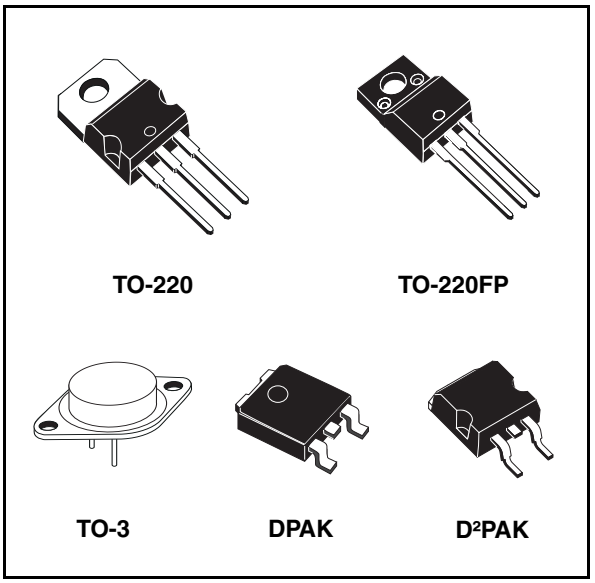
# L78xx
# L78xxC

## Positive voltage regulators

## Features

- Output current 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




## Description

The L78xx series of three-terminal positive regulators is available in TO-220, TO-220FP, TO-3, $D^2PAK$ 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 | L7809C |
| L7805C | L7812C |
| L7806C | L7815C |
| L7808C | L7818C |
| L7885C | L7824C |

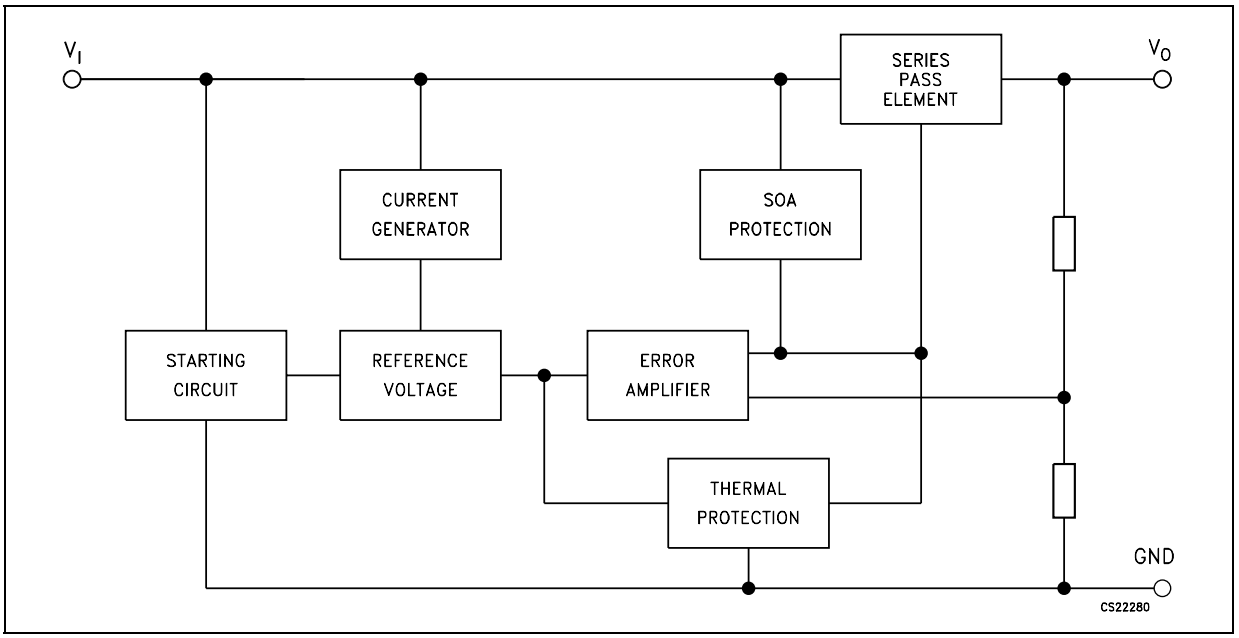
# Contents

# List of figures

# List of tables

# 1 Diagram

**Figure 1. Block diagram**



# 2 Pin configuration

**Figure 2. Pin connections (top view)**

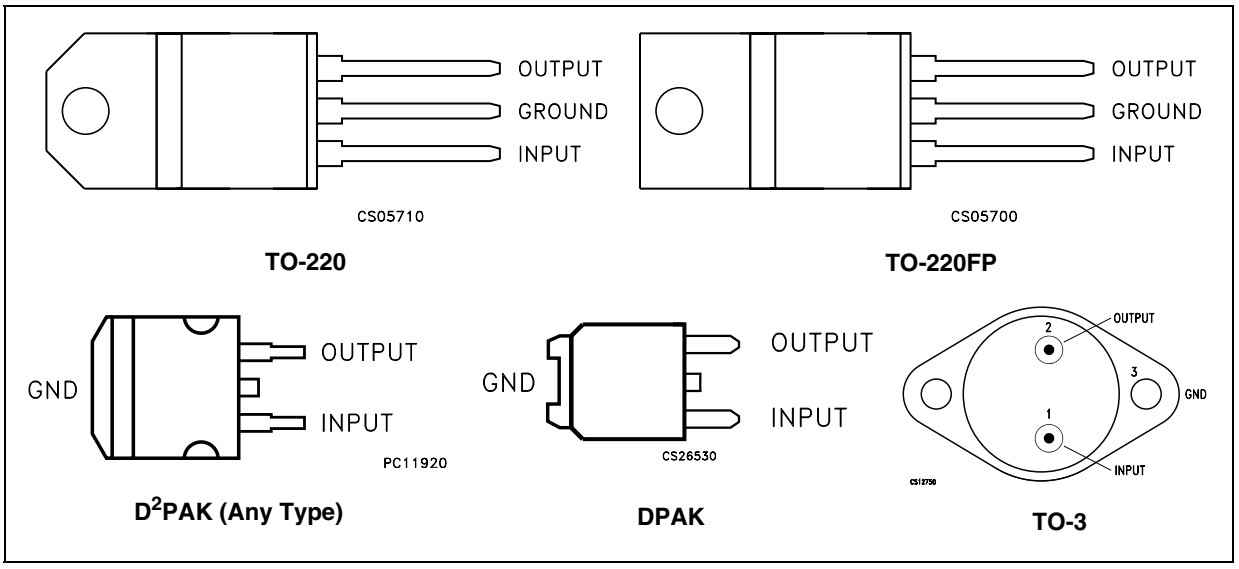
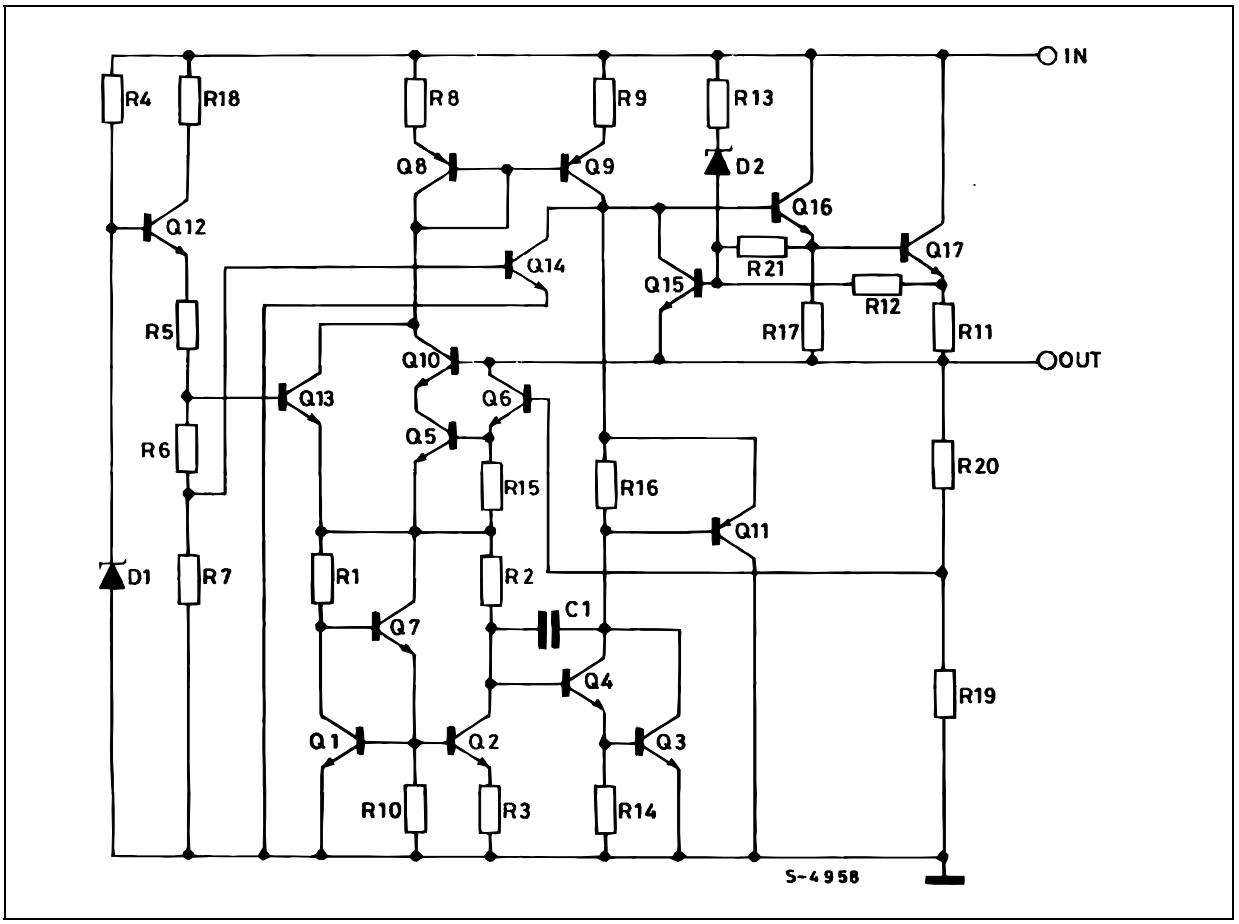



**Figure 3. Schematic diagram**



# 3 Maximum ratings

**Table 2. Absolute maximum ratings**

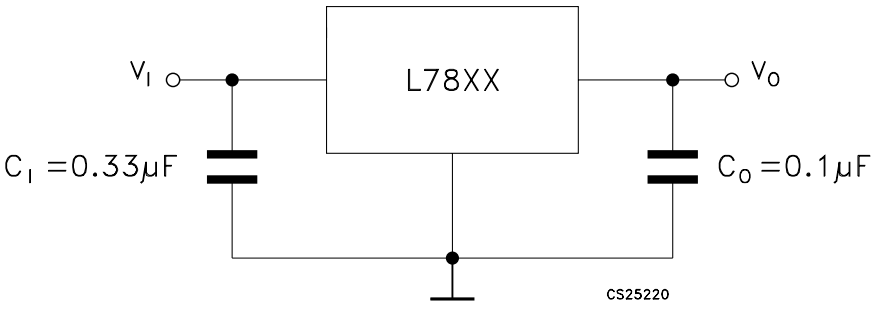
| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_I$ | DC input voltage | for $V_O$= 5 to 18 V | 35 | V |
| | | for $V_O$= 20, 24 V | 40 | |
| $I_O$ | Output current | | Internally limited | |
| $P_D$ | Power dissipation | | Internally limited | |
| $T_{STG}$ | Storage temperature range | | -65 to 150 | °C |
| $T_{OP}$ | Operating junction temperature range | for 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 3. Thermal data**

| Symbol | Parameter | $D^2PAK$ | 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**

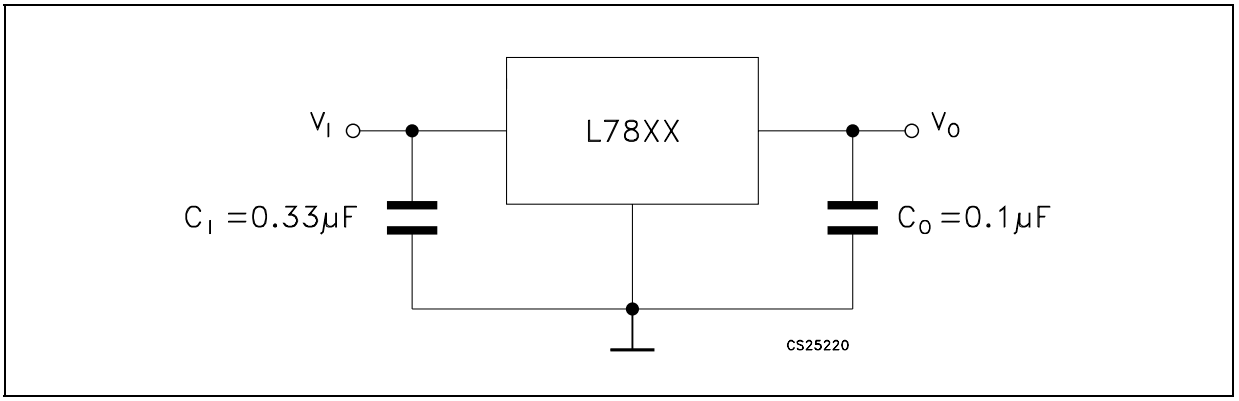



**Figure 6. Load regulation**

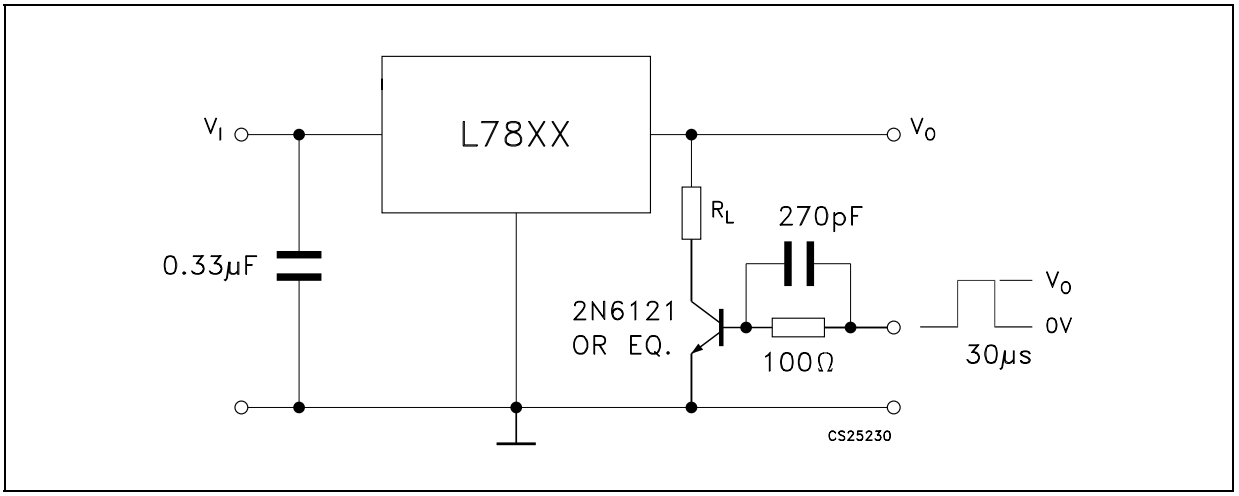
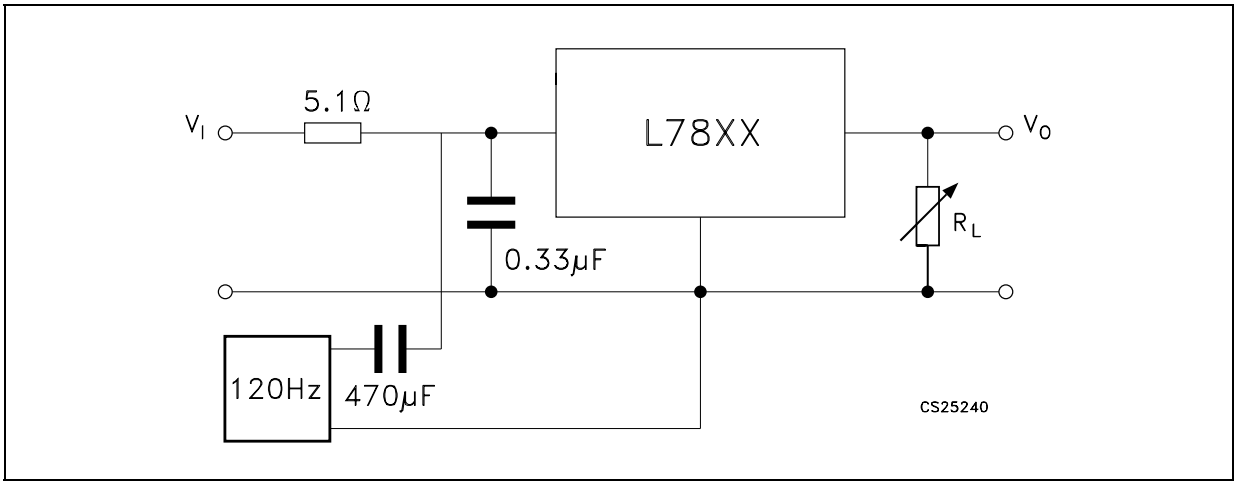



