

# DATA SHEET

**CBT3257**

Quad 1-of-2 multiplexer/demultiplexer

Product data  
Supersedes data of 27 Sep 2002

2002 Dec 13

# Quad 1-of-2 multiplexer/demultiplexer

**CBT3257**

## FEATURES

- 5  $\Omega$  switch connection between two ports
- TTL-compatible input levels
- Minimal propagation delay through the switch
- Latch-up protection exceeds 500 mA per JESD78
- ESD protection exceeds 2000 V HBM per JESD22-A114, 200 V MM per JESD22-A115 and 1000 V CDM per JESD22-C101

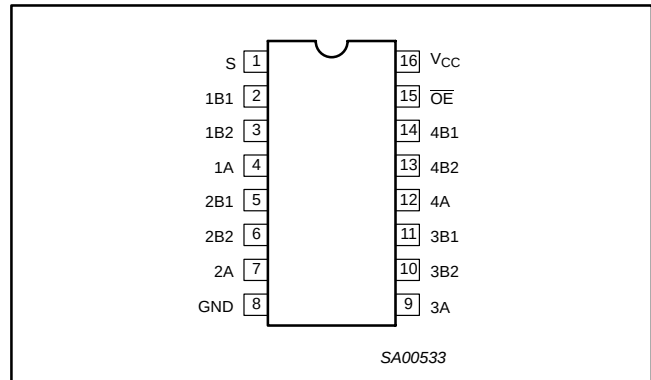
## DESCRIPTION

The CBT3257 is a quad 1-of-2 high-speed TTL-compatible multiplexer/demultiplexer. The low on resistance of the switch allows inputs to be connected to outputs without adding propagation delay or generating additional ground bounce noise.

Output Enable ( $\overline{OE}$ ) and select-control (S) inputs select the appropriate B1 and B2 outputs for the A-input data.

The CBT3257 is characterized for operation from -40 to +85 °C.

## PIN CONFIGURATION



## PIN DESCRIPTION

| PIN NUMBER                 | SYMBOL                                 | NAME AND FUNCTION       |
|----------------------------|----------------------------------------|-------------------------|
| 1                          | S                                      | Select-control input    |
| 2, 3, 5, 6, 10, 11, 13, 14 | 1B1, 1B2, 2B1, 2B2, 3B1, 3B2, 4B1, 4B2 | B outputs               |
| 4, 7, 9, 12                | 1A, 2A, 3A, 4A                         | A inputs                |
| 8                          | GND                                    | Ground (0 V)            |
| 15                         | $\overline{OE}$                        | Output enable           |
| 16                         | V <sub>CC</sub>                        | Positive supply voltage |

## ORDERING INFORMATION

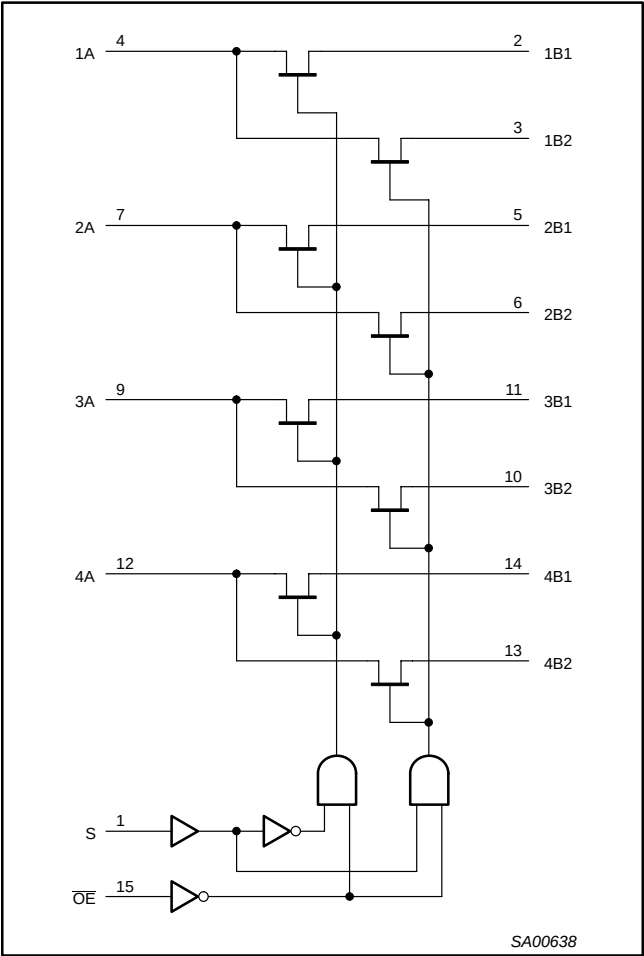
| PACKAGES                   | TEMPERATURE RANGE | ORDER CODE | TOPSIDE MARK | DWG NUMBER |
|----------------------------|-------------------|------------|--------------|------------|
| 16-pin plastic SO          | -40 to 85 °C      | CBT3257D   | CBT3257D     | SOT109-1   |
| 16-pin plastic SSOP        | -40 to 85 °C      | CBT3257DB  | CT3257       | SOT338-1   |
| 16-pin plastic SSOP (QSOP) | -40 to 85 °C      | CBT3257DS  | CBT3257      | SOT519-1   |
| 16-pin plastic TSSOP       | -40 to 85 °C      | CBT3257PW  | CBT3257      | SOT403-1   |

