

DATA SHEET

CBTS3257

Quad 1-of-2 multiplexer/demultiplexer
with Schottky diode

Product data

2002 Sep 27

Quad 1-of-2 multiplexer/demultiplexer with Schottky diode

CBTS3257

FEATURES

- 5 Ω switch connection between two ports
- TTL-compatible input levels
- Schottky diodes on I/O clamp undershoot
- 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

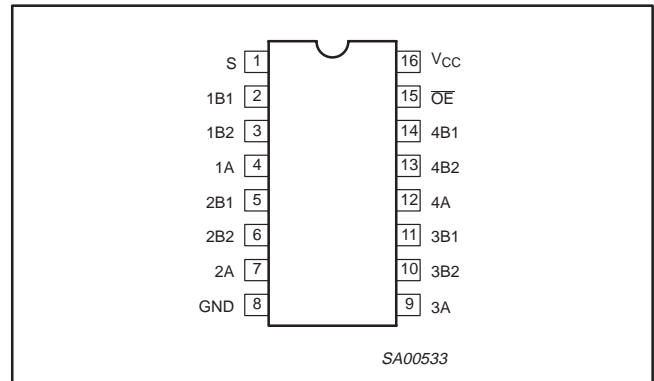
The CBTS3257 is a quad 1-of-2 high-speed TTL-compatible multiplexer/demultiplexer. The low on resistance of the switch allows inputs to be connected to outputs without adding propagation delay or generating additional ground bounce noise.

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

Internal Schottky diode provides I/O undershoot protection.

The CBTS3257 is characterized for operation from -40 to $+85$ $^{\circ}\text{C}$.

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_{CC} | Positive supply voltage |

ORDERING INFORMATION

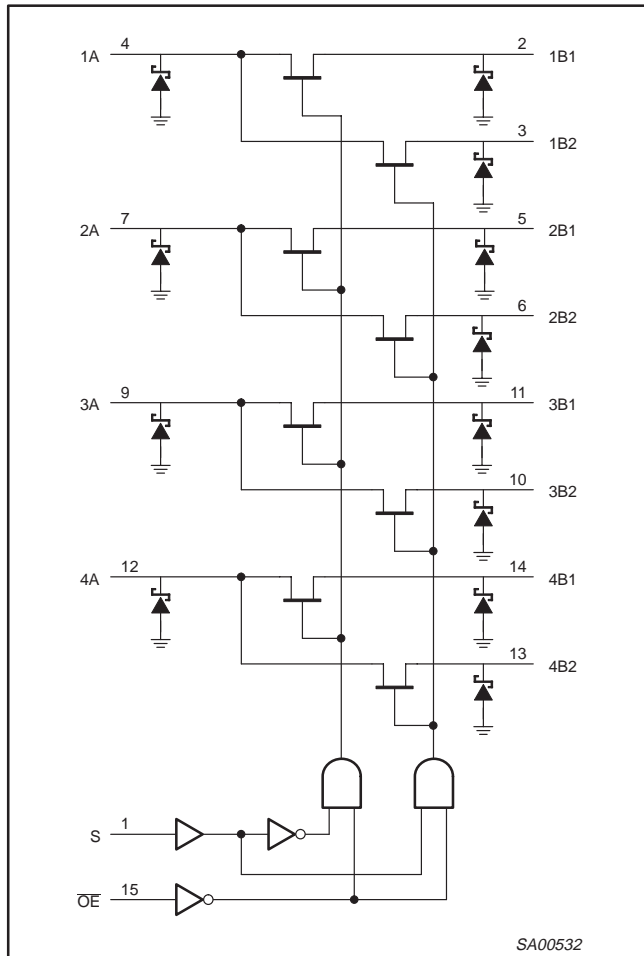
| PACKAGES | TEMPERATURE RANGE | ORDER CODE | TOPSIDE MARK | DWG NUMBER |
|----------------------------|----------------------------------|------------|--------------|------------|
| 16-pin plastic SO | -40 to 85 $^{\circ}\text{C}$ | CBTS3257D | CBTS3257D | SOT109-1 |
| 16-pin plastic SSOP | -40 to 85 $^{\circ}\text{C}$ | CBTS3257DB | CS3257 | SOT338-1 |
| 16-pin plastic SSOP (QSOP) | -40 to 85 $^{\circ}\text{C}$ | CBTS3257DS | CBS3257 | SOT519-1 |
| 16-pin plastic TSSOP | -40 to 85 $^{\circ}\text{C}$ | CBTS3257PW | CBS3257 | SOT403-1 |

Standard packing quantities and other packaging data is available at www.philipslogic.com/packaging.

