NL17SG07E

Buffer with Open Drain Output

The NL17SG07E MiniGate™ is an advanced high−speed CMOS Buffer with Open Drain Output in ultra−small footprint.

The NL17SG07E input and output structures provide protection when voltages up to 3.6 V are applied regardless of the supply voltage.

Features

- Wide Operating V_{CC} Range: 0.9 V to 3.6 V
- High Speed: t_{PD} = 2.5 ns (Typ) at V_{CC} = 3.0 V, C_L = 15 pF
- Low Power Dissipation: I_{CC} = 0.5 μA (Max) at T_A = 25°C
- 3.6 V Overvoltage Tolerant (OVT) Input and Output Pins
- Ultra−Small Packages
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

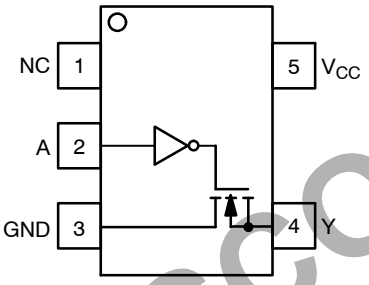

Figure 1. SC−88A
(Top View)

Figure 2. Logic Symbol

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MARKING DIAGRAM

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.

PIN ASSIGNMENT

PIN	NAME
1	NC
2	A
3	GND
4	Y
5	V_{CC}

FUNCTION TABLE

Input A	Output 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.

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MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V_{CC}	DC Supply Voltage		−0.5 to +4.6	V
V_{IN}	DC Input Voltage		−0.5 to +4.6	V
V_{OUT}	DC Output Voltage	Active Mode, LOW State Tri−State Mode, Output at Hi−Z State Power−Down Mode (V_{CC} = 0 V)	−0.5 to V_{CC} + 0.5 −0.5 to +4.6 −0.5 to +4.6	V
I_{IK}	DC Input Diode Current	V_{IN} < GND	−20	mA
I_{OK}	DC Output Diode Current	V_{OUT} < GND	−20	mA
I_{OUT}	DC Output Source/Sink Current		±20	mA
I_{CC}	DC Supply Current per Supply Pin		±20	mA
I_{GND}	DC Ground Current per Ground Pin		±20	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
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)	>2000	V
$I_{LATCHUP}$	Latch−up Performance above V_{CC} and below GND at 125°C (Note 3)		±75	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 EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

Symbol	Characteristics		Min	Max	Unit
V_{CC}	Positive DC Supply Voltage		0.9	3.6	V
V_{IN}	Digital Input Voltage		0.0	3.6	V
V_{OUT}	Output Voltage	Output at Low State Tri−State Mode, Output at Hi−Z State Power−Down Mode (V_{CC} = 0 V)	0.0 0.0 0.0	V_{CC} 3.6 3.6	V
T_A	Operating Temperature Range		−55	+125	°C
$\Delta t / \Delta V$	Input Transition Rise or Fall Rate	V_{CC} = 3.3 V ± 0.3 V	0	10	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.

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DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition		V_{CC} (V)	T_A = 25°C			−55°C ≤ T_A ≤ 125°C		Unit
					Min	Typ	Max	Min	Max	
V_{IH}	High−Level Input Voltage			0.9	V_{CC}			V_{CC}		V
				1.1 to 1.3	0.70 x V_{CC}			0.70 x V_{CC}		
				1.4 to 1.6	0.65 x V_{CC}			0.65 x V_{CC}		
				1.65 to 1.95	0.65 x V_{CC}			0.65 x V_{CC}		
				2.3 to 2.7	1.7			1.7		
				3.0 to 3.6	2.0			2.0		
V_{IL}	Low−Level Input Voltage			0.9			GND		GND	V
				1.1 to 1.3			0.30 x V_{CC}		0.30 x V_{CC}	
				1.4 to 1.6			0.35 x V_{CC}		0.35 x V_{CC}	
				1.65 to 1.95			0.35 x V_{CC}		0.35 x V_{CC}	
				2.3 to 2.7			0.7		0.7	
				3.0 to 3.6			0.8		0.8	
V_{OL}	Low−Level Output Voltage	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 20 μA	0.9			0.1		0.1	V
			I_{OL} = 0.3 mA	1.1 to 1.3			0.25 x V_{CC}		0.25 x V_{CC}	
			I_{OL} = 1.7 mA	1.4 to 1.6			0.25 x V_{CC}		0.25 x V_{CC}	
			I_{OL} = 3.0 mA	1.65 to 1.95			0.45		0.45	
			I_{OL} = 4.0 mA	2.3 to 2.7			0.4		0.4	
			I_{OL} = 8.0 mA	3.0 to 3.6			0.4		0.4	
I_{IN}	Input Leakage Current	V_{IN} = 0 to 3.6 V		0.9 to 3.6			±0.1		±1.0	μA
I_{CC}	Quiescent Supply Current	V_{IN} = V_{CC} or GND		3.6			0.5		10	μA
I_{OZ}	Output Tri−State Leakage Current	V_{IN} = V_{IH} or V_{IL}, V_{OUT} = 0 to 3.6 V		0.9 to 3.6			1.0		10	μA
I_{OFF}	Power Off Leakage Current	V_{IN} = 0 to 3.6 V V_{OUT} = 0 to 3.6 V		0			1.0		10	μA

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.

