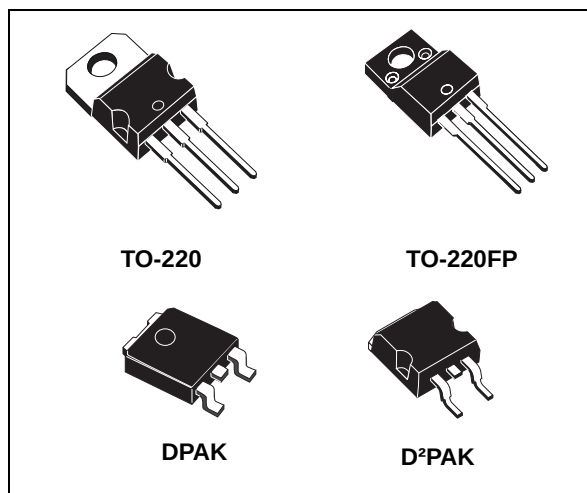


## Positive voltage regulator ICs

Datasheet - production data



### Description

The L78 series of three-terminal positive regulators is available in TO-220, TO-220FP, D<sup>2</sup>PAK and DPAK packages and several fixed output voltages, making it useful in a wide range of applications.

These regulators can provide local on-card regulation, eliminating the distribution problems associated with single point regulation. Each type embeds internal current limiting, thermal shut-down and safe area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1 A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltage and currents.

### Features

- Output current up to 1.5 A
- Output voltages of 5; 6; 8; 8.5; 9; 12; 15; 18; 24 V
- Thermal overload protection
- Short circuit protection
- Output transition SOA protection
- 2 % output voltage tolerance (A version)
- Guaranteed in extended temperature range (A version)

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# 1 Diagram

**Figure 1. Block diagram**

2 Pin configuration

Figure 2. Pin connections (top view)

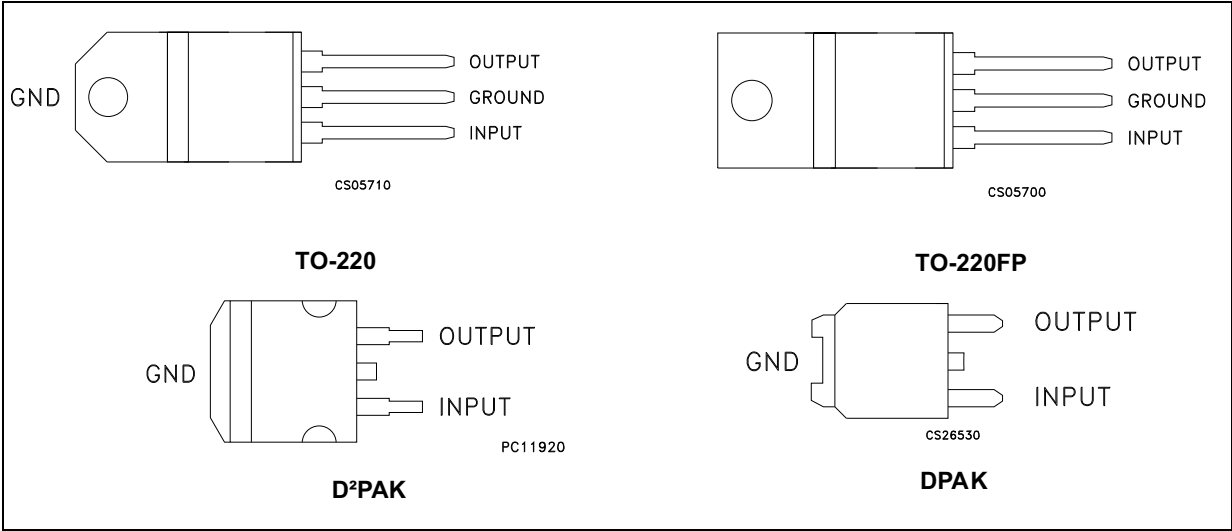
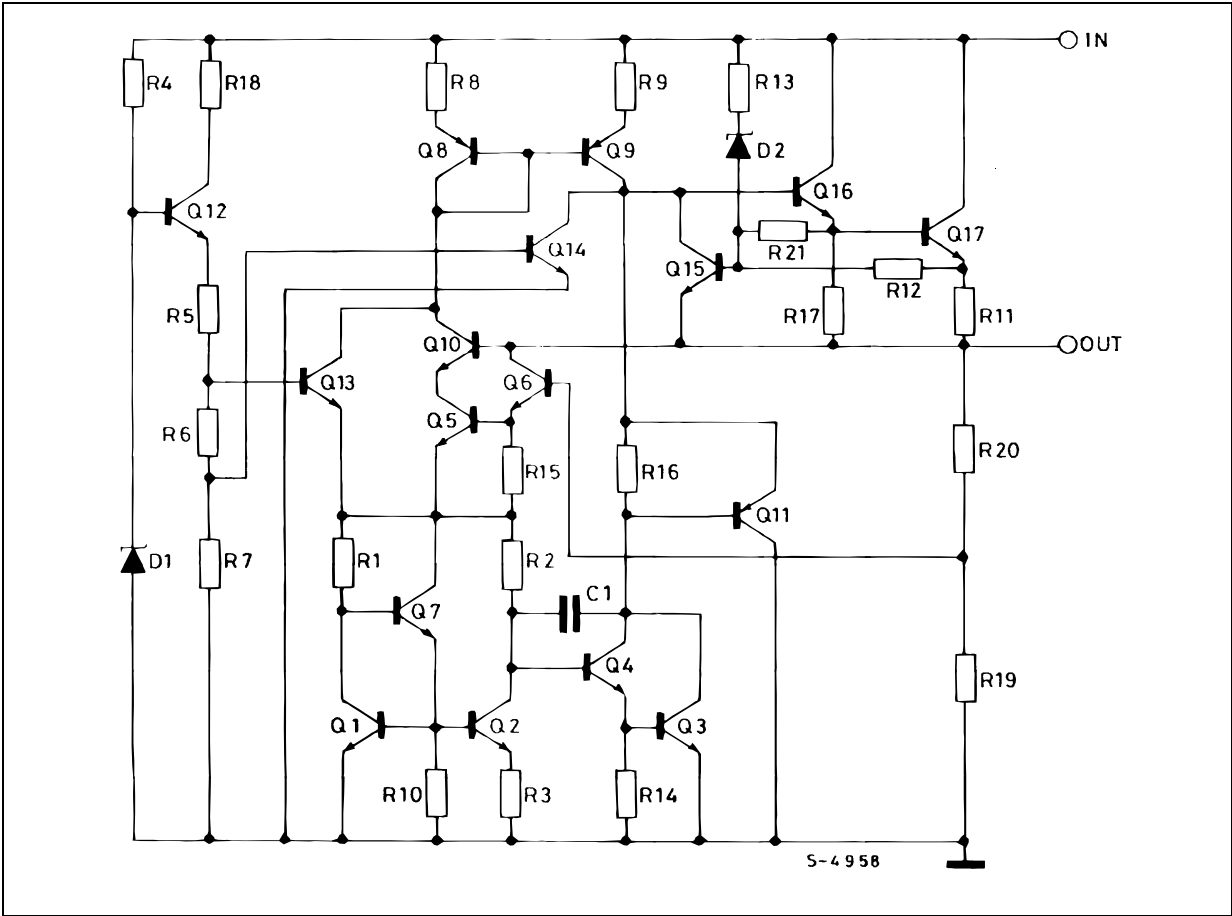


Figure 3. Schematic diagram



### 3 Maximum ratings

Table 1. Absolute maximum ratings

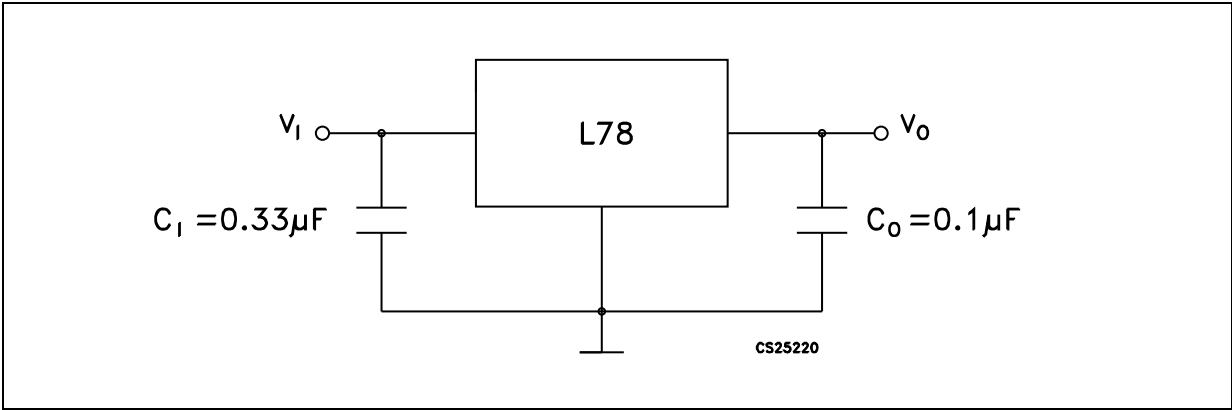
| Symbol    | Parameter                            |                         | Value              | Unit |
|-----------|--------------------------------------|-------------------------|--------------------|------|
| $V_I$     | DC input voltage                     | for $V_O = 5$ to $18$ V | 35                 | V    |
|           |                                      | for $V_O = 20, 24$ V    | 40                 |      |
| $I_O$     | Output current                       |                         | Internally limited |      |
| $P_D$     | Power dissipation                    |                         | Internally limited |      |
| $T_{STG}$ | Storage temperature range            |                         | -65 to 150         | °C   |
| $T_{OP}$  | Operating junction temperature range | for L78xxC, L78xxAC     | 0 to 125           | °C   |
|           |                                      | for L78xxAB             | -40 to 125         |      |

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

Table 2. Thermal data

| Symbol     | Parameter                           | D <sup>2</sup> PAK | DPAK | TO-220 | TO-220FP | Unit |
|------------|-------------------------------------|--------------------|------|--------|----------|------|
| $R_{thJC}$ | Thermal resistance junction-case    | 3                  | 8    | 5      | 5        | °C/W |
| $R_{thJA}$ | Thermal resistance junction-ambient | 62.5               | 100  | 50     | 60       | °C/W |

Figure 4. Application circuits



## 4 Test circuits

Figure 5. DC parameter

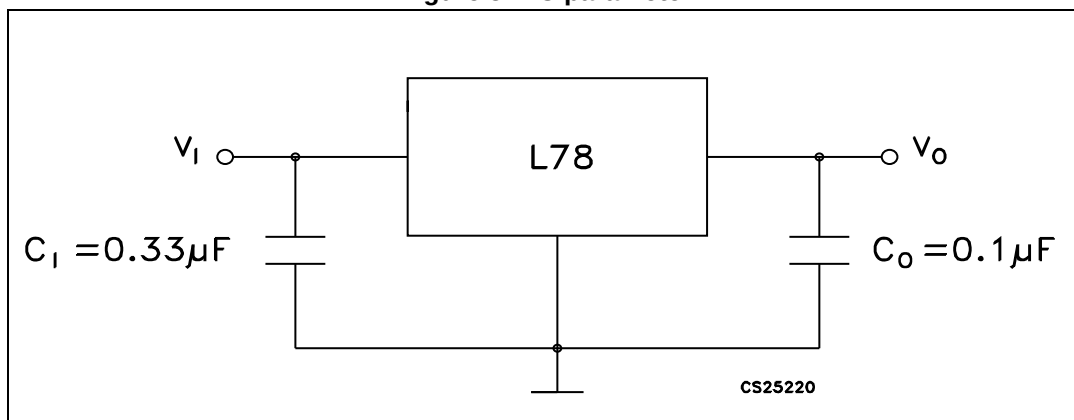


Figure 6. Load regulation

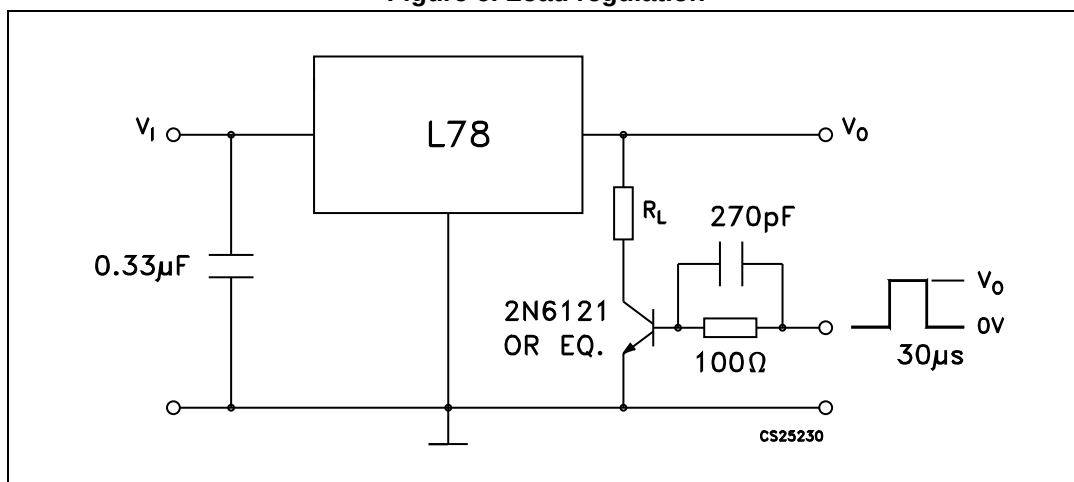
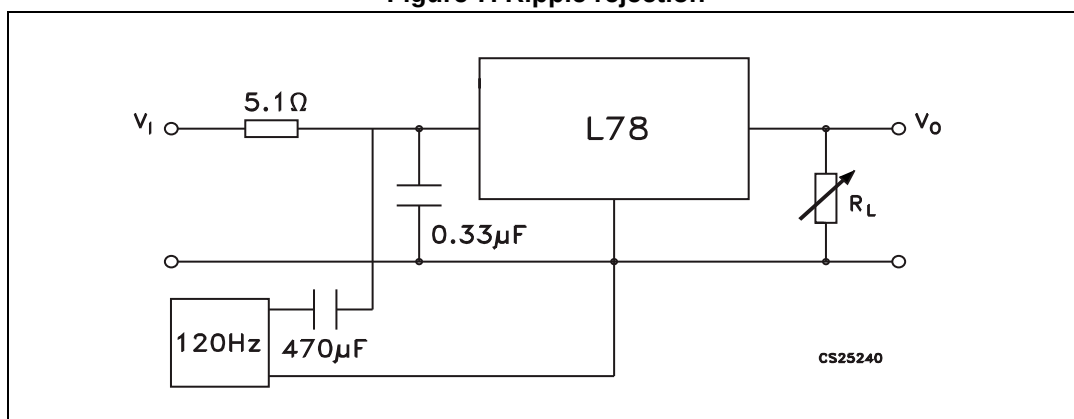


Figure 7. Ripple rejection



## 5 Electrical characteristics

$V_I = 10\text{ V}$ ,  $I_O = 1\text{ A}$ ,  $T_J = 0\text{ to }125\text{ °C}$  (L7805AC),  $T_J = -40\text{ to }125\text{ °C}$  (L7805AB), unless otherwise specified<sup>(a)</sup>.

**Table 3. Electrical characteristics of L7805A**

| Symbol                | Parameter                  | Test conditions                                                                  | Min. | Typ. | Max. | Unit                  |
|-----------------------|----------------------------|----------------------------------------------------------------------------------|------|------|------|-----------------------|
| $V_O$                 | Output voltage             | $T_J = 25\text{ °C}$                                                             | 4.9  | 5    | 5.1  | V                     |
| $V_O$                 | Output voltage             | $I_O = 5\text{ mA to }1\text{ A}$ , $V_I = 7.5\text{ to }18\text{ V}$            | 4.8  | 5    | 5.2  | V                     |
| $V_O$                 | Output voltage             | $I_O = 1\text{ A}$ , $V_I = 18\text{ to }20\text{ V}$ , $T_J = 25\text{ °C}$     | 4.8  | 5    | 5.2  | V                     |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 7.5\text{ to }25\text{ V}$ , $I_O = 500\text{ mA}$ , $T_J = 25\text{ °C}$ |      | 7    | 50   | mV                    |
|                       |                            | $V_I = 8\text{ to }12\text{ V}$                                                  |      | 10   | 50   | mV                    |
|                       |                            | $V_I = 8\text{ to }12\text{ V}$ , $T_J = 25\text{ °C}$                           |      | 2    | 25   | mV                    |
|                       |                            | $V_I = 7.3\text{ to }20\text{ V}$ , $T_J = 25\text{ °C}$                         |      | 7    | 50   | mV                    |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA to }1\text{ A}$                                                |      | 25   | 100  | mV                    |
|                       |                            | $I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25\text{ °C}$                       |      | 30   | 100  |                       |
|                       |                            | $I_O = 250\text{ to }750\text{ mA}$                                              |      | 8    | 50   |                       |
| $I_q$                 | Quiescent current          | $T_J = 25\text{ °C}$                                                             |      | 4.3  | 6    | mA                    |
|                       |                            |                                                                                  |      |      | 6    | mA                    |
| $\Delta I_q$          | Quiescent current change   | $V_I = 8\text{ to }23\text{ V}$ , $I_O = 500\text{ mA}$                          |      |      | 0.8  | mA                    |
|                       |                            | $V_I = 7.5\text{ to }20\text{ V}$ , $T_J = 25\text{ °C}$                         |      |      | 0.8  | mA                    |
|                       |                            | $I_O = 5\text{ mA to }1\text{ A}$                                                |      |      | 0.5  | mA                    |
| SVR                   | Supply voltage rejection   | $V_I = 8\text{ to }18\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 500\text{ mA}$    |      | 68   |      | dB                    |
| $V_d$                 | Dropout voltage            | $I_O = 1\text{ A}$ , $T_J = 25\text{ °C}$                                        |      | 2    |      | V                     |
| eN                    | Output noise voltage       | $T_A = 25\text{ °C}$ , $B = 10\text{ Hz to }100\text{ kHz}$                      |      | 10   |      | $\mu\text{V}/V_O$     |
| $R_O$                 | Output resistance          | $f = 1\text{ kHz}$                                                               |      | 17   |      | $\text{m}\Omega$      |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_A = 25\text{ °C}$                                       |      | 0.2  |      | A                     |
| $I_{scp}$             | Short circuit peak current | $T_J = 25\text{ °C}$                                                             |      | 2.2  |      | A                     |
| $\Delta V_O/\Delta T$ | Output voltage drift       |                                                                                  |      | -1.1 |      | $\text{mV}/\text{°C}$ |

1. Load and line regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

a. Minimum load current for regulation is 5 mA.

$V_I = 11\text{ V}$ ,  $I_O = 1\text{ A}$ ,  $T_J = 0\text{ to }125\text{ °C}$  (L7806AC),  $T_J = -40\text{ to }125\text{ °C}$  (L7806AB), unless otherwise specified<sup>(b)</sup>.

Table 4. Electrical characteristics of L7806A

| Symbol                | Parameter                  | Test conditions                                                                  | Min. | Typ. | Max. | Unit              |
|-----------------------|----------------------------|----------------------------------------------------------------------------------|------|------|------|-------------------|
| $V_O$                 | Output voltage             | $T_J = 25\text{ °C}$                                                             | 5.88 | 6    | 6.12 | V                 |
| $V_O$                 | Output voltage             | $I_O = 5\text{ mA to }1\text{ A}$ , $V_I = 8.6\text{ to }19\text{ V}$            | 5.76 | 6    | 6.24 | V                 |
| $V_O$                 | Output voltage             | $I_O = 1\text{ A}$ , $V_I = 19\text{ to }21\text{ V}$ , $T_J = 25\text{ °C}$     | 5.76 | 6    | 6.24 | V                 |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 8.6\text{ to }25\text{ V}$ , $I_O = 500\text{ mA}$ , $T_J = 25\text{ °C}$ |      | 9    | 60   | mV                |
|                       |                            | $V_I = 9\text{ to }13\text{ V}$                                                  |      | 11   | 60   | mV                |
|                       |                            | $V_I = 9\text{ to }13\text{ V}$ , $T_J = 25\text{ °C}$                           |      | 3    | 30   | mV                |
|                       |                            | $V_I = 8.3\text{ to }21\text{ V}$ , $T_J = 25\text{ °C}$                         |      | 9    | 60   | mV                |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA to }1\text{ A}$                                                |      | 25   | 100  | mV                |
|                       |                            | $I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25\text{ °C}$                       |      | 30   | 100  |                   |
|                       |                            | $I_O = 250\text{ to }750\text{ mA}$                                              |      | 10   | 50   |                   |
| $I_q$                 | Quiescent current          | $T_J = 25\text{ °C}$                                                             |      | 4.3  | 6    | mA                |
|                       |                            |                                                                                  |      |      | 6    | mA                |
| $\Delta I_q$          | Quiescent current change   | $V_I = 9\text{ to }24\text{ V}$ , $I_O = 500\text{ mA}$                          |      |      | 0.8  | mA                |
|                       |                            | $V_I = 8.6\text{ to }21\text{ V}$ , $T_J = 25\text{ °C}$                         |      |      | 0.8  | mA                |
|                       |                            | $I_O = 5\text{ mA to }1\text{ A}$                                                |      |      | 0.5  | mA                |
| SVR                   | Supply voltage rejection   | $V_I = 9\text{ to }19\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 500\text{ mA}$    |      | 65   |      | dB                |
| $V_d$                 | Dropout voltage            | $I_O = 1\text{ A}$ , $T_J = 25\text{ °C}$                                        |      | 2    |      | V                 |
| eN                    | Output noise voltage       | $T_A = 25\text{ °C}$ , $B = 10\text{ Hz to }100\text{ kHz}$                      |      | 10   |      | $\mu\text{V}/V_O$ |
| $R_O$                 | Output resistance          | $f = 1\text{ kHz}$                                                               |      | 17   |      | m $\Omega$        |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_A = 25\text{ °C}$                                       |      | 0.2  |      | A                 |
| $I_{scp}$             | Short circuit peak current | $T_J = 25\text{ °C}$                                                             |      | 2.2  |      | A                 |
| $\Delta V_O/\Delta T$ | Output voltage drift       |                                                                                  |      | -0.8 |      | mV/°C             |

1. Load and line regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

b. Minimum load current for regulation is 5 mA.

