# SD2942

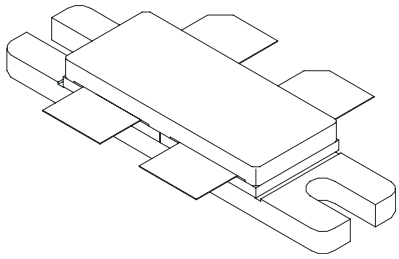
## RF power transistor
## HF/VHF/UHF N-channel MOSFETs

## 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**

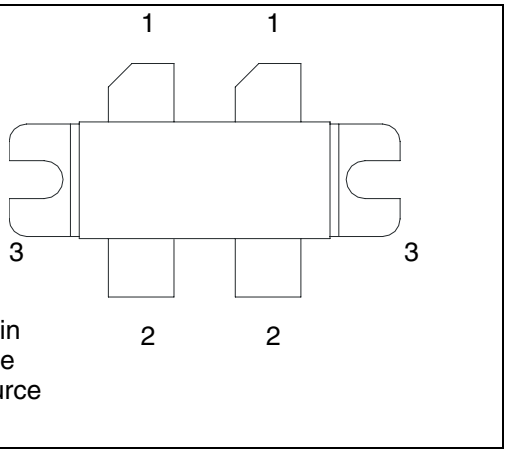



**Table 1. Device summary**

| 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 |
| $\eta_D$ | $V_{DD}$ = 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**

