STAC3932F

RF power transistors
HF/VHF/UHF N-channel MOSFETs

Preliminary data

Features

- Excellent thermal stability
- Common source push-pull configuration
- POUT = 580 W typ. with 24.6 dB gain @ 123 MHz
- In compliance with the 2002/95/EC European directive

Description

The STAC3932F is a N-channel MOS field-effect RF power transistor. It is intended for use in 100 V DC large signal applications up to 250 MHz.

Figure 1. Pin connection

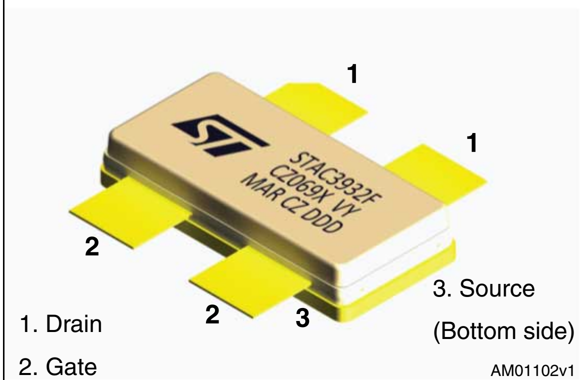


Table 1. Device summary

Order code	Marking	Package	Packaging
STAC3932F	STAC3932F	STAC244F	Plastic tray

Contents

1 Electrical data

1.1 Maximum ratings

Table 2. Absolute maximum ratings (T_{CASE} = 25 °C)

Symbol	Parameter	Value	Unit
$V_{(BR)DSS}$[(1)]	Drain source voltage	250	V
V_{DGR}	Drain-gate voltage (R_{GS} = 1 MΩ)	250	V
V_{GS}	Gate-source voltage	±20	V
I_D	Drain current	20	A
P_{DISS}	Power dissipation	625	W
T_J	Max. operating junction temperature	200	°C
T_{STG}	Storage temperature	-65 to +150	°C

1. T_J = 150 °C

1.2 Thermal data

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Junction - case thermal resistance	0.28	°C/W

2 Electrical characteristics

(T_{CASE} = 25 °C)

2.1 Static

Table 4. Static (per side)

Symbol	Test conditions			Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$[1]	V_{GS} = 0 V	I_{DS} = 100 mA		250			V
I_{DSS}	V_{GS} = 0 V	V_{DS} = 100 V				1	mA
I_{GSS}	V_{GS} = 20 V	V_{DS} = 0 V				250	nA
V_{TH}	V_{DS} = 10 V	I_D = 250 mA		2.0		4.0	V
$V_{DS(ON)}$	V_{GS} = 10 V	I_D = 5 A			2.5	3.5	V
G_{FS}	V_{DS} = 10 V	I_D = 2.5 A		3.0		5.0	S
C_{ISS}	V_{GS} = 0 V	V_{DS} = 100 V	f = 1 MHz		492		pF
C_{OSS}	V_{GS} = 0 V	V_{DS} = 100 V	f = 1 MHz		134		pF
C_{RSS}	V_{GS} = 0 V	V_{DS} = 100 V	f = 1 MHz		5.2		pF

1. T_J = 150 °C

2.2 Dynamic

Table 5. CW

Symbol	Test conditions	Min.	Typ.	Max.	Unit
P_{OUT}	V_{DD} = 100 V, I_{DQ} = 2 x 250 mA, P_{IN} = 2 W, f = 123 MHz	450	580		W
h_D	V_{DD} = 100 V, I_{DQ} = 2 x 250mA, P_{IN} = 2 W, f = 123 MHz		70		%

Table 6. Pulse / 1 mec -- 10 %

Symbol	Test conditions	Min.	Typ.	Max.	Unit
P_{OUT}	V_{DD} = 100 V, I_{DQ} = 2 x 250 mA, P_{IN} = 8 W, f = 123 MHz		900		W
h_D	V_{DD} = 100 V, I_{DQ} = 2 x 250mA, P_{IN} = 8 W, f = 123 MHz		65		%

