



# PD84008-E

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

Preliminary data

### Features

- Excellent thermal stability
- Common source configuration
- $P_{OUT} = 8\text{ W}$  with 14.7 dB gain @ 870 MHz / 7.5 V
- Plastic package
- ESD protection
- In compliance with the 2002/95/EC european directive

### Description

The PD84008-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. PD84008-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. PD84008-E's superior linearity performance makes it an ideal solution for portable 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.

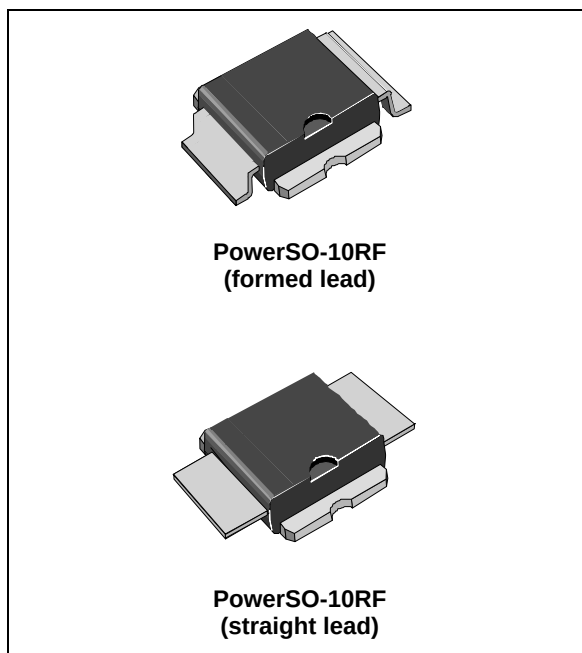


Figure 1. Pin connection

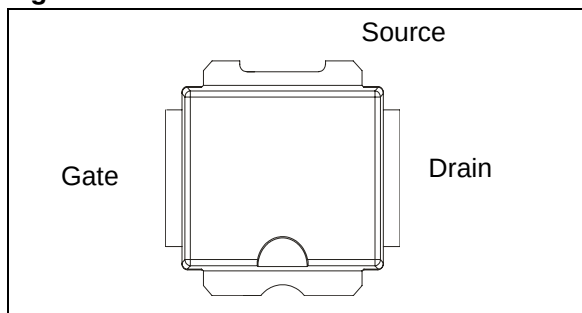


Table 1. Device summary

| Part number  | Package                      | Packing       |
|--------------|------------------------------|---------------|
| PD84008-E    | PowerSO-10RF (formed lead)   | Tube          |
| PD84008S-E   | PowerSO-10RF (straight lead) | Tube          |
| PD84008TR-E  | PowerSO-10RF (formed lead)   | Tape and reel |
| PD84008STR-E | PowerSO-10RF (straight lead) | Tape and reel |

# Contents

|          |                                   |           |
|----------|-----------------------------------|-----------|
| <b>1</b> | <b>Electrical data</b>            | <b>3</b>  |
| 1.1      | Maximum ratings                   | 3         |
| 1.2      | Thermal data                      | 3         |
| <b>2</b> | <b>Electrical characteristics</b> | <b>4</b>  |
| 2.1      | Static                            | 4         |
| 2.2      | Dynamic                           | 4         |
| 2.3      | ESD protection characteristics    | 4         |
| 2.4      | Moisture sensitivity level        | 4         |
| <b>3</b> | <b>Impedance</b>                  | <b>5</b>  |
| <b>4</b> | <b>Typical performance</b>        | <b>6</b>  |
| <b>5</b> | <b>Package mechanical data</b>    | <b>9</b>  |
| <b>6</b> | <b>Revision history</b>           | <b>14</b> |

# 1 Electrical data

## 1.1 Maximum ratings

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

| Symbol        | Parameter                                         | Value       | Unit               |
|---------------|---------------------------------------------------|-------------|--------------------|
| $V_{(BR)DSS}$ | Drain-source voltage                              | 25          | V                  |
| $V_{GS}$      | Gate-source voltage                               | -0.5 to +15 | V                  |
| $I_D$         | Drain current                                     | 7           | A                  |
| $P_{DISS}$    | Power dissipation (@ $T_C = 70^{\circ}\text{C}$ ) | 79          | W                  |
| $T_J$         | Max. operating junction temperature               | 165         | $^{\circ}\text{C}$ |
| $T_{STG}$     | Storage temperature                               | -65 to +150 | $^{\circ}\text{C}$ |

