



# CD4043BM/CD4043BC Quad TRI-STATE® NOR R/S Latches

# CD4044BM/CD4044BC Quad TRI-STATE NAND R/S Latches

## General Description

CD4043BM/CD4043BC are quad cross-couple TRI-STATE CMOS NOR latches, and CD4044BM/CD4044BC are quad cross-couple TRI-STATE CMOS NAND latches. Each latch has a separate Q output and individual SET and RESET inputs. There is a common TRI-STATE ENABLE input for all four latches. A logic "1" on the ENABLE input connects the latch states to the Q outputs. A logic "0" on the ENABLE input disconnects the latch states from the Q outputs resulting in an open circuit condition on the Q output. The TRI-STATE feature allows common bussing of the outputs.

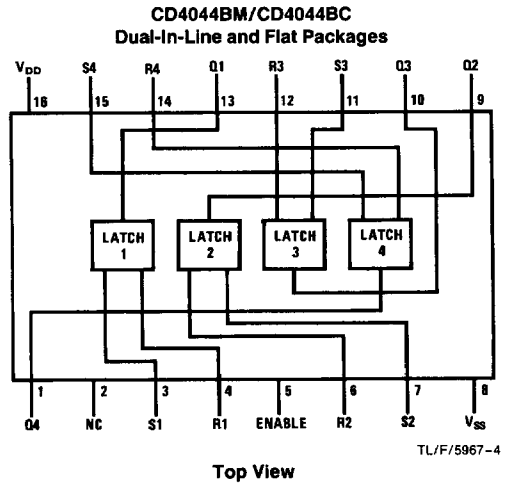
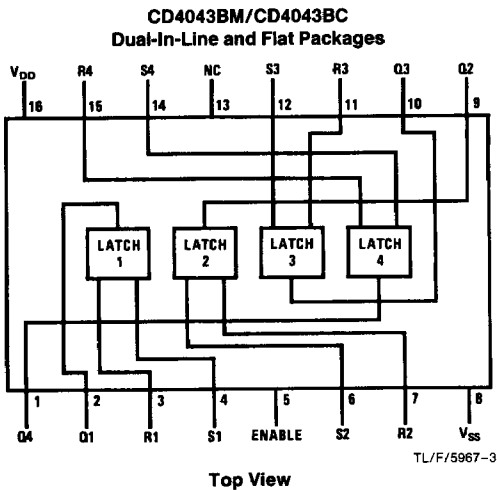
## Features

- Wide supply voltage range 3V to 15V
- Low power 100 nW (typ.)
- High noise immunity 0.45 V<sub>DD</sub> (typ.)
- Separate SET and RESET inputs for each latch
- NOR and NAND configuration
- TRI-STATE output with common output enable

## Applications

- Multiple bus storage
- Strobed register
- Four bits of independent storage with output enable
- General digital logic

## Connection Diagrams



## Truth Table

CD4043BM/CD4043BC			
S	R	E	Q
X	X	0	OC
0	0	1	NC
1	0	1	1
0	1	1	0
1	1	1	Δ

CD4044BM/CD4044BC			
S	R	E	Q
X	X	0	OC
1	1	1	NC
0	1	1	1
1	0	1	0
0	0	1	ΔΔ

## Order Number CD4043B\* or CD4044B\*

\*Please look into Section 8, Appendix D for availability of various package types.

- OC — TRI-STATE
- NC — No change
- X — Don't care
- Δ — Dominated by S = 1 input
- ΔΔ — Dominated by R = 0 input

### Absolute Maximum Ratings (Notes 1 and 2)

If Military/Aerospace specified devices are required, contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage (V <sub>DD</sub> )	-0.5V to +18V
Input Voltage (V <sub>IN</sub> )	-0.5V to V <sub>DD</sub> + 0.5V
Storage Temperature Range (T <sub>S</sub> )	-65°C to +150°C
Power Dissipation (P <sub>D</sub> )	
Dual-In-Line	700 mW
Small Outline	500 mW
Lead Temperature (T <sub>L</sub> )	
(Soldering, 10 seconds)	260°C

### Recommended Operating Conditions (Note 2)

Supply Voltage (V <sub>DD</sub> )	3.0V to 15V
Input Voltage (V <sub>IN</sub> )	0 to V <sub>DD</sub> V
Operating Temperature Range (T <sub>A</sub> )	
CD4043BM, CD4044BM	-55°C to +125°C
CD4043BC, CD4044BC	-40°C to +85°C