Quad 1-of-2 multiplexer/demultiplexer with Schottky diode

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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 |

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ABSOLUTE MAXIMUM RATINGS¹

| SYMBOL | PARAMETER | CONDITIONS | RATING | UNIT |
|-----------|-------------------------------|---------------|--------------|------|
| V_{CC} | DC supply voltage | | -0.5 to +7.0 | V |
| V_I | DC input voltage ² | | -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 |
|-----------------|--|----------------|--|--|------------------|------|------|
| | | | | $T_{amb} = -40 \text{ to } +85 \text{ °C}$ | | | |
| | | | | MIN | TYP ¹ | MAX | |
| V_{IK} | Input clamp voltage | A or B inputs | $V_{CC} = 4.5 \text{ V}; I_I = -18 \text{ mA}$ | — | — | -0.8 | V |
| | | Control inputs | | — | — | -1.2 | V |
| V_P | Pass voltage | | $V_I = V_{CC} = 5.0 \text{ V}; I/O = -100 \text{ mA}$ | 3.4 | 3.6 | 3.9 | V |
| I_I | Input leakage current | | $V_{CC} = 5.5 \text{ V}; V_I = \text{GND or } 5.5 \text{ V}$ | — | — | ±1 | μA |
| I_{CC} | Quiescent supply current | | $V_{CC} = 5.5 \text{ V}; I_O = 0, V_I = V_{CC} \text{ or GND}$ | — | — | 3 | μA |
| ΔI_{CC} | Additional supply current per input pin ² | | $V_{CC} = 5.5 \text{ V}$, one input at 3.4 V, other inputs at V_{CC} or GND | — | — | 2.5 | mA |
| C_I | Control pins capacitance | | $V_I = 3 \text{ V or } 0$ | — | 3.3 | — | pF |
| $C_{IO(OFF)}$ | Off capacitance | A port | $V_O = 3 \text{ V or } 0; \overline{OE} = V_{CC}$ | — | 9.9 | — | pF |
| | | B port | $V_O = 3 \text{ V or } 0; \overline{OE} = V_{CC}$ | — | 6.4 | — | pF |
| r_{on}^3 | On-resistance | | $V_{CC} = 4.5 \text{ V}; V_I = 0\text{V}; I_I = 64 \text{ mA}$ | — | 5 | 7 | Ω |
| | | | $V_{CC} = 4.5 \text{ V}; V_I = 0\text{V}; I_I = 30 \text{ mA}$ | — | 5 | 7 | Ω |
| | | | $V_{CC} = 4.5 \text{ V}; V_I = 2.4 \text{ V}; I_I = 15 \text{ mA}$ | — | 10 | 15 | Ω |

NOTES:

- All typical values are at $V_{CC} = 5 \text{ V}$, $T_{amb} = 25 \text{ °C}$.
- 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

$T_{amb} = -40$ to $+85$ °C; $C_L = 50$ pF

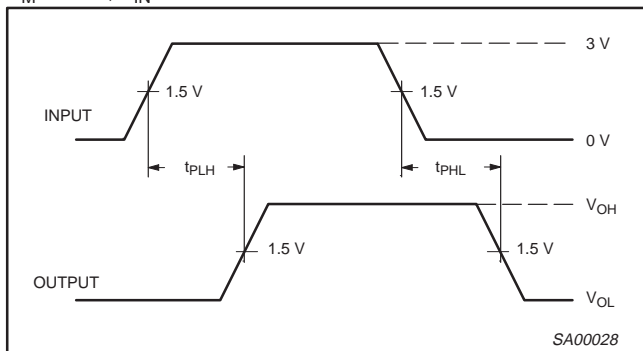
| SYMBOL | PARAMETER | FROM (INPUT) | TO (OUTPUT) | LIMITS | | UNIT |
|-----------|---|-----------------|-------------|-----------------------------|------|------|
| | | | | $V_{CC} = +5.0 V \pm 0.5 V$ | | |
| | | | | MIN | MAX | |
| t_{pd} | Propagation delay ¹ | A or B | B or A | — | 0.25 | ns |
|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

