

## 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 11 dB gain @ 2 GHz / 13.6 V
- Plastic package
- ESD protection
- In compliance with the 2002/95/EC European directive

### Description

The PD20010-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. PD20010-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. PD20010-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.

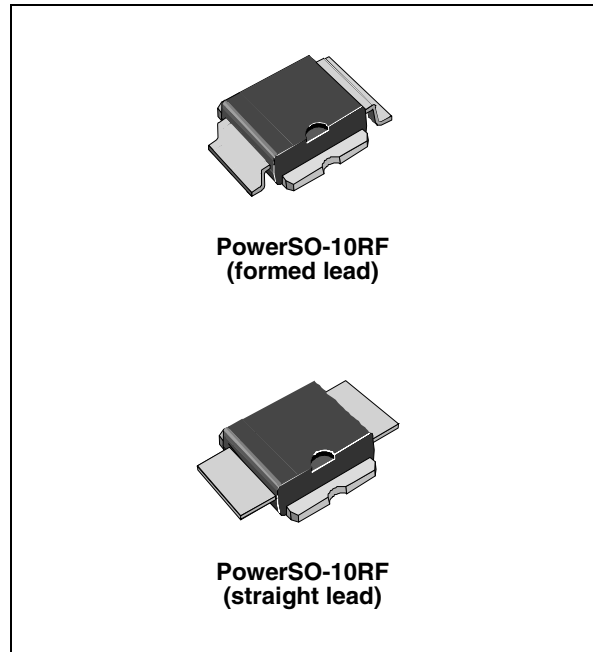


Figure 1. Pin connection

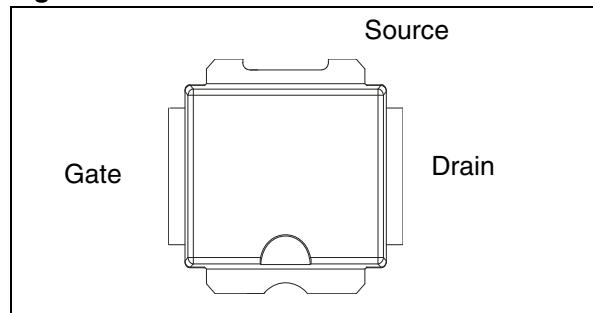


Table 1. Device summary

Order codes	Packages	Packing
PD20010-E	PowerSO-10RF (formed lead)	Tube
PD20010S-E	PowerSO-10RF (straight lead)	Tube
PD20010TR-E	PowerSO-10RF (formed lead)	Tape and reel
PD20010STR-E	PowerSO-10RF (straight lead)	Tape and reel

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# 1 Electrical data

## 1.1 Maximum ratings

$T_{CASE} = 25\text{ °C}$

**Table 2. Absolute maximum ratings**

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	5	A
$P_{DISS}$	Power dissipation (@ $T_C = 70\text{ °C}$ )	59	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	1.6	°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	$\mu\text{A}$
$I_{GSS}$	$V_{GS} = 5\text{ V}$	$V_{DS} = 0\text{ V}$			1	$\mu\text{A}$
$V_{GS(Q)}$	$V_{DS} = 10\text{ V}$	$I_D = 150\text{ mA}$	3.0		4.3	V
$V_{DS(ON)}$	$V_{GS} = 10\text{ V}$	$I_D = 1\text{ A}$		0.34		V
$C_{ISS}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 12.5\text{ V}$		45		pF
$C_{OSS}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 12.5\text{ V}$		36		pF
$C_{RSS}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 12.5\text{ V}$		1.2		pF

### 2.2 Dynamic

Table 5. Dynamic

Symbol	Test conditions		Min.	Typ.	Max.	Unit
P3dB	$V_{DD} = 13.6\text{ V}$ , $I_{DQ} = 150\text{ mA}$	$f = 2000\text{ MHz}$	10	15		W
$G_P$	$V_{DD} = 13.6\text{ V}$ , $I_{DQ} = 150\text{ mA}$ , $P_{OUT} = 10\text{ W}$	$f = 2000\text{ MHz}$	10	11		dB
$\eta_D$	$V_{DD} = 13.6\text{ V}$ , $I_{DQ} = 150\text{ mA}$ , $P_{OUT} = P_{3dB}$	$f = 2000\text{ MHz}$	45	53		%
Load mismatch	$V_{DD} = 15.5\text{ V}$ , $I_{DQ} = 300\text{ mA}$ , $P_{OUT} = 10\text{ W}$	$f = 2000\text{ MHz}$ 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 conditions	Rating
J-STD-020B	MSL 3

