

DATA SHEET

74ALS02

Quad 2-Input NOR gate

Product specification
IC05 Data Handbook

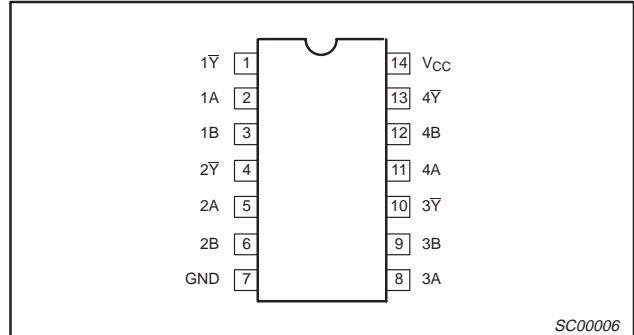
1991 Feb 08

Quad 2-input NOR gate

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| TYPE | TYPICAL PROPAGATION DELAY | TYPICAL SUPPLY CURRENT (TOTAL) |
|---------|---------------------------|--------------------------------|
| 74ALS02 | 4.0ns | 1.0mA |

PIN CONFIGURATION



ORDERING INFORMATION

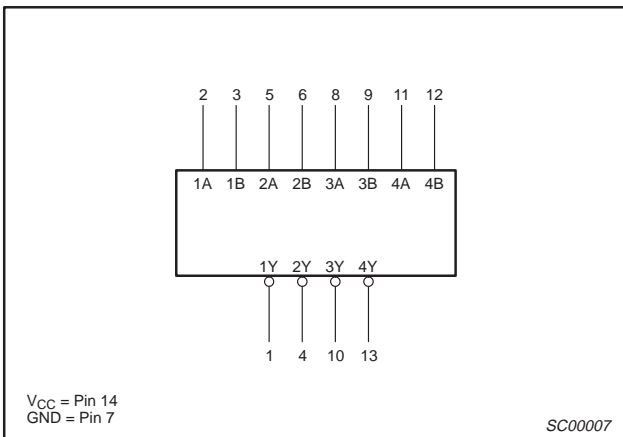
| DESCRIPTION | ORDER CODE | DRAWING NUMBER |
|--------------------|---|----------------|
| | COMMERCIAL RANGE V _{CC} = 5V ±10%, T _{amb} = 0°C to +70°C | |
| 14-pin plastic DIP | 74ALS02N | SOT27-1 |
| 14-pin plastic SO | 74ALS02D | SOT108-1 |

INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

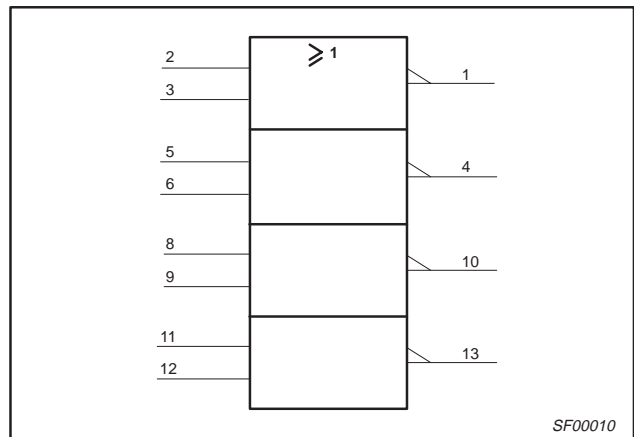
| PINS | DESCRIPTION | 74ALS (U.L.) HIGH/LOW | LOAD VALUE HIGH/LOW |
|--------|-------------|-----------------------|---------------------|
| nA, nB | Data inputs | 1.0/1.0 | 20µA/0.1mA |
| nY | Data output | 20/80 | 0.4mA/8mA |

NOTE: One (1.0) ALS unit load is defined as: 20µA in the High state and 0.1mA in the Low state.

