

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

Datasheet –production data

Features

- Excellent thermal stability
- Common source configuration
- $P_{OUT} = 15\text{ W}$ with 16 dB gain @ 870 MHz / 13.6 V
- Plastic package
- ESD protection
- In compliance with the 2002/95/EC European directive

Description

The PD85015-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. The PD85015-E boasts excellent gain, linearity and reliability thanks to ST's latest LDMOS technology mounted on the first true SMD plastic RF power package, the PowerSO-10RF. The superior linearity of the device makes it an ideal solution for car radios. The PowerSO-10 plastic package, designed for high reliability, is the first JEDEC approved, high power SMD package from ST. It is optimized for RF requirements, and offers excellent RF performance and ease of assembly.

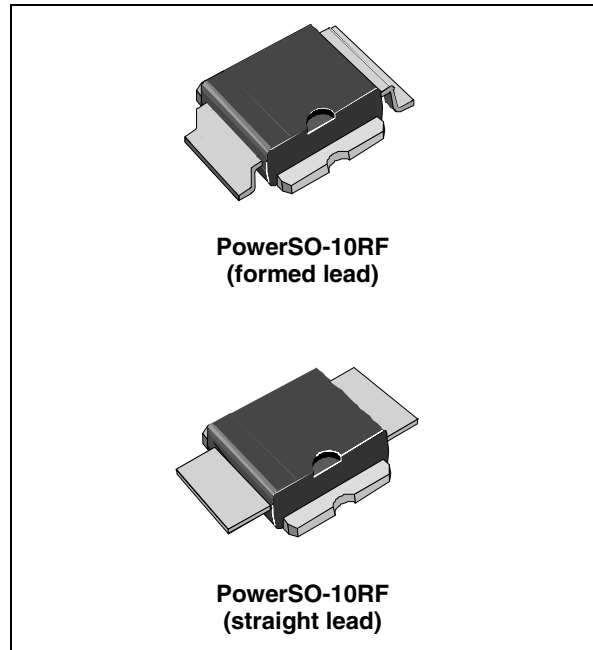


Figure 1. Pin connection

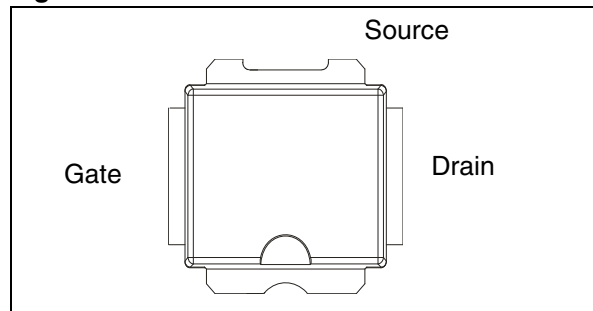


Table 1. Device summary

| Order codes | Package | Packaging |
|--------------|------------------------------|---------------|
| PD85015-E | PowerSO-10RF (formed lead) | Tube |
| PD85015S-E | PowerSO-10RF (straight lead) | Tube |
| PD85015TR-E | PowerSO-10RF (formed lead) | Tape and reel |
| PD85015STR-E | PowerSO-10RF (straight lead) | Tape and reel |

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1 Electrical data

1.1 Maximum ratings

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

| 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 | 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} | $V_{GS} = 0V$ | $V_{DS} = 25 V$ | | | 1 | μA |
| I_{GSS} | $V_{GS} = 5 V$ | $V_{DS} = 0 V$ | | | 1 | μA |
| $V_{GS(Q)}$ | $V_{DS} = 10 V$ | $I_D = 150\text{ mA}$ | 3.0 | | 4.3 | V |
| $V_{DS(ON)}$ | $V_{GS} = 10 V$ | $I_D = 1 A$ | | 0.34 | | V |
| C_{ISS} | $V_{GS} = 0V$ | $V_{DS} = 12.5 V$ | | 45 | | pF |
| C_{OSS} | $V_{GS} = 0V$ | $V_{DS} = 12.5 V$ | | 36 | | pF |
| C_{RSS} | $V_{GS} = 0V$ | $V_{DS} = 12.5 V$ | | 1.2 | | pF |

2.2 Dynamic

Table 5. Dynamic

| Symbol | Test conditions | | Min | Typ | Max | Unit |
|---------------|---|----------------------|------|-----|-----|------|
| P3dB | $V_{DD} = 13.6 V, I_{DQ} = 150\text{ mA}$ | $f = 870\text{ MHz}$ | 15 | 20 | - | W |
| G_P | $V_{DD} = 13.6 V, I_{DQ} = 150\text{ mA}, P_{OUT} = 15\text{ W}, f = 870\text{ MHz}$ | | 16 | | | dB |
| h_D | $V_{DD} = 13.6 V, I_{DQ} = 150\text{ mA}, P_{OUT} = P_{3dB}, f = 870\text{ MHz}$ | | 60 | 70 | | % |
| Load mismatch | $V_{DD} = 1.7 V, I_{DQ} = 300\text{ mA}, P_{OUT} = 25\text{ W}, f = 870\text{ MHz}$ 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 |

3 Impedance

Figure 2. Current conventions

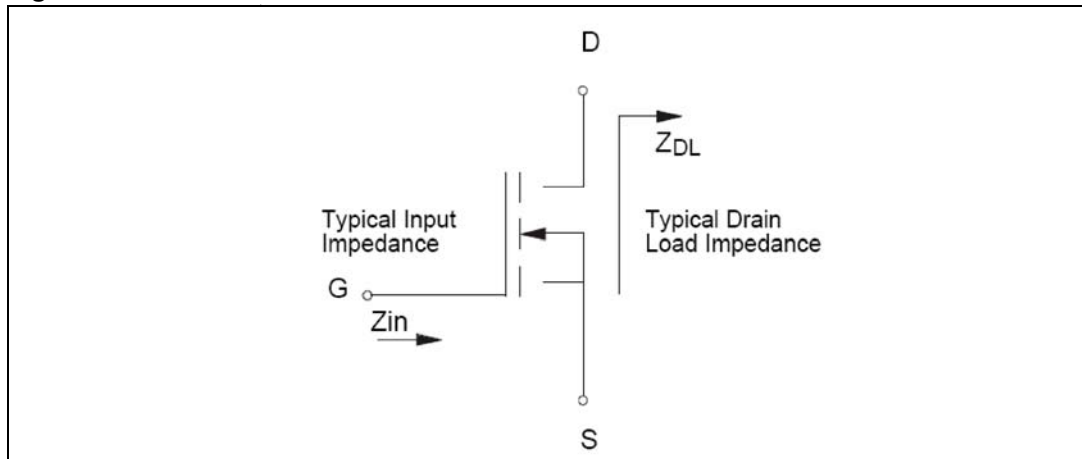


Table 7. Impedance data

| Frequency | $Z_{IN} (\Omega)$ | $Z_{DL} (\Omega)$ |
|-----------|-------------------|-------------------|
| 500 MHz | $0.536 - j 2.968$ | $4.930 + j 1.083$ |
| 600 MHz | $0.557 - j 1.224$ | $4.329 + j 0.811$ |
| 700 MHz | $0.595 + j 0.236$ | $3.784 + j 0.429$ |
| 800 MHz | $0.651 + j 1.512$ | $3.305 - j 0.031$ |
| 900 MHz | $0.708 + j 2.671$ | $2.889 - j 0.542$ |
| 1000 MHz | $0.761 + j 3.759$ | $2.534 - j 1.085$ |

4 Typical performances

Figure 3. Drain current vs gate voltage Figure 4. DC output characteristics

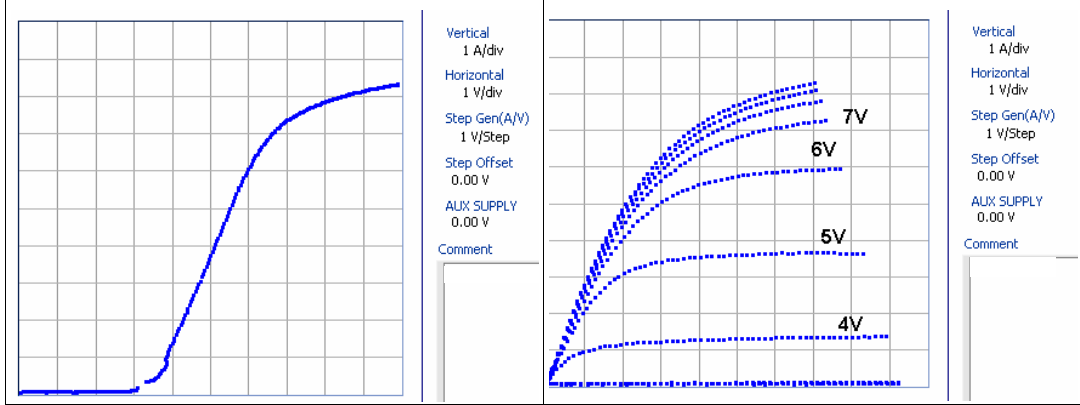
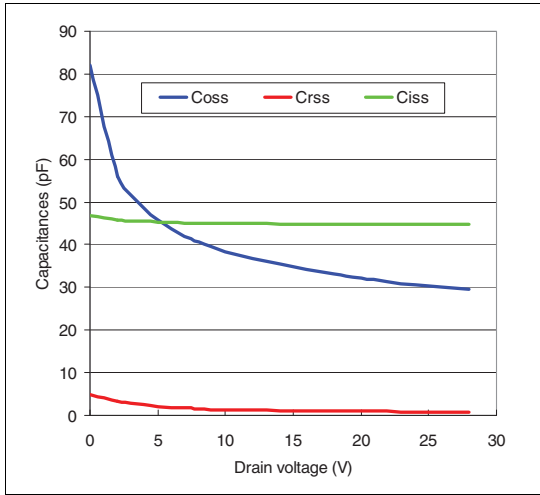