**Figure 7. Ripple rejection**



# 5 Electrical characteristics

**Table 4. Electrical characteristics of L7805** (refer to the test circuits, $T_J$ = -55 to 150 °C, $V_I$ = 10 V, $I_O$ = 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 | $I_O$ = 5 mA to 1 A, $P_O$ ≤15 W<br>$V_I$ = 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°C | | 3 | 50 | mV |
| | | $V_I$ = 8 to 12 V, $T_J$ = 25°C | | 1 | 25 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5 A, $T_J$ = 25°C | | | 100 | mV |
| | | $I_O$ = 250 to 750 mA, $T_J$ = 25°C | | | 25 | |
| $I_d$ | Quiescent current | $T_J$ = 25°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°C | | | 40 | µV/$V_O$ |
| 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°C | | 2 | 2.5 | V |
| $R_O$ | Output resistance | f = 1 kHz | | 17 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35 V, $T_J$ = 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 L7806** (refer to the test circuits, $T_J$ = -55 to 150 °C, $V_I$ = 11 V, $I_O$ = 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 | $I_O$ = 5 mA to 1 A, $P_O \leq$15 W<br>$V_I$ = 9 to 21 V | 5.65 | 6 | 6.35 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 8 to 25 V, $T_J$ = 25°C | | | 60 | mV |
| | | $V_I$ = 9 to 13 V, $T_J$ = 25°C | | | 30 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5 A, $T_J$ = 25°C | | | 100 | mV |
| | | $I_O$ = 250 to 750 mA, $T_J$ = 25°C | | | 30 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 9 to 25 V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5 mA | | 0.7 | | mV/°C |
| eN | Output noise voltage | B =10 Hz to 100 kHz, $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 9 to 19 V, f = 120 Hz | 65 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1 A, $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output resistance | f = 1 kHz | | 19 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35 V, $T_J$ = 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 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 | $I_O$ = 5 mA to 1A, $P_O \leq$15 W<br>$V_I$ = 11.5 to 23 V | 7.6 | 8 | 8.4 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 10.5 to 25 V, $T_J$ = 25°C | | | 80 | mV |
| | | $V_I$ = 11 to 17 V, $T_J$ = 25°C | | | 40 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5 A, $T_J$ = 25°C | | | 100 | mV |
| | | $I_O$ = 250 to 750 mA, $T_J$ = 25°C | | | 40 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 11.5 to 25 V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5 mA | | 1 | | mV/°C |
| eN | Output noise voltage | B =10 Hz to 100 kHz, $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 11.5 to 21.5 V, f = 120 Hz | 62 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1 A, $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output resistance | f = 1 kHz | | 16 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35 V, $T_J$ = 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 L7812** (refer to the test circuits, $T_J$ = -55 to 150 °C, $V_I$ = 19 V, $I_O$ = 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 | $I_O$ = 5 mA to 1 A, $P_O$ ≤15 W<br>$V_I$ = 15.5 to 27 V | 11.4 | 12 | 12.6 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 14.5 to 30 V, $T_J$ = 25°C | | | 120 | mV |
| | | $V_I$ = 16 to 22 V, $T_J$ = 25°C | | | 60 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5 A, $T_J$ = 25°C | | | 100 | mV |
| | | $I_O$ = 250 to 750 mA, $T_J$ = 25°C | | | 60 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 15 to 30 V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5 mA | | 1.5 | | mV/°C |
| eN | Output noise voltage | B =10 Hz to 100 kHz, $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 15 to 25 V, f = 120 Hz | 61 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1 A, $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output resistance | f = 1 kHz | | 18 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35 V, $T_J$ = 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 L7815** (refer to the test circuits, $T_J$ = -55 to 150 °C, $V_I$ = 23 V, $I_O$ = 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 | $I_O$ = 5 mA to 1 A, $P_O \leq$15 W<br>$V_I$ = 18.5 to 30 V | 14.25 | 15 | 15.75 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 17.5 to 30 V, $T_J$ = 25°C | | | 150 | mV |
| | | $V_I$ = 20 to 26 V, $T_J$ = 25°C | | | 75 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5 A, $T_J$ = 25°C | | | 150 | mV |
| | | $I_O$ = 250 to 750 mA, $T_J$ = 25°C | | | 75 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 18.5 to 30 V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5 mA | | 1.8 | | mV/°C |
| eN | Output noise voltage | B =10 Hz to 100 kHz, $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 18.5 to 28.5 V, f = 120 Hz | 60 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1 A, $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output resistance | f = 1 kHz | | 19 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35 V, $T_J$ = 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 L7818** (refer to the test circuits, $T_J$ = -55 to 150 °C, $V_I$ = 26 V, $I_O$ = 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 | $I_O$ = 5 mA to 1 A, $P_O \leq$15 W<br>$V_I$ = 22 to 33 V | 17.1 | 18 | 18.9 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 21 to 33 V, $T_J$ = 25°C | | | 180 | mV |
| | | $V_I$ = 24 to 30 V, $T_J$ = 25°C | | | 90 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5 A, $T_J$ = 25°C | | | 180 | mV |
| | | $I_O$ = 250 to 750 mA, $T_J$ = 25°C | | | 90 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 22 to 33 V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5 mA | | 2.3 | | mV/°C |
| eN | Output noise voltage | B =10 Hz to 100 kHz, $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 22 to 32 V, f = 120 Hz | 59 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1 A, $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output resistance | f = 1 kHz | | 22 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35 V, $T_J$ = 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 L7820** (refer to the test circuits, $T_J$ = -55 to 150 °C, $V_I$ = 28 V, $I_O$ = 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 | $I_O$ = 5 mA to 1 A, $P_O$ ≤15 W<br>$V_I$ = 24 to 35 V | 19 | 20 | 21 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 22.5 to 35 V, $T_J$ = 25°C | | | 200 | mV |
| | | $V_I$ = 26 to 32 V, $T_J$ = 25°C | | | 100 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5 A, $T_J$ = 25°C | | | 200 | mV |
| | | $I_O$ = 250 to 750 mA, $T_J$ = 25°C | | | 100 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 24 to 35 V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5 mA | | 2.5 | | mV/°C |
| eN | Output noise voltage | B =10 Hz to 100 kHz, $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 24 to 35 V, f = 120 Hz | 58 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1 A, $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output resistance | f = 1 kHz | | 24 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35 V, $T_J$ = 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 L7824** (refer to the test circuits, $T_J$ = -55 to 150 °C, $V_I$ = 33 V, $I_O$ = 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 | $I_O$ = 5 mA to 1 A, $P_O \leq$15 W<br>$V_I$ = 28 to 38 V | 22.8 | 24 | 25.2 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 27 to 38 V, $T_J$ = 25°C | | | 240 | mV |
| | | $V_I$ = 30 to 36 V, $T_J$ = 25°C | | | 120 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5 A, $T_J$ = 25°C | | | 240 | mV |
| | | $I_O$ = 250 to 750 mA, $T_J$ = 25°C | | | 120 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 6 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 28 to 38 V | | | 0.8 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5 mA | | 3 | | mV/°C |
| eN | Output noise voltage | B =10 Hz to 100 kHz, $T_J$ = 25°C | | | 40 | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 28 to 38 V, f = 120 Hz | 56 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1 A, $T_J$ = 25°C | | 2 | 2.5 | V |
| $R_O$ | Output resistance | f = 1 kHz | | 28 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35 V, $T_J$ = 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 12. Electrical characteristics of L7805C** (refer to the test circuits, $T_J$ = 0 to 150 °C, $V_I$ = 10 V, $I_O$ = 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 | $I_O$ = 5 mA to 1 A, $P_O$ ≤15 W<br>$V_I$ = 7 to 20 V | 4.75 | 5 | 5.25 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 7 to 25 V, $T_J$ = 25°C | | 3 | 100 | mV |
| | | $V_I$ = 8 to 12 V, $T_J$ = 25°C | | 1 | 50 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5 A, $T_J$ = 25°C | | | 100 | mV |
| | | $I_O$ = 250 to 750 mA, $T_J$ = 25°C | | | 50 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 7 to 25 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°C | | 40 | | µV/$V_O$ |
| 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°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 kHz | | 17 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35 V, $T_J$ = 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 L7852C** (refer to the test circuits, $T_J$ = 0 to 150 °C, $V_I$ = 10 V, $I_O$ = 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 | $I_O$ = 5 mA to 1 A, $P_O \leq$15 W<br>$V_I$ = 8 to 20 V | 4.95 | 5.2 | 5.45 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 7 to 25 V, $T_J$ = 25°C | | 3 | 105 | mV |
| | | $V_I$ = 8 to 12 V, $T_J$ = 25°C | | 1 | 52 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5 A, $T_J$ = 25°C | | | 105 | mV |
| | | $I_O$ = 250 to 750 mA, $T_J$ = 25°C | | | 52 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 7 to 25 V | | | 1.3 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5 mA | | -1 | | mV/°C |
| eN | Output noise voltage | B =10 Hz to 100 kHz, $T_J$ = 25°C | | 42 | | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 8 to 18 V, f = 120 Hz | 61 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1 A, $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 kHz | | 17 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35 V, $T_J$ = 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 14. Electrical characteristics of L7806C** (refer to the test circuits, $T_J$ = 0 to 150 °C, $V_I$ = 11 V, $I_O$ = 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 | $I_O$ = 5 mA to 1 A, $P_O \leq$15 W<br>$V_I$ = 8 to 21 V | 5.7 | 6 | 6.3 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 8 to 25 V, $T_J$ = 25°C | | | 120 | mV |
| | | $V_I$ = 9 to 13 V, $T_J$ = 25°C | | | 60 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5 A, $T_J$ = 25°C | | | 120 | mV |
| | | $I_O$ = 250 to 750 mA, $T_J$ = 25°C | | | 60 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 8 to 25 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°C | | 45 | | µV/$V_O$ |
| 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°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 kHz | | 19 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35 V, $T_J$ = 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 15. Electrical characteristics of L7808C** (refer to the test circuits, $T_J$ = 0 to 150 °C, $V_I$ = 14 V, $I_O$ = 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 | $I_O$ = 5 mA to 1 A, $P_O$ ≤15 W<br>$V_I$ = 10.5 to 25 V | 7.6 | 8 | 8.4 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 10.5 to 25 V, $T_J$ = 25°C | | | 160 | mV |
| | | $V_I$ = 11 to 17 V, $T_J$ = 25°C | | | 80 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5 A, $T_J$ = 25°C | | | 160 | mV |
| | | $I_O$ = 250 to 750 mA, $T_J$ = 25°C | | | 80 | |
| $I_d$ | Quiescent current | $T_J$ = 25°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°C | | 52 | | µV/$V_O$ |
| 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°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 kHz | | 16 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35 V, $T_J$ = 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 L7885C** (refer to the test circuits, $T_J$ = 0 to 150 °C, $V_I$ = 14.5 V, $I_O$ = 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 | $I_O$ = 5 mA to 1 A, $P_O \leq$15 W<br>$V_I$ = 11 to 26 V | 8.1 | 8.5 | 8.9 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 11 to 27 V, $T_J$ = 25°C | | | 160 | mV |
| | | $V_I$ = 11.5 to 17.5 V, $T_J$ = 25°C | | | 80 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5 A, $T_J$ = 25°C | | | 160 | mV |
| | | $I_O$ = 250 to 750 mA, $T_J$ = 25°C | | | 80 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 11 to 27 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°C | | 55 | | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 12 to 22V, f = 120Hz | 56 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1 A, $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 kHz | | 16 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35 V, $T_J$ = 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 17. Electrical characteristics of L7809C** (refer to the test circuits, $T_J$ = 0 to 150 °C, $V_I$ = 15 V, $I_O$ = 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 | $I_O$ = 5 mA to 1 A, $P_O \leq$15 W<br>$V_I$ = 11.5 to 26 V | 8.55 | 9 | 9.45 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 11.5 to 26 V, $T_J$ = 25°C | | | 180 | mV |
| | | $V_I$ = 12 to 18 V, $T_J$ = 25°C | | | 90 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5 A, $T_J$ = 25°C | | | 180 | mV |
| | | $I_O$ = 250 to 750 mA, $T_J$ = 25°C | | | 90 | |
| $I_d$ | Quiescent current | $T_J$ = 25°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°C | | 70 | | µV/$V_O$ |
| 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°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 kHz | | 17 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35 V, $T_J$ = 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 L7810C** (refer to the test circuits, $T_J$ = 0 to 150 °C, $V_I$ = 15 V, $I_O$ = 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 | $I_O$ = 5 mA to 1 A, $P_O \leq$15 W<br>$V_I$ = 12.5 to 26 V | 9.5 | 10 | 10.5 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 12.5 to 26 V, $T_J$ = 25°C | | | 200 | mV |
| | | $V_I$ = 13.5 to 19 V, $T_J$ = 25°C | | | 100 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5 A, $T_J$ = 25°C | | | 200 | mV |
| | | $I_O$ = 250 to 750 mA, $T_J$ = 25°C | | | 100 | |
| $I_d$ | Quiescent current | $T_J$ = 25°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°C | | 70 | | µV/$V_O$ |
| 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°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 kHz | | 17 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35 V, $T_J$ = 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 19. Electrical characteristics of L7812C** (refer to the test circuits, $T_J$ = 0 to 150 °C, $V_I$ = 19 V, $I_O$ = 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 | $I_O$ = 5 mA to 1 A, $P_O$ ≤15 W<br>$V_I$ = 14.5 to 27 V | 11.4 | 12 | 12.6 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 14.5 to 30 V, $T_J$ = 25°C | | | 240 | mV |
| | | $V_I$ = 16 to 22 V, $T_J$ = 25°C | | | 120 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5 A, $T_J$ = 25°C | | | 240 | mV |
| | | $I_O$ = 250 to 750 mA, $T_J$ = 25°C | | | 120 | |
| $I_d$ | Quiescent current | $T_J$ = 25°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°C | | 75 | | µV/$V_O$ |
| 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°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 kHz | | 18 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35 V, $T_J$ = 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 20. Electrical characteristics of L7815C** (refer to the test circuits, $T_J$ = 0 to 150 °C, $V_I$ = 23 V, $I_O$ = 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 | $I_O$ = 5 mA to 1 A, $P_O \leq$15 W<br>$V_I$ = 17.5 to 30 V | 14.25 | 15 | 15.75 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 17.5 to 30 V, $T_J$ = 25°C | | | 300 | mV |
| | | $V_I$ = 20 to 26 V, $T_J$ = 25°C | | | 150 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5 A, $T_J$ = 25°C | | | 300 | mV |
| | | $I_O$ = 250 to 750 mA, $T_J$ = 25°C | | | 150 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5 mA to 1A | | | 0.5 | mA |
| | | $V_I$ = 17.5 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 100kHz, $T_J$ = 25°C | | 90 | | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 18.5 to 28.5 V, f = 120 Hz | 54 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1 A, $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 kHz | | 19 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35 V, $T_J$ = 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 21. Electrical characteristics of L7818C** (refer to the test circuits, $T_J$ = 0 to 150 °C, $V_I$ = 26 V, $I_O$ = 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 | $I_O$ = 5 mA to 1 A, $P_O \leq$15 W<br>$V_I$ = 21 to 33 V | 17.1 | 18 | 18.9 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 21 to 33 V, $T_J$ = 25°C | | | 360 | mV |
| | | $V_I$ = 24 to 30 V, $T_J$ = 25°C | | | 180 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5 A, $T_J$ = 25°C | | | 360 | mV |
| | | $I_O$ = 250 to 750 mA, $T_J$ = 25°C | | | 180 | |
| $I_d$ | Quiescent current | $T_J$ = 25°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°C | | 110 | | µV/$V_O$ |
| 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°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 kHz | | 22 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35 V, $T_J$ = 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 22. Electrical characteristics of L7820C** (refer to the test circuits, $T_J$ = 0 to 150 °C, $V_I$ = 28 V, $I_O$ = 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 | $I_O$ = 5 mA to 1 A, $P_O$ ≤15 W<br>$V_I$ = 23 to 35 V | 19 | 20 | 21 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 22.5 to 35 V, $T_J$ = 25°C | | | 400 | mV |
| | | $V_I$ = 26 to 32 V, $T_J$ = 25°C | | | 200 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5 A, $T_J$ = 25°C | | | 400 | mV |
| | | $I_O$ = 250 to 750 mA, $T_J$ = 25°C | | | 200 | |
| $I_d$ | Quiescent current | $T_J$ = 25°C | | | 8 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = 23 to 35 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°C | | 150 | | µV/$V_O$ |
| SVR | Supply voltage rejection | $V_I$ = 24 to 35 V, f = 120 Hz | 52 | | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1 A, $T_J$ = 25°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 kHz | | 24 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35 V, $T_J$ = 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 23. Electrical characteristics of L7824C** (refer to the test circuits, $T_J$ = 0 to 150 °C, $V_I$ = 33 V, $I_O$ = 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 | $I_O$ = 5 mA to 1 A, $P_O \leq$15 W<br>$V_I$ = 27 to 38 V | 22.8 | 24 | 25.2 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = 27 to 38 V, $T_J$ = 25°C | | | 480 | mV |
| | | $V_I$ = 30 to 36 V, $T_J$ = 25°C | | | 240 | |
| $\Delta V_O$(1) | Load regulation | $I_O$ = 5 mA to 1.5 A, $T_J$ = 25°C | | | 480 | mV |
| | | $I_O$ = 250 to 750 mA, $T_J$ = 25°C | | | 240 | |
| $I_d$ | Quiescent current | $T_J$ = 25°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°C | | 170 | | µV/$V_O$ |
| 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°C | | 2 | | V |
| $R_O$ | Output resistance | f = 1 kHz | | 28 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35 V, $T_J$ = 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.

