

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

Features

- Excellent thermal stability
- Common source configuration
- $P_{OUT} = 35\text{ W}$ with 14.9 dB gain @ 870 MHz / 13.6 V
- Plastic package
- ESD protection
- In compliance with the 2002/95/EC1 European directive

Description

The PD85035-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. PD85035-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. PD85035-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. Mounting recommendations are available in www.st.com/rf/ (look for application note AN1294).

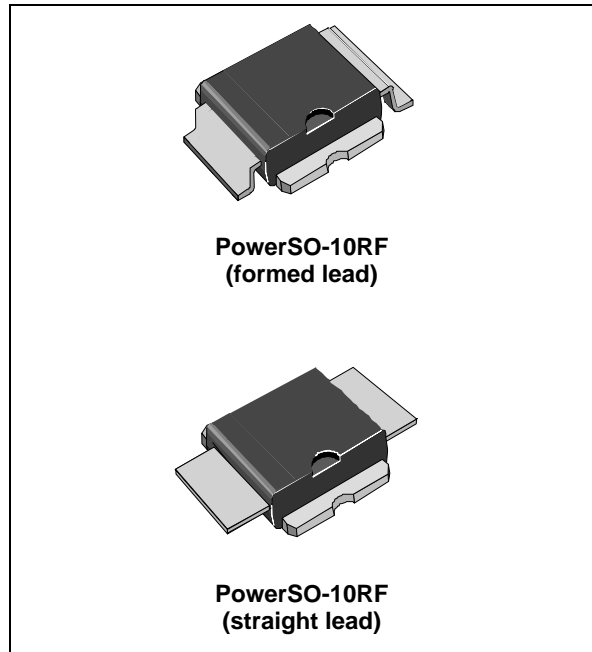


Figure 1. Pin connection

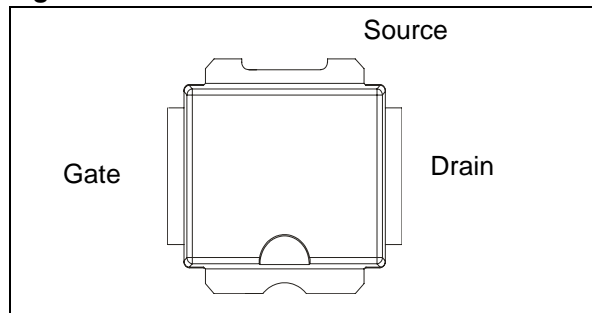


Table 1. Device summary

| Order codes | Package | Packing |
|--------------|------------------------------|---------------|
| PD85035-E | PowerSO-10RF (formed lead) | Tube |
| PD85035S-E | PowerSO-10RF (straight lead) | Tube |
| PD85035TR-E | PowerSO-10RF (formed lead) | Tape and reel |
| PD85035STR-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 | 8 | A |
| P_{DISS} | Power dissipation (@ $T_C = 70\text{ °C}$) | 95 | 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 | 1.0 | °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 |
| $V_{GS(Q)}$ | $V_{DS} = 10\text{ V}$ | $I_D = 250\text{ mA}$ | 3.4 | | 4.6 | V |
| $V_{DS(ON)}$ | $V_{GS} = 10\text{ V}$ | $I_D = 3\text{ A}$ | | 0.64 | 0.7 | V |
| C_{ISS} | $V_{GS} = 0\text{ V}$ | $V_{DS} = 12.5\text{ V}$ | | f = 1 MHz 76 | | pF |
| C_{OSS} | $V_{GS} = 0\text{ V}$ | $V_{DS} = 12.5\text{ V}$ | | f = 1 MHz 45 | | pF |
| C_{RSS} | $V_{GS} = 0\text{ V}$ | $V_{DS} = 12.5\text{ V}$ | | f = 1 MHz 1.4 | | pF |

