

8-Bit Dual Supply Bus Transceiver with Configurable Output Voltage and 3-State Outputs

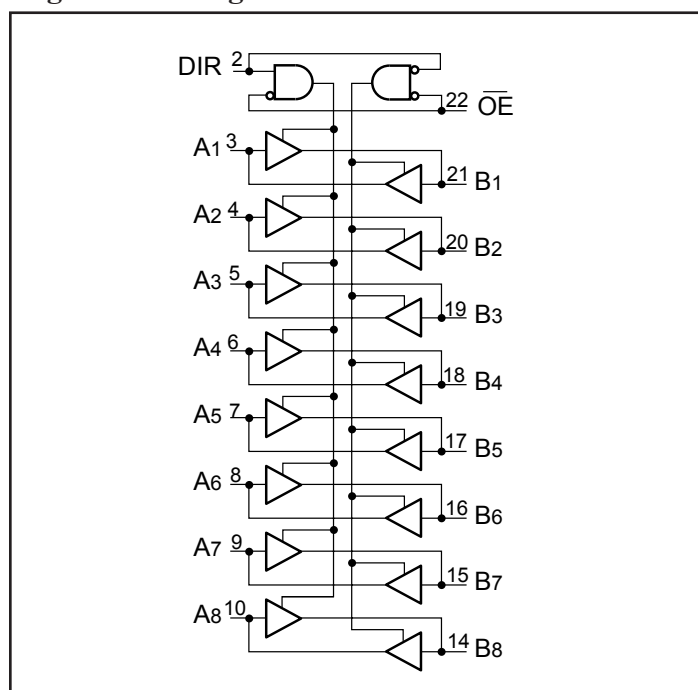
Product Features

- 4.5V to 5.5V on A-port and 2.7V to 5.5V on B-port
- Latch-up performance exceeds 200mA Per JESD78
- ESD protection exceeds JESD 22
 - 2000V Human-Body Model (A114-B)
 - 200V Machine Model (A115-A)
- Industrial Temperature: -40°C to +85°C
- Packages (Pb-free & Green available):
 - 24-pin 173-mil wide plastic TSSOP (L)
 - 24-pin 150-mil wide plastic QSOP (Q)
 - 24-pin 300-mil wide plastic SOIC (S)

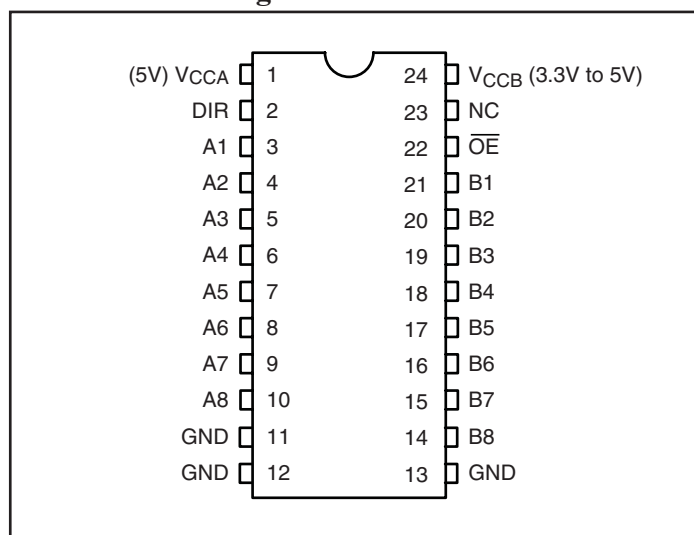
Product Description

The PI74LVCC4245A is a non-inverting 8-bit Bidirectional Transceiver that uses two separate power supply rails. A-port (V_{CCA}) is set to operate at 5V and B-port (V_{CCB}) is set to operate from 3.3V to 5V. This allows for translation from a 3.3V to a 5V environment and vice-versa. This transceiver is designed for asynchronous two-way communication between data buses. The direction control input pin (DIR) determines the dataflow from the A bus to the B bus or from the B bus to the A bus. The output enable (\overline{OE}) input, when HIGH, disables both A and B ports by placing them in HIGH Z condition.

Logic Block Diagram



Product Pin Configuration



Truth Table⁽¹⁾

Inputs		Outputs
\overline{OE}	DIR	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	Z (Isolation)

Notes:

1. H = High Signal Level L = Low Signal Level
 X = Don't Care or Irrelevant Z = High Impedance

Product Pin Description

Pin Name	Description
OE	3-State Output Enable Inputs (Active LOW)
DIR	Direction Control Input
Ax	Side A Inputs or 3-State Outputs
Bx	Side B Inputs or 3-State Outputs
NC	No Internal Connect
GND	Ground
V_{CCA}, V_{CCB}	Power

