

# Quad 2-input NAND Schmitt trigger

## BU4093B/BU4093BF/BU4093BFV

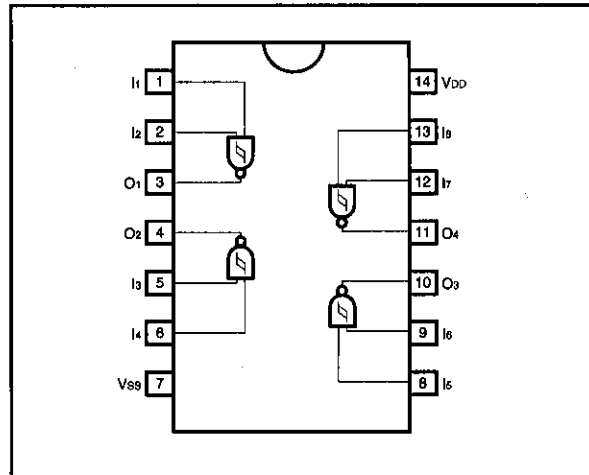
The BU4093B, BU4093BF, and BU4093BFV are 4-circuit, 2-input NAND gates whose input pins all have a Schmitt trigger function.

As the circuit threshold voltages are different when the input waveform rises and when it falls ( $V_{IH}$ ,  $V_{IL}$ ), they can be used for line receivers, waveform rectification, multivibrators, and other purposes in addition to the customary usage as a NAND gate. They may be used in place of the BU4011B which uses the same pin connection.

### ●Features

- 1) Low power consumption.
- 2) Wide range of operating supply voltages.
- 3) High input impedance.
- 4) High fan-out.
- 5) Direct drive of 2 L-TTL inputs and 1 LS-TTL input.

### ●Block diagram



### ●Truth table

INPUT		OUTPUT
A	B	
L	L	H
L	H	H
H	L	H
H	H	L

## ● Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V <sub>DD</sub>	-0.3~18	V
Power dissipation	P <sub>d</sub>	1000 (DIP) , 450 (SOP) , 350 (SSOP)	mW
Operating temperature	T <sub>opr</sub>	-40~85	°C
Storage temperature	T <sub>stg</sub>	-55~150	°C
Input voltage	V <sub>IN</sub>	-0.3~V <sub>DD</sub> +0.3	V

## ● Electrical characteristics

DC characteristics (unless otherwise noted, Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	V <sub>DD</sub> (V)	Conditions	Measurement Circuit
"H" input voltage	V <sub>IH</sub>	3.5	—	—	V	5	—	Fig.1
		7.0	—	—		10		
		11.0	—	—		15		
"L" input voltage	V <sub>IL</sub>	—	—	1.5	V	5	—	Fig.1
		—	—	3.0		10		
		—	—	4.0		15		
"H" input current	I <sub>IH</sub>	—	—	0.3	μA	15	V <sub>IH</sub> =15V	Fig.1
"L" input current	I <sub>IL</sub>	—	—	-0.3	μA	15	V <sub>IL</sub> =0V	Fig.1
"H" output voltage	V <sub>OH</sub>	4.95	—	—	V	5	I <sub>O</sub> =0mA	Fig.1
		9.95	—	—		10		
		14.95	—	—		15		
"L" output voltage	V <sub>OL</sub>	—	—	0.05	V	5	I <sub>O</sub> =0mA	Fig.1
		—	—	0.05		10		
		—	—	0.05		15		
"H" output current	I <sub>OH</sub>	-0.16	—	—	mA	5	V <sub>OH</sub> =4.6V	Fig.1
		-0.4	—	—		10	V <sub>OH</sub> =9.5V	
		-1.2	—	—		15	V <sub>OH</sub> =13.5V	
"L" output current	I <sub>OL</sub>	0.44	—	—	mA	5	V <sub>OL</sub> =0.4V	Fig.1
		1.1	—	—		10	V <sub>OL</sub> =0.5V	
		3.0	—	—		15	V <sub>OL</sub> =1.5V	
Quiescent supply current	I <sub>DD</sub>	—	—	1	μA	5	V <sub>I</sub> =V <sub>DD</sub> or GND	Fig.1
		—	—	2		10		
		—	—	4		15		
Hysteresis voltage	V <sub>H</sub>	0.17	—	0.39	V	5	—	Fig.3
		0.25	—	0.60		10		
		0.33	—	0.90		15		

CMOS logic BU4000B series

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●Electrical characteristics

Switching characteristics (unless otherwise noted,  $T_a=25^\circ\text{C}$ ,  $C_L=50\text{pF}$ )

