

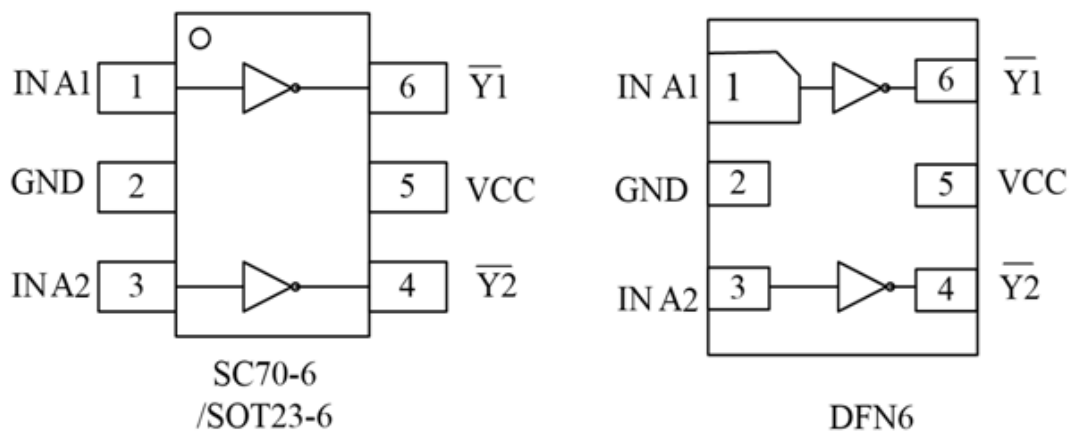
### General Description

The SN74LVC2G04 is a high performance dual inverter operating from a 1.65V to 5.5V supply. This device is fabricated with advanced CMOS technology to achieve ultra-high speed with high output drive.

### Features

- Designed for 1.65V to 5.5V  $V_{CC}$  Operation
- Overvoltage Tolerant Inputs
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- These Devices are Pb-Free and are RoHS Compliant

### Pin Configuration

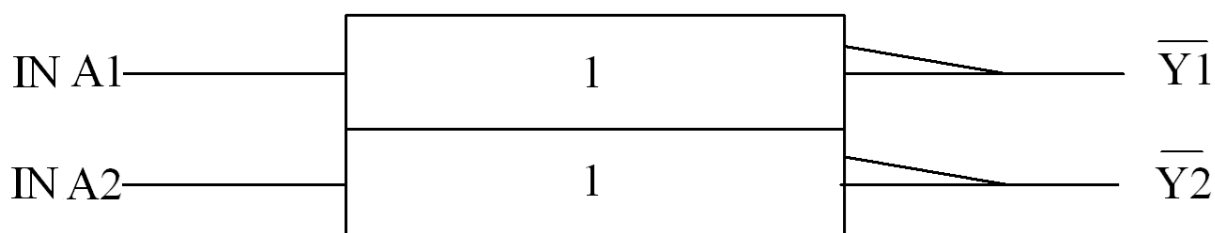


**Figure1. Pinouts (Top View)**

**Pin Function**

| PIN | ASSIGNMENT      |
|-----|-----------------|
| 1   | IN A1           |
| 2   | GND             |
| 3   | IN A2           |
| 4   | $\overline{Y2}$ |
| 5   | VCC             |
| 6   | $\overline{Y1}$ |

**Block Diagram**



**Figure2.Logic symbol**

**Functional Description**

**Function Table**

| A Input | Y Output |
|---------|----------|
| L       | H        |
| H       | L        |

