STAC3932B

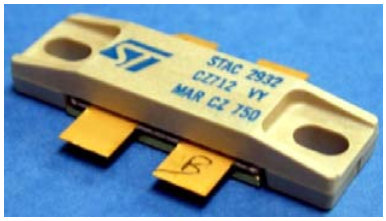
RF power transistors
HF/VHF/UHF N-channel MOSFETs

Features

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

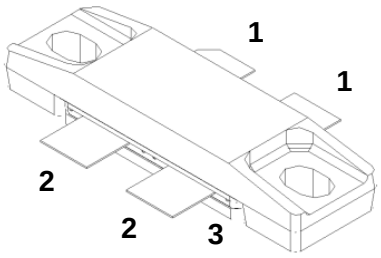
Description

The STAC3932B 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.



STAC244B
Air cavity

Figure 1. Pin connection



1. Drain
2. Gate
3. Source
(Bottom side)

Table 1. Device summary

Order code	Marking	Package	Packaging
STAC3932B	STAC3932	STAC244B	Plastic tray

Contents

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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}	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. Dynamic 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 = 123MHz	450	580	-	W
h_D	V_{DD} = 100 V, I_{DQ} = 2 x 250mA, P_{IN} = 2 W, f = 123MHz		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 250 mA, P_{IN} = 8 W, f = 123 MHz	-	65		%

3 Impedance

Figure 2. Current conventions

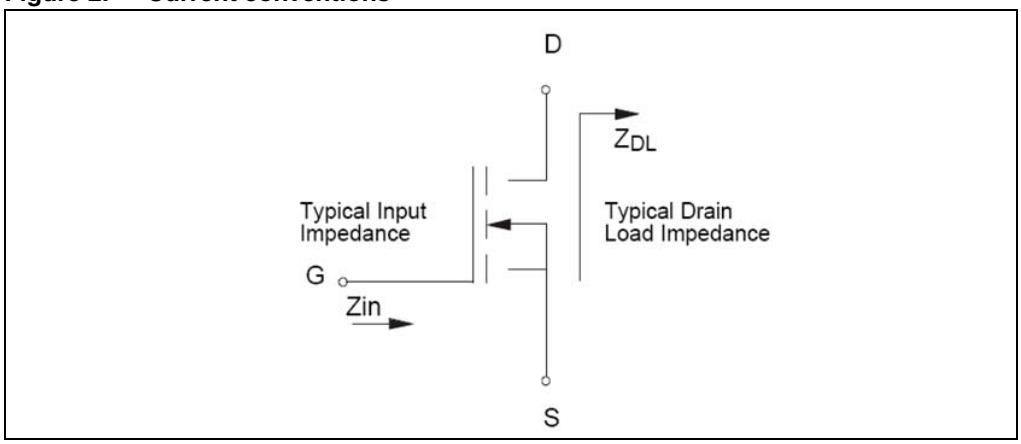

Table 7. Impedance data

Freq. (MHz)	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

Note: Measured gate to gate and drain to drain, respectively.

