Single Inverter with Open Drain Output

NLV17SZ06

The NLV17SZ06 is a single inverter with open drain output in tiny footprint packages.

Features

- Designed for 1.65 V to 5.5 V V_{CC} Operation
- 2.1 ns t_{PD} at V_{CC} = 5 V (typ)
- Input/Output Overvoltage Tolerant up to 5.5 V
- I_{OFF} Supports Partial Power Down Protection
- Source/Sink 24 mA at 3.0 V
- Available in SC−88A, SOT−553 and SOT−953
- 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
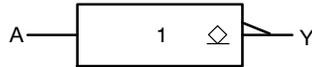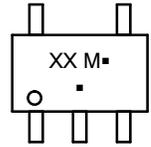
MARKING DIAGRAMS

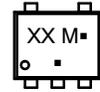SC−88A
CASE 419A

XX M▪

SOT−553
XV5 SUFFIX
CASE 463B

XX M▪

SOT−953
P5 SUFFIX
CASE 527AE

X M
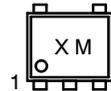
XX	= Specific Device Code
M	= Date Code*
▪	= Pb−Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or position may vary depending upon manufacturing location.

Figure 1. Logic Symbol

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 7 of this data sheet.
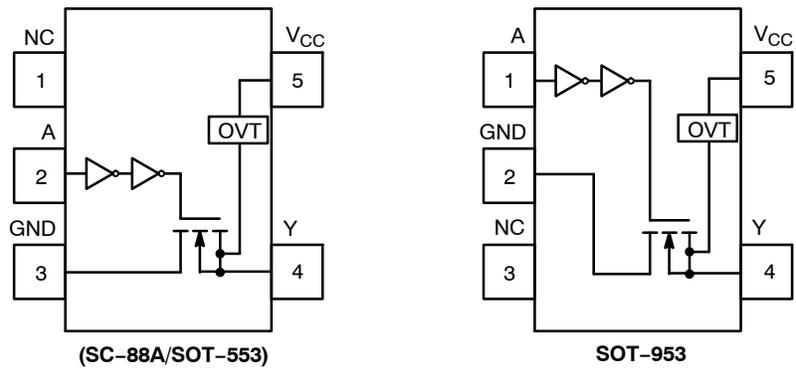
NLV17SZ06

Figure 2. Pinout (Top View)

PIN ASSIGNMENT
(SC−88A/SOT−553)

Pin	Function
1	NC
2	A
3	GND
4	Y
5	V_{CC}

PIN ASSIGNMENT (SOT−953)

Pin	Function
1	A
2	GND
3	NC
4	Y
5	V_{CC}

FUNCTION TABLE

A Input	Y Output
L	Z
H	L

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MAXIMUM RATINGS

Symbol	Characteristics		Value	Unit
V$_{CC}$	DC Supply Voltage		−0.5 to +7.0	V
V$_{IN}$	DC Input Voltage		−0.5 to +7.0	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 +7.0 −0.5 to +7.0	V
	DC Output Voltage	(NL17SZ06P5T5G−L22088 Only)	−0.5 to V$_{CC}$ + 0.5	
I$_{IK}$	DC Input Diode Current	V$_{IN}$ < GND	−50	mA
I$_{OK}$	DC Output Diode Current	V$_{OUT}$ < GND	−50	mA
	DC Output Diode Current	(NL17SZ06P5T5G−L22088 Only)	±50	
I$_{OUT}$	DC Output Source/Sink Current		±50	mA
I$_{CC}$ or I$_{GND}$	DC Supply Current per Supply Pin or Ground Pin		±100	mA
T$_{STG}$	Storage Temperature Range		−65 to +150	°C
T$_L$	Lead Temperature, 1 mm from Case for 10 secs		260	°C
T$_J$	Junction Temperature Under Bias		+150	°C
θ$_{JA}$	Thermal Resistance (Note 2)	SC−88A SOT−553 SOT−953	377 324 254	°C/W
P$_D$	Power Dissipation in Still Air	SC−88A SOT−553 SOT−953	332 386 491	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	V
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 10mm−by−1inch, 2 ounce copper trace no air flow per JESD51−7.
3. HBM tested to ANSI/ESDA/JEDEC JS−001−2017. CDM tested to EIA/JESD22−C101−F. JEDEC recommends that ESD qualification to EIA/JESD22−A115−A (Machine Model) be discontinued per JEDEC/JEP172A.
4. Tested to EIA/JESD78 Class II.

