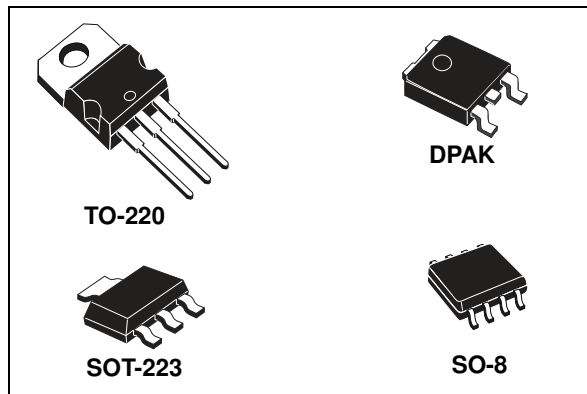


## Adjustable and fixed low drop positive voltage regulator

Datasheet - production data



### Description

The LD1117 is a low drop voltage regulator able to provide up to 800 mA of output current, available even in adjustable version ( $V_{REF} = 1.25\text{ V}$ ). Concerning fixed versions, are offered the following output voltages: 1.2 V, 1.8 V, 2.5 V, 3.3 V and 5.0 V. The device is supplied in: SOT-223, DPAK, SO-8 and TO-220. The SOT-223 and DPAK surface mount packages optimize the thermal characteristics even offering a relevant space saving effect. High efficiency is assured by NPN pass transistor. In fact in this case, unlike than PNP one, the quiescent current flows mostly into the load. Only a very common  $10\text{ }\mu\text{F}$  minimum capacitor is needed for stability. On chip trimming allows the regulator to reach a very tight output voltage tolerance, within  $\pm 1\%$  at  $25\text{ }^{\circ}\text{C}$ . The adjustable LD1117 is pin to pin compatible with the other standard. Adjustable voltage regulators maintaining the better performances in terms of drop and tolerance.

### Features

- Low dropout voltage (1 V typ.)
- Output current up to 800 mA
- Fixed output voltage of: 1.2 V, 1.8 V, 2.5 V, 3.3 V, 5.0 V
- Adjustable version availability ( $V_{REF} = 1.25\text{ V}$ )
- Internal current and thermal limit
- Available in  $\pm 1\%$  (at  $25\text{ }^{\circ}\text{C}$ ) and  $2\%$  in full temperature range
- Supply voltage rejection: 75 dB (typ.)

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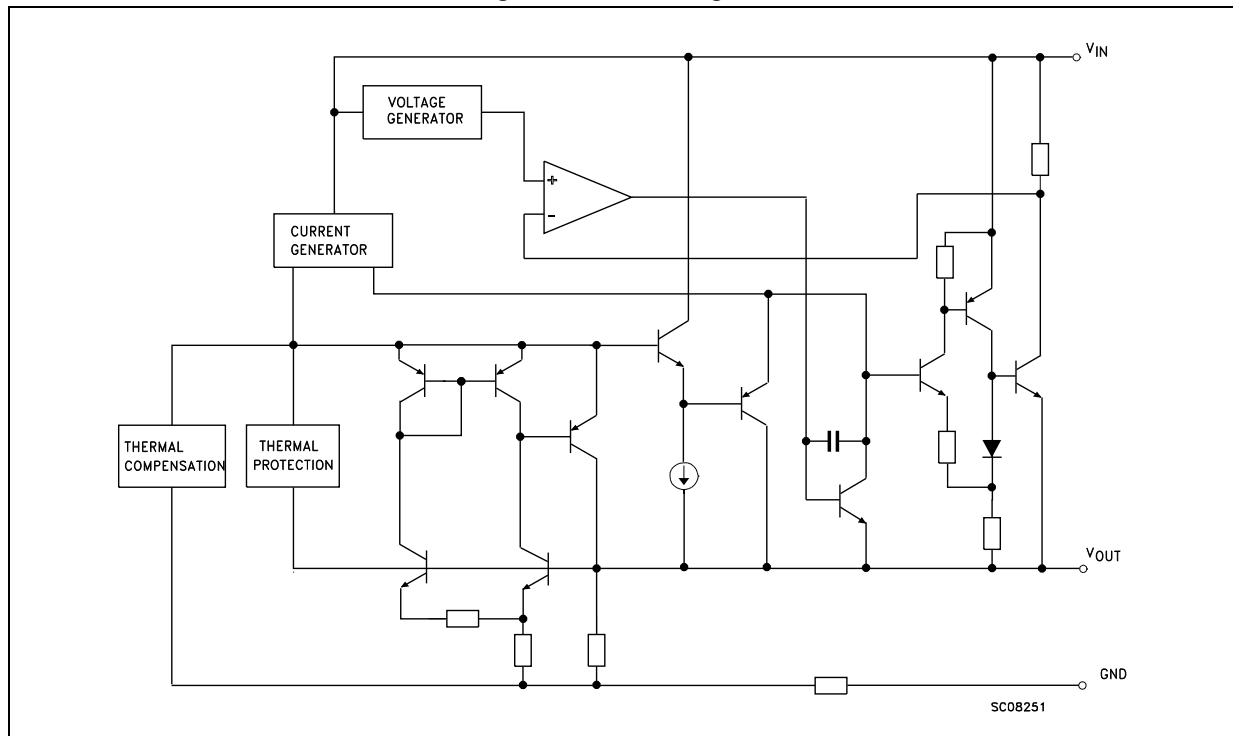
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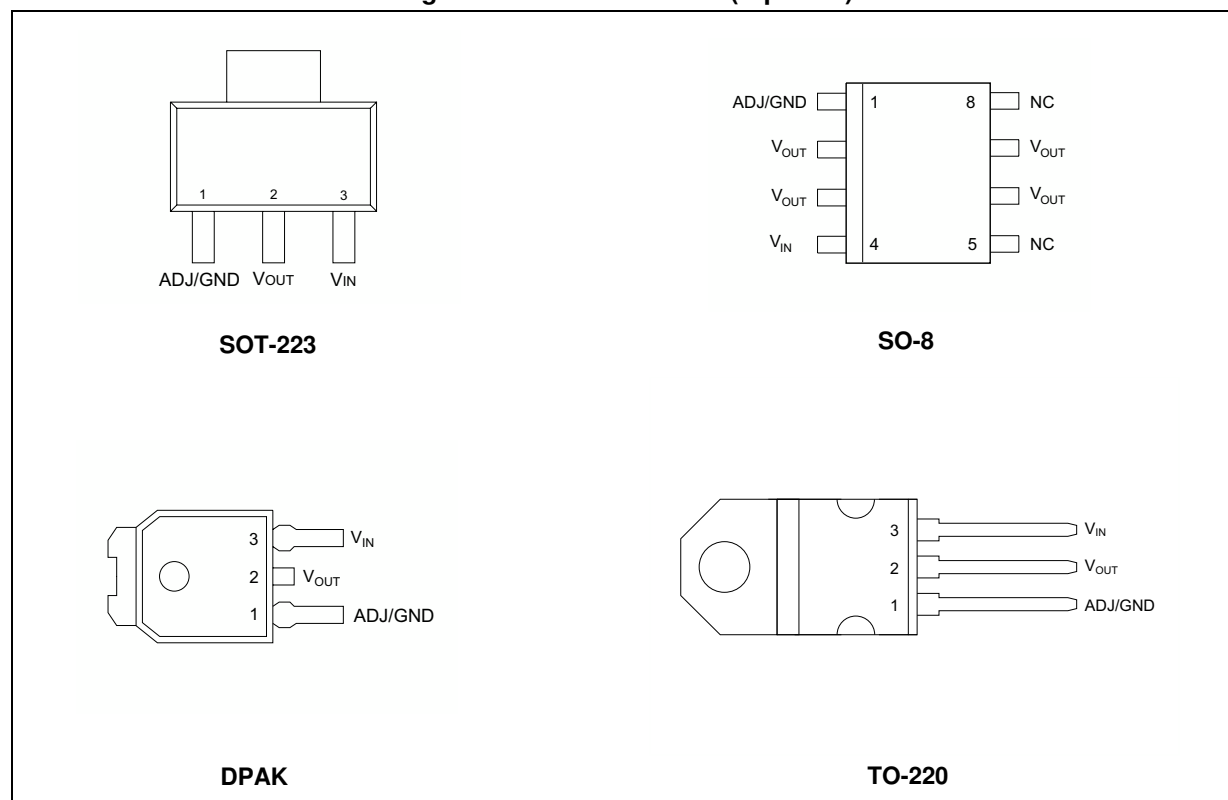
# 1 Diagram

Figure 1. Block diagram



## 2 Pin configuration

Figure 2. Pin connections (top view)



*Note:* The TAB is connected to the  $V_{OUT}$ .

### 3 Maximum ratings

**Table 1. Absolute maximum ratings**

| Symbol         | Parameter                            |                      | Value       | Unit |
|----------------|--------------------------------------|----------------------|-------------|------|
| $V_{IN}^{(1)}$ | DC input voltage                     |                      | 15          | V    |
| $P_{TOT}$      | Power dissipation                    |                      | 12          | W    |
| $T_{STG}$      | Storage temperature range            |                      | -40 to +150 | °C   |
| $T_{OP}$       | Operating junction temperature range | for C version        | -40 to +125 | °C   |
|                |                                      | for standard version | 0 to +125   | °C   |

1. Absolute maximum rating of  $V_{IN} = 18$  V, when  $I_{OUT}$  is lower than 20 mA.

**Table 2. Thermal data**

| Symbol     | Parameter                           | SOT-223 | SO-8 | DPAK | TO-220 | Unit |
|------------|-------------------------------------|---------|------|------|--------|------|
| $R_{thJC}$ | Thermal resistance junction-case    | 15      | 20   | 8    | 5      | °C/W |
| $R_{thJA}$ | Thermal resistance junction-ambient | 110     | 55   | 100  | 50     | °C/W |

## 4 Schematic application

Figure 3. Application circuit (for 1.2 V)

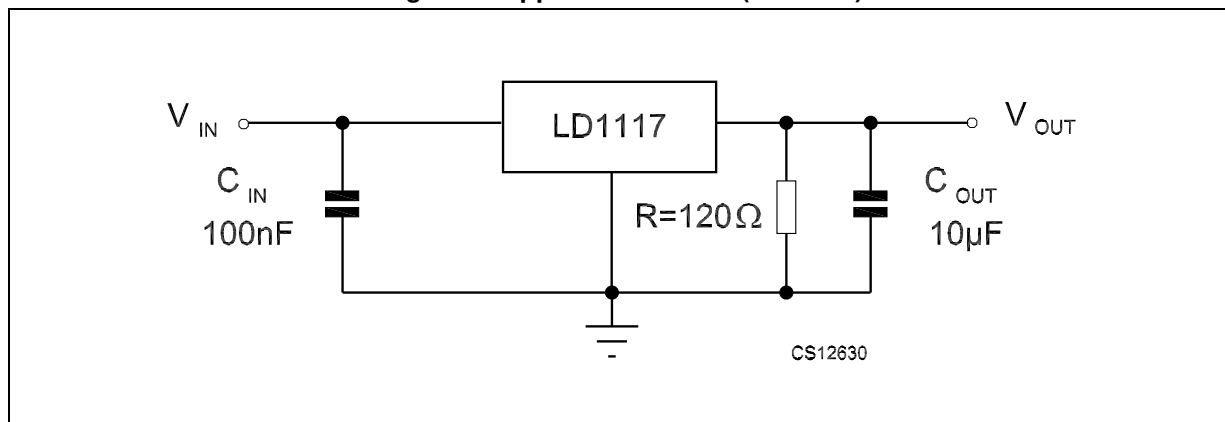
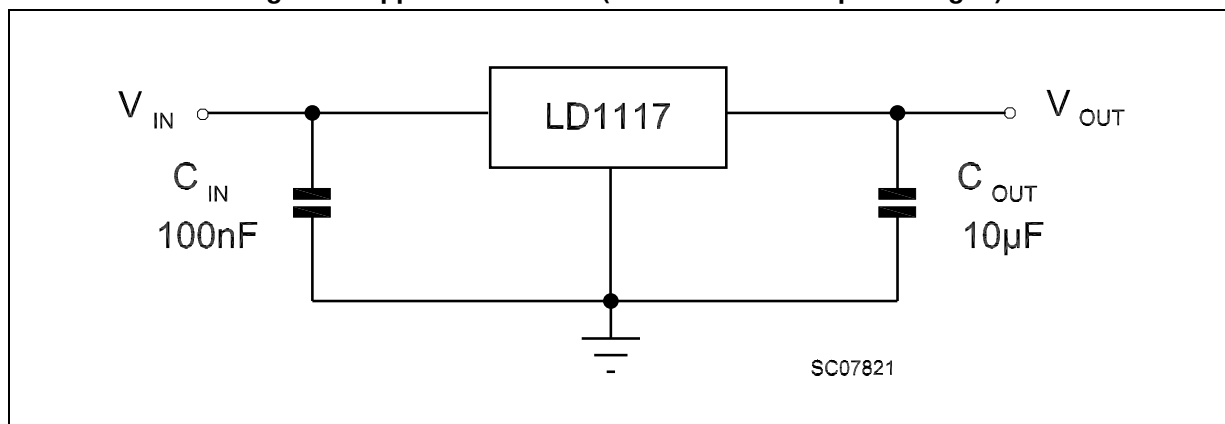


Figure 4. Application circuit (for other fixed output voltages)



## 5 Electrical characteristics

Refer to the test circuits,  $T_J = 0$  to  $125\text{ }^{\circ}\text{C}$ ,  $C_O = 10\text{ }\mu\text{F}$ ,  $R = 120\text{ }\Omega$  between GND and OUT pins, unless otherwise specified.

**Table 3. Electrical characteristics of LD1117#12**

| Symbol           | Parameter                     | Test condition                                                                                                                                  | Min.  | Typ.  | Max.  | Unit          |
|------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|-------|---------------|
| $V_O$            | Output voltage                | $V_{in} = 3.2\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                             | 1.188 | 1.20  | 1.212 | V             |
| $V_O$            | Output voltage                | $I_O = 10$ to $800\text{ mA}$<br>$V_{in} - V_O = 1.4$ to $10\text{ V}$                                                                          | 1.140 | 1.20  | 1.260 | V             |
| $\Delta V_O$     | Line regulation               | $V_{in} - V_O = 1.5$ to $13.75\text{ V}$ , $I_O = 10\text{ mA}$                                                                                 |       | 0.035 | 0.2   | %             |
| $\Delta V_O$     | Load regulation               | $V_{in} - V_O = 3\text{ V}$ , $I_O = 10$ to $800\text{ mA}$                                                                                     |       | 0.1   | 0.4   | %             |
| $\Delta V_O$     | Temperature stability         |                                                                                                                                                 |       | 0.5   |       | %             |
| $\Delta V_O$     | Long term stability           | 1000 hrs, $T_J = 125\text{ }^{\circ}\text{C}$                                                                                                   |       | 0.3   |       | %             |
| $V_{in}$         | Operating input voltage       |                                                                                                                                                 |       |       | 15    | V             |
| $I_{adj}$        | Adjustment pin current        | $V_{in} \leq 15\text{ V}$                                                                                                                       |       | 60    | 120   | $\mu\text{A}$ |
| $\Delta I_{adj}$ | Adjustment pin current change | $V_{in} - V_O = 1.4$ to $10\text{ V}$<br>$I_O = 10$ to $800\text{ mA}$                                                                          |       | 1     | 5     | $\mu\text{A}$ |
| $I_{O(min)}$     | Minimum load current          | $V_{in} = 15\text{ V}$                                                                                                                          |       | 2     | 5     | mA            |
| $I_O$            | Output current                | $V_{in} - V_O = 5\text{ V}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                                | 800   | 950   | 1300  | mA            |
| eN               | Output noise (% $V_O$ )       | $B = 10\text{ Hz}$ to $10\text{ kHz}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                      |       | 0.003 |       | %             |
| SVR              | Supply voltage rejection      | $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $T_J = 25\text{ }^{\circ}\text{C}$<br>$V_{in} - V_O = 3\text{ V}$ , $V_{ripple} = 1\text{ V}_{PP}$ | 60    | 75    |       | dB            |
| $V_d$            | Dropout voltage               | $I_O = 100\text{ mA}$                                                                                                                           |       | 1     | 1.1   | V             |
|                  |                               | $I_O = 500\text{ mA}$                                                                                                                           |       | 1.05  | 1.15  |               |
|                  |                               | $I_O = 800\text{ mA}$                                                                                                                           |       | 1.10  | 1.2   |               |
|                  | Thermal regulation            | $T_a = 25\text{ }^{\circ}\text{C}$ , 30 ms Pulse                                                                                                |       | 0.01  | 0.1   | %/W           |

Refer to the test circuits,  $T_J = 0$  to  $125\text{ }^{\circ}\text{C}$ ,  $C_O = 10\text{ }\mu\text{F}$ , unless otherwise specified.

