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

UM74AVC1T45P *SOT363*
UM74AVC1T45S *SOT23-6*

1 Description

The UM74AVC1T45 is a 1-bit non-inverting bus transceiver using two separate configurable power-supply rails. The A ports are designed to track V_{CCA} and accept supply voltage from 1V to 3.6V. The B ports are designed to track V_{CCB} and accept supply voltage from 1V to 3.6V. This meets the needs for universal low-voltage bidirectional translation and level-shifting between any of the 1.2V, 1.5V, 1.8V, 2.5V, and 3.3V voltage nodes.

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 input (DIR). The direction-control pin (DIR) is referenced to V_{CCA} voltage. The input circuitry on both A and B ports always is active and must have a logic High or Low level applied to prevent excess leakage current on the internal CMOS structure.

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.

The UM74AVC1T45 series are available in SOT363 and SOT23-6 packages.

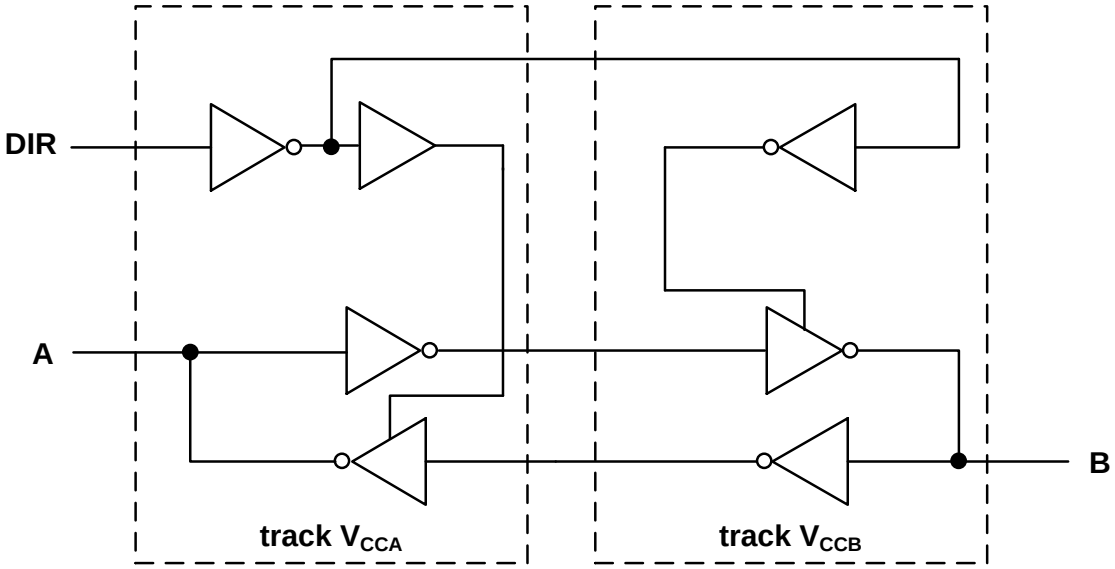
2 Applications

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

3 Features

- Control input 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
- Latch-up performance exceeds 200 mA per JESD 78
- ESD protection on A and B ports
  - ±8kV Human body model
  - ±2kV Charged-device model
- Up to 400Mbps support when translating from 1.8V to 3.3V

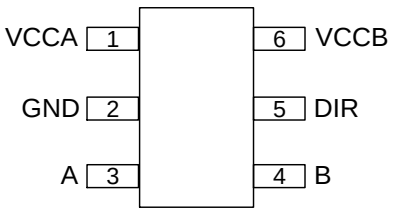
4 Logic Diagram

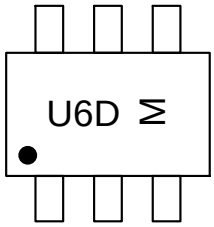


5 Ordering Information

Part Number	Mark Code	Package Type	Shipping Qty
UM74AVC1T45P	U6D	SOT363	3000pcs/7Inch Tape & Reel
UM74AVC1T45S	UCZ	SOT23-6	3000pcs/7Inch Tape & Reel