$V_I = 14\text{ V}$ ,  $I_O = 1\text{ A}$ ,  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  (L7808AC),  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  (L7808AB), unless otherwise specified<sup>(c)</sup>.

Table 5. Electrical characteristics of L7808A

| Symbol                | Parameter                  | Test conditions                                                                       | Min. | Typ. | Max. | Unit                       |
|-----------------------|----------------------------|---------------------------------------------------------------------------------------|------|------|------|----------------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$                                                              | 7.84 | 8    | 8.16 | V                          |
| $V_O$                 | Output voltage             | $I_O = 5\text{ mA to }1\text{ A}$ , $V_I = 10.6\text{ to }21\text{ V}$                | 7.7  | 8    | 8.3  | V                          |
| $V_O$                 | Output voltage             | $I_O = 1\text{ A}$ , $V_I = 21\text{ to }23\text{ V}$ , $T_J = 25^\circ\text{C}$      | 7.7  | 8    | 8.3  | V                          |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 10.6\text{ to }25\text{ V}$ , $I_O = 500\text{ mA}$ , $T_J = 25^\circ\text{C}$ |      | 12   | 80   | mV                         |
|                       |                            | $V_I = 11\text{ to }17\text{ V}$                                                      |      | 15   | 80   | mV                         |
|                       |                            | $V_I = 11\text{ to }17\text{ V}$ , $T_J = 25^\circ\text{C}$                           |      | 5    | 40   | mV                         |
|                       |                            | $V_I = 10.4\text{ to }23\text{ V}$ , $T_J = 25^\circ\text{C}$                         |      | 12   | 80   | mV                         |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA to }1\text{ A}$                                                     |      | 25   | 100  | mV                         |
|                       |                            | $I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^\circ\text{C}$                        |      | 30   | 100  |                            |
|                       |                            | $I_O = 250\text{ to }750\text{ mA}$                                                   |      | 10   | 50   |                            |
| $I_q$                 | Quiescent current          | $T_J = 25^\circ\text{C}$                                                              |      | 4.3  | 6    | mA                         |
|                       |                            |                                                                                       |      |      | 6    | mA                         |
| $\Delta I_q$          | Quiescent current change   | $V_I = 11\text{ to }23\text{ V}$ , $I_O = 500\text{ mA}$                              |      |      | 0.8  | mA                         |
|                       |                            | $V_I = 10.6\text{ to }23\text{ V}$ , $T_J = 25^\circ\text{C}$                         |      |      | 0.8  | mA                         |
|                       |                            | $I_O = 5\text{ mA to }1\text{ A}$                                                     |      |      | 0.5  | mA                         |
| SVR                   | Supply voltage rejection   | $V_I = 11.5\text{ to }21.5\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 500\text{ mA}$    |      | 62   |      | dB                         |
| $V_d$                 | Dropout voltage            | $I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$                                         |      | 2    |      | V                          |
| eN                    | Output noise voltage       | $T_A = 25^\circ\text{C}$ , $B = 10\text{ Hz to }100\text{ kHz}$                       |      | 10   |      | $\mu\text{V}/V_O$          |
| $R_O$                 | Output resistance          | $f = 1\text{ kHz}$                                                                    |      | 18   |      | $\text{m}\Omega$           |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_A = 25^\circ\text{C}$                                        |      | 0.2  |      | A                          |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^\circ\text{C}$                                                              |      | 2.2  |      | A                          |
| $\Delta V_O/\Delta T$ | Output voltage drift       |                                                                                       |      | -0.8 |      | $\text{mV}/^\circ\text{C}$ |

1. Load and line regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

c. Minimum load current for regulation is 5 mA.

$V_I = 15\text{ V}$ ,  $I_O = 1\text{ A}$ ,  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  (L7809AC),  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  (L7809AB), unless otherwise specified<sup>(d)</sup>.

Table 6. Electrical characteristics of L7809A

| Symbol                | Parameter                  | Test conditions                                                                       | Min. | Typ. | Max. | Unit                       |
|-----------------------|----------------------------|---------------------------------------------------------------------------------------|------|------|------|----------------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$                                                              | 8.82 | 9    | 9.18 | V                          |
| $V_O$                 | Output voltage             | $I_O = 5\text{ mA to }1\text{ A}$ , $V_I = 10.6\text{ to }22\text{ V}$                | 8.65 | 9    | 9.35 | V                          |
| $V_O$                 | Output voltage             | $I_O = 1\text{ A}$ , $V_I = 22\text{ to }24\text{ V}$ , $T_J = 25^\circ\text{C}$      | 8.65 | 9    | 9.35 | V                          |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 10.6\text{ to }25\text{ V}$ , $I_O = 500\text{ mA}$ , $T_J = 25^\circ\text{C}$ |      | 12   | 90   | mV                         |
|                       |                            | $V_I = 11\text{ to }17\text{ V}$                                                      |      | 15   | 90   | mV                         |
|                       |                            | $V_I = 11\text{ to }17\text{ V}$ , $T_J = 25^\circ\text{C}$                           |      | 5    | 45   | mV                         |
|                       |                            | $V_I = 11.4\text{ to }23\text{ V}$ , $T_J = 25^\circ\text{C}$                         |      | 12   | 90   | mV                         |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA to }1\text{ A}$                                                     |      | 25   | 100  | mV                         |
|                       |                            | $I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^\circ\text{C}$                        |      | 30   | 100  |                            |
|                       |                            | $I_O = 250\text{ to }750\text{ mA}$                                                   |      | 10   | 50   |                            |
| $I_q$                 | Quiescent current          | $T_J = 25^\circ\text{C}$                                                              |      | 4.3  | 6    | mA                         |
|                       |                            |                                                                                       |      |      | 6    | mA                         |
| $\Delta I_q$          | Quiescent current change   | $V_I = 11\text{ to }25\text{ V}$ , $I_O = 500\text{ mA}$                              |      |      | 0.8  | mA                         |
|                       |                            | $V_I = 10.6\text{ to }23\text{ V}$ , $T_J = 25^\circ\text{C}$                         |      |      | 0.8  | mA                         |
|                       |                            | $I_O = 5\text{ mA to }1\text{ A}$                                                     |      |      | 0.5  | mA                         |
| SVR                   | Supply voltage rejection   | $V_I = 11.5\text{ to }21.5\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 500\text{ mA}$    |      | 61   |      | dB                         |
| $V_d$                 | Dropout voltage            | $I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$                                         |      | 2    |      | V                          |
| eN                    | Output noise voltage       | $T_A = 25^\circ\text{C}$ , $B = 10\text{ Hz to }100\text{ kHz}$                       |      | 10   |      | $\mu\text{V}/V_O$          |
| $R_O$                 | Output resistance          | $f = 1\text{ kHz}$                                                                    |      | 18   |      | $\text{m}\Omega$           |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_A = 25^\circ\text{C}$                                        |      | 0.2  |      | A                          |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^\circ\text{C}$                                                              |      | 2.2  |      | A                          |
| $\Delta V_O/\Delta T$ | Output voltage drift       |                                                                                       |      | -0.8 |      | $\text{mV}/^\circ\text{C}$ |

1. Load and line regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

d. Minimum load current for regulation is 5 mA.

$V_I = 19\text{ V}$ ,  $I_O = 1\text{ A}$ ,  $T_J = 0\text{ to }125\text{ }^{\circ}\text{C}$  (L7812AC),  $T_J = -40\text{ to }125\text{ }^{\circ}\text{C}$  (L7812AB), unless otherwise specified<sup>(e)</sup>.

Table 7. Electrical characteristics of L7812A

| Symbol                | Parameter                  | Test conditions                                                                         | Min.  | Typ. | Max.  | Unit                         |
|-----------------------|----------------------------|-----------------------------------------------------------------------------------------|-------|------|-------|------------------------------|
| $V_O$                 | Output voltage             | $T_J = 25^{\circ}\text{C}$                                                              | 11.75 | 12   | 12.25 | V                            |
| $V_O$                 | Output voltage             | $I_O = 5\text{ mA to }1\text{ A}$ , $V_I = 14.8\text{ to }25\text{ V}$                  | 11.5  | 12   | 12.5  | V                            |
| $V_O$                 | Output voltage             | $I_O = 1\text{ A}$ , $V_I = 25\text{ to }27\text{ V}$ , $T_J = 25^{\circ}\text{C}$      | 11.5  | 12   | 12.5  | V                            |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 14.8\text{ to }30\text{ V}$ , $I_O = 500\text{ mA}$ , $T_J = 25^{\circ}\text{C}$ |       | 13   | 120   | mV                           |
|                       |                            | $V_I = 16\text{ to }12\text{ V}$                                                        |       | 16   | 120   | mV                           |
|                       |                            | $V_I = 16\text{ to }12\text{ V}$ , $T_J = 25^{\circ}\text{C}$                           |       | 6    | 60    | mV                           |
|                       |                            | $V_I = 14.5\text{ to }27\text{ V}$ , $T_J = 25^{\circ}\text{C}$                         |       | 13   | 120   | mV                           |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA to }1\text{ A}$                                                       |       | 25   | 100   | mV                           |
|                       |                            | $I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^{\circ}\text{C}$                        |       | 30   | 100   |                              |
|                       |                            | $I_O = 250\text{ to }750\text{ mA}$                                                     |       | 10   | 50    |                              |
| $I_q$                 | Quiescent current          | $T_J = 25^{\circ}\text{C}$                                                              |       | 4.4  | 6     | mA                           |
|                       |                            |                                                                                         |       |      | 6     | mA                           |
| $\Delta I_q$          | Quiescent current change   | $V_I = 15\text{ to }30\text{ V}$ , $I_O = 500\text{ mA}$                                |       |      | 0.8   | mA                           |
|                       |                            | $V_I = 14.8\text{ to }27\text{ V}$ , $T_J = 25^{\circ}\text{C}$                         |       |      | 0.8   | mA                           |
|                       |                            | $I_O = 5\text{ mA to }1\text{ A}$                                                       |       |      | 0.5   | mA                           |
| SVR                   | Supply voltage rejection   | $V_I = 15\text{ to }25\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 500\text{ mA}$          |       | 60   |       | dB                           |
| $V_d$                 | Dropout voltage            | $I_O = 1\text{ A}$ , $T_J = 25^{\circ}\text{C}$                                         |       | 2    |       | V                            |
| eN                    | Output noise voltage       | $T_A = 25^{\circ}\text{C}$ , $B = 10\text{ Hz to }100\text{ kHz}$                       |       | 10   |       | $\mu\text{V}/V_O$            |
| $R_O$                 | Output resistance          | $f = 1\text{ kHz}$                                                                      |       | 18   |       | $\text{m}\Omega$             |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_A = 25^{\circ}\text{C}$                                        |       | 0.2  |       | A                            |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^{\circ}\text{C}$                                                              |       | 2.2  |       | A                            |
| $\Delta V_O/\Delta T$ | Output voltage drift       |                                                                                         |       | -1   |       | $\text{mV}/^{\circ}\text{C}$ |

1. Load and line regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

e. Minimum load current for regulation is 5 mA.

$V_I = 23\text{ V}$ ,  $I_O = 1\text{ A}$ ,  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  (L7815AC),  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  (L7815AB), unless otherwise specified<sup>(f)</sup>.

Table 8. Electrical characteristics of L7815A

| Symbol                | Parameter                  | Test conditions                                                                       | Min. | Typ. | Max. | Unit                       |
|-----------------------|----------------------------|---------------------------------------------------------------------------------------|------|------|------|----------------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$                                                              | 14.7 | 15   | 15.3 | V                          |
| $V_O$                 | Output voltage             | $I_O = 5\text{ mA to }1\text{ A}$ , $V_I = 17.9\text{ to }28\text{ V}$                | 14.4 | 15   | 15.6 | V                          |
| $V_O$                 | Output voltage             | $I_O = 1\text{ A}$ , $V_I = 28\text{ to }30\text{ V}$ , $T_J = 25^\circ\text{C}$      | 14.4 | 15   | 15.6 | V                          |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 17.9\text{ to }30\text{ V}$ , $I_O = 500\text{ mA}$ , $T_J = 25^\circ\text{C}$ |      | 13   | 150  | mV                         |
|                       |                            | $V_I = 20\text{ to }26\text{ V}$                                                      |      | 16   | 150  | mV                         |
|                       |                            | $V_I = 20\text{ to }26\text{ V}$ , $T_J = 25^\circ\text{C}$                           |      | 6    | 75   | mV                         |
|                       |                            | $V_I = 17.5\text{ to }30\text{ V}$ , $T_J = 25^\circ\text{C}$                         |      | 13   | 150  | mV                         |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA to }1\text{ A}$                                                     |      | 25   | 100  | mV                         |
|                       |                            | $I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^\circ\text{C}$                        |      | 30   | 100  |                            |
|                       |                            | $I_O = 250\text{ to }750\text{ mA}$                                                   |      | 10   | 50   |                            |
| $I_q$                 | Quiescent current          | $T_J = 25^\circ\text{C}$                                                              |      | 4.4  | 6    | mA                         |
|                       |                            |                                                                                       |      |      | 6    | mA                         |
| $\Delta I_q$          | Quiescent current change   | $V_I = 17.5\text{ to }30\text{ V}$ , $I_O = 500\text{ mA}$                            |      |      | 0.8  | mA                         |
|                       |                            | $V_I = 17.5\text{ to }30\text{ V}$ , $T_J = 25^\circ\text{C}$                         |      |      | 0.8  | mA                         |
|                       |                            | $I_O = 5\text{ mA to }1\text{ A}$                                                     |      |      | 0.5  | mA                         |
| SVR                   | Supply voltage rejection   | $V_I = 18.5\text{ to }28.5\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 500\text{ mA}$    |      | 58   |      | dB                         |
| $V_d$                 | Dropout voltage            | $I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$                                         |      | 2    |      | V                          |
| eN                    | Output noise voltage       | $T_A = 25^\circ\text{C}$ , $B = 10\text{ Hz to }100\text{ kHz}$                       |      | 10   |      | $\mu\text{V}/V_O$          |
| $R_O$                 | Output resistance          | $f = 1\text{ kHz}$                                                                    |      | 19   |      | $\text{m}\Omega$           |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_A = 25^\circ\text{C}$                                        |      | 0.2  |      | A                          |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^\circ\text{C}$                                                              |      | 2.2  |      | A                          |
| $\Delta V_O/\Delta T$ | Output voltage drift       |                                                                                       |      | -1   |      | $\text{mV}/^\circ\text{C}$ |

1. Load and line regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

f. Minimum load current for regulation is 5 mA.

$V_I = 33\text{ V}$ ,  $I_O = 1\text{ A}$ ,  $T_J = 0\text{ to }125\text{ °C}$  (L7824AC),  $T_J = -40\text{ to }125\text{ °C}$  (L7824AB), unless otherwise specified<sup>(g)</sup>.

Table 9. Electrical characteristics of L7824A

| Symbol                | Parameter                  | Test conditions                                                                 | Min. | Typ. | Max. | Unit              |
|-----------------------|----------------------------|---------------------------------------------------------------------------------|------|------|------|-------------------|
| $V_O$                 | Output voltage             | $T_J = 25\text{ °C}$                                                            | 23.5 | 24   | 24.5 | V                 |
| $V_O$                 | Output voltage             | $I_O = 5\text{ mA to }1\text{ A}$ , $V_I = 27.3\text{ to }37\text{ V}$          | 23   | 24   | 25   | V                 |
| $V_O$                 | Output voltage             | $I_O = 1\text{ A}$ , $V_I = 37\text{ to }38\text{ V}$ , $T_J = 25\text{ °C}$    | 23   | 24   | 25   | V                 |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 27\text{ to }38\text{ V}$ , $I_O = 500\text{ mA}$ , $T_J = 25\text{ °C}$ |      | 31   | 240  | mV                |
|                       |                            | $V_I = 30\text{ to }36\text{ V}$                                                |      | 35   | 200  | mV                |
|                       |                            | $V_I = 30\text{ to }36\text{ V}$ , $T_J = 25\text{ °C}$                         |      | 14   | 120  | mV                |
|                       |                            | $V_I = 26.7\text{ to }38\text{ V}$ , $T_J = 25\text{ °C}$                       |      | 31   | 240  | mV                |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA to }1\text{ A}$                                               |      | 25   | 100  | mV                |
|                       |                            | $I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25\text{ °C}$                      |      | 30   | 100  |                   |
|                       |                            | $I_O = 250\text{ to }750\text{ mA}$                                             |      | 10   | 50   |                   |
| $I_q$                 | Quiescent current          | $T_J = 25\text{ °C}$                                                            |      | 4.6  | 6    | mA                |
|                       |                            |                                                                                 |      |      | 6    | mA                |
| $\Delta I_q$          | Quiescent current change   | $V_I = 27.3\text{ to }38\text{ V}$ , $I_O = 500\text{ mA}$                      |      |      | 0.8  | mA                |
|                       |                            | $V_I = 27.3\text{ to }38\text{ V}$ , $T_J = 25\text{ °C}$                       |      |      | 0.8  | mA                |
|                       |                            | $I_O = 5\text{ mA to }1\text{ A}$                                               |      |      | 0.5  | mA                |
| SVR                   | Supply voltage rejection   | $V_I = 28\text{ to }38\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 500\text{ mA}$  |      | 54   |      | dB                |
| $V_d$                 | Dropout voltage            | $I_O = 1\text{ A}$ , $T_J = 25\text{ °C}$                                       |      | 2    |      | V                 |
| eN                    | Output noise voltage       | $T_A = 25\text{ °C}$ , $B = 10\text{ Hz to }100\text{ kHz}$                     |      | 10   |      | $\mu\text{V}/V_O$ |
| $R_O$                 | Output resistance          | $f = 1\text{ kHz}$                                                              |      | 20   |      | m $\Omega$        |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_A = 25\text{ °C}$                                      |      | 0.2  |      | A                 |
| $I_{scp}$             | Short circuit peak current | $T_J = 25\text{ °C}$                                                            |      | 2.2  |      | A                 |
| $\Delta V_O/\Delta T$ | Output voltage drift       |                                                                                 |      | -1.5 |      | mV/°C             |

1. Load and line regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

g. Minimum load current for regulation is 5 mA.

Refer to the test circuits,  $T_J = 0$  to  $125^\circ\text{C}$ ,  $V_I = 10\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified<sup>(h)</sup>.

