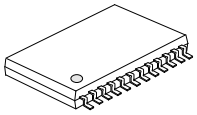
OCTAL BUS TRANSCEIVER AND 3.3V TO 5V SHIFTER WITH 3-STATE OUTPUTS



SSOP-24

■ DESCRIPTION

This 8-bit (octal) noninverting bus transceiver contains two separate supply rails; B port has V_{CCB}, which is set at 3.3V, and A port has V_{CCA}, which is set at 5V. This allows for translation from a 3.3V to a 5V environment, and vice versa.

The **U74LVC4245** device 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 control circuitry (DIR, $\overline{OE}$) is powered by V_{CCA}.

The **U74LVC4245** device terminal out allows the designer to switch to a normal all-3.3V or all-5V 20-terminal **U74LVC4245** device without board relay out.

■ FEATURES

* Bidirectional voltage translator
* 5.5V on A port and 2.7V to 3.6V on B port
* Control inputs V_{IH}/V_{IL} levels are referenced to V_{CC} voltage

■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74LVC4245L-R24-R	U74LVC4245G-R24-R	SSOP-24	Tape Reel

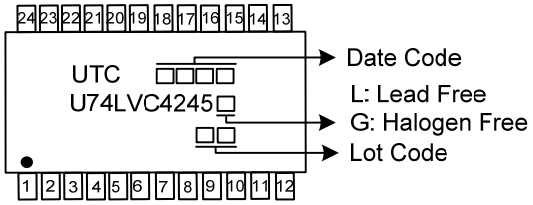
U74LVC4245G-R24-R

(1)Packing Type — (1) R: Tape Reel

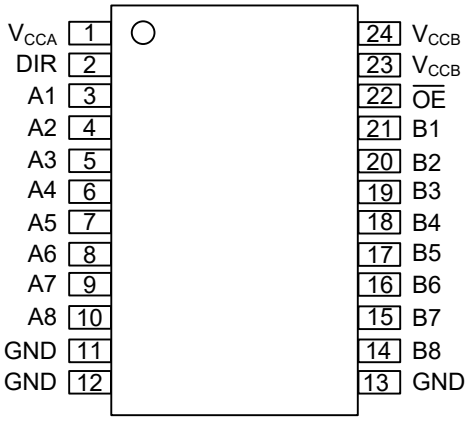
(2)Package Type — (2) P24: SSOP-24

(3)Green Package — (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



■ PIN CONFIGURATION

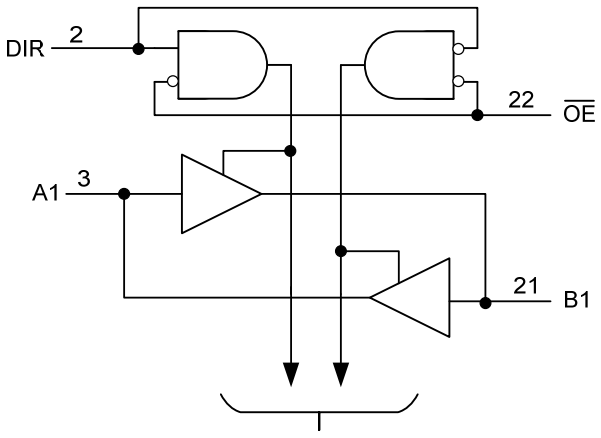


■ FUNCTION TABLE

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

Note: H: HIGH voltage level, L: LOW voltage level, X = Valid H or L

■ LOGIC DIAGRAM (positive logic)



Note: H: HIGH voltage level, L: LOW voltage level, X = Valid H or L, Z = HIGH-Impedance OFF-State

■ ABSOLUTE MAXIMUM RATING (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNIT
Supply Voltage A	V_{CCA}		-0.5 ~ +6.5	V
Supply Voltage B	V_{CCB}		-0.5 ~ +4.6	V
Input Voltage	V_{IN}	A Port	-0.5 ~ V_{CCA} +0.5	V
		B Port	-0.5 ~ V_{CCB} +0.5	V
		Control Inputs	-0.5 ~ +6	V
Output Voltage	V_{OUT}	Output HIGH or LOW State	-0.5 ~ V_{CC} +0.5	V
		Output 3-State	-0.5 ~ +6.5	V
Input Clamp Current	I_{IK}	V_{IN}<0	-50	mA
Output Clamp Current	I_{OK}	V_{OUT}<0V	-50	mA
Continuous V_{CC} or GND Current	I_{CC}	I_{CCA} or I_{CCB}	±100	mA
Continuous Output Current	I_{OUT}		±50	mA
Continuous current through each V_{CCA} or GND			±100	mA
Temperature Range	T_A		-40 ~ +125	°C
Storage Temperature	T_{STG}		-65 ~ +150	°C

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	110	°C/W

■ RECOMMENDED OPERATING COMDITIONS

PARAMETER	SYMBOL	CONDITIONS	MIN	TPY	MAX	UNIT
Supply Voltage A	V_{CCA}		4.5		5.5	V
Supply Voltage B	V_{CCB}		2.7		3.6	V
Input Voltage	V_{IN}		0		V_{CC}	V
Output Voltage	V_{OUT}		0		V_{CC}	V
Input-Pulse Rise and Fall Time	t_r / t_f	V_{CCI}=0.8V to 3.6V			10	ns/V

■ ELECTRICAL CHARACTERISTICS

PARAMETER		SYMBOL	TEST CONDITIONS	T_A=25°C			T_A=-40~+125°C			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
High-level input voltage		V_{IH}	V_{CCB}=2.3 ~ 2.7V	2.0			2.0			V
			V_{CCA}=4.5 ~ 5.5V	2.0			2.0			V
Low-lever output voltage		V_{IL}	V_{CCB}=2.3 ~ 2.7V			0.8			0.8	V
			V_{CCA}=4.5 ~ 5.5V			0.8			0.8	V
High-Level Output Voltage		V_{OH}	V_{CCA}=4.5V, I_{OH}=-100μA	4.3			4.0			V
			V_{CCA}=4.5V, I_{OH}=-24mA	3.7			2.7			V
			V_{CCA}=5.5V, I_{OH}=-100mA	5.3			5.0			V
			V_{CCA}=5.5V, I_{OH}=-24mA	4.7			3.7			V
			V_{CCB}=2.7V~3.6V, I_{OH}=-100μA	V_{CC}-0.2			V_{CC}-0.3			V
			V_{CCB}=2.7V, I_{OH}=-12mA	2.2			2.05			V
			V_{CCB}=3.0V, I_{OH}=-12mA	2.4			2.25			V
			V_{CCB}=3.0V, I_{OH}=-24mA	2			1.8			V
Low-Level Output Voltage		V_{OL}	V_{CCA}=4.5V, I_{OL}=100μA			0.2			0.3	V
			V_{CCA}=4.5V, I_{OL}=24mA			0.55			0.8	V
			V_{CCA}=5.5V, I_{OL}=100mA			0.2			0.3	V
			V_{CCA}=5.5V, I_{OL}=24mA			0.55			0.8	V
			V_{CCB}=2.7V~3.6V, I_{OL}=100μA			0.2			0.3	V
			V_{CCB}=2.7V, I_{OL}=12mA			0.4			0.6	V
			V_{CCB}=3.0V, I_{OL}=24mA			0.55			0.8	V
Input Leakage Current	Control Inputs	$I_{I(LEAK)}$	V_{CCA}=4.5V~5.5V, V_{CCA}=5.5V V_{IN}=V_{CCA} or GND			±1			±20	μA
Output OFF-state current	A port (Note 2)	I_{OZ}	V_{CCA}=4.5V~5.5V, V_{CCA}=5.5V V_{IN}=V_{CCA} or GND			±5			±20	μA
	B port (Note 2)		V_{CCB}=2.7V~3.6V, V_{CCB}=3.6V V_{OUT}=V_{CCB} or GND			±5			±20	μA
Quiescent Supply Current		I_{CCA}	V_{CCA}=4.5V~5.5V, V_{CCA}=5.5V I_{OUT}=0A, V_I=V_{CCA} or GND			80			160	μA
		I_{CCB}	V_{CCB}=2.7V~3.6V, V_{CCB}=3.6V I_{OUT}=0A, V_{OUT}=V_{CCB} or GND			50			100	μA
Additional Quiescent Supply Current Per Input Pin		ΔI_{CCA} (Note 3)	V_{CCA}=4.5V~5.5V, V_{CCA}=5.5V One input at 3.4V, Other inputs at V_{CCA} or GND			1.5			5	mA
		ΔI_{CCB} (Note 3)	V_{CCB}=2.7V~3.6V One input at V_{CCB}-0.6V, Other inputs at V_{CCB} or GND			0.5			5	mA

Notes: 1. V_{CCA}=5V±0.5V.
2. For I/O ports, the parameter I_{OZ} includes the input leakage current.
3. 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}.
4. All typical values are measured at V_{CC}=3.3V, T_A=25°C

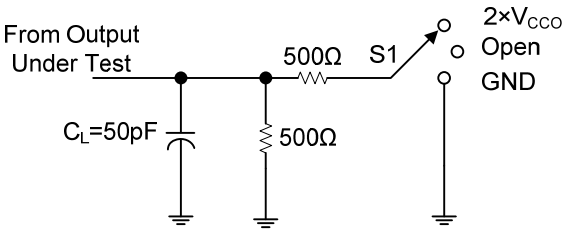
■ SWITCHING CHARACTERISTICS (Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	T_A=25°C			T_A=-40~+125°C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Propagation delay from input (A) to output (B)	t_{PLH}	V_{CCA}=5V±0.5V, V_{CCB}=2.7V~3.6V	1.0		9.5	1		12.5	ns
	t_{PHL}		1.0		6.3	1		8.0	ns
Propagation delay from input (B) to output (A)	t_{PLH}		1.0		8.0	1		11.0	ns
	t_{PHL}		1.0		6.1	1		8.0	ns
Propagation delay from input ($\overline{OE}$) to output (A)	t_{PHZ}		1.0		5.8	1		7.5	ns
	t_{PLZ}		1.0		7.0	1		9.0	ns
Propagation delay from input ($\overline{OE}$) to output (B)	t_{PHZ}		1.0		7.8	1		10.0	ns
	t_{PLZ}		1.0		7.7	1		10.0	ns
Propagation delay from input ($\overline{OE}$) to output (A)	t_{PZH}		1.0		11.5	1		13.5	ns
	t_{PZL}		1.0		9.0	1		11.5	ns
Propagation delay from input ($\overline{OE}$) to output (B)	t_{PZH}		1.0		11	1		14.0	ns
	t_{PZL}		1.0		10.3	1		11.0	ns

■ OPERATING CHARACTERISTICS (C_L=0, f=10MHz, T_A=25°C, unless otherwise specified)

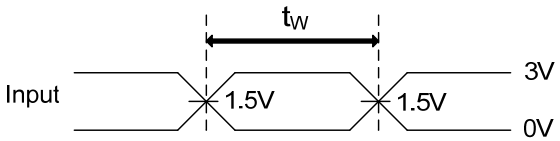
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Capacitance	Control Inputs	C_{IN}	V_{CCA}=2.7~3.6V, V_{IN}=V_{CCA} or GND, V_{CCA}=OPEN		5		pF
Output Capacitance	A Port	C_{IO}	V_{CCA}=5V, V_{OUT}=V_{CCA} or GND		11		pF
	B Port		V_{CCA}=3.3V, V_{OUT}=V_{CCB} or GND		11		pF
Power dissipation capacitance per transceiver	Outputs Enabled	C_{PD}	V_{CCA}=4.5V~5.5V, V_{CCB}=2.7V~3.6V			39.5	pF
	Outputs Disabled					5	pF

■ TEST CIRCUIT AND WAVEFORMS For A PORT

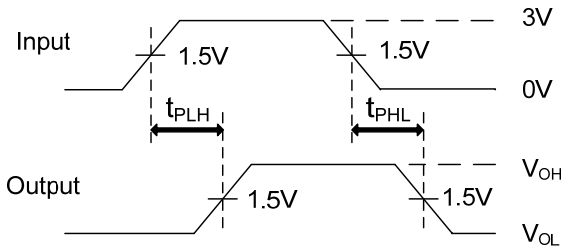


TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	$2\times V_{CCO}$
t_{PHZ}/t_{PZH}	GND

