

SN54CBT16212A, SN74CBT16212A 24-BIT FET BUS-EXCHANGE SWITCHES

SCDS007S – NOVEMBER 1992 – REVISED AUGUST 2002

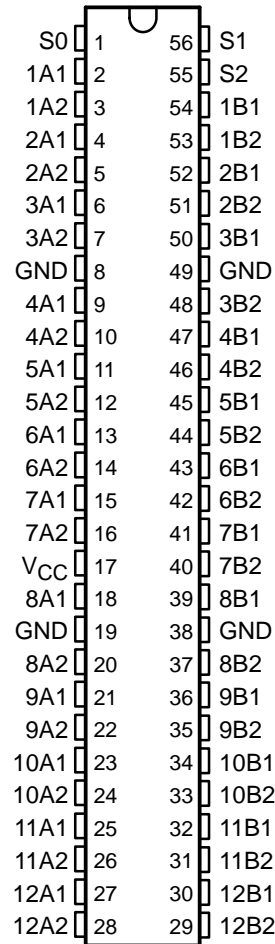
- **Members of the Texas Instruments Widebus™ Family**
- **5-Ω Switch Connection Between Two Ports**
- **TTL-Compatible Input Levels**
- **Latch-Up Performance Exceeds 250 mA Per JESD 17**
- **ESD Protection Exceeds JESD 22**
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)

description/ordering information

The 'CBT16212A devices provide 24 bits of high-speed TTL-compatible bus switching or exchanging. The low on-state resistance of the switch allows connections to be made with minimal propagation delay.

Each device operates as a 24-bit bus switch or a 12-bit bus exchanger that provides data exchanging between the four signal ports via the data-select (S0, S1, S2) terminals.

SN54CBT16212A . . . WD PACKAGE
SN74CBT16212A . . . DGG, DGV, OR DL PACKAGE
(TOP VIEW)



ORDERING INFORMATION

TA	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	SSOP – DL	Tube	SN74CBT16212ADL	CBT16212A
		Tape and reel	SN74CBT16212ADLR	
	TSSOP – DGG	Tape and reel	SN74CBT16212ADGGR	CBT16212A
	TVSOP – DGV	Tape and reel	SN74CBT16212ADGVR	CY212A
–55°C to 125°C	VFBGA – GQL	Tape and reel	SN74CBT16212AGQLR	CY212A
		CFP – WD	Tube	SNJ54CBT16212AWD

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



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.

Widebus is a trademark of Texas Instruments.

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.



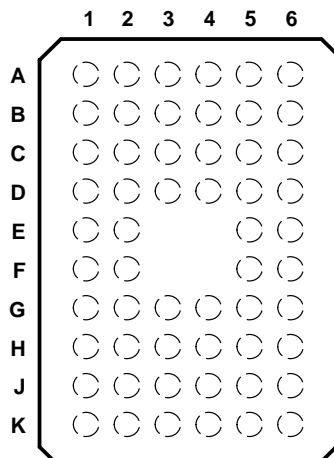
POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2002, Texas Instruments Incorporated
On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

SN54CBT16212A, SN74CBT16212A 24-BIT FET BUS-EXCHANGE SWITCHES

SCDS007S – NOVEMBER 1992 – REVISED AUGUST 2002

**GQL PACKAGE
(TOP VIEW)**



terminal assignments

	1	2	3	4	5	6
A	1A2	1A1	S0	S1	S2	1B1
B	3A1	2A2	2A1	1B2	2B1	2B2
C	4A1	GND	3A2	3B1	GND	3B2
D	5A2	4A2	5A1	4B2	4B1	5B1
E	6A2	6A1			5B2	6B1
F	7A1	7A2			7B1	6B2
G	VCC	GND	8A1	8B1	GND	7B2
H	8A2	9A1	9A2	9B2	9B1	8B2
J	10A1	10A2	11A1	11B1	10B2	10B1
K	11A2	12A1	12A2	12B2	12B1	11B2