### DC Electrical Characteristics CD4043BM/CD4044BM (Note 2)

Symbol	Parameter	Conditions	-55°C		+25°C			+125°C		Units
			Min	Max	Min	Typ	Max	Min	Max	
I <sub>DD</sub>	Quiescent Device Current	V <sub>DD</sub> = 5V, V <sub>IN</sub> = V <sub>DD</sub> or V <sub>SS</sub> V <sub>DD</sub> = 10V, V <sub>IN</sub> = V <sub>DD</sub> or V <sub>SS</sub> V <sub>DD</sub> = 15V, V <sub>IN</sub> = V <sub>DD</sub> or V <sub>SS</sub>		5.0 10 20		0.01 0.01 0.02	5.0 10 20		150 300 600	μA μA μA
V <sub>OL</sub>	Low Level Output Voltage	I <sub>O</sub>   ≤ 1 μA, V <sub>IL</sub> = 0V, V <sub>IH</sub> = V <sub>DD</sub> V <sub>DD</sub> = 5.0V V <sub>DD</sub> = 10V V <sub>DD</sub> = 15V		0.05 0.05 0.05		0 0 0	0.05 0.05 0.05		0.05 0.05 0.05	V V V
V <sub>OH</sub>	High Level Output Voltage	I <sub>O</sub>   ≤ 1 μA, V <sub>IL</sub> = 0V, V <sub>IH</sub> = V <sub>DD</sub> V <sub>DD</sub> = 5.0V V <sub>DD</sub> = 10V V <sub>DD</sub> = 15V	4.95 9.95 14.95		4.95 9.95 14.95	5.0 10 15		4.95 9.95 14.95		V V V
V <sub>IL</sub>	Low Level Input Voltage	I <sub>O</sub>   ≤ 1 μA V <sub>DD</sub> = 5.0V, V <sub>O</sub> = 0.5V or 4.5V V <sub>DD</sub> = 10V, V <sub>O</sub> = 1.0V or 9.0V V <sub>DD</sub> = 15V, V <sub>O</sub> = 1.5V or 13.5V		1.5 3.0 4.0		2.25 4.5 6.75	1.5 3.0 4.0		1.5 3.0 4.0	V V V
V <sub>IH</sub>	High Level Input Voltage	I <sub>O</sub>   ≤ 1 μA V <sub>DD</sub> = 5.0V, V <sub>O</sub> = 0.5V or 4.5V V <sub>DD</sub> = 5.0V, V <sub>O</sub> = 1.0V or 9.0V V <sub>DD</sub> = 15V, V <sub>O</sub> = 1.5V or 13.5V	3.5 7.0 11		3.5 7.0 11	2.75 5.5 8.25		3.5 7.0 11		V V V
I <sub>OL</sub>	Low Level Output Current	V <sub>IL</sub> = 0V, V <sub>IH</sub> = V <sub>DD</sub> V <sub>DD</sub> = 5.0V, V <sub>O</sub> = 0.4V V <sub>DD</sub> = 10V, V <sub>O</sub> = 0.5V V <sub>DD</sub> = 15V, V <sub>O</sub> = 1.5V	0.64 1.6 4.2		0.51 1.3 3.4	1.0 2.6 6.8		0.36 0.9 2.4		mA mA mA
I <sub>OH</sub>	High Level Output Current	V <sub>IL</sub> = 0V, V <sub>IH</sub> = V <sub>DD</sub> V <sub>DD</sub> = 5.0V, V <sub>O</sub> = 4.6V V <sub>DD</sub> = 10V, V <sub>O</sub> = 9.5V V <sub>DD</sub> = 15V, V <sub>O</sub> = 13.5V	-0.64 -1.6 -4.2		-0.51 -1.3 -3.4	-0.4 -1.0 -3.0		-0.36 -0.9 -2.4		mA mA mA
I <sub>IN</sub>	Input Current	V <sub>DD</sub> = 15V, V <sub>IN</sub> = 0V V <sub>DD</sub> = 15V, V <sub>IN</sub> = 15V		-0.1 0.1		-10 <sup>-5</sup> 10 <sup>-5</sup>	-0.1 0.1		-1.0 1.0	μA μA

