

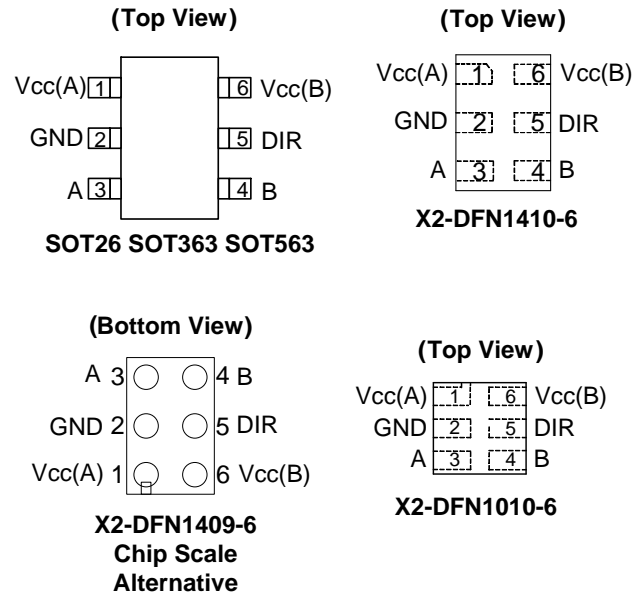
## SINGLE BIT DUAL POWER SUPPLY TRANSLATING TRANSCEIVER WITH 3 STATE OUTPUTS

### Description

The 74LVC1T45 is a single bit, dual supply transceiver with 3-state outputs suitable for transmitting a single logic bit across different voltage domains. The A input/output pin is designed to track  $V_{CCA}$  while the B input/output tracks  $V_{CCB}$ . This arrangement allows for universal low-voltage translation between any voltages from 1.65V to 5.5V. The Direction pin (DIR) controls the direction of the transceiver and in a logic voltage related to  $V_{CCA}$ . When a high logic level is applied to DIR the A pin becomes an input and the B pin becomes the output. Conversely the roles of A and B are reversed when DIR is asserted low.

The 3-state feature occurs when either of the power supply voltages are zero. This is also an off feature and allows for the output to remain in a high impedance state with both power supplies at 0V preventing and damaging backflow currents and providing power down electrical isolation up to 5.5V as not to interfere with any logic activity on pin A or B.

### Pin Assignments



### Features

- Wide Supply Voltage Range:
  - $V_{CC(A)}$ : from 1.65V to 5.5V
  - $V_{CC(B)}$ : from 1.65V to 5.5V
- $\pm 24\text{mA}$  Output Drive at 3.3V
- CMOS low power consumption 16 $\mu\text{A}$  maximum  $I_{CC}$
- High Noise Immunity -- (100mV hysteresis typical)
- $I_{OFF}$  Supports Partial-Power-Down Mode Operation
- $I_{OFF}$  controlled by either  $V_{CC}$  being at 0 V
- Inputs accept up to 5.5V
- ESD Protection Exceeds JESD 22
  - 200-V Machine Model (A115-A)
  - 2000-V Human Body Model (A114-A)
  - 1000 V Charged Device Model ( C101)
- Latch-Up Exceeds 100mA per JESD 78, Class II
- X2-DFN1409-6 package designed as a direct replacement for chip scale packaging.
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

### Applications

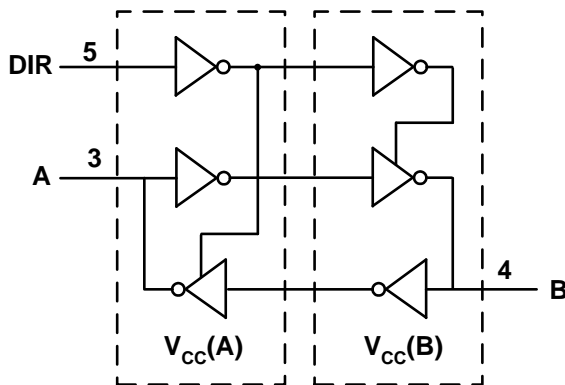
- Voltage Level Translation  
Well suited to join logic types operating at different voltages
- Power Down Signal Isolation  
If either voltage domain is turned off the signal is isolated and there is no loading on signal lines
- Wide array of products such as:
  - Cell Phones, Tablets, E-Readers
  - PCs, notebooks, netbooks, ultrabooks
  - Networking, routers, gateways
  - Computer peripherals, hard drives, CD/DVD ROM
  - TV, DVD, DVR, set top box
  - Personal Navigation / GPS
  - MP3 players, Cameras, Video Recorders

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## Pin Descriptions

Pin Name	Pin	Function
VCC(A)	1	Supply for I/O pin A and reference for DIR
GND	2	Ground
A	3	Data Input/Output
B	4	Data Input/Output
DIR	5	Direction Control
VCC(B)	6	Supply for I/O pin B

## Logic Diagram



## Function Tables

Input DIR (Direction Pin)	Operation
L	B data to A output
H	A data to B output

Inputs			Outputs	
A	B	DIR	A	B
*	L	L	L	*
*	H	L	H	*
L	*	H	*	L
H	*	H	*	H

\*pin condition not applicable as defined by DIR.

