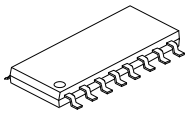
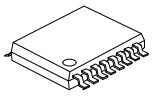
U74AVC4T245

CMOS IC

4 BIT DUAL-SUPPLY BUS TRANSCEIVER WITH CONFIGURABLE VOLTAGE TRANSLATION AND 3-STATE OUTPUTS



SOP-16



TSSOP-16

X1QFN-16(1.8×2.6)

■ DESCRIPTION

The UTC **U74AVC4T245** is an 4-bit dual supply transceiver that enables bidirectional level translation. The A port is designed to track V_{CCA}. V_{CCA} accepts any supply voltage from 1.2V to 3.6V. The B port is designed to track V_{CCB}. V_{CCB} accepts any supply voltage from 1.2V to 3.6V. The UTC **U74AVC4T245** is optimized to operate with V_{CCA}/V_{CCB} set at 1.4V to 3.6V. It is operational with V_{CCA}/V_{CCB} as low as 1.2V. This allows for universal low-voltage bidirectional translation between any of the 1.2V, 1.5V, 1.8V, 2.5V and 3.3V voltage nodes.

The UTC **U74AVC4T245** device is designed for asynchronous communication between two data buses. The logic levels of the direction-control (DIR) input and the output-enable ($\overline{OE}$) input activate either the B-port outputs or the A-port outputs or place both output ports into the high-impedance mode. The device transmits data from the A bus to the B bus when the B-port outputs are activated, and from the B bus to the A bus when the A-port outputs are activated. The input circuitry on both A and B ports is always active and must have a logic HIGH or LOW level applied to prevent excess I_{CC} and I_{CCZ}.

The UTC **U74AVC4T245** device is designed so that the control pins (1DIR, 2DIR, 1 $\overline{OE}$ and 2 $\overline{OE}$) are supplied by V_{CCA}. This device is fully specified for partial-power-down applications using I_{OFF}. The I_{OFF} circuitry disables the outputs, preventing any damaging current backflow through the device when it is powered down.

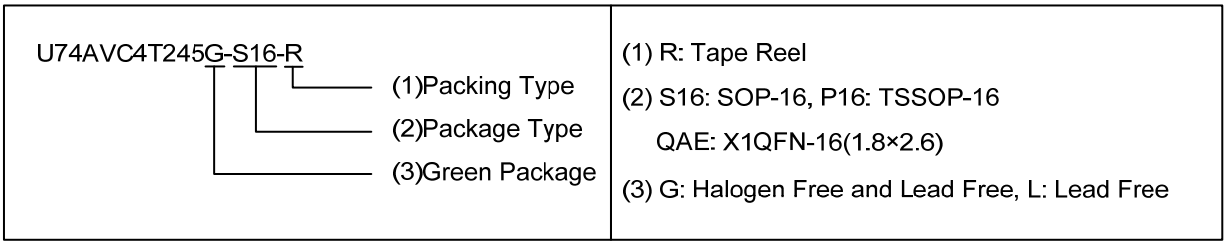
The V_{CC} isolation feature ensures that if either V_{CC} input is at GND, then both ports are in the high- impedance state. To ensure the high-impedance state during power up or power down, $\overline{OE}$ should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

■ FEATURES

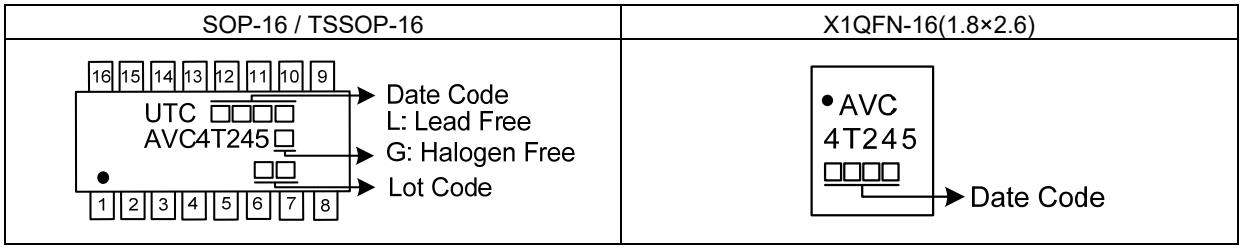
* Operation Voltage Range: 1.2~3.6V
* Control Inputs V_{IH} / V_{IL} Levels Are Referenced to V_{CCA} Voltage
* I/Os Are 4.6V Tolerant
* I_{OFF} Supports Partial Power Down Mode Operation

■ ORDERING INFORMATION

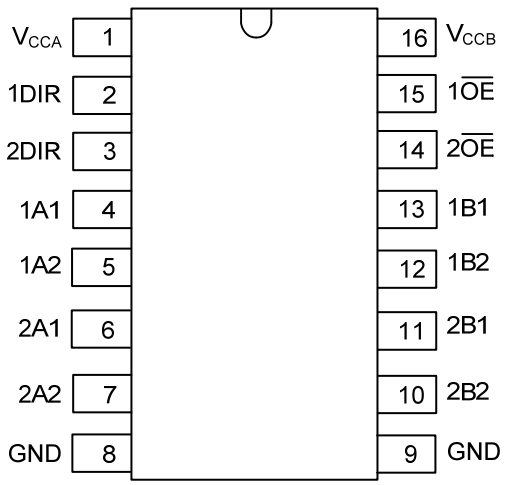
Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74AVC4T245L-S16-R	U74AVC4T245G-S16-R	SOP-16	Tape Reel
U74AVC4T245L-P16-R	U74AVC4T245G-P16-R	TSSOP-16	Tape Reel
U74AVC4T245L-QAE-R	U74AVC4T245G-QAE-R	X1QFN-16(1.8×2.6)	Tape Reel