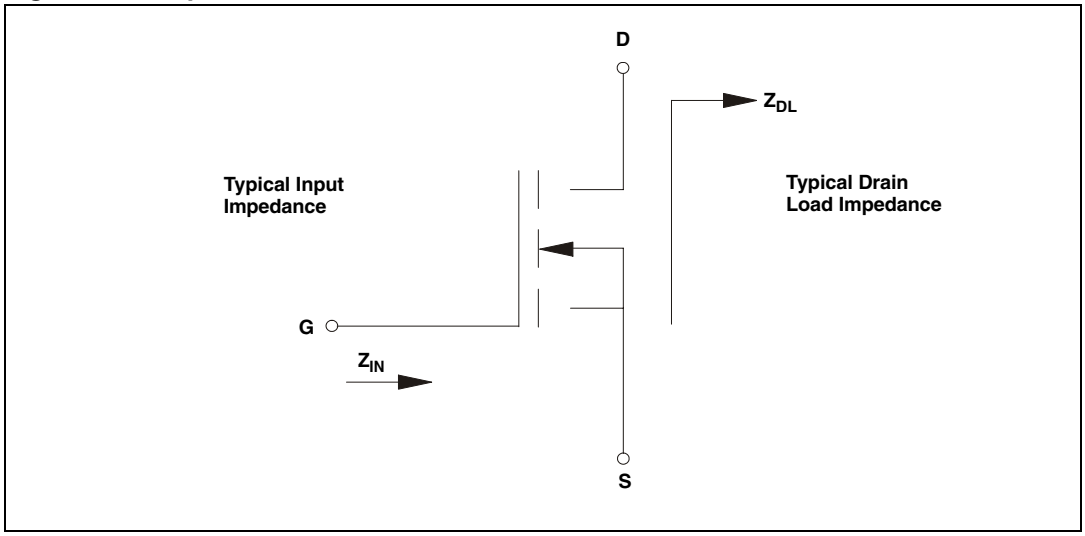



**Table 6. Impedance data**

| 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**

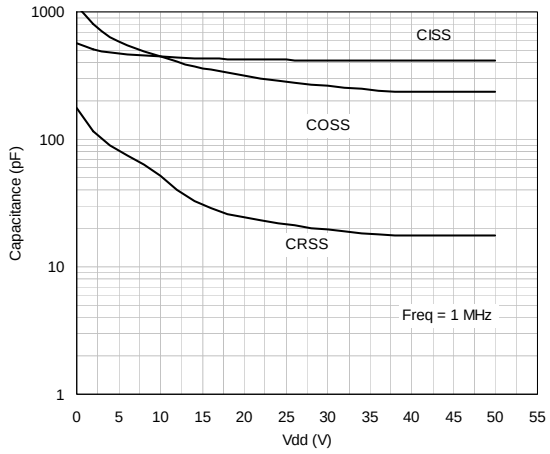



**Figure 4. Drain current vs gate voltage**

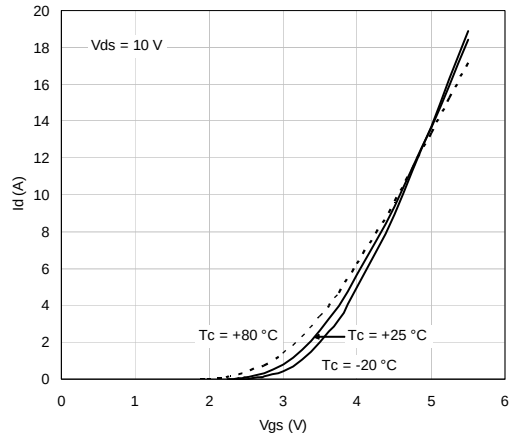



