## NL27WZ16

## Dual Buffer

The NL27WZ16 is a high performance dual buffer operating from a 2.3 to 5.5 V supply. At $\mathrm{V}_{\mathrm{C}}=3 \mathrm{~V}$, high impedance TTL compatible inputs significantly reduce current loading to input drivers while TTL compatible outputs offer improved switching noise performance.

- Extremely High Speed: tpD 2.0 ns (typical) at $\mathrm{V}_{\mathrm{CC}}=5 \mathrm{~V}$
- 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 $\mathrm{V}_{\mathrm{CC}}=3 \mathrm{~V}$
- LVCMOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- Chip Complexity: FET $=72$; Equivalent Gate $=18$


Figure 1. Pinout (Top View)


Figure 2. Logic Symbol

PIN ASSIGNMENT

| 1 | IN A1 |
| :---: | :--- |
| 2 | GND |
| 3 | IN A2 |
| 4 | OUT Y2 |
| 5 | VCC $^{\text {CO }}$ |
| 6 | OUT Y1 |

FUNCTION TABLE

| A Input | $\overline{\text { Y Output }}$ |
| :---: | :---: |
| L | L |
| H | H |

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ORDERING INFORMATION

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

## NL27WZ16

MAXIMUM RATINGS (Note 1)

| Symbol | Characteristics | Value | Unit |
| :---: | :---: | :---: | :---: |
| $V_{\text {CC }}$ | DC Supply Voltage | -0.5 to +7.0 | V |
| $V_{1}$ | DC Input Voltage | $-0.5 \leq \mathrm{V}_{1} \leq+7.0$ | V |
| $\mathrm{V}_{\mathrm{O}}$ | DC Output Voltage $\quad$ Output in Z or LOW State (Note 2) | $-0.5 \leq \mathrm{V}_{\mathrm{O}} \leq 7.0$ | V |
| IIK | DC Input Diode Current $\quad \mathrm{V}_{1}<\mathrm{GND}$ | -50 | mA |
| IOK | DC Output Diode Current $\quad \mathrm{V}_{\mathrm{O}}<\mathrm{GND}$ | -50 | mA |
| Io | DC Output Sink Current | $\pm 50$ | mA |
| ICC | DC Supply Current per Supply Pin | $\pm 100$ | mA |
| IGND | DC Ground Current per Ground Pin | $\pm 100$ | mA |
| TSTG | Storage Temperature Range | -65 to +150 | ${ }^{\circ} \mathrm{C}$ |
| $\mathrm{P}_{\mathrm{D}}$ | Power Dissipation in Still Air SC-88, TSOP-6 | 200 | mW |
| ${ }^{\text {J JA }}$ | Thermal Resistance SC-88, TSOP-6 | 333 | ${ }^{\circ} \mathrm{C} / \mathrm{W}$ |
| $\mathrm{T}_{\mathrm{L}}$ | Lead Temperature, 1 mm from case for 10 s | 260 | ${ }^{\circ} \mathrm{C}$ |
| $\mathrm{T}_{J}$ | Junction Temperature under Bias | + 150 | ${ }^{\circ} \mathrm{C}$ |
| $V_{E S D}$ | Human Body Model (Note 3) Machine Model (Note 4) | $\begin{gathered} >2000 \\ >200 \\ \text { N/A } \end{gathered}$ | V |
| LLatch-Up | Latch-Up Performance $\quad$ Above $\mathrm{V}_{\mathrm{CC}}$ and Below GND at $85^{\circ} \mathrm{C}$ (Note 6) | $\pm 500$ | mA |

1. Absolute maximum continuous 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.
2. Io absolute maximum rating must be observed.
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 | Max | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $V_{\text {CC }}$ | Supply Voltage | Operating Data Retention Only | $\begin{aligned} & 2.3 \\ & 1.5 \end{aligned}$ | $\begin{aligned} & 5.5 \\ & 5.5 \end{aligned}$ | V |
| $V_{1}$ | Input Voltage |  | 0 | 5.5 | V |
| $\mathrm{V}_{\mathrm{O}}$ | Output Voltage | (High or LOW State) | 0 | 5.5 | V |
| $\mathrm{T}_{\text {A }}$ | Operating Free-Air Temperature |  | -40 | +85 | ${ }^{\circ} \mathrm{C}$ |
| $\Delta t / \Delta \mathrm{V}$ | Input Transition Rise or Fall Rate | $\begin{aligned} & \mathrm{V}_{\mathrm{CC}}=2.5 \mathrm{~V} \pm 0.2 \mathrm{~V} \\ & \mathrm{~V}_{\mathrm{CC}}=3.0 \mathrm{~V} \pm 0.3 \mathrm{~V} \\ & \mathrm{~V}_{\mathrm{CC}}=5.0 \mathrm{~V} \pm 0.5 \mathrm{~V} \end{aligned}$ | $\begin{aligned} & 0 \\ & 0 \\ & 0 \end{aligned}$ | $\begin{gathered} \hline 20 \\ 10 \\ 5 \end{gathered}$ | $\mathrm{ns} / \mathrm{V}$ |

DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Condition | $\mathrm{V}_{\mathrm{CC}}$ <br> (V) | $\mathrm{T}_{\mathrm{A}}=25^{\circ} \mathrm{C}$ |  |  | $-40^{\circ} \mathrm{C} \leq \mathrm{T}_{\text {A }} \leq 85^{\circ} \mathrm{C}$ |  | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | Min | Typ | Max | Min | Max |  |
| $\mathrm{V}_{\mathrm{IH}}$ | High-Level Input Voltage |  | 2.3 to 5.5 | $0.7 \mathrm{~V}_{\mathrm{CC}}$ |  |  | $0.7 \mathrm{~V}_{\mathrm{CC}}$ |  | V |
| $\mathrm{V}_{\mathrm{IL}}$ | Low-Level Input Voltage |  | 2.3 to 5.5 |  |  | $0.3 \mathrm{~V}_{\mathrm{CC}}$ |  | $0.3 \mathrm{~V}_{\mathrm{CC}}$ | V |
| $\mathrm{V}_{\mathrm{OH}}$ | High-Level Output Voltage$\mathrm{V}_{\mathrm{IN}}=\mathrm{V}_{\mathrm{IH}} \text { or } \mathrm{V}_{\mathrm{IL}}$ | $\mathrm{l} \mathrm{OH}=100 \mu \mathrm{~A}$ | 2.3 to 5.5 | $\mathrm{V}_{\mathrm{CC}}-0.1$ | VCC |  | $\mathrm{V}_{\mathrm{CC}}-0.1$ |  | V |
|  |  | $\mathrm{IOH}=-8 \mathrm{~mA}$ | 2.3 | 1.9 | 2.1 |  | 1.9 |  |  |
|  |  | $\mathrm{l}^{\mathrm{OH}}=-12 \mathrm{~mA}$ | 2.7 | 2.2 | 2.4 |  | 2.2 |  |  |
|  |  | $\mathrm{l} \mathrm{OH}=-16 \mathrm{~mA}$ | 3.0 | 2.4 | 2.7 |  | 2.4 |  |  |
|  |  | $\mathrm{IOH}=-24 \mathrm{~mA}$ | 3.0 | 2.3 | 2.5 |  | 2.3 |  |  |
|  |  | $\mathrm{l} \mathrm{OH}=-32 \mathrm{~mA}$ | 4.5 | 3.8 | 4.0 |  | 3.8 |  |  |
| $\mathrm{V}_{\mathrm{OL}}$ | Low-Level Output Voltage$\mathrm{V}_{\mathrm{IN}}=\mathrm{V}_{\mathrm{IH}} \text { or } \mathrm{V}_{\mathrm{IL}}$ | $\mathrm{l} \mathrm{OL}=100 \mu \mathrm{~A}$ | 2.3 to 5.5 |  |  | 0.1 |  | 0.1 | V |
|  |  | $\mathrm{IOL}=8 \mathrm{~mA}$ | 2.3 |  | 0.20 | 0.3 |  | 0.3 |  |
|  |  | $\mathrm{OL}=12 \mathrm{~mA}$ | 2.7 |  | 0.22 | 0.4 |  | 0.4 |  |
|  |  | $\mathrm{IOL}=16 \mathrm{~mA}$ | 3.0 |  | 0.28 | 0.4 |  | 0.4 |  |
|  |  | $\mathrm{IOL}=24 \mathrm{~mA}$ | 3.0 |  | 0.38 | 0.55 |  | 0.55 |  |
|  |  | $\mathrm{IOL}=32 \mathrm{~mA}$ | 4.5 |  | 0.42 | 0.55 |  | 0.55 |  |
| In | Input Leakage Current | $\mathrm{V}_{\text {IN }}=\mathrm{V}_{\text {CC }}$ or GND | 0 to 5.5 |  |  | $\pm 0.1$ |  | $\pm 1.0$ | $\mu \mathrm{A}$ |
| IOFF | Power Off-Output Leakage Current | $\mathrm{V}_{\text {OUT }}=5.5 \mathrm{~V}$ | 0 |  |  | 1 |  | 10 | $\mu \mathrm{A}$ |
| ICC | Quiescent Supply Current | $\mathrm{V}_{\text {IN }}=\mathrm{V}_{\text {CC }}$ or GND | 5.5 |  |  | 1 |  | 10 | $\mu \mathrm{A}$ |

