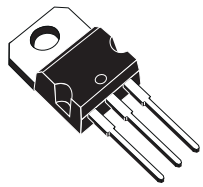
# L79xxAC

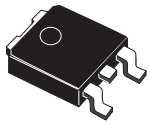
## 2 % negative voltage regulators

## Features

- Output current to 1.5 A
- Output voltages of -5; -12; -15 V
- Thermal overload protection
- Short circuit protection
- Output transition SOA protection



TO-220



D²PAK

## Description

The L79xxAC series of three-terminal negative regulators is available in TO-220 and D²PAK packages and several fixed output voltages. These regulators can provide local on-card regulation, eliminating the distribution problems associated with single point regulation; furthermore, having the same voltage option as the L78xxA positive standard series, they are particularly suited for split power supplies. If adequate heat sinking is provided, they can deliver over 1.5 A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

**Table 1. Device summary**

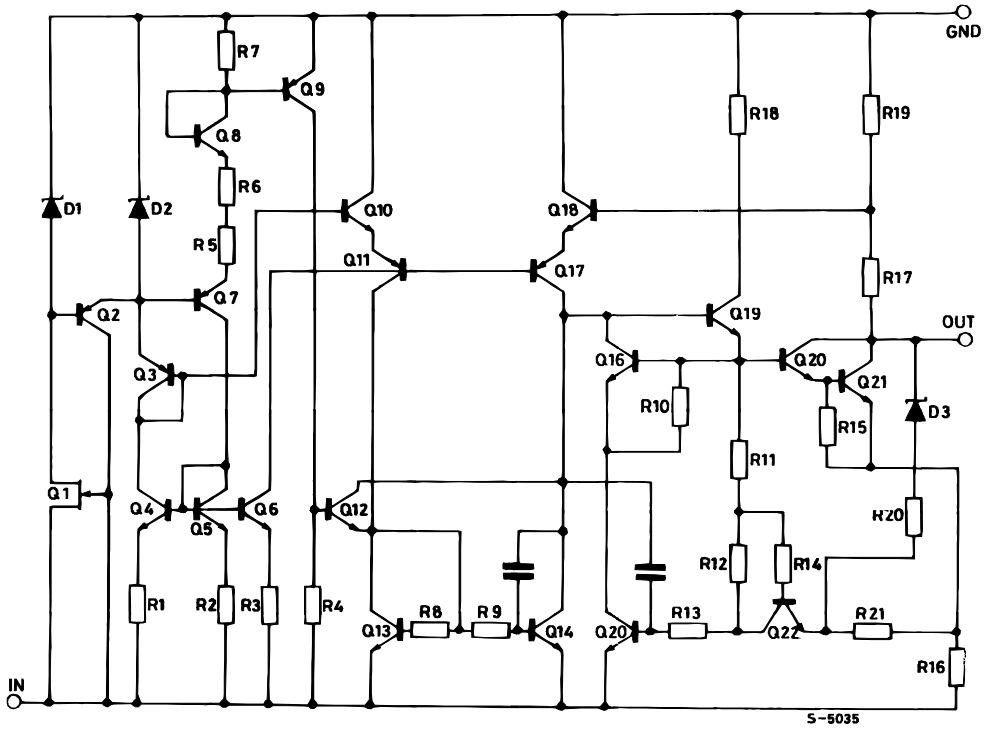
| Part numbers | Order codes | | | Output voltages |
|---|---|---|---|---|
| | TO-220 | | D²PAK | |
| L7905AC | L7905ACV | L7905ACV-DG (1) | L7905ACD2T-TR | -5 V |
| L7912AC | L7912ACV | L7912ACV-DG (1) | | -12 V |
| L7915AC | L7915ACV | L7915ACV-DG (1) | | -15 V |

1. TO-220 Dual Gauge frame.

# Contents

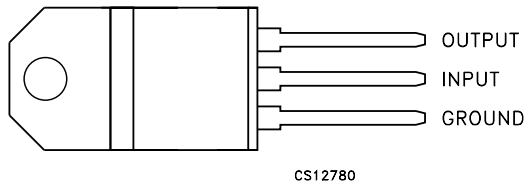
# 1 Diagram

**Figure 1. Schematic diagram**

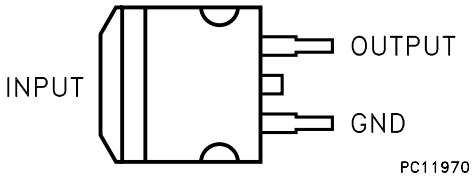


# 2 Pin configuration

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




TO-220




D²PAK

# 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 | |
| $P_D$ | Power dissipation | | Internally limited | |
| $T_{STG}$ | Storage temperature range | | -65 to 150 | °C |
| $T_{OP}$ | Operating junction temperature range | | 0 to 125 | °C |

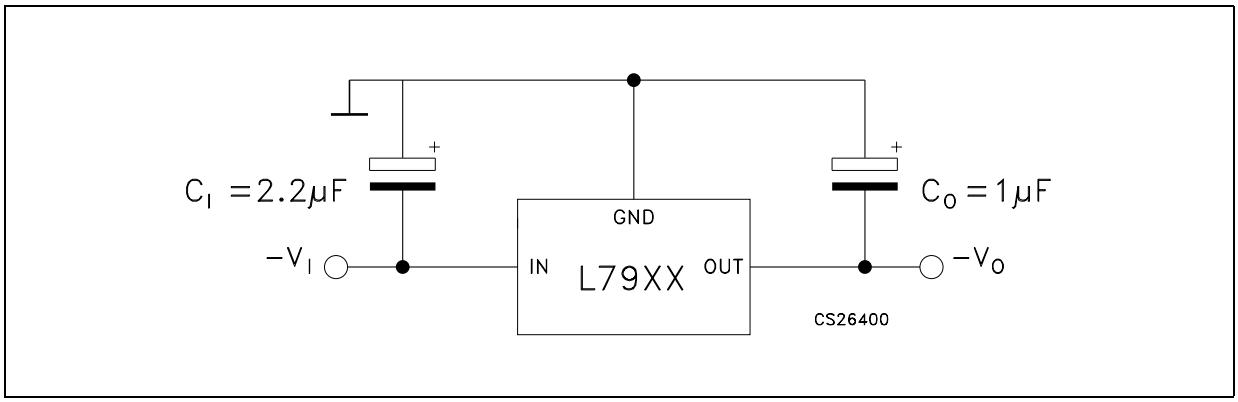
*Note: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.*

