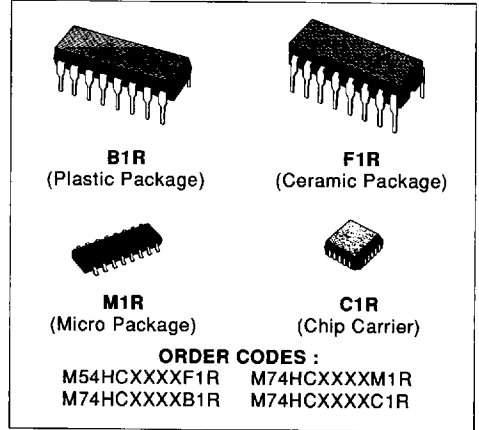


HC4049 HEX BUFFER/CONVERTER (INVERTER) HC4050 HEX BUFFER/CONVERTER

- HIGH SPEED
 $t_{PD} = 9 \text{ ns (TYP.) AT } V_{CC} = 5 \text{ V}$
- LOW POWER DISSIPATION
 $I_{CC} = 1 \mu\text{A (MAX.) AT } T_A = 25 \text{ }^\circ\text{C}$
- HIGH NOISE IMMUNITY
 $V_{NIH} = V_{NIL} = 28 \% V_{CC} \text{ (MIN.)}$
- OUTPUT DRIVE CAPABILITY
 15 LSTTL LOADS
- SYMMETRICAL OUTPUT IMPEDANCE
 $|I_{OH}| = I_{OL} = 6 \text{ mA (MIN.)}$
- BALANCED PROPAGATION DELAYS
 $t_{PLH} = t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE
 $V_{CC} \text{ (OPR)} = 2 \text{ V TO } 6 \text{ V}$
- PIN AND FUNCTION COMPATIBLE
 WITH 4049B/4050B



DESCRIPTION

The M54/74HC4049 and the M54/74HC4050 are high speed CMOS HEX BUFFER fabricated in silicon gate C²MOS technology.

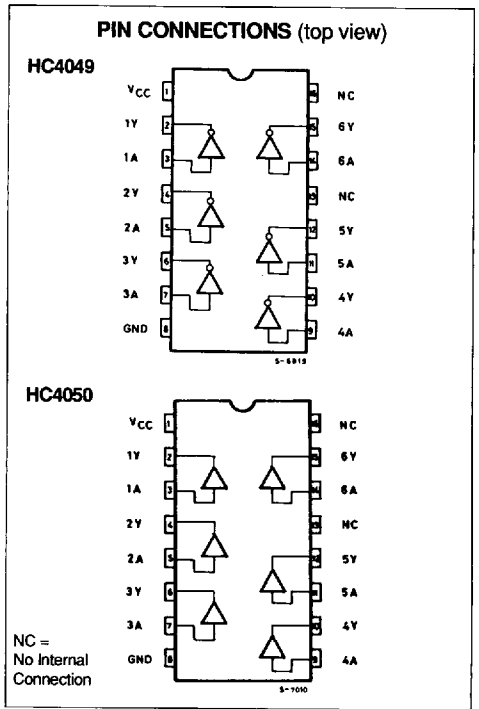
They have the same high speed performance of LSTTL combined with true CMOS low power consumption.

The M54/75HC4049 is an inverting buffer, while the M54/74HC4050 is a non-inverting buffer.

