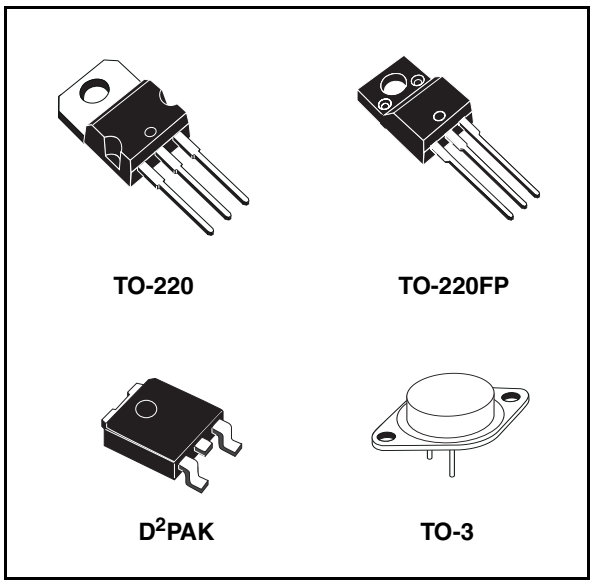
# L7800 series

## Positive voltage regulators

## Feature summary

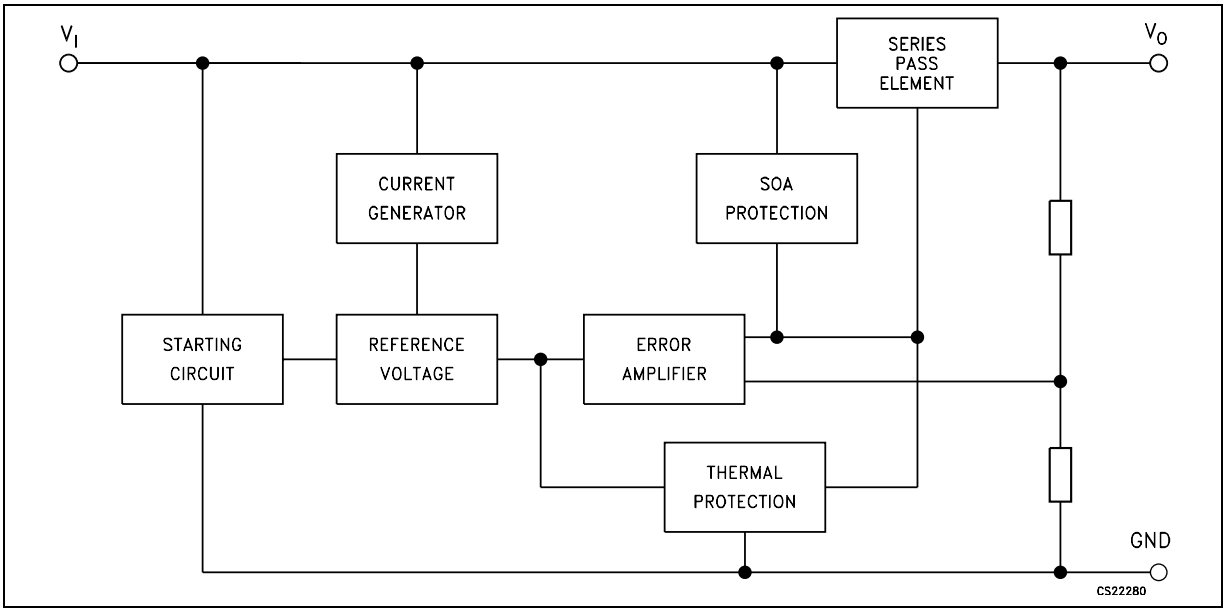
- Output current to 1.5A
- Output voltages of 5; 5.2; 6; 8; 8.5; 9; 10; 12; 15; 18; 24V
- Thermal overload protection
- Short circuit protection
- Output transition SOA protection




## Description

The L7800 series of three-terminal positive regulators is available in TO-220, TO-220FP, TO-3 and $D^2PAK$ 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 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltage and currents.

## Schematic diagram






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# 1 Pin configuration

**Figure 1. Pin connections (top view)**

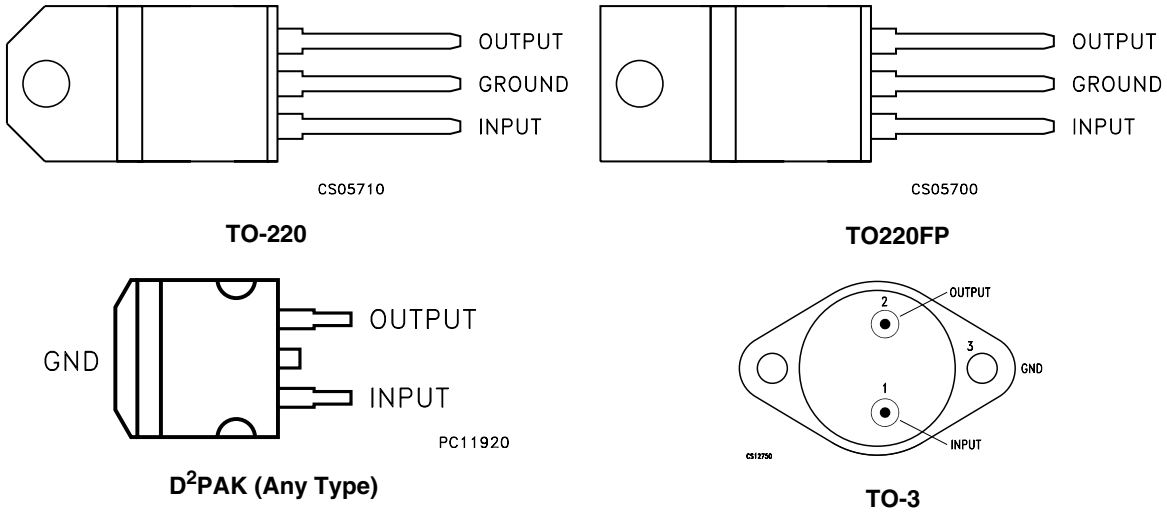
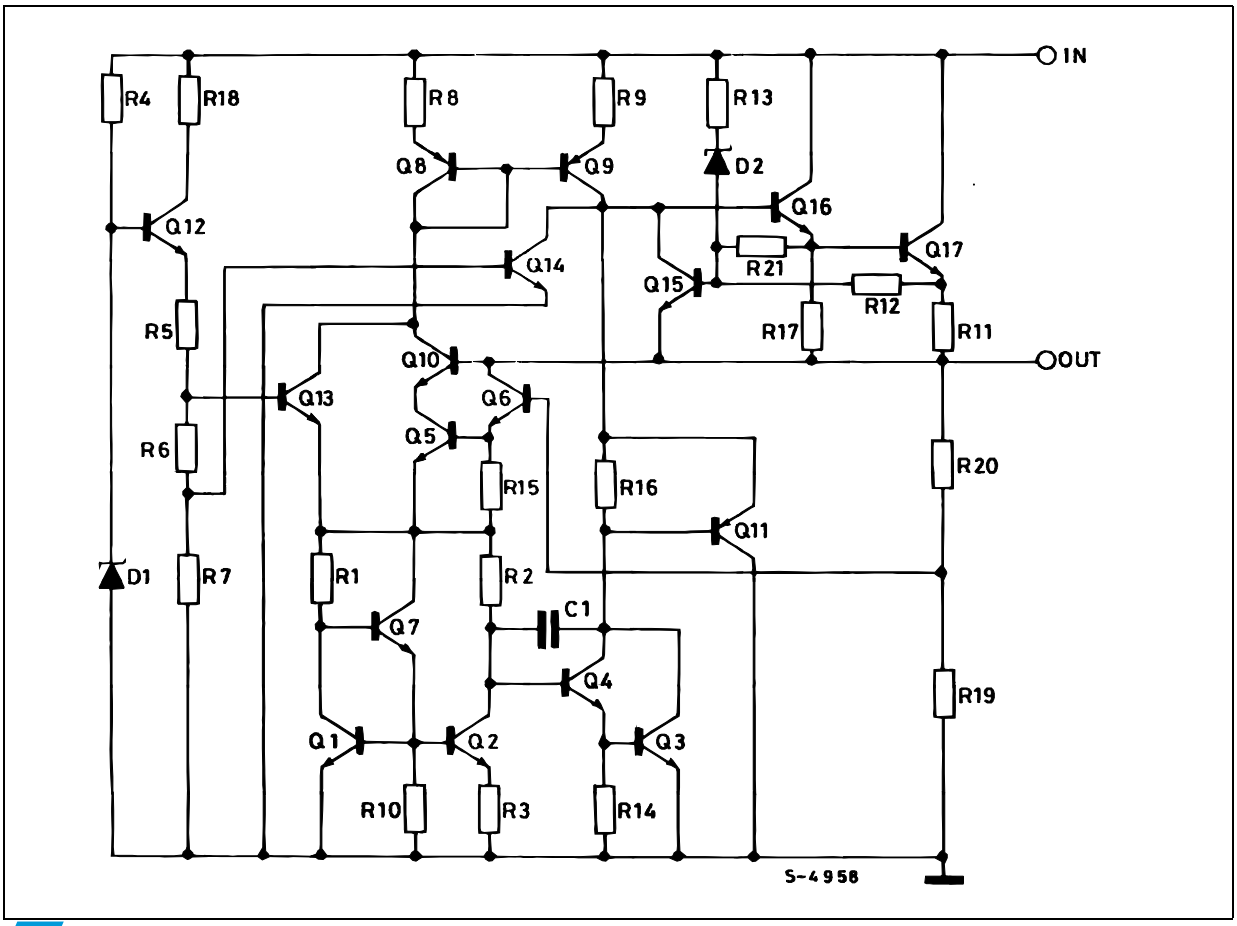



**Figure 2. Schematic diagram**



# 2 Maximum ratings

**Table 1. Absolute maximum ratings**

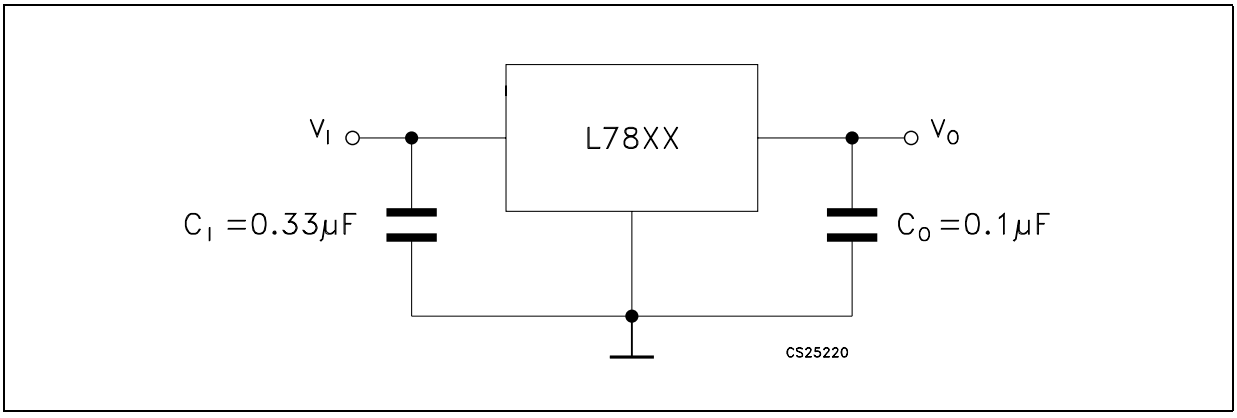
| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_I$ | DC Input voltage | for $V_O$= 5 to 18V | 35 | V |
| | | for $V_O$= 20, 24V | 40 | |
| $I_O$ | Output current | | Internally Limited | |
| $P_D$ | Power dissipation | | Internally Limited | |
| $T_{STG}$ | Storage temperature range | | -65 to 150 | °C |
| $T_{OP}$ | Operating junction temperature range | for L7800 | -55 to 150 | °C |
| | | for L7800C | 0 to 150 | |

