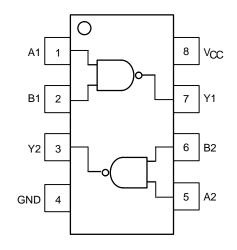
# **Dual 2-Input NAND Gate**

The NL27WZ00 is a high performance dual 2–input NAND Gate operating from a 2.3 V to 5.5 V supply.

- Extremely High Speed: tpD 2.4 ns (typical) at  $V_{CC} = 5 V$
- Designed for 2.3 V to 5.5 V VCC Operation
- Over Voltage Tolerant Inputs
- LVTTL Compatible Interface Capability With 5 V TTL Logic with  $V_{CC} = 3 V$
- LVCMOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- Replacement for NC7WZ00
- Chip Complexity: FET = 112



### Figure 1. Pinout

#### PIN ASSIGNMENT

| Pin | Function |
|-----|----------|
| 1   | A1       |
| 2   | B1       |
| 3   | Y2       |
| 4   | GND      |
| 5   | A2       |
| 6   | B2       |
| 7   | Y1       |
| 8   | VCC      |

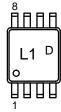


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MARKING DIAGRAM





D = Date Code

#### **ORDERING INFORMATION**

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

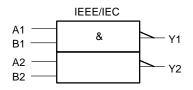


Figure 2. Logic Symbol

#### FUNCTION TABLE $Y = \overline{AB}$

|     | 1 - 718 |        |
|-----|---------|--------|
| Inp | uts     | Output |
|     | В       | Y      |
|     |         |        |

| A | В | Y |
|---|---|---|
| L | L | Н |
| L | Н | н |
| Н | L | н |
| н | Н | L |

H = HIGH Logic Level

L = LOW Logic Level

#### MAXIMUM RATINGS

| Symbol    | Parameter                                     |  | Value                  | Unit |
|-----------|---|--|------------------------|------|
| VCC       | DC Supply Voltage                             |  | -0.5 to +7.0           | V    |
| VI        | DC Input Voltage                              |  | -0.5 to +7.0           | V    |
| VO        | DC Output Voltage                             |  | -0.5 to +7.0           | V    |
| IК        | DC Input Diode Current                        | V <sub>I</sub> < GND   | -50                    | mA   |
| lок       | DC Output Diode Current                       | -50  | mA                     |      |
| lO        | DC Output Sink Current                        |  | ±50                    | mA   |
| ICC       | DC Supply Current per Supply Pin              |  | ±100                   | mA   |
| IGND      | DC Ground Current per Ground Pin              |  | ±100                   | mA   |
| TSTG      | Storage Temperature Range                     |  | -65 to +150            | °C   |
| тL        | Lead Temperature, 1 mm from Case for 10 Secon | ds   | 260                    | °C   |
| ТJ        | Junction Temperature under Bias               |  | + 150                  | °C   |
| θJA       | Thermal Resistance                            | (Note 1)   | 250                    | °C/W |
| PD        | Power Dissipation in Still Air at 85°C        |  | 250                    | mW   |
| MSL       | Moisture Sensitivity                          |  | Level 1                |      |
| FR        | Flammability Rating                           | Oxygen Index: 28 to 34   | UL 94 V–0 @ 0.125 in   |      |
| VESD      | ESD Withstand Voltage                         | Human Body Model (Note 2)<br>Machine Model (Note 3)<br>Charged Device Model (Note 4) | > 2000<br>> 200<br>N/A | V    |
| ILatch-Up | Latch–Up Performance Above V <sub>CC</sub>    | 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.

Tested to EIA/JESD22–A114–A.
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          |      |
|-----------------------|------------------------------------|--|-------------|---------------|------|
| VCC                   | Supply Voltage                     | Operating<br>Data Retention Only   | 2.3<br>1.5  | 5.5<br>5.5    | V    |
| VI                    | Input Voltage                      | (Note 6)   | 0           | 5.5           | V    |
| VO                    | Output Voltage                     | (HIGH or LOW State)  | 0           | VCC           | V    |
| T <sub>A</sub>        | Operating Free–Air Temperature     |  | -40         | + 85          | °C   |
| $\Delta t / \Delta V$ | Input Transition Rise or Fall Rate | $V_{CC} = 2.5 V \pm 0.2 V V_{CC} = 3.0 V \pm 0.3 V V_{CC} = 5.0 V \pm 0.5 V$ | 0<br>0<br>0 | 20<br>10<br>5 | ns/V |

