NL27WZ04

Dual Inverter

The NL27WZ04 is a high performance dual inverter operating from a 1.65 V to 5.5 V supply. High impedance TTL compatible inputs significantly reduce current loading to input drivers while TTL compatible outputs offer improved switching noise performance.

Features

- Extremely High Speed: t_{PD} 2.0 ns (typical) at V_{CC} = 5 V
- Designed for 1.65 V to 5.5 V V_{CC} Operation
- Over Voltage Tolerant Inputs and Outputs
- LVTTL Compatible − Interface Capability with 5 V TTL Logic with V_{CC} = 3 V
- LVCMOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- Replacement for NC7W04
- Chip Complexity: FET = 72; Equivalent Gate = 18
- 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 and are RoHS Compliant

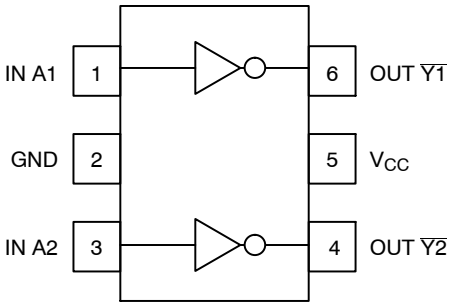

Figure 1. Pinout (Top View)

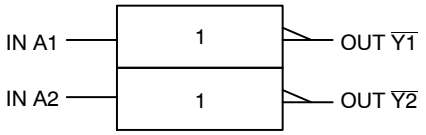

Figure 2. Logic Symbol

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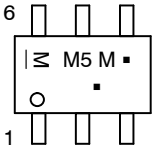
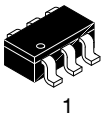
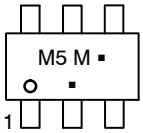
MARKING DIAGRAMS

SC−88
(SC70−6/SOT−363)
DF SUFFIX
CASE 419B





TSOP−6
DT SUFFIX
CASE 318G



M5 = Device Code
M = Date Code*
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or position and underbar may vary depending upon manufacturing location.

PIN ASSIGNMENT

Pin	Function
1	IN A1
2	GND
3	IN A2
4	OUT $\overline{Y2}$
5	V_{CC}
6	OUT $\overline{Y1}$

FUNCTION TABLE

A Input	$\overline{Y}$ Output
L	H
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	Units
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 HIGH 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 Source/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 SC−88, TSOP−6 (Note 2)	200	mW
θ_{JA}	Thermal Resistance SC−88, TSOP−6 (Note 2)	333	°C/W
T_L	Lead Temperature, 1 mm from Case for 10 Seconds	260	°C
T_J	Junction Temperature Under Bias	+150	°C
V_{ESD}	ESD Withstand Voltage Human Body Model (Note 3) Machine Model (Note 4) Charged Device Model (Note 5)	 > 2000 > 200 N/A	V
$I_{LATCHUP}$	Latchup Performance Above V_{CC} and Below GND at 125°C (Note 6)	±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. I_O absolute maximum rating must be observed.
2. Measured with minimum pad spacing on an FR4 board, using 10 mm−by−1 inch, 2−ounce copper trace with no air flow.
3. Tested to EIA/JESD22−A114−A
4. Tested to EIA/JESD22−A115−A
5. Tested to JESD22−C101−A
6. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min	Max	Units
Supply Voltage Operating Data Retention Only	V_{CC}	 1.65 1.5	 5.5 5.5	V
Input Voltage	V_I	0	5.5	V
Output Voltage (HIGH or LOW State)	V_O	0	5.5	V
Operating Free−Air Temperature	T_A	−55	+125	°C
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	$\Delta t/\Delta V$	 0 0 0	 20 10 5	ns/V

DC ELECTRICAL CHARACTERISTICS

Parameter	Condition	Symbol	V_{CC} (V)	T_A = 25°C Min	T_A = 25°C Typ	T_A = 25°C Max	−55°C ≤ T_A ≤ 125°C Min	−55°C ≤ T_A ≤ 125°C Max	Units
High−Level Input Voltage		V_{IH}	1.65−1.95	0.75 V_{CC}			0.75 V_{CC}		V
			2.3 to 5.5	0.7 V_{CC}			0.7 V_{CC}		
Low−Level Input Voltage		V_{IL}	1.65−1.95			0.25 V_{CC}		0.25 V_{CC}	V
			2.3 to 5.5			0.3 V_{CC}		0.3 V_{CC}	
High−Level Output Voltage V_{IN} = V_{IL}	I_{OH} = −100 μA	V_{OH}	1.65 to 5.5	V_{CC} − 0.1	V_{CC}		V_{CC} − 0.1		V
	I_{OH} = −3 mA		1.65	1.29	1.52		1.29		
	I_{OH} = −8 mA		2.3	1.9	2.1		1.9		
	I_{OH} = −12 mA		2.7	2.2	2.4		2.2		
	I_{OH} = −16 mA		3.0	2.4	2.7		2.4		
	I_{OH} = −24 mA		3.0	2.3	2.5		2.3		
	I_{OH} = −32 mA		4.5	3.8	4.0		3.8		
Low−Level Output Voltage V_{IN} = V_{IH}	I_{OL} = 100 μA	V_{OL}	1.65 to 5.5			0.1		0.1	V
	I_{OL} = 3 mA		1.65		0.08	0.24		0.24	
	I_{OL} = 8 mA		2.3		0.20	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	
Input Leakage Current	V_{IN} = 5.5 V or GND	I_{IN}	0 to 5.5			±0.1		±1.0	μA
Power Off Leakage Current	V_{IN} = 5.5 V or V_{OUT} = 5.5 V	I_{OFF}	0			1		10	μA
Quiescent Supply Current	V_{IN} = 5.5 V or GND	I_{CC}	5.5			1		10	μA