Table 10. Electrical characteristics of L7805C

| Symbol                | Parameter                  | Test conditions                                                             | Min. | Typ. | Max. | Unit                 |
|-----------------------|----------------------------|-----------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$                                                    | 4.8  | 5    | 5.2  | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ mA}$ to $1\text{ A}$ , $V_I = 7$ to $18\text{ V}$            | 4.75 | 5    | 5.25 | V                    |
| $V_O$                 | Output voltage             | $I_O = 1\text{ A}$ , $V_I = 18$ to $20\text{ V}$ , $T_J = 25^\circ\text{C}$ | 4.75 | 5    | 5.25 | V                    |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 7$ to $25\text{ V}$ , $T_J = 25^\circ\text{C}$                       |      | 3    | 100  | mV                   |
|                       |                            | $V_I = 8$ to $12\text{ V}$ , $T_J = 25^\circ\text{C}$                       |      | 1    | 50   |                      |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA}$ to $1.5\text{ A}$ , $T_J = 25^\circ\text{C}$            |      |      | 100  | mV                   |
|                       |                            | $I_O = 250$ to $750\text{ mA}$ , $T_J = 25^\circ\text{C}$                   |      |      | 50   |                      |
| $I_d$                 | Quiescent current          | $T_J = 25^\circ\text{C}$                                                    |      |      | 8    | mA                   |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ mA}$ to $1\text{ A}$                                         |      |      | 0.5  | mA                   |
|                       |                            | $V_I = 7$ to $23\text{ V}$                                                  |      |      | 0.8  |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                         |      | -1.1 |      | mV/ $^\circ\text{C}$ |
| eN                    | Output noise voltage       | $B = 10\text{ Hz}$ to $100\text{ kHz}$ , $T_J = 25^\circ\text{C}$           |      | 40   |      | $\mu\text{V}/V_O$    |
| SVR                   | Supply voltage rejection   | $V_I = 8$ to $18\text{ V}$ , $f = 120\text{ Hz}$                            | 62   |      |      | dB                   |
| $V_d$                 | Dropout voltage            | $I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$                               |      | 2    |      | V                    |
| $R_O$                 | Output resistance          | $f = 1\text{ kHz}$                                                          |      | 17   |      | m $\Omega$           |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$                              |      | 0.75 |      | A                    |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^\circ\text{C}$                                                    |      | 2.2  |      | A                    |

1. Load and line regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

h. Minimum load current for regulation is 5 mA.

Refer to the test circuits,  $T_J = 0$  to  $125^\circ\text{C}$ ,  $V_I = 11\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified<sup>(1)</sup>.

Table 11. Electrical characteristics of L7806C

| Symbol                | Parameter                  | Test conditions                                                                  | Min. | Typ. | Max. | Unit                 |
|-----------------------|----------------------------|----------------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$                                                         | 5.75 | 6    | 6.25 | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ mA to }1\text{ A}$ , $V_I = 8\text{ to }19\text{ V}$              | 5.7  | 6    | 6.3  | V                    |
| $V_O$                 | Output voltage             | $I_O = 1\text{ A}$ , $V_I = 19\text{ to }21\text{ V}$ , $T_J = 25^\circ\text{C}$ | 5.7  | 6    | 6.3  | V                    |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 8\text{ to }25\text{ V}$ , $T_J = 25^\circ\text{C}$                       |      |      | 120  | mV                   |
|                       |                            | $V_I = 9\text{ to }13\text{ V}$ , $T_J = 25^\circ\text{C}$                       |      |      | 60   |                      |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^\circ\text{C}$                   |      |      | 120  | mV                   |
|                       |                            | $I_O = 250\text{ to }750\text{ mA}$ , $T_J = 25^\circ\text{C}$                   |      |      | 60   |                      |
| $I_d$                 | Quiescent current          | $T_J = 25^\circ\text{C}$                                                         |      |      | 8    | mA                   |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ mA to }1\text{ A}$                                                |      |      | 0.5  | mA                   |
|                       |                            | $V_I = 8\text{ to }24\text{ V}$                                                  |      |      | 1.3  |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                              |      | -0.8 |      | mV/ $^\circ\text{C}$ |
| eN                    | Output noise voltage       | $B = 10\text{ Hz to }100\text{ kHz}$ , $T_J = 25^\circ\text{C}$                  |      | 45   |      | $\mu\text{V}/V_O$    |
| SVR                   | Supply voltage rejection   | $V_I = 9\text{ to }19\text{ V}$ , $f = 120\text{ Hz}$                            | 59   |      |      | dB                   |
| $V_d$                 | Dropout voltage            | $I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$                                    |      | 2    |      | V                    |
| $R_O$                 | Output resistance          | $f = 1\text{ kHz}$                                                               |      | 19   |      | m $\Omega$           |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$                                   |      | 0.55 |      | A                    |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^\circ\text{C}$                                                         |      | 2.2  |      | A                    |

1. Load and line regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

i. Minimum load current for regulation is 5 mA.

Refer to the test circuits,  $T_J = 0$  to  $125^\circ\text{C}$ ,  $V_I = 14\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified<sup>(1)</sup>.

Table 12. Electrical characteristics of L7808C

| Symbol                | Parameter                  | Test conditions                                                             | Min. | Typ. | Max. | Unit                 |
|-----------------------|----------------------------|-----------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$                                                    | 7.7  | 8    | 8.3  | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ mA}$ to $1\text{ A}$ , $V_I = 10.5$ to $21\text{ V}$         | 7.6  | 8    | 8.4  | V                    |
| $V_O$                 | Output voltage             | $I_O = 1\text{ A}$ , $V_I = 21$ to $25\text{ V}$ , $T_J = 25^\circ\text{C}$ | 7.6  | 8    | 8.4  | V                    |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 10.5$ to $25\text{ V}$ , $T_J = 25^\circ\text{C}$                    |      |      | 160  | mV                   |
|                       |                            | $V_I = 11$ to $17\text{ V}$ , $T_J = 25^\circ\text{C}$                      |      |      | 80   |                      |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA}$ to $1.5\text{ A}$ , $T_J = 25^\circ\text{C}$            |      |      | 160  | mV                   |
|                       |                            | $I_O = 250$ to $750\text{ mA}$ , $T_J = 25^\circ\text{C}$                   |      |      | 80   |                      |
| $I_d$                 | Quiescent current          | $T_J = 25^\circ\text{C}$                                                    |      |      | 8    | mA                   |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ mA}$ to $1\text{ A}$                                         |      |      | 0.5  | mA                   |
|                       |                            | $V_I = 10.5$ to $25\text{ V}$                                               |      |      | 1    |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                         |      | -0.8 |      | mV/ $^\circ\text{C}$ |
| eN                    | Output noise voltage       | $B = 10\text{ Hz}$ to $100\text{ kHz}$ , $T_J = 25^\circ\text{C}$           |      | 52   |      | $\mu\text{V}/V_O$    |
| SVR                   | Supply voltage rejection   | $V_I = 11.5$ to $21.5\text{ V}$ , $f = 120\text{ Hz}$                       | 56   |      |      | dB                   |
| $V_d$                 | Dropout voltage            | $I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$                               |      | 2    |      | V                    |
| $R_O$                 | Output resistance          | $f = 1\text{ kHz}$                                                          |      | 16   |      | m $\Omega$           |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$                              |      | 0.45 |      | A                    |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^\circ\text{C}$                                                    |      | 2.2  |      | A                    |

1. Load and line regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

j. Minimum load current for regulation is 5 mA.

Refer to the test circuits,  $T_J = 0$  to  $125^\circ\text{C}$ ,  $V_I = 14.5\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified<sup>(k)</sup>.

Table 13. Electrical characteristics of L7885C

| Symbol                | Parameter                  | Test conditions                                                               | Min. | Typ. | Max. | Unit                 |
|-----------------------|----------------------------|-------------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$                                                      | 8.2  | 8.5  | 8.8  | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ mA}$ to $1\text{ A}$ , $V_I = 11$ to $21.5\text{ V}$           | 8.1  | 8.5  | 8.9  | V                    |
| $V_O$                 | Output voltage             | $I_O = 1\text{ A}$ , $V_I = 21.5$ to $26\text{ V}$ , $T_J = 25^\circ\text{C}$ | 8.1  | 8.5  | 8.9  | V                    |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 11$ to $27\text{ V}$ , $T_J = 25^\circ\text{C}$                        |      |      | 160  | mV                   |
|                       |                            | $V_I = 11.5$ to $17.5\text{ V}$ , $T_J = 25^\circ\text{C}$                    |      |      | 80   |                      |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA}$ to $1.5\text{ A}$ , $T_J = 25^\circ\text{C}$              |      |      | 160  | mV                   |
|                       |                            | $I_O = 250$ to $750\text{ mA}$ , $T_J = 25^\circ\text{C}$                     |      |      | 80   |                      |
| $I_d$                 | Quiescent current          | $T_J = 25^\circ\text{C}$                                                      |      |      | 8    | mA                   |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ mA}$ to $1\text{ A}$                                           |      |      | 0.5  | mA                   |
|                       |                            | $V_I = 11$ to $26\text{ V}$                                                   |      |      | 1    |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                           |      | -0.8 |      | mV/ $^\circ\text{C}$ |
| eN                    | Output noise voltage       | $B = 10\text{ Hz}$ to $100\text{ kHz}$ , $T_J = 25^\circ\text{C}$             |      | 55   |      | $\mu\text{V}/V_O$    |
| SVR                   | Supply voltage rejection   | $V_I = 12$ to $22\text{ V}$ , $f = 120\text{ Hz}$                             | 56   |      |      | dB                   |
| $V_d$                 | Dropout voltage            | $I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$                                 |      | 2    |      | V                    |
| $R_O$                 | Output resistance          | $f = 1\text{ kHz}$                                                            |      | 16   |      | m $\Omega$           |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$                                |      | 0.45 |      | A                    |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^\circ\text{C}$                                                      |      | 2.2  |      | A                    |

1. Load and line regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

k. Minimum load current for regulation is 5 mA.

Refer to the test circuits,  $T_J = 0$  to  $125^\circ\text{C}$ ,  $V_I = 15\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified<sup>(1)</sup>.

Table 14. Electrical characteristics of L7809C

| Symbol                | Parameter                  | Test conditions                                                             | Min. | Typ. | Max. | Unit                 |
|-----------------------|----------------------------|-----------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$                                                    | 8.64 | 9    | 9.36 | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ mA}$ to $1\text{ A}$ , $V_I = 11.5$ to $22\text{ V}$         | 8.55 | 9    | 9.45 | V                    |
| $V_O$                 | Output voltage             | $I_O = 1\text{ A}$ , $V_I = 22$ to $26\text{ V}$ , $T_J = 25^\circ\text{C}$ | 8.55 | 9    | 9.45 | V                    |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 11.5$ to $26\text{ V}$ , $T_J = 25^\circ\text{C}$                    |      |      | 180  | mV                   |
|                       |                            | $V_I = 12$ to $18\text{ V}$ , $T_J = 25^\circ\text{C}$                      |      |      | 90   |                      |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA}$ to $1.5\text{ A}$ , $T_J = 25^\circ\text{C}$            |      |      | 180  | mV                   |
|                       |                            | $I_O = 250$ to $750\text{ mA}$ , $T_J = 25^\circ\text{C}$                   |      |      | 90   |                      |
| $I_d$                 | Quiescent current          | $T_J = 25^\circ\text{C}$                                                    |      |      | 8    | mA                   |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ mA}$ to $1\text{ A}$                                         |      |      | 0.5  | mA                   |
|                       |                            | $V_I = 11.5$ to $26\text{ V}$                                               |      |      | 1    |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                         |      | -1   |      | mV/ $^\circ\text{C}$ |
| eN                    | Output noise voltage       | $B = 10\text{ Hz}$ to $100\text{ kHz}$ , $T_J = 25^\circ\text{C}$           |      | 70   |      | $\mu\text{V}/V_O$    |
| SVR                   | Supply voltage rejection   | $V_I = 12$ to $23\text{ V}$ , $f = 120\text{ Hz}$                           | 55   |      |      | dB                   |
| $V_d$                 | Dropout voltage            | $I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$                               |      | 2    |      | V                    |
| $R_O$                 | Output resistance          | $f = 1\text{ kHz}$                                                          |      | 17   |      | m $\Omega$           |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$                              |      | 0.40 |      | A                    |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^\circ\text{C}$                                                    |      | 2.2  |      | A                    |

1. Load and line regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

I. Minimum load current for regulation is 5 mA.

Refer to the test circuits,  $T_J = 0$  to  $125\text{ }^{\circ}\text{C}$ ,  $V_I = 19\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified<sup>(m)</sup>.

Table 15. Electrical characteristics of L7812C

| Symbol                | Parameter                  | Test conditions                                                               | Min. | Typ. | Max. | Unit                   |
|-----------------------|----------------------------|-------------------------------------------------------------------------------|------|------|------|------------------------|
| $V_O$                 | Output voltage             | $T_J = 25^{\circ}\text{C}$                                                    | 11.5 | 12   | 12.5 | V                      |
| $V_O$                 | Output voltage             | $I_O = 5\text{ mA}$ to $1\text{ A}$ , $V_I = 14.5$ to $25\text{ V}$           | 11.4 | 12   | 12.6 | V                      |
| $V_O$                 | Output voltage             | $I_O = 1\text{ A}$ , $V_I = 25$ to $27\text{ V}$ , $T_J = 25^{\circ}\text{C}$ | 11.4 | 12   | 12.6 | V                      |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 14.5$ to $30\text{ V}$ , $T_J = 25^{\circ}\text{C}$                    |      |      | 240  | mV                     |
|                       |                            | $V_I = 16$ to $22\text{ V}$ , $T_J = 25^{\circ}\text{C}$                      |      |      | 120  |                        |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA}$ to $1.5\text{ A}$ , $T_J = 25^{\circ}\text{C}$            |      |      | 240  | mV                     |
|                       |                            | $I_O = 250$ to $750\text{ mA}$ , $T_J = 25^{\circ}\text{C}$                   |      |      | 120  |                        |
| $I_d$                 | Quiescent current          | $T_J = 25^{\circ}\text{C}$                                                    |      |      | 8    | mA                     |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ mA}$ to $1\text{ A}$                                           |      |      | 0.5  | mA                     |
|                       |                            | $V_I = 14.5$ to $30\text{ V}$                                                 |      |      | 1    |                        |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                           |      | -1   |      | mV/ $^{\circ}\text{C}$ |
| eN                    | Output noise voltage       | $B = 10\text{ Hz}$ to $100\text{ kHz}$ , $T_J = 25^{\circ}\text{C}$           |      | 75   |      | $\mu\text{V}/V_O$      |
| SVR                   | Supply voltage rejection   | $V_I = 15$ to $25\text{ V}$ , $f = 120\text{ Hz}$                             | 55   |      |      | dB                     |
| $V_d$                 | Dropout voltage            | $I_O = 1\text{ A}$ , $T_J = 25^{\circ}\text{C}$                               |      | 2    |      | V                      |
| $R_O$                 | Output resistance          | $f = 1\text{ kHz}$                                                            |      | 18   |      | m $\Omega$             |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_J = 25^{\circ}\text{C}$                              |      | 0.35 |      | A                      |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^{\circ}\text{C}$                                                    |      | 2.2  |      | A                      |

1. Load and line regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

m. Minimum load current for regulation is 5 mA.

Refer to the test circuits,  $T_J = 0$  to  $125^\circ\text{C}$ ,  $V_I = 23\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified<sup>(n)</sup>.

Table 16. Electrical characteristics of L7815C

| Symbol                | Parameter                  | Test conditions                                                             | Min.  | Typ. | Max.  | Unit                 |
|-----------------------|----------------------------|-----------------------------------------------------------------------------|-------|------|-------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$                                                    | 14.4  | 15   | 15.6  | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ mA}$ to $1\text{ A}$ , $V_I = 17.5$ to $28\text{ V}$         | 14.25 | 15   | 15.75 | V                    |
| $V_O$                 | Output voltage             | $I_O = 1\text{ A}$ , $V_I = 28$ to $30\text{ V}$ , $T_J = 25^\circ\text{C}$ | 14.25 | 15   | 15.75 | V                    |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 17.5$ to $30\text{ V}$ , $T_J = 25^\circ\text{C}$                    |       |      | 300   | mV                   |
|                       |                            | $V_I = 20$ to $26\text{ V}$ , $T_J = 25^\circ\text{C}$                      |       |      | 150   |                      |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA}$ to $1.5\text{ A}$ , $T_J = 25^\circ\text{C}$            |       |      | 300   | mV                   |
|                       |                            | $I_O = 250$ to $750\text{ mA}$ , $T_J = 25^\circ\text{C}$                   |       |      | 150   |                      |
| $I_d$                 | Quiescent current          | $T_J = 25^\circ\text{C}$                                                    |       |      | 8     | mA                   |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ mA}$ to $1\text{ A}$                                         |       |      | 0.5   | mA                   |
|                       |                            | $V_I = 17.5$ to $30\text{ V}$                                               |       |      | 1     |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                         |       | -1   |       | mV/ $^\circ\text{C}$ |
| eN                    | Output noise voltage       | $B = 10\text{ Hz}$ to $100\text{ kHz}$ , $T_J = 25^\circ\text{C}$           |       | 90   |       | $\mu\text{V}/V_O$    |
| SVR                   | Supply voltage rejection   | $V_I = 18.5$ to $28.5\text{ V}$ , $f = 120\text{ Hz}$                       | 54    |      |       | dB                   |
| $V_d$                 | Dropout voltage            | $I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$                               |       | 2    |       | V                    |
| $R_O$                 | Output resistance          | $f = 1\text{ kHz}$                                                          |       | 19   |       | m $\Omega$           |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$                              |       | 0.23 |       | A                    |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^\circ\text{C}$                                                    |       | 2.2  |       | A                    |

1. Load and line regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

n. Minimum load current for regulation is 5 mA.

Refer to the test circuits,  $T_J = 0$  to  $125^\circ\text{C}$ ,  $V_I = 26\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified<sup>(o)</sup>.

Table 17. Electrical characteristics of L7818C

| Symbol                | Parameter                  | Test conditions                                                             | Min. | Typ. | Max. | Unit                 |
|-----------------------|----------------------------|-----------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$                                                    | 17.3 | 18   | 18.7 | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ mA}$ to $1\text{ A}$ , $V_I = 21$ to $31\text{ V}$           | 17.1 | 18   | 18.9 | V                    |
| $V_O$                 | Output voltage             | $I_O = 1\text{ A}$ , $V_I = 31$ to $33\text{ V}$ , $T_J = 25^\circ\text{C}$ | 17.1 | 18   | 18.9 | V                    |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 21$ to $33\text{ V}$ , $T_J = 25^\circ\text{C}$                      |      |      | 360  | mV                   |
|                       |                            | $V_I = 24$ to $30\text{ V}$ , $T_J = 25^\circ\text{C}$                      |      |      | 180  |                      |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA}$ to $1.5\text{ A}$ , $T_J = 25^\circ\text{C}$            |      |      | 360  | mV                   |
|                       |                            | $I_O = 250$ to $750\text{ mA}$ , $T_J = 25^\circ\text{C}$                   |      |      | 180  |                      |
| $I_d$                 | Quiescent current          | $T_J = 25^\circ\text{C}$                                                    |      |      | 8    | mA                   |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ mA}$ to $1\text{ A}$                                         |      |      | 0.5  | mA                   |
|                       |                            | $V_I = 21$ to $33\text{ V}$                                                 |      |      | 1    |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                         |      | -1   |      | mV/ $^\circ\text{C}$ |
| eN                    | Output noise voltage       | $B = 10\text{ Hz}$ to $100\text{ kHz}$ , $T_J = 25^\circ\text{C}$           |      | 110  |      | $\mu\text{V}/V_O$    |
| SVR                   | Supply voltage rejection   | $V_I = 22$ to $32\text{ V}$ , $f = 120\text{ Hz}$                           | 53   |      |      | dB                   |
| $V_d$                 | Dropout voltage            | $I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$                               |      | 2    |      | V                    |
| $R_O$                 | Output resistance          | $f = 1\text{ kHz}$                                                          |      | 22   |      | m $\Omega$           |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$                              |      | 0.20 |      | A                    |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^\circ\text{C}$                                                    |      | 2.1  |      | A                    |

1. Load and line regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

o. Minimum load current for regulation is 5 mA.

Refer to the test circuits,  $T_J = 0$  to  $125\text{ }^{\circ}\text{C}$ ,  $V_I = 33\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified<sup>(p)</sup>.

Table 18. Electrical characteristics of L7824C

| Symbol                | Parameter                  | Test conditions                                                               | Min. | Typ. | Max. | Unit                   |
|-----------------------|----------------------------|-------------------------------------------------------------------------------|------|------|------|------------------------|
| $V_O$                 | Output voltage             | $T_J = 25^{\circ}\text{C}$                                                    | 23   | 24   | 25   | V                      |
| $V_O$                 | Output voltage             | $I_O = 5\text{ mA}$ to $1\text{ A}$ , $V_I = 27$ to $37\text{ V}$             | 22.8 | 24   | 25.2 | V                      |
| $V_O$                 | Output voltage             | $I_O = 1\text{ A}$ , $V_I = 37$ to $38\text{ V}$ , $T_J = 25^{\circ}\text{C}$ | 22.8 | 24   | 25.2 | V                      |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 27$ to $38\text{ V}$ , $T_J = 25^{\circ}\text{C}$                      |      |      | 480  | mV                     |
|                       |                            | $V_I = 30$ to $36\text{ V}$ , $T_J = 25^{\circ}\text{C}$                      |      |      | 240  |                        |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA}$ to $1.5\text{ A}$ , $T_J = 25^{\circ}\text{C}$            |      |      | 480  | mV                     |
|                       |                            | $I_O = 250$ to $750\text{ mA}$ , $T_J = 25^{\circ}\text{C}$                   |      |      | 240  |                        |
| $I_d$                 | Quiescent current          | $T_J = 25^{\circ}\text{C}$                                                    |      |      | 8    | mA                     |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ mA}$ to $1\text{ A}$                                           |      |      | 0.5  | mA                     |
|                       |                            | $V_I = 27$ to $38\text{ V}$                                                   |      |      | 1    |                        |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                           |      | -1.5 |      | mV/ $^{\circ}\text{C}$ |
| eN                    | Output noise voltage       | $B = 10\text{ Hz}$ to $100\text{ kHz}$ , $T_J = 25^{\circ}\text{C}$           |      | 170  |      | $\mu\text{V}/V_O$      |
| SVR                   | Supply voltage rejection   | $V_I = 28$ to $38\text{ V}$ , $f = 120\text{ Hz}$                             | 50   |      |      | dB                     |
| $V_d$                 | Dropout voltage            | $I_O = 1\text{ A}$ , $T_J = 25^{\circ}\text{C}$                               |      | 2    |      | V                      |
| $R_O$                 | Output resistance          | $f = 1\text{ kHz}$                                                            |      | 28   |      | m $\Omega$             |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_J = 25^{\circ}\text{C}$                              |      | 0.15 |      | A                      |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^{\circ}\text{C}$                                                    |      | 2.1  |      | A                      |

1. Load and line regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

p. Minimum load current for regulation is 5 mA.