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

**Table 2. Thermal Data**

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

**Figure 3. Application circuits**



# 3 Test circuits

**Figure 4. DC Parameter**

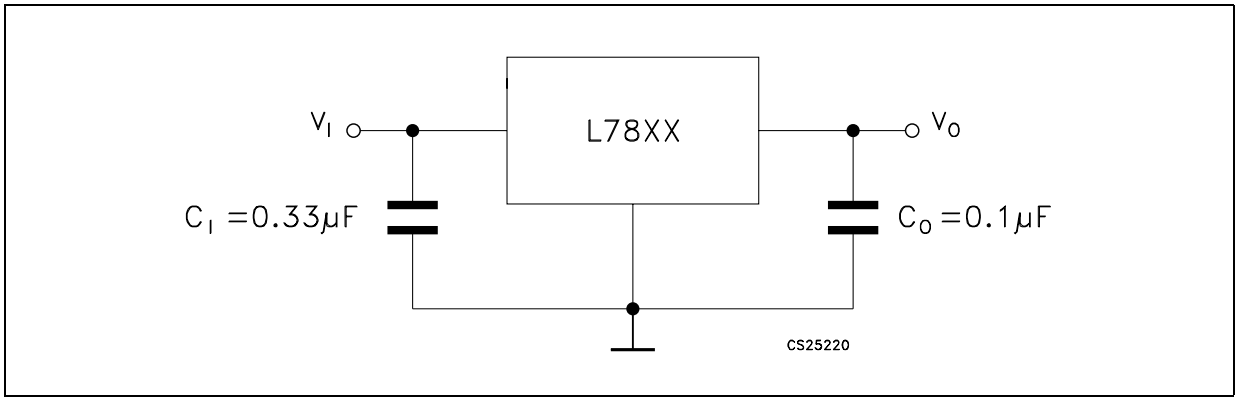



**Figure 5. Load regulation**

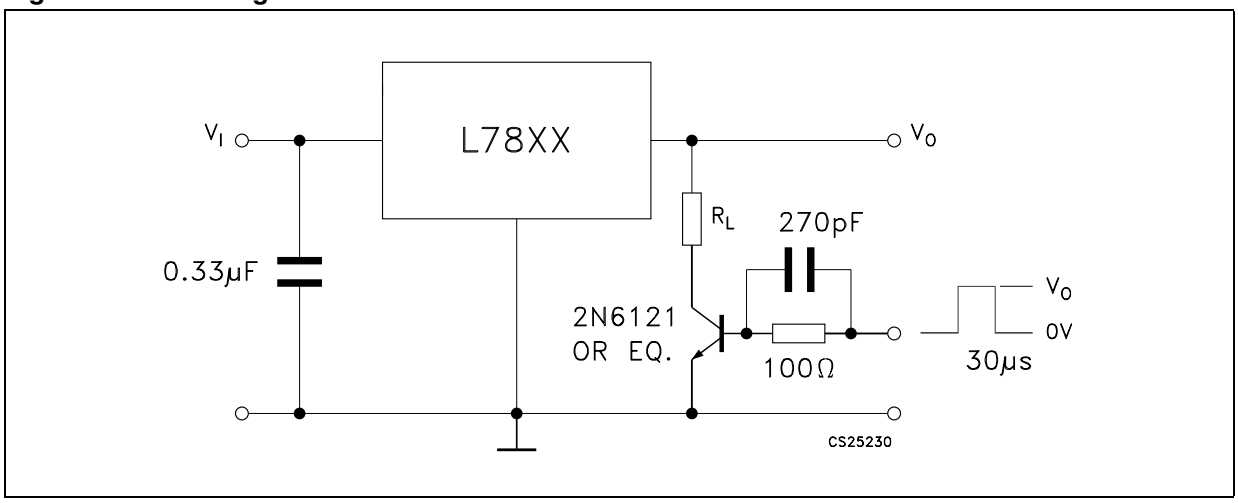
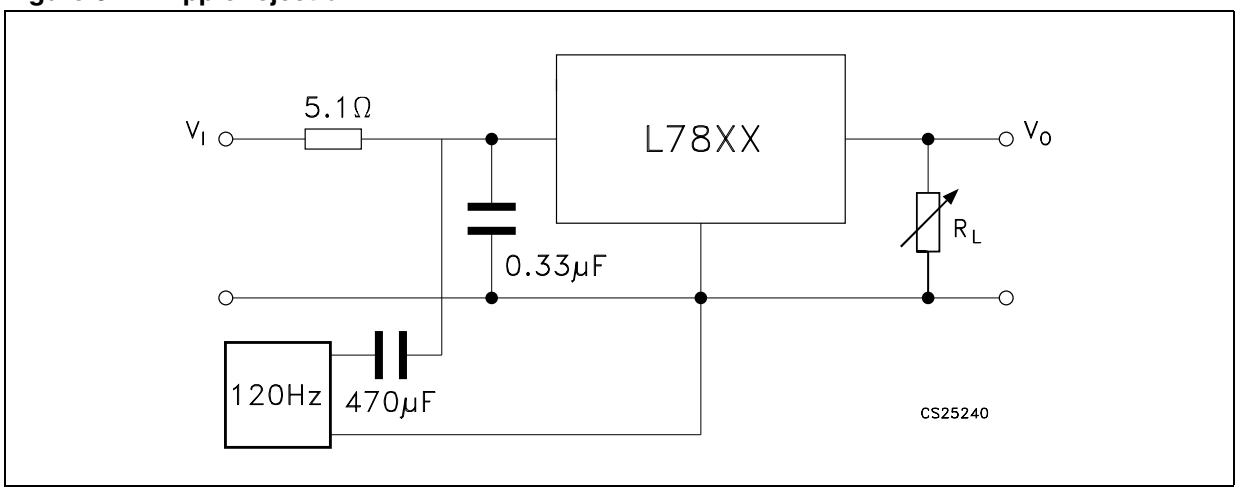



**Figure 6. Ripple rejection**



# 4 Electrical characteristics

**Table 3. Electrical characteristics of L7805** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 10V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 4.8 | 5 | 5.2 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 8 to 20V | 4.65 | 5 | 5.35 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 7 to 25V, $T_J$ = 25°C | | 3 | 50 | mV |
| | | $V_I$ = 8 to 12V, $T_J$ = 25°C | | 1 | 25 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5A, $T_J$ = 25°C | | | 100 | mV |
| | | $I_O$ = 250 to 750mA, $T_J$ = 25°C | | | 25 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| | | $V_I$ = 8 to 25 V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5mA | | 0.6 | | mV/°C |
| eN | Output noise voltage | B =10Hz to 100KHz, $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 8 to 18V, f = 120Hz | 68 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output resistance | f = 1 KHz | | 17 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_J$ = 25°C | | 0.75 | 1.2 | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°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.

**Table 4. Electrical characteristics of L7806** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 11V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 5.75 | 6 | 6.25 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 9 to 21V | 5.65 | 6 | 6.35 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 8 to 25V, $T_J$ = 25°C | | | 60 | mV |
| | | $V_I$ = 9 to 13V, $T_J$ = 25°C | | | 30 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5A, $T_J$ = 25°C | | | 100 | mV |
| | | $I_O$ = 250 to 750mA, $T_J$ = 25°C | | | 30 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| | | $V_I$ = 9 to 25V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5mA | | 0.7 | | mV/°C |
| eN | Output noise voltage | B =10Hz to 100KHz, $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 9 to 19V, f = 120Hz | 65 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output resistance | f = 1 KHz | | 19 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_J$ = 25°C | | 0.75 | 1.2 | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°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.

**Table 5. Electrical characteristics of L7808** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 14V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 7.7 | 8 | 8.3 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 11.5 to 23V | 7.6 | 8 | 8.4 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 10.5 to 25V, $T_J$ = 25°C | | | 80 | mV |
| | | $V_I$ = 11 to 17V, $T_J$ = 25°C | | | 40 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5A, $T_J$ = 25°C | | | 100 | mV |
| | | $I_O$ = 250 to 750mA, $T_J$ = 25°C | | | 40 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| | | $V_I$ = 11.5 to 25V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5mA | | 1 | | mV/°C |
| eN | Output noise voltage | B =10Hz to 100KHz, $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 11.5 to 21.5V, f = 120Hz | 62 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output resistance | f = 1 KHz | | 16 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_J$ = 25°C | | 0.75 | 1.2 | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°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.

**Table 6. Electrical characteristics of L7812** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 19V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 11.5 | 12 | 12.5 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 15.5 to 27V | 11.4 | 12 | 12.6 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 14.5 to 30V, $T_J$ = 25°C | | | 120 | mV |
| | | $V_I$ = 16 to 22V, $T_J$ = 25°C | | | 60 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5A, $T_J$ = 25°C | | | 100 | mV |
| | | $I_O$ = 250 to 750mA, $T_J$ = 25°C | | | 60 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| | | $V_I$ = 15 to 30V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5mA | | 1.5 | | mV/°C |
| eN | Output noise voltage | B =10Hz to 100KHz, $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 15 to 25V, f = 120Hz | 61 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output resistance | f = 1 KHz | | 18 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_J$ = 25°C | | 0.75 | 1.2 | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°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.

**Table 7. Electrical characteristics of L7815** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 23V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 14.4 | 15 | 15.6 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 18.5 to 30V | 14.25 | 15 | 15.75 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 17.5 to 30V, $T_J$ = 25°C | | | 150 | mV |
| | | $V_I$ = 20 to 26V, $T_J$ = 25°C | | | 75 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5A, $T_J$ = 25°C | | | 150 | mV |
| | | $I_O$ = 250 to 750mA, $T_J$ = 25°C | | | 75 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| | | $V_I$ = 18.5 to 30V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5mA | | 1.8 | | mV/°C |
| eN | Output noise voltage | B =10Hz to 100KHz, $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 18.5 to 28.5V, f = 120Hz | 60 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output resistance | f = 1 KHz | | 19 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_J$ = 25°C | | 0.75 | 1.2 | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°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.

**Table 8. Electrical characteristics of L7818** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 26V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 17.3 | 18 | 18.7 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 22 to 33V | 17.1 | 18 | 18.9 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 21 to 33V, $T_J$ = 25°C | | | 180 | mV |
| | | $V_I$ = 24 to 30V, $T_J$ = 25°C | | | 90 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5A, $T_J$ = 25°C | | | 180 | mV |
| | | $I_O$ = 250 to 750mA, $T_J$ = 25°C | | | 90 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| | | $V_I$ = 22 to 33V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5mA | | 2.3 | | mV/°C |
| eN | Output noise voltage | B =10Hz to 100KHz, $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 22 to 32V, f = 120Hz | 59 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output resistance | f = 1 KHz | | 22 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_J$ = 25°C | | 0.75 | 1.2 | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°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.

**Table 9. Electrical characteristics of L7820** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 28V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 19.2 | 20 | 20.8 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 24 to 35V | 19 | 20 | 21 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 22.5 to 35V, $T_J$ = 25°C | | | 200 | mV |
| | | $V_I$ = 26 to 32V, $T_J$ = 25°C | | | 100 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5A, $T_J$ = 25°C | | | 200 | mV |
| | | $I_O$ = 250 to 750mA, $T_J$ = 25°C | | | 100 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| | | $V_I$ = 24 to 35V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5mA | | 2.5 | | mV/°C |
| eN | Output noise voltage | B =10Hz to 100KHz, $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 24 to 35V, f = 120Hz | 58 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output resistance | f = 1 KHz | | 24 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_J$ = 25°C | | 0.75 | 1.2 | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°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.

**Table 10. Electrical characteristics of L7824** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 33V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 23 | 24 | 25 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 28 to 38V | 22.8 | 24 | 25.2 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 27 to 38V, $T_J$ = 25°C | | | 240 | mV |
| | | $V_I$ = 30 to 36V, $T_J$ = 25°C | | | 120 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5A, $T_J$ = 25°C | | | 240 | mV |
| | | $I_O$ = 250 to 750mA, $T_J$ = 25°C | | | 120 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| | | $V_I$ = 28 to 38V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5mA | | 3 | | mV/°C |
| eN | Output noise voltage | B =10Hz to 100KHz, $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 28 to 38V, f = 120Hz | 56 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output resistance | f = 1 KHz | | 28 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_J$ = 25°C | | 0.75 | 1.2 | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°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.

**Table 11. Electrical characteristics of L7805C** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 10V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 4.8 | 5 | 5.2 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 7 to 20V | 4.75 | 5 | 5.25 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 7 to 25V, $T_J$ = 25°C | | 3 | 100 | mV |
| | | $V_I$ = 8 to 12V, $T_J$ = 25°C | | 1 | 50 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5A, $T_J$ = 25°C | | | 100 | mV |
| | | $I_O$ = 250 to 750mA, $T_J$ = 25°C | | | 50 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| | | $V_I$ = 7 to 25 V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5mA | | -1.1 | | mV/°C |
| eN | Output noise voltage | B =10Hz to 100KHz, $T_J$ = 25°C | | 40 | | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 8 to 18V, f = 120Hz | 62 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 KHz | | 17 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_J$ = 25°C | | 0.75 | | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°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.

**Table 12. Electrical characteristics of L7852C** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 10V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 5.0 | 5.2 | 5.4 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 8 to 20V | 4.95 | 5.2 | 5.45 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 7 to 25V, $T_J$ = 25°C | | 3 | 105 | mV |
| | | $V_I$ = 8 to 12V, $T_J$ = 25°C | | 1 | 52 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5A, $T_J$ = 25°C | | | 105 | mV |
| | | $I_O$ = 250 to 750mA, $T_J$ = 25°C | | | 52 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| | | $V_I$ = 7 to 25 V | | | 1.3 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5mA | | -1 | | mV/°C |
| eN | Output noise voltage | B =10Hz to 100KHz, $T_J$ = 25°C | | 42 | | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 8 to 18V, f = 120Hz | 61 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 KHz | | 17 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_J$ = 25°C | | 0.75 | | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°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.

**Table 13. Electrical characteristics of L7806C** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 11V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 5.75 | 6 | 6.25 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 8 to 21V | 5.7 | 6 | 6.3 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 8 to 25V, $T_J$ = 25°C | | | 120 | mV |
| | | $V_I$ = 9 to 13V, $T_J$ = 25°C | | | 60 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5A, $T_J$ = 25°C | | | 120 | mV |
| | | $I_O$ = 250 to 750mA, $T_J$ = 25°C | | | 60 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| | | $V_I$ = 8 to 25V | | | 1.3 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5mA | | -0.8 | | mV/°C |
| eN | Output noise voltage | B =10Hz to 100KHz, $T_J$ = 25°C | | 45 | | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 9 to 19V, f = 120Hz | 59 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 KHz | | 19 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_J$ = 25°C | | 0.55 | | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°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.

**Table 14. Electrical characteristics of L7808C** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 14V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 7.7 | 8 | 8.3 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 10.5 to 25V | 7.6 | 8 | 8.4 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 10.5 to 25V, $T_J$ = 25°C | | | 160 | mV |
| | | $V_I$ = 11 to 17V, $T_J$ = 25°C | | | 80 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5A, $T_J$ = 25°C | | | 160 | mV |
| | | $I_O$ = 250 to 750mA, $T_J$ = 25°C | | | 80 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| | | $V_I$ = 10.5 to 25V | | | 1 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5mA | | -0.8 | | mV/°C |
| eN | Output noise voltage | B =10Hz to 100KHz, $T_J$ = 25°C | | 52 | | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 11.5 to 21.5V, f = 120Hz | 56 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 KHz | | 16 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_J$ = 25°C | | 0.45 | | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°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.

