

# NL17SG14

## Schmitt Inverter

The NL17SG14 MiniGate™ is an advanced high-speed CMOS Schmitt Inverter in ultra-small footprint.

The NL17SG14 input structure provides protection when voltages up to 4.6 V are applied.

### Features

- Wide Operating  $V_{CC}$  Range: 0.9 V to 3.6 V
- High Speed:  $t_{PD} = 3.7$  ns (Typ) at  $V_{CC} = 3.0$  V,  $C_L = 15$  pF
- Low Power Dissipation:  $I_{CC} = 0.5$   $\mu$ A (Max) at  $T_A = 25^\circ$ C
- 4.6 V Overvoltage Tolerant (OVT) Input Pins
- Ultra-Small Packages
- These are Pb-Free and Halide-Free Devices

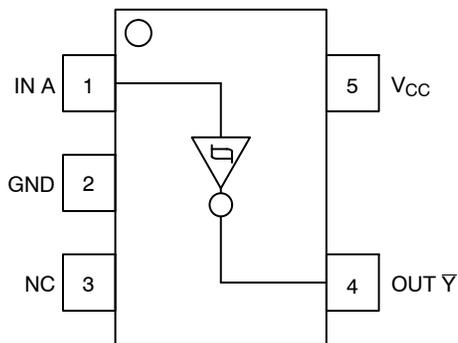


Figure 1. Pinout

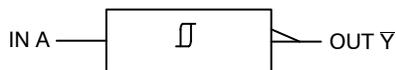


Figure 2. Logic Symbol



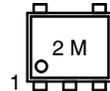
**ON Semiconductor®**

<http://onsemi.com>

### MARKING DIAGRAM



**SOT-953  
CASE 527AE**



2 = Specific Device Code  
M = Month Code

### PIN ASSIGNMENT

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

### FUNCTION TABLE

| A Input | $\bar{Y}$ Output |
|---------|------------------|
| L       | H                |
| H       | L                |

### ORDERING INFORMATION

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

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## MAXIMUM RATINGS

| Symbol        | Parameter   | Value                                  | Unit        |
|---------------|---|--|-------------|
| $V_{CC}$      | DC Supply Voltage   | -0.5 to +5.5                           | V           |
| $V_{IN}$      | DC Input Voltage  | -0.5 to +4.6                           | V           |
| $V_{OUT}$     | DC Output Voltage<br>Output at High or Low State<br>Power-Down Mode ( $V_{CC} = 0$ V) | -0.5 to $V_{CC} + 0.5$<br>-0.5 to +4.6 | V           |
| $I_{IK}$      | DC Input Diode Current<br>$V_{IN} < GND$  | -20                                    | mA          |
| $I_{OK}$      | DC Output Diode Current<br>$V_{OUT} < GND$  | -20                                    | mA          |
| $I_{OUT}$     | DC Output Source/Sink Current   | $\pm 20$                               | mA          |
| $I_{CC}$      | DC Supply Current per Supply Pin  | $\pm 20$                               | mA          |
| $I_{GND}$     | DC Ground Current per Ground Pin  | $\pm 20$                               | mA          |
| $T_{STG}$     | Storage Temperature Range   | -65 to +150                            | $^{\circ}C$ |
| $T_L$         | Lead Temperature, 1 mm from Case for 10 Seconds                                       | 260                                    | $^{\circ}C$ |
| $T_J$         | Junction Temperature Under Bias   | +150                                   | $^{\circ}C$ |
| MSL           | Moisture Sensitivity  | Level 1                                |             |
| $F_R$         | Flammability Rating<br>Oxygen Index: 28 to 34   | UL 94 V-0 @ 0.125 in                   |             |
| $V_{ESD}$     | ESD Withstand Voltage<br>Human Body Model (Note 2)<br>Machine Model (Note 3)          | >2000<br>>100                          | V           |
| $I_{LATCHUP}$ | Latchup Performance<br>Above $V_{CC}$ and Below GND at 125 $^{\circ}C$ (Note 4)       | $\pm 100$                              | mA          |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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 EIA/JESD78.

