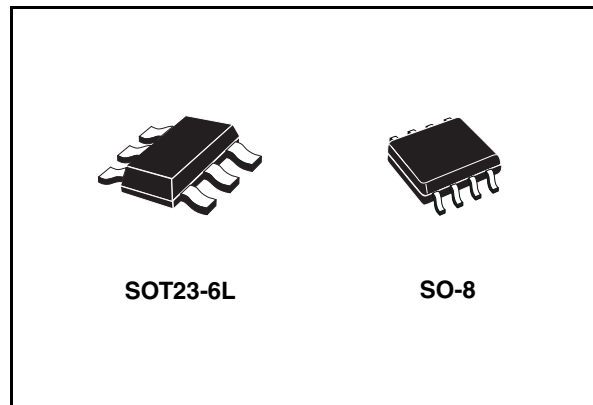


## Feature summary

- Controls ESBT base current in every line/load condition
- Supply voltage range: 8V to 20 V
- Storage time controlled by closed loop architecture (from 150ns to 1.5 $\mu$ s)
- Under voltage lockout with hysteresis

## Description

The STESB01 is a dedicated base current biasing transistor for the Emitter-Switched Bipolar Transistor (ESBT) family of power switches. The device is able to control the ESBT storage time (from 150ns to 1.5 $\mu$ s) using closed loop architecture. This guarantees proper operation of the ESBT in every line and load condition, avoiding oversaturation of the device and, at the same time, ensuring the correct base current



when a higher load is required. The storage time can be adjusted with an external resistor, which allows maximum flexibility in different applications.

The optimization of the base current value also reduces the base current losses to minimum level.

## Order code

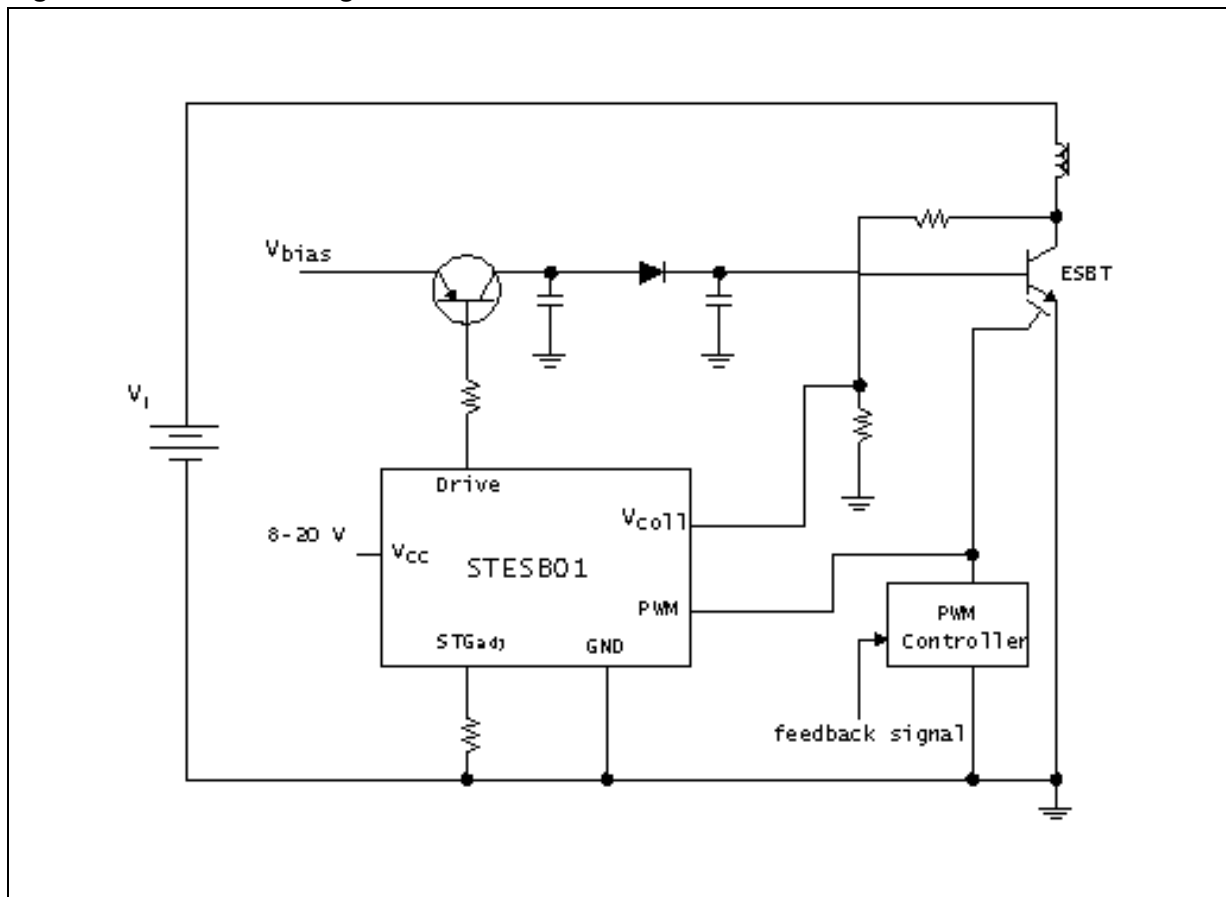
| Part number | Package  | Packaging           |
|-------------|----------|---------------------|
| STESB01STR  | SOT23-6L | 3000 Parts per Reel |
| STESB01DR   | SO-8     | 2500 Parts per Reel |

