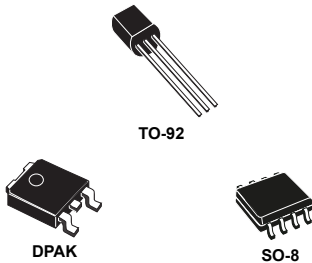


## Very low drop voltage regulators with inhibit



### 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: 3.3; 3.5; 5;
- Automotive-grade product: 3.3 V  $V_{OUT}$  in SO-8 package only
- 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: from -40 to 125 °C

### Description

The L4931 is a very low drop regulator available in SO-8, DPAK and TO-92 packages and in a wide range of output voltages.

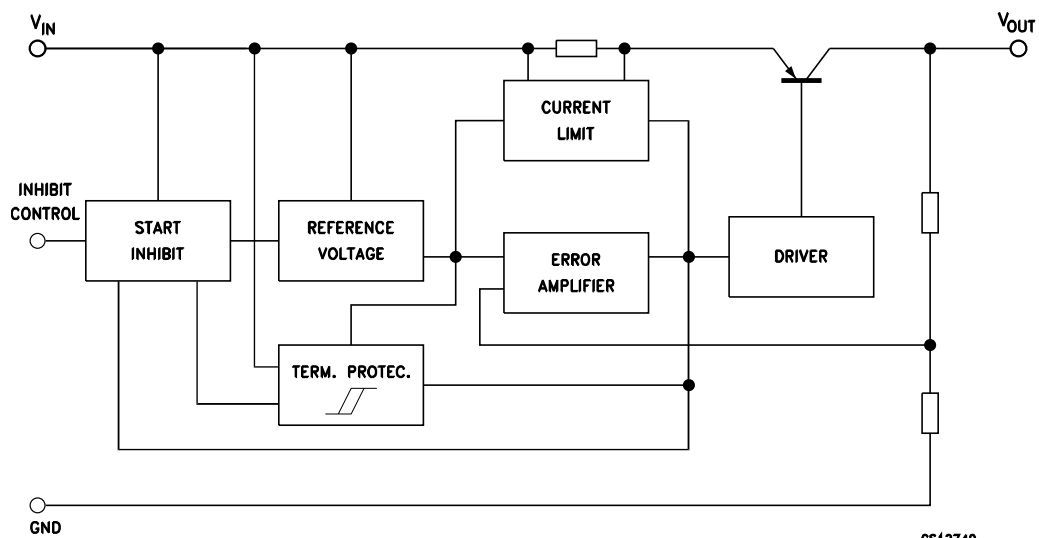
The very low drop voltage (0.4 V) and the very low quiescent current make it particularly suitable for low noise, low power applications and especially in battery-powered systems.

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, a part of the board can be put in standby mode, 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. This device is qualified according to the specification AEC-Q100 of the automotive market, in the temperature range from 40 °C to 125 °C, and the statistical tests: PAT, SYL, SBL are performed.

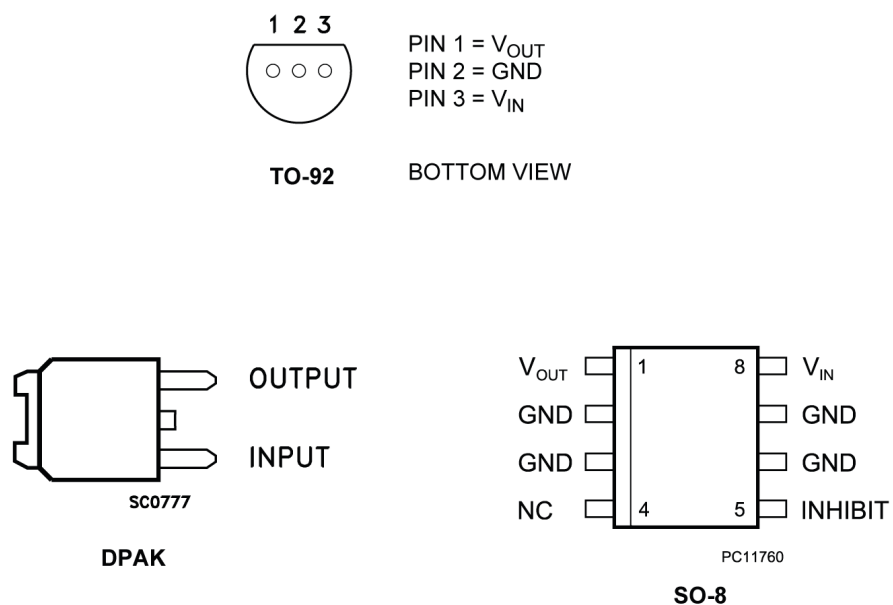
# 1 Diagram

Figure 1. Schematic diagram



## 2 Pin configuration

Figure 2. Pin connections (top view)



### 3 Maximum ratings

**Table 1. 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   |

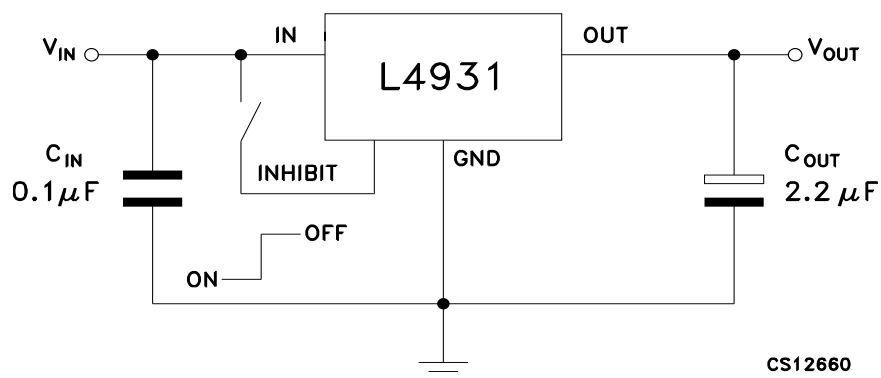
**Note:** *Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.*

**Table 2. Thermal data**

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

## 4 Application circuit

Figure 3. Test circuit



AMG050320171502MT

## 5 Electrical characteristics

(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).

