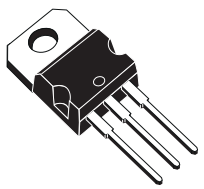
# L78xxAB
# L78xxAC

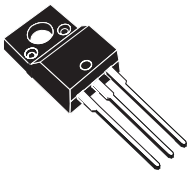
## Precision 1 A regulators

## Features

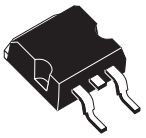
- Output current in excess of 1 A
- Output voltages of 5; 6; 8; 9; 12; 15; 24 V
- Thermal overload protection
- Output transition SOA protection
- 2 % Output voltage tolerance
- Guaranteed in extended temperature range



TO-220



TO-220FP



D²PAK

## Description

The L78xxAB L78xxAC series of three terminal positive regulators are available in TO-220, TO-220FP, and D$^2$PAK 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 problem 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**

| Order codes | |
|---|---|
| L7805AB | L7809AC |
| L7805AC | L7812AB |
| L7806AB | L7812AC |
| L7806AC | L7815AB |
| L7808AB | L7815AC |
| L7808AC | L7824AB |
| L7809AB | L7824AC |

# Contents

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# 1 Diagram

**Figure 1. Block diagram**

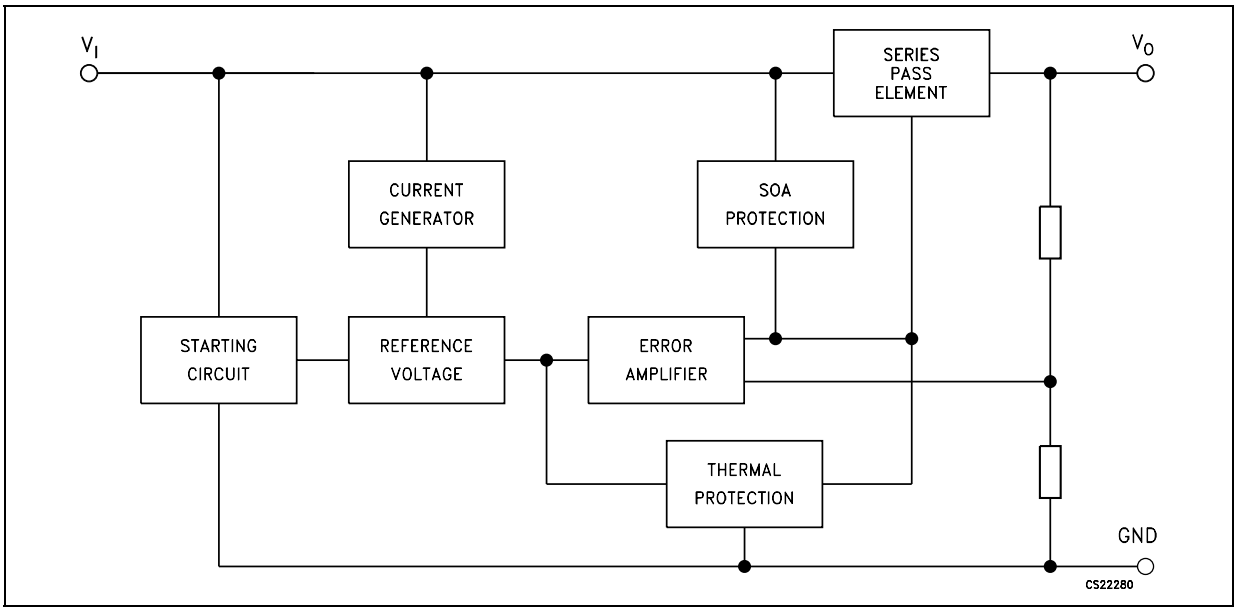
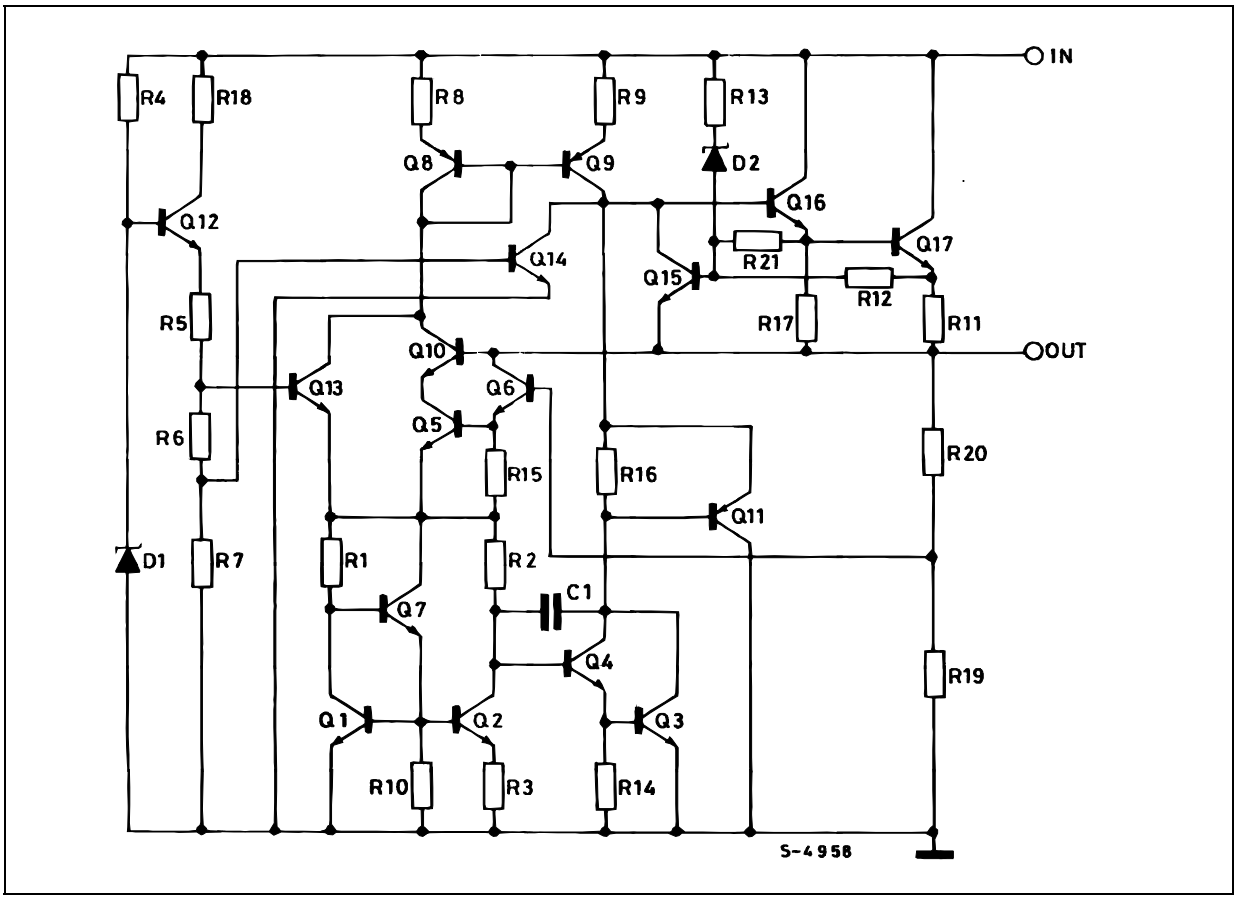
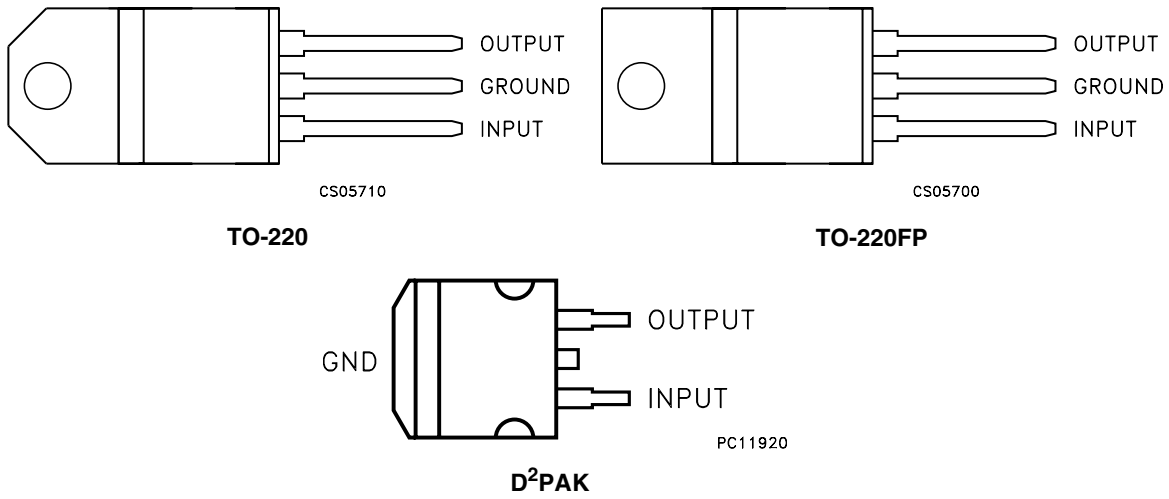



