

NL17SZ02

2-Input NOR Gate

The NL17SZ02 is a single 2-input NOR Gate in a tiny footprint package. The SC70-5/SC-88A occupies a very small board area. The device performs much as LCX multi-gate products in speed and drive.

- Tiny SC70-5/SC-88A Package
- 2.4 ns T_{PD} at 5 Volts (typ)
- Source/Sink 24 mA at 3.0 Volts
- Over-Voltage Tolerant Inputs and Outputs
- Pin For Pin with NC7SZ02
- Chip Complexity: FETs = TBD

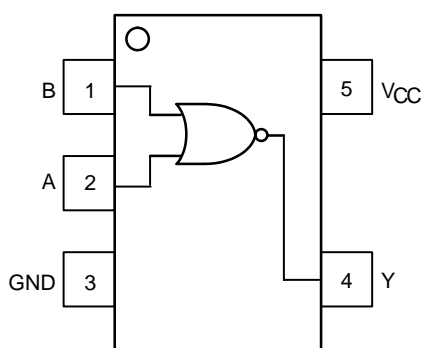


Figure 1. Pinout (Top View)

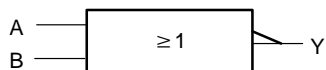


Figure 2. Logic Symbol

PIN ASSIGNMENT

| Pin | Function |
|-----|----------|
| 1 | A |
| 2 | B |
| 3 | GND |
| 4 | Y |
| 5 | VCC |



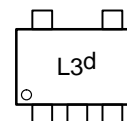
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MARKING DIAGRAMS



SC70-5/SC-88A/SOT-353
DF SUFFIX
CASE 419A



Pin 1

d = Date Code

ORDERING INFORMATION

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

FUNCTION TABLE

| Input | | Output $Y = \overline{A + B}$ |
|-------|---|----------------------------------|
| A | B | Y |
| L | L | H |
| L | H | L |
| H | L | L |
| H | H | L |

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MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|------------------|---|--|------|
| 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 +7.0 | 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 | SC70-5/SC-88A (Note 1) TSOP-5 350 230 | °C/W |
| P _D | Power Dissipation in Still Air at 85°C | SC70-5/SC-88A TSOP-5 150 200 | mW |
| MSL | Moisture Sensitivity | Level 1 | |
| F _R | Flammability Rating | Oxygen Index: 28 to 34 UL 94 V-0 @ 0.125 in | |
| V _{ESD} | ESD Withstand Voltage | Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4) > 2000 > 200 N/A | V |

Maximum Ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute maximum-rated conditions is not implied. Functional operation should be restricted to the Recommended Operating Conditions.

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 JESD22-C101-A.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Max | Unit |
|---------------------------------|-----------------------------|--|----------------|------|
| V _{CC} | DC Supply Voltage | 2.0 | 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 | -40 | +85 | °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 20 | 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 |

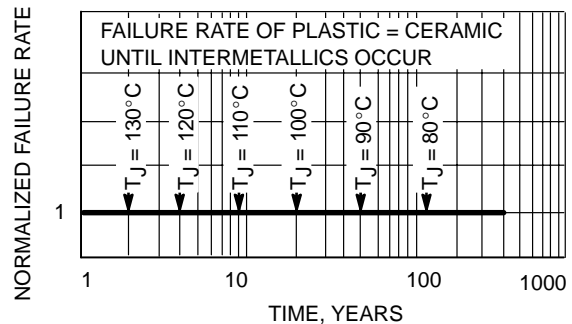


Figure 3. Failure Rate vs. Time Junction Temperature

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DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Condition | V _{CC} (V) | T _A = 25°C | | | -40°C ≤ T _A ≤ 85°C | | Unit |
|-----------------|---|--|------------------------|-----------------------|-----------------|---------------------|-------------------------------|---------------------|------|
| | | | | Min | Typ | Max | Min | Max | |
| V _{IH} | High-Level Input Voltage | | 2.3 to 5.5 | 0.7 V _{CC} | | | 0.7 V _{CC} | | V |
| V _{IL} | Low-Level Input Voltage | | 2.3 to 5.5 | | | 0.3 V _{CC} | | 0.3 V _{CC} | V |
| V _{OH} | High-Level Output Voltage V _{IN} = V _{IL} or V _{IH} | I _{OH} = 100 μA | 2.3 to 5.5 | V _{CC} - 0.1 | V _{CC} | | V _{CC} - 0.1 | | V |
| | | 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 | 2.3 to 5.5 | | | 0.1 | | 0.1 | V |
| | | 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} = V _{CC} or GND | 0 to 5.5 | | | ±0.1 | | ±1.0 | μA |
| I _{CC} | Quiescent Supply Current | V _{IN} = V _{CC} or GND | 5.5 | | | 1 | | 10 | μA |

