

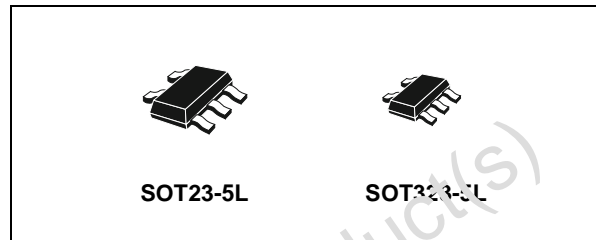
## SINGLE INVERTER (OPEN DRAIN)

- HIGH SPEED:  $t_{PD} = 5.4ns$  (TYP.) at  $V_{CC} = 5V$
- LOW POWER DISSIPATION:  
 $I_{CC} = 1\mu A$  (MAX.) at  $T_A = 25^\circ C$
- COMPATIBLE WITH TTL OUTPUTS:  
 $V_{IH} = 2V$  (MIN),  $V_{IL} = 0.8V$  (MAX)
- POWER DOWN PROTECTION ON INPUT
- OPERATING VOLTAGE RANGE:  
 $V_{CC(OPR)} = 4.5V$  to  $5.5V$
- IMPROVED LATCH-UP IMMUNITY

### DESCRIPTION

The 74V1T05 is an advanced high-speed CMOS SINGLE INVERTER (OPEN DRAIN) 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.

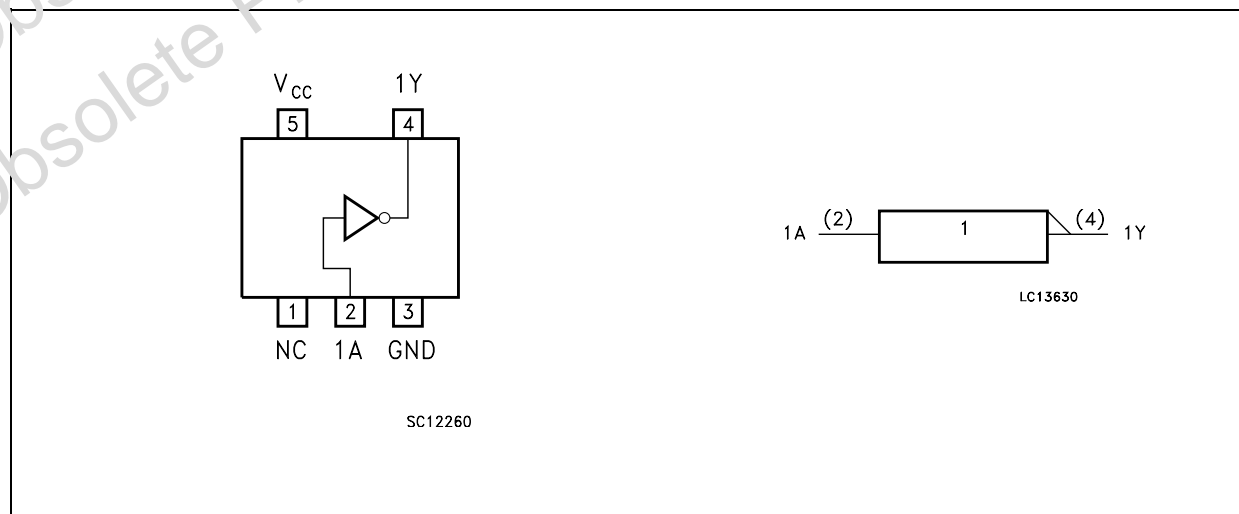


### ORDER CODES

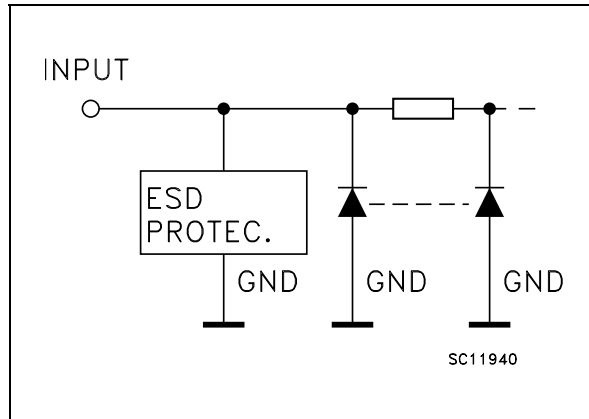
| PACKAGE   | T & R      |
|-----------|------------|
| SOT23-5L  | 74V1T05STR |
| SC1223-5L | 74V1T05CTR |

Power down protection is provided on input and 0 to 7V can be accepted on input with no regard to the supply voltage. This device can be used to interface 5V to 3V.

