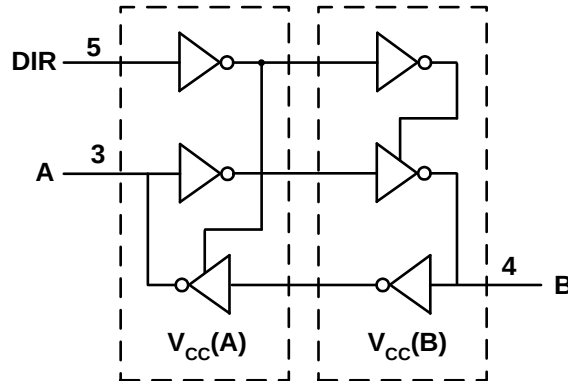


## Pin Descriptions

| 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 |      |

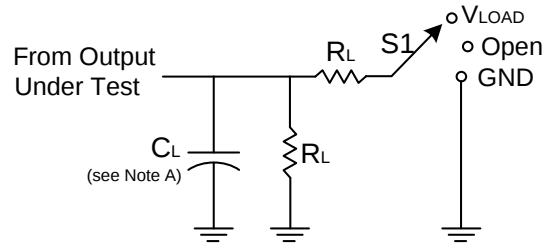
**Switching Characteristics** (continued) ( $V_{CC}(A) = 5V \pm 0.5V$ ,  $T_A = -40^\circ C$  to  $+85^\circ C$ , see Figure 1)

| 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.)

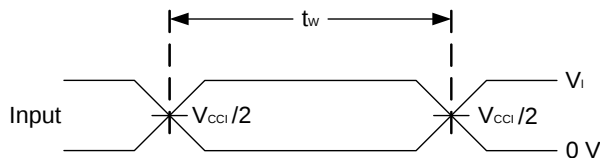
| Parameter<br>Power Dissipation Capacitance |                     | Test<br>Conditions                                    | V <sub>CC</sub> (A) =<br>V <sub>CC</sub> (B) = 1.8V | V <sub>CC</sub> (A) =<br>V <sub>CC</sub> (B) = 2.5V | V <sub>CC</sub> (A) =<br>V <sub>CC</sub> (B) = 3.3V | V <sub>CC</sub> (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

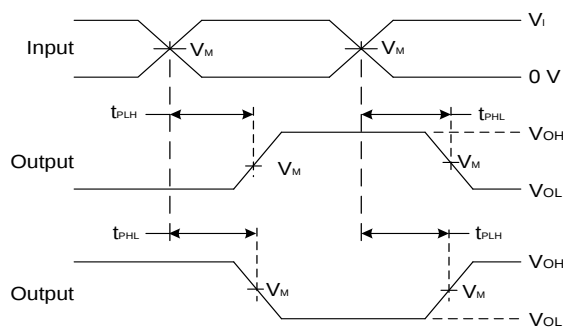


| TEST              | S1    |
|-------------------|-------|
| $t_{PLH}/t_{PHL}$ | Open  |
| $t_{PLZ}/t_{PZL}$ | Vload |
| $t_{PHZ}/t_{PZH}$ | GND   |

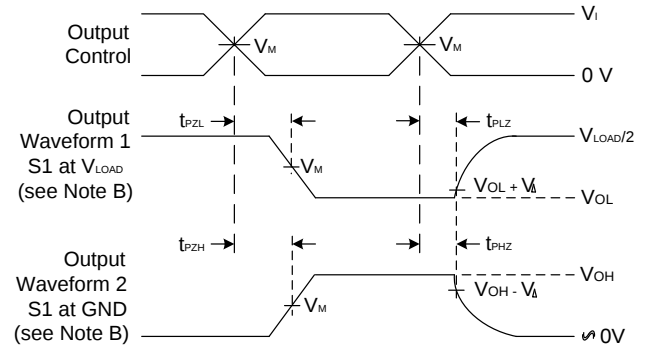
| $V_{CC}$         | Inputs    |              | $V_M$       | $V_{LOAD}$         | $C_L$ | $R_L$       | $V_{\Delta}$ |
|------------------|-----------|--------------|-------------|--------------------|-------|-------------|--------------|
|                  | $V_I$     | $t_r/t_f$    |             |                    |       |             |              |
| $1.8V \pm 0.15V$ | $V_{CCI}$ | $\leq 2ns$   | $V_{CCO}/2$ | $2 \times V_{CCO}$ | 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

