

# DATA SHEET

**74ALS02**

Quad 2-Input NOR gate

Product specification

1991 Feb 08

IC05 Data Handbook

Quad 2-input NOR gate

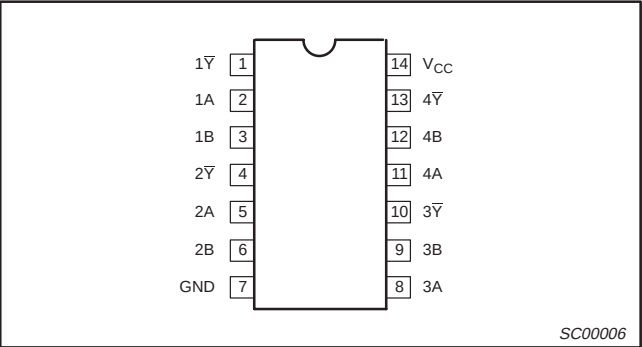
74ALS02

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

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 | 74ALS02N                                                                          | SOT27-1        |
| 14-pin plastic SO  | 74ALS02D                                                                          | SOT108-1       |

PIN CONFIGURATION

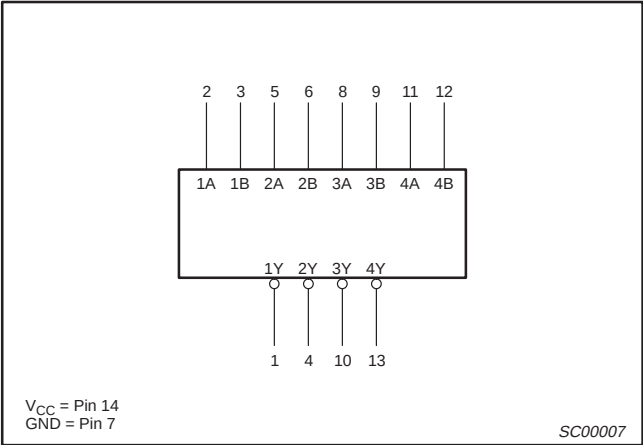


INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

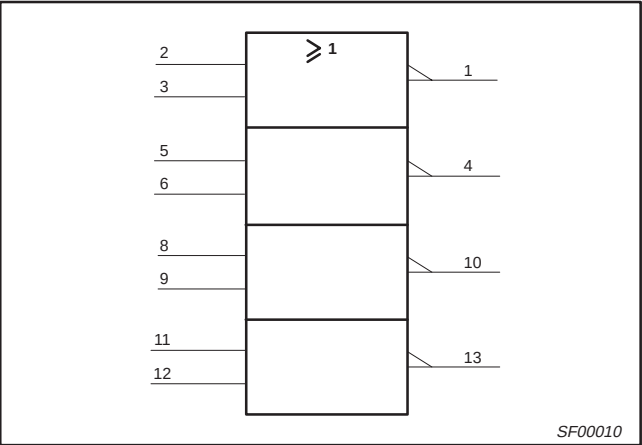
| PINS   | DESCRIPTION | 74ALS (U.L.) HIGH/LOW | LOAD VALUE HIGH/LOW |
|--------|-------------|-----------------------|---------------------|
| nA, nB | Data inputs | 1.0/1.0               | 20µA/0.1mA          |
| nY     | Data output | 20/80                 | 0.4mA/8mA           |

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

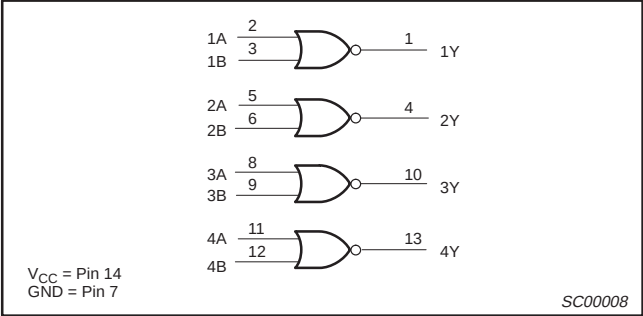
LOGIC SYMBOL



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

## Quad 2-input NOR gate

74ALS02

**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)                 | $I_{CCH}$                                                                                    | $V_I = \text{GND}$    | 0.86             | 2.2  | mA   |
|          |                                        | $I_{CCL}$                                                                                    | $V_I = 4.5\text{V}$   | 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