Standard packing quantities and other packaging data is available at [www.philipslogic.com/packaging](http://www.philipslogic.com/packaging).

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LOGIC DIAGRAM (positive logic)



FUNCTION TABLE

| INPUTS |   | FUNCTION         |
|--------|---|------------------|
| OE     | S |                  |
| L      | L | A port = B1 port |
| L      | H | A port = B2 port |
| H      | X | Disconnect       |

## Quad 1-of-2 multiplexer/demultiplexer

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ABSOLUTE MAXIMUM RATINGS<sup>1</sup>

| SYMBOL    | PARAMETER                     | CONDITIONS    | RATING       | UNIT |
|-----------|-------------------------------|---------------|--------------|------|
| $V_{CC}$  | DC supply voltage             |               | -0.5 to +7.0 | V    |
| $V_I$     | DC input voltage <sup>2</sup> |               | -0.5 to +7.0 | V    |
|           | Continuous channel current    |               | 128          | mA   |
| $I_K$     | Input clamp current           | $V_{I/O} < 0$ | -50          | mA   |
| $T_{stg}$ | Storage temperature range     |               | -65 to +150  | °C   |

## NOTES:

- Stresses beyond those listed 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.
- The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

## RECOMMENDED OPERATING CONDITIONS

| SYMBOL    | PARAMETER                            | LIMITS |     | UNIT |
|-----------|--------------------------------------|--------|-----|------|
|           |                                      | MIN    | MAX |      |
| $V_{CC}$  | DC supply voltage                    | 4.5    | 5.5 | V    |
| $V_{IH}$  | High-level input voltage             | 2.0    | —   | V    |
| $V_{IL}$  | Low-level Input voltage              | —      | 0.8 | V    |
| $T_{amb}$ | Operating free-air temperature range | -40    | +85 | °C   |

## NOTE:

- All unused control inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation.

