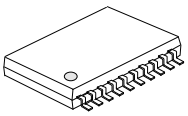
U74LVC2245A **Preliminary** ***CMOS IC***

OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS



TSSOP-20U

■ DESCRIPTION

The **U74LVC2245A** is an 8-bit transceiver with 30Ω termination resistors and 3-state outputs. The device features an output enable ($\overline{OE}$) and transmit/receive (DIR) for direction control. When the $\overline{OE}$ is high, the outputs will be in a high-impedance OFF-state. Inputs can be driven from either 3.3V or 5V devices. This feature allows the use of these devices as translators in mixed 3.3V and 5V environments.

Schmitt-trigger action at all inputs makes the circuit tolerant of slower input rise and fall times.

This device is fully specified for partial power down applications using I_{OFF}. The I_{OFF} circuitry disables the output, preventing the potentially damaging backflow current through the device when it is powered down.

■ FEATURES

* Overvoltage tolerant inputs to 5.5V
* Wide supply voltage range from 1.2V to 3.6V
* CMOS low-power consumption
* I_{OFF} circuitry provides partial Power-down mode operation
* Integrated 30 Ω termination resistors

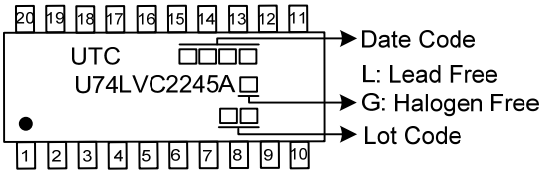
■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74LVC2245AL-ULA-R	U74LVC2245AG-ULA-R	TSSOP-20U	Tape Reel

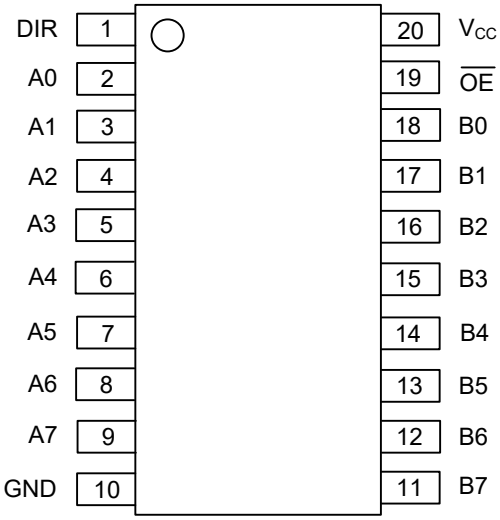
U74LVC2245AG-ULA-R

(1)Packing Type	(1) R: Tape Reel
(2)Package Type	(2) ULA: TSSOP-20U
(3)Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



