

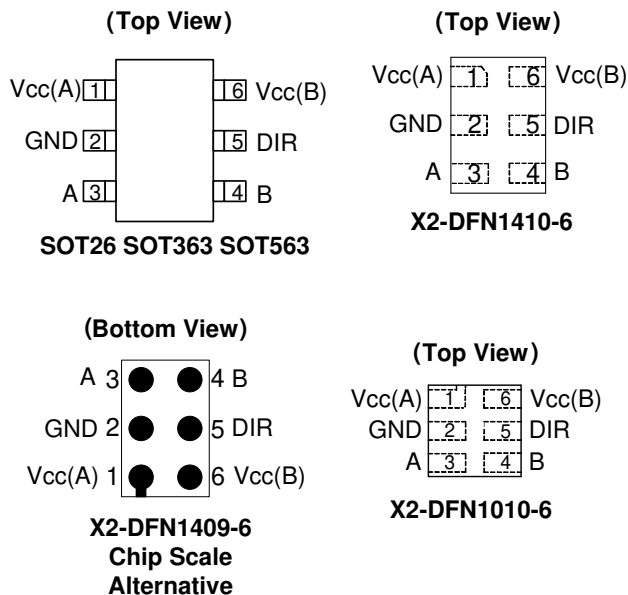
# SINGLE BIT DUAL POWER SUPPLY TRANSLATING TRANSCEIVER WITH 3 STATE OUTPUTS

## Description

The 74LVC1T45 is a single-bit, dual-supply transceiver with tri-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 tri-state feature occurs when either of the power supply voltages are zero. This is also an Ioff feature and allows for the output to remain in a high impedance state with both power supplies at 0V, which prevents and damages backflow currents and provides 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
- $\pm 24mA$  Output Drive at 3.3V
- CMOS Low Power Consumption 16 $\mu A$  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)
  - 2000-V Human Body Model (A114)
  - 1000 V Charged Device Model (C101)
- Latch-up Exceeds 100mA per JESD 78, Class I
- 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)**

## 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

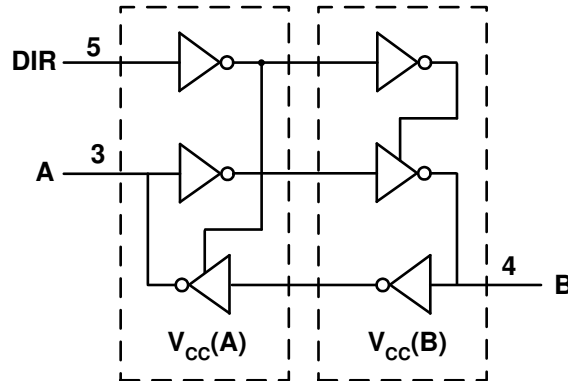
Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See <https://www.diodes.com/quality/lead-free/> 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.

## Pin Descriptions

| Pin Name | Pin | Function                                |
|----------|-----|-----------------------------------------|
| VCC(A)   | 1   | Supply for I/O Pin A; 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<br>DIR (Direction Pin) | Operation          |
|------------------------------|--------------------|
| L                            | B Data to A Output |
| H                            | A Data to B Output |

| Inputs |        |     | Outputs |        |
|--------|--------|-----|---------|--------|
| A      | B      | DIR | A       | B      |
| Note 4 | L      | L   | L       | Note 4 |
| Note 4 | H      | L   | H       | Note 4 |
| L      | Note 4 | H   | Note 4  | L      |
| H      | Note 4 | H   | Note 4  | H      |

Note: 4. Pin condition not applicable as defined by DIR.