**Figure 5. Gate-source voltage vs case temperature**

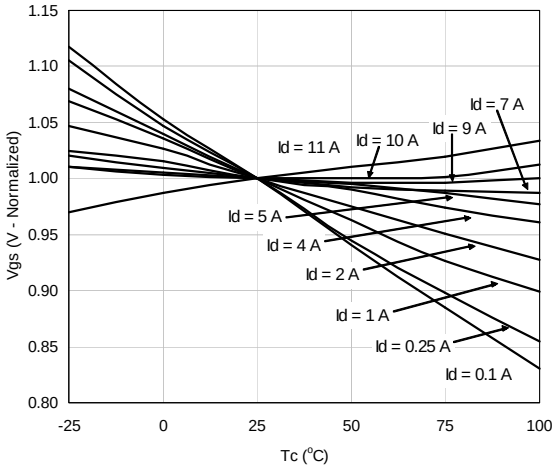



**Figure 6. Power gain vs Pout and case temperature**

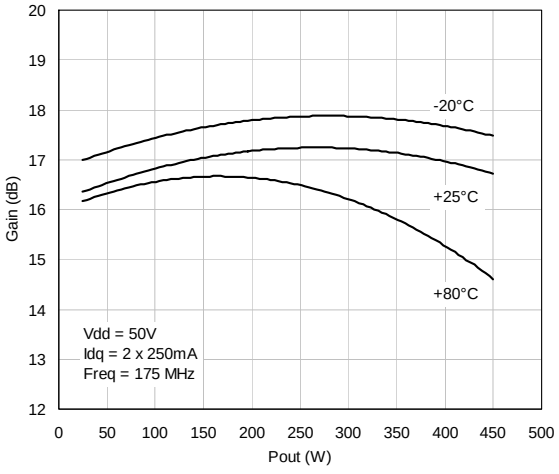


**Figure 7. Efficiency vs case temperature**

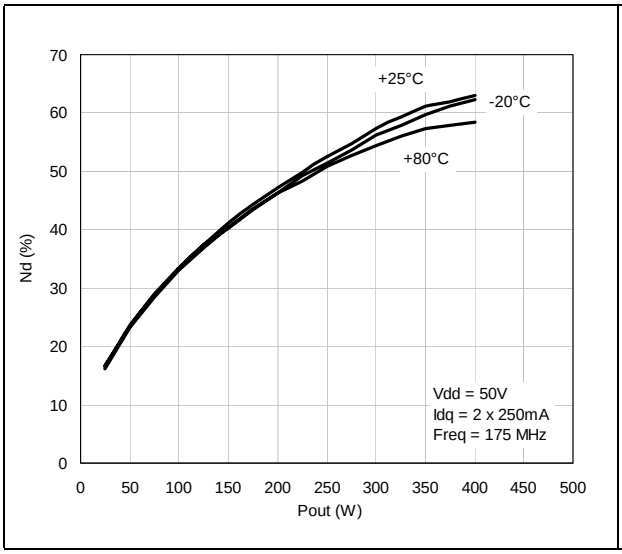



