

# SN74LVC646

## OCTAL BUS TRANSCEIVER AND REGISTER WITH 3-STATE OUTPUTS

SCAS302 – JANUARY 1993 – REVISED MARCH 1994

- **EPIC™** (Enhanced-Performance Implanted CMOS) Submicron Process
- Typical  $V_{OLP}$  (Output Ground Bounce)  $< 0.8\text{ V}$  at  $V_{CC} = 3.3\text{ V}$ ,  $T_A = 25^\circ\text{C}$
- Typical  $V_{OHV}$  (Output  $V_{OH}$  Undershoot)  $> 2\text{ V}$  at  $V_{CC} = 3.3\text{ V}$ ,  $T_A = 25^\circ\text{C}$
- Package Options Include Plastic Small-Outline (DW), Shrink Small-Outline (DB), and Thin Shrink Small-Outline (PW) Packages

### description

This octal bus transceiver and register is designed for 2.7-V to 3.6-V  $V_{CC}$  operation.

The SN74LVC646 consists of bus transceiver circuits, D-type flip-flops, and control circuitry arranged for multiplexed transmission of data directly from the input bus or from the internal registers. Data on the A or B bus is clocked into the registers on the low-to-high transition of the appropriate clock (CLKAB or CLKBA) input. Figure 1 illustrates the four fundamental bus-management functions that can be performed with the SN74LVC646.

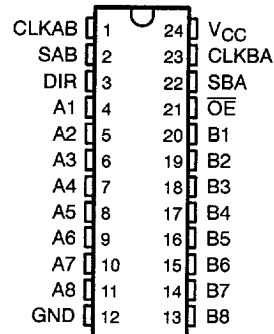
Output-enable ( $\overline{OE}$ ) and direction-control (DIR) inputs are provided to control the transceiver functions. In the transceiver mode, data present at the high-impedance port may be stored in either register or in both.

The select-control (SAB and SBA) inputs can multiplex stored and real-time (transparent mode) data. The direction control (DIR) determines which bus receives data when  $\overline{OE}$  is low. In the isolation mode ( $\overline{OE}$  high), A data may be stored in one register and/or B data may be stored in the other register.

When an output function is disabled, the input function is still enabled and may be used to store and transmit data. Only one of the two buses, A or B, may be driven at a time.

The SN74LVC646 is characterized for operation from  $-40^\circ\text{C}$  to  $85^\circ\text{C}$ .

DB, DW, OR PW PACKAGE  
(TOP VIEW)



FUNCTION TABLE

INPUTS						DATA I/Os		OPERATION OR FUNCTION
$\overline{OE}$	DIR	CLKAB	CLKBA	SAB	SBA	A1 THRU A8	B1 THRU B8	
X	X	$\uparrow$	X	X	X	Input	Unspecified†	Store A, B unspecified†
X	X	X	$\uparrow$	X	X	Unspecified†	Input	Store B, A unspecified†
H	X	$\uparrow$	$\uparrow$	X	X	Input	Input	Store A and B data
H	X	H or L	H or L	X	X	Input disabled	Input disabled	Isolation, hold storage
L	L	X	X	X	L	Output	Input	Real-time B data to A bus
L	L	X	H or L	X	H	Output	Input	Stored B data to A bus
L	H	X	X	L	X	Input	Output	Real-time A data to B bus
L	H	H or L	X	H	X	Input	Output	Stored A data to B bus

† The data output functions may be enabled or disabled by various signals at the  $\overline{OE}$  and DIR inputs. Data input functions are always enabled; i.e., data at the bus pins will be stored on every low-to-high transition of the clock inputs.

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PRODUCT PREVIEW Information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.



