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 μA
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance With the JEDEC Standard No. 7A Requirements
- Chip Complexity: 32 FETs
- These are Pb-Free Devices

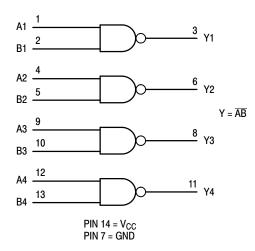


Figure 1. Logic Diagram

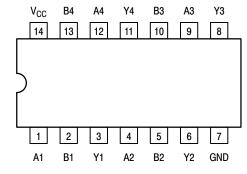


Figure 2. Pinout: 14-Lead Packages (Top View)



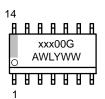
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MARKING DIAGRAMS

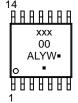


SOIC-14 D SUFFIX CASE 751A





TSSOP-14 DT SUFFIX CASE 948G



xxx = AC or ACT

G or ■

A = Assembly Location

WL or L = Wafer Lot Y = Year WW or W = Work Week

(Note: Microdot may be in either location)

= Pb-Free Package

FUNCTION TABLE

Inp	uts	Output
Α	В	Υ
L	L	Н
L	Н	н
Н	L	н
Н	Н	L

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

MAXIMUM RATINGS

Symbol	Paramet	ter	Value	Unit
V _{CC}	DC Supply Voltage		-0.5 to +7.0	V
VI	DC Input Voltage		$-0.5 \le V_{I} \le V_{CC} + 0.5$	V
Vo	DC Output Voltage	(Note 1)	$-0.5 \le V_{O} \le V_{CC} + 0.5$	V
I _{IK}	DC Input Diode Current		±20	mA
I _{OK}	DC Output Diode Current		±50	mA
Io	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
TL	Lead temperature, 1 mm from Case fo	r 10 Seconds	260	°C
TJ	Junction temperature under Bias		+150	°C
$\theta_{\sf JA}$	Thermal Resistance (Note 2)	SOIC TSSOP	125 170	°C/W
P _D	Power Dissipation in Still Air at 85°C	SOIC TSSOP	125 170	mW
MSL	Moisture Sensitivity		Level 1	
F _R	Flammability Rating	Oxygen Index: 30% – 35%	UL 94 V-0 @ 0.125 in	
V _{ESD}	ESD Withstand Voltage	Human Body Model (Note 3) Machine Model (Note 4) Charged Device Model (Note 5)	> 2000 > 200 > 1000	V
I _{Latch-Up}	Latch-Up Performance Above V _{CC} a	and Below GND at 85°C (Note 6)	±100	mA

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

- I_O absolute maximum rating must be observed.
 The package thermal impedance is calculated in accordance with JESD51–7.
- 3. Tested to EIA/JESD22-A114-A.
- 4. Tested to EIA/JESD22-A115-A.
- 5. Tested to JESD22-C101-A.
- 6. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Тур	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 7) 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 8) MC74ACT00	V _{CC} @ 4.5 V V _{CC} @ 5.5 V	- -	10 8.0	- -	ns/V
TJ	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

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability. 7. V_{in} from 30% to 70% V_{CC} . 8. V_{in} from 0.8 V to 2.0 V.