## Absolute Maximum Ratings (Note 4) (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Symbol	Parameter	Rating	Unit	
ESD HBM	Human Body Model ESD Protection	2	KV	
ESD CDM	Charged Device Model ESD Protection	1	KV	
ESD MM	Machine Model ESD Protection	200	V	
V <sub>CC(A)</sub> , V <sub>CC(B)</sub>	Supply Voltage Range	-0.5 to +6.5	V	
V <sub>I</sub>	Input Voltage Range	-0.5 to +6.5	V	
V <sub>O</sub>	Voltage Applied to Output in High Impedance or I <sub>OFF</sub> State	-0.5 to +6.5	V	
V <sub>O</sub>	Voltage Applied to Output in High or Low State	A pin	-0.3 to V <sub>CC(A)</sub> +0.5	V
		B pin	-0.3 to V <sub>CC(B)</sub> +0.5	V
I <sub>IK</sub>	Input Clamp Current V <sub>I</sub> <0	-50	mA	
I <sub>OK</sub>	Output Clamp Current	-50	mA	
I <sub>O</sub>	Continuous Output Current	±50	mA	
	Continuous Current Through V <sub>CC</sub> or GND	±100	mA	
T <sub>J</sub>	Operating Junction Temperature	-40 to +150	°C	
T <sub>STG</sub>	Storage Temperature	-65 to +150	°C	

Notes: 4. Stresses beyond the absolute maximum may result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.

**Recommended Operating Conditions** (Note 5) (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Symbol	Parameter		V <sub>CC</sub> Inputs	V <sub>CC</sub> Outputs	Min	Max	Units
V <sub>CC(A)</sub>	Operating Voltage		–	–	1.65	5.5	V
V <sub>CC(B)</sub>			–	–	1.65	5.5	V
V <sub>IH</sub>	High-Level Input Voltage Pin A or DIR Referenced to V <sub>CC(A)</sub>		V <sub>CC</sub> = 1.65V to 1.95V	–	0.65 X V <sub>CC(A)</sub>	–	V
			V <sub>CC</sub> = 2.3V to 2.7V	–	1.7	–	
			V <sub>CC</sub> = 3V to 3.6V	–	2	–	
			V <sub>CC</sub> = 4.5V to 5.5V	–	0.7 X V <sub>CC(A)</sub>	–	
V <sub>IL</sub>	Low-Level Input Voltage Pin A or DIR Referenced to V <sub>CC(A)</sub>		V <sub>CC</sub> = 1.65V to 1.95V	–	–	0.35 X V <sub>CC(A)</sub>	V
			V <sub>CC</sub> = 2.3V to 2.7V	–	–	0.7	
			V <sub>CC</sub> = 3V to 3.6V	–	–	0.8	
			V <sub>CC</sub> = 4.5V to 5.5V	–	–	0.3 X V <sub>CC(A)</sub>	
V <sub>IH</sub>	High-Level Input Voltage Pin B Referenced to V <sub>CC(B)</sub>		V <sub>CC</sub> = 1.65V to 1.95V	–	0.65 X V <sub>CC(B)</sub>	–	V
			V <sub>CC</sub> = 2.3V to 2.7V	–	1.7	–	
			V <sub>CC</sub> = 3V to 3.6V	–	2	–	
			V <sub>CC</sub> = 4.5V to 5.5V	–	0.7 X V <sub>CC(B)</sub>	–	
V <sub>IL</sub>	Low-Level Input Voltage Pin B Referenced to V <sub>CC(B)</sub>		V <sub>CC</sub> = 1.65V to 1.95V	–	–	0.35 X V <sub>CC(B)</sub>	V
			V <sub>CC</sub> = 2.3V to 2.7V	–	–	0.7	
			V <sub>CC</sub> = 3V to 3.6V	–	–	0.8	
			V <sub>CC</sub> = 4.5V to 5.5V	–	–	0.3 X V <sub>CC(B)</sub>	
V <sub>I</sub>	Input Voltage		–	–	0	5.5	V
V <sub>O</sub>	Output Voltage		–	–	0	V <sub>CC</sub>	V
I <sub>OH</sub>	High-Level Output Current		–	V <sub>CC</sub> = 1.65V to 1.95V	–	–4	mA
			–	V <sub>CC</sub> = 2.3V to 2.7V	–	–8	
			–	V <sub>CC</sub> = 3V to 3.6V	–	–16	
			–	V <sub>CC</sub> = 4.5V to 5.5V	–	–24	
			–	V <sub>CC</sub> = 1.65V to 1.95V	–	–32	
I <sub>OL</sub>	Low-Level Output Current		–	V <sub>CC</sub> = 2.3V to 2.7V	–	4	mA
			–	V <sub>CC</sub> = 3V to 3.6V	–	8	
			–	V <sub>CC</sub> = 4.5V to 5.5V	–	16	
			–	V <sub>CC</sub> = 1.65V to 1.95V	–	24	
			–	V <sub>CC</sub> = 2.3V to 2.7V	–	32	
• t <sub>r</sub> /V	Input Transition Rise or Fall Rate	Data Inputs	V <sub>CC</sub> = 1.65V to 1.95V	–	–	20	ns/V
			V <sub>CC</sub> = 2.3V to 2.7V	–	–	20	
			V <sub>CC</sub> = 3V to 3.6V	–	–	10	
			V <sub>CC</sub> = 4.5V to 5.5V	–	–	5	
		Control Inputs	V <sub>CC</sub> = 1.65V to 5.5V	–	–	5	
T <sub>A</sub>	Operating Free-Air Temperature		–	–	–40	+125	°C

Note: 5. Unused inputs should be held at V<sub>CC</sub> or Ground.

