

# DATA SHEET

## **CBT3384**

10-bit bus switch with 5-bit output enables  
and Schottky undershoot protection

Product specification  
Supersedes data of 1999 Oct 10

2000 Jan 28

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CBT3384

FEATURES

- 5  $\Omega$  switch connection between two ports
- TTL compatible control input and output levels
- Undershoot protection included to prevent shoot through level changes
- 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 CBT3384 provides ten bits of high-speed TTL-compatible bus switching. The low on-state resistance of the switch allows connections to be made with minimal propagation delay.

The CBT3384 device is organized as two 5-bit with separate output-enable ( $\overline{OE}$ ) inputs. When  $\overline{OE}$  is low, the switch is on and port A is connected to B. When  $\overline{OE}$  is high, the switch is open and high-impedance state exists between the two ports.

The CBT3384 is characterized for operation from 0°C to 85°C.

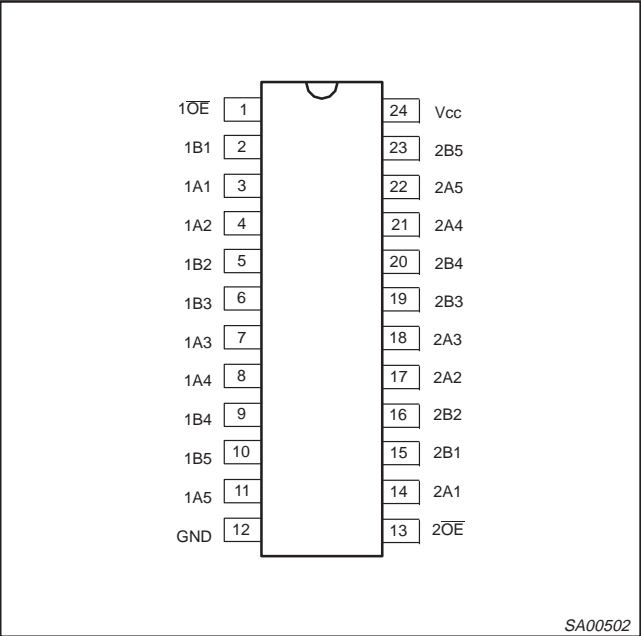
QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS $T_{amb} = 25^{\circ}\text{C}; \text{GND} = 0 \text{ V}$	TYPICAL	UNIT
$t_{PLH}$ $t_{PHL}$	Propagation delay An to Yn	$C_L = 50 \text{ pF}; V_{CC} = 5 \text{ V}$	250	ps
$C_{IN}$	Input capacitance	$V_I = 0 \text{ V or } V_{CC}$	4	pF
$C_{OUT}$	Output capacitance	Outputs disabled; $V_O = 0 \text{ V or } V_{CC}$	10	pF
$I_{CCZ}$	Total supply current	Outputs disabled; $V_{CC} = 5.5 \text{ V}$	3	$\mu\text{A}$

ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	ORDER CODE	DWG NUMBER
24-Pin Plastic TSSOP Type I	-40°C to +85°C	CBT3384 PW DH	SOT403-1

