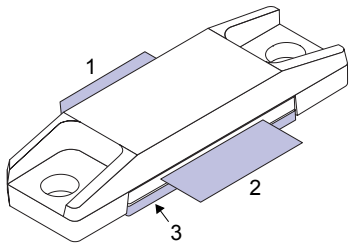
STAC1214-250

Datasheet

LDMOS L-band radar transistor



STAC780-2B

Pin connection	
Pin	**Connection**
1	Drain
2	Gate
3	Source (bottom side)

Features

Order code	Frequency	V_{DD}	P_{OUT}	Gain	Efficiency
STAC1214-250	1200 to 1400 MHz	36 V	250 W	14 dB	50 %

- Excellent thermal stability
- Common source configuration
- P_{OUT} = 250W with 14 dB gain over 1200 to 1400 MHz
- ST air-cavity STAC packaging technology

Applications

- Avionics

Description

The STAC1214-250 is a common source N-channel enhancement-mode lateral field-effect RF power transistor designed for L-band radar applications.

Product status link
STAC1214-250

Product summary	
Order code	STAC1214-250
Marking	1214-250
Package	STAC780-2B
Packing	Tube
Base/bulk quantity	15/90

1 Electrical data

1.1 Maximum ratings

Table 1. Absolute maximum ratings (T_{CASE} = +25 °C)

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

1.2 Thermal data

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Junction-case thermal resistance	0.14	°C/W

Note: Thermal data at 100 µs - 10%

1.3 ESD protection characteristics

Table 3. ESD protection

Symbol	Test methodology	Class
HBM	Human body model (per JESD22-A114)	0

2 Electrical characteristics

(T_C = 25 °C unless otherwise specified)

2.1 Static

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V, I_{DS} = 10 mA	80			V
I_{DSS}	Zero gate voltage drain leakage current	V_{GS} = 0 V, V_{DS} = 28 V			2	µA
I_{GSS}	Gate-source leakage current	V_{GS} = 15 V, V_{DS} = 0 V			1	µA
$V_{GS(Q)}$	Gate quiescent voltage	V_{DS} = 28 V, I_{DS} = 150 mA	2.0		5.0	V
$V_{DS(on)}$	Drain-source on voltage	V_{GS} = 10 V, I_{DS} = 6 A		550	600	mV
G_{FS}	Forward transconductance	V_{DS} = 10 V, I_{DS} = 6 A	2.5			S

2.2 Dynamic

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
f	Frequency		1200		1400	MHz
P_{OUT}	Output power	P_{IN} = 10 W	250	260		W
G_{PS}	Power gain	P_{OUT} = 250 W	13	14		dB
ηD	Drain efficiency	P_{OUT} = 250 W	50			%
t_r	Rise time	P_{OUT} = 250 W			100	ns
t_f	Fall time	P_{OUT} = 250 W			30	ns
ΔG_{PS}	Gain variation	P_{OUT} = 250 W, gain droop within the pulse			0.25	dB
VSWR	Load mismatch	All phase angles at P_{OUT} = 250 W			10:1	

Note: V_{DD} = 36 V, I_{DQ} = 150 mA, pulse width = 100 µs, duty cycle = 10%.

3 Impedance data

Figure 1. **Impedance data**

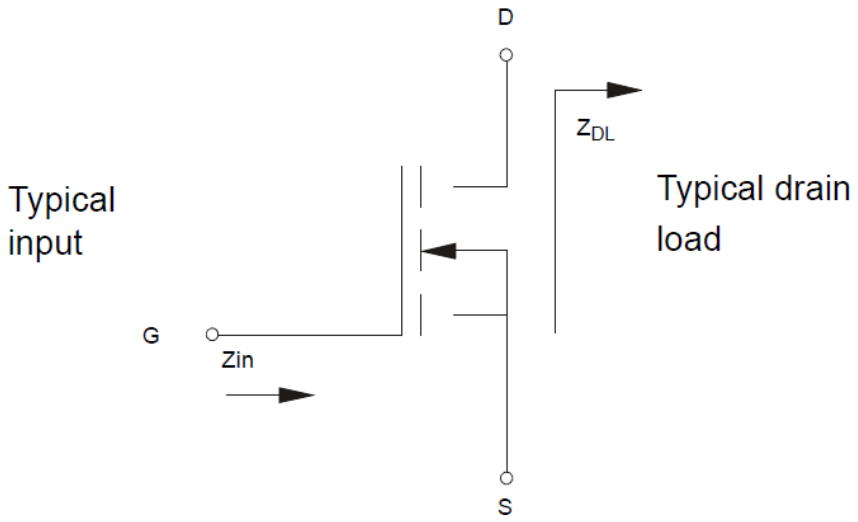


Table 6. **Impedance data**

Frequency (MHz)	Z_{source} (Ohm)	Z_{load} (Ohm)
1200	1.1+j1.9	1.5+j2.8
1300	1.0+j3.1	1.5+j3.1
1400	1.4+j4.3	1.0+j3.6

