National Semiconductor

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.

TRI-STATE is a trademark of National Semiconductor Corp.

Features

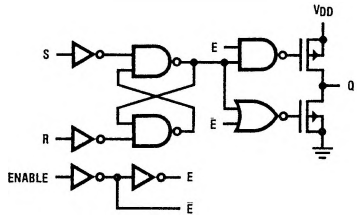
- Wide supply voltage range 3 V to 15 V
- Low power 100 nW (typ.)
- High noise immunity 0.45 V_{DD} (typ.)
- Separate SET and RESET inputs for each latch
- NOR and NAND configuration
- TRI-STATE output with common output enable

Applications

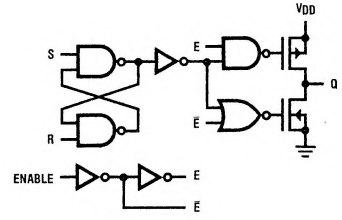
- Multiple bus storage
- Stobed register
- Four bits of independent storage with output enable
- General digital logic

Schematic and Connection Diagrams

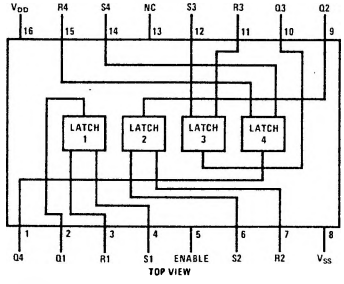
CD4043M/CD4043C



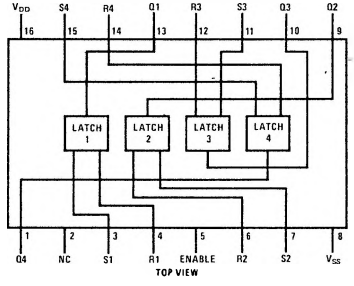
CD4044M/CD4044C



CD4043BM/CD4043BC
Dual-In-Line and Flat Packages



CD4044BM/CD4044BC
Dual-In-Line and Flat Packages



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

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)

V_{DD} Supply Voltage	−0.5 to +18 V
V_{IN} Input Voltage	−0.5 to V_{DD} + 0.5 V
T_S Storage Temperature Range	−65°C to +150°C
P_D Package Dissipation	500 mW
T_L Lead Temperature (Soldering, 10 seconds)	300°C

Recommended Operating Conditions
(Note 2)

V_{DD} Supply Voltage	3.0 to 15 V
V_{IN} Input Voltage	0 to V_{DD} V
T_A Operating Temperature Range	
CD4043BM, CD4044BM	−55°C to +125°C
CD4043BC, CD4044BC	−40°C to +85°C

DC Electrical Characteristics CD4043BM/CD4044BM (Note 2)

