

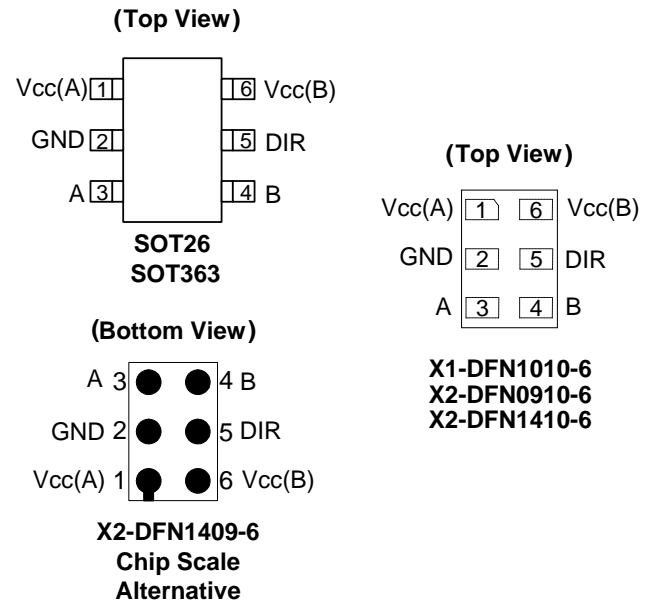
**SINGLE BIT DUAL POWER SUPPLY TRANSLATING TRANSCEIVER WITH 3 STATE OUTPUTS**

## Description

The 74AVC1T45 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 1.2V to 3.6V. 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 preventing damaging backflow currents and providing power down electrical isolation up to 3.6 V as not to interfere with any logic activity on pin A or B.

## Pin Assignments



## Features

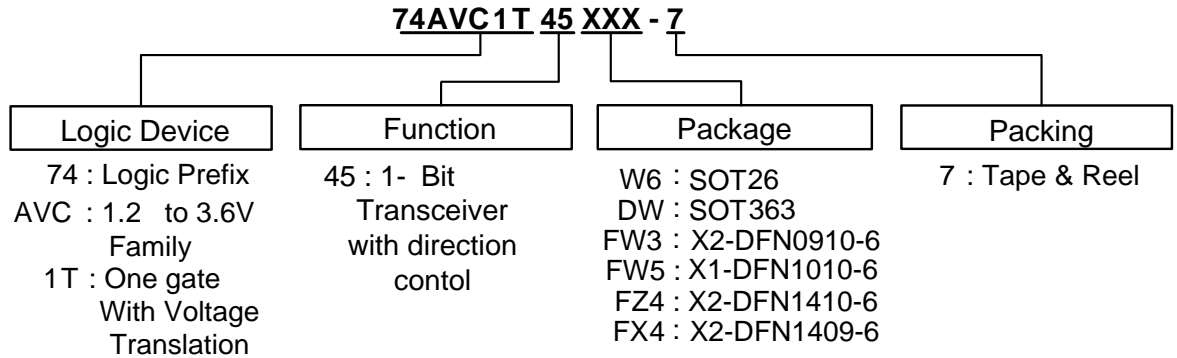
- Wide Supply Voltage Range:
  - $V_{CC(A)}$ : from 1.2V to 3.6V
  - $V_{CC(B)}$ : from 1.2V to 3.6V
- $\pm 12$ mA Output Drive at 3.3V
- High Noise Immunity—(100mV Hysteresis Typical)
- $I_{OFF}$  Supports Partial-Power-Down Mode Operation
- $I_{OFF}$  Controlled by Either  $V_{CC}$  at 0V
- Inputs Accept up to 4.6V
- 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 ROMs
  - TVs, DVDs, DVRs, Set Top Boxes
  - 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.

## Ordering Information



| Part Number    | Package Code | Packaging    | 7" Tape and Reel (Note 7) |                    |
|----------------|--------------|--------------|---------------------------|--------------------|
|                |              |              | Quantity                  | Part Number Suffix |
| 74AVC1T45W6-7  | W6           | SOT26        | 3000/Tape & Reel          | -7                 |
| 74AVC1T45DW-7  | DW           | SOT363       | 3000/Tape & Reel          | -7                 |
| 74AVC1T45FW3-7 | FW3          | X2-DFN0910-6 | 5000/Tape & Reel          | -7                 |
| 74AVC1T45FW5-7 | FW5          | X1-DFN1010-6 | 5000/Tape & Reel          | -7                 |
| 74AVC1T45FZ4-7 | FZ4          | X2-DFN1410-6 | 5000/Tape & Reel          | -7                 |
| 74AVC1T45FX4-7 | FX4          | X2-DFN1409-6 | 5000/Tape & Reel          | -7                 |

Notes: 4. Taping orientation is located on our website at <https://www.diodes.com/assets/Packaging-Support-Docs/Ap02007.pdf>.

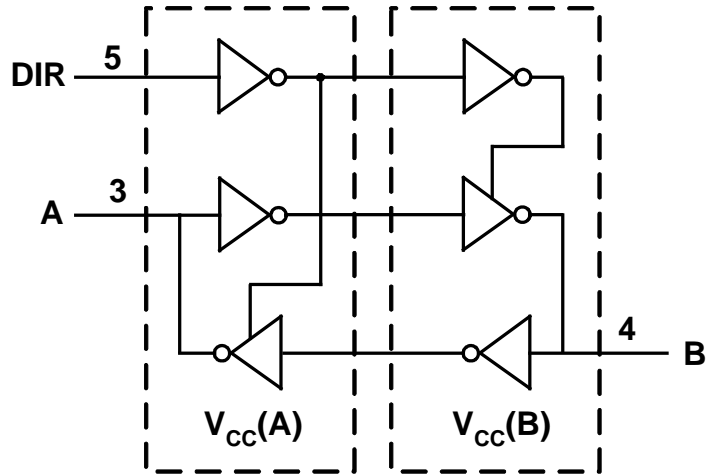
## Pin Descriptions

| 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                       |

## Function Table

| Supply voltage                          | Input               | Input/Output |       |
|---|---------------------|--------------|-------|
|   |                     | A            | B     |
| V <sub>CC(A)</sub> , V <sub>CC(B)</sub> | DIR (Direction Pin) | A = B        | B     |
| 1.2 V to 3.6 V                          | L                   | A = B        | Input |
| 1.2 V to 3.6 V                          | H                   | Input        | B = A |
| GND                                     | X                   | Z            | Z     |

**Logic Diagram**



**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(A)</sub> , V <sub>CC(B)</sub> | Supply Voltage Range  | -0.5 to +4.6 | V                               |
| V <sub>I</sub>                          | Input Voltage Range   | -0.5 to +4.6 | V                               |
| V <sub>O</sub>                          | Voltage Applied to Output in High Impedance or I <sub>OFF</sub> State | -0.5 to +4.6 | V                               |
| V <sub>O</sub>                          | Voltage Applied to Output in High or Low State                        | A pin        | -0.5 to V <sub>CC(A)</sub> +0.5 |
|   |   | B pin        | -0.5 to V <sub>CC(B)</sub> +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 can result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.

