2-Bit Dual-Supply Bus Transceiver With Configurable Voltage Translation and 3-State Outputs

UM74AVC2T245QA ***QFN10 1.8×1.4***

1 Description

The UM74AVC2T245 is designed for asynchronous communication between two 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 of the direction-control inputs (DIR1 and DIR2). The output-enable ($\overline{OE}$) input can be used to disable the outputs so the buses are effectively isolated. The UM74AVC2T245 control pins (DIR1, DIR2 and $\overline{OE}$) are supplied by V_{CCA}.

The device is fully specified for partial-power-down applications using I_{OFF}. The I_{OFF} circuitry disables the outputs, thus preventing damaging current backflow through the device when it is powered down. The V_{CC} isolation feature is designed so that if either V_{CC} input supply is below 100mV, all level shifter outputs are disabled and placed into a high impedance state. To put the device into the high-impedance state during power up or power down, tie $\overline{OE}$ to V_{CC} through a pull-up resistor; the current-sinking capability of the driver determines the minimum value of the resistor.

The UM74AVC2T245 is available in QFN10 1.8×1.4 package.

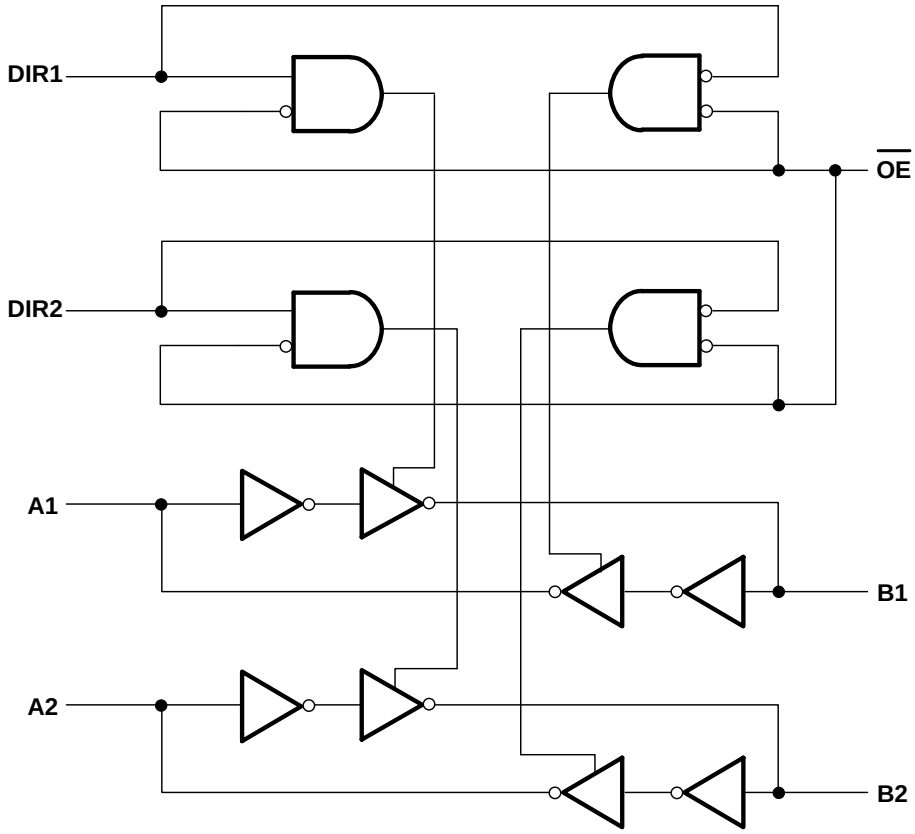
2 Applications

- Enterprise and communications
- Industrial
- Personal electronics
- Wireless infrastructure
- Building automation
- Point of sale

3 Features

- Control inputs V_{IH}/V_{IL} levels are referenced to V_{CCA} voltage
- V_{CC} isolation feature – if either V_{CC} input is at GND, all are in the high-impedance state
- Fully configurable dual-rail design allows each port to operate over the full 1V to 3.6V power supply range
- I_{OFF} supports partial power-down mode operation
- Up to 400Mbps support when translating fr om 1.8V to 3.3V
- Latch-up performance exceeds 200 mA per JESD 78
- ESD protection on A and B ports
  - ±8kV Human body model
  - ±2kV Charged-device model

4 Logic Diagram

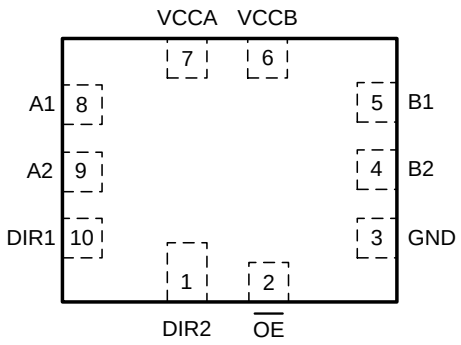


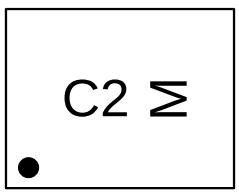
5 Ordering Information

Part Number	Mark Code	Package Type	Shipping Qty
UM74AVC2T245QA	C2	QFN10 1.8×1.4	3000pcs/7Inch Tape & Reel

6 Pin Configuration and Function

(Top View)





XX: Week Code
UM74AVC2T245QA
QFN10 1.8×1.4

6 Pin Configuration and Function (continued)

Table 6-1. Pin Functions

Pin No.	Pin Name	Function
1	DIR2	Direction-control input for A2/B2 ports. Referenced to V_{CCA}.
2	$\overline{OE}$	Output Enable. Pull to GND to enable all outputs. Pull to V_{CCA} to place all outputs in high-impedance mode. Referenced to V_{CCA}.
3	GND	Ground.
4	B2	Input/output B2. Output or input depending on state of DIR2. Referenced to $V_{CCB.}$
5	B1	Input/output B1. Output or input depending on state of DIR1. Referenced to $V_{CCB.}$
6	VCCB	B-port supply voltage. $1V \leq V_{CCB} \leq 3.6$ V.
7	VCCA	A-port supply voltage. $1V \leq V_{CCA} \leq 3.6$ V.
8	A1	Input/output A1. Output or input depending on state of DIR1. Referenced to $V_{CCA.}$
9	A2	Input/output B1. Output or input depending on state of DIR2. Referenced to $V_{CCA.}$
10	DIR1	Direction-control input for A1/B1 ports. Referenced to V_{CCA}.

