

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

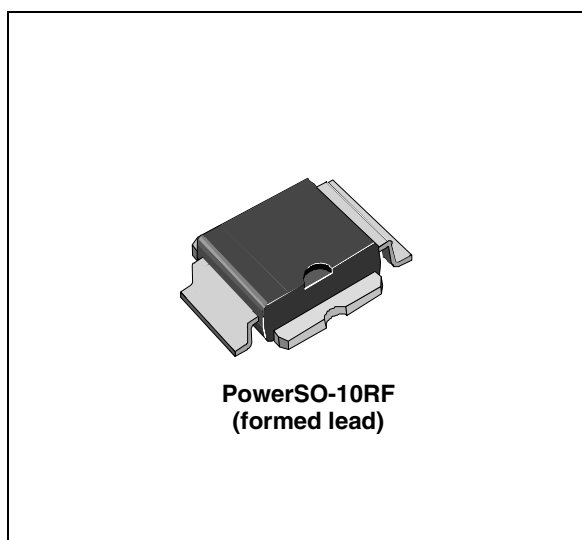
Datasheet –production data

### Features

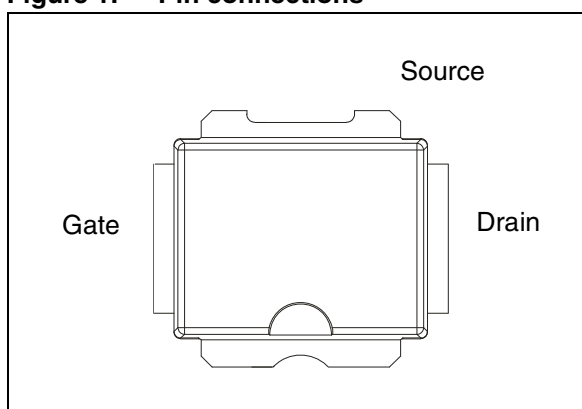
- Excellent thermal stability
- Common source configuration
- Broadband performances:  $P_{OUT} = 6\text{ W}$  with 13 dB gain @ 870 MHz
- Plastic package
- ESD protection
- In compliance with the 2002/95/EC European directive

### Description

The PD84006-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 V in common source mode at frequencies of up to 1 GHz 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's superior linearity performance makes it an ideal solution for portable radio and UHF RFID reader. 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 connections**



**Table 1. Device summary**

Order code	Package	Packaging
PD84006-E	PowerSO-10RF (formed lead)	Tube

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# 1 Electrical data

## 1.1 Maximum ratings

( $T_{\text{CASE}} = 25\text{ °C}$ )

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{(\text{BR})\text{DSS}}$	Drain-source voltage	25	V
$V_{\text{GS}}$	Gate-source voltage	-0.5 to +15	V
$I_{\text{D}}$	Drain current	5	A
$P_{\text{DISS}}$	Power dissipation (@ $T_{\text{C}} = 70\text{ °C}$ )	59	W
$T_{\text{J}}$	Max. operating junction temperature	165	°C
$T_{\text{STG}}$	Storage temperature	-65 to +150	°C

## 1.2 Thermal data

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{\text{thJC}}$	Junction - case thermal resistance	1.6	°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	$\mu\text{A}$
$V_{\text{GS(Q)}}$	$V_{\text{DS}} = 10\text{ V}$	$I_{\text{D}} = 150\text{ mA}$	3.0		4.3	V
$V_{\text{DS(ON)}}$	$V_{\text{GS}} = 10\text{ V}$	$I_{\text{D}} = 1\text{ A}$		0.34		V
$C_{\text{ISS}}$	$V_{\text{GS}} = 0\text{ V}$	$V_{\text{DS}} = 7\text{ V}$		40		pF
$C_{\text{OSS}}$	$V_{\text{GS}} = 0\text{ V}$	$V_{\text{DS}} = 7\text{ V}$		33		pF
$C_{\text{RSS}}$	$V_{\text{GS}} = 0\text{ V}$	$V_{\text{DS}} = 7\text{ V}$		1.45		pF

