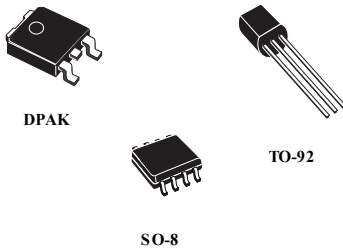


### Very low drop voltage regulators with inhibit function



#### Features

- AEC-Q100 qualified (DPAK only)
- Very low dropout voltage (90 mV typ. at 10 mA load)
- Low quiescent current (typ. 2.5 mA, at 100 mA load)
- Output current up to 100 mA
- Adjustable (from  $V_{OUT} = 2.5$  V only SO-8) and fixed (3.3 V and 5 V) output voltage version
- Internal current and thermal limit
- Load dump protection up to 60 V
- Reverse transient protection up to - 50 V
- Temperature range: - 40 to 125 °C
- Package available: TO-92, DPAK, SO-8 (with inhibit control)

#### Description

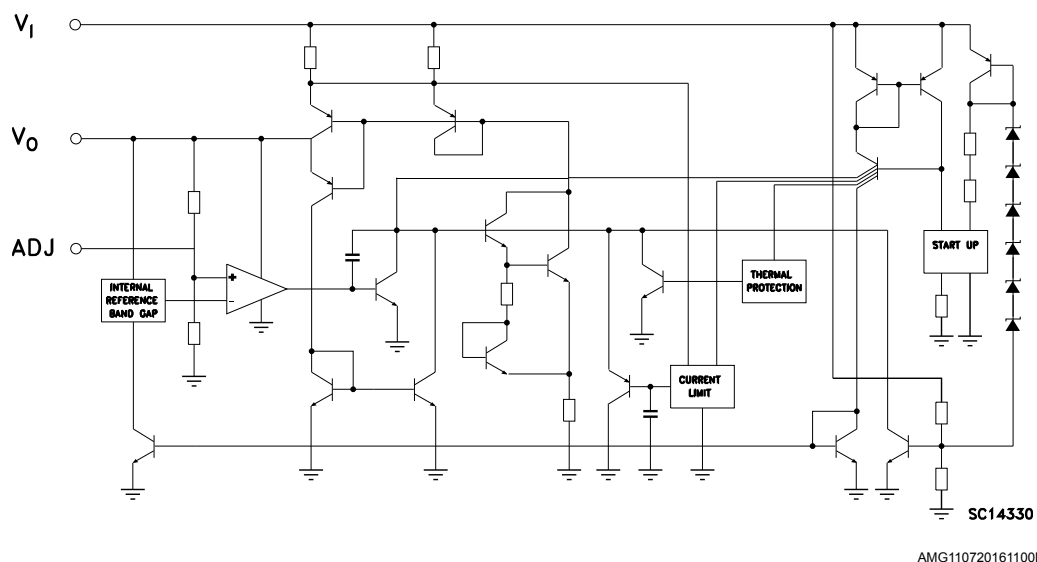
The **LM2931** are very low drop regulators. The very low drop voltage and the low quiescent current make them particularly suitable for low noise, low power applications and in battery-powered systems. In the 8-pin configuration (SO-8), fully compatible with the older L78L family, a shutdown logic control function is available. 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 total power consumption. Ideal for automotive applications, **LM2931** is protected from reverse battery installations or 2 battery jumps. During the transient, such as a 60 V load dump, when the input voltage can exceed the specified maximum operating input voltage of 26 V, the regulator automatically shuts down to protect both internal circuitry and the load.

Maturity status link

[LM2931](#)

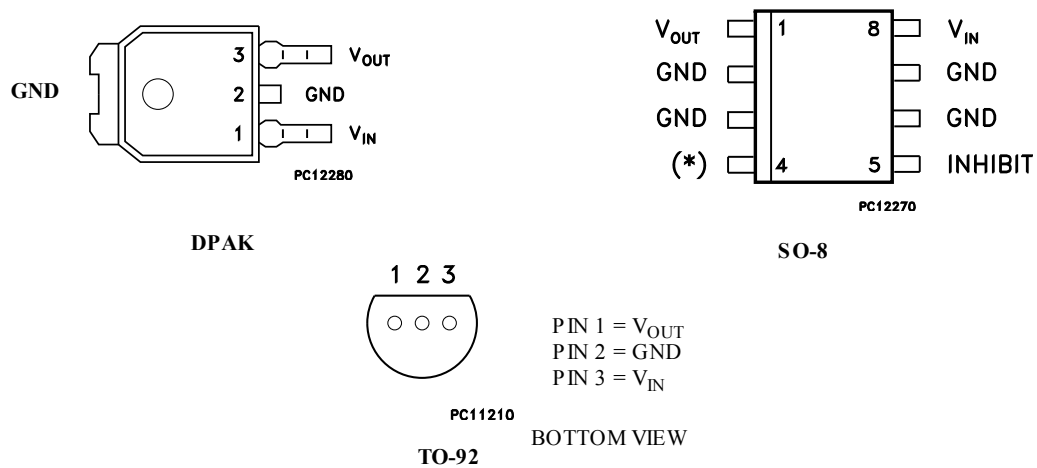
# 1 Diagram

Figure 2. Schematic diagram



## 2 Pin configuration

**Figure 3. Pin connections (top view)**



AMG110720161101MT

**Note:** (\*) ADJ pin on the adjustable version, not connected in the fixed output version.

### 3 Maximum ratings

**Table 1. Absolute maximum ratings**

| Symbol    | Parameter                                       | Value              | Unit |
|-----------|-------------------------------------------------|--------------------|------|
| $V_I$     | DC positive input voltage                       | 40                 | V    |
| $V_I$     | DC reverse input voltage                        | -15                | V    |
| $V_I$     | Transient input voltage ( $T < 100$ ms)         | 60                 | V    |
| $V_I$     | Transient reverse input voltage ( $T < 100$ ms) | -50                | V    |
| $V_{INH}$ | Inhibit input voltage                           | 40                 | V    |
| $I_O$     | Output current                                  | Internally limited |      |
| $T_{STG}$ | Storage temperature range                       | -65 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.

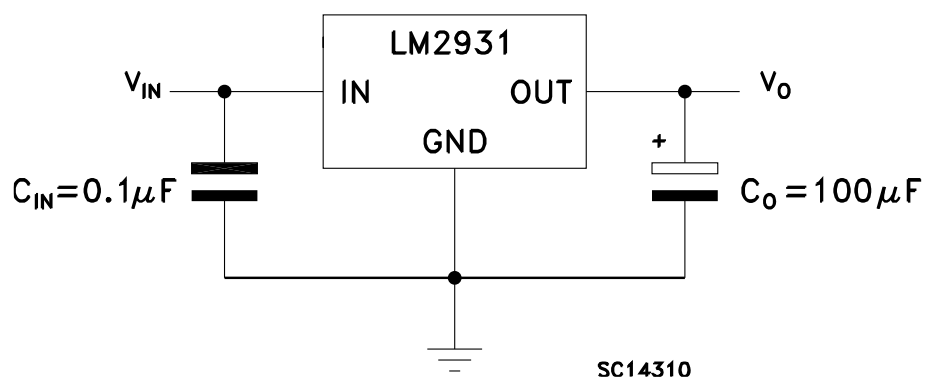
**Table 2. Thermal data**

| Symbol     | Parameter                           | SO-8              | DPAK | TO-92 | Unit |
|------------|-------------------------------------|-------------------|------|-------|------|
| $R_{thJC}$ | Thermal resistance junction-case    | 20                | 8    | 57    | °C/W |
| $R_{thJA}$ | Thermal resistance junction-ambient | 55 <sup>(1)</sup> | 100  | 200   | °C/W |