## 1.2 Thermal data

**Table 3. Thermal data**

| Symbol     | Parameter                          | Value | Unit                 |
|------------|------------------------------------|-------|----------------------|
| $R_{thJC}$ | Junction - case thermal resistance | 1.2   | $^{\circ}\text{C/W}$ |

## 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    | $\mu\text{A}$ |
| $I_{\text{GSS}}$    | $V_{\text{GS}} = 20\text{ V}$ | $V_{\text{DS}} = 0\text{ V}$   |                    |     |      | 1    | $\mu\text{A}$ |
| $V_{\text{GS(Q)}}$  | $V_{\text{DS}} = 10\text{ V}$ | $I_{\text{D}} = 250\text{ mA}$ |                    | 3.2 |      | 4.8  | V             |
| $V_{\text{DS(ON)}}$ | $V_{\text{GS}} = 10\text{ V}$ | $I_{\text{D}} = 1\text{ A}$    |                    |     | 0.27 | 0.31 | V             |
| $C_{\text{ISS}}$    | $V_{\text{GS}} = 0\text{ V}$  | $V_{\text{DS}} = 7\text{ V}$   | $f = 1\text{ MHz}$ |     | 56   |      | pF            |
| $C_{\text{OSS}}$    | $V_{\text{GS}} = 0\text{ V}$  | $V_{\text{DS}} = 7\text{ V}$   | $f = 1\text{ MHz}$ |     | 47   |      | pF            |
| $C_{\text{RSS}}$    | $V_{\text{GS}} = 0\text{ V}$  | $V_{\text{DS}} = 7\text{ V}$   | $f = 1\text{ MHz}$ |     | 2.2  |      | pF            |

### 2.2 Dynamic

**Table 5. Dynamic**

| Symbol         | Test conditions                                                                                                                              |                      |  | Min  | Typ  | Max | Unit |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--|------|------|-----|------|
| P3dB           | $V_{\text{DD}} = 7.5\text{ V}$ , $I_{\text{DQ}} = 250\text{ mA}$                                                                             | $f = 870\text{ MHz}$ |  | 8    | 9.5  |     | W    |
| $G_{\text{P}}$ | $V_{\text{DD}} = 7.5\text{ V}$ , $I_{\text{DQ}} = 250\text{ mA}$ , $P_{\text{OUT}} = 2\text{ W}$ , $f = 870\text{ MHz}$                      |                      |  | 13   | 16.2 |     | dB   |
| $h_{\text{D}}$ | $V_{\text{DD}} = 7.5\text{ V}$ , $I_{\text{DQ}} = 250\text{ mA}$ , $P_{\text{OUT}} = \text{P3dB}$ , $f = 870\text{ MHz}$                     |                      |  | 55   | 65   |     | %    |
| Load mismatch  | $V_{\text{DD}} = 9.5\text{ V}$ , $I_{\text{DQ}} = 250\text{ mA}$ , $P_{\text{OUT}} = 15\text{ W}$ , $f = 870\text{ MHz}$<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

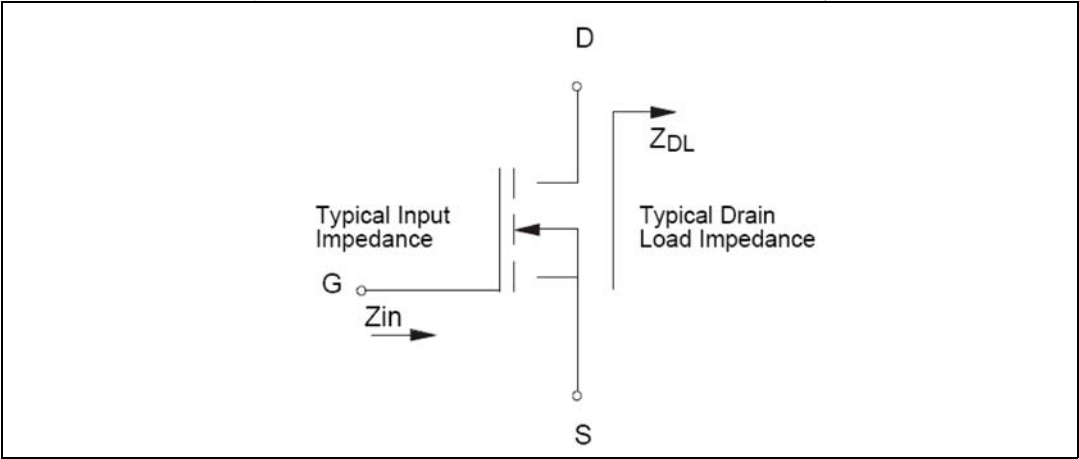


Table 8. Impedance data

| Freq. (MHz) | $Z_{IN} (\Omega)$ | $Z_{DL} (\Omega)$ |
|-------------|-------------------|-------------------|
| 870 MHz     | $0.38 + j 0.94$   | $1.36 - j 0.48$   |

