

# Dual 4-bit static shift register

## BU4015B/BU4015BF

The BU4015B and BU4015BF are 4-stage static shift registers, each consisting of two circuits.

The D flip-flops for each stage share a common reset input, enabling external asynchronous reset at any point.

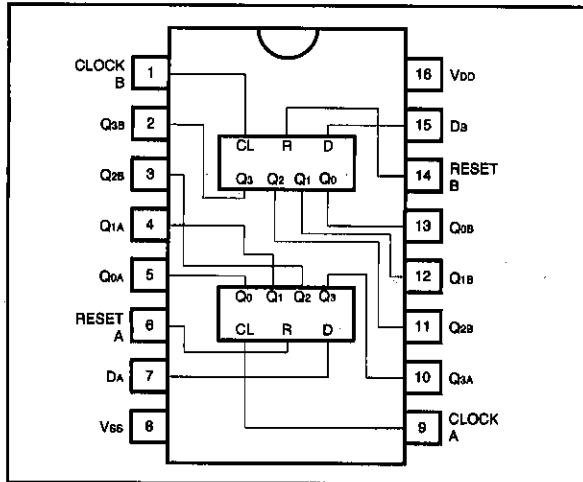
Also, the flip-flops at each stage are triggered by the rising edge of the clock input.

"H" level reset input resets the contents of all stages to "L", regardless of the clock and data input, and sets data outputs Q0 to Q3 to "L".

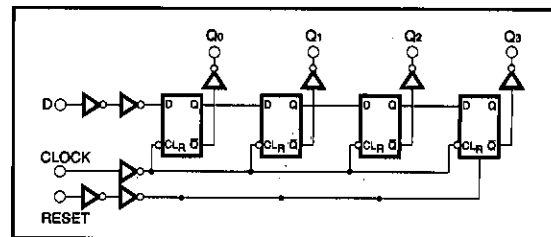
●Features

- 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.

●Block diagram



●Logic diagram



●Truth table

CLOCK	D	RESET	Q <sub>0</sub>	Q <sub>1</sub>	Q <sub>2</sub>	Q <sub>3</sub>
	L	L	L	Q <sub>0</sub>	Q <sub>1</sub>	Q <sub>2</sub>
	H	L	H	Q <sub>0</sub>	Q <sub>1</sub>	Q <sub>2</sub>
	X	L	No Change			
X	X	H	L	L	L	L

X: Don't Care

## ● 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), 500 (SOP)	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, V<sub>SS</sub>=0V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	
						V <sub>DD</sub> (V)	
"H" input voltage	V <sub>IH</sub>	3.5	—	—	V	5	—
		7.0	—	—		10	
		11.0	—	—		15	
"L" input voltage	V <sub>IL</sub>	—	—	1.5	V	5	—
		—	—	3.0		10	
		—	—	4.0		15	
"H" input current	I <sub>IH</sub>	—	—	0.3	μA	15	V <sub>IH</sub> =15V
"L" input current	I <sub>IL</sub>	—	—	-0.3	μA	15	V <sub>IL</sub> =0V
"H" output voltage	V <sub>OH</sub>	4.95	—	—	V	5	I <sub>O</sub> =0mA
		9.95	—	—		10	
		14.95	—	—		15	
"L" output voltage	V <sub>OL</sub>	—	—	0.05	V	5	I <sub>O</sub> =0mA
		—	—	0.05		10	
		—	—	0.05		15	
"H" output current	I <sub>OH</sub>	-0.16	—	—	mA	5	V <sub>OH</sub> =4.6V
		-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
		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>	—	—	20	μA	5	V <sub>I</sub> =V <sub>DD</sub> or GND
		—	—	40		10	
		—	—	80		15	

BU4000B series

CMOS logic

## ●Electrical characteristics

Switching characteristics (unless otherwise noted,  $T_a=25^\circ\text{C}$ ,  $V_{SS}=0\text{V}$ )

