

# NL27WZU04

## Dual Unbuffered Inverter

The NL27WZU04 is a high performance dual unbuffered inverter operating from a 1.65 V 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

- Pb-Free Package is Available
- Designed for 1.65 V to 5.5 V  $V_{CC}$  Operation
- Unbuffered for Crystal Oscillator and Analog Applications
- LVC MOS 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

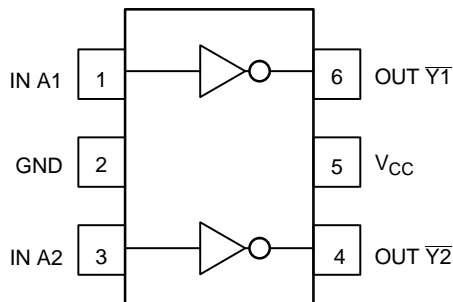


Figure 1. Pinout (Top View)

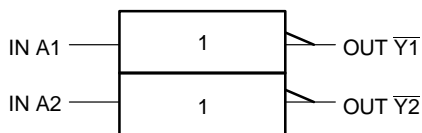


Figure 2. Logic Symbol

### FUNCTION TABLE

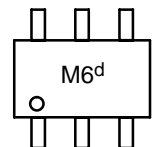
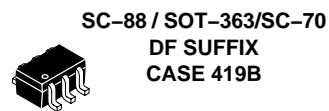
A Input	$\bar{Y}$ Output
L	H
H	L



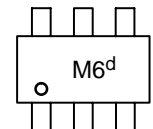
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### MARKING DIAGRAMS



Pin 1  
d = Date Code



Pin 1  
d = Date Code

### 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
$V_{CC}$	DC Supply Voltage	-0.5 to +7.0	V
$V_I$	DC Input Voltage	$-0.5 \leq V_I \leq V_{CC}$	V
$V_O$	DC Output Voltage	-0.5 to 7.0	V
$I_{IK}$	DC Input Diode Current $V_I < GND$	-50	mA
$I_{OK}$	DC Output Diode Current $V_O < GND$ $V_O > V_{CC}$	-50 +50	mA
$I_O$	DC Output Sink Current	$\pm 50$	mA
$I_{CC}$	DC Supply Current per Supply Pin	$\pm 100$	mA
$I_{GND}$	DC Ground Current per Ground Pin	$\pm 100$	mA
$T_{STG}$	Storage Temperature Range	-65 to +150	°C
$P_D$	Power Dissipation in Still Air SC-88, TSOP-6	200	mW
$\theta_{JA}$	Thermal Resistance SC-88, TSOP-6	333	°C/W
$T_L$	Lead Temperature, 1 mm from case for 10 s	260	°C
$T_J$	Junction Temperature under Bias	+150	°C
$V_{ESD}$	ESD Withstand Voltage Human Body Model (Note 1) Machine Model (Note 2) Charged Device Model (Note 3)	> 2000 > 200 N/A	V
$I_{LatchUp}$	LatchUp Performance Above $V_{CC}$ and Below GND at 85°C (Note 4)	$\pm 500$	mA

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

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
$V_{CC}$	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 (High or LOW State)	0	$V_{CC}$	V
$T_A$	Operating Free-Air Temperature	-40	+85	°C
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate $V_{CC} = 2.5 V \pm 0.2 V$ $V_{CC} = 3.0 V \pm 0.3 V$ $V_{CC} = 5.0 V \pm 0.5 V$	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

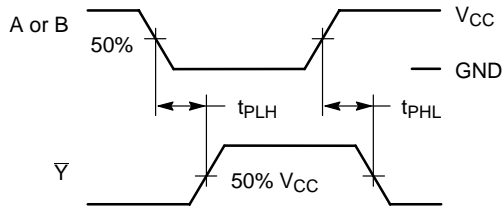
Symbol	Parameter	Condition	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			-40°C ≤ T <sub>A</sub> ≤ 85°C		Unit
				Min	Typ	Max	Min	Max	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Input A to Y (Figure 3 and 4)	R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 50 pF	1.8 ± 0.15	1.5	5.5	1.8	1.5	11.0	ns
		R <sub>L</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>.

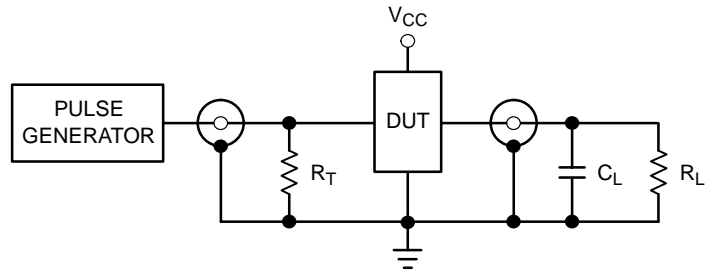
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### PROPAGATION DELAYS

