# 74LVCE1G125

## SINGLE BUFFER GATE WITH 3-STATE OUTPUT

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## Description

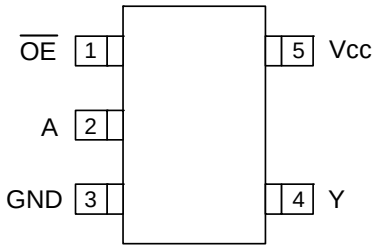
The 74LVCE1G125 is a single non-inverting buffer/bus driver with a 3-state output. The output enters a high impedance state when a HIGH-level is applied to the output enable (OE) pin. The device is designed for operation with a power supply range of 1.4V to 5.5V. The inputs are tolerant to 5.5V allowing this device to be used in a mixed voltage environment. The device is fully specified for partial power down applications using $I_{OFF}$. The $I_{OFF}$ circuitry disables the output preventing damaging current backflow when the device is powered down.

## Features

- Extended Supply Voltage Range from 1.4 to 5.5V
- Switching speed characterized for operation at 1.5V
- Offers 30% speed improvement over LVC at 1.8V.
- ± 24mA Output Drive at 3.3V
- CMOS low power consumption
- IOFF Supports Partial-Power-Down Mode Operation
- Inputs accept up to 5.5V
- ESD Protection Tested per JESD 22
  - Exceeds 200-V Machine Model (A115-A)
  - Exceeds 2000-V Human Body Model (A114-A)
- Latch-Up Exceeds 100mA per JESD 78, Class II
- Range of Package Options
- Direct Interface with TTL Levels
- SOT25, SOT353 and DFN1410: Assembled with “Green” Molding Compound (no Br, Sb)
- Lead Free Finish/ RoHS Compliant (Note 1)

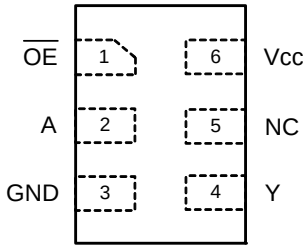
## Pin Assignments

**(Top View)**




**SOT25 / SOT353**

**(Top View)**




**DFN1410 (Note 2)**

## Applications

- Voltage Level Shifting
- Bus Driver / Repeater
- Power Down Signal Isolation
- General Purpose Logic
- Wide array of products such as.
  - o PCs, networking, notebooks, netbooks, PDAs
  - o Computer peripherals, hard drives, CD/DVD ROM
  - o TV, DVD, DVR, set top box
  - o Cell Phones, Personal Navigation / GPS
  - o MP3 players ,Cameras, Video Recorders

Notes: 1. EU Directive 2002/95/EC (RoHS). All applicable RoHS exemptions applied. Please visit our website at http://www.diodes.com/products/lead_free.html.

2. Pin 2 and pin 5 of the DFN1410 package are internally connected.

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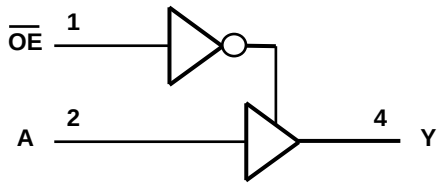
## Pin Descriptions

| Pin Name | Description |
|---|---|
| $\overline{OE}$ | Output Enable (active low) |
| A | Data Input |
| GND | Ground |
| Y | Data Output |
| Vcc | Supply Voltage |

## Logic Diagram




## Function Table

| Inputs | | Output |
|---|---|---|
| $\overline{OE}$ | A | Y |
| L | H | H |
| L | L | L |
| H | X | Z |

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## Absolute Maximum Ratings (Note 3)

| Symbol | Description | Rating | Unit |
|---|---|---|---|
| ESD HBM | Human Body Model ESD Protection | 2 | KV |
| ESD MM | Machine Model ESD Protection | 200 | V |
| $V_{CC}$ | Supply Voltage Range | -0.5 to 6.5 | V |
| $V_I$ | Input Voltage Range | -0.5 to 6.5 | V |
| $V_o$ | Voltage applied to output in high impedance or $I_{OFF}$ state | -0.5 to 6.5 | V |
| $V_o$ | Voltage applied to output in high or low state | -0.3 to $V_{CC}$ +0.5 | V |
| $I_{IK}$ | Input Clamp Current $V_I$<0 | -50 | mA |
| $I_{OK}$ | Output Clamp Current | -50 | mA |
| $I_O$ | Continuous output current | ±50 | mA |
| | Continuous current through Vdd or GND | ±100 | mA |
| $T_J$ | Operating Junction Temperature | -40 to 150 | °C |
| $T_{STG}$ | Storage Temperature | -65 to 150 | °C |

Note: 3. 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.

