



# L78xx, L78xxC L78xxAB, L78xxAC

## Positive voltage regulator ICs

Datasheet – production data

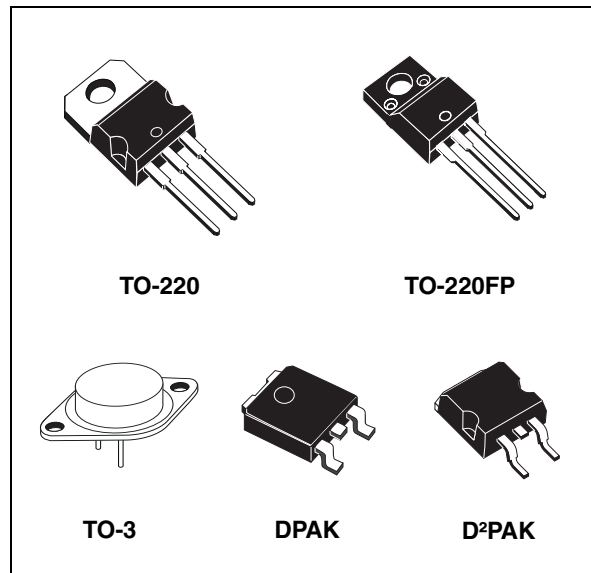
### Features

- 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)

### Description

The L78xx series of three-terminal positive regulators is available in TO-220, TO-220FP, TO-3, 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 employs 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.



**Table 1. Device summary**

| Part numbers |         |         |         |
|--------------|---------|---------|---------|
| L7805        | L7806AC | L7809AB | L7815AB |
| L7805C       | L7808C  | L7809AC | L7815AC |
| L7805AB      | L7808AB | L7812C  | L7818C  |
| L7805AC      | L7808AC | L7812AB | L7824C  |
| L7806C       | L7885C  | L7812AC | L7824AB |
| L7806AB      | L7809C  | L7815C  | L7824AC |

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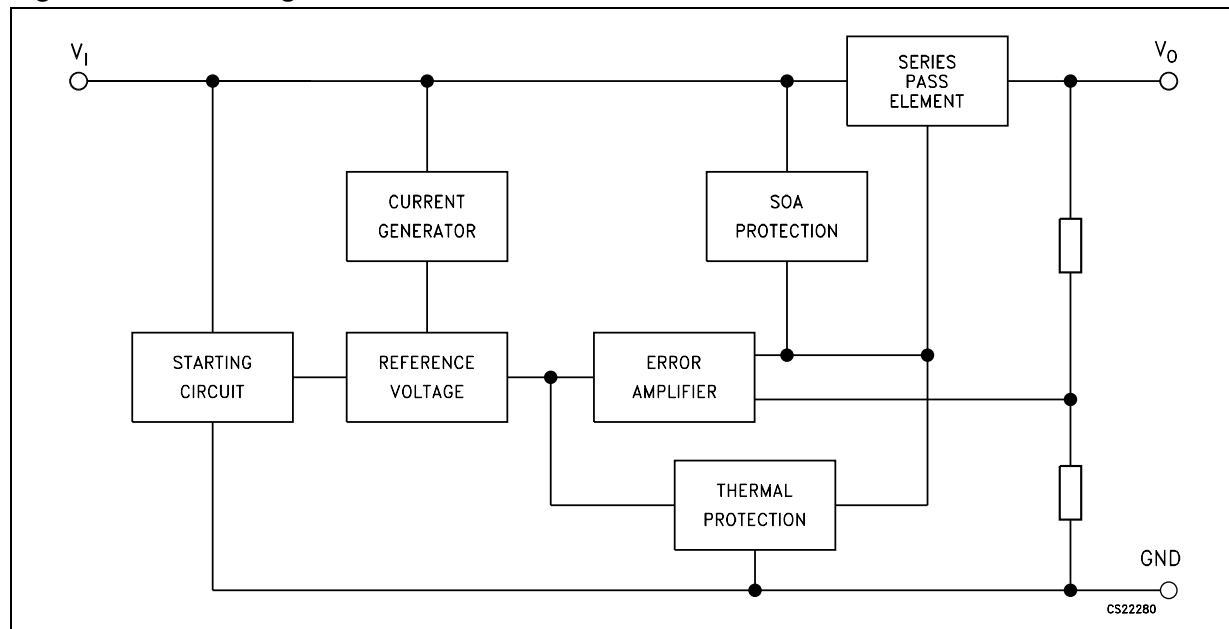
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# 1 Diagram

Figure 1. Block diagram



## 2 Pin configuration

Figure 2. Pin connections (top view)

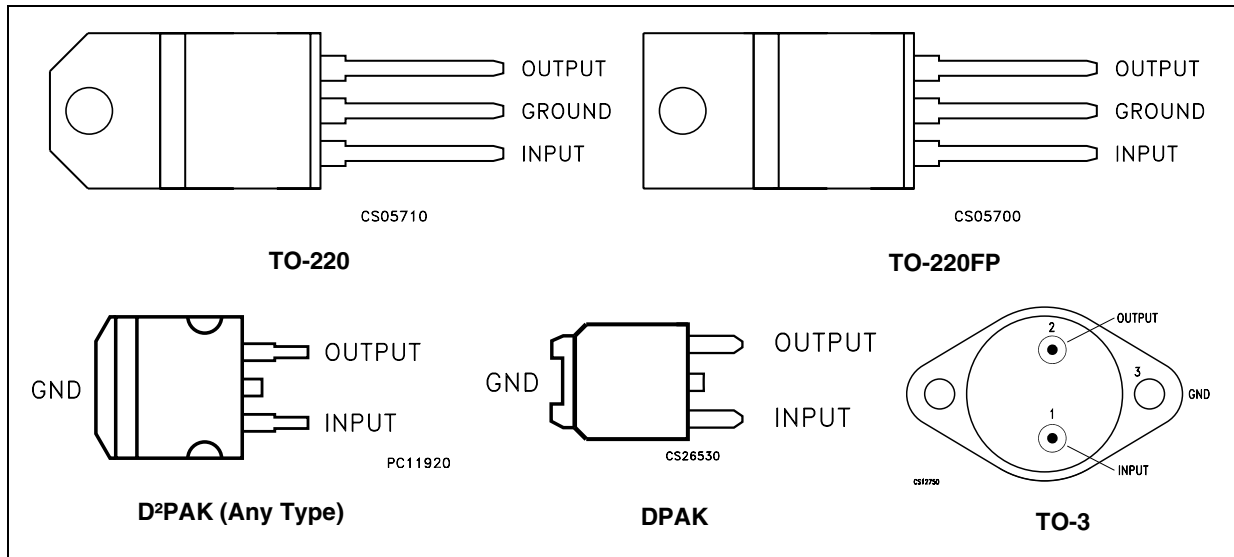
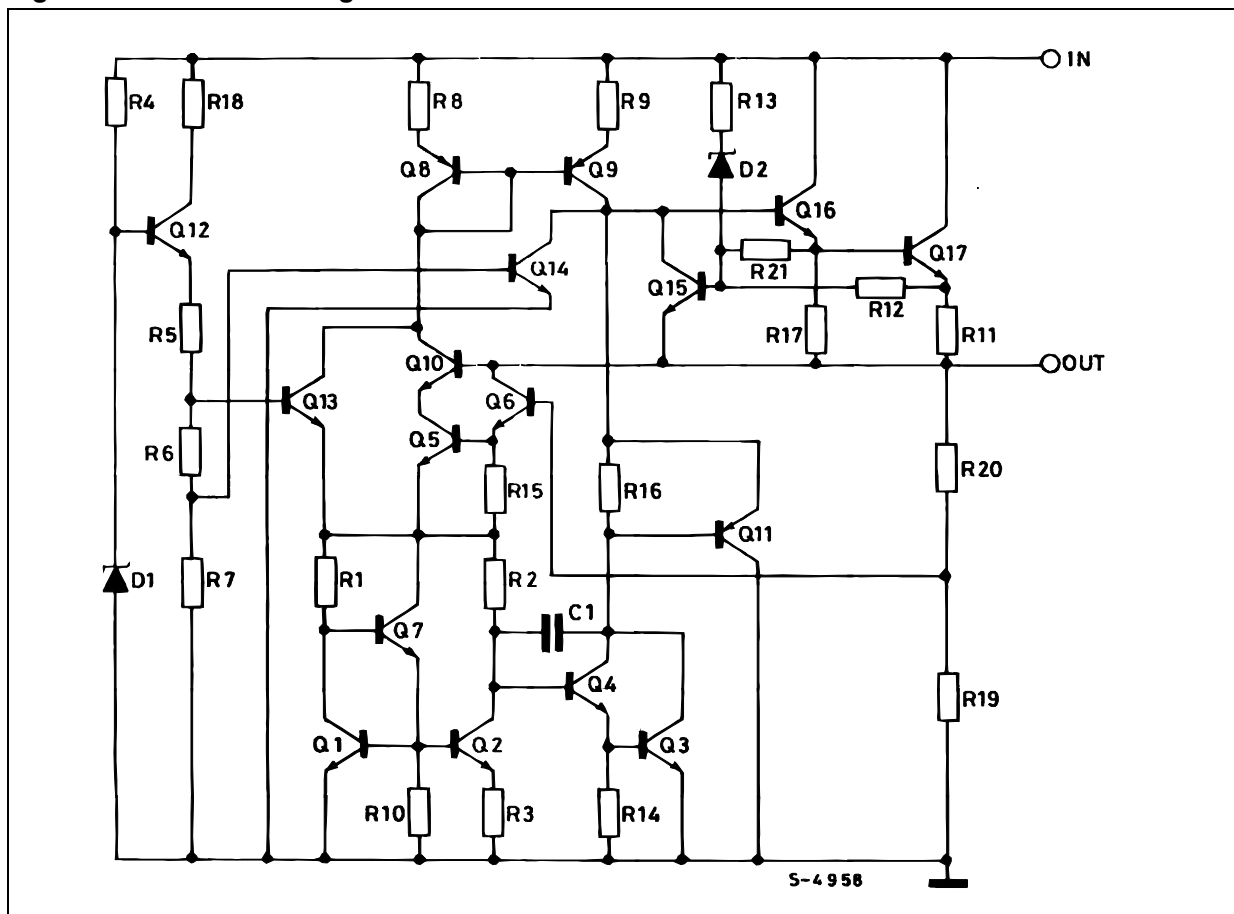


Figure 3. Schematic diagram



### 3 Maximum ratings

**Table 2. Absolute maximum ratings**

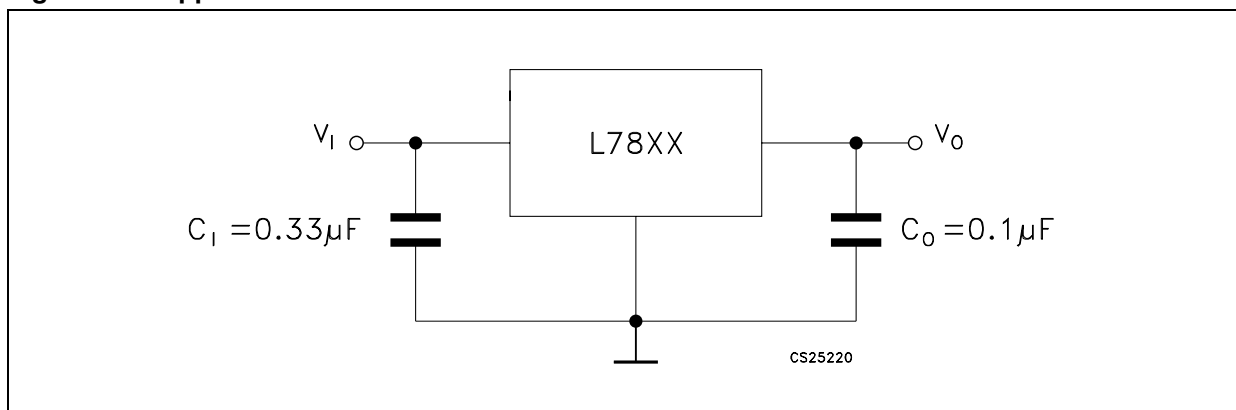
| Symbol    | Parameter                            |                         | Value              | Unit |
|-----------|--------------------------------------|-------------------------|--------------------|------|
| $V_I$     | DC input voltage                     | for $V_O = 5$ to $18$ V | 35                 | 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 L78xx               | -55 to 150         | °C   |
|           |                                      | for L78xxC, L78xxAC     | 0 to 125           |      |
|           |                                      | 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 3. Thermal data**

| Symbol     | Parameter                           | D <sup>2</sup> PAK | DPAK | TO-220 | TO-220FP | TO-3 | Unit |
|------------|-------------------------------------|--------------------|------|--------|----------|------|------|
| $R_{thJC}$ | Thermal resistance junction-case    | 3                  | 8    | 5      | 5        | 4    | °C/W |
| $R_{thJA}$ | Thermal resistance junction-ambient | 62.5               | 100  | 50     | 60       | 35   | °C/W |

**Figure 4. Application circuits**



## 4 Test circuits

Figure 5. DC parameter

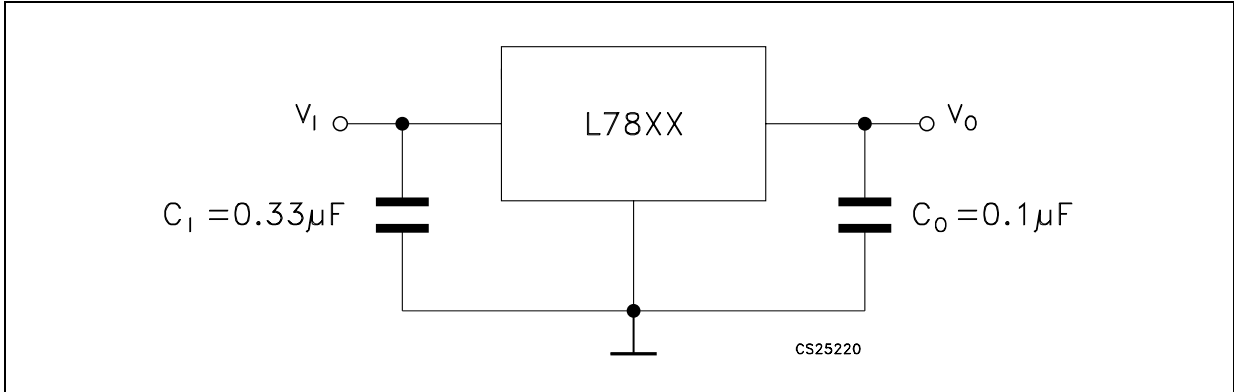


Figure 6. Load regulation

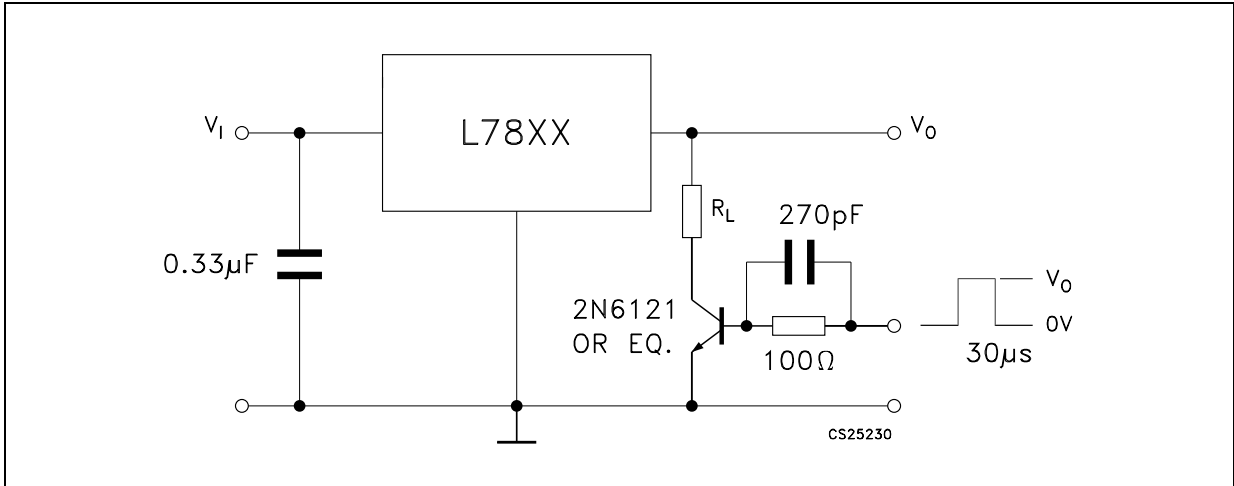
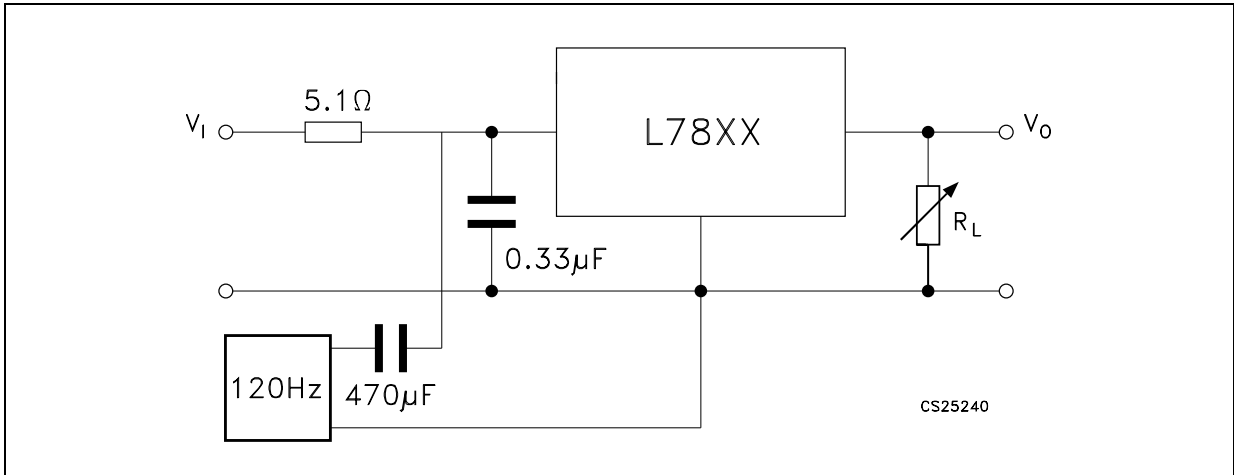


Figure 7. Ripple rejection





## 5 Electrical characteristics

Refer to the test circuits,  $T_J = -55$  to  $150$  °C,  $V_I = 10$  V,  $I_O = 500$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

**Table 4. Electrical characteristics of L7805**

| 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             | $I_O = 5$ mA to 1 A, $V_I = 8$ to 20 V          | 4.65 | 5    | 5.35 | V                 |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 7$ to 25 V, $T_J = 25^\circ\text{C}$     |      | 3    | 50   | mV                |
|                       |                            | $V_I = 8$ to 12 V, $T_J = 25^\circ\text{C}$     |      | 1    | 25   |                   |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$ |      |      | 100  | mV                |
|                       |                            | $I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$ |      |      | 25   |                   |
| $I_d$                 | Quiescent current          | $T_J = 25^\circ\text{C}$                        |      |      | 6    | mA                |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5$ mA to 1 A                             |      |      | 0.5  | mA                |
|                       |                            | $V_I = 8$ to 25 V                               |      |      | 0.8  |                   |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5$ mA                                    |      | 0.6  |      | mV/°C             |
| eN                    | Output noise voltage       | B = 10 Hz to 100 kHz, $T_J = 25^\circ\text{C}$  |      |      | 40   | $\mu\text{V}/V_O$ |
| SVR                   | Supply voltage rejection   | $V_I = 8$ to 18 V, $f = 120$ Hz                 | 68   |      |      | dB                |
| $V_d$                 | Dropout voltage            | $I_O = 1$ A, $T_J = 25^\circ\text{C}$           |      | 2    | 2.5  | V                 |
| $R_O$                 | Output resistance          | $f = 1$ kHz                                     |      | 17   |      | m $\Omega$        |
| $I_{sc}$              | Short circuit current      | $V_I = 35$ V, $T_J = 25^\circ\text{C}$          |      | 0.75 | 1.2  | A                 |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^\circ\text{C}$                        | 1.3  | 2.2  | 3.3  | 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.

