

## 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 14.3 dB gain @ 870 MHz / 7.5 V
- Plastic package
- ESD protection
- In compliance with the 2002/95/EC European directive

### Description

The PD84010-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 7.5 V in common source mode at frequencies of up to 1 GHz. PD84010-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. PD84010-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.

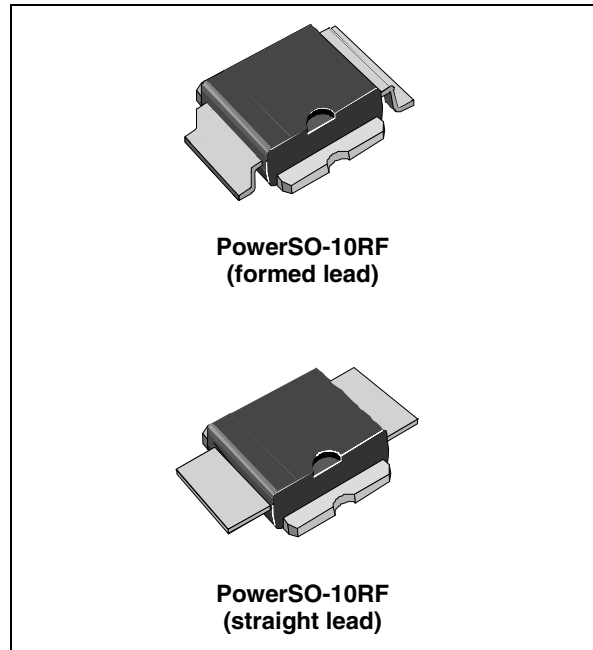


Figure 1. Pin connection

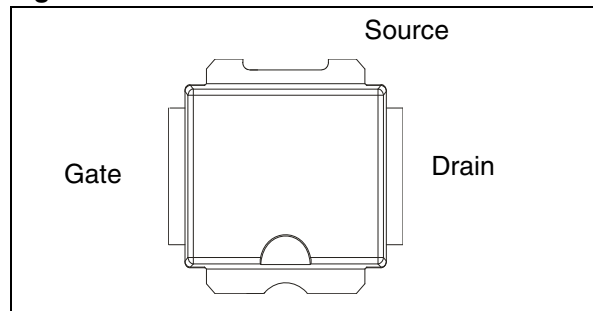


Table 1. Device summary

Order codes	Package	Packing
PD84010-E	PowerSO-10RF (formed lead)	Tube
PD84010TR-E	PowerSO-10RF (formed lead)	Tape and reel
PD84010STR-E	PowerSO-10RF (straight lead)	Tape and reel

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# 1 Electrical data

## 1.1 Maximum ratings

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

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 (@ $T_C = 70^{\circ}C$ )	95	W
$T_J$	Max. operating junction temperature	165	$^{\circ}C$
$T_{STG}$	Storage temperature	-65 to +150	$^{\circ}C$

## 1.2 Thermal data

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thJC}$	Junction - case thermal resistance	1.0	$^{\circ}C/W$

## 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
$C_{\text{ISS}}$	$V_{\text{GS}} = 0\text{ V}$	$V_{\text{DS}} = 7\text{ V}$		77		pF
$C_{\text{OSS}}$	$V_{\text{GS}} = 0\text{ V}$	$V_{\text{DS}} = 7\text{ V}$		54		pF
$C_{\text{RSS}}$	$V_{\text{GS}} = 0\text{ V}$	$V_{\text{DS}} = 7\text{ V}$		2.3		pF

### 2.2 Dynamic

**Table 5. Dynamic**

Symbol	Test conditions		Min.	Typ.	Max.	Unit
P3dB	$V_{\text{DD}} = 7.5\text{ V}$ , $I_{\text{DQ}} = 300\text{ mA}$	$f = 870\text{ MHz}$	10	12		W
$G_{\text{P}}$	$V_{\text{DD}} = 7.5\text{ V}$ , $I_{\text{DQ}} = 300\text{ mA}$ , $P_{\text{OUT}} = 2\text{ W}$ , $f = 870\text{ MHz}$		15	16.3		dB
$h_{\text{D}}$	$V_{\text{DD}} = 7.5\text{ V}$ , $I_{\text{DQ}} = 300\text{ mA}$ , $P_{\text{OUT}} = \text{P3dB}$ , $f = 870\text{ MHz}$		60	73		%
Load mismatch	$V_{\text{DD}} = 9.5\text{ V}$ , $I_{\text{DQ}} = 300\text{ mA}$ , $P_{\text{OUT}} = 20\text{ W}$ , $f = 870\text{ MHz}$ 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

## 2.4 Moisture sensitivity level

Table 7. Moisture sensitivity level

Test methodology	Rating
J-STD-020B	MSL 3

## 3 Impedance

Figure 2. Current conventions

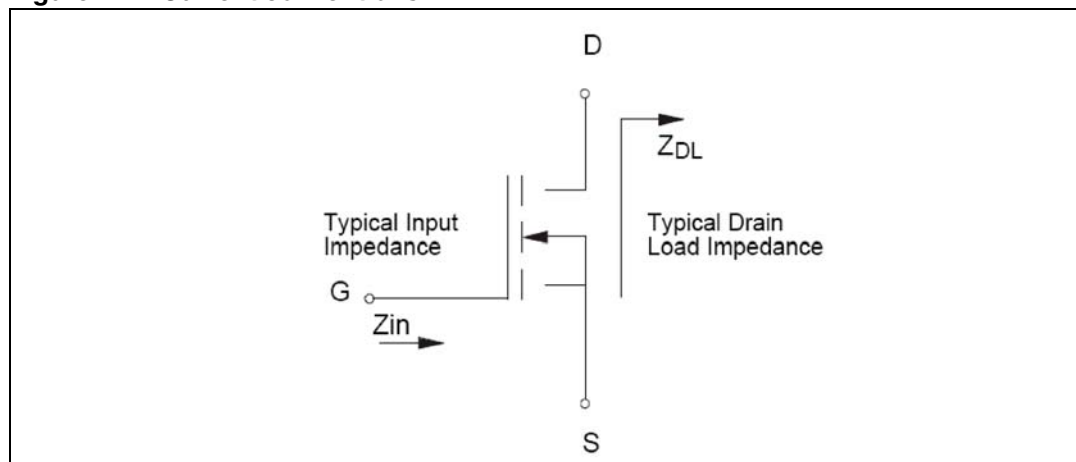


Table 8. Impedance data

Frequency (MHz)	$Z_{IN} (\Omega)$	$Z_{DL}(\Omega)$
870 MHz	$0.35 + j 1.1$	$1.53 - j 0.23$

# 4 Typical performance

Figure 3. Threshold voltage

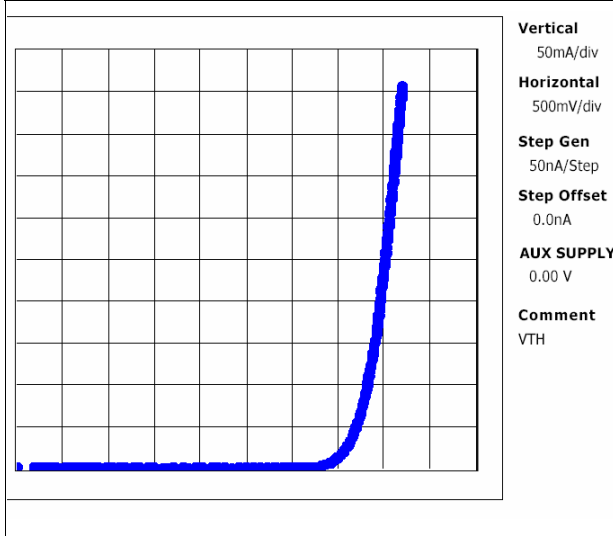


Figure 4. DC output characteristic

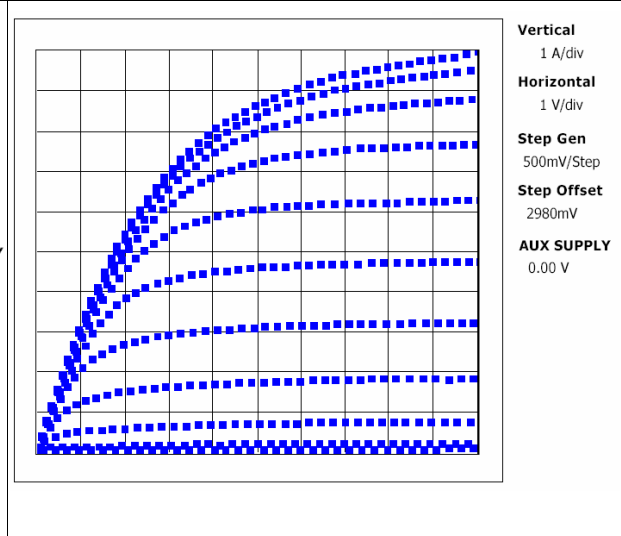


Figure 5. ID vs VGS

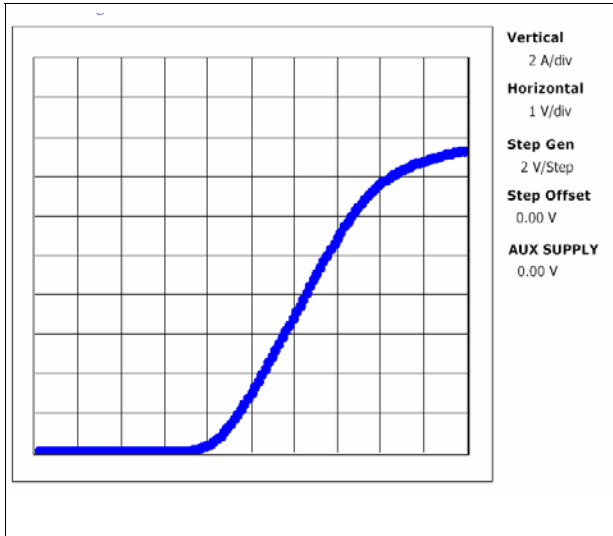


Figure 6. Capacitances vs voltage

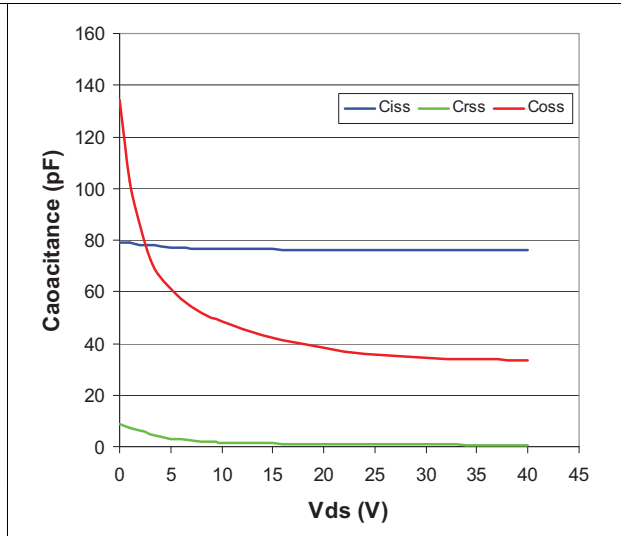


Figure 7. Pout and Id vs VGS

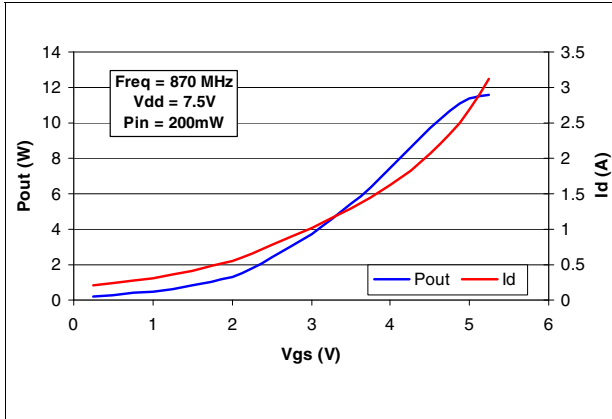


