TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

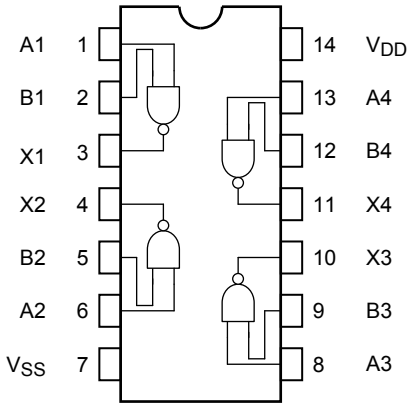
TC4011BP,TC4011BF, TC4011BFT

TC4011B Quad 2 Input NAND Gate

The TC4011B is 2-input positive logic NAND gate respectively.

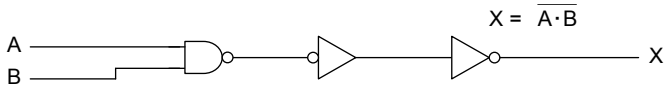
Since all the outputs of these gates are provided with the inverters as buffers, the input/output characteristics have been improved and the variation of propagation delay time due to the increase in load capacity is kept down to the minimum.

Pin Assignment

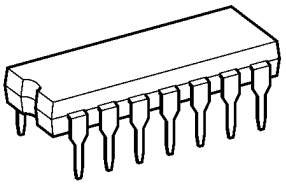


(top view)

Logic Diagram

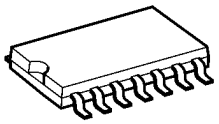


TC4011BP



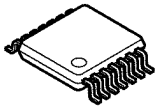
DIP14-P-300-2.54

TC4011BF



SOP14-P-300-1.27A

TC4011BFT



TSSOP14-P-0044-0.65A

Weight

DIP14-P-300-2.54	: 0.96 g (typ.)
SOP14-P-300-1.27A	: 0.18 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}, V_{DD}									
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_{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	

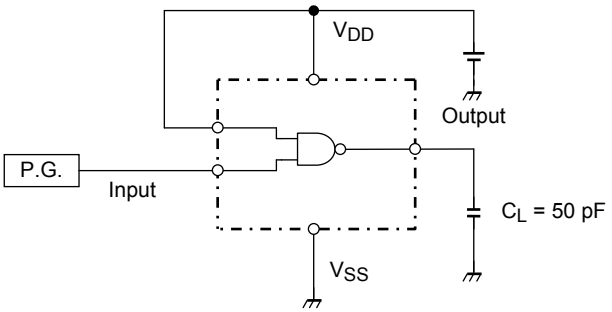
Note: All valid input combinations.

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

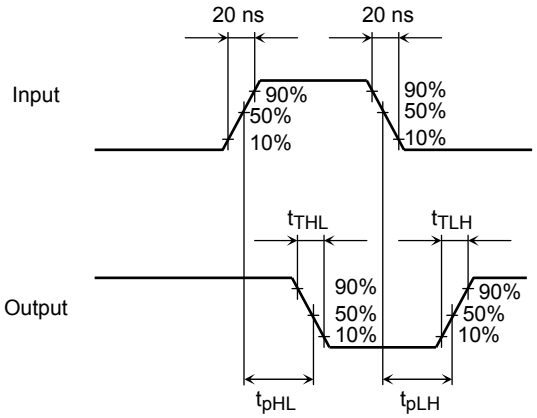
Characteristics	Symbol	Test Condition	V_{DD} (V)	Min	Typ.	Max	Unit
Output transition time	t_{TLH}	—	5	—	70	200	ns
			10	—	35	100	
			15	—	30	80	
Output transition time	t_{THL}	—	5	—	70	200	ns
			10	—	35	100	
			15	—	30	80	
Propagation delay time	t_{pLH}	—	5	—	65	200	ns
			10	—	30	100	
			15	—	25	80	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

