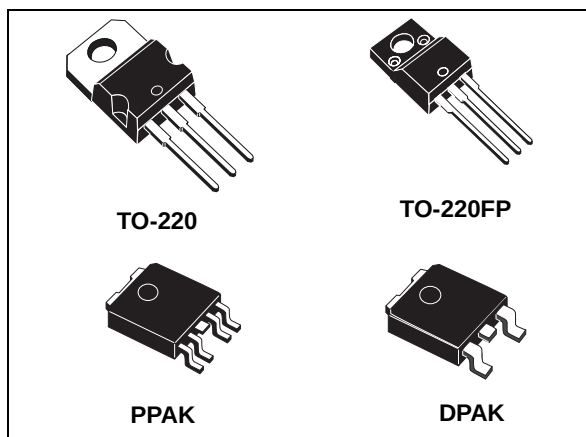


## Very low drop voltage regulator with inhibit function

Datasheet - production data



### Description

The LFXX is a very low drop regulator available in TO-220, TO-220FP, DPAK and PPAK packages and in a wide range of output voltages. The low drop voltage (0.45 V) and low quiescent current make it particularly suitable for low-noise, low-power applications and especially in battery-powered systems. In the 5 pin configuration (PPAK) a shutdown logic control function is available (pin 2, TTL compatible). This means that when the device is used as a local regulator, a part of the board can be put in standby, decreasing the total power consumption. In the three terminal configuration, the device has the same electrical performance, but it is fixed in ON state. It requires a capacitor of only 2.2  $\mu\text{F}$  for stability, saving board space and costs. The LFXX is available as automotive grade in DPAK and PPAK packages, for the options of output voltages whose commercial part numbers are shown in the 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.

### Features

- Very low-dropout voltage (0.45 V)
- Very low quiescent current (typ. 50  $\mu\text{A}$  in OFF mode, 500  $\mu\text{A}$  in ON mode)
- Output current up to 500 mA
- Logic-controlled electronic shutdown
- Output voltages of 1.5; 1.8; 2.5; 3.3; 4.7; 5; 6; 8; 8.5; 9; 12 V
- Automotive grade product: 1.8 V, 2.5 V, 3.3 V, 5.0 V, 8.0 V, 8.5 V  $V_{\text{OUT}}$  in DPAK and PPAK packages
- Internal current and thermal limit
- Only 2.2  $\mu\text{F}$  for stability
- Available in  $\pm 1\%$  (AB) or  $\pm 2\%$  (C) selection at 25 °C
- Supply voltage rejection: 80 db (typ.)
- Temperature range: from -40 to 125 °C

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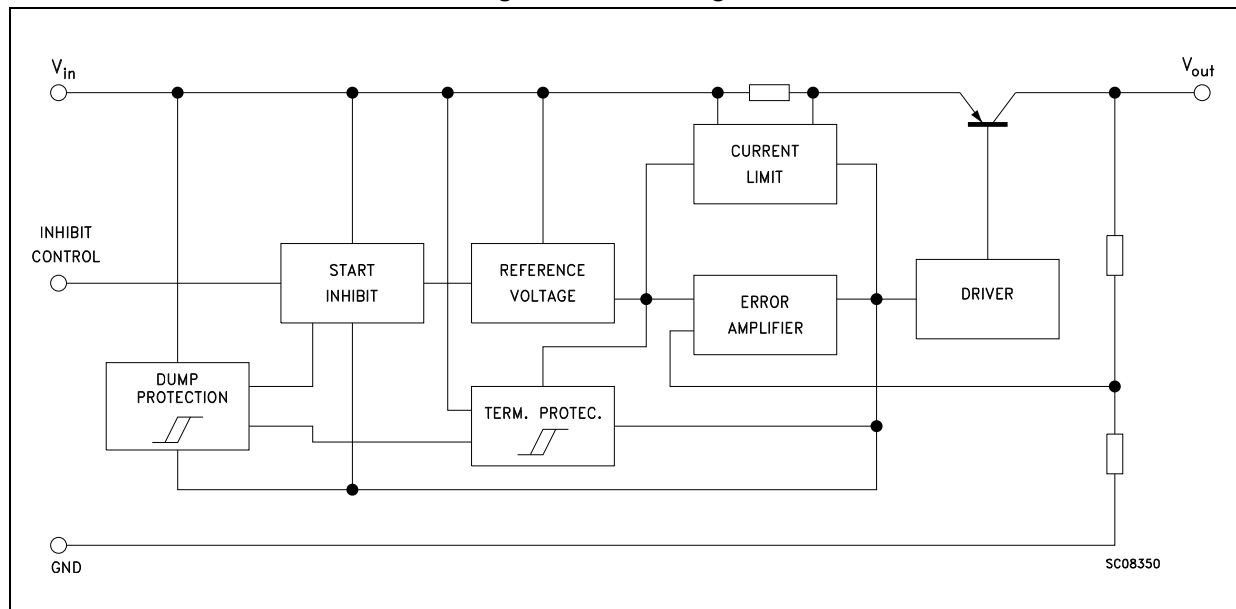
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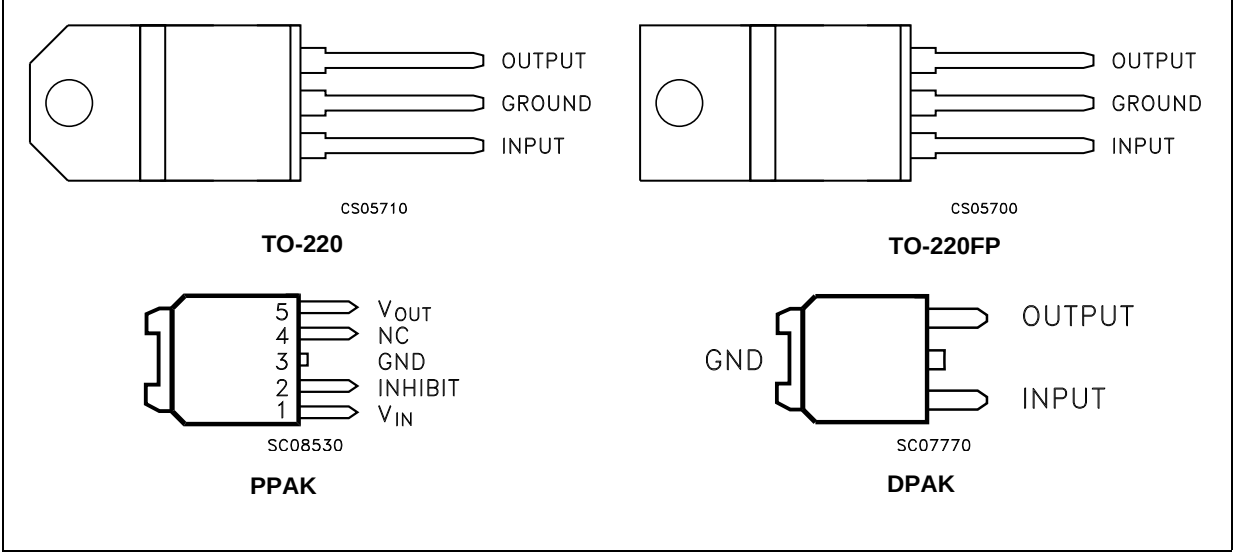
# 1 Diagram

Figure 1. Block diagram



## 2 Pin configuration

Figure 2. Pin connections (top view)



Note: TAB is electrically connected to GND on TO-220, PPAK and DPAK packages

### 3 Maximum ratings

**Table 1. Absolute maximum ratings**

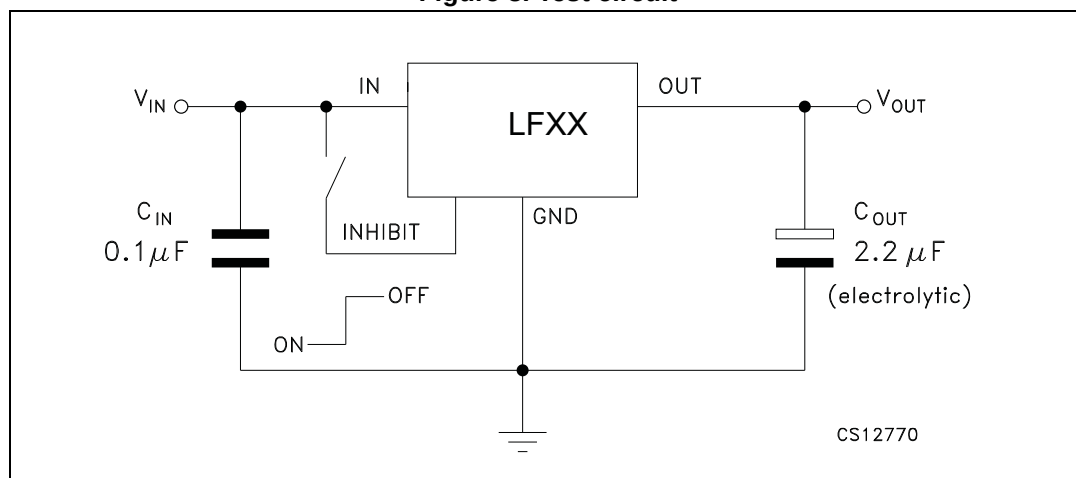
| Symbol    | Parameter                            | Value                     | Unit |
|-----------|--------------------------------------|---------------------------|------|
| $V_I$     | DC input voltage                     | -0.5 to 40 <sup>(1)</sup> | V    |
| $I_O$     | Output current                       | Internally limited        | A    |
| $P_{TOT}$ | Power dissipation                    | Internally limited        | W    |
| $T_{STG}$ | Storage temperature range            | -40 to 150                | °C   |
| $T_{OP}$  | Operating junction temperature range | -40 to 125                | °C   |

1. For  $18 < V_I < 40$  the regulator is in shutdown.

**Table 2. Thermal data**

| Symbol     | Parameter                           | TO-220 | TO-220FP | DPAK/PPAK | Unit |
|------------|-------------------------------------|--------|----------|-----------|------|
| $R_{thJC}$ | Thermal resistance junction-case    | 5      | 5        | 8         | °C/W |
| $R_{thJA}$ | Thermal resistance junction-ambient | 50     | 60       | 100       | °C/W |

**Figure 3. Test circuit**



## 4 Electrical characteristics

Refer to test circuits,  $T_J = 25\text{ °C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 3. LF15AB electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                   | Min.                | Typ. | Max.  | Unit          |
|--------------|---------------------------|-----------------------------------------------------------------------------------|---------------------|------|-------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 3.5\text{ V}$                                       | 1.485               | 1.5  | 1.515 | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 3.5\text{ V}$ , $T_a = -25\text{ to }85\text{ °C}$  | 1.470               |      | 1.530 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                             | 2.5                 |      | 16    | V             |
| $I_O$        | Output current limit      |                                                                                   |                     | 1    |       | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 2.5\text{ to }16\text{ V}$ , $I_O = 5\text{ mA}$                           |                     | 2    | 10    | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 2.8\text{ V}$ , $I_O = 5\text{ to }500\text{ mA}$                          |                     | 2    | 10    | mV            |
| $I_d$        | Quiescent current         | $V_I = 2.5\text{ to }16\text{ V}$ , $I_O = 0\text{ mA}$                           |                     | 0.5  | 1     | mA            |
|              |                           | $V_I = 2.8\text{ to }16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                      |                     |      | 12    |               |
|              |                           | $V_I = 6\text{ V}$                                                                | OFF mode            | 50   | 100   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 3.5 \pm 1\text{ V}$                                  | $f = 120\text{ Hz}$ | 82   |       | dB            |
|              |                           |                                                                                   | $f = 1\text{ kHz}$  | 77   |       |               |
|              |                           |                                                                                   | $f = 10\text{ kHz}$ | 65   |       |               |
| eN           | Output noise voltage      | $B = 10\text{ Hz to }100\text{ kHz}$                                              |                     | 50   |       | $\mu\text{V}$ |
| $V_d$        | Dropout voltage           | $I_O = 200\text{ mA}$                                                             |                     | 1    |       | 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 | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }500\text{ mA}$ | 2                   | 10   |       | $\mu\text{F}$ |

Refer to test circuits,  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 4. LF18AB electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                                | Min.                | Typ. | Max.  | Unit          |
|--------------|---------------------------|------------------------------------------------------------------------------------------------|---------------------|------|-------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 3.3\text{ V}$                                                    | 1.782               | 1.8  | 1.818 | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 3.3\text{ V}$ , $T_a = -25\text{ to }85\text{ }^{\circ}\text{C}$ | 1.764               |      | 1.836 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                          | 3                   |      | 16    | V             |
| $I_O$        | Output current limit      |                                                                                                |                     | 1    |       | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 2.8\text{ to }16\text{ V}$ , $I_O = 5\text{ mA}$                                        |                     | 2    | 12    | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 3.3\text{ V}$ , $I_O = 5\text{ to }500\text{ mA}$                                       |                     | 2    | 10    | mV            |
| $I_d$        | Quiescent current         | $V_I = 2.5\text{ to }16\text{ V}$ , $I_O = 0\text{ mA}$                                        | ON mode             | 0.5  | 1     | mA            |
|              |                           | $V_I = 3.1\text{ to }16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                   |                     |      | 12    |               |
|              |                           | $V_I = 6\text{ V}$                                                                             | OFF mode            | 50   | 100   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 3.5 \pm 1\text{ V}$                                               | $f = 120\text{ Hz}$ | 82   |       | dB            |
|              |                           |                                                                                                | $f = 1\text{ kHz}$  | 77   |       |               |
|              |                           |                                                                                                | $f = 10\text{ kHz}$ | 60   |       |               |
| eN           | Output noise voltage      | $B = 10\text{ Hz to }100\text{ kHz}$                                                           |                     | 50   |       | $\mu\text{V}$ |
| $V_d$        | Dropout voltage           | $I_O = 200\text{ mA}$                                                                          |                     | 0.7  |       | 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 | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }500\text{ mA}$              | 2                   | 10   |       | $\mu\text{F}$ |

Refer to test circuits,  $T_J = 25\text{ °C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 5. LF18C electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                   | Min.                | Typ. | Max.  | Unit          |
|--------------|---------------------------|-----------------------------------------------------------------------------------|---------------------|------|-------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 3.5\text{ V}$                                       | 1.764               | 1.8  | 1.836 | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 3.5\text{ V}$ , $T_a = -25\text{ to }85\text{ °C}$  | 1.728               |      | 1.872 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                             | 3                   |      | 16    | V             |
| $I_O$        | Output current limit      |                                                                                   |                     | 1    |       | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 2.8\text{ to }16\text{ V}$ , $I_O = 5\text{ mA}$                           |                     | 2    | 12    | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 3.3\text{ V}$ , $I_O = 5\text{ to }500\text{ mA}$                          |                     | 2    | 10    | mV            |
| $I_d$        | Quiescent current         | $V_I = 2.5\text{ to }16\text{ V}$ , $I_O = 0\text{ mA}$                           | ON mode             | 0.5  | 1     | mA            |
|              |                           | $V_I = 3.1\text{ to }16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                      |                     |      | 12    |               |
|              |                           | $V_I = 6\text{ V}$                                                                | OFF mode            | 50   | 100   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 3.5 \pm 1\text{ V}$                                  | $f = 120\text{ Hz}$ | 82   |       | dB            |
|              |                           |                                                                                   | $f = 1\text{ kHz}$  | 77   |       |               |
|              |                           |                                                                                   | $f = 10\text{ kHz}$ | 60   |       |               |
| eN           | Output noise voltage      | $B = 10\text{ Hz to }100\text{ kHz}$                                              |                     | 50   |       | $\mu\text{V}$ |
| $V_d$        | Dropout voltage           | $I_O = 200\text{ mA}$                                                             |                     | 0.7  |       | 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 | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }500\text{ mA}$ | 2                   | 10   |       | $\mu\text{F}$ |