**Electrical Characteristics** (@T<sub>A</sub> = +40°C to +85°C, unless otherwise specified.)

Symbol	Parameter	Test Conditions		V <sub>CC</sub> (A)	V <sub>CC</sub> (B)	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40°C to +85°C		Unit
						Min	Typ	Max	Min	Max	
V <sub>OH</sub>	High Level Output Voltage	I <sub>OH</sub> = -100μA		1.65V to 5.5V	1.65V to 5.5V	-	-	-	V <sub>CC</sub> - 0.1	-	V
		I <sub>OH</sub> = -4mA		1.65V	1.65V	-	-	-	1.2	-	
		I <sub>OH</sub> = -8mA		2.3V	2.3V	-	-	-	1.9	-	
		I <sub>OH</sub> = -24mA		3V	3V	-	-	-	2.4	-	
		I <sub>OH</sub> = -32mA		4.5V	4.5V	-	-	-	3.8	-	
V <sub>OL</sub>	Low-Level Output Voltage	I <sub>OL</sub> = 100μA		1.65V to 5.5V	1.65V to 5.5V	-	-	-	-	0.1	V
		I <sub>OL</sub> = 4mA		1.65V	1.65V	-	-	-	-	0.45	
		I <sub>OL</sub> = 8mA		2.3V	2.3V	-	-	-	-	0.3	
		I <sub>OL</sub> = 24mA		3V	3V	-	-	-	-	0.55	
		I <sub>OL</sub> = 32mA		4.5V	4.5V	-	-	-	-	0.55	
I <sub>I</sub>	Input Current	DIR	V <sub>I</sub> = V <sub>CC</sub> (A) or GND	0 to 5.5V	0 to 5.5V	-	-	± 1	-	± 2	μA
I <sub>OFF</sub>	Power Down Leakage Current	A Pin	V <sub>I</sub> or V <sub>O</sub> = 0 to 5.5V	0V	0 V to 5.5V	-	-	± 1	-	± 2	μA
		B Pin		0 V to 5.5V	0V	-	-	± 1	-	± 2	
I <sub>OZ</sub>	3-State Leakage Current	A Pin	V <sub>O</sub> = V <sub>CC</sub> (A)	1.65V to 5.5V	1.65V to 5.5V	-	-	± 1	-	± 2	μA
		B Pin	V <sub>O</sub> = V <sub>CC</sub> (B)	1.65V to 5.5V	1.65V to 5.5V	-	-	± 1	-	± 2	
I <sub>CCA</sub>	Supply Current	V <sub>I</sub> = 5.5V or GND I <sub>O</sub> = 0		1.65V to 5.5V	1.65V to 5.5V	-	-	-	-	3	μA
				5.5V	0V	-	-	-	-	2	
				0V	5.5V	-	-	-	-	-2	
I <sub>CCB</sub>	Supply Current	V <sub>I</sub> = 5.5V or GND I <sub>O</sub> = 0		1.65V to 5.5V	1.65V to 5.5V	-	-	-	-	3	μA
				0V	5.5V	-	-	-	-	2	
				5.5V	0V	-	-	-	-	-2	
I <sub>CCA</sub> + I <sub>CCB</sub>	Supply Current	V <sub>I</sub> = 5.5V or GND I <sub>O</sub> = 0		1.65V to 5.5V	1.65V to 5.5V	-	-	-	-	4	μA
• I <sub>CCA</sub>	Additional Supply Current	A pin	A = V <sub>CC</sub> (A) -0.6V DIR = V <sub>CC</sub> (A) B = open	3V to 5.5V	3V to 5.5V	-	-	-	-	50	μA
		DIR	DIR = V <sub>CC</sub> (A) -0.6V A = V <sub>CC</sub> (A) or GND B = open							50	
• I <sub>CCB</sub>	Additional Supply Current	B pin	B = V <sub>CC</sub> (B) -0.6V DIR = GND A = open	3V to 5.5V	3V to 5.5V	-	-	-	-	50	μA
C <sub>I</sub>	Input Capacitance	DIR	V <sub>I</sub> = V <sub>CC</sub> (A) or GND	3.3V	3.3V	-	2.5	-	-	-	pF
C <sub>IO</sub>	Input/Output Capacitance	A or B pin	V <sub>I</sub> = V <sub>CC</sub> (A)/(B) or GND	3.3V	3.3V	-	6.0	-	-	-	pF

**Electrical Characteristics** (@T<sub>A</sub> = +40°C to +125°C, unless otherwise specified.)

Symbol	Parameter	Test Conditions		V <sub>CC(A)</sub>	V <sub>CC(B)</sub>	T <sub>A</sub> = -40°C to +125°C		Unit
						Min	Max	
V <sub>OH</sub>	High Level Output Voltage	I <sub>OH</sub> = -100μA		1.65V to 5.5V	1.65V to 5.5V	V <sub>CC</sub> - 0.1	-	V
		I <sub>OH</sub> = -4mA		1.65V	1.65V	1.2	-	
		I <sub>OH</sub> = -8mA		2.3V	2.3V	1.9	-	
		I <sub>OH</sub> = -24mA		3V	3V	2.4	-	
		I <sub>OH</sub> = -32mA		4.5V	4.5V	3.8	-	
V <sub>OL</sub>	High-Level Input Voltage	I <sub>OL</sub> = 100μA		1.65V to 5.5V	1.65V to 5.5V	-	0.1	V
		I <sub>OL</sub> = 4mA		1.65V	1.65V	-	0.45	
		I <sub>OL</sub> = 8mA		2.3V	2.3V	-	0.3	
		I <sub>OL</sub> = 24mA		3V	3V	-	0.55	
		I <sub>OL</sub> = 32mA		4.5V	4.5V	-	0.55	
I <sub>I</sub>	Input Current	DIR	V <sub>I</sub> = V <sub>CC(A)</sub> or GND	0 to 5.5V	0 to 5.5V	-	± 2	μA
I <sub>OFF</sub>	Power Down Leakage Current	A Pin	V <sub>I</sub> or V <sub>O</sub> = 0 to 5.5V	0V	1.65V to 5.5V	-	± 2	μA
		B Pin		1.65V to 5.5V	0V	-	± 2	
I <sub>OZ</sub>	3-State Leakage Current	B Pin V <sub>O</sub> = V <sub>CC</sub> (B) DIR = 0 V	V <sub>I</sub> = 0 to 5.5V	1.65V to 5.5V	1.65V to 5.5V	-	± 2	μA
		A Pin V <sub>O</sub> = V <sub>CC</sub> (A) DIR = V <sub>CC</sub> (A)		1.65V to 5.5V	1.65V to 5.5V	-	± 2	
I <sub>CCA</sub>	Supply Current	V <sub>I</sub> = 5.5V or GND I <sub>O</sub> = 0		1.65V to 5.5V	1.65V to 5.5V	-	3	μA
				5.5V	0V	-	2	
				0V	5.5V	-	-2	
I <sub>CCB</sub>	Supply Current	V <sub>I</sub> = 5.5V or GND I <sub>O</sub> = 0		1.65V to 5.5V	1.65V to 5.5V	-	3	μA
				5.5V	0V	-	2	
				0V	5.5V	-	-2	
I <sub>CCA</sub> + I <sub>CCB</sub>	Supply Current	V <sub>I</sub> = 5.5V or GND I <sub>O</sub> = 0		1.65V to 5.5V	1.65V to 5.5V	-	4	μA
• I <sub>CCA</sub>	Additional Supply Current	A pin	A = V <sub>CC</sub> (A) -0.6V DIR = V <sub>CC</sub> (A) B = open	3V to 5.5V	3V to 5.5V	-	50	μA
		DIR	DIR = V <sub>CC</sub> (A) -0.6V A = V <sub>CC</sub> (A) or GND B = open				50	
• I <sub>CCB</sub>	Additional Supply Current	B pin	B = V <sub>CC</sub> (B) -0.6V DIR = GND A = open	3V to 5.5V	3V to 5.5V	-	50	μA

**Package Characteristics** ( $V_{CC} = 3.3V$ ,  $T_A = +25^\circ C$ , unless otherwise specified.)

Symbol	Parameter	Package	Test Conditions	Min	Typ	Max	Unit
• JA	Thermal Resistance Junction-to-Ambient	SOT26	Note 6	–	166	–	°C/W
		SOT363		–	371	–	
		SOT563		–	TBD	–	
		DFN1410		–	430	–	
		DFN1409		–	450	–	
		DFN1010		–	510	–	
• JC	Thermal Resistance Junction-to-Case	SOT26	Note 6	–	46	–	°C/W
		SOT363		–	143	–	
		SOT563		–	TBD	–	
		DFN1410		–	190	–	
		DFN1409		–	200	–	
		DFN1010		–	250	–	

Note: 6. Test condition for SOT26, SOT363, DFN1410, DFN1409 and DFN1010 : Device mounted on FR-4 substrate PC board, 2oz copper with minimum recommended pad layout.

**Switching Characteristics** ( $V_{CC} (A) = 1.8V \pm 0.15V$ ,  $T_A = -40^\circ C$  to  $+85^\circ C$ , see Figure 1)

Parameter	From (Input)	To (Output)	$V_{CC}(B) = 1.8V \pm 0.15V$		$V_{CC}(B) = 2.5V \pm 0.2V$		$V_{CC}(B) = 3.3V \pm 0.3V$		$V_{CC}(B) = 5V \pm 0.5V$		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
$t_{pLH}$	A	B	3	17.7	2.2	10.3	1.7	8.3	1.4	7.5	ns
$t_{pHL}$			2.8	14.3	2.2	8.5	1.8	8.1	1.7	7.5	
$t_{pLH}$	B	A	3	17.7	2.3	16	2.1	15.5	1.9	15.1	ns
$t_{pHL}$			2.8	14.3	2.1	12.9	2	12.6	1.8	12.2	
$t_{pHZ}$	DIR	A	5.2	19.4	4.8	18.5	4.7	18.4	5.1	17.1	ns
$t_{pLZ}$			2.3	10.5	2.1	10.5	2.4	10.7	3.1	10.9	
$t_{pHZ}$	DIR	B	6.4	21.9	4.9	11.5	4.6	10.3	2.8	8.2	ns
$t_{pLZ}$			4.2	17	3.7	9.6	3.3	8.8	2.4	8.0	
$t_{pZH}$	DIR	A	–	33.7	–	25.2	–	23.9	–	21.5	ns
$t_{pZL}$			–	36.2	–	24.4	–	22.9	–	20.4	
$t_{pZH}$	DIR	B	–	28.2	–	20.8	–	19	–	18.1	ns
$t_{pZL}$			–	33.7	–	27	–	25.5	–	24.1	

**Switching Characteristics** (cont.) ( $V_{CC} (A) = 2.5V \pm 0.2V$ ,  $T_A = -40^\circ C$  to  $+85^\circ C$ , see Figure 1)

Parameter	From (Input)	To (Output)	$V_{CC}(B) = 1.8V \pm 0.15V$		$V_{CC}(B) = 2.5V \pm 0.2V$		$V_{CC}(B) = 3.3V \pm 0.3V$		$V_{CC}(B) = 5V \pm 0.5V$		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
$t_{pLH}$	A	B	2.3	16	1.5	8.5	1.3	6.4	1.1	5.1	ns
$t_{pHL}$			2.1	12.9	1.4	7.5	1.3	5.4	0.9	4.6	
$t_{pLH}$	B	A	2.2	10.3	1.5	8.5	1.4	8	1	7.5	ns
$t_{pHL}$			2.2	8.5	1.4	7.5	1.3	7	0.9	6.2	
$t_{pHZ}$	DIR	A	3	8.1	3.1	8.1	2.8	8.1	3.2	8.1	ns
$t_{pLZ}$			1.3	5.9	1.3	5.9	1.3	5.9	1	5.8	
$t_{pHZ}$	DIR	B	5.5	23.7	3.6	11.4	3.5	10.2	2.4	7.1	ns
$t_{pLZ}$			3.9	18.9	3.2	9.6	2.8	8.4	1.8	5.3	
$t_{pZH}$	DIR	A	–	29.2	–	18.1	–	16.4	–	12.8	ns
$t_{pZL}$			–	32.2	–	18.9	–	17.2	–	13.3	
$t_{pZH}$	DIR	B	–	21.9	–	14.4	–	12.3	–	10.9	ns