**Figure 2. Schematic diagram**



# 2 Pin configuration

**Figure 3. Pin connections (top view)**



# 3 Maximum ratings

**Table 2. Absolute maximum ratings**

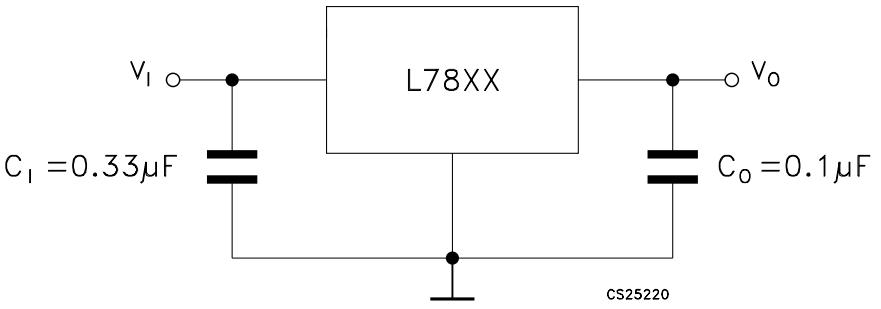
| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_I$ | DC input voltage | for $V_O$= 5 to 18V | 35 | V |
| | | for $V_O$= 20, 24V | 40 | |
| $I_O$ | Output current | | Internally limited | mA |
| $P_D$ | Power dissipation | | Internally limited | mW |
| $T_{STG}$ | Storage temperature range | | -65 to 150 | °C |
| $T_{OP}$ | Operating junction temperature range | for L7800AC | 0 to 150 | °C |
| | | for L7800AB | -40 to 125 | |