**Recommended Operating Condition** (Notes 6, 7 & 8) (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Symbol             | Parameter                          |  | V <sub>CCI</sub> | V <sub>CCO</sub> | Min                       | Max                       | Units |
|--------------------|------------------------------------|--|------------------|------------------|---------------------------|---------------------------|-------|
| V <sub>CC(A)</sub> | Operating Voltage                  |  | —                | —                | 1.2                       | 3.6                       | V     |
| V <sub>CC(B)</sub> | Operating Voltage                  |  | —                | —                | 1.2                       | 3.6                       | V     |
| V <sub>IH</sub>    | High-Level Input Voltage           | Data Inputs                              | 1.2V to 1.95V    | 1.2V to 3.6V     | 0.65 × V <sub>CC(A)</sub> | —                         | V     |
|                    |                                    |  | 1.95V to 2.7V    | 1.2V to 3.6V     | 1.6                       | —                         |       |
|                    |                                    |  | 2.7V to 3.6V     | 1.2V to 3.6V     | 2                         | —                         |       |
| V <sub>IL</sub>    | Low-Level Input Voltage            | Data Inputs                              | 1.2V to 1.95V    | 1.2V to 3.6V     | —                         | 0.35 × V <sub>CC(A)</sub> | V     |
|                    |                                    |  | 1.95V to 2.7V    | 1.2V to 3.6V     | —                         | 0.7                       |       |
|                    |                                    |  | 2.7V to 3.6V     | 1.2V to 3.6V     | —                         | 0.8                       |       |
| V <sub>IH</sub>    | High-Level Input Voltage           | DIR<br>(Referenced to V <sub>CCA</sub> ) | 1.2V to 1.95V    | 1.2V to 3.6V     | 0.65 × V <sub>CC(B)</sub> | —                         | V     |
|                    |                                    |  | 1.95V to 2.7V    | 1.2V to 3.6V     | 1.6                       | —                         |       |
|                    |                                    |  | 2.7V to 3.6V     | 1.2V to 3.6V     | 2                         | —                         |       |
| V <sub>IL</sub>    | Low-Level Input Voltage            | DIR<br>(Referenced to V <sub>CCA</sub> ) | 1.2V to 1.95V    | 1.2V to 3.6V     | —                         | 0.35 × V <sub>CC(B)</sub> | V     |
|                    |                                    |  | 1.95V to 2.7V    | 1.2V to 3.6V     | —                         | 0.7                       |       |
|                    |                                    |  | 2.7 to 3.6V      | 1.2V to 3.6V     | —                         | 0.8                       |       |
| V <sub>I</sub>     | Input Voltage                      |  | —                | —                | 0                         | 3.6                       | V     |
| V <sub>O</sub>     | Output Voltage                     | Active State                             | —                | —                | 0                         | V <sub>CCO</sub>          | V     |
|                    |                                    | 3-State                                  | —                | —                | 0                         | 3.6                       | V     |
| I <sub>OH</sub>    | High-Level Output Current          | 1.2V to 3.6V                             | 1.2V             | —                | -3                        | mA                        |       |
|                    |                                    | 1.2V to 3.6V                             | 1.4V to 1.6V     | —                | -6                        |                           |       |
|                    |                                    | 1.2V to 3.6V                             | 1.65V to 1.95V   | —                | -8                        |                           |       |
|                    |                                    | 1.2V to 3.6V                             | 2.3V to 2.7V     | —                | -9                        |                           |       |
|                    |                                    | 1.2V to 3.6V                             | 3V to 3.6V       | —                | -12                       |                           |       |
| I <sub>OL</sub>    | Low-Level Output Current           | 1.2V to 3.6V                             | 1.2V             | —                | 3                         | mA                        |       |
|                    |                                    | 1.2V to 3.6V                             | 1.4V to 1.6V     | —                | 6                         |                           |       |
|                    |                                    | 1.2V to 3.6V                             | 1.65V to 1.95V   | —                | 8                         |                           |       |
|                    |                                    | 1.2V to 3.6V                             | 2.3V to 2.7V     | —                | 9                         |                           |       |
|                    |                                    | 1.2V to 3.6V                             | 3V to 3.6V       | —                | 12                        |                           |       |
| Δt/ΔV              | Input Transition Rise or Fall Rate |  | 1.2V to 3.6V     | 1.2V to 3.6V     | —                         | 5                         | ns/V  |
| T <sub>A</sub>     | Operating Free-Air Temperature     |  |                  |                  | -40                       | +85                       | °C    |

Note: 6. V<sub>CCO</sub> is the V<sub>CC</sub> associated with the output port.  
7. V<sub>CCI</sub> is the V<sub>CC</sub> associated with the input port.  
8. All unused inputs of the device must be held at V<sub>CCI</sub> of GND.

