

SN74LVCC4245A

OCTAL DUAL-SUPPLY BUS TRANSCEIVER WITH CONFIGURABLE OUTPUT VOLTAGE AND 3-STATE OUTPUTS

SCAS584F – NOVEMBER 1996 – REVISED AUGUST 1998

- **EPIC™ (Enhanced-Performance Implanted CMOS) Submicron Process**
- **ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015**
- **Latch-Up Performance Exceeds 250 mA Per JESD 17**
- **Package Options Include Plastic Small-Outline (DW), Shrink Small-Outline (DB), and Thin Shrink Small-Outline (PW) Packages**

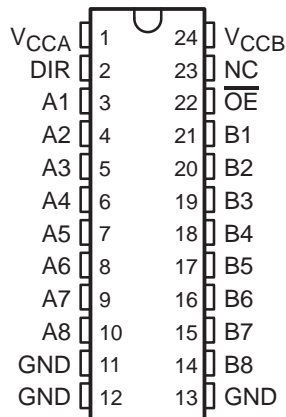
description

This 8-bit (octal) noninverting bus transceiver uses two separate power-supply rails. The A port, V_{CCA} , is dedicated to accept a 5-V supply level, and the configurable B port, which is designed to track V_{CCB} , accepts voltages from 3 V to 5 V. This allows for translation from a 3.3-V to a 5-V environment and vice versa.

The SN74LVCC4245A is designed for asynchronous communication between data buses. The device transmits data from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the direction-control (DIR) input. The output-enable (\overline{OE}) input can be used to disable the device so the buses are effectively isolated.

The SN74LVCC4245A is characterized for operation from -40°C to 85°C .

DB, DW, OR PW PACKAGE
(TOP VIEW)



NC – No internal connection

FUNCTION TABLE

INPUTS		OPERATION
\overline{OE}	DIR	
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation



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 **TEXAS
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recommended operating conditions (see Note 3)

		V _{CCA}	V _{CCB}	MIN	NOM	MAX	UNIT
V _{CCA}	Supply voltage			4.5	5	5.5	V
V _{CCB}	Supply voltage			2.7	3.3	5.5	V
V _{IHA}	High-level input voltage	V _{OB} ≤ 0.1 V, V _{OB} ≥ V _{CCB} – 0.1 V	4.5 V	2.7 V	2		V
				3.6 V	2		
			5.5 V	5.5 V	2		
V _{IHB}	High-level input voltage	V _{OA} ≤ 0.1 V, V _{OA} ≥ V _{CCA} – 0.1 V	4.5 V	2.7 V	2		V
				3.6 V	2		
			5.5 V	5.5 V	3.85		
V _{ILA}	Low-level input voltage	V _{OB} ≤ 0.1 V, V _{OB} ≥ V _{CCB} – 0.1 V	4.5 V	2.7 V		0.8	V
				3.6 V		0.8	
			5.5 V	5.5 V		0.8	
V _{ILB}	Low-level input voltage	V _{OA} ≤ 0.1 V, V _{OA} ≥ V _{CCA} – 0.1 V	4.5 V	2.7 V		0.8	V
				3.6 V		0.8	
			5.5 V	5.5 V		1.65	
V _{IA}	Input voltage			0		V _{CCA}	V
V _{IB}	Input voltage			0		V _{CCB}	V
V _{OA}	Output voltage			0		V _{CCA}	V
V _{OB}	Output voltage			0		V _{CCB}	V
I _{OHA}	High-level output current	4.5 V	3 V			–24	mA
I _{OHB}	High-level output current	4.5 V	2.7 V to 4.5 V			–24	mA
I _{OLA}	Low-level output current	4.5 V	3 V			24	mA
I _{OLB}	Low-level output current	4.5 V	2.7 V to 4.5 V			24	mA
T _A	Operating free-air temperature			–40		85	°C

NOTE 3: All unused inputs of the device must be held at the associated V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

