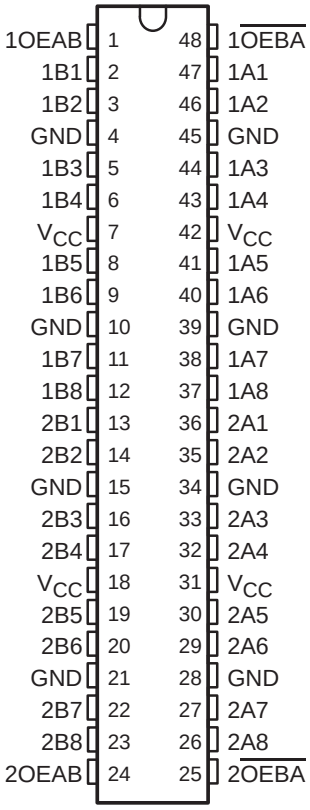
- **Members of the Texas Instruments *Widebus*™ Family**
- **3-State Outputs Drive Bus Lines Directly**
- **Flow-Through Architecture Optimizes PCB Layout**
- **Distributed V_{CC} and GND Pin Configurations Minimize High-Speed Switching Noise**
- ***EPIC*™ (Enhanced-Performance Implanted CMOS) 1-μm Process**
- **500-mA Typical Latch-Up Immunity at 125°C**
- **Package Options Include Plastic 300-mil Shrink Small-Outline (DL) Packages Using 25-mil Center-to-Center Pin Spacings and 380-mil Fine-Pitch Ceramic Flat (WD) Packages Using 25-mil Center-to-Center Pin Spacings**

54AC16620 . . . WD PACKAGE
74AC16620 . . . DL PACKAGE
(TOP VIEW)



description

The ’AC16620 are inverting 16-bit transceivers designed for asynchronous communication between data buses. The control-function implementation allows for maximum flexibility in timing.

These devices can be used as two 8-bit transceivers or one 16-bit transceiver. They allow data transmission from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the complementary output-enable (OEAB or $\overline{\text{OEBA}}$) inputs. The output-enable inputs can be used to disable the device so that the buses are effectively isolated.

The dual-enable configuration gives the transceiver the capability to store data by simultaneously enabling OEAB and $\overline{\text{OEBA}}$. Each output reinforces its input in this transceiver configuration. Thus, when both control inputs are enabled and all other data sources to the two sets of bus lines are at high impedance, the bus lines remain at their last states.

The 74AC16620 is packaged in TI’s shrink small-outline package, which provides twice the I/O pin count and functionality of standard small-outline packages in the same printed-circuit-board area.

The 54AC16620 is characterized for operation over the full military temperature range of –55°C to 125°C. The 74AC16620 is characterized for operation from –40°C to 85°C.

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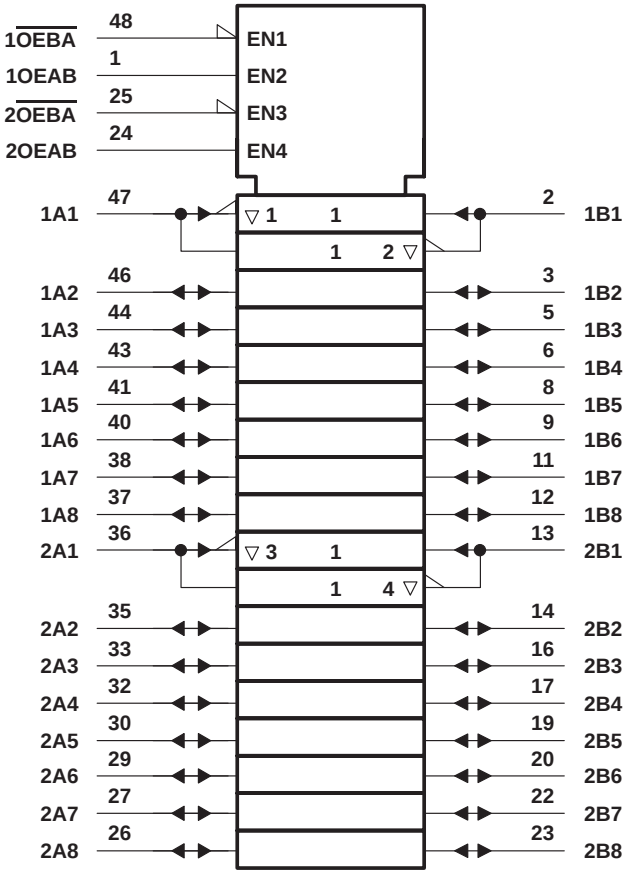
FUNCTION TABLE
(each 8-bit section)

