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DATA SHEET

CBTS3253

Dual 1-of-4 FET multiplexer/demultiplexer with Schottky diode clamping

Product data

2002 Nov 06

PHILIPS

Dual 1-of-4 FET multiplexer/demultiplexer with Schottky diode clamping

CBTS3253

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

- ESD protection exceeds 2000 V HBM per JESD22-A114, 200 V MM per JESD22-A115 and 1000 V CDM per JESD22-C101

- Latch-up testing is done to JESDEC Standard JESD78 which exceeds 100 mA
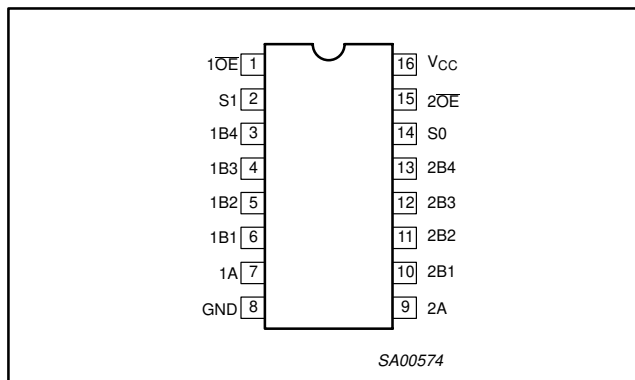
DESCRIPTION

The CBTS3253 is a dual 1-of-4 high-speed TTL-compatible FET 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.

1$\overline{OE}$, 2$\overline{OE}$, S0, and S1 select the appropriate B output for the A-input data.

Internal Schottky diode provides I/O undershoot protection

The CBTS3253 is characterized for operation from −40 to +85°C.

PIN CONFIGURATION

1$\overline{OE}$	1	16 V$_{CC}$
S1	2	15 2$\overline{OE}$
1B4	3	14 S0
1B3	4	13 2B4
1B2	5	12 2B3
1B1	6	11 2B2
1A	7	10 2B1
GND	8	9 2A

SA00574

PIN DESCRIPTION

PIN NUMBER	SYMBOL	NAME AND FUNCTION
1	1$\overline{OE}$	Output enable
2	S1	Select-control input
3, 4, 5, 6	1B[1–4]	B outputs
7	1A	A input
8	GND	Ground (0 V)
9	2A	A input
10, 11, 12, 13	2B[1–4]	Select-control input
14	S0	Select-control input
15	2$\overline{OE}$	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 °C	CBTS3253D	CBTS3257	SOT109-1
16-pin plastic SSOP	−40 to 85 °C	CBTS3253DB	CS3253	SOT338-1
16-pin plastic SSOP (QSOP)	−40 to 85 °C	CBTS3253DS	CBS3253	SOT519-1
16-pin plastic TSSOP	−40 to 85 °C	CBTS3253PW	CBS3253	SOT403-1

