TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7SZU04F,TC7SZU04FU

Inverter (Unbuffered)

Features

• High output drive: ±16 mA (min) at V_{CC} = 4.5 V

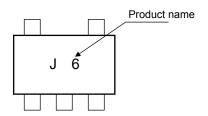
• Low quiescent power: I_{CC} = 2 μA (max)

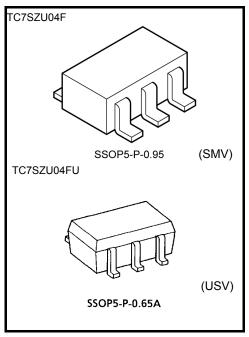
at $V_{CC} = 5.5 \text{ V}$, Ta = 25°C

• Operation voltage range: V_{CC (opr)} = 1.8 to 5.5 V

5.5-V tolerant input

Marking





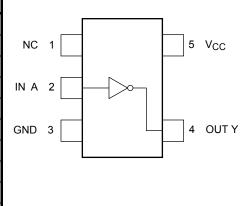
Weight

SSOP5-P-0.95 : 0.016 g (typ.) SSOP5-P-0.65A: 0.006 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
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} + 0.5	V
Input diode current	I _{IK}	-20	mA
Output diode current	lok	±20 (Note 1)	mA
DC output current	lout	±50	mA
DC V _{CC} /ground current	Icc	±50	mA
Power dissipation	P _D	200	mW
Storage temperature	T _{stg}	-65 to 150	°C
Lead temperature (10 s)	TL	260	°C

Pin Assignment (top view)



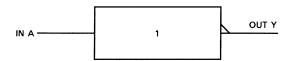
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

Note 1: V_{OUT} < GND, V_{OUT} > V_{CC}



IEC Logic Symbol



Truth Table

Α	Υ
L	Н
Н	L

Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply voltage	V _{CC}	1.8 to 5.5	٧
	VCC	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			
		Condition	V _{CC} (V)	Min	Тур.	Max	Min	Max	Offic	
High-level input voltage VIH —			1.8	V _{CC} × 0.85	_	_	V _{CC} × 0.85	_	. V	
		_	2.3 to 5.5	V _{CC} × 0.8		_	V _{CC} × 0.8	_		
Low-level input voltage	V.,	_		1.8	ı	١	V _{CC} × 0.15	_	V _{CC} × 0.15	V
	VIL			2.3 to 5.5	ı	١	V _{CC} × 0.2	_	V _{CC} × 0.2	V
				1.8	1.6	1.8	_	1.6	_	
		$V_{IN} = V_{IL}$	100 4	2.3	2.1	2.3	_	2.1	_	
		VIN - VIL	I _{OH} = -100 μA	3.0	2.7	3.0	_	2.7	_	
High-level	V _{OH}			4.5	4.0	4.4	_	4.0	_	V
output voltage	VOH	V _{IN} = GND	I _{OH} = -4 mA	2.3	1.9	2.14	_	1.9	_	V
			$I_{OH} = -8 \text{ mA}$	3.0	2.4	2.75	_	2.4	_	
			I _{OH} = -12 mA	3.0	2.3	2.61	_	2.3	_	
			I _{OH} = -16 mA	4.5	3.8	4.13	_	3.8	_	
		$V_{IN} = V_{IH}$ $V_{IN} = V_{CC}$	I _{OL} = 100 μA	1.8	_	0	0.2	_	0.2	V
				2.3	_	0	0.2	_	0.2	
	V _{OL} —			3.0	_	0	0.3	—	0.3	
Low-level				4.5	_	0	0.5	—	0.5	
output voltage			I _{OL} = 4 mA	2.3	_	0.1	0.3	_	0.3	
			I _{OL} = 8 mA	3.0	_	0.17	0.4	_	0.4	
			I _{OL} = 12 mA	3.0		0.25	0.55	_	0.55	
			I _{OL} = 16 mA	4.5	_	0.26	0.55	_	0.55	
Input leakage current	I _{IN}	V _{IN} = 5.5 V or GND		0 to 5.5		_	±1	_	±10	μА
Quiescent supply current	Icc	V _{IN} = V _{CC} or GND		5.5	_	_	2	_	20	μА

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

Characteristics Symbol		Test Condition		Ta = 25°C			Ta = -40	Unit	
Characteristics Symbol	rest Condition	V _{CC} (V)	Min	Тур.	Max	Min	Max	Offic	
Propagation delay tPLH time tPHL		C_L = 15 pF, R_L = 1 M Ω	1.8	1.0	_	8.5	1.0	9.0	ns
			2.5 ± 0.2	0.8	_	6.2	8.0	6.5	
	t _{PLH}		3.3 ± 0.3	0.5	_	4.5	0.5	4.8	
	t _{PHL}		5.0 ± 0.5	0.5	_	3.9	0.5	4.1	
		$\begin{array}{c} C_L = 50 \text{ pF}, \\ R_L = 500 \ \Omega \end{array}$	3.3 ± 0.3	1.0	_	6.0	1.5	6.5	
			5.0 ± 0.5	0.8	_	5.0	8.0	5.5	
Input capacitance	C _{IN}	_	0 to 5.5	_	4.5	_		_	pF
Power dissipation capacitance CPD	(Note 2)	3.3	_	6.3	_	_	_	~F	
	CPD	(Note 3)	(Note 3)	5.5	_	9.5	_	_	_

Note3: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

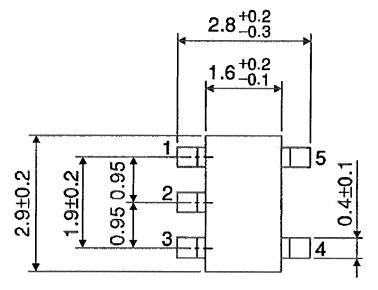
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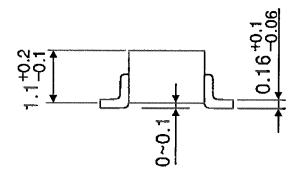
Average operating current can be obtained by the equation.

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

Package Dimensions

SSOP5-P-0.95 Unit: mm





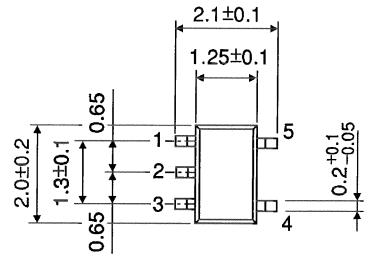
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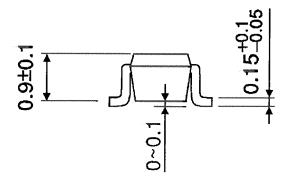
Weight: 0.016 g (typ.)

2009-09-18

Package Dimensions

SSOP5-P-0.65A Unit: mm





Weight: 0.006 g (typ.)

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