Refer to test circuits,  $T_a = -40$  to  $125\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 6. LF18C (automotive grade) electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                        | Min.                | Typ. | Max.  | Unit          |
|--------------|---------------------------|----------------------------------------------------------------------------------------|---------------------|------|-------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 3.5\text{ V}$ , $T_a = 25\text{ }^{\circ}\text{C}$       | 1.764               | 1.8  | 1.836 | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 3.5\text{ V}$                                            | 1.713               |      | 1.887 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                  | 3                   |      | 16    | V             |
| $I_O$        | Output current limit      | $T_a = 25\text{ }^{\circ}\text{C}$                                                     |                     | 1    |       | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 2.8$ to $16\text{ V}$ , $I_O = 5\text{ mA}$                                     |                     | 2    | 15    | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 3.3\text{ V}$ , $I_O = 5$ to $500\text{ mA}$                                    |                     | 2    | 15    | mV            |
| $I_d$        | Quiescent current         | $V_I = 2.5$ to $16\text{ V}$ , $I_O = 0\text{ mA}$                                     | ON mode             | 0.5  | 2     | mA            |
|              |                           | $V_I = 3.1$ to $16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                |                     |      | 12    |               |
|              |                           | $V_I = 6\text{ V}$                                                                     | OFF mode            | 50   | 120   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 3.5 \pm 1\text{ V}$<br>$T_a = 25\text{ }^{\circ}\text{C}$ | $f = 120\text{ Hz}$ | 82   |       | dB            |
|              |                           |                                                                                        | $f = 1\text{ kHz}$  | 77   |       |               |
|              |                           |                                                                                        | $f = 10\text{ kHz}$ | 60   |       |               |
| 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           | $I_O = 200\text{ mA}$                                                                  |                     | 0.2  | 1.3   | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                  |                     | 0.4  | 1.3   |               |
| $V_{IL}$     | Control input logic low   |                                                                                        |                     |      | 0.8   | 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 | $\text{ESR} = 0.1$ to $10\text{ }\Omega$ , $I_O = 0$ to $500\text{ mA}$                | 2                   | 10   |       | $\mu\text{F}$ |

Refer to test circuits,  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

Table 7. LF25AB electrical characteristics

| Symbol       | Parameter                 | Test conditions                                                                                | Min.                | Typ. | Max.  | Unit          |
|--------------|---------------------------|------------------------------------------------------------------------------------------------|---------------------|------|-------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 4.5\text{ V}$                                                    | 2.475               | 2.5  | 2.525 | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 4.5\text{ V}$ , $T_a = -25\text{ to }85\text{ }^{\circ}\text{C}$ | 2.450               |      | 2.550 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                          |                     |      | 16    | V             |
| $I_O$        | Output current limit      |                                                                                                |                     | 1    |       | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 3.5\text{ to }16\text{ V}$ , $I_O = 5\text{ mA}$                                        |                     | 2    | 12    | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 3.8\text{ V}$ , $I_O = 5\text{ to }500\text{ mA}$                                       |                     | 2    | 12    | mV            |
| $I_d$        | Quiescent current         | $V_I = 3.5\text{ to }16\text{ V}$ , $I_O = 0\text{ mA}$                                        | ON mode             | 0.5  | 1     | mA            |
|              |                           | $V_I = 3.8\text{ to }16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                   |                     |      | 12    |               |
|              |                           | $V_I = 6\text{ V}$                                                                             | OFF mode            | 50   | 100   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 4.5 \pm 1\text{ V}$                                               | $f = 120\text{ Hz}$ | 82   |       | dB            |
|              |                           |                                                                                                | $f = 1\text{ kHz}$  | 77   |       |               |
|              |                           |                                                                                                | $f = 10\text{ kHz}$ | 65   |       |               |
| eN           | Output noise voltage      | $B = 10\text{ Hz to }100\text{ kHz}$                                                           |                     | 50   |       | $\mu\text{V}$ |
| $V_d$        | Dropout voltage           | $I_O = 200\text{ mA}$                                                                          |                     | 0.2  | 0.35  | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                          |                     | 0.4  | 0.7   |               |
| $V_{IL}$     | 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 | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }500\text{ mA}$              | 2                   | 10   |       | $\mu\text{F}$ |

Refer to test circuits,  $T_a = -40$  to  $125\text{ }^{\circ}\text{C}$ ,  $C_1 = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 8. LF25AB (automotive grade) electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                        | Min.                | Typ. | Max.  | Unit          |
|--------------|---------------------------|----------------------------------------------------------------------------------------|---------------------|------|-------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 4.5\text{ V}$ , $T_a = 25\text{ }^{\circ}\text{C}$       | 2.475               | 2.5  | 2.525 | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 4.5\text{ V}$                                            | 2.435               |      | 2.565 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                  |                     |      | 16    | V             |
| $I_O$        | Output current limit      | $T_a = 25\text{ }^{\circ}\text{C}$                                                     |                     | 1    |       | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 3.5$ to $16\text{ V}$ , $I_O = 5\text{ mA}$                                     |                     | 2    | 15    | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 3.8\text{ V}$ , $I_O = 5$ to $500\text{ mA}$                                    |                     | 2    | 15    | mV            |
| $I_d$        | Quiescent current         | $V_I = 3.5$ to $16\text{ V}$ , $I_O = 0\text{ mA}$                                     | ON mode             | 0.5  | 2     | mA            |
|              |                           | $V_I = 3.8$ to $16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                |                     |      | 12    |               |
|              |                           | $V_I = 6\text{ V}$                                                                     | OFF mode            | 50   | 120   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 4.5 \pm 1\text{ V}$<br>$T_a = 25\text{ }^{\circ}\text{C}$ | $f = 120\text{ Hz}$ | 82   |       | dB            |
|              |                           |                                                                                        | $f = 1\text{ kHz}$  | 77   |       |               |
|              |                           |                                                                                        | $f = 10\text{ kHz}$ | 65   |       |               |
| 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           | $I_O = 200\text{ mA}$                                                                  |                     | 0.2  | 1.3   | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                  |                     | 0.4  | 1.3   |               |
| $V_{IL}$     | Control input logic low   |                                                                                        |                     |      | 0.8   | 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 | $\text{ESR} = 0.1$ to $10\text{ }\Omega$ , $I_O = 0$ to $500\text{ mA}$                | 2                   | 10   |       | $\mu\text{F}$ |

Refer to test circuits,  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

Table 9. LF25C electrical characteristics

| Symbol       | Parameter                 | Test conditions                                                                                | Min.                | Typ. | Max. | Unit          |
|--------------|---------------------------|------------------------------------------------------------------------------------------------|---------------------|------|------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 4.5\text{ V}$                                                    | 2.45                | 2.5  | 2.55 | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 4.5\text{ V}$ , $T_a = -25\text{ to }85\text{ }^{\circ}\text{C}$ | 2.4                 |      | 2.6  |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                          |                     |      | 16   | V             |
| $I_O$        | Output current limit      |                                                                                                |                     | 1    |      | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 3.5\text{ to }16\text{ V}$ , $I_O = 5\text{ mA}$                                        |                     | 2    | 12   | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 3.8\text{ V}$ , $I_O = 5\text{ to }500\text{ mA}$                                       |                     | 2    | 12   | mV            |
| $I_d$        | Quiescent current         | $V_I = 3.5\text{ to }16\text{ V}$ , $I_O = 0\text{ mA}$                                        | ON mode             | 0.5  | 1    | mA            |
|              |                           | $V_I = 3.8\text{ to }16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                   |                     |      | 12   |               |
|              |                           | $V_I = 6\text{ V}$                                                                             | OFF mode            | 50   | 100  | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 4.5 \pm 1\text{ V}$                                               | $f = 120\text{ Hz}$ | 82   |      | dB            |
|              |                           |                                                                                                | $f = 1\text{ kHz}$  | 77   |      |               |
|              |                           |                                                                                                | $f = 10\text{ kHz}$ | 65   |      |               |
| eN           | Output noise voltage      | $B = 10\text{ Hz to }100\text{ kHz}$                                                           |                     | 50   |      | $\mu\text{V}$ |
| $V_d$        | Dropout voltage           | $I_O = 200\text{ mA}$                                                                          |                     | 0.2  | 0.35 | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                          |                     | 0.4  | 0.7  |               |
| $V_{IL}$     | 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 | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }500\text{ mA}$              | 2                   | 10   |      | $\mu\text{F}$ |

Refer to test circuits,  $T_a = -40$  to  $125\text{ }^{\circ}\text{C}$ ,  $C_1 = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 10. LF25C (automotive grade) electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                        | Min.                | Typ. | Max.  | Unit          |
|--------------|---------------------------|----------------------------------------------------------------------------------------|---------------------|------|-------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 4.5\text{ V}$ , $T_a = 25\text{ }^{\circ}\text{C}$       | 2.45                | 2.5  | 2.55  | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 4.5\text{ V}$                                            | 2.385               |      | 2.615 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                  |                     |      | 16    | V             |
| $I_O$        | Output current limit      | $T_a = 25\text{ }^{\circ}\text{C}$                                                     |                     | 1    |       | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 3.5$ to $16\text{ V}$ , $I_O = 5\text{ mA}$                                     |                     | 2    | 15    | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 3.8\text{ V}$ , $I_O = 5$ to $500\text{ mA}$                                    |                     | 2    | 15    | mV            |
| $I_d$        | Quiescent current         | $V_I = 3.5$ to $16\text{ V}$ , $I_O = 0\text{ mA}$                                     | ON mode             | 0.5  | 2     | mA            |
|              |                           | $V_I = 3.8$ to $16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                |                     |      | 12    |               |
|              |                           | $V_I = 6\text{ V}$                                                                     | OFF mode            | 50   | 120   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 4.5 \pm 1\text{ V}$<br>$T_a = 25\text{ }^{\circ}\text{C}$ | $f = 120\text{ Hz}$ | 82   |       | dB            |
|              |                           |                                                                                        | $f = 1\text{ kHz}$  | 77   |       |               |
|              |                           |                                                                                        | $f = 10\text{ kHz}$ | 65   |       |               |
| 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           | $I_O = 200\text{ mA}$                                                                  |                     | 0.2  | 1.3   | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                  |                     | 0.4  | 1.3   |               |
| $V_{IL}$     | Control input logic low   |                                                                                        |                     |      | 0.8   | 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 | $\text{ESR} = 0.1$ to $10\text{ }\Omega$ , $I_O = 0$ to $500\text{ mA}$                | 2                   | 10   |       | $\mu\text{F}$ |

Refer to test circuits,  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 11. LF33AB electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                                | Min.                | Typ. | Max.  | Unit          |
|--------------|---------------------------|------------------------------------------------------------------------------------------------|---------------------|------|-------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 5.3\text{ V}$                                                    | 3.267               | 3.3  | 3.333 | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 5.3\text{ V}$ , $T_a = -25\text{ to }85\text{ }^{\circ}\text{C}$ | 3.234               |      | 3.366 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                          |                     |      | 16    | V             |
| $I_O$        | Output current limit      |                                                                                                |                     | 1    |       | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 4.3\text{ to }16\text{ V}$ , $I_O = 5\text{ mA}$                                        |                     | 3    | 16    | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 4.6\text{ V}$ , $I_O = 5\text{ to }500\text{ mA}$                                       |                     | 3    | 16    | mV            |
| $I_d$        | Quiescent current         | $V_I = 4.3\text{ to }16\text{ V}$ , $I_O = 0\text{ mA}$                                        | ON mode             | 0.5  | 1     | mA            |
|              |                           | $V_I = 4.6\text{ to }16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                   |                     |      | 12    |               |
|              |                           | $V_I = 6\text{ V}$                                                                             | OFF mode            | 50   | 100   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 5.3 \pm 1\text{ V}$                                               | $f = 120\text{ Hz}$ | 80   |       | dB            |
|              |                           |                                                                                                | $f = 1\text{ kHz}$  | 75   |       |               |
|              |                           |                                                                                                | $f = 10\text{ kHz}$ | 65   |       |               |
| eN           | Output noise voltage      | $B = 10\text{ Hz to }100\text{ kHz}$                                                           |                     | 50   |       | $\mu\text{V}$ |
| $V_d$        | Dropout voltage           | $I_O = 200\text{ mA}$                                                                          |                     | 0.2  | 0.35  | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                          |                     | 0.4  | 0.7   |               |
| $V_{IL}$     | 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 | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }500\text{ mA}$              | 2                   | 10   |       | $\mu\text{F}$ |

Refer to test circuits,  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 12. LF33C electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                                | Min.                | Typ. | Max.  | Unit          |
|--------------|---------------------------|------------------------------------------------------------------------------------------------|---------------------|------|-------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 5.3\text{ V}$                                                    | 3.234               | 3.3  | 3.366 | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 5.3\text{ V}$ , $T_a = -25\text{ to }85\text{ }^{\circ}\text{C}$ | 3.168               |      | 3.432 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                          |                     |      | 16    | V             |
| $I_O$        | Output current limit      |                                                                                                |                     | 1    |       | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 4.3\text{ to }16\text{ V}$ , $I_O = 5\text{ mA}$                                        |                     | 3    | 16    | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 4.6\text{ V}$ , $I_O = 5\text{ to }500\text{ mA}$                                       |                     | 3    | 16    | mV            |
| $I_d$        | Quiescent current         | $V_I = 4.3\text{ to }16\text{ V}$ , $I_O = 0\text{ mA}$                                        | ON mode             | 0.5  | 1     | mA            |
|              |                           | $V_I = 4.6\text{ to }16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                   |                     |      | 12    |               |
|              |                           | $V_I = 6\text{ V}$                                                                             | OFF mode            | 50   | 100   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 5.3 \pm 1\text{ V}$                                               | $f = 120\text{ Hz}$ | 80   |       | dB            |
|              |                           |                                                                                                | $f = 1\text{ kHz}$  | 75   |       |               |
|              |                           |                                                                                                | $f = 10\text{ kHz}$ | 65   |       |               |
| eN           | Output noise voltage      | $B = 10\text{ Hz to }100\text{ kHz}$                                                           |                     | 50   |       | $\mu\text{V}$ |
| $V_d$        | Dropout voltage           | $I_O = 200\text{ mA}$                                                                          |                     | 0.2  | 0.35  | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                          |                     | 0.4  | 0.7   |               |
| $V_{IL}$     | 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 | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }500\text{ mA}$              | 2                   | 10   |       | $\mu\text{F}$ |

