

# DATA SHEET

## **74ALS38A**

Quad 2-Input NAND buffer  
(open collector)

Product specification

1991 Feb 08

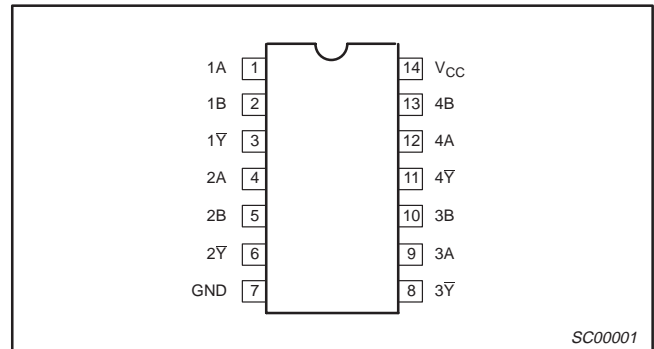
IC05 Data Handbook

# Quad 2-input NAND buffer (open collector)

# 74ALS38A

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74ALS38A	7.0ns	3.5mA

### PIN CONFIGURATION



### ORDERING INFORMATION

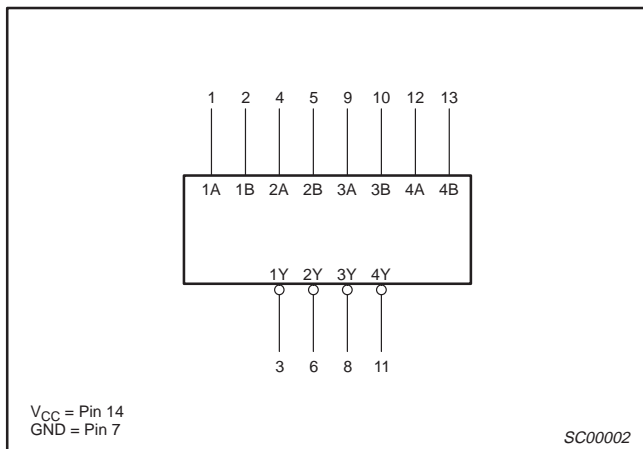
DESCRIPTION	ORDER CODE	DRAWING NUMBER
	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$ , $T_{amb} = 0^{\circ}C \text{ to } +70^{\circ}C$	
14-pin plastic DIP	74ALS38AN	SOT27-1
14-pin plastic SO	74ALS38AD	SOT108-1

### INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

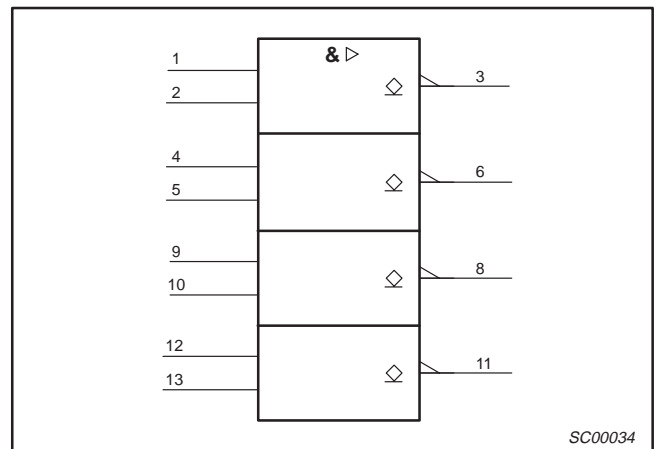
PINS	DESCRIPTION	74ALS (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
nA, nB	Data inputs	1.0/1.0	20 $\mu$ A/0.1mA
nY	Data outputs	20/80	0.4mA/8mA

**NOTE:** One (1.0) ALS unit load is defined as: 20 $\mu$ A in the High state and 0.1mA in the Low state.

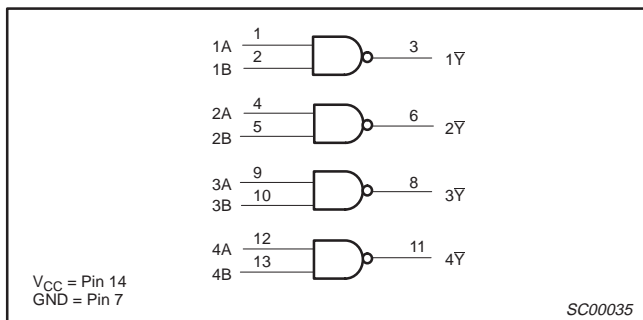
### LOGIC SYMBOL



### IEC/IEEE SYMBOL



### LOGIC DIAGRAM



### FUNCTION TABLE

INPUTS		OUTPUT
nA	nB	nY
L	L	H
L	H	H
H	L	H
H	H	L

H = High voltage level  
L = Low voltage level  
X = Don't care

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**ABSOLUTE MAXIMUM RATINGS**

(Operation beyond the limit set forth in this table may impair the useful life of the device.  
Unless otherwise noted these limits are over the operating free-air temperature range.)