**Figure 8. Pout vs input power and case temperature**

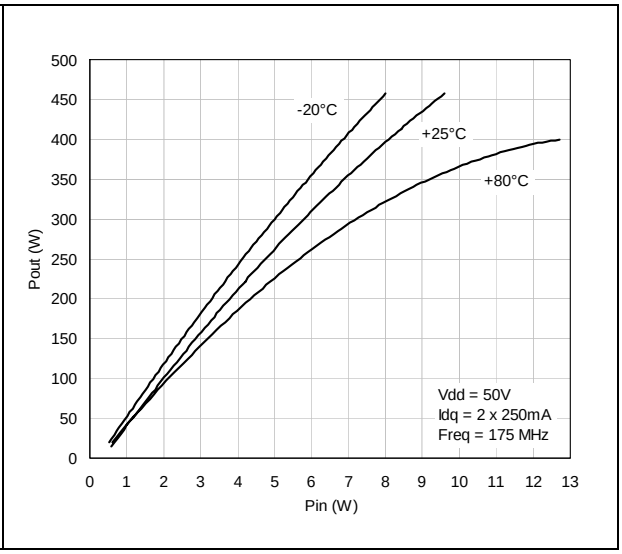



**Figure 9. Pout vs input power and drain voltage**

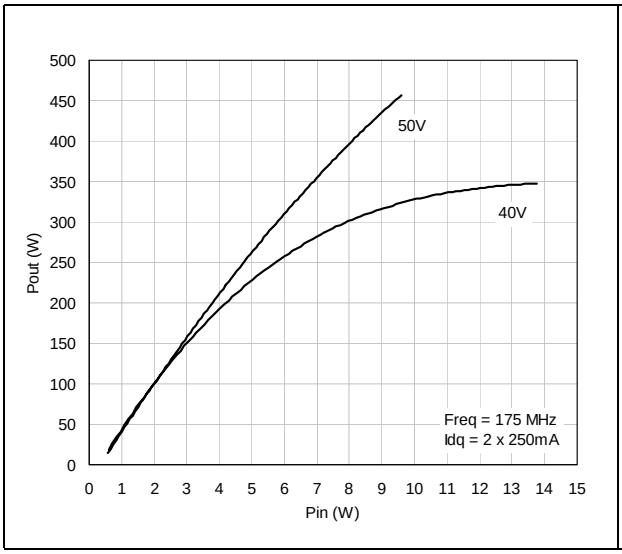