Refer to test circuits,  $T_a = -40$  to  $125\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 13. LF33C (automotive grade) electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                        | Min.                | Typ. | Max.  | Unit          |
|--------------|---------------------------|----------------------------------------------------------------------------------------|---------------------|------|-------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 5.3\text{ V}$ , $T_a = 25\text{ }^{\circ}\text{C}$       | 3.234               | 3.3  | 3.366 | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 5.3\text{ V}$ ,                                          | 3.153               |      | 3.447 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                  |                     |      | 16    | V             |
| $I_O$        | Output current limit      | $T_a = 25\text{ }^{\circ}\text{C}$                                                     |                     | 1    |       | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 4.3$ to $16\text{ V}$ , $I_O = 5\text{ mA}$                                     |                     | 3    | 19    | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 4.6\text{ V}$ , $I_O = 5$ to $500\text{ mA}$                                    |                     | 3    | 19    | mV            |
| $I_d$        | Quiescent current         | $V_I = 4.3$ to $16\text{ V}$ , $I_O = 0\text{ mA}$                                     | ON mode             | 0.5  | 2     | mA            |
|              |                           | $V_I = 4.6$ to $16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                |                     |      | 12    |               |
|              |                           | $V_I = 6\text{ V}$                                                                     | OFF mode            | 50   | 120   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 5.3 \pm 1\text{ V}$<br>$T_a = 25\text{ }^{\circ}\text{C}$ | $f = 120\text{ Hz}$ | 80   |       | dB            |
|              |                           |                                                                                        | $f = 1\text{ kHz}$  | 75   |       |               |
|              |                           |                                                                                        | $f = 10\text{ kHz}$ | 65   |       |               |
| 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           | $I_O = 200\text{ mA}$                                                                  |                     | 0.2  | 1.3   | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                  |                     | 0.4  | 1.3   |               |
| $V_{IL}$     | Control input logic low   |                                                                                        |                     |      | 0.8   | 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 | $\text{ESR} = 0.1$ to $10\text{ }\Omega$ , $I_O = 0$ to $500\text{ mA}$                | 2                   | 10   |       | $\mu\text{F}$ |

Refer to test circuits,  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 14. LF50AB electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                              | Min.                | Typ. | Max. | Unit          |
|--------------|---------------------------|----------------------------------------------------------------------------------------------|---------------------|------|------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 7\text{ V}$                                                    | 4.95                | 5    | 5.05 | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 7\text{ V}$ , $T_a = -25\text{ to }85\text{ }^{\circ}\text{C}$ | 4.9                 |      | 5.1  |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                        |                     |      | 16   | V             |
| $I_O$        | Output current limit      |                                                                                              |                     | 1    |      | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 6\text{ to }16\text{ V}$ , $I_O = 5\text{ mA}$                                        |                     | 5    | 25   | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 6.3\text{ V}$ , $I_O = 5\text{ to }500\text{ mA}$                                     |                     | 5    | 25   | mV            |
| $I_d$        | Quiescent current         | $V_I = 6\text{ to }16\text{ V}$ , $I_O = 0\text{ mA}$                                        | ON mode             | 0.5  | 1    | mA            |
|              |                           | $V_I = 6.3\text{ to }16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                 |                     |      | 12   |               |
|              |                           | $V_I = 6\text{ V}$                                                                           | OFF mode            | 50   | 100  | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 7 \pm 1\text{ V}$                                               | $f = 120\text{ Hz}$ | 76   |      | dB            |
|              |                           |                                                                                              | $f = 1\text{ kHz}$  | 71   |      |               |
|              |                           |                                                                                              | $f = 10\text{ kHz}$ | 60   |      |               |
| eN           | Output noise voltage      | $B = 10\text{ Hz to }100\text{ kHz}$                                                         |                     | 50   |      | $\mu\text{V}$ |
| $V_d$        | Dropout voltage           | $I_O = 200\text{ mA}$                                                                        |                     | 0.2  | 0.35 | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                        |                     | 0.4  | 0.7  |               |
| $V_{IL}$     | 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 | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }500\text{ mA}$            | 2                   | 10   |      | $\mu\text{F}$ |

Refer to test circuits,  $T_a = -40$  to  $125\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 15. LF50AB (automotive grade) electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                      | Min.                | Typ. | Max.  | Unit          |
|--------------|---------------------------|--------------------------------------------------------------------------------------|---------------------|------|-------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 7\text{ V}$ , $T_a = 25\text{ }^{\circ}\text{C}$       | 4.95                | 5    | 5.05  | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 7\text{ V}$                                            | 4.885               |      | 5.115 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                |                     |      | 16    | V             |
| $I_O$        | Output current limit      | $T_a = 25\text{ }^{\circ}\text{C}$                                                   |                     | 1    |       | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 6$ to $16\text{ V}$ , $I_O = 5\text{ mA}$                                     |                     | 5    | 28    | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 6.3\text{ V}$ , $I_O = 5$ to $500\text{ mA}$                                  |                     | 5    | 28    | mV            |
| $I_d$        | Quiescent current         | $V_I = 6$ to $16\text{ V}$ , $I_O = 0\text{ mA}$                                     | ON mode             | 0.5  | 2     | mA            |
|              |                           | $V_I = 6.3$ to $16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                              |                     |      | 12    |               |
|              |                           | $V_I = 6\text{ V}$                                                                   | OFF mode            | 50   | 120   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 7 \pm 1\text{ V}$<br>$T_a = 25\text{ }^{\circ}\text{C}$ | $f = 120\text{ Hz}$ | 76   |       | dB            |
|              |                           |                                                                                      | $f = 1\text{ kHz}$  | 71   |       |               |
|              |                           |                                                                                      | $f = 10\text{ kHz}$ | 60   |       |               |
| 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           | $I_O = 200\text{ mA}$                                                                |                     | 0.2  | 1.3   | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                |                     | 0.4  | 1.3   |               |
| $V_{IL}$     | Control input logic low   |                                                                                      |                     |      | 0.8   | 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 | $\text{ESR} = 0.1$ to $10\text{ }\Omega$ , $I_O = 0$ to $500\text{ mA}$              | 2                   | 10   |       | $\mu\text{F}$ |

Refer to test circuits,  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 16. LF50C electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                              | Min.                | Typ. | Max. | Unit          |
|--------------|---------------------------|----------------------------------------------------------------------------------------------|---------------------|------|------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 7\text{ V}$                                                    | 4.9                 | 5    | 5.1  | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 7\text{ V}$ , $T_a = -25\text{ to }85\text{ }^{\circ}\text{C}$ | 4.8                 |      | 5.2  |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                        |                     |      | 16   | V             |
| $I_O$        | Output current limit      |                                                                                              |                     | 1    |      | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 6\text{ to }16\text{ V}$ , $I_O = 5\text{ mA}$                                        |                     | 5    | 25   | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 6.3\text{ V}$ , $I_O = 5\text{ to }500\text{ mA}$                                     |                     | 5    | 25   | mV            |
| $I_d$        | Quiescent current         | $V_I = 6\text{ to }16\text{ V}$ , $I_O = 0\text{ mA}$                                        | ON mode             | 0.5  | 1    | mA            |
|              |                           | $V_I = 6.3\text{ to }16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                 |                     |      | 12   |               |
|              |                           | $V_I = 6\text{ V}$                                                                           | OFF mode            | 50   | 100  | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 7 \pm 1\text{ V}$                                               | $f = 120\text{ Hz}$ | 76   |      | dB            |
|              |                           |                                                                                              | $f = 1\text{ kHz}$  | 71   |      |               |
|              |                           |                                                                                              | $f = 10\text{ kHz}$ | 60   |      |               |
| eN           | Output noise voltage      | $B = 10\text{ Hz to }100\text{ kHz}$                                                         |                     | 50   |      | $\mu\text{V}$ |
| $V_d$        | Dropout voltage           | $I_O = 200\text{ mA}$                                                                        |                     | 0.2  | 0.35 | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                        |                     | 0.4  | 0.7  |               |
| $V_{IL}$     | 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 | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }500\text{ mA}$            | 2                   | 10   |      | $\mu\text{F}$ |

Refer to test circuits,  $T_a = -40$  to  $125\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 17. LF50C (automotive grade) electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                      | Min.                | Typ. | Max.  | Unit          |
|--------------|---------------------------|--------------------------------------------------------------------------------------|---------------------|------|-------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 7\text{ V}$ , $T_a = 25\text{ }^{\circ}\text{C}$       | 4.9                 | 5    | 5.1   | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 7\text{ V}$                                            | 4.785               |      | 5.215 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                |                     |      | 16    | V             |
| $I_O$        | Output current limit      | $T_a = 25\text{ }^{\circ}\text{C}$                                                   |                     | 1    |       | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 6$ to $16\text{ V}$ , $I_O = 5\text{ mA}$                                     |                     | 5    | 28    | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 6.3\text{ V}$ , $I_O = 5$ to $500\text{ mA}$                                  |                     | 5    | 28    | mV            |
| $I_d$        | Quiescent current         | $V_I = 6$ to $16\text{ V}$ , $I_O = 0\text{ mA}$                                     | ON mode             | 0.5  | 2     | mA            |
|              |                           | $V_I = 6.3$ to $16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                              |                     |      | 12    |               |
|              |                           | $V_I = 6\text{ V}$                                                                   | OFF mode            | 50   | 120   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 7 \pm 1\text{ V}$<br>$T_a = 25\text{ }^{\circ}\text{C}$ | $f = 120\text{ Hz}$ | 76   |       | dB            |
|              |                           |                                                                                      | $f = 1\text{ kHz}$  | 71   |       |               |
|              |                           |                                                                                      | $f = 10\text{ kHz}$ | 60   |       |               |
| 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           | $I_O = 200\text{ mA}$                                                                |                     | 0.2  | 1.3   | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                |                     | 0.4  | 1.3   |               |
| $V_{IL}$     | Control input logic low   |                                                                                      |                     |      | 0.8   | 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 | $\text{ESR} = 0.1$ to $10\text{ }\Omega$ , $I_O = 0$ to $500\text{ mA}$              | 2                   | 10   |       | $\mu\text{F}$ |

Refer to test circuits,  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 18. LF60AB electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                              | Min.                | Typ. | Max. | Unit          |
|--------------|---------------------------|----------------------------------------------------------------------------------------------|---------------------|------|------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 8\text{ V}$                                                    | 5.94                | 6    | 6.06 | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 8\text{ V}$ , $T_a = -25\text{ to }85\text{ }^{\circ}\text{C}$ | 5.88                |      | 6.12 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                        |                     |      | 16   | V             |
| $I_O$        | Output current limit      |                                                                                              |                     | 1    |      | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 7\text{ to }16\text{ V}$ , $I_O = 5\text{ mA}$                                        |                     | 6    | 30   | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 7.3\text{ V}$ , $I_O = 5\text{ to }500\text{ mA}$                                     |                     | 6    | 30   | mV            |
| $I_d$        | Quiescent current         | $V_I = 7\text{ to }16\text{ V}$ , $I_O = 0\text{ mA}$                                        | ON mode             | 0.7  | 1.5  | mA            |
|              |                           | $V_I = 7.3\text{ to }16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                 |                     |      | 12   |               |
|              |                           | $V_I = 9\text{ V}$                                                                           | OFF mode            | 70   | 140  | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 8 \pm 1\text{ V}$                                               | $f = 120\text{ Hz}$ | 75   |      | dB            |
|              |                           |                                                                                              | $f = 1\text{ kHz}$  | 70   |      |               |
|              |                           |                                                                                              | $f = 10\text{ kHz}$ | 60   |      |               |
| eN           | Output noise voltage      | $B = 10\text{ Hz to }100\text{ kHz}$                                                         |                     | 50   |      | $\mu\text{V}$ |
| $V_d$        | Dropout voltage           | $I_O = 200\text{ mA}$                                                                        |                     | 0.2  | 0.35 | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                        |                     | 0.4  | 0.7  |               |
| $V_{IL}$     | 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     | $V_I = 9\text{ V}$ , $V_C = 6\text{ V}$                                                      |                     | 10   |      | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }500\text{ mA}$            | 2                   | 10   |      | $\mu\text{F}$ |

Refer to test circuits,  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 19. LF60C electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                              | Min.                | Typ. | Max. | Unit          |
|--------------|---------------------------|----------------------------------------------------------------------------------------------|---------------------|------|------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 8\text{ V}$                                                    | 5.88                | 6    | 6.12 | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 8\text{ V}$ , $T_a = -25\text{ to }85\text{ }^{\circ}\text{C}$ | 5.76                |      | 6.24 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                        |                     |      | 16   | V             |
| $I_O$        | Output current limit      |                                                                                              |                     | 1    |      | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 7\text{ to }16\text{ V}$ , $I_O = 5\text{ mA}$                                        |                     | 6    | 30   | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 7.3\text{ V}$ , $I_O = 5\text{ to }500\text{ mA}$                                     |                     | 6    | 30   | mV            |
| $I_d$        | Quiescent current         | $V_I = 7\text{ to }16\text{ V}$ , $I_O = 0\text{ mA}$                                        | ON mode             | 0.7  | 1.5  | mA            |
|              |                           | $V_I = 7.3\text{ to }16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                 |                     |      | 12   |               |
|              |                           | $V_I = 9\text{ V}$                                                                           | OFF mode            | 70   | 140  | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 8 \pm 1\text{ V}$                                               | $f = 120\text{ Hz}$ | 75   |      | dB            |
|              |                           |                                                                                              | $f = 1\text{ kHz}$  | 70   |      |               |
|              |                           |                                                                                              | $f = 10\text{ kHz}$ | 60   |      |               |
| eN           | Output noise voltage      | $B = 10\text{ Hz to }100\text{ kHz}$                                                         |                     | 50   |      | $\mu\text{V}$ |
| $V_d$        | Dropout voltage           | $I_O = 200\text{ mA}$                                                                        |                     | 0.2  | 0.35 | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                        |                     | 0.4  | 0.7  |               |
| $V_{IL}$     | 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     | $V_I = 9\text{ V}$ , $V_C = 6\text{ V}$                                                      |                     | 10   |      | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }500\text{ mA}$            | 2                   | 10   |      | $\mu\text{F}$ |

Refer to test circuits,  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 20. LF80AB electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                               | Min.                | Typ. | Max. | Unit          |
|--------------|---------------------------|-----------------------------------------------------------------------------------------------|---------------------|------|------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 10\text{ V}$                                                    | 7.92                | 8    | 8.08 | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 10\text{ V}$ , $T_a = -25\text{ to }85\text{ }^{\circ}\text{C}$ | 7.84                |      | 8.16 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                         |                     |      | 16   | V             |
| $I_O$        | Output current limit      |                                                                                               |                     | 1    |      | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 9\text{ to }16\text{ V}$ , $I_O = 5\text{ mA}$                                         |                     | 8    | 40   | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 9.3\text{ V}$ , $I_O = 5\text{ to }500\text{ mA}$                                      |                     | 8    | 40   | mV            |
| $I_d$        | Quiescent current         | $V_I = 9\text{ to }16\text{ V}$ , $I_O = 0\text{ mA}$                                         | ON mode             | 0.7  | 1.5  | mA            |
|              |                           | $V_I = 9.3\text{ to }16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                  |                     |      | 12   |               |
|              |                           | $V_I = 9\text{ V}$                                                                            | OFF mode            | 70   | 140  | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 10 \pm 1\text{ V}$                                               | $f = 120\text{ Hz}$ |      | 72   | dB            |
|              |                           |                                                                                               | $f = 1\text{ kHz}$  |      | 67   |               |
|              |                           |                                                                                               | $f = 10\text{ kHz}$ |      | 57   |               |
| eN           | Output noise voltage      | $B = 10\text{ Hz to }100\text{ kHz}$                                                          |                     | 50   |      | $\mu\text{V}$ |
| $V_d$        | Dropout voltage           | $I_O = 200\text{ mA}$                                                                         |                     | 0.2  | 0.35 | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                         |                     | 0.4  | 0.7  |               |
| $V_{IL}$     | 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     | $V_I = 9\text{ V}$ , $V_C = 6\text{ V}$                                                       |                     | 10   |      | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }500\text{ mA}$             | 2                   | 10   |      | $\mu\text{F}$ |

