

SN74CBTD16210

20-BIT FET BUS SWITCH

WITH LEVEL SHIFTING

SCDS049C – MARCH 1998 – REVISED MAY 1998

- 5-Ω Switch Connection Between Two Ports
- TTL-Compatible Input Levels
- Designed to Be Used in Level-Shifting Applications
- Package Options Include Plastic 300-mil Shrink Small-Outline (DL), Thin Shrink Small-Outline (DGG), and Thin Very Small-Outline (DGV) Packages

description

The SN74CBTD16210 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 A port is connected to B port. When $\overline{OE}$ is high, the switch is open, and a high-impedance state exists between the ports.

The SN74CBTD16210 is characterized for operation from -40°C to 85°C .

DGG, DGV, OR DL PACKAGE (TOP VIEW)

NC	1	48	$1\overline{OE}$
1A1	2	47	$2\overline{OE}$
1A2	3	46	1B1
1A3	4	45	1B2
1A4	5	44	1B3
1A5	6	43	1B4
1A6	7	42	1B5
GND	8	41	GND
1A7	9	40	1B6
1A8	10	39	1B7
1A9	11	38	1B8
1A10	12	37	1B9
2A1	13	36	1B10
2A2	14	35	2B1
V_{CC}	15	34	2B2
2A3	16	33	2B3
GND	17	32	GND
2A4	18	31	2B4
2A5	19	30	2B5
2A6	20	29	2B6
2A7	21	28	2B7
2A8	22	27	2B8
2A9	23	26	2B9
2A10	24	25	2B10

NC – No internal connection

FUNCTION TABLE
(each 10-bit bus switch)

INPUT $\overline{OE}$	FUNCTION
L	A port = B port
H	Z



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

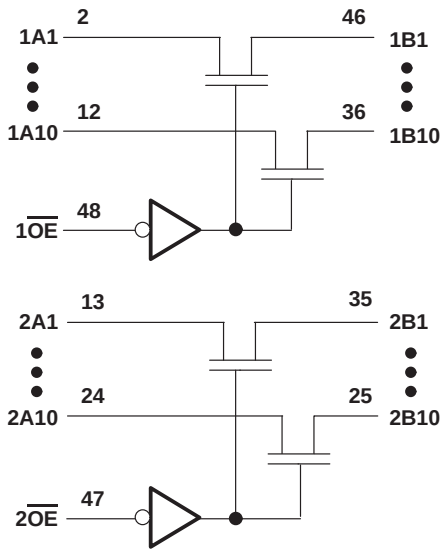
PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 1998, Texas Instruments Incorporated

logic diagram (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)[†]

Supply voltage range, V_{CC}	−0.5 V to 7 V
Input voltage range, V_I (see Note 1)	−0.5 V to 7 V
Continuous channel current	128 mA
Input clamp current, I_{IK} ($V_I < 0$)	−50 mA
Package thermal impedance, θ_{JA} (see Note 2):	
DGG package	89°C/W
DGV package	93°C/W
DL package	94°C/W
Storage temperature range, T_{stg}	−65°C to 150°C

[†] Stresses beyond those listed under “absolute maximum ratings” 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.

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

recommended operating conditions (see Note 3)

	MIN	MAX	UNIT
V_{CC} Supply voltage	4.5	5.5	V
V_{IH} High-level control input voltage	2		V
V_{IL} Low-level control input voltage		0.8	V
T_A Operating free-air temperature	−40	85	°C

NOTE 3: All unused control inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP [†]	MAX	UNIT
V_{IK}		$V_{CC} = 4.5\text{ V}$,	$I_I = -18\text{ mA}$			-1.2	V
V_{OH}		See Figure 2					
I_I		$V_{CC} = 0\text{ V}$,	$V_I = 5.5\text{ V}$			10	μA
		$V_{CC} = 5.5\text{ V}$,	$V_I = 5.5\text{ V or GND}$			± 1	
I_{CC}		$V_{CC} = 5.5\text{ V}$,	$I_O = 0$,			1.5	mA
$\Delta I_{CC}^\ddagger$		$V_{CC} = 5.5\text{ V}$,	One input at 3.4 V, Other inputs at V_{CC} or GND			2.5	mA
C_i		$V_I = 3\text{ V or } 0$				4.5	pF
$C_{io(OFF)}$		$V_O = 3\text{ V or } 0$,	$\overline{OE} = V_{CC}$			5.5	pF
$r_{on}^\S$		$V_{CC} = 4.5\text{ V}$	$V_I = 0$	$I_I = 64\text{ mA}$	5	7	Ω
				$I_I = 30\text{ mA}$	5	7	
			$V_I = 2.4\text{ V}$,	$I_I = 15\text{ mA}$	35	50	