**Absolute Maximum Ratings**

| Symbol               | Parameter  | Value                         | Unit |
|----------------------|--|-------------------------------|------|
| V <sub>CC</sub>      | DC Supply Voltage  | -0.5 to 7.0                   | V    |
| V <sub>I</sub>       | DC Input Voltage   | -0.5 ≤ V <sub>I</sub> ≤ +7.0  | V    |
| V <sub>O</sub>       | DC Output Voltage Output in Higher or Low State (Note 1)                       | -0.5 to V <sub>CC</sub> + 0.5 | V    |
| I <sub>IK</sub>      | DC Input Diode Current V <sub>I</sub> < GND                                    | -50                           | mA   |
| I <sub>OK</sub>      | DC Output Diode Current V <sub>O</sub> < GND, V <sub>O</sub> > V <sub>CC</sub> | ±50                           | mA   |
| I <sub>O</sub>       | DC Output Sink Current   | ±50                           | mA   |
| I <sub>CC</sub>      | DC Supply Current per Supply Pin   | ±100                          | mA   |
| I <sub>GND</sub>     | DC Ground Current per Supply Pin   | ±100                          | mA   |
| T <sub>STG</sub>     | Storage Temperature Range  | -65 to 150                    | °C   |
| T <sub>L</sub>       | Lead Temperature, 1 mm from Case for 10 Seconds                                | 260                           | °C   |
| T <sub>J</sub>       | Junction Temperature Under Bias  | 150                           | °C   |
| θ <sub>JA</sub>      | Thermal Resistance SC70-6  | 333                           | °C/W |
|                      | SOT23-6  | 225                           |      |
|                      | DFN6   | 423                           |      |
| P <sub>D</sub>       | Power Dissipation in Still Air at 85 °C  | 200                           | mW   |
| MSL                  | Moisture Sensitivity   | Level 1                       |      |
| ESD                  | ESD Classification Human Body Model (Note 2)                                   | 2000                          | V    |
|                      | Machine Model (Note 3)   | 200                           |      |
|                      | Charged Device Model (Note 4)  | N/A                           |      |
| I <sub>Latchup</sub> | Latchup Performance Above V <sub>CC</sub> and Below GND at 125 °C (Note 5)     | ±100                          | mA   |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. IO absolute maximum rating must be observed.
2. Tested to EIA/JESD22-A114-A, rated to EIA/JESD22-A114-B.
3. Tested to EIA/JESD22-A115-A, rated to EIA/JESD22-A115-A.
4. Tested to JESD22-C101-A.
5. Tested to EIA/JESD78.

**Recommended Operating Conditions**

| Symbol                          | Parameter  | Min  | Max | Unit |
|---------------------------------|--|------|-----|------|
| V <sub>CC</sub>                 | DC Supply Voltage Operating                              | 1.65 | 5.5 | V    |
|                                 | Date Retention   | 1.5  | 5.5 |      |
| V <sub>IN</sub>                 | DC Input Voltage   | 0    | 5.5 | V    |
| V <sub>OUT</sub>                | DC Output Voltage (High or Low State)                    | 0    | 5.5 | V    |
| T <sub>A</sub>                  | Operating Temperature Range                              | -40  | 85  | °C   |
| t <sub>r</sub> , t <sub>f</sub> | Input Rise and Fall Time V <sub>CC</sub> = 2.5 V ± 0.2 V | 0    | 20  | ns/V |
|                                 | V <sub>CC</sub> = 3.0 V ± 0.3 V                          | 0    | 10  |      |
|                                 | V <sub>CC</sub> = 5.0 V ± 0.5 V                          | 0    | 5   |      |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied.