PARAMETER		TEST CONDITIONS	V _{CCA}	V _{CCB}	MIN	TYP	MAX	UNIT
V _{OHA}		I _{OH} = -100 μA	4.5 V	3 V	4.4	4.49		V
		I _{OH} = -24 mA	4.5 V	3 V	3.76	4.25		
V _{OHB}		I _{OH} = -100 μA	4.5 V	3 V	2.9	2.99		V
		I _{OH} = -12 mA	4.5 V	2.7 V	2.2	2.5		
				3 V	2.46	2.85		
		I _{OH} = -24 mA	4.5 V	2.7 V	2.1	2.3		
				3 V	2.25	2.65		
4.5 V	3.76	4.25						
V _{OLA}		I _{OL} = 100 μA	4.5 V	3 V			0.1	V
		I _{OL} = 24 mA	4.5 V	3 V		0.21	0.44	
V _{OLB}		I _{OL} = 100 μA	4.5 V	3 V			0.1	V
		I _{OL} = 12 mA	4.5 V	2.7 V		0.11	0.44	
				3 V		0.21	0.44	
		I _{OL} = 24 mA	4.5 V	4.5 V		0.18	0.44	
I _I	Control inputs	V _I = V _{CCA} or GND	5.5 V	3.6 V		±0.1	±1	μA
				5.5 V		±0.1	±1	
I _{OZ} [†]	A or B ports	V _O = V _{CCA/B} or GND, V _I = V _{IL} or V _{IH}	5.5 V	3.6 V		±0.5	±5	μA
I _{CCA}	B to A	A _n = V _{CC} or GND	5.5 V	Open		8	80	μA
		I _O (A port) = 0, B _n = V _{CCB} or GND	5.5 V	3.6 V		8	80	
I _{CCB}	A to B	A _n = V _{CCA} or GND, I _O (B port) = 0	5.5 V	3.6 V		5	50	μA
				5.5 V		8	80	
ΔI _{CCA} [‡]	A port	V _I = V _{CCA} - 2.1 V, Other inputs at V _{CCA} or GND, $\overline{\text{OE}}$ at GND and DIR at V _{CCA}	5.5 V	5.5 V		1.35	1.5	mA
	$\overline{\text{OE}}$	V _I = V _{CCA} - 2.1 V, Other inputs at V _{CCA} or GND, DIR at V _{CCA} or GND	5.5 V	5.5 V		1	1.5	
	DIR	V _I = V _{CCA} - 2.1 V, Other inputs at V _{CCA} or GND, $\overline{\text{OE}}$ at V _{CCA} or GND	5.5 V	3.6 V		1	1.5	
ΔI _{CCB} [‡]	B port	V _I = V _{CCB} - 0.6 V, Other inputs at V _{CCB} or GND, $\overline{\text{OE}}$ at GND and DIR at GND	5.5 V	3.6 V		0.35	0.5	mA
C _i	Control inputs	V _I = V _{CCA} or GND	Open	Open		5		pF
C _{io}	A or B ports	V _O = V _{CCA/B} or GND	5 V	3.3 V		11		pF

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

[‡] This is the increase in supply current for each input that is at one of the specified TTL voltage levels rather than 0 V or the associated V_{CC}.



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switching characteristics over recommended operating free-air temperature range, $C_L = 50$ pF (unless otherwise noted) (see Figures 1 through 4)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCA} = 5\text{ V} \pm 0.5\text{ V}$, $V_{CCB} = 5\text{ V} \pm 0.5\text{ V}$		$V_{CCA} = 5\text{ V} \pm 0.5\text{ V}$, $V_{CCB} = 2.7\text{ V TO } 3.6\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	
t_{PHL}	A	B	1	7.1	1	7	ns
t_{PLH}			1	6	1	7	
t_{PHL}	B	A	1	6.8	1	6.2	ns
t_{PLH}			1	6.1	1	5.3	
t_{PZL}	\overline{OE}	A	1	9	1	9	ns
t_{PZH}			1	8.3	1	8	
t_{PZL}	\overline{OE}	B	1	8.2	1	10	ns
t_{PZH}			1	8.1	1	10.2	
t_{PLZ}	\overline{OE}	A	1	4.7	1	5.2	ns
t_{PHZ}			1	4.9	1	5.2	
t_{PLZ}	\overline{OE}	B	1	5.4	1	5.4	ns
t_{PHZ}			1	6.3	1	7.4	