Refer to test circuits,  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 21. LF80C electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                               | Min.                | Typ. | Max. | Unit          |
|--------------|---------------------------|-----------------------------------------------------------------------------------------------|---------------------|------|------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 10\text{ V}$                                                    | 7.84                | 8    | 8.16 | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 10\text{ V}$ , $T_a = -25\text{ to }85\text{ }^{\circ}\text{C}$ | 7.68                |      | 8.32 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                         |                     |      | 16   | V             |
| $I_O$        | Output current limit      |                                                                                               |                     | 1    |      | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 9\text{ to }16\text{ V}$ , $I_O = 5\text{ mA}$                                         |                     | 8    | 40   | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 9.3\text{ V}$ , $I_O = 5\text{ to }500\text{ mA}$                                      |                     | 8    | 40   | mV            |
| $I_d$        | Quiescent current         | $V_I = 9\text{ to }16\text{ V}$ , $I_O = 0\text{ mA}$                                         |                     | 0.7  | 1.5  | mA            |
|              |                           | $V_I = 9.3\text{ to }16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                  |                     |      | 12   |               |
|              |                           | $V_I = 9\text{ V}$                                                                            | OFF mode            | 70   | 140  | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 10 \pm 1\text{ V}$                                               | $f = 120\text{ Hz}$ | 72   |      | dB            |
|              |                           |                                                                                               | $f = 1\text{ kHz}$  | 67   |      |               |
|              |                           |                                                                                               | $f = 10\text{ kHz}$ | 57   |      |               |
| eN           | Output noise voltage      | $B = 10\text{ Hz to }100\text{ kHz}$                                                          |                     | 50   |      | $\mu\text{V}$ |
| $V_d$        | Dropout voltage           | $I_O = 200\text{ mA}$                                                                         |                     | 0.2  | 0.35 | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                         |                     | 0.4  | 0.7  |               |
| $V_{IL}$     | 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     | $V_I = 9\text{ V}$ , $V_C = 6\text{ V}$                                                       |                     | 10   |      | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }500\text{ mA}$             | 2                   | 10   |      | $\mu\text{F}$ |

Refer to test circuits,  $T_a = -40$  to  $125\text{ }^{\circ}\text{C}$ ,  $C_1 = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 22. LF80C (automotive grade) electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                       | Min.                | Typ. | Max.  | Unit          |
|--------------|---------------------------|---------------------------------------------------------------------------------------|---------------------|------|-------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 10\text{ V}$ , $T_a = 25\text{ }^{\circ}\text{C}$       | 7.84                | 8    | 8.16  | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 10\text{ V}$                                            | 7.665               |      | 8.335 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                 |                     |      | 16    | V             |
| $I_O$        | Output current limit      | $T_a = 25\text{ }^{\circ}\text{C}$                                                    |                     | 1    |       | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 9$ to $16\text{ V}$ , $I_O = 5\text{ mA}$                                      |                     | 8    | 44    | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 9.3\text{ V}$ , $I_O = 5$ to $500\text{ mA}$                                   |                     | 8    | 44    | mV            |
| $I_d$        | Quiescent current         | $V_I = 9$ to $16\text{ V}$ , $I_O = 0\text{ mA}$                                      | ON mode             | 0.7  | 2.5   | mA            |
|              |                           | $V_I = 9.3$ to $16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                               |                     |      | 12    |               |
|              |                           | $V_I = 9\text{ V}$                                                                    | OFF mode            | 70   | 160   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 10 \pm 1\text{ V}$<br>$T_a = 25\text{ }^{\circ}\text{C}$ | $f = 120\text{ Hz}$ | 72   |       | dB            |
|              |                           |                                                                                       | $f = 1\text{ kHz}$  | 67   |       |               |
|              |                           |                                                                                       | $f = 10\text{ kHz}$ | 57   |       |               |
| 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           | $I_O = 200\text{ mA}$                                                                 |                     | 0.2  | 1.3   | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                 |                     | 0.4  | 1.3   |               |
| $V_{IL}$     | Control input logic low   |                                                                                       |                     |      | 0.8   | V             |
| $V_{IH}$     | Control input logic high  |                                                                                       | 2                   |      |       | V             |
| $I_I$        | Control input current     | $V_I = 9\text{ V}$ , $V_C = 6\text{ V}$ , $T_a = 25\text{ }^{\circ}\text{C}$          |                     | 10   |       | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance | $\text{ESR} = 0.1$ to $10\text{ }\Omega$ , $I_O = 0$ to $500\text{ mA}$               | 2                   | 10   |       | $\mu\text{F}$ |

Refer to test circuits,  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 23. LF85AB electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                                 | Min.                | Typ. | Max.  | Unit          |
|--------------|---------------------------|-------------------------------------------------------------------------------------------------|---------------------|------|-------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 10.5\text{ V}$                                                    | 8.415               | 8.5  | 8.585 | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 10.5\text{ V}$ , $T_a = -25\text{ to }85\text{ }^{\circ}\text{C}$ | 8.33                |      | 8.67  |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                           |                     |      | 16    | V             |
| $I_O$        | Output current limit      |                                                                                                 |                     | 1    |       | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 9.5\text{ to }16\text{ V}$ , $I_O = 5\text{ mA}$                                         |                     | 8    | 42    | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 9.8\text{ V}$ , $I_O = 5\text{ to }500\text{ mA}$                                        |                     | 8    | 42    | mV            |
| $I_d$        | Quiescent current         | $V_I = 9.5\text{ to }16\text{ V}$ , $I_O = 0\text{ mA}$                                         | ON mode             | 0.7  | 1.5   | mA            |
|              |                           | $V_I = 9.8\text{ to }16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                    |                     |      | 12    |               |
|              |                           | $V_I = 9\text{ V}$                                                                              | OFF mode            | 70   | 140   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 10.5 \pm 1\text{ V}$                                               | $f = 120\text{ Hz}$ | 72   |       | dB            |
|              |                           |                                                                                                 | $f = 1\text{ kHz}$  | 67   |       |               |
|              |                           |                                                                                                 | $f = 10\text{ kHz}$ | 57   |       |               |
| eN           | Output noise voltage      | $B = 10\text{ Hz to }100\text{ kHz}$                                                            |                     | 50   |       | $\mu\text{V}$ |
| $V_d$        | Dropout voltage           | $I_O = 200\text{ mA}$                                                                           |                     | 0.2  | 0.35  | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                           |                     | 0.4  | 0.7   |               |
| $V_{IL}$     | 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     | $V_I = 9\text{ V}$ , $V_C = 6\text{ V}$                                                         |                     | 10   |       | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }500\text{ mA}$               | 2                   | 10   |       | $\mu\text{F}$ |

Refer to test circuits,  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 24. LF85C electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                                 | Min.                | Typ. | Max. | Unit          |
|--------------|---------------------------|-------------------------------------------------------------------------------------------------|---------------------|------|------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 10.5\text{ V}$                                                    | 8.33                | 8.5  | 8.67 | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 10.5\text{ V}$ , $T_a = -25\text{ to }85\text{ }^{\circ}\text{C}$ | 8.16                |      | 8.84 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                           |                     |      | 16   | V             |
| $I_O$        | Output current limit      |                                                                                                 |                     | 1    |      | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 9.5\text{ to }16\text{ V}$ , $I_O = 5\text{ mA}$                                         |                     | 8    | 42   | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 9.8\text{ V}$ , $I_O = 5\text{ to }500\text{ mA}$                                        |                     | 8    | 42   | mV            |
| $I_d$        | Quiescent current         | $V_I = 9.5\text{ to }16\text{ V}$ , $I_O = 0\text{ mA}$                                         | ON mode             | 0.7  | 1.5  | mA            |
|              |                           | $V_I = 9.8\text{ to }16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                    |                     |      | 12   |               |
|              |                           | $V_I = 9\text{ V}$                                                                              | OFF mode            | 70   | 140  | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 10.5 \pm 1\text{ V}$                                               | $f = 120\text{ Hz}$ | 72   |      | dB            |
|              |                           |                                                                                                 | $f = 1\text{ kHz}$  | 67   |      |               |
|              |                           |                                                                                                 | $f = 10\text{ kHz}$ | 57   |      |               |
| eN           | Output noise voltage      | $B = 10\text{ Hz to }100\text{ kHz}$                                                            |                     | 50   |      | $\mu\text{V}$ |
| $V_d$        | Dropout voltage           | $I_O = 200\text{ mA}$                                                                           |                     | 0.2  | 0.35 | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                           |                     | 0.4  | 0.7  |               |
| $V_{IL}$     | 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     | $V_I = 9\text{ V}$ , $V_C = 6\text{ V}$                                                         |                     | 10   |      | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }500\text{ mA}$               | 2                   | 10   |      | $\mu\text{F}$ |

Refer to test circuits,  $T_a = -40$  to  $125\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 25. LF85C (automotive grade) electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                         | Min.                | Typ. | Max.  | Unit          |
|--------------|---------------------------|-----------------------------------------------------------------------------------------|---------------------|------|-------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 10.5\text{ V}$ , $T_a = 25\text{ }^{\circ}\text{C}$       | 8.33                | 8.5  | 8.67  | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 10.5\text{ V}$                                            | 8.145               |      | 8.855 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                   |                     |      | 16    | V             |
| $I_O$        | Output current limit      | $T_a = 25\text{ }^{\circ}\text{C}$                                                      |                     | 1    |       | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 9.5$ to $16\text{ V}$ , $I_O = 5\text{ mA}$                                      |                     | 8    | 44    | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 9.8\text{ V}$ , $I_O = 5$ to $500\text{ mA}$                                     |                     | 8    | 44    | mV            |
| $I_d$        | Quiescent current         | $V_I = 9.5$ to $16\text{ V}$ , $I_O = 0\text{ mA}$                                      | ON mode             | 0.7  | 2.5   | mA            |
|              |                           | $V_I = 9.8$ to $16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                 |                     |      | 12    |               |
|              |                           | $V_I = 9\text{ V}$                                                                      | OFF mode            | 70   | 160   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 10.5 \pm 1\text{ V}$<br>$T_a = 25\text{ }^{\circ}\text{C}$ | $f = 120\text{ Hz}$ | 72   |       | dB            |
|              |                           |                                                                                         | $f = 1\text{ kHz}$  | 67   |       |               |
|              |                           |                                                                                         | $f = 10\text{ kHz}$ | 57   |       |               |
| 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           | $I_O = 200\text{ mA}$                                                                   |                     | 0.2  | 1.3   | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                   |                     | 0.4  | 1.3   |               |
| $V_{IL}$     | Control input logic low   |                                                                                         |                     |      | 0.8   | V             |
| $V_{IH}$     | Control input logic high  |                                                                                         | 2                   |      |       | V             |
| $I_I$        | Control input current     | $V_I = 9\text{ V}$ , $V_C = 6\text{ V}$ , $T_a = 25\text{ }^{\circ}\text{C}$            |                     | 10   |       | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance | $\text{ESR} = 0.1$ to $10\text{ }\Omega$ , $I_O = 0$ to $500\text{ mA}$                 | 2                   | 10   |       | $\mu\text{F}$ |

Refer to test circuits,  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 26. LF90C electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                               | Min.                | Typ. | Max. | Unit          |
|--------------|---------------------------|-----------------------------------------------------------------------------------------------|---------------------|------|------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 11\text{ V}$                                                    | 8.82                | 9    | 9.18 | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 11\text{ V}$ , $T_a = -25\text{ to }85\text{ }^{\circ}\text{C}$ | 8.64                |      | 9.36 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                         |                     |      | 16   | V             |
| $I_O$        | Output current limit      |                                                                                               |                     | 1    |      | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 10\text{ to }16\text{ V}$ , $I_O = 5\text{ mA}$                                        |                     | 9    | 45   | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 10.3\text{ V}$ , $I_O = 5\text{ to }500\text{ mA}$                                     |                     | 9    | 45   | mV            |
| $I_d$        | Quiescent current         | $V_I = 10\text{ to }16\text{ V}$ , $I_O = 0\text{ mA}$                                        | ON mode             | 0.7  | 1.5  | mA            |
|              |                           | $V_I = 10.3\text{ to }16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                 |                     |      | 12   |               |
|              |                           | $V_I = 10\text{ V}$                                                                           | OFF mode            | 70   | 140  | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 11 \pm 1\text{ V}$                                               | $f = 120\text{ Hz}$ | 71   |      | dB            |
|              |                           |                                                                                               | $f = 1\text{ kHz}$  | 66   |      |               |
|              |                           |                                                                                               | $f = 10\text{ kHz}$ | 56   |      |               |
| eN           | Output noise voltage      | $B = 10\text{ Hz to }100\text{ kHz}$                                                          |                     | 50   |      | $\mu\text{V}$ |
| $V_d$        | Dropout voltage           | $I_O = 200\text{ mA}$                                                                         |                     | 0.2  | 0.35 | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                         |                     | 0.4  | 0.7  |               |
| $V_{IL}$     | 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     | $V_I = 10\text{ V}$ , $V_C = 6\text{ V}$                                                      |                     | 10   |      | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }500\text{ mA}$             | 2                   | 10   |      | $\mu\text{F}$ |

Refer to test circuits,  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

Table 27. LF120AB electrical characteristics

| Symbol       | Parameter                 | Test conditions                                                                               | Min.                | Typ. | Max.  | Unit          |
|--------------|---------------------------|-----------------------------------------------------------------------------------------------|---------------------|------|-------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 15\text{ V}$                                                    | 11.88               | 12   | 12.12 | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 15\text{ V}$ , $T_a = -25\text{ to }85\text{ }^{\circ}\text{C}$ | 11.76               |      | 12.24 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                         |                     |      | 16    | V             |
| $I_O$        | Output current limit      |                                                                                               |                     | 1    |       | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 13\text{ to }16\text{ V}$ , $I_O = 5\text{ mA}$                                        |                     | 12   | 60    | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 13.3\text{ V}$ , $I_O = 5\text{ to }500\text{ mA}$                                     |                     | 12   | 60    | mV            |
| $I_d$        | Quiescent current         | $V_I = 13\text{ to }16\text{ V}$ , $I_O = 0\text{ mA}$                                        |                     | 0.7  | 1.5   | mA            |
|              |                           | $V_I = 13.3\text{ to }16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                 |                     |      | 12    |               |
|              |                           | $V_I = 13\text{ V}$                                                                           | OFF mode            | 70   | 140   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 14 \pm 1\text{ V}$                                               | $f = 120\text{ Hz}$ | 69   |       | dB            |
|              |                           |                                                                                               | $f = 1\text{ kHz}$  | 64   |       |               |
|              |                           |                                                                                               | $f = 10\text{ kHz}$ | 54   |       |               |
| eN           | Output noise voltage      | $B = 10\text{ Hz to }100\text{ kHz}$                                                          |                     | 50   |       | $\mu\text{V}$ |
| $V_d$        | Dropout voltage           | $I_O = 200\text{ mA}$                                                                         |                     | 0.2  | 0.35  | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                         |                     | 0.4  | 0.7   |               |
| $V_{IL}$     | 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     | $V_I = 13\text{ V}$ , $V_C = 6\text{ V}$                                                      |                     | 10   |       | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }500\text{ mA}$             | 2                   | 10   |       | $\mu\text{F}$ |

Refer to test circuits,  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $C_I = 0.1\text{ }\mu\text{F}$ ,  $C_O = 2.2\text{ }\mu\text{F}$  unless otherwise specified.

