

# NL17SV16XV5T2

## Ultra-Low Voltage Buffer

The NL17SV16XV5T2 is an ultra-high performance single Buffer fabricated in sub-micron silicon gate (0.35  $\mu$ ) CMOS technology with excellent performance down to 0.9 V. This device is ideal for extremely high-speed and high-drive applications. Additionally, limitations of board space are no longer a constraint. The very small SOT-553 makes this device fit most tight designs and spaces.

The internal circuit is composed of three stages; including a buffered output which provides high noise immunity and stable output. The NL17SV16XV5T2 input structure provides protection when voltages up to 3.6 V are applied.

### Features

- Extremely High Speed: 1.5 ns (Typ) at  $V_{CC} = 3.3$  V
- Designed for 0.9 V to 3.6 V Operation
- Overvoltage Tolerance (OVT)\* Input Permits Logic Translation
- Balanced  $\pm 24$  mA Output Drive @ 3.3 Volts
- Near Zero Static Supply Current
- Ultra-Tiny SOT-553 5 Pin Package Only 1.6 x 1.6 mm Footprint
- Ultra-Tiny SOT-553 5-Pin Package, only 1.6 x 1.6 x 0.6 mm
- These are Pb-Free Devices

### Typical Applications

- Cellular
- Digital Camera
- PDA
- Digital Video

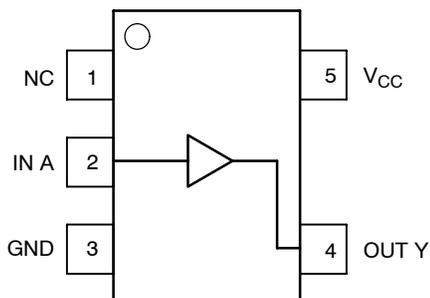


Figure 1. Pinout (Top View)

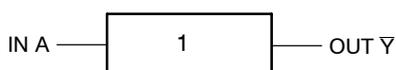


Figure 2. Logic Symbol

\*Overvoltage Tolerance (OVT) enables input pins to function outside (higher) of their operating voltages, with no damage to the devices or to signal integrity.



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**SOT-553  
XV5 SUFFIX  
CASE 463B**

### MARKING DIAGRAM



UN = Device Code  
M = Date Code\*  
A = Assembly Location  
Y = Year  
W = Work Week  
▪ = Pb-Free Package  
(Note: Microdot may be in either location)

### PIN ASSIGNMENT

| Pin | Assignment |
|-----|------------|
| 1   | NC         |
| 2   | IN A       |
| 3   | GND        |
| 4   | OUT Y      |
| 5   | $V_{CC}$   |

### FUNCTION TABLE

| Input A | Output Y |
|---------|----------|
| L       | L        |
| H       | H        |

### ORDERING INFORMATION

| Device         | Package  | Shipping†          |
|----------------|----------|--------------------|
| NL17SV16XV5T2  | SOT-553* | 4000 / Tape & Reel |
| NL17SV16XV5T2G | SOT-553* | 4000 / 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.

\*This package is inherently Pb-Free.