Parameter	Symbol	Min.	Typ.	Max.	Unit	V <sub>DD</sub> (V)	Conditions	Measurement Circuit
Output rise time	t <sub>RLH</sub>	—	180	—	ns	5	—	Fig.1, 2
		—	90	—		10		
		—	65	—		15		
Output fall time	t <sub>FHL</sub>	—	100	—	ns	5	—	Fig.1, 2
		—	50	—		10		
		—	40	—		15		
Propagation delay time, CLOCK, D→Q	t <sub>PLH</sub> t <sub>PHL</sub>	—	310	—	ns	5	—	Fig.1, 2
		—	125	—		10		
		—	90	—		15		
Propagation delay time, RESET to Q	t <sub>PLH</sub> t <sub>PHL</sub>	—	480	—	ns	5	—	Fig.1, 2
		—	180	—		10		
		—	120	—		15		
Setup time	t <sub>su</sub>	—	100	—	ns	5	—	Fig.1, 2
		—	50	—		10		
		—	40	—		15		
Minimum clock pulse width	t <sub>WH</sub> (CLK)	—	185	—	ns	5	—	Fig.1, 2
		—	85	—		10		
		—	55	—		15		
Minimum reset pulse width	t <sub>WH</sub> (R)	—	200	—	ns	5	—	Fig.1, 2
		—	80	—		10		
		—	60	—		15		
Maximum clock frequency	f (CLK) Max.	—	20	—	MHz	5	—	Fig.1, 2
		—	6.0	—		10		
		—	7.5	—		15		
Maximum clock rise time and fall time	t <sub>r</sub> (CLK) t <sub>f</sub> (CLK)	—	100	—	μs	5	—	Fig.1, 2
		—	40	—		10		
		—	15	—		15		
Input capacitance	C <sub>IN</sub>	—	5	—	pF	—	—	—