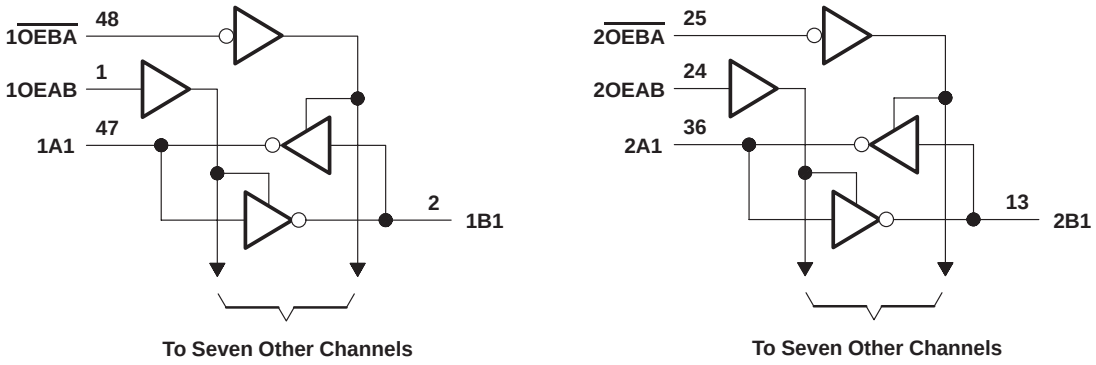
INPUTS		OPERATION
$\overline{\text{OEBA}}$	OEAB	
L	L	$\overline{\text{B}}$ data to A bus
L	H	$\overline{\text{B}}$ data to A bus, $\overline{\text{A}}$ data to B bus
H	L	Isolation
H	H	$\overline{\text{A}}$ data to B bus

logic symbol†



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

logic diagram (positive logic)



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 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 or V_I > V_{CC}) . . . . . ±20 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 . . . . . ±400 mA
Maximum power dissipation at T_A = 55°C (in still air) (see Note 2): DL package . . . . . 1.2 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 voltage ratings may be exceeded if the input and output current ratings are observed.
2. The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils.

recommended operating conditions (see Note 2)

			54AC16620			74AC16620			UNIT
			MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage		3	5	5.5	3	5	5.5	V
V_{IH}	High-level input voltage	V_{CC} = 3 V	2.1			2.1			V
		V_{CC} = 4.5 V	3.15			3.15			
		V_{CC} = 5.5 V	3.85			3.85			
V_{IL}	Low-level input voltage	V_{CC} = 3 V			0.9			0.9	V
		V_{CC} = 4.5 V			1.35			1.35	
		V_{CC} = 5.5 V			1.65			1.65	
V_I	Input voltage		0		V_{CC}	0		V_{CC}	V
V_O	Output voltage		0		V_{CC}	0		V_{CC}	V
I_{OH}	High-level output current	V_{CC} = 3 V			–4			–4	mA
		V_{CC} = 4.5 V			–24			–24	
		V_{CC} = 5.5 V			–24			–24	
I_{OL}	Low-level output current	V_{CC} = 3 V			12			12	mA
		V_{CC} = 4.5 V			24			24	
		V_{CC} = 5.5 V			24			24	
$\Delta t/\Delta v$	Input transition rise or fall rate		0		10	0		10	ns/V
T_A	Operating free-air temperature		–55		125	–40		85	°C

NOTE 3: Unused inputs must be held high or low to prevent them from floating.

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

PARAMETER		TEST CONDITIONS	V_{CC}	T_A = 25°C			54AC16620		74AC16620		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}		I_{OH} = –50 µA	3 V	2.9			2.9		2.9		V
			4.5 V	4.4			4.4		4.4		
			5.5 V	5.4			5.4		5.4		
		I_{OH} = –4 mA	3 V	2.58			2.48		2.48		
		I_{OH} = –24 mA	4.5 V	3.94			3.8		3.8		
			5.5 V	4.94			4.8		4.8		
		I_{OH} = –75 mA†	5.5 V				3.85		3.85		
V_{OL}		I_{OL} = 50 µA	3 V			0.1		0.1		0.1	V
			4.5 V			0.1		0.1		0.1	
			5.5 V			0.1		0.1		0.1	
		I_{OL} = 12 mA	3 V			0.36		0.44		0.44	
		I_{OL} = 24 mA	4.5 V			0.36		0.44		0.44	
			5.5 V			0.36		0.44		0.44	
		I_{OL} = 75 mA†	5.5 V					1.65		1.65	
I_I	Control inputs	$V_I = V_{CC}$ or GND	5.5 V			±0.1		±1		±1	µA
I_{OZ}‡	A or B ports	$V_O = V_{CC}$ or GND	5.5 V			±0.5		±5		±5	µA
I_{CC}		$V_I = V_{CC}$ or GND, I_O = 0	5.5 V			8		80		80	µA
C_i	Control inputs	$V_I = V_{CC}$ or GND	5 V		4.5						pF
C_{io}	A or B ports	$V_O = V_{CC}$ or GND	5 V		16						pF

† Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.
‡ For I/O ports, the parameter I_{OZ} includes the input leakage current.

