

RF power transistor, LdmoST plastic family N-channel enhancement-mode lateral MOSFETs

Datasheet — production data

Features

- Excellent thermal stability
- Common source configuration
- $P_{OUT} = 10\text{ W}$ with 11 dB gain @ 2 GHz / 13.6 V
- Plastic package
- ESD protection
- In compliance with the 2002/95/EC European directive

Description

The PD20010-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. PD20010-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. PD20010-E's superior linearity performance makes it an ideal solution for car mobile radio.

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.

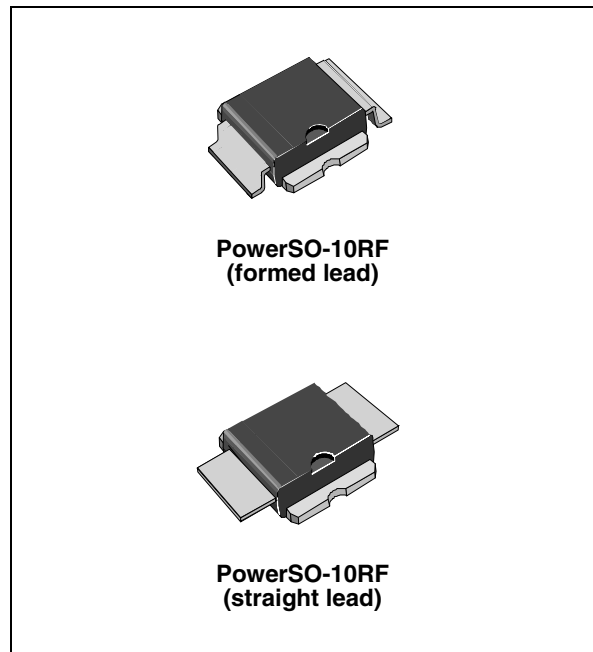


Figure 1. Pin connection

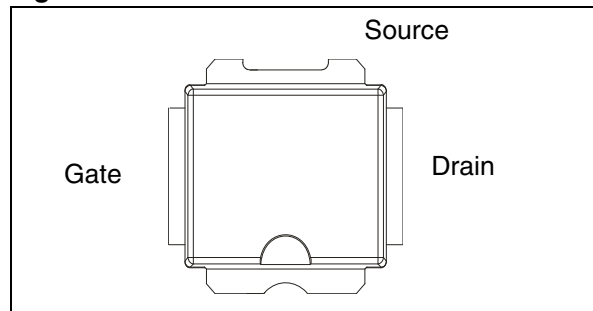


Table 1. Device summary

| Order codes | Packages | Packing |
|--------------|------------------------------|---------------|
| PD20010-E | PowerSO-10RF (formed lead) | Tube |
| PD20010S-E | PowerSO-10RF (straight lead) | Tube |
| PD20010TR-E | PowerSO-10RF (formed lead) | Tape and reel |
| PD20010STR-E | PowerSO-10RF (straight lead) | Tape and reel |

Contents

| | | |
|----------|---|-----------|
| 1 | Electrical data | 3 |
| 1.1 | Maximum ratings | 3 |
| 1.2 | Thermal data | 3 |
| 2 | Electrical characteristics | 4 |
| 2.1 | Static | 4 |
| 2.2 | Dynamic | 4 |
| 2.3 | ESD protection characteristics | 4 |
| 2.4 | Moisture sensitivity level | 4 |
| 3 | Typical performance | 5 |
| 4 | Package mechanical data | 6 |
| 5 | Revision history | 11 |

1 Electrical data

1.1 Maximum ratings

$T_{CASE} = 25\text{ °C}$

Table 2. Absolute maximum ratings

| 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 | 5 | A |
| P_{DISS} | Power dissipation (@ $T_C = 70\text{ °C}$) | 59 | 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 | 1.6 | °C/W |

