

SN74LVC16543

16-BIT REGISTERED TRANSCEIVER

WITH 3-STATE OUTPUTS

SCAS317 – NOVEMBER 1993 – REVISED MARCH 1994

- Member of the Texas Instruments *Widebus™* Family
- **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 $V_{CC} = 3.3\text{ V}$, $T_A = 25^\circ\text{C}$
- 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 low-voltage (3.3 V) V_{CC} operation.

The SN74LVC16543 can be used as two 8-bit transceivers or one 16-bit transceiver. Separate latch-enable ($\overline{\text{LEAB}}$ or $\overline{\text{LEBA}}$) and output-enable ($\overline{\text{OEAB}}$ or $\overline{\text{OEBA}}$) inputs are provided for each register to permit independent control in either direction of data flow.

The A-to-B enable ($\overline{\text{CEAB}}$) input must be low in order to enter data from A or to output data from B. If $\overline{\text{CEAB}}$ is low and $\overline{\text{LEAB}}$ is low, the A-to-B latches are transparent; a subsequent low-to-high transition of $\overline{\text{LEAB}}$ puts the A latches in the storage mode. With $\overline{\text{CEAB}}$ and $\overline{\text{OEAB}}$ both low, the 3-state B outputs are active and reflect the data present at the output of the A latches. Data flow from B to A is similar but requires using the $\overline{\text{CEBA}}$, $\overline{\text{LEBA}}$, and $\overline{\text{OEBA}}$ inputs.

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

The SN74LVC16543 is characterized for operation from -40°C to 85°C .

DGG OR DL PACKAGE (TOP VIEW)

1 $\overline{\text{OEAB}}$	1	56	1 $\overline{\text{OEBA}}$
1 $\overline{\text{LEAB}}$	2	55	1 $\overline{\text{LEBA}}$
1 $\overline{\text{CEAB}}$	3	54	1 $\overline{\text{CEBA}}$
GND	4	53	GND
1A1	5	52	1B1
1A2	6	51	1B2
V_{CC}	7	50	V_{CC}
1A3	8	49	1B3
1A4	9	48	1B4
1A5	10	47	1B5
GND	11	46	GND
1A6	12	45	1B6
1A7	13	44	1B7
1A8	14	43	1B8
2A1	15	42	2B1
2A2	16	41	2B2
2A3	17	40	2B3
GND	18	39	GND
2A4	19	38	2B4
2A5	20	37	2B5
2A6	21	36	2B6
V_{CC}	22	35	V_{CC}
2A7	23	34	2B7
2A8	24	33	2B8
GND	25	32	GND
2 $\overline{\text{CEAB}}$	26	31	2 $\overline{\text{CEBA}}$
2 $\overline{\text{LEAB}}$	27	30	2 $\overline{\text{LEBA}}$
2 $\overline{\text{OEAB}}$	28	29	2 $\overline{\text{OEBA}}$

PRODUCT PREVIEW

FUNCTION TABLE†
(each 8-bit section)

INPUTS				OUTPUT B
$\overline{\text{CEAB}}$	$\overline{\text{LEAB}}$	$\overline{\text{OEAB}}$	A	
H	X	X	X	Z
X	X	H	X	Z
L	H	L	X	$B_0^\ddagger$
L	L	L	L	L
L	L	L	H	H

† A-to-B data flow is shown; B-to-A flow control is the same except that it uses $\overline{\text{CEBA}}$, $\overline{\text{LEBA}}$, and $\overline{\text{OEBA}}$.

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

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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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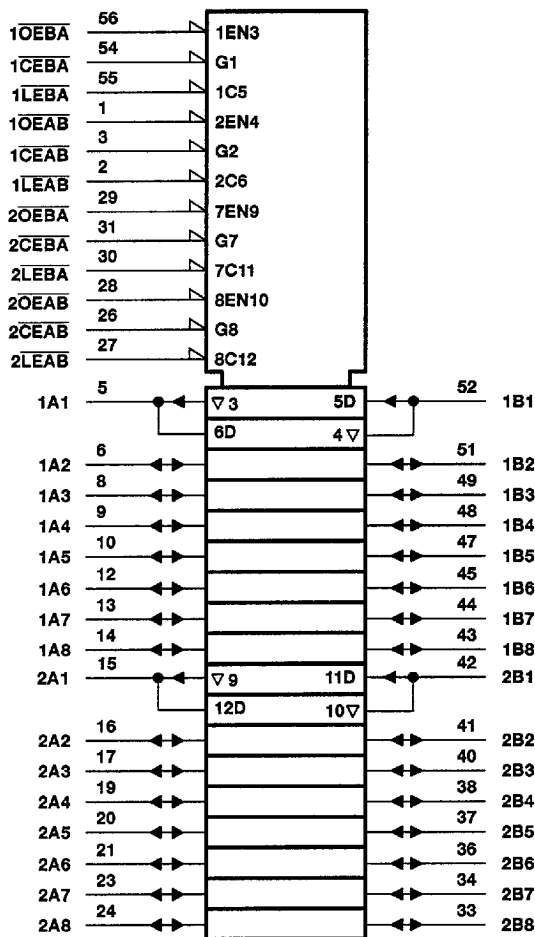
8-35