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

LOGIC DIAGRAM (positive logic)
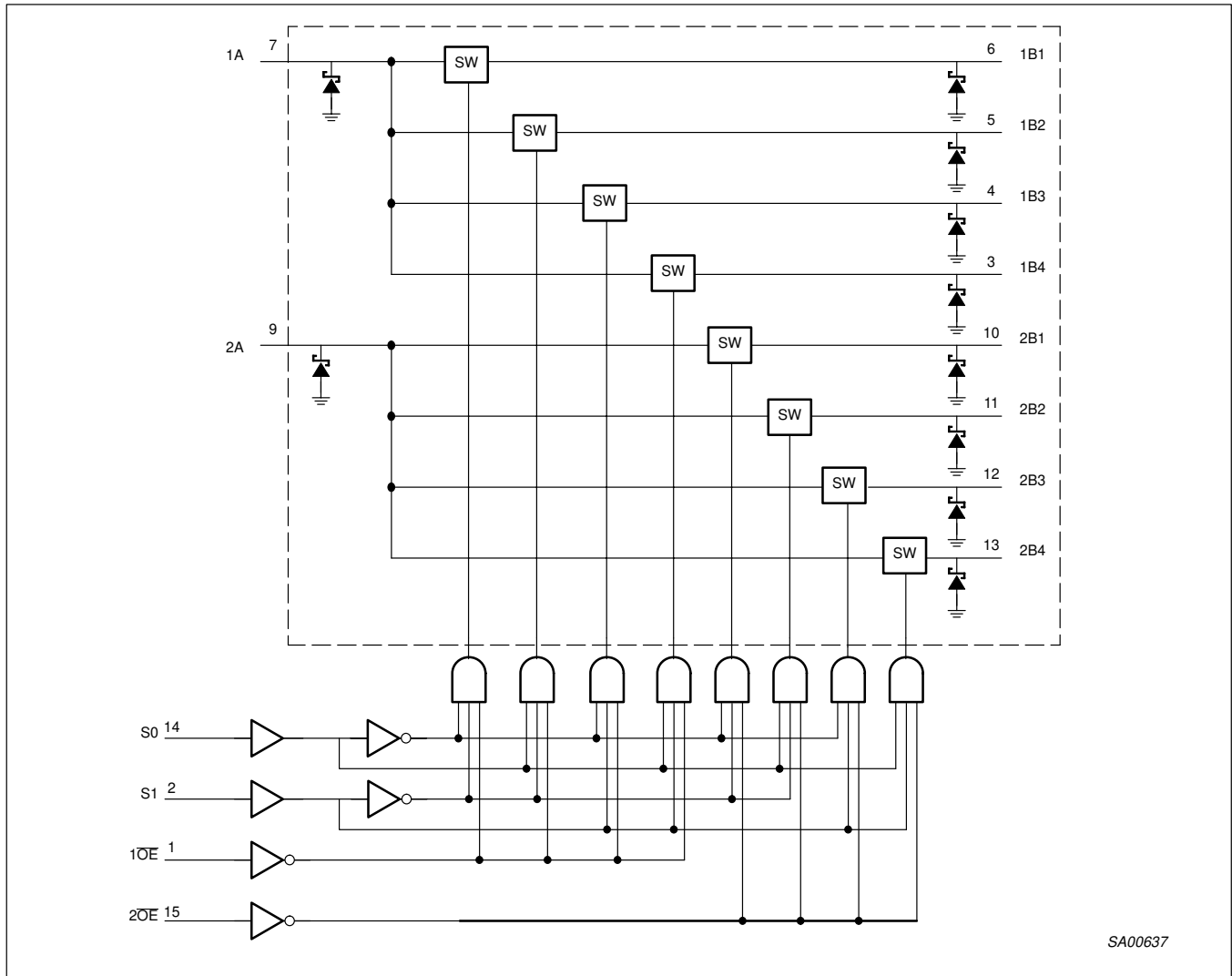
SA00637

FUNCTION TABLE

INPUTS				FUNCTION
$\overline{OE1}$	$\overline{OE2}$	S1	S0	
H	X	X	X	Disconnect 1A
X	H	X	X	Disconnect 2A
L	L	L	L	1A to 1B1 and 2A to 2B1
L	L	L	H	1A to 1B2 and 2A to 2B2
L	L	H	L	1A to 1B3 and 2A to 2B3
L	L	H	H	1A to 1B4 and 2A to 2B4

Dual 1-of-4 FET multiplexer/demultiplexer with Schottky diode clamping

CBTS3253

ABSOLUTE MAXIMUM RATINGS[1]

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:
1. 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.
2. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
3. The package thermal impedance is calculated in accordance with JESD 51-7.

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	—	V
V_{IL}	Low-level Input voltage	—	0.8	V
T_{amb}	Operating free-air temperature range	−40	+85	°C

NOTE:
1. 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 T_{amb} = −40 to +85 °C			UNIT
				MIN	TYP[1]	MAX	
V_{IK}	Input clamp voltage	A or B inputs	V_{CC} = 4.5 V; I_I = −18 mA	—	—	−0.8	V
		Control inputs		—	—	−1.2	
V_P	Pass voltage		$V_I = V_{CC}$ = 5.5 V; I/O = −100 μA	3.4	3.6	3.9	V
I_I	Input leakage current		V_{CC} = 5.5 V; V_I = 5.5 or GND	—	—	±1	μA
I_{CC}	Quiescent supply current		V_{CC} = 5.5 V; I_O = 0, $V_I = V_{CC}$ or GND	—	—	3	μA
ΔI_{CC}	Control inputs[2]		V_{CC} = 5.5 V, one input at 3.4 V, other inputs at V_{CC} or GND	—	—	2.5	mA
C_I	Control pins		V_I= 3 V or 0	—	4.5	—	pF
$C_{IO(OFF)}$	Power-off leakage current	A port	V_O = 3 V or 0; $\overline{OE}$ = V_{CC}	—	24.6	—	pF
		B port	V_O = 3 V or 0; $\overline{OE}$ = V_{CC}	—	7.6	—	
r_{on}[3]	On-resistance	V_{CC} = 4.5 V	V_I = 0 V; I_I = 64 mA	—	5	7	Ω
			V_I = 0 V; I_I = 30 mA	—	5	7	
			V_I = 2.4 V; I_I = −15 mA	—	10	15	

NOTES:
1. All typical values are at V_{CC} = 5 V, T_{amb} = 25 °C.
2. This is the increase in supply current for each input that is at the specified TTL voltage level rather than V_{CC} or GND
3. 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.