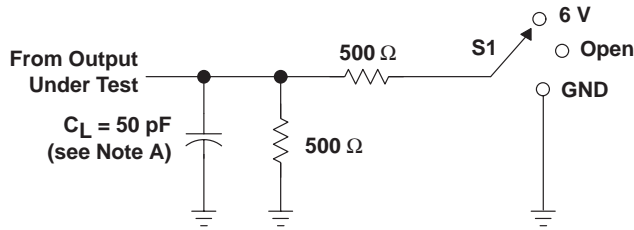
operating characteristics, $V_{CCA} = 5\text{ V}$, $V_{CCB} = 3.3\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	TYP	UNIT
C_{pd}	Power dissipation capacitance per transceiver	Outputs enabled	20	pF
		Outputs disabled	6.5	

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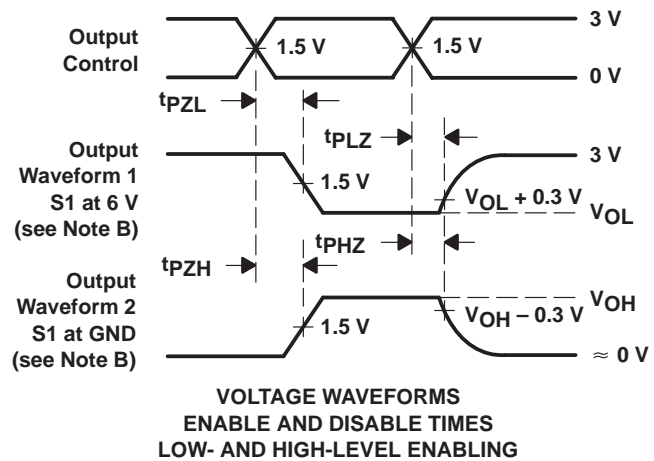
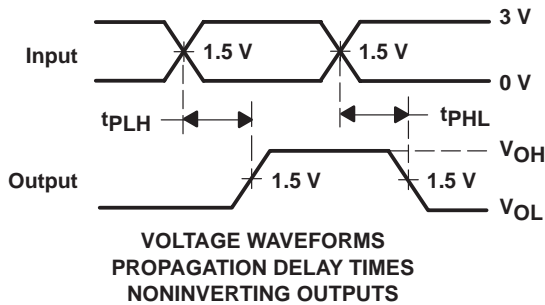
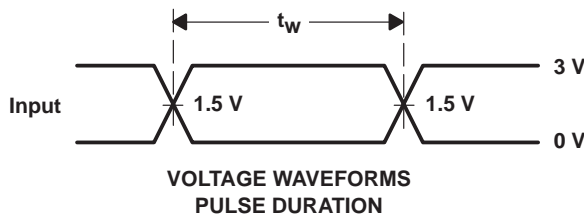
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PARAMETER MEASUREMENT INFORMATION FOR A TO B
 $V_{CCA} = 4.5\text{ V TO }5.5\text{ V}$ AND $V_{CCB} = 2.7\text{ V TO }3.6\text{ V}$



LOAD CIRCUIT

TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	6 V
t_{PHZ}/t_{PZH}	GND



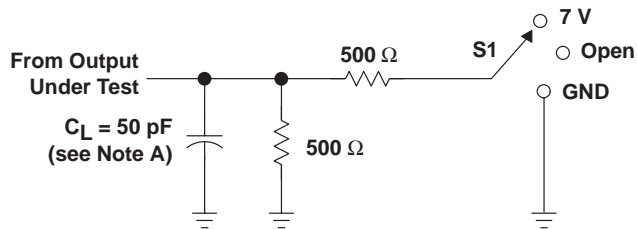
- NOTES: A. C_L includes probe and jig capacitance.
 B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
 C. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 2.5\text{ ns}$, $t_f \leq 2.5\text{ ns}$.
 D. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

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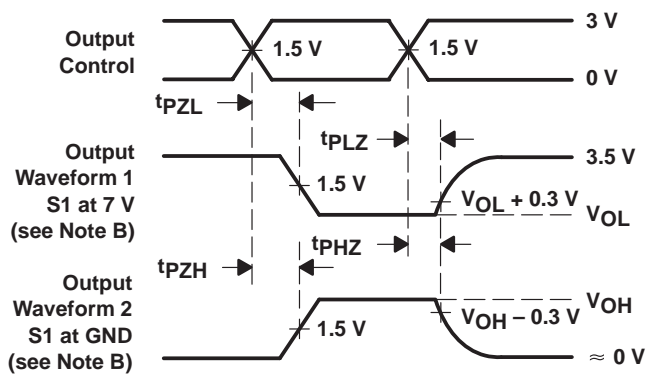
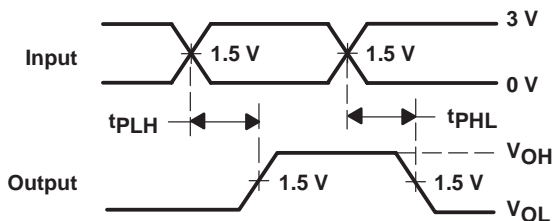
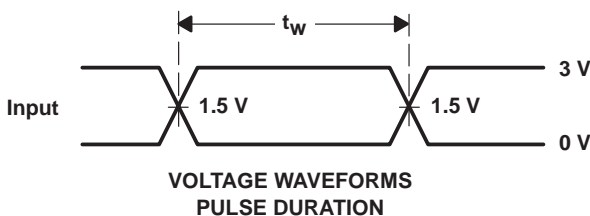
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PARAMETER MEASUREMENT INFORMATION FOR A TO B
 $V_{CCA} = 4.5\text{ V TO } 5.5\text{ V}$ AND $V_{CCB} = 3.6\text{ V TO } 5.5\text{ V}$



LOAD CIRCUIT

TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	7 V
t_{PHZ}/t_{PZH}	GND



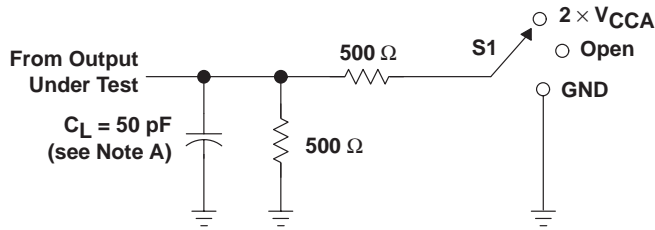
- NOTES: A. C_L includes probe and jig capacitance.
 B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
 C. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 2.5\text{ ns}$, $t_f \leq 2.5\text{ ns}$.
 D. The outputs are measured one at a time with one transition per measurement.

Figure 2. Load Circuit and Voltage Waveforms

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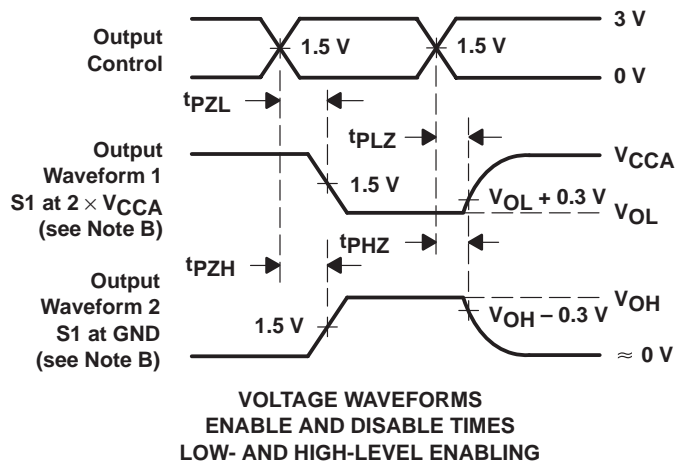
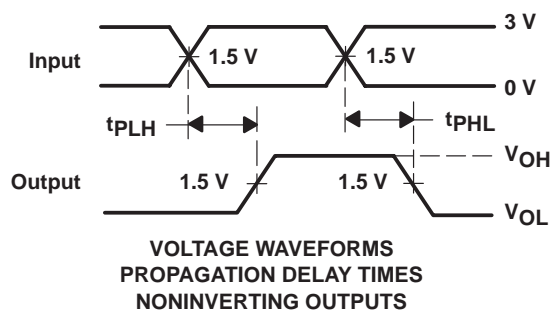
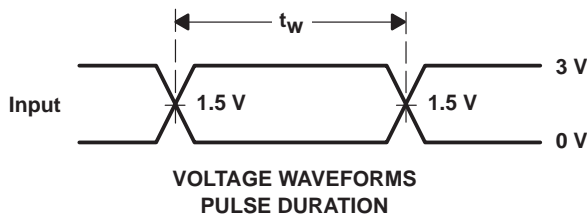
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PARAMETER MEASUREMENT INFORMATION FOR B TO A
 $V_{CCA} = 4.5\text{ V TO }5.5\text{ V}$ AND $V_{CCB} = 2.7\text{ V TO }3.6\text{ V}$



TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	$2 \times V_{CCA}$
t_{PHZ}/t_{PZH}	GND

LOAD CIRCUIT



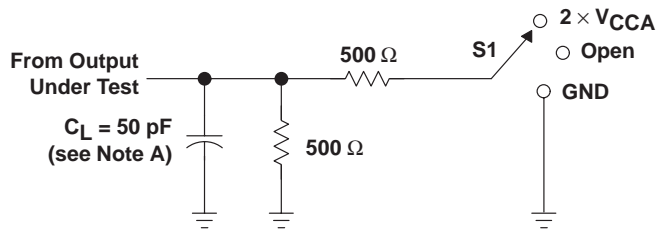
- NOTES: A. C_L includes probe and jig capacitance.
 B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
 C. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 2.5\text{ ns}$, $t_f \leq 2.5\text{ ns}$.
 D. The outputs are measured one at a time with one transition per measurement.

Figure 3. Load Circuit and Voltage Waveforms

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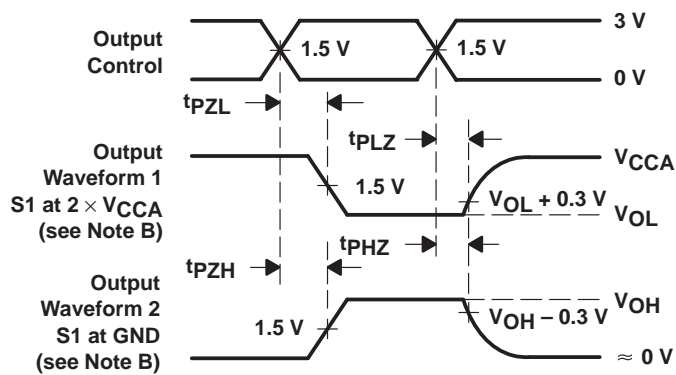
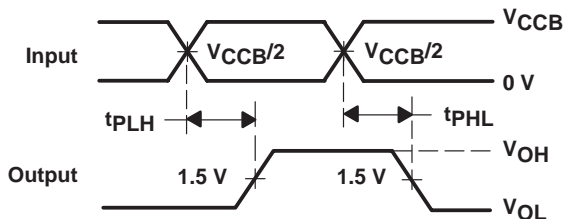
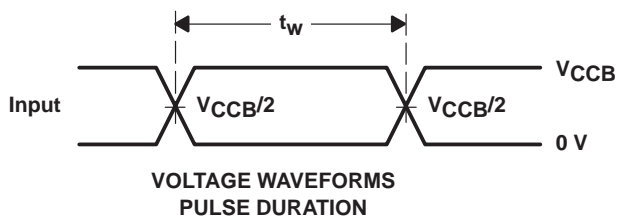
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PARAMETER MEASUREMENT INFORMATION FOR B TO A
 $V_{CCA} = 4.5\text{ V TO }5.5\text{ V}$ AND $V_{CCB} = 3.6\text{ V TO }5.5\text{ V}$



LOAD CIRCUIT

TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	$2 \times V_{CCA}$
t_{PHZ}/t_{PZH}	GND



- 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: $PRR \leq 10\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 2.5\text{ ns}$, $t_f \leq 2.5\text{ ns}$.
D. The outputs are measured one at a time with one transition per measurement.

Figure 4. Load Circuit and Voltage Waveforms

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