**Switching Characteristics** (cont.) ( $V_{CC}(A) = 3.3V \pm 0.3V$ ,  $T_A = -40^\circ C$  to  $+85^\circ C$ , see Figure 1)

Parameter	From (Input)	To (Output)	$V_{CC}(B) = 1.8V \pm 0.15V$		$V_{CC}(B) = 2.5V \pm 0.2V$		$V_{CC}(B) = 3.3V \pm 0.3V$		$V_{CC}(B) = 5V \pm 0.5V$		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
$t_{pLH}$	A	B	2.1	15.5	1.4	8	0.7	5.8	0.7	4.4	ns
$t_{pHL}$			2	12.6	1.3	7	0.8	5	0.7	4	
$t_{pLH}$	B	A	1.7	8.3	1.3	6.4	0.7	5.8	0.6	5.4	ns
$t_{pHL}$			1.8	7.1	1.3	5.4	0.8	5	0.7	4.5	
$t_{pHZ}$	DIR	A	2.9	7.3	3	7.3	2.8	7.3	3.4	7.3	ns
$t_{pLZ}$			1.8	5.6	1.6	5.6	2.2	5.7	2.2	5.7	
$t_{pHZ}$	DIR	B	4.0	20.5	3.5	10.1	2.9	8.8	2.4	6.8	ns
$t_{pLZ}$			3.3	14.5	2.9	7.8	2.4	7.1	1.7	4.9	
$t_{pZH}$	DIR	A	–	22.8	–	14.2	–	12.9	–	10.3	ns
$t_{pZL}$			–	27.6	–	15.5	–	13.8	–	11.3	
$t_{pZH}$	DIR	B	–	21.1	–	13.6	–	11.5	–	10.1	ns
$t_{pZL}$			–	19.9	–	14.3	–	12.3	–	11.3	

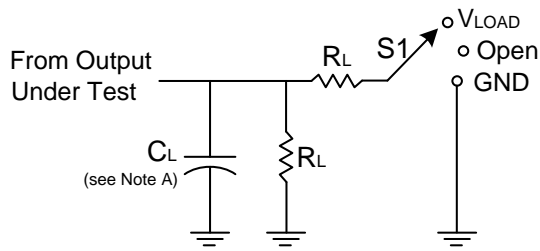
**Switching Characteristics** (cont.) ( $V_{CC}(A) = 5V \pm 0.5V$ ,  $T_A = -40^\circ C$  to  $+85^\circ C$ , see Figure 1)

Parameter	From (Input)	To (Output)	$V_{CC}(B) = 1.8V \pm 0.15V$		$V_{CC}(B) = 2.5V \pm 0.2V$		$V_{CC}(B) = 3.3V \pm 0.3V$		$V_{CC}(B) = 5V \pm 0.5V$		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
$t_{pLH}$	A	B	1.9	15.1	1	7.5	0.6	5.4	0.5	3.9	ns
$t_{pHL}$			1.8	12.2	0.9	6.2	0.7	4.5	0.5	3.5	
$t_{pLH}$	B	A	1.4	8.5	1	5.1	0.7	4.4	0.5	3.9	ns
$t_{pHL}$			1.7	8.5	0.9	4.6	0.7	4	0.5	3.5	
$t_{pHZ}$	DIR	A	2.1	5.4	2.2	5.4	2.2	5.5	2.2	5.4	ns
$t_{pLZ}$			0.9	3.8	1	3.8	1	3.7	0.9	3.7	
$t_{pHZ}$	DIR	B	4.8	20.2	2.5	9.8	1	8.5	2.2	6.5	ns
$t_{pLZ}$			4.2	14.8	2.5	7.4	2.5	7	1.6	4.5	
$t_{pZH}$	DIR	A	–	22	–	12.5	–	11.4	–	8.4	ns
$t_{pZL}$			–	27.2	–	14.4	–	12.5	–	10	
$t_{pZH}$	DIR	B	–	18.9	–	11.3	–	9.1	–	7.6	ns