## Contents

|   |                                  |    |
|---|----------------------------------|----|
| 1 | Schematic diagram .....          | 3  |
| 2 | Pin configuration .....          | 4  |
| 3 | Maximum ratings .....            | 5  |
| 4 | Electrical characteristics ..... | 6  |
| 5 | Diagram .....                    | 7  |
| 6 | Package mechanical data .....    | 8  |
| 7 | Revision history .....           | 13 |

# 1 Schematic diagram

Figure 1. Schematic diagram



## 2 Pin configuration

Figure 2. Pin Connections (Top View)

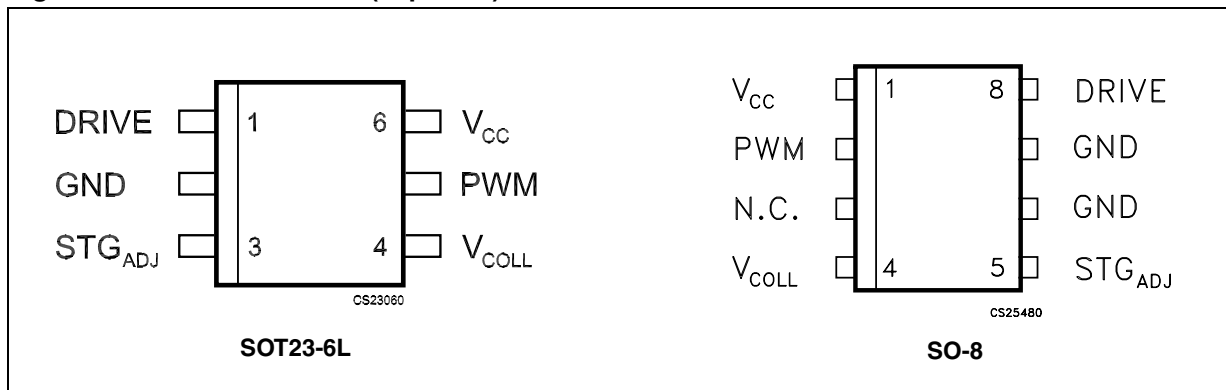


Table 1. Pin description

| Pin N° for SO-8 | Pin N° for SOT23 | Symbol             | Name and function   |
|-----------------|------------------|--------------------|---|
| 8               | 1                | DRIVE              | This is the base current driver for the external PNP transistor (see Application Schematic) which determines the ESBT base current value.                                   |
| 6, 7            | 2                | GND                | Ground. Reference for all the signal of the IC.   |
| 5               | 3                | STG <sub>ADJ</sub> | Adjustable Storage (adjusted by connecting a resistor between this pin and GND pin). A minimum value of 150ns can be achieved with 10kΩ resistor. See note 4.               |
| 4               | 4                | V <sub>COLL</sub>  | Collector Voltage.<br>This pin must be connected to the ESBT collector through a resistor divider. The rising edge of this signal provides end-of-storage time information. |
| 2               | 5                | PWM                | Pulse Width Modulation.<br>This pin must be connected to the PWM controller output. The falling edge of this signal provides beginning-of-storage time information.         |
| 1               | 6                | V <sub>CC</sub>    | Supply Voltage.<br>It range is from 8V to 20V. A ceramic Bypass capacitor must be connected between V <sub>CC</sub> and GND.  |
| 3               |                  | N.C.               | Not Connected.  |