AC ELECTRICAL CHARACTERISTICS t_R = t_F = 3.0 ns

| Symbol | Parameter | Condition | V _{CC} (V) | T _A = 25°C | | | -40°C ≤ T _A ≤ 85°C | | Unit |
|--------------------------------------|---------------------------------------|--|------------------------|-----------------------|-----|-----|-------------------------------|-----|------|
| | | | | Min | Typ | Max | Min | Max | |
| t _{PLH} t _{PHL} | Propagation Delay (Figure 4 and 5) | R _L = 1 MΩ, C _L = 15 pF | 2.5 ± 0.2 | 0.8 | 2.9 | 6.5 | 0.8 | 7.0 | ns |
| | | R _L = 1 MΩ, C _L = 15 pF | 3.3 ± 0.3 | 0.5 | 2.3 | 4.5 | 0.5 | 4.7 | |
| | | R _L = 500 Ω, C _L = 50 pF | | 1.5 | 2.9 | 5.0 | 1.5 | 5.2 | |
| | | R _L = 1 MΩ, C _L = 15 pF | 5.0 ± 0.5 | 0.5 | 1.9 | 3.9 | 0.5 | 4.1 | |
| | | R _L = 500 Ω, C _L = 50 pF | | 0.8 | 2.4 | 4.3 | 0.8 | 4.5 | |

CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Condition | Typical | Unit |
|-----------------|---|--|---------|------|
| C _{IN} | Input Capacitance | V _{CC} = 5.5 V, V _I = 0 V or V _{CC} | 4 | pF |
| C _{PD} | Power Dissipation Capacitance (Note 5) | 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 | |

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} • 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}.

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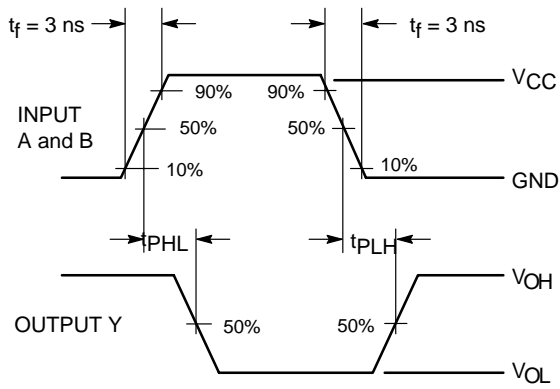
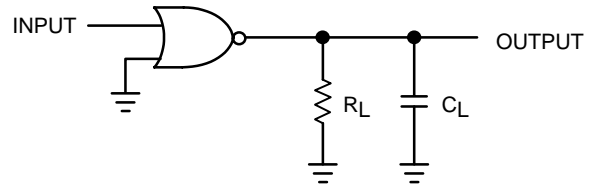


Figure 4. Switching Waveform



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

Figure 5. Test Circuit

DEVICE ORDERING INFORMATION

| Device Order Number | Device Nomenclature | | | | | | | Package Type | Tape and Reel Size |
|---------------------|-------------------------|--------------------------|-----------------------|------------|-----------------|----------------|----------------------|-------------------------------|-----------------------|
| | Logic Circuit Indicator | No. of Gates per Package | Temp Range Identifier | Technology | Device Function | Package Suffix | Tape and Reel Suffix | | |
| NL17SZ02DFT2 | NL | 1 | 7 | SZ | 02 | DF | T2 | SC70-5/ SC-88A/ SOT-353 | 178 mm, 3000 Units |