## 4 Typical performance

Figure 3. Capacitances vs drain voltage

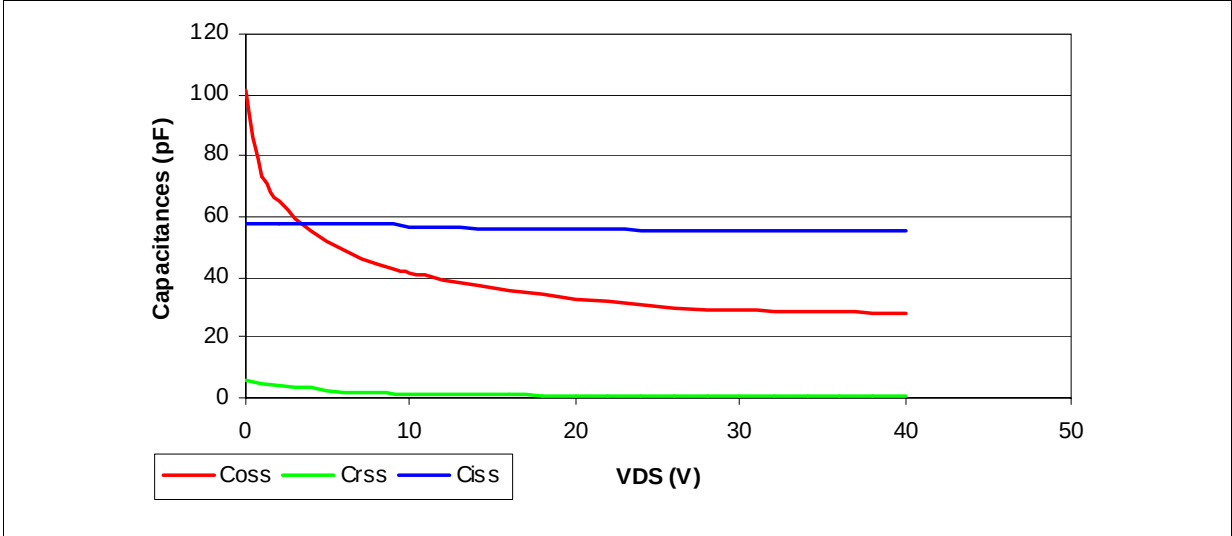


Figure 4. DC output characteristics

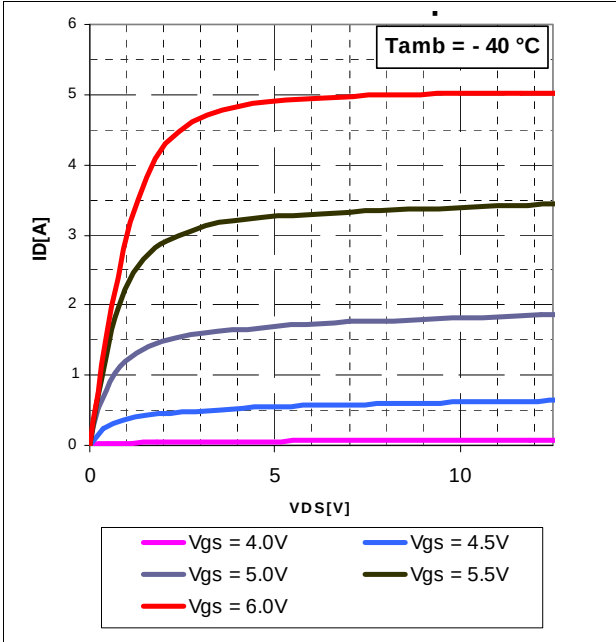


Figure 5. DC output characteristics

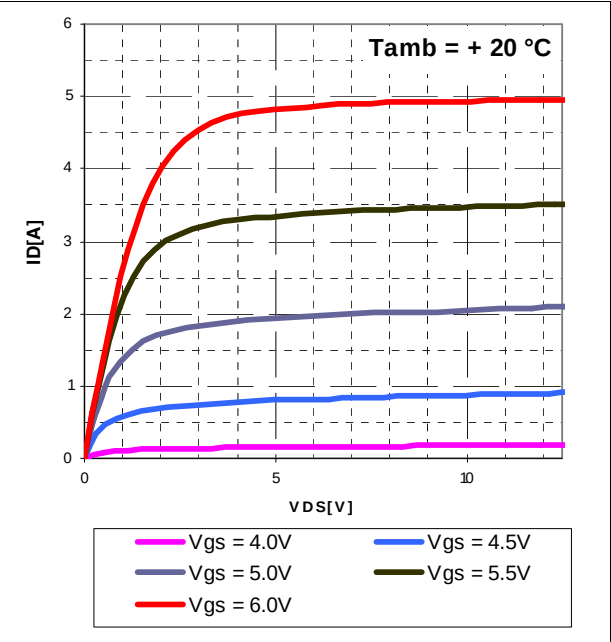


Figure 6. DC output characteristics

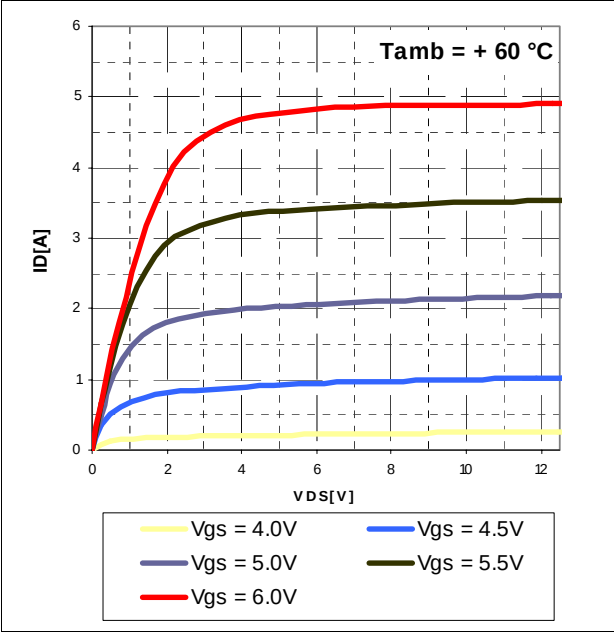


Figure 7. Gain vs output power and bias current

