TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

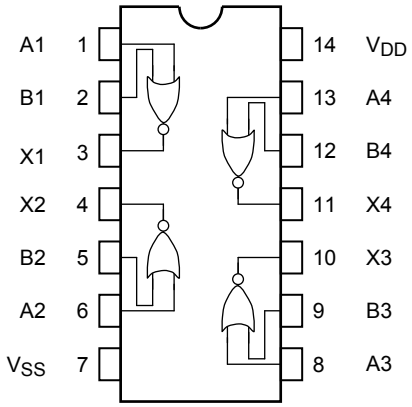
TC4001BP,TC4001BF,TC4001BFN,TC4001BFT

TC4001B Quad 2 Input NOR Gate

The TC4001B is 2-input positive NOR gate, respectively.

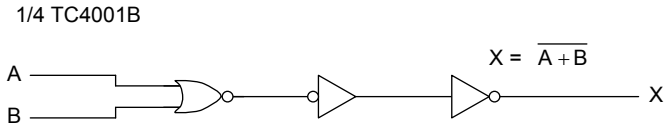
Since the outputs of these gates are equipped with the buffers, the input/output transmission characteristics have been improved and the variation of transmission time due to an increase in the load capacity is kept minimum.

Pin Assignment



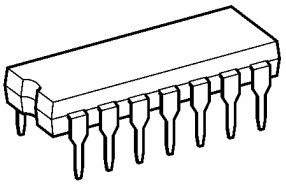
(top view)

Logic Diagram



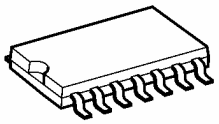
Note: xxxFN (JEDEC SOP) is not available in Japan.

TC4001BP



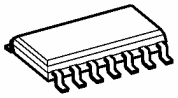
DIP14-P-300-2.54

TC4001BF



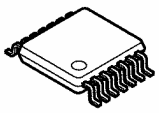
SOP14-P-300-1.27A

TC4001BFN



SOL14-P-150-1.27

TC4001BFT



TSSOP14-P-0044-0.65A

Weight

DIP14-P-300-2.54	: 0.96 g (typ.)
SOP14-P-300-1.27A	: 0.18 g (typ.)
SOL14-P-150-1.27	: 0.12 g (typ.)
TSSOP14-P-0044-0.65A	: 0.06 g (typ.)

Absolute Maximum Ratings (Note)

Characteristics	Symbol	Rating	Unit
DC supply voltage	V_{DD}	V_{SS} − 0.5 to V_{SS} + 20	V
Input voltage	V_{IN}	V_{SS} − 0.5 to V_{DD} + 0.5	V
Output voltage	V_{OUT}	V_{SS} − 0.5 to V_{DD} + 0.5	V
DC input current	I_{IN}	±10	mA
Power dissipation	P_D	300 (DIP)/180 (SOIC)	mW
Operating temperature range	T_{opr}	−40 to 85	°C
Storage temperature range	T_{stg}	−65 to 150	°C

Note: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.
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).

Operating Ranges (V_{SS} = 0 V) (Note)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
DC supply voltage	V_{DD}	—	3	—	18	V
Input voltage	V_{IN}	—	0	—	V_{DD}	V

Note: The operating ranges must be maintained to ensure the normal operation of the device.
Unused inputs must be tied to either V_{DD} or V_{SS}.

Static Electrical Characteristics (V_{SS} = 0 V)