## 6 Application information

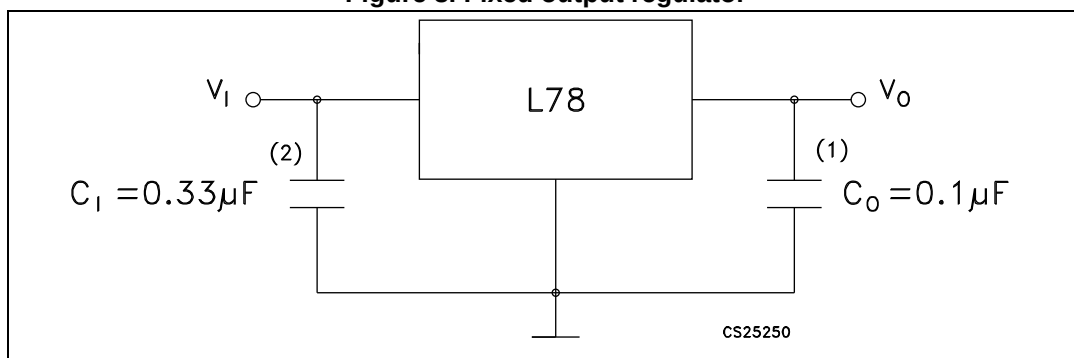
### 6.1 Design consideration

The L78 Series of fixed voltage regulators are designed with thermal overload protection that shuts down the circuit when subjected to an excessive power overload condition, internal short-circuit protection that limits the maximum current the circuit will pass, and output transistor safe-area compensation that reduces the output short-circuit current as the voltage across the pass transistor is increased. In many low current applications, compensation capacitors are not required. However, it is recommended that the regulator input be bypassed with capacitor if the regulator is connected to the power supply filter with long lengths, or if the output load capacitance is large. An input bypass capacitor should be selected to provide good high frequency characteristics to insure stable operation under all load conditions. A  $0.33\ \mu\text{F}$  or larger tantalum, mylar or other capacitor having low internal impedance at high frequencies should be chosen. The bypass capacitor should be mounted with the shortest possible leads directly across the regulators input terminals. Normally good construction techniques should be used to minimize ground loops and lead resistance drops since the regulator has no external sense lead.

The addition of an operational amplifier allows adjustment to higher or intermediate values while retaining regulation characteristics. The minimum voltage obtained with the arrangement is 2 V greater than the regulator voltage.

The circuit of [Figure 13](#) can be modified to provide supply protection against short circuit by adding a short circuit sense resistor, RSC, and an additional PNP transistor. The current sensing PNP must be able to handle the short circuit current of the three terminal regulator. Therefore a four ampere plastic power transistor is specified.

**Figure 8. Fixed output regulator**



1. Although no output capacitor is need for stability, it does improve transient response.
2. Required if regulator is located an appreciable distance from power supply filter.

Figure 9. Current regulator

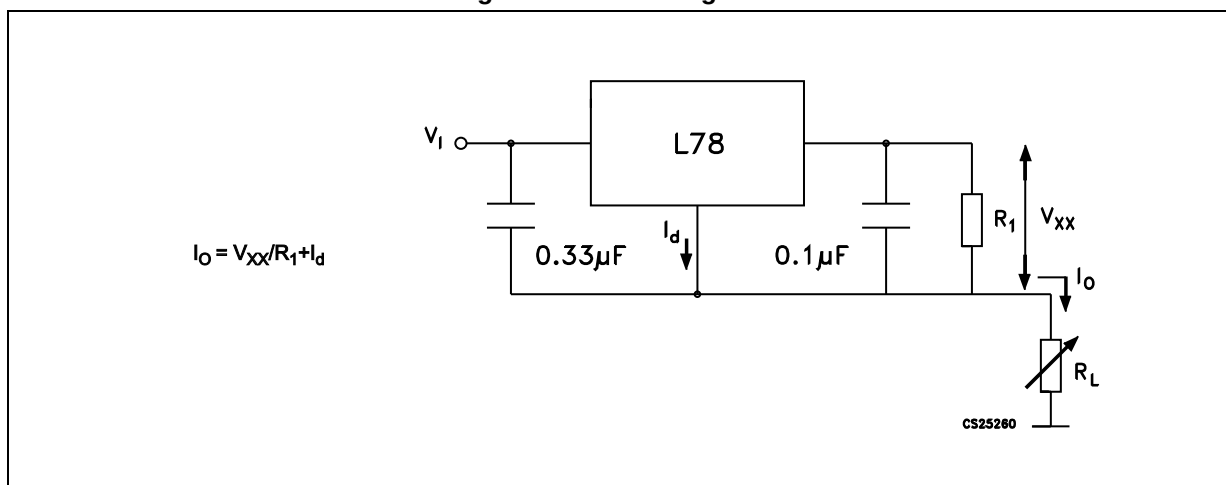


Figure 10. Circuit for increasing output voltage

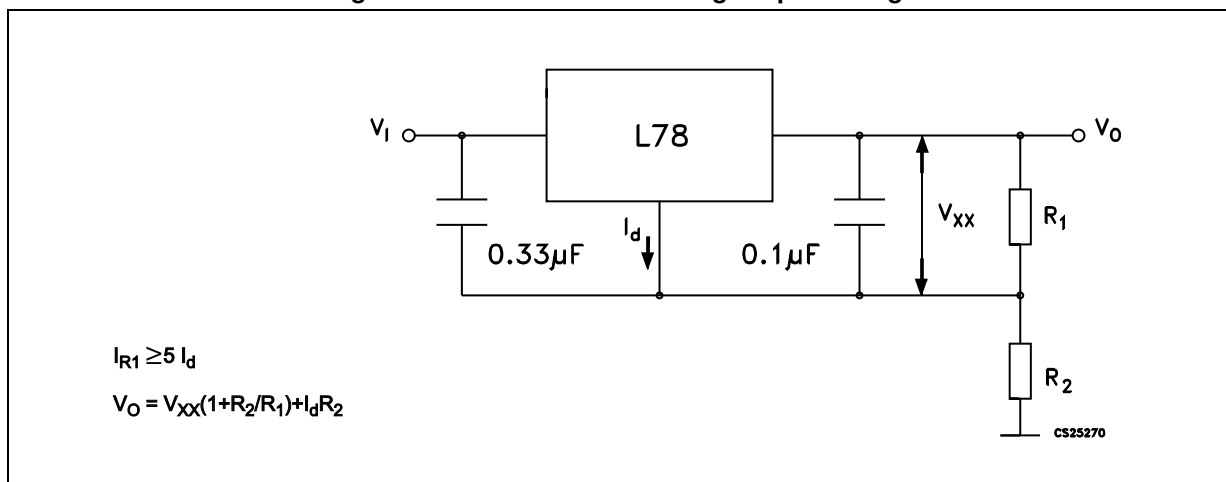


Figure 11. Adjustable output regulator (7 to 30 V)

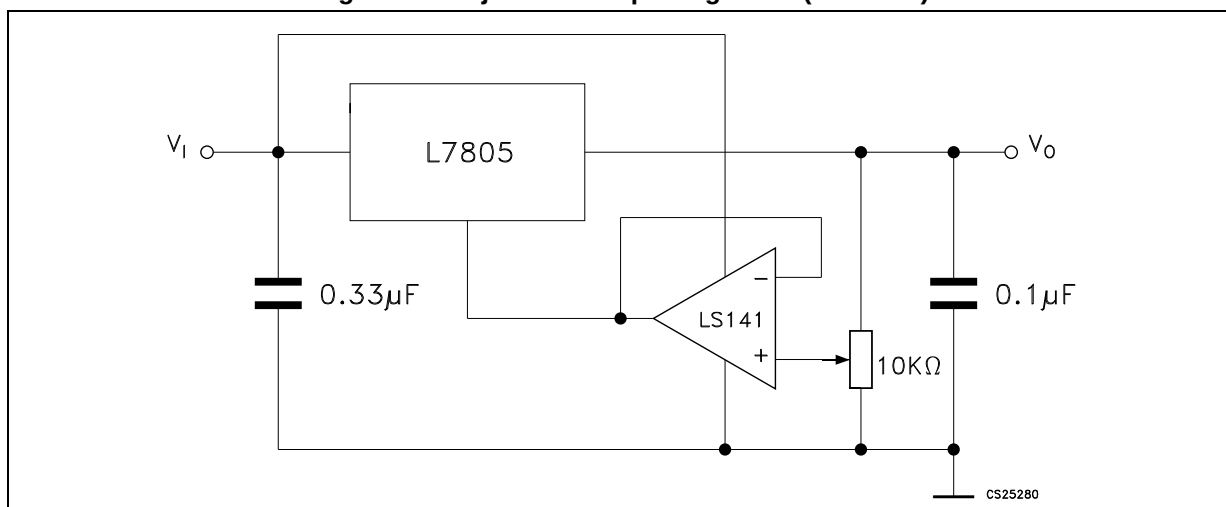


Figure 12. 0.5 to 10 V regulator

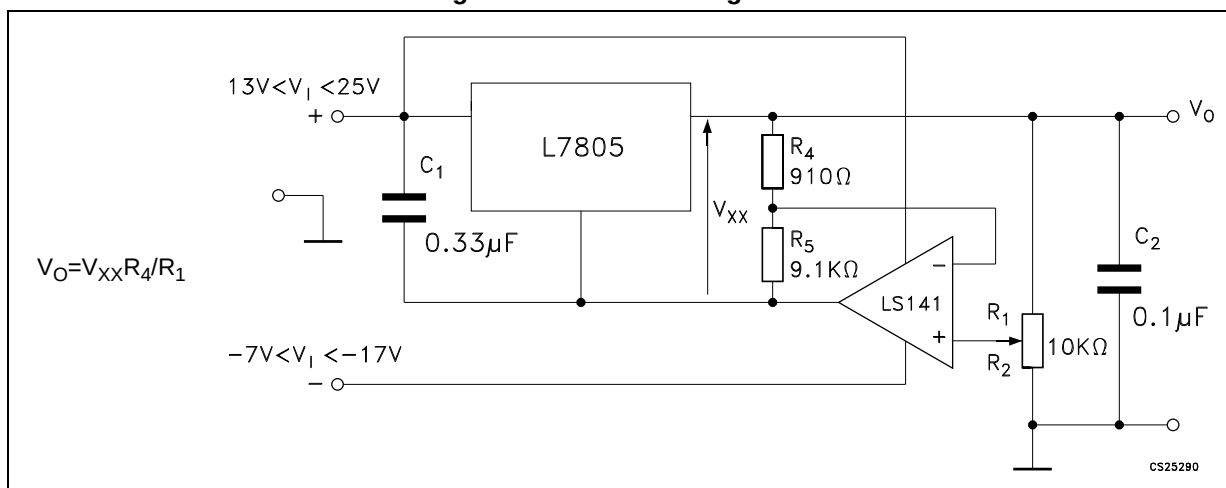


Figure 13. High current voltage regulator

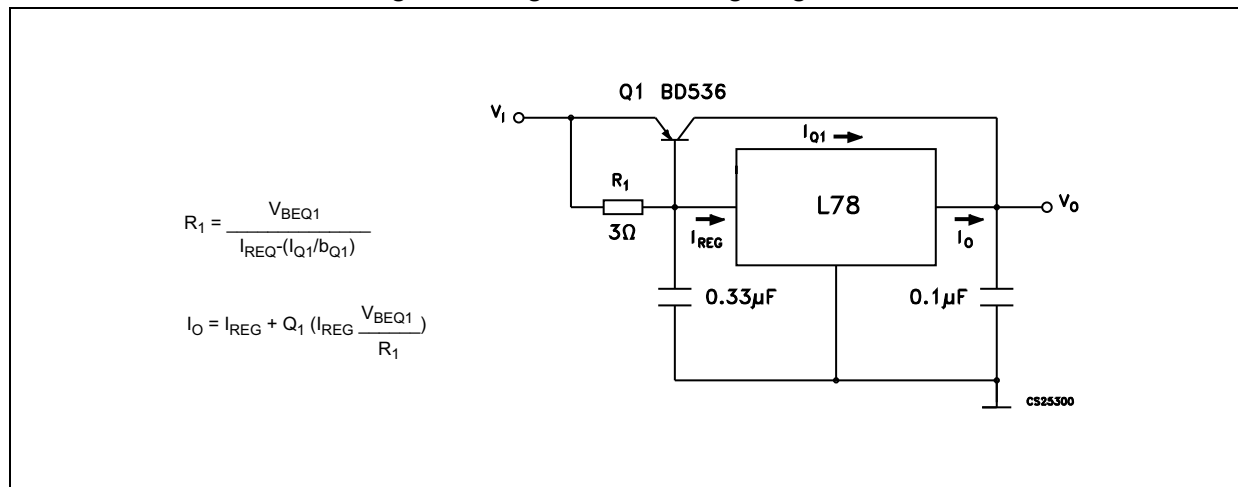


Figure 14. High output current with short circuit protection

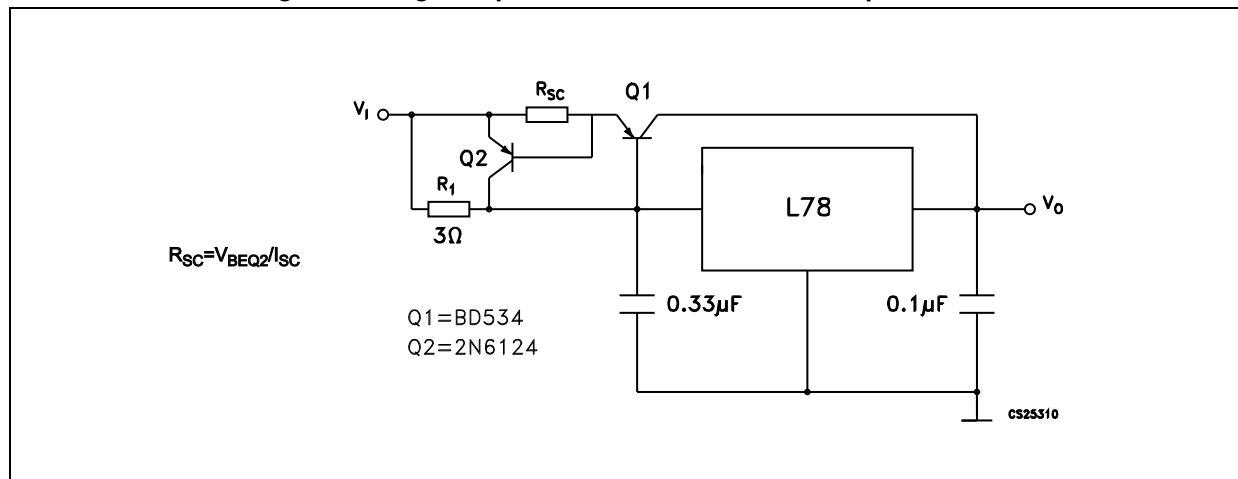
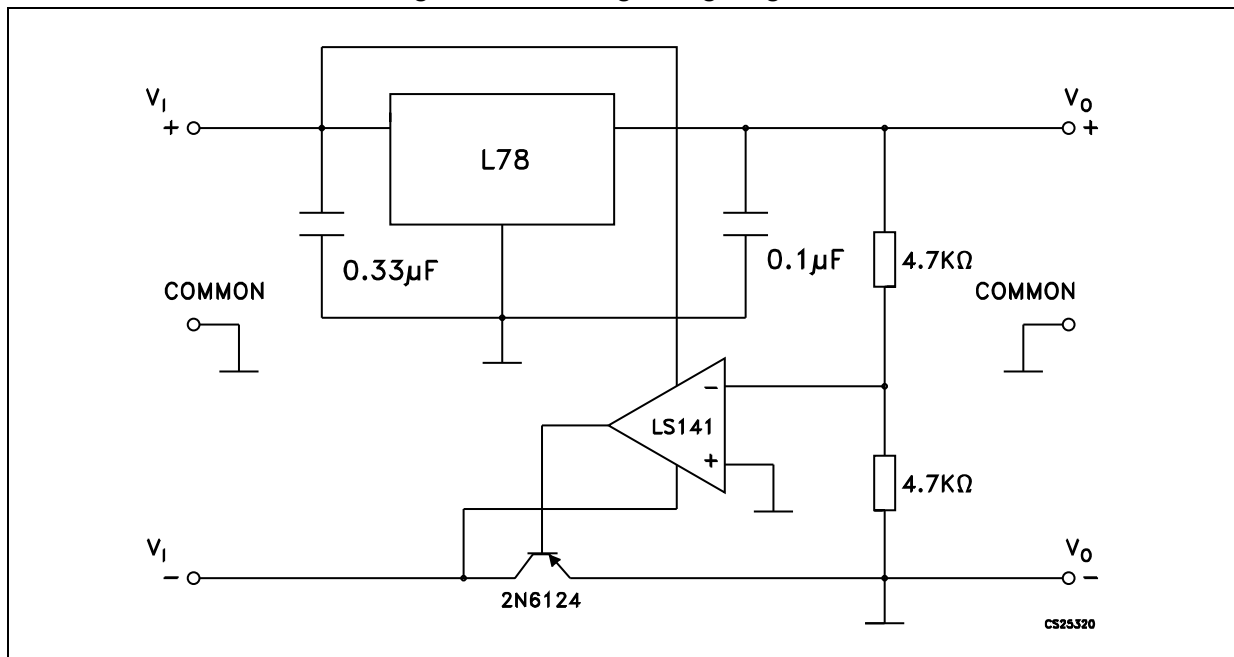
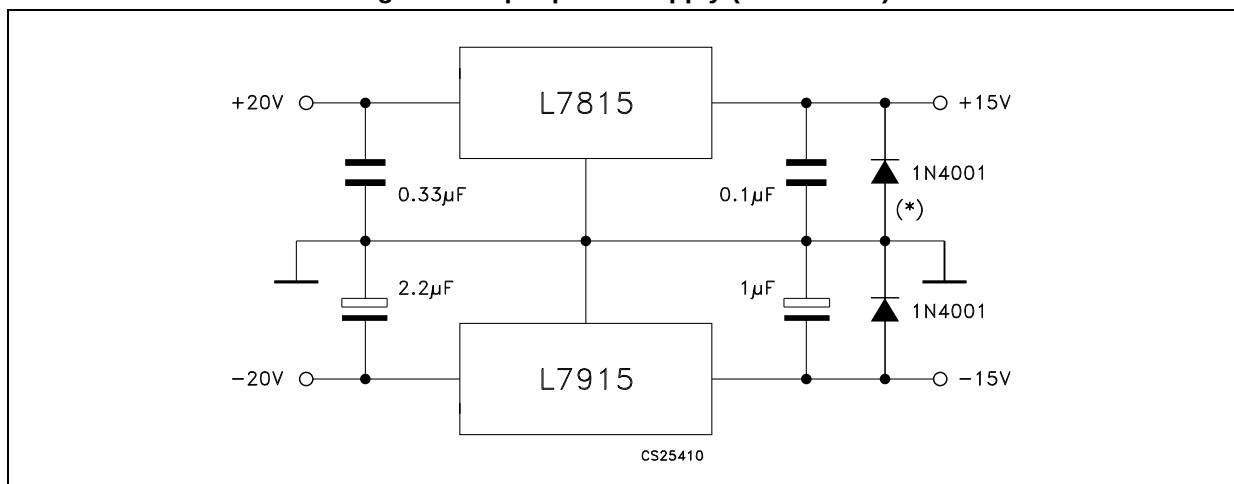


Figure 15. Tracking voltage regulator

Figure 16. Split power supply ( $\pm 15$  V - 1 A)

\* Against potential latch-up problems.