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

**Table 5. 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   |      | 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 |      | 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.

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

**Table 6. 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.

$V_I = 14\text{ V}$ ,  $I_O = 1\text{ A}$ ,  $T_J = 0\text{ to }125\text{ °C}$  (L7808AC),  $T_J = -40\text{ to }125\text{ °C}$  (L7808AB), unless otherwise specified.

**Table 7. Electrical characteristics of L7808A**

| Symbol                | Parameter                  | Test conditions   | Min. | Typ. | Max. | Unit                  |
|-----------------------|----------------------------|---|------|------|------|-----------------------|
| $V_O$                 | Output voltage             | $T_J = 25\text{ °C}$  | 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             | $I_O = 1\text{ A}$ , $V_I = 21\text{ to }23\text{ V}$ , $T_J = 25\text{ °C}$          | 7.7  | 8    | 8.3  | V                     |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 10.6\text{ to }25\text{ V}$ , $I_O = 500\text{ mA}$ ,<br>$T_J = 25\text{ °C}$  |      | 12   | 80   | mV                    |
|                       |                            | $V_I = 11\text{ to }17\text{ V}$  |      | 15   | 80   | mV                    |
|                       |                            | $V_I = 11\text{ to }17\text{ V}$ , $T_J = 25\text{ °C}$                               |      | 5    | 40   | mV                    |
|                       |                            | $V_I = 10.4\text{ to }23\text{ V}$ , $T_J = 25\text{ °C}$                             |      | 12   | 80   | mV                    |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA to }1\text{ A}$   |      | 25   | 100  | mV                    |
|                       |                            | $I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25\text{ °C}$                            |      | 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   | $V_I = 11\text{ to }23\text{ V}$ , $I_O = 500\text{ mA}$                              |      |      | 0.8  | mA                    |
|                       |                            | $V_I = 10.6\text{ to }23\text{ V}$ , $T_J = 25\text{ °C}$                             |      |      | 0.8  | mA                    |
|                       |                            | $I_O = 5\text{ mA to }1\text{ A}$   |      |      | 0.5  | mA                    |
| SVR                   | Supply voltage rejection   | $V_I = 11.5\text{ to }21.5\text{ V}$ , $f = 120\text{ Hz}$ ,<br>$I_O = 500\text{ mA}$ |      | 62   |      | 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          | $f = 1\text{ kHz}$  |      | 18   |      | $\text{m}\Omega$      |
| $I_{sc}$              | 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       |   |      | -0.8 |      | $\text{mV}/\text{°C}$ |

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.

$V_I = 15\text{ V}$ ,  $I_O = 1\text{ A}$ ,  $T_J = 0\text{ to }125\text{ °C}$  (L7809AC),  $T_J = -40\text{ to }125\text{ °C}$  (L7809AB), unless otherwise specified.

**Table 8. Electrical characteristics of L7809A**

| Symbol                | Parameter                  | Test conditions   | Min. | Typ. | Max. | Unit                  |
|-----------------------|----------------------------|---|------|------|------|-----------------------|
| $V_O$                 | Output voltage             | $T_J = 25\text{ °C}$  | 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             | $I_O = 1\text{ A}$ , $V_I = 22\text{ to }24\text{ V}$ , $T_J = 25\text{ °C}$          | 8.65 | 9    | 9.35 | V                     |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 10.6\text{ to }25\text{ V}$ , $I_O = 500\text{ mA}$ ,<br>$T_J = 25\text{ °C}$  |      | 12   | 90   | mV                    |
|                       |                            | $V_I = 11\text{ to }17\text{ V}$  |      | 15   | 90   | mV                    |
|                       |                            | $V_I = 11\text{ to }17\text{ V}$ , $T_J = 25\text{ °C}$                               |      | 5    | 45   | mV                    |
|                       |                            | $V_I = 11.4\text{ to }23\text{ V}$ , $T_J = 25\text{ °C}$                             |      | 12   | 90   | mV                    |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA to }1\text{ A}$   |      | 25   | 100  | mV                    |
|                       |                            | $I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25\text{ °C}$                            |      | 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   | $V_I = 11\text{ to }25\text{ V}$ , $I_O = 500\text{ mA}$                              |      |      | 0.8  | mA                    |
|                       |                            | $V_I = 10.6\text{ to }23\text{ V}$ , $T_J = 25\text{ °C}$                             |      |      | 0.8  | mA                    |
|                       |                            | $I_O = 5\text{ mA to }1\text{ A}$   |      |      | 0.5  | mA                    |
| SVR                   | Supply voltage rejection   | $V_I = 11.5\text{ to }21.5\text{ V}$ , $f = 120\text{ Hz}$ ,<br>$I_O = 500\text{ mA}$ |      | 61   |      | 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          | $f = 1\text{ kHz}$  |      | 18   |      | $\text{m}\Omega$      |
| $I_{sc}$              | 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       |   |      | -0.8 |      | $\text{mV}/\text{°C}$ |

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.

$V_I = 19\text{ V}$ ,  $I_O = 1\text{ A}$ ,  $T_J = 0\text{ to }125\text{ °C}$  (L7812AC),  $T_J = -40\text{ to }125\text{ °C}$  (L7812AB), unless otherwise specified.

**Table 9. Electrical characteristics of L7812A**

| Symbol                | Parameter                  | Test conditions   | Min.  | Typ. | Max.  | Unit                  |
|-----------------------|----------------------------|---|-------|------|-------|-----------------------|
| $V_O$                 | Output voltage             | $T_J = 25\text{ °C}$  | 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             | $I_O = 1\text{ A}$ , $V_I = 25\text{ to }27\text{ V}$ , $T_J = 25\text{ °C}$      | 11.5  | 12   | 12.5  | V                     |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 14.8\text{ to }30\text{ V}$ , $I_O = 500\text{ mA}$ , $T_J = 25\text{ °C}$ |       | 13   | 120   | mV                    |
|                       |                            | $V_I = 16\text{ to }12\text{ V}$  |       | 16   | 120   | mV                    |
|                       |                            | $V_I = 16\text{ to }12\text{ V}$ , $T_J = 25\text{ °C}$                           |       | 6    | 60    | mV                    |
|                       |                            | $V_I = 14.5\text{ to }27\text{ V}$ , $T_J = 25\text{ °C}$                         |       | 13   | 120   | mV                    |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA to }1\text{ A}$   |       | 25   | 100   | mV                    |
|                       |                            | $I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25\text{ °C}$                        |       | 30   | 100   |                       |
|                       |                            | $I_O = 250\text{ to }750\text{ mA}$   |       | 10   | 50    |                       |
| $I_q$                 | Quiescent current          | $T_J = 25\text{ °C}$  |       | 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                    |
|                       |                            | $V_I = 14.8\text{ to }27\text{ V}$ , $T_J = 25\text{ °C}$                         |       |      | 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            | $I_O = 1\text{ A}$ , $T_J = 25\text{ °C}$   |       | 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          | $f = 1\text{ kHz}$  |       | 18   |       | $\text{m}\Omega$      |
| $I_{sc}$              | 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   |       | $\text{mV}/\text{°C}$ |

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.

$V_I = 23\text{ V}$ ,  $I_O = 1\text{ A}$ ,  $T_J = 0\text{ to }125\text{ °C}$  (L7815AC),  $T_J = -40\text{ to }125\text{ °C}$  (L7815AB), unless otherwise specified.

**Table 10. Electrical characteristics of L7815A**

| Symbol                | Parameter                  | Test conditions   | Min. | Typ. | Max. | Unit                  |
|-----------------------|----------------------------|---|------|------|------|-----------------------|
| $V_O$                 | Output voltage             | $T_J = 25\text{ °C}$  | 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             | $I_O = 1\text{ A}$ , $V_I = 28\text{ to }30\text{ V}$ , $T_J = 25\text{ °C}$          | 14.4 | 15   | 15.6 | V                     |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 17.9\text{ to }30\text{ V}$ , $I_O = 500\text{ mA}$ ,<br>$T_J = 25\text{ °C}$  |      | 13   | 150  | mV                    |
|                       |                            | $V_I = 20\text{ to }26\text{ V}$  |      | 16   | 150  | mV                    |
|                       |                            | $V_I = 20\text{ to }26\text{ V}$ , $T_J = 25\text{ °C}$                               |      | 6    | 75   | mV                    |
|                       |                            | $V_I = 17.5\text{ to }30\text{ V}$ , $T_J = 25\text{ °C}$                             |      | 13   | 150  | mV                    |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA to }1\text{ A}$   |      | 25   | 100  | mV                    |
|                       |                            | $I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25\text{ °C}$                            |      | 30   | 100  |                       |
|                       |                            | $I_O = 250\text{ to }750\text{ mA}$   |      | 10   | 50   |                       |
| $I_q$                 | Quiescent current          | $T_J = 25\text{ °C}$  |      | 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                    |
|                       |                            | $V_I = 17.5\text{ to }30\text{ V}$ , $T_J = 25\text{ °C}$                             |      |      | 0.8  | mA                    |
|                       |                            | $I_O = 5\text{ mA to }1\text{ A}$   |      |      | 0.5  | mA                    |
| SVR                   | Supply voltage rejection   | $V_I = 18.5\text{ to }28.5\text{ V}$ , $f = 120\text{ Hz}$ ,<br>$I_O = 500\text{ mA}$ |      | 58   |      | 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          | $f = 1\text{ kHz}$  |      | 19   |      | $\text{m}\Omega$      |
| $I_{sc}$              | 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   |      | $\text{mV}/\text{°C}$ |

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.

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

**Table 11. 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.



Refer to the test circuits,  $T_J = 0$  to  $125$  °C,  $V_I = 10$  V,  $I_O = 500$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

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

Refer to the test circuits,  $T_J = 0$  to  $125$  °C,  $V_I = 11$  V,  $I_O = 500$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

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

Refer to the test circuits,  $T_J = 0$  to  $125$  °C,  $V_I = 14$  V,  $I_O = 500$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

**Table 14. 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             | $I_O = 5$ mA to 1 A, $V_I = 10.5$ to 21 V                 | 7.6  | 8    | 8.4  | V                 |
| $V_O$                 | Output voltage             | $I_O = 1$ A, $V_I = 21$ to 25 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 V, $T_J = 25^\circ\text{C}$            |      |      | 160  | mV                |
|                       |                            | $V_I = 11$ to 17 V, $T_J = 25^\circ\text{C}$              |      |      | 80   |                   |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$           |      |      | 160  | mV                |
|                       |                            | $I_O = 250$ to 750 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   | $I_O = 5$ mA to 1 A                                       |      |      | 0.5  | mA                |
|                       |                            | $V_I = 10.5$ to 25 V                                      |      |      | 1    |                   |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5$ mA  |      | -0.8 |      | mV/°C             |
| eN                    | Output noise voltage       | $B = 10$ Hz to 100 kHz, $T_J = 25^\circ\text{C}$          |      | 52   |      | $\mu\text{V}/V_O$ |
| SVR                   | Supply voltage rejection   | $V_I = 11.5$ to 21.5 V, $f = 120$ Hz                      | 56   |      |      | dB                |
| $V_d$                 | Dropout voltage            | $I_O = 1$ A, $T_J = 25^\circ\text{C}$                     |      | 2    |      | V                 |
| $R_O$                 | Output resistance          | $f = 1$ kHz   |      | 16   |      | m $\Omega$        |
| $I_{sc}$              | Short circuit current      | $V_I = 35$ 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.

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

**Table 15. 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             | $I_O = 5\text{ mA to }1\text{ A}$ , $V_I = 11\text{ to }21.5\text{ V}$             | 8.1  | 8.5  | 8.9  | V                    |
| $V_O$                 | Output voltage             | $I_O = 1\text{ A}$ , $V_I = 21.5\text{ to }26\text{ V}$ , $T_J = 25^\circ\text{C}$ | 8.1  | 8.5  | 8.9  | V                    |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 11\text{ to }27\text{ V}$ , $T_J = 25^\circ\text{C}$                        |      |      | 160  | mV                   |
|                       |                            | $V_I = 11.5\text{ to }17.5\text{ V}$ , $T_J = 25^\circ\text{C}$                    |      |      | 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                   |
|                       |                            | $I_O = 250\text{ to }750\text{ mA}$ , $T_J = 25^\circ\text{C}$                     |      |      | 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                   |
|                       |                            | $V_I = 11\text{ to }26\text{ V}$   |      |      | 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   | $V_I = 12\text{ to }22\text{ V}$ , $f = 120\text{ Hz}$                             | 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.

Refer to the test circuits,  $T_J = 0$  to  $125$  °C,  $V_I = 15$  V,  $I_O = 500$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

**Table 16. 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             | $I_O = 5$ mA to 1 A, $V_I = 11.5$ to 22 V                 | 8.55 | 9    | 9.45 | V                 |
| $V_O$                 | Output voltage             | $I_O = 1$ A, $V_I = 22$ to 26 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 V, $T_J = 25^\circ\text{C}$            |      |      | 180  | mV                |
|                       |                            | $V_I = 12$ to 18 V, $T_J = 25^\circ\text{C}$              |      |      | 90   |                   |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$           |      |      | 180  | mV                |
|                       |                            | $I_O = 250$ to 750 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   | $I_O = 5$ mA to 1 A                                       |      |      | 0.5  | mA                |
|                       |                            | $V_I = 11.5$ to 26 V                                      |      |      | 1    |                   |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5$ mA  |      | -1   |      | mV/°C             |
| eN                    | Output noise voltage       | $B = 10$ Hz to 100 kHz, $T_J = 25^\circ\text{C}$          |      | 70   |      | $\mu\text{V}/V_O$ |
| SVR                   | Supply voltage rejection   | $V_I = 12$ to 23 V, $f = 120$ Hz                          | 55   |      |      | dB                |
| $V_d$                 | Dropout voltage            | $I_O = 1$ A, $T_J = 25^\circ\text{C}$                     |      | 2    |      | V                 |
| $R_O$                 | Output resistance          | $f = 1$ kHz   |      | 17   |      | m $\Omega$        |
| $I_{sc}$              | Short circuit current      | $V_I = 35$ 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.

Refer to the test circuits,  $T_J = 0$  to  $125$  °C,  $V_I = 15$  V,  $I_O = 500$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

**Table 17. Electrical characteristics of L7810C**

| Symbol                | Parameter                  | Test conditions   | Min. | Typ. | Max. | Unit              |
|-----------------------|----------------------------|---|------|------|------|-------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$                                  | 9.6  | 10   | 10.4 | V                 |
| $V_O$                 | Output voltage             | $I_O = 5$ mA to 1 A, $V_I = 12.5$ to 23 V                 | 9.5  | 10   | 10.5 | V                 |
| $V_O$                 | Output voltage             | $I_O = 1$ A, $V_I = 23$ to 26 V, $T_J = 25^\circ\text{C}$ | 9.5  | 10   | 10.5 | V                 |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 12.5$ to 26 V, $T_J = 25^\circ\text{C}$            |      |      | 200  | mV                |
|                       |                            | $V_I = 13.5$ to 19 V, $T_J = 25^\circ\text{C}$            |      |      | 100  |                   |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$           |      |      | 200  | mV                |
|                       |                            | $I_O = 250$ to 750 mA, $T_J = 25^\circ\text{C}$           |      |      | 100  |                   |
| $I_d$                 | Quiescent current          | $T_J = 25^\circ\text{C}$                                  |      |      | 8    | mA                |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5$ mA to 1 A                                       |      |      | 0.5  | mA                |
|                       |                            | $V_I = 12.5$ to 26 V                                      |      |      | 1    |                   |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5$ mA  |      | -1   |      | mV/°C             |
| eN                    | Output noise voltage       | $B = 10$ Hz to 100 kHz, $T_J = 25^\circ\text{C}$          |      | 70   |      | $\mu\text{V}/V_O$ |
| SVR                   | Supply voltage rejection   | $V_I = 13$ to 23 V, $f = 120$ Hz                          | 55   |      |      | dB                |
| $V_d$                 | Dropout voltage            | $I_O = 1$ A, $T_J = 25^\circ\text{C}$                     |      | 2    |      | V                 |
| $R_O$                 | Output resistance          | $f = 1$ kHz   |      | 17   |      | m $\Omega$        |
| $I_{sc}$              | Short circuit current      | $V_I = 35$ 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.

Refer to the test circuits,  $T_J = 0$  to  $125$  °C,  $V_I = 19$  V,  $I_O = 500$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

**Table 18. 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             | $I_O = 5$ mA to 1 A, $V_I = 14.5$ to 25 V                 | 11.4 | 12   | 12.6 | V                 |
| $V_O$                 | Output voltage             | $I_O = 1$ A, $V_I = 25$ to 27 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 V, $T_J = 25^\circ\text{C}$            |      |      | 240  | mV                |
|                       |                            | $V_I = 16$ to 22 V, $T_J = 25^\circ\text{C}$              |      |      | 120  |                   |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$           |      |      | 240  | mV                |
|                       |                            | $I_O = 250$ to 750 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   | $I_O = 5$ mA to 1 A                                       |      |      | 0.5  | mA                |
|                       |                            | $V_I = 14.5$ to 30 V                                      |      |      | 1    |                   |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5$ mA  |      | -1   |      | mV/°C             |
| eN                    | Output noise voltage       | $B = 10$ Hz to 100 kHz, $T_J = 25^\circ\text{C}$          |      | 75   |      | $\mu\text{V}/V_O$ |
| SVR                   | Supply voltage rejection   | $V_I = 15$ to 25 V, $f = 120$ Hz                          | 55   |      |      | dB                |
| $V_d$                 | Dropout voltage            | $I_O = 1$ A, $T_J = 25^\circ\text{C}$                     |      | 2    |      | V                 |
| $R_O$                 | Output resistance          | $f = 1$ kHz   |      | 18   |      | m $\Omega$        |
| $I_{sc}$              | Short circuit current      | $V_I = 35$ 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.

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

**Table 19. Electrical characteristics of L7815C**

| Symbol                | Parameter                  | Test conditions  | Min.  | Typ. | Max.  | Unit                 |
|-----------------------|----------------------------|--|-------|------|-------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$   | 14.5  | 15   | 15.6  | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ mA to }1\text{ A}$ , $V_I = 17.5\text{ to }28\text{ V}$           | 14.25 | 15   | 15.75 | V                    |
| $V_O$                 | Output voltage             | $I_O = 1\text{ A}$ , $V_I = 28\text{ to }30\text{ V}$ , $T_J = 25^\circ\text{C}$ | 14.25 | 15   | 15.75 | V                    |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 17.5\text{ to }30\text{ V}$ , $T_J = 25^\circ\text{C}$                    |       |      | 300   | mV                   |
|                       |                            | $V_I = 20\text{ to }26\text{ V}$ , $T_J = 25^\circ\text{C}$                      |       |      | 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                   |
|                       |                            | $I_O = 250\text{ to }750\text{ mA}$ , $T_J = 25^\circ\text{C}$                   |       |      | 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                   |
|                       |                            | $V_I = 17.5\text{ to }30\text{ V}$   |       |      | 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   | $V_I = 18.5\text{ to }28.5\text{ V}$ , $f = 120\text{ Hz}$                       | 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.