## Absolute Maximum Ratings (Note 5) (@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</sub> (A), V <sub>CC</sub> (B) | 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</sub> (A) +0.5 |
|                                          |                                                                       | B Pin        | -0.3 to V <sub>CC</sub> (B) +0.5 |
| 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                               |

Note: 5. 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 6) (@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     | —                         | -24                       |       |
|                    |                                                                        |                | —                                | V <sub>CC</sub> = 4.5V to 5.5V   | —                         | -32                       |       |
| I <sub>OL</sub>    | Low-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     | —                         | 24                        |       |
|                    |                                                                        |                | —                                | V <sub>CC</sub> = 4.5V to 5.5V   | —                         | 32                        |       |
| Δt/ΔV              | 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  | —                         | —                         |       |
| T <sub>A</sub>     | Operating Free-Air Temperature                                         |                | —                                | —                                | -40                       | +125                      | °C    |

Note: 6. 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                                  | 0                   | 0V to 5.5V          | —                      | —   | ± 1 | —                               | ±2   | μA   |
|                                     |                            | B Pin                                              |                                                                               | 0 to 5.5V           | 0                   | —                      | —   | ± 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<br>I <sub>O</sub> = 0 |                                                                               | 1.65V to 5.5V       | 1.65V to 5.5V       | —                      | —   | —   | —                               | 3    | μA   |
|                                     |                            |                                                    |                                                                               | 5.5V                | 0                   | —                      | —   | —   | —                               | 2    |      |
|                                     |                            |                                                    |                                                                               | 0                   | 5.5V                | —                      | —   | —   | —                               | -2   |      |
| I <sub>CCB</sub>                    | Supply Current             | V <sub>I</sub> = 5.5V or GND<br>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   |
| ΔI <sub>CCA</sub>                   | Additional Supply Current  | A Pin                                              | A = V <sub>CC</sub> (A) -0.6V<br>DIR = V <sub>CC</sub> (A)<br>B = Open        | 3V to 5.5V          | 3V to 5.5V          | —                      | —   | —   | —                               | 50   | μA   |
|                                     |                            | DIR                                                | DIR = V <sub>CC</sub> (A) -0.6V<br>A = V <sub>CC</sub> (A) or GND<br>B = Open |                     |                     |                        |     |     |                                 | 50   |      |
| ΔI <sub>CCB</sub>                   | Additional Supply Current  | B Pin                                              | B = V <sub>CC</sub> (B) -0.6V<br>DIR = GND<br>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</sub> (A) | V <sub>CC</sub> (B) | 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</sub> (A) 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                                | 0                   | 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<br>V <sub>O</sub> =V <sub>CC</sub> (B)<br>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<br>V <sub>O</sub> = V <sub>CC</sub> (A)<br>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<br>I <sub>O</sub> = 0                        |                                                                             | 1.65V to 5.5V       | 1.65V to 5.5V       | —                                | 3    | μA   |
|                                     |                            |                                                                           |                                                                             | 5.5V                | 0                   | —                                | 2    |      |
|                                     |                            |                                                                           |                                                                             | 0                   | 5.5V                | —                                | -2   |      |
| I <sub>CCB</sub>                    | Supply Current             | V <sub>I</sub> = 5.5V or GND<br>I <sub>O</sub> = 0                        |                                                                             | 1.65V to 5.5V       | 1.65V to 5.5V       | —                                | 3    | μA   |
|                                     |                            |                                                                           |                                                                             | 5.5V                | 0                   | —                                | 2    |      |
|                                     |                            |                                                                           |                                                                             | 0                   | 5.5V                | —                                | -2   |      |
| I <sub>CCA</sub> + I <sub>CCB</sub> | Supply Current             | V <sub>I</sub> = 5.5V or GND<br>I <sub>O</sub> = 0                        |                                                                             | 1.65V to 5.5V       | 1.65V to 5.5V       | —                                | 4    | μA   |
| ΔI <sub>CCA</sub>                   | Additional Supply Current  | A Pin                                                                     | A = V <sub>CC</sub> (A) -0.6V<br>DIR = V <sub>CC</sub> (A)<br>B = Open      | 3V to 5.5V          | 3V to 5.5V          | —                                | 50   | μA   |
|                                     |                            | DIR                                                                       | DIR= V <sub>CC</sub> (A) -0.6V<br>A= V <sub>CC</sub> (A) or GND<br>B = Open |                     |                     |                                  | 50   |      |
| ΔI <sub>CCB</sub>                   | Additional Supply Current  | B Pin                                                                     | B = V <sub>CC</sub> (B) -0.6V<br>DIR = GND<br>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         |
|---------------|----------------------------------------|---------|-----------------|-----|-----|-----|--------------|
| $\Theta_{JA}$ | Thermal Resistance Junction-to-Ambient | SOT26   | Note 7          | —   | 166 | —   | $^\circ C/W$ |
|               |                                        | SOT363  |                 | —   | 371 | —   |              |
|               |                                        | SOT563  |                 | —   | 290 | —   |              |
|               |                                        | DFN1410 |                 | —   | 430 | —   |              |
|               |                                        | DFN1409 |                 | —   | 450 | —   |              |
|               |                                        | DFN1010 |                 | —   | 510 | —   |              |
| $\Theta_{JC}$ | Thermal Resistance Junction-to-Case    | SOT26   | Note 7          | —   | 46  | —   | $^\circ C/W$ |
|               |                                        | SOT363  |                 | —   | 143 | —   |              |
|               |                                        | SOT563  |                 | —   | 96  | —   |              |
|               |                                        | DFN1410 |                 | —   | 190 | —   |              |
|               |                                        | DFN1409 |                 | —   | 200 | —   |              |
|               |                                        | DFN1010 |                 | —   | 250 | —   |              |