# NL17SV16XV5T2

## MAXIMUM RATINGS

| Symbol           | Rating  | Value                        | Unit |
|------------------|---|------------------------------|------|
| V <sub>CC</sub>  | DC Supply Voltage   | -0.5 to + 4.6                | V    |
| V <sub>I</sub>   | DC Input Voltage  | -0.5 to + 4.6                | V    |
| V <sub>O</sub>   | DC Output Voltage   | -0.5 to V <sub>CC</sub> +0.5 | V    |
| I <sub>IK</sub>  | DC Input Diode Current<br>V <sub>I</sub> < GND                                      | ±50                          | mA   |
| I <sub>OK</sub>  | DC Output Diode Current<br>V <sub>O</sub> = GND<br>V <sub>O</sub> = V <sub>CC</sub> | -50<br>+50                   | mA   |
| I <sub>O</sub>   | DC Output Sink Current  | ±50                          | mA   |
| I <sub>CC</sub>  | DC Supply Current per Supply Pin  | ±50                          | mA   |
| I <sub>GND</sub> | DC Ground Current per Ground Pin  | ±50                          | mA   |
| T <sub>STG</sub> | Storage Temperature Range   | - 65 to +150                 | °C   |
| T <sub>L</sub>   | Lead Temperature, 1.0 mm from Case for 10 seconds                                   | 260                          | °C   |
| T <sub>J</sub>   | Junction Temperature Under Bias   | +150                         | °C   |
| θ <sub>JA</sub>  | Thermal Resistance (Note 1)   | 250                          | °C/W |
| P <sub>D</sub>   | Power Dissipation in Still Air at 85°C  | 250                          | mW   |
| MSL              | Moisture Sensitivity  | Level 1                      |      |
| F <sub>R</sub>   | Flammability Rating<br>Oxygen index: 28 to 34                                       | UL 94 V-0 @ 0125 in          |      |
| V <sub>ESD</sub> | ESD Withstand Voltage<br>Human Body Model (Note 2)<br>Machine Model (Note 3)        | 2000<br>300                  | V    |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2 ounce copper trace no air flow.
2. Tested to EIA/JESD22-A114-A.
3. Tested to EIA/JESD22-A115-A.

## RECOMMENDED OPERATING CONDITIONS

| Symbol                           | Parameter   | Min | Max                                  | Unit |
|----------------------------------|---|-----|--------------------------------------|------|
| V <sub>CC</sub>                  | Positive DC Supply Voltage  | 0.9 | 3.6                                  | V    |
| V <sub>IN</sub>                  | Digital Input Voltage   | 0   | 3.6                                  | V    |
| V <sub>out</sub>                 | Output Voltage  | 0   | V <sub>CC</sub>                      | V    |
| I <sub>OH</sub> /I <sub>OL</sub> | Output Current<br>V <sub>CC</sub> = 3.0 V to 3.6 V<br>V <sub>CC</sub> = 2.3 V to 2.7 V<br>V <sub>CC</sub> = 1.65 V to 1.95 V<br>V <sub>CC</sub> = 1.4 V to 1.6 V<br>V <sub>CC</sub> = 1.1 V to 1.3 V<br>V <sub>CC</sub> = 0.9 V |     | ±24<br>±18<br>±6<br>±4<br>±2<br>±0.1 | mA   |
| t <sub>A</sub>                   | Operating Temperature Range. All Package Types  | -40 | +85                                  | °C   |
| t <sub>r</sub> , t <sub>f</sub>  | Input Rise or Fall Time<br>V <sub>CC</sub> = 3.3V ± 0.3 V   | 0   | 10                                   | 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         |

