

CD4041UB/CD4041UBC Quad True/Complement Buffer

General Description

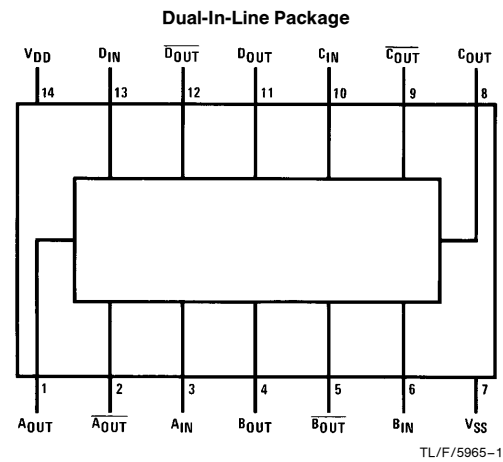
The CD4041UB/CD4041UBC is a quad true/complement buffer consisting of N- and P-channel enhancement mode transistors having low-channel resistance and high current (sourcing and sinking) capability. The CD4041 is intended for use as a buffer, line driver, or CMOS-to-TTL driver.

All inputs are protected from static discharge by diode clamps to V_{DD} and V_{SS} .

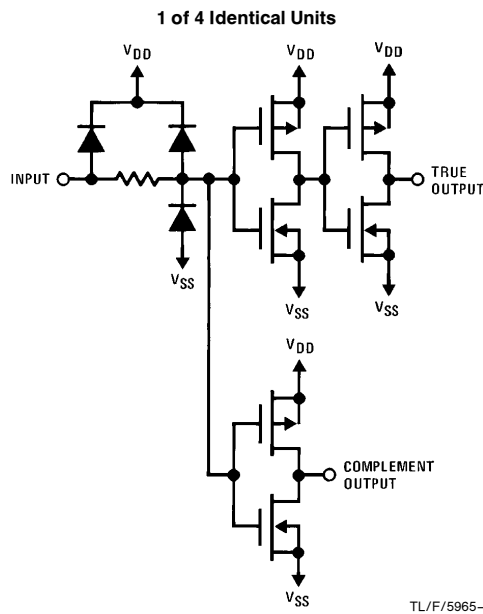
Features

- Wide supply voltage range 3.0V to 15V
- High noise immunity 40% V_{DD} (typ.)
- True output
 - High current source and sink capability
 - 8 mA (typ.) @ $V_O = 9.5V$, $V_{DD} = 10V$
 - 3.2 mA (typ.) @ $V_O = 0.4V$, $V_{DD} = 5V$ (two TTL loads)
- Complement output
 - Medium current source and sink capability
 - 3.6 mA (typ.) @ $V_O = 9.5V$, $V_{DD} = 10V$
 - 1.6 mA (typ.) @ $V_O = 0.4V$, $V_{DD} = 5V$

Connection and Schematic Diagrams



Top View
Order Number CD4041UB



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 V_{DD} + 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 Temp. (T_L) (Soldering, 10 sec.)	260°C

Recommended Operating Conditions (Note 2)

Supply Voltage (V_{DD})	3V to 15V
Input Voltage (V_{IN})	0V to V_{DD}
Operating Temperature Range (T_A)	
CD4041UB	-55°C to +125°C
CD4041UBC	-40°C to +85°C

DC Electrical Characteristics CD4041UBM (Note 2)