Note: 7. Test condition for SOT26, SOT363, DFN1410, DFN1409 and DFN1010: Device mounted on FR-4 substrate PCB, 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** (continued) ( $V_{CC}(A) = 2.5V \pm 0.2V$ ,  $T_A = -40^\circ C$  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** (continued) ( $V_{CC}(A) = 3.3V \pm 0.3V$ ,  $T_A = -40^\circ C$  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 |      |

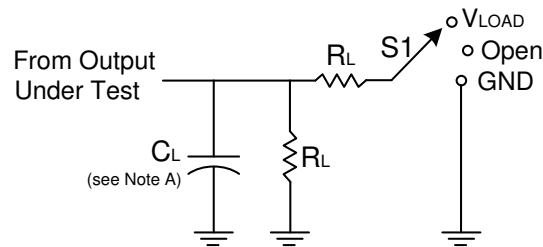
**Switching Characteristics** (continued) ( $V_{CC}(A) = 5V \pm 0.5V$ ,  $T_A = -40^\circ C$  to  $+85^\circ C$ , see Figure 1)

| 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.)

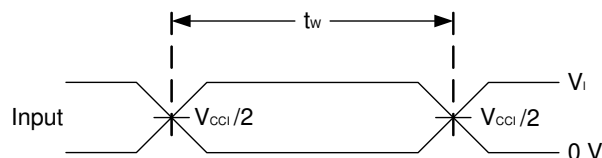
| Parameter<br>Power Dissipation Capacitance |                     | Test<br>Conditions                               | $V_{CC}(A) =$<br>$V_{CC}(B) = 1.8V$ | $V_{CC}(A) =$<br>$V_{CC}(B) = 2.5V$ | $V_{CC}(A) =$<br>$V_{CC}(B) = 3.3V$ | $V_{CC}(A) =$<br>$V_{CC}(B) = 5V$ | Unit |
|--------------------------------------------|---------------------|-------------------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

## Parameter Measurement Information

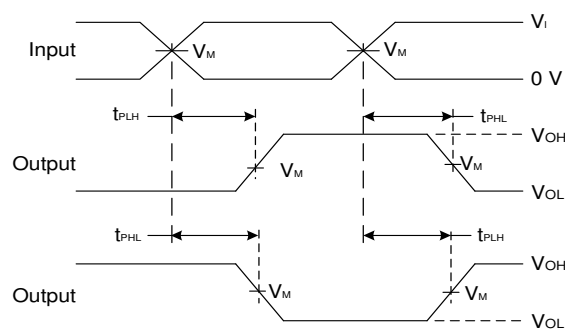


| TEST              | S1         |
|-------------------|------------|
| $t_{PLH}/t_{PHL}$ | Open       |
| $t_{PLZ}/t_{PZL}$ | $V_{LOAD}$ |
| $t_{PHZ}/t_{PZH}$ | GND        |

