

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

UM74AVC4T245SG SOP16
UM74AVC4T245UG TSSOP16
UM74AVC4T245QA QFN16 2.6×1.8
UM74AVC4T245QB QFN16 2.5×3.5
UM74AVC4T245QC QFN16 4.0×3.5

1 Description

The UM74AVC4T245 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 (1DIR and 2DIR). The output-enable ($\overline{1OE}$ and $\overline{2OE}$) input can be used to disable the outputs so the buses are effectively isolated. The UM74AVC4T245 is designed so that the control pins (DIR and \overline{OE}) are referenced to V_{CCA} voltage.

This 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 UM74AVC4T245 series are available in QFN16 2.6×1.8, QFN16 2.5×3.5, QFN16 4.0×3.5, SOP16 and TSSOP16 packages.

2 Applications

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

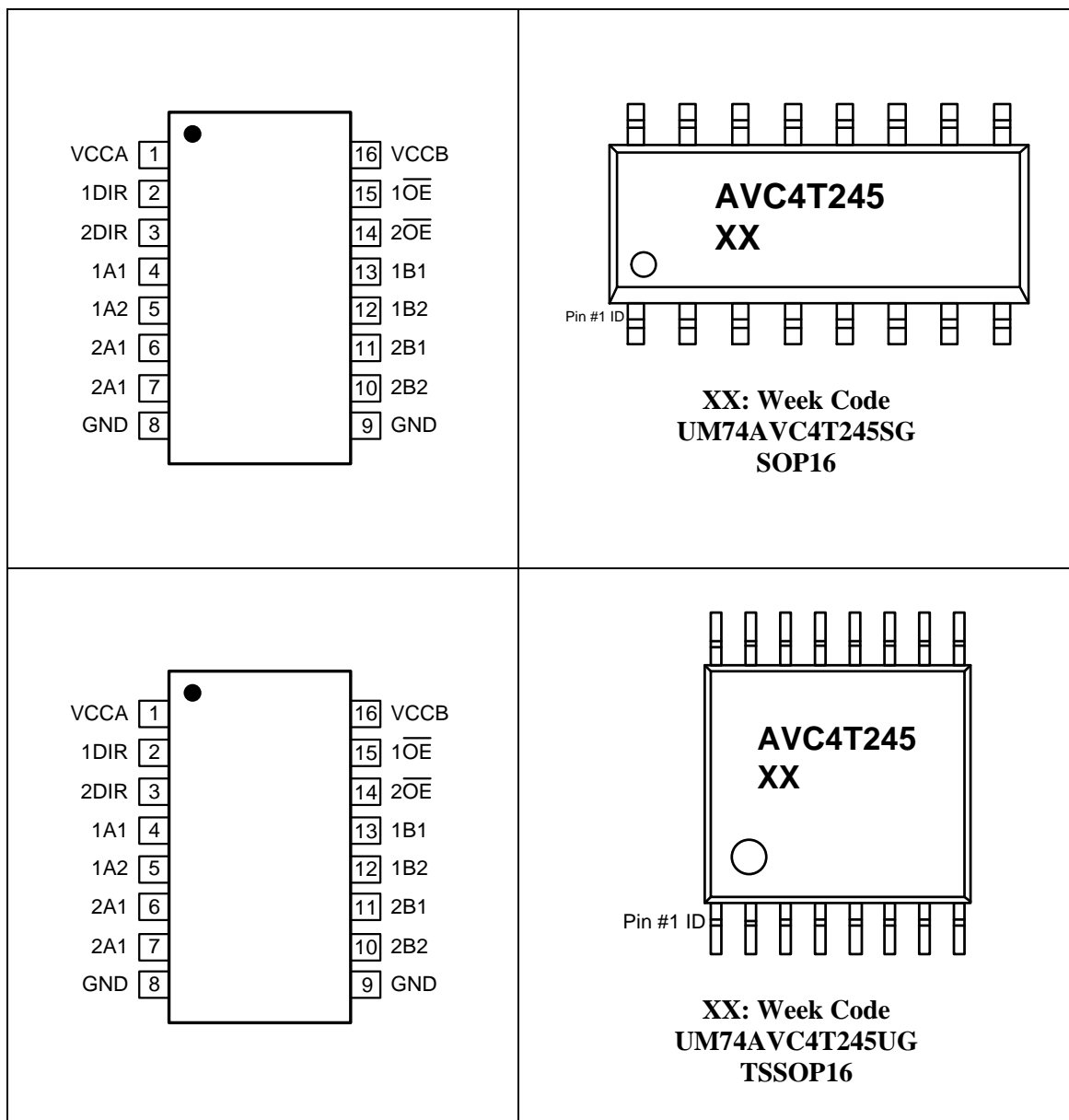
3 Features

- Control inputs V_{IH}/V_{IL} levels are referenced to V_{CCA} voltage
- I_{OFF} supports partial power-down mode operation
- 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
- Up to 400Mbps support when translating from 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

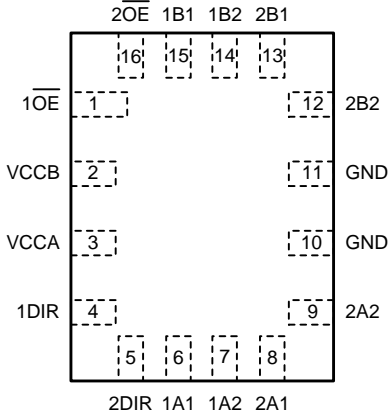
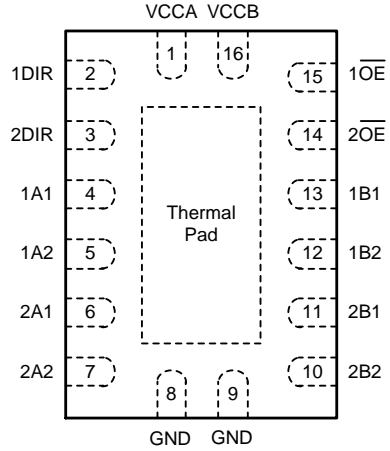
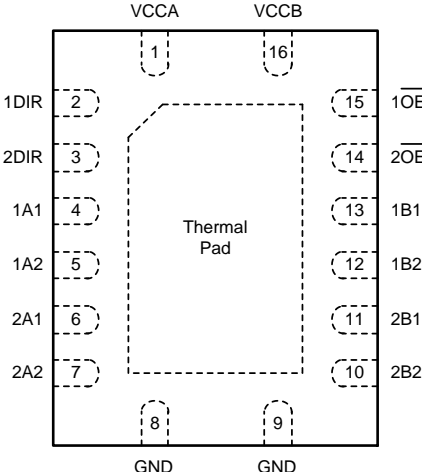
4 Ordering Information