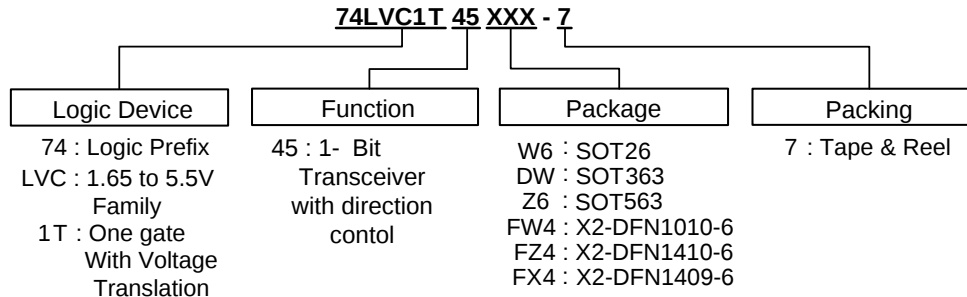


Voltage Waveform Enable and Disable Times  
Low and High Level Enabling

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

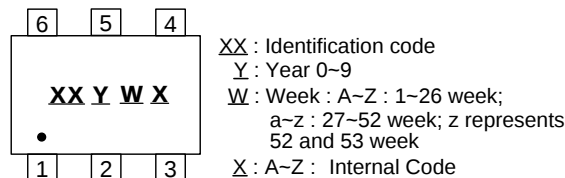


| Part Number    | Package Code | Packaging    | 7" Tape and Reel (Note 7) |                    |
|----------------|--------------|--------------|---------------------------|--------------------|
|                |              |              | Quantity                  | Part Number Suffix |
| 74LVC1T45W6-7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

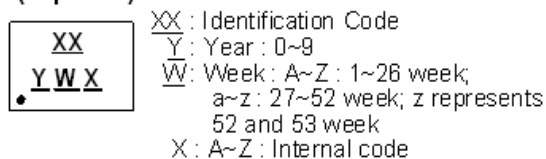
### (1) SOT363, SOT563



| 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)

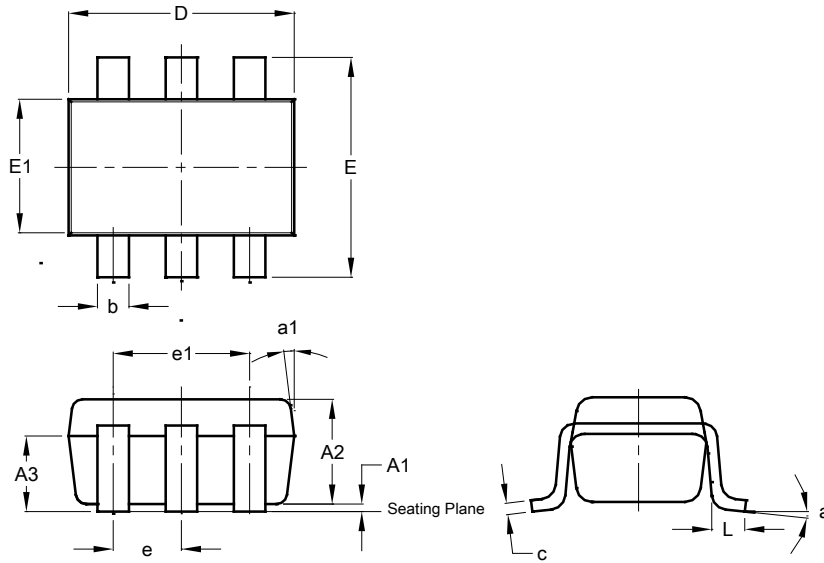


| Part Number  | Package      | Identification Code |
|--------------|--------------|---------------------|
| 74LVC1T45FW4 | X2-DFN1010-6 | TR                  |
| 74LVC1T45FX4 | X2-DFN1409-6 | TT                  |
| 74LVC1T45FZ4 | X2-DFN1410-6 | TS                  |