### 2.2 Dynamic

**Table 5. Dynamic**

Symbol	Test conditions	Min	Typ	Max	Unit
$P_{3\text{dB}}$	$V_{\text{DD}} = 7.5\text{ V}$ , $I_{\text{DQ}} = 150\text{ mA}$ $f = 870\text{ MHz}$	5	6	-	W
$G_{\text{P}}$	$V_{\text{DD}} = 7.5\text{ V}$ , $I_{\text{DQ}} = 150\text{ mA}$ , $P_{\text{OUT}} = 2\text{ W}$ , $f = 870\text{ MHz}$	15			dB
$h_{\text{D}}$	$V_{\text{DD}} = 7.5\text{ V}$ , $I_{\text{DQ}} = 150\text{ mA}$ , $P_{\text{OUT}} = P_{3\text{dB}}$ , $f = 870\text{ MHz}$	50	60		%
Load mismatch	$V_{\text{DD}} = 9.5\text{ V}$ , $I_{\text{DQ}} = 150\text{ mA}$ , $P_{\text{OUT}} = 8\text{ W}$ , $f = 870\text{ MHz}$ All phase angles	20:1			VSWR

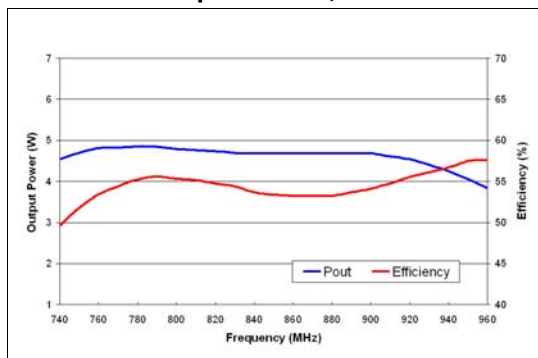
### 2.3 ESD protection characteristics

**Table 6. ESD protection characteristics**

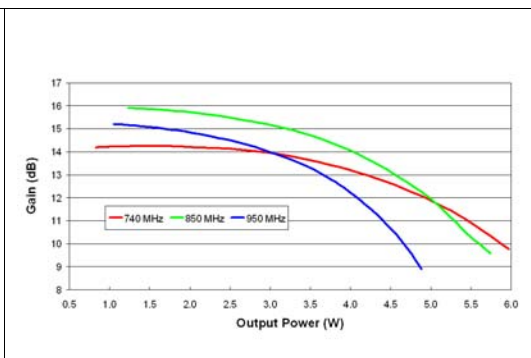
Test conditions	Class
Human body model	2
Machine model	M3

### 3 Typical performances

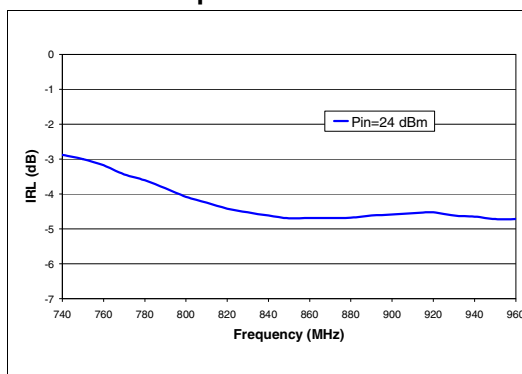
**Figure 2.** Output power and efficiency vs. frequency  $V_{dd} = 7.2$  V,  $I_{dq} = 200$  mA,  $P_{in} = 24$  dBm



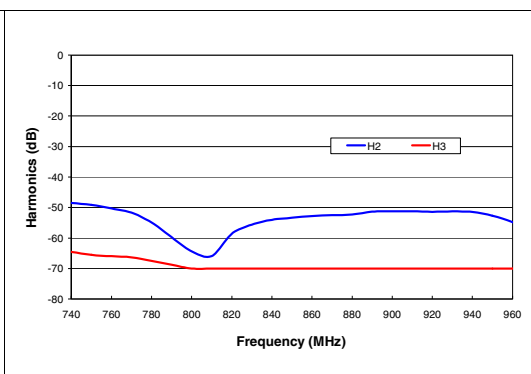
**Figure 3.** Gain vs. output power  $V_{dd} = 7.2$  V,  $I_{dq} = 200$  mA



