

## Very low drop voltage regulators with inhibit

### Features

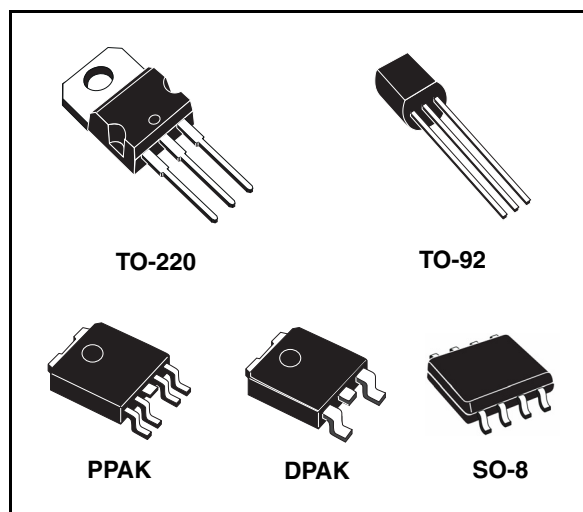
- Very low dropout voltage (0.4 V)
- Very low quiescent current
- (Typ. 50  $\mu$ A in off mode, 600  $\mu$ A in on mode)
- Output current up to 250 mA
- Logic-controlled electronic shutdown
- Output voltages of 2.7; 3.3; 3.5; 5; 8; 12 V
- Automotive Grade product: 2.7 V, 3.3 V, 3.5 V  $V_{OUT}$  only in SO-8 package
- Internal current and thermal limit
- Only 2.2  $\mu$ F for stability
- Available in  $\pm 1\%$  (AB) or  $2\%$  (C) selection at 25 °C
- Supply voltage rejection: 70 dB typ. for 5 V version
- Temperature range: -40 to 125 °C

### Description

The L4931ABxx L4931Cxx are very Low Drop regulators available in TO-220, SO-8, DPAK, PPAK and TO-92 packages and in a wide range of output voltages.

The very low drop voltage (0.4 V) and the very low quiescent current make them particularly suitable for low noise, low power applications and specially in battery powered systems.

A TTL compatible shutdown logic control function is available in PPAK and SO-8 packages.



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. It requires only a 2.2  $\mu$ F capacitor for stability allowing space and cost saving.

The L4931 is available as Automotive Grade in SO-8 package only, for the options of output voltages whose commercial Part Numbers are shown in the [Table 19 on page 34](#) (order codes). These devices are qualified according to the specification AEC-Q100 of the Automotive market, in the temperature range -40 °C to 125 °C, and the statistical tests PAT, SYL, SBL are performed.

**Table 1. Device summary**

| Part numbers |             |             |              |
|--------------|-------------|-------------|--------------|
| L4931ABXX27  | L4931CXX33  | L4931ABXX50 | L4931CXX80   |
| L4931CXX27   | L4931ABXX35 | L4931CXX50  | L4931ABXX120 |
| L4931ABXX33  | L4931CXX35  | L4931ABXX80 | L4931CXX120  |

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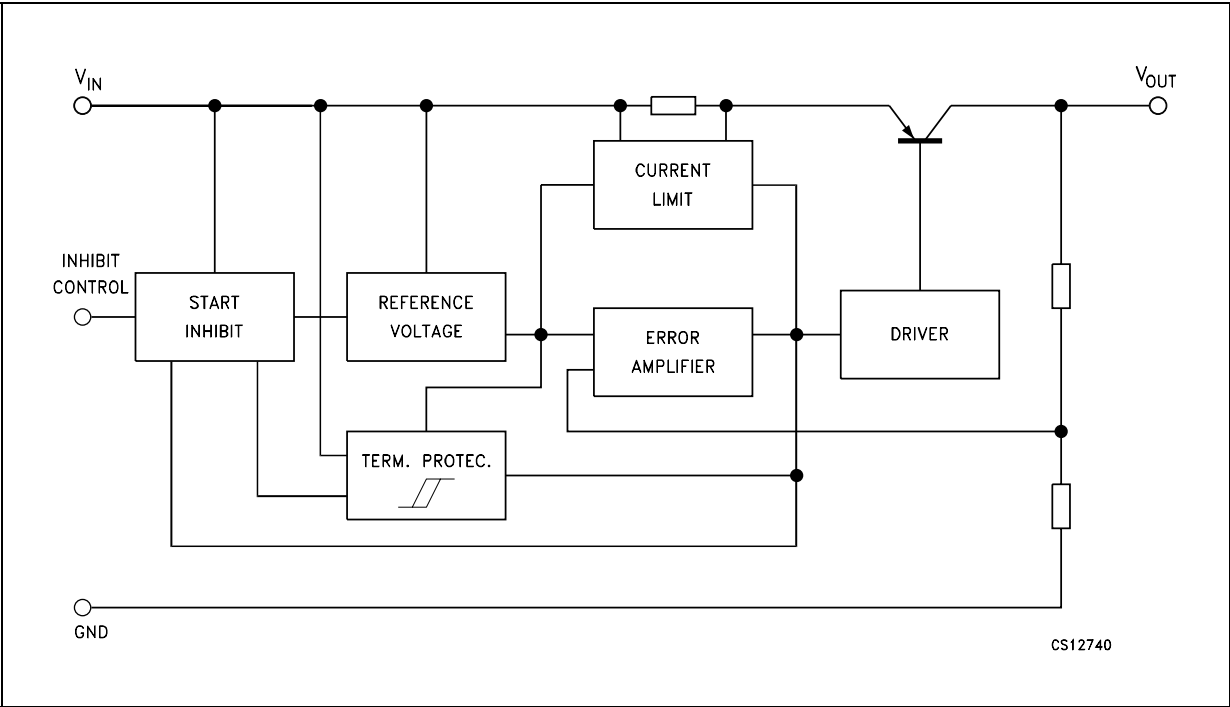
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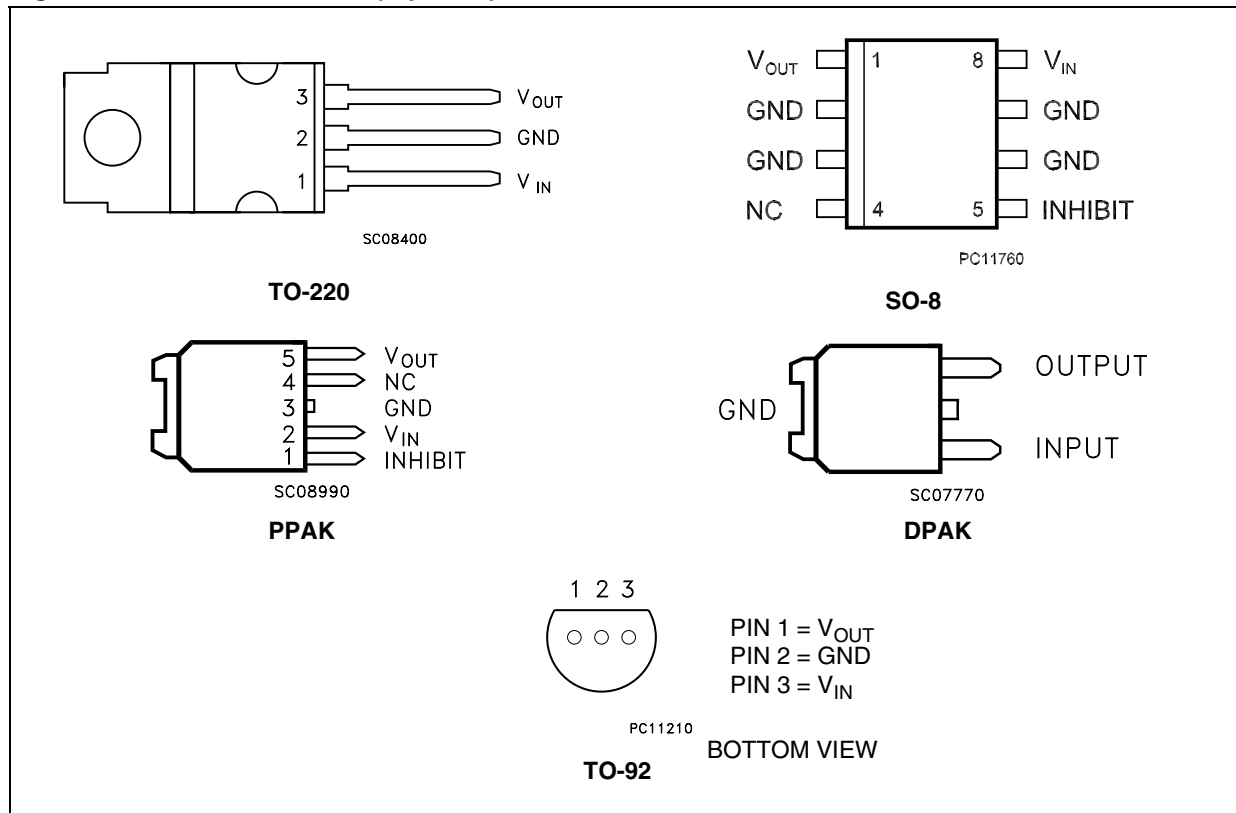
# 1 Diagram

Figure 1. Schematic diagram



## 2 Pin configuration

Figure 2. Pin connections (top view)



### 3 Maximum ratings

**Table 2. Absolute maximum ratings**

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

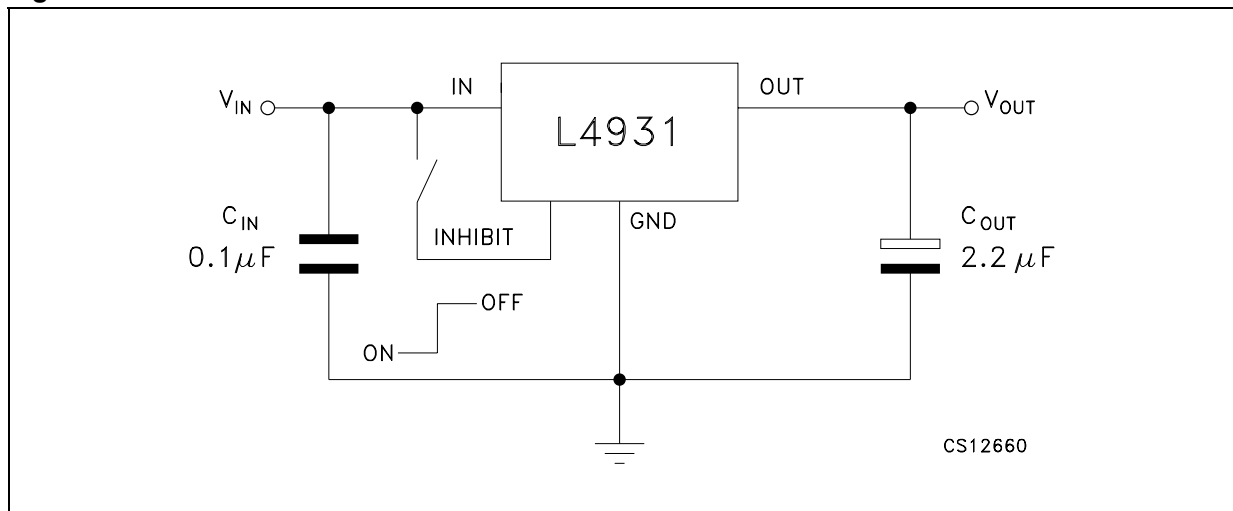
*Note: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied*

**Table 3. Thermal data**

| Symbol     | Parameter                           | TO-220 | SO-8 | DPAK | PPAK | TO-92 | Unit |
|------------|-------------------------------------|--------|------|------|------|-------|------|
| $R_{thJC}$ | Thermal resistance junction-case    | 3      | 20   | 8    | 8    |       | °C/W |
| $R_{thJA}$ | Thermal resistance junction-ambient | 50     | 55   | 100  | 100  | 200   | °C/W |

## 4 Application circuit

Figure 3. Test circuit





## 5 Electrical characteristics

**Table 4. Electrical characteristics of L4931ABxx27** (refer to the test circuits,  $T_A = 25\text{ }^\circ\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified).