Refer to the test circuits,  $T_J = 0$  to  $125$  °C,  $V_I = 26$  V,  $I_O = 500$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

**Table 20. 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             | $I_O = 5$ mA to 1 A, $V_I = 21$ to 31 V                   | 17.1 | 18   | 18.9 | V                 |
| $V_O$                 | Output voltage             | $I_O = 1$ A, $V_I = 31$ to 33 V, $T_J = 25^\circ\text{C}$ | 17.1 | 18   | 18.9 | V                 |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 21$ to 33 V, $T_J = 25^\circ\text{C}$              |      |      | 360  | mV                |
|                       |                            | $V_I = 24$ to 30 V, $T_J = 25^\circ\text{C}$              |      |      | 180  |                   |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5$ mA to 1.5 A, $T_J = 25^\circ\text{C}$           |      |      | 360  | mV                |
|                       |                            | $I_O = 250$ to 750 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   | $I_O = 5$ mA to 1 A                                       |      |      | 0.5  | mA                |
|                       |                            | $V_I = 21$ to 33 V  |      |      | 1    |                   |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5$ mA  |      | -1   |      | mV/°C             |
| eN                    | Output noise voltage       | $B = 10$ Hz to 100 kHz, $T_J = 25^\circ\text{C}$          |      | 110  |      | $\mu\text{V}/V_O$ |
| SVR                   | Supply voltage rejection   | $V_I = 22$ to 32 V, $f = 120$ Hz                          | 53   |      |      | dB                |
| $V_d$                 | Dropout voltage            | $I_O = 1$ A, $T_J = 25^\circ\text{C}$                     |      | 2    |      | V                 |
| $R_O$                 | Output resistance          | $f = 1$ kHz   |      | 22   |      | m $\Omega$        |
| $I_{sc}$              | Short circuit current      | $V_I = 35$ 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.

Refer to the test circuits,  $T_J = 0$  to  $125\text{ }^\circ\text{C}$ ,  $V_I = 28\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified.

**Table 21. Electrical characteristics of L7820C**

| Symbol                | Parameter                  | Test conditions  | Min. | Typ. | Max. | Unit                 |
|-----------------------|----------------------------|--|------|------|------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25^\circ\text{C}$   | 19.2 | 20   | 20.8 | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ mA to }1\text{ A}$ , $V_I = 23\text{ to }33\text{ V}$             | 19   | 20   | 21   | V                    |
| $V_O$                 | Output voltage             | $I_O = 1\text{ A}$ , $V_I = 33\text{ to }35\text{ V}$ , $T_J = 25^\circ\text{C}$ | 19   | 20   | 21   | V                    |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 22.5\text{ to }35\text{ V}$ , $T_J = 25^\circ\text{C}$                    |      |      | 400  | mV                   |
|                       |                            | $V_I = 26\text{ to }32\text{ V}$ , $T_J = 25^\circ\text{C}$                      |      |      | 200  |                      |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5\text{ mA to }1.5\text{ A}$ , $T_J = 25^\circ\text{C}$                   |      |      | 400  | mV                   |
|                       |                            | $I_O = 250\text{ to }750\text{ mA}$ , $T_J = 25^\circ\text{C}$                   |      |      | 200  |                      |
| $I_d$                 | 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                   |
|                       |                            | $V_I = 23\text{ to }35\text{ V}$   |      |      | 1    |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$  |      | -1   |      | mV/ $^\circ\text{C}$ |
| eN                    | Output noise voltage       | $B = 10\text{ Hz to }100\text{ kHz}$ , $T_J = 25^\circ\text{C}$                  |      | 150  |      | $\mu\text{V}/V_O$    |
| SVR                   | Supply voltage rejection   | $V_I = 24\text{ to }35\text{ V}$ , $f = 120\text{ Hz}$                           | 52   |      |      | dB                   |
| $V_d$                 | Dropout voltage            | $I_O = 1\text{ A}$ , $T_J = 25^\circ\text{C}$                                    |      | 2    |      | V                    |
| $R_O$                 | Output resistance          | $f = 1\text{ kHz}$   |      | 24   |      | m $\Omega$           |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_J = 25^\circ\text{C}$                                   |      | 0.18 |      | 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.

Refer to the test circuits,  $T_J = 0$  to  $125$  °C,  $V_I = 33$  V,  $I_O = 500$  mA,  $C_I = 0.33$   $\mu$ F,  $C_O = 0.1$   $\mu$ F unless otherwise specified.

**Table 22. 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             | $I_O = 5$ mA to $1$ A, $V_I = 27$ to $37$ V                 | 22.8 | 24   | 25.2 | V                 |
| $V_O$                 | Output voltage             | $I_O = 1$ A, $V_I = 37$ to $38$ V, $T_J = 25^\circ\text{C}$ | 22.8 | 24   | 25.2 | V                 |
| $\Delta V_O^{(1)}$    | Line regulation            | $V_I = 27$ to $38$ V, $T_J = 25^\circ\text{C}$              |      |      | 480  | mV                |
|                       |                            | $V_I = 30$ to $36$ V, $T_J = 25^\circ\text{C}$              |      |      | 240  |                   |
| $\Delta V_O^{(1)}$    | Load regulation            | $I_O = 5$ mA to $1.5$ A, $T_J = 25^\circ\text{C}$           |      |      | 480  | mV                |
|                       |                            | $I_O = 250$ to $750$ 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   | $I_O = 5$ mA to $1$ A                                       |      |      | 0.5  | mA                |
|                       |                            | $V_I = 27$ to $38$ V  |      |      | 1    |                   |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5$ mA  |      | -1.5 |      | mV/°C             |
| eN                    | Output noise voltage       | $B = 10$ Hz to $100$ kHz, $T_J = 25^\circ\text{C}$          |      | 170  |      | $\mu\text{V}/V_O$ |
| SVR                   | Supply voltage rejection   | $V_I = 28$ to $38$ V, $f = 120$ Hz                          | 50   |      |      | dB                |
| $V_d$                 | Dropout voltage            | $I_O = 1$ A, $T_J = 25^\circ\text{C}$                       |      | 2    |      | V                 |
| $R_O$                 | Output resistance          | $f = 1$ kHz   |      | 28   |      | m $\Omega$        |
| $I_{sc}$              | Short circuit current      | $V_I = 35$ 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.

## 6 Application information

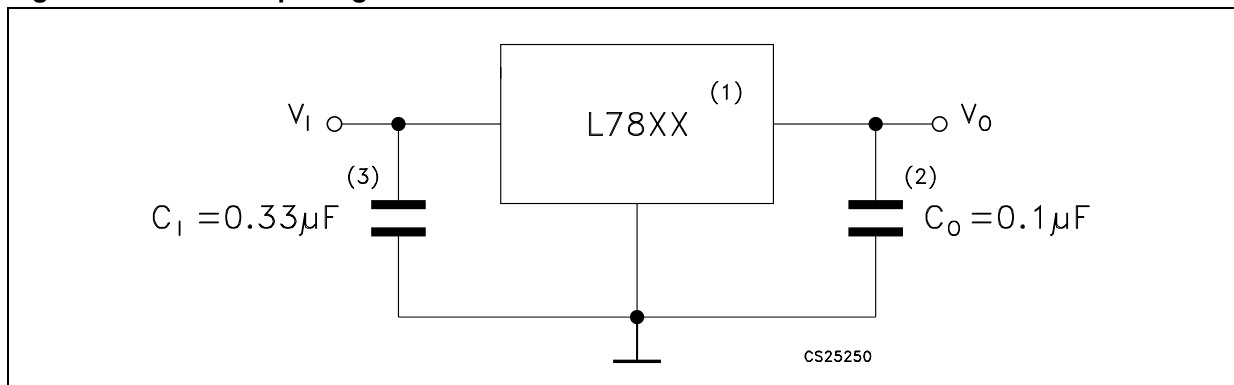
### 6.1 Design consideration

The L78xx 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. To specify an output voltage, substitute voltage value for "XX".
2. Although no output capacitor is need for stability, it does improve transient response.
3. Required if regulator is locate an appreciable distance from power supply filter.

Figure 9. Current regulator

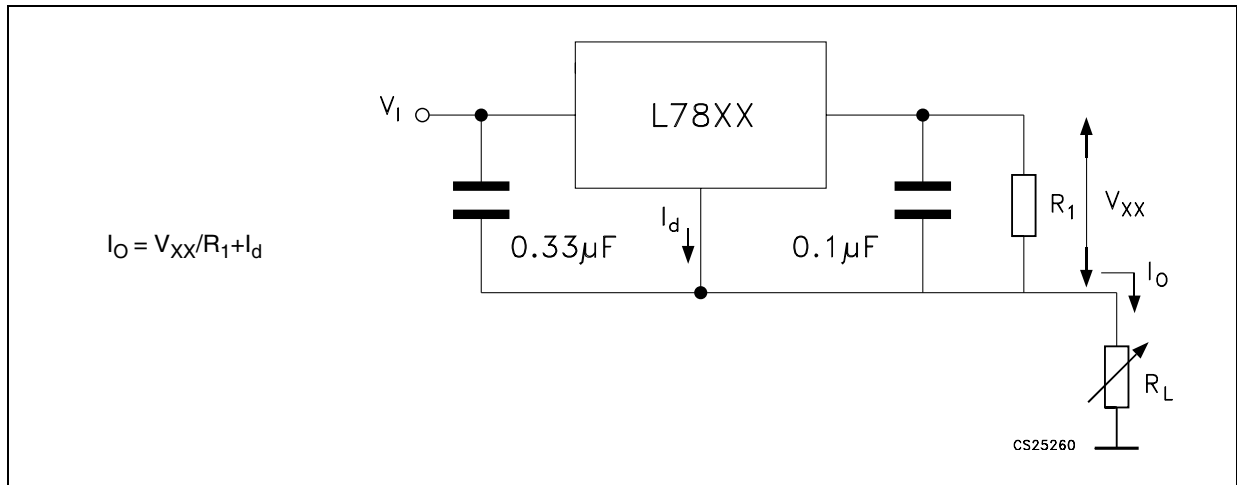


Figure 10. Circuit for increasing output voltage

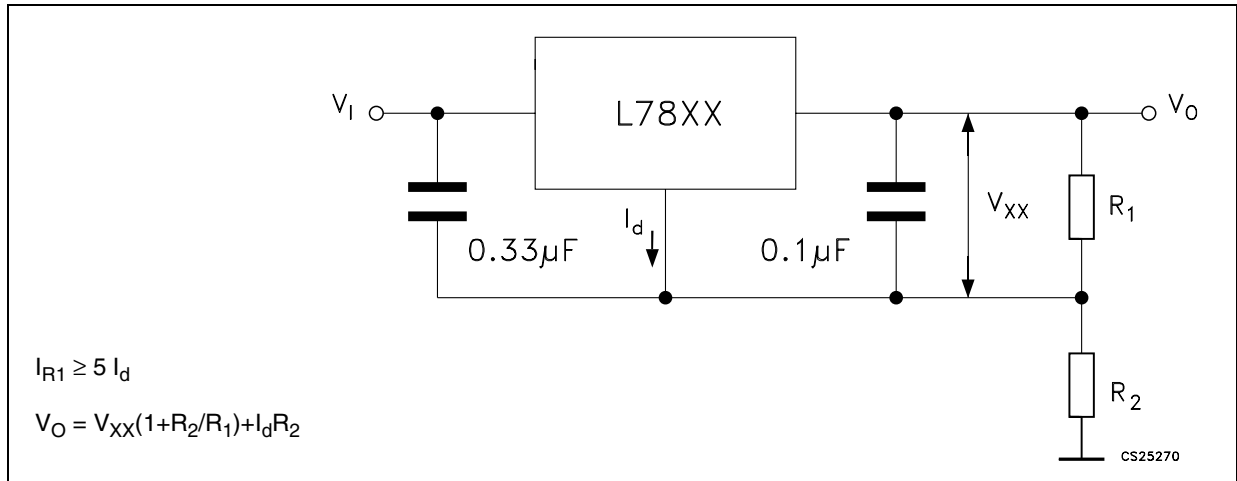


Figure 11. Adjustable output regulator (7 to 30 V)