### 3 Maximum ratings

**Table 2. Absolute maximum ratings**

| Symbol      | Parameter  | Value            | Unit             |
|-------------|--|------------------|------------------|
| $V_{CC}$    | DC Input voltage   | -0.3 to 22       | V                |
| Drive       | Drive output voltage   | -0.3 to $V_{CC}$ | V                |
| $STG_{ADJ}$ | Storage time adjust voltage                                  | -0.3 to 5        | V                |
| PWM         | PWM Input voltage  | -0.3 to 15       | V                |
| $V_{COLL}$  | Collector input voltage                                      | -0.6 to 5        | V                |
| ESD         | Human body model   | $\pm 2$          | kV               |
| $P_{TOT}$   | Continuous power dissipation (at $T_A = 105^\circ\text{C}$ ) | TBD              | mW               |
| $T_{STG}$   | Storage temperature range                                    | -40 to 150       | $^\circ\text{C}$ |
| $T_{OP}$    | Operating junction temperature range                         | -40 to 125       | $^\circ\text{C}$ |

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

**Table 3. Thermal data**

| Symbol     | Parameter                           | SOT23-6L | SO-8 | Unit                      |
|------------|-------------------------------------|----------|------|---------------------------|
| $R_{thJC}$ | Thermal resistance junction-case    | 81       | 20   | $^\circ\text{C}/\text{W}$ |
| $R_{thJA}$ | Thermal resistance junction-ambient | 255      | 55   | $^\circ\text{C}/\text{W}$ |

This value is referred to 1 layer PCB board with minimum copper connections for the leads.

## 4 Electrical characteristics

**Table 4. Electrical characteristics**

( $V_{CC} = 20V$ ,  $C_1 = 3.3\mu F$ ,  $T_J = -40^\circ C$  to  $125^\circ C$  unless otherwise specified.)

| Symbol   | Parameter                        | Test Conditions   | Min. | Typ. | Max. | Unit    |
|--|----------------------------------|---|------|------|------|---------|
| <b>Supply Input and Under Voltage Lock Out</b>       |                                  |   |      |      |      |         |
| $V_{CC}$   | Turn On Threshold                | $V_{CC}$ rising   |      | 7.5  | 8    | V       |
|  | Turn Off Threshold after Turn On | $V_{CC}$ falling  | 6.5  | 7    |      |         |
| $I_{CC}$   | Supply Current                   | PWM= $V_{COLL}=0V$  |      | 2    |      | mA      |
|  |                                  | See <a href="#">Note 1</a>  |      | 2    |      |         |
| <b>Driver Output (<math>T_J = 27^\circ C</math>)</b> |                                  |   |      |      |      |         |
| $V_{OL}$   | Low Level Voltage                | $I_{DRIVE} = 10mA$  |      | 50   |      | mV      |
| $I_{DRIVE(OL)}$                                      | Drive Current in open loop       | $V_{DRIVE} = 1.25V$ , $R_{STGadj} = 150 k\Omega$<br>See <a href="#">Note 2</a> , <a href="#">Note 4</a> |      | 0.25 |      | A       |
| <b>Storage Control</b>                               |                                  |   |      |      |      |         |
| $V_{PWML}$   | PWM Low Level Threshold          | See <a href="#">Note 3</a>  |      |      | 1.5  | V       |
| $V_{PVMH}$   | PWM High Level Threshold         | See <a href="#">Note 3</a>  | 3.5  |      |      | V       |
| $I_{PWM}$  | PWM input bias current           | PWM = 0V to 15V   | -0.1 |      | 0.1  | $\mu A$ |
| $V_{COLL(L)}$  | Collector Low Level Threshold    | See <a href="#">Note 3</a>  |      |      | 0.8  | V       |
| $V_{COLL(H)}$  | Collector High Level Threshold   | See <a href="#">Note 3</a>  | 2.5  |      |      | V       |
| $I_{COLL}$   | $V_{COLL}$ input bias current    | $V_{COLL} = 0V$ to 5V   | -0.1 |      | 0.1  | $\mu A$ |

- 1 To the PWM pin must be applied a 5V to 0V falling edge while the voltage level on the  $V_{COLL}$  pin must be 0V. After 300 ns, to the  $V_{COLL}$  pin must be applied a 0V to 5V rising edge. The maximum frequency of signals applied to PWM and  $V_{COLL}$  pins must be 300 kHz.
- 2 To the PWM pin must be applied a 5V to 0V falling edge while the voltage level on the  $V_{COLL}$  pin must be 0V. After 200 ns, to the  $V_{COLL}$  pin must be applied a 0V to 5V raising edge. The maximum frequency of signals applied to PWM and  $V_{COLL}$  pins must be 300 kHz.
- 3 Guaranteed by Design.
- 4 In parallel to the resistor a low-leakage/low-ESR capacitor could be necessary for bypassing purpose.

