TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

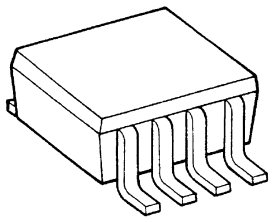
TC7WZ04FU,TC7WZ04FK

Triple Inverter

Features

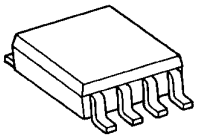
- High output drive: ±24 mA (min) at V_{CC} = 3 V
- Super high speed operation: t_{pd} = 2.3 ns (typ.) at V_{CC} = 5 V, 50 pF
- Operation voltage range: $V_{CC\ (opr)}$ = 1.65~5.5 V
- 5.5-V Tolerant inputs
- 5.5-V Power down protection outputs
- Matches the performance of TC74LCX series when operated at 3.3-V V_{CC}

TC7WZ04FU



SSOP8-P-0.65

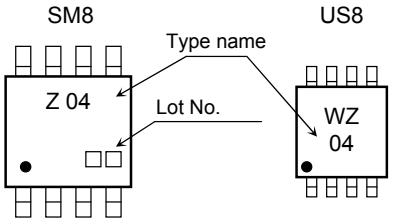
TC7WZ04FK



SSOP8-P-0.50A

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

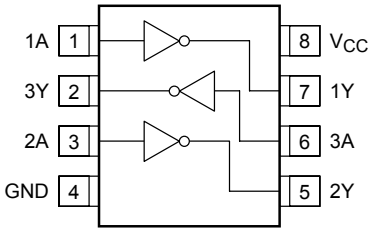
Marking



Maximum Ratings (Ta = 25°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}	−0.5~6	V
Input diode current	I_{IK}	−20	mA
Output diode current	I_{OK}	−20	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}	−65~150	°C
Lead temperature (10s)	T_L	260	°C

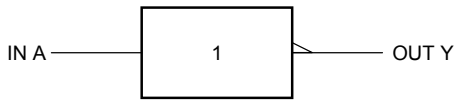
Pin Assignment (top view)



Truth Table

A	Y
L	H
H	L

Logic Diagram



Recommended Operating Conditions

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	1.65~5.5	V
		1.5~5.5 (Note 1)	
Input voltage	V_{IN}	0~5.5	V
Output voltage	V_{OUT}	0~5.5 (Note 2)	V
		0~V_{CC} (Note 3)	
Operating temperature	T_{opr}	−40~85	°C
Input rise and fall time	d_t/d_v	0~20 (V_{CC} = 1.8 V ± 0.15 V, 2.5 V ± 0.2 V)	ns/V
		0~10 (V_{CC} = 3.3 V ± 0.3 V)	
		0~5 (V_{CC} = 5.5 V ± 0.5 V)	

Note 1: Data retention only

Note 2: V_{CC} = 0 V

Note 3: High or low state

Electrical Characteristics

DC Characteristics

Characteristics		Symbol	Test Condition		V_{CC} (V)	Ta = 25°C			Ta = −40~85°C		Unit
						Min	Typ.	Max	Min	Max	
Input voltage	High level	V_{IH}	—		1.65~1.95	0.75 × V_{CC}	—	—	0.75 × V_{CC}	—	V
					2.3~5.5	0.7 × V_{CC}	—	—	0.7 × V_{CC}	—	
	Low level	V_{IL}	—		1.65~1.95	—	—	0.25 × V_{CC}	—	0.25 × V_{CC}	
					2.3~5.5	—	—	0.3 × V_{CC}	—	0.3 × V_{CC}	
Output voltage	High level	V_{OH}	V_{IN} = V_{IL}	I_{OH} = −100 μA	1.65	1.55	1.65	—	1.55	—	V
					2.3	2.2	2.3	—	2.2	—	
					3.0	2.9	3.0	—	2.9	—	
					4.5	4.4	4.5	—	4.4	—	
				I_{OH} = −4 mA	1.65	1.29	1.52	—	1.29	—	
				I_{OH} = −8 mA	2.3	1.9	2.15	—	1.9	—	
				I_{OH} = −16 mA	3.0	2.4	2.8	—	2.4	—	
				I_{OH} = −24 mA	3.0	2.3	2.68	—	2.3	—	
				I_{OH} = −32 mA	4.5	3.8	4.2	—	3.8	—	
	Low level	V_{OL}	V_{IN} = V_{IH}	I_{OL} = 100 μA	1.65	—	0	0.1	—	0.1	
					2.3	—	0	0.1	—	0.1	
					3.0	—	0	0.1	—	0.1	
					4.5	—	0	0.1	—	0.1	
				I_{OL} = 4 mA	1.65	—	0.08	0.24	—	0.24	
				I_{OL} = 8 mA	2.3	—	0.1	0.3	—	0.3	
				I_{OL} = 16 mA	3.0	—	0.15	0.4	—	0.4	
				I_{OL} = 24 mA	3.0	—	0.22	0.55	—	0.55	
				I_{OL} = 32 mA	4.5	—	0.22	0.55	—	0.55	
Input leakage current		I_{IN}	V_{IN} = 5.5 V or GND		0~5.5	—	—	±1	—	±10	μA
Power off leakage current		I_{OFF}	V_{IN} or V_{OUT} = 5.5 V		0.0	—	—	1	—	10	μA
Quiescent supply current		I_{CC}	V_{IN} = 5.5 V or GND		1.65~5.5	—	—	1	—	10	μA