4 Electrical schematic and BOM

Figure 3. Electrical schematic

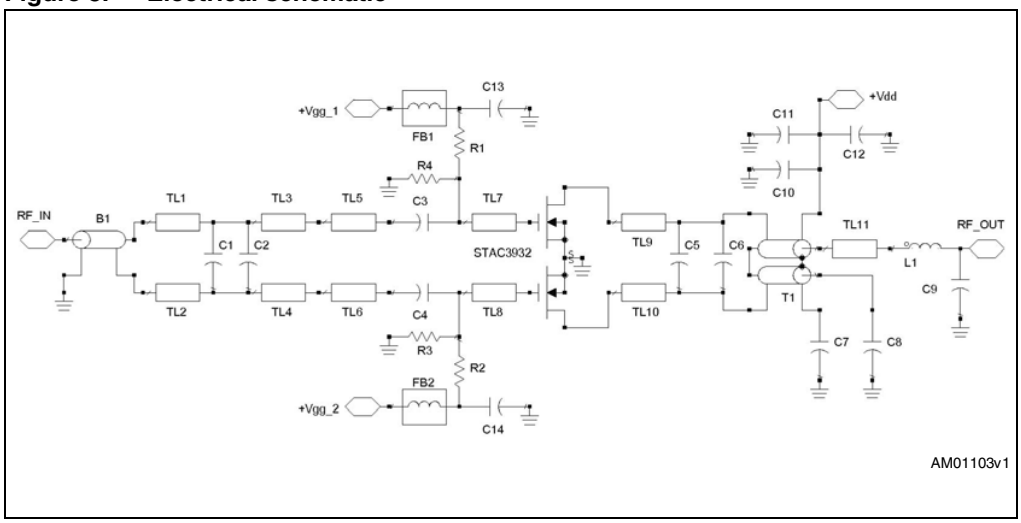

Table 8. Bill of materials

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"

Table 8. Bill of materials (continued)

Component	Description
TL1, TL2	.740" x .200" microstrip
TL3, TL4	.360" x .200" microstrip
TL5, TL6	.480" x .350" microstrip
TL7, TL8	.220" x .350" microstrip
TL9, TL10	.350" x .660" microstrip
TL11	.415" x .200" microstrip
Board	.062" FR-4

5 Circuit layout

Figure 4. Circuit layout

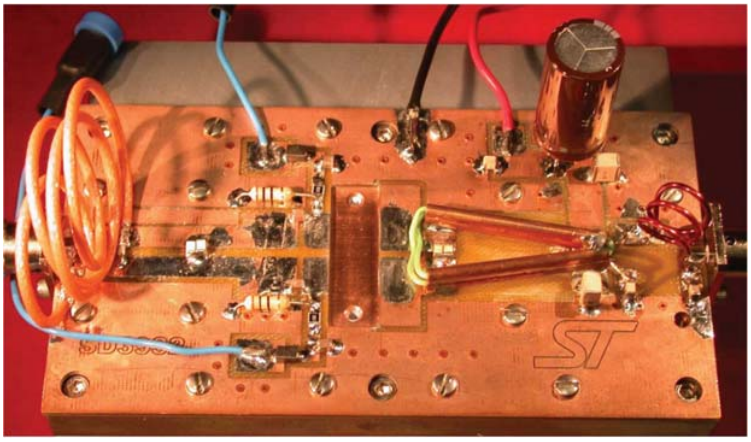

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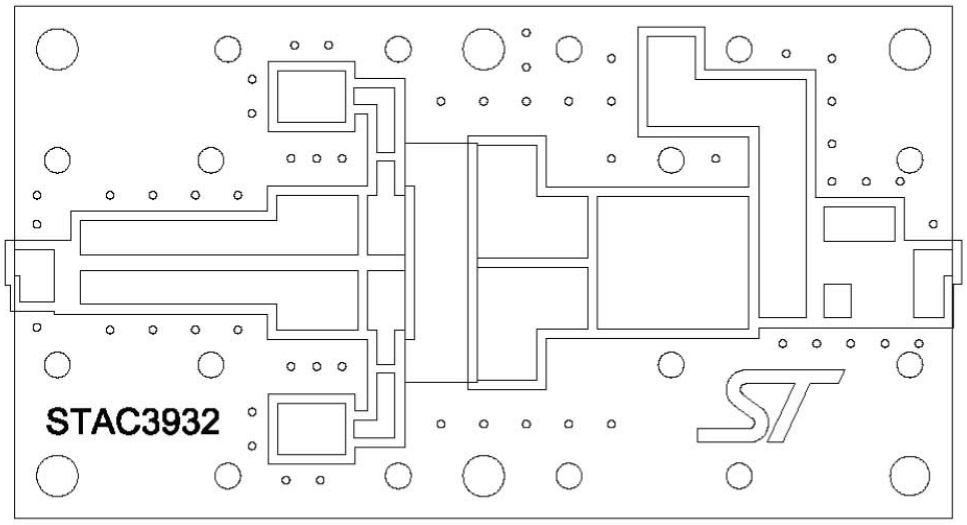
Figure 5. Circuit layout