3 Impedances

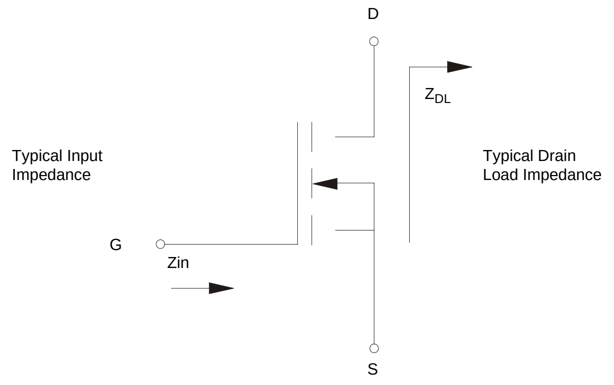


Figure 2. Impedance data

Table 7. Impedance data

Freq.	Z_{IN} (Ω)	Z_{DL} (Ω)
123 MHz (Pulse)	1.0 - j 4.80	6.3 + j 10.5
123 MHz (CW)	0.8 - j 3.45	5.0 + j 13.0
64 MHz	1.4 - j 10.0	12.8 + j 14.0

4 Electrical schematic and BOM

Figure 3. Electrical schematic

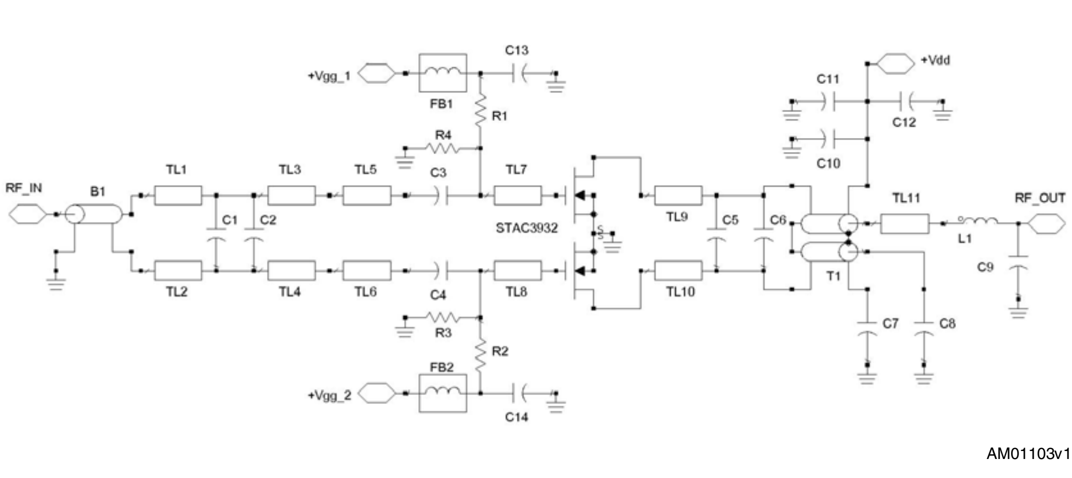


Table 8. Bill of materials

Component	Description
C1	270 pF ATC 100B chip capacitor
C2	180 pF ATC 100B chip capacitor
C3, C4	750 pF ATC 700B chip capacitor
C5, C8	43 pF ATC 100B chip capacitor
C6	20 pF ATC 100B chip capacitor
C7	1000 pF ATC 100C chip capacitor
C9	5.6 pF ATC 100B chip capacitor
C10	2200 pF ATC 100C chip capacitor
C11	470 pF ATC 100B chip capacitor
C12	100 µF, 200 V electrolytic capacitor
C13, C14	1200 pF ATC 700B chip capacitor
R1, R2	15 Ω 1/4 watt chip resistor
R3, R4	30 Ω 1/4 watt axial lead resistor
L1	3 turns, 16 ga magnet wire, Id 3/8", .165" turn spacing, 78 nH
FB1, FB2	ferrite bead, Fair-Rite # 2743019447
B1	1/4λ balun transformer, RG316-25Ω ,16.5"
T1	20 ga teflon coated wire thru 4 copper tubes OD 1/8"x 1.5"
TL1, TL2	0.740" x 0.200" microstrip
TL3, TL4	0.360" x 0.200" microstrip

Table 8. Bill of materials (continued)

Component	Description
TL5, TL6	0.480" x 0.350" microstrip
TL7, TL8	0.220" x 0.350" microstrip
TL9, TL10	0.350" x 0.660" microstrip
TL11	0.415" x 0.200" microstrip
Board	0.062" FR-4