Figure 8. Pout and Id vs supply voltage @ Pin = 200 mW

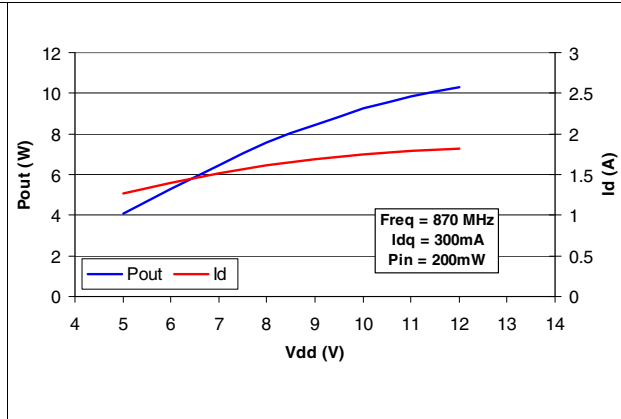


Figure 9. Pout and id vs supply voltage @ Pin = 400 mW

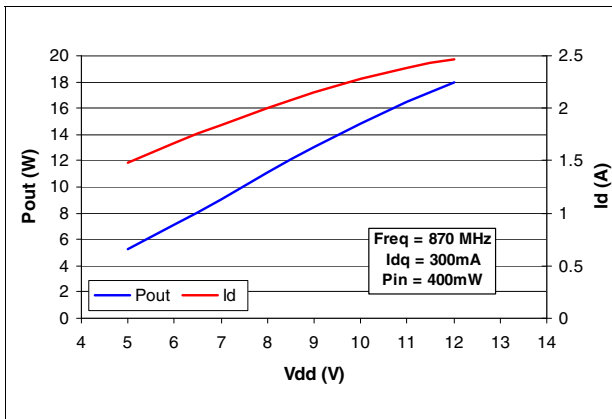


Figure 10. Pout and id vs supply voltage @ Pin = 800 mW

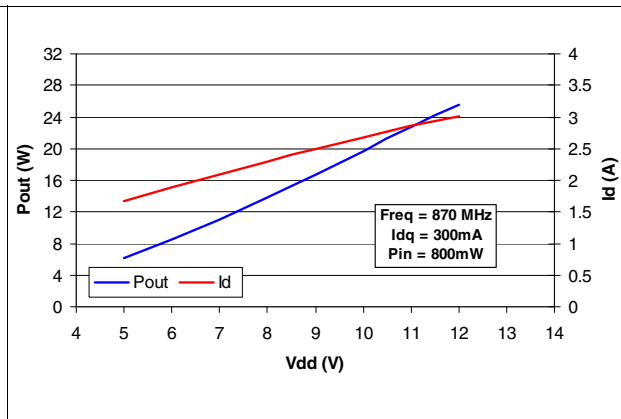


Figure 11. Gain vs Pout and bias current

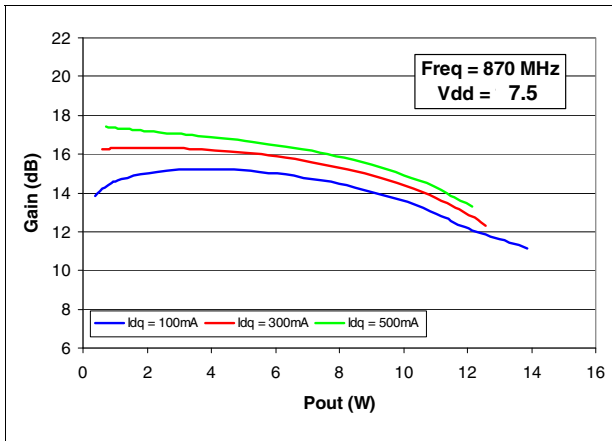
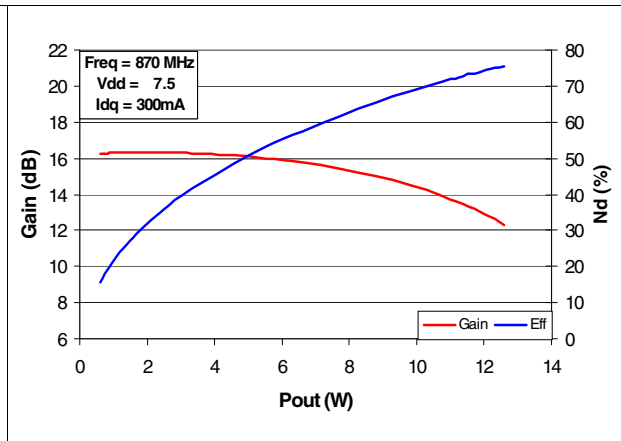