# NL17SV16XV5T2

## DC CHARACTERISTICS— Digital Section (Voltages Referenced to GND)

| Symbol                        | Parameter                     | Condition                               | V <sub>CC</sub>               | T <sub>A</sub> = 25°C  |                        | T <sub>A</sub> = -40 to 85°C |                        | Unit |
|-------------------------------|-------------------------------|---|-------------------------------|------------------------|------------------------|------------------------------|------------------------|------|
|                               |                               |   |                               | Min                    | Max                    | Min                          | Max                    |      |
| V <sub>IH</sub>               | High Level Input Voltage      |   | 0.90                          | 0.65 x V <sub>CC</sub> |                        | 0.65 x V <sub>CC</sub>       |                        | V    |
|                               |                               |   | 1.10 ≤ V <sub>CC</sub> ≤ 1.30 | 0.65 x V <sub>CC</sub> |                        | 0.65 x V <sub>CC</sub>       |                        |      |
|                               |                               |   | 1.40 ≤ V <sub>CC</sub> ≤ 1.60 | 0.65 x V <sub>CC</sub> |                        | 0.65 x V <sub>CC</sub>       |                        |      |
|                               |                               |   | 1.65 ≤ V <sub>CC</sub> ≤ 1.95 | 0.65 x V <sub>CC</sub> |                        | 0.65 x V <sub>CC</sub>       |                        |      |
|                               |                               |   | 2.30 ≤ V <sub>CC</sub> ≤ 2.70 | 1.6                    |                        | 1.6                          |                        |      |
| 2.70 ≤ V <sub>CC</sub> ≤ 3.60 | 2.0                           |   | 2.0                           |                        |                        |                              |                        |      |
| V <sub>IL</sub>               | Low Level Input Voltage       |   | 0.90                          |                        | 0.35 x V <sub>CC</sub> |                              | 0.35 x V <sub>CC</sub> | V    |
|                               |                               |   | 1.10 ≤ V <sub>CC</sub> ≤ 1.30 |                        | 0.35 x V <sub>CC</sub> |                              | 0.35 x V <sub>CC</sub> |      |
|                               |                               |   | 1.40 ≤ V <sub>CC</sub> ≤ 1.60 |                        | 0.35 x V <sub>CC</sub> |                              | 0.35 x V <sub>CC</sub> |      |
|                               |                               |   | 1.65 ≤ V <sub>CC</sub> ≤ 1.95 |                        | 0.35 x V <sub>CC</sub> |                              | 0.35 x V <sub>CC</sub> |      |
|                               |                               |   | 2.30 ≤ V <sub>CC</sub> ≤ 2.70 |                        | 0.7                    |                              | 0.7                    |      |
| 2.70 ≤ V <sub>CC</sub> ≤ 3.60 |                               | 0.8                                     |                               | 0.8                    |                        |                              |                        |      |
| V <sub>OH</sub>               | High Level Output Voltage     | I <sub>OH</sub> = -100 μA               | 0.90                          | V <sub>CC</sub> - 0.1  |                        | V <sub>CC</sub> - 0.1        |                        | V    |
|                               |                               |   | 1.10 ≤ V <sub>CC</sub> ≤ 1.30 | V <sub>CC</sub> - 0.1  |                        | V <sub>CC</sub> - 0.1        |                        |      |
|                               |                               |   | 1.40 ≤ V <sub>CC</sub> ≤ 1.60 | V <sub>CC</sub> - 0.2  |                        | V <sub>CC</sub> - 0.2        |                        |      |
|                               |                               |   | 1.65 ≤ V <sub>CC</sub> ≤ 1.95 | V <sub>CC</sub> - 0.2  |                        | V <sub>CC</sub> - 0.2        |                        |      |
|                               |                               |   | 2.30 ≤ V <sub>CC</sub> ≤ 2.70 | V <sub>CC</sub> - 0.2  |                        | V <sub>CC</sub> - 0.2        |                        |      |
|                               |                               | 2.70 ≤ V <sub>CC</sub> ≤ 3.60           | V <sub>CC</sub> - 0.2         |                        | V <sub>CC</sub> - 0.2  |                              |                        |      |
|                               |                               | I <sub>OH</sub> = -2.0 mA               | 1.10 ≤ V <sub>CC</sub> ≤ 1.30 | 0.75 x V <sub>CC</sub> |                        | 0.75 x V <sub>CC</sub>       |                        |      |
| I <sub>OH</sub> = -4.0 mA     | 1.40 ≤ V <sub>CC</sub> ≤ 1.60 | 0.75 x V <sub>CC</sub>                  |                               | 0.75 x V <sub>CC</sub> |                        |                              |                        |      |
| I <sub>OH</sub> = -6.0 mA     | 1.65 ≤ V <sub>CC</sub> ≤ 1.95 | 2.30 ≤ V <sub>CC</sub> ≤ 2.70           | 1.25                          |                        | 1.25                   |                              |                        |      |
