# **Dual 2-Input AND Gate**

The NL27WZ08 is a high performance dual 2-input AND Gate operating from a 1.65 V to 5.5 V supply.

### **Features**

- Extremely High Speed:  $t_{PD}$  2.5 ns (typical) at  $V_{CC} = 5 \text{ V}$
- Designed for 1.65 V to 5.5 V V<sub>CC</sub> Operation
- Over Voltage Tolerant Inputs
- LVTTL Compatible Interface Capability With 5 V TTL Logic with  $V_{CC} = 5 \text{ V}$
- LVCMOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- Replacement for NC7WZ08
- Chip Complexity: FET = 124
- Pb-Free Package is Available

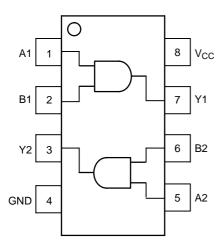


Figure 1. Pinout

### **PIN ASSIGNMENT**

Pin	Function
1	A1
2	B1
3	Y2
4	GND
5	A2
6	B2
7	Y1
8	V <sub>CC</sub>



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US8 US SUFFIX CASE 493





L2 = Device Code M = Date Code\* ■ Pb–Free Package

(Note: Microdot may be in either location)

\*Date Code orientation may vary depending upon manufacturing location.

### **ORDERING INFORMATION**

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

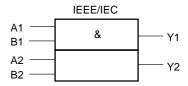


Figure 2. Logic Symbol

# FUNCTION TABLE $Y = \overline{AB}$

Inp	Output	
A B		Y
L	L	L
L	Н	L
Н	L	L
Н	Н	Н

H = HIGH Logic Level L = LOW Logic Level

### **MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	DC Supply Voltage	-0.5 to $+7.0$	V
VI	DC Input Voltage	-0.5  to  +7.0	V
Vo	DC Output Voltage	$-0.5$ to $V_{CC} + 0.5$	V
I <sub>IK</sub>	DC Input Diode Current $V_1 < GND$	-50	mA
I <sub>OK</sub>	DC Output Diode Current V <sub>O</sub> < GND	-50	mA
Io	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
T <sub>L</sub>	Lead Temperature, 1 mm from Case for 10 Seconds	260	°C
TJ	Junction Temperature under Bias	+ 150	°C
$\theta_{JA}$	Thermal Resistance (Note 1)	250	°C/W
$P_{D}$	Power Dissipation in Still Air at 85°C	250	mW
MSL	Moisture Sensitivity	Level 1	
F <sub>R</sub>	Flammability Rating Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	
V <sub>ESD</sub>	ESD Withstand Voltage  Human Body Model (Note 2)  Machine Model (Note 3)  Charged Device Model (Note 4)	> 2000 > 200 N/A	V
I <sub>Latch-Up</sub>	Latch–Up Performance Above V <sub>CC</sub> and Below GND at 85°C (Note 5)	±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. 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.
- Tested to JESD22-C101-A.
   Tested to EIA/JESD78.

# RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter			Max	Unit	
V <sub>CC</sub>	Supply Voltage	Operating Data Retention Only	1.65 1.5	5.5 5.5	V	
VI	Input Voltage	(Note 6)	0	5.5	V	
Vo	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	$V_{CC} = 2.5 \text{ V } \pm 0.2 \text{ V}$ $V_{CC} = 3.0 \text{ V } \pm 0.3 \text{ V}$ $V_{CC} = 5.0 \text{ V } \pm 0.5 \text{ V}$	0 0 0	20 10 5	ns/V	

<sup>6.</sup> Unused inputs may not be left open. All inputs must be tied to a high- or low-logic input voltage level.

# DC ELECTRICAL CHARACTERISTICS

			V <sub>CC</sub>	T <sub>A</sub> = 25°C			$-40^{\circ}\text{C} \leq \text{T}_{\text{A}} \leq 85^{\circ}\text{C}$		
Symbol	Parameter	Condition	(V)	Min	Тур	Max	Min	Max	Unit
V <sub>IH</sub>	High-Level Input Voltage		1.65 2.3 to 5.5	0.75 V <sub>CC</sub> 0.7 V <sub>CC</sub>			0.75 V <sub>CC</sub> 0.7 V <sub>CC</sub>		V
V <sub>IL</sub>	Low-Level Input Voltage		1.65 2.3 to 5.5			0.25 V <sub>CC</sub> 0.3 V <sub>CC</sub>		0.25 0.3 V <sub>CC</sub>	V
V <sub>OH</sub>	High-Level Output Voltage V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub>	$I_{OH} = 100 \mu A$ $I_{OH} = -3 \text{ mA}$ $I_{OH} = -8 \text{ mA}$ $I_{OH} = -12 \text{ mA}$ $I_{OH} = -16 \text{ mA}$ $I_{OH} = -24 \text{ mA}$ $I_{OH} = -32 \text{ mA}$	1.65 to 5.5 165 2.3 2.7 3.0 3.0 4.5	V <sub>CC</sub> - 0.1 1.29 1.9 2.2 2.4 2.3 3.8	V <sub>CC</sub> 1.5 2.1 2.4 2.7 2.5 4.0		V <sub>CC</sub> - 0.1 1.5 1.9 2.2 2.4 2.3 3.8		V
V <sub>OL</sub>	Low-Level Output Voltage V <sub>IN</sub> = V <sub>IH</sub> or V <sub>OH</sub>	$\begin{split} I_{OL} &= 100 \ \mu\text{A} \\ I_{OL} &= 3 \ \text{mA} \\ I_{OL} &= 8 \ \text{mA} \\ I_{OL} &= 12 \ \text{mA} \\ I_{OL} &= 16 \ \text{mA} \\ I_{OL} &= 24 \ \text{mA} \\ I_{OL} &= 32 \ \text{mA} \end{split}$	1.65 to 5.5 2.3 2.7 3.0 3.0 4.5		0.08 0.20 0.22 0.28 0.38 0.42	0.1 0.24 0.3 0.4 0.4 0.55 0.55		0.1 0.24 0.3 0.4 0.4 0.55 0.55	V
I <sub>IN</sub>	Input Leakage Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	0 to 5.5			± 0.1		±1.0	μА
I <sub>CC</sub>	Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND	5.5			1.0		10	μΑ