## RECOMMENDED OPERATING CONDITIONS

| Symbol                | Characteristics  | Min        | Max             | Unit        |
|-----------------------|--|------------|-----------------|-------------|
| $V_{CC}$              | Positive DC Supply Voltage   | 0.9        | 3.6             | V           |
| $V_{IN}$              | Digital Input Voltage  | 0.0        | 3.6             | V           |
| $V_{OUT}$             | Output Voltage<br>Output at High or Low State<br>Power-Down Mode ( $V_{CC} = 0$ V) | 0.0<br>0.0 | $V_{CC}$<br>3.6 | V           |
| $T_A$                 | Operating Temperature Range  | -55        | +125            | $^{\circ}C$ |
| $\Delta t / \Delta V$ | Input Transition Rise or Fall Rate<br>$V_{CC} = 3.3$ V $\pm$ 0.3 V                 | 0          | 10              | ns/V        |

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## DC ELECTRICAL CHARACTERISTICS

| Symbol          | Parameter                              | Condition  | V <sub>CC</sub><br>(V)    | T <sub>A</sub> = 25°C |                        |      | -55°C ≤ T <sub>A</sub> ≤ 125°C |                        | Unit |
|-----------------|--|--|---------------------------|-----------------------|------------------------|------|--------------------------------|------------------------|------|
|                 |  |  |                           | Min                   | Typ                    | Max  | Min                            | Max                    |      |
| V <sub>T+</sub> | Positive-Going Input Threshold Voltage |  | 0.9                       |                       | 0.7                    | 0.86 |                                | 0.87                   | V    |
|                 |  |  | 1.1                       |                       | 0.81                   | 0.95 |                                | 1                      |      |
|                 |  |  | 1.4                       |                       | 0.94                   | 1.16 |                                | 1.2                    |      |
|                 |  |  | 1.65                      |                       | 1.06                   | 1.25 |                                | 1.3                    |      |
|                 |  |  | 2.3                       |                       | 1.36                   | 1.6  |                                | 1.65                   |      |
|                 |  |  | 3.0                       |                       | 1.8                    | 2.05 |                                | 2.1                    |      |
| V <sub>T-</sub> | Negative-Going Input Threshold Voltage |  | 0.9                       | 0.09                  | 0.23                   |      | 0.08                           |                        | V    |
|                 |  |  | 1.1                       | 0.15                  | 0.33                   |      | 0.12                           |                        |      |
|                 |  |  | 1.4                       | 0.3                   | 0.47                   |      | 0.25                           |                        |      |
|                 |  |  | 1.65                      | 0.35                  | 0.6                    |      | 0.3                            |                        |      |
|                 |  |  | 2.3                       | 0.55                  | 0.85                   |      | 0.5                            |                        |      |
|                 |  |  | 3.0                       | 0.95                  | 1.13                   |      | 0.9                            |                        |      |
| V <sub>H</sub>  | Hysteresis Voltage                     |  | 0.9                       | 0.15                  | 0.5                    | 0.75 | 0.2                            | 0.8                    | V    |
|                 |  |  | 1.1                       | 0.15                  | 0.5                    | 0.75 | 0.2                            | 0.8                    |      |
|                 |  |  | 1.4                       | 0.15                  | 0.5                    | 0.75 | 0.2                            | 0.8                    |      |
|                 |  |  | 1.65                      | 0.15                  | 0.5                    | 0.75 | 0.2                            | 0.8                    |      |
|                 |  |  | 2.3                       | 0.15                  | 0.5                    | 0.75 | 0.2                            | 0.8                    |      |
|                 |  |  | 3.0                       | 0.25                  | 0.65                   | 0.85 | 0.3                            | 0.9                    |      |
| V <sub>OH</sub> | High-Level Output Voltage              | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> | I <sub>OH</sub> = -20 μA  | 0.9                   | 0.75                   |      |                                | 0.75                   | V    |
|                 |  |  | I <sub>OH</sub> = -0.3 mA | 1.1 to 1.3            | 0.75 x V <sub>CC</sub> |      |                                | 0.75 x V <sub>CC</sub> |      |
|                 |  |  | I <sub>OH</sub> = -1.7 mA | 1.4 to 1.6            | 0.75 x V <sub>CC</sub> |      |                                | 0.75 x V <sub>CC</sub> |      |
|                 |  |  | I <sub>OH</sub> = -3.0 mA | 1.65 to 1.95          | V <sub>CC</sub> - 0.45 |      |                                | V <sub>CC</sub> - 0.45 |      |
|                 |  |  | I <sub>OH</sub> = -4.0 mA | 2.3 to 2.7            | 2.0                    |      |                                | 2.0                    |      |
|                 |  |  | I <sub>OH</sub> = -8.0 mA | 3.0 to 3.6            | 2.48                   |      |                                | 2.48                   |      |
| V <sub>OL</sub> | Low-Level Output Voltage               | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> | I <sub>OL</sub> = 20 μA   | 0.9                   |                        |      | 0.1                            | 0.1                    | V    |
|                 |  |  | I <sub>OL</sub> = 0.3 mA  | 1.1 to 1.3            |                        |      | 0.25 x V <sub>CC</sub>         | 0.25 x V <sub>CC</sub> |      |
|                 |  |  | I <sub>OL</sub> = 1.7 mA  | 1.4 to 1.6            |                        |      | 0.25xV <sub>CC</sub>           | 0.25 x V <sub>CC</sub> |      |
|                 |  |  | I <sub>OL</sub> = 3.0 mA  | 1.65 to 1.95          |                        |      | 0.45                           | 0.45                   |      |
|                 |  |  | I <sub>OL</sub> = 4.0 mA  | 2.3 to 2.7            |                        |      | 0.4                            | 0.4                    |      |
|                 |  |  | I <sub>OL</sub> = 8.0 mA  | 3.0 to 3.6            |                        |      | 0.4                            | 0.4                    |      |
| I <sub>IN</sub> | Input Leakage Current                  | 0 ≤ V <sub>IN</sub> ≤ 3.6 V                          | 0 to 3.6                  |                       |                        | ±0.1 |                                | ±1.0                   | μA   |
| I <sub>CC</sub> | Quiescent Supply Current               | V <sub>IN</sub> = V <sub>CC</sub> or GND             | 3.6                       |                       |                        | 0.5  |                                | 10.0                   | μA   |

