NL17SZ125E

Non-Inverting 3-State Buffer

The NL17SZ125E is a high performance non−inverting buffer operating from a 1.65 V to 5.5 V supply.

Features

- Designed for 1.65 V to 5.5 V V_{CC} Operation
- 2.7 ns t_{PD} at V_{CC} = 5 V (typ)
- Inputs/Outputs Overvoltage Tolerant up to 5.5 V
- I_{OFF} Supports Partial Power Down Protection
- Source/Sink 24 mA at 3.0 V
- Chip Complexity < 100 FETs
- 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

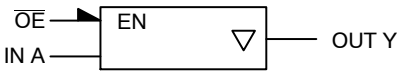

Figure 1. Logic Symbol

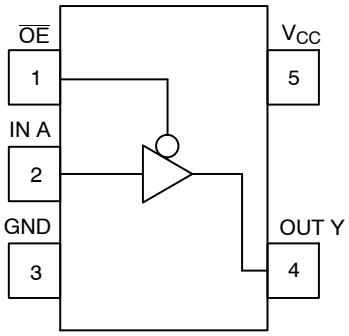

Figure 2. Pinout (Top View)

PIN ASSIGNMENT

Pin	Function
1	$\overline{OE}$
2	IN A
3	GND
4	OUT Y
5	V_{CC}

FUNCTION TABLE

Input		Output
$\overline{OE}$	A	Y
L	L	L
L	H	H
H	X	Z

X = Don't Care

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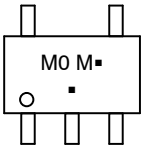
MARKING DIAGRAM

SC−88A (SOT−353)
DF SUFFIX
CASE 419A



M0 = Specific Device Code
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.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

DEVICE ORDERING INFORMATION

Device	Package	Shipping†
NL17SZ125EDFT2G	SC−88A (SOT−353) (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.

Table 1. 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	Active Mode, High or Low State	−0.5 V to V_{CC} + 0.5 V	V
	DC Output Voltage	Power Down Mode (V_{CC} = 0 V)	−0.5 V to +6.5 V	
I_{IK}	DC Input Diode Current		−50	mA
I_{OK}	DC Output Diode Current	V_{OUT} < GND	±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)		659	°C/W
P_D	Power Dissipation in Still Air at 85°C		190	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) Charged Device Model (Note 3)	4000 1000	V
$I_{LATCHUP}$	Latchup Performance Above V_{CC} and Below GND at 125°C (Note 4)		±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.
3. Tested to JESD22−C101−A.
4. Tested to EIA/JESD78.

Table 2. 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	Active Mode, High or Low State	0	Vcc	V
	DC Output Voltage	Power Down Mode (V_{CC} = 0 V)	0	5.5	
T_A	Operating Temperature Range		−55	+125	°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		 0 0 0 0	 20 20 10 5.0	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.

Table 3. DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	V_{CC} (V)	T_A = 25°C			−55°C ≤ T_A ≤ 125°C		Units	Condition
			Min	Typ	Max	Min	Max		
V_{IH}	High−Level Input Voltage	1.65 to 1.95 2.3 to 5.5	0.65 V_{CC} 0.7 V_{CC}			0.65 V_{CC} 0.7 V_{CC}		V	
V_{IL}	Low−Level Input Voltage	1.65 to 1.95 2.3 to 5.5			0.35 V_{CC} 0.3 V_{CC}		0.35 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	1.65 to 5.5			±0.1		±1.0	μA	V_{IN} = 5.5 V or GND
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			1.0		10	μA	V_{IN} = 5.5 V or V_{OUT} = 5.5 V
I_{CC}	Quiescent Supply Current	5.5			1.0		10	μA	V_{IN} = 5.5 V or GND

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.

Table 4. 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 AN to YN (Figures 3 and 4, Table 6)	R_L = 1 MΩ C_L = 15 pF	1.8 ± 0.15		6.0	10		10.5	ns
		R_L = 1 MΩ C_L = 15 pF	2.5 ± 0.2		3.4	7.5		8.0	
		R_L = 1 MΩ C_L = 15 pF R_L = 500 Ω C_L = 50 pF	3.3 ± 0.3		2.5 2.9	5.2 5.7		5.5 6.0	
		R_L = 1 MΩ C_L = 15 pF R_L = 500 Ω C_L = 50 pF	5.0 ± 0.5		2.0 2.3	4.5 5.0		4.8 5.3	
t_{PZH} t_{PZL}	Output Enable Time (Figures 5, 6and 7, Table 6)	R_L = 250 Ω C_L = 50 pF	1.8 ± 0.15		6.5	9.5		10	ns
			2.5 ± 0.2		3.6	8.5		9.0	
			3.3 ± 0.3		2.8	6.2		6.5	
			5.0 ± 0.5		2.0	5.5		5.8	
t_{PHZ} t_{PLZ}	Output Disable Time (Figures 5, 6and 7, Table 6)	R_L and R_1= 500 Ω C_L = 50 pF	1.8 ± 0.15		5.0	10		10.5	ns
			2.5 ± 0.2		3.3	8.0		8.5	
			3.3 ± 0.3		2.7	5.7		6.0	
			5.0 ± 0.5		2.6	4.7		5.0	

Table 5. CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Units
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: $I_{CC(OPR)} = C_{PD} \bullet V_{CC} \bullet f_{in} + I_{CC}$. C_{PD} is used to determine the no−load dynamic power consumption; $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.