Parameter	Symbol	Min.	Typ.	Max.	Unit.	V <sub>DD</sub> (V)	Conditions	Measurement Circuit
						5		
Output rise time	t <sub>TLH</sub>	—	100	—	ns	5	—	Fig.2
		—	50	—		10		
		—	40	—		15		
Output fall time	t <sub>THL</sub>	—	100	—	ns	5	—	Fig.2
		—	50	—		10		
		—	40	—		15		
Propagation delay time, "L" to "H"	t <sub>PLH</sub>	—	125	—	ns	5	—	Fig.2
		—	50	—		10		
		—	40	—		15		
Propagation delay time, "H" to "L"	t <sub>PHL</sub>	—	125	—	ns	5	—	Fig.2
		—	50	—		10		
		—	40	—		15		
Input capacitance	C <sub>IN</sub>	—	5	—	pF	—	—	—

●Measurement circuits

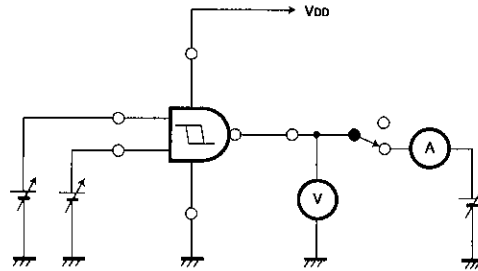


Fig. 1 DC characteristics measurement circuit

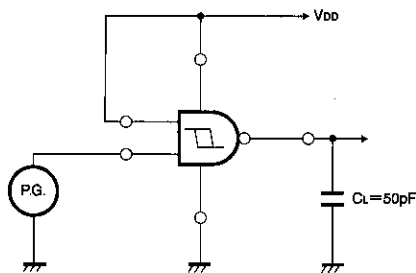


Fig. 2 Switching characteristic measurement circuit

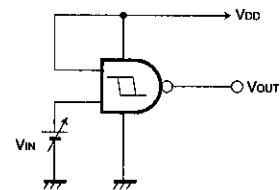
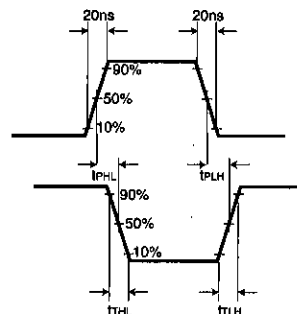


Fig. 3 Hysteresis voltage measurement circuit

● Electrical characteristic curve

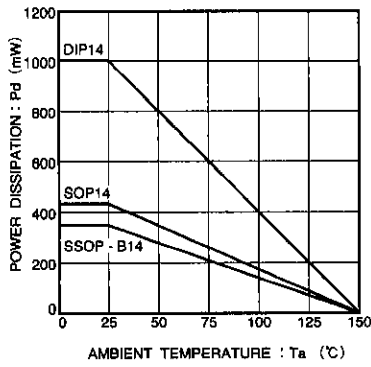
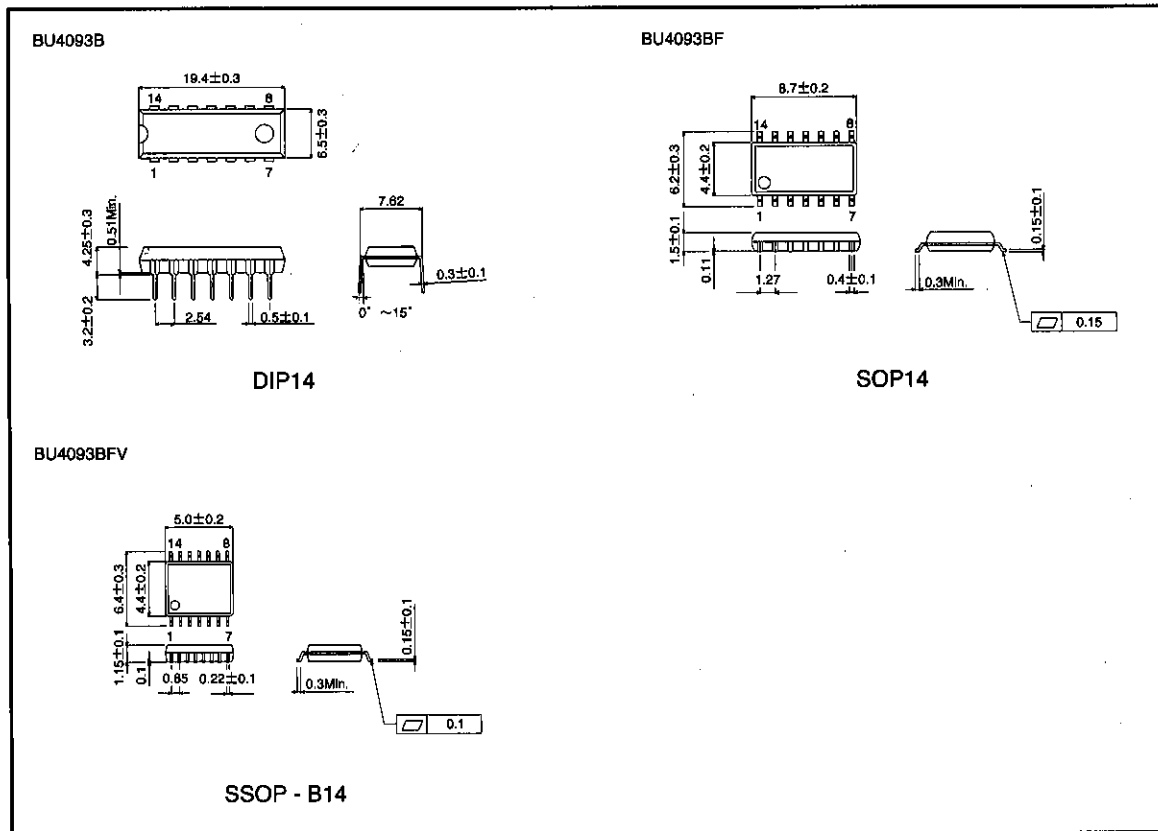