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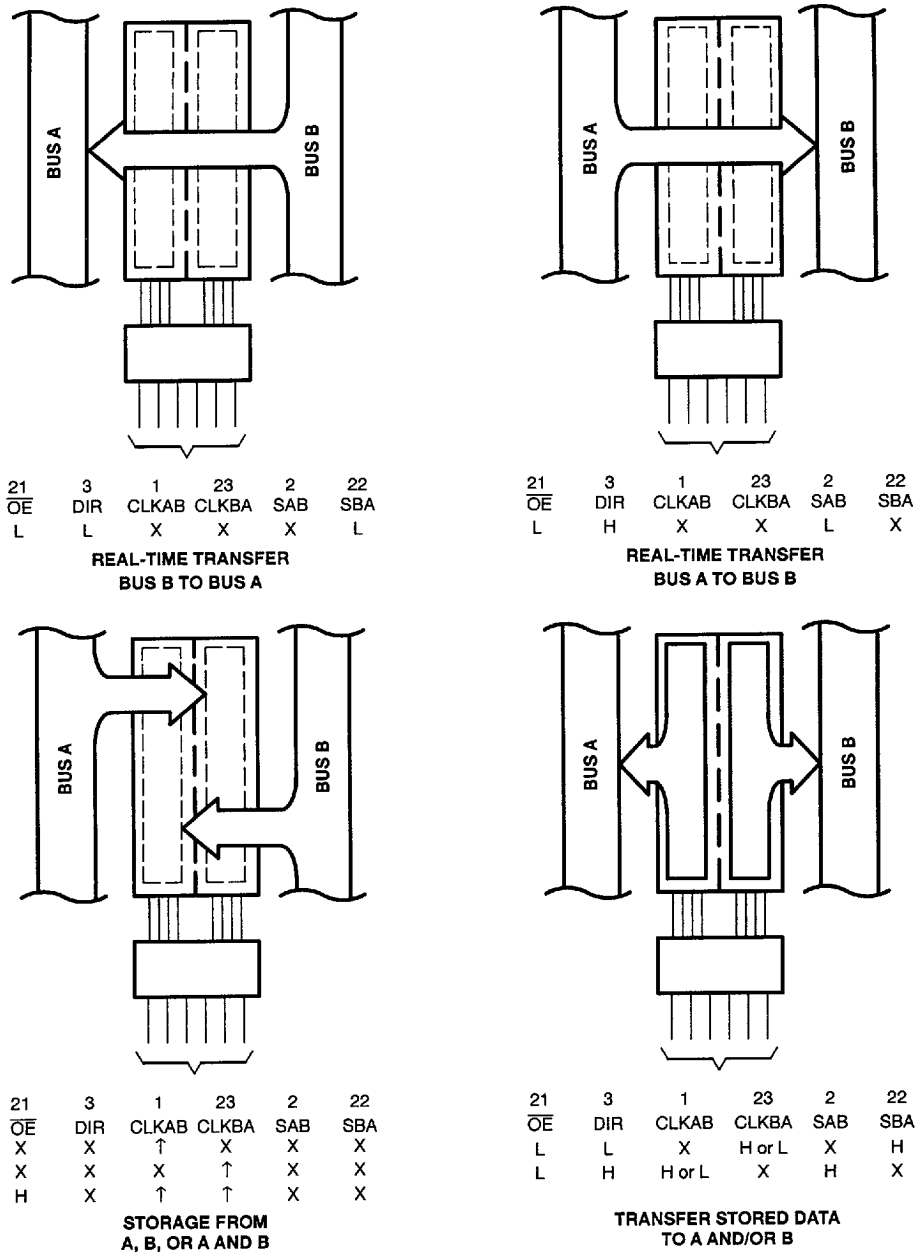


Figure 1. Bus-Management Functions

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**TEXAS**  
**INSTRUMENTS**

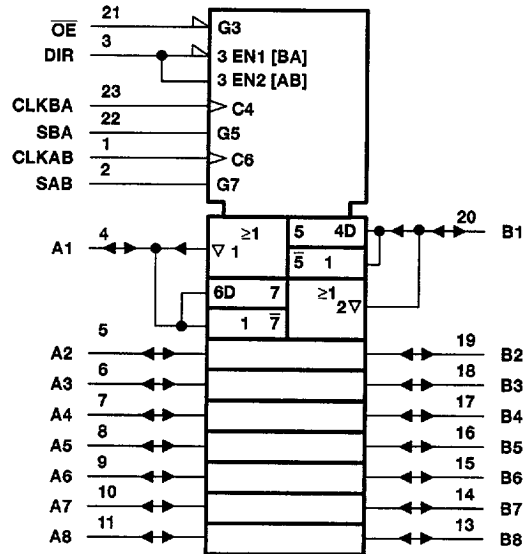
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logic symbol†