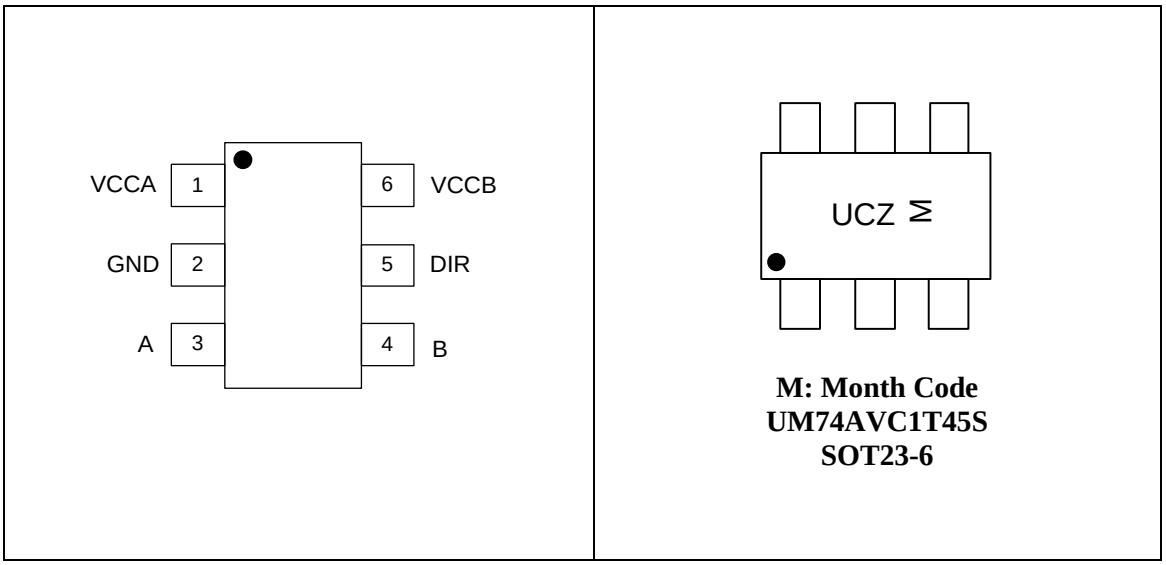
6 Pin Configuration and Function





M: Month Code
UM74AVC1T45P
SOT363

6 Pin Configuration and Function (continued)



M: Month Code
UM74AVC1T45S
SOT23-6

Table 6-1. Pin Functions

Pin No.	Pin Name	Function
1	VCCA	A-port supply voltage. $1V \le V_{CCA} \le 3.6$ V.
2	GND	Ground.
3	A	Input/output A. Output or input depending on state of DIR. Referenced to $V_{CCA.}$
4	B	Input/output B. Output or input depending on state of DIR. Referenced to $V_{CCB.}$
5	DIR	Direction-control input. Referenced to V_{CCA}.
6	VCCB	B-port supply voltage. $1V \le V_{CCB} \le 3.6$ V.

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 input	-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	℃
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 input (DIR) 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 input (DIR) 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	SOT363	210.8	℃/W
		SOT23-6	182.8	
$R_{\theta JC(TOP)}$	Junction-to-case (top) thermal resistance	SOT363	144.6	℃/W
		SOT23-6	101.7	
$R_{\theta JB}$	Junction-to-board thermal resistance	SOT363	65.1	℃/W
		SOT23-6	63.0	

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		0V	3.6V	-5	0.1	5	μA
				3.6V	0V	-5	0.1	5	
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}	DIR	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}	DIR	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}	DIR	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}	DIR	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}	DIR	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}	DIR	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}	DIR	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}	DIR	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}	DIR	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}	DIR	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}	DIR	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}	DIR	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}	DIR	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}	DIR	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}	DIR	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}	DIR	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}	DIR	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}	DIR	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}	DIR	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}	DIR	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}	DIR	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}	DIR	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}	DIR	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}	DIR	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