5 Circuit layout

Figure 4. Circuit layout

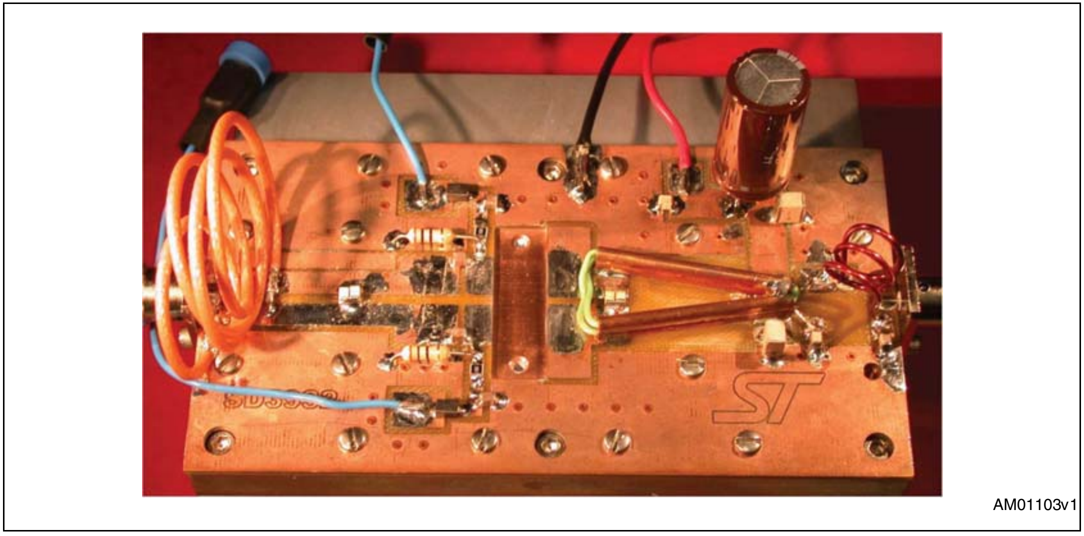
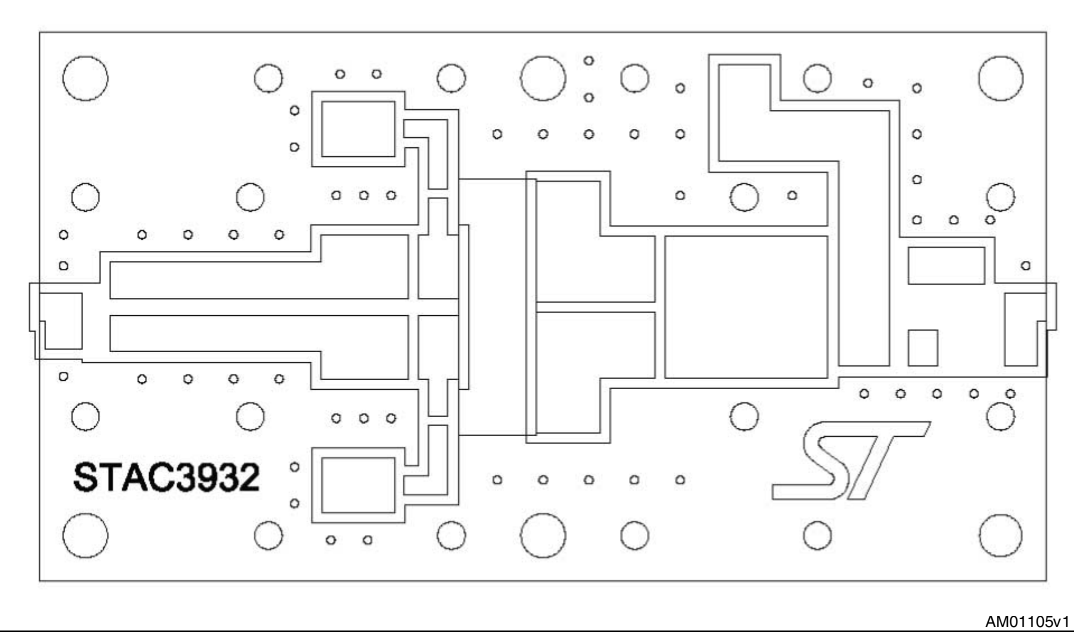