Figure 5. Capacitances vs drain voltage



5 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 6. Package dimensions

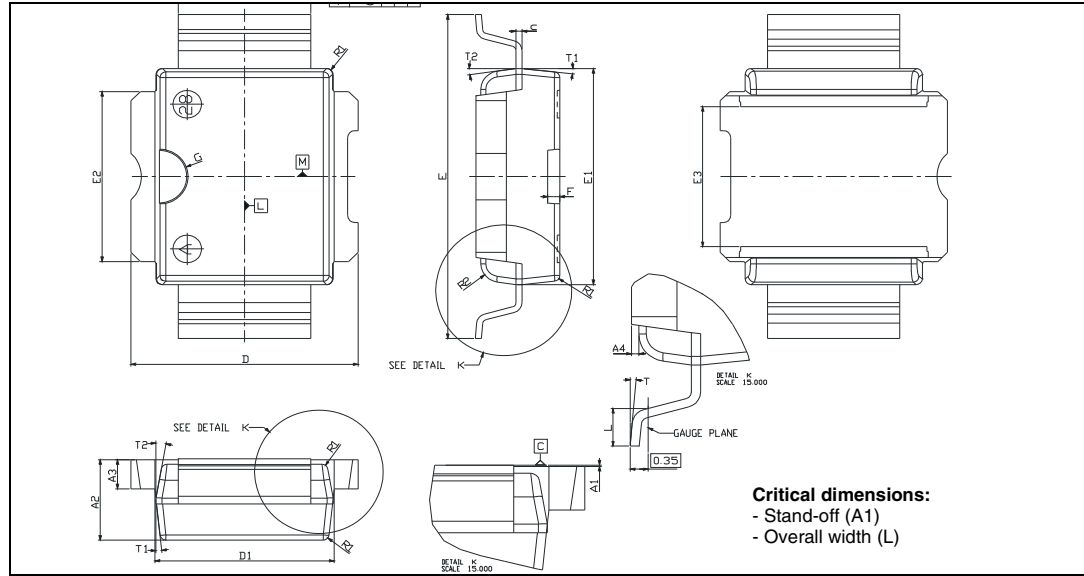


Table 9. PowerSO-10RF straight lead mechanical data

| 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 7. Package dimensions

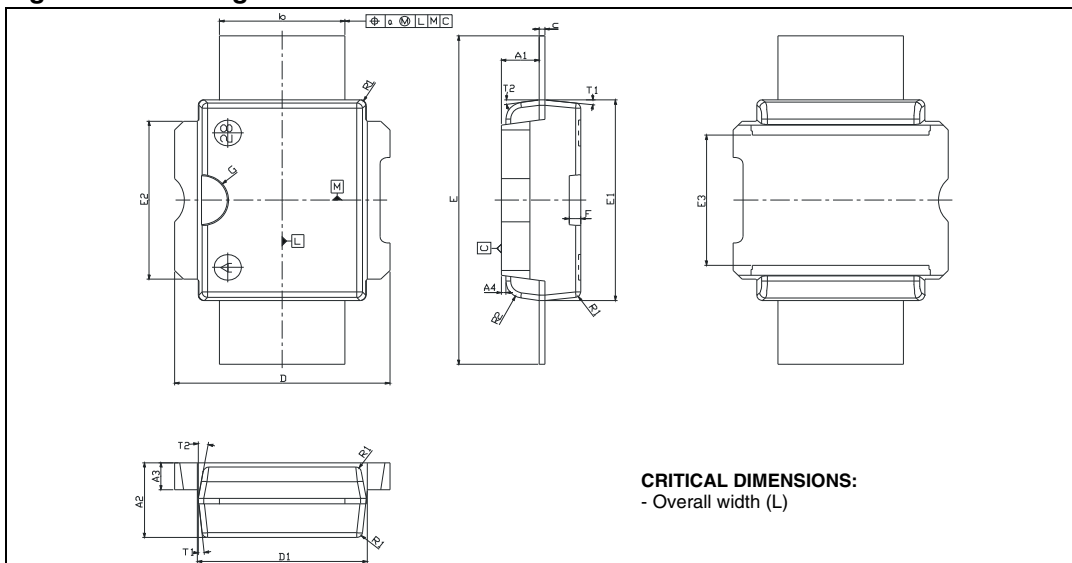


Figure 8. Tube information

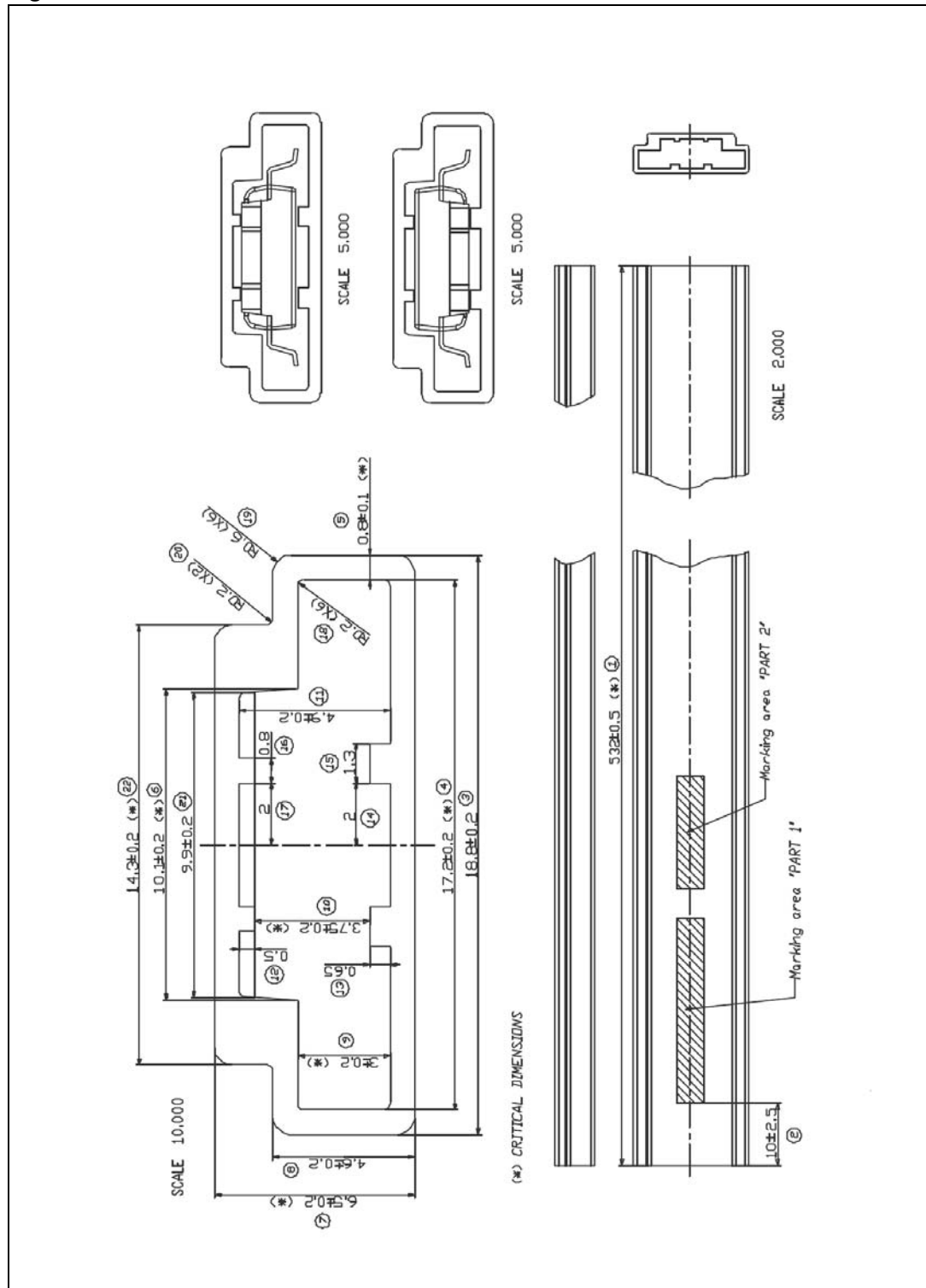
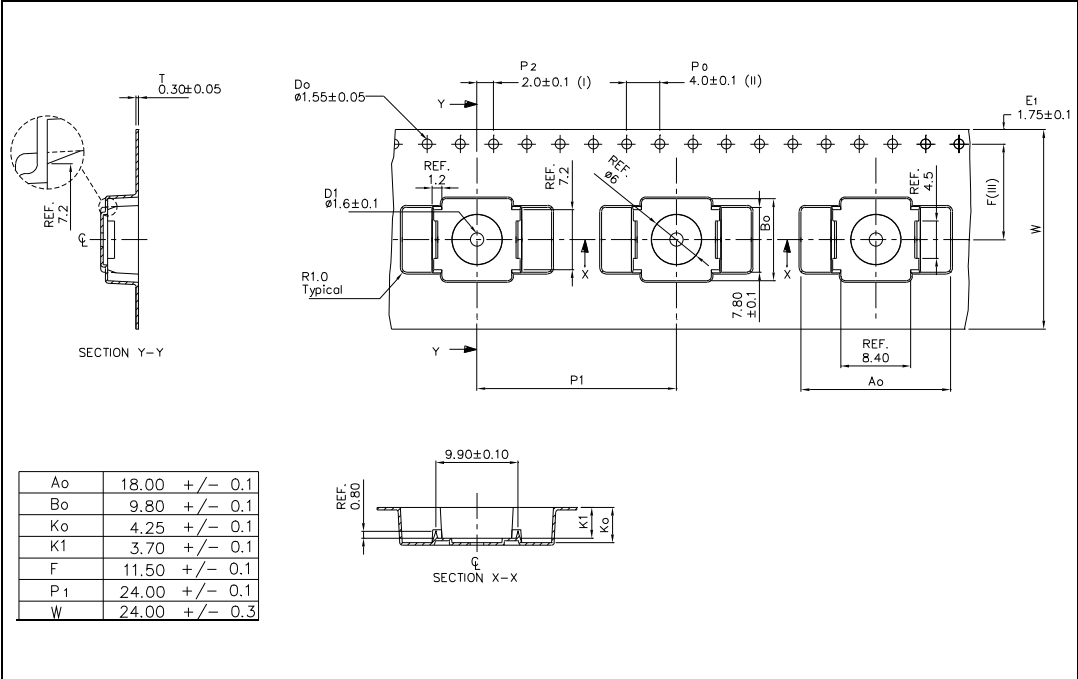


Figure 9. Reel information



6 Revision history

Table 10. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 10-Mar-2008 | 1 | Initial release |
| 06-Jul-2009 | 2 | Document status promoted from preliminary data to datasheet. |
| 13-Dec-2011 | 3 | Updated values in Table 7: Impedance data . |
| 24-May-2012 | 4 | Updated $V_{GS(Q)}$ in Figure 4: DC output characteristics . |

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