**Table 28. LF120C electrical characteristics**

| Symbol       | Parameter                 | Test conditions                                                                               | Min.                | Typ. | Max.  | Unit          |
|--------------|---------------------------|-----------------------------------------------------------------------------------------------|---------------------|------|-------|---------------|
| $V_O$        | Output voltage            | $I_O = 50\text{ mA}$ , $V_I = 14\text{ V}$                                                    | 11.76               | 12   | 12.24 | V             |
|              |                           | $I_O = 50\text{ mA}$ , $V_I = 14\text{ V}$ , $T_a = -25\text{ to }85\text{ }^{\circ}\text{C}$ | 11.52               |      | 12.48 |               |
| $V_I$        | Operating input voltage   | $I_O = 500\text{ mA}$                                                                         |                     |      | 16    | V             |
| $I_O$        | Output current limit      |                                                                                               |                     | 1    |       | A             |
| $\Delta V_O$ | Line regulation           | $V_I = 13\text{ to }16\text{ V}$ , $I_O = 5\text{ mA}$                                        |                     | 12   | 60    | mV            |
| $\Delta V_O$ | Load regulation           | $V_I = 13.3\text{ V}$ , $I_O = 5\text{ to }500\text{ mA}$                                     |                     | 12   | 60    | mV            |
| $I_d$        | Quiescent current         | $V_I = 13\text{ to }16\text{ V}$ , $I_O = 0\text{ mA}$                                        | ON mode             | 0.7  | 1.5   | mA            |
|              |                           | $V_I = 13.3\text{ to }16\text{ V}$ ,<br>$I_O = 500\text{ mA}$                                 |                     |      | 12    |               |
|              |                           | $V_I = 13\text{ V}$                                                                           | OFF mode            | 70   | 140   | $\mu\text{A}$ |
| SVR          | Supply voltage rejection  | $I_O = 5\text{ mA}$ , $V_I = 14 \pm 1\text{ V}$                                               | $f = 120\text{ Hz}$ | 69   |       | dB            |
|              |                           |                                                                                               | $f = 1\text{ kHz}$  | 64   |       |               |
|              |                           |                                                                                               | $f = 10\text{ kHz}$ | 54   |       |               |
| eN           | Output noise voltage      | $B = 10\text{ Hz to }100\text{ kHz}$                                                          |                     | 50   |       | $\mu\text{V}$ |
| $V_d$        | Dropout voltage           | $I_O = 200\text{ mA}$                                                                         |                     | 0.2  | 0.35  | V             |
|              |                           | $I_O = 500\text{ mA}$                                                                         |                     | 0.4  | 0.7   |               |
| $V_{IL}$     | 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     | $V_I = 13\text{ V}$ , $V_C = 6\text{ V}$                                                      |                     | 10   |       | $\mu\text{A}$ |
| $C_O$        | Output bypass capacitance | $\text{ESR} = 0.1\text{ to }10\text{ }\Omega$ , $I_O = 0\text{ to }500\text{ mA}$             | 2                   | 10   |       | $\mu\text{F}$ |

## 5 Typical performance characteristics

Figure 4. Dropout voltage vs. output current

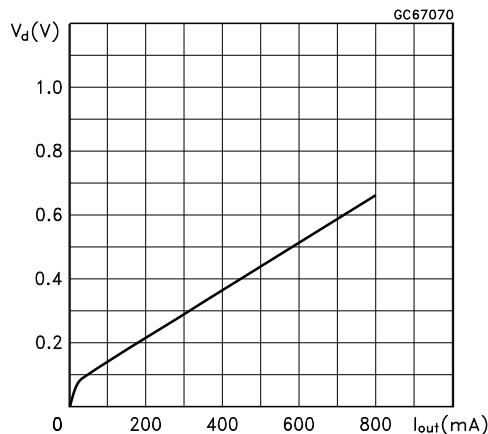


Figure 5. Dropout voltage vs. temperature

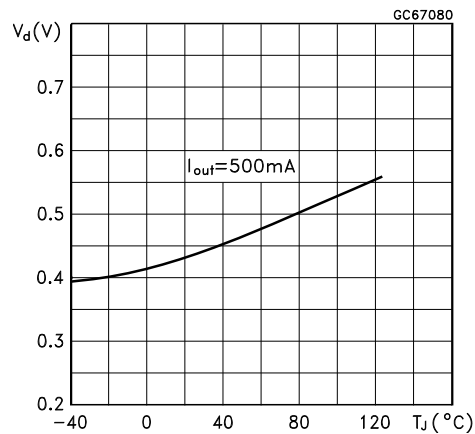


Figure 6. Supply current vs. input voltage

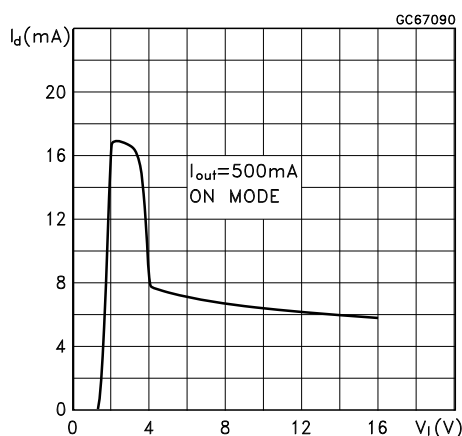


Figure 7. Supply current vs. input voltage (no load)

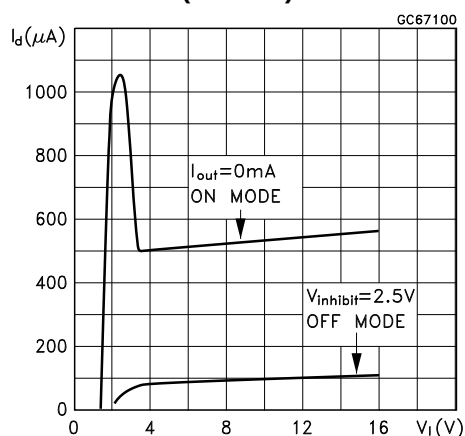


Figure 8. Short-circuit current vs. input voltage

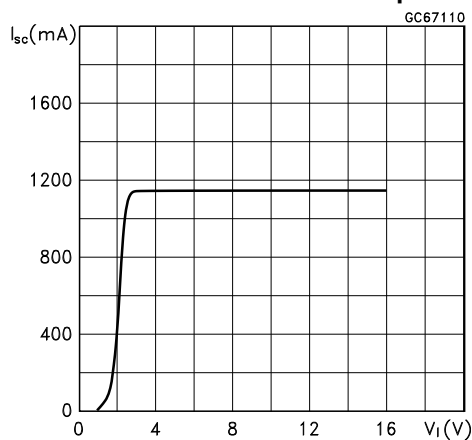
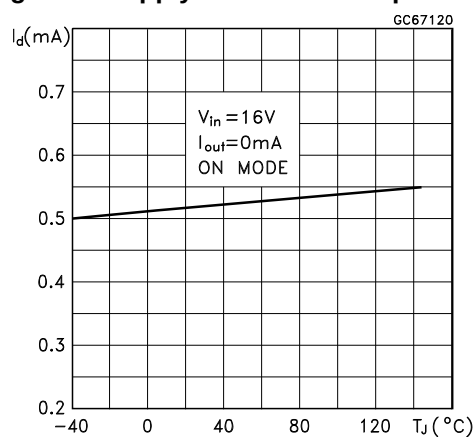


