

HS-C²MOS™ INTEGRATED CIRCUITS

041934

M54HC27
M74HC27

PRELIMINARY DATA

TRIPLE 3-INPUT NOR GATE

DESCRIPTION

The M54/74HC27 is a high speed CMOS TRIPLE 3-INPUT NOR 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 3 stages including buffer output, which enables high noise immunity and stable output. All inputs are equipped with protection circuits against static discharge or transient excess voltage.

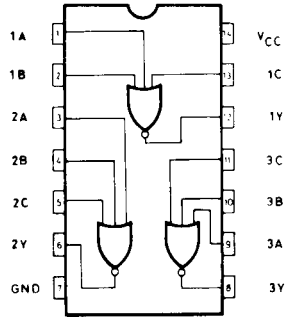
B1 Plastic Package **F1** Ceramic Package **C1** Chip Carrier

ORDERING NUMBERS: M54HC27 F1
M74HC27 B1
M74HC27 F1
M74HC27 C1

FEATURES

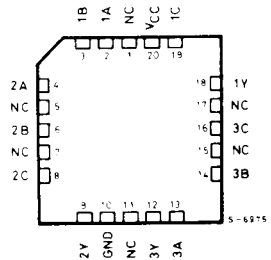
- High Speed
 $t_{PD} = 10 \text{ ns (Typ.) at } V_{CC} = 5\text{V}$
- Low Power Dissipation
 $I_{CC} = 1 \mu\text{A (Max.) at } T_A = 25^\circ\text{C}$
- High Noise Immunity
 $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (Min.)}$
- Output Drive Capability
10 LSTTL Loads
- Symmetrical Output Impedance
 $|I_{OH}| = I_{OL} = 4 \text{ mA (Min.)}$
- Balanced Propagation Delays
 $t_{PLH} = t_{PHL}$
- Wide Operating Voltage Range
 $V_{CC} \text{ (opr)} = 2\text{V to } 6\text{V}$
- Pin and Function compatible with 54/74LS27

PIN CONNECTIONS (top view)



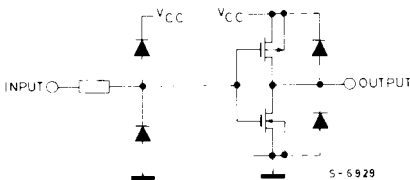
Dual in Line

CHIP CARRIER



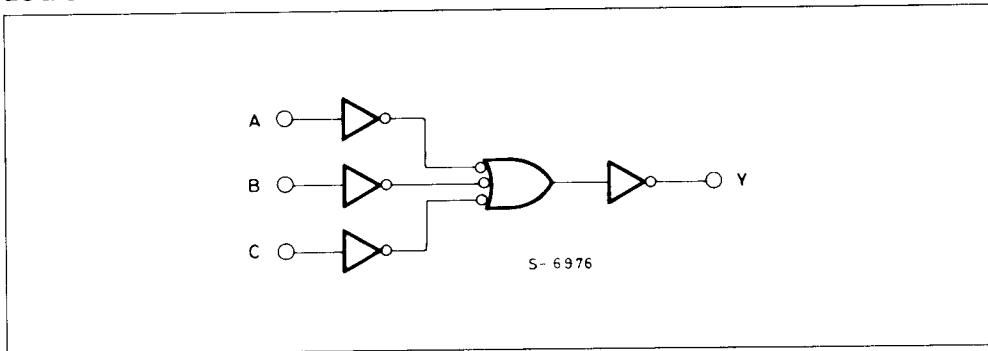
NC = No Internal Connection

INPUT AND OUTPUT EQUIVALENT CIRCUIT





LOGIC DIAGRAM



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 conditions 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	$^{\circ}C$
t_r, t_f	Input Rise and Fall Time	V_{CC} { 2 V 4.5V 6 V	ns
			0 to 1000 0 to 500 0 to 400

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	-4.0 mA -5.2 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	—	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		4.0 mA 5.2 mA	—	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		4	8	ns
t _{PLH} t _{PHL}	Propagation Delay Time		9	15	ns

M54HC27**M74HC27****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		— — —	22 8 7	75 15 13	— — —	90 18 16			ns
t_{PLH} t_{PHL}	Propagation Delay Time	2.0 4.5 6.0		— — —	50 11 10	90 18 16	— — —	110 22 19			ns
C_{IN}	Input Capacitance			—	5	10	—	10			pF
C_{PD} (*)	Power Dissipation Capacitance			—	27	—	—	—			

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.

$$I_{CC(opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/3 \text{ (per Gate)}$$