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6 Typical performance

Figure 6. Capacitances vs drain supply voltage

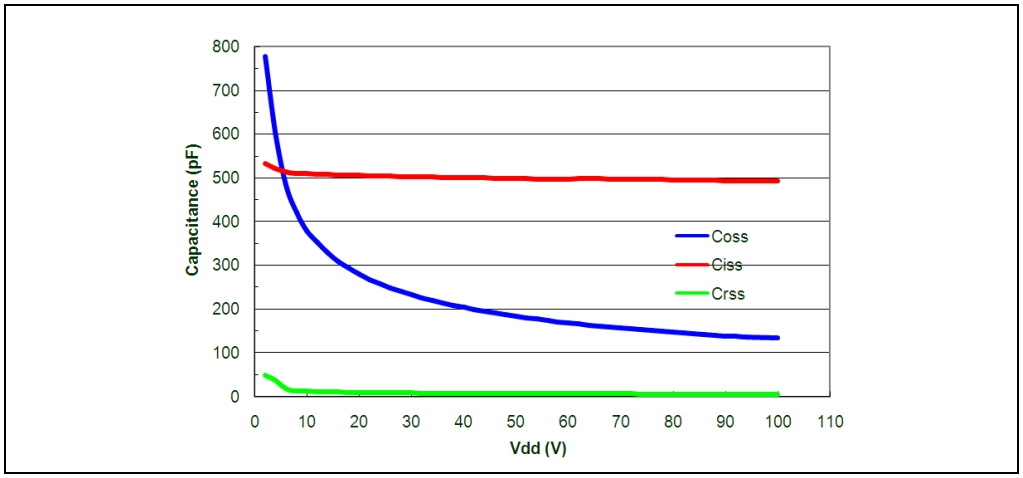


Figure 7. Maximum safe operating area

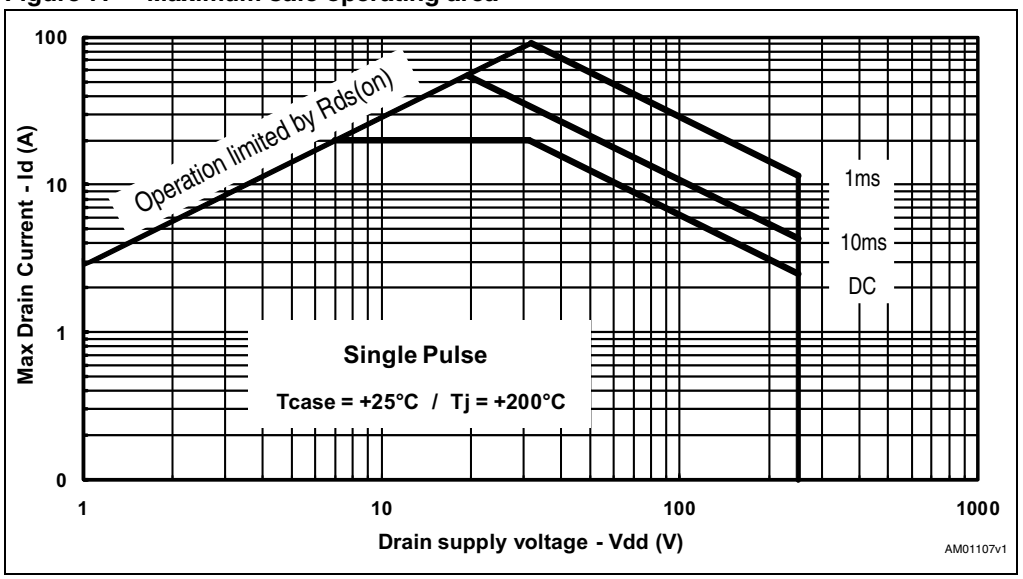


