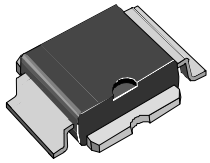
PD85006-E

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

Features

- Excellent thermal stability
- Common source configuration
- Broadband performances:
  P_{OUT} = 6 W with 15 dB gain @ 870 MHz/13.6 V
- Plastic package
- ESD protection
- In compliance with the 2002/95/EC european directive



PowerSO-10RF
(formed lead)

Description

The PD85006-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. PD85006-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's superior linearity performance makes it an ideal solution for mobile 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 performance and ease of assembly. Mounting recommendations are available in www.st.com/rf (search for AN1294).

Figure 1. Pin connections

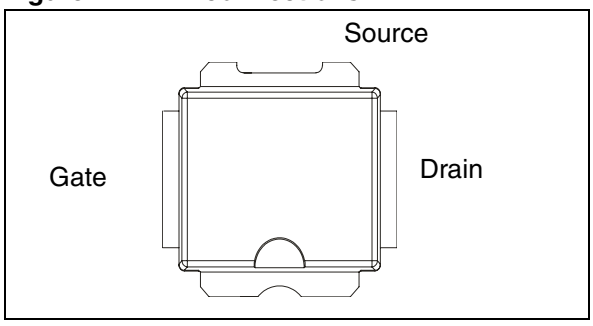


Table 1. Device summary

Order codes	Packages	Packaging
PD85006-E	PowerSO-10RF (formed lead)	Tube
PD85006TR-E	PowerSO-10RF (formed lead)	Tape and reel

Contents

1 Electrical data

1.1 Maximum ratings

Table 2. Absolute maximum ratings (T_{CASE} = 25 °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	2	A
P_{DISS}	Power dissipation (@ T_C = 70 °C)	36.5	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	2.6	°C/W

2 Electrical characteristics

T_{CASE} = +25 °C

2.1 Static

Table 4. Static

Symbol	Test conditions			Min	Typ	Max	Unit
I_{DSS}	V_{GS} = 0V	V_{DS} = 25 V		-		1	µA
I_{GSS}	V_{GS} = 5 V	V_{DS} = 0 V				1	µA
$V_{GS(Q)}$	V_{DS} = 13.6 V	I_D = 200 mA			4		V
$V_{DS(ON)}$	V_{GS} = 10 V	I_D = 0.25 A			0.27		V
C_{ISS}	V_{GS} = 0V	V_{DS} = 13.6 V	f = 1 MHz		16		pF
C_{OSS}	V_{GS} = 0V	V_{DS} = 13.6 V	f = 1 MHz		14		pF
C_{RSS}	V_{GS} = 0V	V_{DS} = 13.6 V	f = 1 MHz		1.1		pF

2.2 Dynamic

Table 5. Dynamic

Symbol	Test conditions	Min	Typ	Max	Unit
P_{OUT}	V_{DD} = 13.6 V, I_{DQ} = 200 mA, P_{IN} = 0.1 W, f = 870 MHz	5	6	-	W
G_P	V_{DD} = 13.6 V, I_{DQ} = 200 mA, P_{OUT} = 5 W, f = 870 MHz	15	17		dB
h_D	V_{DD} = 13.6 V, I_{DQ} = 200 mA, P_{OUT} = 5 W, f = 870 MHz	55	63		%
Load mismatch	V_{DD} = 13.6 V, I_{DQ} = 200 mA, P_{OUT} = 5 W, f = 870 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 Impedances

