SN74AC08-EP Quadruple 2-Input Positive-and Gate

1 Features

- Controlled Baseline
  - One Assembly/Test Site, One Fabrication Site
- Extended Temperature Performance of −55°C to 125°C
- Enhanced Diminishing Manufacturing Sources (DMS) Support
- Enhanced Product-Change Notification
- Qualification Pedigree†
- 2-V to 6-V V_{CC} Operation
- Inputs Accept Voltages to 6 V
- Max t_{pd} of 7.5 ns at 5 V

[1]

2 Description

The SN74AC08 is a quadruple 2-input positive-AND gate. This device performs the Boolean function Y = A • B or Y = $\overline{A}$ + $\overline{B}$ in positive logic.

Package Information

PART NUMBER	PACKAGE[1]	PACKAGE SIZE[2]
SN74AC08-EP	D (SOIC, 14)	8.65 mm × 3.91 mm

1. For all available packages, see the orderable addendum at the end of the data sheet.
2. The package size (length × width) is a nominal value and includes pins, where applicable.

Figure 2-1. Logic Diagram, Each Gate (Positive Logic)

[1] † Component qualification in accordance with JEDEC and industry standards to provide reliable operation over an extended temperature range. This includes, but is not limited to, Highly Accelerated Stress Test (HAST) or biased 85/85, temperature cycle, autoclave or unbiased HAST, electromigration, bond intermetallic life, and mold compound life. Such qualification testing should not be viewed as justifying use of this component beyond specified performance and environmental limits.

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3 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision * (September 2003) to Revision A (June 2023)	Page
• Added *Package Information* table, *Pin Functions* table, *Thermal Information* table, *Device Functional Modes, Device and Documentation Support* section, and *Mechanical, Packaging, and Orderable Information* section	1

4 Pin Configuration and Functions

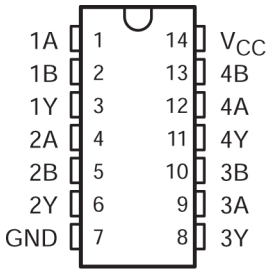


Figure 4-1. D Package (Top View)

Table 4-1. Pin Functions

PIN		TYPE	DESCRIPTION
NAME	NO.		
1A	1	Input	Channel 1, Input A
1B	2	Input	Channel 1, Input B
1Y	3	Output	Channel 1, Output Y
2A	4	Input	Channel 2, Input A
2B	5	Input	Channel 2, Input B
2Y	6	Output	Channel 2, Output Y
GND	7	—	Ground
3Y	8	Output	Channel 3, Output Y
3A	9	Input	Channel 3, Input A
3B	10	Input	Channel 3, Input B
4Y	11	Output	Channel 4, Output Y
4A	12	Input	Channel 4, Input A
4B	13	Input	Channel 4, Input B
V_{CC}	14	—	Positive Supply

5 Specifications

5.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)(1)

			MIN	MAX	UNIT
V_{CC}	Supply voltage range		−0.5	7	V
V_I [1]	Input voltage range		−0.5	V_{CC} + 0.5	V
V_O [1]	Output voltage range		−0.5	V_{CC} + 0.5	V
I_{IK}	Input clamp current	(V_I < 0 or V_I > V_{CC})		±20	mA
I_{OK}	Output clamp current	(V_O < 0 or V_O > V_{CC})		±20	mA
I_O	Continuous output current	(V_O = 0 to V_{CC})		±50	mA
	Continuous current through V_{CC} or GND			±200	mA
T_{stg}	Storage temperature range		−65	150	°C

(1) Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

5.2 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)[1]

			MIN	MAX	UNIT
V_{CC}	Supply voltage		2	6	V
V_{IH}	High-level input voltage	V_{CC} = 3 V	2.1		V
		V_{CC} = 4.5 V	3.15		
		V_{CC} = 5.5 V	3.85		
V_{IL}	Low-level input voltage	V_{CC} = 3 V		0.9	V
		V_{CC} = 4.5 V		1.35	
		V_{CC} = 5.5 V		1.65	
V_I	Input voltage		0	V_{CC}	V
V_O	Output voltage		0	V_{CC}	V
I_{OH}	High-level output current	V_{CC} = 3 V		−12	mA
		V_{CC} = 4.5 V		−24	
		V_{CC} = 5.5 V		−24	
I_{OL}	Low-level output current	V_{CC} = 3 V		12	mA
		V_{CC} = 4.5 V		24	
		V_{CC} = 5.5 V		24	
$\Delta t/\Delta v$	Input transition rise or fall rate			8	ns/V
T_A	Operating free-air temperature		−55	125	°C

(1) All unused inputs of the device must be held at V_{CC} or GND for proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

5.3 Thermal Information

THERMAL METRIC(1)		SN74AC08-EP D (SOIC) 14 PINS	UNIT
$R_{\theta JA}$	Junction-to-ambient thermal resistance	86	°C/W

