SD2942

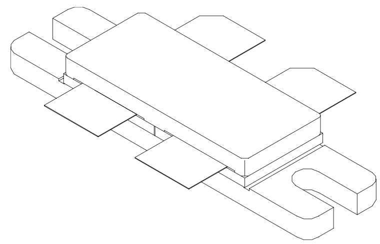
RF power transistor
HF/VHF/UHF N-channel MOSFETs

Features

- Gold metallization
- Excellent thermal stability
- Common source configuration, push pull
- P_{OUT} = 350W min. with 15 db gain @ 175 MHz
- Low $R_{DS(on)}$

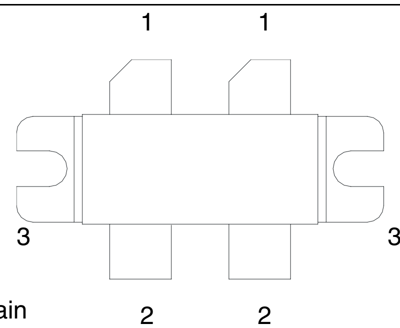
Description

The SD2942 is a gold metallized N-channel MOS field-effect RF power transistor. The SD2942 offers 25% lower $R_{ds(ON)}$ than industry standard and 20% higher power saturation than ST SD2932. These characteristics make the SD2942 ideal for 50V DC very high power application up to 250 MHz.



M244 Epoxy sealed

Figure 1. Pin connection



1. Drain
2. Gate
3. Source

Table 1. Device summary

Order code	Marking	Package	Packaging
SD2942	SD2942	M244	Plastic Tray

Content

1 Electrical data

1.1 Maximum rating

T_{CASE} = 25° C

Table 2. Absolute maximum rating

Symbol	Parameter	Value	Unit
$V_{(BR)DSS}$(1)	Drain source voltage	130	V
V_{DGR}(1)	Drain-gate voltage (R_{GS} = 1MΩ)	130	V
V_{GS}	Gate-source voltage	±20	V
I_D	Drain current	40	A
P_{DISS}	Power dissipation	500	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 to case thermal resistance	0.35	° C/W

2 Electrical characteristics

T_{CASE} = 25°C

Table 4. Static (per section)

Symbol	Test conditions			Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$[1]	V_{GS} = 0 V	I_{DS} = 100 mA		130			V
I_{DSS}	V_{GS} = 0 V	V_{DS} = 50 V				100	µA
I_{GSS}	V_{GS} = 20 V	V_{DS} = 0 V				250	nA
$V_{GS(Q)}$	V_{DS} = 10 V	I_D = 250 mA		1.5		4	V
$V_{DS(ON)}$	V_{GS} = 10 V	I_D = 10 A				3.0	V
G_{FS}	V_{DS} = 10 V	I_D = 5 A		5			mho
C_{ISS}	V_{GS} = 0 V	V_{DS} = 50 V	f = 1 MHz		415		pF
C_{OSS}	V_{GS} = 0 V	V_{DS} = 50 V	f = 1 MHz		236		pF
C_{RSS}	V_{GS} = 0 V	V_{DS} = 50 V	f = 1 MHz		17		pF

1. T_J = 150° C

Table 5. Dynamic

Symbol	Test Conditions	Min.	Typ.	Max.	Unit
P_{OUT}	V_{DD} = 50 V I_{DQ} = 500 mA f = 175MHz	350			W
G_{PS}	V_{DD} = 50 V I_{DQ} = 500 mA P_{OUT} = 350 W f = 175MHz	15	17		dB
η_D	V_{DD} = 50 V I_{DQ} = 500 mA P_{OUT} = 350 W f = 175MHz	55	61		%
Load Mismatch	V_{DD} = 50 V I_{DQ} = 500 mA P_{OUT} = 350 W f = 175MHz all phase angles	5:1			VSWR