7 Specifications

7.1 Absolute Maximum Ratings (Note 1)

Symbol	Parameter		Value	Unit
V_{CCA}	Supply Voltage		-0.5 to +4.6	V
V_{CCB}	Supply Voltage		-0.5 to +4.6	V
V_I	Input Voltage (Note 2)	A ports	-0.5 to +4.6	V
		B ports	-0.5 to +4.6	
		Control inputs	-0.5 to +4.6	
V_O	Voltage applied to any output in the high-impedance or Power-Off State (Note 2)	A ports	-0.5 to +4.6	V
		B ports	-0.5 to +4.6	
V_O	Voltage Range Applied to Any Output in the High or Low State (Note 2, 3)	A ports	-0.5 to (V_{CCA}+0.5)	V
		B ports	-0.5 to (V_{CCB}+0.5)	
V_{ESD}	Human-body model (HBM), per ANSI/ESDA/ JEDEC JS-001	Ax and Bx pins	±8	kV
		Other pins	±4	kV
	Charged-device model (CDM), per ANSI/ESDA/JEDEC JS-002	All pins	±2	kV
I_{IK}	Input clamp current	V_I<0	-50	mA
I_{OK}	Output clamp current	V_O<0	-50	mA
I_O	Continuous Output Current		±50	mA
	Continuous Current through V_{CCA}, V_{CCB}, or GND		±100	mA
T_J	Operating Junction Temperature		-40 to +150	℃
T_{STG}	Storage Temperature		-65 to +150	℃

Note 1: Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
Note 2: The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
Note 3: The output positive-voltage rating may be exceeded up to 4.6 V maximum if the output current rating is observed.

7.2 Recommended Operating Conditions (Note 1, 2, 3)

Over recommended operating free-air temperature range (unless otherwise noted).

Symbol	Parameter		V_{CCI}	V_{CCO}	Min	Max	Unit
V_{CCA}	Supply voltage				1	3.6	V
V_{CCB}					1	3.6	
V_{IH}	High-level input voltage	Data inputs	1V		V_{CCI}×0.7		V
			1.1 V to 1.95 V		V_{CCI}×0.65		
			1.95 V to 2.7 V		1.6		
			2. 7V to 3.6 V		2		
V_{IL}	Low-level input voltage	Data inputs	1V			V_{CCI}×0.3	V
			1.1 V to 1.95 V			V_{CCI}×0.35	
			1.95 V to 2.7 V			0.7	
			2. 7V to 3.6 V			0.8	
V_{IH}	High-level input voltage	Control inputs (DIR, $\overline{OE}$) referenced to V_{CCA}	1V		V_{CCI}×0.7		V
			1.1 V to 1.95 V		V_{CCI}×0.65		
			1.95 V to 2.7 V		1.6		
			2. 7V to 3.6 V		2		
V_{IL}	Low-level input voltage	Control inputs (DIR, $\overline{OE}$) referenced to V_{CCA}	1V			V_{CCI}×0.3	V
			1.1 V to 1.95 V			V_{CCI}×0.35	
			1.95 V to 2.7 V			0.7	
			2. 7V to 3.6 V			0.8	
V_I	Input voltage				0	3.6	V
V_O	Output voltage	Active state			0	V_{CCO}	V
		Three-State			0	3.6	
I_{OH}	High-level output current			1.1V to 1.3 V		-3	mA
				1.4 V to 1.6 V		-6	
				1.65 V to 1.95 V		-8	
				2.3 V to 2.7 V		-9	
				3 V to 3.6 V		-12	
I_{OL}	Low-level output current			1.1V to 1.3 V		3	mA
				1.4 V to 1.6 V		6	
				1.65 V to 1.95 V		8	
				2.3 V to 2.7 V		9	
				3 V to 3.6 V		12	
Δt/ΔV	Input transition rise or fall rate					10	ns/V
T_A	Operating free-air temperature				-40	125	℃

Note 1: V_{CCI} is the V_{CC} associated with the input port.
Note 2: V_{CCO} is the V_{CC} associated with the output port.
Note 3: All unused or driven (floating) data inputs (I/Os) of the device must be held at logic High or Low (preferably V_{CCI} or GND) to ensure proper device operation and minimize power.

7.3 Package Thermal Impedance

Symbol	Parameter		Value	Unit
$R_{\theta JA}$	Junction-to-ambient thermal resistance	QFN10 1.8×1.4	225.8	℃/W
$R_{\theta JC(TOP)}$	Junction-to-case (top) thermal resistance	QFN10 1.8×1.4	95.0	℃/W
$R_{\theta JB}$	Junction-to-board thermal resistance	QFN10 1.8×1.4	137.9	℃/W

7.4 Electrical Characteristics (Note 1, 2)

Over recommended operating free-air temperature range (unless otherwise noted).

Parameter		Test Conditions		V_{CCA}	V_{CCB}	Min	Typ	Max	Unit
V_{OH}		I_{OH}=-100μA	$V_I=V_{IH}$	1V to 3.6V	1V to 3.6V	V_{CCO}-0.2			V
		I_{OH}=-3mA		1.1V	1.1V	0.85	0.98		
		I_{OH}=-6mA		1.4V	1.4V	1			
		I_{OH}=-8mA		1.65V	1.65V	1.2			
		I_{OH}=-9mA		2.3V	2.3V	1.8			
		I_{OH}=-12mA		3V	3V	2.4			
V_{OL}		I_{OL}=100μA	$V_I=V_{IL}$	1V to 3.6V	1V to 3.6V			0.2	V
		I_{OL}=3mA		1.1V	1.1V		0.1	0.25	
		I_{OL}=6mA		1.4V	1.4V			0.35	
		I_{OL}=8mA		1.65V	1.65V			0.45	
		I_{OL}=9mA		2.3V	2.3V			0.55	
		I_{OL}=12mA		3V	3V			0.7	
I_I	Control inputs	V_I = V_{CCA} or GND		1V to 3.6V	1V to 3.6V	-1	0.1	1	μA
I_{OZ}	A or B Port	V_O = V_{CCO} or GND, V_I = V_{CCI} or GND, $\overline{OE}$= V_{IH}		3.6V	3.6V	-5	0.1	5	μA
I_{OFF}	A or B Port	V_I or V_O = 0 to 3.6V		0V	0V to 3.6V	-5	0.1	5	μA
				0V to 3.6V	0V	-5	0.1	5	
I_{CCA}		V_I=V_{CCI} or GND I_O=0		1V to 3.6V	1V to 3.6V			8	μA
				0V	3.6V	-2			
				3.6V	0V			8	
I_{CCB}		V_I=V_{CCI} or GND I_O=0		1V to 3.6V	1V to 3.6V			8	μA
				0V	3.6V			8	
				3.6V	0V	-2			
I_{CCA}+I_{CCB}		V_I=V_{CCI} or GND I_O=0		1V to 3.6V	1V to 3.6V			16	μA
C_I	Control inputs	V_I = 3.3V or GND		3.3V	3.3V			7.5	pF
C_{IO}	A or B Port	V_O = 3.3V or GND		3.3V	3.3V			8.5	pF

