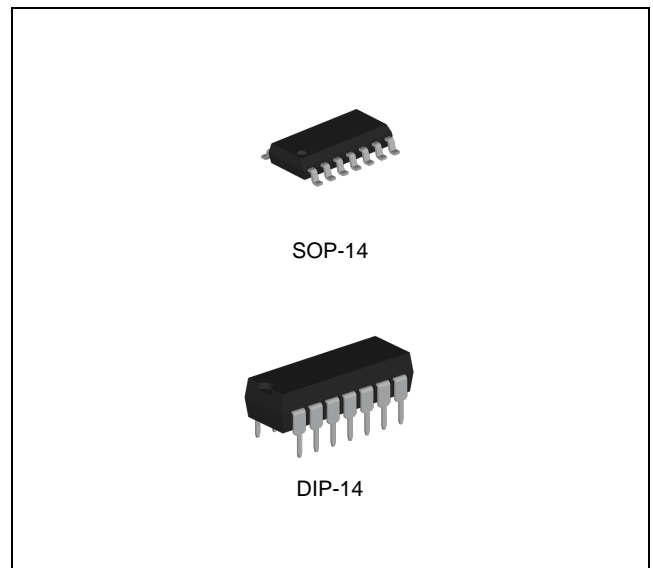


FEATURES

- Wide Operating Voltage Range of 3.0V to 18.0V
- Maximum Input Current of 1 μ A 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 Multivibrators
- NAND Logic



DESCRIPTION

The CD4093B consists 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).

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)

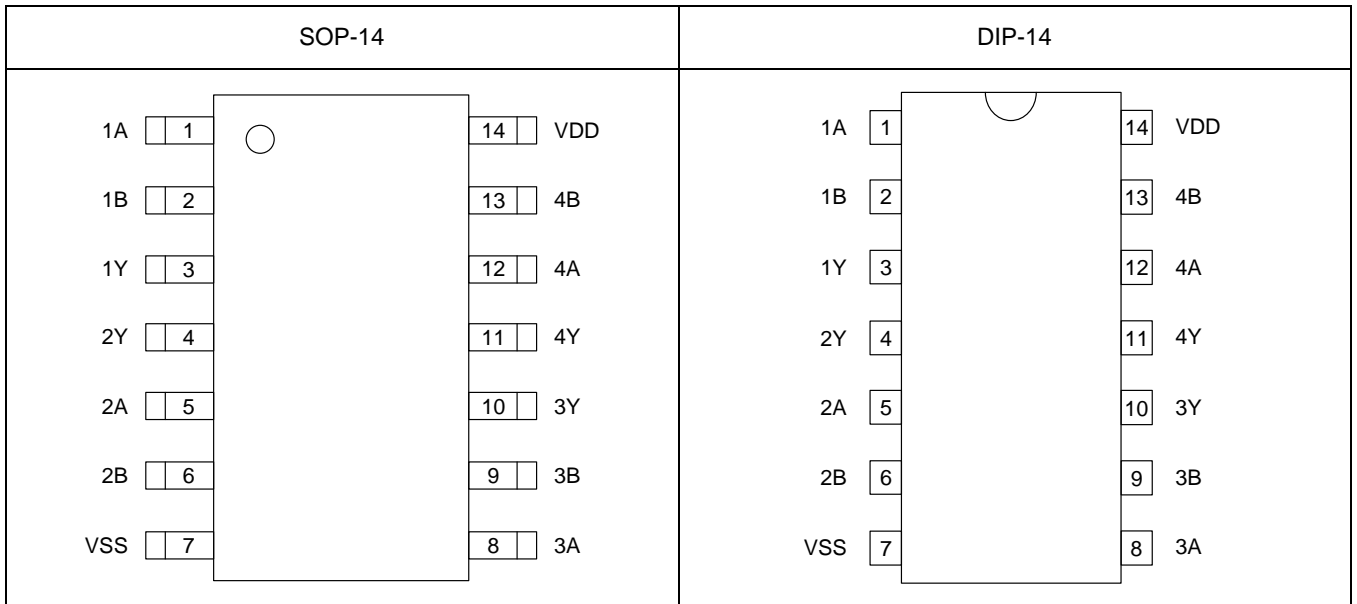
CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage	V_{DD}	3	18	V
DC Input Voltage	V_{IN}	0	V_{DD}	V
DC Output Voltage	V_{OUT}	0	V_{DD}	V
Operating Free-Air Temperature Range	T_A	-55	125	°C