**Table 4. Electrical characteristics of LD1117#18**

| Symbol       | Parameter                | Test condition                                                                                                                              | Min. | Typ. | Max. | Unit          |
|--------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| $V_O$        | Output voltage           | $V_{in} = 3.8\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                         | 1.78 | 1.8  | 1.82 | V             |
| $V_O$        | Output voltage           | $I_O = 0$ to $800\text{ mA}$ , $V_{in} = 3.3$ to $8\text{ V}$                                                                               | 1.76 |      | 1.84 | V             |
| $\Delta V_O$ | Line regulation          | $V_{in} = 3.3$ to $8\text{ V}$ , $I_O = 0\text{ mA}$                                                                                        |      | 1    | 6    | mV            |
| $\Delta V_O$ | Load regulation          | $V_{in} = 3.3\text{ V}$ , $I_O = 0$ to $800\text{ mA}$                                                                                      |      | 1    | 10   | mV            |
| $\Delta V_O$ | Temperature stability    |                                                                                                                                             |      | 0.5  |      | %             |
| $\Delta V_O$ | Long term stability      | 1000 hrs, $T_J = 125\text{ }^{\circ}\text{C}$                                                                                               |      | 0.3  |      | %             |
| $V_{in}$     | Operating input voltage  | $I_O = 100\text{ mA}$                                                                                                                       |      |      | 15   | V             |
| $I_d$        | Quiescent current        | $V_{in} \leq 8\text{ V}$                                                                                                                    |      | 5    | 10   | mA            |
| $I_O$        | Output current           | $V_{in} = 6.8\text{ V}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                                | 800  | 950  | 1300 | mA            |
| eN           | Output noise voltage     | $B = 10\text{ Hz}$ to $10\text{ kHz}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                  |      | 100  |      | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $T_J = 25\text{ }^{\circ}\text{C}$<br>$V_{in} = 5.5\text{ V}$ , $V_{ripple} = 1\text{ V}_{PP}$ | 60   | 75   |      | dB            |
| $V_d$        | Dropout voltage          | $I_O = 100\text{ mA}$                                                                                                                       |      | 1    | 1.1  | V             |
|              |                          | $I_O = 500\text{ mA}$                                                                                                                       |      | 1.05 | 1.15 |               |
|              |                          | $I_O = 800\text{ mA}$                                                                                                                       |      | 1.10 | 1.2  |               |
|              | Thermal regulation       | $T_a = 25\text{ }^{\circ}\text{C}$ , 30 ms Pulse                                                                                            |      | 0.01 | 0.1  | %/W           |

Refer to the test circuits,  $T_J = 0$  to  $125\text{ }^{\circ}\text{C}$ ,  $C_O = 10\text{ }\mu\text{F}$ , unless otherwise specified.

**Table 5. Electrical characteristics of LD1117#25**

| Symbol       | Parameter                | Test condition                                                                                                                              | Min.  | Typ. | Max.  | Unit          |
|--------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------|------|-------|---------------|
| $V_O$        | Output voltage           | $V_{in} = 4.5\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                         | 2.475 | 2.5  | 2.525 | V             |
| $V_O$        | Output voltage           | $I_O = 0$ to $800\text{ mA}$ , $V_{in} = 3.9$ to $10\text{ V}$                                                                              | 2.45  |      | 2.55  | V             |
| $\Delta V_O$ | Line regulation          | $V_{in} = 3.9$ to $10\text{ V}$ , $I_O = 0\text{ mA}$                                                                                       |       | 1    | 6     | mV            |
| $\Delta V_O$ | Load regulation          | $V_{in} = 3.9\text{ V}$ , $I_O = 0$ to $800\text{ mA}$                                                                                      |       | 1    | 10    | mV            |
| $\Delta V_O$ | Temperature stability    |                                                                                                                                             |       | 0.5  |       | %             |
| $\Delta V_O$ | Long term stability      | 1000 hrs, $T_J = 125\text{ }^{\circ}\text{C}$                                                                                               |       | 0.3  |       | %             |
| $V_{in}$     | Operating input voltage  | $I_O = 100\text{ mA}$                                                                                                                       |       |      | 15    | V             |
| $I_d$        | Quiescent current        | $V_{in} \leq 10\text{ V}$                                                                                                                   |       | 5    | 10    | mA            |
| $I_O$        | Output current           | $V_{in} = 7.5\text{ V}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                                | 800   | 950  | 1300  | mA            |
| eN           | Output noise voltage     | $B = 10\text{ Hz}$ to $10\text{ kHz}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                  |       | 100  |       | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $T_J = 25\text{ }^{\circ}\text{C}$<br>$V_{in} = 5.5\text{ V}$ , $V_{ripple} = 1\text{ V}_{PP}$ | 60    | 75   |       | dB            |
| $V_d$        | Dropout voltage          | $I_O = 100\text{ mA}$                                                                                                                       |       | 1    | 1.1   | V             |
|              |                          | $I_O = 500\text{ mA}$                                                                                                                       |       | 1.05 | 1.15  |               |
|              |                          | $I_O = 800\text{ mA}$                                                                                                                       |       | 1.10 | 1.2   |               |
|              | Thermal regulation       | $T_a = 25\text{ }^{\circ}\text{C}$ , 30 ms Pulse                                                                                            |       | 0.01 | 0.1   | %/W           |

Refer to the test circuits,  $T_J = 0$  to  $125\text{ }^{\circ}\text{C}$ ,  $C_O = 10\text{ }\mu\text{F}$ , unless otherwise specified.

**Table 6. Electrical characteristics of LD1117#33**

| Symbol       | Parameter                | Test condition                                                                                                                              | Min.  | Typ. | Max.  | Unit          |
|--------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------|------|-------|---------------|
| $V_O$        | Output voltage           | $V_{in} = 5.3\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                         | 3.267 | 3.3  | 3.333 | V             |
| $V_O$        | Output voltage           | $I_O = 0$ to $800\text{ mA}$ , $V_{in} = 4.75$ to $10\text{ V}$                                                                             | 3.235 |      | 3.365 | V             |
| $\Delta V_O$ | Line regulation          | $V_{in} = 4.75$ to $15\text{ V}$ , $I_O = 0\text{ mA}$                                                                                      |       | 1    | 6     | mV            |
| $\Delta V_O$ | Load regulation          | $V_{in} = 4.75\text{ V}$ , $I_O = 0$ to $800\text{ mA}$                                                                                     |       | 1    | 10    | mV            |
| $\Delta V_O$ | Temperature stability    |                                                                                                                                             |       | 0.5  |       | %             |
| $\Delta V_O$ | Long term stability      | 1000 hrs, $T_J = 125\text{ }^{\circ}\text{C}$                                                                                               |       | 0.3  |       | %             |
| $V_{in}$     | Operating input voltage  | $I_O = 100\text{ mA}$                                                                                                                       |       |      | 15    | V             |
| $I_d$        | Quiescent current        | $V_{in} \leq 15\text{ V}$                                                                                                                   |       | 5    | 10    | mA            |
| $I_O$        | Output current           | $V_{in} = 8.3\text{ V}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                                | 800   | 950  | 1300  | mA            |
| eN           | Output noise voltage     | $B = 10\text{ Hz}$ to $10\text{ kHz}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                  |       | 100  |       | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $T_J = 25\text{ }^{\circ}\text{C}$<br>$V_{in} = 6.3\text{ V}$ , $V_{ripple} = 1\text{ V}_{PP}$ | 60    | 75   |       | dB            |
| $V_d$        | Dropout voltage          | $I_O = 100\text{ mA}$                                                                                                                       |       | 1    | 1.1   | V             |
|              |                          | $I_O = 500\text{ mA}$                                                                                                                       |       | 1.05 | 1.15  |               |
|              |                          | $I_O = 800\text{ mA}$                                                                                                                       |       | 1.10 | 1.2   |               |
|              | Thermal regulation       | $T_a = 25\text{ }^{\circ}\text{C}$ , 30 ms Pulse                                                                                            |       | 0.01 | 0.1   | %/W           |

Refer to the test circuits,  $T_J = 0$  to  $125\text{ }^{\circ}\text{C}$ ,  $C_O = 10\text{ }\mu\text{F}$ , unless otherwise specified.

**Table 7. Electrical characteristics of LD1117#50**

| Symbol       | Parameter                | Test condition                                                                                                                            | Min. | Typ. | Max. | Unit          |
|--------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| $V_O$        | Output voltage           | $V_{in} = 7\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                         | 4.95 | 5    | 5.05 | V             |
| $V_O$        | Output voltage           | $I_O = 0$ to $800\text{ mA}$ , $V_{in} = 6.5$ to $15\text{ V}$                                                                            | 4.9  |      | 5.1  | V             |
| $\Delta V_O$ | Line regulation          | $V_{in} = 6.5$ to $15\text{ V}$ , $I_O = 0\text{ mA}$                                                                                     |      | 1    | 10   | mV            |
| $\Delta V_O$ | Load regulation          | $V_{in} = 6.5\text{ V}$ , $I_O = 0$ to $800\text{ mA}$                                                                                    |      | 1    | 15   | mV            |
| $\Delta V_O$ | Temperature stability    |                                                                                                                                           |      | 0.5  |      | %             |
| $\Delta V_O$ | Long term stability      | 1000 hrs, $T_J = 125\text{ }^{\circ}\text{C}$                                                                                             |      | 0.3  |      | %             |
| $V_{in}$     | Operating input voltage  | $I_O = 100\text{ mA}$                                                                                                                     |      |      | 15   | V             |
| $I_d$        | Quiescent current        | $V_{in} \leq 15\text{ V}$                                                                                                                 |      | 5    | 10   | mA            |
| $I_O$        | Output current           | $V_{in} = 10\text{ V}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                               | 800  | 950  | 1300 | mA            |
| eN           | Output noise voltage     | $B = 10\text{ Hz}$ to $10\text{ kHz}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                |      | 100  |      | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $T_J = 25\text{ }^{\circ}\text{C}$<br>$V_{in} = 8\text{ V}$ , $V_{ripple} = 1\text{ V}_{PP}$ | 60   | 75   |      | dB            |
| $V_d$        | Dropout voltage          | $I_O = 100\text{ mA}$                                                                                                                     |      | 1    | 1.1  | V             |
|              |                          | $I_O = 500\text{ mA}$                                                                                                                     |      | 1.05 | 1.15 |               |
|              |                          | $I_O = 800\text{ mA}$                                                                                                                     |      | 1.10 | 1.2  |               |
|              | Thermal regulation       | $T_a = 25\text{ }^{\circ}\text{C}$ , 30 ms Pulse                                                                                          |      | 0.01 | 0.1  | %/W           |

Refer to the test circuits,  $T_J = 0$  to  $125\text{ }^{\circ}\text{C}$ ,  $C_O = 10\text{ }\mu\text{F}$ , unless otherwise specified.

**Table 8. Electrical characteristics of LD1117 (adjustable)**

| Symbol                  | Parameter                     | Test condition                                                                                                                                                       | Min.  | Typ.  | Max.  | Unit          |
|-------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|-------|---------------|
| $V_{\text{ref}}$        | Reference voltage             | $V_{\text{in}} - V_O = 2\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                       | 1.238 | 1.25  | 1.262 | V             |
| $V_{\text{ref}}$        | Reference voltage             | $I_O = 10$ to $800\text{ mA}$ , $V_{\text{in}} - V_O = 1.4$ to $10\text{ V}$                                                                                         | 1.225 |       | 1.275 | V             |
| $\Delta V_O$            | Line regulation               | $V_{\text{in}} - V_O = 1.5$ to $13.75\text{ V}$ , $I_O = 10\text{ mA}$                                                                                               |       | 0.035 | 0.2   | %             |
| $\Delta V_O$            | Load regulation               | $V_{\text{in}} - V_O = 3\text{ V}$ , $I_O = 10$ to $800\text{ mA}$                                                                                                   |       | 0.1   | 0.4   | %             |
| $\Delta V_O$            | Temperature stability         |                                                                                                                                                                      |       | 0.5   |       | %             |
| $\Delta V_O$            | Long term stability           | 1000 hrs, $T_J = 125\text{ }^{\circ}\text{C}$                                                                                                                        |       | 0.3   |       | %             |
| $V_{\text{in}}$         | Operating input voltage       |                                                                                                                                                                      |       |       | 15    | V             |
| $I_{\text{adj}}$        | Adjustment pin current        | $V_{\text{in}} \leq 15\text{ V}$                                                                                                                                     |       | 60    | 120   | $\mu\text{A}$ |
| $\Delta I_{\text{adj}}$ | Adjustment pin current change | $V_{\text{in}} - V_O = 1.4$ to $10\text{ V}$ , $I_O = 10$ to $800\text{ mA}$                                                                                         |       | 1     | 5     | $\mu\text{A}$ |
| $I_{O(\text{min})}$     | Minimum load current          | $V_{\text{in}} = 15\text{ V}$                                                                                                                                        |       | 2     | 5     | mA            |
| $I_O$                   | Output current                | $V_{\text{in}} - V_O = 5\text{ V}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                                              | 800   | 950   | 1300  | mA            |
| eN                      | Output noise (% $V_O$ )       | $B = 10\text{ Hz}$ to $10\text{ kHz}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                                           |       | 0.003 |       | %             |
| SVR                     | Supply voltage rejection      | $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $T_J = 25\text{ }^{\circ}\text{C}$<br>$V_{\text{in}} - V_O = 3\text{ V}$ , $V_{\text{ripple}} = 1\text{ V}_{\text{PP}}$ | 60    | 75    |       | dB            |
| $V_d$                   | Dropout voltage               | $I_O = 100\text{ mA}$                                                                                                                                                |       | 1     | 1.1   | V             |
|                         |                               | $I_O = 500\text{ mA}$                                                                                                                                                |       | 1.05  | 1.15  |               |
|                         |                               | $I_O = 800\text{ mA}$                                                                                                                                                |       | 1.10  | 1.2   |               |
|                         | Thermal regulation            | $T_a = 25\text{ }^{\circ}\text{C}$ , 30 ms Pulse                                                                                                                     |       | 0.01  | 0.1   | %/W           |

Refer to the test circuits,  $T_J = -40$  to  $125\text{ }^{\circ}\text{C}$ ,  $C_O = 10\text{ }\mu\text{F}$ ,  $R = 120\text{ }\Omega$  between GND and OUT pins, unless otherwise specified.

