

MC74AC00, MC74ACT00

Quad 2-Input NAND Gate

High-Performance Silicon-Gate CMOS

Features

- Output Drive Capability: ± 24 mA
- Operating Voltage Range: 2 to 6 V AC00; 4.5 to 5.5 ACT00
- Low Input Current: 1.0 μ A
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance With the JEDEC Standard No. 7A Requirements
- Chip Complexity: 32 FETs
- Pb-Free Packages are Available

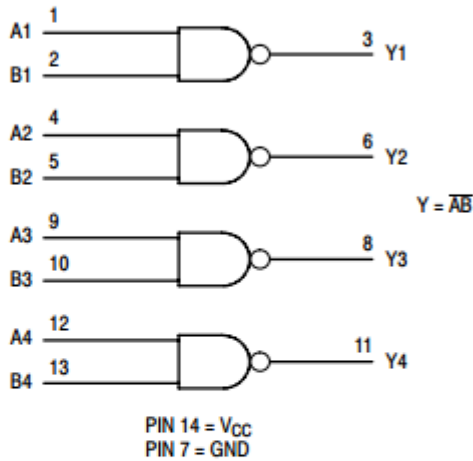


Figure 1. Logic Diagram

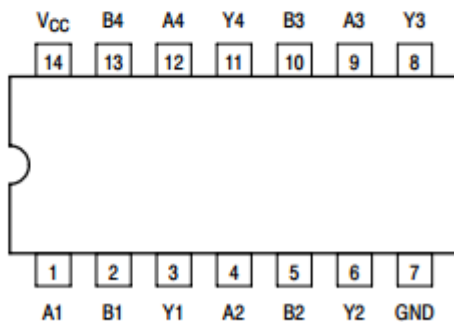
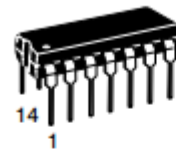
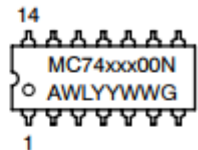


Figure 2. Pinout: 14-Lead Packages (Top View)

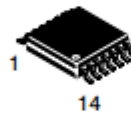
MARKING DIAGRAMS



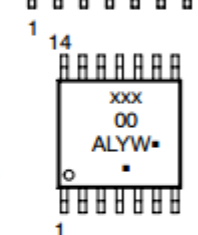
PDIP-14
N SUFFIX
CASE 646



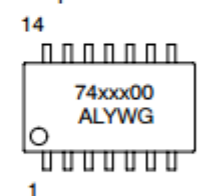
SOIC-14
D SUFFIX
CASE 751A



TSSOP-14
DT SUFFIX
CASE 948G



SOEIAJ-14
M SUFFIX
CASE 965



xxx = AC or ACT
A = Assembly Location
WL or L = Wafer Lot
YY or Y = Year
WW or W = Work Week
G = Pb-Free Package

FUNCTION TABLE

Inputs		Output
A	B	Y
L	L	H
L	H	H
H	L	H
H	H	L

MC74AC00, MC74ACT00

MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CC}	DC Supply Voltage	-0.5 to +7.0	V
V _I	DC Input Voltage	-0.5 ≤ V _I ≤ V _{CC} + 0.5	V
V _O	DC Output Voltage (Note 1)	-0.5 ≤ V _O ≤ V _{CC} + 0.5	V
I _{IK}	DC Input Diode Current	±20	mA
I _{OK}	DC Output Diode Current	±50	mA
I _O	DC Output Sink/Source Current	±50	mA
I _{CC}	DC Supply Current per Output Pin	±50	mA
I _{GND}	DC Ground Current per Output Pin	±50	mA
T _{STG}	Storage Temperature Range	-65 to +150	°C
T _L	Lead temperature, 1 mm from Case for 10 Seconds	260	°C
T _J	Junction temperature under Bias	+150	°C
θ _{JA}	Thermal resistance PDIP SOIC TSSOP	78 125 170	°C/W
P _D	Power Dissipation in Still Air at 85°C PDIP SOIC TSSOP	78 125 170	mW
MSL	Moisture Sensitivity	Level 1	
FR	Flammability Rating Oxygen Index: 30% – 35%	UL 94 V-0 @ 0.125 in	
V _{ESD}	ESD Withstand Voltage Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4)	> 2000 > 200 > 1000	V
I _{Latch-Up}	Latch-Up Performance Above V _{CC} and Below GND at 85°C (Note 5)	±100	mA