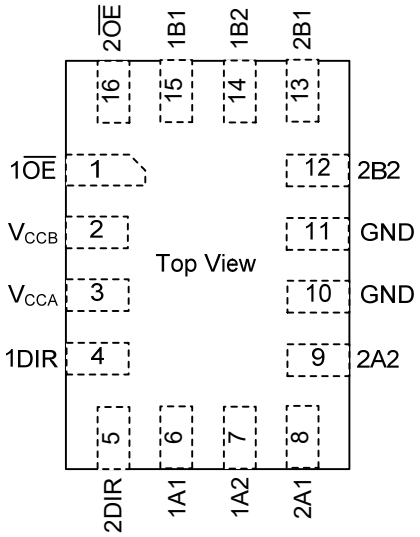
■ MARKING



■ PIN CONFIGURATION



SOP-16 / TSSOP-16



X1QFN-16(1.8×2.6)

■ PIN DESCRIPTION

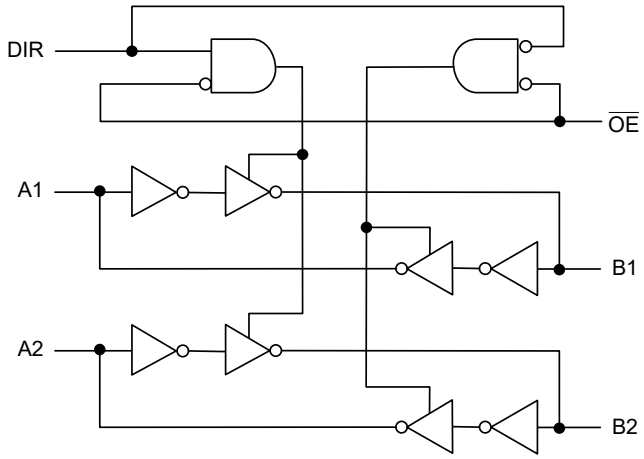
PIN NO.		PIN NAME	TYPE	DESCRIPTION
SOP-16 TSSOP-16	X1QFN-16(1.8×2.6)			
1	3	V_{CCA}		A-port power supply voltage. 1.2V ≤ V_{CCA} ≤ 3.6V
2	4	1DIR	I	Direction-control input for '1' ports
3	5	2DIR	I	Direction-control input for '2' ports
4	6	1A1	I/O	Input/output 1A1. Referenced to V_{CCA}
5	7	1A2	I/O	Input/output 1A2. Referenced to V_{CCA}
6	8	2A1	I/O	Input/output 2A1. Referenced to V_{CCA}
7	9	2A2	I/O	Input/output 2A2. Referenced to V_{CCA}
8, 9	10, 11	GND		Ground
10	12	2B2	I/O	Input/output 2B2. Referenced to V_{CCB}
11	13	2B1	I/O	Input/output 2B1. Referenced to V_{CCB}
12	14	1B2	I/O	Input/output 1B2. Referenced to V_{CCB}
13	15	1B1	I/O	Input/output 1B1. Referenced to V_{CCB}
14	16	2$\overline{OE}$	I	3-state output-mode enables. Pull $\overline{OE}$ high to place '2' outputs in 3-state mode. Referenced to V_{CCA}
15	1	1$\overline{OE}$	I	3-state output-mode enables. Pull $\overline{OE}$ high to place '1' outputs in 3-state mode. Referenced to V_{CCA}
16	2	V_{CCB}		B-port power supply voltage. 1.2V ≤ V_{CCB} ≤ 3.6V

■ FUNCTION TABLE

INPUTS		OUTPUT		OPERATION
$\overline{OE}$ n	DIRn	A PORT	B PORT	
L	L	Enabled	Hi-Z	Bn data to An data
L	H	Hi-Z	Enabled	An data to Bn data
H	X	Hi-Z	Hi-Z	Isolation

Notes: 1. L: low voltage level; H: high voltage level; X: don't care
2. Input circuits of the data I/Os are always active.

■ LOGIC DIAGRAM



■ ABSOLUTE MAXIMUM RATING (T_A=25°C, unless otherwise specified) (Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	RATINGS	UNIT
Supply Voltage	V_{CCA}, V_{CCB}		-0.5 ~ 4.6	V
Input Voltage (Note 2)	V_{IN}	I/O ports (A port)	-0.5 ~ 4.6	V
		I/O ports (B port)	-0.5 ~ 4.6	V
		Control inputs	-0.5 ~ 4.6	V
Voltage range applied to any output in the high-impedance or power-off state (Note 2)	V_{OUT}	A port	-0.5 ~ 4.6	V
		B port	-0.5 ~ 4.6	V
Voltage range applied to any output in the high or low state (Note 2, 3)	V_{OUT}	A port	-0.5 ~ V_{CCA}+0.5	V
		B port	-0.5 ~ V_{CCB}+0.5	V
Continuous Output Current	I_{OUT}		±50	mA
Continuous Current Through V_{CCA}, V_{CCB} or GND	I_{CC}		±100	mA
Input Clamp Current	I_{IK}	V_{IN}<0	-50	mA
Output Clamp Current	I_{OK}	V_{OUT}<0	-50	mA
Storage Temperature Range	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 voltage and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
3. The output positive-voltage rating may be exceeded up to 4.6V maximum if the output current rating is observed.

