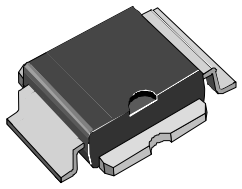
# PD20015-E
# PD20015S-E

## RF power transistor - LdmoST family

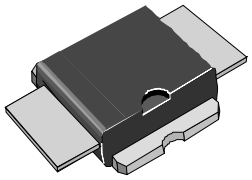
**Preliminary Data**

## Features

- Excellent thermal stability
- Common source configuration
- $P_{OUT}$ = 15 W with 11 dB gain @ 2 GHz / 13.6 V
- Plastic package
- ESD protection
- In compliance with the 2002/95/EC european directive



**PowerSO-10RF (formed lead)**



**PowerSO-10RF (straight lead)**

## Description

The PD20015-E is a common source N-channel, enhancement-mode lateral field-effect RF power transistor. It is designed for high gain, broadband commercial and industrial applications. It operates at 13.6 V in common source mode at frequencies of up to 1 GHz. PD20015-E boasts the excellent gain, linearity and reliability of ST's latest LDMOS technology mounted in the first true SMD plastic RF power package, PowerSO-10RF. PD20015-E's superior linearity performance makes it an ideal solution for mobile radio applications.

The PowerSO-10 plastic package, designed to offer high reliability, is the first ST JEDEC approved, high power SMD package. It has been specially optimized for RF needs and offers excellent RF performances and ease of assembly. Mounting recommendations are available in www.st.com/ (look for application note AN1294)

**Figure 1. Pin connection**

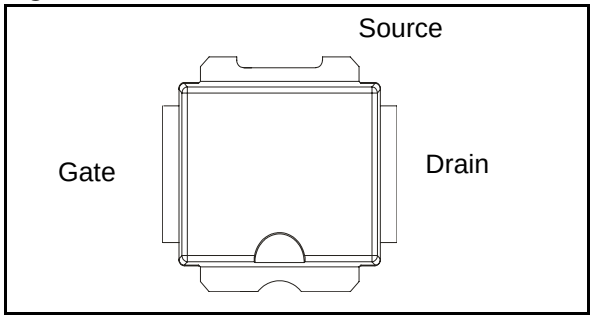



**Table 1. Device summary**

| Order code | Package | Packing |
|---|---|---|
| PD20015-E | PowerSO-10RF (formed lead) | Tube |
| PD20015S-E | PowerSO-10RF (straight lead) | Tube |
| PD20015TR-E | PowerSO-10RF (formed lead) | Tape and reel |
| PD20015STR-E | PowerSO-10RF (straight lead) | Tape and reel |

# Contents

# 1 Electrical data

## 1.1 Maximum ratings

**Table 2. Absolute maximum ratings** ($T_{CASE}$ = 25 °C)

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-source voltage | 40 | V |
| $V_{GS}$ | Gate-source voltage | -0.5 to +15 | V |
| $I_D$ | Drain current | 7 | A |
| $P_{DISS}$ | Power dissipation (@ $T_C$ = 70 °C) | 79 | W |
| $T_J$ | Max. operating junction temperature | 165 | °C |
| $T_{STG}$ | Storage temperature | -65 to +150 | °C |

## 1.2 Thermal data

**Table 3. Thermal data**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{thJC}$ | Junction - case thermal resistance | 1.2 | °C/W |

# 2 Electrical characteristics

$T_{CASE}$ = +25 °C

## 2.1 Static

**Table 4. Static**

| Symbol | Test conditions | | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $I_{DSS}$ | $V_{GS}$ = 0 V | $V_{DS}$ = 25 V | | | | 1 | µA |
| $I_{GSS}$ | $V_{GS}$ = 20 V | $V_{DS}$ = 0 V | | | | 1 | µA |
| $V_{GS(Q)}$ | $V_{DS}$ = 10 V | $I_D$ = TBD mA | | | TBD | | V |
| $V_{DS(ON)}$ | $V_{GS}$ = 10 V | $I_D$ = 1 A | | | 0.27 | 0.31 | V |
| $C_{ISS}$ | $V_{GS}$ = 0 V | $V_{DS}$ = 12.5 V | f = 1 MHz | | 55 | | pF |
| $C_{OSS}$ | $V_{GS}$ = 0 V | $V_{DS}$ = 12.5 V | f = 1 MHz | | 40 | | pF |
| $C_{RSS}$ | $V_{GS}$ = 0 V | $V_{DS}$ = 12.5 V | f = 1 MHz | | 1.5 | | pF |