## DC ELECTRICAL CHARACTERISTICS

| SYMBOL                       | PARAMETER                                            |        | TEST CONDITIONS                                                                      | LIMITS                           |                  |      | UNIT |
|------------------------------|------------------------------------------------------|--------|--------------------------------------------------------------------------------------|----------------------------------|------------------|------|------|
|                              |                                                      |        |                                                                                      | T <sub>amb</sub> = -40 to +85 °C |                  |      |      |
|                              |                                                      |        |                                                                                      | MIN                              | TYP <sup>1</sup> | MAX  |      |
| V <sub>IK</sub>              | Input clamp voltage                                  |        | V <sub>CC</sub> = 4.5 V; I <sub>I</sub> = -18 mA                                     | —                                | —                | -1.2 | V    |
| V <sub>P</sub>               | Pass voltage                                         |        | V <sub>I</sub> = V <sub>CC</sub> = 5.0 V; I/O = -100 mA                              | 3.4                              | 3.6              | 3.9  | V    |
| I <sub>I</sub>               | Input leakage current                                |        | V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = GND or 5.5 V                               | —                                | —                | ±1   | μA   |
| I <sub>CC</sub>              | Quiescent supply current                             |        | V <sub>CC</sub> = 5.5 V; I <sub>O</sub> = 0, V <sub>I</sub> = V <sub>CC</sub> or GND | —                                | —                | 3    | μA   |
| ΔI <sub>CC</sub>             | Additional supply current per input pin <sup>2</sup> |        | V <sub>CC</sub> = 5.5 V, one input at 3.4 V, other inputs at V <sub>CC</sub> or GND  | —                                | —                | 2.5  | mA   |
| C <sub>I</sub>               | Control pins                                         |        | V <sub>I</sub> = 3 V or 0                                                            | —                                | 3.3              | —    | pF   |
| C <sub>IO(OFF)</sub>         | Power-off leakage current                            | A port | V <sub>O</sub> = 3 V or 0; $\overline{OE}$ = V <sub>CC</sub>                         | —                                | 9.9              | —    | pF   |
|                              |                                                      | B port | V <sub>O</sub> = 3 V or 0; $\overline{OE}$ = V <sub>CC</sub>                         | —                                | 6.4              | —    | pF   |
| r <sub>on</sub> <sup>3</sup> | On-resistance                                        |        | V <sub>CC</sub> = 4.5 V; V <sub>I</sub> = 0V; I <sub>I</sub> = 64 mA                 | —                                | 5                | 7    | Ω    |
|                              |                                                      |        | V <sub>CC</sub> = 4.5 V; V <sub>I</sub> = 0V; I <sub>I</sub> = 30 mA                 | —                                | 5                | 7    | Ω    |
|                              |                                                      |        | V <sub>CC</sub> = 4.5 V; V <sub>I</sub> = 2.4 V; I <sub>I</sub> = 15 mA              | —                                | 10               | 15   | Ω    |

## NOTES:

- All typical values are at  $V_{CC} = 5 \text{ V}$ ,  $T_{amb} = 25 \text{ }^{\circ}\text{C}$ .
- This is the increase in supply current for each input that is at the specified TTL voltage level rather than  $V_{CC}$  or GND.
- Measured by the voltage drop between the A and the B terminals at the indicated current through the switch. On-state resistance is determined by the lowest voltage of the two (A or B) terminals.

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AC CHARACTERISTICS

T<sub>amb</sub> = -40 to +85 °C; C<sub>L</sub> = 50 pF

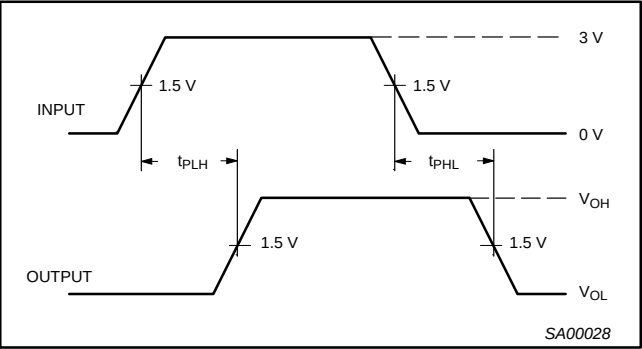
| SYMBOL           | PARAMETER                                   | FROM (INPUT)           | TO (OUTPUT) | LIMITS                          |      | UNIT |
|------------------|---------------------------------------------|------------------------|-------------|---------------------------------|------|------|
|                  |                                             |                        |             | V <sub>CC</sub> = +5.0 V ±0.5 V |      |      |
|                  |                                             |                        |             | MIN                             | MAX  |      |
| t <sub>pd</sub>  | Propagation delay <sup>1</sup>              | A or B                 | B or A      | —                               | 0.25 | ns   |
| t <sub>pd</sub>  | Propagation delay                           | S                      | A           | 1.6                             | 5.0  | ns   |
| t <sub>en</sub>  | Output enable time to High and Low level    | $\overline{\text{OE}}$ | A or B      | 1.8                             | 5.1  | ns   |
|                  |                                             | S                      | B           | 1.6                             | 5.2  | ns   |
| t <sub>dis</sub> | Output disable time from High and Low level | $\overline{\text{OE}}$ | A or B      | 2.2                             | 5.5  | ns   |
|                  |                                             | S                      | B           | 1.0                             | 5.0  | ns   |

