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 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

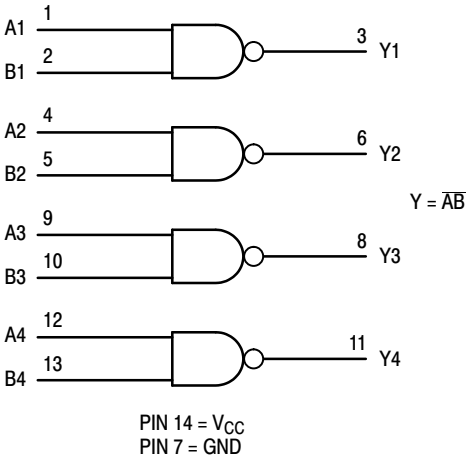

Figure 1. Logic Diagram

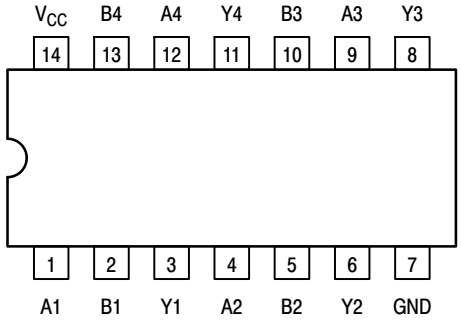

Figure 2. Pinout: 14−Lead Packages (Top View)

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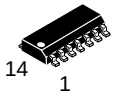
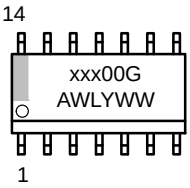
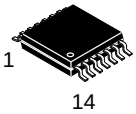
MARKING DIAGRAMS

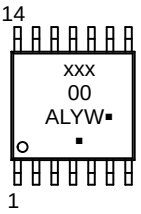


SOIC−14
D SUFFIX
CASE 751A





TSSOP−14
DT SUFFIX
CASE 948G



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

(Note: Microdot may be in either location)

FUNCTION TABLE

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

ORDERING INFORMATION

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

MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V_{CC}	DC Supply Voltage		−0.5 to +7.0	V
V_I	DC Input Voltage		$-0.5 \le V_I \le V_{CC} + 0.5$	V
V_O	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
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 (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} 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.

1. I_O absolute maximum rating must be observed.
2. 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	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 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
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

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

Symbol	Parameter	V_{CC} (V)	MC74AC00 T_A = +25°C Typ	MC74AC00 T_A = +25°C Guaranteed Limits	MC74AC00 T_A = −40°C to +85°C	MC74AC00 T_A = −55°C + 125°C	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	V	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} or V_{IH} −12 mA I_{OH} −24 mA −24 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 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
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

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 nS; C_L = 50 pF; see Figures 3 and 4 for Waveforms)

Symbol	Parameter	V_{CC}* (V)	MC74AC00 T_A = +25°C Min	Typ	Max	T_A = −40°C to +85°C Min	Max	T_A = −55°C to + 125°C 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 ±0.3 V.
Voltage Range 5.0 V is 5.0 V ±0.5 V.

DC CHARACTERISTICS

Symbol	Parameter	V_{CC} (V)	MC74ACT00 T_A = +25°C Typ	MC74ACT00 T_A = −40°C to +85°C Guaranteed Limits	MC74ACT00 T_A = −55°C to + 125°C 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	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	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	V	I_{OUT} = −50 μA
		4.5 5.5	− −	3.86 4.86	3.76 4.76	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	V	I_{OUT} = 50 μA
		4.5 5.5	− −	0.36 0.36	0.44 0.44	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	μA	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 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

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 nS; C_L = 50 pF; see Figures 3 and 4 for Waveforms)

Symbol	Parameter	V_{CC}* (V)	MC74ACT00 T_A = +25°C Min	Typ	Max	T_A = −40°C to +85°C Min	Max	T_A = −55°C to +125°C 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 ±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

