

# 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  $\Omega$  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

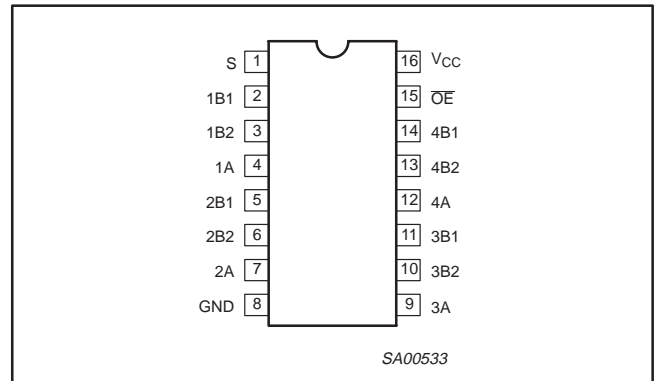
The CBTS3257 is a quad 1-of-2 high-speed TTL-compatible multiplexer/demultiplexer. The low on resistance of the switch allows inputs to be connected to outputs without adding propagation delay or generating additional ground bounce noise.

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

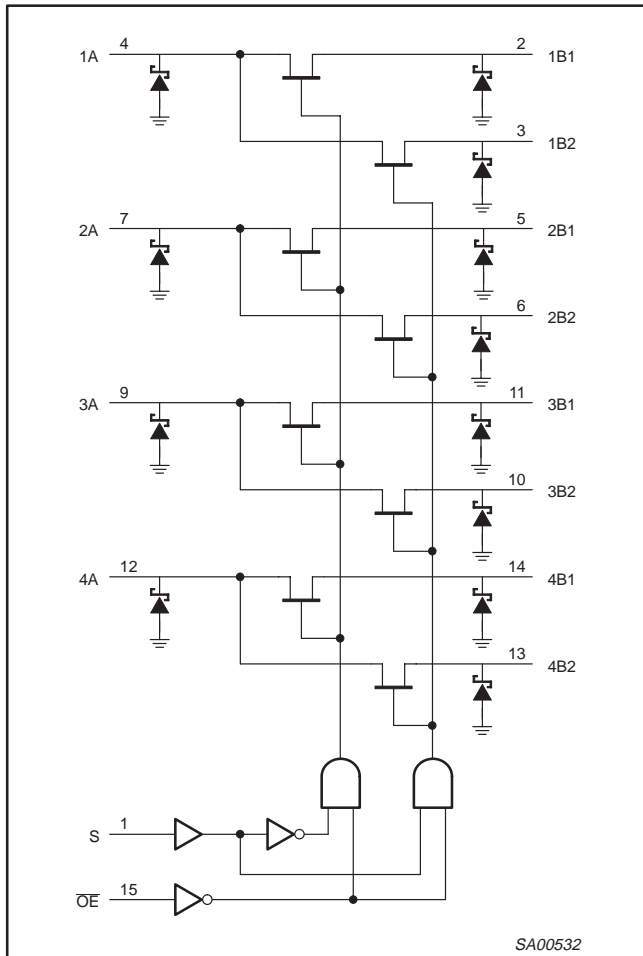
PACKAGES	TEMPERATURE RANGE	ORDER CODE	TOPSIDE MARK	DWG NUMBER
16-pin plastic SO	$-40$ to $85$ $^{\circ}\text{C}$	CBTS3257D	CBTS3257D	SOT109-1
16-pin plastic SSOP	$-40$ to $85$ $^{\circ}\text{C}$	CBTS3257DB	CS3257	SOT338-1
16-pin plastic SSOP (QSOP)	$-40$ to $85$ $^{\circ}\text{C}$	CBTS3257DS	CBS3257	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](http://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 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
				$T_{amb} = -40 \text{ to } +85 \text{ } ^\circ\text{C}$			
				MIN	TYP <sup>1</sup>	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		$V_{CC} = 5.5 \text{ V}; V_I = \text{GND or } 5.5 \text{ V}$	—	—	$\pm 1$	$\mu\text{A}$
$I_{CC}$	Quiescent supply current		$V_{CC} = 5.5 \text{ V}; I_O = 0, V_I = V_{CC} \text{ or GND}$	—	—	3	$\mu\text{A}$
$\Delta I_{CC}$	Additional supply current per input pin <sup>2</sup>		$V_{CC} = 5.5 \text{ V}$ , 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	$\Omega$
			$V_{CC} = 4.5 \text{ V}; V_I = 0\text{V}; I_I = 30 \text{ mA}$	—	5	7	$\Omega$
			$V_{CC} = 4.5 \text{ V}; V_I = 2.4 \text{ V}; I_I = 15 \text{ mA}$	—	10	15	$\Omega$