**Table 15. Electrical characteristics of L7885C** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 14.5V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 8.2 | 8.5 | 8.8 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 11 to 26V | 8.1 | 8.5 | 8.9 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 11 to 27V, $T_J$ = 25°C | | | 160 | mV |
| | | $V_I$ = 11.5 to 17.5V, $T_J$ = 25°C | | | 80 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5A, $T_J$ = 25°C | | | 160 | mV |
| | | $I_O$ = 250 to 750mA, $T_J$ = 25°C | | | 80 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| | | $V_I$ = 11 to 27V | | | 1 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5mA | | -0.8 | | mV/°C |
| eN | Output noise voltage | B =10Hz to 100KHz, $T_J$ = 25°C | | 55 | | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 12 to 22V, f = 120Hz | 56 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 KHz | | 16 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_J$ = 25°C | | 0.45 | | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°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.

**Table 16. Electrical characteristics of L7809C** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 15V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 8.64 | 9 | 9.36 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 11.5 to 26V | 8.55 | 9 | 9.45 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 11.5 to 26V, $T_J$ = 25°C | | | 180 | mV |
| | | $V_I$ = 12 to 18V, $T_J$ = 25°C | | | 90 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5A, $T_J$ = 25°C | | | 180 | mV |
| | | $I_O$ = 250 to 750mA, $T_J$ = 25°C | | | 90 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| | | $V_I$ = 11.5 to 26V | | | 1 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5mA | | -1 | | mV/°C |
| eN | Output noise voltage | B =10Hz to 100KHz, $T_J$ = 25°C | | 70 | | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 12 to 23V, f = 120Hz | 55 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 KHz | | 17 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_J$ = 25°C | | 0.40 | | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°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.

**Table 17. Electrical characteristics of L7810C** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 15V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 9.6 | 10 | 10.4 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 12.5 to 26V | 9.5 | 10 | 10.5 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 12.5 to 26V, $T_J$ = 25°C | | | 200 | mV |
| | | $V_I$ = 13.5 to 19V, $T_J$ = 25°C | | | 100 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5A, $T_J$ = 25°C | | | 200 | mV |
| | | $I_O$ = 250 to 750mA, $T_J$ = 25°C | | | 100 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| | | $V_I$ = 12.5 to 26V | | | 1 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5mA | | -1 | | mV/°C |
| eN | Output noise voltage | B =10Hz to 100KHz, $T_J$ = 25°C | | 70 | | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 13 to 23V, f = 120Hz | 55 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 KHz | | 17 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_J$ = 25°C | | 0.40 | | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°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.

**Table 18. Electrical characteristics of L7812C** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 19V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified)

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

**Table 19. Electrical characteristics of L7815C** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 23V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 14.5 | 15 | 15.6 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 17.5 to 30V | 14.25 | 15 | 15.75 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 17.5 to 30V, $T_J$ = 25°C | | | 300 | mV |
| | | $V_I$ = 20 to 26V, $T_J$ = 25°C | | | 150 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5A, $T_J$ = 25°C | | | 300 | mV |
| | | $I_O$ = 250 to 750mA, $T_J$ = 25°C | | | 150 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| | | $V_I$ = 17.5 to 30V | | | 1 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5mA | | -1 | | mV/°C |
| eN | Output noise voltage | B =10Hz to 100KHz, $T_J$ = 25°C | | 90 | | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 18.5 to 28.5V, f = 120Hz | 54 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 KHz | | 19 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_J$ = 25°C | | 0.23 | | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°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.

**Table 20. Electrical characteristics of L7818C** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 26V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 17.3 | 18 | 18.7 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 21 to 33V | 17.1 | 18 | 18.9 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 21 to 33V, $T_J$ = 25°C | | | 360 | mV |
| | | $V_I$ = 24 to 30V, $T_J$ = 25°C | | | 180 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5A, $T_J$ = 25°C | | | 360 | mV |
| | | $I_O$ = 250 to 750mA, $T_J$ = 25°C | | | 180 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| | | $V_I$ = 21 to 33V | | | 1 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5mA | | -1 | | mV/°C |
| eN | Output noise voltage | B =10Hz to 100KHz, $T_J$ = 25°C | | 110 | | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 22 to 32V, f = 120Hz | 53 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 KHz | | 22 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_J$ = 25°C | | 0.20 | | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°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.

**Table 21. Electrical characteristics of L7820C** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 28V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 19.2 | 20 | 20.8 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 23 to 35V | 19 | 20 | 21 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 22.5 to 35V, $T_J$ = 25°C | | | 400 | mV |
| | | $V_I$ = 26 to 32V, $T_J$ = 25°C | | | 200 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5A, $T_J$ = 25°C | | | 400 | mV |
| | | $I_O$ = 250 to 750mA, $T_J$ = 25°C | | | 200 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| | | $V_I$ = 23 to 35V | | | 1 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5mA | | -1 | | mV/°C |
| eN | Output noise voltage | B =10Hz to 100KHz, $T_J$ = 25°C | | 150 | | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 24 to 35V, f = 120Hz | 52 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 KHz | | 24 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_J$ = 25°C | | 0.18 | | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°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.

**Table 22. Electrical characteristics of L7824C** (refer to the test circuits, $T_J$ = -55 to 150°C, $V_I$ = 33V, $I_O$ = 500 mA, $C_I$ = 0.33 µF, $C_O$ = 0.1 µF unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 23 | 24 | 25 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 27 to 38V | 22.8 | 24 | 25.2 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 27 to 38V, $T_J$ = 25°C | | | 480 | mV |
| | | $V_I$ = 30 to 36V, $T_J$ = 25°C | | | 240 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5A, $T_J$ = 25°C | | | 480 | mV |
| | | $I_O$ = 250 to 750mA, $T_J$ = 25°C | | | 240 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| | | $V_I$ = 27 to 38V | | | 1 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5mA | | -1.5 | | mV/°C |
| eN | Output noise voltage | B =10Hz to 100KHz, $T_J$ = 25°C | | 170 | | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 28 to 38V, f = 120Hz | 50 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 KHz | | 28 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_J$ = 25°C | | 0.15 | | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°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.

# 5 Typical performance

**Figure 7. Dropout voltage vs junction temperature**

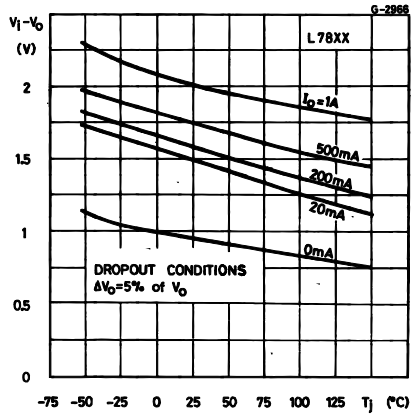



**Figure 8. Peak output current vs input/output differential voltage**

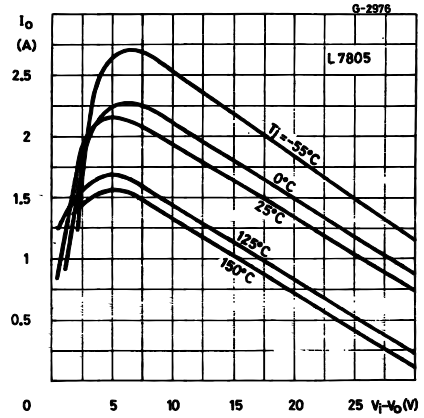



**Figure 9. Supply voltage rejection vs frequency**

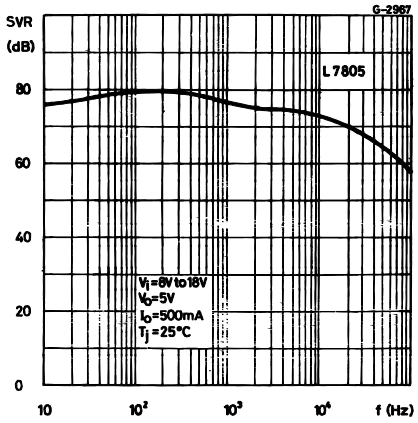



**Figure 10. Output voltage vs junction temperature**

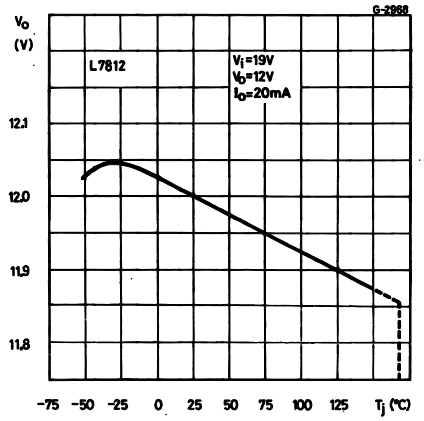



**Figure 11. Output impedance vs frequency**

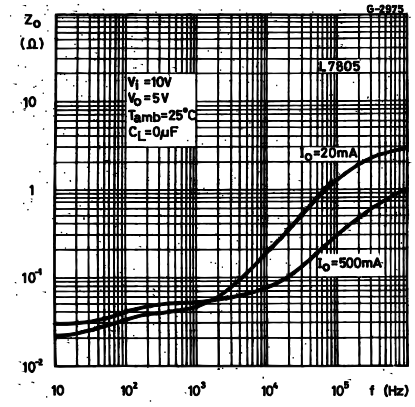



**Figure 12. Quiescent current vs junction temperature**

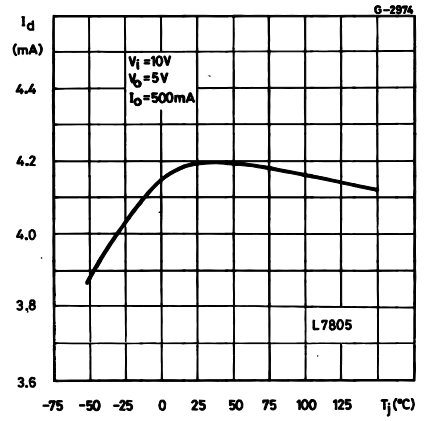


**Figure 13. Load transient response**

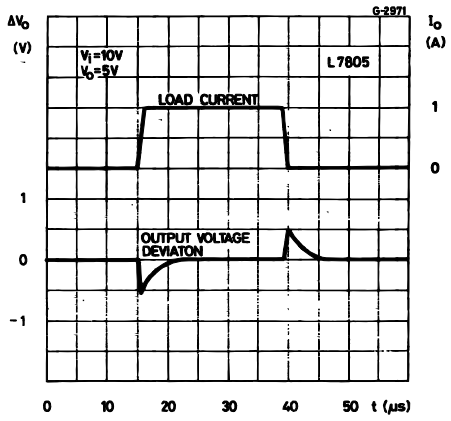



**Figure 14. Line transient response**

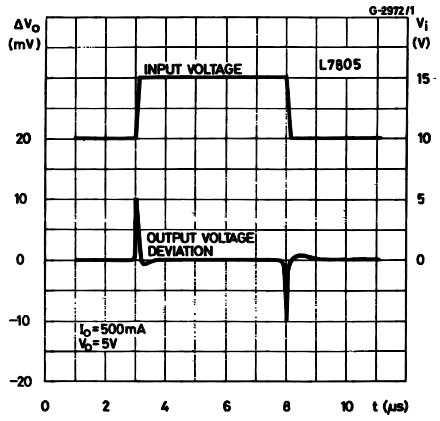



**Figure 15. Quiescent current vs input voltage**

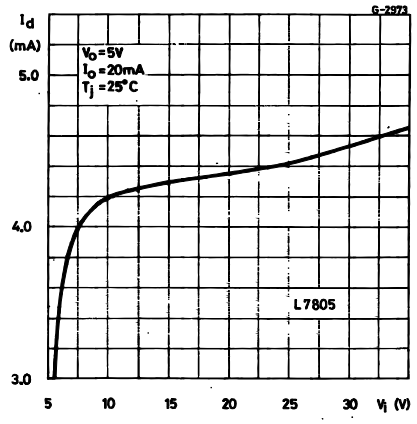
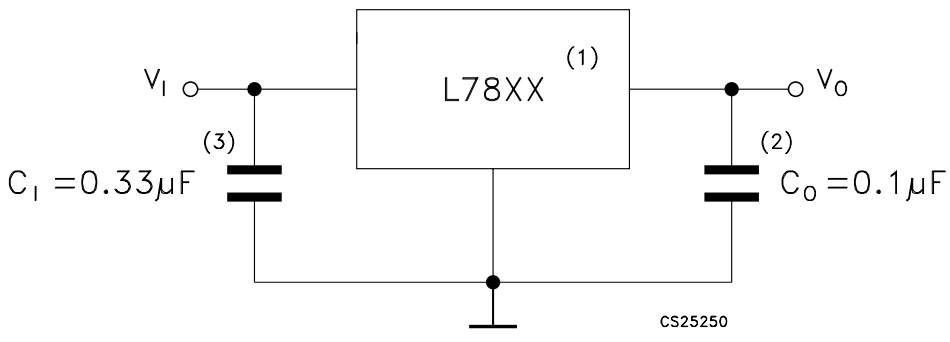