2 Electrical characteristics

$T_{CASE} = + 25\text{ }^{\circ}\text{C}$

2.1 Static

Table 4. Static

| Symbol | Test conditions | | Min. | Typ. | Max. | Unit |
|--------------|------------------------|--------------------------|------|------|------|---------------|
| I_{DSS} | $V_{GS} = 0\text{ V}$ | $V_{DS} = 25\text{ V}$ | | | 1 | μA |
| I_{GSS} | $V_{GS} = 5\text{ V}$ | $V_{DS} = 0\text{ V}$ | | | 1 | μA |
| $V_{GS(Q)}$ | $V_{DS} = 10\text{ V}$ | $I_D = 150\text{ mA}$ | 3.0 | | 4.3 | V |
| $V_{DS(ON)}$ | $V_{GS} = 10\text{ V}$ | $I_D = 1\text{ A}$ | | 0.34 | | V |
| C_{ISS} | $V_{GS} = 0\text{ V}$ | $V_{DS} = 12.5\text{ V}$ | | 45 | | pF |
| C_{OSS} | $V_{GS} = 0\text{ V}$ | $V_{DS} = 12.5\text{ V}$ | | 36 | | pF |
| C_{RSS} | $V_{GS} = 0\text{ V}$ | $V_{DS} = 12.5\text{ V}$ | | 1.2 | | pF |

2.2 Dynamic

Table 5. Dynamic

| Symbol | Test conditions | | Min. | Typ. | Max. | Unit |
|---------------|---|---|------|------|------|------|
| P3dB | $V_{DD} = 13.6\text{ V}$, $I_{DQ} = 150\text{ mA}$ | $f = 2000\text{ MHz}$ | 10 | 15 | | W |
| G_P | $V_{DD} = 13.6\text{ V}$, $I_{DQ} = 150\text{ mA}$, $P_{OUT} = 10\text{ W}$ | $f = 2000\text{ MHz}$ | 10 | 11 | | dB |
| η_D | $V_{DD} = 13.6\text{ V}$, $I_{DQ} = 150\text{ mA}$, $P_{OUT} = P_{3dB}$ | $f = 2000\text{ MHz}$ | 45 | 53 | | % |
| Load mismatch | $V_{DD} = 15.5\text{ V}$, $I_{DQ} = 300\text{ mA}$, $P_{OUT} = 10\text{ W}$ | $f = 2000\text{ MHz}$ 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 conditions | Rating |
|-----------------|--------|
| J-STD-020B | MSL 3 |

3 Typical performance

Figure 2. Drain current vs. gate voltage Figure 3. DC output characteristics

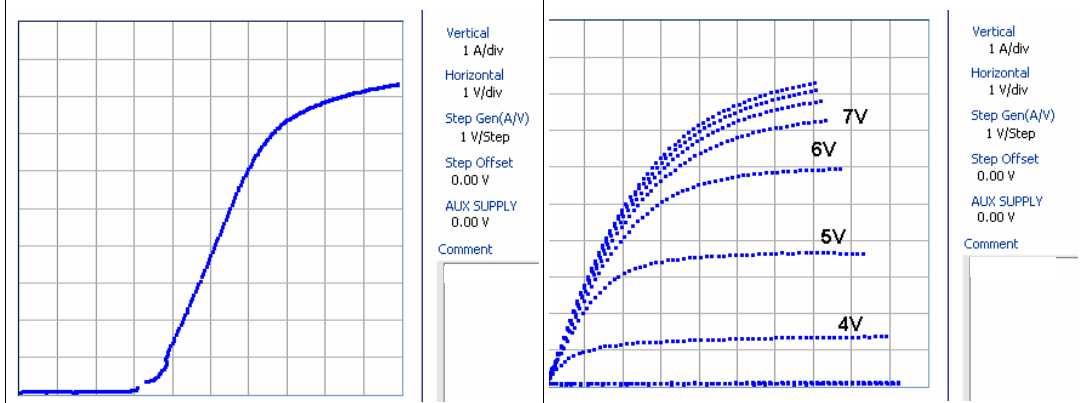
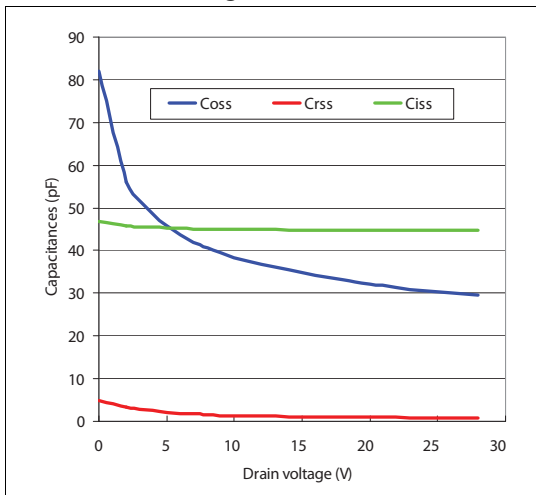


Figure 4. Capacitances vs. drain voltage



4 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 8. 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 5. Package dimensions

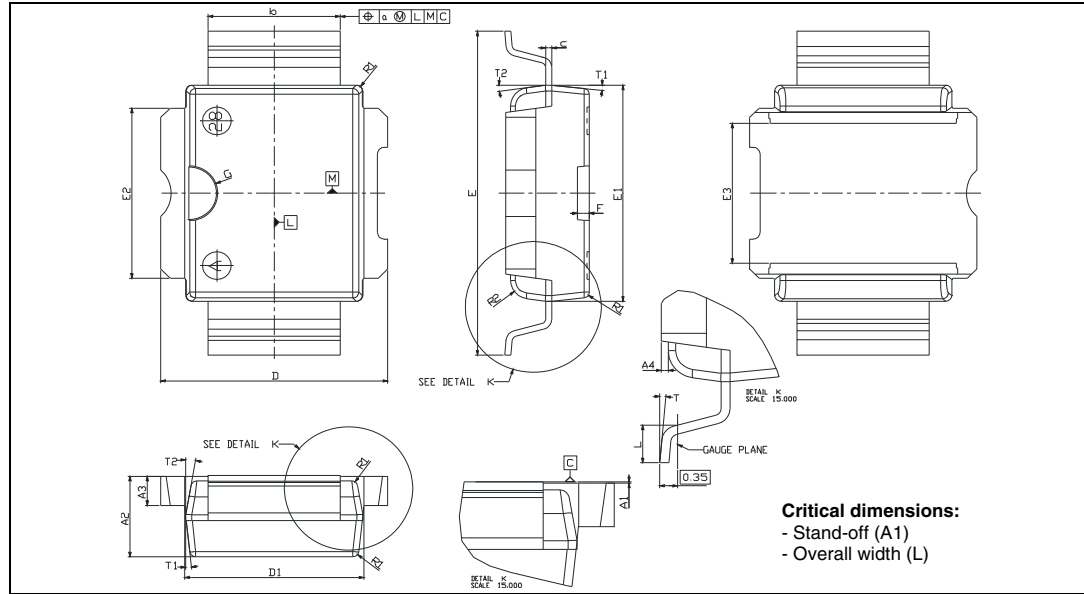


Table 9. PowerSO-10RF straight lead mechanical data

