

# SN74ALVCH16952 16-BIT REGISTERED TRANSCEIVER WITH 3-STATE OUTPUTS

SCES011 – JULY 1995

- Member of the Texas Instruments *Widebus™* Family
- *EPIC™* (Enhanced-Performance Implanted CMOS) Submicron Process
- 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 16-bit registered transceiver is designed for 2.3-V to 3.6-V  $V_{CC}$  operation.

The SN74ALVCH16952 contains two sets of D-type flip-flops for temporary storage of data flowing in either direction. This device can be used as two 8-bit transceivers or one 16-bit transceiver. Data on the A or B bus is stored in the registers on the low-to-high transition of the clock (CLKAB or CLKBA) input provided that the clock-enable ( $\overline{CEAB}$  or  $\overline{CEBA}$ ) input is low. Taking the output-enable ( $\overline{OEAB}$  or  $\overline{OEBA}$ ) input low accesses the data on either port.

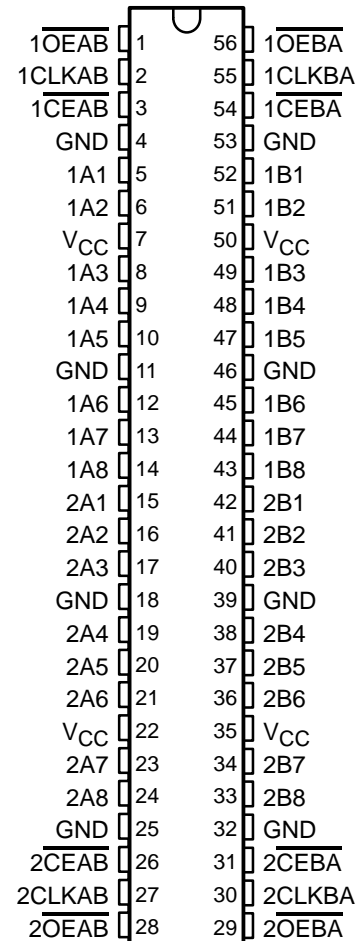
To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

Active bus-hold circuitry is provided to hold unused or floating data inputs at a valid logic level.

The SN74ALVCH16952 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 SN74ALVCH16952 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

DGG OR DL PACKAGE  
(TOP VIEW)



ADVANCE INFORMATION



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.

EPIC and Widebus are trademarks of Texas Instruments Incorporated.

ADVANCE INFORMATION concerns new products in the sampling or preproduction phase of development. Characteristic data and other specifications are subject to change without notice.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 1995, Texas Instruments Incorporated

SN74ALVCH16952  
16-BIT REGISTERED TRANSCEIVER  
WITH 3-STATE OUTPUTS

SCES011 – JULY 1995

FUNCTION TABLE†

INPUTS				OUTPUT
CLKENAB	CLKAB	OEAB	A	B
H	X	L	X	B <sub>0</sub> ‡
X	L	L	X	B <sub>0</sub> ‡
L	↑	L	L	L
L	↑	L	H	H
X	X	H	X	Z

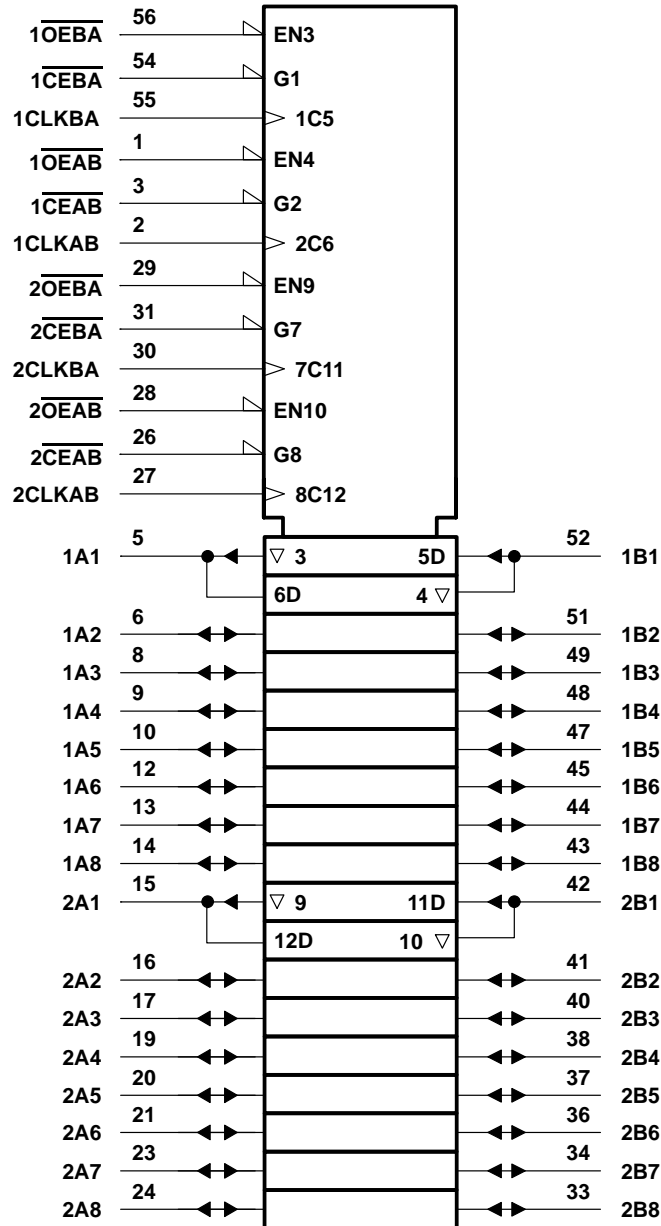
† A-to-B data flow is shown; B-to-A data flow is similar but uses CLKENBA, CLKBA, and OEBA.