■ RECOMMENDED OPERATING CONDITIONS (T_A=25°C , unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V_{CCA}, V_{CCB}		1.2		3.6	V
Input Voltage	V_{IN}		0		3.6	V
Output Voltage	V_{OUT}	Active state	0		V_{CC}	V
		3-state	0		3.6	
Input Transition Rise or Fall Rate	Δt/Δv				5	ns/V
Operating Temperature (Note)	T_A		-40		+125	°C

■ ELECTRICAL CHARACTERISTICS (Note 1, 2, 3)

PARAMETER		SYMBOL	TEST CONDITIONS	T_A=25°C			T_A=-40~+125°C			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
High-level input voltage	Data inputs (Note 4)	V_{IH}	V_{CCI}=1.2V~1.95V	V_{CCI}× 0.65			V_{CCI}× 0.65			V
			V_{CCI}=1.95V~2.7V	1.6			1.6			V
			V_{CCI}=2.7V~3.6V	2			2			V
	DIR (Referenced to V_{CCA}) (Note 5)		V_{CCI}=1.2V~1.95V	V_{CCA} × 0.65			V_{CCA} × 0.65			V
			V_{CCI}=1.95V~2.7V	1.6			1.6			V
			V_{CCI}=2.7V~3.6V	2			2			V
Low-lever output voltage	Data inputs (Note 4)	V_{IL}	V_{CCI}=1.2V~1.95V			V_{CCI}× 0.35			V_{CCI}× 0.35	V
			V_{CCI}=1.95V~2.7V			0.7			0.7	V
			V_{CCI}=2.7V~3.6V			0.8			0.8	V
	DIR (Referenced to V_{CCA}) (Note 5)		V_{CCI}=1.2V~1.95V			V_{CCA} × 0.35			V_{CCA} × 0.35	V
			V_{CCI}=1.95V~2.7V			0.7			0.7	V
			V_{CCI}=2.7V~3.6V			0.8			0.8	V
High-Level Output Voltage		V_{OH}	V_{CCA}=V_{CCB}=1.2V~3.6V I_{OH}=-100μA, V_I=V_{IH}	V_{CC}- 0.2			V_{CC}- 0.1			V
			V_{CCA}=V_{CCB}=1.2V I_{OH}=-3mA, V_I=V_{IH}		0.95			0.65		V
			V_{CCA}=V_{CCB}=1.4V I_{OH}=-6mA, V_I=V_{IH}	1.05			0.75			V
			V_{CCA}=V_{CCB}=1.65V I_{OH}=-8mA, V_I=V_{IH}	1.2			0.9			V
			V_{CCA}=V_{CCB}=2.3V I_{OH}=-9mA, V_I=V_{IH}	1.75			1.45			V
			V_{CCA}=V_{CCB}=3.0V I_{OH}=-12mA, V_I=V_{IH}	2.3			2.0			V
Low-Level Output Voltage		V_{OL}	V_{CCA}=V_{CCB}=1.2V~3.6V I_{OL}=100μA, V_I=V_{IL}			0.2			0.1	V
			V_{CCA}=V_{CCB}=1.2V I_{OL}=3mA, V_I=V_{IL}		0.25			0.5		V
			V_{CCA}=V_{CCB}=1.4V I_{OL}=6mA, V_I=V_{IL}			0.35			0.6	V
			V_{CCA}=V_{CCB}=1.65V I_{OL}=8mA, V_I=V_{IL}			0.45			0.7	V
			V_{CCA}=V_{CCB}=2.3V I_{OL}=9mA, V_I=V_{IL}			0.55			0.8	V
			V_{CCA}=V_{CCB}=3.0V I_{OL}=12mA, V_I=V_{IL}			0.7			0.95	V

■ ELECTRICAL CHARACTERISTICS (Cont.)

PARAMETER		SYMBOL	TEST CONDITIONS	T_A=25°C			T_A=-40~+125°C			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
Input Leakage Current	Control inputs	$I_{I(LEAK)}$	V_{CCA}=V_{CCB}=1.2~3.6V V_{IN}=V_{CCA} or GND		±0.025	±0.25			±1	μA
Power OFF Leakage Current	A or B port	I_{OFF}	V_{CCA}=0V, V_{CCB}=0~3.6V V_{IN} or V_{OUT}=0~3.6V		±0.1	±1			±5	μA
			V_{CCA}=0~3.6V, V_{CCB}=0V V_{IN} or V_{OUT}=0~3.6V		±0.1	±1			±5	μA
Output OFF-state current	A or B port	I_{OZ}	V_{CCA}=V_{CCB}=3.6V V_{OUT}=V_{CCO} or GND V_{IN}=V_{CCI} or GND, $\overline{OE}$ =V_{IH}		±0.5	±2.5			±5	μA
Quiescent Supply Current		I_{CCA}	V_{CCA}=V_{CCB}=1.2~3.6V V_{IN}=V_{CCI} or GND, I_O=0			8			50	μA
			V_{CCA}=0V, V_{CCB}=0~3.6V V_{IN}=V_{CCI} or GND, I_O=0	-2			-12			μA
			V_{CCA}=0~3.6V, V_{CCB}=0V V_{IN}=V_{CCI} or GND, I_O=0			8			50	μA
Quiescent Supply Current		I_{CCB}	V_{CCA}=V_{CCB}=1.2~3.6V V_{IN}=V_{CCI} or GND, I_O=0			8			50	μA
			V_{CCA}=0V, V_{CCB}=0~3.6V V_{IN}=V_{CCI} or GND, I_O=0			8			50	μA
			V_{CCA}=0~3.6V, V_{CCB}=0V V_{IN}=V_{CCI} or GND, I_O=0	-2			-12			μA
Quiescent Supply Current & Quiescent Supply Current		I_{CCA}+I_{CCB}	V_{CCA}=V_{CCB}=1.2~3.6V V_{IN}=V_{CCI} or GND, I_O=0			16			65	μA