| Symbol       | Parameter                      | Test conditions   | Min.                | Typ. | Max.  | Unit          |
|--------------|--------------------------------|---|---------------------|------|-------|---------------|
| $V_O$        | Output voltage                 | $I_O = 5\text{ mA}$ , $V_I = 4.7\text{ V}$  | 2.673               | 2.7  | 2.727 | V             |
|              |                                | $I_O = 5\text{ mA}$ , $V_I = 4.7\text{ V}$ , $T_A = -25\text{ to }85\text{ }^\circ\text{C}$ | 2.646               |      | 2.754 |               |
| $V_I$        | Operating input voltage        | $I_O = 250\text{ mA}$   |                     |      | 20    | V             |
| $I_{out}$    | Output current limit           |   |                     | 300  |       | mA            |
| $\Delta V_O$ | Line regulation                | $V_I = 3.4\text{ to }20\text{ V}$ , $I_O = 0.5\text{ mA}$                                   |                     | 3    | 15    | mV            |
| $\Delta V_O$ | Load regulation <sup>(1)</sup> | $V_I = 3.6\text{ V}$ , $I_O = 0.5\text{ to }250\text{ mA}$                                  |                     | 3    | 15    | mV            |
| $I_d$        | Quiescent current<br>ON MODE   | $V_I = 3.6\text{ to }20\text{ V}$ , $I_O = 0\text{ mA}$                                     |                     | 0.6  | 1     | mA            |
|              |                                | $V_I = 3.6\text{ to }20\text{ V}$ , $I_O = 250\text{ mA}$                                   |                     | 4    | 6     |               |
|              | OFF MODE                       | $V_I = 6\text{ V}$  |                     | 50   | 100   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection       | $I_O = 5\text{ mA}$<br>$V_I = 4.6 \pm 1\text{ V}$   | $f = 120\text{ Hz}$ |      | 74    | dB            |
|              |                                |   | $f = 1\text{ kHz}$  |      | 71    |               |
|              |                                |   | $f = 10\text{ kHz}$ |      | 55    |               |
| eN           | Output noise voltage           | $B = 10\text{ Hz to }100\text{ kHz}$  |                     | 50   |       | $\mu\text{V}$ |
| $V_d$        | Dropout voltage <sup>(1)</sup> | $I_O = 250\text{ mA}$   |                     | 0.4  | 0.6   | V             |
|              |                                | $I_O = 250\text{ mA}$ , $T_A = -40\text{ to }125\text{ }^\circ\text{C}$                     |                     |      | 0.8   | V             |
| $V_{IL}$     | Control input logic low        | $T_A = -40\text{ to }125\text{ }^\circ\text{C}$   |                     |      | 0.8   | V             |
| $V_{IH}$     | Control Input Logic High       | $T_A = -40\text{ to }125\text{ }^\circ\text{C}$   | 2                   |      |       | V             |
| $I_I$        | Control input current          | $V_I = 6\text{ V}$ , $V_C = 6\text{ V}$   |                     | 10   |       | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance      | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }250\text{ mA}$           | 2                   | 10   |       | $\mu\text{F}$ |

1. For SO-8 package the maximum limit of load regulation and dropout is increased by 20 mV.

**Table 5. Electrical characteristics of L4931Cxx27** (refer to the test circuits,  $T_A = 25^\circ\text{C}$ ,  $C_I = 0.1\ \mu\text{F}$ ,  $C_O = 2.2\ \mu\text{F}$  unless otherwise specified).

| Symbol           | Parameter                      | Test conditions   | Min.                 | Typ. | Max.  | Unit          |
|------------------|--------------------------------|---|----------------------|------|-------|---------------|
| $V_O$            | Output voltage                 | $I_O = 5\ \text{mA}$ , $V_I = 4.7\ \text{V}$  | 2.646                | 2.7  | 2.754 | V             |
|                  |                                | $I_O = 5\ \text{mA}$ , $V_I = 4.7\ \text{V}$ , $T_A = -25\ \text{to}\ 85^\circ\text{C}$ | 2.592                |      | 2.808 |               |
| $V_I$            | Operating input voltage        | $I_O = 250\ \text{mA}$  |                      |      | 20    | V             |
| $I_{\text{out}}$ | Output current limit           |   |                      | 300  |       | mA            |
| $\Delta V_O$     | Line regulation                | $V_I = 3.4\ \text{to}\ 20\ \text{V}$ , $I_O = 0.5\ \text{mA}$                           |                      | 3    | 18    | mV            |
| $\Delta V_O$     | Load regulation <sup>(1)</sup> | $V_I = 3.6\ \text{V}$ , $I_O = 0.5\ \text{to}\ 250\ \text{mA}$                          |                      | 3    | 18    | mV            |
| $I_d$            | Quiescent current<br>ON MODE   | $V_I = 3.6\ \text{to}\ 20\ \text{V}$ , $I_O = 0\ \text{mA}$                             |                      | 0.6  | 1     | mA            |
|                  |                                | $V_I = 3.6\ \text{to}\ 20\ \text{V}$ , $I_O = 250\ \text{mA}$                           |                      | 4    | 6     |               |
|                  | OFF MODE                       | $V_I = 6\ \text{V}$   |                      | 50   | 100   | $\mu\text{A}$ |
| SVR              | Supply voltage rejection       | $I_O = 5\ \text{mA}$<br>$V_I = 4.6 \pm 1\ \text{V}$                                     | $f = 120\ \text{Hz}$ |      | 74    | dB            |
|                  |                                |   | $f = 1\ \text{kHz}$  |      | 71    |               |
|                  |                                |   | $f = 10\ \text{kHz}$ |      | 55    |               |
| eN               | Output noise voltage           | $B = 10\ \text{Hz to}\ 100\ \text{kHz}$   |                      | 50   |       | $\mu\text{V}$ |
| $V_d$            | Dropout voltage <sup>(1)</sup> | $I_O = 250\ \text{mA}$  |                      | 0.4  | 0.6   | V             |
|                  |                                | $I_O = 250\ \text{mA}$ , $T_A = -40\ \text{to}\ 125^\circ\text{C}$                      |                      |      | 0.8   | V             |
| $V_{\text{IL}}$  | Control input logic low        | $T_A = -40\ \text{to}\ 125^\circ\text{C}$   |                      |      | 0.8   | V             |
| $V_{\text{IH}}$  | Control Input Logic High       | $T_A = -40\ \text{to}\ 125^\circ\text{C}$   | 2                    |      |       | V             |
| $I_I$            | Control input current          | $V_I = 6\ \text{V}$ , $V_C = 6\ \text{V}$   |                      | 10   |       | $\mu\text{A}$ |
| $C_O$            | Output bypass capacitance      | $\text{ESR} = 0.1\ \text{to}\ 10\ \Omega$ , $I_O = 0\ \text{to}\ 250\ \text{mA}$        | 2                    | 10   |       | $\mu\text{F}$ |

1. For SO-8 package the maximum limit of load regulation and dropout is increased by 20 mV.

**Table 6. Electrical characteristics of L4931Cxx27-TRY (Automotive Grade)** (refer to the test circuits,  $T_A = -40$  to  $125^\circ\text{C}$ ,  $C_I = 0.1 \mu\text{F}$ ,  $C_O = 2.2 \mu\text{F}$  unless otherwise specified).

| Symbol       | Parameter                    | Test conditions  | Min.                 | Typ. | Max.  | Unit          |
|--------------|------------------------------|--|----------------------|------|-------|---------------|
| $V_O$        | Output voltage               | $I_O = 5 \text{ mA}$ , $V_I = 4.7 \text{ V}$ , $T_A = 25^\circ\text{C}$                  | 2.646                | 2.7  | 2.754 | V             |
|              |                              | $I_O = 5 \text{ mA}$ , $V_I = 4.7 \text{ V}$   | 2.592                |      | 2.808 |               |
| $V_I$        | Operating input voltage      | $I_O = 250 \text{ mA}$   |                      |      | 20    | V             |
| $I_{out}$    | Output current limit         | $T_A = 25^\circ\text{C}$   |                      | 300  |       | mA            |
| $\Delta V_O$ | Line regulation              | $V_I = 3.4$ to $20 \text{ V}$ , $I_O = 0.5 \text{ mA}$                                   |                      |      | 20    | mV            |
| $\Delta V_O$ | Load regulation              | $V_I = 3.6 \text{ V}$ , $I_O = 0.5$ to $250 \text{ mA}$                                  |                      |      | 38    | mV            |
| $I_d$        | Quiescent current<br>ON MODE | $V_I = 3.6$ to $20 \text{ V}$ , $I_O = 0 \text{ mA}$                                     |                      |      | 1     | mA            |
|              |                              | $V_I = 3.6$ to $20 \text{ V}$ , $I_O = 250 \text{ mA}$                                   |                      |      | 6     |               |
|              | OFF MODE                     | $V_I = 6 \text{ V}$  |                      |      | 100   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection     | $I_O = 5 \text{ mA}$<br>$V_I = 4.6 \pm 1 \text{ V}$<br>$T_A = 25^\circ\text{C}$          | $f = 120 \text{ Hz}$ |      | 74    | dB            |
|              |                              |  | $f = 1 \text{ kHz}$  |      | 71    |               |
|              |                              |  | $f = 10 \text{ kHz}$ |      | 55    |               |
| eN           | Output noise voltage         | $B = 10 \text{ Hz}$ to $100 \text{ kHz}$ , $T_A = 25^\circ\text{C}$                      |                      | 50   |       | $\mu\text{V}$ |
| $V_d$        | Dropout voltage              | $I_O = 250 \text{ mA}$ , $T_A = 25^\circ\text{C}$  |                      | 0.4  | 0.6   | V             |
|              |                              | $I_O = 250 \text{ mA}$   |                      |      | 0.82  | V             |
| $V_{IL}$     | Control input logic low      |  |                      |      | 0.82  | V             |
| $V_{IH}$     | Control Input Logic High     |  | 2                    |      |       | V             |
| $I_I$        | Control input current        | $V_I = 6 \text{ V}$ , $V_C = 6 \text{ V}$ , $T_A = 25^\circ\text{C}$                     |                      | 10   |       | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance    | ESR = $0.1$ to $10 \Omega$ , $I_O = 0$ to $250 \text{ mA}$ ,<br>$T_A = 25^\circ\text{C}$ | 2                    | 10   |       | $\mu\text{F}$ |

**Table 7. Electrical characteristics of L4931ABxx33** (refer to the test circuits,  $T_A = 25\text{ °C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified).

| Symbol       | Parameter                      | Test conditions   | Min.                | Typ. | Max.  | Unit          |
|--------------|--------------------------------|---|---------------------|------|-------|---------------|
| $V_O$        | Output voltage                 | $I_O = 5\text{ mA}$ , $V_I = 5.3\text{ V}$  | 3.267               | 3.3  | 3.333 | V             |
|              |                                | $I_O = 5\text{ mA}$ , $V_I = 5.3\text{ V}$ , $T_A = -25\text{ to }85\text{ °C}$   | 3.234               |      | 3.366 |               |
| $V_I$        | Operating input voltage        | $I_O = 250\text{ mA}$   |                     |      | 20    | V             |
| $I_{out}$    | Output current limit           |   |                     | 300  |       | mA            |
| $\Delta V_O$ | Line regulation                | $V_I = 4\text{ to }20\text{ V}$ , $I_O = 0.5\text{ mA}$                           |                     | 3    | 15    | mV            |
| $\Delta V_O$ | Load regulation <sup>(1)</sup> | $V_I = 4.2\text{ V}$ , $I_O = 0.5\text{ to }250\text{ mA}$                        |                     | 3    | 15    | mV            |
| $I_d$        | Quiescent current<br>ON MODE   | $V_I = 4.2\text{ to }20\text{ V}$ , $I_O = 0\text{ mA}$                           |                     | 0.6  | 1     | mA            |
|              |                                | $V_I = 4.2\text{ to }20\text{ V}$ , $I_O = 250\text{ mA}$                         |                     | 4    | 6     |               |
|              | OFF MODE                       | $V_I = 6\text{ V}$  |                     | 50   | 100   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection       | $I_O = 5\text{ mA}$<br>$V_I = 5.2 \pm 1\text{ V}$                                 | $f = 120\text{ Hz}$ |      | 73    | dB            |
|              |                                |   | $f = 1\text{ kHz}$  |      | 70    |               |
|              |                                |   | $f = 10\text{ kHz}$ |      | 55    |               |
| eN           | Output noise voltage           | $B = 10\text{ Hz to }100\text{ kHz}$  |                     | 50   |       | $\mu\text{V}$ |
| $V_d$        | Dropout voltage <sup>(1)</sup> | $I_O = 250\text{ mA}$   |                     | 0.4  | 0.6   | V             |
|              |                                | $I_O = 250\text{ mA}$ , $T_A = -40\text{ to }125\text{ °C}$                       |                     |      | 0.8   | V             |
| $V_{IL}$     | Control input logic low        | $T_A = -40\text{ to }125\text{ °C}$   |                     |      | 0.8   | V             |
| $V_{IH}$     | Control Input Logic High       | $T_A = -40\text{ to }125\text{ °C}$   | 2                   |      |       | V             |
| $I_I$        | Control input current          | $V_I = 6\text{ V}$ , $V_C = 6\text{ V}$   |                     | 10   |       | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance      | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }250\text{ mA}$ | 2                   | 10   |       | $\mu\text{F}$ |

1. For SO-8 package the maximum limit of load regulation and dropout is increased by 20 mV.

**Table 8. Electrical characteristics of L4931Cxx33** (refer to the test circuits,  $T_A = 25\text{ }^\circ\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified).