# 6 Typical performance

**Figure 8. Dropout voltage vs junction temperature**

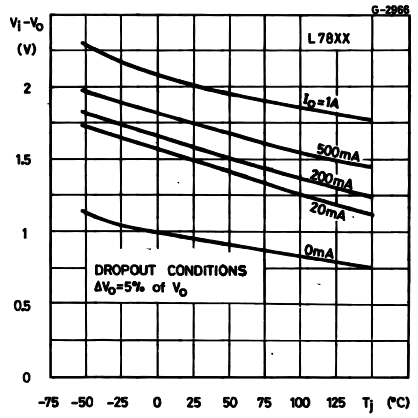



**Figure 9. Peak output current vs input/output differential voltage**

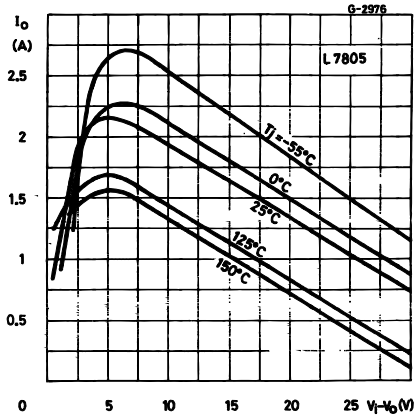



**Figure 10. Supply voltage rejection vs frequency**

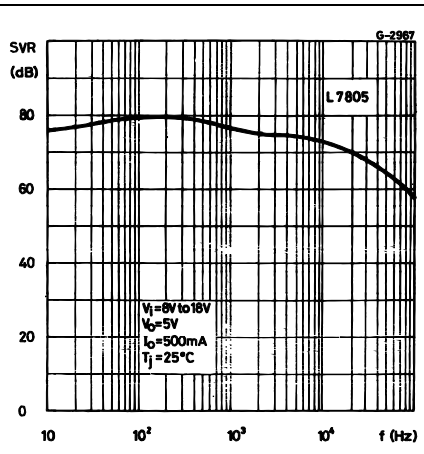



**Figure 11. Output voltage vs junction temperature**

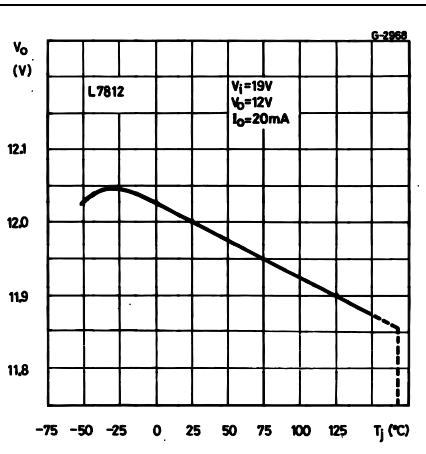



**Figure 12. Output impedance vs frequency**

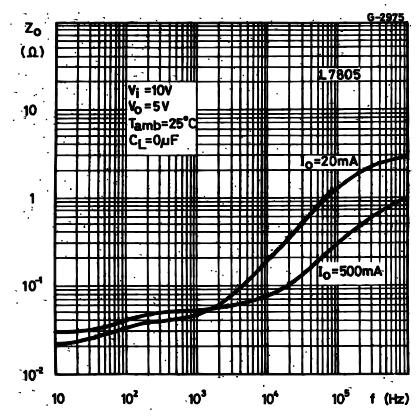



**Figure 13. Quiescent current vs junction temp.**

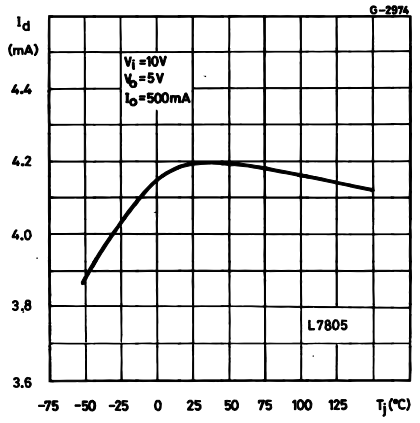


**Figure 14. Load transient response**

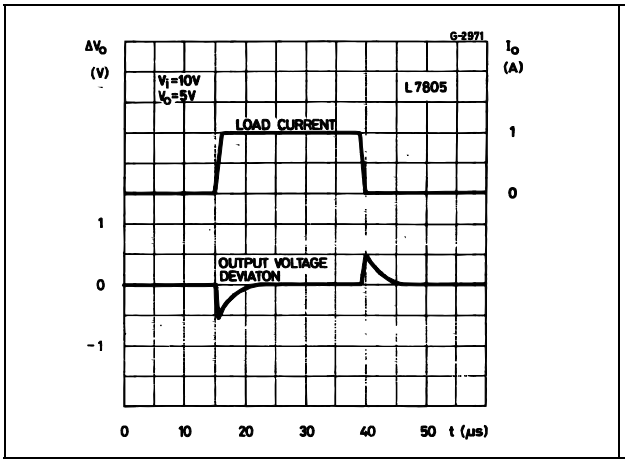



**Figure 15. Line transient response**

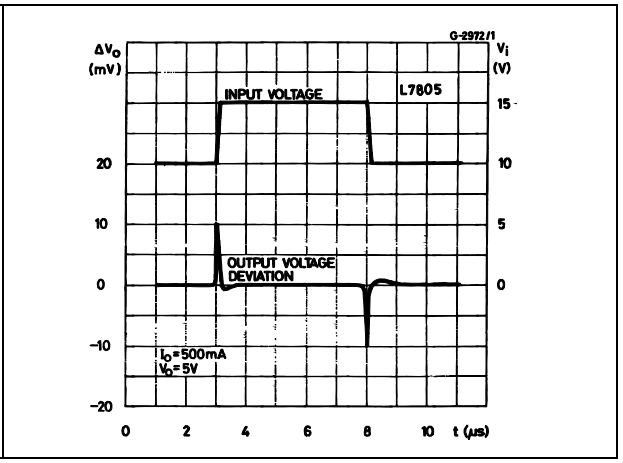



**Figure 16. Quiescent current vs input voltage**

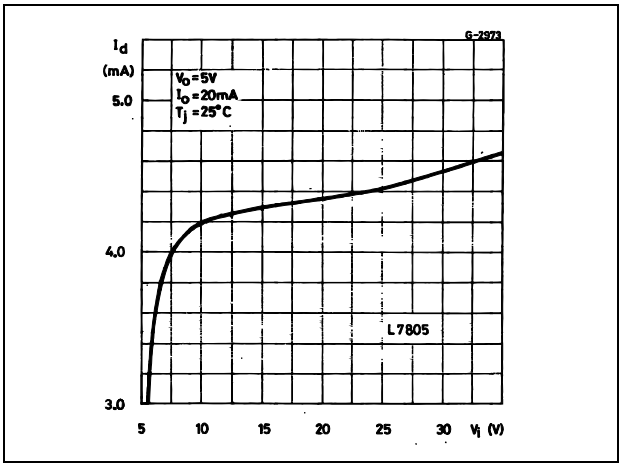
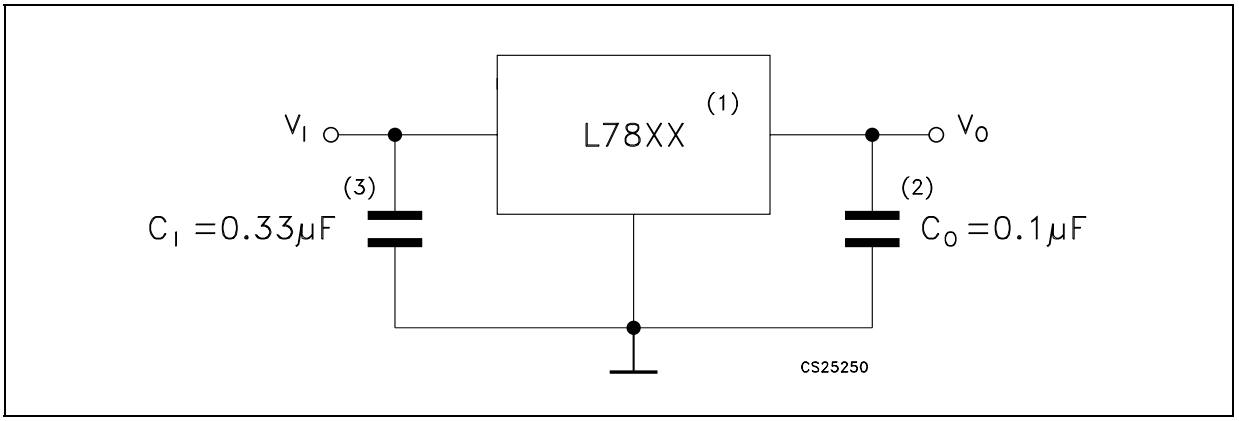