**Table 9. Electrical characteristics of LD1117#12C**

| Symbol           | Parameter                     | Test condition                                                                                                                                  | Min.  | Typ.  | Max.  | Unit          |
|------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|-------|---------------|
| $V_O$            | Output voltage                | $V_{in} - V_O = 2\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                         | 1.176 | 1.20  | 1.224 | V             |
| $V_O$            | Output voltage                | $I_O = 10$ to $800\text{ mA}$ , $V_{in} - V_O = 1.4$ to $10\text{ V}$                                                                           | 1.120 | 1.20  | 1.280 | V             |
| $\Delta V_O$     | Line regulation               | $V_{in} - V_O = 1.5$ to $13.75\text{ V}$ , $I_O = 10\text{ mA}$                                                                                 |       |       | 1     | %             |
| $\Delta V_O$     | Load regulation               | $V_{in} - V_O = 3\text{ V}$ , $I_O = 10$ to $800\text{ mA}$                                                                                     |       |       | 1     | %             |
| $\Delta V_O$     | Temperature stability         |                                                                                                                                                 |       | 0.5   |       | %             |
| $\Delta V_O$     | Long term stability           | 1000 hrs, $T_J = 125\text{ }^{\circ}\text{C}$                                                                                                   |       | 0.3   |       | %             |
| $V_{in}$         | Operating input voltage       |                                                                                                                                                 |       |       | 15    | V             |
| $I_{adj}$        | Adjustment pin current        | $V_{in} \leq 15\text{ V}$                                                                                                                       |       | 60    | 120   | $\mu\text{A}$ |
| $\Delta I_{adj}$ | Adjustment pin current change | $V_{in} - V_O = 1.4$ to $10\text{ V}$<br>$I_O = 10$ to $800\text{ mA}$                                                                          |       | 1     | 5     | $\mu\text{A}$ |
| $I_{O(min)}$     | Minimum load current          | $V_{in} = 15\text{ V}$                                                                                                                          |       | 2     | 5     | mA            |
| $I_O$            | Output current                | $V_{in} - V_O = 5\text{ V}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                                | 800   | 950   | 1300  | mA            |
| eN               | Output noise (% $V_O$ )       | $B = 10\text{ Hz}$ to $10\text{ kHz}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                      |       | 0.003 |       | %             |
| SVR              | Supply voltage rejection      | $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $T_J = 25\text{ }^{\circ}\text{C}$<br>$V_{in} - V_O = 3\text{ V}$ , $V_{ripple} = 1\text{ V}_{PP}$ | 60    | 75    |       | dB            |
| $V_d$            | Dropout voltage               | $I_O = 100\text{ mA}$ , $T_J = 0$ to $125\text{ }^{\circ}\text{C}$                                                                              |       | 1     | 1.1   | V             |
|                  |                               | $I_O = 500\text{ mA}$ , $T_J = 0$ to $125\text{ }^{\circ}\text{C}$                                                                              |       | 1.05  | 1.2   |               |
|                  |                               | $I_O = 800\text{ mA}$ , $T_J = 0$ to $125\text{ }^{\circ}\text{C}$                                                                              |       | 1.10  | 1.3   |               |
|                  | Thermal regulation            | $T_a = 25\text{ }^{\circ}\text{C}$ , 30 ms Pulse                                                                                                |       | 0.01  | 0.1   | %/W           |

Refer to the test circuits,  $T_J = -40$  to  $125\text{ }^{\circ}\text{C}$ ,  $C_O = 10\text{ }\mu\text{F}$ , unless otherwise specified.

**Table 10. Electrical characteristics of LD1117#18C**

| Symbol       | Parameter                | Test condition                                                                                                                              | Min. | Typ. | Max. | Unit          |
|--------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| $V_O$        | Output voltage           | $V_{in} = 3.8\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                         | 1.76 | 1.8  | 1.84 | V             |
| $V_O$        | Output voltage           | $I_O = 0$ to $800\text{ mA}$ , $V_{in} = 3.9$ to $10\text{ V}$                                                                              | 1.73 |      | 1.87 | V             |
| $\Delta V_O$ | Line regulation          | $V_{in} = 3.3$ to $8\text{ V}$ , $I_O = 0\text{ mA}$                                                                                        |      | 1    | 30   | mV            |
| $\Delta V_O$ | Load regulation          | $V_{in} = 3.3\text{ V}$ , $I_O = 0$ to $800\text{ mA}$                                                                                      |      | 1    | 30   | mV            |
| $\Delta V_O$ | Temperature stability    |                                                                                                                                             |      | 0.5  |      | %             |
| $\Delta V_O$ | Long term stability      | 1000 hrs, $T_J = 125\text{ }^{\circ}\text{C}$                                                                                               |      | 0.3  |      | %             |
| $V_{in}$     | Operating input voltage  | $I_O = 100\text{ mA}$                                                                                                                       |      |      | 15   | V             |
| $I_d$        | Quiescent current        | $V_{in} \leq 8\text{ V}$                                                                                                                    |      | 5    | 10   | mA            |
| $I_O$        | Output current           | $V_{in} = 6.8\text{ V}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                                | 800  | 950  | 1300 | mA            |
| eN           | Output noise voltage     | $B = 10\text{ Hz}$ to $10\text{ kHz}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                  |      | 100  |      | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $T_J = 25\text{ }^{\circ}\text{C}$<br>$V_{in} = 5.5\text{ V}$ , $V_{ripple} = 1\text{ V}_{PP}$ | 60   | 75   |      | dB            |
| $V_d$        | Dropout voltage          | $I_O = 100\text{ mA}$ , $T_J = 0$ to $125\text{ }^{\circ}\text{C}$                                                                          |      | 1    | 1.1  | V             |
|              |                          | $I_O = 500\text{ mA}$ , $T_J = 0$ to $125\text{ }^{\circ}\text{C}$                                                                          |      | 1.05 | 1.15 |               |
|              |                          | $I_O = 800\text{ mA}$ , $T_J = 0$ to $125\text{ }^{\circ}\text{C}$                                                                          |      | 1.10 | 1.2  |               |
| $V_d$        | Dropout voltage          | $I_O = 100\text{ mA}$                                                                                                                       |      |      | 1.1  | V             |
|              |                          | $I_O = 500\text{ mA}$                                                                                                                       |      |      | 1.2  |               |
|              |                          | $I_O = 800\text{ mA}$                                                                                                                       |      |      | 1.3  |               |
|              | Thermal regulation       | $T_a = 25\text{ }^{\circ}\text{C}$ , 30 ms Pulse                                                                                            |      | 0.01 | 0.1  | %/W           |

Refer to the test circuits,  $T_J = -40$  to  $125\text{ }^{\circ}\text{C}$ ,  $C_O = 10\text{ }\mu\text{F}$ , unless otherwise specified.

**Table 11. Electrical characteristics of LD1117#25C**

| Symbol       | Parameter                | Test condition                                                                                                                              | Min. | Typ. | Max. | Unit          |
|--------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| $V_O$        | Output voltage           | $V_{in} = 4.5\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                         | 2.45 | 2.5  | 2.55 | V             |
| $V_O$        | Output voltage           | $I_O = 0$ to $800\text{ mA}$ , $V_{in} = 3.9$ to $10\text{ V}$                                                                              | 2.4  |      | 2.6  | V             |
| $\Delta V_O$ | Line regulation          | $V_{in} = 3.9$ to $10\text{ V}$ , $I_O = 0\text{ mA}$                                                                                       |      | 1    | 30   | mV            |
| $\Delta V_O$ | Load regulation          | $V_{in} = 3.9\text{ V}$ , $I_O = 0$ to $800\text{ mA}$                                                                                      |      | 1    | 30   | mV            |
| $\Delta V_O$ | Temperature stability    |                                                                                                                                             |      | 0.5  |      | %             |
| $\Delta V_O$ | Long term stability      | 1000 hrs, $T_J = 125\text{ }^{\circ}\text{C}$                                                                                               |      | 0.3  |      | %             |
| $V_{in}$     | Operating input voltage  | $I_O = 100\text{ mA}$                                                                                                                       |      |      | 15   | V             |
| $I_d$        | Quiescent current        | $V_{in} \leq 10\text{ V}$                                                                                                                   |      | 5    | 10   | mA            |
| $I_O$        | Output current           | $V_{in} = 7.5\text{ V}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                                | 800  | 950  | 1300 | mA            |
| eN           | Output noise voltage     | $B = 10\text{ Hz}$ to $10\text{ kHz}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                  |      | 100  |      | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $T_J = 25\text{ }^{\circ}\text{C}$<br>$V_{in} = 5.5\text{ V}$ , $V_{ripple} = 1\text{ V}_{PP}$ | 60   | 75   |      | dB            |
| $V_d$        | Dropout voltage          | $I_O = 100\text{ mA}$ , $T_J = 0$ to $125\text{ }^{\circ}\text{C}$                                                                          |      | 1    | 1.1  | V             |
|              |                          | $I_O = 500\text{ mA}$ , $T_J = 0$ to $125\text{ }^{\circ}\text{C}$                                                                          |      | 1.05 | 1.15 |               |
|              |                          | $I_O = 800\text{ mA}$ , $T_J = 0$ to $125\text{ }^{\circ}\text{C}$                                                                          |      | 1.10 | 1.2  |               |
| $V_d$        | Dropout voltage          | $I_O = 100\text{ mA}$                                                                                                                       |      |      | 1.1  | V             |
|              |                          | $I_O = 500\text{ mA}$                                                                                                                       |      |      | 1.2  |               |
|              |                          | $I_O = 800\text{ mA}$                                                                                                                       |      |      | 1.3  |               |
|              | Thermal regulation       | $T_a = 25\text{ }^{\circ}\text{C}$ , 30 ms Pulse                                                                                            |      | 0.01 | 0.1  | %/W           |

Refer to the test circuits,  $T_J = -40$  to  $125\text{ }^{\circ}\text{C}$ ,  $C_O = 10\text{ }\mu\text{F}$ , unless otherwise specified.

**Table 12. Electrical characteristics of LD1117#33C**

| Symbol       | Parameter                | Test condition                                                                                                                              | Min. | Typ. | Max. | Unit          |
|--------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| $V_O$        | Output voltage           | $V_{in} = 5.3\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                         | 3.24 | 3.3  | 3.36 | V             |
| $V_O$        | Output voltage           | $I_O = 0$ to $800\text{ mA}$ , $V_{in} = 4.75$ to $10\text{ V}$                                                                             | 3.16 |      | 3.44 | V             |
| $\Delta V_O$ | Line regulation          | $V_{in} = 4.75$ to $15\text{ V}$ , $I_O = 0\text{ mA}$                                                                                      |      | 1    | 30   | mV            |
| $\Delta V_O$ | Load regulation          | $V_{in} = 4.75\text{ V}$ , $I_O = 0$ to $800\text{ mA}$                                                                                     |      | 1    | 30   | mV            |
| $\Delta V_O$ | Temperature stability    |                                                                                                                                             |      | 0.5  |      | %             |
| $\Delta V_O$ | Long term stability      | 1000 hrs, $T_J = 125\text{ }^{\circ}\text{C}$                                                                                               |      | 0.3  |      | %             |
| $V_{in}$     | Operating input voltage  | $I_O = 100\text{ mA}$                                                                                                                       |      |      | 15   | V             |
| $I_d$        | Quiescent current        | $V_{in} \leq 15\text{ V}$                                                                                                                   |      | 5    | 10   | mA            |
| $I_O$        | Output current           | $V_{in} = 8.3\text{ V}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                                | 800  | 950  | 1300 | mA            |
| eN           | Output noise voltage     | $B = 10\text{ Hz}$ to $10\text{ kHz}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                  |      | 100  |      | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $T_J = 25\text{ }^{\circ}\text{C}$<br>$V_{in} = 6.3\text{ V}$ , $V_{ripple} = 1\text{ V}_{PP}$ | 60   | 75   |      | dB            |
| $V_d$        | Dropout voltage          | $I_O = 100\text{ mA}$ , $T_J = 0$ to $125\text{ }^{\circ}\text{C}$                                                                          |      | 1    | 1.1  | V             |
|              |                          | $I_O = 500\text{ mA}$ , $T_J = 0$ to $125\text{ }^{\circ}\text{C}$                                                                          |      | 1.05 | 1.15 |               |
|              |                          | $I_O = 800\text{ mA}$ , $T_J = 0$ to $125\text{ }^{\circ}\text{C}$                                                                          |      | 1.10 | 1.2  |               |
| $V_d$        | Dropout voltage          | $I_O = 100\text{ mA}$                                                                                                                       |      |      | 1.1  | V             |
|              |                          | $I_O = 500\text{ mA}$                                                                                                                       |      |      | 1.2  |               |
|              |                          | $I_O = 800\text{ mA}$                                                                                                                       |      |      | 1.3  |               |
|              | Thermal regulation       | $T_a = 25\text{ }^{\circ}\text{C}$ , 30 ms Pulse                                                                                            |      | 0.01 | 0.1  | %/W           |

Refer to the test circuits,  $T_J = -40$  to  $125\text{ }^{\circ}\text{C}$ ,  $C_O = 10\text{ }\mu\text{F}$ , unless otherwise specified.

**Table 13. Electrical characteristics of LD1117#50C**

| Symbol       | Parameter                | Test condition                                                                                                                            | Min. | Typ. | Max. | Unit          |
|--------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| $V_O$        | Output voltage           | $V_{in} = 7\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                         | 4.9  | 5    | 5.1  | V             |
| $V_O$        | Output voltage           | $I_O = 0$ to $800\text{ mA}$ , $V_{in} = 6.5$ to $15\text{ V}$                                                                            | 4.8  |      | 5.2  | V             |
| $\Delta V_O$ | Line regulation          | $V_{in} = 6.5$ to $15\text{ V}$ , $I_O = 0\text{ mA}$                                                                                     |      | 1    | 50   | mV            |
| $\Delta V_O$ | Load regulation          | $V_{in} = 6.5\text{ V}$ , $I_O = 0$ to $800\text{ mA}$                                                                                    |      | 1    | 50   | mV            |
| $\Delta V_O$ | Temperature stability    |                                                                                                                                           |      | 0.5  |      | %             |
| $\Delta V_O$ | Long term stability      | 1000 hrs, $T_J = 125\text{ }^{\circ}\text{C}$                                                                                             |      | 0.3  |      | %             |
| $V_{in}$     | Operating input voltage  | $I_O = 100\text{ mA}$                                                                                                                     |      |      | 15   | V             |
| $I_d$        | Quiescent current        | $V_{in} \leq 15\text{ V}$                                                                                                                 |      | 5    | 10   | mA            |
| $I_O$        | Output current           | $V_{in} = 10\text{ V}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                               | 800  | 950  | 1300 | mA            |
| eN           | Output noise voltage     | $B = 10\text{ Hz}$ to $10\text{ kHz}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                |      | 100  |      | $\mu\text{V}$ |
| SVR          | Supply voltage rejection | $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $T_J = 25\text{ }^{\circ}\text{C}$<br>$V_{in} = 8\text{ V}$ , $V_{ripple} = 1\text{ V}_{PP}$ | 60   | 75   |      | dB            |
| $V_d$        | Dropout voltage          | $I_O = 100\text{ mA}$ , $T_J = 0$ to $125\text{ }^{\circ}\text{C}$                                                                        |      | 1    | 1.1  | V             |
|              |                          | $I_O = 500\text{ mA}$ , $T_J = 0$ to $125\text{ }^{\circ}\text{C}$                                                                        |      | 1.05 | 1.15 |               |
|              |                          | $I_O = 800\text{ mA}$ , $T_J = 0$ to $125\text{ }^{\circ}\text{C}$                                                                        |      | 1.10 | 1.2  |               |
| $V_d$        | Dropout voltage          | $I_O = 100\text{ mA}$                                                                                                                     |      |      | 1.1  | V             |
|              |                          | $I_O = 500\text{ mA}$                                                                                                                     |      |      | 1.2  |               |
|              |                          | $I_O = 800\text{ mA}$                                                                                                                     |      |      | 1.3  |               |
|              | Thermal regulation       | $T_a = 25\text{ }^{\circ}\text{C}$ , 30 ms Pulse                                                                                          |      | 0.01 | 0.1  | %/W           |

Refer to the test circuits,  $T_J = -40$  to  $125\text{ }^{\circ}\text{C}$ ,  $C_O = 10\text{ }\mu\text{F}$ , unless otherwise specified.