Figure 2. Impedances

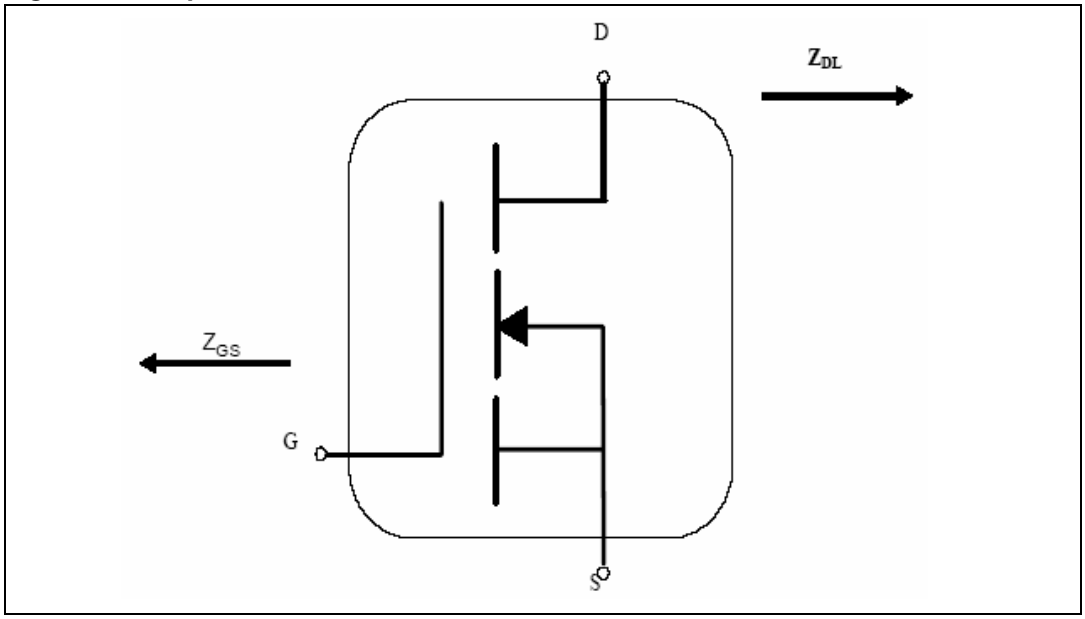


Table 7. Broadband impedances

F(MHz)	Z_{GS}	Z_{DL}
860	2.66+ j 4.28	6.23+ j 5.71
880	2.81+ j 4.35	6.46+ j 6.20
900	2.88+ j 4.34	6.73 + j 6.66
920	2.87+ j 4.25	7.06+ j 7.06
940	2.68+ j 4.20	7.40+ j 7.45
960	2.39+ j 4.20	7.80+ j 7.75

4 DC curves

Figure 3. Output power and efficiency vs. frequency 13.6 V / 200 mA / Pin = 21 dBm