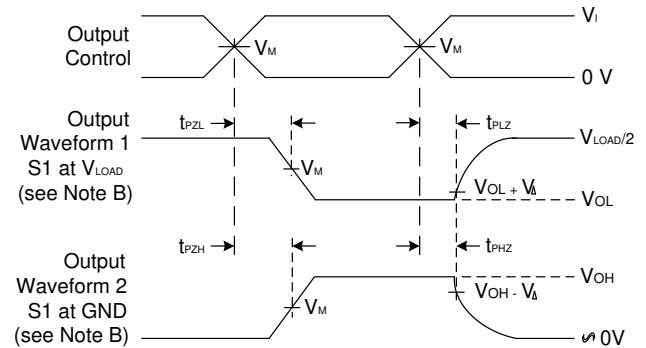
| $V_{CC}$         | Inputs    |              | $V_M$       | $V_{LOAD}$         | $C_L$ | $R_L$       | $V_{\Delta}$ |
|------------------|-----------|--------------|-------------|--------------------|-------|-------------|--------------|
|                  | $V_I$     | $t_r/t_f$    |             |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



Voltage Waveform Pulse Duration



Voltage Waveform Propagation Delay Times  
Inverting and Non Inverting Outputs

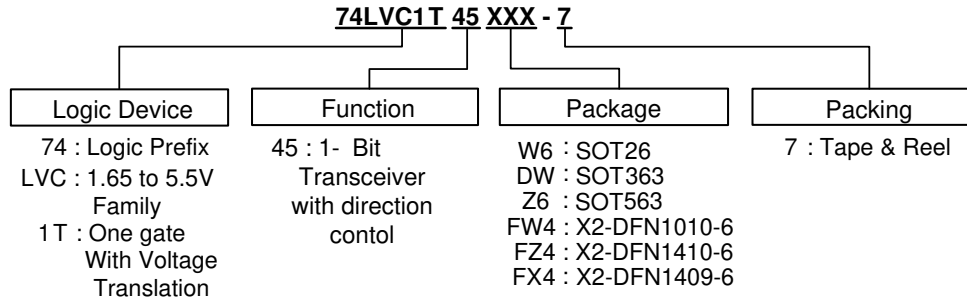


Voltage Waveform Enable and Disable Times  
Low and High Level Enabling

Figure 1 Load Circuit and Voltage Waveforms

- Notes:
- Includes test lead and test apparatus capacitance.
  - 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.
  - All pulses are supplied at pulse repetition rate  $\leq 10$  MHz.
  - $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{EN}$ .
  - $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{PD}$ .
  - $V_{CCI}$  is the  $V_{CC}$  associated with the input.
  - $V_{CCO}$  is the  $V_{CC}$  associated with the output.

## Ordering Information

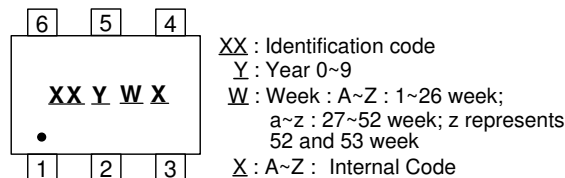


| Part Number    | Package Code | Packaging    | 7" Tape and Reel (Note 7) |                    |
|----------------|--------------|--------------|---------------------------|--------------------|
|                |              |              | Quantity                  | Part Number Suffix |
| 74LVC1T45W6-7  | 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                 |

Note: 16. The taping orientation is located on our website at <http://www.diodes.com/package-outlines.html>.

## Marking Information

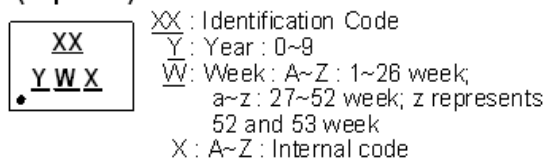
### (1) SOT363, SOT563



| 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)