### PIN CONNECTION AND IEC LOGIC SYMBOLS



## INPUT EQUIVALENT CIRCUIT



## PIN DESCRIPTION

| PIN N° | SYMBOL          | NAME AND FUNCTION       |
|--------|-----------------|-------------------------|
| 1      | NC              | Not Connected           |
| 2      | 1A              | Data Input              |
| 4      | 1Y              | Data Output             |
| 3      | GND             | Ground (0V)             |
| 5      | V <sub>CC</sub> | Positive Supply Voltage |

## TRUTH TABLE

| A | Y |
|---|---|
| L | Z |
| H | L |

Z: High Impedance

## 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                    | -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.

## RECOMMENDED OPERATING CONDITIONS

| Symbol          | Parameter  | Value                | Unit |
|-----------------|--|----------------------|------|
| V <sub>CC</sub> | Supply Voltage   | 4.5 to 5.5           | V    |
| V <sub>I</sub>  | Input Voltage  | 0 to 5.5             | V    |
| V <sub>O</sub>  | Output Voltage   | 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 1) (V <sub>CC</sub> = 5.0 ± 0.5V) | 0 to 20              | ns/V |

1) V<sub>IN</sub> from 0.8V to 2V

## 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              | 4.5 to 5.5             |  | 2                     |      |       | 2           |       | 2            |       | V    |
| V <sub>IL</sub>  | Low Level Input Voltage               | 4.5 to 5.5             |  |                       |      | 0.8   |             | 0.8   |              | 0.8   | V    |
| V <sub>OL</sub>  | Low Level Output Voltage              | 4.5                    | I <sub>O</sub> =50 μA  |                       | 0.0  | 0.1   |             | 0.1   |              | 0.1   | V    |
|                  |                                       | 4.5                    | I <sub>O</sub> =8 mA   |                       |      | 0.36  |             | 0.44  |              | 0.55  |      |
| I <sub>OZ</sub>  | High Impedance Output Leakage Current | 5.5                    | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>V <sub>O</sub> = V <sub>CC</sub> or GND |                       |      | ±0.25 |             | ± 2.5 |              | ± 5.0 | μA   |
| I <sub>I</sub>   | Input Leakage Current                 | 0 to 5.5               | V <sub>I</sub> = 5.5V or GND   |                       |      | ± 0.1 |             | ± 1.0 |              | ± 1.0 | 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>CC</sub> | Additional Worst Case Supply Current  | 5.5                    | One Input at 3.4V,<br>other input at V <sub>CC</sub><br>or GND                                 |                       |      | 1.35  |             | 1.5   |              | 1.5   | mA   |

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>PZL</sub> | Enable Delay Time  | 5.0 (*)                | 15                     |                       | 3.7  | 7.0  | 1.0         | 8.0  | 1.0          | 9.0  | ns   |
|                  |                    | 5.0 (*)                | 50                     |                       | 4.1  | 8.0  | 1.0         | 9.0  | 1.0          | 10.0 |      |
| t <sub>PLZ</sub> | Disable Delay Time | 5.0 (*)                | 15                     |                       | 5.4  | 7.0  | 1.0         | 8.0  | 1.0          | 9.0  | ns   |
|                  |                    | 5.0 (*)                | 50                     |                       | 5.8  | 8.0  | 1.0         | 9.0  | 1.0          | 10.0 |      |

