

NLV17SZ06

Single Inverter with Open Drain Outputs

The NLV17SZ06 is a high performance single inverter 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 NLV17SZ06 to be used to interface 5.0 V circuits to circuits of any voltage between 0 and +7.0 V.

Features

- Tiny SOT-353 Package
- Extremely High Speed: t_{PD} 2.5 ns (typical) at $V_{CC} = 5.0$ V
- Designed for 1.65 V to 5.5 V V_{CC} Operation, CMOS Compatible
- Over Voltage Tolerant Inputs V_{IN} may be Between 0 and 7.0 V for V_{CC} Between 0.5 and 5.5 V
- TTL Compatible – Interface Capability with 5.0 V TTL Logic with $V_{CC} = 2.7$ V to 3.6 V
- LVCMOS Compatible
- 24 mA Output Sink Capability, Pullup may be between 0 and 7.0 V
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- Chip Complexity: FET = 20
- 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

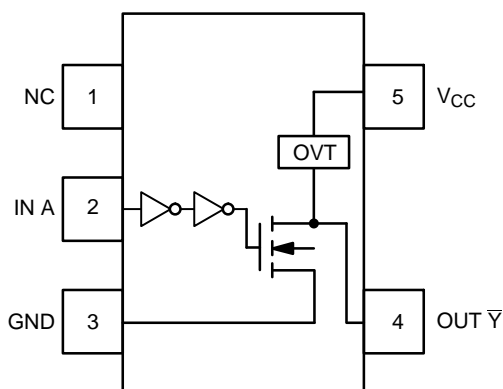


Figure 1. Pinout (Top View)

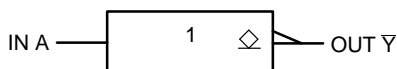


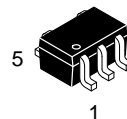
Figure 2. Logic Symbol



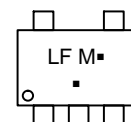
ON Semiconductor®

www.onsemi.com

MARKING DIAGRAMS



SOT-353/SC70-5/SC-88A
DF SUFFIX
CASE 419A



LF = Specific Device Marking

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 | Function |
|-----|---------------|
| 1 | NC |
| 2 | IN A |
| 3 | GND |
| 4 | OUT \bar{Y} |
| 5 | V_{CC} |

FUNCTION TABLE

| A Input | \bar{Y} Output |
|---------|------------------|
| L | Z |
| H | L |

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

MAXIMUM RATINGS

| Symbol | Characteristics | Value | Unit |
|-----------------------|--|------------------------------|------|
| V _{CC} | DC Supply Voltage | −0.5 to +7.0 | V |
| V _I | DC Input Voltage | −0.5 ≤ V _I ≤ +7.0 | V |
| V _O | DC Output Voltage Output in Z or LOW State (Note 1) | −0.5 ≤ V _O ≤ 7.0 | V |
| I _{IK} | DC Input Diode Current V _I < GND | −50 | mA |
| I _{OK} | DC Output Diode Current V _O < GND | −50 | mA |
| I _O | DC Output Sink Current | ±50 | mA |
| I _{CC} | DC Supply Current Per Supply Pin | ±100 | mA |
| I _{GND} | DC Ground Current Per Ground Pin | ±100 | mA |
| T _{STG} | Storage Temperature Range | −65 to +150 | °C |
| P _D | Power Dissipation in Still Air | 186 | mW |
| θ _{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 |
| I _{Latch-Up} | Latchup Performance Above V _{CC} and Below GND at 85°C (Note 5) | ±500 | mA |
| 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 3) Machine Model (Note 4) Charged Device Model (Note 5) | Class IC Class A N/A | |

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 EIA/JESD22-A115-A, rated to EIA/JESD22-A115-A.
4. Tested to JESD22-C101-A.
5. 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 |
| V _O | Output Voltage (Z or LOW State) | 0 | 5.5 | V |
| T _A | Operating Free-Air Temperature | −55 | +125 | °C |
| Δt/ΔV | Input Transition Rise or Fall Rate V _{CC} = 2.5 V ±0.2 V V _{CC} = 3.0 V ±0.3 V V _{CC} = 5.0 V ±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°C | | | -55°C ≤ T _A ≤ 125°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} | | 0.25 V _{CC} 0.3 V _{CC} | V |
| I _{LKG} | Z-State Output Leakage Current | V _{IN} = V _{IL} V _{OUT} = V _{CC} or GND | 2.3 to 5.5 | | | ±5.0 | | ±10.0 | μA |
| V _{OL} | Low-Level Output Voltage V _{IN} = V _{IH} or V _{IL} | I _{OL} = 100 μA | 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 | | 0.22 | 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 | 0 to 5.5 | | | ±0.1 | | ±1.0 | μA |
| I _{OFF} | Power Off Leakage Current | V _{IN} = 5.5 V or V _{OUT} = 5.5 V | 0 | | | 1.0 | | 10 | μA |
| I _{CC} | Quiescent Supply Current | V _{IN} = 5.5 V 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.

AC ELECTRICAL CHARACTERISTICS t_R = t_F = 2.5 ns; C_L = 50 pF; R_L = 500 Ω

| Symbol | Parameter | Condition | V _{CC} (V) | T _A = 25°C | | | -55°C ≤ T _A ≤ 125°C | | Unit |
|------------------|---------------------------------------|---|---------------------|-----------------------|-----|------|--------------------------------|------|------|
| | | | | Min | Typ | Max | Min | Max | |
| t _{PZL} | Propagation Delay (Figure 3 and 4) | R _L = R ₁ = 500 Ω, C _L = 50 pF | 1.65 | 0.8 | 5.3 | 11.6 | 0.8 | 12.0 | ns |
| | | | 2.5 ± 0.2 | 0.8 | 3.0 | 3.6 | 0.8 | 4.1 | |
| | | | 3.3 ± 0.3 | 0.8 | 2.4 | 3.2 | 0.8 | 3.7 | |
| | | | 5.0 ± 0.5 | 0.5 | 2.4 | 3.0 | 0.5 | 3.5 | |
| t _{PLZ} | Propagation Delay (Figure 3 and 4) | R _L = R ₁ = 500 Ω, C _L = 50 pF | 1.65 | 0.8 | 5.3 | 11.6 | 0.8 | 12.0 | ns |
| | | | 2.5 ± 0.2 | 0.8 | 2.5 | 3.6 | 0.8 | 4.1 | |
| | | | 3.3 ± 0.3 | 0.8 | 2.1 | 3.2 | 0.8 | 3.7 | |
| | | | 5.0 ± 0.5 | 0.5 | 1.2 | 3.0 | 0.5 | 3.5 | |

CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Condition | Typical | Unit |
|------------------|--|--|---------|------|
| C _{IN} | Input Capacitance | V _{CC} = 5.5 V, V _I = 0 V or V _{CC} | > 2.5 | pF |
| C _{OUT} | Output Capacitance | V _{CC} = 5.5 V, V _I = 0 V or V _{CC} | 4.0 | pF |
| C _{PD} | Power Dissipation Capacitance (Note 6) | 10 MHz, V _{CC} = 5.5 V, V _I = 0 V or V _{CC} | 4.0 | pF |

6. 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}.

NLV17SZ06

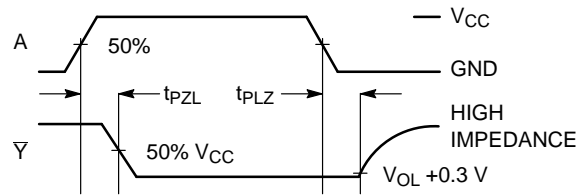


Figure 3. Switching Waveforms

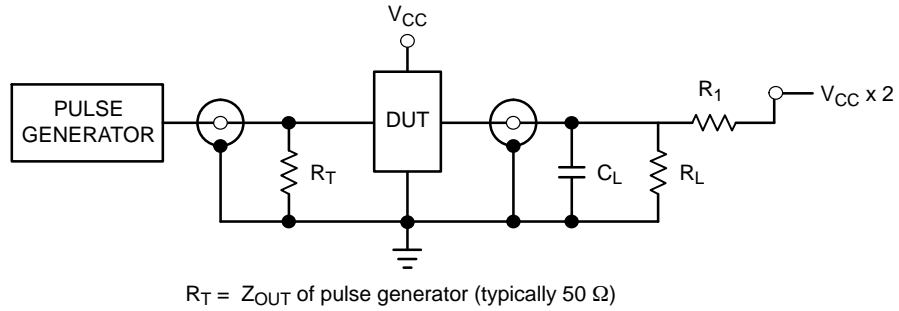


Figure 4. Test Circuit

DEVICE ORDERING INFORMATION

| Device Order Number | Package Type | Tape and Reel Size [†] |
|---------------------|------------------------------------|---------------------------------|
| NLV17SZ06DFT2G* | SOT-353/SC70-5/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.

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

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

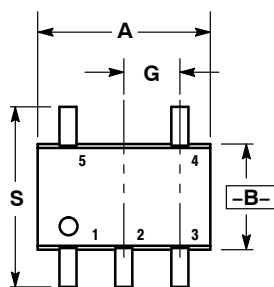
ON Semiconductor®



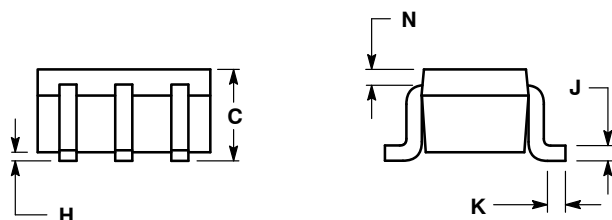
SCALE 2:1

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

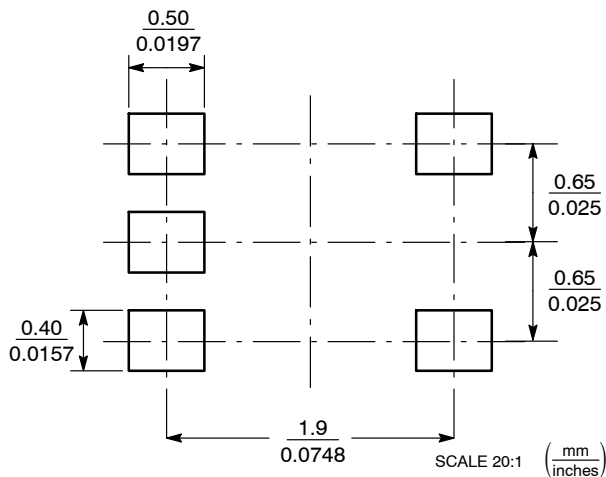
DATE 17 JAN 2013



D 5 PL \oplus 0.2 (0.008) (M) B (M)



SOLDER FOOTPRINT



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

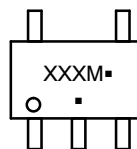
Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: INCH.
- 419A-01 OBSOLETE. NEW STANDARD 419A-02.
- 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 |

GENERIC MARKING DIAGRAM*



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

(Note: Microdot may be in either location)

*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.

DOCUMENT NUMBER: 98ASB42984B

Electronic versions are uncontrolled except when accessed directly from the Document Repository.
Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.

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

PAGE 1 OF 1

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Email Requests to: orderlit@onsemi.com

ON Semiconductor Website: www.onsemi.com

TECHNICAL SUPPORT

North American Technical Support:

Voice Mail: 1 800-282-9855 Toll Free USA/Canada

Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative