

74AC11652 OCTAL BUS TRANSCEIVER AND REGISTERS WITH 3-STATE OUTPUTS

SCAS088A - DECEMBER 1989 - REVISED APRIL 1996

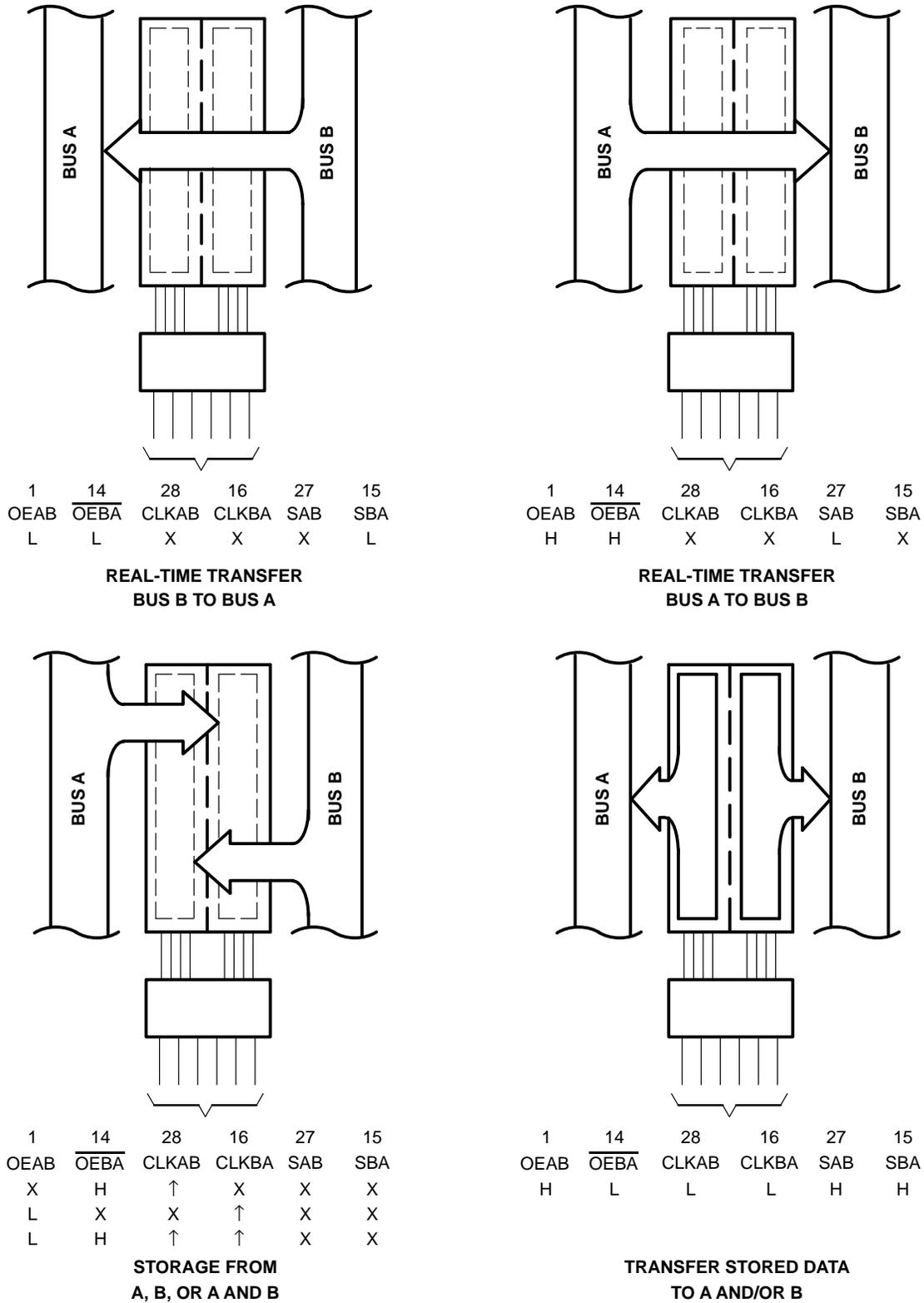


Figure 1. Bus-Management Functions

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FUNCTION TABLE

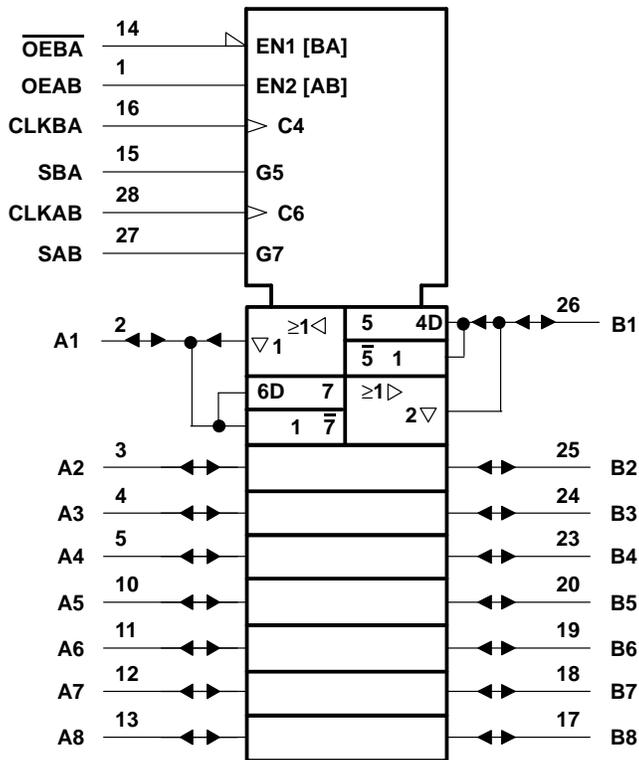
INPUTS						DATA I/O†		OPERATION OR FUNCTION
OEAB	OEBA	CLKAB	CLKBA	SAB	SBA	A1 THRU A8	B1 THRU B8	
L	H	L	L	X	X	Input	Input	Isolation
L	H	↑	↑	X	X	Input	Input	Store A and B data
X	H	↑	L	X	X	Input	Unspecified‡	Store A, hold B
H	H	↑	↑	X‡	X	Input	Output	Store A in both registers
L	X	L	↑	X	X	Unspecified‡	Input	Hold A, store B
L	L	↑	↑	X	X‡	Output	Input	Store B in both registers
L	L	X	X	X	L	Output	Input	Real-time B data to A bus
L	L	X	L	X	H	Output	Input	Stored B data to A bus
H	H	X	X	L	X	Input	Output	Real-time A data to B bus
H	H	L	X	H	X	Input	Output	Stored A data to B bus
H	L	L	L	H	H	Output	Output	Stored A data to B bus and stored B data to A bus

† The data output functions may be enabled or disabled by a variety of level combinations at the OEAB or OEBA inputs. Data input functions are always enabled; i.e., data at the bus pins is stored on every low-to-high transition on the clock inputs.

‡ Select control = L; clocks can occur simultaneously.

Select control = H; clocks must be staggered to load both registers.

logic symbols§

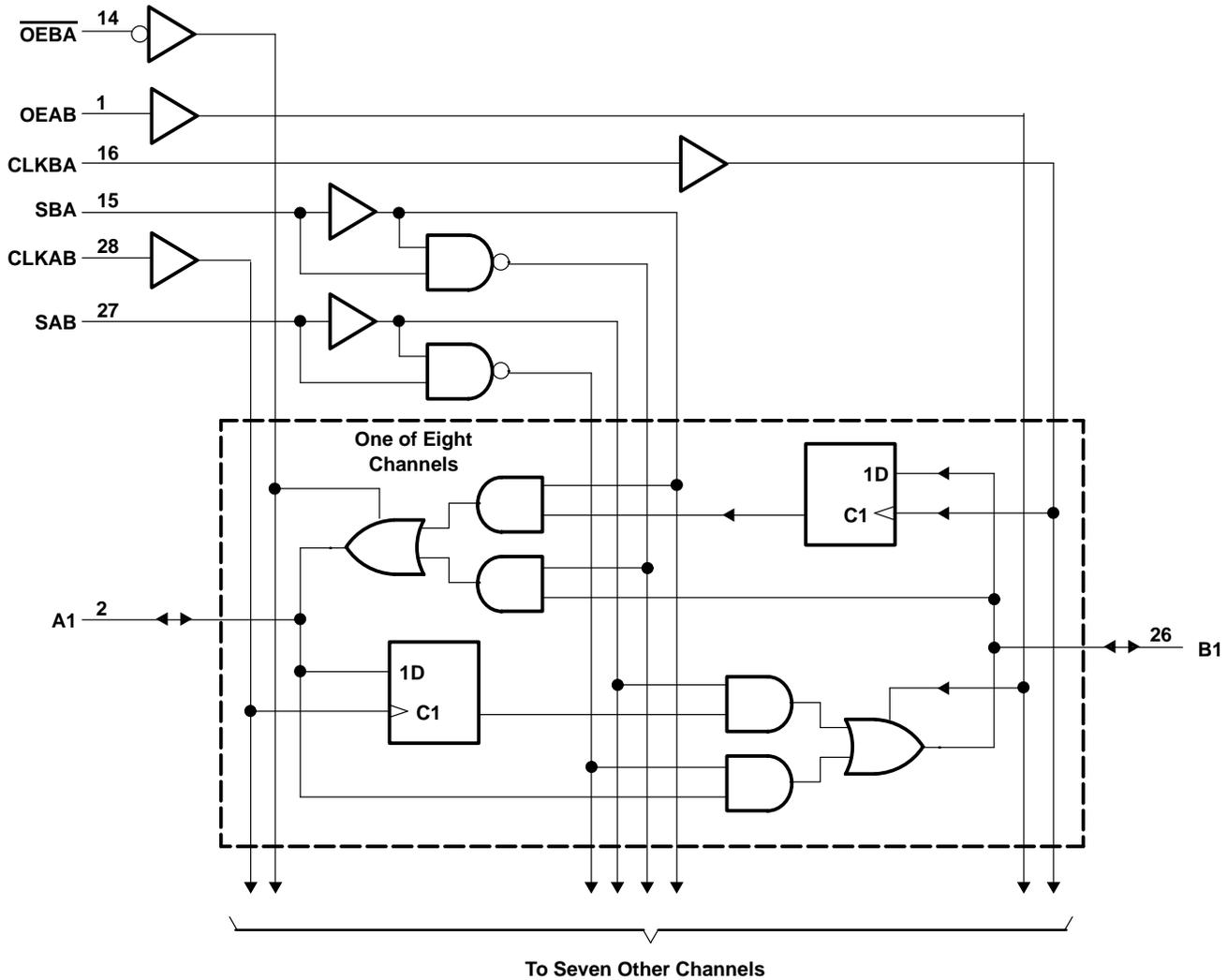


§ This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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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	± 200 mA
Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 2)	1.7 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 clamp-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.



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recommended operating conditions

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

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

PARAMETER	TEST CONDITIONS	V_{CC}	$T_A = 25^{\circ}\text{C}$			MIN	MAX	UNIT
			MIN	TYP	MAX			
V_{OH}	$I_{OH} = -50\ \mu\text{A}$	3 V	2.9		2.9	V		
		4.5 V	4.4		4.4			
		5.5 V	5.4		5.4			
	$I_{OH} = -4\ \text{mA}$	3 V	2.58		2.48			
		4.5 V	3.94		3.8			
		5.5 V	4.94		4.8			
	$I_{OH} = -75\ \text{mA}^{\dagger}$	5.5 V			3.85			
V_{OL}	$I_{OL} = 50\ \mu\text{A}$	3 V			0.1	0.1	V	
		4.5 V			0.1	0.1		
		5.5 V			0.1	0.1		
	$I_{OL} = 12\ \text{mA}$	3 V			0.36	0.44		
		4.5 V			0.36	0.44		
		5.5 V			0.36	0.44		
	$I_{OL} = 75\ \text{mA}^{\dagger}$	5.5 V			1.65			
I_I	Control inputs	$V_I = V_{CC}$ or GND	5.5 V		± 0.1	± 1	μA	
I_{OZ}^{\ddagger}	A or B ports	$V_O = V_{CC}$ or GND	5.5 V		± 0.5	± 5	μA	
I_{CC}		$V_I = V_{CC}$ or GND, $I_O = 0$	5.5 V		8	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	12			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.



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timing requirements over recommended operating free-air temperature range, $V_{CC} = 3.3 V \pm 0.3 V$ (unless otherwise noted) (see Figure 2)

		$T_A = 25^\circ C$		MIN	MAX	UNIT
		MIN	MAX			
f_{clock}	Clock frequency	0	65	0	65	MHz
t_w	Pulse duration, CLK high or low	7.7		7.7		ns
t_{su}	Setup time, A or B before CLKAB \uparrow or CLKBA \uparrow	6		6		ns
t_h	Hold time, A or B after CLKAB \uparrow or CLKBA \uparrow	1		1		ns

timing requirements over recommended operating free-air temperature range, $V_{CC} = 5 V \pm 0.5 V$ (unless otherwise noted) (see Figure 2)

		$T_A = 25^\circ C$		MIN	MAX	UNIT
		MIN	MAX			
f_{clock}	Clock frequency	0	105	0	105	MHz
t_w	Pulse duration, CLK high or low	4.8		4.8		ns
t_{su}	Setup time, A or B before CLKAB \uparrow or CLKBA \uparrow	4.5		4.5		ns
t_h	Hold time, A or B after CLKAB \uparrow or CLKBA \uparrow	1		1		ns

switching characteristics over recommended operating free-air temperature range, $V_{CC} = 3.3 V \pm 0.3 V$ (unless otherwise noted) (see Figure 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ C$			MIN	MAX	UNIT
			MIN	TYP	MAX			
f_{max}			65			65		MHz
t_{PLH}	A or B	B or A	2.9	8.5	11.1	2.9	12.9	ns
t_{PHL}			3.9	10.3	12.9	3.9	14.2	
t_{PLH}	CLKBA or CLKAB	A or B	4.3	11.2	14.3	4.3	16.2	ns
t_{PHL}			5.3	13.1	16.2	5.3	17.8	
t_{PLH}	SBA or SAB \uparrow (A or B high)	A or B	3.4	9.4	12	3.4	13.7	ns
t_{PHL}			4.7	11.5	14.3	4.7	15.6	
t_{PLH}	SBA or SAB \uparrow (A or B low)	A or B	3.9	10.5	13.3	3.9	14.9	ns
t_{PHL}			4.8	12.1	16.3	4.8	17.7	
t_{PZH}	\overline{OEBA}	A	4.3	11.1	14.5	4.3	16.5	ns
t_{PZL}			5.2	14.4	19.8	5.2	22	
t_{PHZ}	\overline{OEBA}	A	3.7	6.4	8.1	3.7	8.5	ns
t_{PLZ}			3.5	6	7.8	3.5	8.2	
t_{PZH}	OEAB	B	4.7	11.6	15	4.7	16.9	ns
t_{PZL}			5.6	14.8	19.9	5.6	21.9	
t_{PHZ}	OEAB	B	4	6.6	8.2	4	8.6	ns
t_{PLZ}			3.5	6.1	7.7	3.5	8	

† These parameters are measured with the internal output state of the storage register opposite that of the bus input.



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switching characteristics over recommended operating free-air temperature range,
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (unless otherwise noted) (see Figure 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
			MIN	TYP	MAX			
f_{max}			105			105		MHz
t_{PLH}	A or B	B or A	2.4	5.2	7.6	2.4	8.6	ns
t_{PHL}			3.1	6	8.7	3.1	9.6	
t_{PLH}	CLKBA or CLKAB	A or B	3.6	6.7	9.5	3.6	10.7	ns
t_{PHL}			4.4	7.8	10.8	4.4	12	
t_{PLH}	SBA or SAB (A or B high)	A or B	2.9	5.6	8.1	2.9	9.1	ns
t_{PHL}			3.8	6.9	9.6	3.8	10.7	
t_{PLH}	SBA or SAB (A or B low)	A or B	3.3	6.2	8.8	3.3	9.9	ns
t_{PHL}			4	7.1	9.9	4	10.9	
t_{PZH}	$\overline{\text{OEBA}}$	A	3.3	6.6	9.6	3.3	10.9	ns
t_{PZL}			4.2	7.4	10.9	4.2	12.2	
t_{PHZ}	$\overline{\text{OEBA}}$	A	3.6	5.5	7.2	3.6	7.6	ns
t_{PLZ}			3.3	5	6.7	3.3	7.1	
t_{PZH}	OEAB	B	4.1	7.2	10.1	4.1	11.3	ns
t_{PZL}			4.6	7.9	11.1	4.6	12.3	
t_{PHZ}	OEAB	B	3.9	5.6	7.3	3.9	7.6	ns
t_{PLZ}			3.4	5.2	6.8	3.4	7.2	