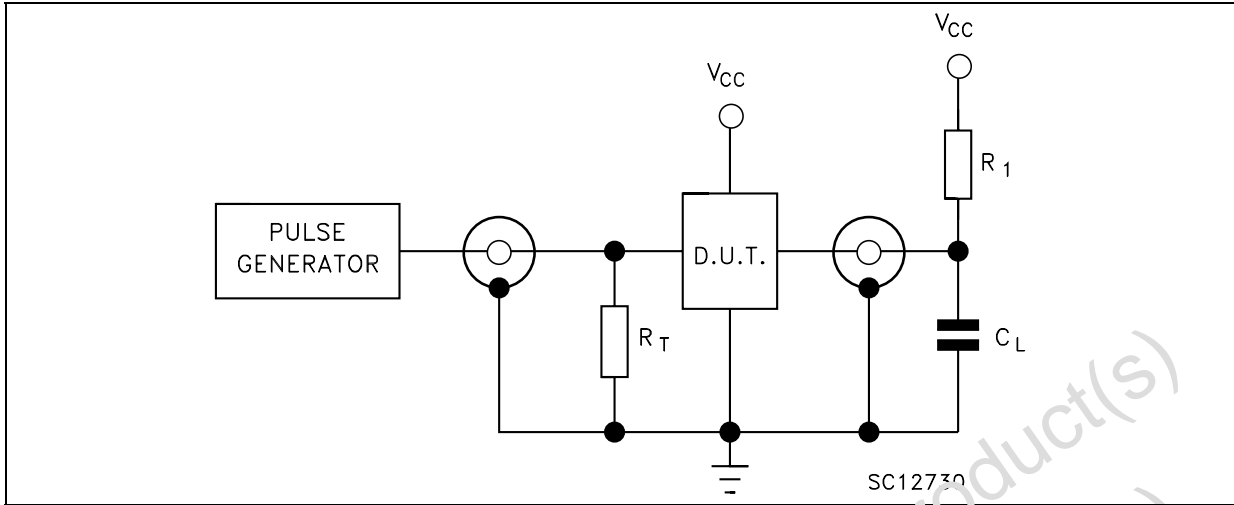
(\*) Voltage range is 5.0V ± 0.5V

## CAPACITIVE 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>OUT</sub> | Output Capacitance                     |                |  |                       | 5    | 10   |             | 10   |              | 10   | pF   |
| C <sub>PD</sub>  | Power Dissipation Capacitance (note 1) |                |  |                       | 6    |      |             |      |              |      | pF   |

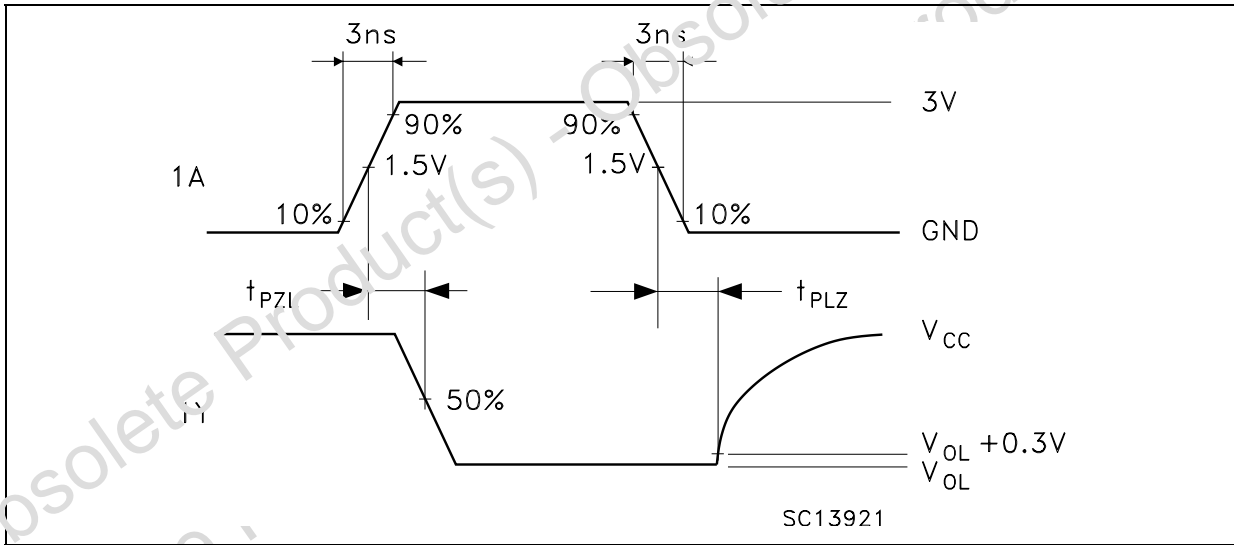
1) C<sub>PD</sub> is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. I<sub>CC(opr)</sub> = C<sub>PD</sub> × V<sub>CC</sub> × f<sub>IN</sub> + I<sub>CC</sub>