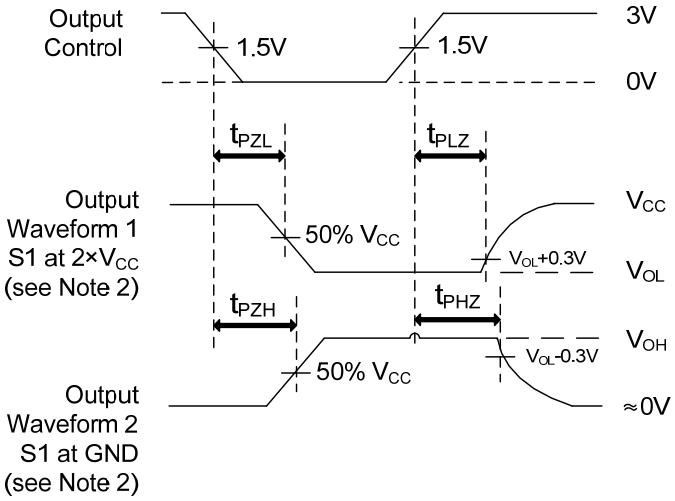
Load Circuit



PULSE DURATION



PROPAGATION DELAY TIMES

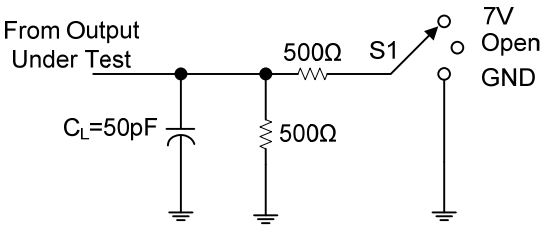


ENABLE AND DISABLE TIMES

Notes: 1. C_L includes probe and jig capacitance.

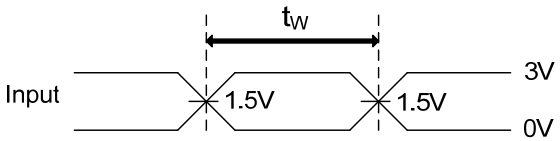
2. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control.
   Waveform2 is for an output with internal conditions such that the output is high, except when disabled by the output control
3. All input pulses are supplied by generators having the following characteristics: PRR ≤1MHz, Z_O = 50Ω, t_r≤2.5ns, t_f≤2.5ns.
4. The outputs are measured one at a time, with one transition per measurement.
5. All parameters and waveforms are not applicable to all devices.

■ TEST CIRCUIT AND WAVEFORMS For B PORT

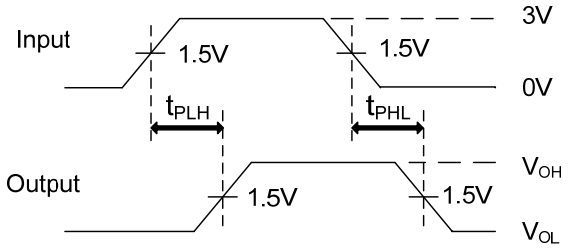


TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	7V
t_{PHZ}/t_{PZH}	GND

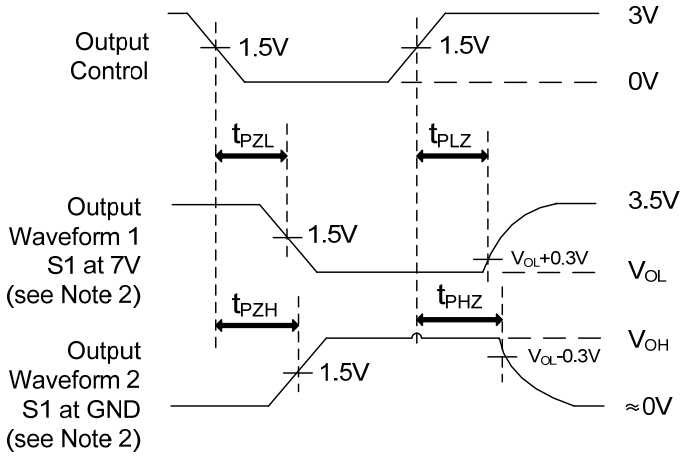
Load Circuit



PULSE DURATION



PROPAGATION DELAY TIMES



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