

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC4093BP, TC4093BF

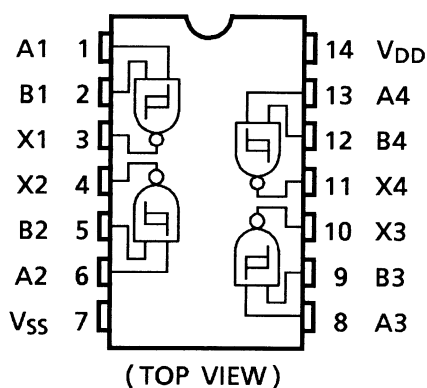
TC4093B Quad 2-Input NAND Schmitt Triggers

The TC4093B is a quad 2-input NAND gate having Schmitt trigger function for all the input terminals.

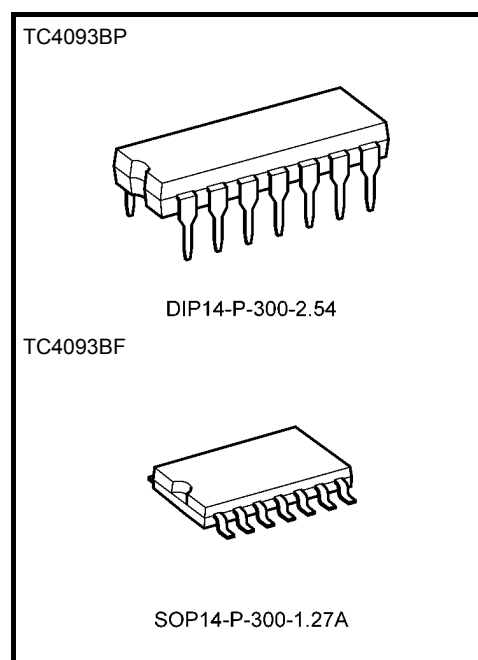
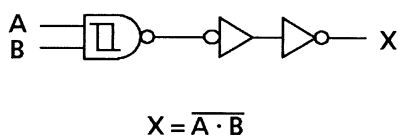
Since the circuit threshold voltage varies with rising time and falling time of the input waveform (V_P and V_N), this gate can be used for a wide variety of applications to line receivers, waveform shaping, astable multivibrators, monostable multivibrators in addition to regular NAND gates.

As the TC4093B and the TC4011B are identical in pin assignment, they are compatible each other.

Pin Assignment



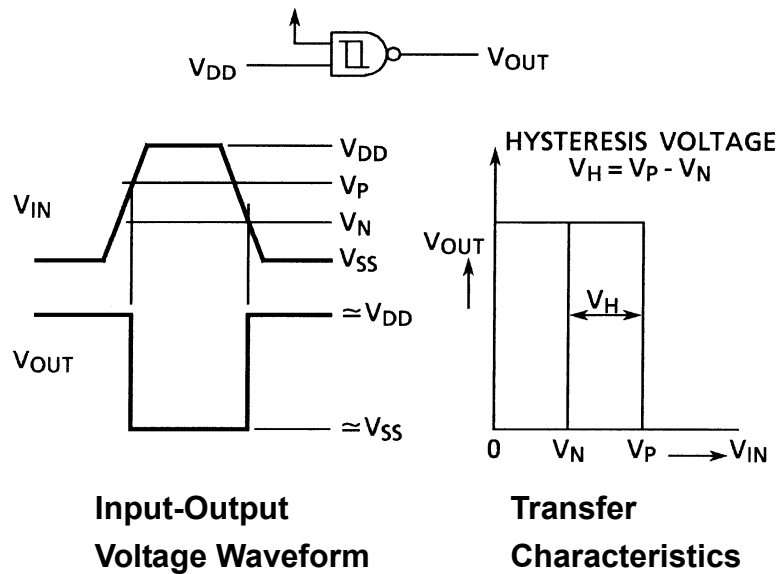
Logic Diagram



Weight	
DIP14-P-300-2.54	: 0.96 g (typ.)
SOP14-P-300-1.27A	: 0.18 g (typ.)

