

# DATA SHEET

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## **74ALS08** Quad 2-Input AND gate

Product specification

1991 Feb 08

IC05 Data Handbook

# Quad 2-input AND gate

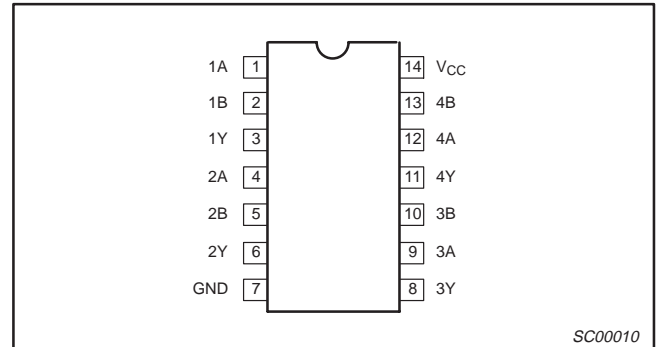
# 74ALS08

| TYPE    | TYPICAL PROPAGATION DELAY | TYPICAL SUPPLY CURRENT (TOTAL) |
|---------|---------------------------|--------------------------------|
| 74ALS08 | 5.0ns                     | 1.8mA                          |

### ORDERING INFORMATION

| DESCRIPTION                 | ORDER CODE  | DRAWING NUMBER |
|-----------------------------|---|----------------|
|                             | COMMERCIAL RANGE<br>V <sub>CC</sub> = 5V ±10%,<br>T <sub>amb</sub> = 0°C to +70°C |                |
| 14-pin plastic DIP          | 74ALS08N  | SOT27-1        |
| 14-pin plastic SO           | 74ALS08D  | SOT108-1       |
| 14-pin plastic SSOP Type II | 74ALS08DB   | SOT337-1       |

### PIN CONFIGURATION

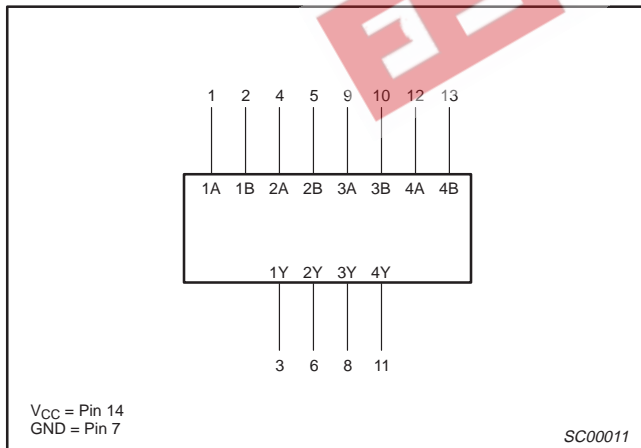


### INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

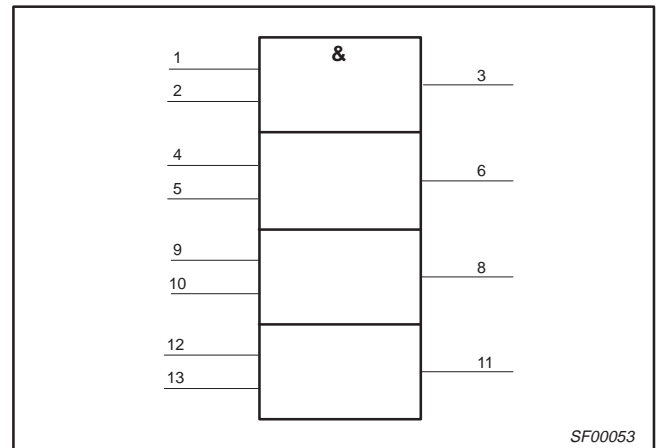
| PINS   | DESCRIPTION  | 74ALS (U.L.) HIGH/LOW | LOAD VALUE HIGH/LOW |
|--------|--------------|-----------------------|---------------------|
| nA, nB | Data inputs  | 1.0/1.0               | 20µA/0.1mA          |
| nY     | Data outputs | 20/80                 | 0.4mA/8mA           |