**Figure 17. Fixed output regulator**




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 18. Current regulator**

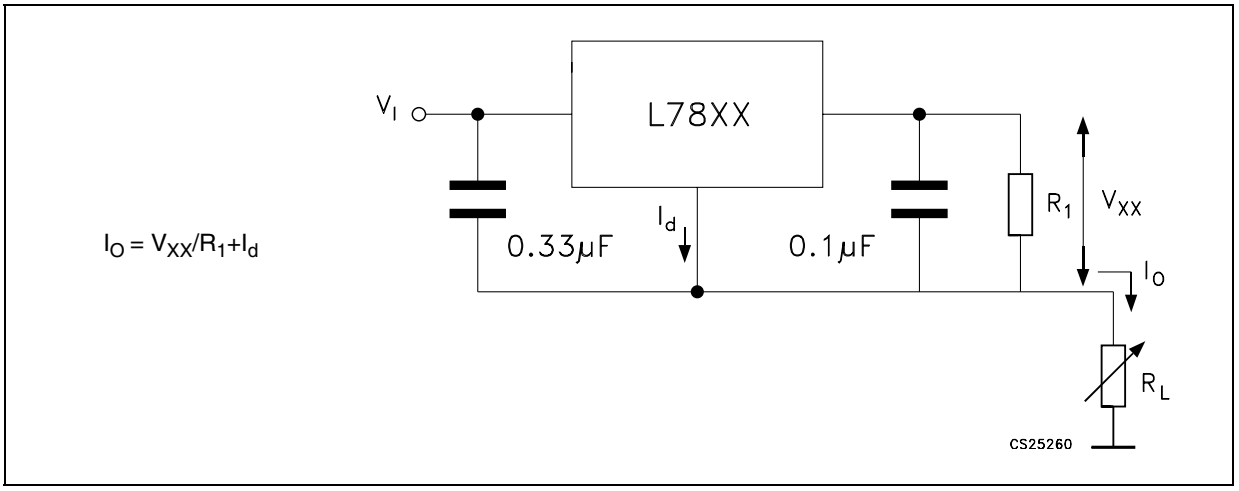



**Figure 19. Circuit for increasing output voltage**

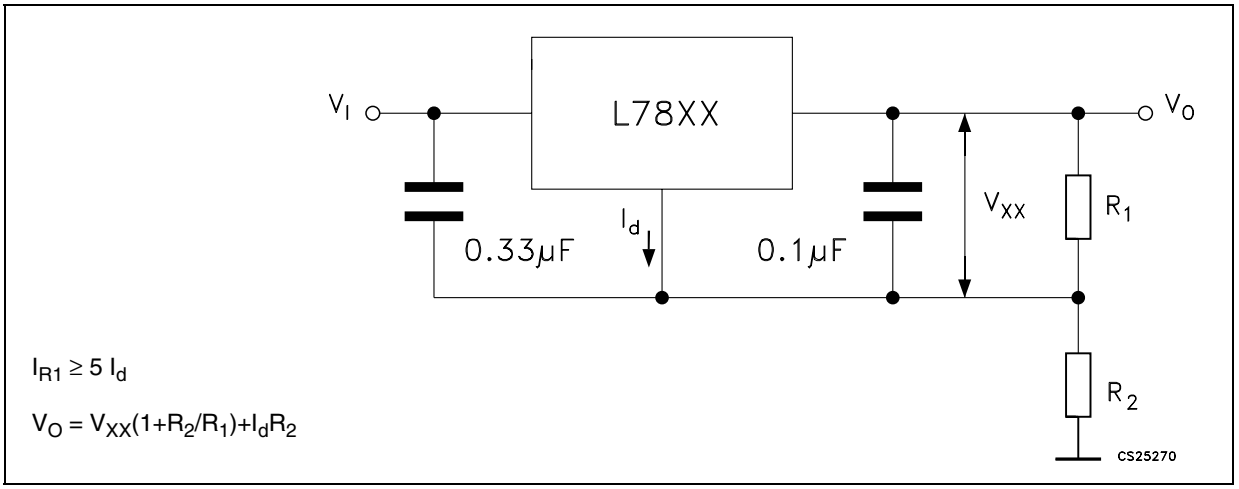



**Figure 20. Adjustable output regulator (7 to 30 V)**

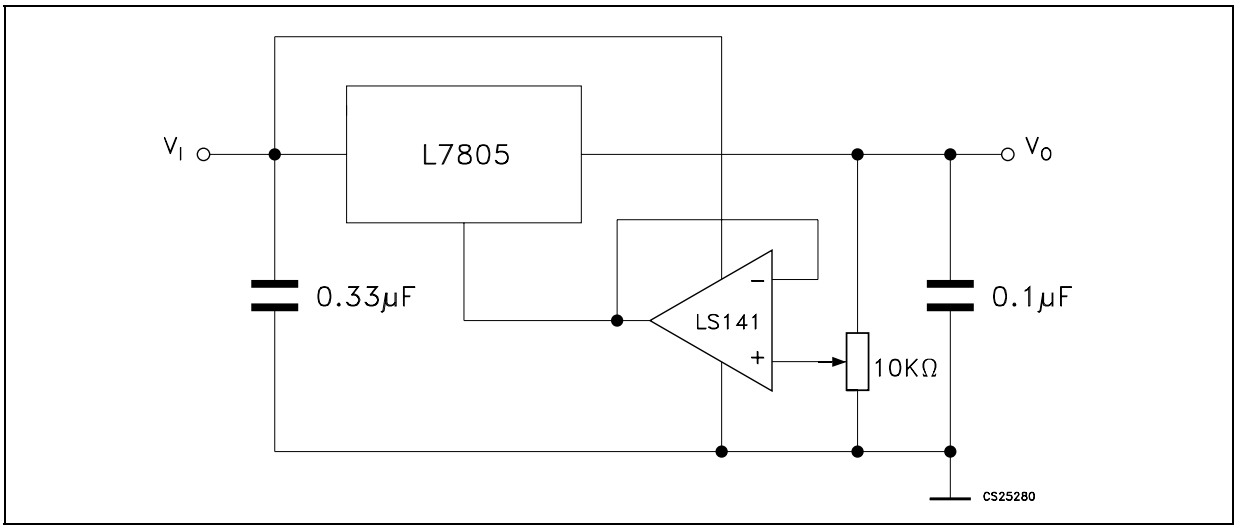


**Figure 21. 0.5 to 10 V regulator**

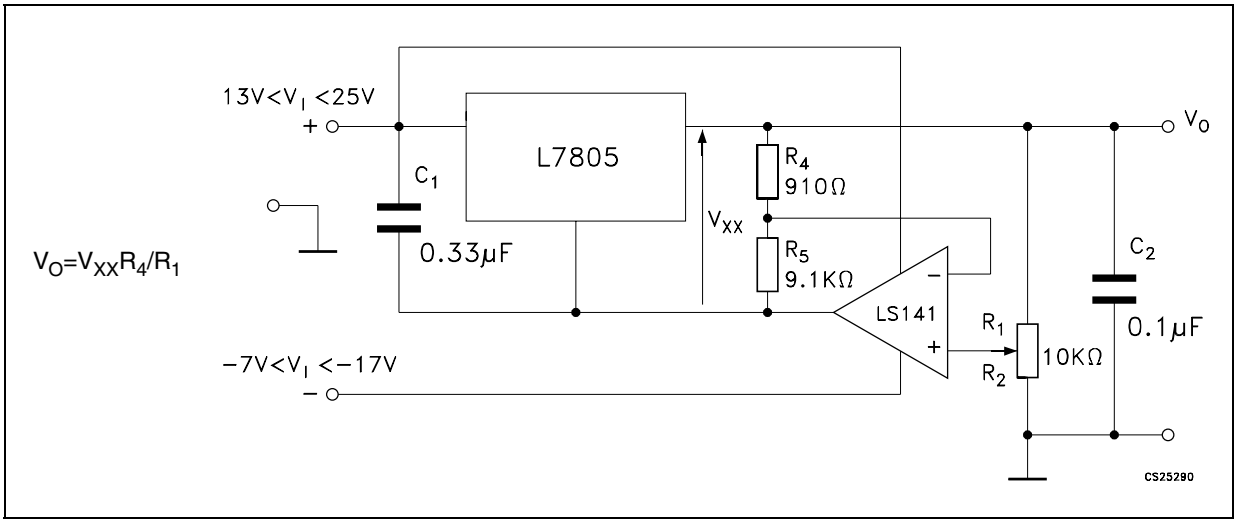



**Figure 22. High current voltage regulator**

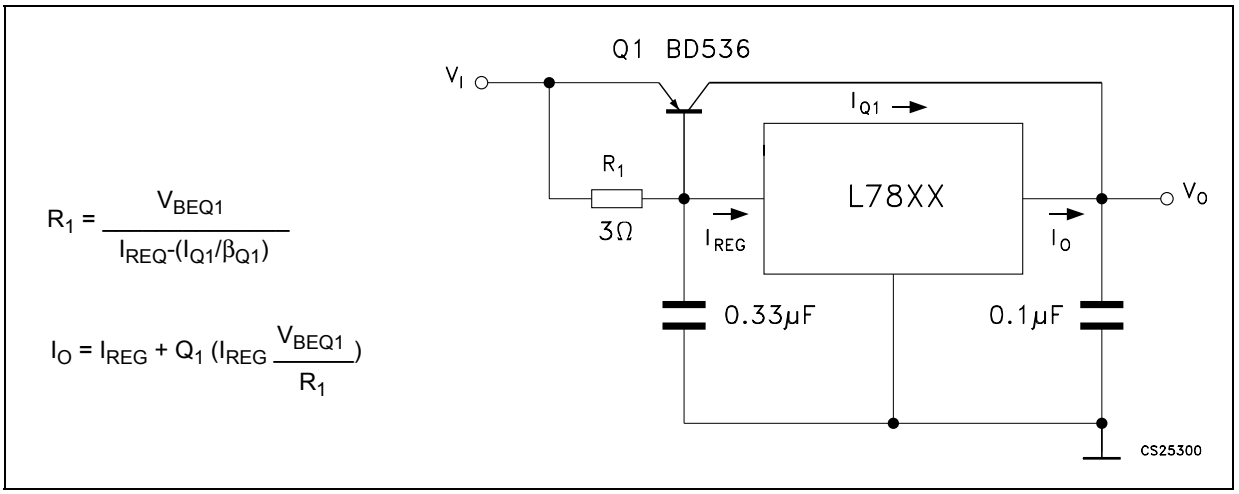



**Figure 23. High output current with short circuit protection**

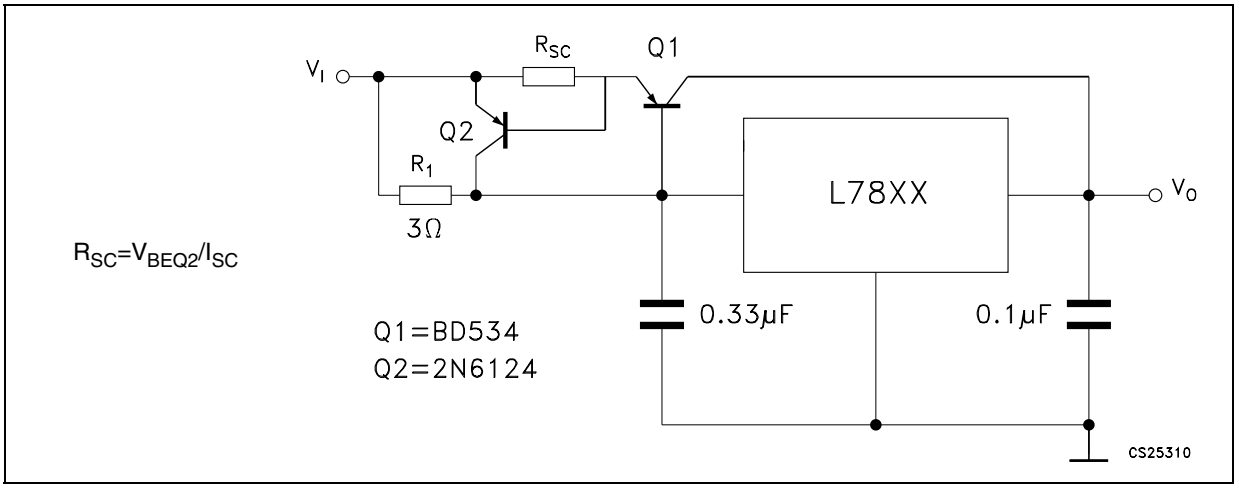


**Figure 24. Tracking voltage regulator**

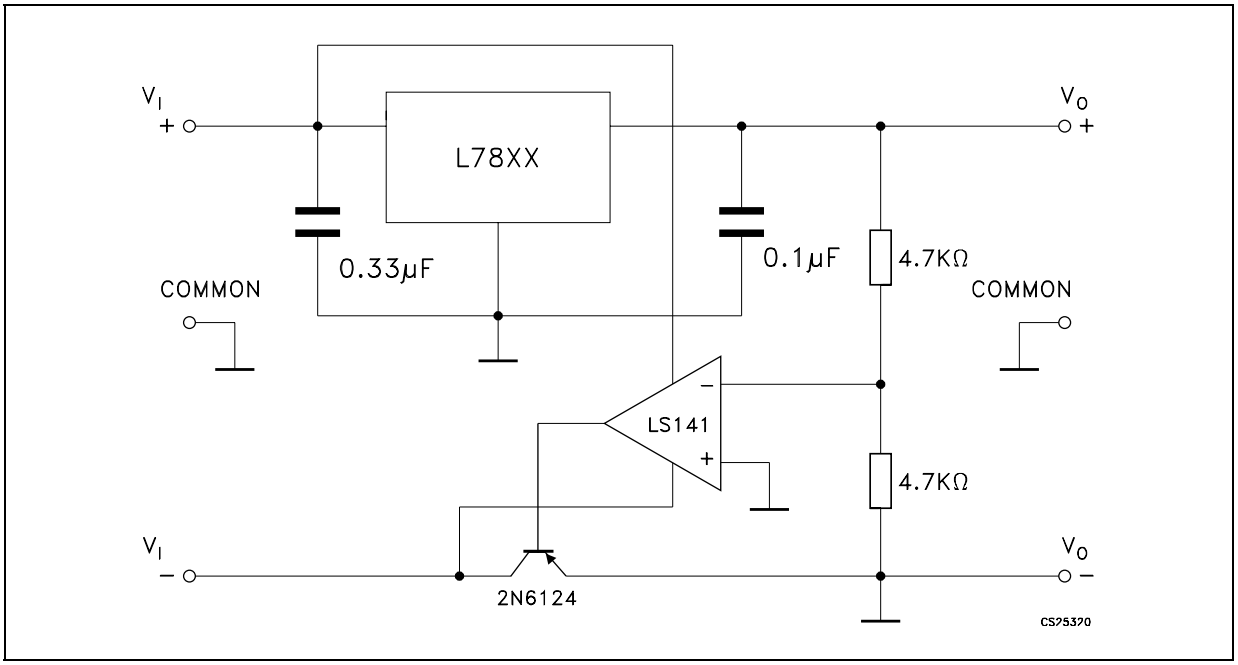
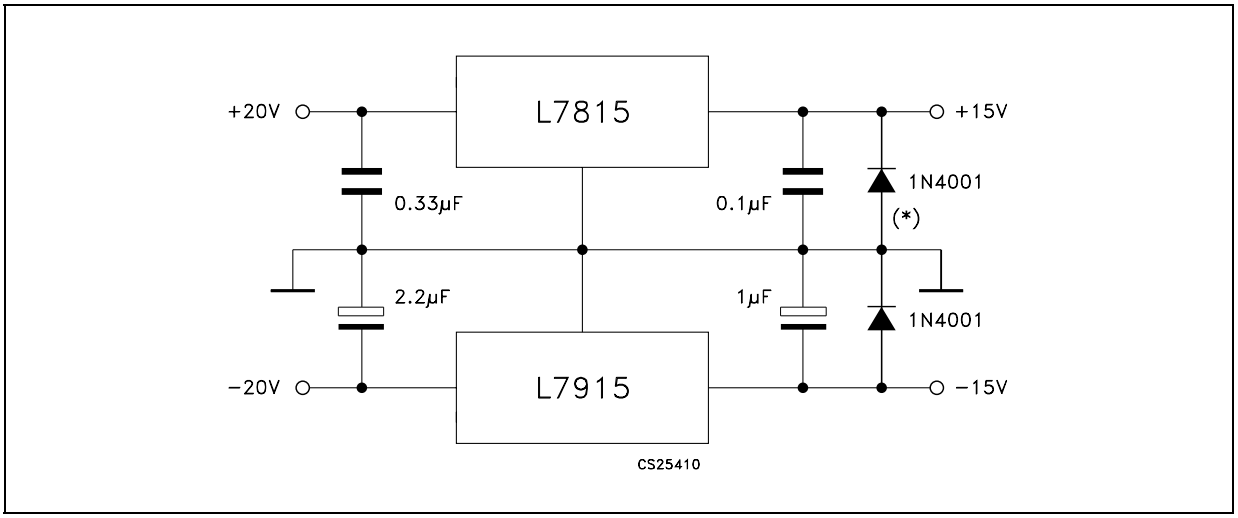



**Figure 25. Split power supply (± 15 V - 1 A)**




* Against potential latch-up problems.