**Table 3. L4931ABxx33 electrical characteristics**

| 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             |
|              |                                | $I_O = 5\text{ mA}$ , $V_I = 5.3\text{ V}$ , $T_A = -25\text{ to }85\text{ }^{\circ}\text{C}$ | 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             |
|              |                                | $I_O = 250\text{ mA}$ , $T_A = -40\text{ to }125\text{ }^{\circ}\text{C}$                     |                     |      | 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 should be increased by 20 mV.

(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).

**Table 4. L4931Cxx33 electrical characteristics**

| 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 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       | $I_O = 5\text{ mA}$                                                                           | $f = 120\text{ Hz}$ | 73   |       | dB            |

| Symbol   | Parameter                      | Test conditions                                                                       |                      | Min. | Typ. | Max. | Unit          |
|----------|--------------------------------|---------------------------------------------------------------------------------------|----------------------|------|------|------|---------------|
| SVR      | Supply voltage rejection       | $V_I = 5.3 \pm 1 \text{ V}$                                                           | $f = 1 \text{ kHz}$  |      | 70   |      | dB            |
|          |                                |                                                                                       | $f = 10 \text{ kHz}$ |      | 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 should be increased by 20 mV.

(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).

**Table 5. L4931CD33-TRY (automotive-grade) electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                                                        |                      | Min.  | Typ. | Max.  | Unit          |
|--------------|---------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------|-------|------|-------|---------------|
| $V_O$        | Output voltage            | $I_O = 5 \text{ mA}, V_I = 5.3 \text{ V}, T_A = 25 \text{ }^\circ\text{C}$                                             |                      | 3.234 | 3.3  | 3.366 | V             |
|              |                           |                                                                                                                        |                      | 3.168 |      | 3.432 |               |
| $V_I$        | Operating input voltage   | $I_O = 250 \text{ mA}$                                                                                                 |                      |       |      | 20    | V             |
| $I_{out}$    | Output current limit      | $T_A = 25 \text{ }^\circ\text{C}$                                                                                      |                      |       | 300  |       | mA            |
| $\Delta V_O$ | Line regulation           | $V_I = 4.1 \text{ to } 20 \text{ V}, I_O = 0.5 \text{ mA}$                                                             |                      |       |      | 20    | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 4.3 \text{ V}, I_O = 0.5 \text{ to } 250 \text{ mA}$                                                            |                      |       |      | 38    | mV            |
| $I_d$        | Quiescent current ON mode | $V_I = 4.3 \text{ to } 20 \text{ V}, I_O = 0 \text{ mA}$                                                               |                      |       |      | 1     | mA            |
|              |                           | $V_I = 4.3 \text{ to } 20 \text{ V}, I_O = 250 \text{ mA}$                                                             |                      |       |      | 11    | mA            |
|              | OFF mode                  | $V_I = 6 \text{ V}$                                                                                                    |                      |       |      | 100   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5 \text{ mA}, V_I = 5.3 \pm 1 \text{ V}, T_A = 25 \text{ }^\circ\text{C}$                                       | $f = 120 \text{ Hz}$ |       | 73   |       | dB            |
|              |                           |                                                                                                                        | $f = 1 \text{ kHz}$  |       | 70   |       |               |
|              |                           |                                                                                                                        | $f = 10 \text{ kHz}$ |       | 55   |       |               |
| eN           | Output noise voltage      | $B = 10 \text{ Hz to } 100 \text{ kHz}, T_A = 25 \text{ }^\circ\text{C}$                                               |                      |       | 50   |       | $\mu\text{V}$ |
| $V_d$        | Dropout voltage           | $I_O = 250 \text{ mA}, T_A = 25 \text{ }^\circ\text{C}$                                                                |                      |       | 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     | $V_I = 6 \text{ V}, V_C = 6 \text{ V}, T_A = 25 \text{ }^\circ\text{C}$                                                |                      |       | 10   |       | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance | $\text{ESR} = 0.1 \text{ to } 10 \text{ } \Omega, I_O = 0 \text{ to } 250 \text{ mA}, T_A = 25 \text{ }^\circ\text{C}$ |                      | 2     | 10   |       | $\mu\text{F}$ |

**Table 6. L4931ABxx35 electrical characteristics**

| 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    |
|        |                         | $I_O = 5 \text{ mA}, V_I = 5.5 \text{ V}, T_A = -25 \text{ to } 85 \text{ }^\circ\text{C}$ |  | 3.43  |      | 3.57  |      |
| $V_I$  | Operating input voltage | $I_O = 250 \text{ mA}$                                                                     |  |       |      | 20    | V    |

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

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

(Refer to the test circuits,  $T_A = 25$  °C,  $C_I = 0.1$   $\mu$ F,  $C_O = 2.2$   $\mu$ F unless otherwise specified).

**Table 7. L4931ABxx50 electrical characteristics**

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

| Symbol | Parameter                 | Test conditions                                | Min. | Typ. | Max. | Unit          |
|--------|---------------------------|------------------------------------------------|------|------|------|---------------|
| $I_I$  | Control input current     | $V_I = 6\text{ V}$ , $V_C = 6\text{ V}$        |      | 10   |      | $\mu\text{A}$ |
| $C_O$  | Output bypass capacitance | ESR = 0.1 to 10 $\Omega$ , $I_O = 0$ to 250 mA | 2    | 10   |      | $\mu\text{F}$ |

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

(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).