**Figure 10. Pout vs gate voltage and case temperature**

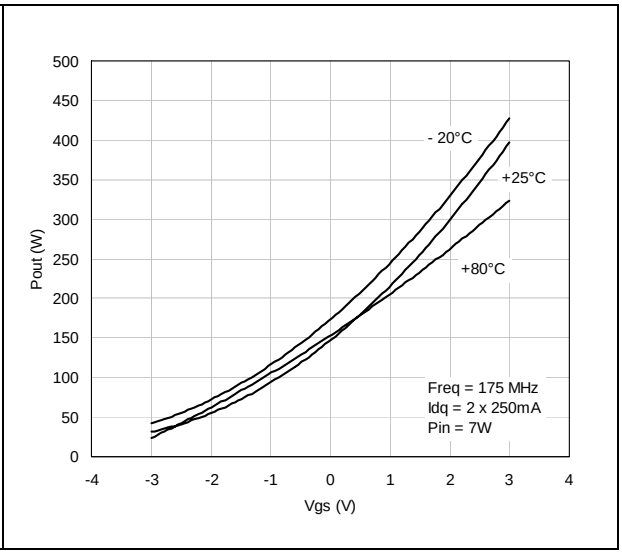


**Figure 11. Pout vs drain voltage and input power**

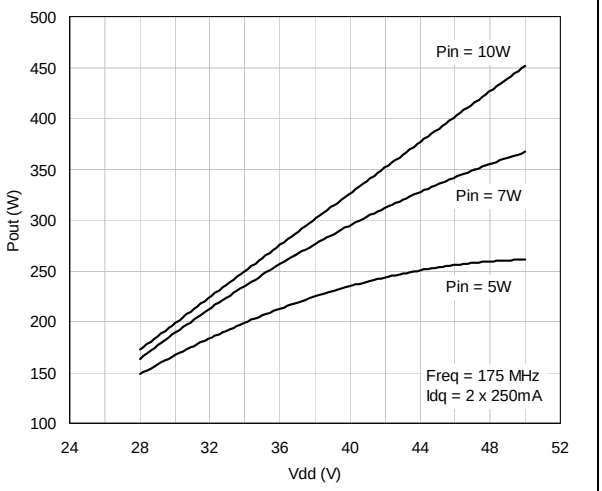



**Figure 12. Maximum thermal resist vs case temperature**

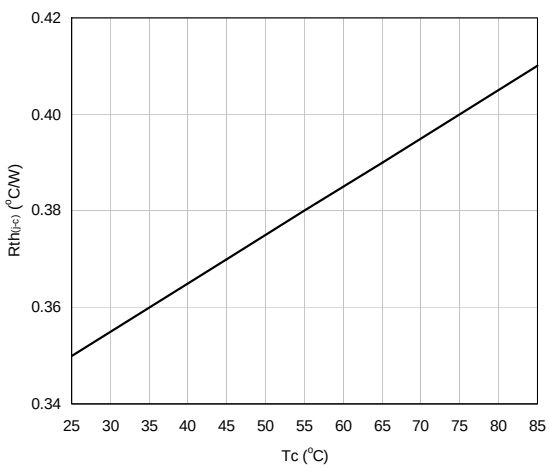