Figure 8. Transient thermal impedance

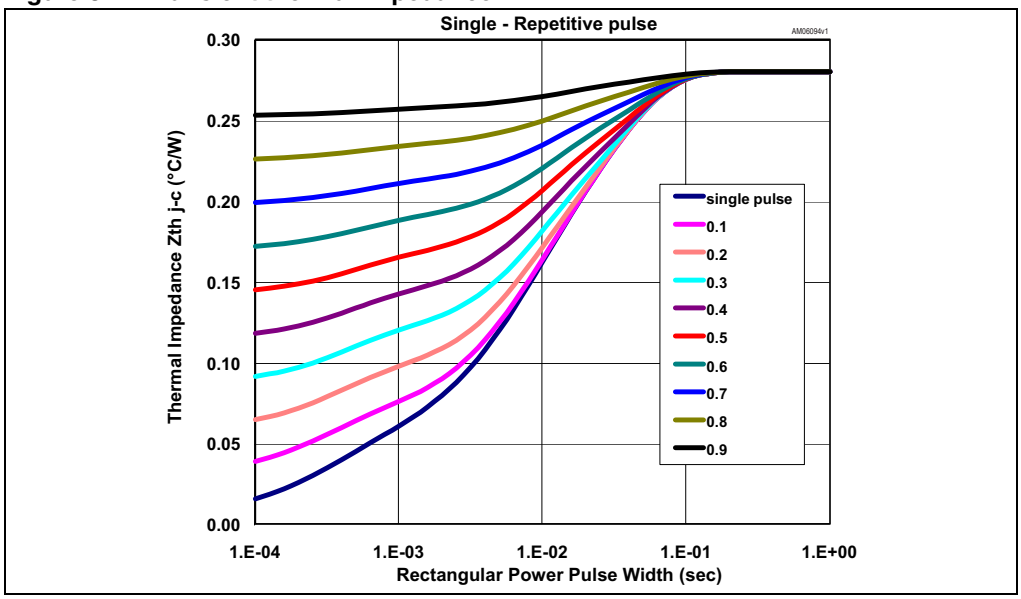


Figure 9. Transient thermal model

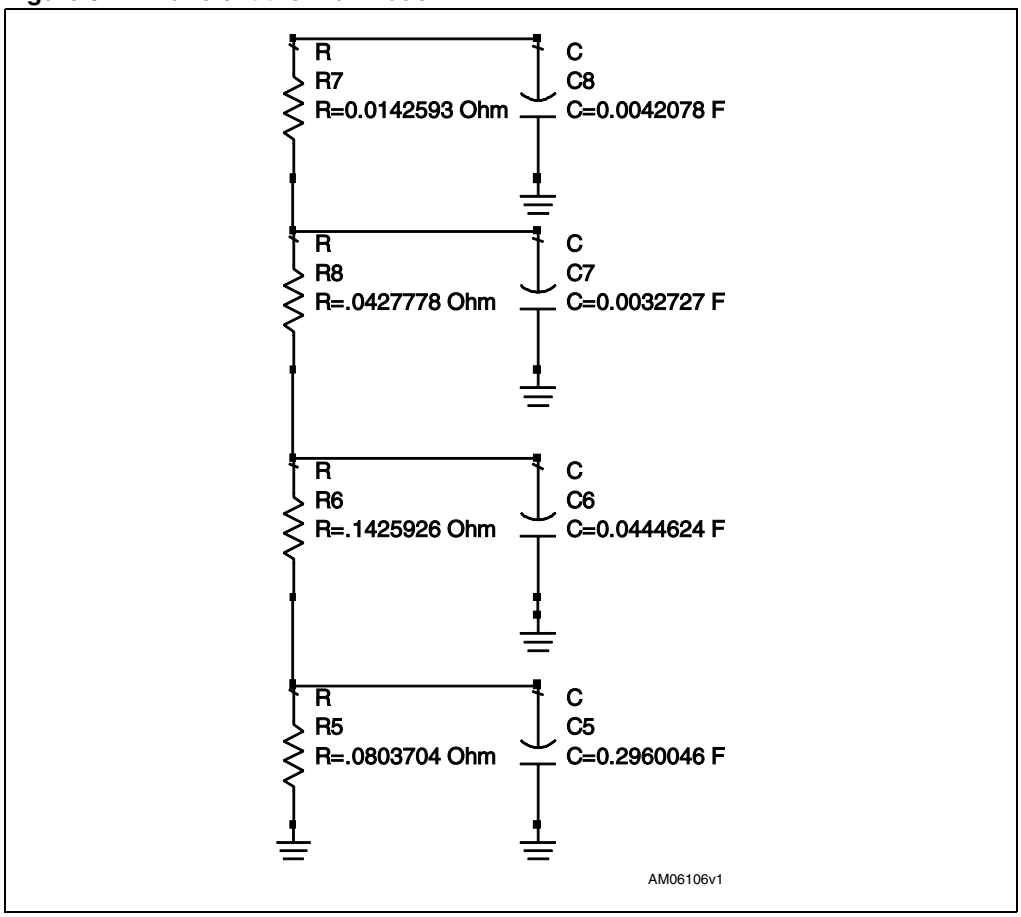


Figure 10. Zero temperature coefficient point

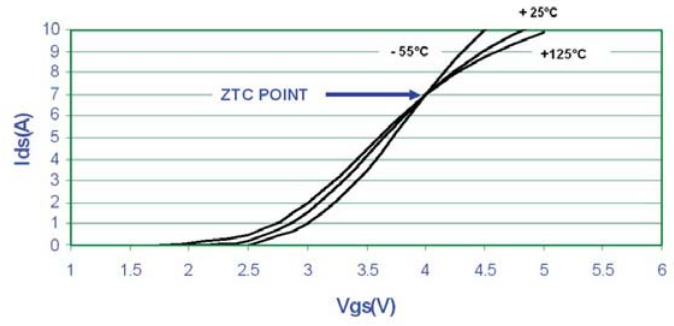


