TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7SH02F, TC7SH02FU

2-Input NOR Gate

Features

• High Speed Operation : t_{pd} = 3.6 ns (typ.)

at $V_{CC} = 5 \text{ V}, 15 \text{ pF}$

Low Power Dissipation : I_{CC} = 2μA (max) at Ta = 25°C

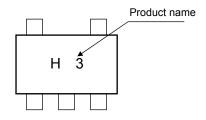
• Balanced Propagation Delays : $t_{pLH} = t_{pHL}$

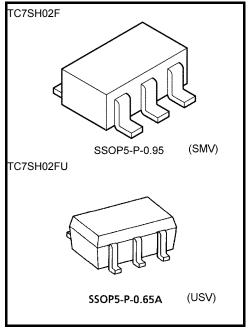
• High noise immunity : $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (min)

• 5.5-V Tolerant Inputs

Wide Operating Voltage Range: V_{CC} = 2 to 5.5V

Marking





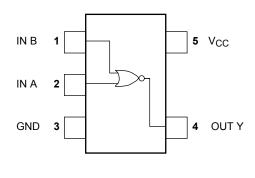
Weight

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 7	V
DC Input Voltage	V _{IN}	– 0.5 to 7	V
DC Output Voltage	V _{OUT}	-0.5 to $V_{CC}+0.5$	V
Input Diode Current	l _{IK}	- 20	mA
Output Diode Current	lok	± 20 (Note 1)	mA
DC Output Current	lout	± 25	mA
DC V _{CC} /Ground Current	Icc	± 50	mA
Power Dissipation	PD	200	mW
Storage Temperature	T _{stg}	– 65 to 150	°C
Lead Temperature(10s)	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).

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

IEC Logic Symbol

Truth Table



Α	В	Υ
L	L	Н
L	Н	L
Н	L	L
Н	Н	L

Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply Voltage	V _{CC}	2 to 5.5	V
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
Input Rise and Fall Time	dt/dv	0 to 100 (V $_{CC} = 3.3~\text{V} \pm 0.3~\text{V})$	ns/V
	uuuv	0 to 20 (V _{CC} = 5.0 V \pm 0.5 V)	115/ V

Electrical Characteristics

DC Characteristics

Characteristics Symbol		T4			Ta = 25°C	;	Ta = -40 to 85°C		Unit	
		Test Condition		V _{CC} (V)	Min	Тур.	Max	Min.	Max.	Offic
High-level				2.0	1.5	_	_	1.5	_	V
input voltage	V _{IH}	_		3.0 to 5.5	V _{CC} × 0.7	_	_	V _{CC} × 0.7	_	
Low-level				2.0	_	_	0.5	_	0.5	
input voltage	V _{IL}		_	3.0 to 5.5	_	_	V _{CC} × 0.3	_	V _{CC} × 0.3	
		$V_{IN} = V_{IL}$	I _{OH} = -50 μA	2.0	1.9	2.0	_	1.9	_	V
High-level output voltage				3.0	2.9	3.0	_	2.9	_	
	V _{OH}			4.5	4.4	4.5	_	4.4		
			$I_{OH} = -4 \text{ mA}$	3.0	2.58	_	_	2.48		
			$I_{OH} = -8 \text{ mA}$	4.5	3.94	_	_	3.80		
Low-level Voutput voltage		V _{IN} =V _{IH}	I _{OL} = 50 μA	2.0		0	0.1	_	0.1	
				3.0		0	0.1	_	0.1	
	V_{OL}			4.5		0	0.1	_	0.1	
			I _{OL} = 4 mA	3.0	_	_	0.36	_	0.44	
			$I_{OL} = 8 \text{ mA}$	4.5	_	_	0.36	_	0.44	
Input leakage current	I _{IN}	$V_{IN} = 5.5$	V or GND	0 to 5.5	_	_	±0.1	_	±1.0	μА
Quiescent supply current	Icc	$V_{IN} = V_{CC}$	or GND	5.5	_	_	2.0	_	20	μА

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)	C _L (pF)	Min	Тур.	Max	Min.	Max.	Offic
Propagation delay time	t _{pLH}	3.3 ± 0.3	15	_	5.6	7.9	1.0	9.5		
			3.3 ± 0.3	50	_	8.1	11.4	1.0	13.0	- ns
			50.05	15	_	3.6	5.5	1.0	6.5	
		5.0 ± 0.5	50	_	5.1	7.5	1.0	8.5		
Input capacitance	C _{IN}				_	4	10	_	10	pF
Power dissipation capacitance	C _{PD}		(1	Note 2)		15		_	_	pF

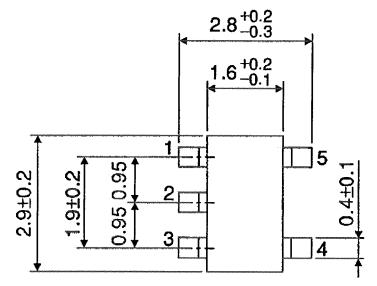
Note 2: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

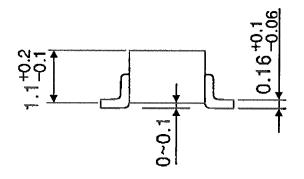
Average operating current can be obtained by the equation :

ICC (opr) = CPD·VCC·fIN ICC

Package Dimensions

SSOP5-P-0.95 Unit: mm





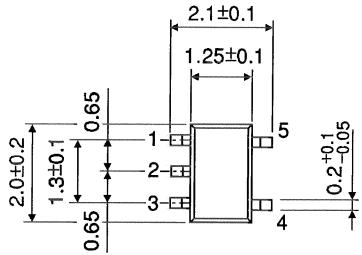
Weight: 0.016 g (typ.)

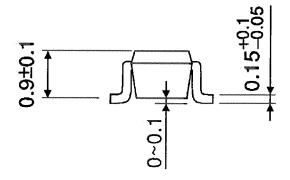
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Package Dimensions

TOSHIBA

SSOP5-P-0.65A Unit: mm





Weight: 0.006 g (typ.)

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