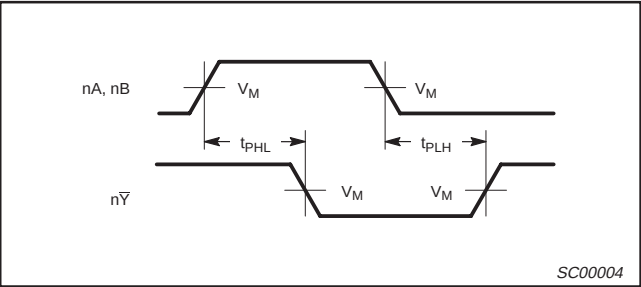
74ALS02

AC ELECTRICAL CHARACTERISTICS

| SYMBOL                 | PARAMETER                         | TEST CONDITION | LIMITS                                                                                                        |              | UNIT |
|------------------------|-----------------------------------|----------------|---------------------------------------------------------------------------------------------------------------|--------------|------|
|                        |                                   |                | $T_{amb} = 0^{\circ}C \text{ to } +70^{\circ}C$<br>$V_{CC} = +5.0V \pm 10\%$<br>$C_L = 50pF, R_L = 500\Omega$ |              |      |
|                        |                                   |                | MIN                                                                                                           | MAX          |      |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation delay<br>nA, nB to nY | Waveform 1     | 2.0<br>2.0                                                                                                    | 12.0<br>10.0 | ns   |

AC WAVEFORMS

For all waveforms,  $V_M = 1.3V$ .



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     |

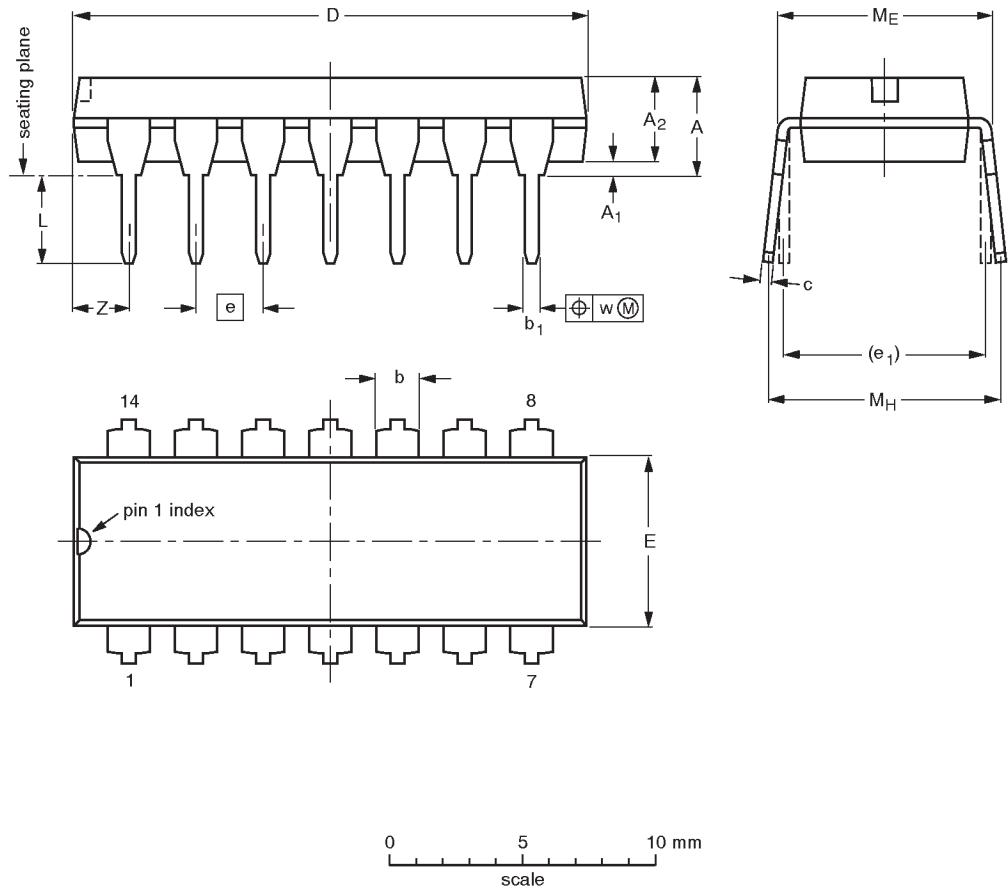
SC00005

Quad 2-input NOR gate

74ALS02

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

SOT27-1



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

| UNIT   | A<br>max. | A <sub>1</sub><br>min. | A <sub>2</sub><br>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><br>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.