**Figure 26. Negative output voltage circuit**

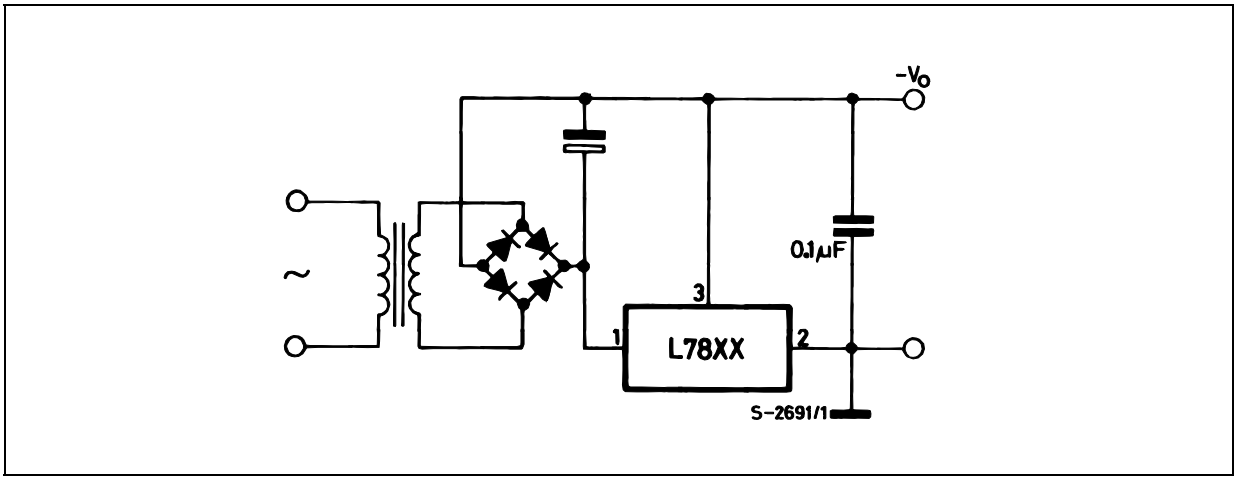



**Figure 27. Switching regulator**

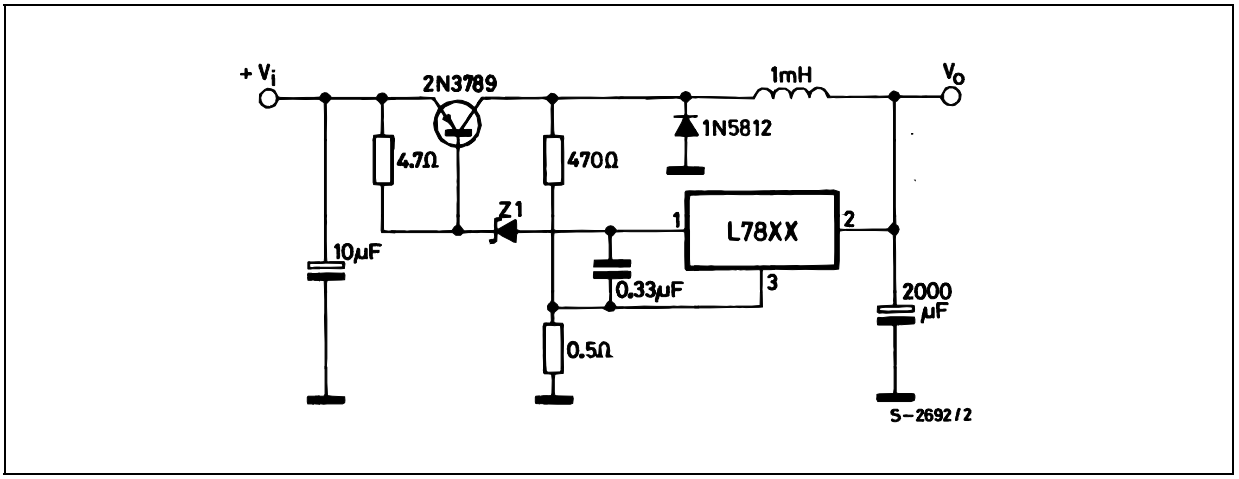



**Figure 28. High input voltage circuit**

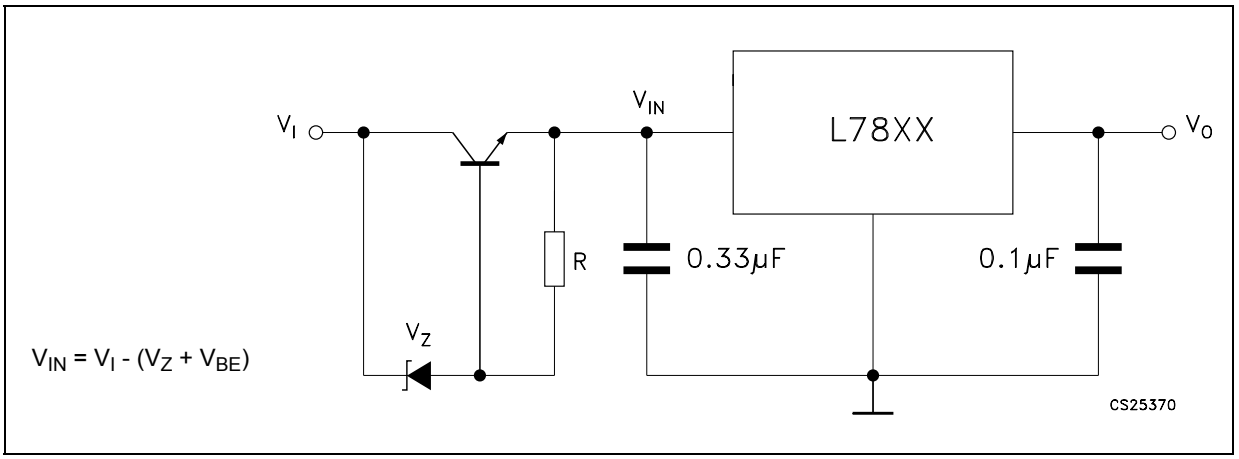


**Figure 29. High input voltage circuit**

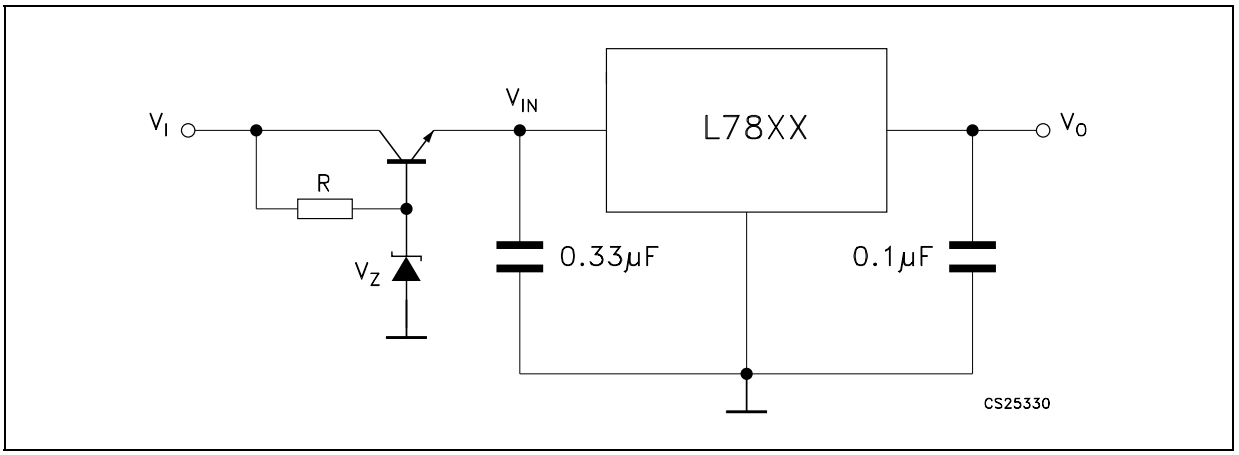



**Figure 30. High output voltage regulator**

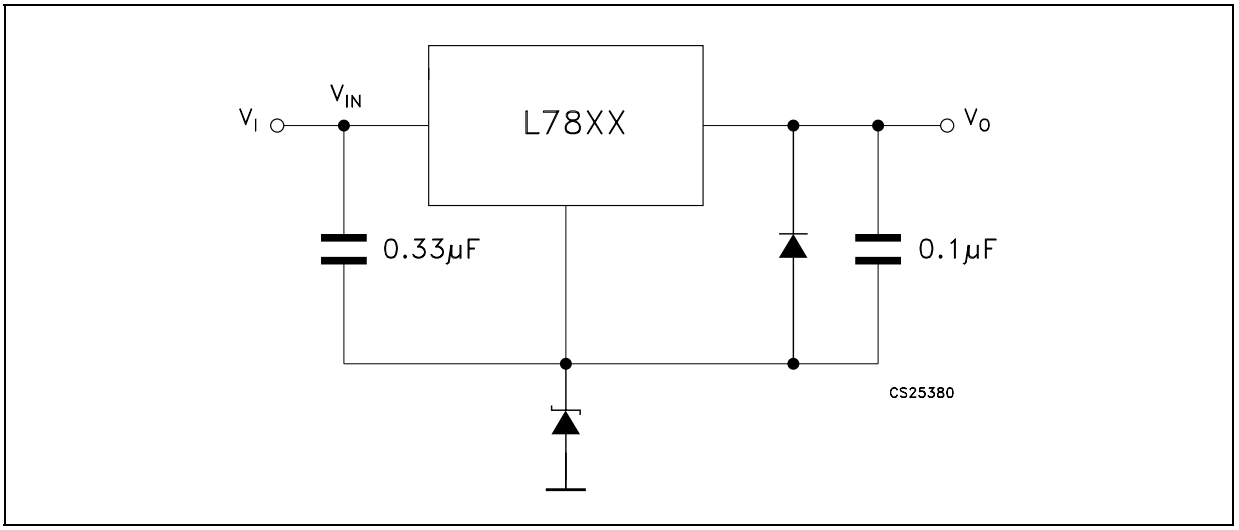



**Figure 31. High input and output voltage**

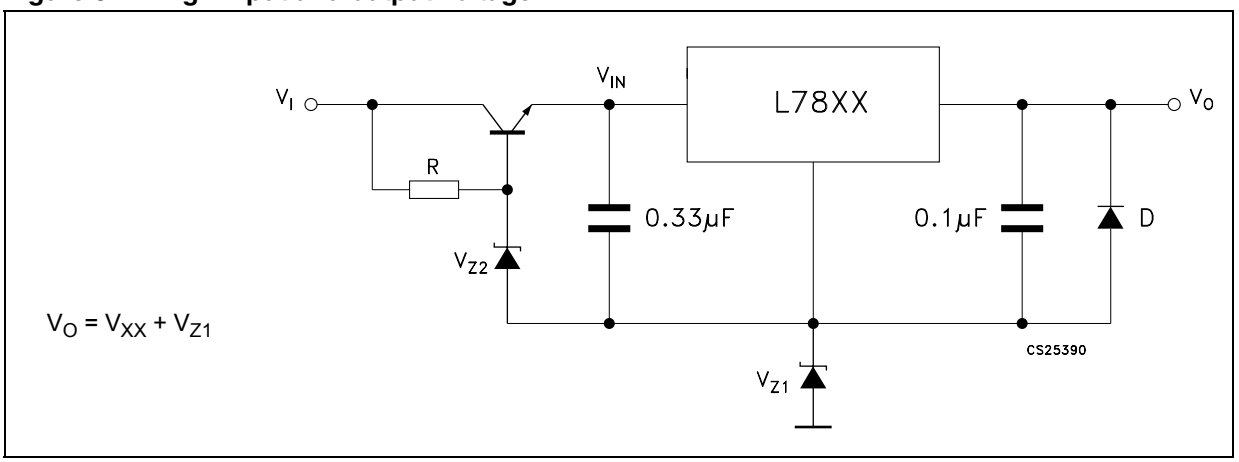


**Figure 32. Reducing power dissipation with dropping resistor**

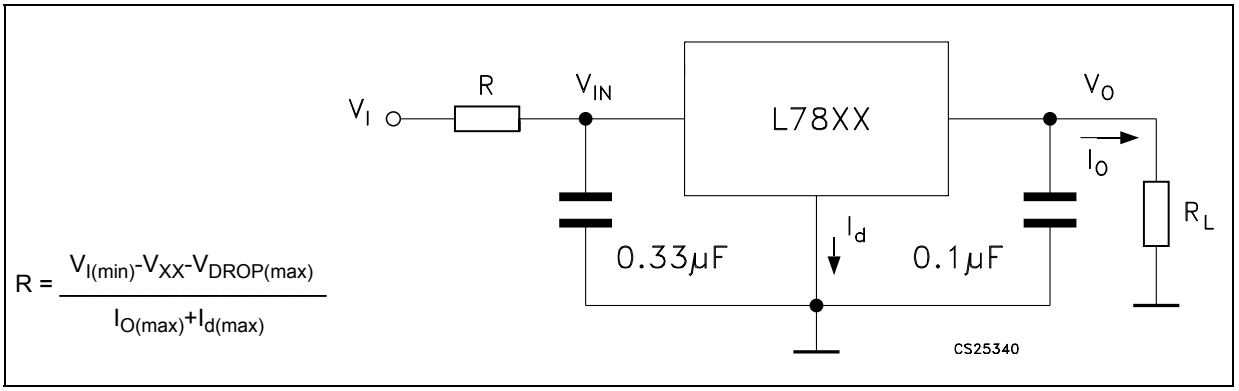



**Figure 33. Remote shutdown**

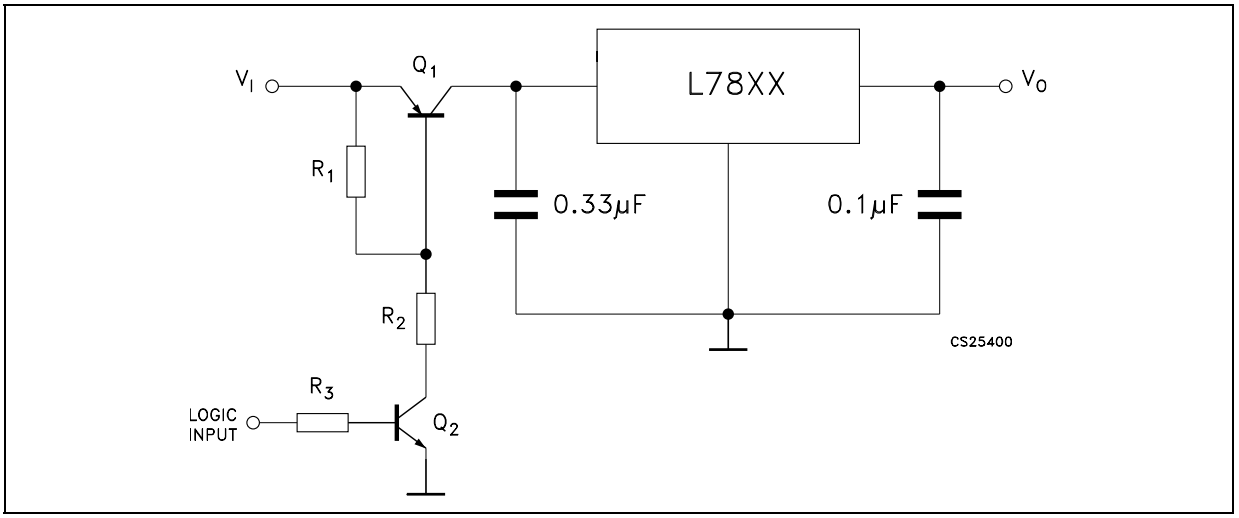
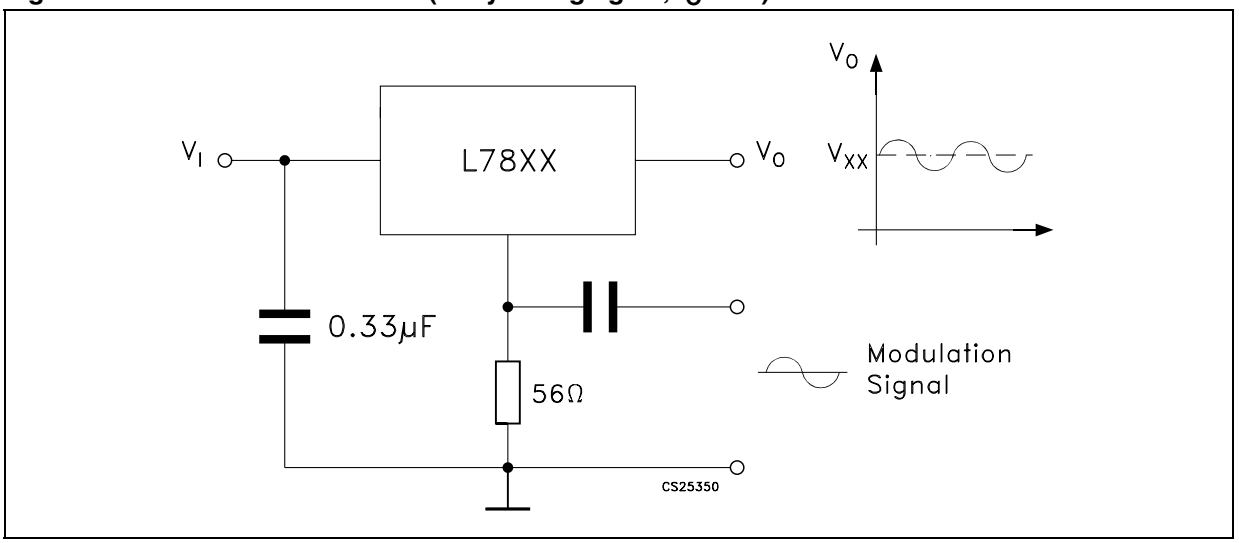
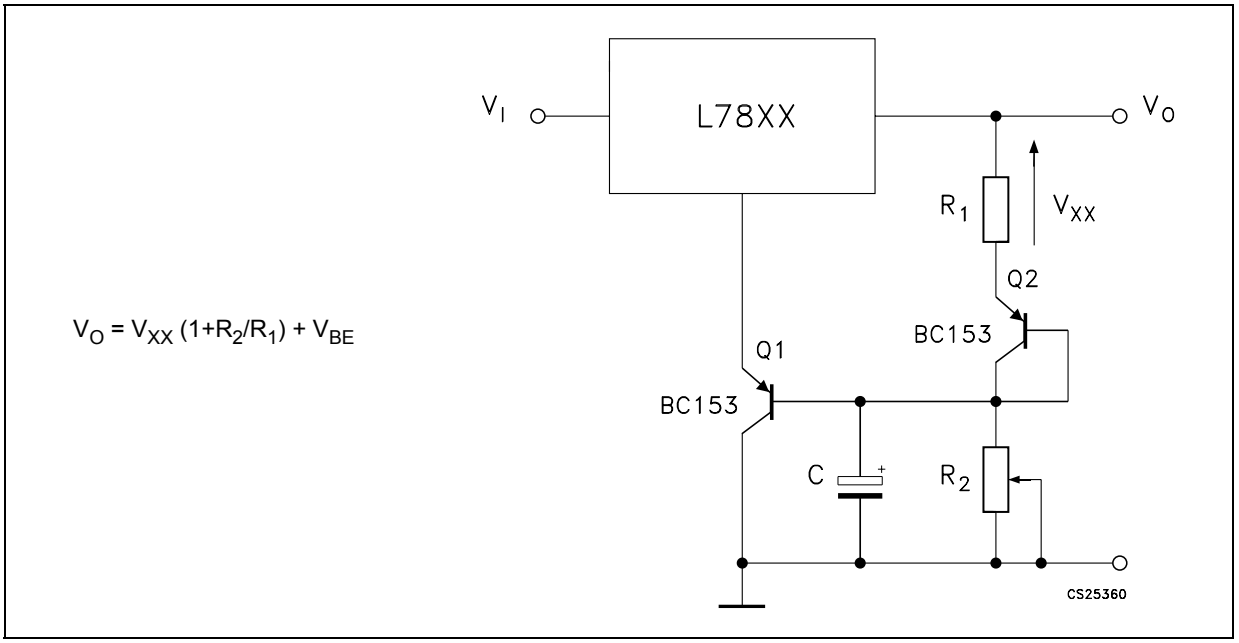



