National Semiconductor

October 1993

CD4503BM/CD4503BC Hex Non-Inverting TRI-STATE® Buffer

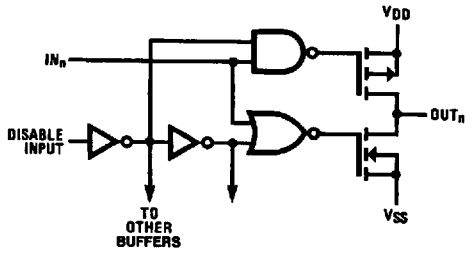
General Description

The CD4503B is a hex non-inverting TRI-STATE buffer with high output current sink and source capability. TRI-STATE outputs make it useful in bus-oriented applications. Two separate disable inputs are provided. Buffers 1 through 4 are controlled by the disable 4 input. Buffers 5 and 6 are controlled by the disable 2 input. A high level on either disable input will cause those gates on its control line to go into a high impedance state.

Features

- Wide supply voltage range 3.0 V_{DC} to 18 V_{DC}
- TRI-STATE outputs
- Symmetrical turn on/turn off delays
- Symmetrical output rise and fall times
- Pin-for-pin replacement for MM80C97 and MC14503

Schematic and Connection Diagrams



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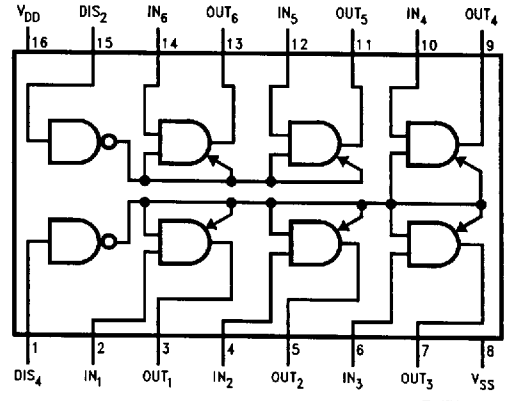
Dual-In-Line Package



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Top View

Order Number CD4503B

Truth Table

In	Disable Input	Out
0	0	0
1	0	1
X	1	TRI-STATE

X = Don't Care

TRI-STATE® is a registered trademark of National Semiconductor Corporation.

RRD-B30M105/Printed in U. S. A.

Absolute Maximum Ratings (Notes 1 and 2)

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

Supply Voltage (V_{DD})	−0.5V to +18V
Input Voltage (V_{IN})	−0.5V to +0.5V
Storage Temperature Range (T_S)	−65°C to +150°C
Power Dissipation (P_D)	
Dual-In-Line	700 mW
Small Outline	500 mW
Lead Temperature (T_L)	
(Soldering, 10 seconds)	260°C

Recommended Operating Conditions (Note 2)

Supply Voltage (V_{DD})	+3V to +15V
Operating Temperature Range (T_A)	
CD4503BM	−55°C to +125°C
CD4503BC	−40°C to +85°C

DC Electrical Characteristics CD4503BM (Note 2)