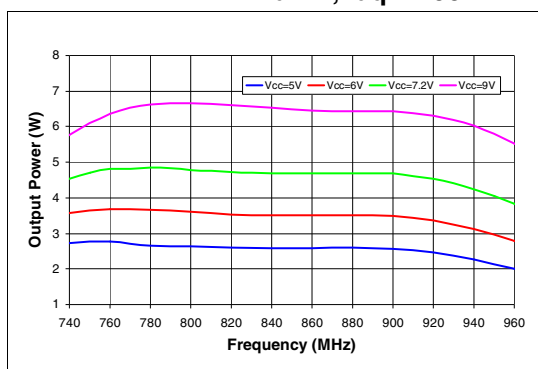
**Figure 4.** Input return loss vs. frequency  $V_{dd} = 7.2$  V,  $I_{dq} = 200$  mA



**Figure 5.** Harmonics vs. frequency  $V_{dd} = 7.2$  V,  $I_{dq} = 200$  mA,  $P_{in} = 24$  dBm



**Figure 6.** Output power vs. frequency and supply voltage  $P_{in} = 24$  dBm,  $I_{dq} = 200$  mA



## 4 Package mechanical data

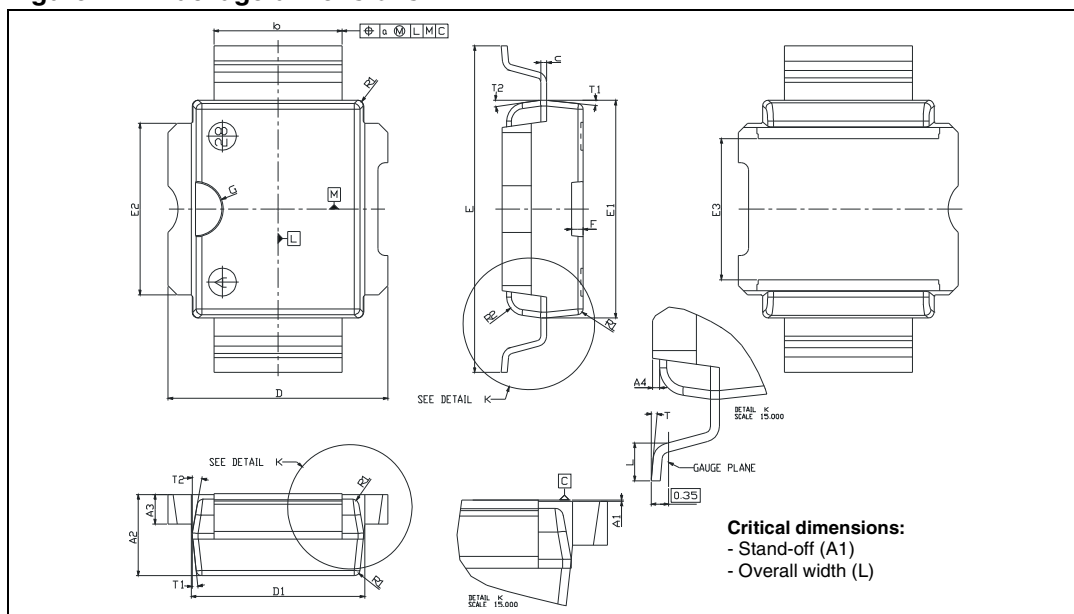
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK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