| Symbol       | Parameter                      | Test conditions   | Min.                | Typ. | Max.  | Unit          |
|--------------|--------------------------------|---|---------------------|------|-------|---------------|
| $V_O$        | Output voltage                 | $I_O = 5\text{ mA}$ , $V_I = 5.3\text{ V}$  | 3.234               | 3.3  | 3.366 | V             |
|              |                                | $I_O = 5\text{ mA}$ , $V_I = 5.3\text{ V}$ , $T_A = -25\text{ to }85\text{ }^\circ\text{C}$ | 3.168               |      | 3.432 |               |
| $V_I$        | Operating input voltage        | $I_O = 250\text{ mA}$   |                     |      | 20    | V             |
| $I_{out}$    | Output current limit           |   |                     | 300  |       | mA            |
| $\Delta V_O$ | Line regulation                | $V_I = 4.1\text{ to }20\text{ V}$ , $I_O = 0.5\text{ mA}$                                   |                     | 3    | 18    | mV            |
| $\Delta V_O$ | Load regulation <sup>(1)</sup> | $V_I = 4.3\text{ V}$ , $I_O = 0.5\text{ to }250\text{ mA}$                                  |                     | 3    | 18    | mV            |
| $I_d$        | Quiescent current<br>ON MODE   | $V_I = 4.3\text{ to }20\text{ V}$ , $I_O = 0\text{ mA}$                                     |                     | 0.6  | 1     | mA            |
|              |                                | $V_I = 4.3\text{ to }20\text{ V}$ , $I_O = 250\text{ mA}$                                   |                     | 4    | 6     |               |
|              | OFF MODE                       | $V_I = 6\text{ V}$  |                     | 50   | 100   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection       | $I_O = 5\text{ mA}$<br>$V_I = 5.3 \pm 1\text{ V}$   | $f = 120\text{ Hz}$ |      | 73    | dB            |
|              |                                |   | $f = 1\text{ kHz}$  |      | 70    |               |
|              |                                |   | $f = 10\text{ kHz}$ |      | 55    |               |
| eN           | Output noise voltage           | $B = 10\text{ Hz to }100\text{ kHz}$  |                     | 50   |       | $\mu\text{V}$ |
| $V_d$        | Dropout voltage <sup>(1)</sup> | $I_O = 250\text{ mA}$   |                     | 0.4  | 0.6   | V             |
|              |                                | $I_O = 250\text{ mA}$ , $T_A = -40\text{ to }125\text{ }^\circ\text{C}$                     |                     |      | 0.8   | V             |
| $V_{IL}$     | Control input logic low        | $T_A = -40\text{ to }125\text{ }^\circ\text{C}$   |                     |      | 0.8   | V             |
| $V_{IH}$     | Control Input Logic High       | $T_A = -40\text{ to }125\text{ }^\circ\text{C}$   | 2                   |      |       | V             |
| $I_I$        | Control input current          | $V_I = 6\text{ V}$ , $V_C = 6\text{ V}$   |                     | 10   |       | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance      | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }250\text{ mA}$           | 2                   | 10   |       | $\mu\text{F}$ |

1. For SO-8 package the maximum limit of load regulation and dropout is increased by 20 mV.

**Table 9. Electrical characteristics of L4931Cxx33-TRY (Automotive Grade)** (refer to the test circuits,  $T_A = -40$  to  $125$  °C,  $C_I = 0.1$   $\mu$ F,  $C_O = 2.2$   $\mu$ F unless otherwise specified).

| Symbol       | Parameter                    | Test conditions   | Min.         | Typ. | Max.  | Unit    |
|--------------|------------------------------|---|--------------|------|-------|---------|
| $V_O$        | Output voltage               | $I_O = 5$ mA, $V_I = 5.3$ V, $T_A = 25$ °C                          | 3.234        | 3.3  | 3.366 | V       |
|              |                              | $I_O = 5$ mA, $V_I = 5.3$ V   | 3.168        |      | 3.432 |         |
| $V_I$        | Operating input voltage      | $I_O = 250$ mA  |              |      | 20    | V       |
| $I_{out}$    | Output current limit         | $T_A = 25$ °C   |              | 300  |       | mA      |
| $\Delta V_O$ | Line regulation              | $V_I = 4.1$ to $20$ V, $I_O = 0.5$ mA                               |              |      | 20    | mV      |
| $\Delta V_O$ | Load regulation              | $V_I = 4.3$ V, $I_O = 0.5$ to $250$ mA                              |              |      | 38    | mV      |
| $I_d$        | Quiescent current<br>ON MODE | $V_I = 4.3$ to $20$ V, $I_O = 0$ mA                                 |              |      | 1     | mA      |
|              |                              | $V_I = 4.3$ to $20$ V, $I_O = 250$ mA                               |              |      | 6     |         |
|              | OFF MODE                     | $V_I = 6$ V   |              |      | 100   | $\mu$ A |
| SVR          | Supply voltage rejection     | $I_O = 5$ mA<br>$V_I = 5.3 \pm 1$ V<br>$T_A = 25$ °C                | $f = 120$ Hz |      | 73    | dB      |
|              |                              |   | $f = 1$ kHz  |      | 70    |         |
|              |                              |   | $f = 10$ kHz |      | 55    |         |
| eN           | Output noise voltage         | $B = 10$ Hz to $100$ kHz, $T_A = 25$ °C                             |              | 50   |       | $\mu$ V |
| $V_d$        | Dropout voltage              | $I_O = 250$ mA, $T_A = 25$ °C                                       |              | 0.4  | 0.6   | V       |
|              |                              | $I_O = 250$ mA  |              |      | 0.82  | V       |
| $V_{IL}$     | Control input logic low      |   |              |      | 0.82  | V       |
| $V_{IH}$     | Control Input Logic High     |   | 2            |      |       | V       |
| $I_I$        | Control input current        | $V_I = 6$ V, $V_C = 6$ V, $T_A = 25$ °C                             |              | 10   |       | $\mu$ A |
| $C_O$        | Output bypass capacitance    | ESR = $0.1$ to $10$ $\Omega$ , $I_O = 0$ to $250$ mA, $T_A = 25$ °C | 2            | 10   |       | $\mu$ F |

**Table 10. Electrical characteristics of L4931ABxx35** (refer to the test circuits,  $T_A = 25\text{ °C}$ ,  $C_I = 0.1\ \mu\text{F}$ ,  $C_O = 2.2\ \mu\text{F}$  unless otherwise specified).

| Symbol       | Parameter                      | Test conditions   | Min.                 | Typ. | Max.  | Unit          |
|--------------|--------------------------------|---|----------------------|------|-------|---------------|
| $V_O$        | Output voltage                 | $I_O = 5\ \text{mA}$ , $V_I = 5.5\ \text{V}$  | 3.465                | 3.5  | 3.535 | V             |
|              |                                | $I_O = 5\ \text{mA}$ , $V_I = 5.5\ \text{V}$ , $T_A = -25\ \text{to}\ 85\text{ °C}$ | 3.43                 |      | 3.57  |               |
| $V_I$        | Operating input voltage        | $I_O = 250\ \text{mA}$  |                      |      | 20    | V             |
| $I_{out}$    | Output current limit           |   |                      | 300  |       | mA            |
| $\Delta V_O$ | Line regulation                | $V_I = 4.2\ \text{to}\ 20\ \text{V}$ , $I_O = 0.5\ \text{mA}$                       |                      | 3    | 15    | mV            |
| $\Delta V_O$ | Load regulation <sup>(1)</sup> | $V_I = 4.4\ \text{V}$ , $I_O = 0.5\ \text{to}\ 250\ \text{mA}$                      |                      | 3    | 15    | mV            |
| $I_d$        | Quiescent current<br>ON MODE   | $V_I = 4.4\ \text{to}\ 20\ \text{V}$ , $I_O = 0\ \text{mA}$                         |                      | 0.6  | 1     | mA            |
|              |                                | $V_I = 4.4\ \text{to}\ 20\ \text{V}$ , $I_O = 250\ \text{mA}$                       |                      | 4    | 6     |               |
|              | OFF MODE                       | $V_I = 6\ \text{V}$   |                      | 50   | 100   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection       | $I_O = 5\ \text{mA}$<br>$V_I = 5.4 \pm 1\ \text{V}$                                 | $f = 120\ \text{Hz}$ |      | 73    | dB            |
|              |                                |   | $f = 1\ \text{kHz}$  |      | 70    |               |
|              |                                |   | $f = 10\ \text{kHz}$ |      | 55    |               |
| eN           | Output noise voltage           | $B = 10\ \text{Hz to}\ 100\ \text{kHz}$   |                      | 50   |       | $\mu\text{V}$ |
| $V_d$        | Dropout voltage <sup>(1)</sup> | $I_O = 250\ \text{mA}$  |                      | 0.4  | 0.6   | V             |
|              |                                | $I_O = 250\ \text{mA}$ , $T_A = -40\ \text{to}\ 125\text{ °C}$                      |                      |      | 0.8   | V             |
| $V_{IL}$     | Control input logic low        | $T_A = -40\ \text{to}\ 125\text{ °C}$   |                      |      | 0.8   | V             |
| $V_{IH}$     | Control Input Logic High       | $T_A = -40\ \text{to}\ 125\text{ °C}$   | 2                    |      |       | V             |
| $I_I$        | Control input current          | $V_I = 6\ \text{V}$ , $V_C = 6\ \text{V}$   |                      | 10   |       | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance      | $\text{ESR} = 0.1\ \text{to}\ 10\ \Omega$ , $I_O = 0\ \text{to}\ 250\ \text{mA}$    | 2                    | 10   |       | $\mu\text{F}$ |

1. For SO-8 package the maximum limit of load regulation and dropout is increased by 20 mV.

**Table 11. Electrical characteristics of L4931ABxx35-TRY (Automotive Grade)** (refer to the test circuits,  $T_A = -40$  to  $125$  °C,  $C_I = 0.1$   $\mu$ F,  $C_O = 2.2$   $\mu$ F unless otherwise specified).

| Symbol       | Parameter                    | Test conditions   | Min.         | Typ. | Max.  | Unit    |
|--------------|------------------------------|---|--------------|------|-------|---------|
| $V_O$        | Output voltage               | $I_O = 5$ mA, $V_I = 5.5$ V, $T_A = 25$ °C                          | 3.465        | 3.5  | 3.535 | V       |
|              |                              | $I_O = 5$ mA, $V_I = 5.5$ V   | 3.43         |      | 3.57  |         |
| $V_I$        | Operating input voltage      | $I_O = 250$ mA  |              |      | 20    | V       |
| $I_{out}$    | Output current limit         | $T_A = 25$ °C   |              | 300  |       | mA      |
| $\Delta V_O$ | Line regulation              | $V_I = 4.2$ to $20$ V, $I_O = 0.5$ mA                               |              |      | 17    | mV      |
| $\Delta V_O$ | Load regulation              | $V_I = 4.4$ V, $I_O = 0.5$ to $250$ mA                              |              |      | 35    | mV      |
| $I_d$        | Quiescent current<br>ON MODE | $V_I = 4.4$ to $20$ V, $I_O = 0$ mA                                 |              |      | 1     | mA      |
|              |                              | $V_I = 4.4$ to $20$ V, $I_O = 250$ mA                               |              |      | 6     |         |
|              | OFF MODE                     | $V_I = 6$ V   |              |      | 100   | $\mu$ A |
| SVR          | Supply voltage rejection     | $I_O = 5$ mA<br>$V_I = 5.4 \pm 1$ V<br>$T_A = 25$ °C                | $f = 120$ Hz |      | 73    | dB      |
|              |                              |   | $f = 1$ kHz  |      | 70    |         |
|              |                              |   | $f = 10$ kHz |      | 55    |         |
| eN           | Output noise voltage         | $B = 10$ Hz to $100$ kHz, $T_A = 25$ °C                             |              | 50   |       | $\mu$ V |
| $V_d$        | Dropout voltage              | $I_O = 250$ mA, $T_A = 25$ °C                                       |              | 0.4  | 0.6   | V       |
|              |                              | $I_O = 250$ mA  |              |      | 0.82  | V       |
| $V_{IL}$     | Control input logic low      |   |              |      | 0.82  | V       |
| $V_{IH}$     | Control Input Logic High     |   | 2            |      |       | V       |
| $I_I$        | Control input current        | $V_I = 6$ V, $V_C = 6$ V, $T_A = 25$ °C                             |              | 10   |       | $\mu$ A |
| $C_O$        | Output bypass capacitance    | ESR = $0.1$ to $10$ $\Omega$ , $I_O = 0$ to $250$ mA, $T_A = 25$ °C | 2            | 10   |       | $\mu$ F |



**Table 12. Electrical characteristics of L4931Cxx35** (refer to the test circuits,  $T_A = 25\text{ }^\circ\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified).