**Operating Characteristics** ( $T_A = +25^\circ C$ , unless otherwise specified.)

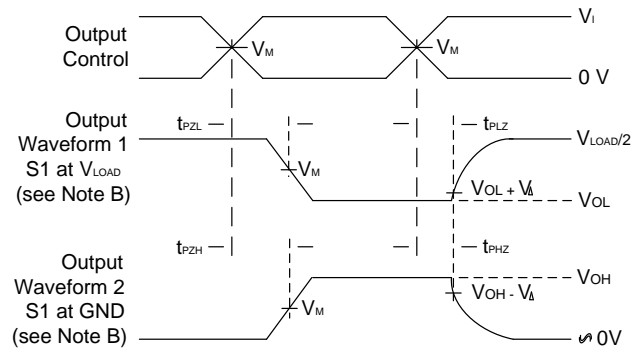
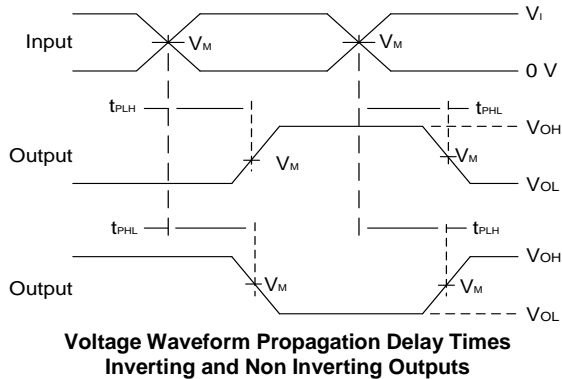
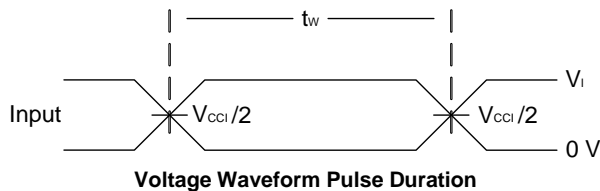
Parameter		Test Conditions	$V_{CC}(A) = V_{CC}(B) = 1.8V$	$V_{CC}(A) = V_{CC}(B) = 2.5V$	$V_{CC}(A) = V_{CC}(B) = 3.3V$	$V_{CC}(A) = V_{CC}(B) = 5V$	Unit
Power Dissipation Capacitance			Typ	Typ	Typ	Typ	
$C_{pd}(A)$	A- input, B- output	$C_L = 0\text{ pF}$ $f = 10\text{ MHz}$ $t_r = t_f = 1\text{ ns}$	3	4	4	4	pF
	B- input, A- output		18	19	20	21	
$C_{pd}(B)$	A- input, B- output	$C_L = 0\text{ pF}$ $f = 10\text{ MHz}$ $t_r = t_f = 1\text{ ns}$	18	19	20	21	pF
	B- input, A- output		3	4	4	4	

**Parameter Measurement Information**



TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	Vload
$t_{PHZ}/t_{PZH}$	GND

$V_{CC}$	Inputs		$V_M$	$V_{LOAD}$	$C_L$	$R_L$	$V_o$
	$V_I$	$t_r/t_f$					
$1.8V \pm 0.15V$	$V_{CCI}$	$\bullet 2ns$	$V_{CCO}/2$	$2 \times V_{CCO}$	15pF	2K $\bullet$	0.15V
$2.5V \pm 0.2V$	$V_{CC}$	$\bullet 2ns$	$V_{CCO}/2$	$2 \times V_{CCO}$	15pF	2K $\bullet$	0.15V
$3.3V \pm 0.3V$	3V	$\bullet 2.5ns$	$V_{CCO}/2$	$2 \times V_{CCO}$	15pF	2K $\bullet$	0.3V
$5V \pm 0.5V$	$V_{CC}$	$\bullet 2.5ns$	$V_{CCO}/2$	$2 \times V_{CCO}$	15pF	2K $\bullet$	0.3V

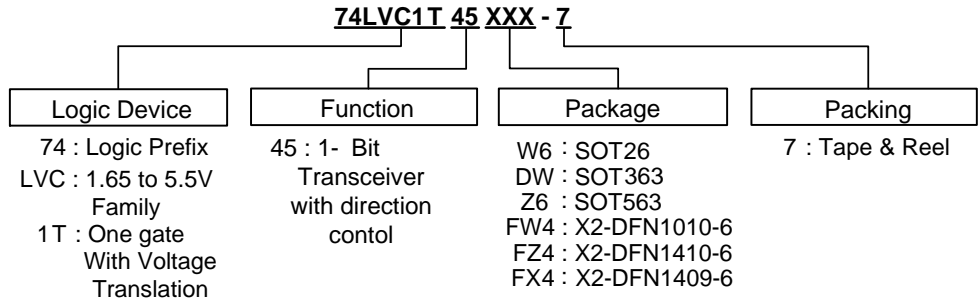


**Figure 1. Load Circuit and Voltage Waveforms**

- Notes:
- A. Includes test lead and test apparatus capacitance.
  - B. Waveform 1 is for an output with input set up as a low and device coming out or into 3-state via DIR control. Waveform 2 is for an output with input set up as a high and device coming out or into 3-state via DIR control.
  - C. All pulses are supplied at pulse repetition rate  $\bullet 10$  MHz
  - D.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - E.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{EN}$ .
  - F.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{PD}$ .
  - G.  $V_{CCI}$  is the  $V_{CC}$  associated with the input.
  - F.  $V_{CCO}$  is the  $V_{CC}$  associated with the output.



## Ordering Information

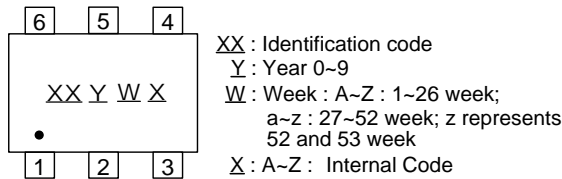


Part Number	Package Code	Packaging	7" Tape and Reel (Note 7)	
			Quantity	Part Number Suffix
74LVC1T45W6-7**	W6	SOT26	3000/Tape & Reel	-7
74LVC1T45DW-7**	DW	SOT363	3000/Tape & Reel	-7
74LVC1T45Z6-7 **	Z6	SOT563	4000/Tape & Reel	-7
74LVC1T45FW4-7	FW4	X2-DFN1010-6	5000/Tape & Reel	-7
74LVC1T45FZ4-7	FZ4	X2-DFN1410-6	5000/Tape & Reel	-7
74LVC1T45FX4-7	FX4	X2-DFN1409-6	5000/Tape & Reel	-7

Notes: 8. The taping orientation is located on our website at <http://www.diodes.com/datasheets/ap02007.pdf>  
 \*\* Future packages.