2.2 Dynamic

Table 5. Dynamic

| Symbol | Test conditions | | Min | Typ | Max | Unit |
|---------------|---|-------------|------|-----|-----|------|
| P3dB | $V_{DD} = 13.6\text{ V}$, $I_{DQ} = 350\text{ mA}$ | f = 870 MHz | 35 | 40 | | W |
| G_P | $V_{DD} = 13.6\text{ V}$, $I_{DQ} = 350\text{ mA}$, $P_{OUT} = 15\text{ W}$, f = 870 MHz | | 15 | 17 | | dB |
| h_D | $V_{DD} = 13.6\text{ V}$, $I_{DQ} = 350\text{ mA}$, $P_{OUT} = P_{3dB}$, f = 870 MHz | | 60 | 72 | | % |
| Load mismatch | $V_{DD} = 1\text{ 7V}$, $I_{DQ} = 350\text{ mA}$, $P_{OUT} = 50\text{ W}$, f = 870 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 methodology | Rating |
|------------------|--------|
| J-STD-020B | MSL 3 |

3 Impedance

Figure 2. Current conventions

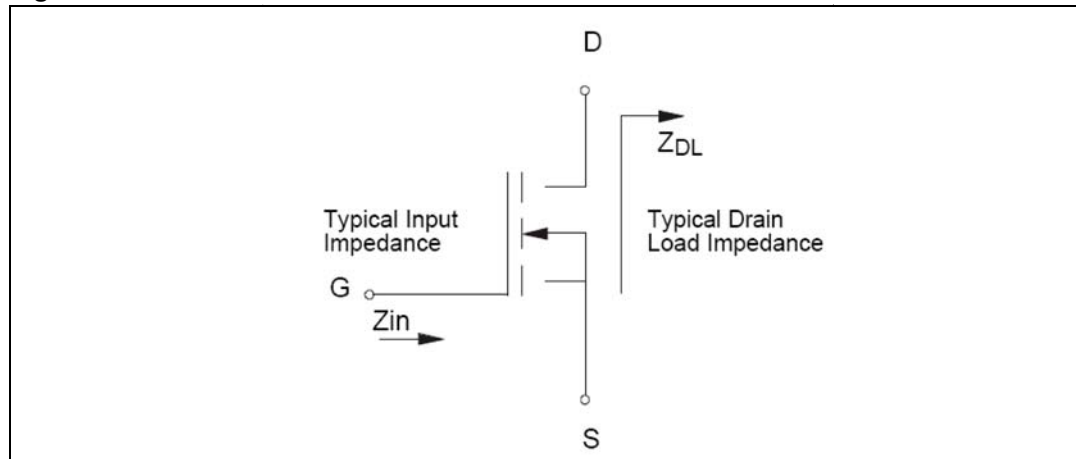


Table 8. Impedance data

| Frequency (MHz) | $Z_{IN} (\Omega)$ | $Z_{DL}(\Omega)$ |
|-----------------|-------------------|------------------|
| 870 MHz | $0.57 + j 0.73$ | $1.73 - j 0.15$ |

4 Typical performance

Figure 3. Threshold voltage

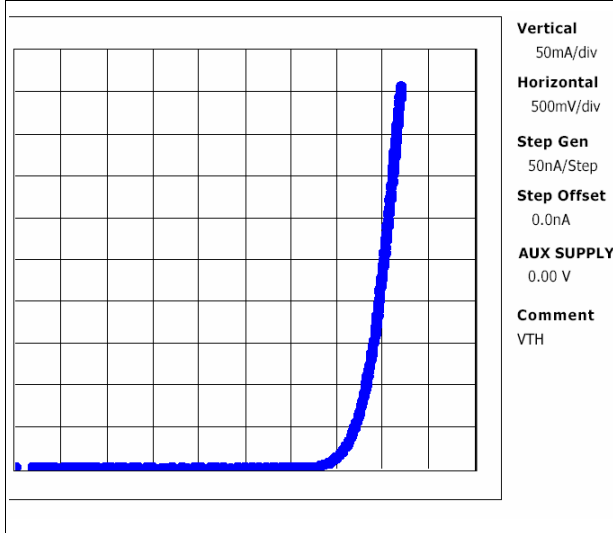


Figure 4. DC output characteristic

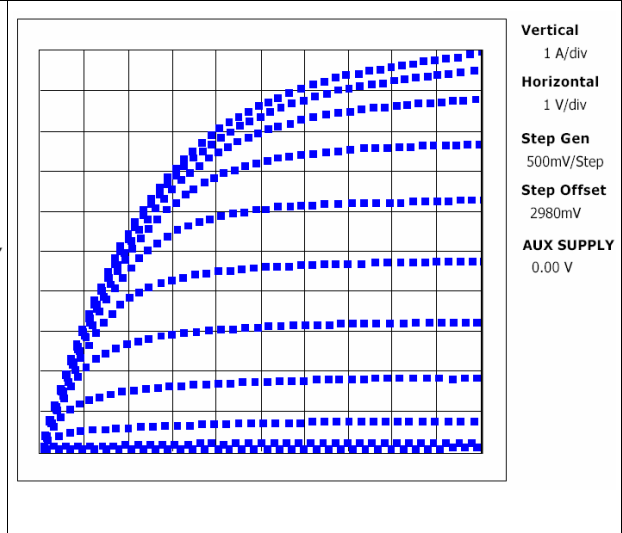


Figure 5. I_D vs V_{GS}

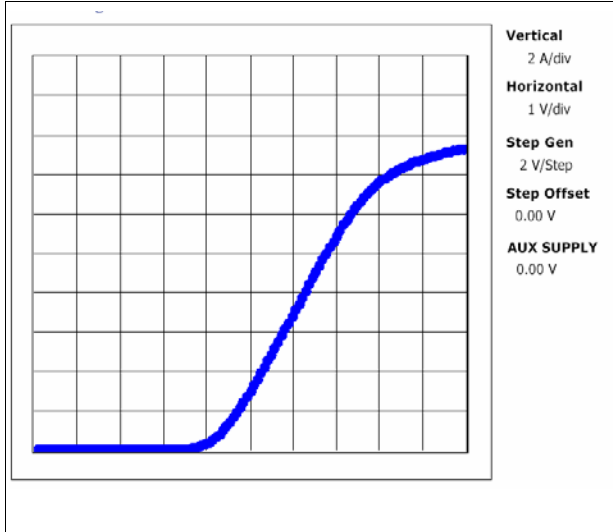


Figure 6. Capacitances vs voltage

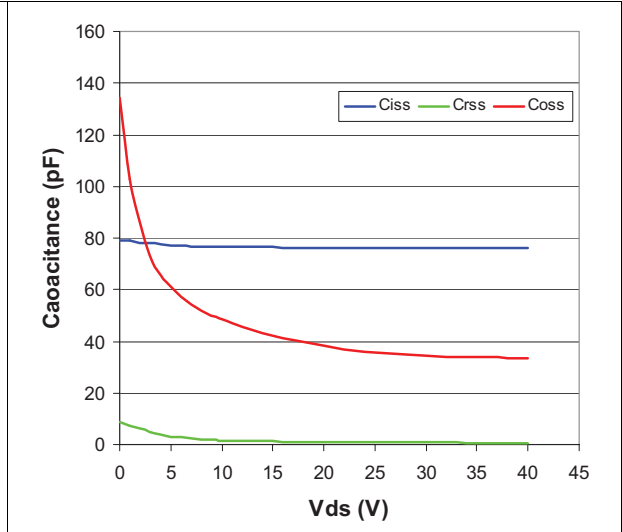


Figure 7. Pout and Id vs VGS

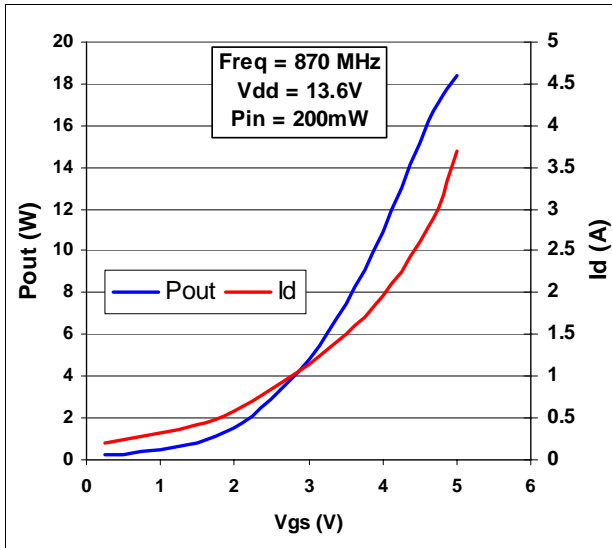


Figure 8. Pout and Id vs VGS

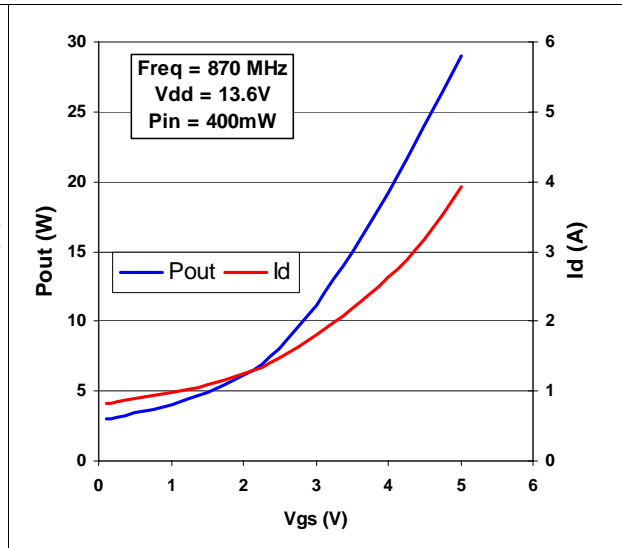


Figure 9. Gain vs Pout and bias current

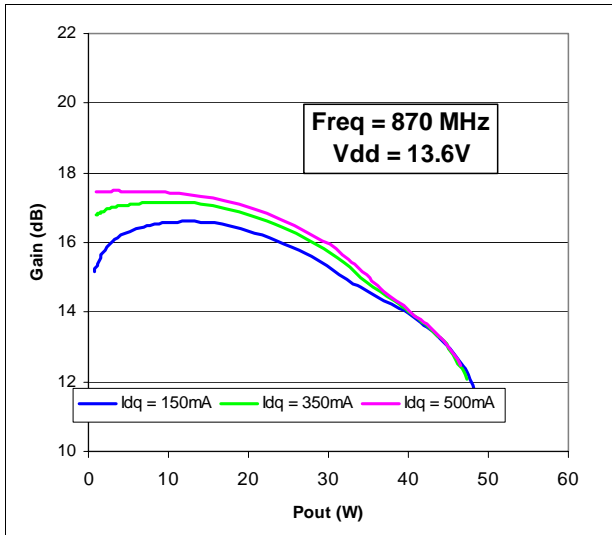


Figure 10. Gain and efficiency vs Pout

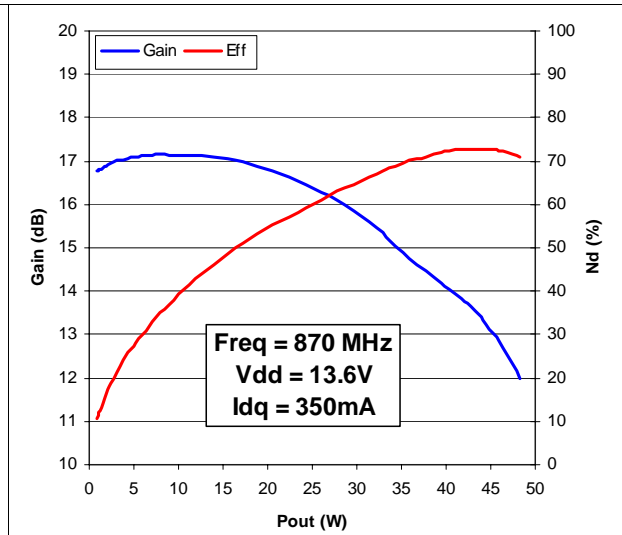


Figure 11. Pout and Id vs supply voltage

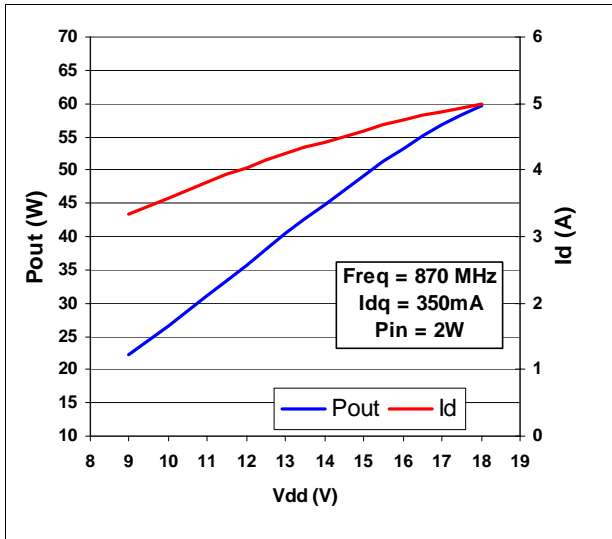
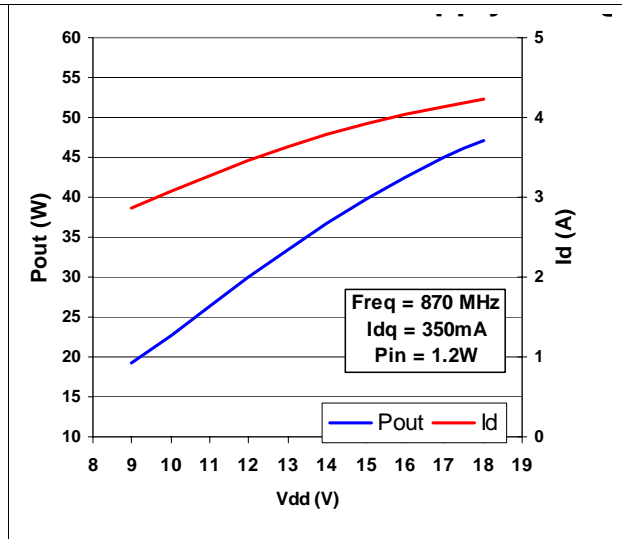


Figure 12. Pout and Id vs supply voltage



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 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 13. Package dimensions

