

DATA SHEET

CBT6810

10-bit bus switch with precharged outputs
and Schottky undershoot protection for
live insertion

Product specification

1999 Apr 05

10-bit bus switch with precharged outputs and Schottky undershoot protection for live insertion

CBT6810

FEATURES

- 5Ω switch connection between port A and port B
- TTL compatible input and output levels
- Undershoot protection included to prevent shoot through level changes
- Bias voltage pre-charges the outputs to minimize signal distortion during live insertion

DESCRIPTION

The CBT6810 provides ten bits of high-speed TTL-compatible bus switching. The low on-state resistance of the switch allows bi-directional connections to be made while adding near-zero propagation delay. The device also precharges the B port to a user-selectable bias voltage (BIASV) to minimize live-insertion noise.

The CBT6810 is organized as one 10-bit switch with a single enable (\overline{OE}) input. When \overline{OE} is low, the switch is on and port A is connected to port B. When \overline{OE} is high, the switch between port A and port B is open and the B port is precharged to BIASV through the equivalent of a 10-kΩ resistor.

The CBT6810 is characterized for operation from 0°C to 85°C.

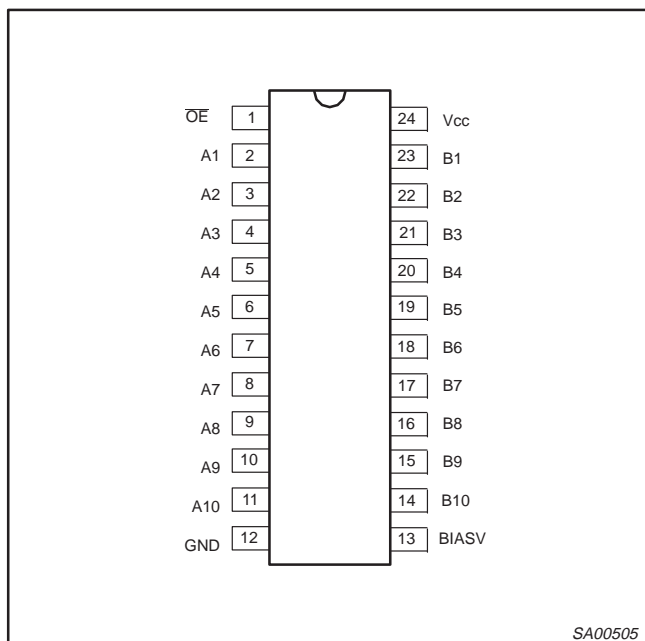
QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS $T_{amb} = 25^{\circ}C; GND = 0V$	TYPICAL	UNIT
t_{PLH} t_{PHL}	Propagation delay An to Bn or Bn to An	$C_L = 50pF; V_{CC} = 5V$	250	ps
C_{IN}	Input capacitance	$V_I = 0V$ or V_{CC}	3.5	pF
C_{IO}	Input/output capacitance	Outputs disabled; $V_O = 0V$ or V_{CC}	9.0	pF

ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
24-Pin Plastic TSSOP Type I	-40°C to +85°C	CBT6810 PW	CBT6810PW DH	SOT355-1

PIN CONFIGURATION



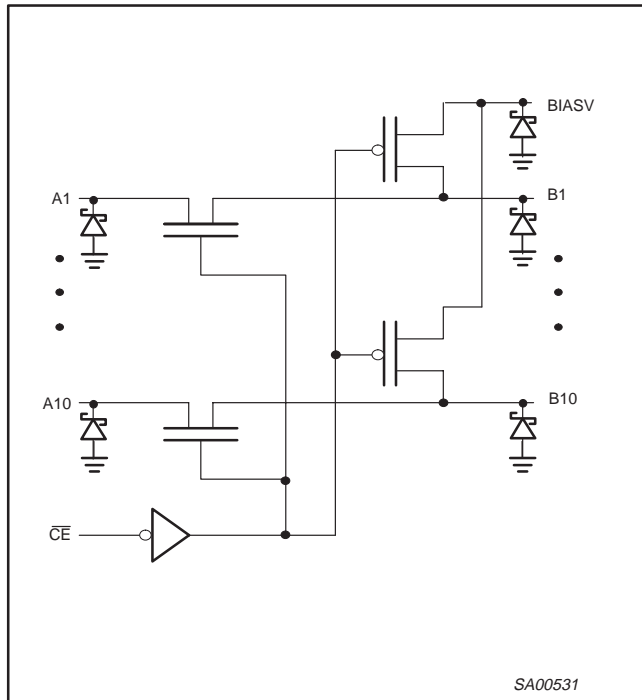
PIN DESCRIPTION

PIN NUMBER	SYMBOL	NAME AND FUNCTION
1	\overline{OE}	Output enable
13	BIASV	Bias supply pin
2, 3, 4, 5, 6, 7, 8, 9, 10, 11	A1-A10	A - port side
23, 22, 21, 20, 19, 18, 17, 16, 15, 14	B1-B10	B - port side with active pullup
12	GND	Ground (V)
24	V_{CC}	Positive supply voltage