PIN CONFIGURATION



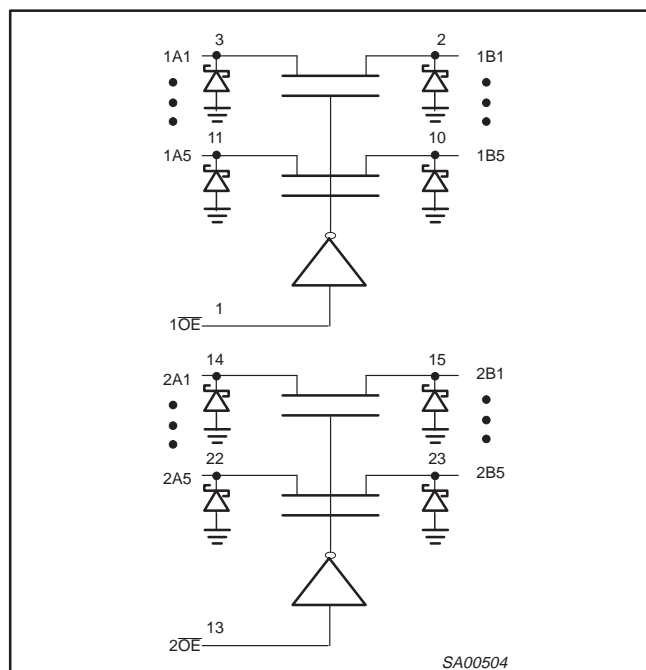
PIN DESCRIPTION

PIN NUMBER	SYMBOL	NAME AND FUNCTION
1, 13	$1\overline{OE}, 2\overline{OE}$	Output enables
3, 4, 7, 8, 11	1A1–1A5	Inputs
14, 17, 18, 21, 22	2A1–2A5	Inputs
2, 5, 6, 9, 10	1B1–1B5	Outputs
15, 16, 19, 20, 23	2B1–2B5	Outputs
12	GND	Ground (0 V)
24	$V_{CC}$	Positive supply voltage

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## LOGIC SYMBOL



## FUNCTION TABLE

INPUTS		OUTPUTS	
1OE	2OE	1A, 1B	2A, 2B
L	L	1A = 1B	2A = 2B
L	H	1A = 1B	Z
H	L	Z	2A = 2B
H	H	Z	Z

H = High voltage level

L = Low voltage level

Z = High impedance "off" state

## ABSOLUTE MAXIMUM RATINGS<sup>1, 2</sup>

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V <sub>CC</sub>	DC supply voltage		-0.5 to +7.0	V
I <sub>IK</sub>	DC input diode current		-50	mA
V <sub>I</sub>	DC input voltage <sup>3</sup>		-1.2 to +7.0	V
I <sub>SW</sub>	DC output diode current	V <sub>O</sub> < 0	±128	mA
T <sub>stg</sub>	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 performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150°C.
- The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

## RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS		UNIT
		Min	Max	
V <sub>CC</sub>	DC supply voltage	4.5	5.5	V
V <sub>IH</sub>	High-level input voltage	2.0		V
V <sub>IL</sub>	Low-level Input voltage		0.8	V
T <sub>amb</sub>	Operating free-air temperature range	0	+85	°C

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## DC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			T <sub>amb</sub> = −40°C 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
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 <sup>2</sup>	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> = 3.0 V or 0		4		pF
C <sub>I(OFF)</sub>	Power-off leakage current	V <sub>O</sub> = 3.0 V or 0, $\overline{OE}$ = V <sub>CC</sub>		10		pF
r <sub>on</sub> <sup>3</sup>	On-resistance	V <sub>CC</sub> = 4.5 V; V <sub>I</sub> = 0 V; I <sub>I</sub> = 64 mA		5	7	Ω
		V <sub>CC</sub> = 4.5 V; V <sub>I</sub> = 0 V; I <sub>I</sub> = 30 mA		5	7	
		V <sub>CC</sub> = 4.5 V; V <sub>I</sub> = 2.4 V; I <sub>I</sub> = −15 mA		10	15	
V <sub>P</sub>	Pass voltage	V <sub>I</sub> = V <sub>CC</sub> = 5.0 V; I <sub>O</sub> = −100 μA	3.4	3.6	3.9	V
I <sub>UCP</sub>	Undershoot static current protection	V <sub>CC</sub> = 5.0 V, I <sub>B</sub> = 400 μA; $\overline{OE}$ = 5.0 V; V <sub>B</sub> ≥ 3.0 V		8		mA

### NOTES:

1. All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^{\circ}\text{C}$
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

GND = 0 V;  $t_R$ ;  $C_L = 50\text{ pF}$ 

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		.25	ns
t <sub>en</sub>	Output enable time to High and Low level	OE	A or B	1.0	5.7	ns
t <sub>dis</sub>	Output disable time from High and Low level	OE	A or B	1.0	5.2	ns

### NOTE:

1. This parameter is warranted but not production tested. The propagation delay is based on the RC time constant of the typical on-state resistance of the switch and a load capacitance of 50 pF, when driven by an ideal voltage source (zero output impedance).