3 Impedance

Figure 2. Impedance data schematic

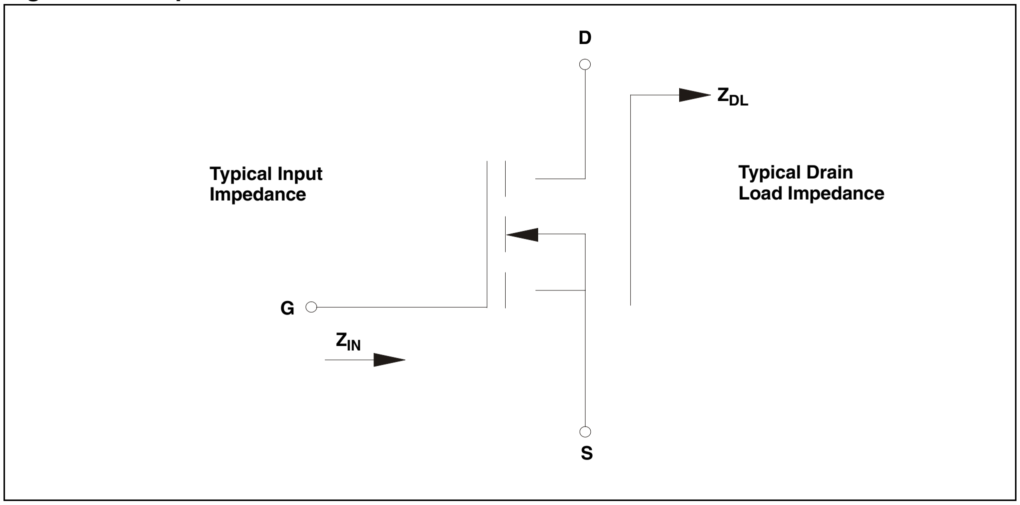


Table 6. Impedance data

f	Z_{IN} (Ω)	Z_{DL} (Ω)
250 MHz	1.3 - j 1.9	1.9 + j 3.2
230 MHz	1.2 - j 1.8	2.1 + j 3.7
200 MHz	1.1 - j 1.6	2.7 +j 4.2
175 MHz	1.0 - j 1.4	3.3 + j 4.8
100 MHz	1.8 - j 2.5	7.5 + j 9
50 MHz	3.2 - j 4.4	10 + j 12