**Table 8. L4931Cxx50 electrical characteristics**

| 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             |
|              |                                | $I_O = 5\text{ mA}$ , $V_I = 7\text{ V}$ , $T_A = -25$ 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                | $V_I = 5.8$ to $20\text{ V}$ , $I_O = 0.5\text{ mA}$                                 |                     | 3.5  | 17.5 | mV            |
| $\Delta V_O$ | Load regulation <sup>(1)</sup> | $V_I = 6\text{ V}$ , $I_O = 0.5$ to $250\text{ mA}$                                  |                     | 3    | 15   | mV            |
| $I_d$        | Quiescent current              | $V_I = 6$ to $20\text{ V}$ , $I_O = 0\text{ mA}$                                     |                     | 0.6  | 1    | mA            |
|              | ON mode                        | $V_I = 6$ 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 Hz to 100 kHz                                                                 |                     | 50   |      | $\mu\text{V}$ |
| $V_d$        | Dropout voltage <sup>(1)</sup> | $I_O = 250\text{ mA}$                                                                |                     | 0.4  | 0.6  | V             |
|              |                                | $I_O = 250\text{ mA}$ , $T_A = -40$ to $125\text{ }^\circ\text{C}$                   |                     |      | 0.8  | V             |
| $V_{IL}$     | Control input logic low        | $T_A = -40$ to $125\text{ }^\circ\text{C}$                                           |                     |      | 0.8  | V             |
| $V_{IH}$     | Control input logic high       | $T_A = -40$ 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      | ESR = 0.1 to 10 $\Omega$ , $I_O = 0$ to 250 mA                                       | 2                   | 10   |      | $\mu\text{F}$ |

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

(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).

**Table 9. L4931ABxx120 electrical characteristics**

| 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    |
|              |                                | $I_O = 5\text{ mA}$ , $V_I = 14\text{ V}$ , $T_A = -25$ 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                | $V_I = 12.8$ to $20\text{ V}$ , $I_O = 0.5\text{ mA}$                                 |       | 4    | 20    | mV   |
| $\Delta V_O$ | Load regulation <sup>(1)</sup> | $V_I = 13\text{ V}$ , $I_O = 0.5$ to $250\text{ mA}$                                  |       | 3    | 15    | mV   |
| $I_d$        | Quiescent current              | $V_I = 13$ to $20\text{ V}$ , $I_O = 0\text{ mA}$                                     |       | 0.8  | 1.6   | mA   |

| Symbol   | Parameter                      | Test conditions                                                                          |                      | Min. | Typ. | Max. | Unit          |
|----------|--------------------------------|------------------------------------------------------------------------------------------|----------------------|------|------|------|---------------|
| $I_d$    | ON mode                        | $V_I = 13 \text{ to } 20 \text{ V}$ , $I_O = 250 \text{ mA}$                             |                      |      | 4.5  | 7    | mA            |
|          | 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 should be increased by 20 mV.

## 6 Typical application

**Figure 4. Line regulation vs temperature**

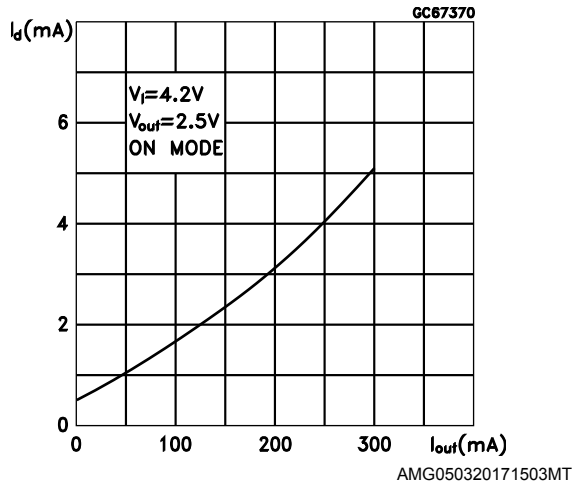


**Figure 5. Dropout voltage vs temperature**

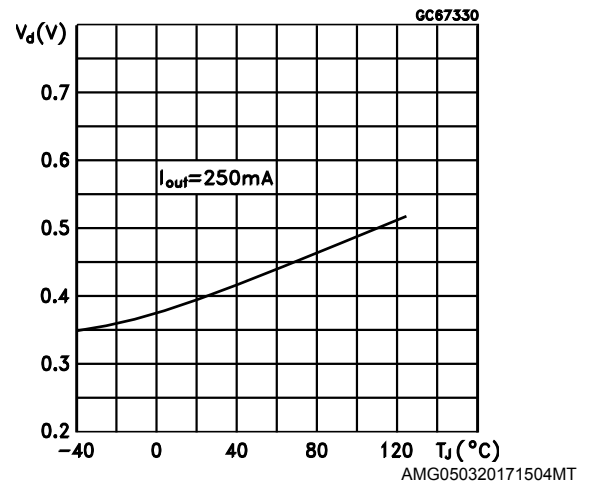


**Figure 6. Supply current vs input voltage**

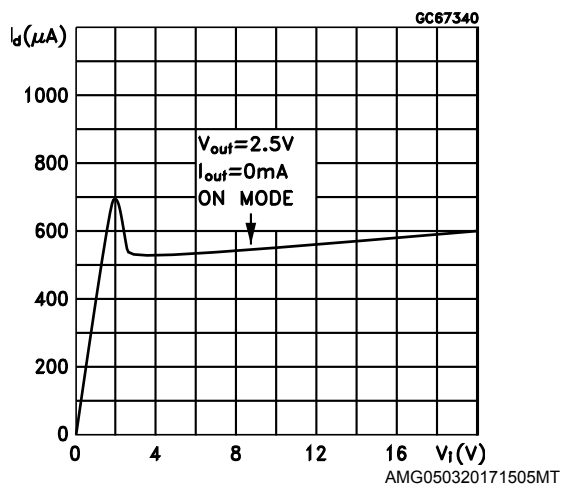


**Figure 7. Supply current vs temperature**

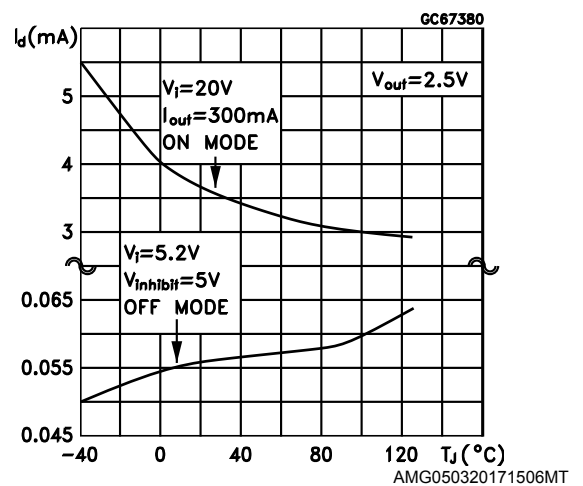


**Figure 8. Short-circuit current vs dropout voltage**

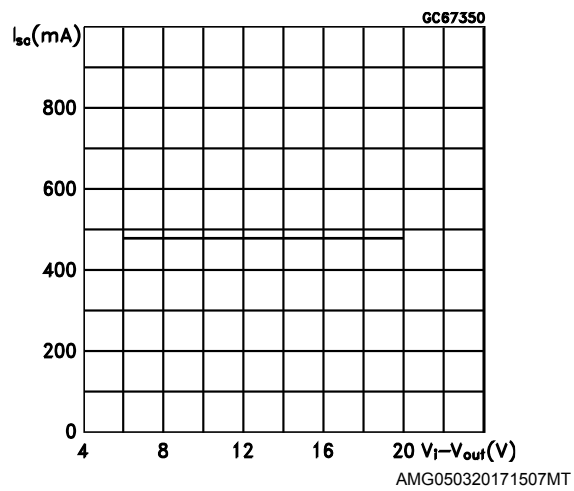
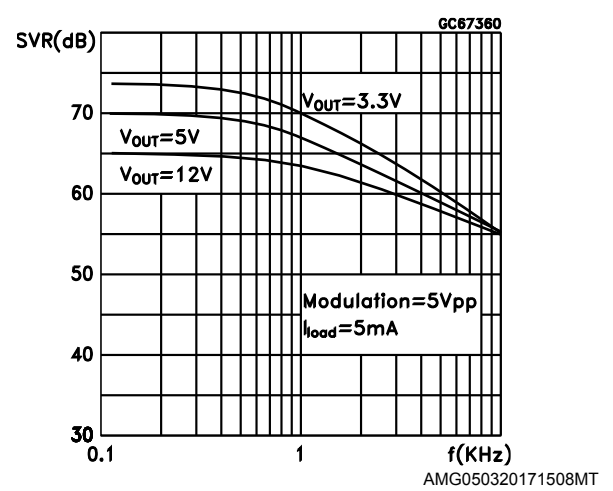


**Figure 9. SVR vs input voltage signal frequency**

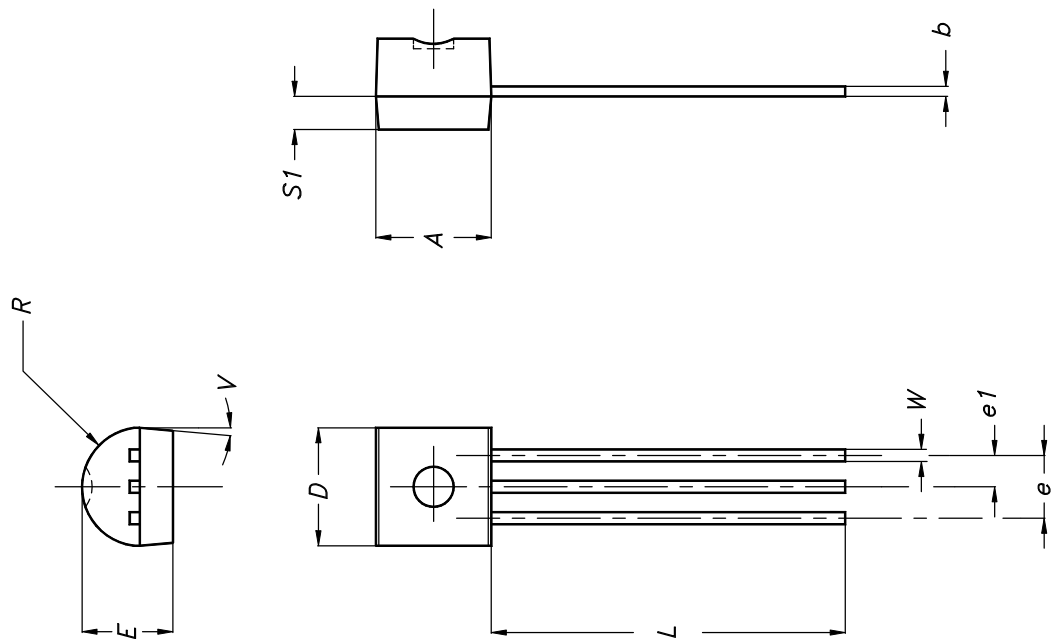


## 7 Package information

To meet environmental requirements, ST offers these devices in different grades of **ECOPACK** packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions, and product status are available at: [www.st.com](http://www.st.com). ECOPACK is an ST trademark.

### 7.1 TO-92 package information

**Figure 10. TO-92 package outline**



0102782\_E

**Table 10. TO-92 mechanical data**

| Dim. | mm    |      |       |
|------|-------|------|-------|
|      | Min.  | Typ. | Max.  |
| A    | 4.32  |      | 4.95  |
| b    | 0.36  |      | 0.51  |
| D    | 4.45  |      | 4.95  |
| E    | 3.30  |      | 3.94  |
| e    | 2.41  |      | 2.67  |
| e1   | 1.14  |      | 1.40  |
| L    | 12.70 |      | 15.49 |
| R    | 2.16  |      | 2.41  |
| S1   | 0.92  |      | 1.52  |
| W    | 0.41  |      | 0.56  |
| V    |       | 5°   |       |

## 7.2 TO-92 Ammopak packing information

**Figure 11.** TO-92 Ammopak tape and reel outline

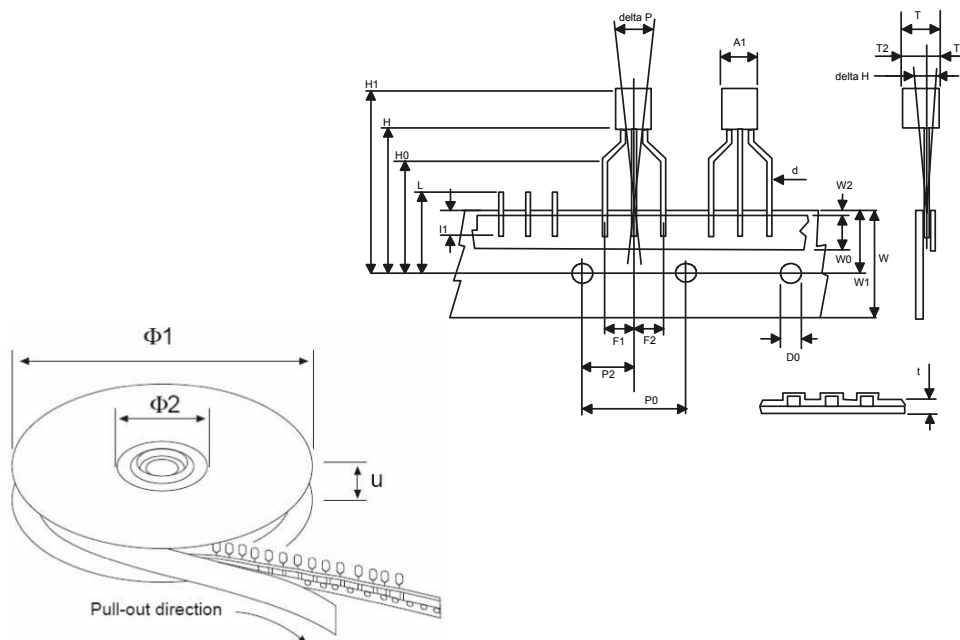


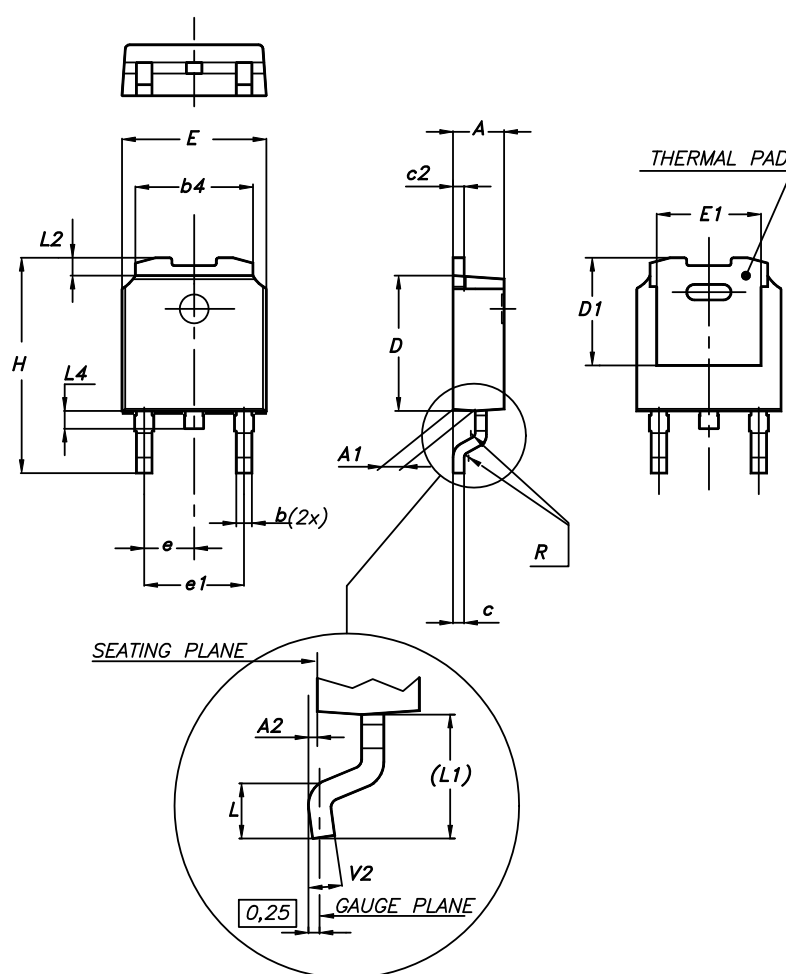
**Table 11.** TO-92 Ammopak tape and reel mechanical data

| Dim.    | mm    |       |       |
|---------|-------|-------|-------|
|         | Min.  | Typ.  | Max.  |
| A1      |       |       | 4.80  |
| T       |       |       | 3.80  |
| T1      |       |       | 1.60  |
| T2      |       |       | 2.30  |
| d       | 0.45  | 0.47  | 0.48  |
| P0      | 12.50 | 12.70 | 12.90 |
| P2      | 5.65  | 6.35  | 7.05  |
| F1, F2  | 2.40  | 2.50  | 2.94  |
| F3      | 4.98  | 5.08  | 5.48  |
| delta H | -2.00 |       | 2.00  |
| W       | 17.50 | 18.00 | 19.00 |
| W0      | 5.5   | 6.00  | 6.5   |
| W1      | 8.50  | 9.00  | 9.25  |
| W2      |       |       | 0.50  |
| H       |       | 18.50 | 21    |
| H3      | 0.5   | 1     | 2     |
| H0      | 15.50 | 16.00 | 18.8  |
| H1      |       | 25.0  | 27.0  |
| D0      | 3.80  | 4.00  | 4.20  |

| Dim.    | mm    |      |       |
|---------|-------|------|-------|
|         | Min.  | Typ. | Max.  |
| t       |       |      | 0.90  |
| L       |       |      | 11.00 |
| l1      | 3.00  |      |       |
| delta P | -1.00 |      | 1.00  |

### 7.3 DPAK package information

Figure 12. DPAK package outline



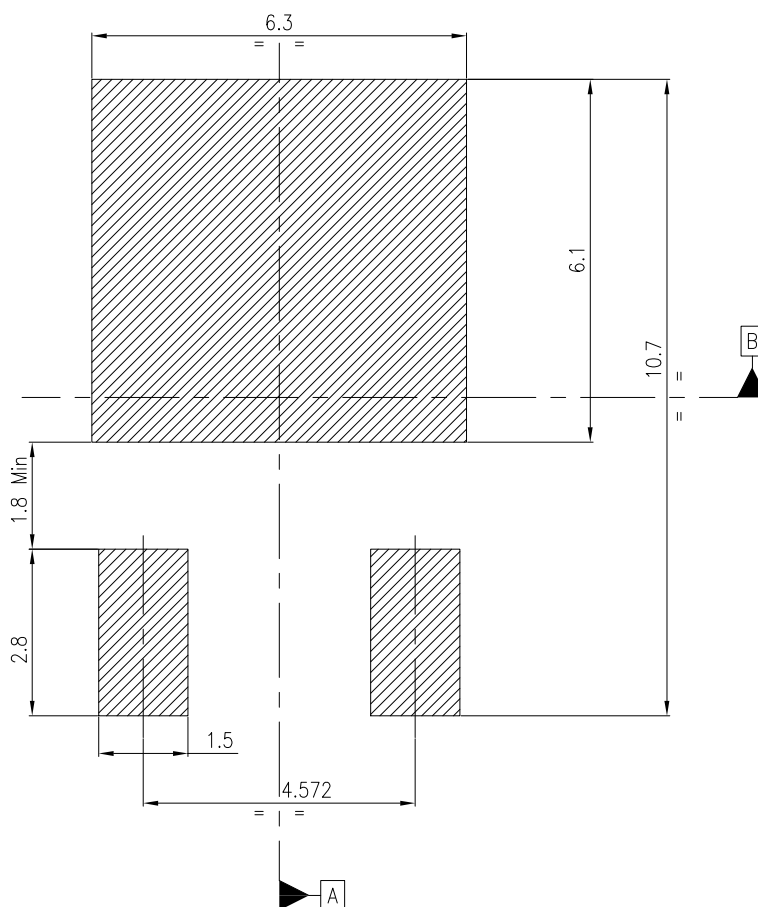
0068772\_A\_21

Table 12. DPAK mechanical data

| Dim. | mm   |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| A    | 2.20 |      | 2.40 |
| A1   | 0.90 |      | 1.10 |
| A2   | 0.03 |      | 0.23 |
| b    | 0.64 |      | 0.90 |

| Dim. | mm   |      |       |
|------|------|------|-------|
|      | Min. | Typ. | Max.  |
| b4   | 5.20 |      | 5.40  |
| c    | 0.45 |      | 0.60  |
| c2   | 0.48 |      | 0.60  |
| D    | 6.00 |      | 6.20  |
| D1   |      | 5.10 |       |
| E    | 6.40 |      | 6.60  |
| E1   |      | 4.70 |       |
| e    |      | 2.28 |       |
| e1   | 4.40 |      | 4.60  |
| H    | 9.35 |      | 10.10 |
| L    | 1.00 |      | 1.50  |
| (L1) |      | 2.80 |       |
| L2   |      | 0.80 |       |
| L4   | 0.60 |      | 1.00  |
| R    |      | 0.20 |       |
| V2   | 0°   |      | 8°    |

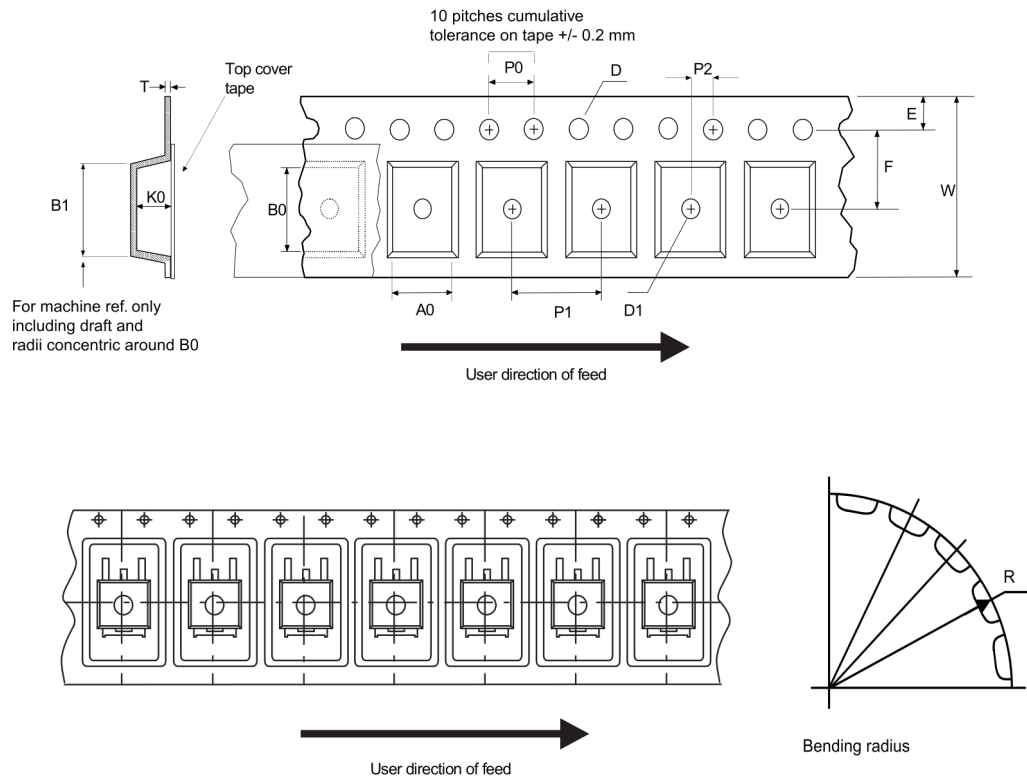
**Figure 13. DPAK recommended footprint (dimensions are in mm)**