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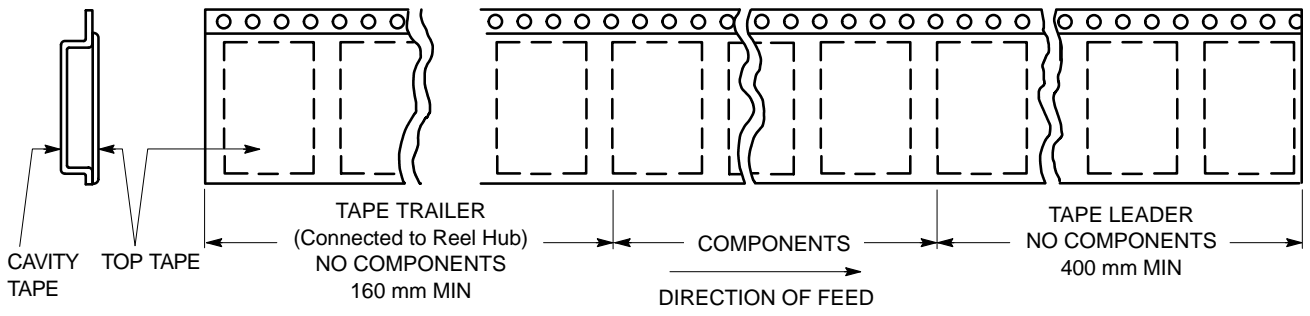


Figure 6. Tape Ends for Finished Goods

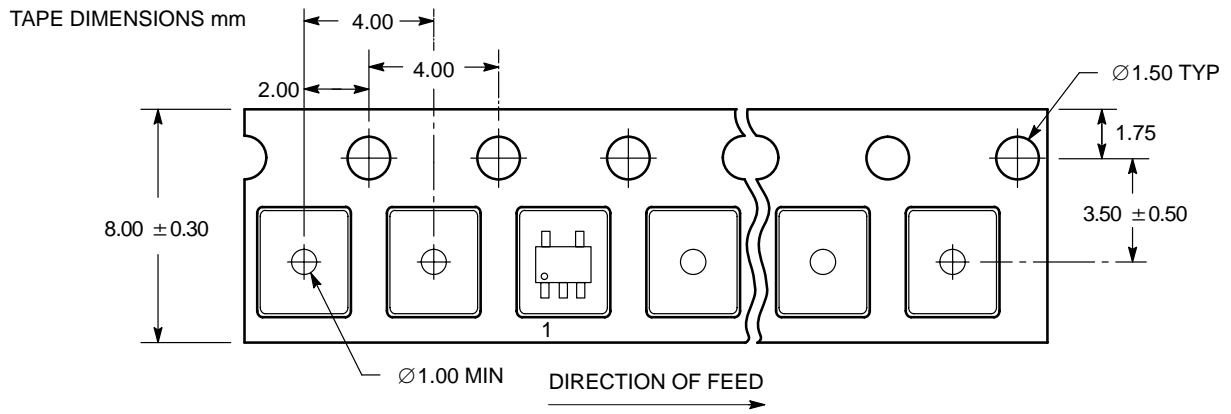


Figure 7. SC-70/SC-88A/SOT-353 DFT2 Reel Configuration/Orientation

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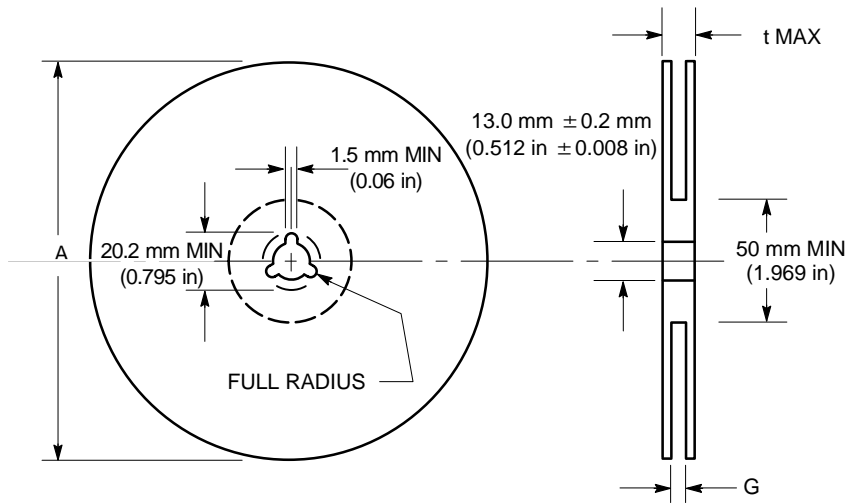