Symbol	Parameter	Conditions	−55°C		+25°			+125°C		Units
			Min	Max	Min	Typ	Max	Min	Max	
I_{DD}	Quiescent Device Current	V_{DD} = 5V, V_{IN} = V_{DD} or V_{SS}		1			1		30	μA
		V_{DD} = 10V, V_{IN} = V_{DD} or V_{SS}		2			2		60	μA
		V_{DD} = 15V, V_{IN} = V_{DD} or V_{SS}		4			4		120	μA
V_{OL}	Low Level Output Voltage	V_{IN} = V_{DD} or 0								
		V_{DD} = 5V		0.05		0	0.05		0.05	V
		V_{DD} = 10V		0.05		0	0.05		0.05	V
		V_{DD} = 15V		0.05		0	0.05		0.05	V
V_{OH}	High Level Output Voltage	V_{IN} = V_{DD} or 0								
		V_{DD} = 5V	4.95		4.95	5		4.95		V
		V_{DD} = 10V	9.95		9.95	10		9.95		V
		V_{DD} = 15V	14.95		14.95	15		14.95		V
V_{IL}	Low Level Input Voltage	V_{DD} = 5V, V_O = 4.5V or 0.5V		1.5		2.25	1.5		1.5	V
		V_{DD} = 10V, V_O = 9.0V or 1.0V		3.0		4.50	3.0		3.0	V
		V_{DD} = 15V, V_O = 13.5V or 1.5V		4.0		6.75	4.0		4.0	V
V_{IH}	High Level Input Voltage	V_{DD} = 5V, V_O = 0.5V or 4.5V	3.5		3.5	2.75		3.5		V
		V_{DD} = 10V, V_O = 1.0V or 9.0V	7.0		7.0	5.5		7.0		V
		V_{DD} = 15V, V_O = 1.5V or 13.5V	11.0		11.0	8.25		11.0		V
I_{OL}	Low Level Output Current (Note 3)	V_{DD} = 4.5V, V_{OL} = 0.4V	2.80		2.30	2.55		1.60		mA
		V_{DD} = 5.0V, V_{OL} = 0.4V	3.00		2.40	2.75		1.75		mA
		V_{DD} = 10V, V_{OL} = 0.5V	7.85		6.35	7.00		4.45		mA
		V_{DD} = 15V, V_{OL} = 1.5V	19.95		16.10	25.00		11.30		mA
I_{OH}	High Level Output Current (Note 3)	V_{DD} = 5V, V_{OH} = 4.6V	−1.28		−1.02	−1.76		−0.72		mA
		V_{DD} = 10V, V_{OH} = 9.5V	−3.20		−2.60	−4.5		−1.8		mA
		V_{DD} = 15V, V_{OH} = 13.5V	−8.20		−6.80	−17.6		−4.8		mA
I_{OZ}	TRI-STATE Leakage Current	V_{DD} = 15V		±0.1		$\pm 10^{-4}$	±0.1		±1.0	μA
I_{IN}	Input Current	V_{DD} = 15V		±0.1		$\pm 10^{-4}$	±0.1		±1.0	μA

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} = 0V unless otherwise specified.

Note 3: I_{OH} and I_{OL} are tested one output at a time.

DC Electrical Characteristics CD4503BC (Note 2)

Symbol	Parameter	Conditions	−40°C		+25°C			+85°C		Units
			Min	Max	Min	Typ	Max	Min	Max	
I_{DD}	Quiescent Device Current	V_{DD} = 5V, V_{IN} = V_{DD} or V_{SS}		4			4		30	μA
		V_{DD} = 10V, V_{IN} = V_{DD} or V_{SS}		8			8		60	μA
		V_{DD} = 15V, V_{IN} = V_{DD} or V_{SS}		16			16		120	μA
V_{OL}	Low Level Output Voltage	V_{IN} = V_{DD} or 0								
		V_{DD} = 5V		0.05		0	0.05		0.05	V
		V_{DD} = 10V		0.05		0	0.05		0.05	V
		V_{DD} = 15V		0.05		0	0.05		0.05	V
V_{OH}	High Level Output Voltage	V_{IN} = V_{DD} or 0								
		V_{DD} = 5V	4.95		4.95			4.95		V
		V_{DD} = 10V	9.95		9.95			9.95		V
		V_{DD} = 15V	14.95		14.95			14.95		V
V_{IL}	Low Level Input Voltage	V_{DD} = 5V, V_O = 4.5V or 0.5V		1.5		2.25	1.5		1.5	V
		V_{DD} = 10V, V_O = 9.0V or 1.0V		3.0		4.50	3.0		3.0	V
		V_{DD} = 15V, V_O = 13.5V or 1.5V		4.0		6.75	4.0		4.0	V
V_{IH}	High Level Input Voltage	V_{DD} = 5V, V_O = 0.5V or 4.5V	3.5		3.5	2.75		3.5		V
		V_{DD} = 10V, V_O = 1.0V or 9.0V	7.0		7.0	5.5		7.0		V
		V_{DD} = 15V, V_O = 1.5V or 13.5V	11.0		11.0	8.25		11.0		V
I_{OL}	Low Level Output Current (Note 3)	V_{DD} = 4.5V, V_{OL} = 0.4V	2.30		1.95	2.65		1.60		mA
		V_{DD} = 5.0V, V_{OL} = 0.4V	2.5		2.10	2.75		1.75		mA
		V_{DD} = 10V, V_{OL} = 0.5V	6.5		5.45	7.0		4.45		mA
		V_{DD} = 15V, V_{OL} = 1.5V	16.50		13.80	25.00		11.30		mA
I_{OH}	High Level Output Current (Note 3)	V_{DD} = 5V, V_{OH} = 4.6V	−1.04		−0.88	−1.76		−0.7		mA
		V_{DD} = 10V, V_{OH} = 9.5V	−2.60		−2.2	−4.50		−1.8		mA
		V_{DD} = 15V, V_{OH} = 13.5V	−7.2		−6.0	−17.6		−4.8		mA
I_{TL}	TRI-STATE Leakage Current	V_{DD} = 15V		±0.3		$\pm 10^{-4}$	±0.3		±1.0	μA
I_{IN}	Input Current	V_{DD} = 15V		±0.3		$\pm 10^{-5}$	±0.3		±1.0	μA