Note 1: V_{CCI} is the V_{CC} associated with the input port.
Note 2: V_{CCO} is the V_{CC} associated with the output port.

7.5 Switching Characteristics

Over recommended operating free-air temperature range, V_{CCA}= 1V.

Parameter	From (Input)	To (Output)	V_{CCB}	Min	Typ	Max	Unit
t_{PLH}, t_{PHL}	A	B	V_{CCB}=1V	0.5		30	ns
			V_{CCB}=1.2V ±0.1V	0.5		20	
			V_{CCB}=1.5V ±0.1V	0.5		17	
			V_{CCB}=1.8V ±0.15V	0.5		15	
			V_{CCB}=2.5V ±0.2V	0.5		15	
			V_{CCB}=3.3V ±0.3V	0.5		17	
t_{PLH}, t_{PHL}	B	A	V_{CCB}=1V	0.5		30	ns
			V_{CCB}=1.2V ±0.1V	0.5		20	
			V_{CCB}=1.5V ±0.1V	0.5		17	
			V_{CCB}=1.8V ±0.15V	0.5		15	
			V_{CCB}=2.5V ±0.2V	0.5		17	
			V_{CCB}=3.3V ±0.3V	0.5		17	
t_{PZH}, t_{PZL}	$\overline{OE}$	A	V_{CCB}=1V	0.5		40	ns
			V_{CCB}=1.2V ±0.1V	0.5		35	
			V_{CCB}=1.5V ±0.1V	0.5		35	
			V_{CCB}=1.8V ±0.15V	0.5		35	
			V_{CCB}=2.5V ±0.2V	0.5		35	
			V_{CCB}=3.3V ±0.3V	0.5		35	
t_{PZH}, t_{PZL}	$\overline{OE}$	B	V_{CCB}=1V	0.5		40	ns
			V_{CCB}=1.2V ±0.1V	0.5		35	
			V_{CCB}=1.5V ±0.1V	0.5		35	
			V_{CCB}=1.8V ±0.15V	0.5		35	
			V_{CCB}=2.5V ±0.2V	0.5		35	
			V_{CCB}=3.3V ±0.3V	0.5		35	
t_{PHZ}, t_{PLZ}	$\overline{OE}$	A	V_{CCB}=1V	0.5		35	ns
			V_{CCB}=1.2V ±0.1V	0.5		35	
			V_{CCB}=1.5V ±0.1V	0.5		35	
			V_{CCB}=1.8V ±0.15V	0.5		35	
			V_{CCB}=2.5V ±0.2V	0.5		35	
			V_{CCB}=3.3V ±0.3V	0.5		35	
t_{PHZ}, t_{PLZ}	$\overline{OE}$	B	V_{CCB}=1V	0.5		40	ns
			V_{CCB}=1.2V ±0.1V	0.5		35	
			V_{CCB}=1.5V ±0.1V	0.5		35	
			V_{CCB}=1.8V ±0.15V	0.5		35	
			V_{CCB}=2.5V ±0.2V	0.5		35	
			V_{CCB}=3.3V ±0.3V	0.5		35	

7.5 Switching Characteristics (continued)

Over recommended operating free-air temperature range, V_{CCA}= 1.2V ± 0.1V.

Parameter	From (Input)	To (Output)	V_{CCB}	Min	Typ	Max	Unit
t_{PLH}, t_{PHL}	A	B	V_{CCB}=1V	0.5		23	ns
			V_{CCB}=1.2V ±0.1V	0.5		15	
			V_{CCB}=1.5V ±0.1V	0.5		10	
			V_{CCB}=1.8V ±0.15V	0.5		9	
			V_{CCB}=2.5V ±0.2V	0.5		7	
			V_{CCB}=3.3V ±0.3V	0.5		7.5	
t_{PLH}, t_{PHL}	B	A	V_{CCB}=1V	0.5		23	ns
			V_{CCB}=1.2V ±0.1V	0.5		15	
			V_{CCB}=1.5V ±0.1V	0.5		13	
			V_{CCB}=1.8V ±0.15V	0.5		11	
			V_{CCB}=2.5V ±0.2V	0.5		8	
			V_{CCB}=3.3V ±0.3V	0.5		7	
t_{PZH}, t_{PZL}	$\overline{OE}$	A	V_{CCB}=1V	0.5		30	ns
			V_{CCB}=1.2V ±0.1V	0.5		30	
			V_{CCB}=1.5V ±0.1V	0.5		30	
			V_{CCB}=1.8V ±0.15V	0.5		30	
			V_{CCB}=2.5V ±0.2V	0.5		30	
			V_{CCB}=3.3V ±0.3V	0.5		30	
t_{PZH}, t_{PZL}	$\overline{OE}$	B	V_{CCB}=1V	0.5		30	ns
			V_{CCB}=1.2V ±0.1V	0.5		25	
			V_{CCB}=1.5V ±0.1V	0.5		25	
			V_{CCB}=1.8V ±0.15V	0.5		25	
			V_{CCB}=2.5V ±0.2V	0.5		25	
			V_{CCB}=3.3V ±0.3V	0.5		25	
t_{PHZ}, t_{PLZ}	$\overline{OE}$	A	V_{CCB}=1V	0.5		35	ns
			V_{CCB}=1.2V ±0.1V	0.5		30	
			V_{CCB}=1.5V ±0.1V	0.5		30	
			V_{CCB}=1.8V ±0.15V	0.5		30	
			V_{CCB}=2.5V ±0.2V	0.5		30	
			V_{CCB}=3.3V ±0.3V	0.5		30	
t_{PHZ}, t_{PLZ}	$\overline{OE}$	B	V_{CCB}=1V	0.5		35	ns
			V_{CCB}=1.2V ±0.1V	0.5		30	
			V_{CCB}=1.5V ±0.1V	0.5		30	
			V_{CCB}=1.8V ±0.15V	0.5		30	
			V_{CCB}=2.5V ±0.2V	0.5		30	
			V_{CCB}=3.3V ±0.3V	0.5		30	

7.5 Switching Characteristics (continued)

Over recommended operating free-air temperature range, V_{CCA}= 1.5V ± 0.1V.