Figure 12. Gain and efficiency vs Pout



## 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<sup>®</sup> 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

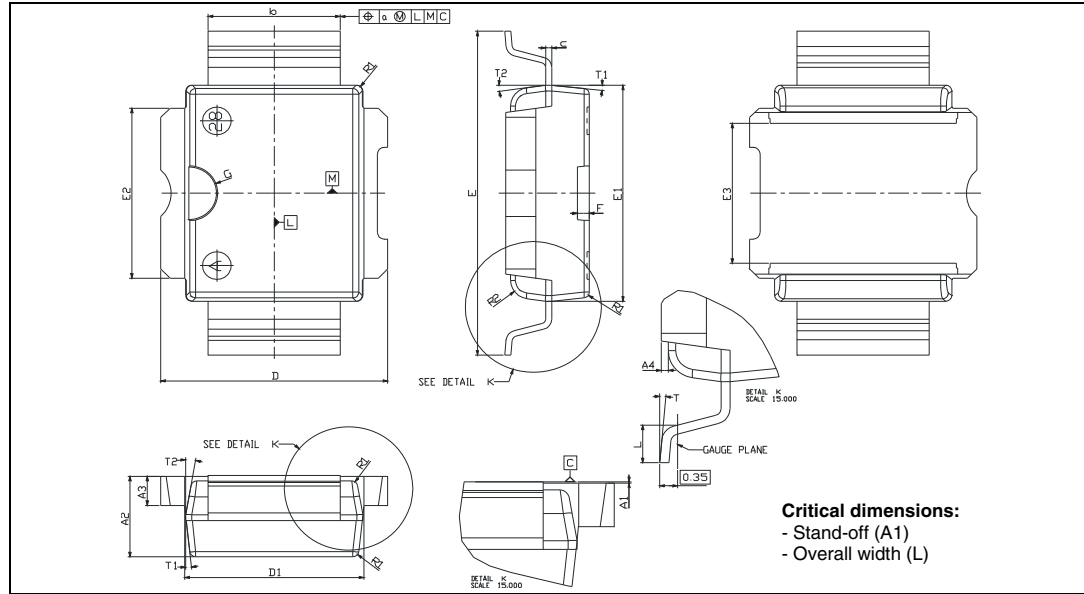


Table 10. PowerSO-10RF straight lead mechanical data

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

