

SN74ALVC16500

18-BIT UNIVERSAL BUS TRANSCEIVER WITH 3-STATE OUTPUTS

SCAS260 - JANUARY 1993 - REVISED MARCH 1994

- Member of the Texas Instruments *Widebus™* Family
- *UBT™* (Universal Bus Transceiver) Combines D-Type Latches and D-Type Flip-Flops for Operation in Transparent, Latched, or Clocked Mode
- *EPIC™* (Enhanced-Performance Implanted CMOS) Submicron Process
- Designed to Facilitate Incident-Wave Switching for Line Impedances of 50 Ω or Greater
- Typical V_{OLP} (Output Ground Bounce) < 0.8 V at $V_{CC} = 3.3$ V, $T_A = 25^\circ\text{C}$
- Typical V_{OHV} (Output V_{OH} Undershoot) > 2 V at $V_{CC} = 3.3$ V, $T_A = 25^\circ\text{C}$
- Bus-Hold On Data Inputs Eliminates the Need for External Pullup/Pulldown Resistors
- Package Options Include Plastic 300-mil Shrink Small-Outline (DL) and Thin Shrink Small-Outline (DGG) Packages

description

This 18-bit universal bus transceiver is designed for 2.7-V to 3.6-V V_{CC} operation.

Data flow in each direction is controlled by output-enable (\overline{OEAB} and \overline{OEBA}), latch-enable (\overline{LEAB} and \overline{LEBA}), and clock (\overline{CLKAB} and \overline{CLKBA}) inputs. For A-to-B data flow, the device operates in the transparent mode when \overline{LEAB} is high. When \overline{LEAB} is low, the A data is latched if \overline{CLKAB} is held at a high or low logic level. If \overline{LEAB} is low, the A-bus data is stored in the latch/flip-flop on the high-to-low transition of \overline{CLKAB} . Output-enable \overline{OEAB} is active high. When \overline{OEAB} is high, the B-port outputs are active. When \overline{OEAB} is low, the B-port outputs are in the high-impedance state.

Data flow for B to A is similar to that of A to B but uses \overline{OEBA} , \overline{LEBA} , and \overline{CLKBA} . The output enables are complementary (\overline{OEAB} is active high, and \overline{OEBA} is active low).

The SN74ALVC16500 is available in TI's shrink small-outline (DL) and thin shrink small-outline (DGG) packages, which provide twice the I/O pin count and functionality of standard small-outline packages in the same printed-circuit-board area.

The SN74ALVC16500 is characterized for operation from -40°C to 85°C .

DGG OR DL PACKAGE
(TOP VIEW)

\overline{OEAB}	1		56		GND
\overline{LEAB}	2		55		\overline{CLKAB}
A1	3		54		B1
GND	4		53		GND
A2	5		52		B2
A3	6		51		B3
V_{CC}	7		50		V_{CC}
A4	8		49		B4
A5	9		48		B5
A6	10		47		B6
GND	11		46		GND
A7	12		45		B7
A8	13		44		B8
A9	14		43		B9
A10	15		42		B10
A11	16		41		B11
A12	17		40		B12
GND	18		39		GND
A13	19		38		B13
A14	20		37		B14
A15	21		36		B15
V_{CC}	22		35		V_{CC}
A16	23		34		B16
A17	24		33		B17
GND	25		32		GND
A18	26		31		B18
\overline{OEBA}	27		30		\overline{CLKBA}
\overline{LEBA}	28		29		GND

PRODUCT PREVIEW

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FUNCTION TABLE†

INPUTS				OUTPUT B
OEAB	LEAB	CLKAB	A	
L	X	X	X	Z
H	H	X	L	L
H	H	X	H	H
H	L	↓	L	L
H	L	↓	H	H
H	L	H	X	B ₀ ‡
H	L	L	X	B ₀ §

† A-to-B data flow is shown; B-to-A flow is similar but uses OEBA, LEBA, and CLKBA.

‡ Output level before the indicated steady-state input conditions were established.

§ Output level before the indicated steady-state input conditions were established, provided that CLKAB was low before LEAB went low.

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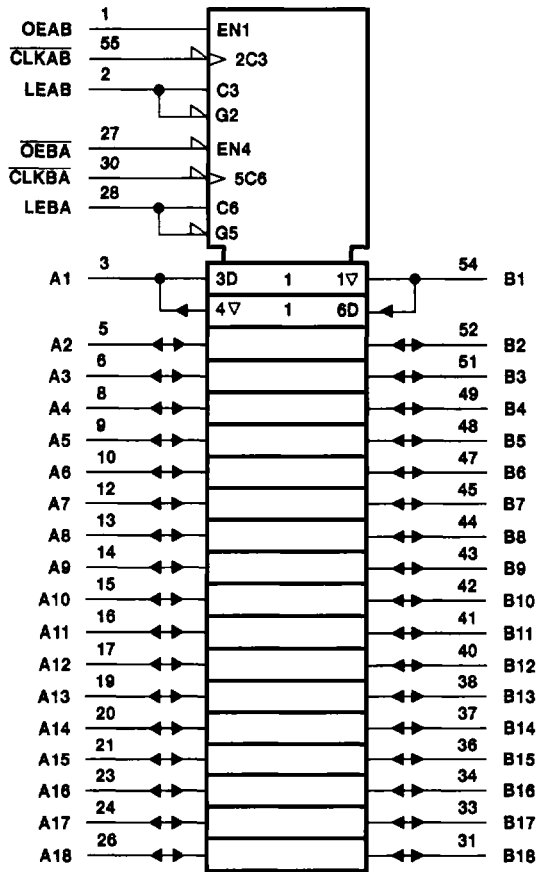