**Figure 13. Maximum safe operating area**

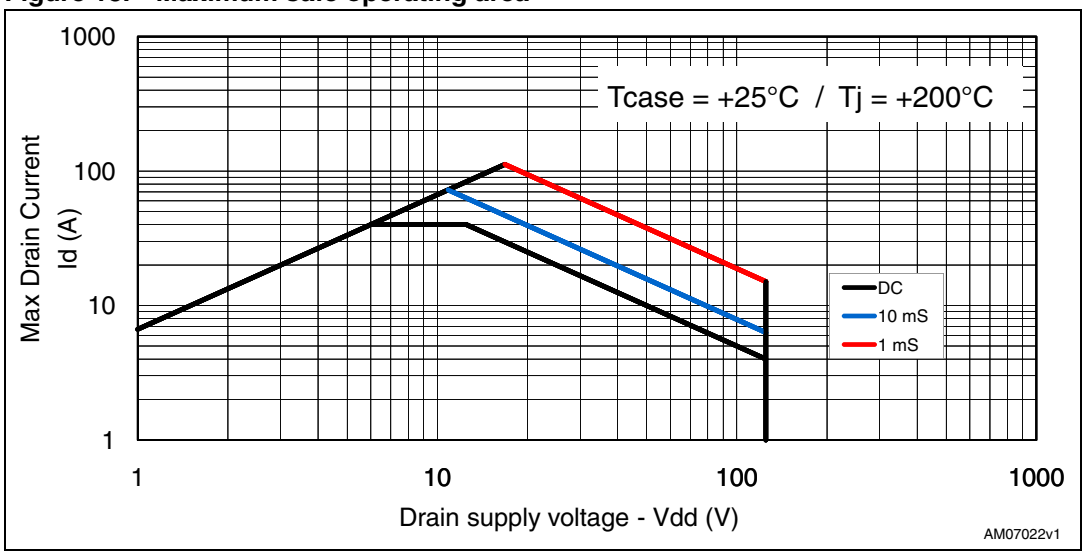


**Figure 14. Transient thermal impedance**

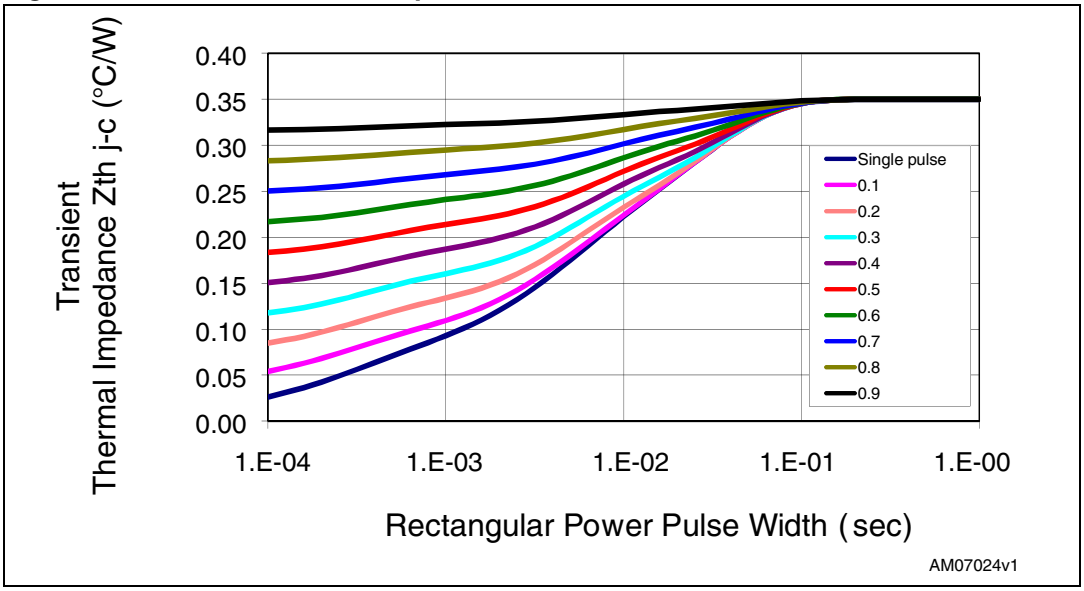
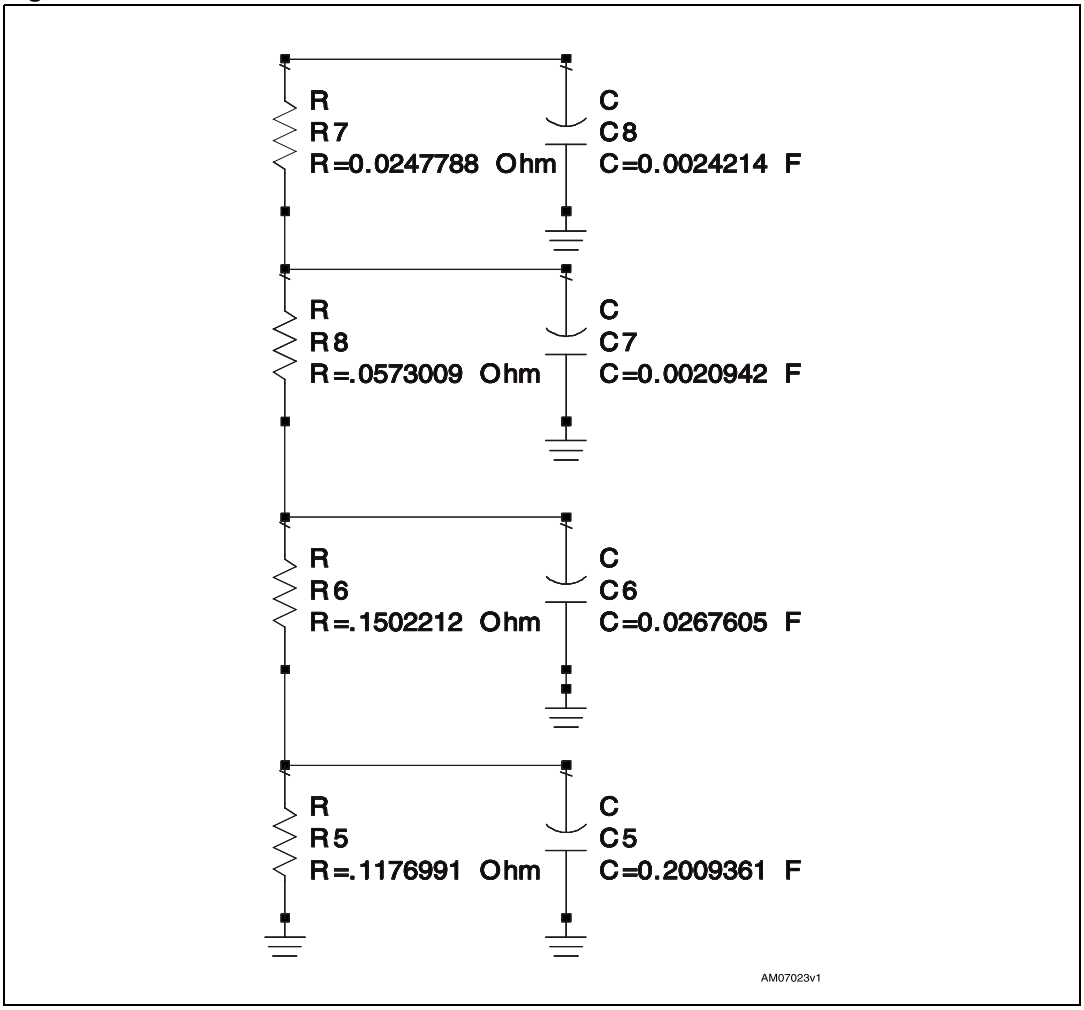
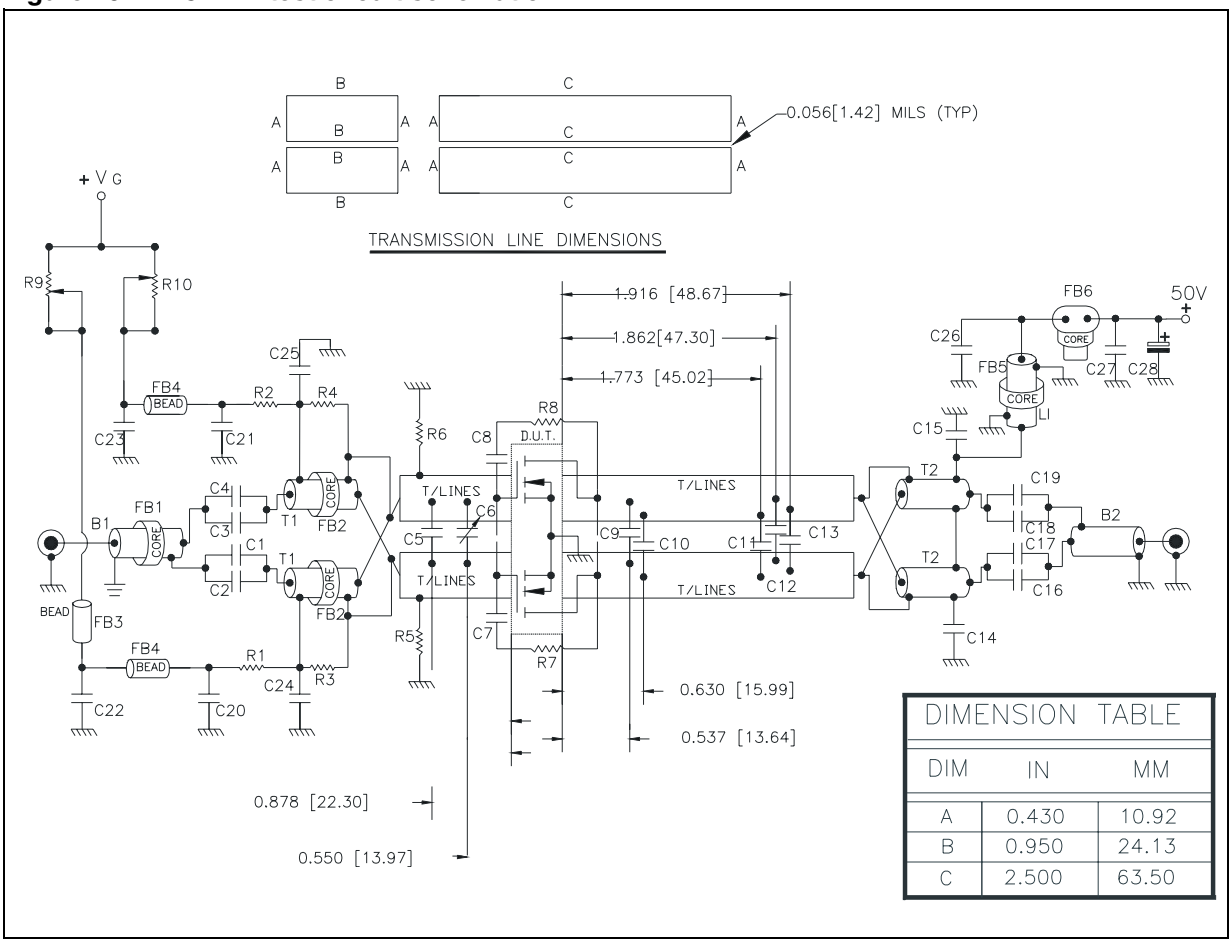



