

# NL17SZ86

## Single 2-Input Exclusive-OR Gate

The NL17SZ86 is a high performance single 2-input Exclusive-OR Gate operating from a 2.3 V to 5.5 V supply.

### Features

- Extremely High Speed:  $t_{PD}$  2.4 ns (typical) at  $V_{CC} = 5.0$  V
- Designed for 1.65 V to 5.5 V  $V_{CC}$  Operation
- Over Voltage Tolerant Inputs
- $L_{VTTL}$  Compatible – Interface Capability with 5.0 V TTL Logic with  $V_{CC} = 3$  V
- LVC MOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- Replacement for NC7SZ86
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

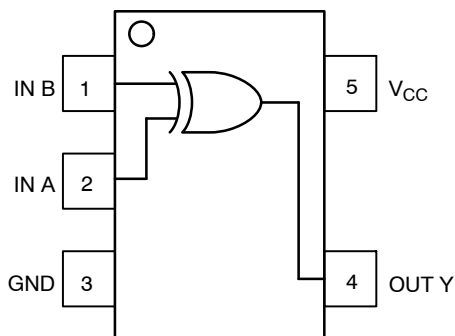


Figure 1. Pinout (Top View)

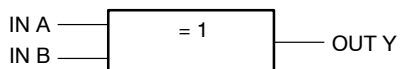


Figure 2. Logic Symbol



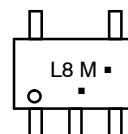
ON Semiconductor®

<http://onsemi.com>



SC-88A / SOT-353 / SC-70  
DF SUFFIX  
CASE 419A

### MARKING DIAGRAM



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   | IN B       |
| 2   | IN A       |
| 3   | GND        |
| 4   | OUT Y      |
| 5   | $V_{CC}$   |

### FUNCTION TABLE

| Inputs |   | Output |
|--------|---|--------|
| A      | B | Y      |
| L      | L | L      |
| 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.

## MAXIMUM RATINGS

| Symbol        | Parameter                                                                                                 | Value                                       | Unit |
|---------------|-----------------------------------------------------------------------------------------------------------|---------------------------------------------|------|
| $V_{CC}$      | DC Supply Voltage                                                                                         | -0.5 to +7.0                                | V    |
| $V_I$         | DC Input Voltage                                                                                          | $-0.5\text{ V} \leq V_I \leq +7.0\text{ V}$ | V    |
| $V_O$         | DC Output Voltage, Output in High or Low State (Note 1)                                                   | -0.5 V to $V_{CC} + 0.5$                    | V    |
| $I_{IK}$      | DC Input Diode Current<br>$V_I < \text{GND}$                                                              | -50                                         | mA   |
| $I_{OK}$      | DC Output Diode Current<br>$V_O < \text{GND}$                                                             | -50                                         | mA   |
| $I_O$         | DC Output Sink Current                                                                                    | $\pm 50$                                    | mA   |
| $I_{CC}$      | DC Supply Current per Supply Pin                                                                          | $\pm 100$                                   | mA   |
| $I_{GND}$     | DC Ground Current per Ground Pin                                                                          | $\pm 100$                                   | 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   |
| $\theta_{JA}$ | Thermal Resistance (Note 2)                                                                               | 350                                         | °C/W |
| $P_D$         | Power Dissipation in Still Air at 85°C                                                                    | 150                                         | mW   |
| MSL           | Moisture Sensitivity                                                                                      | Level 1                                     |      |
| $F_R$         | Flammability Rating<br>Oxygen Index: 28 to 34                                                             | UL 94 V-0 @ 0.125 in                        |      |
| ESD           | ESD Classification<br>Human Body Model (Note 4)<br>Machine Model (Note 5)<br>Charge Device Model (Note 6) | Class 1B<br>Class B<br>N/A                  |      |
| $I_{LATCHUP}$ | Latchup Performance Above $V_{CC}$ and Below GND at 85°C (Note 3)                                         | $\pm 500$                                   | 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.  $I_O$  absolute maximum rating must be observed.
2. Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2-ounce copper trace with no air flow.
3. Tested to EIA/JESD78
4. Tested to EIA/JESD22-A114-A, rated to EIA/JESD22-A114-B.
5. Tested to EIA/JESD22-A115-A, rated to EIA/JESD22-A115-B.
6. Tested to JESD22-C101-A.

## RECOMMENDED OPERATING CONDITIONS

| Symbol              | Parameter                                                                                                                                                              | Min         | Max           | Unit |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------------|------|
| $V_{CC}$            | Supply Voltage<br>Operating<br>Data Retention Only                                                                                                                     | 1.65<br>1.5 | 5.5<br>5.5    | V    |
| $V_I$               | Input Voltage (Note 7)                                                                                                                                                 | 0           | 5.5           | V    |
| $V_O$               | Output Voltage (HIGH or LOW State)                                                                                                                                     | 0           | 5.5           | V    |
| $T_A$               | Operating Free-Air Temperature                                                                                                                                         | -55         | +125          | °C   |
| $\Delta t/\Delta V$ | Input Transition Rise or Fall Rate<br>$V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$<br>$V_{CC} = 3.0\text{ V} \pm 0.3\text{ V}$<br>$V_{CC} = 5.0\text{ V} \pm 0.5\text{ V}$ | 0<br>0<br>0 | 20<br>10<br>5 | ns/V |