Notes: 1. V_{CCI} is the V_{CC} associated with the input port.
2. V_{CCO} is the V_{CC} associated with the output port.
3. All unused data inputs of the device must be held at V_{CCI} or GND to ensure proper device operation.
4. For V_{CC}I values not specified in the data sheet, V_{IHMIN}=V_{CCI}×0.7V, V_{ILMAX}=V_{CCI}×0.3V
5. For V_{CCI} values not specified in the data sheet, V_{IHMIN}=V_{CCA}×0.7V, V_{ILMAX}=V_{CCA}×0.3V

■ SWITCHING CHARACTERISTICS

(Over recommended operating free-air temperature range, V_{CCA}=1.2V, 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} t_{PHL}	V_{CCB}=1.2V		3.4			15		ns
		V_{CCB}=1.5V±0.1V		2.9			13		ns
		V_{CCB}=1.8V±0.15V		2.7			13		ns
		V_{CCB}=2.5V±0.2V		2.6			13		ns
		V_{CCB}=3.3V±0.3V		2.8			13		ns
Propagation delay from input (B) to output (A)	t_{PLH} t_{PHL}	V_{CCB}=1.2V		3.6			15		ns
		V_{CCB}=1.5V±0.1V		3.1			15		ns
		V_{CCB}=1.8V±0.15V		2.8			13		ns
		V_{CCB}=2.5V±0.2V		2.6			13		ns
		V_{CCB}=3.3V±0.3V		2.6			13		ns
Propagation delay from input ($\overline{OE}$) to output (A)	t_{PZH} t_{PZL}	V_{CCB}=1.2V		5.6			17		ns
		V_{CCB}=1.5V±0.1V		4.7			16		ns
		V_{CCB}=1.8V±0.15V		4.3			16		ns
		V_{CCB}=2.5V±0.2V		3.9			15		ns
		V_{CCB}=3.3V±0.3V		3.7			15		ns
Propagation delay from input ($\overline{OE}$) to output (B)	t_{PZH} t_{PZL}	V_{CCB}=1.2V		5.0			17		ns
		V_{CCB}=1.5V±0.1V		4.3			16		ns
		V_{CCB}=1.8V±0.15V		3.9			15		ns
		V_{CCB}=2.5V±0.2V		3.6			15		ns
		V_{CCB}=3.3V±0.3V		3.6			15		ns
Propagation delay from input ($\overline{OE}$) to output (A)	t_{PHZ} t_{PLZ}	V_{CCB}=1.2V		6.2			18		ns
		V_{CCB}=1.5V±0.1V		5.2			17		ns
		V_{CCB}=1.8V±0.15V		5.2			17		ns
		V_{CCB}=2.5V±0.2V		4.3			16		ns
		V_{CCB}=3.3V±0.3V		4.8			16		ns
Propagation delay from input ($\overline{OE}$) to output (B)	t_{PHZ} t_{PLZ}	V_{CCB}=1.2V		5.9			17		ns
		V_{CCB}=1.5V±0.1V		5.1			17		ns
		V_{CCB}=1.8V±0.15V		5.0			17		ns
		V_{CCB}=2.5V±0.2V		4.7			16		ns
		V_{CCB}=3.3V±0.3V		5.5			17		ns

■ SWITCHING CHARACTERISTICS (Cont.)

(Over recommended operating free-air temperature range, V_{CCA}=1.5V±0.1V, 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} t_{PHL}	V_{CCB}=1.2V		3.2			13		ns
		V_{CCB}=1.5V±0.1V	0.3		6.3	0.1		12.5	ns
		V_{CCB}=1.8V±0.15V	0.3		5.2	0.1		11.5	ns
		V_{CCB}=2.5V±0.2V	0.4		4.2	0.1		11	ns
		V_{CCB}=3.3V±0.3V	0.4		4.2	0.1		11	ns
Propagation delay from input (B) to output (A)	t_{PLH} t_{PHL}	V_{CCB}=1.2V		3.3			13		ns
		V_{CCB}=1.5V±0.1V	0.7		6.3	0.1		12.5	ns
		V_{CCB}=1.8V±0.15V	0.5		6	0.1		12	ns
		V_{CCB}=2.5V±0.2V	0.4		5.7	0.1		12	ns
		V_{CCB}=3.3V±0.3V	0.3		5.6	0.1		12	ns
Propagation delay from input ($\overline{OE}$) to output (A)	t_{PZH} t_{PZL}	V_{CCB}=1.2V		4.9			13		ns
		V_{CCB}=1.5V±0.1V	1.4		9.6	0.1		12	ns
		V_{CCB}=1.8V±0.15V	1.1		9.5	0.1		11.5	ns
		V_{CCB}=2.5V±0.2V	0.7		9.4	0.1		11	ns
		V_{CCB}=3.3V±0.3V	0.4		9.4	0.1		11	ns
Propagation delay from input ($\overline{OE}$) to output (B)	t_{PZH} t_{PZL}	V_{CCB}=1.2V		4.5			13		ns
		V_{CCB}=1.5V±0.1V	1.4		9.6	0.1		12	ns
		V_{CCB}=1.8V±0.15V	1.1		7.7	0.1		10	ns
		V_{CCB}=2.5V±0.2V	0.9		5.8	0.1		8	ns
		V_{CCB}=3.3V±0.3V	0.9		5.6	0.1		8	ns
Propagation delay from input ($\overline{OE}$) to output (A)	t_{PHZ} t_{PLZ}	V_{CCB}=1.2V		5.6			13		ns
		V_{CCB}=1.5V±0.1V	1.8		10.2	0.1		13.5	ns
		V_{CCB}=1.8V±0.15V	1.5		10.2	0.1		13.5	ns
		V_{CCB}=2.5V±0.2V	1.3		10.2	0.1		13.5	ns
		V_{CCB}=3.3V±0.3V	1.6		10.2	0.1		13.5	ns
Propagation delay from input ($\overline{OE}$) to output (B)	t_{PHZ} t_{PLZ}	V_{CCB}=1.2V		5.2			13		ns
		V_{CCB}=1.5V±0.1V	1.9		10.3	0.1		12	ns
		V_{CCB}=1.8V±0.15V	1.9		9.1	0.1		11	ns
		V_{CCB}=2.5V±0.2V	1.4		7.4	0.1		9	ns
		V_{CCB}=3.3V±0.3V	1.2		7.6	0.1		9	ns

