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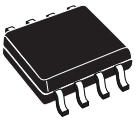
# LK115XX30
# LK115XX33 - LK115XX50

## Very low drop with inhibit voltage regulators

## Features

- Very low dropout voltage (0.2 V typ.)
- Very low quiescent current
  (Typ. 0.01 µA in off mode, 280 µA in on mode)
- Output current up to 100 mA
- Two logic-controlled electronic shutdowns
- Output voltages of 3.0; 3.3; 5.0 V
- Internal current and thermal limit
- Only 2.2 µF for stability
- $V_{OUT}$ tolerance ± 3 % at 25 °C
- Supply voltage rejection: 80 dB (typ)
- Temperature range: -40 °C to 125 °C



**SO-8**

It requires only a 2.2 µF capacitor for stability allowing space and cost saving.

## Description

The LK115XX series are very low drop regulators available in SO-8 package and in a wide range of output voltages.

The very low drop voltage (0.2 V) and the very low quiescent current (0.01 µA in OFF MODE, 280 µA in ON MODE) make them particularly suitable for low noise, low power applications and specially in battery powered systems.

Both active HIGH and active LOW shutdown logic control are available (pin 2 and 3). This means that when the device is used as a local regulator, it is possible to put a part of the board in standby, decreasing the total power consumption.

**Table 1. Device summary**

| Order codes | Output voltages |
|---|---|
| LK115D30-TR | 3 V |
| LK115D33-TR | 3.3 V |
| LK115D50-TR | 5 V |

# Contents

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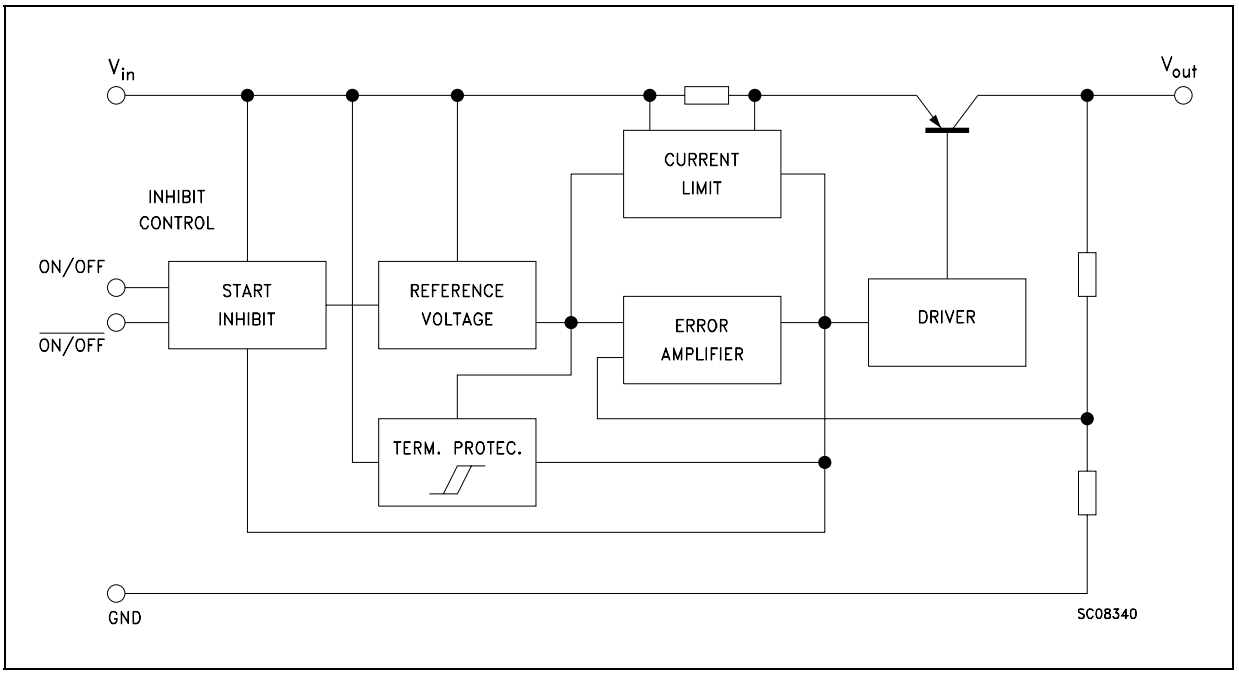
# 1 Diagram

**Figure 1. Schematic diagram**



# 2 Pin configuration

**Figure 2. Pin connection (top view)**

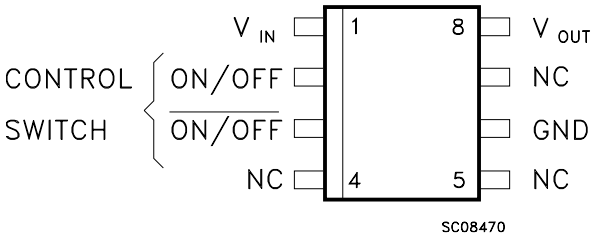



**Table 2. Truth table**

| ON/$\overline{\text{OFF}}$ (Pin 2) | $\overline{\text{ON}}$/OFF (Pin 3) | Status |
|---|---|---|
| H | L | ON |
| H | H | OFF |
| L | L | OFF |
| L | H | NOT ALLOWED |

*Note: Logic levels are those defined in the electrical characteristics.*

# 3 Maximum ratings

**Table 3. Absolute maximum ratings**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_I$ | DC input voltage | 20 | V |
| $I_O$ | Output current | Internally limited | |
| $P_{TOT}$ | Power dissipation | Internally limited | |
| $T_{STG}$ | Storage temperature range | -40 to 150 | °C |
| $T_{OP}$ | Operating junction temperature range | -40 to 125 | °C |

*Note: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.*

# 4 Test circuits

**Figure 3. Supply current (On mode)**

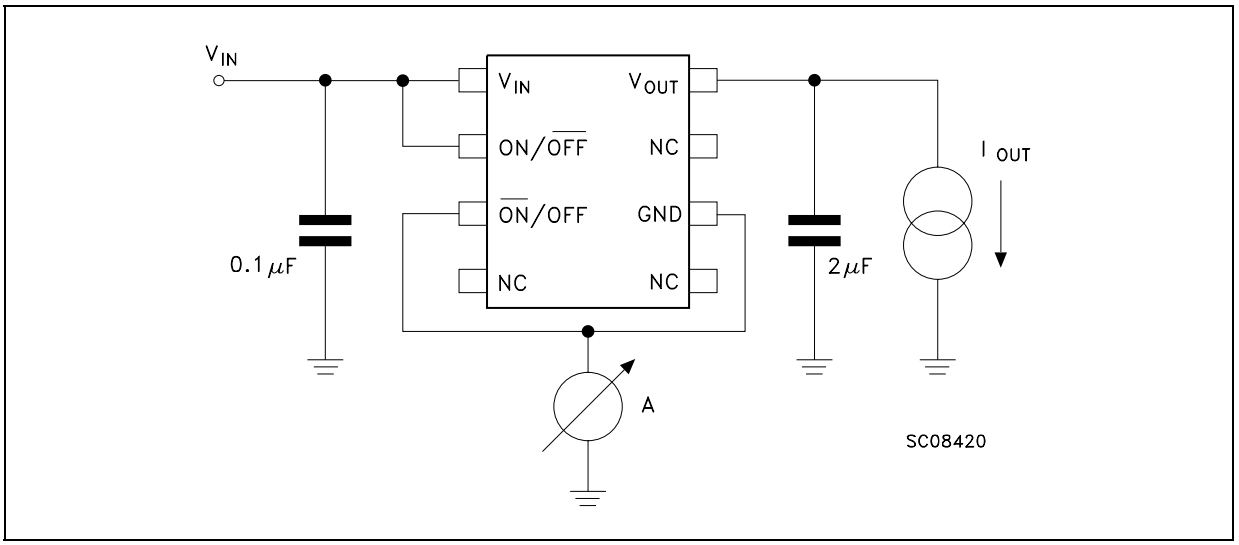
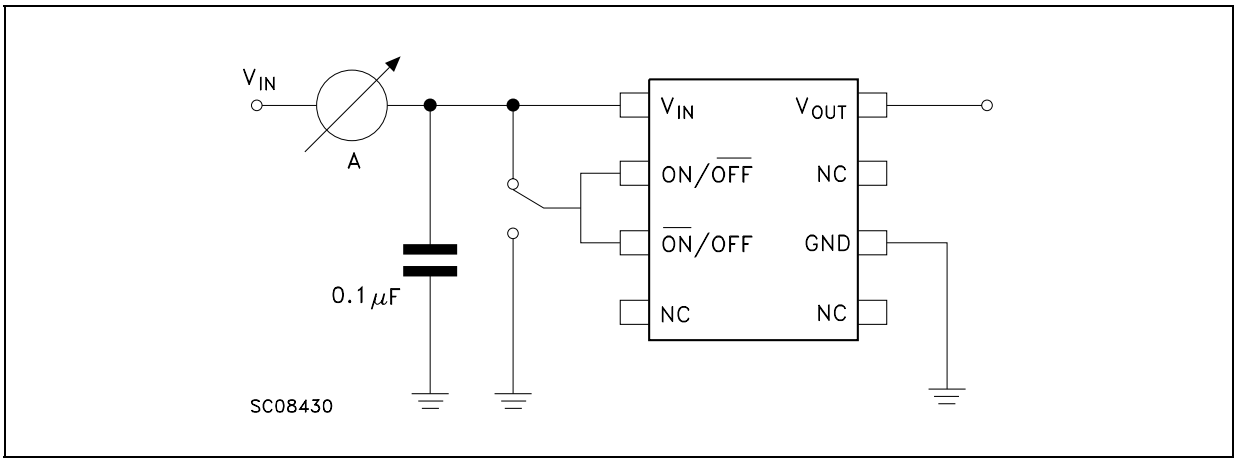



**Figure 4. Supply current (Off mode)**




*Note: The switch emulates the two possibilities to set the regulator in OFF mode.*

# 5 Electrical characteristics

**Table 4. Electrical characteristics for LK115D30** (refer to the test circuits, $T_J$ = 25 °C, $C_I$ = 0.1 µF, $C_O$ = 2.2 µF unless otherwise specified.)

| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $I_O$ = 10 mA, $V_I$ = 5 V | | 2.910 | 3 | 3.090 | V |
| | | $I_O$ = 10 mA, $V_I$ = 5 V, $T_a$= -40 to 125°C | | 2.850 | | 3.150 | |
| $V_I$ | Operating input voltage | $I_O$ = 100 mA | | | | 20 | V |
| $I_{out}$ | Output current limit | | | 120 | 200 | | mA |
| $\Delta V_O$ | Line regulation | $V_I$ = 4 to 20 V, $I_O$ = 0.5 mA | | | 2 | 10 | mV |
| $\Delta V_O$ | Load regulation | $V_I$ = 4 V, $I_O$ = 0.5 to 100 mA | | | 4 | 20 | mV |
| $I_d$ | Quiescent current (On Mode) | $V_I$ = 4 to 20 V, $I_O$ = 0 | | | 0.28 | 0.5 | mA |
| | | $V_I$ = 4 to 20 V, $I_O$ = 100 mA | | | 1.5 | 3 | |
| | (Off Mode) | $V_I$ = 4 to 20 V | | | 0.01 | 2 | µA |
| SVR | Supply voltage rejection | $I_O$ = 5 mA<br>$V_I$ = 5 V ± 1V | f = 120 Hz | | 79 | | dB |
| | | | f = 1 kHz | | 74 | | |
| | | | f = 10 kHz | | 57 | | |
| eN | Output noise voltage (RMS) | B = 10 Hz to 100 kHz | | | 66 | | µV |
| $V_d$ | Dropout voltage | $I_O$ = 60 mA | | | 0.17 | | V |
| $V_{HIc}$ | ON/$\overline{OFF}$ Control (pin 2) | Pin 3 to GND, OFF | | 0 | | 0.5 | V |
| | | Pin 3 to GND, ON | | 2.4 | | $V_{in}$ | |
| $V_{LIc}$ | $\overline{ON}$/OFF Control (pin 3) | Pin 2 to $V_{in}$, OFF | | $V_{in}$-0.2 | | $V_{in}$ | V |
| | | Pin 2 to $V_{in}$, ON | | 0 | | $V_{in}$-2.4 | |
| $C_O$ | Output bypass capacitance | ESR = 0.5 to 10 Ω, $I_O$ = 0 to 100 mA | | 2 | 10 | | µF |

**Table 5. Electrical characteristics for LK115D33** (refer to the test circuits, $T_J$ = 25 °C, $C_I$ = 0.1 µF, $C_O$ = 2.2 µF unless otherwise specified.)

| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $I_O$ = 10 mA, $V_I$ = 5.3 V | | 3.2 | 3.3 | 3.4 | V |
| | | $I_O$ = 10 mA, $V_I$ = 5.3 V, $T_a$= -40 to 125°C | | 3.135 | | 3.465 | |
| $V_I$ | Operating input voltage | $I_O$ = 100 mA | | | | 20 | V |
| $I_{out}$ | Output current limit | | | 120 | 200 | | mA |
| $\Delta V_O$ | Line regulation | $V_I$ = 4.3 to 20 V, $I_O$ = 0.5 mA | | | 2 | 10 | mV |
| $\Delta V_O$ | Load regulation | $V_I$ = 4.3 V, $I_O$ = 0.5 to 100 mA | | | 4 | 20 | mV |
| $I_d$ | Quiescent current (On Mode) | $V_I$ = 4.3 to 20 V, $I_O$ = 0 | | | 0.28 | 0.5 | mA |
| | | $V_I$ = 4.3 to 20 V, $I_O$ = 100 mA | | | 1.5 | 3 | |
| | (Off Mode) | $V_I$ = 4.3 to 20 V | | | 0.01 | 2 | µA |
| SVR | Supply voltage rejection | $I_O$ = 5 mA<br>$V_I$ = 5.3 V ± 1V | f = 120 Hz | | 79 | | dB |
| | | | f = 1 kHz | | 74 | | |
| | | | f = 10 kHz | | 57 | | |
| eN | Output noise voltage (RMS) | B = 10 Hz to 100 kHz | | | 72.6 | | µV |
| $V_d$ | Dropout voltage | $I_O$ = 60 mA | | | 0.17 | | V |
| $V_{HIc}$ | ON/$\overline{OFF}$ Control (pin 2) | Pin 3 to GND, OFF | | 0 | | 0.5 | V |
| | | Pin 3 to GND, ON | | 2.4 | | $V_{in}$ | |
| $V_{LIc}$ | $\overline{ON}$/OFF Control (pin 3) | Pin 2 to $V_{in}$, OFF | | $V_{in}$-0.2 | | $V_{in}$ | V |
| | | Pin 2 to $V_{in}$, ON | | 0 | | $V_{in}$-2.4 | |
| $C_O$ | Output bypass capacitance | ESR = 0.5 to 10Ω, $I_O$ = 0 to 100 mA | | 2 | 10 | | µF |

**Table 6. Electrical characteristics for LK115D50** (refer to the test circuits, $T_J$ = 25 °C, $C_I$ = 0.1 µF, $C_O$ = 2.2 µF unless otherwise specified.)