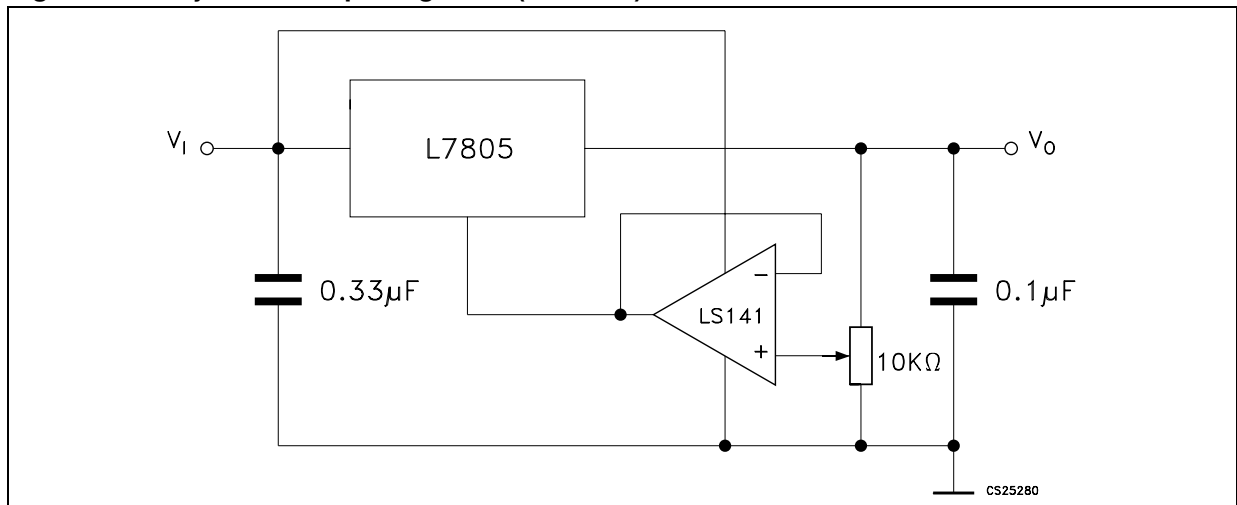


Figure 12. 0.5 to 10 V regulator

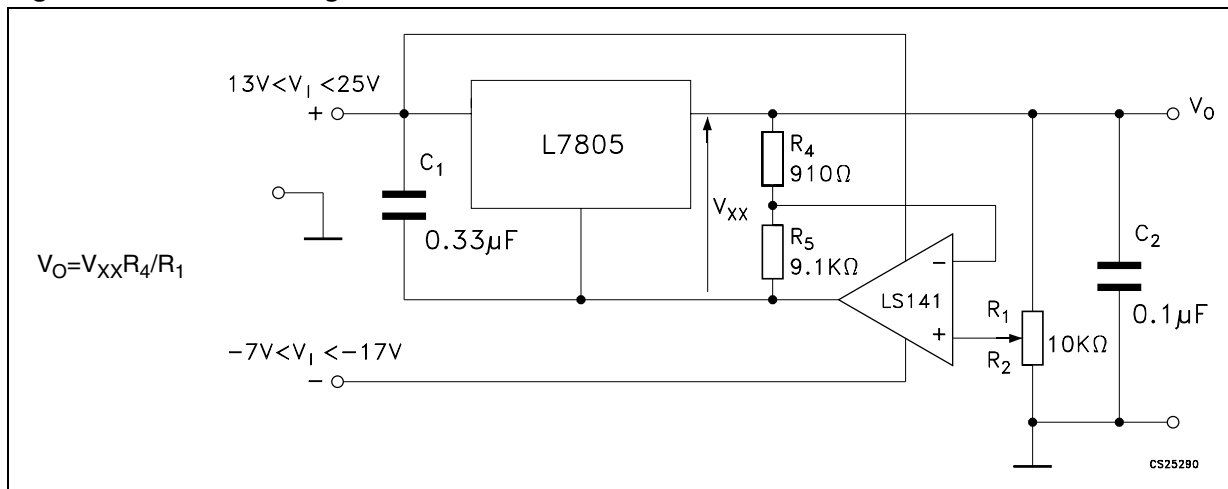


Figure 13. High current voltage regulator

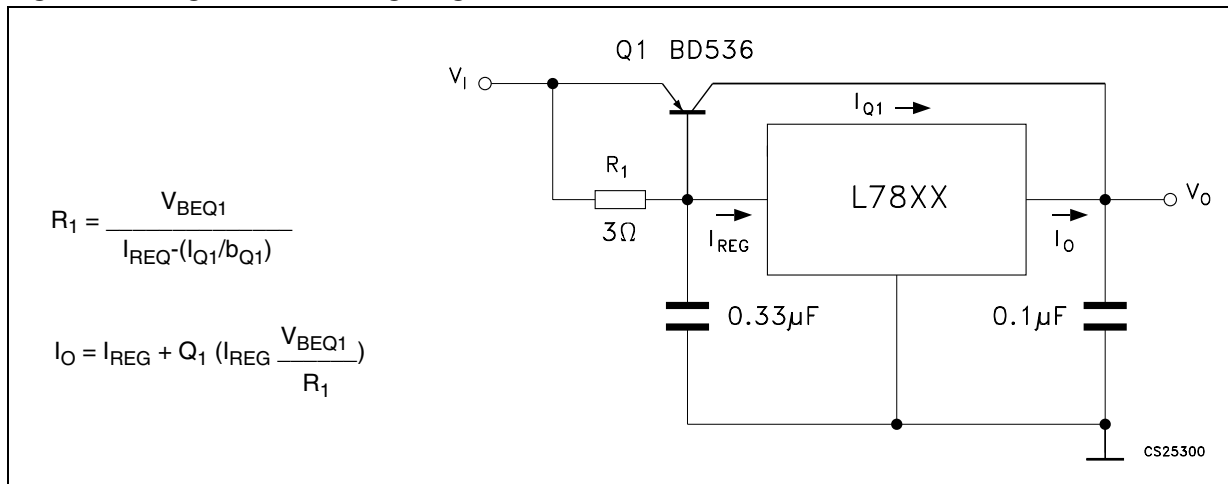


Figure 14. High output current with short circuit protection

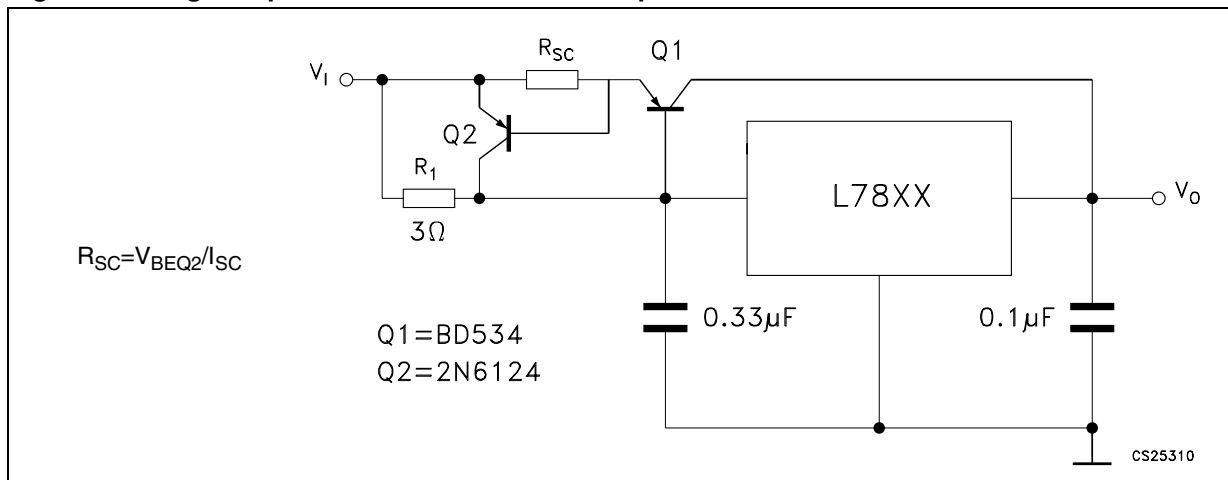


Figure 15. Tracking voltage regulator

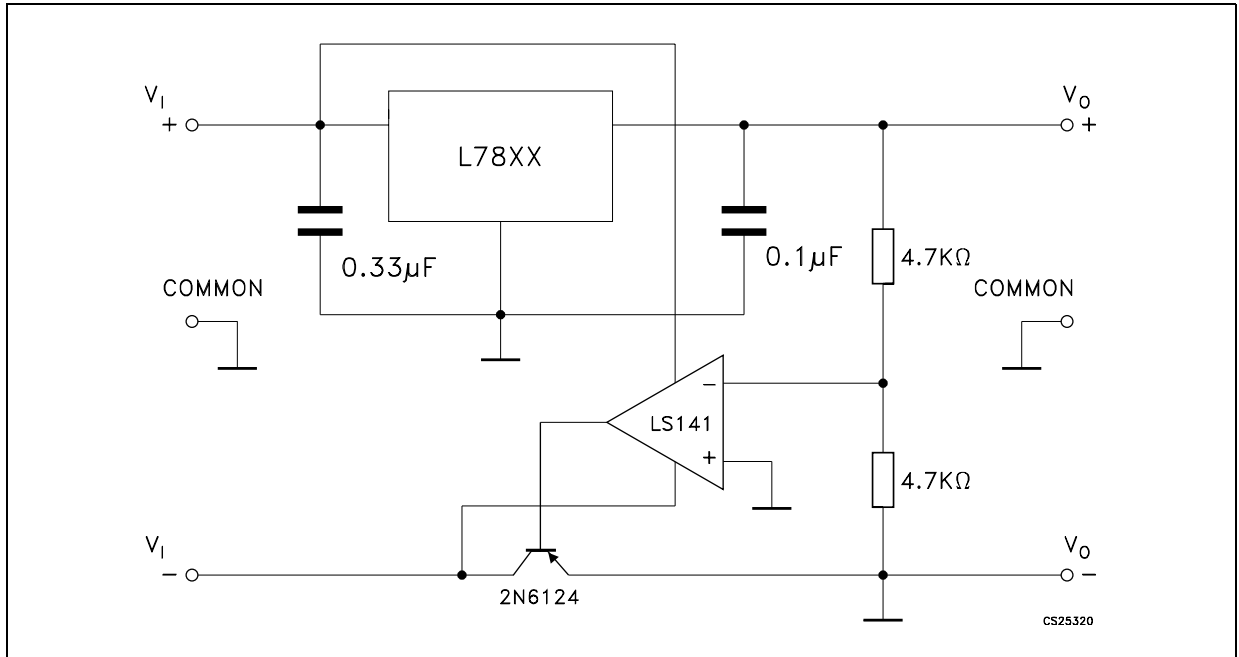
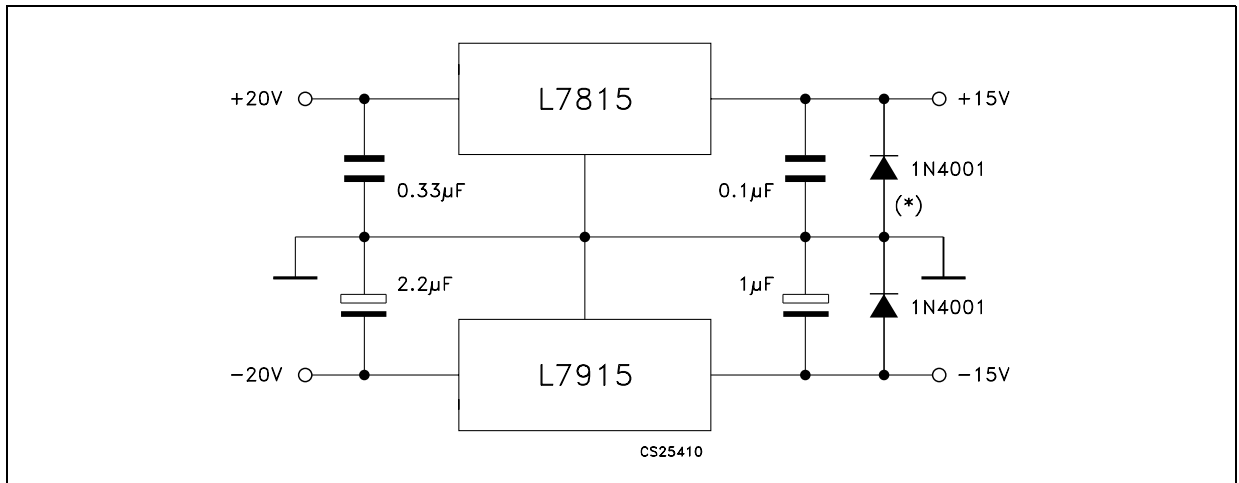


Figure 16. Split power supply ( $\pm 15\text{ V} - 1\text{ A}$ )



\* Against potential latch-up problems.

Figure 17. Negative output voltage circuit

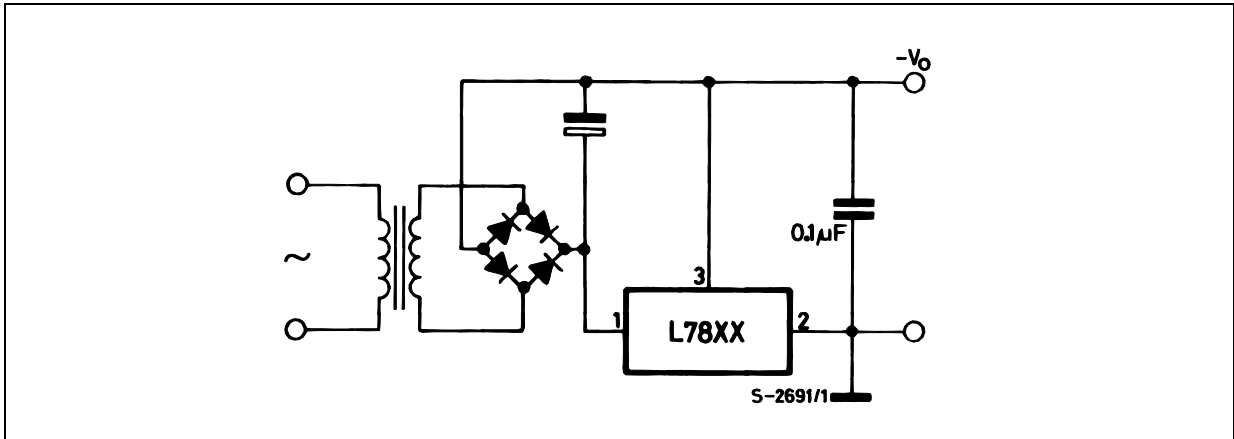


Figure 18. Switching regulator

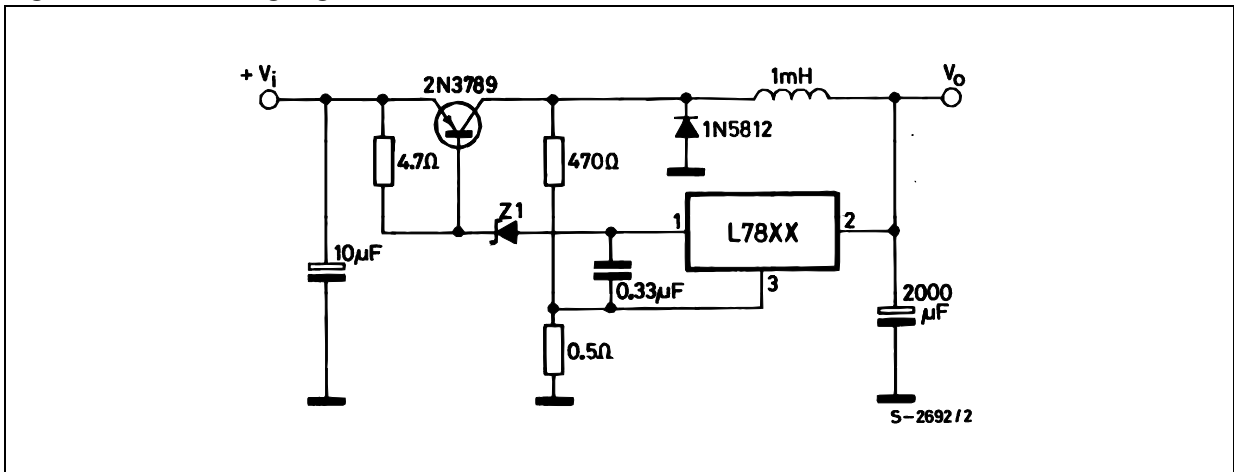


Figure 19. High input voltage circuit (configuration 1)

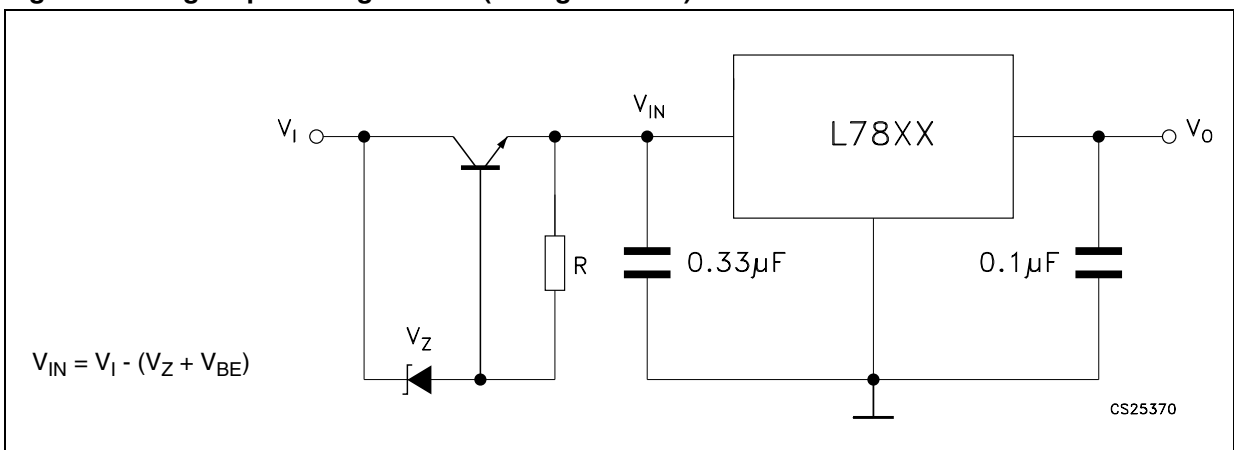




Figure 20. High input voltage circuit (configuration 2)