**Figure 34. Power AM modulator (unity voltage gain, $I_O \leq 0.5$)**



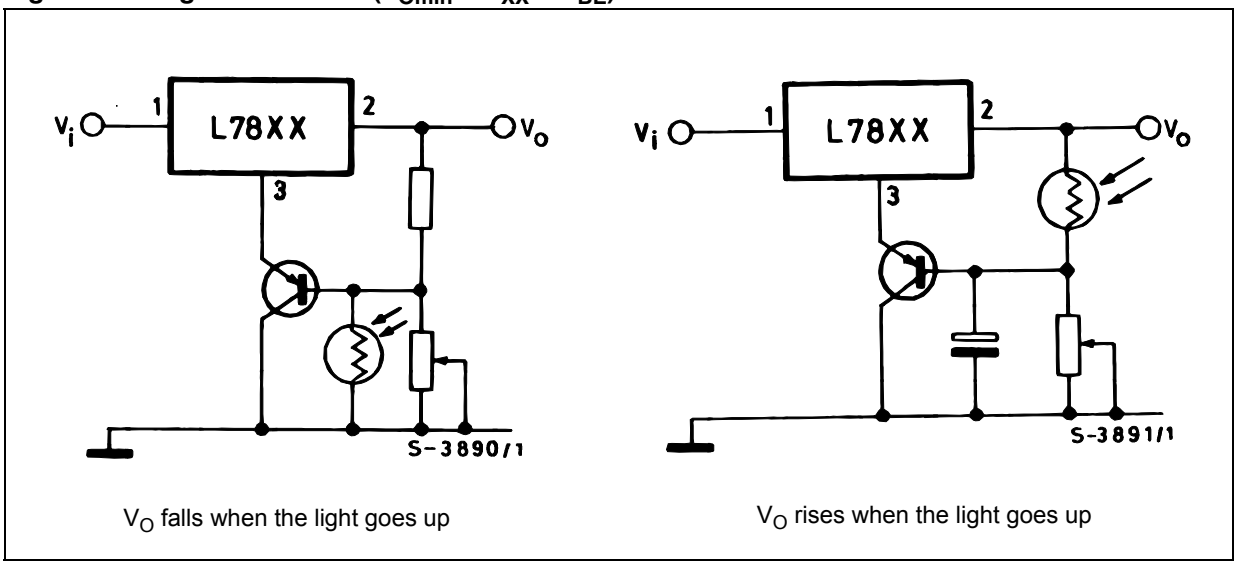

*Note: The circuit performs well up to 100 kHz.*

**Figure 35. 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 $V_O$.*

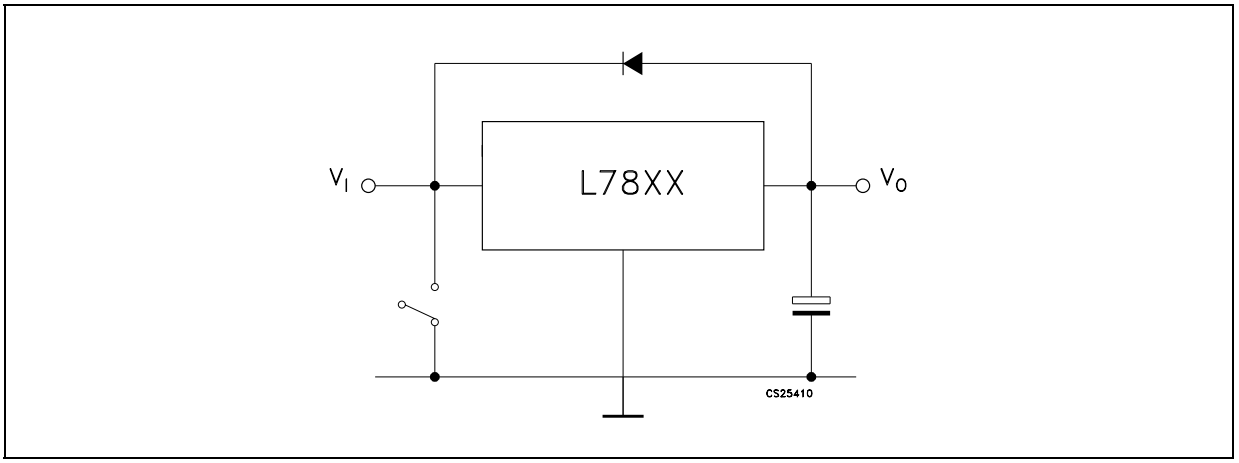
**Figure 36. Light controllers ($V_{Omin} = V_{XX} + V_{BE}$)**




$V_O$ falls when the light goes up

$V_O$ rises when the light goes up

**Figure 37. 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 *Figure 32 on page 36*) 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 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.

**Figure 38. Drawing dimension TO-220 (type SMIC-subcon.)**

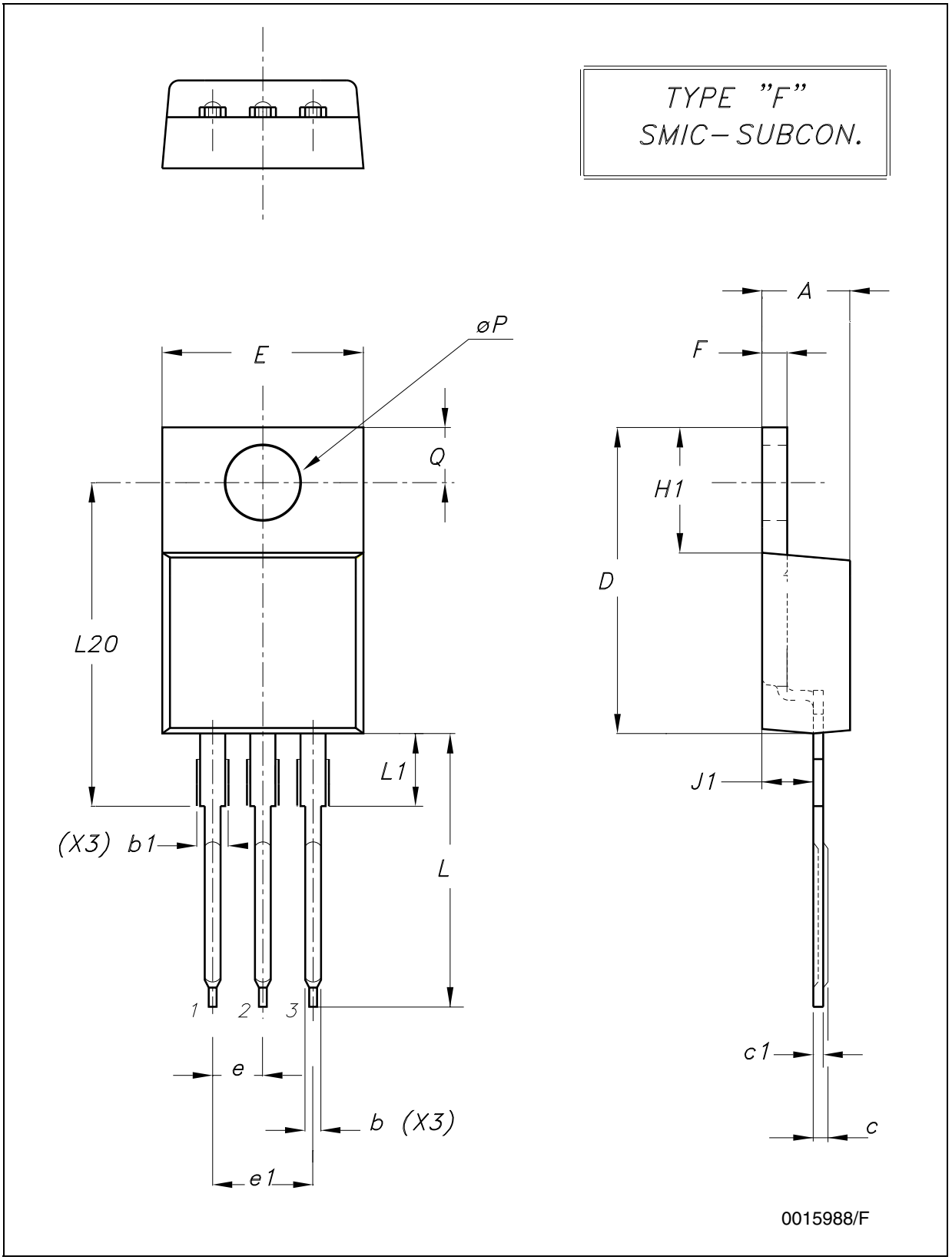


**Figure 39. Drawing dimension TO-220 (type STD-ST)**

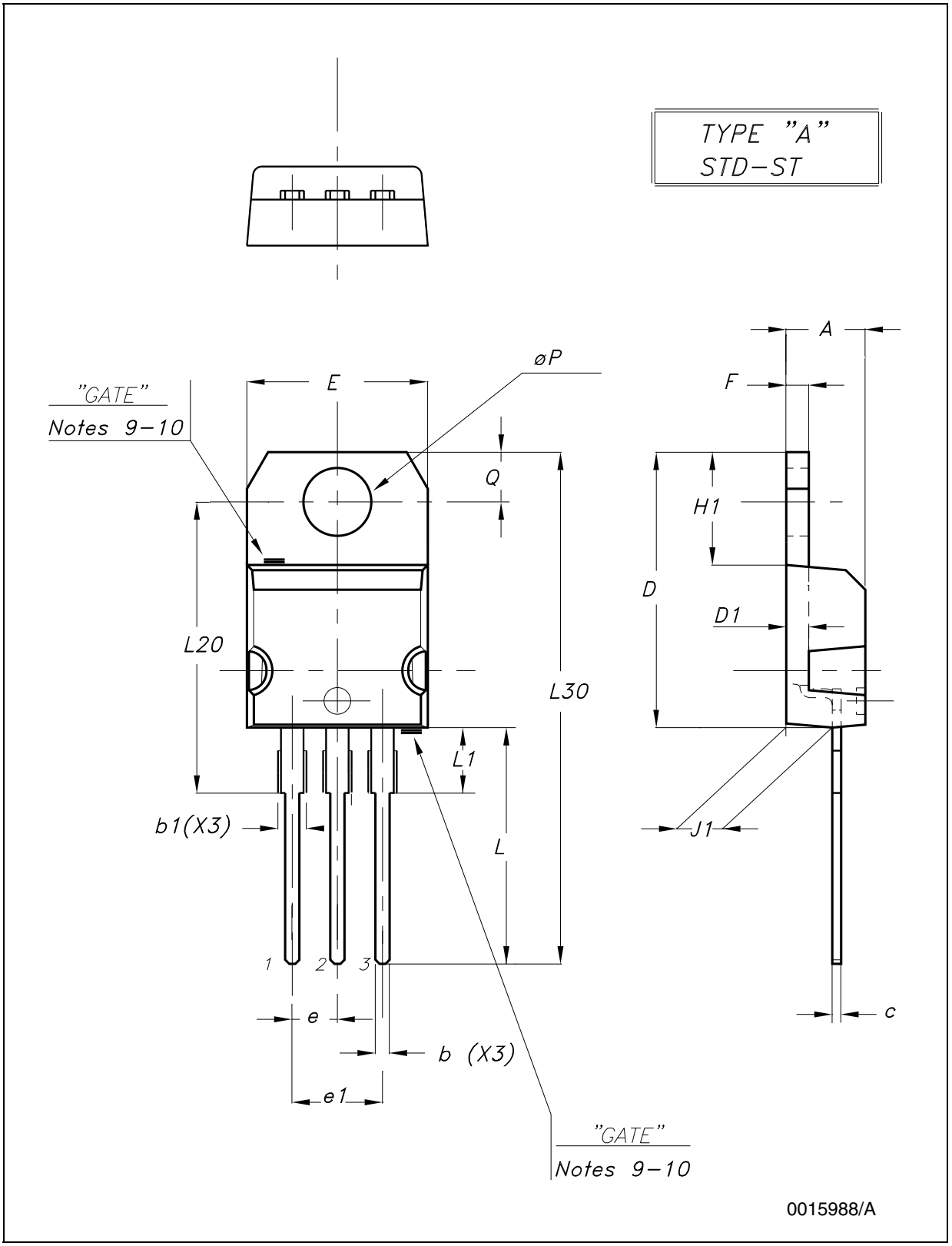


**Table 24. TO-220 mechanical data**

| Dim. | Type STD-ST | | | Type SMIC-Subcon. | | |
|---|---|---|---|---|---|---|
| | mm. | | | mm. | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 4.40 | | 4.60 | 4.47 | 4.57 | 4.67 |
| A1 | 0.61 | | 0.88 | 0.80 | 0.81 | 0.86 |
| b1 | 1.14 | | 1.70 | 1.15 | | 1.44 |
| c | 0.49 | | 0.70 | | 0.56 | |
| c1 | | | | | 0.38 | |
| D | 15.25 | | 15.75 | 15.07 | 15.24 | 15.45 |
| D1 | | 1.27 | | | | |
| E | 10.00 | | 10.40 | 10 | 10.15 | 10.30 |
| e | 2.40 | | 2.70 | 2.29 | 2.54 | 2.79 |
| e1 | 4.95 | | 5.15 | 4.83 | 5.08 | 5.33 |
| F | 1.23 | | 1.32 | | 1.27 | |
| H1 | 6.20 | | 6.60 | | 6.24 | |
| J1 | 2.40 | | 2.72 | 2.04 | 2.67 | 2.92 |
| L | 13.00 | | 14.00 | 13.35 | 13.50 | 13.65 |
| L1 | 3.50 | | 3.93 | | 3.90 | |
| L20 | | 16.40 | | 16.25 | 16.40 | 16.55 |
| L30 | | 28.90 | | | 28.74 | |
| ∅P | 3.75 | | 3.85 | | 3.83 | |
| Q | 2.65 | | 2.95 | 2.72 | 2.74 | 2.80 |