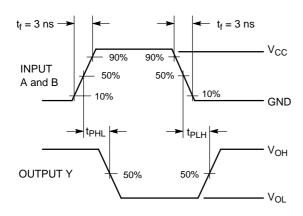
# AC ELECTRICAL CHARACTERISTICS $t_{R} = t_{F} = 3.0 \ \text{ns}$

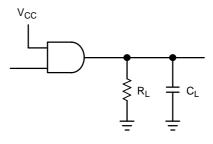
			V <sub>CC</sub>		T <sub>A</sub> = 25°C	;	-40°C ≤	Γ <sub>A</sub> ≤ 85°C	
Symbol	Parameter	Condition	(V)	Min	Тур	Max	Min	Max	Unit
t <sub>PLH</sub>	Propagation Delay	$R_L = 1 \text{ M}\Omega$ , $C_L = 15 \text{ pF}$	$1.8 \pm 0.15$	2.0	5.7	10.5	2.0	11.0	ns
t <sub>PHL</sub>	(Figure 3 and 4)		$2.5 \pm 0.2$	1.0	3.5	5.8	2.0	6.2	
		$R_L = 1 \text{ M}\Omega, C_L = 15 \text{ pF}$ $R_L = 500 \Omega, C_L = 50 \text{ pF}$	$3.3 \pm 0.3$	0.8 1.2	2.6 3.2	3.9 4.8	0.8 1.2	4.3 5.2	
		$\begin{aligned} R_L &= 1 \text{ M}\Omega, C_L = 15 \text{ pF} \\ R_L &= 500 \ \Omega, C_L = 50 \text{ pF} \end{aligned}$	5.0 ± 0.5	0.5 0.8	1.9 2.5	3.1 3.7	0.5 0.8	3.3 4.0	

# **CAPACITIVE CHARACTERISTICS**

Symbol	Parameter	Condition	Typical	Unit
C <sub>IN</sub>	Input Capacitance	$V_{CC} = 5.5 \text{ V}, V_I = 0 \text{ V or } V_{CC}$	4	pF
C <sub>PD</sub>	Power Dissipation Capacitance (Note 7)	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 $V_{CC}$	25 30	pF

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





A 1–MHz square input wave is recommended for propagation delay tests.

Figure 3. Switching Waveform

Figure 4. Test Circuit

# **DEVICE ORDERING INFORMATION**

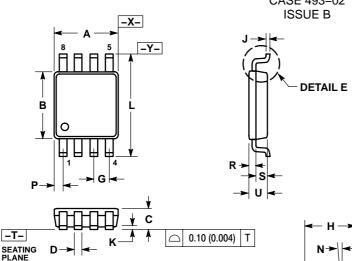
Device Order Number	Package Type	Tape and Reel Size <sup>†</sup>	
NL27WZ08US	US8	178 mm, 3000 Unit / Tape & Reel	
NL27WZ08USG	US8 (Pb-Free)	178 mm, 3000 Unit / Tape & Reel	

<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.

#### PACKAGE DIMENSIONS

# US8 **US SUFFIX**

CASE 493-02



#### NOTES:

**R 0.10 TYP** 

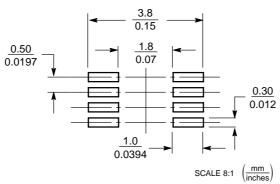
- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- 2. CONTROLLING DIMENSION: MILLIMETERS.
  3. DIMENSION "A" DOES NOT INCLUDE MOLD
- FLASH, PROTRUSION OR GATE BURR.
  MOLD FLASH, PROTRUSION AND GATE BURR SHALL NOT EXCEED 0.140 MM
- 0.0055") PER SIDE.
  DIMENSION "B" DOES NOT INCLUDE
  INTER-LEAD FLASH OR PROTRUSION.
  INTER-LEAD FLASH AND PROTRUSION SHALL NOT E3XCEED 0.140 (0.0055") PER SIDE
- LEAD FINISH IS SOLDER PLATING WITH THICKNESS OF 0.0076-0.0203 MM. (300–800 °).
  ALL TOLERANCE UNLESS OTHERWISE
- SPECIFIED ±0.0508 (0.0002 ").

		MILLIMETERS		INC	HES
	DIM	MIN	MAX	MIN	MAX
	Α	1.90	2.10	0.075	0.083
	В	2.20	2.40	0.087	0.094
	C	0.60	0.90	0.024	0.035
	D	0.17	0.25	0.007	0.010
,	F	0.20	0.35	0.008	0.014
	G	0.50	BSC	0.020	BSC
	Н	0.40	REF	0.016	REF
	7	0.10	0.18	0.004	0.007
	K	0.00	0.10	0.000	0.004
	L	3.00	3.20	0.118	0.126
	M	0°	6 °	0 °	6 °
	N	5°	10 °	5°	10 °
	Ρ	0.23	0.34	0.010	0.013
	R	0.23	0.33	0.009	0.013
	S	0.37	0.47	0.015	0.019
	U	0.60	0.80	0.024	0.031
	٧	0.12	BSC	0.005	BSC

## **SOLDERING FOOTPRINT\***

**DETAIL E** 

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\*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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