**Electrical Characteristics**
**DC ELECTRICAL CHARACTERISTICS**

| Symbol           | Parameter   | Condition   | VCC(V)                   | TA = 25 °C                                |                 |   | -40°C ≤TA≤85°C                            |   | Unit |
|------------------|---|---|--------------------------|---|-----------------|---|---|---|------|
|                  |   |   |                          | Min                                       | Typ             | Max                                       | Min                                       | Max                                       |      |
| V <sub>IH</sub>  | High-Level Input Voltage                                    |   | 1.65to1.95<br>2.3 to 5.5 | 0.75V <sub>cc</sub><br>0.7V <sub>cc</sub> |                 |   | 0.75V <sub>cc</sub><br>0.7V <sub>cc</sub> |   | V    |
| V <sub>IL</sub>  | Low-Level Input Voltage                                     |   | 1.65to1.95<br>2.3 to 5.5 |   |                 | 0.25V <sub>cc</sub><br>0.3V <sub>cc</sub> |   | 0.25V <sub>cc</sub><br>0.3V <sub>cc</sub> | V    |
| V <sub>OH</sub>  | High-Level Output Voltage V <sub>IN</sub> = V <sub>IL</sub> | I <sub>OH</sub> = -100uA                          | 1.65to5.5                | V <sub>cc</sub> -0.1                      | V <sub>cc</sub> |   | V <sub>cc</sub> -0.1                      |   | V    |
|                  |   | I <sub>OH</sub> = -3mA                            | 1.65                     | 1.29                                      | 1.52            |   | 1.29                                      |   |      |
|                  |   | I <sub>OH</sub> = -8mA                            | 2.3                      | 1.9                                       | 2.1             |   | 1.9                                       |   |      |
|                  |   | I <sub>OH</sub> = -12mA                           | 2.7                      | 2.2                                       | 2.4             |   | 2.2                                       |   |      |
|                  |   | I <sub>OH</sub> = -16mA                           | 3.0                      | 2.4                                       | 2.7             |   | 2.4                                       |   |      |
|                  |   | I <sub>OH</sub> = -24mA                           | 3.0                      | 2.3                                       | 2.5             |   | 2.3                                       |   |      |
| V <sub>OL</sub>  | Low-Level Output Voltage V <sub>IN</sub> = V <sub>IH</sub>  | I <sub>OH</sub> = 100uA                           | 1.65to5.5                |   | 0.0             | 0.1                                       |   | 0.1                                       | V    |
|                  |   | I <sub>OL</sub> = 3mA                             | 1.65                     |   | 0.08            | 0.24                                      |   | 0.24                                      |      |
|                  |   | I <sub>OL</sub> = 8mA                             | 2.3                      |   | 0.20            | 0.3                                       |   | 0.3                                       |      |
|                  |   | I <sub>OL</sub> = 12mA                            | 2.7                      |   | 0.22            | 0.4                                       |   | 0.4                                       |      |
|                  |   | I <sub>OL</sub> = 16mA                            | 3.0                      |   | 0.28            | 0.4                                       |   | 0.4                                       |      |
|                  |   | I <sub>OL</sub> = 24mA                            | 3.0                      |   | 0.38            | 0.55                                      |   | 0.55                                      |      |
| I <sub>IN</sub>  | Input Leakage Current                                       | V <sub>IN</sub> = 5.5V or GND                     | 0 to 5.5                 |   | ±0.1            |   |   | ±1.0                                      | uA   |
|                  |   |   |                          |   |                 |   |   |   |      |
| I <sub>OFF</sub> | Power Off Leakage Current                                   | V <sub>IN</sub> = 5.5V or V <sub>OUT</sub> = 5.5V | 0                        |   |                 | 1   |   | 10  | uA   |
| I <sub>CC</sub>  | Quiescent Supply Current                                    | V <sub>IN</sub> = 5.5V or GND                     | 5.5                      |   |                 |   |   | 10  | uA   |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

**AC ELECTRICAL CHARACTERISTICS**

**tr=tf= 2.5ns**

| Symbol                                      | Parameter                          | Condition                                   | V <sub>CC</sub> (V) | TA = 25 °C |      |      | -40°C ≤TA≤85°C |      | Unit |
|---|------------------------------------|---|---------------------|------------|------|------|----------------|------|------|
|   |                                    |   |                     | Min        | Typ  | Max  | Min            | Max  |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub>        | Propagation Delay<br>(Figure3and4) | R <sub>L</sub> = 1MΩ C <sub>L</sub> = 15 pF | 1.65                | 2.0        | 10.1 | 12.9 | 2.0            | 13.9 | ns   |
|   |                                    |   | 1.8                 | 2.0        | 9.1  | 11.6 | 2.0            | 12.4 |      |
|   |                                    | R <sub>L</sub> = 1MΩ C <sub>L</sub> = 15 pF | 2.5                 | 0.2        | 6.0  | 7.7  | 0.8            | 8.2  |      |
|   |                                    | R <sub>L</sub> = 1MΩ C <sub>L</sub> = 15 pF | 3.3                 | 0.8        | 5.0  | 6.5  | 0.5            | 7.0  |      |
|   |                                    | R <sub>L</sub> = 500Ω C <sub>L</sub> =50 pF |                     | 1.2        | 5.6  | 7.1  | 1.5            | 7.6  |      |
|   |                                    | R <sub>L</sub> = 1MΩ C <sub>L</sub> = 15 pF | 5.0                 | 0.5        | 4.4  | 5.6  | 0.5            | 6.1  |      |
| R <sub>L</sub> = 500Ω C <sub>L</sub> =50 pF | 0.8                                | 4.8   |                     | 6.1        | 0.8  | 6.6  |                |      |      |