### 3 Typical performance

Figure 2. Drain current vs. gate voltage Figure 3. DC output characteristics

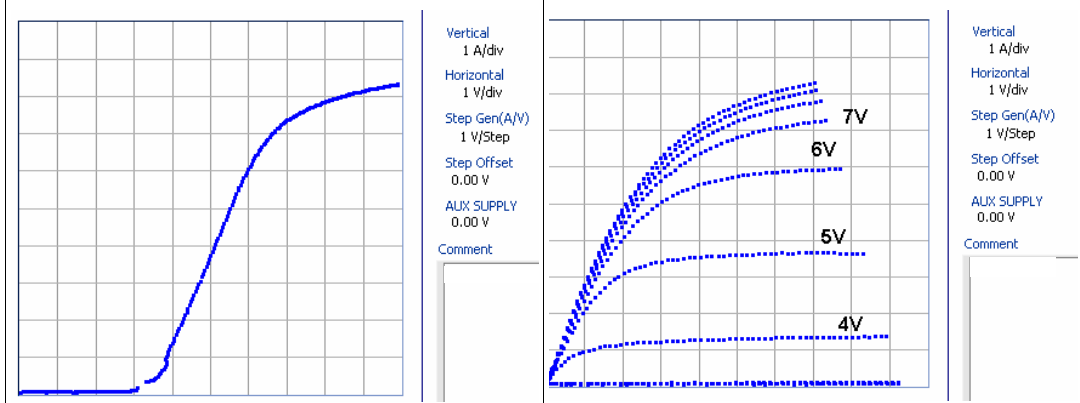
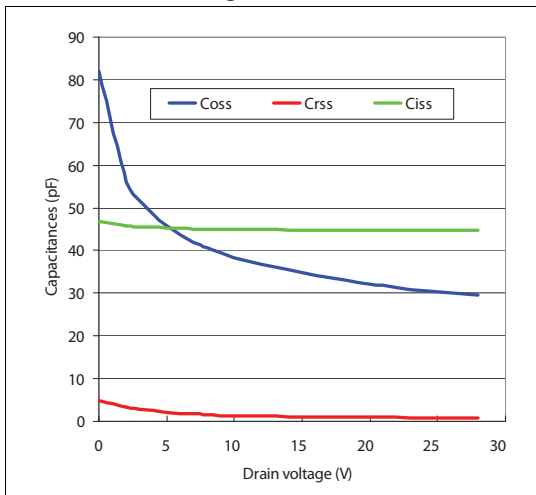


Figure 4. Capacitances vs. drain voltage



## 4 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 8. 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 5. Package dimensions