10-bit bus switch with precharged outputs and Schottky undershoot protection for live insertion

CBT6810

LOGIC SYMBOL



FUNCTION TABLE

OE	STATE
L	A port = B port
H	A port = Z
H	B port = BIASV

H = High voltage level
 L = Low voltage level
 Z = High impedance "off" state

ABSOLUTE MAXIMUM RATINGS^{1, 2}

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V _{CC}	DC supply voltage		-0.5 to +7.0	V
I _{IK}	DC clamp diode current		-50	mA
V _I	DC input voltage ³		-0.5 to +7.0	V
I _{SW}	DC continuous channel current		± 128	mA
T _{stg}	Storage temperature range		-65 to 150	°C
BIASV	DC Bias voltage range		-0.5 to 7.0	V
øJA	Power dissipation per package Plastic thin shrink small outline package		134	°C/W

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.

10-bit bus switch with precharged outputs and Schottky undershoot protection for live insertion

CBT6810

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS		UNIT
		Min	Max	
V_{CC}	DC supply voltage	4.0	5.5	V
BIASV	DC supply voltage	1.3	V_{CC}	V
V_{IH}	High-level input voltage (control pin)	2.0		V
V_{IL}	Low-level Input voltage (control pin)		0.8	V
T_{amb}	Operating free-air temperature range	-40	+85	°C

DC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			$T_{amb} = -40^{\circ}\text{C to } +85^{\circ}\text{C}$			
			Min	Typ ¹	Max	
V_{IK}	Input clamp voltage	$V_{CC} = 4.5\text{V}; I_I = -18\text{mA}$			-1.2	V
I_I	Input leakage current (control pin)	$V_{CC} = 5.5\text{V}; V_I = \text{GND or } 5.5\text{V}$			± 5	μA
I_O	Output bias current (B pins)	$V_{CC} = 4.5\text{V}; \text{BiasV} = 2.4\text{V}; V_O = 0, \overline{\text{OE}} = V_{CC}$			-0.25	mA
I_{CC}	Quiescent supply current	$V_{CC} = 5.5\text{V}; I_O = 0, V_I = V_{CC} \text{ or GND}$			2.5	mA
ΔI_{CC}	Control pins ²	$V_{CC} = 5.5\text{V}$, one input at 3.4V, other inputs at V_{CC} or GND			2.5	mA
C_I	Control pins	$V_I = 3\text{V or } 0$		3.5		pF
$C_{O(\text{OFF})}$	Terminal capacitance	$V_O = 3\text{V or } 0$; switch off		9.0		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	
		$V_{CC} = 4.5\text{V}; V_I = 2.4\text{V}; I_I = -15\text{mA}$		10	15	
V_P	Pass voltage	$V_{IN} = V_{CC} = 5.0\text{V}; I_{out} = -100\mu\text{A}$	3.4	3.6	3.9	V
I_{USP}^4	Undershoot static current protection	$V_{CC} = 5.0\text{V}, \text{BiasV} = V_{CC}$ $I_B = -5\mu\text{A}, V_B \geq 3\text{V}$		-10		mA

NOTES:

- All typical values are at $V_{CC} = 5\text{V}$, $T_A = 25^{\circ}\text{C}$
- 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.
- Force I_{USP} , measure $V_B \geq 3\text{V}$

10-bit bus switch with precharged outputs and Schottky undershoot protection for live insertion

CBT6810

AC CHARACTERISTICS FOR $V_{CC} = 5.0V \pm 0.5V$ RANGE

$GND = 0V$; $t_r = t_f \leq 2.5ns$; $C_L = 50pF$.

