

NL17SZ08

Single 2-Input AND Gate

The NL17SZ08 is a single 2-input AND Gate in two 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 and SOT-553 Packages
- 2.7 ns T_{PD} at 5.0 V (typ)
- Source/Sink 24 mA at 3.0 V
- Overvoltage Tolerant Inputs
- Pin For Pin with NC7SZ08P5X, TC7SZ08FU and TC7SZ08AFE
- Chip Complexity: FETs = 20
- Designed for 1.65 V to 5.5 V V_{CC} Operation
- 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, Halogen Free/BFR Free and are RoHS Compliant

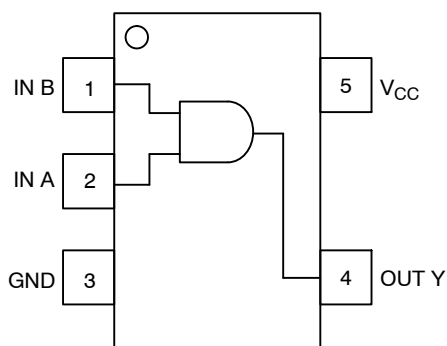


Figure 1. Pinout (Top View)

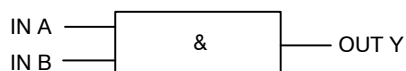
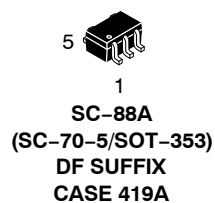


Figure 2. Logic Symbol

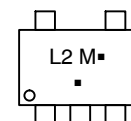


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MARKING DIAGRAMS



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 $Y = AB$ |
|-------|---|--------------------|
| 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.

NL17SZ08

MAXIMUM RATINGS

| Symbol | Parameter | Value | Units |
|----------------------|---|--|----------------------|
| V _{CC} | DC Supply Voltage | -0.5 to +7.0 | V |
| V _{IN} | DC Input Voltage | -0.5 to +7.0 | V |
| V _{OUT} | DC Output Voltage | -0.5 to V _{CC} +0.5 | V |
| I _{IK} | DC Input Diode Current | -50 | mA |
| I _{OK} | DC Output Diode Current | -50 | mA |
| I _{OUT} | DC Output Sink Current | ±50 | mA |
| I _{CC} | DC Supply Current per Supply Pin | ±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 |
| θ _{JA} | Thermal Resistance | SOT-353 (Note 1) SOT-553 350 496 | °C/W |
| P _D | Power Dissipation in Still Air at 85°C | SOT-353 SOT-553 186 135 | mW |
| MSL | Moisture Sensitivity | Level 1 | |
| F _R | Flammability Rating | Oxygen Index: 28 to 34 | UL 94 V-0 @ 0.125 in |
| ESD | ESD Classification | Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4) 2 kV 400 V N/A | |
| I _{LATCHUP} | Latchup Performance Above V _{CC} and Below GND at 125°C (Note 5) | ±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, rated to EIA/JESD22-A114-B.
3. Tested to EIA/JESD22-A115-A, rated to EIA/JESD22-A115-A.
4. Tested to JESD22-C101-A.
5. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Max | Units |
|---------------------------------|-----------------------------|--|----------|-------|
| V _{CC} | DC Supply Voltage | 1.65 | 5.5 | V |
| V _{IN} | DC Input Voltage | 0 | 5.5 | V |
| V _{OUT} | DC Output Voltage | 0 | 5.5 | V |
| T _A | Operating Temperature Range | -55 | +125 | °C |
| t _r , t _f | Input Rise and Fall Time | V _{CC} = 3.0 V ±0.3 V V _{CC} = 5.0 V ±0.5 V | 0 100 | ns/V |
| | | 0 | 20 | |