1. Considering 6 cm<sup>2</sup> of copper board heat-sink.

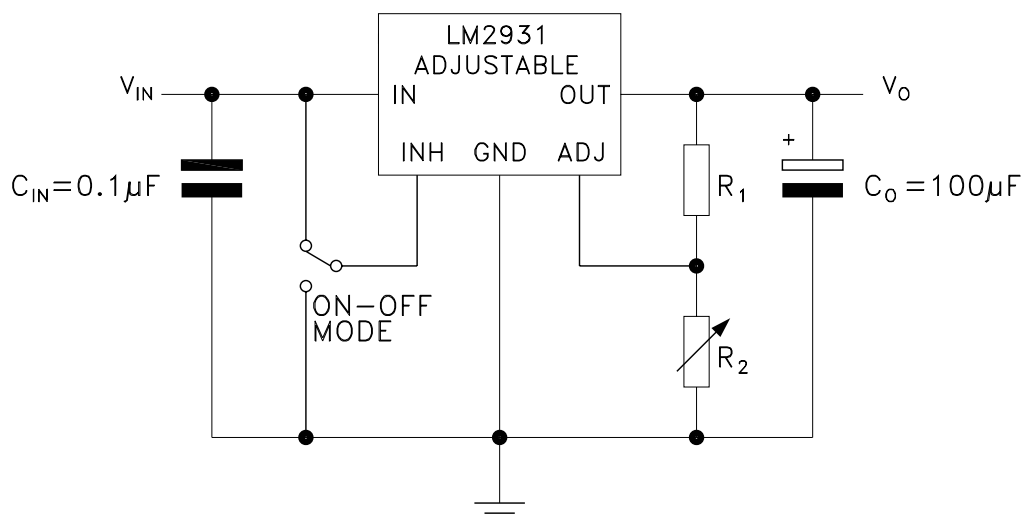
## 4 Application circuits

Figure 4. Application circuit for fixed output



AMG110720161102MT

Figure 5. Application circuit for adjustable output



Note:  $R_1$  suggested value = 27 k $\Omega$   
 $V_O = V_{REF} (R_1 + R_2)/R_1$   
 Inhibit pin: regulator is enabled when  $V_{INH} < 1.2$  V , disabled when  $V_{INH} > 3.25$  V

## 5 Electrical characteristics

Refer to the application circuit [Figure 4. Application circuit for fixed output](#),  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 100\text{ }\mu\text{F}$ ,  $V_I = 14\text{ V}$ ,  $I_O = 10\text{ mA}$ ,  $V_{INH} = 0\text{ V}$ , unless otherwise specified.

**Table 3. Electrical characteristics of LM2931A33/LM2931A33Y**

| Symbol    | Parameter                                | Test conditions                                                                                             | Min.  | Typ. | Max.  | Unit                |
|-----------|------------------------------------------|-------------------------------------------------------------------------------------------------------------|-------|------|-------|---------------------|
| $V_I$     | Maximum operating input voltage          | $I_O = 10\text{ mA}$ , $T_J = -40\text{ to }125\text{ }^{\circ}\text{C}$                                    | 26    |      |       | V                   |
| $V_O$     | Output voltage                           |                                                                                                             | 3.175 | 3.3  | 3.425 | V                   |
| $V_O$     | Output voltage                           | $I_O = 100\text{ mA}$ , $V_I = 6\text{ to }26\text{ V}$ , $T_J = -40\text{ to }125\text{ }^{\circ}\text{C}$ | 3.135 | 3.3  | 3.465 | V                   |
| $DV_O$    | Line regulation                          | $V_I = 9\text{ to }16\text{ V}$                                                                             |       | 2    | 10    | mV                  |
|           |                                          | $V_I = 6\text{ to }26\text{ V}$                                                                             |       | 4    | 33    |                     |
| $DV_O$    | Load regulation                          | $I_O = 5\text{ to }100\text{ mA}$                                                                           |       | 10   | 33    | mV                  |
| $V_d$     | Dropout voltage <sup>(1)</sup>           | $I_O = 10\text{ mA}$                                                                                        |       | 90   | 250   | mV                  |
|           |                                          | $I_O = 100\text{ mA}$                                                                                       |       | 250  | 600   |                     |
| $I_d$     | Quiescent current<br>ON MODE             | $I_O = 100\text{ mA}$                                                                                       |       | 2.5  | 30    | mA                  |
|           | OFF MODE                                 | $V_{INH} = 2.5\text{ V}$ , $R_{LOAD} = 330\text{ }\Omega$                                                   |       | 0.3  | 1     |                     |
| $I_{SC}$  | Short circuit current                    |                                                                                                             | 100   | 300  |       | mA                  |
| SVR       | Supply voltage rejection                 | $I_O = 100\text{ mA}$ , $V_I = 14 \pm 2\text{ V}$ , $f = 120\text{ Hz}$                                     | 55    | 78   |       | dB                  |
| $V_{IL}$  | Control input voltage low                | $T_J = -40\text{ to }125\text{ }^{\circ}\text{C}$                                                           |       | 2    | 1.2   | V                   |
| $V_{IH}$  | Control input voltage high               | $T_J = -40\text{ to }125\text{ }^{\circ}\text{C}$                                                           | 3.25  | 2    |       | V                   |
| $I_{INH}$ | Inhibit input current                    | $V_{INH} = 2.5\text{ V}$                                                                                    |       | 22   | 50    | $\mu\text{A}$       |
| $V_I$     | Transient input voltage                  | $R_{LOAD} = 330\text{ }\Omega$ , $T < 100\text{ ms}$                                                        | 60    | 70   |       | V                   |
| $V_I$     | Reverse polarity input voltage           | $V_O = \pm 0.3\text{ V}$ , $R_{LOAD} = 330\text{ }\Omega$                                                   | -15   | -50  |       | V                   |
| $V_I$     | Reverse polarity input voltage transient | $R_{LOAD} = 330\text{ }\Omega$ , $T < 100\text{ ms}$                                                        | -50   |      |       | V                   |
| eN        | Output noise voltage                     | $B = 10\text{ Hz to }100\text{ kHz}$                                                                        |       | 330  |       | $\mu\text{V}_{RMS}$ |

1.  $V_d$  measured when the output voltage has dropped 100 mV from the nominal value obtained at 14 V.

Refer to the application circuit [Figure 4. Application circuit for fixed output](#),  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 100\text{ }\mu\text{F}$ ,  $V_I = 14\text{ V}$ ,  $I_O = 10\text{ mA}$ ,  $V_{INH} = 0\text{ V}$ , unless otherwise specified.

**Table 4. Electrical characteristics of LM2931A50/ LM2931A50Y**

| Symbol | Parameter                       | Test conditions                                                                                             | Min. | Typ. | Max. | Unit |
|--------|---------------------------------|-------------------------------------------------------------------------------------------------------------|------|------|------|------|
| $V_I$  | Maximum operating input voltage | $I_O = 10\text{ mA}$ , $T_J = -40\text{ to }125\text{ }^{\circ}\text{C}$                                    | 26   |      |      | V    |
| $V_O$  | Output voltage                  |                                                                                                             | 4.81 | 5    | 5.19 | V    |
| $V_O$  | Output voltage                  | $I_O = 100\text{ mA}$ , $V_I = 6\text{ to }26\text{ V}$ , $T_J = -40\text{ to }125\text{ }^{\circ}\text{C}$ | 4.75 | 5    | 5.25 | V    |
| $DV_O$ | Line regulation                 | $V_I = 9\text{ to }16\text{ V}$                                                                             |      | 2    | 10   | mV   |
|        |                                 | $V_I = 6\text{ to }26\text{ V}$                                                                             |      | 4    | 30   |      |
| $DV_O$ | Load regulation                 | $I_O = 5\text{ to }100\text{ mA}$                                                                           |      | 15   | 50   | mV   |
| $V_d$  | Dropout voltage <sup>(1)</sup>  | $I_O = 10\text{ mA}$                                                                                        |      | 90   | 200  | mV   |
|        |                                 | $I_O = 100\text{ mA}$                                                                                       |      | 250  | 600  |      |

| Symbol    | Parameter                                | Test conditions                                                          | Min. | Typ. | Max. | Unit                |
|-----------|------------------------------------------|--------------------------------------------------------------------------|------|------|------|---------------------|
| $I_d$     | Quiescent current ON MODE                | $I_O = 100 \text{ mA}$                                                   |      | 2.5  | 30   | mA                  |
|           | OFF MODE                                 | $V_{INH} = 2.5 \text{ V}$ , $R_{LOAD} = 500 \Omega$                      |      | 0.3  | 1    | mA                  |
| $I_{SC}$  | Short circuit current                    |                                                                          | 100  | 300  |      | mA                  |
| SVR       | Supply voltage rejection                 | $I_O = 100 \text{ mA}$ , $V_I = 14 \pm 2 \text{ V}$ $f = 120 \text{ Hz}$ | 55   | 75   |      | dB                  |
| $V_{IL}$  | Control input voltage low                | $T_J = -40 \text{ to } 125 \text{ }^\circ\text{C}$                       |      | 2    | 1.2  | V                   |
| $V_{IH}$  | Control input voltage high               | $T_J = -40 \text{ to } 125 \text{ }^\circ\text{C}$                       | 3.25 | 2    |      | V                   |
| $I_{INH}$ | Inhibit input current                    | $V_{INH} = 2.5 \text{ V}$                                                |      | 22   | 50   | $\mu\text{A}$       |
| $V_I$     | Transient input voltage                  | $R_{LOAD} = 500 \Omega$ , $T < 100 \text{ ms}$                           | 60   | 70   |      | V                   |
| $V_I$     | Reverse polarity input voltage           | $V_O = \pm 0.3 \text{ V}$ , $R_{LOAD} = 500 \Omega$                      | -15  | -50  |      | V                   |
| $V_I$     | Reverse polarity input voltage transient | $R_{LOAD} = 500 \Omega$ , $T < 100 \text{ ms}$                           | -50  |      |      | V                   |
| eN        | Output noise voltage                     | $B = 10 \text{ Hz to } 100 \text{ kHz}$                                  |      | 500  |      | $\mu\text{V}_{RMS}$ |

