



## PD85035-E

### 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/](http://www.st.com/rf/) (look for application note AN1294).

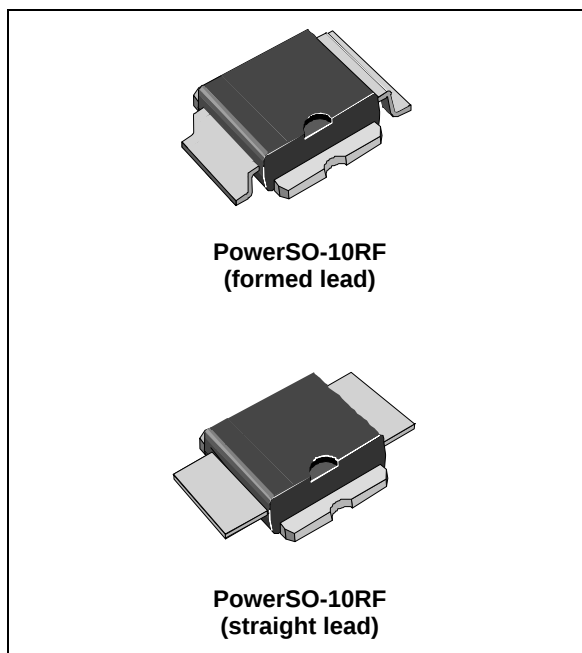


Figure 1. Pin connection

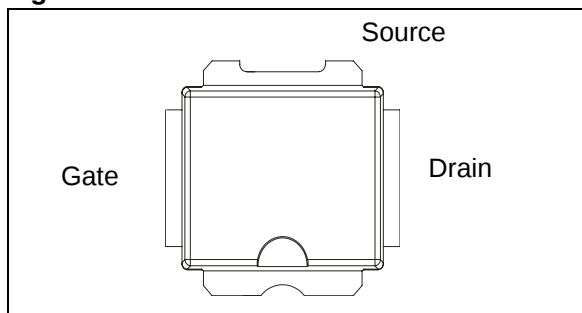


Table 1. Device summary

| 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

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

### 2.1 Static

**Table 4. Static**

| Symbol              | Test conditions               |                                 | Min | Typ  | Max | Unit          |
|---------------------|-------------------------------|---------------------------------|-----|------|-----|---------------|
| $I_{\text{DSS}}$    | $V_{\text{GS}} = 0\text{ V}$  | $V_{\text{DS}} = 25\text{ V}$   |     |      | 1   | $\mu\text{A}$ |
| $I_{\text{GSS}}$    | $V_{\text{GS}} = 5\text{ V}$  | $V_{\text{DS}} = 0\text{ V}$    |     |      | 1   | $\mu\text{A}$ |
| $V_{\text{GS(Q)}}$  | $V_{\text{DS}} = 10\text{ V}$ | $I_{\text{D}} = 250\text{ mA}$  | 3.4 |      | 4.6 | V             |
| $V_{\text{DS(ON)}}$ | $V_{\text{GS}} = 10\text{ V}$ | $I_{\text{D}} = 3\text{ A}$     |     | 0.64 | 0.7 | V             |
| $C_{\text{ISS}}$    | $V_{\text{GS}} = 0\text{ V}$  | $V_{\text{DS}} = 12.5\text{ V}$ |     | 76   |     | pF            |
| $C_{\text{OSS}}$    | $V_{\text{GS}} = 0\text{ V}$  | $V_{\text{DS}} = 12.5\text{ V}$ |     | 45   |     | pF            |
| $C_{\text{RSS}}$    | $V_{\text{GS}} = 0\text{ V}$  | $V_{\text{DS}} = 12.5\text{ V}$ |     | 1.4  |     | pF            |

### 2.2 Dynamic

**Table 5. Dynamic**

| Symbol         | Test conditions                                                                                                                            | Min  | Typ | Max | Unit |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------|------|-----|-----|------|
| P3dB           | $V_{\text{DD}} = 13.6\text{ V}$ , $I_{\text{DQ}} = 350\text{ mA}$ $f = 870\text{ MHz}$                                                     | 35   | 40  |     | W    |
| $G_{\text{P}}$ | $V_{\text{DD}} = 13.6\text{ V}$ , $I_{\text{DQ}} = 350\text{ mA}$ , $P_{\text{OUT}} = 15\text{ W}$ , $f = 870\text{ MHz}$                  | 15   | 17  |     | dB   |
| $h_{\text{D}}$ | $V_{\text{DD}} = 13.6\text{ V}$ , $I_{\text{DQ}} = 350\text{ mA}$ , $P_{\text{OUT}} = \text{P3dB}$ , $f = 870\text{ MHz}$                  | 60   | 72  |     | %    |
| Load mismatch  | $V_{\text{DD}} = 1\text{ V}$ , $I_{\text{DQ}} = 350\text{ mA}$ , $P_{\text{OUT}} = 50\text{ W}$ , $f = 870\text{ MHz}$<br>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

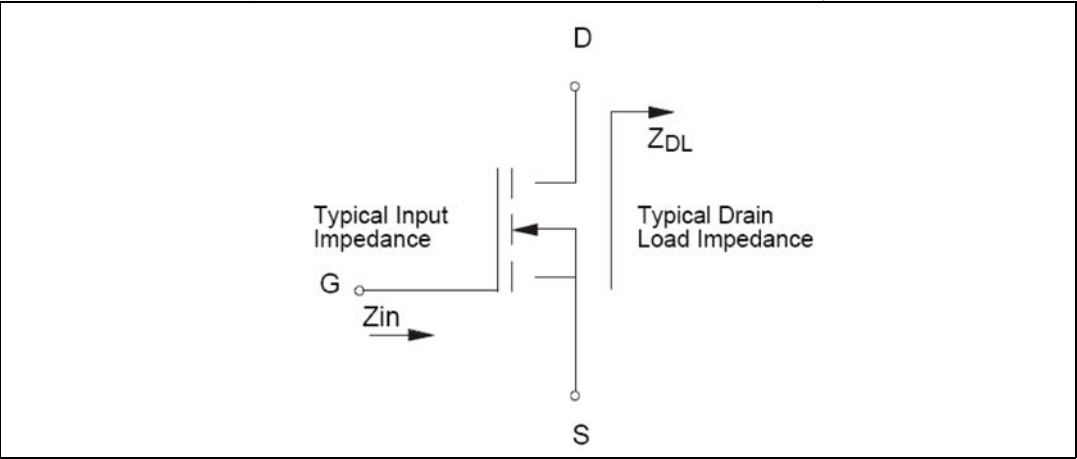


Table 8. Impedance data

| 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

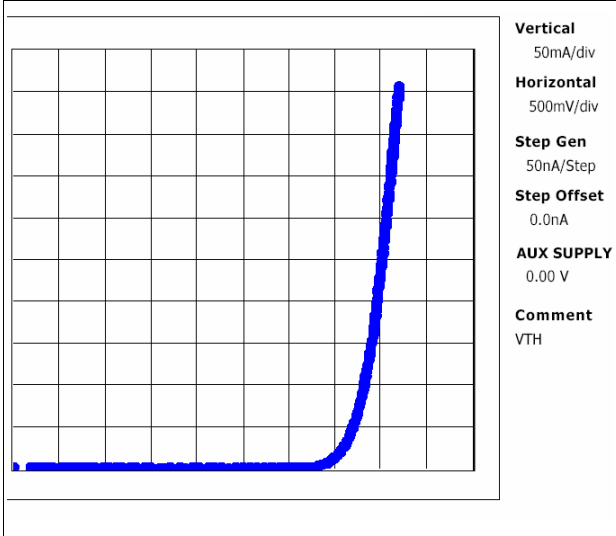


Figure 4. DC output characteristic

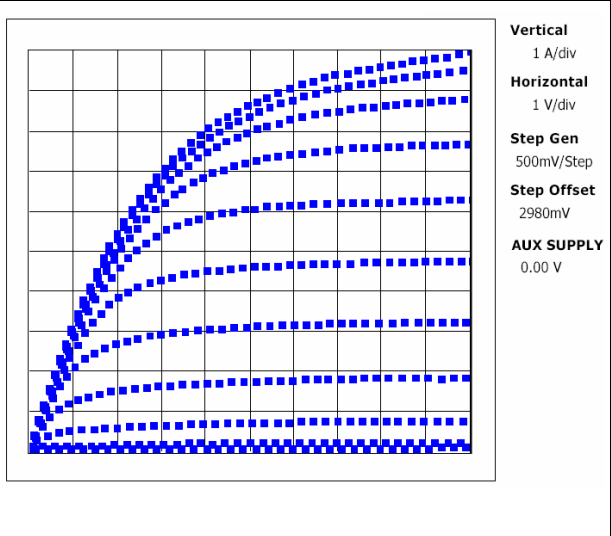


Figure 5.  $I_D$  vs  $V_{GS}$

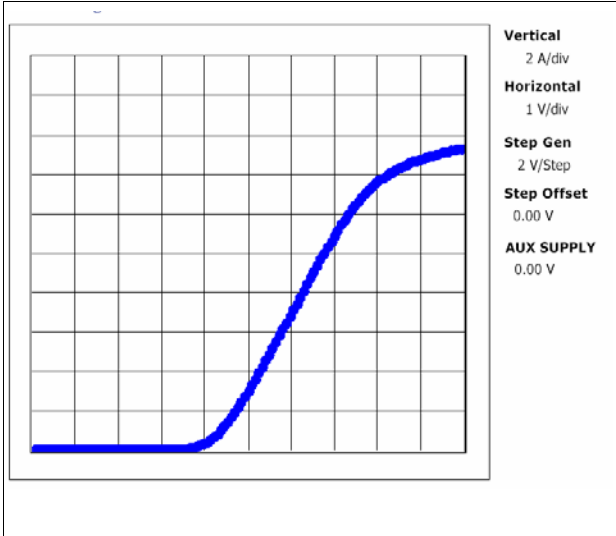


Figure 6. Capacitances vs voltage

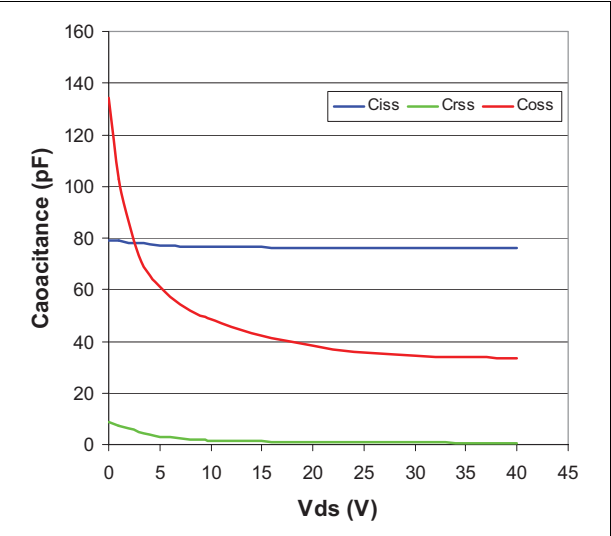


Figure 7. Pout and Id vs VGS

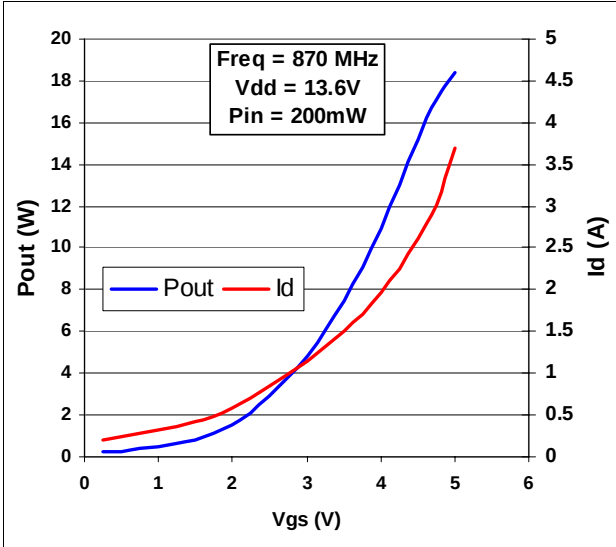


Figure 8. Pout and Id vs VGS

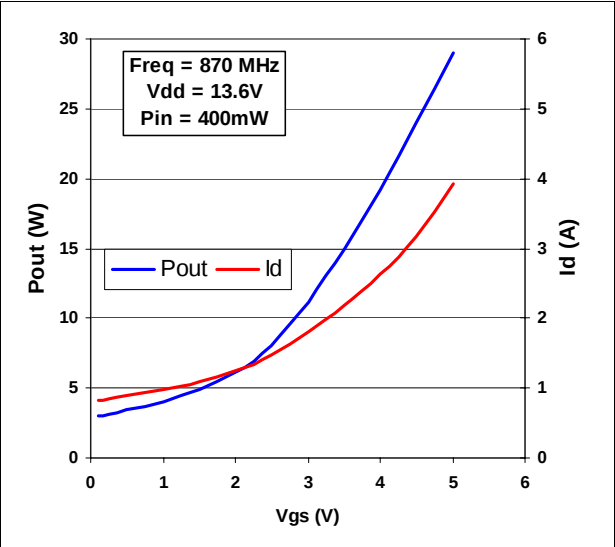


Figure 9. Gain vs Pout and bias current

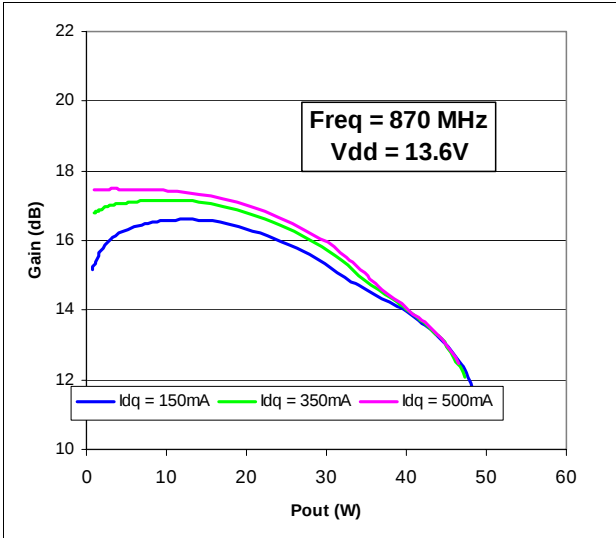


Figure 10. Gain and efficiency vs Pout

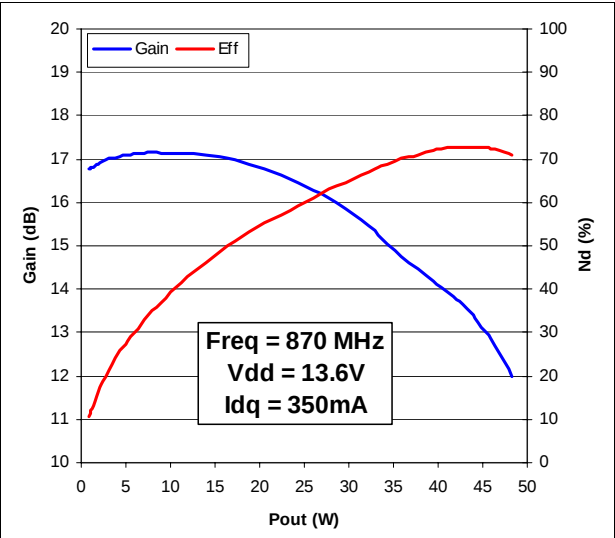


Figure 11. Pout and Id vs supply voltage

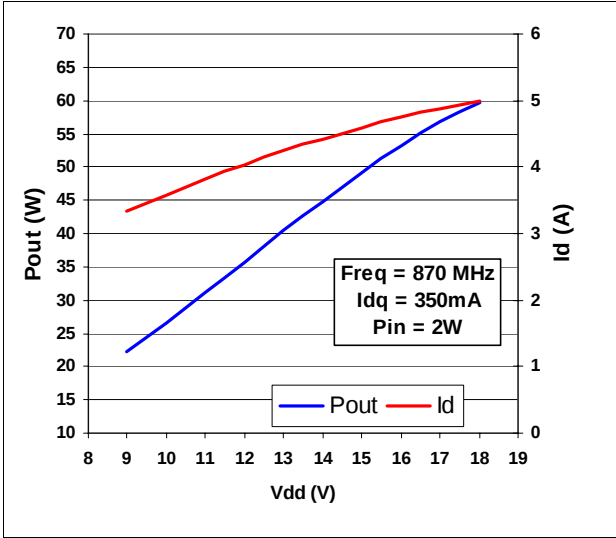
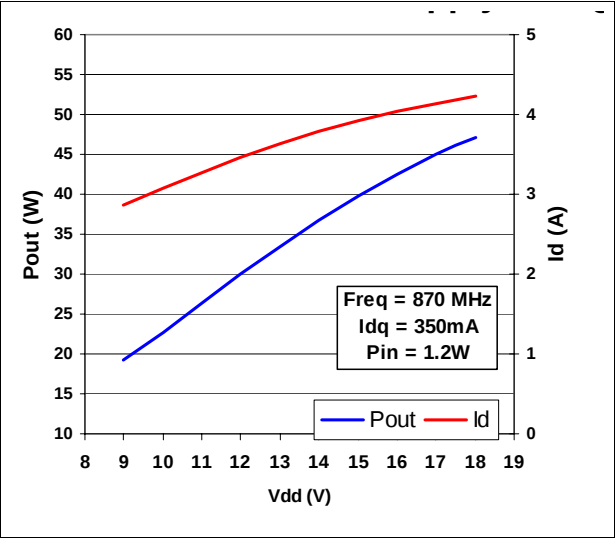


Figure 12. Pout and Id vs supply voltage



## 5 Package mechanical data

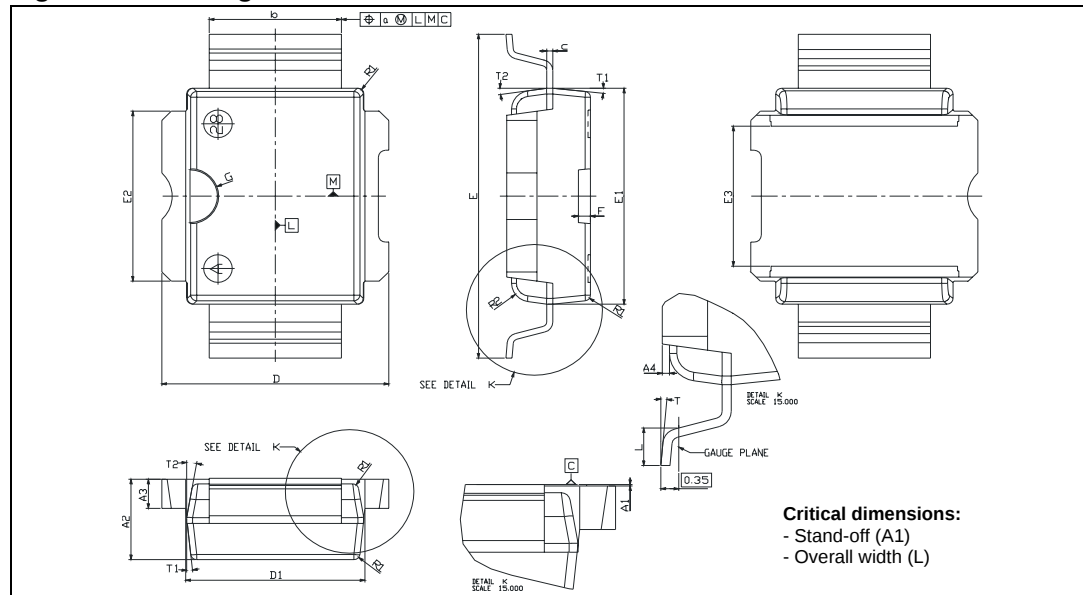
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK 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