Characteristics	Symbol	Test Condition		−40°C		25°C			85°C		Unit
			V_{DD} (V)	Min	Max	Min	Typ.	Max	Min	Max	
High-level output voltage	V_{OH}	$\|I_{OUT}\|$ < 1 μA V_{IN} = V_{SS}, V_{DD}	5	4.95	—	4.95	5.00	—	4.95	—	V
			10	9.95	—	9.95	10.00	—	9.95	—	
			15	14.95	—	14.95	15.00	—	14.95	—	
Low-level output voltage	V_{OL}	$\|I_{OUT}\|$ < 1 μA V_{IN} = V_{SS}, V_{DD}	5	—	0.05	—	0.00	0.05	—	0.05	V
			10	—	0.05	—	0.00	0.05	—	0.05	
			15	—	0.05	—	0.00	0.05	—	0.05	
Output high current	I_{OH}	V_{OH} = 4.6 V	5	−0.61	—	−0.51	−1.0	—	−0.42	—	mA
		V_{OH} = 2.5 V	5	−2.50	—	−2.10	−4.0	—	−1.70	—	
		V_{OH} = 9.5 V	10	−1.50	—	−1.30	−2.2	—	−1.10	—	
		V_{OH} = 13.5 V	15	−4.00	—	−3.40	−9.0	—	−2.80	—	
		V_{IN} = V_{SS}									
Output low current	I_{OL}	V_{OL} = 0.4 V	5	0.61	—	0.51	1.2	—	0.42	—	mA
		V_{OL} = 0.5 V	10	1.50	—	1.30	3.2	—	1.10	—	
		V_{OL} = 1.5 V	15	4.00	—	3.40	12.0	—	2.80	—	
		V_{IN} = V_{SS}, V_{DD}									
Input high voltage	V_{IH}	V_{OUT} = 0.5 V	5	3.5	—	3.5	2.75	—	3.5	—	V
		V_{OUT} = 1.0 V	10	7.0	—	7.0	5.50	—	7.0	—	
		V_{OUT} = 1.5 V	15	11.0	—	11.0	8.25	—	11.0	—	
		$\|I_{OUT}\|$ < 1 μA									
Input low voltage	V_{IL}	V_{OUT} = 4.5 V	5	—	1.5	—	2.25	1.5	—	1.5	V
		V_{OUT} = 9.0 V	10	—	3.0	—	4.50	3.0	—	3.0	
		V_{OUT} = 13.5 V	15	—	4.0	—	6.75	4.0	—	4.0	
		$\|I_{OUT}\|$ < 1 μA									
Input current "H" level	I_{IH}	V_{IH} = 18 V	18	—	0.1	—	10^{-5}	0.1	—	1.0	μA
Input current "L" level	I_{IL}	V_{IL} = 0 V	18	—	−0.1	—	-10^{-5}	−0.1	—	−1.0	
Quiescent supply current	I_{DD}	V_{IN} = V_{SS}, V_{DD} (Note)	5	—	0.25	—	0.001	0.25	—	7.5	μA
			10	—	0.50	—	0.001	0.50	—	15.0	
			15	—	1.00	—	0.002	1.00	—	30.0	

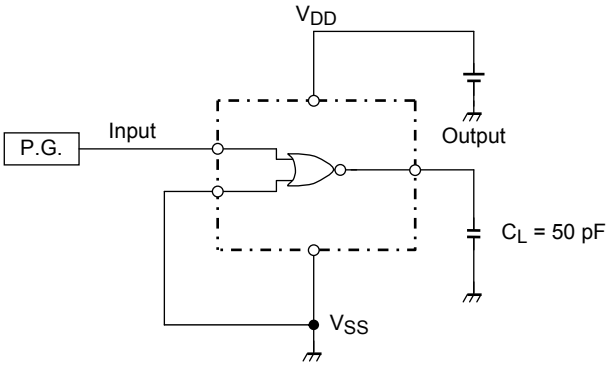
Note: All valid input combinations.

Dynamic Electrical Characteristics ($Ta = 25°C$, $V_{SS} = 0$ V, $C_L = 50$ pF)