Figure 17. Negative output voltage circuit

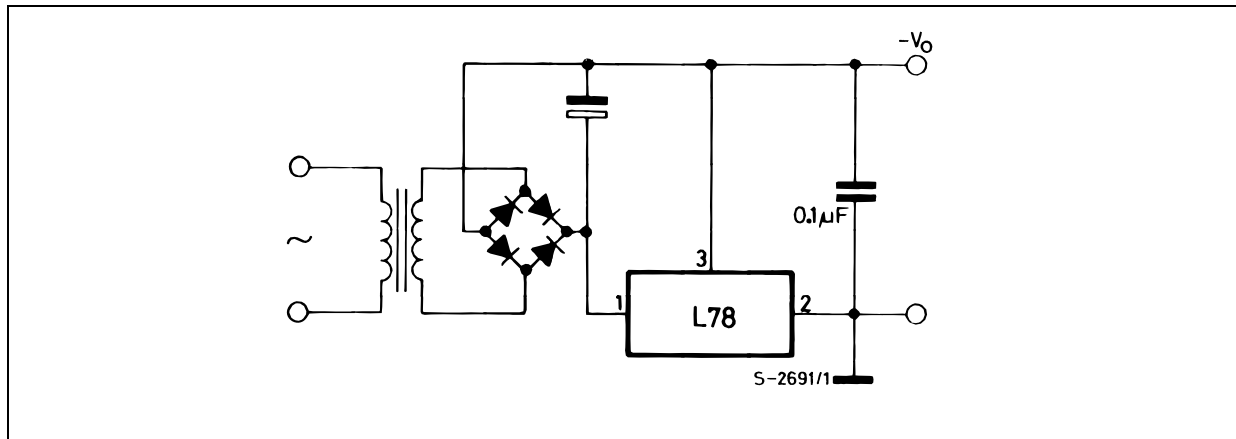


Figure 18. Switching regulator

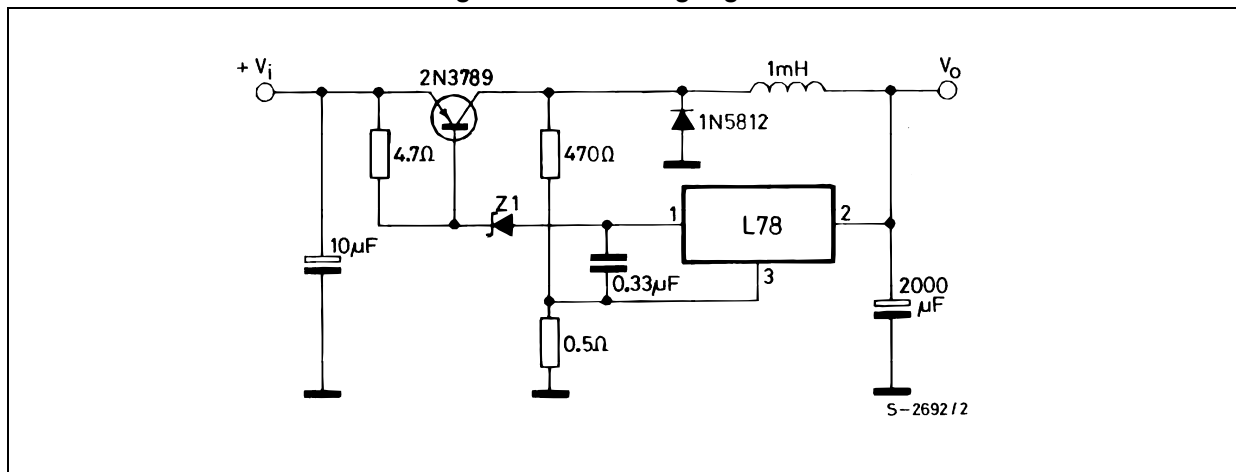


Figure 19. High input voltage circuit (configuration 1)

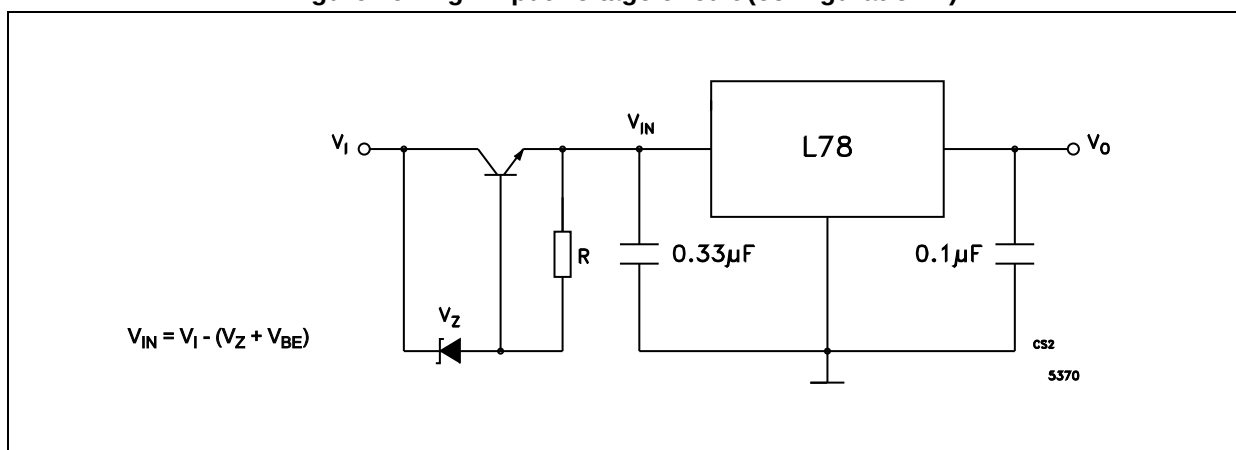


Figure 20. High input voltage circuit (configuration 2)

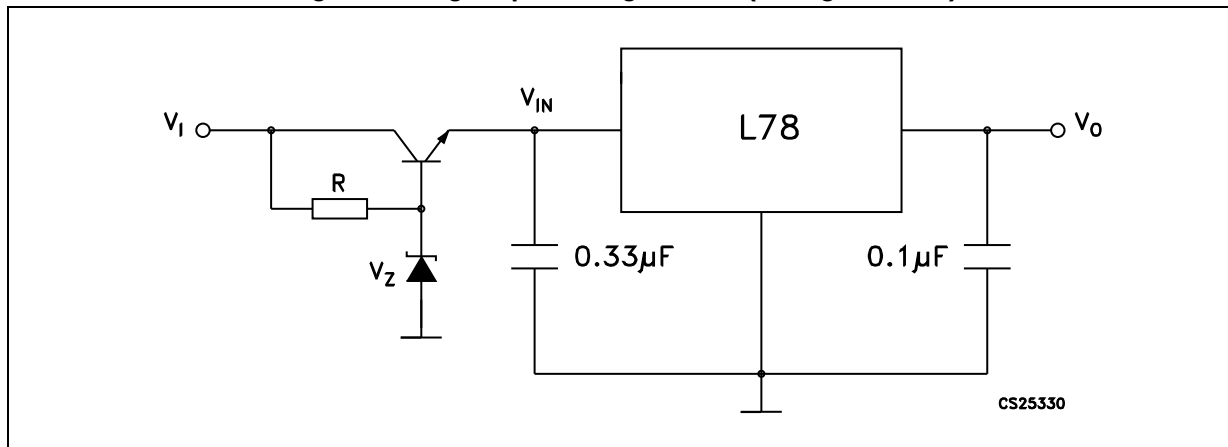


Figure 21. High input and output voltage

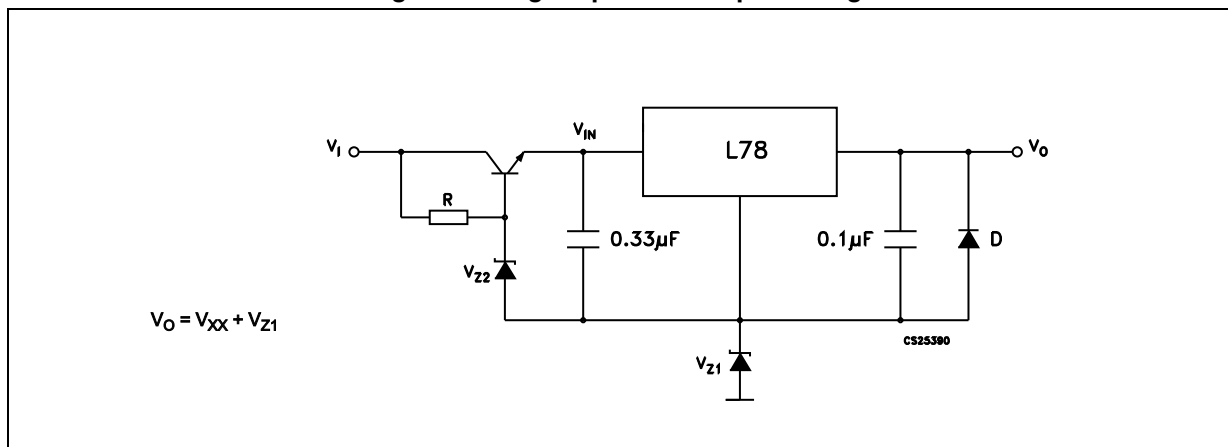


Figure 22. Reducing power dissipation with dropping resistor

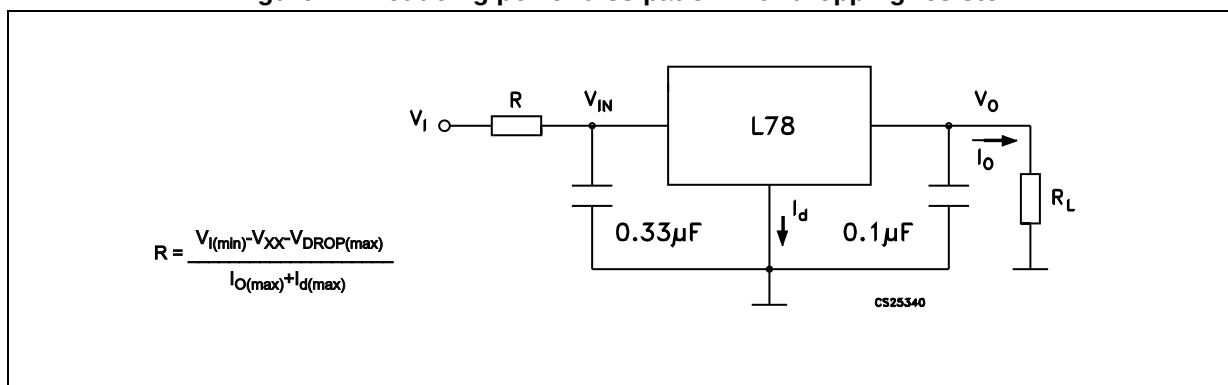
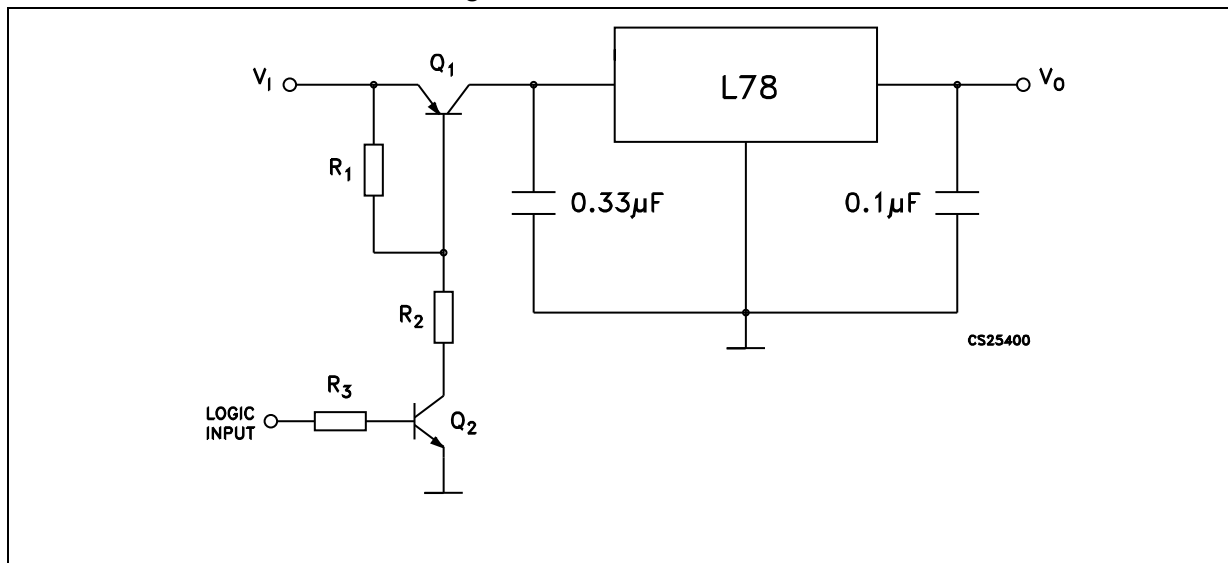
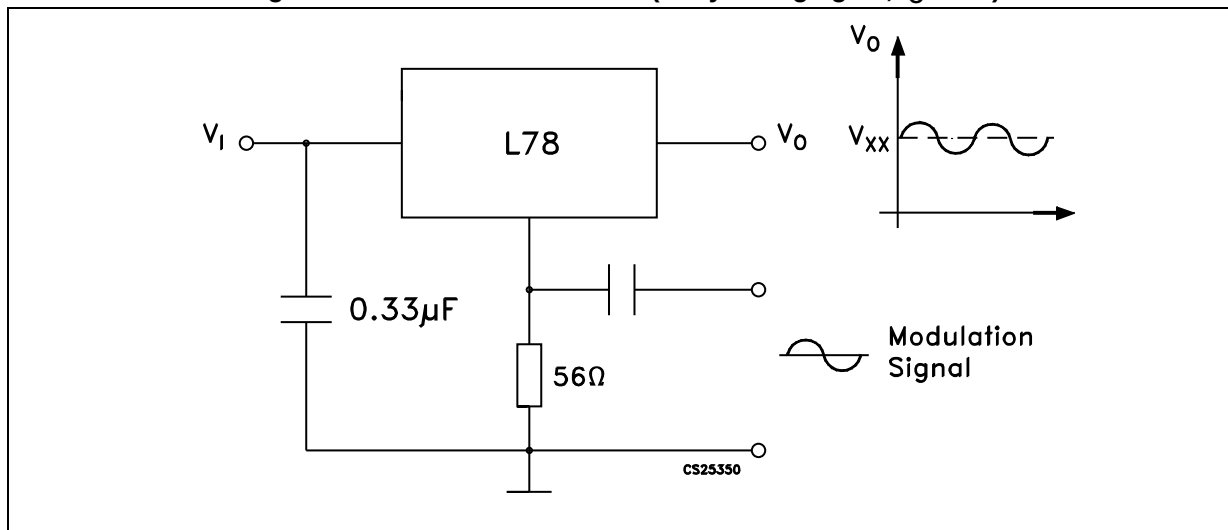
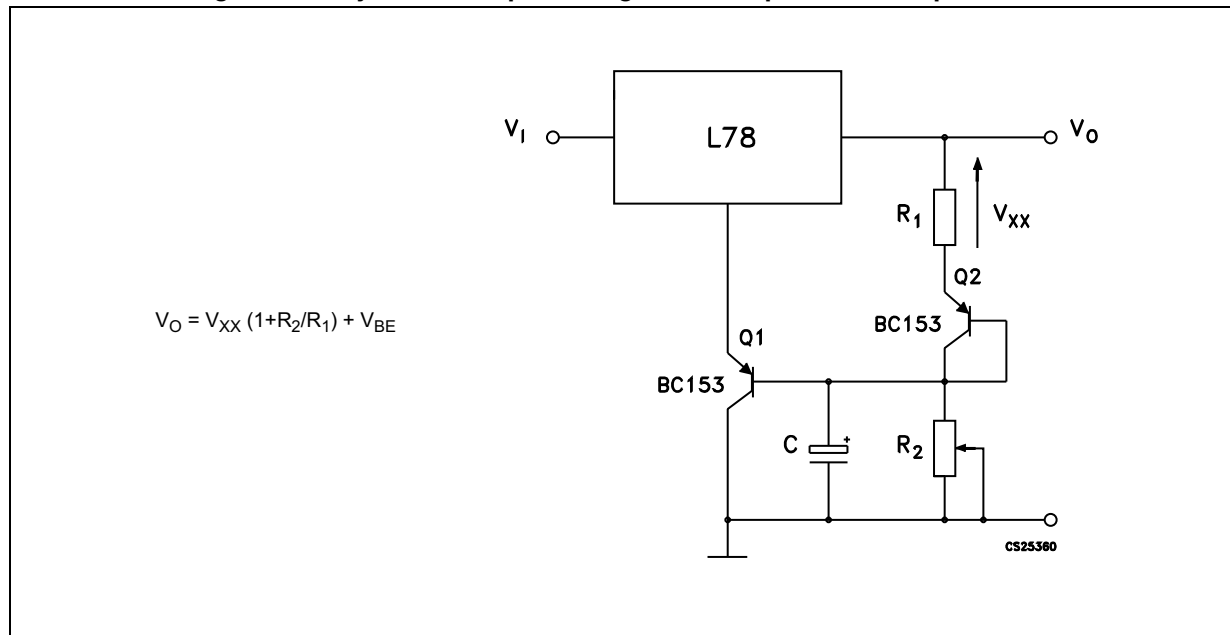


Figure 23. Remote shutdown

Figure 24. Power AM modulator (unity voltage gain,  $I_O \leq 0.5$ )

Note: The circuit performs well up to 100 kHz.

Figure 25. Adjustable output voltage with temperature compensation



Note:  $Q_2$  is connected as a diode in order to compensate the variation of the  $Q_1$   $V_{BE}$  with the temperature.  $C$  allows a slow rise time of the  $V_O$ .

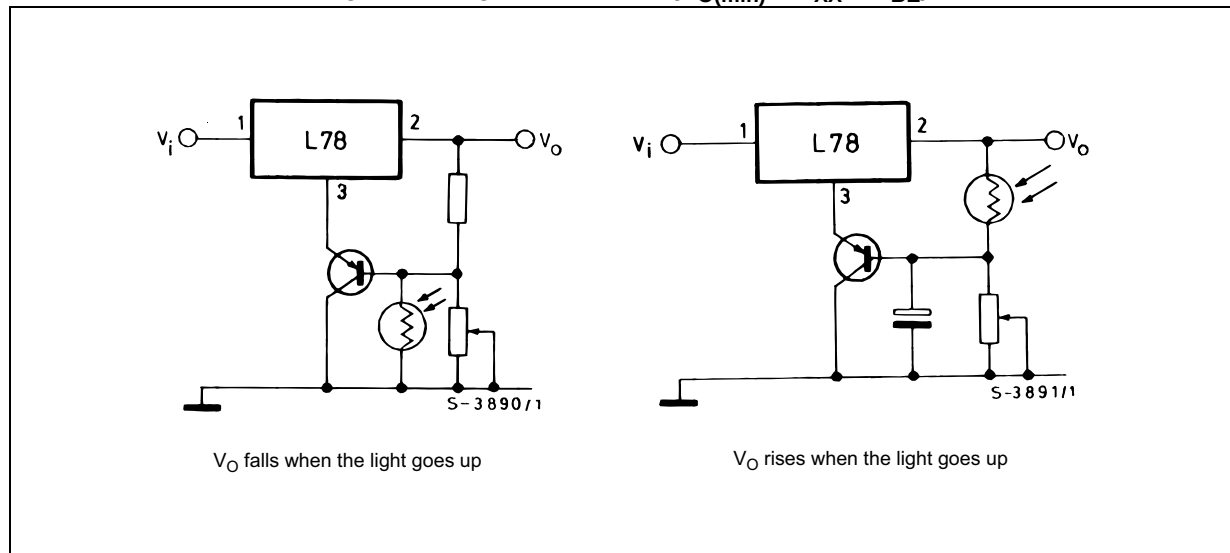
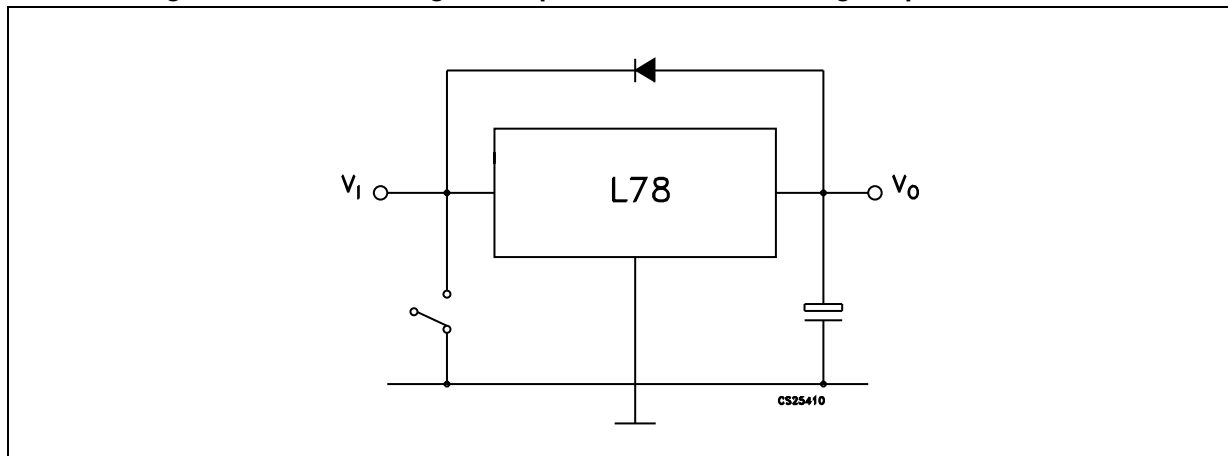
Figure 26. Light controllers ( $V_{O(min)} = V_{XX} + V_{BE}$ )

Figure 27. Protection against input short-circuit with high capacitance loads



**Note:** Application with high capacitance loads and an output voltage greater than 6 volts need an external diode (see [Figure 22 on page 31](#)) to protect the device against input short circuit. In this case the input voltage falls rapidly while the output voltage decrease slowly. The capacitance discharges by means of the base-emitter junction of the series pass transistor in the regulator. If the energy is sufficiently high, the transistor may be destroyed. The external diode by-passes the current from the IC to ground.

