

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

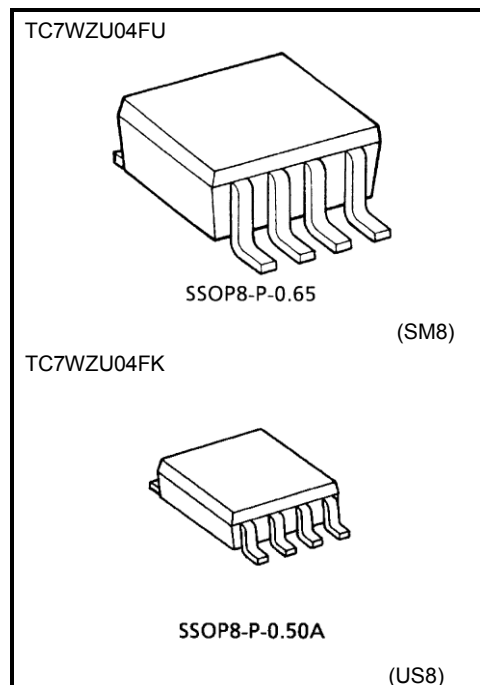
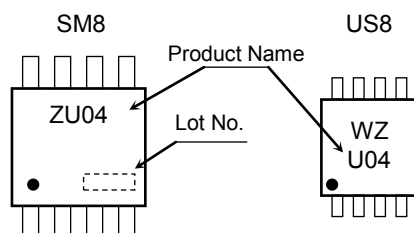
TC7WZU04FU, TC7WZU04FK

Triple Inverter (Un-Buffer)

Features

- High output drive: ± 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

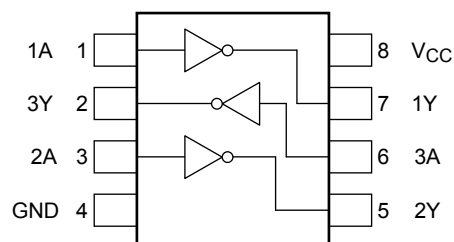


Weight
 SSOP8-P-0.65 : 0.02 g (typ.)
 SSOP8-P-0.50A : 0.01 g (typ.)

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}	± 20 (Note 1)	mA
DC output current	I_{OUT}	± 50	mA
DC V_{CC} /ground current	I_{CC}	± 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 _{CC}	1.6 to 5.5	V
		1.5 to 5.5 (Note 2)	
Input voltage	V _{IN}	0 to 5.5	V
Output voltage	V _{OUT}	0 to V _{CC}	V
Operating temperature	T _{opr}	−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 _{CC} (V)	Min	Typ.	Max	Min		Max	
Input voltage	High level	V _{IH}	—		1.65 to 2.7	V _{CC} ×0.85	—	—	V _{CC} ×0.85	—	V	
					3.0 to 5.5	V _{CC} ×0.8	—	—	V _{CC} ×0.8	—		
	Low level	V _{IL}	—		1.65 to 2.7	—	—	V _{CC} ×0.15	—	V _{CC} ×0.15		
					3.0 to 5.5	—	—	V _{CC} ×0.2	—	V _{CC} ×0.2		
Output voltage	High level	V _{OH}	V _{IN} = V _{IL}	I _{OH} = −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 _{OH}	V _{IN} = GND	I _{OH} = −2 mA	1.65	1.29	1.52	—	1.29	—		
				I _{OH} = −4 mA	2.3	1.9	2.19	—	1.9	—		
				I _{OH} = −8 mA	3.0	2.4	2.82	—	2.4	—		
				I _{OH} = −12 mA	3.0	2.3	2.73	—	2.3	—		
	V _{OH}	V _{IN} = GND	I _{OH} = −16 mA	4.5	3.8	4.24	—	3.8	—			
			V _{OL}	V _{IN} = V _{IH}	I _{OL} = 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 _{OL}	V _{IN} = V _{CC}	I _{OL} = 2 mA	1.65	—	0.08	0.24	—	0.24			
			I _{OL} = 4 mA	2.3	—	0.12	0.3	—	0.3			
			I _{OL} = 8 mA	3.0	—	0.19	0.4	—	0.4			
			I _{OL} = 12 mA	3.0	—	0.29	0.55	—	0.55			
	V _{OL}	V _{IN} = V _{CC}	I _{OL} = 16 mA	4.5	—	0.29	0.55	—	0.55			
Input leakage current			I _{IN}	V _{IN} = 5.5 V or GND		0 to 5.5	—	—	±1	—	±10	μA
Quiescent supply current		I _{CC}	V _{IN} = 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
			V _{CC} (V)	Min	Typ.	Max	Min	Max
Propagation delay time	t _{pLH}	C _L = 15 pF, R _L = 1 MΩ	1.8 ± 0.15	1.5	4.6	8.1	1.5	8.9
			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 _{pHL}	C _L = 50 pF, R _L = 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 _{IN}	—	0 to 5.5	—	5.4	—	—	pF
Power dissipation capacitance	C _{PD}	(Note 3)	3.3	—	9.8	—	—	pF
			5.5	—	22	—	—	