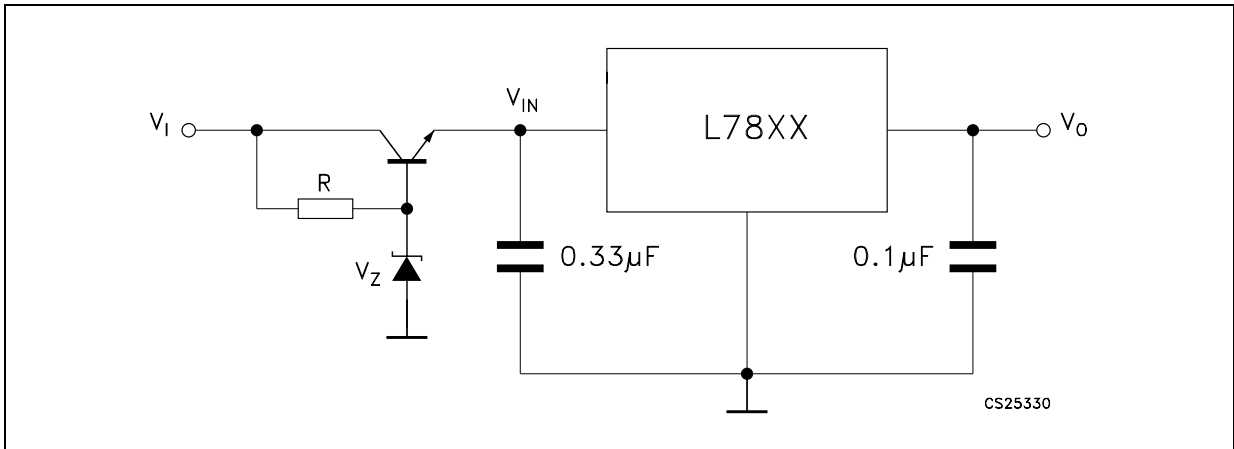


Figure 21. High output voltage regulator

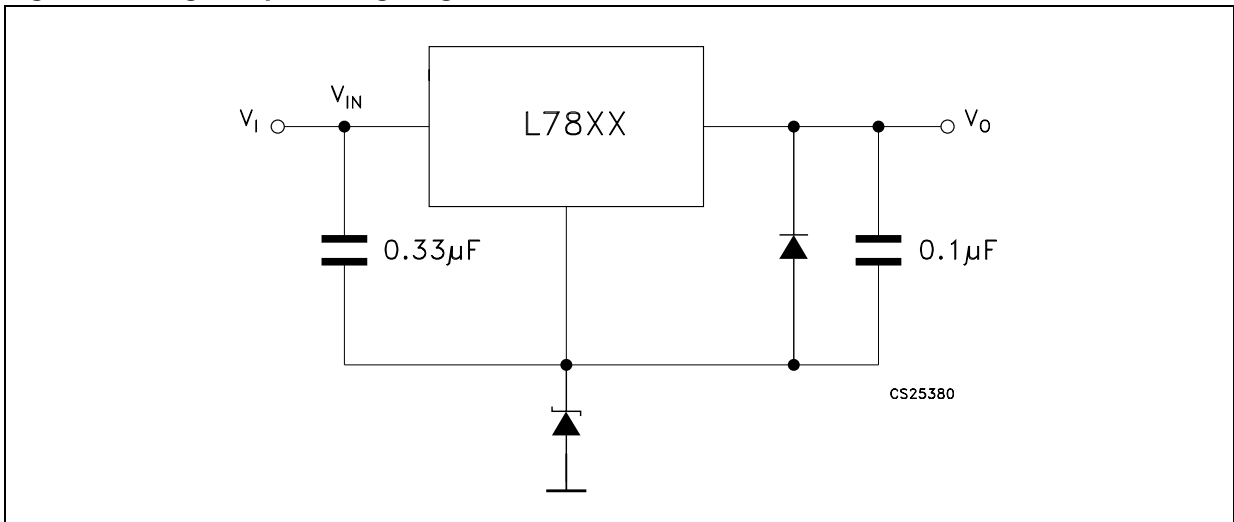


Figure 22. High input and output voltage

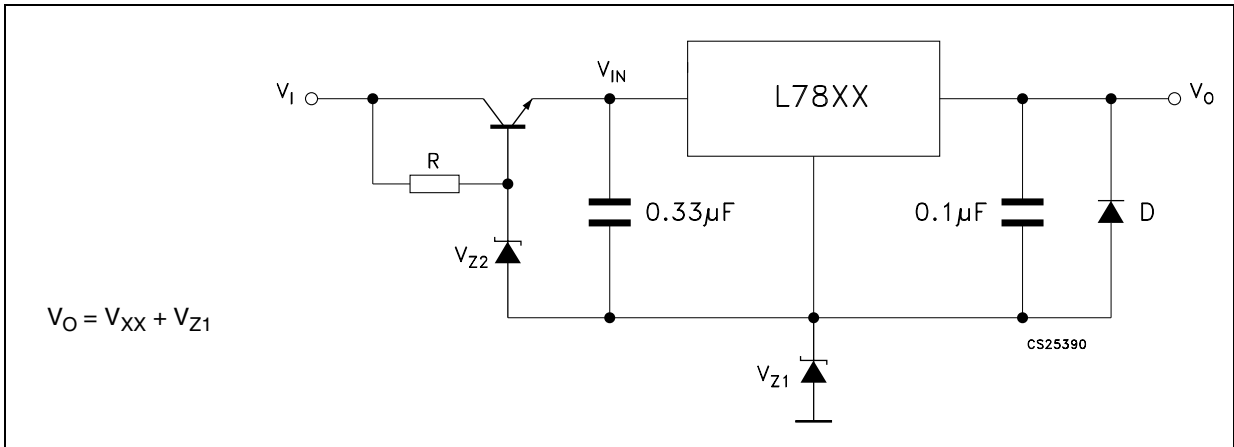


Figure 23. Reducing power dissipation with dropping resistor

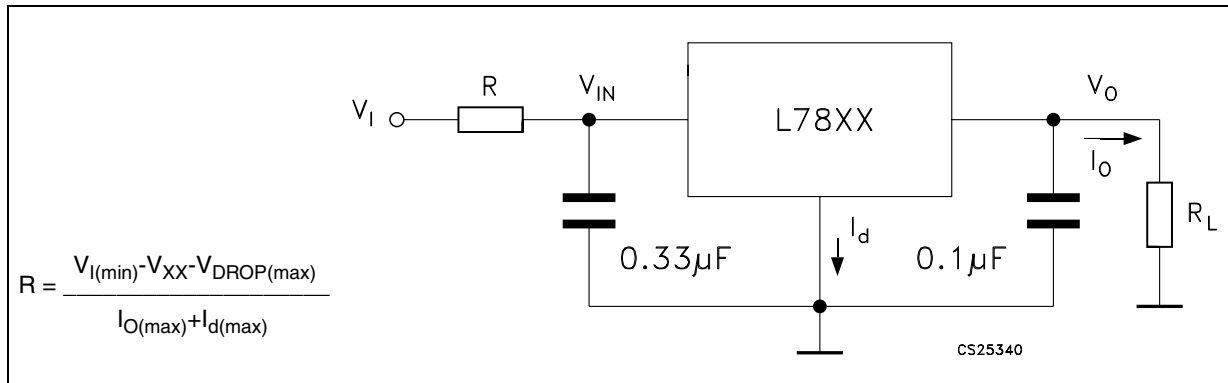


Figure 24. Remote shutdown

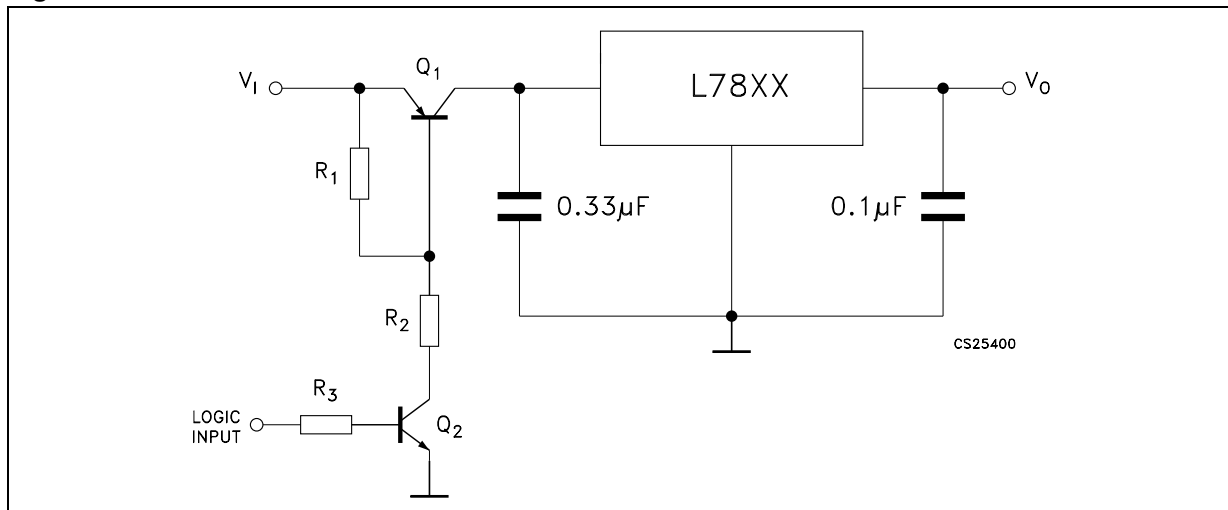
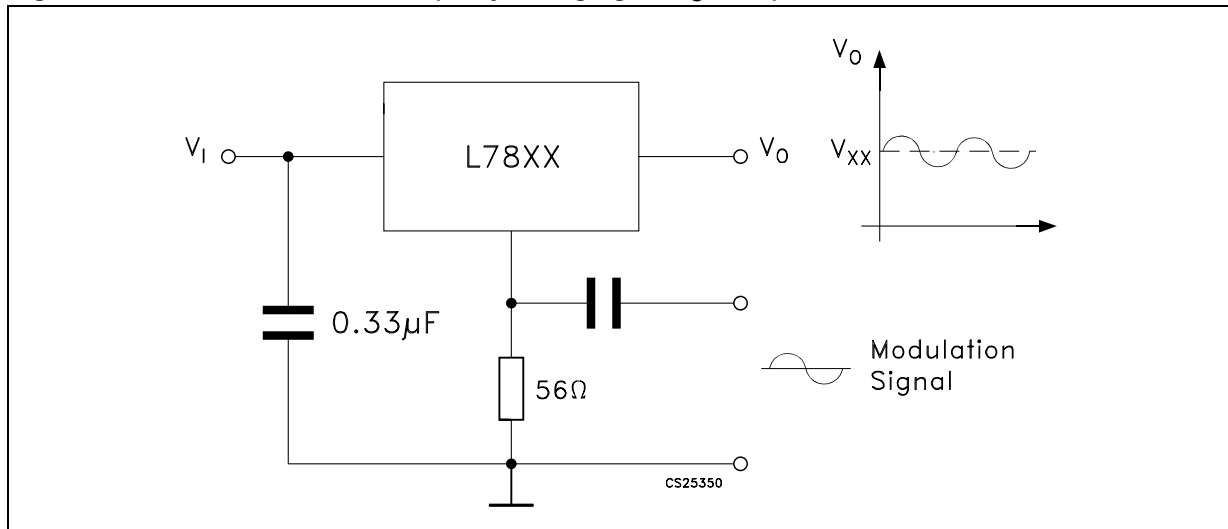
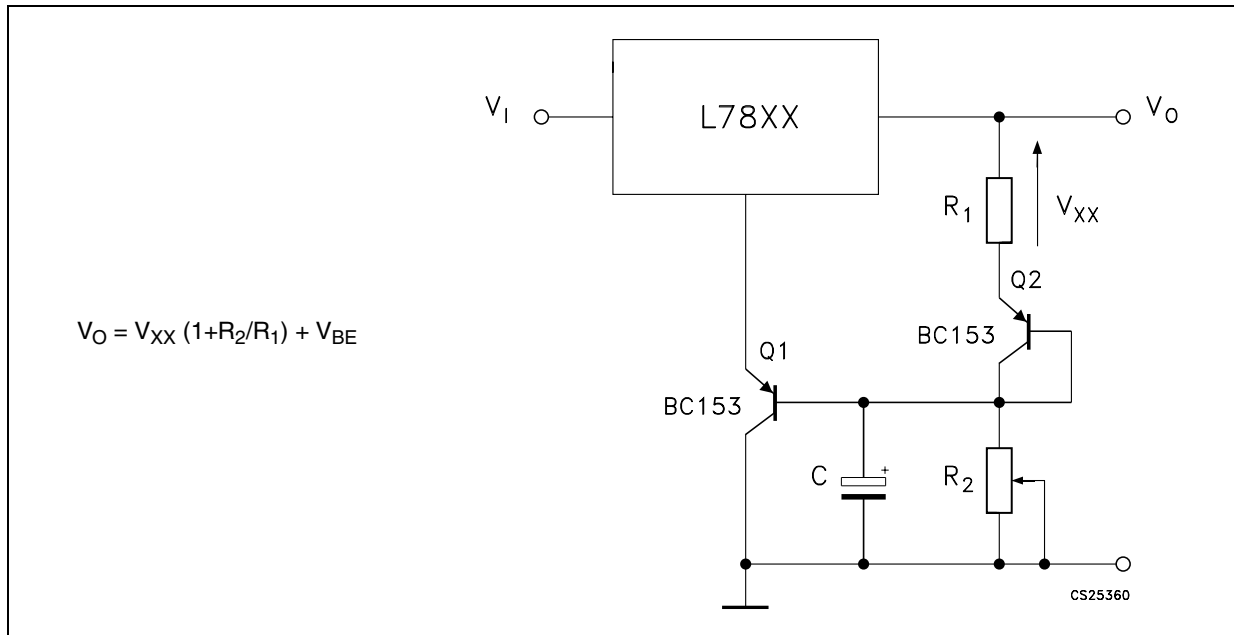


Figure 25. Power AM modulator (unity voltage gain,  $I_O \leq 0.5$ )



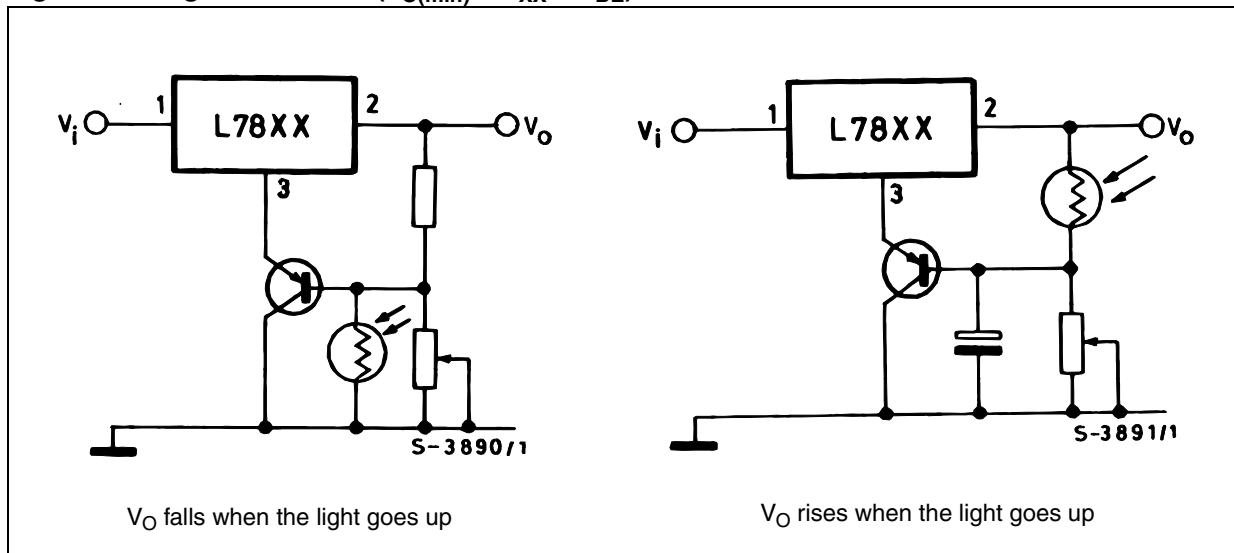
Note: The circuit performs well up to 100 kHz.

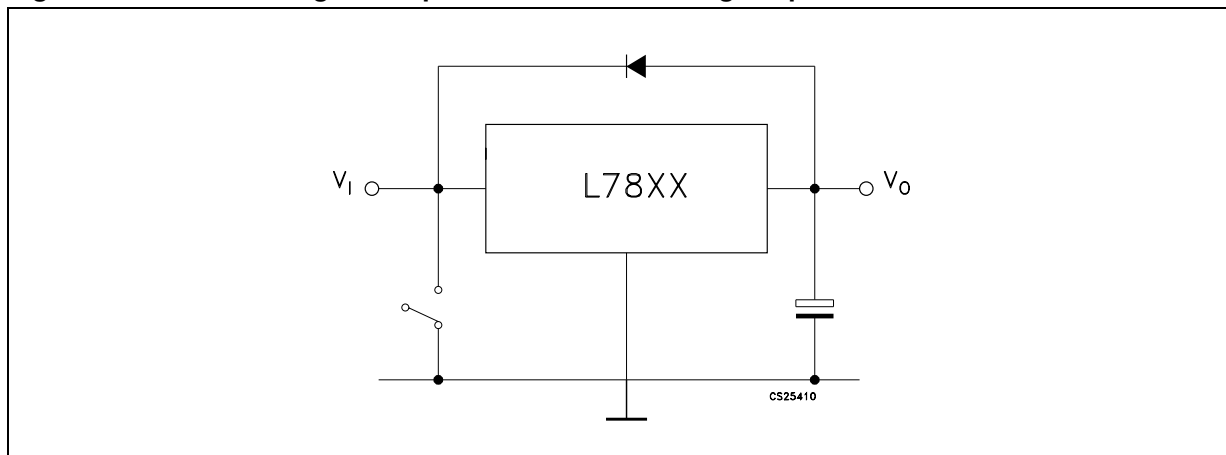
Figure 26. Adjustable output voltage with temperature compensation



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



**Figure 28. 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 23 on page 34](#)) 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 29. Dropout voltage vs. junction temperature

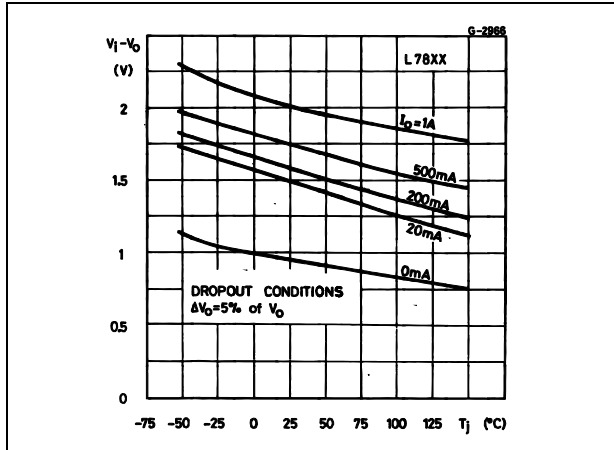


Figure 30. Peak output current vs. input/output differential voltage

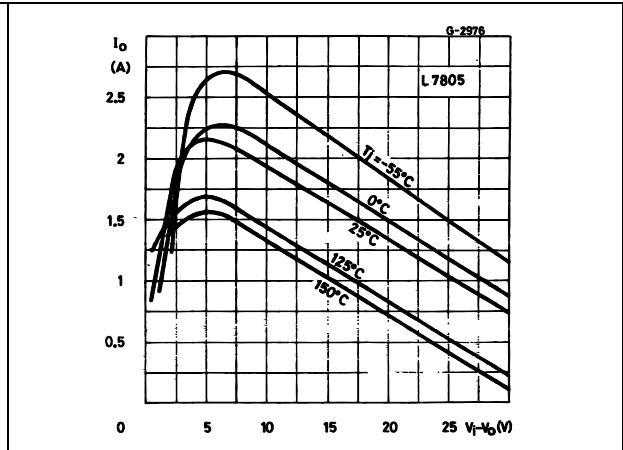


Figure 31. Supply voltage rejection vs. frequency

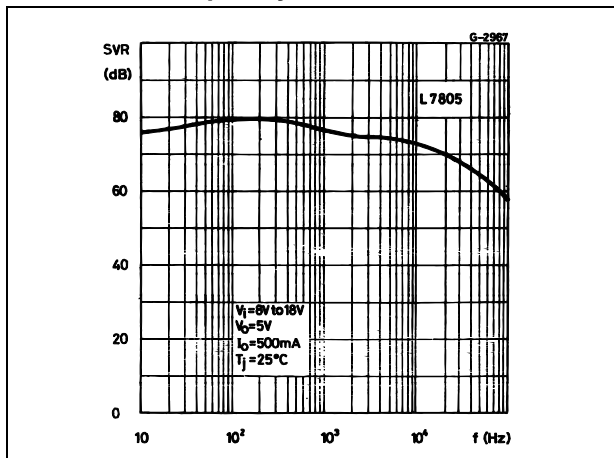


Figure 32. Output voltage vs. junction temperature

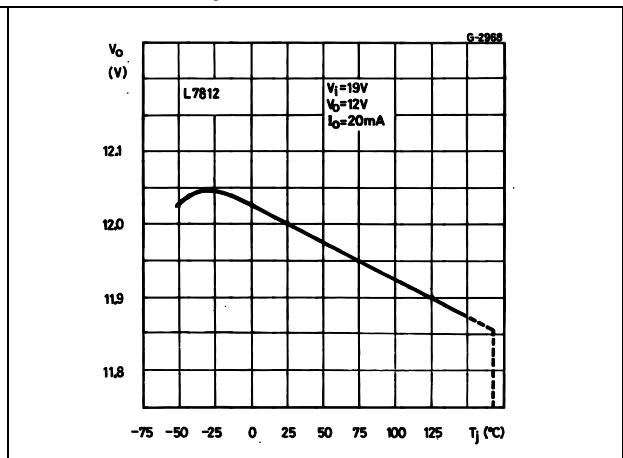


Figure 33. Output impedance vs. frequency

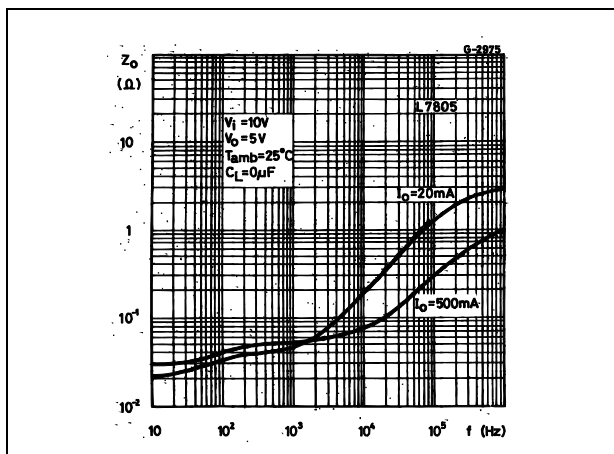


Figure 34. Quiescent current vs. junction temp.

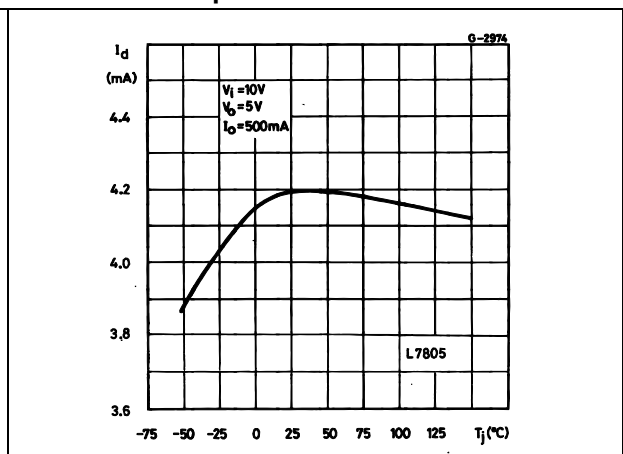


Figure 35. Load transient response

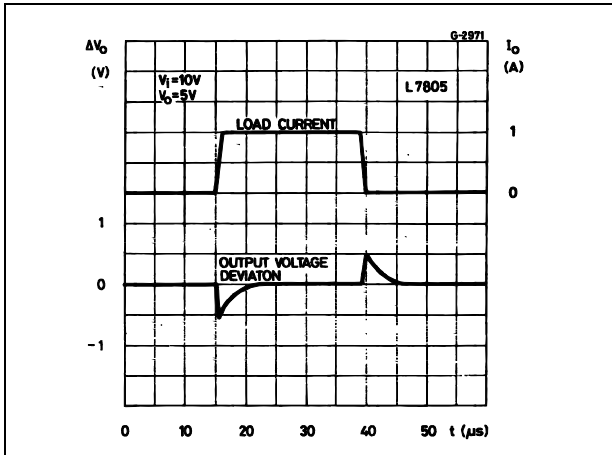


Figure 36. Line transient response

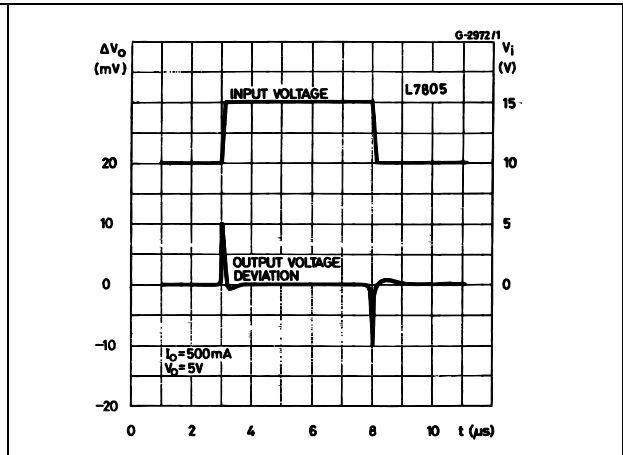
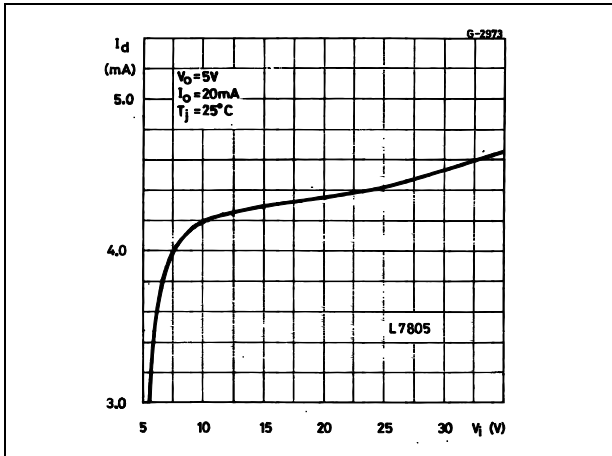


Figure 37. Quiescent current vs. input voltage



## 8 Package mechanical data

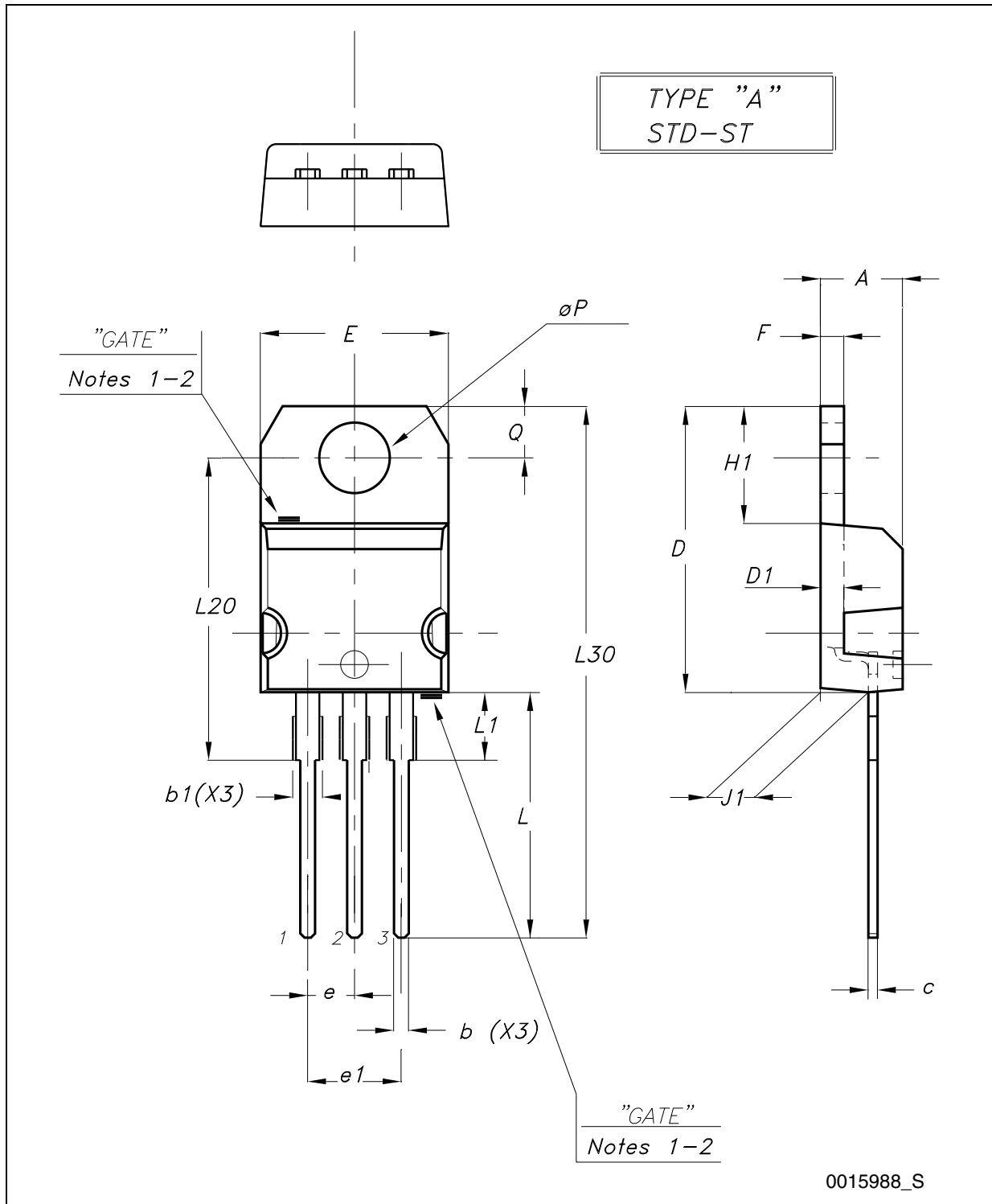
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.

