

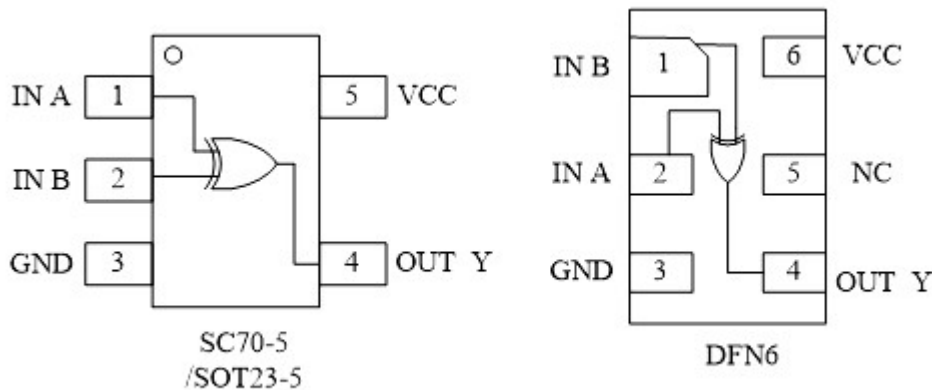
**General Description**

The SN74LVC1G86 is a high performance single 2-input Exclusive-OR Gate operating from a 2.3V to 5.5V supply.

**Features**

- Tiny SC70-5, SOT23-5 and DFN6-1.0mm\*1.5mm Packages
- Extremely High Speed:  $t_{PD}$  2.5ns (typical) at  $V_{CC}$  = 5.0V
- Designed for 1.65V to 5.5V  $V_{CC}$  Operation, CMOS Compatible
- Over Voltage Tolerant Inputs,  $V_{IN}$  may be Between 0 and 7.0V for  $V_{CC}$  Between 0.5 and 5.5V
- TTL Compatible – Interface Capability with 5.0V TTL Logic with  $V_{CC}$  = 2.7V to 3.6V
- LVC MOS Compatible
- 24mA Output Sink Capability, Pullup may be between 0 and 7.0V
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- Chip Complexity: FET = 20
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

**Pin Configuration**



**Figure1: Top View**

**Pin Function**

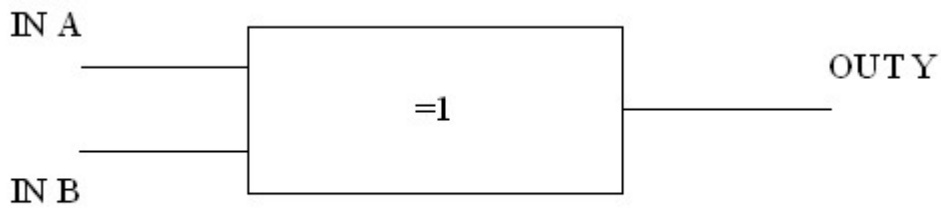
(SC70-5/ SOT23-5)

| PIN | FUNCTION |
|-----|----------|
| 1   | IN B     |
| 2   | INA      |
| 3   | GND      |
| 4   | Y        |
| 5   | VCC      |

DFN6-1.0×1.5

| PIN | FUNCTION |
|-----|----------|
| 1   | IN B     |
| 2   | IN A     |
| 3   | GND      |
| 4   | Y        |
| 5   | NC       |
| 6   | VCC      |