Figure 11. Output power and efficiency vs input power (CW)

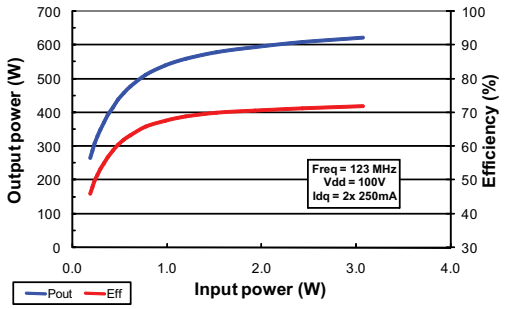


Figure 12. Gain vs output power (CW)

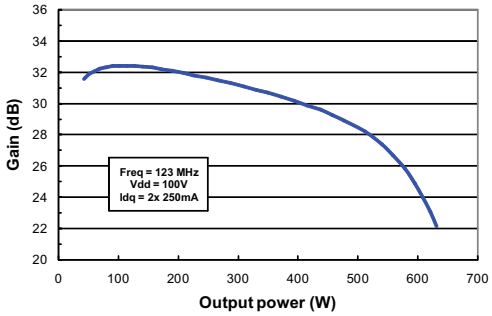
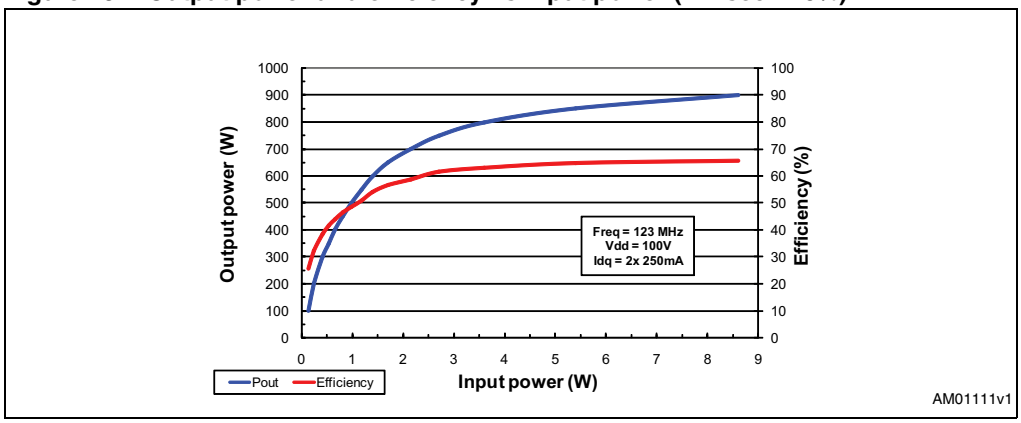