**Table 23. TO-220 mechanical data**

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

*In spite of some difference in tolerances, the packages are compatible.*

Figure 38. Drawing dimension TO-220 (type STD-ST Dual Gauge)



- Note: 1 Maximum resin gate protrusion: 0.5 mm.  
 2 Resin gate position is accepted in each of the two positions shown on the drawing, or their symmetrical.



Figure 39. Drawing dimension TO-220 (type STD-ST Single Gauge)

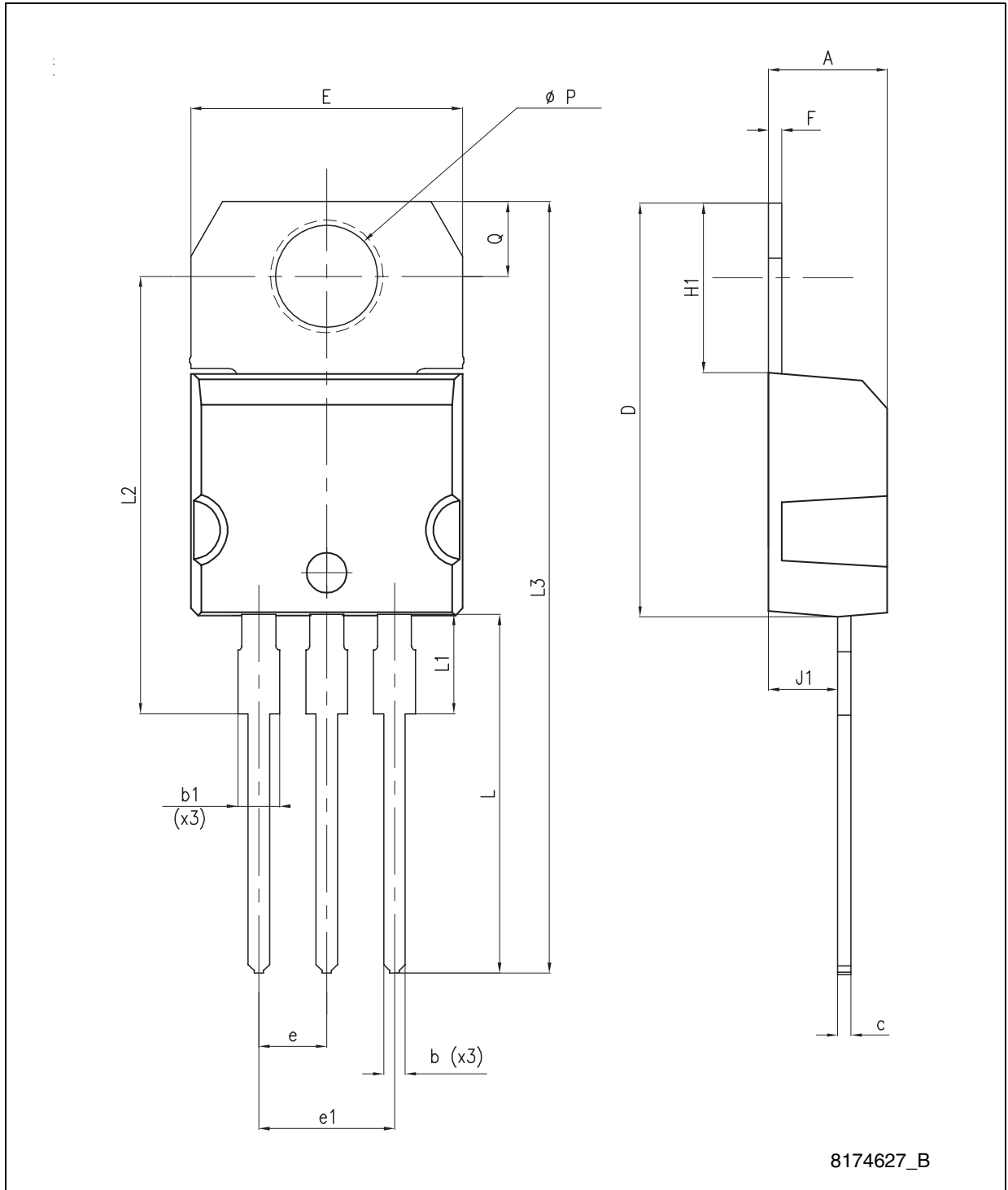


Figure 40. Drawing dimension tube for TO-220 Dual Gauge (mm.)

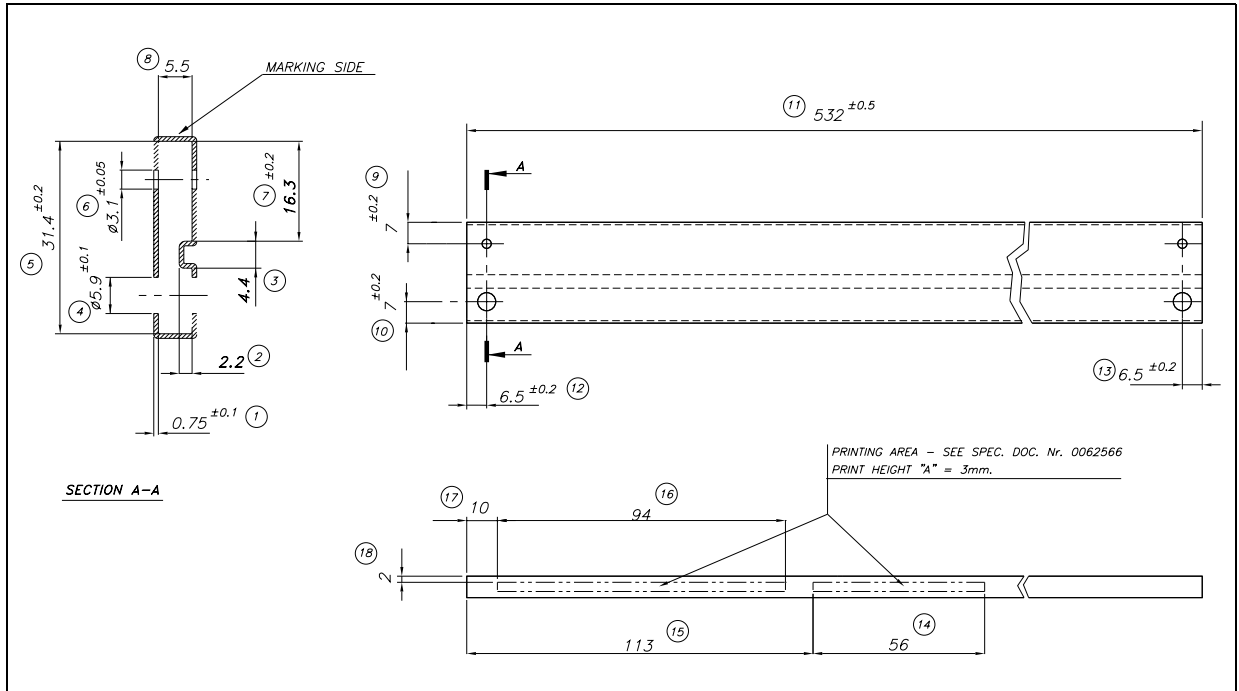


Figure 41. Drawing dimension tube for TO-220 Single Gauge (mm.)

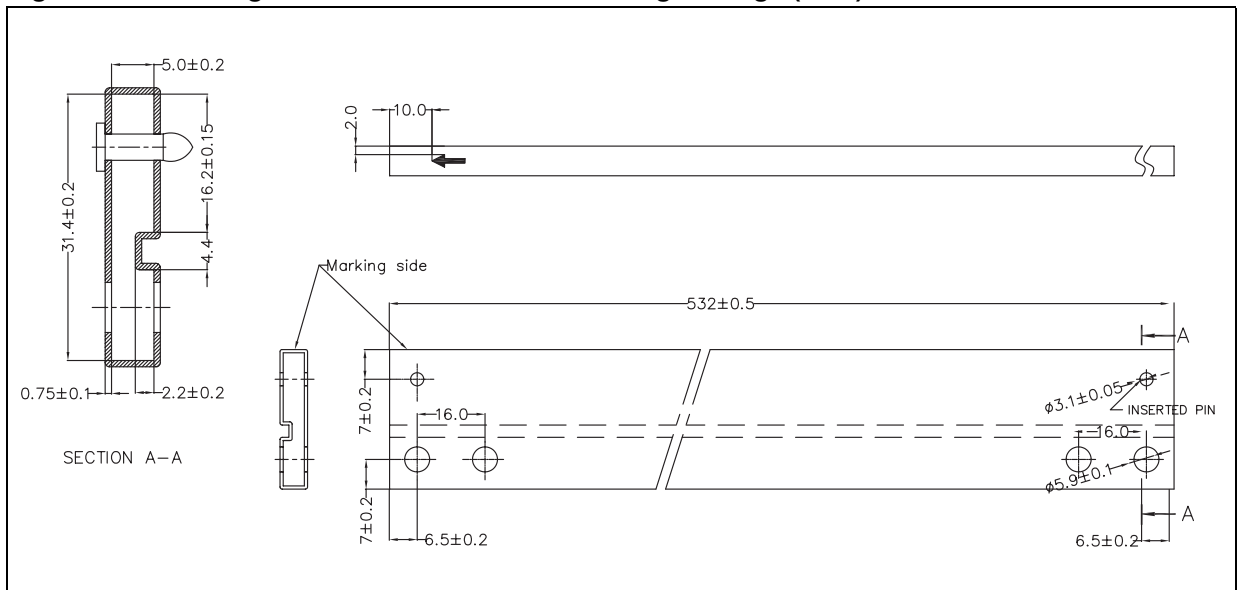


Figure 42. Drawing dimension TO-220FP

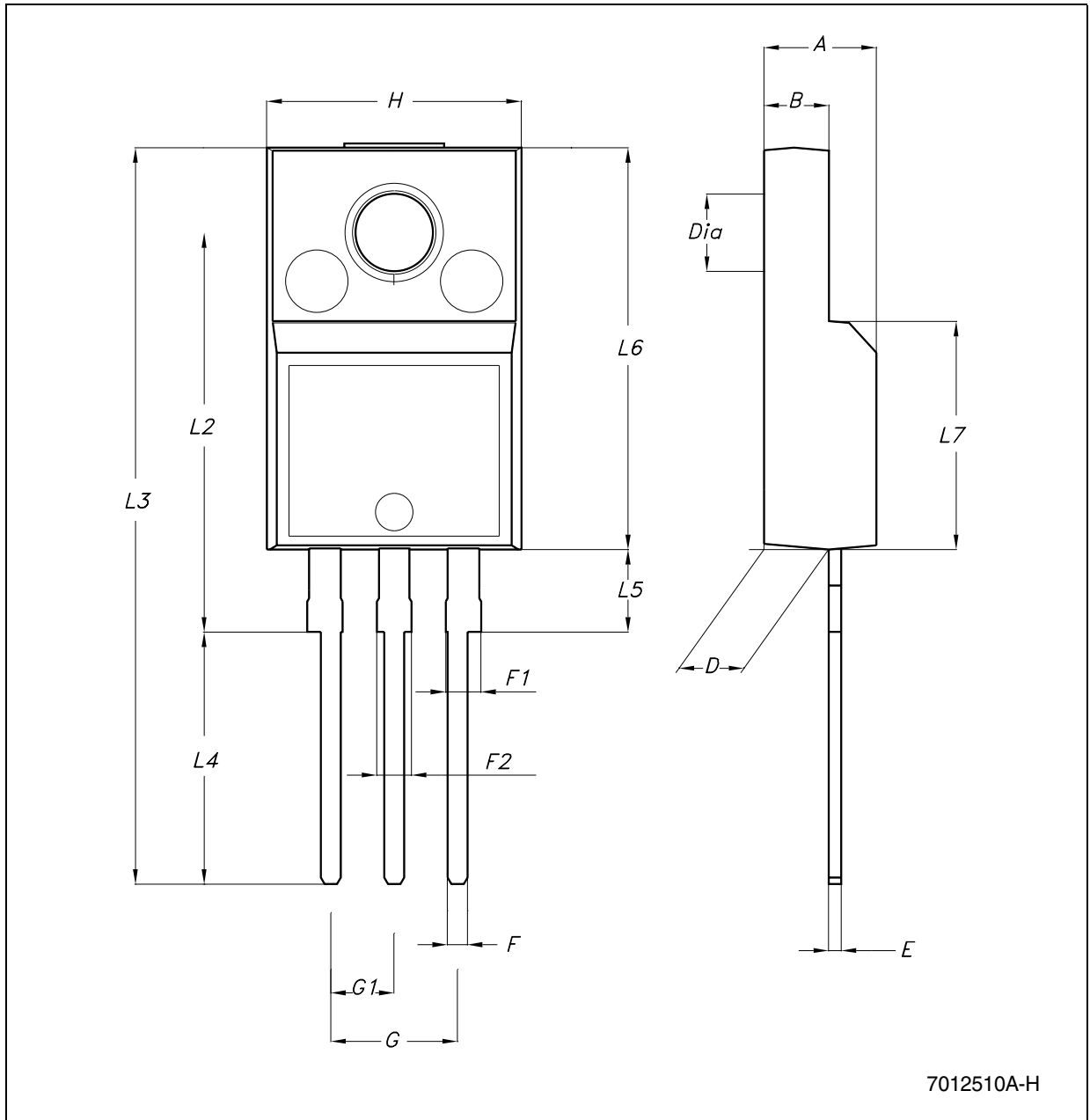


Table 24. TO-220FP mechanical data

| Dim. | mm.  |      |       | inch. |       |       |
|------|------|------|-------|-------|-------|-------|
|      | Min. | Typ. | Max.  | Min.  | Typ.  | Max.  |
| A    | 4.40 |      | 4.60  | 0.173 |       | 0.181 |
| B    | 2.5  |      | 2.7   | 0.098 |       | 0.106 |
| D    | 2.5  |      | 2.75  | 0.098 |       | 0.108 |
| E    | 0.45 |      | 0.70  | 0.017 |       | 0.027 |
| F    | 0.75 |      | 1     | 0.030 |       | 0.039 |
| F1   | 1.15 |      | 1.50  | 0.045 |       | 0.059 |
| F2   | 1.15 |      | 1.50  | 0.045 |       | 0.059 |
| G    | 4.95 |      | 5.2   | 0.194 |       | 0.204 |
| G1   | 2.4  |      | 2.7   | 0.094 |       | 0.106 |
| H    | 10.0 |      | 10.40 | 0.393 |       | 0.409 |
| L2   |      | 16   |       |       | 0.630 |       |
| L3   | 28.6 |      | 30.6  | 1.126 |       | 1.204 |
| L4   | 9.8  |      | 10.6  | 0.385 |       | 0.417 |
| L5   | 2.9  |      | 3.6   | 0.114 |       | 0.142 |
| L6   | 15.9 |      | 16.4  | 0.626 |       | 0.645 |
| L7   | 9    |      | 9.3   | 0.354 |       | 0.366 |
| DIA. | 3    |      | 3.2   | 0.118 |       | 0.126 |

