



CMOS OCTAL DUAL-SUPPLY BUS TRANSCEIVER WITH CONFIGURABLE OUTPUT VOLTAGE, 3-STATE OUTPUTS, 3.3V AND 5V I/O

IDT74LVCC4245A

FEATURES:

- 0.5 MICRON CMOS Technology
- $V_{CCA} = 5V \pm 0.5V$
- $V_{CCB} = 2.7V$ to $5.5V$
- CMOS power levels ($0.4\mu W$ typ. static)
- Rail-to-rail output swing for increased noise margin
- All inputs, outputs, and I/O are 5V tolerant
- Supports hot insertion
- Available in SSOP, QSOP, and TSSOP packages

DRIVE FEATURES:

- High Output Drivers: $\pm 24mA$
- Reduced system switching noise

APPLICATIONS:

- 5V and 3.3V mixed voltage systems
- Data communication and telecommunication systems

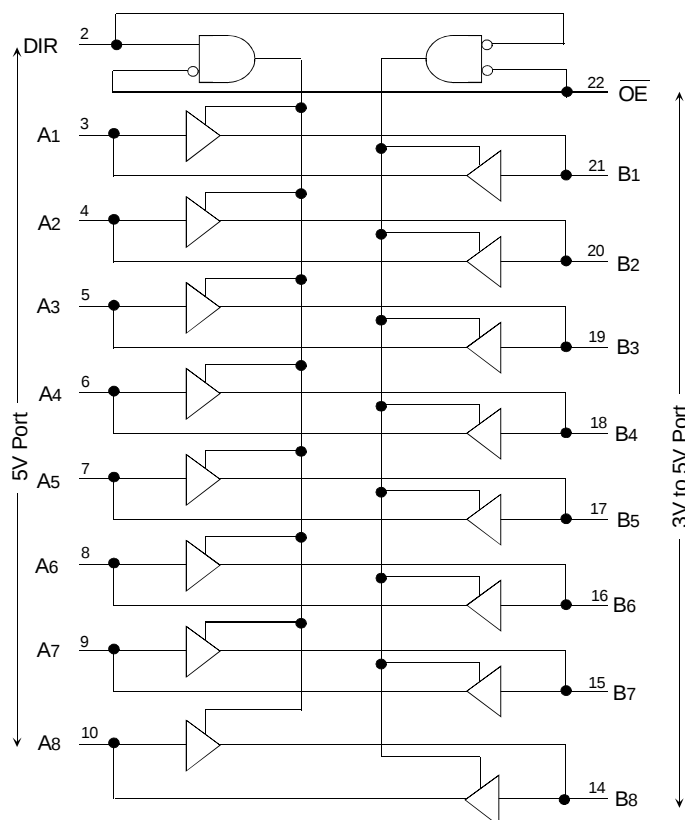
DESCRIPTION:

The LVCC4245A is manufactured using advanced dual metal CMOS technology. This 8-bit (octal) noninverting bus transceiver contains two separate power-supply rails. The configurable B port is designed to track V_{CCB} , which accepts voltages from 3V to 5V, and the A port is dedicated to accept a 5V supply level. This allows for translation from a 3.3V to a 5V system environment and vice-versa.

This LVCC4245A is ideal for asynchronous communication between two data buses (A and B). The device transmits data from A to B or from B to A, 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 LVCC4245A has been designed with a $\pm 24mA$ output driver. This driver is capable of driving a moderate to heavy load while maintaining speed performance.