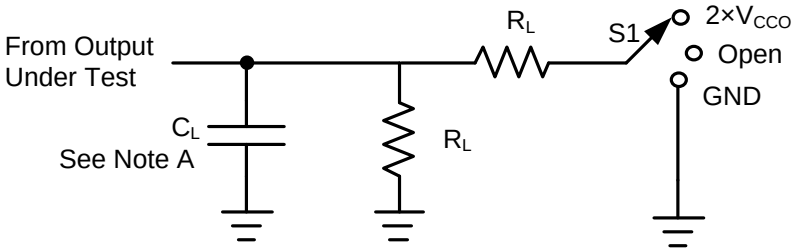


Figure 8-1. Load Circuit

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

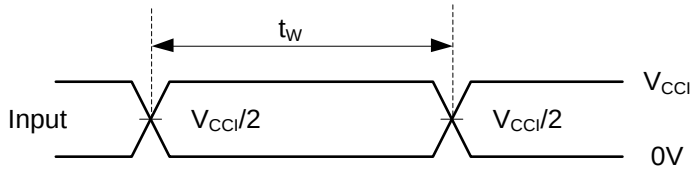


Figure 8-2. Voltage Waveforms Pulse Duration

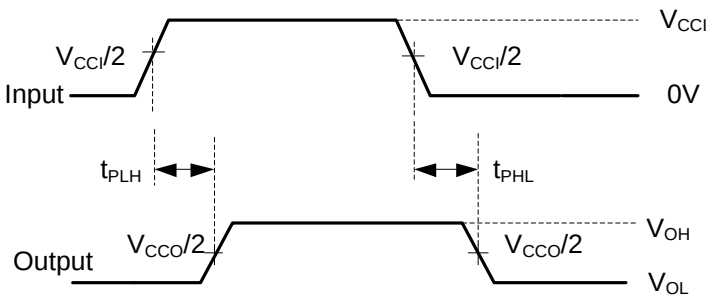


Figure 8-3. Voltage Waveforms Propagation Delay Times

8 Parameter Measurement Information (continued)

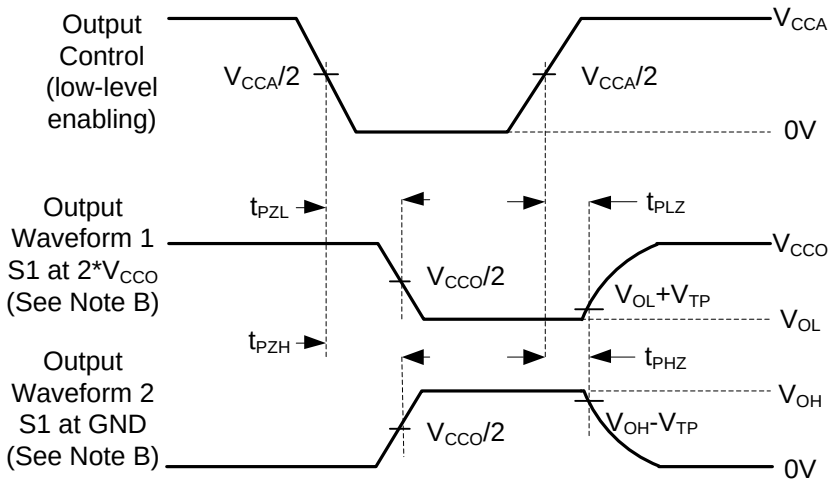


Figure 8-4. Voltage Waveforms Enable and Disable Times

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 UM74AVC1T45 device is a 1-bit, dual-supply non-inverting transceiver with bidirectional voltage level translation. The A ports are designed to track V_{CCA} and accept supply voltage from 1V to 3.6V. The B ports are designed to track V_{CCB} and accept supply voltage from 1V to 3.6V. This meets the needs for universal low-voltage bidirectional translation and level-shifting between any of the 1.2V, 1.5V, 1.8V, 2.5V, and 3.3V voltage nodes.

