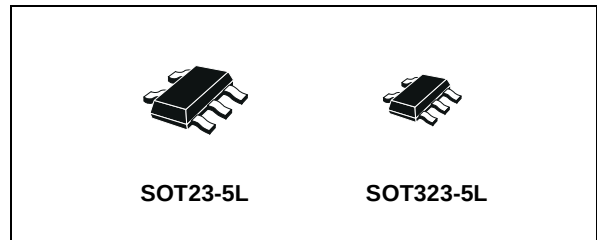




## 74V1G80

### SINGLE POSITIVE EDGE TRIGGERED D-TYPE FLIP-FLOP

- HIGH SPEED:  
 $f_{\text{MAX}} = 180\text{MHz}$  (TYP.) at  $V_{\text{CC}} = 5\text{V}$
- LOW POWER DISSIPATION:  
 $I_{\text{CC}} = 1\mu\text{A}$  (MAX.) at  $T_A = 25^\circ\text{C}$
- HIGH NOISE IMMUNITY:  
 $V_{\text{NIH}} = V_{\text{NIL}} = 28\% V_{\text{CC}}$  (MIN.)
- POWER DOWN PROTECTION ON INPUTS
- SYMMETRICAL OUTPUT IMPEDANCE:  
 $|I_{\text{OH}}| = I_{\text{OL}} = 8\text{mA}$  (MIN) at  $V_{\text{CC}} = 4.5\text{V}$
- BALANCED PROPAGATION DELAYS:  
 $t_{\text{PLH}} \approx t_{\text{PHL}}$
- OPERATING VOLTAGE RANGE:  
 $V_{\text{CC}}(\text{OPR}) = 2\text{V}$  to  $5.5\text{V}$
- IMPROVED LATCH-UP IMMUNITY



#### ORDER CODES

| PACKAGE   | T & R      |
|-----------|------------|
| SOT23-5L  | 74V1G80STR |
| SOT323-5L | 74V1G80CTR |

#### DESCRIPTION

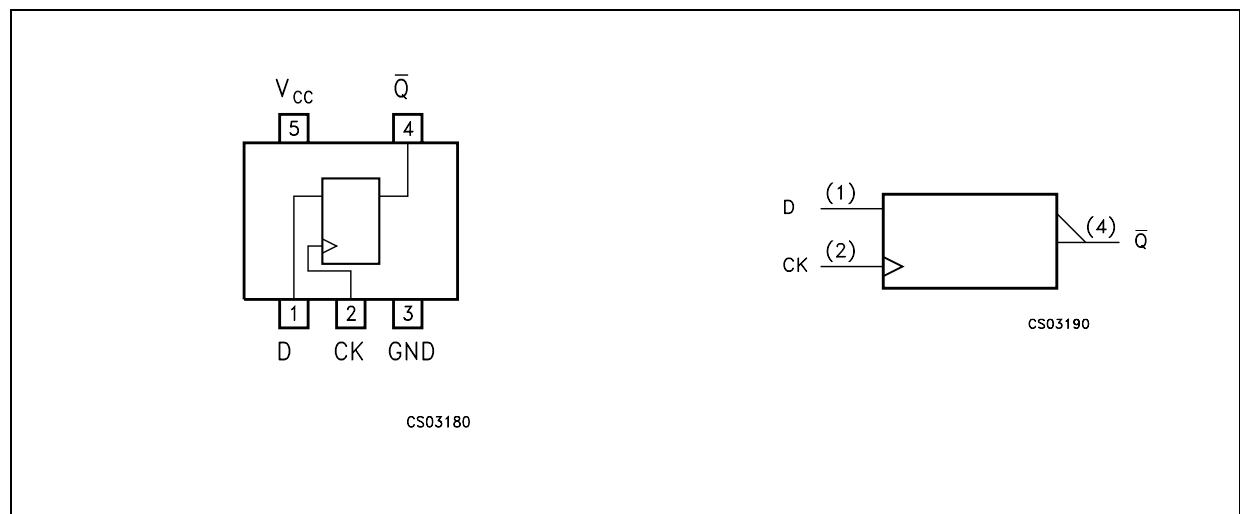
The 74V1G80 is an advanced high-speed CMOS SINGLE POSITIVE EDGE TRIGGERED D-TYPE FLIP-FLOP WITH INVERTED OUTPUT fabricated with sub-micron silicon gate and double-layer metal wiring C<sup>2</sup>MOS technology. It is designed to operate from 2V to 5.5V, making this device ideal for portable applications.