6. Unused inputs may not be left open. All inputs must be tied to a high- or low-logic input voltage level.

## DC ELECTRICAL CHARACTERISTICS

|          |                                      |                                   | VCC        | T <sub>A</sub> = 25°C |      | ;                   | -40°C ≤ -            | Γ <sub>Α</sub> ≤ 85°C |      |
|----------|--------------------------------------|-----------------------------------|------------|-----------------------|------|---------------------|----------------------|-----------------------|------|
| Symbol   | Parameter                            | Condition                         | (V)        | Min                   | Тур  | Max                 | Min                  | Max                   | Unit |
| $V_{IH}$ | High–Level Input Voltage             |                                   | 2.3 to 5.5 | 0.7 V <sub>CC</sub>   |      |                     | 0.7 V <sub>CC</sub>  |                       | V    |
| $V_{IL}$ | Low–Level Input Voltage              |                                   | 2.3 to 5.5 |                       |      | 0.3 V <sub>CC</sub> |                      | 0.3 V <sub>CC</sub>   | V    |
| VOH      | High-Level Output Voltage            | I <sub>OH</sub> = 100 μA          | 2.3 to 5.5 | V <sub>CC</sub> - 0.1 | VCC  |                     | V <sub>CC</sub> -0.1 |                       | V    |
|          | $V_{IN} = V_{IL} \text{ or } V_{IL}$ | $I_{OH} = -8 \text{ mA}$          | 2.3        | 1.9                   | 2.1  |                     | 1.9                  |                       |      |
|          |                                      | $I_{OH} = -12 \text{ mA}$         | 2.7        | 2.2                   | 2.4  |                     | 2.2                  |                       |      |
|          |                                      | I <sub>OH</sub> = -16 mA          | 3.0        | 2.4                   | 2.7  |                     | 2.4                  |                       |      |
|          |                                      | $I_{OH} = -24 \text{ mA}$         | 3.0        | 2.3                   | 2.5  |                     | 2.3                  |                       |      |
|          |                                      | $I_{OH} = -32 \text{ mA}$         | 4.5        | 3.8                   | 4.0  |                     | 3.8                  |                       |      |
| VOL      | Low-Level Output Voltage             | I <sub>OL</sub> = 100 μA          | 2.3 to 5.5 |                       |      | 0.1                 |                      | 0.1                   | V    |
|          | $V_{IN} = V_{IH}$                    | I <sub>OL</sub> = 8 mA            | 2.3        |                       | 0.20 | 0.3                 |                      | 0.3                   |      |
|          |                                      | I <sub>OL</sub> = 12 mA           | 2.7        |                       | 0.22 | 0.4                 |                      | 0.4                   |      |
|          |                                      | I <sub>OL</sub> = 16 mA           | 3.0        |                       | 0.28 | 0.4                 |                      | 0.4                   |      |
|          |                                      | I <sub>OL</sub> = 24 mA           | 3.0        |                       | 0.38 | 0.55                |                      | 0.55                  |      |
|          |                                      | I <sub>OL</sub> = 32 mA           | 4.5        |                       | 0.42 | 0.55                |                      | 0.55                  |      |
| IIN      | Input Leakage Current                | $V_{IN} = V_{CC} \text{ or } GND$ | 0 to 5.5   |                       |      | ±0.1                |                      | ±1.0                  | μΑ   |
| ICC      | Quiescent Supply Current             | $V_{IN} = V_{CC} \text{ or } GND$ | 5.5        |                       |      | 1                   |                      | 10                    | μΑ   |

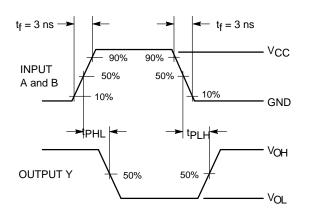
## AC ELECTRICAL CHARACTERISTICS $t_R = t_F = 3.0 \text{ ns}$