SYMBOL	PARAMETER	RATING	UNIT
$V_{CC}$	Supply voltage	-0.5 to +7.0	V
$V_{IN}$	Input voltage	-0.5 to +7.0	V
$I_{IN}$	Input current	-30 to +5	mA
$V_{OUT}$	Voltage applied to output in High output state	-0.5 to $V_{CC}$	V
$I_{OUT}$	Current applied to output in Low output state	48	mA
$T_{amb}$	Operating free-air temperature range	0 to +70	°C
$T_{stg}$	Storage temperature range	-65 to +150	°C

**RECOMMENDED OPERATING CONDITIONS**

SYMBOL	PARAMETER	LIMITS			UNIT
		MIN	NOM	MAX	
$V_{CC}$	Supply voltage	4.5	5.0	5.5	V
$V_{IH}$	High-level input voltage	2.0			V
$V_{IL}$	Low-level input voltage			0.8	V
$I_{IK}$	Input clamp current			-18	mA
$V_{OH}$	High-level output voltage			5.5	V
$I_{OL}$	Low-level output current			24	mA
$T_{amb}$	Operating free-air temperature range	0		+70	°C

**DC ELECTRICAL CHARACTERISTICS**

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

SYMBOL	PARAMETER	TEST CONDITIONS <sup>1</sup>	LIMITS			UNIT	
			MIN	TYP <sup>2</sup>	MAX		
$I_{OH}$	High-level output current	$V_{CC} = \text{MIN}, V_{IL} = \text{MAX}, V_{IH} = \text{MIN}, V_{OH} = \text{MAX}$			100	μA	
$V_{OL}$	Low-level output voltage	$V_{CC} = \text{MIN}, V_{IL} = \text{MAX}, V_{IH} = \text{MIN}$	$I_{OL} = 12\text{mA}$	0.25	0.40	V	
			$I_{OL} = 24\text{mA}$	0.35	0.50	V	
$V_{IK}$	Input clamp voltage	$V_{CC} = \text{MIN}, I_I = I_{IK}$		-0.73	-1.5	V	
$I_I$	Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 7.0\text{V}$			0.1	mA	
$I_{IH}$	High-level input current	$V_{CC} = \text{MAX}, V_I = 2.7\text{V}$			20	μA	
$I_{IL}$	Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.5\text{V}$			-0.1	mA	
$I_{CC}$	Supply current (total)	$I_{CCH}$	$V_{CC} = \text{MAX}$	$V_I = \text{GND}$	0.65	1.6	mA
		$I_{CCL}$		$V_I = 4.5\text{V}$	6.5	9.0	mA

**NOTES:**

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at  $V_{CC} = 5\text{V}, T_{amb} = 25^\circ\text{C}$ .

# Quad 2-input NAND buffer (open collector)

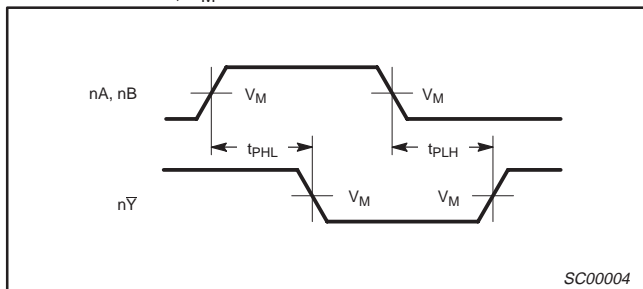
74ALS38A

## AC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITION	LIMITS		UNIT
			$T_{amb} = 0^{\circ}\text{C to } +70^{\circ}\text{C}$ $V_{CC} = +5.0\text{V} \pm 10\%$ $C_L = 50\text{pF}, R_L = 500\Omega$		
			MIN	MAX	
$t_{PLH}$ $t_{PHL}$	Propagation delay nA or nB to nY	Waveform 1	3.0 3.0	11.0 11.0	ns

## AC WAVEFORMS

For all waveforms,  $V_M = 1.3\text{V}$ .