|                               |                               |   | 2.0                           |                        | 2.0                    |                              |                        |      |
| I <sub>OH</sub> = -12 mA      | 2.30 ≤ V <sub>CC</sub> ≤ 2.70 | 2.70 ≤ V <sub>CC</sub> ≤ 3.60           | 1.8                           |                        | 1.8                    |                              |                        |      |
|                               |                               |   | 2.2                           |                        | 2.2                    |                              |                        |      |
| I <sub>OH</sub> = -18 mA      | 2.30 ≤ V <sub>CC</sub> ≤ 2.70 | 2.70 ≤ V <sub>CC</sub> ≤ 3.60           | 1.7                           |                        | 1.7                    |                              |                        |      |
|                               |                               |   | 2.4                           |                        | 2.4                    |                              |                        |      |
| I <sub>OH</sub> = -24 mA      | 2.70 ≤ V <sub>CC</sub> ≤ 3.60 |   | 2.2                           |                        | 2.2                    |                              |                        |      |
| V <sub>OL</sub>               | Low Level Output Voltage      | I <sub>OL</sub> = 100 μA                | 0.90                          |                        | 0.1                    |                              | 0.1                    | V    |
|                               |                               |   | 1.10 ≤ V <sub>CC</sub> ≤ 1.30 |                        | 0.1                    |                              | 0.1                    |      |
|                               |                               |   | 1.40 ≤ V <sub>CC</sub> ≤ 1.60 |                        | 0.2                    |                              | 0.2                    |      |
|                               |                               |   | 1.65 ≤ V <sub>CC</sub> ≤ 1.95 |                        | 0.2                    |                              | 0.2                    |      |
|                               |                               |   | 2.30 ≤ V <sub>CC</sub> ≤ 2.70 |                        | 0.2                    |                              | 0.2                    |      |
|                               |                               |   | 2.70 ≤ V <sub>CC</sub> ≤ 3.60 |                        | 0.2                    |                              | 0.2                    |      |
|                               |                               | I <sub>OL</sub> = 2.0 mA                | 1.10 ≤ V <sub>CC</sub> ≤ 1.30 |                        | 0.25 x V <sub>CC</sub> |                              | 0.25 x V <sub>CC</sub> |      |
|                               |                               | I <sub>OL</sub> = 4.0 mA                | 1.40 ≤ V <sub>CC</sub> ≤ 1.60 |                        | 0.25 x V <sub>CC</sub> |                              | 0.25 x V <sub>CC</sub> |      |
| I <sub>OL</sub> = 6.0 mA      | 1.65 ≤ V <sub>CC</sub> ≤ 1.95 |   |                               | 0.3                    |                        | 0.3                          |                        |      |
|                               |                               |   |                               |                        |                        |                              |                        |      |
| I <sub>OL</sub> = 12 mA       | 2.30 ≤ V <sub>CC</sub> ≤ 2.70 | 2.70 ≤ V <sub>CC</sub> ≤ 3.60           |                               | 0.4                    |                        | 0.4                          |                        |      |
|                               |                               |   |                               | 0.4                    |                        | 0.4                          |                        |      |
| I <sub>OL</sub> = 18 mA       | 2.30 ≤ V <sub>CC</sub> ≤ 2.70 | 2.70 ≤ V <sub>CC</sub> ≤ 3.60           |                               | 0.6                    |                        | 0.6                          |                        |      |
|                               |                               |   |                               | 0.4                    |                        | 0.4                          |                        |      |
| I <sub>OL</sub> = 24 mA       | 2.70 ≤ V <sub>CC</sub> ≤ 3.60 |   |                               | 0.55                   |                        | 0.55                         |                        |      |
| I <sub>IN</sub>               | Input Leakage Current         | 0 = V <sub>I</sub> = 3.6 V              | 0.90 to 3.60                  |                        | ±0.1                   |                              | ±0.9                   | μA   |
| I <sub>OFF</sub>              | Power Off Leakage Current     |   | 0                             |                        | 1                      |                              | 5                      | μA   |
| I <sub>CC</sub>               | Quiescent Supply Current      | V <sub>I</sub> = V <sub>CC</sub> or GND | 0.90 to 3.60                  |                        | 0.9                    |                              | 5                      | μA   |