Part Number	Mark Code	Package Type	Shipping Qty
UM74AVC4T245SG	AVC4T245	SOP16	2500pcs/13Inch Tape & Reel
UM74AVC4T245UG	AVC4T245	TSSOP16	3000pcs/13Inch Tape & Reel
UM74AVC4T245QA	AQA	QFN16 2.6×1.8	3000pcs/7Inch Tape & Reel
UM74AVC4T245QB	AQB	QFN16 2.5×3.5	6000pcs/13Inch Tape & Reel
UM74AVC4T245QC	AVC4T245	QFN16 4.0×3.5	3000pcs/13Inch Tape & Reel

5 Pin Configuration and Function



5 Pin Configuration and Function (continued)

	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>AQA Σ</p> <p>●</p> <p>M: Month Code UM74AVC4T245QA QFN16 2.6×1.8</p> </div>
	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>AQB Σ</p> <p>●</p> <p>M: Month Code UM74AVC4T245QB QFN16 2.5×3.5</p> </div>
	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>AVC4T245 XX</p> <p>●</p> <p>XX: Week Code UM74AVC4T245QC QFN16 4.0×3.5</p> </div>

5 Pin Configuration and Function (continued)

Table 5-1. Pin Functions

Pin Name	Function
VCCA	A-port supply voltage. $1V \leq V_{CCA} \leq 3.6V$.
VCCB	B-port supply voltage. $1V \leq V_{CCB} \leq 3.6V$.
1DIR	Direction-control input for '1' ports. Referenced to V_{CCA} .
2DIR	Direction-control input for '2' ports. Referenced to V_{CCA} .
$1\overline{OE}$	Output Enable. Pull to GND to enable all outputs. Pull to V_{CCA} to place '1' outputs in high-impedance mode. Referenced to V_{CCA} .
$2\overline{OE}$	Output Enable. Pull to GND to enable all outputs. Pull to V_{CCA} to place '2' outputs in high-impedance mode. Referenced to V_{CCA} .
1A1	Input/output 1A1. Referenced to V_{CCA} .
1A2	Input/output 1A2. Referenced to V_{CCA} .
2A1	Input/output 2A1. Referenced to V_{CCA} .
2A2	Input/output 2A2. Referenced to V_{CCA} .
GND	Ground.
2B2	Input/output 2B2. Referenced to V_{CCB} .
2B1	Input/output 2B1. Referenced to V_{CCB} .
1B2	Input/output 1B2. Referenced to V_{CCB} .
1B1	Input/output 1B1. Referenced to V_{CCB} .

6 Specifications

6.1 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	A and B 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	°C
T _{STG}	Storage Temperature		-65 to +150	°C

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.

6.2 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	°C	

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.

6.3 Package Thermal Impedance

Symbol	Parameter		Value	Unit
R _{θJA}	Junction-to-ambient thermal resistance	SOP16	85.5	°C/W
		TSSOP16	101.8	
		QFN16 2.6×1.8	146.9	
		QFN16 2.5×3.5	80.8	
		QFN16 4.0×3.5	37.5	
R _{θJC(TOP)}	Junction-to-case (top) thermal resistance	SOP16	46.9	°C/W
		TSSOP16	37.2	
		QFN16 2.6×1.8	53.6	
		QFN16 2.5×3.5	77.9	
		QFN16 4.0×3.5	54.5	
R _{θJB}	Junction-to-board thermal resistance	SOP16	43	°C/W
		TSSOP16	60.6	
		QFN16 2.6×1.8	75.6	
		QFN16 2.5×3.5	50.7	
		QFN16 4.0×3.5	15.6	

6.4 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}		V _I =V _{IH}	1V to 3.6V	1V to 3.6V	V _{CCO} -0.2			V
			1.1V	1.1V	0.85	0.98		
			1.4V	1.4V	1			
			1.65V	1.65V	1.2			
			2.3V	2.3V	1.8			
			3V	3V	2.4			
V _{OL}		V _I =V _{IL}	1V to 3.6V	1V to 3.6V			0.2	V
			1.1V	1.1V		0.1	0.25	
			1.4V	1.4V			0.35	
			1.65V	1.65V			0.45	
			2.3V	2.3V			0.55	
			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 _{CC1} or GND, 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 _{CC1} 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 _{CC1} 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 _{CC1} 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_{CC1} is the V_{CC} associated with the input port.