AC CHARACTERISTICS

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

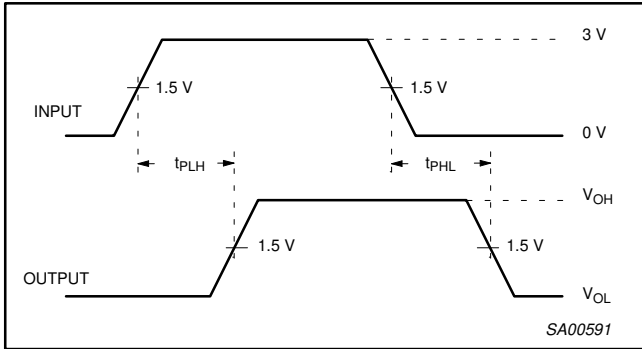| SYMBOL	PARAMETER	FROM (INPUT)	TO (OUTPUT)	LIMITS $V_{CC} = +5.0$ V ± 0.5 V		UNIT
				MIN	MAX	
t_{pd}	Propagation delay[1]	A or B	B or A	—	0.25	ns
		S	A or B	1.2	6.2	
t_{en}	Output enable time to High and Low level	S	A or B	1.3	6.3	ns
		$\overline{OE}$		1.4	6.4	
t_{dis}	Output disable time from High and Low level	S	A or B	1.1	7.2	ns
		$\overline{OE}$		1.0	7	

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. Pulse duration

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.
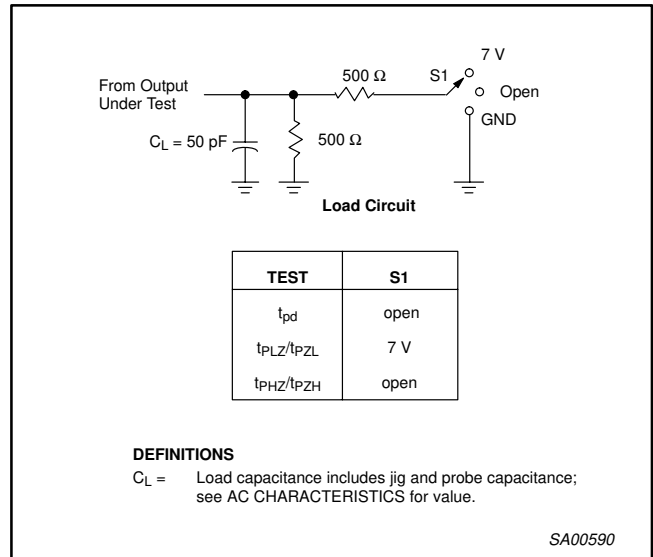
SA00592
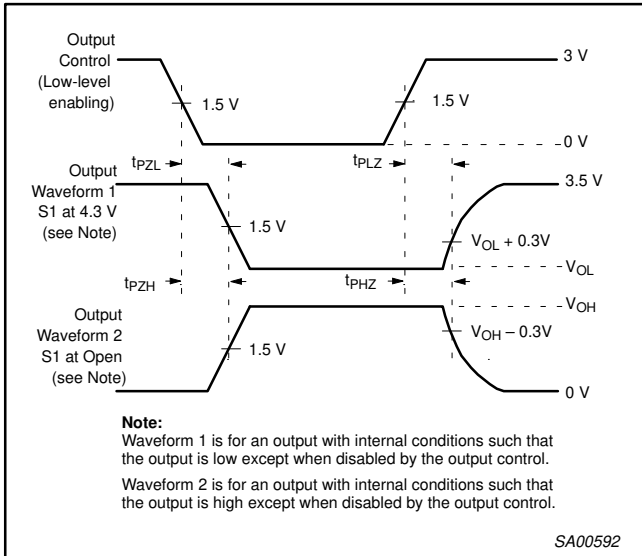
Waveform 2. 3-State Output Enable and Disable Times

