

Inverter with Schmitt-Trigger

NL17SG14

The NL17SG14 is a single inverter with Schmitt-trigger input in tiny footprint packages. The device is designed to operate for V_{CC} = 0.9 V to 3.6 V.

Features

- Designed for 0.9 V to 3.6 V V_{CC} Operation
- 2.4 ns (Typ) at $V_{CC} = 3.0 \text{ V}$, $C_L = 15 \text{ pF}$
- Inputs/Outputs Over-Voltage Tolerant up to 3.6 V
- I_{OFF} Supports Partial Power Down Protection
- Available in UDFN Package
- –Q Suffix 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 RoHS–Compliant

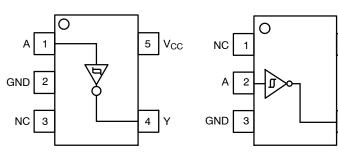


Figure 1. SOT-953 (Top Thru View)

Figure 2. SC-88A (Top View)

1

 V_{CC}

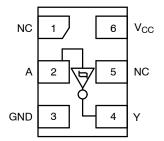


Figure 3. UDFN (Top View)

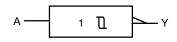


Figure 4. Logic Symbol

MARKING DIAGRAMS



SOT-953 CASE 527AE





UDFN6 1.0 x 1.0 CASE 517BX





UDFN6 1.45 x 1.0 CASE 517AQ





SC-88A DF SUFFIX CASE 419A



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						
	SOT-953 SC-88A UDFN6					
1	А	NC	NC			
2	GND	Α	Α			
3	NC	GND	GND			
4	Υ	Y	Υ			
5	V _{CC}	V _{CC}	NC			
6			V _{CC}			

FUNCTION TABLE

A Input	Y Output
L	Н
Н	L

ORDERING INFORMATION

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

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 6.

Table 1. MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage	-0.5 to +4.3	V
V _{IN}	DC Input Voltage	-0.5 to +4.3	V
V _{OUT}	DC Output Voltage Active-Mode (High or Low State) Tri-State Mode (Note 1) Power-Down Mode (V _{CC} = 0 V)	-0.5 to V _{CC} + 0.5 -0.5 to +4.3 -0.5 to +4.3	V
I _{IK}	DC Input Diode Current V _{IN} < GND	-20	mA
I _{OK}	DC Output Diode Current V _{OUT} < GND	-20	mA
l _{out}	DC Output Source/Sink Current	±20	mA
I _{CC or} I _{GND}	DC Supply Current Per Supply Pin or Ground Pin	±20	mA
T _{STG}	Storage Temperature Range	-65 to +150	°C
TL	Lead Temperature, 1 mm from Case for 10 Seconds	260	°C
TJ	Junction Temperature Under Bias	+150	°C
$\theta_{\sf JA}$	Thermal Resistance (Note 2)	154	°C/W
P_{D}	Power Dissipation in Still Air	812	mW
$\theta_{\sf JA}$	Thermal Resistance (Note 2) SC–88A SOT–953 UDFN6	377 254 154	°C/W
P_{D}	Power Dissipation in Still Air SC-88A SOT-953 UDFN6	332 491 812	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 (Note 3) Human Body Model Charged Device Model	2000 1000	٧
I _{LATCHUP}	Latchup Performance (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. Applicable to devices with outputs that may be tri–stated.

- 2. Measured with minimum pad spacing on an FR4 board, using 10 mm by 1inch, 2 ounce copper trace no air flow per JESD51-7.
- 3. HBM tested to EIA / JESD22-A114-A. CDM tested to JESD22-C101-A. JEDEC recommends that ESD qualification to EIA/JESD22-A115A (Machine Model) be discontinued.
 4. Tested to EIA/JESD78 Class II.