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

6.5 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
			$V_{CCB}=1.2V \pm 0.1V$	0.5		20	
			$V_{CCB}=1.5V \pm 0.1V$	0.5		17	
			$V_{CCB}=1.8V \pm 0.15V$	0.5		15	
			$V_{CCB}=2.5V \pm 0.2V$	0.5		15	
			$V_{CCB}=3.3V \pm 0.3V$	0.5		17	
t_{PLH}, t_{PHL}	B	A	$V_{CCB}=1V$	0.5		30	ns
			$V_{CCB}=1.2V \pm 0.1V$	0.5		20	
			$V_{CCB}=1.5V \pm 0.1V$	0.5		17	
			$V_{CCB}=1.8V \pm 0.15V$	0.5		15	
			$V_{CCB}=2.5V \pm 0.2V$	0.5		17	
			$V_{CCB}=3.3V \pm 0.3V$	0.5		17	
t_{PZH}, t_{PZL}	\overline{OE}	A	$V_{CCB}=1V$	0.5		40	ns
			$V_{CCB}=1.2V \pm 0.1V$	0.5		35	
			$V_{CCB}=1.5V \pm 0.1V$	0.5		35	
			$V_{CCB}=1.8V \pm 0.15V$	0.5		35	
			$V_{CCB}=2.5V \pm 0.2V$	0.5		35	
			$V_{CCB}=3.3V \pm 0.3V$	0.5		35	
t_{PZH}, t_{PZL}	\overline{OE}	B	$V_{CCB}=1V$	0.5		40	ns
			$V_{CCB}=1.2V \pm 0.1V$	0.5		35	
			$V_{CCB}=1.5V \pm 0.1V$	0.5		35	
			$V_{CCB}=1.8V \pm 0.15V$	0.5		35	
			$V_{CCB}=2.5V \pm 0.2V$	0.5		35	
			$V_{CCB}=3.3V \pm 0.3V$	0.5		35	
t_{PHZ}, t_{PLZ}	\overline{OE}	A	$V_{CCB}=1V$	0.5		35	ns
			$V_{CCB}=1.2V \pm 0.1V$	0.5		35	
			$V_{CCB}=1.5V \pm 0.1V$	0.5		35	
			$V_{CCB}=1.8V \pm 0.15V$	0.5		35	
			$V_{CCB}=2.5V \pm 0.2V$	0.5		35	
			$V_{CCB}=3.3V \pm 0.3V$	0.5		35	
t_{PHZ}, t_{PLZ}	\overline{OE}	B	$V_{CCB}=1V$	0.5		40	ns
			$V_{CCB}=1.2V \pm 0.1V$	0.5		35	
			$V_{CCB}=1.5V \pm 0.1V$	0.5		35	
			$V_{CCB}=1.8V \pm 0.15V$	0.5		35	
			$V_{CCB}=2.5V \pm 0.2V$	0.5		35	
			$V_{CCB}=3.3V \pm 0.3V$	0.5		35	

6.5 Switching Characteristics (continued)

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

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

6.5 Switching Characteristics (continued)

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

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

6.5 Switching Characteristics (continued)

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

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

6.5 Switching Characteristics (continued)

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

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

6.5 Switching Characteristics (continued)

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

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

6.6 Operating Characteristics (Note 1)

$T_A=25^{\circ}\text{C}$.

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	$C_L = 0,$ $f=10\text{MHz},$ $t_R = t_F = 1\text{ns}$	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.

7 Parameter Measurement Information

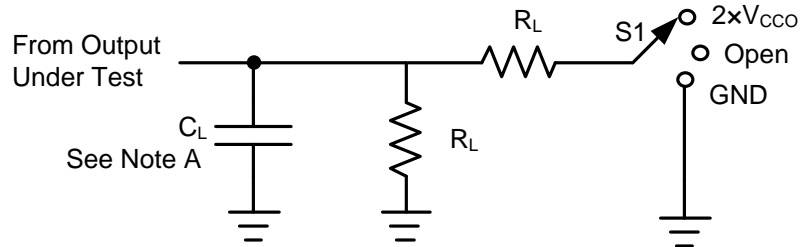


Figure 7-1. Load Circuit

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

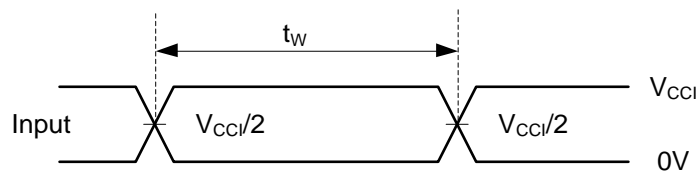


Figure 7-2. Voltage Waveforms Pulse Duration

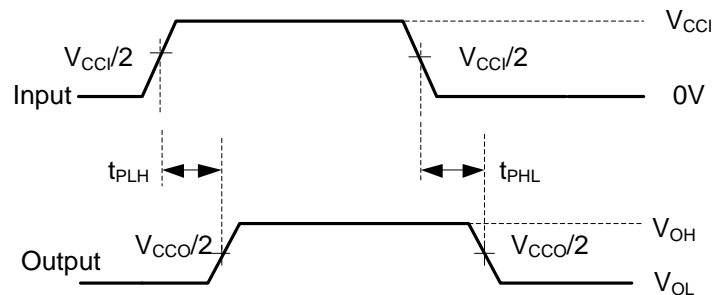


Figure 7-3. Voltage Waveforms Propagation Delay Times

7 Parameter Measurement Information (continued)

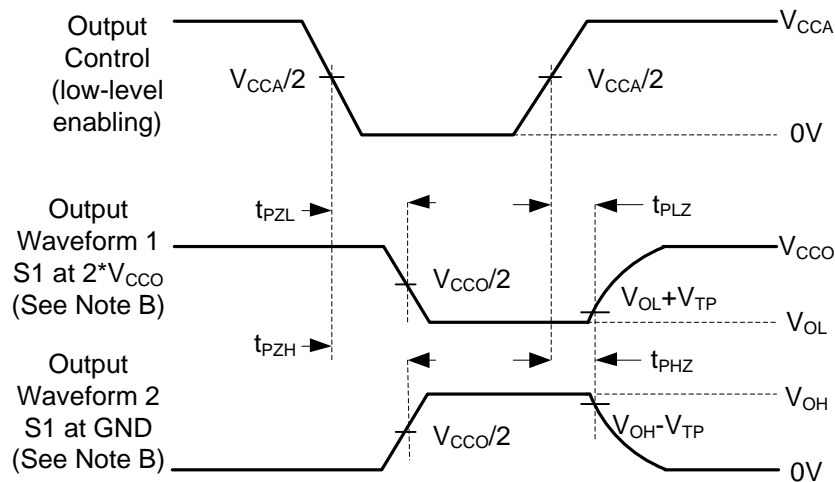


Figure 7-4. Voltage Waveforms Enable and Disable Times

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: $PRR \leq 10$ MHz, $Z_O = 50\Omega$, $dv/dt \geq 1V/ns$.
- 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.

9.3 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.