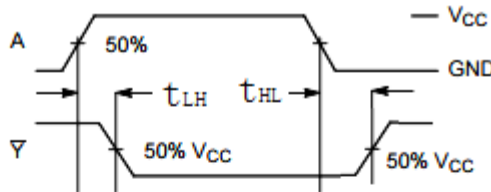
**CAPACITIVE CHARACTERISTICS**

| Symbol          | Parameter                                 | Condition   | Typical | Unit |
|-----------------|---|---|---------|------|
| C <sub>IN</sub> | Input Capacitance                         | V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>        | >2.5    | pF   |
| C <sub>PD</sub> | Power Dissipation Capacitance<br>(Note 6) | 10MHz, V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub> | 4       | pF   |
|                 |   | 10MHz, V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0 V or V <sub>CC</sub> | 4       |      |

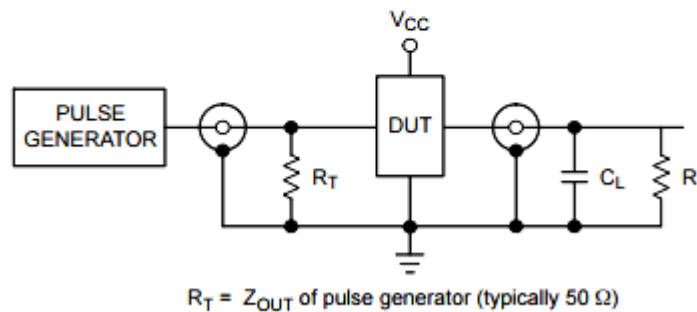
6. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation:

$I_{CC(OPR)} = C_{PD} * V_{CC} * f_{in} + I_{CC} * C_{PD}$  is used to determine the no-load dynamic power consumption;

$P_D = C_{PD} * V_{CC}^2 * f_{in} + I_{CC} * V_{CC} * Fig.$



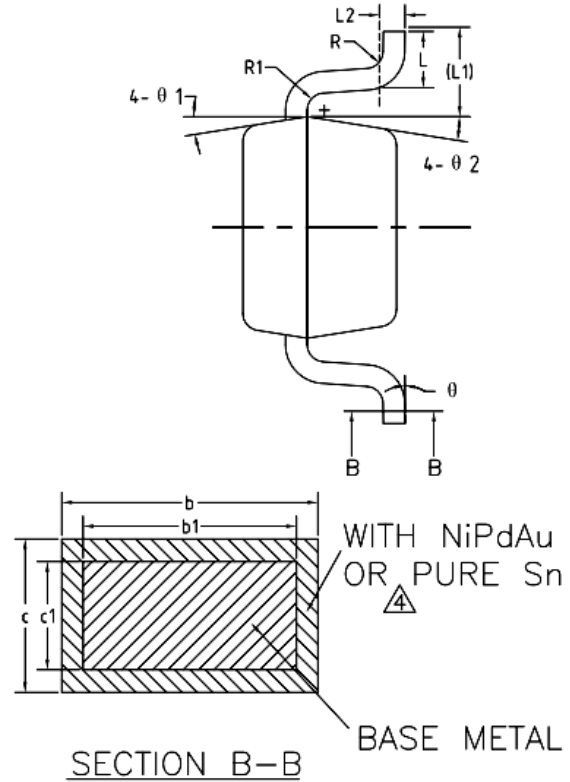
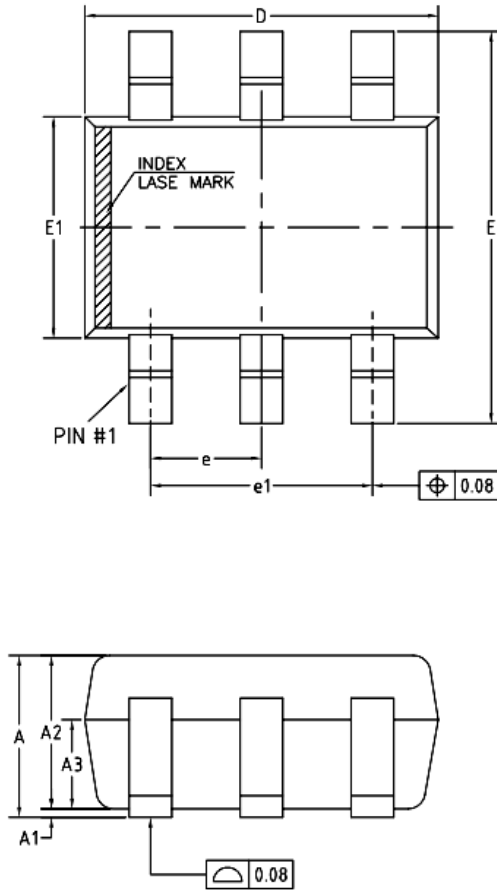
**Figure 3. Switching Waveforms**