■ SWITCHING CHARACTERISTICS (Cont.)

(Over recommended operating free-air temperature range, V_{CCA}=1.8V±0.15V, 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} t_{PHL}	V_{CCB}=1.2V		2.9			12		ns
		V_{CCB}=1.5V±0.1V	0.1		6	0.1		12	ns
		V_{CCB}=1.8V±0.15V	0.1		4.9	0.1		11	ns
		V_{CCB}=2.5V±0.2V	0.1		3.9	0.1		10	ns
		V_{CCB}=3.3V±0.3V	0.3		3.9	0.1		10.	ns
Propagation delay from input (B) to output (A)	t_{PLH} t_{PHL}	V_{CCB}=1.2V		3.0			12		ns
		V_{CCB}=1.5V±0.1V	0.6		5.3	0.1		11.5	ns
		V_{CCB}=1.8V±0.15V	0.5		4.9	0.1		11	ns
		V_{CCB}=2.5V±0.2V	0.3		4.6	0.1		10.6	ns
		V_{CCB}=3.3V±0.3V	0.3		4.5	0.1		10.5	ns
Propagation delay from input ($\overline{OE}$) to output (A)	t_{PZH} t_{PZL}	V_{CCB}=1.2V		4.4			12		ns
		V_{CCB}=1.5V±0.1V	1.0		7.4	0.1		9.5	ns
		V_{CCB}=1.8V±0.15V	1.0		7.3	0.1		9.3	ns
		V_{CCB}=2.5V±0.2V	0.6		7.3	0.1		9.3	ns
		V_{CCB}=3.3V±0.3V	0.4		7.2	0.1		9	ns
Propagation delay from input ($\overline{OE}$) to output (B)	t_{PZH} t_{PZL}	V_{CCB}=1.2V		4.1			12		ns
		V_{CCB}=1.5V±0.1V	1.2		9.2	0.1		11.5	ns
		V_{CCB}=1.8V±0.15V	1.0		7.4	0.1		9.5	ns
		V_{CCB}=2.5V±0.2V	0.8		5.3	0.1		7.5	ns
		V_{CCB}=3.3V±0.3V	0.8		4.6	0.1		6.5	ns
Propagation delay from input ($\overline{OE}$) to output (A)	t_{PHZ} t_{PLZ}	V_{CCB}=1.2V		5.4			12		ns
		V_{CCB}=1.5V±0.1V	1.6		8.6	0.1		11.5	ns
		V_{CCB}=1.8V±0.15V	1.8		8.7	0.1		12	ns
		V_{CCB}=2.5V±0.2V	1.3		8.7	0.1		12	ns
		V_{CCB}=3.3V±0.3V	1.6		8.7	0.1		12	ns
Propagation delay from input ($\overline{OE}$) to output (B)	t_{PHZ} t_{PLZ}	V_{CCB}=1.2V		5.0			12		ns
		V_{CCB}=1.5V±0.1V	1.7		9.9	0.1		12	ns
		V_{CCB}=1.8V±0.15V	1.6		8.7	0.1		11	ns
		V_{CCB}=2.5V±0.2V	1.2		6.9	0.1		8.5	ns
		V_{CCB}=3.3V±0.3V	1.0		6.9	0.1		8.5	ns

■ SWITCHING CHARACTERISTICS (Cont.)