TEST CIRCUIT



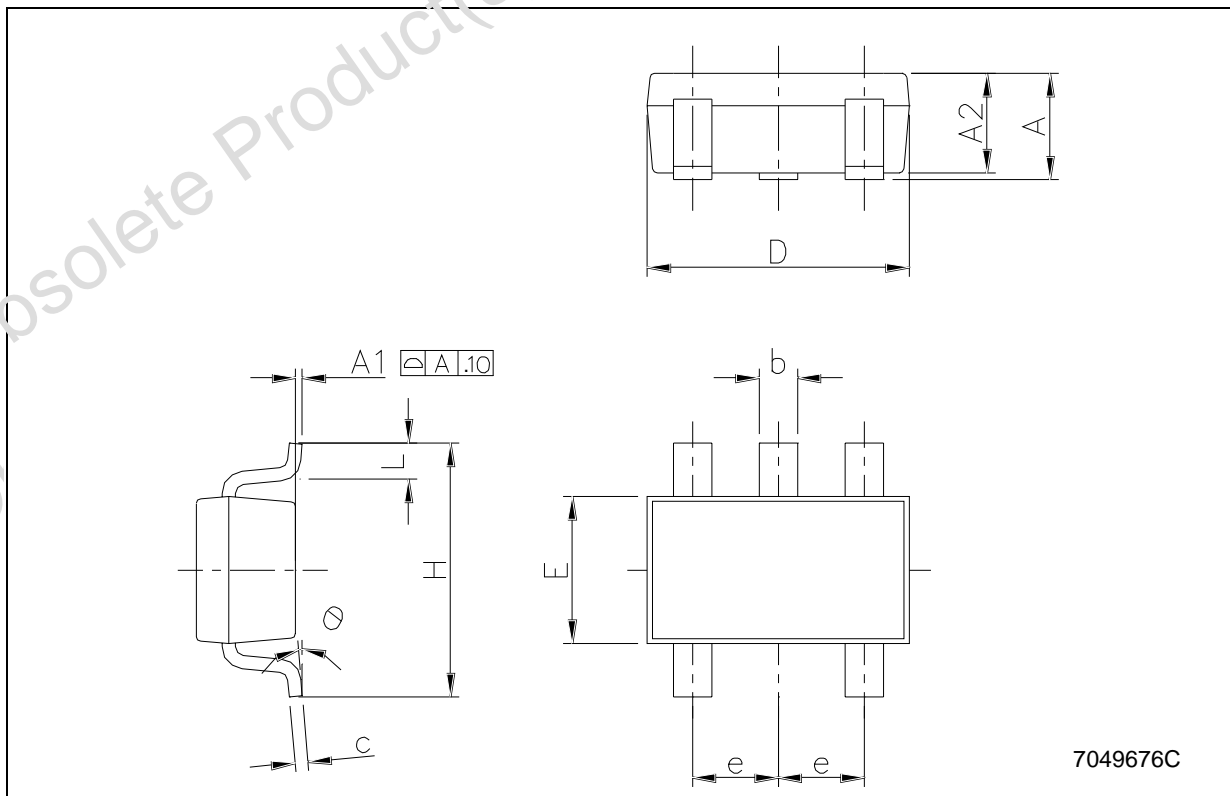
$C_L = 15/50\text{pF}$  or equivalent (includes jig and probe capacitance)  
 $R_1 = 1\text{K}\Omega$  or equivalent  
 $R_T = Z_{OUT}$  of pulse generator (typically  $50\Omega$ )

