

Quad 2-Input NAND Gate

MM74HC00

General Description

The MM74HC00 NAND gates utilize advanced silicon-gate CMOS technology to achieve operating speeds similar to LS-TTL gates with the low power consumption of standard CMOS integrated circuits. All gates have buffered outputs. All devices have high noise immunity and the ability to drive 10 LS-TTL loads. The 74HC logic family is functionally as well as pin-out compatible with the standard 74LS logic family. All inputs are protected from damage due to static discharge by internal diode clamps to V_{CC} and ground.

Features

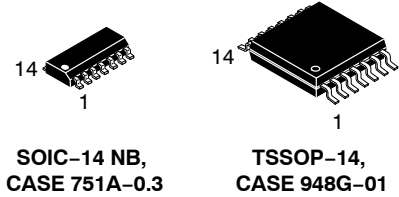
- Typical Propagation Delay: 8 ns
- Wide Power Supply Range: 2 V–6 V
- Low Quiescent Current: 20 μ A Maximum (74HC Series)
- Low Input Current: 1 μ A Maximum
- Fanout of 10 LS-TTL Loads
- This Device is Pb-Free and Halide Free

ABSOLUTE MAXIMUM RATINGS (Note 1)

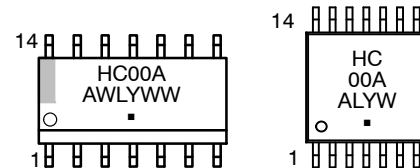
| Symbol | Parameter | Rating | Unit |
|------------------|---|------------------------|--------------|
| V_{CC} | Supply Voltage | -0.5 to +7.0 | V |
| V_{IN} | DC Input Voltage | -0.5 to $V_{CC} + 0.5$ | V |
| V_{OUT} | DC Output Voltage | -0.5 to $V_{CC} + 0.5$ | V |
| I_{IK}, I_{OK} | Clamp Diode Current | ± 20 | mA |
| I_{OUT} | DC Output Current, per pin | ± 25 | mA |
| I_{CC} | DC V_{CC} or GND Current, per pin | ± 50 | mA |
| T_{STG} | Storage Temperature Range | -65 to +150 | $^{\circ}$ C |
| P_D | Power Dissipation (Note 2) | 600 | mW |
| | S.O. Package only | 500 | |
| T_L | Lead Temperature (Soldering 10 seconds) | 260 | $^{\circ}$ C |

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. Unless otherwise specified all voltages are referenced to ground.
2. Power Dissipation temperature derating – plastic “N” package: -12 mW/ $^{\circ}$ C from 65 $^{\circ}$ C to 85 $^{\circ}$ C.



MARKING DIAGRAM

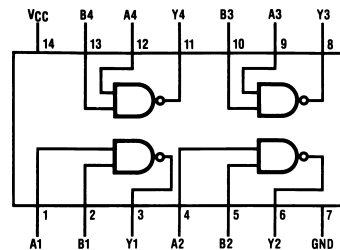


- HC00A = Specific Device Code
- A = Assembly Location
- WL, L = Wafer Lot Number
- Y = Year
- WW, YW = Work Week
- = Pb-Free Package

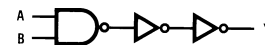
(Note: Microdot may be in either location)

CONNECTION DIAGRAM

Pin Assignment for SOIC and TSSOP



LOGIC DIAGRAM



ORDERING INFORMATION

See detailed ordering and shipping information on page 3 of this data sheet.

MM74HC00

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Max | Unit | |
|-------------------|-----------------------------|-------------------------|----------|------|----|
| V_{CC} | Supply Voltage | 2 | 6 | V | |
| V_{IN}, V_{OUT} | DC Input or Output Voltage | 0 | V_{CC} | V | |
| T_A | Operating Temperature Range | -40 | +85 | °C | |
| t_r, t_f | Input Rise or Fall Times | $V_{CC} = 2.0\text{ V}$ | - | 1000 | ns |
| | | $V_{CC} = 4.5\text{ V}$ | - | 500 | |
| | | $V_{CC} = 6.0\text{ V}$ | - | 400 | |

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.