Parameter	Conditions	−55°C		25°C			125°C		Units
		Min.	Max.	Min.	Typ.	Max.	Min.	Max.	
I_{DD} Quiescent Device Current	$V_{DD} = 5.0$ V		5.0		0.01	5.0		150	μA
	$V_{DD} = 10$ V		10		0.01	10		300	μA
	$V_{DD} = 15$ V		20		0.02	20		600	μA
V_{OL} Low Level Output Voltage	$\|I_O\| \leq 1\,\mu A$, $V_{IL} = 0$ V, $V_{IH} = V_{DD}$								
	$V_{DD} = 5.0$ V		0.05		0	0.05		0.05	V
	$V_{DD} = 10$ V		0.05		0	0.05		0.05	V
	$V_{DD} = 15$ V		0.05		0	0.05		0.05	V
V_{OH} High Level Output Voltage	$\|I_O\| \leq 1\,\mu A$, $V_{IL} = 0$ V, $V_{IH} = V_{DD}$								
	$V_{DD} = 5.0$ V	4.95		4.95	5.0		4.95		V
	$V_{DD} = 10$ V	9.95		9.95	10		9.95		V
	$V_{DD} = 15$ V	14.95		14.95	15		14.95		V
V_{IL} Low Level Input Voltage	$\|I_O\| \leq 1\,\mu A$								
	$V_{DD} = 5.0$ V, $V_O = 0.5$ V or 4.5 V		1.5		2.25	1.5		1.5	V
	$V_{DD} = 10$ V, $V_O = 1.0$ V or 9.0 V		3.0		4.5	3.0		3.0	V
	$V_{DD} = 15$ V, $V_O = 1.5$ V or 13.5 V		4.0		6.75	4.0		4.0	V
V_{IH} High Level Input Voltage	$\|I_O\| \leq 1\,\mu A$								
	$V_{DD} = 5.0$ V, $V_O = 0.5$ V or 4.5 V	3.5		3.5	2.75		3.5		V
	$V_{DD} = 5.0$ V, $V_O = 1.0$ V or 9.0 V	7.0		7.0	5.5		7.0		V
	$V_{DD} = 15$ V, $V_O = 1.5$ V or 13.5 V	11		11	8.25		11		V
I_{OL} Low Level Output Current	$V_{IL} = 0$ V, $V_{IH} = V_{DD}$								
	$V_{DD} = 5.0$ V, $V_O = 0.4$ V	0.64		0.51	1.0		0.36		mA
	$V_{DD} = 10$ V, $V_O = 0.5$ V	1.6		1.3	2.6		0.9		mA
	$V_{DD} = 15$ V, $V_O = 1.5$ V	4.2		3.4	6.8		2.4		mA
I_{OH} High Level Output Current	$V_{IL} = 0$ V, $V_{IH} = V_{DD}$								
	$V_{DD} = 5.0$ V, $V_O = 4.6$ V	−0.25		−0.2	−0.4		−0.14		mA
	$V_{DD} = 10$ V, $V_O = 9.5$ V	−0.62		−0.5	−1.0		−0.35		mA
	$V_{DD} = 15$ V, $V_O = 13.5$ V	−1.8		−1.5	−3.0		−1.1		mA
I_{IN} Input Current	$V_{DD} = 15$ V, $V_{IN} = 0$ V		−0.1		-10^{-5}	−0.1		−1.0	μA
	$V_{DD} = 15$ V, $V_{IN} = 15$ V		0.1		10^{-5}	0.1		1.0	μA

DC Electrical Characteristics CD4043BC/CD4044BC (Note 2)

Parameter	Conditions	−40°C		25°C			85°C		Units
		Min.	Max.	Min.	Typ.	Max.	Min.	Max.	
I_{DD} Quiescent Device Current	$V_{DD} = 5.0$ V		20		0.01	20		150	μA
	$V_{DD} = 10$ V		40		0.01	40		300	μA
	$V_{DD} = 15$ V		80		0.02	80		600	μA
V_{OL} Low Level Output Voltage	$\|I_O\| \leq 1\,\mu A$, $V_{IL} = 0$ V, $V_{IH} = V_{DD}$								
	$V_{DD} = 5.0$ V		0.05		0	0.05		0.05	V
	$V_{DD} = 10$ V		0.05		0	0.05		0.05	V
	$V_{DD} = 15$ V		0.05		0	0.05		0.05	V
V_{OH} High Level Output Voltage	$\|I_O\| \leq 1\,\mu A$, $V_{IL} = 0$ V, $V_{IH} = V_{DD}$								
	$V_{DD} = 5.0$ V	4.95		4.95	5.0		4.95		V
	$V_{DD} = 10$ V	9.95		9.95	10		9.95		V
	$V_{DD} = 15$ V	14.95		14.95	15		14.95		V

DC Electrical Characteristics CD4043BC/CD4044BC (cont'd)