FUNCTIONAL BLOCK DIAGRAM

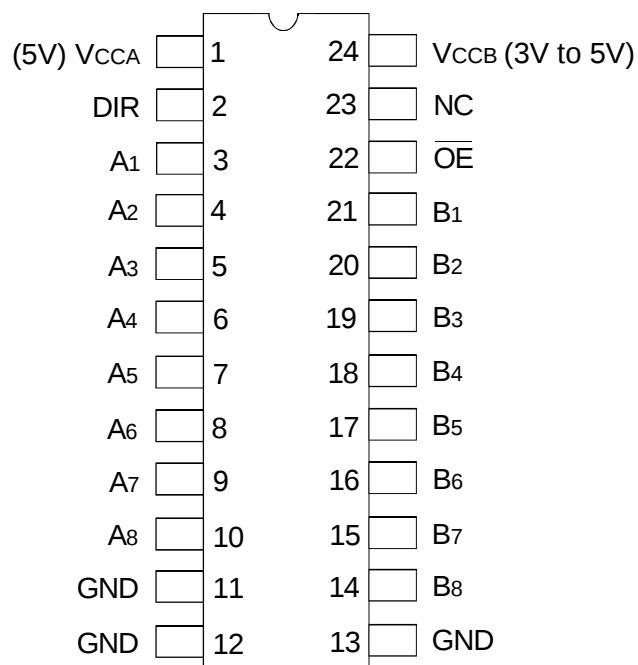


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INDUSTRIAL TEMPERATURE RANGE

JANUARY 2004

PIN CONFIGURATION



SSOP/ QSOP/ TSSOP
TOP VIEW

ABSOLUTE MAXIMUM RATINGS FOR VCCB OR VCCB⁽¹⁾

Symbol	Description	Max	Unit
VTERM	Terminal Voltage with Respect to GND	-0.5 to +6	V
TSTG	Storage Temperature	-65 to +150	°C
IOUT	DC Output Current	-50 to +50	mA
I _{IK} I _{OK}	Continuous Clamp Current, V _I < 0 or V _O < 0	-50	mA
I _{CC} I _{SS}	Continuous Current through each V _{CC} or GND	±100	mA

NOTE:

- Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

CAPACITANCE (T_A = +25°C, F = 1.0MHz)

Symbol	Parameter ⁽¹⁾	Conditions	Typ.	Max.	Unit
C _{IN}	Input Capacitance	V _{IN} = 0V	5	—	pF
C _{I/O}	I/O Port Capacitance	V _{IN} = 0V	11	—	pF

NOTE:

- As applicable to the device type.

PIN DESCRIPTION

Pin Names	Description
OE	Output Enable Input (Active LOW)
DIR	Direction Control Input
A _x	Port A Inputs or 3-State Outputs
B _x	Port B Inputs or 3-State Outputs
NC	No Internal Connection

FUNCTION TABLE⁽¹⁾

Inputs		Outputs
OE	DIR	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	High Z state

NOTE:

- H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE (A PORT)

Following Conditions Apply Unless Otherwise Specified:

Operating Condition: $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{CCA} = 4.5\text{V}$ to $5.5\text{V}^{(1)}$

Symbol	Parameter	Test Conditions		Min.	Typ. ⁽²⁾	Max.	Unit
V_{IH}	Input HIGH Voltage Level	$V_{CCA} = 4.5\text{V}$, $V_{CCB} = 2.7\text{V}$	$V_{OB} \leq 0.1\text{V}$ or $V_{OB} \geq V_{CCB} - 0.1\text{V}$	2	—	—	V
		$V_{CCA} = 4.5\text{V}$, $V_{CCB} = 3.6\text{V}$		2	—	—	
		$V_{CCA} = 5.5\text{V}$, $V_{CCB} = 5.5\text{V}$		2	—	—	
V_{IL}	Input LOW Voltage Level	$V_{CCA} = 4.5\text{V}$, $V_{CCB} = 2.7\text{V}$	$V_{OB} \leq 0.1\text{V}$ or $V_{OB} \geq V_{CCB} - 0.1\text{V}$	—	—	0.8	V
		$V_{CCA} = 4.5\text{V}$, $V_{CCB} = 3.6\text{V}$		—	—	0.8	
		$V_{CCA} = 5.5\text{V}$, $V_{CCB} = 5.5\text{V}$		—	—	0.8	
I_{IH} I_{IL}	Input Leakage Current (Control Inputs)	$V_{CCA} = 5.5\text{V}$ $V_{CCB} = 3.6\text{V}$ or 5.5V	$V_I = 0$ to 5.5V	—	—	± 1	μA
I_{OZH} I_{OZL}	High Impedance Output Current (3-State Output pins)	$V_{CCA} = 5.5\text{V}$ $V_{CCB} = 3.6\text{V}$	$V_O = 0$ to 5.5V	—	—	± 5	μA
V_H	Input Hysteresis	$V_{CCA} = 5.0\text{V}$		—	100	—	mV
I_{CCL} I_{CCH}	Quiescent Power Supply Current	$V_{CCA} = 5.5\text{V}$ $V_{CCB} = 3.6\text{V}$ or 5.5V	$V_{IN} = \text{GND}$ or V_{CCA} $I_{OB} = 0$	—	—	80	μA
ΔI_{CC}	Quiescent Power Supply Current Variation	One input at 3.4V , other inputs at V_{CCA} or GND		—	—	1.5	mA