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

# 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>IH</sub>  | High-Level Input Voltage                                                          |                                                                                                                                                                                                | 1.65 to 1.95<br>2.3 to 5.5                             | 0.75 V <sub>CC</sub><br>0.7 V <sub>CC</sub>                      |                                                           |                                                  | 0.75 V <sub>CC</sub><br>0.7 V <sub>CC</sub>                      |                                                  | V    |
| V <sub>IL</sub>  | Low-Level Input Voltage                                                           |                                                                                                                                                                                                | 1.65 to 1.95<br>2.3 to 5.5                             |                                                                  |                                                           | 0.25 V <sub>CC</sub><br>0.3 V <sub>CC</sub>      |                                                                  | 0.25 V <sub>CC</sub><br>0.3 V <sub>CC</sub>      | V    |
| V <sub>OH</sub>  | High-Level Output Voltage<br>V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IL</sub> | I <sub>OH</sub> = 100 μA<br>I <sub>OH</sub> = -3 mA<br>I <sub>OH</sub> = -8 mA<br>I <sub>OH</sub> = -12 mA<br>I <sub>OH</sub> = -16 mA<br>I <sub>OH</sub> = -24 mA<br>I <sub>OH</sub> = -32 mA | 1.65 to 5.5<br>1.65<br>2.3<br>2.7<br>3.0<br>3.0<br>4.5 | V <sub>CC</sub> - 0.1<br>1.29<br>1.9<br>2.2<br>2.4<br>2.5<br>3.8 | V <sub>CC</sub><br>1.8<br>2.1<br>2.4<br>2.7<br>2.5<br>4.0 |                                                  | V <sub>CC</sub> - 0.1<br>1.29<br>1.9<br>2.2<br>2.4<br>2.3<br>3.8 |                                                  | V    |
| V <sub>OL</sub>  | Low-Level Output Voltage<br>V <sub>IN</sub> = V <sub>IH</sub>                     | I <sub>OL</sub> = 100 μA<br>I <sub>OL</sub> = 3 mA<br>I <sub>OL</sub> = 8 mA<br>I <sub>OL</sub> = 12 mA<br>I <sub>OL</sub> = 16 mA<br>I <sub>OL</sub> = 24 mA<br>I <sub>OL</sub> = 32 mA       | 1.65 to 5.5<br>1.65<br>2.3<br>2.7<br>3.0<br>3.0<br>4.5 |                                                                  | 0.08<br>0.20<br>0.22<br>0.28<br>0.38<br>0.42              | 0.1<br>0.24<br>0.3<br>0.4<br>0.4<br>0.55<br>0.55 |                                                                  | 0.1<br>0.24<br>0.3<br>0.4<br>0.4<br>0.55<br>0.55 | V    |
| I <sub>IN</sub>  | Input Leakage Current                                                             | V <sub>IN</sub> = 5.5 V or GND                                                                                                                                                                 | 0 to 5.5                                               |                                                                  |                                                           | ±0.1                                             |                                                                  | ±1.0                                             | μA   |
| I <sub>OFF</sub> | Power Off Leakage Current                                                         | V <sub>IN</sub> = 5.5 V or<br>V <sub>OUT</sub> = 5.5 V                                                                                                                                         | 0                                                      |                                                                  |                                                           | 1                                                |                                                                  | 10                                               | μA   |
| I <sub>CC</sub>  | Quiescent Supply Current                                                          | V <sub>IN</sub> = 5.5 V or GND                                                                                                                                                                 | 5.5                                                    |                                                                  |                                                           | 1                                                |                                                                  | 10                                               | μA   |

# AC ELECTRICAL CHARACTERISTICS t<sub>R</sub> = t<sub>F</sub> = 3.0 ns

| 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        |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay<br>(Figure 3 and 4) | R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF                                                   | 1.65                   | 2.0                   | 6.9        | 13.8       | 2.0                            | 14.5       | ns   |
|                                      |                                       | R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF                                                   | 1.8                    | 2.0                   | 5.7        | 11.5       | 2.0                            | 12         |      |
|                                      |                                       | R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF                                                   | 2.5 ± 0.2              | 1.2                   | 4.1        | 7.0        | 1.2                            | 7.5        |      |
|                                      |                                       | R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF<br>R <sub>L</sub> = 500 Ω, C <sub>L</sub> = 50 pF | 3.3 ± 0.3              | 0.8<br>1.2            | 3.0<br>3.8 | 4.8<br>5.4 | 0.8<br>1.2                     | 5.2<br>5.9 |      |
|                                      |                                       | R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF<br>R <sub>L</sub> = 500 Ω, C <sub>L</sub> = 50 pF | 5.0 ± 0.5              | 0.5<br>0.8            | 2.2<br>2.9 | 3.5<br>4.2 | 0.5<br>1.0                     | 3.8<br>4.6 |      |