Symbol	Parameter	Conditions	-55°C		+25°C			+125°C		Units
			Min	Max	Min	Typ	Max	Min	Max	
I_{DD}	Quiescent Device Current	$V_{DD} = 5V$		1		0.01	1		30	μA
		$V_{DD} = 10V$		2		0.01	2		60	μA
		$V_{DD} = 15V$		4		0.01	4		120	μA
V_{OL}	Low Level Output Voltage	$ I_O < 1 \mu A, V_{IL} = 0V, V_{IH} = V_{DD}$								
		$V_{DD} = 5V$		0.05		0	0.05		0.05	V
		$V_{DD} = 10V$		0.05		0	0.05		0.05	V
V_{OH}	High Level Output Voltage	$ I_O < 1 \mu A, V_{IL} = 0V, V_{IH} = V_{DD}$								
		$V_{DD} = 5V$	4.95		4.95	5		4.95		V
		$V_{DD} = 10V$	9.95		9.95	10		9.95		V
V_{IL}	Low Level Input Voltage	$ I_O < 1 \mu A$								
		$V_{DD} = 5V, V_O = 0.5V$ or 4.5V		1.0		2	1.0		1.0	V
		$V_{DD} = 10V, V_O = 1V$ or 9V		2.0		4	2.0		2.0	V
V_{IH}	High Level Input Voltage	$ I_O < 1 \mu A$								
		$V_{DD} = 5V, V_O = 0.5V$ or 4.5V	4.0		4.0	3		4.0		V
		$V_{DD} = 10V, V_O = 1V$ or 9V	8.0		8.0	6		8.0		V
I_{OL}	Low Level Output Current True Output (Note 3)	$V_{IL} = 0V$								
		$V_{DD} = 5V, V_O = 0.4V$	2.1		1.6	3.2		1.2		mA
		$V_{DD} = 10V, V_O = 0.5V$	6.25		5.0	10		3.5		mA
I_{OL}	Low Level Output Current Complement Output (Note 3)	$V_{IH} = V_{DD}$								
		$V_{DD} = 5V, V_O = 0.4V$	1.0		0.8	1.6		0.55		mA
		$V_{DD} = 10V, V_O = 0.5V$	2.5		2	4.0		1.4		mA
I_{OH}	High Level Output Current True Output (Note 3)	$V_{IH} = V_{DD}$								
		$V_{DD} = 5V, V_O = 4.6V$	-1.75		-1.4	-2.8		-1.0		mA
		$V_{DD} = 10V, V_O = 9.5V$	-5.0		-4	-8.0		-2.8		mA
I_{OH}	High Level Output Current Complement Output (Note 3)	$V_{IL} = 0V$								
		$V_{DD} = 5V, V_O = 4.6V$	-0.75		-0.6	-1.2		-0.4		mA
		$V_{DD} = 10V, V_O = 9.5V$	-2.25		-1.8	-3.6		-1.25		mA
I_{IN}	Input Current	$V_{DD} = 15V, V_{IN} = 0V$		-0.1		-10^{-5}	-0.1		-1.0	μA
		$V_{DD} = 15V, V_{IN} = 15V$		0.1		10^{-5}	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 CD4041UBC (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		4		0.01	4		30	μA
		V _{DD} = 10V		8		0.01	8		60	μA
		V _{DD} = 15V		16		0.01	16		120	μA
V _{OL}	Low Level Output Voltage	I _O < 1 μA, V _{IL} = 0V, V _{IH} = V _{DD}								
		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	I _O < 1 μA, V _{IL} = 0V, V _{IH} = V _{DD}								
		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	I _O < 1 μA								
		V _{DD} = 5V, V _O = 0.5V or 4.5V		1.0		2	1.0		1.0	V
		V _{DD} = 10V, V _O = 1V or 9V		2.0		4	2.0		2.0	V
		V _{DD} = 15V, V _O = 1.5V or 13.5V		3.0		6	3.0		3.0	V
V _{IH}	High Level Input Voltage	I _O < 1 μA								
		V _{DD} = 5V, V _O = 0.5V or 4.5V	4.0		4.0	3		4.0		V
		V _{DD} = 10V, V _O = 1V or 9V	8.0		8.0	6		8.0		V
		V _{DD} = 15V, V _O = 1.5V or 13.5V	12.0		12.0	9		12.0		V
I _{OL}	Low Level Output Current True Output (Note 3)	V _{IL} = 0V								
		V _{DD} = 5V, V _O = 0.4V	1.7		1.5	3.2		1.2		mA
		V _{DD} = 10V, V _O = 0.5V	4.9		4.3	10		3.5		mA
		V _{DD} = 15V, V _O = 1.5V	11		10	24		8		mA
I _{OL}	Low Level Output Current Complement Output (Note 3)	V _{IL} = V _{DD}								
		V _{DD} = 5V, V _O = 0.4V	0.75		0.68	1.6		0.55		mA
		V _{DD} = 10V, V _O = 0.5V	2.0		1.8	4.0		1.4		mA
		V _{DD} = 15V, V _O = 1.5V	4.4		3.8	9.0		3.0		mA
I _{OH}	High Level Output Current True Output (Note 3)	V _{IL} = V _{DD}								
		V _{DD} = 5V, V _O = 4.6V	-1.5		-1.3	-2.8		-1.0		mA
		V _{DD} = 10V, V _O = 9.5V	-4.0		-3.5	-8.0		-2.8		mA
		V _{DD} = 15V, V _O = 13.5V	-8.7		-7.5	-18		-6		mA
I _{OH}	High Level Output Current Complement Output (Note 3)	V _{IL} = 0V								
		V _{DD} = 5V, V _O = 4.6V	-0.57		-0.50	-1.2		-0.4		mA
		V _{DD} = 10V, V _O = 9.5V	-1.8		-1.6	-3.6		-1.25		mA
		V _{DD} = 15V, V _O = 13.5V	-3.9		-3.4	-8.0		-2.7		mA
I _{IN}	Input Current	V _{DD} = 15V, V _{IN} = 0V		-0.3		-10 ⁻⁵	-0.3		-1.0	μA
		V _{DD} = 15V, V _{IN} = 15V		0.3		10 ⁻⁵	0.3		1.0	μA

