STAC0912-250

RF power transistor from the LdmoST family of N-channel enhancement-mode lateral MOSFETs

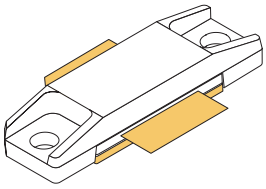
Preliminary data

Features

- Excellent thermal stability
- Common source configuration push-pull
- P_{OUT} = 250 W with 16 dB gain over 960 - 1215 MHz
- ST Air Cavity / STAC package

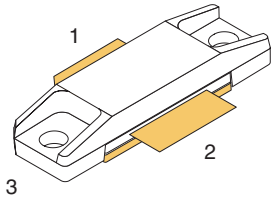
Description

The STAC0912-250 is a common source N-channel enhancement-mode lateral field-effect RF power transistor designed for mode -S, T-CAS, JTIDS, DME or TACAN applications in the 960 to 1215 MHz frequency range.



STAC265B
Epoxy sealed

Figure 1. Pin connection



1 - Drain
2 - Gate
3 - Source

Table 1. Device summary

Order code	Package	Branding
STAC0912-250	STAC265B	0912-250

Contents

1 Electrical data

1.1 Maximum ratings

T_{CASE} = 25 °C

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
$V_{(BR)DSS}$	Drain-source voltage	80	V
V_{GS}	Gate-source voltage	± 20	V
P_{DISS}	Power dissipation (@ T_C = 70 °C)	928	W
T_J	Max. operating junction temperature	200	°C
T_{STG}	Storage temperature	- 65 to + 150	°C

1.2 Thermal data

Table 3. Thermal data @ 100 µs - 10 %

Symbol	Parameter	Value	Unit
R_{thJC}	Junction - case thermal resistance	0.14	°C/W

2 Electrical characteristics

T_{CASE} = + 25 °C

2.1 Static

Table 4. Static

Symbol	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	V_{GS} = 20 V I_{DS} = 10 mA	80			V
I_{DSS}	V_{GS} = 0 V V_{DS} = 28 V			2	µA
I_{GSS}	V_{GS} = 15 V V_{DS} = 0 V			1	µA
$V_{GS(Q)}$	V_{DS} = 28 V I_{DS} = 150 mA	2.0		5.0	V
$V_{DS(ON)}$	V_{GS} = 10 V I_{DS} = 6 A		0.9	1.2	V
G_{FS}	V_{DS} = 10 V I_{DS} = 6 A	2.5			mho

2.2 Dynamic

Vdd = 36 V Idq = 150 mA pulse width = 100 µsec duty cycle = 10 %

Table 5. Dynamic

Symbol	Test conditions	Min.	Typ.	Max.	Unit
Frequency		960		1215	MHz
P_{OUT}	P_{IN} = 12 W	250	285		W
G_{PS}	P_{OUT} = 250 W	14	16.3		dB
η_D	P_{OUT} = 250 W	50	58		%
T_r	Rise Time - P_{OUT} = 250 W			25	ns
T_f	Fall Time - P_{OUT} = 250 W			10	ns
Droop	P_{OUT} = 250 W			0.2	dB
Load Mismatch	All phase angles at P_{OUT} = 250 W			10:1	VSWR

Table 6. Reference data(1)

Mode of operation	Pulse conditions	V_{DD} (V)	P_{OUT} (W)	Gain (dB)	Delta gain (dB)	Eff. (%)	Pulse droop (dB)	TR (nsec)	TF (nsec)	RTH_{J-C} (°C/W)
All modes	100µsec - 10%	36	250	16	0.7	58	0.1	25	5	0.14
TCAS 1030 - 1090 MHz	32µsec - 1%	36	250	16	0.3	57	0.1	25	5	0.06
Mode-S 1030 - 1090 MHz	128µsec - 2%	36	250	15.5	0.3	56	0.2	25	5	0.125
	340µsec - 1%	36	250	15.5	0.3	56	0.25	25	5	0.17

1. Typical RF performance measured in common source class-AB broadband circuit 960 MHz to 1215 MHz frequency band. Th = 25 °C; RTH_{J-C} = 0.15°C/W; unless specified otherwise.

