

# NL17SZ08E

## Single 2-Input AND Gate

The NL17SZ08E is a single 2-input AND Gate in three tiny footprint packages. The device performs much as LCX multi-gate products in speed and drive. They should be used wherever the need for higher speed and drive are needed.

### Features

- Tiny SOT-353 Package
- 2.7 ns  $T_{PD}$  at 5.0 V (typ)
- Source/Sink 24 mA at 3.0 V
- Overvoltage Tolerant Inputs
- Chip Complexity: FETs = 20
- Designed for 1.65 V to 5.5 V  $V_{CC}$  Operation
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

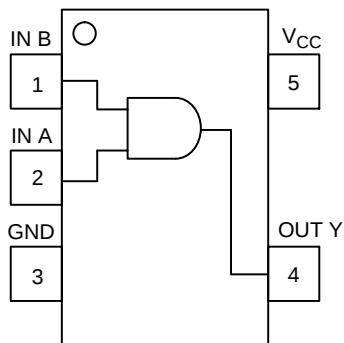


Figure 1. Pinout (Top View)

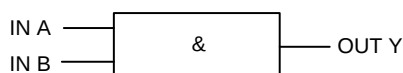


Figure 2. Logic Symbol

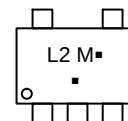


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5 1  
SC-88A  
(SC-70-5/SOT-353)  
DF SUFFIX  
CASE 419A

### MARKING DIAGRAMS



L2 = Specific Device Marking  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or position may vary depending upon manufacturing location.

### PIN ASSIGNMENT

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

### FUNCTION TABLE

| Input |   | Output<br>$Y = AB$ |
|-------|---|--------------------|
| A     | B | Y                  |
| L     | L | L                  |
| L     | H | L                  |
| H     | L | L                  |
| H     | H | H                  |

### ORDERING INFORMATION

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

# NL17SZ08E

## MAXIMUM RATINGS

| Symbol        | Parameter                                                                                | Value                                  | Units |
|---------------|------------------------------------------------------------------------------------------|----------------------------------------|-------|
| $V_{CC}$      | DC Supply Voltage                                                                        | -0.5 to +6.5                           | V     |
| $V_{IN}$      | DC Input Voltage                                                                         | -0.5 to +6.5                           | V     |
| $V_{OUT}$     | DC Output Voltage<br>Active Mode, High or LOW State<br>Power Down Mode ( $V_{CC} = 0$ V) | -0.5 to $V_{CC} + 0.5$<br>-0.5 to +6.5 | V     |
| $I_{IK}$      | DC Input Diode Current                                                                   | -50                                    | mA    |
| $I_{OK}$      | DC Output Diode Current<br>$V_{OUT} < GND$                                               | -50                                    | mA    |
| $I_{OUT}$     | DC Output Sink Current                                                                   | $\pm 50$                               | mA    |
| $I_{CC}$      | DC Supply Current per Supply 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 1)                                                              | 350                                    | °C/W  |
| $P_D$         | Power Dissipation in Still Air at 85°C                                                   | 186                                    | 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 2)<br>Charged Device Model (Note 3)         | 4000<br>1000                           | V     |
| $I_{LATCHUP}$ | Latchup Performance Above $V_{CC}$ and Below GND at 125°C (Note 4)                       | $\pm 100$                              | mA    |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, 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 with no air flow.
2. Tested to EIA/JESD22-A114-A, rated to EIA/JESD22-A114-B.
3. Tested to JESD22-C101-A.
4. Tested to EIA/JESD78.

# RECOMMENDED OPERATING CONDITIONS

| Symbol                          | Parameter                                                                                                                      | Min         | Max                    | Units |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------|-------|
| V <sub>CC</sub>                 | DC Supply Voltage                                                                                                              | 1.65        | 5.5                    | V     |
| V <sub>IN</sub>                 | DC Input Voltage                                                                                                               | 0           | 5.5                    | V     |
| V <sub>OUT</sub>                | DC Output Voltage<br>Active Mode, LOW State<br>Power-Down Mode (V <sub>CC</sub> = 0 V)                                         | 0<br>0      | V <sub>CC</sub><br>5.5 | V     |
| T <sub>A</sub>                  | Operating Temperature Range                                                                                                    | -55         | +125                   | °C    |
| t <sub>r</sub> , t <sub>f</sub> | Input Rise and Fall Time<br>V <sub>CC</sub> = 2.5 V ±0.3 V<br>V <sub>CC</sub> = 3.0 V ±0.3 V<br>V <sub>CC</sub> = 5.0 V ±0.5 V | 0<br>0<br>0 | 20<br>10<br>5          | ns/V  |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