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

**Figure 40. Drawing dimension TO-220FP**

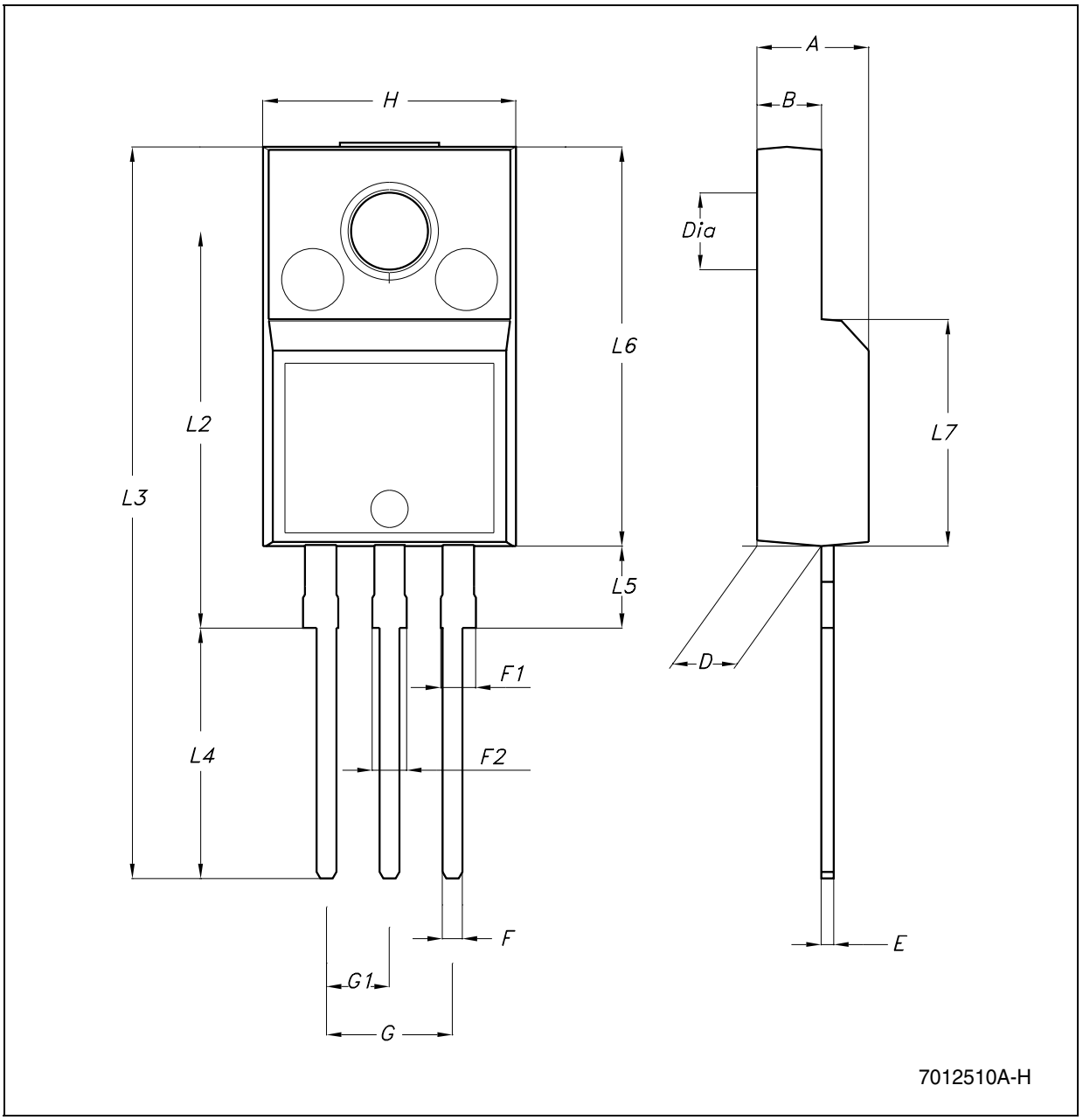


**Table 25. TO-220FP mechanical data**

| 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 41. Drawing dimension TO-3**

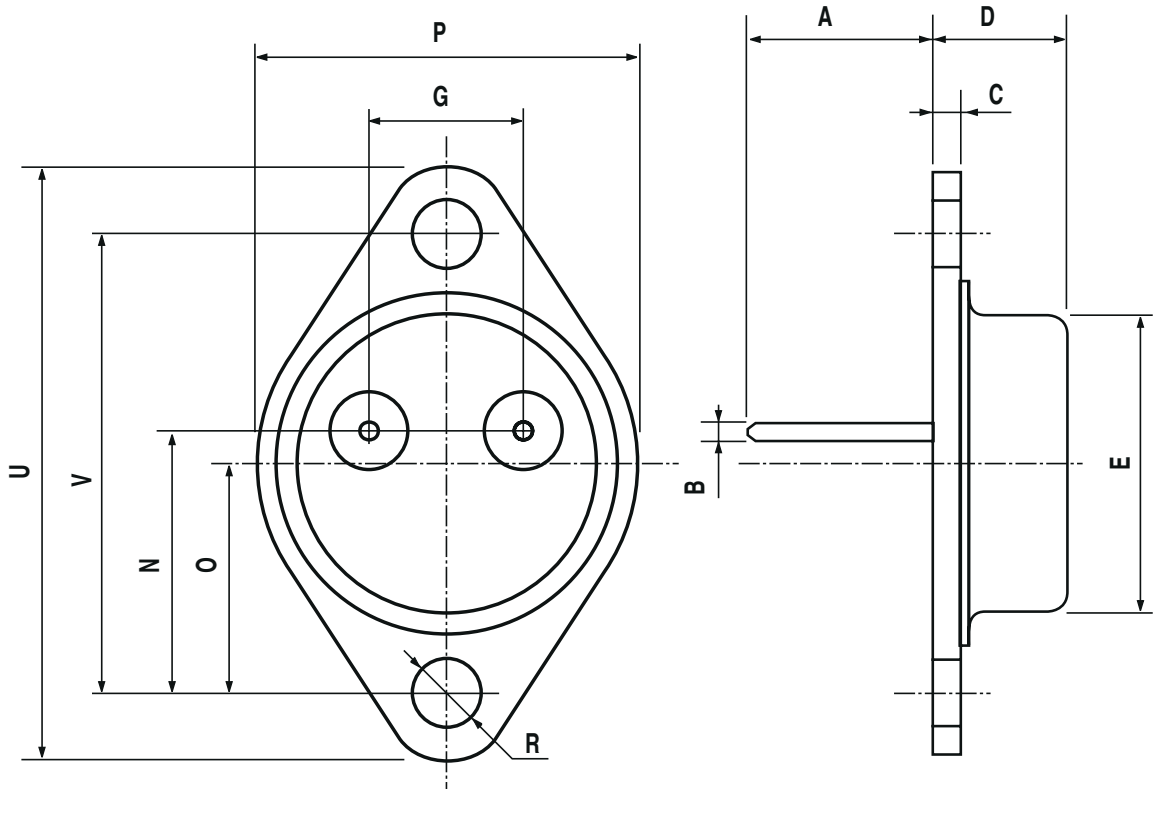



**Table 26. TO-3 mechanical data**

| 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 42. Drawing dimension DPAK**

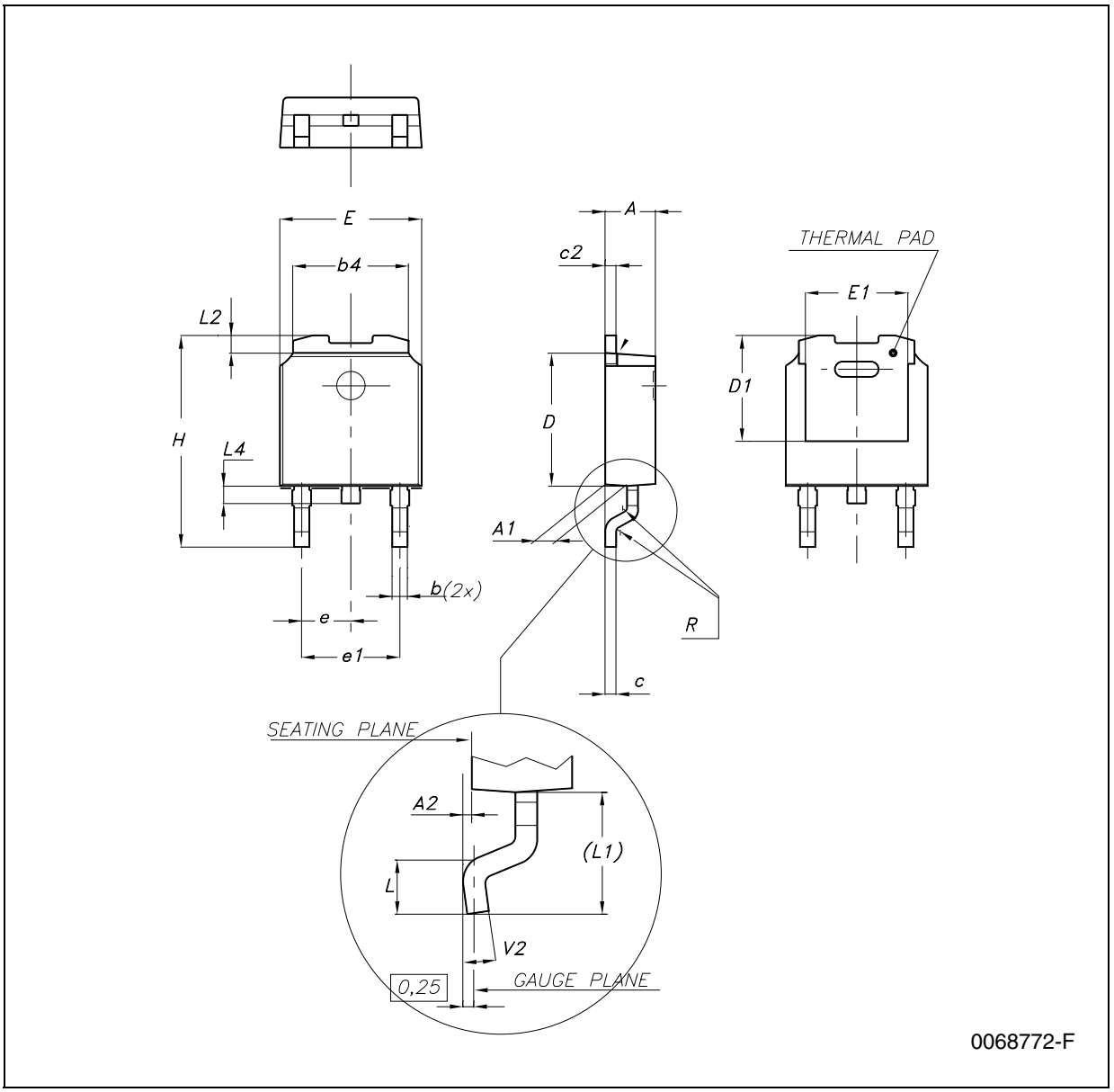


Table 27. DPAK mechanical data

| 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 43. Drawing dimension tape and reel for DPAK**

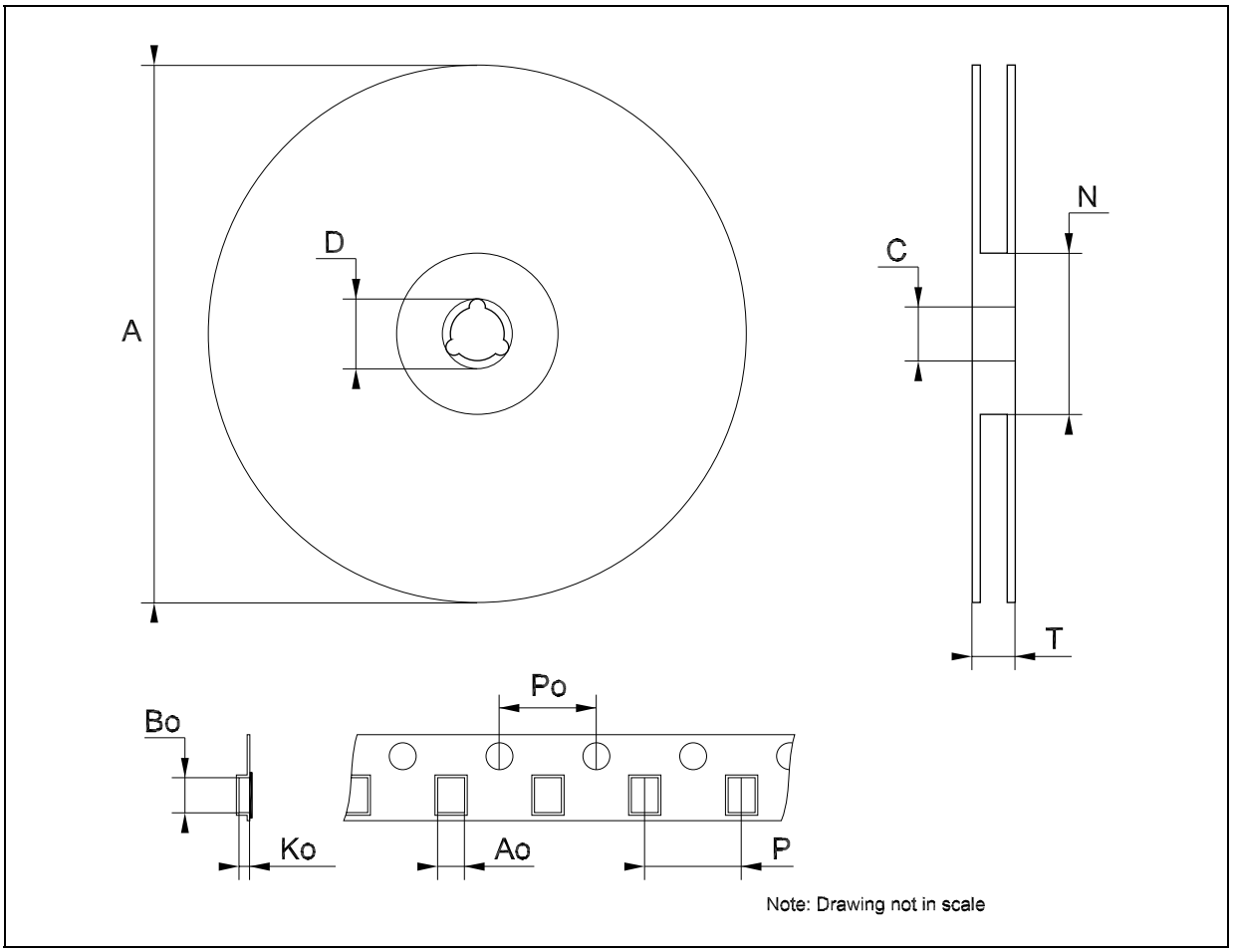



**Table 28. Tape and reel DPAK mechanical data**

| 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 | 0.2.76 |
| 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 44. Drawing dimension D²PAK (type STD-ST)**