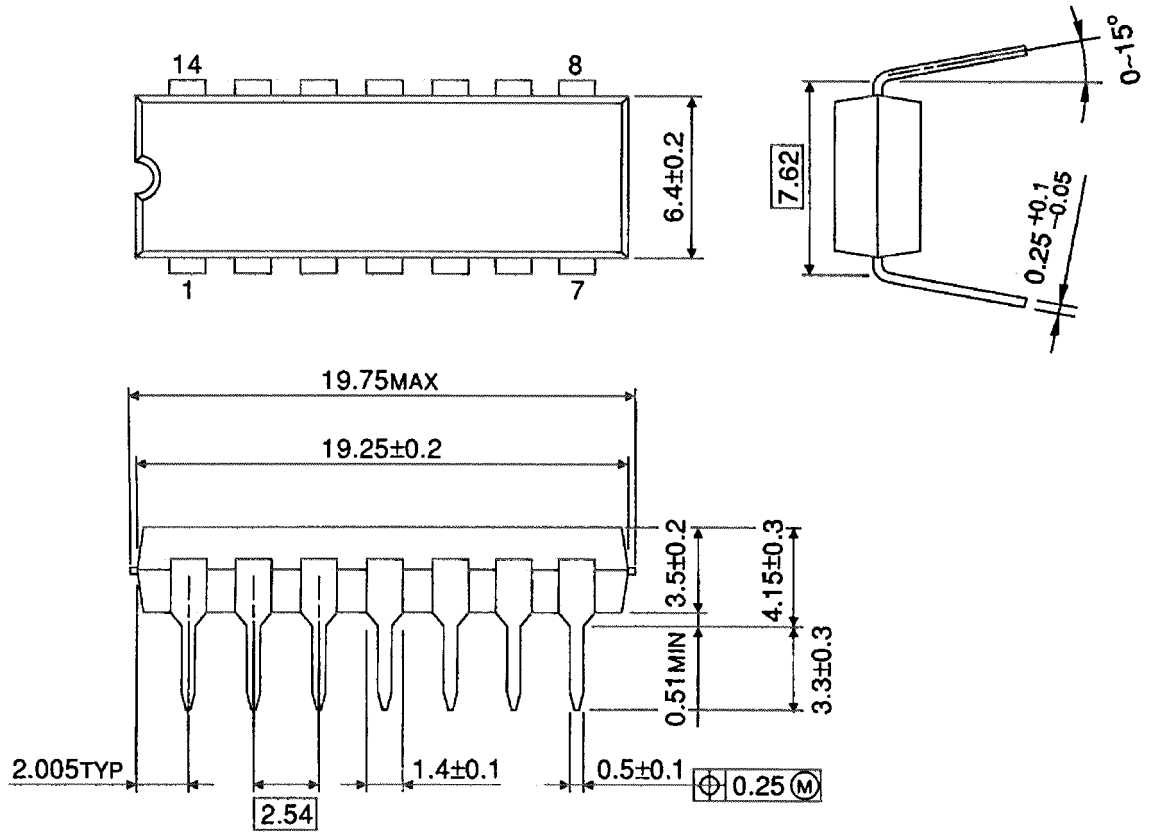


Waveform



Package Dimensions

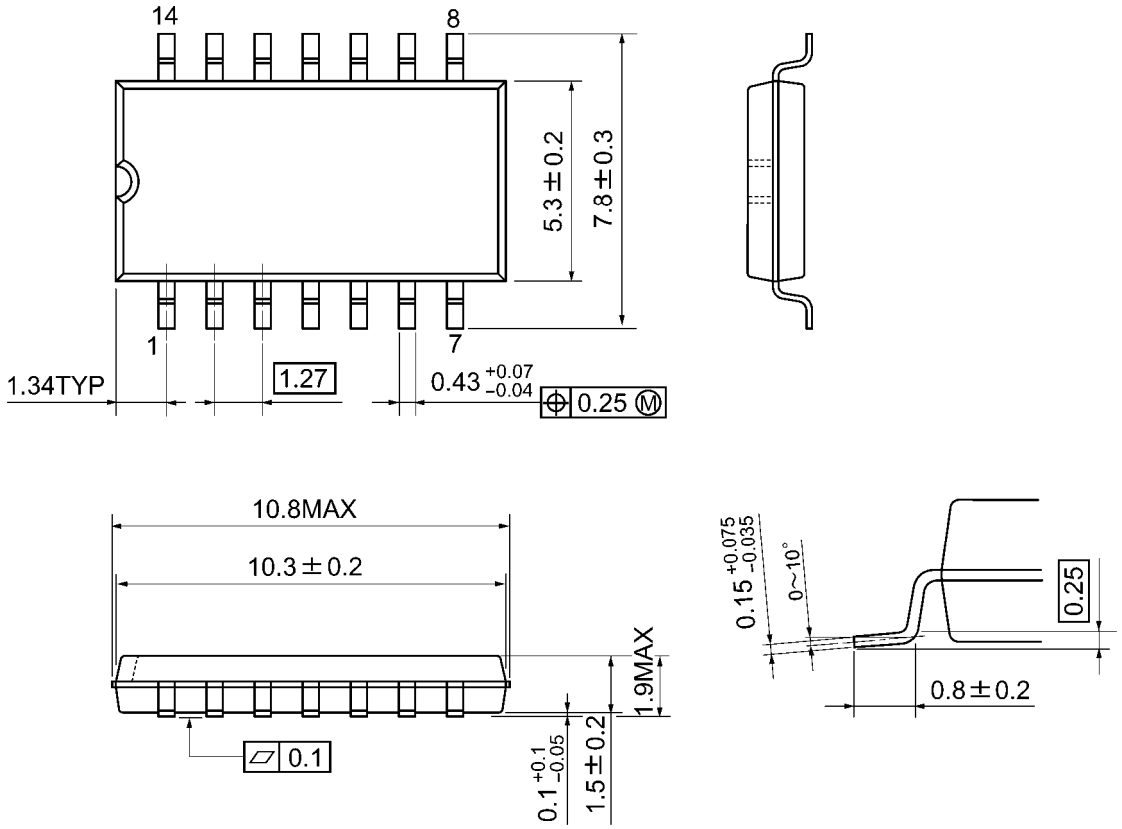
DIP14-P-300-2.54 Unit : mm



Weight: 0.96 g (typ.)