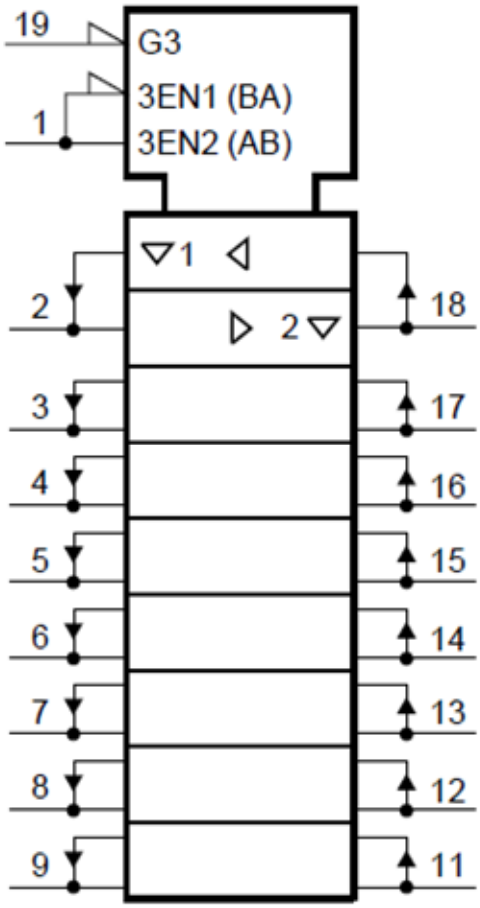
■ PIN CONFIGURATION



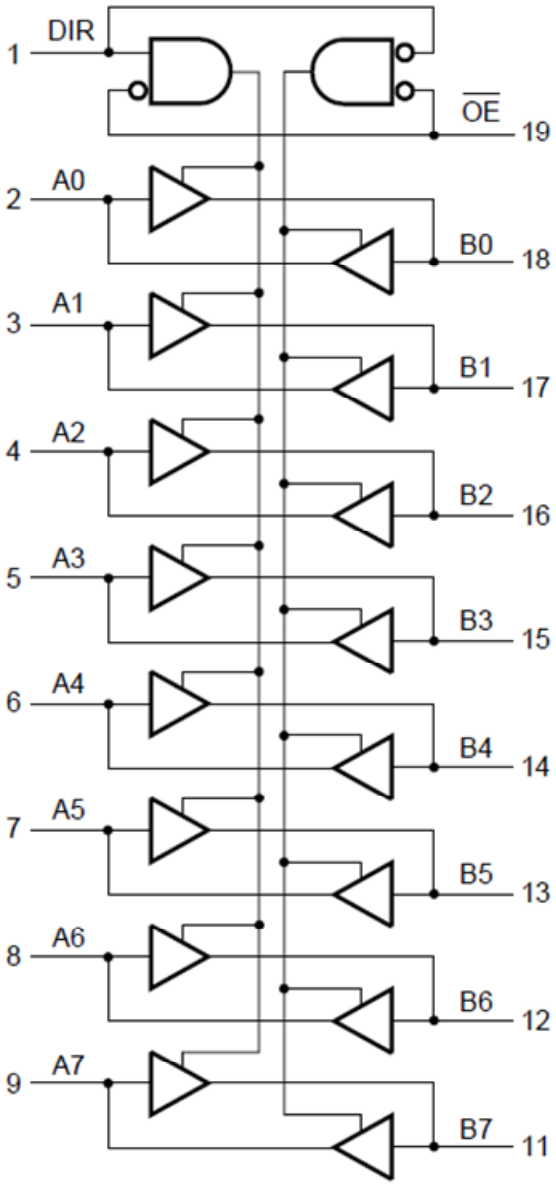
■ FUNCTION TABLE

INPUT		INPUT / OUTPUT	
$\overline{OE}$	DIR	An	Bn
LOW	LOW	A=B	INPUT
LOW	HIGH	INPUT	B=A
HIGH	Don't Care	Z (High-Impedance OFF-State)	Z (High-Impedance OFF-State)

■ LOGIC DIAGRAM



IEC LOGIC SYMBOL



LOGIC SYMBOL

■ ABSOLUTE MAXIMUM RATING (Unless otherwise specified) (Note 1)

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNIT
Supply Voltage	V_{CC}		-0.5 ~ +6.5	V
Input Voltage (Note 2)	V_{IN}		-0.5 ~ +6.5	V
Output Voltage (Note 3)	V_{OUT}	Output HIGH or LOW state	-0.5 ~ V_{CC}+0.5	V
		Output 3-State	-0.5 ~ +6.5	V
Continuous Output Current	I_{OUT}	V_{OUT}=0V ~ V_{CC}	±50	mA
Continuous V_{CC} or GND Current	I_{CC}		±100	mA
Input Clamp Current	I_{IK}	V_{IN} < 0V	-50	mA
Output Clamp Current	I_{OK}	V_{OUT} > V_{CC} or V_{OUT} < 0V	±50	mA
Power Dissipation	P_D		500	mW
Storage Temperature Range	T_{STG}	T_A=-40 ~ +125°C	-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 minimum input voltage ratings may be exceeded if the input current ratings are observed.
3. The output voltage ratings may be exceeded if the output current ratings are observed.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V_{CC}		1.65		3.6	V
		Functional	1.2			V
Input Voltage	V_{IN}		0		5.5	V
Output Voltage	V_{OUT}	Output HIGH or LOW state	0		V_{CC}	V
		Output 3-State	0		5.5	V
Input Transition Rise or Fall Rate	Δt/Δv	V_{CC} =1.65V~2.7V	0		20	ns/V
		V_{CC} =2.7V~3.6V	0		10	ns/V
Operating Temperature	T_A		-40		+125	°C