Figure 9. Supply current vs. temperature



Note: Unless otherwise specified  $V_{O(NOM)} = 3.3\text{ V}$

Figure 10. Logic-controlled precision 3.3/5.0 V selectable output

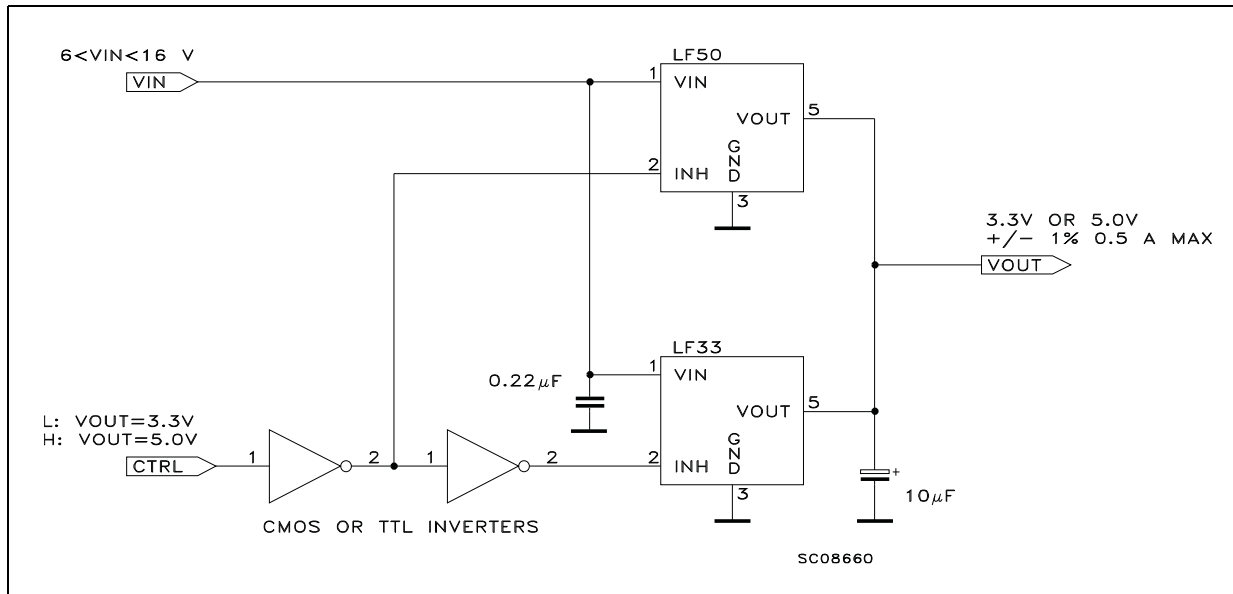


Figure 11. Sequential multi-output supply

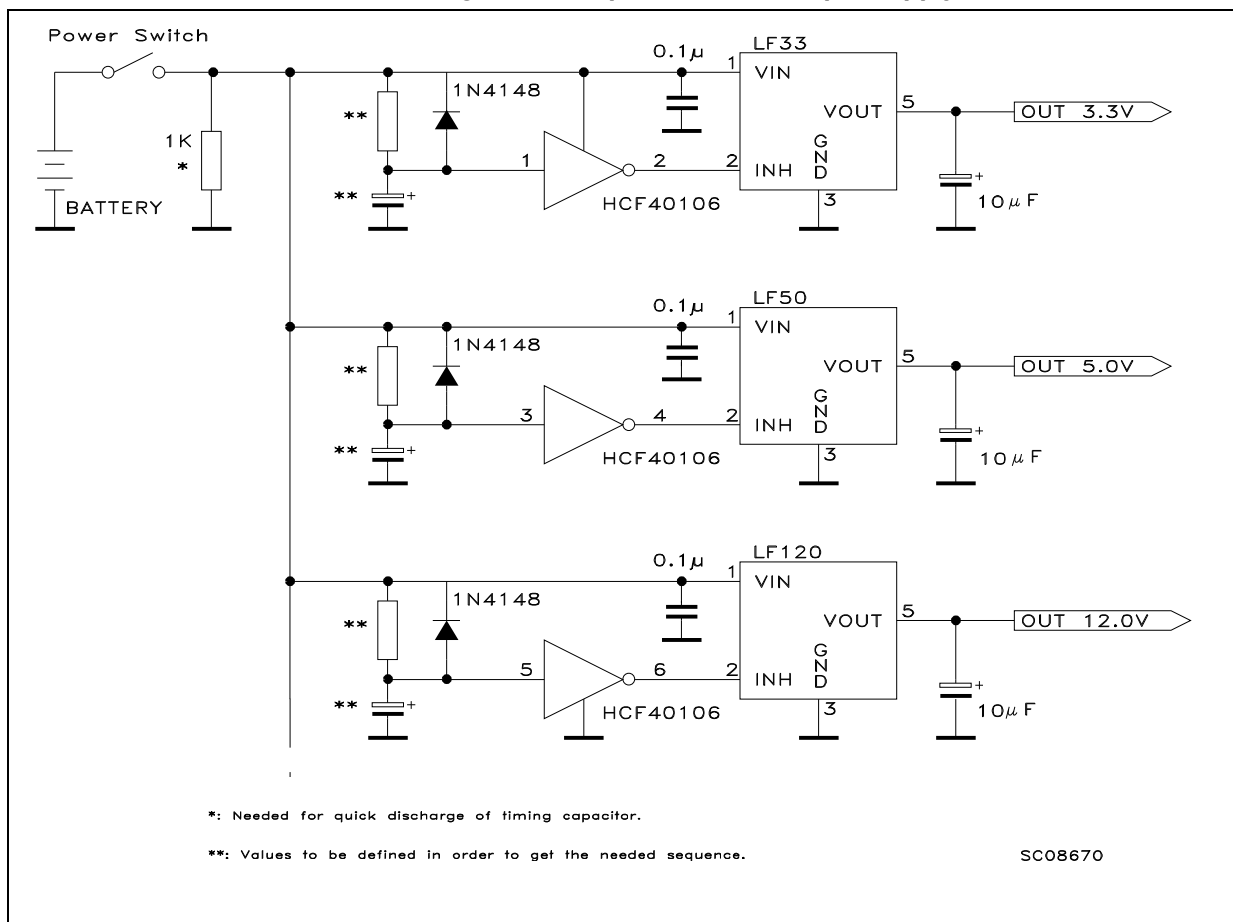


Figure 12. Multiple supply with ON/OFF toggle switch

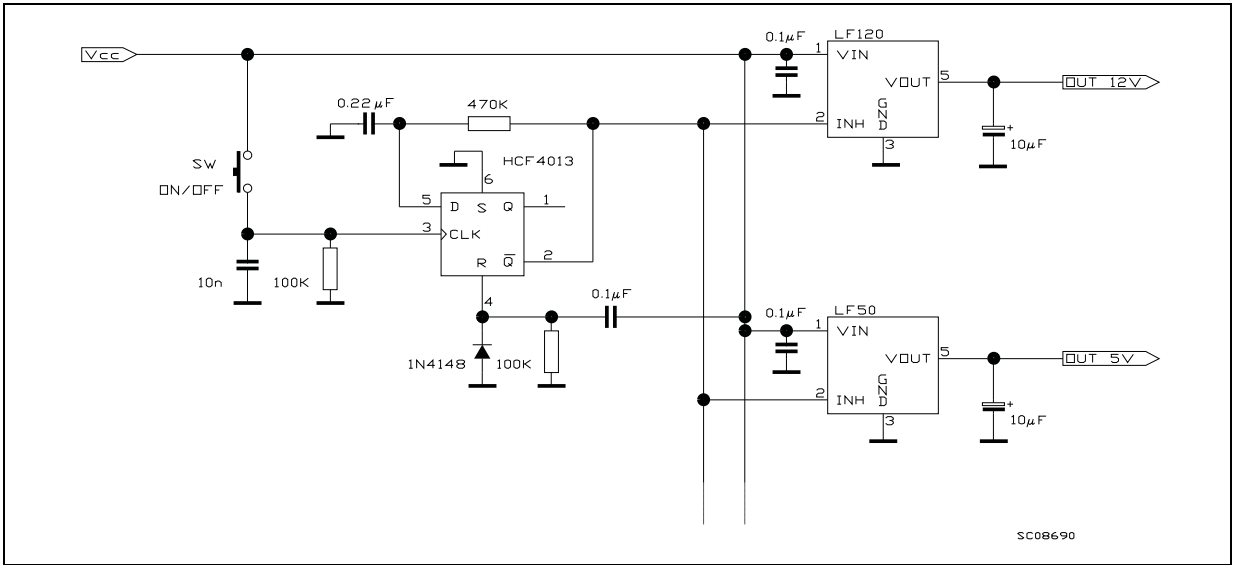


Figure 13. Basic inhibit functions

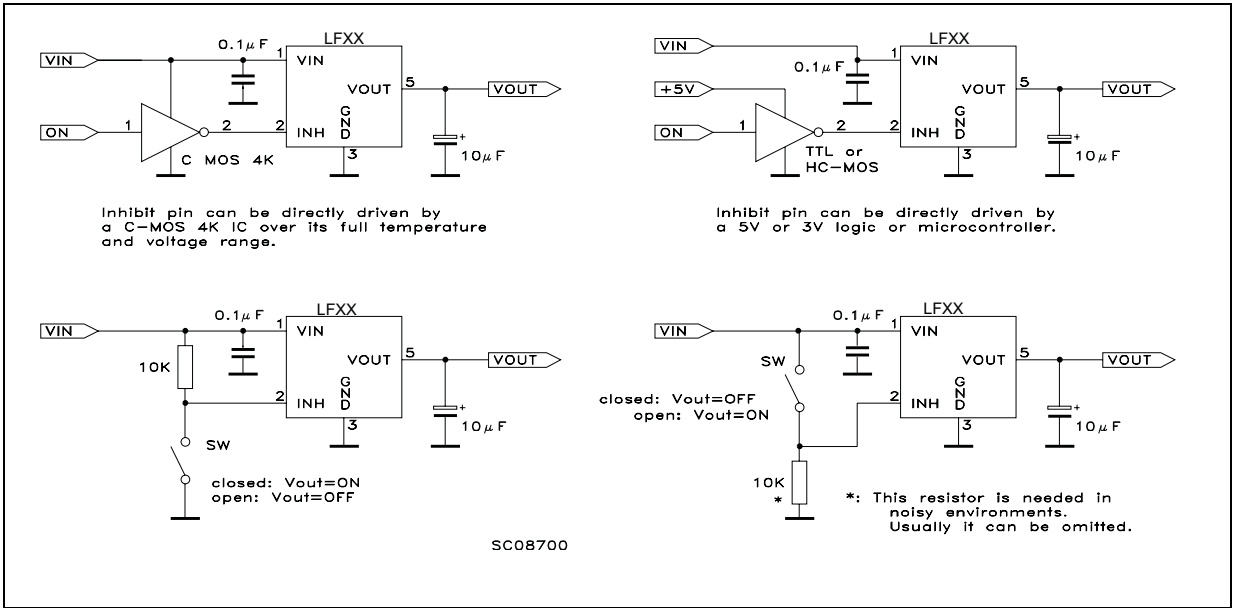


Figure 14. Delayed turn-on

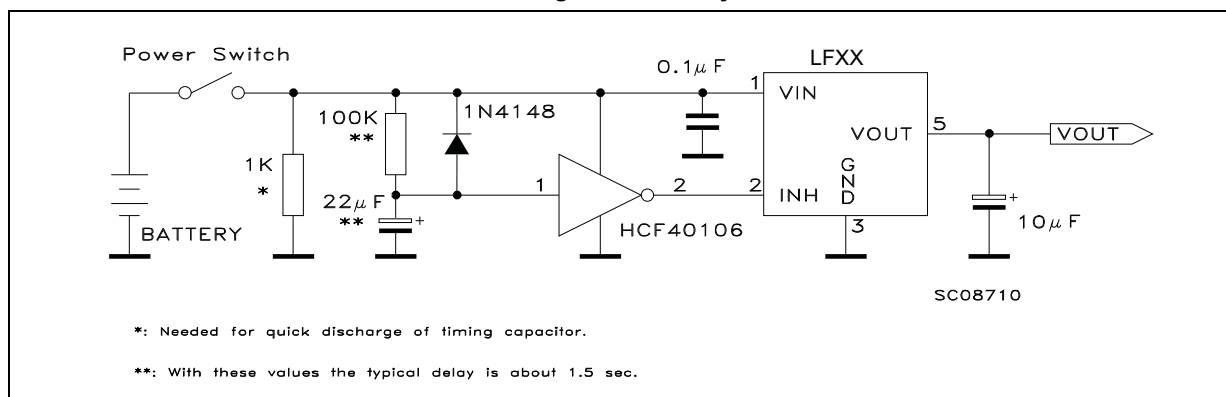
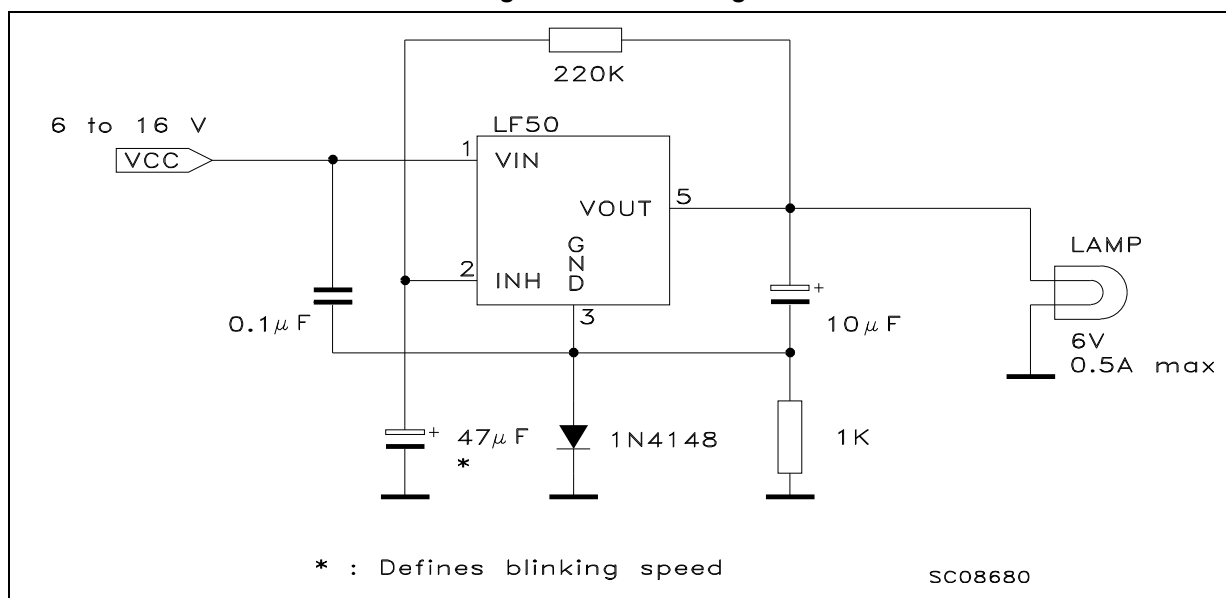


Figure 15. Low voltage bulb blinker



## 6 Package information

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

## 6.1 TO-220 package information

Figure 16. TO-220 (STD-ST dual gauge) package outline

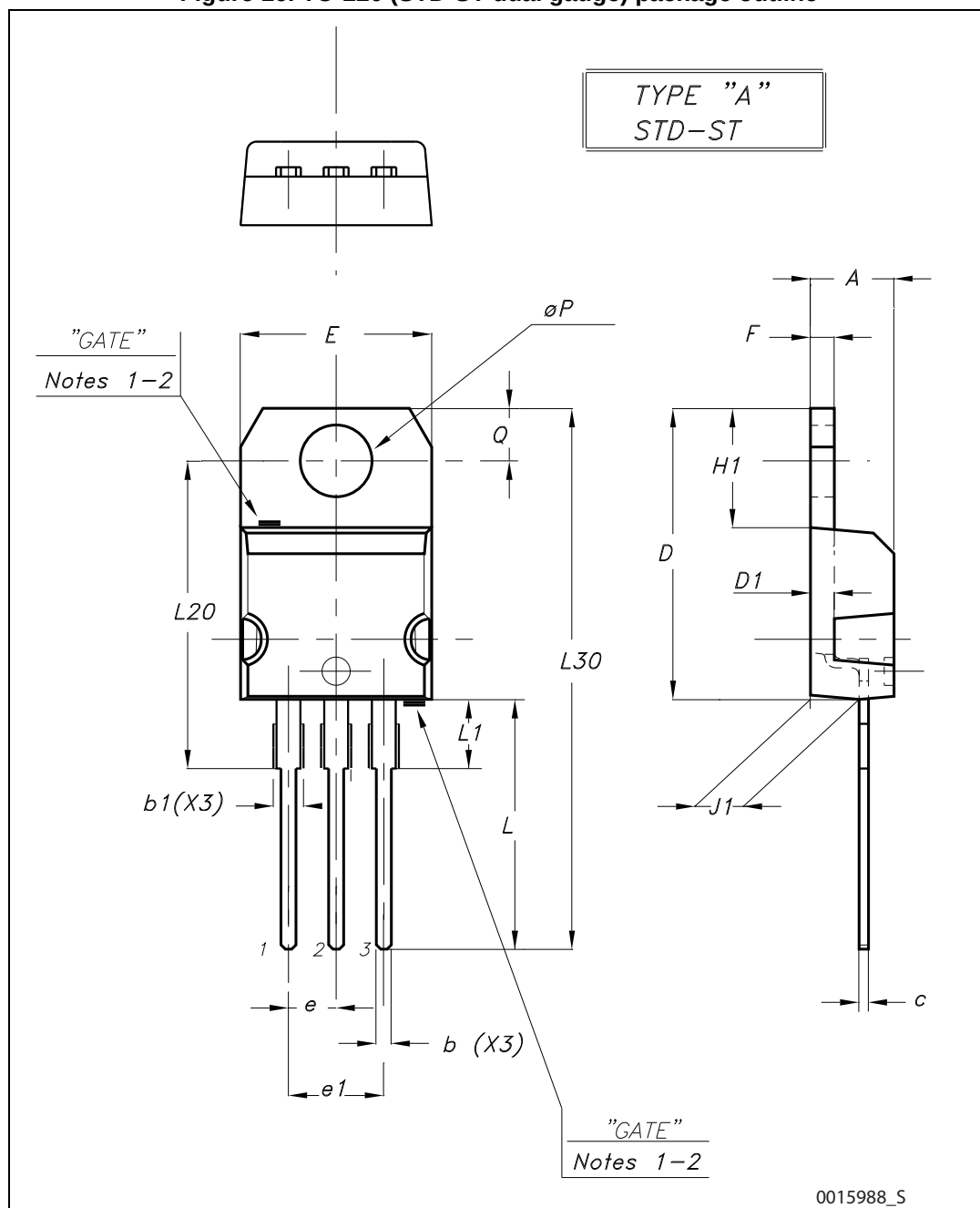


Figure 17. TO-220 (STD-ST single gauge) package outline

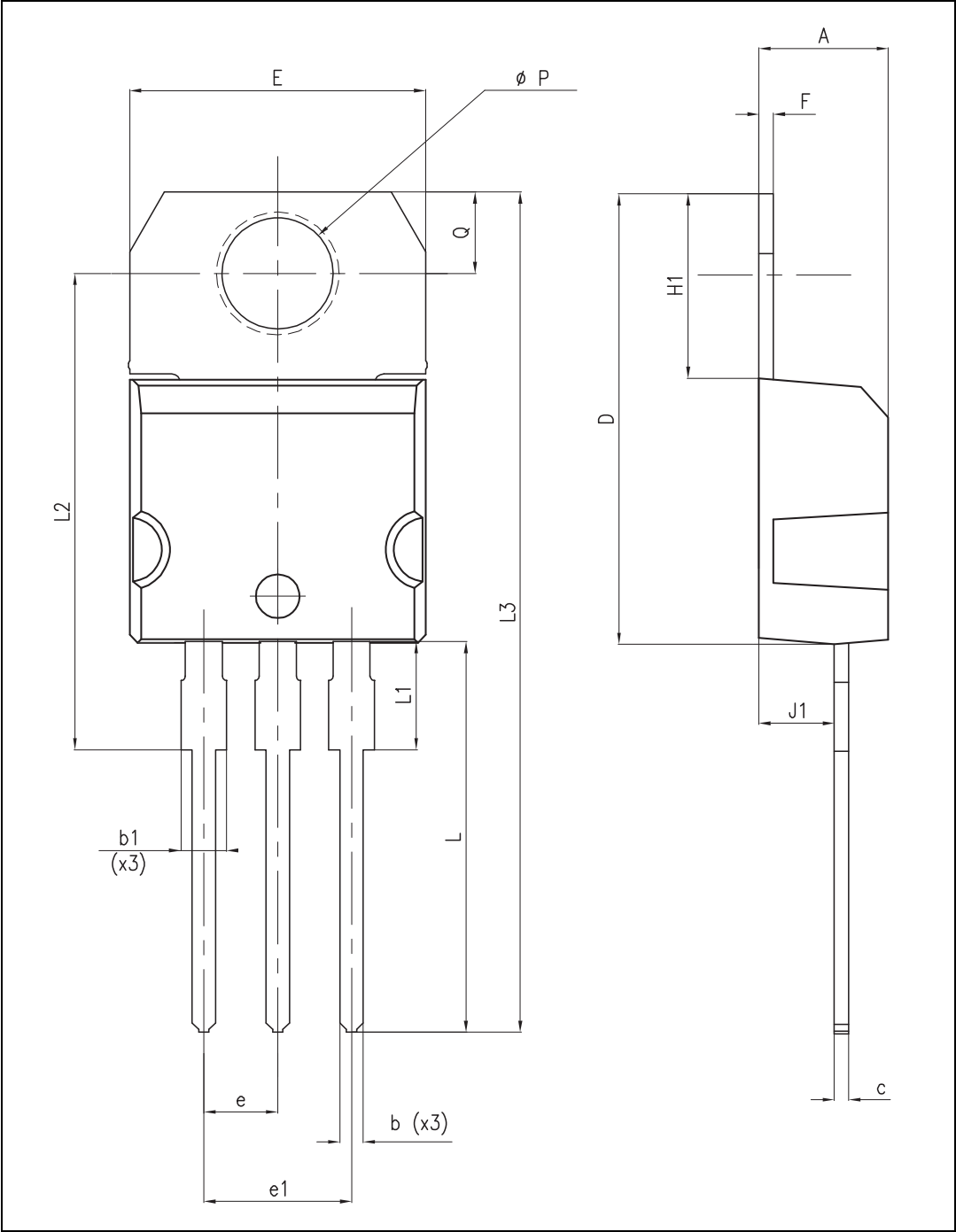


Table 29. TO-220 mechanical data

| Dim. | Type STD - ST dual gauge |       |       | Type STD - ST single gauge |       |       |
|------|--------------------------|-------|-------|----------------------------|-------|-------|
|      | mm                       |       |       | mm                         |       |       |
|      | Min.                     | Typ.  | Max.  | Min.                       | Typ.  | Max.  |
| A    | 4.40                     |       | 4.60  | 4.40                       |       | 4.60  |
| b    | 0.61                     |       | 0.88  | 0.61                       |       | 0.88  |
| b1   | 1.14                     |       | 1.70  | 1.14                       |       | 1.70  |
| c    | 0.48                     |       | 0.70  | 0.48                       |       | 0.70  |
| D    | 15.25                    |       | 15.75 | 15.25                      |       | 15.75 |
| D1   |                          | 1.27  |       |                            |       |       |
| E    | 10.00                    |       | 10.40 | 10.00                      |       | 10.40 |
| e    | 2.40                     |       | 2.70  | 2.40                       |       | 2.70  |
| e1   | 4.95                     |       | 5.15  | 4.95                       |       | 5.15  |
| F    | 1.23                     |       | 1.32  | 0.51                       |       | 0.60  |
| H1   | 6.20                     |       | 6.60  | 6.20                       |       | 6.60  |
| J1   | 2.40                     |       | 2.72  | 2.40                       |       | 2.72  |
| L    | 13.00                    |       | 14.00 | 13.00                      |       | 14.00 |
| L1   | 3.50                     |       | 3.93  | 3.50                       |       | 3.93  |
| L20  |                          | 16.40 |       |                            | 16.40 |       |
| L30  |                          | 28.90 |       |                            | 28.90 |       |
| ØP   | 3.75                     |       | 3.85  | 3.75                       |       | 3.85  |
| Q    | 2.65                     |       | 2.95  | 2.65                       |       | 2.95  |

*Note:* Despite of some differences in tolerances, packages are compatible

Figure 18. TO-220FP package outline

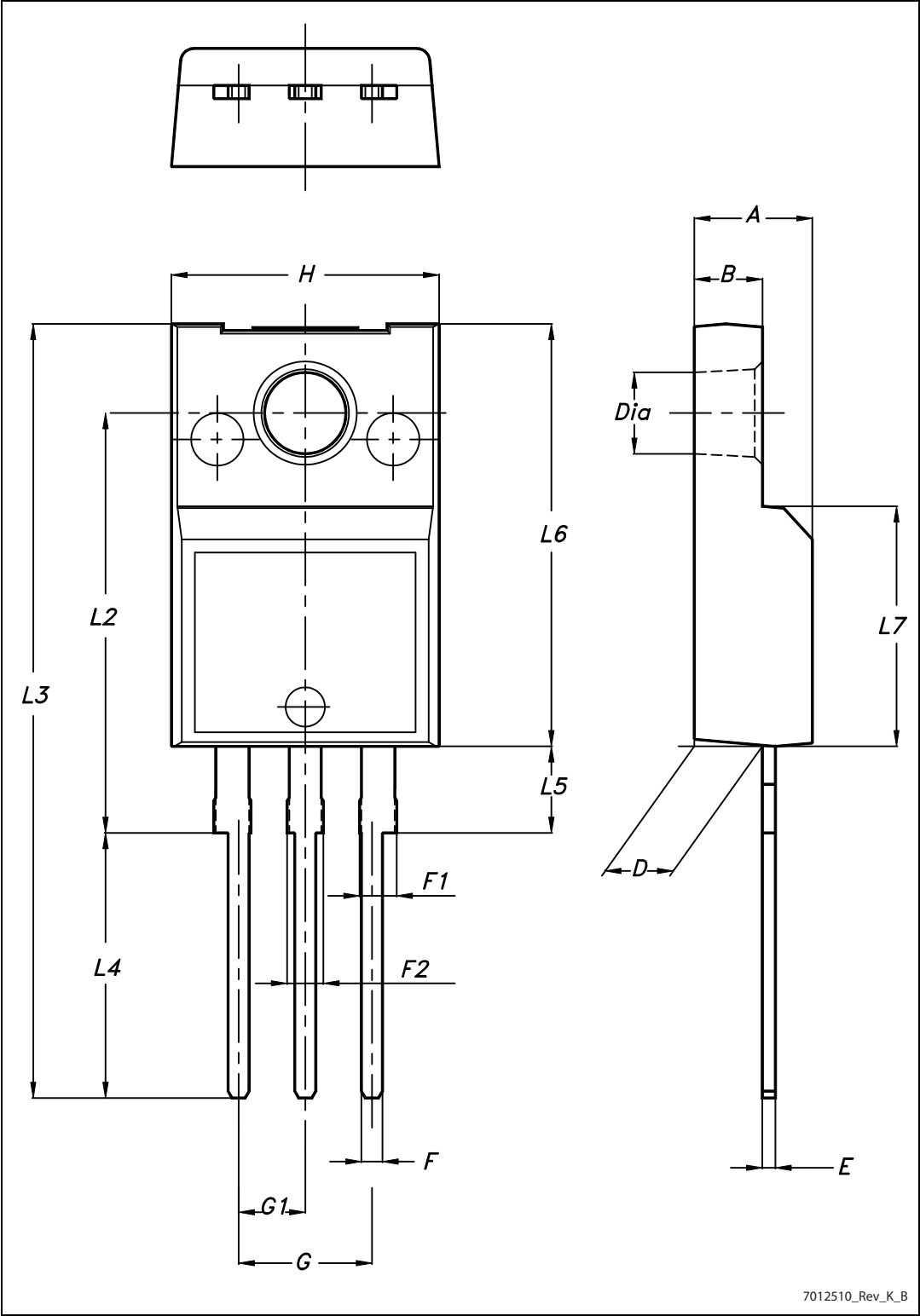
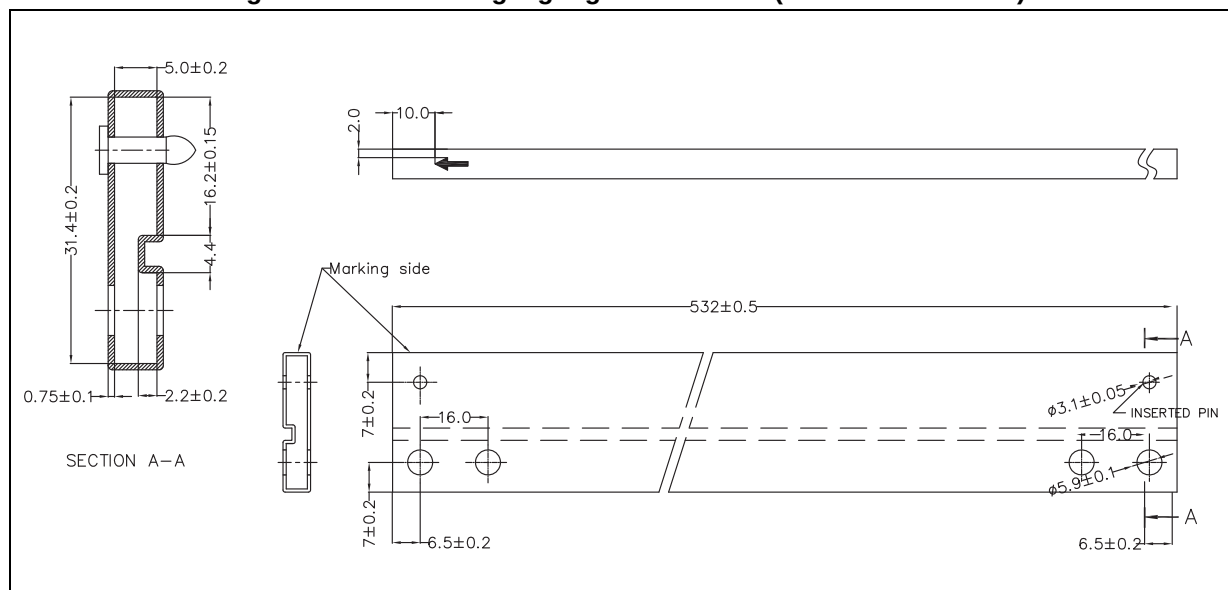
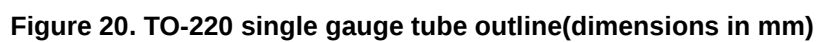


Table 30. TO-220FP mechanical data

| Dim. | mm   |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| A    | 4.4  |      | 4.6  |
| B    | 2.5  |      | 2.7  |
| D    | 2.5  |      | 2.75 |
| E    | 0.45 |      | 0.7  |
| F    | 0.75 |      | 1    |
| F1   | 1.15 |      | 1.70 |
| F2   | 1.15 |      | 1.70 |
| G    | 4.95 |      | 5.2  |
| G1   | 2.4  |      | 2.7  |
| H    | 10   |      | 10.4 |
| L2   |      | 16   |      |
| L3   | 28.6 |      | 30.6 |
| L4   | 9.8  |      | 10.6 |
| L5   | 2.9  |      | 3.6  |
| L6   | 15.9 |      | 16.4 |
| L7   | 9    |      | 9.3  |
| Dia  | 3    |      | 3.2  |

**Figure 19. TO-220 dual gauge tube outline (dimensions in mm)**



### 6.3 DPAK package information

Figure 21. DPAK package outline

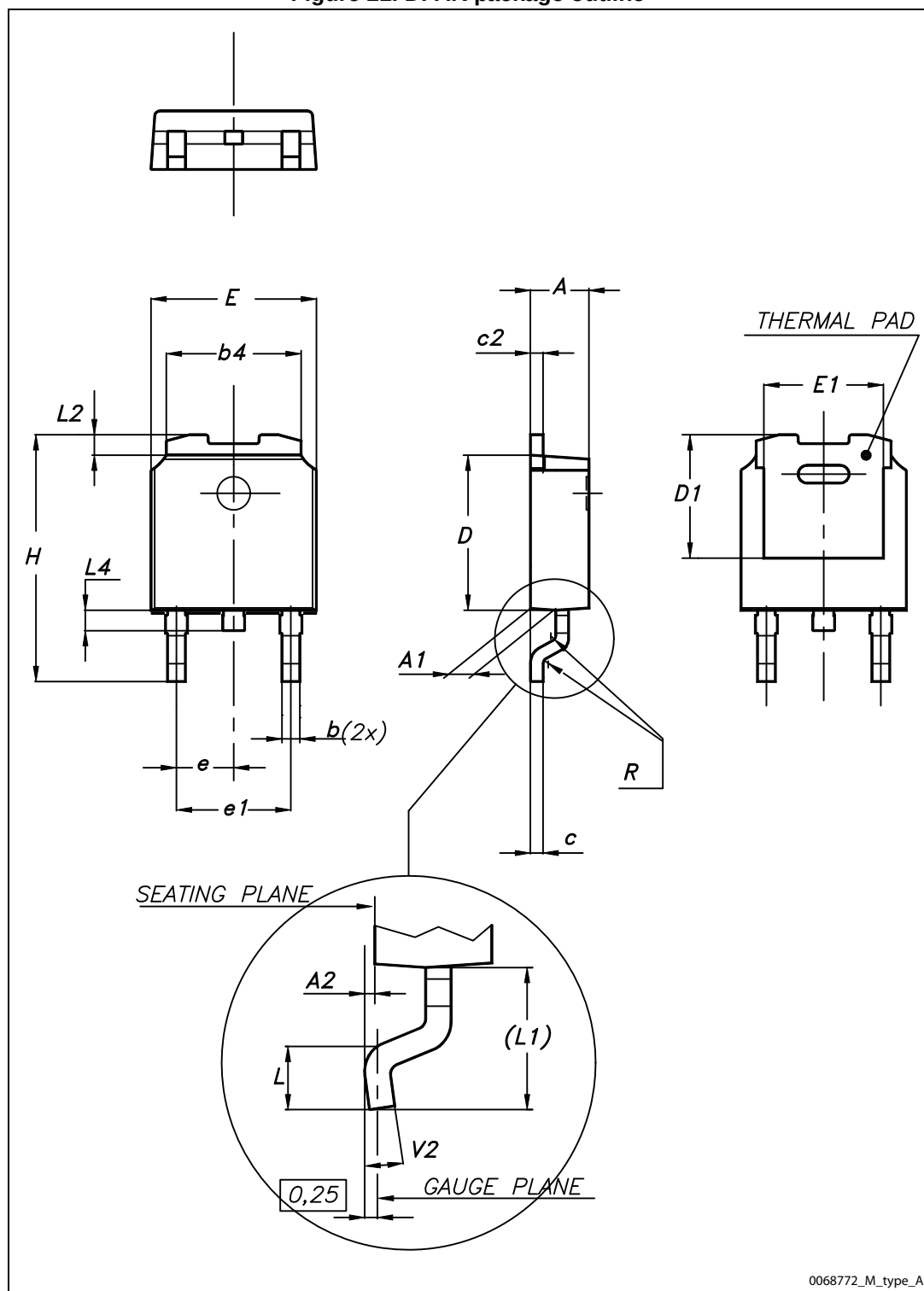
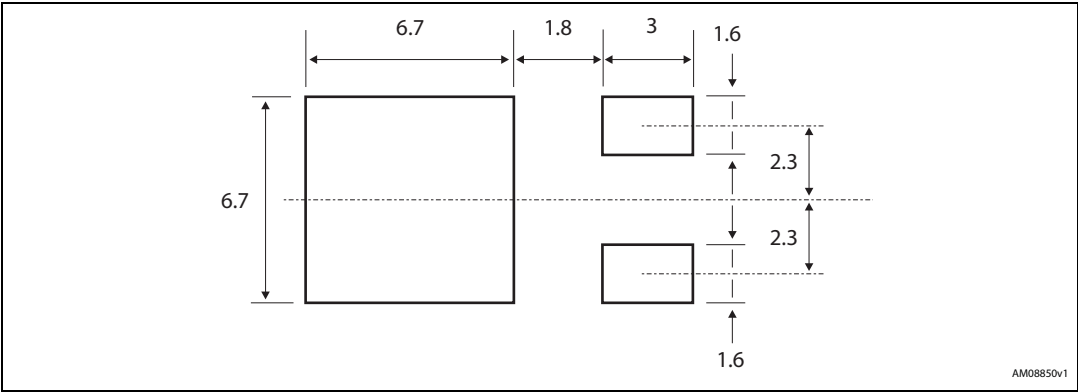


Table 31. DPAK mechanical data

| 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  |
| 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 22. DPAK recommended footprint



## 6.4 PPAK package information

Figure 23. PPAK package outline

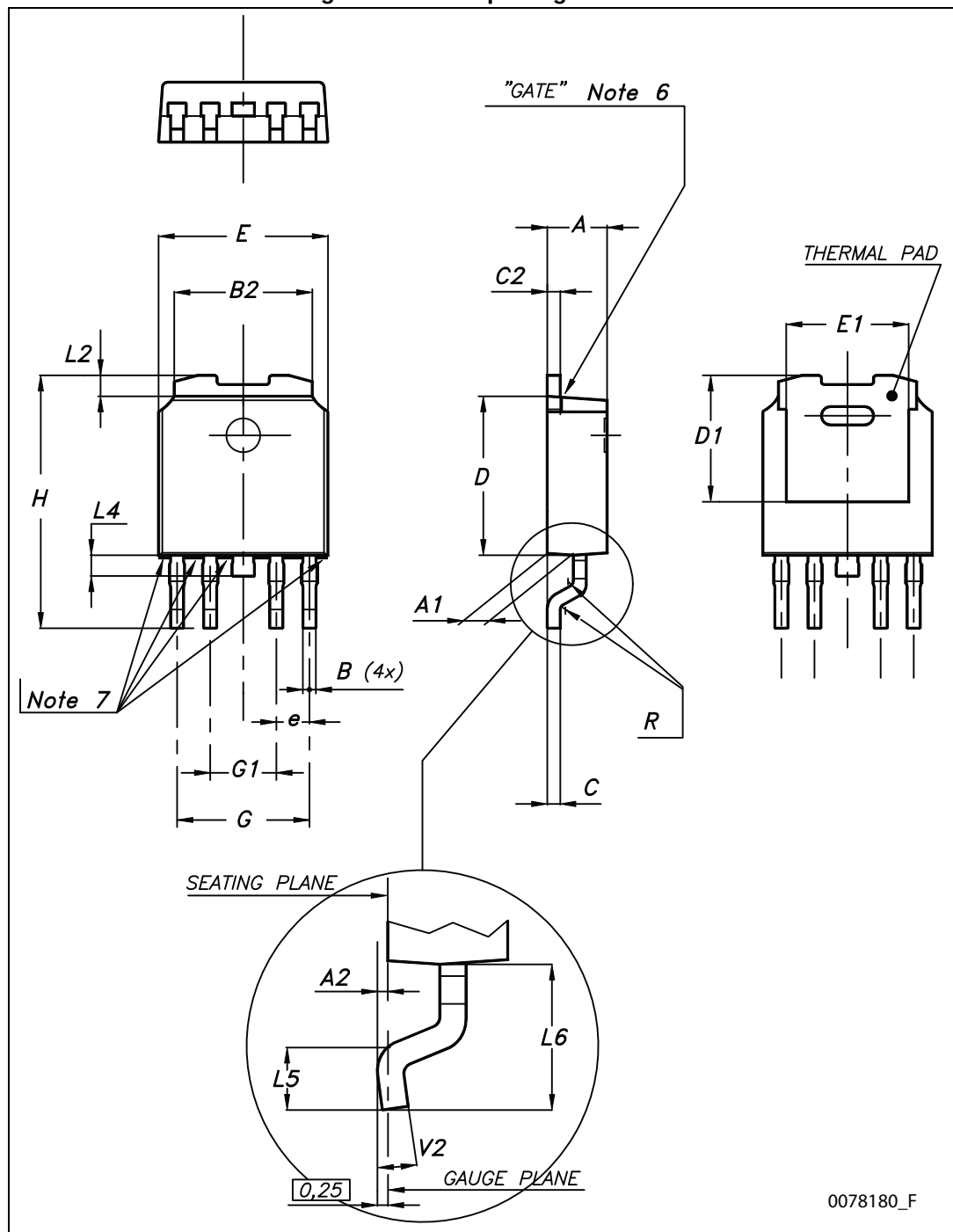


Table 32. PPAK mechanical data

| Dim. | mm   |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| A    | 2.2  |      | 2.4  |
| A1   | 0.9  |      | 1.1  |
| A2   | 0.03 |      | 0.23 |
| B    | 0.4  |      | 0.6  |
| B2   | 5.2  |      | 5.4  |
| C    | 0.45 |      | 0.6  |
| C2   | 0.48 |      | 0.6  |
| D    | 6    |      | 6.2  |
| D1   |      | 5.1  |      |
| E    | 6.4  |      | 6.6  |
| E1   |      | 4.7  |      |
| e    |      | 1.27 |      |
| G    | 4.9  |      | 5.25 |
| G1   | 2.38 |      | 2.7  |
| H    | 9.35 |      | 10.1 |
| L2   |      | 0.8  | 1    |
| L4   | 0.6  |      | 1    |
| L5   | 1    |      |      |
| L6   |      | 2.8  |      |
| R    |      | 0.20 |      |
| V2   | 0°   |      | 8°   |

## 6.5 DPAK and PPAK packing information

Figure 24. DPAK and PPAK tape outline

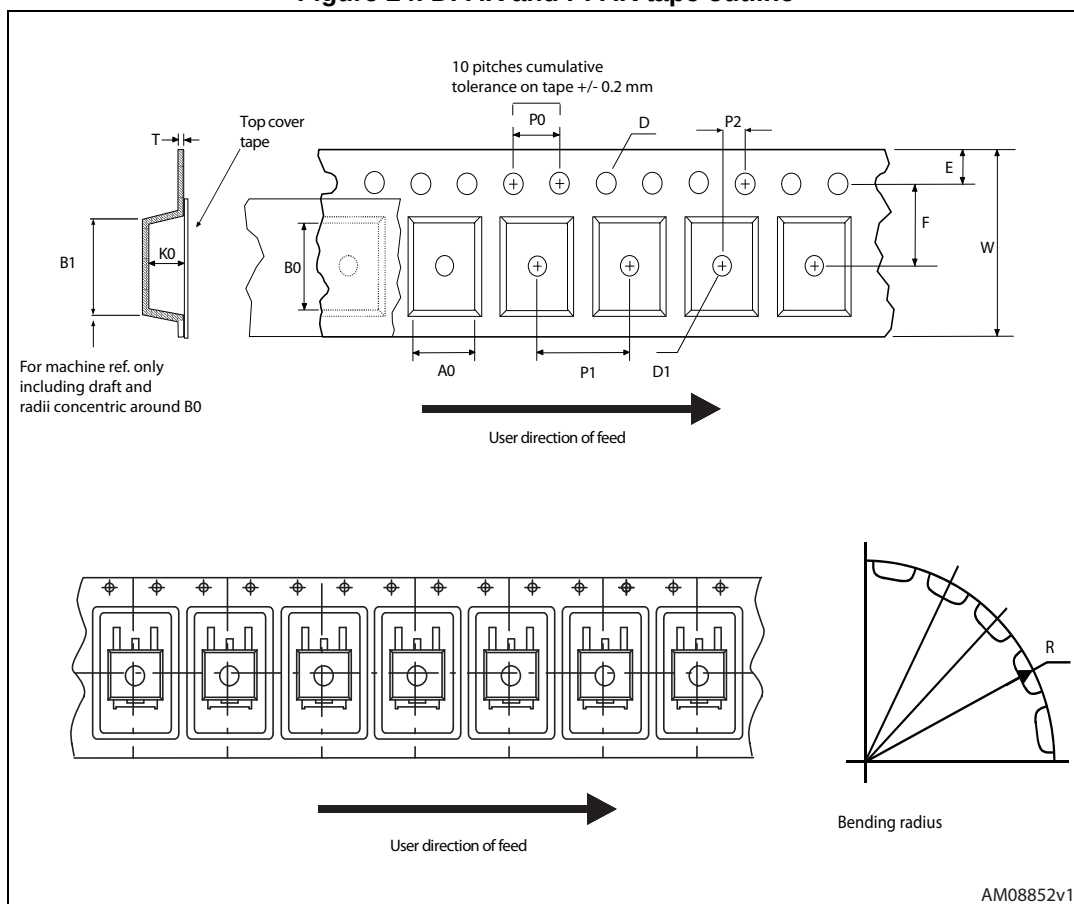


Figure 25. DPAK and PPAK reel outline

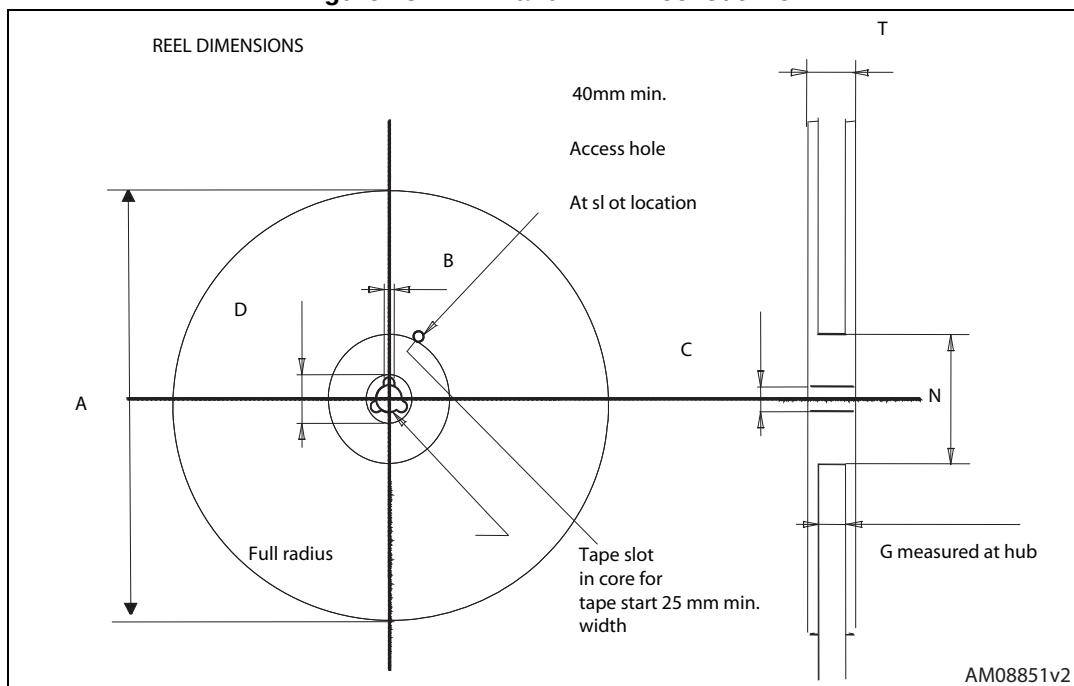


Table 33. DPAK and PPAK tape and reel mechanical data

| Tape |      |      | Reel      |      |      |
|------|------|------|-----------|------|------|
| Dim. | mm   |      | Dim.      | mm   |      |
|      | Min. | Max. |           | Min. | Max. |
| A0   | 6.8  | 7    | A         |      | 330  |
| B0   | 10.4 | 10.6 | B         | 1.5  |      |
| B1   |      | 12.1 | C         | 12.8 | 13.2 |
| D    | 1.5  | 1.6  | D         | 20.2 |      |
| D1   | 1.5  |      | G         | 16.4 | 18.4 |
| E    | 1.65 | 1.85 | N         | 50   |      |
| F    | 7.4  | 7.6  | T         |      | 22.4 |
| K0   | 2.55 | 2.75 |           |      |      |
| P0   | 3.9  | 4.1  | Base qty. |      | 2500 |
| P1   | 7.9  | 8.1  | Bulk qty. |      | 2500 |
| P2   | 1.9  | 2.1  |           |      |      |
| R    | 40   |      |           |      |      |
| T    | 0.25 | 0.35 |           |      |      |
| W    | 15.7 | 16.3 |           |      |      |

## 7 Ordering information

Table 34. Order code

| Packages |                        |          |                             |                            | Output voltages |
|----------|------------------------|----------|-----------------------------|----------------------------|-----------------|
| TO-220   | TO-220<br>(dual gauge) | TO-220FP | DPAK (tape and reel)        | PPAK (tape and reel)       |                 |
|          |                        |          | LF15ABDT-TR                 |                            | 1.5 V           |
|          |                        |          | LF18CDT-TR                  | LF18CPT-TR                 | 1.8 V           |
|          |                        |          | LF18CDT-TRY <sup>(1)</sup>  |                            | 1.8 V           |
|          |                        |          | LF18ABDT-TR                 | LF18ABPT-TR                | 1.8 V           |
|          |                        |          | LF25CDT-TR                  | LF25CPT-TR                 | 2.5 V           |
|          |                        |          | LF25CDT-TRY <sup>(1)</sup>  |                            | 2.5 V           |
|          |                        |          | LF25ABDT-TR                 |                            | 2.5 V           |
|          |                        |          | LF25ABDT-TRY <sup>(1)</sup> |                            | 2.5 V           |
| LF33CV   | LF33CV-DG              |          | LF33CDT-TR                  | LF33CPT-TR                 | 3.3 V           |
|          |                        |          | LF33CDT-TRY <sup>(1)</sup>  | LF33CPT-TRY <sup>(1)</sup> | 3.3 V           |
| LF33ABV  | LF33ABV-DG             |          | LF33ABDT-TR                 |                            | 3.3 V           |
| LF50CV   | LF50CV-DG              |          | LF50CDT-TR                  | LF50CPT-TR                 | 5 V             |
|          |                        |          | LF50CDT-TRY <sup>(1)</sup>  | LF50CPT-TRY <sup>(1)</sup> | 5 V             |
| LF50ABV  | LF50ABV-DG             | LF50ABP  | LF50ABDT-TR                 | LF50ABPT-TR                | 5 V             |
|          |                        |          | LF50ABDT-TRY <sup>(1)</sup> |                            | 5 V             |
| LF60CV   |                        |          | LF60CDT-TR                  |                            | 6 V             |
| LF60ABV  |                        |          | LF60ABDT-TR                 |                            | 6 V             |
|          |                        |          | LF80CDT-TR                  |                            | 8 V             |
|          |                        |          | LF80CDT-TRY <sup>(1)</sup>  |                            | 8 V             |
|          |                        |          | LF80ABDT-TR                 |                            | 8 V             |
|          |                        |          | LF85CDT-TR                  | LF85CPT-TR                 | 8.5 V           |
|          |                        |          | LF85CDT-TRY <sup>(1)</sup>  | LF85CPT-TRY <sup>(1)</sup> | 8.5 V           |
| LF90CV   |                        |          |                             | LF90CPT-TR                 | 9 V             |
|          |                        |          | LF120CDT-TR                 |                            | 12 V            |
| LF120ABV |                        |          | LF120ABDT-TR                |                            | 12 V            |

1. Automotive grade products.

## 8 Revision history

**Table 35. Document revision history**

| Date        | Revision | Changes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 21-Jun-2004 | 14       | Document updating.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 24-May-2006 | 15       | Order codes updated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 02-Apr-2007 | 16       | Order codes updated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 14-May-2007 | 17       | Order codes updated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 26-Jul-2007 | 18       | Add table 1 in cover page.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 26-Nov-2007 | 19       | Modified: <a href="#">Table 34</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 16-Jan-2008 | 20       | Added new order codes for automotive grade products see <a href="#">Table 34 on page 51</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 12-Feb-2008 | 21       | Modified: <a href="#">Table 34 on page 51</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 10-Jul-2008 | 22       | Modified: <a href="#">Table 34 on page 51</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 05-May-2010 | 23       | Added: <a href="#">Table 29 on page 41</a> , fig 16, fig 17, fig 18 and fig 19.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 16-Nov-2010 | 24       | Modified: $R_{thJC}$ value for TO-220 <a href="#">Table 2 on page 7</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 10-Feb-2012 | 25       | Added: order code LF33CV-DG and LF33ABV-DG <a href="#">Table 34 on page 51</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 09-Mar-2012 | 26       | Added: order code LF50ABV-DG <a href="#">Table 34 on page 51</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 28-Feb-2014 | 27       | <p>Changed the part numbers LFxxAB and LFxxC to LFXX.</p> <p>Changed the title.</p> <p>Removed table from cover page.</p> <p>Removed PENTAWATT package from the figure in cover page, the <a href="#">Description</a> and <a href="#">Figure 2</a>.</p> <p>Updated the <a href="#">Description</a>.</p> <p>Updated: <a href="#">Table 2</a>, <a href="#">Table 6</a>, <a href="#">Table 8</a>, <a href="#">Table 10</a>, <a href="#">Table 13</a>, <a href="#">Table 15</a>, <a href="#">Table 17</a>, <a href="#">Table 22</a>, <a href="#">Table 25</a> and <a href="#">Table 34</a>.</p> <p>Changed title of <a href="#">Figure 7</a>.</p> <p>Updated mechanical data.</p> |
| 03-Mar-2015 | 28       | <p>Updated <a href="#">Table 34: Order code</a>.</p> <p>Minor text changes.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

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