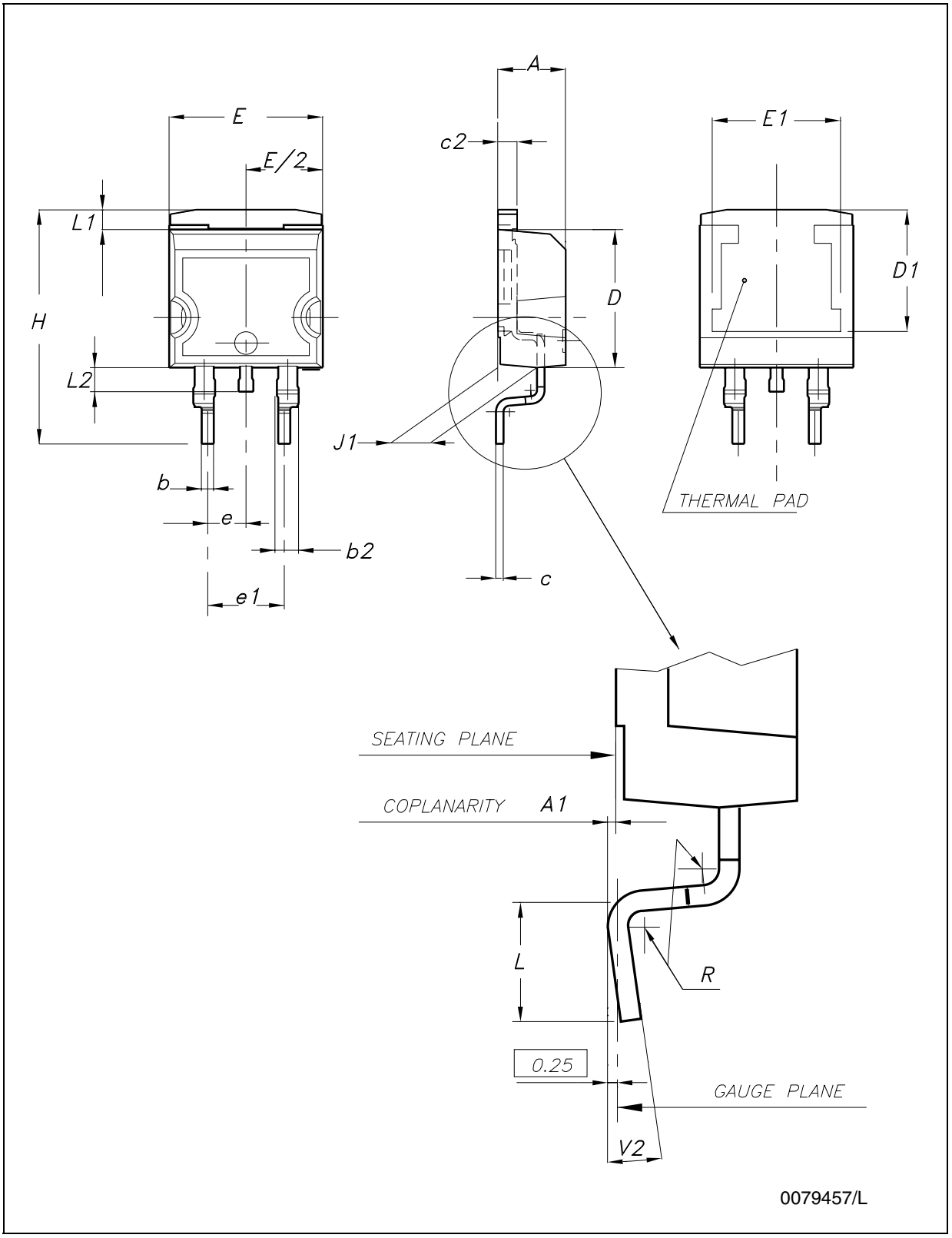


**Figure 45. Drawing dimension D²PAK (type WOOSEOK-Subcon.)**

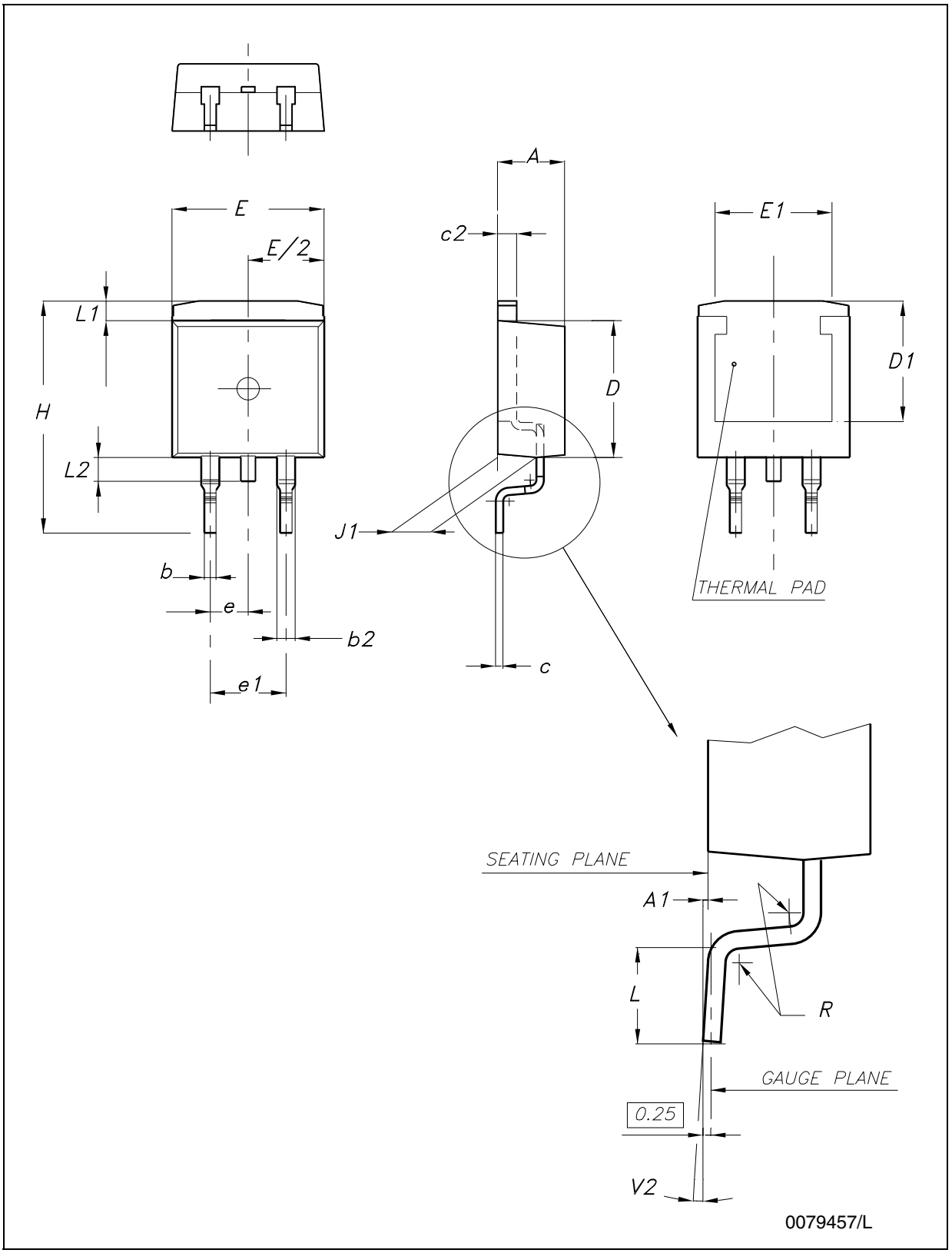


**Table 29. D²PAK mechanical data**

| 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 D²PAK package coming from the subcontractor Wooseok is fully compatible with the ST's package suggested footprint.*

**Figure 46. D²PAK footprint recommended data**

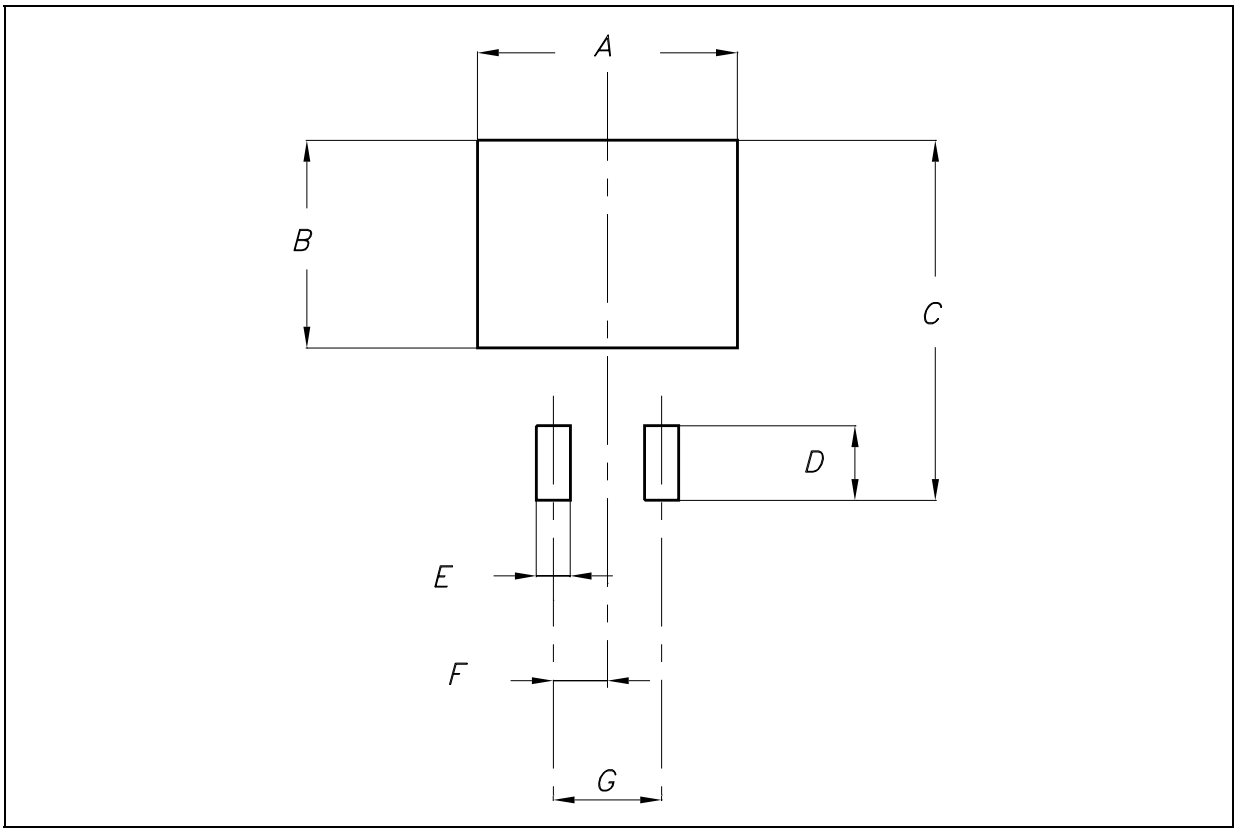


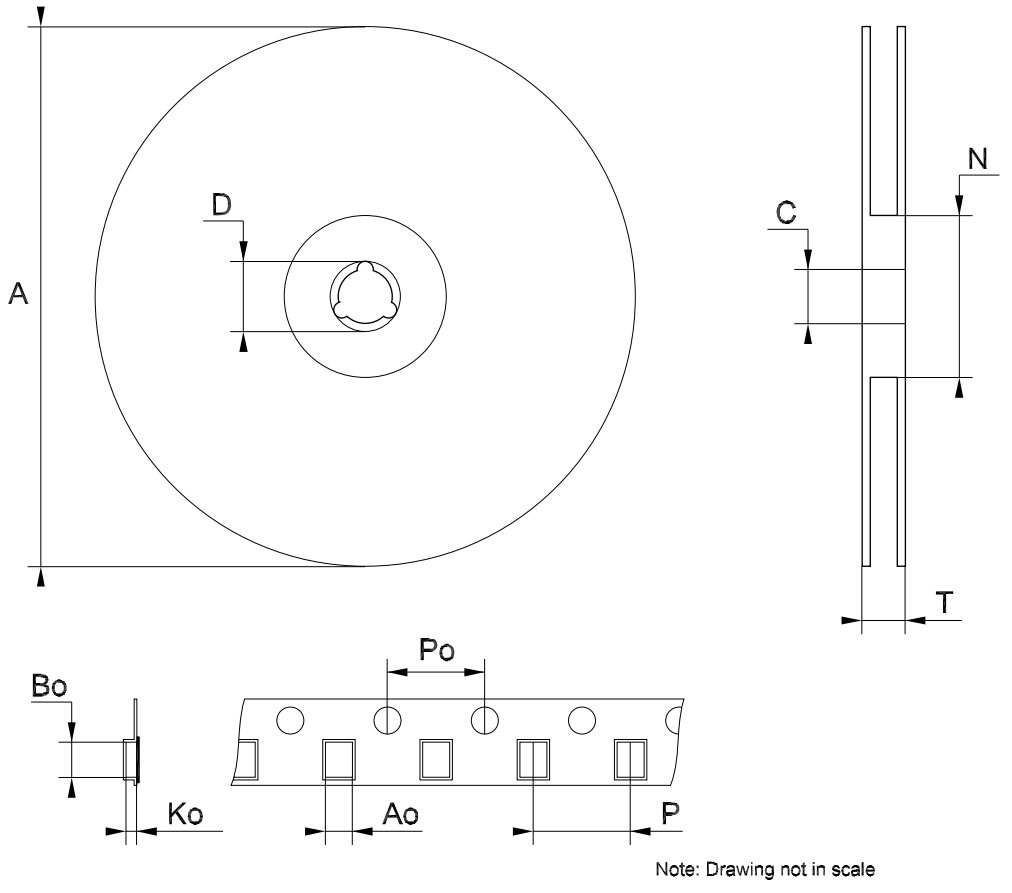

**Table 30. D²PAK footprint data**

| Values | | |
|---|---|---|
| **Dim.** | **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 31. Tape and reel D²PAK 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 47. Drawing dimension tape and reel for D²PAK**



# 8 Order codes

**Table 32. Order codes**

| Part numbers | Order codes | | | | |
|---|---|---|---|---|---|
| | TO-220 | DPAK | $D^2PAK$ | TO-220FP | TO-3 |
| L7805 | | | | | L7805T |
| L7805C | L7805CV | L7805CDT-TR | L7805CD2T-TR | L7805CP | L7805CT |
| L7806C | L7806CV | | L7806CD2T-TR | | L7806CT |
| L7808C | L7808CV | | L7808CD2T-TR | L7808CP | |
| L7885C | L7885CV | | L7885CD2T-TR (1) | L7885CP (1) | L7885CT (1) |
| L7809C | L7809CV | | L7809CD2T-TR | L7809CP | |
| L7812C | L7812CV | | L7812CD2T-TR | L7812CP | L7812CT |
| L7815C | L7815CV | | L7815CD2T-TR | L7815CP | L7815CT |
| L7818C | L7818CV | | L7818CD2T-TR (1) | | L7818CT |
| L7824C | L7824CV | | L7824CD2T-TR | L7824CP | L7824CT |

1. Available on request.

# 9 Revision history

**Table 33. 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 | $D^2PAK$ mechanical data has been updated and add footprint data. |
| 31-May-2007 | 15 | Order codes has been updated. |
| 29-Aug-2007 | 16 | Added *Table 1* in cover page. |
| 11-Dec-2007 | 17 | Modified: *Table 32*. |
| 06-Feb-2008 | 18 | Added: TO-220 mechanical data *Figure 38 on page 40*, *Figure 39 on page 41* and *Table 24 on page 42*. Modified: *Table 32 on page 54*. |
| 18-Mar-2008 | 19 | Added: *Table 27: DPAK mechanical data on page 47.*, *Table 28: Tape and reel DPAK mechanical data on page 48*. Modified: *Table 32 on page 54*. |

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