4 Typical performance

Figure 3. Capacitance vs drain voltage

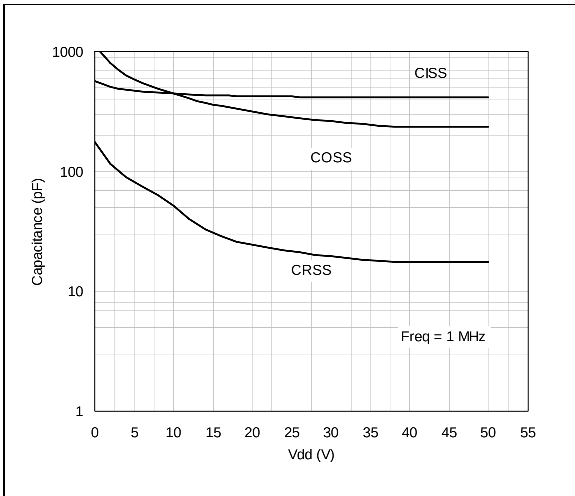


Figure 4. Drain current vs gate voltage

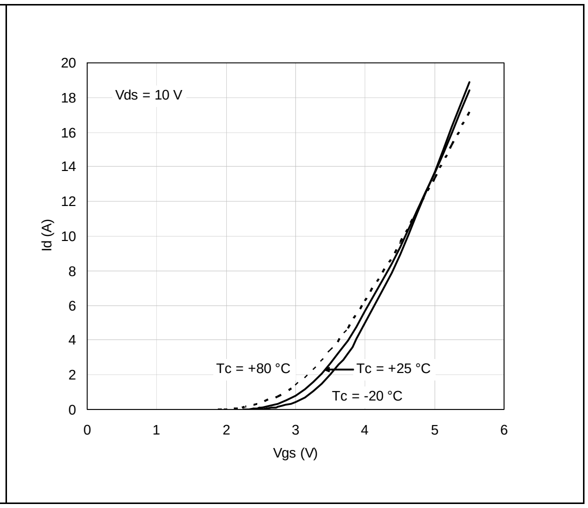


Figure 5. Gate-source voltage vs case temperature

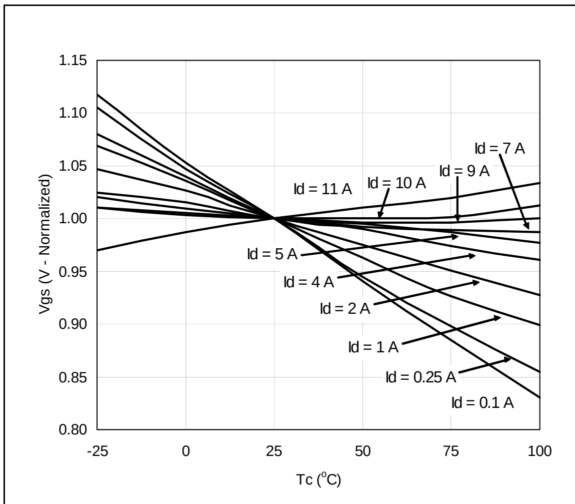