NOTE:

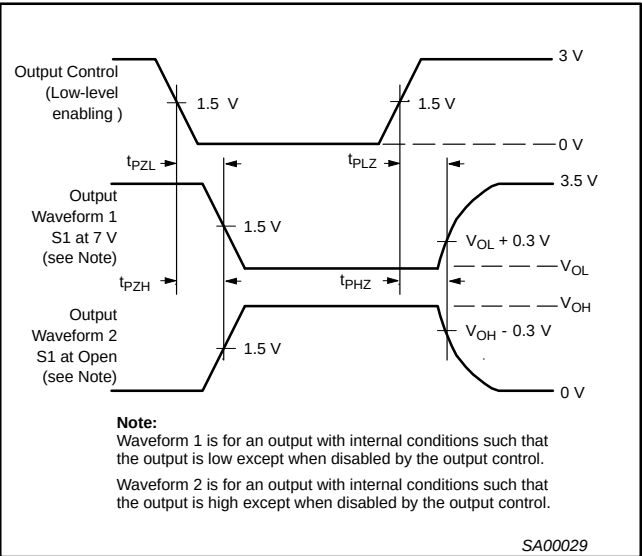
1. The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).

AC WAVEFORMS

V<sub>M</sub> = 1.5 V, V<sub>IN</sub> = GND to 3.0 V



Waveform 1. Input to Output Propagation Delays

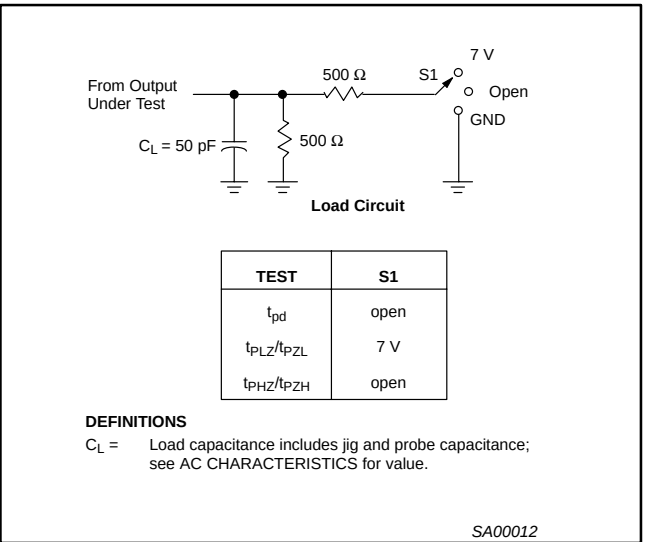


Waveform 2. 3-State Output Enable and Disable Times

NOTES:

1. t<sub>PLZ</sub> and t<sub>PHZ</sub> are the same as t<sub>dis</sub>.  
2. t<sub>PZL</sub> and t<sub>PZH</sub> are the same as t<sub>en</sub>.  
3. t<sub>PLH</sub> and t<sub>PHL</sub> are the same as t<sub>pd</sub>.

TEST CIRCUIT AND WAVEFORMS



DEFINITIONS

C<sub>L</sub> = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

NOTES:

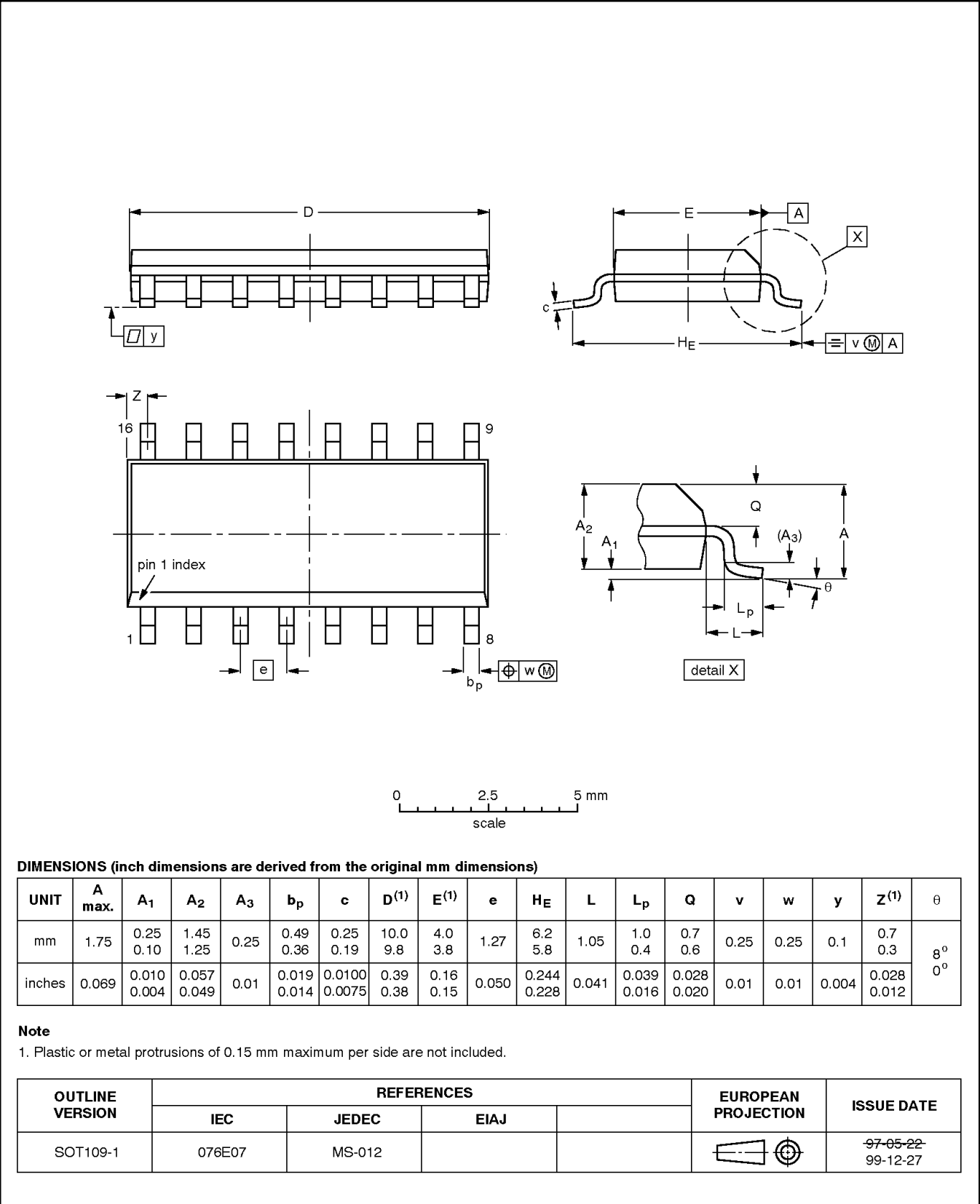
1. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z<sub>O</sub> = 50 Ω, t<sub>r</sub> ≤ 2.5 ns, t<sub>f</sub> ≤ 2.5 ns.  
2. The outputs are measured one at a time with one transition per measurement.

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SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1

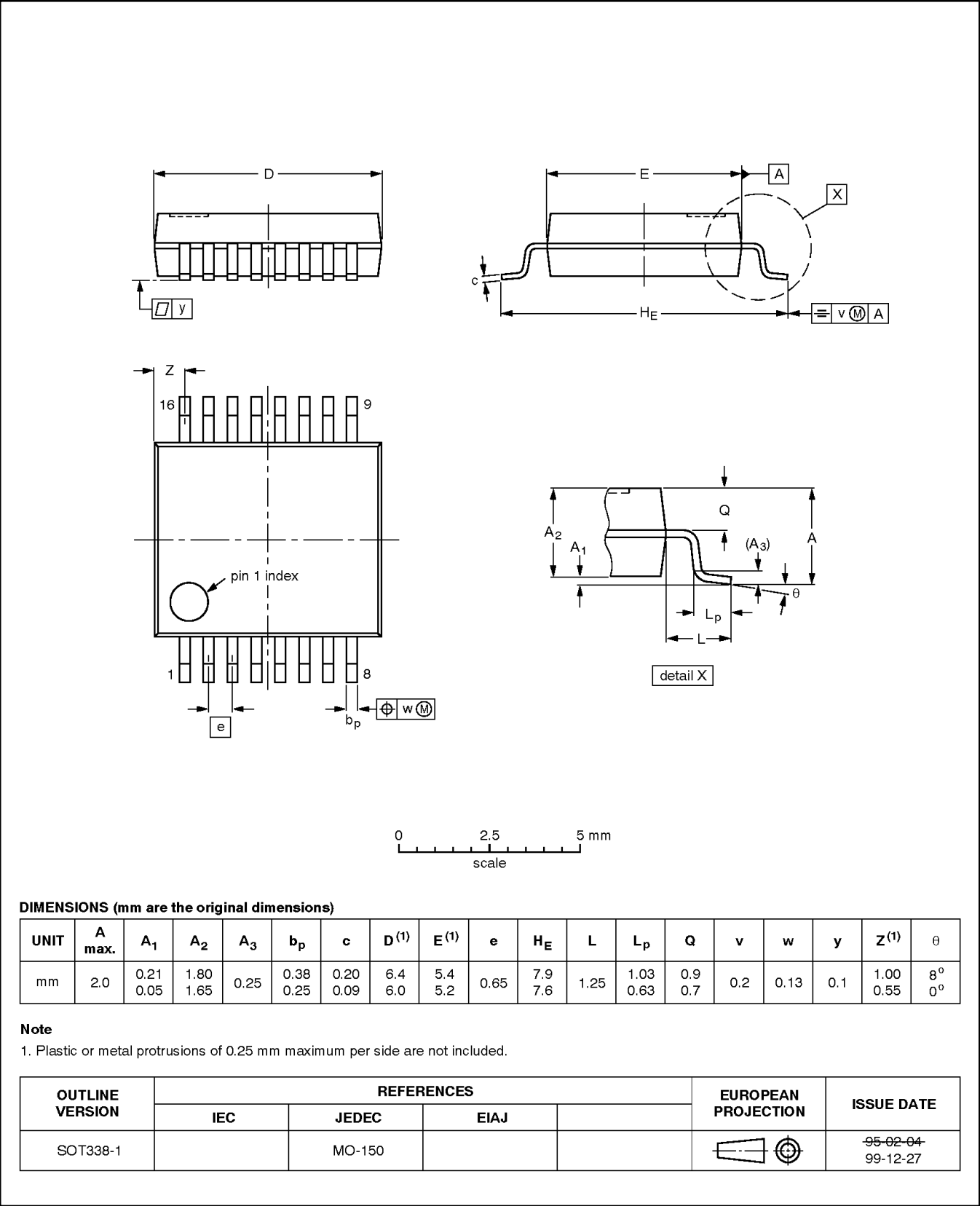


Quad 1-of-2 multiplexer/demultiplexer

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SSOP16: plastic shrink small outline package; 16 leads; body width 5.3 mm