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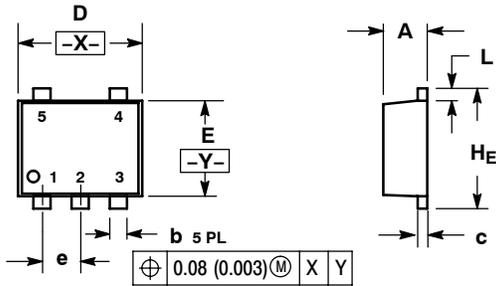
### AC CHARACTERISTICS (Input $t_r = t_f = 3.0$ nS)

| Symbol  | Parameter                     | -40°C   |                               | 25°C |     |     | 85°C |      | Unit |
|---|-------------------------------|---|-------------------------------|------|-----|-----|------|------|------|
|   |                               | Condition   | V <sub>CC</sub>               | Min  | Typ | Max | Min  | Max  |      |
| T <sub>PHL</sub> ,<br>T <sub>PLH</sub>          | Propagation Delay             | C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1.0 MΩ       | 0.90                          |      | 20  |     |      |      | nS   |
|   |                               | C <sub>L</sub> = 15 pF, R <sub>L</sub> = 2.0 kΩ       | 1.10 ≤ V <sub>CC</sub> ≤ 1.30 | 2.0  | 6.0 | 13  | 1.0  | 16.9 | nS   |
|   |                               |   | 1.40 ≤ V <sub>CC</sub> ≤ 1.60 | 1.0  | 3.2 | 6.1 | 1.0  | 7.0  |      |
| C <sub>L</sub> = 30 pF, R <sub>L</sub> = 500 kΩ | 1.65 ≤ V <sub>CC</sub> ≤ 1.95 | 1.0   | 2.0                           | 5.2  | 1.0 | 6.2 | nS   |      |      |
|   |                               | 2.30 ≤ V <sub>CC</sub> ≤ 2.70                         | 0.8                           | 1.2  | 3.7 | 0.7 |      | 4.4  |      |
|   |                               | 2.70 ≤ V <sub>CC</sub> ≤ 3.60                         | 0.7                           | 1.0  | 3.3 | 0.6 |      | 3.8  |      |
| C <sub>IN</sub>                                 | Input Capacitance             |   | 0                             |      | 2.0 |     |      |      | pF   |
| C <sub>OUT</sub>                                | Output Capacitance            |   | 0                             |      | 4.5 |     |      |      | pF   |
| C <sub>PD</sub>                                 | Power Dissipation Capacitance | V <sub>I</sub> = 0 V or V <sub>CC</sub><br>F = 10 MHz | 0.90 to 3.60                  |      | 20  |     |      |      | pF   |

# NL17SV16XV5T2

## PACKAGE DIMENSIONS

SOT-553, 5 LEAD  
CASE 463B-01  
ISSUE B

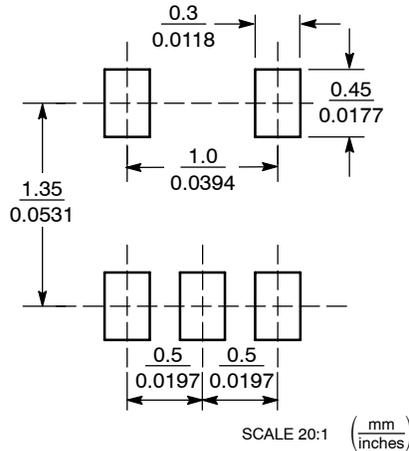


NOTES:

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

| DIM | MILLIMETERS |      |      | INCHES    |       |       |
|-----|-------------|------|------|-----------|-------|-------|
|     | MIN         | NOM  | MAX  | MIN       | NOM   | MAX   |
| A   | 0.50        | 0.55 | 0.60 | 0.020     | 0.022 | 0.024 |
| b   | 0.17        | 0.22 | 0.27 | 0.007     | 0.009 | 0.011 |
| c   | 0.08        | 0.13 | 0.18 | 0.003     | 0.005 | 0.007 |
| D   | 1.50        | 1.60 | 1.70 | 0.059     | 0.063 | 0.067 |
| E   | 1.10        | 1.20 | 1.30 | 0.043     | 0.047 | 0.051 |
| e   | 0.50 BSC    |      |      | 0.020 BSC |       |       |
| L   | 0.10        | 0.20 | 0.30 | 0.004     | 0.008 | 0.012 |
| HE  | 1.50        | 1.60 | 1.70 | 0.059     | 0.063 | 0.067 |

### SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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