MN4093B/MN4093BS

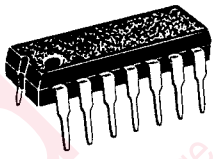
Quad 2-Input NAND Schmitt Trigger

■ Outline

The MN4093B/S is a 2-input NAND gate consisting of four circuits, and all the input pins have a Schmitt trigger function. The circuit threshold voltage (V_{IH}) at the rise of the input waveform differs from the circuit threshold voltage (V_{IL}) at the fall of the input waveform. So, this 2-input NAND gate is also usable as a line receiver.

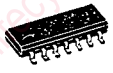
The MN4093B/S is equivalent to Motorola's MC14093B and RCA's CD4093B.

P-1



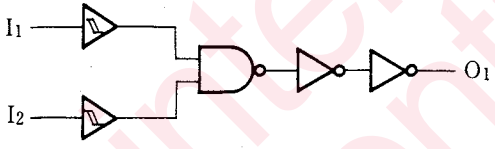
14-pin plastic DIL package

P-2

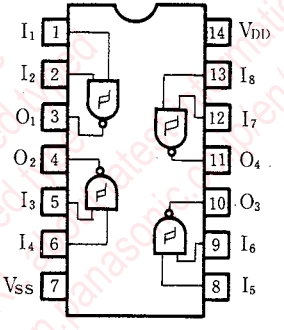


14-pin PANAFLAT package (SO-14D)

■ Logic Diagram



Pin Configuration



■ Absolute Maximum Ratings (Ta=25°C)

Item		Symbol	Rating	Unit
Supply voltage		V_{DD}	−0.5~+18	V
Input voltage		V_I	−0.5~V_{DD}+0.5*	V
Output pin voltage		V_O	−0.5~V_{DD}+0.5*	V
Peak input · output pin current		$\pm I_I$	max. 10	mA
Power dissipation (per package)	Ta=−40~+60°C	P_D	max. 400	mW
	Ta=+60~+80°C		Decrease to 200mW at the rate of 8mW/°C	
Power dissipation (per output pin)		P_D	max. 100	mW
Operating ambient temperature		T_{opr}	−40~+85	°C
Storage temperature		T_{stg}	−65~+150	°C

* V_{DD}+0.5V should be lower than 18V.

■ DC Characteristics (V_{SS}=0V)

Item	V_{DD} (V)	Symbol	Condition	Ta=−40°C min.	Ta=−40°C max.	Ta=25°C min.	Ta=25°C max.	Ta=85°C min.	Ta=85°C max.	Unit
Static supply current	5	I_{DD}	V_I=V_{SS} or V_{DD}	—	1	—	1	—	7.5	μA
	10			—	2	—	2	—	15	
	15			—	4	—	4	—	30	
Output voltage low level	5	V_{OL}	V_I=V_{SS} or V_{DD}, $\|I_O\|$<1μA	—	0.05	—	0.05	—	0.05	V
	10			—	0.05	—	0.05	—	0.05	
	15			—	0.05	—	0.05	—	0.05	
Output voltage high level	5	V_{OH}	V_I=V_{SS} or V_{DD}, $\|I_O\|$<1μA	4.95	—	4.95	—	4.95	—	V
	10			9.95	—	9.95	—	9.95	—	
	15			14.95	—	14.95	—	14.95	—	
Input voltage low level	5	V_{IL}	$\|I_O\|$<1μA, V_O=0.5V or 4.5V	—	1.5	—	1.5	—	1.5	V
	10		V_O=1V or 9V	—	3	—	3	—	3	
	15		V_O=1.5V or 13.5V	—	4	—	4	—	4	
Input voltage high level	5	V_{IH}	$\|I_O\|$<1μA, V_O=0.5V or 4.5V	3.5	—	3.5	—	3.5	—	V
	10		V_O=1V or 9V	7	—	7	—	7	—	
	15		V_O=1.5V or 13.5V	11	—	11	—	11	—	
Output current low level	5	I_{OL}	V_O=0.4V, V_I=0 or 5V	0.52	—	0.44	—	0.36	—	mA
	10		V_O=0.5V, V_I=0 or 10V	1.3	—	1.1	—	0.9	—	
	15		V_O=1.5V, V_I=0 or 15V	3.6	—	3	—	2.4	—	
Output current high level	5	$-I_{OH}$	V_O=4.6V, V_I=0 or 5V	0.52	—	0.44	—	0.36	—	mA
	10		V_O=9.5V, V_I=0 or 10V	1.3	—	1.1	—	0.9	—	
	15		V_O=13.5V, V_I=0 or 15V	3.6	—	3	—	2.4	—	
Output current high level	5	$-I_{OH}$	V_O=2.5V, V_I=0 or 5V	1.7	—	1.4	—	1.1	—	mA
Input leakage current	15	$\pm I_I$	V_I=0 or 15V	—	0.3	—	0.3	—	1	μA