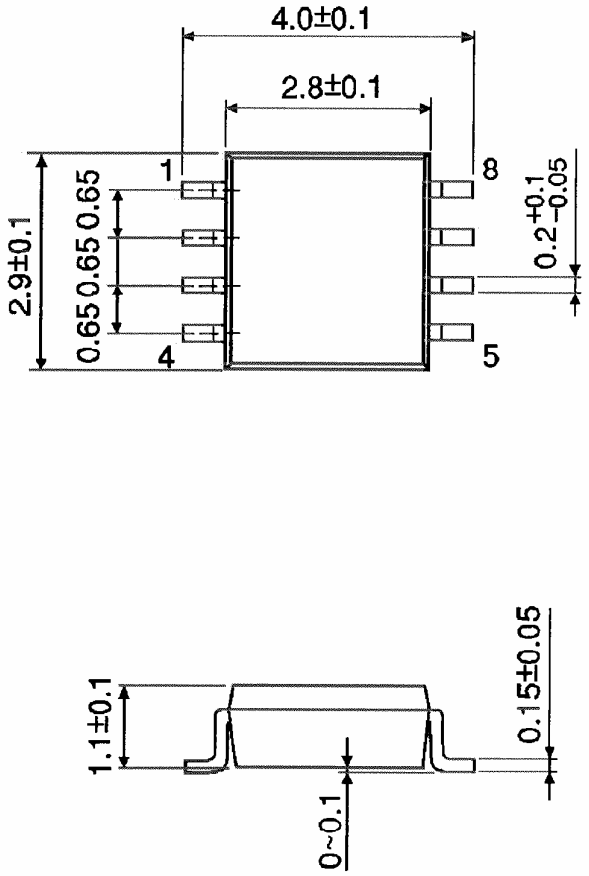
AC Characteristics (unless otherwise specified, Input: $t_r = t_f = 3$ ns)

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = −40~85°C		Unit
			V_{CC} (V)	Min	Typ.	Max	Min	Max	
Propagation delay time	t_{pLH}	C_L = 15 pF, R_L = 1 MΩ	1.8 ± 0.15	1.8	4.4	9.5	2.0	10.0	ns
			2.5 ± 0.2	1.2	3.0	5.1	1.2	5.6	
			3.3 ± 0.3	0.8	2.2	3.4	0.8	3.8	
			5.0 ± 0.5	0.5	1.8	2.8	0.5	3.1	
	t_{pHL}	C_L = 50 pF, R_L = 500 Ω	3.3 ± 0.3	1.2	2.9	4.5	1.2	5.0	
			5.0 ± 0.5	0.8	2.3	3.6	0.8	4.0	
Input capacitance	C_{IN}	—	0~5.5	—	3.0	—	—	—	pF
Power dissipation capacitance	C_{PD}	(Note 4)	3.3	—	18	—	—	—	pF
			5.5	—	23	—	—	—	

Note 4: 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

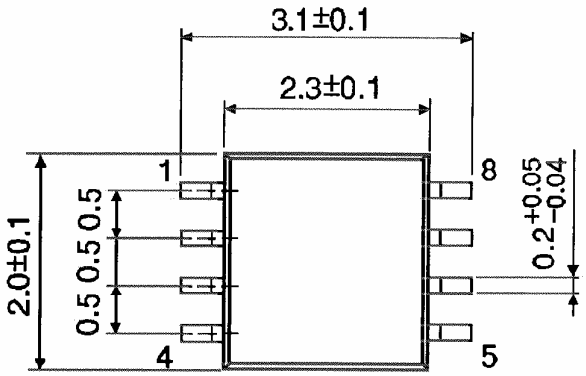
SSOP8-P-0.65 Unit : mm

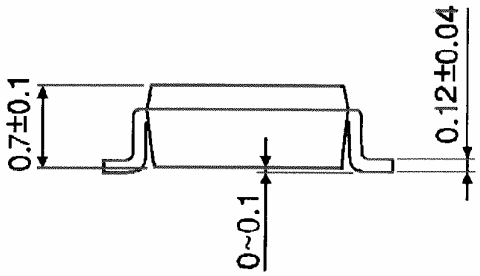


Weight: 0.02 g (typ.)

Package Dimensions

SSOP8-P-0.50A Unit : mm





Weight: 0.01 g (typ.)

RESTRICTIONS ON PRODUCT USE

030619EBA

- The information contained herein is subject to change without notice.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA for any infringements of patents or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of TOSHIBA or others.
- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
  In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the “Handling Guide for Semiconductor Devices,” or “TOSHIBA Semiconductor Reliability Handbook” etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury (“Unintended Usage”). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer’s own risk.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- TOSHIBA products should not be embedded to the downstream products which are prohibited to be produced and sold, under any law and regulations.