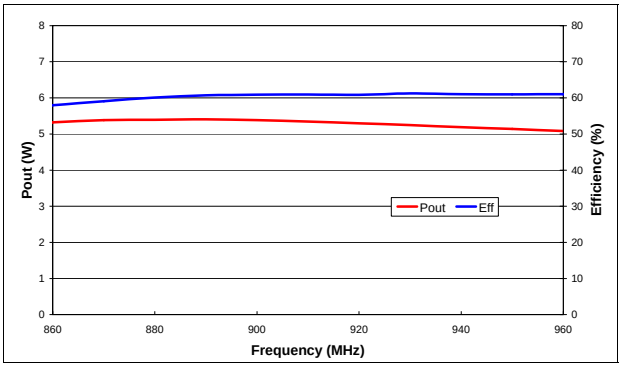


Figure 4. Gain vs. frequency 13.6 V / 200 mA

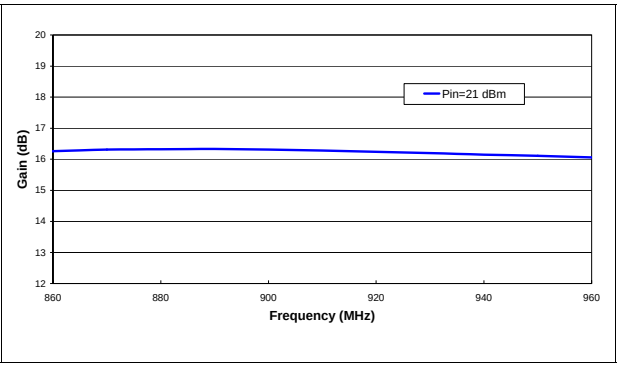


Figure 5. Input return loss vs. frequency 13.6 V / 200 mA

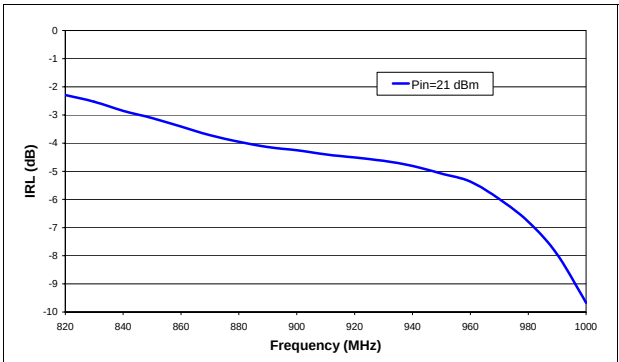


Figure 6. Gain vs. pout 13.6 V / 200 mA

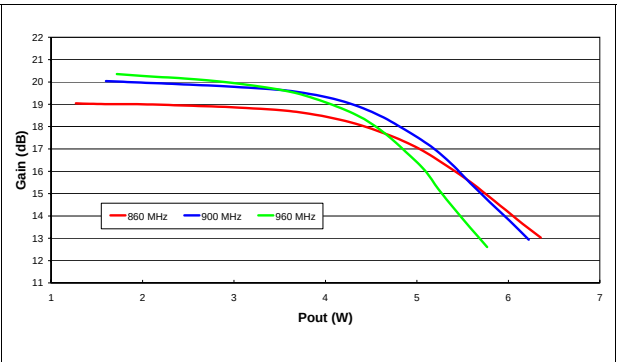


Figure 7. Id vs. pin 13.6 V / 200 mA

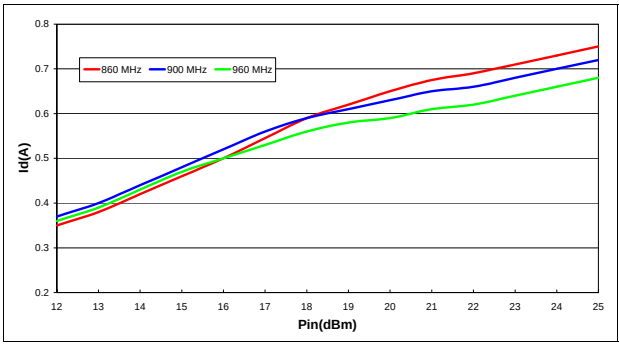