9.2 Functional Block Diagram

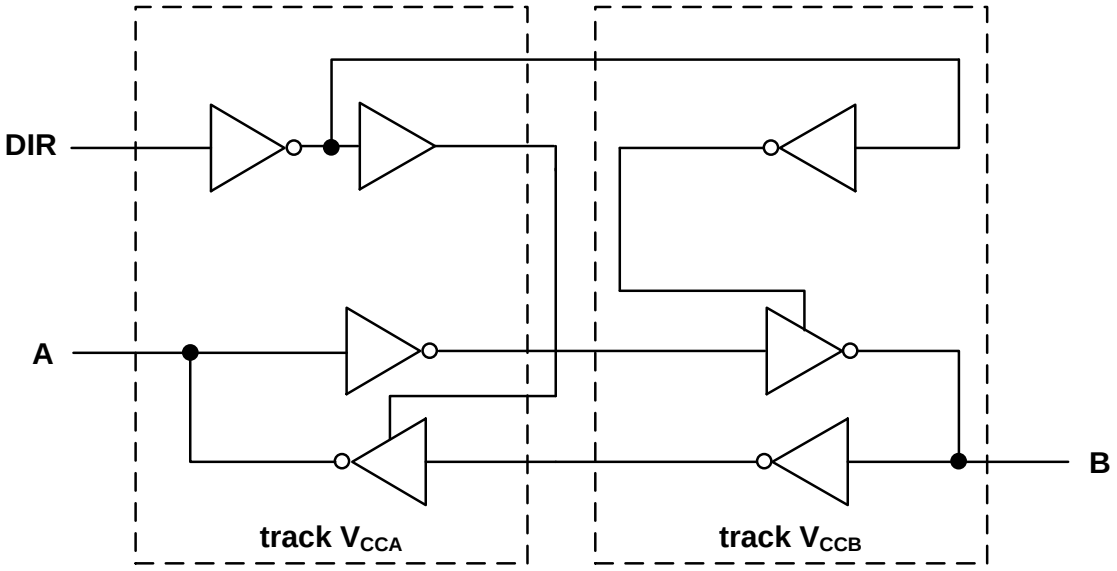


Figure 9-1. Logic Diagram of UM74AVC1T45

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 Input	Output Circuits		Operation
DIR	A port	B port	
L	Enabled	Hi-Z	B data to A bus
H	Hi-Z	Enabled	A data to B bus

11 Application Information

11.1 Application Information

The UM74AVC1T45 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 UM74AVC1T45 is up-translating a 1.8V input to a 3.3V output to interface between a system controller and a peripheral device.

11.2 Typical Application

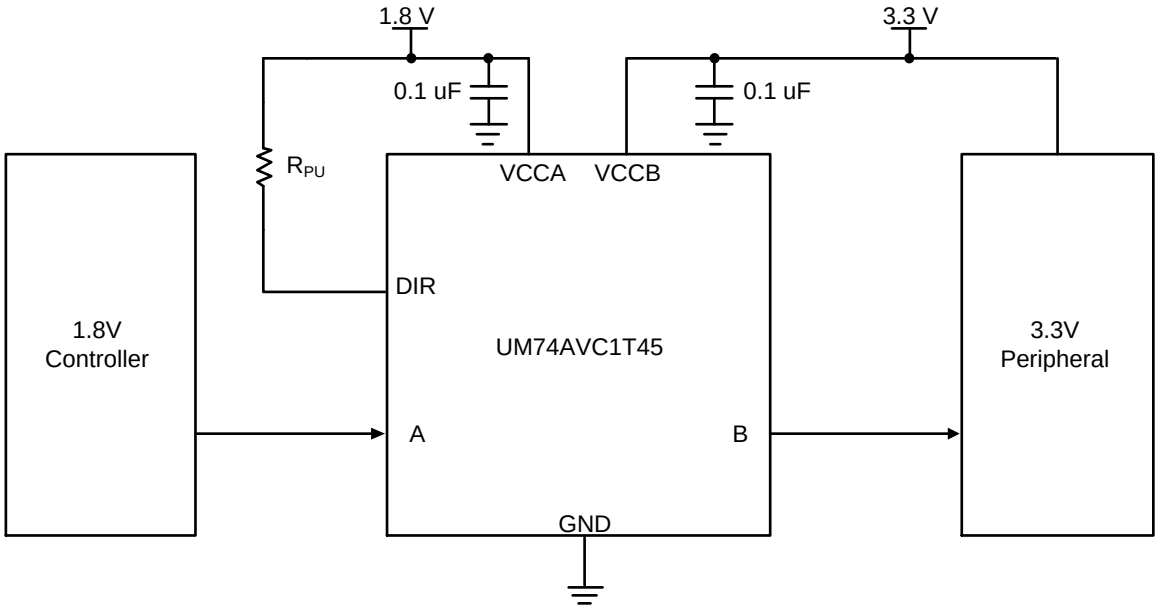
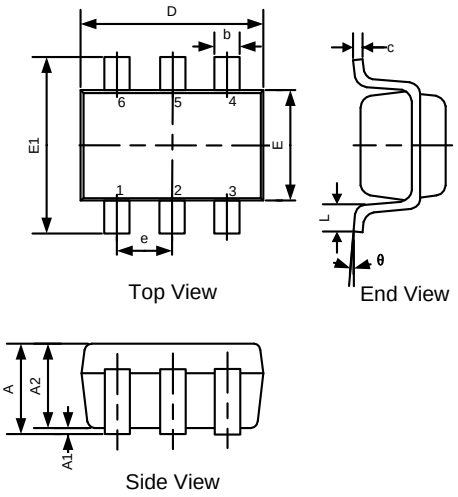