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

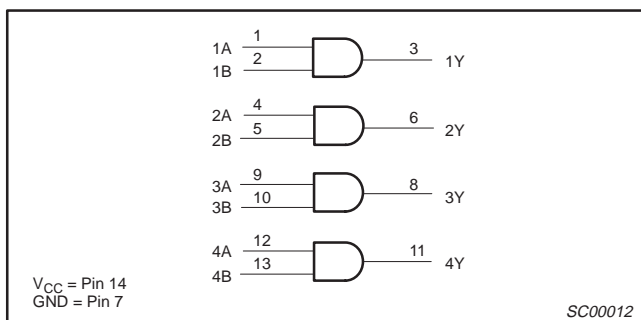
### LOGIC SYMBOL



### 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

## Quad 2-input AND gate

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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 <sup>1</sup>   | LIMITS                |                  |      | UNIT |
|----------|--|--|-----------------------|------------------|------|------|
|          |  |  | MIN                   | TYP <sup>2</sup> | 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               | $V_{CC} = \text{MIN}$ , $V_{IL} = \text{MAX}$ ,<br>$V_{IH} = \text{MIN}$                     | $I_{OL} = 4\text{mA}$ | 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 <sup>3</sup>            | $V_{CC} = \text{MAX}$ , $V_O = 2.25\text{V}$   | -30                   |                  | -112 | mA   |
| $I_{CC}$ | Supply current (total)                 | $V_{CC} = \text{MAX}$  | $V_I = 4.5\text{V}$   | 1.3              | 2.4  | mA   |
|          |  |  | $V_I = 0\text{V}$     | 2.2              | 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 AND gate

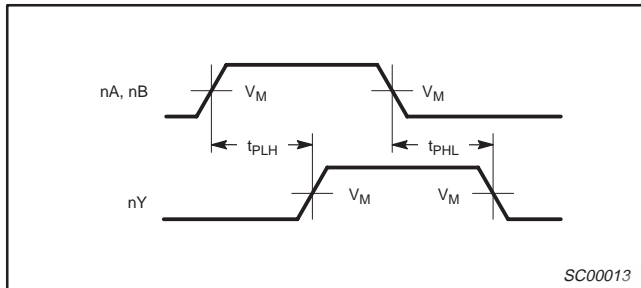
74ALS08

## AC ELECTRICAL CHARACTERISTICS

| SYMBOL                 | PARAMETER                           | TEST CONDITION | LIMITS  |              | UNIT |
|------------------------|-------------------------------------|----------------|---|--------------|------|
|                        |                                     |                | $T_{amb} = 0^{\circ}\text{C to } +70^{\circ}\text{C}$<br>$V_{CC} = +5.0\text{V} \pm 10\%$<br>$C_L = 50\text{pF}, R_L = 500\Omega$ |              |      |
|                        |                                     |                | MIN   | MAX          |      |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation delay<br>nA or nB to nY | Waveform 1     | 2.0<br>3.0  | 14.0<br>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**