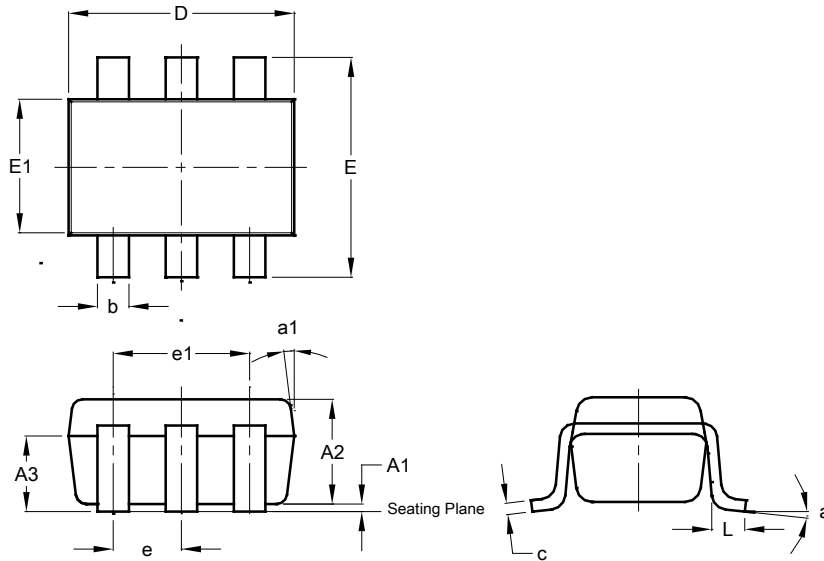


| Part Number  | Package      | Identification Code |
|--------------|--------------|---------------------|
| 74LVC1T45FW4 | X2-DFN1010-6 | TR                  |
| 74LVC1T45FX4 | X2-DFN1409-6 | TT                  |
| 74LVC1T45FZ4 | X2-DFN1410-6 | TS                  |

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

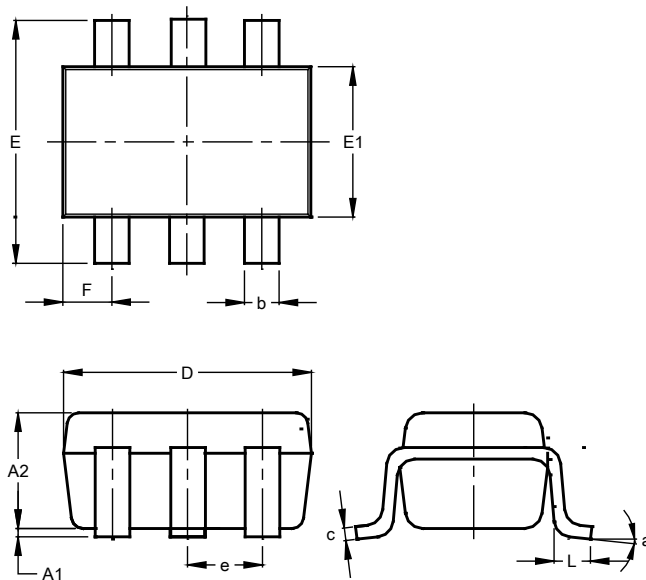
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### (1) Package Type: SOT26



| SOT26 (SC74R)        |       |      |      |
|----------------------|-------|------|------|
| Dim                  | Min   | Max  | Typ  |
| A1                   | 0.013 | 0.10 | 0.05 |
| A2                   | 1.00  | 1.30 | 1.10 |
| A3                   | 0.70  | 0.80 | 0.75 |
| b                    | 0.35  | 0.50 | 0.38 |
| c                    | 0.10  | 0.20 | 0.15 |
| D                    | 2.90  | 3.10 | 3.00 |
| e                    | —     | —    | 0.95 |
| e1                   | —     | —    | 1.90 |
| E                    | 2.70  | 3.00 | 2.80 |
| E1                   | 1.50  | 1.70 | 1.60 |
| L                    | 0.35  | 0.55 | 0.40 |
| a                    | —     | —    | 8°   |
| a1                   | —     | —    | 7°   |
| All Dimensions in mm |       |      |      |