Recommended Operating Conditions⁽¹⁾

Parameters	Description		V _{CCA}	V _{CCB}	Min.	Nom.	Max.	Units
V _{CCA}	Supply Voltage				4.5	5	5.5	V
V _{CCB}	Supply Voltage				2.7	3.3	5.5	
V _{IHA}	High-Level Input Voltage	V _{OB} < 0.1V or V _{OB} > V _{CCB} - 0.1V	4.5V	2.7V	2			
				3.6V	2			
			5.5V	5.5V	2			
V _{IHB}	High-Level Input Voltage	V _{OA} < 0.1V or V _{OA} > V _{CCA} - 0.1V	4.5V	2.7V	2			
				3.6V	2			
			5.5V	5.5V	3.85			
V _{ILA}	Low-Level Input Voltage	V _{OB} < 0.1V or V _{OB} > V _{CCB} - 0.1V	4.5V	2.7V			0.8	
				3.6V			0.8	
			5.5V	5.5V			0.8	
V _{ILB}	Low-Level Input Voltage	V _{OA} < 0.1V or V _{OA} > V _{CCA} - 0.1V	4.5V	2.7V			0.8	
				3.6V			0.8	
			5.5V	5.5V			1.65	
V _{IH}	High-Level Input Voltage (Control Pins)	V _{OA} < 0.1V or V _{OA} > V _{CCA} - 0.1V, or V _{OB} < 0.1V or V _{OB} > V _{CCB} - 0.1V	4.5V	2.7V	2			
				3.6V	2			
			5.5V	5.5V	2			
V _{IL}	Low-Level Input Voltage (Control Pins)	V _{OA} < 0.1V or V _{OA} > V _{CCA} - 0.1V, or V _{OB} < 0.1V or V _{OB} > V _{CCB} - 0.1V	4.5V	2.7V			0.8	
				3.6V			0.8	
			5.5V	5.5V			0.8	
V _{IA}	Input Voltage			0		V _{CCA}		
V _{IB}	Input Voltage			0		V _{CCB}		
V _{OA}	Output Voltage			0		V _{CCA}		
V _{OB}	Output Voltage			0		V _{CCB}		
I _{OHA}	High-Level Output Current		4.5V	3V			-24	mA
I _{OHB}	High-Level Output Current		4.5V	2.7V to 4.5V			-24	
I _{OLA}	Low-Level Output Current		4.5V	3V			24	
I _{OLB}	Low-Level Output Current		4.5V	2.7V to 4.5V			24	
Δt/Δv	Input Transmition Rise or Fall Rate						10	ns/v
T _A	Operating Free-Air Temperature				-40		85	°C

Notes:

1. All unused inputs of the device must be held at the associated V_{CC} or GND to ensure proper device operation.

DC Electrical Characteristics (Over Supply Voltage and Operating Temperature Ranges, unless otherwise specified).

Parameters	Description	Test Conditions	V _{CCA}	V _{CCB}	Min.	Typ.	Max.	Units
V _{OHA}	Minimum High Level Output Voltage (Port A)	I _{OH} = -100μA	4.5V	3V	4.4	4.5		V
		I _{OH} = -24mA	4.5V	3V	3.76	4.17		
V _{OHB}	Minimum High Level Output Voltage (Port B)	I _{OH} = -100μA	4.5V	3V	2.9	3.0		
		I _{OH} = -12mA	4.5V	2.7V	2.2	2.56		
				3V	2.46	2.85		
		I _{OH} = -24mA	4.5V	2.7V	2.1	2.42		
				3V	2.25	2.70		
4.5V	3.76	4.21						
V _{OLA}	Maximum Low Level Output Voltage (Port A)	I _{OL} = 100μA	4.5V	3V			0.1	
		I _{OL} = 24mA	4.5V	3V		0.19	0.44	
V _{OLB}	Maximum Low Level Output Voltage (Port B)	I _{OL} = 100μA	4.5V	3V			0.1	
		I _{OL} = 12mA	4.5V	2.7V		0.09	0.44	
				3V		0.18	0.5	
		I _{OL} = 24mA	4.5V	3V		0.18	0.44	
				4.5V		0.18	0.44	
I _I	Maximum Input Leakage Current (Control Inputs)	V _I = V _{CCA} or GND	5.5V	3.6V			±1	
				5.5V			±1	
I _{OZ} ⁽¹⁾	Maximum 3-state Output Leakage Current (A or B ports)	V _I = V _{IL} or V _{IH} , \overline{OE} = V _{CCA} , V _O = V _{CCA/B} or GND	5.5V	3.6V			±5	
I _{CCA}	Quiescent V _{CCA} Supply Current	A port = V _{CCA} or GND, I _O = 0	5.5V	Open			10	
		B to A, B-port = V _{CCB} or GND, I _O (A port) = 0	5.5V	3.6V			10	
				5.5V			10	
I _{CCB}	Quiescent V _{CCB} Supply Current	A to B, A port = V _{CCA} or GND, I _O (B port) = 0	5.5V	3.6V			10	
				5.5V			10	
ΔI _{CC} ⁽²⁾	I _{CC} per input (A port)	One Input V _I = V _{CCA} - 2.1V, Other inputs = V _{CCA} or GND, \overline{OE} = GND and DIR = V _{CCA}	5.5V	5.5V		0.65	1.5	
	I _{CC} per input (\overline{OE})	V _I = V _{CCA} - 2.1V, Other inputs = V _{CCA} or GND, DIR = V _{CCA} or GND	5.5V	5.5V		0.65	1.5	
	I _{CC} per input (DIR)	V _I = V _{CCA} - 2.1V, Other inputs = V _{CCA} or GND, \overline{OE} = V _{CCA} or GND	5.5V	3.6V		0.65	1.5	
	I _{CC} per input (B Port)	One Input V _I = V _{CCB} - 0.6V, Other inputs = V _{CCB} or GND, \overline{OE} = GND and DIR = GND	5.5V	3.6V			50	

Notes:

- 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 0V or the associated V_{CC}.

Capacitance ($T_A = 25^\circ\text{C}$)

Parameters	Description	Test Conditions	Typ.	Units
C_{IN}	Control Input Capacitance	$V_I = V_{CCA}$ or GND, $V_{CCA} = \text{Open}$, $V_{CCB} = \text{Open}$	2.4	pF
$C_{I/O}$	Input/Output Capacitance (A or B port)	$V_{I/O} = V_{CCA/B}$ or GND, $V_{CCA} = 5\text{V}$, $V_{CCB} = 3.3\text{V}$	9.5	
C_{PD}	Power Dissipation Capacitance ⁽¹⁾	Outputs Enabled	20	
		Outputs Disabled	2.2	

Notes:

- C_{PD} is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I_{CCD}) at no output loading and operating at 50% duty cycle, C_{PD} is related to I_{CCD} dynamic operating current by the expression:
 $I_{CCD} = (C_{PD})(V_{CC})(f_{IN}) + (I_{CC} \text{ static})$

AC Electrical Characteristics (Over Operating Range, -40°C to $+85^\circ\text{C}$)

Parameters	From (Input)	To (Output)	$V_{CCA} = 5\text{V} \pm 0.5\text{V}$, $V_{CCB} = 5\text{V} \pm 0.5\text{V}$		$V_{CCA} = 5\text{V} \pm 0.5\text{V}$, $V_{CCB} = 2.7\text{V to } 3.6\text{V}$		Units
			$C_L = 50\text{pF}$, $R_L = 500\Omega$		$C_L = 50\text{pF}$, $R_L = 500\Omega$		
			Min.	Max.	Min.	Max.	
t_{PHL}	A	B	1	6.1	1	6	ns
t_{PLH}			1	5.8	1	5.8	
t_{PHL}	B	A	1	6	1	6.1	
t_{PLH}			1	6.2	1	6.2	
t_{PZL}	$\overline{\text{OE}}$	A	1	8	1	8	
t_{PZH}			1	7.1	1	7.1	
t_{PZL}	$\overline{\text{OE}}$	B	1	8	1	8	
t_{PZH}			1	8	1	7.8	
t_{PLZ}	$\overline{\text{OE}}$	A	1	5.2	1	5.2	
t_{PHZ}			1	4.9	1	4.9	
t_{PLZ}	$\overline{\text{OE}}$	B	1	5.2	1	5.4	
t_{PHZ}			1	4.9	1	5.4	
$t_{SK(O)}$	Output-to-Output Skew ⁽¹⁾			1.5		1.5	

Notes:

- Skew between any two outputs of the same device, switching in the same direction. Parameter guaranteed by design.

Power- Up Considerations

To avoid excessive supply current, bus contention or oscillation during power-up, the following guidelines should be followed:

1. Connect ground first before any supply voltage is applied.
2. Then Power up V_{CCA} , which is the control side of the device.
3. Ramp \overline{OE} ahead of or with V_{CCA} to help prevent bus contention
4. Ramp DIR with V_{CCA} if DIR high is needed (A bus to B bus). Otherwise keep DIR Low.