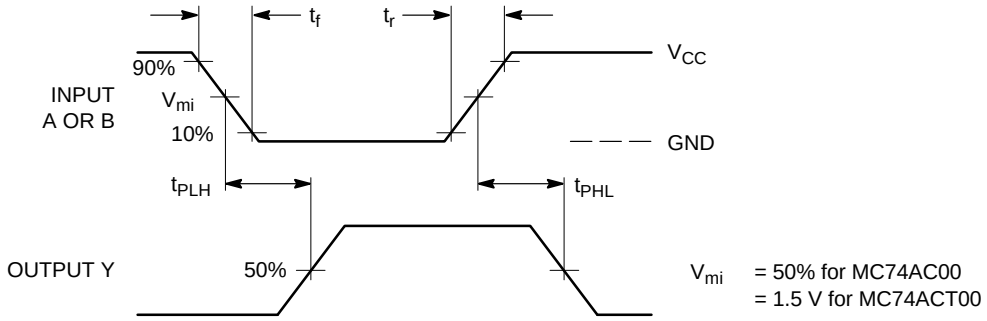
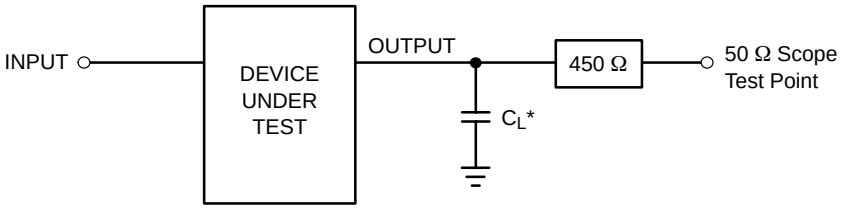


Figure 3. Switching Waveforms



*Includes all probe and jig capacitance

Figure 4. Test Circuit

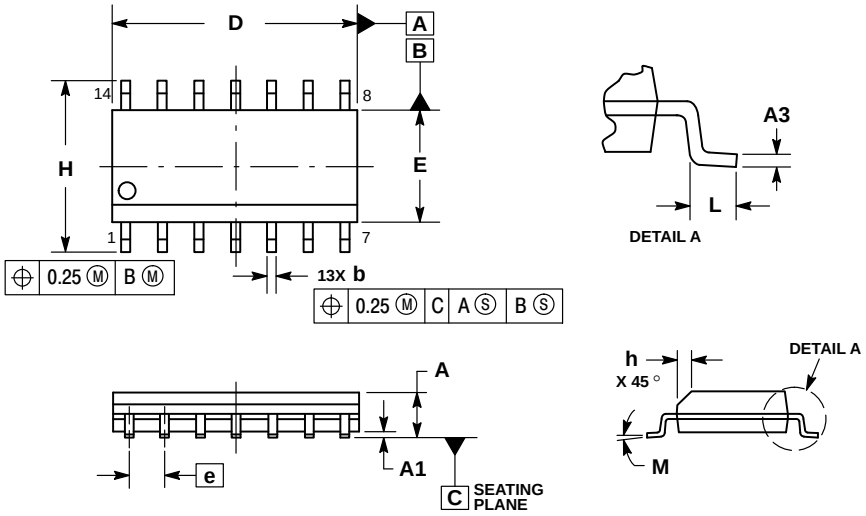
ORDER INFORMATION

Device	Package	Shipping†
MC74AC00DG	SOIC−14 (Pb−Free)	55 Units / Rail
MC74AC00DR2G	SOIC−14 (Pb−Free)	2500 / Tape and Reel
MC74AC00DTR2G	TSSOP−14 (Pb−Free)	
MC74ACT00DG	SOIC−14 (Pb−Free)	55 Units / Rail
MC74ACT00DR2G	SOIC−14 (Pb−Free)	2500 / Tape and Reel
MC74ACT00DTR2G	TSSOP−14 (Pb−Free)	