PRODUCT PREVIEW

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switching characteristics over recommended operating free-air temperature range, V_{CC} = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	T_A = 25°C			54AC16620		74AC16620		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A or B	B or A	2.7	6.1	8.7	2.7	9.7	2.7	9.7	ns
t_{PHL}			3.9	7.9	10.6	3.9	11.7	3.9	11.7	
t_{PZH}	$\overline{OEBA}$	A	3.2	7.1	10	3.2	11.2	3.2	11.2	ns
t_{PZL}			4.5	11.1	13.5	4.5	15	4.5	15	
t_{PHZ}	$\overline{OEBA}$	A	5.3	7.4	9.5	5.3	10.2	5.3	10.2	ns
t_{PLZ}			4.6	7	9.2	4.6	9.8	4.6	9.8	
t_{PZH}	OEAB	B	3.1	6.7	9.5	3.1	10.7	3.1	10.7	ns
t_{PZL}			4.4	9.6	13	4.4	14.5	4.4	14.5	
t_{PHZ}	OEAB	B	5	7.1	9.3	5	9.8	5	9.8	ns
t_{PLZ}			4.4	6.8	8.9	4.4	9.4	4.4	9.4	

PRODUCT PREVIEW

switching characteristics over recommended operating free-air temperature range, V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	T_A = 25°C			54AC16620		74AC16620		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A or B	B or A	2.1	3.9	6.1	2.1	6.8	2.1	6.8	ns
t_{PHL}			3.1	4.9	7.3	3.1	8.2	3.1	8.2	
t_{PZH}	$\overline{OEBA}$	A	2.2	4.3	6.8	2.2	7.6	2.2	7.6	ns
t_{PZL}			3.3	5.5	8.4	3.3	9.4	3.3	9.4	
t_{PHZ}	$\overline{OEBA}$	A	4.9	6.6	8.6	4.9	9.2	4.9	9.2	ns
t_{PLZ}			4.1	5.8	7.8	4.1	8.3	4.1	8.3	
t_{PZH}	OEAB	B	2.2	4.2	6.5	2.2	7.3	2.2	7.3	ns
t_{PZL}			3.4	5.4	8.1	3.4	9.1	3.4	9.1	
t_{PHZ}	OEAB	B	4.6	6.4	8.5	4.6	9	4.6	9	ns
t_{PLZ}			4.1	5.6	7.6	4.1	8	4.1	8	

PRODUCT PREVIEW

operating characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER			TEST CONDITIONS		TYP	UNIT
C_{pd}	Power dissipation capacitance per transceiver	Outputs enabled	C_L = 50 pF,	f = 1 MHz	49	pF
		Outputs disabled			6	

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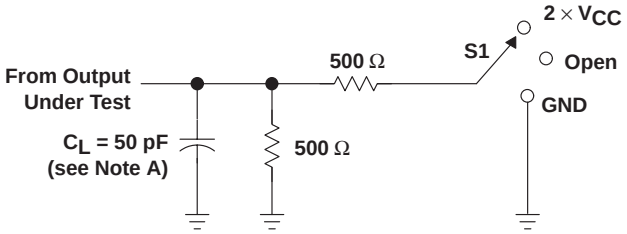
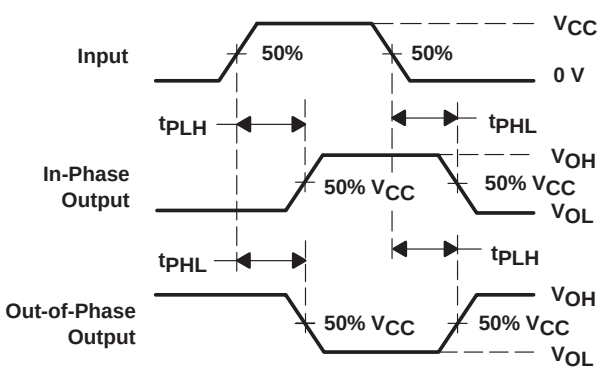
PARAMETER MEASUREMENT INFORMATION

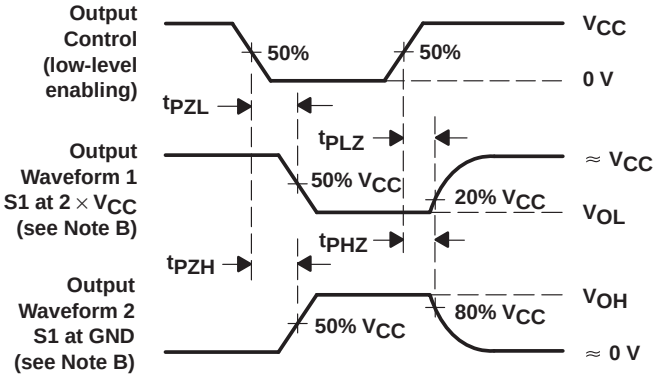


TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	2 × V_{CC}
t_{PHZ}/t_{PZH}	GND

LOAD CIRCUIT



VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS

NOTES: A. C_L includes probe and jig capacitance.
B. 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.
C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O = 50 Ω, t_r = 3 ns, t_f = 3 ns.
D. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

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