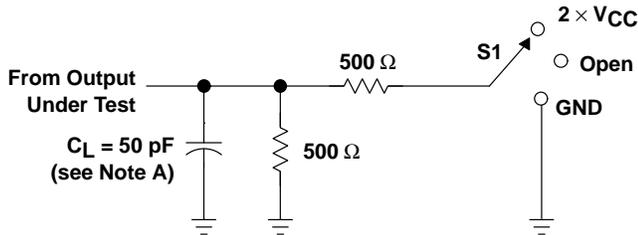
operating characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	TYP	UNIT
C_{pd}	Power dissipation capacitance per transceiver	Outputs enabled	60	pF
		Outputs disabled	14	

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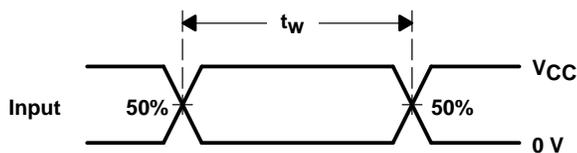
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PARAMETER MEASUREMENT INFORMATION

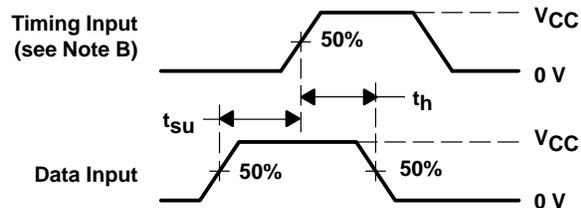


LOAD CIRCUIT

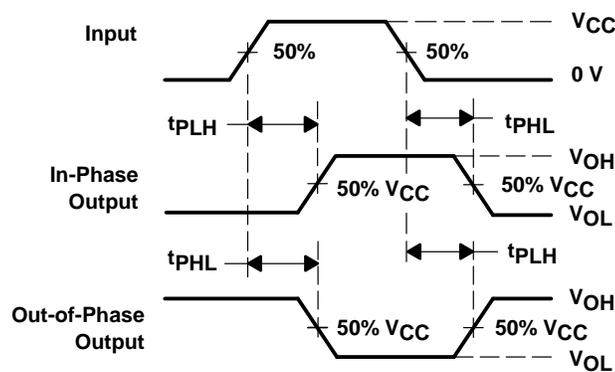
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	$2 \times V_{CC}$
t_{PHZ}/t_{PZH}	GND



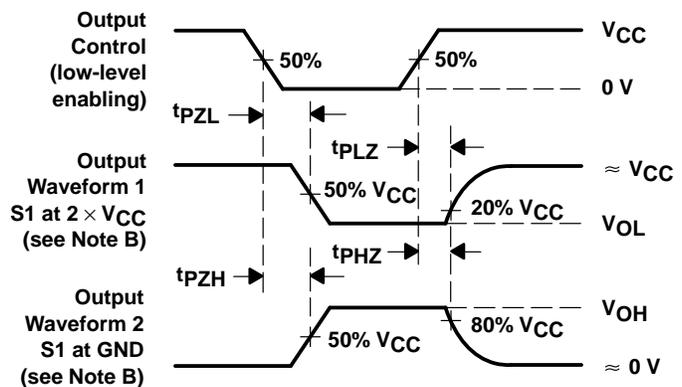
VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS



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: $PRR \leq 10$ MHz, $Z_O = 50 \Omega$, $t_r = 3$ ns, $t_f = 3$ ns.
 D. The outputs are measured one at a time with one input transition per measurement.

Figure 2. Load Circuit and Voltage Waveforms

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