PARAMETER MEASUREMENT INFORMATION FOR A TO B PORT

$V_{CCA} = 4.5V$ TO $5.5V$ and $V_{CCB} = 2.7V$ to $3.6V$

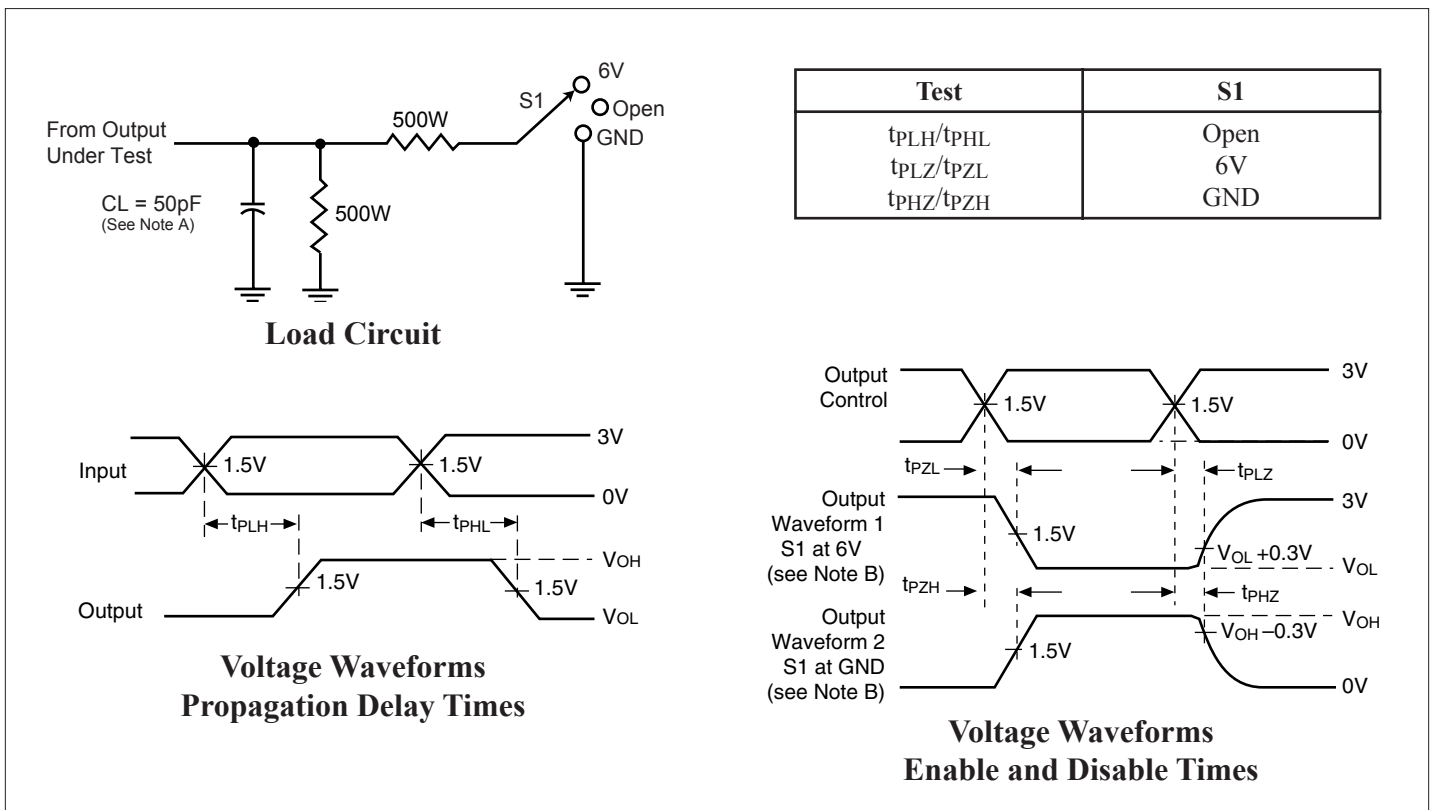


Figure 1. Load Circuit and Voltage Waveforms

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.
- All input impulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, $Z_O = 50\Omega$, $t_R \leq 2.5ns$, $t_F \leq 2.5ns$.
- The outputs are measured one at a time with one transition per measurement.

