

040632

HS-C²MOS™ INTEGRATED CIRCUITS

PRELIMINARY DATA

QUAD 2-INPUT AND GATE

DESCRIPTION

The M54/74HC08 is a high speed CMOS QUAD 2-INPUT AND GATE fabricated in silicon gate C²MOS technology. It has the same high speed performance of LSTTL combined with true CMOS low power consumption.

The internal circuit is composed of 2 stages including buffer output, which gives high noise immunity and stable output.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.

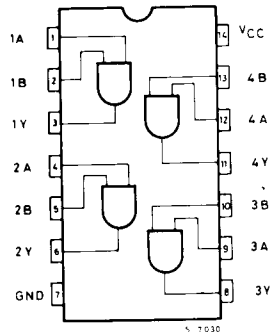
B1 Plastic Package **F1** Ceramic Package **C1** Chip Carrier

ORDERING NUMBERS: M54HC08 F1
M74HC08 B1 ✓
M74HC08 F1 ✓
M74HC08 C1 ✓

FEATURES

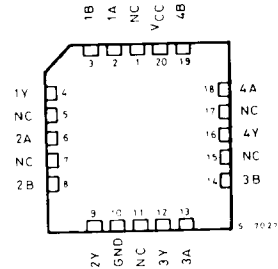
- High Speed
 $t_{PD} = 7 \text{ ns (Typ.) at } V_{CC} = 5V$
- Low Power Dissipation
 $I_{CC} = 1 \mu A \text{ (Max.) at } T_A = 25^\circ C$
- High Noise Immunity
 $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (Min.)}$
- Output Drive Capability
10 LSTTL Loads
- Symmetrical Output Impedance
 $|I_{OH}| = I_{OL} = 4 \text{ mA (Min.)}$
- Balanced Propagation Delays
 $t_{PLH} = t_{PHL}$
- Wide Operating Voltage Range
 $V_{CC} \text{ (opr)} = 2V \text{ to } 6V$
- Pin and Function compatible
with 54/74LS08

PIN CONNECTIONS (top view)



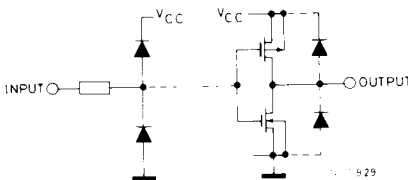
Dual in line

CHIP CARRIER

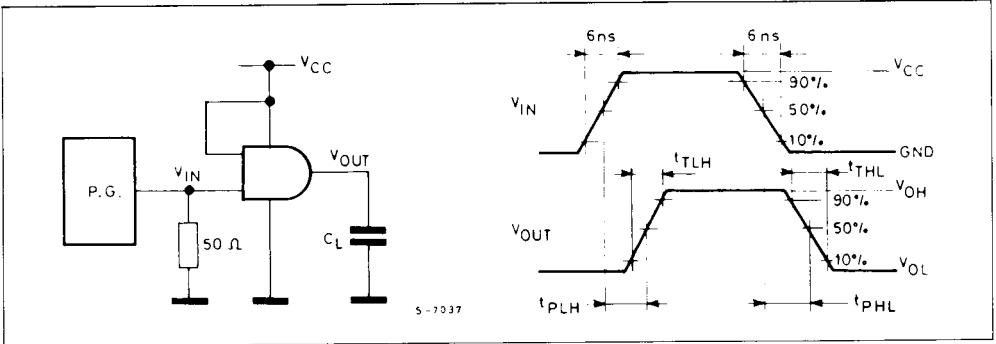


NC = No Internal Connection

INPUT AND OUTPUT EQUIVALENT CIRCUIT



SWITCHING CHARACTERISTICS TEST CIRCUIT



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	$^{\circ}C$

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

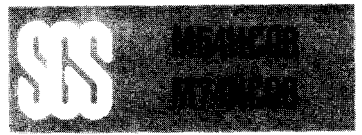


DC SPECIFICATIONS

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 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}	Low Level Input Voltage	2.0 4.5 6.0		— — —	— — —	0.5 1.35 1.8	— — —	0.5 1.35 1.8	— — —	0.5 1.35 1.8	V	
V _{OH}	High Level Output Voltage	2.0 4.5 6.0 4.5 6.0	V _I	I _O	1.9	2.0	—	1.9	—	1.9	—	V
			V _{IH} or V _{IL}	-20 μA	4.4	4.5	—	4.4	—	4.4	—	
			V _{IH} or V _{IL}	-4.0 mA	4.18	4.31	—	4.13	—	4.10	—	
				-5.2 mA	5.68	5.8	—	5.63	—	5.60	—	
V _{OL}	Low Level Output Voltage	2.0 4.5 6.0 4.5 6.0	V _{IH} or V _{IL}	20 μA	—	0	0.1	—	0.1	—	0.1	V
				—	0	0.1	—	0.1	—	0.1		
				—	0	0.1	—	0.1	—	0.1		
				4.0 mA	—	0.17	0.26	—	0.33	—	0.40	
5.2 mA	—	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		4	8	ns
t _{PLH} t _{PHL}	Propagation Delay Time		9	15	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		—	30	75	—	90			ns
		4.5		—	8	15	—	18			
		6.0		—	7	13	—	16			
t_{PLH} t_{PHL}	Propagation Delay Time	2.0		—	38	90	—	110			ns
		4.5		—	10	18	—	22			
		6.0		—	9	16	—	19			
C_{IN}	Input Capacitance			—	5	10	—	10			pF
$C_{PD} (*)$	Power Dissipation Capacitance			—	21	—	—	—			

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.

$$I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/4 \text{ (per Gate).}$$