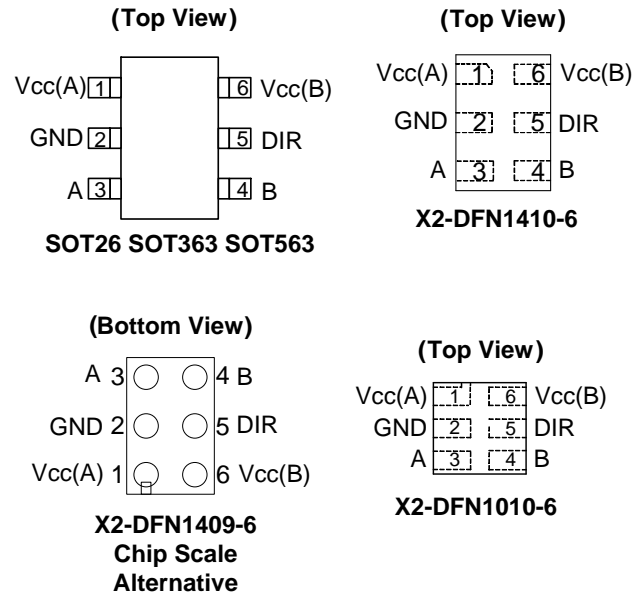


SINGLE BIT DUAL POWER SUPPLY TRANSLATING TRANSCEIVER WITH 3 STATE OUTPUTS
Description

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
- ± 24 mA Output Drive at 3.3V
- CMOS low power consumption 16 μ 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 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

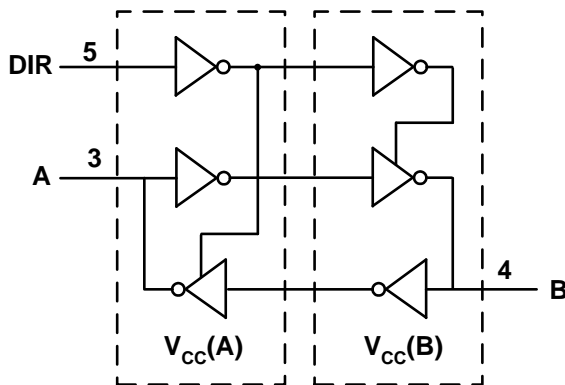
- Voltage Level Translation
Well suited to join logic types operating at different voltages
- Power Down Signal Isolation
If either voltage domain is turned off the signal is isolated and there is no loading on signal lines
- Wide array of products such as:
 - Cell Phones, Tablets, E-Readers
 - PCs, 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

[Click for Ordering Information](#)

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_A = +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 _{CC(A)} , V _{CC(B)} | Supply Voltage Range | -0.5 to +6.5 | V |
| V _I | Input Voltage Range | -0.5 to +6.5 | V |
| V _O | Voltage Applied to Output in High Impedance or I _{OFF} State | -0.5 to +6.5 | V |
| V _O | Voltage Applied to Output in High or Low State | A pin | -0.3 to V _{CC(A)} +0.5 |
| | | B pin | -0.3 to V _{CC(B)} +0.5 |
| I _{IK} | Input Clamp Current V _I <0 | -50 | mA |
| I _{OK} | Output Clamp Current | -50 | mA |
| I _O | Continuous Output Current | ±50 | mA |
| | Continuous Current Through V _{CC} or GND | ±100 | mA |
| T _J | Operating Junction Temperature | -40 to +150 | °C |
| T _{STG} | 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_A = +25°C, unless otherwise specified.)

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

Note: 5. Unused inputs should be held at V_{CC} or Ground.

Electrical Characteristics (@T_A = +40°C to +85°C, unless otherwise specified.)

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

Electrical Characteristics (@ $T_A = +40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, unless otherwise specified.)

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

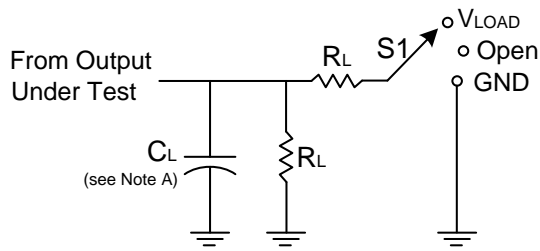
Switching Characteristics (cont.) ($V_{CC(A)} = 5V \pm 0.5V$, $T_A = -40^\circ C$ to $+85^\circ C$, see Figure 1)

| 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 | $C_L = 0 pF$ $f = 10 MHz$ $t_r = t_f = 1 ns$ | 3 | 4 | 4 | 4 | pF |
| | B- input, A- output | | 18 | 19 | 20 | 21 | |
| $C_{pd(B)}$ | A- input, B- output | $C_L = 0 pF$ $f = 10 MHz$ $t_r = t_f = 1 ns$ | 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 |

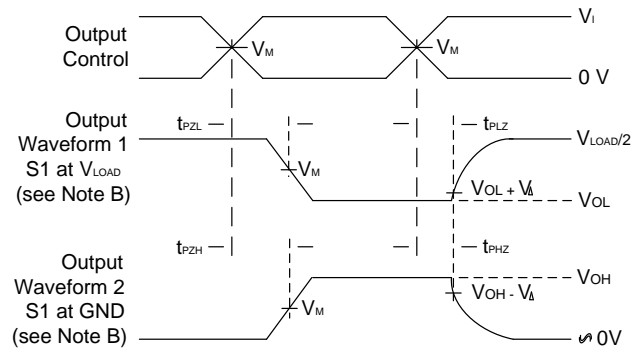
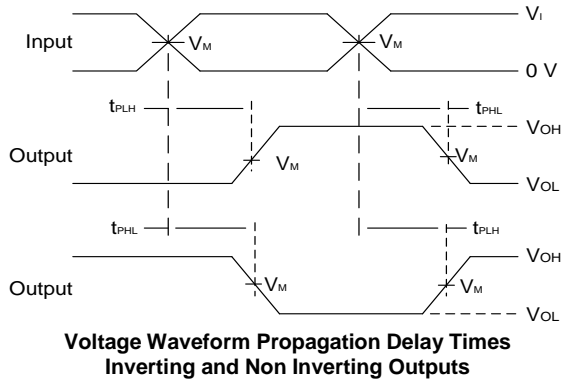
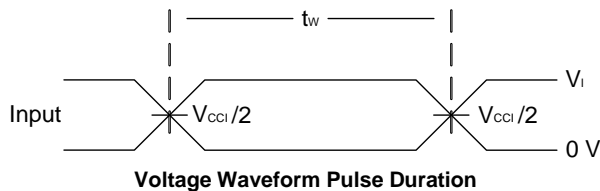
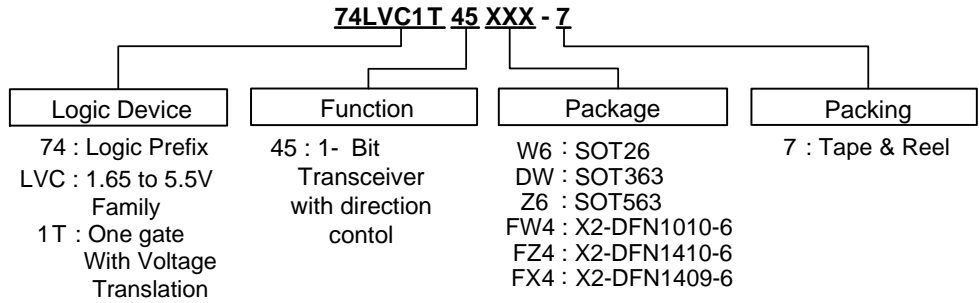


Figure 1. Load Circuit and Voltage Waveforms

- 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

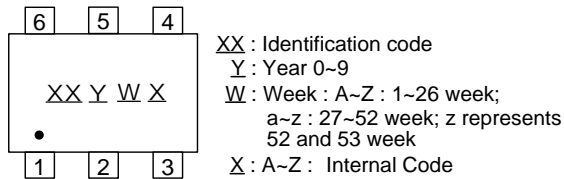


| Part Number | Package Code | Packaging | 7" Tape and Reel (Note 7) | |
|------------------|--------------|--------------|---------------------------|--------------------|
| | | | Quantity | Part Number Suffix |
| 74LVC1T45W6-7** | W6 | SOT26 | 3000/Tape & Reel | -7 |
| 74LVC1T45DW-7** | DW | SOT363 | 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

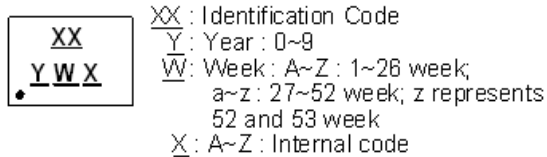
(1) SOT363, SOT563



| 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)

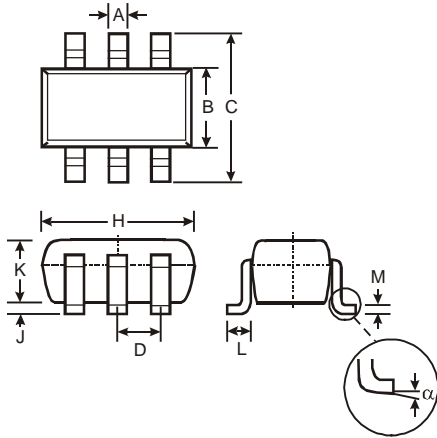


| Part Number | Package | Identification Code |
|--------------|--------------|---------------------|
| 74LVC1T45FW4 | X2-DFN1010-6 | TR |
| 74LVC1T45FX4 | X2-DFN1409-6 | TT |
| 74LVC1T45FZ4 | X2-DFN1410-6 | TS |

Package Outline Dimensions (All dimensions in mm.)