DC ELECTRICAL CHARACTERISTICS (Note 3)

| Symbol | Parameter | V_{CC} (V) | Conditions | $T_A = 25^\circ\text{C}$ | | $T_A = -40^\circ\text{C}$ to 85°C | $T_A = -55^\circ\text{C}$ to 125°C | Unit |
|----------|-----------------------------------|--------------|---|--|-------------------|--|---|---------------|
| | | | | Typ. | Guaranteed Limits | | | |
| V_{IH} | Minimum 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} | Maximum 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} | Minimum HIGH Level Output Voltage | 2.0 | $V_{IN} = V_{IH}$ or V_{IL} , $ I_{OUT} \leq 20\ \mu\text{A}$ | 2.0 | 1.9 | 1.9 | 1.9 | V |
| | | 4.5 | | 4.5 | 4.4 | 4.4 | 4.4 | |
| | | 6.0 | | 6.0 | 5.9 | 5.9 | 5.9 | |
| | | 4.5 | $V_{IN} = V_{IH}$ or V_{IL} , $ I_{OUT} \leq 4.0\ \text{mA}$ | 4.2 | 3.98 | 3.84 | 3.7 | |
| | | 6.0 | | $V_{IN} = V_{IH}$ or V_{IL} , $ I_{OUT} \leq 5.2\ \text{mA}$ | 5.7 | 5.48 | 5.34 | |
| V_{OL} | Maximum LOW Level Output Voltage | 2.0 | $V_{IN} = V_{IH}$ or V_{IL} , $ I_{OUT} \leq 20\ \mu\text{A}$ | 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 | $V_{IN} = V_{IH}$ or V_{IL} , $ I_{OUT} \leq 4.0\ \text{mA}$ | 0.2 | 0.26 | 0.33 | 0.4 | |
| | | 6.0 | | $V_{IN} = V_{IH}$ or V_{IL} , $ I_{OUT} \leq 5.2\ \text{mA}$ | 0.2 | 0.26 | 0.33 | |
| I_{IN} | Maximum Input Current | 6.0 | $V_{IN} = V_{CC}$ or GND | - | ± 0.1 | ± 1.0 | ± 1.0 | μA |
| I_{CC} | Maximum Quiescent Supply Current | 6.0 | $V_{IN} = V_{CC}$ or GND, $I_{OUT} = 0\ \mu\text{A}$ | - | 2.0 | 20 | 40 | μA |

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.

3. For a power supply of $5\text{ V} \pm 10\%$ the worst case output voltages (V_{OH} , and V_{OL}) occur for HC at 4.5 V. Thus the 4.5 V values should be used when designing with this supply. Worst case V_{IH} and V_{IL} occur at $V_{CC} = 5.5\text{ V}$ and 4.5 V respectively. (The V_{IH} value at 5.5 V is 3.85 V.) The worst case leakage current (I_{IN} , I_{CC} , and I_{OZ}) occur for CMOS at the higher voltage and so the 6.0 V values should be used.

AC ELECTRICAL CHARACTERISTICS

($V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$, $C_L = 15\ \text{pF}$, $t_r = t_f = 6\ \text{ns}$)

| Symbol | Parameter | Conditions | Typ. | Guaranteed Limit | Unit |
|--------------------|---------------------------|------------|------|------------------|------|
| t_{PHL}, t_{PLH} | Maximum Propagation Delay | | 8 | 15 | ns |

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.