| Symbol       | Parameter                      | Test conditions   | Min.                | Typ. | Max. | Unit          |
|--------------|--------------------------------|---|---------------------|------|------|---------------|
| $V_O$        | Output voltage                 | $I_O = 5\text{ mA}$ , $V_I = 5.5\text{ V}$  | 3.43                | 3.5  | 3.57 | V             |
|              |                                | $I_O = 5\text{ mA}$ , $V_I = 5.5\text{ V}$ , $T_A = -25\text{ to }85\text{ }^\circ\text{C}$ | 3.36                |      | 3.64 |               |
| $V_I$        | Operating input voltage        | $I_O = 250\text{ mA}$   |                     |      | 20   | V             |
| $I_{out}$    | Output current limit           |   |                     | 300  |      | mA            |
| $\Delta V_O$ | Line regulation                | $V_I = 4.3\text{ to }20\text{ V}$ , $I_O = 0.5\text{ mA}$                                   |                     | 3    | 18   | mV            |
| $\Delta V_O$ | Load regulation <sup>(1)</sup> | $V_I = 4.5\text{ V}$ , $I_O = 0.5\text{ to }250\text{ mA}$                                  |                     | 3    | 18   | mV            |
| $I_d$        | Quiescent current<br>ON MODE   | $V_I = 4.5\text{ to }20\text{ V}$ , $I_O = 0\text{ mA}$                                     |                     | 0.6  | 1    | mA            |
|              |                                | $V_I = 4.5\text{ to }20\text{ V}$ , $I_O = 250\text{ mA}$                                   |                     | 4    | 6    |               |
|              | OFF MODE                       | $V_I = 6\text{ V}$  |                     | 50   | 100  | $\mu\text{A}$ |
| SVR          | Supply voltage rejection       | $I_O = 5\text{ mA}$<br>$V_I = 5.5 \pm 1\text{ V}$   | $f = 120\text{ Hz}$ |      | 73   | dB            |
|              |                                |   | $f = 1\text{ kHz}$  |      | 70   |               |
|              |                                |   | $f = 10\text{ kHz}$ |      | 55   |               |
| eN           | Output noise voltage           | $B = 10\text{ Hz to }100\text{ kHz}$  |                     | 50   |      | $\mu\text{V}$ |
| $V_d$        | Dropout voltage <sup>(1)</sup> | $I_O = 250\text{ mA}$   |                     | 0.4  | 0.6  | V             |
|              |                                | $I_O = 250\text{ mA}$ , $T_A = -40\text{ to }125\text{ }^\circ\text{C}$                     |                     |      | 0.8  | V             |
| $V_{IL}$     | Control input logic low        | $T_A = -40\text{ to }125\text{ }^\circ\text{C}$   |                     |      | 0.8  | V             |
| $V_{IH}$     | Control Input Logic High       | $T_A = -40\text{ to }125\text{ }^\circ\text{C}$   | 2                   |      |      | V             |
| $I_I$        | Control input current          | $V_I = 6\text{ V}$ , $V_C = 6\text{ V}$   |                     | 10   |      | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance      | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }250\text{ mA}$           | 2                   | 10   |      | $\mu\text{F}$ |

1. For SO-8 package the maximum limit of load regulation and dropout is increased by 20 mV.

**Table 13. Electrical characteristics of L4931ABxx50** (refer to the test circuits,  $T_A = 25\text{ }^\circ\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified).

| Symbol       | Parameter                      | Test conditions   | Min.                | Typ. | Max. | Unit          |
|--------------|--------------------------------|---|---------------------|------|------|---------------|
| $V_O$        | Output voltage                 | $I_O = 5\text{ mA}$ , $V_I = 7\text{ V}$  | 4.95                | 5    | 5.05 | V             |
|              |                                | $I_O = 5\text{ mA}$ , $V_I = 7\text{ V}$ , $T_A = -25\text{ to }85\text{ }^\circ\text{C}$ | 4.9                 |      | 5.1  |               |
| $V_I$        | Operating input voltage        | $I_O = 250\text{ mA}$   |                     |      | 20   | V             |
| $I_{out}$    | Output current limit           |   |                     | 300  |      | mA            |
| $\Delta V_O$ | Line regulation                | $V_I = 5.8\text{ to }20\text{ V}$ , $I_O = 0.5\text{ mA}$                                 |                     | 3.5  | 17.5 | mV            |
| $\Delta V_O$ | Load regulation <sup>(1)</sup> | $V_I = 6\text{ V}$ , $I_O = 0.5\text{ to }250\text{ mA}$                                  |                     | 3    | 15   | mV            |
| $I_d$        | Quiescent current<br>ON MODE   | $V_I = 6\text{ to }20\text{ V}$ , $I_O = 0\text{ mA}$                                     |                     | 0.6  | 1    | mA            |
|              |                                | $V_I = 6\text{ to }20\text{ V}$ , $I_O = 250\text{ mA}$                                   |                     | 4    | 6    |               |
|              | OFF MODE                       | $V_I = 6\text{ V}$  |                     | 50   | 100  | $\mu\text{A}$ |
| SVR          | Supply voltage rejection       | $I_O = 5\text{ mA}$<br>$V_I = 7 \pm 1\text{ V}$   | $f = 120\text{ Hz}$ |      | 70   | dB            |
|              |                                |   | $f = 1\text{ kHz}$  |      | 67   |               |
|              |                                |   | $f = 10\text{ kHz}$ |      | 55   |               |
| eN           | Output noise voltage           | $B = 10\text{ Hz to }100\text{ kHz}$  |                     | 50   |      | $\mu\text{V}$ |
| $V_d$        | Dropout voltage <sup>(1)</sup> | $I_O = 250\text{ mA}$   |                     | 0.4  | 0.6  | V             |
|              |                                | $I_O = 250\text{ mA}$ , $T_A = -40\text{ to }125\text{ }^\circ\text{C}$                   |                     |      | 0.8  | V             |
| $V_{IL}$     | Control input logic low        | $T_A = -40\text{ to }125\text{ }^\circ\text{C}$   |                     |      | 0.8  | V             |
| $V_{IH}$     | Control Input Logic High       | $T_A = -40\text{ to }125\text{ }^\circ\text{C}$   | 2                   |      |      | V             |
| $I_I$        | Control input current          | $V_I = 6\text{ V}$ , $V_C = 6\text{ V}$   |                     | 10   |      | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance      | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }250\text{ mA}$         | 2                   | 10   |      | $\mu\text{F}$ |

1. For SO-8 package the maximum limit of load regulation and dropout is increased by 20 mV.

**Table 14. Electrical characteristics of L4931Cxx50** (refer to the test circuits,  $T_A = 25\text{ }^\circ\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified).

| Symbol       | Parameter                      | Test conditions   | Min.                | Typ. | Max. | Unit          |
|--------------|--------------------------------|---|---------------------|------|------|---------------|
| $V_O$        | Output voltage                 | $I_O = 5\text{ mA}$ , $V_I = 7\text{ V}$  | 4.9                 | 5    | 5.1  | V             |
|              |                                | $I_O = 5\text{ mA}$ , $V_I = 7\text{ V}$ , $T_A = -25\text{ to }85\text{ }^\circ\text{C}$ | 4.8                 |      | 5.2  |               |
| $V_I$        | Operating input voltage        | $I_O = 250\text{ mA}$   |                     |      | 20   | V             |
| $I_{out}$    | Output current limit           |   |                     | 300  |      | mA            |
| $\Delta V_O$ | Line regulation                | $V_I = 5.8\text{ to }20\text{ V}$ , $I_O = 0.5\text{ mA}$                                 |                     | 3.5  | 17.5 | mV            |
| $\Delta V_O$ | Load regulation <sup>(1)</sup> | $V_I = 6\text{ V}$ , $I_O = 0.5\text{ to }250\text{ mA}$                                  |                     | 3    | 15   | mV            |
| $I_d$        | Quiescent current<br>ON MODE   | $V_I = 6\text{ to }20\text{ V}$ , $I_O = 0\text{ mA}$                                     |                     | 0.6  | 1    | mA            |
|              |                                | $V_I = 6\text{ to }20\text{ V}$ , $I_O = 250\text{ mA}$                                   |                     | 4    | 6    |               |
|              | OFF MODE                       | $V_I = 6\text{ V}$  |                     | 50   | 100  | $\mu\text{A}$ |
| SVR          | Supply voltage rejection       | $I_O = 5\text{ mA}$<br>$V_I = 7 \pm 1\text{ V}$   | $f = 120\text{ Hz}$ |      | 70   | dB            |
|              |                                |   | $f = 1\text{ kHz}$  |      | 67   |               |
|              |                                |   | $f = 10\text{ kHz}$ |      | 55   |               |
| eN           | Output noise voltage           | $B = 10\text{ Hz to }100\text{ kHz}$  |                     | 50   |      | $\mu\text{V}$ |
| $V_d$        | Dropout voltage <sup>(1)</sup> | $I_O = 250\text{ mA}$   |                     | 0.4  | 0.6  | V             |
|              |                                | $I_O = 250\text{ mA}$ , $T_A = -40\text{ to }125\text{ }^\circ\text{C}$                   |                     |      | 0.8  | V             |
| $V_{IL}$     | Control input logic low        | $T_A = -40\text{ to }125\text{ }^\circ\text{C}$   |                     |      | 0.8  | V             |
| $V_{IH}$     | Control Input Logic High       | $T_A = -40\text{ to }125\text{ }^\circ\text{C}$   | 2                   |      |      | V             |
| $I_I$        | Control input current          | $V_I = 6\text{ V}$ , $V_C = 6\text{ V}$   |                     | 10   |      | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance      | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }250\text{ mA}$         | 2                   | 10   |      | $\mu\text{F}$ |

1. For SO-8 package the maximum limit of load regulation and dropout is increased by 20 mV.

**Table 15. Electrical characteristics of L4931ABxx80** (refer to the test circuits,  $T_A = 25\text{ }^\circ\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified).

| Symbol       | Parameter                      | Test conditions  | Min.                | Typ. | Max. | Unit          |
|--------------|--------------------------------|--|---------------------|------|------|---------------|
| $V_O$        | Output voltage                 | $I_O = 5\text{ mA}$ , $V_I = 10\text{ V}$  | 7.92                | 8    | 8.08 | V             |
|              |                                | $I_O = 5\text{ mA}$ , $V_I = 10\text{ V}$ , $T_A = -25\text{ to }85\text{ }^\circ\text{C}$ | 7.84                |      | 8.16 |               |
| $V_I$        | Operating input voltage        | $I_O = 250\text{ mA}$  |                     |      | 20   | V             |
| $I_{out}$    | Output current limit           |  |                     | 300  |      | mA            |
| $\Delta V_O$ | Line regulation                | $V_I = 8.8\text{ to }20\text{ V}$ , $I_O = 0.5\text{ mA}$                                  |                     | 4    | 20   | mV            |
| $\Delta V_O$ | Load regulation <sup>(1)</sup> | $V_I = 9\text{ V}$ , $I_O = 0.5\text{ to }250\text{ mA}$                                   |                     | 3    | 15   | mV            |
| $I_d$        | Quiescent current<br>ON MODE   | $V_I = 9\text{ to }20\text{ V}$ , $I_O = 0\text{ mA}$                                      |                     | 0.8  | 1.6  | mA            |
|              |                                | $V_I = 9\text{ to }20\text{ V}$ , $I_O = 250\text{ mA}$                                    |                     | 4.5  | 7    |               |
|              | OFF MODE                       | $V_I = 6\text{ V}$   |                     | 70   | 140  | $\mu\text{A}$ |
| SVR          | Supply voltage rejection       | $I_O = 5\text{ mA}$<br>$V_I = 10 \pm 1\text{ V}$   | $f = 120\text{ Hz}$ |      | 67   | dB            |
|              |                                |  | $f = 1\text{ kHz}$  |      | 64   |               |
|              |                                |  | $f = 10\text{ kHz}$ |      | 55   |               |
| eN           | Output noise voltage           | $B = 10\text{ Hz to }100\text{ kHz}$   |                     | 50   |      | $\mu\text{V}$ |
| $V_d$        | Dropout voltage <sup>(1)</sup> | $I_O = 250\text{ mA}$  |                     | 0.4  | 0.6  | V             |
|              |                                | $I_O = 250\text{ mA}$ , $T_A = -40\text{ to }125\text{ }^\circ\text{C}$                    |                     |      | 0.8  | V             |
| $V_{IL}$     | Control input logic low        | $T_A = -40\text{ to }125\text{ }^\circ\text{C}$  |                     |      | 0.8  | V             |
| $V_{IH}$     | Control Input Logic High       | $T_A = -40\text{ to }125\text{ }^\circ\text{C}$  | 2                   |      |      | V             |
| $I_I$        | Control input current          | $V_I = 6\text{ V}$ , $V_C = 6\text{ V}$  |                     | 10   |      | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance      | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }250\text{ mA}$          | 2                   | 10   |      | $\mu\text{F}$ |