(Over recommended operating free-air temperature range, V_{CCA}=2.5V±0.2V, 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} t_{PHL}	V_{CCB}=1.2V		2.8			12		ns
		V_{CCB}=1.5V±0.1V	0.1		5.7	0.1		11.5	ns
		V_{CCB}=1.8V±0.15V	0.1		4.6	0.1		10.5	ns
		V_{CCB}=2.5V±0.2V	0.2		3.5	0.1		9.5	ns
		V_{CCB}=3.3V±0.3V	0.1		3.6	0.1		8.5.	ns
Propagation delay from input (B) to output (A)	t_{PLH} t_{PHL}	V_{CCB}=1.2V		2.7			12		ns
		V_{CCB}=1.5V±0.1V	0.6		4.2	0.1		10	ns
		V_{CCB}=1.8V±0.15V	0.4		3.9	0.1		9	ns
		V_{CCB}=2.5V±0.2V	0.2		3.4	0.1		8	ns
		V_{CCB}=3.3V±0.3V	0.2		3.3	0.1		7	ns
Propagation delay from input ($\overline{OE}$) to output (A)	t_{PZH} t_{PZL}	V_{CCB}=1.2V		4.0			12		ns
		V_{CCB}=1.5V±0.1V	0.7		6.5	0.1		8.5	ns
		V_{CCB}=1.8V±0.15V	0.7		5.2	0.1		7.5	ns
		V_{CCB}=2.5V±0.2V	0.6		4.8	0.1		5.5	ns
		V_{CCB}=3.3V±0.3V	0.4		4.8	0.1		5.5	ns
Propagation delay from input ($\overline{OE}$) to output (B)	t_{PZH} t_{PZL}	V_{CCB}=1.2V		3.8			12		ns
		V_{CCB}=1.5V±0.1V	0.9		8.8	0.1		10.5	ns
		V_{CCB}=1.8V±0.15V	0.8		7	0.1		9	ns
		V_{CCB}=2.5V±0.2V	0.6		4.8	0.1		7	ns
		V_{CCB}=3.3V±0.3V	0.6		4	0.1		5	ns
Propagation delay from input ($\overline{OE}$) to output (A)	t_{PHZ} t_{PLZ}	V_{CCB}=1.2V		4.7			12		ns
		V_{CCB}=1.5V±0.1V	1.0		8.4	0.1		11	ns
		V_{CCB}=1.8V±0.15V	1.0		8.4	0.1		11	ns
		V_{CCB}=2.5V±0.2V	1.0		6.2	0.1		8.5	ns
		V_{CCB}=3.3V±0.3V	1.0		6.6	0.1		9	ns
Propagation delay from input ($\overline{OE}$) to output (B)	t_{PHZ} t_{PLZ}	V_{CCB}=1.2V		4.5			12		ns
		V_{CCB}=1.5V±0.1V	1.5		9.4	0.1		10.5	ns
		V_{CCB}=1.8V±0.15V	1.3		8.2	0.1		9.5	ns
		V_{CCB}=2.5V±0.2V	1.1		6.2	0.1		7.5	ns
		V_{CCB}=3.3V±0.3V	0.9		5.2	0.1		7	ns

■ SWITCHING CHARACTERISTICS (Cont.)

(Over recommended operating free-air temperature range, V_{CCA}=3.3V±0.3V, 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} t_{PHL}	V_{CCB}=1.2V		2.9			15		ns
		V_{CCB}=1.5V±0.1V	0.1		5.6	0.1		11	ns
		V_{CCB}=1.8V±0.15V	0.1		4.5	0.1		10	ns
		V_{CCB}=2.5V±0.2V	0.1		3.3	0.1		9	ns
		V_{CCB}=3.3V±0.3V	0.1		2.9	0.1		8.5	ns
Propagation delay from input (B) to output (A)	t_{PLH} t_{PHL}	V_{CCB}=1.2V		2.6			15		ns
		V_{CCB}=1.5V±0.1V	0.6		4.2	0.1		9.5	ns
		V_{CCB}=1.8V±0.15V	0.4		3.4	0.1		8.5	ns
		V_{CCB}=2.5V±0.2V	0.2		3	0.1		7.5	ns
		V_{CCB}=3.3V±0.3V	0.1		2.8	0.1		6.5	ns
Propagation delay from input ($\overline{OE}$) to output (A)	t_{PZH} t_{PZL}	V_{CCB}=1.2V		3.8			15		ns
		V_{CCB}=1.5V±0.1V	0.6		8.7	0.1		10.5	ns
		V_{CCB}=1.8V±0.15V	0.6		5.2	0.1		8.5	ns
		V_{CCB}=2.5V±0.2V	0.6		3.8	0.1		4.5	ns
		V_{CCB}=3.3V±0.3V	0.4		3.8	0.1		4.5	ns
Propagation delay from input ($\overline{OE}$) to output (B)	t_{PZH} t_{PZL}	V_{CCB}=1.2V		3.7			15		ns
		V_{CCB}=1.5V±0.1V	0.8		8.7	0.1		10.5	ns
		V_{CCB}=1.8V±0.15V	0.6		6.8	0.1		8.5	ns
		V_{CCB}=2.5V±0.2V	0.5		4.7	0.1		7.0	ns
		V_{CCB}=3.3V±0.3V	0.5		3.8	0.1		4.5	ns
Propagation delay from input ($\overline{OE}$) to output (A)	t_{PHZ} t_{PLZ}	V_{CCB}=1.2V		4.8			15		ns
		V_{CCB}=1.5V±0.1V	0.7		9.3	0.1		11	ns
		V_{CCB}=1.8V±0.15V	0.7		8.3	0.1		10	ns
		V_{CCB}=2.5V±0.2V	0.7		5.6	0.1		8.5	ns
		V_{CCB}=3.3V±0.3V	0.7		6.6	0.1		9.5	ns
Propagation delay from input ($\overline{OE}$) to output (B)	t_{PHZ} t_{PLZ}	V_{CCB}=1.2V		5.3			15		ns
		V_{CCB}=1.5V±0.1V	1.4		9.3	0.1		11	ns
		V_{CCB}=1.8V±0.15V	1.2		8.1	0.1		9.5	ns
		V_{CCB}=2.5V±0.2V	1.0		6.4	0.1		8	ns
		V_{CCB}=3.3V±0.3V	0.8		6.2	0.1		7.5	ns