Table 2. RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V _{CC}	Positive DC Supply Voltage		3.6	V
V _{IN}	Digital Input Voltage	0	3.6	V
V _{OUT}	Output Voltage Active Mode (High or Low State) Tri-State Mode (Note 1) Power Down Mode (V _{CC} = 0 V)	0 0 0	V _{CC} 3.6 3.6	V
T _A	Operating Free-Air Temperature	-55	+125	°C
t _r , t _f	Input Transition Rise or Fall Rate	0	No Limit	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

				T _A = 25°C			T _A = -55°C to +125°C		Ì
Symbol	Parameter	Conditions	V _{CC} (V)	Min	Тур	Max	Min	Max	Unit
V _{T+}	Positive Going		0.9	-	0.7	-	_	_	V
	Input Threshold Voltage		1.1	-	0.81	0.95	-	0.95	
			1.4	-	0.94	1.16	-	1.16	
			1.65	-	1.06	1.3	-	1.3	
			2.3	-	1.36	1.73	-	1.73	
			3.0	-	1.8	2.24	_	2.24	
V_{T-}	Negative Going		0.9	-	0.23	-	_	_	V
	Input Threshold Voltage		1.1	0.15	0.33	-	0.15	_	
	Ŭ		1.4	0.3	0.47	-	0.3	_	
			1.65	0.35	0.6	-	0.35	_	
			2.3	0.55	0.85	-	0.55	_	
			3.0	0.95	1.13	-	0.95	_	
V _H	Hysteresis Voltage		0.9	-	0.27	-	_	_	V
			1.1	0.2	0.35	0.8	0.2	0.8	
			1.4	0.25	0.41	0.86	0.25	0.86	
			1.65	0.30	0.46	0.9	0.30	0.9	
			2.3	0.40	0.56	1.05	0.40	1.05	
			3.0	0.49	0.59	1.1	0.49	1.1	
V _{OH}	High-Level Output	V _{IN} = V _{IH} or V _{IL}							V
	Voltage	I _{OH} = -20 μA	0.9	-	0.75	-	_	_	
		I _{OH} = -0.3 mA	1.1 o 1.3	0.75 x V _{CC}	-	-	0.75 x V _{CC}	_	
		I _{OH} = −1.7 mA	1.4 to 1.6	0.75 x V _{CC}	-	-	0.75 x V _{CC}	_	
		I _{OH} = -3.0 mA	1.65 to 1.95	V _{CC} – 0.45	_	-	V _{CC} – 0.45	-	
		I _{OH} = -4.0 mA	2.3 to 2.7	2.0	-	-	2.0	-	
		I _{OH} = -8.0 mA	3.0 to 3.6	2.48	-	-	2.48	-	
V _{OL}	Low-Level Output	$V_{IN} = V_{IH}$ or V_{IL}							V
	Voltage	I _{OL} = 20 μA	0.9	-	0.1	-	_	_	
		I _{OL} = 0.3 mA	1.1 o 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	2.7 to 3.6	-	_	0.4	-	0.4	
I _{IN}	Input Leakage Current	V _{IN} = 0 V to 3.6 V	0.9 to 3.6	-	-	±0.1	-	±1.0	μΑ
I _{OFF}	Power Off Leakage Current	V _{IN} = 0 V to 3.6 V; V _{OUT} = 0 V to 3.6 V	0	-	-	1.0	-	10.0	μΑ
I _{CC}	Quiescent Supply Current	V _{IN} = V _{CC} or GND	0.9 to 3.6	-	-	0.5	-	10.0	μΑ

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.