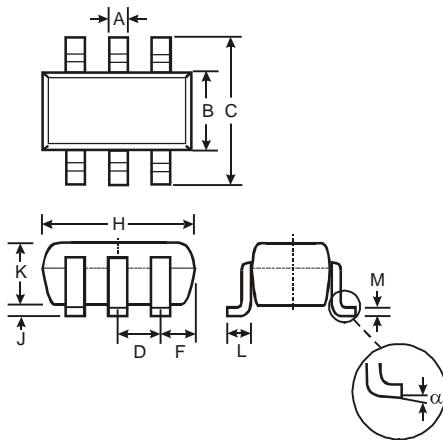
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

(1) Package Type: SOT26



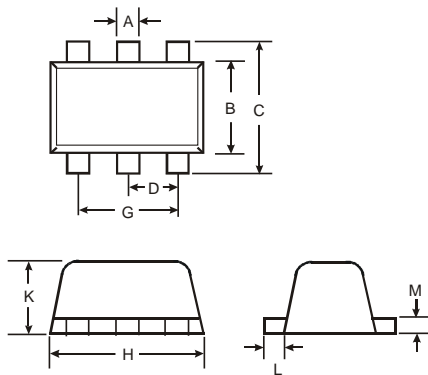
| SOT26 | | | |
|----------------------|-------|------|------|
| Dim | Min | Max | Typ |
| A | 0.35 | 0.50 | 0.38 |
| B | 1.50 | 1.70 | 1.60 |
| C | 2.70 | 3.00 | 2.80 |
| D | — | — | 0.95 |
| H | 2.90 | 3.10 | 3.00 |
| J | 0.013 | 0.10 | 0.05 |
| K | 1.00 | 1.30 | 1.10 |
| L | 0.35 | 0.55 | 0.40 |
| 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

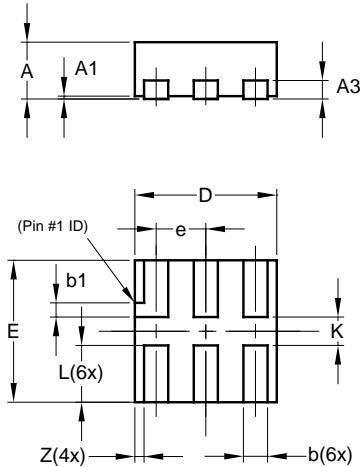


| SOT563 | | | |
|----------------------|------|------|------|
| Dim | Min | Max | Typ |
| A | 0.15 | 0.30 | 0.20 |
| B | 1.10 | 1.25 | 1.20 |
| C | 1.55 | 1.70 | 1.60 |
| D | - | - | 0.50 |
| G | 0.90 | 1.10 | 1.00 |
| H | 1.50 | 1.70 | 1.60 |
| K | 0.55 | 0.60 | 0.60 |
| L | 0.10 | 0.30 | 0.20 |
|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

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

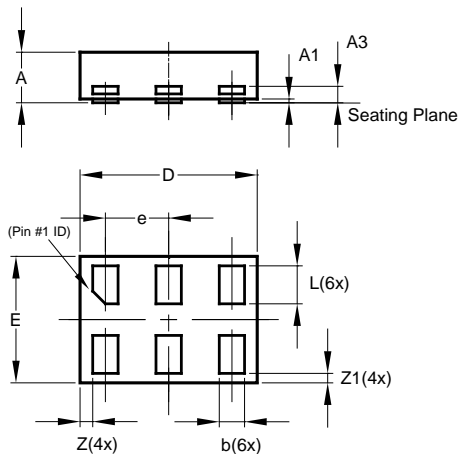
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

(4) Package Type X2-DFN1010-6



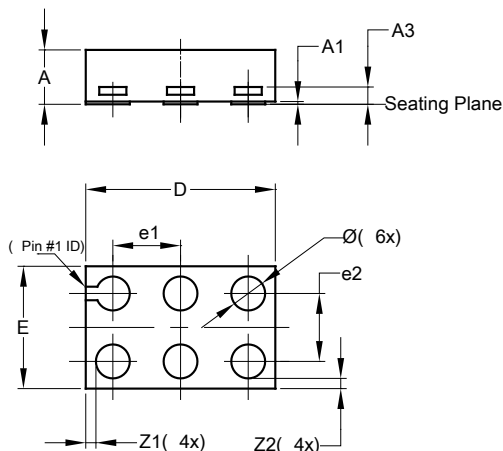
| X2-DFN1010-6 | | | |
|----------------------|------|------|-------|
| Dim | Min | Max | Typ |
| A | — | 0.40 | 0.39 |
| A1 | 0.00 | 0.05 | 0.02 |
| A3 | — | — | 0.13 |
| b | 0.14 | 0.20 | 0.17 |
| b1 | 0.05 | 0.15 | 0.10 |
| D | 0.95 | 1.05 | 1.00 |
| E | 0.95 | 1.05 | 1.00 |
| e | — | — | 0.35 |
| 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

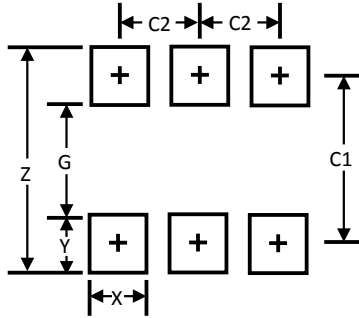


| X2-DFN1409-6 | | | |
|----------------------|------|------|-------|
| Dim | Min | Max | Typ |
| A | - | 0.40 | 0.39 |
| A1 | 0 | 0.05 | 0.02 |
| A3 | - | - | 0.13 |
| Ø | 0.20 | 0.30 | 0.25 |
| D | 1.35 | 1.45 | 1.40 |
| E | 0.85 | 0.95 | 0.90 |
| e1 | - | - | 0.50 |
| e2 | - | - | 0.50 |
| Z1 | -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

Suggested Pad Layout

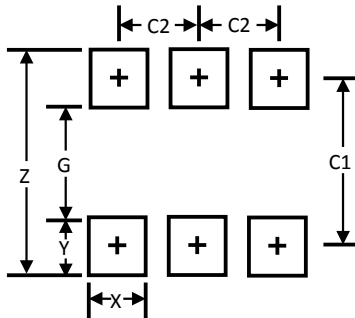
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

(1) Package Type: SOT26



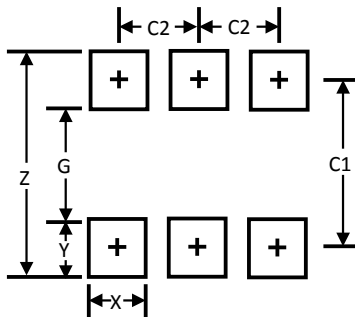
| Dimensions | Value (in mm) |
|------------|---------------|
| Z | 3.20 |
| G | 1.60 |
| X | 0.55 |
| Y | 0.80 |
| C1 | 2.40 |
| C2 | 0.95 |

(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

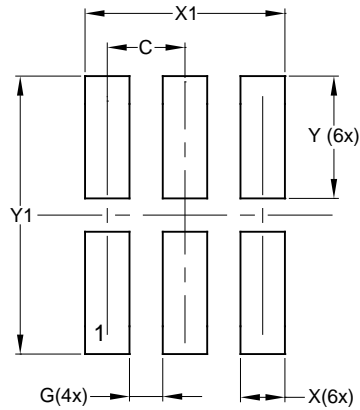


| Dimensions | Value (in mm) |
|------------|---------------|
| Z | 2.2 |
| G | 1.2 |
| X | 0.375 |
| Y | 0.5 |
| C1 | 1.7 |
| C2 | 0.5 |

Suggested Pad Layout (cont.)

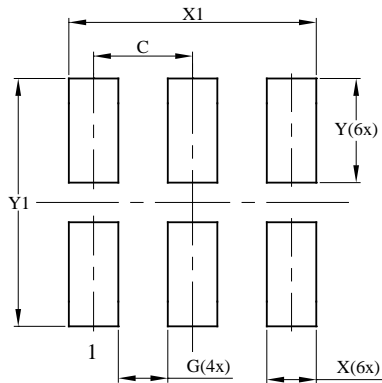
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

(4) Package Type X2-DFN1010-6



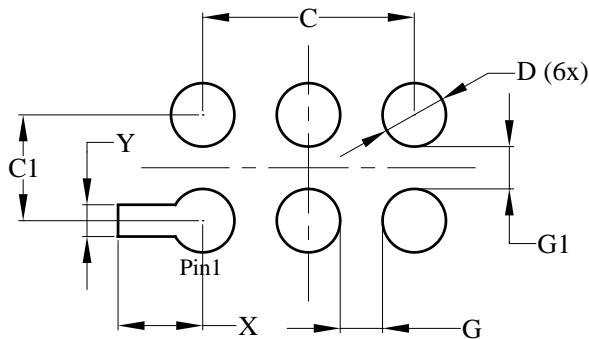
| Dimensions | Value (in mm) |
|------------|---------------|
| C | 0.350 |
| G | 0.150 |
| X | 0.200 |
| X1 | 0.900 |
| Y | 0.550 |
| Y1 | 1.250 |

(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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