Figure 5. Circuit layout



6 Typical performance

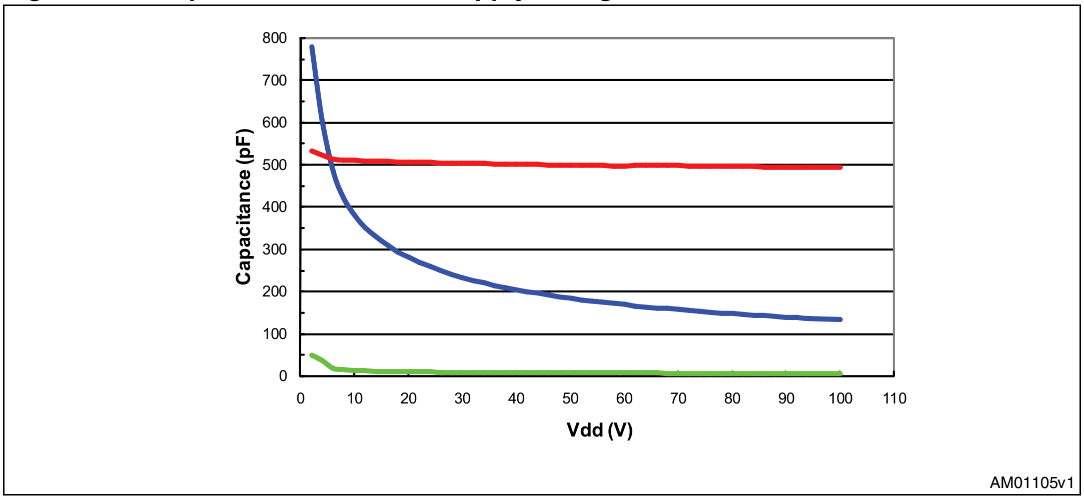


Figure 6. Capacitances vs drain supply voltage

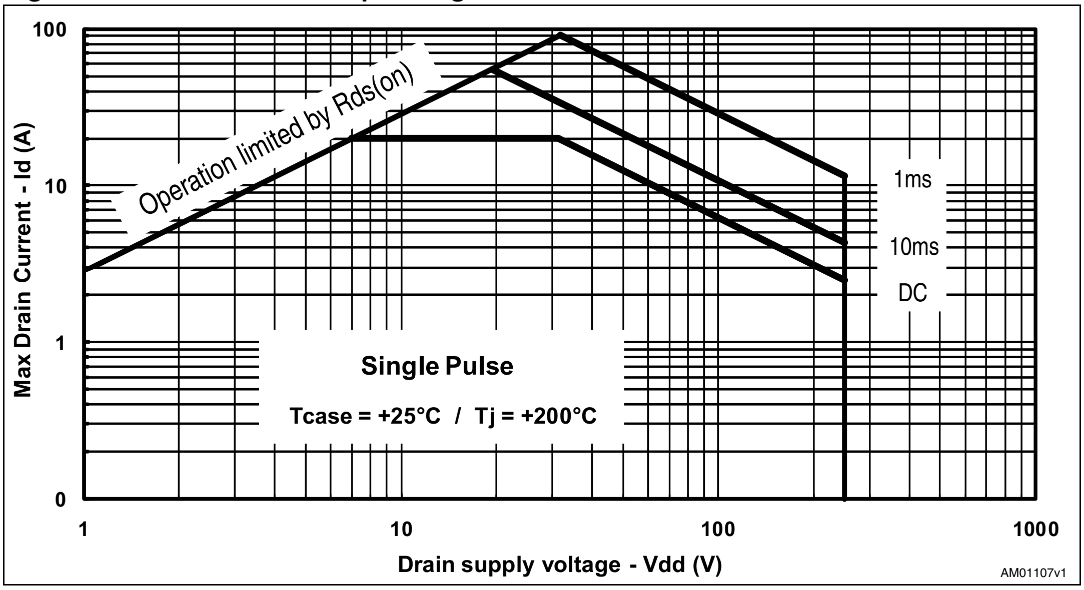


Figure 7. Maximum safe operating area

Figure 8. Transient thermal impedance