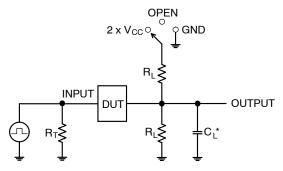
Table 4. AC ELECTRICAL CHARACTERISTICS

					T _A = 25°C	;		\ = 0 +125°C	
Symbol	Parameter	Test Condition	V _{CC} (V)	Min	Тур	Max	Min	Max	Unit
t _{PLH} ,	Propagation Delay,	C _L = 10 pF,	0.9	-	38.0	-	_	-	ns
t _{PHL}	A to Y (Figures 5 and 6)	A to Y $R_L = 1 M\Omega$	1.1 to 1.3	-	9.7	24.1	-	35.9	
	(Figures 5 and 6)		1.4 to 1.6	-	5.4	10.5	_	11.3	
			1.65 to 1.95	-	3.9	7.8	_	8.2	
			2.3 to 2.7	-	2.8	5.4	_	5.8	
			3.0 to 3.6	-	2.3	4.4	_	4.6	
		C _L = 15 pF,	0.9	-	38.4	_	_	-	
		R_L = 1 MΩ	1.1 to 1.3	-	9.9	25.1	_	41.6	
			1.4 to 1.6	-	5.6	11.5	_	12.6	
			1.65 to 1.95	-	4.1	8.4	_	8.7	
			2.3 to 2.7	-	2.9	5.7	_	6.1	
			3.0 to 3.6	-	2.4	4.6	_	5.0	
		C _L = 30 pF,	0.9	-	39.6	_	_	-	
		$R_L = 1 M\Omega$	1.1 to 1.3	-	10.5	35.7	_	58.1	
			1.4 to 1.6	-	6.0	15.8	_	17.6	
			1.65 to 1.95	-	4.7	10.7	_	11.7	
			2.3 to 2.7	-	3.2	6.9	_	8.1	
			3.0 to 3.6	-	2.6	5.2	_	6.1	

Table 5. CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition	Typical (T _A = 25°C)	Unit
C _{IN}	Input Capacitance	V _{CC} = 0 V	3.0	pF
C _{OUT}	Output Capacitance	V _{CC} = 0 V	3.0	pF
C _{PD}	Power Dissipation Capacitance (Note 5)	f = 10 MHz, V_{CC} = 0.9 V to 3.6 V, V_{IN} = 0 V or V_{CC}	4.0	pF

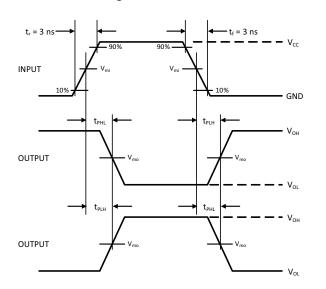
^{5.} C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the dynamic operating current consumption without load. Average operating current can be obtained by the equation I_{CC(OPR)} = C_{PD} • V_{CC} • f_{in} + I_{CC}. C_{PD} is used to determine the no–load dynamic power consumption: P_D = C_{PD} • V_{CC}² • f_{in} + I_{CC} • V_{CC}.



Test	Switch Position
t _{PLH} / t _{PHL}	Open
t _{PLZ} / t _{PZL}	2 x V _{CC}
t _{PHZ} / t _{PZH}	GND

 C_L includes probe and jig capacitance R_T is Z_{OUT} of pulse generator (typically 50 W) f = 1 MHz

Figure 5. Test Circuit



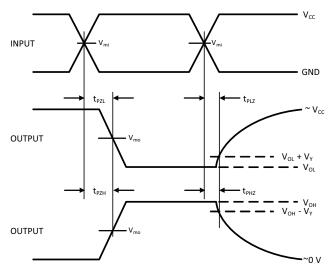


Figure 6. Switching Waveforms

V _{CC} , V	V _{mi} , V	V_{mo} , V	V _Y , V
0.9	V _{CC} /2	V _{CC} /2	0.1
1.1 to 1.3	V _{CC} /2	V _{CC} /2	0.1
1.4 to 1.6	V _{CC} /2	V _{CC} /2	0.1
1.65 to 1.95	V _{CC} /2	V _{CC} /2	0.15
2.3 to 2.7	V _{CC} /2	V _{CC} /2	0.15
3.0 to 3.6	1.5	1.5	0.3

ORDERING INFORMATION

Device	Package	Marking	Pin 1 Orientation (See below)	Shipping [†]
NL17SG14MU1TCG	UDFN6, 1.45 x 1.0	4 (Rotated 180°CW)	Q4	3000 / Tape & Reel
NL17SG14DFT2G-Q*	SC-88A	AR	Q4	3000 / Tape & Reel
NL17SG14P5T5G	SOT-953	2	Q2	8000 / Tape & Reel

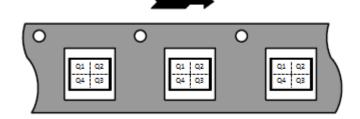
DISCONTINUED (Note 6)

NL17SG14DFT2G	SC-88A	AR	Q4	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.