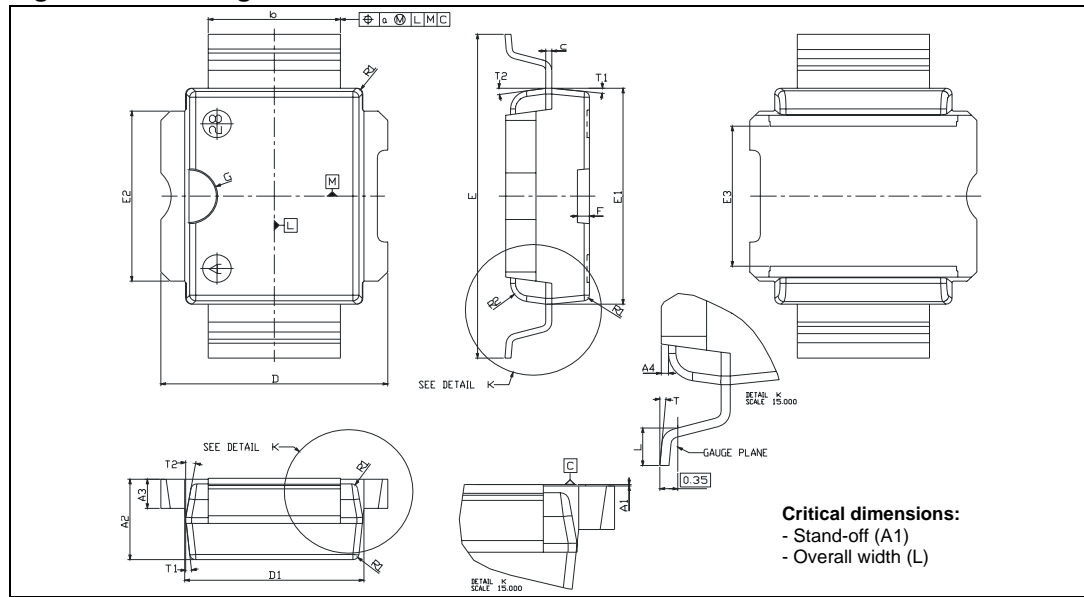


Table 10. PowerSO-10RF straight lead mechanical data

| 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 14. Package dimensions

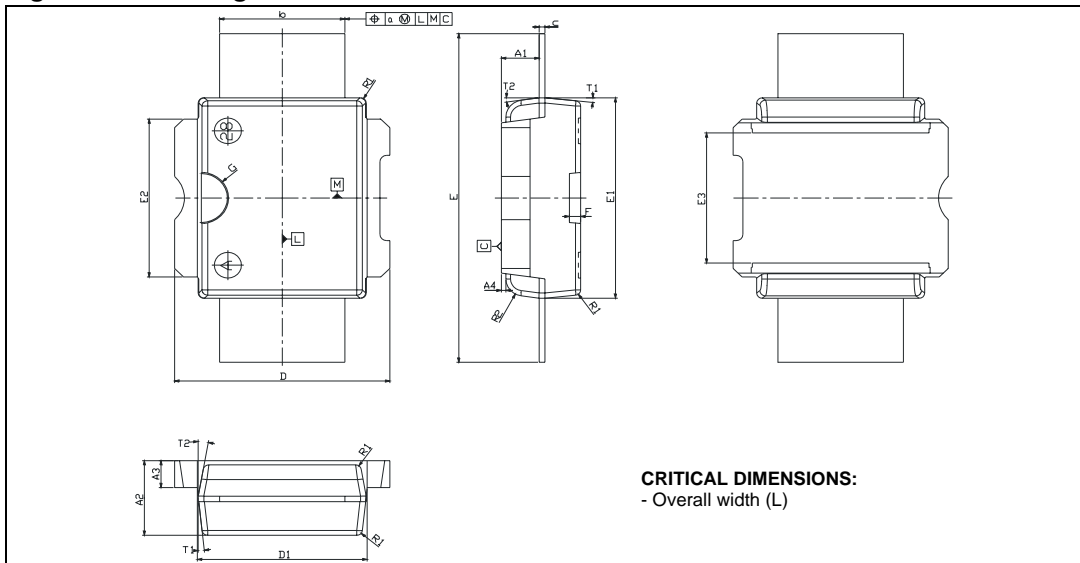


Figure 15. Tube information

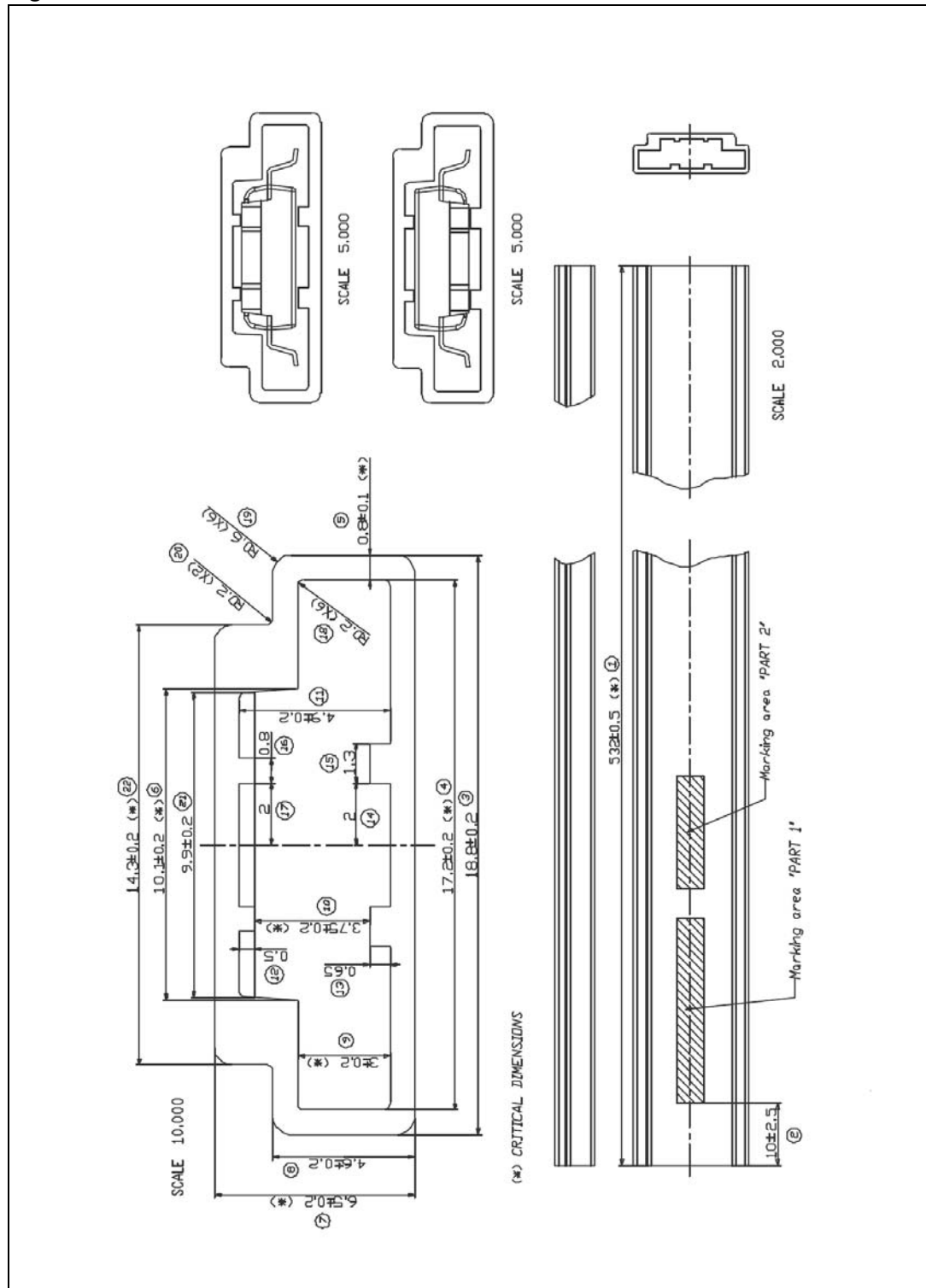
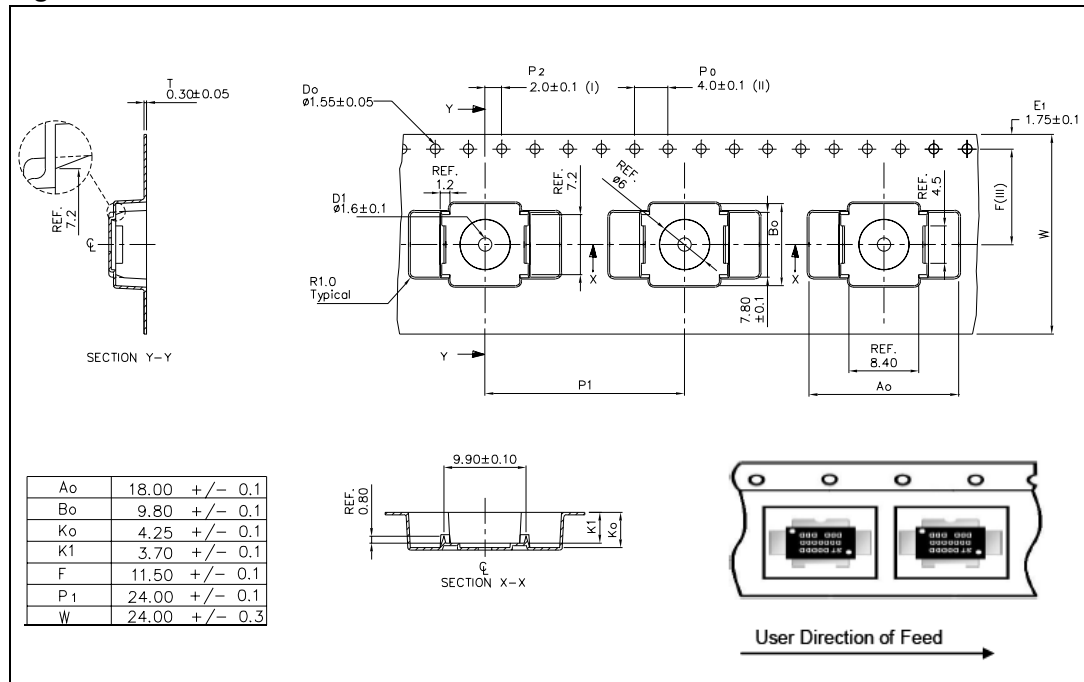


Figure 16. Reel information



6 Revision history

Table 11. Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| 16-May-2007 | 1 | Initial release. |
| 26-Aug-2008 | 2 | Updated Table 4 on page 4 . |
| 04-May-2011 | 3 | Updated Table 4 on page 4 and Figure 16: Reel information . |

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