NOTES:

- $V_{CCB} = 2.7\text{V}$ to 5.5V unless otherwise noted.
- Typical values are at $V_{CCA} = 5\text{V}$, $+25^{\circ}\text{C}$ ambient.

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE (B PORT)

Following Conditions Apply Unless Otherwise Specified:

Operating Condition: $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{CCB} = 2.7\text{V}$ to $5.5\text{V}^{(1)}$

Symbol	Parameter	Test Conditions		Min.	Typ. ⁽²⁾	Max.	Unit
V_{IH}	Input HIGH Voltage Level	$V_{CCB} = 2.7\text{V}$, $V_{CCA} = 4.5\text{V}$	$V_{OA} \leq 0.1\text{V}$ or $V_{OA} \geq V_{CCA} - 0.1\text{V}$	2	—	—	V
		$V_{CCB} = 3.6\text{V}$, $V_{CCA} = 4.5\text{V}$		2	—	—	
		$V_{CCB} = 5.5\text{V}$, $V_{CCA} = 5.5\text{V}$		3.85	—	—	
V_{IL}	Input LOW Voltage Level	$V_{CCB} = 2.7\text{V}$, $V_{CCA} = 4.5\text{V}$	$V_{OA} \leq 0.1\text{V}$ or $V_{OA} \geq V_{CCA} - 0.1\text{V}$	—	—	0.8	V
		$V_{CCB} = 3.6\text{V}$, $V_{CCA} = 4.5\text{V}$		—	—	0.8	
		$V_{CCB} = 5.5\text{V}$, $V_{CCA} = 5.5\text{V}$		—	—	1.65	
I_{OZH} I_{OZL}	High Impedance Output Current (3-State Output pins)	$V_{CCB} = 3.6\text{V}$ $V_{CCA} = 5.5\text{V}$	$V_O = 0$ to 5.5V	—	—	± 5	μA
V_H	Input Hysteresis	$V_{CCB} = 3.3\text{V}$		—	100	—	mV
I_{CCL} I_{CCH}	Quiescent Power Supply Current	$V_{CCB} = 3.6\text{V}$ or 5.5V $V_{CCA} = 5.5\text{V}$	$V_{IN} = \text{GND}$ or V_{CCB} $I_{OA} = 0$	—	—	80	μA
ΔI_{CC}	Quiescent Power Supply Current Variation	One input at $V_{CCB} - 0.6\text{V}$, other inputs at V_{CCB} or GND		—	—	500	μA

NOTES:

- $V_{CCA} = 4.5\text{V}$ to 5.5V unless otherwise noted.
- Typical values are at $V_{CCB} = 3.3\text{V}$, $+25^{\circ}\text{C}$ ambient.

OUTPUT DRIVE CHARACTERISTICS (A PORT)

Symbol	Parameter	Test Conditions ⁽¹⁾			Min.	Max.	Unit
VOH	Output HIGH Voltage (B port to A port)	VCCA = 4.5V	VCCB = 3V	IOH = - 0.1mA	4.4	—	V
				IOH = - 24mA	3.76	—	
VOL	Output LOW Voltage (B port to A port)	VCCA = 4.5V	VCCB = 3V	IOL = 0.1mA	—	0.1	V
				IOL = 24mA	—	0.44	

NOTE:

1. VIH and VIL must be within the min. or max. range shown in the DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE table for the appropriate Vcc range.
TA = - 40°C to + 85°C.