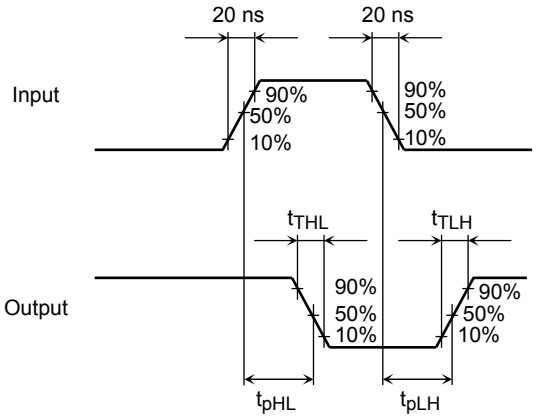
Characteristics	Symbol	Test Condition	V_{DD} (V)	Min	Typ.	Max	Unit
Output transition time	t_{TLH}	—	5	—	70	200	ns
			10	—	35	100	
			15	—	30	80	
Output transition time	t_{THL}	—	5	—	70	200	ns
			10	—	35	100	
			15	—	30	80	
Propagation delay time	t_{pLH}	—	5	—	65	200	ns
			10	—	30	100	
			15	—	25	80	
Propagation delay time	t_{pHL}	—	5	—	65	200	ns
			10	—	30	100	
			15	—	25	80	
Input capacitance	C_{IN}	—		—	5	7.5	pF