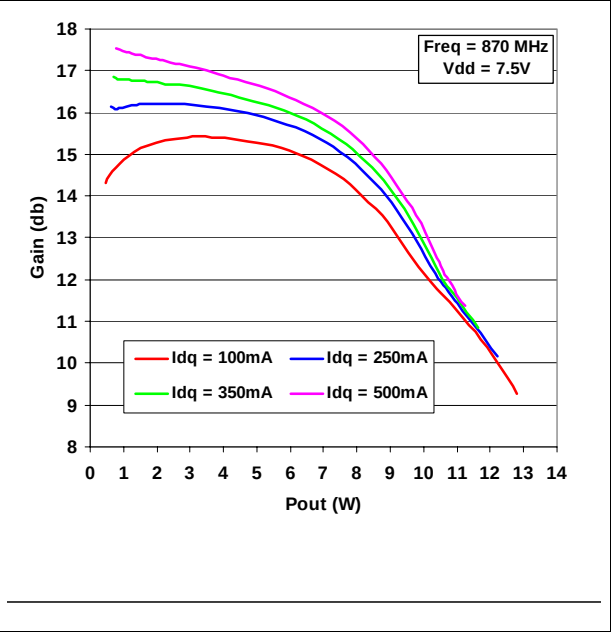


Figure 8. Gain and efficiency vs  $P_{OUT}$

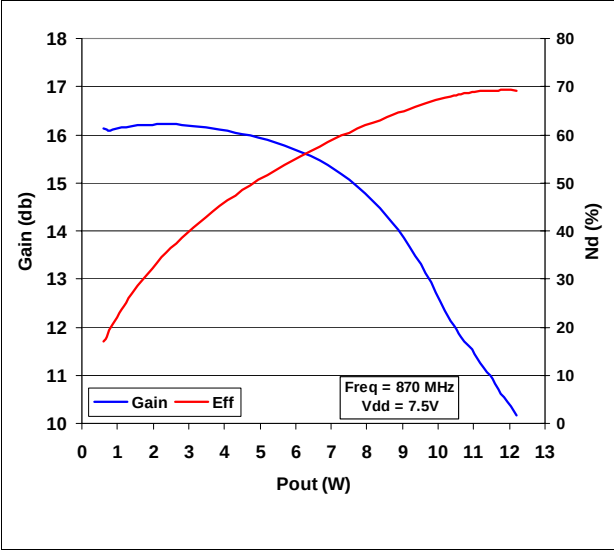


Figure 9.  $P_{out}$  and  $I_d$  vs  $V_{GS}$

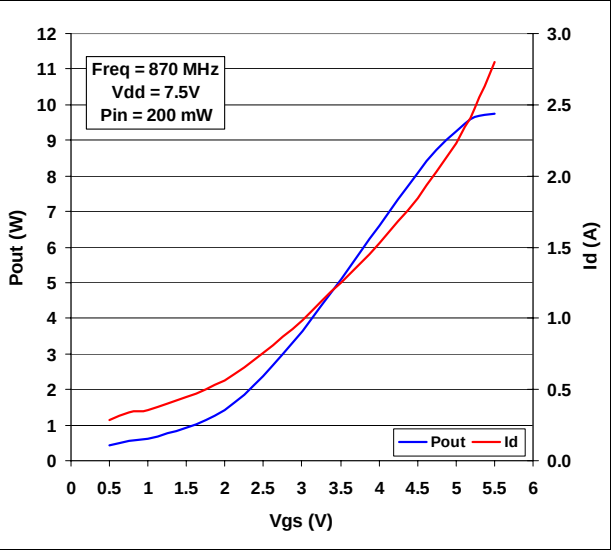


Figure 10. Pout and Id vs Vgs

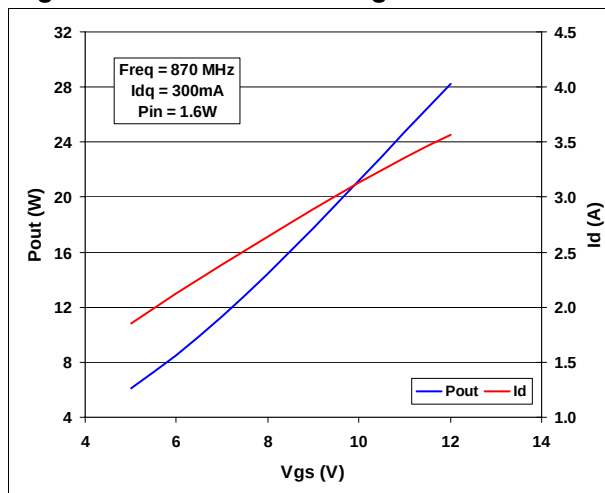


Figure 11. Pout and Id vs VDD

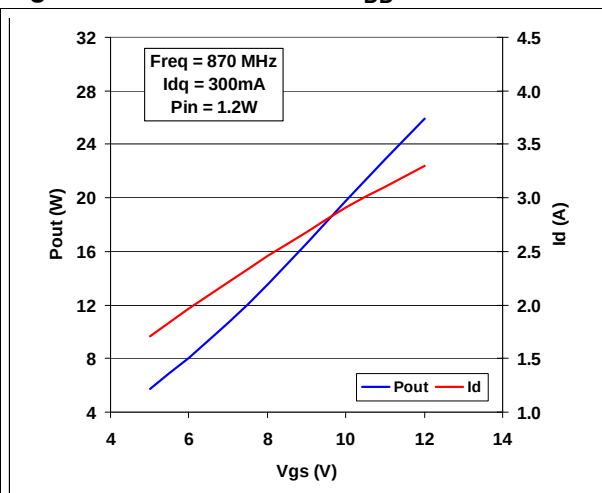