SYMBOL	PARAMETER DESCRIPTION	LIMITS			UNIT
		−40° C/+85° V <sub>CC</sub> = 5 V, ±0.5 V			
		MIN.	MEAN	MAX.	
Tpd	Propagation delay (see Note 1)			250	pS
TPZH	Output enable time to High level	1.6	3.4	5.6	nS
TPHZ	Output enable time from High level	1.7	3.3	5.5	nS
TPZL	Output enable time to Low level	2.3	4	6	nS
TPLZ	Output enable time from Low level	2.5	4.5	6.6	nS

### NOTE:

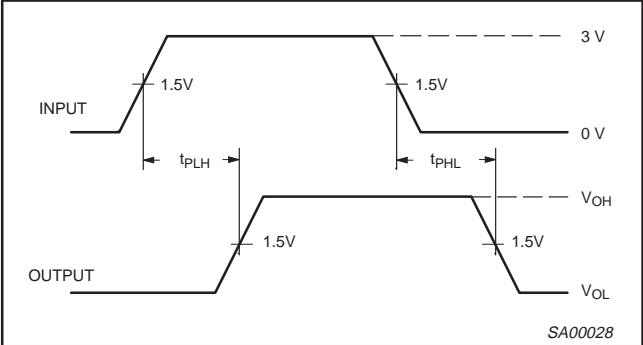
1. This parameter is warranted but not production tested. The propagation delay is based on the RC time constant of the typical on-state resistance of the switch and a load capacitance of 50 pF, when driven by an ideal voltage source (zero output impedance); at  $+25^{\circ}\text{C}$ .

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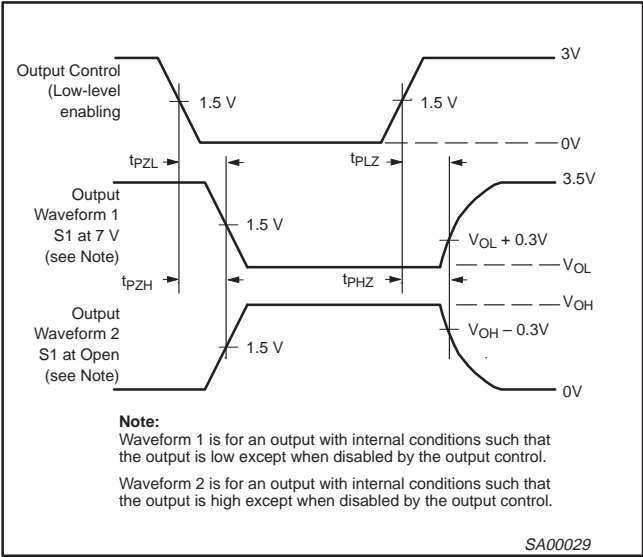
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AC WAVEFORMS