# 5 Diagram

Figure 3. Block diagram

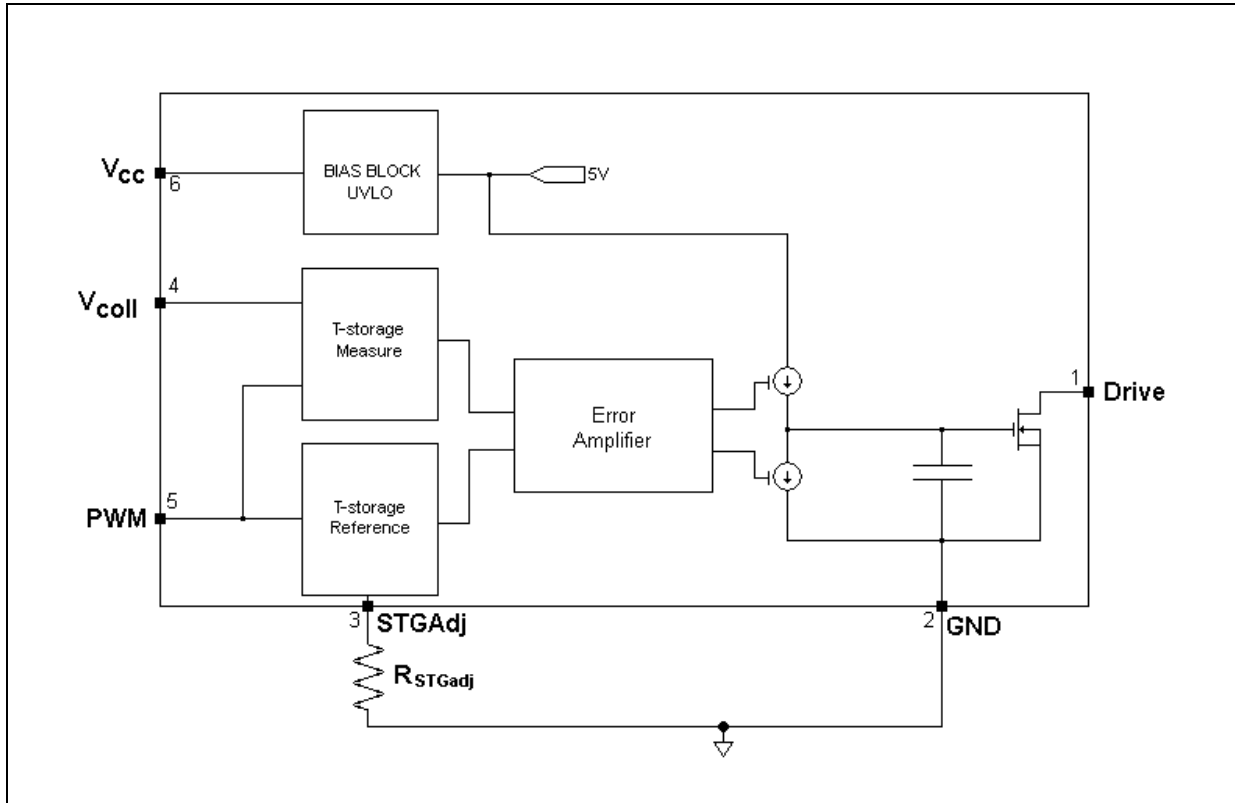
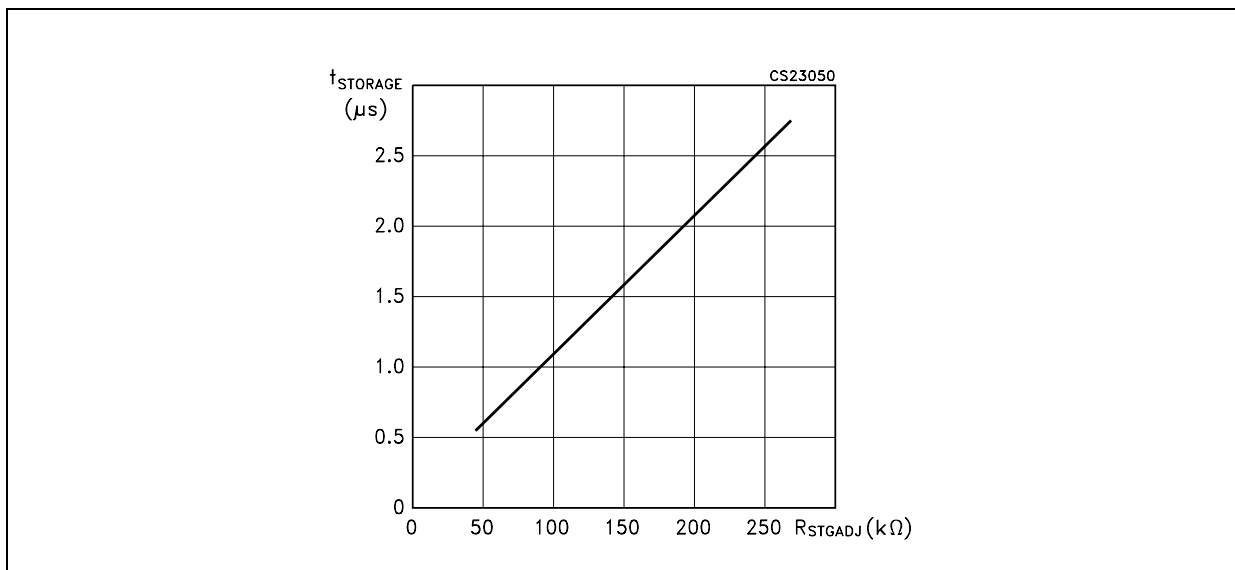