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

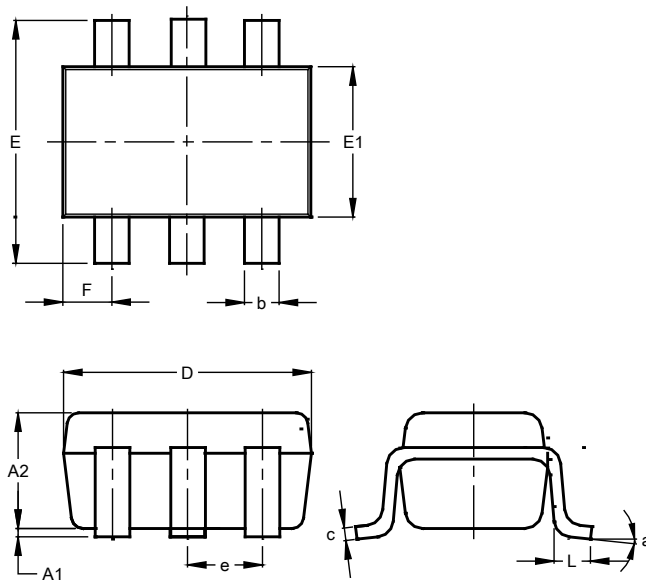
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### (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

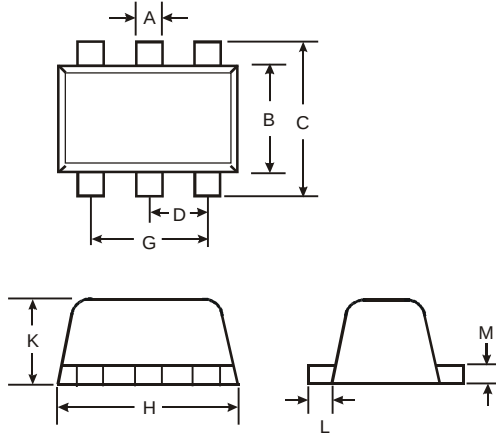


| SOT363               |           |      |       |
|----------------------|-----------|------|-------|
| Dim                  | Min       | Max  | Typ   |
| A1                   | 0.00      | 0.10 | 0.05  |
| A2                   | 0.90      | 1.00 | 0.95  |
| b                    | 0.10      | 0.30 | 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.)

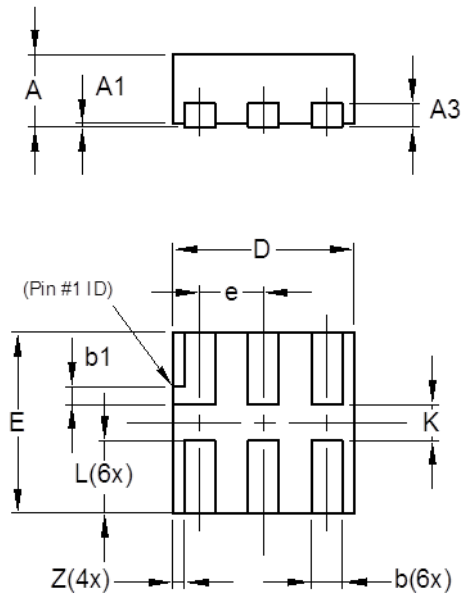
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### (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

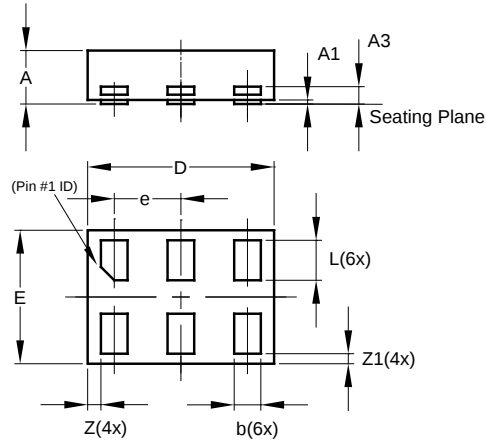


| X2-DFN1010-6         |      |      |       |
|----------------------|------|------|-------|
| Dim                  | Min  | Max  | Typ   |
| A                    | —    | 0.40 | 0.39  |
| A1                   | 0.00 | 0.05 | 0.02  |
| A3                   | —    | —    | 0.13  |
| b               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