Package Dimensions

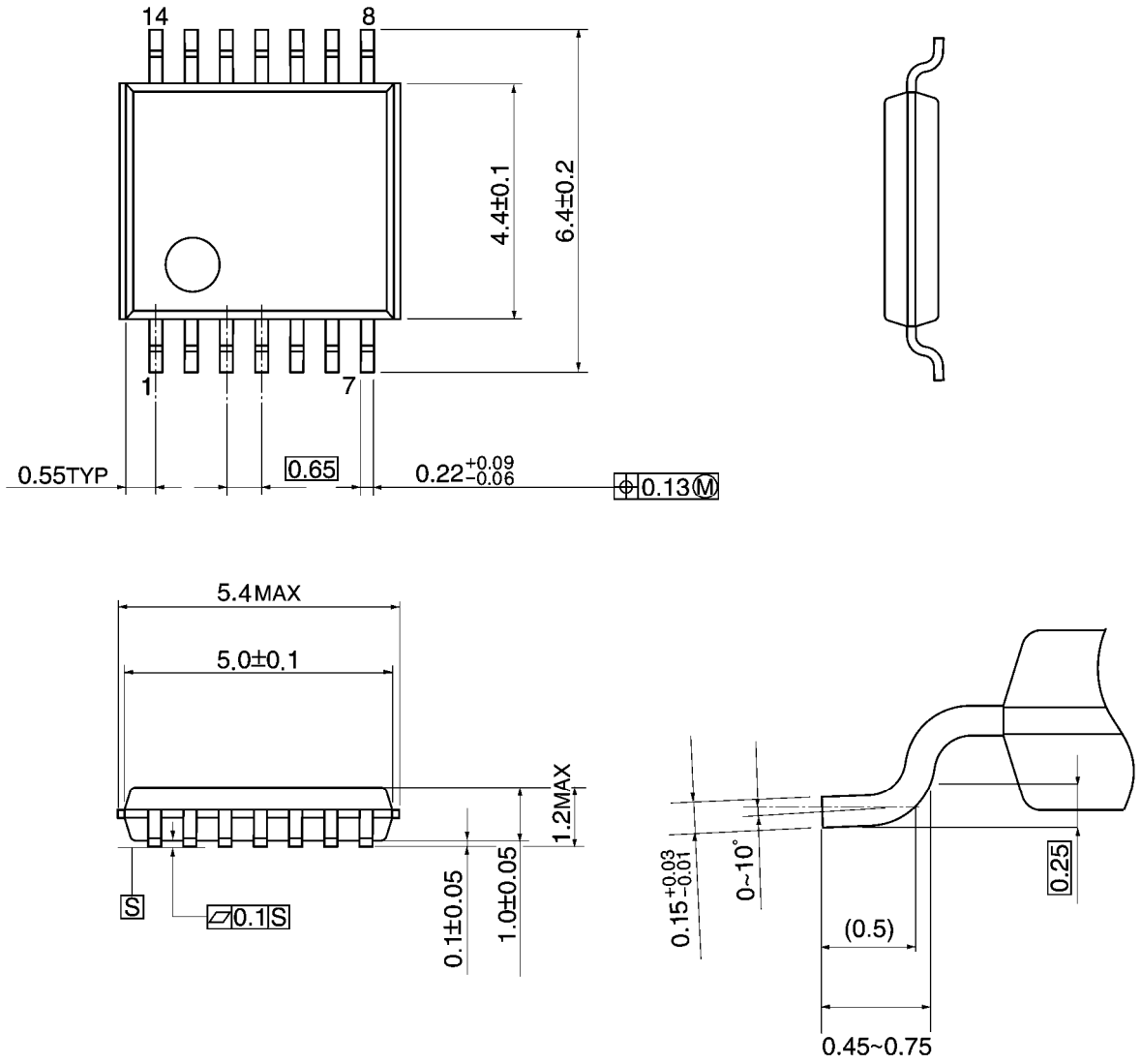
SOP14-P-300-1.27A Unit: mm



Weight: 0.18 g (typ.)

Package Dimensions

TSSOP14-P-0044-0.65A Unit: mm



Weight: 0.06 g (typ.)

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