†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

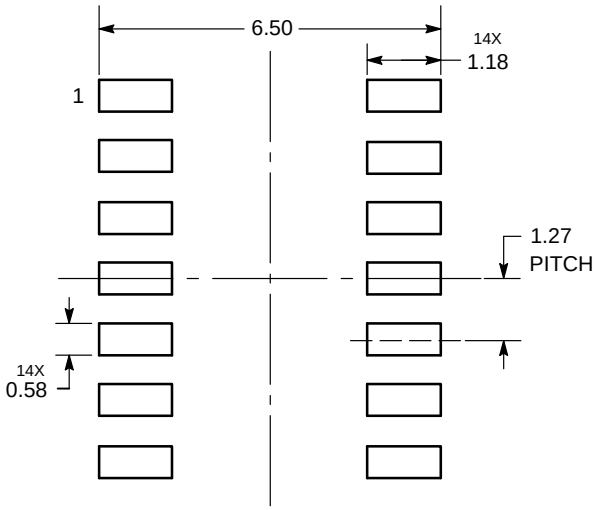
SOIC−14 NB
CASE 751A−03
ISSUE K



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
5. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	1.35	1.75	0.054	0.068
A1	0.10	0.25	0.004	0.010
A3	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
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	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
M	0 °	7 °	0 °	7 °

SOLDERING FOOTPRINT*

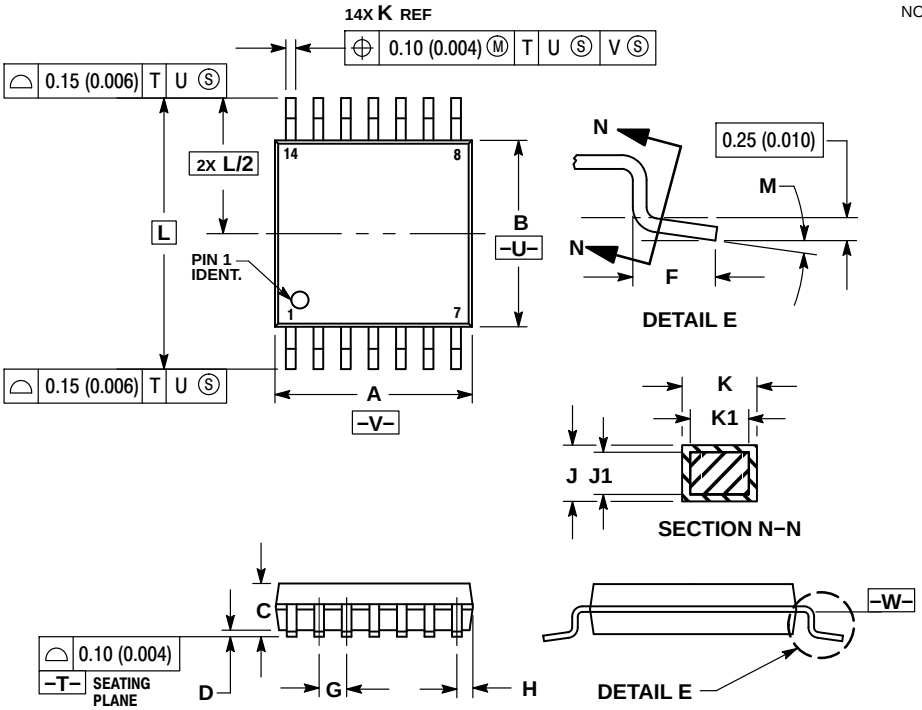


DIMENSIONS: MILLIMETERS

*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

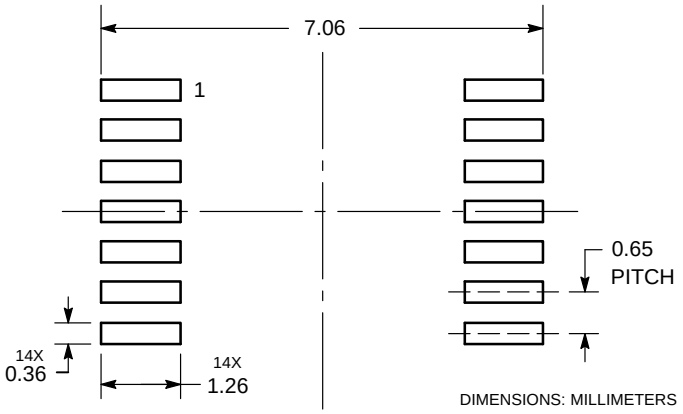
TSSOP−14
CASE 948G
ISSUE B



NOTES:
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 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−.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	−−−	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	
H	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	
M	0 °	8 °	0 °	8 °

SOLDERING FOOTPRINT*



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.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative

MC74AC00/D