## 2.2 Dynamic

**Table 5. Dynamic**

| Symbol | Test conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| P3dB | $V_{DD}$ = 13.6 V, $I_{DQ}$ = 350 mA | f = 2 GHz | | 23 | | W |
| $G_P$ | $V_{DD}$ = 13.6 V, $I_{DQ}$ = 350 mA, $P_{OUT}$ = 15 W, f = 2 GHz | | 10 | 11 | | dB |
| $h_D$ | $V_{DD}$ = 13.6 V, $I_{DQ}$ = 350 mA, $P_{OUT}$ = P3dB, f = 2 GHz | | 45 | 53 | | % |
| Load mismatch | $V_{DD}$ = 15.5 V, $I_{DQ}$ = 350 mA, $P_{OUT}$ = 20 W, f = 2 GHz All phase angles | | 20:1 | | | VSWR |

## 2.3 ESD protection characteristics

**Table 6. ESD protection characteristics**

| Test conditions | Class |
|---|---|
| Human body model | 2 |
| Machine model | M3 |

## 2.4 Moisture sensitivity level

**Table 7. Moisture sensitivity level**

| Test methodology | Rating |
|---|---|
| J-STD-020B | MSL 3 |

# 3 Impedance

**Figure 2. Current conventions**

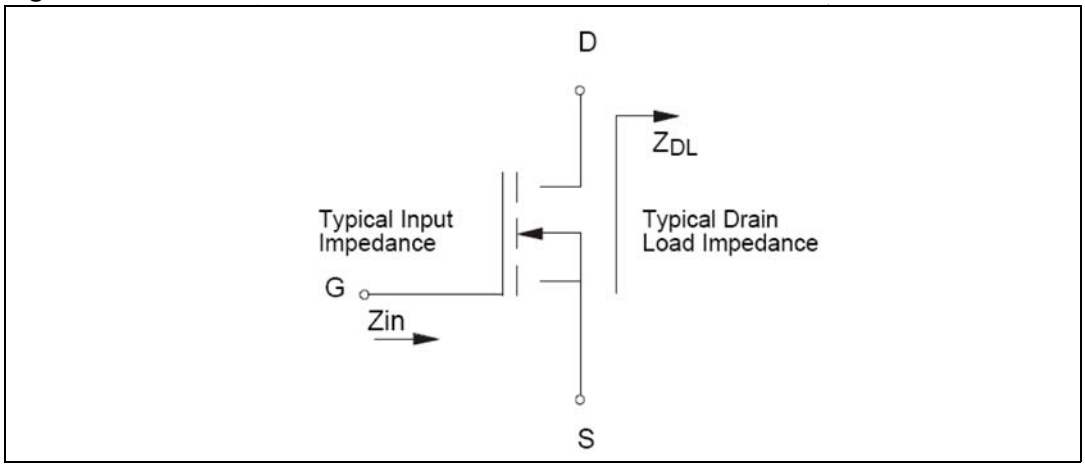



**Table 8. Impedance data**

| Freq. (MHz) | $Z_{IN}$ (Ω) | $Z_{DL}$(Ω) |
|---|---|---|
| 2000 | TBD | TBD |