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## AC ELECTRICAL CHARACTERISTICS Input $t_r = t_f = 3.0$ ns

| Symbol                   | Parameter                              | Test Condition                         | $V_{CC}$ (V) | $T_A = 25^\circ\text{C}$ |      |      | $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ |      | Unit |
|--------------------------|--|--|--------------|--------------------------|------|------|--|------|------|
|                          |  |  |              | Min                      | Typ  | Max  | Min  | Max  |      |
| $t_{PLH}$ ,<br>$t_{PHL}$ | Propagation Delay,<br>A or $\bar{Y}$   | $C_L = 10$ pF,<br>$R_L = 1$ M $\Omega$ | 0.9          | –                        | 27.3 | –    | –  | –    | ns   |
|                          |  |  | 1.1 to 1.3   | –                        | 13.0 | 22.6 | 1.0  | 35.9 |      |
|                          |  |  | 1.4 to 1.6   | –                        | 7.5  | 10.5 | 1.0  | 11.3 |      |
|                          |  |  | 1.65 to 1.95 | –                        | 6.0  | 7.8  | 1.0  | 8.2  |      |
|                          |  |  | 2.3 to 2.7   | –                        | 4.3  | 5.4  | 1.0  | 5.8  |      |
|                          |  |  | 3.0 to 3.6   | –                        | 3.5  | 4.4  | 1.0  | 4.6  |      |
|                          |  | $C_L = 15$ pF,<br>$R_L = 1$ M $\Omega$ | 0.9          | –                        | 29.5 | –    | –  | –    | ns   |
|                          |  |  | 1.1 to 1.3   | –                        | 14.3 | 25.1 | 1.0  | 41.6 |      |
|                          |  |  | 1.4 to 1.6   | –                        | 8.0  | 11.5 | 1.0  | 12.6 |      |
|                          |  |  | 1.65 to 1.95 | –                        | 6.3  | 8.4  | 1.0  | 8.7  |      |
|                          |  |  | 2.3 to 2.7   | –                        | 4.6  | 5.7  | 1.0  | 6.1  |      |
|                          |  |  | 3.0 to 3.6   | –                        | 3.7  | 4.6  | 1.0  | 5.0  |      |
|                          |  | $C_L = 30$ pF,<br>$R_L = 1$ M $\Omega$ | 0.9          | –                        | 40.5 | –    | –  | –    | ns   |
|                          |  |  | 1.1 to 1.3   | –                        | 19.6 | 35.7 | 1.0  | 58.1 |      |
|                          |  |  | 1.4 to 1.6   | –                        | 10.7 | 15.8 | 1.0  | 17.6 |      |
|                          |  |  | 1.65 to 1.95 | –                        | 7.8  | 10.7 | 1.0  | 11.7 |      |
|                          |  |  | 2.3 to 2.7   | –                        | 5.4  | 6.9  | 1.0  | 8.1  |      |
|                          |  |  | 3.0 to 3.6   | –                        | 4.3  | 5.2  | 1.0  | 6.1  |      |
| $C_{IN}$                 | Input Capacitance                      |  | 0 to 3.6     |                          | 3    | –    | –  | pF   |      |
| $C_O$                    | Output Capacitance                     | $V_O = \text{GND}$                     | 0            |                          | 3    | –    | –  | pF   |      |
| $C_{PD}$                 | Power Dissipation Capacitance (Note 5) | $f = 10$ MHz                           | 0.9 to 3.6   | –                        | 4    | –    | –  | pF   |      |