■ OPERATING CHARACTERISTIC (C_L=0, f=10MHz, t_r=t_f=1ns, T_A=25°C, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Dissipation Capacitance (A to B)	Outputs enabled	C_{PDA}	V_{CCA}=V_{CCB}=1.2V		1		pF
			V_{CCA}=V_{CCB}=1.5V		1		pF
			V_{CCA}=V_{CCB}=1.8V		1		pF
			V_{CCA}=V_{CCB}=2.5V		1.5		pF
			V_{CCA}=V_{CCB}=3.3V		2		pF
	Outputs disabled		V_{CCA}=V_{CCB}=1.2V		1		pF
			V_{CCA}=V_{CCB}=1.5V		1		pF
			V_{CCA}=V_{CCB}=1.8V		1		pF
			V_{CCA}=V_{CCB}=2.5V		1		pF
			V_{CCA}=V_{CCB}=3.3V		1		pF
Power Dissipation Capacitance (B to A)	Outputs enabled		V_{CCA}=V_{CCB}=1.2V		12		pF
			V_{CCA}=V_{CCB}=1.5V		12.5		pF
			V_{CCA}=V_{CCB}=1.8V		13		pF
			V_{CCA}=V_{CCB}=2.5V		14		pF
			V_{CCA}=V_{CCB}=3.3V		15		pF
	Outputs disabled		V_{CCA}=V_{CCB}=1.2V		1		pF
			V_{CCA}=V_{CCB}=1.5V		1		pF
			V_{CCA}=V_{CCB}=1.8V		1		pF
			V_{CCA}=V_{CCB}=2.5V		1		pF
			V_{CCA}=V_{CCB}=3.3V		1		pF
Power Dissipation Capacitance (A to B)	Outputs enabled	C_{PDB}	V_{CCA}=V_{CCB}=1.2V		12		pF
			V_{CCA}=V_{CCB}=1.5V		12.5		pF
			V_{CCA}=V_{CCB}=1.8V		13		pF
			V_{CCA}=V_{CCB}=2.5V		14		pF
			V_{CCA}=V_{CCB}=3.3V		15		pF
	Outputs disabled		V_{CCA}=V_{CCB}=1.2V		1		pF
			V_{CCA}=V_{CCB}=1.5V		1		pF
			V_{CCA}=V_{CCB}=1.8V		1		pF
			V_{CCA}=V_{CCB}=2.5V		1		pF
			V_{CCA}=V_{CCB}=3.3V		1		pF
Power Dissipation Capacitance (B to A)	Outputs enabled		V_{CCA}=V_{CCB}=1.2V		1		pF
			V_{CCA}=V_{CCB}=1.5V		1		pF
			V_{CCA}=V_{CCB}=1.8V		1		pF
			V_{CCA}=V_{CCB}=2.5V		1		pF
			V_{CCA}=V_{CCB}=3.3V		2		pF
	Outputs disabled		V_{CCA}=V_{CCB}=1.2V		1		pF
			V_{CCA}=V_{CCB}=1.5V		1		pF
			V_{CCA}=V_{CCB}=1.8V		1		pF
			V_{CCA}=V_{CCB}=2.5V		1		pF
			V_{CCA}=V_{CCB}=3.3V		1		pF

■ Note: Power dissipation capacitance per transceiver.

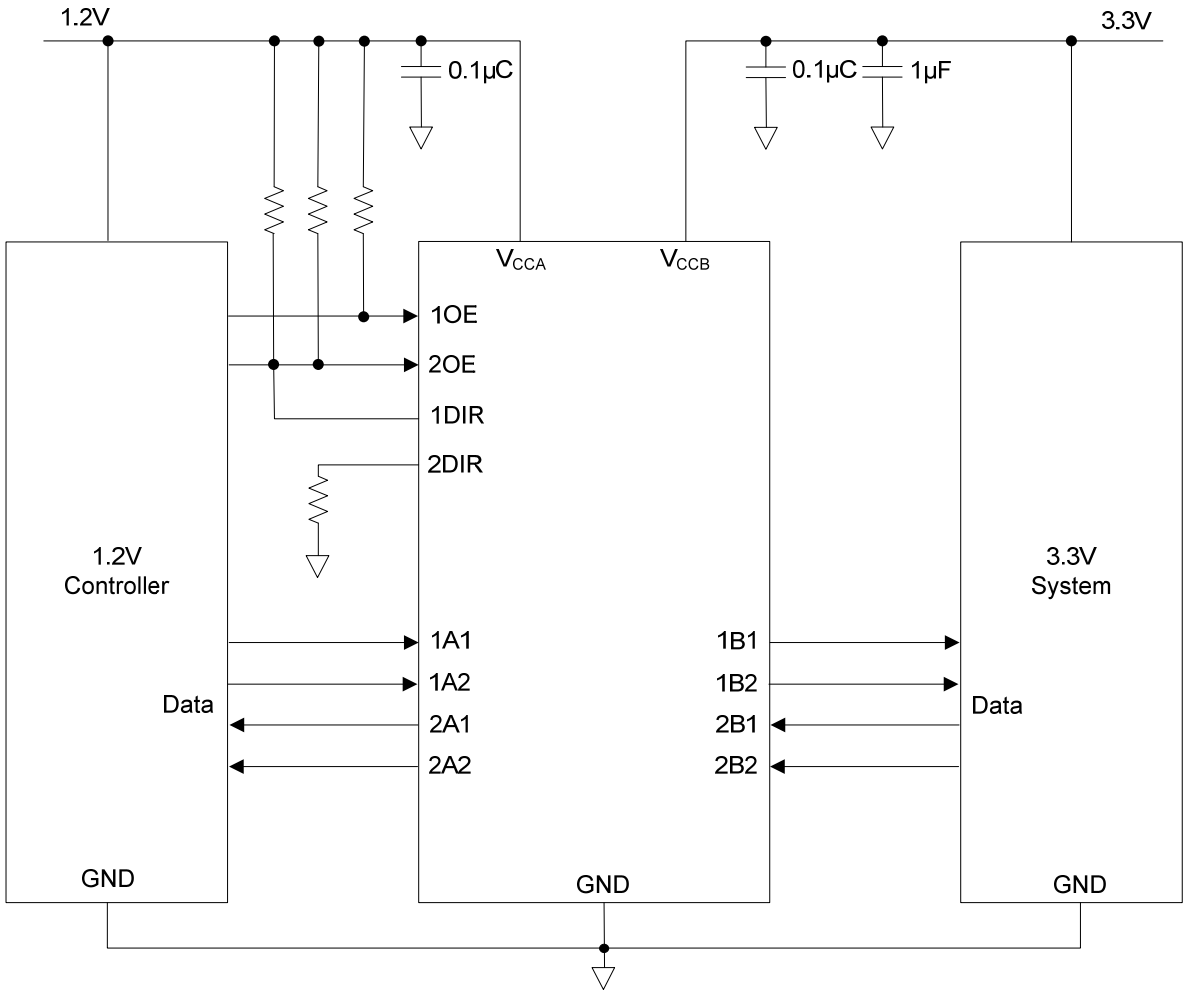
■ OPERATING CHARACTERISTICS (f=10MHz, T_A=25°C, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Capacitance	Control inputs	C_{IN}	V_{CCA}=V_{CCB}=3.3V V_{IN}=3.3V or GND		3.5		pF
Output Capacitance	A or B port	C_{IO}	V_{CCA}=V_{CCB}=3.3V V_{IN}=3.3V or GND		6		pF

