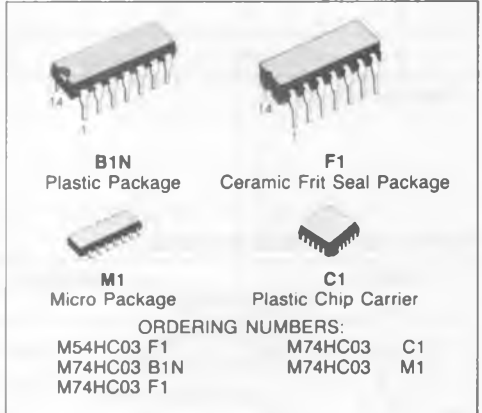


QUAD 2-INPUT OPEN DRAIN NAND GATE

- **LOW POWER DISSIPATION**
 $I_{CC} = 1 \mu A$ (MAX.) at $T_A = 25^\circ C$
- **HIGH NOISE IMMUNITY**
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (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} (OPR) = 2V to 6V
- **PIN AND FUNCTION COMPATIBLE**
 WITH 54/74LS03

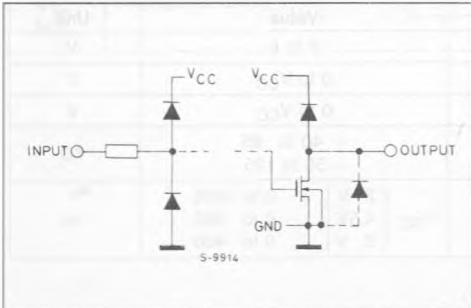


DESCRIPTION

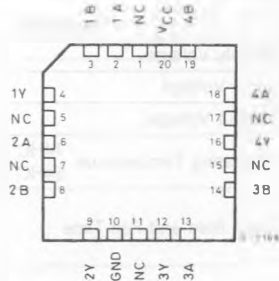
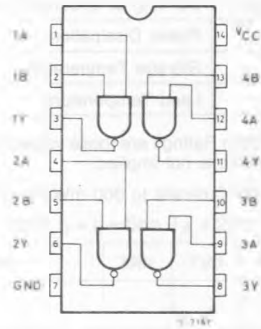
The M54/74HC03 is a high speed CMOS QUAD 2-INPUT OPEN DRAIN NAND GATE fabricated in silicon gate C²MOS technology. It has the same high speed performance of LSTTL combined with true CMOS low power consumption.

The internal circuit is composed of 3 stages including buffer output, which gives high noise immunity and stable output. This device can, with an external pull-up resistor, be used in wired AND configuration. This device can be also used as a led driver and in any other application requiring a current sink. All inputs are equipped with protection circuits against static discharge and transient excess voltage.

INPUT AND OUTPUT EQUIVALENT CIRCUIT



PIN CONNECTIONS (top view)



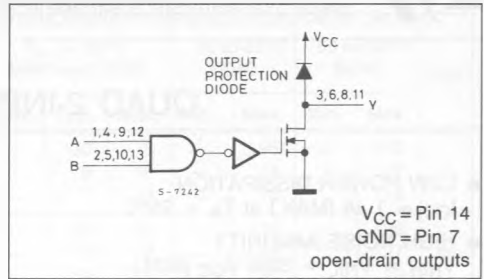
NC =
No Internal
Connection

TRUTH TABLE

INPUTS		OUTPUT
A	B	Y
L	L	Z
L	H	Z
H	L	Z
H	H	L

Z = HIGH IMPEDANCE

CIRCUIT 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	°C
T _L	Lead Temperature	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 10 mW/°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 _A	Operating Temperature	74HC Series 54HC Series	- 40 to 85 - 55 to 125	°C
t _r , t _f	Input Rise and Fall Time	V _{CC} { 2 V 4.5V 6 V	0 to 1000 0 to 500 0 to 400	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 _{OL}	Low Level Output Voltage	2.0 4.5 6.0	V _I	I _O	—	0	0.1	—	0.1	—	0.1	V
			V _{IH} or V _{IL}	20 μA	—	0	0.1	—	0.1	—	0.1	
			4.5 6.0	4.0 mA 5.2 mA	—	0.17	0.26	—	0.33	—	0.40	
					—	0.18	0.26	—	0.33	—	0.40	
I _I	Input Leakage Current	6.0	V _{IN} = V _{CC} or GND	—	—	±0.1	—	±1.0	—	±1.0	μA	
I _{OZ}	Output Leakage Current	6.0	V _I = V _{IH} or V _{IL} V _O = V _{CC} or GND	—	—	±0.5	—	±5.0	—	±10		
I _{CC}	Quiescent Supply Current	6.0	V _{IN} = V _{CC} or GND	—	—	1	—	10	—	20	μA	

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

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
t _{TLH} t _{THL}	Output Transition Time			4	8	ns
t _{PLZ} t _{PZL}	Propagation Delay Time	C _L = 5pF		8	16	ns
		C _L = 15pF		10	20	

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		—	30 8 7	75 15 13	—	95 19 16	—	110 22 19	ns
t_{PZL} t_{PLZ}	Propagation Delay Time	2.0 4.5 6.0	$R_L = 1\text{K}\Omega$	—	52 13 11	125 25 21	—	155 31 26	—	190 38 32	ns
C_{IN}	Input Capacitance			—	5	10	—	10	—	10	pF
C_{OUT}	Output Capacitance			—	5	—	—	—	—	—	pF
$C_{PD} (*)$	Power Dissipation Capacitance			—	17	—	—	—	—	—	pF

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 from the equation:

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

TYPICAL APPLICATIONS

Wired AND

S-9915

LED Driver with Blanking

S-9916

Typical values

- $V_{CC} = 5\text{V}$
- $V_D = 2\text{V}$
- $V_{DS} = 0.4\text{V}$
- $R_D = 120 - 270\Omega$

$I_D = 10 - 20\text{mA}$

$$R_D = \frac{V_{CC} - V_D - V_{DS}}{I_D} = \frac{5 - 2 - 0.4}{(10 - 20)10^{-3}} = 130 - 260\Omega$$

$$W = Y1 Y2 \dots Yn = \frac{A1B1 \ A2B2 \dots \ AnBn}{= A1B1 + A2B2 + \dots \ AnBn}$$