OUTPUT DRIVE CHARACTERISTICS (B PORT)

Symbol	Parameter	Test Conditions ⁽¹⁾			Min.	Max.	Unit
VOH	Output HIGH Voltage (A port to B port)	VCCB = 3V	VCCA = 4.5V	IOH = - 0.1mA	2.9	—	V
		VCCB = 2.7V	VCCA = 4.5V	IOH = - 12mA	2.2	—	
		VCCB = 3V	VCCA = 4.5V		2.46	—	
		VCCB = 2.7V	VCCA = 4.5V	IOH = - 24mA	2.1	—	
		VCCB = 3V	VCCA = 4.5V		2.25	—	
		VCCB = 4.5V	VCCA = 4.5V		3.76	—	
VOL	Output LOW Voltage (A port to B port)	VCCB = 3V	VCCA = 4.5V	IOL = 0.1mA	—	0.1	V
		VCCB = 2.7V	VCCA = 4.5V	IOL = 12mA	—	0.44	
		VCCB = 2.7V	VCCA = 4.5V	IOL = 24mA	—	0.5	
		VCCB = 3V	VCCA = 4.5V		—	0.44	
		VCCB = 4.5V	VCCA = 4.5V		—	0.44	

NOTE:

1. VIH and VIL must be within the min. or max. range shown in the DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE table for the appropriate Vcc range.
TA = - 40°C to + 85°C, VCCA = 4.5V.

OPERATING CHARACTERISTICS, TA = 25°C

Symbol	Parameter	Test Conditions	VCCA = 5V, VCCB = 3.3V	Unit
			Typical	
CPD	Power Dissipation Capacitance per Transceiver Outputs enabled	CL = 0pF, f = 10Mhz	20	pF
CPD	Power Dissipation Capacitance per Transceiver Outputs disabled		6.5	

SWITCHING CHARACTERISTICS⁽¹⁾

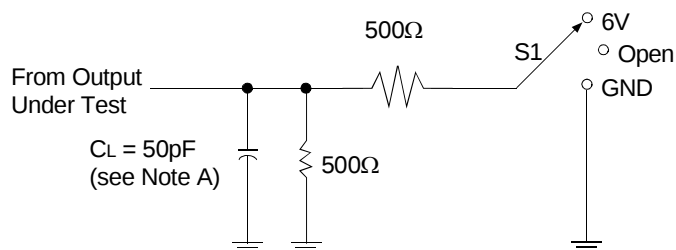
Symbol	Parameter	VCCA = 5V ± 0.5V				Unit
		VCCB = 5V ± 0.5V		VCCB = 2.7V to 3.6V		
		Min.	Max.	Min.	Max.	
tPLH	Propagation Delay	1	7.1	1	7	ns
tPHL	Ax to Bx	1	6	1	7	
tPLH	Propagation Delay	1	6.8	1	6.2	ns
tPHL	Bx to Ax	1	6.1	1	5.3	
tPZL	Output Enable Time	1	8.2	1	10	ns
tPZH	$\overline{OE}$ to Bx	1	8.1	1	10.2	
tPZL	Output Enable Time	1	9	1	9	ns
tPZH	$\overline{OE}$ to Ax	1	8.3	1	8	
tPLZ	Output Disable Time	1	4.7	1	5.2	ns
tPHZ	$\overline{OE}$ to Ax	1	4.9	1	5.2	
tPLZ	Output Disable Time	1	5.4	1	5.4	ns
tPHZ	$\overline{OE}$ to Bx	1	6.3	1	7.4	

NOTE:

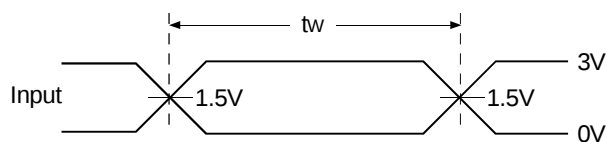
1. See TEST CIRCUITS AND WAVEFORMS. T_A = – 40°C to + 85°C.