Figure 6. Power gain vs Pout and case temperature

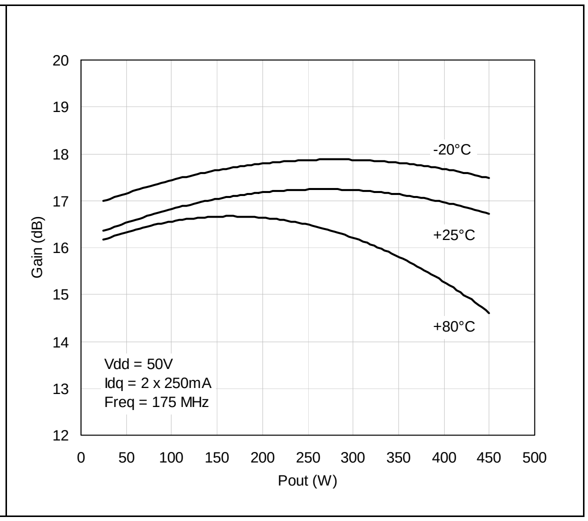


Figure 7. Efficiency vs case temperature

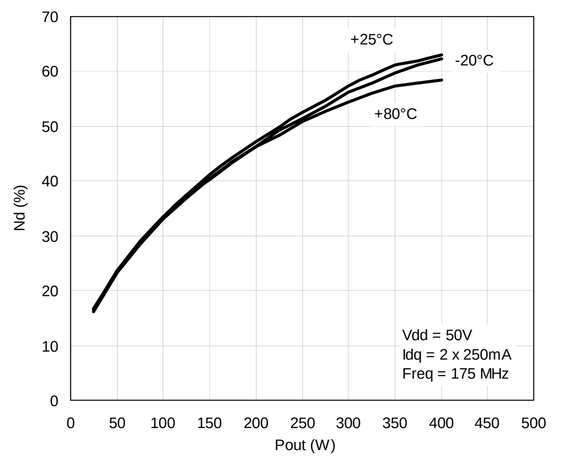


Figure 8. Pout vs input power and case temperature

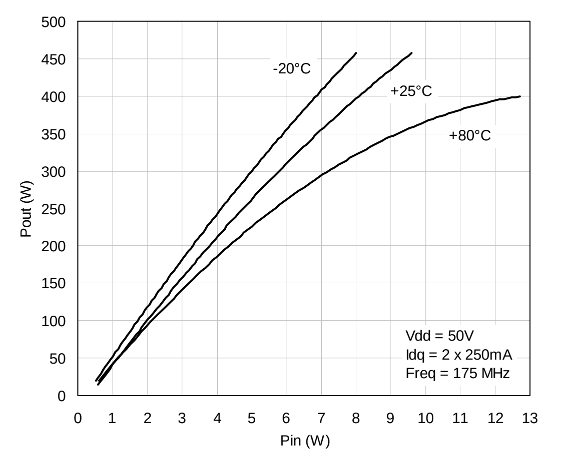


Figure 9. Pout vs input power and drain voltage