MM74HC00

AC ELECTRICAL CHARACTERISTICS

($V_{CC} = 2.0\text{ V to }6.0\text{ V}$, $C_L = 50\text{ pF}$, $t_r = t_f = 6\text{ ns}$, unless otherwise specified)

| Symbol | Parameter | V_{CC} (V) | Conditions | $T_A = 25^\circ\text{C}$ | | $T_A = -40^\circ\text{C}$ to 85°C | $T_A = -55^\circ\text{C}$ to 125°C | Unit |
|-----------------------|--|--------------|------------|--------------------------|-------------------|--|---|------|
| | | | | Typ. | Guaranteed Limits | | | |
| t_{PHL} , t_{PLH} | Maximum Propagation Delay | 2.0 | | 45 | 90 | 113 | 134 | ns |
| | | 4.5 | | 9 | 18 | 23 | 27 | |
| | | 6.0 | | 8 | 15 | 19 | 23 | |
| t_{TLH} , t_{THL} | Maximum Output Rise and Fall Time | 2.0 | | 30 | 75 | 95 | 110 | ns |
| | | 4.5 | | 8 | 15 | 19 | 22 | |
| | | 6.0 | | 7 | 13 | 16 | 19 | |
| C_{PD} | Power Dissipation Capacitance (Note 4) | | (per gate) | 20 | - | - | - | pF |
| C_{IN} | Maximum Input Capacitance | | | 5 | 10 | 10 | 10 | pF |

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.

4. C_{PD} determines the no load dynamic power consumption, $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$, and the no load dynamic current consumption, $I_S = C_{PD} V_{CC} f + I_{CC}$.

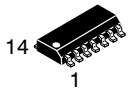
ORDERING INFORMATION

| Device | Package | Shipping [†] |
|--------------|---|-----------------------|
| MM74HC00M | SOIC-14 NB (Pb-Free and Halide Free) | 55 Units / Tube |
| MM74HC00MX | | 2500 / Tape & Reel |
| MM74HC00MTCX | TSSOP-14 (Pb-Free and Halide Free) | 2500 / Tape & 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](#).

NOTE: All packages are lead free per JEDEC: J-STD-020B standard.

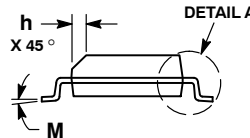
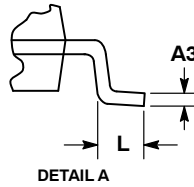
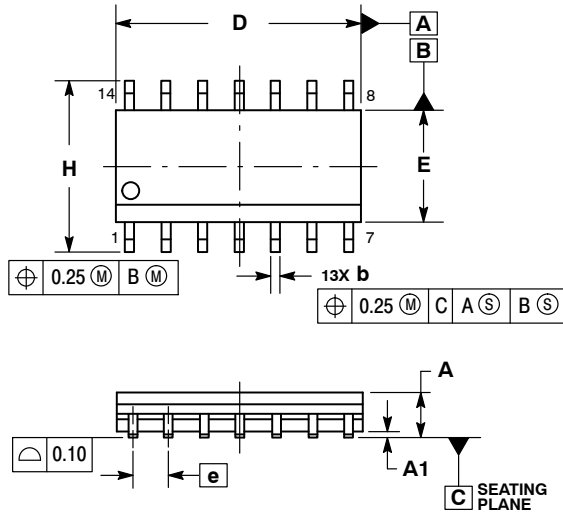
MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 1:1

SOIC-14 NB
CASE 751A-03
ISSUE L

DATE 03 FEB 2016

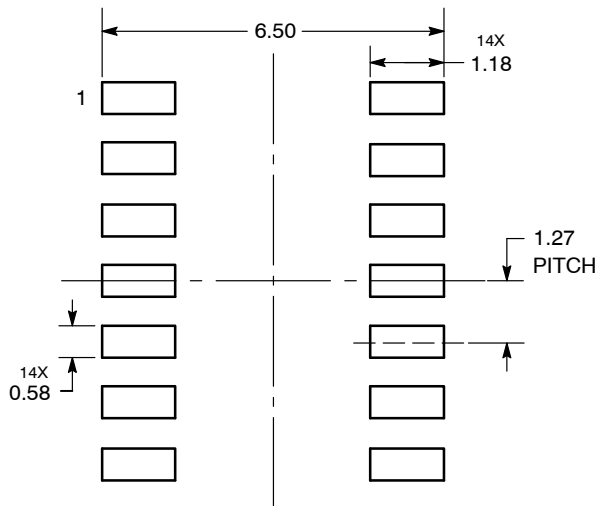


NOTES:

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.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|------|-----------|-------|
| | 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° |

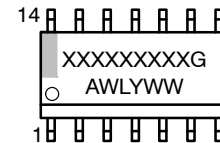
SOLDERING FOOTPRINT*



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.