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## Recommended Operating Conditions (Note 4)

| Symbol | Parameter | | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{CC}$ | Operating Voltage | Operating | 1.4 | 5.5 | V |
| | | Data retention only | 1.2 | | V |
| $V_{IH}$ | High-level Input Voltage | $V_{CC}$ = 1.4 V to 1.95 V | 0.65 X $V_{CC}$ | | V |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.7 | | |
| | | $V_{CC}$ = 3 V to 3.6 V | 2 | | |
| | | $V_{CC}$ = 4.5 V to 5.5 V | 0.7 X $V_{CC}$ | | |
| $V_{IL}$ | Low-level input voltage | $V_{CC}$ = 1.4 V to 1.95 V | | 0.35 X $V_{CC}$ | V |
| | | $V_{CC}$ = 2.3 V to 2.7 V | | 0.7 | |
| | | $V_{CC}$ = 3 V to 3.6 V | | 0.8 | |
| | | $V_{CC}$ = 4.5 V to 5.5 V | | 0.3 X $V_{CC}$ | |
| $V_I$ | Input Voltage | | 0 | 5.5 | V |
| $V_O$ | Output Voltage | | 0 | $V_{CC}$ | V |
| $I_{OH}$ | High-level output current | Vcc=1.4 V | | -3 | mA |
| | | $V_{CC}$ = 1.65 V | | -4 | |
| | | $V_{CC}$ = 2.3 V | | -8 | |
| | | $V_{CC}$ = 3 V | | -16 | |
| | | | | -24 | |
| | | $V_{CC}$ = 4.5 V | | -32 | |
| $I_{OL}$ | Low-level output current | Vcc=1.4 V | | 3 | mA |
| | | $V_{CC}$ = 1.65 V | | 4 | |
| | | $V_{CC}$ = 2.3 V | | 8 | |
| | | $V_{CC}$ = 3 V | | 16 | |
| | | | | 24 | |
| | | $V_{CC}$ = 4.5 V | | 32 | |
| Δt/ΔV | Input transition rise or fall rate | $V_{CC}$ = 1.4 to 3V | | 20 | ns/V |
| | | $V_{CC}$ = 3.3 V ± 0.3 V | | 10 | |
| | | $V_{CC}$ = 5 V ± 0.5 V | | 5 | |
| $T_A$ | Operating free-air temperature | | -40 | 85 | ºC |

Note: 4. Unused inputs should be held at Vcc or Ground.

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## Electrical Characteristics (All typical values are at Vcc = 3.3V, $T_A$ = 25°C)

Over recommended free-air temperature range (unless otherwise noted)

| Symbol | Parameter | Test Conditions | Vcc | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{OH}$ | High Level Output Voltage | $I_{OH}$ = -100µA | 1.4 V to 5.5V | $V_{CC}$ – 0.1 | | | V |
| | | $I_{OH}$ = -3mA | 1.4 V | 1.05 | | | |
| | | $I_{OH}$ = -4mA | 1.65 V | 1.2 | | | |
| | | $I_{OH}$ = -8mA | 2.3V | 1.9 | | | |
| | | $I_{OH}$ = -16mA | 3 V | 2.4 | | | |
| | | $I_{OH}$ = -24mA | | 2.3 | | | |
| | | $I_{OH}$ = -32mA | 4.5 V | 3.8 | | | |
| $V_{OL}$ | High-level Input Voltage | $I_{OL}$ = 100µA | 1.4 V to 5.5V | | | 0.1 | V |
| | | $I_{OL}$ = 3mA | 1.4V | | | .4 | |
| | | $I_{OL}$ = 4mA | 1.65 V | | | 0.45 | |
| | | $I_{OL}$ = 8mA | 2.3V | | | 0.3 | |
| | | $I_{OL}$ = 16mA | 3 V | | | 0.4 | |
| | | $I_{OL}$ = 24mA | | | | 0.55 | |
| | | $I_{OL}$ = 32mA | 4.5 | | | 0.55 | |
| $I_I$ | Input Current | $V_I$ = 5.5 V or GND | 0 to 5.5 V | | | ± 5 | µA |
| $I_{OFF}$ | Power Down Leakage Current | $V_I$ or $V_O$ = 5.5V | 0 | | | ± 10 | µA |
| $I_{OZ}$ | Z State Leakage Current | $V_O$ =0 to 5.5V | 3.6V | | | 10 | µA |
| $I_{CC}$ | Supply Current | $V_I$ = 5.5V of GND $I_O$=0 | 1.4 V to 5.5V | | | 10 | µA |
| $\Delta I_{CC}$ | Additional Supply Current | One input at $V_{CC}$ – 0.6 V Other inputs at $V_{CC}$ or GND | 3 V to 5.5V | | | 500 | µA |
| $C_i$ | Input Capacitance | $V_i$ = $V_{CC}$ – or GND | 3.3 | | 3.5 | | pF |
| $\theta_{JA}$ | Thermal Resistance Junction-to-Ambient | SOT25 | (Note 5) | | 204 | | °C/W |
| | | SOT353 | (Note 5) | | 371 | | |
| | | DFN1410 | (Note 5) | | 430 | | |
| $\theta_{JC}$ | Thermal Resistance Junction-to-Case | SOT25 | (Note 5) | | 52 | | °C/W |
| | | SOT353 | (Note 5) | | 143 | | |
| | | DFN1410 | (Note 5) | | 190 | | |