**Electrical Characteristics** (Notes 9 & 10) (@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                                       | 1.2V to 3.6V                                    | 1.2V to 3.6V        | —                      | —     | —     | V <sub>CC</sub> - 0.2           | —    | V    |    |
|                                     |                            | I <sub>OH</sub> = -3mA   | 1.2V  | 1.2V                | —                      | 0.95  | —     | —                               | —    |      |    |
|                                     |                            | I <sub>OH</sub> = -6mA   | 1.4V  | 1.4V                | —                      | —     | —     | 1.05                            | —    |      |    |
|                                     |                            | I <sub>OH</sub> = -8mA   | 1.65V   | 1.65V               | —                      | —     | —     | 1.2                             | —    |      |    |
|                                     |                            | I <sub>OH</sub> = -9mA   | 2.3V  | 2.3V                | —                      | —     | —     | 1.75                            | —    |      |    |
|                                     |                            | I <sub>OH</sub> = -12mA  | 3V  | 3V                  | —                      | —     | —     | 2.3                             | —    |      |    |
| V <sub>OL</sub>                     | Low-Level Output Voltage   | I <sub>OL</sub> = 100µA  | 1.2V to 3.6V                                    | 1.2V to 3.6V        | —                      | —     | —     | —                               | 0.2  | V    |    |
|                                     |                            | I <sub>OL</sub> = 3mA  | 1.2V  | 1.2V                | —                      | 0.15  | —     | —                               | —    |      |    |
|                                     |                            | I <sub>OL</sub> = 6mA  | 1.4V  | 1.4V                | —                      | —     | —     | —                               | 0.35 |      |    |
|                                     |                            | I <sub>OL</sub> = 8mA  | 1.65V   | 1.65V               | —                      | —     | —     | —                               | 0.45 |      |    |
|                                     |                            | I <sub>OL</sub> = 9mA  | 2.3V  | 2.3V                | —                      | —     | —     | —                               | 0.55 |      |    |
|                                     |                            | I <sub>OL</sub> = 12mA   | 3V  | 3V                  | —                      | —     | —     | —                               | 0.7  |      |    |
| I <sub>I</sub>                      | Input Current              | DIR  | V <sub>I</sub> = V <sub>CC</sub> (A) or GND     | 1.2V to 3.6V        | 1.2V to 3.6V           | -0.25 | ±0.25 | 0.25                            | -1   | 1    | µA |
| I <sub>OFF</sub>                    | Power Down Leakage Current | A Pin  | V <sub>I</sub> or V <sub>O</sub> = 0V to 3.6V   | 0V                  | 0V to 3.6V             | -1    | ±0.1  | 1                               | -5   | 5    | µA |
|                                     |                            | B Pin  |   | 0V to 3.6V          | 0V                     | -1    | ±0.1  | 1                               | -5   | 5    |    |
| I <sub>OZ</sub>                     | 3-State Leakage Current    | B Pin  | V <sub>O</sub> = V <sub>CCO</sub> or GND        | 0V                  | 0V to 3.6V             | -2.5  | ±0.5  | 2.5                             | -5   | 5    | µA |
|                                     |                            | A Pin  | V <sub>I</sub> = V <sub>CCI</sub> or GND        | 0V to 3.6V          | 0V                     | -2.5  | ±0.5  | 2.5                             | -5   | 5    |    |
| I <sub>CCA</sub>                    | Supply Current             | V <sub>I</sub> = V <sub>CCI</sub> or GND<br>I <sub>O</sub> = 0 | 1.2 to 3.6V                                     | 11.2V to 3.6V       | —                      | —     | —     | —                               | 10   | µA   |    |
|                                     |                            |  | 3.6V  | 0V                  | —                      | —     | —     | —                               | -2   |      |    |
|                                     |                            |  | 0V  | 3.6V                | —                      | —     | —     | —                               | 10   |      |    |
| I <sub>CCB</sub>                    | Supply Current             | V <sub>I</sub> = V <sub>CCI</sub> or GND<br>I <sub>O</sub> = 0 | 1.2V to 3.6V                                    | 1.2V to 3.6V        | —                      | —     | —     | —                               | 10   | µA   |    |
|                                     |                            |  | 0V  | 3.6V                | —                      | —     | —     | —                               | 10   |      |    |
|                                     |                            |  | 3.6V  | 0V                  | —                      | —     | —     | —                               | -2   |      |    |
| I <sub>CCA</sub> + I <sub>CCB</sub> | Supply Current             | V <sub>I</sub> = V <sub>CCI</sub> or GND<br>I <sub>O</sub> = 0 | 1.2V to 3.6V                                    | 1.2V to 3.6V        | —                      | —     | —     | —                               | 20   | 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 |

Notes: 9. V<sub>CCO</sub> is the V<sub>CC</sub> associated with the output port.  
 10. V<sub>CCI</sub> is the V<sub>CC</sub> associated with the input port.

**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 11)       | —   | 166 | —   | $^{\circ}C/W$ |
|               |  | SOT363       |                 | —   | 371 | —   |               |
|               |  | X2-DFN0910-6 |                 | —   | 530 | —   |               |
|               |  | X2-DFN1410-6 |                 | —   | 430 | —   |               |
|               |  | X2-DFN1409-6 |                 | —   | 450 | —   |               |
|               |  | X1-DFN1010-6 |                 | —   | 510 | —   |               |
| $\theta_{JC}$ | Thermal Resistance Junction-to-Case    | SOT26        | (Note 11)       | —   | 46  | —   | $^{\circ}C/W$ |
|               |  | SOT363       |                 | —   | 143 | —   |               |
|               |  | X2-DFN0910-6 |                 | —   | 260 | —   |               |
|               |  | X2-DFN1410-6 |                 | —   | 190 | —   |               |
|               |  | X2-DFN1409-6 |                 | —   | 200 | —   |               |
|               |  | X1-DFN1010-6 |                 | —   | 250 | —   |               |

Note: 11. Test condition for all packages: Device mounted on FR-4 substrate PC board, 2oz copper with minimum recommended pad layout.

**Switching Characteristics**

$V_{CC} (A) = 1.2V$ ,  $T_A = -40^{\circ}C$  to  $+85^{\circ}C$ , See Figure 1

| Parameter   | From (Input) | To (Output) | $V_{CC}(B) = 1.2V$ | $V_{CC}(B) = 1.5V \pm 0.1$ | $V_{CC}(B) = 1.8V \pm 0.15V$ | $V_{CC}(B) = 2.5V \pm 0.2V$ | $V_{CC}(B) = 3.3V \pm 0.3V$ | Unit |
|-------------|--------------|-------------|--------------------|----------------------------|------------------------------|-----------------------------|-----------------------------|------|
|             |              |             | TYP                | TYP                        | TYP                          | TYP                         | TYP                         |      |
| $t_{pLH}$   | A            | B           | 3.3                | 2.7                        | 2.4                          | 2.3                         | 2.4                         | ns   |
| $t_{pHL}$   |              |             | 3.3                | 2.7                        | 2.4                          | 2.3                         | 2.4                         |      |
| $t_{pLH}$   | B            | A           | 3.3                | 3.1                        | 2.9                          | 2.8                         | 2.7                         | ns   |
| $t_{pHL}$   |              |             | 3.3                | 3.1                        | 2.9                          | 2.8                         | 2.7                         |      |
| $t_{pHZ}$   | DIR          | A           | 5.1                | 5.2                        | 5.3                          | 5.2                         | 3.7                         | ns   |
| $t_{pLZ}$   |              |             | 5.1                | 5.2                        | 5.3                          | 5.2                         | 3.7                         |      |
| $t_{pHZ}$   | DIR          | B           | 5.3                | 4.3                        | 4.0                          | 3.3                         | 3.7                         | ns   |
| $t_{pLZ}$   |              |             | 5.3                | 4.3                        | 4.0                          | 3.3                         | 3.7                         |      |
| $t_{pZH}^*$ | DIR          | A           | 8.6                | 7.3                        | 6.8                          | 6.1                         | 6.4                         | ns   |
| $t_{pZL}^*$ |              |             | 8.6                | 7.3                        | 6.8                          | 6.1                         | 6.4                         |      |
| $t_{pZH}^*$ | DIR          | B           | 8.3                | 7.8                        | 7.7                          | 7.5                         | 5.8                         | ns   |
| $t_{pZL}^*$ |              |             | 8.3                | 7.8                        | 7.7                          | 7.5                         | 5.8                         |      |

\*Enable times are calculated vales see table at end of switching characteristics.