Parameter	Conditions	−40°C		25°C			85°C		Units
		Min.	Max.	Min.	Typ.	Max.	Min.	Max.	
V_{IL} Low Level Input Voltage	$\|I_O\| \leq 1\,\mu A$								
	$V_{DD} = 5.0\,V$, $V_O = 0.5\,V$ or $4.5\,V$		1.5		2.25	1.5		1.5	V
	$V_{DD} = 10\,V$, $V_O = 1.0\,V$ or $9.0\,V$		3.0		4.5	3.0		3.0	V
	$V_{DD} = 15\,V$, $V_O = 1.5\,V$ or $13.5\,V$		4.0		6.75	4.0		4.0	V
V_{IH} High Level Input Voltage	$\|I_O\| \leq 1\,\mu A$								
	$V_{DD} = 5.0\,V$, $V_O = 0.5\,V$ or $4.5\,V$	3.5		3.5			3.5		V
	$V_{DD} = 5.0\,V$, $V_O = 1.0\,V$ or $9.0\,V$	7.0		7.0			7.0		V
	$V_{DD} = 15\,V$, $V_O = 1.5\,V$ or $13.5\,V$	11		11			11		V
I_{OL} Low Level Output Current	$V_{IL} = 0\,V$, $V_{IH} = V_{DD}$								
	$V_{DD} = 5.0\,V$, $V_O = 0.4\,V$	0.52		0.44	0.88		0.36		mA
	$V_{DD} = 10\,V$, $V_O = 0.5\,V$	1.3		1.1	2.2		0.9		mA
	$V_{DD} = 15\,V$, $V_O = 1.5\,V$	3.6		3.0	6.0		2.4		mA
I_{OH} High Level Output Current	$V_{IL} = 0\,V$, $V_{IH} = V_{DD}$								
	$V_{DD} = 5.0\,V$, $V_O = 4.6\,V$	−0.2		−0.16	−0.32		−0.12		mA
	$V_{DD} = 10\,V$, $V_O = 9.5\,V$	−0.5		−0.4	−0.8		−0.3		mA
	$V_{DD} = 15\,V$, $V_O = 13.5\,V$	−1.4		−1.2	−2.4		−1.0		mA
I_{IN} Input Current	$V_{DD} = 15\,V$, $V_{IN} = 0\,V$	−0.3			−0.3			−1.0	μA
	$V_{DD} = 15\,V$, $V_{IN} = 15\,V$	0.3			0.3			1.0	

AC Electrical Characteristics $T_A = 25°C$, $C_L = 50\,pF$, $R_L = 200\,k$, Input $t_r = t_f = 20\,ns$, unless otherwise noted.

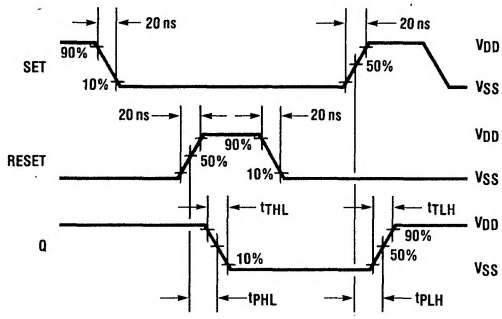
Parameter	Conditions	Min.	Typ.	Max.	Units
t_{PLH}, t_{PHL} Propagation Delay S or R to Q	$V_{DD} = 5.0\,V$		175	350	ns
	$V_{DD} = 10\,V$		75	175	ns
	$V_{DD} = 15\,V$		60	120	ns
t_{PZH}, t_{PHZ} Propagation Delay Enable to Q (High)	$V_{DD} = 5.0\,V$		115	230	ns
	$V_{DD} = 10\,V$		55	110	ns
	$V_{DD} =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

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.

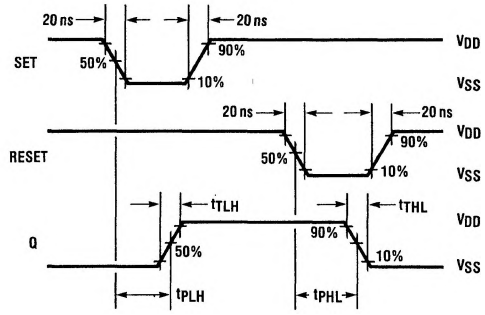
Note 2: $V_{SS} = 0\,V$ unless otherwise specified.

Timing Waveforms

CD4043B



CD4044B



Enable Timing