Note: 5. Test condition for SOT25, SOT353 and DFN1410: Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

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## Switching Characteristics

Over recommended free-air temperature range, CL = 15pF (see Figure 1)

| Parameter | From (Input) | TO (OUTPUT) | Vcc = 1.5 V ± 0.1V | | Vcc = 1.8 V ± 0.15V | | Vcc = 2.5 V ± 0.2V | | Vcc = 3.3 V ± 0.3V | | Vcc = 5 V ± 0.5V | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | |
| $t_{pd}$ | A | Y | 1.9 | 6.9 | 1.3 | 4.8 | 0.5 | 3.6 | 0.4 | 3 | 0.4 | 3 | ns |

Over recommended free-air temperature range, CL = 30 or 50pF as noted (see Figure 2)

| Parameter | From (Input) | TO (OUTPUT) | Vcc = 1.5 V ± 0.1V | | Vcc = 1.8 V ± 0.15V | | Vcc = 2.5 V ± 0.2V | | Vcc = 3.3 V ± 0.3V | | Vcc = 5 V ± 0.5V | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | |
| $t_{pd}$ | A | Y | 2.8 | 9 | 1.9 | 6.3 | 0.9 | 4.4 | 0.8 | 3.6 | 0.9 | 3.6 | ns |
| $t_{en}$ | $\overline{OE}$ | Y | 3.3 | 10.1 | 2.3 | 7 | 1.2 | 5.2 | 0.8 | 4.3 | 0.9 | 4.5 | |
| $t_{dis}$ | $\overline{OE}$ | Y | 1.3 | 9.2 | 0.9 | 6.4 | 0.8 | 4 | 0.8 | 4.1 | 0.9 | 3.7 | |

## Operating Characteristics

$T_A$ = 25 °C

| Parameter | | | Test Conditions | Vcc = 1.5 V | Vcc = 1.8 V | Vcc = 2.5 V | Vcc = 3.3 V | Vcc = 5 V | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | | TYP | TYP | TYP | TYP | TYP | |
| $C_{pd}$ | Power dissipation capacitance | Outputs enabled | f = 10 MHz | 20 | 20 | 20 | 21 | 22 | pF |
| | | Outputs disabled | | 2 | 2 | 2 | 2 | 4 | |

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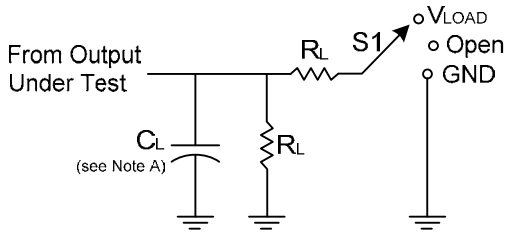
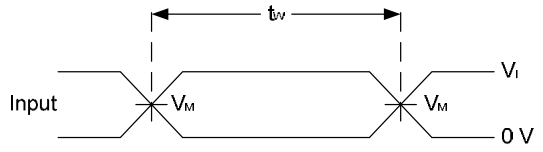
## Parameter Measurement Information

