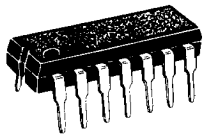
MN4093B / MN4093BS

Quad 2-Input NAND Schmitt Triggers

■ Description

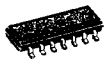
The MN4093B/S are quad 2-input NANDs with inputs which have the schmitt trigger function.
They are used for applications such as line drivers, reforming signals, multi-vibrators and so on because the two thresholds (V_{IH}, V_{IL}) are different for the rising and the falling edges of the input signal.
They have same pin outputs and may be replaced by the MN4011B.
The MN4093B/S are equivalent to MOTOROLA MC14093B and RCA CD4093B.

P-1



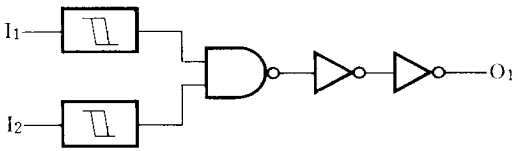
14-Pin • Plastic DIL Package

P-2

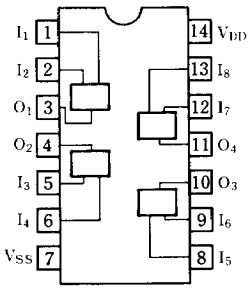


14-Pin • Panaflat Package (SO-14D)

■ Schematic Diagram (1/4)



Pin Configuration



■ Maximum Ratings (Ta=25℃)

Item		Symbol	Ratings	Unit
Supply Voltage		V_{DD}	−0.5～+18	V
Input Voltage		V_I	−0.5～V_{DD}+0.5*	V
Output Voltage		V_O	−0.5～V_{DD}+0.5*	V
Peak Input · Output Current		$\pm I_I$	max. 10	mA
Power Dissipation (per package)	Ta=−40～+60℃	P_D	max. 400	mW
	Ta=+60～+85℃		Decrease up to 200mW rating at 8mW/°C	
Power Dissipation (per output terminal)		P_D	max. 100	mW
Operating Ambient Temperature		Topr	−40～+85	℃
Storage Temperature		Tstg	−65～+150	℃

* V_{DD} + 0.5V should be under 18V

■ DC Characteristics ($V_{SS}=0V$)

Item	V_{DD} V	Symbol	Conditions	Ta=−40℃ min.	Ta=−40℃ max.	Ta=25℃ min.	Ta=25℃ max.	Ta=85℃ min.	Ta=85℃ max.	Unit
Quiescent Power 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} $\lvert I_O\rvert<1\mu A$	—	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} $\lvert I_O\rvert<1\mu A$	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}	$\lvert I_O\rvert<1\mu A$, $V_O=0.5V$ or $4.5V$	—	1.5	—	1.5	—	1.5	V
	10		$\lvert I_O\rvert<1\mu A$, $V_O=1V$ or $9V$	—	3	—	3	—	3	
	15		$\lvert I_O\rvert<1\mu A$, $V_O=1.5V$ or $13.5V$	—	4	—	4	—	4	
Input Voltage High Level	5	V_{IH}	$\lvert I_O\rvert<1\mu A$, $V_O=0.5V$ or $4.5V$	3.5	—	3.5	—	3.5	—	V
	10		$\lvert I_O\rvert<1\mu A$, $V_O=1V$ or $9V$	7	—	7	—	7	—	
	15		$\lvert I_O\rvert<1\mu A$, $V_O=1.5V$ 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 ($Ta=25℃$, $V_{SS}=0V$, $C_L=50pF$)

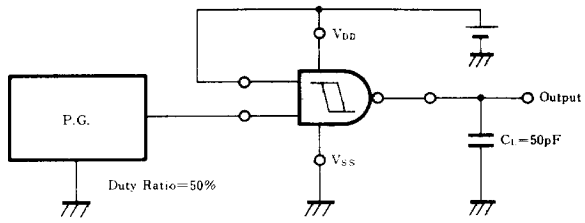
Item	V_{DD} (V)	Symbol	min.	typ.	max.	Unit
Output Rise Time (Fig. 1)	5	t_{TLH}	—	60	180	ns
	10		—	30	90	
	15		—	20	60	
Output Fall Time (Fig. 1)	5	t_{THL}	—	60	180	ns
	10		—	30	90	
	15		—	20	60	
Propagation Delay Time (Fig. 1)	5	t_{PLH}	—	85	255	ns
	10		—	40	120	
	15		—	30	90	
Propagation Delay Time (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** ($Ta = 25℃$, $V_{SS} = 0V$, $C_L = 50pF$) (continued)

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 Test Circuit and Waveforms

1. Test Circuit



2. Waveforms

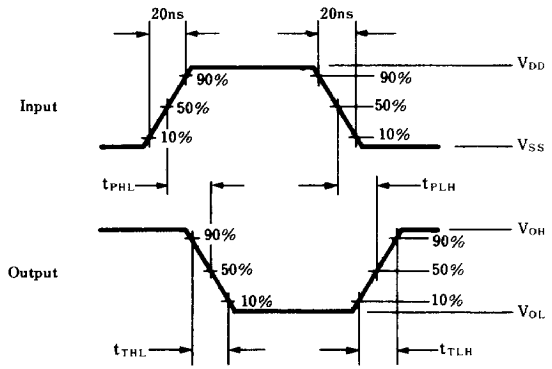
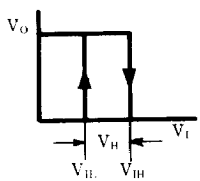
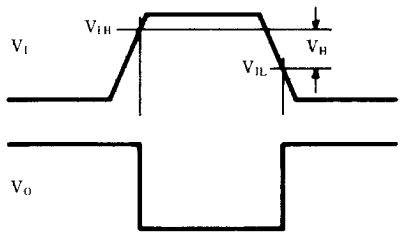


Fig. 2 Transfer Characteristics



Transfer Characteristics



The upper waveform shows its definition rating 30%, to 70% limit