

# NL17SG125

## Bus Buffer with 3-State Output

The NL17SG125 MiniGate™ is an advanced high-speed CMOS Bus Buffer with 3-State Output in ultra-small footprint.

The NL17SG125 input structures provides protection when voltages up to 4.6 V are applied.

### Features

- Wide Operating  $V_{CC}$  Range: 0.9 V to 3.6 V
- High Speed:  $t_{PD} = 2.4$  ns (Typ) at  $V_{CC} = 3.0$  V,  $C_L = 15$  pF
- Low Power Dissipation:  $I_{CC} = 0.5$   $\mu$ A (Max) at  $T_A = 25^\circ$ C
- 4.6 V Overvoltage Tolerant (OVT) Input Pins
- Ultra-Small Packages
- These are Pb-Free and Halide-Free Devices

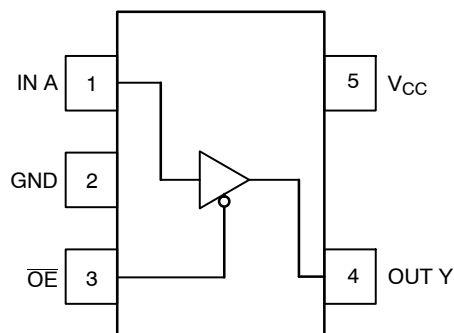


Figure 1. Pinout (Top View)

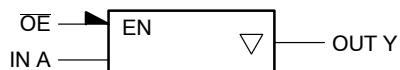


Figure 2. Logic Symbol



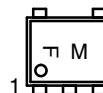
**ON Semiconductor®**

<http://onsemi.com>

### MARKING DIAGRAM



**SOT-953  
CASE 527AE**



F = Specific Device Code  
(F with 90 degree clockwise rotation)  
M = Month Code

### PIN ASSIGNMENT

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

### FUNCTION TABLE

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

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

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## MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	DC Supply Voltage	-0.5 to +5.5	V
V <sub>IN</sub>	DC Input Voltage	-0.5 to +5.5	V
V <sub>OUT</sub>	DC Output Voltage	-0.5 to V <sub>CC</sub> +0.5	V
I <sub>IK</sub>	DC Input Diode Current V <sub>IN</sub> < GND	-20	mA
I <sub>OK</sub>	DC Output Diode Current V <sub>OUT</sub> < GND, V <sub>OUT</sub> > V <sub>CC</sub>	±20	mA
I <sub>OUT</sub>	DC Output Source/Sink Current	±20	mA
I <sub>CC</sub>	DC Supply Current per Supply Pin	±20	mA
I <sub>GND</sub>	DC Ground Current per Ground Pin	±20	mA
T <sub>STG</sub>	Storage Temperature Range	-65 to +150	°C
T <sub>L</sub>	Lead Temperature, 1 mm from Case for 10 Seconds	260	°C
T <sub>J</sub>	Junction Temperature Under Bias	+150	°C
MSL	Moisture Sensitivity	Level 1	
F <sub>R</sub>	Flammability Rating Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	
V <sub>ESD</sub>	ESD Withstand Voltage Human Body Model (Note 2) Machine Model (Note 3)	>2000 >100	V
I <sub>LATCHUP</sub>	Latchup Performance Above V <sub>CC</sub> and Below GND at 125°C (Note 4)	±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.
3. Tested to EIA/JESD22-A115-A.
4. Tested to EIA/JESD78.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Characteristics	Min	Max	Unit
V <sub>CC</sub>	Positive DC Supply Voltage	0.9	4.6	V
V <sub>IN</sub>	Digital Input Voltage	0.0	4.6	V
V <sub>OUT</sub>	Output Voltage	0.0	V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature Range	-55	+125	°C
Δt / ΔV	Input Transition Rise or Fall Rate V <sub>CC</sub> = 3.3 V ± 0.3 V	0	10	ns/V