PIN 1 ORIENTATION IN TAPE AND REEL

Direction of Feed

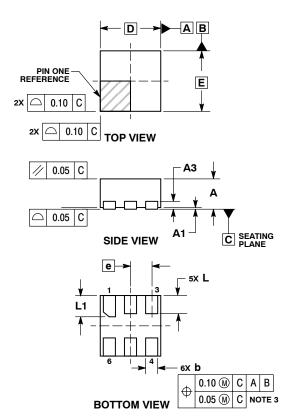


^{*-}Q Suffix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC – Q100 Qualified and PPAP Capable.

^{6.} DISCONTINUED: These devices are not recommended for new design. Please contact your **onsemi** representative for information. The most current information on these devices may be available on www.onsemi.com.

PACKAGE DIMENSIONS

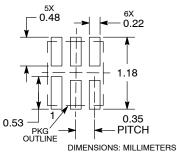
UDFN6, 1x1, 0.35P CASE 517BX ISSUE O



- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. DIMENSION & APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.20 MM FROM TERMINAL TIP.
 4. PACKAGE DIMENSIONS EXCLUSIVE OF RUBRS AND MOI D FI ASH.
- BURRS AND MOLD FLASH.

	MILLIMETERS		
DIM	MIN	MAX	
Α	0.45	0.55	
A1	0.00	0.05	
A3	0.13 REF		
b	0.12	0.22	
D	1.00	BSC	
E	1.00	BSC	
е	0.35 BSC		
L	0.25	0.35	
L1	0.30	0.40	

RECOMMENDED SOLDERING FOOTPRINT*



*For additional information on our Pb-Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.





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

DATE 11 APR 2023

NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: MILLIMETERS
- 419A-01 DBSDLETE, NEW STANDARD 419A-02
- DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH,

DIM	MI	LLIMETE	RS
INITU	MIN.	N□M.	MAX.
А	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
Е	2.00	2.10	2.20
E1	1.15	1.25	1.35
е	0.65 BSC		
L	0.10	0.15	0.30

5X b

→ 0.2 M B M

- PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.1016MM PER SIDE.

	L ——		
<u> </u>	0.50	5	

RECOMMENDED MOUNTING FOOTPRINT

For additional information on our Pb-Free strategy and soldering details, please download the DN Semiconductor Soldering and Mounting Techniques Reference Manual, SDLDERRM/D.

5. COLLECTOR

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

= Date Code

= Pb-Free Package

(Note: Microdot may be in either location)

STYLE 1:	STYLE 2:	STYLE 3:	STYLE 4:	STYLE 5:
PIN 1. BASE	PIN 1. ANODE	PIN 1. ANODE 1	PIN 1. SOURCE 1	PIN 1. CATHODE
2. EMITTER	2. EMITTER	2. N/C	2. DRAIN 1/2	2. COMMON ANODE
3. BASE	3. BASE	3. ANODE 2	SOURCE 1	3. CATHODE 2
4. COLLECTOR	COLLECTOR	CATHODE 2	4. GATE 1	4. CATHODE 3
COLLECTOR	CATHODE	CATHODE 1	5. GATE 2	5. CATHODE 4
STYLE 6:	STYLE 7:	STYLE 8:	STYLE 9:	Note: Please refer to datasheet for
PIN 1. EMITTER 2	PIN 1. BASE	PIN 1. CATHODE	PIN 1. ANODE	style callout. If style type is not called
2. BASE 2	EMITTER	2. COLLECTOR	2. CATHODE	
3. EMITTER 1	3. BASE	3. N/C	3. ANODE	out in the datasheet refer to the device
4. COLLECTOR	COLLECTOR	4. BASE	4. ANODE	datasheet pinout or pin assignment.
COLLECTOR 2/BASE 1	5. COLLECTOR	5. EMITTER	5. ANODE	datasheet pinout of pin assignment.