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

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**INSTRUMENTS**

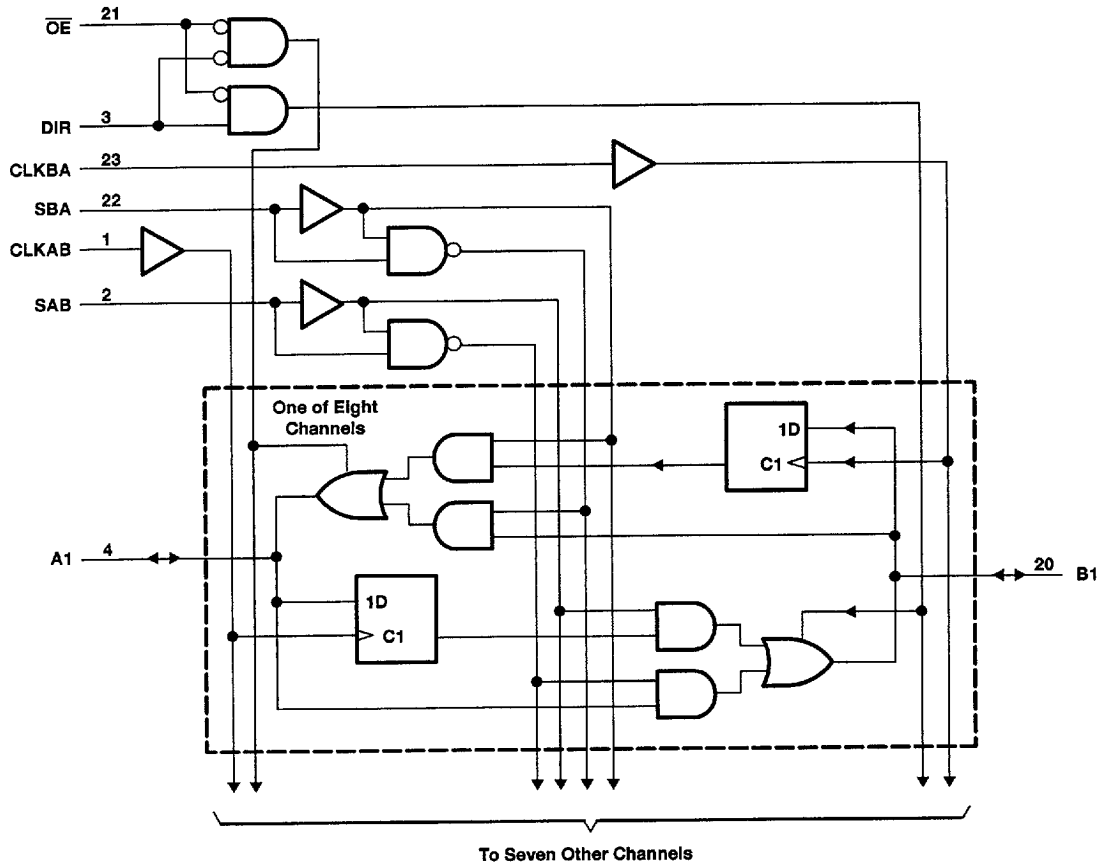
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**logic diagram (positive logic)**



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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 4.6 V
Input voltage range, $V_I$ (except I/O ports)	–0.5 V to 4.6 V
Input voltage range, $V_I$ (I/O ports) (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Output voltage range, $V_O$ (see Note 1)	–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):	
DB package	0.65 W
DW package	1.7 W
PW package	0.7 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.

NOTE 1: This value is limited to 4.6 V maximum.

## recommended operating conditions (see Note 2)

			MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage		2.7	3.6	V
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 2.7 V to 3.6 V	2		V
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 2.7 V to 3.6 V	0.8		V
V <sub>I</sub>	Input voltage		0	V <sub>CC</sub>	V
V <sub>O</sub>	Output voltage		0	V <sub>CC</sub>	V
I <sub>OH</sub>	High-level output current	V <sub>CC</sub> = 2.7 V	−12		mA
		V <sub>CC</sub> = 3 V	−24		
I <sub>OL</sub>	Low-level output current	V <sub>CC</sub> = 2.7 V	12		mA
		V <sub>CC</sub> = 3 V	24		
Δt/Δv	Input transition rise or fall rate		0	10	ns/V
T <sub>A</sub>	Operating free-air temperature		−40	85	°C

NOTE 2: Unused or floating pins (input or I/O) must be held high or low.

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

PARAMETER		TEST CONDITIONS	V <sub>CC</sub> †	T <sub>A</sub> = –40°C to 85°C		UNIT
				MIN	MAX	
V <sub>OH</sub>		I <sub>OH</sub> = –100 µA	MIN to MAX	V <sub>CC</sub> –0.2		V
		I <sub>OH</sub> = –12 mA	2.7 V	2.2		
			3 V	2.4		
		I <sub>OH</sub> = –24 mA	3 V	2		
V <sub>OL</sub>		I <sub>OL</sub> = 100 µA	MIN to MAX	0.2		V
		I <sub>OL</sub> = 12 mA	2.7 V	0.4		
		I <sub>OL</sub> = 24 mA	3 V	0.55		
I <sub>I</sub>		V <sub>I</sub> = V <sub>CC</sub> or GND	3.6 V	±5		µA
I <sub>OZ</sub> ‡		V <sub>O</sub> = V <sub>CC</sub> or GND	3.6 V	±10		µA
I <sub>CC</sub>		V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	3.6 V	20		µA
ΔI <sub>CC</sub>		V <sub>CC</sub> = 3 V to 3.6 V, One input at V <sub>CC</sub> – 0.6 V, Other inputs at V <sub>CC</sub> or GND		500		µA
C <sub>i</sub>	Control inputs	V <sub>I</sub> = V <sub>CC</sub> or GND	3.3 V			pF
C <sub>io</sub>	A or B ports	V <sub>O</sub> = V <sub>CC</sub> 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<sub>OZ</sub> includes the input leakage current.

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