| 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 6. Package dimensions

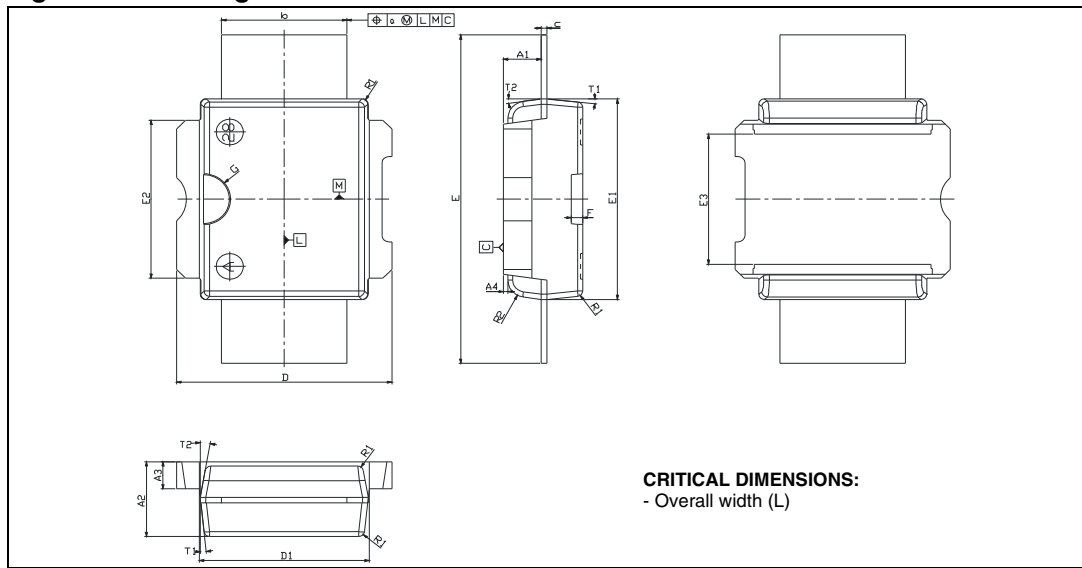


Figure 7. Tube information

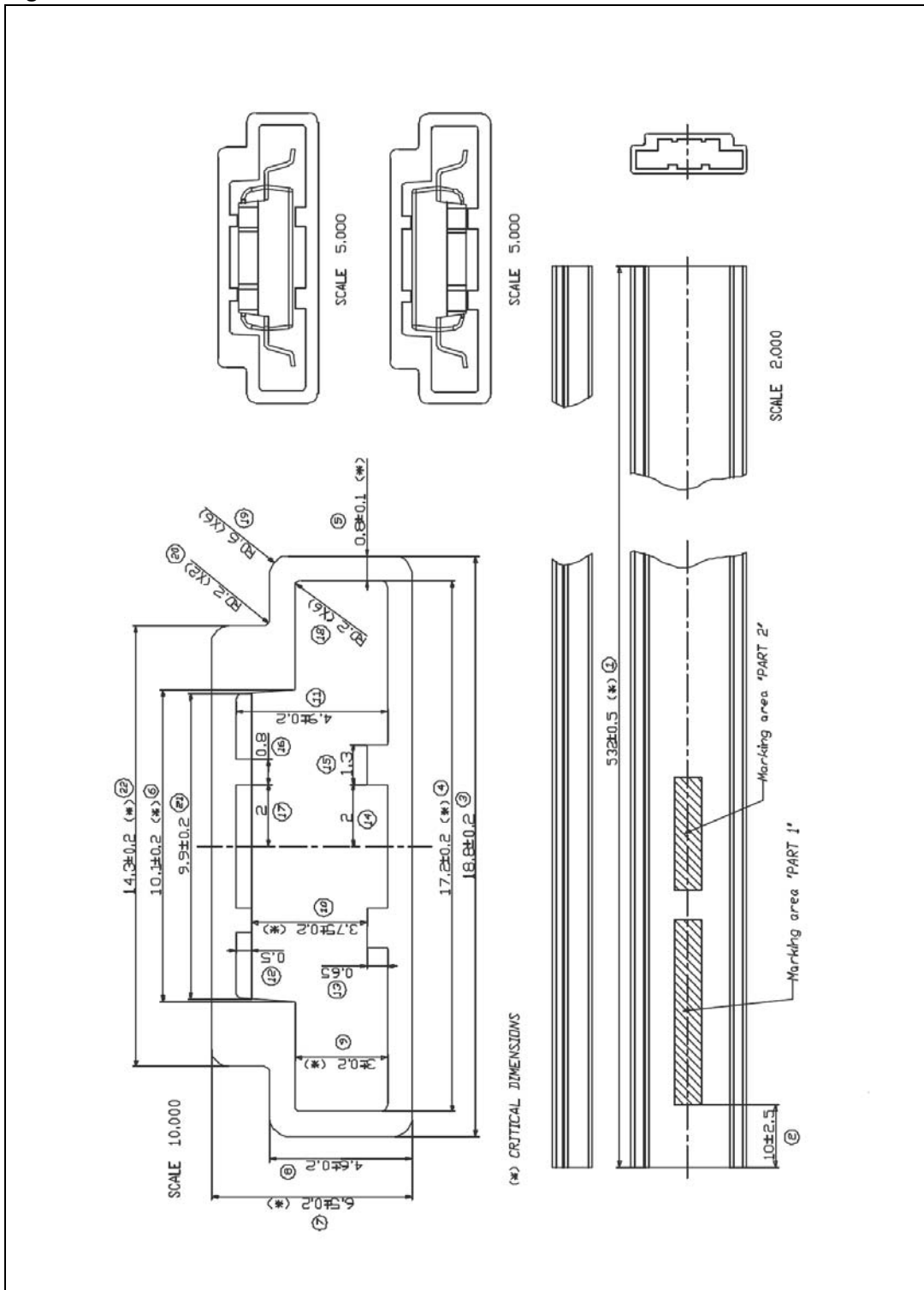
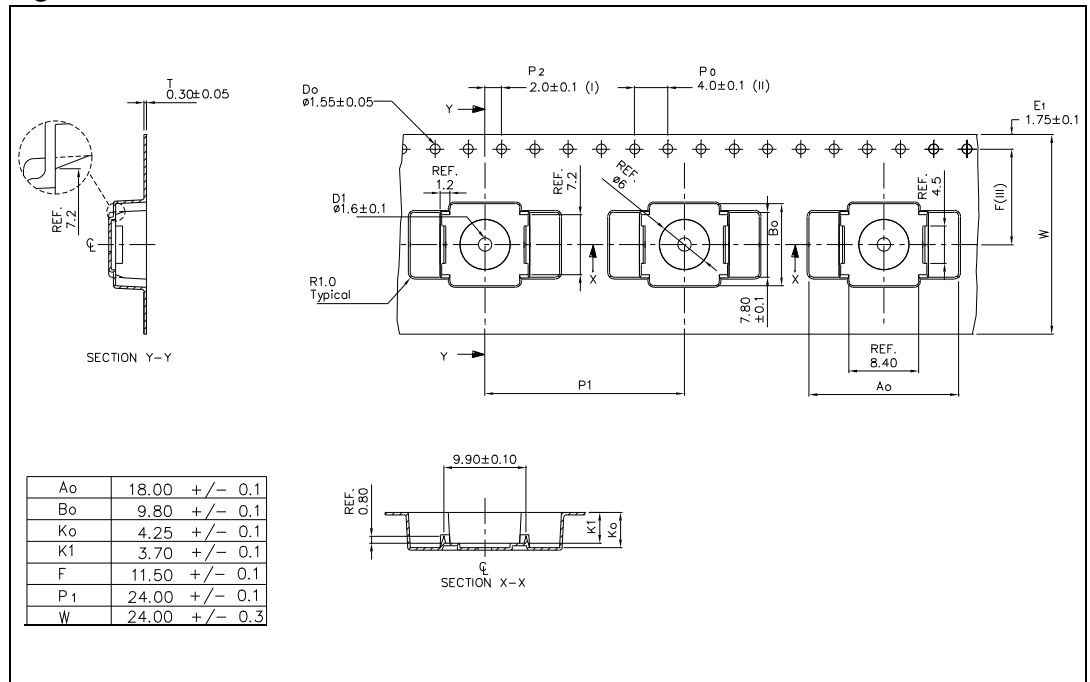


Figure 8. Reel information



5 Revision history

Table 10. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 24-Mar-2009 | 1 | Initial release. |
| 23-May-2012 | 2 | Updated $V_{GS(Q)}$ in Table 4: Static . |

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