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

**Table 3. Thermal data**

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

**Figure 4. Application circuit**



# 4 Test circuits

**Figure 5. DC parameter**

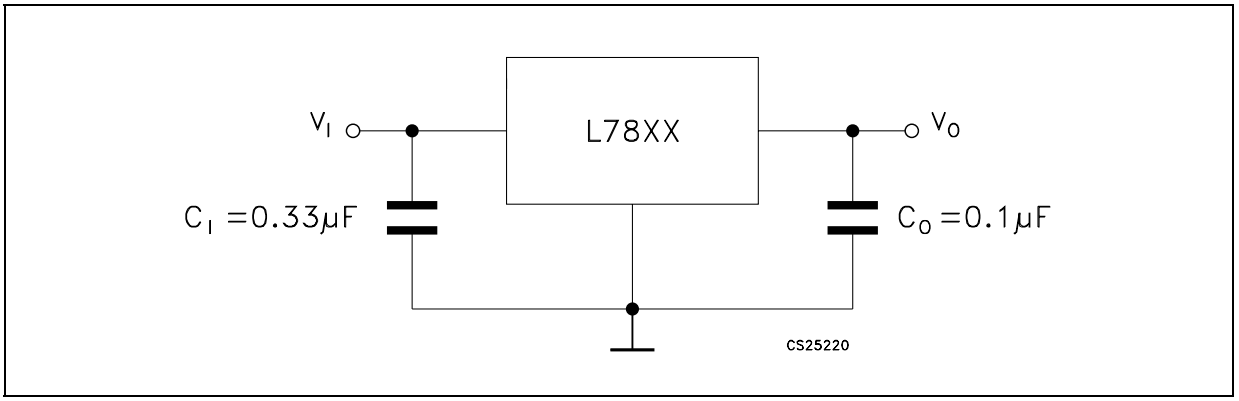



**Figure 6. Load regulation**

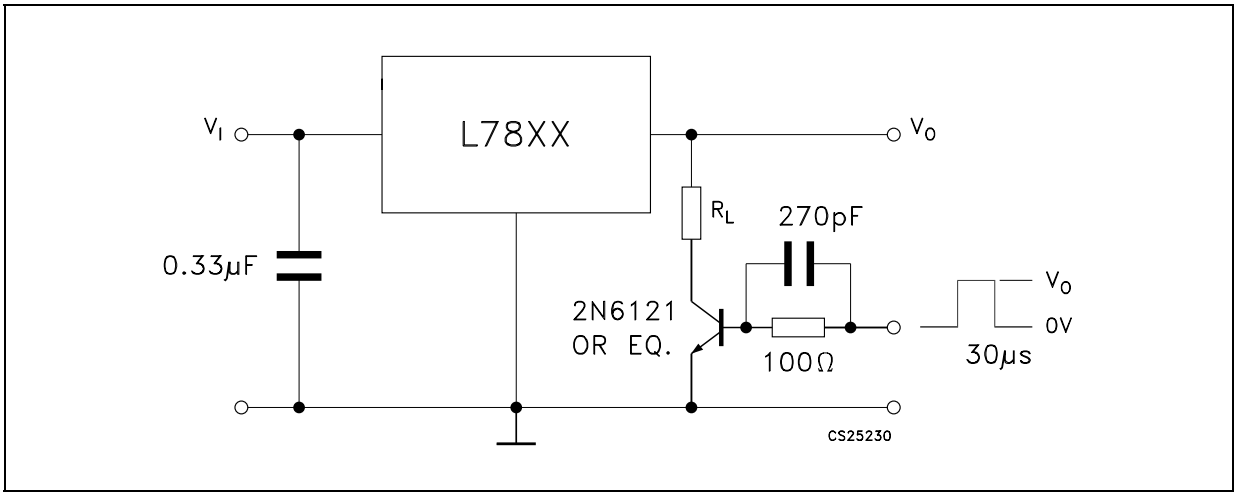
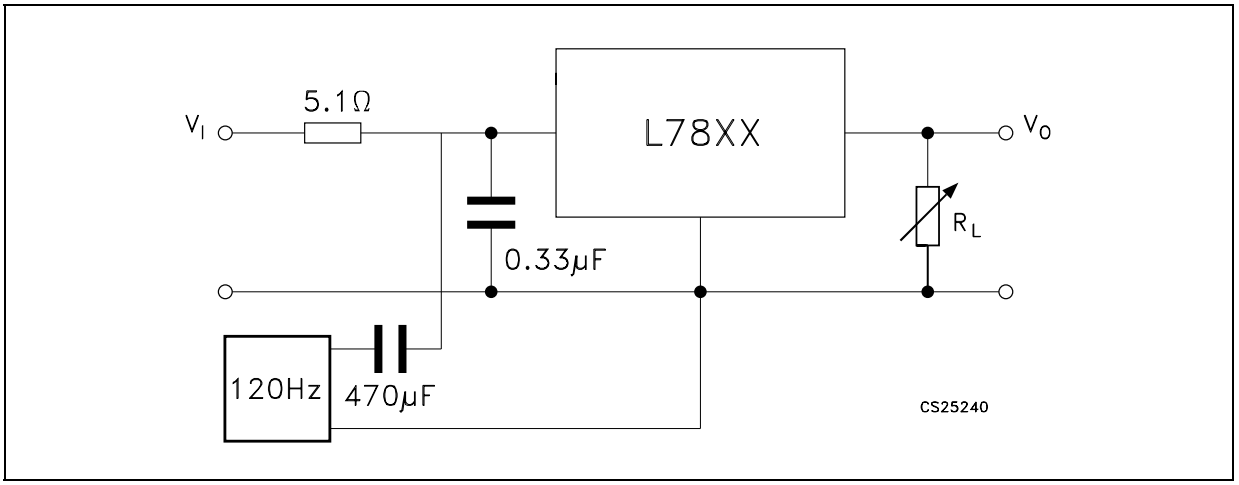



**Figure 7. Ripple rejection**



# 5 Electrical characteristics

**Table 4. Electrical characteristics of L7805A** ($V_I$ = 10 V, $I_O$ = 1 A, $T_J$ = 0 to 150 °C (L7805AC), $T_J$ = -40 to 125 °C (L7805AB), unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 4.9 | 5 | 5.1 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O$ ≤15W<br>$V_I$ = 7.5 to 20V | 4.8 | 5 | 5.2 | V |
| $\Delta V_O$ (1) | Line regulation | $V_I$ = 7.5 to 25V, $I_O$ = 500 mA | | 7 | 50 | mV |
| | | $V_I$ = 8 to 12V | | 10 | 50 | mV |
| | | $V_I$ = 8 to 12V, $T_J$ = 25°C | | 2 | 25 | mV |
| | | $V_I$ = 7.3 to 20V, $T_J$ = 25°C | | 7 | 50 | mV |
| $\Delta V_O$(*) | Load regulation | $I_O$ = 5mA to 1A | | 25 | 100 | mV |
| | | $I_O$ = 5mA to 1.5A, $T_J$ = 25°C | | 30 | 100 | V |
| | | $I_O$ = 250 to 750mA | | 8 | 50 | V |
| $I_q$ | Quiescent current | $T_J$ = 25°C | | 4.3 | 6 | mA |
| | | | | | 6 | mA |
| $\Delta I_q$ | Quiescent current change | $V_I$ = 8 to 25V, $I_O$ = 500 mA | | | 0.8 | mA |
| | | $V_I$ = 7.5 to 20V, $T_J$ = 25°C | | | 0.8 | mA |
| | | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| SVR | Supply voltage rejection | $V_I$ = 8 to 18V, f = 120Hz, $I_O$ = 500mA | | 68 | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | | V |
| eN | Output noise voltage | $T_A$ = 25°C, B =10Hz to 100kHz | | 10 | | µV/$V_O$ |
| $R_O$ | Output resistance | f =1kHz | | 17 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_A$ = 25°C | | 0.2 | | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°C | | 2.2 | | A |
| $\Delta V_O/\Delta T$ | Output voltage drift | | | -1.1 | | mV/°C |

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

**Table 5. Electrical characteristics of L7806A** ($V_I$ = 11 V, $I_O$ = 1 A, $T_J$ = 0 to 150 °C (L7806AC), $T_J$ = -40 to 125 °C (L7806AB), unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 5.88 | 6 | 6.12 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 8.6 to 21V | 5.76 | 6 | 6.24 | V |
| $\Delta V_O$ (1) | Line regulation | $V_I$ = 8.6 to 25V, $I_O$ = 500 mA | | 9 | 60 | mV |
| | | $V_I$ = 9 to 13V | | 11 | 60 | mV |
| | | $V_I$ = 9 to 13V, $T_J$ = 25°C | | 3 | 30 | mV |
| | | $V_I$ = 8.3 to 21V, $T_J$ = 25°C | | 9 | 60 | mV |
| $\Delta V_O$ (1) | Load regulation | $I_O$ = 5mA to 1A | | 25 | 100 | mV |
| | | $I_O$ = 5mA to 1.5A, $T_J$ = 25°C | | 30 | 100 | V |
| | | $I_O$ = 250 to 750mA | | 10 | 50 | V |
| $I_q$ | Quiescent current | $T_J$ = 25°C | | 4.3 | 6 | mA |
| | | | | | 6 | mA |
| $\Delta I_q$ | Quiescent current change | $V_I$ = 9 to 25V, $I_O$ = 500 mA | | | 0.8 | mA |
| | | $V_I$ = 8.6 to 21V, $T_J$ = 25°C | | | 0.8 | mA |
| | | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| SVR | Supply voltage rejection | $V_I$ = 9 to 19V, f = 120Hz, $I_O$ = 500mA | | 65 | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | | V |
| eN | Output noise voltage | $T_A$ = 25°C, B =10Hz to 100kHz | | 10 | | $\mu V/V_O$ |
| $R_O$ | Output resistance | f =1kHz | | 17 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_A$ = 25°C | | 0.2 | | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°C | | 2.2 | | A |
| $\Delta V_O/\Delta T$ | Output voltage drift | | | -0.8 | | mV/°C |

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

**Table 6. Electrical characteristics of L7808A** ($V_I$ = 14 V, $I_O$ = 1 A, $T_J$ = 0 to 150 °C (L7808AC), $T_J$ = -40 to 125 °C (L7808AB), unless otherwise specified)