Waveform 1. Propagation Delay for Data to Output

## TEST CIRCUIT AND WAVEFORMS

**Test Circuit for Open Collector Outputs**

**Input Pulse Definition**

**DEFINITIONS:**  
 $R_L$  = Load resistor; see AC electrical characteristics for value.  
 $C_L$  = Load capacitance includes jig and probe capacitance; see AC electrical characteristics for value.  
 $R_T$  = Termination resistance should be equal to  $Z_{OUT}$  of pulse generators.

Family	INPUT PULSE REQUIREMENTS					
	Amplitude	$V_M$	Rep.Rate	$t_w$	$t_{TLH}$	$t_{THL}$
74ALS	3.5V	1.3V	1MHz	500ns	2.0ns	2.0ns

Quad 2-input NAND buffer (open collector)

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DIP14: plastic dual in-line package; 14 leads (300 mil)

SOT27-1



**DIMENSIONS** (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A <sub>1</sub> min.	A <sub>2</sub> max.	b	b <sub>1</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	e <sub>1</sub>	L	M <sub>E</sub>	M <sub>H</sub>	w	Z <sup>(1)</sup> max.
mm	4.2	0.51	3.2	1.73 1.13	0.53 0.38	0.36 0.23	19.50 18.55	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	2.2
inches	0.17	0.020	0.13	0.068 0.044	0.021 0.015	0.014 0.009	0.77 0.73	0.26 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.087

**Note**

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

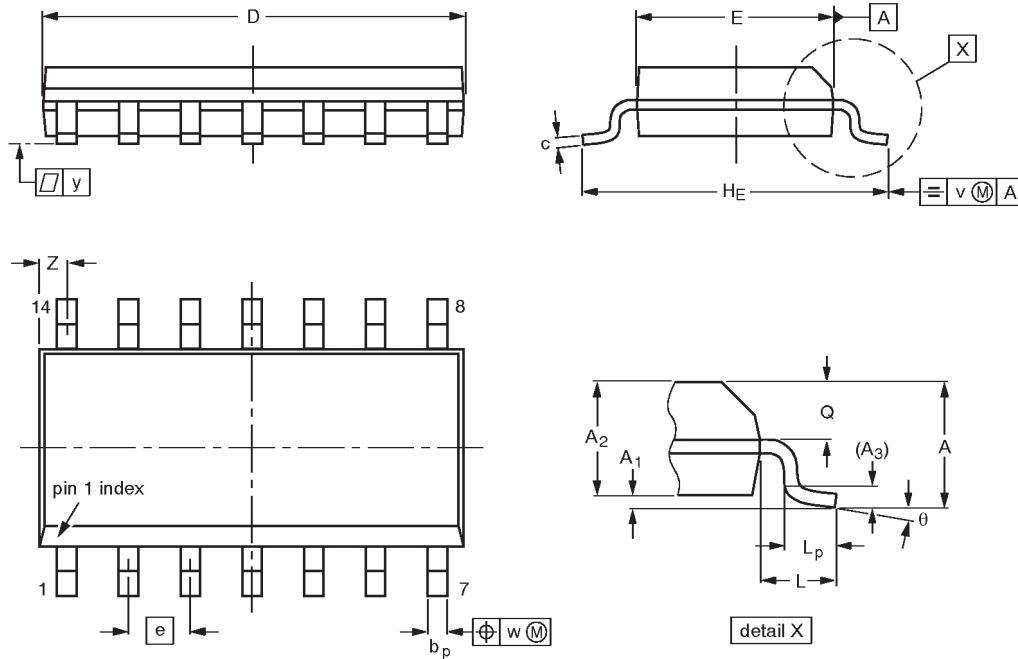
OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ		
SOT27-1	050G04	MO-001AA			92-11-17 95-03-11

Quad 2-input NAND buffer (open collector)

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SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	8.75 8.55	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.0098 0.0039	0.057 0.049	0.01	0.019 0.014	0.0098 0.0075	0.35 0.34	0.16 0.15	0.050	0.24 0.23	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT108-1	076E06S	MS-012AB				91-08-13 95-01-23

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## DEFINITIONS

Data Sheet Identification	Product Status	Definition
<i>Objective Specification</i>	<b>Formative or in Design</b>	This data sheet contains the design target or goal specifications for product development. Specifications may change in any manner without notice.
<i>Preliminary Specification</i>	<b>Preproduction Product</b>	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
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