‡ Level of B before the indicated steady-state input conditions were established

ADVANCE INFORMATION



logic symbol†



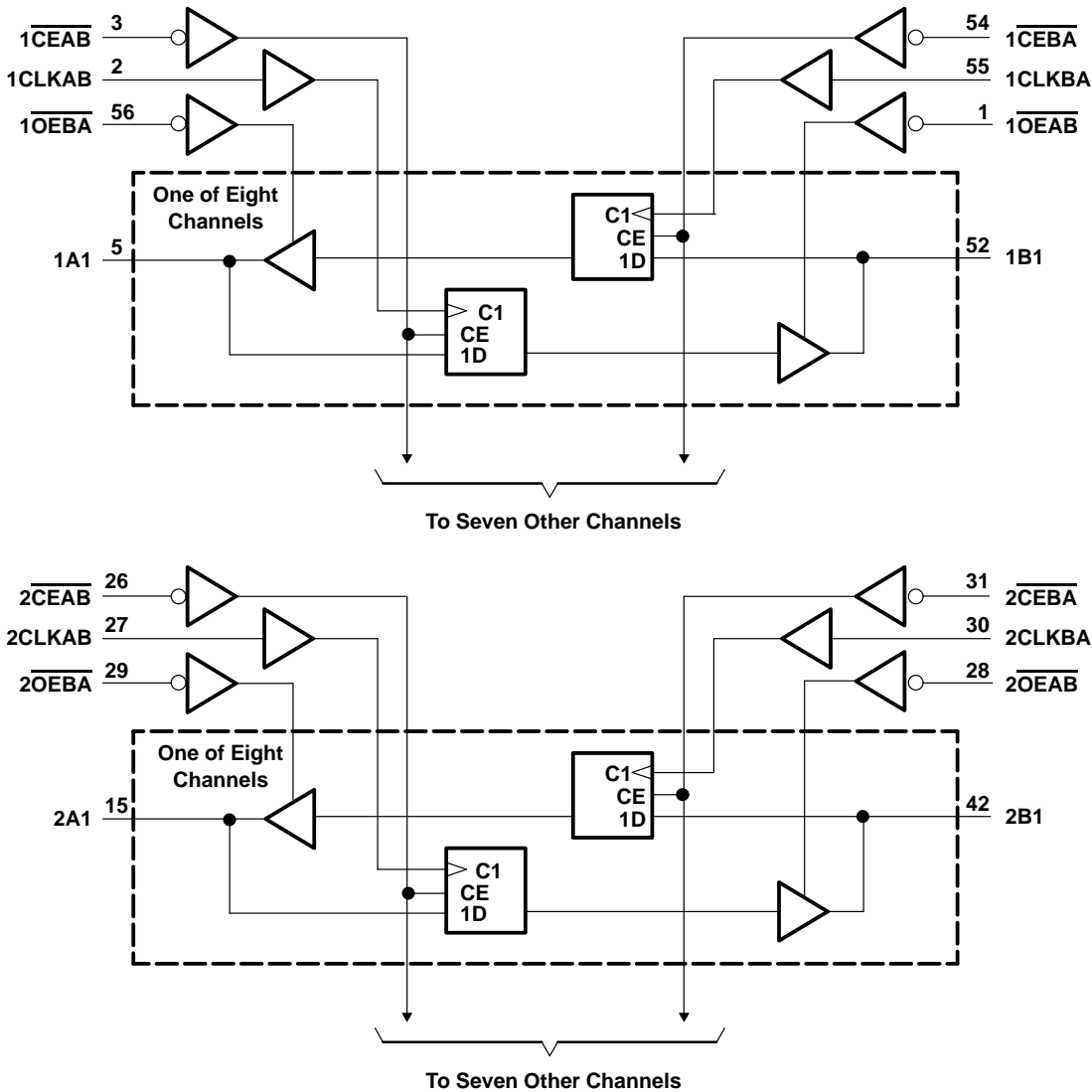
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