### DC Electrical Characteristics CD4043BC/CD4044BC (Note 2)

Symbol	Parameter	Conditions	-40°C		+25°C			+85°C		Units
			Min	Max	Min	Typ	Max	Min	Max	
I <sub>DD</sub>	Quiescent Device Current	V <sub>DD</sub> = 5V, V <sub>IN</sub> = V <sub>DD</sub> or V <sub>SS</sub> V <sub>DD</sub> = 10V, V <sub>IN</sub> = V <sub>DD</sub> or V <sub>SS</sub> V <sub>DD</sub> = 15V, V <sub>IN</sub> = V <sub>DD</sub> or V <sub>SS</sub>		20 40 80		0.01 0.01 0.02	20 40 80		150 300 600	μA μA μA
V <sub>OL</sub>	Low Level Output Voltage	I <sub>O</sub>   ≤ 1 μA, V <sub>IL</sub> = 0V, V <sub>IH</sub> = V <sub>DD</sub> V <sub>DD</sub> = 5.0V V <sub>DD</sub> = 10V V <sub>DD</sub> = 15V		0.05 0.05 0.05		0 0 0	0.05 0.05 0.05		0.05 0.05 0.05	V V V
V <sub>OH</sub>	High Level Output Voltage	I <sub>O</sub>   ≤ 1 μA, V <sub>IL</sub> = 0V, V <sub>IH</sub> = V <sub>DD</sub> V <sub>DD</sub> = 5.0V V <sub>DD</sub> = 10V V <sub>DD</sub> = 15V	4.95 9.95 14.95		4.95 9.95 14.95	5.0 10 15		4.95 9.95 14.95		V V V

## DC Electrical Characteristics CD4043BC/CD4044BC (Continued)

Symbol	Parameter	Conditions	-40°C		+25°C			+85°C		Units
			Min	Max	Min	Typ	Max	Min	Max	
V <sub>IL</sub>	Low Level Input Voltage	I <sub>O</sub>   ≤ 1 μA V <sub>DD</sub> = 5.0V, V <sub>O</sub> = 0.5V or 4.5V V <sub>DD</sub> = 10V, V <sub>O</sub> = 1.0V or 9.0V V <sub>DD</sub> = 15V, V <sub>O</sub> = 1.5V or 13.5V		1.5		2.25	1.5		1.5	V
				3.0		4.5	3.0		3.0	V
				4.0		6.75	4.0		4.0	V
V <sub>IH</sub>	High Level Input Voltage	I <sub>O</sub>   ≤ 1 μA V <sub>DD</sub> = 5.0V, V <sub>O</sub> = 0.5V or 4.5V V <sub>DD</sub> = 5.0V, V <sub>O</sub> = 1.0V or 9.0V V <sub>DD</sub> = 15V, V <sub>O</sub> = 1.5V or 13.5V	3.5		3.5			3.5		V
			7.0		7.0			7.0		V
			11		11			11		V
I <sub>OL</sub>	Low Level Output Current (Note 3)	V <sub>IL</sub> = 0V, V <sub>IH</sub> = V <sub>DD</sub> V <sub>DD</sub> = 5.0V, V <sub>O</sub> = 0.4V V <sub>DD</sub> = 10V, V <sub>O</sub> = 0.5V V <sub>DD</sub> = 15V, V <sub>O</sub> = 1.5V	0.52		0.44	0.88		0.36		mA
			1.3		1.1	2.2		0.9		mA
			3.6		3.0	6.0		2.4		mA
I <sub>OH</sub>	High Level Output Current (Note 3)	V <sub>IL</sub> = 0V, V <sub>IH</sub> = V <sub>DD</sub> V <sub>DD</sub> = 5.0V, V <sub>O</sub> = 4.6V V <sub>DD</sub> = 10V, V <sub>O</sub> = 9.5V V <sub>DD</sub> = 15V, V <sub>O</sub> = 13.5V	-0.52		-0.44	-0.32		-0.36		mA
			-1.3		-1.1	-0.8		-0.9		mA
			-3.6		-3.0	-2.4		-2.4		mA
I <sub>IN</sub>	Input Current	V <sub>DD</sub> = 15V, V <sub>IN</sub> = 0V V <sub>DD</sub> = 15V, V <sub>IN</sub> = 15V	-0.3			-0.3			-1.0	μA
			0.3			0.3			1.0	μA

