

HS-C²MOS™ INTEGRATED CIRCUITS

040675 (4049)
040679 (4050)



HC 4049 HEX BUFFER/CONVERTER (INV.) HC 4050 HEX BUFFER/CONVERTER

DESCRIPTION

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

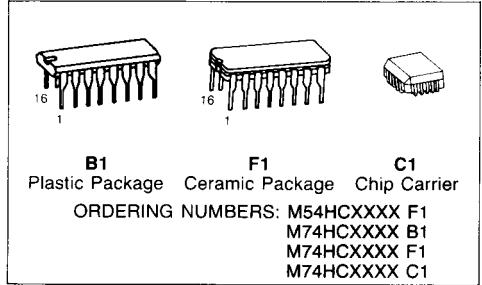
They have the same high speed performance of LSTTL combined with true CMOS low power consumption.

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 enables high noise immunity and stable output.

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

The V_{CC} side diodes are emitted to allow logic-level conversion from high-level voltages (up to 8V) to low-level voltages.

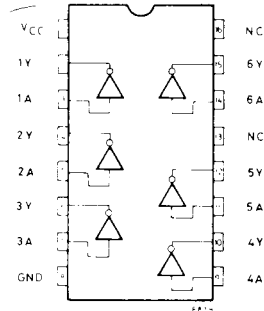


FEATURES

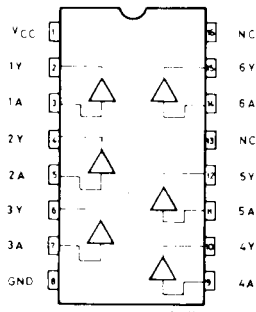
- High Speed
t_{PD} = 10 ns (Typ.) at V_{CC} = 5V
- Low Power Dissipation
I_{CC} = 1 μA (Max.) at T_A = 25°C
- High Noise Immunity
V_{NIH} = V_{NIL} = 28% V_{CC} (Min.)
- Output Drive Capability
15 LSTTL Loads
- Symmetrical Output Impedance
|I_{OH}| = I_{OL} = 6 mA (Min.)
- Balanced Propagation Delays
t_{PLH} = t_{PHL}
- Wide Operating Voltage Range
V_{CC} (opr) = 2V to 6V
- Pin and Function compatible
with 4049B / 4050B

PIN CONNECTIONS (top view)

HC4049



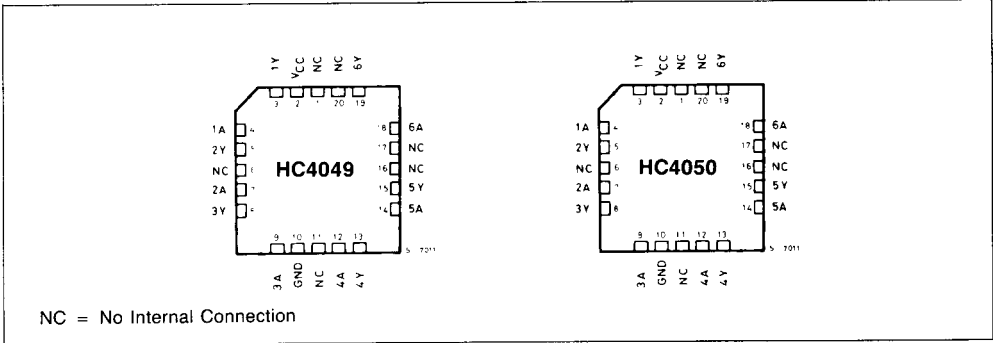
HC4050



Dual in line



CHIP CARRIER



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	± 35	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	± 70	mA
P_D	Power Dissipation	500 (*)	mW
T_{stg}	Storage Temperature	- 65 to 150	$^{\circ}C$

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

(*) 500 mW: $\cong 65^{\circ}C$ derate to 300 mW by 10 mW/ $^{\circ}C$: $65^{\circ}C$ to $85^{\circ}C$.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Limit	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_A	Operating Temperature	74HC Series - 40 to 85 54HC Series - 55 to 125	$^{\circ}C$
t_r, t_f	Input Rise and Fall Time	$V_{CC} \begin{cases} 2 \text{ V} & 0 \text{ to } 1000 \\ 4.5 \text{ V} & 0 \text{ to } 500 \\ 6 \text{ V} & 0 \text{ to } 400 \end{cases}$	ns

DC SPECIFICATIONS

Symbol	Parameter	V _{CC}	Test Condition	T _A = 25°C 54HC and 74HC			- 40 to 85°C 74HC		- 55 to 125°C 54HC		Unit	
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.		
V _{IH}	High Level Input Voltage	2.0		1.5	—	—	1.5	—	1.5	—	V	
		4.5		3.15	—	—	3.15	—	3.15	—		
		6.0		4.2	—	—	4.2	—	4.2	—		
V _{IL}	Low Level Input Voltage	2.0		—	—	0.5	—	0.5	—	0.5	V	
		4.5		—	—	1.35	—	1.35	—	1.35		
		6.0		—	—	1.8	—	1.8	—	1.8		
V _{OH}	High Level Output Voltage	2.0	V _I	I _O	1.9	2.0	—	1.9	—	1.9	—	V
		4.5	V _{IH} or V _{IL}	- 20 μA	4.4	4.5	—	4.4	—	4.4	—	
		6.0			5.9	6.0	—	5.9	—	5.9	—	
		4.5	- 6.0 mA - 7.8 mA	4.18	4.31	—	4.13	—	4.10	—		
		6.0		5.68	5.8	—	5.63	—	5.60	—		
V _{OL}	Low Level Output Voltage	2.0	V _{IH} or V _{IL}	20 μA 6.0 mA 7.8 mA	—	0	0.1	—	0.1	—	0.1	V
		4.5			—	0	0.1	—	0.1	—	0.1	
		6.0			—	0	0.1	—	0.1	—	0.1	
		4.5			—	0.17	0.26	—	0.33	—	0.40	
		6.0			—	0.18	0.26	—	0.33	—	0.40	
I _I	Input Leakage Current	6.0	V _I = V _{CC} or GND	—	—	±0.1	—	±1		±1	μA	
I _{CC}	Quiescent Supply Current	6.0	V _I = V _{CC} or GND	—	—	1	—	10		20	μA	

AC ELECTRICAL CHARACTERISTICS (V_{CC} = 5V, T_A = 25°C, C_L = 15pF, Input t_r = t_f = 6ns)

Symbol	Parameter	54HC and 74HC			Unit
		MIN.	TYP.	MAX.	
t _{TLH} t _{THL}	Output Transition Time		7	11	ns
t _{PLH} t _{PHL}	Propagation Delay Time		11	18	ns

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

Symbol	Parameter	V_{CC}	Test Condition	$T_A = 25^\circ\text{C}$ 54HC and 74HC			-40 to 85°C 74HC		-55 to 125°C 54HC		Unit
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t_{TLH} t_{THL}	Output Transition Time	2.0 4.5 6.0		— — —	24 6 5	60 12 10	— — —	75 15 13			ns
t_{PLH} t_{PHL}	Propagation Delay Time	2.0 4.5 6.0		— — —	35 12 10	100 20 17	— — —	120 24 21			ns
C_{IN}	Input Capacitance			—	5	10	—	10			pF
$C_{PD} (*)$	Power Dissipation Capacitance			—	25	—	—	—			

Note (*) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the following equation.

$$I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/6 \text{ (per Gate).}$$