Figure 4. Typical operating characteristics



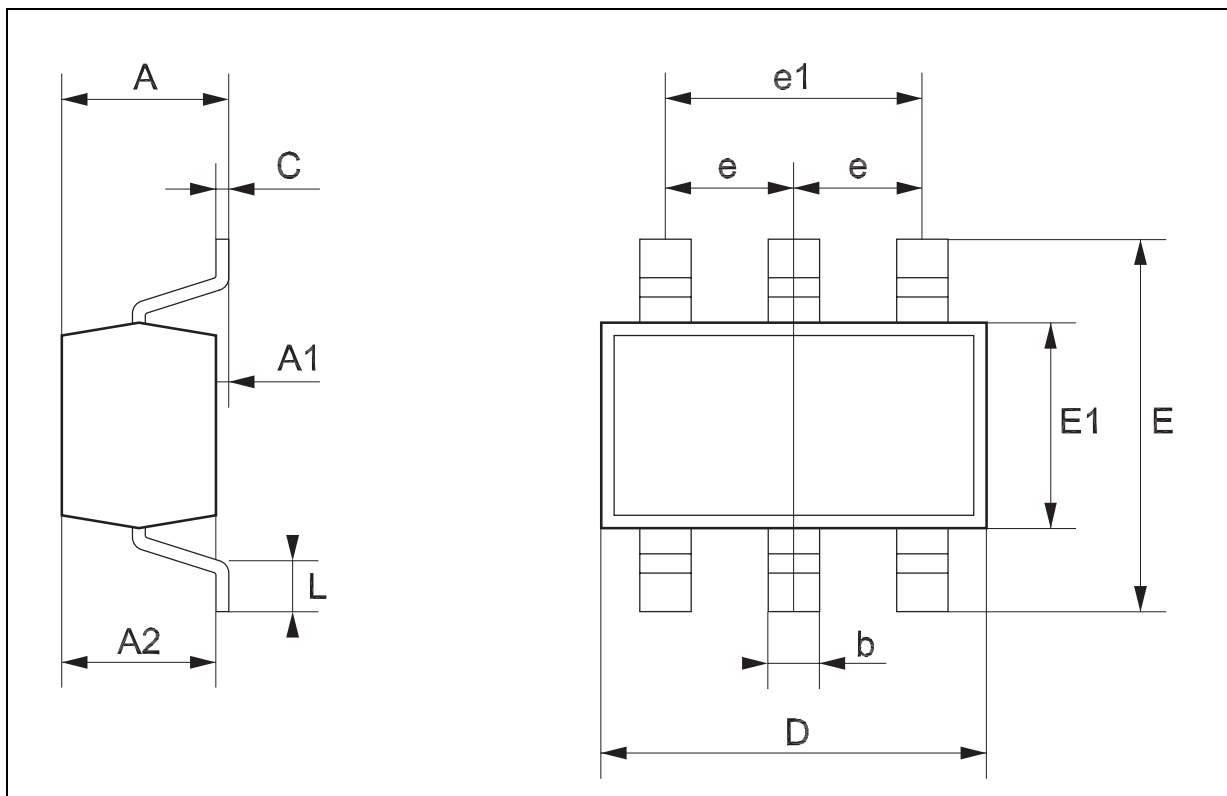
## 6 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second Level Interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: [www.st.com](http://www.st.com).



