

NL17SZ125

Non-Inverting 3-State Buffer

The NL17SZ125 is a high performance noninverting buffer operating from a 1.65 V to 5.5 V supply.

- Extremely High Speed: t_{PD} 2.6 ns (typical) at $V_{CC} = 5.0$ V
- Designed for 1.65 V to 5.5 V V_{CC} Operation
- Over Voltage Tolerant Inputs and Outputs
- LVTTL Compatible – Interface Capability With 5.0 V TTL Logic with $V_{CC} = 3.0$ V
- LVC MOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- 3-State OE Input is Active-Low
- Replacement for NC7SZ125
- Chip Complexity = 36 FETs

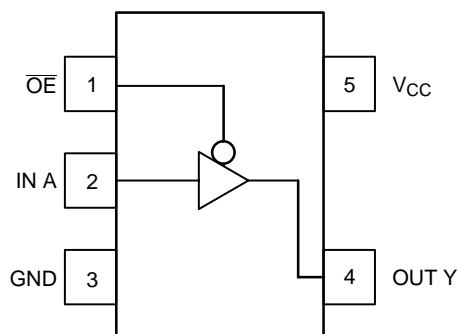


Figure 1. Pinout (Top View)

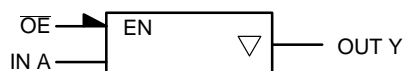


Figure 2. Logic Symbol



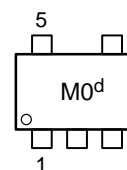
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MARKING DIAGRAM



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



d = Date Code

PIN ASSIGNMENT

| PIN | FUNCTION |
|-----|-----------------|
| 1 | OE |
| 2 | IN A |
| 3 | GND |
| 4 | OUT Y |
| 5 | V _{CC} |

FUNCTION TABLE

| OE Input | A Input | Y Output |
|----------|---------|----------|
| L | L | L |
| L | H | H |
| H | X | Z |

X = Don't Care

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

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 (Note 1) | 350 | °C/W |
| P _D | Power Dissipation in Still Air at 85°C | 150 | mW |
| MSL | Moisture Sensitivity | Level 1 | |
| FR | 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 |

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 | 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 | − 40 | + 85 | °C |
| t _r , t _f | Input Rise and Fall Time | V _{CC} = 1.8 V ± 0.15 V V _{CC} = 2.5 V ± 0.2 V V _{CC} = 3.0 V ± 0.3 V V _{CC} = 5.0 V ± 0.5 V | | 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 |

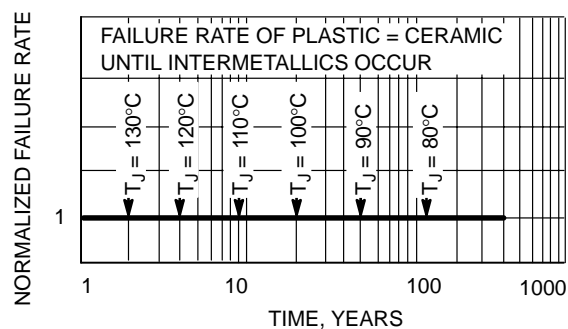


Figure 3. Failure Rate vs. Time Junction Temperature

DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | V _{CC} (V) | T _A = 25°C | | | -40°C ≤ T _A ≤ 85°C | | Unit | Condition |
|------------------|--|----------------------------------|---|--------------------------------------|---|---|---|------|--|
| | | | 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 _{IH} | 1.65 1.8 2.3 3.0 4.5 | 1.55 1.7 2.2 2.9 4.4 | 1.65 1.8 2.3 3.0 4.5 | | 1.55 1.7 2.2 2.9 4.4 | | V | I _{OH} = -100 μA |
| | | 1.65 2.3 3.0 3.0 4.5 | 1.29 1.9 2.4 2.3 3.8 | 1.52 2.15 2.80 2.68 4.20 | | 1.29 1.9 2.4 2.3 3.8 | | V | I _{OH} = -4 mA I _{OH} = -8 mA I _{OH} = -16 mA I _{OH} = -24 mA I _{OH} = -32 mA |
| V _{OL} | Low-Level Output Voltage V _{IN} = V _{IL} | 1.65 1.8 2.3 3.0 4.5 | | 0.0 0.0 0.0 0.0 0.0 | 0.1 0.1 0.1 0.1 0.1 | | 0.1 0.1 0.1 0.1 0.1 | V | I _{OL} = 100 μA |
| | | 1.65 2.3 3.0 3.0 4.5 | | 0.08 0.10 0.15 0.22 0.22 | 0.24 0.30 0.40 0.55 0.55 | | 0.24 0.30 0.40 0.55 0.55 | V | I _{OL} = 4 mA I _{OL} = 8 mA I _{OL} = 16 mA I _{OL} = 24 mA I _{OL} = 32 mA |
| I _{IN} | Input Leakage Current | 0 to 5.5 | | | ±1.0 | | ±1.0 | μA | 0 V ≤ V _{IN} ≤ 5.5 V |
| I _{OZ} | 3-State Output Leakage | 1.65 to 5.5 | | | ±0.5 | | ±5.0 | μA | V _{IN} = V _{IH} or V _{IL} 0 V ≤ V _{OUT} ≤ 5.5 V |
| I _{OFF} | Power Off Leakage Current | 0.0 | | | 1.0 | | 10 | μA | V _{IN} or V _{OUT} = 5.5 V |
| I _{CC} | Quiescent Supply Current | 1.65 to 5.5 | | | 1.0 | | 10 | μA | V _{IN} = 5.5 V, GND |