■ ELECTRICAL CHARACTERISTICS (Unless otherwise specified)

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_{CC}=1.2V		1.08			1.08			V
		V_{CC}=1.65V~1.95V		0.65× V_{CC}			0.65× V_{CC}			V
		V_{CC}=2.3V~2.7V		1.7			1.7			V
		V_{CC} =2.7V~3.6V		2.0			2.0			V
Low-Level Input Voltage	V_{IL}	V_{CC}=1.2V				0.12			0.12	V
		V_{CC}=1.65V~1.95V				0.35× V_{CC}			0.35× V_{CC}	V
		V_{CC}=2.3V~2.7V				0.7			0.7	V
		V_{CC} =2.7V~3.6V				0.8			0.8	V
High-Level Output Voltage	V_{OH}	V_I=V_{IH} or V_{IL}	V_{CC}=1.65V~3.6V I_{OH}=-100μA	V_{CC} -0.2			V_{CC} -0.3			V
			V_{CC}=1.65V, I_{OH}=-2mA	1.2			1.05			V
			V_{CC}=2.3V, I_{OH}=-4mA	1.8			1.65			V
			V_{CC}=2.7V, I_{OH}=-6mA	2.2			2.05			V
			V_{CC}=3.0V, I_{OH}=-9mA	2.4			2.25			V
			V_{CC}=3.0V, I_{OH}=-12mA	2.2			2.0			V
Low-Level Output Voltage	V_{OL}		V_{CC}=1.65V~3.6V I_{OL}=100μA			0.2			0.3	V
			V_{CC}=1.65V, I_{OL}=2mA			0.45			0.65	V
			V_{CC}=2.3V, I_{OL}=4mA			0.6			0.8	V
			V_{CC}=2.7V, I_{OL}=6mA			0.4			0.6	V
			V_{CC}=3.0V, I_{OL}=12mA			0.55			0.8	V
Input Leakage Current	$I_{I(LEAK)}$	V_{CC}=3.6V, V_{IN}=5.5 or GND				±5			±20	μA
OFF-State Output Current	I_{OZ}	V_I=V_{IH} or V_{IL}, V_{CC}=3.6V, V_{IN}=5.5V or GND				±5			±20	μA
Power-Off Leakage Current	I_{OFF}	V_{CC}=0V, V_{IN} or V_{OUT}=5.5V				±10			±20	μA
Supply Current	I_{CC}	V_{CC}=3.6V, V_{IN}=V_{CC} or GND, I_{OUT}=0				10			40	μA
Additional Supply Current	ΔI_{CC}	Per Input Pin V_{CC} =2.7V~3.6V V_{IN}=V_{CC}-0.6V. I_{OUT}=0				500			5000	μA

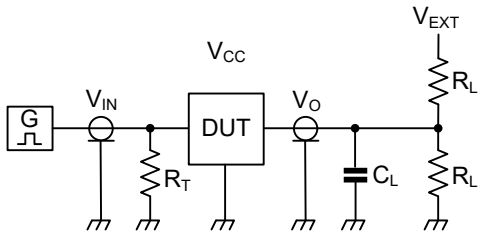
■ SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	T_A=25°C			T_A=-40~+125°C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Propagation Delay From An to Bn or Bn to An	t_{PD} (t_{PLH}/t_{PHL})	V_{CC}=1.2V		26					ns
		V_{CC}=1.65V~1.95V	1		17.1	1		18	ns
		V_{CC}=2.3V~2.7V	1		10.4	1		12	ns
		V_{CC} =2.7V	1		9.3	1		11.5	ns
		V_{CC} =3.0V~3.6V	1		8.3	1		10	ns
Enable Time From $\overline{OE}$ to An or Bn	t_{EN} (t_{PZL}/t_{PZH})	V_{CC}=1.2V		28					ns
		V_{CC}=1.65V~1.95V	1		18.8	1		21	ns
		V_{CC}=2.3V~2.7V	1		12.3	1		14.5	ns
		V_{CC} =2.7V	1		11.5	1		14	ns
		V_{CC} =3.0V~3.6V	1		10.2	1		12.5	ns
Disable Time From $\overline{OE}$ to An or Bn	t_{DIS} (t_{PLZ}/t_{PHZ})	V_{CC}=1.2V		25					ns
		V_{CC}=1.65V~1.95V	1		10.2	1		11	ns
		V_{CC}=2.3V~2.7V	1		8	1		9.5	ns
		V_{CC} =2.7V	1		6.9	1		9	ns
		V_{CC} =3.0V~3.6V	1		5.9	1		7.5	ns