Parameter	From (Input)	To (Output)	V_{CCB}	Min	Typ	Max	Unit
t_{PLH}, t_{PHL}	A	B	V_{CCB}=1V	0.5		18	ns
			V_{CCB}=1.2V ±0.1V	0.5		13	
			V_{CCB}=1.5V ±0.1V	0.5		9	
			V_{CCB}=1.8V ±0.15V	0.5		7	
			V_{CCB}=2.5V ±0.2V	0.5		6	
			V_{CCB}=3.3V ±0.3V	0.5		5.5	
t_{PLH}, t_{PHL}	B	A	V_{CCB}=1V	0.5		17	ns
			V_{CCB}=1.2V ±0.1V	0.5		11	
			V_{CCB}=1.5V ±0.1V	0.5		9	
			V_{CCB}=1.8V ±0.15V	0.5		7.5	
			V_{CCB}=2.5V ±0.2V	0.5		6	
			V_{CCB}=3.3V ±0.3V	0.5		5	
t_{PZH}, t_{PZL}	$\overline{OE}$	A	V_{CCB}=1V	0.5		25	ns
			V_{CCB}=1.2V ±0.1V	0.5		23	
			V_{CCB}=1.5V ±0.1V	0.5		23	
			V_{CCB}=1.8V ±0.15V	0.5		23	
			V_{CCB}=2.5V ±0.2V	0.5		23	
			V_{CCB}=3.3V ±0.3V	0.5		23	
t_{PZH}, t_{PZL}	$\overline{OE}$	B	V_{CCB}=1V	0.5		27	ns
			V_{CCB}=1.2V ±0.1V	0.5		24	
			V_{CCB}=1.5V ±0.1V	0.5		20	
			V_{CCB}=1.8V ±0.15V	0.5		20	
			V_{CCB}=2.5V ±0.2V	0.5		20	
			V_{CCB}=3.3V ±0.3V	0.5		20	
t_{PHZ}, t_{PLZ}	$\overline{OE}$	A	V_{CCB}=1V	0.5		34	ns
			V_{CCB}=1.2V ±0.1V	0.5		34	
			V_{CCB}=1.5V ±0.1V	0.5		34	
			V_{CCB}=1.8V ±0.15V	0.5		34	
			V_{CCB}=2.5V ±0.2V	0.5		34	
			V_{CCB}=3.3V ±0.3V	0.5		34	
t_{PHZ}, t_{PLZ}	$\overline{OE}$	B	V_{CCB}=1V	0.5		45	ns
			V_{CCB}=1.2V ±0.1V	0.5		40	
			V_{CCB}=1.5V ±0.1V	0.5		35	
			V_{CCB}=1.8V ±0.15V	0.5		31	
			V_{CCB}=2.5V ±0.2V	0.5		28	
			V_{CCB}=3.3V ±0.3V	0.5		25	

7.5 Switching Characteristics (continued)

Over recommended operating free-air temperature range, V_{CCA}= 1.8V ± 0.15V.

Parameter	From (Input)	To (Output)	V_{CCB}	Min	Typ	Max	Unit
t_{PLH}, t_{PHL}	A	B	V_{CCB}=1V	0.5		16	ns
			V_{CCB}=1.2V ±0.1V	0.5		11	
			V_{CCB}=1.5V ±0.1V	0.5		8	
			V_{CCB}=1.8V ±0.15V	0.5		7	
			V_{CCB}=2.5V ±0.2V	0.5		6	
			V_{CCB}=3.3V ±0.3V	0.5		5	
t_{PLH}, t_{PHL}	B	A	V_{CCB}=1V	0.5		16	ns
			V_{CCB}=1.2V ±0.1V	0.5		10	
			V_{CCB}=1.5V ±0.1V	0.5		7	
			V_{CCB}=1.8V ±0.15V	0.5		7	
			V_{CCB}=2.5V ±0.2V	0.5		5	
			V_{CCB}=3.3V ±0.3V	0.5		4	
t_{PZH}, t_{PZL}	$\overline{OE}$	A	V_{CCB}=1V	0.5		23	ns
			V_{CCB}=1.2V ±0.1V	0.5		20	
			V_{CCB}=1.5V ±0.1V	0.5		17	
			V_{CCB}=1.8V ±0.15V	0.5		17	
			V_{CCB}=2.5V ±0.2V	0.5		17	
			V_{CCB}=3.3V ±0.3V	0.5		17	
t_{PZH}, t_{PZL}	$\overline{OE}$	B	V_{CCB}=1V	0.5		23	ns
			V_{CCB}=1.2V ±0.1V	0.5		23	
			V_{CCB}=1.5V ±0.1V	0.5		17	
			V_{CCB}=1.8V ±0.15V	0.5		15	
			V_{CCB}=2.5V ±0.2V	0.5		15	
			V_{CCB}=3.3V ±0.3V	0.5		15	
t_{PHZ}, t_{PLZ}	$\overline{OE}$	A	V_{CCB}=1V	0.5		30	ns
			V_{CCB}=1.2V ±0.1V	0.5		30	
			V_{CCB}=1.5V ±0.1V	0.5		30	
			V_{CCB}=1.8V ±0.15V	0.5		30	
			V_{CCB}=2.5V ±0.2V	0.5		30	
			V_{CCB}=3.3V ±0.3V	0.5		30	
t_{PHZ}, t_{PLZ}	$\overline{OE}$	B	V_{CCB}=1V	0.5		30	ns
			V_{CCB}=1.2V ±0.1V	0.5		30	
			V_{CCB}=1.5V ±0.1V	0.5		30	
			V_{CCB}=1.8V ±0.15V	0.5		30	
			V_{CCB}=2.5V ±0.2V	0.5		30	
			V_{CCB}=3.3V ±0.3V	0.5		30	

7.5 Switching Characteristics (continued)

Over recommended operating free-air temperature range, V_{CCA}= 2.5V ± 0.2V.