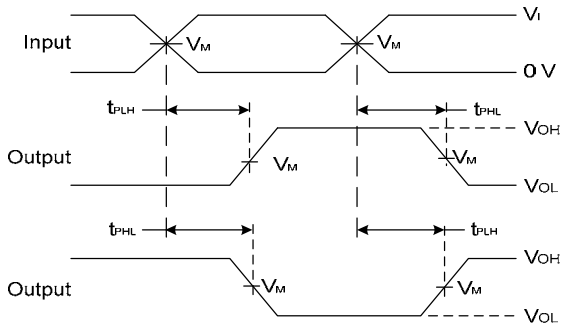



| TEST | S1 |
|---|---|
| $t_{PLH}/t_{PHL}$ | Open |
| $t_{PLZ}/t_{PZL}$ | Vload |
| $t_{PHZ}/t_{PZH}$ | GND |

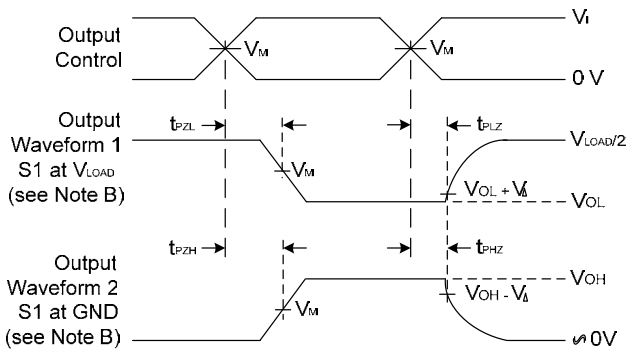
| Vcc | Inputs | | $V_M$ | $C_L$ | $R_L$ |
|---|---|---|---|---|---|
| | $V_I$ | $t_r/t_f$ | | | |
| 1.5V±0.1V | $V_{CC}$ | ≤2ns | $V_{CC}/2$ | 15pF | 1MΩ |
| 1.8V±0.15V | $V_{CC}$ | ≤2ns | $V_{CC}/2$ | 15pF | 1MΩ |
| 2.5V±0.2V | $V_{CC}$ | ≤2ns | $V_{CC}/2$ | 15pF | 1MΩ |
| 3.3V±0.3V | 3V | ≤2.5ns | 1.5V | 15pF | 1MΩ |
| 5V±0.5V | $V_{CC}$ | ≤2.5ns | $V_{CC}/2$ | 15pF | 1MΩ |




**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**

Notes:
A. Includes test lead and test apparatus capacitance.
B. All pulses are supplied at pulse repetition rate ≤ 10 MHz.
C. Inputs are measured separately one transition per measurement.
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 $t_{PD}$.

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

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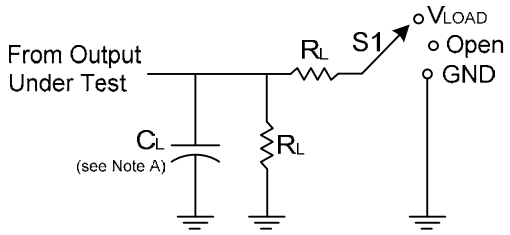
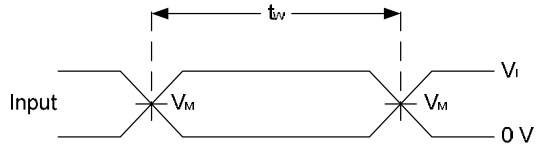
## Parameter Measurement Information (Continued)

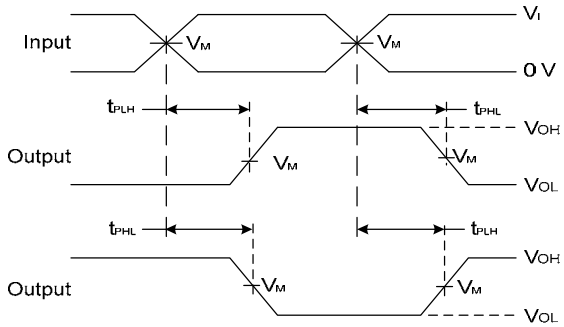



| TEST | S1 |
|---|---|
| $t_{PLH}/t_{PHL}$ | Open |
| $t_{PLZ}/t_{PZL}$ | Vload |
| $t_{PHZ}/t_{PZH}$ | GND |