LOAD CIRCUIT AND VOLTAGE WAVEFORMS PARAMETER MEASUREMENT INFORMATION FOR A TO B

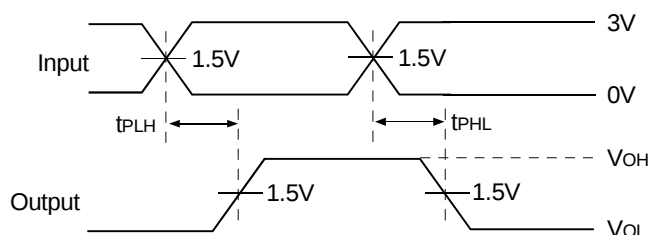
$V_{CCA} = 4.5V$ to $5.5V$ and $V_{CCB} = 2.7V$ to $3.6V$



Load Circuit



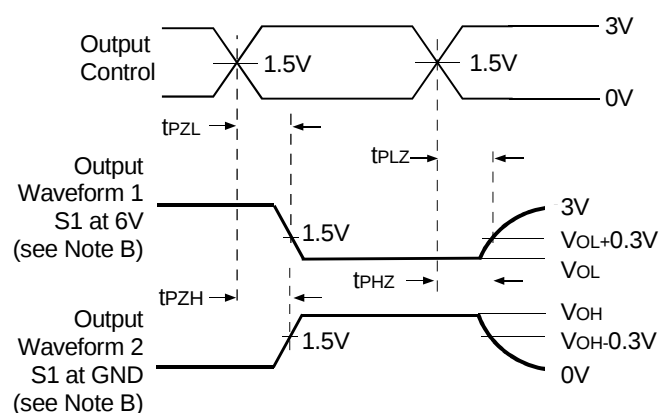
Voltage Waveforms Pulse Duration



**Voltage Waveforms Propagation Delay Times
Noninverting Outputs**

TEST CONDITIONS

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



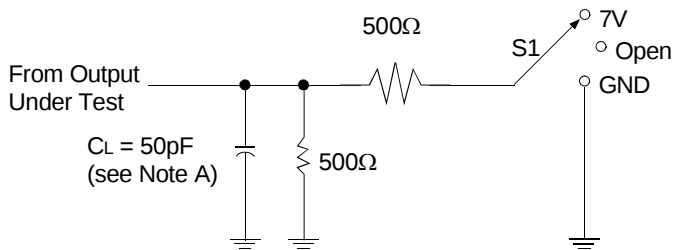
**Voltage Waveforms Enable and Disable Times
Low- and High-Level Enabling**

NOTES:

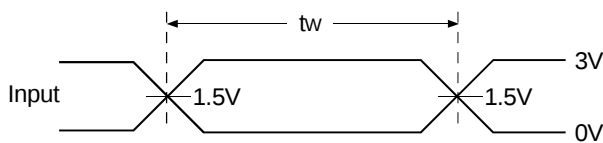
- C_L includes probe and jig capacitance.
- Waveform 1 is for an output with internal conditions such that the output is LOW except when disabled by the output control.
Waveform 2 is for an output with internal conditions such that the output is HIGH except when disabled by the output control.
- All input pulses are supplied by generators having the following characteristics: $PRR \leq 10MHz$; $Z_o = 50\Omega$; $t_r \leq 2.5ns$; $t_f \leq 2.5ns$.
- The outputs are measured one at a time with one transition per measurement.

LOAD CIRCUIT AND VOLTAGE WAVEFORMS PARAMETER MEASUREMENT INFORMATION FOR A TO B

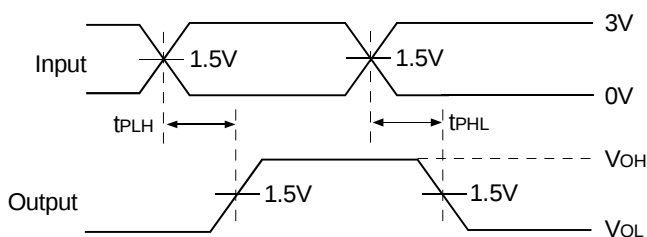
$V_{CCA} = 4.5V$ to $5.5V$ and $V_{CCB} = 3.6V$ to $5.5V$