4 Typical performances

Figure 2. Output power vs input power

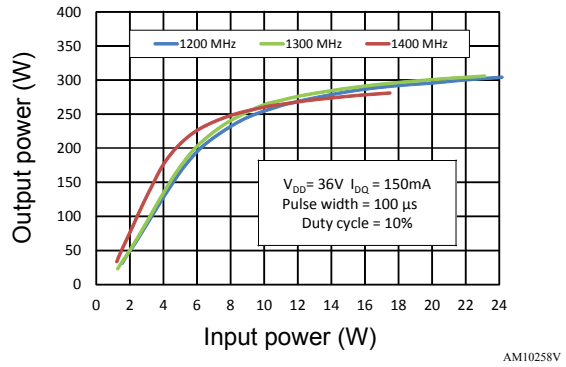


Figure 3. Power gain vs output power

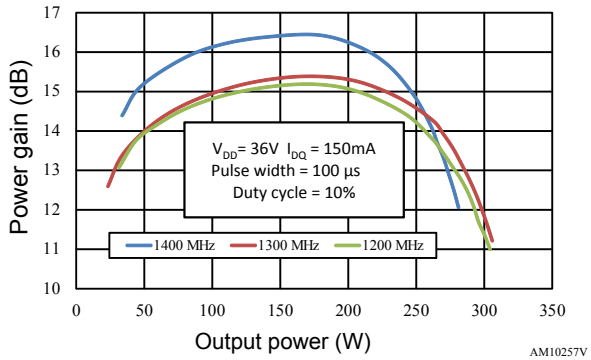


Figure 4. Efficiency vs output power

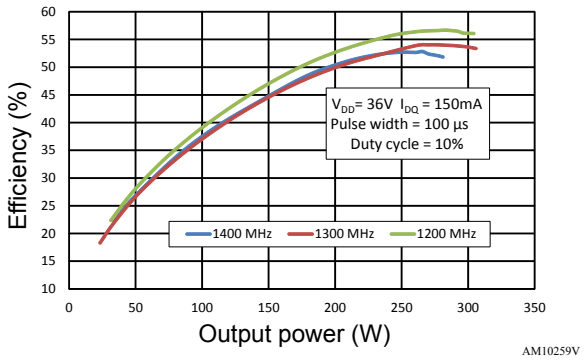
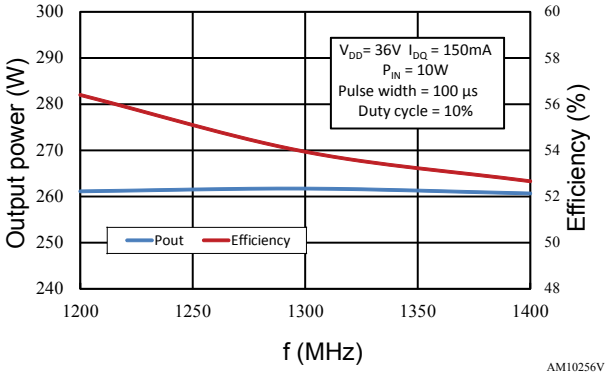


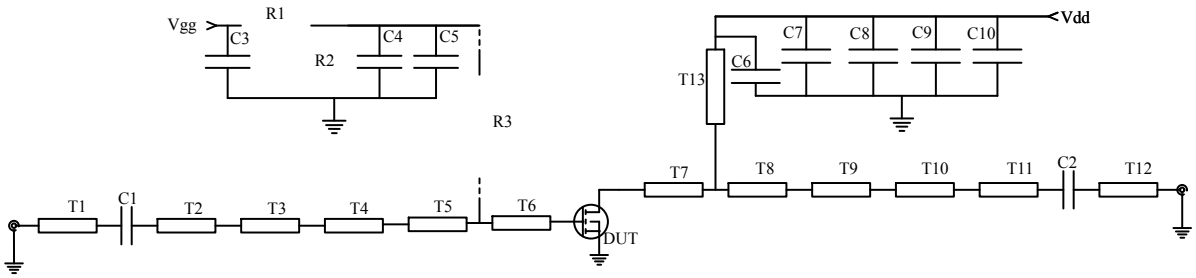
Figure 5. Output power and efficiency vs frequency