Figure 11-1. UM74AVC1T45 Typical Application

Package Information

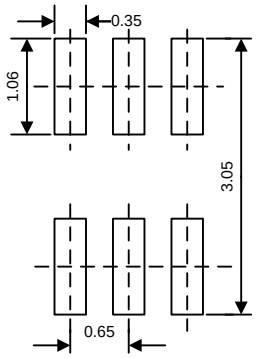
SOT363

Outline Drawing



Symbol	DIMENSIONS					
	MILLIMETERS			INCHES		
	Min	Typ	Max	Min	Typ	Max
A	0.90	-	1.10	0.035	-	0.043
A1	0.00	-	0.10	0.000	-	0.004
A2	0.90	-	1.00	0.035	-	0.039
b	0.10	-	0.35	0.004	-	0.014
c	0.08	-	0.22	0.003	-	0.009
D	1.80	-	2.20	0.071	-	0.087
E	1.15	-	1.35	0.045	-	0.053
E1	2.00	-	2.45	0.079	--	0.096
e	0.65BSC			0.026BSC		
L	0.25	-	0.46	0.010	-	0.018
θ	0 °	-	8 °	0 °	-	8 °

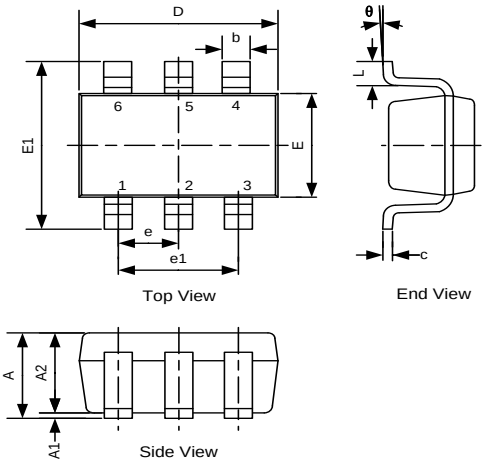
Land Pattern



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

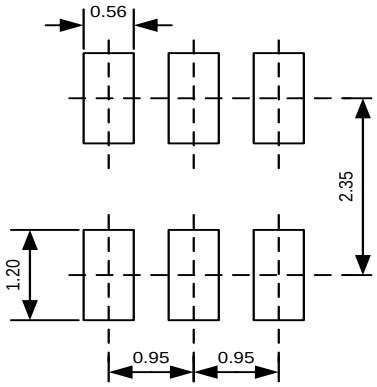
SOT23-6

Outline Drawing