# 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                                   |                                                  | Units |
|------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------------|--------------------------------------------------|------------------------------------------------------------------|--------------------------------------------------|-------|
|                  |                                                                                   |                                                                                                                                                                                                 |                                                        | 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>IH</sub> | I <sub>OH</sub> = -100 μA<br>I <sub>OH</sub> = -4 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>2.3<br>3.8 | V <sub>CC</sub><br>1.52<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> or V <sub>OH</sub>  | I <sub>OL</sub> = 100 μA<br>I <sub>OL</sub> = 4 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                                                                                                                                                                  | 1.65 to 5.5                                            |                                                                  |                                                            | ±0.1                                             |                                                                  | ±1.0                                             | μA    |
| I <sub>CC</sub>  | Quiescent Supply Current                                                          | V <sub>IN</sub> = 5.5 V or GND                                                                                                                                                                  | 5.5                                                    |                                                                  |                                                            | 1                                                |                                                                  | 10                                               | μA    |
| I <sub>OFF</sub> | Power Off Leakage Current                                                         | V <sub>IN</sub> = 5.5 V or V <sub>OUT</sub> = 5.5 V                                                                                                                                             | 0                                                      |                                                                  |                                                            | 1                                                |                                                                  | 10                                               | μA    |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

# NL17SZ08E

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

| Symbol                 | Parameter                             | Condition                                      | $V_{CC}$<br>(V) | $T_A = 25^\circ\text{C}$ |     |     | $-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$ |      | Units |
|------------------------|---------------------------------------|------------------------------------------------|-----------------|--------------------------|-----|-----|-----------------------------------------------------|------|-------|
|                        |                                       |                                                |                 | Min                      | Typ | Max | Min                                                 | Max  |       |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay<br>(Figure 3 and 4) | $R_L = 1 \text{ M}\Omega, C_L = 15 \text{ pF}$ | 1.65            |                          | 6.3 | 12  |                                                     | 12.7 | ns    |
|                        |                                       | $R_L = 1 \text{ M}\Omega, C_L = 15 \text{ pF}$ | 1.8             |                          | 6.2 | 10  |                                                     | 10.5 |       |
|                        |                                       | $R_L = 1 \text{ M}\Omega, C_L = 15 \text{ pF}$ | $2.5 \pm 0.2$   |                          | 3.4 | 7.0 |                                                     | 7.5  |       |
|                        |                                       | $R_L = 1 \text{ M}\Omega, C_L = 15 \text{ pF}$ | $3.3 \pm 0.3$   |                          | 2.6 | 4.7 |                                                     | 5.0  |       |
|                        |                                       | $R_L = 500 \Omega, C_L = 50 \text{ pF}$        |                 |                          | 3.3 | 5.2 |                                                     | 5.5  |       |
|                        |                                       | $R_L = 1 \text{ M}\Omega, C_L = 15 \text{ pF}$ | $5.0 \pm 0.5$   |                          | 2.2 | 4.1 |                                                     | 4.4  |       |
|                        |                                       | $R_L = 500 \Omega, C_L = 50 \text{ pF}$        |                 |                          | 2.7 | 4.5 |                                                     | 4.8  |       |

## CAPACITIVE CHARACTERISTICS

| Symbol   | Parameter                                 | Condition                                                      | Typical | Units |
|----------|-------------------------------------------|----------------------------------------------------------------|---------|-------|
| $C_{IN}$ | Input Capacitance                         | $V_{CC} = 5.5 \text{ V}, V_I = 0 \text{ V or } V_{CC}$         | > 4.0   | pF    |
| $C_{PD}$ | Power Dissipation Capacitance<br>(Note 5) | 10 MHz, $V_{CC} = 3.3 \text{ V}, V_I = 0 \text{ V or } V_{CC}$ | 25      | pF    |
|          |                                           | 10 MHz, $V_{CC} = 5.5 \text{ V}, V_I = 0 \text{ V or } V_{CC}$ | 30      |       |

5.  $C_{PD}$  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:  $I_{CC(OPR)} = C_{PD} \cdot V_{CC} \cdot f_{in} + I_{CC}$ .  $C_{PD}$  is used to determine the no-load dynamic power consumption;  $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_{in} + I_{CC} \cdot V_{CC}$ .

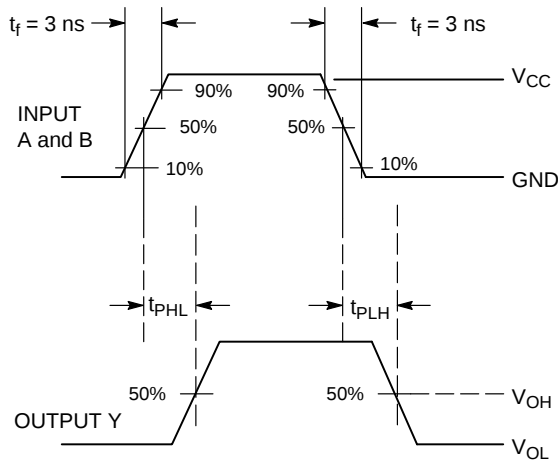
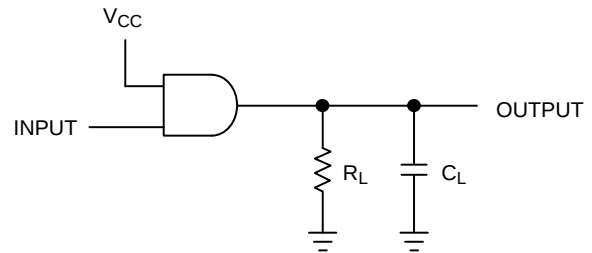


