

## TRIPLE BUFFER

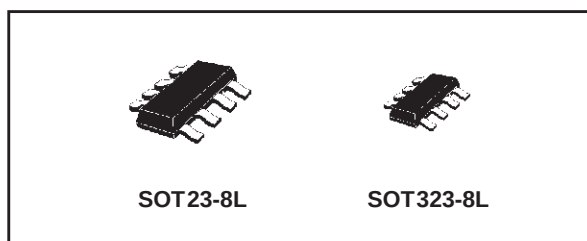
- HIGH SPEED:  $t_{PD} = 3.0ns$  (TYP.) at  $V_{CC} = 5V$
- LOW POWER DISSIPATION:  
 $I_{CC} = 1\mu A$ (MAX.) at  $T_A = 25^\circ C$
- HIGH NOISE IMMUNITY:  
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (MIN.)
- POWER DOWN PROTECTION ON INPUTS AND OUTPUTS
- SYMMETRICAL OUTPUT IMPEDANCE:  
 $|I_{OH}| = I_{OL} = 8mA$  (MIN) at  $V_{CC} = 4.5V$   
 $|I_{OH}| = I_{OL} = 4mA$  (MIN) at  $V_{CC} = 3.0V$
- BALANCED PROPAGATION DELAYS:  
 $t_{PLH} \cong t_{PHL}$
- OPERATING VOLTAGE RANGE:  
 $V_{CC}(OPR) = 2V$  to  $5.5V$
- IMPROVED LATCH-UP IMMUNITY

### DESCRIPTION

The 74V2G70 is an advanced high-speed CMOS TRIPLE NOT INVERTED BUFFER fabricated with sub-micron silicon gate and double-layer metal wiring C<sup>2</sup>MOS technology.

The internal circuit is composed of 3 stages including buffer output, which provide high noise immunity and stable output.

Power down protection is provided on all inputs and outputs and 0 to 7V can be accepted on inputs with no regard to the supply voltage.



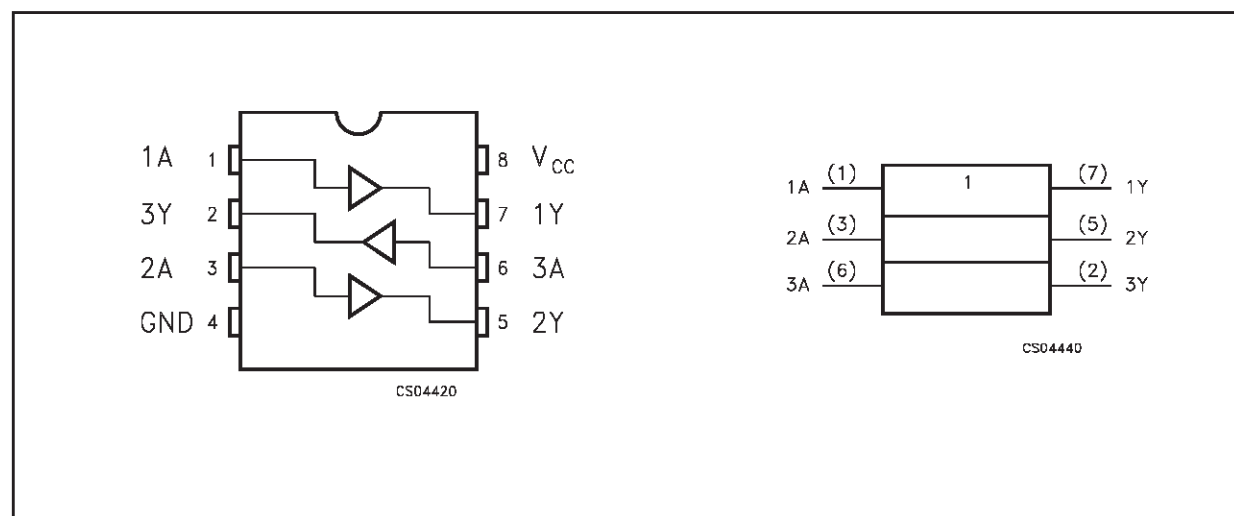
### ORDER CODES

| PACKAGE   | T & R      |
|-----------|------------|
| SOT23-8L  | 74V2G70STR |
| SOT323-8L | 74V2G70CTR |

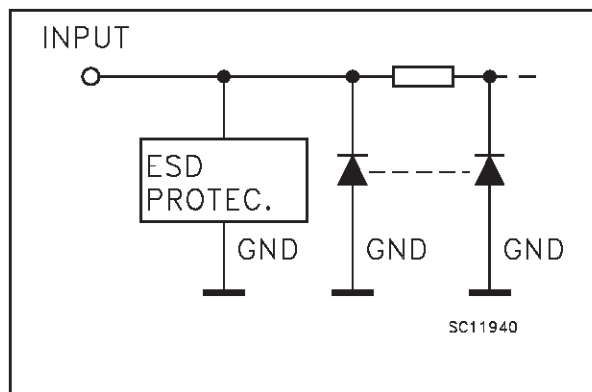
This device can be used to interface 5V to 3V systems and it is ideal for portable applications like personal digital assistant, camcorder and all battery-powered equipment.