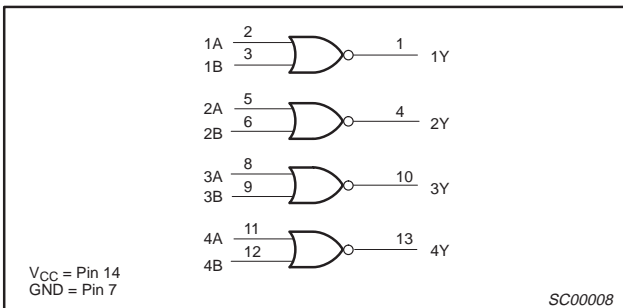
LOGIC SYMBOL



IEC/IEEE SYMBOL



LOGIC DIAGRAM



FUNCTION TABLE

| INPUTS | | OUTPUT |
|--------|----|--------|
| nA | nB | nY |
| H | H | L |
| L | X | H |
| X | L | H |

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 | 16 | 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 |
| I_{OH} | High-level output current | | | -0.4 | mA |
| I_{OL} | Low-level output current | | | 8 | 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 ¹ | LIMITS | | | UNIT |
|----------|--|--|-----------------------|------------------|------|------|
| | | | MIN | TYP ² | MAX | |
| V_{OH} | High-level output voltage | $V_{CC} \pm 10\%$, $V_{IL} = \text{MAX}$, $V_{IH} = \text{MIN}$, $I_{OH} = -0.4\text{mA}$ | $V_{CC} - 2$ | | | V |
| V_{OL} | Low-level output voltage | $V_{CC} = \text{MIN}$, $V_{IL} = \text{MAX}$, $V_{IH} = \text{MIN}$ | $I_{OL} = 4\text{mA}$ | 0.25 | 0.40 | V |
| | | | $I_{OL} = 8\text{mA}$ | 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_O | Output current ³ | $V_{CC} = \text{MAX}$, $V_O = 2.25\text{V}$ | -30 | | -112 | mA |
| I_{CC} | Supply current (total) | $V_{CC} = \text{MAX}$ | $V_I = \text{GND}$ | 0.86 | 2.2 | mA |
| | | | $V_I = 4.5\text{V}$ | 2.16 | 4.0 | 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 $V_{CC} = 5\text{V}$, $T_{amb} = 25^\circ\text{C}$.
- The output conditions have been chosen to produce a current that closely approximate one half of the true short-circuit output current, I_{OS} .

Quad 2-input NOR gate

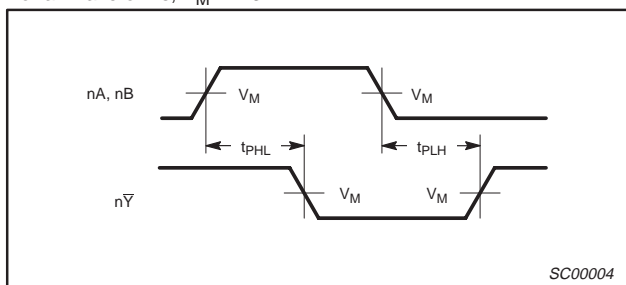
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AC ELECTRICAL CHARACTERISTICS

| 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, nB to nY | Waveform 1 | 2.0 2.0 | 12.0 10.0 | 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 Totem-pole Outputs

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.