Figure 3. Switching Waveform



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

Figure 4. Test Circuit

## DEVICE ORDERING INFORMATION

| Device Order Number | Package Type                        | Tape and Reel Size† |
|---------------------|-------------------------------------|---------------------|
| NL17SZ08EDFT2G      | SC-88A/SC-70-5/SOT-353<br>(Pb-Free) | 3000 / 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.

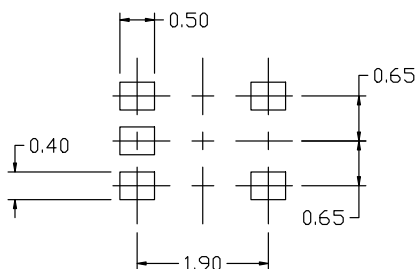
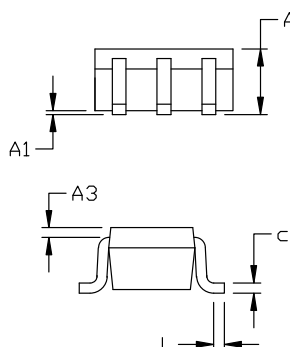
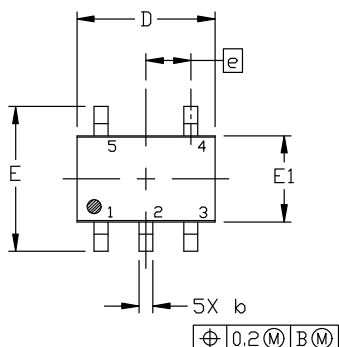
# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 2:1

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

DATE 11 APR 2023



### RECOMMENDED MOUNTING FOOTPRINT

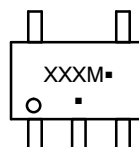
\* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. 419A-01 OBSOLETE. NEW STANDARD 419A-02
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.1016MM PER SIDE.

| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN.        | NOM. | MAX. |
| A   | 0.80        | 0.95 | 1.10 |
| A1  | ---         | ---  | 0.10 |
| A3  | 0.20 REF    |      |      |
| b   | 0.10        | 0.20 | 0.30 |
| c   | 0.10        | ---  | 0.25 |
| D   | 1.80        | 2.00 | 2.20 |
| E   | 2.00        | 2.10 | 2.20 |
| E1  | 1.15        | 1.25 | 1.35 |
| e   | 0.65 BSC    |      |      |
| L   | 0.10        | 0.15 | 0.30 |

### GENERIC MARKING DIAGRAM\*



\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

XXX = Specific Device Code

M = Date Code

▪ = Pb-Free Package

(Note: Microdot may be in either location)

#### STYLE 1:

- PIN 1. BASE
2. EMITTER
3. BASE
4. COLLECTOR
5. COLLECTOR

#### STYLE 2:

- PIN 1. ANODE
2. EMITTER
3. BASE
4. COLLECTOR
5. CATHODE

#### STYLE 3:

- PIN 1. ANODE 1
2. N/C
3. ANODE 2
4. CATHODE 2
5. CATHODE 1

#### STYLE 4:

- PIN 1. SOURCE 1
2. DRAIN 1/2
3. SOURCE 1
4. GATE 1
5. GATE 2

#### STYLE 5:

- PIN 1. CATHODE
2. COMMON ANODE
3. CATHODE 2
4. CATHODE 3
5. CATHODE 4

#### STYLE 6:

- PIN 1. EMITTER 2
2. BASE 2
3. EMITTER 1
4. COLLECTOR
5. COLLECTOR 2/BASE 1

#### STYLE 7:

- PIN 1. BASE
2. EMITTER
3. BASE
4. COLLECTOR
5. COLLECTOR

#### STYLE 8:

- PIN 1. CATHODE
2. COLLECTOR
3. N/C
4. BASE
5. EMITTER

#### STYLE 9:

- PIN 1. ANODE
2. CATHODE
3. ANODE
4. ANODE
5. ANODE

Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

|                  |                          |                                                                                                                                                                                     |
|------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| DESCRIPTION:     | SC-88A (SC-70-5/SOT-353) | PAGE 1 OF 1                                                                                                                                                                         |

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