Figure 8. Pout vs. pin 13.6 V / 200 mA

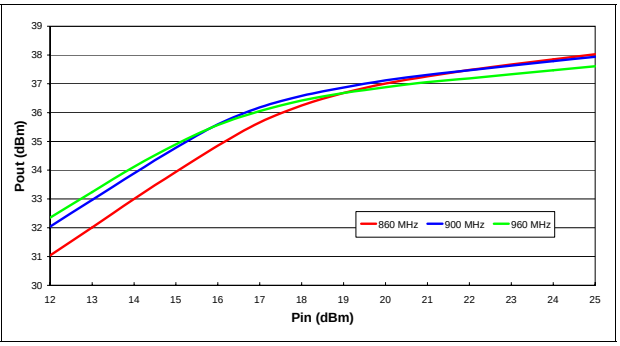


Figure 9. DC output characteristics

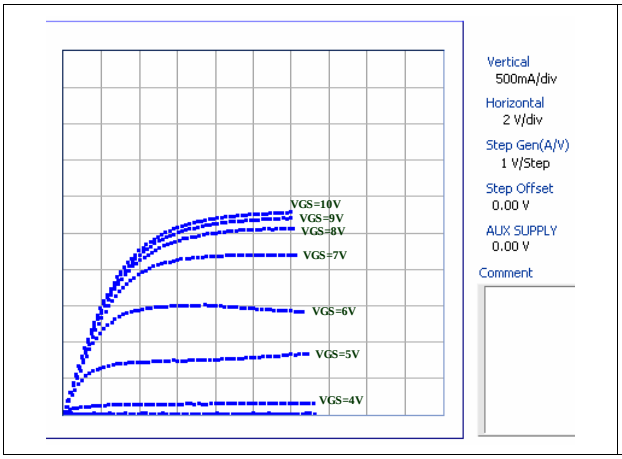


Figure 10. I_D vs. V_{GS}

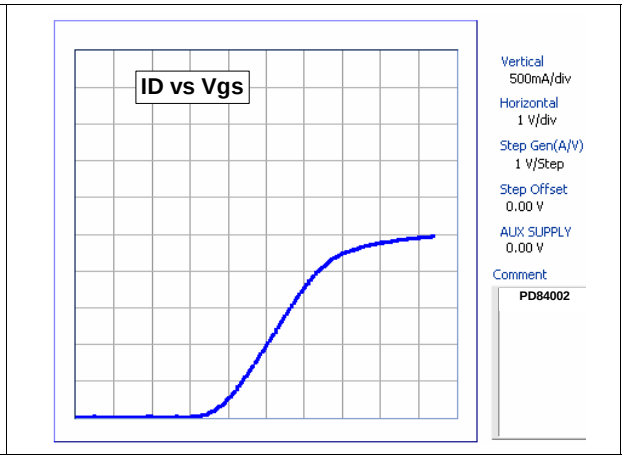
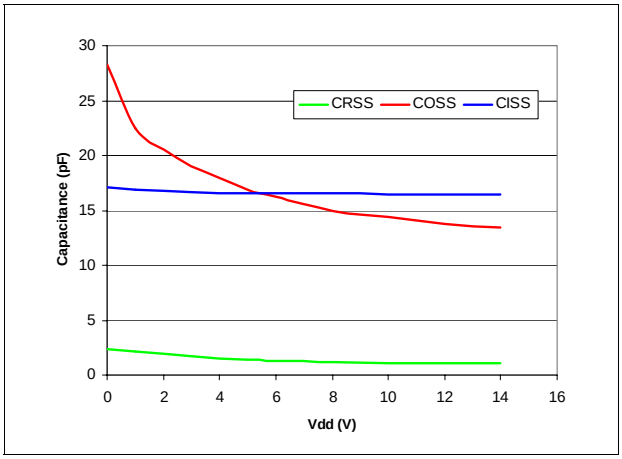


Figure 11. Capacitances vs. drain voltage



5 RF curves

Figure 12. Output power and efficiency vs. frequency 13.6 V / 200 mA / Pin = 21 dBm

