

SN54CBT16209, SN74CBT16209A 18-BIT FET BUS-EXCHANGE SWITCHES

SCDS006K – NOVEMBER 1992 – REVISED MAY 1998

- 5-Ω Switch Connection Between Two Ports
- TTL-Compatible Input Levels
- Package Options Include Plastic Thin Shrink Small-Outline (DGG), Thin Very Small-Outline (DGV), 300-mil Shrink Small-Outline (DL), and 380-mil Fine-Pitch Ceramic Flat (WD) Packages

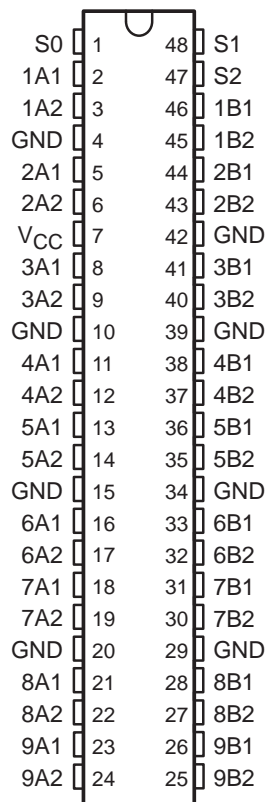
description

The SN54CBT16209 and SN74CBT16209A devices provide 18 bits of high-speed TTL-compatible bus switching or exchanging. The low on-state resistance of the switches allows connections to be made with minimal propagation delay.

The devices operate as an 18-bit bus switch or a 9-bit bus exchanger, which provides data exchanging between the four signal ports via the data-select (S0, S1, S2) terminals.

The SN54CBT16209 is characterized for operation over the full military temperature range of -55°C to 125°C. The SN74CBT16209A is characterized for operation from -40°C to 85°C.

SN54CBT16209 . . . WD PACKAGE
SN74CBT16209A . . . DGG, DGV, OR DL PACKAGE
(TOP VIEW)



FUNCTION TABLE

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



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 **TEXAS
INSTRUMENTS**

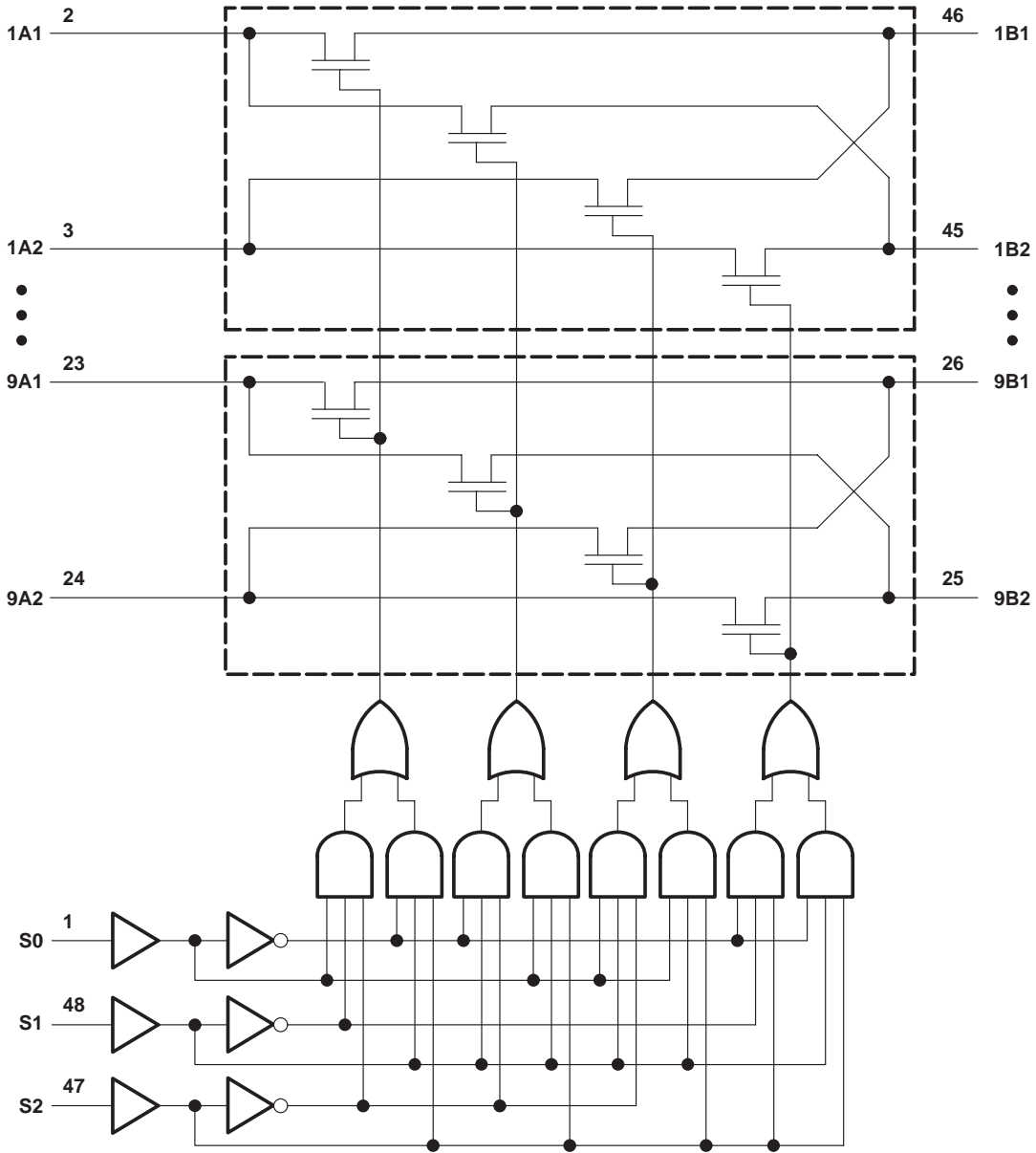
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logic diagram (positive logic)