This D-Type flip-flop is controlled by a clock input (CK). On the positive transition of the clock, the Q output will be set to the logic inverted state that was setup at the D input.

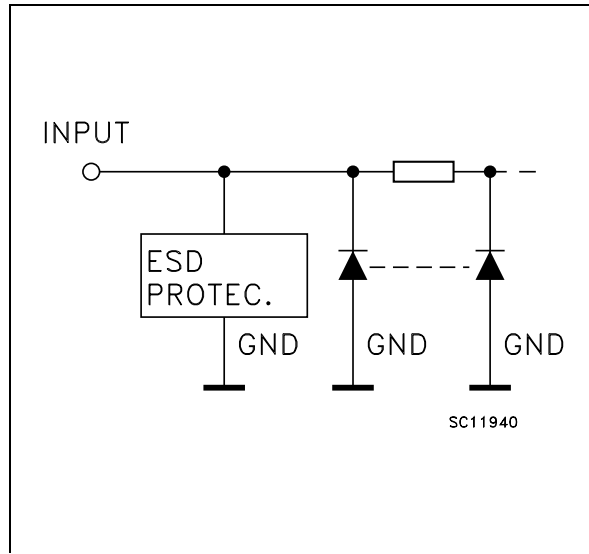
Following the hold time interval, data at the D input can be changed without affecting the level at the output. Power down protection is provided on input and 0 to 7V can be accepted on input with no regard to the supply voltage. This device can be used to interface 5V to 3V.

It's available in the commercial temperature range. All inputs and output 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 AND FUNCTION           |
|--------|-----------------|-----------------------------|
| 1      | D               | Data Input                  |
| 2      | CK              | Clock Input (Positive Edge) |
| 4      | $\bar{Q}$       | Inverted Flip-Flop Output   |
| 3      | GND             | Ground (0V)                 |
| 5      | V <sub>CC</sub> | Positive Supply Voltage     |

## TRUTH TABLE

| D | CK | $\bar{Q}$ |
|---|----|-----------|
| L |    | H         |
| H |    | L         |
| L |    | Qn        |
| H |    | Qn        |

## 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                                                                                     | 2 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> = 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>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 Output 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 |      |

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 CK to Q  | 3.3 <sup>(*)</sup>     | 15                     |  |                       | 4.9  | 8.4  | 1.0         | 9.8  | 1.0          | 10.8 | ns   |
|                                   |                                 | 3.3 <sup>(*)</sup>     | 50                     |  |                       | 5.9  | 12.0 | 1.0         | 14.0 | 1.0          | 15.0 |      |
|                                   |                                 | 5.0 <sup>(**)</sup>    | 15                     |  |                       | 3.5  | 5.6  | 1.0         | 7.0  | 1.0          | 8.0  |      |
|                                   |                                 | 5.0 <sup>(**)</sup>    | 50                     |  |                       | 4.5  | 8.0  | 1.0         | 10.0 | 1.0          | 11.0 |      |
| t <sub>W</sub>                    | CK Pulse Width, HIGH or LOW     | 3.3 <sup>(*)</sup>     |                        |  | 4.0                   |      |      | 4.0         |      | 4.0          |      | ns   |
|                                   |                                 | 5.0 <sup>(**)</sup>    |                        |  | 3.0                   |      |      | 3.0         |      | 3.0          |      |      |
| t <sub>S</sub>                    | Setup Time D to CK, HIGH or LOW | 3.3 <sup>(*)</sup>     |                        |  | 4.0                   |      |      | 4.0         |      | 4.0          |      | ns   |
|                                   |                                 | 5.0 <sup>(**)</sup>    |                        |  | 3.0                   |      |      | 3.0         |      | 3.0          |      |      |
| t <sub>h</sub>                    | Hold Time D to CK, HIGH or LOW  | 3.3 <sup>(*)</sup>     |                        |  | 1.0                   |      |      | 1.0         |      | 1.0          |      | ns   |
|                                   |                                 | 5.0 <sup>(**)</sup>    |                        |  | 1.0                   |      |      | 1.0         |      | 1.0          |      |      |
| f <sub>MAX</sub>                  | Maximum Clock Frequency         | 3.3 <sup>(*)</sup>     | 50                     |  | 100                   | 120  |      | 90          |      | 90           |      | MHz  |
|                                   |                                 | 5.0 <sup>(**)</sup>    | 50                     |  | 165                   | 180  |      | 150         |      | 150          |      |      |

(\*) Voltage range is 3.3V ± 0.3V

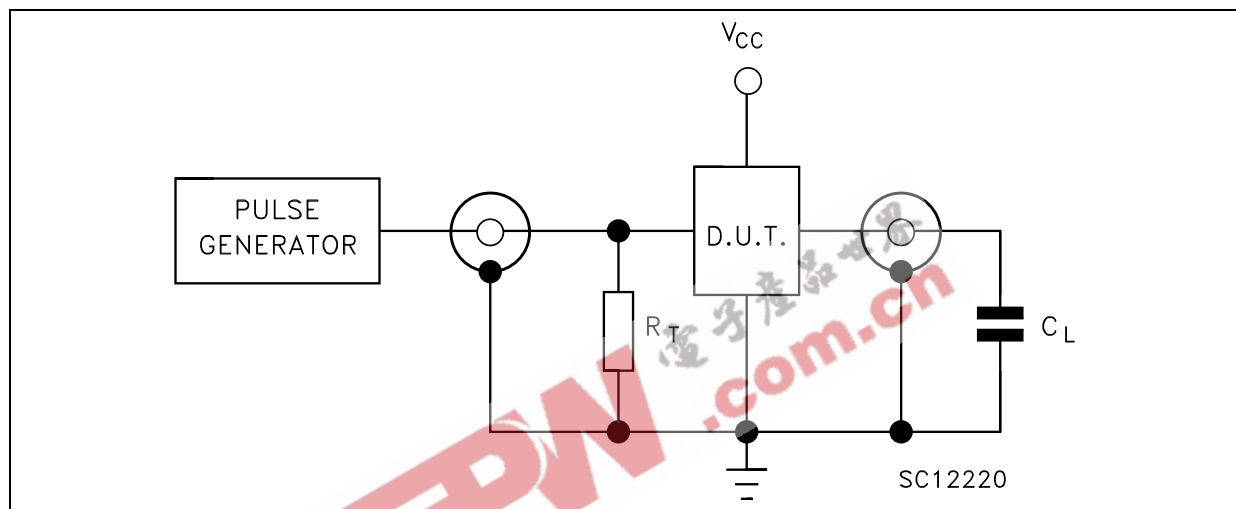
(\*\*) Voltage range is 5.0V ± 0.5V

## CAPACITIVE CHARACTERISTICS

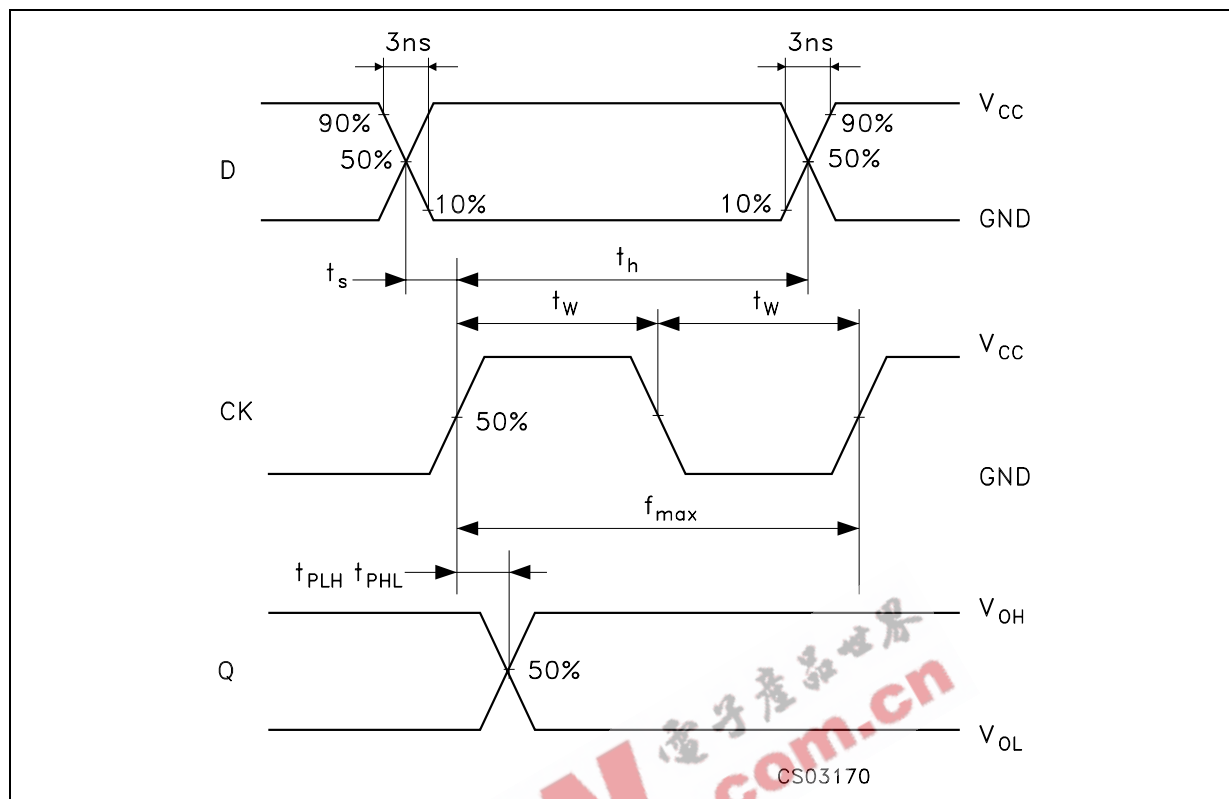
| Symbol          | Parameter                              | Test Condition | Value                 |      |      |             |      |              |      |    | Unit |
|-----------------|----------------------------------------|----------------|-----------------------|------|------|-------------|------|--------------|------|----|------|
|                 |                                        |                | 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>PD</sub> | Power Dissipation Capacitance (note 1) |                |                       | 8    |      |             |      |              |      | pF |      |