NL17SZ08

DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Condition | V _{CC} (V) | T _A = 25°C | | | -55°C ≤ T _A ≤ 125°C | | Units |
|------------------|---|---|----------------------------|---|-----------------|---|---|---|-------|
| | | | | Min | Typ | Max | Min | Max | |
| V _{IH} | High-Level Input Voltage | | 1.65 to 1.95 2.3 to 5.5 | 0.75 V _{CC} 0.7 V _{CC} | | | 0.75 V _{CC} 0.7 V _{CC} | | V |
| V _{IL} | Low-Level Input Voltage | | 1.65 to 1.95 2.3 to 5.5 | | | 0.25 V _{CC} 0.3 V _{CC} | | 0.25 V _{CC} 0.3 V _{CC} | V |
| V _{OH} | High-Level Output Voltage V _{IN} = V _{IL} or V _{IH} | I _{OH} = 100 μA | 1.65 to 5.5 | V _{CC} - 0.1 | V _{CC} | | V _{CC} - 0.1 | | V |
| | | I _{OH} = -3 mA | 1.65 | 1.29 | 1.52 | 1.29 | | | |
| | | I _{OH} = -8 mA | 2.3 | 1.9 | 2.1 | 1.9 | | | |
| | | I _{OH} = -12 mA | 2.7 | 2.2 | 2.4 | 2.2 | | | |
| | | I _{OH} = -16 mA | 3.0 | 2.4 | 2.7 | 2.4 | | | |
| | | I _{OH} = -24 mA | 3.0 | 2.3 | 2.5 | 2.3 | | | |
| | | I _{OH} = -32 mA | 4.5 | 3.8 | 4.0 | 3.8 | | | |
| V _{OL} | Low-Level Output Voltage V _{IN} = V _{IH} or V _{OH} | I _{OL} = 100 μA | 1.65 to 5.5 | | | 0.1 | | 0.1 | V |
| | | I _{OL} = 3 mA | 1.65 | | 0.08 | 0.24 | | 0.24 | |
| | | I _{OL} = 8 mA | 2.3 | | 0.20 | 0.3 | | 0.3 | |
| | | I _{OL} = 12 mA | 2.7 | | 0.22 | 0.4 | | 0.4 | |
| | | I _{OL} = 16 mA | 3.0 | | 0.28 | 0.4 | | 0.4 | |
| | | I _{OL} = 24 mA | 3.0 | | 0.38 | 0.55 | | 0.55 | |
| | | I _{OL} = 32 mA | 4.5 | | 0.42 | 0.55 | | 0.55 | |
| I _{IN} | Input Leakage Current | V _{IN} = 5.5 V or GND | 0 to 5.5 | | | ±0.1 | | ±1.0 | μA |
| I _{CC} | Quiescent Supply Current | V _{IN} = 5.5 V or GND | 5.5 | | | 1 | | 10 | μA |
| I _{OFF} | Power Off Leakage Current | V _{IN} = 5.5 V or V _{OUT} = 5.5 V | 0 | | | 1 | | 10 | μA |

AC ELECTRICAL CHARACTERISTICS t_R = t_F = 3.0 ns

| Symbol | Parameter | Condition | V _{CC} (V) | T _A = 25°C | | | -55°C ≤ T _A ≤ 125°C | | Units |
|--------------------------------------|---------------------------------------|--|------------------------|-----------------------|-----|-----|--------------------------------|------|-------|
| | | | | Min | Typ | Max | Min | Max | |
| t _{PLH} t _{PHL} | Propagation Delay (Figure 3 and 4) | R _L = 1 MΩ, C _L = 15 pF | 1.65 | 2.0 | 6.3 | 12 | 2.0 | 12.7 | ns |
| | | R _L = 1 MΩ, C _L = 15 pF | 1.8 | 2.0 | 6.2 | 10 | 2.0 | 10.5 | |
| | | R _L = 1 MΩ, C _L = 15 pF | 2.5 ± 0.2 | 0.8 | 3.4 | 7.0 | 0.8 | 7.5 | |
| | | R _L = 1 MΩ, C _L = 15 pF | 3.3 ± 0.3 | 0.5 | 2.6 | 4.7 | 0.5 | 5.0 | |
| | | R _L = 500 Ω, C _L = 50 pF | | 1.5 | 3.3 | 5.2 | 1.5 | 5.5 | |
| | | R _L = 1 MΩ, C _L = 15 pF | 5.0 ± 0.5 | 0.5 | 2.2 | 4.1 | 0.5 | 4.4 | |
| | | R _L = 500 Ω, C _L = 50 pF | | 0.8 | 2.7 | 4.5 | 0.8 | 4.8 | |

CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Condition | Typical | Units |
|-----------------|---|--|---------|-------|
| C _{IN} | Input Capacitance | V _{CC} = 5.5 V, V _I = 0 V or V _{CC} | > 4.0 | pF |
| C _{PD} | Power Dissipation Capacitance (Note 6) | 10 MHz, V _{CC} = 3.3 V, V _I = 0 V or V _{CC} | 25 | pF |
| | | 10 MHz, V _{CC} = 5.5 V, V _I = 0 V or V _{CC} | 30 | |

6. 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} • V_{CC} • f_{in} + I_{CC}. C_{PD} is used to determine the no-load dynamic power consumption; P_D = C_{PD} • V_{CC}² • f_{in} + I_{CC} • V_{CC}.

NL17SZ08

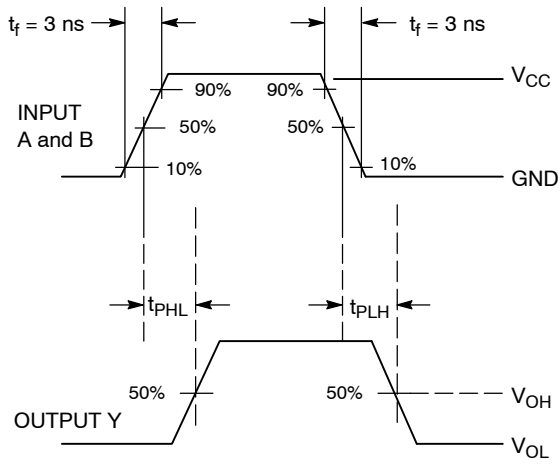
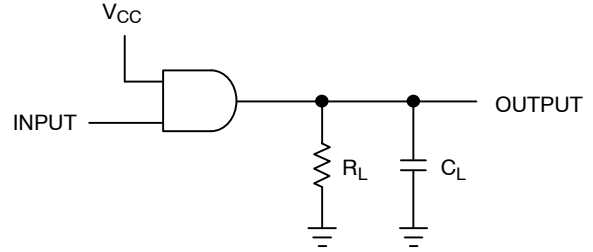


