



# CD4041UB/CD4041UBC Quad True/Complement Buffer

## General Description

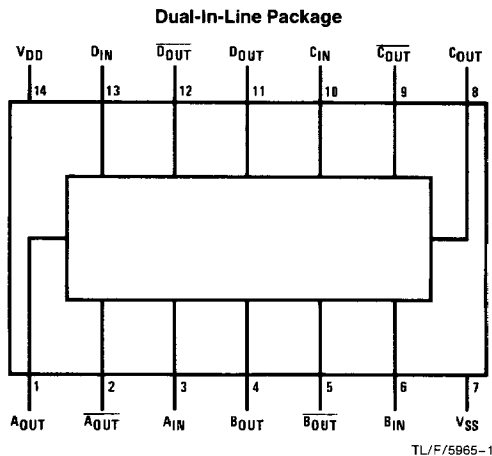
The CD4041UB/CD4041UBC is a quad true/complement buffer consisting of N- and P-channel enhancement mode transistors having low-channel resistance and high current (sourcing and sinking) capability. The CD4041 is intended for use as a buffer, line driver, or CMOS-to-TTL driver.

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.) @  $V_O = 0.4V, V_{DD} = 5V$

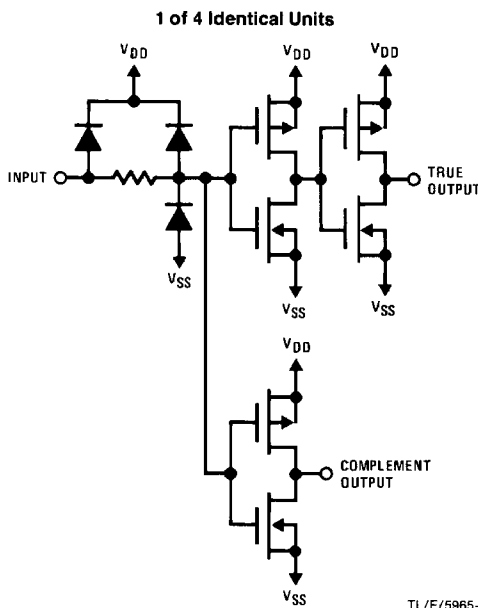
## Connection and Schematic Diagrams



### Top View

**Order Number CD4041UB\***

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



**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 ( $V_{DD}$ )	-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	$V_{DD} = 5V$ $V_{DD} = 10V$ $V_{DD} = 15V$		1 2 4		0.01 0.01 0.01	1 2 4		30 60 120	$\mu A$ $\mu A$ $\mu A$
$V_{OL}$	Low Level Output Voltage	$ I_O  < 1 \mu A$ , $V_{IL} = 0V$ , $V_{IH} = V_{DD}$ $V_{DD} = 5V$ $V_{DD} = 10V$ $V_{DD} = 15V$		0.05 0.05 0.05		0 0 0	0.05 0.05 0.05		0.05 0.05 0.05	V V V
$V_{OH}$	High Level Output Voltage	$ I_O  < 1 \mu A$ , $V_{IL} = 0V$ , $V_{IH} = V_{DD}$ $V_{DD} = 5V$ $V_{DD} = 10V$ $V_{DD} = 15V$	4.95 9.95 14.95		4.95 9.95 14.95	5 10 15		4.95 9.95 14.95		V V V
$V_{IL}$	Low Level Input Voltage	$ I_O  < 1 \mu A$ $V_{DD} = 5V$ , $V_O = 0.5V$ or $4.5V$ $V_{DD} = 10V$ , $V_O = 1V$ or $9V$ $V_{DD} = 15V$ , $V_O = 1.5V$ or $13.5V$		1.0 2.0 3.0		2 4 6	1.0 2.0 3.0		1.0 2.0 3.0	V V V
$V_{IH}$	High Level Input Voltage	$ I_O  < 1 \mu A$ $V_{DD} = 5V$ , $V_O = 0.5V$ or $4.5V$ $V_{DD} = 10V$ , $V_O = 1V$ or $9V$ $V_{DD} = 15V$ , $V_O = 1.5V$ or $13.5V$	4.0 8.0 12.0		4.0 8.0 12.0	3 6 9		4.0 8.0 12.0		V V V
$I_{OL}$	Low Level Output Current True Output (Note 3)	$V_{IL} = 0V$ $V_{DD} = 5V$ , $V_O = 0.4V$ $V_{DD} = 10V$ , $V_O = 0.5V$ $V_{DD} = 15V$ , $V_O = 1.5V$	2.1 6.25 14		1.6 5.0 12	3.2 10 24		1.2 3.5 8		mA mA mA
$I_{OL}$	Low Level Output Current Complement Output (Note 3)	$V_{IH} = V_{DD}$ $V_{DD} = 5V$ , $V_O = 0.4V$ $V_{DD} = 10V$ , $V_O = 0.5V$ $V_{DD} = 15V$ , $V_O = 1.5V$	1.0 2.5 5.5		0.8 2 4.5	1.6 4.0 9.0		0.55 1.4 3.0		mA mA mA
$I_{OH}$	High Level Output Current True Output (Note 3)	$V_{IH} = V_{DD}$ $V_{DD} = 5V$ , $V_O = 4.6V$ $V_{DD} = 10V$ , $V_O = 9.5V$ $V_{DD} = 15V$ , $V_O = 13.5V$	-1.75 -5.0 -11		-1.4 -4 -9	-2.8 -8.0 -18		-1.0 -2.8 -6		mA mA mA
$I_{OH}$	High Level Output Current Complement Output (Note 3)	$V_{IL} = 0V$ $V_{DD} = 5V$ , $V_O = 4.6V$ $V_{DD} = 10V$ , $V_O = 9.5V$ $V_{DD} = 15V$ , $V_O = 13.5V$	-0.75 -2.25 -4.8		-0.6 -1.8 -4	-1.2 -3.6 -8		-0.4 -1.25 -2.7		mA mA mA
$I_{IN}$	Input Current	$V_{DD} = 15V$ , $V_{IN} = 0V$ $V_{DD} = 15V$ , $V_{IN} = 15V$		-0.1 0.1		$-10^{-5}$ $10^{-5}$	-0.1 0.1		-1.0 1.0	$\mu A$ $\mu A$