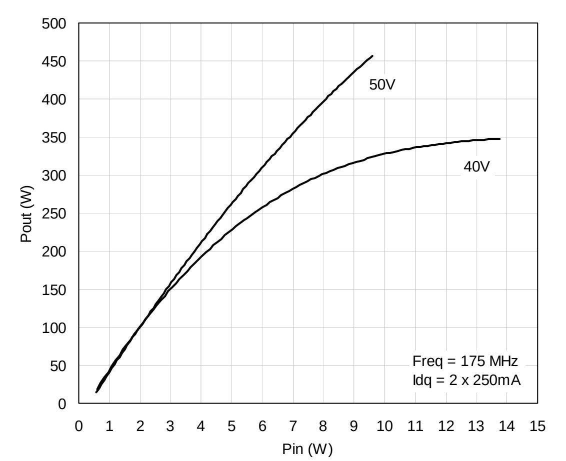


Figure 10. Pout vs gate voltage and case temperature

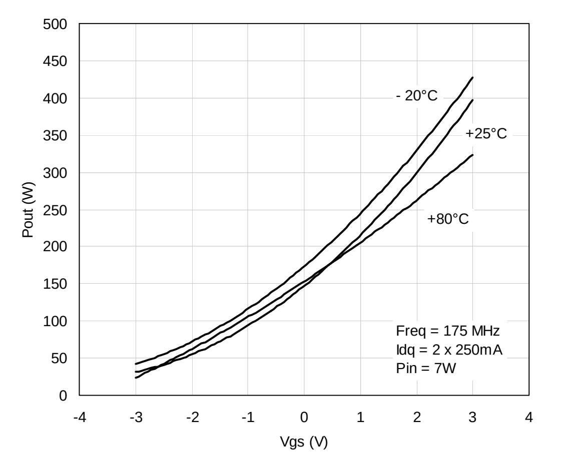


Figure 11. Pout vs drain voltage and input power

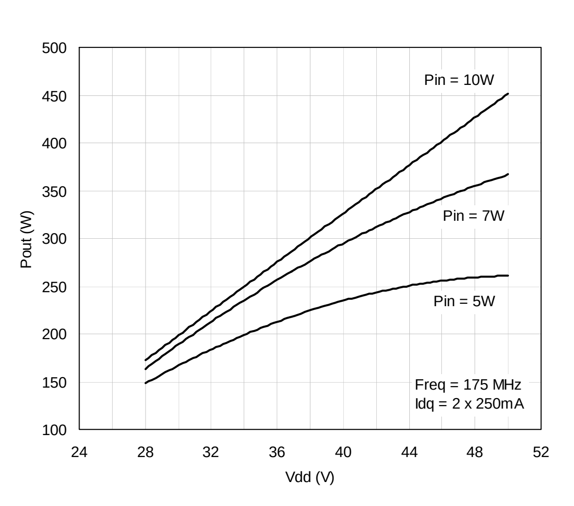


Figure 12. Maximum thermal resist vs case temperature