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 AN to YN (Figures 4 and 5, Table 1) | R _L = 1 MΩ C _L = 15 pF | 1.8 ± 0.15 | 2.0 | 9.0 | 10 | 2.0 | 10.5 | ns |
| | | R _L = 1 MΩ C _L = 15 pF | 2.5 ± 0.2 | 1.0 | | 7.5 | 1.0 | 8.0 | |
| | | R _L = 1 MΩ C _L = 15 pF R _L = 500 Ω C _L = 50 pF | 3.3 ± 0.3 | 0.8 1.2 | | 5.2 5.7 | 0.8 1.2 | 5.5 6.0 | |
| | | R _L = 1 MΩ C _L = 15 pF R _L = 500 Ω C _L = 50 pF | 5.0 ± 0.5 | 0.5 0.8 | | 4.5 5.0 | 0.5 0.8 | 4.8 5.3 | |
| t _{PZH} t _{PZL} | Output Enable Time (Figures 6, 7 and 8, Table 1) | R _L = 250 Ω C _L = 50 pF | 1.8 ± 0.15 | 2.0 | 7.6 | 9.5 | 2.0 | 10 | ns |
| | | | 2.5 ± 0.2 | 1.8 | | 8.5 | 1.8 | 9.0 | |
| | | | 3.3 ± 0.3 | 1.2 | | 6.2 | 1.2 | 6.5 | |
| | | | 5.0 ± 0.5 | 0.8 | | 5.5 | 0.8 | 5.8 | |
| t _{PHZ} t _{PLZ} | Output Disable Time (Figures 6, 7 and 8, Table 1) | R _L and R ₁ = 500 Ω C _L = 50 pF | 1.8 ± 0.15 | 2.0 | 8.0 | 10 | 2.0 | 10.5 | ns |
| | | | 2.5 ± 0.2 | 1.5 | | 8.0 | 1.5 | 8.5 | |
| | | | 3.3 ± 0.3 | 0.8 | | 5.7 | 0.8 | 6.0 | |
| | | | 5.0 ± 0.5 | 0.3 | | 4.7 | 0.3 | 5.0 | |

CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Condition | Typical | Unit |
|------------------|---|--|---------|------|
| C _{IN} | Input Capacitance | V _{CC} = 5.5 V, V _I = 0 V or V _{CC} | 2.5 | pF |
| C _{OUT} | Output Capacitance | V _{CC} = 5.5 V, V _I = 0 V or V _{CC} | 2.5 | pF |
| C _{PD} | Power Dissipation Capacitance (Note 5) | 10 MHz, V _{CC} = 3.3 V, V _I = 0 V or V _{CC} 10 MHz, V _{CC} = 5.5 V, V _I = 0 V or V _{CC} | 9 11 | pF |

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; $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_{in} + I_{CC} \cdot V_{CC}$.

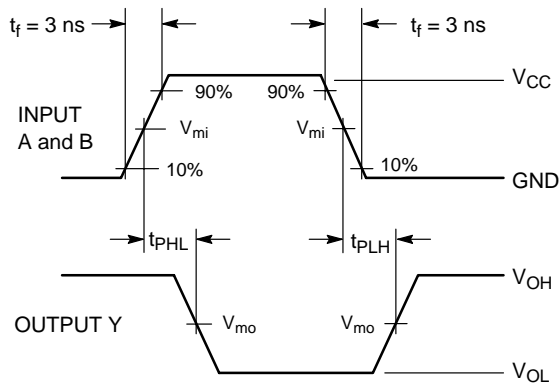
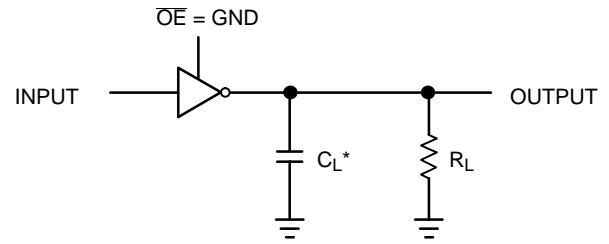
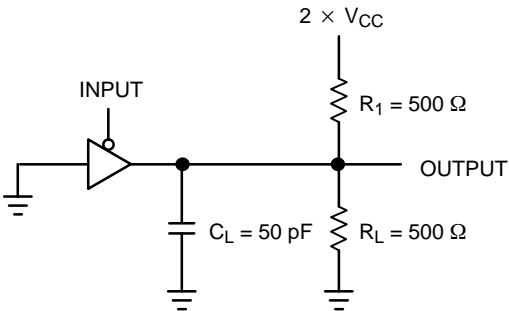


Figure 4. Switching Waveform



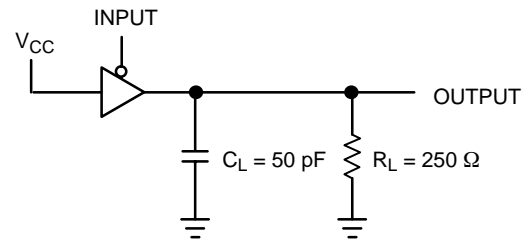
*Includes all probe and jig capacitance.
A 1 MHz square input wave is recommended for propagation delay tests.