**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     |

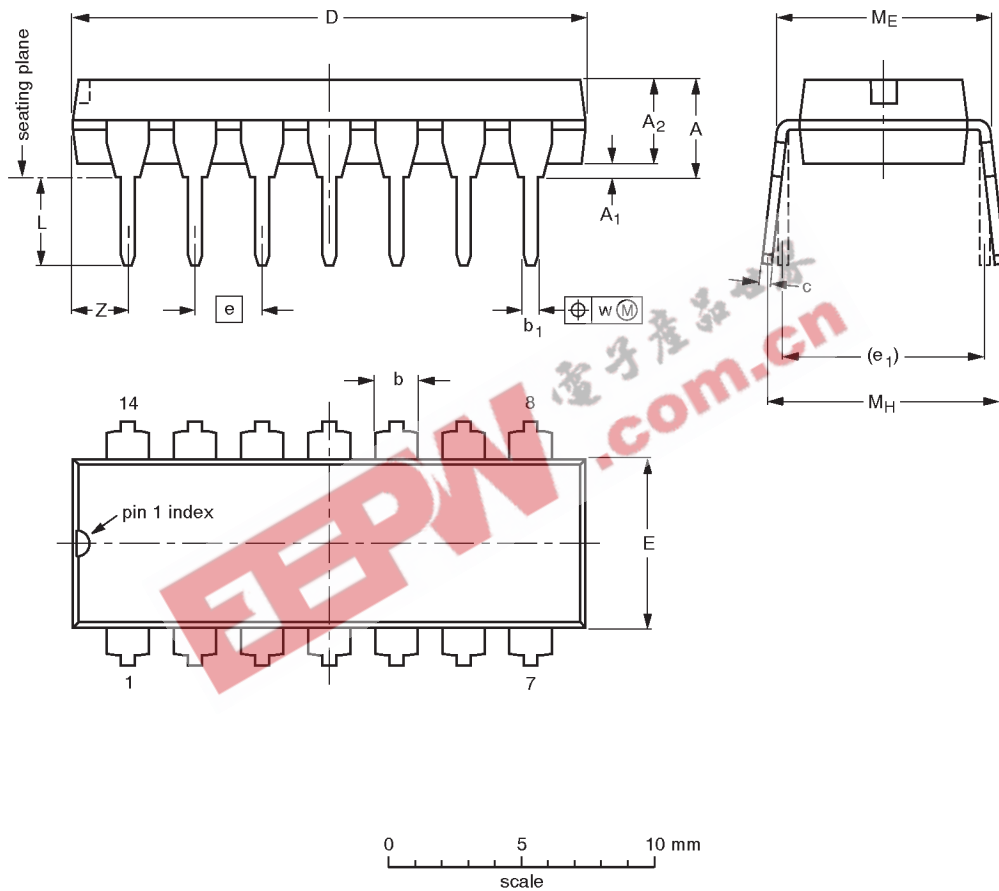
SC00005

Quad 2-input AND 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 <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<br>1.13   | 0.53<br>0.38   | 0.36<br>0.23   | 19.50<br>18.55   | 6.48<br>6.20     | 2.54 | 7.62           | 3.60<br>3.05 | 8.25<br>7.80   | 10.0<br>8.3    | 0.254 | 2.2                   |
| inches | 0.17   | 0.020               | 0.13                | 0.068<br>0.044 | 0.021<br>0.015 | 0.014<br>0.009 | 0.77<br>0.73     | 0.26<br>0.24     | 0.10 | 0.30           | 0.14<br>0.12 | 0.32<br>0.31   | 0.39<br>0.33   | 0.01  | 0.087                 |