GENERIC MARKING DIAGRAM*



- XXXXXX = Specific Device Code
- A = Assembly Location
- WL = Wafer Lot
- Y = Year
- WW = Work Week
- G = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

STYLES ON PAGE 2

| | | |
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SOIC-14
CASE 751A-03
ISSUE L

DATE 03 FEB 2016

STYLE 1:
 PIN 1. COMMON CATHODE
 2. ANODE/CATHODE
 3. ANODE/CATHODE
 4. NO CONNECTION
 5. ANODE/CATHODE
 6. NO CONNECTION
 7. ANODE/CATHODE
 8. ANODE/CATHODE
 9. ANODE/CATHODE
 10. NO CONNECTION
 11. ANODE/CATHODE
 12. ANODE/CATHODE
 13. NO CONNECTION
 14. COMMON ANODE

STYLE 2:
 CANCELLED

STYLE 3:
 PIN 1. NO CONNECTION
 2. ANODE
 3. ANODE
 4. NO CONNECTION
 5. ANODE
 6. NO CONNECTION
 7. ANODE
 8. ANODE
 9. ANODE
 10. NO CONNECTION
 11. ANODE
 12. ANODE
 13. NO CONNECTION
 14. COMMON CATHODE

STYLE 4:
 PIN 1. NO CONNECTION
 2. CATHODE
 3. CATHODE
 4. NO CONNECTION
 5. CATHODE
 6. NO CONNECTION
 7. CATHODE
 8. CATHODE
 9. CATHODE
 10. NO CONNECTION
 11. CATHODE
 12. CATHODE
 13. NO CONNECTION
 14. COMMON ANODE

STYLE 5:
 PIN 1. COMMON CATHODE
 2. ANODE/CATHODE
 3. ANODE/CATHODE
 4. ANODE/CATHODE
 5. ANODE/CATHODE
 6. NO CONNECTION
 7. COMMON ANODE
 8. COMMON CATHODE
 9. ANODE/CATHODE
 10. ANODE/CATHODE
 11. ANODE/CATHODE
 12. ANODE/CATHODE
 13. NO CONNECTION
 14. COMMON ANODE

STYLE 6:
 PIN 1. CATHODE
 2. CATHODE
 3. CATHODE
 4. CATHODE
 5. CATHODE
 6. CATHODE
 7. CATHODE
 8. ANODE
 9. ANODE
 10. ANODE
 11. ANODE
 12. ANODE
 13. ANODE
 14. ANODE

STYLE 7:
 PIN 1. ANODE/CATHODE
 2. COMMON ANODE
 3. COMMON CATHODE
 4. ANODE/CATHODE
 5. ANODE/CATHODE
 6. ANODE/CATHODE
 7. ANODE/CATHODE
 8. ANODE/CATHODE
 9. ANODE/CATHODE
 10. ANODE/CATHODE
 11. COMMON CATHODE
 12. COMMON ANODE
 13. ANODE/CATHODE
 14. ANODE/CATHODE

STYLE 8:
 PIN 1. COMMON CATHODE
 2. ANODE/CATHODE
 3. ANODE/CATHODE
 4. NO CONNECTION
 5. ANODE/CATHODE
 6. ANODE/CATHODE
 7. COMMON ANODE
 8. COMMON ANODE
 9. ANODE/CATHODE
 10. ANODE/CATHODE
 11. NO CONNECTION
 12. ANODE/CATHODE
 13. ANODE/CATHODE
 14. COMMON CATHODE

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