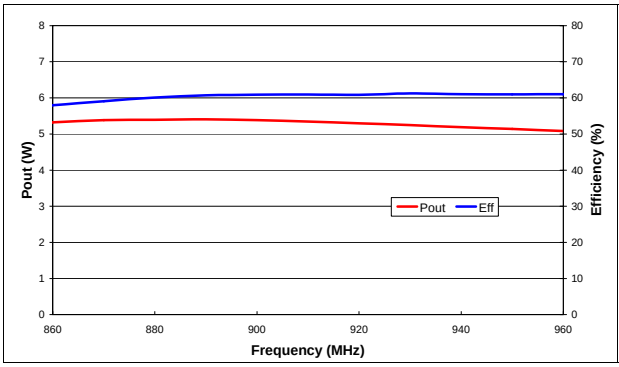


Figure 13. Gain vs. frequency 13.6 V / 200 mA

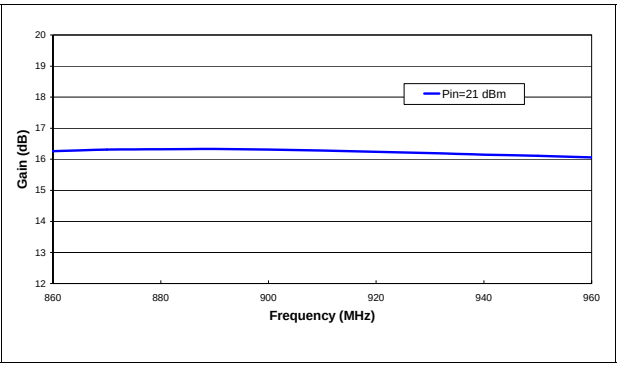


Figure 14. Input return loss vs. frequency 13.6 V / 200 mA

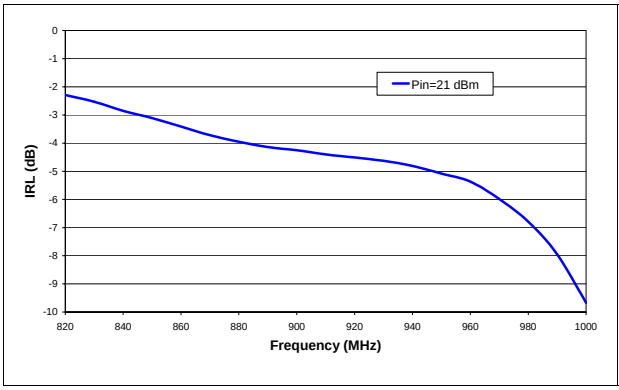


Figure 15. Gain vs. pout 13.6 V / 200 mA

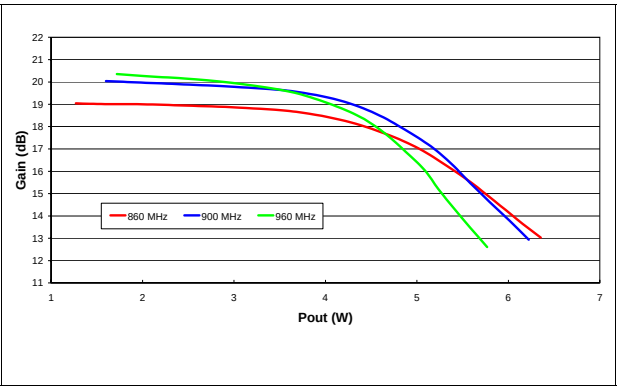


Figure 16. Id vs. pin 13.6 V / 200 mA

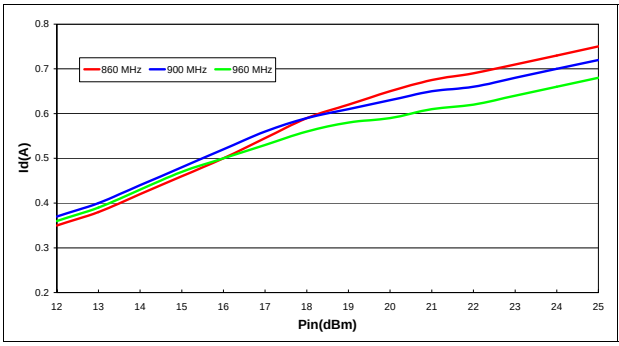


Figure 17. Pout vs. pin 13.6 V / 200 mA

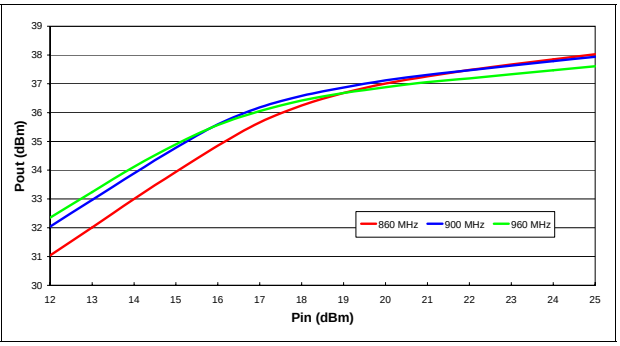
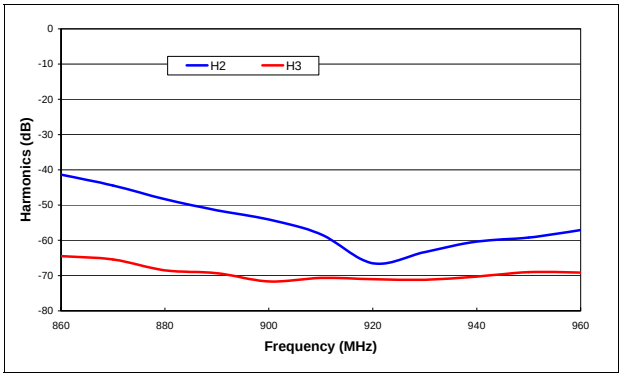