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

Load Circuit

TEST	S1
t_{pd}	open
t_{PLZ}/t_{PZL}	7 V
t_{PHZ}/t_{PZH}	open

DEFINITIONS

C_L = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

SA00590

NOTES:

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

Dual 1-of-4 FET multiplexer/demultiplexer
with Schottky diode clamping

CBTS3253

SO16:   plastic small outline package; 16 leads; body width 3.9 mm   **SOT109-1**

pin 1 index

detail X

0   2.5   5 mm
scale
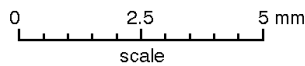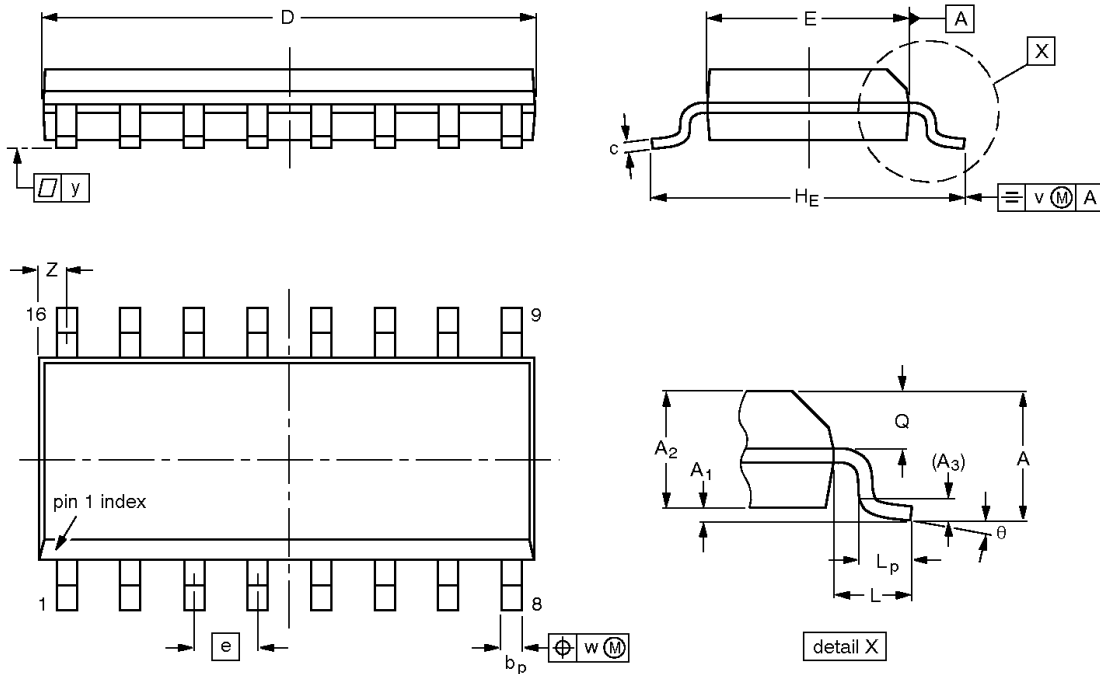
DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A₁	A₂	A₃	bₚ	c	D⁽¹⁾	E⁽¹⁾	e	Hₑ	L	Lₚ	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.
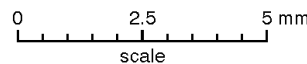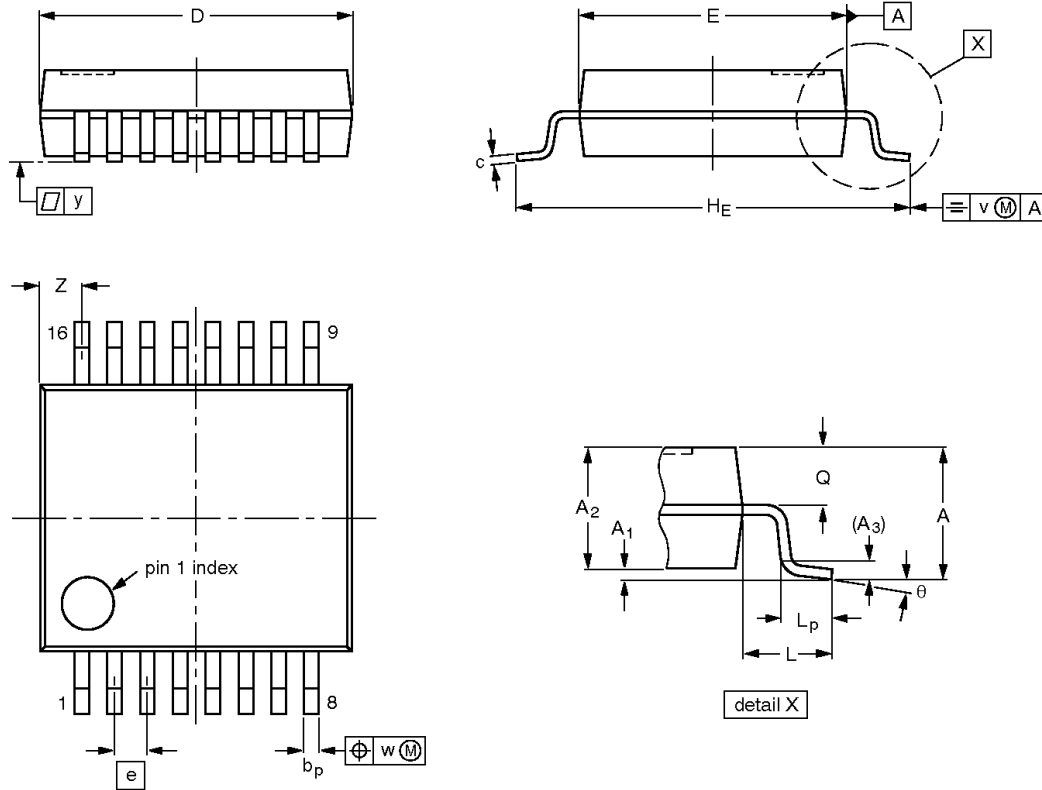
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT109-1	076E07	MS-012				~~97-05-22~~ 99-12-27