1.  $V_d$  measured when the output voltage has dropped 100 mV from the nominal value obtained at 14 V.

Refer to the application circuit [Figure 5. Application circuit for adjustable output](#) with  $R_1 = 27 \text{ k}\Omega$  and  $R_2 = 40.5 \text{ k}\Omega$ ,  $T_J = 25 \text{ }^\circ\text{C}$ ,  $C_I = 0.1 \text{ }\mu\text{F}$ ,  $C_O = 100 \text{ }\mu\text{F}$ ,  $V_I = 14 \text{ V}$ ,  $I_O = 10 \text{ mA}$ ,  $V_{INH} = 0 \text{ V}$ , unless otherwise specified.

**Table 5. Electrical characteristics of LM2931 (adjustable version)**

| Symbol    | Parameter                                | Test conditions                                                             | Min. | Typ. | Max. | Unit                |
|-----------|------------------------------------------|-----------------------------------------------------------------------------|------|------|------|---------------------|
| $V_I$     | Maximum operating input voltage          | $I_O = 10 \text{ mA}$ , $T_J = -40 \text{ to } 125 \text{ }^\circ\text{C}$  | 26   |      |      | V                   |
| $V_{REF}$ | Reference voltage <sup>(1)</sup>         |                                                                             | 1.14 | 1.2  | 1.26 | V                   |
| $V_{REF}$ | Reference voltage <sup>(1)</sup>         | $I_O = 100 \text{ mA}$ , $T_J = -40 \text{ to } 125 \text{ }^\circ\text{C}$ | 1.08 | 1.2  | 1.32 | V                   |
| $DV_O$    | Line regulation                          | $V_I = 3.6 \text{ to } 26 \text{ V}$                                        |      | 0.6  | 4.5  | mV                  |
| $DV_O$    | Load regulation                          | $I_O = 5 \text{ to } 100 \text{ mA}$                                        |      | 9    | 30   | mV                  |
| $V_d$     | Dropout voltage <sup>(2)</sup>           | $I_O = 10 \text{ mA}$                                                       |      | 90   | 200  | mV                  |
|           |                                          | $I_O = 100 \text{ mA}$                                                      |      | 250  | 600  |                     |
| $I_d$     | Quiescent current<br>ON MODE             | $I_O = 100 \text{ mA}$                                                      |      | 2.5  | 30   | mA                  |
|           | OFF MODE                                 | $V_{INH} = 2.5 \text{ V}$ , $R_{LOAD} = 300 \Omega$                         |      | 0.3  | 1    | mA                  |
| $I_{SC}$  | Short circuit current                    |                                                                             | 100  | 300  |      | mA                  |
| SVR       | Supply voltage rejection                 | $I_O = 100 \text{ mA}$ , $V_I = 14 \pm 2 \text{ V}$ $f = 120 \text{ Hz}$    | 55   | 80   |      | dB                  |
| $V_{IL}$  | Control input voltage low                | $T_J = -40 \text{ to } 125 \text{ }^\circ\text{C}$                          |      | 2    | 1.2  | V                   |
| $V_{IH}$  | Control input voltage high               | $T_J = -40 \text{ to } 125 \text{ }^\circ\text{C}$                          | 3.25 | 2    |      | V                   |
| $I_{INH}$ | Inhibit input current                    | $V_{INH} = 2.5 \text{ V}$                                                   |      | 22   | 50   | $\mu\text{A}$       |
| $V_I$     | Transient input voltage                  | $R_{LOAD} = 300 \Omega$ , $T < 100 \text{ ms}$                              | 60   | 70   |      | V                   |
| $V_I$     | Reverse polarity input voltage           | $V_O = \pm 0.3 \text{ V}$ , $R_{LOAD} = 300 \Omega$                         | -15  | -50  |      | V                   |
| $V_I$     | Reverse polarity input voltage transient | $R_{LOAD} = 300 \Omega$ , $T < 100 \text{ ms}$                              | -50  |      |      | V                   |
| eN        | Output noise voltage                     | $B = 10 \text{ Hz to } 100 \text{ kHz}$                                     |      | 330  |      | $\mu\text{V}_{RMS}$ |

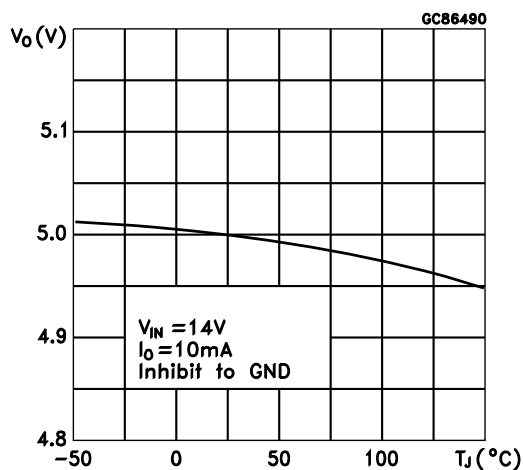
1. Reference voltage is measured from  $V_{OUT}$  to ADJ pin.

2.  $V_d$  measured when the output voltage has dropped 100 mV from the nominal value obtained at 14 V.

## 6 Typical characteristics

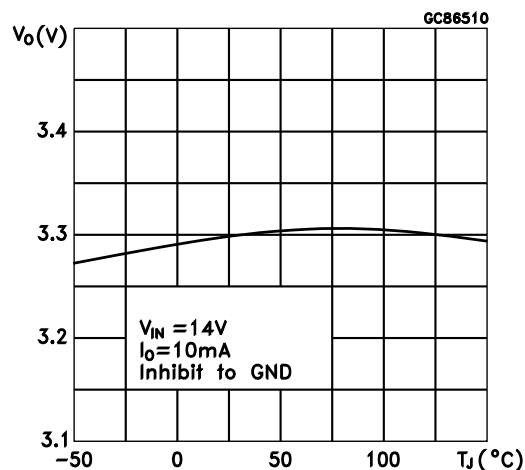
Unless otherwise specified  $C_I = 0.1 \mu\text{F}$ ,  $C_O = 100 \mu\text{F}$ .