**Table 3. Thermal data**

| Symbol | Parameter | D²PAK | TO-220 | Unit |
|---|---|---|---|---|
| $R_{thJC}$ | Thermal resistance junction-case | 3 | 5 | °C/W |
| $R_{thJA}$ | Thermal resistance junction-ambient | 62.5 | 50 | °C/W |

# 4 Application

**Figure 3. Application circuit**



# 5 Electrical characteristics

Refer to the test circuits, $T_J$ = 0 to 125 °C, $V_I$ = -10 V, $I_O$ = 500 mA, $C_I$ = 2.2 µF, $C_O$ = 1 µF unless otherwise specified.

**Table 4. Electrical characteristics of L7905AC**

| 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 | $I_O$ = -5 mA to -1 A, $P_O \leq$ 15 W<br>$V_I$ = -8 to -20 V | -4.8 | -5 | -5.2 | V |
| $\Delta V_O$(1) | Line regulation | $V_I$ = -7 to -25 V, $T_J$ = 25°C | | | 100 | mV |
| | | $V_I$ = -8 to -12 V, $T_J$ = 25°C | | | 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 | | | 3 | 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 | | -0.4 | | mV/°C |
| eN | Output noise voltage | B = 10Hz to 100kHz, $T_J$ = 25°C | | 100 | | µV |
| SVR | Supply voltage rejection | $\Delta V_I$ = 10 V, f = 120Hz | 54 | 60 | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1 A, $T_J$ = 25°C, $\Delta V_O$ = 100 mV | | 1.4 | | V |
| $I_{sc}$ | Short circuit current | | | 2.1 | | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°C | | 2.5 | | A |

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

Refer to the test circuits, $T_J$ = 0 to 125 °C, $V_I$ = -19 V, $I_O$ = 500 mA, $C_I$ = 2.2 µF, $C_O$ = 1 µF unless otherwise specified.

**Table 5. Electrical characteristics of L7912AC**

| 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 | $I_O$ = -5 mA to -1 A, $P_O \leq$ 15 W<br>$V_I$ = -15.5 to -27 V | -11.5 | -12 | -12.5 | 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 | | | 3 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = -15 to -30 V | | | 1 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5 mA | | -0.8 | | mV/°C |
| eN | Output noise voltage | B = 10Hz to 100kHz, $T_J$ = 25°C | | 200 | | µV |
| SVR | Supply voltage rejection | $\Delta V_I$ = 10 V, f = 120Hz | 54 | 60 | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1 A, $T_J$ = 25°C, $\Delta V_O$ = 100 mV | | 1.1 | | V |
| $I_{sc}$ | Short circuit current | | | 1.5 | | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°C | | 2.5 | | A |

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

Refer to the test circuits, $T_J$ = 0 to 125 °C, $V_I$ = -23 V, $I_O$ = 500 mA, $C_I$ = 2.2 µF, $C_O$ = 1 µF unless otherwise specified.

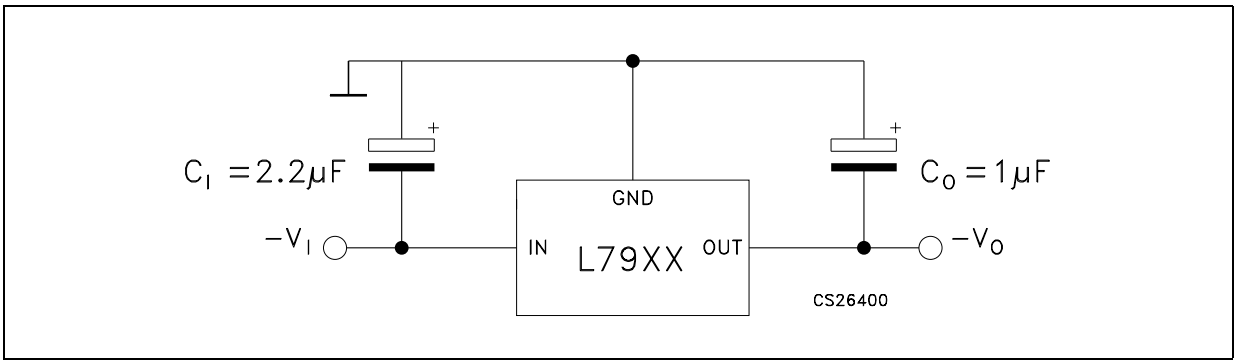
**Table 6. Electrical characteristics of L7915AC**

| 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 | $I_O$ = -5 mA to -1 A, $P_O \leq$ 15 W<br>$V_I$ = -18.5 to -30 V | -14.4 | -15 | -15.6 | 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 | | | 3 | mA |
| $\Delta I_d$ | Quiescent current change | $I_O$ = 5 mA to 1 A | | | 0.5 | mA |
| | | $V_I$ = -18.5 to -30 V | | | 1 | |
| $\Delta V_O/\Delta T$ | Output voltage drift | $I_O$ = 5 mA | | -0.9 | | mV/°C |
| eN | Output noise voltage | B = 10Hz to 100kHz, $T_J$ = 25°C | | 250 | | µV |
| SVR | Supply voltage rejection | $\Delta V_I$ = 10 V, f = 120Hz | 54 | 60 | | dB |
| $V_d$ | Dropout voltage | $I_O$ = 1 A, $T_J$ = 25°C, $\Delta V_O$ = 100 mV | | 1.1 | | V |
| $I_{sc}$ | Short circuit current | | | 1.3 | | A |
| $I_{scp}$ | Short circuit peak current | $T_J$ = 25°C | | 2.5 | | A |