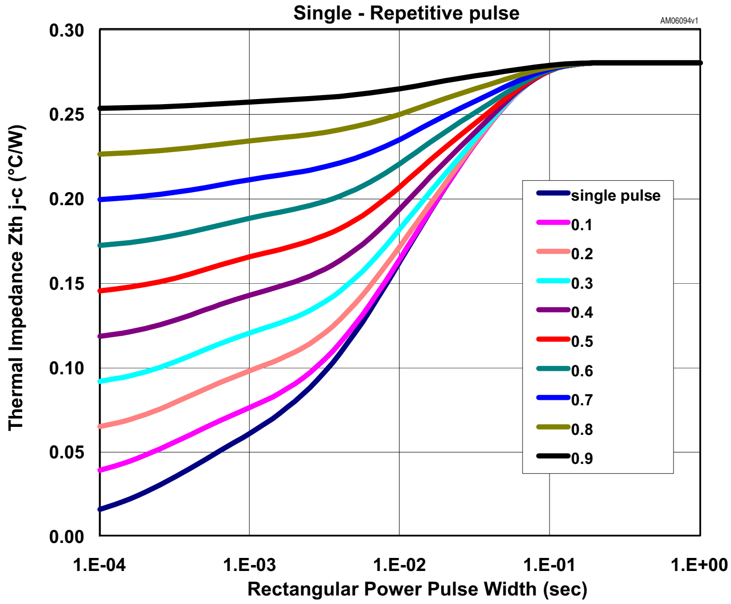


Figure 9. Transient thermal model

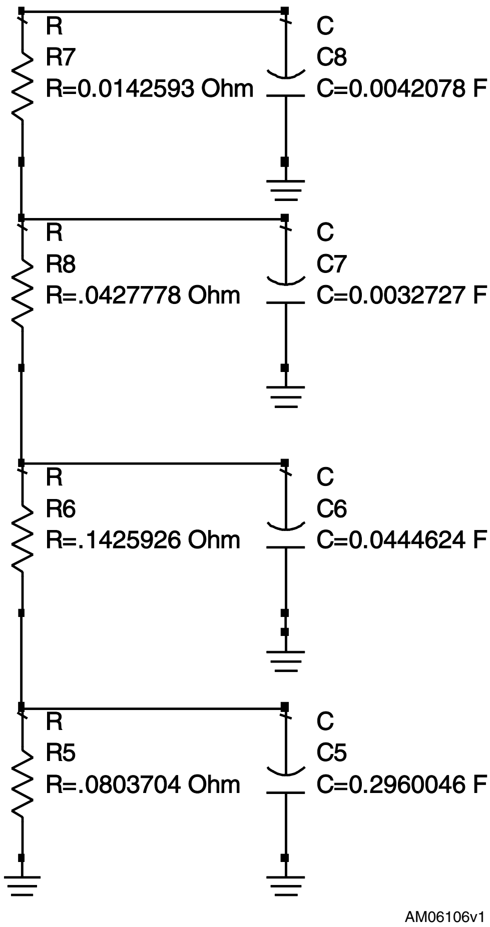


Figure 10. Zero temperature coefficient point

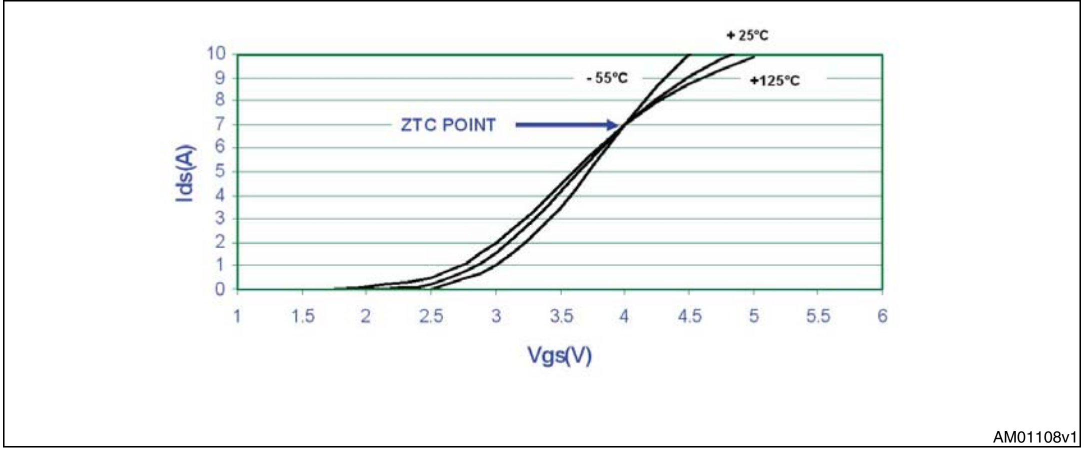


Figure 11. Output power and efficiency vs input power (CW)