Figure 12. Pout and Id vs VDD

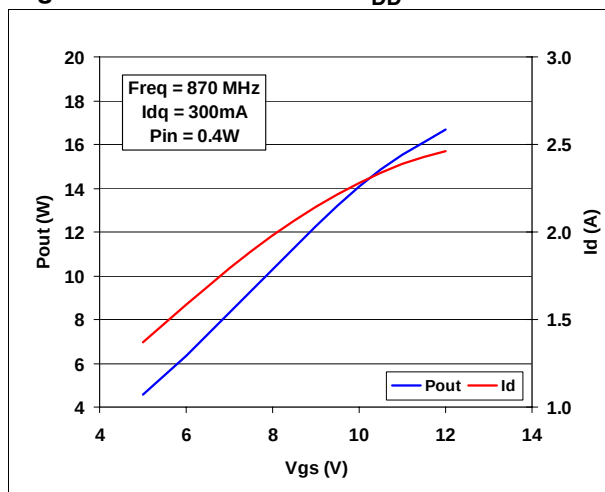


Figure 13. Pout and Id vs VDD

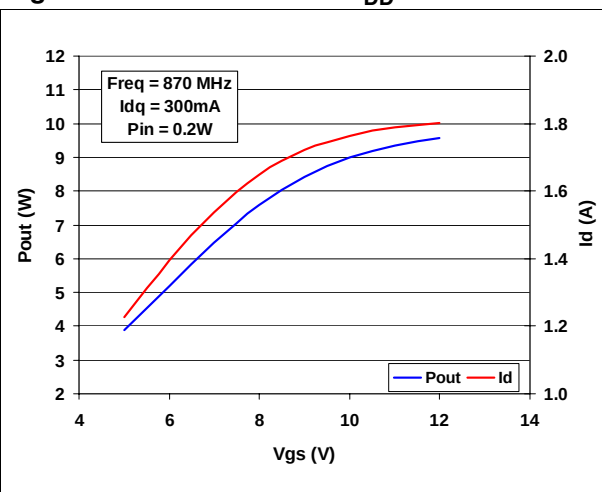
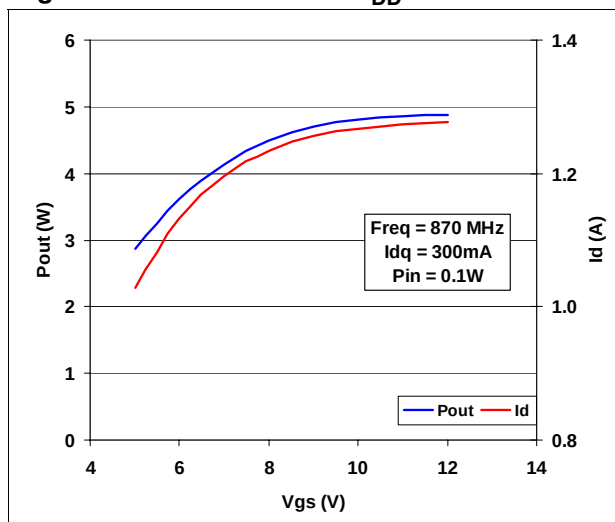


Figure 14. Pout and Id vs VDD





## 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](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 15. Package dimensions