Circuit and Waveform for Measurement of Dynamic Characteristics

Circuit

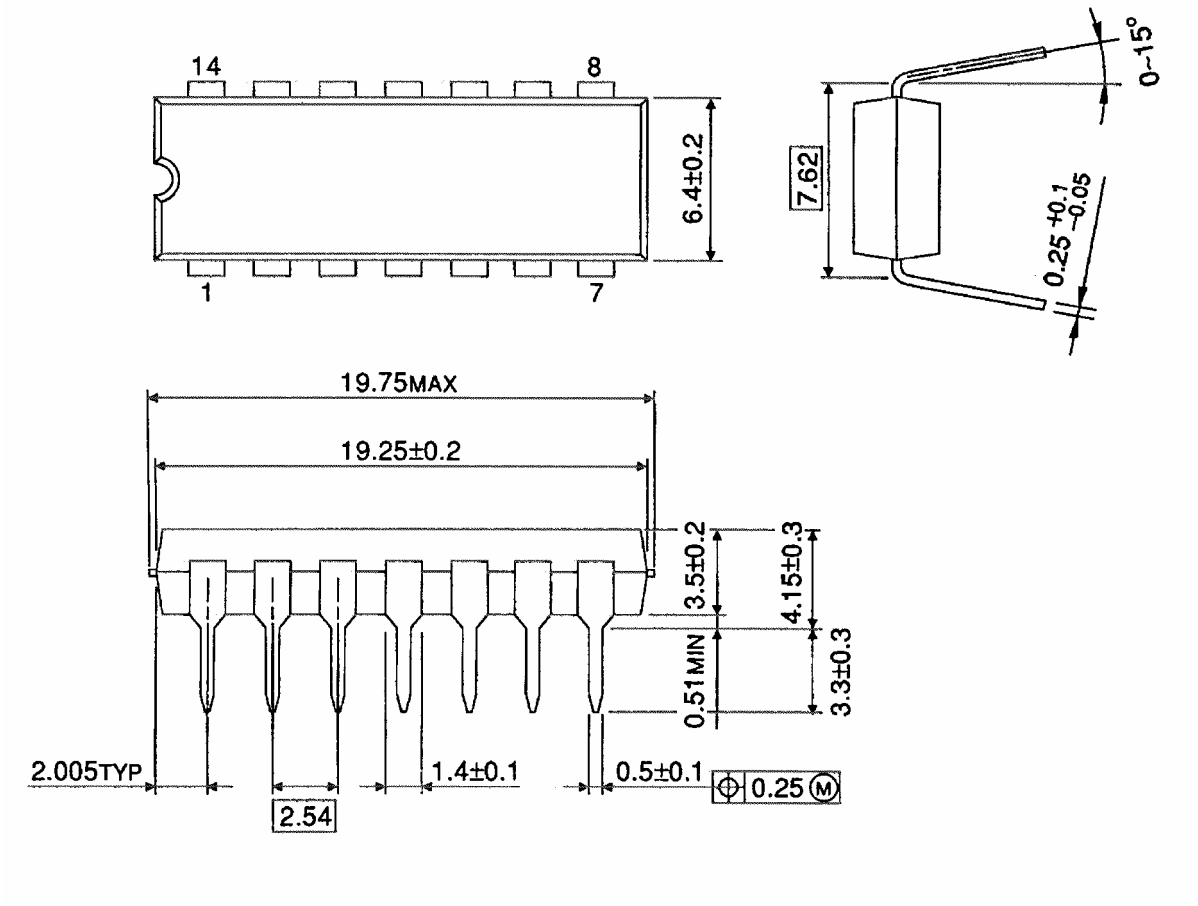


Waveform



Package Dimensions

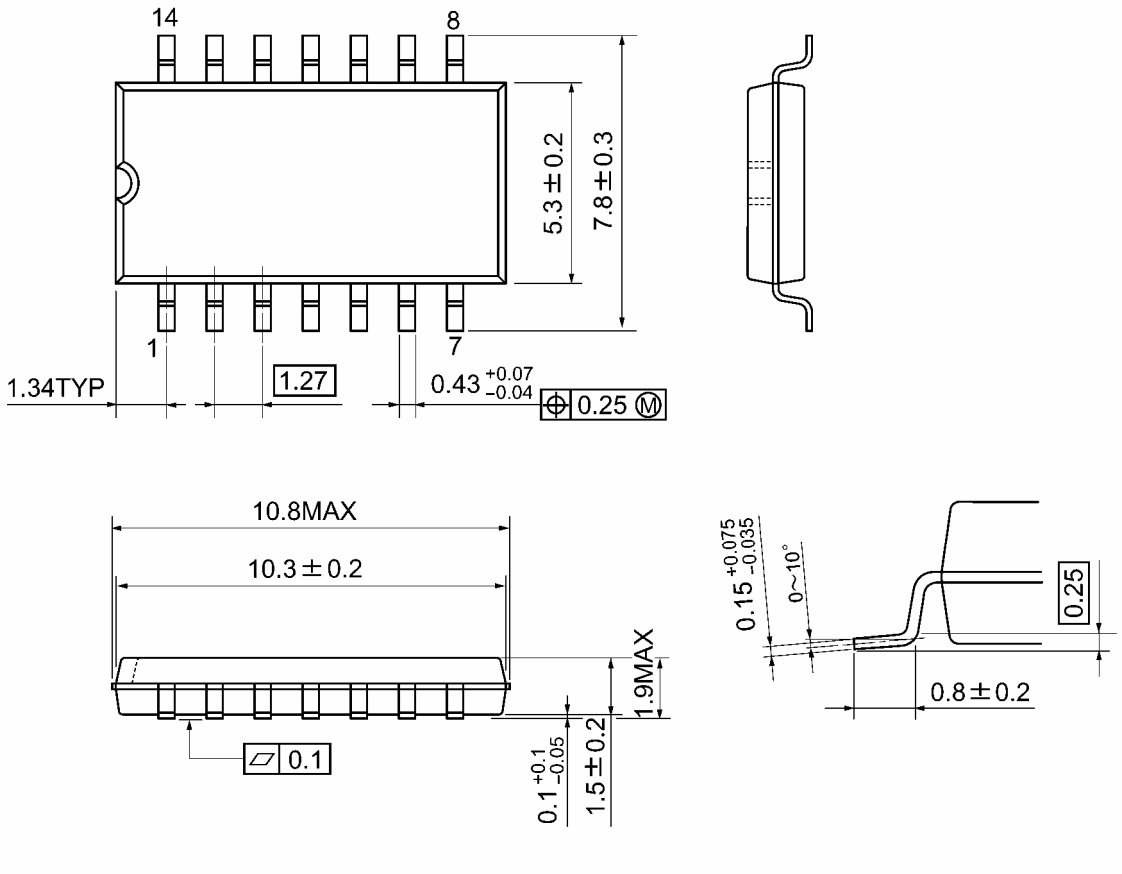
DIP14-P-300-2.54 Unit : mm



Weight: 0.96 g (typ.)