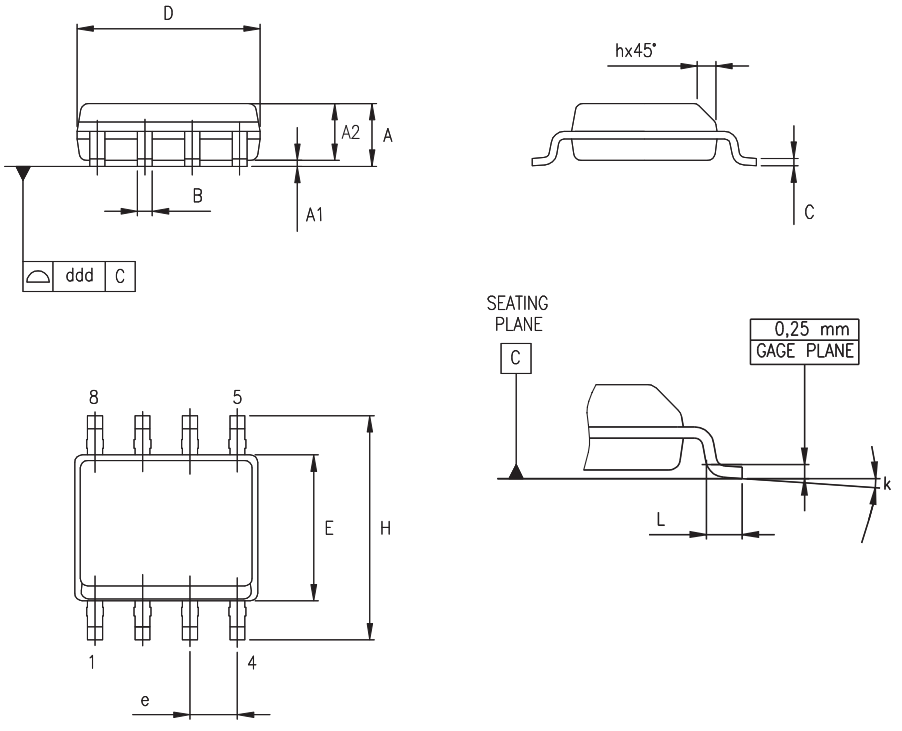
| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $I_O$ = 10 mA, $V_I$ = 7 V | | 4.85 | 5 | 5.15 | V |
| | | $I_O$ = 10 mA, $V_I$ = 7 V, $T_a$= -40 to 125°C | | 4.75 | | 5.25 | |
| $V_I$ | Operating input voltage | $I_O$ = 100 mA | | | | 20 | V |
| $I_{out}$ | Output current limit | | | 120 | 200 | | mA |
| $\Delta V_O$ | Line regulation | $V_I$ = 6 to 20 V, $I_O$ = 0.5 mA | | | 3 | 15 | mV |
| $\Delta V_O$ | Load regulation | $V_I$ = 6 V, $I_O$ = 0.5 to 100 mA | | | 4 | 20 | mV |
| $I_d$ | Quiescent current (On Mode) | $V_I$ = 6 to 20 V, $I_O$ = 0 | | | 0.28 | 0.5 | mA |
| | | $V_I$ = 6 to 20 V, $I_O$ = 100 mA | | | 1.5 | 3 | |
| | (Off Mode) | $V_I$ = 6 to 20 V | | | 0.01 | 2 | µA |
| SVR | Supply voltage rejection | $I_O$ = 5 mA<br>$V_I$ = 7 V ± 1V | f = 120 Hz | | 75 | | dB |
| | | | f = 1 kHz | | 70 | | |
| | | | f = 10 kHz | | 55 | | |
| eN | Output noise voltage (RMS) | B = 10 Hz to 100 kHz | | | 110 | | µV |
| $V_d$ | Dropout voltage | $I_O$ = 60 mA | | | 0.17 | | V |
| $V_{HIc}$ | ON/$\overline{OFF}$ Control (pin 2) | Pin 3 to GND, OFF | | 0 | | 0.5 | V |
| | | Pin 3 to GND, ON | | 2.4 | | $V_{in}$ | |
| $V_{LIc}$ | $\overline{ON}$/OFF Control (pin 3) | Pin 2 to $V_{in}$, OFF | | $V_{in}$-0.2 | | $V_{in}$ | V |
| | | Pin 2 to $V_{in}$, ON | | 0 | | $V_{in}$-2.4 | |
| $C_O$ | Output bypass capacitance | ESR = 0.5 to 10Ω, $I_O$ = 0 to 100 mA | | 2 | 10 | | µF |