Figure 43. Drawing dimension TO-3

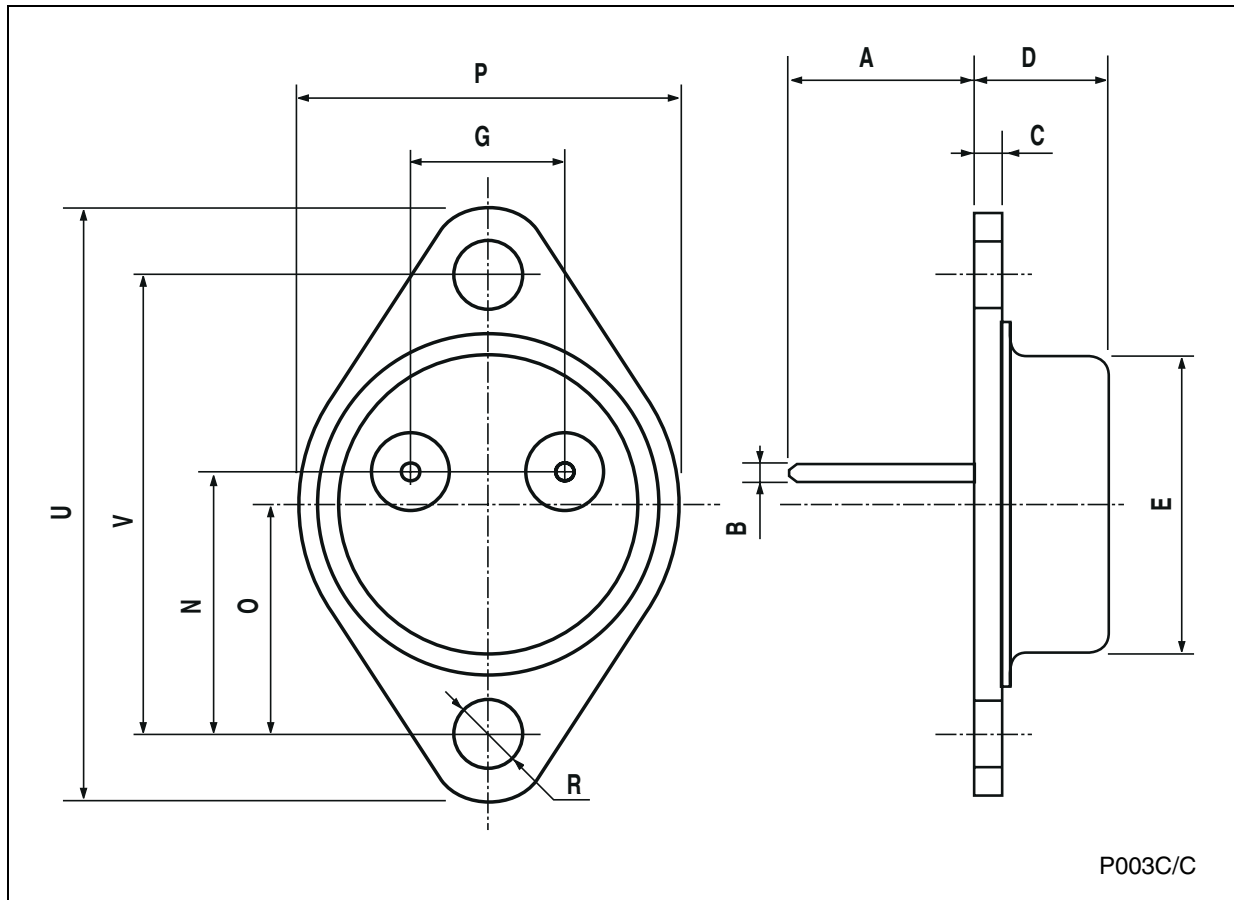


Table 25. TO-3 mechanical data

| Dim. | mm.  |       |      | inch. |       |       |
|------|------|-------|------|-------|-------|-------|
|      | Min. | Typ.  | Max. | Min.  | Typ.  | Max.  |
| A    |      | 11.85 |      |       | 0.466 |       |
| B    | 0.96 | 1.05  | 1.10 | 0.037 | 0.041 | 0.043 |
| C    |      |       | 1.70 |       |       | 0.066 |
| D    |      |       | 8.7  |       |       | 0.342 |
| E    |      |       | 20.0 |       |       | 0.787 |
| G    |      | 10.9  |      |       | 0.429 |       |
| N    |      | 16.9  |      |       | 0.665 |       |
| P    |      |       | 26.2 |       |       | 1.031 |
| R    | 3.88 |       | 4.09 | 0.152 |       | 0.161 |
| U    |      |       | 39.5 |       |       | 1.555 |
| V    |      | 30.10 |      |       | 1.185 |       |

Figure 44. Drawing dimension DPAK

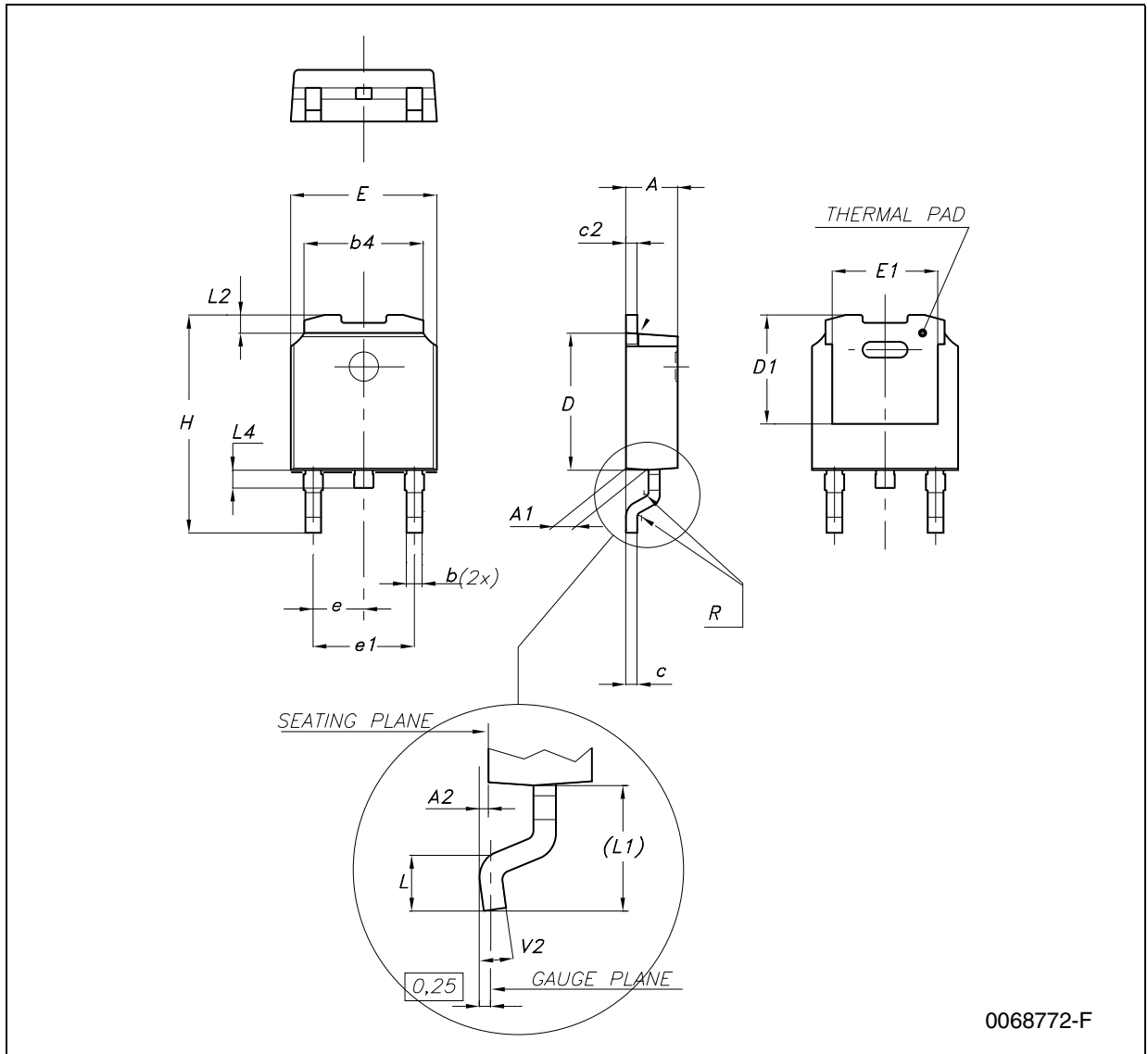


Table 26. DPAK mechanical data

| Dim. | mm.  |      |      | inch. |       |       |
|------|------|------|------|-------|-------|-------|
|      | Min. | Typ. | Max. | Min.  | Typ.  | Max.  |
| A    | 2.2  |      | 2.4  | 0.086 |       | 0.094 |
| A1   | 0.9  |      | 1.1  | 0.035 |       | 0.043 |
| A2   | 0.03 |      | 0.23 | 0.001 |       | 0.009 |
| B    | 0.64 |      | 0.9  | 0.025 |       | 0.035 |
| b4   | 5.2  |      | 5.4  | 0.204 |       | 0.212 |
| C    | 0.45 |      | 0.6  | 0.017 |       | 0.023 |
| C2   | 0.48 |      | 0.6  | 0.019 |       | 0.023 |
| D    | 6    |      | 6.2  | 0.236 |       | 0.244 |
| D1   |      | 5.1  |      |       | 0.200 |       |
| E    | 6.4  |      | 6.6  | 0.252 |       | 0.260 |
| E1   |      | 4.7  |      |       | 0.185 |       |
| e    |      | 2.28 |      |       | 0.090 |       |
| e1   | 4.4  |      | 4.6  | 0.173 |       | 0.181 |
| H    | 9.35 |      | 10.1 | 0.368 |       | 0.397 |
| L    | 1    |      |      | 0.039 |       |       |
| (L1) |      | 2.8  |      |       | 0.110 |       |
| L2   |      | 0.8  |      |       | 0.031 |       |
| L4   | 0.6  |      | 1    | 0.023 |       | 0.039 |
| R    |      | 0.2  |      |       | 0.008 |       |
| V2   | 0°   |      | 8°   | 0°    |       | 8°    |

Figure 45. Drawing dimension tape and reel for DPAK

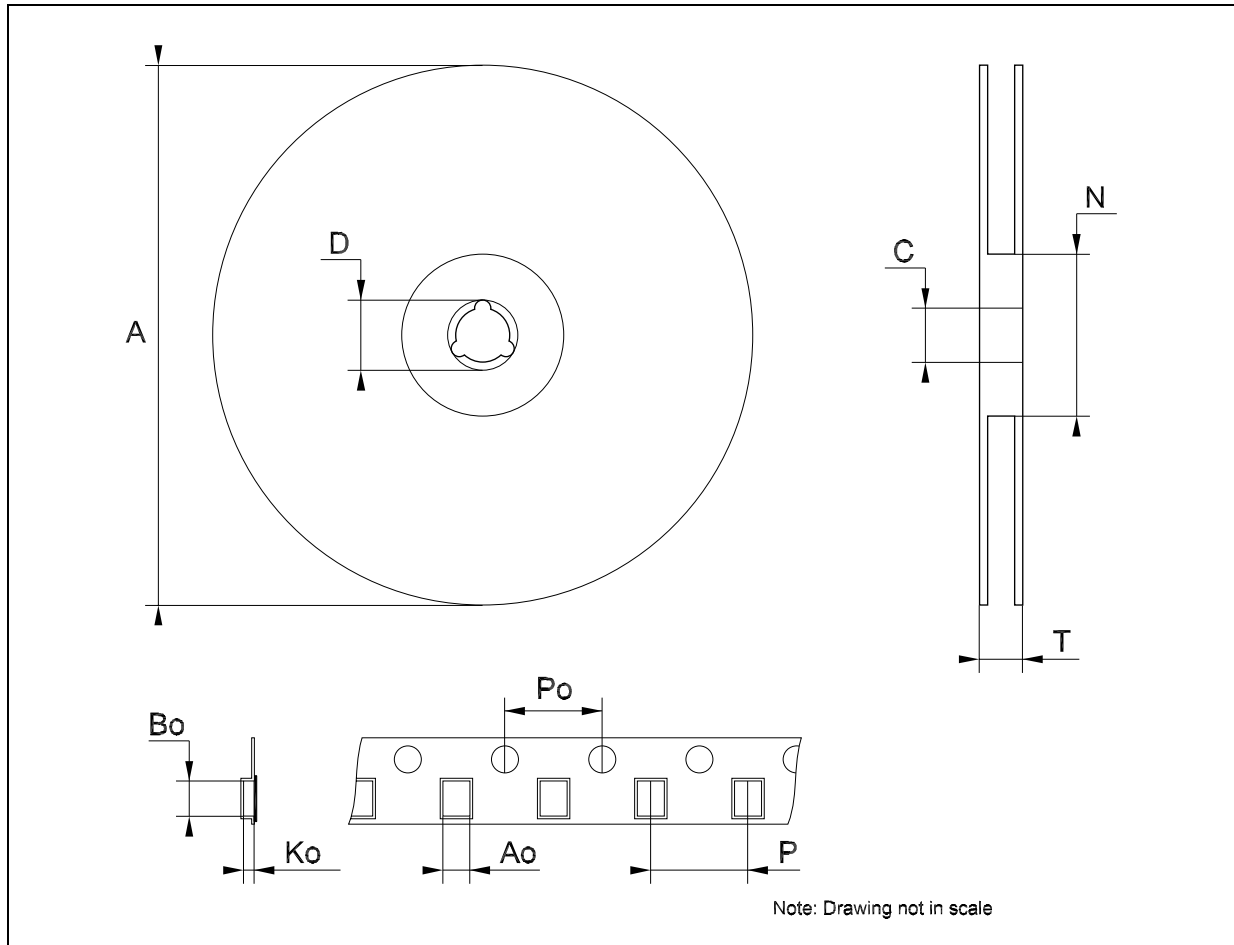


Table 27. Tape and reel DPAK mechanical data

| Dim. | mm.   |       |       | inch. |       |        |
|------|-------|-------|-------|-------|-------|--------|
|      | Min.  | Typ.  | Max.  | Min.  | Typ.  | Max.   |
| A    |       |       | 330   |       |       | 12.992 |
| C    | 12.8  | 13.0  | 13.2  | 0.504 | 0.512 | 0.519  |
| D    | 20.2  |       |       | 0.795 |       |        |
| N    | 60    |       |       | 2.362 |       |        |
| T    |       |       | 22.4  |       |       | 0.882  |
| Ao   | 6.80  | 6.90  | 7.00  | 0.268 | 0.272 | 0.276  |
| Bo   | 10.40 | 10.50 | 10.60 | 0.409 | 0.413 | 0.417  |
| Ko   | 2.55  | 2.65  | 2.75  | 0.100 | 0.104 | 0.105  |
| Po   | 3.9   | 4.0   | 4.1   | 0.153 | 0.157 | 0.161  |
| P    | 7.9   | 8.0   | 8.1   | 0.311 | 0.315 | 0.319  |



Figure 46. Drawing dimension D<sup>2</sup>PAK (type STD-ST)

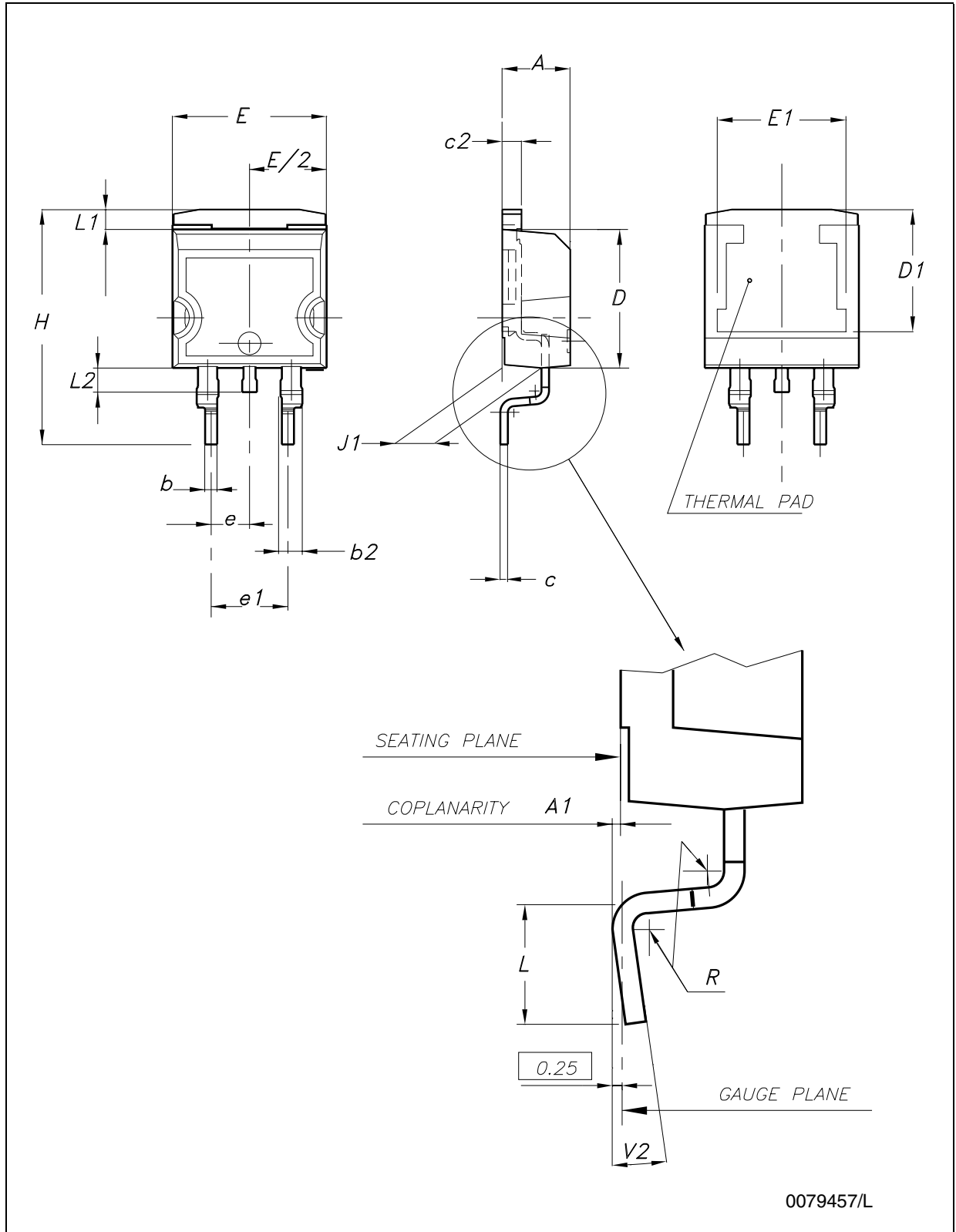


Figure 47. Drawing dimension D<sup>2</sup>PAK (type WOOSEOK-Subcon.)