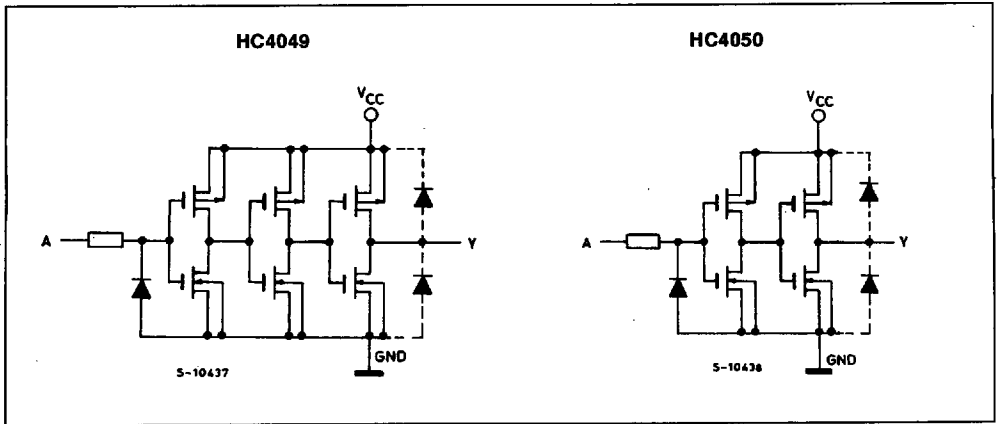
The internal circuit is composed of 3 stage or 2-stage inverters, which provides high noise immunity and a stable output.

Input protection circuits are different from those of the high speed CMOS IC's.

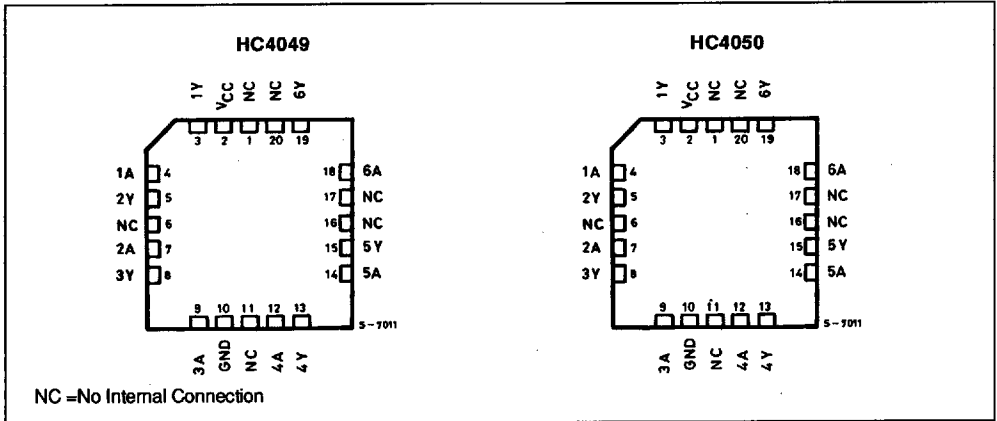
The VCC side diodes are designed to allow logic-level conversion from high-level voltages (up to 15 V) to low-level voltages.



CIRCUIT SCHEMATIC (Per Gate)



CHIP CARRIER



TRUTH TABLE (HC4049)

INPUT	OUTPUT
nA	nY
L	H
H	L

TRUTH TABLE (HC4050)

INPUT	OUTPUT
nA	nY
L	L
H	H

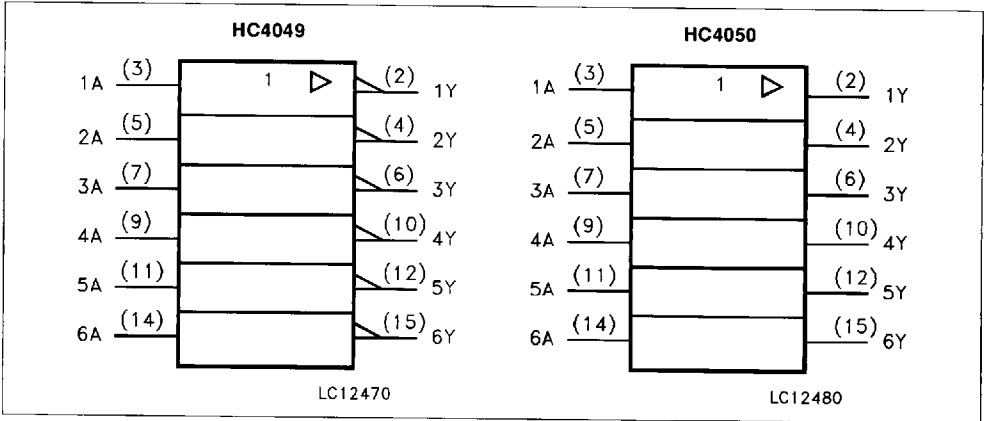
PIN DESCRIPTION (HC4049)