Load Circuit



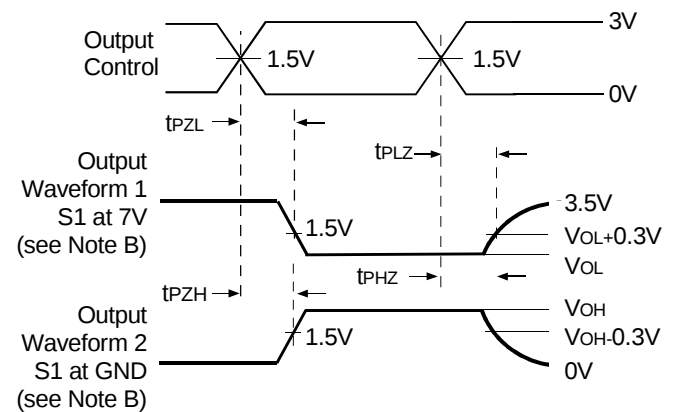
Voltage Waveforms Pulse Duration



**Voltage Waveforms Propagation Delay Times
Noninverting Outputs**

TEST CONDITIONS

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



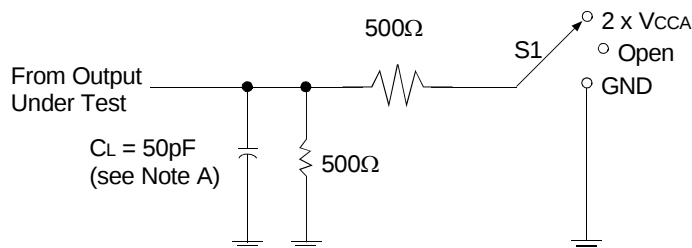
**Voltage Waveforms Enable and Disable Times
Low- and High-Level Enabling**

NOTES:

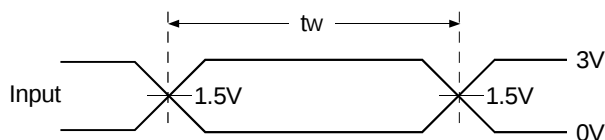
- C_L includes probe and jig capacitance.
- Waveform 1 is for an output with internal conditions such that the output is LOW except when disabled by the output control.
Waveform 2 is for an output with internal conditions such that the output is HIGH except when disabled by the output control.
- All input pulses are supplied by generators having the following characteristics: $PRR \leq 10MHz$; $Z_o = 50\Omega$; $t_r \leq 2.5ns$; $t_f \leq 2.5ns$.
- The outputs are measured one at a time with one transition per measurement.

LOAD CIRCUIT AND VOLTAGE WAVEFORMS PARAMETER MEASUREMENT INFORMATION FOR B TO A

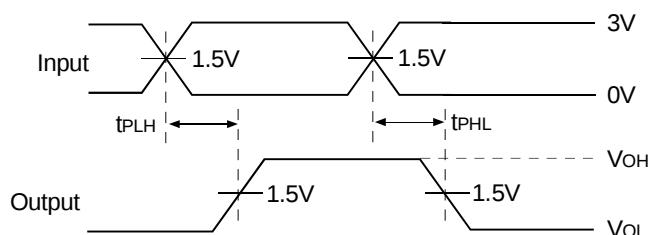
$V_{CCA} = 4.5V$ to $5.5V$ and $V_{CCB} = 2.7V$ to $3.6V$



Load Circuit



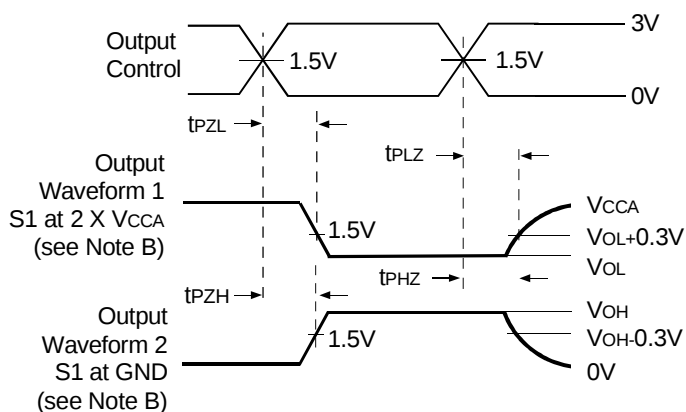
Voltage Waveforms Pulse Duration



Voltage Waveforms Propagation Delay Times
Noninverting Outputs

TEST CONDITIONS

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



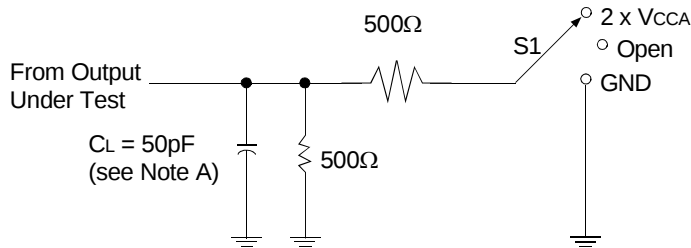
Voltage Waveforms Enable and Disable Times
Low- and High-Level Enabling