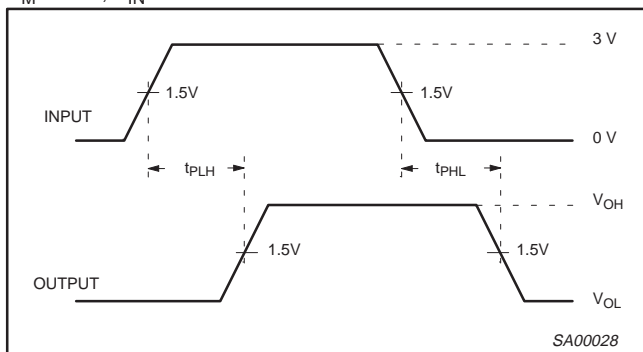
SYMBOL	PARAMETER	WAVEFORM	LIMITS			UNIT
			$T_{amb} = -40 \text{ to } +85^\circ\text{C}$			
			MIN	TYP ¹	MAX	
t_{pd}	Propagation delay An to Bn; Bn to An ²	1			0.25	ns
t_{pZH}	3-State output enable time OE to An; OE to Bn; BIASV = GND	2	1.8	3.5	5.3	ns
t_{pZL}	3-State output enable time OE to An; OE to Bn; BIASV = 3.0V	2	2.1	4.2	7.2	ns
t_{pHZ}	3-State output enable time OE to An; OE to Bn; BIASV = GND	2	1.7	3.7	6.1	ns
t_{pLZ}	3-State output enable time OE to An; OE to Bn; BIASV = 3.0V	2	1.0	5.5	7.3	ns

NOTE:

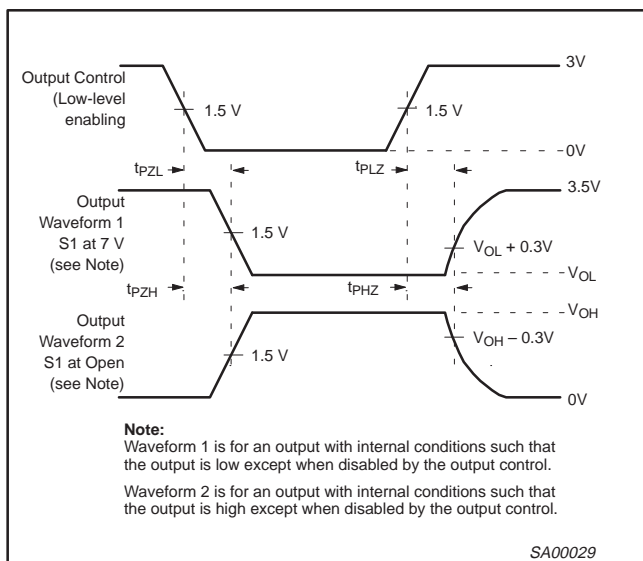
1. All typical values are measured at $T_{amb} = 25^\circ\text{C}$ and $V_{CC} = 5.0V$
2. Warranted but not production tested. The propagation delay is based on the RC time constant of the typical ON-state resistance of the switch and a load capacitance of 50pF, when driven by an ideal voltage source (zero output impedance)

AC WAVEFORMS

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



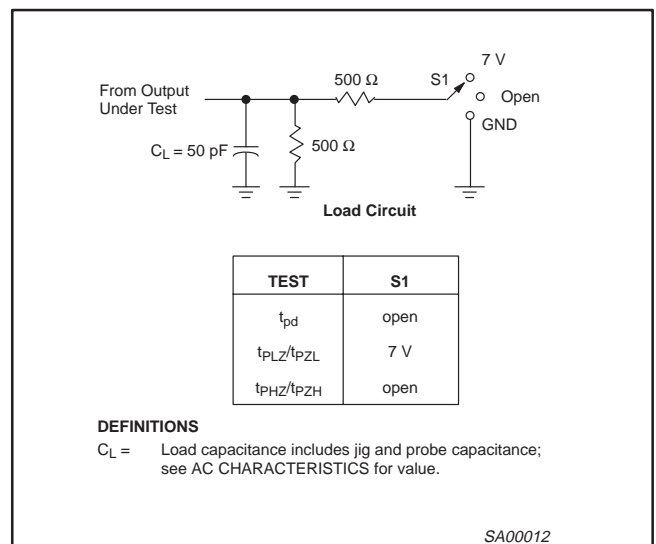
Waveform 1. Waveforms Showing the Input (An) to Output (Yn) Propagation Delays



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. Waveforms Showing the 3-State Output Enable and Disable Times

TEST CIRCUIT AND WAVEFORMS



NOTES:

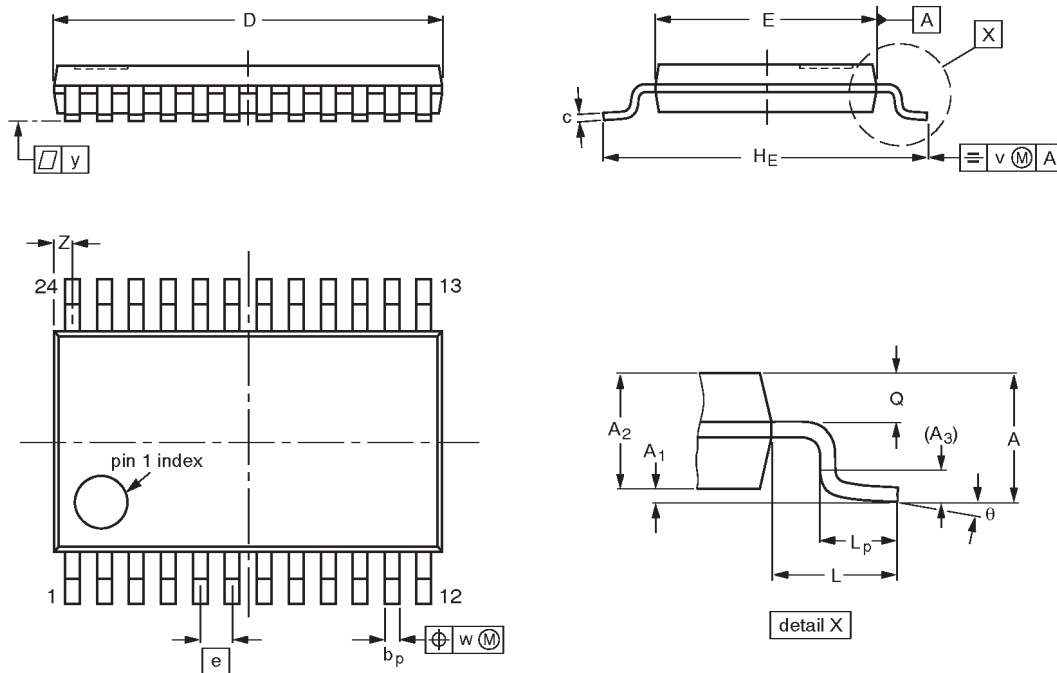
1. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10MHz$, $Z_O = 50 \Omega$, $t_r \leq 2.5 ns$, $t_f \leq 2.5 ns$.
2. The outputs are measured one at a time with one transition per measurement.

10-bit bus switch with precharged outputs and Schottky undershoot protection for live insertion

CBT6810

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

SOT355-1



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	7.9 7.7	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	0.5 0.2	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			
SOT355-1		MO-153AD				93-06-16 95-02-04

10-bit bus switch with precharged outputs
and Schottky undershoot protection for live insertion

CBT6810

NOTES

10-bit bus switch with precharged outputs and Schottky undershoot protection for live insertion

CBT6810

DEFINITIONS

Data Sheet Identification	Product Status	Definition
<i>Objective Specification</i>	Formative or in Design	This data sheet contains the design target or goal specifications for product development. Specifications may change in any manner without notice.
<i>Preliminary Specification</i>	Preproduction Product	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.
<i>Product Specification</i>	Full 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.

Philips Semiconductors and Philips Electronics North America Corporation reserve the right to make changes, without notice, in the products, including circuits, standard cells, and/or software, described or contained herein in order to improve design and/or performance. Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no license or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified. Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

LIFE SUPPORT APPLICATIONS

Philips Semiconductors and Philips Electronics North America Corporation Products are not designed for use in life support appliances, devices, or systems where malfunction of a Philips Semiconductors and Philips Electronics North America Corporation Product can reasonably be expected to result in a personal injury. Philips Semiconductors and Philips Electronics North America Corporation customers using or selling Philips Semiconductors and Philips Electronics North America Corporation Products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors and Philips Electronics North America Corporation for any damages resulting from such improper use or sale.

Philips Semiconductors
811 East Arques Avenue
P.O. Box 3409
Sunnyvale, California 94088-3409
Telephone 800-234-7381

Philips Semiconductors and Philips Electronics North America Corporation
 register eligible circuits under the Semiconductor Chip Protection Act.
 © Copyright Philips Electronics North America Corporation 1998
 All rights reserved. Printed in U.S.A.