Fig. 4 Power dissipation - Ta characteristic

● External dimensions (Units: mm)



BU4000B series

CMOS logic

# Series Standard

## BU4000B

The BU4000 Series are CMOS ICs featuring low voltage and low power consumption. The wide range of operating power supply voltages is compatible with the general-purpose 4000B Series, and when a 5V power supply voltage is used, the LS-TTL IC can be driven directly.

These ICs are available in SOP and SSOP packages as well as the standard DIP package.

●Features

- 1) Low power consumption.
- 2) Wide range of operating power supply voltages.
- 3) High input impedance.
- 4) High fan-out.
- 5) Direct drive of 2 L-TTL inputs and 1 LS-TTL input.

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V <sub>DD</sub>	18 *1	V
Input voltage	V <sub>IN</sub>	-0.3~V <sub>DD</sub> +0.3	V
Power dissipation *2	P <sub>d</sub>	Please refer to specifications for individual package	mW
Storage temperature	T <sub>stg</sub>	-55~150	°C

\*1 For the BU4XXXBC type, V<sub>DD</sub> = 20 V.

\*2 The values for the SOP and SSOP packages are the values when mounted on a glass epoxy PCB (50 mm x 50 mm x 1.6 mm).

●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V <sub>DD</sub>	3~16 *	V
Input voltage	V <sub>IN</sub>	0~V <sub>DD</sub>	V
Operating temperature	T <sub>opr</sub>	-40~85	°C

\* For the BU4XXXBC type, V<sub>DD</sub> = 3 to 18 V.