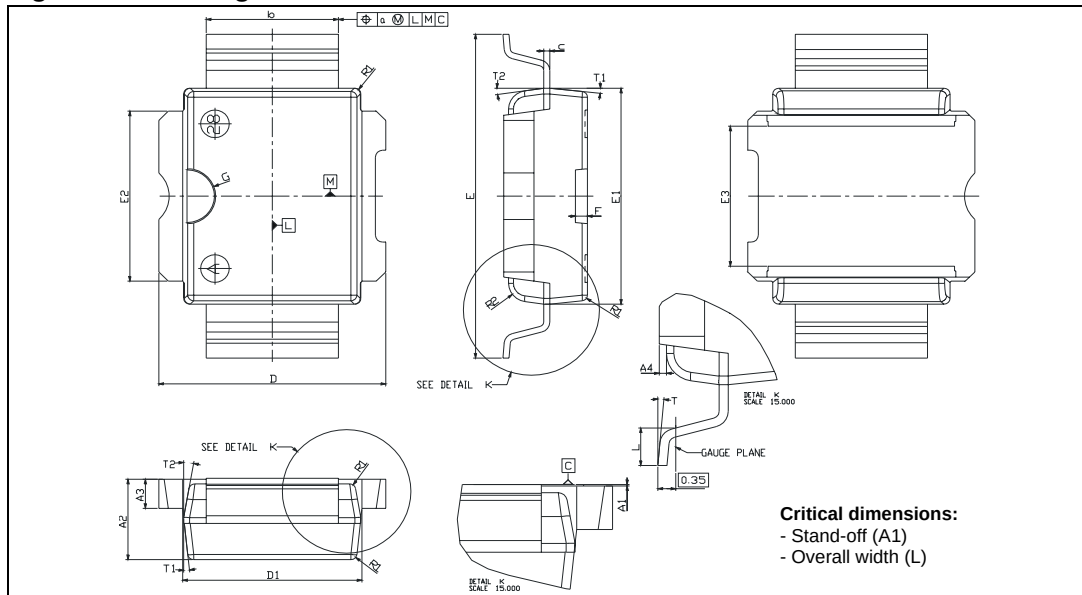


Table 10. PowerSO-10RF straight lead mechanical data

| 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 16. Package dimensions**

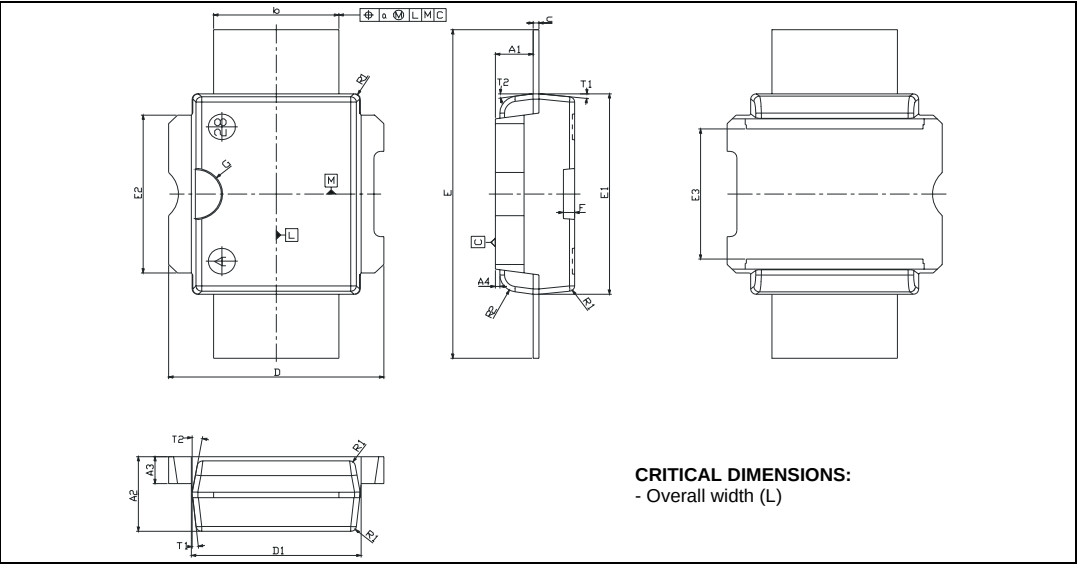


Figure 17. Tube information