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



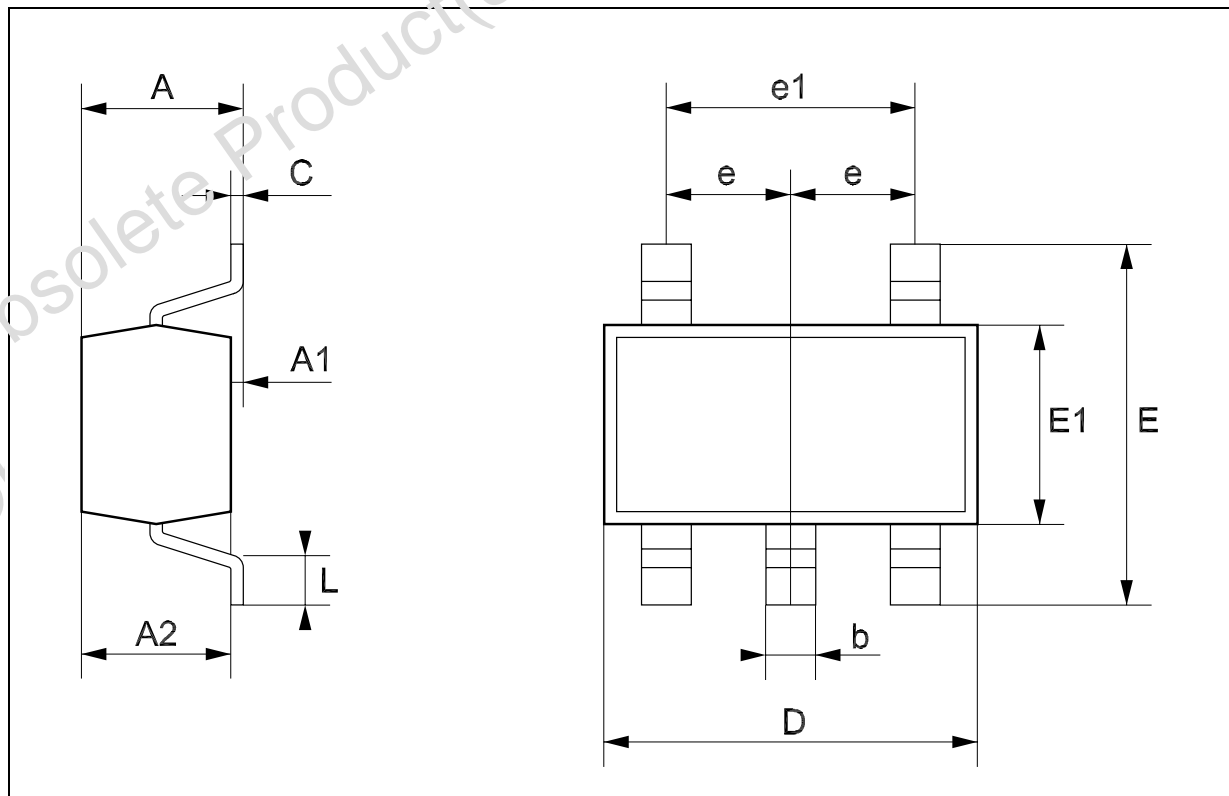
## SOT23-5L MECHANICAL DATA

| DIM. | mm.  |      |      | mils  |      |       |
|------|------|------|------|-------|------|-------|
|      | MIN. | TYP. | MAX. | MIN.  | TYP. | MAX.  |
| A    | 0.90 |      | 1.45 | 35.4  |      | 57.1  |
| A1   | 0.00 |      | 0.10 | 0.0   |      | 3.9   |
| A2   | 0.90 |      | 1.30 | 35.4  |      | 51.2  |
| b    | 0.35 |      | 0.50 | 13.7  |      | 19.7  |
| C    | 0.09 |      | 0.20 | 3.5   |      | 7.8   |
| D    | 2.80 |      | 3.00 | 110.2 |      | 118.1 |
| E    | 1.50 |      | 1.75 | 59.0  |      | 68.8  |
| e    |      | 0.95 |      |       | 37.4 |       |
| H    | 2.60 |      | 3.00 | 102.3 |      | 118.1 |
| L    | 0.10 |      | 0.60 | 3.9   |      | 23.6  |