All inputs and outputs are equipped with protection circuits against static discharge, giving them ESD immunity and transient excess voltage.

### PIN CONNECTION AND IEC LOGIC SYMBOLS



## INPUT EQUIVALENT CIRCUIT



## PIN DESCRIPTION

| PIN No  | SYMBOL          | NAME QND FUNCTION       |
|---------|-----------------|-------------------------|
| 1, 3, 6 | 1A, 2A, 3A      | Data Inputs             |
| 7, 5, 2 | 1Y, 2Y, 3Y      | Data Outputs            |
| 4       | GND             | Ground (0V)             |
| 8       | V <sub>CC</sub> | Positive Supply Voltage |

## TRUTH TABLE

| nA | nY |
|----|----|
| L  | L  |
| H  | H  |

## ABSOLUTE MAXIMUM RATINGS

| Symbol                              | Parameter                            | Value                         | Unit |
|-------------------------------------|--------------------------------------|-------------------------------|------|
| V <sub>CC</sub>                     | Supply Voltage                       | -0.5 to +7.0                  | V    |
| V <sub>I</sub>                      | DC Input Voltage                     | -0.5 to +7.0                  | V    |
| V <sub>O</sub>                      | DC Output Voltage (see note 1)       | -0.5 to +7.0                  | V    |
| V <sub>O</sub>                      | DC Output Voltage (see note 2)       | -0.5 to V <sub>CC</sub> + 0.5 | V    |
| I <sub>IK</sub>                     | DC Input Diode Current               | - 20                          | mA   |
| I <sub>OK</sub>                     | DC Output Diode Current              | - 20                          | mA   |
| I <sub>O</sub>                      | DC Output Current                    | ± 25                          | mA   |
| I <sub>CC</sub> or I <sub>GND</sub> | DC V <sub>CC</sub> or Ground Current | ± 50                          | mA   |
| T <sub>stg</sub>                    | Storage Temperature                  | -65 to +150                   | °C   |
| T <sub>L</sub>                      | Lead Temperature (10 sec)            | 260                           | °C   |

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied.

1) V<sub>CC</sub>=0V

2) High or Low State

## RECOMMENDED OPERATING CONDITIONS

| Symbol          | Parameter                                                                                          | Value                | Unit         |
|-----------------|----------------------------------------------------------------------------------------------------|----------------------|--------------|
| V <sub>CC</sub> | Supply Voltage                                                                                     | 2 to 5.5             | V            |
| V <sub>I</sub>  | Input Voltage                                                                                      | 0 to 5.5             | V            |
| V <sub>O</sub>  | Output Voltage (see note 1)                                                                        | 0 to 5.5             | V            |
| V <sub>O</sub>  | Output Voltage (see note 2)                                                                        | 0 to V <sub>CC</sub> | V            |
| T <sub>op</sub> | Operating Temperature                                                                              | -55 to 125           | °C           |
| dt/dv           | Input Rise and Fall Time (note 3) (V <sub>CC</sub> = 3.3 ± 0.3V)<br>(V <sub>CC</sub> = 5.0 ± 0.5V) | 0 to 100<br>0 to 20  | ns/V<br>ns/V |