SOT338-1

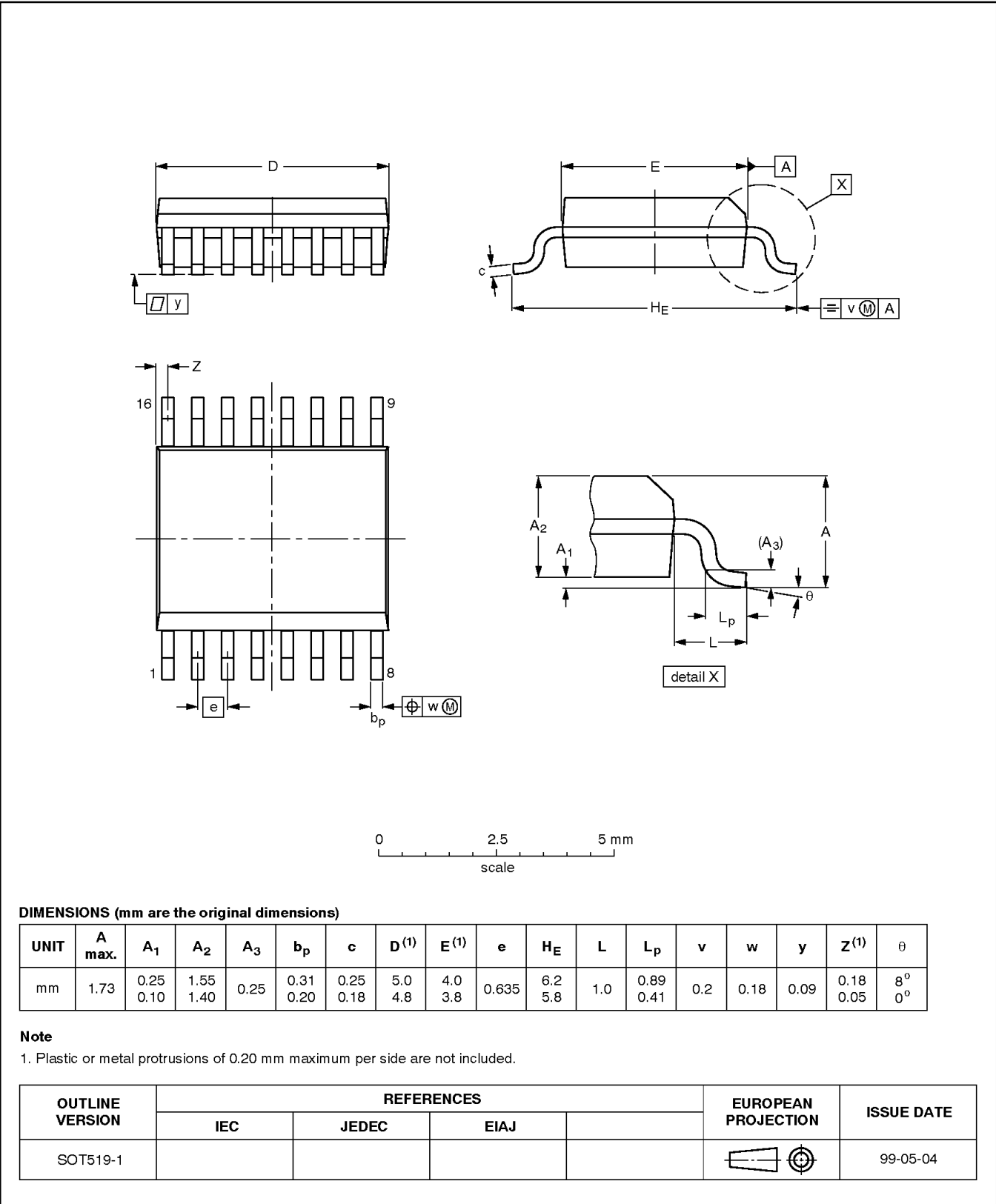


Quad 1-of-2 multiplexer/demultiplexer

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SSOP16: plastic shrink small outline package; 16 leads;  
body width 3.9 mm; lead pitch 0.635 mm