Figure 13. Output power and efficiency vs input power (1 msec - 10%)



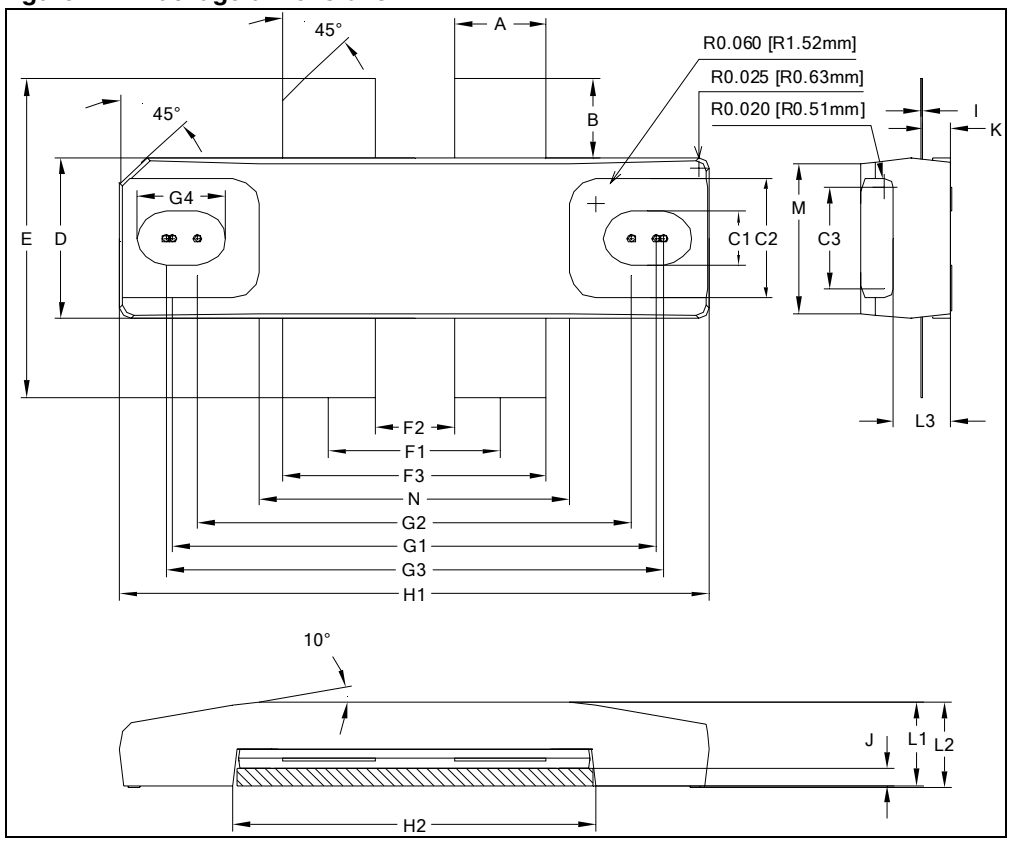
7 Package mechanical data

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. STAC244B package dimensions

Dim.	mm.			Inch		
	Min	Typ	Max	Min	Typ	Max
A	-	5.33	-	-	0.210	-
B		4.83			0.190	
C1		3.25			0.128	
C2		7.24			0.285	
C3		6.22			0.245	
D		9.78			0.385	
E		19.43			0.765	
F1		9.91			0.390	
F2		4.57			0.180	
F3		15.24			0.600	
G1		27.94			1.100	
G2		25.10			0.988	
G3		28.75			1.132	
G4		5.08			0.200	
H1		34.04			1.340	
H2		20.96			0.825	
I		0.15			0.006	
J		1.02			0.040	
K		1.57			0.062	
L1		5.21			0.205	
L2		5.33			0.210	
L3		3.25			0.128	
M		9.14			0.360	
N		17.91			0.705	
Controlling dimension: inches						

Figure 14. Package dimensions



8 Revision history

Table 10. Document revision history

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

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