Note

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

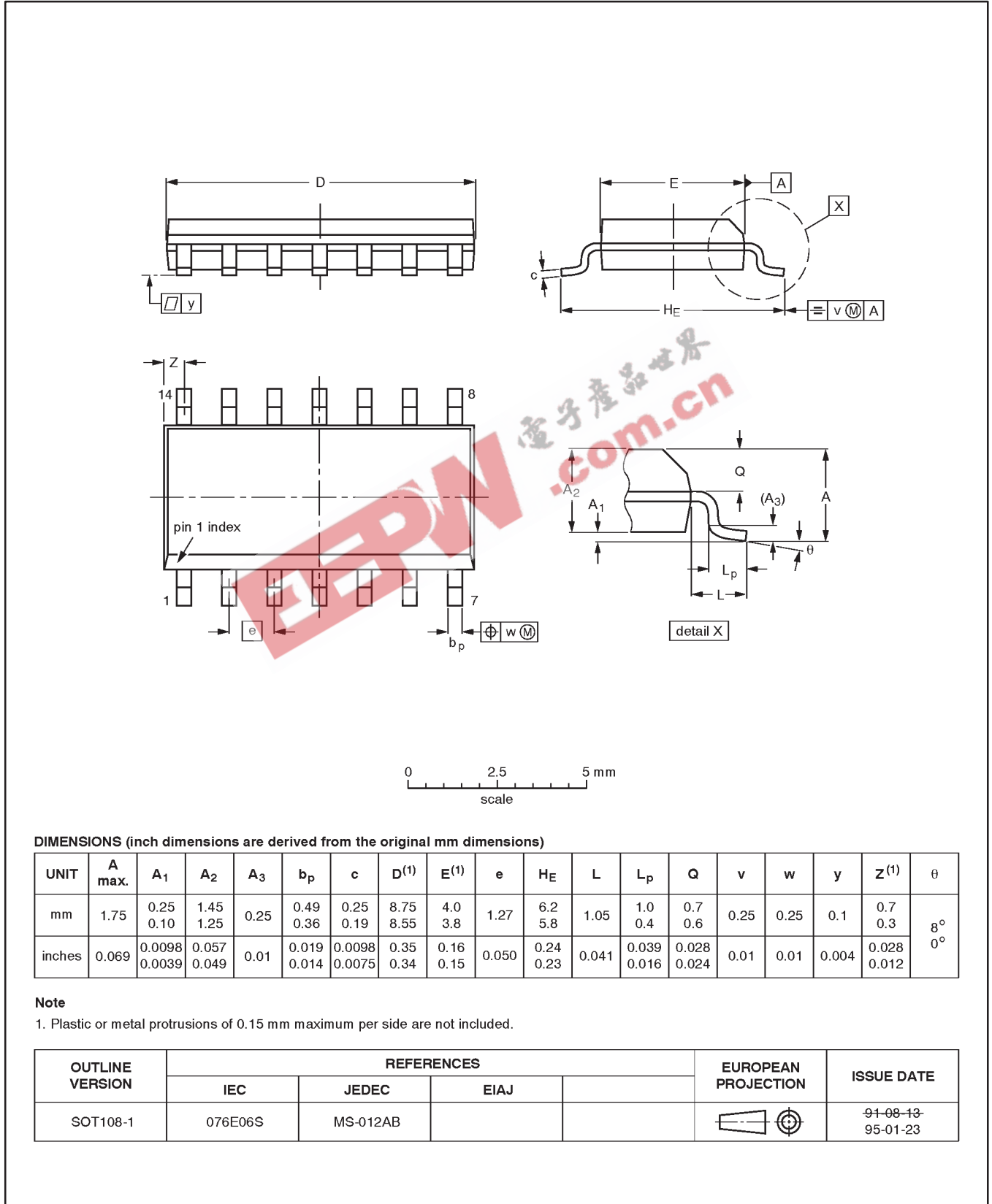
| OUTLINE VERSION | REFERENCES |          |      |  | EUROPEAN PROJECTION | ISSUE DATE           |
|-----------------|------------|----------|------|--|---------------------|----------------------|
|                 | IEC        | JEDEC    | EIAJ |  |                     |                      |
| SOT27-1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

Quad 2-input AND gate

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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<br>0.10     | 1.45<br>1.25   | 0.25           | 0.49<br>0.36   | 0.25<br>0.19     | 8.75<br>8.55     | 4.0<br>3.8       | 1.27  | 6.2<br>5.8     | 1.05  | 1.0<br>0.4     | 0.7<br>0.6     | 0.25 | 0.25 | 0.1   | 0.7<br>0.3       | 8°<br>0° |
| inches | 0.069  | 0.0098<br>0.0039 | 0.057<br>0.049 | 0.01           | 0.019<br>0.014 | 0.0098<br>0.0075 | 0.35<br>0.34     | 0.16<br>0.15     | 0.050 | 0.24<br>0.23   | 0.041 | 0.039<br>0.016 | 0.028<br>0.024 | 0.01 | 0.01 | 0.004 | 0.028<br>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<br>95-01-23 |

## Quad 2-input AND gate

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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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