● Measurement circuits

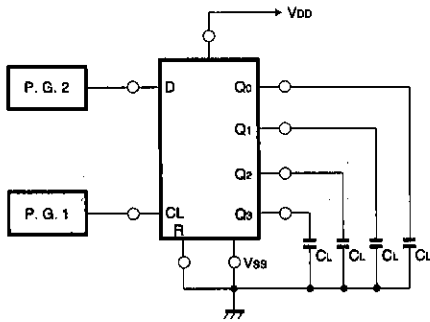


Fig.1 Switching characteristics measurement circuit

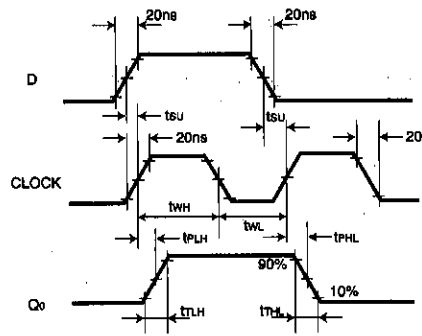


Fig.2 Switching time measurement waveform

● Electrical characteristic curve

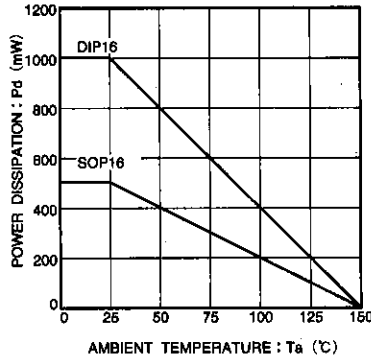
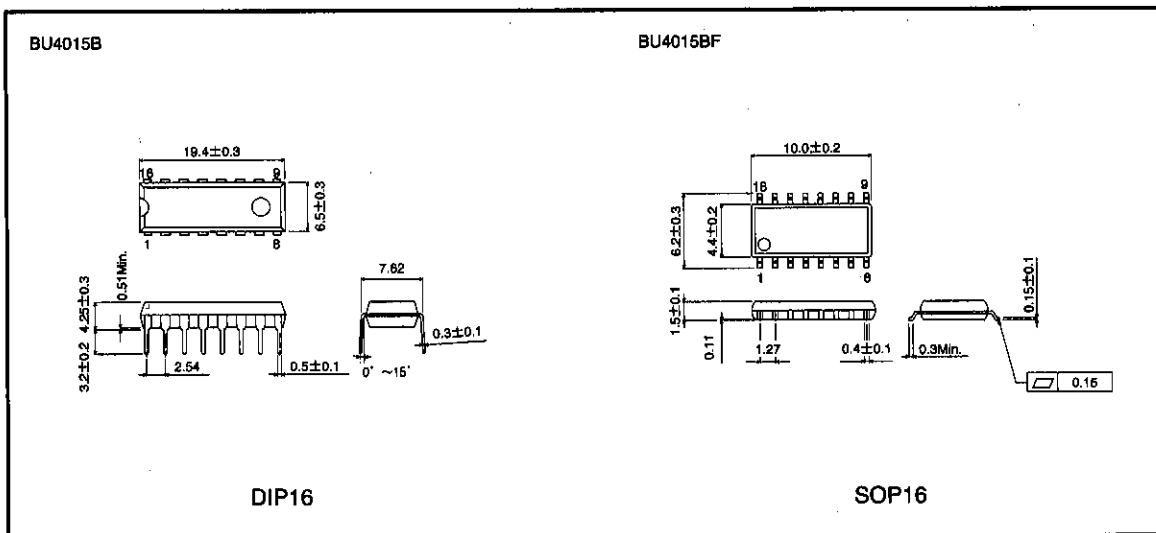


Fig.3 Power dissipation - ambient temperature characteristic

● External dimensions (Units: mm)



# 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	Pd	Please refer to specifications for individual package	mW
Storage temperature	Tstg	-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	Topr	-40~85	°C