NOTE:

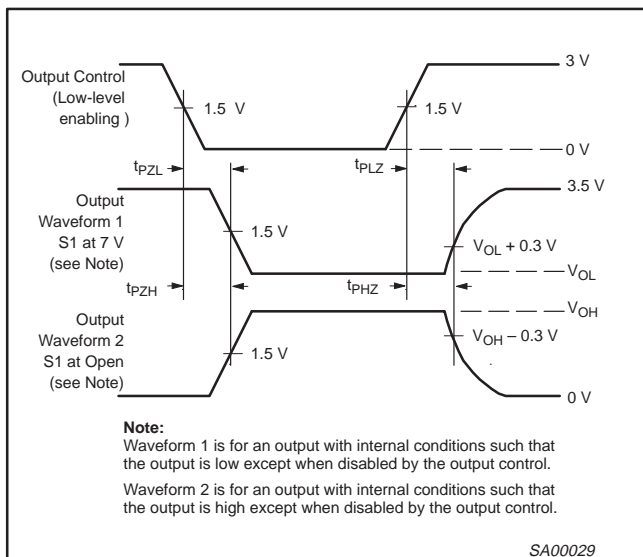
1. The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).

AC WAVEFORMS

$V_M = 1.5 V$, $V_{IN} = GND$ to $3.0 V$



Waveform 1. Input to Output Propagation Delays



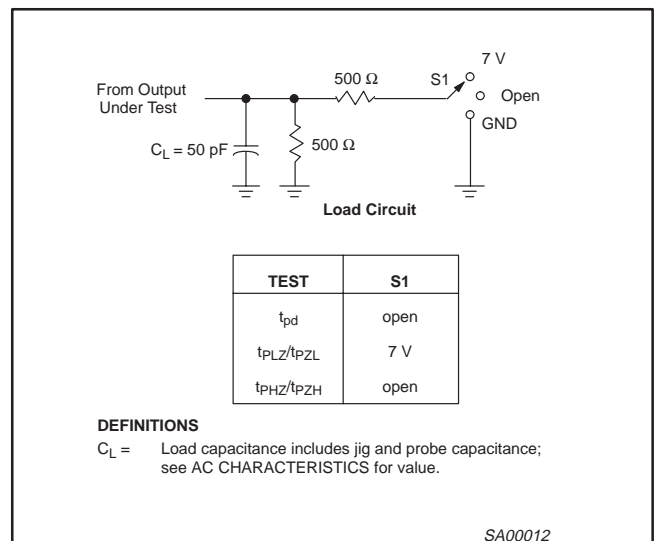
Note:
 Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control.
 Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.

Waveform 2. 3-State Output Enable and Disable Times

NOTES:

1. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
2. t_{PZL} and t_{PZH} are the same as t_{en} .
3. t_{PLH} and t_{PHL} are the same as t_{pd} .

TEST CIRCUIT AND WAVEFORMS



NOTES:

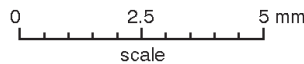
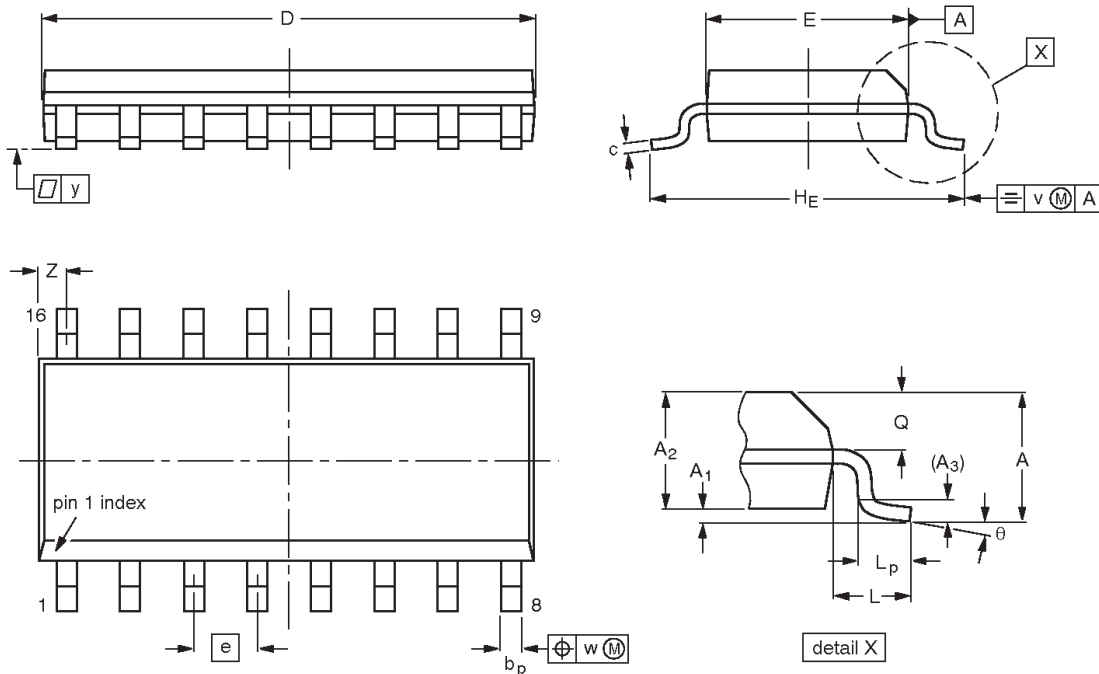
1. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10$ MHz, $Z_O = 50 \Omega$, $t_r \leq 2.5$ ns, $t_f \leq 2.5$ ns.
2. The outputs are measured one at a time with one transition per measurement.

Quad 1-of-2 multiplexer/demultiplexer with Schottky diode

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

SOT109-1



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 | 10.0 9.8 | 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 | 0.010 0.004 | 0.057 0.049 | 0.01 | 0.019 0.014 | 0.0100 0.0075 | 0.39 0.38 | 0.16 0.15 | 0.050 | 0.244 0.228 | 0.041 | 0.039 0.016 | 0.028 0.020 | 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.

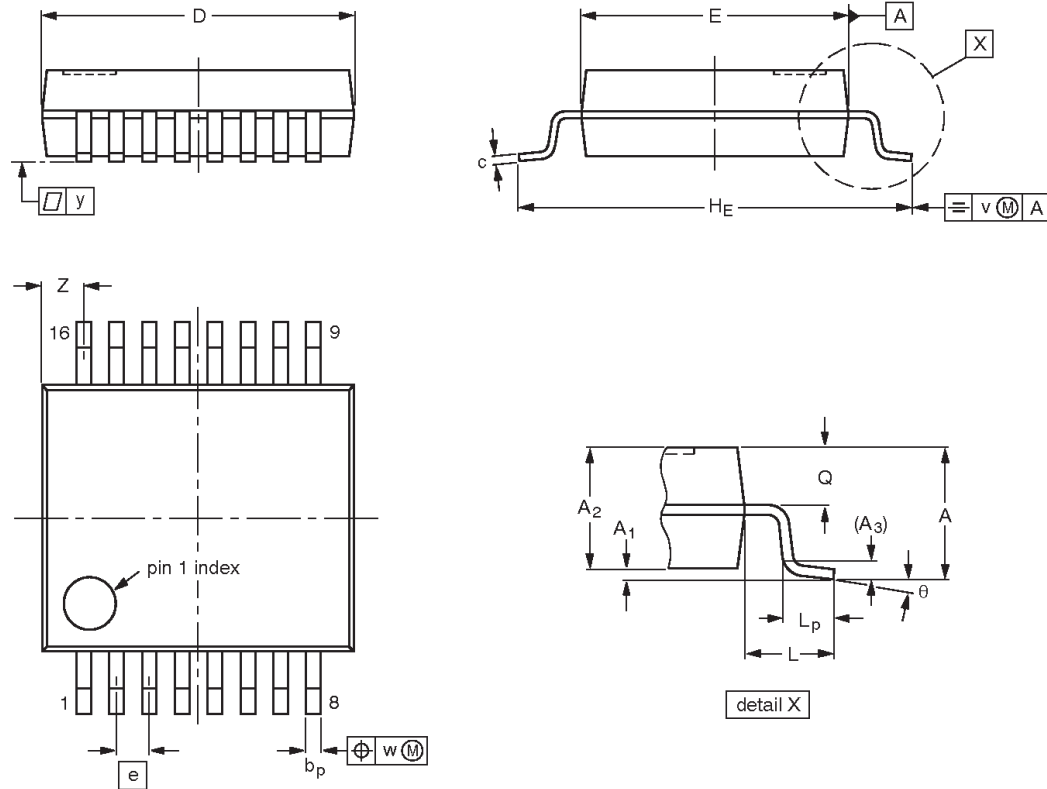
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|------|--|---------------------|-----------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT109-1 | 076E07 | MS-012 | | | | 97-05-22- 99-12-27 |