### 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.

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

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## AC CHARACTERISTICS

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

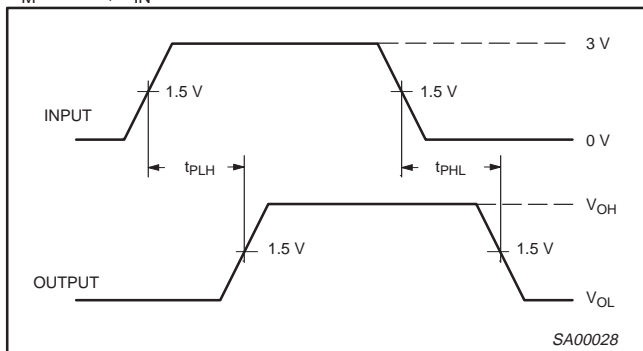
SYMBOL	PARAMETER	FROM (INPUT)	TO (OUTPUT)	LIMITS		UNIT
				$V_{CC} = +5.0 V \pm 0.5 V$		
				MIN	MAX	
$t_{pd}$	Propagation delay <sup>1</sup>	A or B	B or A	—	0.25	ns
$t_{pd}$	Propagation delay	S	A	1.6	5.0	ns
$t_{en}$	Output enable time to High and Low level	$\overline{OE}$	A or B	1.8	5.1	ns
		S	B	1.6	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:**

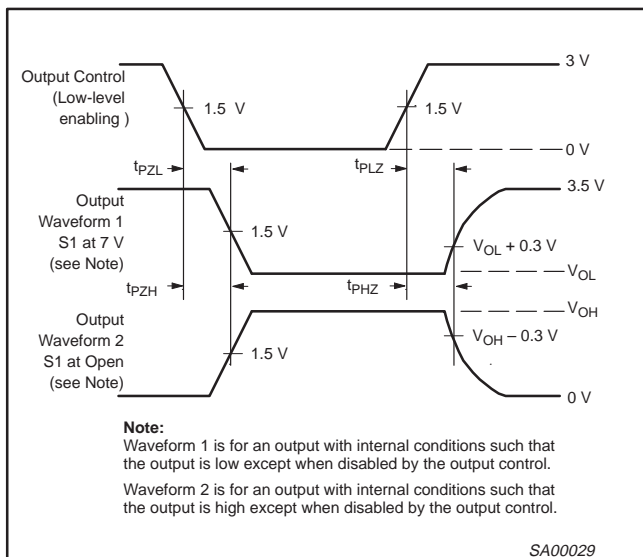
1. The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).