ADVANCE INFORMATION

SN74ALVCH16952  
16-BIT REGISTERED TRANSCEIVER  
WITH 3-STATE OUTPUTS

SCES011 – JULY 1995

logic diagram (positive logic)



ADVANCE INFORMATION



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

**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
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 each $V_{CC}$ 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, $T_{stg}$	–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. 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 in the 1994 *ABT Advanced BiCMOS Technology Data Book*, literature number SCBD002B.

**recommended operating conditions (see Note 4)**

			MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage		2.3	3.6	V
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 2.3 V to 2.7 V	1.7		V
		V <sub>CC</sub> = 2.7 V to 3.6 V	2		
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 2.3 V to 2.7 V		0.7	V
		V <sub>CC</sub> = 2.7 V to 3.6 V		0.8	
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> = 2.3 V		−12	mA
		V <sub>CC</sub> = 2.7 V		−12	
		V <sub>CC</sub> = 3 V		−24	
I <sub>OL</sub>	Low-level output current	V <sub>CC</sub> = 2.3 V		12	mA
		V <sub>CC</sub> = 2.7 V		12	
		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 4: Unused control inputs must be held high or low to prevent them from floating.

# SN74ALVCH16952

## 16-BIT REGISTERED TRANSCEIVER

### WITH 3-STATE OUTPUTS

SCES011 – JULY 1995

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub> <sup>†</sup>	MIN	TYP <sup>‡</sup>	MAX	UNIT
V <sub>OH</sub>	I <sub>OH</sub> = –100 µA	MIN to MAX	V <sub>CC</sub> – 0.2			V
	I <sub>OH</sub> = –6 mA, V <sub>IH</sub> = 1.7 V	2.3 V	2			
	I <sub>OH</sub> = –12 mA	V <sub>IH</sub> = 1.7 V	2.3 V		1.7	
		V <sub>IH</sub> = 2 V	2.7 V		2.2	
		V <sub>IH</sub> = 2 V	3 V		2.4	
	I <sub>OH</sub> = –24 mA, V <sub>IH</sub> = 2 V	3 V	2			
V <sub>OL</sub>	I <sub>OL</sub> = 100 µA	MIN to MAX	0.2			V
	I <sub>OL</sub> = 6 mA, V <sub>IL</sub> = 0.7 V	2.3 V	0.4			
	I <sub>OL</sub> = 12 mA	V <sub>IL</sub> = 0.7 V	2.3 V		0.7	
		V <sub>IL</sub> = 0.8 V	2.7 V		0.4	
	I <sub>OL</sub> = 24 mA, V <sub>IL</sub> = 0.8 V	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>I(hold)</sub>	V <sub>I</sub> = 0.7 V	2.3 V	45			µA
	V <sub>I</sub> = 1.7 V		–45			
	V <sub>I</sub> = 0.8 V	3 V	75			
	V <sub>I</sub> = 2 V		–75			
	V <sub>I</sub> = 0 to 3.6 V	3.6 V	±500			
I <sub>OZ</sub> <sup>§</sup>	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	40			µA
ΔI <sub>CC</sub>	One input at V <sub>CC</sub> – 0.6 V, Other inputs at V <sub>CC</sub> or GND	3 V to 3.6 V	750			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

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

<sup>‡</sup> Typical values are measured at V<sub>CC</sub> = 3.3 V, T<sub>A</sub> = 25°C.

<sup>§</sup> For I/O ports, the parameter I<sub>OZ</sub> includes the input leakage current.

ADVANCE INFORMATION



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

## **IMPORTANT NOTICE**

Texas Instruments (TI) reserves the right to make changes to its products or to discontinue any semiconductor product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

TI warrants performance of its semiconductor products and related software 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, INTENDED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS.**

Inclusion of TI products in such applications is understood to be fully at the risk of the customer. Use of TI products in such applications requires the written approval of an appropriate TI officer. Questions concerning potential risk applications should be directed to TI through a local SC sales office.

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

TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein. Nor does TI 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.