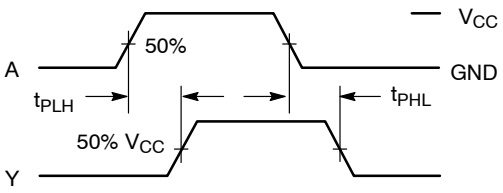
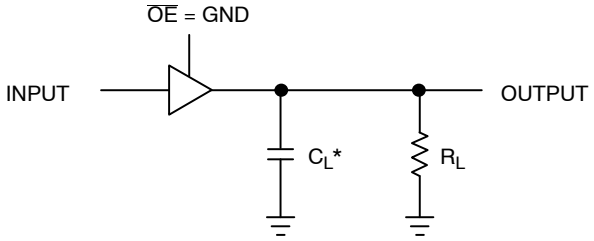
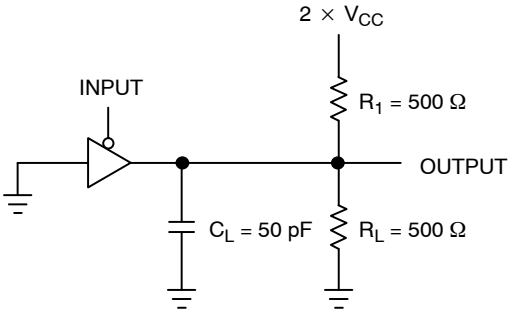


Figure 3. Switching Waveform



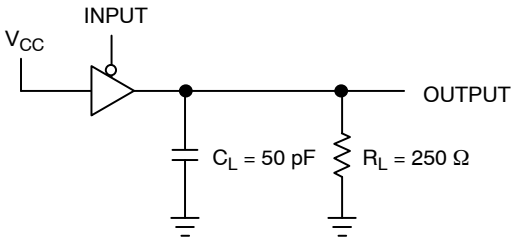
*Includes all probe and jig capacitance.
A 1 MHz square input wave is recommended for propagation delay tests.

Figure 4. t_{PLH} or t_{PHL}



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

Figure 5. t_{PZL} or t_{PLZ}



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

Figure 6. t_{PZH} or t_{PHZ}

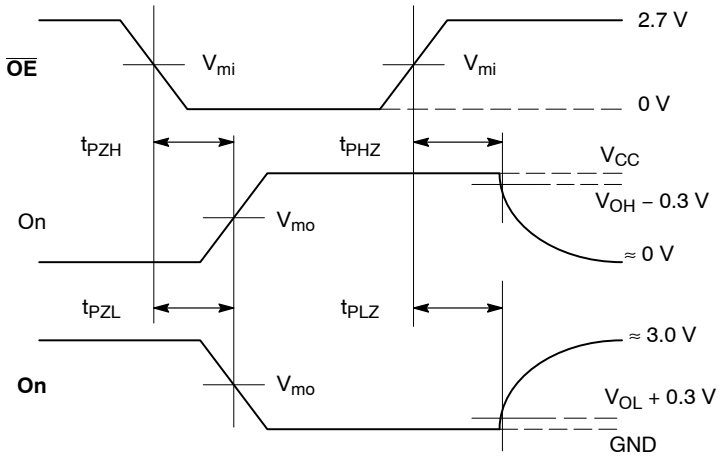


Figure 7. AC Output Enable and Disable Waveform

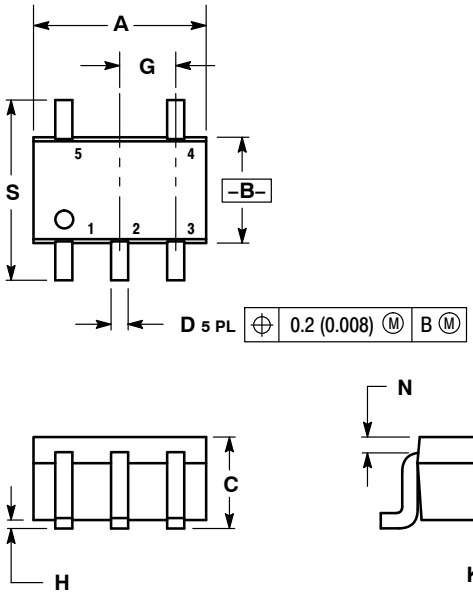
Table 6. OUTPUT ENABLE AND DISABLE TIMES

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

Symbol	V_{CC}		
	3.3 V ± 0.3 V	**2.7 V**	**2.5 V ± 0.2 V**
V_{mi}	1.5 V	1.5 V	$V_{CC}/2$
V_{mo}	1.5 V	1.5 V	$V_{CC}/2$

PACKAGE DIMENSIONS

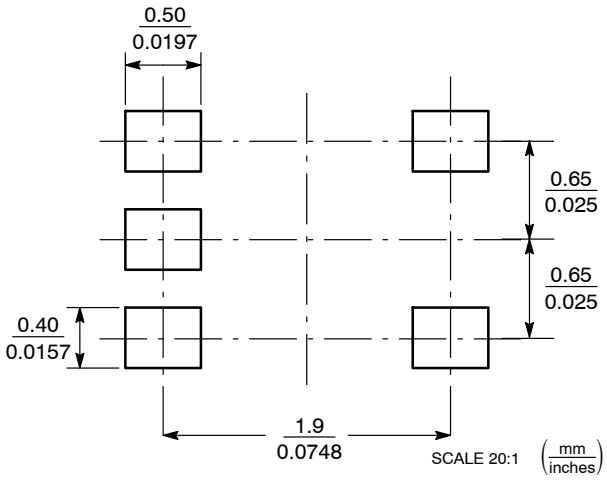
SC−88A (SC−70−5/SOT−353)
CASE 419A−02
ISSUE L



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.

	INCHES		MILLIMETERS	
DIM	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.

PUBLICATION ORDERING INFORMATION

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