Package Dimensions

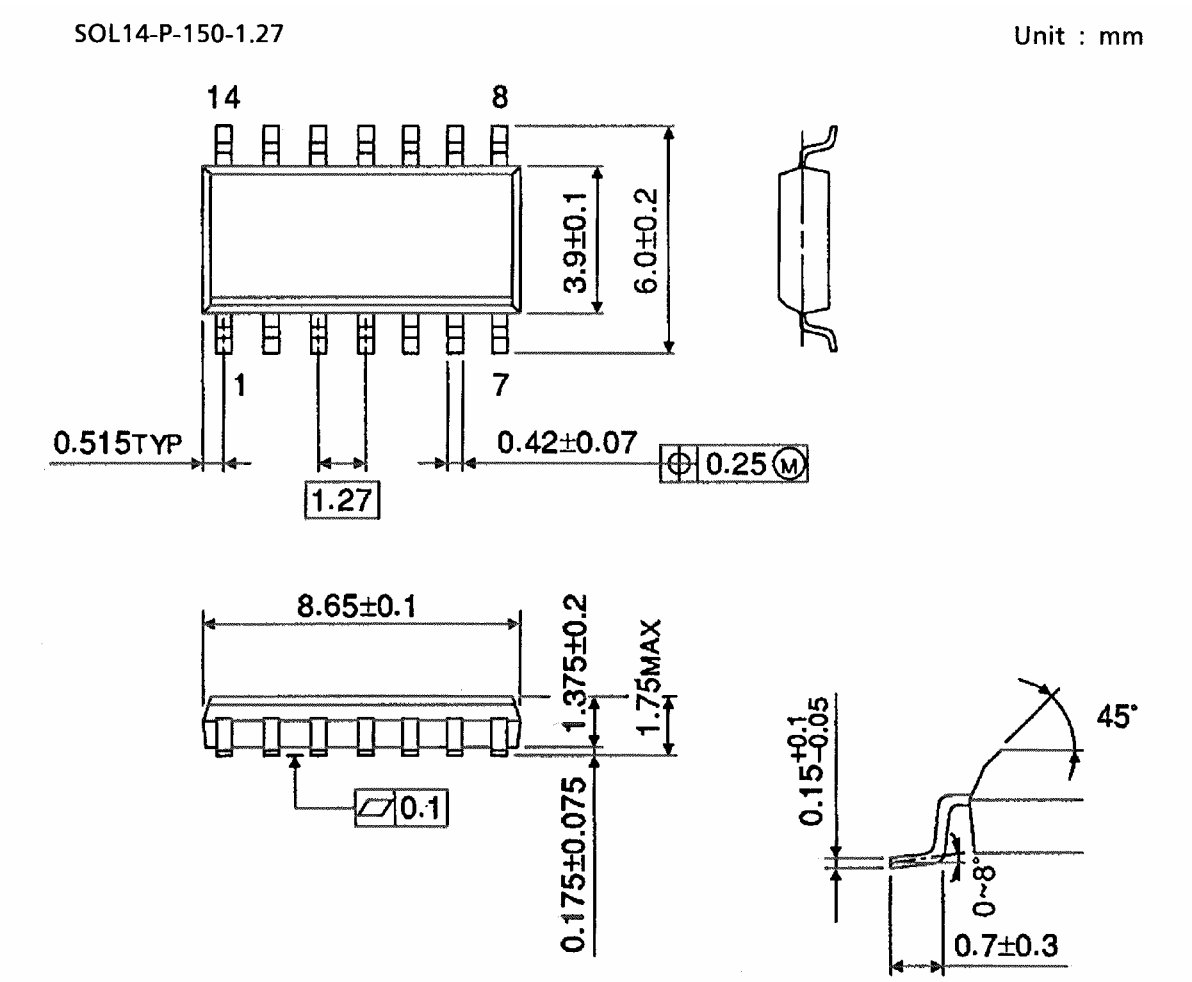
SOP14-P-300-1.27A Unit: mm



Weight: 0.18 g (typ.)