**Figure 6. Output voltage vs temperature**



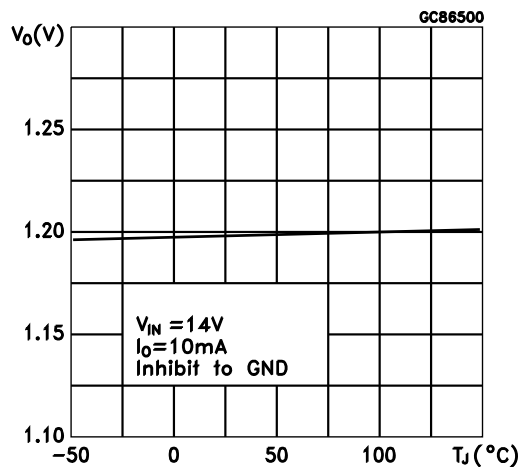
AMG110720161200MT

**Figure 7. Output voltage vs temperature**



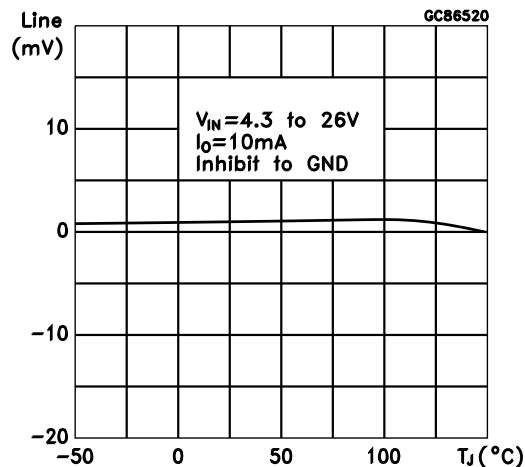
AMG110720161201MT

**Figure 8. Reference voltage vs temperature**



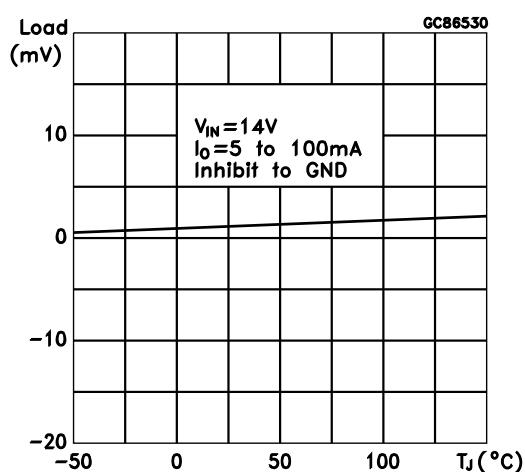
AMG110720161202MT

**Figure 9. Line regulation vs temperature**

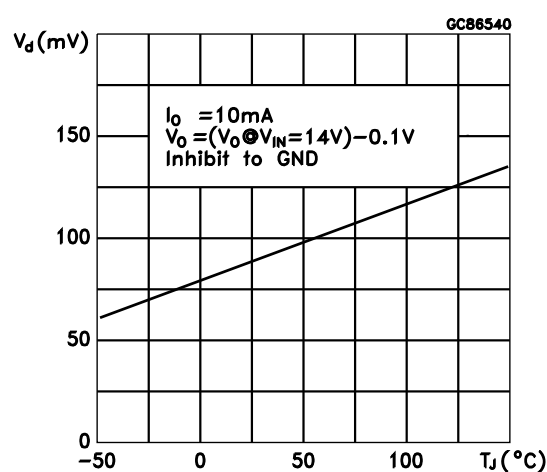


AMG110720161203MT

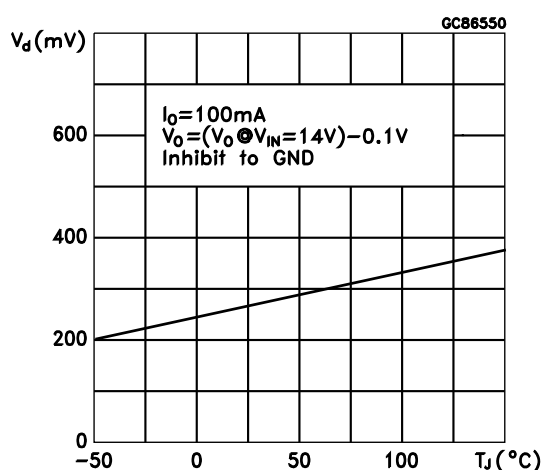


**Figure 10. Load regulation vs temperature**


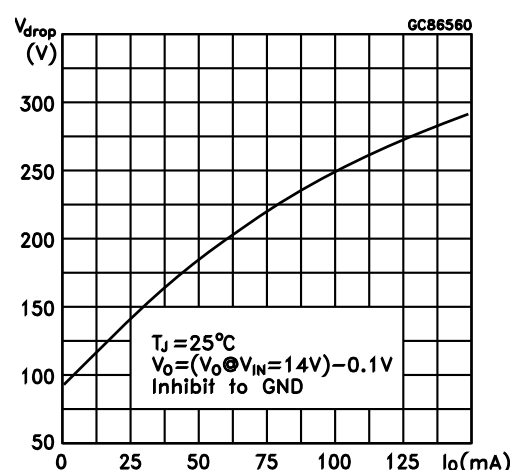
AMG110720161204MT

**Figure 11. Dropout voltage vs temperature**


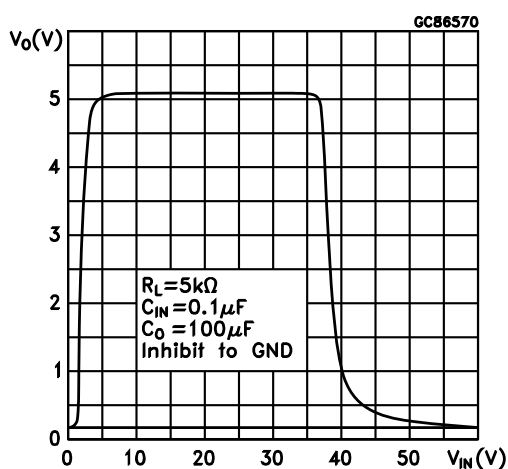
AMG110720161205MT

**Figure 12. Dropout voltage vs temperature**


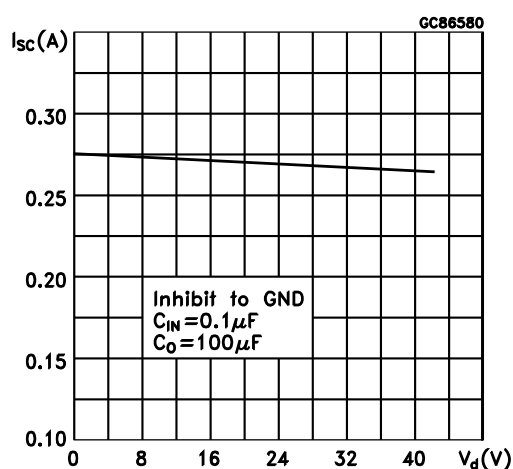
AMG110720161206MT

**Figure 13. Dropout voltage vs output current**


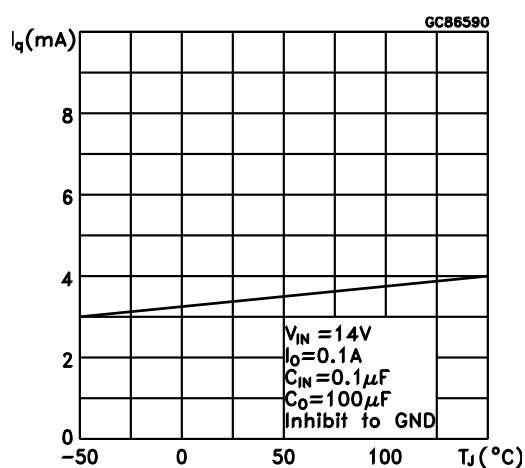
AMG110720161207MT

**Figure 14. Output voltage vs input voltage**


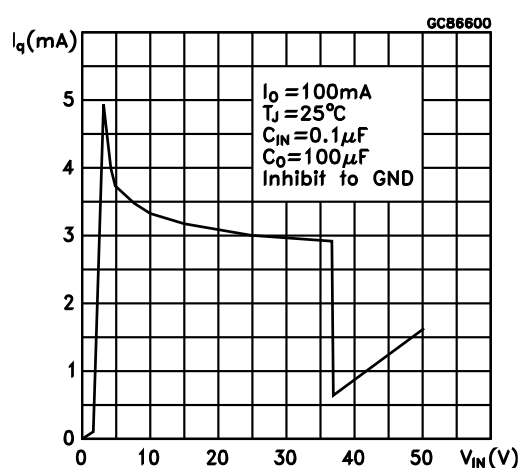
AMG110720161208MT

**Figure 15. Short circuit current vs drop voltage**


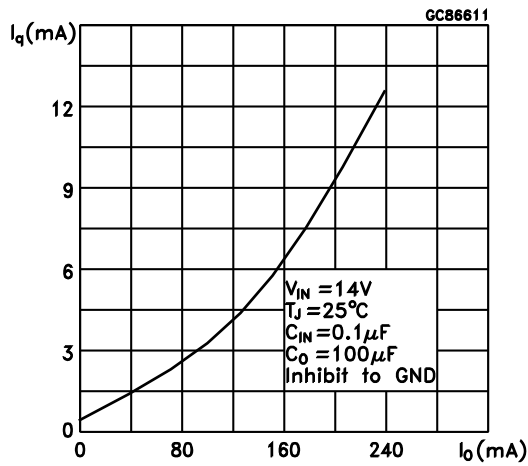