9.4 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 9-1 summarizes the possible modes of device operation based on the configuration of the control inputs.

Table 9-1. 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

10 Application Information

10.1 Application Information

The UM74AVC4T245 can be used in level-translation applications for interfacing devices or systems operating at different voltage nodes. Typical Application Circuit depicts an application in which the UM74AVC4T245 is up-translating a 1.8V input to a 3.3V output to interface between a system controller and a peripheral device.

10.2 Typical Application

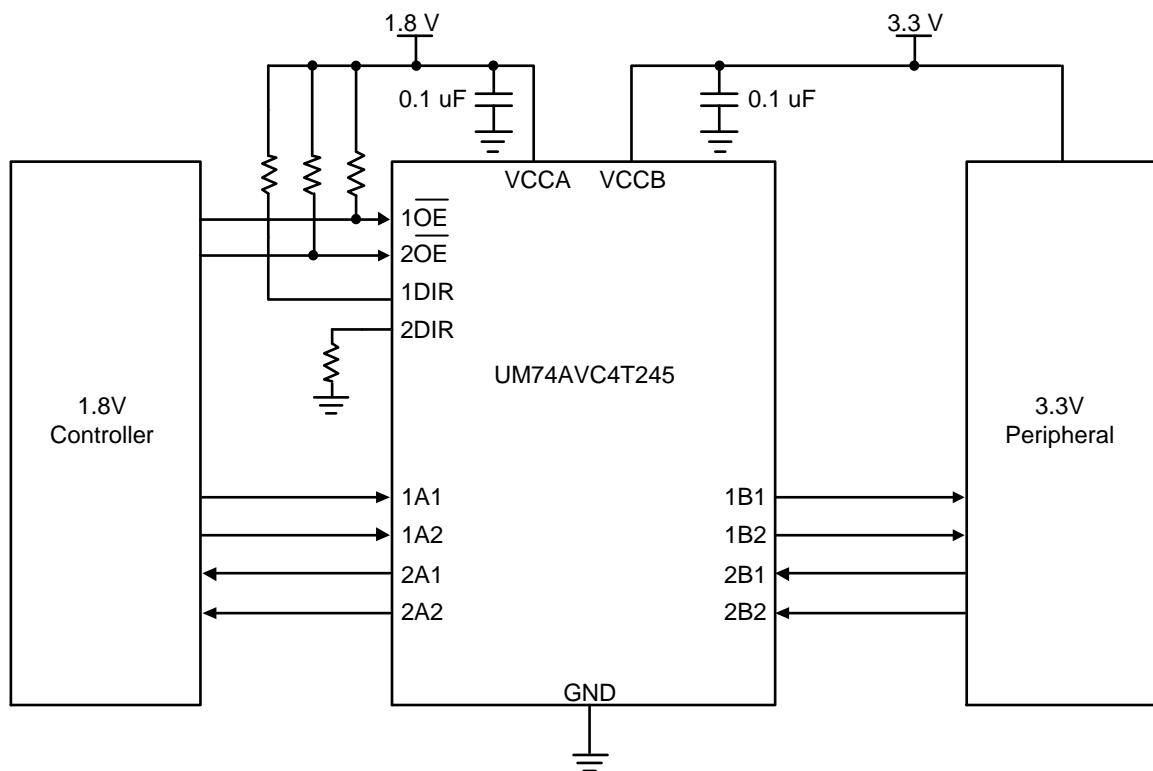
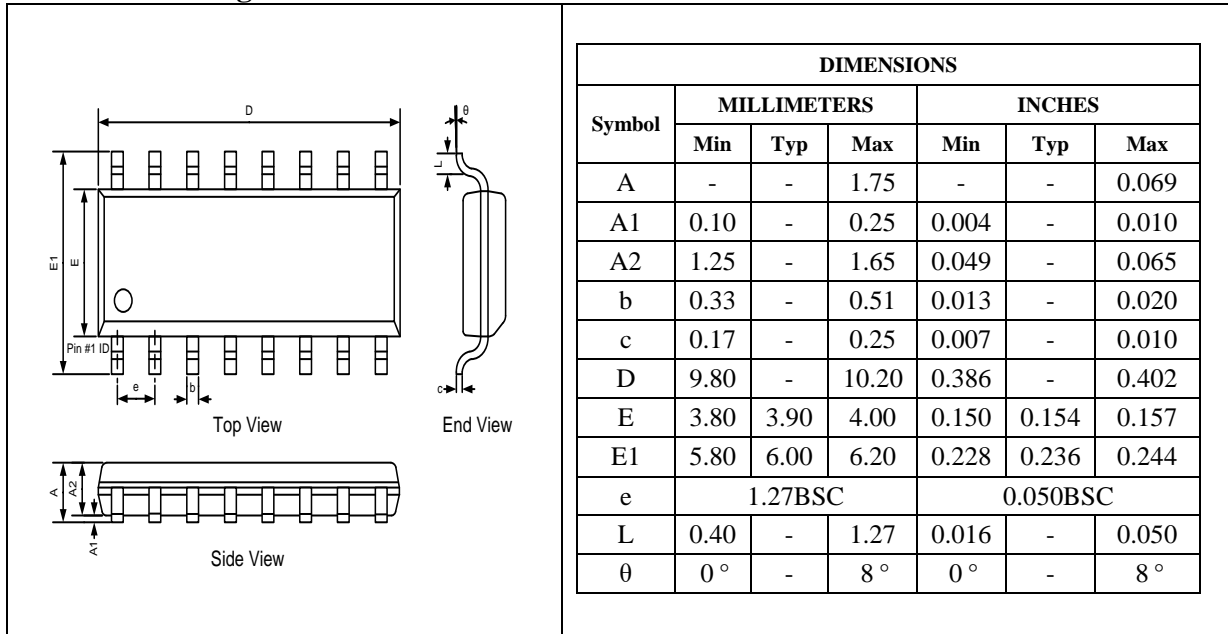