### (2) Package Type: SOT363

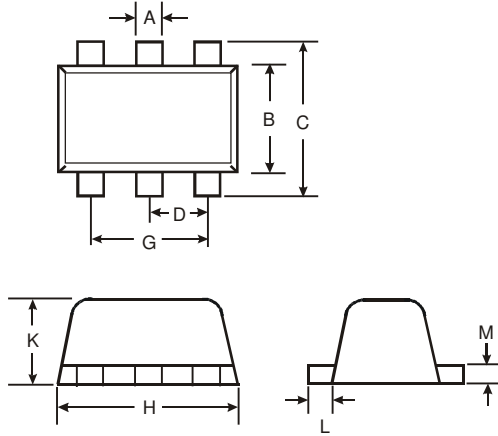


| SOT363               |           |      |       |
|----------------------|-----------|------|-------|
| Dim                  | Min       | Max  | Typ   |
| A1                   | 0.00      | 0.10 | 0.05  |
| A2                   | 0.90      | 1.00 | 0.95  |
| b                    | 0.10      | 0.30 | 0.25  |
| c                    | 0.10      | 0.22 | 0.11  |
| D                    | 1.80      | 2.20 | 2.15  |
| E                    | 2.00      | 2.20 | 2.10  |
| E1                   | 1.15      | 1.35 | 1.30  |
| e                    | 0.650 BSC |      |       |
| F                    | 0.40      | 0.45 | 0.425 |
| L                    | 0.25      | 0.40 | 0.30  |
| a                    | 0°        | 8°   | —     |
| All Dimensions in mm |           |      |       |

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

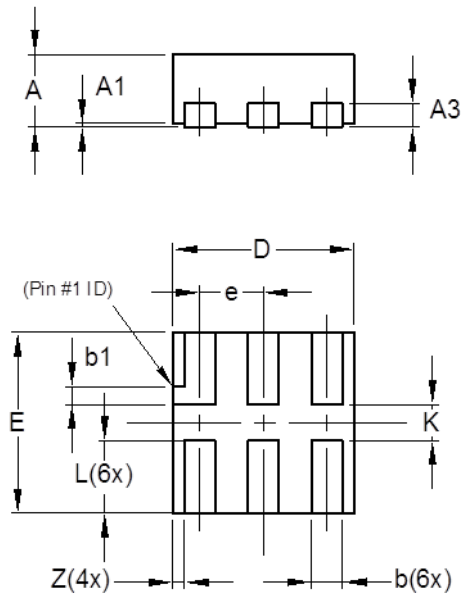
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### (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 |      |      |      |

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

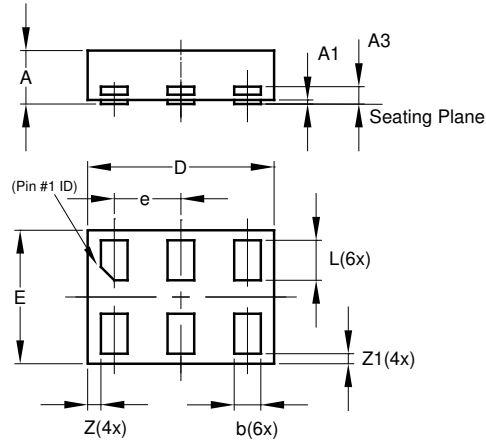


| X2-DFN1010-6         |      |      |       |
|----------------------|------|------|-------|
| Dim                  | Min  | Max  | Typ   |
| A                    | —    | 0.40 | 0.39  |
| A1                   | 0.00 | 0.05 | 0.02  |
| A3                   | —    | —    | 0.13  |
| b                    | 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 |      |      |       |

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

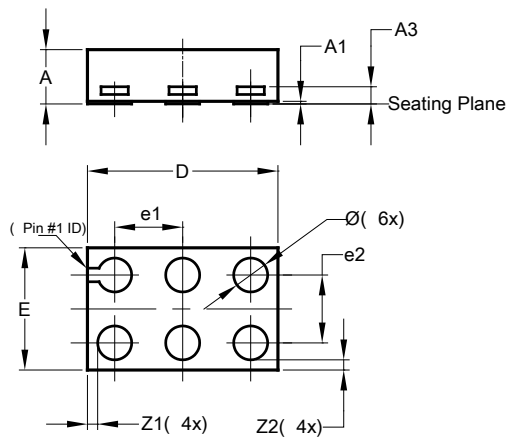
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### (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