1) V<sub>CC</sub>=0V

2) High or Low State

3) V<sub>IN</sub> from 30% to 70% of V<sub>CC</sub>

## DC SPECIFICATIONS

| Symbol           | Parameter                         | Test Condition         |                                         | Value                 |      |                    |                    |                    |                    |                    | Unit |
|------------------|-----------------------------------|------------------------|-----------------------------------------|-----------------------|------|--------------------|--------------------|--------------------|--------------------|--------------------|------|
|                  |                                   | V <sub>CC</sub><br>(V) |                                         | T <sub>A</sub> = 25°C |      |                    | -40 to 85°C        |                    | -55 to 125°C       |                    |      |
|                  |                                   |                        |                                         | Min.                  | Typ. | Max.               | Min.               | Max.               | Min.               | Max.               |      |
| V <sub>IH</sub>  | High Level Input Voltage          | 2.0                    |                                         | 1.5                   |      |                    | 1.5                |                    | 1.5                |                    | V    |
|                  |                                   | 3.0 to 5.5             |                                         | 0.7V <sub>CC</sub>    |      |                    | 0.7V <sub>CC</sub> |                    | 0.7V <sub>CC</sub> |                    |      |
| V <sub>IL</sub>  | Low Level Input Voltage           | 2.0                    |                                         |                       |      | 0.5                |                    | 0.5                |                    | 0.5                | V    |
|                  |                                   | 3.0 to 5.5             |                                         |                       |      | 0.3V <sub>CC</sub> |                    | 0.3V <sub>CC</sub> |                    | 0.3V <sub>CC</sub> |      |
| V <sub>OH</sub>  | High Level Ouput Voltage          | 2.0                    | I <sub>O</sub> =-50 μA                  | 1.9                   | 2.0  |                    | 1.9                |                    | 1.9                |                    | V    |
|                  |                                   | 3.0                    | I <sub>O</sub> =-50 μA                  | 2.9                   | 3.0  |                    | 2.9                |                    | 2.9                |                    |      |
|                  |                                   | 4.5                    | I <sub>O</sub> =-50 μA                  | 4.4                   | 4.5  |                    | 4.4                |                    | 4.4                |                    |      |
|                  |                                   | 3.0                    | I <sub>O</sub> =-4 mA                   | 2.58                  |      |                    | 2.48               |                    | 2.4                |                    |      |
|                  |                                   | 4.5                    | I <sub>O</sub> =-8 mA                   | 3.94                  |      |                    | 3.8                |                    | 3.7                |                    |      |
| V <sub>OL</sub>  | Low Level Output Voltage          | 2.0                    | I <sub>O</sub> =50 μA                   |                       | 0.0  | 0.1                |                    | 0.1                |                    | 0.1                | V    |
|                  |                                   | 3.0                    | I <sub>O</sub> =50 μA                   |                       | 0.0  | 0.1                |                    | 0.1                |                    | 0.1                |      |
|                  |                                   | 4.5                    | I <sub>O</sub> =50 μA                   |                       | 0.0  | 0.1                |                    | 0.1                |                    | 0.1                |      |
|                  |                                   | 3.0                    | I <sub>O</sub> =4 mA                    |                       |      | 0.36               |                    | 0.44               |                    | 0.55               |      |
|                  |                                   | 4.5                    | I <sub>O</sub> =8 mA                    |                       |      | 0.36               |                    | 0.44               |                    | 0.55               |      |
| I <sub>I</sub>   | Input Leakage Current             | 0 to 5.5               | V <sub>I</sub> = 5.5V or GND            |                       |      | ± 0.1              |                    | ± 1                |                    | ± 1                | μA   |
| I <sub>CC</sub>  | Quiescent Supply Current          | 5.5                    | V <sub>I</sub> = V <sub>CC</sub> or GND |                       |      | 1                  |                    | 10                 |                    | 20                 | μA   |
| I <sub>OPD</sub> | Power down Output Leakage Current | 0                      | V <sub>O</sub> = 5.5                    |                       |      | 0.5                |                    | 5                  |                    | 10                 | μA   |

AC ELECTRICAL CHARACTERISTICS (Input t<sub>r</sub> = t<sub>f</sub> = 3ns)

| Symbol                            | Parameter              | Test Condition         |                        |  | Value                 |      |      |             |      |              | Unit |      |
|-----------------------------------|------------------------|------------------------|------------------------|--|-----------------------|------|------|-------------|------|--------------|------|------|
|                                   |                        | V <sub>CC</sub><br>(V) | C <sub>L</sub><br>(pF) |  | T <sub>A</sub> = 25°C |      |      | -40 to 85°C |      | -55 to 125°C |      |      |
|                                   |                        |                        |                        |  | Min.                  | Typ. | Max. | Min.        | Max. | Min.         |      | Max. |
| t <sub>PLH</sub> t <sub>PHL</sub> | Propagation Delay Time | 3.3 <sup>(*)</sup>     | 15                     |  |                       | 3.7  | 7.0  | 1.0         | 8.0  | 1.0          | 9.0  | ns   |
|                                   |                        | 3.3 <sup>(*)</sup>     | 50                     |  |                       | 5.3  | 8.0  | 1.0         | 9.5  | 1.0          | 10.5 |      |
|                                   |                        | 5.0 <sup>(**)</sup>    | 15                     |  |                       | 3.0  | 5.0  | 1.0         | 6.0  | 1.0          | 7.0  |      |
|                                   |                        | 5.0 <sup>(**)</sup>    | 50                     |  |                       | 4.1  | 6.5  | 1.0         | 7.5  | 1.0          | 8.5  |      |

(\*) Voltage range is 3.3V ± 0.3V

(\*\*) Voltage range is 5.0V ± 0.5V

## CAPACITANCE CHARACTERISTICS

| Symbol          | Parameter                              | Test Condition | Value                 |      |      |             |      |              |      |    | Unit |
|-----------------|----------------------------------------|----------------|-----------------------|------|------|-------------|------|--------------|------|----|------|
|                 |                                        |                | T <sub>A</sub> = 25°C |      |      | -40 to 85°C |      | -55 to 125°C |      |    |      |
|                 |                                        |                | Min.                  | Typ. | Max. | Min.        | Max. | Min.         | Max. |    |      |
| C <sub>IN</sub> | Input Capacitance                      |                |                       | 4    | 10   |             | 10   |              | 10   | pF |      |
| C <sub>PD</sub> | Power Dissipation Capacitance (note 1) |                |                       | 12   |      |             |      |              |      | pF |      |