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## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C		T <sub>A</sub> = -55°C to +125°C		Unit
				Min	Max	Min	Max	
V <sub>IH</sub>	High-Level Input Voltage		0.9	V <sub>CC</sub>		V <sub>CC</sub>		V
			1.1 to 1.3	0.7xV <sub>CC</sub>		0.7xV <sub>CC</sub>		
			1.4 to 1.6	0.65xV <sub>CC</sub>		0.65xV <sub>CC</sub>		
			1.65 to 1.95	0.65xV <sub>CC</sub>		0.65xV <sub>CC</sub>		
			2.3 to 2.7	1.7		1.7		
			3.0 to 3.6	2.0		2.0		
V <sub>IL</sub>	Low-Level Input Voltage		0.9		GND		GND	V
			1.1 to 1.3		0.3xV <sub>CC</sub>		0.3xV <sub>CC</sub>	
			1.4 to 1.6		0.35xV <sub>CC</sub>		0.35xV <sub>CC</sub>	
			1.65 to 1.95		0.35xV <sub>CC</sub>		0.35xV <sub>CC</sub>	
			2.3 to 2.7		0.7		0.7	
			3.0 to 3.6		0.8		0.8	
V <sub>OH</sub>	High-Level Output Voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -20 μA	0.9	0.75		0.75	V
			I <sub>OH</sub> = -0.3 mA	1.1 to 1.3	0.75xV <sub>CC</sub>		0.75xV <sub>CC</sub>	
			I <sub>OH</sub> = -1.7 mA	1.4 to 1.6	0.75xV <sub>CC</sub>		0.75xV <sub>CC</sub>	
			I <sub>OH</sub> = -3.0 mA	1.65 to 1.95	V <sub>CC</sub> -0.45		V <sub>CC</sub> -0.45	
			I <sub>OH</sub> = -4.0 mA	2.3 to 2.7	2.0		2.0	
			I <sub>OH</sub> = -8.0 mA	3.0 to 3.6	2.48		2.48	
V <sub>OL</sub>	Low-Level Output Voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 20 μA	0.9		0.1	0.1	V
			I <sub>OL</sub> = 0.3 mA	1.1 to 1.3		0.25xV <sub>CC</sub>	0.25xV <sub>CC</sub>	
			I <sub>OL</sub> = 1.7 mA	1.4 to 1.6		0.25xV <sub>CC</sub>	0.25xV <sub>CC</sub>	
			I <sub>OL</sub> = 3.0 mA	1.65 to 1.95		0.45	0.45	
			I <sub>OL</sub> = 4.0 mA	2.3 to 2.7		0.4	0.4	
			I <sub>OL</sub> = 8.0 mA	3.0 to 3.6		0.4	0.4	
I <sub>IN</sub>	Input Leakage Current	0 ≤ V <sub>IN</sub> ≤ 3.6 V	0 to 3.6		±0.1		±1.0	μA
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	3.6		1.0		10.0	μA
I <sub>OZ</sub>	3-State Output Leakage Current	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>OUT</sub> = 0 to 3.6 V	0.9 to 3.6		1.0		10.0	μA

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## AC ELECTRICAL CHARACTERISTICS Input $t_r = t_f = 3.0$ ns

Symbol	Parameter	Test Condition	V <sub>CC</sub> (V)	T <sub>A</sub> = 25 °C			T <sub>A</sub> = -55°C to +125°C		Unit		
				Min	Typ	Max	Min	Max			
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay, A or B to Y	C <sub>L</sub> = 10 pF, R <sub>L</sub> = 1 MΩ	0.9	-	11.3	13.6	-	15.9	ns		
			1.1 to 1.3	-	8.3	10.4	-	12.8			
			1.4 to 1.6	-	5.0	8.5	-	10.0			
			1.65 to 1.95	-	4.0	6.2	-	6.7			
			2.3 to 2.7	-	2.6	3.9	-	4.4			
			3.0 to 3.6	-	2.1	3.1	-	3.7			
		C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1 MΩ	0.9	-	12.6	14.7	-	17.0	ns		
			1.1 to 1.3	-	9.6	11.5	-	15.2			
			1.4 to 1.6	-	5.6	9.3	-	11.2			
			1.65 to 1.95	-	4.5	6.9	-	7.1			
			2.3 to 2.7	-	2.9	4.4	-	5.0			
		C <sub>L</sub> = 30 pF, R <sub>L</sub> = 1 MΩ	0.9	-	14.5	16.3	-	19.6	ns		
			1.1 to 1.3	-	11.3	13.6	-	17.5			
			1.4 to 1.6	-	8.2	13.1	-	15.9			
			1.65 to 1.95	-	6	9.2	-	9.6			
			2.3 to 2.7	-	4	5.7	-	6.1			
		t <sub>PZH</sub> , t <sub>PZL</sub>	Output Enable Time, OE to Y	C <sub>L</sub> = 10 pF; R <sub>L</sub> = 100 kΩ R <sub>L</sub> = 5 kΩ R <sub>L</sub> = 5 kΩ R <sub>L</sub> = 5 kΩ R <sub>L</sub> = 5 kΩ						ns	
					0.9	-	11.0	13.3	-		15.8
					1.1 to 1.3	-	8.4	10.9	-		13.0
					1.4 to 1.6	-	5.3	7.8	-		8.3
					1.65 to 1.95	-	3.9	5.5	-		5.9
2.3 to 2.7	-				2.5	3.5	-	3.8			
3.0 to 3.6	-				2.1	2.7	-	3			
C <sub>L</sub> = 15 pF; R <sub>L</sub> = 100 kΩ R <sub>L</sub> = 5 kΩ R <sub>L</sub> = 5 kΩ R <sub>L</sub> = 5 kΩ									ns		
	0.9			-	12.0	14.8	-	17.0			
	1.1 to 1.3			-	9.0	11.7	-	13.8			
	1.4 to 1.6			-	5.9	8.9	-	11			
	1.65 to 1.95			-	4.4	6.3	-	6.5			
	2.3 to 2.7			-	2.9	3.9	-	4.2			
C <sub>L</sub> = 30 pF; R <sub>L</sub> = 100 kΩ R <sub>L</sub> = 5 kΩ R <sub>L</sub> = 5 kΩ R <sub>L</sub> = 5 kΩ									ns		
	0.9			-	13.0	15.2	-	18.3			
	1.1 to 1.3			-	10.0	13.1	-	15.2			
	1.4 to 1.6			-	8.3	12.2	-	13.7			
	1.65 to 1.95			-	6.1	8.6	-	9.7			
	2.3 to 2.7			-	3.8	5	-	5.5			
3.0 to 3.6	-			2.9	3.8	-	4.2				

