CMOS Quad 2-Input NAND Schmitt Triggers CD4093B

FEATURES

- Wide Operating Voltage Range of 3.0V to 18.0V
- Maximum Input Current of 1μA at 18V over Full Package-Temperature range, 100nA at 18V and 25°C
- Independent Schmitt-Trigger at each Input

APPLICATIONS

- Wave and Pulse Shapers
- High-Noise-Environment Systems
- Monostable Multivibrators
- Asstable Multivibtayors
- NAND Logic

SOP-14

DIP-14

DESCRIPTION

The CD4093B consist of four Schmitt-trigger circuits. Each circuit functions as a two-input NAND gate with Schmitt-trigger action on both inputs. The gate switches at different points for positive- and negative-going signals. The difference between the positive voltage (V_{TP}) and the negative voltage (V_{TN}) is defined as hysteresis voltage (V_H).

ORDERING INFORMATION

Device	Package
CD4093BD	SOP-14
CD4093BN	DIP-14

ABSOLUTE MAXIMUM RATINGS (Note 1)

CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT
DC Supply Voltage (Referenced to V_{SS})	V_{DD}	-0.5	20	V
DC Input Voltage (Referenced to V_{SS})	V_{IN}	-0.5	V_{DD} + 0.5	V
DC Input Current	I_{IN}	-	±10	mA
Maximum Junction Temperature	T_J	-	150	°C
Storage Temperature	T_{STG}	-65	150	°C

Note1. Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

RECOMMENDED OPERATING CONDITIONS (Note 2)

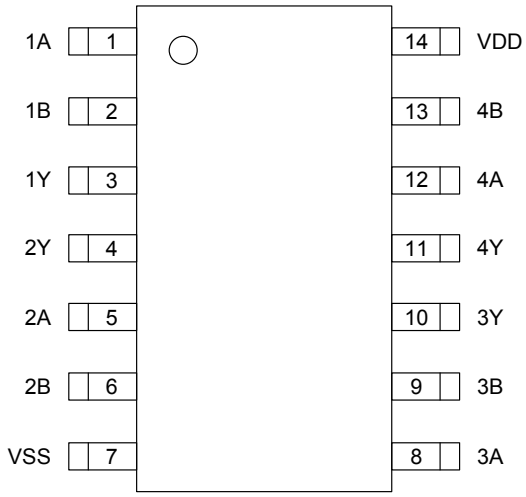
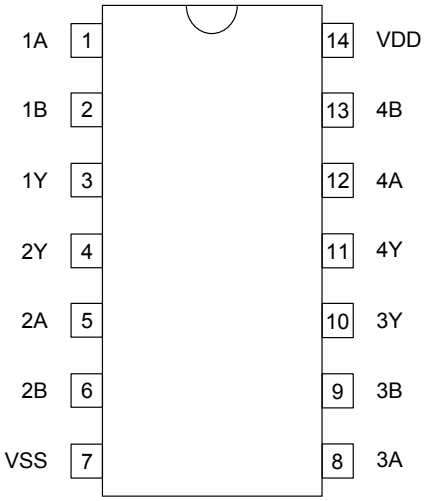
CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage	V_{DD}	3	18	V
DC Input Voltage	V_{IN}	0	V_{DD}	V
DC Output Voltage	V_{OUT}	0	V_{DD}	V
Operating Free-Air Temperature Range	T_A	-55	125	°C

Note 2. The device is not guaranteed to function outside its operating ratings.

ORDERING INFORMATION

Package	Order No.	Description	Supplied As	Status
SOP-14	CD4093BD	Quad 2-Input NAND Schmitt Triggers	Tape & Reel	Active
DIP-14	CD4093BN	Quad 2-Input NAND Schmitt Triggers	Tube	Active

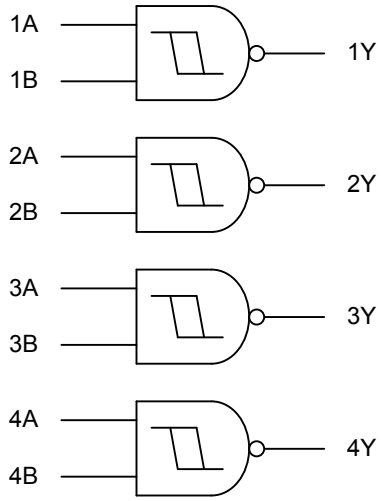
PIN CONFIGURATION

SOP-14	DIP-14
	

PIN DESCRIPTION

Pin No.		Pin Name	Pin Function
SOP-14	DIP-14		
1	1	1A	Input 1A
2	2	1B	Input 1B
3	3	1Y	Output 1
4	4	2Y	Output 2
5	5	2A	Input 2A
6	6	2B	Input 2B
7	7	VSS	Ground
8	8	3A	Input 3A
9	9	3B	Input 3B
10	10	3Y	Output 3
11	11	4Y	Output 4
12	12	4A	Input 4A
13	13	4B	Input 4B
14	14	VDD	Power Supply