**Block Diagram**



**Figure2.Logic symbol**

**Functional Description**

**Function Table**

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

**Absolute Maximum Ratings**

| Symbol        | Parameter   | Value                         | Unit |
|---------------|---|-------------------------------|------|
| $V_{CC}$      | DC Supply Voltage   | -0.5 to 7.0                   | V    |
| $V_I$         | DC Input Voltage  | $-0.5 \leq V_I \leq +7.0$     | V    |
| $V_O$         | DC Output Voltage Output in Higher or Low State (Note 1)      | -0.5 to $V_{CC} + 0.5$        | V    |
| $I_{IK}$      | DC Input Diode Current $V_I < GND$                            | -50                           | mA   |
| $I_{OK}$      | DC Output Diode Current $V_O < GND, V_O > V_{CC}$             | $\pm 50$                      | mA   |
| $I_O$         | DC Output Sink Current  | $\pm 50$                      | mA   |
| $I_{CC}$      | DC Supply Current per Supply Pin                              | $\pm 100$                     | mA   |
| $I_{GND}$     | DC Ground Current per Supply Pin                              | $\pm 100$                     | mA   |
| $T_{STG}$     | Storage Temperature Range                                     | -65 to 150                    | °C   |
| $T_L$         | Lead Temperature, 1 mm from Case for 10 Seconds               | 260                           | °C   |
| $T_J$         | Junction Temperature Under Bias                               | 150                           | °C   |
| $\theta_{JA}$ | Thermal Resistance  | SC70-5 (Note 1)               | 435  |
|               |   | SOT23-5                       | 300  |
|               |   | DFN6                          | 450  |
| $P_D$         | Power Dissipation in Still Air at 85°C                        | SC70-5                        | 150  |
|               |   | SOT23-5                       | 200  |
|               |   | DFN6                          | 130  |
| MSL           | Moisture Sensitivity  | Level 1                       |      |
| $F_R$         | Flammability Rating Oxygen Index:28 to 34                     | UL94V-0@0.12in                |      |
| ESD           | ESD Classification Human                                      | Body Model (Note 2)           | 2000 |
|               |   | Machine Model (Note3)         | 200  |
|               |   | Charged Device Model (Note 4) | N/A  |
| $I_{Latchup}$ | Latchup Performance Above VCC and Below GND at 125°C (Note 5) | $\pm 100$                     | 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           | -55                             | 125 | °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    |      |

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

| Symbol           | Parameter   | Condition   | VCC(V)                     | T <sub>A</sub> = 25 °C                    |                 |   | -55°C ≤ T <sub>A</sub> ≤ 125°C            |   | Unit |
|------------------|---|---|----------------------------|---|-----------------|---|---|---|------|
|                  |   |   |                            | Min                                       | Typ             | Max                                       | Min                                       | Max                                       |      |
| V <sub>IH</sub>  | High-Level Input Voltage                                    |   | 1.65 to 1.95<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                                     |   | 1.65 to 1.95<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> = -100µA                            | 1.65 to 5.5                | 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                                       |   |      |
|                  |   | I <sub>OH</sub> = -32mA                             | 4.5                        | 3.8                                       | 4.0             |   | 3.8                                       |   |      |
| V <sub>OL</sub>  | Low-Level Output Voltage V <sub>IN</sub> = V <sub>IH</sub>  | I <sub>OL</sub> = 100µA                             | 1.65 to 5.5                |   | 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>OL</sub> = 32mA                              | 4.5                        |   | 0.42            | 0.55                                      |   | 0.55                                      |      |
| I <sub>IN</sub>  | Input Leakage Current                                       | V <sub>IN</sub> = 5.5 V or GND                      | 0 to 5.5                   |   | ±0.1            |   |   | ±1.0                                      | µA   |
| I <sub>OFF</sub> | Power Off Leakage Current                                   | V <sub>IN</sub> = 5.5 V or V <sub>OUT</sub> = 5.5 V | 0                          |   |                 | 1   |   | 10  | µA   |
| I <sub>CC</sub>  | Quiescent Supply Current                                    | V <sub>IN</sub> = 5.5 V or GND                      | 5.5                        |   |                 |   |   | 10  | µA   |

**AC ELECTRICAL CHARACTERISTICS  $t_r=t_f= 2.5\text{ns}$ ;  $C_L = 50\text{pF}$ ;  
 $R_L = 500 \Omega$**

| Symbol                 | Parameter                             | Condition                                   | $V_{CC}(\text{V})$ | $T_A = 25^\circ\text{C}$ |     |      | $-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$ |      | Unit |
|------------------------|---------------------------------------|---|--------------------|--------------------------|-----|------|---|------|------|
|                        |                                       |   |                    | Min                      | Typ | Max  | Min   | Max  |      |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay<br>(Figure 3 and 4) | $R_L = 1\text{M}\Omega$ $C_L = 15\text{pF}$ | 1.65               | 2.0                      | 5.3 | 11.4 | 2.0   | 12.0 | ns   |
|                        |                                       |   | 1.8                | 2.0                      | 4.4 | 9.5  | 2.0   | 10.0 |      |
|                        |                                       | $R_L = 1\text{M}\Omega$ $C_L = 15\text{pF}$ | $2.5 \pm 0.2$      | 0.2                      | 3.5 | 6.5  | 0.8   | 4.1  |      |
|                        |                                       | $R_L = 1\text{M}\Omega$ $C_L = 15\text{pF}$ | $3.3 \pm 0.3$      | 0.8                      | 2.1 | 4.5  | 0.5   | 3.7  |      |
|                        |                                       | $R_L = 500\Omega$ $C_L = 50\text{pF}$       |                    | 1.2                      | 2.9 | 5.5  | 1.5   | 5.2  |      |
|                        |                                       | $R_L = 1\text{M}\Omega$ $C_L = 15\text{pF}$ | $5.0 \pm 0.5$      | 0.5                      | 1.8 | 3.9  | 0.5   | 4.1  |      |
|                        |                                       | $R_L = 500\Omega$ $C_L = 50\text{pF}$       |                    | 0.8                      | 2.4 | 4.3  | 0.8   | 4.5  |      |