5 Test circuit

5.1 Electrical schematic and BOM

Figure 6. Electrical schematic



GADG060420201037SA

Table 7. Component list

Component	Description	Dimension (X,Y)	Values
TL1	Stripline	L=0.111" W=0.022"	
TL2	Stripline	L=0.304" W=0.022"	
TL3	Stripline	L=1.74" W=0.196"	
TL4	Stripline	L=0.402" W=0.929"	
TL5	Stripline	L=0.100" W=0.929"	
TL6	Stripline	L=0.368" W=0.929"	
TL7	Stripline	L=1.136" W1=0.196"	
TL8	Stripline	L=0.165" W=0.109"	
TL9	Stripline	L=0.341" W=0.022"	
TL10	Stripline	L=0.145" W=0.221"	
S1	Shim	L=0.048" W=0.091"	
S2	Shim	L=0.048" W=0.091"	
S3	Shim	L=0.105" W=0.091"	
S4	Shim	L=0.105" W=0.091"	
S5	Shim	L=0.050" W=0.361"	
S6	Shim	L=0.022" W=0.303"	
S7	Shim	L=0.105" W=0.069"	
S8	Shim	L=0.048" W=0.187"	
S9	Shim	L=0.158" W=0.069"	
S10	Shim	L=0.105" W=0.069"	
S11	Shim	L=0.105" W=0.069"	
S12	Shim	L=0.022" W=0.424"	
C1, C2	ATC100A300J chip capacitor		30 pF
C3	ATC100B101 chip capacitor		100 pF

Component	Description	Dimension (X,Y)	Values
C4	ATC100B910 chip capacitor		91 pF
C5	220 µF, 63 V Electrolytic capacitor		220 µF
C6	ATC100B390 chip capacitor		39 pF
C7	ATC700B122JT chip capacitor		1200 pF
C8	1000 µF, 63 V Electrolytic capacitor		1000 µF
C9	100 µF, 100 V Electrolytic capacitor		100 µF
R1	CR1206-8W-102JB		1 kΩ
R2	CR1206-8W-202JB		2 kΩ
R3	CR1206-8W-501JB		50 Ω
Board material	Rogers Duroid 6010 Er = 10.2, Th = 0.64 mm	3X5"	

