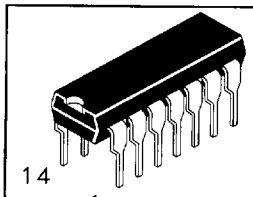
Dual 4-Input NAND Gate

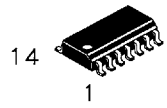
DV74HC20
DV74HCT20

This device is identical in pinout to the LS20. The device inputs are compatible with standard CMOS outputs; with pullup resistors, they are compatible with TTL FAMILY outputs.

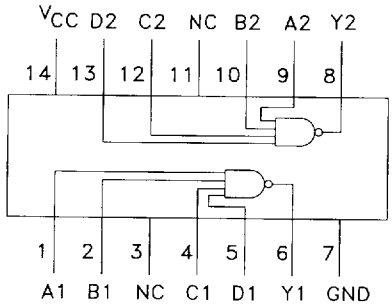
- **Output Drive Capability: 10 LSTTL Loads**
- **Outputs Directly Interface to CMOS, NMOS, and TTL**
- **Operating Voltage Range: 2 to 6 V for HC devices**
- **Low Input Current: 1 μA**
- **DC, AC parameters guaranteed from -55°C to 125°C**



N Suffix
Plastic DIP
AVG-001 Case



D Suffix
Plastic SOP
AVG-002 Case



NC = No Connection

TRUTH TABLE

Inputs				Outputs
A	**B**	**C**	**D**	**Y**
L	X	X	X	H
X	L	X	X	H
X	X	L	X	H
X	X	X	L	H
H	H	H	H	L

H = High Logic Level
L = Low Logic Level
X = Don't Care

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ABSOLUTE MAXIMUM RATINGS

Maximum ratings are those values beyond which damage to the device may occur.

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	–0.5 to +7.0	V
V_{IN}	DC Input Voltage (Referenced to GND)	–1.5 to V_{CC} +1.5	V
V_{OUT}	DC Output Voltage (Referenced to GND)	–0.5 to V_{CC} +0.5	V
I_{IN}	DC Input Current, per Pin	± 20	mA
I_{OUT}	DC Output Current, per Pin	± 25	mA
I_{CC}	DC Supply Current, V_{CC} and GND Pins	± 50	mA
P_D	Power Dissipation in Still Air, Plastic DIP SOP Package	750 500	mW
T_{STG}	Storage Temperature Range	–65 to,+150	°C
TL	Lead Temperature, 1mm from Case for 10 Seconds	260	°C

GUARANTEED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V_{CC}	DC Supply Voltage, HC (HCT), Referenced to GND	2.0 (4.5)	6.0 (5.5)	V
V_{IN}, V_{OUT}	DC Input Voltage, Output Voltage, Referenced to GND	0	V_{CC}	V
T_A	Ambient Temperature	–55	+125	°C
t_r, t_f	Input Rise and Fall Time: HC: V_{CC}=2.0V HCT: V_{CC}=5.5V / HC: V_{CC}=4.5V HC: V_{CC}=6.0V	0 0 0	1000 500 400	ns

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	Vcc V	Guaranteed Limits			Unit
				25°C to −55°C	≤85°C	≤125°C	
V_{IH}	Minimum High-Level Input Voltage	V_{OUT}=0.1V, or V_{OUT}=V_{CC}-0.1V $\|I_{OUT}\| \leq$ 20 µA	2.0 4.5 6.0	1.5 3.15 4.2	1.5 3.15 4.2	1.5 3.15 4.2	V
V_{IL}	Maximum Low- Level Input Voltage	V_{OUT}=0.1V, or V_{OUT}=V_{CC}-0.1V $\|I_{OUT}\| \leq$ 20 µA	2.0 4.5 6.0	0.3 0.9 1.2	0.3 0.9 1.2	0.3 0.9 1.2	V
V_{OH}	Minimum High-Level Output Voltage	V_{IN} = V_{IH} or V_{IL} $\|I_{OUT}\| \leq$ 20 µA	2.0 4.5 6.0	1.9 4.4 5.9	1.9 4.4 5.9	1.9 4.4 5.9	V
		V_{IN} = V_{IH} or V_{IL}, $\|I_{OUT}\| \leq$ 4.0mA $\|I_{OUT}\| \leq$ 5.2 mA	4.5 6.0	3.98 5.48	3.84 5.34	3.7 5.2	
V_{OL}	Maximum Low Level Output Voltage	V_{IN} = V_{IH} or V_{IL} $\|I_{OUT}\| \leq$ 20 µA	2.0 4.5 6.0	0.1 0.1 0.1	0.1 0.1 0.1	0.1 0.1 0.1	V
		V_{IN} = V_{IH} or V_{IL}, $\|I_{OUT}\| \leq$ 4.0mA $\|I_{OUT}\| \leq$ 5.2 mA	4.5 6.0	0.26 0.26	0.33 0.33	0.40 0.40	V
I_{IN}	Maximum Input Leakage Current	V_{IN} = V_{CC} or GND	6.0	± 0.1	± 1.0	± 1.0	µA
I_{CC}	Maximum Quiescent Supply Current (Per Package)	V_{IN} = V_{CC} or GND I_{OUT} = 0 µA	6.0	2.0	20	40	µA