Start of commercial production
1978-04

Input-Output Characteristic



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		Sym- bol	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 \mu A$ $V_{IN} = V_{SS}, V_{DD}$	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 \mu A$ $V_{IN} = V_{DD}$	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	1.5	—	0.42	—	mA
			$V_{OL} = 0.5$ V	10	1.5	—	1.30	3.8	—	1.10	—	
			$V_{OL} = 1.5$ V	15	4.0	—	3.40	15.0	—	2.80	—	
			$V_{IN} = V_{DD}$									
High threshold voltage		V_P	$V_{OUT} = 0.5$ V, 4.5 V	5	—	—	2.05	2.8	3.55	—	—	V
			$V_{OUT} = 1.0$ V, 9.0 V	10	—	—	4.10	5.3	7.00	—	—	
			$V_{OUT} = 1.5$ V, 13.5 V	15	—	—	6.20	7.8	10.40	—	—	
Low threshold voltage		V_N	$V_{OUT} = 0.5$ V, 4.5 V	5	—	—	1.5	2.3	3.15	—	—	V
			$V_{OUT} = 1.0$ V, 9.0 V	10	—	—	3.2	4.5	6.30	—	—	
			$V_{OUT} = 1.5$ V, 13.5 V	15	—	—	4.8	6.6	9.30	—	—	
Hysteresis voltage		V_H	—	5	—	—	0.20	0.5	0.85	—	—	V
				10	—	—	0.30	0.8	1.40	—	—	
				15	—	—	0.45	1.2	1.90	—	—	
Input current	"H" level	I_{IH}	$V_{IH} = 18$ V	18	—	0.1	—	10^{-5}	0.1	—	1.0	μA
	"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	—	1	—	0.001	1	—	7.5	μA
				10	—	2	—	0.002	2	—	15.0	
				15	—	4	—	0.004	4	—	30.0	

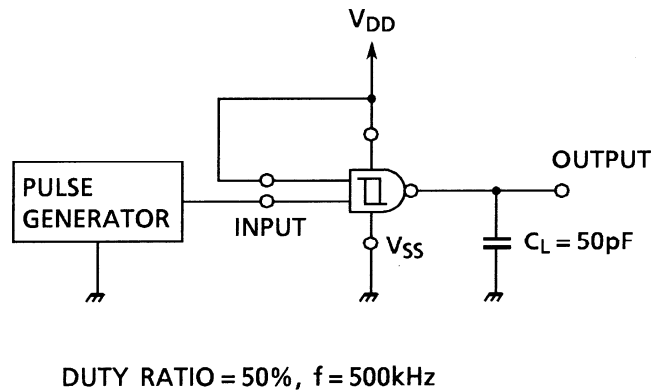
Note: All valid input combinations.

Dynamic Electrical Characteristics (Ta = 25°C, VSS = 0 V, CL = 50 pF)

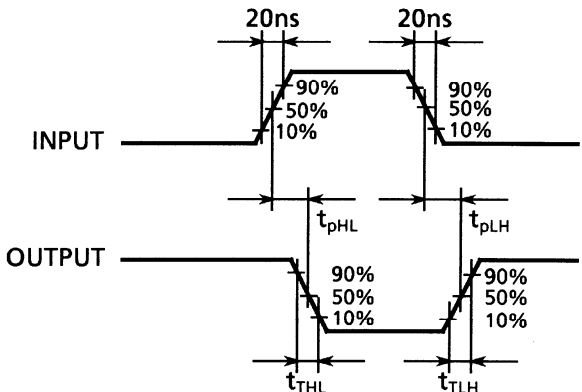
Characteristics	Symbol	Test Condition		Min	Typ.	Max	Unit
			VDD (V)				
Output transition time (low to high)	tTLH	—	5	—	80	200	ns
			10	—	50	100	
			15	—	40	80	
Output transition time (high to low)	tTHL	—	5	—	80	200	ns
			10	—	50	100	
			15	—	40	80	
Propagation delay time	tPLH tPHL	—	5	—	130	260	ns
			10	—	60	120	
			15	—	40	80	
Input capacitance	CIN	—		—	5	7.5	pF