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

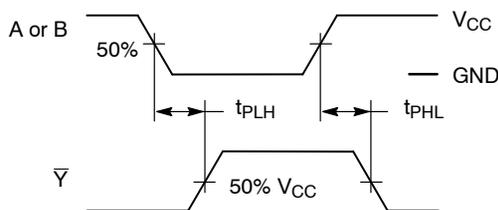
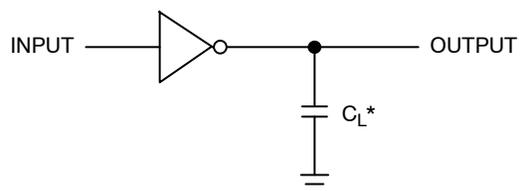


Figure 3. Switching Waveform



\*Includes all probe and jig capacitance.  
A 1 MHz square input wave is recommended for propagation delay tests.

Figure 4. Test Circuit

## ORDERING INFORMATION

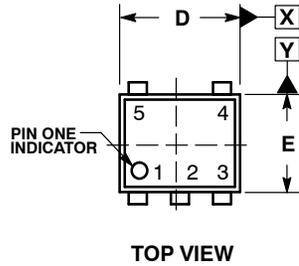
| Device        | Package              | Shipping <sup>†</sup> |
|---------------|----------------------|-----------------------|
| NL17SG14P5T5G | SOT-953<br>(Pb-Free) | 8000 / Tape & Reel    |

<sup>†</sup>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.

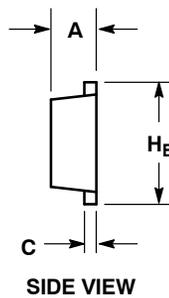
# NL17SG14

## PACKAGE DIMENSIONS

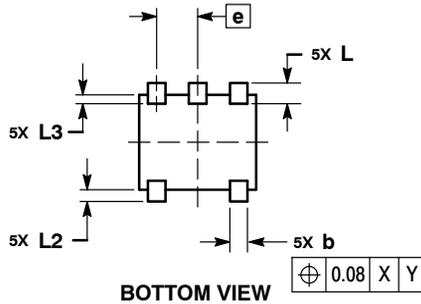
SOT-953  
CASE 527AE  
ISSUE E



TOP VIEW



SIDE VIEW



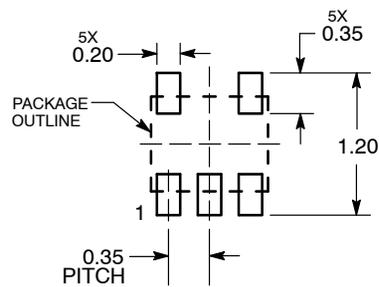
BOTTOM VIEW

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN         | NOM  | MAX  |
| A   | 0.34        | 0.37 | 0.40 |
| b   | 0.10        | 0.15 | 0.20 |
| C   | 0.07        | 0.12 | 0.17 |
| D   | 0.95        | 1.00 | 1.05 |
| E   | 0.75        | 0.80 | 0.85 |
| e   | 0.35 BSC    |      |      |
| HE  | 0.95        | 1.00 | 1.05 |
| L   | 0.175 REF   |      |      |
| L2  | 0.05        | 0.10 | 0.15 |
| L3  | ---         | ---  | 0.15 |

### 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.

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