**Table 7. 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	

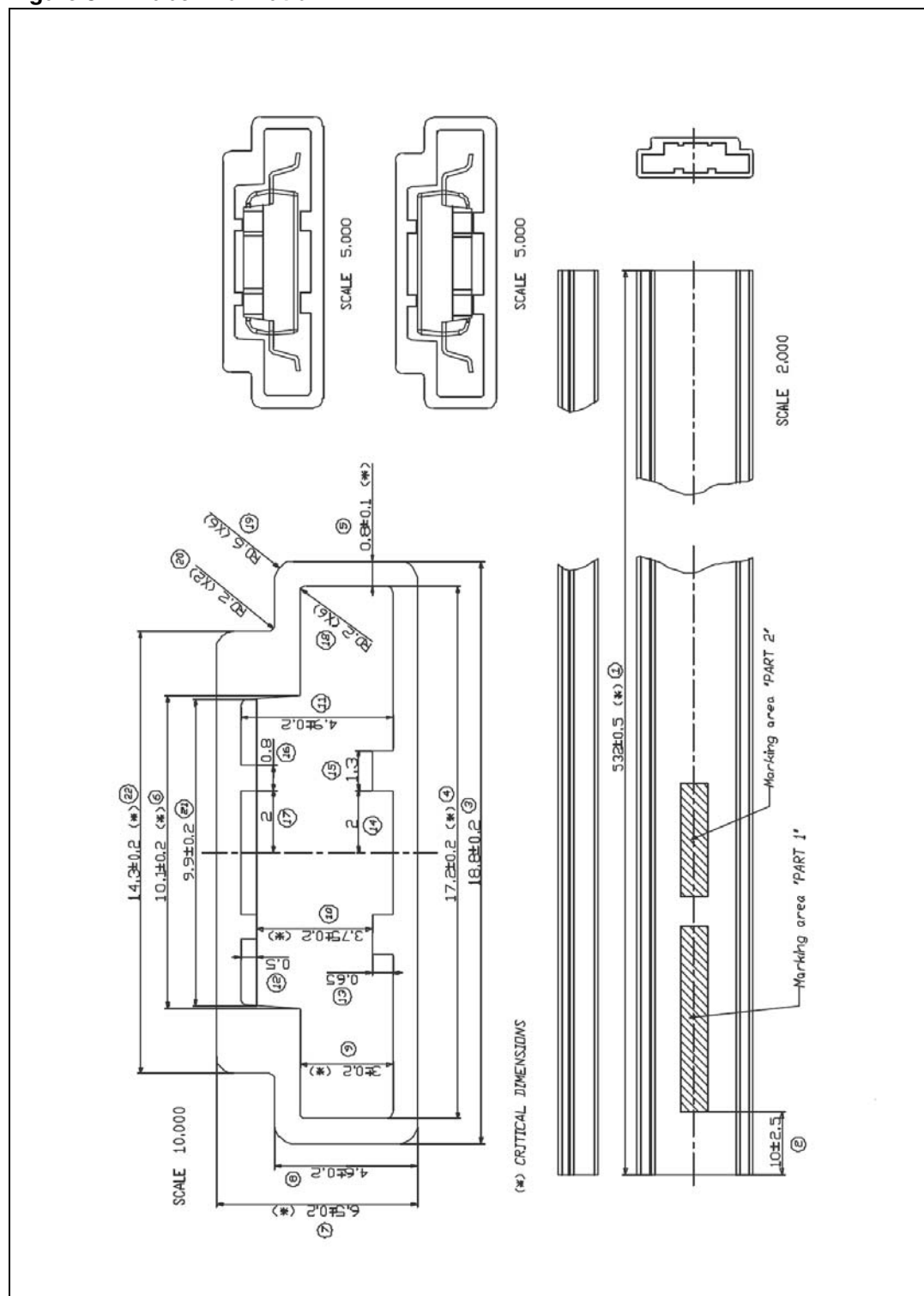
**Note:** *Resin protrusions not included (max value: 0.15 mm per side)*

Figure 7. Package dimensions





**Figure 8. Tube information**



## 5 Revision history

**Table 8. Document revision history**

Date	Revision	Changes
07-Aug-2009	1	Initial release.
23-May-2012	2	Updated $V_{GS(Q)}$ in <a href="#">Table 4: Static</a> .

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