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

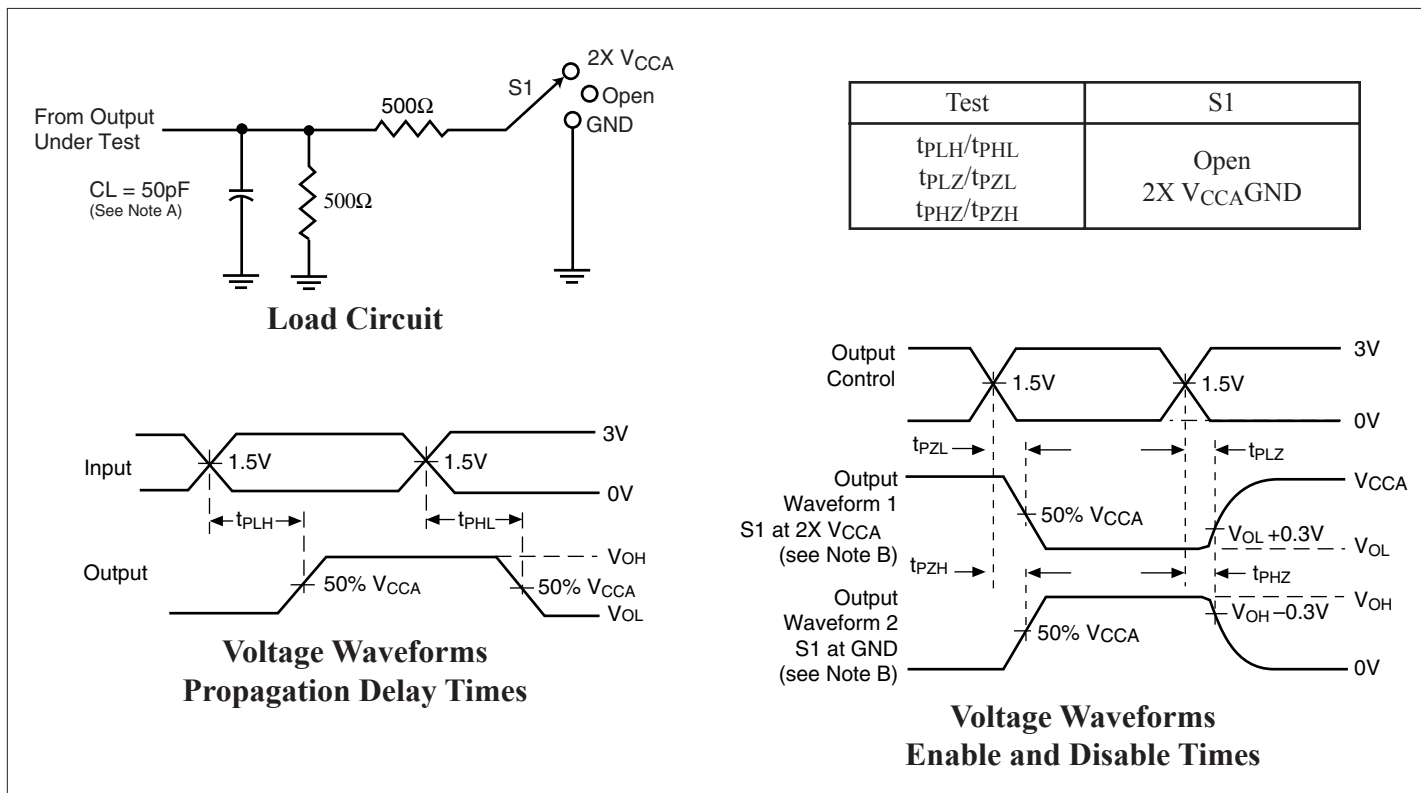


Figure 3. Load Circuit and Voltage Waveforms

Notes:

- A. C_L includes probe and jig capacitance.
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 Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
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- The outputs are measured one at a time with one transition per measurement.

PARAMETER MEASUREMENT INFORMATION FOR A TO B
 $V_{CCA} = 4.5V$ TO $5.5V$ and $V_{CCB} = 4.5V$ TO $5.5V$

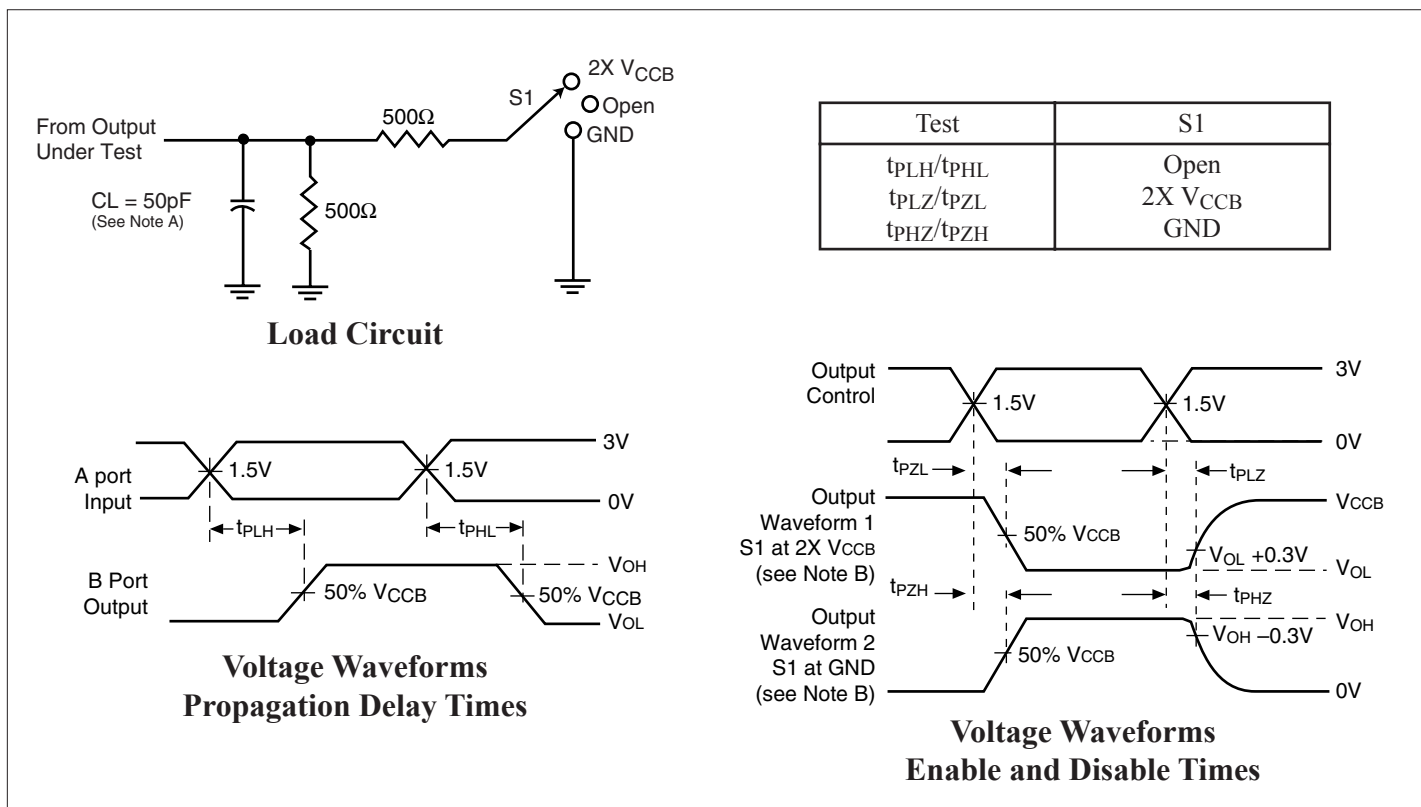


Figure 2. Load Circuit and Voltage Waveforms

Notes:

- A. C_L includes probe and jig capacitance.
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- All input impulses are supplied by generators having the following characteristics: $PRR \leq 10$ MHz, $Z_O = 50\Omega$, $t_R \leq 2.5ns$, $t_F \leq 2.5ns$.
- The outputs are measured one at a time with one transition per measurement.