DC CHARACTERISTICS

				MC74AC00				
		V _{CC}	T _A = +	-25°C	$T_A = -40$ °C to +85°C	T _A = -55°C + 125°C	1	
Symbol	Parameter	(V)	Тур		Guaranteed I	Limits	Unit	Conditions
V _{IH}	Minimum High Level Input Voltage	3.0 4.5 5.5	1.5 2.25 2.75	2.1 3.15 3.85	2.1 3.15 3.85	2.1 3.15 3.85	V	V _{OUT} = 0.1 V or V _{CC} – 0.1 V
V _{IL}	Maximum Low Level Input Voltage	3.0 4.5 5.5	1.5 2.25 2.75	0.9 1.35 1.65	0.9 1.35 1.65	0.9 1.35 1.65	V	V _{OUT} = 0.1 V or V _{CC} – 0.1 V
V _{OH}	Minimum High Level Output Voltage	3.0 4.5 5.5	2.99 4.49 5.49	2.9 4.4 5.4	2.9 4.4 5.4	2.9 4.4 5.4	٧	I _{OUT} = -50 μA
		3.0 4.5 5.5	- - -	2.56 3.86 4.86	2.46 3.76 4.76	2.4 3.7 4.7	V	$^{*}V_{IN} = V_{IL} \text{ or } V_{IH} \\ -12 \text{ mA} \\ I_{OH} -24 \text{ mA} \\ -24 \text{ mA}$
V _{OL}	Maximum Low Level Output Voltage	3.0 4.5 5.5	0.002 0.001 0.001	0.1 0.1 0.1	0.1 0.1 0.1	0.1 0.1 0.1	V	I _{OUT} = 50 μA
		3.0 4.5 5.5	- - -	0.36 0.36 0.36	0.44 0.44 0.44	0.5 0.5 0.5	V	* V _{IN} = V _{IL} or V _{IH} 12 mA 1 _{OL} 24 mA 24 mA
I _{IN}	Maximum Input Leakage Current	5.5	-	±0. 1	±1.0	±1.0	μΑ	$V_I = V_{CC}$, GND
I _{OLD}	†Minimum Dynamic	5.5	_	_	75	50	mA	V _{OLD} = 1.65 V Max
I _{OHD}	Output Current	5.5	-	-	-75	-50	mA	V _{OHD} = 3.85 V Min
I _{CC}	Maximum Quiescent Supply Current	5.5	-	4.0	40	40	μА	$V_{IN} = V_{CC}$ or GND

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions. *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 ($t_r = t_f = 3.0 \text{ nS}$; $C_L = 50 \text{ pF}$; see Figures 3 and 4 for Waveforms)

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

^{*}Voltage Range 3.3 V is 3.3 V \pm 0.3 V. Voltage Range 5.0 V is 5.0 V \pm 0.5 V.

DC CHARACTERISTICS

					MC74ACT00)		
		V _{CC}	T _A = 4	-25°C	$T_A = -40$ °C to +85°C	T _A = -55°C to + 125°C		
Symbol	Parameter	(V)	Тур		Guaranteed	Limits	Unit	Conditions
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	μΑ	$V_I = V_{CC}$, GND
ΔI_{CCT}	Additional Max. I _{CC} /Input	5.5	0.6	_	1.5	1.6	mA	$V_{I} = V_{CC} - 2.1 \text{ V}$
I _{OLD}	†Minimum Dynamic	5.5	-	-	75	50	mA	V _{OLD} = 1.65 V Max
I _{OHD}	Output Current	5.5	_	_	-75	– 50	mA	V _{OHD} = 3.85 V Min
I _{CC}	Maximum Quiescent Supply Current	5.5	_	4.0	40	40	μΑ	$V_{IN} = V_{CC}$ or GND

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

*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 ($t_r = t_f = 3.0 \text{ nS}$; $C_L = 50 \text{ pF}$; see Figures 3 and 4 for Waveforms)

			MC74ACT00							
		V _{CC} *	T,	₄ = +25°	С	$T_A = -40^{\circ}C$	to +85°C	T _A = -55°C	to +125°C	
Symbol	Parameter	(V)	Min	Тур	Max	Min	Max	Min	Max	Unit
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 $\pm\,0.5$ 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

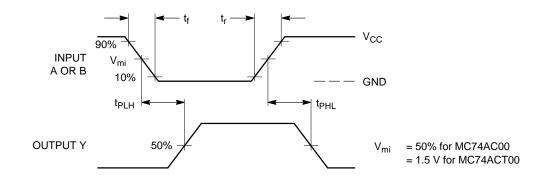
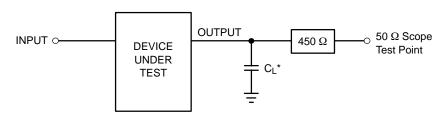