Circuit and Waveform for Measurement of Dynamic Characteristics

Circuit



Waveform



Package Dimensions

DIP14-P-300-2.54

Unit : mm

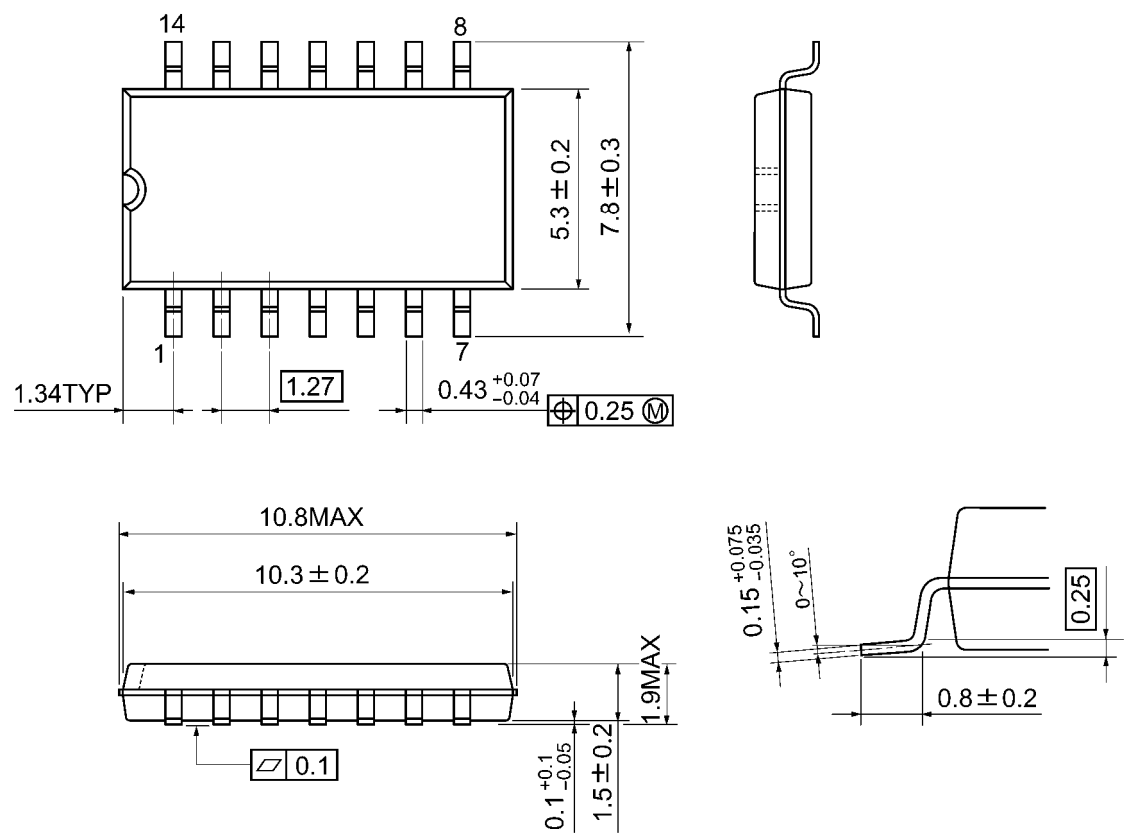


Weight: 0.96 g (typ.)

Package Dimensions

SOP14-P-300-1.27A

Unit: mm



Weight: 0.18 g (typ.)

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