3 Impedance data

Figure 2. Impedance data

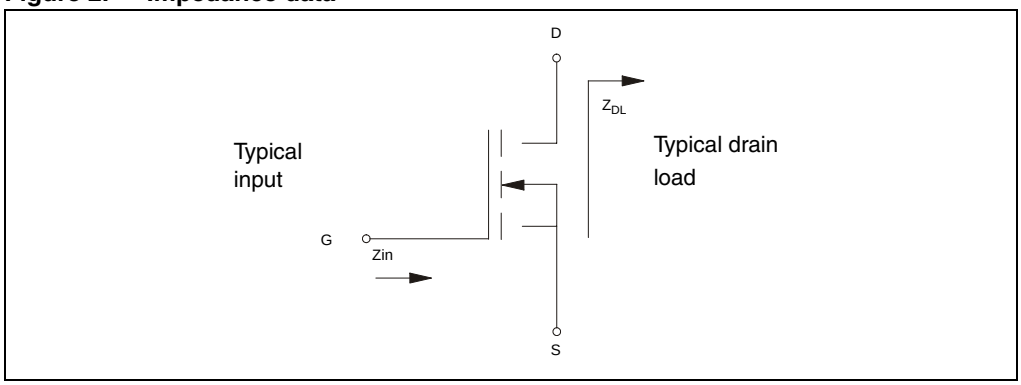


Table 7. Impedance data

Frequency (MHz)	Z_{source} (Ohm)	Z_{load} (Ohm)
960	0.96+j0.75	2.2+j0.57
1030	1.01+j1.3	1.57+j0.97
1090	1.18+j1.73	1.25+j1.5
1140	1.29+j1.86	1.1+j1.88
1215	1.1+j1.9	1.01+j2.44

4 Typical performance

Figure 3. Gain vs. output power

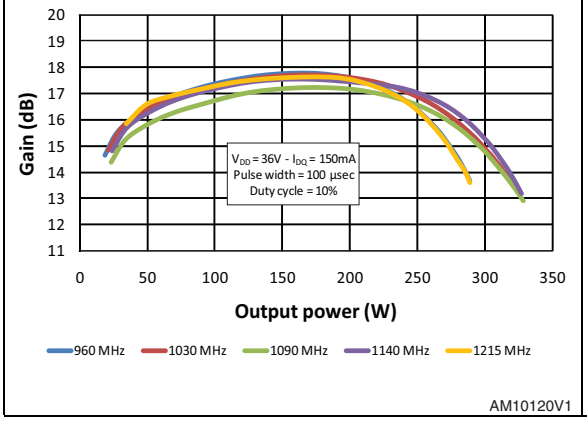


Figure 4. Efficiency vs output power

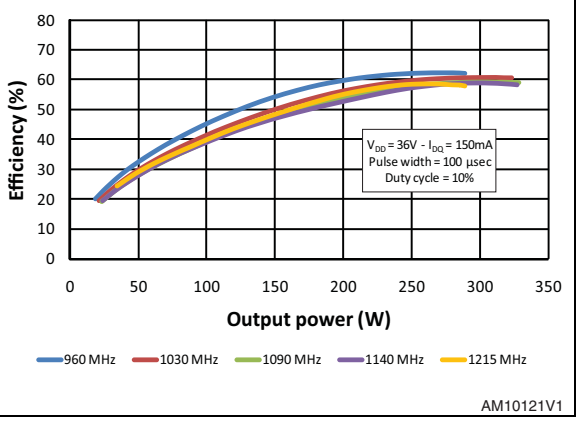
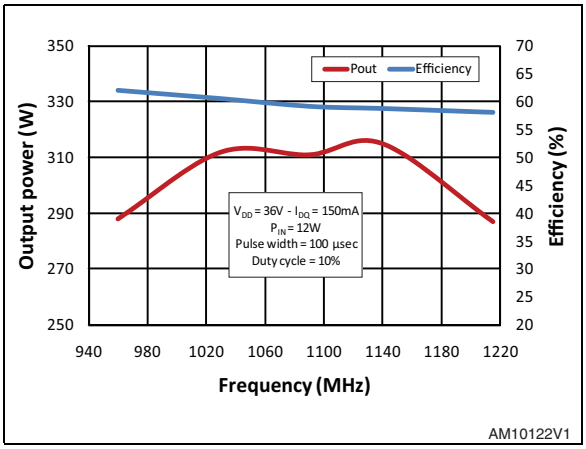