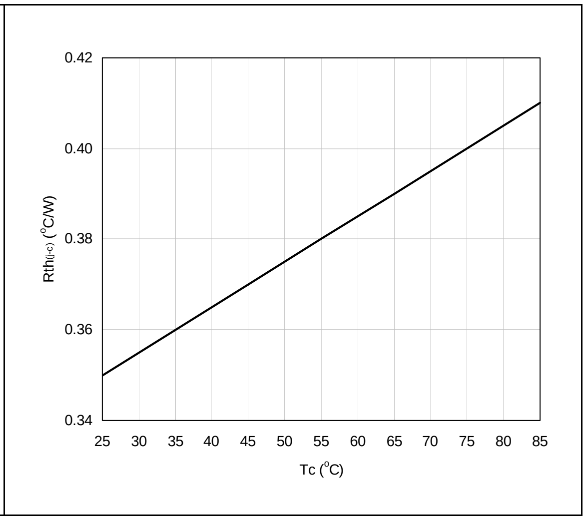


Figure 13. Maximum safe operating area

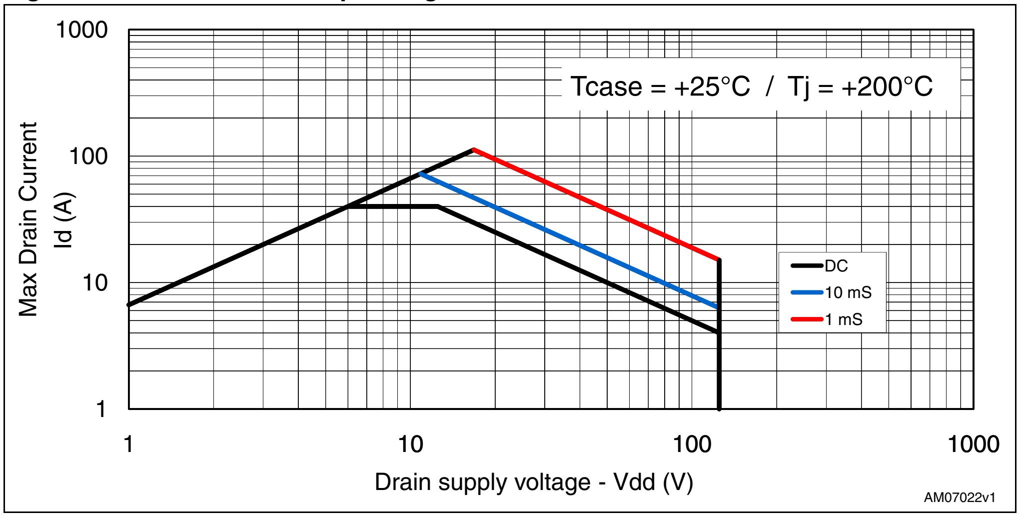


Figure 14. Transient thermal impedance

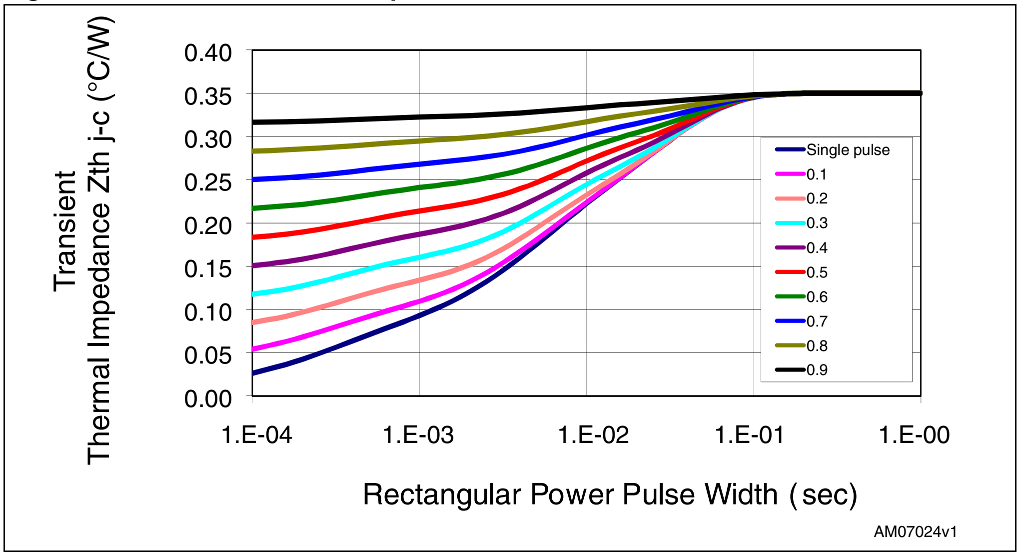
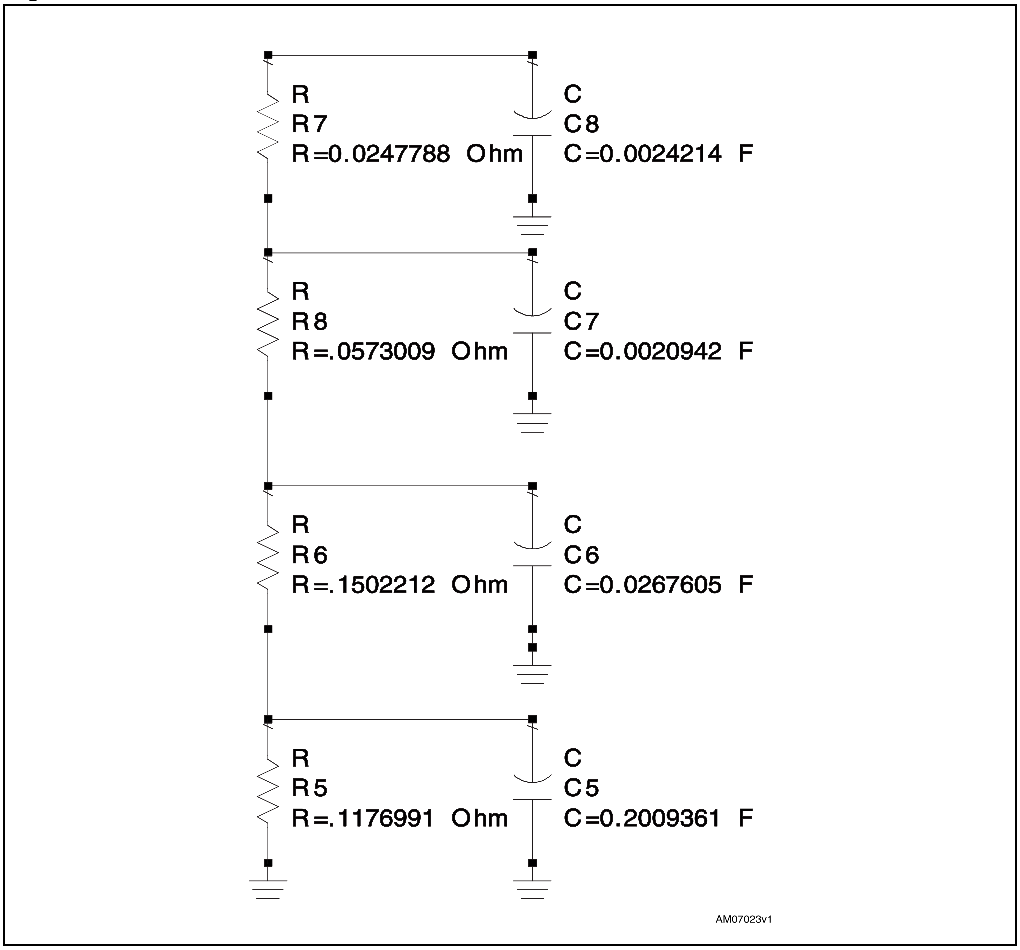
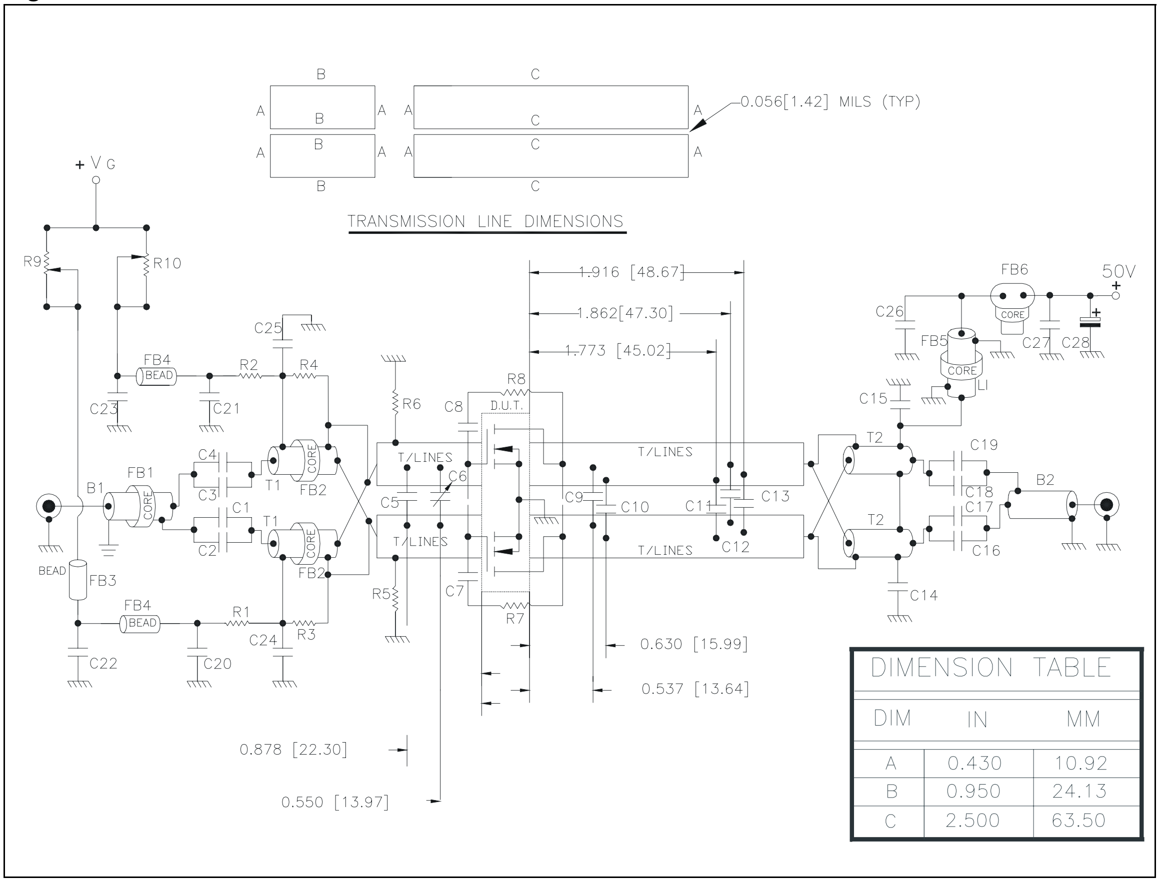