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

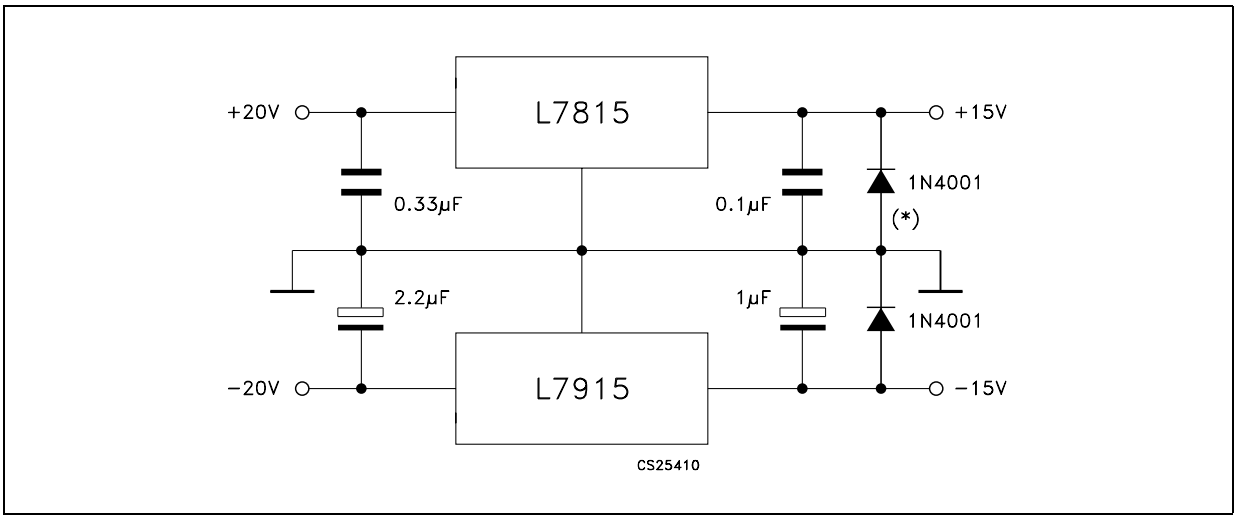
# 6 Application information

**Figure 4. Fixed output regulator**




1. To specify an output voltage, substitute voltage value for "XX".
2. Required for stability. For value given, capacitor must be solid tantalum. If aluminium electrolytic are used, at least ten times value should be selected. C1 is required if regulator is located an appreciable distance from power supply filter.
3. To improve transient response. If large capacitors are used, a high current diode from input to output (1N4001 or similar) should be introduced to protect the device from momentary input short circuit.

**Figure 5. Split power supply (± 15 V - 1 A)**

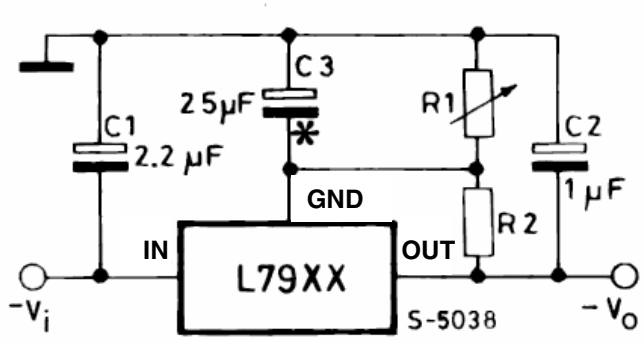



(*) Against potential latch-up problems.

**Figure 6. Circuit for increasing output voltage**

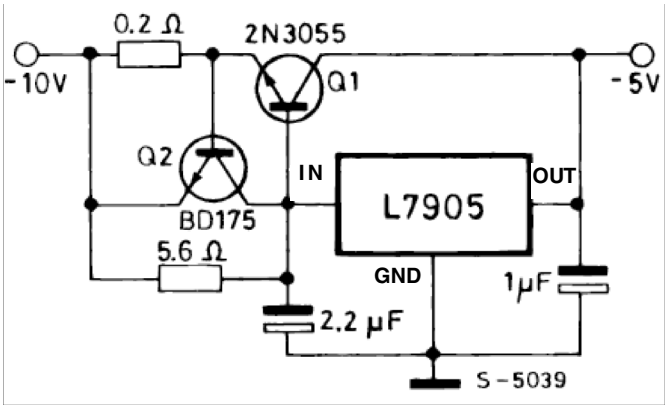
$V_O=V_{XX}(R_1+R_2)/R_2$

$V_{XX}/R_2 > 3I_d$




C3 Optional for improved transient response and ripple rejection.

