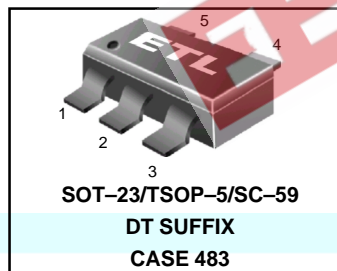
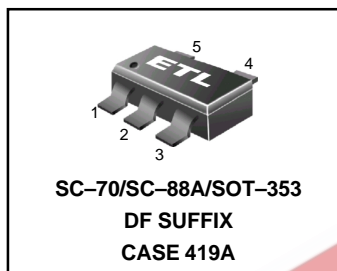


2-Input NAND Gate

MC74VHC1G00

The MC74VHC1G00 is an advanced high speed CMOS 2-input NAND gate fabricated with silicon gate CMOS technology. It achieves high speed operation similar to equivalent Bipolar Schottky TTL while maintaining CMOS low power dissipation. The internal circuit is composed of multiple stages, including a buffer output which provides high noise immunity and stable output. The MC74VHC1G00 input structure provides protection when voltages up to 7 V are applied, regardless of the supply voltage. This allows the MC74VHC1G00 to be used to interface 5 V circuits to 3 V circuits.

- High Speed: $t_{PD} = 3.0 \text{ ns}$ (Typ) at $V_{CC} = 5 \text{ V}$
- Low Power Dissipation: $I_{CC} = 2 \text{ mA}$ (Max) at $T_A = 25^\circ\text{C}$
- Power Down Protection Provided on Inputs
- Balanced Propagation Delays
- Pin and Function Compatible with Other Standard Logic Families



| PIN ASSIGNMENT | |
|----------------|---------------|
| 1 | IN B |
| 2 | IN A |
| 3 | GND |
| 4 | OUT \bar{Y} |
| 5 | V_{CC} |

MARKING DIAGRAMS

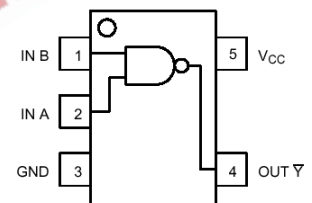
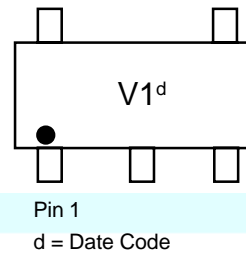
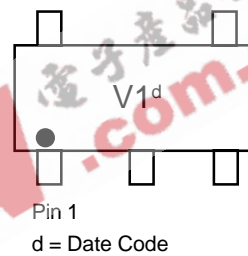


Figure 1. Pinout (Top View)

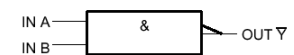


Figure 2. Logic Symbol

FUNCTION TABLE

| Inputs | | Output |
|--------|---|-----------|
| A | B | \bar{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 4 of this data sheet.

MC74VHC1G00

MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|----------------|---|--|-----------------------|
| V_{CC} | DC 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} | DC Input Diode Current | ± 20 | mA |
| I_{OK} | DC Output Diode Current | ± 20 | mA |
| I_{OUT} | DC Output Sink Current | ± 12.5 | mA |
| I_{CC} | DC Supply Current per Supply Pin | ± 25 | 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 | SC-70/SC-88A (Note 1) | °C/W |
| | | TSOP-5 | 200 |
| P_D | Power Dissipation in Still Air at 85°C | SC-70/SC-88A | 150 |
| | | TSOP-5 | 230 |
| 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 2) Machine Model (Note 3) Charged Device Model (Note 4) | >2000 > 200 N/A |
| $I_{LATCH-UP}$ | Latch-Up Performance | Above V_{CC} and Below GND at 85°C (Note 5) | ± 500 mA |

Maximum Ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute-maximum-rated conditions is not implied. Functional operation should be restricted to the Recommended Operating Conditions.

1. Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2-ounce copper trace with no air flow.
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 | Max | Unit |
|------------|-----------------------------|--|----------------|------|
| V_{CC} | DC Supply Voltage | 2.0 | 5.5 | V |
| V_{IN} | DC Input Voltage | 0.0 | 5.5 | V |
| V_{OUT} | DC Output Voltage | 0.0 | V_{CC} | V |
| T_A | Operating Temperature Range | - 55 | + 125 | °C |
| t_r, t_f | Input Rise and Fall Time | $V_{CC} = 3.3 \pm 0.3$ V $V_{CC} = 5.0 \pm 0.5$ V | 0 100 20 | ns/V |

DEVICE JUNCTION TEMPERATURE VERSUS TIME TO 0.1% BOND FAILURES

| Junction Temperature °C | Time, Hours | Time, Years |
|-------------------------|-------------|-------------|
| 80 | 1,032,200 | 117.8 |
| 90 | 419,300 | 47.9 |
| 100 | 178,700 | 20.4 |
| 110 | 79,600 | 9.4 |
| 120 | 37,000 | 4.2 |
| 130 | 17,800 | 2.0 |
| 140 | 8,900 | 1.0 |

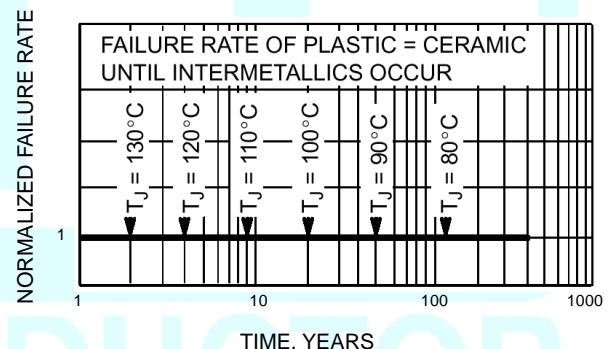


Figure 3. Failure Rate vs. Time Junction Temperature

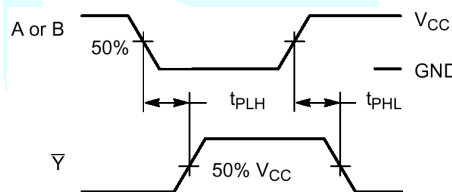
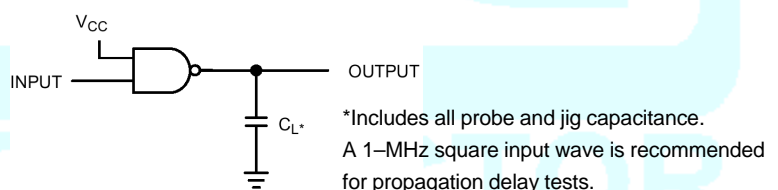
DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Test Conditions | V _{CC} (V) | T _A = 25°C | | | T _A ≤ 85°C | | -55°C to 125°C | | Unit |
|-----------------|---|--|--------------------------|----------------------------|-------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|------|
| | | | | Min | Typ | Max | Min | Max | Min | Max | |
| V _{IH} | Minimum High-Level Input Voltage | | 2.0 3.0 4.5 5.5 | 1.5 2.1 3.15 3.85 | | | 1.5 2.1 3.15 3.85 | | 1.5 2.1 3.15 3.85 | | V |
| V _{IL} | Maximum Low-Level Input Voltage | | 2.0 3.0 4.5 5.5 | | | 0.5 0.9 1.35 1.65 | | 0.5 0.9 1.35 1.65 | | 0.5 0.9 1.35 1.65 | V |
| V _{OH} | Minimum High-Level Output Voltage V _{IN} = V _{IH} or V _{IL} | V _{IN} = V _{IH} or V _{IL} I _{OH} = -50 μA | 2.0 3.0 4.5 | 1.9 2.9 4.4 | 2.0 3.0 4.0 | | 1.9 2.9 4.4 | | 1.9 2.9 4.4 | | V |
| | | V _{IN} = V _{IH} or V _{IL} I _{OH} = -4 mA | 3.0 | 2.58 | | | 2.48 | | 2.34 | | |
| | | I _{OH} = -8 mA | 4.5 | 3.94 | | | 3.80 | | 3.66 | | |
| V _{OL} | Maximum Low-Level Output Voltage V _{IN} = V _{IH} or V _{IL} | V _{IN} = V _{IH} or V _{IL} I _{OL} = 50 μA | 2.0 3.0 4.5 | | 0.0 0.0 0.0 | 0.1 0.1 0.1 | | 0.1 0.1 0.1 | | 0.1 0.1 0.1 | V |
| | | V _{IN} = V _{IH} or V _{IL} I _{OL} = 4 mA | 3.0 | | | 0.36 | | 0.44 | | 0.52 | |
| | | I _{OL} = 8 mA | 4.5 | | | 0.36 | | 0.44 | | 0.52 | |
| I _{IN} | Maximum Input Leakage Current | V _{IN} = 5.5 V or GND | 0 to 5.5 | | | ±0.1 | | ±1.0 | | ±1.0 | μA |
| I _{CC} | Maximum Quiescent Supply Current | V _{IN} = V _{CC} or GND | 5.5 | | | 2.0 | | 20 | | 40 | μA |