Footprint\_0068772

## 7.4 DPAK\_PPAK packing information

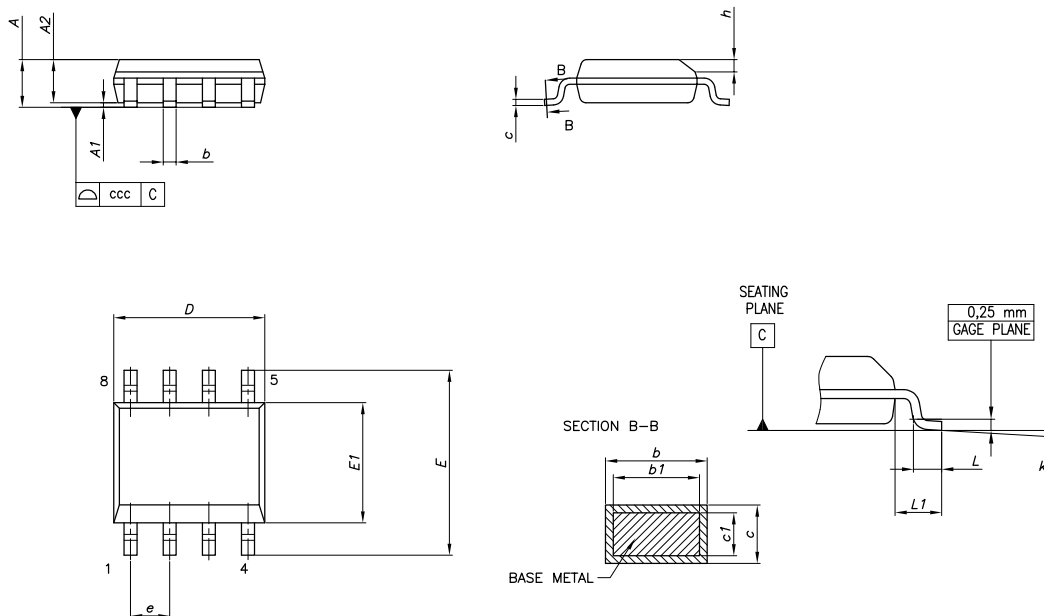
**Figure 14. PPAK and DPAK tape**



AM08852v1

## 7.5 SO8 package information

Figure 15. SO-8 package outline

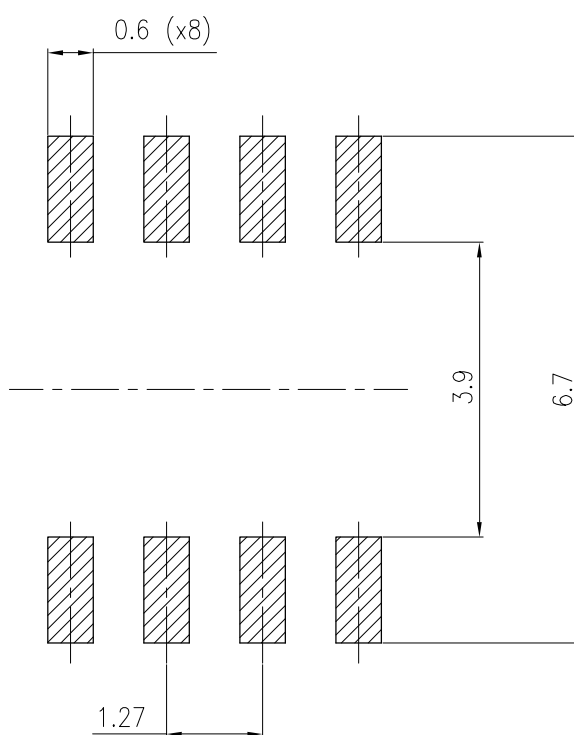


0016023\_I

Table 13. SO-8 mechanical data

| Dim. | mm   |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| A    |      |      | 1.75 |
| A1   | 0.10 |      | 0.25 |
| A2   | 1.25 |      |      |
| b    | 0.28 |      | 0.48 |
| c    | 0.17 |      | 0.23 |
| D    | 4.80 | 4.90 | 5.00 |
| E    | 5.80 | 6.00 | 6.20 |
| E1   | 3.80 | 3.90 | 4.00 |
| e    |      | 1.27 |      |
| h    | 0.25 |      | 0.50 |
| L    | 0.40 |      | 1.27 |
| L1   |      | 1.04 |      |
| k    | 0°   |      | 8°   |
| ccc  |      |      | 0.10 |

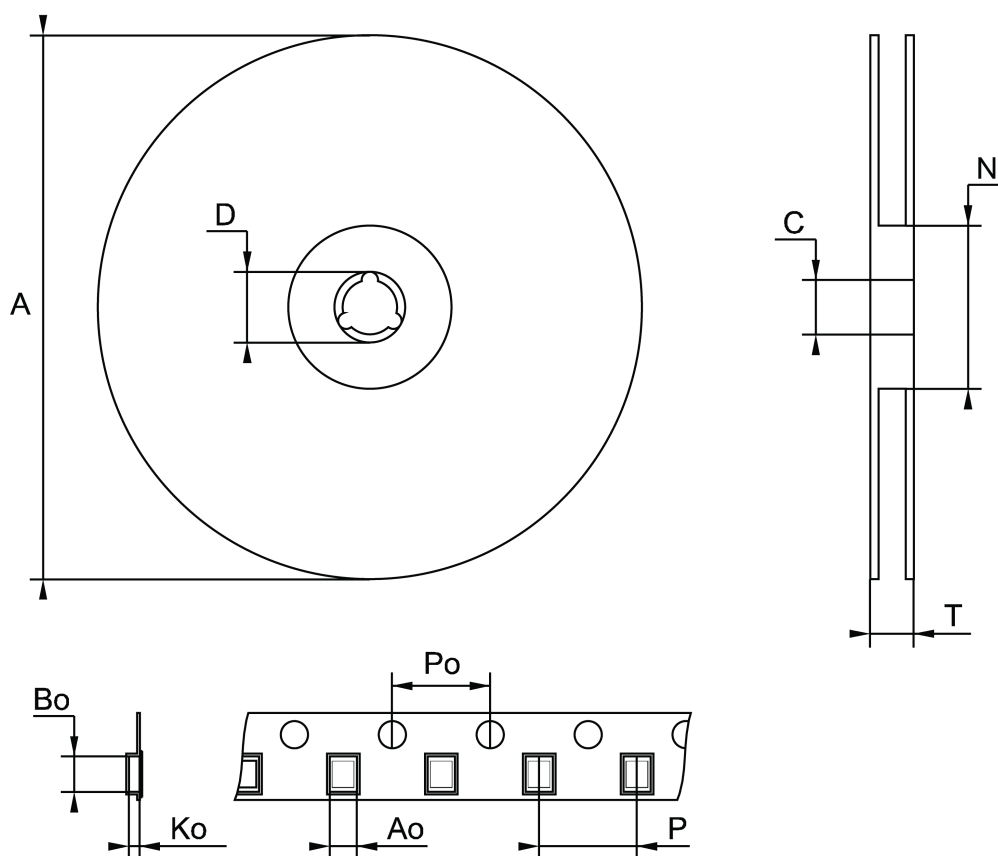
**Figure 16. SO-8 recommended footprint**



0016023\_I

## 7.6 SO8-batwing packing information

**Figure 17.** SO8-batwing tape and reel outline



Note: Drawing not in scale

**Table 14.** SO8-batwing mechanical data

| Dim. | mm   |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| A    |      |      | 330  |
| C    | 12.8 |      | 13.2 |
| D    | 20.2 |      |      |
| N    | 60   |      |      |
| T    |      |      | 22.4 |
| A0   | 8.1  | -    | 8.5  |
| B0   | 5.5  |      | 5.9  |
| K0   | 2.1  |      | 2.3  |
| P0   | 3.9  |      | 4.1  |
| P    | 7.9  |      | 8.1  |

## 8 Ordering information

**Table 15. Order codes**

| Package      |                              |                |               | Output voltage |
|--------------|------------------------------|----------------|---------------|----------------|
| TO-92        | SO-8<br>(automotive-grade)   | DPAK           | SO-8          |                |
| L4931CZ33-AP | L4931CD33-TRY <sup>(1)</sup> | L4931CDT33-TR  | L4931CD33-TR  | 3.3 V          |
|              |                              | L4931ABDT33-TR |               | 3.3 V          |
| L4931CZ50-AP |                              | L4931CDT50-TR  | L4931CD50-TR  | 5 V            |
|              |                              |                | L4931ABD50-TR | 5 V            |

1. Qualified and characterized according to AEC Q100 and Q003 or equivalent, advanced screening according to AEC Q001 and Q002 or equivalent.

## Revision history

**Table 16. Document revision history**

| Date        | Revision | Changes                                                                                                                                                                                                                                                                                                                                                                       |
|-------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 21-Jun-2004 | 11       | Document updating.                                                                                                                                                                                                                                                                                                                                                            |
| 14-Jun-2006 | 12       | Order codes updated.                                                                                                                                                                                                                                                                                                                                                          |
| 31-Jan-2008 | 13       | Added: Table 1 and new order codes for Automotive grade products.                                                                                                                                                                                                                                                                                                             |
| 20-Feb-2008 | 14       | Modified: Table 23 on page 36.                                                                                                                                                                                                                                                                                                                                                |
| 11-Mar-2008 | 15       | Modified: Table 1 on page 1 and Table 23 on page 36.                                                                                                                                                                                                                                                                                                                          |
| 15-Jul-2008 | 16       | Modified: Table 1 on page 1 and Table 23 on page 36.                                                                                                                                                                                                                                                                                                                          |
| 18-Aug-2008 | 17       | Modified: Table 23 on page 36.                                                                                                                                                                                                                                                                                                                                                |
| 30-Oct-2013 | 18       | <p>Changed the L4931ABxx and L4931Cxx to L4931.</p> <p>Updated: Description in cover page.</p> <p>Deleted table1: Device summary.</p> <p>Updated Figure 2: Pin connections (top view), Table 2: Thermal data, Section 5: Electrical characteristics and Section 7: Package mechanical data.</p> <p>Added Section 8: Packaging mechanical data.</p> <p>Minor text changes.</p> |
| 02-Aug-2017 | 19       | <p>Updated features in cover page.</p> <p>Deleted table 3: L4931Cxx27 electrical characteristics, table 4: L4931Cxx27-TRY (automotive-grade) electrical characteristics, table 12:L4931ABxx80 electrical characteristics, table 13: L4931Cxx80 electrical characteristics.</p> <p>Updated Table 19. Order codes.</p> <p>Minor text changes.</p>                               |
| 29-Jan-2024 | 20       | Updated Table 5.                                                                                                                                                                                                                                                                                                                                                              |
| 09-Aug-2024 | 21       | <p>Updated features and description on the cover page.</p> <p>Removed PPAK package information , updated <a href="#">Table 15</a></p>                                                                                                                                                                                                                                         |
| 28-Oct-2024 | 22       | updated <a href="#">Table 15</a>                                                                                                                                                                                                                                                                                                                                              |

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