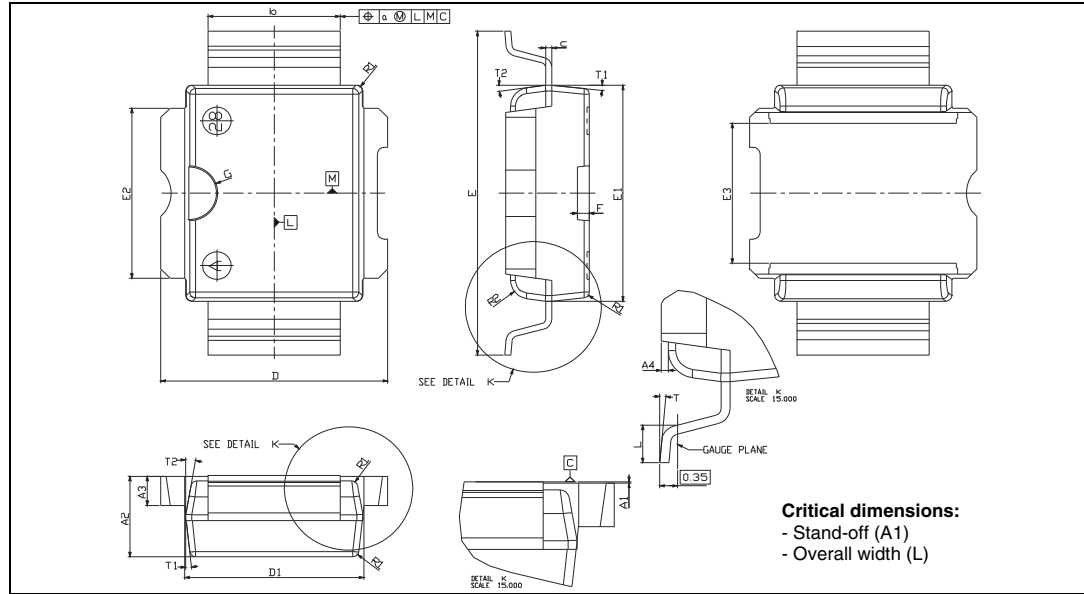


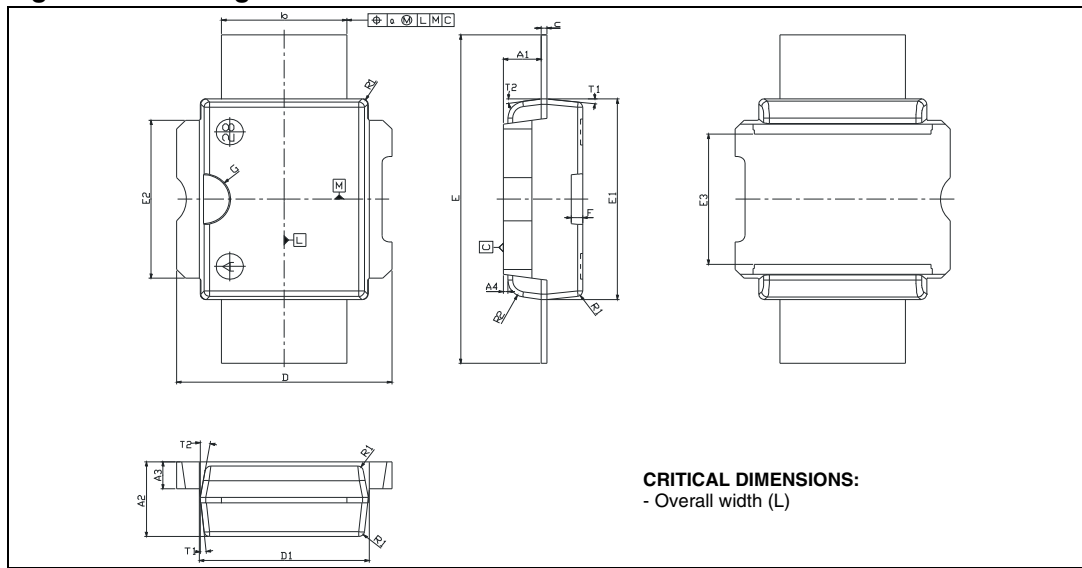
Table 9. PowerSO-10RF straight lead mechanical data