# 4 Typical performance

**Figure 3. Capacitances vs drain voltage**

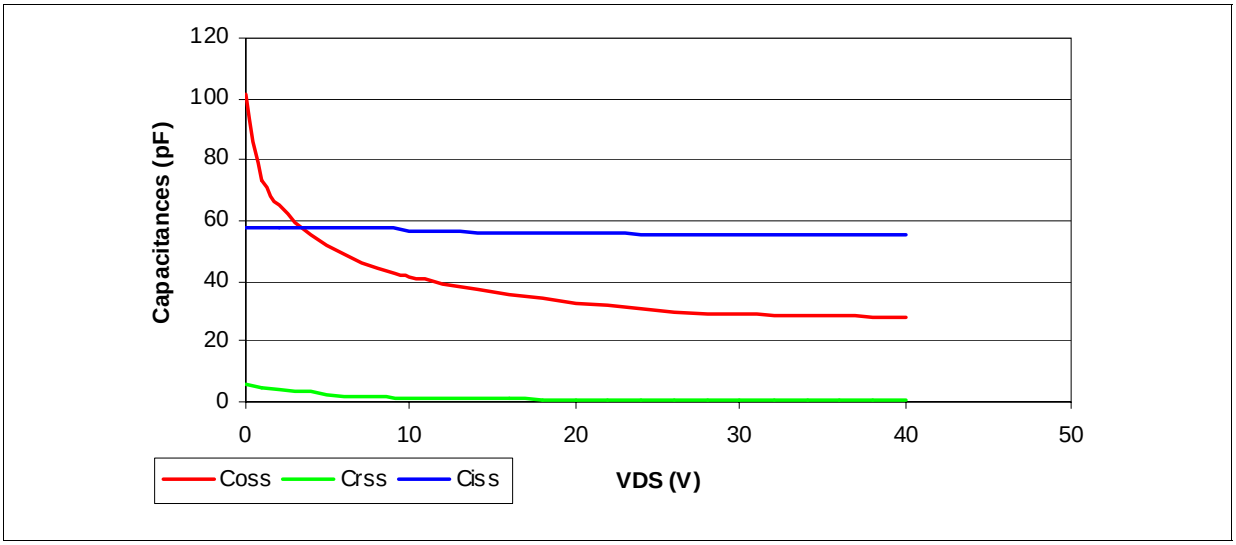



**Figure 4. DC output characteristics**

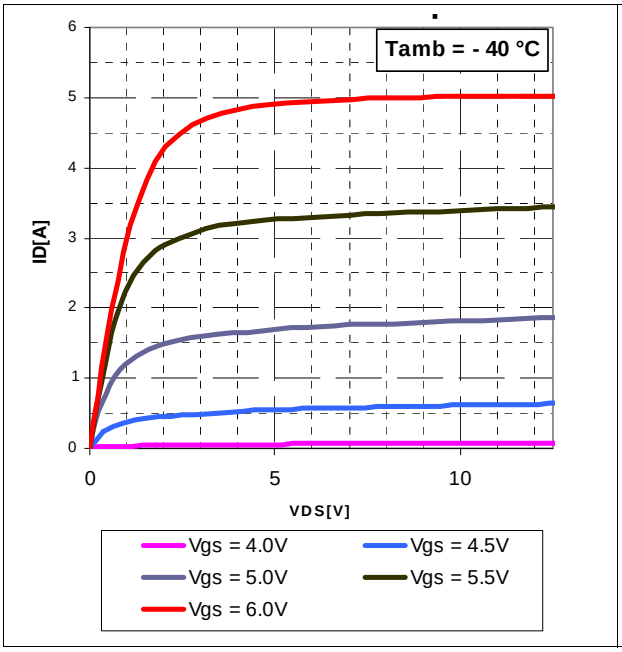



**Figure 5. DC output characteristics**

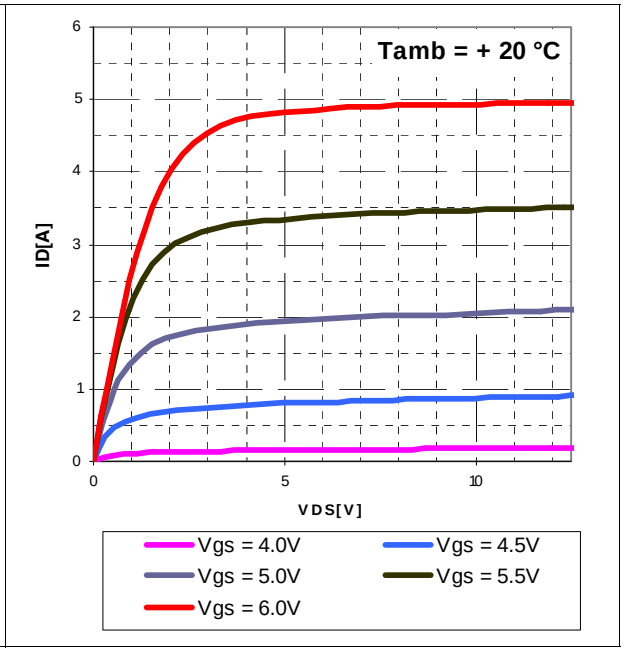


**Figure 6. DC output characteristics**

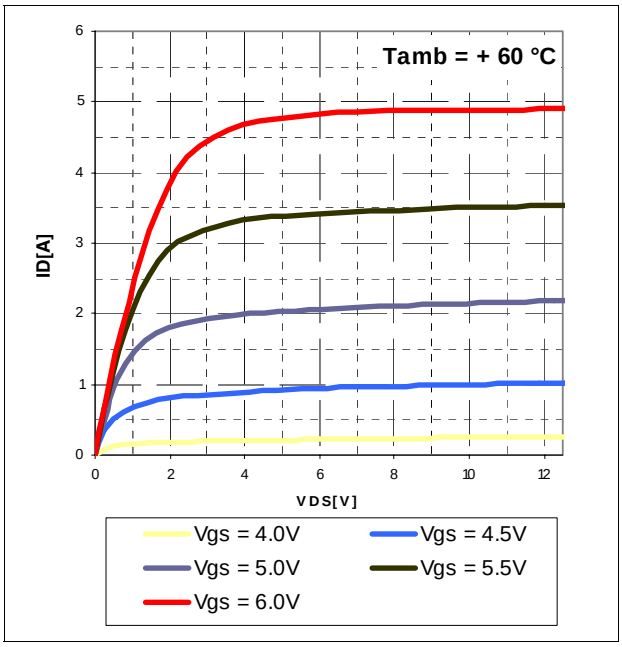


Figure 7. Gain and efficiency vs $P_{OUT}$

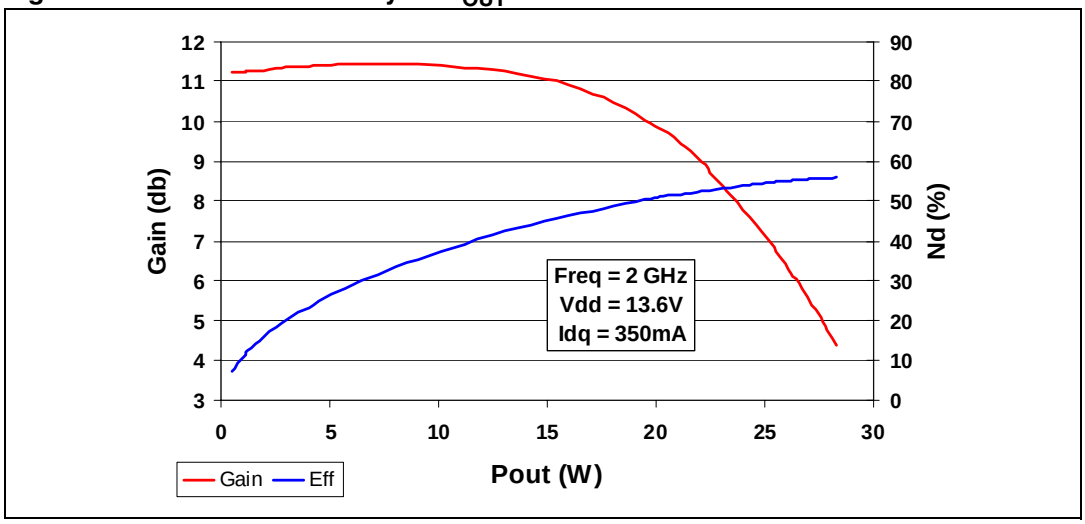
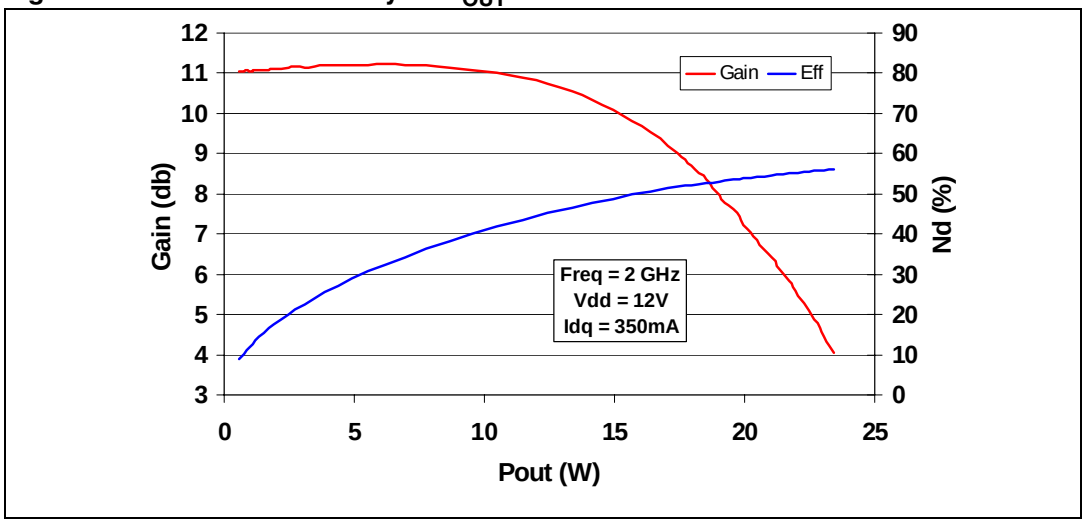