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

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

**Table 7. Electrical characteristics of L7809A** ($V_I$ = 15 V, $I_O$ = 1 A, $T_J$ = 0 to 150 °C (L7809AC), $T_J$ = -40 to 125 °C (L7809AB), unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 8.82 | 9 | 9.18 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 10.6 to 23V | 8.65 | 9 | 9.35 | V |
| $\Delta V_O$ (1) | Line regulation | $V_I$ = 10.6 to 25V, $I_O$ = 500 mA | | 12 | 90 | mV |
| | | $V_I$ = 11 to 17V | | 15 | 90 | mV |
| | | $V_I$ = 11 to 17V, $T_J$ = 25°C | | 5 | 45 | mV |
| | | $V_I$ = 10.4 to 23V, $T_J$ = 25°C | | 12 | 90 | mV |
| $\Delta V_O$ (1) | Load regulation | $I_O$ = 5mA to 1A | | 25 | 100 | mV |
| | | $I_O$ = 5mA to 1.5A, $T_J$ = 25°C | | 30 | 100 | V |
| | | $I_O$ = 250 to 750mA | | 10 | 50 | V |
| $I_q$ | Quiescent current | $T_J$ = 25°C | | 4.3 | 6 | mA |
| | | | | | 6 | mA |
| $\Delta I_q$ | Quiescent current change | $V_I$ = 11 to 25V, $I_O$ = 500 mA | | | 0.8 | mA |
| | | $V_I$ = 10.6 to 23V, $T_J$ = 25°C | | | 0.8 | mA |
| | | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| SVR | Supply voltage rejection | $V_I$ = 11.5 to 21.5V, f = 120Hz,<br>$I_O$ = 500mA | | 61 | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | | V |
| eN | Output noise voltage | $T_A$ = 25°C, B =10Hz to 100kHz | | 10 | | $\mu V/V_O$ |
| $R_O$ | Output resistance | f =1kHz | | 18 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_A$ = 25°C | | 0.2 | | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°C | | 2.2 | | A |
| $\Delta V_O/\Delta T$ | Output voltage drift | | | -0.8 | | mV/°C |

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

**Table 8. Electrical characteristics of L7812A** ($V_I$ = 19 V, $I_O$ = 1 A, $T_J$ = 0 to 150 °C (L7812AC), $T_J$ = -40 to 125 °C (L7812AB), unless otherwise specified)

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

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

**Table 9. Electrical characteristics of L7815A** ($V_I$ = 23 V, $I_O$ = 1 A, $T_J$ = 0 to 150 °C (L7815AC), $T_J$ = -40 to 125 °C (L7815AB), unless otherwise specified)

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

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

**Table 10. Electrical characteristics of L7824A** ($V_I$ = 33 V, $I_O$ = 1 A, $T_J$ = 0 to 150 °C (L7824AC), $T_J$ = -40 to 125 °C (L7824AB), unless otherwise specified)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_O$ | Output voltage | $T_J$ = 25°C | 23.5 | 24 | 24.5 | V |
| $V_O$ | Output voltage | $I_O$ = 5mA to 1A, $P_O \leq$15W<br>$V_I$ = 27.3 to 38V | 23 | 24 | 25 | V |
| $\Delta V_O$ (1) | Line regulation | $V_I$ = 27 to 38V, $I_O$ = 500 mA | | 31 | 240 | mV |
| | | $V_I$ = 30 to 36V | | 35 | 200 | mV |
| | | $V_I$ = 30 to 36V, $T_J$ = 25°C | | 14 | 120 | mV |
| | | $V_I$ = 26.7 to 38V, $T_J$ = 25°C | | 31 | 240 | mV |
| $\Delta V_O$ (1) | Load regulation | $I_O$ = 5mA to 1A | | 25 | 100 | mV |
| | | $I_O$ = 5mA to 1.5A, $T_J$ = 25°C | | 30 | 100 | V |
| | | $I_O$ = 250 to 750mA | | 10 | 50 | V |
| $I_q$ | Quiescent current | $T_J$ = 25°C | | 4.6 | 6 | mA |
| | | | | | 6 | mA |
| $\Delta I_q$ | Quiescent current change | $V_I$ = 27.3 to 38V, $I_O$ = 500 mA | | | 0.8 | mA |
| | | $V_I$ = 27.3 to 38V, $T_J$ = 25°C | | | 0.8 | mA |
| | | $I_O$ = 5mA to 1A | | | 0.5 | mA |
| SVR | Supply voltage rejection | $V_I$ = 28 to 38V, f = 120Hz, $I_O$ = 500mA | | 54 | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1A, $T_J$ = 25°C | | 2 | | V |
| eN | Output noise voltage | $T_A$ = 25°C, B =10Hz to 100kHz | | 10 | | $\mu V/V_O$ |
| $R_O$ | Output resistance | f =1kHz | | 20 | | mΩ |
| $I_{sc}$ | Short circuit current | $V_I$ = 35V, $T_A$ = 25°C | | 0.2 | | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°C | | 2.2 | | A |
| $\Delta V_O/\Delta T$ | Output voltage drift | | | -1.5 | | mV/°C |

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

# 6 Application information

## 6.1 Design consideration

The L78xxA Series of fixed voltage regulators are designed with Thermal Overload Protection that shuts down the circuit when subjected to an excessive power overload condition, internal short-circuit protection that limits the maximum current the circuit will pass, and output transistor safe-area compensation that reduces the output short-circuit current as the voltage across the pass transistor is increased. In many low current applications, compensation capacitors are not required. However, it is recommended that the regulator input be bypassed with capacitor if the regulator is connected to the power supply filter with long lengths, or if the output load capacitance is large. An input bypass capacitor should be selected to provide good high frequency characteristics to insure stable operation under all load conditions. A 0.33 µF or larger tantalum, mylar or other capacitor having low internal impedance at high frequencies should be chosen. The bypass capacitor should be mounted with the shortest possible leads directly across the regulators input terminals. Normally good construction techniques should be used to minimize ground loops and lead resistance drops since the regulator has no external sense lead.

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

The circuit of figure 6 can be modified to provide supply protection against short circuit by adding a short circuit sense resistor, RSC, and an additional PNP transistor. The current sensing PNP must be able to handle the short circuit current of the three terminal regulator Therefore a four ampere plastic power transistor is specified.

**Figure 8. DC parameter**

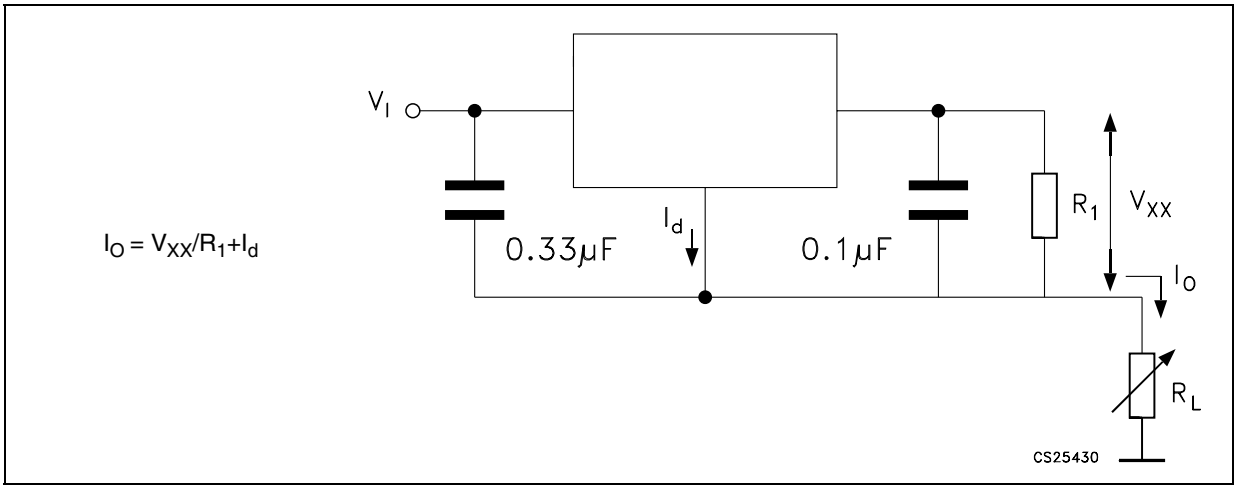


**Figure 9. DC parameter**

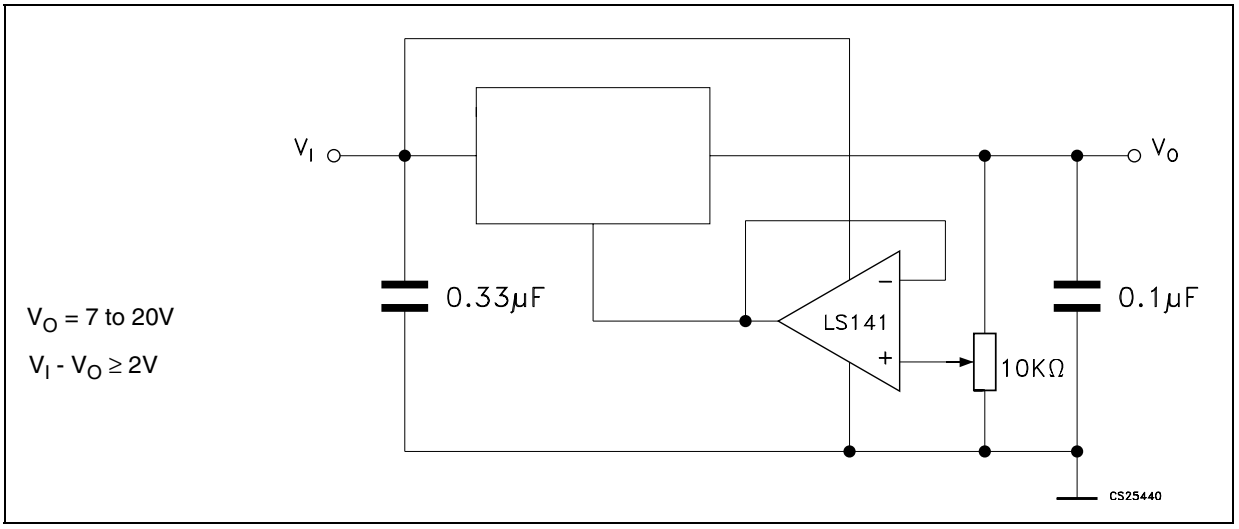



**Figure 10. DC parameter**

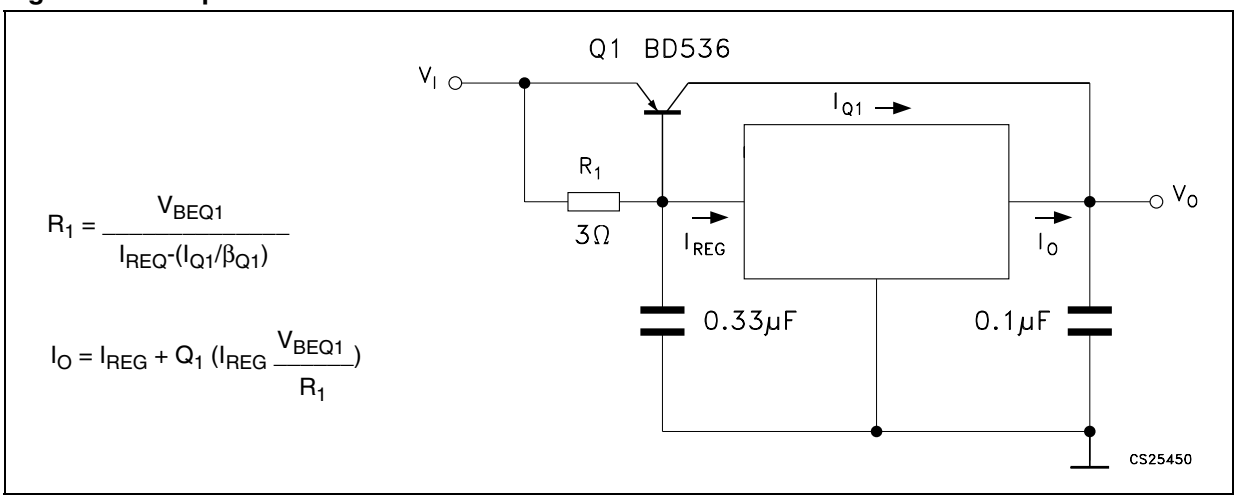
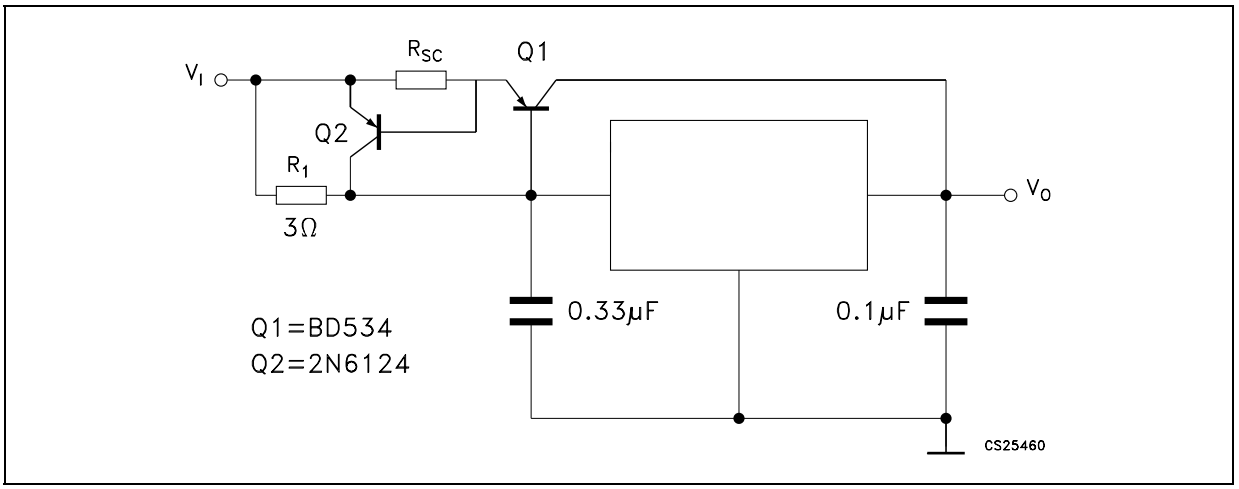



