC7WZU04FK

Triple Inverter (Un-Buffer)

### Features

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

### Marking

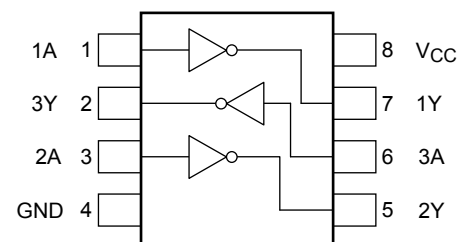


Weight  
 SSOP8-P-0.65 : 0.02 g (typ.)  
 SSOP8-P-0.50A : 0.01 g (typ.)

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

Characteristics	Symbol	Rating	Unit
Power supply voltage	$V_{CC}$	-0.5 to 6	V
DC input voltage	$V_{IN}$	-0.5 to 6	V
DC output voltage	$V_{OUT}$	-0.5 to $V_{CC} + 0.5V$	V
Input diode current	$I_{IK}$	-20	mA
Output diode current	$I_{OK}$	$\pm 20$ (Note 1)	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 to 150	$^\circ C$
Lead temperature (10s)	$T_L$	260	$^\circ C$

### 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).

Note1:  $V_{OUT} < GND$ ,  $V_{OUT} > V_{CC}$

Start of commercial production  
2000-08

**Truth Table**

A	Y
L	H
H	L

**IEC Logic Symbol**



**Operating Ranges**

Characteristics	Symbol	Rating	Unit
Supply voltage	V <sub>CC</sub>	1.6 to 5.5	V
		1.5 to 5.5 (Note 2)	
Input voltage	V <sub>IN</sub>	0 to 5.5	V
Output voltage	V <sub>OUT</sub>	0 to V <sub>CC</sub>	V
Operating temperature	T <sub>opr</sub>	−40 to 85	°C

Note 2: Data retention only

**Electrical Characteristics**
**DC Characteristics**

Characteristics		Symbol	Test Condition		Ta = 25°C			Ta = −40 to 85°C		Unit			
					V <sub>CC</sub> (V)	Min	Typ.	Max	Min		Max		
Input voltage	High level	V <sub>IH</sub>	—		1.65 to 2.7	V <sub>CC</sub> ×0.85	—	—	V <sub>CC</sub> ×0.85	—	V		
					3.0 to 5.5	V <sub>CC</sub> ×0.8	—	—	V <sub>CC</sub> ×0.8	—			
	Low level	V <sub>IL</sub>	—		1.65 to 2.7	—	—	V <sub>CC</sub> ×0.15	—	V <sub>CC</sub> ×0.15			
					3.0 to 5.5	—	—	V <sub>CC</sub> ×0.2	—	V <sub>CC</sub> ×0.2			
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>OH</sub>	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 to 5.5	—	—	±1	—		±10	μA
	Quiescent supply current		I <sub>CC</sub>	V <sub>IN</sub> = 5.5 V or GND		1.65 to 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 to 85°C		Unit
			VCC (V)	Min	Typ.	Max	Min	Max	
Propagation delay time	t <sub>pLH</sub>	CL = 15 pF, RL = 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>	CL = 50 pF, RL = 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	CIN	—	0 to 5.5	—	5.4	—	—	pF	
Power dissipation capacitance	CPD	(Note 3)	3.3	—	9.8	—	—	—	pF
			5.5	—	22	—	—	—	

Note 3: C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

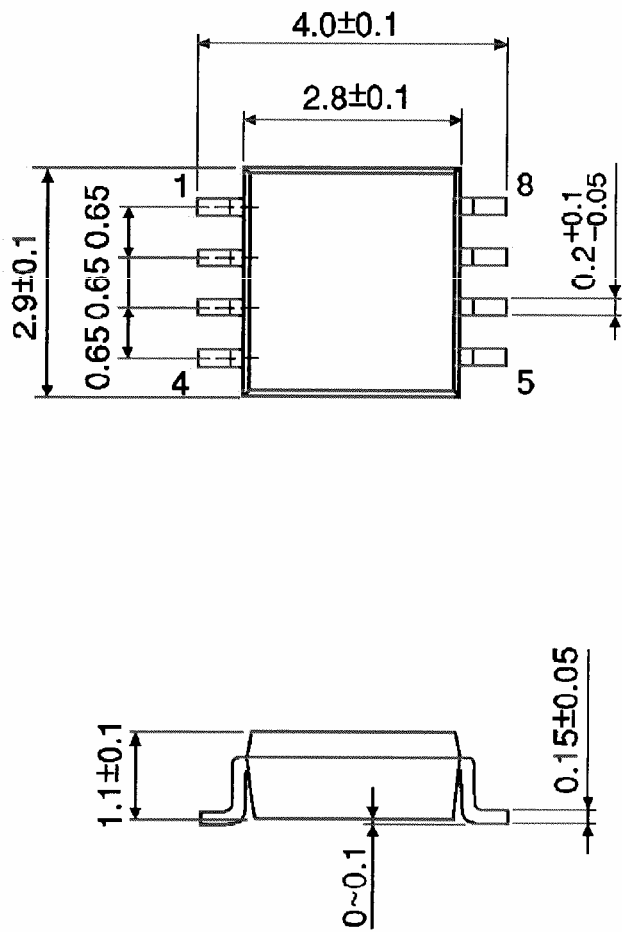
Average operating current can be obtained by the equation:

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

Package Dimensions

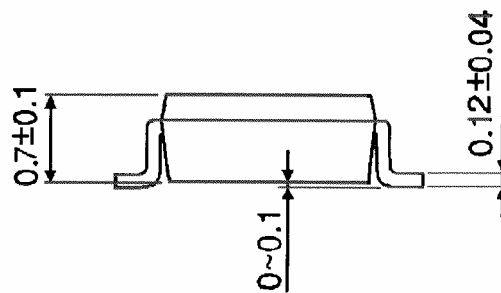
SSOP8-P-0.65

Unit : mm



Weight: 0.02 g (typ.)

## SSOP8-P-0.50A



2014-03-01

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