AC ELECTRICAL CHARACTERISTICS $\mathrm{t}_{\mathrm{R}}=\mathrm{t}_{\mathrm{F}}=2.5 \mathrm{~ns} ; \mathrm{C}_{\mathrm{L}}=50 \mathrm{pF} ; \mathrm{R}_{\mathrm{L}}=500 \Omega$

| Symbol | Parameter | Condition | $\mathrm{V}_{\mathrm{Cc}}(\mathrm{V})$ | $\mathrm{T}_{\mathrm{A}}=25^{\circ} \mathrm{C}$ |  |  | $-40^{\circ} \mathrm{C} \leq \mathrm{T}_{\text {A }} \leq 85^{\circ} \mathrm{C}$ |  | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | Min | Typ | Max | Min | Max |  |
| $\begin{array}{\|l\|l\|l\|} \text { tPLH } \\ \text { tpHL } \end{array}$ | Propagation Delay <br> (Figure 3 and 4) | $\mathrm{R}_{\mathrm{L}}=1 \mathrm{M} \Omega, \mathrm{C}_{\mathrm{L}}=15 \mathrm{pF}$ | $2.5 \pm 0.2$ | 1.0 | 3.0 | 5.2 | 1.0 | 5.8 | ns |
|  |  | $R_{L}=1 \mathrm{M} \Omega, C_{L}=15 \mathrm{pF}$ | $3.3 \pm 0.3$ | 0.8 | 2.3 | 3.6 | 0.8 | 4.0 |  |
|  |  | $\mathrm{R}_{\mathrm{L}}=500 \Omega, \mathrm{C}_{\mathrm{L}}=50 \mathrm{pF}$ |  | 1.2 | 3.0 | 4.6 | 1.2 | 5.1 |  |
|  |  | $\mathrm{R}_{\mathrm{L}}=1 \mathrm{M} \Omega, \mathrm{C}_{\mathrm{L}}=15 \mathrm{pF}$ | $5.0 \pm 0.5$ | 0.5 | $1 . .8$ | 2.9 | 0.5 | 3.2 |  |
|  |  | $\mathrm{R}_{\mathrm{L}}=500 \Omega, \mathrm{C}_{\mathrm{L}}=50 \mathrm{pF}$ |  | 0.8 | 2.4 | 3.8 | 0.8 | 4.2 |  |

## CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Condition | Typical | Unit |
| :--- | :--- | :---: | :---: | :---: |
| $\mathrm{C}_{\mathrm{IN}}$ | Input Capacitance | $\mathrm{V}_{\mathrm{CC}}=5.5 \mathrm{~V}, \mathrm{~V}_{\mathrm{I}}=0 \mathrm{~V}$ or $\mathrm{V}_{\mathrm{CC}}$ | 7.0 | pF |
| $\mathrm{C}_{\mathrm{PD}}$ | Power Dissipation Capacitance (Note 7$)$ | $10 \mathrm{MHz}, \mathrm{V}_{\mathrm{CC}}=3.3 \mathrm{~V}, \mathrm{~V}_{\mathrm{I}}=0 \mathrm{~V}$ or $\mathrm{V}_{\mathrm{CC}}$ | 9 | pF |
|  |  | $10 \mathrm{MHz}, \mathrm{V}_{\mathrm{CC}}=5.5 \mathrm{~V}, \mathrm{~V}_{\mathrm{I}}=0 \mathrm{~V}$ or $\mathrm{V}_{\mathrm{CC}}$ | 11 |  |

7. CPD 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: $\operatorname{ICC}(O P R)=\mathrm{CPD} \bullet \mathrm{V}_{\mathrm{CC}} \cdot \mathrm{fin}_{\mathrm{in}}+\mathrm{I}_{\mathrm{CC}}$. $\mathrm{C}_{P D}$ is used to determine the no-load dynamic power consumption; $\mathrm{P}_{\mathrm{D}}=\mathrm{C}_{\mathrm{PD}} \cdot \mathrm{V}_{\mathrm{CC}}{ }^{2} \cdot \mathrm{f}_{\mathrm{in}}+\mathrm{I}_{\mathrm{CC}} \cdot \mathrm{V}_{\mathrm{CC}}$.