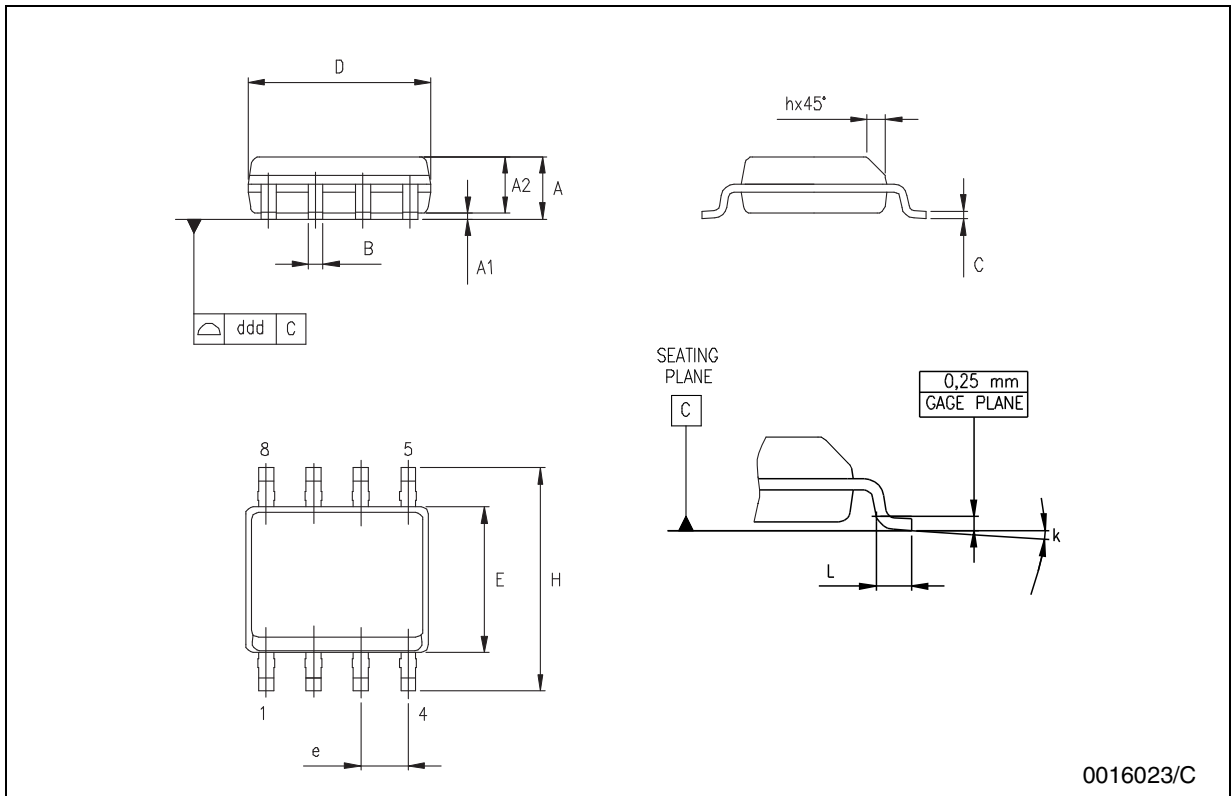
### SOT23-6L MECHANICAL DATA

| 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  |



**SO-8 MECHANICAL DATA**

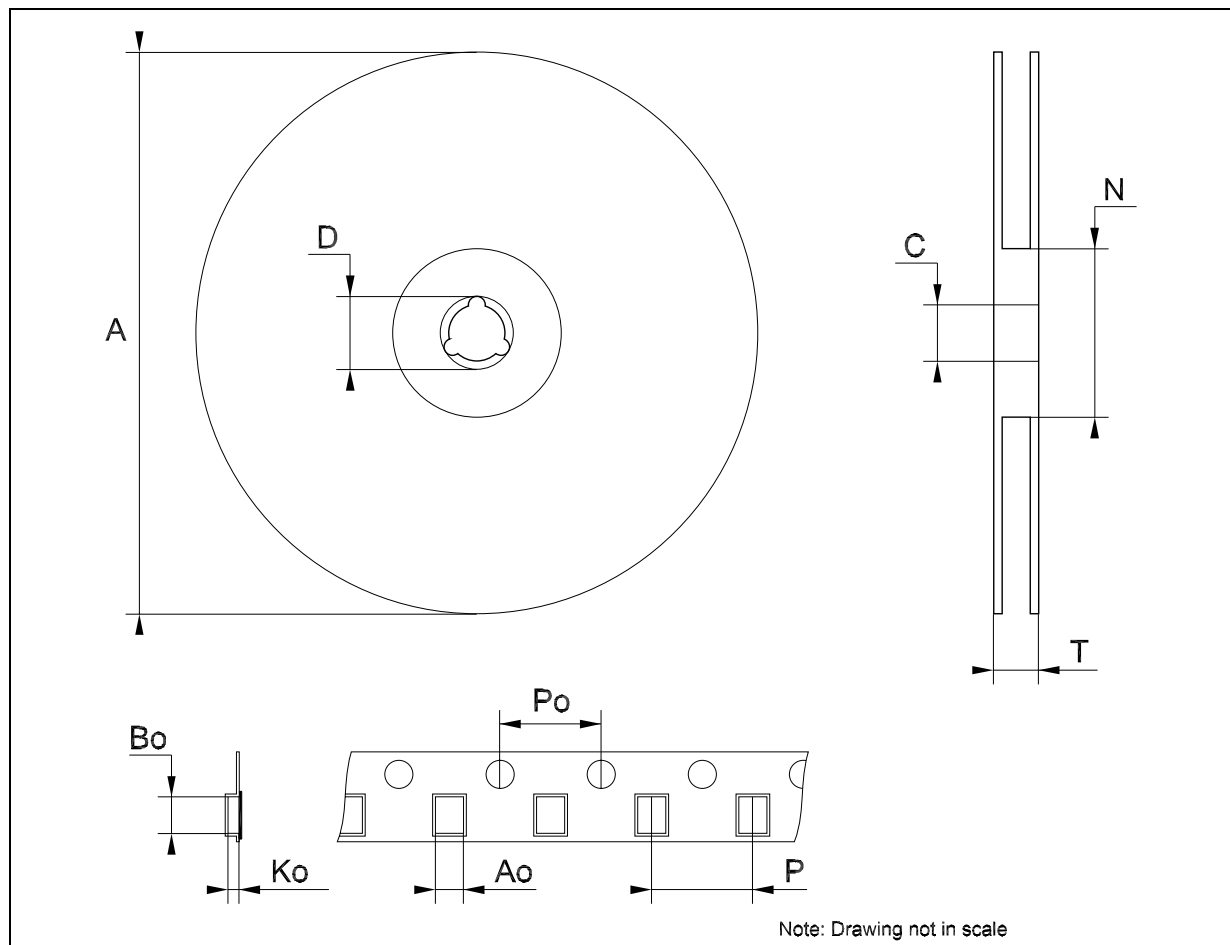
| DIM. | mm.       |      |      | inch  |       |       |
|------|-----------|------|------|-------|-------|-------|
|      | MIN.      | TYP  | MAX. | MIN.  | TYP.  | MAX.  |
| A    | 1.35      |      | 1.75 | 0.053 |       | 0.069 |
| A1   | 0.10      |      | 0.25 | 0.04  |       | 0.010 |
| A2   | 1.10      |      | 1.65 | 0.043 |       | 0.065 |
| B    | 0.33      |      | 0.51 | 0.013 |       | 0.020 |
| C    | 0.19      |      | 0.25 | 0.007 |       | 0.010 |
| D    | 4.80      |      | 5.00 | 0.189 |       | 0.197 |
| E    | 3.80      |      | 4.00 | 0.150 |       | 0.157 |
| e    |           | 1.27 |      |       | 0.050 |       |
| H    | 5.80      |      | 6.20 | 0.228 |       | 0.244 |
| h    | 0.25      |      | 0.50 | 0.010 |       | 0.020 |
| L    | 0.40      |      | 1.27 | 0.016 |       | 0.050 |
| k    | 8° (max.) |      |      |       |       |       |
| ddd  |           |      | 0.1  |       |       | 0.04  |