Figure 10-1. UM74AVC4T245 Typical Application

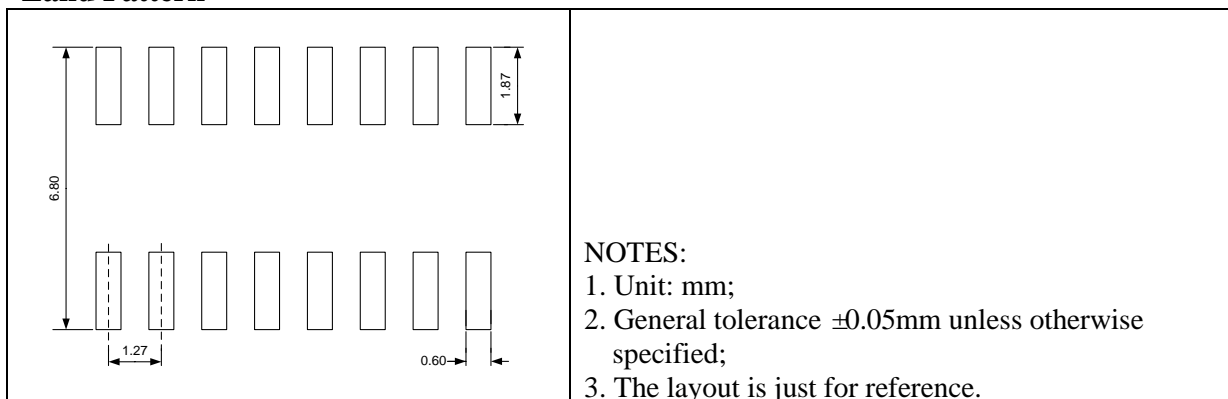
Package Information

SOP16

Outline Drawing

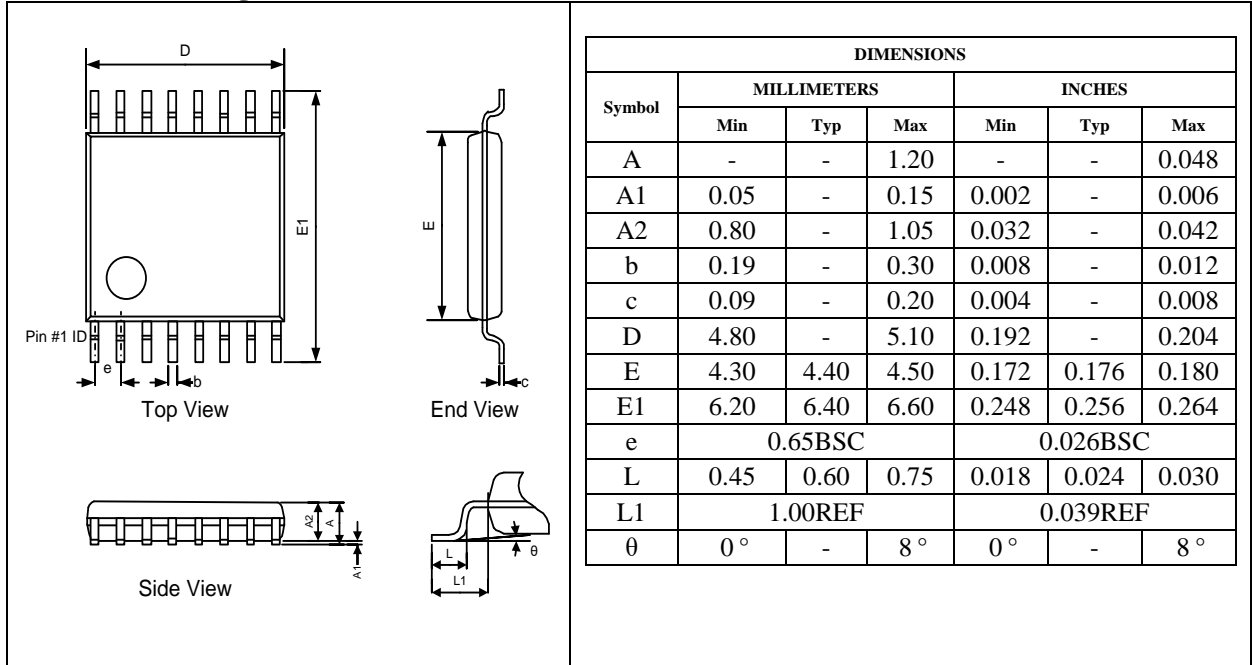


Land Pattern

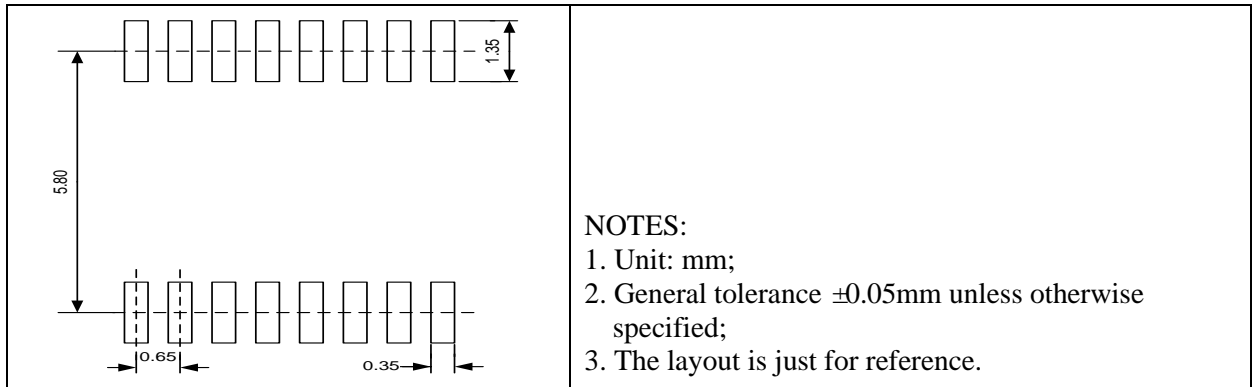


TSSOP16

Outline Drawing

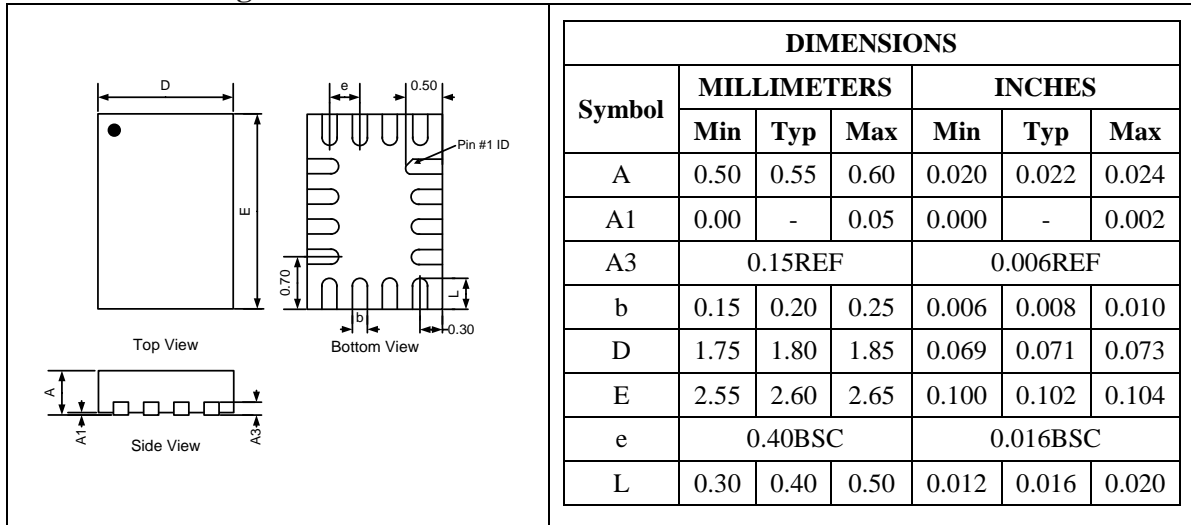