**Figure 4. Test Circuit**

**Package Dimension**

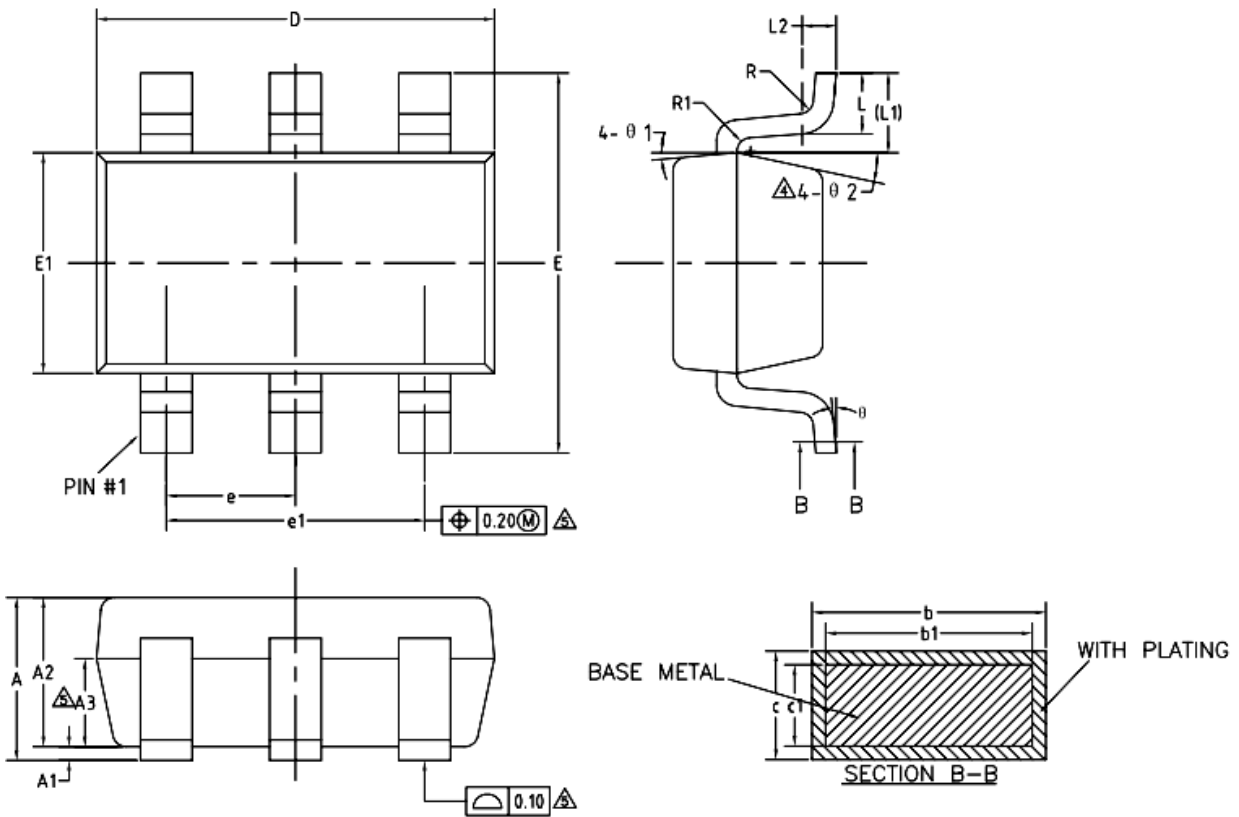
**SC70-6**



COMMON DIMENSIONS  
(UNITS OF MEASURE=MILLIMETER)

| SYMBOL | MIN          | NOM  | MAX  |
|--------|--------------|------|------|
| A      | 0.85         | —    | 1.05 |
| A1     | 0            | —    | 0.10 |
| A2     | 0.80         | 0.90 | 1.00 |
| A3     | 0.47         | 0.52 | 0.57 |
| b      | NiPdAu 0.22  | —    | 0.29 |
|        | PURE Sn 0.23 | —    | 0.33 |
| b1     | 0.22         | 0.25 | 0.28 |
| c      | NiPdAu 0.115 | —    | 0.15 |
|        | PURE Sn 0.12 | —    | 0.18 |
| c1     | 0.115        | 0.13 | 0.14 |