0016023/C

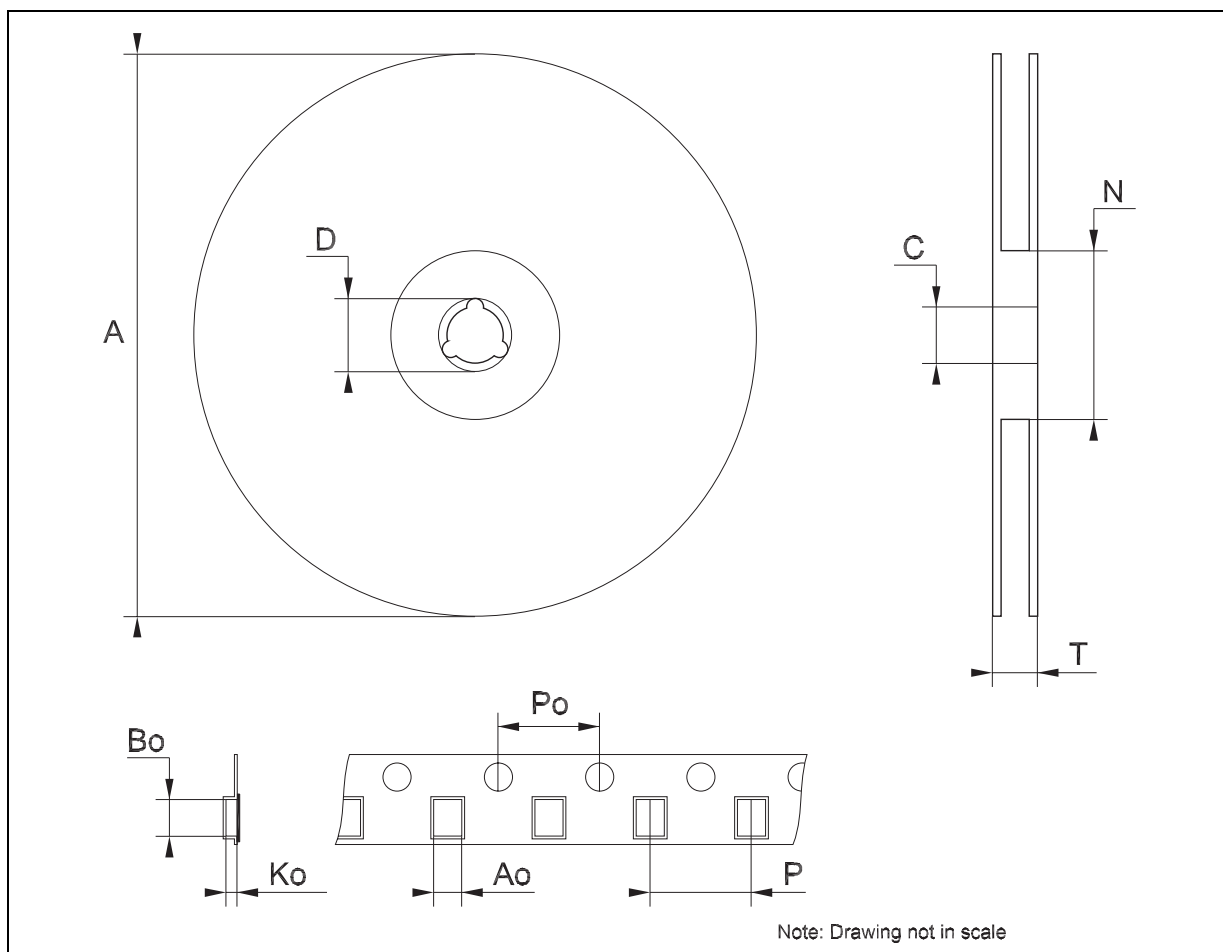
## Tape &amp; Reel SOT23-xL MECHANICAL DATA

| 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 SO-8 MECHANICAL DATA**

| DIM. | mm.  |      |      | inch  |      |        |
|------|------|------|------|-------|------|--------|
|      | MIN. | TYP. | MAX. | MIN.  | TYP. | MAX.   |
| A    |      |      | 330  |       |      | 12.992 |
| C    | 12.8 |      | 13.2 | 0.504 |      | 0.519  |
| D    | 20.2 |      |      | 0.795 |      |        |
| N    | 60   |      |      | 2.362 |      |        |
| T    |      |      | 22.4 |       |      | 0.882  |
| Ao   | 8.1  |      | 8.5  | 0.319 |      | 0.335  |
| Bo   | 5.5  |      | 5.9  | 0.216 |      | 0.232  |
| Ko   | 2.1  |      | 2.3  | 0.082 |      | 0.090  |
| Po   | 3.9  |      | 4.1  | 0.153 |      | 0.161  |
| P    | 7.9  |      | 8.1  | 0.311 |      | 0.319  |



## 7 Revision history

**Table 5. Revision history**

| <b>Date</b> | <b>Revision</b> | <b>Changes</b>                        |
|-------------|-----------------|---------------------------------------|
| 16-Nov-2005 | 1               | Initial release.                      |
| 26-Jul-2006 | 2               | Mistake on table 3 function of pin 3. |
| 03-Oct-2006 | 3               | Add new package SO-8.                 |

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