Figure 18. Harmonics vs. frequency 13.6 V / 200 mA



6 Schematic and bill of material

Figure 19. Schematic and bill of material

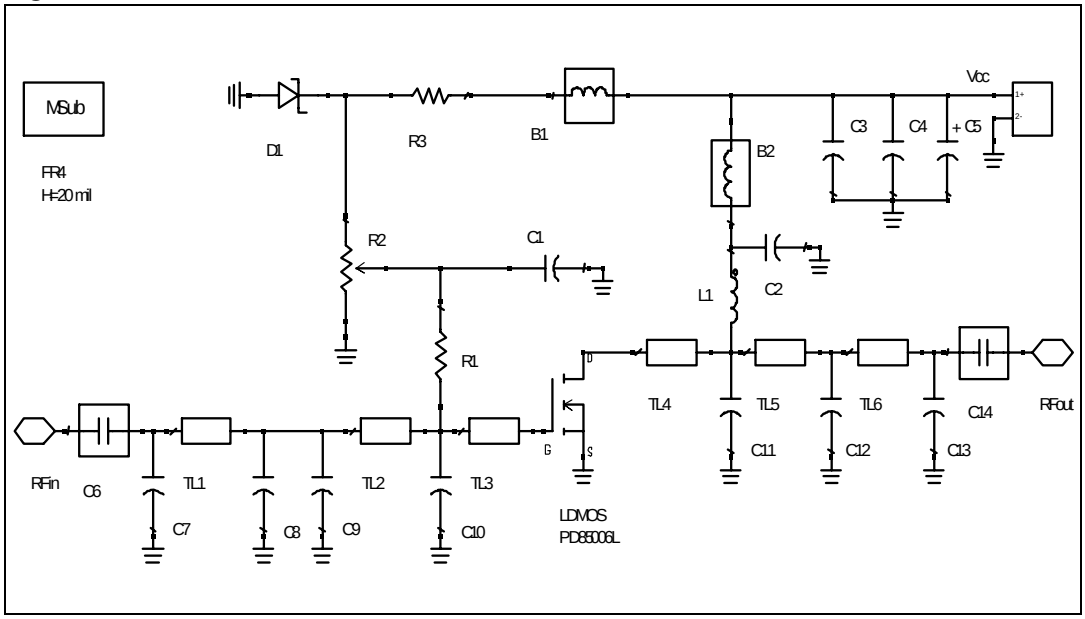


Table 8. Components part list

Component ID	Description	Value	Case size	Manufacturer	Part code
B1	Ferrite Bead			Panasonic	EXCELDRC35C
B2	Ferrite Bead			Panasonic	EXCELDRC35C
C1, C2	Capacitor	120 pF	0603	Murata	GRM39-C0G121J50D500
C3	Capacitor	1 nF	0603	Murata	GRM39-X7R102K50C560
C4	Capacitor	10 nF	0603	Murata	GRM39-X7R103K50C560
C5	Capacitor	10 µF	SMT	Panasonic	EEVHB1V100P
C6, C14	Capacitor	39 pF	0603	Murata	GRM39-C0G390J50D500
C7	Capacitor	3.3 pF	0603	Murata	GRM39-C0G3R3C50Z500
C8	Capacitor	2.7 pF	0603	Murata	GRM39-C0G2R7C50Z500
C9	Capacitor	12 pF	0603	Murata	GRM39-C0G120J50D500
C10	Capacitor	22 pF	0603	Murata	GRM39-C0G220J50D500
C11	Capacitor	8.2 pF	0603	Murata	GRM39-C0G8R2D50Z500
C12	Capacitor	6,8 pF	0603	Murata	GRM39-C0G6R8D50Z500
C13	Capacitor	3.9 pF	0603	Murata	GRM39-C0G3R9C50Z500
D1	Zener Diode	5.1 V	SOD110	Philips	BZX284C5V1
L1	Inductor	12.55 nH		Coilcraft	1606-10
R1	Resistor	510 Ω	0603	Tyco electronics	

Table 8. Components part list (continued)

Component ID	Description	Value	Case size	Manufacturer	Part code
R2	Potentiometer	10 kΩ		Bourns electronics	3214W-1-103E
R3	Resistor	1 k	0603	Tyco electronics	01623440-1
TL1	Transmission line	W=0.92mm	L = 12.1 mm		
TL2	Transmission line	W=0.92mm	L = 3.2 mm		
TL3	Transmission line	W=0.92mm	L = 3.0 mm		
TL4	Transmission line	W= 0.92 mm	L = 3.2 mm		
TL5	Transmission line	W= 0.92 mm	L = 3.9 mm		
TL6	Transmission line	W=0.92mm	L=11.0 mm		
RF in, RF out	SMA-CONN	50 Ω	60 mils	Johnson	142-0701-801
PD85006	LDMOS			STMicroelectronics	PD85006
Board	FR-4 THk=0.020" 2OZ Cu both sides				

7 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*. 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 20. Package dimensions