7 Typical performance

Figure 28. Dropout voltage vs. junction temperature

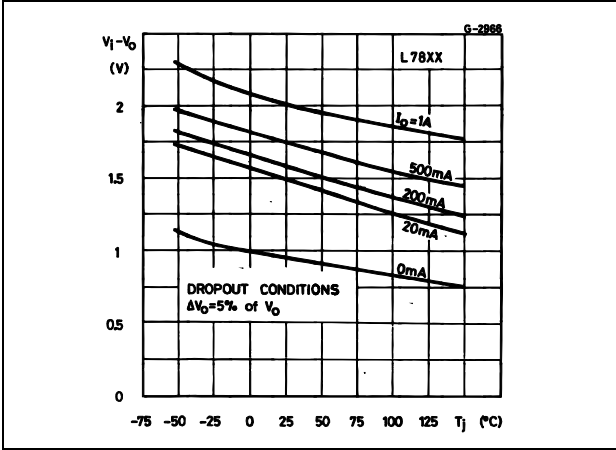


Figure 29. Peak output current vs. input/output differential voltage

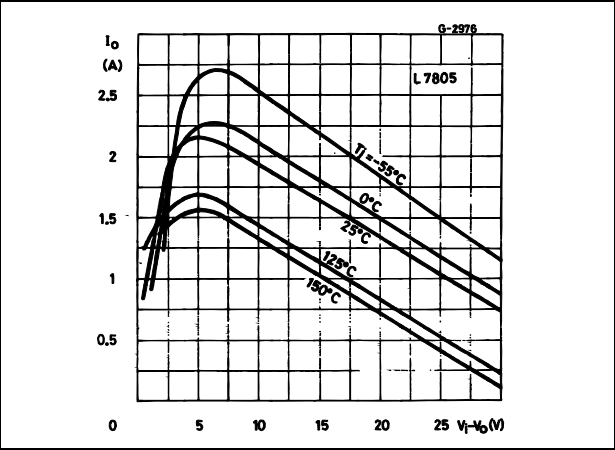


Figure 30. Supply voltage rejection vs. frequency

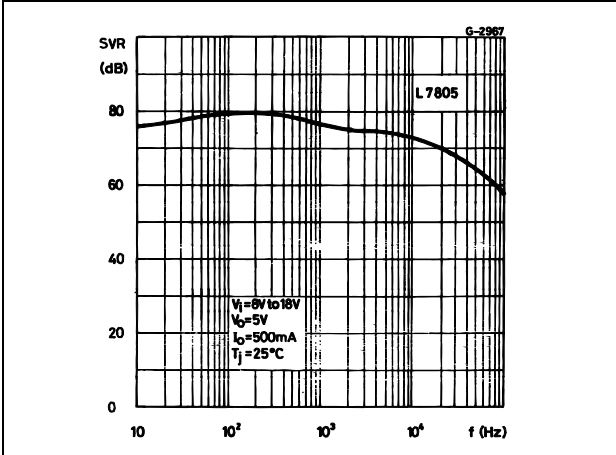


Figure 31. Output voltage vs. junction temperature

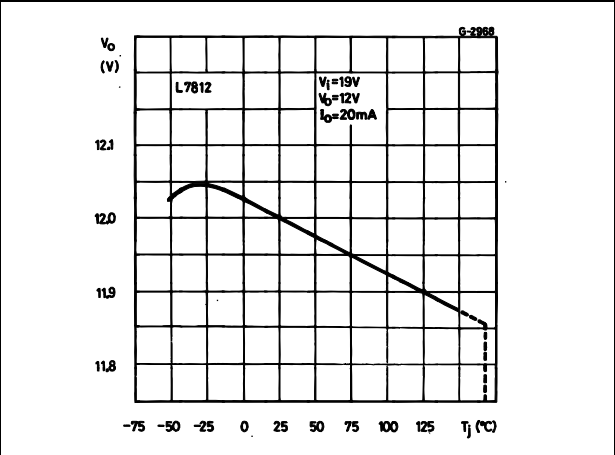


Figure 32. Output impedance vs. frequency

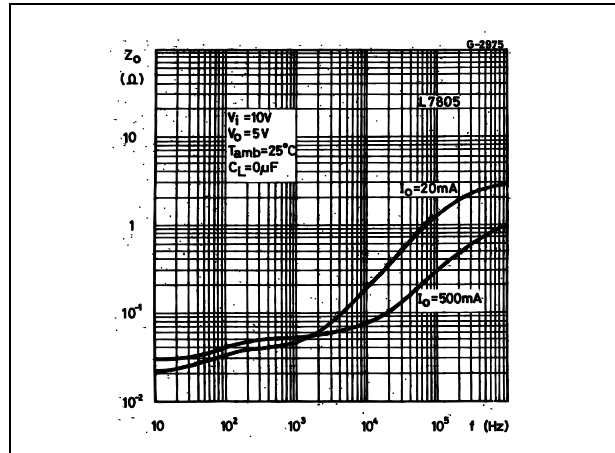


Figure 33. Quiescent current vs. junction temp.

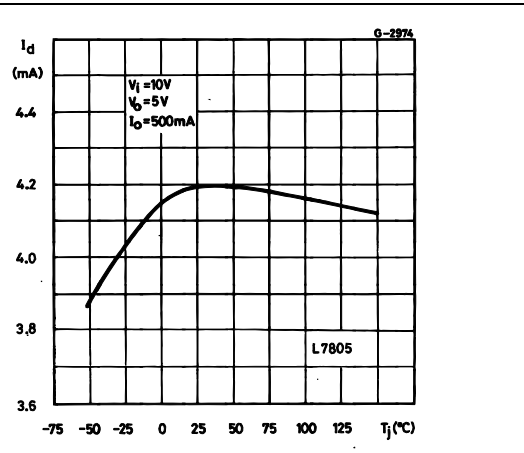


Figure 34. Load transient response

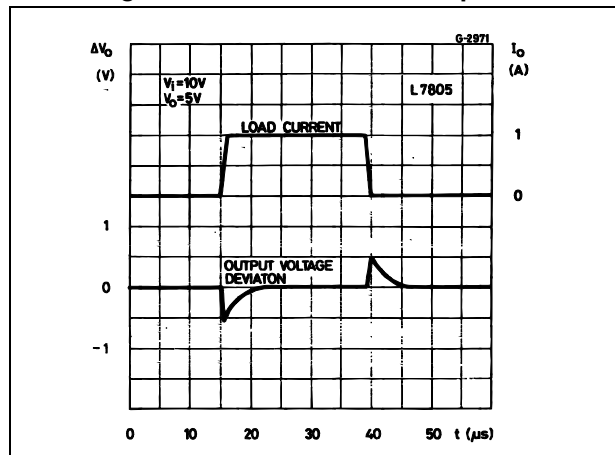


Figure 35. Line transient response

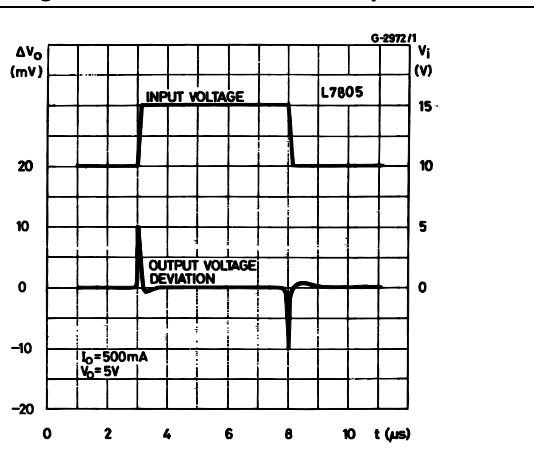
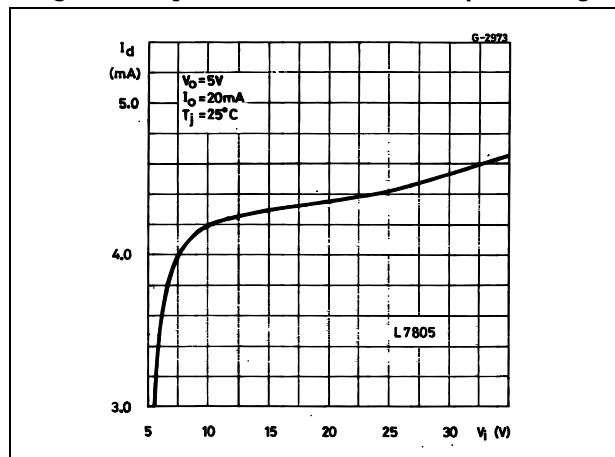


Figure 36. Quiescent current vs. input voltage



## 8 Package mechanical data

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

Figure 37. TO-220 (dual gauge) drawing

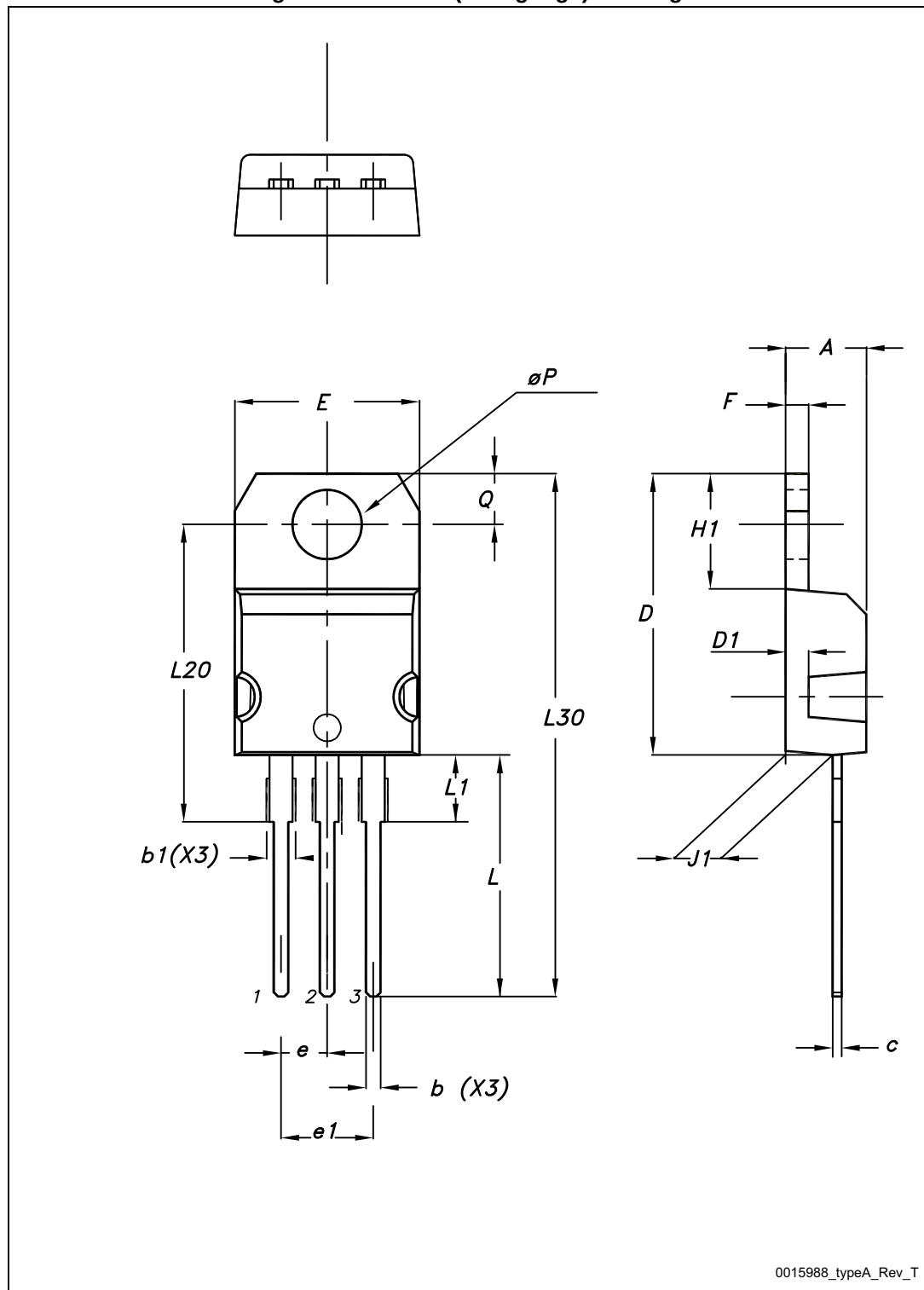


Table 19. TO-220 (dual gauge) mechanical data

| 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 38. TO-220 SG (single gauge) drawing

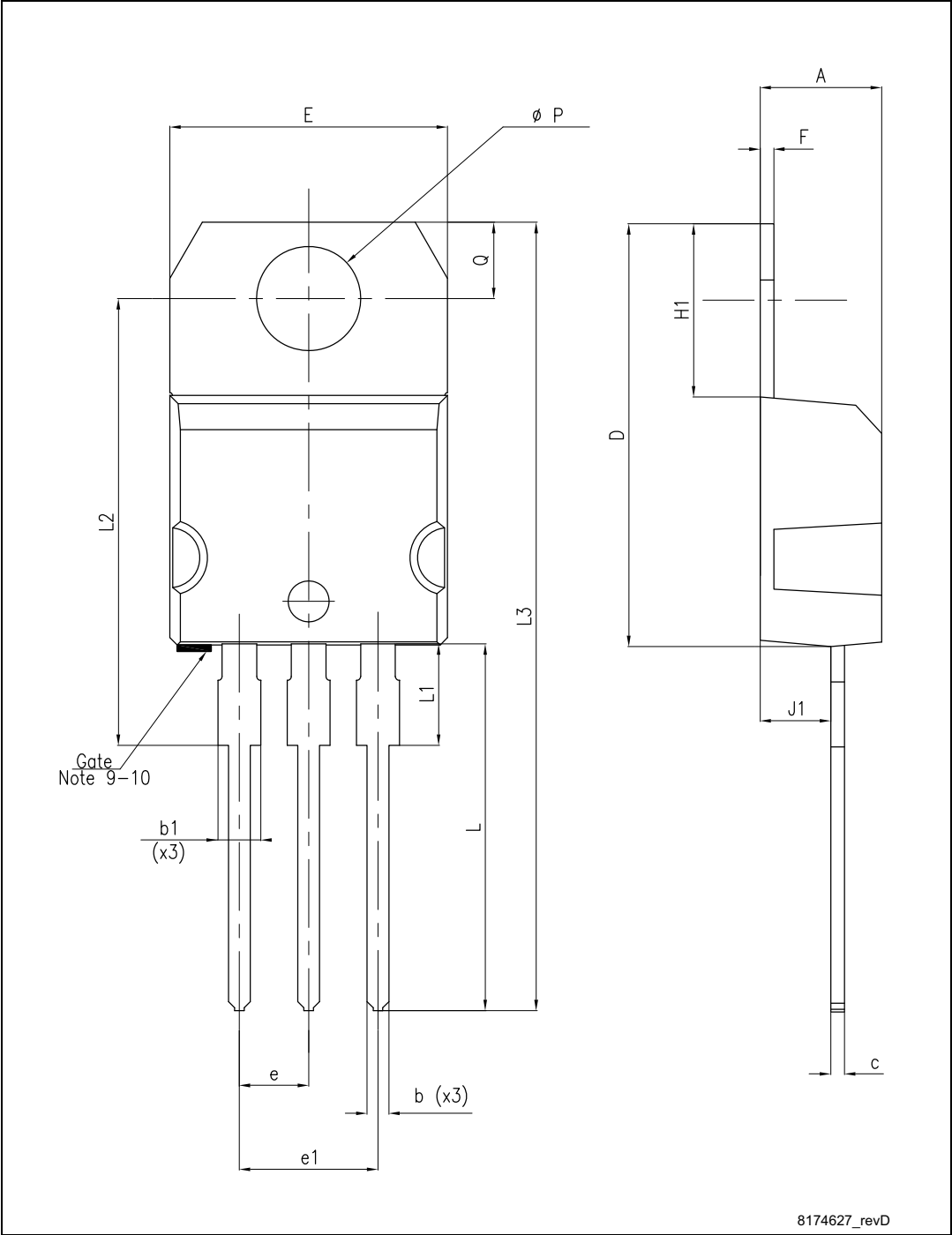


Table 20. TO-220 SG (single gauge) mechanical data

| 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 39. TO-220FP drawing

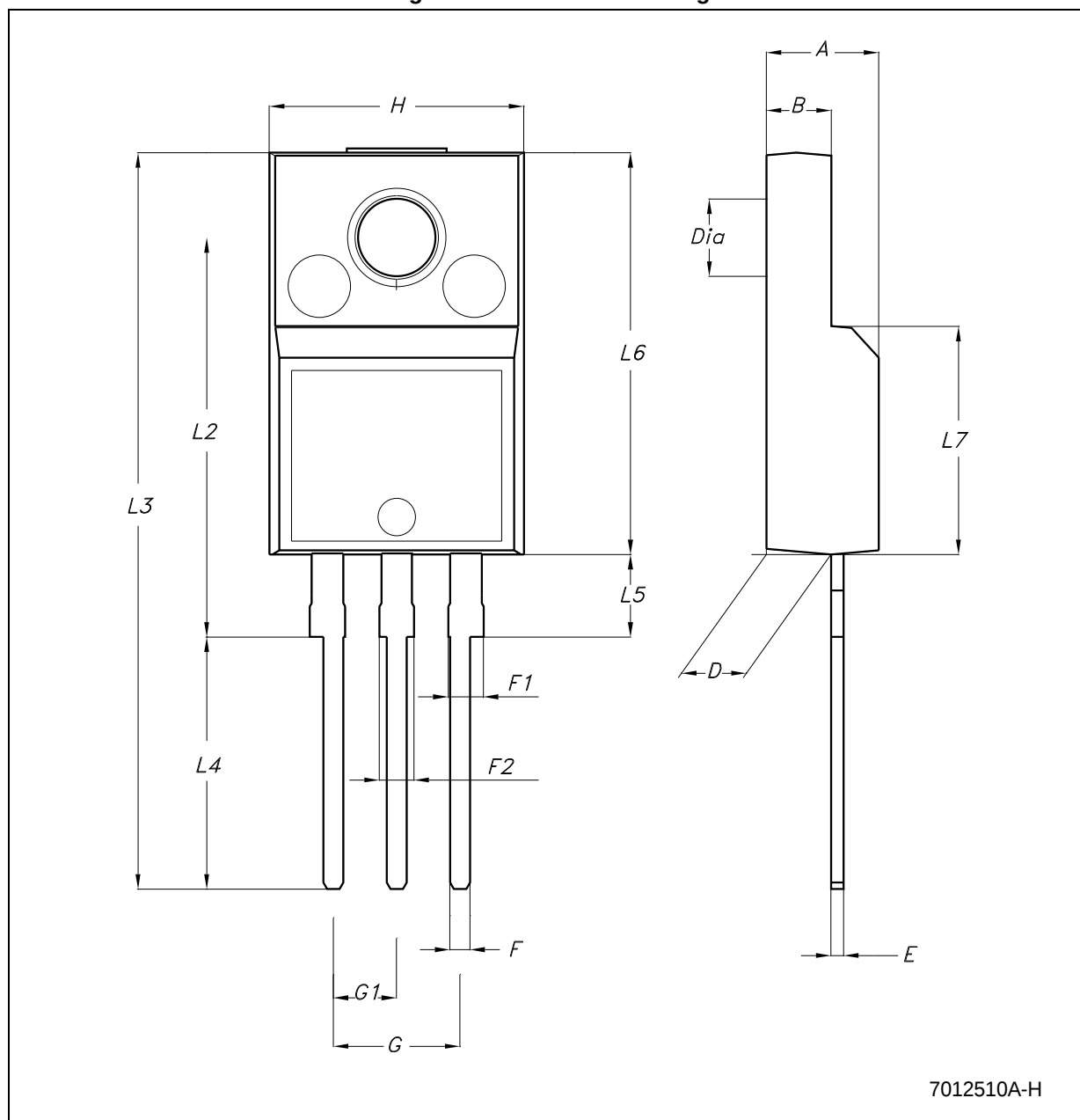


Table 21. TO-220FP mechanical data

| Dim. | mm.  |      |       |
|------|------|------|-------|
|      | Min. | Typ. | Max.  |
| A    | 4.40 |      | 4.60  |
| B    | 2.5  |      | 2.7   |
| D    | 2.5  |      | 2.75  |
| E    | 0.45 |      | 0.70  |
| F    | 0.75 |      | 1     |
| F1   | 1.15 |      | 1.50  |
| F2   | 1.15 |      | 1.50  |
| G    | 4.95 |      | 5.2   |
| G1   | 2.4  |      | 2.7   |
| H    | 10.0 |      | 10.40 |
| L2   |      | 16   |       |
| L3   | 28.6 |      | 30.6  |
| L4   | 9.8  |      | 10.6  |
| L5   | 2.9  |      | 3.6   |
| L6   | 15.9 |      | 16.4  |
| L7   | 9    |      | 9.3   |
| DIA. | 3    |      | 3.2   |