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 6. Package dimensions



**CRITICAL DIMENSIONS:**  
- Overall width (L)

Figure 7. Tube information

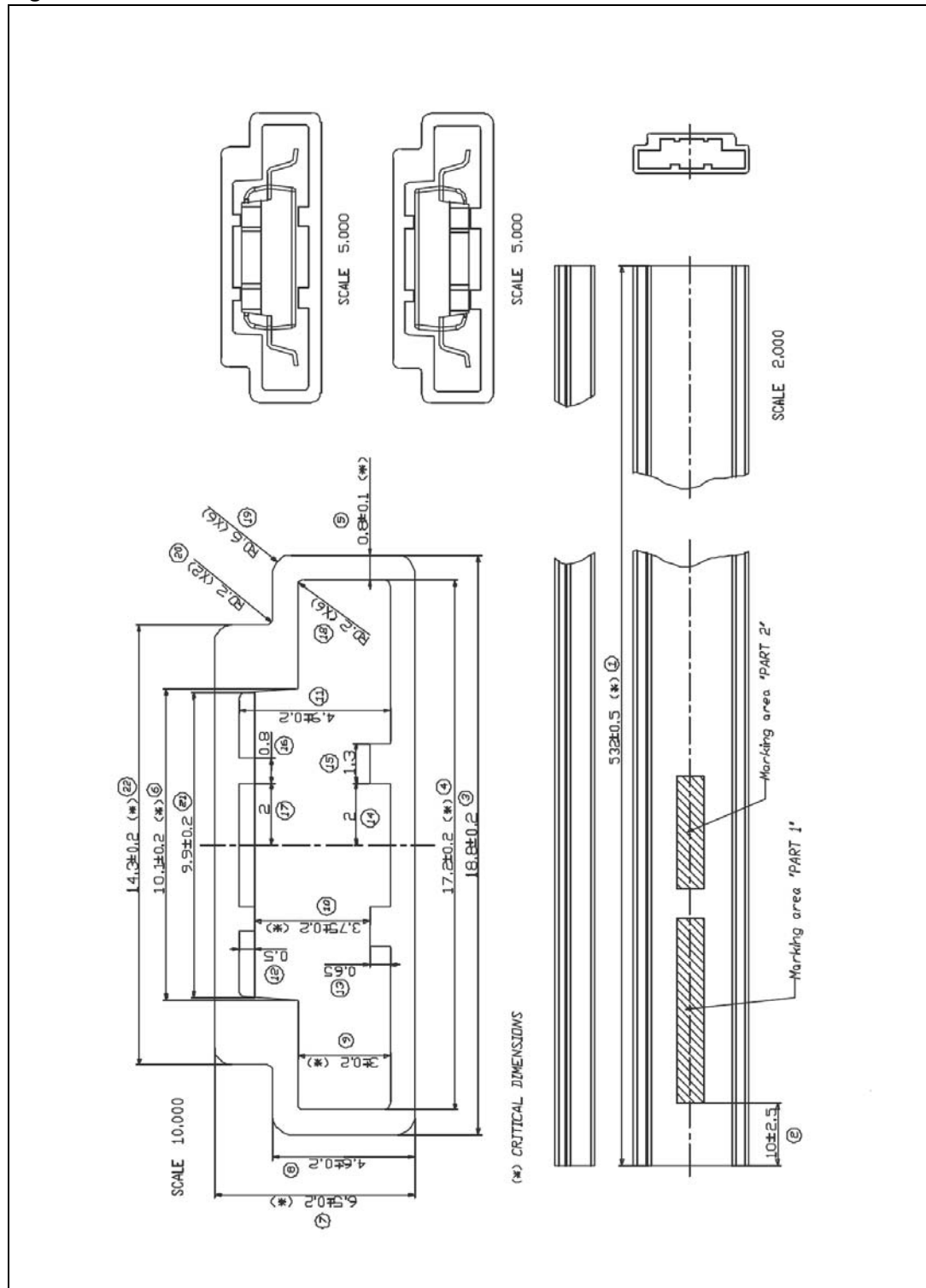
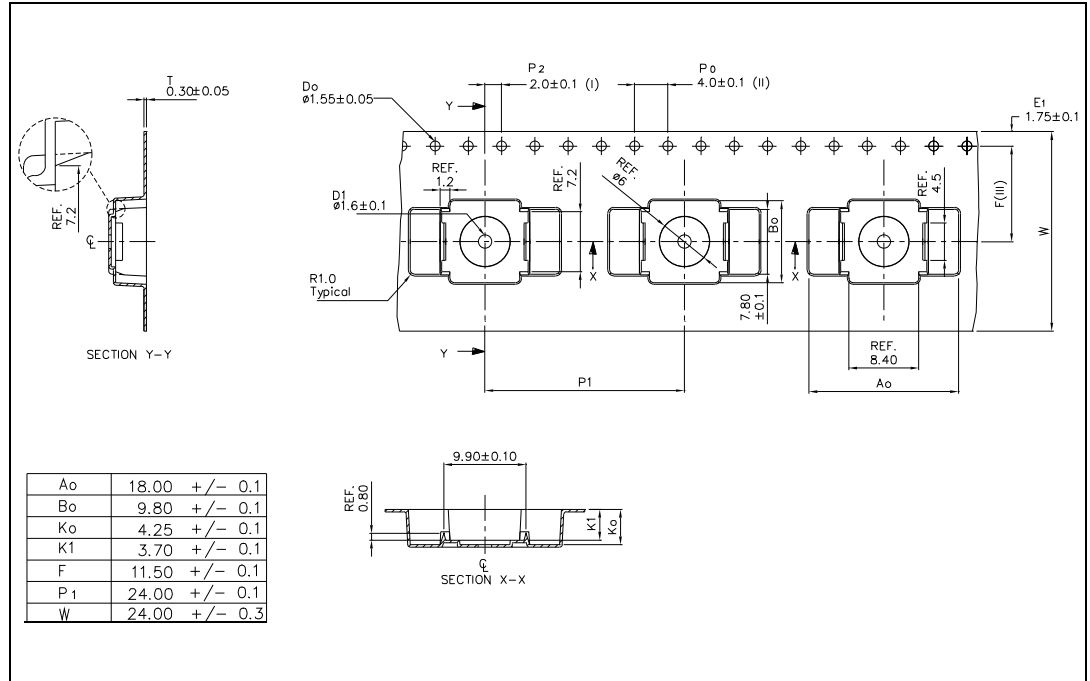


Figure 8. Reel information



## 5 Revision history

**Table 10. Document revision history**

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

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