## AC WAVEFORMS

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



**Waveform 1. Input to Output Propagation Delays**



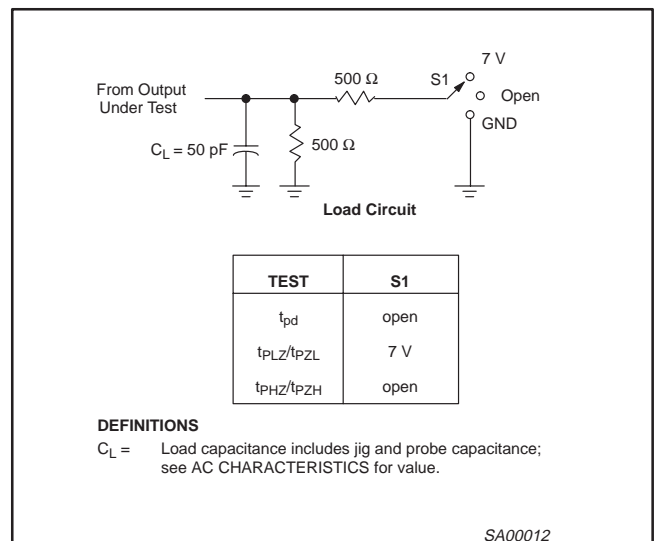
**Note:**  
Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control.  
Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.

**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:**

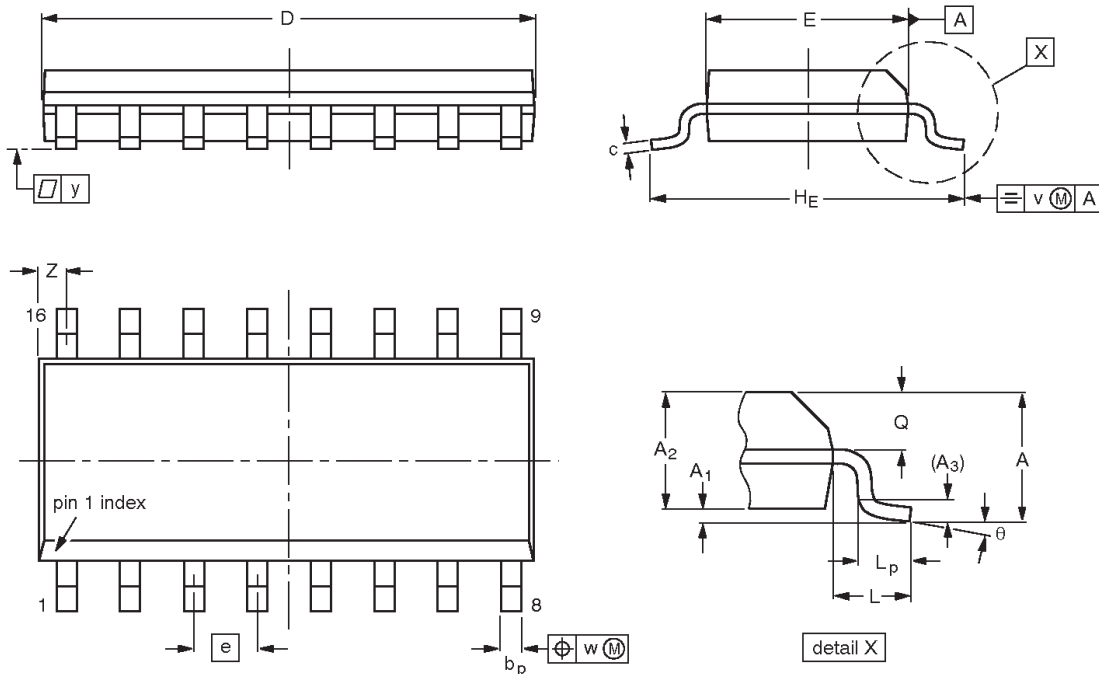
1. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10$  MHz,  $Z_O = 50 \Omega$ ,  $t_r \leq 2.5$  ns,  $t_f \leq 2.5$  ns.
2. The outputs are measured one at a time with one transition per measurement.

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

CBTS3257

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 <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 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.