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. I_O absolute maximum rating must be observed.
2. Tested to EIA/JESD22-A114-A.
3. Tested to EIA/JESD22-A115-A.
4. Tested to JESD22-C101-A.
5. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Typ	Max	Unit
V _{CC}	Supply Voltage MC74AC00 MC74ACT00	2.0 4.5	5.0 5.0	6.0 5.5	V
V _{in} , V _{out}	DC Input Voltage, Output Voltage (Ref. to GND)	0	-	V _{CC}	V
t _r , t _f	Input Rise and Fall Time (Note 6) MC74AC00 V _{CC} @ 3.0 V V _{CC} @ 4.5 V V _{CC} @ 5.5 V	- - -	150 40 25	- - -	ns/V
t _r , t _f	Input Rise and Fall Time (Note 7) MC74ACT00 V _{CC} @ 4.5 V V _{CC} @ 5.5 V	- -	10 8.0	- -	ns/V
T _J	Junction Temperature	-	-	150	°C
T _A	Operating Ambient Temperature Range	-55	25	125	°C
I _{OH}	Output Current – High	-	-	-24	mA
I _{OL}	Output Current – Low	-	-	24	mA

6. V_{in} from 30% to 70% V_{CC}.
7. V_{in} from 0.8 V to 2.0 V.

DC CHARACTERISTICS

Symbol	Parameter	V _{CC} (V)	MC74AC00						Unit	Conditions
			T _A = +25°C		T _A = -40°C to +85°C		T _A = -55°C to +125°C			
			Typ	Guaranteed Limits						
V _{IH}	Minimum High Level Input Voltage	3.0	1.5	2.1	2.1		2.1		V	V _{OUT} = 0.1 V or V _{CC} - 0.1 V
		4.5	2.25	3.15	3.15		3.15			
		5.5	2.75	3.85	3.85		3.85			
V _{IL}	Maximum Low Level Input Voltage	3.0	1.5	0.9	0.9		0.9		V	V _{OUT} = 0.1 V or V _{CC} - 0.1 V
		4.5	2.25	1.35	1.35		1.35			
		5.5	2.75	1.65	1.65		1.65			
V _{OH}	Minimum High Level Output Voltage	3.0	2.99	2.9	2.9		2.9		V	I _{OUT} = -50 μA
		4.5	4.49	4.4	4.4		4.4			
		5.5	5.49	5.4	5.4		5.4			
		3.0	-	2.56	2.46		2.4		V	*V _{IN} = V _{IL} or V _{IH} -12 mA I _{OH} -24 mA -24 mA
		4.5	-	3.86	3.76		3.7			
		5.5	-	4.86	4.76		4.7			
V _{OL}	Maximum Low Level Output Voltage	3.0	0.002	0.1	0.1		0.1		V	I _{OUT} = 50 μA
		4.5	0.001	0.1	0.1		0.1			
		5.5	0.001	0.1	0.1		0.1			
		3.0	-	0.36	0.44		0.5		V	*V _{IN} = V _{IL} or V _{IH} 12 mA I _{OL} 24 mA 24 mA
		4.5	-	0.36	0.44		0.5			
		5.5	-	0.36	0.44		0.5			
I _{IN}	Maximum Input Leakage Current	5.5	-	±0.1	±1.0		±1.0		μA	V _I = V _{CC} , GND
I _{OLD}	†Minimum Dynamic Output Current	5.5	-	-	75		50		mA	V _{OLD} = 1.65 V Max
I _{OHD}		5.5	-	-	-75		-50		mA	V _{OHD} = 3.85 V Min
I _{CC}	Maximum Quiescent Supply Current	5.5	-	4.0	40		40		μA	V _{IN} = V _{CC} or GND

*All outputs loaded; thresholds on input associated with output under test.