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

●Electrical characteristic curves

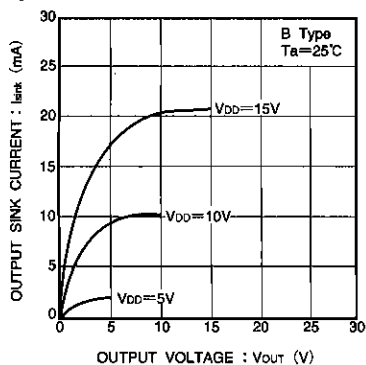


Fig.1 Output sink current - output voltage characteristic

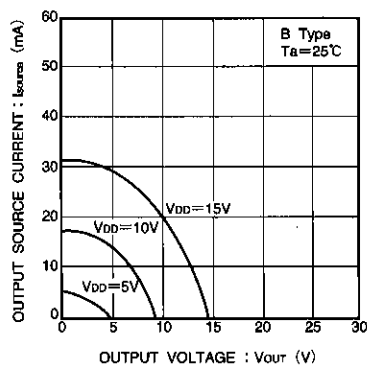


Fig.2 Output source current - output voltage characteristic

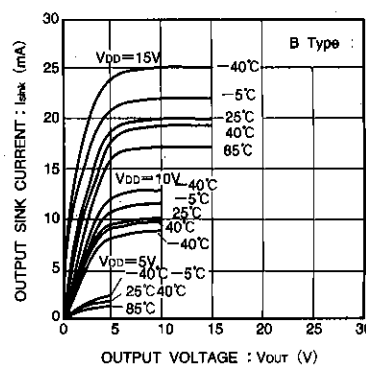


Fig.3 Output SINK current - output voltage characteristic

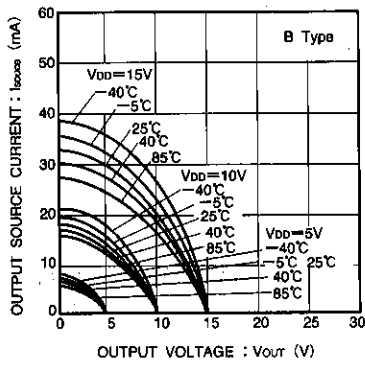


Fig.4 Output source current - output voltage characteristic

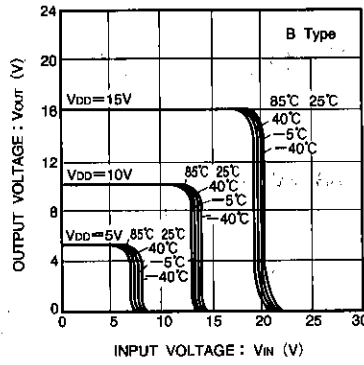


Fig.5 Output voltage - input voltage characteristic

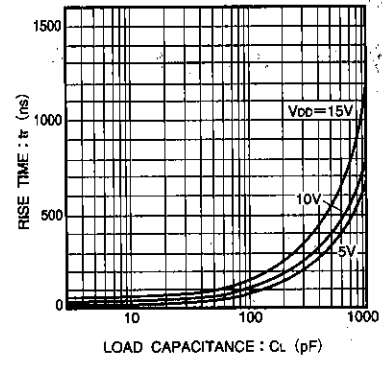


Fig.6 Rise time - load capacitance characteristic

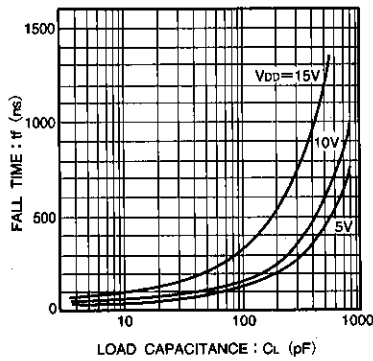


Fig.7 Fall time - load capacitance characteristic

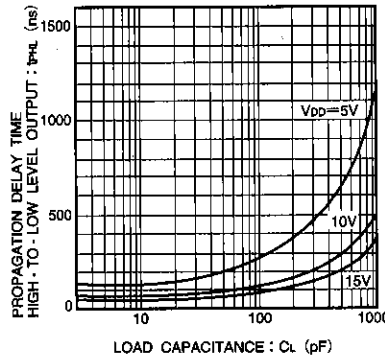


Fig.8 "H" to "L" propagation delay time - load capacitance characteristic

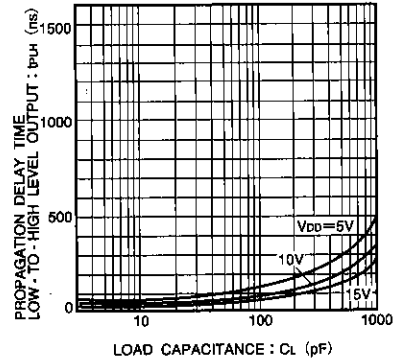


Fig.9 "L" to "H" propagation delay time - load capacitance characteristic

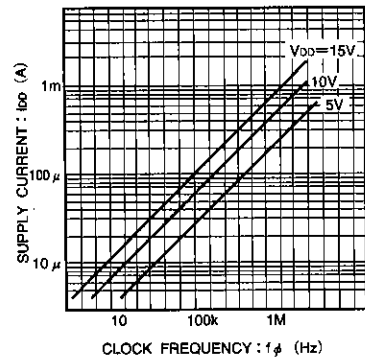


Fig.10 Supply current - clock frequency characteristic

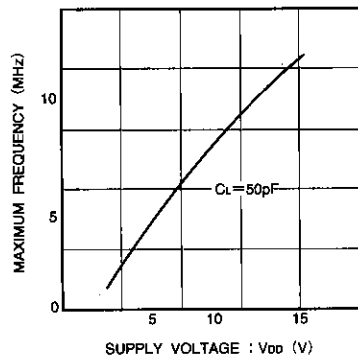


Fig.11 Maximum clock frequency - power supply voltage characteristic

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