SSOP16: plastic shrink small outline package; 16 leads; body width 5.3 mm
SOT338-1

0   2.5   5 mm
scale

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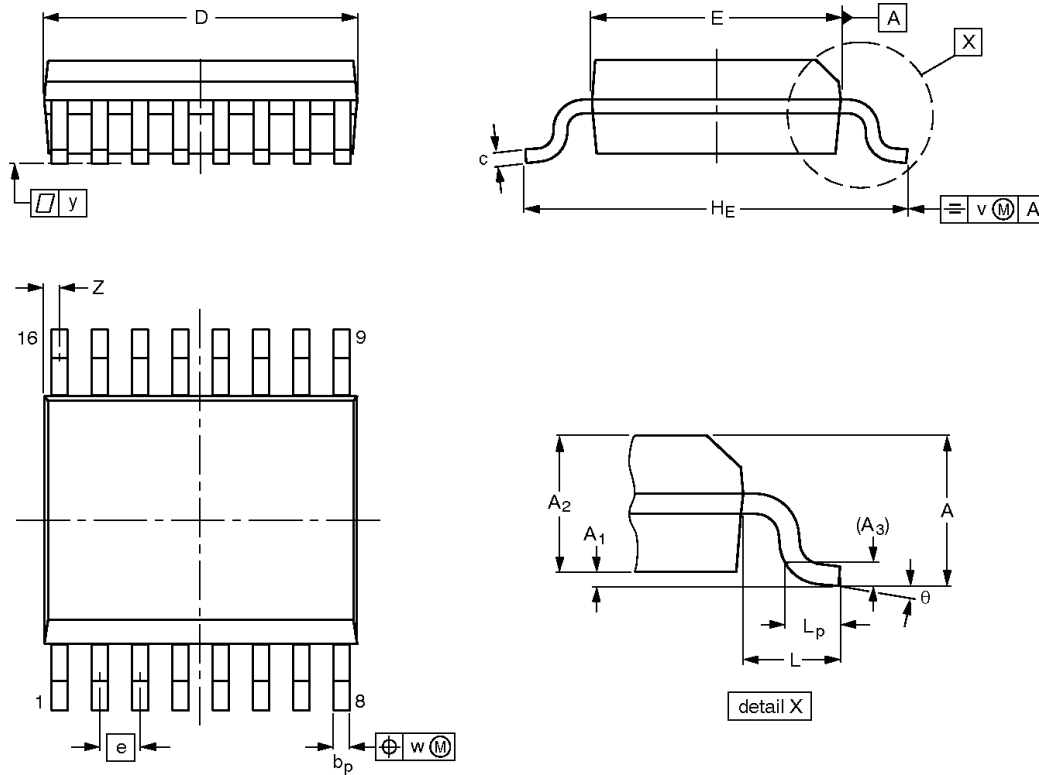
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT338-1		MO-150				~~95-02-04~~ 99-12-27