**Figure 15. Transient thermal model**



# 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**

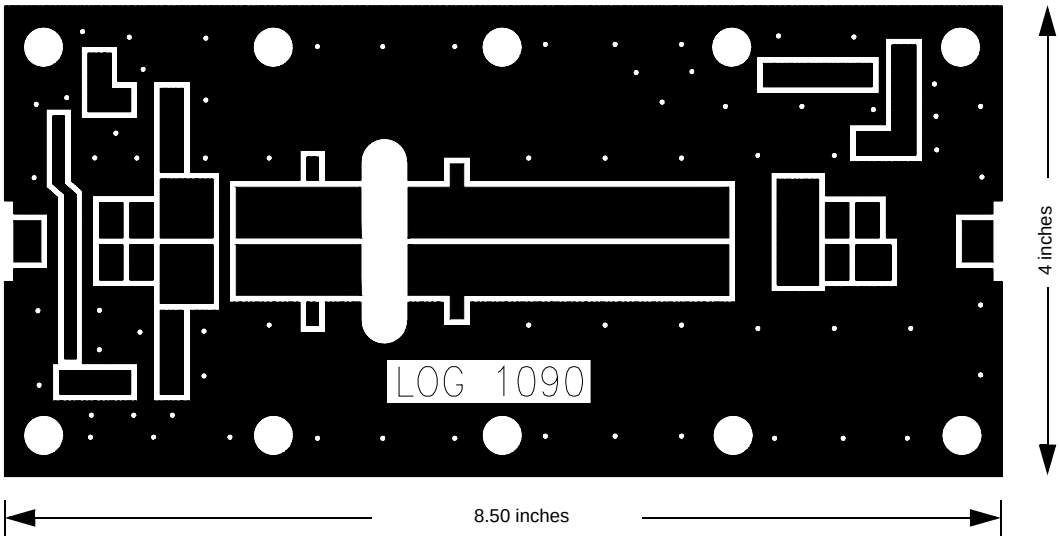
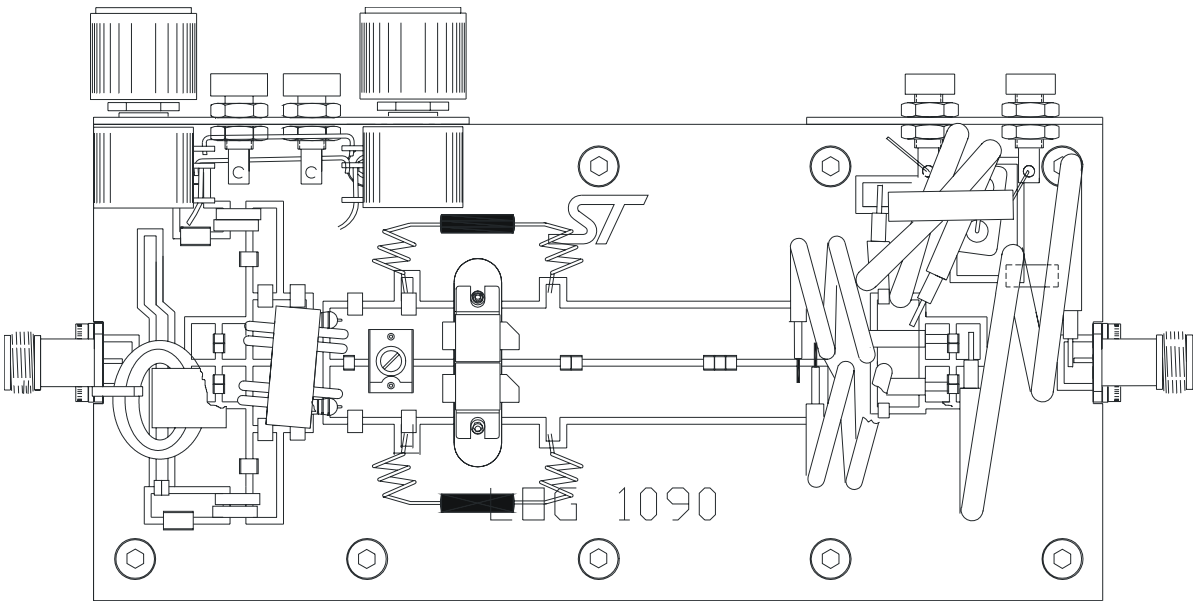