# 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.

## SO-8 mechanical data

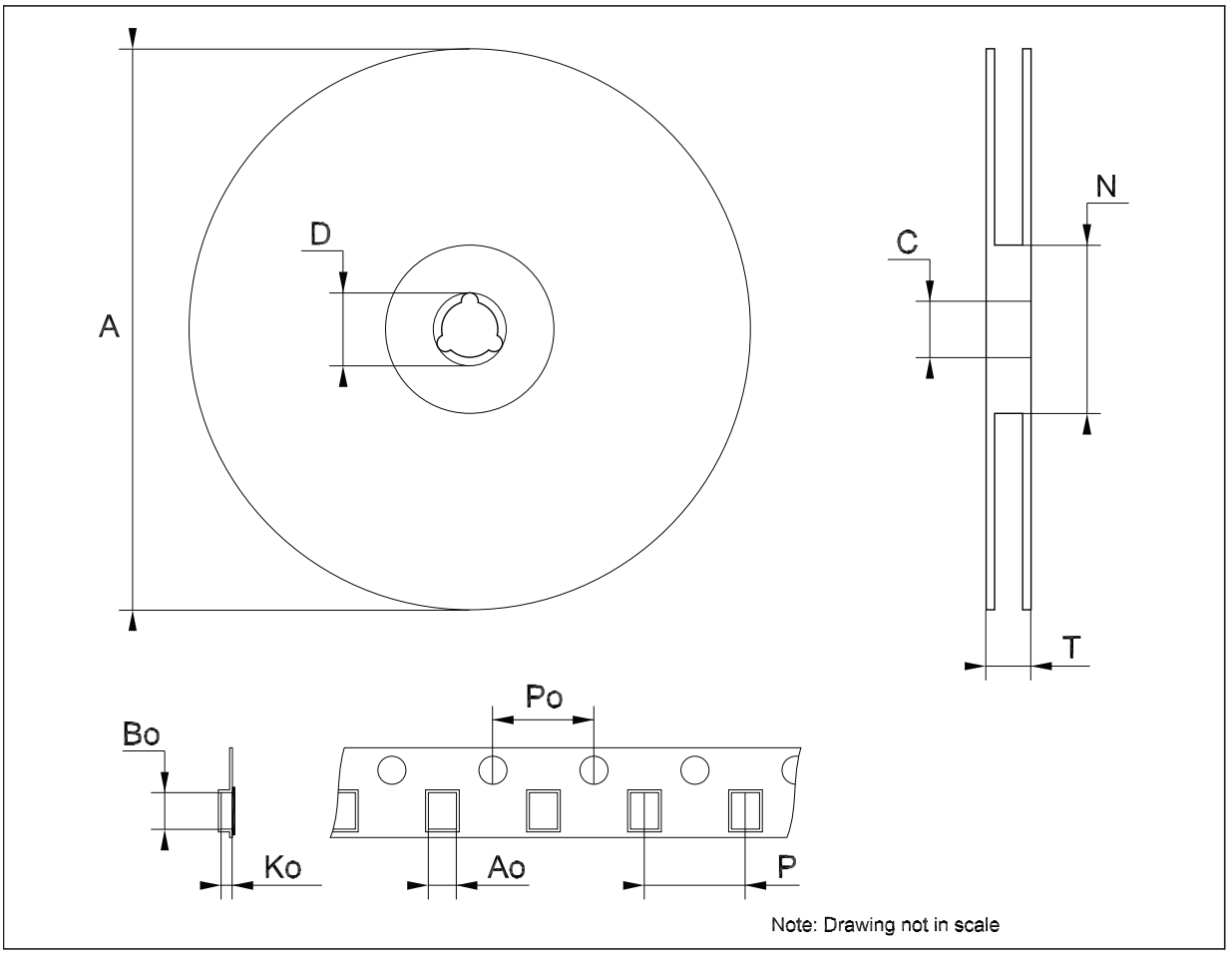
| Dim. | mm. | | | inch. | | |
|---|---|---|---|---|---|---|
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 1.35 | | 1.75 | 0.053 | | 0.069 |
| A1 | 0.10 | | 0.25 | 0.04 | | 0.010 |
| A2 | 1.10 | | 1.65 | 0.043 | | 0.065 |
| B | 0.33 | | 0.51 | 0.013 | | 0.020 |
| C | 0.19 | | 0.25 | 0.007 | | 0.010 |
| 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 & 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 |




Note: Drawing not in scale

# 7 Revision history

**Table 7. Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 07-Jun-2006 | 3 | Order codes updated. |
| 07-Jul-2008 | 4 | Added *Table 1 on page 1*. |