**CAPACITIVE CHARACTERISTICS**

| Symbol   | Parameter                                 | Condition   | Typical | Unit |
|----------|---|---|---------|------|
| $C_{IN}$ | Input Capacitance                         | $V_{CC} = 5.5\text{V}, V_I = 0\text{V}$ or $V_{CC}$               | $>2.5$  | pF   |
| $C_{PD}$ | Power Dissipation Capacitance<br>(Note 6) | $10\text{MHz}, V_{CC} = 3.3\text{V}, V_I = 0\text{V}$ or $V_{CC}$ | 4       | pF   |
|          |   | $10\text{MHz}, V_{CC} = 5.5\text{V}, V_I = 0\text{V}$ or $V_{CC}$ | 4       |      |

6.  $C_{PD}$  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;

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

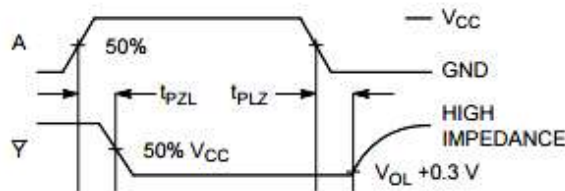


Figure 3. Switching Waveforms

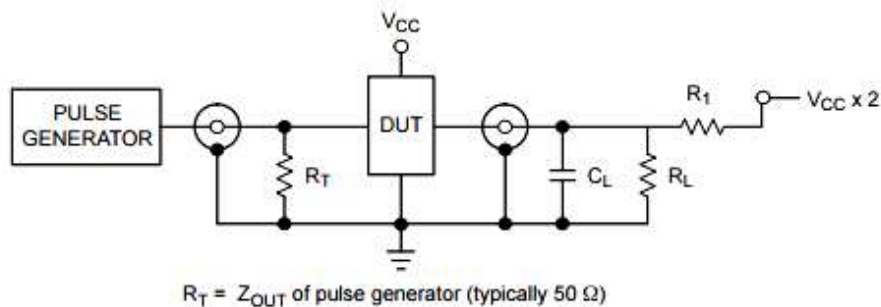
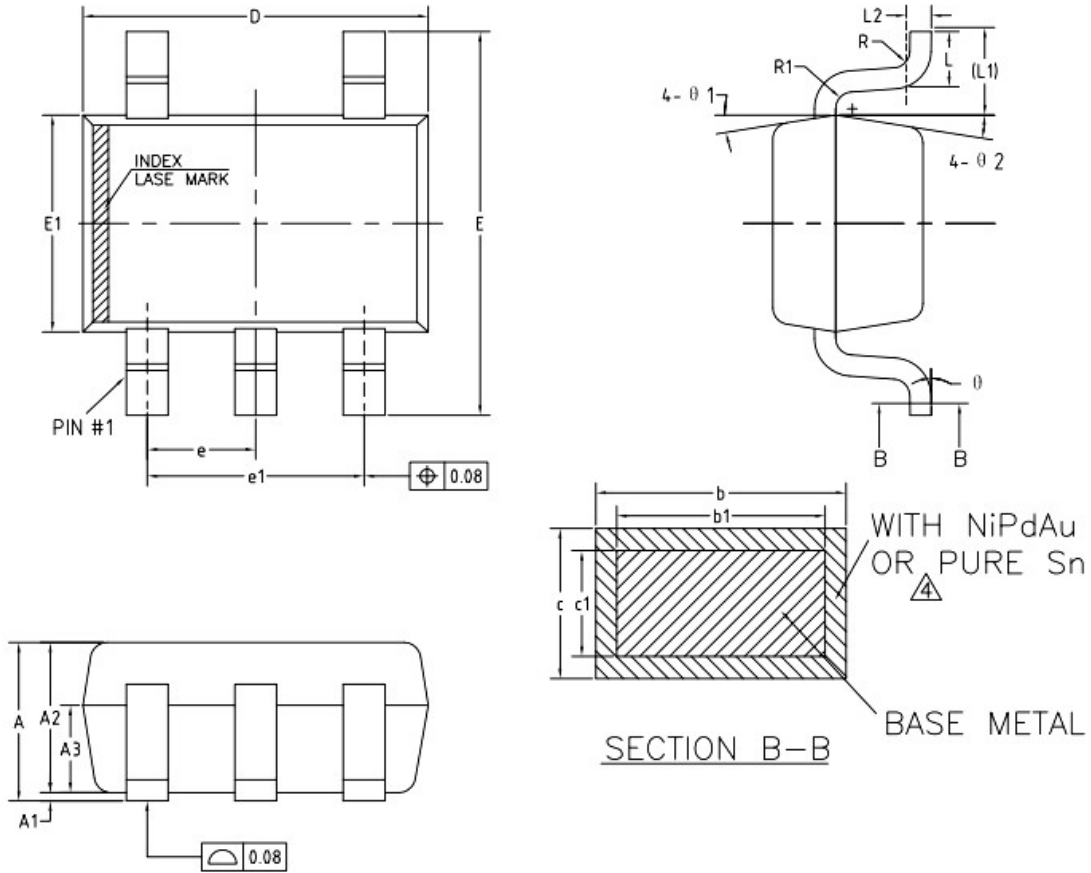