Input Pulse Definition

| 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 |

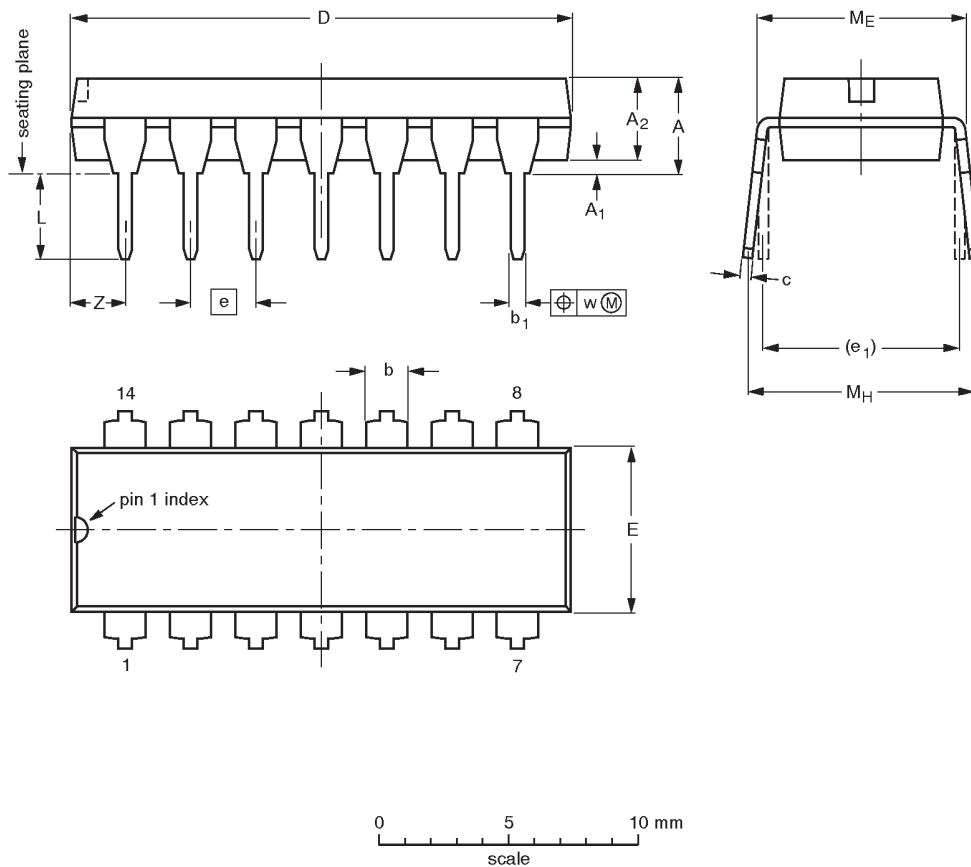
SC00005

Quad 2-input NOR gate

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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 ₁ min. | A ₂ max. | b | b ₁ | c | D ⁽¹⁾ | E ⁽¹⁾ | e | e ₁ | L | M _E | M _H | w | Z ⁽¹⁾ 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.

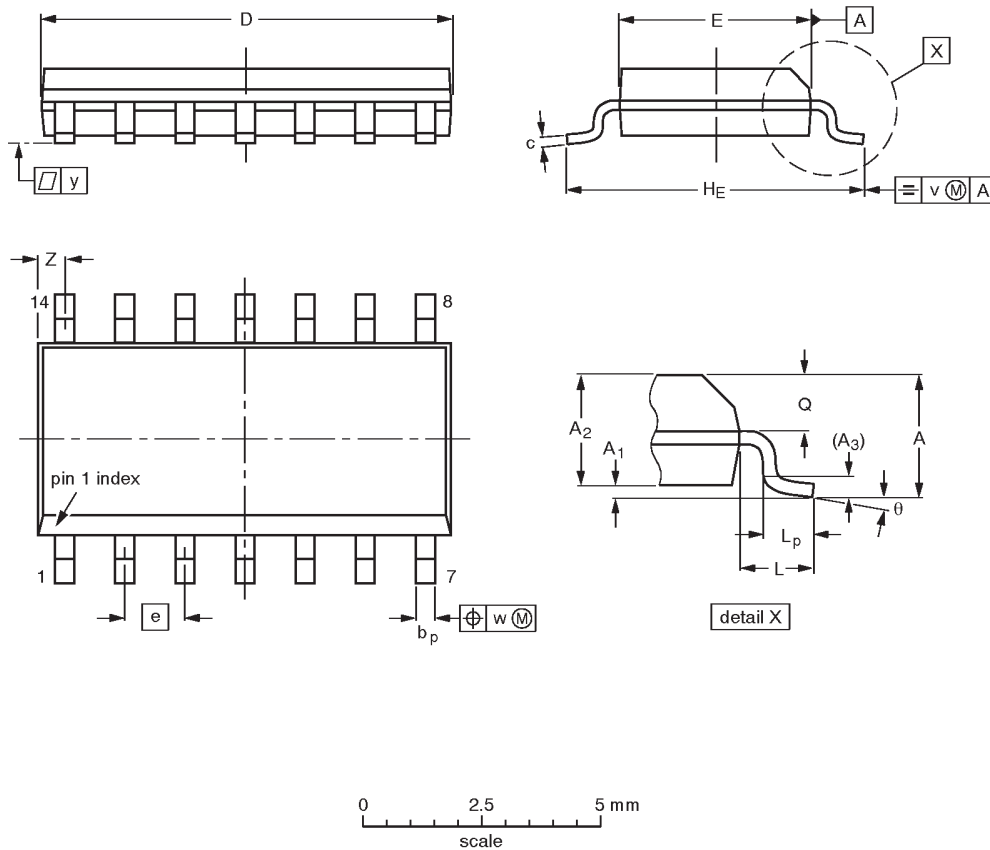
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|----------|------|--|---------------------|----------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT27-1 | 050G04 | MO-001AA | | | | 92-11-17 95-03-11 |

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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 ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽¹⁾ | e | H _E | L | L _p | Q | v | w | y | z ⁽¹⁾ | 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° |
| 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 | 0° |

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> | Formative or in Design | 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> | Preproduction Product | 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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