Note 3: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

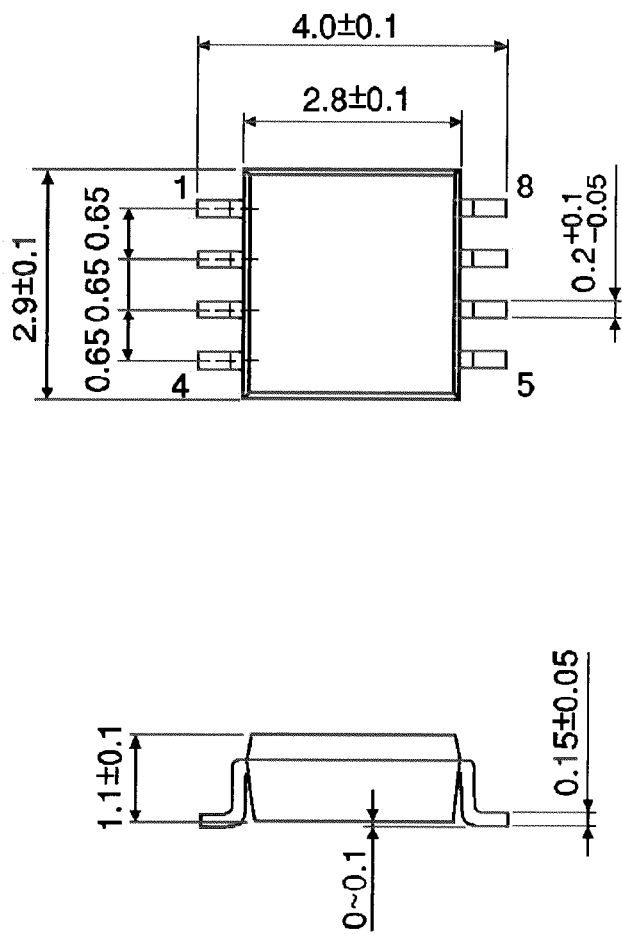
Average operating current can be obtained by the equation:

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

Package Dimensions

SSOP8-P-0.65

Unit : mm

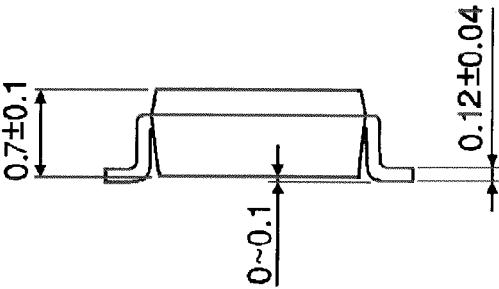
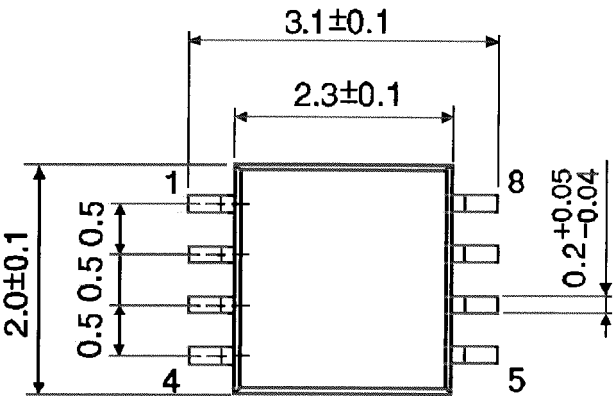


Weight: 0.02 g (typ.)

Package Dimensions

SSOP8-P-0.50A

Unit : mm



Weight: 0.01 g (typ.)

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