1)  $C_{PD}$  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.  $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$

## TEST CIRCUIT

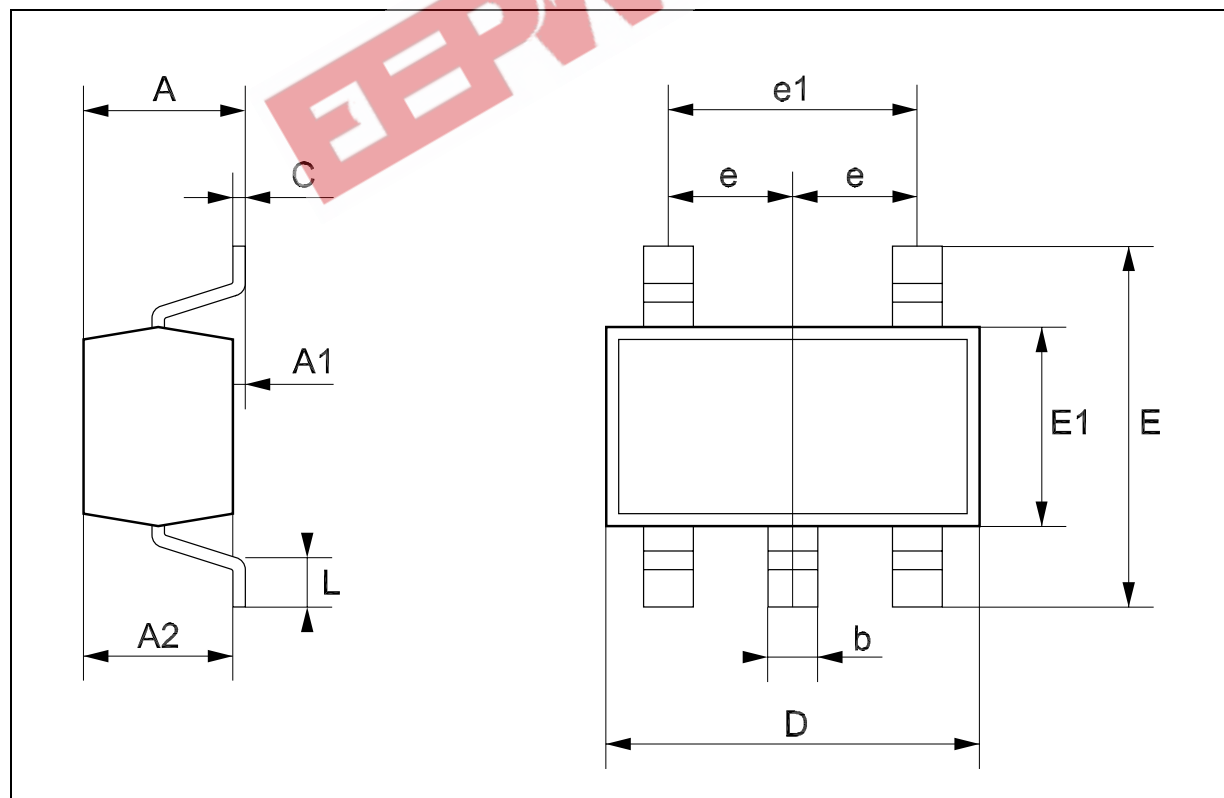


$C_L = 15/50\text{pF}$  or equivalent (includes jig and probe capacitance)  
 $R_T = Z_{OUT}$  of pulse generator (typically  $50\Omega$ )