| D      | 2.02         | 2.07 | 2.12 |
| E      | 2.20         | 2.30 | 2.40 |
| E1     | 1.25         | 1.30 | 1.35 |
| e      | 0.60         | 0.65 | 0.70 |
| e1     | 1.20         | 1.30 | 1.40 |
| L      | 0.28         | 0.33 | 0.38 |
| L1     | 0.50REF      |      |      |
| L2     | 0.15BSC      |      |      |
| R      | 0.10         | —    | —    |
| R1     | 0.10         | —    | 0.25 |
| θ      | 0°           | —    | 8°   |
| θ 1    | 6°           | 9°   | 12°  |
| θ 2    | 6°           | 9°   | 12°  |

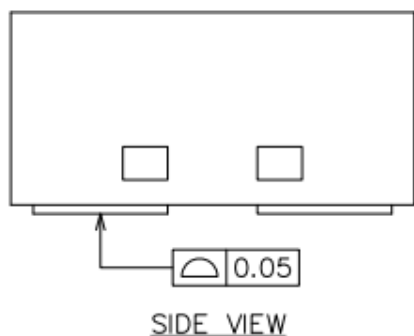
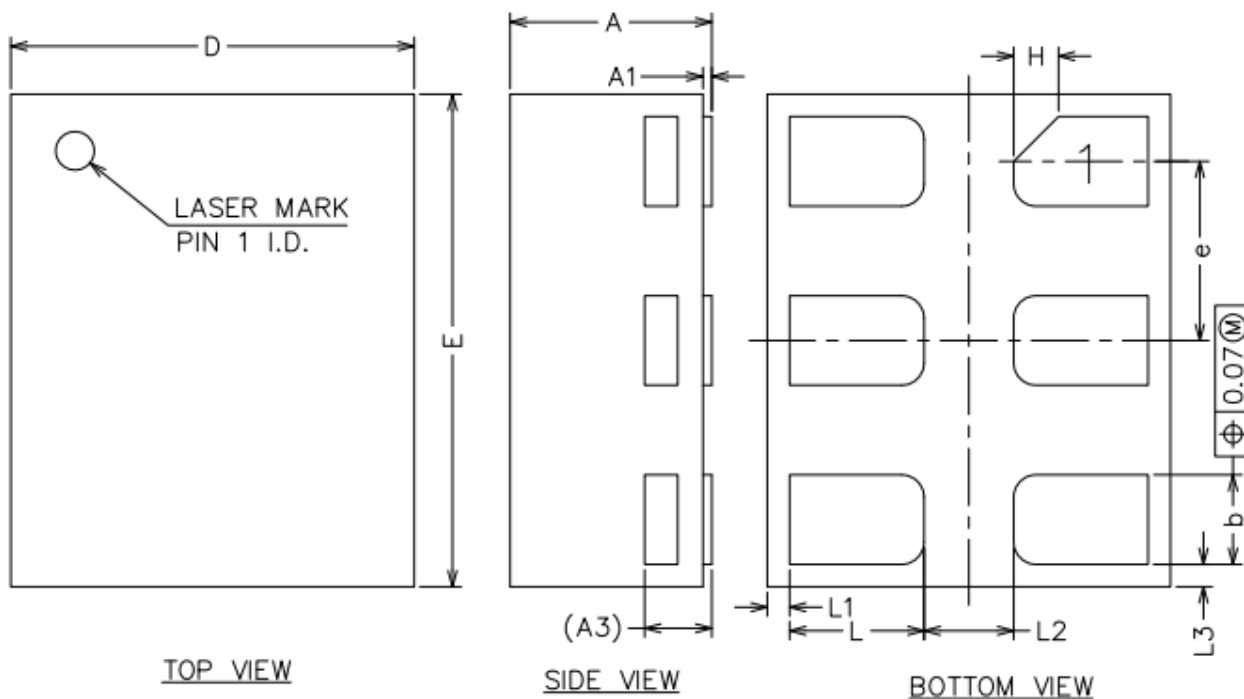
**SOT23-6**