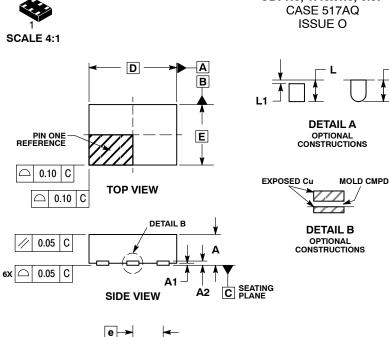
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DESCRIPTION:	SC-88A (SC-70-5/SOT-353)		PAGE 1 OF 1	

5. EMITTER

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5. COLLECTOR 2/BASE 1





6X L

6X b

Ф

0.10 | C | A | B

0.05 C NOTE 3

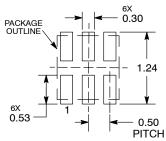
UDFN6, 1.45x1.0, 0.5P CASE 517AQ

DATE 15 MAY 2008

- NOTES:
 1. DIMENSIONING AND TOLERANCING PER
- ASME Y14.5M, 1994. CONTROLLING DIMENSION: MILLIMETERS.
- DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.

	MILLIMETERS		
DIM	MIN	MAX	
Α	0.45	0.55	
A1	0.00	0.05	
A2	0.07 REF		
b	0.20	0.30	
D	1.45 BSC		
Е	1.00 BSC		
е	0.50 BSC		
Ĺ	0.30	0.40	
L1		0.15	

MOUNTING FOOTPRINT



DIMENSIONS: MILLIMETERS

GENERIC MARKING DIAGRAM*

BOTTOM VIEW



Χ = Specific Device Code

*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.

DOCUMENT NUMBER:	98AON30313E	Electronic versions are uncontrolled except when accessed directly from the Document Repository Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.		
DESCRIPTION:	UDFN6, 1.45x1.0, 0.5P		PAGE 1 OF 1	

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^{*}For additional information on our Pb-Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

MILLIMFTERS

 $N\square M$

0.37

0.15

0.12

1.00

0.80

0.35 BSC

1.00

0.175

0.10

(REF)

-0.350

0.075

-0.200

MIN

0.34

0.10

0.07

0.95

0.75

0.95

0.125

0.05

DIM

Α

b

C

 \mathbb{D}

E

9 Н

L2

L3





SOT-953 1.00x0.80x0.37, 0.35P CASE 527AE **ISSUE F**

DATE 17 JAN 2024

MAX

0.40

0.20

0.17

1.05

0.85

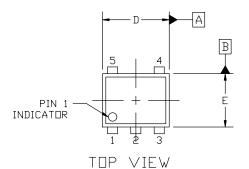
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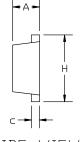
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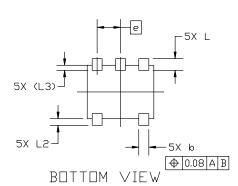
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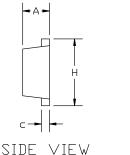
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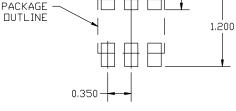
- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
- CONTROLLING DIMENSION: MILLIMETERS.
- MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
- 4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.











RECOMMENDED MOUNTING FOOTPRINT

*For additional information on our Pb-Free strategy and soldering details, please download the DN Semiconductor Soldering and Mounting Techniques Reference Manual, SDLDERRM/D.

GENERIC MARKING DIAGRAM*



= Specific Device Code

= Month Code

*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.

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