Quad 1-of-2 multiplexer/demultiplexer with Schottky diode

CBTS3257

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

SOT338-1



DIMENSIONS (mm are the original 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 | 2.0 | 0.21 0.05 | 1.80 1.65 | 0.25 | 0.38 0.25 | 0.20 0.09 | 6.4 6.0 | 5.4 5.2 | 0.65 | 7.9 7.6 | 1.25 | 1.03 0.63 | 0.9 0.7 | 0.2 | 0.13 | 0.1 | 1.00 0.55 | 8° 0° |

Note

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

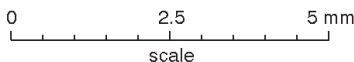
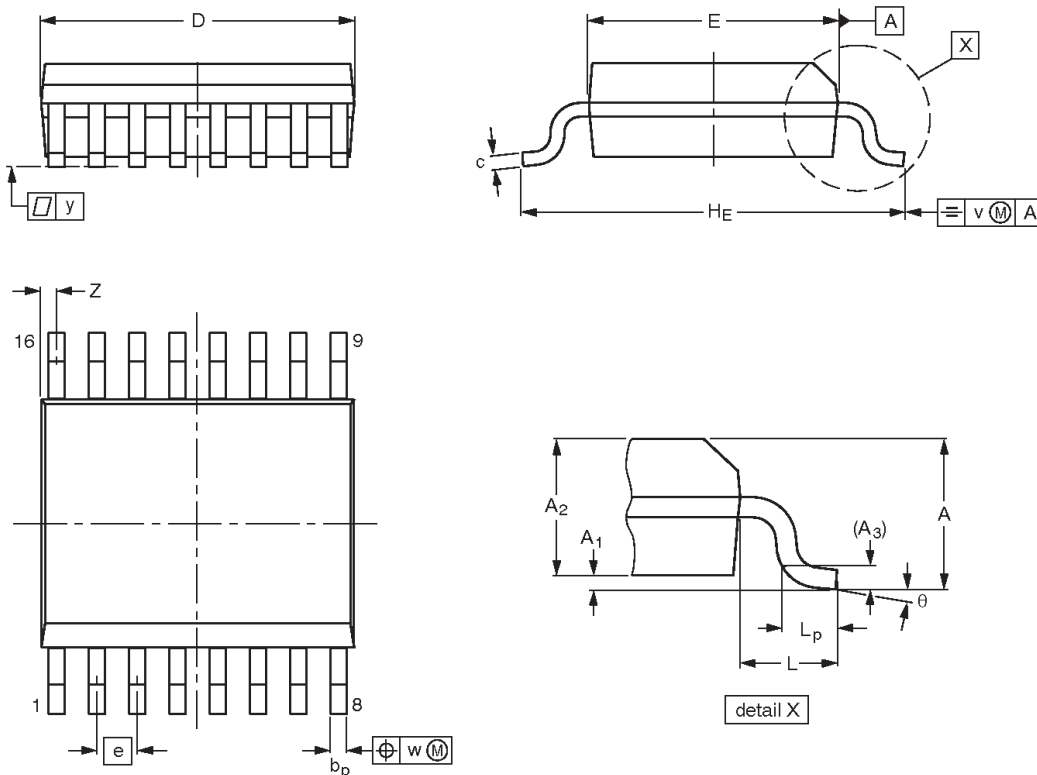
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|------|--|---------------------|----------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT338-1 | | MO-150 | | | | 95-02-04 99-12-27 |

Quad 1-of-2 multiplexer/demultiplexer with Schottky diode

CBTS3257

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

SOT519-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽¹⁾ | e | H _E | L | L _p | v | w | y | Z ⁽¹⁾ | θ |
|------|--------|----------------|----------------|----------------|----------------|--------------|------------------|------------------|-------|----------------|-----|----------------|-----|------|------|------------------|----------|
| mm | 1.73 | 0.25 0.10 | 1.55 1.40 | 0.25 | 0.31 0.20 | 0.25 0.18 | 5.0 4.8 | 4.0 3.8 | 0.635 | 6.2 5.8 | 1.0 | 0.89 0.41 | 0.2 | 0.18 | 0.09 | 0.18 0.05 | 8° 0° |