PIN No	SYMBOL	NAME AND FUNCTION
2, 4, 6, 10, 12, 15	$\overline{1Y}$ to $\overline{6Y}$	Data Outputs
3, 5, 7, 9, 11, 14	1A to 6A	Data Inputs
13, 16	NC	Not Connected
8	GND	Ground (0V)
1	V _{CC}	Positive Supply Voltage

PIN DESCRIPTION (HC4050)

PIN No	SYMBOL	NAME AND FUNCTION
2, 4, 6, 10, 12, 15	1Y to 6Y	Data Outputs
3, 5, 7, 9, 11, 14	1A to 6A	Data Inputs
13, 16	NC	Not Connected
8	GND	Ground (0V)
1	V _{CC}	Positive Supply Voltage

IEC LOGIC SYMBOLS



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CC}	Supply Voltage	-0.5 to +7	V
V _I	DC Input Voltage	-0.5 to V _{CC} + 0.5	V
V _O	DC Output Voltage	-0.5 to V _{CC} + 0.5	V
I _{IK}	DC Input Diode Current	± 20	mA
I _{OK}	DC Output Diode Current	± 20	mA
I _O	DC Output Source Sink Current Per Output Pin	± 25	mA
I _{CC} or I _{GND}	DC V _{CC} or Ground Current	± 50	mA
P _D	Power Dissipation	500 (*)	mW
T _{stg}	Storage Temperature	-65 to +150	°C
T _L	Lead Temperature (10 sec)	300	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied. (*) 500 mW: ± 65 °C derate to 300 mW by 10mW/°C: 65 °C to 85 °C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit	
V _{CC}	Supply Voltage	2 to 6	V	
V _I	Input Voltage	0 to V _{CC}	V	
V _O	Output Voltage	0 to V _{CC}	V	
T _{op}	Operating Temperature: M54HC Series M74HC Series	-55 to +125 -40 to +85	°C °C	
t _r , t _f	Input Rise and Fall Time	V _{CC} = 2 V V _{CC} = 4.5 V V _{CC} = 6 V	0 to 1000 0 to 500 0 to 400	ns