BLOCK DIAGRAM



DC ELECTRICAL CHARACTERISTICS

Voltages referenced to V_{SS}.

SYMBOL	PARAMETER	TEST CONDITION	V_{DD}	Limit			UNIT
				−55°C	25°C	125°C	
V_{TP}.min	Minimum Positive-Going Input Threshold Voltage	Input on Terminal A or B; Other Inputs to V_{DD}	5 V	2.2	2.2	2.2	V
			10 V	4.6	4.6	4.6	
			15 V	6.8	6.8	6.8	
		Input on Terminal A and B; Other Inputs to V_{DD}	5 V	2.6	2.6	2.6	
			10 V	5.6	5.6	5.6	
			15 V	6.3	6.3	6.3	
V_{TP}.max	Maximum Positive-Going Input Threshold Voltage	Input on Terminal A or B; Other Inputs to V_{DD}	5 V	3.6	3.6	3.6	V
			10 V	7.1	7.1	7.1	
			15 V	10.8	10.8	10.8	
		Input on Terminal A and B; Other Inputs to V_{DD}	5 V	4.0	4.0	4.0	
			10 V	8.2	8.2	8.2	
			15 V	12.7	12.7	12.7	
V_{TN}.min	Minimum Negative-Going Input Threshold Voltage	Input on Terminal A or B; Other Inputs to V_{DD}	5 V	0.9	0.9	0.9	V
			10 V	2.5	2.5	2.5	
			15 V	4.0	4.0	4.0	
		Input on Terminal A and B; Other Inputs to V_{DD}	5 V	1.4	1.4	1.4	
			10 V	3.4	3.4	3.4	
			15 V	4.8	4.8	4.8	
V_{TN}.max	Maximum Negative-Going Input Threshold Voltage	Input on Terminal A or B; Other Inputs to V_{DD}	5 V	2.8	2.8	2.8	V
			10 V	5.2	5.2	5.2	
			15 V	7.4	7.4	7.4	
		Input on Terminal A and B; Other Inputs to V_{DD}	5 V	3.2	3.2	3.2	
			10 V	6.6	6.6	6.6	
			15 V	9.6	9.6	9.6	
V_H.min	Minimum Hysteresis Voltage	Input on Terminal A and/or B; Other Inputs to V_{DD}	5 V	0.3	0.3	0.3	V
			10 V	1.2	1.2	1.2	
			15 V	1.6	1.6	1.6	
V_H.max	Maximum Hysteresis Voltage	Input on Terminals A and/or B; Other Inputs to V_{DD}	5 V	1.6	1.6	1.6	V
			10 V	3.4	3.4	3.4	
			15 V	5.0	5.0	5.0	

DC ELECTRICAL CHARACTERISTICS (continued)

Voltages referenced to V_{SS}.

SYMBOL	PARAMETER	TEST CONDITION		V_{DD}	Limit			UNIT
					−55°C	25°C	125°C	
V_{OH}	Minimum High-Level Output Voltage	V_{IN} = V_{DD} or V_{SS}		5 V	4.95	4.95	4.95	V
				10 V	9.95	9.95	9.95	
				15 V	14.95	14.95	14.95	
V_{OL}	Maximum Low-Level Output Voltage	V_{IN} = V_{DD}		5 V	0.05	0.05	0.05	V
				10 V	0.05	0.05	0.05	
				15 V	0.05	0.05	0.05	
I_{IN}	Maximum Input Leakage Current	V_{IN} = V_{DD} or V_{SS}		18 V	±0.1	±0.1	±1.0	μA
I_{CC}	Maximum Quiescent Supply Current	V_{IN} = V_{DD} or V_{SS}		5 V	1	1	30	μA
				10 V	2	2	60	
				15 V	4	4	120	
				20 V	20	20	600	
I_{OL}	Minimum Output Low (Sink) Current	V_{IN} = V_{DD} or V_{SS}	V_{OL} = 0.4V	5 V	0.64	0.51	0.36	mA
			V_{OL} = 0.5V	10 V	1.6	1.3	0.9	
			V_{OL} = 1.5V	15 V	4.2	3.4	2.4	
I_{OH}	Minimum Output High (Source) Current	V_{IN} = V_{DD} or V_{SS}	V_{OH} = 2.5V	5 V	−2.0	−1.6	−1.15	mA
			V_{OH} = 4.6V	5 V	−0.64	−0.51	−0.36	
			V_{OH} = 9.5V	10 V	−1.6	−1.3	−0.9	
			V_{OH} = 13.5V	15 V	−4.2	−3.4	−2.4	