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RECOMMENDED OPERATING CONDITIONS

Symbol	Characteristics		Min	Max	Unit
V_{CC}	Positive 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) Tri−State Mode (Note 1) Power−Down Mode (V_{CC} = 0 V)	0 0 0	V_{CC} 5.5 5.5	V
	DC Output Voltage	(NL17SZ06P5T5G−L22088 Only)	0	V_{CC}	
T_A	Operating Temperature Range		−55	+125	°C
t_r , t_f	Input Rise and Fall Time	V_{CC} = 3.0 V to 3.6 V V_{CC} = 4.5 V to 5.5 V	0 0	100 20	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°C			−55°C ≤ T_A ≤ 125°C		Units
				Min	Typ	Max	Min	Max	
V_{IH}	High−Level Input Voltage		1.65 to 1.95	0.75 x V_{CC}	–	–	0.75 x V_{CC}	–	V
			2.3 to 5.5	0.70 x V_{CC}	–	–	0.70 x V_{CC}	–	
V_{IL}	Low−Level Input Voltage		1.65 to 1.95	–	–	0.25 x V_{CC}	–	0.25 x V_{CC}	V
			2.3 to 5.5	–	–	0.30 x V_{CC}	–	0.30 x V_{CC}	
V_{OL}	Low−Level Output Voltage	V_{IN} = V_{IH} or V_{IL} I_{OL} = 100 μA I_{OL} = 4 mA I_{OL} = 8 mA I_{OL} = 12 mA I_{OL} = 16 mA I_{OL} = 24 mA I_{OL} = 32 mA	1.65 to 5.5 1.65 2.3 2.7 3.0 3.0 4.5	– – – – – – –	0.08 0.2 0.22 0.28 0.38 0.42	0.1 0.24 0.3 0.4 0.4 0.55 0.55	– – – – – – –	0.1 0.24 0.3 0.4 0.4 0.55 0.55	V
I_{IN}	Input Leakage Current	V_{IN} = 5.5 V or GND	1.65 to 5.5	–	–	±0.1	–	±1.0	μA
I_{OZ}	3−State Output Leakage Current	V_{OUT} = 0 V to 5.5 V	1.65 to 5.5	–	–	±0.5	–	±5.0	μA
I_{OFF}	Power Off Leakage Current	V_{IN} = 5.5 V or V_{OUT} = 5.5 V	0	–	–	1.0	–	10	μA
	Power Off Leakage Current (NL17SZ06P5T5G−L22088 Only)	V_{IN} = 5.5 V	0	–	–	1.0	–	10	μA
I_{CC}	Quiescent Supply Current	V_{IN} = V_{CC} or GND	5.5	–	–	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

Symbol	Parameter	Condition	V$_{CC}$ (V)	T$_A$ = 25°C			−55°C ≤ T$_A$ ≤ 125°C		Units
				Min	Typ	Max	Min	Max	
t$_{PZL}$	Propagation Delay, A to Y (Figures 3 and 4)		1.65 to 1.95	–	6.0	9.0	–	9.5	ns
			2.3 to 2.7	–	3.6	6.1	–	6.5	
			3.0 to 3.6	–	2.7	5.6	–	6.0	
			4.5 to 5.5	–	2.1	4.4	–	4.8	
t$_{PLZ}$	Propagation Delay, A to Y (Figures 3 and 4)		1.65 to 1.95	–	4.0	9.0	–	9.5	ns
			2.3 to 2.7	–	2.8	6.1	–	6.5	
			3.0 to 3.6	–	2.5	5.6	–	6.0	
			4.5 to 5.5	–	2.2	4.4	–	4.8	

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Units
C$_{IN}$	Input Capacitance	V$_{CC}$ = 5.5 V, V$_{IN}$ = 0 V or V$_{CC}$	2.5	pF
C$_{OUT}$	Output Capacitance	V$_{CC}$ = 5.5 V, V$_{IN}$ = 0 V or V$_{CC}$	2.5	pF
C$_{PD}$	Power Dissipation Capacitance (Note 5)	10 MHz, V$_{CC}$ = 3.3 V, V$_{IN}$ = 0 V or V$_{CC}$ 10 MHz, V$_{CC}$ = 5.5 V, V$_{IN}$ = 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$_{PD}$ • 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$_{CC}$.

Figure 3. Test Circuit
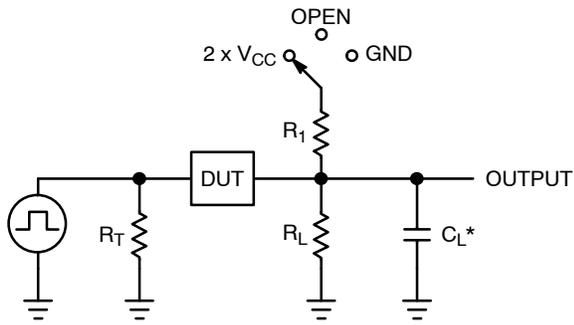
C_L includes probe and jig capacitance
R_T is Z_{OUT} of pulse generator (typically 50 Ω)
f = 1 MHz