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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)

		SN54CBT16209		SN74CBT16209A		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		MIN	TYP [‡]	MAX	UNIT
V_{IK}		$V_{CC} = 4.5$ V,	$I_I = -18$ mA			–1.2	V
I_I		$V_{CC} = 0$,	$V_I = 5.5$ V			10	μ A
		$V_{CC} = 5.5$ V,	$V_I = 5.5$ V or GND			± 1	
I_{CC}		$V_{CC} = 5.5$ V,	$I_O = 0$, $V_I = V_{CC}$ or GND			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	mA
C_i	Control inputs	$V_I = 3$ V or 0				4	pF
$C_{iO(OFF)}$		$V_O = 3$ V or 0,	S_0, S_1 , or $S_2 = V_{CC}$			7.5	pF
r_{on} [¶]		$V_{CC} = 4$ V, TYP at $V_{CC} = 4$ V	$V_I = 2.4$ V, $I_I = 15$ mA				Ω
		$V_{CC} = 4.5$ V	$V_I = 0$		4	8	
				$I_I = 64$ mA		4	
			$V_I = 2.4$ V, $I_I = 15$ mA		6	15	

[‡] All typical values are at $V_{CC} = 5$ V (unless otherwise noted), $T_A = 25^\circ\text{C}$.

[§] 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 lower of the voltages of the two (A or B) terminals.



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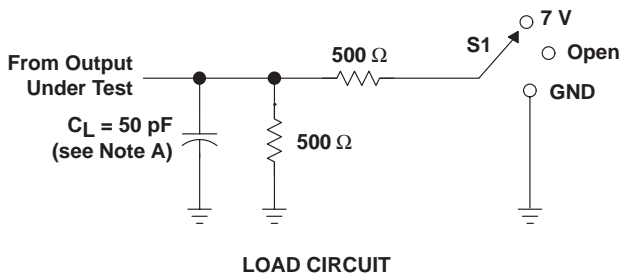
switching characteristics over recommended operating free-air temperature range, $C_L = 50$ pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN54CBT16209				SN74CBT16209A				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	2	13.1		9.9	1.5	9	ns
t_{en}	S	A or B		16	1.7	15.3		10.3	1.5	9.8	ns
t_{dis}	S	A or B		14.5	1	13.2		9.3	1.5	8.8	ns

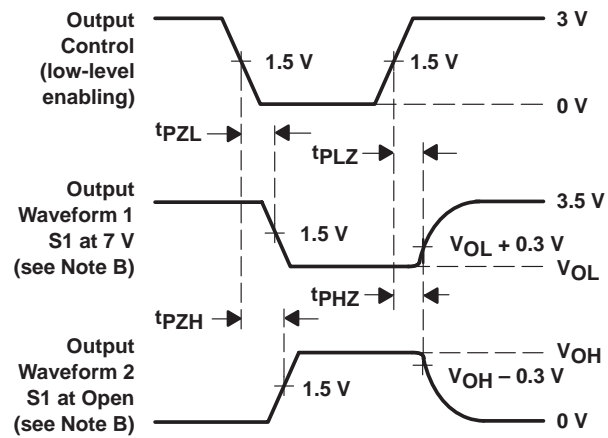
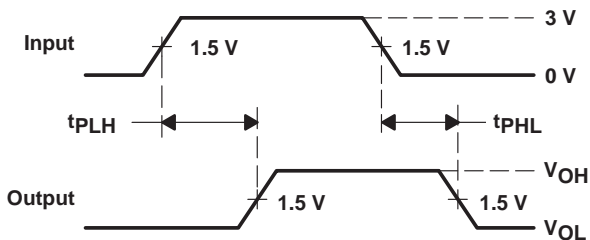
* On products compliant to MIL-PRF-38535, this parameter is not production tested.

† 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



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 ≤ 10 MHz, $Z_O = 50$ Ω , $t_r \leq 2.5$ 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} .

Figure 1. Load Circuit and Voltage Waveforms

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