●Electrical characteristic curves

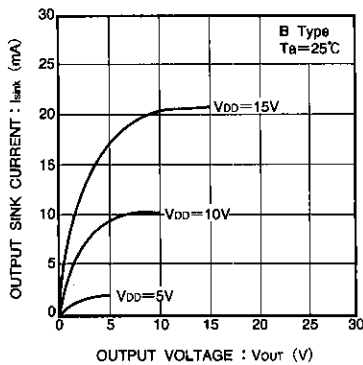


Fig.1 Output sink current - output voltage characteristic

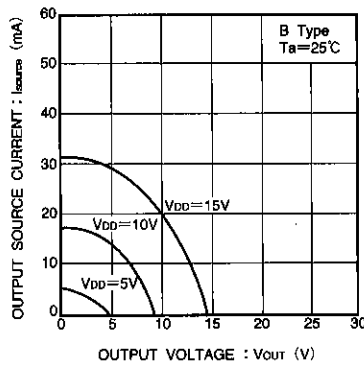


Fig.2 Output source current - output voltage characteristic

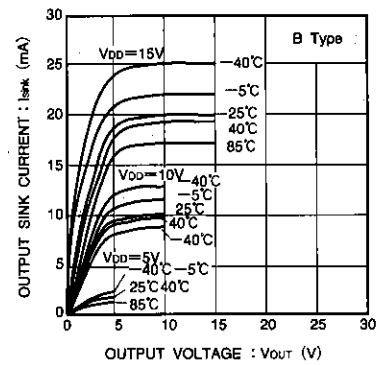


Fig.3 Output SINK current - output voltage characteristic

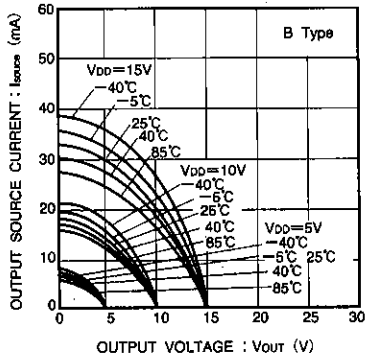


Fig.4 Output source current - output voltage characteristic

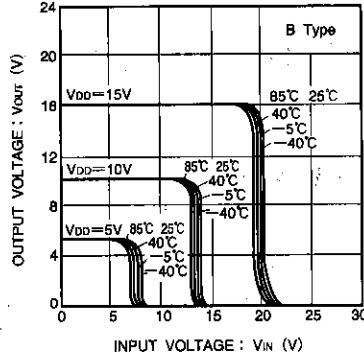


Fig.5 Output voltage - input voltage characteristic

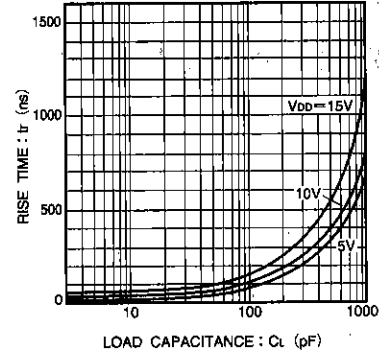


Fig.6 Rise time - load capacitance characteristic

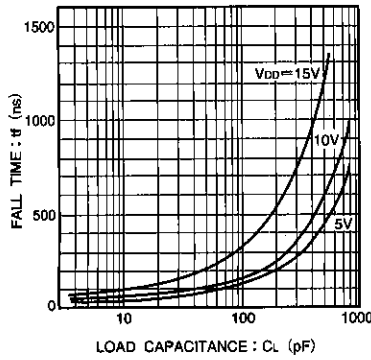


Fig.7 Fall time - load capacitance characteristic

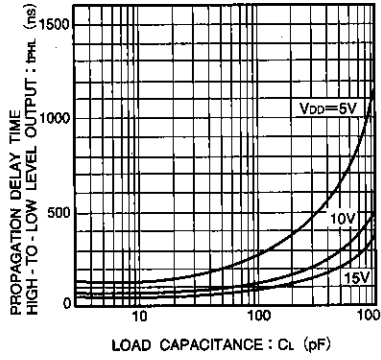


Fig.8 "H" to "L" propagation delay time - load capacitance characteristic

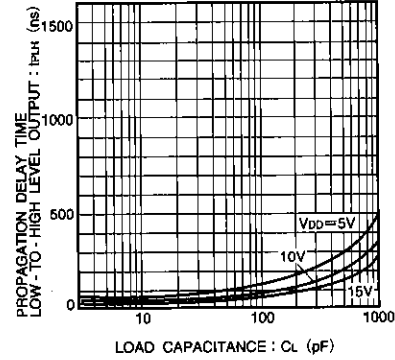


Fig.9 "L" to "H" propagation delay time - load capacitance characteristic

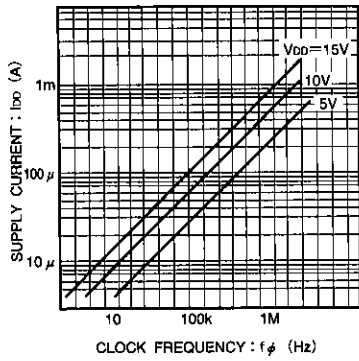


Fig.10 Supply current - clock frequency characteristic

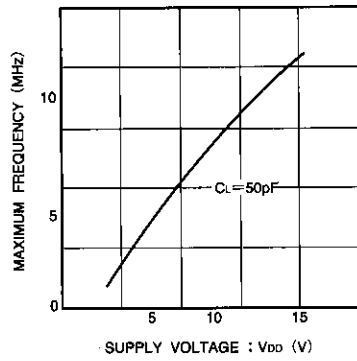


Fig.11 Maximum clock frequency - power supply voltage characteristic

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