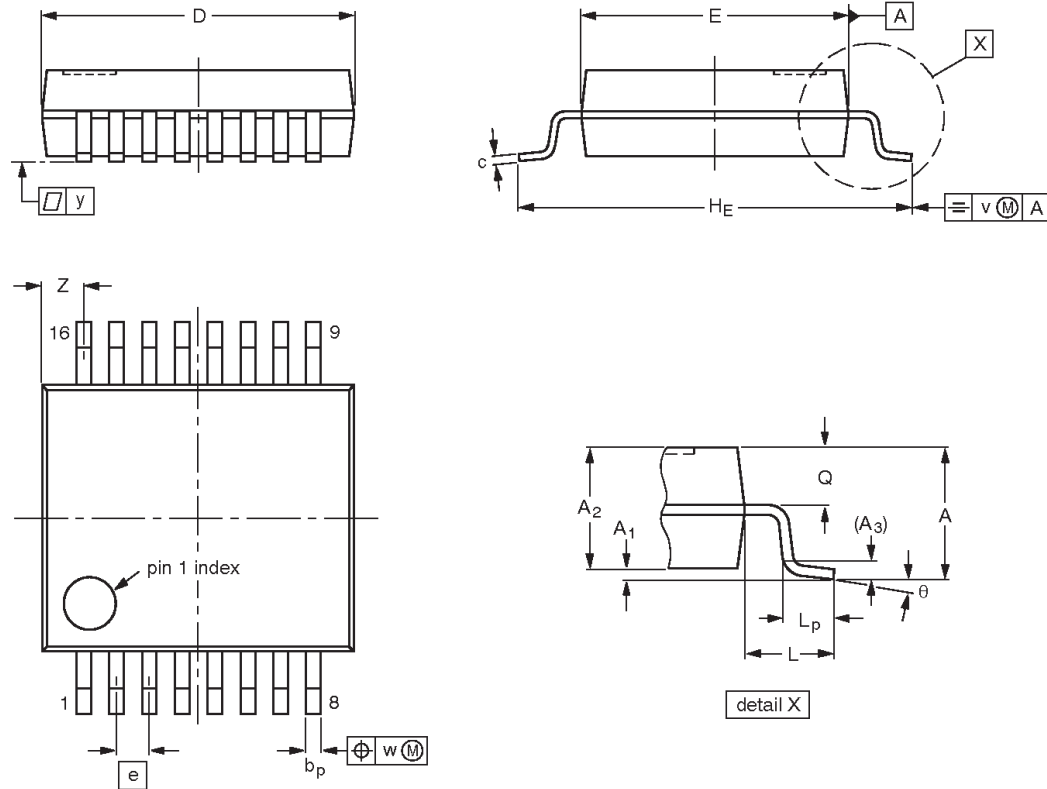
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT109-1	076E07	MS-012				97-05-22- 99-12-27

# 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 <sub>max.</sub>	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	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.

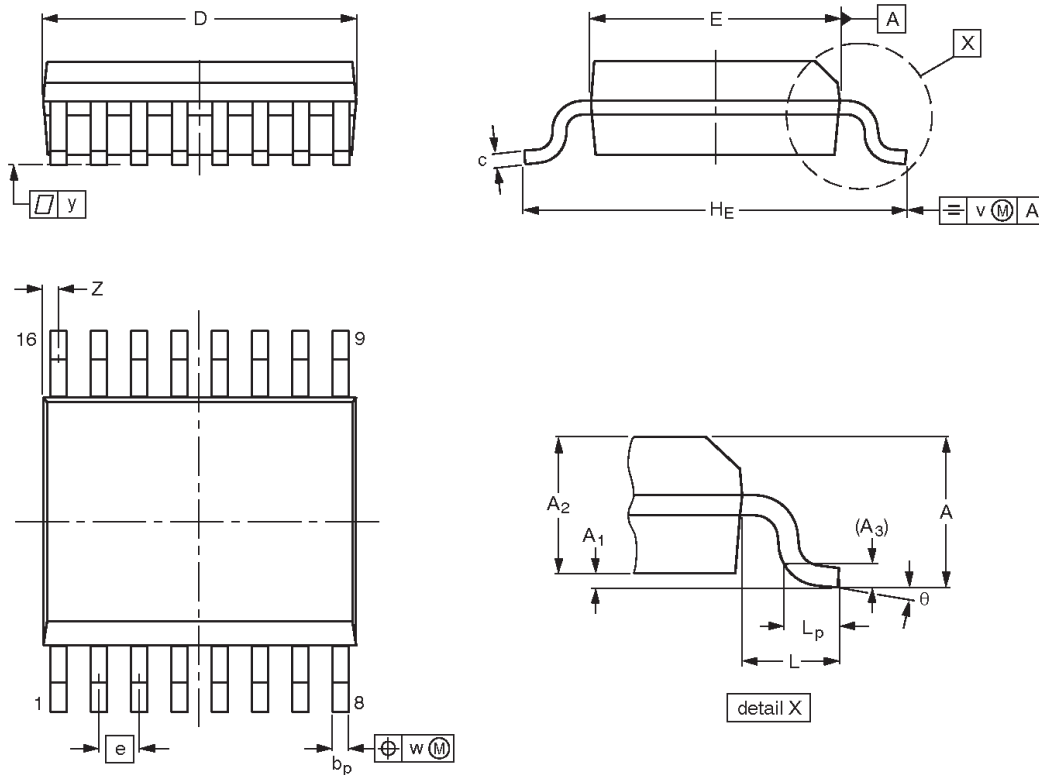
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT338-1		MO-150				95-02-04 99-12-27