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## AC ELECTRICAL CHARACTERISTICS Input $t_r = t_f = 3.0$ ns

Symbol	Parameter	Test Condition	V <sub>CC</sub> (V)	Min	Typ	Max	Min	Max	Unit	
$t_{PHZ}$ , $t_{PLZ}$	Output Disable Time, OE to Y	$C_L = 10$ pF; $R_L = 100$ k $\Omega$ $R_L = 5$ k $\Omega$ $R_L = 5$ k $\Omega$ $R_L = 5$ k $\Omega$ $R_L = 5$ k $\Omega$ $R_L = 5$ k $\Omega$							ns	
			0.9	-	100.4	-	-	-		
			1.1 to 1.3	-	9.1	14.4	-	22.4		
			1.4 to 1.6	-	7.1	9.1	-	10.4		
			1.65 to 1.95	-	6.5	8.3	-	9		
			2.3 to 2.7	-	5.8	7.3	-	8.8		
			3.0 to 3.6	-	5.4	6.9	-	7.6		
		$C_L = 15$ pF; $R_L = 100$ k $\Omega$ $R_L = 5$ k $\Omega$ $R_L = 5$ k $\Omega$ $R_L = 5$ k $\Omega$ $R_L = 5$ k $\Omega$ $R_L = 5$ k $\Omega$								ns
			0.9	-	122.2	-	-	-		
			1.1 to 1.3	-	9.8	15.3	-	25.1		
			1.4 to 1.6	-	7.8	9.8	-	11.3		
			1.65 to 1.95	-	7.2	9.2	-	10.6		
			2.3 to 2.7	-	7	8.2	-	10.3		
			3.0 to 3.6	-	6.6	7.7	-	9.5		
		$C_L = 30$ pF; $R_L = 100$ k $\Omega$ $R_L = 5$ k $\Omega$ $R_L = 5$ k $\Omega$ $R_L = 5$ k $\Omega$ $R_L = 5$ k $\Omega$ $R_L = 5$ k $\Omega$								ns
			0.9	-	217.1	-	-	-		
			1.1 to 1.3	-	13.2	19.6	-	31.9		
			1.4 to 1.6	-	12.2	13.5	-	14.9		
			1.65 to 1.95	-	11.4	12.7	-	13.9		
			2.3 to 2.7	-	11.3	12.2	-	13.5		
			3.0 to 3.6	-	10.2	11.5	-	12.9		
$C_{IN}$	Input Capacitance		0 to 3.6		3	-	-	-	pF	
$C_O$	Output Capacitance	$V_O = GND$	0		3	-	-	-	pF	
$C_{PD}$	Power Dissipation Capacitance (Note 5)	$f = 10$ MHz	0.9 to 3.6		4	-	-	-	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;  $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_{in} + I_{CC} \cdot V_{CC}$ .

## ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
NL17SG125P5T5G	SOT-953 (Pb-Free)	8000 / Tape & Reel

<sup>†</sup>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.