†Maximum test duration 2.0 ms, one output loaded at a time.

NOTE: I_{IN} and I_{CC} @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V V_{CC}.

AC CHARACTERISTICS (t_r = t_f = 3.0 nS; C_L = 50 pF; see Figures 3 and 4 for Waveforms)

Symbol	Parameter	V _{CC} * (V)	MC74AC00								Unit
			T _A = +25°C			T _A = -40°C to +85°C		T _A = -55°C to +125°C			
			Min	Typ	Max	Min	Max	Min	Max		
t _{PLH}	Propagation Delay	3.3	2.0	7.0	9.5	2.0	10.0	1.0	11.0	ns	
		5.0	1.5	6.0	8.0	1.5	8.5	1.0	8.5		
t _{PHL}	Propagation Delay	3.3	1.5	5.5	8.0	1.0	8.5	1.0	9.0	ns	
		5.0	1.5	4.5	6.5	1.0	7.0	1.0	7.0		

*Voltage Range 3.3 V is 3.3 V ± 0.3 V.

Voltage Range 5.0 V is 5.0 V ± 0.5 V.

DC CHARACTERISTICS

Symbol	Parameter	V _{CC} (V)	MC74ACT00				Unit	Conditions
			T _A = +25°C		T _A = -40°C to +85°C	T _A = -55°C to +125°C		
			Typ	Guaranteed Limits				
V _{IH}	Minimum High Level Input Voltage	4.5 5.5	1.5 1.5	2.0 2.0	2.0 2.0	2.0 2.0	V	V _{OUT} = 0.1 V or V _{CC} - 0.1 V
V _{IL}	Maximum Low Level Input Voltage	4.5 5.5	1.5 1.5	0.8 0.8	0.8 0.8	0.8 0.8	V	V _{OUT} = 0.1 V or V _{CC} - 0.1 V
V _{OH}	Minimum High Level Output Voltage	4.5 5.5	4.49 5.49	4.4 5.4	4.4 5.4	4.4 5.4	V	I _{OUT} = -50 μA
		4.5 5.5	- -	3.86 4.86	3.76 4.76	3.7 4.7	V	*V _{IN} = V _{IL} or V _{IH} I _{OH} = -24 mA -24 mA
V _{OL}	Maximum Low Level Output Voltage	4.5 5.5	0.001 0.001	0.1 0.1	0.1 0.1	0.1 0.1	V	I _{OUT} = 50 μA
		4.5 5.5	- -	0.36 0.36	0.44 0.44	0.5 0.5	V	*V _{IN} = V _{IL} or V _{IH} I _{OL} = 24 mA 24 mA
I _{IN}	Maximum Input Leakage Current	5.5	-	±0.1	±1.0	±1.0	μA	V _I = V _{CC} , GND
ΔI _{CC}	Additional Max. I _{CC} /Input	5.5	0.6	-	1.5	1.6	mA	V _I = V _{CC} - 2.1 V
I _{OLD}	†Minimum Dynamic Output Current	5.5	-	-	75	50	mA	V _{OLD} = 1.65 V Max
I _{OHD}		5.5	-	-	-75	-50	mA	V _{OHD} = 3.85 V Min
I _{CC}	Maximum Quiescent Supply Current	5.5	-	4.0	40	40	μA	V _{IN} = V _{CC} or GND

*All outputs loaded; thresholds on input associated with output under test.

†Maximum test duration 2.0 ms, one output loaded at a time.

AC CHARACTERISTICS (t_r = t_f = 3.0 nS; C_L = 50 pF; see Figures 3 and 4 for Waveforms)

Symbol	Parameter	V _{CC} * (V)	MC74ACT00						Unit	
			T _A = +25°C			T _A = -40°C to +85°C		T _A = -55°C to +125°C		
			Min	Typ	Max	Min	Max	Min		Max
t _{PLH}	Propagation Delay	5.0	1.5	5.5	9.0	1.0	9.5	1.0	9.5	ns
t _{PHL}	Propagation Delay	5.0	1.5	4.0	7.0	1.0	8.0	1.0	8.0	ns

*Voltage Range 5.0 V is 5.0 V ± 0.5 V.