Figure 3. Switching Waveforms



*Includes all probe and jig capacitance

Figure 4. Test Circuit

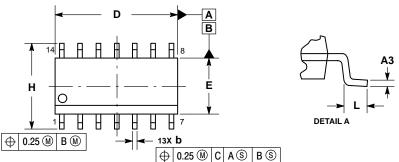
ORDER INFORMATION

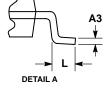
Device	Package	Shipping [†]
MC74AC00DG	SOIC-14 (Pb-Free)	55 Units / Rail
MC74AC00DR2G	SOIC-14 (Pb-Free)	0500 (7
MC74AC00DTR2G	TSSOP-14 (Pb-Free)	2500 / Tape and Reel
MC74ACT00DG	SOIC-14 (Pb-Free)	55 Units / Rail
MC74ACT00DR2G	SOIC-14 (Pb-Free)	OFOO / Tone and Book
MC74ACT00DTR2G	TSSOP-14 (Pb-Free)	— 2500 / Tape and Reel

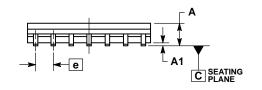
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

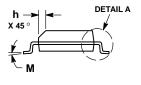
PACKAGE DIMENSIONS

SOIC-14 NB CASE 751A-03 ISSUE K









NOTES:

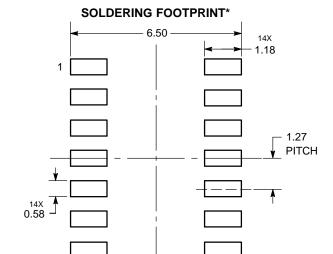
- NOTES:

 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. DIMENSION & DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAYMM IM MATERIAL CONDITION
- MAXIMUM MATERIAL CONDITION.

 4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.

 5. MAXIMUM MOLD PROTRUSION 0.15 PER

	MILLIN	IETERS	INC	HES
DIM	MIN	MAX	MIN	MAX
Α	1.35	1.75	0.054	0.068
A1	0.10	0.25	0.004	0.010
А3	0.19	0.25	0.008	0.010
b	0.35	0.49	0.014	0.019
D	8.55	8.75	0.337	0.344
Е	3.80	4.00	0.150	0.157
е	1.27	BSC	0.050	BSC
Н	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.019
L	0.40	1.25	0.016	0.049
М	0 °	7°	0 °	7°

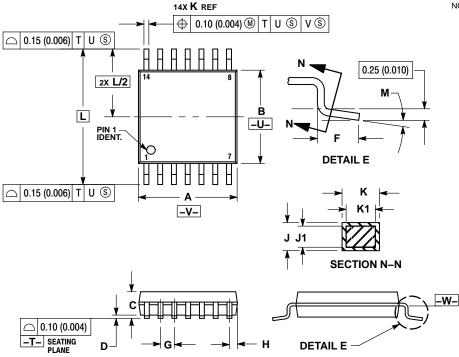


DIMENSIONS: MILLIMETERS

^{*}For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

TSSOP-14 CASE 948G **ISSUE B**



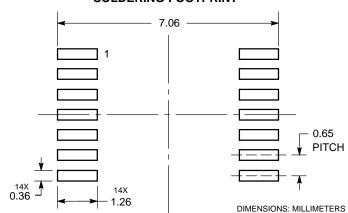
NOTES:

- OTES:

 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
 4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
 5. DIMENSION K DOES NOT INCLUDE DAMBA
- NOT EXCEED 0.25 (0.010) PER SIDE.
 5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
 6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
 7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE –W-.

	MILLIN	IETERS	INC	HES	
DIM	MIN	MAX	MIN	MAX	
Α	4.90	5.10	0.193	0.200	
В	4.30	4.50	0.169	0.177	
С		1.20		0.047	
D	0.05	0.15	0.002	0.006	
F	0.50	0.75	0.020	0.030	
G	0.65	BSC	0.026 BSC		
Н	0.50	0.60	0.020	0.024	
J	0.09	0.20	0.004	0.008	
J1	0.09	0.16	0.004	0.006	
K	0.19	0.30	0.007	0.012	
K1	0.19	0.25	0.007	0.010	
L	6.40	BSC	0.252	BSC	
М	0°	8 °	0°	8 °	

SOLDERING FOOTPRINT*



*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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