Parameter	From (Input)	To (Output)	V_{CCB}	Min	Typ	Max	Unit
t_{PLH}, t_{PHL}	A	B	V_{CCB}=1V	0.5		15	ns
			V_{CCB}=1.2V ±0.1V	0.5		8	
			V_{CCB}=1.5V ±0.1V	0.5		6	
			V_{CCB}=1.8V ±0.15V	0.5		5.5	
			V_{CCB}=2.5V ±0.2V	0.5		5	
			V_{CCB}=3.3V ±0.3V	0.5		4	
t_{PLH}, t_{PHL}	B	A	V_{CCB}=1V	0.5		15	ns
			V_{CCB}=1.2V ±0.1V	0.5		7.5	
			V_{CCB}=1.5V ±0.1V	0.5		6	
			V_{CCB}=1.8V ±0.15V	0.5		5.5	
			V_{CCB}=2.5V ±0.2V	0.5		5	
			V_{CCB}=3.3V ±0.3V	0.5		4	
t_{PZH}, t_{PZL}	$\overline{OE}$	A	V_{CCB}=1V	0.5		25	ns
			V_{CCB}=1.2V ±0.1V	0.5		20	
			V_{CCB}=1.5V ±0.1V	0.5		15	
			V_{CCB}=1.8V ±0.15V	0.5		15	
			V_{CCB}=2.5V ±0.2V	0.5		15	
			V_{CCB}=3.3V ±0.3V	0.5		15	
t_{PZH}, t_{PZL}	$\overline{OE}$	B	V_{CCB}=1V	0.5		21	ns
			V_{CCB}=1.2V ±0.1V	0.5		18	
			V_{CCB}=1.5V ±0.1V	0.5		15	
			V_{CCB}=1.8V ±0.15V	0.5		15	
			V_{CCB}=2.5V ±0.2V	0.5		15	
			V_{CCB}=3.3V ±0.3V	0.5		15	
t_{PHZ}, t_{PLZ}	$\overline{OE}$	A	V_{CCB}=1V	0.5		25	ns
			V_{CCB}=1.2V ±0.1V	0.5		25	
			V_{CCB}=1.5V ±0.1V	0.5		25	
			V_{CCB}=1.8V ±0.15V	0.5		25	
			V_{CCB}=2.5V ±0.2V	0.5		25	
			V_{CCB}=3.3V ±0.3V	0.5		25	
t_{PHZ}, t_{PLZ}	$\overline{OE}$	B	V_{CCB}=1V	0.5		35	ns
			V_{CCB}=1.2V ±0.1V	0.5		32	
			V_{CCB}=1.5V ±0.1V	0.5		30	
			V_{CCB}=1.8V ±0.15V	0.5		28	
			V_{CCB}=2.5V ±0.2V	0.5		25	
			V_{CCB}=3.3V ±0.3V	0.5		23	

7.5 Switching Characteristics (continued)

Over recommended operating free-air temperature range, V_{CCA}= 3.3V ± 0.3V.

Parameter	From (Input)	To (Output)	V_{CCB}	Min	Typ	Max	Unit
t_{PLH}, t_{PHL}	A	B	V_{CCB}=1V	0.5		16	ns
			V_{CCB}=1.2V ±0.1V	0.5		7	
			V_{CCB}=1.5V ±0.1V	0.5		5	
			V_{CCB}=1.8V ±0.15V	0.5		4	
			V_{CCB}=2.5V ±0.2V	0.5		4	
			V_{CCB}=3.3V ±0.3V	0.5		4	
t_{PLH}, t_{PHL}	B	A	V_{CCB}=1V	0.5		16	ns
			V_{CCB}=1.2V ±0.1V	0.5		7	
			V_{CCB}=1.5V ±0.1V	0.5		6	
			V_{CCB}=1.8V ±0.15V	0.5		5	
			V_{CCB}=2.5V ±0.2V	0.5		4	
			V_{CCB}=3.3V ±0.3V	0.5		4	
t_{PZH}, t_{PZL}	$\overline{OE}$	A	V_{CCB}=1V	0.5		25	ns
			V_{CCB}=1.2V ±0.1V	0.5		20	
			V_{CCB}=1.5V ±0.1V	0.5		15	
			V_{CCB}=1.8V ±0.15V	0.5		15	
			V_{CCB}=2.5V ±0.2V	0.5		15	
			V_{CCB}=3.3V ±0.3V	0.5		15	
t_{PZH}, t_{PZL}	$\overline{OE}$	B	V_{CCB}=1V	0.5		25	ns
			V_{CCB}=1.2V ±0.1V	0.5		20	
			V_{CCB}=1.5V ±0.1V	0.5		15	
			V_{CCB}=1.8V ±0.15V	0.5		15	
			V_{CCB}=2.5V ±0.2V	0.5		15	
			V_{CCB}=3.3V ±0.3V	0.5		15	
t_{PHZ}, t_{PLZ}	$\overline{OE}$	A	V_{CCB}=1V	0.5		22	ns
			V_{CCB}=1.2V ±0.1V	0.5		22	
			V_{CCB}=1.5V ±0.1V	0.5		22	
			V_{CCB}=1.8V ±0.15V	0.5		22	
			V_{CCB}=2.5V ±0.2V	0.5		22	
			V_{CCB}=3.3V ±0.3V	0.5		22	
t_{PHZ}, t_{PLZ}	$\overline{OE}$	B	V_{CCB}=1V	0.5		36	ns
			V_{CCB}=1.2V ±0.1V	0.5		33	
			V_{CCB}=1.5V ±0.1V	0.5		30	
			V_{CCB}=1.8V ±0.15V	0.5		27	
			V_{CCB}=2.5V ±0.2V	0.5		25	
			V_{CCB}=3.3V ±0.3V	0.5		23	

7.6 Operating Characteristics (Note 1)

T_A=25°C.