Figure 8. Gain and efficiency vs $P_{OUT}$



# 5 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

**Table 9. PowerSO-10RF formed lead (Gull Wing) mechanical data**

| Dim. | mm. | | | Inch | | |
|---|---|---|---|---|---|---|
| | Min | Typ | Max | Min | Typ | Max |
| A1 | 0 | 0.05 | 0.1 | 0. | 0.0019 | 0.0038 |
| A2 | 3.4 | 3.5 | 3.6 | 0.134 | 0.137 | 0.142 |
| A3 | 1.2 | 1.3 | 1.4 | 0.046 | 0.05 | 0.054 |
| A4 | 0.15 | 0.2 | 0.25 | 0.005 | 0.007 | 0.009 |
| a | | 0.2 | | | 0.007 | |
| b | 5.4 | 5.53 | 5.65 | 0.212 | 0.217 | 0.221 |
| c | 0.23 | 0.27 | 0.32 | 0.008 | 0.01 | 0.012 |
| D | 9.4 | 9.5 | 9.6 | 0.370 | 0.374 | 0.377 |
| D1 | 7.4 | 7.5 | 7.6 | 0.290 | 0.295 | 0.298 |
| E | 13.85 | 14.1 | 14.35 | 0.544 | 0.555 | 0.565 |
| E1 | 9.3 | 9.4 | 9.5 | 0.365 | 0.37 | 0.375 |
| E2 | 7.3 | 7.4 | 7.5 | 0.286 | 0.292 | 0.294 |
| E3 | 5.9 | 6.1 | 6.3 | 0.231 | 0.24 | 0.247 |
| F | | 0.5 | | | 0.019 | |
| G | | 1.2 | | | 0.047 | |
| L | 0.8 | 1 | 1.1 | 0.030 | 0.039 | 0.042 |
| R1 | | | 0.25 | | | 0.01 |
| R2 | | 0.8 | | | 0.031 | |
| T | 2 deg | 5 deg | 8 deg | 2 deg | 5 deg | 8 deg |
| T1 | | 6 deg | | | 6 deg | |
| T2 | | 10 deg | | | 10 deg | |