$V_{CC} (A) = 1.5V \pm 0.1V$ ,  $T_A = -40^{\circ}C$  to  $+85^{\circ}C$ , See Figure 1

| Parameter   | From (Input) | To (Output) | $V_{CC}(B) = 1.2V$ | $V_{CC}(B) = 1.5V \pm 0.1$ |      | $V_{CC}(B) = 1.8V \pm 0.15V$ |      | $V_{CC}(B) = 2.5V \pm 0.2V$ |      | $V_{CC}(B) = 3.3V \pm 0.3V$ |      | Unit |
|-------------|--------------|-------------|--------------------|----------------------------|------|------------------------------|------|-----------------------------|------|-----------------------------|------|------|
|             |              |             | TYP                | Min                        | Max  | Min                          | Max  | Min                         | Max  | Min                         | Max  |      |
| $t_{pLH}$   | A            | B           | 2.9                | 0.7                        | 5.6  | 0.6                          | 5.2  | 0.5                         | 4.2  | 0.5                         | 3.8  | ns   |
| $t_{pHL}$   |              |             | 2.9                | 0.7                        | 5.6  | 0.6                          | 5.2  | 0.5                         | 4.2  | 0.5                         | 3.8  |      |
| $t_{pLH}$   | B            | A           | 2.6                | 0.6                        | 5.5  | 0.4                          | 5.3  | 0.3                         | 4.9  | 0.3                         | 4.8  | ns   |
| $t_{pHL}$   |              |             | 2.6                | 0.6                        | 5.5  | 0.4                          | 5.3  | 0.3                         | 4.9  | 0.3                         | 4.8  |      |
| $t_{pHZ}$   | DIR          | A           | 3.8                | 1.6                        | 6.7  | 1.5                          | 6.8  | 0.3                         | 6.9  | 0.9                         | 6.9  | ns   |
| $t_{pLZ}$   |              |             | 3.8                | 1.6                        | 6.7  | 1.5                          | 6.8  | 0.3                         | 6.9  | 0.9                         | 6.9  |      |
| $t_{pHZ}$   | DIR          | B           | 5.1                | 1.8                        | 8.1  | 1.6                          | 7.1  | 1.1                         | 4.7  | 1.4                         | 4.5  | ns   |
| $t_{pLZ}$   |              |             | 5.1                | 1.8                        | 8.1  | 1.6                          | 7.1  | 1.1                         | 4.7  | 1.4                         | 4.5  |      |
| $t_{pZH}^*$ | DIR          | A           | 7.7                | —                          | 13.6 | —                            | 12.4 | —                           | 9.6  | —                           | 9.3  | ns   |
| $t_{pZL}^*$ |              |             | 7.7                | —                          | 13.6 | —                            | 12.4 | —                           | 9.6  | —                           | 9.3  |      |
| $t_{pZH}^*$ | DIR          | B           | 6.7                | —                          | 12.3 | —                            | 12   | —                           | 11.1 | —                           | 10.7 | ns   |
| $t_{pZL}^*$ |              |             | 6.7                | —                          | 12.3 | —                            | 12   | —                           | 11.1 | —                           | 10.7 |      |

\*Enable times are calculated vales see table at end of switching characteristics.

**Switching Characteristics** (continued)

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

| Parameter   | From (Input) | To (Output) | $V_{CC}(B) = 1.2V$ | $V_{CC}(B) = 1.5V \pm 0.1$ |      | $V_{CC}(B) = 1.8V \pm 0.15V$ |      | $V_{CC}(B) = 2.5V \pm 0.2V$ |     | $V_{CC}(B) = 3.3V \pm 0.3V$ |     | Unit |
|-------------|--------------|-------------|--------------------|----------------------------|------|------------------------------|------|-----------------------------|-----|-----------------------------|-----|------|
|             |              |             | TYP                | Min                        | Max  | Min                          | Max  | Min                         | Max | Min                         | Max |      |
| $t_{pLH}$   | A            | B           | 2.7                | 0.6                        | 5.3  | 0.5                          | 5.0  | 0.4                         | 3.9 | 0.4                         | 3.4 | ns   |
| $t_{pHL}$   |              |             | 2.7                | 0.6                        | 5.3  | 0.5                          | 5.0  | 0.4                         | 3.9 | 0.4                         | 3.4 |      |
| $t_{pLH}$   | B            | A           | 2.3                | 0.5                        | 5.2  | 0.4                          | 5.0  | 0.3                         | 4.6 | 0.2                         | 4.4 | ns   |
| $t_{pHL}$   |              |             | 2.3                | 0.5                        | 5.2  | 0.4                          | 5.0  | 0.3                         | 4.6 | 0.2                         | 4.4 |      |
| $t_{pHZ}$   | DIR          | A           | 3.8                | 1.6                        | 5.9  | 1.6                          | 5.9  | 1.6                         | 5.9 | 0.5                         | 6.0 | ns   |
| $t_{pLZ}$   |              |             | 3.8                | 1.6                        | 5.9  | 1.6                          | 5.9  | 1.6                         | 5.9 | 0.5                         | 6.0 |      |
| $t_{pHZ}$   | DIR          | B           | 5.0                | 1.8                        | 7.7  | 1.4                          | 6.8  | 1.0                         | 4.4 | 1.4                         | 5.3 | ns   |
| $t_{pLZ}$   |              |             | 5.0                | 1.8                        | 7.7  | 1.4                          | 6.8  | 1.0                         | 4.4 | 1.4                         | 5.3 |      |
| $t_{pZH}^*$ | DIR          | A           | 7.3                | —                          | 12.9 | —                            | 11.8 | —                           | 9.0 | —                           | 8.7 | ns   |
| $t_{pZL}^*$ |              |             | 7.3                | —                          | 12.9 | —                            | 11.8 | —                           | 9.0 | —                           | 8.7 |      |
| $t_{pZH}^*$ | DIR          | B           | 6.5                | —                          | 11.2 | —                            | 10.9 | —                           | 9.8 | —                           | 9.4 | ns   |
| $t_{pZL}^*$ |              |             | 6.5                | —                          | 11.2 | —                            | 10.9 | —                           | 9.8 | —                           | 9.4 |      |

\*Enable times are calculated vales see table at end of switching characteristics.