Parameter			Test Conditions	V_{CCA} = V_{CCB} = 1V	V_{CCA} = V_{CCB} = 1.2V	V_{CCA} = V_{CCB} = 1.5V	V_{CCA} = V_{CCB} = 1.8V	V_{CCA} = V_{CCB} = 2.5V	V_{CCA} = V_{CCB} = 3.3V	Unit
				Typ	Typ	Typ	Typ	Typ	Typ	
C_{PDA}	A to B	Outputs enabled	C_L = 0, f=10MHz, t_R = t_F = 1ns	2	2.2	2.3	2.5	2.7	3.5	pF
		Outputs disabled		1	1	1	1	1	1	
	B to A	Outputs enabled		12	12	12	12	13	13.5	
		Outputs disabled		1	1	1	1	1	1	
C_{PDB}	A to B	Outputs enabled		12	12	12	12	13	13.5	
		Outputs disabled		1	1	1	1	1	1	
	B to A	Outputs enabled		2	2.2	2.3	2.5	2.7	3.5	
		Outputs disabled		1	1	1	1	1	1	

Note 1: C_{PDA} and C_{PDB} are power dissipation capacitance per transceiver.

8 Parameter Measurement Information

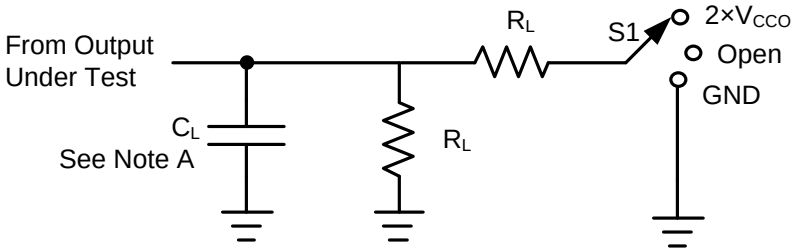


Figure 8-1. Load Circuit

Parameter	V_{CCO}	C_L	R_L	S1	V_{TP}
t_{PD}	1V to 3.6V	15pF	2kΩ	Open	N/A
t_{PLZ}, t_{PZL}	1V to 1.6V	15pF	2kΩ	2 ×V_{CCO}	0.1V
	1.65V to 2.7V	15pF	2kΩ	2 ×V_{CCO}	0.15V
	3V to 3.6V	15pF	2kΩ	2 ×V_{CCO}	0.3V
t_{PHZ}, t_{PZH}	1V to 1.6V	15pF	2kΩ	GND	0.1V
	1.65V to 2.7V	15pF	2kΩ	GND	0.15V
	3V to 3.6V	15pF	2kΩ	GND	0.3V

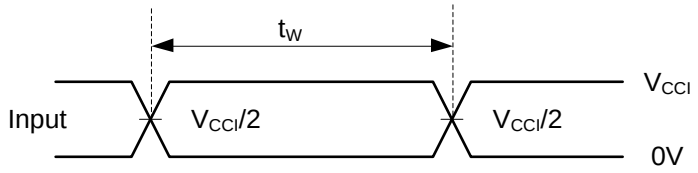


Figure 8-2. Voltage Waveforms Pulse Duration

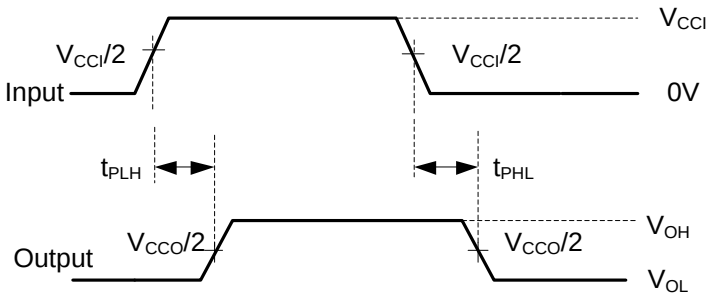


Figure 8-3. Voltage Waveforms Propagation Delay Times

8 Parameter Measurement Information (continued)

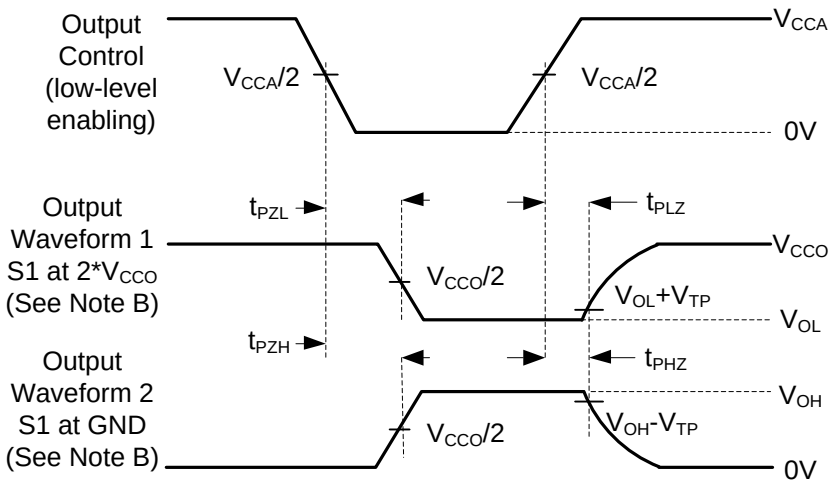


Figure 8-4. Voltage Waveforms Enable and Disable Times

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.
C. All input pulses are supplied by generators having the following characteristics: PRR≤10 MHz, Z_O = 50Ω, dv/dt ≥ 1V/ns.
D. The outputs are measured one at a time, with one transition per measurement.
E. t_{PLZ} and t_{PHZ} are the same as t_{DIS}.
F. t_{PZL} and t_{PZH} are the same as t_{EN}.
G. t_{PLH} and t_{PHL} are the same as t_{PD}.
H. V_{CCI} is the V_{CC} associated with the input port.
I. V_{CCO} is the V_{CC} associated with the output port.

9 Detailed Description

9.1 Overview

The UM74AVC2T245 is a 2-bit, dual-supply non-inverting transceiver with bidirectional voltage level translation. The I/O pins Ax and the control pins (DIR1, DIR2 and $\overline{OE}$) are supported by V_{CCA}, and the I/O pins Bx are supported by V_{CCB}. The A port and the B port are able to accept I/O voltages ranging from 1 V to 3.6 V.