Figure 40. DPAK drawing

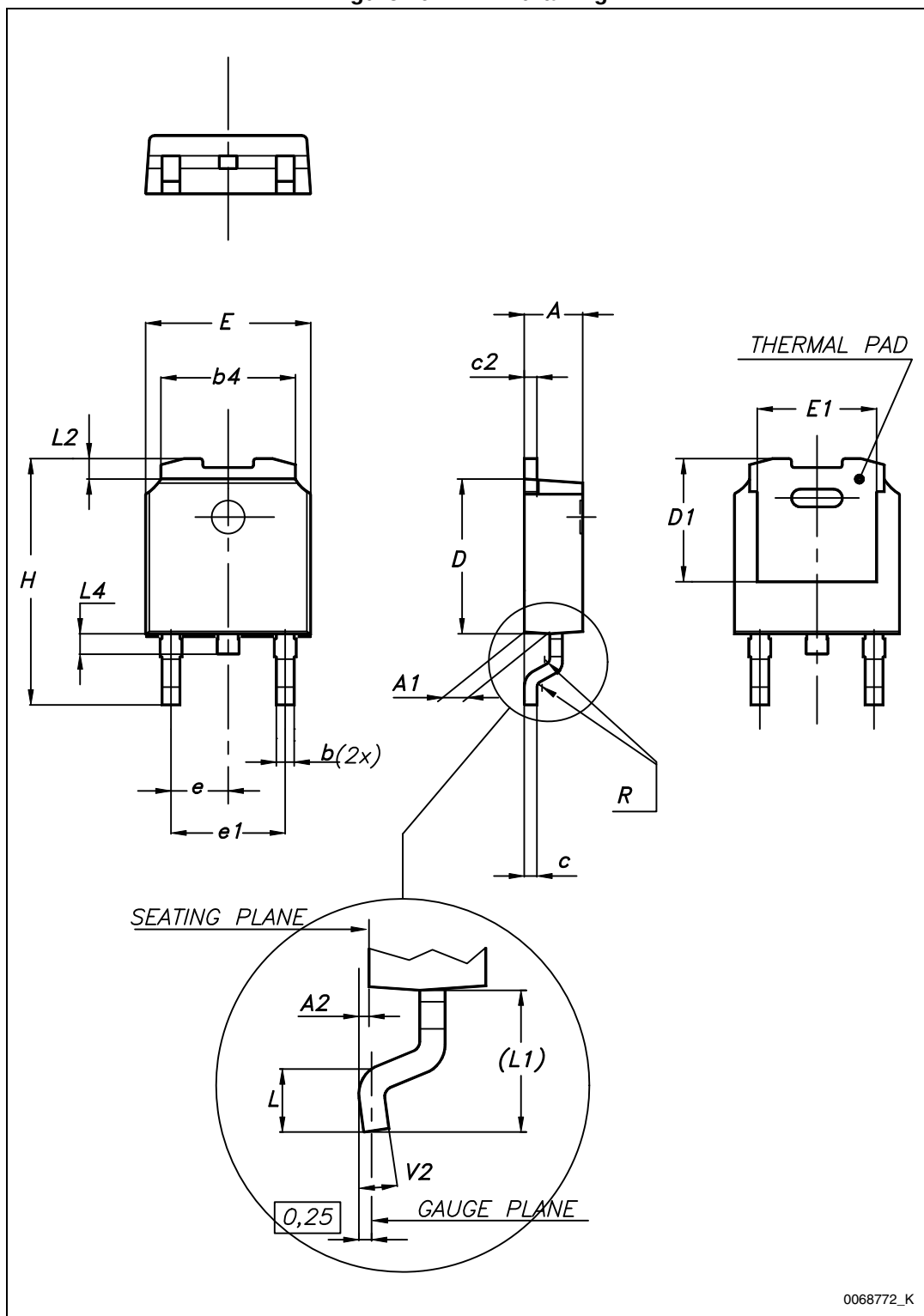
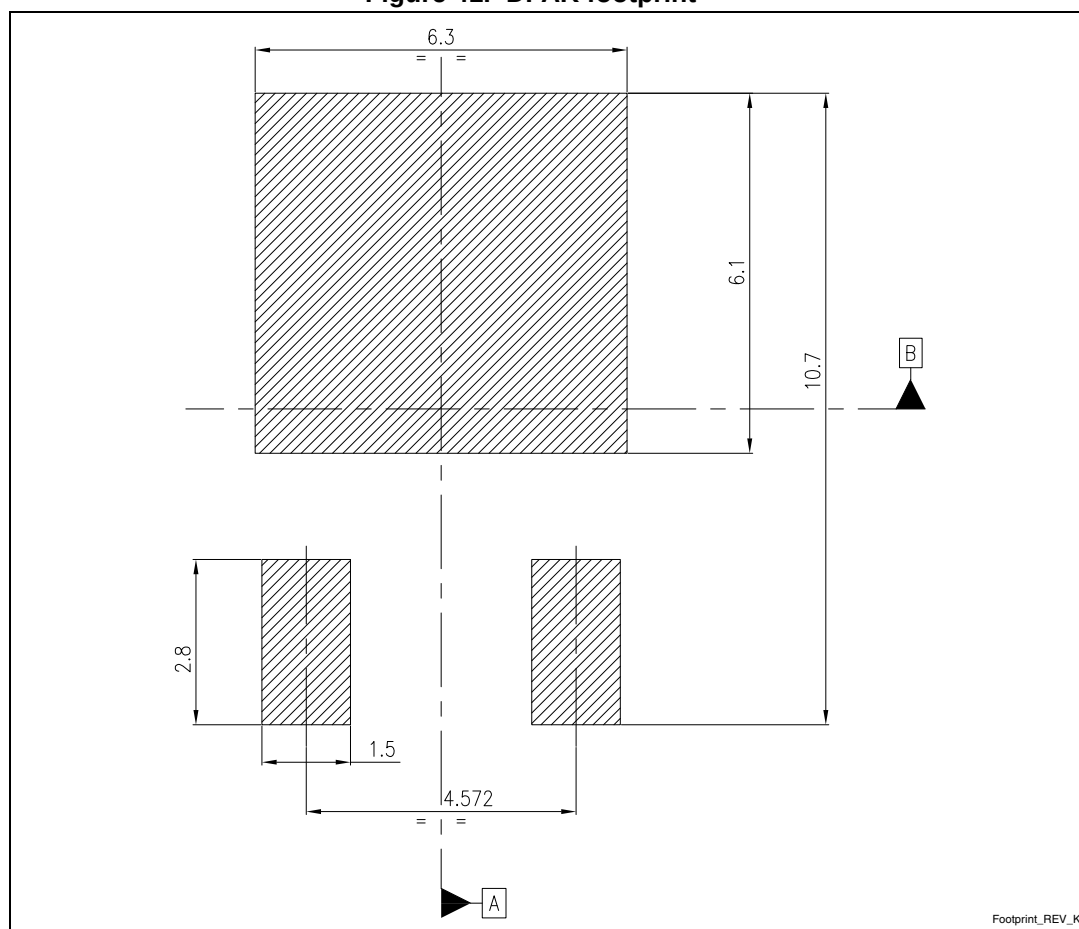


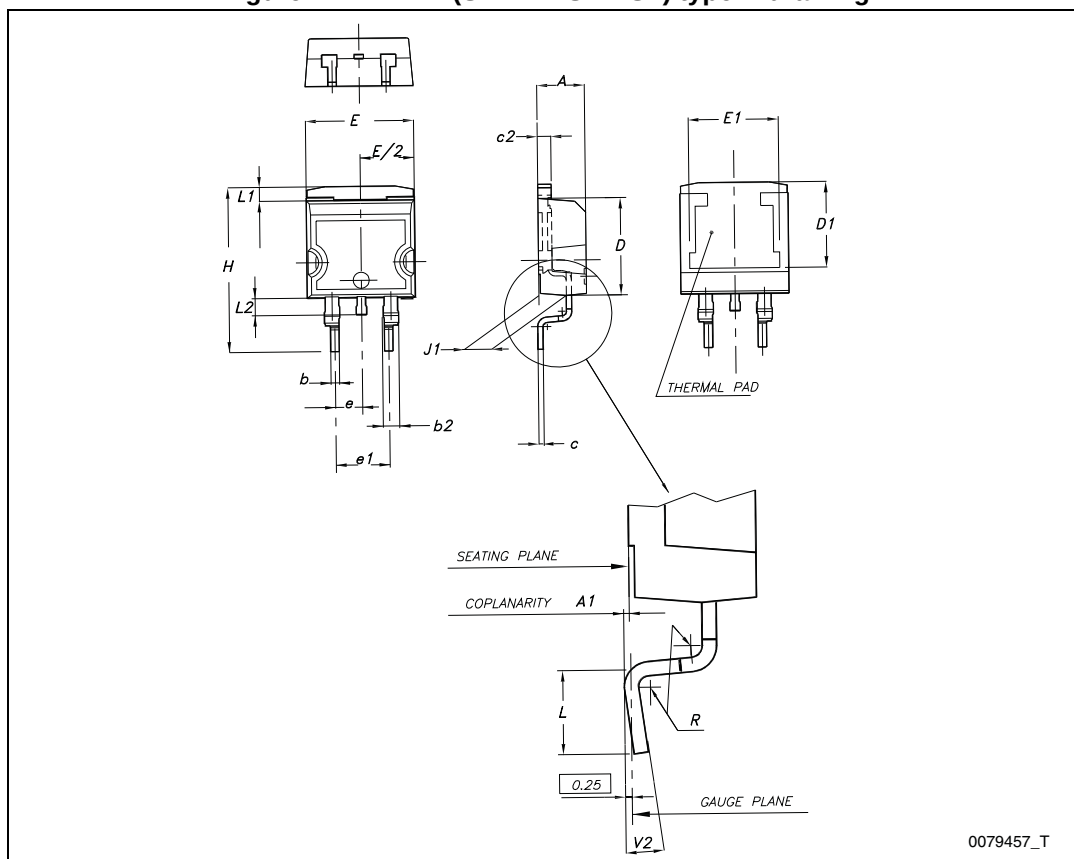
Table 22. DPAK mechanical data

| Dim. | mm   |      |       |
|------|------|------|-------|
|      | Min. | Typ. | Max.  |
| A    | 2.20 |      | 2.40  |
| A1   | 0.90 |      | 1.10  |
| A2   | 0.03 |      | 0.23  |
| b    | 0.64 |      | 0.90  |
| b4   | 5.20 |      | 5.40  |
| c    | 0.45 |      | 0.60  |
| c2   | 0.48 |      | 0.60  |
| D    | 6.00 |      | 6.20  |
| D1   |      | 5.10 |       |
| E    | 6.40 |      | 6.60  |
| E1   |      | 4.70 |       |
| e    |      | 2.28 |       |
| e1   | 4.40 |      | 4.60  |
| H    | 9.35 |      | 10.10 |
| L    | 1.00 |      | 1.50  |
| (L1) |      | 2.80 |       |
| L2   |      | 0.80 |       |
| L4   | 0.60 |      | 1.00  |
| R    |      | 0.20 |       |
| V2   | 0°   |      | 8°    |

Figure 41. DPAK footprint (q)



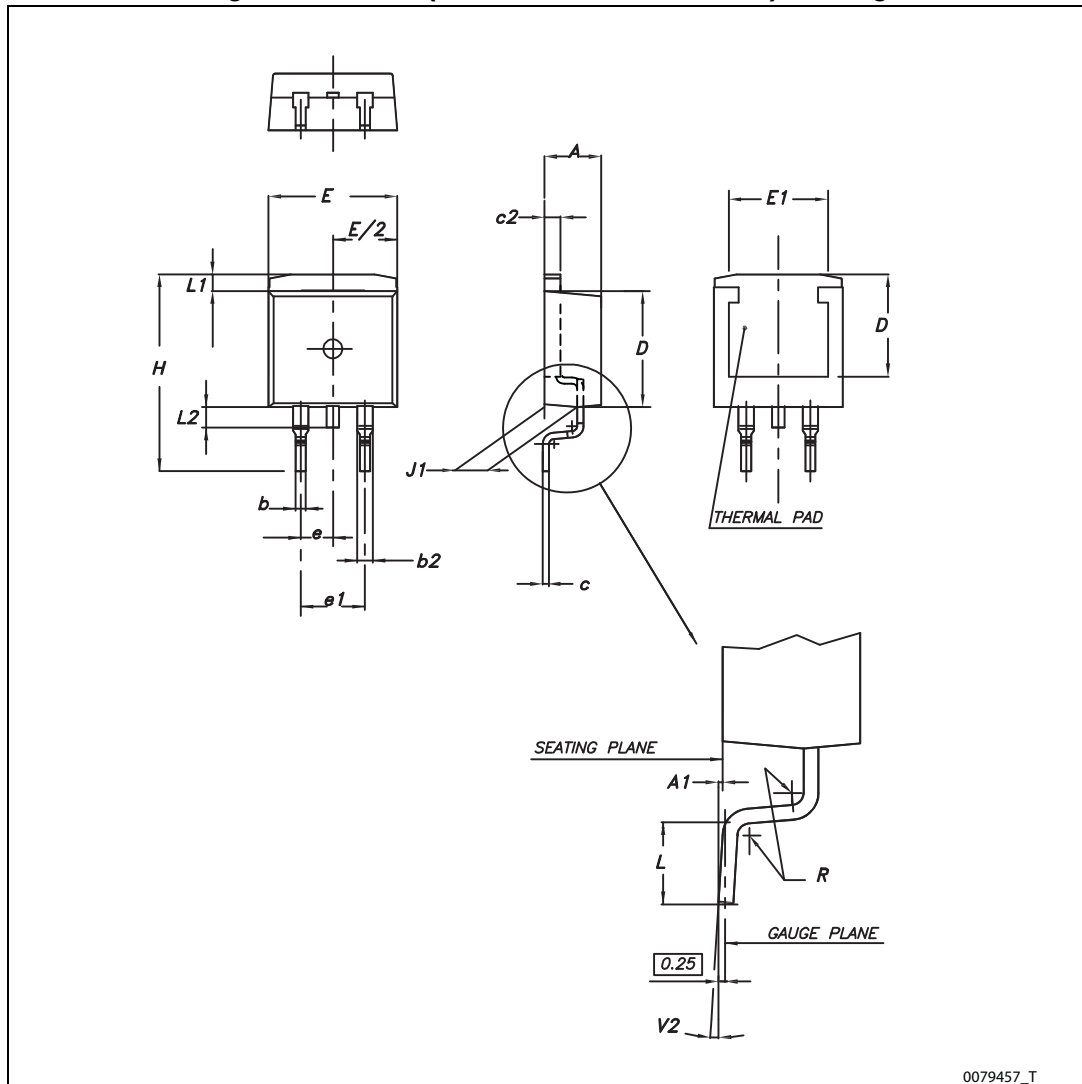
q. All dimensions are in millimeters

Figure 42. D<sup>2</sup>PAK (SMD 2L STD-ST) type A drawing

0079457\_T

Table 23. D<sup>2</sup>PAK (SMD 2L STD-ST) mechanical data

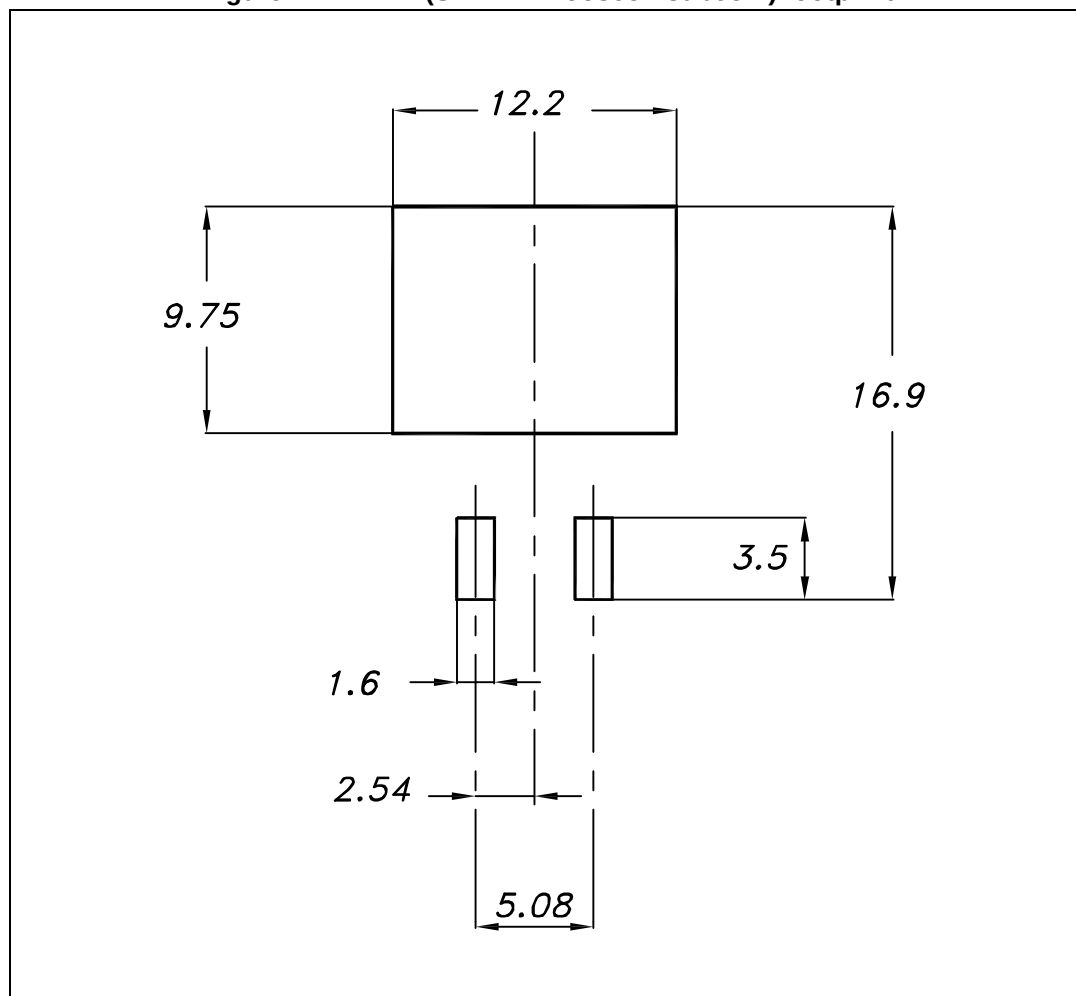
| Dim. | mm   |      |       |
|------|------|------|-------|
|      | Min. | Typ. | Max.  |
| A    | 4.40 |      | 4.60  |
| A1   | 0.03 |      | 0.23  |
| b    | 0.70 |      | 0.93  |
| b2   | 1.14 |      | 1.70  |
| c    | 0.45 |      | 0.60  |
| c2   | 1.23 |      | 1.36  |
| D    | 8.95 |      | 9.35  |
| D1   | 7.50 |      |       |
| E    | 10   |      | 10.40 |
| E1   | 8.50 |      |       |
| e    |      | 2.54 |       |
| e1   | 4.88 |      | 5.28  |
| H    | 15   |      | 15.85 |
| J1   | 2.49 |      | 2.69  |
| L    | 2.29 |      | 2.79  |
| L1   | 1.27 |      | 1.40  |
| L2   | 1.30 |      | 1.75  |
| R    |      | 0.4  |       |
| V2   | 0°   |      | 8°    |

