

# NL27WZU04

## Dual Unbuffered Inverter

The NL27WZU04 is a high performance dual unbuffered inverter operating from a 1.65 to 5.5 V supply. These devices are well suited for use as oscillators, pulse shapers, and in many other applications requiring a high-input impedance amplifier. For digital applications, the NL27WZ04 is recommended.

### Features

- Designed for 1.65 V to 5.5 V  $V_{CC}$  Operation
- Unbuffered for Crystal Oscillator and Analog Applications
- LVCMOS Compatible
- Source/Sink  $\pm 16$  mA @ 4.5 V  $V_{CC}$
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- Chip Complexity: FET = 72; Equivalent Gate = 18
- Pb-Free Packages are Available

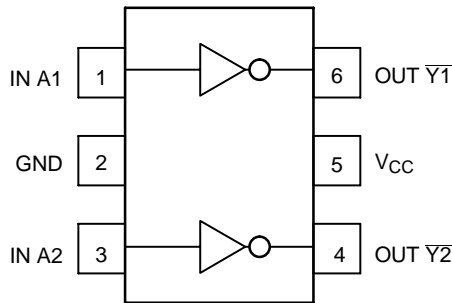


Figure 1. Pinout (Top View)

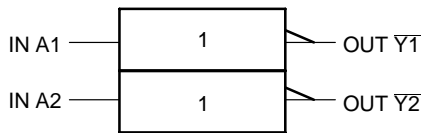


Figure 2. Logic Symbol

### FUNCTION TABLE

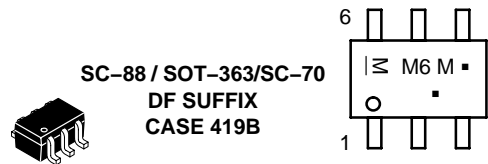
A Input	Y Output
L	H
H	L



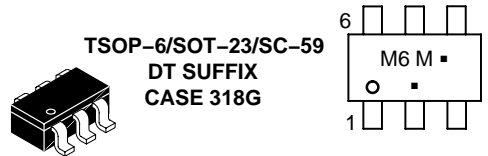
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### MARKING DIAGRAMS



SC-88 / SOT-363/SC-70  
DF SUFFIX  
CASE 419B



TSOP-6/SOT-23/SC-59  
DT SUFFIX  
CASE 318G

M6 = 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.

### PIN ASSIGNMENT

1	IN A1
2	GND
3	IN A2
4	OUT $\bar{Y}2$
5	$V_{CC}$
6	OUT $\bar{Y}1$

### ORDERING INFORMATION

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

# NL27WZU04

## MAXIMUM RATINGS

Symbol	Characteristics	Value	Unit
V <sub>CC</sub>	DC Supply Voltage	-0.5 to +7.0	V
V <sub>I</sub>	DC Input Voltage	-0.5 ≤ V <sub>I</sub> ≤ V <sub>CC</sub>	V
V <sub>O</sub>	DC Output Voltage	-0.5 to 7.0	V
I <sub>IK</sub>	DC Input Diode Current V <sub>I</sub> < GND	-50	mA
I <sub>OK</sub>	DC Output Diode Current V <sub>O</sub> < GND V <sub>O</sub> > V <sub>CC</sub>	-50 +50	mA
I <sub>O</sub>	DC Output Sink Current	±50	mA
I <sub>CC</sub>	DC Supply Current per Supply Pin	±100	mA
I <sub>GND</sub>	DC Ground Current per Ground Pin	±100	mA
T <sub>STG</sub>	Storage Temperature Range	-65 to +150	°C
P <sub>D</sub>	Power Dissipation in Still Air SC-88, TSOP-6	200	mW
θ <sub>JA</sub>	Thermal Resistance SC-88, TSOP-6	333	°C/W
T <sub>L</sub>	Lead Temperature, 1 mm from case for 10 s	260	°C
T <sub>J</sub>	Junction Temperature under Bias	+150	°C
V <sub>ESD</sub>	ESD Withstand Voltage Human Body Model (Note 1) Machine Model (Note 2) Charged Device Model (Note 3)	> 2000 > 200 N/A	V
I <sub>Latchup</sub>	Latchup Performance Above V <sub>CC</sub> and Below GND at 85°C (Note 4)	±500	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. Tested to EIA/JESD22-A114-A.
2. Tested to EIA/JESD22-A115-A.
3. Tested to JESD22-C101-A.
4. Tested to EIA/JESD78.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V <sub>CC</sub>	Supply Voltage Operating Data Retention Only	1.65 1.5	5.5 5.5	V
V <sub>I</sub>	Input Voltage	0	5.5	V
V <sub>O</sub>	Output Voltage (High or LOW State)	0	V <sub>CC</sub>	V
T <sub>A</sub>	Operating Free-Air Temperature	-40	+85	°C
Δt/ΔV	Input Transition Rise or Fall Rate V <sub>CC</sub> = 2.5 V ± 0.2 V V <sub>CC</sub> = 3.0 V ± 0.3 V V <sub>CC</sub> = 5.0 V ± 0.5 V	0 0 0	20 10 5	ns/V