CAPACITANCE

Symbol	Parameter	Value Typ	Test Conditions	Unit
C _{IN}	Input Capacitance	4.5	V _{CC} = 5.0 V	pF
C _{PD}	Power Dissipation Capacitance	30	V _{CC} = 5.0 V	pF

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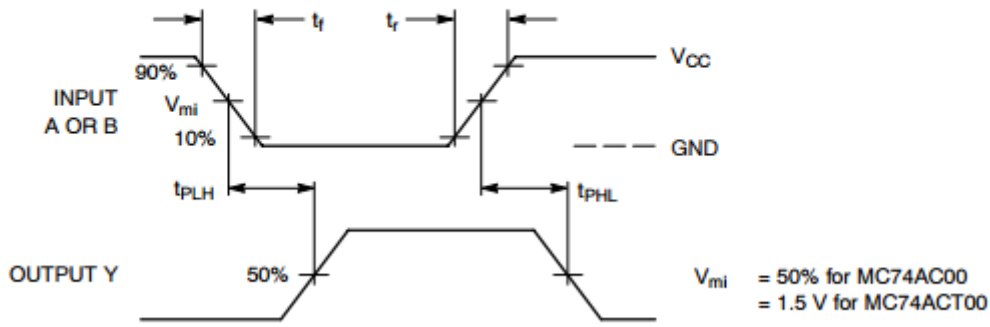
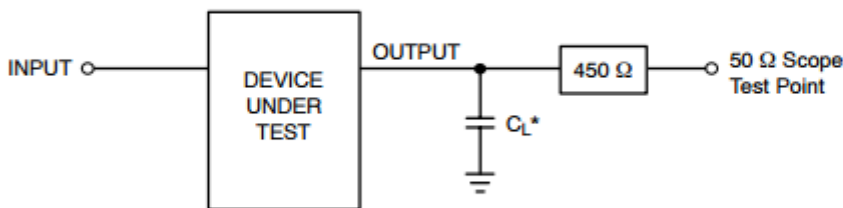


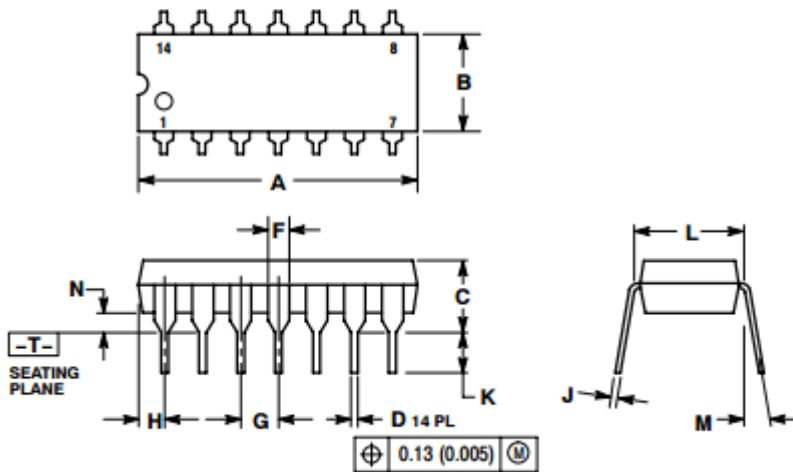
Figure 3. Switching Waveforms



*Includes all probe and jig capacitance

Figure 4. Test Circuit

PDIP-14
CASE 646-06
ISSUE P



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.715	0.770	18.18	19.56
B	0.240	0.260	6.10	6.60
C	0.145	0.185	3.69	4.69
D	0.015	0.021	0.38	0.53
F	0.040	0.070	1.02	1.78
G	0.100 BSC		2.54 BSC	
H	0.052	0.095	1.32	2.41
J	0.008	0.015	0.20	0.38
K	0.115	0.135	2.92	3.43
L	0.290	0.310	7.37	7.87
M	--- 10°		--- 10°	
N	0.015	0.039	0.38	1.01