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logic symbol†



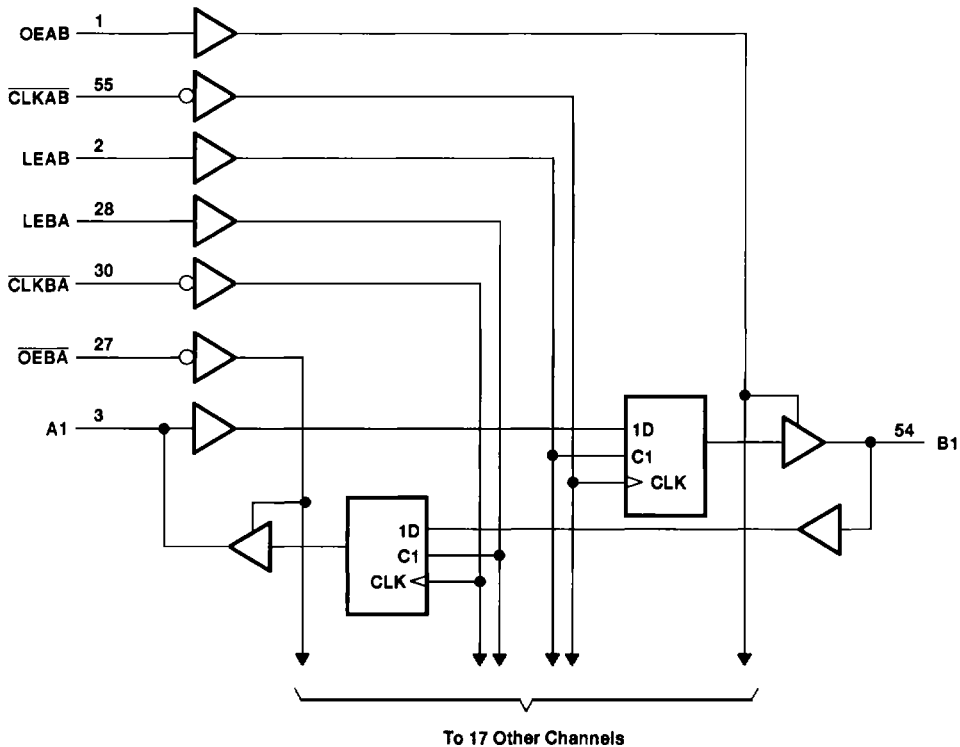
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.



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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 4.6 V
Input voltage range, V_I (except I/O ports) (see Note 1)	-0.5 V to 4.6 V
Input voltage range, V_I (I/O ports) (see Notes 1 and 2)	-0.5 V to $V_{CC} + 0.5$ V
Output voltage range, V_O (see Notes 1 and 2)	-0.5 V to $V_{CC} + 0.5$ V
Input clamp current, I_{IK} ($V_I < 0$)	-50 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$)	±50 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	±50 mA
Continuous current through V_{CC} or GND	±100 mA
Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 3): DGG package	1 W
DL package	1.4 W
Storage temperature range	-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 voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
 2. This value is limited to 4.6 V maximum.
 3. The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils. For more information, refer to the *Package Thermal Considerations* application note.



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recommended operating conditions

		MIN	MAX	UNIT
V_{CC}	Supply voltage	2.7	3.6	V
V_{IH}	High-level input voltage	$V_{CC} = 2.7\text{ V to }3.6\text{ V}$		V
V_{IL}	Low-level input voltage	$V_{CC} = 2.7\text{ V to }3.6\text{ V}$		V
V_I	Input voltage	0	V_{CC}	V
V_O	Output voltage	0	V_{CC}	V
I_{OH}	High-level output current	$V_{CC} = 2.7\text{ V}$		mA
		$V_{CC} = 3\text{ V}$		
I_{OL}	Low-level output current	$V_{CC} = 2.7\text{ V}$		mA
		$V_{CC} = 3\text{ V}$		
$\Delta t/\Delta v$	Input transition rise or fall rate	0	10	ns/V
T_A	Operating free-air temperature	-40	85	°C

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

PARAMETER		TEST CONDITIONS	V_{CC}^\dagger	MIN	MAX	UNIT
V_{OH}		$I_{OH} = -100\ \mu\text{A}$	MIN to MAX	$V_{CC} - 0.2$		V
		$I_{OH} = -12\ \text{mA}$	2.7 V	2.2		
		$I_{OH} = -24\ \text{mA}$	3 V	2.4		
V_{OL}		$I_{OL} = 100\ \mu\text{A}$	MIN to MAX	0.2		V
		$I_{OL} = 12\ \text{mA}$	2.7 V	0.4		
		$I_{OL} = 24\ \text{mA}$	3 V	0.55		
I_I		$V_I = V_{CC}$ or GND	3.6 V	± 5		μA
$I_{I(\text{hold})}$	Data I/Os	$V_I = 0.8\text{ V}$	3 V	75		μA
		$V_I = 2\text{ V}$		-75		
I_{OZ}^\ddagger		$V_O = V_{CC}$ or GND	3.6 V	± 10		μA
I_{CC}		$V_I = V_{CC}$ or GND, $I_O = 0$	3.6 V	40		μA
ΔI_{CC}		$V_{CC} = 3\text{ V to }3.6\text{ V}$, Other inputs at V_{CC} or GND		750		μA
C_i	Control inputs	$V_I = V_{CC}$ or GND	3.3 V			pF
C_{iO}	A or B ports	$V_O = V_{CC}$ or GND	3.3 V			pF

† For conditions shown as MIN or MAX, use the appropriate values under recommended operating conditions.

‡ For I/O ports, the parameter I_{OZ} includes the input leakage current.



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