 $V_{CC}(A) = 2.5V \pm 0.2V$ ,  $T_A = -40^\circ C$  to  $+85^\circ C$ , See Figure 1

| Parameter   | From (Input) | To (Output) | $V_{CC}(B) = 1.2V$ | $V_{CC}(B) = 1.5V \pm 0.1$ |      | $V_{CC}(B) = 1.8V \pm 0.15V$ |      | $V_{CC}(B) = 2.5V \pm 0.2V$ |     | $V_{CC}(B) = 3.3V \pm 0.3V$ |     | Unit |
|-------------|--------------|-------------|--------------------|----------------------------|------|------------------------------|------|-----------------------------|-----|-----------------------------|-----|------|
|             |              |             | TYP                | Min                        | Max  | Min                          | Max  | Min                         | Max | Min                         | Max |      |
| $t_{pLH}$   | A            | B           | 2.6                | 0.5                        | 4.9  | 0.4                          | 4.6  | 0.3                         | 3.4 | 0.3                         | 3.0 | ns   |
| $t_{pHL}$   |              |             | 2.6                | 0.5                        | 4.9  | 0.4                          | 4.6  | 0.3                         | 3.4 | 0.3                         | 3.0 |      |
| $t_{pLH}$   | B            | A           | 2.2                | 0.4                        | 4.2  | 0.3                          | 3.8  | 0.2                         | 3.4 | 0.2                         | 3.3 | ns   |
| $t_{pHL}$   |              |             | 2.2                | 0.4                        | 4.2  | 0.3                          | 3.8  | 0.2                         | 3.4 | 0.2                         | 3.3 |      |
| $t_{pHZ}$   | DIR          | A           | 2.8                | 0.3                        | 3.8  | 0.8                          | 3.8  | 0.4                         | 3.8 | 0.5                         | 3.8 | ns   |
| $t_{pLZ}$   |              |             | 2.8                | 0.3                        | 3.8  | 0.8                          | 3.8  | 0.4                         | 3.8 | 0.5                         | 3.8 |      |
| $t_{pHZ}$   | DIR          | B           | 4.9                | 2.0                        | 7.6  | 1.5                          | 6.5  | 0.6                         | 4.1 | 1.0                         | 4.0 | ns   |
| $t_{pLZ}$   |              |             | 4.9                | 2.0                        | 7.6  | 1.5                          | 6.5  | 0.6                         | 4.1 | 1.0                         | 4.0 |      |
| $t_{pZH}^*$ | DIR          | A           | 7.1                | —                          | 11.8 | —                            | 10.3 | —                           | 7.5 | —                           | 7.3 | ns   |
| $t_{pZL}^*$ |              |             | 7.1                | —                          | 11.8 | —                            | 10.3 | —                           | 7.5 | —                           | 7.3 |      |
| $t_{pZH}^*$ | DIR          | B           | 5.4                | —                          | 8.6  | —                            | 8.1  | —                           | 7.0 | —                           | 6.6 | ns   |
| $t_{pZL}^*$ |              |             | 5.4                | —                          | 8.6  | —                            | 8.1  | —                           | 7.0 | —                           | 6.6 |      |

\*Enable times are calculated vales see table at end of switching characteristics.

 $V_{CC}(A) = 3.3V \pm 0.3V$ ,  $T_A = -40^\circ C$  to  $+85^\circ C$ , See Figure 1

| Parameter   | From (Input) | To (Output) | $V_{CC}(B) = 1.2V$ | $V_{CC}(B) = 1.5V \pm 0.1$ |      | $V_{CC}(B) = 1.8V \pm 0.15V$ |     | $V_{CC}(B) = 2.5V \pm 0.2V$ |     | $V_{CC}(B) = 3.3V \pm 0.3V$ |     | Unit |
|-------------|--------------|-------------|--------------------|----------------------------|------|------------------------------|-----|-----------------------------|-----|-----------------------------|-----|------|
|             |              |             | TYP                | Min                        | Max  | Min                          | Max | Min                         | Max | Min                         | Max |      |
| $t_{pLH}$   | A            | B           | 2.6                | 0.4                        | 4.7  | 0.3                          | 4.4 | 0.2                         | 3.3 | 0.2                         | 2.8 | ns   |
| $t_{pHL}$   |              |             | 2.6                | 0.4                        | 4.7  | 0.3                          | 4.4 | 0.2                         | 3.3 | 0.2                         | 2.8 |      |
| $t_{pLH}$   | B            | A           | 2.2                | 0.4                        | 3.8  | 0.3                          | 3.4 | 0.2                         | 3   | 0.1                         | 2.8 | ns   |
| $t_{pHL}$   |              |             | 2.2                | 0.4                        | 3.8  | 0.3                          | 3.4 | 0.2                         | 3   | 0.1                         | 2.8 |      |
| $t_{pHZ}$   | DIR          | A           | 3.1                | 1.3                        | 4.3  | 1.3                          | 4.3 | 1.3                         | 4.3 | 1.3                         | 4.3 | ns   |
| $t_{pLZ}$   |              |             | 3.1                | 1.3                        | 4.3  | 1.3                          | 4.3 | 1.3                         | 4.3 | 1.3                         | 4.3 |      |
| $t_{pHZ}$   | DIR          | B           | 4                  | 0.7                        | 7.4  | 0.6                          | 6.5 | 0.7                         | 4   | 1.5                         | 4.9 | ns   |
| $t_{pLZ}$   |              |             | 4                  | 0.7                        | 7.4  | 0.6                          | 6.5 | 0.7                         | 4   | 1.5                         | 4.9 |      |
| $t_{pZH}^*$ | DIR          | A           | 6.2                | —                          | 11.2 | —                            | 9.9 | —                           | 7   | —                           | 6.7 | ns   |
| $t_{pZL}^*$ |              |             | 6.2                | —                          | 11.2 | —                            | 9.9 | —                           | 7   | —                           | 6.7 |      |
| $t_{pZH}^*$ | DIR          | B           | 5.7                | —                          | 8.9  | —                            | 8.5 | —                           | 7.2 | —                           | 6.8 | ns   |
| $t_{pZL}^*$ |              |             | 5.7                | —                          | 8.9  | —                            | 8.5 | —                           | 7.2 | —                           | 6.8 |      |

\*Enable times are calculated vales see table at end of switching characteristics.

## Enable Time Calculations

Enable times can be calculated as follows:

- $t_{pZH} \text{ (DIR to A)} = t_{pLZ} \text{ (DIR to B)} + t_{pLH} \text{ (B to A)}$
- $t_{pZL} \text{ (DIR to A)} = t_{pHZ} \text{ (DIR to B)} + t_{pHL} \text{ (B to A)}$
- $t_{pZH} \text{ (DIR to B)} = t_{pLZ} \text{ (DIR to A)} + t_{pLH} \text{ (A to B)}$
- $t_{pZL} \text{ (DIR to B)} = t_{pHZ} \text{ (DIR to A)} + t_{pHL} \text{ (A to B)}$

These times represent the length of time from a direction change plus the propagation time through the part.