|                  |                   |   | Vcc         | 1   | Γ <sub>A</sub> = 25°C | ;   | -40°C ≤ 1 | <b>T</b> A ≤ 85°C |      |
|------------------|-------------------|---|-------------|-----|-----------------------|-----|-----------|-------------------|------|
| Symbol           | Parameter         | Condition                                 | (V)         | Min | Тур                   | Max | Min       | Max               | Unit |
| <sup>t</sup> PLH | Propagation Delay | $R_L = 1 M\Omega, C_L = 15 pF$            | $2.5\pm0.2$ | 1.2 | 3.2                   | 5.3 | 1.2       | 5.7               | ns   |
| <sup>t</sup> PHL | (Figure 3 and 4)  | $R_L = 1 M\Omega, C_L = 15 pF$            | $3.3\pm0.3$ | 0.8 | 2.4                   | 3.7 | 0.8       | 4.0               |      |
|                  |                   | $R_L = 500 \ \Omega, \ C_L = 50 \ pF$     |             | 1.2 | 3.0                   | 4.6 | 1.2       | 4.9               |      |
|                  |                   | $R_L = 1 M\Omega, C_L = 15 pF$            | $5.0\pm0.5$ | 0.5 | 1.9                   | 2.9 | 0.5       | 3.2               |      |
|                  |                   | $R_{L} = 500 \ \Omega, \ C_{L} = 50 \ pF$ |             | 0.8 | 2.4                   | 3.6 | 0.8       | 3.9               |      |

#### **CAPACITIVE CHARACTERISTICS**

| Symbol          | Parameter                     | Condition  | Typical | Unit |
|-----------------|-------------------------------|--|---------|------|
| C <sub>IN</sub> | Input Capacitance             | $V_{CC}$ = 5.5 V, $V_{I}$ = 0 V or $V_{CC}$                              | 2.5     | pF   |
| C <sub>PD</sub> | Power Dissipation Capacitance | 10 MHz, $V_{CC}$ = 3.3 V, $V_{I}$ = 0 V or $V_{CC}$                      | 9       | pF   |
|                 | (Note 7)                      | 10 MHz, V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0 V or V <sub>CC</sub> | 11      |      |

7. C<sub>PD</sub> 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:  $I_{CC(OPR)} = C_{PD} \bullet V_{CC} \bullet f_{in} + I_{CC}$ . C<sub>PD</sub> is used to determine the no–load dynamic power consumption;  $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$ .



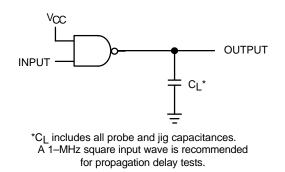
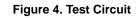


Figure 3. Switching Waveform



### **DEVICE ORDERING INFORMATION**

|                        |                               |                                | Device No                   | menclature |                    |                   |                 |                       |
|------------------------|-------------------------------|--------------------------------|-----------------------------|------------|--------------------|-------------------|-----------------|-----------------------|
| Device Order<br>Number | Logic<br>Circuit<br>Indicator | No. of<br>Gates per<br>Package | Temp<br>Range<br>Identifier | Technology | Device<br>Function | Package<br>Suffix | Package<br>Type | Tape and<br>Reel Size |
| NL27WZ00US             | NL                            | 2                              | 7                           | WZ         | 00                 | US                | US8             | 178 mm, 3000 Unit     |

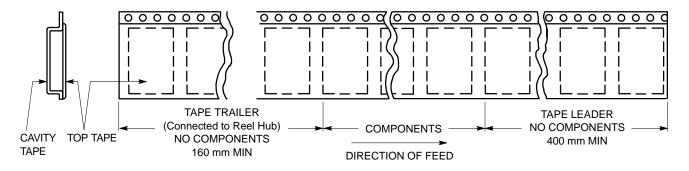


Figure 5. Tape Ends for Finished Goods

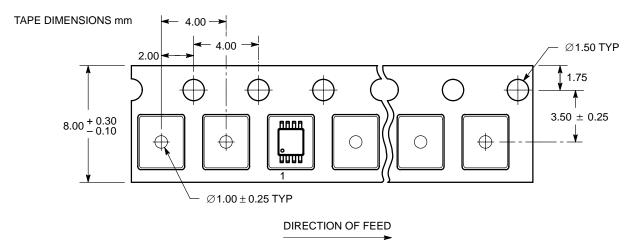
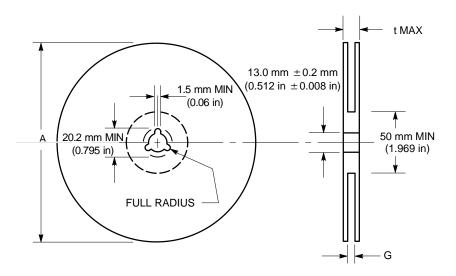


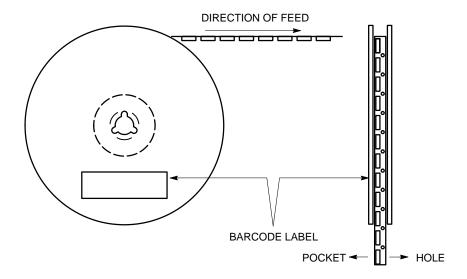
Figure 6. US8 Reel Configuration/Orientation





#### **REEL DIMENSIONS**

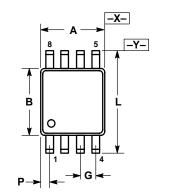
| Tape Size | T and R Suffix | A Max            | G   | t Max                |
|-----------|----------------|------------------|---|----------------------|
| 8 mm      | US             | 178 mm<br>(7 in) | 8.4 mm, + 1.5 mm, –0.0<br>(0.33 in + 0.059 in, –0.00) | 14.4 mm<br>(0.56 in) |





### PACKAGE DIMENSIONS

US8 **US SUFFIX** CASE 493-01 ISSUE O



0.10 (0.004) M T

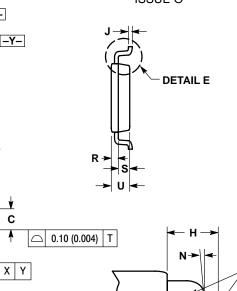
-T-

SEATING PLANE

D

 $\oplus$ 

С ¥



4

R 0.10 TYP

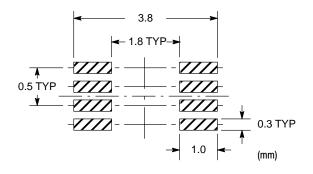
Μ

F >

NOTES: 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982. 2. CONTROLLING DIMENSION: MILLIMETERS 3. DIMENSION 'A" DOES NOT INCLUDE MOLD FLASH, PROTRUSION OR GATE BURR. MOLD FLASH, PROTRUSION OR GATE BURR SHALL NOT EXCEED 0.140 MM (0.0055') PER SIDE. 4. DIMENSION 'B' DOES NOT INCLUDE INTER-LEAD FLASH OR PROTRUSION. INTER-LEAD FLASH AND PROTRUSION. SHALL NOT E3XCEED 0.140 (0.0055') PER SIDE. 5. LEAD FINISH IS SOLDER PLATING WITH THICKNESS OF 0.0076-0.0203 MM. (300-800 INCH).

- INCH). 6. ALL TOLERANCE UNLESS OTHERWISE SPECIFIED ±0.0508 (0.0002").

|     | MILLIN | MILLIMETERS |           | HES   |  |
|-----|--------|-------------|-----------|-------|--|
| DIM | MIN    | MAX         | MIN       | MAX   |  |
| Α   | 1.90   | 2.10        | 0.075     | 0.083 |  |
| В   | 2.20   | 2.40        | 0.087     | 0.094 |  |
| С   | 0.60   | 0.90        | 0.024     | 0.035 |  |
| D   | 0.17   | 0.25        | 0.007     | 0.010 |  |
| F   | 0.20   | 0.35        | 0.008     | 0.014 |  |
| G   | 0.50   | BSC         | 0.020 BSC |       |  |
| Н   | 0.40   | REF         | 0.016 REF |       |  |
| J   | 0.10   | 0.18        | 0.004     | 0.007 |  |
| K   | 0.00   | 0.10        | 0.000     | 0.004 |  |
| L   | 3.00   | 3.20        | 0.118     | 0.126 |  |
| М   | 0 °    | 6 °         | 0 °       | 6 °   |  |
| Ν   | 5 °    | 10 °        | 5 °       | 10 °  |  |
| Р   | 0.28   | 0.44        | 0.011     | 0.017 |  |
| R   | 0.23   | 0.33        | 0.009     | 0.013 |  |
| S   | 0.37   | 0.47        | 0.015     | 0.019 |  |
| U   | 0.60   | 0.80        | 0.024     | 0.031 |  |
| V   | 0.12   | BSC         | 0.005     | 5 BSC |  |



DETAIL E

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