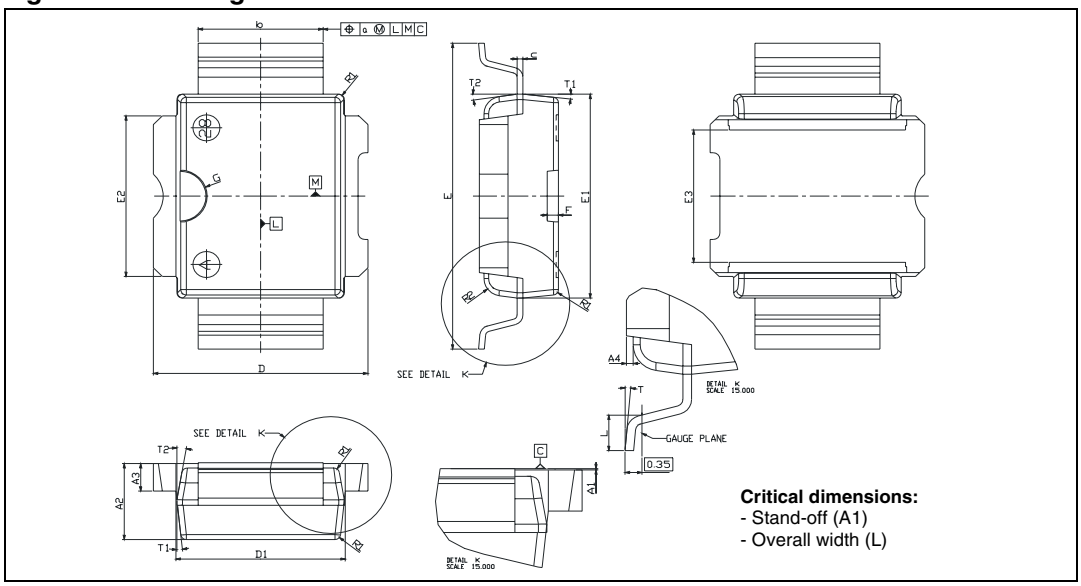


Figure 21. Tube information

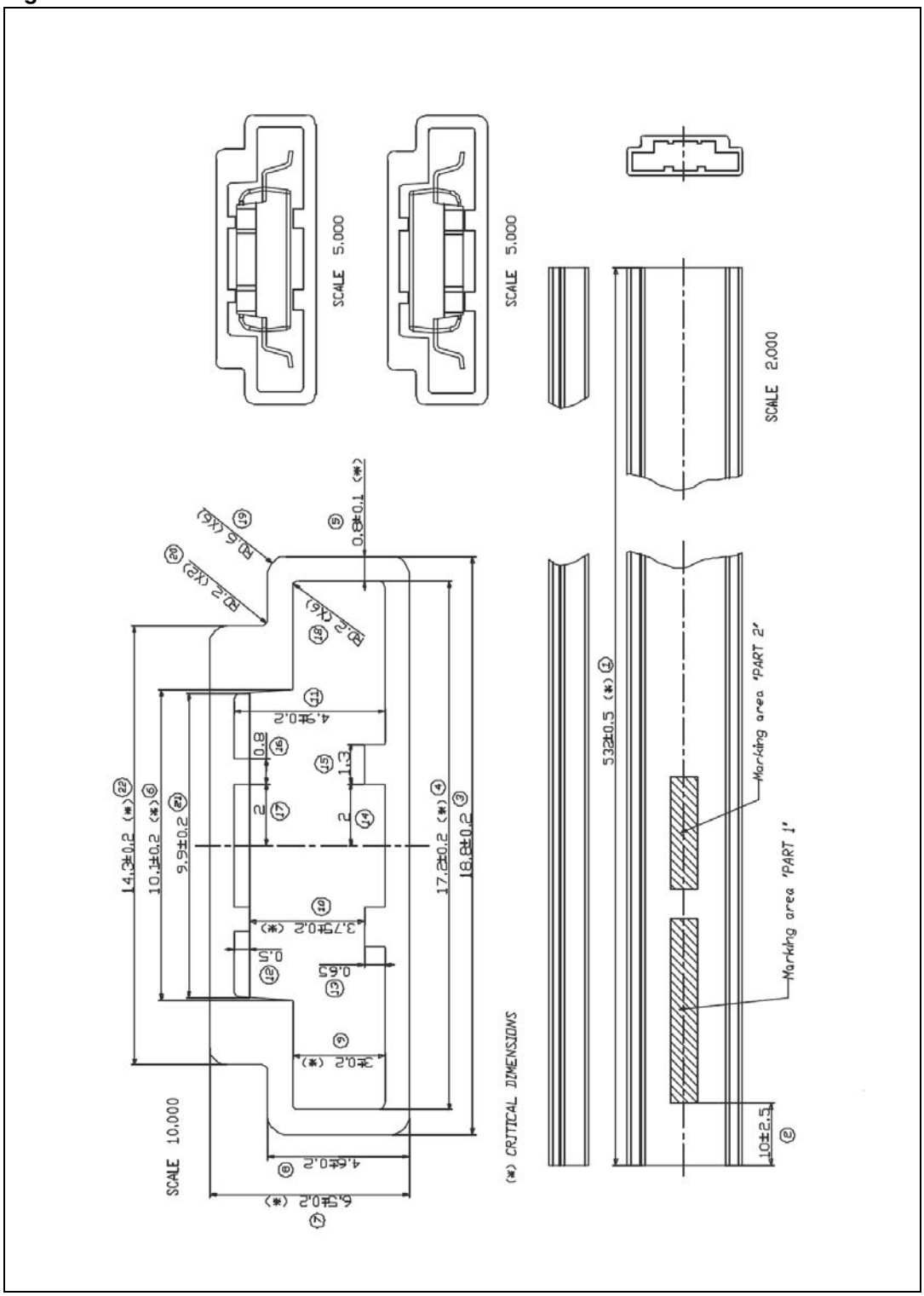
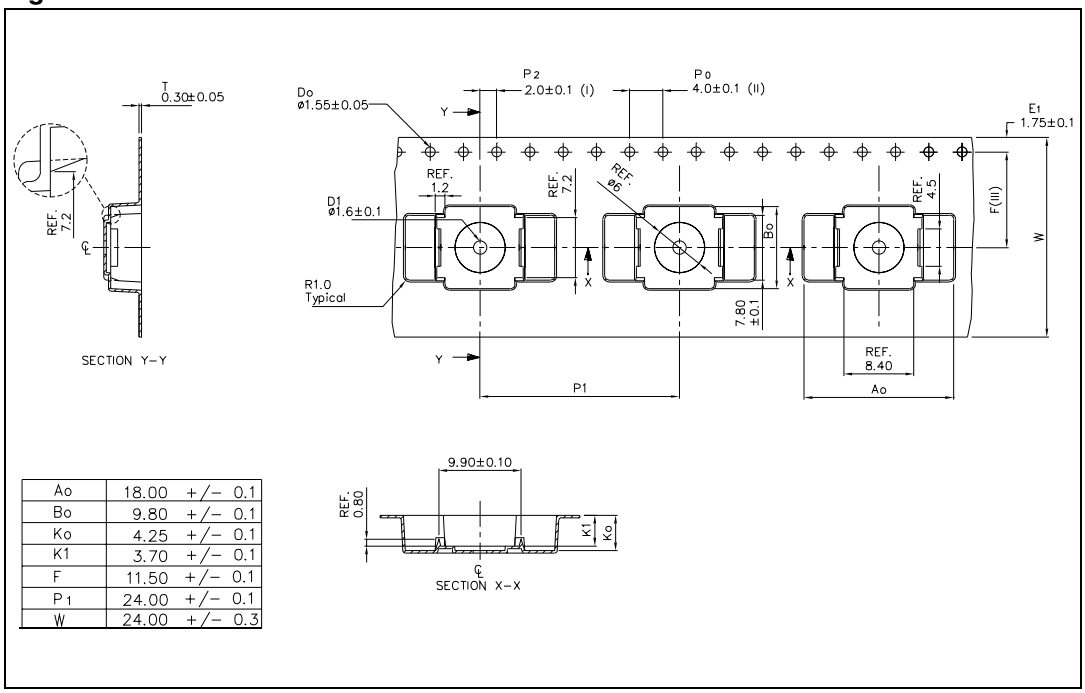


Figure 22. Reel information



Ao	18.00	+/−	0.1
Bo	9.80	+/−	0.1
Ko	4.25	+/−	0.1
K1	3.70	+/−	0.1
F	11.50	+/−	0.1
P1	24.00	+/−	0.1
W	24.00	+/−	0.3

8 Revision history

Table 10. Document revision history

Date	Revision	Changes
03-Sep-2009	1	Initial release.
29-Oct-2009	2	Updated figure on cover page.
04-Aug-2010	3	Added device shipped in tape and reel, see *Table 1: Device summary*.

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