**Figure 16. Fixed output regulator**




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 17. Current regulator**

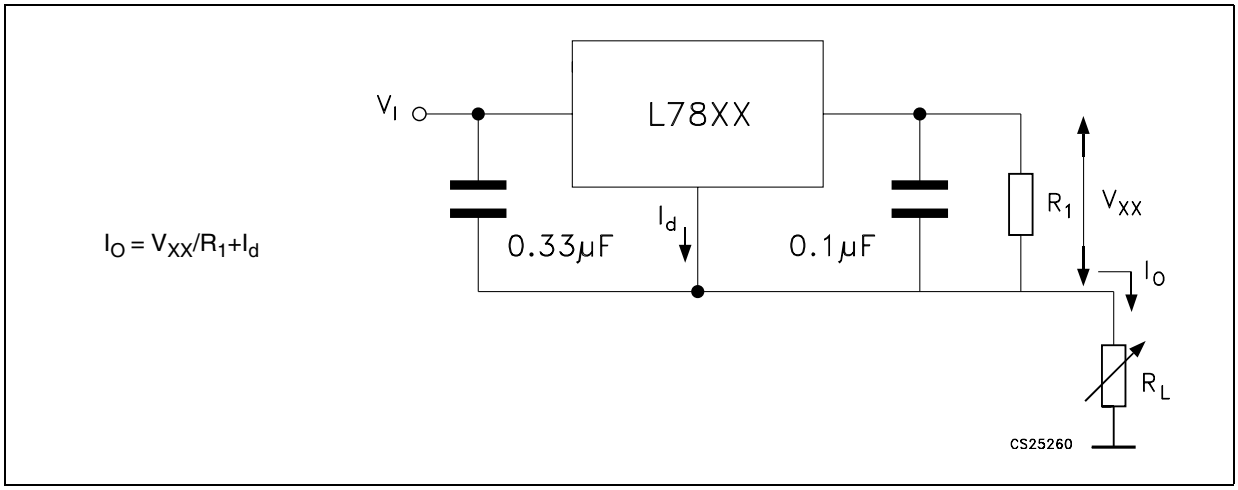



**Figure 18. Circuit for increasing output voltage**

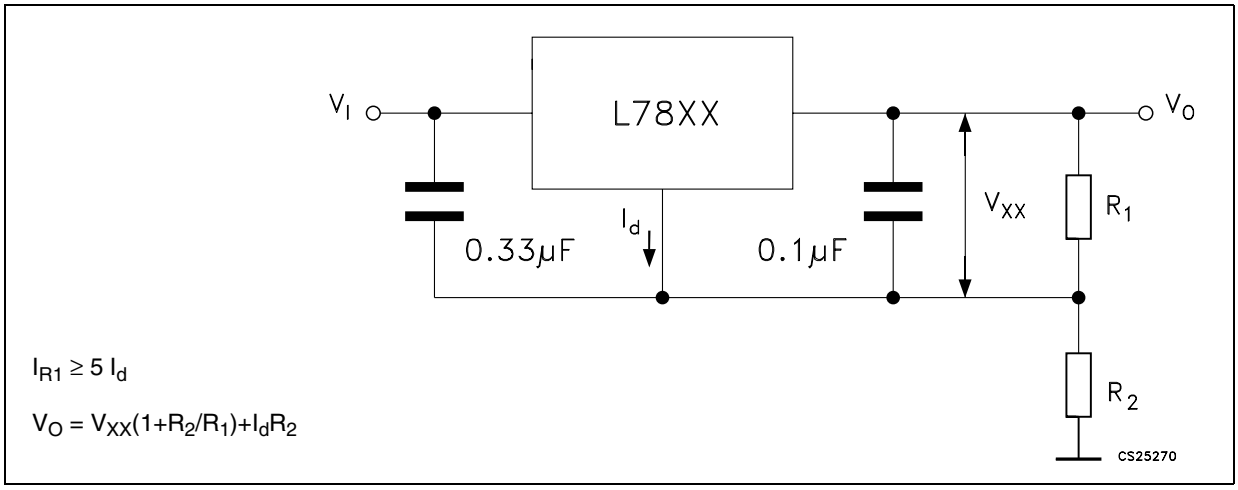



**Figure 19. Adjustable output regulator (7 to 30V)**

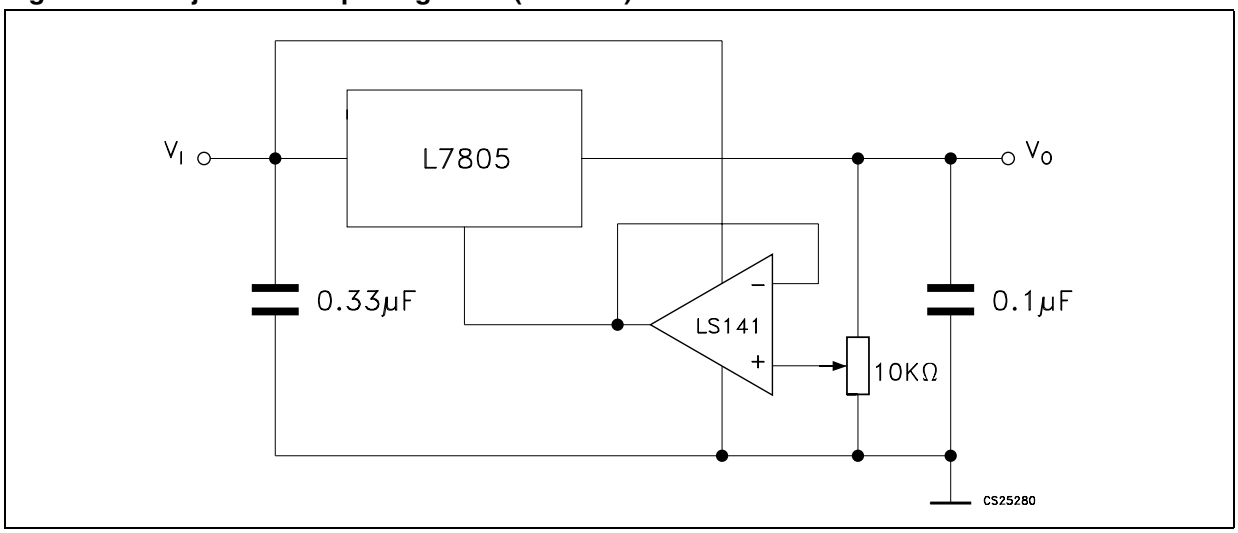


**Figure 20. 0.5 to 10V Regulator**

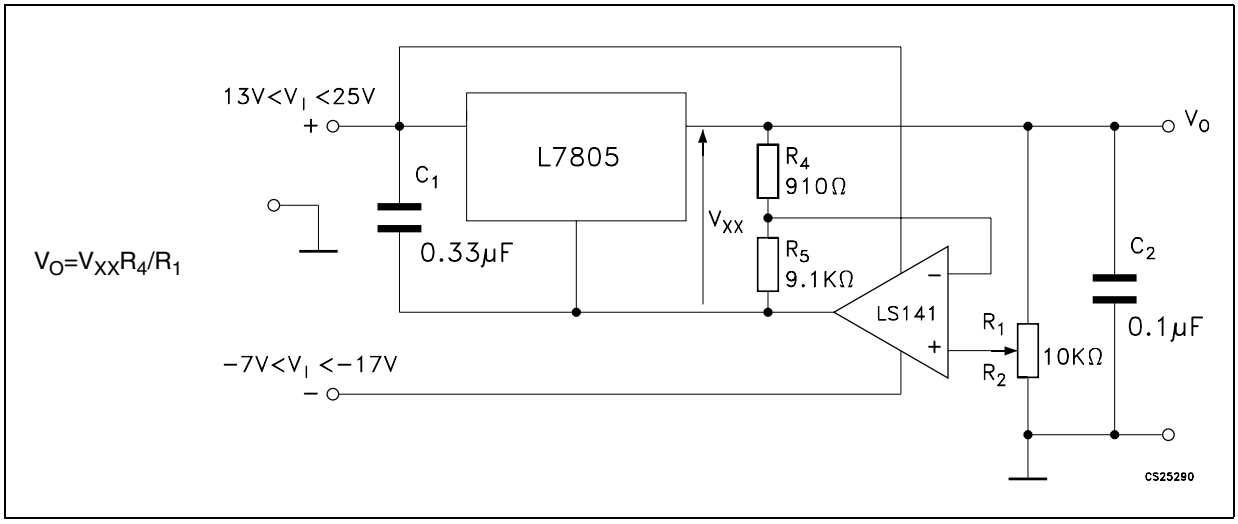



**Figure 21. High current voltage regulator**

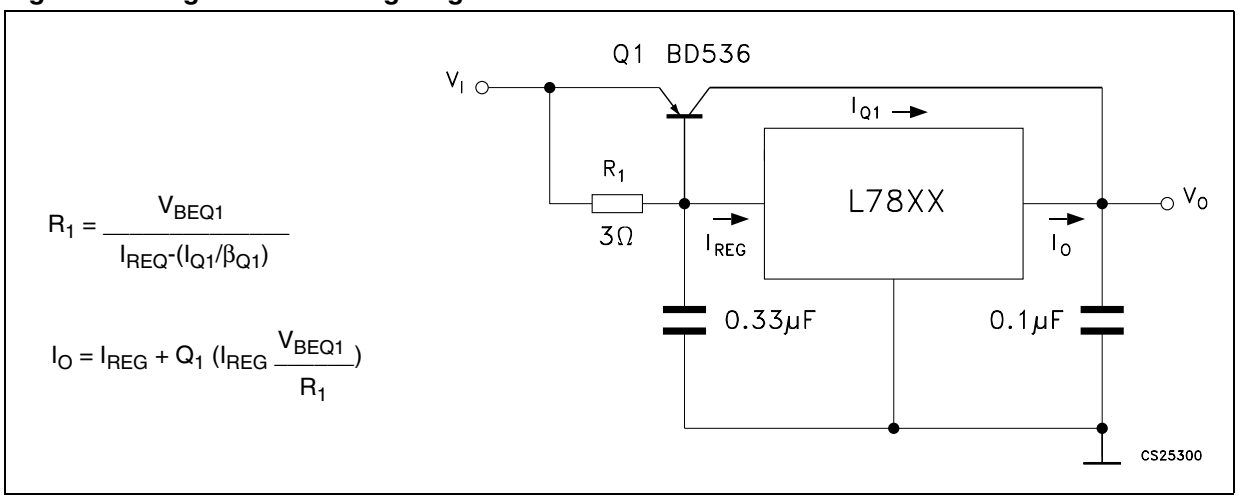



**Figure 22. High output current with short circuit protection**

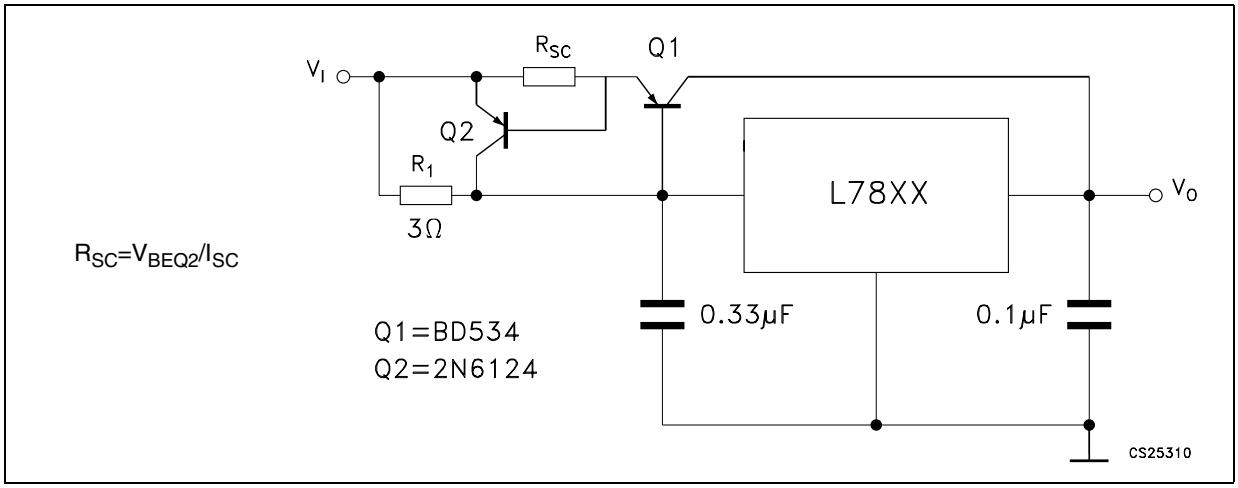