Figure 3. Switching Waveform



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 [†] |
|---------------------|-------------------------------------|---------------------------------|
| NL17SZ08DFT2G | SC-88A/SC-70-5/SOT-353 (Pb-Free) | 3000 / Tape & Reel |
| NLV17SZ08DFT2G* | SC-88A/SC-70-5/SOT-353 (Pb-Free) | 3000 / Tape & Reel |
| NL17SZ08XV5T2G | SOT-553 (Pb-Free) | 4000 / Tape & Reel |

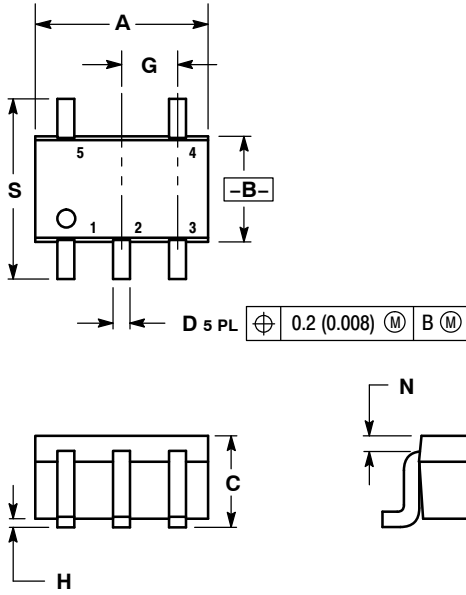
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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

NL17SZ08

PACKAGE DIMENSIONS

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

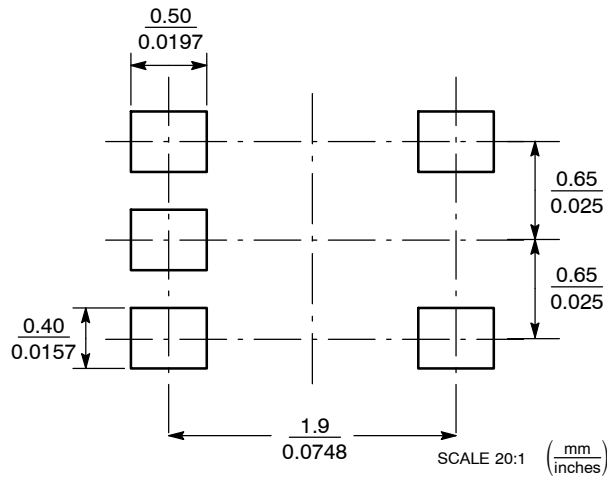


NOTES:

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*

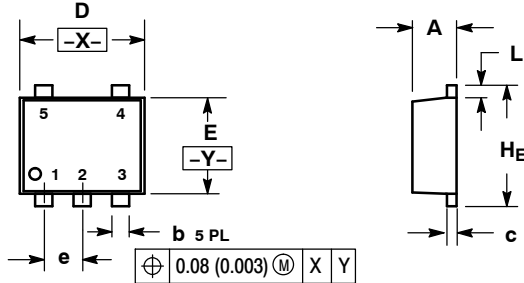


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

NL17SZ08

PACKAGE DIMENSIONS

SOT-553, 5 LEAD
XV5 SUFFIX
CASE 463B
ISSUE C

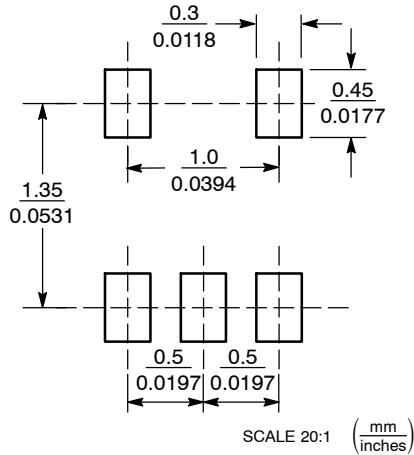


NOTES:

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 | 1.55 | 1.60 | 1.65 | 0.061 | 0.063 | 0.065 |
| E | 1.15 | 1.20 | 1.25 | 0.045 | 0.047 | 0.049 |
| e | 0.50 BSC | | | 0.020 BSC | | |
| L | 0.10 | 0.20 | 0.30 | 0.004 | 0.008 | 0.012 |
| HE | 1.55 | 1.60 | 1.65 | 0.061 | 0.063 | 0.065 |

RECOMMENDED SOLDERING FOOTPRINT*



SCALE 20:1 $\left(\frac{\text{mm}}{\text{inches}} \right)$

*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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