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SN74LVC16543
16-BIT REGISTERED TRANSCEIVER
WITH 3-STATE OUTPUTS

SCAS317 – NOVEMBER 1993 – REVISED MARCH 1994

logic symbol†



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

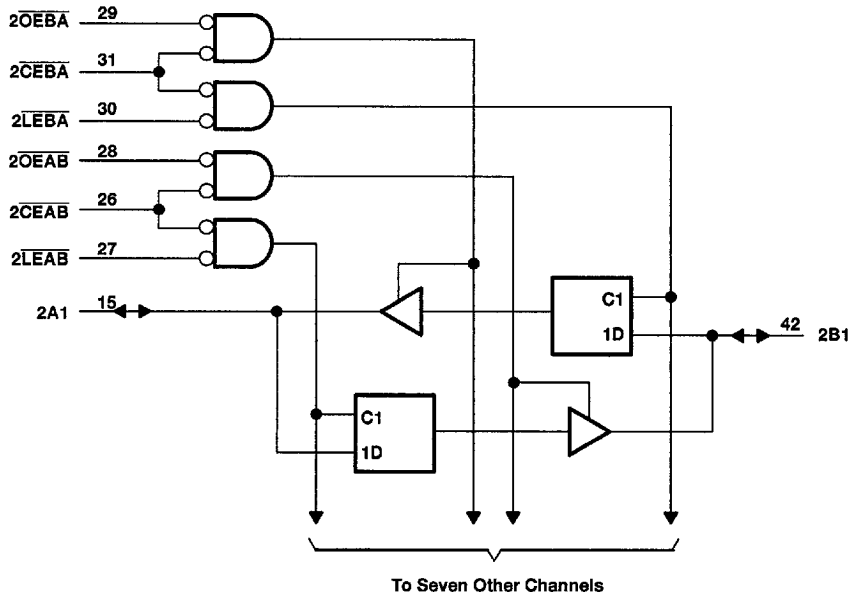
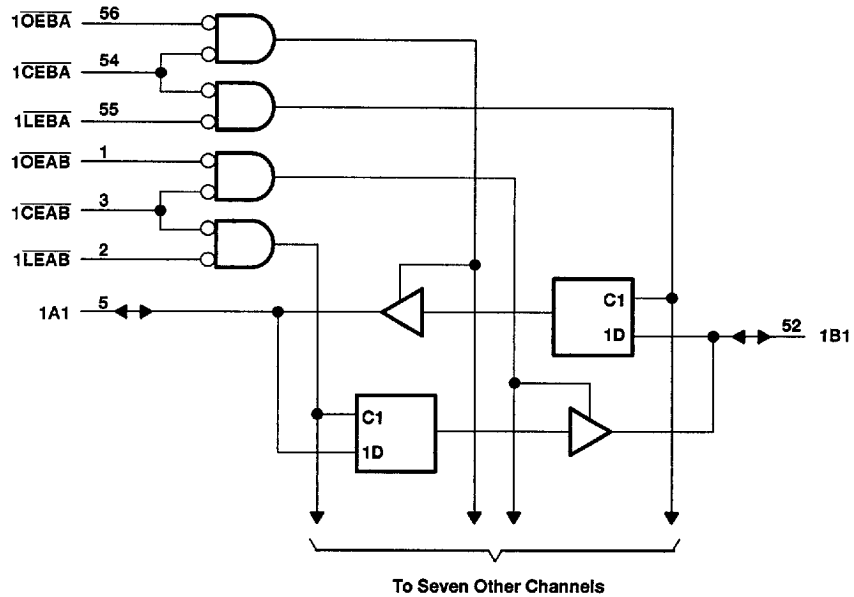
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logic diagram (positive logic)



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8961723 0100609 340

SN74LVC16543
16-BIT REGISTERED TRANSCEIVER
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 SCAS317 – NOVEMBER 1993 – REVISED MARCH 1994

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): 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.

recommended operating conditions (see Note 3)

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

NOTE 3: Unused or floating control pins must be held high or low.

PRODUCT PREVIEW

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SN74LVC16543
16-BIT REGISTERED TRANSCEIVER
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SCAS317 – NOVEMBER 1993 – REVISED MARCH 1994

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

PARAMETER		TEST CONDITIONS	$V_{CC}^{\dagger}$	MIN	MAX	UNIT
V_{OH}		$I_{OH} = -100 \mu A$	MIN to MAX	$V_{CC}-0.2$		V
		$I_{OH} = -12 \text{ mA}$	2.7 V	2.2		
			3 V	2.4		
		$I_{OH} = -24 \text{ mA}$	3 V	2		
V_{OL}		$I_{OL} = 100 \mu A$	MIN to MAX		0.2	V
		$I_{OL} = 12 \text{ mA}$	2.7 V		0.4	
			3 V		0.55	
		$I_{OL} = 24 \text{ mA}$				
I_I	Control inputs	$V_I = V_{CC}$ or GND	3.6 V		± 5	μA
$I_{I(\text{hold})}$	A or B ports	$V_I = 0.8 \text{ V}$	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}		$V_{CC} = 3 \text{ V to } 3.6 \text{ V}$, One input at $V_{CC} - 0.6 \text{ V}$, Other inputs at V_{CC} or GND			500	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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8-39