**Figure 23. Tracking voltage regulator**

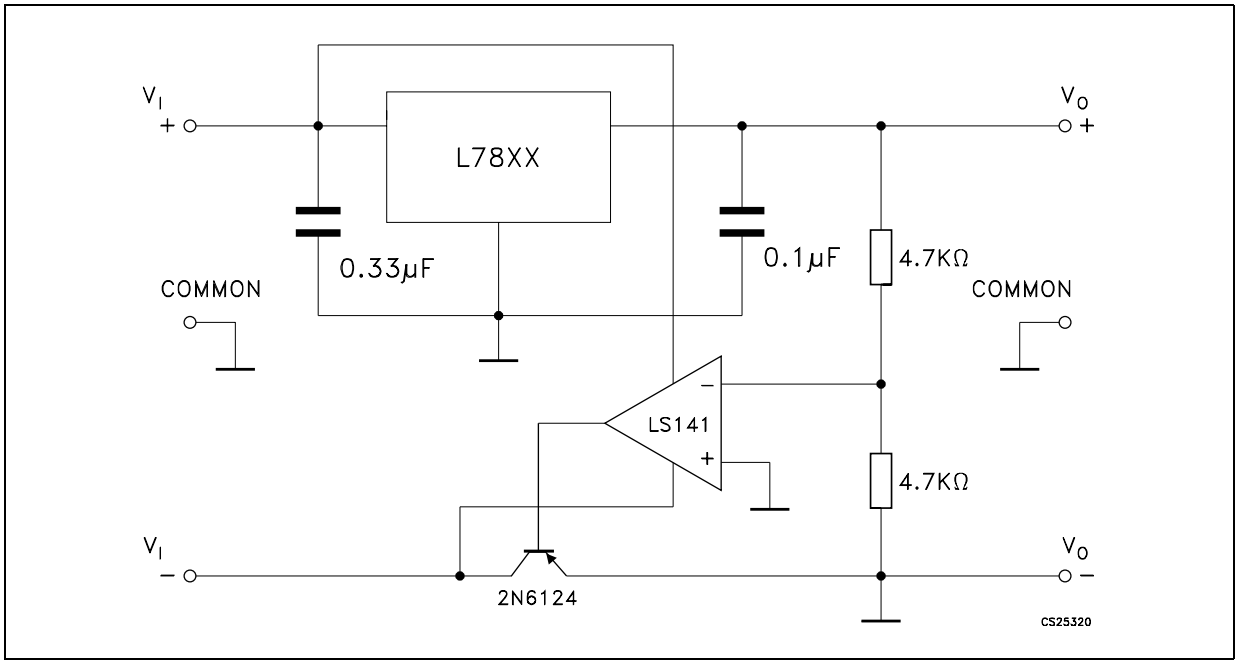
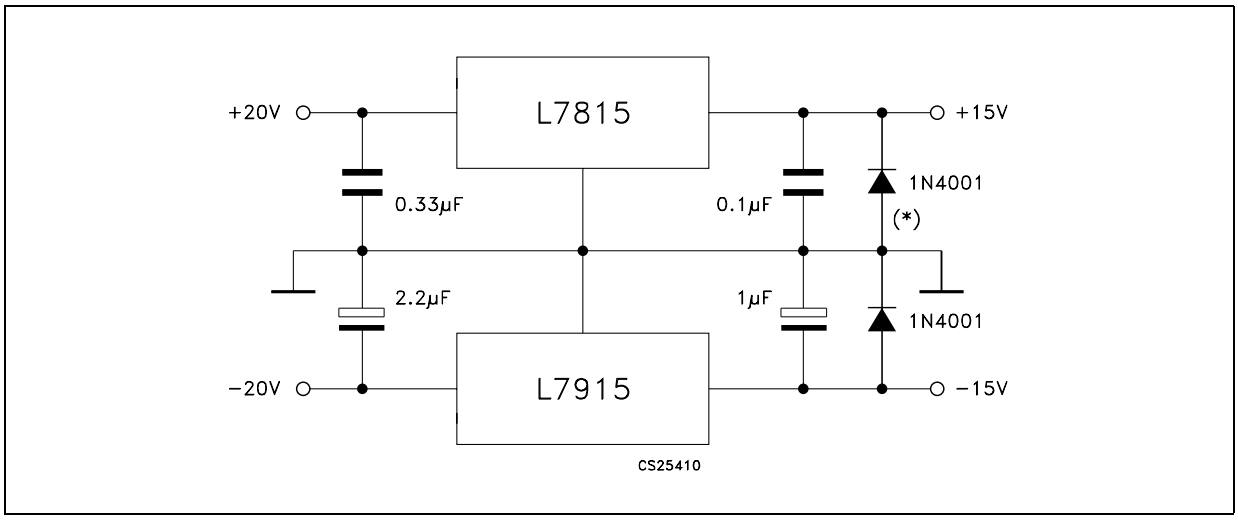



**Figure 24. Split power supply (± 15V - 1 A)**




* Against potential latch-up problems.

**Figure 25. Negative output voltage circuit**

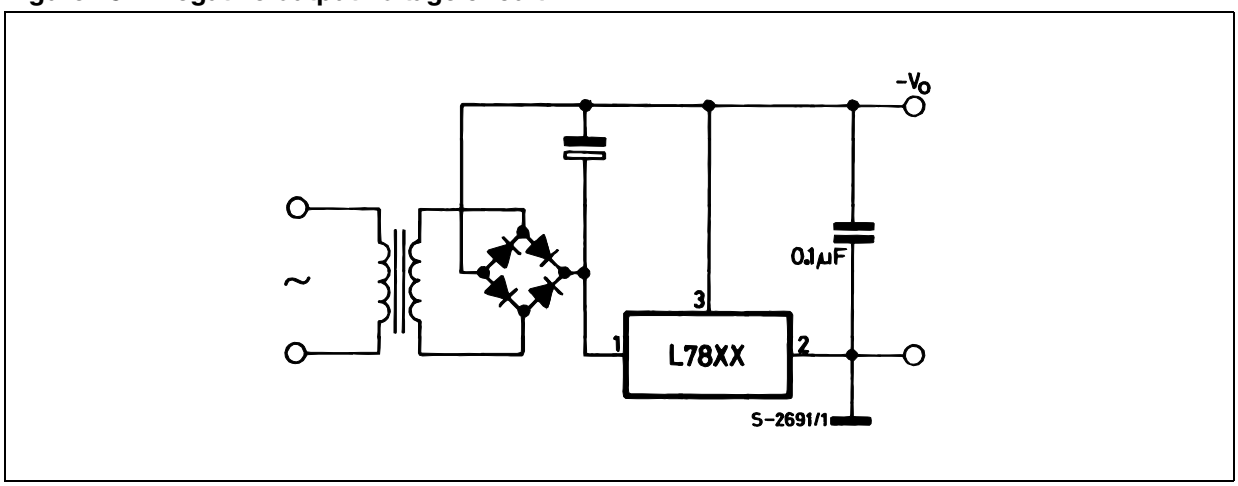



**Figure 26. Switching regulator**

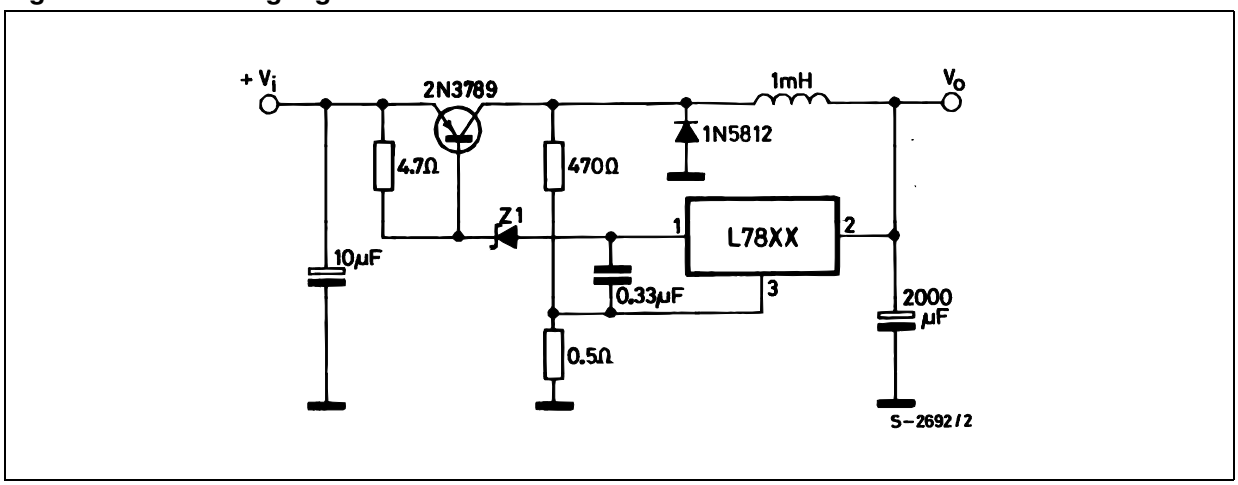



**Figure 27. High input voltage circuit**

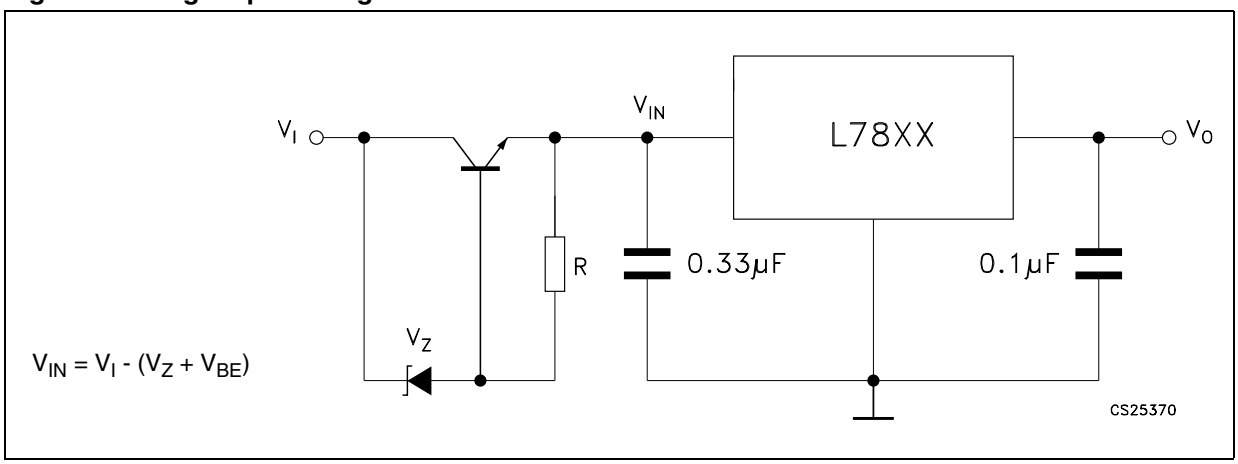


**Figure 28. High input voltage circuit**

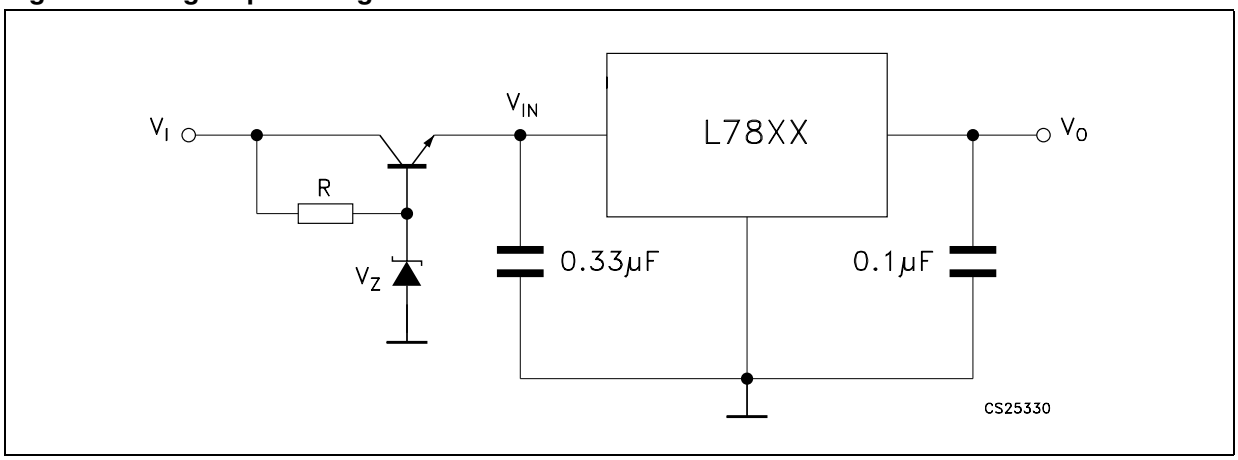



**Figure 29. High output voltage regulator**

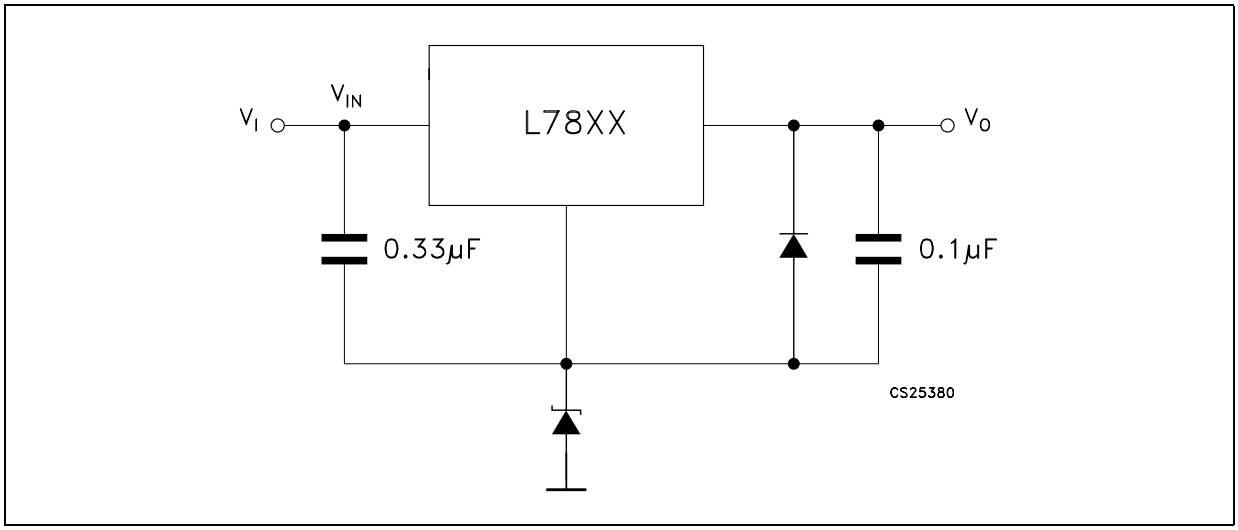
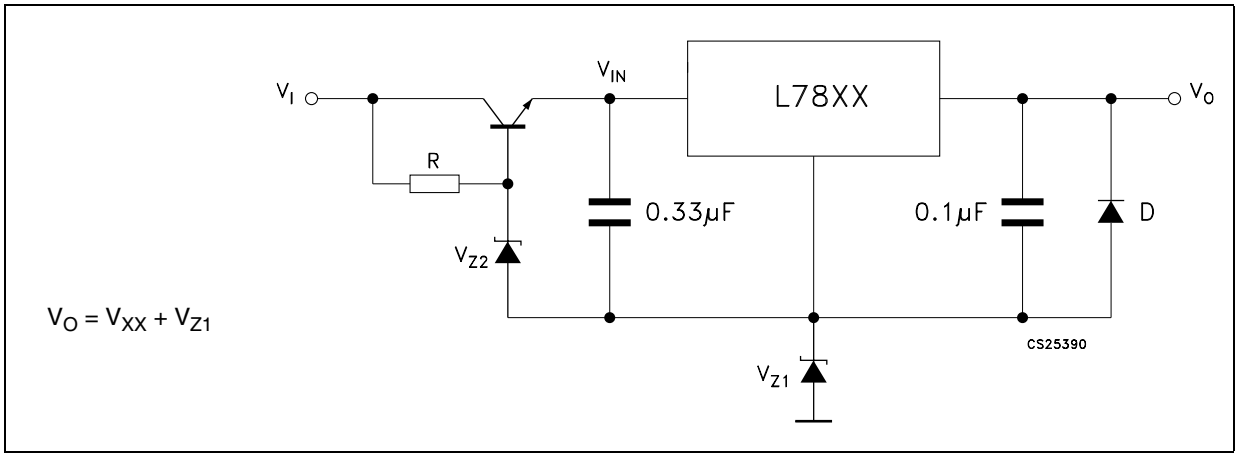