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## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			-40°C ≤ T <sub>A</sub> ≤ 85°C		Unit
				Min	Typ	Max	Min	Max	
V <sub>IH</sub>	High-Level Input Voltage		1.65 to 1.85	0.85 V <sub>CC</sub>			0.85 V <sub>CC</sub>		V
			2.3 to 5.5	0.8 V <sub>CC</sub>			0.8 V <sub>CC</sub>		
V <sub>IL</sub>	Low-Level Input Voltage		1.65 to 1.85			0.15 V <sub>CC</sub>		0.15 V <sub>CC</sub>	V
			2.3 to 5.5			0.2 V <sub>CC</sub>		0.2 V <sub>CC</sub>	
V <sub>OH</sub>	High-Level Output Voltage V <sub>IN</sub> = V <sub>IL</sub>	I <sub>OH</sub> = -100 μA	1.65 to 5.5	V <sub>CC</sub> -0.1			V <sub>CC</sub> -0.1		V
		V <sub>IN</sub> = GND	I <sub>OH</sub> = -3 mA	1.65	1.29	1.52		1.29	
	I <sub>OH</sub> = -4 mA		2.3	1.9	2.1		1.9		
	I <sub>OH</sub> = -6 mA		2.7	2.2	2.3		2.2		
	I <sub>OH</sub> = -8 mA		3.0	2.4	2.6		2.4		
	I <sub>OH</sub> = -12 mA		3.0	2.3	2.5		2.3		
	I <sub>OH</sub> = -16 mA	4.5	3.8	4.2		3.8			
V <sub>OL</sub>	Low-Level Output Voltage V <sub>IN</sub> = V <sub>IH</sub>	I <sub>OL</sub> = 100 μA	1.65 to 5.5			0.1		0.1	V
		V <sub>IN</sub> = V <sub>CC</sub>	I <sub>OL</sub> = 3 mA	1.65		0.08	0.24		
	I <sub>OL</sub> = 4 mA		2.3		0.12	0.3		0.3	
	I <sub>OL</sub> = 6 mA		2.7		0.20	0.4		0.4	
	I <sub>OL</sub> = 8 mA		3.0		0.24	0.4		0.4	
	I <sub>OL</sub> = 12 mA		3.0		0.26	0.55		0.55	
	I <sub>OL</sub> = 16 mA	4.5		0.31	0.55		0.55		
I <sub>IN</sub>	Input Leakage Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	5.5			±0.1		±1.0	μA
I <sub>CC</sub>	Maximum Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	1.65 to 5.5			1.0		10	μA

