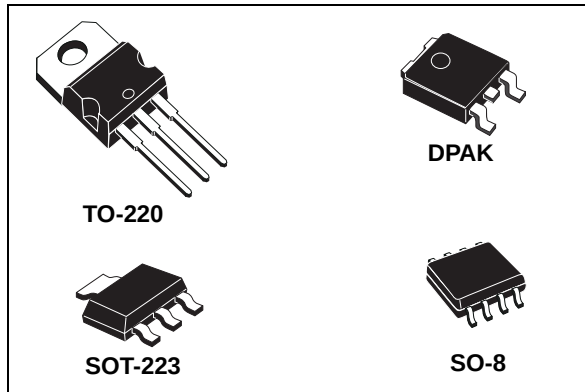


## Adjustable and fixed low drop positive voltage regulator

Datasheet - production data



flows mostly into the load. Only a very common 10  $\mu$ 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 °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.)
- 2.85 V device performances are suitable for SCSI-2 active termination
- 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 ( $V_{REF} = 1.25$  V)
- Internal current and thermal limit
- Available in  $\pm 1\%$  (at 25 °C) and 2 % in full temperature range
- Supply voltage rejection: 75 dB (typ.)

### Description

The LD1117 is a low drop voltage regulator able to provide up to 800 mA of output current, available even in adjustable version ( $V_{REF} = 1.25$  V). Concerning fixed versions, are offered the following output voltages: 1.2 V, 1.8 V, 2.5 V, 2.85 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

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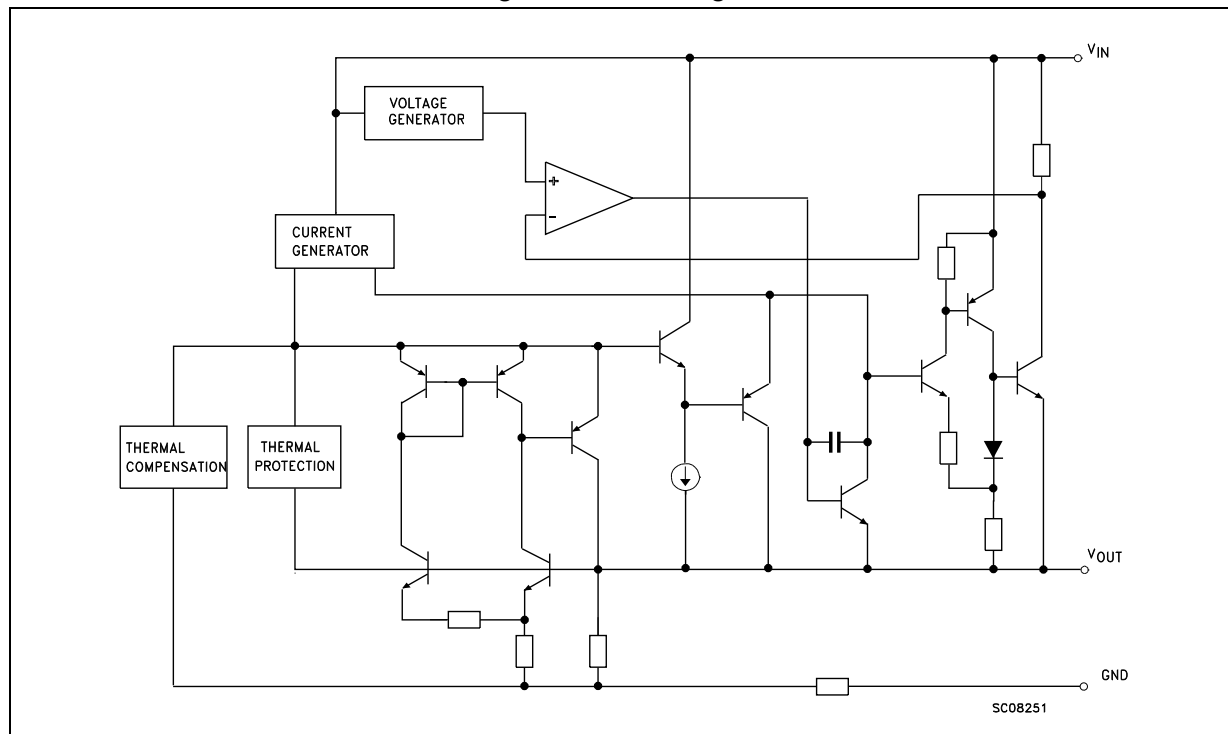
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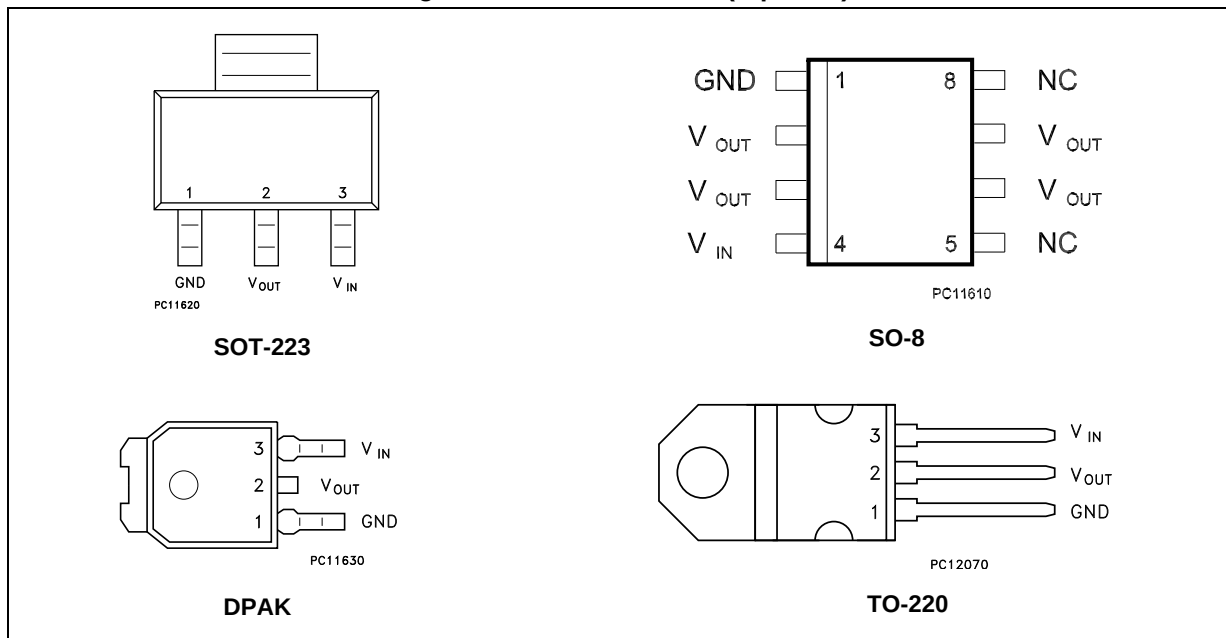
# 1 Diagram

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)

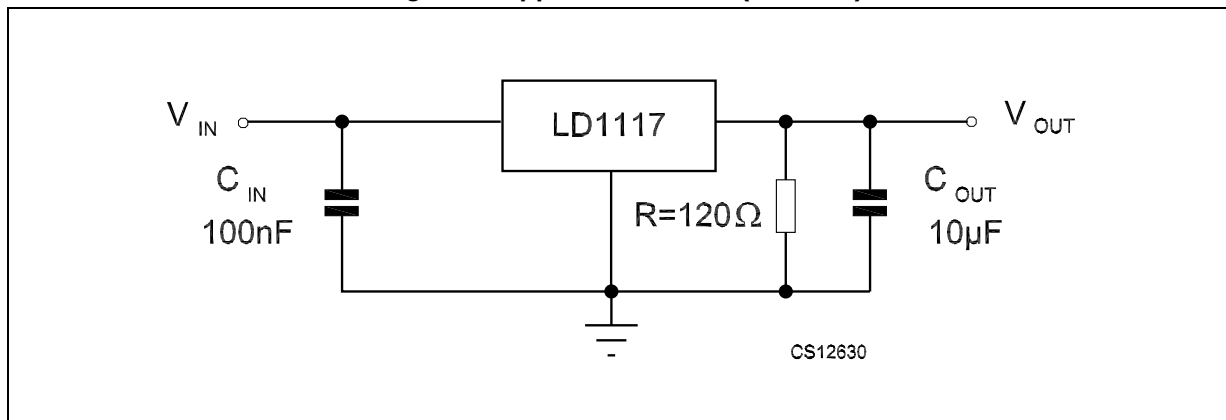
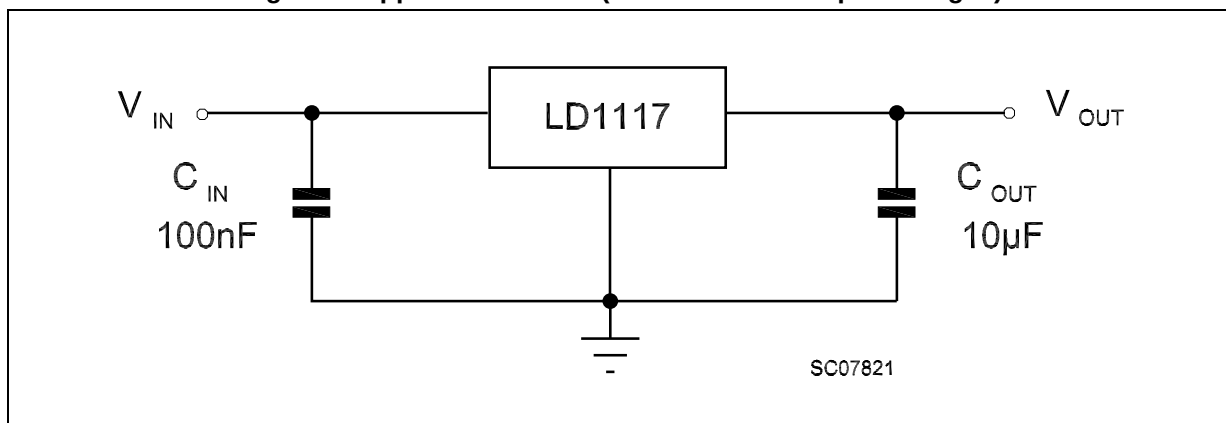