**Figure 7. High current negative regulator (-5 V / 4 A with 5 A current limiting)**



# 7 Package mechanical data

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

**Table 7. TO-220 mechanical data**

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

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

**Figure 8. Drawing dimension TO-220 (type STD-ST Dual Gauge)**

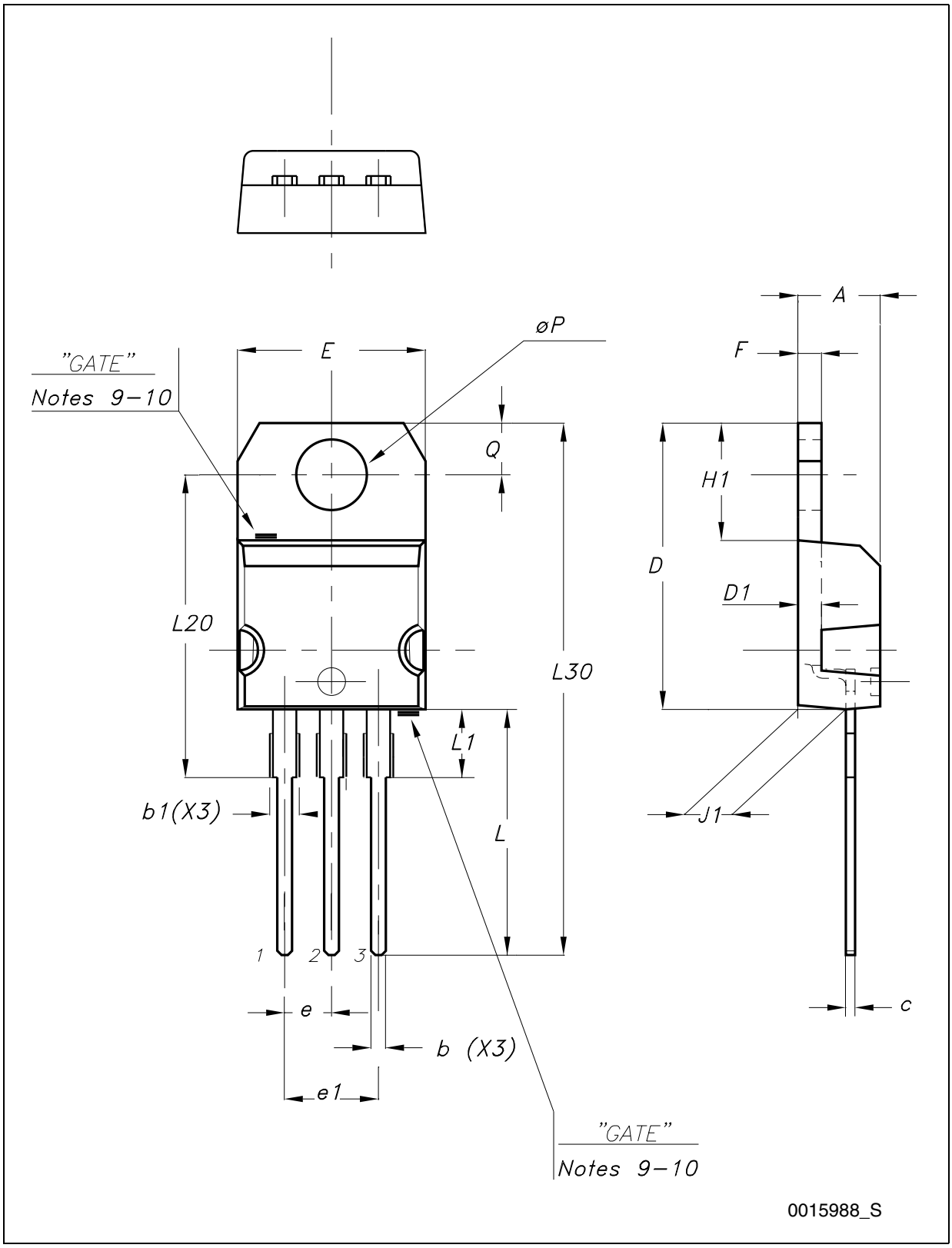