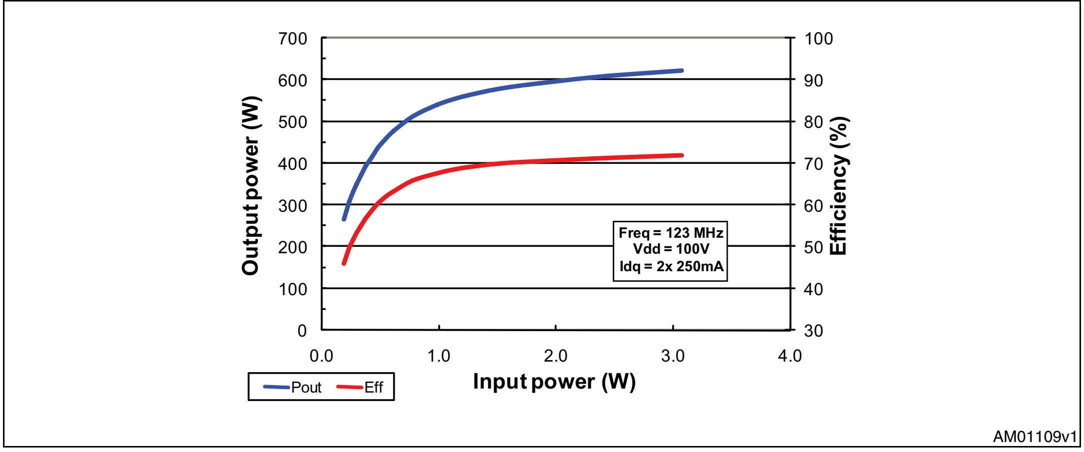


Figure 12. Gain vs output power (CW)

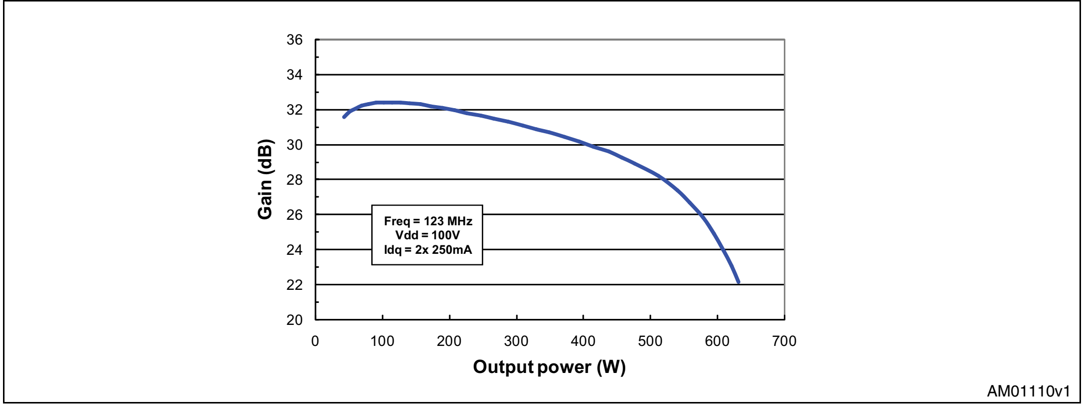
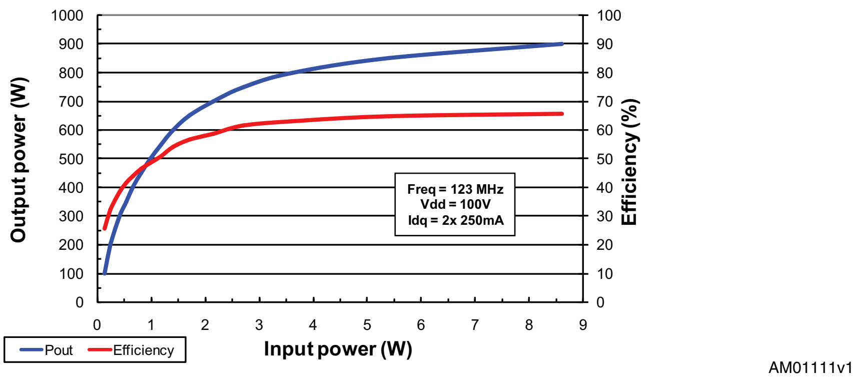