**Table 14. Electrical characteristics of LD1117C (adjustable)**

| Symbol                  | Parameter                     | Test condition                                                                                                                                                       | Min.  | Typ.  | Max.  | Unit          |
|-------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|-------|---------------|
| $V_{\text{ref}}$        | Reference voltage             | $V_{\text{in}} - V_O = 2\text{ V}$ , $I_O = 10\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                       | 1.225 | 1.25  | 1.275 | V             |
| $V_{\text{ref}}$        | Reference voltage             | $I_O = 10$ to $800\text{ mA}$ , $V_{\text{in}} - V_O = 1.4$ to $10\text{ V}$                                                                                         | 1.2   |       | 1.3   | V             |
| $\Delta V_O$            | Line regulation               | $V_{\text{in}} - V_O = 1.5$ to $13.75\text{ V}$ , $I_O = 10\text{ mA}$                                                                                               |       |       | 1     | %             |
| $\Delta V_O$            | Load regulation               | $V_{\text{in}} - V_O = 3\text{ V}$ , $I_O = 10$ to $800\text{ mA}$                                                                                                   |       |       | 1     | %             |
| $\Delta V_O$            | Temperature stability         |                                                                                                                                                                      |       | 0.5   |       | %             |
| $\Delta V_O$            | Long term stability           | 1000 hrs, $T_J = 125\text{ }^{\circ}\text{C}$                                                                                                                        |       | 0.3   |       | %             |
| $V_{\text{in}}$         | Operating input voltage       |                                                                                                                                                                      |       |       | 15    | V             |
| $I_{\text{adj}}$        | Adjustment pin current        | $V_{\text{in}} \leq 15\text{ V}$                                                                                                                                     |       | 60    | 120   | $\mu\text{A}$ |
| $\Delta I_{\text{adj}}$ | Adjustment pin current change | $V_{\text{in}} - V_O = 1.4$ to $10\text{ V}$ , $I_O = 10$ to $800\text{ mA}$                                                                                         |       | 1     | 10    | $\mu\text{A}$ |
| $I_{O(\text{min})}$     | Minimum load current          | $V_{\text{in}} = 15\text{ V}$                                                                                                                                        |       | 2     | 5     | mA            |
| $I_O$                   | Output current                | $V_{\text{in}} - V_O = 5\text{ V}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                                              | 800   | 950   | 1300  | mA            |
| eN                      | Output noise (% $V_O$ )       | $B = 10\text{ Hz}$ to $10\text{ kHz}$ , $T_J = 25\text{ }^{\circ}\text{C}$                                                                                           |       | 0.003 |       | %             |
| SVR                     | Supply voltage rejection      | $I_O = 40\text{ mA}$ , $f = 120\text{ Hz}$ , $T_J = 25\text{ }^{\circ}\text{C}$<br>$V_{\text{in}} - V_O = 3\text{ V}$ , $V_{\text{ripple}} = 1\text{ V}_{\text{PP}}$ | 60    | 75    |       | dB            |
| $V_d$                   | Dropout voltage               | $I_O = 100\text{ mA}$ , $T_J = 0$ to $125\text{ }^{\circ}\text{C}$                                                                                                   |       | 1     | 1.1   | V             |
|                         |                               | $I_O = 500\text{ mA}$ , $T_J = 0$ to $125\text{ }^{\circ}\text{C}$                                                                                                   |       | 1.05  | 1.15  |               |
|                         |                               | $I_O = 800\text{ mA}$ , $T_J = 0$ to $125\text{ }^{\circ}\text{C}$                                                                                                   |       | 1.10  | 1.2   |               |
| $V_d$                   | Dropout voltage               | $I_O = 100\text{ mA}$                                                                                                                                                |       |       | 1.1   | V             |
|                         |                               | $I_O = 500\text{ mA}$                                                                                                                                                |       |       | 1.2   |               |
|                         |                               | $I_O = 800\text{ mA}$                                                                                                                                                |       |       | 1.3   |               |
|                         | Thermal regulation            | $T_a = 25\text{ }^{\circ}\text{C}$ , 30 ms Pulse                                                                                                                     |       | 0.01  | 0.1   | %/W           |

## 6 Typical application

Figure 5. Negative supply

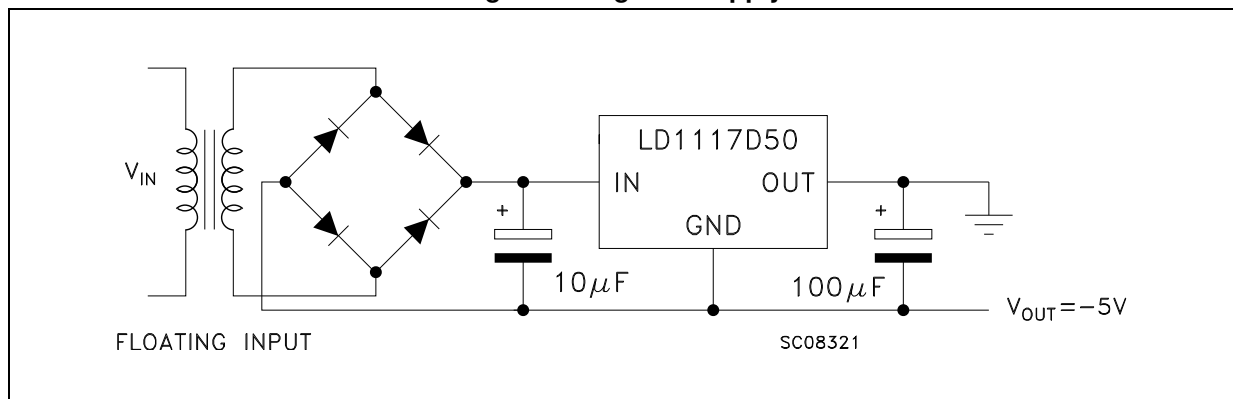


Figure 6. Circuit for increasing output voltage

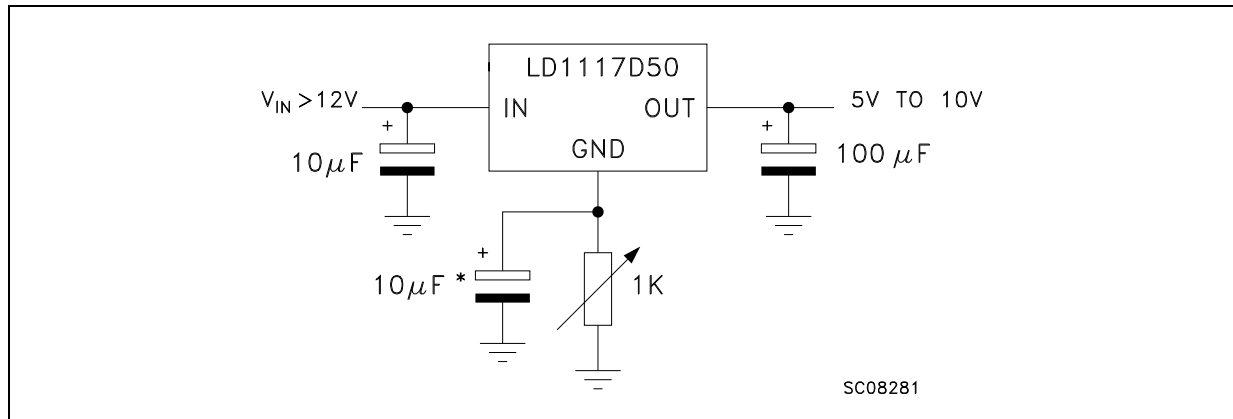


Figure 7. Voltage regulator with reference

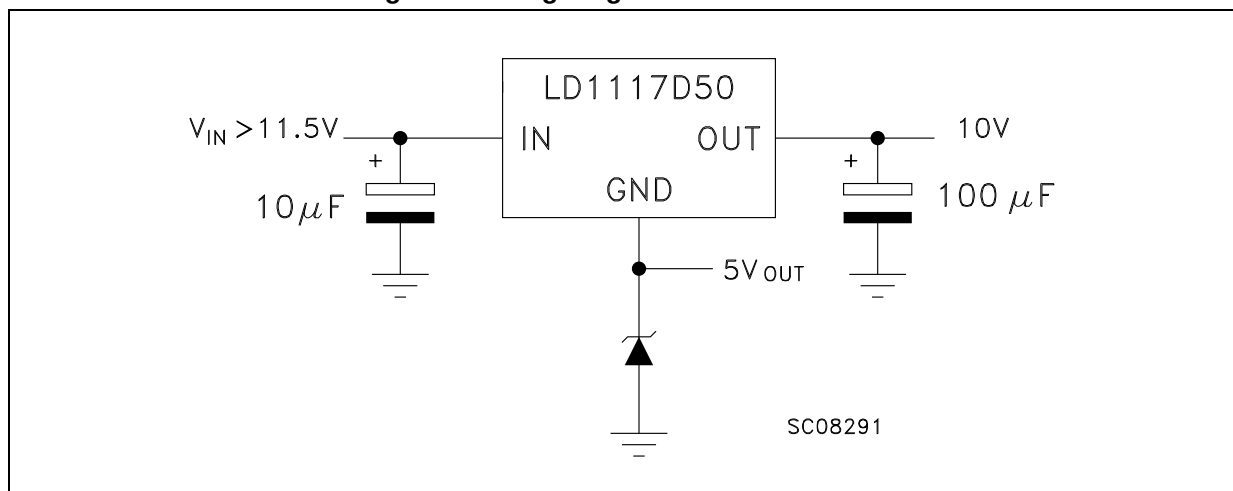


Figure 8. Battery backed-up regulated supply

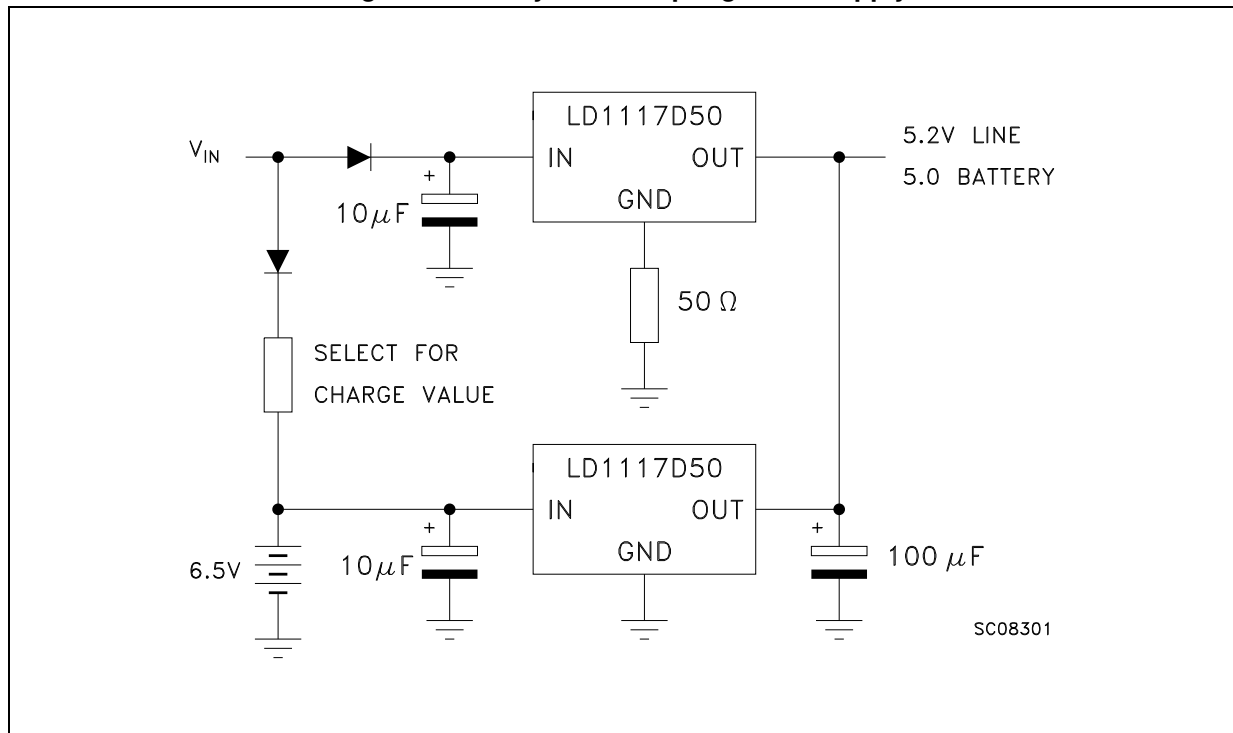
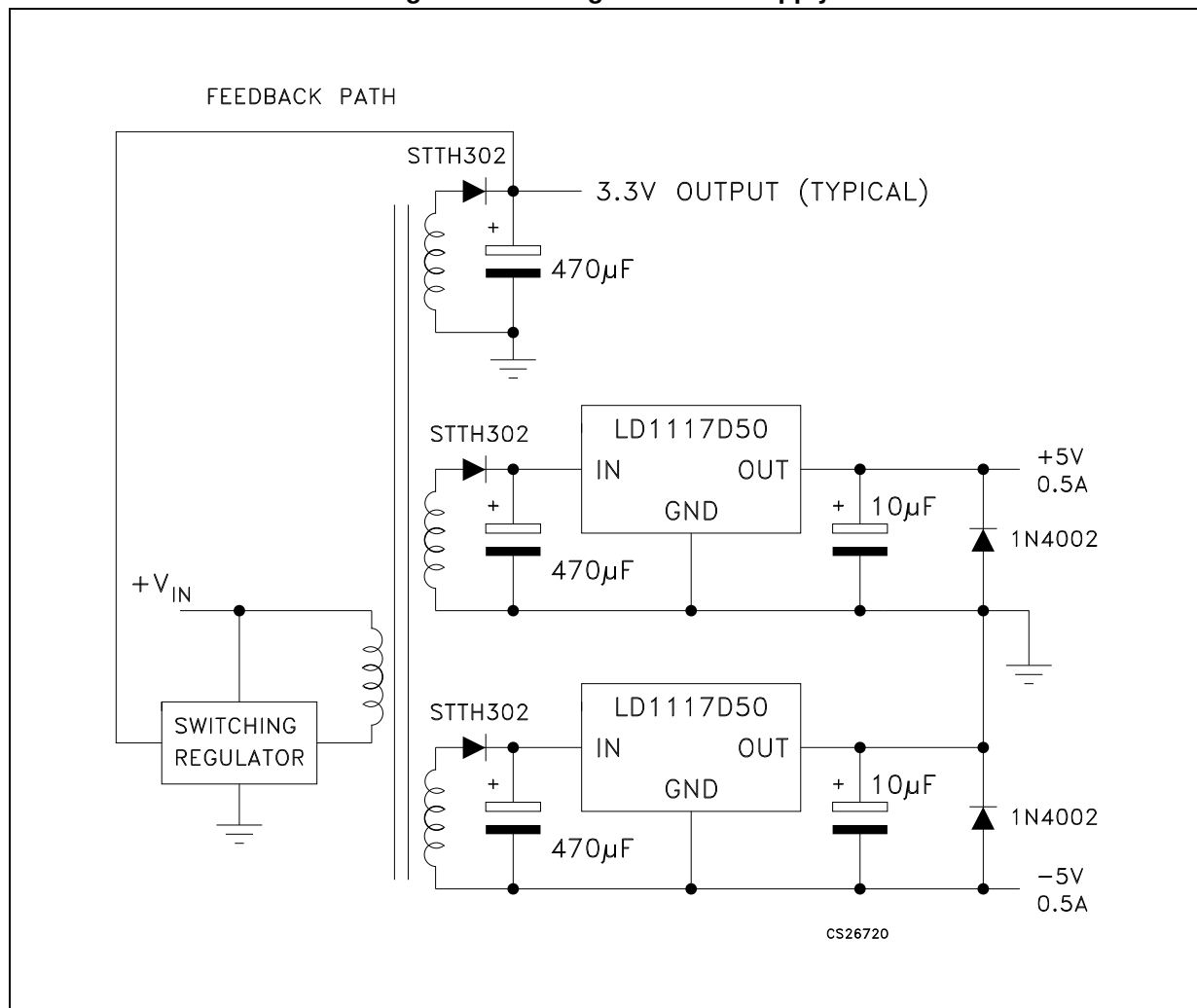


Figure 9. Post-regulated dual supply



## 7 LD1117 adjustable: application note

The LD1117 adjustable has a thermal stabilized  $1.25 \pm 0.012$  V reference voltage between the OUT and ADJ pins.  $I_{ADJ}$  is 60  $\mu$ A typ. (120  $\mu$ A max.) and  $\Delta I_{ADJ}$  is 1  $\mu$ A typ. (5  $\mu$ A max.).