**Figure 11. DC parameter**

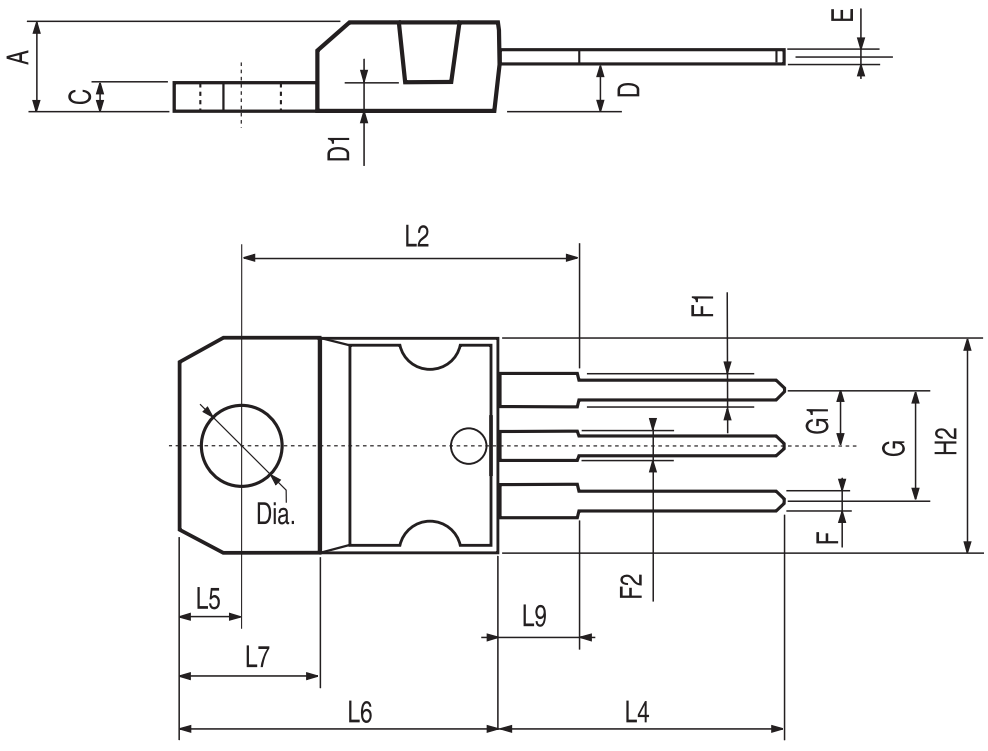


# 7 Package mechanical data

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.

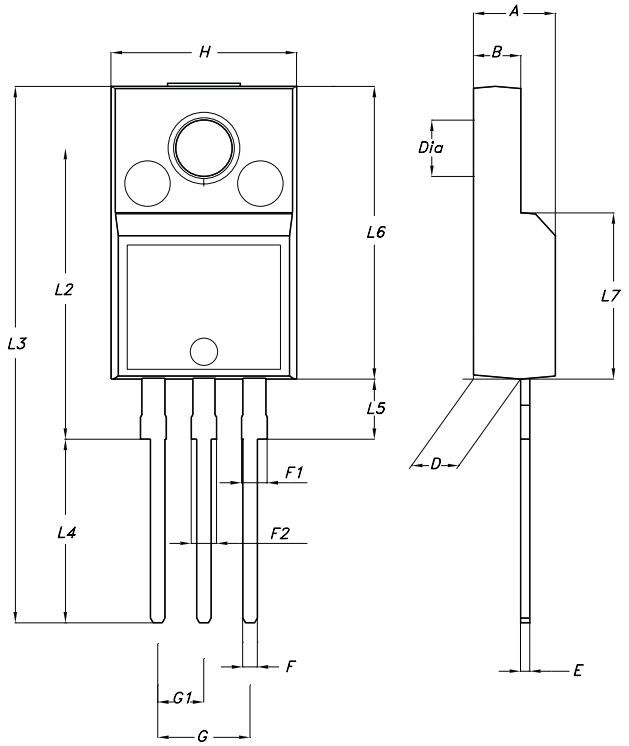
## TO-220 mechanical data

| Dim. | mm. | | | inch. | | |
|---|---|---|---|---|---|---|
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| C | 1.23 | | 1.32 | 0.048 | | 0.051 |
| D | 2.40 | | 2.72 | 0.094 | | 0.107 |
| D1 | | 1.27 | | | 0.050 | |
| E | 0.49 | | 0.70 | 0.019 | | 0.027 |
| F | 0.61 | | 0.88 | 0.024 | | 0.034 |
| F1 | 1.14 | | 1.70 | 0.044 | | 0.067 |
| F2 | 1.14 | | 1.70 | 0.044 | | 0.067 |
| G | 4.95 | | 5.15 | 0.194 | | 0.203 |
| G1 | 2.4 | | 2.7 | 0.094 | | 0.106 |
| H2 | 10.0 | | 10.40 | 0.393 | | 0.409 |
| L2 | | 16.4 | | | 0.645 | |
| L4 | 13.0 | | 14.0 | 0.511 | | 0.551 |
| L5 | 2.65 | | 2.95 | 0.104 | | 0.116 |
| L6 | 15.25 | | 15.75 | 0.600 | | 0.620 |
| L7 | 6.2 | | 6.6 | 0.244 | | 0.260 |
| L9 | 3.5 | | 3.93 | 0.137 | | 0.154 |
| DIA. | 3.75 | | 3.85 | 0.147 | | 0.151 |