Test	Switch Position	C_L, pF		R_L, Ω	R_1, Ω
t_{PLH} / t_{PHL}	Open	See AC Characteristics Table			
t_{PLZ} / t_{PZL}	2 x V_{CC}	50		500	500
t_{PHZ} / t_{PZH}	GND	50		500	500

X = Don't Care
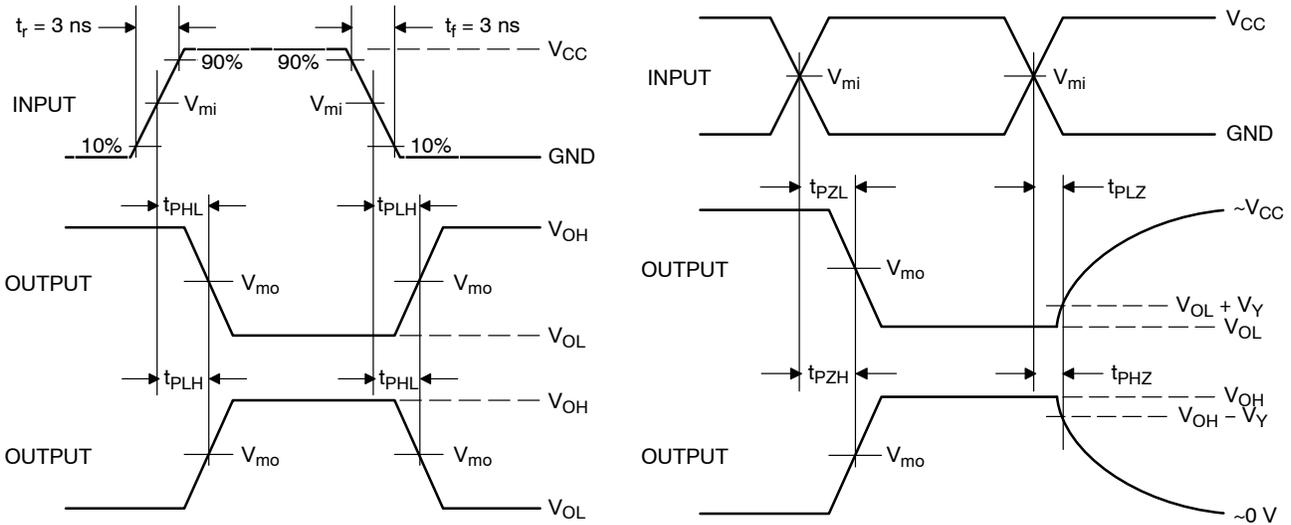
Figure 4. Switching Waveforms

V_{CC}, V	V_{mi}, V	V_{mo}, V		V_Y, V
		t_{PLH}, t_{PHL}	t_{PZL}, t_{PLZ}, t_{PZH}, t_{PHZ}	
1.65 to 1.95	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	0.15
2.3 to 2.7	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	0.15
3.0 to 3.6	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	0.3
4.5 to 5.5	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	0.3

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DEVICE ORDERING INFORMATION

Device	Packages	Specific Device Code	Pin 1 Orientation (See below)	Shipping†
NLV17SZ06DFT2G*	SC−88A	LF	Q4	3000 / Tape & Reel
NL17SZ06XV5T2G−L22087	SOT−553	LF	Q4	4000 / Tape & Reel
NL17SZ06P5T5G−L22088	SOT−953	A (Rotated 180°)	Q2	8000 / 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.

*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q100 Qualified and PPAP Capable.

Pin 1 Orientation in Tape and Reel
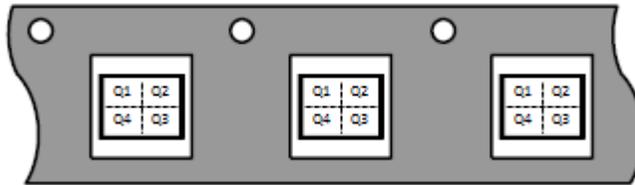
PACKAGE DIMENSIONS