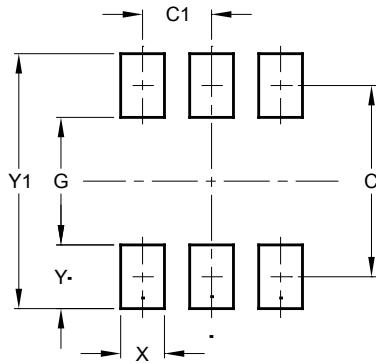


| X2-DFN1409-6         |      |      |       |
|----------------------|------|------|-------|
| Dim                  | Min  | Max  | Typ   |
| A                    | -    | 0.40 | 0.39  |
| A1                   | 0    | 0.05 | 0.02  |
| A3                   | -    | -    | 0.13  |
| Ø                    | 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

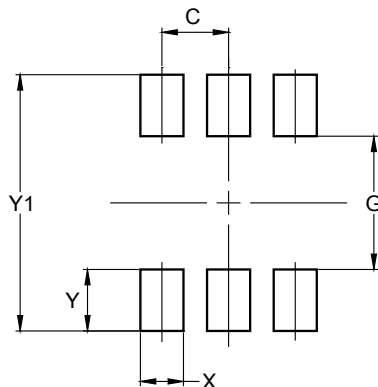
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### (1) Package Type: SOT26



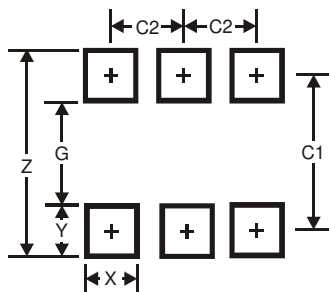
| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 2.40          |
| C1         | 0.95          |
| G          | 1.60          |
| X          | 0.55          |
| Y          | 0.80          |
| Y1         | 3.20          |

### (2) Package Type: SOT363



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.650         |
| G          | 1.300         |
| X          | 0.420         |
| Y          | 0.600         |
| Y1         | 2.500         |

### (3) Package Type: SOT563

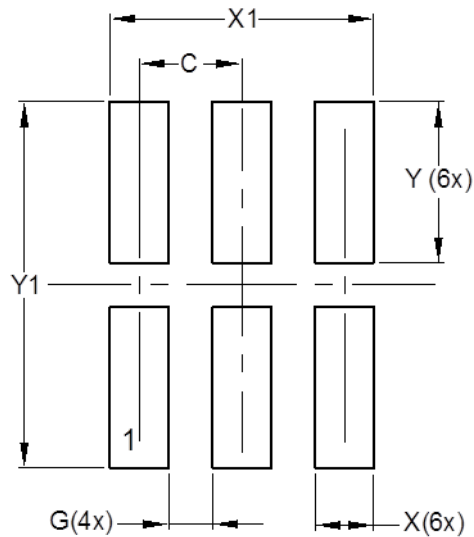


| Dimensions | SOT563 |
|------------|--------|
| Z          | 2.2    |
| G          | 1.2    |
| X          | 0.375  |
| Y          | 0.5    |
| C1         | 1.7    |
| C2         | 0.5    |

## Suggested Pad Layout

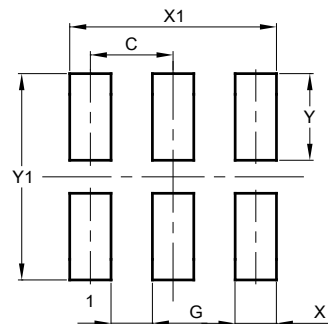
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

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



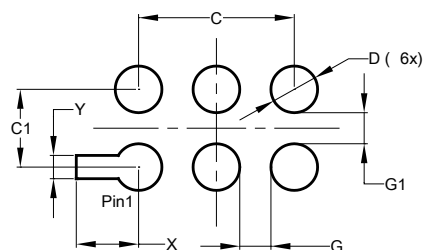
| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.350         |
| G          | 0.150         |
| X          | 0.200         |
| X1         | 0.900         |
| Y          | 0.550         |
| Y1         | 1.250         |

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



| Dimension s | 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         |

**IMPORTANT NOTICE**

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel. Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and determinative format released by Diodes Incorporated.

**LIFE SUPPORT**

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or
2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

Copyright © 2018, Diodes Incorporated

[www.diodes.com](http://www.diodes.com)