## 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

**Figure 12. Drawing dimension D²PAK (type STD-ST)**

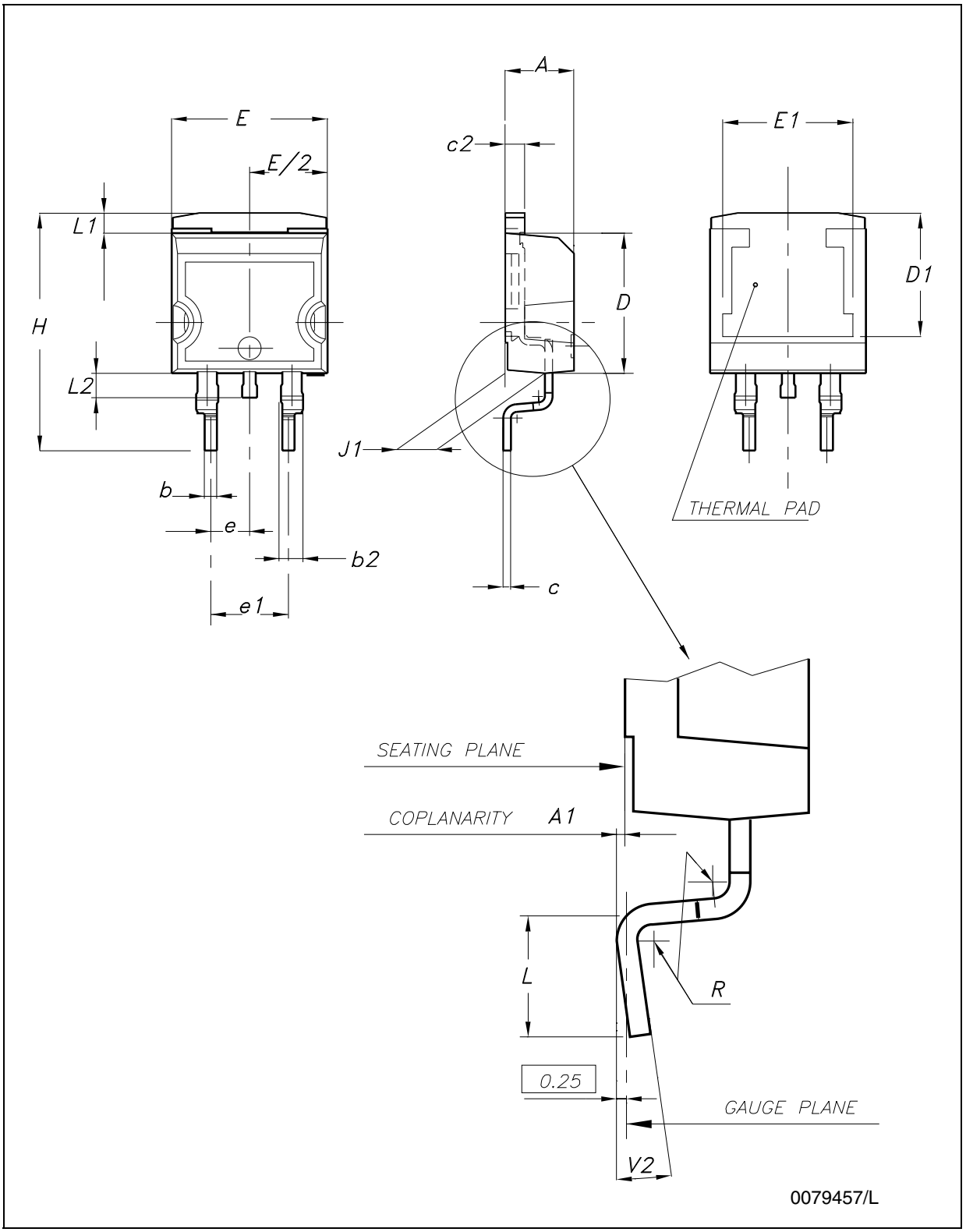


**Figure 13. Drawing dimension D²PAK (type WOOSEOK-Subcon.)**

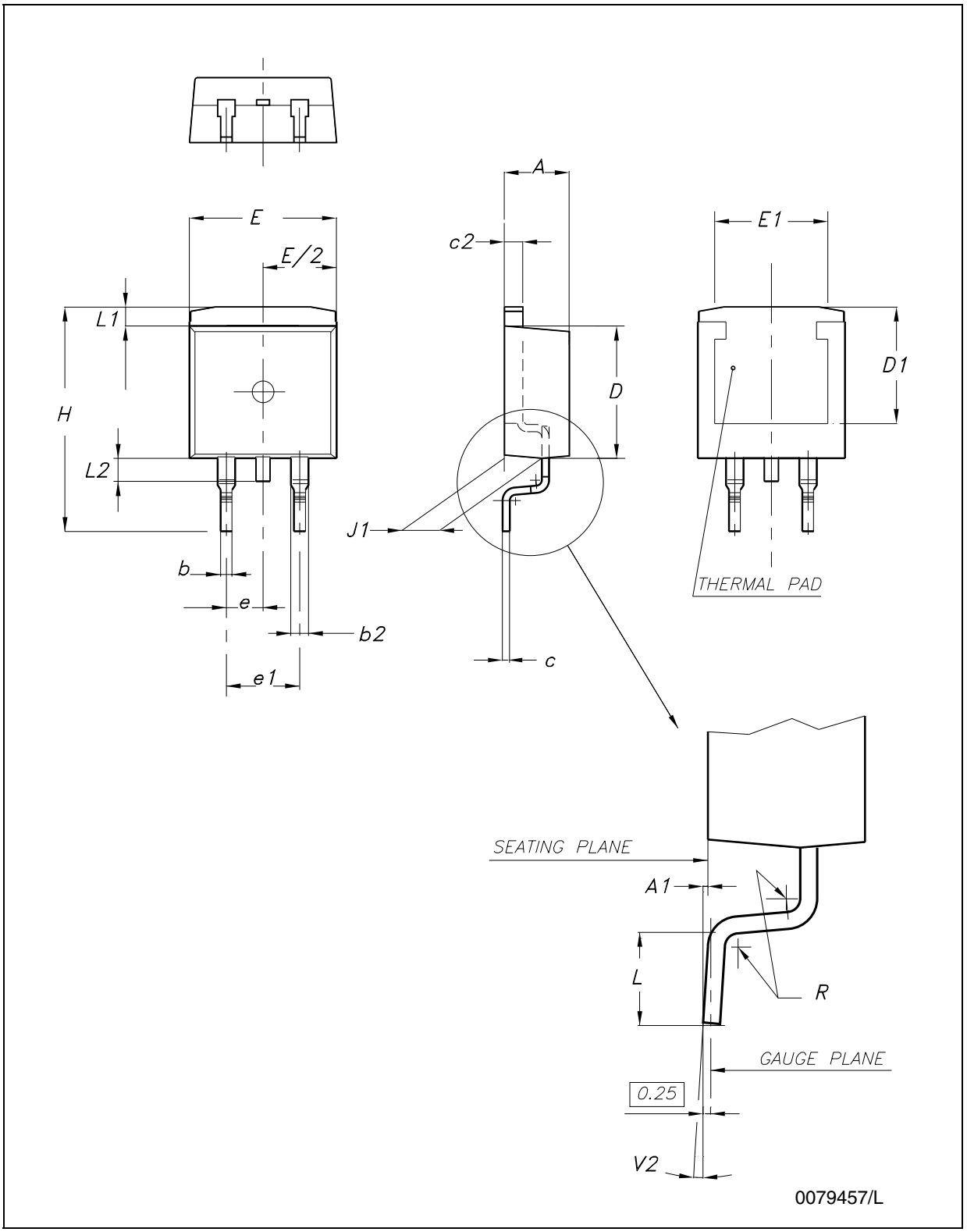


**Table 11. D²PAK mechanical data**

| 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 14. D²PAK footprint recommended data**