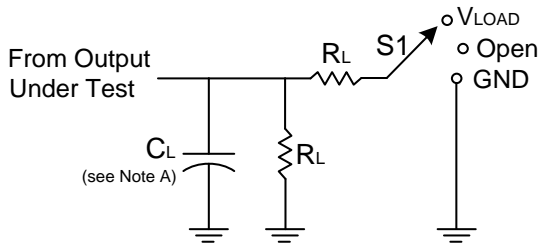
A new input signal must not be applied until the new input pin has been disabled.

## Operating Characteristics (T<sub>A</sub> = +25°C, unless otherwise specified.)

| Parameter<br>Power Dissipation Capacitance |                     | Test<br>Conditions                                    | V <sub>CC</sub> (A) =<br>V <sub>CC</sub> (B) = 1.8V | V <sub>CC</sub> (A) =<br>V <sub>CC</sub> (B) = 2.5V | V <sub>CC</sub> (A) =<br>V <sub>CC</sub> (B) = 3.3V | V <sub>CC</sub> (A) =<br>V <sub>CC</sub> (B) = 5V | Unit |
|--|---------------------|---|---|---|---|---|------|
|  |                     |   | Typ   | Typ   | Typ   | Typ   |      |
| C <sub>pd</sub> (A)                        | A- Input, B- Output | C <sub>L</sub> = 0 pF<br>f = 10 MHz<br>tr = tf = 1 ns | 3   | 4   | 4   | 4   | pF   |
|  | B- Input, A- Output |   | 18  | 19  | 20  | 21  |      |
| C <sub>pd</sub> (B)                        | A- Input, B- Output | C <sub>L</sub> = 0 pF<br>f = 10 MHz<br>tr = tf = 1 ns | 18  | 19  | 20  | 21  | pF   |
|  | B- Input, A- Output |   | 3   | 4   | 4   | 4   |      |

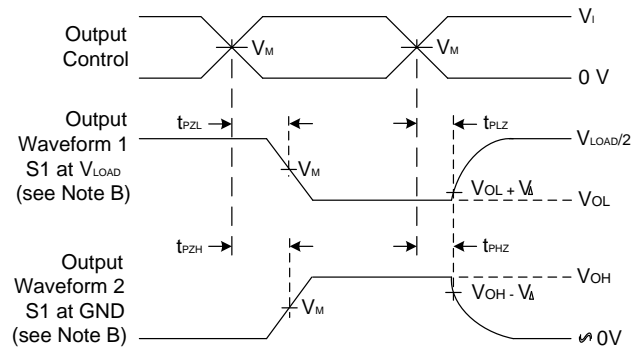
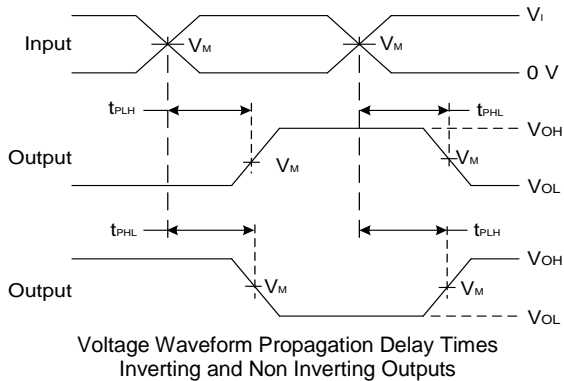
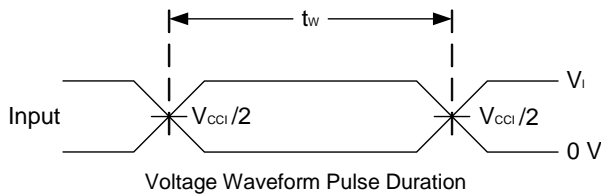


**Parameter Measurement Information**



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

| $V_{CC}$         | Inputs    |              | $V_M$       | $V_{LOAD}$         | $C_L$ | $R_L$       | $V_{\Delta}$ |
|------------------|-----------|--------------|-------------|--------------------|-------|-------------|--------------|
|                  | $V_I$     | $t_r/t_f$    |             |                    |       |             |              |
| 1.2V             | $V_{CCI}$ | $\leq 2ns$   | $V_{CCO}/2$ | $2 \times V_{CCO}$ | 15pF  | 2K $\Omega$ | 0.15V        |
| 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  | $V_{CCI}$ | $\leq 2ns$   | $V_{CCO}/2$ | $2 \times V_{CCO}$ | 15pF  | 2K $\Omega$ | 0.15V        |
| 3.3V $\pm$ 0.3V  | $V_{CCI}$ | $\leq 2.5ns$ | $V_{CCO}/2$ | $2 \times V_{CCO}$ | 15pF  | 2K $\Omega$ | 0.3V         |

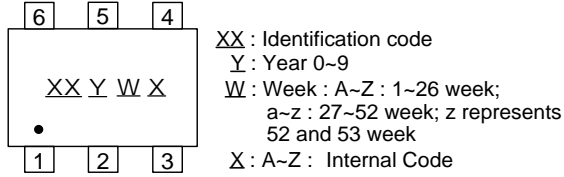


**Figure 1. Load Circuit and Voltage Waveforms**

- 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  $\leq 10$  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.

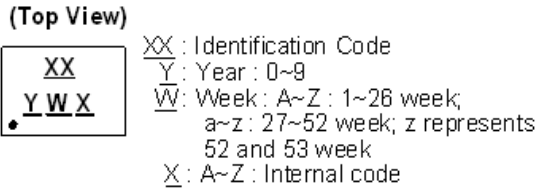
**Marking Information**

(1) SOT363, SOT563



| Part Number   | Package | Identification Code |
|---------------|---------|---------------------|
| 74AVC1T45W6-7 | SOT26   | 7A                  |
| 74AVC1T45DW-7 | SOT363  | 7B                  |