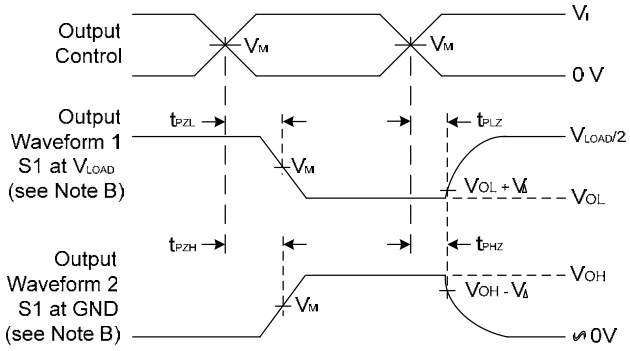
| Vcc | Inputs | | $V_M$ | $C_L$ | $R_L$ |
|---|---|---|---|---|---|
| | $V_I$ | $t_r/t_f$ | | | |
| 1.5V±0.1V | $V_{CC}$ | ≤2ns | $V_{CC}/2$ | 30pF | 1KΩ |
| 1.8V±0.15V | $V_{CC}$ | ≤2ns | $V_{CC}/2$ | 30pF | 1KΩ |
| 2.5V±0.2V | $V_{CC}$ | ≤2ns | $V_{CC}/2$ | 30pF | 500Ω |
| 3.3V±0.3V | 3V | ≤2.5ns | 1.5V | 50pF | 500Ω |
| 5V±0.5V | $V_{CC}$ | ≤2.5ns | $V_{CC}/2$ | 50pF | 500Ω |




**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**

Notes: A. Includes test lead and test apparatus capacitance.
B. All pulses are supplied at pulse repetition rate ≤ 10 MHz.
C. Inputs are measured separately one transition per measurement.
D. $t_{PLZ}$ and $t_{PHZ}$ are the same as $t_{dis}$.
E. $t_{PZL}$ and $t_{PZH}$ are the same as $t_{EN0}$
F. $t_{PLH}$ and $t_{PHL}$ are the same as $t_{PD}$.

**Figure 2. Load Circuit and Voltage Waveforms**

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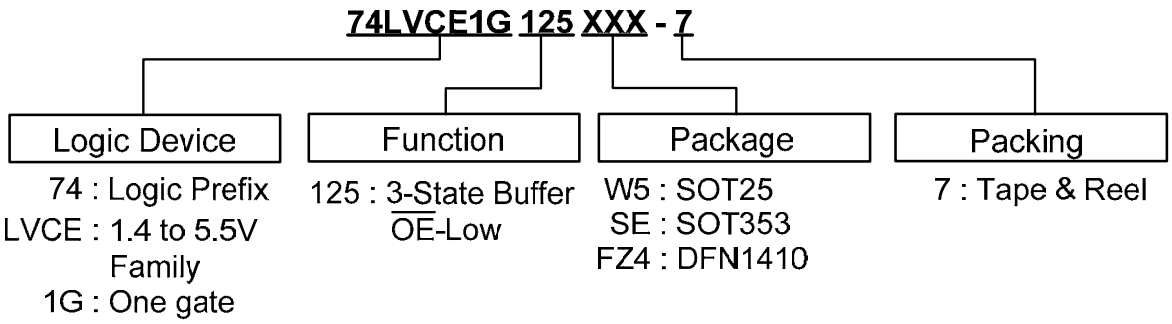
## Ordering Information




| Device | Package Code | Packaging (Note 5) | 7" Tape and Reel | |
|---|---|---|---|---|
| | | | Quantity | Part Number Suffix |
| 74LVCE1G125W5-7 | W6 | SOT25 | 3000/Tape & Reel | -7 |
| 74LVCE1G125SE-7 | SE | SOT353 | 3000/Tape & Reel | -7 |
| 74LVCE1G125FZ4-7 | FZ4 | DFN1410 | 5000/Tape & Reel | -7 |

Note: 6. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at http://www.diodes.com/datasheets/ap02001.pdf.