**Dual 1-of-4 FET multiplexer/demultiplexer
with Schottky diode clamping**

CBTS3253

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

SOT519-1


```
0          2.5          5 mm
scale
```
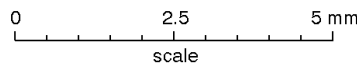
DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A₁	A₂	A₃	bₚ	c	D⁽¹⁾	E⁽¹⁾	e	Hₑ	L	Lₚ	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

Dual 1-of-4 FET multiplexer/demultiplexer
with Schottky diode clamping

CBTS3253

TSSOP16:   plastic thin shrink small outline package; 16 leads; body width 4.4 mm   SOT403-1

pin 1 index

detail X

0   2.5   5 mm
scale
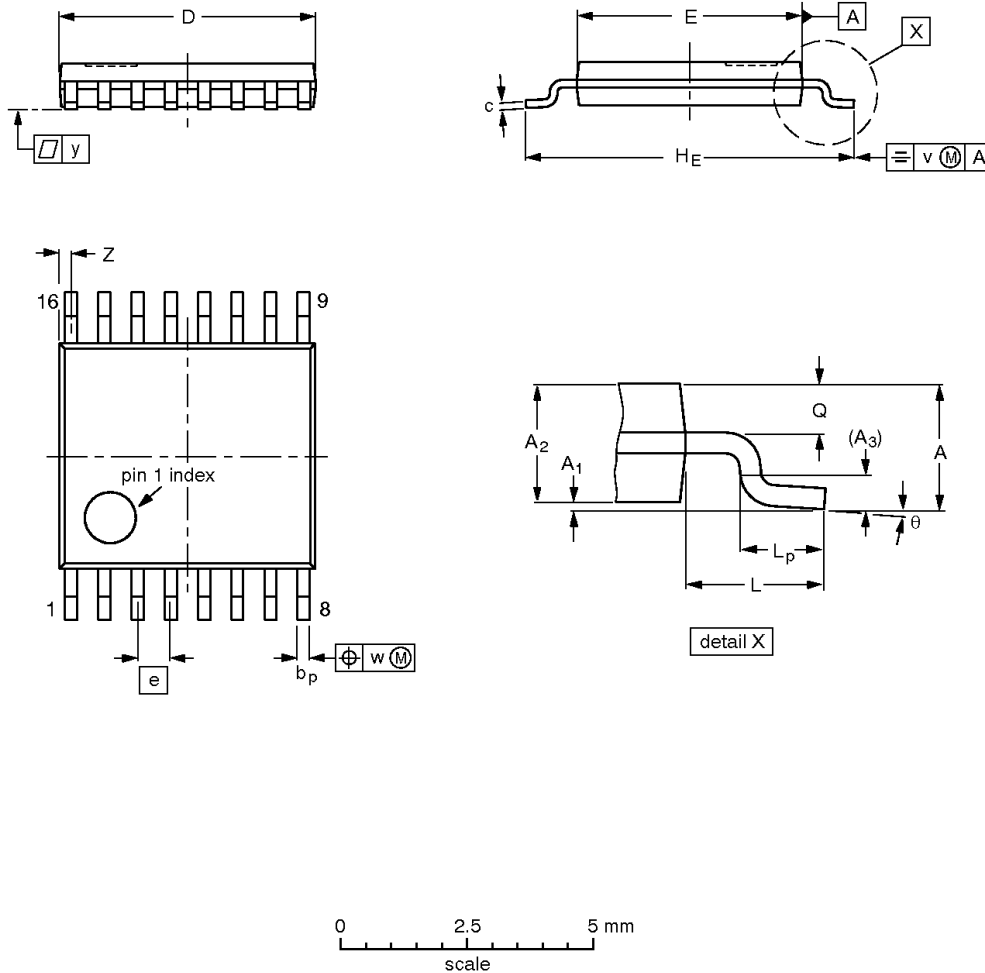
DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A₁	A₂	A₃	bₚ	c	D (1)	E (2)	e	H_E	L	Lₚ	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

REVISION HISTORY

Rev	Date	Description
_1	2002 Nov 06	Product data (9397 750 10665); initial version
		Engineering Change Notice: 853–2390 29065 (2002 Oct 15)

Dual 1-of-4 FET multiplexer/demultiplexer with Schottky diode clamping

CBTS3253

Data sheet status

Level	Data sheet status[1]	Product status[2] [3]	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.
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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.

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