INTEGRATED CIRCUITS



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CBTD16210

FEATURES

- 5 Ω switch connection between two ports
- TTL compatible control input levels
- Designed to be used in 5.5 V to 3.3 V level shifting applications
- Package options include shrink small outline (SSOP) and thin shrink small outline (TSSOP)

DESCRIPTION

The CBTD16210 provides 20 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.

A diode to V_{CC} is integrated in the circuit to allow for level shifting between 5 V inputs and 3.3 V outputs.

The device is organized as a dual 10-bit bus switch with separate output-enable (\overline{OE}) inputs. It can be used as two 10-bit bus switches or as one 20-bit bus switch. When \overline{OE} is low, the associated 10-bit bus switch is on, and port A is connected to port B. When \overline{OE} is high, the switch is open, and a high-impedance state exists between the ports.

The CBTD16210 is characterized for operation from –40°C to +85°C.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS T _{amb} = 25°C; GND = 0V	TYPICAL	UNIT
t _{PLH} t _{PHL}	Propagation delay An to Yn	C _L = 50pF; V _{CC} = 5V	0.25	ns
C _{IN}	Input capacitance	$V_I = 0V \text{ or } V_{CC}$	4.3	pF
C _{OUT}	Output capacitance	Outputs disabled; $V_O = 0V$ or V_{CC}	6.9	pF
I _{CCZ}	Total supply current	Outputs disabled; $V_{CC} = 5.5V$	4.0	μΑ

ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	ORDER CODE	DWG NUMBER
48-Pin Plastic SSOP Type III	–40°C to +85°C	CBTD16210 DL	SOT370-1
48-Pin Plastic TSSOP Type II	–40°C to +85°C	CBTD16210 DGG	SOT362-1

LOGIC SYMBOL



FUNCTION TABLE

INPUTS		OUTPUTS		
1 <mark>0E</mark>	2 <mark>0E</mark>	1A, 1B	2A, 2B	
L	L	1A = 1B	2A = 2B	
L	Н	1A = 1B	Z	
н	L	Z	2A = 2B	
н	Н	Z	Z	

H = High voltage level

L = Low voltage level

Z = High impedance "off" state

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PIN CONFIGURATION



PIN DESCRIPTION

PIN NUMBER	SYMBOL	NAME AND FUNCTION
1	NC	No internal connection
48, 47	1 <u>0E,</u> 20E	Output enables
2, 3, 4, 5, 6, 7, 9, 10, 11, 12	1A1-1A10	Inputs
46, 45, 44, 43, 42, 40, 39, 38, 37, 36	1B1-1B10	Outputs
13, 14, 16, 18, 19, 20, 21, 22, 23, 24	2A1-2A10	Inputs
35, 34, 33, 31, 30, 29, 28, 27, 26, 25	2B1-2B10	Outputs
8, 17, 32, 41	GND	Ground (0V)
15	V _{CC}	Positive supply voltage

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ABSOLUTE MAXIMUM RATINGS^{1, 2}

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V _{CC}	DC supply voltage		-0.5 to +7.0	V
I _{IK}	DC input diode current	V ₁ < 0	-50	mA
VI	DC input voltage ³		-0.5 to +7.0	V
V _{OUT}	DC output voltage ³	output in Off or High state	–0.5 to +5.5	V
I _{OUT}	DC output current	output in Low state	128	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 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.

3. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIM	UNIT	
	FARAIVIETER	Min	Max	UNIT
V _{CC}	DC supply voltage	4.5	5.5	V
V _{IH}	High-level input voltage	2.0		V
VIL	Low-level Input voltage		0.8	V
T _{amb}	Operating free-air temperature range	-40	+85	°C

DC ELECTRICAL CHARACTERISTICS

				LIMITS		
SYMBOL	PARAMETER	TEST CONDITIONS	T _{amb}	= −40°C to	+85°C	UNIT
		Min	Typ ¹	Max	1	
V _{IK}	Input clamp voltage	$V_{CC} = 4.5 \text{ V}; \text{ I}_{\text{I}} = -18 \text{ mA}$			-1.2	V
V _{OH}	Output high pass voltage	See Figure 1, page 6				V
		V _{CC} = 0 V; V _I = 5.5 V			10	
I _I	Input leakage current	V_{CC} = 5.5 V; V_{I} = GND or 5.5 V			±1	μA
I _{CC}	Quiescent supply current ²	$V_{CC} = 5.5 \text{ V}; I_O = 0, V_I = V_{CC} \text{ or GND};$ 1 $\overline{OE}=2\overline{OE}=GND$			1.5	mA
ΔI_{CC}	Additional supply current per input pin ²	V_{CC} = 5.5 V, one input at 3.4 V, other inputs at V _{CC} or GND			2.5	mA
Cl	Control pins	V _I = 3 V or 0		4.5		pF
C _{IO(OFF)}	Power-off leakage current	$V_{O} = 3 V \text{ or } 0, \overline{OE} = V_{CC}$		8		pF
		$V_{CC} = 4.5 \text{ V}; V_1 = 0 \text{ V}; I_1 = 64 \text{ mA}$		5	7	
r _{on} ³		$V_{CC} = 4.5 \text{ V}; \text{ V}_1 = 0 \text{ V}; \text{ I}_1 = 30 \text{ mA}$		5	7	Ω
		V _{CC} = 4.5 V; V ₁ = 2.4 V; I ₁ = -15 mA		16	50	

NOTES:

1. All typical values are at V_{CC} = 5 V, T_{amb} = 25^{\circ}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.

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AC CHARACTERISTICS

GND = 0 V: tp. C₁ = 50 pF

SYMBOL	PARAMETER DESCRIPTION		LIMITS -40°C to +85°C V _{CC} = 5 V ± 0.5 V		
			Mean	Max	
t _{pd}	Propagation delay ¹			250	ps
t _{PZH}	Output enable time to HIGH level	1.5	5.0	7.5	ns
t _{PHZ}	Output disable time from HIGH level	1.0	2.5	4.5	ns
t _{PZL}	Output enable time to LOW level	1.5	6.0	9.0	ns
t _{PLZ}	Output disable time from LOW level	1.5	3.5	6.0	ns

NOTES:

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).

AC WAVEFORMS

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



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



Waveform 2. 3-State Output Enable and Disable Times

TEST CIRCUIT AND WAVEFORMS



SA00012

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TYPICAL CHARACTERISTICS



Figure 1. V_{OH} values ($V_{in} = V_{CC}$)

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NOTES

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

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Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

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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