1. For SO-8 package the maximum limit of load regulation and dropout is increased by 20 mV.

**Table 16. Electrical characteristics of L4931Cxx80** (refer to the test circuits,  $T_A = 25^\circ\text{C}$ ,  $C_I = 0.1\ \mu\text{F}$ ,  $C_O = 2.2\ \mu\text{F}$  unless otherwise specified).

| Symbol           | Parameter                      | Test conditions  | Min.                 | Typ. | Max. | Unit          |
|------------------|--------------------------------|--|----------------------|------|------|---------------|
| $V_O$            | Output voltage                 | $I_O = 5\ \text{mA}$ , $V_I = 10\ \text{V}$  | 7.84                 | 8    | 8.16 | V             |
|                  |                                | $I_O = 5\ \text{mA}$ , $V_I = 10\ \text{V}$ , $T_A = -25\ \text{to}\ 85^\circ\text{C}$ | 7.68                 |      | 8.32 |               |
| $V_I$            | Operating input voltage        | $I_O = 250\ \text{mA}$   |                      |      | 20   | V             |
| $I_{\text{out}}$ | Output current limit           |  |                      | 300  |      | mA            |
| $\Delta V_O$     | Line regulation                | $V_I = 8.9\ \text{to}\ 20\ \text{V}$ , $I_O = 0.5\ \text{mA}$                          |                      | 4    | 24   | mV            |
| $\Delta V_O$     | Load regulation <sup>(1)</sup> | $V_I = 9.1\ \text{V}$ , $I_O = 0.5\ \text{to}\ 250\ \text{mA}$                         |                      | 3    | 18   | mV            |
| $I_d$            | Quiescent current<br>ON MODE   | $V_I = 9.1\ \text{to}\ 20\ \text{V}$ , $I_O = 0\ \text{mA}$                            |                      | 0.8  | 1.6  | mA            |
|                  |                                | $V_I = 9.1\ \text{to}\ 20\ \text{V}$ , $I_O = 250\ \text{mA}$                          |                      | 4.5  | 7    |               |
|                  | OFF MODE                       | $V_I = 6\ \text{V}$  |                      | 70   | 140  | $\mu\text{A}$ |
| SVR              | Supply voltage rejection       | $I_O = 5\ \text{mA}$<br>$V_I = 10.1 \pm 1\ \text{V}$                                   | $f = 120\ \text{Hz}$ |      | 67   | dB            |
|                  |                                |  | $f = 1\ \text{kHz}$  |      | 64   |               |
|                  |                                |  | $f = 10\ \text{kHz}$ |      | 55   |               |
| eN               | Output noise voltage           | $B = 10\ \text{Hz to}\ 100\ \text{kHz}$  |                      | 50   |      | $\mu\text{V}$ |
| $V_d$            | Dropout voltage <sup>(1)</sup> | $I_O = 250\ \text{mA}$   |                      | 0.4  | 0.6  | V             |
|                  |                                | $I_O = 250\ \text{mA}$ , $T_A = -40\ \text{to}\ 125^\circ\text{C}$                     |                      |      | 0.8  | V             |
| $V_{\text{IL}}$  | Control input logic low        | $T_A = -40\ \text{to}\ 125^\circ\text{C}$  |                      |      | 0.8  | V             |
| $V_{\text{IH}}$  | Control Input Logic High       | $T_A = -40\ \text{to}\ 125^\circ\text{C}$  | 2                    |      |      | V             |
| $I_I$            | Control input current          | $V_I = 6\ \text{V}$ , $V_C = 6\ \text{V}$  |                      | 10   |      | $\mu\text{A}$ |
| $C_O$            | Output bypass capacitance      | $\text{ESR} = 0.1\ \text{to}\ 10\ \Omega$ , $I_O = 0\ \text{to}\ 250\ \text{mA}$       | 2                    | 10   |      | $\mu\text{F}$ |

1. For SO-8 package the maximum limit of load regulation and dropout is increased by 20 mV.

**Table 17. Electrical characteristics of L4931ABxx120** (refer to the test circuits,  $T_A = 25\text{ }^\circ\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified).

| Symbol       | Parameter                      | Test conditions  | Min.                | Typ. | Max.  | Unit          |
|--------------|--------------------------------|--|---------------------|------|-------|---------------|
| $V_O$        | Output voltage                 | $I_O = 5\text{ mA}$ , $V_I = 14\text{ V}$  | 11.88               | 12   | 12.12 | V             |
|              |                                | $I_O = 5\text{ mA}$ , $V_I = 14\text{ V}$ , $T_A = -25\text{ to }85\text{ }^\circ\text{C}$ | 11.76               |      | 12.24 |               |
| $V_I$        | Operating input voltage        | $I_O = 250\text{ mA}$  |                     |      | 20    | V             |
| $I_{out}$    | Output current limit           |  |                     | 300  |       | mA            |
| $\Delta V_O$ | Line regulation                | $V_I = 12.8\text{ to }20\text{ V}$ , $I_O = 0.5\text{ mA}$                                 |                     | 4    | 20    | mV            |
| $\Delta V_O$ | Load regulation <sup>(1)</sup> | $V_I = 13\text{ V}$ , $I_O = 0.5\text{ to }250\text{ mA}$                                  |                     | 3    | 15    | mV            |
| $I_d$        | Quiescent current<br>ON MODE   | $V_I = 13\text{ to }20\text{ V}$ , $I_O = 0\text{ mA}$                                     |                     | 0.8  | 1.6   | mA            |
|              |                                | $V_I = 13\text{ to }20\text{ V}$ , $I_O = 250\text{ mA}$                                   |                     | 4.5  | 7     |               |
|              | OFF MODE                       | $V_I = 6\text{ V}$   |                     | 90   | 180   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection       | $I_O = 5\text{ mA}$<br>$V_I = 14 \pm 1\text{ V}$   | $f = 120\text{ Hz}$ |      | 64    | dB            |
|              |                                |  | $f = 1\text{ kHz}$  |      | 61    |               |
|              |                                |  | $f = 10\text{ kHz}$ |      | 55    |               |
| eN           | Output noise voltage           | $B = 10\text{ Hz to }100\text{ kHz}$   |                     | 50   |       | $\mu\text{V}$ |
| $V_d$        | Dropout voltage <sup>(1)</sup> | $I_O = 250\text{ mA}$  |                     | 0.4  | 0.6   | V             |
|              |                                | $I_O = 250\text{ mA}$ , $T_A = -40\text{ to }125\text{ }^\circ\text{C}$                    |                     |      | 0.8   | V             |
| $V_{IL}$     | Control input logic low        | $T_A = -40\text{ to }125\text{ }^\circ\text{C}$  |                     |      | 0.8   | V             |
| $V_{IH}$     | Control Input Logic High       | $T_A = -40\text{ to }125\text{ }^\circ\text{C}$  | 2                   |      |       | V             |
| $I_I$        | Control input current          | $V_I = 6\text{ V}$ , $V_C = 6\text{ V}$  |                     | 10   |       | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance      | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }250\text{ mA}$          | 2                   | 10   |       | $\mu\text{F}$ |

1. For SO-8 package the maximum limit of load regulation and dropout is increased by 20 mV.

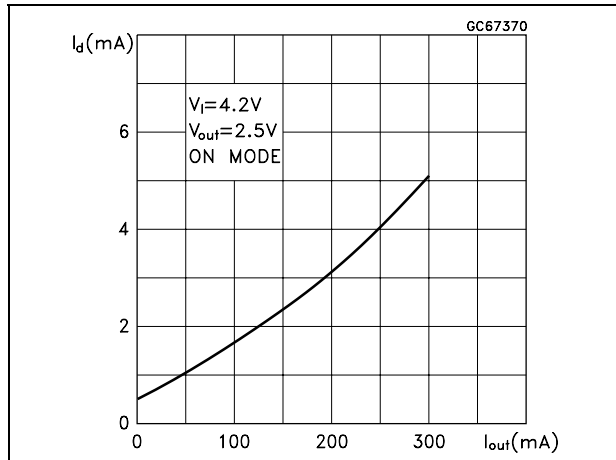
**Table 18. Electrical characteristics of L4931Cxx120** (refer to the test circuits,  $T_A = 25\text{ °C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified).

| Symbol       | Parameter                      | Test conditions   | Min.                | Typ. | Max.  | Unit          |
|--------------|--------------------------------|---|---------------------|------|-------|---------------|
| $V_O$        | Output voltage                 | $I_O = 5\text{ mA}$ , $V_I = 14\text{ V}$   | 11.76               | 12   | 12.24 | V             |
|              |                                | $I_O = 5\text{ mA}$ , $V_I = 14\text{ V}$ , $T_A = -25\text{ to }85\text{ °C}$    | 11.52               |      | 12.48 |               |
| $V_I$        | Operating input voltage        | $I_O = 250\text{ mA}$   |                     |      | 20    | V             |
| $I_{out}$    | Output current limit           |   |                     | 300  |       | mA            |
| $\Delta V_O$ | Line regulation                | $V_I = 12.9\text{ to }20\text{ V}$ , $I_O = 0.5\text{ mA}$                        |                     | 4    | 24    | mV            |
| $\Delta V_O$ | Load regulation <sup>(1)</sup> | $V_I = 13.1\text{ V}$ , $I_O = 0.5\text{ to }250\text{ mA}$                       |                     | 3    | 18    | mV            |
| $I_d$        | Quiescent current<br>ON MODE   | $V_I = 13.1\text{ to }20\text{ V}$ , $I_O = 0\text{ mA}$                          |                     | 0.8  | 1.6   | mA            |
|              |                                | $V_I = 13.1\text{ to }20\text{ V}$ , $I_O = 250\text{ mA}$                        |                     | 4.5  | 7     |               |
|              | OFF MODE                       | $V_I = 6\text{ V}$  |                     | 90   | 180   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection       | $I_O = 5\text{ mA}$<br>$V_I = 14.1 \pm 1\text{ V}$                                | $f = 120\text{ Hz}$ |      | 64    | dB            |
|              |                                |   | $f = 1\text{ kHz}$  |      | 61    |               |
|              |                                |   | $f = 10\text{ kHz}$ |      | 55    |               |
| eN           | Output noise voltage           | $B = 10\text{ Hz to }100\text{ kHz}$  |                     | 50   |       | $\mu\text{V}$ |
| $V_d$        | Dropout voltage <sup>(1)</sup> | $I_O = 250\text{ mA}$   |                     | 0.4  | 0.6   | V             |
|              |                                | $I_O = 250\text{ mA}$ , $T_A = -40\text{ to }125\text{ °C}$                       |                     |      | 0.8   | V             |
| $V_{IL}$     | Control input logic low        | $T_A = -40\text{ to }125\text{ °C}$   |                     |      | 0.8   | V             |
| $V_{IH}$     | Control Input Logic High       | $T_A = -40\text{ to }125\text{ °C}$   | 2                   |      |       | V             |
| $I_I$        | Control input current          | $V_I = 6\text{ V}$ , $V_C = 6\text{ V}$   |                     | 10   |       | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance      | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }250\text{ mA}$ | 2                   | 10   |       | $\mu\text{F}$ |

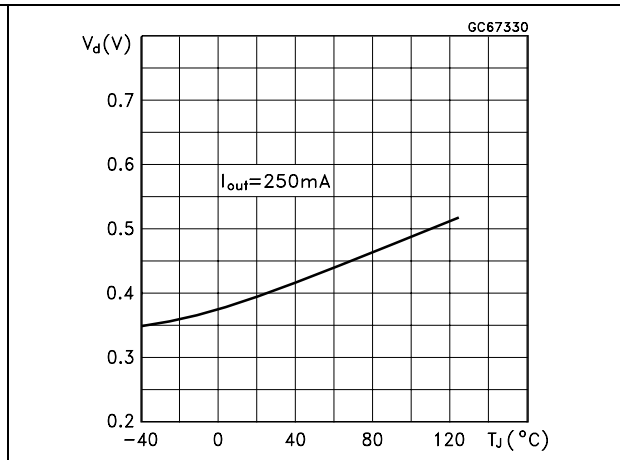
1. For SO-8 package the maximum limit of load regulation and dropout is increased by 20 mV.