5.2 Test circuit layout

Figure 7. **Broadband 1200-1400 MHz test circuit layout**

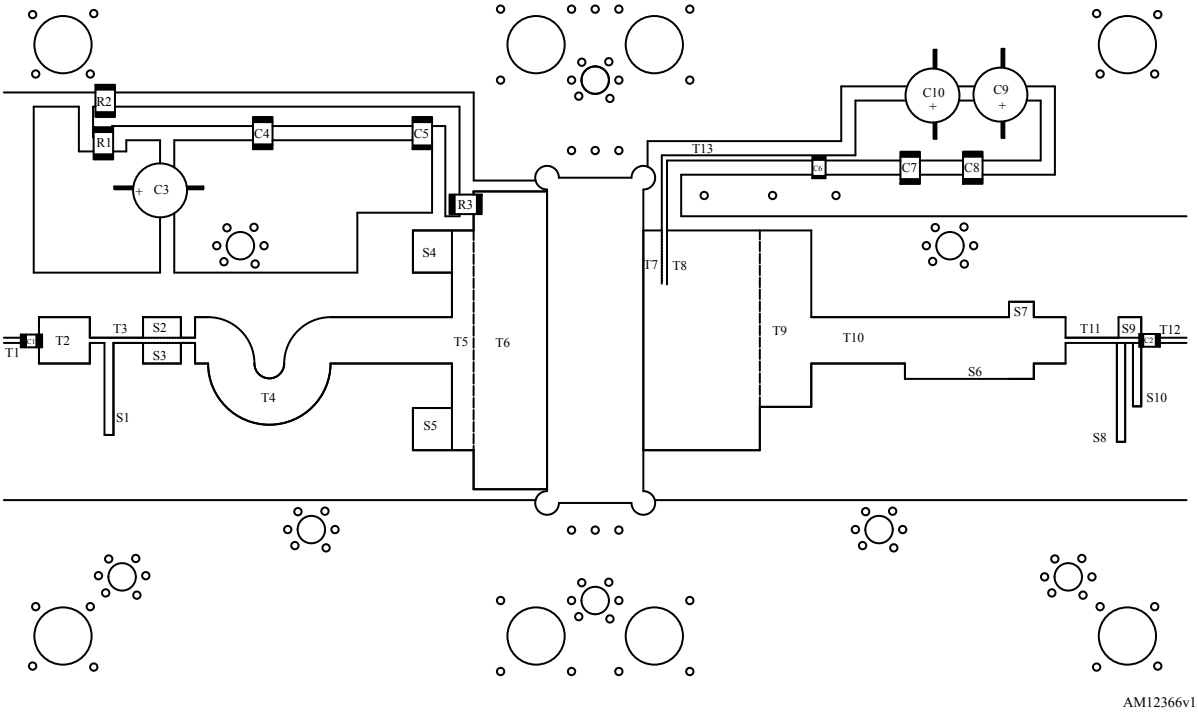
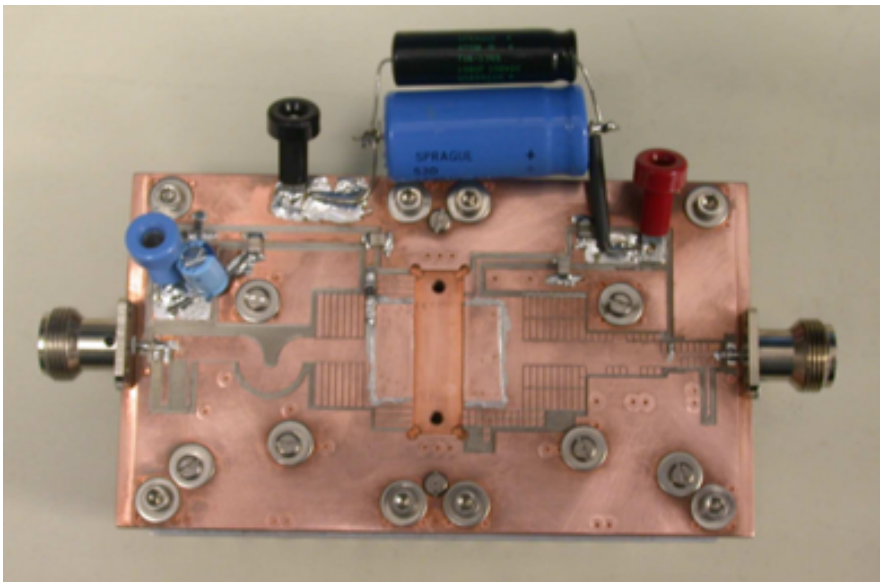