AC ELECTRICAL CHARACTERISTICS

C_L = 50 pF, R_L = 200kΩ, Input t_r = t_f = 20 ns

SYMBOL	PARAMETER	V_{DD}	Limit			UNIT
			−55°C	25°C	125°C	
t_{PLH}, t_{PHL}	Maximum Propagation Delay, Input A or Input B to Output Y (Figure 4)	5 V	380	380	760	ns
		10 V	180	180	360	
		15 V	130	130	260	
t_{TLH}, t_{THL}	Maximum Output Transition Time, Any Output (Figure 4)	5 V	200	200	400	ns
		10 V	100	100	200	
		15 V	80	80	160	
C_{IN}	Maximum Input Capacitance	–		7.5		pF

FUNCTION TABLE

Input (A)	Input (B)	Output (Y)
L	L	H
L	H	H
H	L	H
H	H	L

SWITCHING CHARACTERISTICS

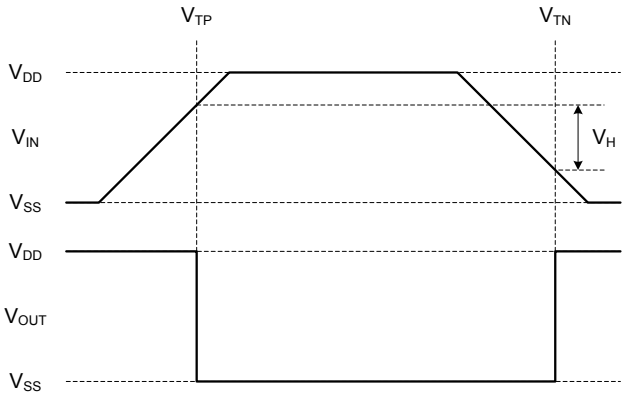


Fig. 1. Hysteresis Definition

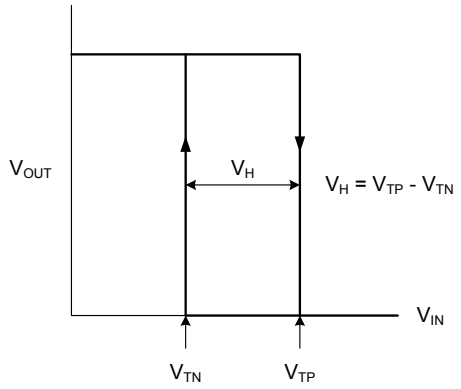


Fig. 2. Hysteresis Characteristic

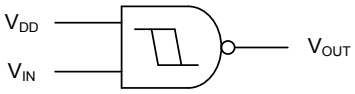


Fig. 3. Test Circuit

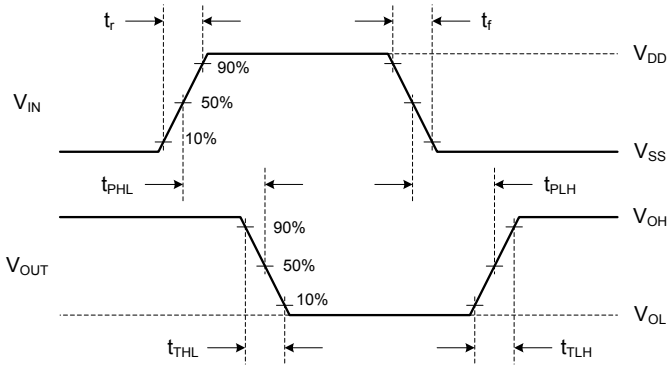


Fig. 4. Switching Time Waveforms

TYPICAL OPERATING CHARACTERISTICS

T.B.D.

REVISION NOTICE

The description in this datasheet is subject to change without any notice to describe its electrical characteristics properly.