



# U74HC20

CMOS IC

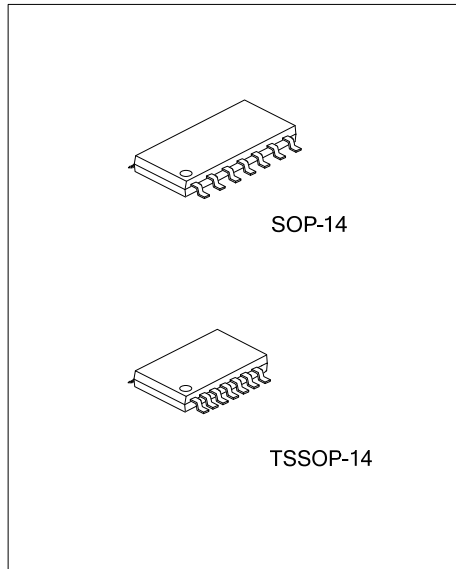
## DUAL 4-INPUT NAND GATES

### DESCRIPTION

The **U74HC20** contains two independent 4-input NAND gates. They perform the Boolean function  $Y = \overline{A \cdot B \cdot C \cdot D}$  or  $Y = \overline{A} + \overline{B} + \overline{C} + \overline{D}$  in positive logic.

### FEATURES

- \* Operation voltage range: 2~6V
- \* Low Quiescent Current:  $I_{CC} = 2\mu A$  (Max)
- \* High speed:  $t_{PD} = 11ns$  (Typ)
- \* Low input current: 100nA (Max)



### ORDERING INFORMATION

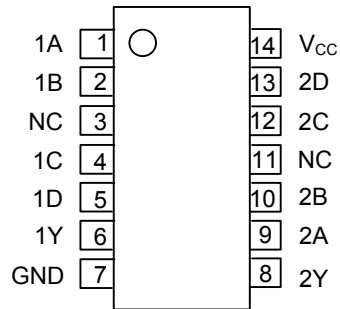
Ordering Number	Package	Packing
U74HC20G-S14-R	SOP-14	Tape Reel
U74HC20G-P14-R	TSSOP-14	Tape Reel

<p>U74HC20G-P14-R</p> <ul style="list-style-type: none"> <li>(1) Packing Type</li> <li>(2) Package Type</li> <li>(3) Green Package</li> </ul>	<ul style="list-style-type: none"> <li>(1) R: Tape Reel</li> <li>(2) S14: SOP-14, P14: TSSOP-14</li> <li>(3) G: Halogen Free and Lead Free</li> </ul>
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### MARKING

SOP-14	TSSOP-14

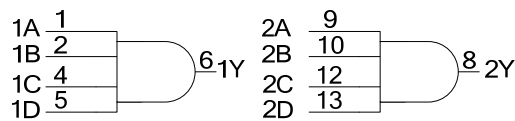
■ PIN CONFIGURATION



■ FUNCTION TABLE (each gate)

INPUT(A)	INPUT(B)	INPUT(C)	INPUT(D)	OUTPUT(Y)
H	H	H	H	L
L	X	X	X	H
X	L	X	X	H
X	X	L	X	H
X	X	X	L	H

■ LOGIC DIAGRAM



■ ABSOLUTE MAXIMUM RATING (unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V_{CC}$	-0.5~7	V
Input Clamp Current	$I_{IK}$	-20	mA
Output Clamp Current	$I_{OK}$	$\pm 20$	mA
Output Current	$I_{OUT}$	$\pm 25$	mA
$V_{CC}$ or GND Current	$I_{CC}$	$\pm 50$	mA
Storage Temperature	$T_{STG}$	-65 ~ +150	$^{\circ}C$

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	CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	$V_{CC}$		2		6	V
Input Voltage	$V_{IN}$		0		$V_{CC}$	V
Output Voltage	$V_{OUT}$		0		$V_{CC}$	V
Input Transition Rise or Fall Rate	$t_R, t_F$	$V_{CC}=2V$			1000	ns
		$V_{CC}=4.5V$			500	
		$V_{CC}=6V$			400	
Operating Temperature	$T_A$		-40		85	$^{\circ}C$

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	SOP-14	76	$^{\circ}C/W$
	TSSOP-14	113	