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AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3.0$ ns)

Symbol	Parameter	Test Condition	V_{CC} (V)	T_A = 25°C			T_A = −55°C to +125°C		Unit
				Min	Typ	Max	Min	Max	
t_{PZL}	Propagation Delay, Enable Time, A to Y	C_L = 10 pF, $R_1 = R_L$ = 5 kΩ	0.9	–	12	–	–	–	ns
			1.1 to 1.3	–	5.5	7.9	–	9.0	
			1.4 to 1.6	–	4.0	5.7	–	7.3	
			1.65 to 1.95	–	3.3	3.9	–	5.9	
			2.3 to 2.7	–	2.7	3.3	–	4.5	
			3.0 to 3.6	–	2.4	2.9	–	3.7	
		C_L = 15 pF, $R_1 = R_L$ = 5 kΩ	0.9	–	12.5	–	–	–	ns
			1.1 to 1.3	–	5.8	8.1	–	9.2	
			1.4 to 1.6	–	4.1	6.0	–	7.4	
			1.65 to 1.95	–	3.4	4.0	–	6.2	
			2.3 to 2.7	–	2.8	3.4	–	4.6	
			3.0 to 3.6	–	2.5	3.0	–	3.7	
		C_L = 30 pF, $R_1 = R_L$ = 5 kΩ	0.9	–	13.2	–	–	–	ns
			1.1 to 1.3	–	6.2	8.7	–	9.8	
			1.4 to 1.6	–	4.5	6.2	–	7.6	
			1.65 to 1.95	–	3.5	4.2	–	6.4	
			2.3 to 2.7	–	3.0	3.6	–	4.7	
			3.0 to 3.6	–	2.6	3.1	–	3.9	
t_{PLZ}	Propagation Delay, Disable Time, A to Y	C_L = 10 pF, $R_1 = R_L$ = 5 kΩ	0.9	–	8.0	–	–	–	ns
			1.1 to 1.3	–	6.5	10.9	–	11.5	
			1.4 to 1.6	–	5.2	8.9	–	9.5	
			1.65 to 1.95	–	4.9	8.8	–	9.4	
			2.3 to 2.7	–	3.8	8.4	–	9.3	
			3.0 to 3.6	–	3.5	8.1	–	8.5	
		C_L = 15 pF, $R_1 = R_L$ = 5 kΩ	0.9	–	11.1	–	–	–	ns
			1.1 to 1.3	–	9.0	13.4	–	14	
			1.4 to 1.6	–	7.9	11.4	–	12.0	
			1.65 to 1.95	–	7.6	11.3	–	11.9	
			2.3 to 2.7	–	6.3	10.9	–	11.8	
			3.0 to 3.6	–	6.0	10.6	–	11.0	
		C_L = 30 pF, $R_1 = R_L$ = 5 kΩ	0.9	–	16.2	–	–	–	ns
			1.1 to 1.3	–	14	20.2	–	20	
			1.4 to 1.6	–	13	18.9	–	19.5	
			1.65 to 1.95	–	12.5	18.8	–	19.4	
			2.3 to 2.7	–	11.2	18.4	–	19.3	
			3.0 to 3.6	–	11	18.1	–	18.3	
C_{IN}	Input Capacitance		0 to 3.6	–	3	–	–	–	pF
C_{PD}	Power Dissipation Capacitance (Note 4)		0.9 to 3.6	–	4	–	–	–	pF

4. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the dynamic 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; $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.