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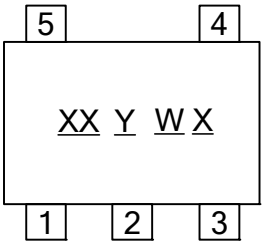
## Marking Information

**(1) SOT25 and SOT353**

(Top View)

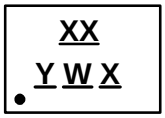



XX : Identification code
Y : Year 0~9
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents 52 and 53 week
X : A~Z : Internal code

| Part Number | Package | Identification Code |
|---|---|---|
| 74LVCE1G125W5 | SOT25 | PY |
| 74LVCE1G125SE | SOT353 | PY |

**(2) DFN1410**

**(Top View)**




XX : Identification Code
Y : Year : 0~9
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents 52 and 53 week
X : A~Z : Internal code

| Part Number | Package | Identification Code |
|---|---|---|
| 74LVCE1G125FZ4 | DFN1410 | PY |

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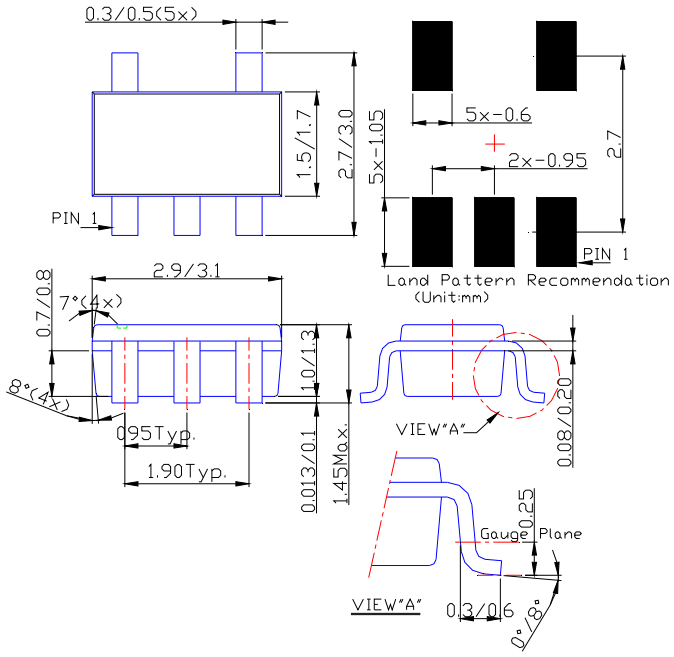
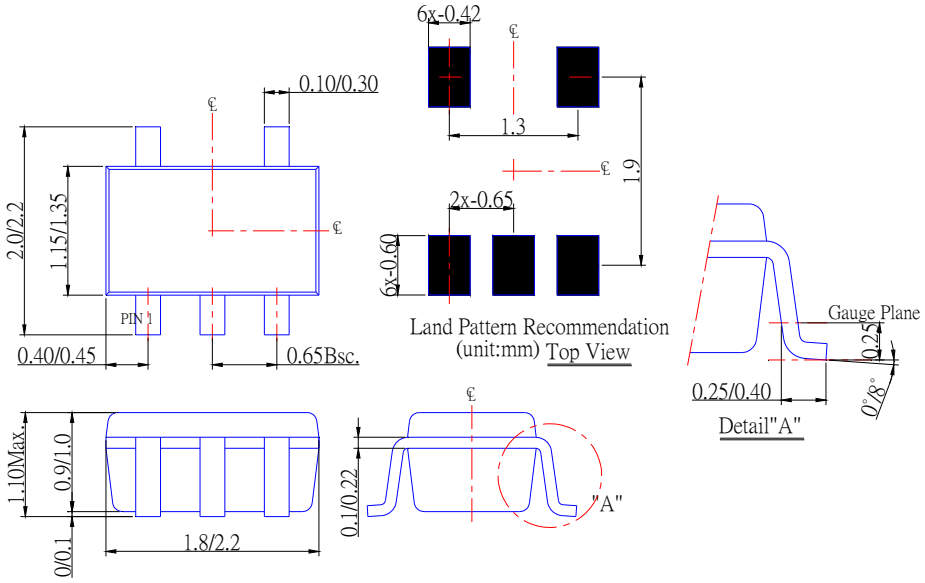
## Package Outline Dimensions (All Dimensions in mm)