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} = 0V unless otherwise specified.

AC Electrical Characteristics* CD4503B

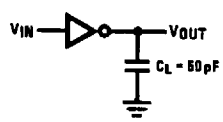
T_A = 25°C, C_L = 50 pF, R_L = 200 kΩ, Input t_r = t_f = 20 ns, unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t_{PHL}, t_{PLH}	Propagation Delay Time	V_{DD} = 5V		75	100	ns
		V_{DD} = 10V		35	40	ns
		V_{DD} = 15V		25	30	ns
t_{PLZ}, t_{PHZ}	Propagation Delay Time, Logical Level to High Impedance State	V_{DD} = 5V		80	125	ns
		V_{DD} = 10V		40	90	ns
		V_{DD} = 15V		35	70	ns
t_{PZL}, t_{PZH}	Propagation Delay Time, High Impedance State to Logical Level	V_{DD} = 5V		95	175	ns
		V_{DD} = 10V		40	80	ns
		V_{DD} = 15V		35	70	ns
t_{TLH}	Output Rise Time	V_{DD} = 5V		45	80	ns
		V_{DD} = 10V		23	40	ns
		V_{DD} = 15V		18	35	ns
t_{THL}	Output Fall Time	V_{DD} = 5V		45	80	ns
		V_{DD} = 10V		23	40	ns
		V_{DD} = 15V		18	35	ns

*AC Parameters are guaranteed by DC correlated testing.

AC Test Circuits and Switching Time Waveforms

t_{PHL}, t_{PLH}



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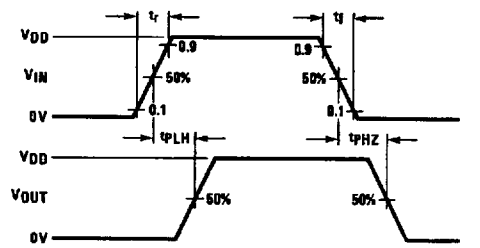
CMOS to CMOS



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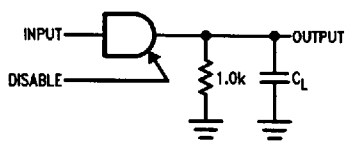
t_{PHZ} and t_{PZH}



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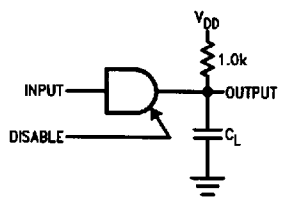
t_{PLZ} and t_{PZL}