Figure 13. Output power and efficiency vs input power (1 msec - 10%)



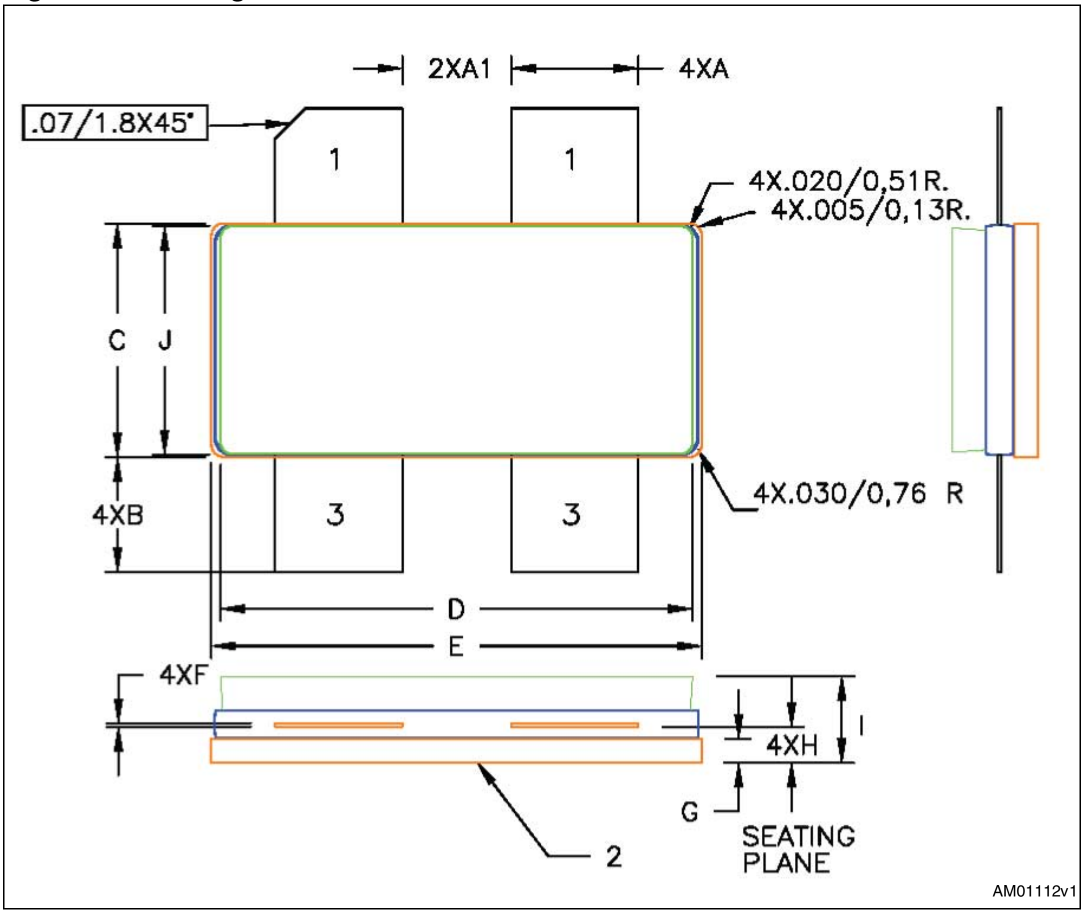
7 Package mechanical data

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. STAC244F package dimensions

Dim.	mm.		Inch	
	Min	Max	Min	Max
A	5.10	5.59	200	220
A1	4.32	4.83	170	190
B	4.32	5.33	170	210
C	9.65	9.91	380	390
D	19.61	20.02	772	788
E	20.45	20.70	805	815
F	0.08	1.15	0.003	0.006
G	0.89	1.14	0.035	0.045
H	1.45	1.70	0.057	0.067
I	3.18	4.32	0.125	0.170
J	9.27	9.53	0.365	0.375

Figure 14. Package dimensions



8 Revision history

Table 10. Document revision history

Date	Revision	Changes
24-Mar-2009	1	First release.
12-Feb-2010	2	*Table 1* (packaging) modified *Figure 1* modified.
18-Feb-2010	3	Updated description on cover page.
16-Mar-2010	4	Updated *Figure 7: Maximum safe operating area*. Added *Figure 8: Transient thermal impedance*. and *Figure 9: Transient thermal model*.