9.2 Functional Block Diagram

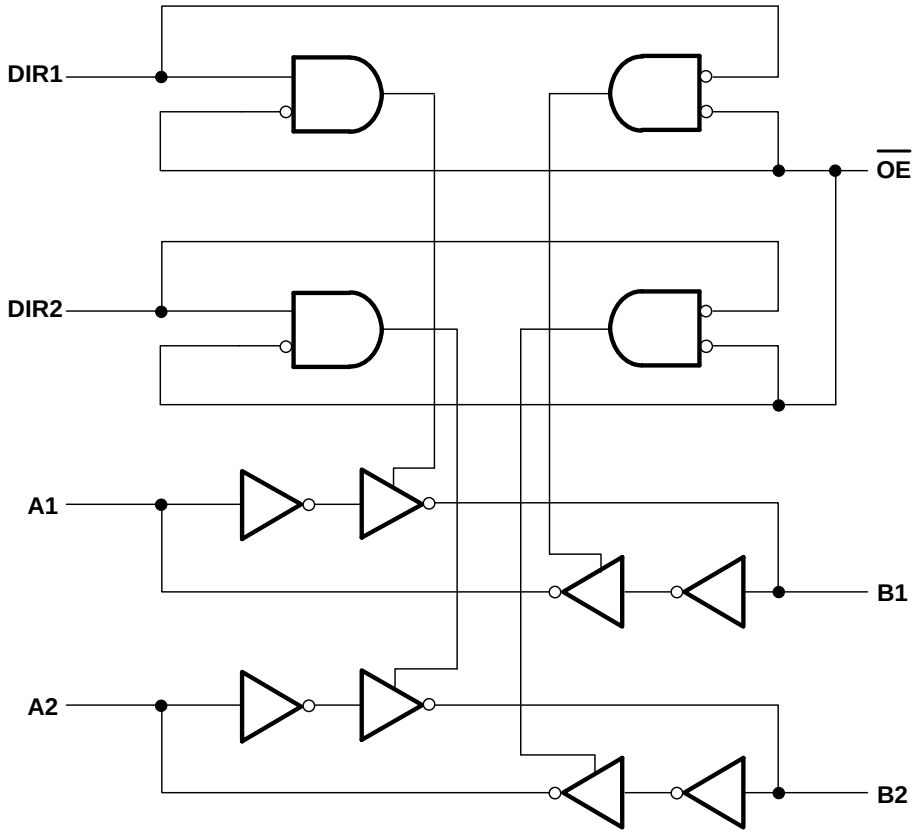


Figure 9-1. Logic Diagram

10 Feature Description

10.1 Fully Configurable Dual-Rail Design

The fully configurable dual-rail design allows each port to operate over the full 1 V to 3.6 V power-supply range. Both V_{CCA} and V_{CCB} can be supplied at any voltage between 1 V and 3.6 V making the device an excellent choice for translating between any of the low voltage nodes (1 V, 1.2 V, 1.8 V, 2.5 V and 3.3 V).

10.2 I_{OFF} Supports Partial-Power-Down Mode Operation

I_{OFF} prevents backflow current by disabling I/O output circuits when device is in partial power-down mode. The inputs and outputs for this device enter a high-impedance state when the device is powered down, inhibiting current backflow into the device. The maximum leakage into or out of any input or output pin on the device is specified by I_{OFF} in the Electrical Characteristics.

10.3 V_{CC} Isolation

The I/Os of both ports will enter a high-impedance state when one of the supplies are at GND, while the other supply is still connected to the device.

10.4 Device Functional Modes

All control inputs are referenced to V_{CCA} and must be driven to a valid Logic High or Logic Low (that is, not floating) to assure proper device operation and to prevent excessive power consumption. Table 10-1 summarizes the possible modes of device operation based on the configuration of the control inputs.

Table 10-1. Function Table

Control Inputs		Output Circuits		Operation
$\overline{OE}$	DIR	A port	B port	
L	L	Enabled	Hi-Z	B data to A bus
L	H	Hi-Z	Enabled	A data to B bus
H	X	Hi-Z	Hi-Z	Isolation

11 Application Information

11.1 Application Information

The UM74AVC2T45 is used to shift IO voltage levels from one voltage domain to another. Bus A and bus B have independent power supplies, and a direction pin is used to control the direction of data flow. Unused data ports must not be floating; tie the unused port input and output to ground directly.

11.2 Typical Application

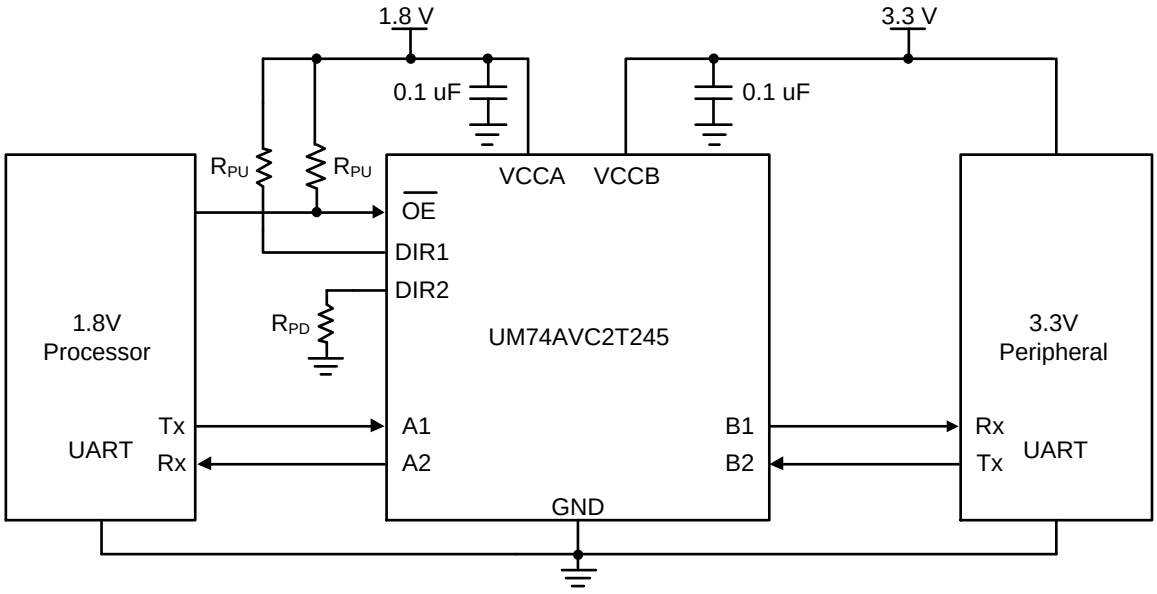
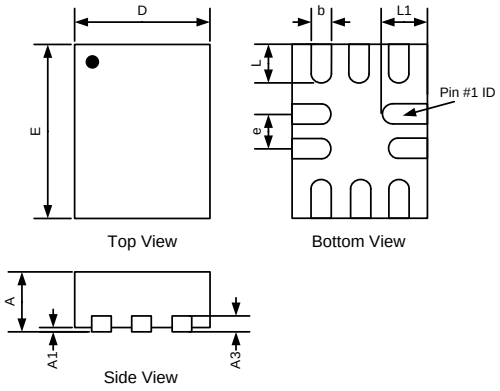