Figure 8. **Demonstration board picture**

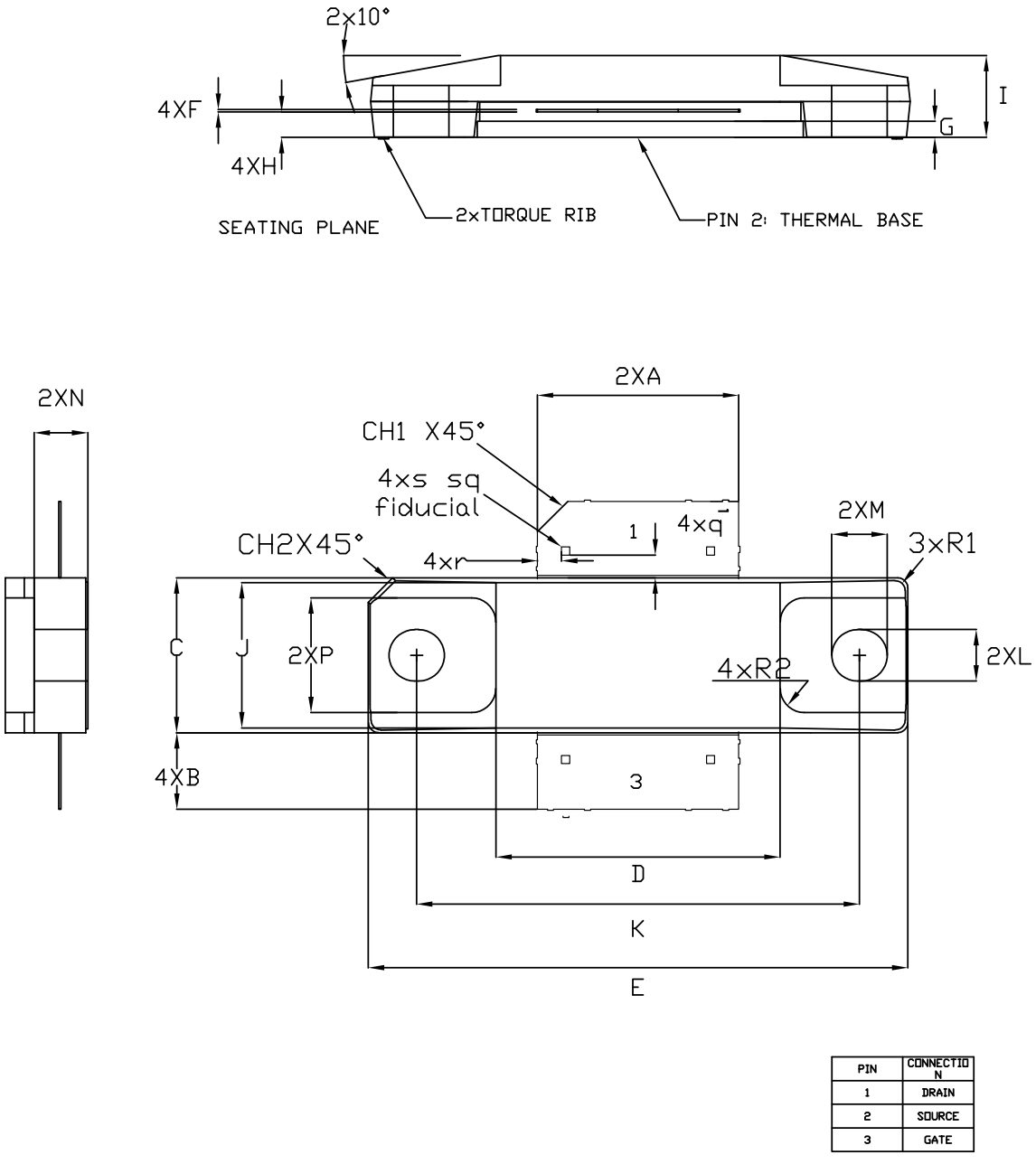


6 Package information

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.

6.1 STAC780-2B package information

Figure 9. **STAC780-2B package outline**



PIN	CONNECTION
1	DRAIN
2	SOURCE
3	GATE

DM00481924_2

Table 8. **STAC780-2B mechanical data**

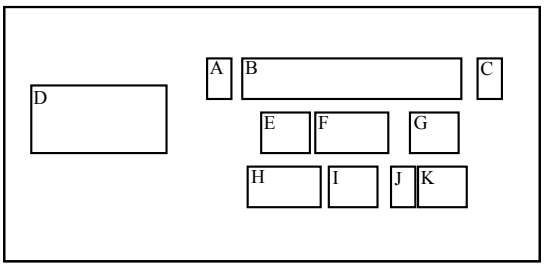
Ref.	Millimeters		
	Min.	Typ.	Max.
A	12.65		12.75
B	4.57		5.08
C	9.65		9.91
D	17.78		18.08
E	33.88		34.19
F	0.11		0.17
G	0.97		1.14
H	1.52		1.70
I	4.83		5.33
J	9.52		9.78
K	27.69		28.19
L	3.20	3.25	3.30
M	3.43	3.51	3.58
N	3.30	3.38	3.45
p	7.14	7.21	7.29
q		1.37	
r		1.52	
R1		0.63	
R2		1.52	
s		0.51	
θ		10°	
CH1		2.72	
CH2		1.52	

6.2 STAC780-2B marking information

Figure 10. **STAC780-2B marking information**

Product

PACKAGE FACE : TOP



LEGEND

- Unmarkable Surface
- Marking Composition Field

A ADDITIONAL INFORMATION
(MAX CHAR ALLOWED = 1)

B MARKING AREA

C ADDITIONAL INFORMATION
(MAX CHAR ALLOWED = 1)

D STANDARD ST LOGO
(0000093)

E Assy Plant
(PP)

F FE Sequence
(nnn)

G Diffusion Traceability
Plant
(WX)

H COUNTRY OF ORIGIN
(MAX CHAR ALLOWED = 3)

I Test & Finishing Plant
(TF)

J Assy Year
(Y)

K Assy Week
(WW)

CD00362879_13

Revision history

Table 9. **Document revision history**

Date	Version	Changes
27-Jan-2012	1	First release
06-Jun-2012	2	– Modified: *Figure 7* – Added: *Figure 8* – Updated the entire *Table 7*
24-Sep-2012	3	Updated title on the coverpage and *Table 4*.
20-May-2014	4	Updated *Table 8: STAC265B mechanical data*. Minor text changes.
03-Apr-2020	5	Updated *Section 6.1 STAC780-2B package information* and datasheet modified accordingly. Added *Table 3. ESD protection*. Minor text changes.
13-Jul-2020	6	Modified features table on cover page.

Contents