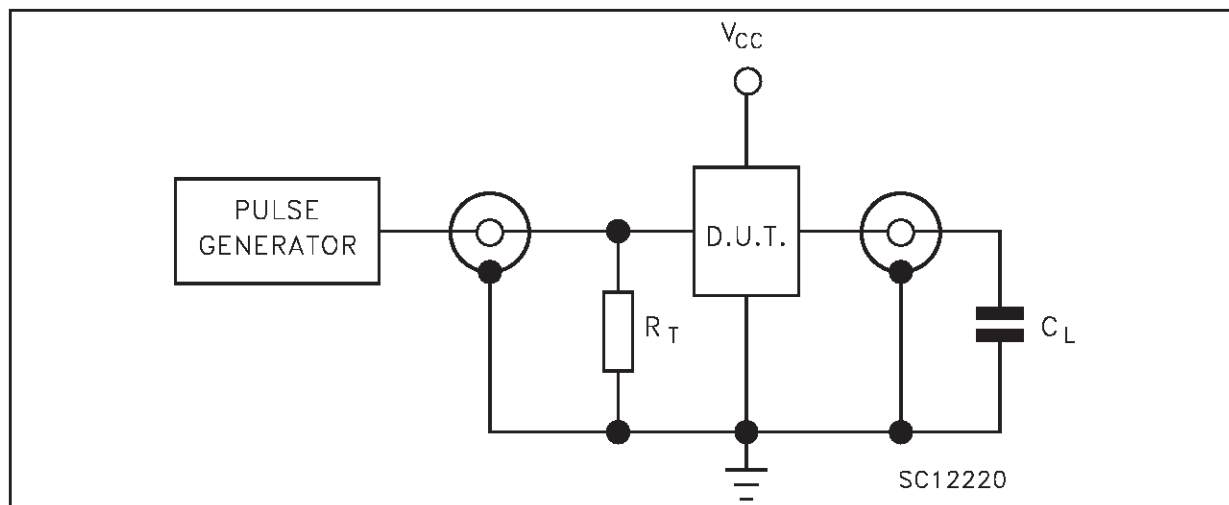
1) C<sub>PD</sub> is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average current can be obtained by the following equation.  $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/2$

## DYNAMIC SWITCHING CHARACTERISTICS

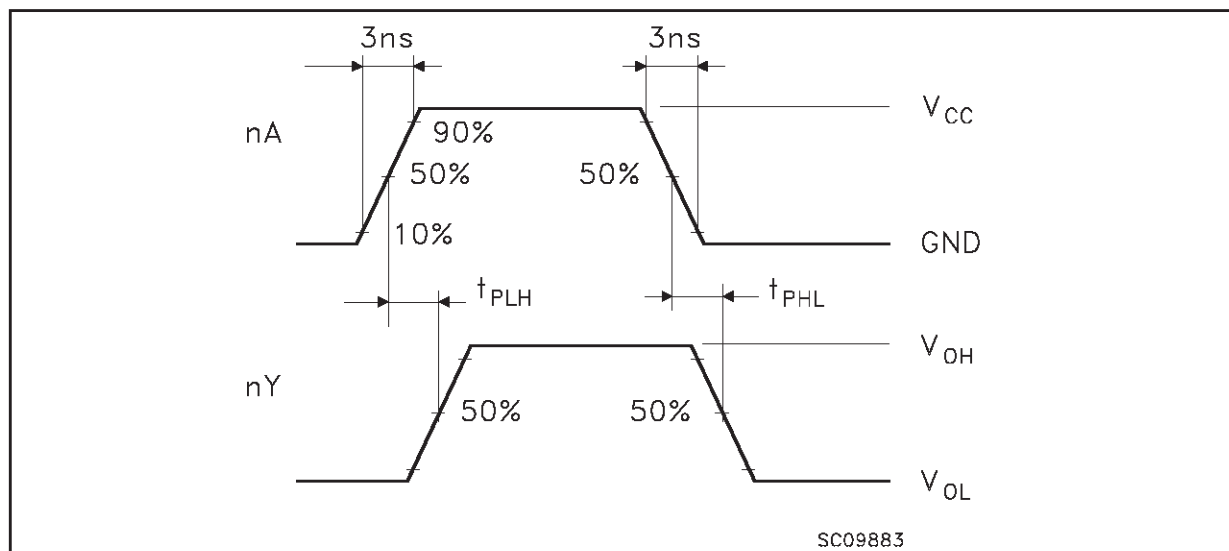
| Symbol           | Parameter                                | Test Condition      |                                                                       | Value                  |      | Unit |
|------------------|------------------------------------------|---------------------|-----------------------------------------------------------------------|------------------------|------|------|
|                  |                                          | V <sub>CC</sub> (V) |                                                                       | T <sub>A</sub> = 25 °C |      |      |
|                  |                                          |                     |                                                                       | Min.                   | Max. |      |
| V <sub>OLP</sub> | Dynamic Low Level Quiet Out-put (note 1) | 5.0                 | C <sub>L</sub> = 50pF<br>V <sub>IL</sub> = 0V, V <sub>IH</sub> = 3.3V |                        | 0.8  | V    |
| V <sub>OLV</sub> |                                          |                     |                                                                       | -0.8                   |      |      |

1) Number of output defined as "n". Measured with "n-1" outputs switching from HIGH to LOW or LOW to HIGH. The remaining outputs are measured in the LOW state.