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

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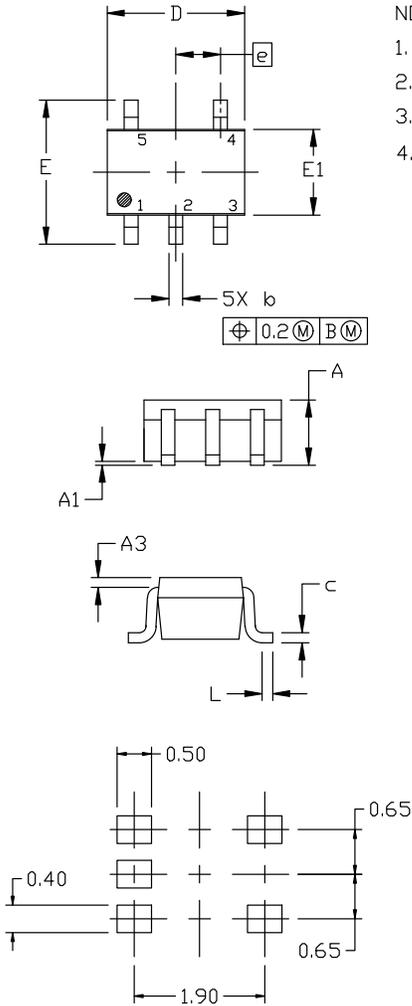
DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.80	0.95	1.10
A1	---	---	0.10
A3	0.20 REF		
b	0.10	0.20	0.30
c	0.10	---	0.25
D	1.80	2.00	2.20
E	2.00	2.10	2.20
E1	1.15	1.25	1.35
e	0.65 BSC		
L	0.10	0.15	0.30

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.

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PACKAGE DIMENSIONS

SOT−553, 5 LEAD
CASE 463B
ISSUE C
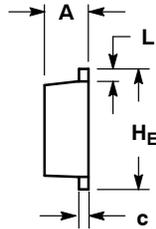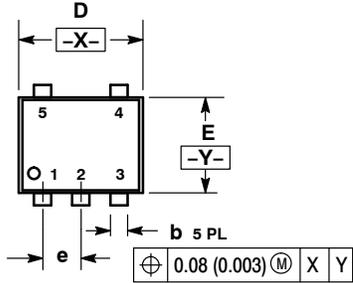
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.50	0.55	0.60	0.020	0.022	0.024
b	0.17	0.22	0.27	0.007	0.009	0.011
c	0.08	0.13	0.18	0.003	0.005	0.007
D	1.55	1.60	1.65	0.061	0.063	0.065
E	1.15	1.20	1.25	0.045	0.047	0.049
e	0.50 BSC			0.020 BSC		
L	0.10	0.20	0.30	0.004	0.008	0.012
H$_E$	1.55	1.60	1.65	0.061	0.063	0.065

RECOMMENDED SOLDERING FOOTPRINT*
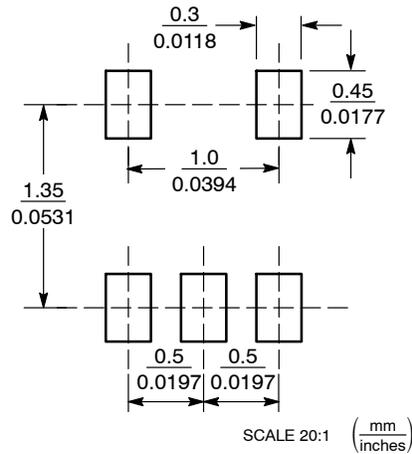
SCALE 20:1 $\left(\dfrac{mm}{inches}\right)$

*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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PACKAGE DIMENSIONS

SOT−953
CASE 527AE
ISSUE E

TOP VIEW

SIDE VIEW

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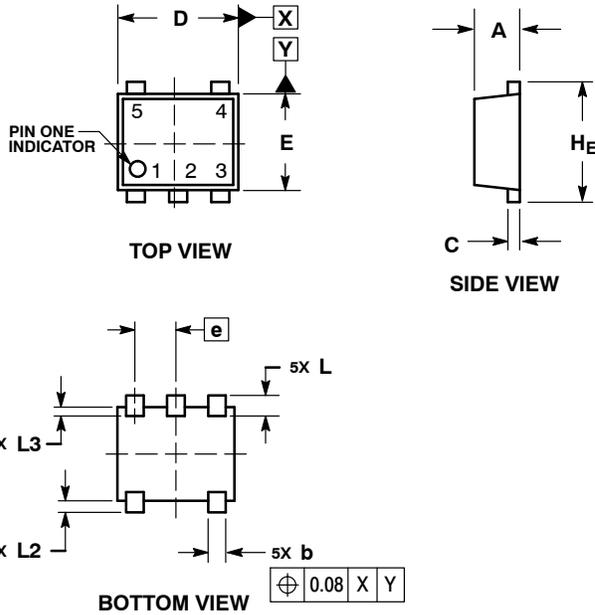
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

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_E	0.95	1.00	1.05
L	0.175 REF		
L2	0.05	0.10	0.15
L3	–––	–––	0.15

SOLDERING FOOTPRINT*
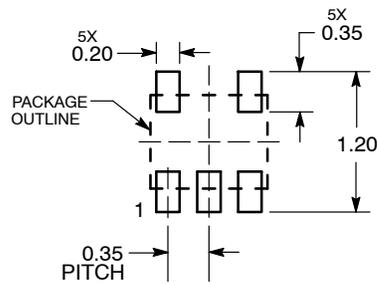
DIMENSIONS: MILLIMETERS

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

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