Land Pattern

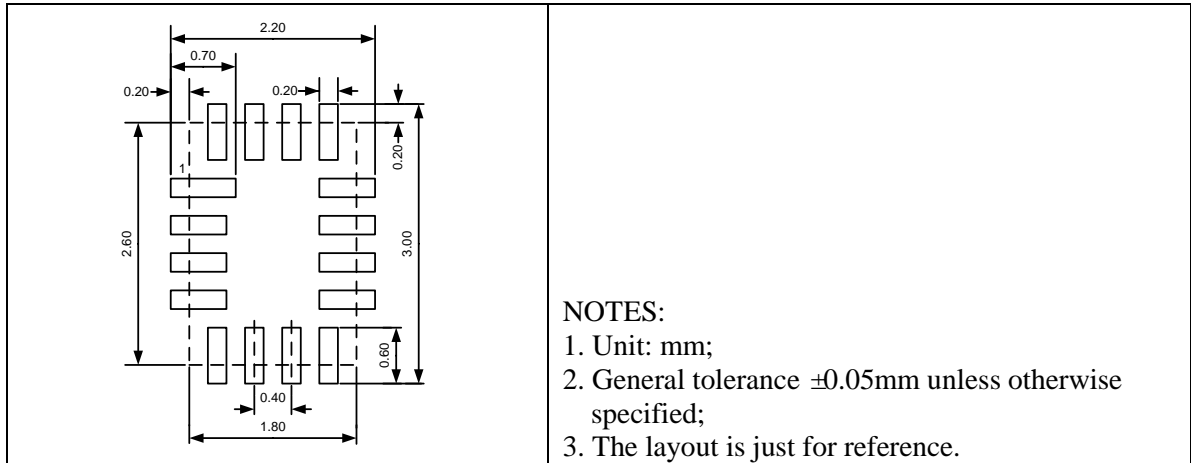


QFN16 2.6×1.8

Outline Drawing

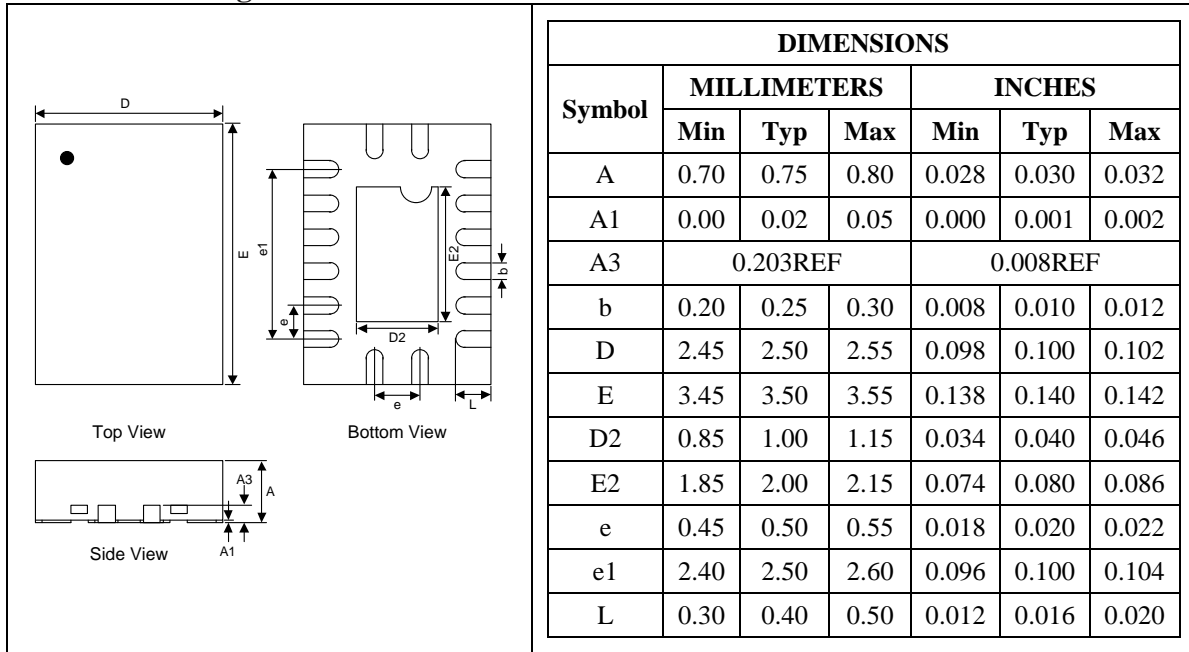


Land Pattern

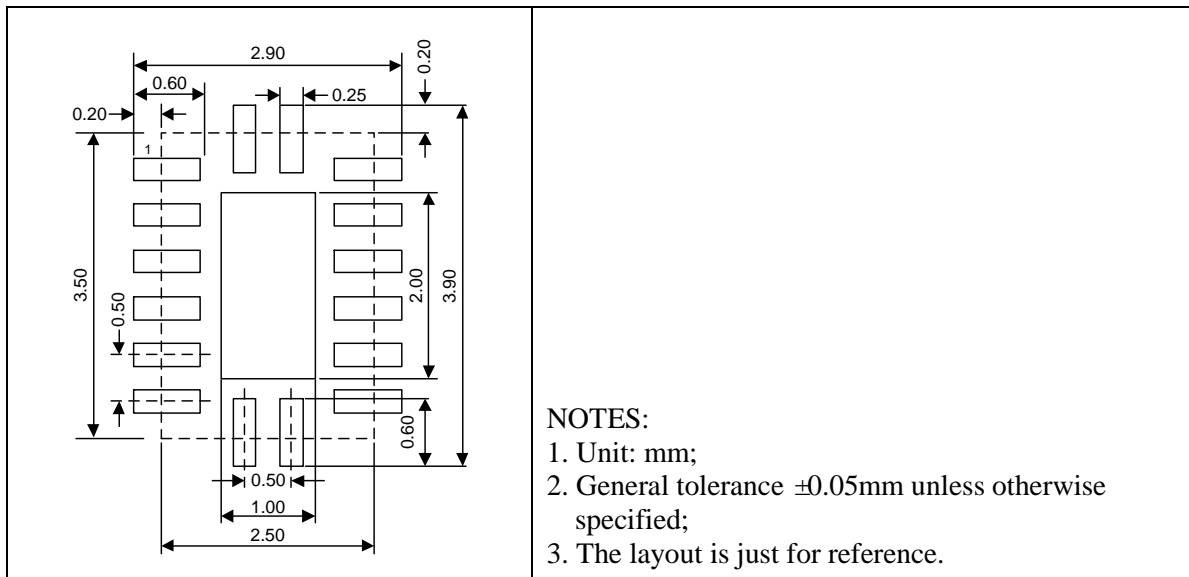


QFN16 2.5×3.5

Outline Drawing

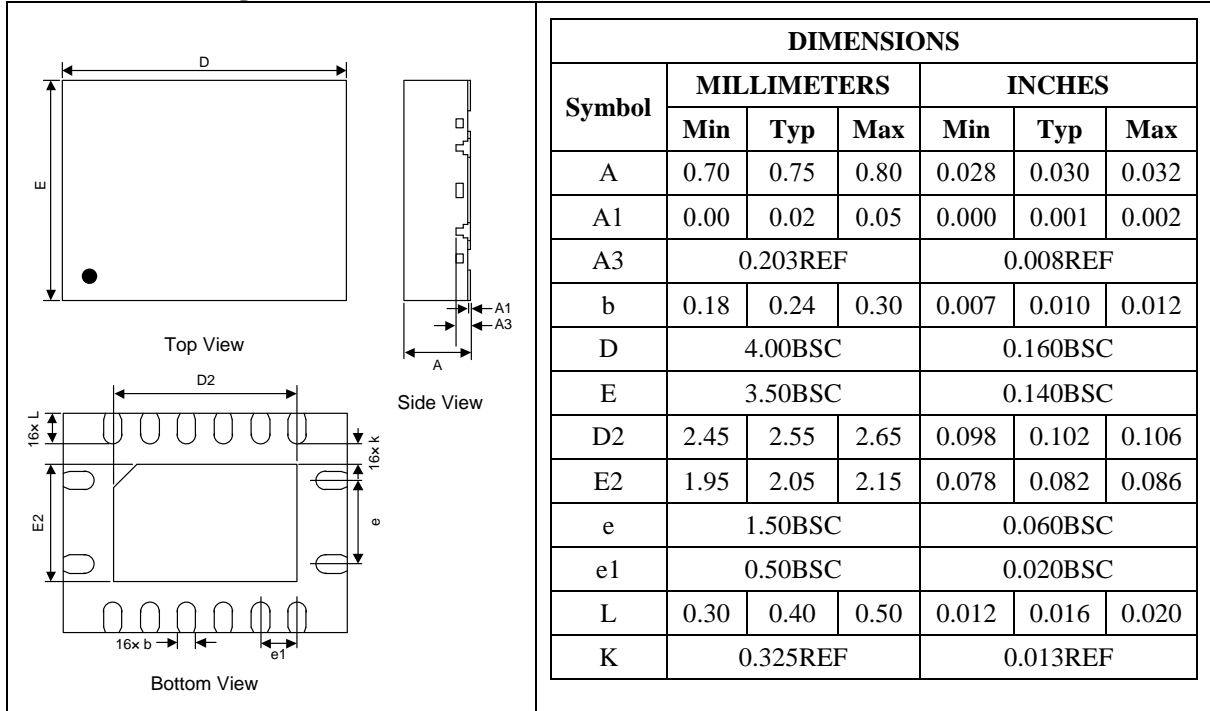