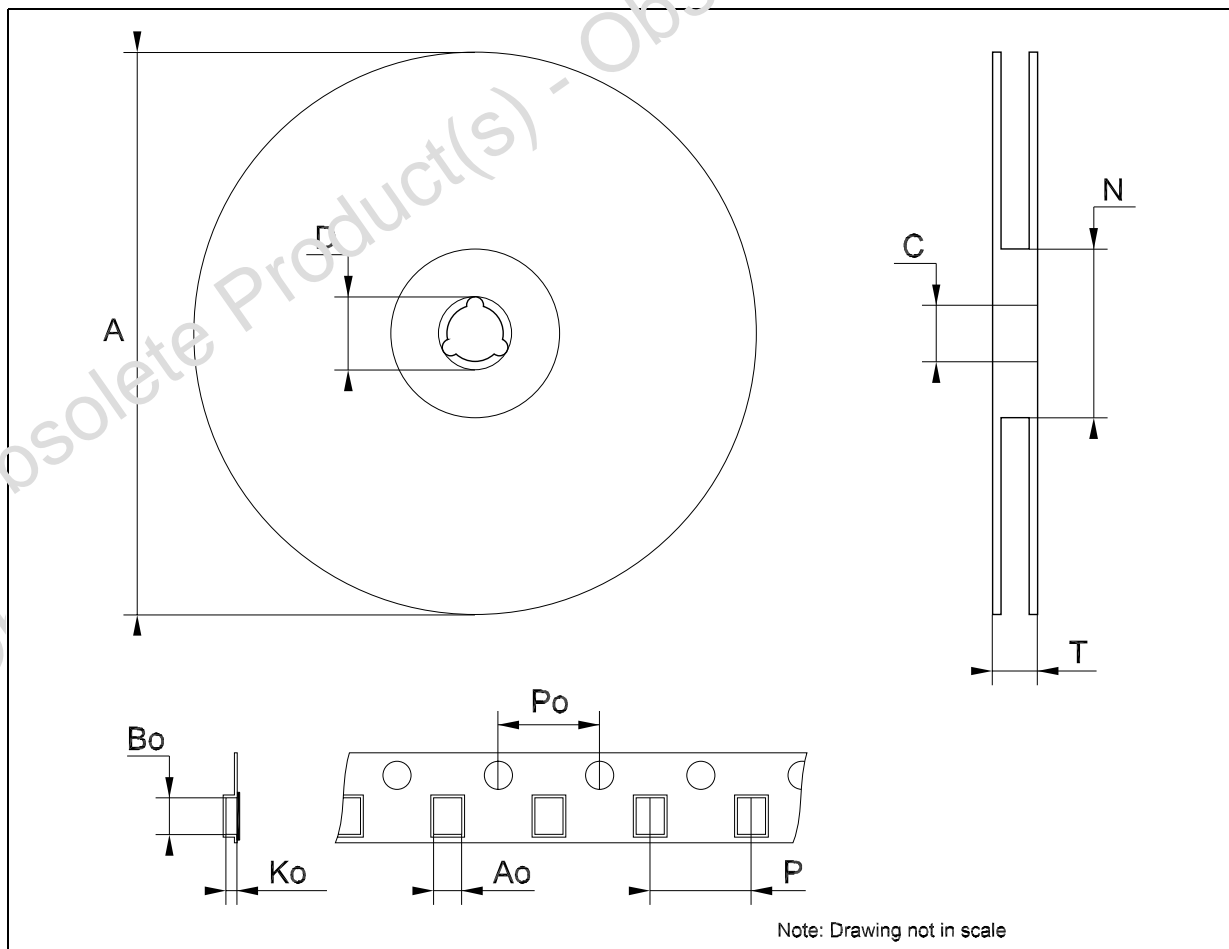
## SOT323-5L MECHANICAL DATA

| 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 |      | 39.4 |
| b    | 0.15 |      | 0.30 | 5.9  |      | 11.8 |
| 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    |      | 0.65 |      |      | 25.6 |      |
| e1   |      | 1.3  |      |      | 51.2 |      |
| L    | 0.10 |      | 0.30 | 3.9  |      | 11.8 |