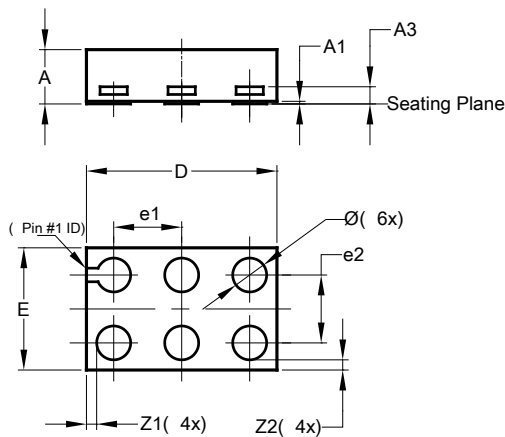
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### (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

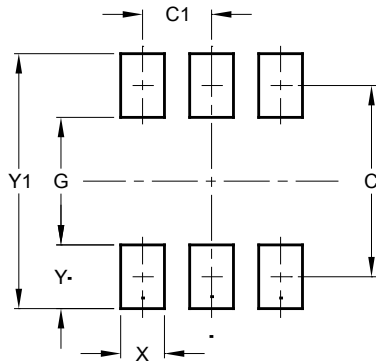


| X2-DFN1409-6         |      |      |       |
|----------------------|------|------|-------|
| Dim                  | Min  | Max  | Typ   |
| A                    | -    | 0.40 | 0.39  |
| A1                   | 0    | 0.05 | 0.02  |
| A3                   | -    | -    | 0.13  |
| Ø               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

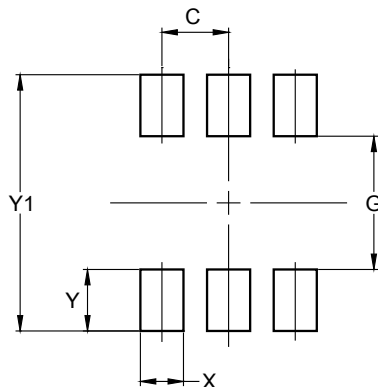
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### (1) Package Type: SOT26



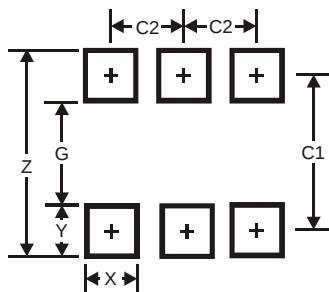
| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 2.40          |
| C1         | 0.95          |
| G          | 1.60          |
| X          | 0.55          |
| Y          | 0.80          |
| Y1         | 3.20          |

### (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

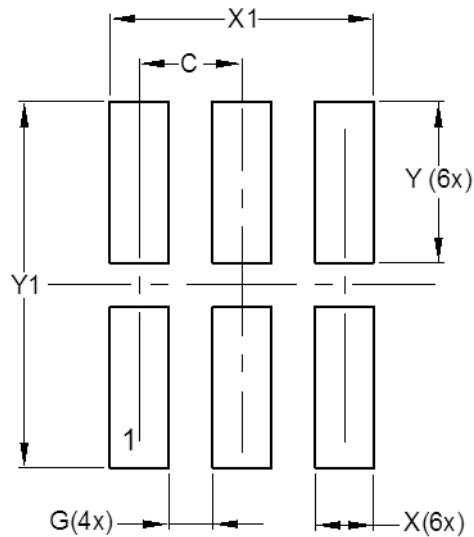


| Dimensions | SOT563 |
|------------|--------|
| Z          | 2.2    |
| G          | 1.2    |
| X          | 0.375  |
| Y          | 0.5    |
| C1         | 1.7    |
| C2         | 0.5    |

## Suggested Pad Layout

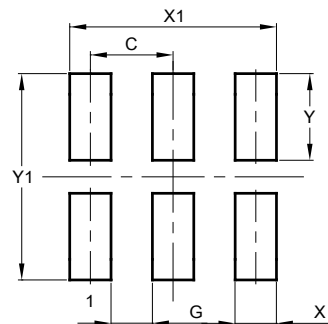
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

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



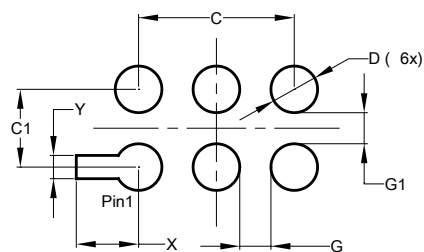
| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.350         |
| G          | 0.150         |
| X          | 0.200         |
| X1         | 0.900         |
| Y          | 0.550         |
| Y1         | 1.250         |

### (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         |

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