SOT519-1



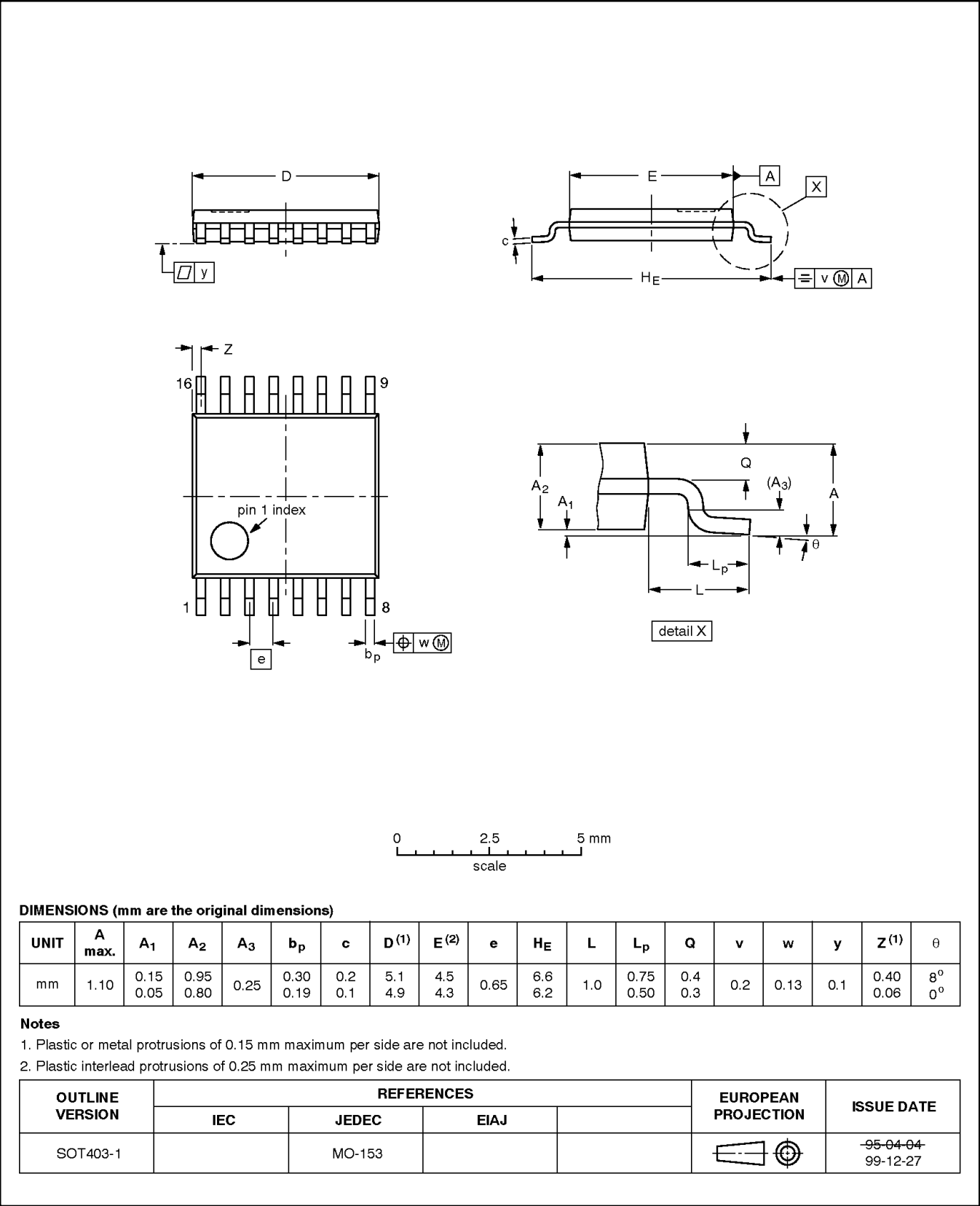


Quad 1-of-2 multiplexer/demultiplexer

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TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm

SOT403-1



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Quad 1-of-2 multiplexer/demultiplexer

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**REVISION HISTORY**

| Rev | Date     | Description                                                                                                                                                                      |
|-----|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| _2  | 20021213 | Product data (9397 750 10869); ECN 853-2381 29158 of 06 November 2002.<br>Modifications: <ul style="list-style-type: none"><li>• Corrections to Block Diagram graphic.</li></ul> |
| _1  | 20020927 | Product data (9397 750 10332); ECN 853-2381 28892 of 27 September 2002.                                                                                                          |

## Quad 1-of-2 multiplexer/demultiplexer

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## Data sheet status

| Level | Data sheet status <sup>[1]</sup> | Product status <sup>[2] [3]</sup> | Definitions                                                                                                                                                                                                                                                                                    |
|-------|----------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I     | Objective data                   | Development                       | This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.                                                                                                    |
| II    | Preliminary data                 | Qualification                     | This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.             |
| III   | Product data                     | Production                        | This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN). |

[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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## Contact information

For additional information please visit

<http://www.semiconductors.philips.com>. Fax: +31 40 27 24825

For sales offices addresses send e-mail to:

[sales.addresses@www.semiconductors.philips.com](mailto:sales.addresses@www.semiconductors.philips.com).

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Date of release: 12-02

Document order number:

9397 750 10869

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