NOTES:

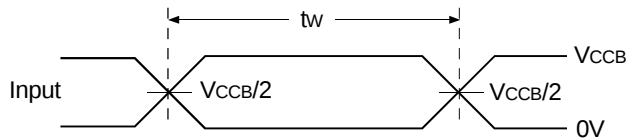
- C_L includes probe and jig capacitance.
- Waveform 1 is for an output with internal conditions such that the output is LOW except when disabled by the output control.
Waveform 2 is for an output with internal conditions such that the output is HIGH except when disabled by the output control.
- All input pulses are supplied by generators having the following characteristics: $PRR \leq 10MHz$; $Z_o = 50\Omega$; $t_r \leq 2.5ns$; $t_f \leq 2.5ns$.
- The outputs are measured one at a time with one transition per measurement.

LOAD CIRCUIT AND VOLTAGE WAVEFORMS PARAMETER MEASUREMENT INFORMATION FOR B TO A

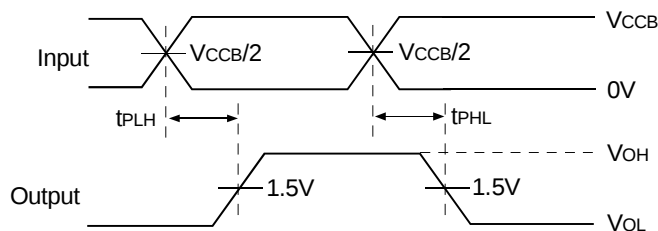
$V_{CCA} = 4.5V$ to $5.5V$ and $V_{CCB} = 3.6V$ to $5.5V$



Load Circuit



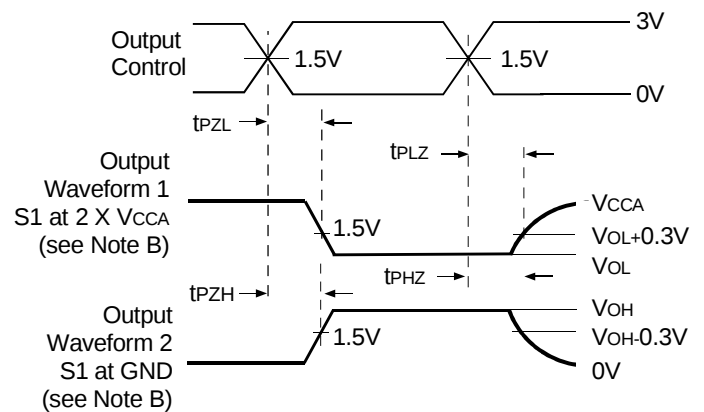
Voltage Waveforms Pulse Duration



**Voltage Waveforms Propagation Delay Times
Noninverting Outputs**

TEST CONDITIONS

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



**Voltage Waveforms Enable and Disable Times
Low- and High-Level Enabling**

NOTES:

- CL includes probe and jig capacitance.
- 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 pulses are supplied by generators having the following characteristics: $PRR \leq 10MHz$; $Z_o = 50\Omega$; $t_r \leq 2.5ns$; $t_f \leq 2.5ns$.
- The outputs are measured one at a time with one transition per measurement.

ORDERING INFORMATION

IDT	XX	LVC	X	XXXX	XX	
Temp. Range			Bus-Hold	Device Type	Package	
					PY	Shrink Small Outline Package
					Q	Quarter Size Small Outline Package
					PG	Thin Shrink Small Outline Package
				C4245A		Octal Dual-Supply Bus Transceiver with Configurable Output Voltage and 3-State Outputs, $\pm 24\text{mA}$
			Blank			No Bus-Hold
				74		-40°C to $+85^{\circ}\text{C}$



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