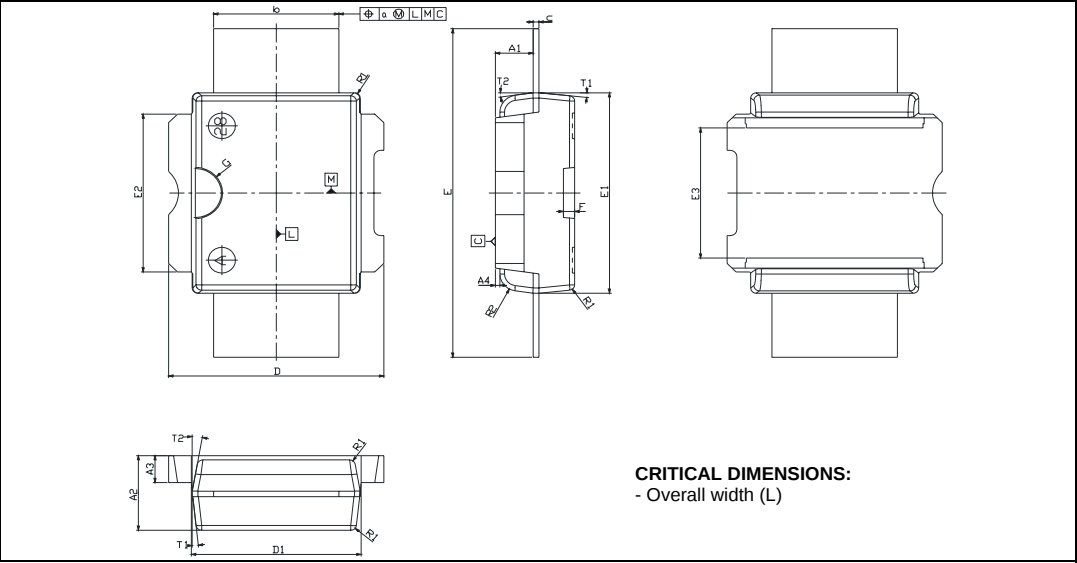


**Table 10. PowerSO-10RF straight lead mechanical data**

| 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

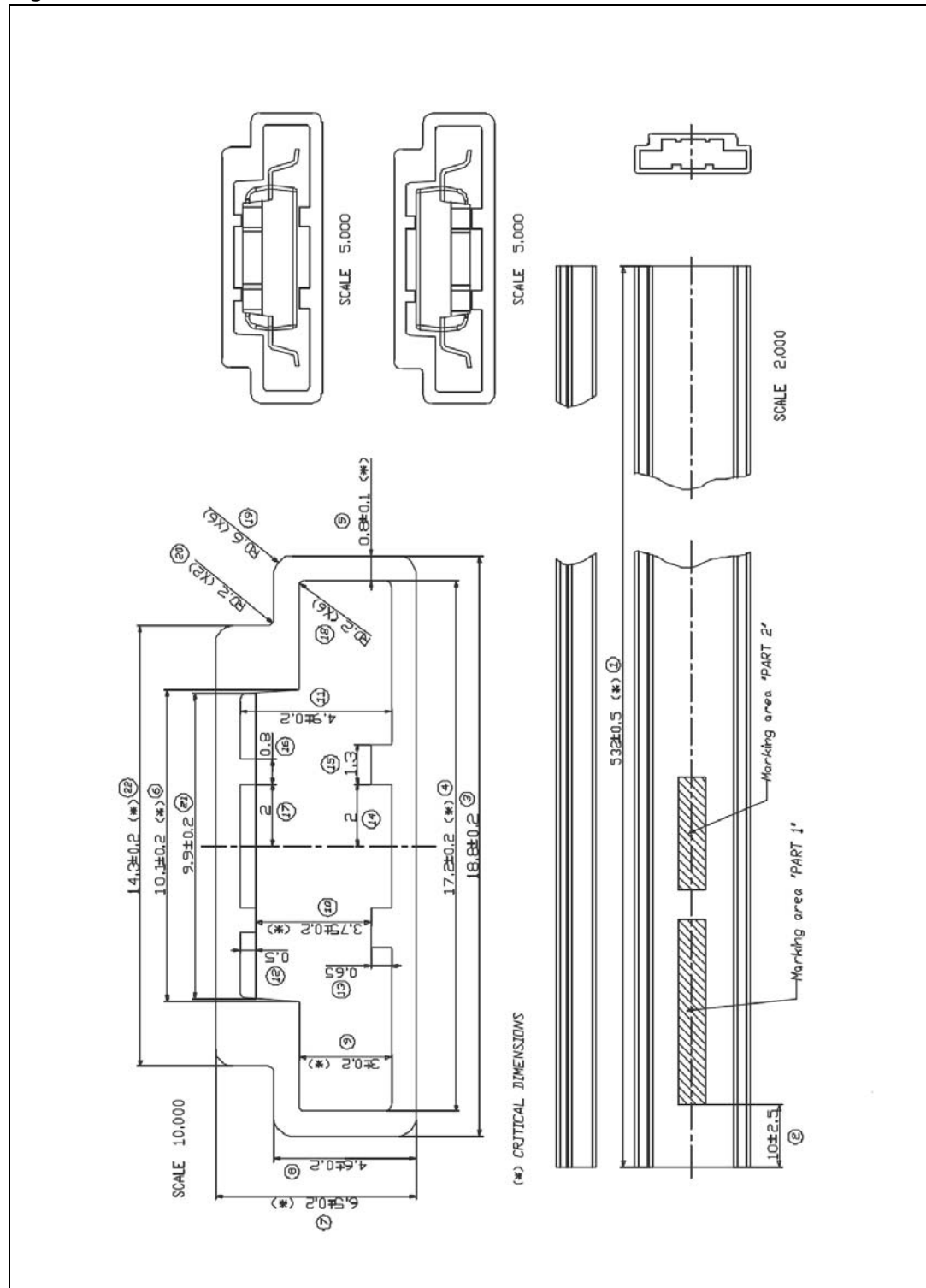
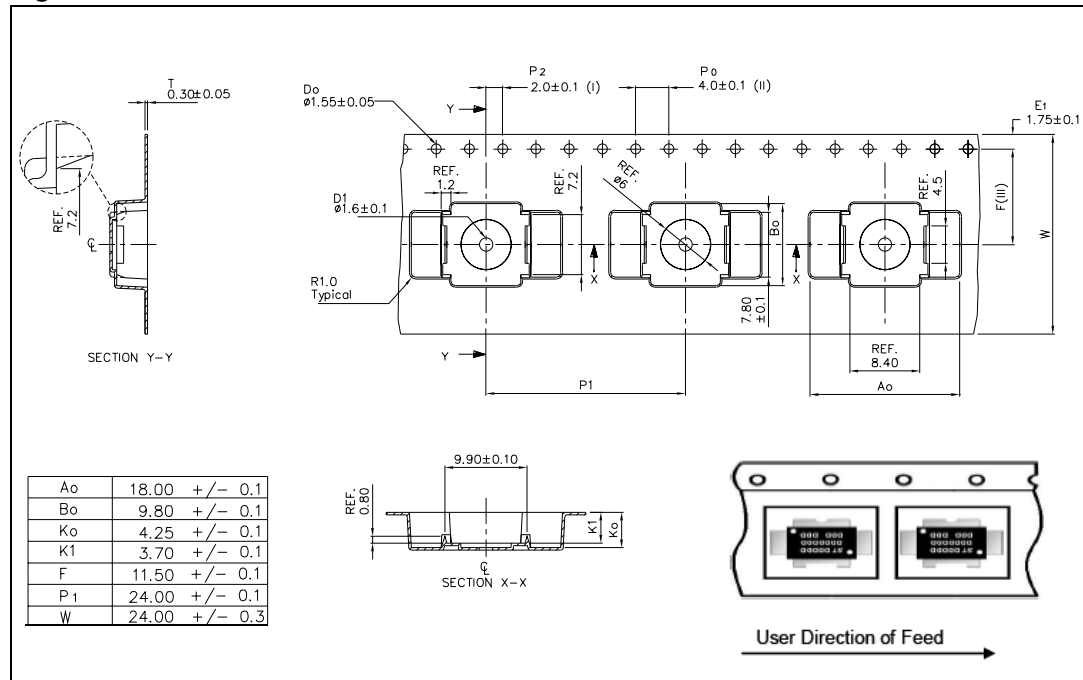


Figure 16. Reel information



## 6 Revision history

**Table 11. Document revision history**

| Date        | Revision | Changes                                                                                     |
|-------------|----------|---------------------------------------------------------------------------------------------|
| 16-May-2007 | 1        | Initial release.                                                                            |
| 26-Aug-2008 | 2        | Updated <a href="#">Table 4 on page 4</a> .                                                 |
| 04-May-2011 | 3        | Updated <a href="#">Table 4 on page 4</a> and <a href="#">Figure 16: Reel information</a> . |

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