AMG110720161209MT

**Figure 16. Quiescent current vs temperature**


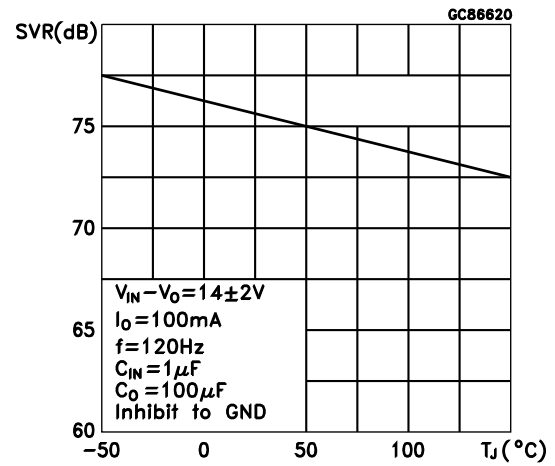
AMG110720161210MT

**Figure 17. Quiescent current vs input voltage**


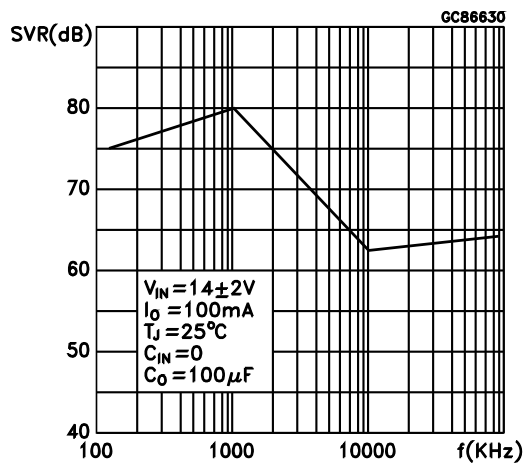
AMG110720161211MT

**Figure 18. Quiescent current vs output current**


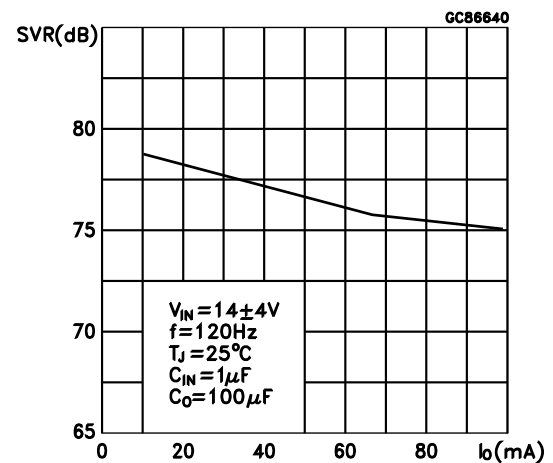
AMG110720161212MT

**Figure 19. Supply voltage rejection vs temperature**


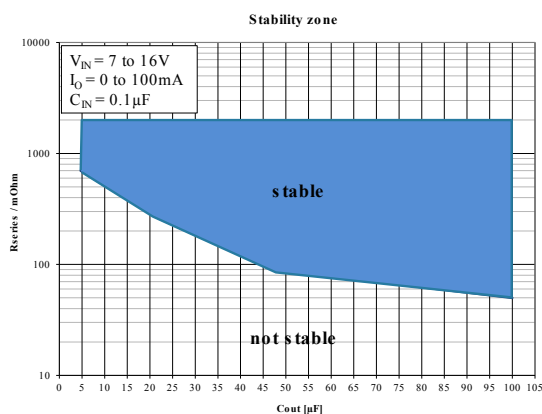
AMG110720161213MT

**Figure 20. Supply voltage rejection vs frequency**


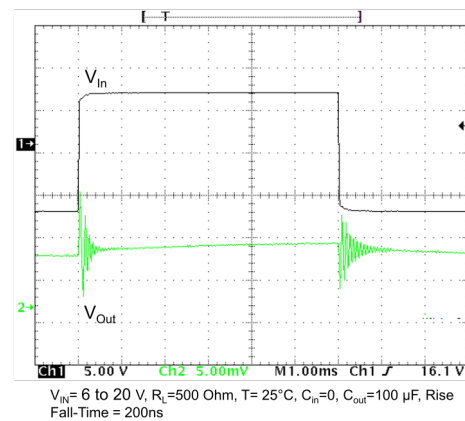
AMG110720161214MT

**Figure 21. Supply voltage rejection vs output current**


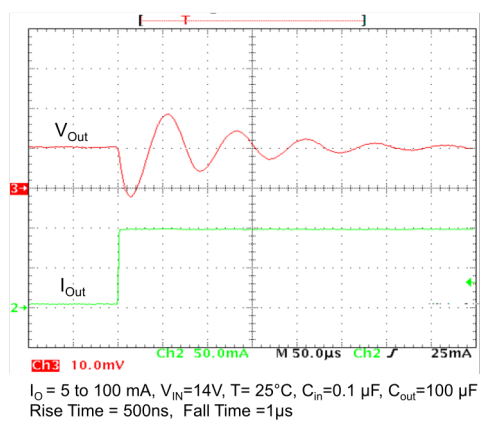
AMG110720161215MT

**Figure 22. Stability vs  $C_O$** 


AMG150320171500MT

**Figure 23. Line transient**


AMG150320171501MT

**Figure 24. Load transient**


AMG150320171502MT

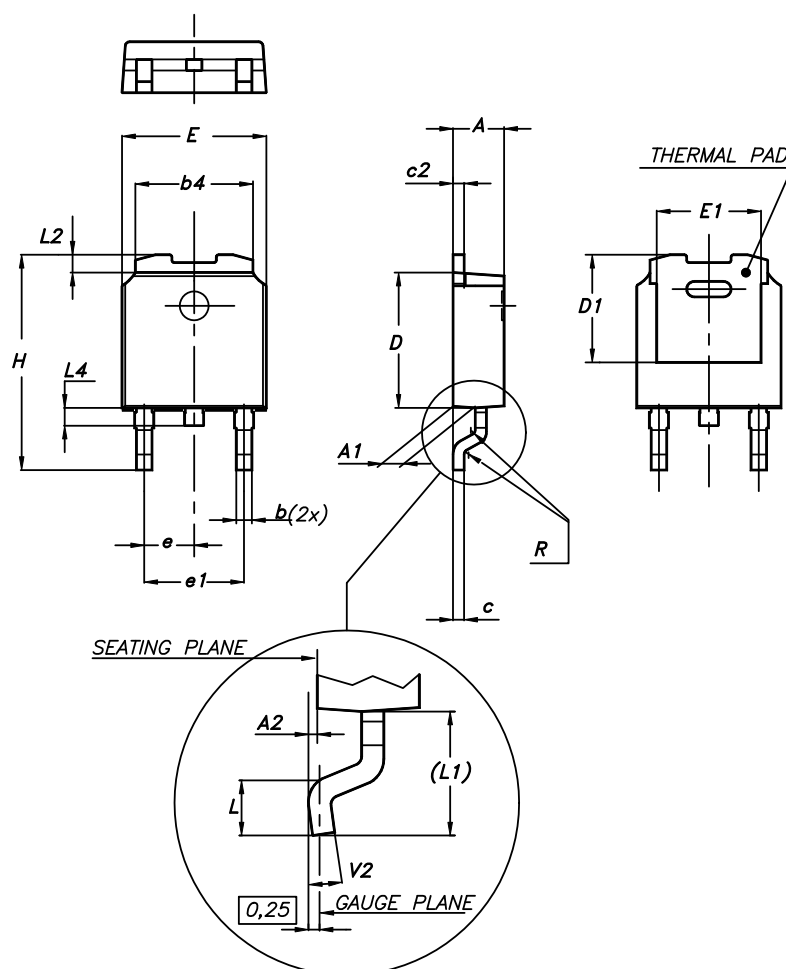
## 7 Package information

---

In order 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 DPAK package information