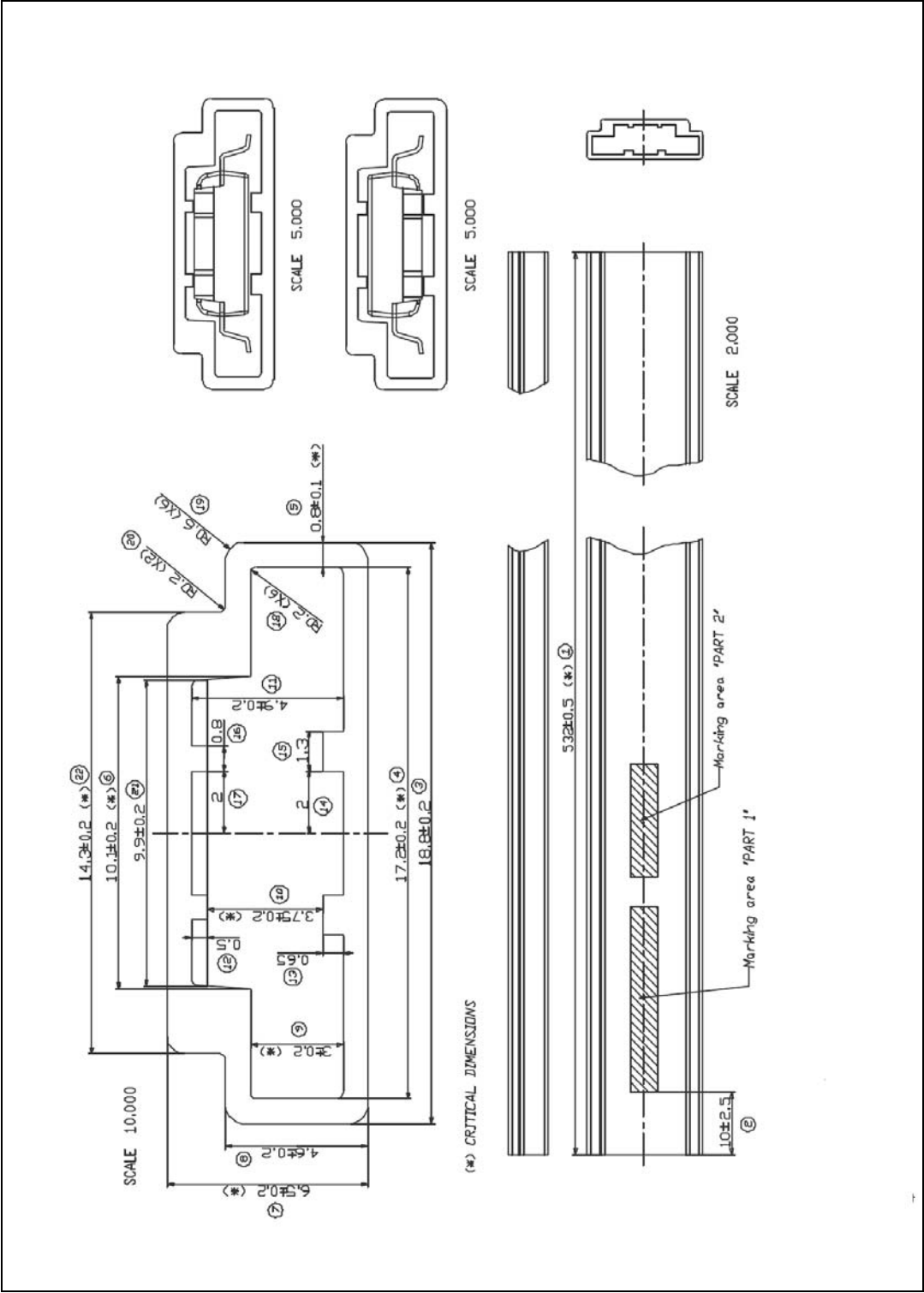
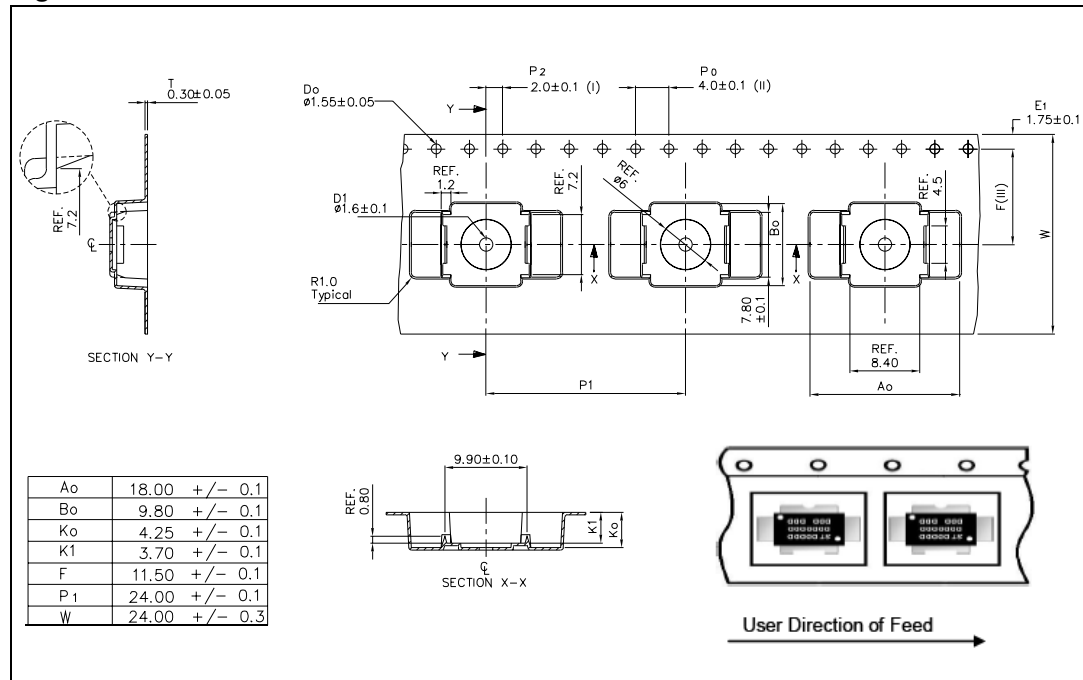


Figure 18. Reel information



## 6 Revision history

**Table 11. Document revision history**

| Date        | Revision | Changes                           |
|-------------|----------|-----------------------------------|
| 05-Dec-2007 | 1        | Initial release.                  |
| 28-Jun-2011 | 2        | Updated <a href="#">Table 4</a> . |

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