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

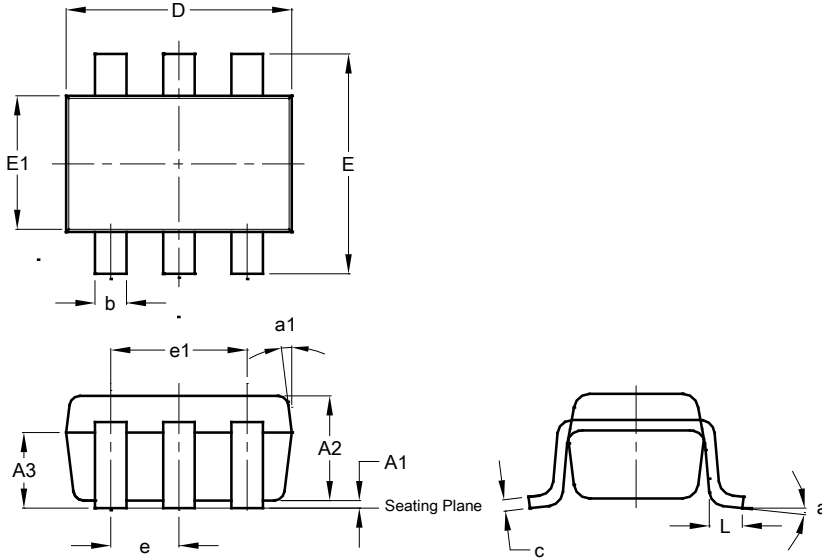


| Part Number    | Package      | Identification Code |
|----------------|--------------|---------------------|
| 74AVC1T45FW3-7 | X2-DFN0910-6 | 7A                  |
| 74AVC1T45FW5-7 | X1-DFN1010-6 | 7X                  |
| 74AVC1T45FX4-7 | X2-DFN1409-6 | 7B                  |
| 74AVC1T45FZ4-7 | X2-DFN1410-6 | 7C                  |

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

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

**SOT26 (SC74R)**

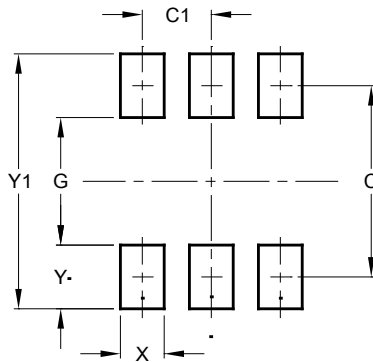


| SOT26 (SC74R)               |       |      |      |
|-----------------------------|-------|------|------|
| Dim                         | Min   | Max  | Typ  |
| A1                          | 0.013 | 0.10 | 0.05 |
| A2                          | 1.00  | 1.30 | 1.10 |
| A3                          | 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°   |
| <b>All Dimensions in mm</b> |       |      |      |

**Suggested Pad Layout**

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

**SOT26 (SC74R)**

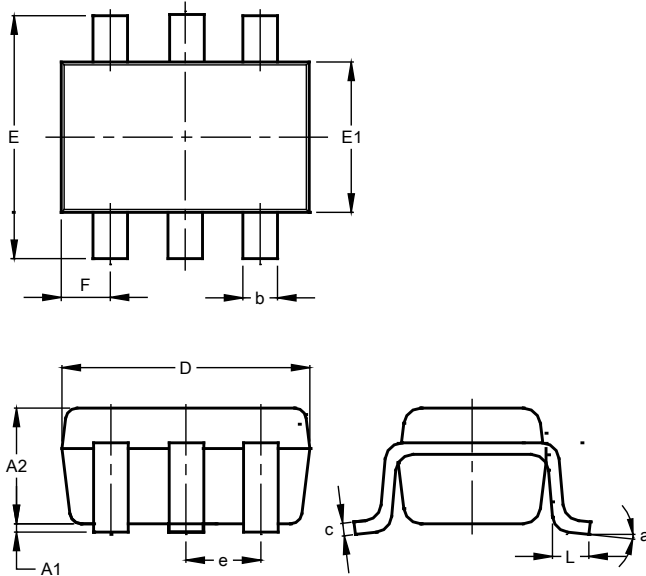


| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 2.40          |
| C1         | 0.95          |
| G          | 1.60          |
| X          | 0.55          |
| Y          | 0.80          |
| Y1         | 3.20          |

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

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

**SOT363**

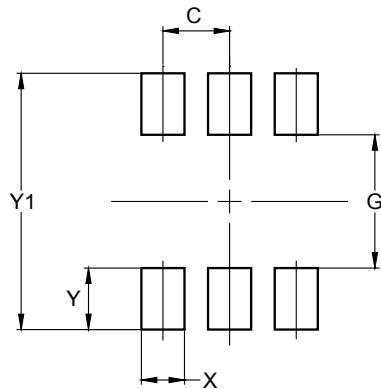


| SOT363                      |           |      |       |
|-----------------------------|-----------|------|-------|
| Dim                         | Min       | Max  | Typ   |
| A1                          | 0.00      | 0.10 | 0.05  |
| A2                          | 0.90      | 1.00 | 0.95  |
| b                           | 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°   | --    |
| <b>All Dimensions in mm</b> |           |      |       |

**Suggested Pad Layout**

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

**SOT363**

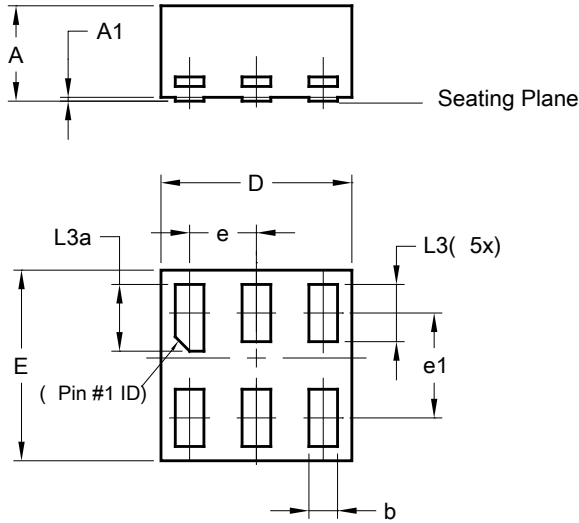


| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.650         |
| G          | 1.300         |
| X          | 0.420         |
| Y          | 0.600         |
| Y1         | 2.500         |

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

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

**X1-DFN1010-6 (Type B)**

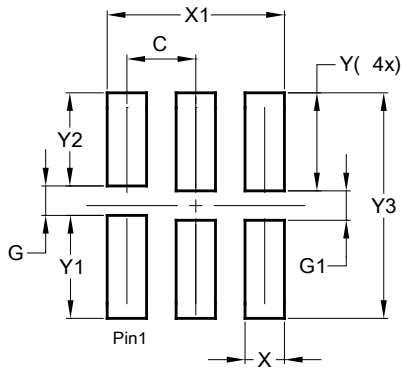


| X1-DFN1010-6<br>(Type B) |          |       |      |
|--------------------------|----------|-------|------|
| Dim                      | Min      | Max   | Typ  |
| A                        | -        | 0.50  | 0.39 |
| A1                       | -        | 0.04  | -    |
| b                        | 0.12     | 0.20  | 0.15 |
| D                        | 0.95     | 1.050 | 1.00 |
| E                        | 0.95     | 1.050 | 1.00 |
| e                        | 0.35 BSC |       |      |
| e1                       | 0.55 BSC |       |      |
| L3                       | 0.27     | 0.30  | 0.30 |
| L3a                      | 0.32     | 0.40  | 0.35 |
| All Dimensions in mm     |          |       |      |