# 6 Typical application

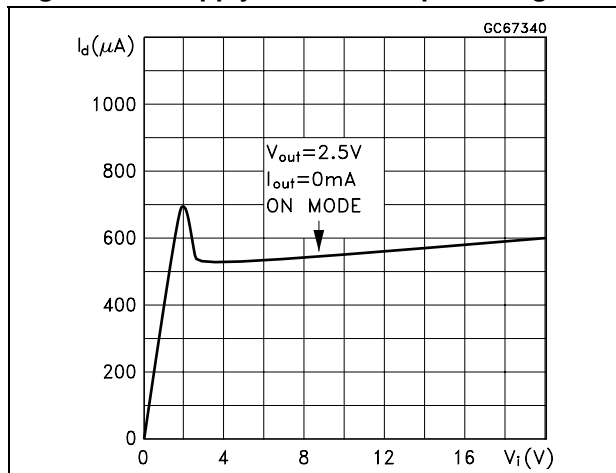
**Figure 4. Line regulation vs temperature**



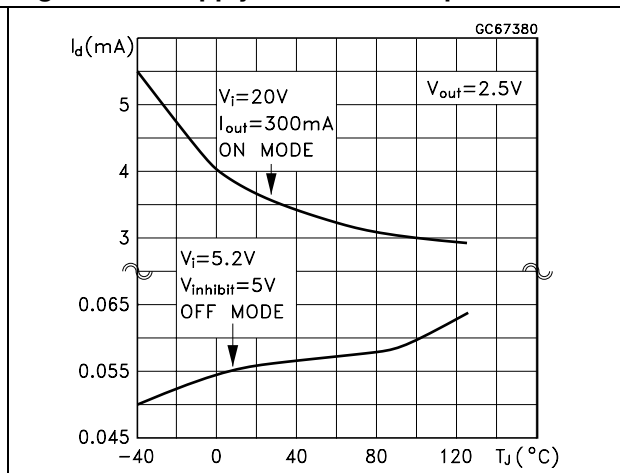
**Figure 5. Dropout voltage vs temperature**



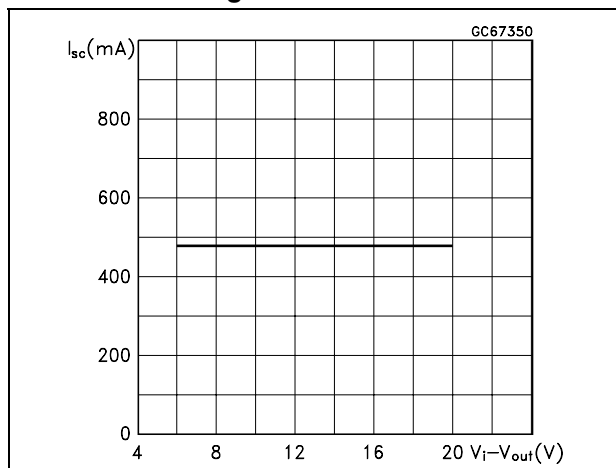
**Figure 6. Supply current vs input voltage**



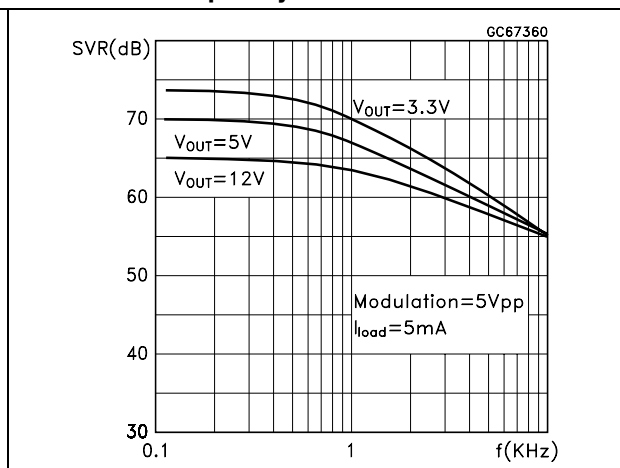
**Figure 7. Supply current vs temperature**



**Figure 8. Short circuit current vs dropout voltage**



**Figure 9. SVR vs input voltage signal frequency**



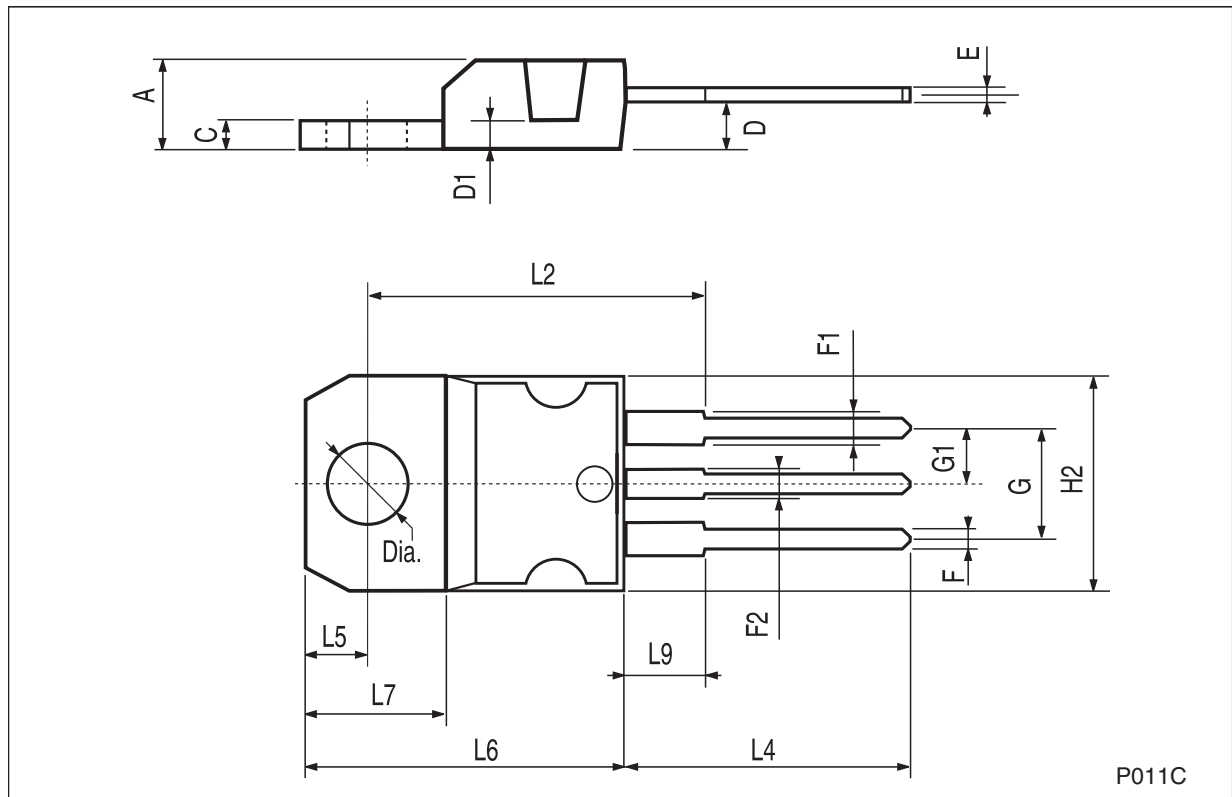


## 7 Package mechanical data

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).

**TO-220 mechanical data**

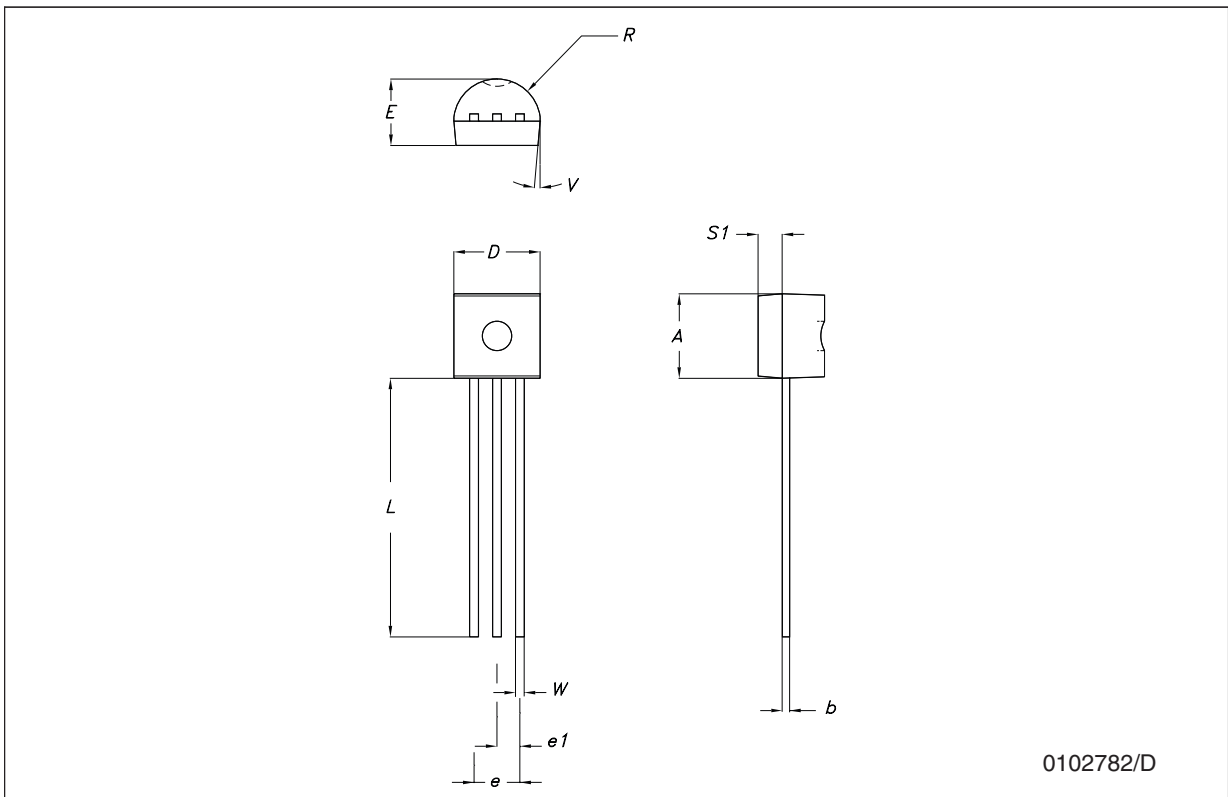
| Dim. | mm.   |      |       | inch. |       |       |
|------|-------|------|-------|-------|-------|-------|
|      | Min.  | Typ. | Max.  | Min.  | Typ.  | Max.  |
| A    | 4.40  |      | 4.60  | 0.173 |       | 0.181 |
| C    | 1.23  |      | 1.32  | 0.048 |       | 0.051 |
| D    | 2.40  |      | 2.72  | 0.094 |       | 0.107 |
| D1   |       | 1.27 |       |       | 0.050 |       |
| E    | 0.49  |      | 0.70  | 0.019 |       | 0.027 |
| F    | 0.61  |      | 0.88  | 0.024 |       | 0.034 |
| F1   | 1.14  |      | 1.70  | 0.044 |       | 0.067 |
| F2   | 1.14  |      | 1.70  | 0.044 |       | 0.067 |
| G    | 4.95  |      | 5.15  | 0.194 |       | 0.203 |
| G1   | 2.4   |      | 2.7   | 0.094 |       | 0.106 |
| H2   | 10.0  |      | 10.40 | 0.393 |       | 0.409 |
| L2   |       | 16.4 |       |       | 0.645 |       |
| L4   | 13.0  |      | 14.0  | 0.511 |       | 0.551 |
| L5   | 2.65  |      | 2.95  | 0.104 |       | 0.116 |
| L6   | 15.25 |      | 15.75 | 0.600 |       | 0.620 |
| L7   | 6.2   |      | 6.6   | 0.244 |       | 0.260 |
| L9   | 3.5   |      | 3.93  | 0.137 |       | 0.154 |
| DIA. | 3.75  |      | 3.85  | 0.147 |       | 0.151 |



P011C

**TO-92 mechanical data**

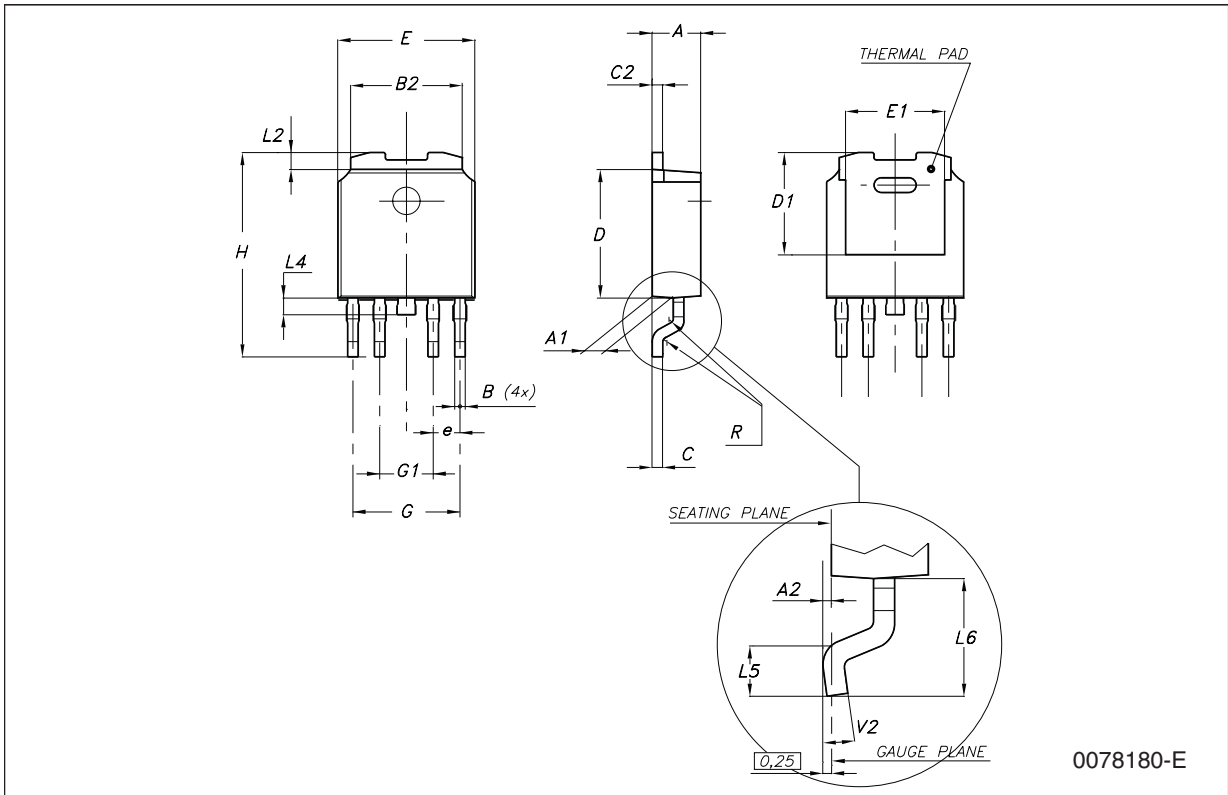
| Dim.     | mm.  |      |       | mils. |      |       |
|----------|------|------|-------|-------|------|-------|
|          | Min. | Typ. | Max.  | Min.  | Typ. | Max.  |
| A        | 4.32 |      | 4.95  | 170.1 |      | 194.9 |
| b        | 0.36 |      | 0.51  | 14.2  |      | 20.1  |
| D        | 4.45 |      | 4.95  | 175.2 |      | 194.9 |
| E        | 3.30 |      | 3.94  | 129.9 |      | 155.1 |
| e        | 2.41 |      | 2.67  | 94.9  |      | 105.1 |
| e1       | 1.14 |      | 1.40  | 44.9  |      | 55.1  |
| L        | 12.7 |      | 15.49 | 500.0 |      | 609.8 |
| R        | 2.16 |      | 2.41  | 85.0  |      | 94.9  |
| S1       | 0.92 |      | 1.52  | 36.2  |      | 59.8  |
| W        | 0.41 |      | 0.56  | 16.1  |      | 22.0  |
| $\alpha$ |      | 5°   |       |       | 5°   |       |



0102782/D

**PPAK mechanical data**

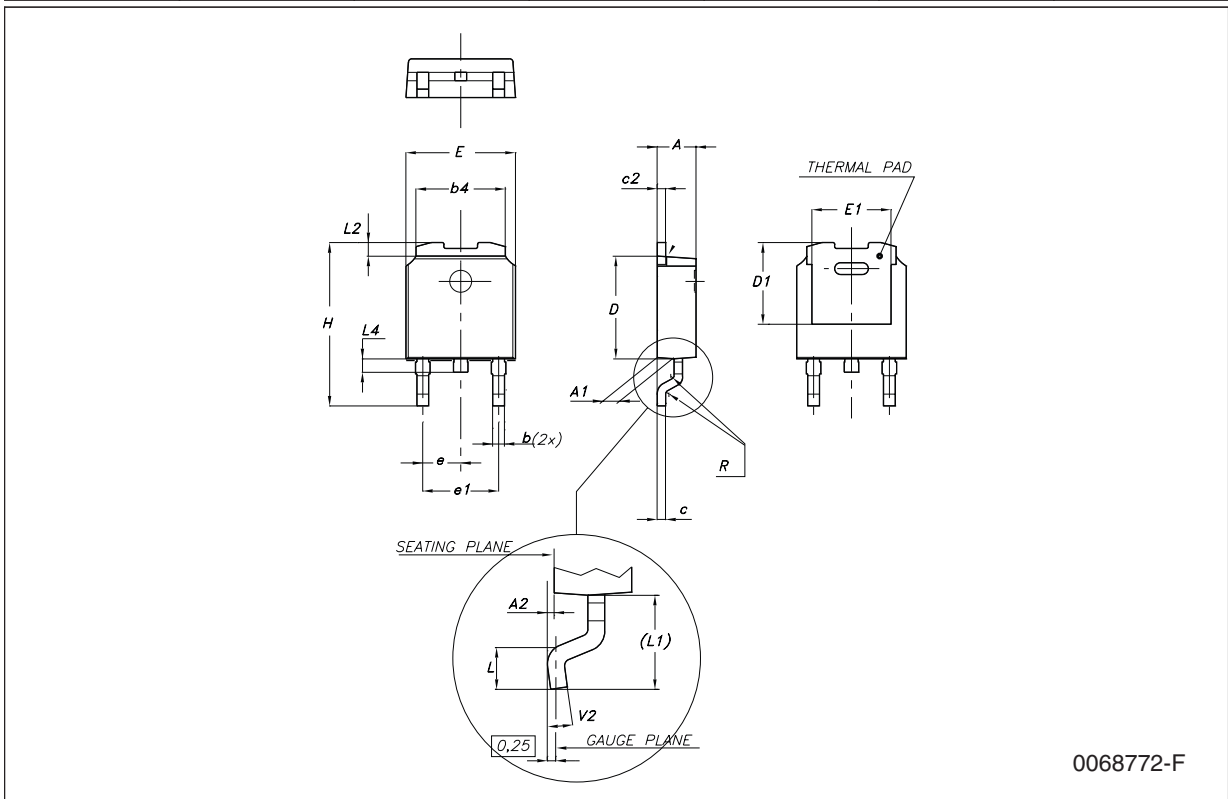
| Dim. | mm.  |      |      | inch. |       |       |
|------|------|------|------|-------|-------|-------|
|      | Min. | Typ. | Max. | Min.  | Typ.  | Max.  |
| A    | 2.2  |      | 2.4  | 0.086 |       | 0.094 |
| A1   | 0.9  |      | 1.1  | 0.035 |       | 0.043 |
| A2   | 0.03 |      | 0.23 | 0.001 |       | 0.009 |
| B    | 0.4  |      | 0.6  | 0.015 |       | 0.023 |
| B2   | 5.2  |      | 5.4  | 0.204 |       | 0.212 |
| C    | 0.45 |      | 0.6  | 0.017 |       | 0.023 |
| C2   | 0.48 |      | 0.6  | 0.019 |       | 0.023 |
| D    | 6    |      | 6.2  | 0.236 |       | 0.244 |
| D1   |      | 5.1  |      |       | 0.201 |       |
| E    | 6.4  |      | 6.6  | 0.252 |       | 0.260 |
| E1   |      | 4.7  |      |       | 0.185 |       |
| e    |      | 1.27 |      |       | 0.050 |       |
| G    | 4.9  |      | 5.25 | 0.193 |       | 0.206 |
| G1   | 2.38 |      | 2.7  | 0.093 |       | 0.106 |
| H    | 9.35 |      | 10.1 | 0.368 |       | 0.397 |
| L2   |      | 0.8  | 1    |       | 0.031 | 0.039 |
| L4   | 0.6  |      | 1    | 0.023 |       | 0.039 |
| L5   | 1    |      |      | 0.039 |       |       |
| L6   |      | 2.8  |      |       | 0.110 |       |



0078180-E

**DPAK mechanical data**

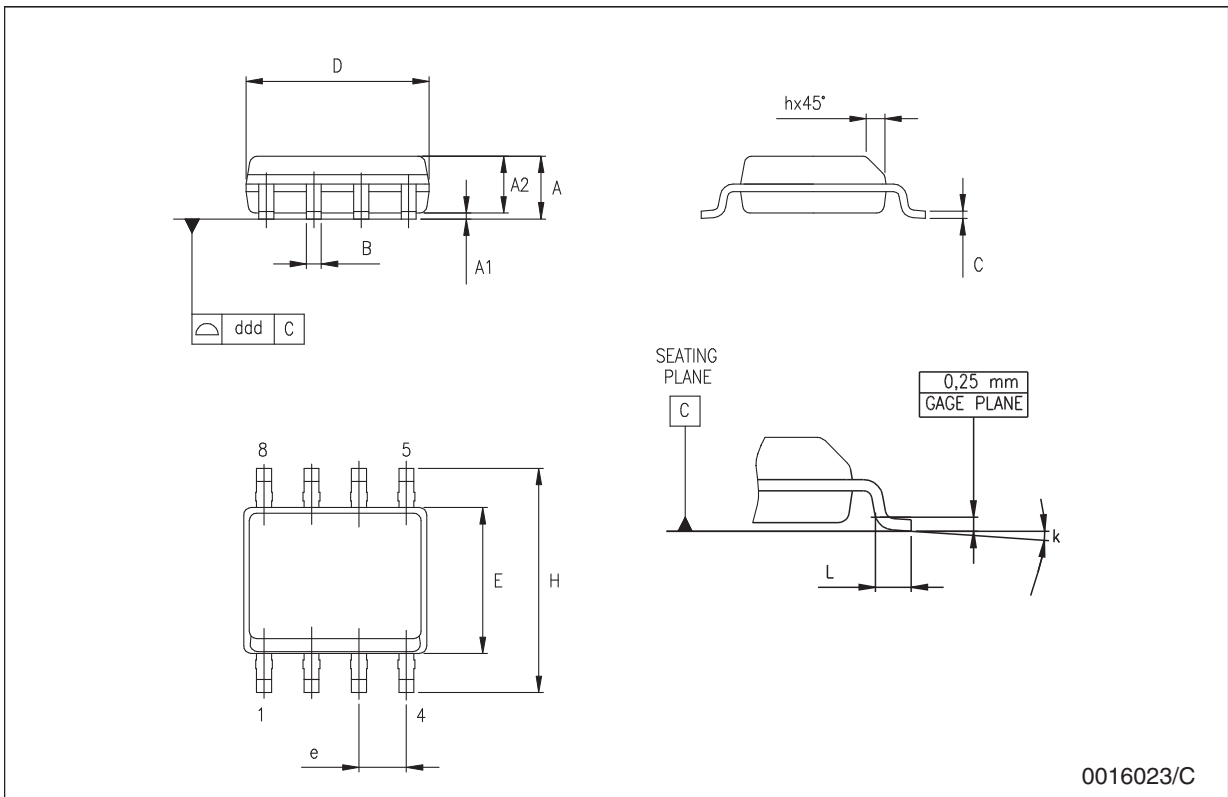
| Dim. | mm.  |      |      | inch. |       |       |
|------|------|------|------|-------|-------|-------|
|      | Min. | Typ. | Max. | Min.  | Typ.  | Max.  |
| A    | 2.2  |      | 2.4  | 0.086 |       | 0.094 |
| A1   | 0.9  |      | 1.1  | 0.035 |       | 0.043 |
| A2   | 0.03 |      | 0.23 | 0.001 |       | 0.009 |
| B    | 0.64 |      | 0.9  | 0.025 |       | 0.035 |
| b4   | 5.2  |      | 5.4  | 0.204 |       | 0.212 |
| C    | 0.45 |      | 0.6  | 0.017 |       | 0.023 |
| C2   | 0.48 |      | 0.6  | 0.019 |       | 0.023 |
| D    | 6    |      | 6.2  | 0.236 |       | 0.244 |
| D1   |      | 5.1  |      |       | 0.200 |       |
| E    | 6.4  |      | 6.6  | 0.252 |       | 0.260 |
| E1   |      | 4.7  |      |       | 0.185 |       |
| e    |      | 2.28 |      |       | 0.090 |       |
| e1   | 4.4  |      | 4.6  | 0.173 |       | 0.181 |
| H    | 9.35 |      | 10.1 | 0.368 |       | 0.397 |
| L    | 1    |      |      | 0.039 |       |       |
| (L1) |      | 2.8  |      |       | 0.110 |       |
| L2   |      | 0.8  |      |       | 0.031 |       |
| L4   | 0.6  |      | 1    | 0.023 |       | 0.039 |
| R    |      | 0.2  |      |       | 0.008 |       |
| V2   | 0°   |      | 8°   | 0°    |       | 8°    |



0068772-F

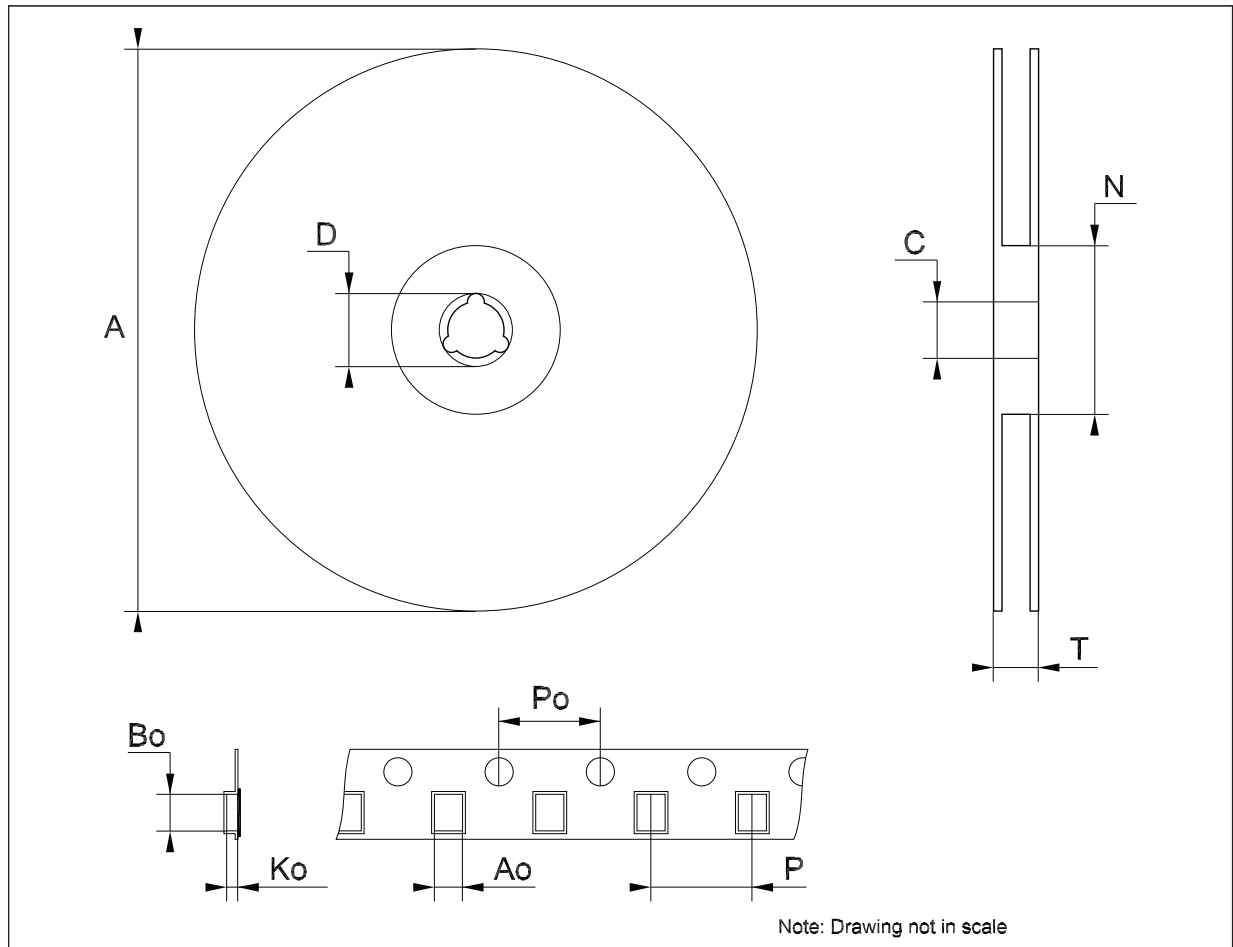
**SO-8 mechanical data**

| 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  |



**Tape & reel DPAK-PPAK mechanical data**

| Dim. | mm.   |       |       | inch. |       |        |
|------|-------|-------|-------|-------|-------|--------|
|      | Min.  | Typ.  | Max.  | Min.  | Typ.  | Max.   |
| A    |       |       | 330   |       |       | 12.992 |
| C    | 12.8  | 13.0  | 13.2  | 0.504 | 0.512 | 0.519  |
| D    | 20.2  |       |       | 0.795 |       |        |
| N    | 60    |       |       | 2.362 |       |        |
| T    |       |       | 22.4  |       |       | 0.882  |
| Ao   | 6.80  | 6.90  | 7.00  | 0.268 | 0.272 | 0.276  |
| Bo   | 10.40 | 10.50 | 10.60 | 0.409 | 0.413 | 0.417  |
| Ko   | 2.55  | 2.65  | 2.75  | 0.100 | 0.104 | 0.105  |
| Po   | 3.9   | 4.0   | 4.1   | 0.153 | 0.157 | 0.161  |
| P    | 7.9   | 8.0   | 8.1   | 0.311 | 0.315 | 0.319  |



**Tape & reel SO-8 mechanical data**

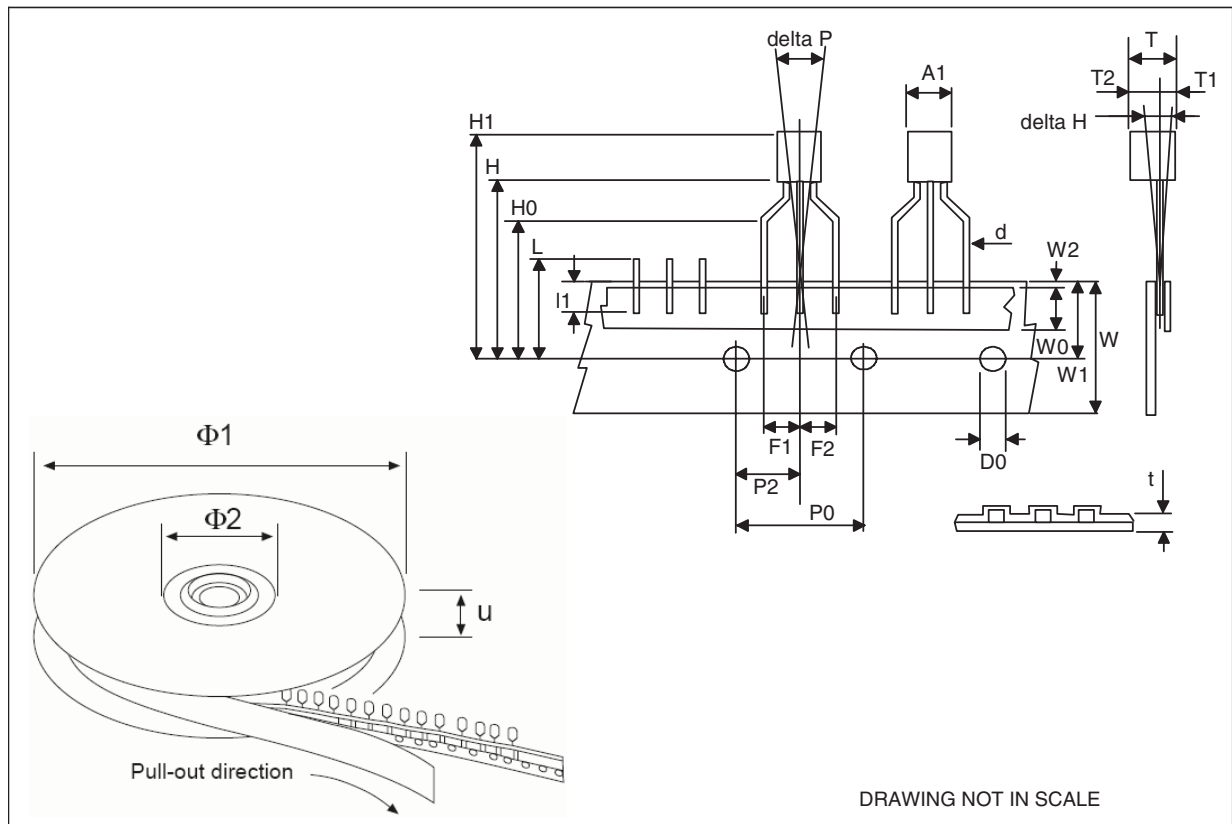
| Dim. | mm.  |      |      | inch. |      |        |
|------|------|------|------|-------|------|--------|
|      | Min. | Typ. | Max. | Min.  | Typ. | Max.   |
| A    |      |      | 330  |       |      | 12.992 |
| C    | 12.8 |      | 13.2 | 0.504 |      | 0.519  |
| D    | 20.2 |      |      | 0.795 |      |        |
| 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  |





**Tape & reel for TO-92 mechanical data**

| Dim.    | mm.   |       |       | inch. |        |       |
|---------|-------|-------|-------|-------|--------|-------|
|         | Min.  | Typ.  | Max.  | Min.  | Typ.   | Max.  |
| A1      |       | 4.80  |       |       | 0.189  |       |
| T       |       | 3.80  |       |       | 0.150  |       |
| T1      |       | 1.60  |       |       | 0.063  |       |
| T2      |       | 2.30  |       |       | 0.091  |       |
| d       |       | 0.48  |       |       | 0.019  |       |
| P0      | 12.5  |       | 12.9  | 0.492 |        | 0.508 |
| P2      | 5.65  |       | 7.05  | 0.222 |        | 0.278 |
| F1, F2  | 2.44  | 2.54  | 2.94  | 0.096 | 0.100  | 0.116 |
| delta H |       | ±2    |       |       | 0.079  |       |
| W       | 17.5  | 18.00 | 19.0  | 0.689 | 0.709  | 0.748 |
| W0      | 5.7   |       | 6.3   | 0.224 |        | 0.248 |
| W1      | 8.5   |       | 9.25  | 0.335 |        | 0.364 |
| W2      |       | 0.50  |       |       | 0.20   |       |
| H       |       | 18.50 | 18.70 |       | 0.728  | 0.726 |
| H0      | 15.50 |       | 16.50 | 0.610 |        | 0.650 |
| H1      |       | 25.00 |       |       | 0.984  |       |
| D0      | 3.8   |       | 4.2   | 0.150 |        | 0.165 |
| t       |       | 0.90  |       |       | 0.035  |       |
| L1      |       | 3     |       |       | 0.118  |       |
| delta P |       | ±1    |       |       | 0.039  |       |
| u       |       | 50    |       |       | 1.968  |       |
| Φ1      |       | 360   |       |       | 14.173 |       |
| Φ2      |       | 30    |       |       | 1.181  |       |



## 8 Order codes

Table 19. Order codes

| Packages   |                               |                |                |              | Output voltage |
|------------|-------------------------------|----------------|----------------|--------------|----------------|
| TO-220     | SO-8                          | PPAK           | DPAK           | TO-92        |                |
|            | L4931CD27-TR                  |                |                |              | 2.7 V          |
|            | L4931CD27-TRY <sup>(1)</sup>  | L4931ABPT27TR  |                |              | 2.7 V          |
|            | L4931CD33-TR                  | L4931CPT33-TR  | L4931CDT33-TR  | L4931CZ33-AP | 3.3 V          |
| L4931ABV33 | L4931ABD33-TR                 |                | L4931ABDT33-TR |              | 3.3 V          |
|            | L4931CD33-TRY <sup>(1)</sup>  |                |                |              | 3.3 V          |
|            | L4931CD35-TR                  |                | L4931CDT35-TR  |              | 3.5 V          |
|            | L4931ABD35-TR                 |                | L4931ABDT35TR  |              | 3.5 V          |
|            | L4931ABD35-TRY <sup>(1)</sup> |                |                |              | 3.5 V          |
|            | L4931CD50-TR                  | L4931CPT50-TR  | L4931CDT50-TR  | L4931CZ50-AP | 5 V            |
|            | L4931ABD50-TR                 |                | L4931ABDT50-TR |              | 5 V            |
|            | L4931CD80-TR                  | L4931CPT80-TR  | L4931CDT80-TR  |              | 8 V            |
|            |                               | L4931ABPT80TR  | L4931ABDT80-TR |              | 8 V            |
|            | L4931CD120-TR                 | L4931CPT120-TR | L4931CDT120-TR |              | 12 V           |
|            | L4931ABD120TR                 | L4931ABPT120R  |                |              | 12 V           |

1. Automotive Grade products.

## 9 Revision history

**Table 20. Document revision history**

| <b>Date</b> | <b>Revision</b> | <b>Changes</b>  |
|-------------|-----------------|---|
| 21-Jun-2004 | 11              | Document updating.  |
| 14-Jun-2006 | 12              | Order codes updated.  |
| 31-Jan-2008 | 13              | Added: <a href="#">Table 1</a> and new order codes for Automotive grade products.     |
| 20-Feb-2008 | 14              | Modified: <a href="#">Table 19 on page 34</a> .                                       |
| 11-Mar-2008 | 15              | Modified: <a href="#">Table 1 on page 1</a> and <a href="#">Table 19 on page 34</a> . |
| 15-Jul-2008 | 16              | Modified: <a href="#">Table 1 on page 1</a> and <a href="#">Table 19 on page 34</a> . |
| 18-Aug-2008 | 17              | Modified: <a href="#">Table 19 on page 34</a> .                                       |

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