Figure 15. Transient thermal model



5 Test circuit

Figure 16. 175 MHz test circuit schematic



Note: 1 *Dimension at component symbol are reference for component placement.*

2 *Gap between ground and transmission lines is + 0.002{0.05} - 0.000{0.00} Typ.*

Table 7. 175 MHz test circuit component part list

Symbol	Description
R1,R2,R5,R6	470 Ω 1 W, surface mount chip resistor
R3,R4	360 Ω 0.5 W, carbon comp. axial lead resistor or equivalent
R7,R8	560 Ω 2 W, resistor two turn wire air-wound axial lead resistor
R9,R10	20 KΩ 3.09 W, 10 turn wirewound precision potentiometer
C1,C4	680 pF ATC 130B surface mount ceramic chip capacitor
C2,C3,C7,C8,C17,C19,C20,C21	10000 pF ATC 200B surface mount ceramic chip capacitor
C5	75 pF ATC 100B surface mount ceramic chip capacitor
C6	ST40 25 pF - 115 pF miniature variable trimmer
C9,C10	47 pF ATC 100B surface mount ceramic chip capacitor
C11,C12, C13	43 pF ATC 100B surface mount ceramic chip capacitor
C14,C15,C24,C25	1200 pF ATC 700B surface mount ceramic chip capacitor
C16,C18	470 pF ATC 700B surface mount ceramic chip capacitor
C22,C23	0.1 µF / 500 V surface mount ceramic chip capacitor
C26,C27	0.01 µF / 500 V surface mount ceramic chip capacitor
C28	10 µF / 63 aluminum electrolytic axial lead capacitor
B1	50 Ω RG316 O.D 0.076[1.93] L = 11.80[299.72] flexible coaxial cable 4 turns thru fair-rite bead
B2	50 Ω RG-142B O.D 0.165[4.19] L = 11.80[299.72] flexible coaxial cable
T1	R.F. transformer 4:1, 25 Ω O.D RG316-25 O.D 0.080[2.03] L = 5.90[149.86] flexible coaxial cable 2 turns thru fair-rite multi-aperture core
T2	R.F. transformer 1:4, 25 Ω semi-rigid coaxial cable O.D. 0.141[3.58] L = 5.90[149.86]
L1	Inductor λ 1/4 wave 50 Ω O.D 0.165[4.19] L = 11.80 [299.72] flexible coaxial cable 2 turns thru fair-rite bead
FB1,FB5	Shield bead
FB2,FB6	Multi-aperture core
FB3	Multilayer ferrite chip bead (surface mount)
FB4	Surface mount emi shield bead
PCB	Woven glass reinforced ptfe microwave Laminate 0.06”, 1 oz EDCu, both sides, εr = 2.55

Figure 17. 175 MHz test circuit photomaster

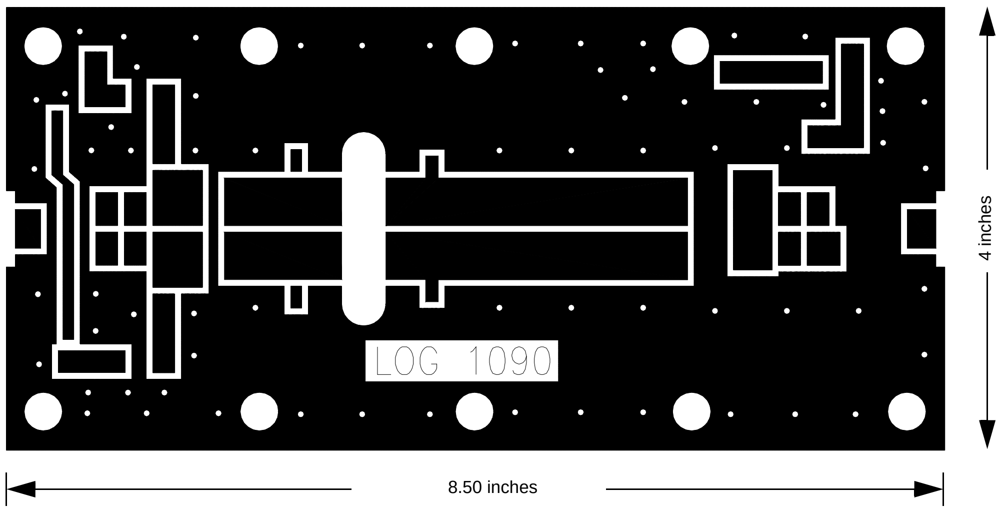
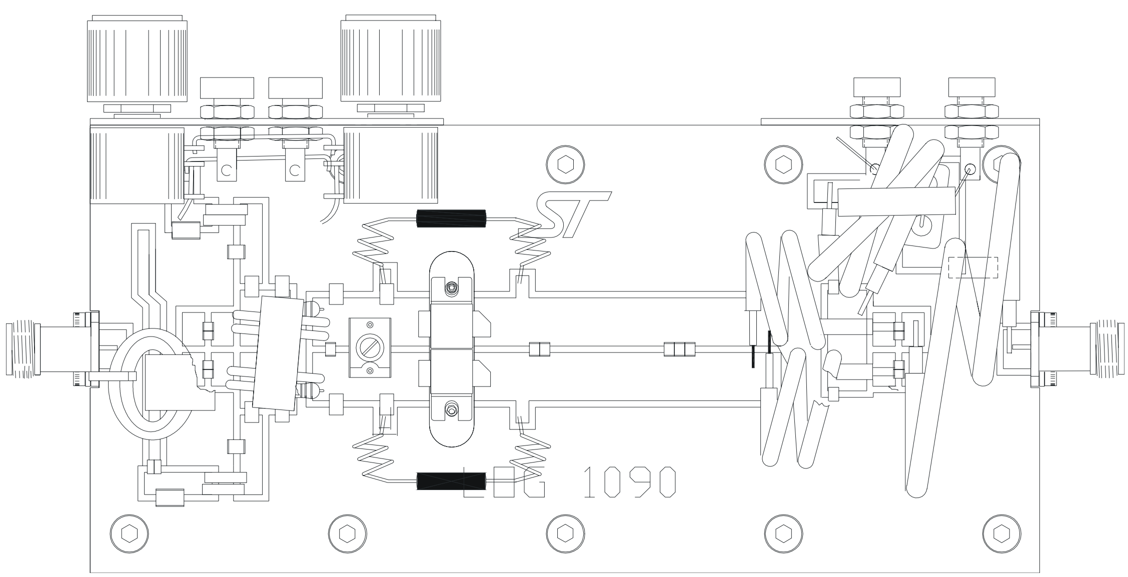