FUNCTION TABLE

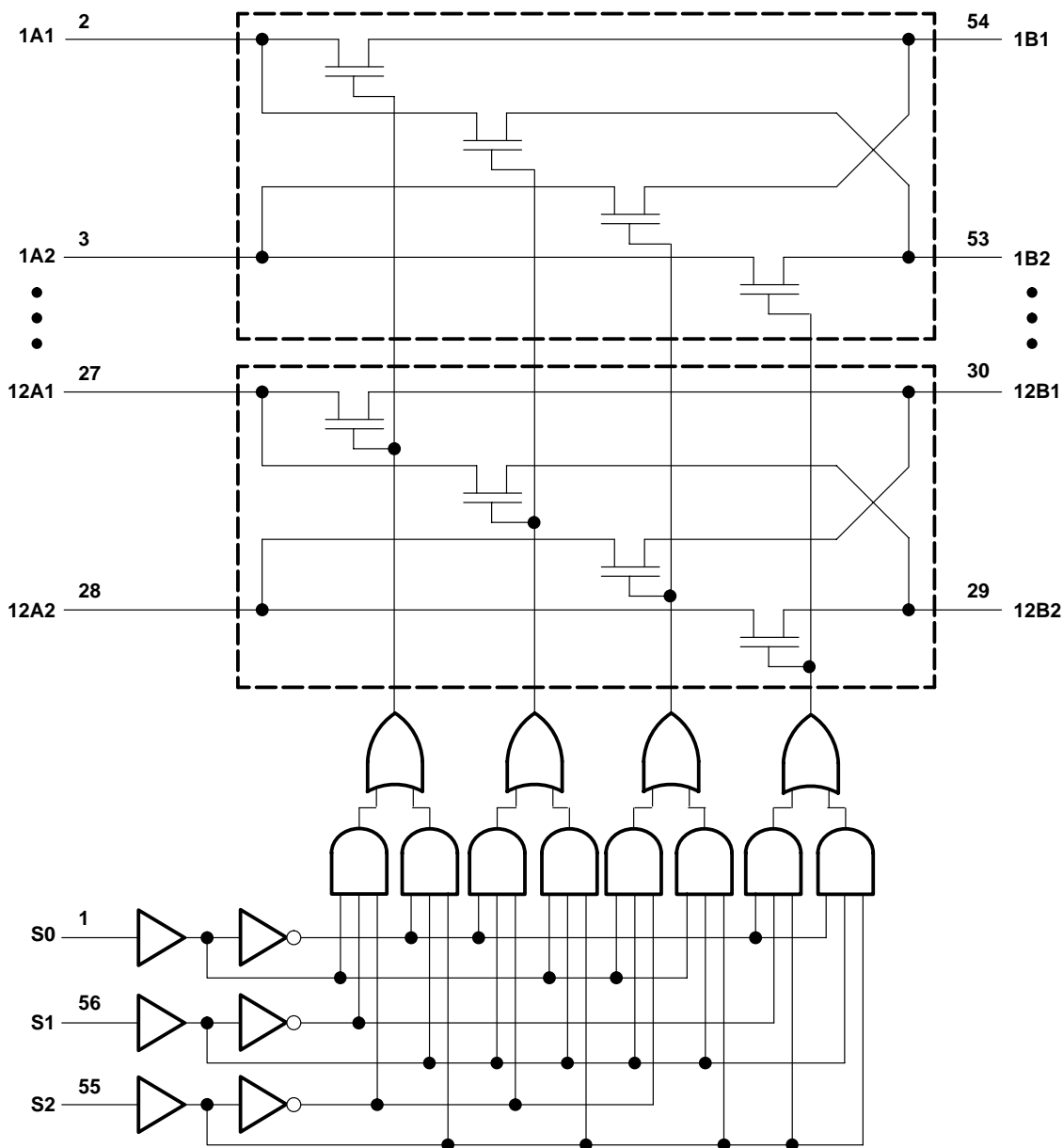
INPUTS			INPUTS/OUTPUTS		FUNCTION
S2	S1	S0	A1	A2	
L	L	L	Z	Z	Disconnect
L	L	H	B1 port	Z	A1 port = B1 port
L	H	L	B2 port	Z	A1 port = B2 port
L	H	H	Z	B1 port	A2 port = B1 port
H	L	L	Z	B2 port	A2 port = B2 port
H	L	H	Z	Z	Disconnect
H	H	L	B1 port	B2 port	A1 port = B1 port A2 port = B2 port
H	H	H	B2 port	B1 port	A1 port = B2 port A2 port = B1 port



SN54CBT16212A, SN74CBT16212A 24-BIT FET BUS-EXCHANGE SWITCHES

SCDS007S – NOVEMBER 1992 – REVISED AUGUST 2002

logic diagram (positive logic)



Pin numbers shown are for the DGG, DGV, DL, and WD packages.

SN54CBT16212A, SN74CBT16212A 24-BIT FET BUS-EXCHANGE SWITCHES

SCDS007S – NOVEMBER 1992 – REVISED AUGUST 2002

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	64°C/W
DGV package	48°C/W
DL package	56°C/W
GQL package	42°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 51-7.

recommended operating conditions (see Note 3)

	SN54CBT16212A		SN74CBT16212A		UNIT
	MIN	MAX	MIN	MAX	
V_{CC} Supply voltage	4	5.5	4	5.5	V
V_{IH} High-level control input voltage	2		2		V
V_{IL} Low-level control input voltage		0.8		0.8	V
T_A Operating free-air temperature	-55	125	-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	SN54CBT16212A		SN74CBT16212A		UNIT		
		MIN	TYP‡	MAX	MIN		TYP‡	MAX
V_{IK}	$V_{CC} = 4.5$ V, $I_I = -18$ mA			-1.2		-1.2	V	
I_I	$V_{CC} = 0$, $V_I = 5.5$ V			10		10	μ A	
	$V_{CC} = 5.5$ V, $V_I = 5.5$ V or GND			± 1		± 1		
I_{CC}	$V_{CC} = 5.5$ V, $I_O = 0$, $V_I = V_{CC}$ or GND			3.2		3	μ A	
ΔI_{CC} §	Control inputs $V_{CC} = 5.5$ V, One input at 3.4 V, Other inputs at V_{CC} or GND			2.5		2.5	mA	
C_i	Control inputs $V_I = 3$ V or 0			2.5		2.5	pF	
$C_{io(off)}$	$V_O = 3$ V or 0, $S_0, S_1,$ and $S_2 =$ GND			7.5		7.5	pF	
r_{on} ¶	$V_{CC} = 4$ V, TYP at $V_{CC} = 4$ V	$V_I = 2.4$ V, $I_I = 15$ mA		14	20	14	20	Ω
			$V_I = 0$	$I_I = 64$ mA	4	10	4	
	$V_{CC} = 4.5$ V	$V_I = 0$	$I_I = 30$ mA	4	10	4	7	
			$V_I = 2.4$ V, $I_I = 15$ mA	6	14	6	12	