**Figure 18. 175 MHz test circuit**



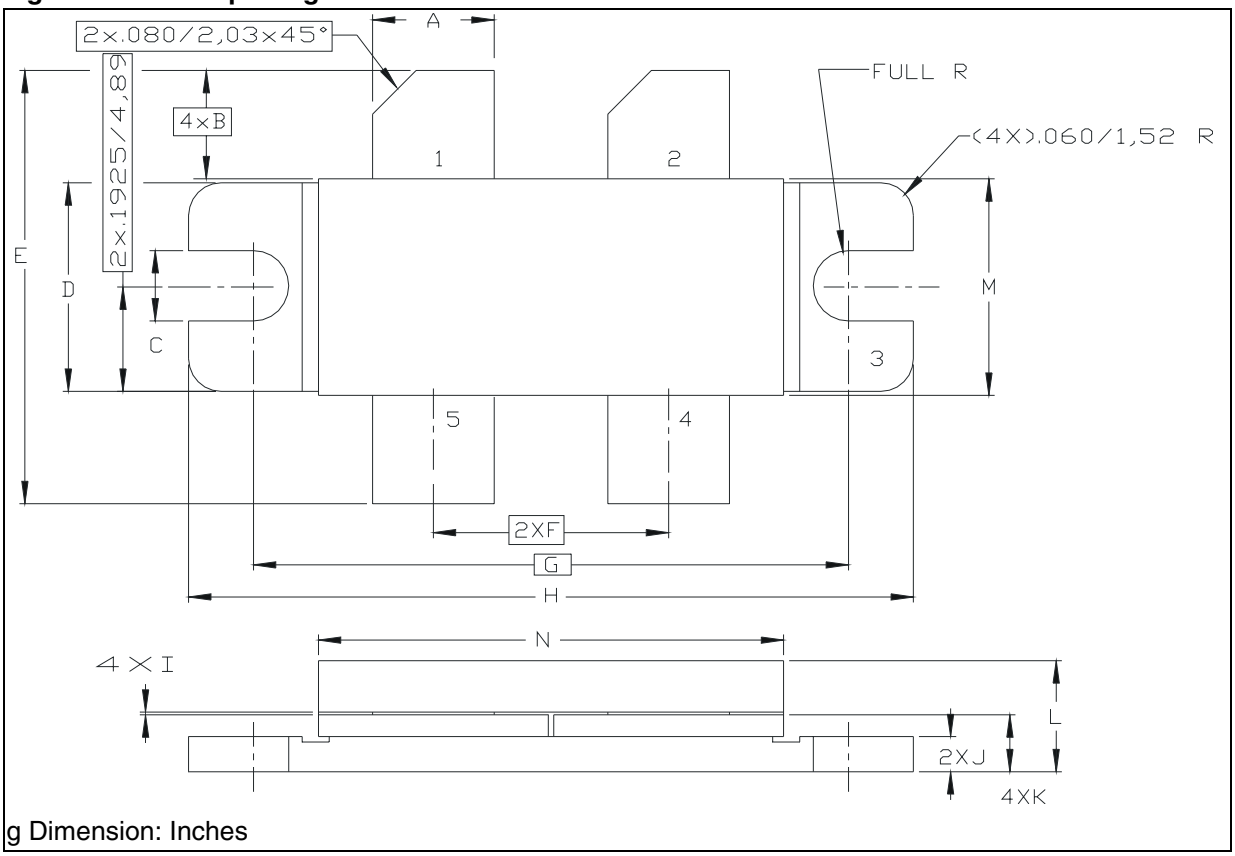
# 6 Package mechanical data

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*. |

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