# CAPACITIVE CHARACTERISTICS

| Symbol          | Parameter                                 | Condition                                                                                                                                            | Typical | Unit |
|-----------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------|
| C <sub>IN</sub> | Input Capacitance                         | V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>                                                                                     | 7.0     | pF   |
| C <sub>PD</sub> | Power Dissipation Capacitance<br>(Note 8) | 10 MHz, V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub><br>10 MHz, V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0 V or V <sub>CC</sub> | 9<br>11 | pF   |

8. 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<sub>CC(OPR)</sub> = C<sub>PD</sub> • V<sub>CC</sub> • f<sub>in</sub> + I<sub>CC</sub>. C<sub>PD</sub> is used to determine the no-load dynamic power consumption; P<sub>D</sub> = C<sub>PD</sub> • V<sub>CC</sub><sup>2</sup> • f<sub>in</sub> + I<sub>CC</sub> • V<sub>CC</sub>.

# NL17SZ86

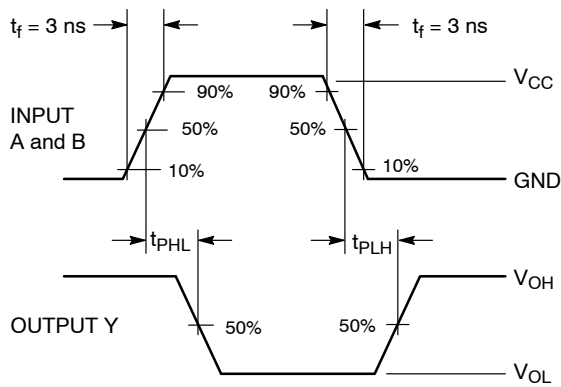
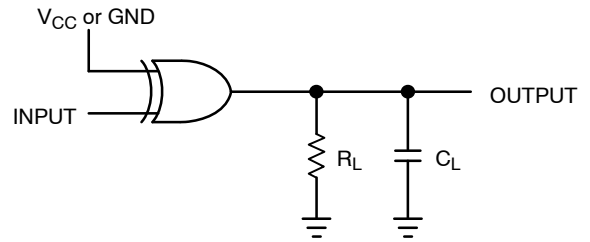


Figure 3. Switching Waveform



A 1-MHz square input wave is recommended for propagation delay tests.

Figure 4. Test Circuit

## DEVICE ORDERING INFORMATION

| Device          | Package                            | Shipping <sup>†</sup> |
|-----------------|------------------------------------|-----------------------|
| NL17SZ86DFT2G   | SC70-5/SC-88A/SOT-353<br>(Pb-Free) | 3000 / Tape & Reel    |
| NLV17SZ86DFT2G* | SC70-5/SC-88A/SOT-353<br>(Pb-Free) | 3000 / Tape & Reel    |

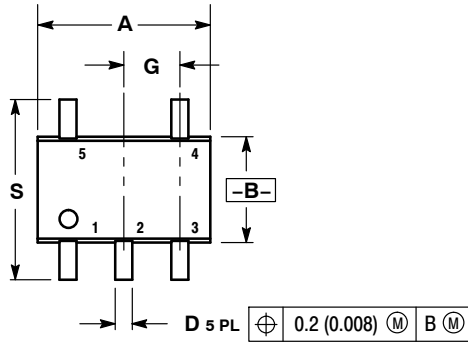
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

\*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

# NL17SZ86

## PACKAGE DIMENSIONS

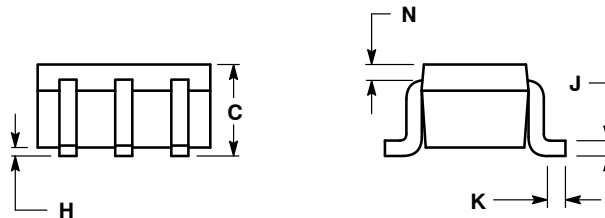
SC-88A (SC-70-5/SOT-353)  
CASE 419A-02  
ISSUE L



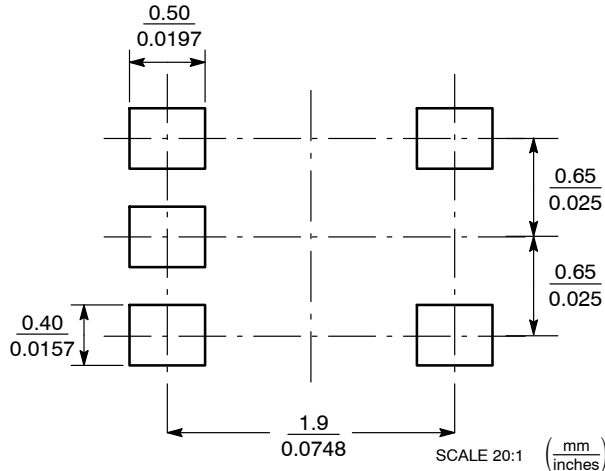
### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419A-01 OBSOLETE. NEW STANDARD 419A-02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | INCHES    |       | MILLIMETERS |      |
|-----|-----------|-------|-------------|------|
|     | 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 |



### SOLDER 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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- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
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#### Как с нами связаться

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**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.