Package Dimensions (Note)

SOL14-P-150-1.27 Unit : mm

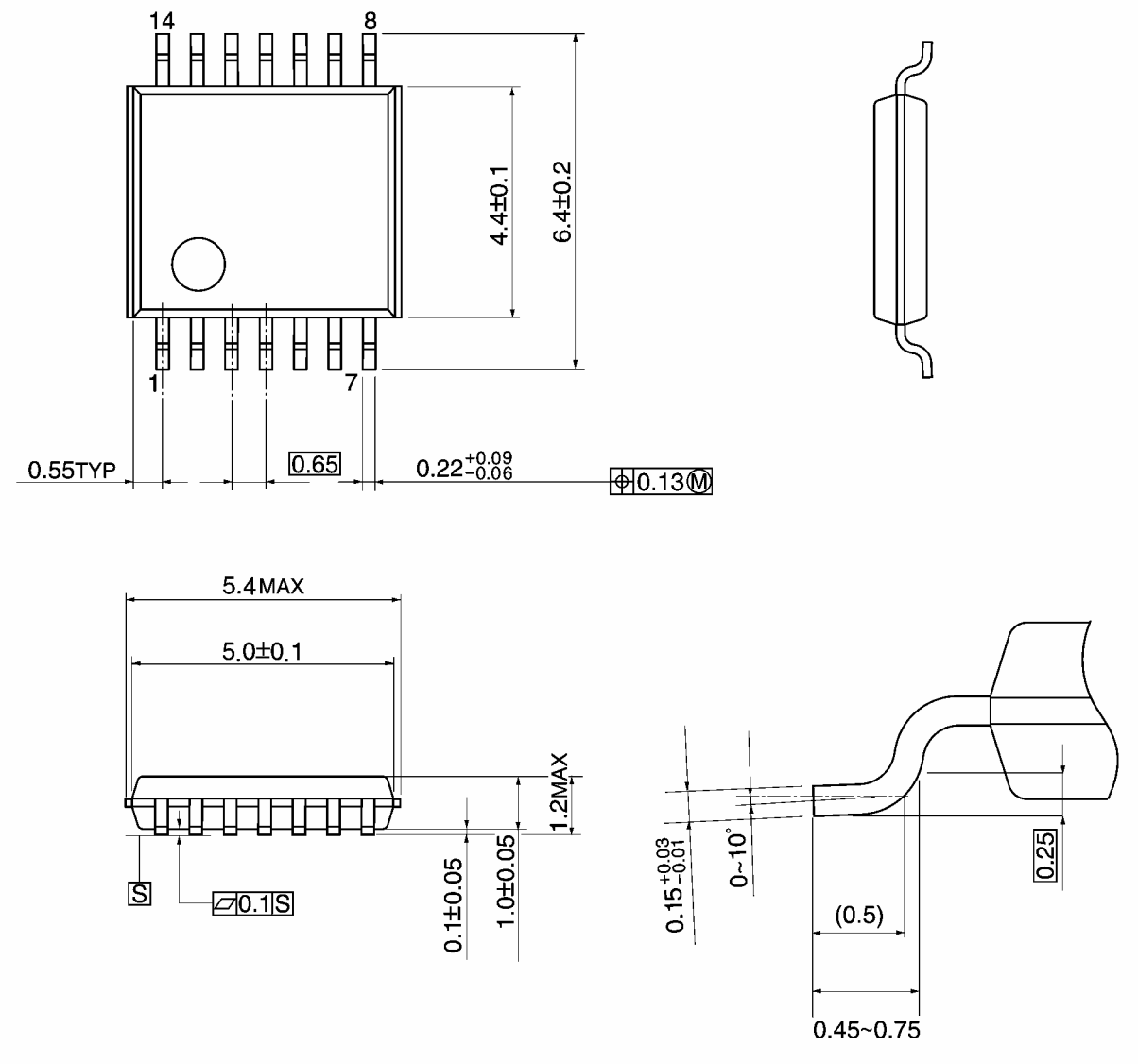


Note: This package is not available in Japan.

Weight: 0.12 g (typ.)

Package Dimensions

TSSOP14-P-0044-0.65A Unit: mm



Weight: 0.06 g (typ.)

RESTRICTIONS ON PRODUCT USE

20070701-EN GENERAL

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