Figure 43. D<sup>2</sup>PAK (SMD 2L Wooseok-subcon.) drawing

0079457\_T

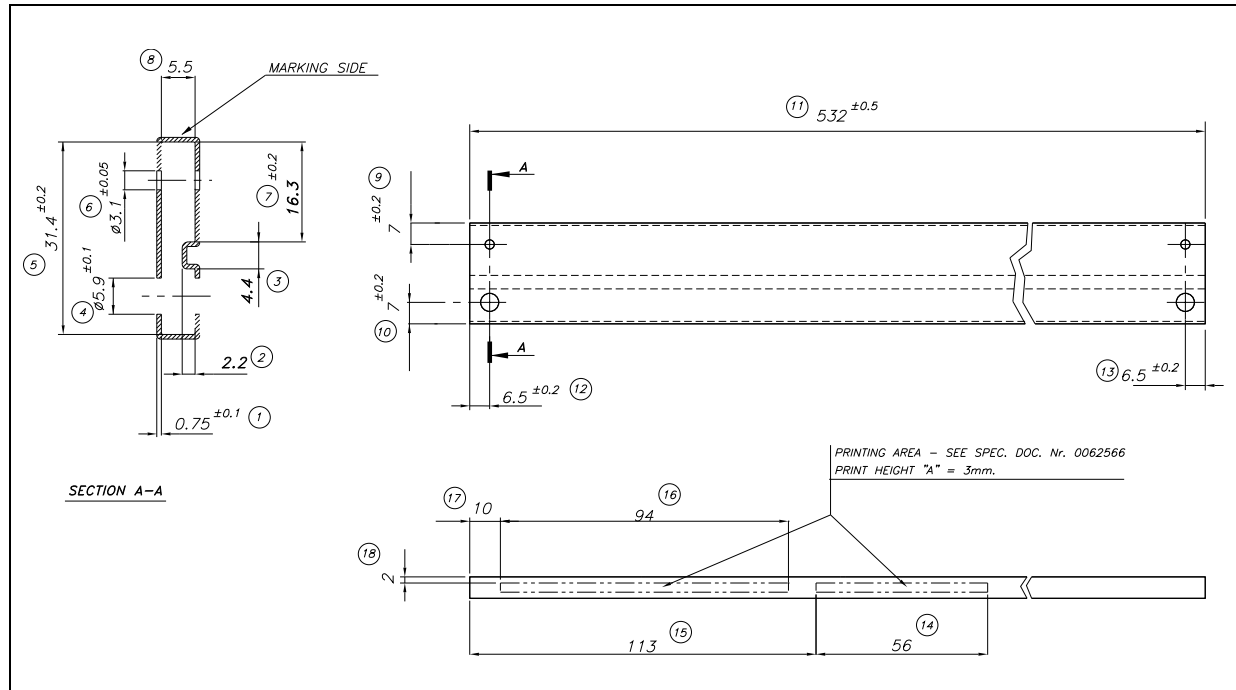
Table 24. D<sup>2</sup>PAK (SMD 2L Wooseok-subcon.) mechanical data

| Dim. | mm   |      |       |
|------|------|------|-------|
|      | Min. | Typ. | Max.  |
| A    | 4.30 |      | 4.70  |
| A1   | 0    |      | 0.20  |
| b    | 0.70 |      | 0.90  |
| b2   | 1.17 |      | 1.37  |
| c    | 0.45 | 0.50 | 0.60  |
| c2   | 1.25 | 1.30 | 1.40  |
| D    | 9    | 9.20 | 9.40  |
| D1   | 7.50 |      |       |
| E    | 10   |      | 10.40 |
| E1   | 8.50 |      |       |
| e    |      | 2.54 |       |
| e1   | 4.88 |      | 5.08  |
| H    | 15   |      | 15.30 |
| J1   | 2.20 |      | 2.60  |
| L    | 1.79 |      | 2.79  |
| L1   | 1    |      | 1.40  |
| L2   | 1.20 |      | 1.60  |
| R    |      | 0.30 |       |
| V2   | 0°   |      | 3°    |

Figure 44. D<sup>2</sup>PAK (SMD 2L Wooseok-subcon.) footprint

## 9 Packaging mechanical data

**Figure 45. Tube for TO-220 (dual gauge) (mm.)**



**Figure 46. Tube for TO-220 (single gauge) (mm.)**

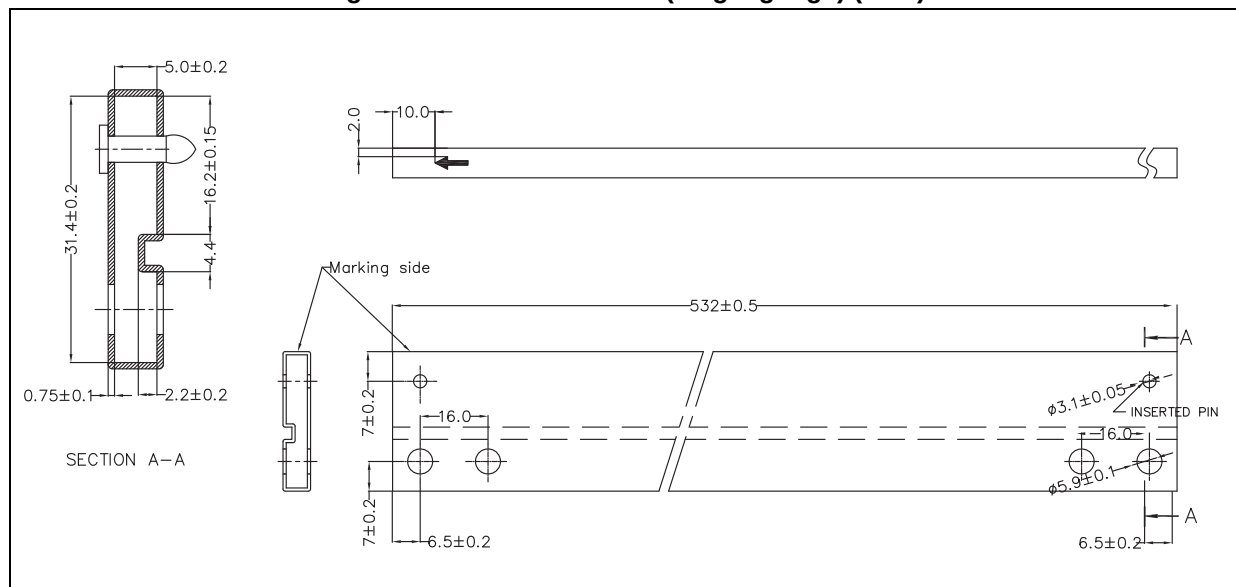


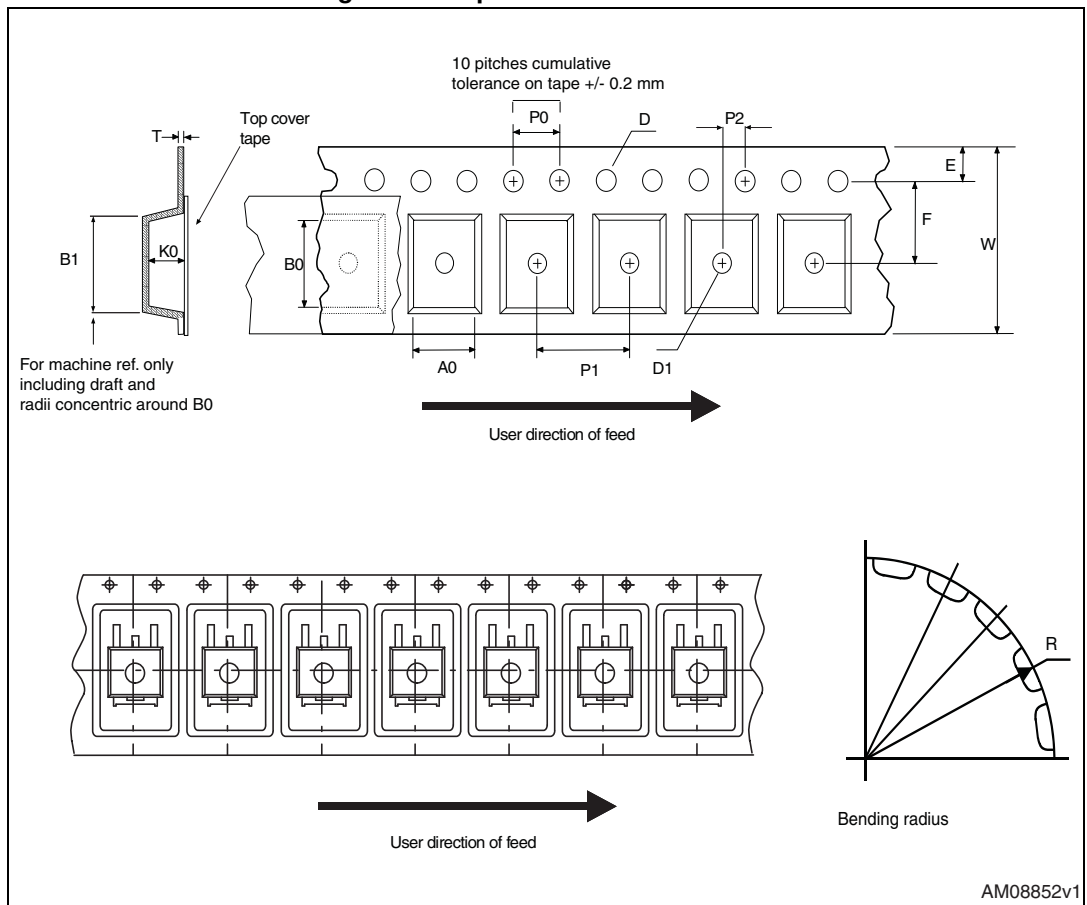
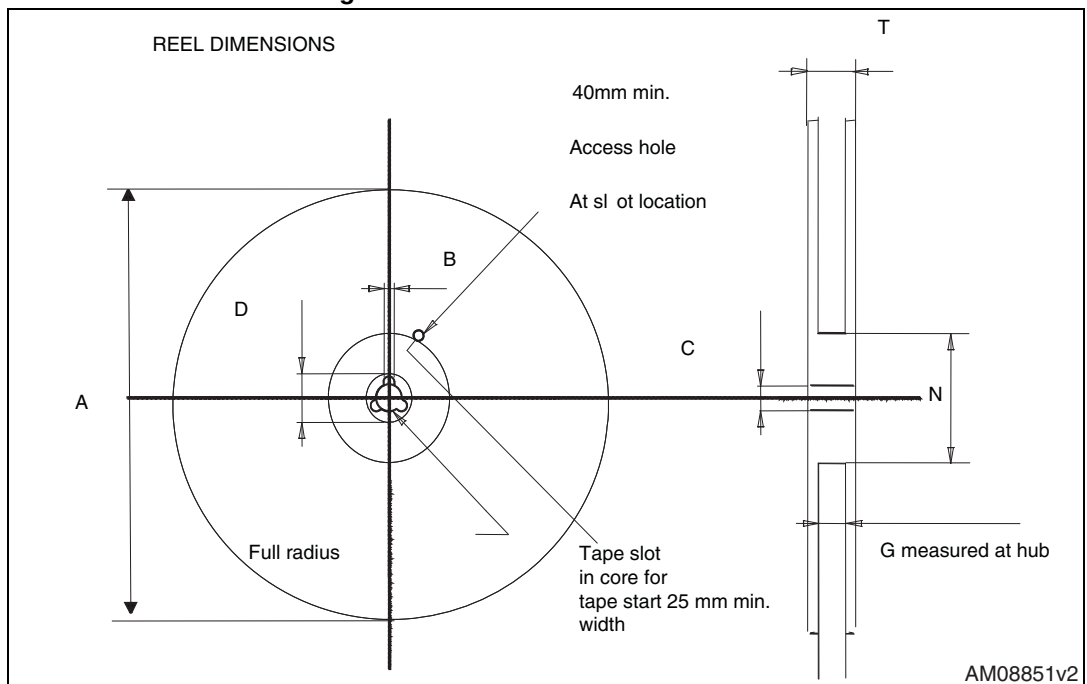
Figure 47. Tape for DPAK and D<sup>2</sup>PAKFigure 48. Reel for DPAK and D<sup>2</sup>PAK

Table 25. DPAK and D<sup>2</sup>PAK 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 |           |      |      |

## 10 Order codes

Table 26. Order codes

| Part numbers | Order codes              |                        |             |                    |          |                    |
|--------------|--------------------------|------------------------|-------------|--------------------|----------|--------------------|
|              | TO-220<br>(single gauge) | TO-220<br>(dual gauge) | DPAK        | D <sup>2</sup> PAK | TO-220FP | Output<br>voltages |
| L7805C       | L7805CV                  |                        | L7805CDT-TR | L7805CD2T-TR       | L7805CP  | 5 V                |
|              |                          | L7805CV-DG             |             |                    |          | 5 V                |
| L7805AB      | L7805ABV                 |                        |             | L7805ABD2T-TR      | L7805ABP | 5 V                |
|              |                          | L7805ABV-DG            |             |                    |          | 5 V                |
| L7805AC      | L7805ACV                 |                        |             | L7805ACD2T-TR      | L7805ACP | 5 V                |
|              |                          | L7805ACV-DG            |             |                    |          | 5 V                |
| L7806C       | L7806CV                  |                        |             | L7806CD2T-TR       |          | 6 V                |
|              |                          | L7806CV-DG             |             |                    |          | 6 V                |
| L7806AB      | L7806ABV                 |                        |             | L7806ABD2T-TR      |          | 6 V                |
|              |                          | L7806ABV-DG            |             |                    |          | 6 V                |
| L7806AC      | L7806ACV                 |                        |             |                    |          | 6 V                |
|              |                          | L7806ACV-DG            |             |                    |          | 6 V                |
| L7808C       | L7808CV                  |                        |             | L7808CD2T-TR       |          | 8 V                |
|              |                          | L7808CV-DG             |             |                    |          | 8 V                |
| L7808AB      | L7808ABV                 |                        |             | L7808ABD2T-TR      |          | 8 V                |
|              |                          | L7808ABV-DG            |             |                    |          | 8 V                |
| L7808AC      | L7808ACV                 |                        |             |                    |          | 8 V                |
|              |                          | L7808ACV-DG            |             |                    |          | 8 V                |
| L7885C       | L7885CV                  |                        |             |                    |          | 8.5 V              |
| L7809C       | L7809CV                  |                        |             | L7809CD2T-TR       | L7809CP  | 9 V                |
|              |                          | L7809CV-DG             |             |                    |          | 9 V                |
| L7809AB      | L7809ABV                 |                        |             | L7809ABD2T-TR      |          | 9 V                |
|              | L7809ABV-DG              |                        |             |                    |          | 9 V                |
| L7809AC      | L7809ACV                 |                        |             |                    |          | 9 V                |
| L7812C       | L7812CV                  |                        |             | L7812CD2T-TR       | L7812CP  | 12 V               |
|              |                          | L7812CV-DG             |             |                    |          | 12 V               |
| L7812AB      | L7812ABV                 |                        |             | L7812ABD2T-TR      |          | 12 V               |
|              |                          | L7812ABV-DG            |             |                    |          | 12 V               |
| L7812AC      | L7812ACV                 |                        |             | L7812ACD2T-TR      |          | 12 V               |
|              |                          | L7812ACV-DG            |             |                    |          | 12 V               |

Table 26. Order codes (continued)

| Part numbers | Order codes              |                        |      |                    |          |                    |
|--------------|--------------------------|------------------------|------|--------------------|----------|--------------------|
|              | TO-220<br>(single gauge) | TO-220<br>(dual gauge) | DPAK | D <sup>2</sup> PAK | TO-220FP | Output<br>voltages |
| L7815C       | L7815CV                  |                        |      | L7815CD2T-TR       | L7815CP  | 15 V               |
|              |                          | L7815CV-DG             |      |                    |          | 15 V               |
| L7815AB      | L7815ABV                 |                        |      | L7815ABD2T-TR      |          | 15 V               |
|              |                          | L7815ABV-DG            |      |                    |          | 15 V               |
| L7815AC      | L7815ACV                 |                        |      | L7815ACD2T-TR      |          | 15 V               |
|              |                          | L7815ACV-DG            |      |                    |          | 15 V               |
| L7818C       | L7818CV                  |                        |      |                    |          | 18 V               |
|              |                          | L7818CV-DG             |      |                    |          | 18 V               |
| L7824C       | L7824CV                  |                        |      | L7824CD2T-TR       | L7824CP  | 24 V               |
|              |                          | L7824CV-DG             |      |                    |          | 24 V               |
| L7824AB      | L7824ABV                 |                        |      |                    |          | 24 V               |
|              |                          | L7824ABV-DG            |      |                    |          | 24 V               |
| L7824AC      | L7824ACV                 |                        |      |                    |          | 24 V               |
|              |                          | L7824ACV-DG            |      |                    |          | 24 V               |

# 11 Revision history

**Table 27. Document revision history**

| Date        | Revision | Changes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 21-Jun-2004 | 12       | Document updating.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 03-Aug-2006 | 13       | Order codes has been updated and new template.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 19-Jan-2007 | 14       | D <sup>2</sup> PAK mechanical data has been updated and add footprint data.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 31-May-2007 | 15       | Order codes has been updated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 29-Aug-2007 | 16       | Added <a href="#">Table 1</a> in cover page.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 11-Dec-2007 | 17       | Modified: <a href="#">Table 26</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 06-Feb-2008 | 18       | Added: TO-220 mechanical data <a href="#">Figure 38 on page 38</a> , <a href="#">Figure 39 on page 39</a> , and <a href="#">Table 23 on page 37</a> . Modified: <a href="#">Table 26 on page 55</a> .                                                                                                                                                                                                                                                                                                                                                                     |
| 18-Mar-2008 | 19       | Added: <a href="#">Table 29: DPAK mechanical data on page 50</a> , <a href="#">Table 30: Tape and reel DPAK mechanical data on page 52</a> . Modified: <a href="#">Table 26 on page 55</a> .                                                                                                                                                                                                                                                                                                                                                                              |
| 26-Jan-2010 | 20       | Modified <a href="#">Table 1 on page 1</a> and <a href="#">Table 23 on page 37</a> , added: <a href="#">Figure 38 on page 38</a> and <a href="#">Figure 39 on page 39</a> , <a href="#">Figure 45 on page 52</a> and <a href="#">Figure 46 on page 52</a> .                                                                                                                                                                                                                                                                                                               |
| 04-Mar-2010 | 21       | Added notes <a href="#">Figure 38 on page 38</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 08-Sep-2010 | 22       | Modified <a href="#">Table 26 on page 55</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 23-Nov-2010 | 23       | Added: T <sub>J</sub> = 25 °C test condition in $\Delta V_O$ on <a href="#">Table 3</a> , <a href="#">4</a> , <a href="#">5</a> , <a href="#">6</a> , <a href="#">7</a> , <a href="#">8</a> and <a href="#">Table 9</a> .                                                                                                                                                                                                                                                                                                                                                 |
| 16-Sep-2011 | 24       | Modified title on page 1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 30-Nov-2011 | 25       | Added: order codes L7805CV-DG, L7806CV-DG, L7808ABV-DG, L7812CV-DG and L7815CV-DG <a href="#">Table 26 on page 55</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 08-Feb-2012 | 26       | Added: order codes L7805ACV-DG, L7805ABV-DG, L7806ABV-DG, L7808CV-DG, L7809CV-DG, L7812ACV-DG, L7818CV-DG, L7824CV-DG <a href="#">Table 26 on page 55</a> .                                                                                                                                                                                                                                                                                                                                                                                                               |
| 27-Mar-2012 | 27       | Added: order codes L7812ABV-DG, L7815ABV-DG <a href="#">Table 26 on page 55</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 27-Apr-2012 | 28       | Modified: V <sub>I</sub> = 10.4 to 23 V ==> V <sub>I</sub> = 11.4 to 23 V test conditon value<br>Line regulation <a href="#">Table 6 on page 12</a> .                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 10-May-2012 | 29       | Added: order codes L7806ACV-DG, L7808ACV-DG, L7815ACV-DG, L7824ABV-DG and L7824ACV-DG <a href="#">Table 26 on page 55</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 19-Sep-2012 | 30       | Modified load regulation units from V to mV in <a href="#">Table 3</a> to <a href="#">Table 9</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 12-Mar-2013 | 31       | Modified: V <sub>O</sub> output voltage at 25 °C min. value 14.4 V <a href="#">Table 16 on page 22</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 04-Mar-2014 | 32       | Part numbers L78xx, L78xxC, L78xxAB, L78xxAC changed to L78.<br>Removed TO-3 package.<br>Updated the description in cover page, <a href="#">Section 2: Pin configuration</a> , <a href="#">Section 3: Maximum ratings</a> , <a href="#">Section 4: Test circuits</a> , <a href="#">Section 5: Electrical characteristics</a> , <a href="#">Section 6: Application information</a> , <a href="#">Section 8: Package mechanical data</a> and <a href="#">Table 26: Order codes</a> .<br>Added <a href="#">Section 9: Packaging mechanical data</a> .<br>Minor text changes. |

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