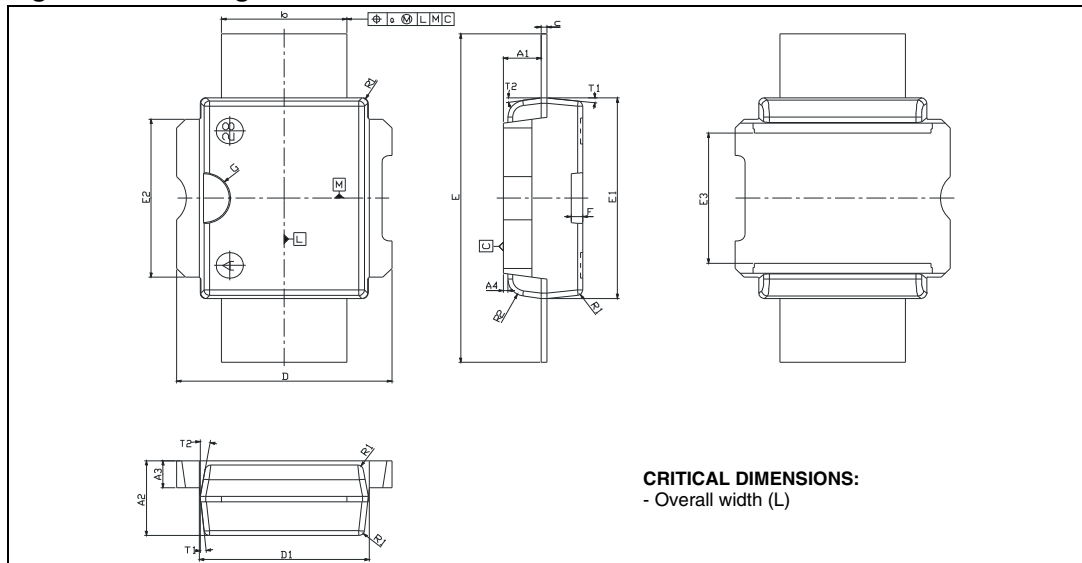


Figure 15. Tube information

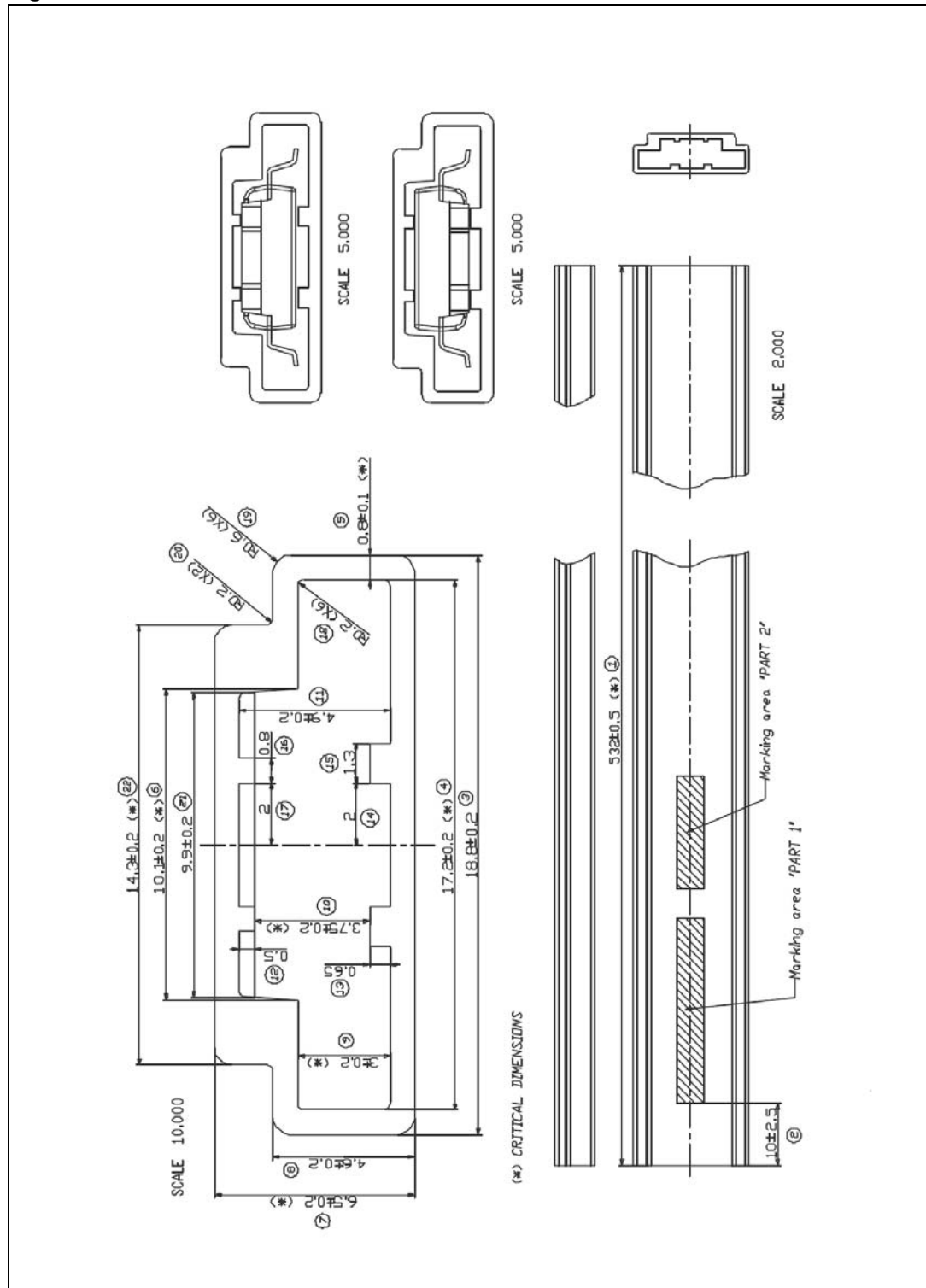
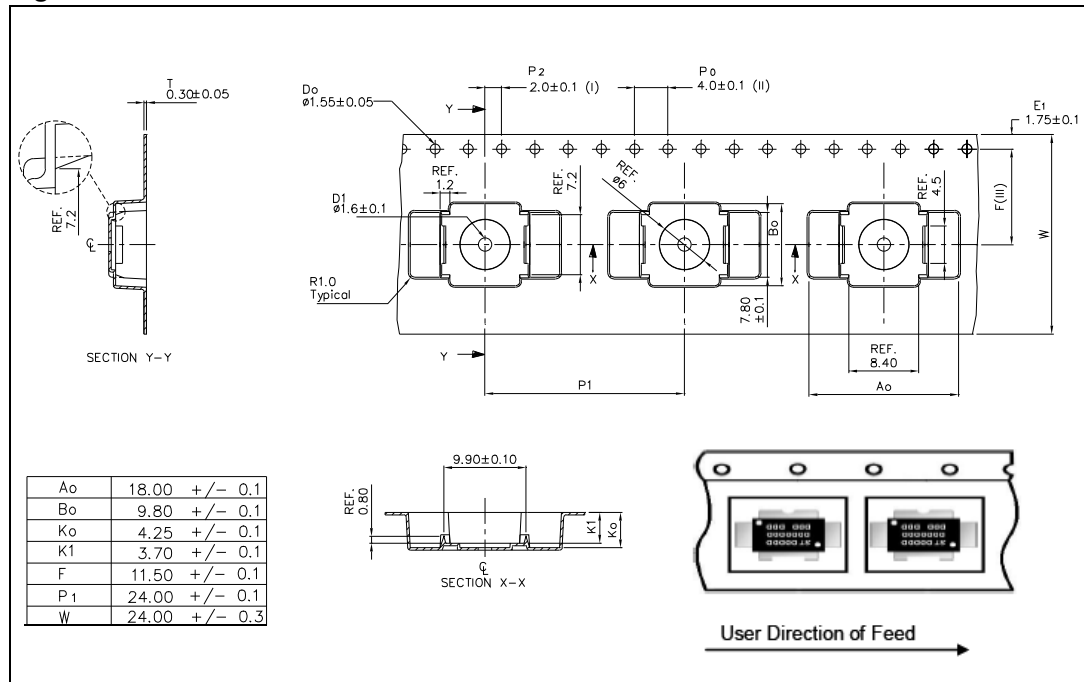


Figure 16. Reel information



## 6 Revision history

**Table 11. Document revision history**

Date	Revision	Changes
31-Jul-2007	1	Initial release.
04-May-2011	2	Updated <a href="#">Table 4 on page 4</a> and <a href="#">Figure 16: Reel information</a> .
07-Jun-2012	3	Removed commercial PD84010S-E and updated <a href="#">Table 1: Device summary</a> .

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