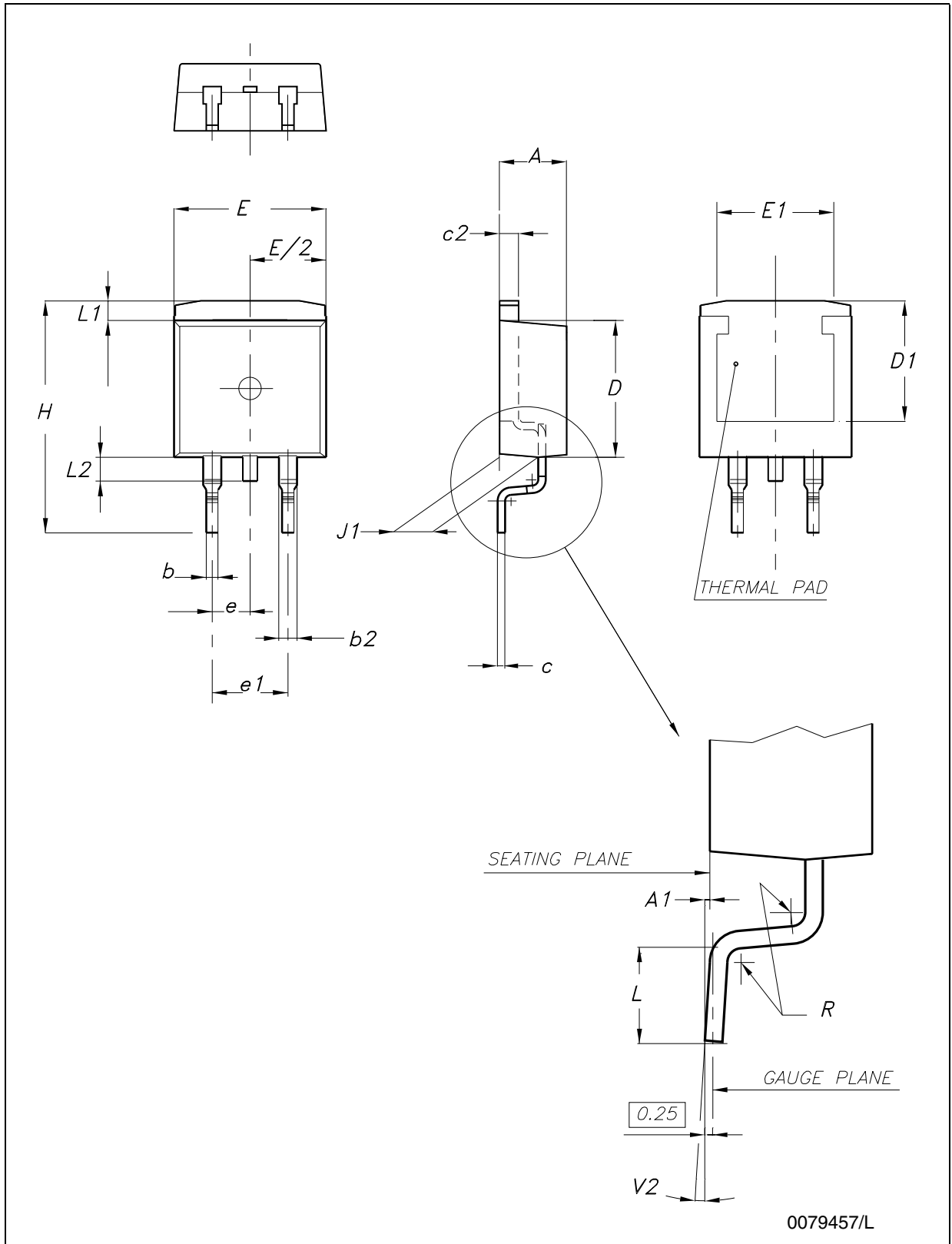


Table 28. D<sup>2</sup>PAK mechanical data

| Dim. | Type STD-ST |      |       | Type WOOSEOK-Subcon. |       |       |
|------|-------------|------|-------|----------------------|-------|-------|
|      | mm.         |      |       | mm.                  |       |       |
|      | Min.        | Typ. | Max.  | Min.                 | Typ.  | Max.  |
| A    | 4.40        |      | 4.60  | 4.30                 |       | 4.70  |
| A1   | 0.03        |      | 0.23  | 0                    |       | 0.20  |
| b    | 0.70        |      | 0.93  | 0.70                 |       | 0.90  |
| b2   | 1.14        |      | 1.70  | 1.17                 |       | 1.37  |
| c    | 0.45        |      | 0.60  | 0.45                 | 0.50  | 0.60  |
| c2   | 1.23        |      | 1.36  | 1.25                 | 1.30  | 1.40  |
| D    | 8.95        |      | 9.35  | 9                    | 9.20  | 9.40  |
| D1   | 7.50        |      |       | 7.50                 |       |       |
| E    | 10          |      | 10.40 | 9.80                 |       | 10.20 |
| E1   | 8.50        |      |       | 7.50                 |       |       |
| e    |             | 2.54 |       |                      | 2.54  |       |
| e1   | 4.88        |      | 5.28  |                      | 5.08  |       |
| H    | 15          |      | 15.85 | 15                   | 15.30 | 15.60 |
| J1   | 2.49        |      | 2.69  | 2.20                 |       | 2.60  |
| L    | 2.29        |      | 2.79  | 1.79                 |       | 2.79  |
| L1   | 1.27        |      | 1.40  | 1                    |       | 1.40  |
| L2   | 1.30        |      | 1.75  | 1.20                 |       | 1.60  |
| R    |             | 0.4  |       |                      | 0.30  |       |
| V2   | 0°          |      | 8°    | 0°                   |       | 3°    |

Note: The D<sup>2</sup>PAK package coming from the subcontractor Wooseok is fully compatible with the ST's package suggested footprint.

Figure 48. D<sup>2</sup>PAK footprint recommended data

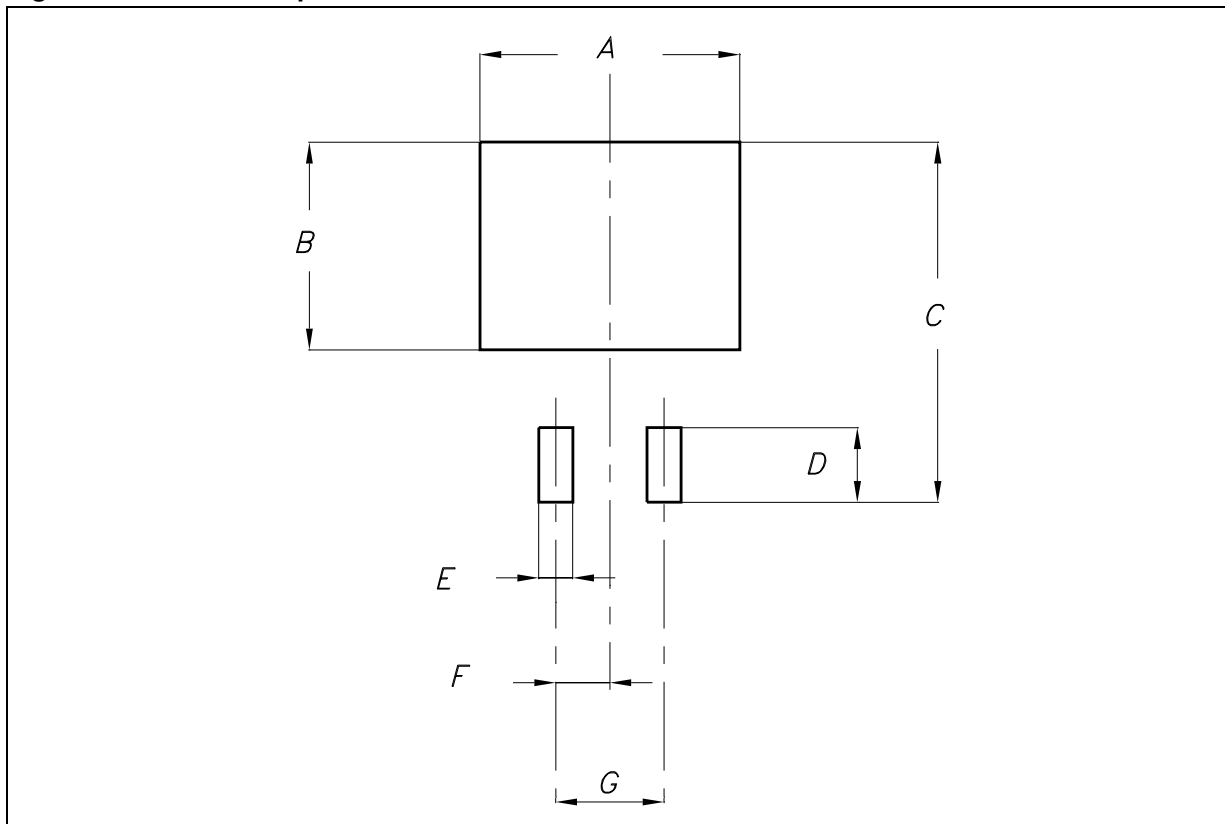


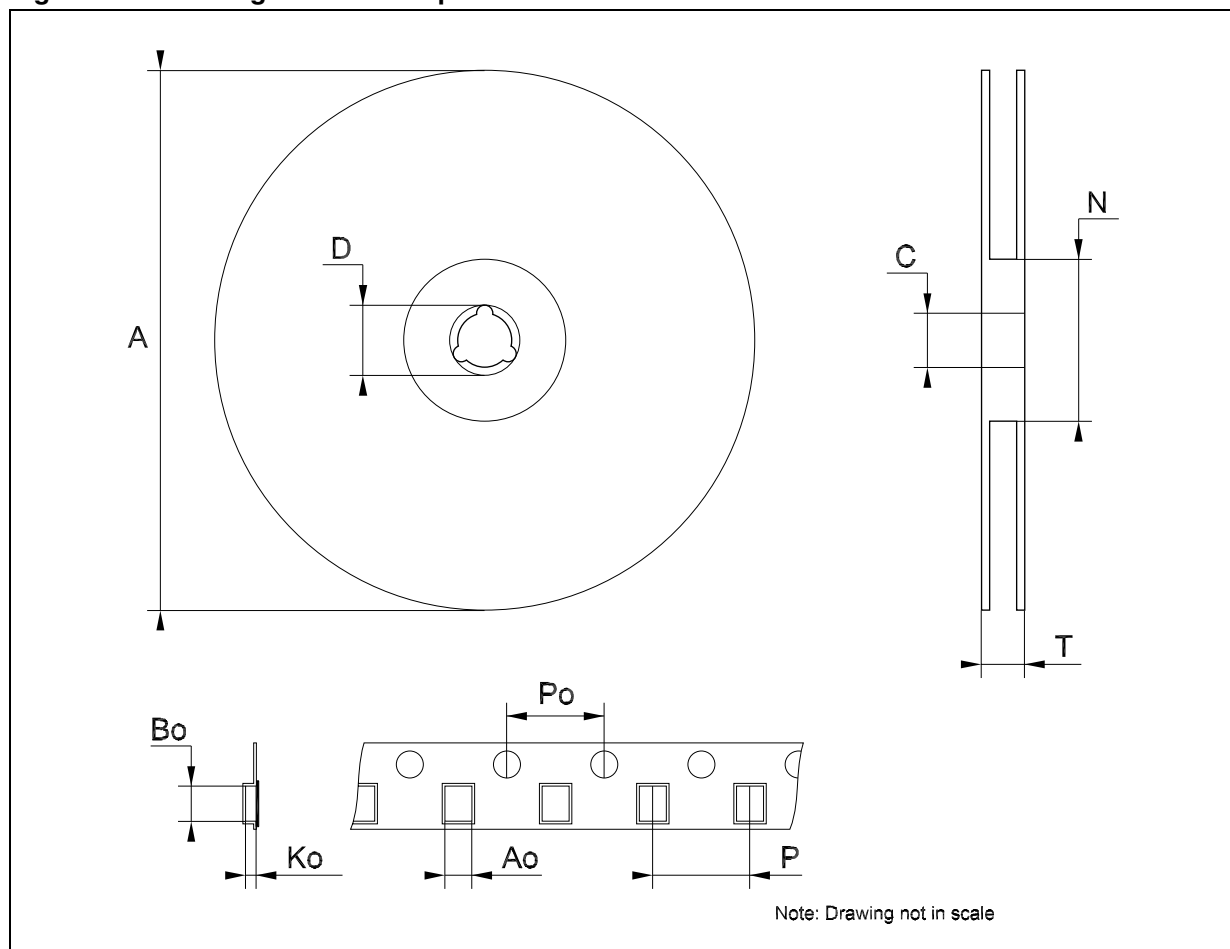
Table 29. D<sup>2</sup>PAK footprint data

| Dim. | Values |       |
|------|--------|-------|
|      | mm.    | inch. |
| A    | 12.20  | 0.480 |
| B    | 9.75   | 0.384 |
| C    | 16.90  | 0.665 |
| D    | 3.50   | 0.138 |
| E    | 1.60   | 0.063 |
| F    | 2.54   | 0.100 |
| G    | 5.08   | 0.200 |

Table 30. Tape and reel D<sup>2</sup>PAK mechanical data

| Dim. | mm.   |       |       | inch. |       |       |
|------|-------|-------|-------|-------|-------|-------|
|      | Min.  | Typ.  | Max.  | Min.  | Typ.  | Max.  |
| A    |       |       | 180   |       |       | 7.086 |
| C    | 12.8  | 13.0  | 13.2  | 0.504 | 0.512 | 0.519 |
| D    | 20.2  |       |       | 0.795 |       |       |
| N    | 60    |       |       | 2.362 |       |       |
| T    |       |       | 14.4  |       |       | 0.567 |
| Ao   | 10.50 | 10.6  | 10.70 | 0.413 | 0.417 | 0.421 |
| Bo   | 15.70 | 15.80 | 15.90 | 0.618 | 0.622 | 0.626 |
| Ko   | 4.80  | 4.90  | 5.00  | 0.189 | 0.193 | 0.197 |
| Po   | 3.9   | 4.0   | 4.1   | 0.153 | 0.157 | 0.161 |
| P    | 11.9  | 12.0  | 12.1  | 0.468 | 0.472 | 0.476 |

Figure 49. Drawing dimension tape and reel for D<sup>2</sup>PAK



## 9 Order codes

Table 31. Order codes

| Part numbers | Order codes                |             |                             |                        |                        |                 |
|--------------|----------------------------|-------------|-----------------------------|------------------------|------------------------|-----------------|
|              | TO-220                     | DPAK        | D <sup>2</sup> PAK          | TO-220FP               | TO-3                   | Output voltages |
| L7805        |                            |             |                             |                        | L7805T                 | 5 V             |
| L7805C       | L7805CV                    | L7805CDT-TR | L7805CD2T-TR                | L7805CP                | L7805CT                | 5 V             |
|              | L7805CV-DG <sup>(1)</sup>  |             |                             |                        |                        | 5 V             |
| L7805AB      | L7805ABV                   |             | L7805ABD2T-TR               | L7805ABP               |                        | 5 V             |
|              | L7805ABV-DG <sup>(1)</sup> |             |                             |                        |                        | 5 V             |
| L7805AC      | L7805ACV                   |             | L7805ACD2T-TR               | L7805ACP               |                        | 5 V             |
|              | L7805ACV-DG <sup>(1)</sup> |             |                             |                        |                        | 5 V             |
| L7806C       | L7806CV                    |             | L7806CD2T-TR                |                        | L7806CT                | 6 V             |
|              | L7806CV-DG <sup>(1)</sup>  |             |                             |                        |                        | 6 V             |
| L7806AB      | L7806ABV                   |             | L7806ABD2T-TR               |                        |                        | 6 V             |
|              | L7806ABV-DG <sup>(1)</sup> |             |                             |                        |                        | 6 V             |
| L7806AC      | L7806ACV                   |             |                             |                        |                        | 6 V             |
|              | L7806ACV-DG <sup>(1)</sup> |             |                             |                        |                        | 6 V             |
| L7808C       | L7808CV                    |             | L7808CD2T-TR                |                        |                        | 8 V             |
|              | L7808CV-DG <sup>(1)</sup>  |             |                             |                        |                        | 8 V             |
| L7808AB      | L7808ABV                   |             | L7808ABD2T-TR               |                        |                        | 8 V             |
|              | L7808ABV-DG <sup>(1)</sup> |             |                             |                        |                        | 8 V             |
| L7808AC      | L7808ACV                   |             |                             |                        |                        | 8 V             |
|              | L7808ACV-DG <sup>(1)</sup> |             |                             |                        |                        | 8 V             |
| L7885C       | L7885CV                    |             | L7885CD2T-TR <sup>(2)</sup> | L7885CP <sup>(2)</sup> | L7885CT <sup>(2)</sup> | 8.5 V           |
| L7809C       | L7809CV                    |             | L7809CD2T-TR                | L7809CP                |                        | 9 V             |
|              | L7809CV-DG <sup>(1)</sup>  |             |                             |                        |                        | 9 V             |
| L7809AB      | L7809ABV                   |             | L7809ABD2T-TR               |                        |                        | 9 V             |
| L7809AC      | L7809ACV                   |             |                             |                        |                        | 9 V             |
| L7812C       | L7812CV                    |             | L7812CD2T-TR                | L7812CP                | L7812CT                | 12 V            |
|              | L7812CV-DG <sup>(1)</sup>  |             |                             |                        |                        | 12 V            |
| L7812AB      | L7812ABV                   |             | L7812ABD2T-TR               |                        |                        | 12 V            |
|              | L7812ABV-DG <sup>(1)</sup> |             |                             |                        |                        | 12 V            |
| L7812AC      | L7812ACV                   |             | L7812ACD2T-TR               |                        |                        | 12 V            |
|              | L7812ACV-DG <sup>(1)</sup> |             |                             |                        |                        | 12 V            |

Table 31. Order codes

| Part numbers | Order codes                |      |                             |          |         |                 |
|--------------|----------------------------|------|-----------------------------|----------|---------|-----------------|
|              | TO-220                     | DPAK | D <sup>2</sup> PAK          | TO-220FP | TO-3    | Output voltages |
| L7815C       | L7815CV                    |      | L7815CD2T-TR                | L7815CP  | L7815CT | 15 V            |
|              | L7815CV-DG <sup>(1)</sup>  |      |                             |          |         | 15 V            |
| L7815AB      | L7815ABV                   |      | L7815ABD2T-TR               |          |         | 15 V            |
|              | L7815ABV-DG <sup>(1)</sup> |      |                             |          |         | 15 V            |
| L7815AC      | L7815ACV                   |      | L7815ACD2T-TR               |          |         | 15 V            |
|              | L7815ACV-DG <sup>(1)</sup> |      |                             |          |         | 15 V            |
| L7818C       | L7818CV                    |      | L7818CD2T-TR <sup>(2)</sup> |          | L7818CT | 18 V            |
|              | L7818CV-DG <sup>(1)</sup>  |      |                             |          |         | 18 V            |
| L7824C       | L7824CV                    |      | L7824CD2T-TR                | L7824CP  | L7824CT | 24 V            |
|              | L7824CV-DG <sup>(1)</sup>  |      |                             |          |         | 24 V            |
| L7824AB      | L7824ABV                   |      |                             |          |         | 24 V            |
|              | L7824ABV-DG <sup>(1)</sup> |      |                             |          |         | 24 V            |
| L7824AC      | L7824ACV                   |      |                             |          |         | 24 V            |
|              | L7824ACV-DG <sup>(1)</sup> |      |                             |          |         | 24 V            |

1. TO-220 Dual Gauge frame.

2. Available on request.

## 10 Revision history

**Table 32. 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 31</a> .  |
| 06-Feb-2008 | 18       | Added: TO-220 mechanical data <a href="#">Figure 38 on page 40</a> , <a href="#">Figure 39 on page 41</a> , and <a href="#">Table 23 on page 39</a> . Modified: <a href="#">Table 31 on page 54</a> .   |
| 18-Mar-2008 | 19       | Added: <a href="#">Table 26: DPAK mechanical data on page 47</a> , <a href="#">Table 27: Tape and reel DPAK mechanical data on page 48</a> . Modified: <a href="#">Table 31 on page 54</a> .  |
| 26-Jan-2010 | 20       | Modified <a href="#">Table 1 on page 1</a> and <a href="#">Table 23 on page 39</a> , added: <a href="#">Figure 38 on page 40</a> and <a href="#">Figure 39 on page 41</a> , <a href="#">Figure 40 on page 42</a> and <a href="#">Figure 41 on page 42</a> . |
| 04-Mar-2010 | 21       | Added notes <a href="#">Figure 38 on page 40</a> .  |
| 08-Sep-2010 | 22       | Modified <a href="#">Table 31 on page 54</a> .  |
| 23-Nov-2010 | 23       | Added: $T_J = 25\text{ }^\circ\text{C}$ test condition in $\Delta V_O$ on <a href="#">Table 5</a> , <a href="#">6</a> , <a href="#">7</a> , <a href="#">8</a> , <a href="#">9</a> , <a href="#">10</a> and <a href="#">Table 11</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 31 on page 54</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 31 on page 54</a> .   |
| 27-Mar-2012 | 27       | Added: order codes L7812ABV-DG, L7815ABV-DG <a href="#">Table 31 on page 54</a> .   |
| 27-Apr-2012 | 28       | Modified: $V_I = 10.4$ to $23\text{ V}$ ==> $V_I = 11.4$ to $23\text{ V}$ test conditon value Line regulation <a href="#">Table 8 on page 13</a> .  |
| 10-May-2012 | 29       | Added: order codes L7806ACV-DG, L7808ACV-DG, L7815ACV-DG, L7824ABV-DG and L7824ACV-DG <a href="#">Table 31 on page 54</a> .   |
| 19-Sep-2012 | 30       | Modified load regulation units from V to mV in <a href="#">Table 5</a> to <a href="#">Table 11</a> .  |



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