Land Pattern

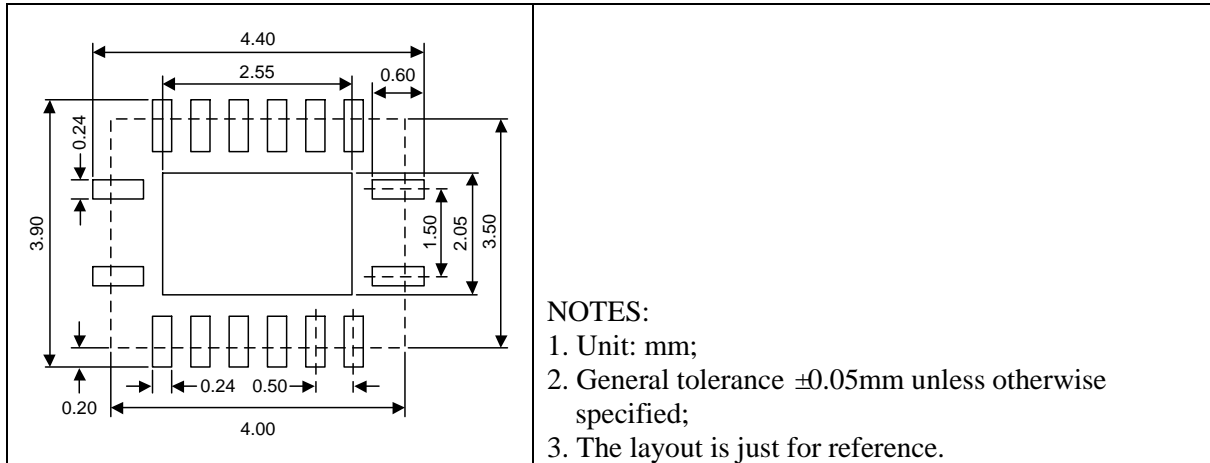


QFN16 4.0×3.5

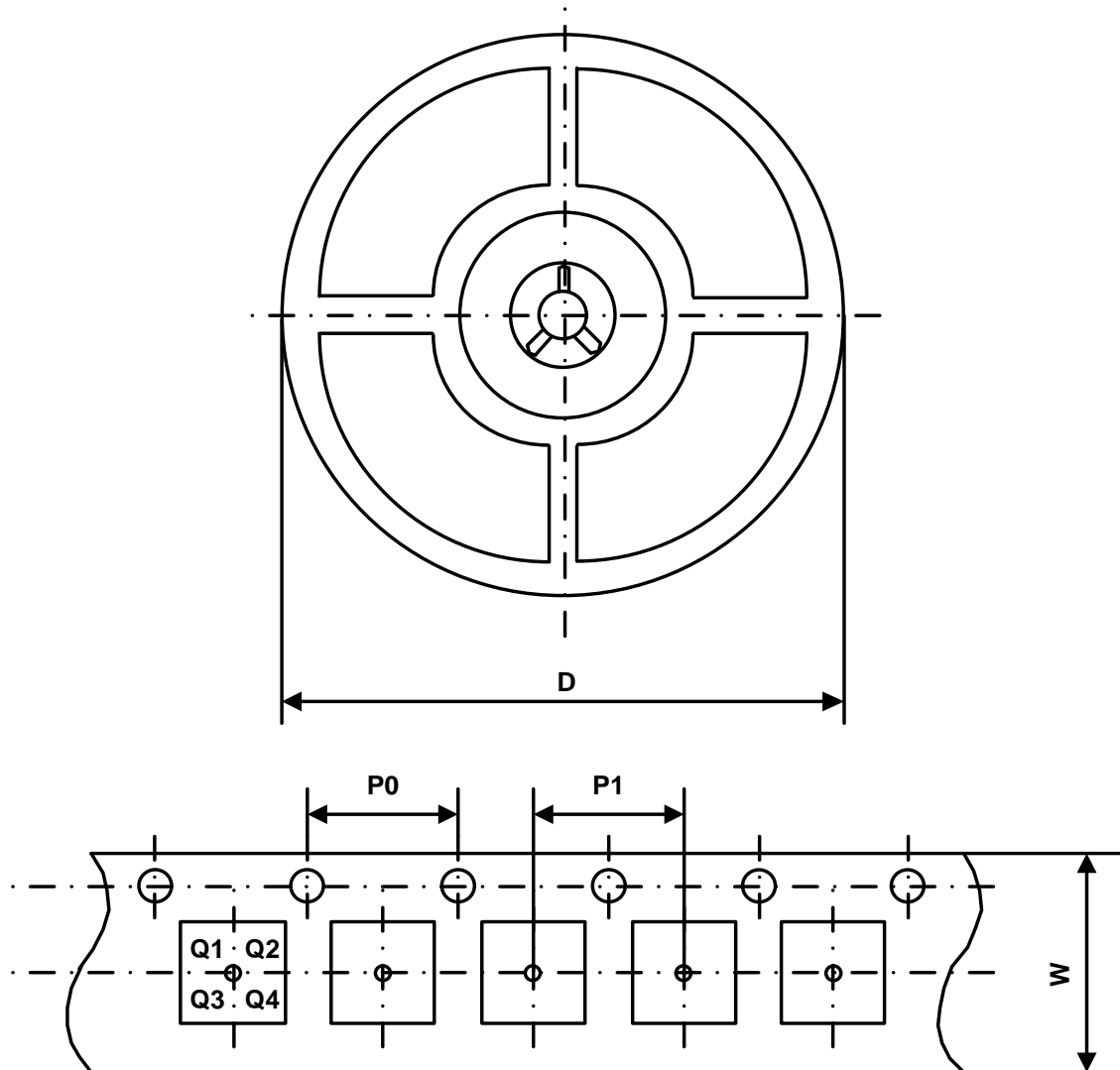
Outline Drawing



Land Pattern



Packing Information



Part Number	Package Type	Carrier Width (W)	Pitch (P0)	Pitch (P1)	Reel Size (D)	PIN 1 Quadrant
UM74AVC4T245SG	SOP16	16 mm	4 mm	8 mm	330 mm	Q1
UM74AVC4T245UG	TSSOP16	16 mm	4 mm	8 mm	330 mm	Q1
UM74AVC4T245QA	QFN16 2.6×1.8	8 mm	4 mm	4 mm	180 mm	Q1
UM74AVC4T245QB	QFN16 2.5×3.5	12 mm	4 mm	8 mm	330 mm	Q1
UM74AVC4T245QC	QFN16 4.0×3.5	12 mm	4 mm	8 mm	330 mm	Q1

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