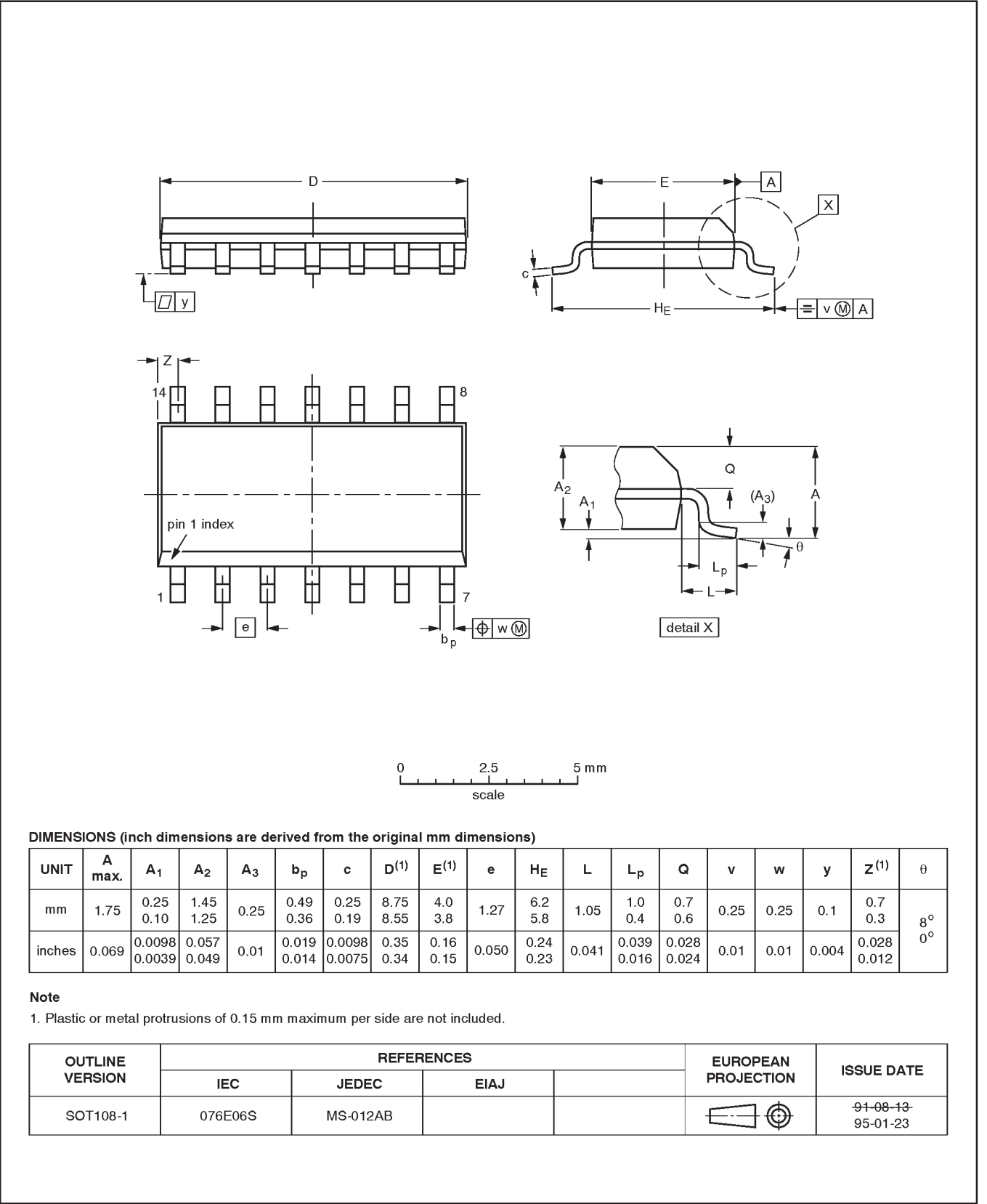
| OUTLINE<br>VERSION | REFERENCES |          |      |  | EUROPEAN<br>PROJECTION | ISSUE DATE           |
|--------------------|------------|----------|------|--|------------------------|----------------------|
|                    | IEC        | JEDEC    | EIAJ |  |                        |         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

Quad 2-input NOR gate

74ALS02

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

SOT108-1



Quad 2–input NOR gate

74ALS02

| DEFINITIONS               |                        |                                                                                                                                                                                                                                                            |
|---------------------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data Sheet Identification | Product Status         | Definition                                                                                                                                                                                                                                                 |
| Objective Specification   | 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.                                                                                                         |
| Preliminary Specification | 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. |
| Product Specification     | Full Production        | This data sheet contains Final Specifications. Philips Semiconductors reserves the right to make changes at any time without notice, in order to improve design and supply the best possible product.                                                      |

Philips Semiconductors and Philips Electronics North America Corporation reserve the right to make changes, without notice, in the products, including circuits, standard cells, and/or software, described or contained herein in order to improve design and/or performance. Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no license or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified. Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

LIFE SUPPORT APPLICATIONS  
Philips Semiconductors and Philips Electronics North America Corporation Products are not designed for use in life support appliances, devices, or systems where malfunction of a Philips Semiconductors and Philips Electronics North America Corporation Product can reasonably be expected to result in a personal injury. Philips Semiconductors and Philips Electronics North America Corporation customers using or selling Philips Semiconductors and Philips Electronics North America Corporation Products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors and Philips Electronics North America Corporation for any damages resulting from such improper use or sale.

Philips Semiconductors  
811 East Arques Avenue  
P.O. Box 3409  
Sunnyvale, California 94088–3409  
Telephone 800-234-7381

© Copyright Philips Electronics North America Corporation 1997  
All rights reserved. Printed in U.S.A.

print code

Document order number:

Date of release: 05-96

Let's make things better.