Figure 11-1. UM74AVC2T245 Typical Application

Package Information

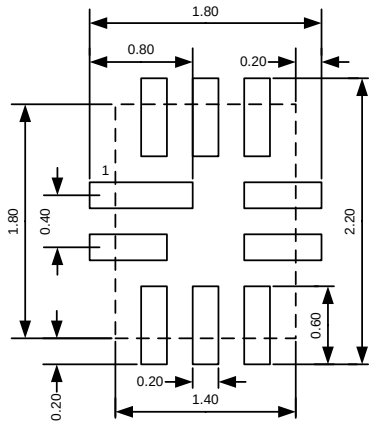
QFN10 1.8×1.4

Outline Drawing



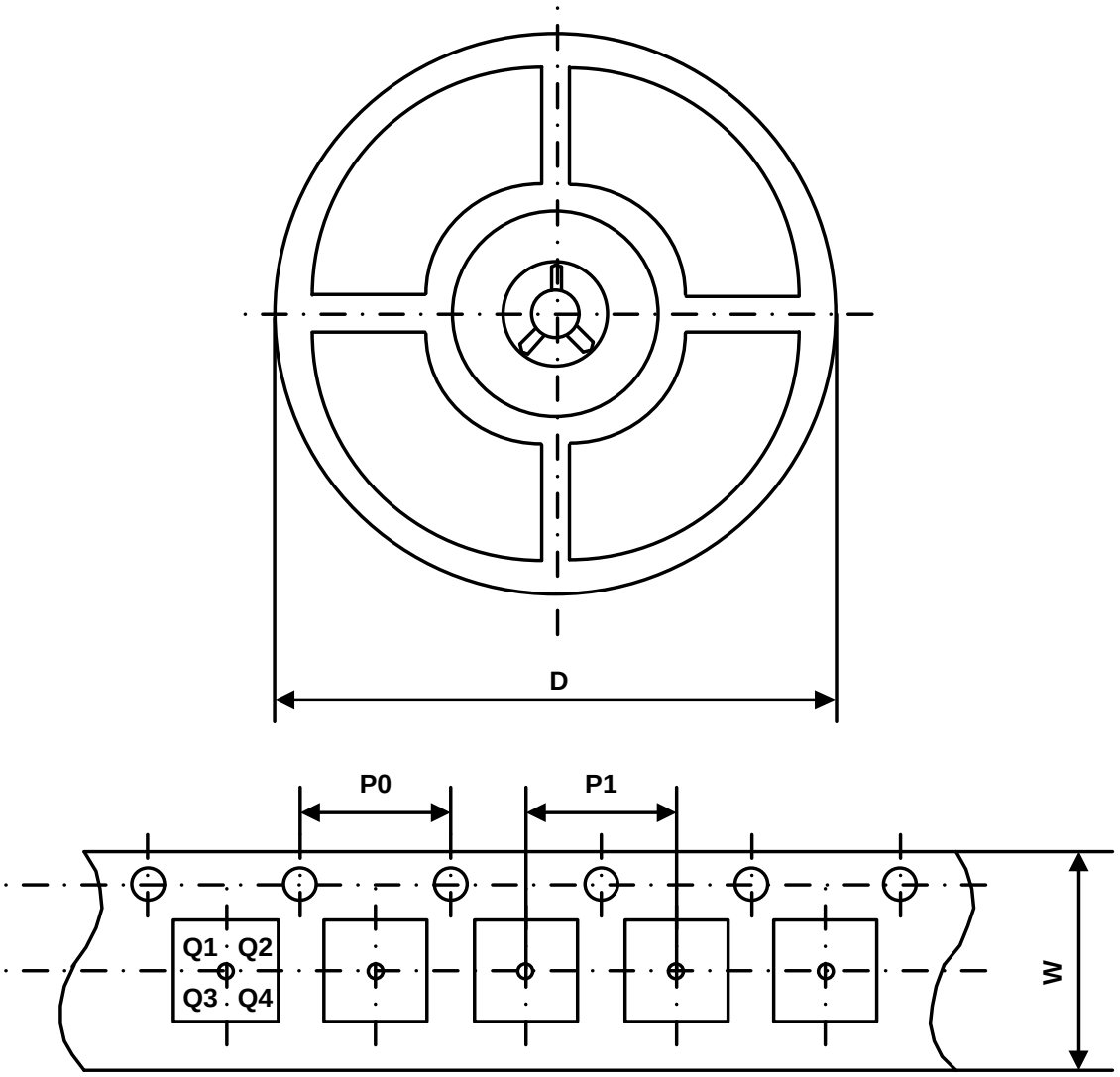
DIMENSIONS						
Symbol	MILLIMETERS			INCHES		
	Min	Typ	Max	Min	Typ	Max
A	0.40	-	0.60	0.016	-	0.024
A1	0.00	-	0.05	0.000	-	0.002
A3	0.15REF			0.006REF		
b	0.15	0.20	0.25	0.006	0.008	0.010
D	1.30	1.40	1.50	0.052	0.056	0.060
E	1.70	1.80	1.90	0.068	0.072	0.076
e	0.40BSC			0.016BSC		
L	0.30	0.40	0.50	0.012	0.016	0.020
L1	0.40	0.50	0.60	0.016	0.020	0.024

Land Pattern



NOTES:
1. Unit: mm;
2. General tolerance ±0.05mm unless otherwise specified;
3. The layout is just for reference.

Packing Information



Part Number	Package Type	Carrier Width (W)	Pitch (P0)	Pitch (P1)	Reel Size (D)	PIN 1 Quadrant
UM74AVC2T245QA	QFN10 1.8×1.4	8 mm	4 mm	4 mm	180 mm	Q1

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