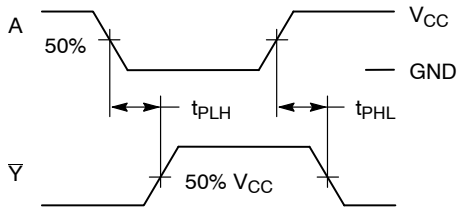
AC ELECTRICAL CHARACTERISTICS $t_R = t_F$ = 2.5 ns; C_L = 50 pF; R_L = 500 Ω

Parameter	Condition	Symbol	V_{CC} (V)	T_A = 25°C Min	T_A = 25°C Typ	T_A = 25°C Max	−55°C ≤ T_A ≤ 125°C Min	−55°C ≤ T_A ≤ 125°C Max	Units
Propagation Delay (Figure 3 and 4)	R_L = 1 MΩ, C_L = 15 pF	t_{PLH} t_{PHL}	1.65	1.8	2.3	9.2	1.8	11.0	ns
	R_L = 1 MΩ, C_L = 15 pF		1.8	1.8	4.4	7.6	1.8	8.4	
	R_L = 1 MΩ, C_L = 15 pF		2.5 ± 0.2	1.2	3.0	5.1	1.2	5.6	
	R_L = 1 MΩ, C_L = 15 pF		3.3 ± 0.3	0.8	2.2	3.4	0.8	3.8	
	R_L = 500 Ω, C_L = 50 pF			1.2	2.9	4.5	1.2	5.0	
	R_L = 1 MΩ, C_L = 15 pF		5.0 ± 0.5	0.5	1..8	2.8	0.5	3.1	
	R_L = 500 Ω, C_L = 50 pF			0.8	2.3	3.6	0.8	4.0	

CAPACITIVE CHARACTERISTICS

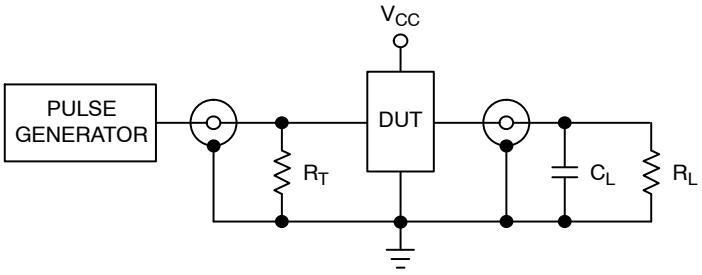
Parameter	Symbol	Condition	Typical	Units
Input Capacitance	C_{IN}	V_{CC} = 5.5 V, V_I = 0 V or V_{CC}	2.5	pF
Power Dissipation Capacitance (Note 7)	C_{PD}	10 MHz, V_{CC} = 3.3 V, V_I = 0 V or V_{CC} 10 MHz, V_{CC} = 5.5 V, V_I = 0 V or V_{CC}	9 11	pF

7. 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: $I_{CC(OPR)} = C_{PD} \bullet V_{CC} \bullet f_{in} + I_{CC}$. C_{PD} is used to determine the no−load dynamic power consumption; $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.