Note

1. Plastic or metal protrusions of 0.20 mm maximum per side are not included.

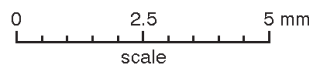
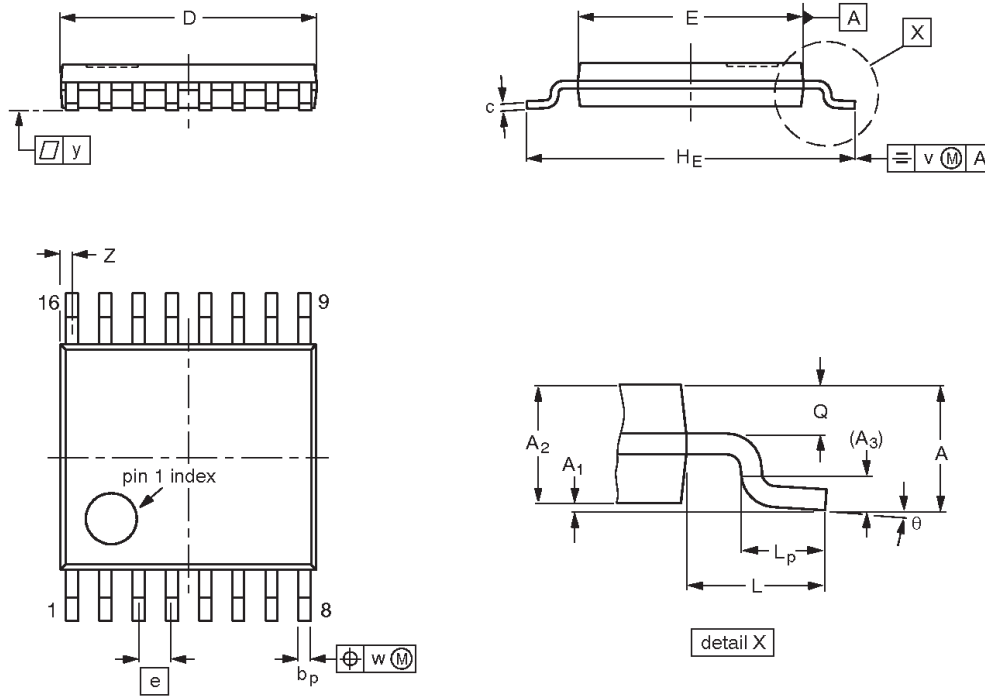
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|------|--|---------------------|------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT519-1 | | | | | | 99-05-04 |

Quad 1-of-2 multiplexer/demultiplexer with Schottky diode

CBTS3257

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

SOT403-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽²⁾ | e | H _E | L | L _p | Q | v | w | y | Z ⁽¹⁾ | θ |
|------|--------|----------------|----------------|----------------|----------------|------------|------------------|------------------|------|----------------|-----|----------------|------------|-----|------|-----|------------------|----------|
| mm | 1.10 | 0.15 0.05 | 0.95 0.80 | 0.25 | 0.30 0.19 | 0.2 0.1 | 5.1 4.9 | 4.5 4.3 | 0.65 | 6.6 6.2 | 1.0 | 0.75 0.50 | 0.4 0.3 | 0.2 | 0.13 | 0.1 | 0.40 0.06 | 8° 0° |

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|------|--|---------------------|----------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT403-1 | | MO-153 | | | | 95-04-04 99-12-27 |

**Quad 1-of-2 multiplexer/demultiplexer
with Schottky diode**

CBTS3257**REVISION HISTORY**

| Rev | Date | Description |
|------------|-------------|---|
| _1 | 2002 Sep 27 | Product data (9397 750 10333); initial version Engineering Change Notice: 853–2380 28892 (2002 Sep 10) |

Quad 1-of-2 multiplexer/demultiplexer with Schottky diode

CBTS3257

Data sheet status

| Data sheet status ^[1] | Product status ^[2] | Definitions |
|----------------------------------|-------------------------------|--|
| 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. |
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[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>.

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