**Figure 30. High input and output voltage**




$V_O = V_{XX} + V_{Z1}$

**Figure 31. Reducing power dissipation with dropping resistor**

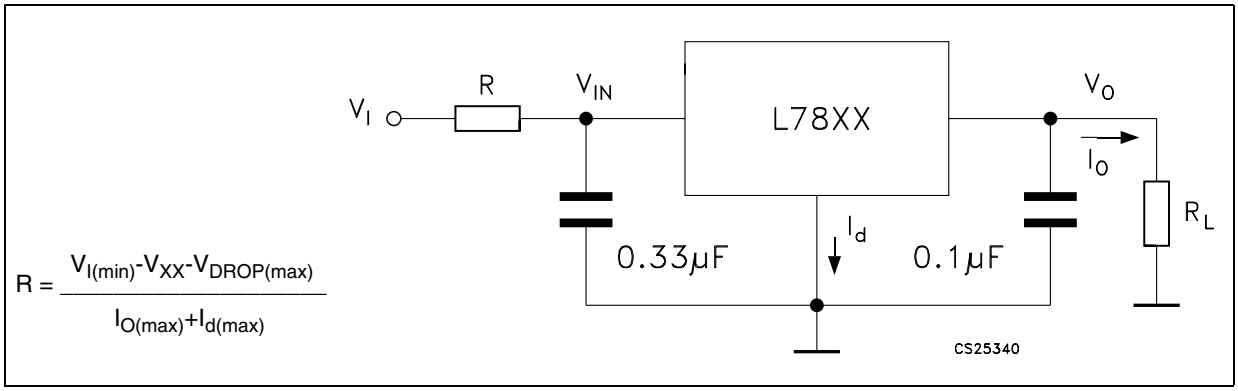



**Figure 32. Remote shutdown**

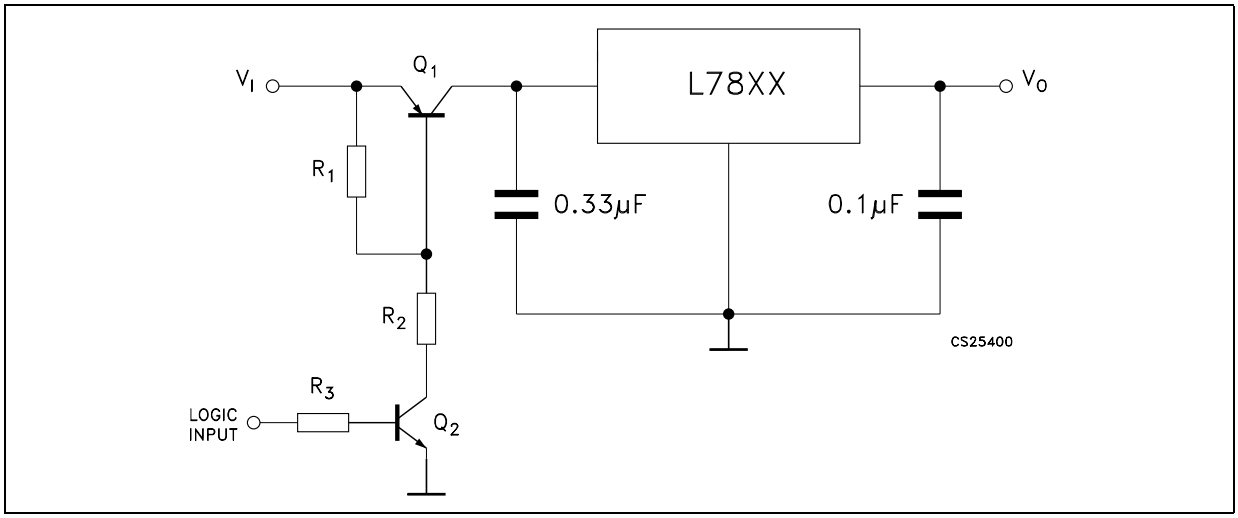
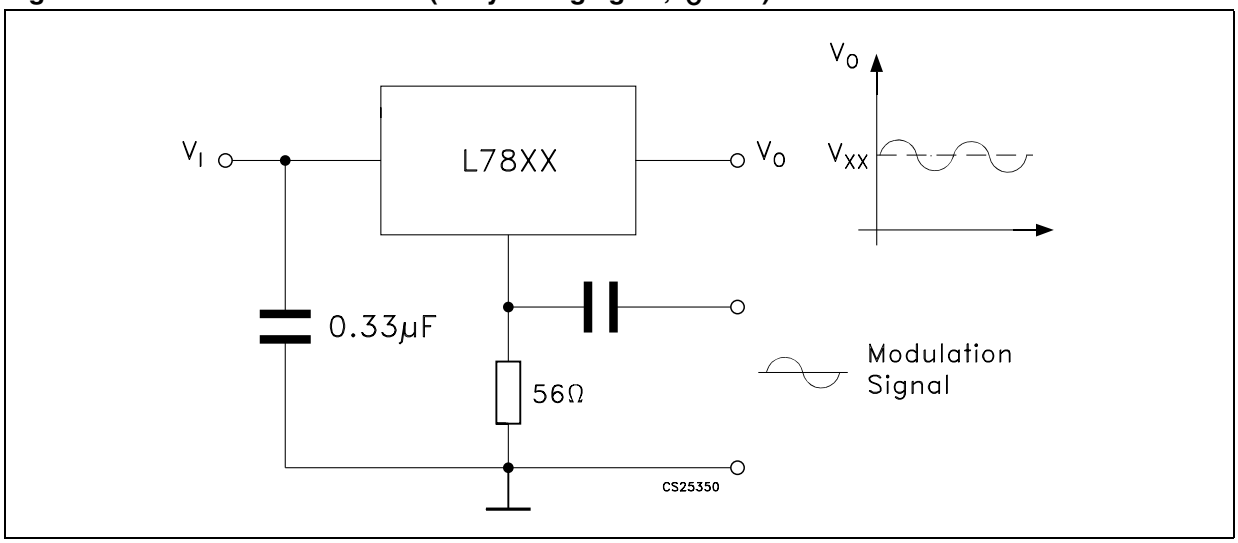
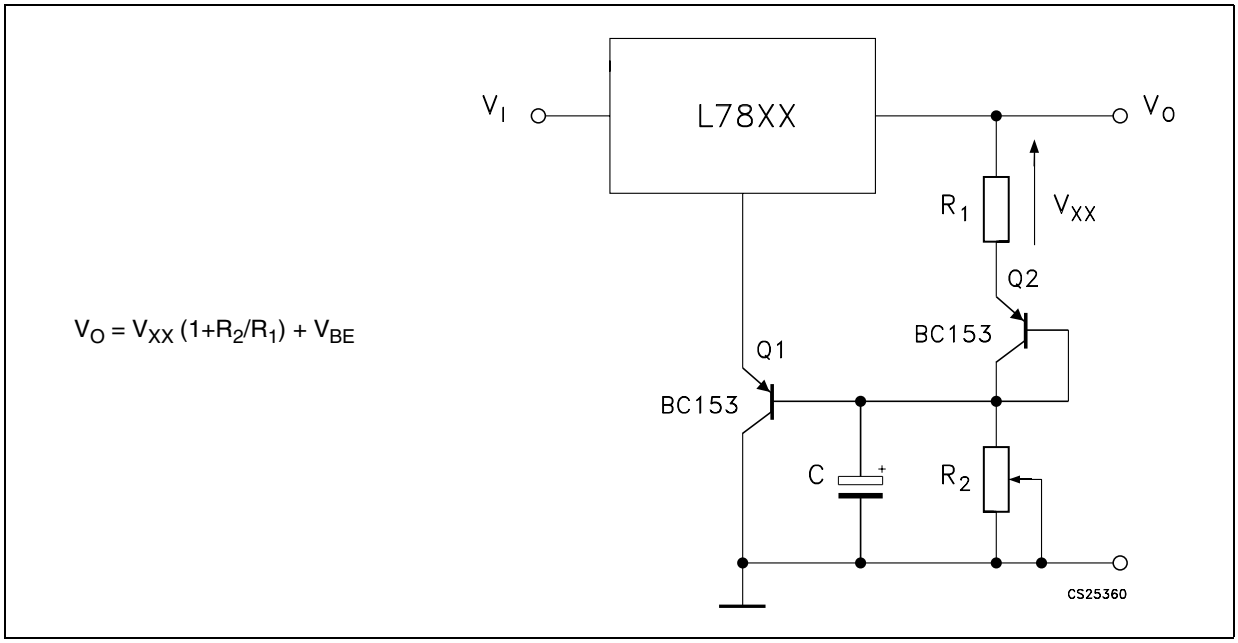



**Figure 33. Power AM modulator (unity voltage gain, $I_O \leq 0.5$)**



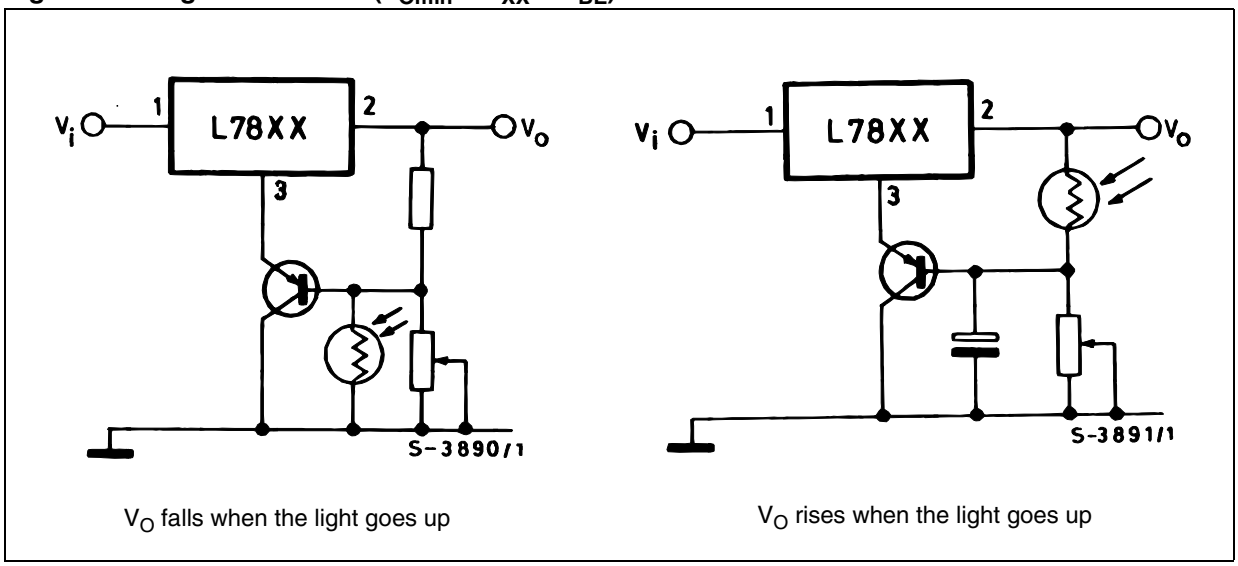

*Note: The circuit performs well up to 100 KHz.*

**Figure 34. 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 $V_O$.*

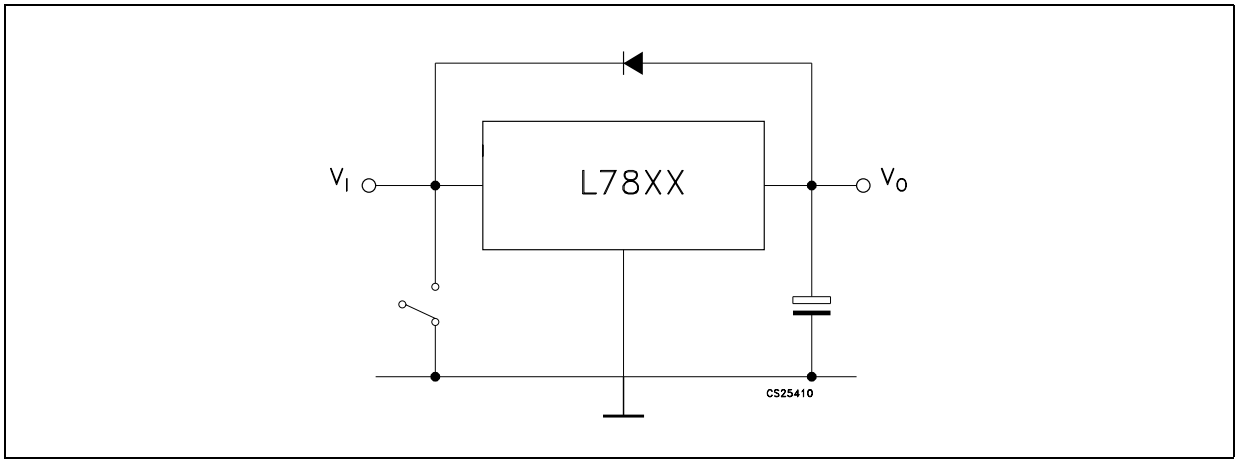
**Figure 35. Light controllers ($V_{Omin} = V_{XX} + V_{BE}$)**