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

ORDERING INFORMATION

Package	Order No.	Description	Supplied As	Status
SOP-14	CD4093BM	Quad 2-Input NAND Schmitt Triggers	Tape & Reel	Active
DIP-14	CD4093BE	Quad 2-Input NAND Schmitt Triggers	Tube	Active

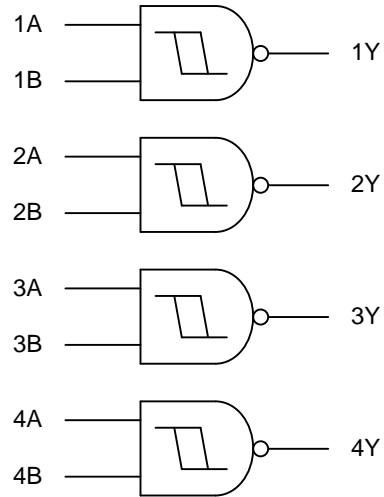
PIN CONFIGURATION



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, $R_L = 200k\Omega$, 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

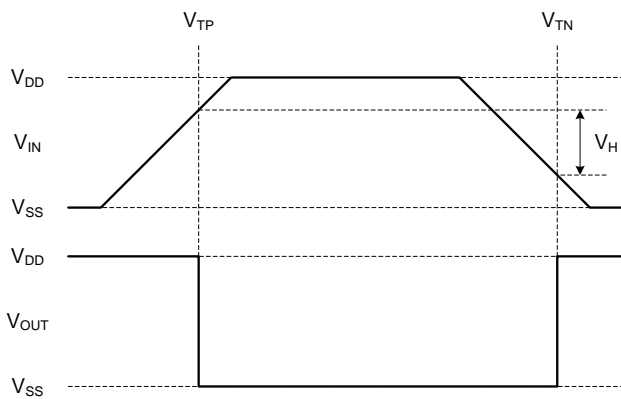


Fig. 1. Hysteresis Definition

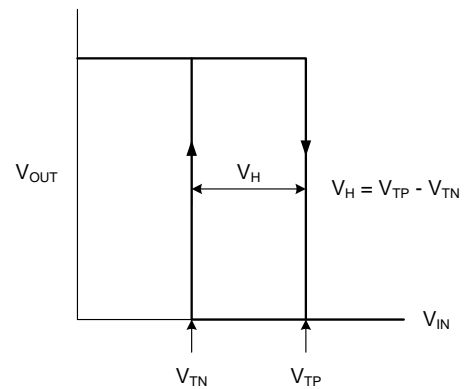


Fig. 2. Hysteresis Characteristic

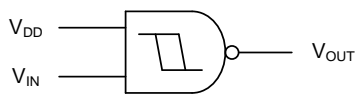


Fig. 3. Test Circuit

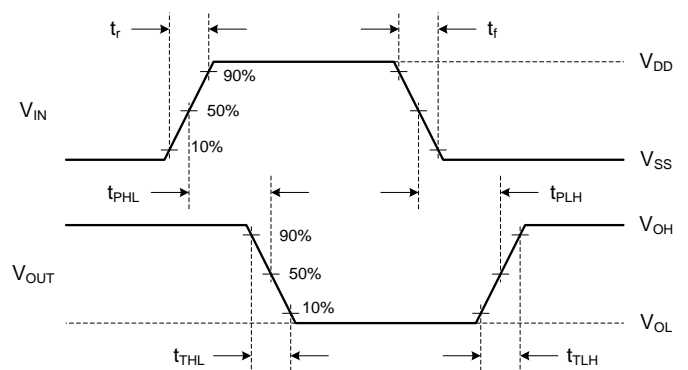


Fig. 4. Switching Time Waveforms