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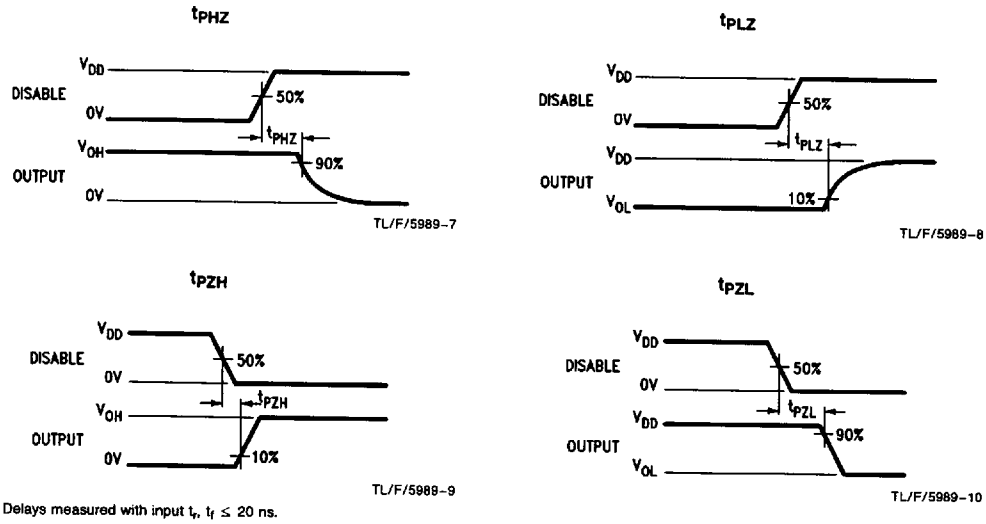
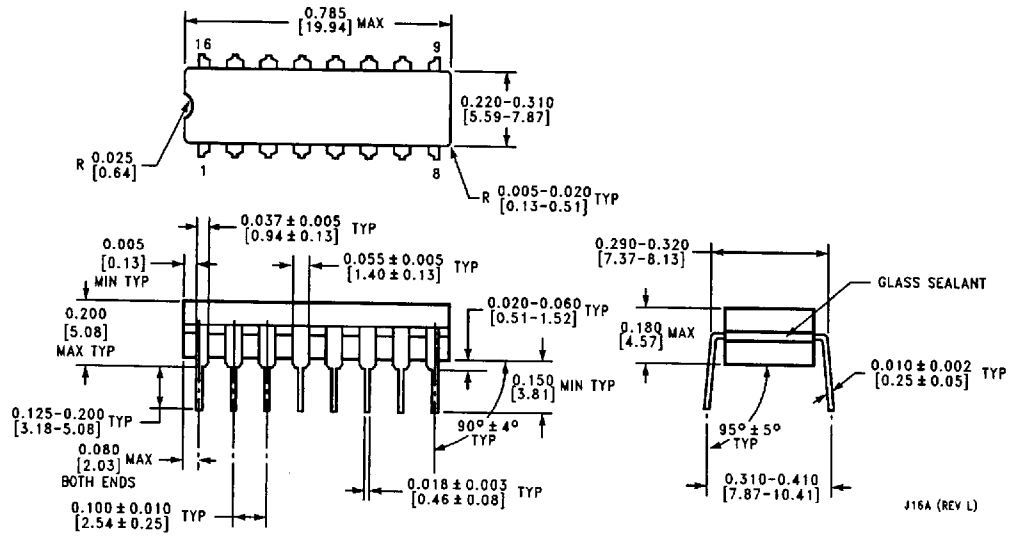
AC Test Circuits and Switching Time Waveforms (Continued)



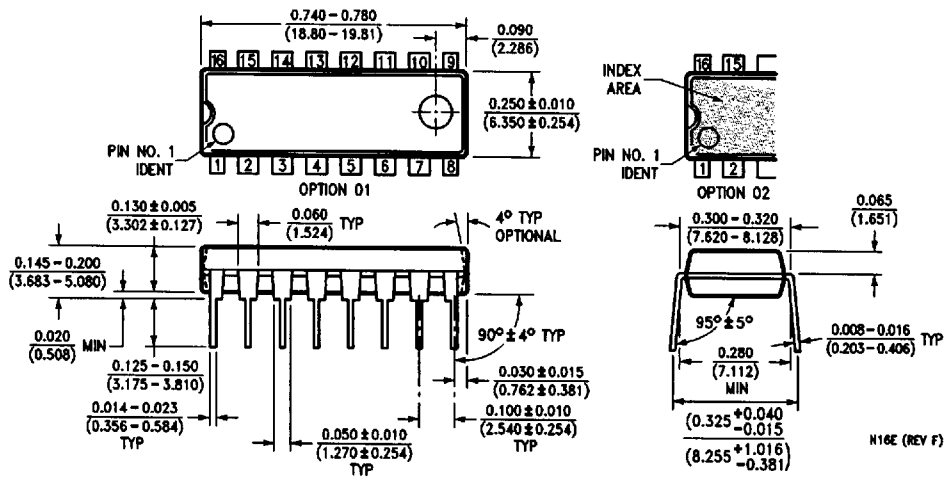
Note: Delays measured with input t_r, $t_f \leq 20$ ns.

Physical Dimensions inches (millimeters)



Ceramic Dual-In-Line Package (J)
Order Number CD4503BMJ or CD4503BCJ
NS Package Number J16A

Physical Dimensions inches (millimeters) (Continued)



Molded Dual-In-Line Package (N)
Order Number CD4503BMN or CD4503BCN
NS Package Number N16E

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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