COMMON DIMENSIONS  
(UNITS OF MEASURE=MILLIMETER)

| SYMBOL              | MIN     | NOM   | MAX   |
|---------------------|---------|-------|-------|
| A                   | —       | —     | 1.25  |
| A1                  | 0       | —     | 0.15  |
| A2                  | 1.00    | 1.10  | 1.20  |
| A3                  | 0.60    | 0.65  | 0.70  |
| b                   | 0.36    | —     | 0.50  |
| b1                  | 0.36    | 0.38  | 0.45  |
| c                   | 0.14    | —     | 0.20  |
| c1                  | 0.14    | 0.15  | 0.16  |
| D                   | 2.826   | 2.926 | 3.026 |
| E                   | 2.60    | 2.80  | 3.00  |
| E1                  | 1.526   | 1.626 | 1.726 |
| $\Delta$ e          | 0.90    | 0.95  | 1.00  |
| $\Delta$ e1         | 1.80    | 1.90  | 2.00  |
| L                   | 0.35    | 0.45  | 0.60  |
| L1                  | 0.59REF |       |       |
| L2                  | 0.25BSC |       |       |
| $\Delta$ R          | 0.10    | —     | —     |
| $\Delta$ R1         | 0.10    | —     | 0.20  |
| $\theta$            | 0°      | —     | 8°    |
| $\theta$ 1          | 3°      | 5°    | 7°    |
| $\Delta$ $\theta$ 2 | 6°      | —     | 14°   |

**DFN6**



COMMON DIMENSIONS  
(UNITS OF MEASURE=MILLIMETER)

| SYMBOL | MIN      | NOM  | MAX  |
|--------|----------|------|------|
| A      | 0.40     | 0.45 | 0.50 |
| A1     | 0.00     | 0.02 | 0.05 |
| A3     | 0.152REF |      |      |
| b      | 0.15     | 0.20 | 0.25 |
| D      | 0.85     | 0.90 | 0.95 |
| E      | 1.05     | 1.10 | 1.15 |
| e      | 0.35     | 0.40 | 0.45 |
| H      | 0.10REF  |      |      |
| L      | 0.25     | 0.30 | 0.35 |
| L1     | 0.00     | 0.05 | 0.10 |
| L2     | 0.15     | 0.20 | 0.25 |
| L3     | 0.00     | 0.05 | 0.10 |



**Ordering information**

| <b>Order code</b> | <b>Marking code</b> | <b>Package</b> | <b>Baseqty</b> | <b>Deliverymode</b> |
|-------------------|---------------------|----------------|----------------|---------------------|
| SN74LVC2G04DBVR   | C045                | SOT23-6        | 3000           | Tape and reel       |
| SN74LVC2G04DCKR   | CCF                 | SC70-6         | 3000           | Tape and reel       |
| SN74LVC2G04DRYR   | CC                  | DFN6           | 3000           | Tape and reel       |