# 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 <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>	v	w	y	Z <sup>(1)</sup>	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

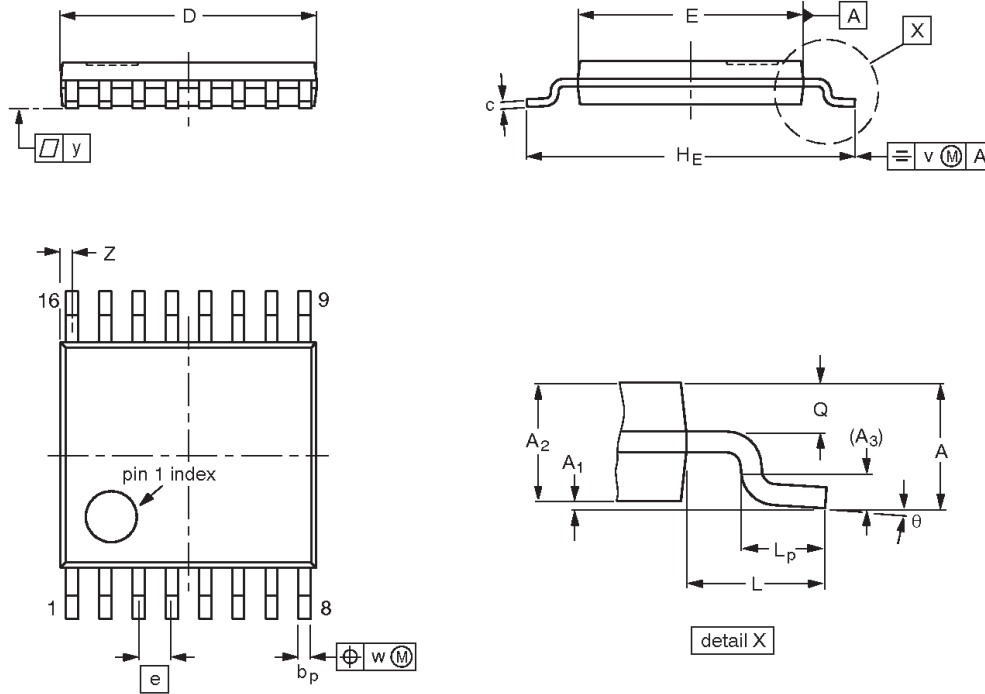


# Quad 1-of-2 multiplexer/demultiplexer with Schottky diode

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 <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(2)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	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

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

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**CBTS3257****REVISION HISTORY**

<b>Rev</b>	<b>Date</b>	<b>Description</b>
_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 <sup>[1]</sup>	Product status <sup>[2]</sup>	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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