$V_O$ falls when the light goes up

$V_O$ rises when the light goes up

**Figure 36. Protection against input short-circuit with high capacitance loads**



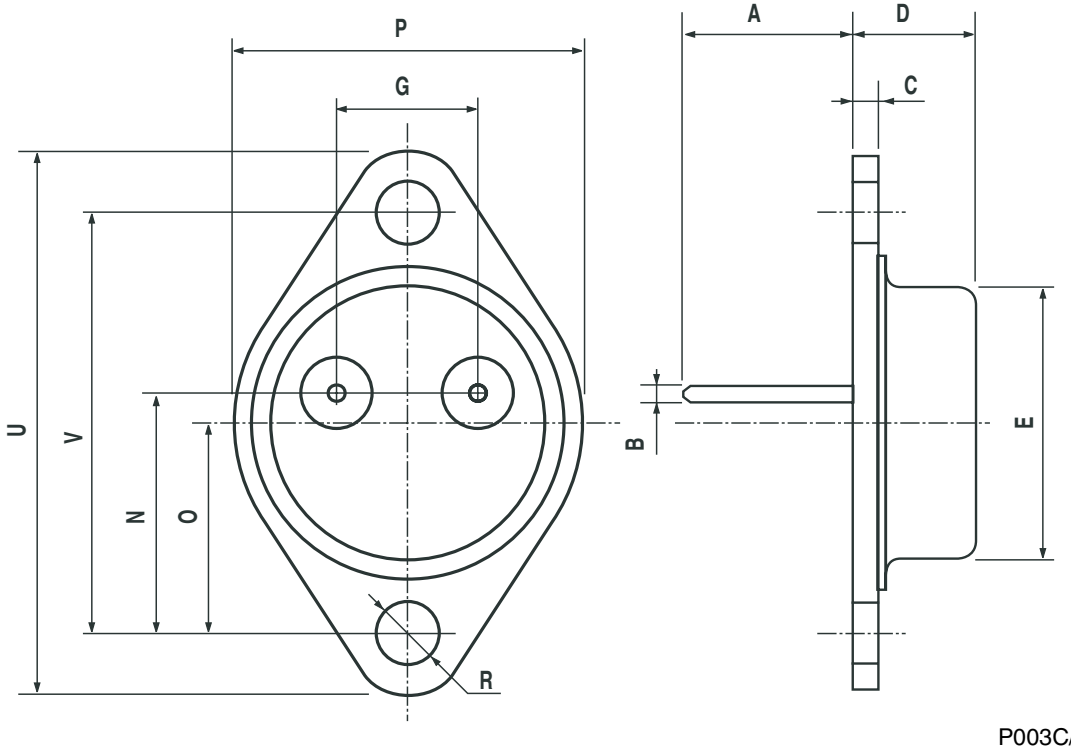

1. Application with high capacitance loads and an output voltage greater than 6 volts need an external diode (see fig. 32) to protect the device against input short circuit. In this case the input voltage falls rapidly while the output voltage decrease slowly. The capacitance discharges by means of the 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.

# 6 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second Level Interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

## TO-3 MECHANICAL DATA

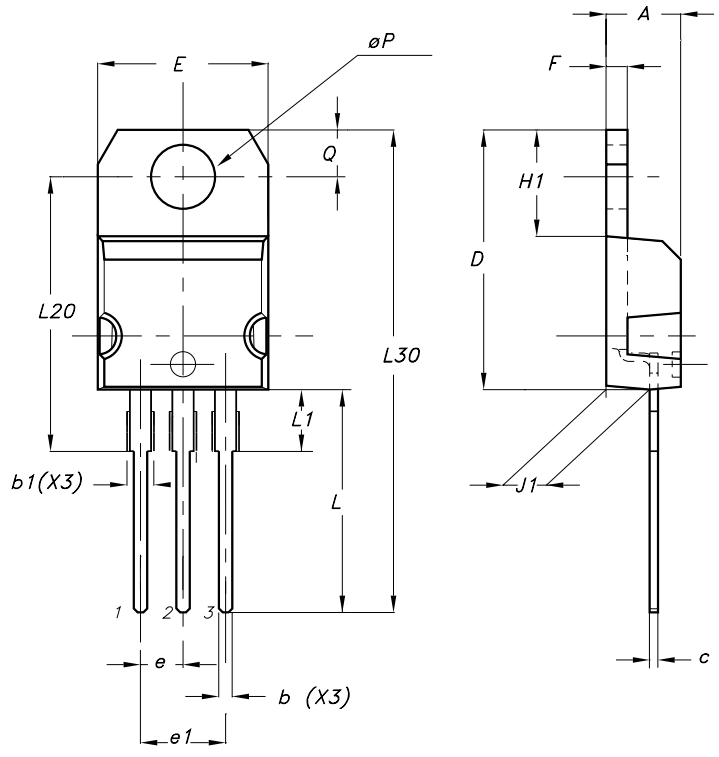
| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | 11.85 | | | 0.466 | |
| B | 0.96 | 1.05 | 1.10 | 0.037 | 0.041 | 0.043 |
| C | | | 1.70 | | | 0.066 |
| D | | | 8.7 | | | 0.342 |
| E | | | 20.0 | | | 0.787 |
| G | | 10.9 | | | 0.429 | |
| 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 | |




P003C/C

## TO-220 (A TYPE) MECHANICAL DATA

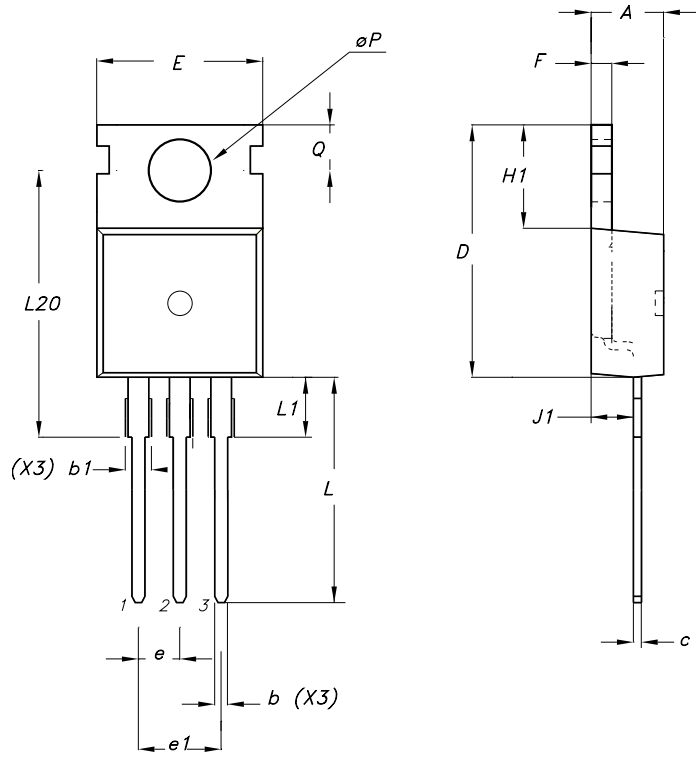
| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| b | 0.61 | | 0.88 | 0.024 | | 0.034 |
| b1 | 1.15 | | 1.70 | 0.045 | | 0.067 |
| c | 0.49 | | 0.70 | 0.019 | | 0.027 |
| D | 15.25 | | 15.75 | 0.600 | | 0.620 |
| E | 10.0 | | 10.40 | 0.393 | | 0.409 |
| e | 2.4 | | 2.7 | 0.094 | | 0.106 |
| e1 | 4.95 | | 5.15 | 0.194 | | 0.203 |
| F | 1.23 | | 1.32 | 0.048 | | 0.051 |
| H1 | 6.2 | | 6.6 | 0.244 | | 0.260 |
| J1 | 2.40 | | 2.72 | 0.094 | | 0.107 |
| L | 13.0 | | 14.0 | 0.511 | | 0.551 |
| L1 | 3.5 | | 3.93 | 0.137 | | 0.154 |
| L20 | | 16.4 | | | 0.645 | |
| L30 | | 28.9 | | | 1.138 | |
| ϕP | 3.75 | | 3.85 | 0.147 | | 0.151 |
| Q | 2.65 | | 2.95 | 0.104 | | 0.116 |




0015988/N

## TO-220 (C TYPE) MECHANICAL DATA

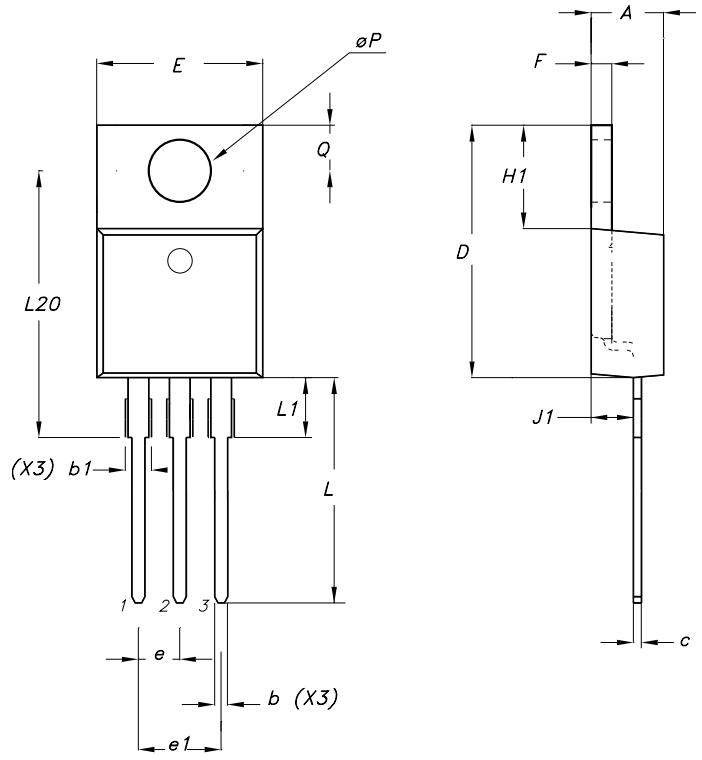
| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 4.30 | | 4.70 | 0.169 | | 0.185 |
| b | 0.70 | | 0.90 | 0.028 | | 0.035 |
| b1 | 1.42 | | 1.62 | 0.056 | | 0.064 |
| c | 0.45 | | 0.60 | 0.018 | | 0.024 |
| D | | 15.70 | | | 0.618 | |
| E | 9.80 | | 10.20 | 0.386 | | 0.402 |
| e | | 2.54 | | | 0.100 | |
| e1 | | 5.08 | | | 0.200 | |
| F | 1.25 | | 1.39 | 0.049 | | 0.055 |
| H1 | | 6.5 | | | 0.256 | |
| J1 | 2.20 | | 2.60 | 0.087 | | 0.202 |
| L | 12.88 | | 13.28 | 0.507 | | 0.523 |
| L1 | | 3 | | | 0.118 | |
| L20 | 15.70 | | 16.1 | 0.618 | | 0.634 |
| L30 | | 28.9 | | | 1.138 | |
| ϕP | 3.50 | | 3.70 | 0.138 | | 0.146 |
| Q | 2.70 | | 2.90 | 0.106 | | 0.114 |




0015988/N

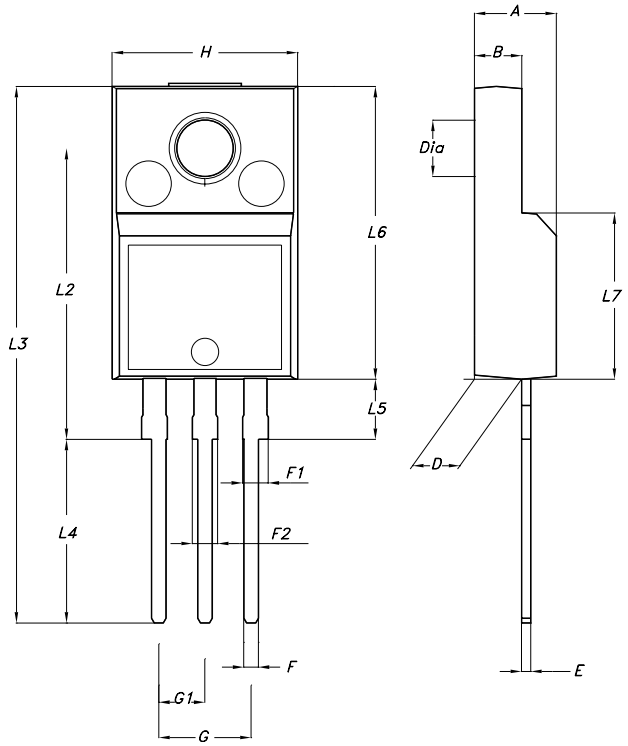
## TO-220 (E TYPE) MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 4.47 | | 4.67 | 0.176 | | 0.184 |
| b | 0.70 | | 0.91 | 0.028 | | 0.036 |
| b1 | 1.17 | | 1.37 | 0.046 | | 0.054 |
| c | 0.31 | | 0.53 | 0.012 | | 0.021 |
| D | 14.60 | | 15.70 | 0.575 | | 0.618 |
| E | 9.96 | | 10.36 | 0.392 | | 0.408 |
| e | | 2.54 | | | 0.100 | |
| e1 | | 5.08 | | | 0.200 | |
| F | 1.17 | | 1.37 | 0.046 | | 0.054 |
| H1 | 6.1 | | 6.8 | 0.240 | | 0.268 |
| J1 | 2.52 | | 2.82 | 0.099 | | 0.111 |
| L | 12.70 | | 13.80 | 0.500 | | 0.543 |
| L1 | 3.20 | | 3.96 | 0.126 | | 0.156 |
| L20 | 15.21 | | 16.77 | 0.599 | | 0.660 |
| ϕP | 3.73 | | 3.94 | 0.147 | | 0.155 |
| Q | 2.59 | | 2.89 | 0.102 | | 0.114 |