Figure 5. Output power and efficiency vs frequency



5 Circuit and BOM

Figure 6. Circuit

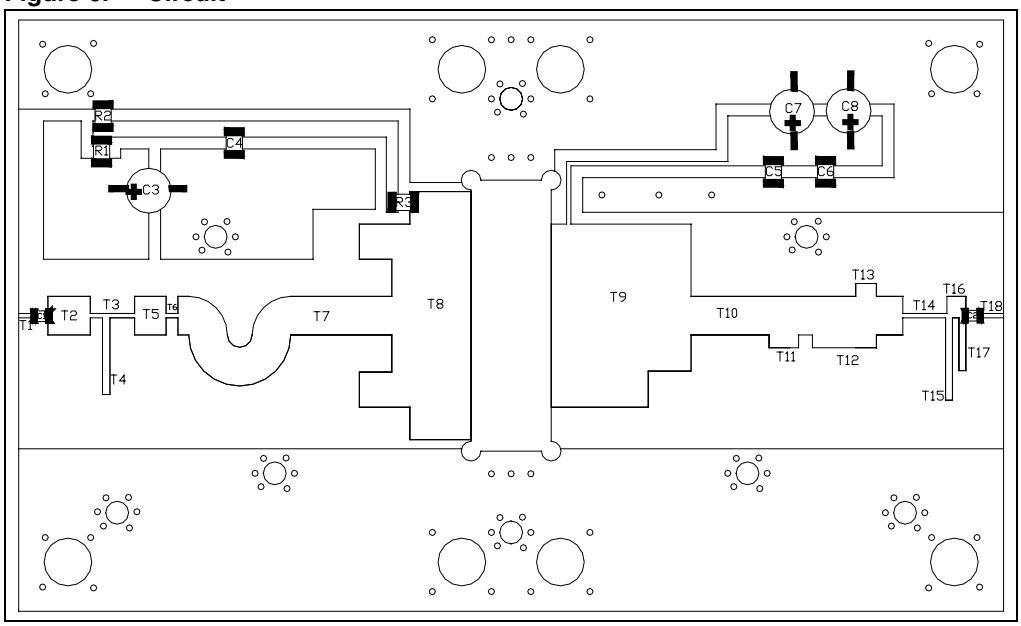


Table 8. Components list

Component	Description	Dimensions	Values
TL1	Stripline	L=0.085" W=0.022"	
TL2	Stripline	L=0.215" W=0.196"	
TL3	Stripline	L=0.225" W=0.022"	
TL4	Stripline	L=0.038" W=0.389"	
TL5	Stripline	L=0.160" W=0.196"	
TL6	Stripline	L=0.060" W=0.022"	
TL7	Stripline	L=1.382" W=0.196"	
TL8	Stripline	L_1=0.165" W_1=0.178" L_2=0.165" W_2=0.178" L_3=0.092" W_3=0.929" L_4=0.311" W_4=1.259"	
TL9	Stripline	L_1=0.492" W_1=0.929" L_2=0.217" W_2=0.764"	
TL10	Stripline	L=1.075" W=0.196"	
TL11	Stripline	L=0.150" W=0.065"	
TL12	Stripline	L=0.325" W=0.065"	
TL13	Stripline	L=0.105" W=0.065"	
TL14	Stripline	L=0.217" W=0.022"	

Table 8. Components list (continued)

Component	Description	Dimensions	Values
TL15	Stripline	L=0.035" W=0.418"	
TL16	Stripline	L=0.096" W=0.109"	
TL17	Stripline	L=0.035" W=0.268"	
TL18	Stripline	L=0.124" W=0.022"	
C1, C2	ATC100A300J chip capacitor		30pF
C3	220µF, 63V electrolytic capacitor		220µF
C4	ATC100B101 chip capacitor		100pF
C5, C6	ATC100B390 chip capacitor		39 pF
C17	220µF, 63V electrolytic capacitor		220µF
C20	100µF, 50V electrolytic capacitor		100µF
C21	1000µF, 63V electrolytic capacitor		1000µF
R1	CR1206-8W-361JB		360 Ohm
R2	CR1206-8W-621JB		620 Ohm
R3	CR1206-8W-122JB		1200 Ohm
Board Material	Rogers duroid 6010 Er = 10.2, Th = 0.64mm	3x5	in^2