PARAMETER MEASUREMENT INFORMATION FOR B TO A
 $V_{CCA} = 4.5V$ TO $5.5V$ and $V_{CCB} = 4.5V$ TO $5.5V$

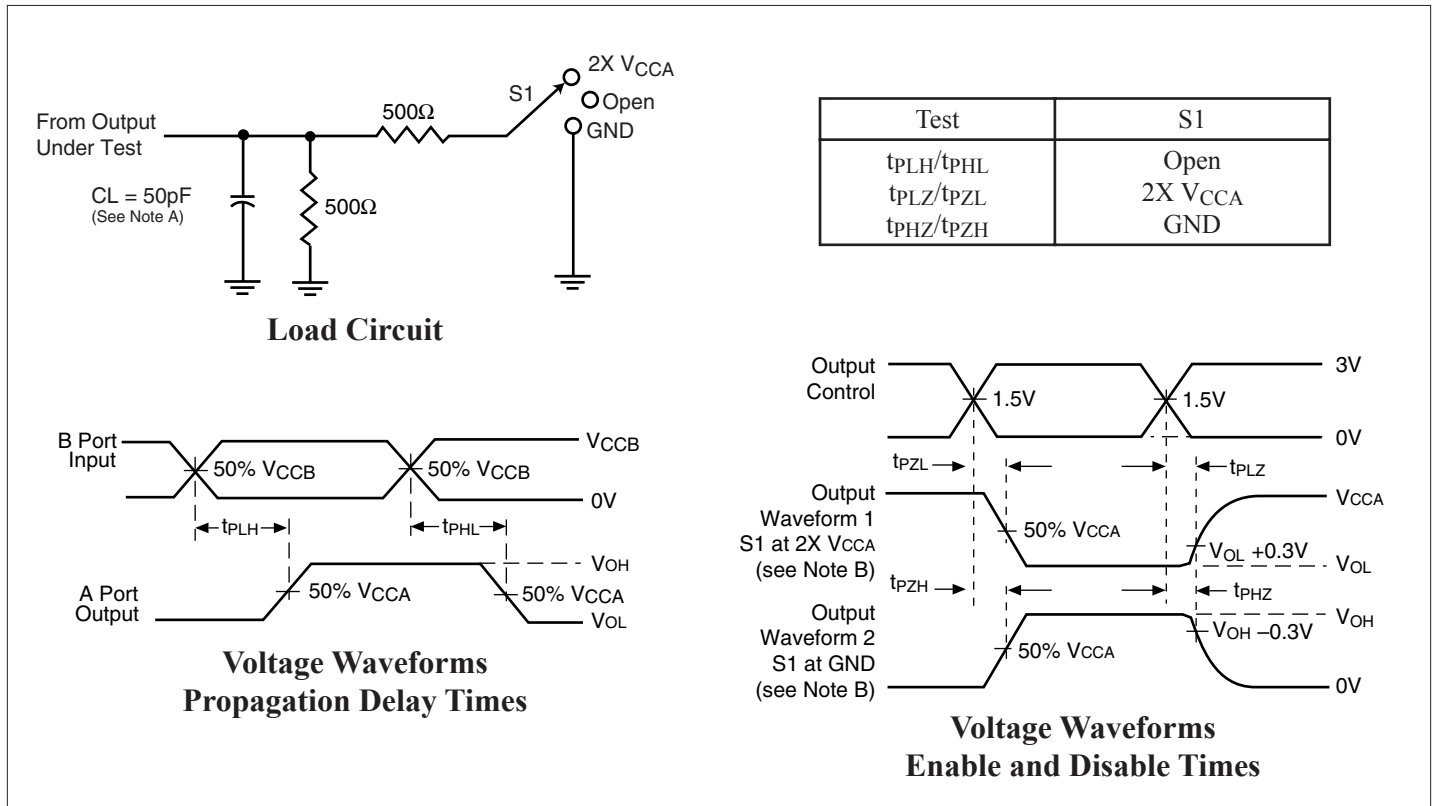
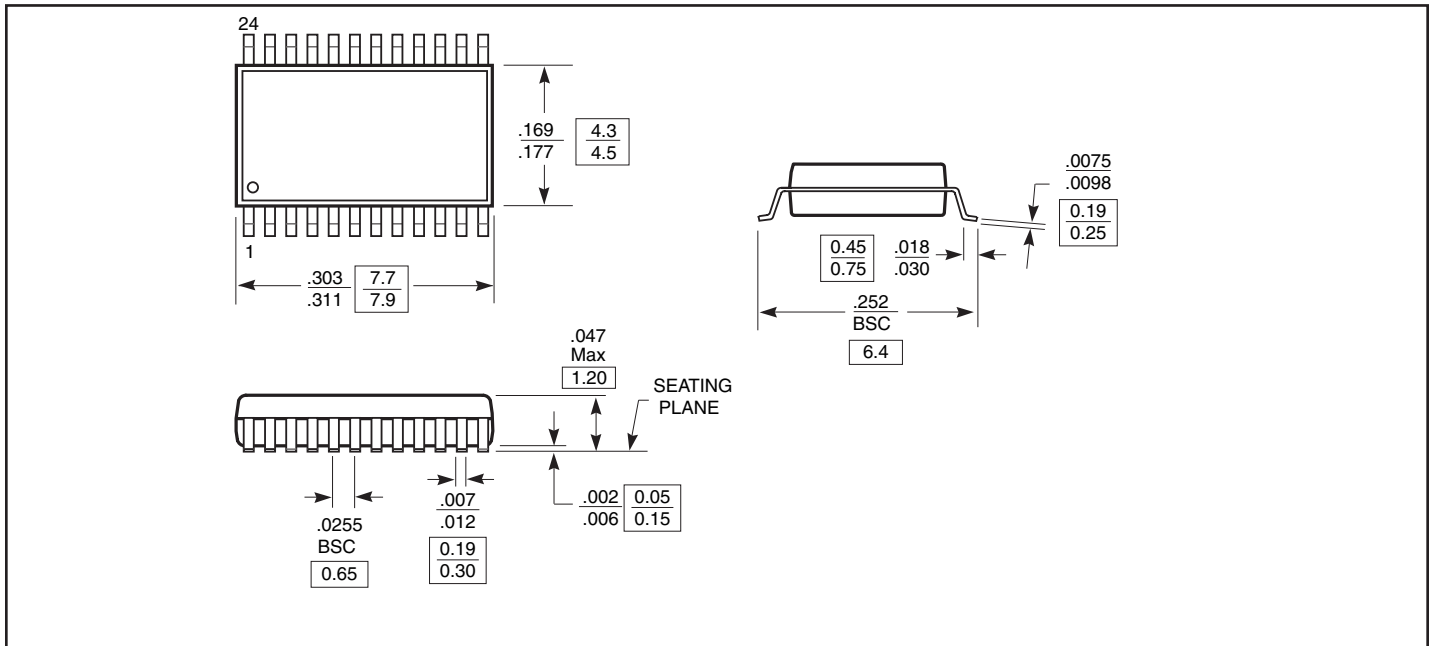
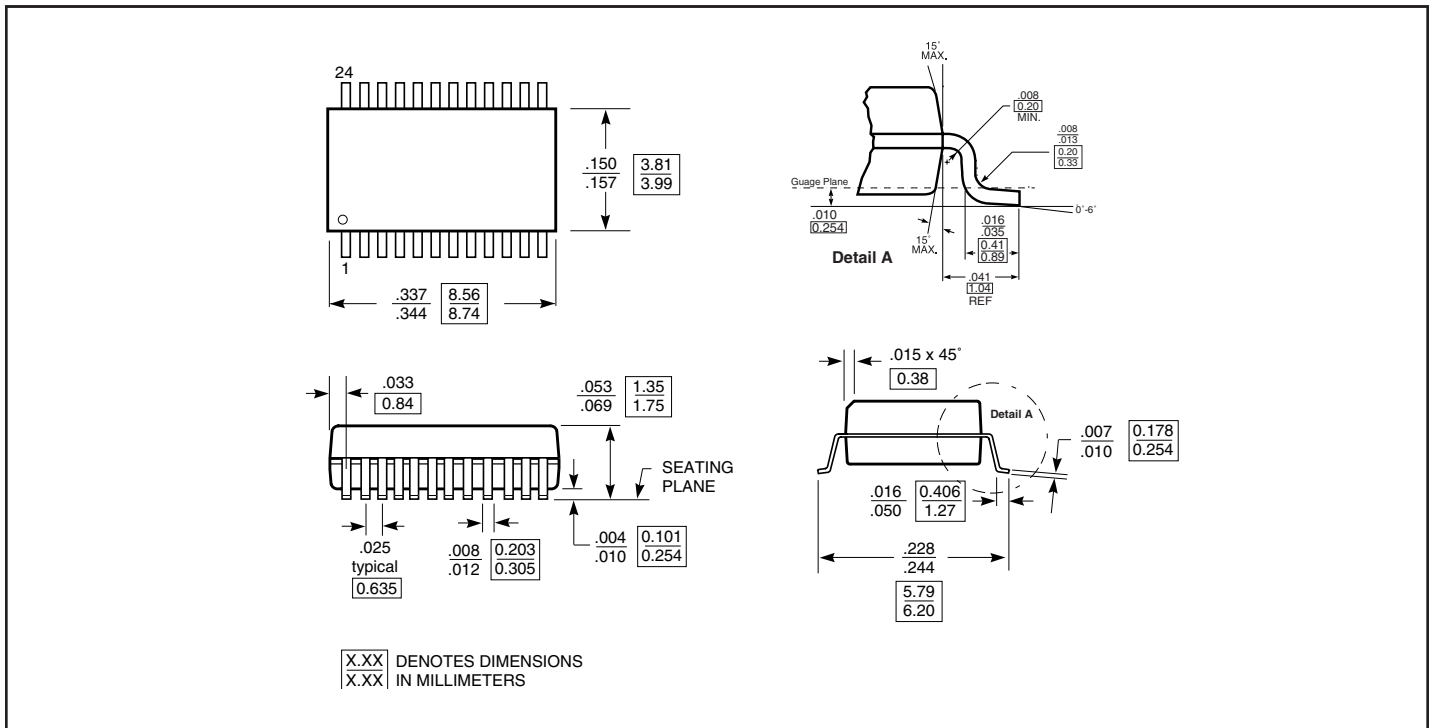
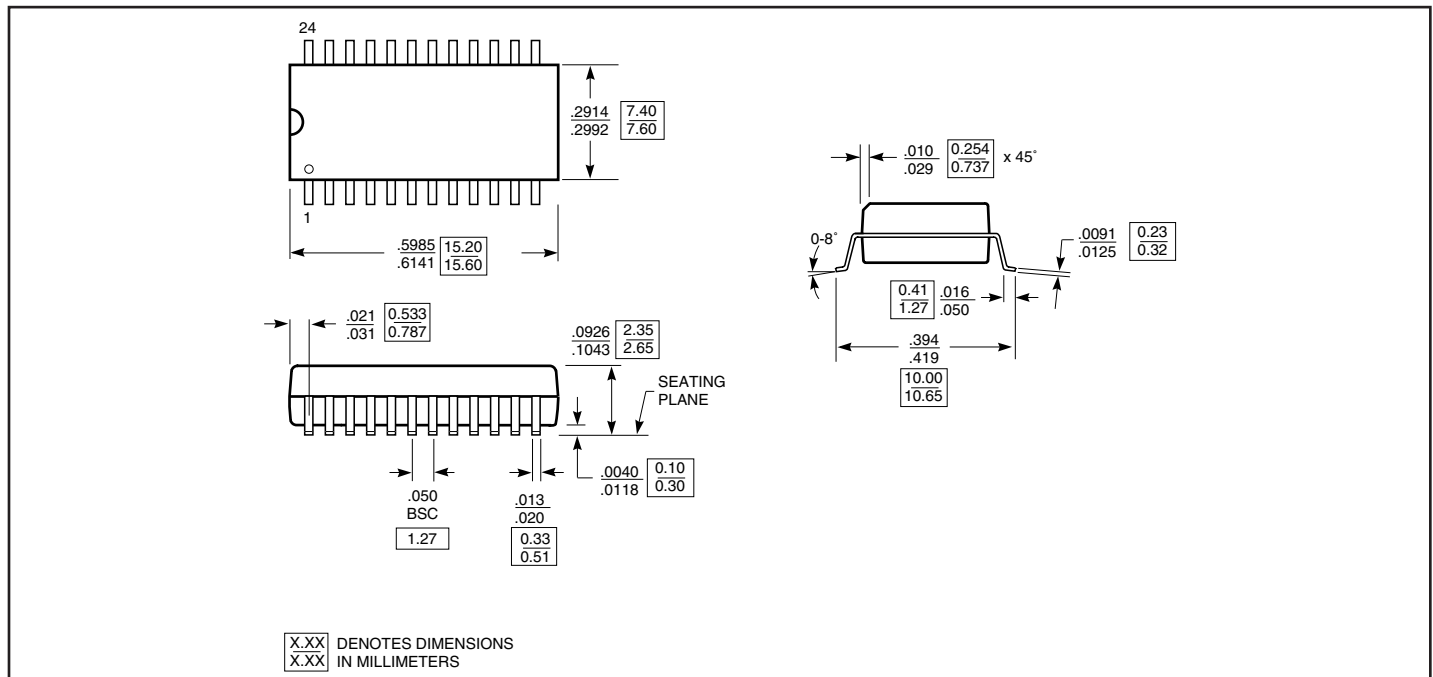


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- The outputs are measured one at a time with one transition per measurement.

Packaging Mechanical: 24-pin TSSOP (L)

Packaging Mechanical: 24-pin QSOP (Q)


Packaging Mechanical: 24-pin SOIC (S)

Ordering Information

Ordering Code	Package Code	Package Type
PI74LVCC4245AL	L	24-pin, 173-mil wide plastic TSSOP
PI74LVCC4245ALE	L	Pb-free & Green, 24-pin, 173-mil wide plastic TSSOP
PI74LVCC4245AQ	Q	24-pin, 150-mil wide plastic QSOP
PI74LVCC4245AS	S	24-pin, 300-mil wide plastic SOI
PI74LVCC4245ASE	S	Pb-free & Green, 24-pin, 300-mil wide plastic SOI

Notes:

- Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
- E = Pb-free & Green
- Adding an X suffix = Tape/Reel