## Marking Information

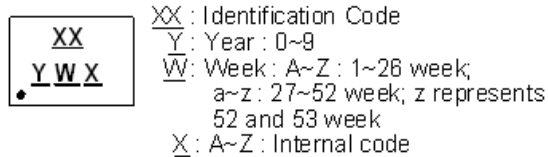
(1) SOT363, SOT563



Part Number	Package	Identification Code
74LVC1T45W6	SOT26	TT
74LVC1T45DW	SOT363	TR
74LVC1T45Z6	SOT563	TS

(2) X2-DFN1010-6, X2-DFN1410-6, and X2-DFN1409-6

(Top View)

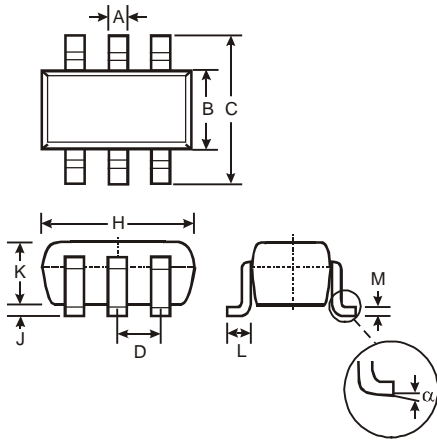


Part Number	Package	Identification Code
74LVC1T45FW4	X2-DFN1010-6	TR
74LVC1T45FX4	X2-DFN1409-6	TT
74LVC1T45FZ4	X2-DFN1410-6	TS

**Package Outline Dimensions** (All dimensions in mm.)

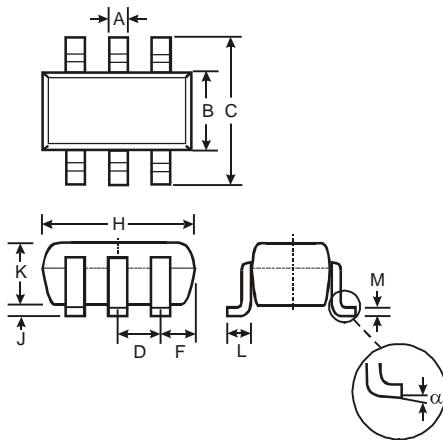
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

(1) Package Type: SOT26



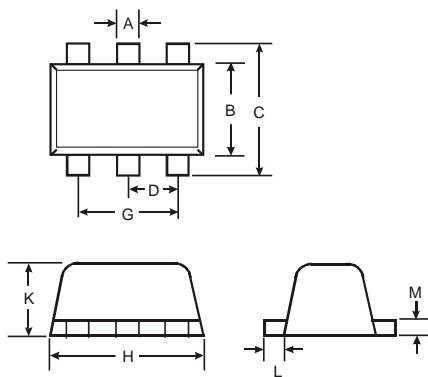
SOT26			
Dim	Min	Max	Typ
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	—	—	0.95
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
α	0°	8°	—
All Dimensions in mm			

(2) Package Type: SOT363



SOT363		
Dim	Min	Max
A	0.10	0.30
B	1.15	1.35
C	2.00	2.20
D	0.65 Typ	
F	0.40	0.45
H	1.80	2.20
J	0	0.10
K	0.90	1.00
L	0.25	0.40
M	0.10	0.22
α	0°	8°
All Dimensions in mm		

(3) Package Type: SOT563

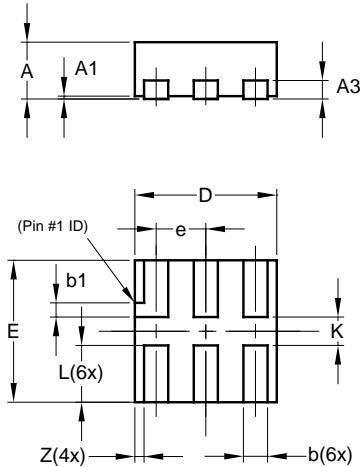


SOT563			
Dim	Min	Max	Typ
A	0.15	0.30	0.20
B	1.10	1.25	1.20
C	1.55	1.70	1.60
D	-	-	0.50
G	0.90	1.10	1.00
H	1.50	1.70	1.60
K	0.55	0.60	0.60
L	0.10	0.30	0.20
M	0.10	0.18	0.11
All Dimensions in mm			

**Package Outline Dimensions** (cont.) (All dimensions in mm.)

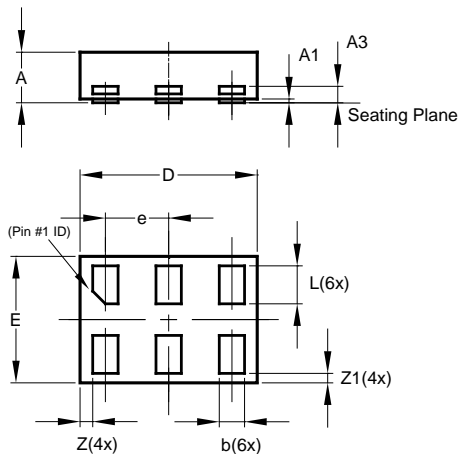
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