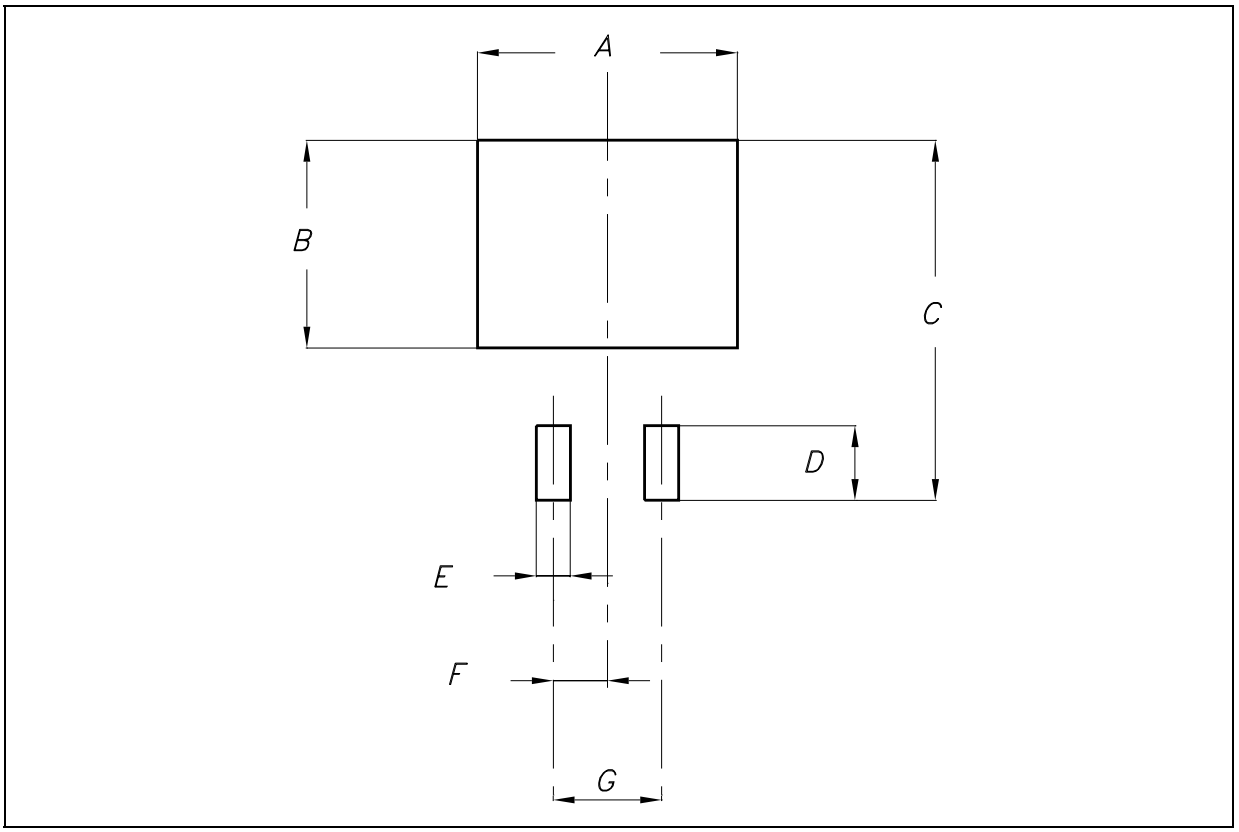
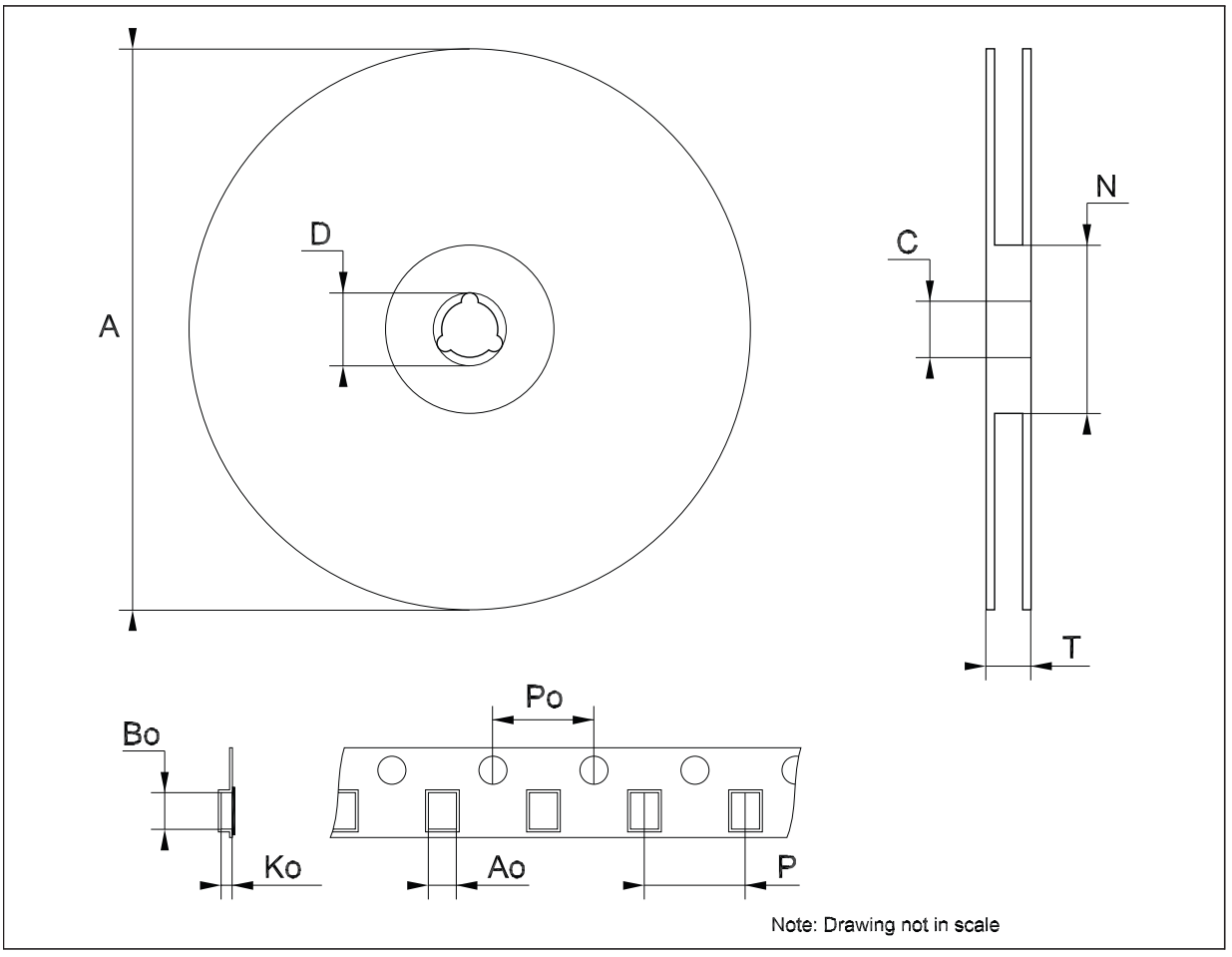



**Table 12. Footprint data**

| 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 |

## Tape & reel $D^2PAK$-$P^2PAK$-$D^2PAK/A$-$P^2PAK/A$ 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

# 8 Order codes

**Table 13. Order codes**

| Part number | Packaging | | | Output voltage |
|---|---|---|---|---|
| | TO-220 | TO-220FP | $D^2PAK$ | |
| L7805AB | L7805ABV | L7805ABP | L7805ABD2T-TR | 5 V |
| L7805AC | L7805ACV | L7805ACP | L7805ACD2T-TR | 5 V |
| L7806AB | L7806ABV | | L7806ABD2T-TR | 6 V |
| L7806AC | L7806ACV | | L7806ACD2T-TR | 6 V |
| L7808AB | L7808ABV | | L7808ABD2T-TR | 8 V |
| L7808AC | L7808ACV | | L7808ACD2T-TR | 8 V |
| L7809AB | L7809ABV | | L7809ABD2T-TR | 9 V |
| L7809AC | L7809ACV | | L7809ACD2T-TR | 9 V |
| L7812AB | L7812ABV | | L7812ABD2T-TR | 12 V |
| L7812AC | L7812ACV | | L7812ACD2T-TR | 12 V |
| L7815AB | L7815ABV | | L7815ABD2T-TR | 15 V |
| L7815AC | L7815ACV | | L7815ACD2T-TR | 15 V |
| L7824AB | L7824ABV | | L7824ABD2T-TR | 24 V |
| L7824AC | L7824ACV | | | 24 V |

# 9 Revision history

**Table 14. Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 21-Jun-2004 | 9 | Document updating. |
| 04-Aug-2006 | 10 | Order codes updated and new template. |
| 19-Jan-2007 | 11 | $D^2PAK$ mechanical data has been updated and add footprint data. |
| 07-Mar-2007 | 12 | Update figure $D^2PAK$ in cover page. |
| 01-Jun-2007 | 13 | Order codes updated. |
| 25-Jul-2007 | 14 | Add *Table 1* in cover page. |
| 11-Dec-2007 | 15 | Modified: *Table 13*. |
| 20-Feb-2008 | 16 | Modified: *Table 13 on page 24*. |
| 15-Jul-2008 | 17 | Modified: *Table 1 on page 1* and *Table 13 on page 24*. |

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