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

Figure 3. Switching Waveforms



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

Figure 4. Test Circuit

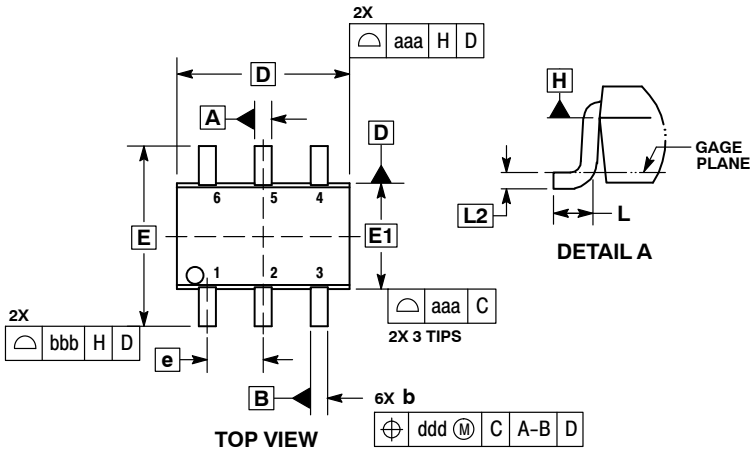
ORDERING INFORMATION

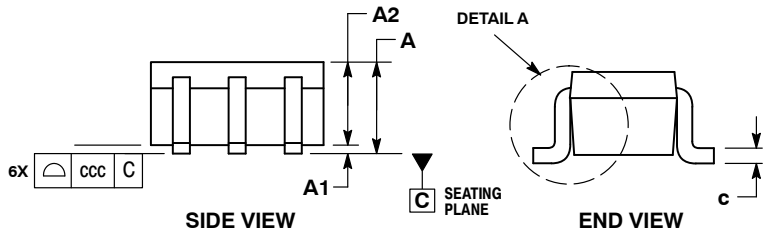
Device	Package	Shipping†
NL27WZ04DFT1G	SC−88/SC70−6/SOT−363 (Pb−Free)	3000 / Tape & Reel
NL27WZ04DFT2G	SC−88/SC70−6/SOT−363 (Pb−Free)	3000 / Tape & Reel
NLV27WZ04DFT1G*	SC−88/SC70−6/SOT−363 (Pb−Free)	3000 / Tape & Reel
NLV27WZ04DFT2G*	SC−88/SC70−6/SOT−363 (Pb−Free)	3000 / Tape & Reel
NL27WZ04DTT1G	TSOP−6 (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.

PACKAGE DIMENSIONS

SC−88/SC70−6/SOT−363
CASE 419B−02
ISSUE Y

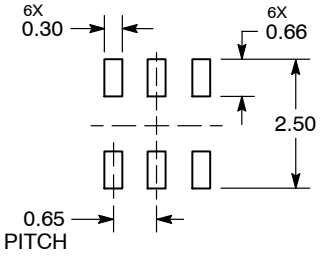




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.
5. DATUMS A AND B ARE DETERMINED AT DATUM H.
6. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION b AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	−−−	−−−	1.10	−−−	−−−	0.043
A1	0.00	−−−	0.10	0.000	−−−	0.004
A2	0.70	0.90	1.00	0.027	0.035	0.039
b	0.15	0.20	0.25	0.006	0.008	0.010
C	0.08	0.15	0.22	0.003	0.006	0.009
D	1.80	2.00	2.20	0.070	0.078	0.086
E	2.00	2.10	2.20	0.078	0.082	0.086
E1	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65 BSC			0.026 BSC		
L	0.26	0.36	0.46	0.010	0.014	0.018
L2	0.15 BSC			0.006 BSC		
aaa	0.15			0.006		
bbb	0.30			0.012		
ccc	0.10			0.004		
ddd	0.10			0.004		

RECOMMENDED SOLDERING FOOTPRINT*

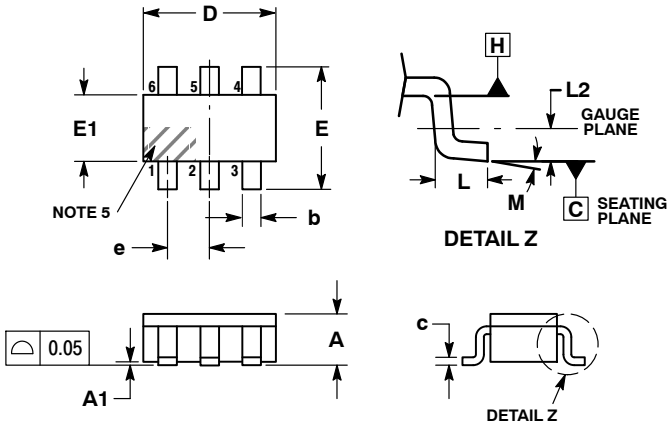


DIMENSIONS: MILLIMETERS

*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

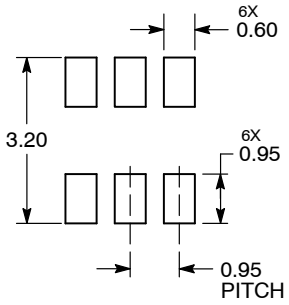
TSOP−6
CASE 318G−02
ISSUE V



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
5. PIN ONE INDICATOR MUST BE LOCATED IN THE INDICATED ZONE.

	MILLIMETERS		
DIM	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.01	0.06	0.10
b	0.25	0.38	0.50
c	0.10	0.18	0.26
D	2.90	3.00	3.10
E	2.50	2.75	3.00
E1	1.30	1.50	1.70
e	0.85	0.95	1.05
L	0.20	0.40	0.60
L2	0.25 BSC		
M	0°	–	10°

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*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
Japan Customer Focus Center
Phone: 81−3−5817−1050

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For additional information, please contact your local Sales Representative

NL27WZ04/D