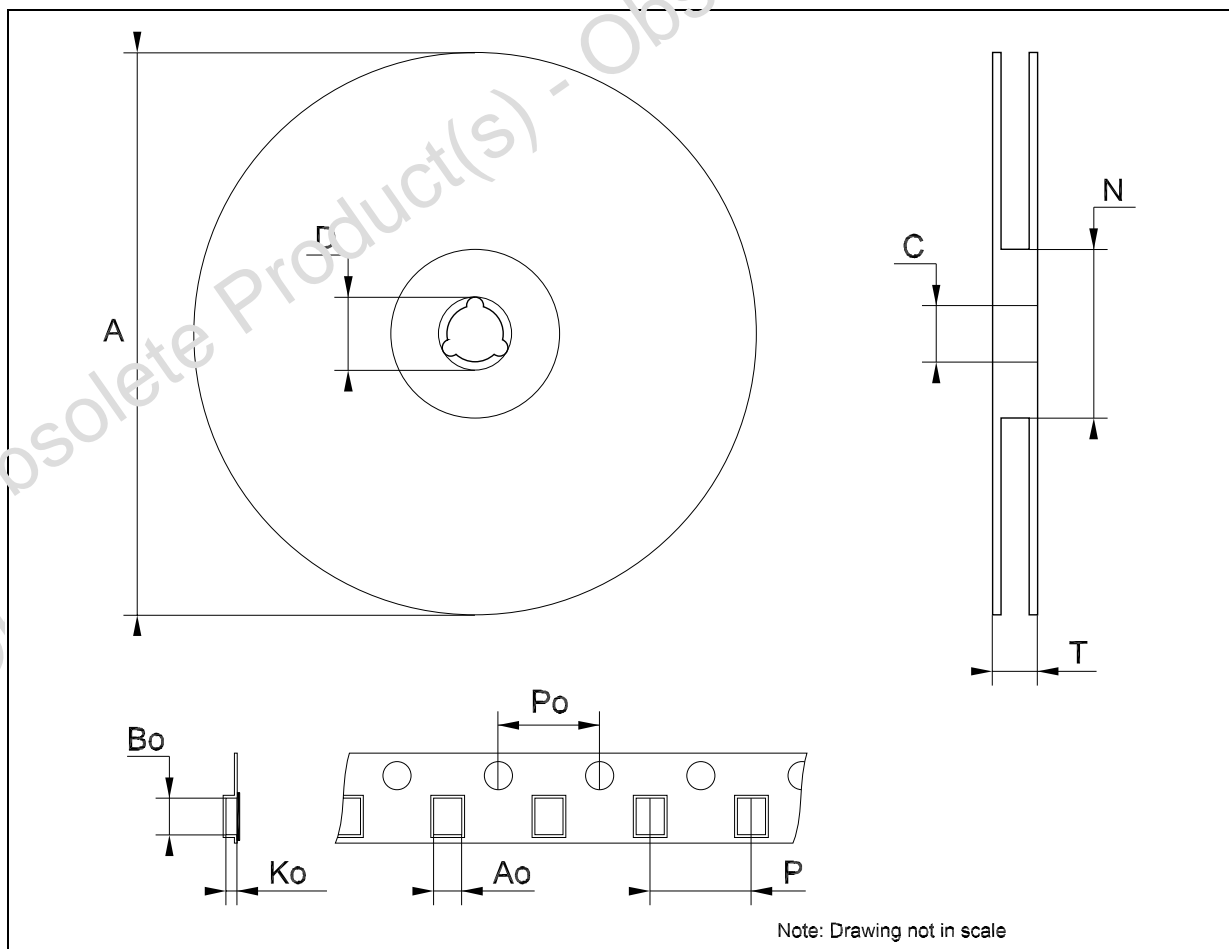
## Tape &amp; Reel SOT23-xL MECHANICAL DATA

| 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 |      |       | 0.089 |       |
| Bo   |      | 2.7  |      |       | 0.106 |       |
| Ko   |      | 1.2  |      |       | 0.047 |       |
| Po   | 3.9  | 4    | 4.1  | 0.153 | 0.157 | 0.161 |
| P    | 3.8  | 4    | 4.2  | 0.149 | 0.157 | 0.165 |



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