[†] 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 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.

switching characteristics over recommended operating free-air temperature range, $C_L = 50\text{ pF}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	MIN	MAX	UNIT
$t_{pd}^{\dagger\dagger}$	A or B	B or A		0.25	ns
t_{en}	$\overline{OE}$	A or B	1.5	9.8	ns
t_{dis}	$\overline{OE}$	A or B	1.5	8.9	ns

^{††} 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).

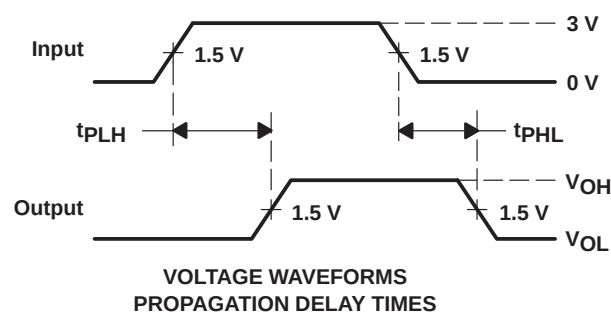
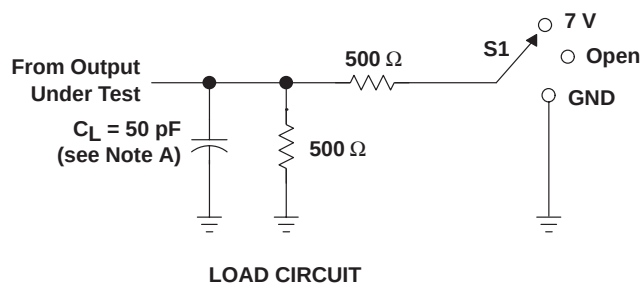
SN74CBTD16210

20-BIT FET BUS SWITCH

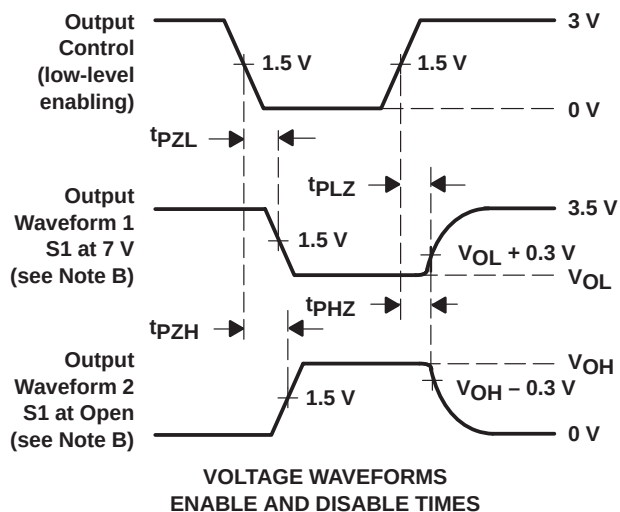
WITH LEVEL SHIFTING

SCDS049C – MARCH 1998 – REVISED MAY 1998

PARAMETER MEASUREMENT INFORMATION



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



- NOTES:
- C_L includes probe and jig capacitance.
 - 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.
 - All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2.5 \text{ ns}$, $t_f \leq 2.5 \text{ ns}$.
 - The outputs are measured one at a time with one transition per measurement.
 - t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - t_{PZL} and t_{PZH} are the same as t_{en} .
 - t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 1. Load Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS

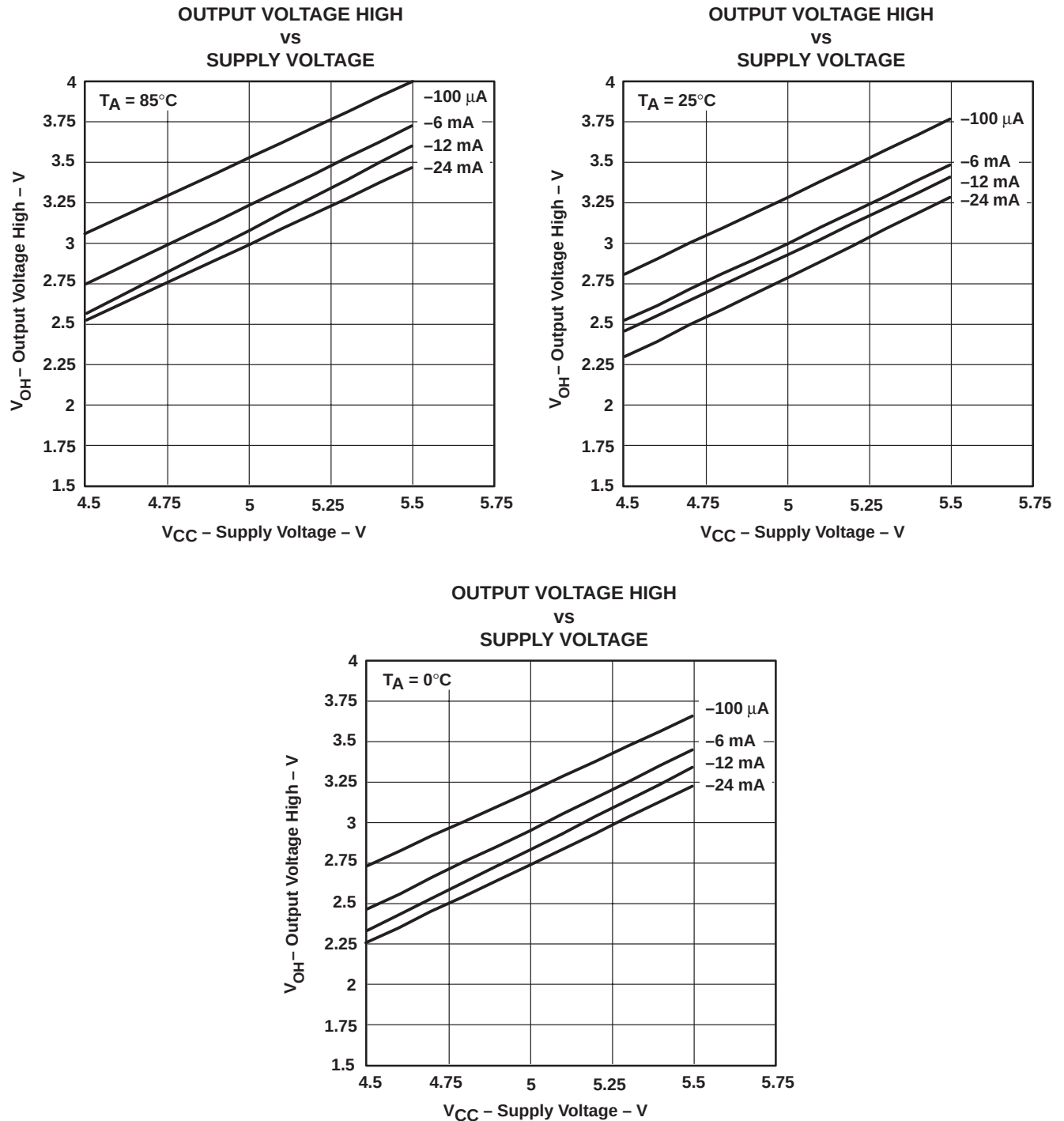


Figure 2. VOH Values

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.



ООО «НИОКРсистемс» - это оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов. Реализуемая нашей компанией продукция насчитывает более полумиллиона наименований.

Благодаря этому наша компания предлагает к поставке практически не ограниченный ассортимент компонентов как оптовыми, мелкооптовыми партиями, так и в розницу.

Благодаря развитой сети поставщиков, помогаем в поиске и приобретении экзотичных или снятых с производства компонентов.

Наша компания это:

- Гарантия качества поставляемой продукции
- Широкий ассортимент
- Минимальные сроки поставок
- Техническая поддержка
- Подбор комплектации
- Индивидуальный подход
- Гибкое ценообразование
- Работаем по 275 ФЗ