## NL27WZ16



## DEVICE ORDERING INFORMATION

|  | Device Nomenclature |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Device Order Number | Logic Circuit Indicator | No. of Gates per Package | Temp Range Identifier | Technology | Device Function | Package Suffix | Tape \& Reel Suffix | Package Type (Name/SOT\#/ Common Name) | Tape and Reel Size |
| NL27WZ16DFT2 | NL | 2 | 7 | WZ | 16 | DF | T2 | $\begin{gathered} \hline \text { SC-88 / SOT-363 } \\ \text { / SC-70 } \end{gathered}$ | $\begin{aligned} & 178 \mathrm{~mm}\left(7^{\prime \prime}\right) \\ & 3000 \text { Unit } \end{aligned}$ |
| NL27WZ16DTT1 | NL | 2 | 7 | WZ | 16 | DT | T1 | $\begin{gathered} \text { TSOP-6 / SOT-23 } \\ \text { / SC-59 } \end{gathered}$ | $\begin{aligned} & 178 \text { mm (7") } \\ & 3000 \text { Unit } \end{aligned}$ |



Figure 5. Tape Ends for Finished Goods


Figure 6. SC70-6/SC-88/SOT-363 DFT2 and SOT23-6/TSOP-6/SC59-6 DTT1 Reel Configuration/Orientation


Figure 7. Reel Dimensions

REEL DIMENSIONS

| Tape Size | T and R Suffix | A Max | $\mathbf{G}$ | $\mathbf{t}$ Max |
| :---: | :---: | :---: | :---: | :---: |
| 8 mm | $\mathrm{~T} 1, \mathrm{~T} 2$ | 178 mm <br> $(7 \mathrm{in})$ | $8.4 \mathrm{~mm},+1.5 \mathrm{~mm},-0.0$ <br> $(0.33 \mathrm{in}+0.059 \mathrm{in},-0.00)$ | 14.4 mm <br> $(0.56 \mathrm{in})$ |



Figure 8. Reel Winding Direction

## NL27WZ16

## PACKAGE DIMENSIONS

## SC70-6/SC-88/SOT-363 <br> DF SUFFIX <br> CASE 419B-02 <br> ISSUE H



1. DIMENSIONING AND TOLERANCING PER ANSI

Y14.5M, 1982
2. CONTROLLING DIMENSION: INCH

|  |  |  | MILLII | TERS |
| :---: | :---: | :---: | :---: | :---: |
| DIM | MIN | MAX | MIN | MAX |
| A | 0.071 | 0.087 | 1.80 | 2.20 |
| B | 0.045 | 0.053 | 1.15 | 1.35 |
| C | 0.031 | 0.043 | 0.80 | 1.10 |
| D | 0.004 | 0.012 | 0.10 | 0.30 |
| G | 0.026 BSC |  | 0.65 BSC |  |
| H | --- | 0.004 | --- | 0.10 |
| J | 0.004 | 0.010 | 0.10 | 0.25 |
| K | 0.004 | 0.012 | 0.10 | 0.30 |
| N | 0.008 REF |  | 0.20 REF |  |
| S | 0.079 | 0.087 | 2.00 | 2.20 |



## NL27WZ16

## PACKAGE DIMENSIONS

## SOT23-6/TSOP-6/SC59-6 DT SUFFIX

CASE 318G-02

notes:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

|  | MILLIMETERS |  |  | INCHES |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| DIM | MIN | MAX | MIN | MAX |  |
| A | 2.90 | 3.10 | 0.1142 | 0.1220 |  |
| B | 1.30 | 1.70 | 0.0512 | 0.0669 |  |
| C | 0.90 | 1.10 | 0.0354 | 0.0433 |  |
| D | 0.25 | 0.50 | 0.0098 | 0.0197 |  |
| G | 0.85 | 1.05 | 0.0335 | 0.0043 |  |
| H | 0.013 | 0.100 | 0.0005 | 0.0040 |  |
| J | 0.10 | 0.26 | 0.0040 | 0.0102 |  |
| K | 0.20 | 0.60 | 0.0079 | 0.0236 |  |
| L | 1.25 | 1.55 | 0.0493 | 0.0610 |  |
| M | $0^{\circ}$ | $10^{\circ}$ | $0^{\circ}$ | $10^{\circ}$ |  |
| S | 2.50 | 3.00 | 0.0985 | 0.1181 |  |



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