## TEST CIRCUIT

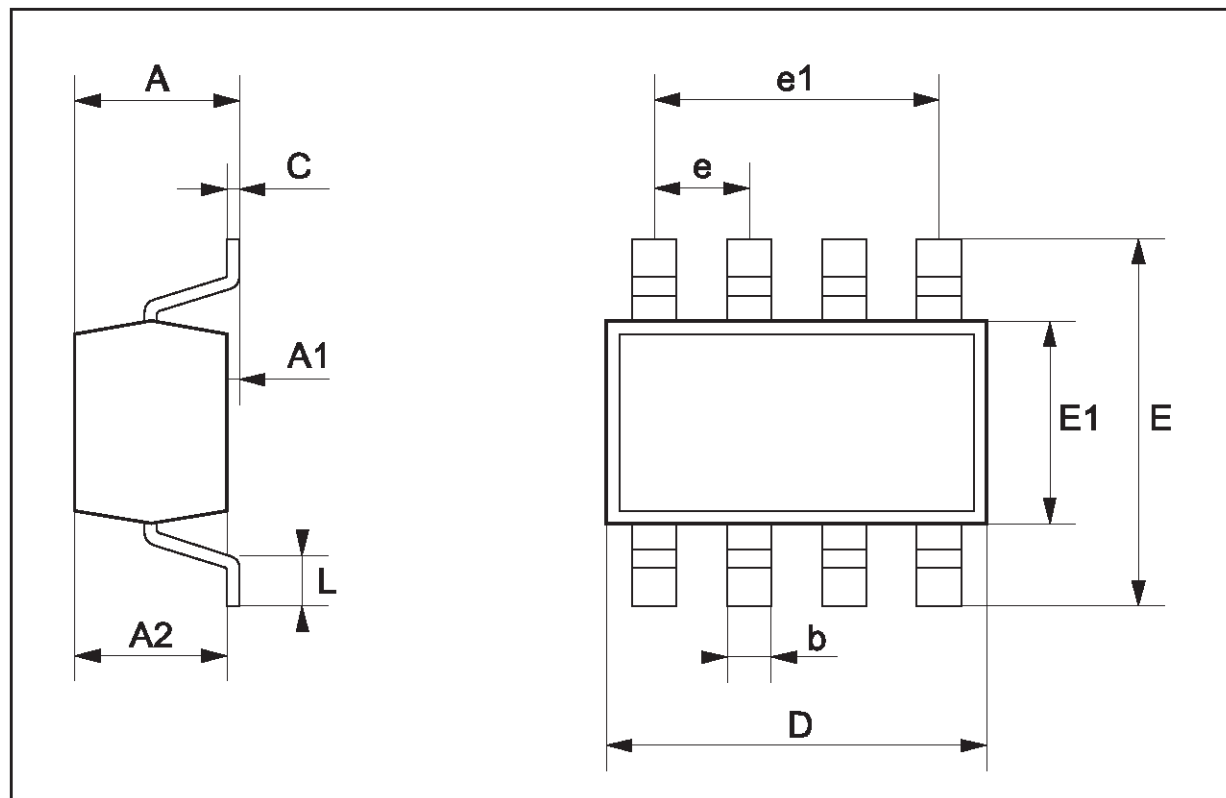


$C_L = 15/50\text{pF}$  or equivalent (includes jig and probe capacitance)  
 $R_T = Z_{OUT}$  of pulse generator (typically  $50\Omega$ )

WAVEFORM: PROPAGATION DELAY ( $f=1\text{MHz}$ ; 50% duty cycle)