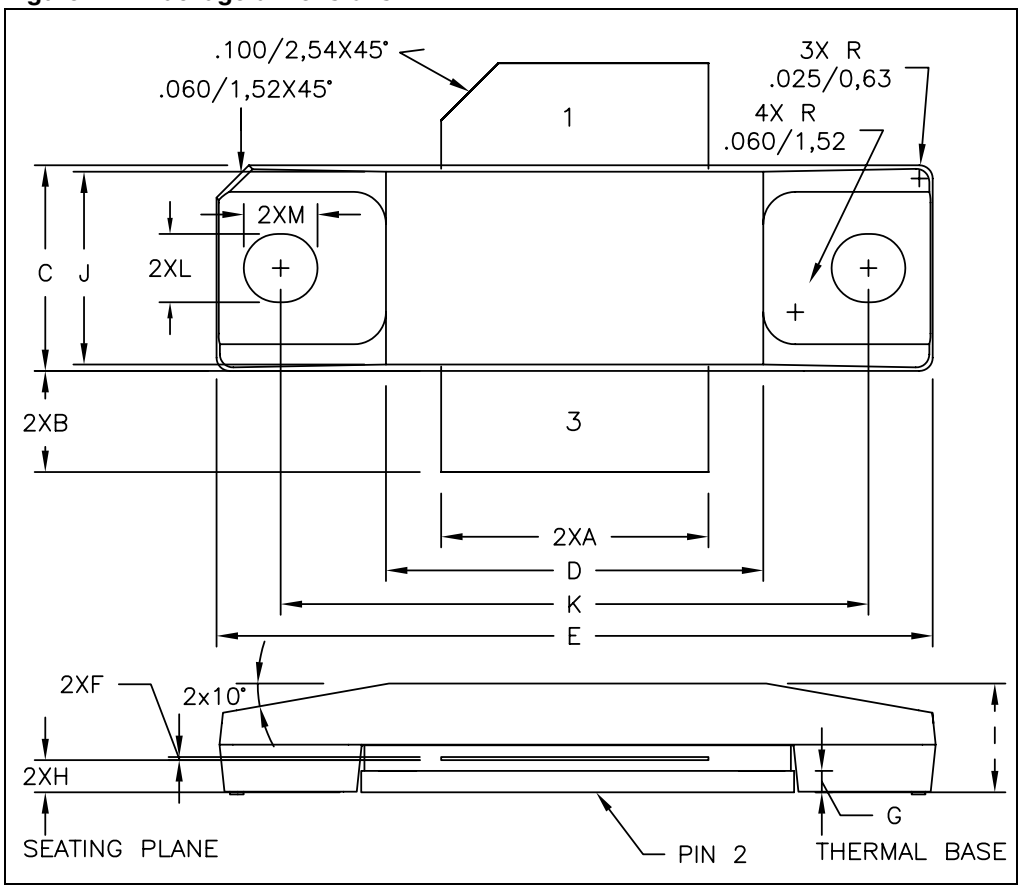
6 Package mechanical data

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. STAC265B mechanical data

Dim.	mm.		
	Min.	Typ.	Max.
A	12.57		12.83
B	4.32		5.33
C	9.65		9.91
D	17.78		18.08
E	33.88		34.19
F	0.10		0.15
G		1.02	
H	1.45		1.70
I	4.83		5.33
J	9.27		9.52
K	27.69		28.19
L		3.23	
M		3.45	

Figure 7. Package dimensions



7 Revision history

Table 10. Document revision history

Date	Revision	Changes
20-Apr-2011	1	First release.
09-Aug-2011	2	Updated features on cover page. Updated P_{DISS} value in *Table 2: Absolute maximum ratings*, R_{thJC} value in *Table 3: Thermal data @ 100 µs - 10 %*. Updated typical and maximum values in *Table 5: Dynamic* Inserted new *Table 6: Reference data* and *Section 3: Impedance data*. Updated figures: *3*, *4* and *5*. Minor text changes.
13-Sep-2011	3	Added *Section 5: Circuit and BOM*.

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