**Suggested Pad Layout**

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

**X1-DFN1010-6 (Type B)**

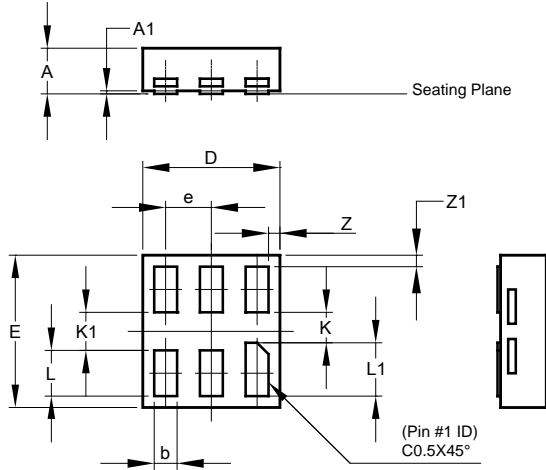


| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.350         |
| G          | 0.150         |
| G1         | 0.150         |
| X          | 0.200         |
| X1         | 0.900         |
| Y          | 0.500         |
| Y1         | 0.525         |
| Y2         | 0.475         |
| Y3         | 1.150         |

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

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

**X2-DFN0910-6**

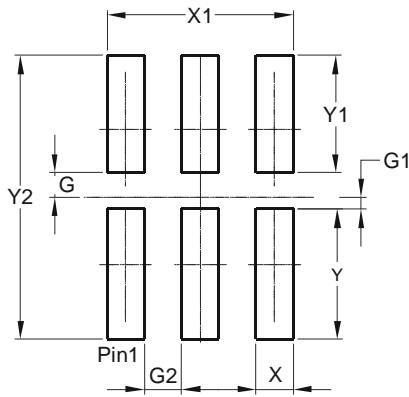


| X2-DFN0910-6                |      |      |       |
|-----------------------------|------|------|-------|
| Dim                         | Min  | Max  | Typ   |
| A                           | -    | 0.35 | 0.30  |
| A1                          | 0    | 0.03 | 0.02  |
| b                           | 0.10 | 0.20 | 0.15  |
| D                           | 0.85 | 0.95 | 0.90  |
| E                           | 0.95 | 1.05 | 1.00  |
| e                           | -    | -    | 0.30  |
| K                           | 0.20 | -    | -     |
| K1                          | 0.25 | -    | -     |
| L                           | 0.25 | 0.35 | 0.30  |
| L1                          | 0.30 | 0.40 | 0.35  |
| Z                           | -    | -    | 0.075 |
| Z1                          | -    | -    | 0.075 |
| <b>All Dimensions in mm</b> |      |      |       |

**Suggested Pad Layout**

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

**X2-DFN0910-6**

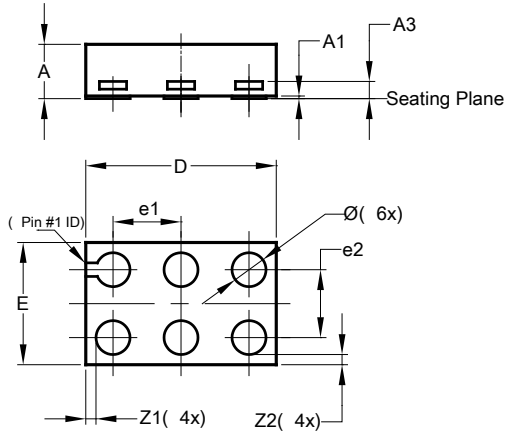


| Dimensions | Value (in mm) |
|------------|---------------|
| G          | 0.100         |
| G1         | 0.050         |
| G2         | 0.150         |
| X          | 0.150         |
| X1         | 0.750         |
| Y          | 0.525         |
| Y1         | 0.475         |
| Y2         | 1.150         |

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

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

**X2-DFN1409-6**

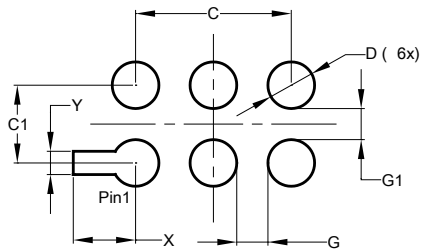


| X2-DFN1409-6         |      |      |       |
|----------------------|------|------|-------|
| Dim                  | Min  | Max  | Typ   |
| A                    | -    | 0.40 | 0.39  |
| A1                   | 0    | 0.05 | 0.02  |
| A3                   | -    | -    | 0.13  |
| Ø               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

**X2-DFN1409-6**

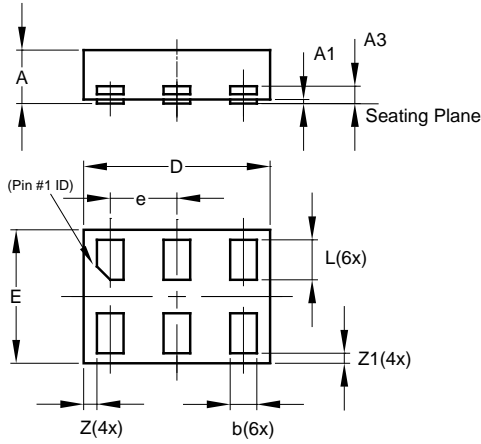


| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 1.000         |
| C1         | 0.500         |
| D          | 0.300         |
| G          | 0.200         |
| G1         | 0.200         |
| X          | 0.400         |
| Y          | 0.150         |

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

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

**X2-DFN1410-6**

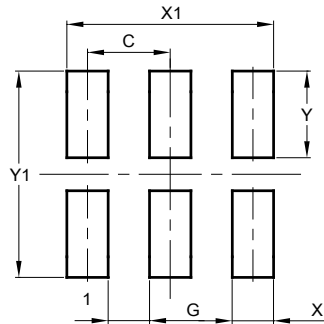


| X2-DFN1410-6         |       |       |       |
|----------------------|-------|-------|-------|
| Dim                  | Min   | Max   | Typ   |
| A                    | —     | 0.40  | 0.39  |
| A1                   | 0.00  | 0.05  | 0.02  |
| A3                   | —     | —     | 0.13  |
| b                    | 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 |       |       |       |

**Suggested Pad Layout**

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

**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         |



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