DC SPECIFICATIONS

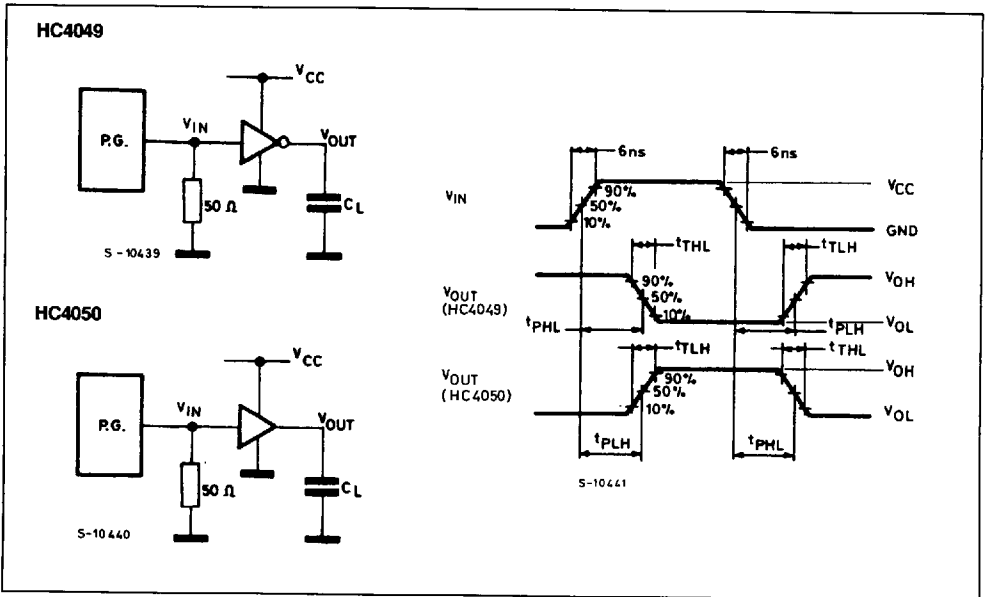
Symbol	Parameter	Test Conditions		Value						Unit			
				T _A = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC				
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.		
V _{IH}	High Level Input Voltage	V _{CC} (V)		1.5			1.5		1.5	V			
				3.15			3.15		3.15				
				4.2			4.2		4.2				
V _{IL}	Low Level Input Voltage	V _{CC} (V)				0.5		0.5		0.5	V		
						1.35		1.35		1.35			
						1.8		1.8		1.8			
V _{OH}	High Level Output Voltage	V _{CC} (V)	V _I = V _{IH} or V _{IL} I _O = -20 µA	1.9	2.0		1.9		1.9	V			
				4.4	4.5		4.4		4.4				
				5.9	6.0		5.9		5.9				
				4.5		I _O = -6.0 mA	4.18	4.31			4.13		4.10
				6.0		I _O = -7.8 mA	5.68	5.8			5.63		5.60
V _{OL}	Low Level Output Voltage	V _{CC} (V)	V _I = V _{IH} or V _{IL} I _O = 20 µA		0.0	0.1		0.1		0.1	V		
					0.0	0.1		0.1		0.1			
					0.0	0.1		0.1		0.1			
					0.17	0.26		0.33		0.40			
					0.18	0.26		0.33		0.40			
I _I	Input Leakage Current	6.0	V _I = V _{CC} or GND V _I = 15 V			±0.1 ±0.5		±1 ±5		±1	µA		
I _{CC}	Quiescent Supply Current	6.0	V _I = V _{CC} or GND			1		10		20	µA		

AC ELECTRICAL CHARACTERISTICS ($C_L = 50 \text{ pF}$, Input $t_r = t_f = 6 \text{ ns}$)

Symbol	Parameter	Test Conditions		Value						Unit	
		V_{CC} (V)	C_L (pF)	$T_A = 25^\circ\text{C}$ 54HC and 74HC			$-40 \text{ to } 85^\circ\text{C}$ 74HC		$-55 \text{ to } 125^\circ\text{C}$ 54HC		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
t_{TLH} t_{THL}	Output Transition Time	2.0 4.5 6.0	50	25 7 6	60 12 10	75 15 13	90 18 15			ns	
t_{PLH} t_{PHL}	Propagation Delay Time	2.0 4.5 6.0 2.0 4.5 6.0	50 150	30 9 8 45 14 12	75 15 13 100 20 17	95 19 16 125 25 21	115 23 20 150 30 36			ns	
C_{IN}	Input Capacitance			5	10	10	10			pF	
$C_{PD} (*)$	Power Dissipation Capacitance			26						pF	

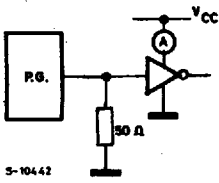
C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. $I_{CC(oper)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$ (per Gate)

SWITCHING CHARACTERISTICS TEST WAVEFORM

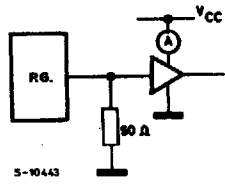


TEST CIRCUIT I_{CC} (Opr.)

HC4049



HC4050



INPUT WAVEFORM IS THE SAME AS THAT IN CASE OF SWITCHING CHARACTERISTICS TEST.