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AC ELECTRICAL CHARACTERISTICS over full operating conditions (C_L=50 pF, Input t_f=t_r=6ns)

Symbol	Parameter	Vcc V	Guaranteed Limit			Unit
			25°C to −55°C	≤85°C	≤125°C	
t_{PLH}, t_{PHL}	Maximum Propagation Delay Time, Input A, B, C or D To Output Y	2.0 4.5 6.0	90 18 15	115 23 20	135 27 23	ns
t_{TLH}, t_{THL}	Maximum Output Transition Time Any Output	2.0 4.5 6.0	75 15 13	95 19 16	110 22 19	ns
C_{IN}	Maximum Input Capacitance	—	10	10	10	pF

C_{PD}	Power Dissipation Capacitance (Per Gate) Used to determine the no-load dynamic power consumption, $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$	Typical @ 25°C, V_{CC} = 5 V 26	pF

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V_{CC} V	Guaranteed Limits						Unit
				25°C to −55°C		≤85°C		≤125°C		
				Min	Max	Min	Max	Min	Max	
V_{IH}	Minimum High-Level Input Voltage	V_{OUT} = 0.1 V or V_{CC}–0.1 V $\|I_{OUT}\| \leq$ 20 µA	4.5 5.5	2.00 2.00		2.00 2.00		2.00 2.00		V
V_{IL}	Maximum Low- Level Input Voltage	V_{OUT} =0.1 V or V_{CC}– 0.1 V $\|I_{OUT}\| \leq$ 20 µA	4.5 5.5		0.80 0.80		0.80 0.80		0.80 0.80	V
V_{OH}	Minimum High-Level Output Voltage	V_{IN} = V_{IL} or VIH $\|I_{OUT}\| \leq$ 20 µA	4.5 5.5	4.40 5.40		4.40 5.40		4.40 5.40		V
		V_{IN} = V_{IL} or V_{IH} $|I_{OUT}| \leq$4.0 mA	4.5	3.98		3.84		3.70		V
V_{OL}	Maximum Low Level Output Voltage	V_{IN} = V_{IH} or V_{IL} $\|I_{OUT}\| \leq$ 20 µA	4.5 5.5		0.1 0.1		0.1 0.1		0.1 0.1	V
		V_{IN} = V_{IH} or V_{IL} $\|I_{OUT}\| \leq$ 4.0mA	4.5		0.26		0.33		0.40	V
I_{IN}	Maximum Input Leakage Current	V_{IN} = V_{CC} or GND	5.5		± 0.1		± 1.0		± 1.0	µA
I_{CC}	Maximum Quiescent Supply Current	V_{IN} = V_{CC} or GND $\|I_{OUT}\|$ = 0 µA	5.5		2.0		20		40	µA

Δ I_{CC}	Additional Quiescent Supply Current	V_{IN}=2.4V, Any One Input V_{IN}=V_{CC} or GND, Other Inputs I_{OUT}=0 µA	5.5	≥ −55°C	25°C to 125°C	mA
				2.9	2.4	

AC ELECTRICAL CHARACTERISTICS over full operating conditions (CL=50pF, Input t_f=t_r=6ns)

Symbol	Parameter	V_{CC} V	Guaranteed Limit						Unit
			25°C to −55°C		≤85°C		≤125°C		
			Min	Max	Min	Max	Min	Max	
t_{PLH}, t_{PHL}	Propagation Delay Time, Input to Output	5.0V ± 10%		28		35		42	ns
t_{TLH}, t_{THL}	Output Transition Time Any Output			15		19		22	ns
C_{IN}	Maximum Input Capacitance	—		10		10		10	pF

C_{PD}	Power Dissipation Capacitance (Per Inverter) Used to determine the no-load dynamic power consumption, P_D = C_{PD} $V_{CC}^2 f$ + I_{CC} V_{CC}	Typical @ 25°C, V_{CC} = 5 V	pF
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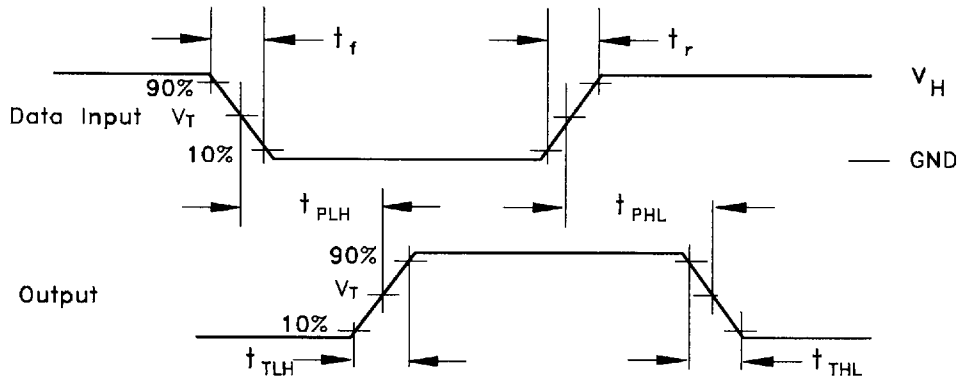
SWITCHING WAVEFORMS



Input and Output Threshold Voltage: V_T =50% V_{CC} for HC,
1.3V for HCT, V_H = V_{CC} for HC, 3V for HCT