**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	$V_{DD} = 5V$ $V_{DD} = 10V$ $V_{DD} = 15V$		4 8 16		0.01 0.01 0.01	4 8 16		30 60 120	$\mu A$ $\mu A$ $\mu A$
$V_{OL}$	Low Level Output Voltage	$ I_O  < 1 \mu A, V_{IL} = 0V, V_{IH} = V_{DD}$ $V_{DD} = 5V$ $V_{DD} = 10V$ $V_{DD} = 15V$		0.05 0.05 0.05		0 0 0	0.05 0.05 0.05		0.05 0.05 0.05	V V V
$V_{OH}$	High Level Output Voltage	$ I_O  < 1 \mu A, V_{IL} = 0V, V_{IH} = V_{DD}$ $V_{DD} = 5V$ $V_{DD} = 10V$ $V_{DD} = 15V$	4.95 9.95 14.95		4.95 9.95 14.95	5 10 15		4.95 9.95 14.95		V V V
$V_{IL}$	Low Level Input Voltage	$ I_O  < 1 \mu A$ $V_{DD} = 5V, V_O = 0.5V \text{ or } 4.5V$ $V_{DD} = 10V, V_O = 1V \text{ or } 9V$ $V_{DD} = 15V, V_O = 1.5V \text{ or } 13.5V$		1.0 2.0 3.0		2 4 6	1.0 2.0 3.0		1.0 2.0 3.0	V V V
$V_{IH}$	High Level Input Voltage	$ I_O  < 1 \mu A$ $V_{DD} = 5V, V_O = 0.5V \text{ or } 4.5V$ $V_{DD} = 10V, V_O = 1V \text{ or } 9V$ $V_{DD} = 15V, V_O = 1.5V \text{ or } 13.5V$	4.0 8.0 12.0		4.0 8.0 12.0	3 6 9		4.0 8.0 12.0		V V V
$I_{OL}$	Low Level Output Current True Output (Note 3)	$V_{IL} = 0V$ $V_{DD} = 5V, V_O = 0.4V$ $V_{DD} = 10V, V_O = 0.5V$ $V_{DD} = 15V, V_O = 1.5V$	1.7 4.9 11		1.5 4.3 10	3.2 10 24		1.2 3.5 8		mA mA mA
$I_{OL}$	Low Level Output Current Complement Output (Note 3)	$V_{IH} = V_{DD}$ $V_{DD} = 5V, V_O = 0.4V$ $V_{DD} = 10V, V_O = 0.5V$ $V_{DD} = 15V, V_O = 1.5V$	0.75 2.0 4.4		0.68 1.8 3.8	1.6 4.0 9.0		0.55 1.4 3.0		mA mA mA
$I_{OH}$	High Level Output Current True Output (Note 3)	$V_{IH} = V_{DD}$ $V_{DD} = 5V, V_O = 4.6V$ $V_{DD} = 10V, V_O = 9.5V$ $V_{DD} = 15V, V_O = 13.5V$	-1.5 -4.0 -8.7		-1.3 -3.5 -7.5	-2.8 -8.0 -18		-1.0 -2.8 -6		mA mA mA
$I_{OH}$	High Level Output Current Complement Output (Note 3)	$V_{IL} = 0V$ $V_{DD} = 5V, V_O = 4.6V$ $V_{DD} = 10V, V_O = 9.5V$ $V_{DD} = 15V, V_O = 13.5V$	-0.57 -1.8 -3.9		-0.50 -1.6 -3.4	-1.2 -3.6 -8.0		-0.4 -1.25 -2.7		mA mA mA
$I_{IN}$	Input Current	$V_{DD} = 15V, V_{IN} = 0V$ $V_{DD} = 15V, V_{IN} = 15V$		-0.3 0.3		$-10^{-5}$ $10^{-5}$	-0.3 0.3		-1.0 1.0	$\mu A$ $\mu A$

## AC Electrical Characteristics\*

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

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

### AC Electrical Characteristics\* (Continued)

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 specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t <sub>THL</sub> , t <sub>TLH</sub>	Output Transition Time Complement Output	V <sub>DD</sub> = 5V V <sub>DD</sub> = 10V V <sub>DD</sub> = 15V		90 45 35	180 90 75	ns
C <sub>IN</sub>	Input Capacitance	Any Input		10	15	pF

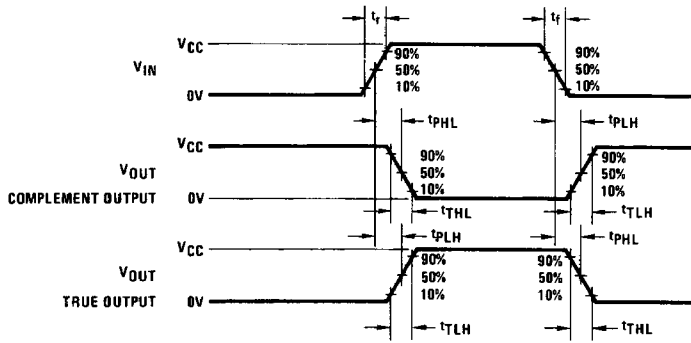
\*AC Parameters are guaranteed by DC correlated testing.

**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<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.

### Switching Time Waveforms



TL/F/5965-3