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

Figure 3. Switching Waveforms



$C_L = 50 \text{ pF}$  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

## DEVICE ORDERING INFORMATION

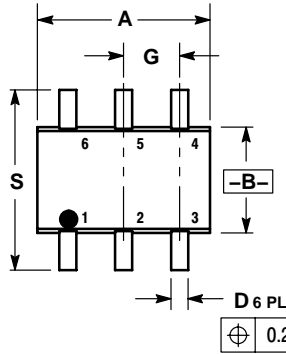
Device Order Number	Device Nomenclature							Package Type (Name/SOT#/ Common Name)	Tape and Reel Size†
	Logic Circuit Indicator	No. of Gates per Package	Temp Range Identifier	Technology	Device Function	Package Suffix	Tape & Reel Suffix		
NL27WZU04DFT2	NL	2	7	WZ	U04	DF	T2	SC-88 / SOT-363 / SC-70	178 mm (7") 3000 Unit
NL27WZU04DFT2G	NL	2	7	WZ	U04	DF	T2	SC-88 / SOT-363 / SC-70 (Pb-Free)	178 mm (7") 3000 Unit
NL27WZU04DTT1	NL	2	7	WZ	U04	DT	T1	TSOP-6 / SOT-23 / SC-59	178 mm (7") 3000 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.

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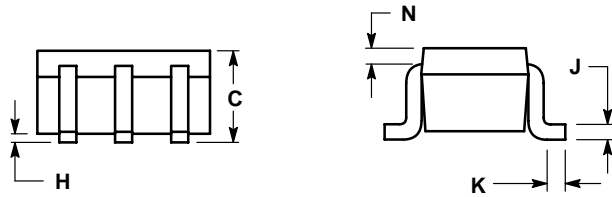
## PACKAGE DIMENSIONS

SC70-6/SC-88/SOT-363  
 DF SUFFIX  
 CASE 419B-02  
 ISSUE U

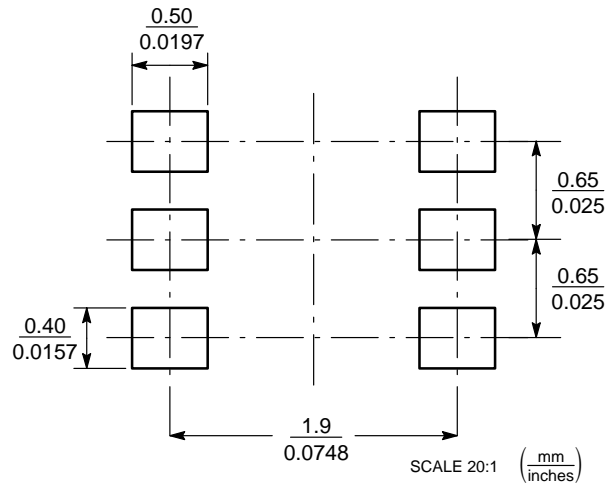


- NOTES:  
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
 2. CONTROLLING DIMENSION: INCH.  
 3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

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



### SOLDERING FOOTPRINT\*

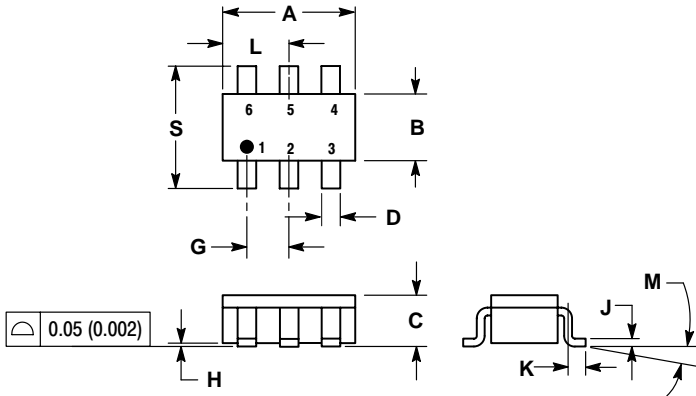


\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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## PACKAGE DIMENSIONS

SOT23-6/TSOP-6/SC59-6  
DT SUFFIX  
CASE 318G-02  
ISSUE M

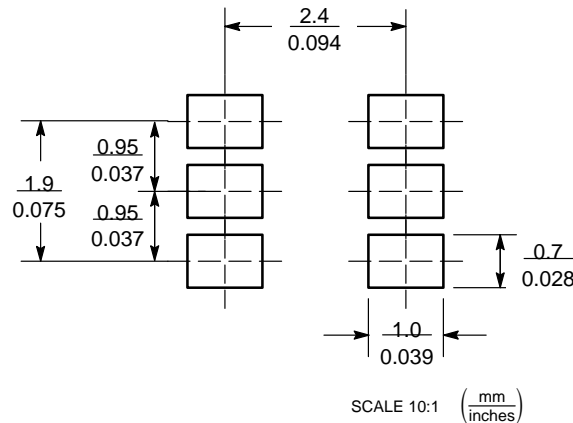


### NOTES:

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	MAX	MIN	MAX
A	2.90	3.10	0.1142	0.1220
B	1.30	1.70	0.0512	0.0669
C	0.90	1.10	0.0354	0.0433
D	0.25	0.50	0.0098	0.0197
G	0.85	1.05	0.0335	0.0413
H	0.013	0.100	0.0005	0.0040
J	0.10	0.26	0.0040	0.0102
K	0.20	0.60	0.0079	0.0236
L	1.25	1.55	0.0493	0.0610
M	0°	10°	0°	10°
S	2.50	3.00	0.0985	0.1181

### 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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