(1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics*

5.4 Electrical Characteristics

over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS		V_{CC}	T_A = 25°C			MIN	MAX	UNIT
					MIN	TYP	MAX			
V_{OH}		I_{OH} = −50 µA		3 V	2.9			2.9		V
				4.5 V	4.4			4.4		
				5.5 V	5.4			5.4		
		I_{OH} = −12 mA		3 V	2.56			2.4		
		I_{OH} = −24 mA		4.5 V	3.86			3.7		
				5.5 V	4.86			4.7		
V_{OL}		I_{OL} = 50 µA		3 V		0.002	0.1		0.1	V
				4.5 V		0.001	0.1		0.1	
				5.5 V		0.001	0.1		0.1	
		I_{OL} = 12 mA		3 V			0.36		0.5	
		I_{OL} = 24 mA		4.5 V			0.36		0.5	
				5.5 V			0.36		0.5	
I_I	A or B ports	V_I = V_{CC} or GND		5.5 V			±0.1		±1	µA
I_{CC}		V_I = V_{CC} or GND,	I_O = 0	5.5 V			2		40	µA
C_i		VI = V_{CC} or GND		5 V		4.5				pF

5.5 Switching Characteristics, V_{CC} = 3.3 V ± 0.3 V

over recommended operating free-air temperature range, V_{CC} = 3.3 V ± 0.3 V (unless otherwise noted) (see Load Circuit and Voltage Waveforms)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	T_A = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
t_{PLH}	A or B	Y	1.5	7.5	9.5	1	12.5	ns
t_{PHL}			1.5	7	8.5	1	11.5	

5.6 Switching Characteristics, V_{CC} = 5 V ± 0.5 V

over recommended operating free-air temperature range, V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see Load Circuit and Voltage Waveforms)

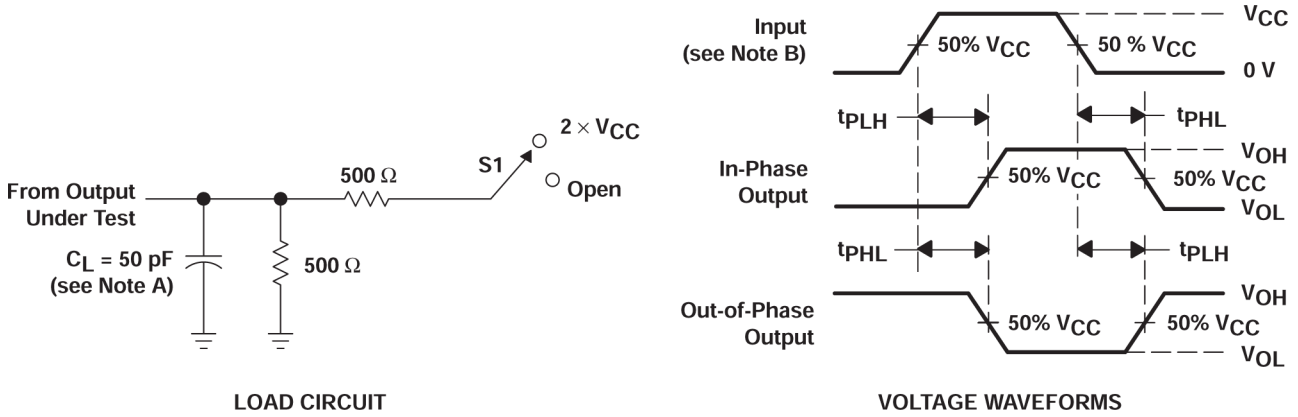
PARAMETER	FROM (INPUT)	TO (OUTPUT)	T_A = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
t_{PLH}	A or B	Y	1.5	5.5	7.5	1	9	ns
t_{PHL}			1.5	5.5	7	1	8.5	

5.7 Operating Characteristics

V_{CC} = 5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS		TYP	UNIT
C_{pd}	Power dissipation capacitance	C_L = 50 pF,	f = 1 MHz	20	pF

6 Parameter Measurement Information



LOAD CIRCUIT VOLTAGE WAVEFORMS

A. C_L includes probe and jig capacitance.
B. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O = 50 Ω, t_r v 2.5 ns, t_f v 2.5 ns.
C. The outputs are measured one at a time with one input transition per measurement.

Figure 6-1. Load Circuit and Voltage Waveforms

TEST	S1
t_{PLH}/t_{PHL}	Open

7 Detailed Description

7.1 Functional Block Diagram

Figure 7-1. Logic Diagram, Each Gate (Positive Logic)

7.2 Device Functional Modes

Table 7-1. Function Table (Each Gate)

INPUTS		OUTPUT Y
A	B	
H	H	H
L	X	L
X	L	L

8 Device and Documentation Support

TI offers an extensive line of development tools. Tools and software to evaluate the performance of the device, generate code, and develop solutions are listed below.

8.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. Click on *Subscribe to updates* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

8.2 Support Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

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8.4 Electrostatic Discharge Caution

This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

8.5 Glossary

TI Glossary	This glossary lists and explains terms, acronyms, and definitions.

9 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
SN74AC08MDREP	Obsolete	Production	SOIC (D) | 14	-	-	Call TI	Call TI	-55 to 125	SAC08MEP

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

OTHER QUALIFIED VERSIONS OF SN74AC08-EP :

- Catalog : SN74AC08
- Automotive : SN74AC08-Q1

- Military : SN54AC08

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Military - QML certified for Military and Defense Applications

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