## AC ELECTRICAL CHARACTERISTICS t<sub>R</sub> = t<sub>F</sub> = 2.5 ns; C<sub>L</sub> = 50 pF; R<sub>L</sub> = 500 Ω

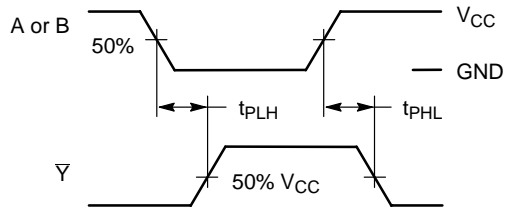
Symbol	Parameter	Condition	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			-40°C ≤ T <sub>A</sub> ≤ 85°C		Unit
				Min	Typ	Max	Min	Max	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Input A to Y (Figure 3 and 4)	R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 50 pF	1.8 ± 0.15	1.5	5.5	1.8	1.5	11.0	ns
		R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	2.5 ± 0.2	1.2	3.3	5.7	1.2	6.3	
		R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	3.3 ± 0.3	0.8	2.7	4.1	0.8	4.5	
		R <sub>L</sub> = 500 Ω, C <sub>L</sub> = 50 pF		1.2	4.0	6.4	1.2	7.0	
		R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 15 pF	5.0 ± 0.5	0.5	2.2	3.3	0.5	3.6	
		R <sub>L</sub> = 500 Ω, C <sub>L</sub> = 50 pF		0.8	3.4	5.6	0.8	6.2	

## CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Unit
C <sub>IN</sub>	Input Capacitance	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	7	pF
C <sub>OUT</sub>	Output Capacitance	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	8	pF
C <sub>PD</sub>	Power Dissipation Capacitance (Note 5)	10 MHz, V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	25	pF

5. C<sub>PD</sub> 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<sub>CC(OPR)</sub> = C<sub>PD</sub> • V<sub>CC</sub> • f<sub>in</sub> + I<sub>CC</sub>. C<sub>PD</sub> is used to determine the no-load dynamic power consumption; P<sub>D</sub> = C<sub>PD</sub> • V<sub>CC</sub><sup>2</sup> • f<sub>in</sub> + I<sub>CC</sub> • V<sub>CC</sub>.

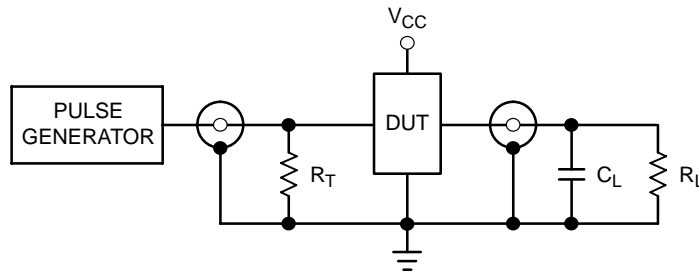
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### PROPAGATION DELAYS

$t_R = t_F = 2.5$  ns, 10% to 90%;  $f = 1$  MHz;  $t_W = 500$  ns

**Figure 3. Switching Waveforms**



$C_L = 50$  pF or equivalent (includes jig and probe capacitance)  
 $R_L = R_1 = 500 \Omega$  or equivalent  
 $R_T = Z_{OUT}$  of pulse generator (typically  $50 \Omega$ )

**Figure 4. Test Circuit**

### ORDERING INFORMATION

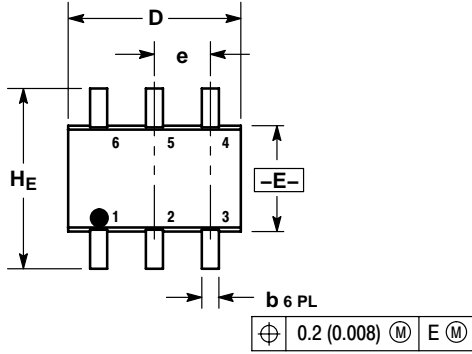
Device	Package	Shipping <sup>†</sup>
NL27WZU04DFT2	SC-88 / SOT-363 / SC-70	3000 / Tape & Reel
NL27WZU04DFT2G	SC-88 / SOT-363 / SC-70 (Pb-Free)	
NL27WZU04DTT1	TSOP-6 / SOT-23 / SC-59	
NL27WZU04DTT1G	TSOP-6 / SOT-23 / SC-59 (Pb-Free)	

<sup>†</sup>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.