■ APPLICATION INFORMATION

The **U74AVC4T245** device can be used in level-translation applications for interfacing devices or systems operating at different interface voltages with one another. The **U74AVC4T245** device is ideal for use in applications where a push-pull driver is connected to the data I/Os.

■ TYPICAL APPLICATION CIRCUIT

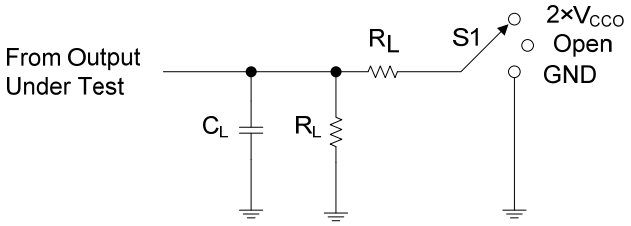


■ POWER SUPPLY RECOMMENDATIONS

The **U74AVC4T245** device uses two separate configurable power-supply rails, V_{CCA} and V_{CCB}. V_{CCA} accepts any supply voltage from 1.2V to 3.6V and V_{CCB} accepts any supply voltage from 1.2V to 3.6V. The A port and B port are designed to track V_{CCA} and V_{CCB} respectively allowing for low-voltage bidirectional translation between any of the 1.2V, 1.5V, 1.8V, 2.5V and 3.3V voltage nodes.

The output-enable ($\overline{OE}$) input circuit is designed so that it is supplied by V_{CCA} and when the $\overline{OE}$ input is high, all outputs are placed in the high-impedance state. To ensure the high-impedance state of the outputs during power up or power down, the $\overline{OE}$ input pin must be tied to V_{CCA} through a pullup resistor and must not be enabled until V_{CCA} and V_{CCB} are fully ramped and stable. The minimum value of the pullup resistor to V_{CCA} is determined by the current-sinking capability of the driver.

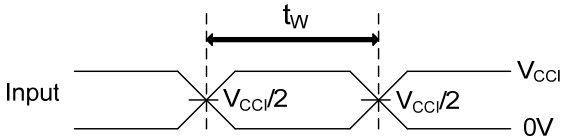
■ TEST CIRCUIT AND WAVEFORMS



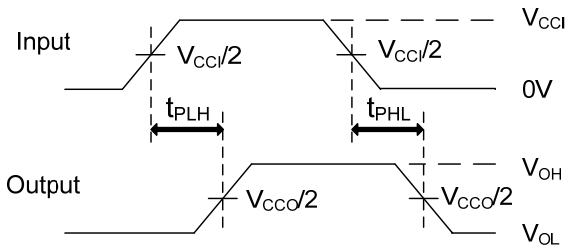
TEST	S1
t_{PD}	Open
t_{PLZ}/t_{PZL}	$2\times V_{CCO}$
t_{PHZ}/t_{PZH}	GND

LOAD CIRCUIT

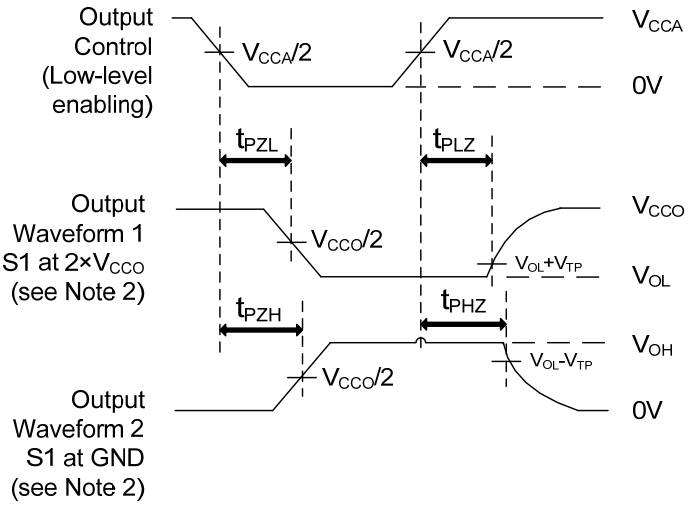
V_{CCO}	C_L	R_L	V_{TP}
1.2V	15pF	2kΩ	0.1V
1.5V±0.1V	15pF	2kΩ	0.1V
1.8V±0.15V	15pF	2kΩ	0.15V
2.5V±0.2V	15pF	2kΩ	0.15V
3.3V±0.3V	15pF	2kΩ	0.3V



PULSE DURATION



PROPAGATION DELAY TIMES



ENABLE AND DISABLE TIMES

Note: C_L includes probe and jig capacitance.