Figure 4. Test Circuit

Package Dimension

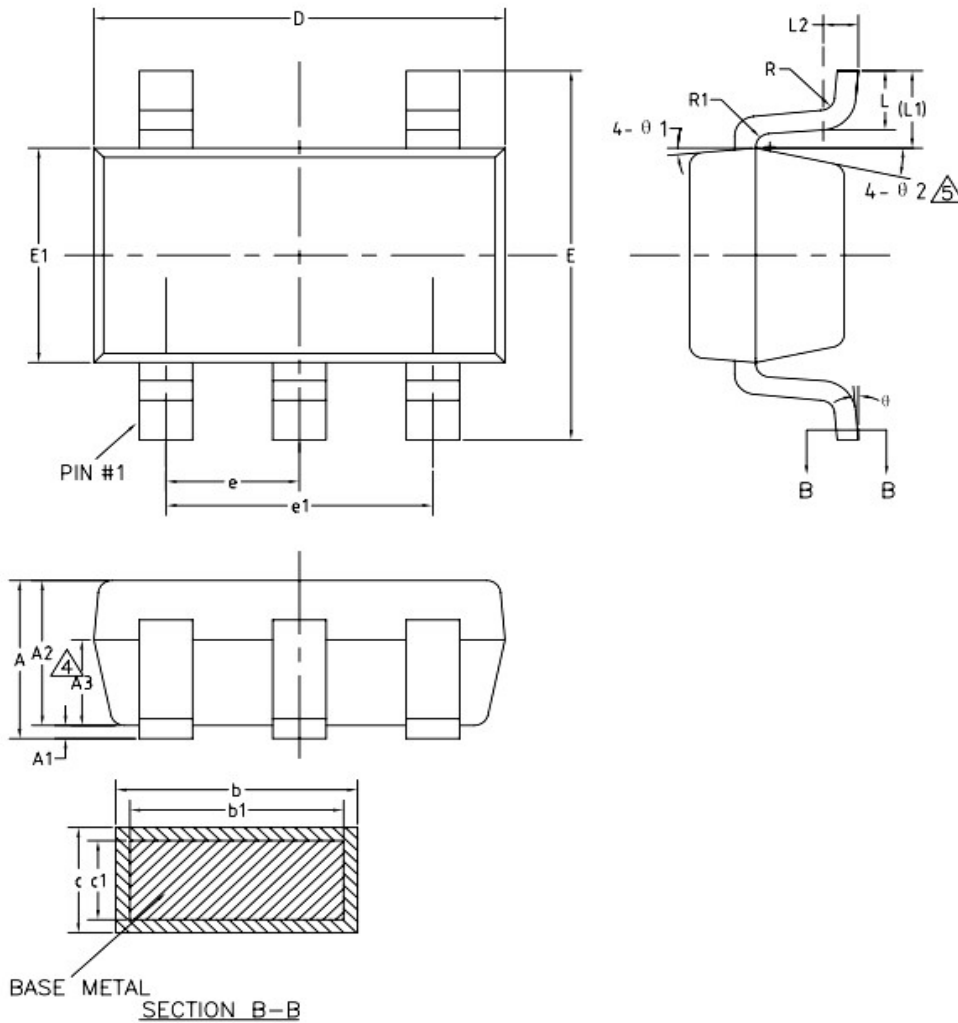
SC70-5






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 |      |
| $\theta$   | 0°      | —     | 8°   |      |
| $\theta 1$ | 6°      | 9°    | 12°  |      |
| $\theta 2$ | 6°      | 9°    | 12°  |      |

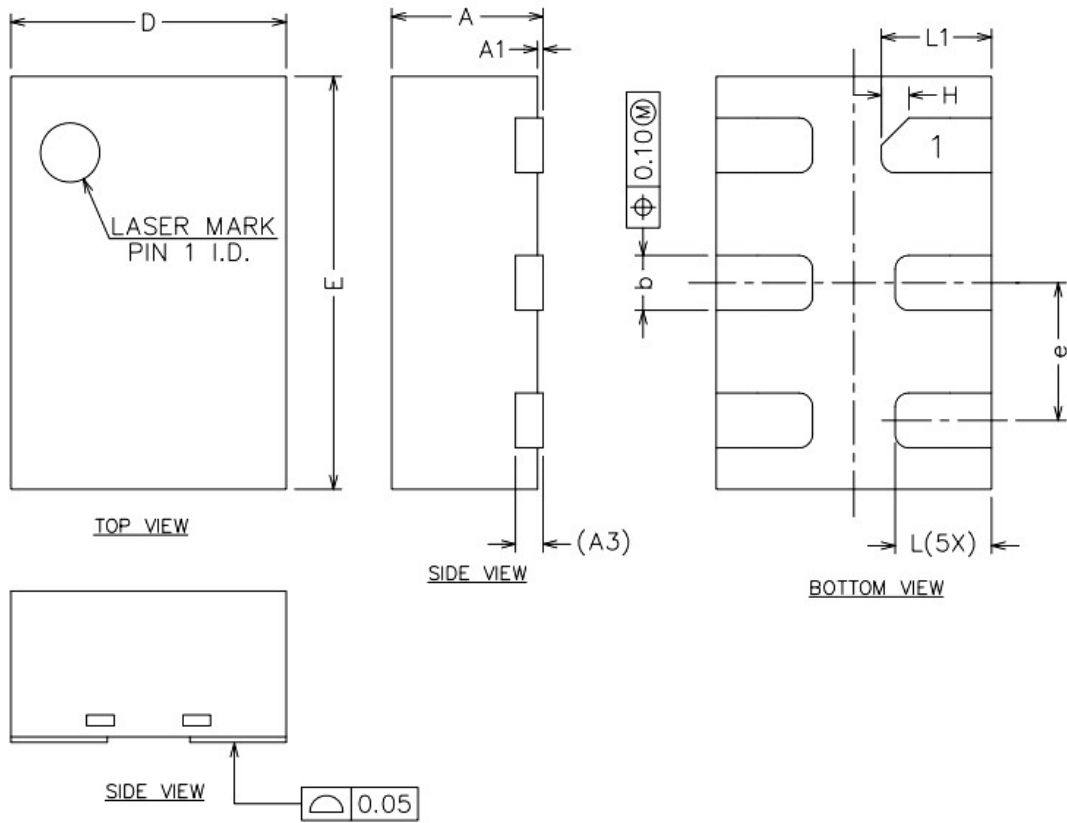
SOT23-5



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 |
| e   | 0.90    | 0.95  | 1.00  |
|  e1  | 1.80    | 1.90  | 2.00  |
| L   | 0.35    | 0.45  | 0.60  |
| L1  | 0.59REF |       |       |
| L2  | 0.25BSC |       |       |
| R   | 0.10    | —     | —     |
| R1  | 0.10    | —     | 0.25  |
| θ   | 0°      | —     | 8°    |
| θ 1   | 3°      | 5°    | 7°    |
|  θ 2 | 6°      | —     | 14°   |

DFN6



COMMON DIMENSIONS  
(UNITS OF MEASURE=MILLIMETER)

| SYMBOL | MIN     | NOM  | MAX  |
|--------|---------|------|------|
| A      | 0.50    | —    | 0.60 |
| A1     | 0.00    | 0.02 | 0.05 |
| A3     | 0.10REF |      |      |
| b      | 0.15    | 0.20 | 0.25 |
| D      | 0.90    | 1.00 | 1.10 |
| E      | 1.40    | 1.50 | 1.60 |
| e      | 0.40    | 0.50 | 0.60 |
| H      | 0.10REF |      |      |
| L      | 0.30    | 0.35 | 0.40 |
| L1     | 0.35    | 0.40 | 0.45 |



**Ordering information**

| Order code          | Marking code | Package      | Baseqty | Deliverymode  |
|---------------------|--------------|--------------|---------|---------------|
| UMW SN74LVC1G86DBVR | C86J         | SOT23-5      | 3000    | Tape and reel |
| UMW SN74LVC1G86DCKR | CH5          | SC70-5       | 3000    | Tape and reel |
| UMW SN74LVC1G86DRYR | CH           | DFN-6(1x1.5) | 5000    | Tape and reel |