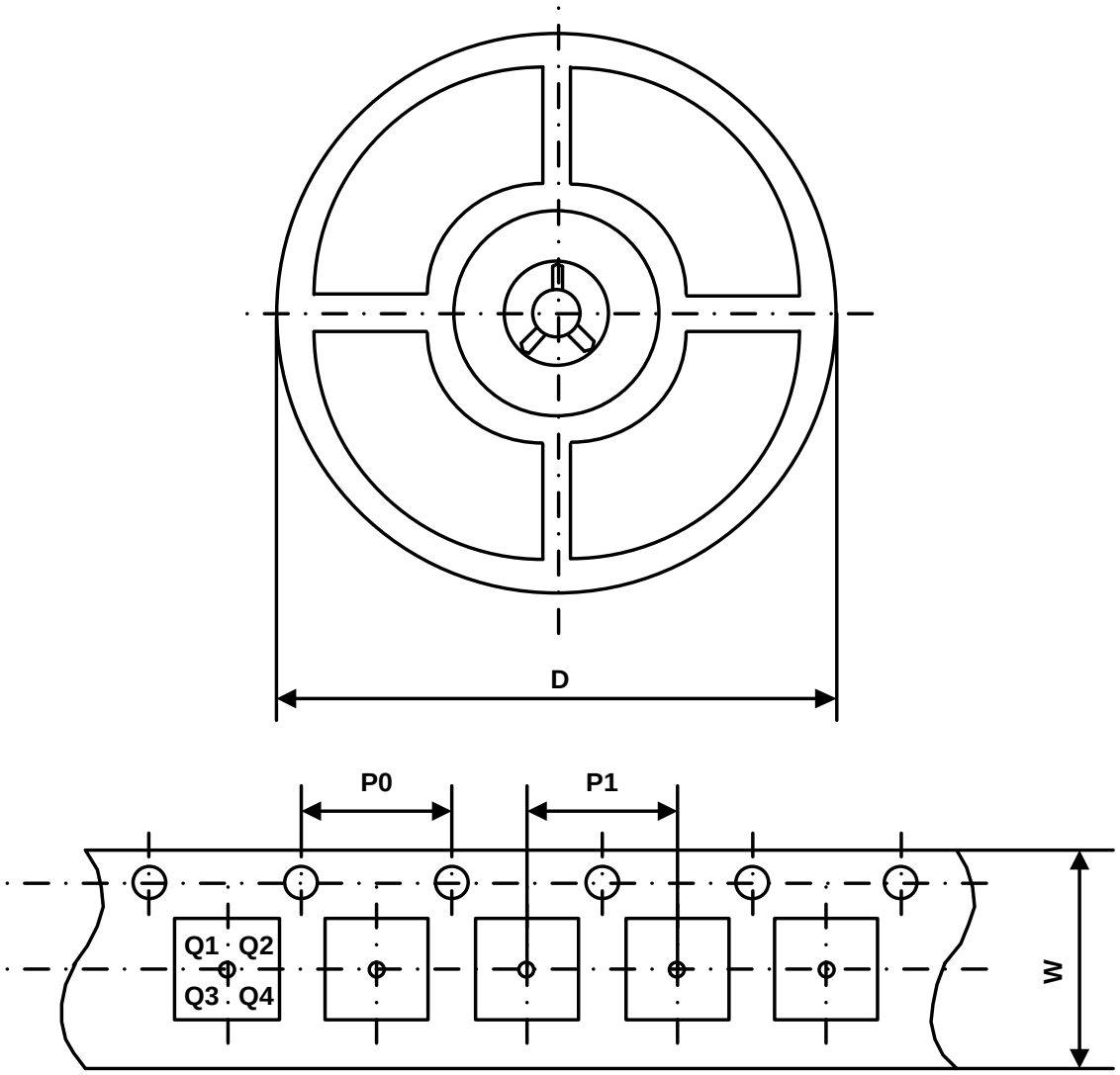
Symbol	DIMENSIONS					
	MILLIMETERS			INCHES		
	Min	Typ	Max	Min	Typ	Max
A	1.013	1.15	1.40	0.040	0.045	0.055
A1	0.00	0.05	0.10	0.000	0.002	0.004
A2	1.00	1.10	1.30	0.039	0.043	0.051
b	0.30	-	0.50	0.012	-	0.020
c	0.10	0.15	0.20	0.004	0.006	0.008
D	2.82	-	3.10	0.111	-	0.122
E	1.50	1.60	1.70	0.059	0.063	0.067
E1	2.60	2.80	3.00	0.102	0.110	0.118
e	0.95REF			0.037REF		
e1	1.90REF			0.075REF		
L	0.30	-	0.60	0.012	-	0.024
θ	0°	-	8°	0°	-	8°

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
UM74AVC1T45P	SOT363	8 mm	4 mm	4 mm	180 mm	Q3
UM74AVC1T45S	SOT23-6	8 mm	4 mm	4 mm	180 mm	Q3

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