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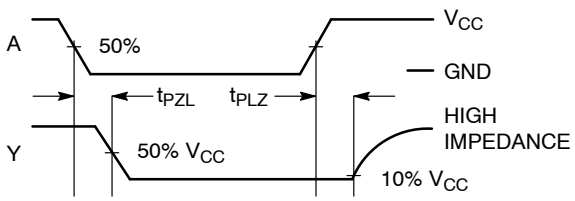
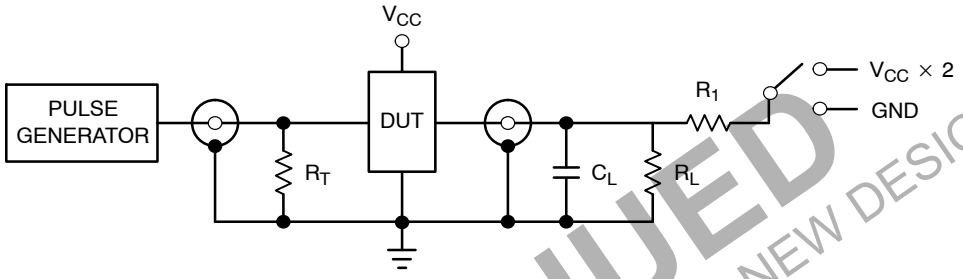


Figure 3. Switching Waveform



Test	Switch
t_{PZL}	V_{CC} x 2
t_{PLZ}	V_{CC} x 2

Figure 4. Test Circuit

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ORDERING INFORMATION

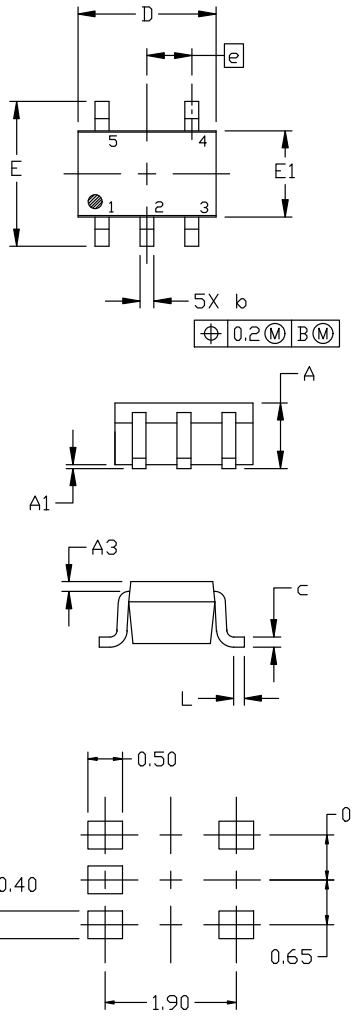
Device	Package	Shipping†
NL17SG07EDFT2G	SC−88A (Pb−Free)	3000 / Tape & Reel

†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.

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

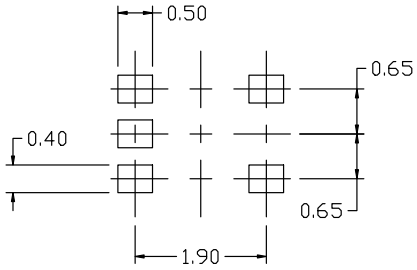
DATE 11 APR 2023

SCALE 2:1



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. 419A−01 OBSOLETE. NEW STANDARD 419A−02
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.1016MM PER SIDE.

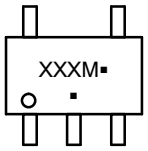
DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.80	0.95	1.10
A1	---	---	0.10
A3	0.20 REF		
b	0.10	0.20	0.30
c	0.10	---	0.25
D	1.80	2.00	2.20
E	2.00	2.10	2.20
E1	1.15	1.25	1.35
e	0.65 BSC		
L	0.10	0.15	0.30



RECOMMENDED
MOUNTING 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.

GENERIC MARKING DIAGRAM*



*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

XXX = Specific Device Code
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

STYLE 1:
PIN 1. BASE
2. EMITTER
3. BASE
4. COLLECTOR
5. COLLECTOR

STYLE 2:
PIN 1. ANODE
2. EMITTER
3. BASE
4. COLLECTOR
5. CATHODE

STYLE 3:
PIN 1. ANODE 1
2. N/C
3. ANODE 2
4. CATHODE 2
5. CATHODE 1

STYLE 4:
PIN 1. SOURCE 1
2. DRAIN 1/2
3. SOURCE 1
4. GATE 1
5. GATE 2

STYLE 5:
PIN 1. CATHODE
2. COMMON ANODE
3. CATHODE 2
4. CATHODE 3
5. CATHODE 4

STYLE 6:
PIN 1. EMITTER 2
2. BASE 2
3. EMITTER 1
4. COLLECTOR
5. COLLECTOR 2/BASE 1

STYLE 7:
PIN 1. BASE
2. EMITTER
3. BASE
4. COLLECTOR
5. COLLECTOR

STYLE 8:
PIN 1. CATHODE
2. COLLECTOR
3. N/C
4. BASE
5. EMITTER

STYLE 9:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. ANODE
5. ANODE

Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

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DESCRIPTION:	**SC−88A (SC−70−5/SOT−353)**	**PAGE 1 OF 1**

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