NL17SZ06

Single Inverter with Open Drain Outputs

The NL17SZ06 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 NL17SZ06 to be used to interface 5.0 V circuits to circuits of any voltage between 0 and +7.0 V.

Features

- Tiny SOT−353 and SOT−553 Packages
- 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 5.4 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
- Pb−Free Packages are Available

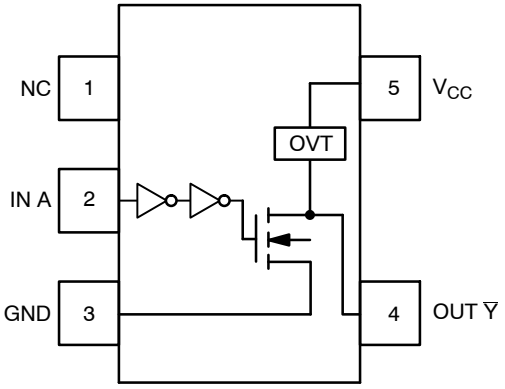

Figure 1. Pinout (Top View)

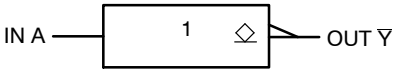

Figure 2. Logic Symbol

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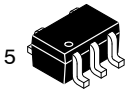
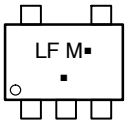
http://onsemi.com

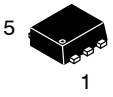
MARKING DIAGRAMS



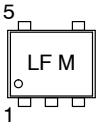
SOT−353/SC70−5/SC−88A
DF SUFFIX
CASE 419A



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.



SOT−553
XV5 SUFFIX
CASE 463B



LF = Specific Device Marking
M = Date Code

PIN ASSIGNMENT

Pin	Function
1	NC
2	IN A
3	GND
4	OUT $\overline{Y}$
5	V_{CC}

FUNCTION TABLE

A Input	$\overline{Y}$ 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		$-0.5 \le V_I \le +7.0$	V
V_O	DC Output Voltage	Output in Z or LOW State (Note 1)	$-0.5 \le V_O \le 7.0$	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	SOT−353 SOT−553	186 135	mW
θ_{JA}	Thermal Resistance	SOT−353 SOT−553	350 496	°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 Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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
$\Delta t/\Delta V$	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

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} or V_{OUT} = V_{CC} or GND	0 to 5.5			±0.1		±1.0	μA
I_{OFF}	Power Off−Output Leakage Current	V_{OUT} = 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

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}.

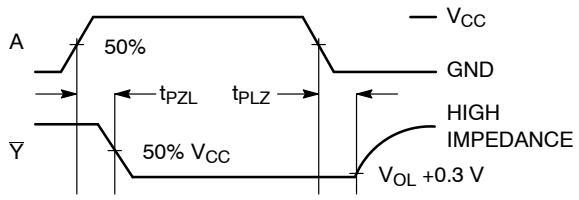
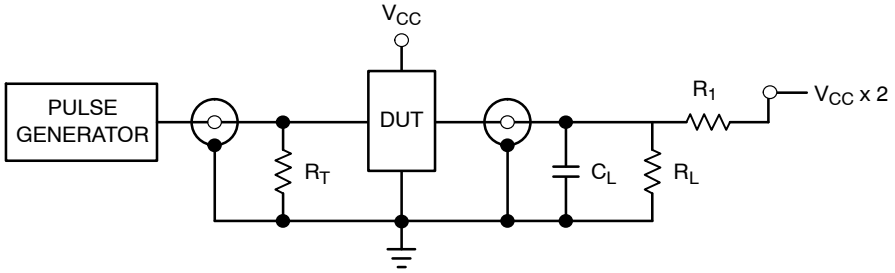


Figure 3. Switching Waveforms



R_T = Z_{OUT} of pulse generator (typically 50 Ω)

Figure 4. Test Circuit

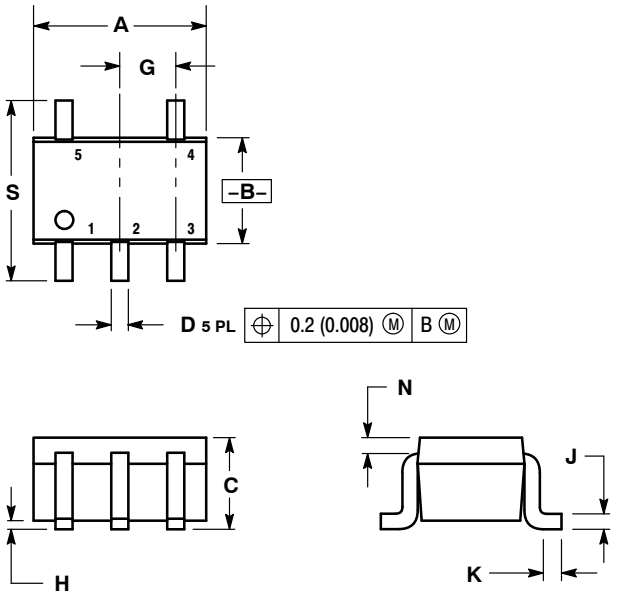
DEVICE ORDERING INFORMATION

Device Order Number	Device Nomenclature							Package Type	Tape and Reel Size†
	Logic Circuit Indicator	No. of Gates per Package	Temp Range Identifier	Technology	Device Function	Package Suffix	Tape & Reel Suffix		
NL17SZ06DFT2	NL	1	7	SZ	06	DF	T2	SOT−353/ SC70−5/ SC−88A	178 mm (7") 3000 Unit
NL17SZ06DFT2G	NL	1	7	SZ	06	DF	T2	SOT−353/ SC70−5/ SC−88A (Pb−Free)	178 mm (7") 3000 Unit
NL17SZ06XV5T2	NL	1	7	SZ	06	XV5	T2	SOT−553*	178 mm (7") 4000 Unit

†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.
*All Devices in Package SOT553 are Inherently Pb−Free.

PACKAGE DIMENSIONS

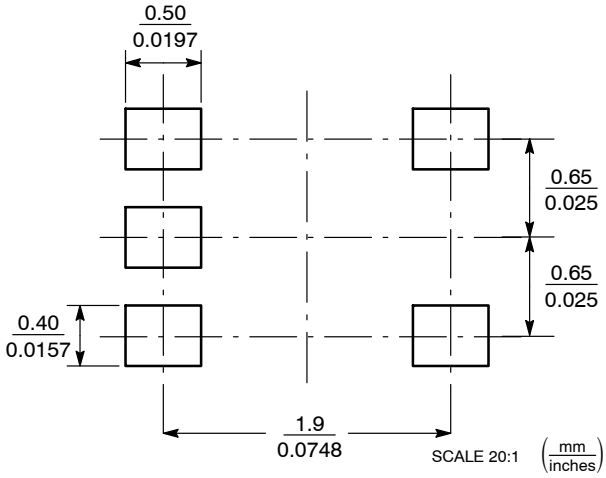
SOT−353
(SC−88A, SC−70)
DF SUFFIX
CASE 419A−02
ISSUE J



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.

	INCHES		MILLIMETERS	
DIM	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

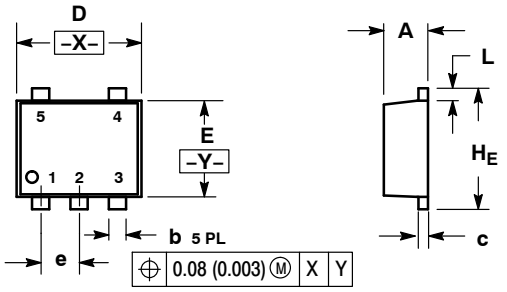
SOLDERING FOOTPRINT*



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

PACKAGE DIMENSIONS

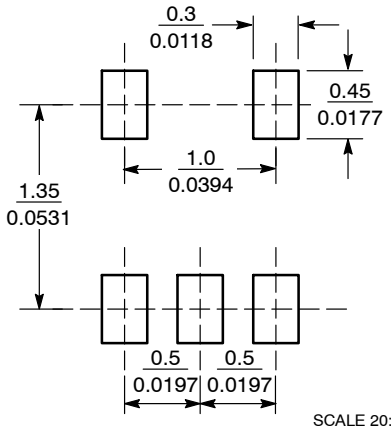
SOT−553
XV5 SUFFIX
CASE 463B−01
ISSUE B



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.

	MILLIMETERS			INCHES		
DIM	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	1.50	1.60	1.70	0.059	0.063	0.067
E	1.10	1.20	1.30	0.043	0.047	0.051
e		0.50 BSC			0.020 BSC	
L	0.10	0.20	0.30	0.004	0.008	0.012
H_E	1.50	1.60	1.70	0.059	0.063	0.067

SOLDERING 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.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
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