Figure 4. Application circuit (for other fixed output voltages)





## 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

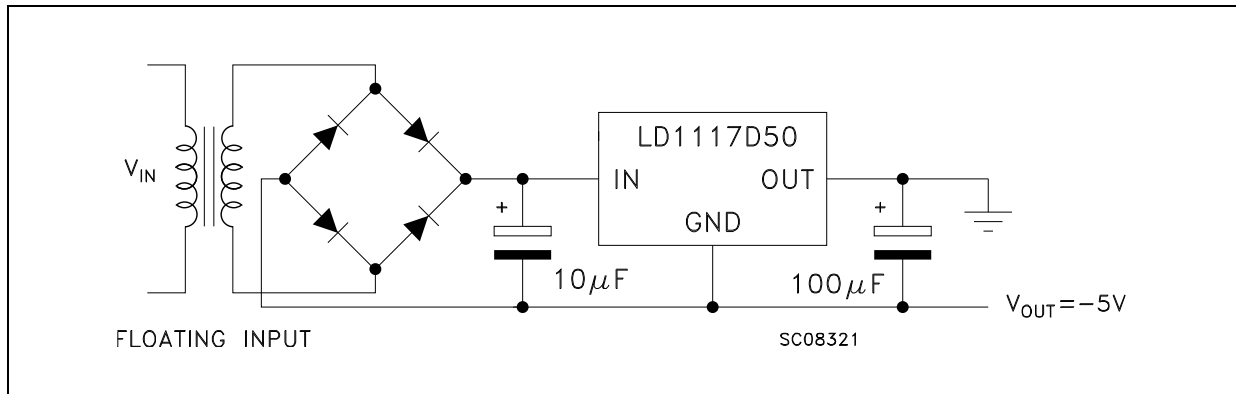


Figure 6. Circuit for increasing output voltage

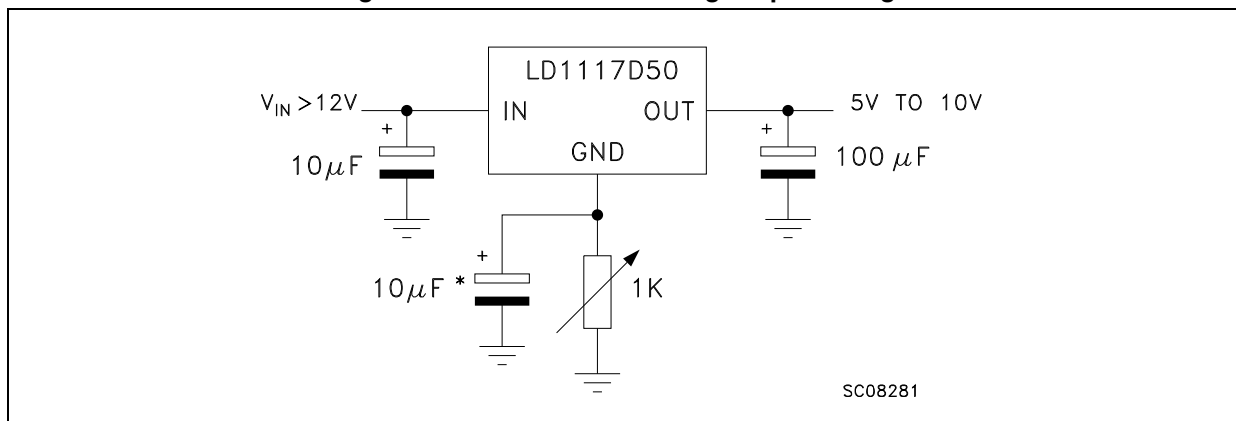


Figure 7. Voltage regulator with reference

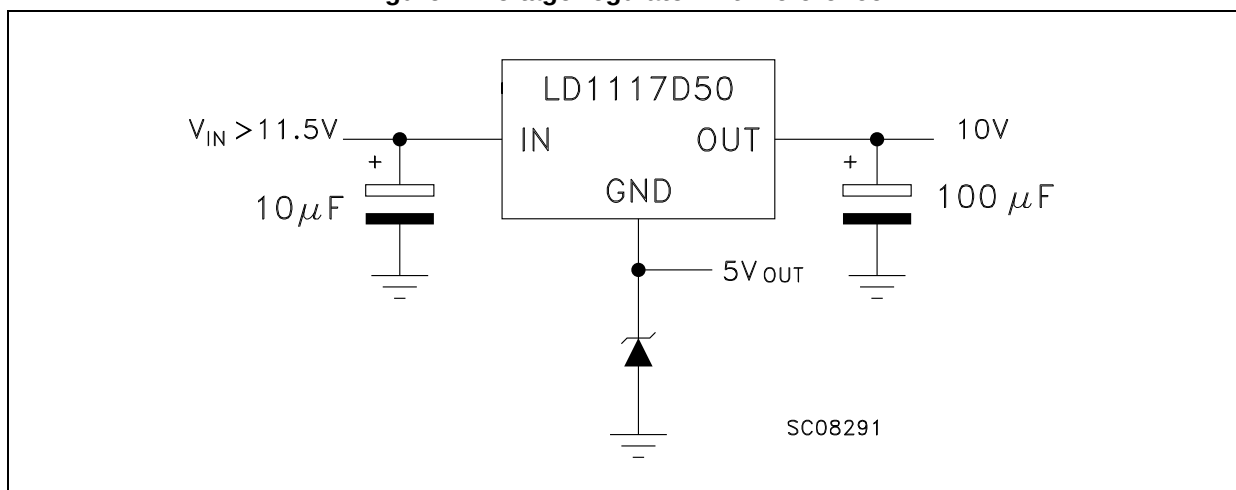


Figure 8. Battery backed-up regulated supply

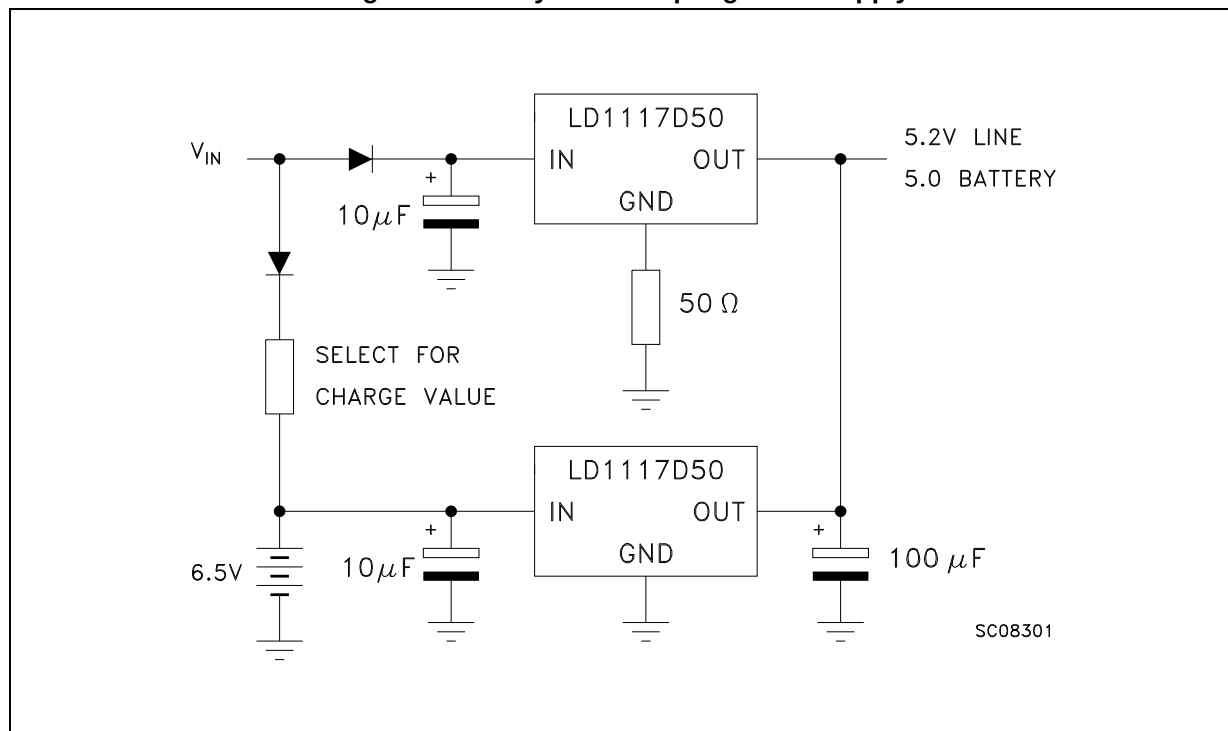
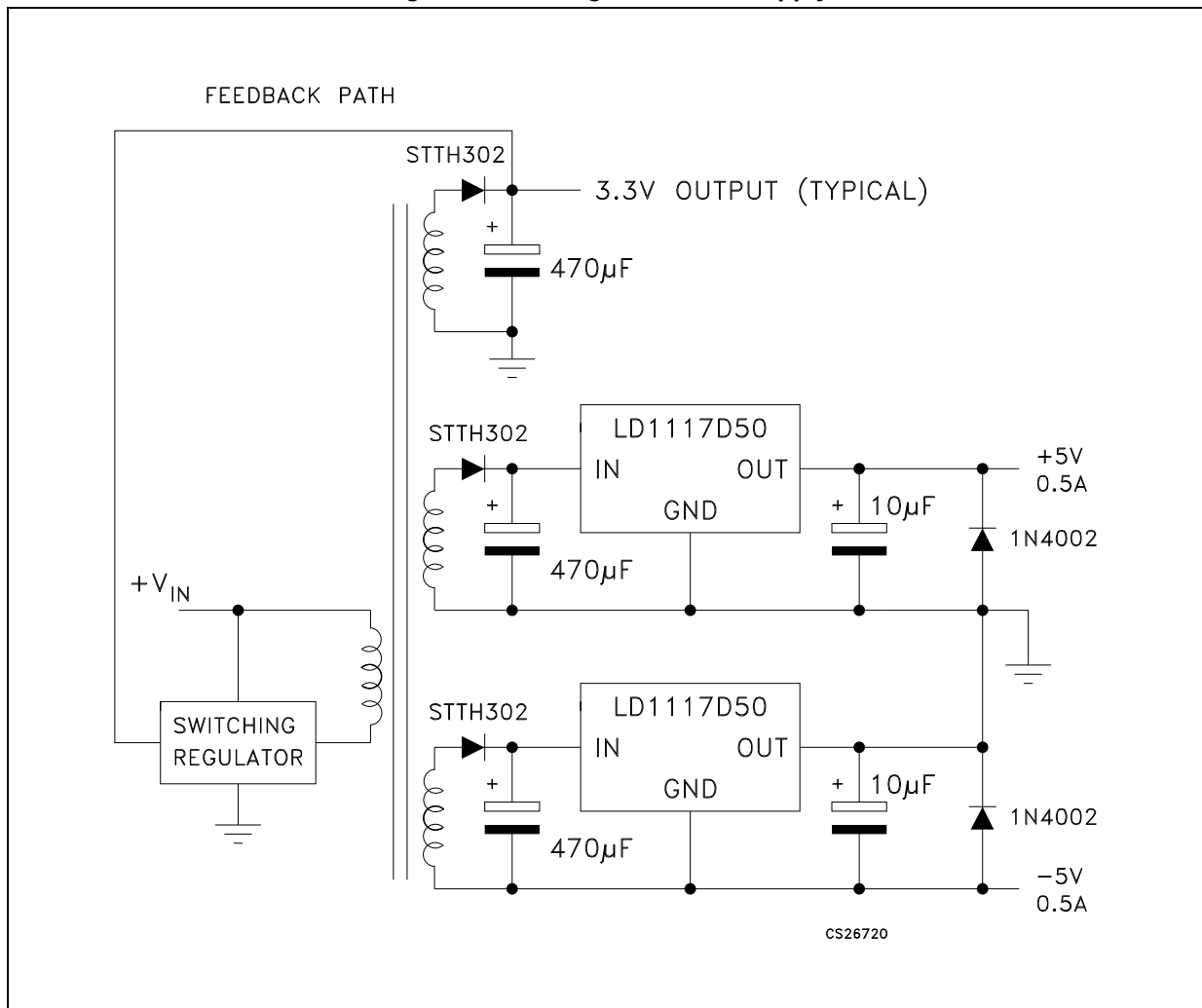


Figure 9. Post-regulated dual supply



## 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:

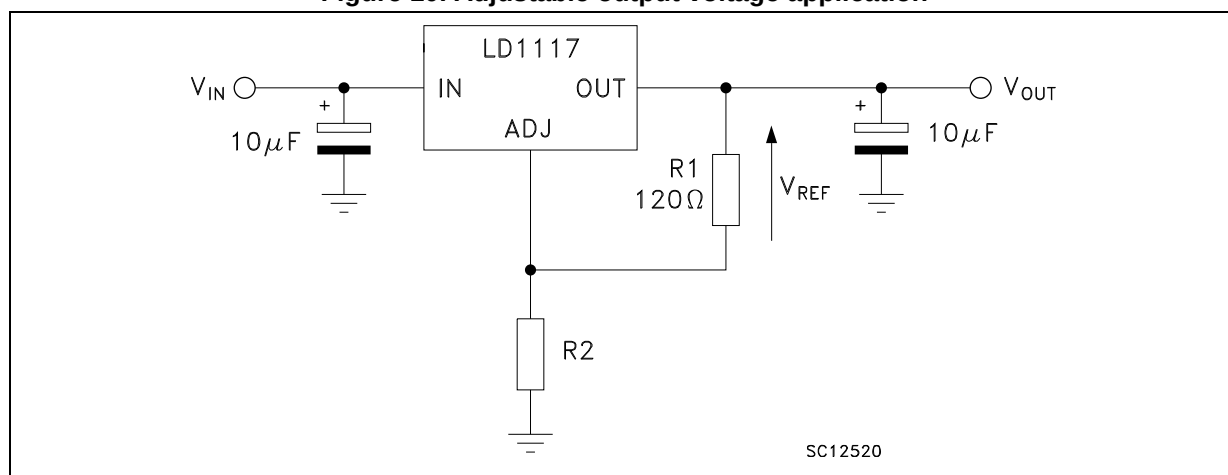
$$V_{OUT} = V_{REF} + R_2 (I_{ADJ} + I_{R1}) = V_{REF} + R_2 (I_{ADJ} + V_{REF} / R_1) = V_{REF} (1 + R_2 / R_1) + R_2 \times I_{ADJ}.$$

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:

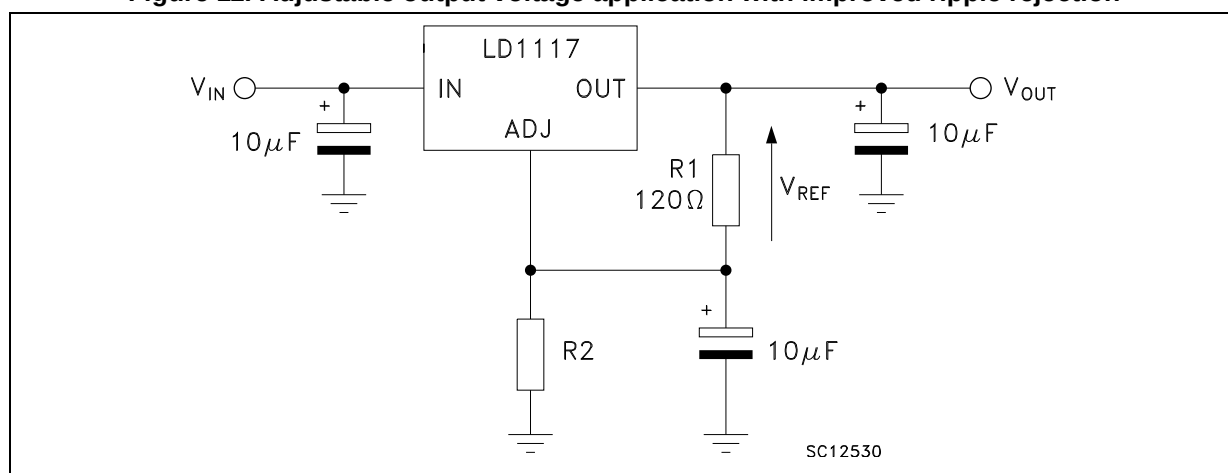
$$V_{OUT} = V_{REF} (1 + R_2 / R_1).$$

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 mechanical data

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)

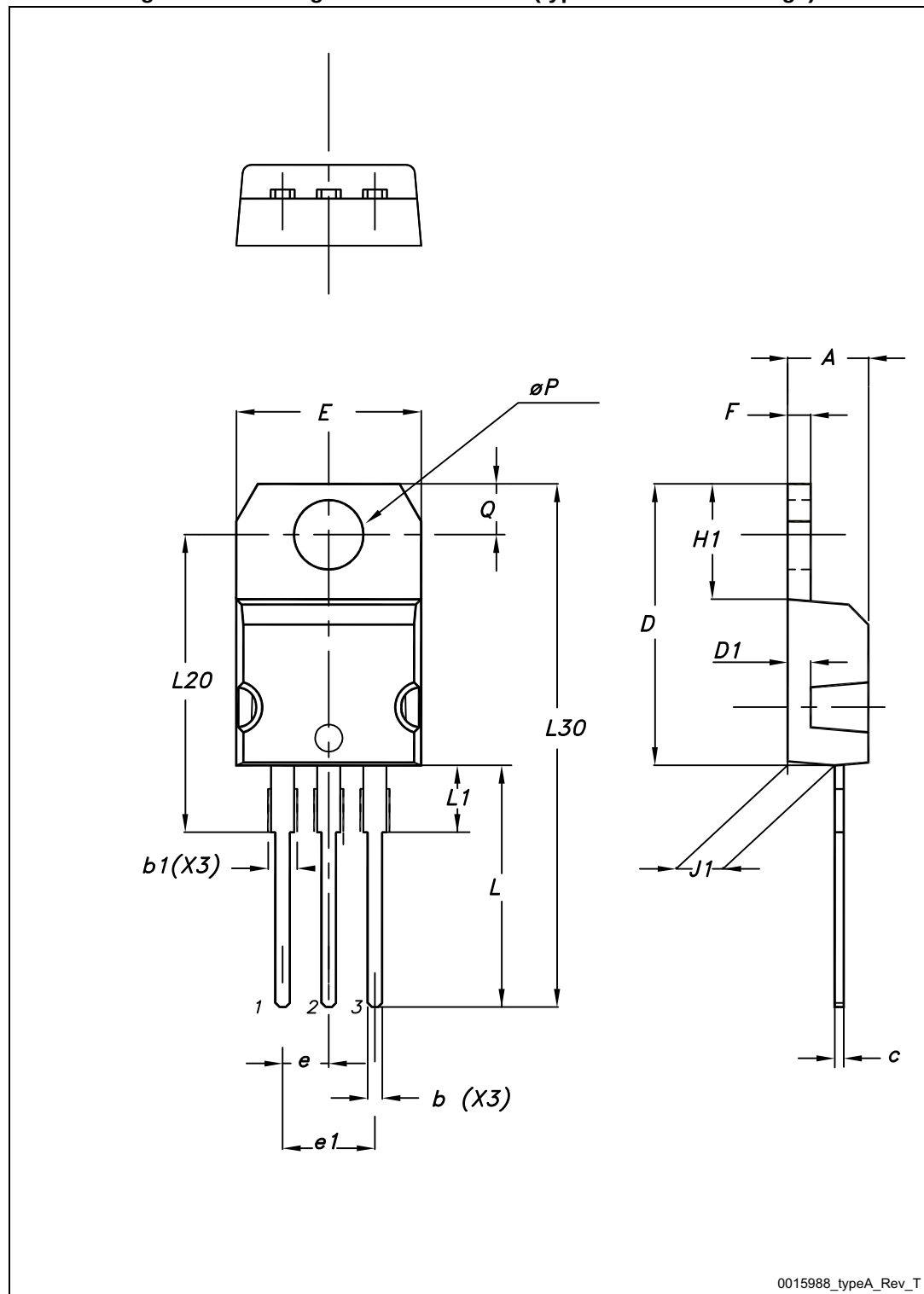


Table 16. TO-220 mechanical data (type STD-ST Single Gauge)

| 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)

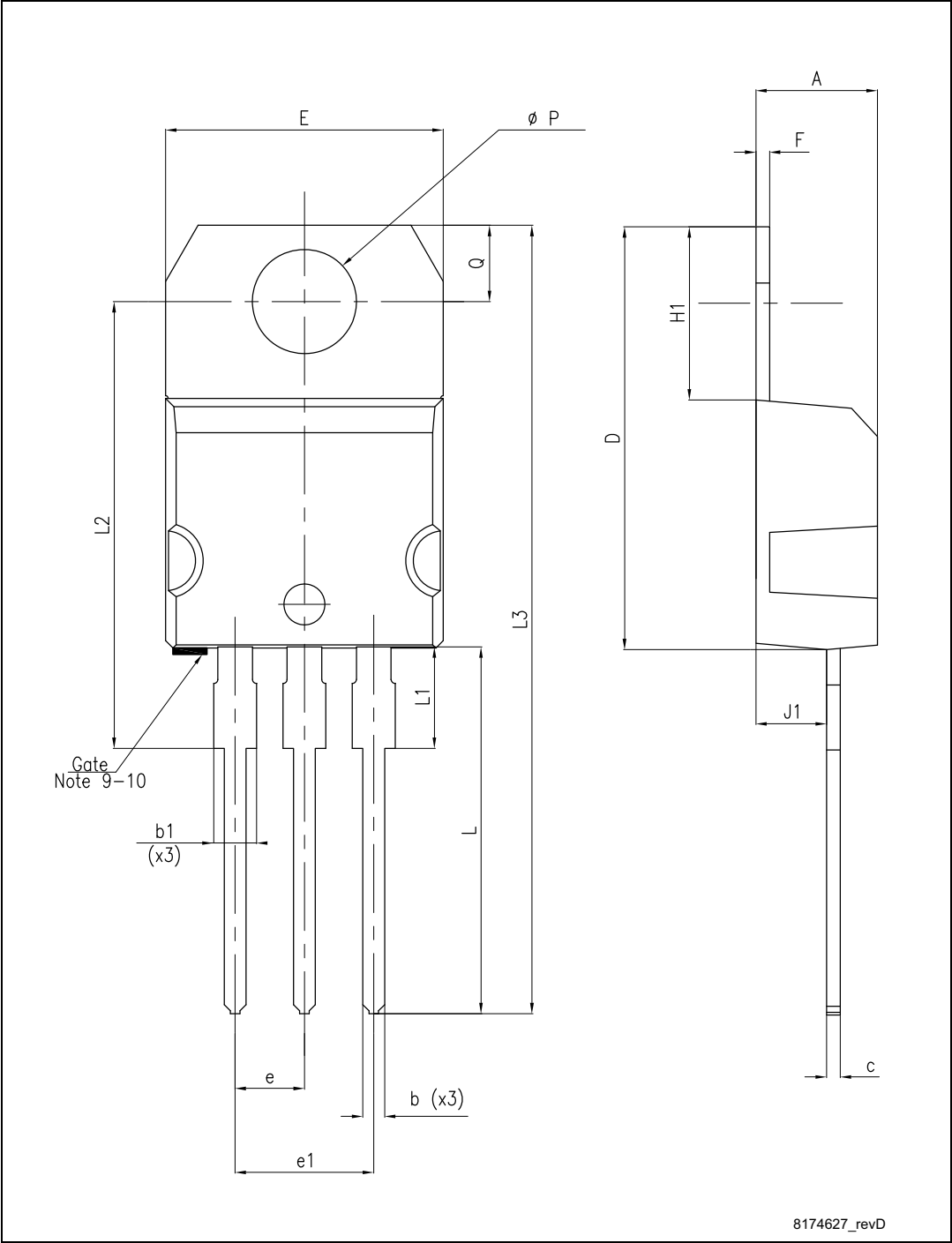


Table 17. SOT-223 mechanical data

| Dim. | mm   |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| A    |      |      | 1.80 |
| A1   | 0.02 |      | 0.1  |
| 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

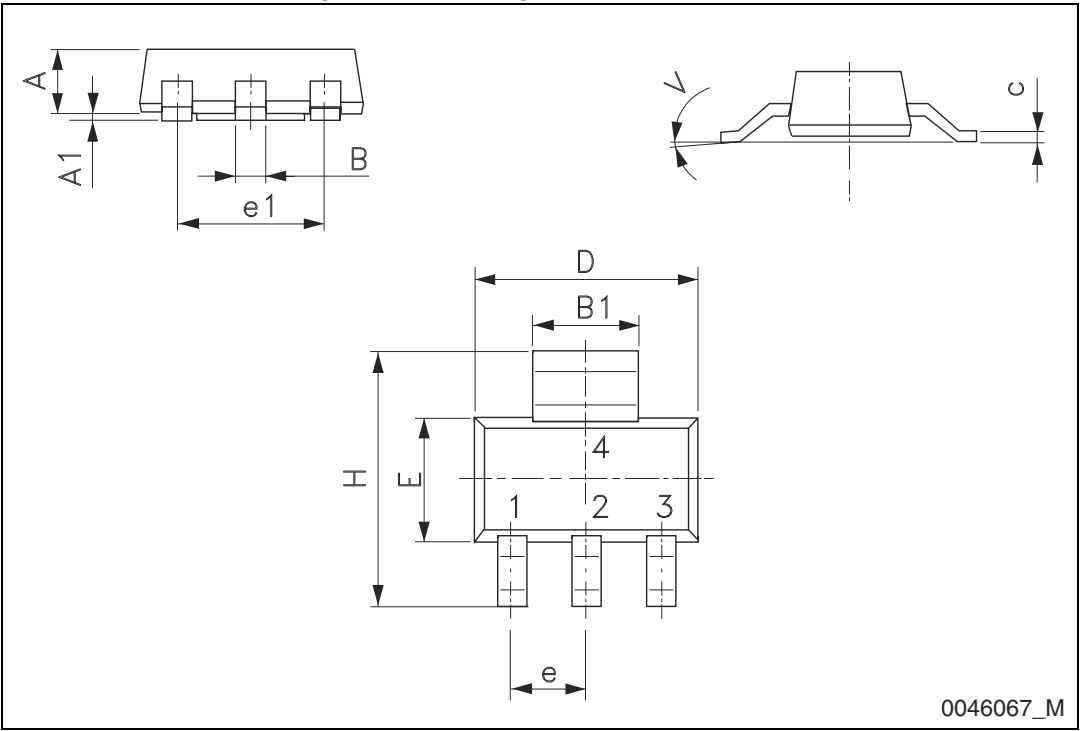


Table 18. SO-8 mechanical data

| 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

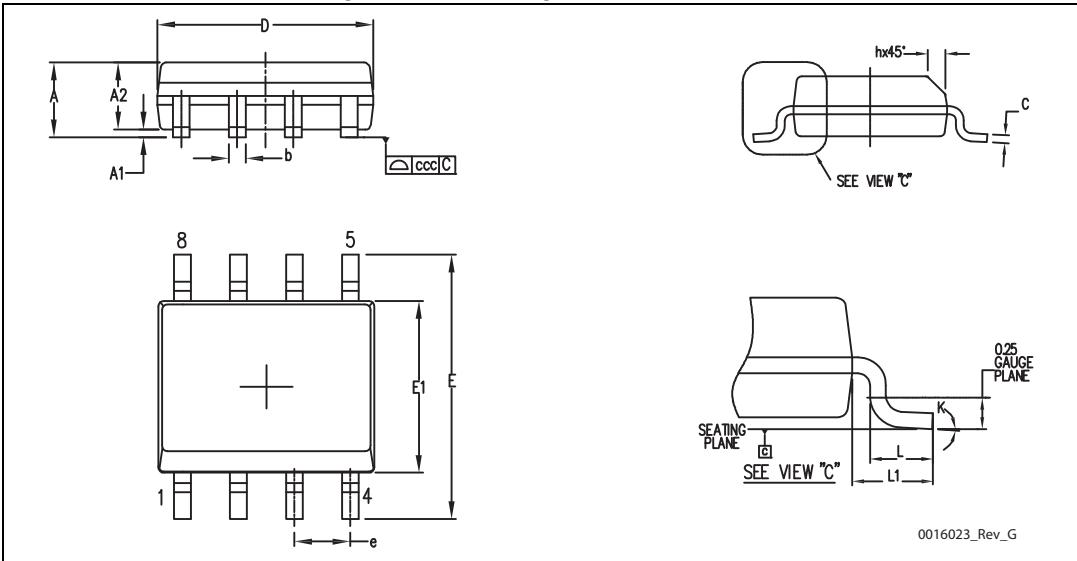
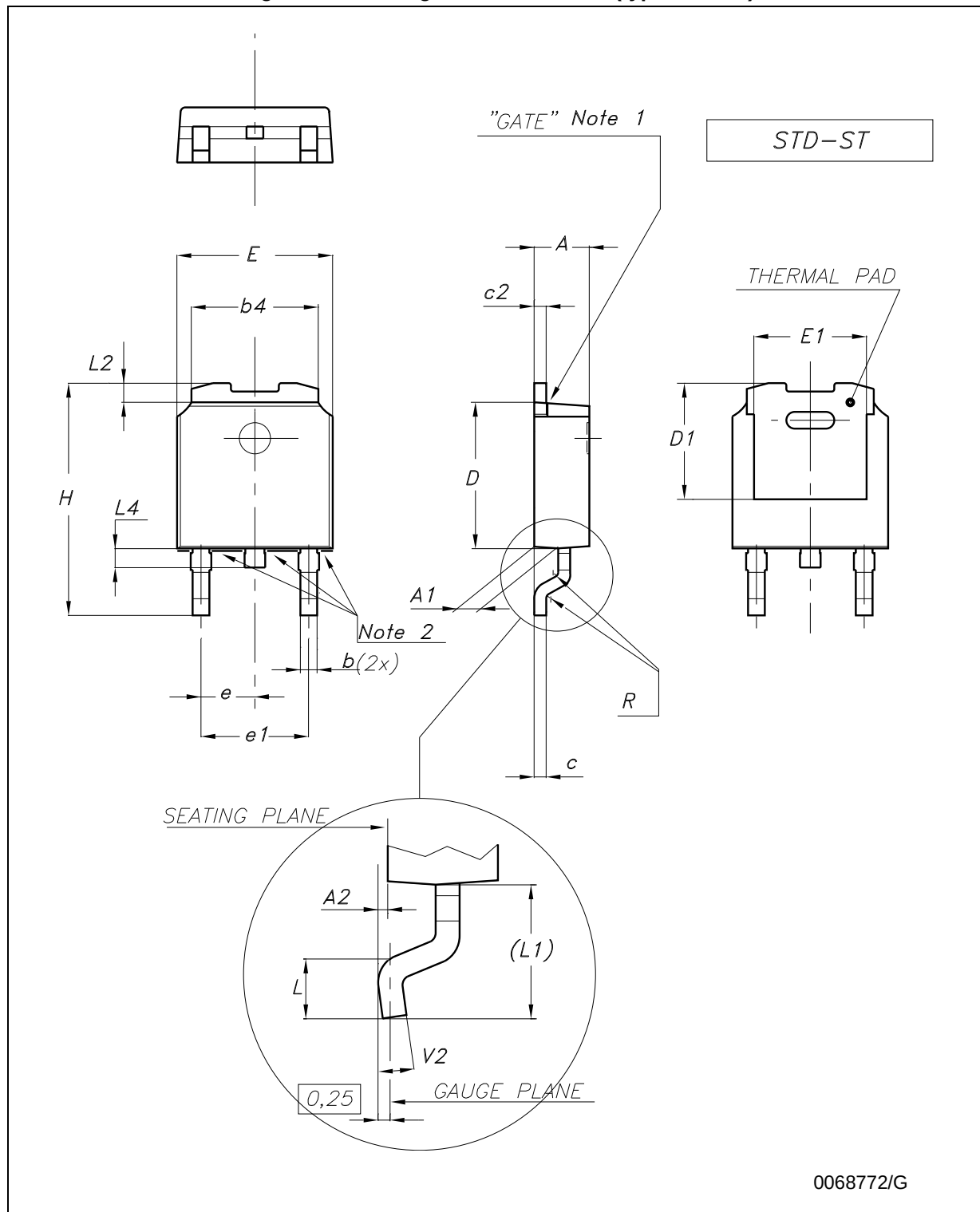


Table 19. DPAK mechanical data

| Dim. | Type STD-ST |      |       | Type Fujitsu-subcon. |      |       | Type IDS-subcon |      |       |
|------|-------------|------|-------|----------------------|------|-------|-----------------|------|-------|
|      | mm.         |      |       | mm.                  |      |       | mm.             |      |       |
|      | Min.        | Typ. | Max.  | Min.                 | Typ. | Max.  | Min.            | Typ. | Max.  |
| A    | 2.20        |      | 2.40  | 2.25                 | 2.30 | 2.35  | 2.19            |      | 2.38  |
| A1   | 0.90        |      | 1.10  | 0.96                 |      | 1.06  | 0.89            |      | 1.14  |
| A2   | 0.03        |      | 0.23  | 0                    |      | 0.10  | 0.03            |      | 0.23  |
| b    | 0.64        |      | 0.90  | 0.76                 |      | 0.86  | 0.64            |      | 0.88  |
| b4   | 5.20        |      | 5.40  | 5.28                 |      | 5.38  | 5.21            |      | 5.46  |
| c    | 0.45        |      | 0.60  | 0.46                 |      | 0.56  | 0.46            |      | 0.58  |
| c2   | 0.48        |      | 0.60  | 0.46                 |      | 0.56  | 0.46            |      | 0.58  |
| D    | 6.00        |      | 6.20  | 6.05                 |      | 6.15  | 5.97            |      | 6.22  |
| D1   |             | 5.10 |       | 5.27                 |      | 5.47  |                 | 5.20 |       |
| E    | 6.40        |      | 6.60  | 6.55                 | 6.60 | 6.65  | 6.35            |      | 6.73  |
| E1   |             | 4.70 |       |                      | 4.77 |       |                 | 4.70 |       |
| e    |             | 2.28 |       | 2.23                 | 2.28 | 2.33  |                 | 2.28 |       |
| e1   | 4.40        |      | 4.60  |                      |      |       | 4.51            |      | 4.61  |
| H    | 9.35        |      | 10.10 | 9.90                 |      | 10.30 | 9.40            |      | 10.42 |
| L    | 1.00        |      |       | 1.40                 |      | 1.60  | 0.90            |      |       |
| L1   |             | 2.80 |       |                      |      |       | 2.50            |      | 2.65  |
| L2   |             | 0.80 |       | 1.03                 |      | 1.13  | 0.89            |      | 1.27  |
| L4   | 0.60        |      | 1.00  | 0.70                 |      | 0.90  | 0.64            |      | 1.02  |
| R    |             | 0.20 |       |                      | 0.40 |       |                 | 0.20 |       |
| V2   | 0°          |      | 8°    | 0°                   |      | 8°    | 0°              |      | 8°    |

**Note:** The DPAK package coming from the two subcontractors (Fujitsu and IDS) are fully compatible with the ST's package suggested footprint.

Figure 16. Drawing dimension DPAK (type STD-ST)



Note: 1 Maximum resin gate protrusion: 0.5 mm.

2 Maximum resin protrusion: 0.25 mm.



Figure 17. Drawing dimension DPAK (type Fujitsu-subcon.)

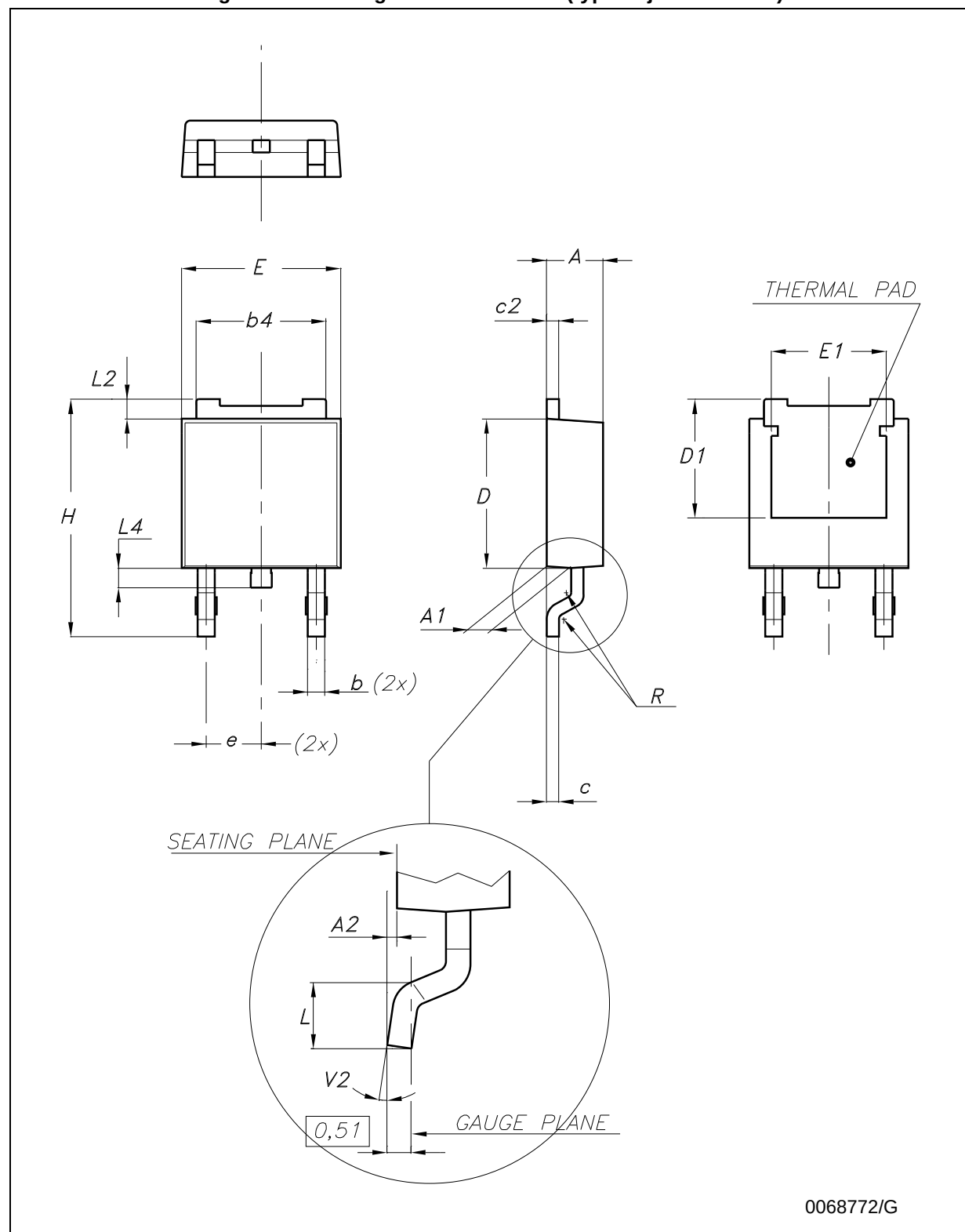


Figure 18. Drawing dimension DPAK (type IDS-subcon.)

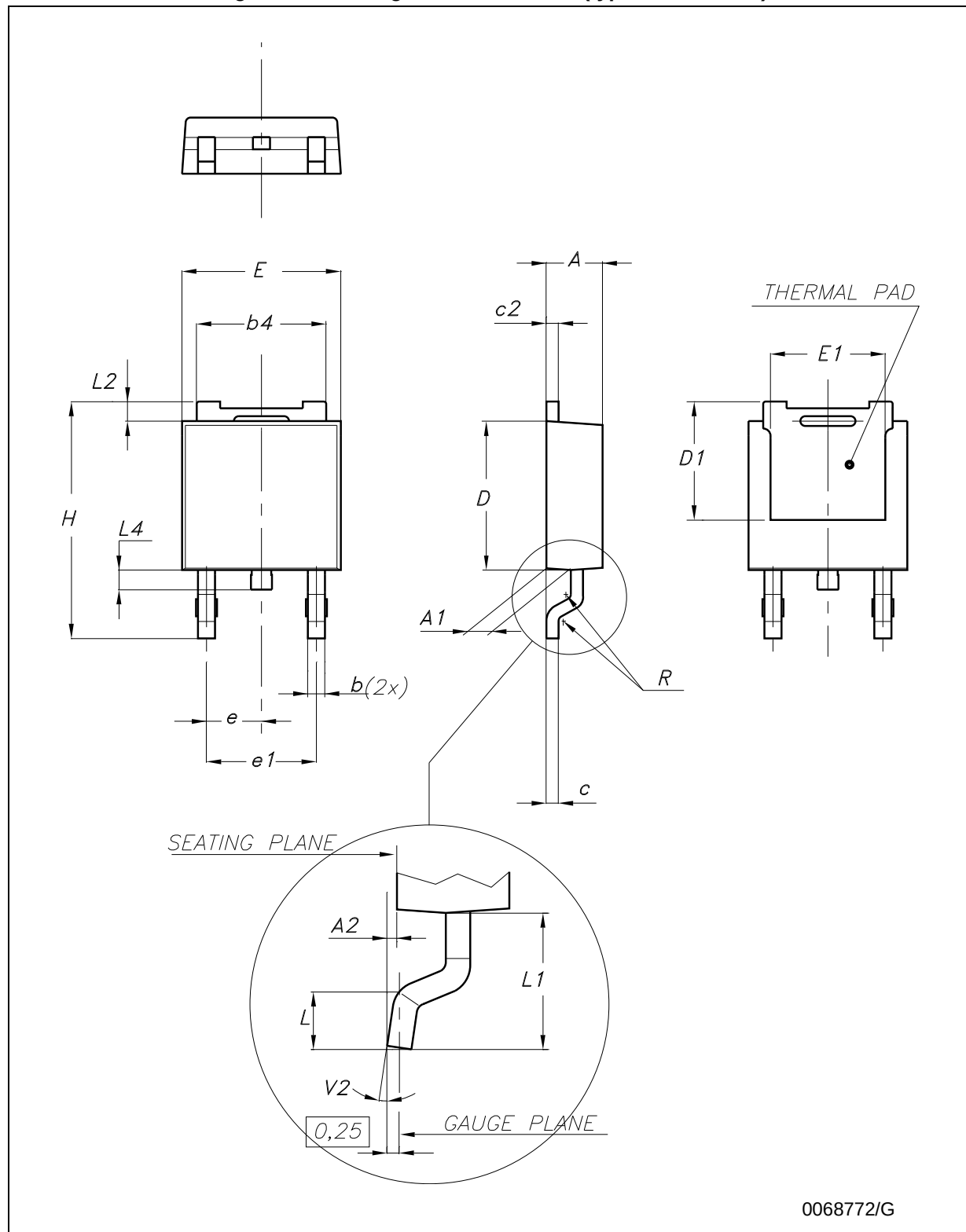
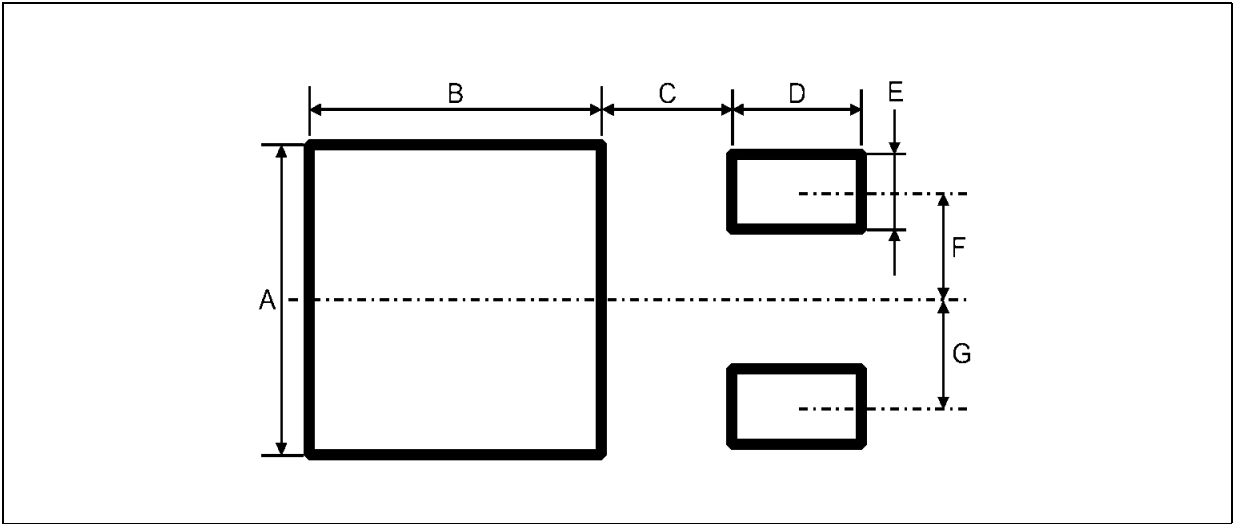


Table 20. Footprint data

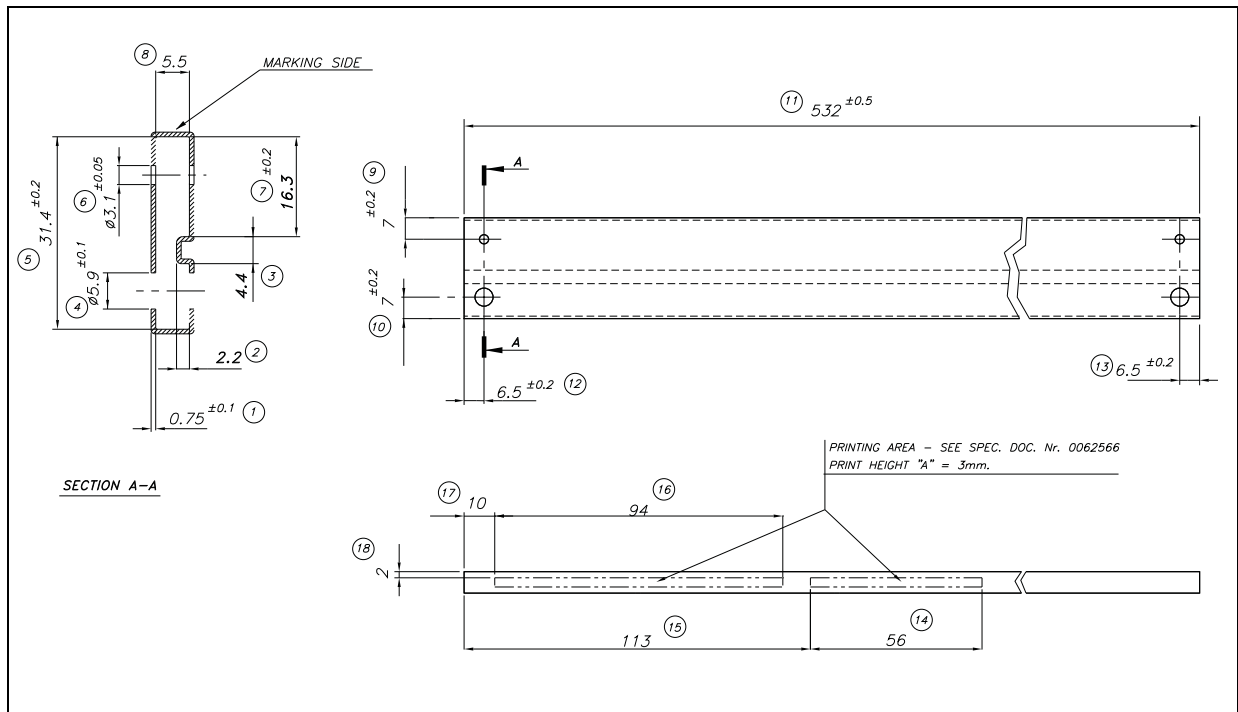
| Values |      |       |
|--------|------|-------|
|        | mm.  | inch. |
| A      | 6.70 | 0.264 |
| B      | 6.70 | 0.64  |
| C      | 1.8  | 0.070 |
| D      | 3.0  | 0.118 |
| E      | 1.60 | 0.063 |
| F      | 2.30 | 0.091 |
| G      | 2.30 | 0.091 |

Figure 19. DPAK footprint recommended data



## 9 Packaging mechanical data

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



**Figure 21. Drawing dimension tube for TO-220 Single Gauge (mm.)**

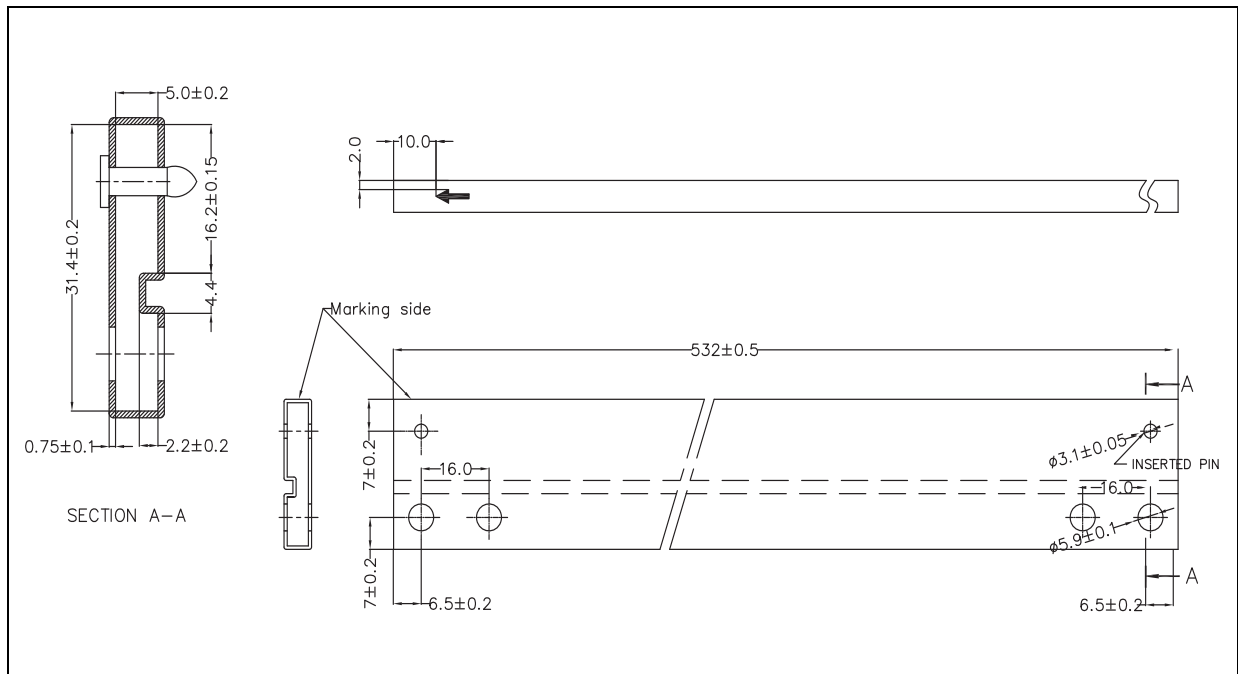


Table 21. SOT-223 tape and reel mechanical data

| 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)

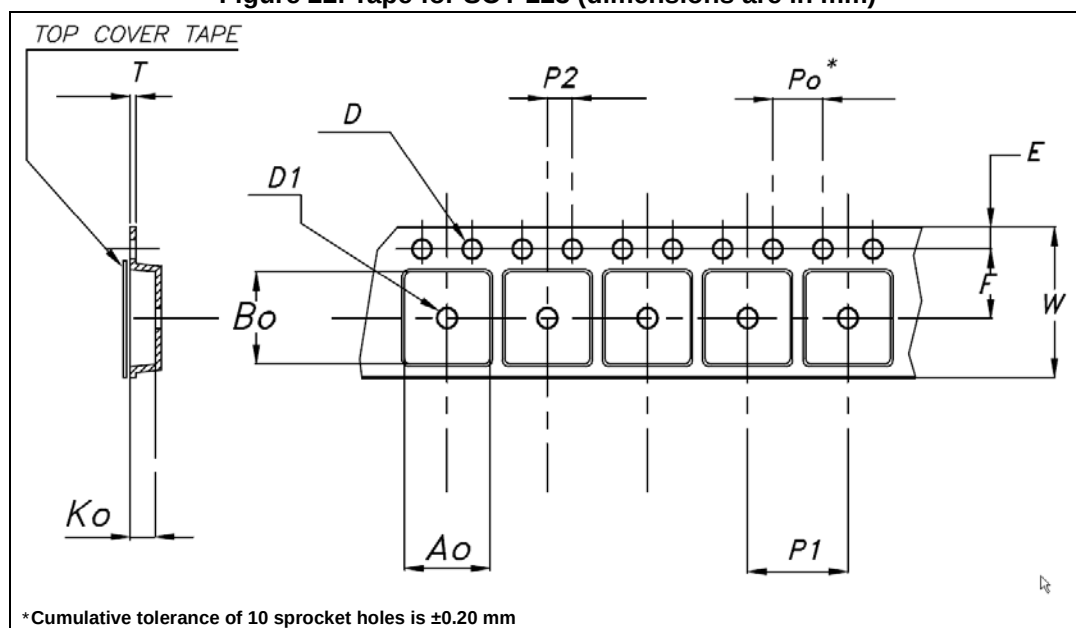


Figure 23. Reel for SOT-223 (dimensions are in mm)

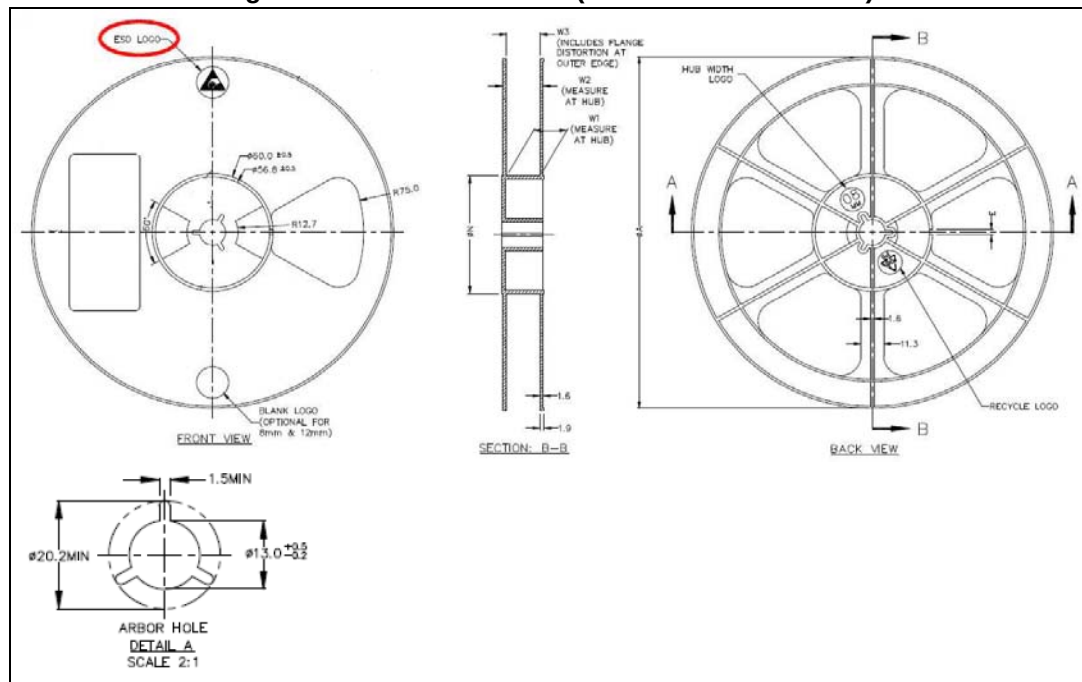


Table 22. SO-8 tape and reel mechanical data

| 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

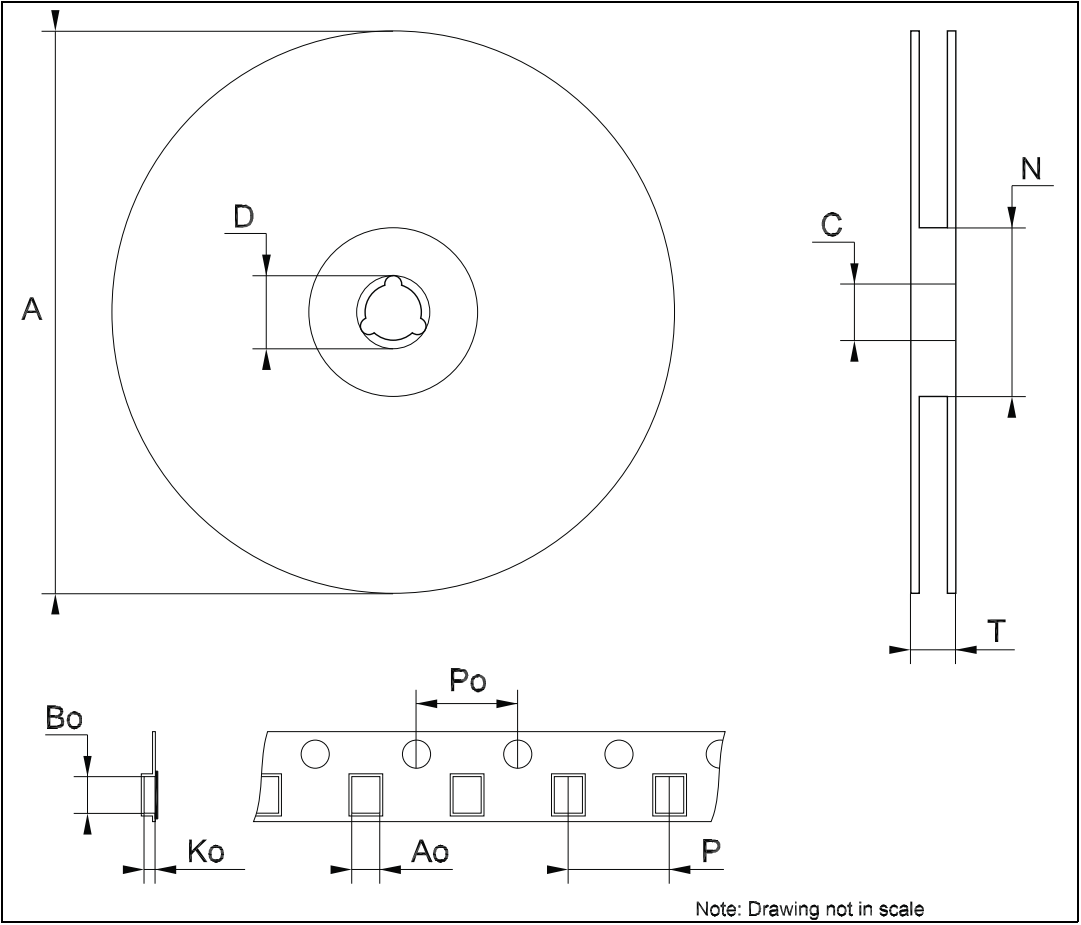
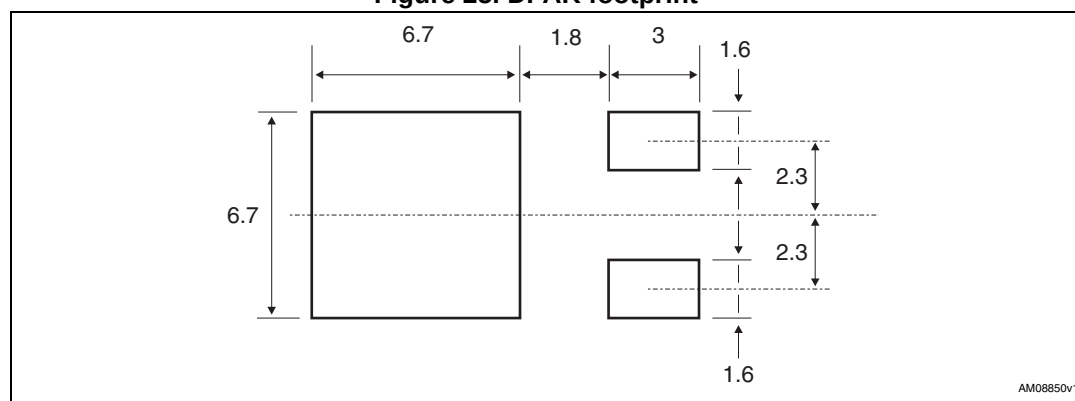


Table 23. DPAK tape and reel mechanical data

| 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. DPAK footprint<sup>(a)</sup>

a. All dimensions are in millimeters



Figure 26. Tape for DPAK

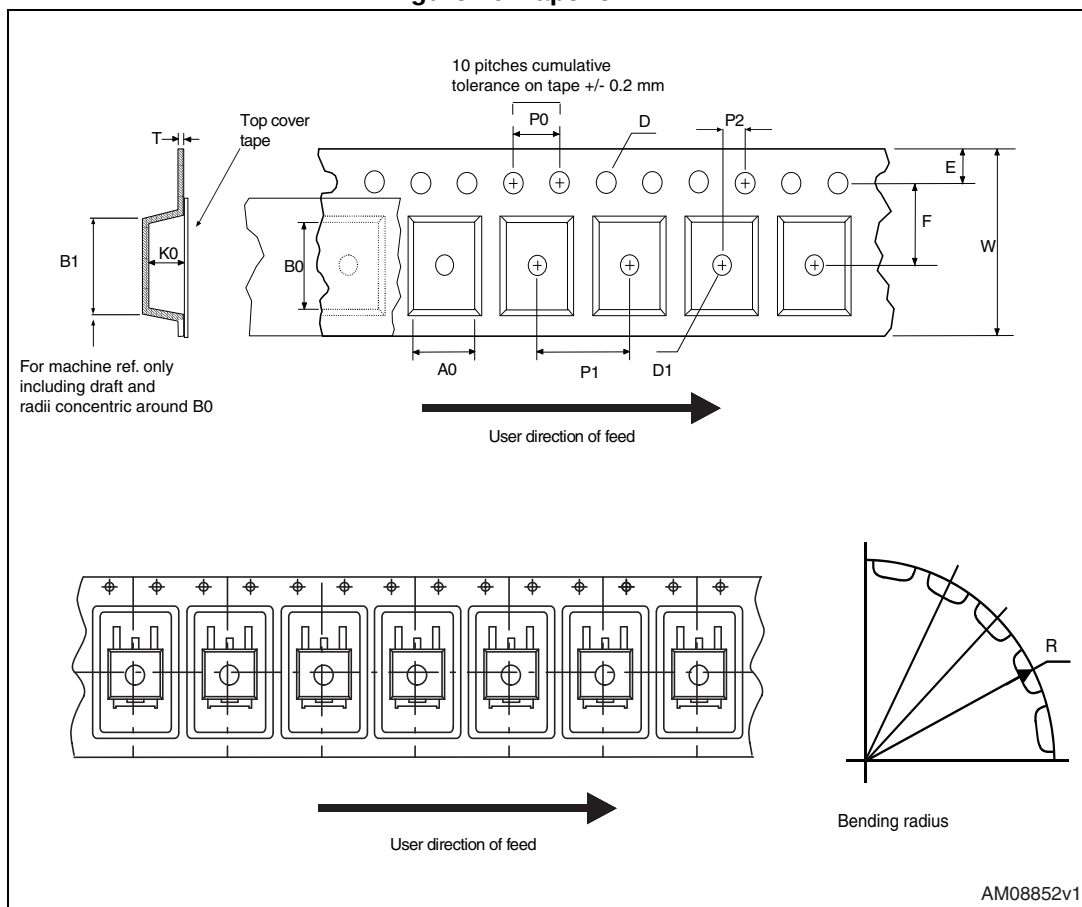
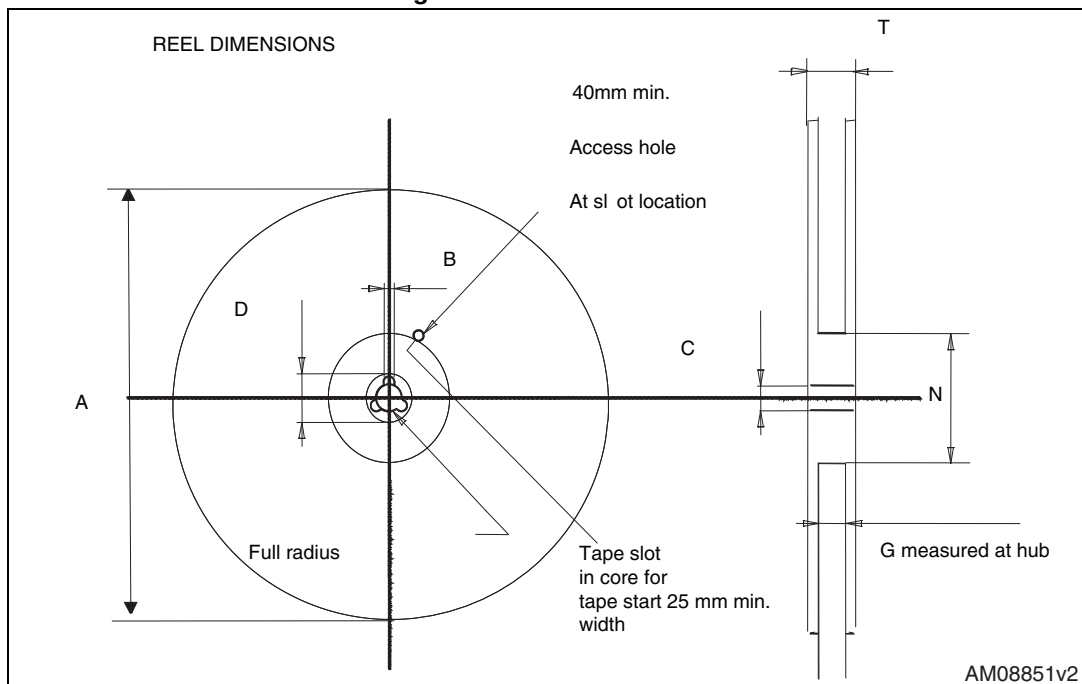


Figure 27. Reel for DPAK



## 10 Order codes

Table 24. 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   |              | LD1117DTC-R             |            |                        | ADJ from<br>1.25 to 15 V |

# 11 Revision history

**Table 25. 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 <a href="#">Table 1</a> .                                                                                                                                                                                                                                                                               |
| 16-Apr-2008 | 23       | Modified: <a href="#">Table 24 on page 42</a> .                                                                                                                                                                                                                                                               |
| 08-Jul-2008 | 24       | Added note <a href="#">1. on page 7</a> .                                                                                                                                                                                                                                                                     |
| 30-Mar-2009 | 25       | Modified: $V_{IN}$ max value <a href="#">Table 4 on page 10</a> and <a href="#">Figure 9 on page 23</a> .                                                                                                                                                                                                     |
| 29-Jul-2009 | 26       | Modified: <a href="#">Table 24 on page 42</a> .                                                                                                                                                                                                                                                               |
| 03-Feb-2010 | 27       | Modified <a href="#">Table 9 on page 15</a> .                                                                                                                                                                                                                                                                 |
| 22-Mar-2010 | 28       | Added: <a href="#">Table 16 on page 22</a> , <a href="#">Figure 13 on page 23</a> , <a href="#">Figure 14 on page 24</a> , <a href="#">Figure 17</a> and <a href="#">Figure 18 on page 33</a> .                                                                                                               |
| 15-Nov-2010 | 29       | Modified: $R_{thJC}$ value for TO-220 <a href="#">Table 2 on page 7</a> .                                                                                                                                                                                                                                     |
| 30-Nov-2011 | 30       | Added: order code LD1117V33-DG <a href="#">Table 24 on page 42</a> .                                                                                                                                                                                                                                          |
| 13-Feb-2012 | 31       | Added: order codes LD1117V50-DG and LD1117V-DG <a href="#">Table 24 on page 42</a> .                                                                                                                                                                                                                          |
| 19-Oct-2012 | 32       | Added: $R_{thJA}$ value for DPAK, SOT-223 and SO-8 <a href="#">Table 2 on page 7</a> .                                                                                                                                                                                                                        |
| 20-Nov-2013 | 33       | Part number LD1117xx changed to LD1117.<br>Updated the Description in cover page, <a href="#">Section 8: Package mechanical data</a> and <a href="#">Table 24: Order codes</a> .<br>Cancelled Table 1: Device summary.<br>Added <a href="#">Section 9: Packaging mechanical data</a> .<br>Minor text changes. |

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