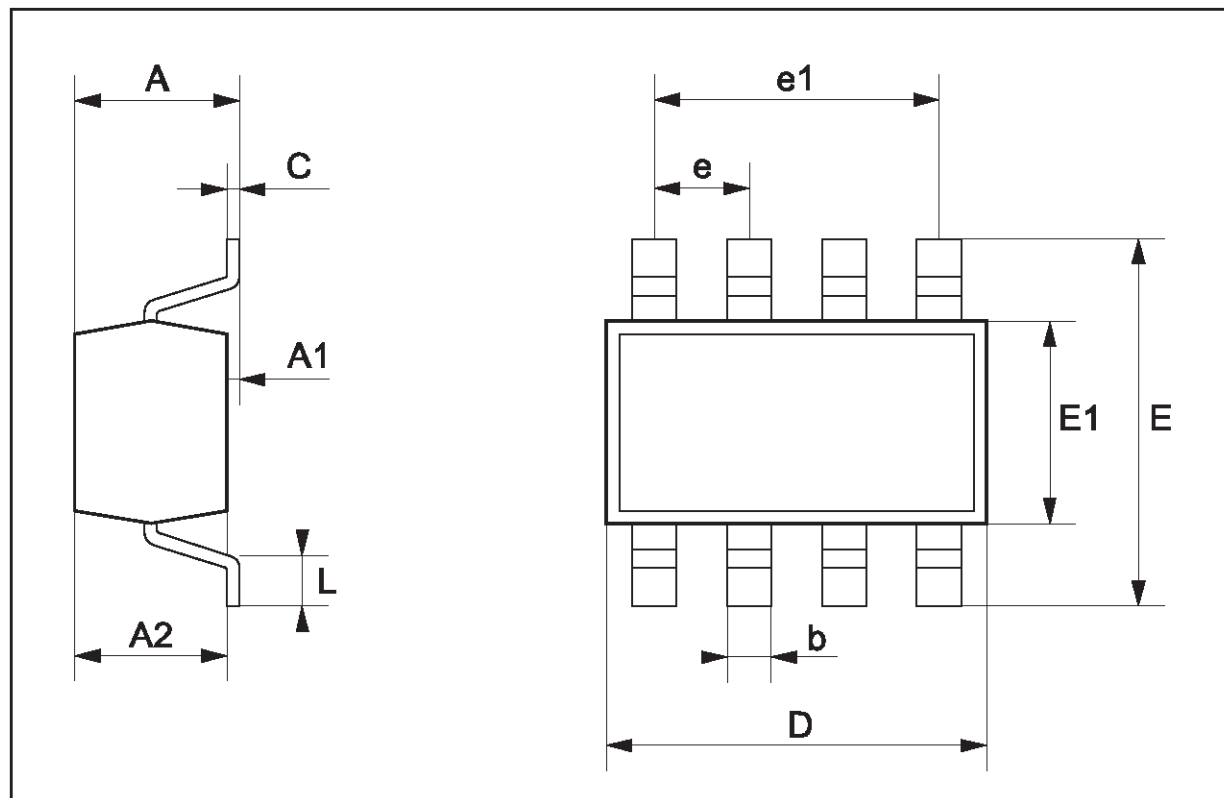
## SOT23-8L MECHANICAL DATA

| DIM. | mm.  |      |      | mils  |      |       |
|------|------|------|------|-------|------|-------|
|      | MIN. | TYP  | MAX. | MIN.  | TYP. | MAX.  |
| A    | 0.90 |      | 1.45 | 35.4  |      | 57.1  |
| A1   | 0.00 |      | 0.15 | 0.0   |      | 5.9   |
| A2   | 0.90 |      | 1.30 | 35.4  |      | 51.2  |
| b    | 0.22 |      | 0.38 | 8.6   |      | 14.9  |
| C    | 0.09 |      | 0.20 | 3.5   |      | 7.8   |
| D    | 2.80 |      | 3.00 | 110.2 |      | 118.1 |
| E    | 2.60 |      | 3.00 | 102.3 |      | 118.1 |
| E1   | 1.50 |      | 1.75 | 59.0  |      | 68.8  |
| e    | 0    | .65  |      |       | 25.6 |       |
| e1   |      | 1.95 |      |       | 76.7 |       |
| L    | 0.35 |      | 0.55 | 13.7  |      | 21.6  |



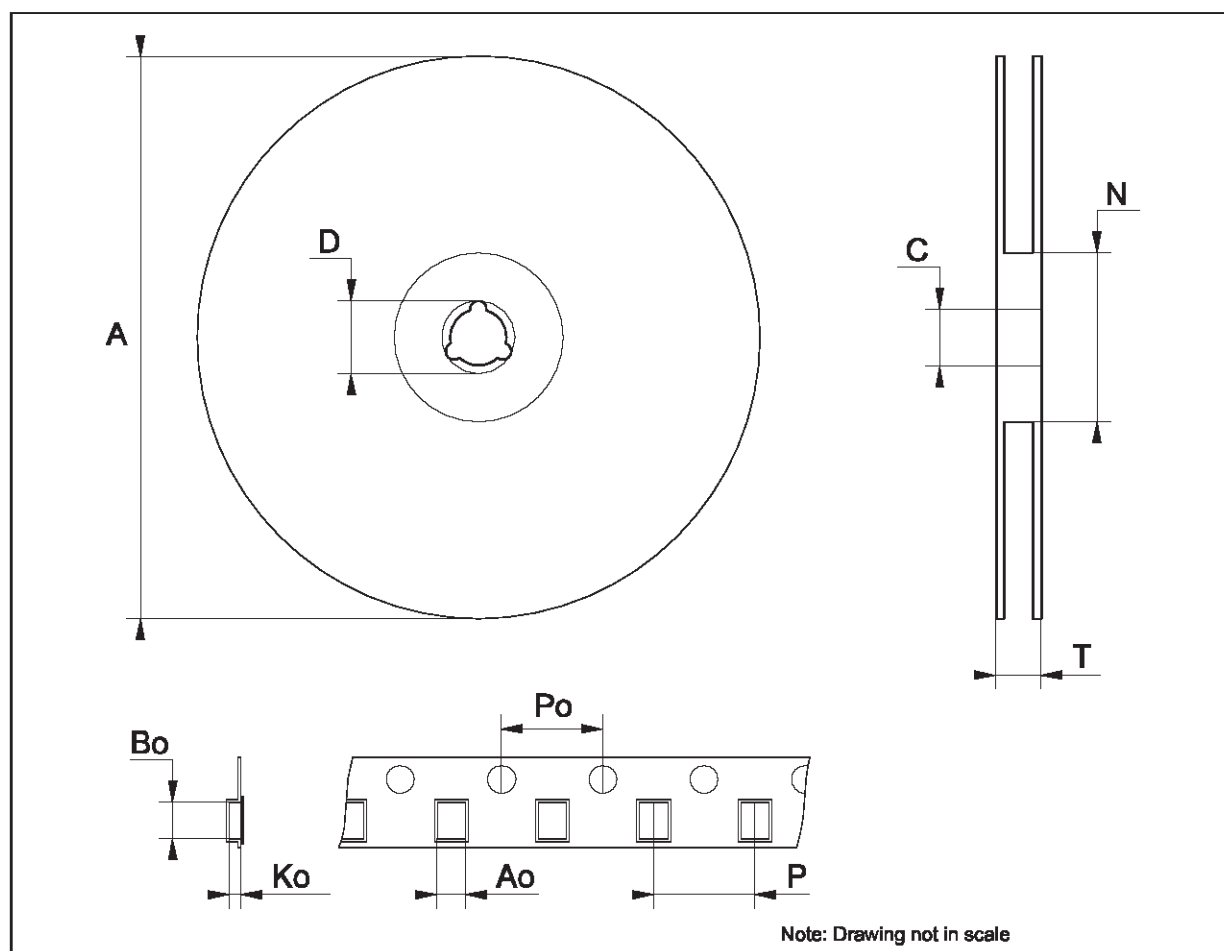
## SOT323-8L MECHANICAL DATA

| DIM. | mm.  |     |      | mils |      |      |
|------|------|-----|------|------|------|------|
|      | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A    | 0.80 |     | 1.10 | 31.5 |      | 43.3 |
| A1   | 0.00 |     | 0.10 | 0.0  |      | 3.9  |
| A2   | 0.80 |     | 1.00 | 31.5 |      | 34.9 |
| b    | 0.13 |     | 0.28 | 5.1  |      | 11.0 |
| C    | 0.10 |     | 0.18 | 3.9  |      | 7.1  |
| D    | 1.80 |     | 2.20 | 70.9 |      | 86.6 |
| E    | 1.80 |     | 2.40 | 70.9 |      | 94.5 |
| E1   | 1.15 |     | 1.35 | 45.3 |      | 53.1 |
| e    |      | 0.5 |      |      | 19.7 |      |
| e1   |      | 1.5 |      |      | 59.0 |      |
| L    | 0.10 |     | 0.30 | 3.9  |      | 11.8 |