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

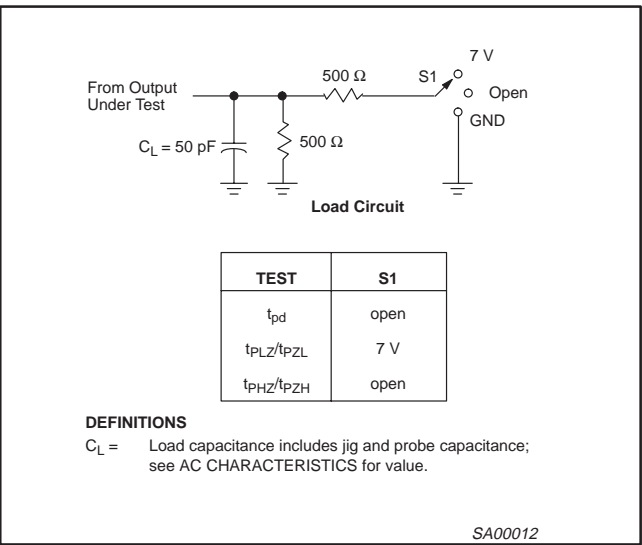


Waveform 1. Input (An) to Output (Yn) Propagation Delays



Waveform 2. 3-State Output Enable and Disable Times

TEST CIRCUIT AND WAVEFORMS



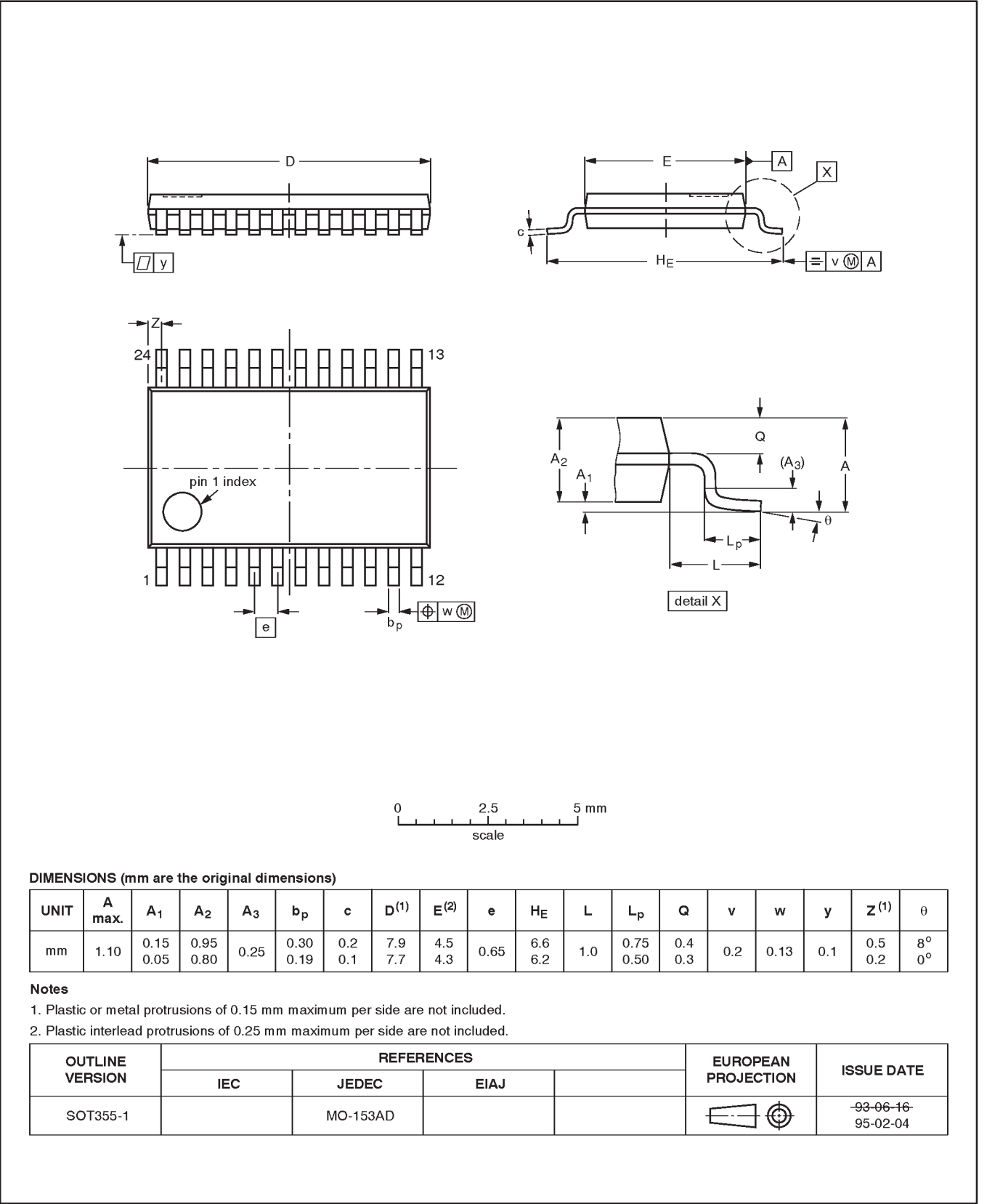
- NOTES:**
1. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10\text{ MHz}$ ,  $Z_O = 50\text{ }\Omega$ ,  $t_r \leq 2.5\text{ ns}$ ,  $t_f \leq 2.5\text{ ns}$ .
  2. The outputs are measured one at a time with one transition per measurement.

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TSSOP24: plastic thin shrink small outline package; 24 leads; body width 4.4 mm

SOT355-1



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## Data sheet status

Data sheet status	Product status	Definition [1]
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
Preliminary specification	Qualification	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	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.

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

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**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). 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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Date of release: 01-00

Document order number:

9397 750 06832

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