**Figure 25. DPAK package outline**



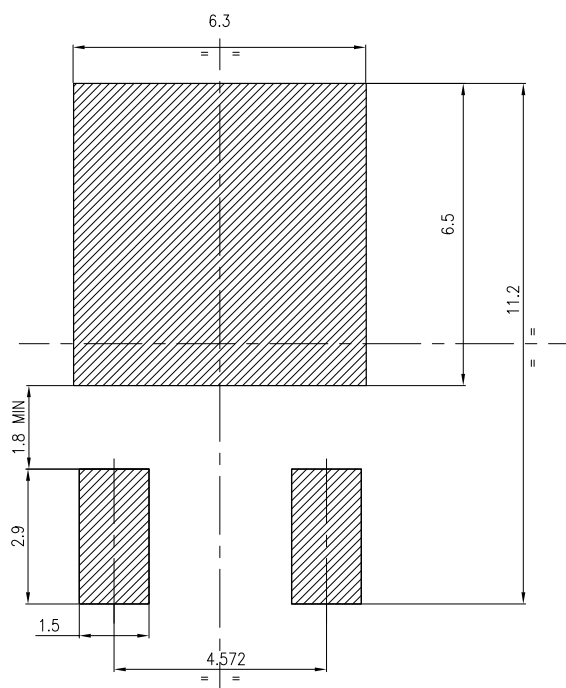
0068772\_A\_21

**Table 6. 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 |
| b4   | 5.20 |      | 5.40 |
| c    | 0.45 |      | 0.60 |
| c2   | 0.48 |      | 0.60 |
| D    | 6.00 |      | 6.20 |

| Dim. | mm   |      |       |
|------|------|------|-------|
|      | Min. | Typ. | Max.  |
| 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 26. DPAK recommended footprint (dimensions are in mm)**



FP\_0068772\_24

## 7.2 DPAK packing information

Figure 27. DPAK tape outline

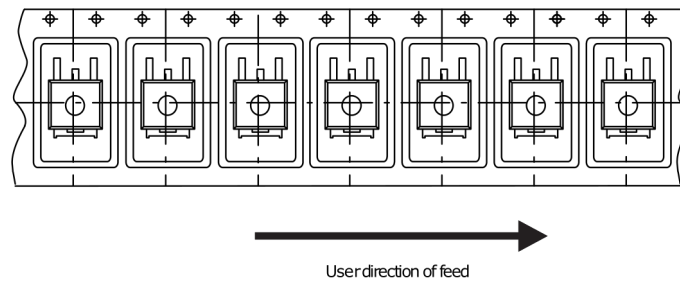
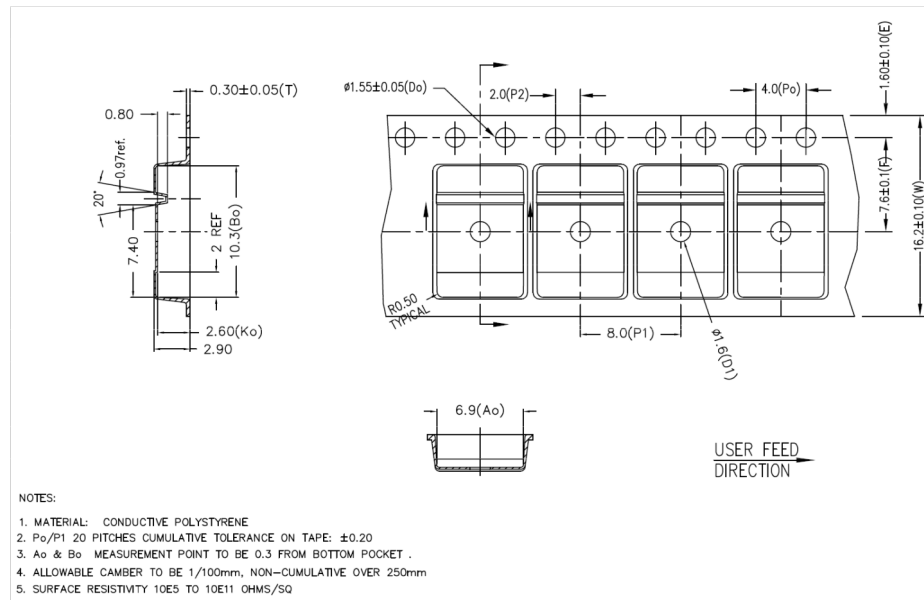
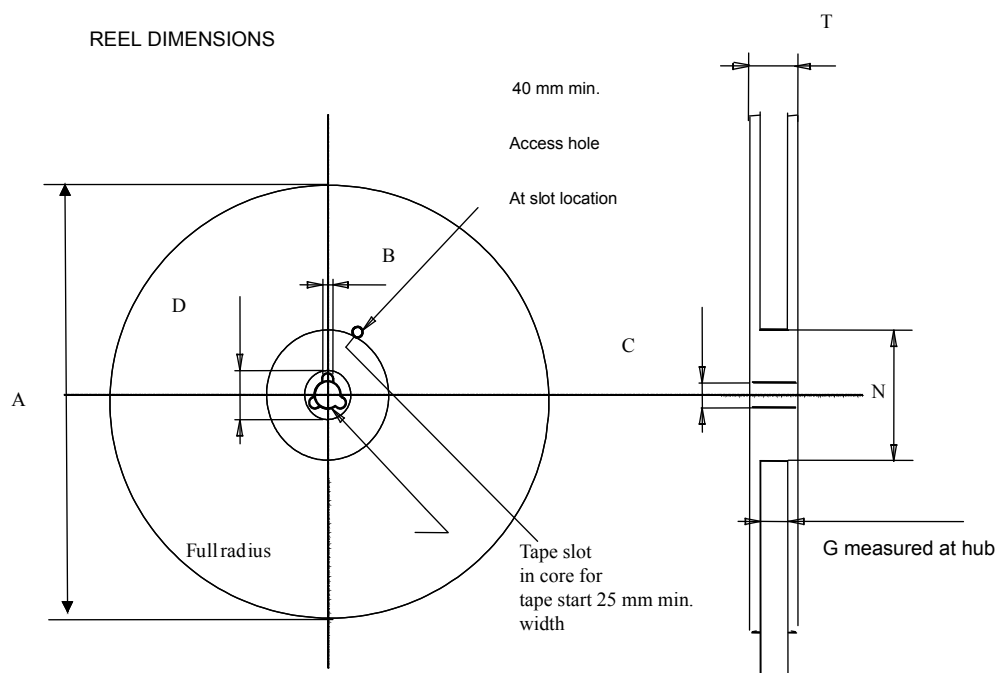


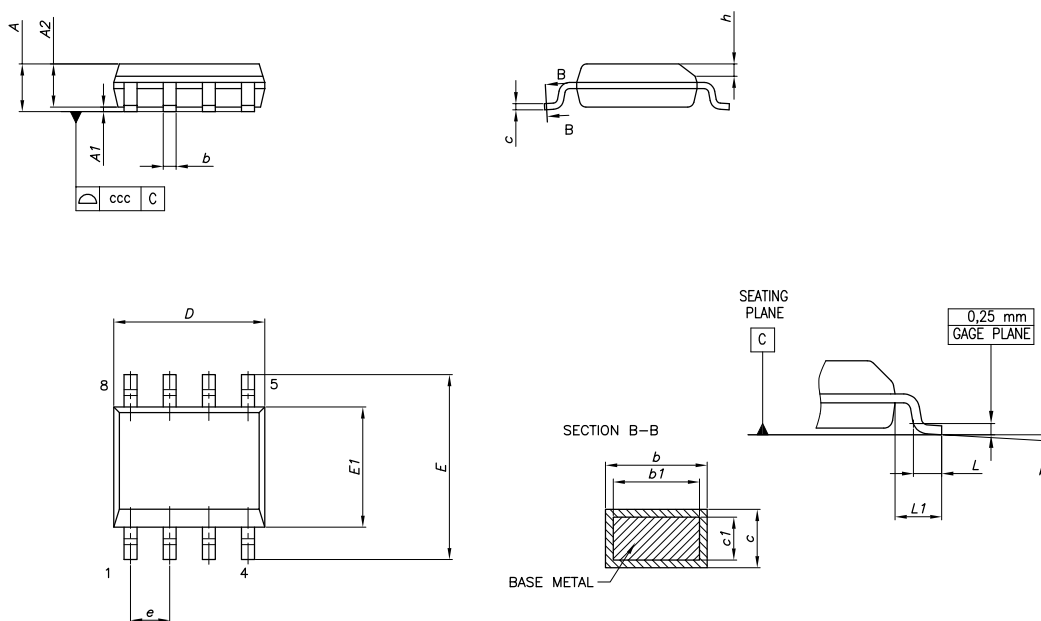


Figure 28. DPAK reel outline



### 7.3 SO8 package information

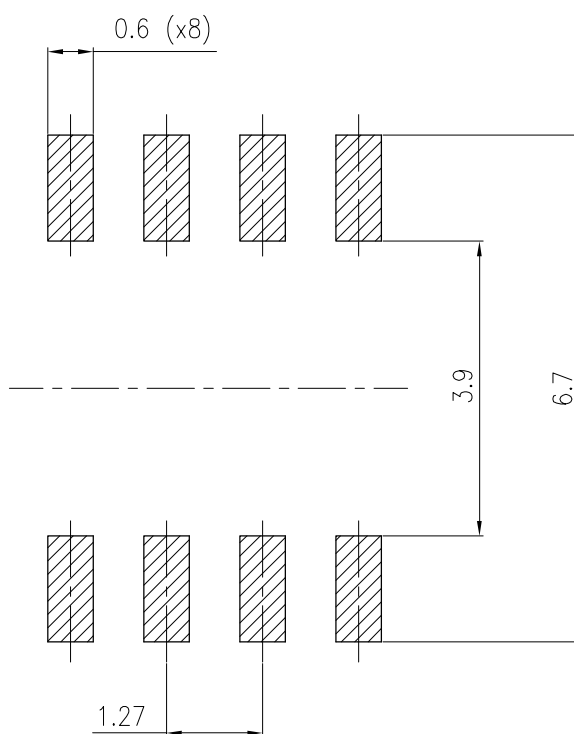
Figure 29. SO-8 package outline



0016023\_I

**Table 7. 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 30. SO-8 recommended footprint**


0016023\_I

## 7.4 SO-8 packing information

Figure 31. SO-8 tape and reel outline

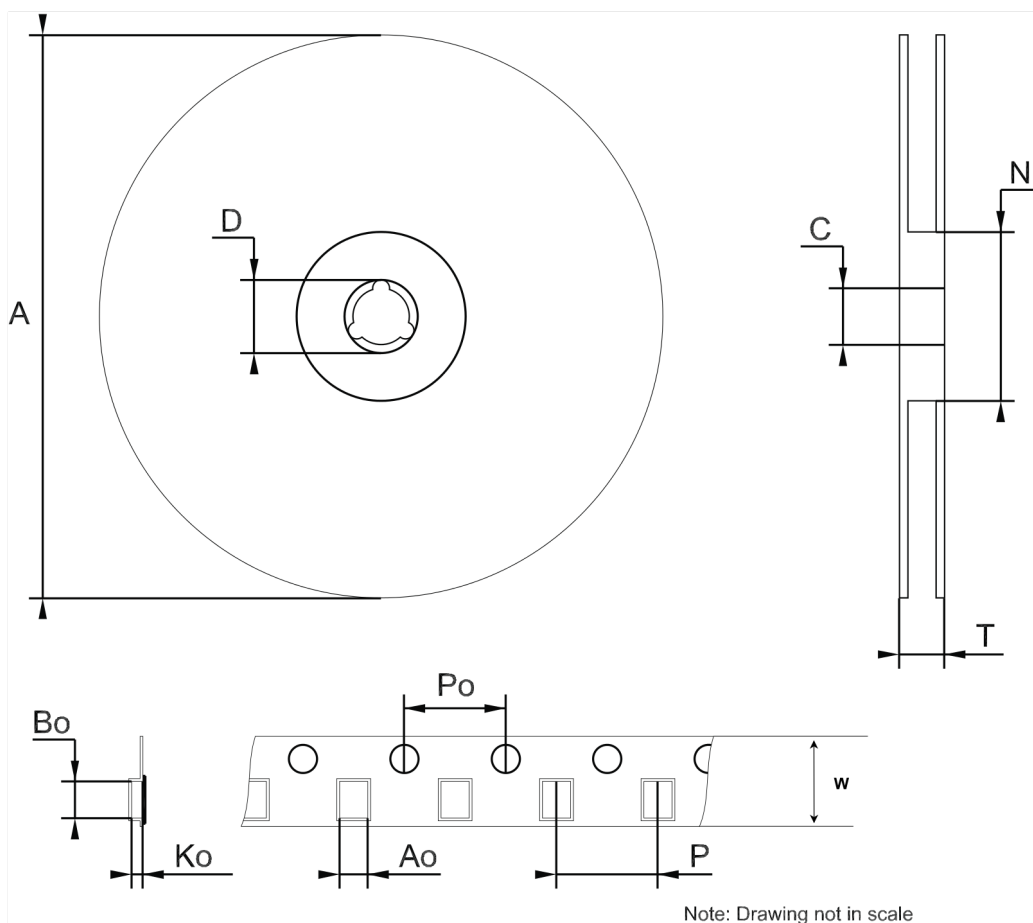
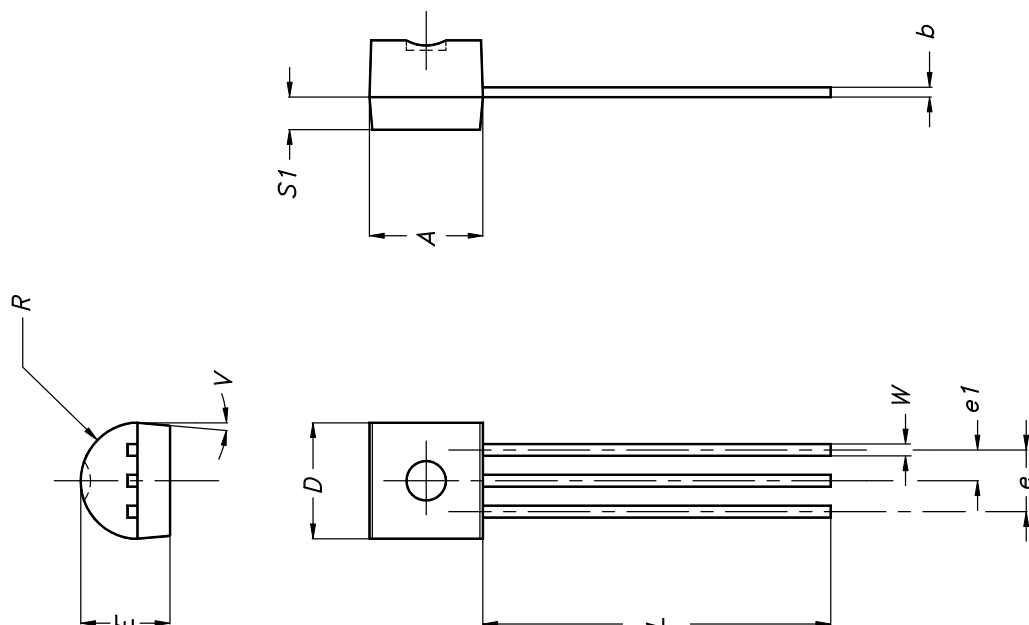


Table 8. SO-8 mechanical data

| Dim. | mm   |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| A    |      |      | 330  |
| C    | 12.8 |      | 13.2 |
| D    | 20.2 |      |      |
| N    | 50   |      |      |
| T    |      |      | 22.4 |
| Ao   | 6.4  | 6.5  | 6.6  |
| Bo   | 5.2  |      | 5.4  |
| Ko   | 2.1  |      | 2.3  |
| Po   | 3.9  |      | 4.1  |
| P    | 7.9  |      | 8.1  |
| W    | 11.7 | 12.0 | 12.3 |

## 7.5 TO-92 package information

**Figure 32. TO-92 package outline**



0102782\_E

**Table 9. 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°   |       |

## 8 Ordering informations

**Table 10. Order code**

| DPAK                         |              | TO-92 (bag) | SO-8        | Output voltages |
|------------------------------|--------------|-------------|-------------|-----------------|
| AG                           | Standard     |             |             |                 |
| LM2931ADT33RY <sup>(1)</sup> |              |             | LM2931AD33R | 3.3 V           |
| LM2931ADT50RY <sup>(1)</sup> | LM2931ADT50R | LM2931AZ50R | LM2931AD50R | 5.0 V           |
|                              |              |             | LM2931D-R   | 2.5 to 26 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 11. Document revision history**

| Date        | Revision | Changes                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 21-Jun-2004 | 12       | Document updated.                                                                                                                                                                                                                                                                                                                                                                                         |
| 16-Jun-2006 | 13       | Order codes updated.                                                                                                                                                                                                                                                                                                                                                                                      |
| 27-Jul-2007 | 14       | Added Table 1 in cover page.                                                                                                                                                                                                                                                                                                                                                                              |
| 21-Aug-2007 | 15       | Added root part number - (see Table 1).                                                                                                                                                                                                                                                                                                                                                                   |
| 22-Nov-2007 | 16       | Modified: Table 1.                                                                                                                                                                                                                                                                                                                                                                                        |
| 11-Feb-2008 | 17       | Modified: Table 1 on page 1.                                                                                                                                                                                                                                                                                                                                                                              |
| 10-Jul-2008 | 18       | Removed package TO-220, modified Table 1 on page 1.                                                                                                                                                                                                                                                                                                                                                       |
| 26-May-2010 | 19       | Modified: $V_I$ values Table 4 on page 6, Table 5 on page 7 and Table 6 on page 8.                                                                                                                                                                                                                                                                                                                        |
| 02-Nov-2011 | 20       | Modified: Figure 4 on page 6. Added: (*) ADJ pin on the Adjustable version, Not Connected in the fixed output version. on page 4 and Inhibit pin: regulator is enabled when $V_{INH} < 1.2$ V , disabled when $V_{INH} > 3.25$ V on page 6.                                                                                                                                                               |
| 09-Apr-2014 | 21       | Part numbers LM2931XX, LM2931AXX33 and LM2931AXX50 changed to LM2931. Updated the description in cover page Section 2: Pin configuration and Section 7: Package information. Added Section 8: Revision history. Minor text changes.                                                                                                                                                                       |
| 16-Mar-2017 | 22       | Updated features in cover page, removed Table 1. Device summary from cover page, Table 3: "Electrical characteristics of LM2931A33/LM2931A33Y" , Table 4: "Electrical characteristics of LM2931A50/ LM2931A50Y" and Table 5: "Electrical characteristics of LM2931 (adjustable version)".<br>Updated Section 7: "Package information".<br>Added Section 8: "Ordering information".<br>Minor text changes. |
| 23-Feb-2018 | 23       | Updated <a href="#">Figure 5. Application circuit for adjustable output.</a>                                                                                                                                                                                                                                                                                                                              |

## Contents

|          |                                        |           |
|----------|----------------------------------------|-----------|
| <b>1</b> | <b>Diagram .....</b>                   | <b>2</b>  |
| <b>2</b> | <b>Pin configuration .....</b>         | <b>3</b>  |
| <b>3</b> | <b>Maximum ratings .....</b>           | <b>4</b>  |
| <b>4</b> | <b>Application circuits .....</b>      | <b>5</b>  |
| <b>5</b> | <b>Electrical characteristics.....</b> | <b>6</b>  |
| <b>6</b> | <b>Typical characteristics .....</b>   | <b>8</b>  |
| <b>7</b> | <b>Package information.....</b>        | <b>13</b> |
| 7.1      | DPAK package information .....         | 14        |
| 7.2      | DPAK packing information .....         | 15        |
| 7.3      | SO8 package information .....          | 17        |
| 7.4      | SO-8 packing information .....         | 18        |
| 7.5      | TO-92 package information .....        | 19        |
| <b>8</b> | <b>Ordering informations .....</b>     | <b>21</b> |
|          | <b>Revision history .....</b>          | <b>22</b> |
|          | <b>Contents .....</b>                  | <b>23</b> |
|          | <b>List of tables .....</b>            | <b>24</b> |
|          | <b>List of figures.....</b>            | <b>25</b> |
|          | <b>Disclaimer.....</b>                 | <b>26</b> |

## List of tables

|                  |                                                                     |    |
|------------------|---------------------------------------------------------------------|----|
| <b>Table 1.</b>  | Absolute maximum ratings . . . . .                                  | 4  |
| <b>Table 2.</b>  | Thermal data . . . . .                                              | 4  |
| <b>Table 3.</b>  | Electrical characteristics of LM2931A33/LM2931A33Y . . . . .        | 6  |
| <b>Table 4.</b>  | Electrical characteristics of LM2931A50/ LM2931A50Y . . . . .       | 6  |
| <b>Table 5.</b>  | Electrical characteristics of LM2931 (adjustable version) . . . . . | 7  |
| <b>Table 6.</b>  | DPAK mechanical data . . . . .                                      | 14 |
| <b>Table 7.</b>  | SO-8 mechanical data . . . . .                                      | 18 |
| <b>Table 8.</b>  | SO-8 mechanical data . . . . .                                      | 19 |
| <b>Table 9.</b>  | TO-92 mechanical data . . . . .                                     | 20 |
| <b>Table 10.</b> | Order code . . . . .                                                | 21 |
| <b>Table 11.</b> | Document revision history . . . . .                                 | 22 |



## List of figures

|                   |                                                            |    |
|-------------------|------------------------------------------------------------|----|
| <b>Figure 2.</b>  | Schematic diagram . . . . .                                | 2  |
| <b>Figure 3.</b>  | Pin connections (top view) . . . . .                       | 3  |
| <b>Figure 4.</b>  | Application circuit for fixed output . . . . .             | 5  |
| <b>Figure 5.</b>  | Application circuit for adjustable output . . . . .        | 5  |
| <b>Figure 6.</b>  | Output voltage vs temperature . . . . .                    | 8  |
| <b>Figure 7.</b>  | Output voltage vs temperature . . . . .                    | 8  |
| <b>Figure 8.</b>  | Reference voltage vs temperature. . . . .                  | 8  |
| <b>Figure 9.</b>  | Line regulation vs temperature . . . . .                   | 8  |
| <b>Figure 10.</b> | Load regulation vs temperature. . . . .                    | 9  |
| <b>Figure 11.</b> | Dropout voltage vs temperature . . . . .                   | 9  |
| <b>Figure 12.</b> | Dropout voltage vs temperature . . . . .                   | 9  |
| <b>Figure 13.</b> | Dropout voltage vs output current . . . . .                | 9  |
| <b>Figure 14.</b> | Output voltage vs input voltage . . . . .                  | 10 |
| <b>Figure 15.</b> | Short circuit current vs drop voltage. . . . .             | 10 |
| <b>Figure 16.</b> | Quiescent current vs temperature . . . . .                 | 10 |
| <b>Figure 17.</b> | Quiescent current vs input voltage . . . . .               | 10 |
| <b>Figure 18.</b> | Quiescent current vs output current. . . . .               | 11 |
| <b>Figure 19.</b> | Supply voltage rejection vs temperature. . . . .           | 11 |
| <b>Figure 20.</b> | Supply voltage rejection vs frequency . . . . .            | 11 |
| <b>Figure 21.</b> | Supply voltage rejection vs output current . . . . .       | 11 |
| <b>Figure 22.</b> | Stability vs $C_O$ . . . . .                               | 11 |
| <b>Figure 23.</b> | Line transient . . . . .                                   | 11 |
| <b>Figure 24.</b> | Load transient . . . . .                                   | 12 |
| <b>Figure 25.</b> | DPAK package outline . . . . .                             | 14 |
| <b>Figure 26.</b> | DPAK recommended footprint (dimensions are in mm). . . . . | 15 |
| <b>Figure 27.</b> | DPAK tape outline. . . . .                                 | 16 |
| <b>Figure 28.</b> | DPAK reel outline . . . . .                                | 17 |
| <b>Figure 29.</b> | SO-8 package outline . . . . .                             | 17 |
| <b>Figure 30.</b> | SO-8 recommended footprint . . . . .                       | 18 |
| <b>Figure 31.</b> | SO-8 tape and reel outline . . . . .                       | 19 |
| <b>Figure 32.</b> | TO-92 package outline . . . . .                            | 20 |

**IMPORTANT NOTICE – PLEASE READ CAREFULLY**

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2018 STMicroelectronics – All rights reserved

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[STMicroelectronics:](#)

[LM2931AZ50R](#) [LM2931AD50R](#) [LM2931ADT50R](#) [LM2931D-R](#) [LM2931AD33R](#) [LM2931ADT50RY](#)  
[LM2931ADT33RY](#)