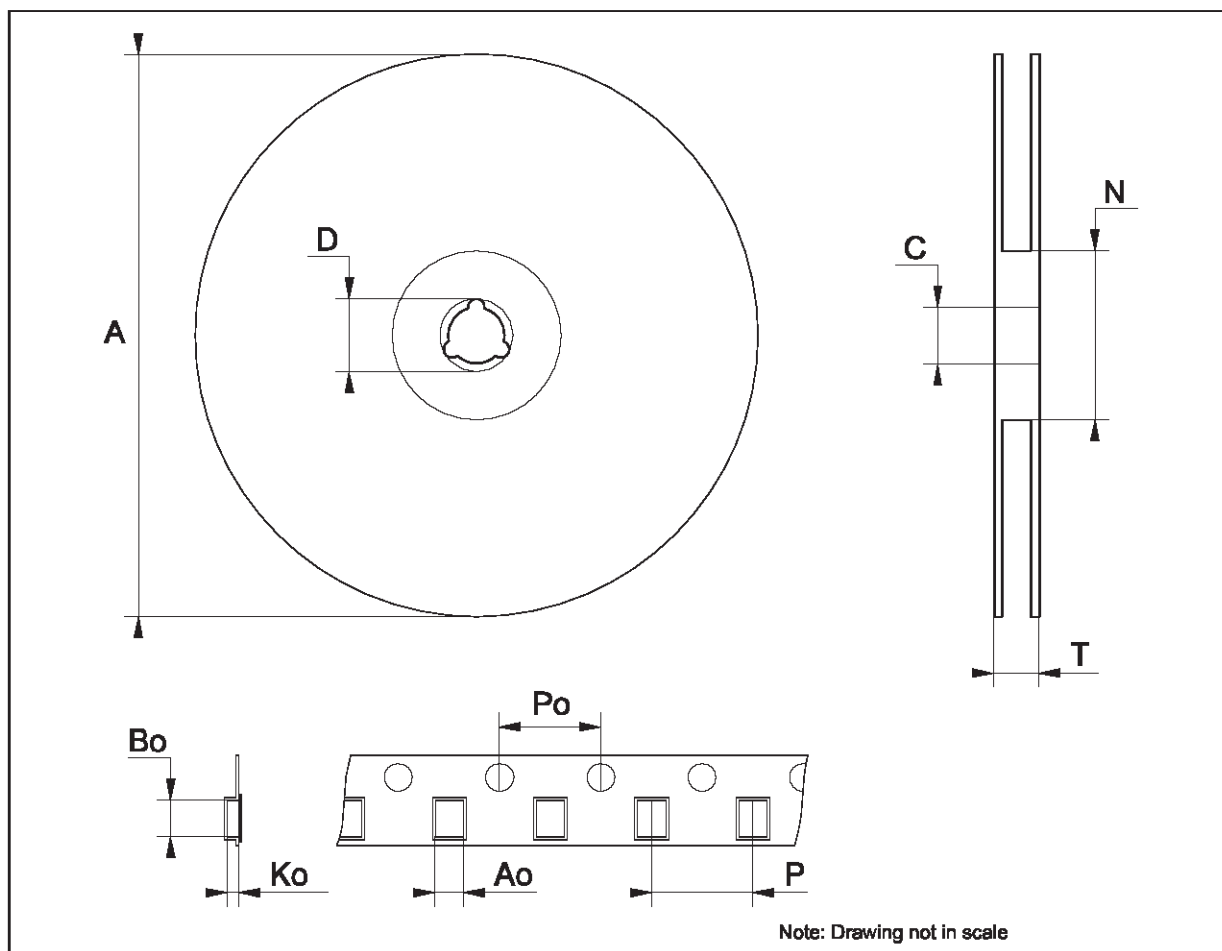
## Tape &amp; Reel SOT23-xL MECHANICAL DATA

| DIM. | mm.  |      |      | inch  |       |       |
|------|------|------|------|-------|-------|-------|
|      | MIN. | TYP  | MAX. | MIN.  | TYP.  | MAX.  |
| A    |      |      | 180  |       |       | 7.086 |
| C    | 12.8 | 13.0 | 13.2 | 0.504 | 0.512 | 0.519 |
| D    | 20.2 |      |      | 0.795 |       |       |
| N    | 60   |      |      | 2.362 |       |       |
| T    |      |      | 14.4 |       |       | 0.567 |
| Ao   | 3.13 | 3.23 | 3.33 | 0.123 | 0.127 | 0.131 |
| Bo   | 3.07 | 3.17 | 3.27 | 0.120 | 0.124 | 0.128 |
| Ko   | 1.27 | 1.37 | 1.47 | 0.050 | 0.054 | 0.058 |
| Po   | 3.9  | 4.0  | 4.1  | 0.153 | 0.157 | 0.161 |
| P    | 3.9  | 4.0  | 4.1  | 0.153 | 0.157 | 0.161 |



## Tape &amp; Reel SOT323-xL MECHANICAL DATA

| DIM. | mm.  |      |      | inch  |       |       |
|------|------|------|------|-------|-------|-------|
|      | MIN. | TYP  | MAX. | MIN.  | TYP.  | MAX.  |
| A    | 175  | 180  | 185  | 6.889 | 7.086 | 7.283 |
| C    | 12.8 | 13   | 13.2 | 0.504 | 0.512 | 0.519 |
| D    | 20.2 |      |      | 0.795 |       |       |
| N    | 59.5 | 60   | 60.5 |       | 2.362 |       |
| T    |      |      | 14.4 |       |       | 0.567 |
| Ao   |      | 2.25 |      |       | 0.088 |       |
| Bo   |      | 2.7  |      |       | 0.106 |       |
| Ko   |      | 1.2  |      |       | 0.047 |       |
| Po   | 3.98 | 4    | 4.2  | 0.156 | 0.157 | 0.165 |
| P    | 3.98 | 4    | 4.2  | 0.156 | 0.157 | 0.165 |



Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

© The ST logo is a registered trademark of STMicroelectronics

© 2001 STMicroelectronics - Printed in Italy - All Rights Reserved  
STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - Canada - China - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco  
Singapore - Spain - Sweden - Switzerland - United Kingdom - United States.

© <http://www.st.com>