**(4) Package Type X2-DFN1010-6**



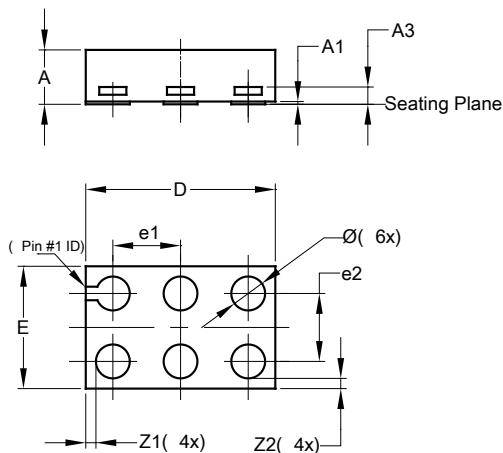
X2-DFN1010-6			
Dim	Min	Max	Typ
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.14	0.20	0.17
b1	0.05	0.15	0.10
D	0.95	1.05	1.00
E	0.95	1.05	1.00
e	—	—	0.35
L	0.35	0.45	0.40
K	0.15	—	—
Z	—	—	0.065
All Dimensions in mm			

**(5) Package Type: X2-DFN1410-6**



X2-DFN1410-6			
Dim	Min	Max	Typ
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.15	0.25	0.20
D	1.35	1.45	1.40
E	0.95	1.05	1.00
e	—	—	0.50
L	0.25	0.35	0.30
Z	—	—	0.10
Z1	0.045	0.105	0.075
All Dimensions in mm			

**(6) Package Type: X2-DFN1409-6 CHIP SCALE ALTERNATIVE**

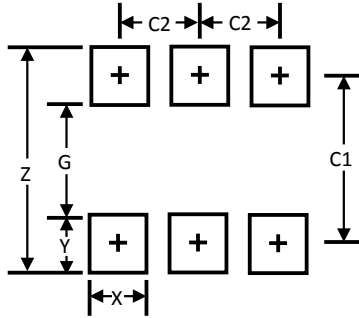


X2-DFN1409-6			
Dim	Min	Max	Typ
A	-	0.40	0.39
A1	0	0.05	0.02
A3	-	-	0.13
Ø	0.20	0.30	0.25
D	1.35	1.45	1.40
E	0.85	0.95	0.90
e1	-	-	0.50
e2	-	-	0.50
Z1	-	-	0.075
Z2	-	-	0.075
All Dimensions in mm			

## Suggested Pad Layout

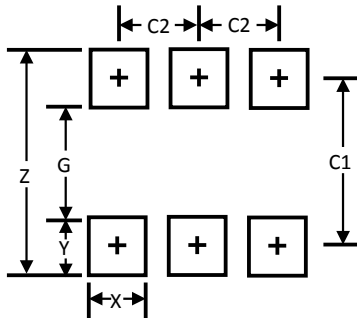
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

### (1) Package Type: SOT26



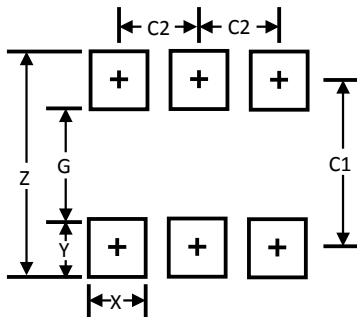
Dimensions	Value (in mm)
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95

### (2) Package Type: SOT363



Dimensions	Value (in mm)
Z	2.5
G	1.3
X	0.42
Y	0.6
C1	1.9
C2	0.65

### (3) Package Type: SOT563

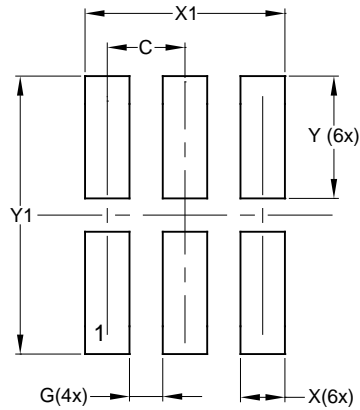


Dimensions	Value (in mm)
Z	2.2
G	1.2
X	0.375
Y	0.5
C1	1.7
C2	0.5

**Suggested Pad Layout (cont.)**

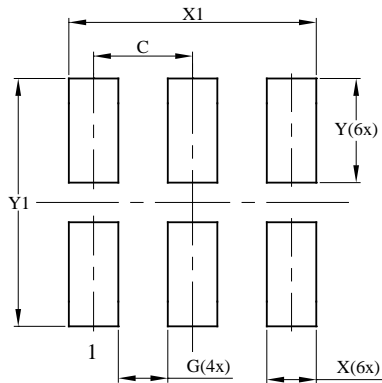
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

**(4) Package Type X2-DFN1010-6**



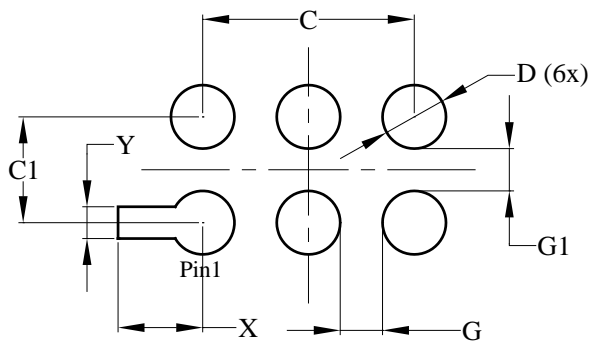
Dimensions	Value (in mm)
C	0.350
G	0.150
X	0.200
X1	0.900
Y	0.550
Y1	1.250

**(5) Package Type: X2-DFN1410-6**



Dimensions	Value (in mm)
C	0.500
G	0.250
X	0.250
X1	1.250
Y	0.525
Y1	1.250

**(6) Package Type: X2-DFN1409-6**



Dimensions	Value (in mm)
C	1.000
C1	0.500
D	0.300
G	0.200
G1	0.200
X	0.400
Y	0.150

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