## TO-220FP MECHANICAL DATA

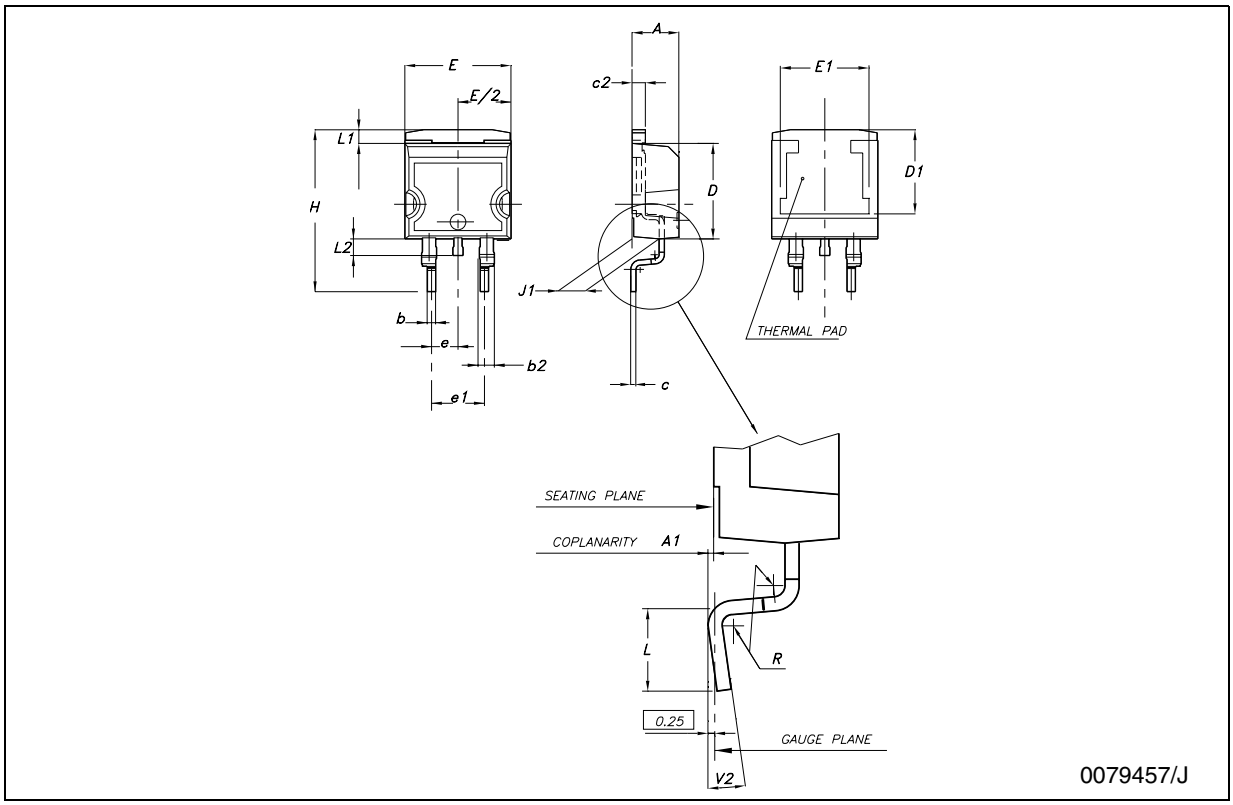
| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| B | 2.5 | | 2.7 | 0.098 | | 0.106 |
| D | 2.5 | | 2.75 | 0.098 | | 0.108 |
| E | 0.45 | | 0.70 | 0.017 | | 0.027 |
| F | 0.75 | | 1 | 0.030 | | 0.039 |
| 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 |




7012510A-H

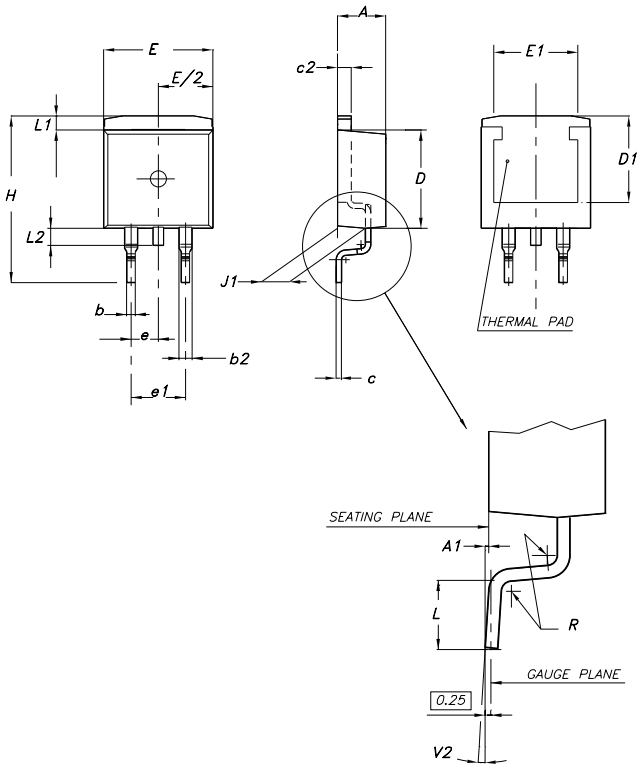
## D²PAK (A TYPE) MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 4.4 | | 4.6 | 0.173 | | 0.181 |
| A1 | 0.03 | | 0.23 | 0.001 | | 0.009 |
| b | 0.7 | | 0.93 | 0.027 | | 0.036 |
| b2 | 1.14 | | 1.7 | 0.044 | | 0.067 |
| c | 0.45 | | 0.6 | 0.017 | | 0.023 |
| c2 | 1.23 | | 1.36 | 0.048 | | 0.053 |
| D | 8.95 | | 9.35 | 0.352 | | 0.368 |
| D1 | 8 | | | 0.315 | | |
| E | 10 | | 10.4 | 0.393 | | 0.409 |
| E1 | 8.5 | | | 0.335 | | |
| e | | 2.54 | | | 0.100 | |
| e1 | 4.88 | | 5.28 | 0.192 | | 0.208 |
| H | 15 | | 15.85 | 0.590 | | 0.624 |
| J1 | 2.49 | | 2.69 | 0.098 | | 0.106 |
| L | 2.29 | | 2.79 | 0.090 | | 0.110 |
| L1 | 1.27 | | 1.4 | 0.050 | | 0.055 |
| L2 | 1.3 | | 1.75 | 0.051 | | 0.069 |
| R | | 0.4 | | | 0.016 | |
| V2 | 0° | | 8° | 0° | | 8° |



## D²PAK (C TYPE) MECHANICAL DATA

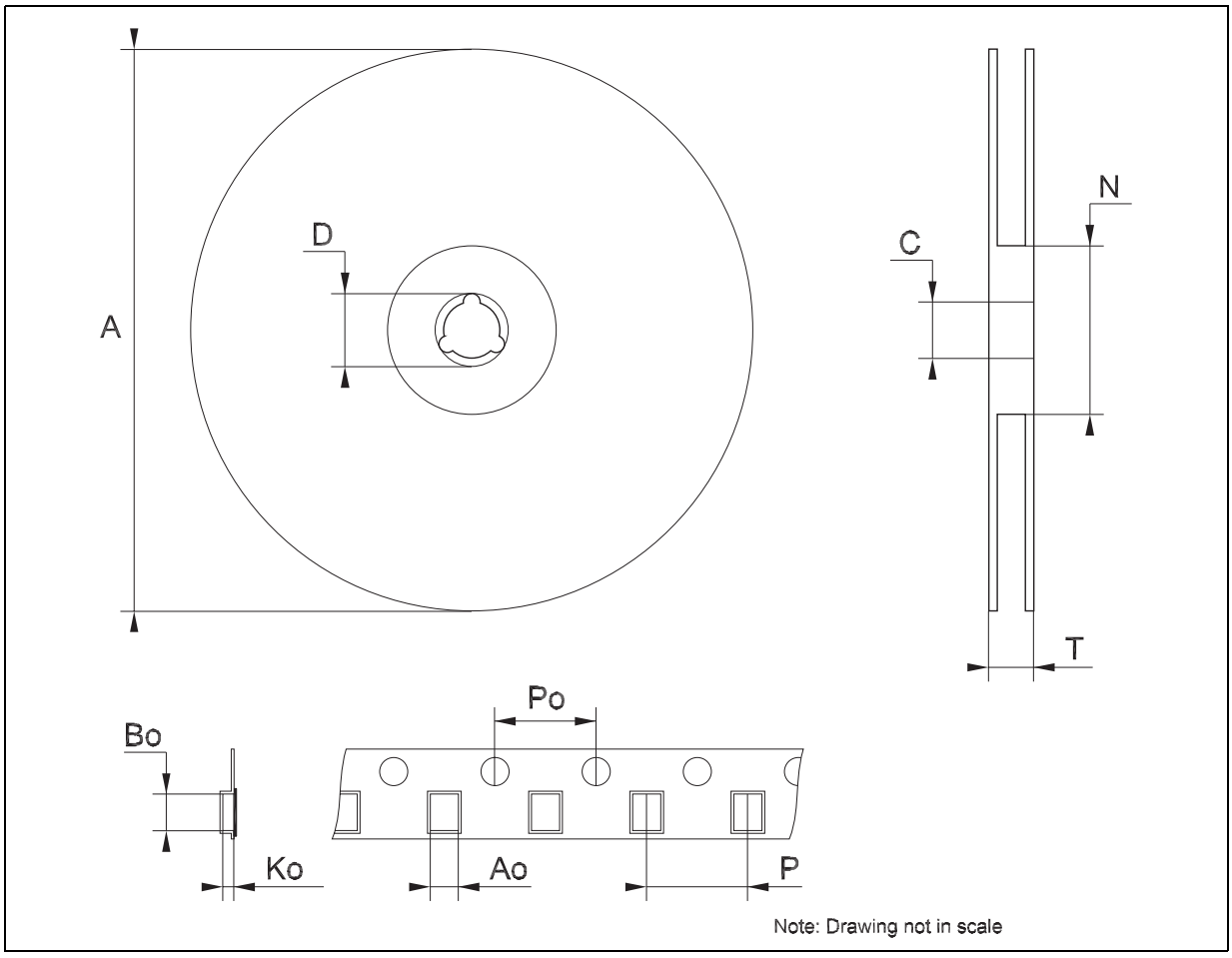
| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 4.3 | | 4.7 | 0.169 | | 0.185 |
| A1 | 0 | | 0.20 | 0.000 | | 0.008 |
| b | 0.70 | | 0.90 | 0.028 | | 0.035 |
| b2 | 1.17 | | 1.37 | 0.046 | | 0.054 |
| c | 0.45 | 0.50 | 0.6 | 0.018 | 0.020 | 0.024 |
| c2 | 1.25 | 1.30 | 1.40 | 0.049 | 0.051 | 0.055 |
| D | 9.0 | 9.2 | 9.4 | 0.354 | 0.362 | 0.370 |
| D1 | 7.5 | | | 0.295 | | |
| E | 9.8 | | 10.2 | 0.386 | | 0.402 |
| E1 | 7.5 | | | 0.295 | | |
| e | | 2.54 | | | 0.100 | |
| e1 | | 5.08 | | | 0.200 | |
| H | 15 | 15.30 | 15.60 | 0.591 | 0.602 | 0.614 |
| J1 | 2.20 | | 2.60 | 0.087 | | 0.102 |
| L | 1.79 | | 2.79 | 0.070 | | 0.110 |
| L1 | 1.0 | | 1.4 | 0.039 | | 0.055 |
| L2 | 1.2 | | 1.6 | 0.047 | | 0.063 |
| R | | 0.3 | | | 0.012 | |
| V2 | 0° | | 3° | 0° | | 3° |




0079457/J

## Tape & Reel D²PAK-P²PAK-D²PAK/A-P²PAK/A 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 |




Note: Drawing not in scale

# 7 Order code

**Table 23. Order code**

| Part numbers | Packaging | | | | | |
|---|---|---|---|---|---|---|
| | TO-220 (A Type) | TO-220 (C Type) | $D^2PAK$ (A Type) | $D^2PAK$ (C Type) | TO-220FP | TO-3 |
| L7805 | | | | | | L7805T |
| L7805C | L7805CV | L7805C-V | L7805CD2T-TR | L7805C-D2TR | L7805CP | L7805CT |
| L7852C | L7852CV | | L7852CD2T-TR(1) | | L7852CP(1) | L7852CT(1) |
| L7806C | L7806CV | L7806C-V | L7806CD2T-TR | | L7806CP | L7806CT |
| L7808C | L7808CV | L7808C-V | L7808CD2T-TR | | L7808CP | L7808CT |
| L7885C | L7885CV | | L7885CD2T-TR(1) | | L7885CP(1) | L7885CT(1) |
| L7809C | L7809CV | L7809C-V | L7809CD2T-TR | | L7809CP | L7809CT |
| L7810C | L7810CV | | L7810CD2T-TR(1) | | L7810CP | |
| L7812C | L7812CV | L7812C-V | L7812CD2T-TR | | L7812CP | L7812CT |
| L7815C | L7815CV | L7815C-V | L7815CD2T-TR | | L7815CP | L7815CT |
| L7818C | L7818CV | | L7818CD2T-TR(1) | | L7818CP | L7818CT |
| L7820C | L7820CV | | L7820CD2T-TR(1) | | L7820CP(1) | L7820CT(1) |
| L7824C | L7824CV | | L7824CD2T-TR | | L7824CP | L7824CT |

1. Available on request.

# 8 Revision history

**Table 24. Revision history**

| Date | Revision | Changes |
|---|---|---|
| 21-Jun-2004 | 12 | Document updating. |
| 03-Aug-2006 | 13 | Order Codes has been updated and new template. |

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