### (1) Package Type: SOT25




### (2) Package Type: SOT353



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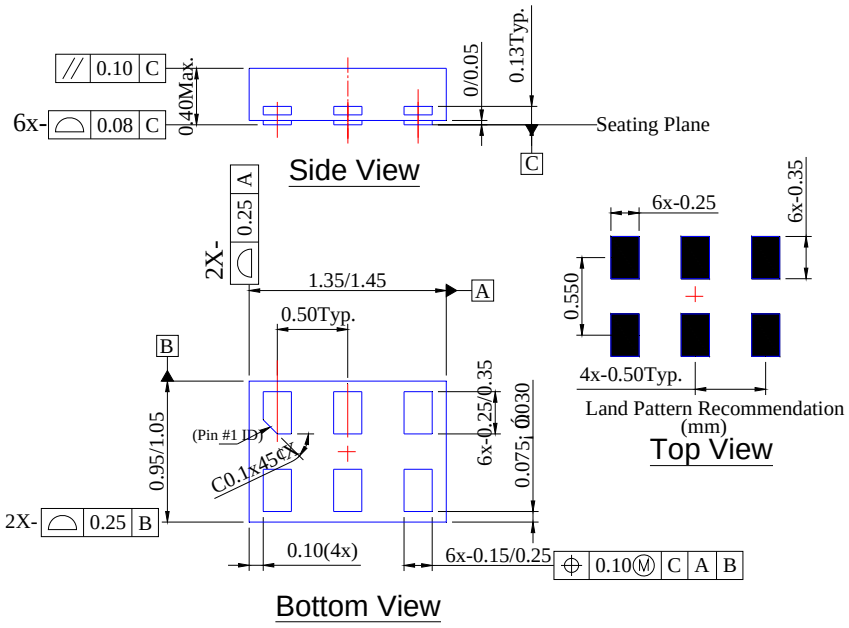
## Package Outline Dimensions (All Dimensions in mm)

### (3) Package Type: DFN1410



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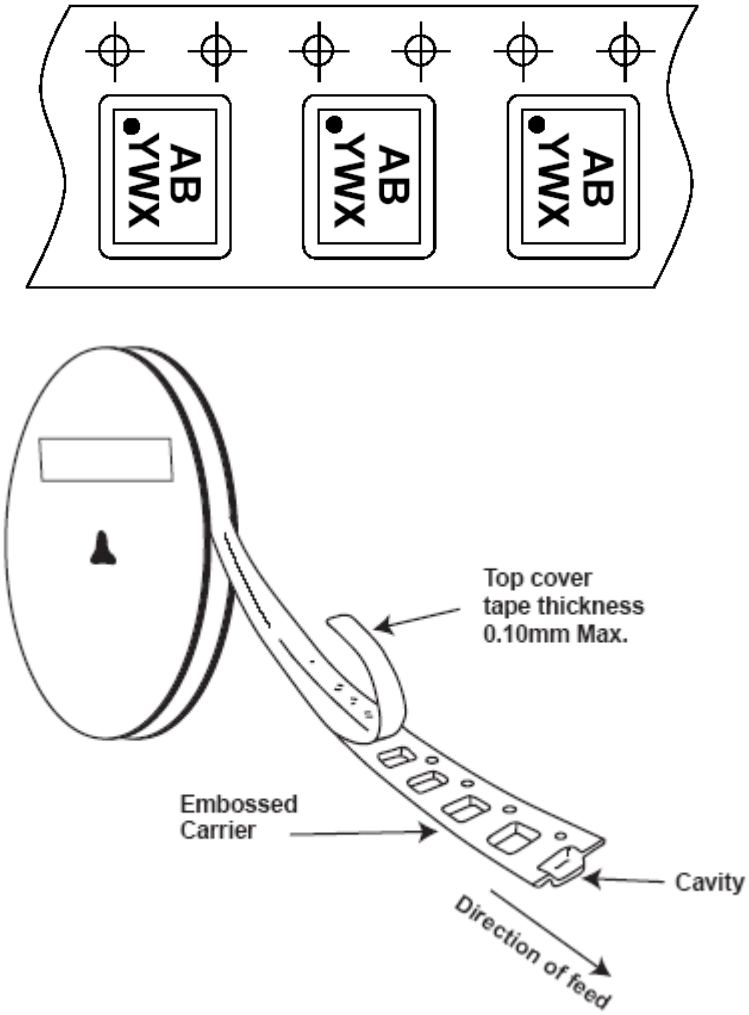
## Taping Orientation (Note 7)

**For DFN1410**




Note: 7. The taping orientation of the other package type can be found on our website at http://www.diodes.com/datasheets/ap02007.pdf

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

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

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



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