**Figure 9. Drawing dimension TO-220 (type STD-ST Single Gauge)**

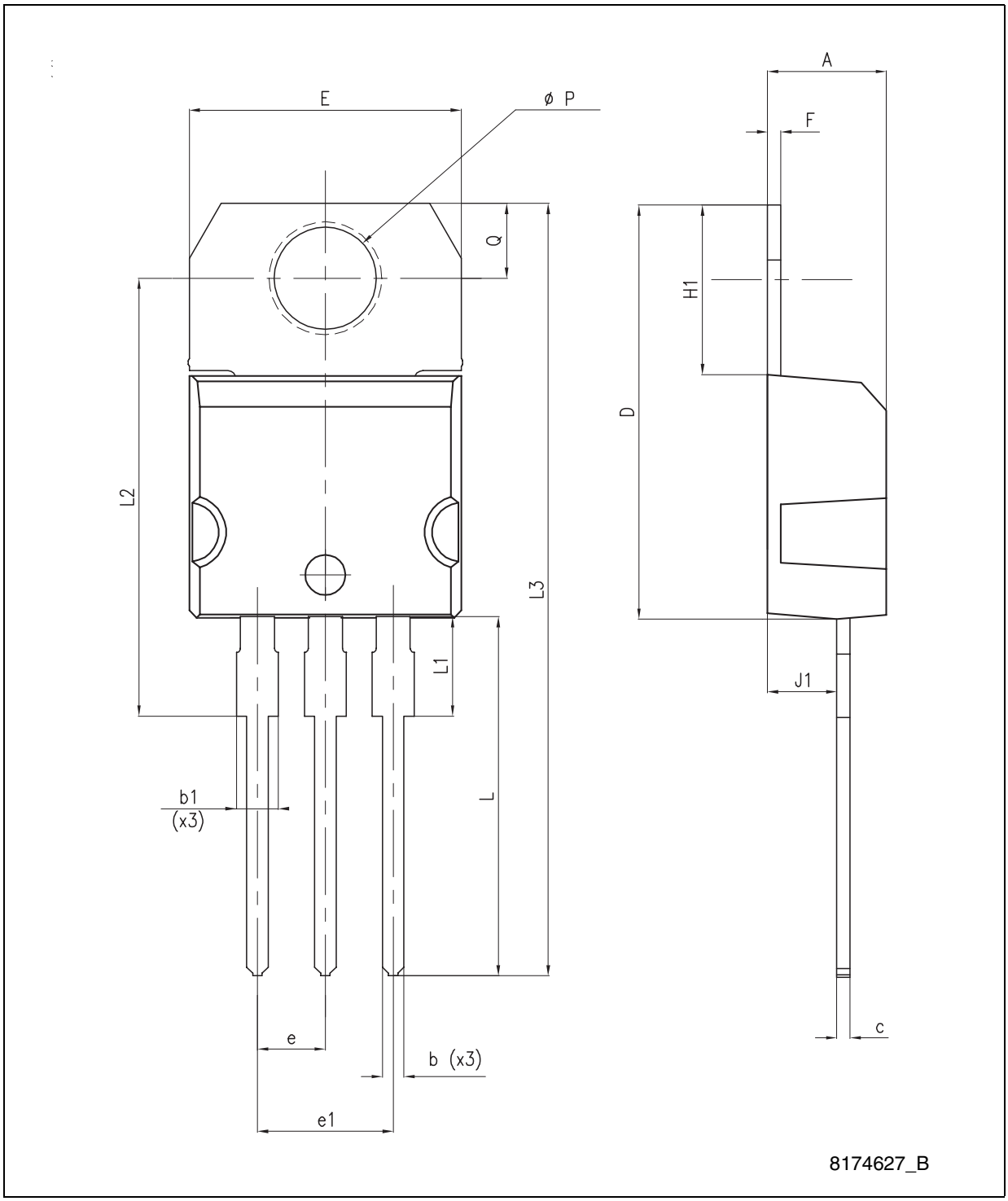


**Figure 10. Drawing dimension tube for TO-220 Dual Gauge (mm.)**

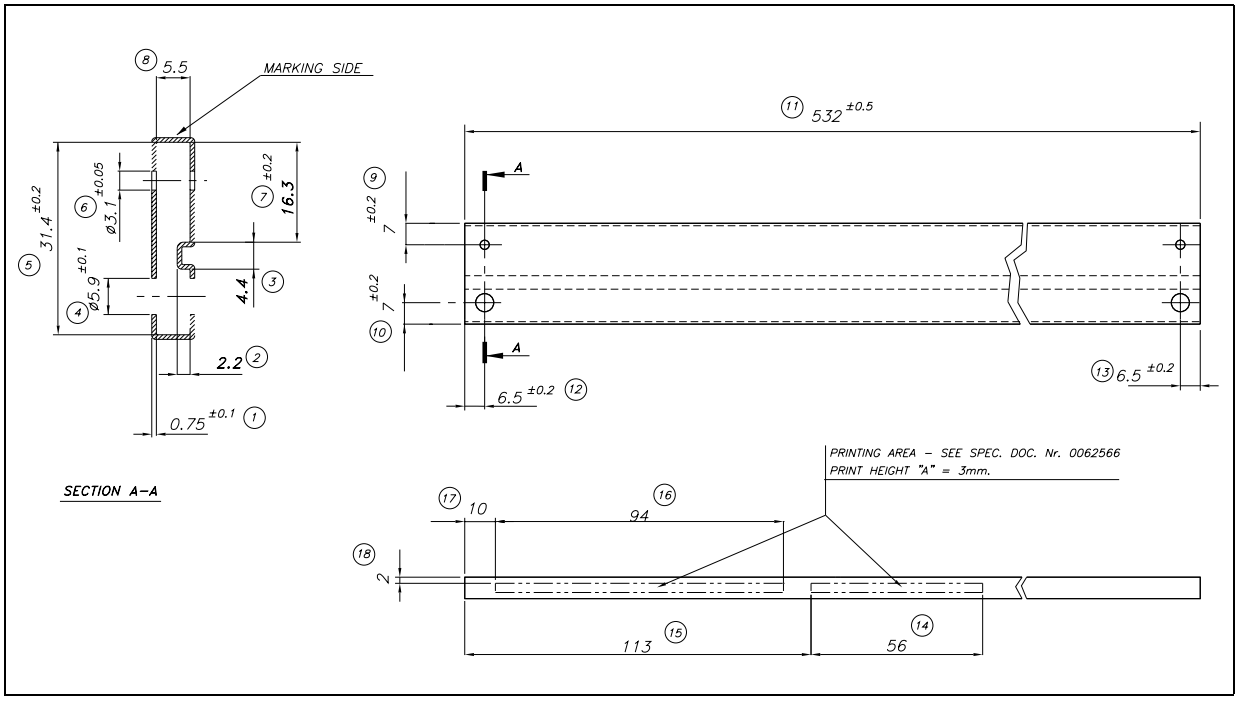



**Figure 11. Drawing dimension tube for TO-220 Single Gauge (mm.)**

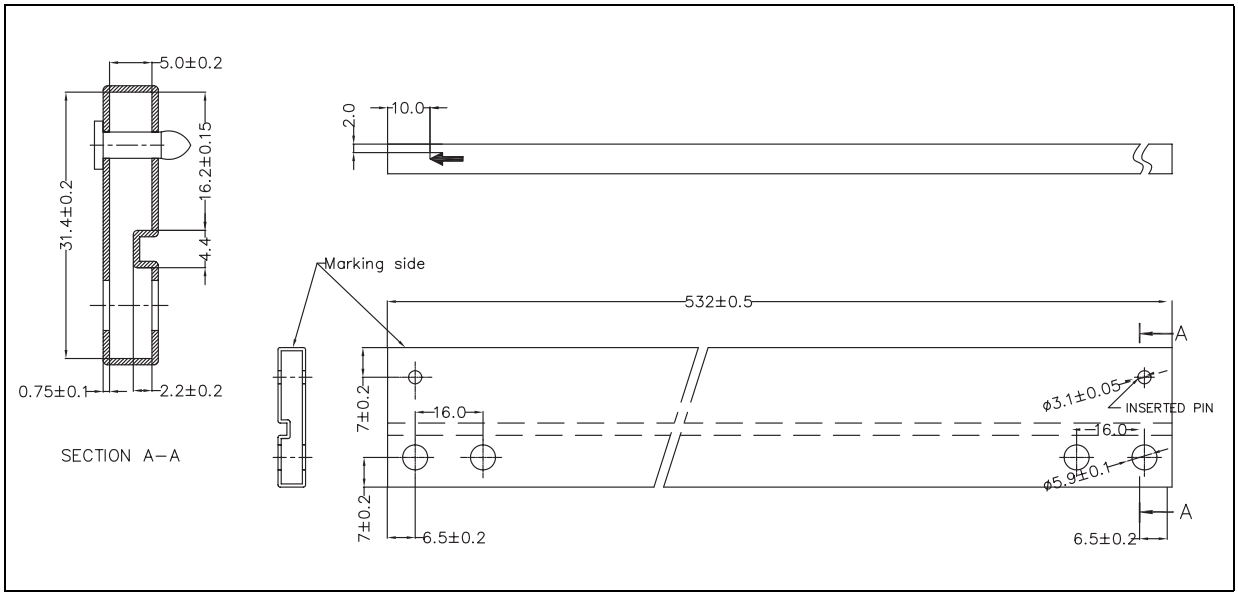