‡ All typical values are at $V_{CC} = 5$ V (unless otherwise noted), $T_A = 25^\circ$ 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 lower of the voltages of the two (A or B) terminals.



SN54CBT16212A, SN74CBT16212A 24-BIT FET BUS-EXCHANGE SWITCHES

SCDS007S – NOVEMBER 1992 – REVISED AUGUST 2002

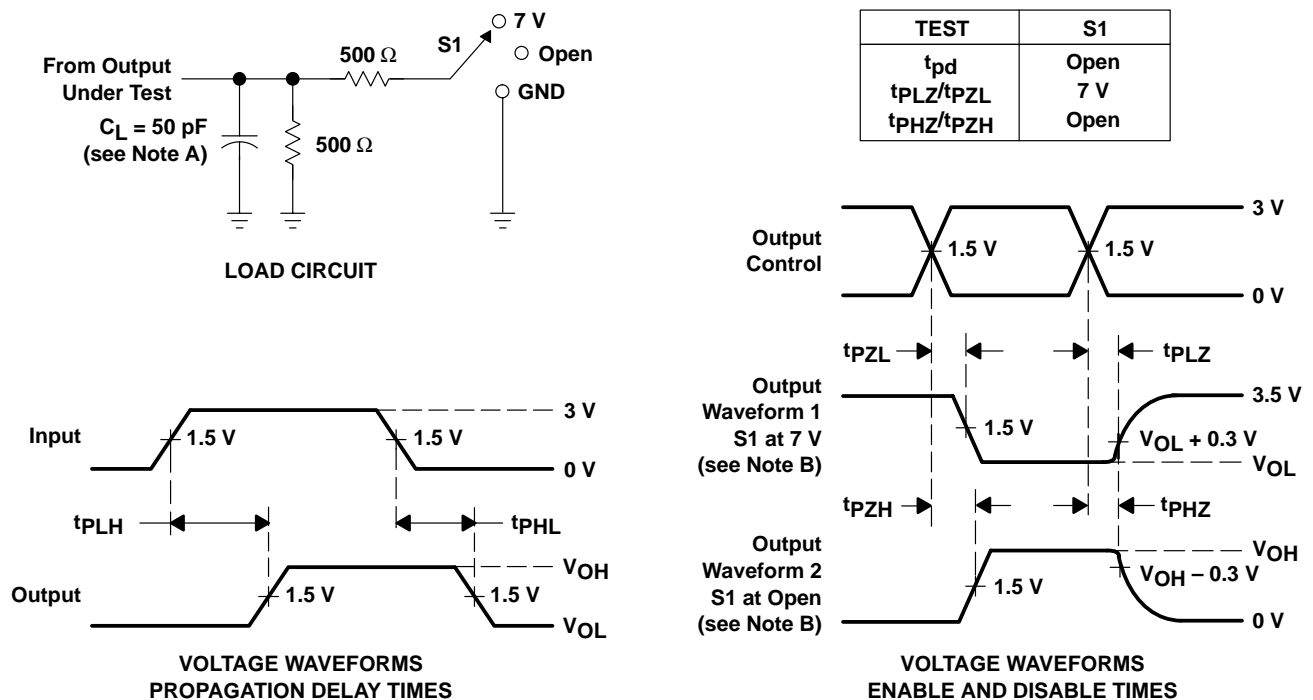
switching characteristics over recommended operating free-air temperature range, $C_L = 50$ pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN54CBT16212A				SN74CBT16212A				UNIT
			$V_{CC} = 4$ V		$V_{CC} = 5$ V ± 0.5 V		$V_{CC} = 4$ V		$V_{CC} = 5$ V ± 0.5 V		
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t_{pd}^\dagger	A or B	B or A				0.8*		0.35		0.25	ns
t_{pd}	S	A or B		14	1.5	13		10	1.5	9.1	ns
t_{en}	S	A or B		15	1.5	13.7		10.4	1.5	9.7	ns
t_{dis}	S	A or B		14.2	1.5	13.5		9.2	1.5	8.8	ns

* On products compliant to MIL-PRF-38535, this parameter is not production tested.

† 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).

PARAMETER MEASUREMENT INFORMATION



- 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: $PRR \leq 10$ MHz, $Z_O = 50 \Omega$, $t_r \leq 2.5$ ns, $t_f \leq 2.5$ 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} .
 - All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

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

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265