



## UCD4002B

Preliminary

CMOS IC

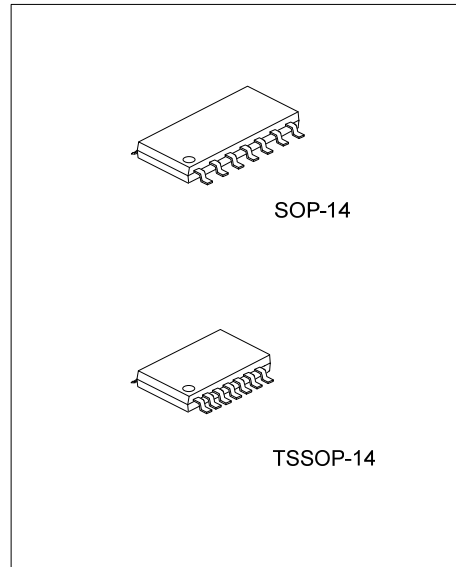
### CMOS NOR Gates High-Voltage Types

#### DESCRIPTION

**UCD4002B** NOR gate provides the system designer with direct implementation of the NOR function and supplements the existing family of CMOS gates. All inputs and outputs are buffered.

#### FEATURES

- \* Propagation delay time=60ns at  $C_L=50pF, V_{DD}=10V$
- \* Buffered inputs and outputs
- \* Maximum input current of 1 $\mu$ A at 18V
- \* standardized symmetrical output characteristics
- \* 100% tested for maximum quiescent current at 20V

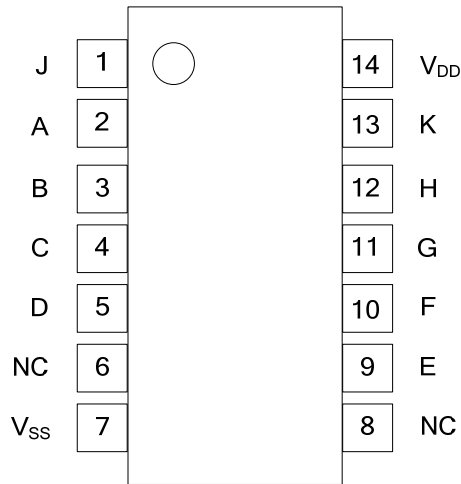


#### ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
UCD4002BL-S14-T	UCD4002BG-S14-T	SOP-14	Tube
UCD4002BL-S14-R	UCD4002BG-S14-R	SOP-14	Tape Reel
UCD4002BL-P14-T	UCD4002BG-P14-T	TSSOP-14	Tube
UCD4002BL-P14-R	UCD4002BG-P14-R	TSSOP-14	Tape Reel

<p>UCD4002BL-S14-T</p> <p>(1) Packing Type (2) Package Type (3) Halogen Free</p>	<p>(1) T: Tube, R: Tape Reel (2) S14: SOP-14, P14: TSSOP-14 (3) L: Lead Free, G: Halogen Free</p>
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PIN CONFIGURATION

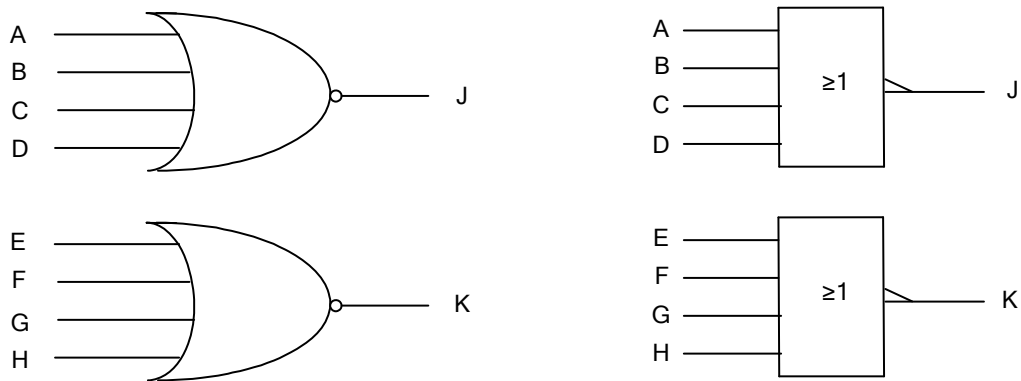


FUNCTION TABLE

INPUT	INPUT	INPUT	INPUT	INPUT	INPUT	INPUT	INPUT	OUTPUT	OUTPUT
A	B	C	D	E	F	G	H	K	J
L	L	L	L	L	L	L	L	H	H
H	X	X	X	H	X	X	X	L	L
X	H	X	X	X	H	X	X	L	L
X	X	H	X	X	X	H	X	L	L
X	X	X	H	X	X	X	H	L	L

NOTE: X = DON'T CARE CASE

LOGIC DIAGRAM



■ ABSOLUTE MAXIMUM RATING ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V_{DD}$	-0.5 ~ 20	V
Input Voltage	$V_{IN}$	-0.5 ~ $V_{CC} + 0.5$	V
Output Voltage	$V_{OUT}$	-0.5 ~ $V_{CC} + 0.5$	V
Power Dissipation( $T_A = 55^\circ\text{C}$ )	$P_D$	500	mW
Storage Temperature	$T_{STG}$	-65 ~ + 150	$^\circ\text{C}$

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.  
Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	$V_{DD}$		3		18	V
Operating Temperature	$T_{OPR}$		-40		125	$^\circ\text{C}$

■ ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
High-Level Input Voltage	$V_{IH}$	$V_{DD} = 5\text{V}, V_O = 0.5\text{V}$	3.5			V
		$V_{DD} = 10\text{V}, V_O = 1.0\text{V}$	7.0			
		$V_{DD} = 15\text{V}, V_O = 1.5\text{V}$	11.0			
Low-Level Input Voltage	$V_{IL}$	$V_{DD} = 5\text{V}, V_O = 4.5\text{V}$			1.5	V
		$V_{DD} = 10\text{V}, V_O = 9.0\text{V}$			3.0	
		$V_{DD} = 15\text{V}, V_O = 13.5\text{V}$			4.0	
High-Level Output Voltage	$V_{OH}$	$V_{DD} = 5\text{V}, \text{No Load}$	4.95	5		V
		$V_{DD} = 10\text{V}, \text{No Load}$	9.95	10		
		$V_{DD} = 15\text{V}, \text{No Load}$	14.95	15		
Low-Level Output Voltage	$V_{OL}$	$V_{DD} = 5\text{V}, \text{No Load}$		0	0.05	V
		$V_{DD} = 10\text{V}, \text{No Load}$		0	0.05	
		$V_{DD} = 15\text{V}, \text{No Load}$		0	0.05	
High-Level Output Current (Note)	$I_{OH}$	$V_{DD} = 5\text{V}, V_O = 4.6\text{V}$	-0.51	-1.0		mA
		$V_{DD} = 5\text{V}, V_O = 2.5\text{V}$	-1.6	-3.2		
		$V_{DD} = 10\text{V}, V_O = 9.5\text{V}$	-1.3	-2.6		
		$V_{DD} = 15\text{V}, V_O = 13.5\text{V}$	-3.4	-6.8		
Low-Level Output Current (Note)	$I_{OL}$	$V_{DD} = 5\text{V}, V_O = 0.4\text{V}$	0.51	1		mA
		$V_{DD} = 10\text{V}, V_O = 0.5\text{V}$	1.3	2.6		
		$V_{DD} = 15\text{V}, V_O = 1.5\text{V}$	3.4	6.8		
Input Leakage Current	$I_{I(LEAK)}$	$V_{DD} = 15\text{V}, V_{IN} = V_{DD} \text{ or } \text{GND}$			$\pm 0.1$	$\mu\text{A}$
Quiescent Supply Current	$I_{DD}$	$V_{DD} = 5\text{V}, V_{IN} = V_{DD} \text{ or } V_{SS}, I_{OUT} = 0$		0.01	0.25	$\mu\text{A}$
		$V_{DD} = 10\text{V}, V_{IN} = V_{DD} \text{ or } V_{SS}, I_{OUT} = 0$		0.01	0.5	
		$V_{DD} = 15\text{V}, V_{IN} = V_{DD} \text{ or } V_{SS}, I_{OUT} = 0$		0.01	1.0	
		$V_{DD} = 20\text{V}, V_{IN} = V_{DD} \text{ or } V_{SS}, I_{OUT} = 0$		0.02	5.0	

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

■ SWITCHING CHARACTERISTICS

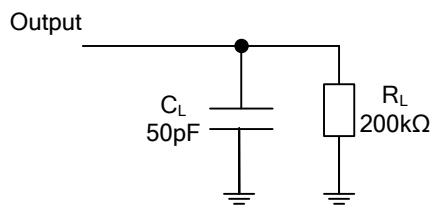
( $T_A = 25^\circ\text{C}$ , Input  $t_r$ ,  $t_f = 20\text{ns}$ ,  $C_L = 50\text{pf}$ ,  $R_L = 200\text{k}\Omega$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation delay from Input(A or B) to Output(Y)	$t_{PLH}$	$V_{DD}=5\text{V}$		125	250	ns
		$V_{DD}=10\text{V}$		60	120	
		$V_{DD}=15\text{V}$		45	90	
	$t_{PHL}$	$V_{DD}=5\text{V}$		125	250	
		$V_{DD}=10\text{V}$		60	120	
		$V_{DD}=15\text{V}$		45	90	
Transition Time	$t_{TLH}/t_{THL}$	$V_{DD}=5\text{V}$		100	200	ns
		$V_{DD}=10\text{V}$		50	100	
		$V_{DD}=15\text{V}$		40	80	

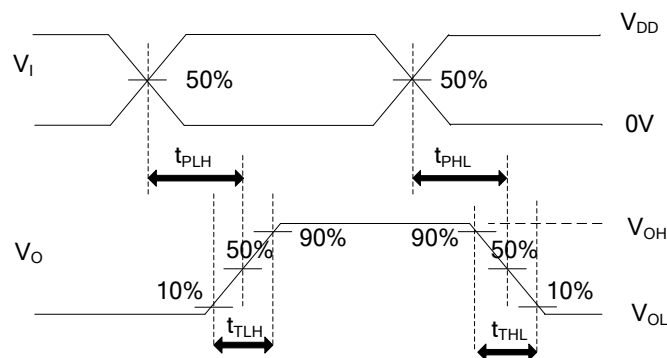
■ OPERATING CHARACTERISTICS( $T_A=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Average Input Capacitance	$C_{IN}$	Any Input		5	7.5	pF

■ TEST CIRCUIT AND WAVEFORMS



Definitions for test circuit



Propagation Delay Times

Note:  $C_L$  includes probe and jig capacitance.

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