

048385

# HS-C<sup>2</sup>MOS™ INTEGRATED CIRCUITS

## PRELIMINARY DATA

### DUAL 4-INPUT OR GATE

#### DESCRIPTION

The M54/74HC4072 is a high speed CMOS DUAL 4-INPUT OR GATE fabricated in silicon gate C<sup>2</sup>MOS technology. It has the same high speed performance of LSTTL combined with true CMOS low power consumption.

The internal circuit is composed of 3 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.

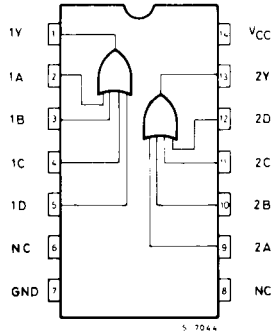
**B1** Plastic Package      **F1** Ceramic Package      **C1** Chip Carrier

ORDERING NUMBERS: M54HC4072 F1  
M74HC4072 B1  
M74HC4072 F1  
M74HC4072 C1

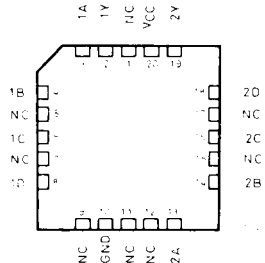
#### FEATURES

- High Speed  
 $t_{PD} = 11 \text{ ns (Typ.) at } V_{CC} = 5V$
- 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 4072 B

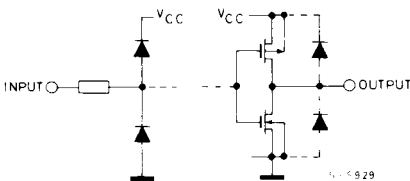
#### PIN CONNECTIONS (top view)



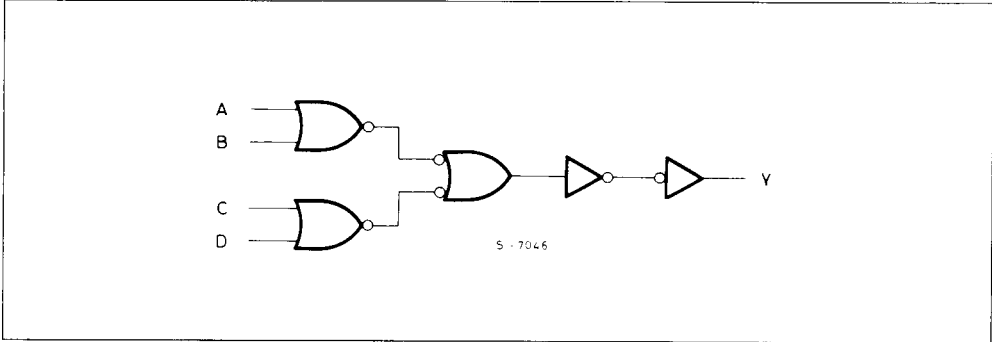
#### CHIP CARRIER



#### INPUT AND OUTPUT EQUIVALENT CIRCUIT



### LOGIC DIAGRAM (1/2 of Device Show)



### 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	$\pm 20$	mA
$I_{OK}$	DC Output Diode Current	$\pm 20$	mA
$I_O$	DC Output Source Sink Current Per Output Pin	$\pm 25$	mA
$I_{CC}$ or $I_{GND}$	DC $V_{CC}$ or Ground Current	$\pm 50$	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 54HC Series	- 40 to 85 - 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 <sub>CC</sub>	Test Condition	T <sub>A</sub> = 25°C 54HC and 74HC			- 40 to 85°C 74HC		- 55 to 125°C 54HC		Unit	
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.		
V <sub>IH</sub>	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 <sub>IL</sub>	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 <sub>OH</sub>	High Level Output Voltage	2.0 4.5 6.0 4.5 6.0	V <sub>I</sub>	I <sub>O</sub>	1.9	2.0	—	1.9	—	1.9	—	V
			V <sub>IH</sub> or V <sub>IL</sub>	- 20 μA	4.4 5.9	4.5 6.0	— —	4.4 5.9	— —	4.4 5.9	— —	
				- 4.0 mA - 5.2 mA	4.18 5.68	4.31 5.8	— —	4.13 5.63	— —	4.10 5.60	— —	
V <sub>OL</sub>	Low Level Output Voltage	2.0 4.5 6.0 4.5 6.0	V <sub>IH</sub> or V <sub>IL</sub>	20 μA	— — —	0 0 0	0.1 0.1 0.1	— — —	0.1 0.1 0.1	— — —	0.1 0.1 0.1	V
				4.0 mA 5.2 mA	— —	0.17 0.18	0.26 0.26	— —	0.33 0.33	— —	0.40 0.40	
I <sub>I</sub>	Input Leakage Current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND	—	—	±0.1	—	±1		±1	μA	
I <sub>CC</sub>	Quiescent Supply Current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND	—	—	1	—	10		20	μA	

### AC ELECTRICAL CHARACTERISTICS (V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C, C<sub>L</sub> = 15pF, Input t<sub>r</sub> = t<sub>f</sub> = 6ns)

Symbol	Parameter	54HC and 74HC			Unit
		MIN.	TYP.	MAX.	
t <sub>TLH</sub> t <sub>THL</sub>	Output Transition Time		4	8	ns
t <sub>PLH</sub> t <sub>PHL</sub>	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 $85^\circ\text{C}$ 74HC		$-55$ to $125^\circ\text{C}$ 54HC		Unit
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
$t_{TLH}$ $t_{THL}$	Output Transition Time	2.0 4.5 6.0		— — —	30 8 7	75 15 13	— — —	90 18 16			ns
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time	2.0 4.5 6.0		— — —	50 14 12	110 22 19	— — —	130 26 23			ns
$C_{IN}$	Input Capacitance			—	5	10	—	10			pF
$C_{PD} (*)$	Power Dissipation Capacitance			—	28	—	—	—			

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.

$$I_{CC(\text{opr})} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/2 \text{ (per Gate)}$$