*Note: Resin protrusions not included (max value: 0.15 mm per side)*

**Figure 9. Package dimensions**

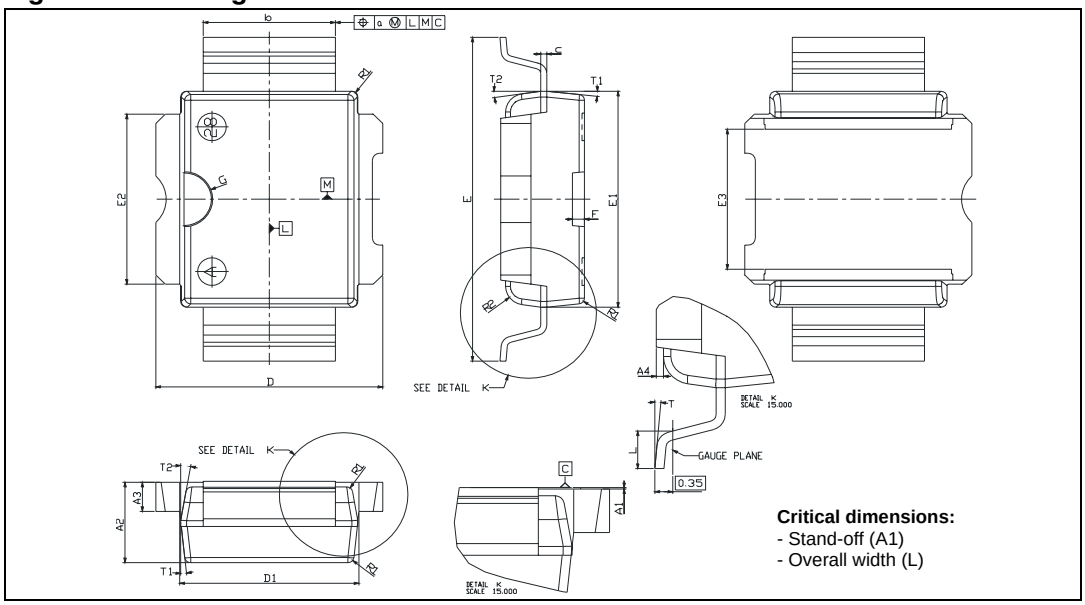


**Table 10. PowerSO-10RF straight lead mechanical data**

| Dim. | mm. | | | Inch | | |
|---|---|---|---|---|---|---|
| | Min | Typ | Max | Min | Typ | Max |
| A1 | 1.62 | 1.67 | 1.72 | 0.064 | 0.065 | 0.068 |
| A2 | 3.4 | 3.5 | 3.6 | 0.134 | 0.137 | 0.142 |
| A3 | 1.2 | 1.3 | 1.4 | 0.046 | 0.05 | 0.054 |
| A4 | 0.15 | 0.2 | 0.25 | 0.005 | 0.007 | 0.009 |
| a | | 0.2 | | | 0.007 | |
| b | 5.4 | 5.53 | 5.65 | 0.212 | 0.217 | 0.221 |
| c | 0.23 | 0.27 | 0.32 | 0.008 | 0.01 | 0.012 |
| D | 9.4 | 9.5 | 9.6 | 0.370 | 0.374 | 0.377 |
| D1 | 7.4 | 7.5 | 7.6 | 0.290 | 0.295 | 0.298 |
| E | 15.15 | 15.4 | 15.65 | 0.595 | 0.606 | 0.615 |
| E1 | 9.3 | 9.4 | 9.5 | 0.365 | 0.37 | 0.375 |
| E2 | 7.3 | 7.4 | 7.5 | 0.286 | 0.292 | 0.294 |
| E3 | 5.9 | 6.1 | 6.3 | 0.231 | 0.24 | 0.247 |
| F | | 0.5 | | | 0.019 | |
| G | | 1.2 | | | 0.047 | |
| R1 | | | 0.25 | | | 0.01 |
| R2 | | 0.8 | | | 0.031 | |
| T1 | | 6 deg | | | 6 deg | |
| T2 | | 10 deg | | | 10 deg | |

*Note: Resin protrusions not included (max value: 0.15 mm per side)*

**Figure 10. Package dimensions**

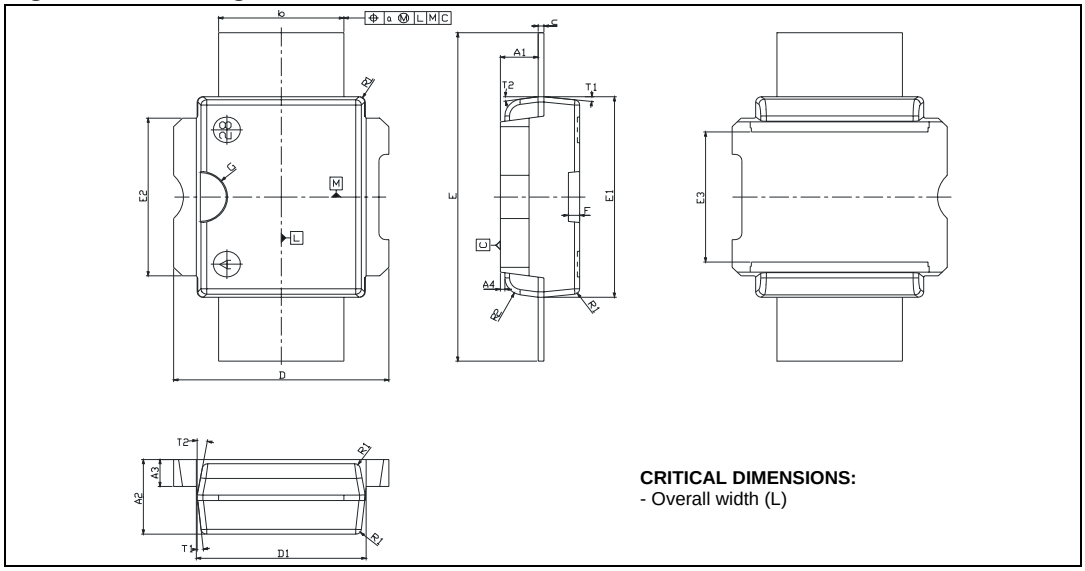


**Figure 11. Tube information**

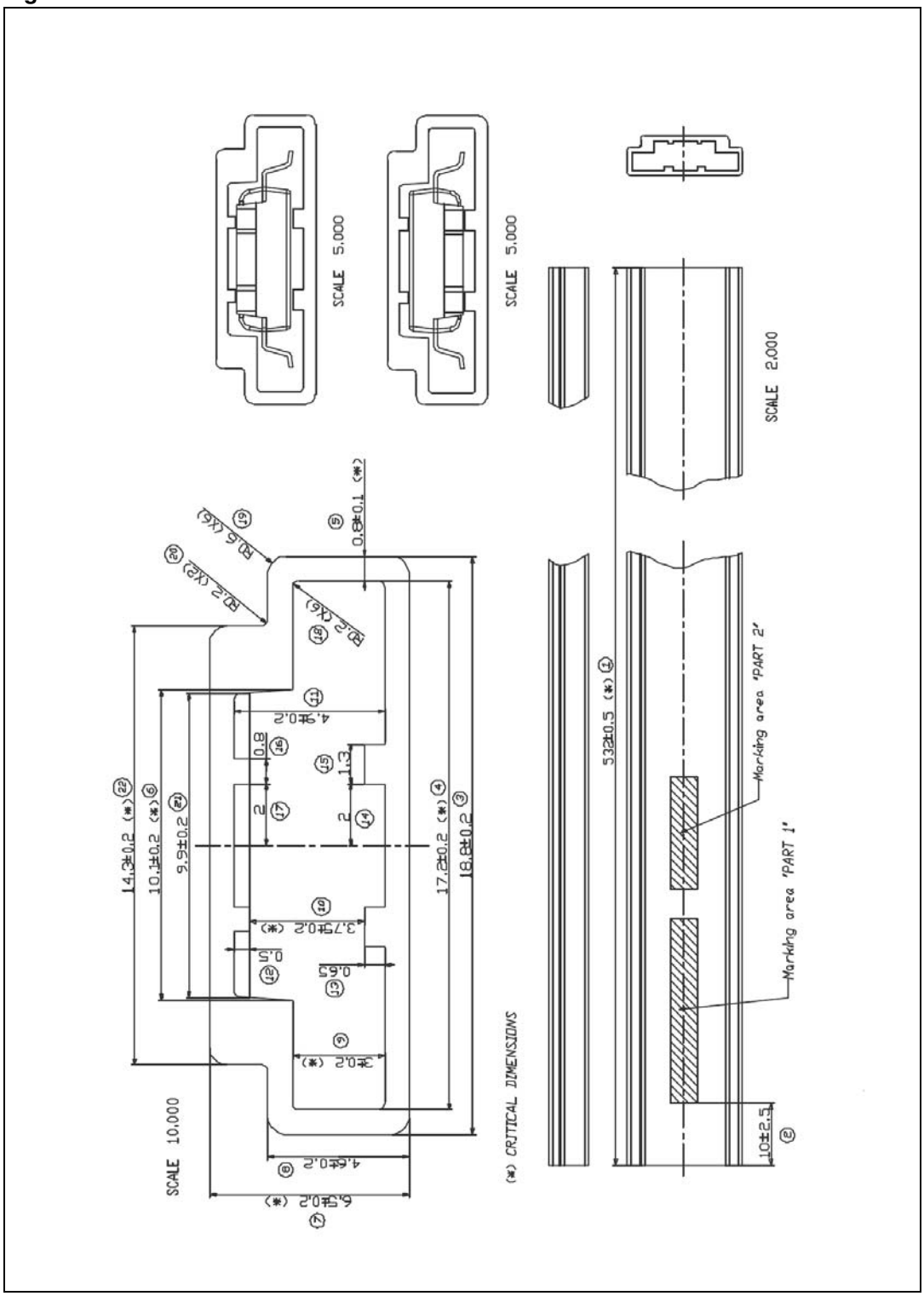
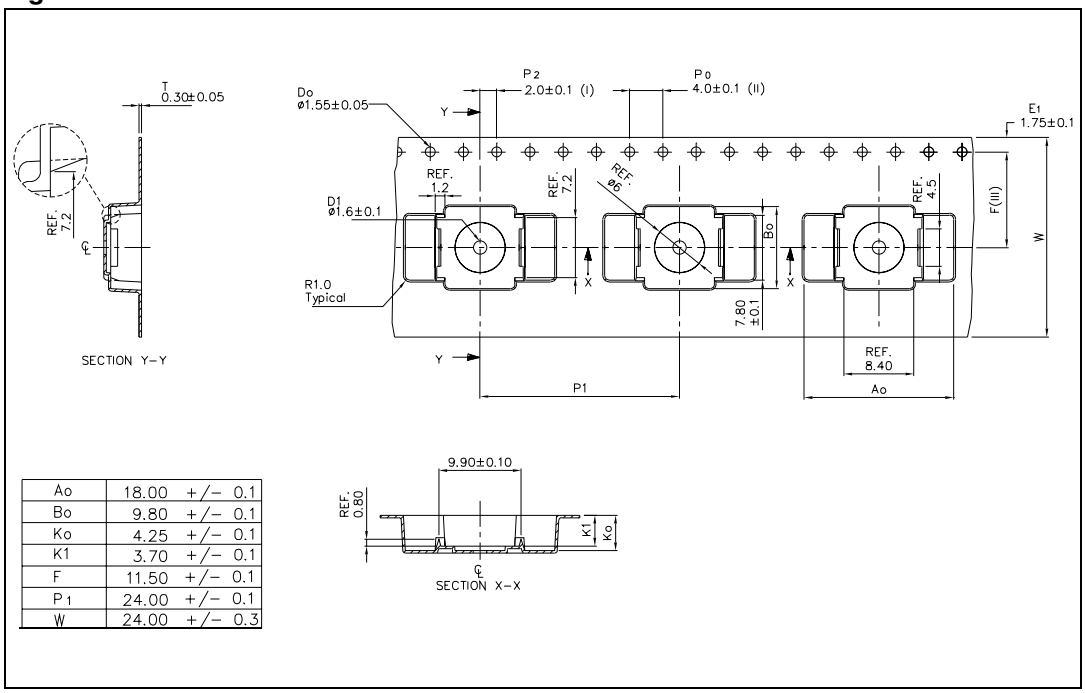


**Figure 12. Reel information**




| | |
|---|---|
| Ao | 18.00 +/- 0.1 |
| Bo | 9.80 +/- 0.1 |
| Ko | 4.25 +/- 0.1 |
| K1 | 3.70 +/- 0.1 |
| F | 11.50 +/- 0.1 |
| P1 | 24.00 +/- 0.1 |
| W | 24.00 +/- 0.3 |

# 6 Revision history

Table 11. Document revision history

| Date | Revision | Changes |
|---|---|---|
| 14-Dec-2007 | 1 | Initial release. |

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