Figure 5. T_{PLH} or T_{PLH}



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

Figure 6. T_{PZL} or T_{PL}



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

Figure 7. T_{PZH} or T_{PHZ}

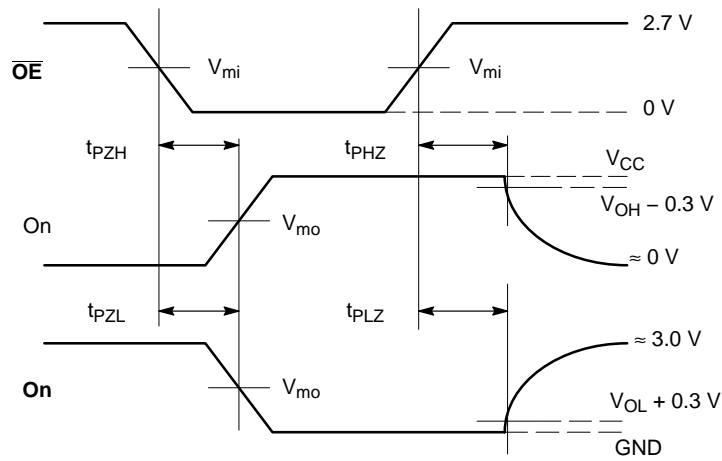


Figure 8. AC Output Enable and Disable Waveform

Table 1. Output Enable and Disable Times

$t_R = t_F = 2.5$ ns, 10% to 90%; $f = 1$ MHz; $t_W = 500$ ns

| Symbol | V_{CC} | | |
|----------|-----------------------------------|-----------------|-----------------------------------|
| | $3.3 \text{ V} \pm 0.3 \text{ V}$ | 2.7 V | $2.5 \text{ V} \pm 0.2 \text{ V}$ |
| V_{mi} | 1.5 V | 1.5 V | $V_{CC}/2$ |
| V_{mo} | 1.5 V | 1.5 V | $V_{CC}/2$ |

NL17SZ125

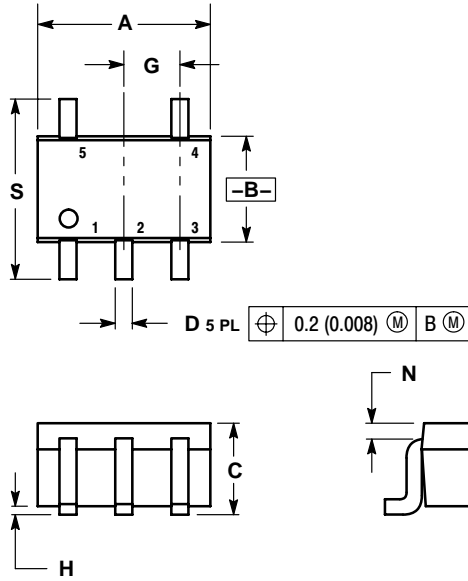
DEVICE ORDERING INFORMATION

| 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 | | |
| NL17SZ125 | NL | 1 | 7 | SZ | 125 | DF | T2 | SC70-5/SC-88A/ SOT-353 | 178 mm (7"), 3000 Units |

NL17SZ125

PACKAGE DIMENSIONS

SC70-5/SC-88A/SOT-353
DF SUFFIX
5-LEAD PACKAGE
CASE 419A-02
ISSUE G

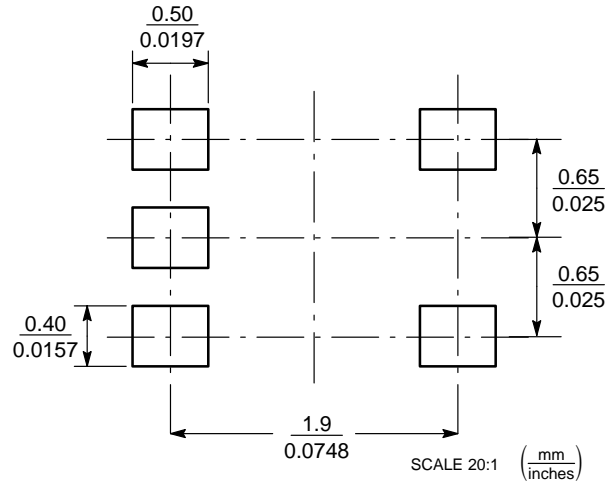


NOTES:


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 |

SOLDERING 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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