Figure 18. 175 MHz test circuit



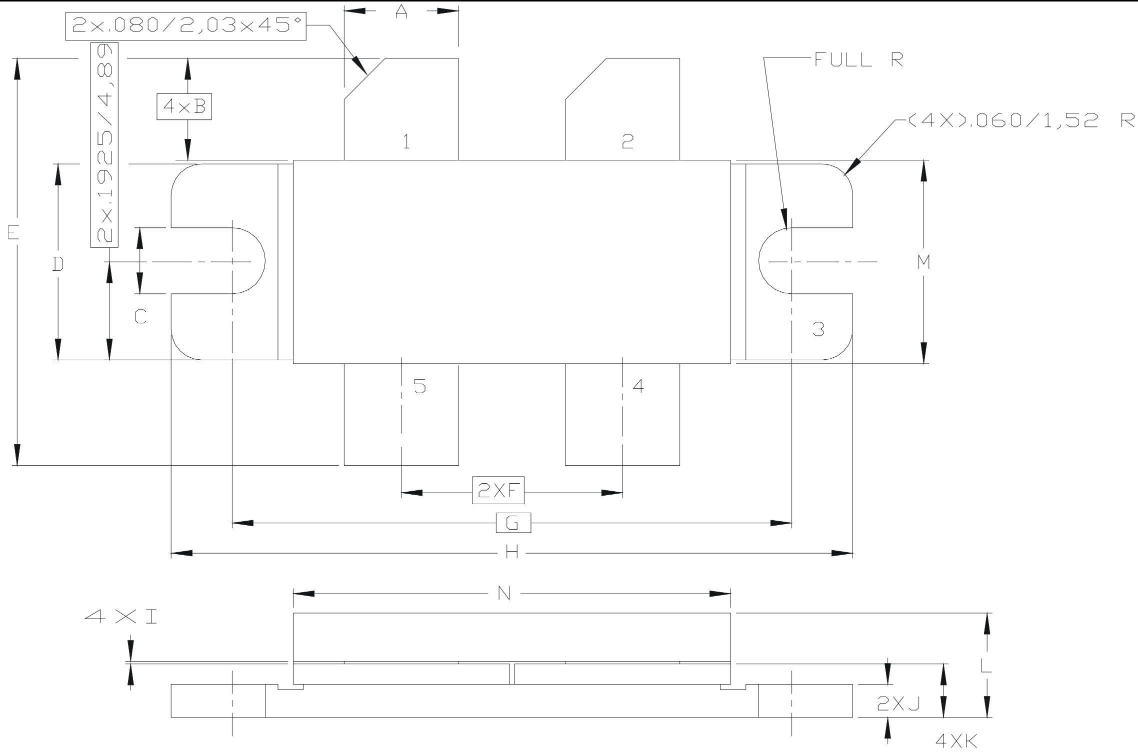
6 Package mechanical data

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 8. M244 (.400 x .860 4/L BAL N/HERM W/FLG)

DIM.	mm.			inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	5.59		5.84	0.220		0.230
B		5.08			0.200	
C	3.02		3.28	0.119		0.129
D	9.65		9.91	0.380		0.390
E	19.81		20.82	0.780		0.820
F	10.92		11.18	0.430		0.440
G		27.94			1.100	
H	33.91		34.16	1.335		1.345
I	0.10		0.15	0.004		0.006
J	1.52		1.78	0.060		0.070
K	2.59		2.84	0.102		0.112
L	4.83		5.84	0.190		0.230
M	10.03		10.34	0.395		0.407
N	21.59		22.10	0.850		0.870

Figure 19. M244 package dimensions



g Dimension: Inches

7 Revision history

Table 9. Document revision history

Date	Revision	Changes
18-Oct-2005	1	First Issue.
04-Jan-2006	2	Complete version.
14-Apr-2010	3	Added *Figure 13*, *Figure 14* and *Figure 15*.

Please Read Carefully: