

NL17SG04

Single Inverter

The NL17SG04 MiniGate™ is an advanced high-speed CMOS Inverter in ultra-small footprint.

The NL17SG04 input structures provides protection when voltages up to 4.6 V are applied.

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: $I_{CC} = 0.5$ μ A (Max) at $T_A = 25^\circ$ C
- 4.6 V Overvoltage Tolerant (OVT) Input Pins
- Ultra-Small Packages
- These are Pb-Free and Halide-Free Devices

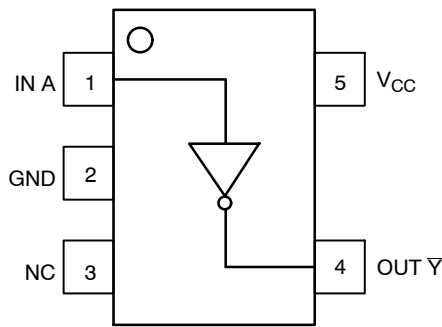


Figure 1. Pinout (Top View)

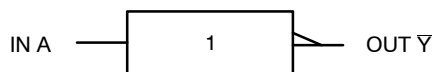


Figure 2. Logic Symbol



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MARKING DIAGRAM



V = Specific Device Code
M = Month Code

PIN ASSIGNMENT

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

FUNCTION TABLE

A Input	\bar{Y} Output
L	H
H	L

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 +5.5	V
V_{IN}	DC Input Voltage	-0.5 to +5.5	V
V_{OUT}	DC Output Voltage	-0.5 to $V_{CC} + 0.5$	V
I_{IK}	DC Input Diode Current $V_{IN} < GND$	-20	mA
I_{OK}	DC Output Diode Current $V_{OUT} < GND, V_{OUT} > V_{CC}$	± 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) Machine Model (Note 3)	>2000 >100	V
$I_{LATCHUP}$	Latchup Performance Above V_{CC} and Below GND at 125°C (Note 4)	± 100	mA

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. 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/JESD22-A115-A.
4. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

Symbol	Characteristics	Min	Max	Unit
V_{CC}	Positive DC Supply Voltage	0.9	4.6	V
V_{IN}	Digital Input Voltage	0.0	4.6	V
V_{OUT}	Output Voltage	0.0	V_{CC}	V
T_A	Operating Temperature Range	-55	+125	°C
$\Delta t / \Delta V$	Input Transition Rise or Fall Rate $V_{CC} = 3.3 V \pm 0.3 V$	0	10	ns/V

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DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V _{CC} (V)	T _A = 25°C		T _A = -55°C to +125°C		Unit
				Min	Max	Min	Max	
V _{IH}	High-Level Input Voltage		0.9	V _{CC}		V _{CC}		V
			1.1 to 1.3	0.7xV _{CC}		0.7xV _{CC}		
			1.4 to 1.6	0.65xV _{CC}		0.65xV _{CC}		
			1.65 to 1.95	0.65xV _{CC}		0.65xV _{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		0.3xV _{CC}		0.3xV _{CC}	
			1.4 to 1.6		0.35xV _{CC}		0.35xV _{CC}	
			1.65 to 1.95		0.35xV _{CC}		0.35xV _{CC}	
			2.3 to 2.7		0.7		0.7	
			3.0 to 3.6		0.8		0.8	
V _{OH}	High-Level Output Voltage	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -20 μA	0.9	0.75		0.75	V
			I _{OH} = -0.3 mA	1.1 to 1.3	0.75xV _{CC}		0.75xV _{CC}	
			I _{OH} = -1.7 mA	1.4 to 1.6	0.75xV _{CC}		0.75xV _{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 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		0.25xV _{CC}	0.25xV _{CC}	
			I _{OL} = 1.7 mA	1.4 to 1.6		0.25xV _{CC}	0.25xV _{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	0 ≤ V _{IN} ≤ 3.6 V	0 to 3.6		±0.1		±1.0	μA
I _{CC}	Quiescent Supply Current	V _{IN} = V _{CC} or GND	3.6		0.5		10.0	μA

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

Symbol	Parameter	Test Condition	V_{CC} (V)	$T_A = 25^\circ\text{C}$			$T_A = -55^\circ\text{C to } +125^\circ\text{C}$		Unit
				Min	Typ	Max	Min	Max	
t_{PLH} , t_{PHL}	Propagation Delay, A or B to Y	$C_L = 10$ pF, $R_L = 1$ M Ω	0.9	-	10.0	13.3	-	17.0	ns
			1.1 to 1.3	-	8.7	11.2	-	14.0	
			1.4 to 1.6	-	4.9	8.5	-	10.0	
			1.65 to 1.95	-	3.8	6.2	-	6.7	
			2.3 to 2.7	-	2.6	3.9	-	4.4	
			3.0 to 3.6	-	2.1	3.1	-	3.7	
		$C_L = 15$ pF, $R_L = 1$ M Ω	0.9	-	11.55	13.7	-	19.7	ns
			1.1 to 1.3	-	7.2	10.8	-	15.6	
			1.4 to 1.6	-	5.4	9.3	-	11.2	
			1.65 to 1.95	-	4.2	6.9	-	7.1	
			2.3 to 2.7	-	2.8	4.4	-	5.0	
			3.0 to 3.6	-	2.3	3.4	-	3.9	
		$C_L = 30$ pF, $R_L = 1$ M Ω	0.9	-	16.85	18.9	-	22.3	ns
			1.1 to 1.3	-	10.2	13.4	-	17.5	
			1.4 to 1.6	-	7.4	13.1	-	15.9	
			1.65 to 1.95	-	5.6	9.2	-	9.6	
			2.3 to 2.7	-	3.7	5.7	-	6.1	
			3.0 to 3.6	-	2.9	4.4	-	4.8	
C_{IN}	Input Capacitance		0 to 3.6		3	-	-	pF	
C_{PD}	Power Dissipation Capacitance (Note 5)	$f = 10$ MHz	0.9 to 3.6	-	4	-	-	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: $I_{CC(OPR)} = C_{PD} \cdot V_{CC} \cdot f_{in} + I_{CC}$. C_{PD} is used to determine the no-load dynamic power consumption; $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_{in} + I_{CC} \cdot V_{CC}$.

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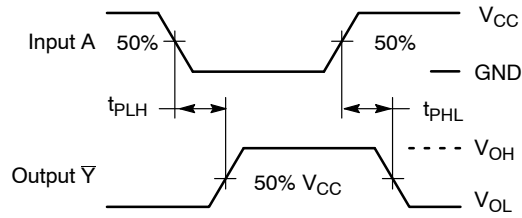
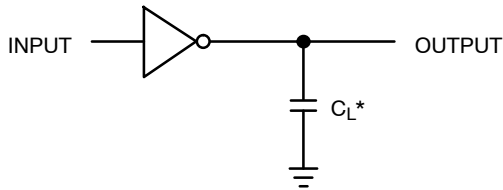


Figure 3. Switching Waveforms



*Includes all probe and jig capacitance.
A 1-MHz square input wave is recommended for propagation delay tests.

Figure 4. Test Circuit

ORDERING INFORMATION

Device	Package	Shipping†
NL17SG04P5T5G	SOT-953 (Pb-Free)	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.