**WAVEFORM: PROPAGATION DELAY, SETUP AND HOLD TIMES ( $f=1\text{MHz}$ ; 50% duty cycle)**

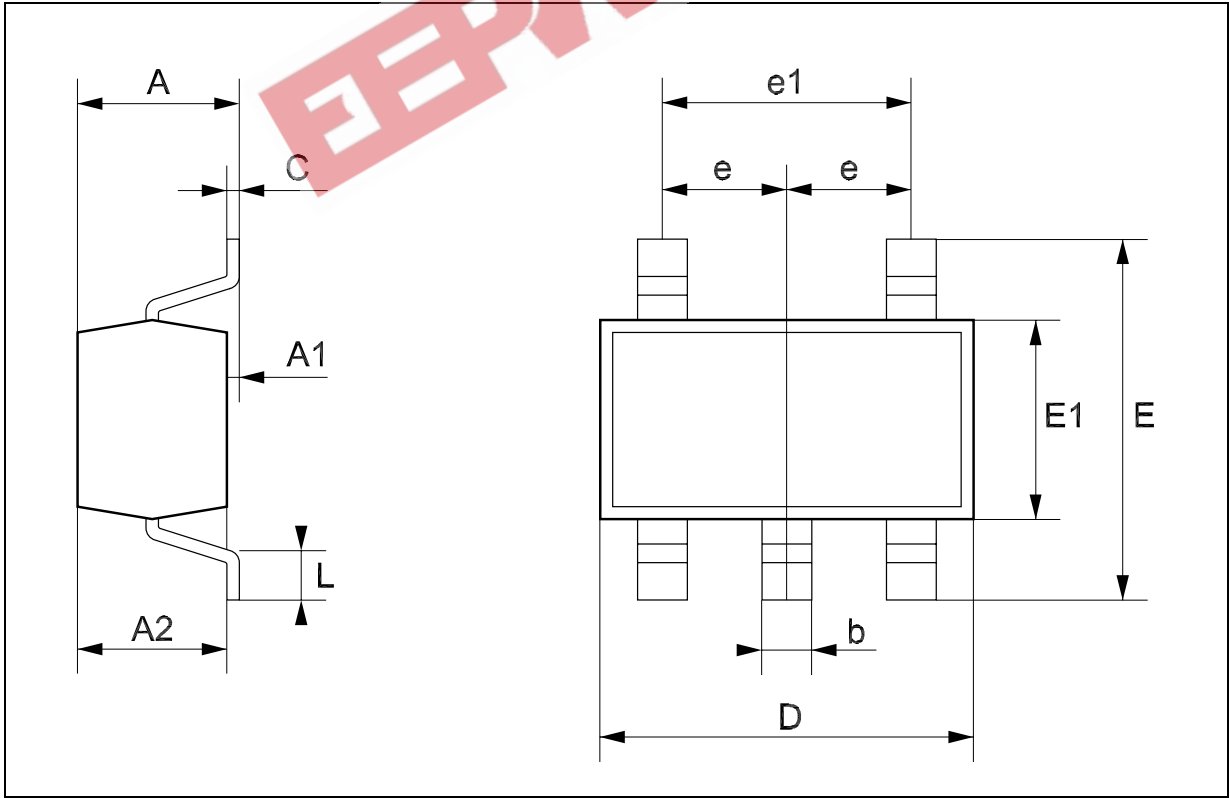
## SOT23-5L MECHANICAL DATA

| DIM. | mm.  |      |      | mils  |      |       |
|------|------|------|------|-------|------|-------|
|      | MIN. | TYP  | MAX. | MIN.  | TYP. | MAX.  |
| A    | 0.90 |      | 1.45 | 35.4  |      | 57.1  |
| A1   | 0.00 |      | 0.15 | 0.0   |      | 5.9   |
| 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    | 2.60 |      | 3.00 | 102.3 |      | 118.1 |
| E1   | 1.50 |      | 1.75 | 59.0  |      | 68.8  |
| e    |      | 0.95 |      |       | 37.4 |       |
| e1   |      | 1.9  |      |       | 74.8 |       |
| L    | 0.35 |      | 0.55 | 13.7  |      | 21.6  |