AC Electrical Characteristics*

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t _{PHL} , t _{PLH}	Propagation Delay Time True Output	V _{DD} = 5V		60	120	ns
		V _{DD} = 10V		35	70	ns
		V _{DD} = 15V		25	50	ns
t _{PHL} , t _{PLH}	Propagation Delay Time Complement Output	V _{DD} = 5V		75	150	ns
		V _{DD} = 10V		40	80	ns
		V _{DD} = 15V		30	65	ns
t _{THL} , t _{TLH}	Output Transition Time True Output	V _{DD} = 5V		55	110	ns
		V _{DD} = 10V		30	60	ns
		V _{DD} = 15V		25	50	ns

AC Electrical Characteristics* (Continued)

$T_A = 25^\circ\text{C}$, $C_L = 50\text{ pF}$, $R_L = 200\text{ k}$, Input $t_r = t_f = 20\text{ ns}$, unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t_{THL} , t_{TLH}	Output Transition Time Complement Output	$V_{DD} = 5\text{V}$		90	180	ns
		$V_{DD} = 10\text{V}$		45	90	ns
		$V_{DD} = 15\text{V}$		35	75	ns
C_{IN}	Input Capacitance	Any Input		10	15	pF

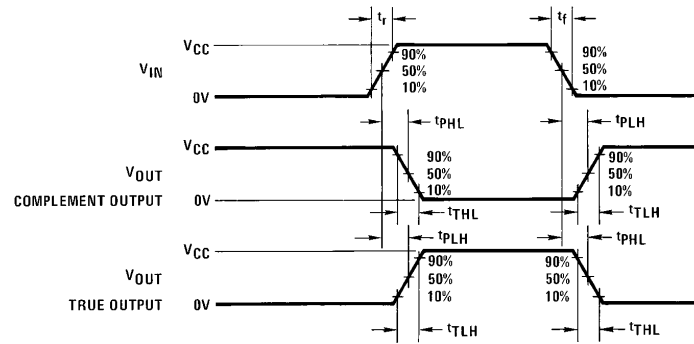
*AC Parameters are guaranteed by DC correlated testing.

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: $V_{SS} = 0\text{V}$ unless otherwise specified.

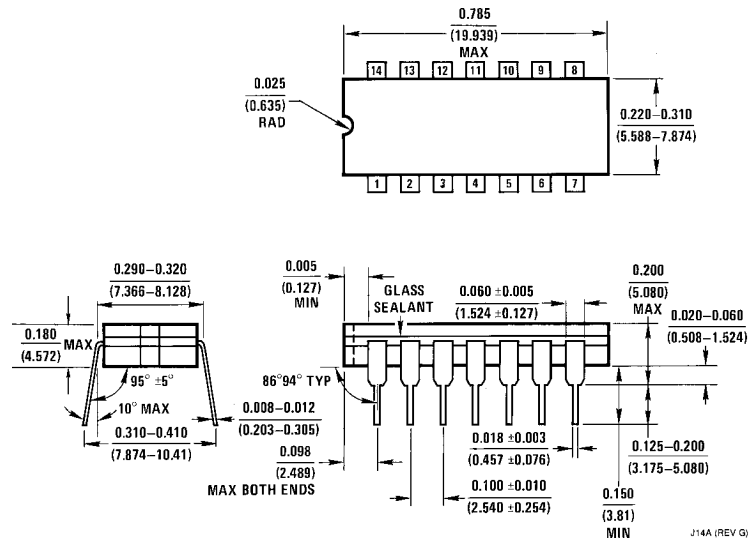
Note 3: I_{OH} and I_{OL} are tested one output at a time.

Switching Time Waveforms



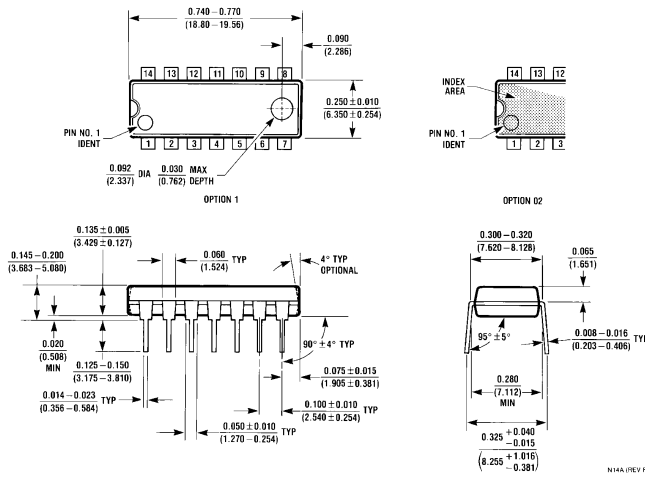
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Physical Dimensions inches (millimeters)



Ceramic Dual-In-Line Package (J)
Order Number CD4041UBMJ or CD4041UBCJ
NS Package Number J14A

Physical Dimensions inches (millimeters) (Continued)



Molded Dual-In-Line Package (N)
Order Number CD4041UBN or CD4041UBCN
NS Package Number N14A

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