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## PACKAGE DIMENSIONS

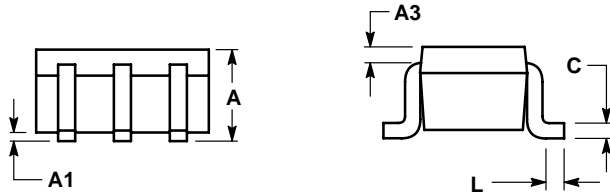
SC-88/SC70-6/SOT-363  
CASE 419B-02  
ISSUE W



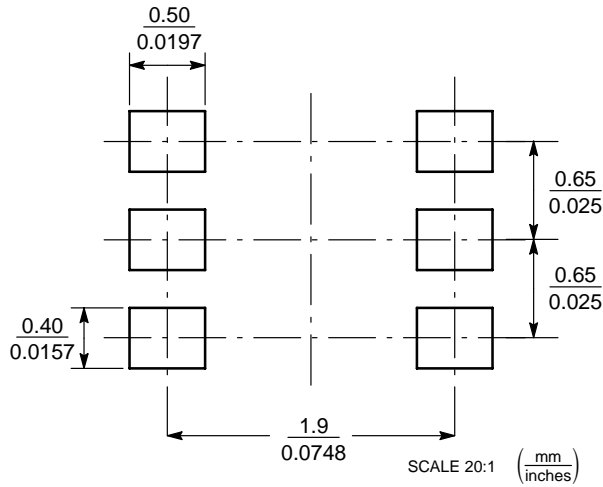
NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	0.95	1.10	0.031	0.037	0.043
A1	0.00	0.05	0.10	0.000	0.002	0.004
A3	0.20 REF			0.008 REF		
b	0.10	0.21	0.30	0.004	0.008	0.012
C	0.10	0.14	0.25	0.004	0.005	0.010
D	1.80	2.00	2.20	0.070	0.078	0.086
E	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65 BSC			0.026 BSC		
L	0.10	0.20	0.30	0.004	0.008	0.012
H <sub>E</sub>	2.00	2.10	2.20	0.078	0.082	0.086



### SOLDERING FOOTPRINT\*

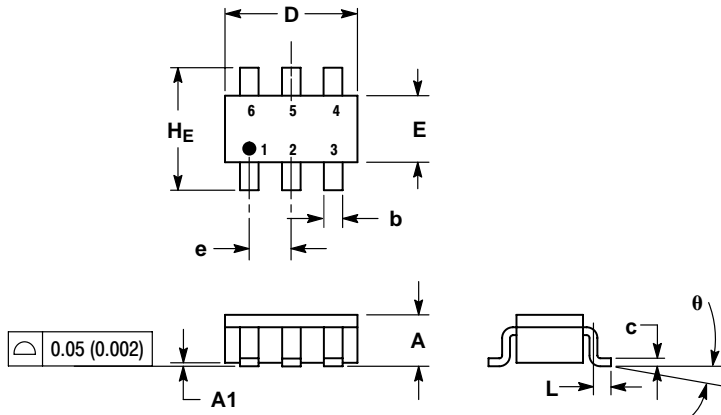


\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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## PACKAGE DIMENSIONS

TSOP-6  
CASE 318G-02  
ISSUE S

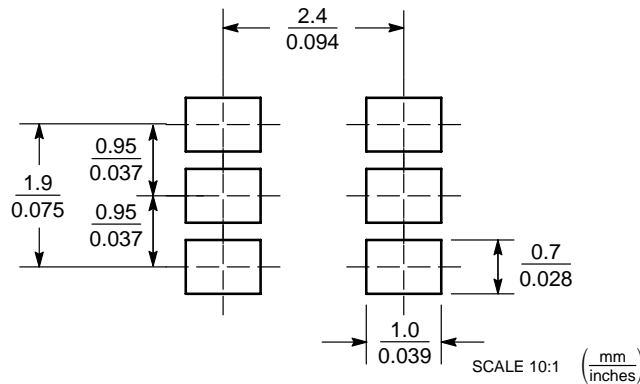


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.90	1.00	1.10	0.035	0.039	0.043
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.25	0.38	0.50	0.010	0.014	0.020
c	0.10	0.18	0.26	0.004	0.007	0.010
D	2.90	3.00	3.10	0.114	0.118	0.122
E	1.30	1.50	1.70	0.051	0.059	0.067
e	0.85	0.95	1.05	0.034	0.037	0.041
L	0.20	0.40	0.60	0.008	0.016	0.024
HE	2.50	2.75	3.00	0.099	0.108	0.118
theta	0°	-	10°	0°	-	10°

### 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.

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