

## Single Non-Inverting Buffer with Open Drain Output

The NL17SZ07E is a high performance single non-inverting buffer with open drain outputs operating from a 1.65 to 5.5 V supply.

The Output stage is open drain with Over Voltage Tolerance. This allows the NL17SZ07E to be used to interface 5.0 V circuits to circuits of any voltage between 0 and +5.5 V.

### Features

- Tiny SOT-353 Package
- Extremely High Speed: tpd 2.5 ns (typical) at V<sub>CC</sub> = 5 V
- Designed for 1.65 V to 5.5 V V<sub>CC</sub> Operation, CMOS Compatible
- Over Voltage Tolerant Inputs V<sub>IN</sub> may be Between 0 and 5.5 V for V<sub>CC</sub> Between 0.5 and 5.5 V
- TTL Compatible – Interface Capability with 5.0 V TTL Logic with V<sub>CC</sub> = 2.7 V to 3.6 V
- LVC MOS Compatible
- 24 mA Output Sink Capability, Pullup may be between 0 and 5.5 V
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- Chip Complexity: FET = 20
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

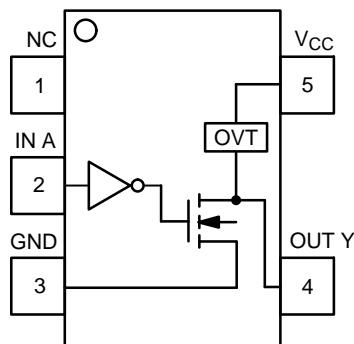


Figure 1. Pinout

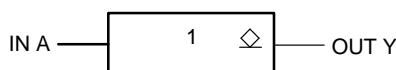


Figure 2. Logic Symbol



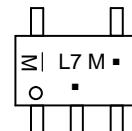
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### MARKING DIAGRAMS



SC-88A / SOT-353 / SC-70  
DF SUFFIX  
CASE 419A



L7 = Specific Device Marking  
M = Date Code\*  
O = 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	NC
2	IN A
3	GND
4	OUT Y
5	V <sub>CC</sub>

### FUNCTION TABLE

Input	Output
A	Y
L	L
H	Z

### ORDERING INFORMATION

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

## MAXIMUM RATINGS

Symbol	Characteristics	Value	Unit
$V_{CC}$	DC Supply Voltage	-0.5 to +6.5	V
$V_I$	DC Input Voltage	-0.5 to +6.5	V
	DC Output Voltage Active Mode, LOW State (Note 1) Tri-State Mode Power-Down Mode ( $V_{CC} = 0$ V)	-0.5 to $V_{CC} + 0.5$ -0.5 to +6.5 -0.5 to +6.5	
$I_{OK}$	DC Output Diode Current $V_O < GND$	-50	mA
$I_{IK}$	DC Input Diode Current $V_I < GND$	-50	mA
$I_O$	DC Output Sink Current	$\pm 50$	mA
$I_{CC}$	DC Supply Current per Supply Pin	$\pm 100$	mA
$I_{GND}$	DC Ground Current per Ground Pin	$\pm 100$	mA
$T_{STG}$	Storage Temperature Range	-65 to +150	°C
$P_D$	Power Dissipation in Still Air	186	mW
$\theta_{JA}$	Thermal Resistance	350	°C/W
$T_L$	Lead Temperature, 1 mm from Case for 10 Seconds	260	°C
$T_J$	Junction Temperature Under Bias	+150	°C
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) Charged Device Model (Note 3)	4000 1000	V V
$I_{Latch-Up}$	Latch-Up Performance Above $V_{CC}$ and Below GND at 85°C (Note 4)	$\pm 100$	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.  $I_O$  absolute maximum rating must be observed.
2. Tested to EIA/JESD22-A114-A, rated to EIA/JESD22-A114-B.
3. Tested to JESD22-C101-A.
4. Tested to EIA/JESD78.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit	
$V_{CC}$	Supply Voltage Operating Data Retention Only	1.65 1.5	5.5 5.5	V	
$V_I$	Input Voltage	0	5.5	V	
	Output Voltage Active Mode, LOW State Tri-State Mode Power-Down Mode ( $V_{CC} = 0$ V)	0 0 0	$V_{CC}$ 5.5 5.5		
$T_A$	Operating Free-Air Temperature	-55	+125	°C	
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate	$V_{CC} = 2.5$ V $\pm 0.2$ V $V_{CC} = 3.0$ V $\pm 0.3$ V $V_{CC} = 5.0$ V $\pm 0.5$ V	0 0 0	20 10 5	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.

## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	$V_{CC}$ (V)	$T_A = 25^\circ\text{C}$			$-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$		Unit
				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 $V_{CC}$		V
$I_{LKG}$	Z-State Output Leakage Current	$V_{IN} = V_{IH}$ $V_{OUT} = V_{CC}$ or GND	2.3 to 5.5			$\pm 5.0$		$\pm 10.0$	$\mu\text{A}$
$V_{OL}$	Low-Level Output Voltage $V_{IN} = V_{IL}$	$I_{OL} = 100$ $\mu\text{A}$	1.65 to 5.5		0.0	0.1		0.1	V
		$I_{OL} = 4$ 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	1.65 to 5.5			$\pm 0.1$		$\pm 1.0$	$\mu\text{A}$
$I_{OFF}$	Power Off Leakage Current	$V_{IN} = 5.5$ V or $V_{OUT} = 5.5$ V	0			1		10	$\mu\text{A}$
$I_{CC}$	Quiescent Supply Current	$V_{IN} = 5.5$ V or GND	5.5			1		10	$\mu\text{A}$
$I_{CCT}$	Quiescent Supply Current	$V_{IN} = 3.0$ V	3.6			10		100	$\mu\text{A}$

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.

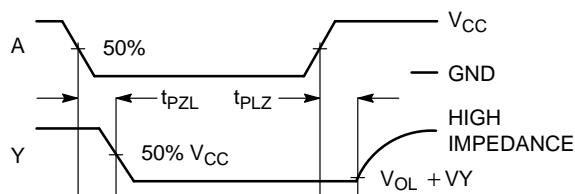
AC ELECTRICAL CHARACTERISTICS  $t_R = t_F = 2.5$  ns

Symbol	Parameter	Condition	$V_{CC}$ (V)	$T_A = 25^\circ C$			$-55^\circ C \leq T_A \leq 125^\circ C$		Unit
				Min	Typ	Max	Min	Max	
$t_{PZL}$	Propagation Delay (Figure 3 and 4)	$R_L = R_1 = 500 \Omega$ , $C_L = 50 \text{ pF}$	$1.8 \pm 0.15$		5.3	9.0		9.5	ns
			$2.5 \pm 0.2$		3.7	6.1		6.5	
			$3.3 \pm 0.3$		2.9	5.6		6.0	
			$5.0 \pm 0.5$		2.3	4.4		4.8	
$t_{PLZ}$	Propagation Delay (Figure 3 and 4)	$R_L = R_1 = 500 \Omega$ , $C_L = 50 \text{ pF}$	$1.8 \pm 0.15$		5.3	9.0		9.5	ns
			$2.5 \pm 0.2$		2.8	6.1		6.5	
			$3.3 \pm 0.3$		2.1	5.6		6.0	
			$5.0 \pm 0.5$		1.4	4.4		4.8	

## CAPACITIVE CHARACTERISTICS

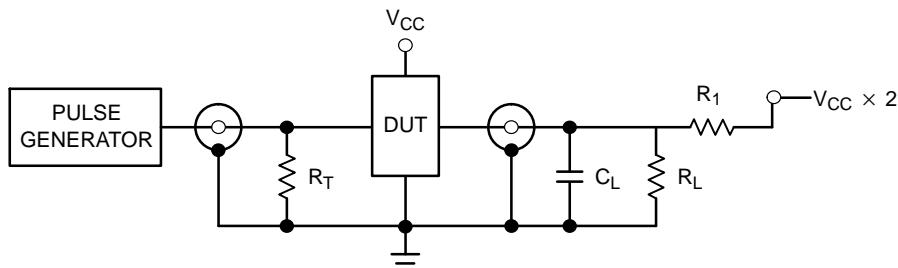
Symbol	Parameter	Condition	Typical	Unit
$C_{IN}$	Input Capacitance	$V_{CC} = 5.5 \text{ V}$ , $V_I = 0 \text{ V}$ or $V_{CC}$	$> 2.5$	pF
$C_{OUT}$	Output Capacitance	$V_{CC} = 5.5 \text{ V}$ , $V_I = 0 \text{ V}$ or $V_{CC}$	4.0	pF
$C_{PD}$	Power Dissipation Capacitance (Note 5)	10 MHz, $V_{CC} = 5.5 \text{ V}$ , $V_I = 0 \text{ V}$ or $V_{CC}$	4.0	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;  $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_{in} + I_{CC} \cdot V_{CC}$ .



$V_{CC} = 1.8 \pm 0.15 \text{ V}$  or  $2.5 \pm 0.2 \text{ V}$ ,  $V_Y = 0.15 \text{ V}$   
 $V_{CC} = 3.3 \pm 0.3 \text{ V}$  or  $5.0 \pm 0.5 \text{ V}$ ,  $V_Y = 0.30 \text{ V}$

Figure 3. Switching Waveforms



$R_T = Z_{OUT}$  of pulse generator (typically  $50 \Omega$ )

Figure 4. Test Circuit

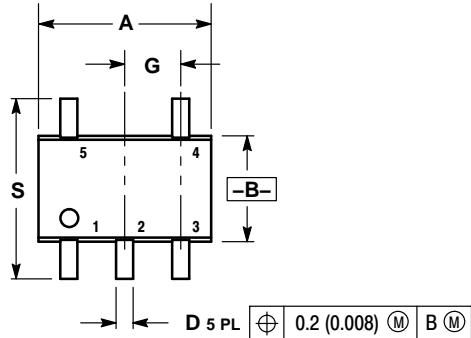
# NL17SZ07E

## DEVICE ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
NL17SZ07EDFT2G	SOT-353/SC70-5/SC-88A (Pb-Free)	3000 / 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.

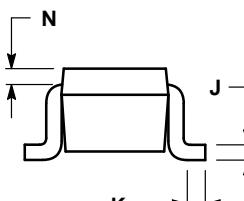
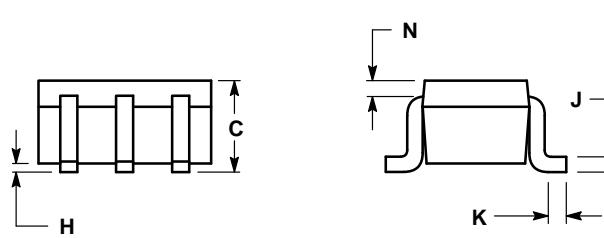
## PACKAGE DIMENSIONS

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

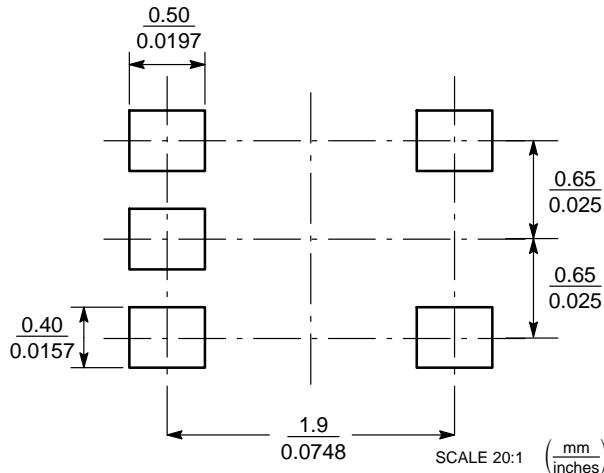
NOTES:

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.

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