$R_1$  is normally fixed to 120  $\Omega$ . From [Figure 9](#) we obtain:

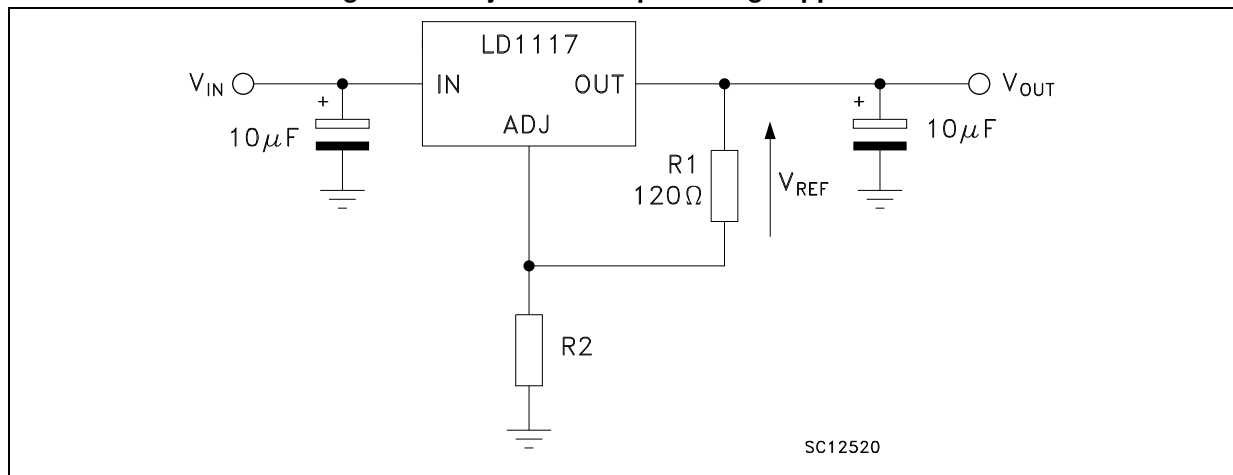
$$V_{OUT} = V_{REF} + R_2 (I_{ADJ} + I_{R1}) = V_{REF} + R_2 (I_{ADJ} + V_{REF} / R_1) = V_{REF} (1 + R_2 / R_1) + R_2 \times I_{ADJ}.$$

In normal application  $R_2$  value is in the range of few k $\Omega$ , so the  $R_2 \times I_{ADJ}$  product could not be considered in the  $V_{OUT}$  calculation; then the above expression becomes:

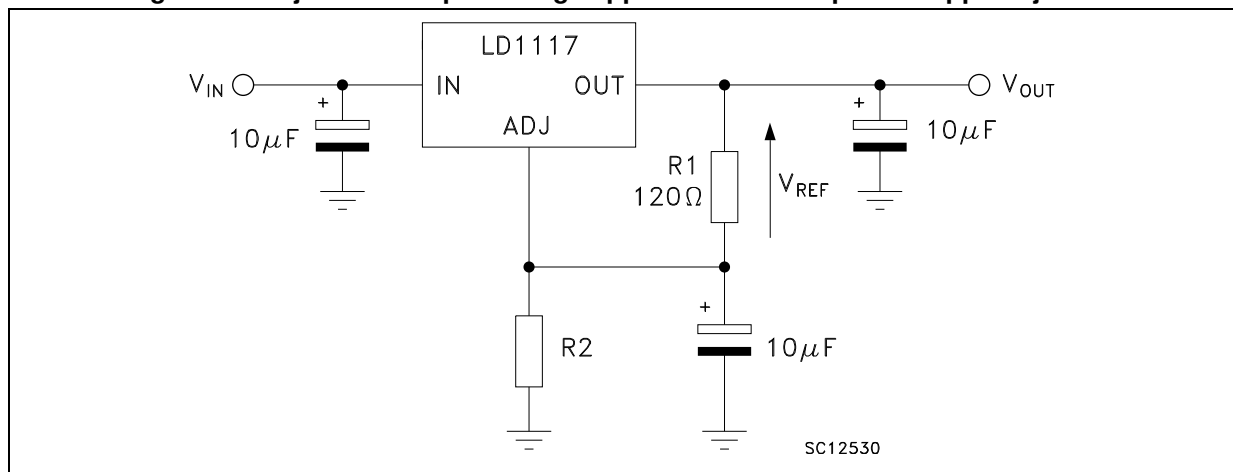
$$V_{OUT} = V_{REF} (1 + R_2 / R_1).$$

In order to have the better load regulation it is important to realize a good Kelvin connection of  $R_1$  and  $R_2$  resistors. In particular  $R_1$  connection must be realized very close to OUT and ADJ pin, while  $R_2$  ground connection must be placed as near as possible to the negative Load pin. Ripple rejection can be improved by introducing a 10  $\mu$ F electrolytic capacitor placed in parallel to the  $R_2$  resistor (see [Figure 10](#)).

**Figure 10. Adjustable output voltage application**



**Figure 11. Adjustable output voltage application with improved ripple rejection**



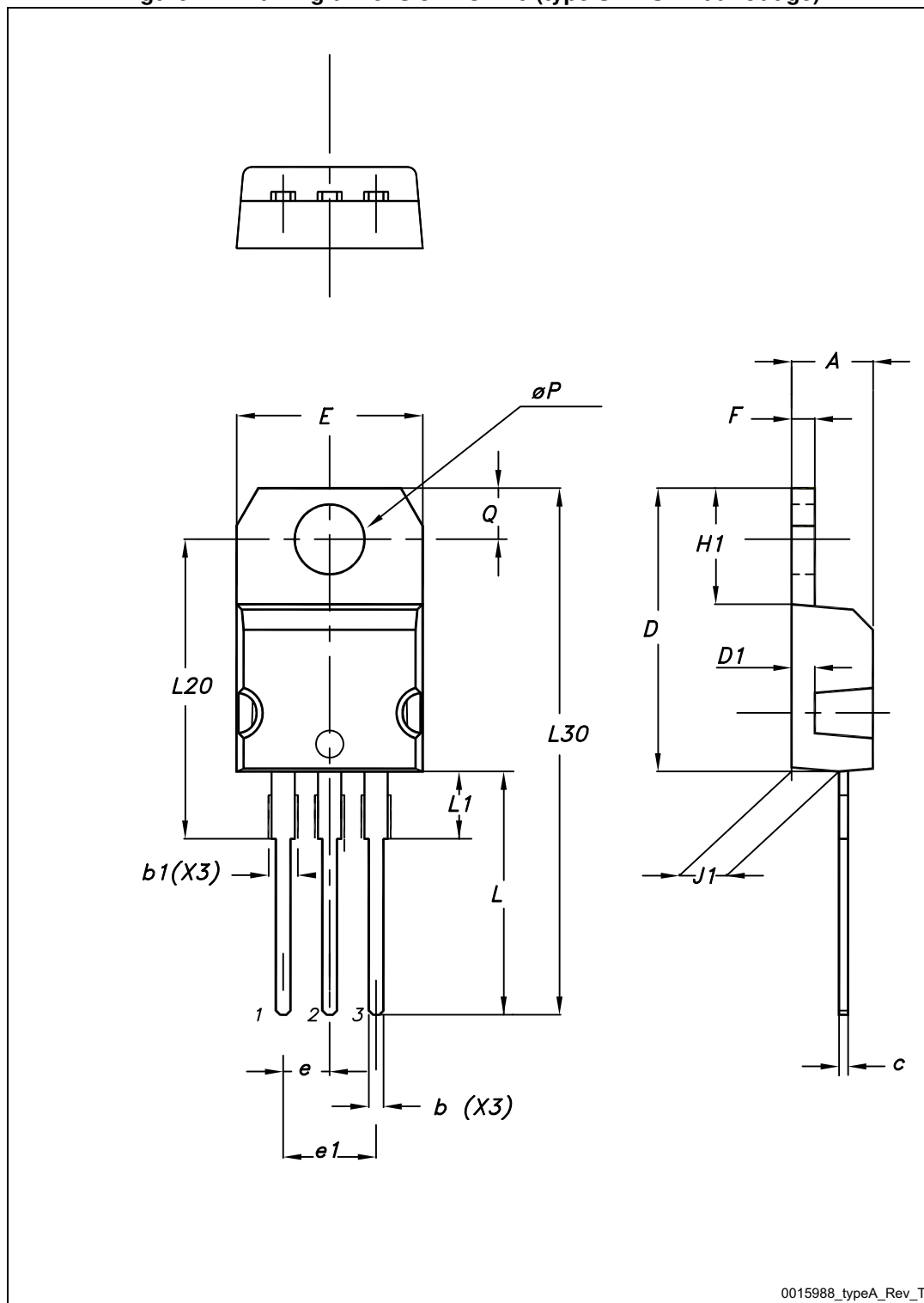
## 8 Package information

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

**Table 15. TO-220 mechanical data (type STD-ST Dual Gauge)**

| Dim. | mm    |       |       |
|------|-------|-------|-------|
|      | Min.  | Typ.  | Max.  |
| A    | 4.40  |       | 4.60  |
| b    | 0.61  |       | 0.88  |
| b1   | 1.14  |       | 1.70  |
| c    | 0.48  |       | 0.70  |
| D    | 15.25 |       | 15.75 |
| D1   |       | 1.27  |       |
| E    | 10    |       | 10.40 |
| e    | 2.40  |       | 2.70  |
| e1   | 4.95  |       | 5.15  |
| F    | 1.23  |       | 1.32  |
| H1   | 6.20  |       | 6.60  |
| J1   | 2.40  |       | 2.72  |
| L    | 13    |       | 14    |
| L1   | 3.50  |       | 3.93  |
| L20  |       | 16.40 |       |
| L30  |       | 28.90 |       |
| ØP   | 3.75  |       | 3.85  |
| Q    | 2.65  |       | 2.95  |

Figure 12. Drawing dimension TO-220 (type STD-ST Dual Gauge)



0015988\_typeA\_Rev\_T

Table 16. TO-220 mechanical data (type STD-ST Single Gauge)

| Dim. | mm    |       |       |
|------|-------|-------|-------|
|      | Min.  | Typ.  | Max.  |
| A    | 4.40  |       | 4.60  |
| b    | 0.61  |       | 0.88  |
| b1   | 1.14  |       | 1.70  |
| c    | 0.48  |       | 0.70  |
| D    | 15.25 |       | 15.75 |
| E    | 10    |       | 10.40 |
| e    | 2.40  |       | 2.70  |
| e1   | 4.95  |       | 5.15  |
| F    | 0.51  |       | 0.60  |
| H1   | 6.20  |       | 6.60  |
| J1   | 2.40  |       | 2.72  |
| L    | 13    |       | 14    |
| L1   | 3.50  |       | 3.93  |
| L20  |       | 16.40 |       |
| L30  |       | 28.90 |       |
| ØP   | 3.75  |       | 3.85  |
| Q    | 2.65  |       | 2.95  |

Figure 13. Drawing dimension TO-220 (type STD-ST Single Gauge)

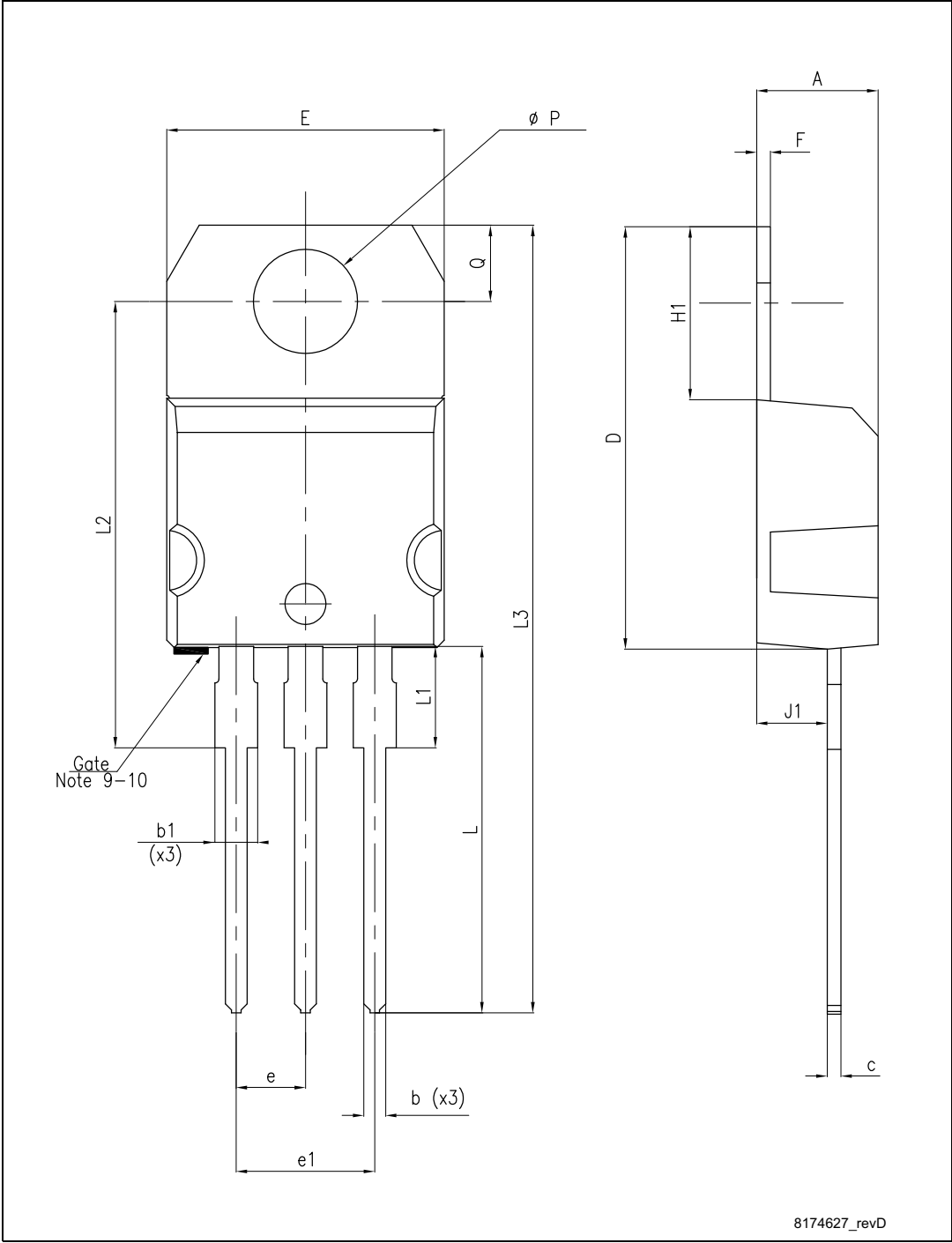


Table 17. SOT-223 mechanical data

| Dim. | mm   |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| A    |      |      | 1.80 |
| A1   | 0.02 |      | 0.10 |
| B    | 0.60 | 0.70 | 0.85 |
| B1   | 2.90 | 3.00 | 3.15 |
| c    | 0.24 | 0.26 | 0.35 |
| D    | 6.30 | 6.50 | 6.70 |
| e    |      | 2.30 |      |
| e1   |      | 4.60 |      |
| E    | 3.30 | 3.50 | 3.70 |
| H    | 6.70 | 7.00 | 7.30 |
| V    |      |      | 10°  |

Figure 14. Drawing dimension SOT-223

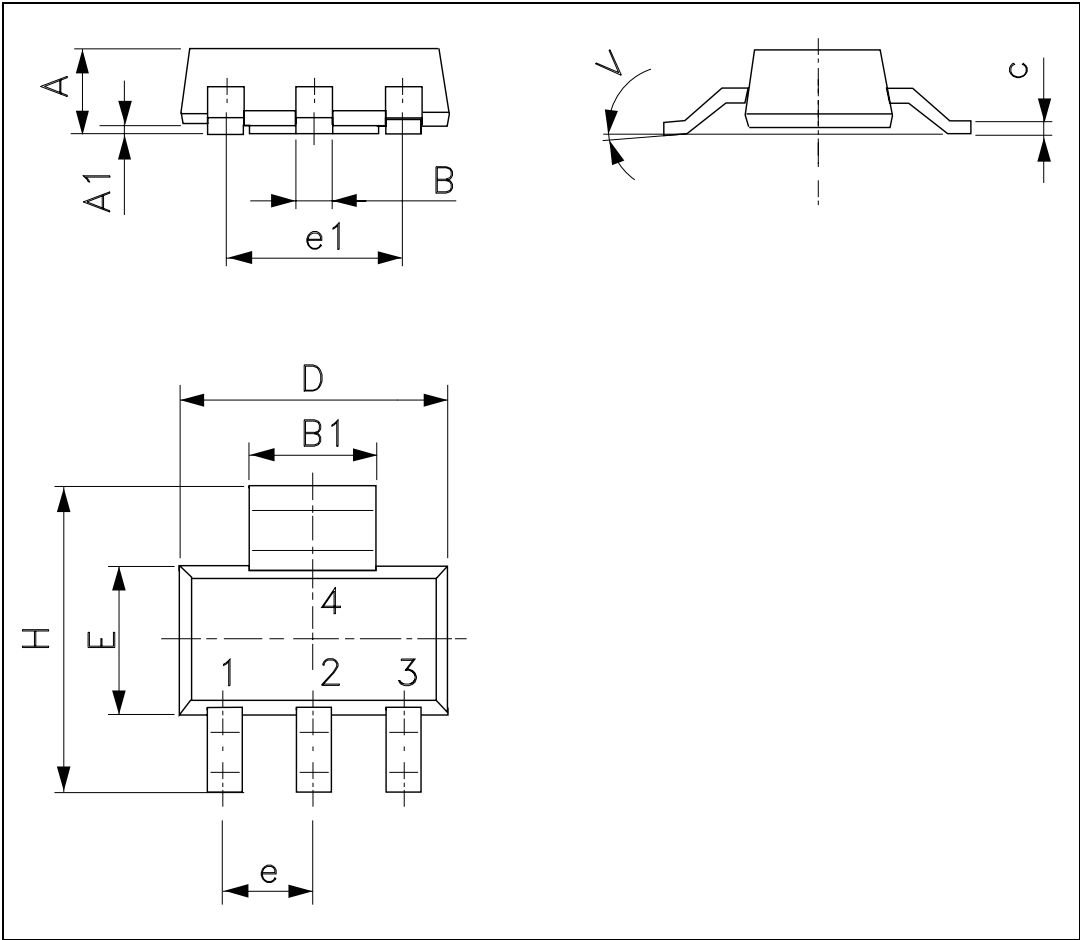


Table 18. SO-8 mechanical data

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

Figure 15. Drawing dimension SO-8

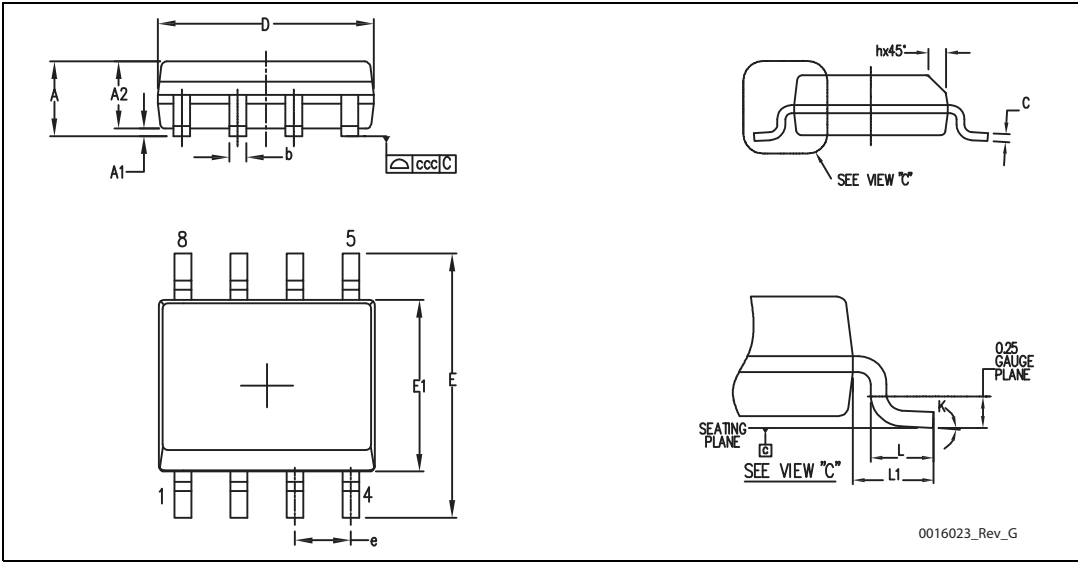


Table 19. DPAK (TO-252) mechanical data (type A)

| 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   | 4.95  | 5.10  | 5.25  |
| E    | 6.40  |       | 6.60  |
| E1   | 4.60  | 4.70  | 4.80  |
| e    | 2.159 | 2.286 | 2.143 |
| e1   | 4.445 | 4.572 | 4.699 |
| H    | 9.35  |       | 10.10 |
| L    | 1.00  |       | 1.50  |
| L1   | 2.60  | 2.80  | 1.50  |
| L2   |       |       | 3.00  |
| L4   | 0.60  |       | 1.00  |
| R    |       | 0.20  |       |
| V2   | 0°    |       | 8°    |

Figure 16. DPAK (TO-252) package outline A

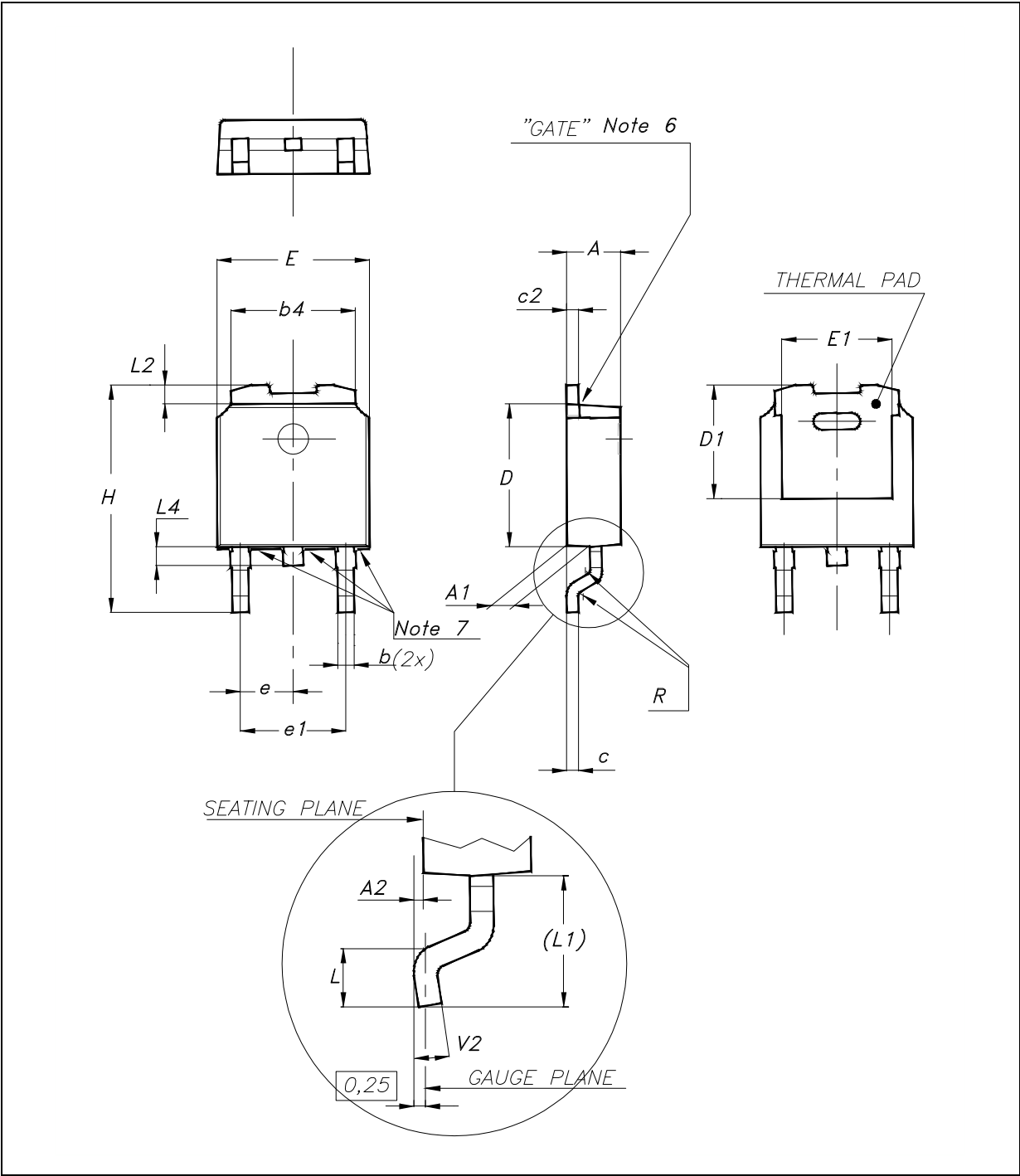


Table 20. DPAK (TO-252) mechanical data (type E)

| Dim. | mm   |       |       |
|------|------|-------|-------|
|      | Min. | Typ.  | Max.  |
| A    | 2.18 |       | 2.39  |
| A2   |      |       | 0.13  |
| b    | 0.65 |       | 0.884 |
| b4   | 4.95 |       | 5.46  |
| c    | 0.46 |       | 0.61  |
| c2   | 0.46 |       | 0.60  |
| D    | 5.97 |       | 6.22  |
| D1   | 5.21 |       |       |
| E    | 6.35 |       | 6.73  |
| E1   | 4.32 |       |       |
| e    |      | 2.286 |       |
| e1   |      | 4.572 |       |
| H    | 9.94 |       | 10.34 |
| L    | 1.50 |       | 1.78  |
| L1   |      | 2.74  |       |
| L2   | 0.89 |       | 1.27  |
| L4   |      |       | 1.02  |

Figure 17. DPAK (TO-252) package outline E

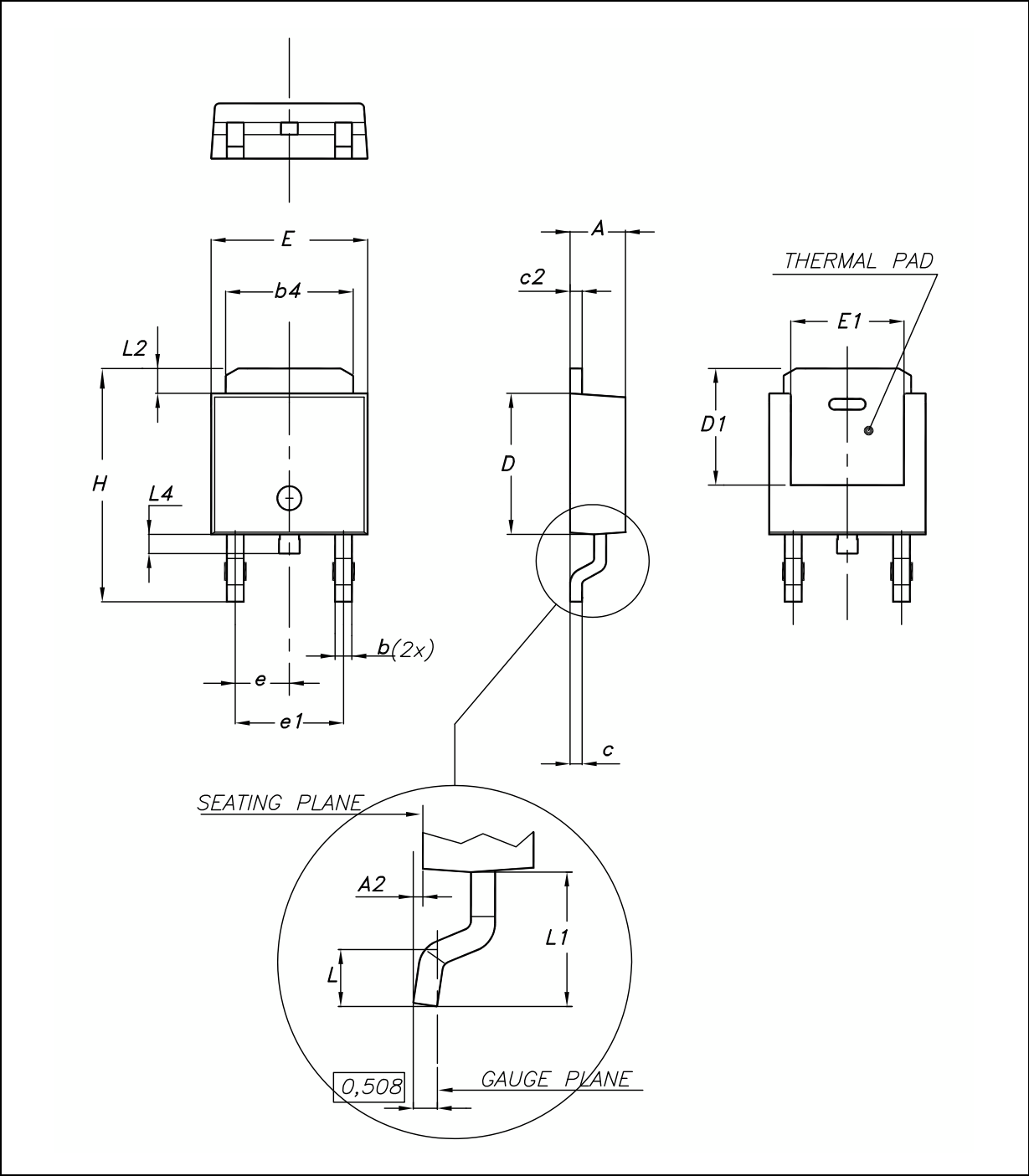


Table 21. DPAK (TO-252) mechanical data type I

| Dim. | mm        |       |       |
|------|-----------|-------|-------|
|      | Min.      | Typ.  | Max.  |
| A    | 2.20      | 2.30  | 2.38  |
| A1   | 0.90      | 1.01  | 1.10  |
| A2   | 0.00      | -     | 0.10  |
| b    | 0.77      | -     | 0.89  |
| b1   | 0.76      | 0.81  | 0.86  |
| b2   | 0.77      | -     | 1.10  |
| b3   | 5.23      | 5.33  | 5.43  |
| c    | 0.47      | -     | 0.60  |
| c1   | 0.46      | 0.51  | 0.56  |
| c2   | 0.47      | -     | 0.60  |
| D    | 6.00      | 6.10  | 6.20  |
| D1   | 5.25      | 5.40  | 5.60  |
| E    | 6.50      | 6.60  | 6.70  |
| E1   | 4.70      | 4.85  | 5.00  |
| e    | 2.286 BSC |       |       |
| H    | 9.80      | 10.10 | 10.40 |
| L    | 1.40      | 1.50  | 1.70  |
| L1   | 2.90 REF  |       |       |
| L2   | 0.90      | -     | 1.25  |
| L3   | 0.51 BSC  |       |       |
| L4   | 0.60      | 0.80  | 1.00  |
| L5   | 0.90      | -     | 1.50  |
| L6   | 1.80 BSC  |       |       |
| Θ    | 0°        | -     | 8°    |
| Θ 1  | 3°        | 5°    | 7°    |
| Θ 2  | 1°        | 3°    | 5°    |

Figure 18. DPAK (TO-252) package outline I

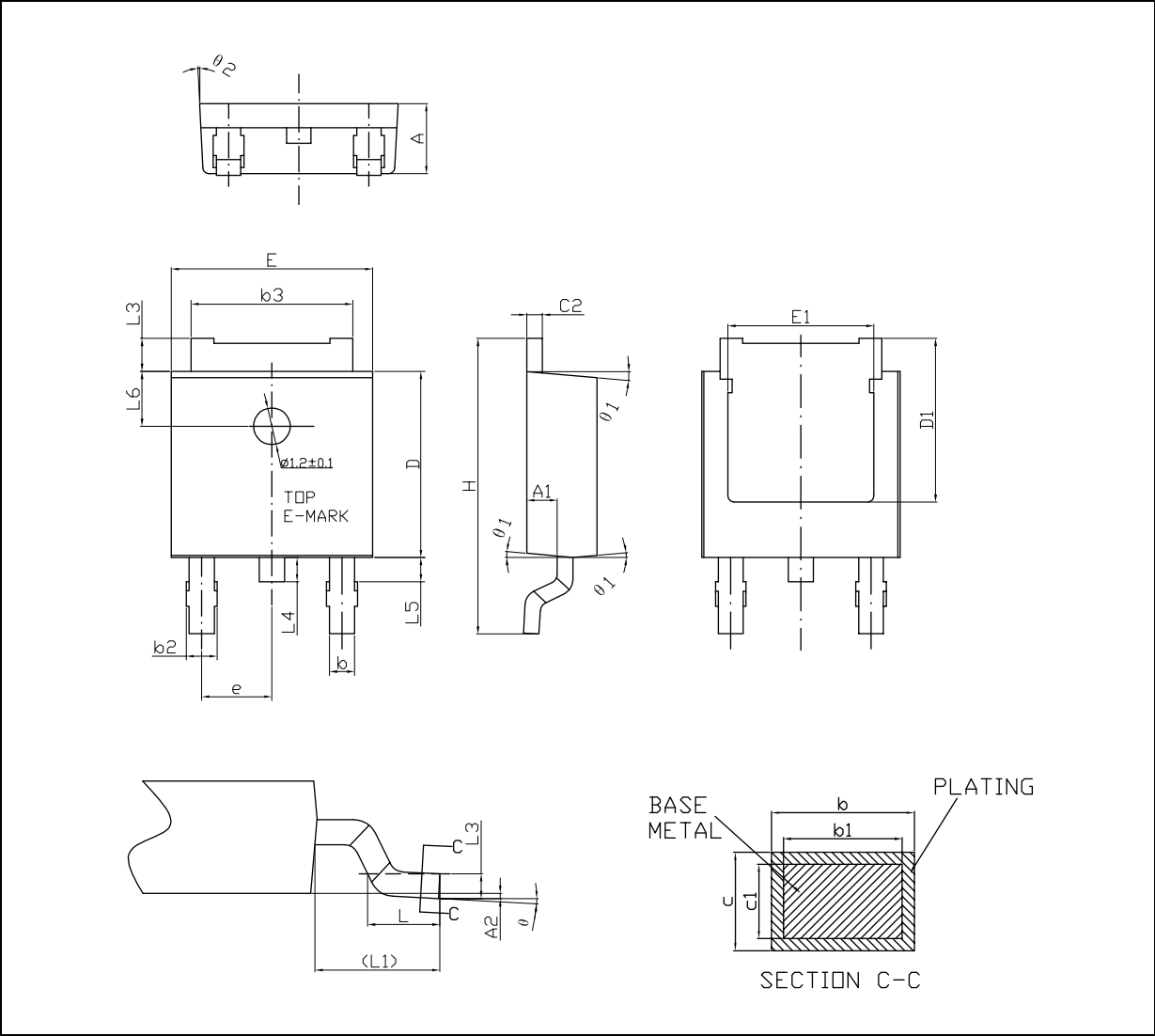
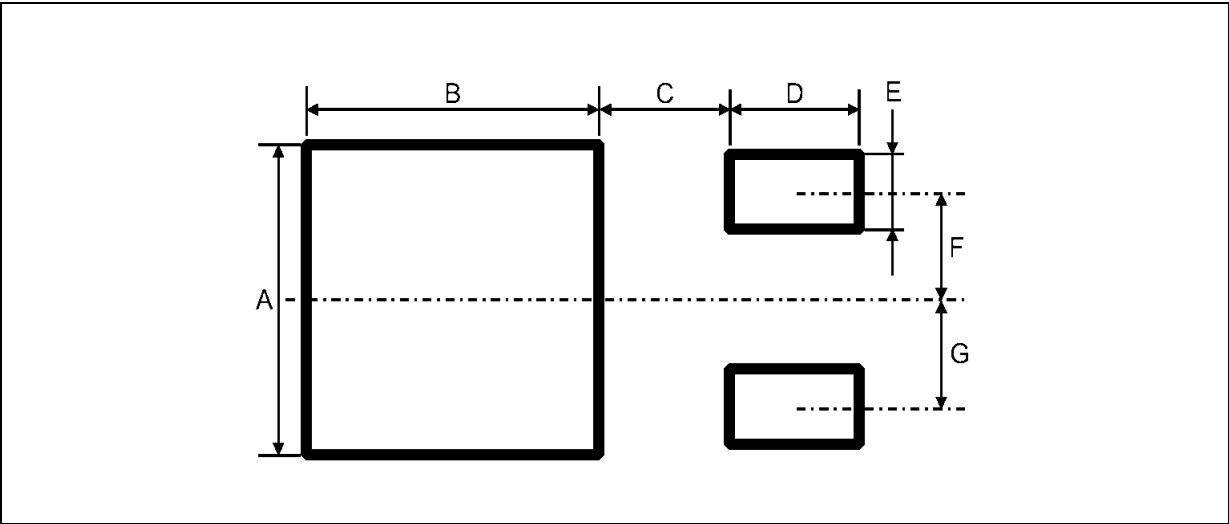


Table 22. Footprint data

| Values |      |       |
|--------|------|-------|
|        | mm.  | inch. |
| A      | 6.70 | 0.264 |
| B      | 6.70 | 0.64  |
| C      | 1.8  | 0.070 |
| D      | 3.0  | 0.118 |
| E      | 1.60 | 0.063 |
| F      | 2.30 | 0.091 |
| G      | 2.30 | 0.091 |

Figure 19. DPAK footprint recommended data



**Figure 20. Drawing dimension tube for TO-220 Dual Gauge (mm.)**

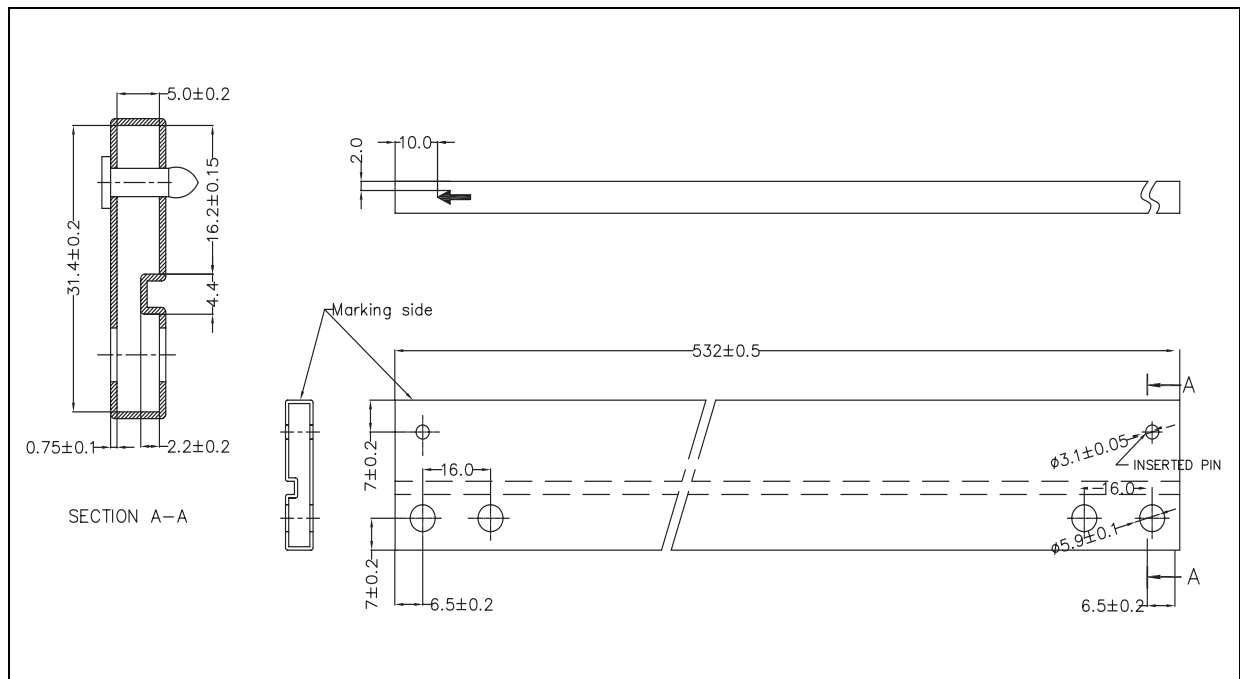


Table 23. SOT-223 tape and reel mechanical data

| Tape      |      |      |      | Reel              |      |      |
|-----------|------|------|------|-------------------|------|------|
| Dim.      | mm   |      |      | Dim.              | mm   |      |
|           | Min. | Typ. | Max. |                   | Min. | Max. |
| A0        | 6.75 | 6.85 | 6.95 | A                 |      | 180  |
| B0        | 7.30 | 7.40 | 7.50 | N                 | 60   |      |
| K0        | 1.80 | 1.90 | 2.00 | W1                |      | 12.4 |
| F         | 5.40 | 5.50 | 5.60 | W2                |      | 18.4 |
| E         | 1.65 | 1.75 | 1.85 | W3                | 11.9 | 15.4 |
| W         | 11.7 | 12   | 12.3 |                   |      |      |
| P2        | 1.90 | 2    | 2.10 | Base quantity pcs |      | 1000 |
| P0        | 3.90 | 4    | 4.10 | Bulk quantity pcs |      | 1000 |
| P1        | 7.90 | 8    | 8.10 |                   |      |      |
| T         | 0.25 | 0.30 | 0.35 |                   |      |      |
| D $\phi$  | 1.50 | 1.55 | 1.60 |                   |      |      |
| D1 $\phi$ | 1.50 | 1.60 | 1.70 |                   |      |      |

Figure 22. Tape for SOT-223 (dimensions are in mm)

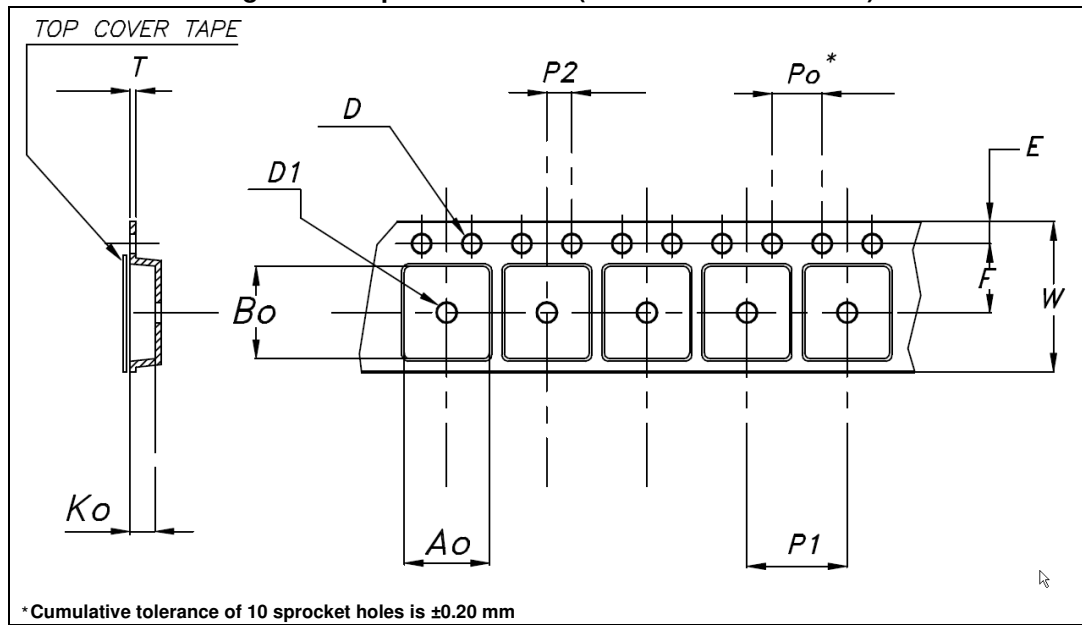


Figure 23. Reel for SOT-223 (dimensions are in mm)

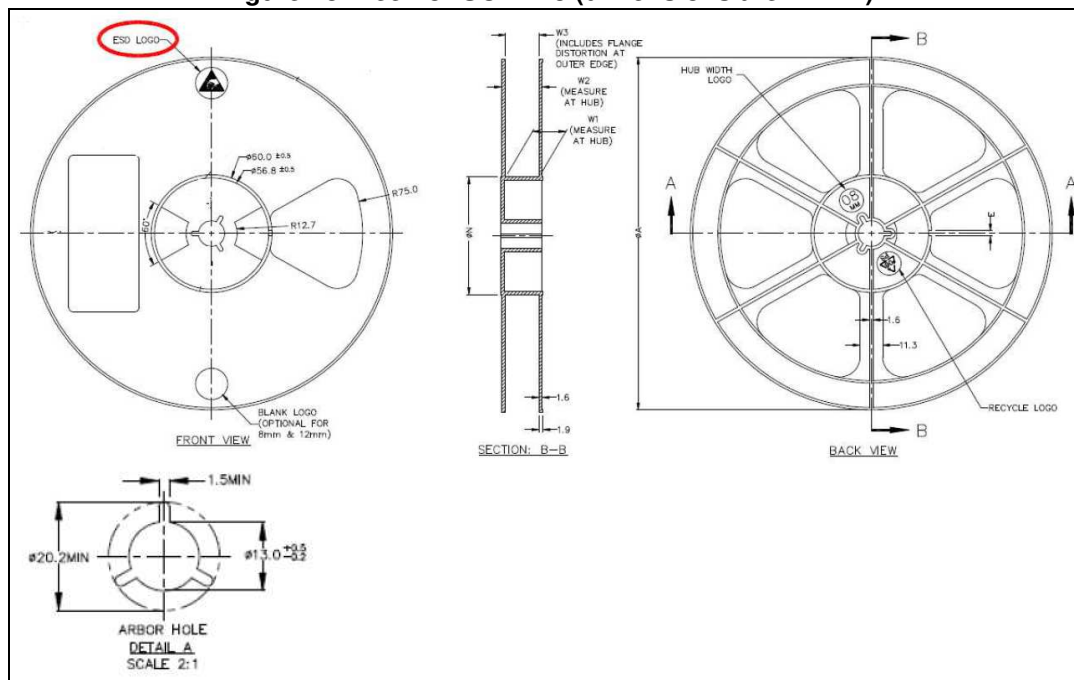


Table 24. SO-8 tape and reel mechanical data

| Dim. | mm   |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| A    |      |      | 330  |
| C    | 12.8 |      | 13.2 |
| D    | 20.2 |      |      |
| N    | 60   |      |      |
| T    |      |      | 22.4 |
| Ao   | 8.1  |      | 8.5  |
| Bo   | 5.5  |      | 5.9  |
| Ko   | 2.1  |      | 2.3  |
| Po   | 3.9  |      | 4.1  |
| P    | 7.9  |      | 8.1  |

Figure 24. SO-8 tape and reel dimensions

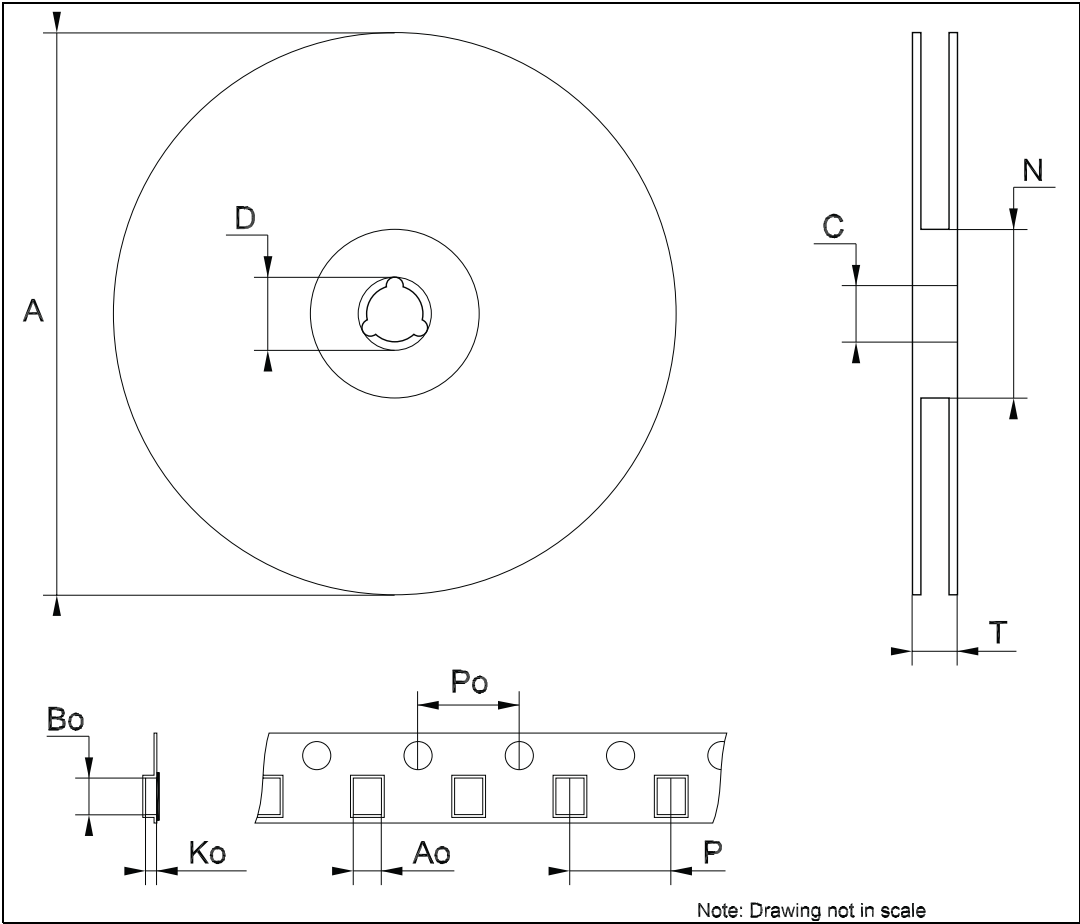


Table 25. DPAK tape and reel mechanical data

| 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 |           |      |      |

Figure 25. Tape for DPAK

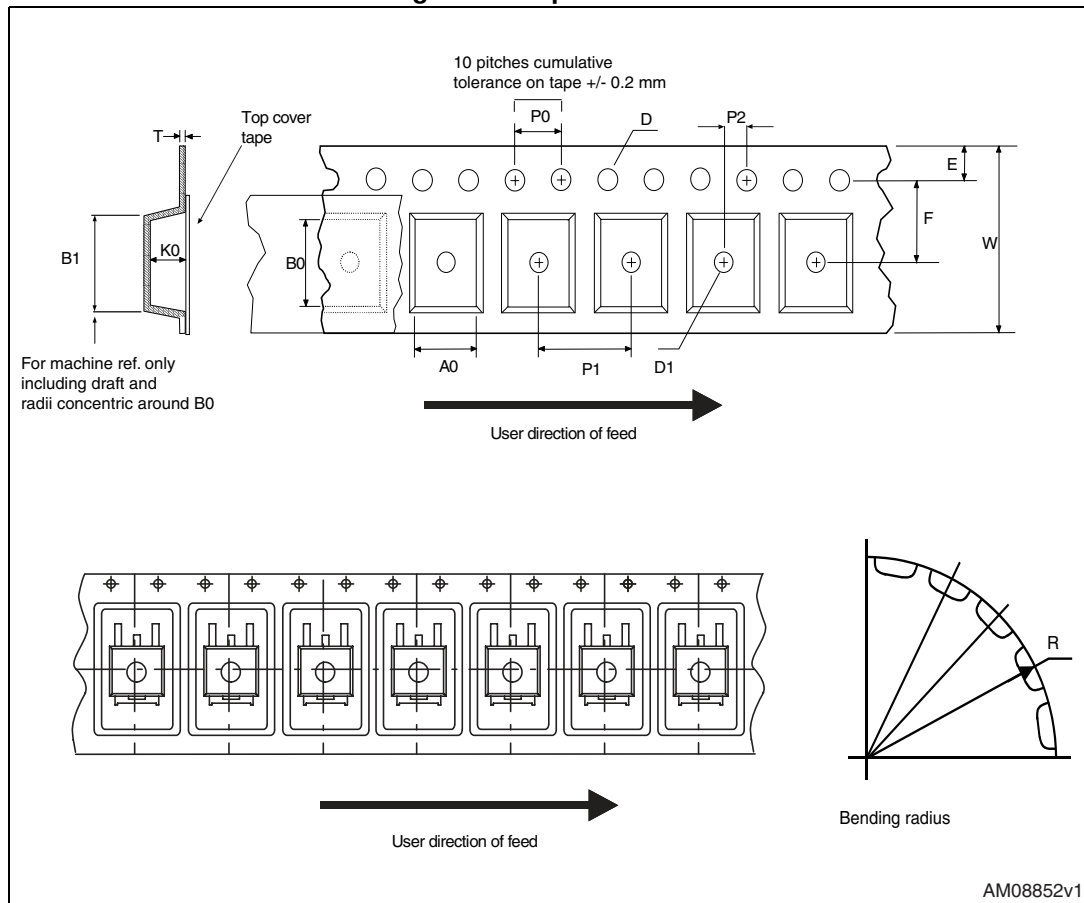
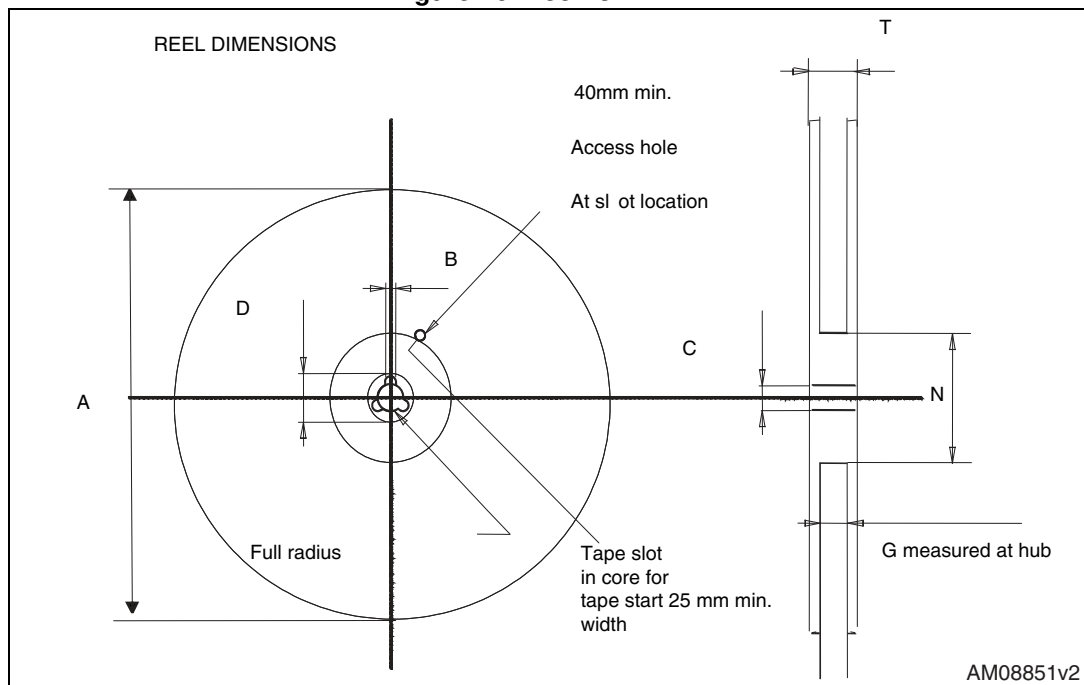


Figure 26. Reel for DPAK



## 10 Order codes

Table 26. Order codes

| Packages     |              |                         |            |                        |                          |
|--------------|--------------|-------------------------|------------|------------------------|--------------------------|
| SOT-223      | SO-8         | DPAK<br>(Tape and reel) | TO-220     | TO-220<br>(Dual Gauge) | Output<br>voltages       |
| LD1117S12TR  |              | LD1117DT12TR            |            |                        | 1.2 V                    |
| LD1117S12CTR |              | LD1117DT12CTR           |            |                        | 1.2 V                    |
| LD1117S18TR  |              | LD1117DT18TR            | LD1117V18  |                        | 1.8 V                    |
| LD1117S18CTR |              | LD1117DT18CTR           |            |                        | 1.8 V                    |
| LD1117S25TR  |              | LD1117DT25TR            |            |                        | 2.5 V                    |
| LD1117S25CTR |              | LD1117DT25CTR           |            |                        | 2.5 V                    |
| LD1117S33TR  | LD1117D33TR  | LD1117DT33TR            | LD1117V33  | LD1117V33-DG           | 3.3 V                    |
|              |              |                         |            | LD1117V33C-DG          | 3.3 V                    |
| LD1117S33CTR | LD1117D33CTR | LD1117DT33CTR           | LD1117V33C |                        | 3.3 V                    |
| LD1117S50TR  |              | LD1117DT50TR            | LD1117V50  | LD1117V50-DG           | 5 V                      |
|              |              |                         |            |                        | 5 V                      |
| LD1117S50CTR |              | LD1117DT50CTR           | LD1117V50C |                        | 5 V                      |
| LD1117STR    |              | LD1117DTTR              | LD1117V    | LD1117V-DG             | ADJ from<br>1.25 to 15 V |
|              |              |                         |            |                        | ADJ from<br>1.25 to 15 V |
| LD1117SC-R   |              |                         |            |                        | ADJ from<br>1.25 to 15 V |

# 11 Revision history

**Table 27. Document revision history**

| Date        | Revision | Changes                                                                                                                                                                                                                                                     |
|-------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 22-Sep-2004 | 15       | Add new part number #12C; typing error: note on table 2.                                                                                                                                                                                                    |
| 25-Oct-2004 | 16       | Add $V_{ref}$ reference voltage on table 12.                                                                                                                                                                                                                |
| 18-Jul-2005 | 17       | The DPAK mechanical data updated.                                                                                                                                                                                                                           |
| 25-Nov-2005 | 18       | The TO220FM package removed.                                                                                                                                                                                                                                |
| 14-Dec-2005 | 19       | The $T_{op}$ on table 2 updated.                                                                                                                                                                                                                            |
| 06-Dec-2006 | 20       | DPAK mechanical data updated and added footprint data.                                                                                                                                                                                                      |
| 05-Apr-2007 | 21       | Order codes updated.                                                                                                                                                                                                                                        |
| 30-Nov-2007 | 22       | Added Table 1.                                                                                                                                                                                                                                              |
| 16-Apr-2008 | 23       | Modified: Table 24 on page 42.                                                                                                                                                                                                                              |
| 08-Jul-2008 | 24       | Added note 1. on page 7.                                                                                                                                                                                                                                    |
| 30-Mar-2009 | 25       | Modified: $V_{IN}$ max value Table 4 on page 10 and Figure 9 on page 23                                                                                                                                                                                     |
| 29-Jul-2009 | 26       | Modified: Table 24 on page 42.                                                                                                                                                                                                                              |
| 03-Feb-2010 | 27       | Modified Table 9 on page 15.                                                                                                                                                                                                                                |
| 22-Mar-2010 | 28       | Added: Table 16 on page 22, Figure 13 on page 23, Figure 14 on page 24, Figure 17 and Figure 18 on page 33                                                                                                                                                  |
| 15-Nov-2010 | 29       | Modified: $R_{thJC}$ value for TO-220 Table 2 on page 7.                                                                                                                                                                                                    |
| 30-Nov-2011 | 30       | Added: order code LD1117V33-DG Table 24 on page 42.                                                                                                                                                                                                         |
| 13-Feb-2012 | 31       | Added: order codes LD1117V50-DG and LD1117V-DG Table 24 on page 42.                                                                                                                                                                                         |
| 19-Oct-2012 | 32       | Added: $R_{thJA}$ value for DPAK, SOT-223 and SO-8 Table 2 on page 7.                                                                                                                                                                                       |
| 20-Nov-2013 | 33       | Part number LD1117xx changed to LD1117.<br>Updated the Description in cover page, Section 8: Package mechanical data and Table 24: Order codes.<br>Cancelled Table 1: Device summary.<br>Added Section 9: Packaging mechanical data.<br>Minor text changes. |
| 12-Jun-2019 | 34       | Updated Table 19, Table 20, Figure 16, Figure 17 and Figure 18.                                                                                                                                                                                             |
| 16-Oct-2019 | 35       | Updated Figure 2: Pin connections (top view).                                                                                                                                                                                                               |
| 04-Dec-2019 | 36       | Added Table 20: DPAK (TO-252) mechanical data (type E).<br>Updated pin 3 DPAK package in Figure 2: Pin connections (top view).                                                                                                                              |
| 11-Feb-2020 | 37       | Updated Figure 14: Drawing dimensions SOT-223.                                                                                                                                                                                                              |
| 27-Jan-2025 | 38       | Updated feature on the cover page.                                                                                                                                                                                                                          |

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