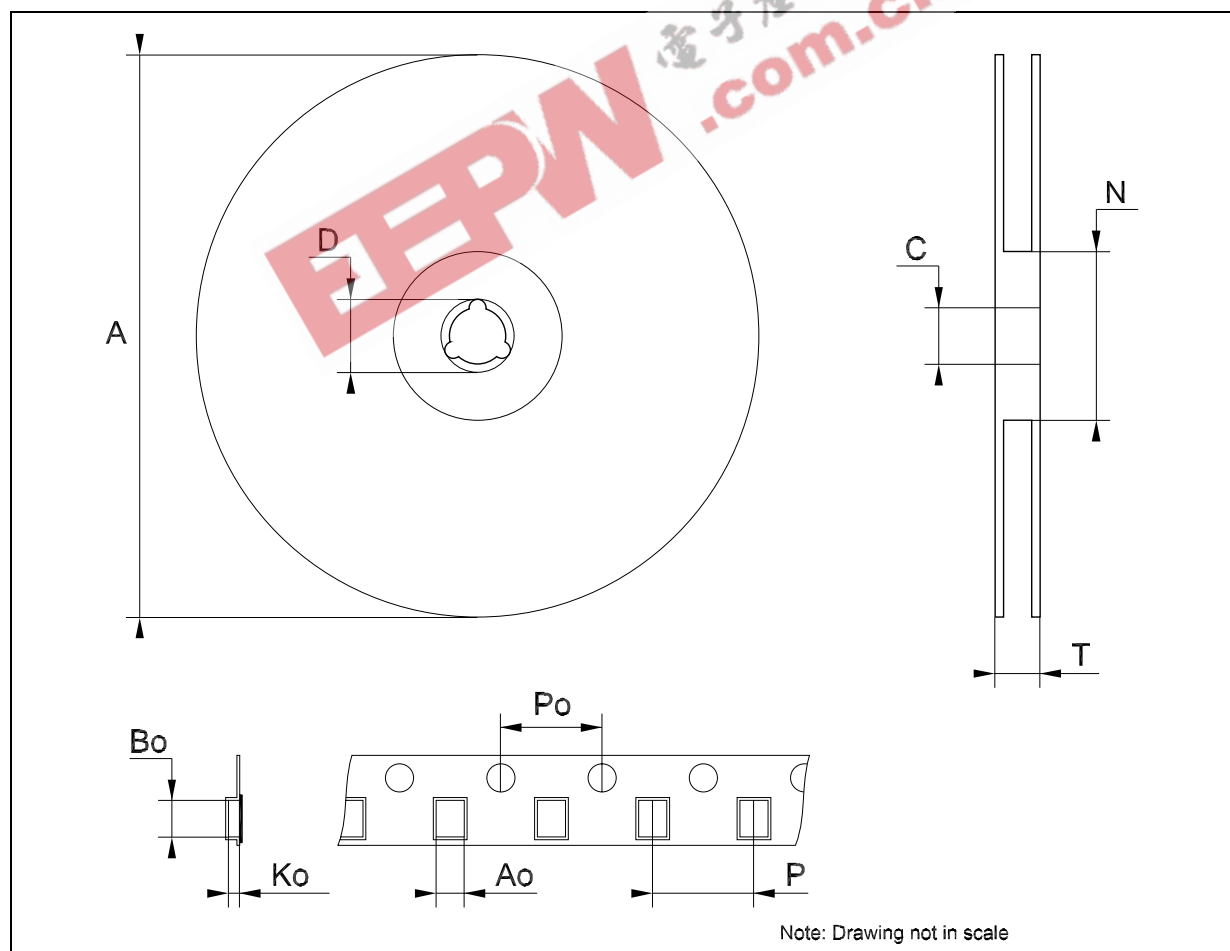
SOT323-5L MECHANICAL DATA

| 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

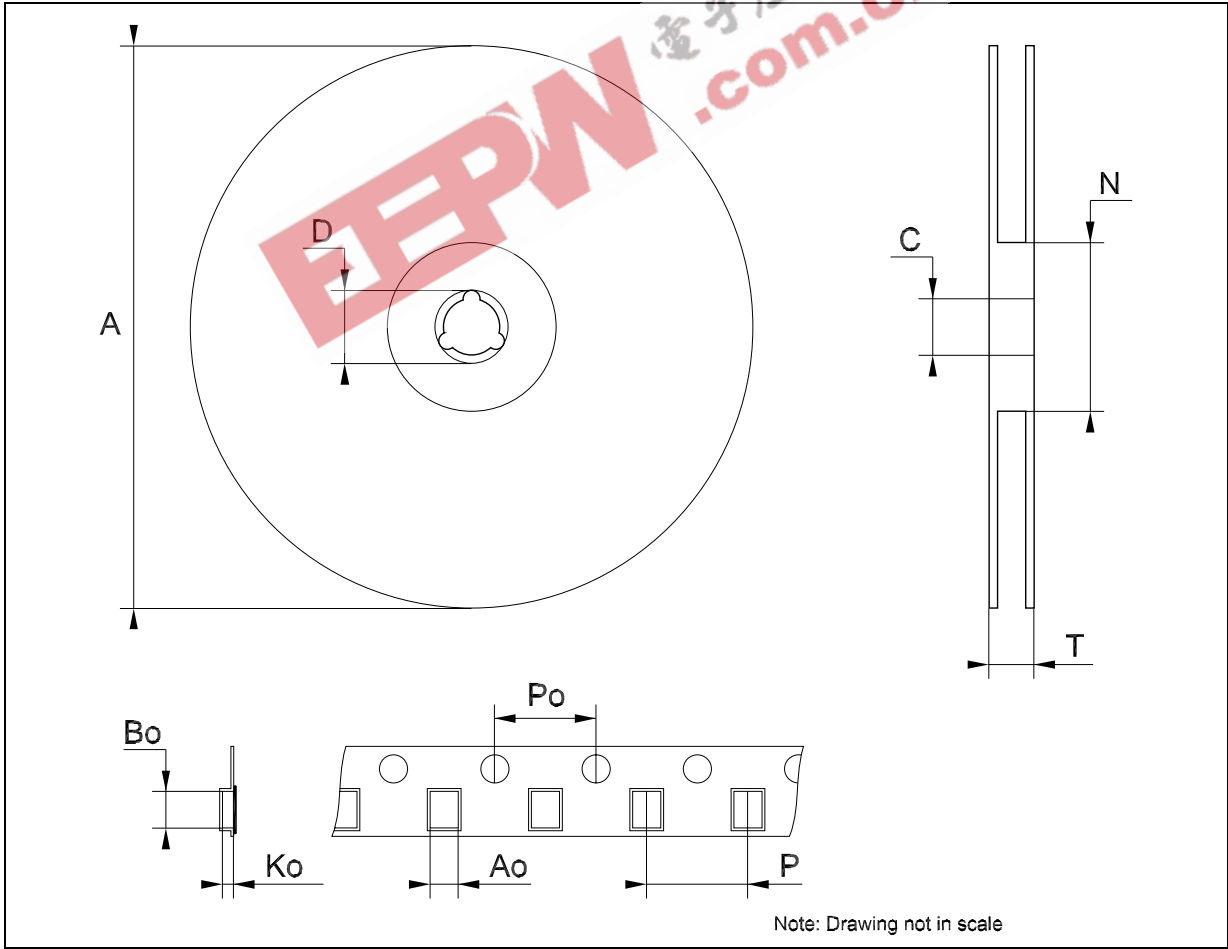
| DIM. | mm.  |      |      | inch  |       |       |
|------|------|------|------|-------|-------|-------|
|      | MIN. | TYP  | MAX. | MIN.  | TYP.  | MAX.  |
| A    |      |      | 180  |       |       | 7.086 |
| C    | 12.8 | 13.0 | 13.2 | 0.504 | 0.512 | 0.519 |
| D    | 20.2 |      |      | 0.795 |       |       |
| 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 & 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 |



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