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

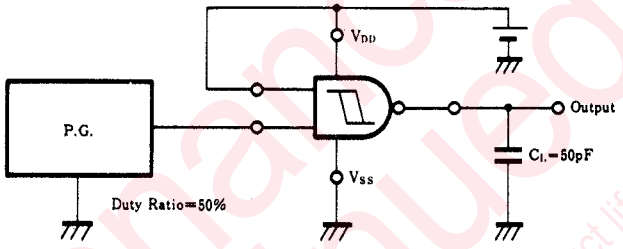
Item	V_{DD}(V)	Symbol	min.	typ.	max.	Unit
Output rise time (Fig. 1)	5	t_{TLH}	—	60	180	ns
	10		—	30	90	
	15		—	20	60	
Output fall time (Fig. 1)	5	t_{THL}	—	60	180	ns
	10		—	30	90	
	15		—	20	60	
Propagation time (Fig. 1)	5	t_{PLH}	—	85	255	ns
	10		—	40	120	
	15		—	30	90	
Propagation time (Fig. 1)	5	t_{PHL}	—	90	270	ns
	10		—	40	120	
	15		—	30	90	
Threshold voltage (Fig. 2)	5	V_{IH}	—	2.9	3.5	V
	10		—	5.2	7	
	15		—	7.3	11	
Threshold voltage (Fig. 2)	5	V_{IL}	1.5	2.2	—	V
	10		3	4.2	—	
	15		4	6	—	

■ Switching Characteristics (cont.)

Item	V_{DD}(V)	Symbol	min.	typ.	max.	Unit
Hysteresis voltage (Fig. 2)	5	V_H	0.4	0.7	—	V
	10		0.6	1	—	
	15		0.7	1.3	—	
Input capacitance		C_I	—	—	7.5	pF

Fig. 1 Switching time measuring circuit and wavefoms

1. Switching time measuring circuit



2. Switching waveforms

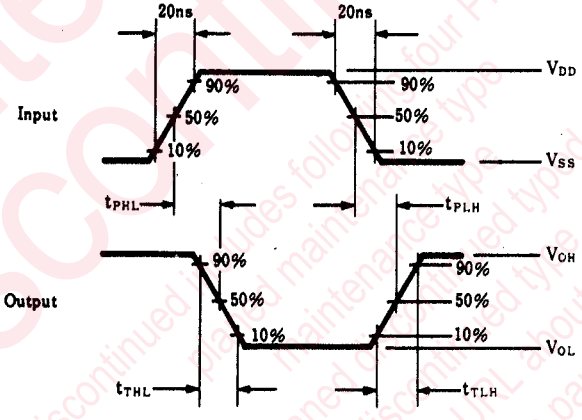
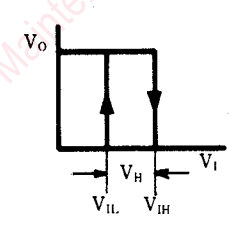
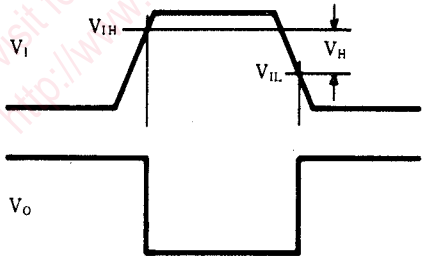


Fig. 2 Input-output characteristics



Transfer characteristics



Above wavefrom specifies V_{IH}, V_{IL} and V_{IL} and V_{IH} are in the scope from 30% to 70%.

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