■ STATIC CHARACTERISTICS ( $T_A = 25^{\circ}C$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
High-Level Input Voltage	$V_{IH}$	$V_{CC} = 2V$	1.5			V
		$V_{CC} = 4.5V$	3.15			
		$V_{CC} = 6V$	4.2			
Low-Level Input Voltage	$V_{IL}$	$V_{CC} = 2V$			0.5	V
		$V_{CC} = 4.5V$			1.35	
		$V_{CC} = 6V$			1.8	
High-Level Output Voltage	$V_{OH}$	$V_{CC} = 2V, I_{OH} = 20\mu A$	1.9	1.998		V
		$V_{CC} = 4.5V, I_{OH} = 20\mu A$	4.4	4.999		
		$V_{CC} = 6V, I_{OH} = 20\mu A$	5.9	5.999		
		$V_{CC} = 4.5V, I_{OH} = 4mA$	3.98	4.3		
		$V_{CC} = 6V, I_{OH} = 5.2mA$	5.48	5.8		
Low-Level Output Voltage	$V_{OL}$	$V_{CC} = 2V, I_{OL} = 20\mu A$		0.002	0.1	V
		$V_{CC} = 4.5V, I_{OL} = 20\mu A$		0.001	0.1	
		$V_{CC} = 6V, I_{OL} = 20\mu A$		0.001	0.1	
		$V_{CC} = 4.5V, I_{OL} = 4mA$		0.17	0.26	
		$V_{CC} = 6V, I_{OL} = 5.2mA$		0.15	0.26	
Input Leakage Current	$I_{I(LEAK)}$	$V_{CC} = 6V, V_{IN} = V_{CC}$ or GND		$\pm 0.1$	$\pm 100$	nA
Quiescent Supply Current	$I_Q$	$V_{CC} = 6V, V_{IN} = V_{CC}$ or GND, $I_{OUT} = 0$			2	$\mu A$
Input Capacitance	$C_{IN}$	$V_{CC}=2V\sim 6V$		3	10	pF

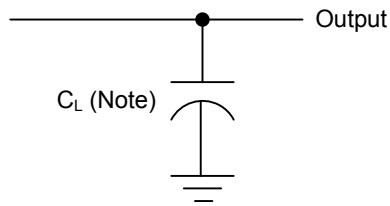
■ DYNAMIC CHARACTERISTICS ( $T_A=25^{\circ}\text{C}$ , Input:  $t_R=t_F=6\text{ns}$ , unless otherwise specified )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation delay from Input(A, B, C or D) to Output(Y)	$t_{PLH}, t_{PHL}$	$V_{CC}=2\text{V}, C_L=50\text{pF}$		45	110	ns
		$V_{CC}=4.5\text{V}, C_L=50\text{pF}$		14	22	
		$V_{CC}=6\text{V}, C_L=50\text{pF}$		11	19	
Output Transition Time	$t_T$	$V_{CC}=2\text{V}, C_L=50\text{pF}$		27	75	ns
		$V_{CC}=4.5\text{V}, C_L=50\text{pF}$		9	15	
		$V_{CC}=6\text{V}, C_L=50\text{pF}$		7	13	

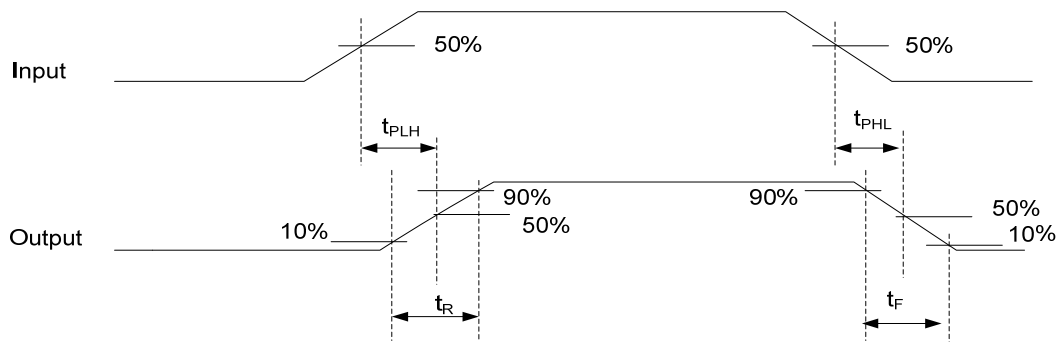
■ OPERATING CHARACTERISTICS ( $T_A=25^{\circ}\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Power Dissipation Capacitance	$C_{PD}$	No load		25		pF

## TEST CIRCUIT AND WAVEFORMS



Note : C<sub>L</sub> includes probe and jig capacitance.



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