## AC Electrical Characteristics\*

T<sub>A</sub> = 25°C, C<sub>L</sub> = 50 pF, R<sub>L</sub> = 200k, input t<sub>r</sub> = t<sub>f</sub> = 20 ns, unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay S or R to Q	V <sub>DD</sub> = 5.0V		175	350	ns
		V <sub>DD</sub> = 10V		75	175	ns
		V <sub>DD</sub> = 15V		60	120	ns
t <sub>PZH</sub> , t <sub>PHZ</sub>	Propagation Delay Enable to Q (High)	V <sub>DD</sub> = 5.0V		115	230	ns
		V <sub>DD</sub> = 10V		55	110	ns
		V <sub>DD</sub> = 15V		40	80	ns
t <sub>PZL</sub> , t <sub>PLZ</sub>	Propagation Delay Enable to Q (Low)	V <sub>DD</sub> = 5.0V		100	200	ns
		V <sub>DD</sub> = 10V		50	100	ns
		V <sub>DD</sub> = 15V		40	80	ns
t <sub>THL</sub> , t <sub>TLH</sub>	Transition Time	V <sub>DD</sub> = 5.0V		100	200	ns
		V <sub>DD</sub> = 10V		50	100	ns
		V <sub>DD</sub> = 15V		40	80	ns
t <sub>WO</sub>	Minimum SET or RESET Pulse Width	V <sub>DD</sub> = 5.0V		80	160	ns
		V <sub>DD</sub> = 10V		40	80	ns
		V <sub>DD</sub> = 15V		20	40	ns
C <sub>IN</sub>	Input Capacitance			5.0	7.5	pF

\*AC Parameters are guaranteed by DC correlated testing.

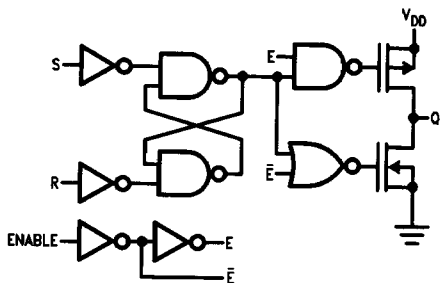
**Note 1:** "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed; they are not meant to imply that the devices should be operated at these limits. The tables of "Recommended Operating Conditions" and "Electrical Characteristics" provide conditions for actual device operation.

**Note 2:** V<sub>SS</sub> = 0V unless otherwise specified.

**Note 3:** I<sub>OH</sub> and I<sub>OL</sub> are tested one output at a time.

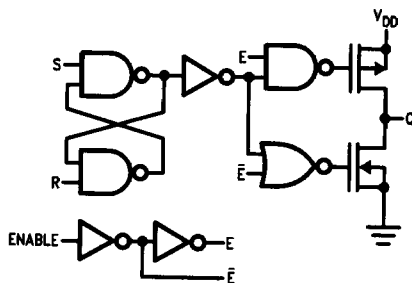
### Schematic Diagrams

CD4043BM/CD4043BC



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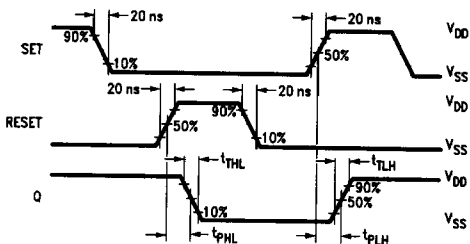
CD4044BM/CD4044BC



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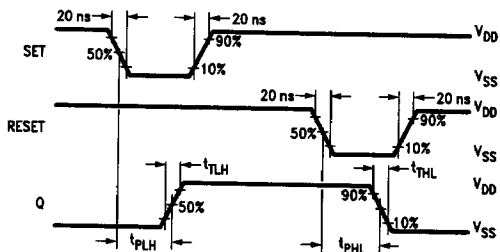
### Timing Waveforms

CD4043B



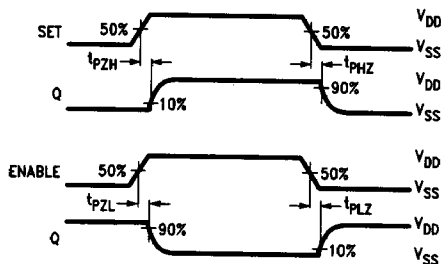
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CD4044B



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### Enable Timing



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