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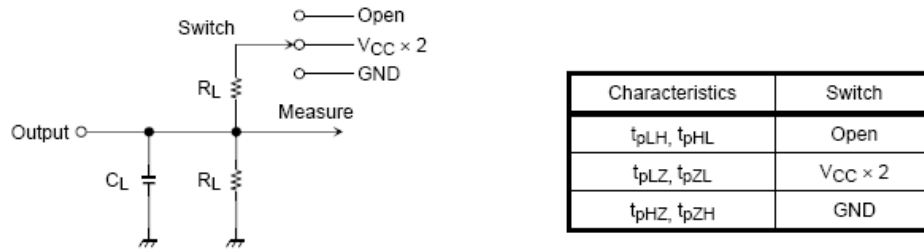


Figure 3. Test Circuit

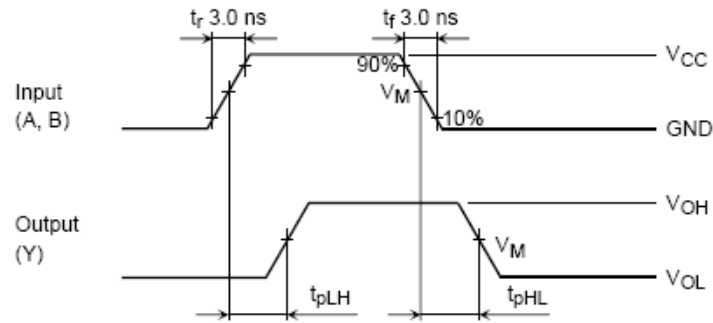


Figure 4.  $t_{pLH}$ ,  $t_{pHL}$  Waveforms

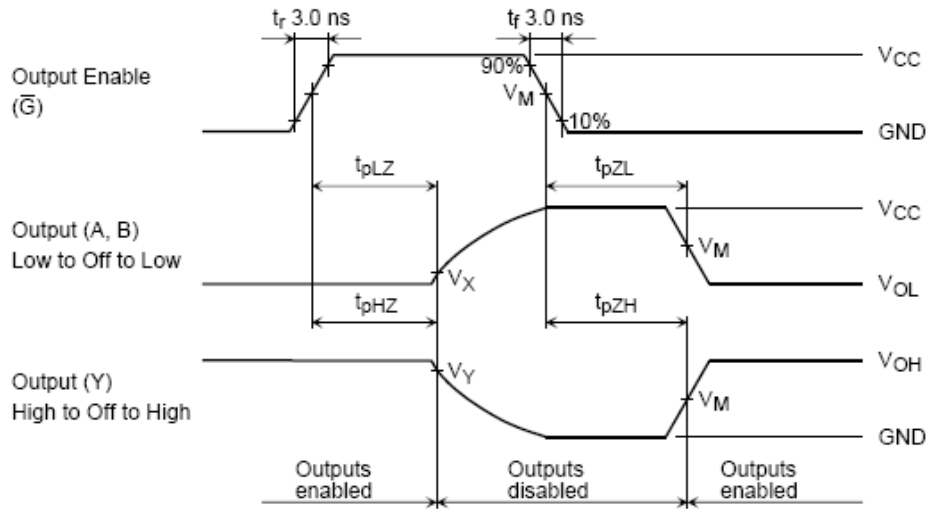
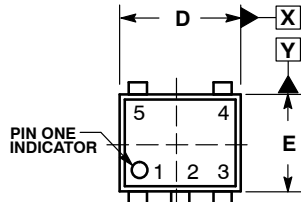


Figure 5.  $t_{pLZ}$ ,  $t_{pHZ}$ ,  $t_{pZH}$ ,  $t_{pZL}$  Waveforms

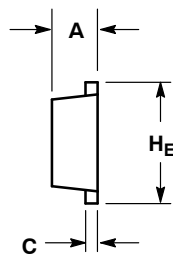
# NL17SG125

## PACKAGE DIMENSIONS

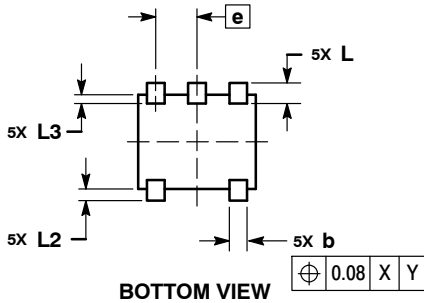
SOT-953  
CASE 527AE  
ISSUE E



TOP VIEW



SIDE VIEW



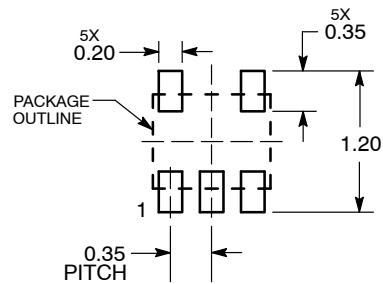
BOTTOM VIEW

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.34	0.37	0.40
b	0.10	0.15	0.20
C	0.07	0.12	0.17
D	0.95	1.00	1.05
E	0.75	0.80	0.85
e	0.35 BSC		
H <sub>E</sub>	0.95	1.00	1.05
L	0.175 REF		
L2	0.05	0.10	0.15
L3	---	---	0.15

### SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

\*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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