**Figure 12. Drawing dimension D²PAK (type STD-ST)**

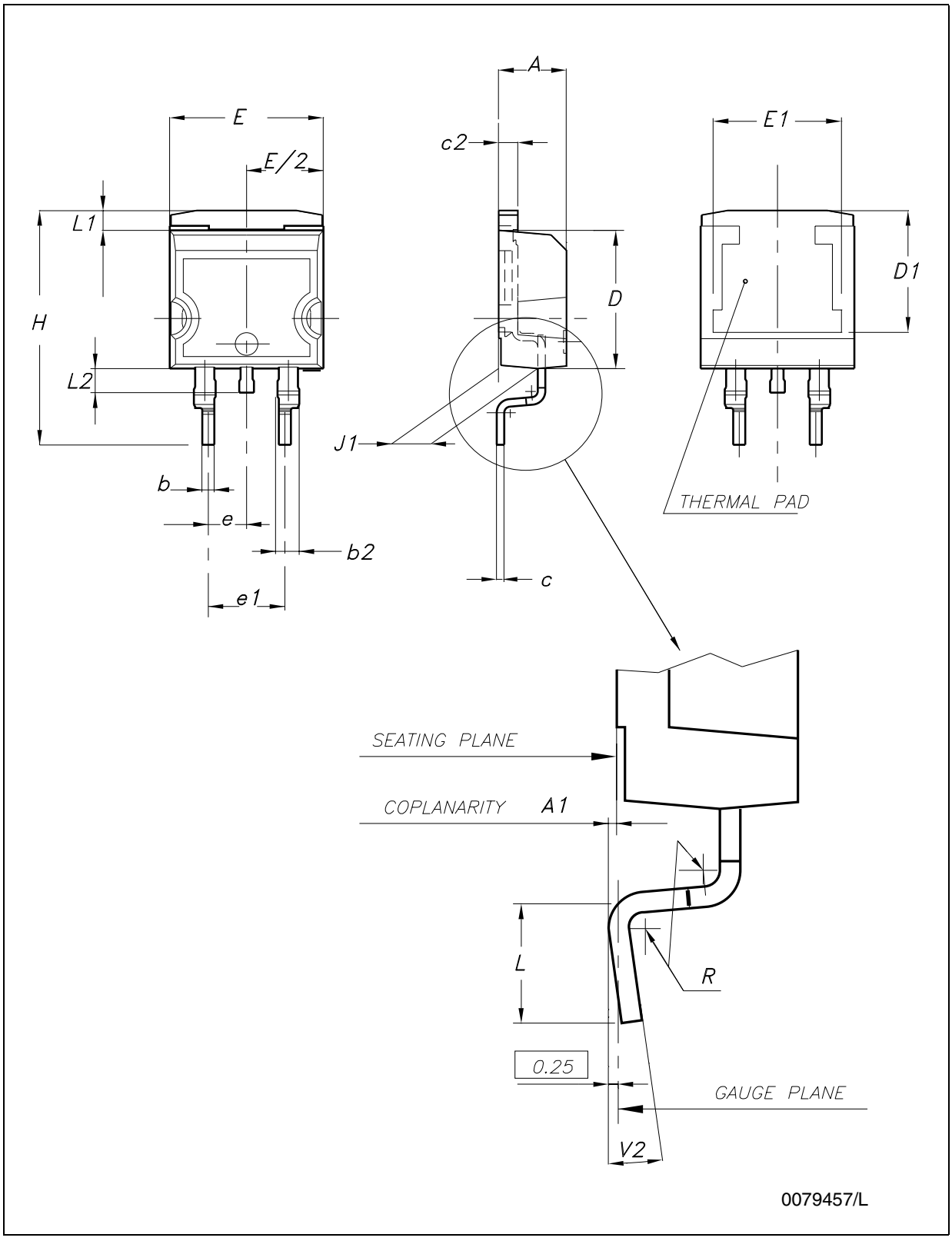


**Figure 13. Drawing dimension D²PAK (type WOOSEOK-subcon.)**

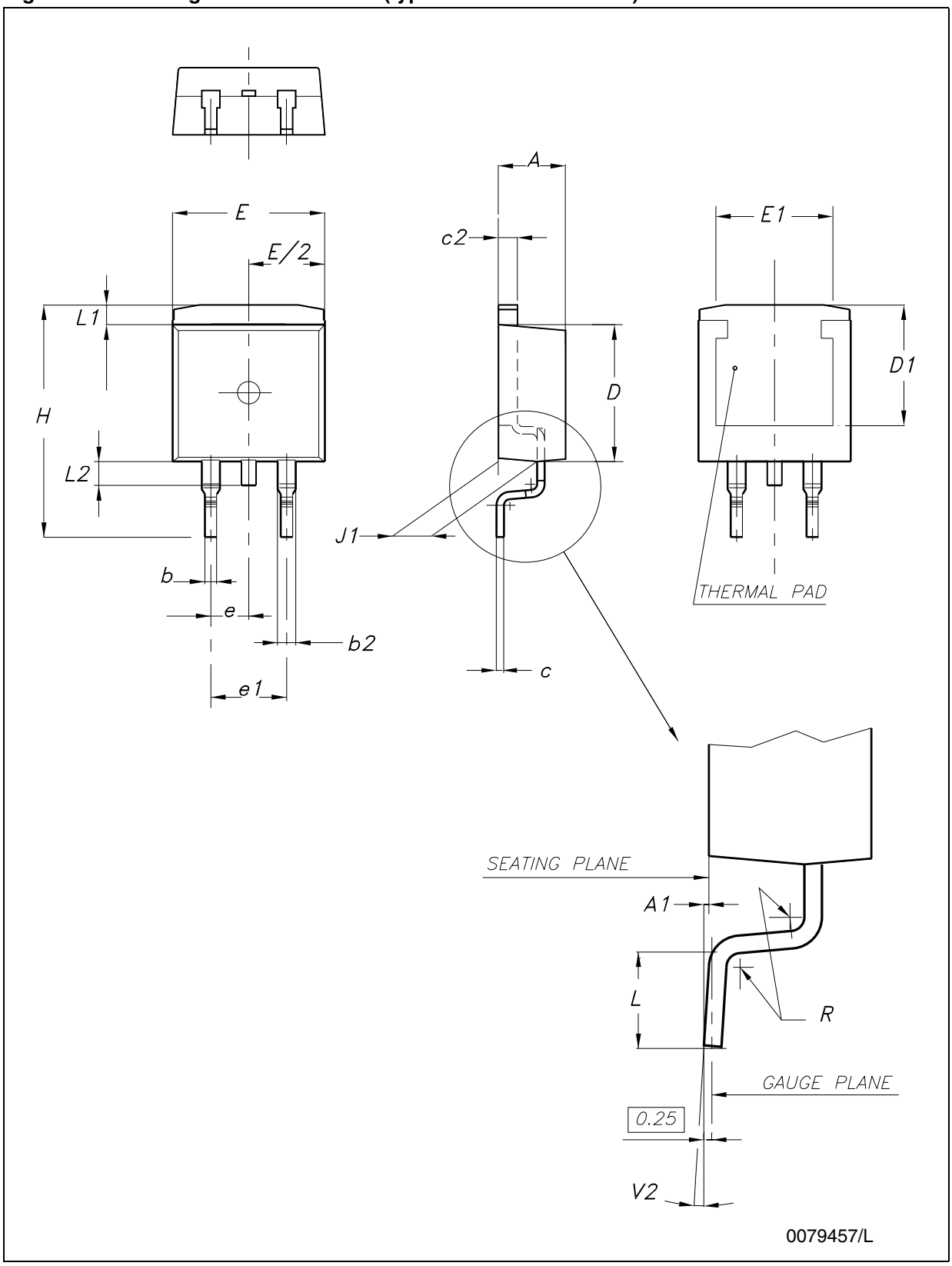


**Table 8. D²PAK mechanical data**

| 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**

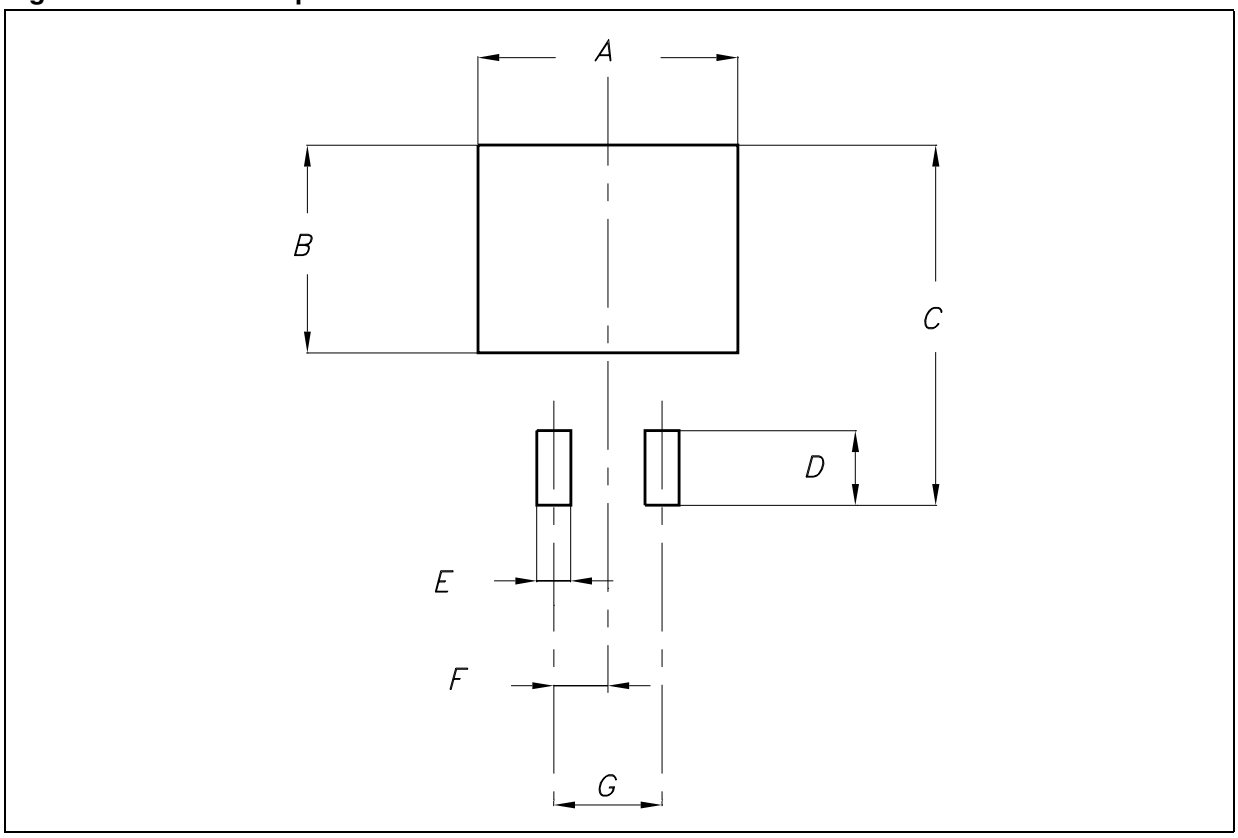
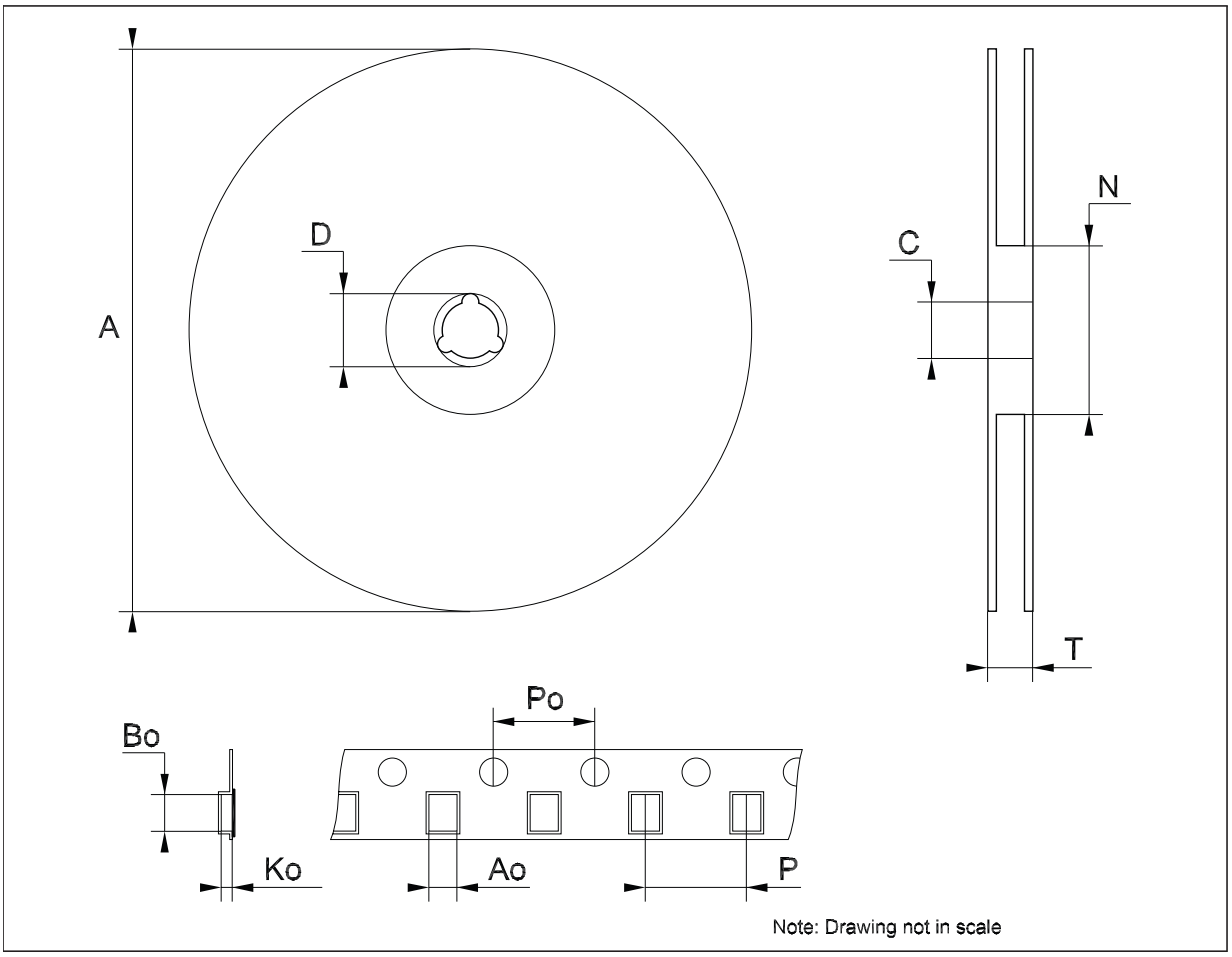



**Table 9. Footprint data**

| 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 Revision history

**Table 10. Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 22-Jun-2004 | 7 | Order codes updated. |
| 12-Dec-2007 | 8 | Added: *Table 1*. |
| 18-Feb-2008 | 9 | Modified: *Table 1 on page 1*. |
| 28-Jan-2010 | 10 | Modified: *Table 7 on page 12*, *Figure 8 on page 13*, *Figure 9 on page 14*, *Figure 10* and *Figure 11 on page 15*. |
| 12-Nov-2010 | 11 | Modified: $R_{thJC}$ value for TO-220 *Table 3 on page 5*. |
| 28-Nov-2011 | 12 | Added: order codes L7912ACV-DG and L7915ACV-DG *Table 1 on page 1*. |
| 09-Feb-2012 | 13 | Added: order code L7905ACV-DG *Table 1 on page 1*. |

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