■ OPERATING CHARACTERISTICS

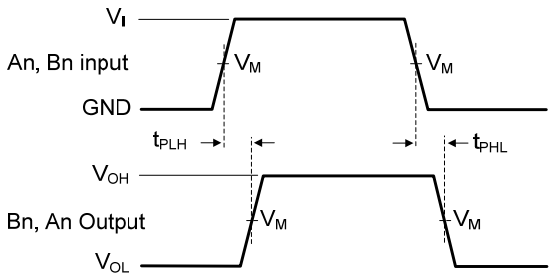
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Capacitance	C_{IN}	V_{CC}=0~3.6V, V_{IN}=GND to V_{CC}		4		pF
Power Dissipation Capacitance	C_{PD}	No Load		40		pF

■ TEST CIRCUIT AND WAVEFORMS

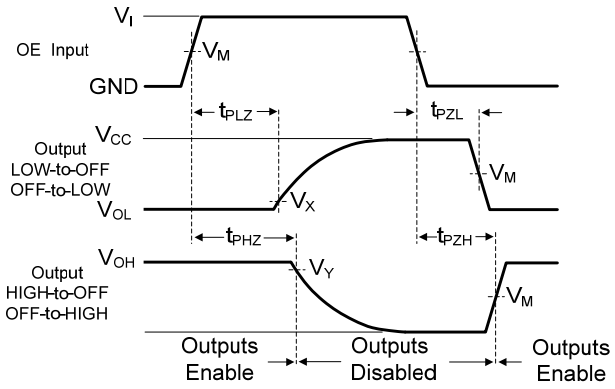


Note: C_L includes probe and jig capacitance.

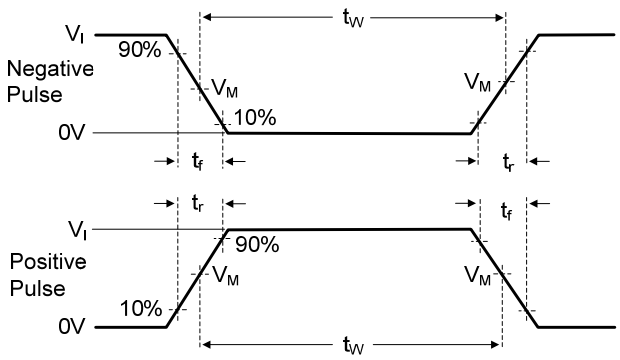
V_{CC}	Input			Output			Load		V_{EXT}		
	V_{IN}	t_r / t_f	V_M	V_M	V_X	V_Y	C_L	R_L	t_{PLH} / t_{PHL}	t_{PLZ} / t_{PZL}	t_{PHZ} / t_{PZH}
1.2V	V_{CC}	≤2ns	0.5×V_{CC}	0.5×V_{CC}	V_{OL}+0.15V	V_{OH}-0.15V	30 pF	1 KΩ	OPEN	2×V_{CC}	GND
1.65V ~ 1.95V	V_{CC}	≤2ns	0.5×V_{CC}	0.5×V_{CC}	V_{OL}+0.15V	V_{OH}-0.15V	30 pF	1 KΩ	OPEN	2×V_{CC}	GND
2.3V ~ 2.7V	V_{CC}	≤2ns	0.5×V_{CC}	0.5×V_{CC}	V_{OL}+0.15V	V_{OH}-0.15V	30 pF	500Ω	OPEN	2×V_{CC}	GND
2.7V	2.7V	≤2.5ns	1.5V	1.5V	V_{OL}+0.3V	V_{OH}-0.3V	50 pF	500Ω	OPEN	2×V_{CC}	GND
3.0V ~ 3.6V	2.7V	≤2.5ns	1.5V	1.5V	V_{OL}+0.3V	V_{OH}-0.3V	50 pF	500Ω	OPEN	2×V_{CC}	GND



Propagation Delay Times



3-State Enable and Disable Times



Test Circuit for Measuring Switching Times