AC ELECTRICAL CHARACTERISTICS C_{load} = 50 pF, Input t_r = t_f = 3.0 ns

| Symbol | Parameter | Test Conditions | T _A = 25°C | | | T _A ≤ 85°C | | -55°C ≤ T _A ≤ 125°C | | Unit |
|---|--|--|-----------------------|-----|------|-----------------------|------|--------------------------------|------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| t _{PLH} , t _{PHL} | Maximum Propagation Delay, Input A or B to \bar{Y} | V _{CC} = 3.3 ± 0.3 V C _L = 15 pF | | 4.5 | 7.9 | | 9.5 | | 11.0 | ns |
| | | C _L = 50 pF | | 5.6 | 11.4 | | 13.0 | | 15.1 | |
| | | V _{CC} = 5.0 ± 0.5 V C _L = 15 pF | | 3.0 | 5.5 | | 6.5 | | 8.0 | pF |
| | | C _L = 50 pF | | 3.8 | 7.5 | | 8.5 | | 10.0 | |
| C _{IN} | Maximum Input Capacitance | | | 5.5 | 10 | | 10 | | 10 | |
| Typical @ 25°C, V_{CC} = 5.0 V | | | | | | | | | | |
| C _{PD} | Power Dissipation Capacitance (Note 6) | | | 10 | | | | | | pF |

6. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: I_{CC(OPR)} = C_{PD} • V_{CC} • f_{in} + I_{CC}. C_{PD} is used to determine the no-load dynamic power consumption; P_D = C_{PD} • V_{CC}² • f_{in} + I_{CC} • V_{CC}.


Figure 4. Switching Waveforms

Figure 5. Test Circuit

MC74VHC1G00

DEVICE ORDERING INFORMATION

| Device Order Number | Device Nomenclature | | | | | | Package Type (Name/SOT#/Common Name) | Tape and Reel Size |
|---------------------|-------------------------|-----------------------|------------|-----------------|----------------|----------------------|---|----------------------------|
| | Logic Circuit Indicator | Temp Range Identifier | Technology | Device Function | Package Suffix | Tape and Reel Suffix | | |
| MC74VHC1G00DFT | MC | 74 | VHC1G | 00 | DF | T1 | SC-70/SC-88A/ SOT-353 | 178 mm (7 in) 3000 Unit |
| MC74VHC1G00DFT2 | MC | 74 | VHC1G | 00 | DF | T2 | SC-70/SC-88A/ SOT-353 | 178 mm (7 in) 3000 Unit |
| MC74VHC1G00DTT1 | MC | 74 | VHC1G | 00 | DT | T1 | SOT-23/TSOP-5/ SC-59 | 178 mm (7 in) 3000 Unit |

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