Figure 8. Reel Dimensions

REEL DIMENSIONS

| Tape Size | T and R Suffix | A Max | G | t Max |
|-----------|----------------|------------------|---|----------------------|
| 8 mm | T1, T2 | 178 mm (7 in) | 8.4 mm, + 1.5 mm, -0.0 (0.33 in + 0.059 in, -0.00) | 14.4 mm (0.56 in) |

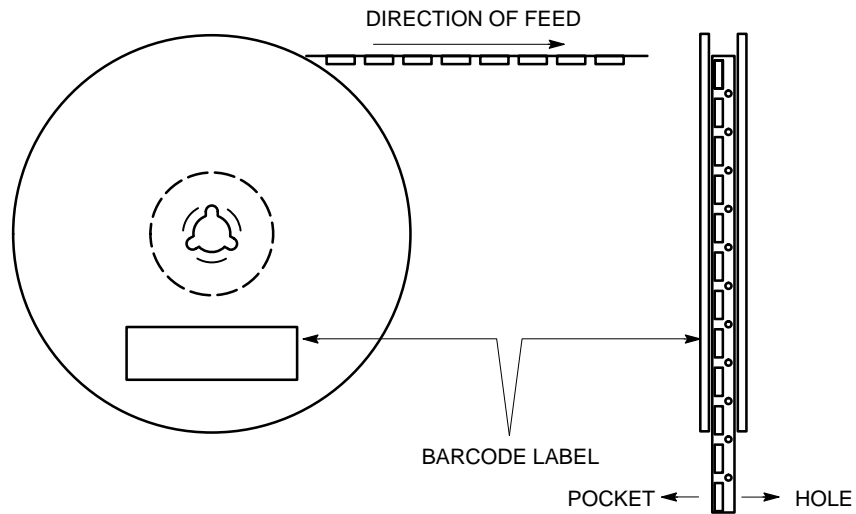
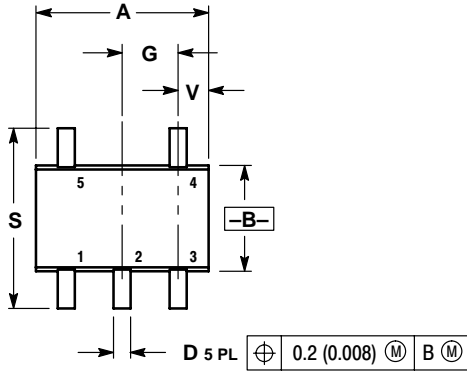


Figure 9. Reel Winding Direction

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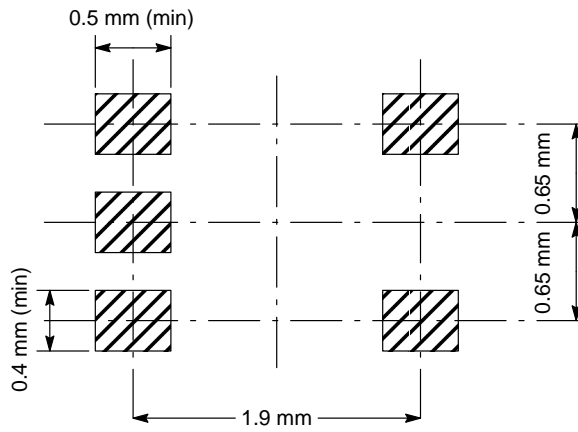
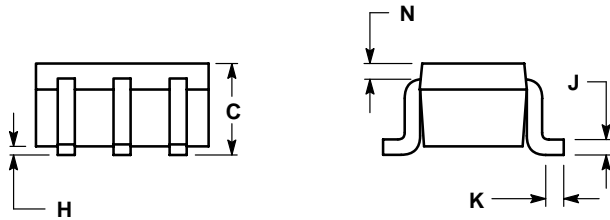
PACKAGE DIMENSIONS


SC70-5/SC-88A/SOT-353
 DF SUFFIX
 5-LEAD PACKAGE
 CASE 419A-01
 ISSUE E



- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.

| 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 |
| V | 0.012 | 0.016 | 0.30 | 0.40 |



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