



## SD57060

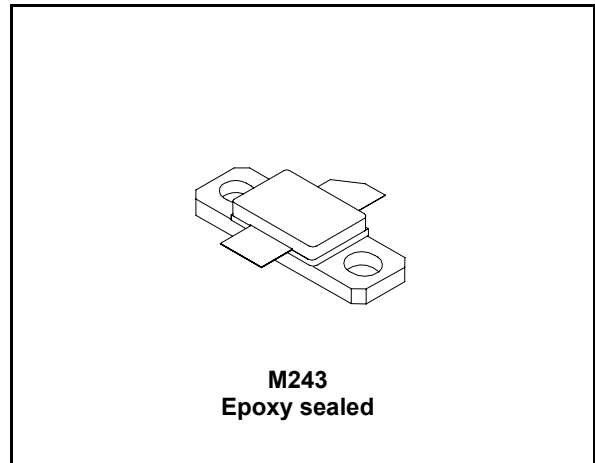
RF power transistor  
the LdmoST family

### Features

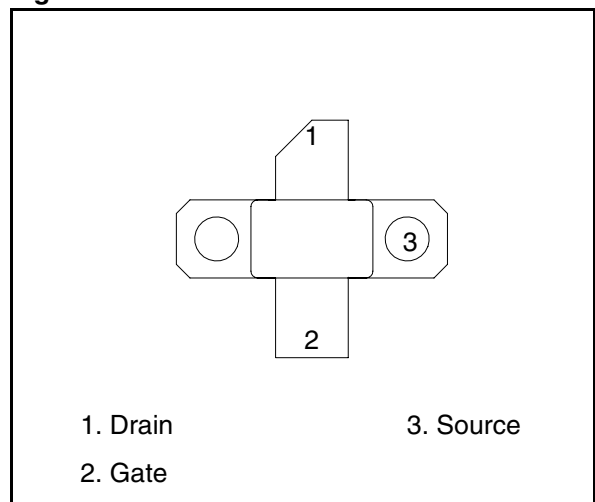
- Excellent thermal stability
- Common source configuration
- $P_{OUT} = 60W$  with 13dB gain @ 945MHz
- BeO free package
- In compliance with the 2002/95/EC european directive

### Description

The SD57060 is a common source N-Channel enhancement-mode lateral Field-Effect RF power transistor designed for broadband commercial and industrial applications at frequencies up to 1.0 GHz. The SD57060 is designed for high gain and broadband performance operating in common source mode at 28V. It is ideal for base station applications requiring high linearity.



**Figure 1. Pin connection**



**Table 1. Device summary**

| Order code | Package | Branding |
|------------|---------|----------|
| SD57060    | M243    | SD57060  |

# Contents

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# 1 Electrical data

## 1.1 Maximum ratings

**Table 2. Absolute maximum ratings** ( $T_{CASE} = 25^{\circ}C$ )

| Symbol        | Parameter                                  | Value        | Unit        |
|---------------|--------------------------------------------|--------------|-------------|
| $V_{(BR)DSS}$ | Drain-source voltage                       | 65           | V           |
| $V_{GS}$      | Gate-source voltage                        | $\pm 20$     | V           |
| $I_D$         | Drain current                              | 7            | A           |
| $P_{DISS}$    | Power dissipation (@ $T_c = 70^{\circ}C$ ) | 108          | W           |
| $T_J$         | Max. operating junction temperature        | 200          | $^{\circ}C$ |
| $T_{STG}$     | Storage temperature                        | -65 to + 150 | $^{\circ}C$ |

## 1.2 Thermal data

**Table 3. Thermal data**

| Symbol     | Parameter                          | Value | Unit          |
|------------|------------------------------------|-------|---------------|
| $R_{thJC}$ | Junction - case thermal resistance | 1.2   | $^{\circ}C/W$ |

## 2 Electrical characteristics

$$T_{\text{CASE}} = +25\text{ }^{\circ}\text{C}$$

### 2.1 Static

**Table 4. Static**

| Symbol                      | Test conditions               |                                | Min | Typ | Max | Unit          |
|-----------------------------|-------------------------------|--------------------------------|-----|-----|-----|---------------|
| $V_{(\text{BR})\text{DSS}}$ | $V_{\text{GS}} = 0\text{ V}$  | $I_{\text{DS}} = 1\text{ mA}$  | 65  |     |     | V             |
| $I_{\text{DSS}}$            | $V_{\text{GS}} = 0\text{ V}$  | $V_{\text{DS}} = 28\text{ V}$  |     |     | 1   | $\mu\text{A}$ |
| $I_{\text{GSS}}$            | $V_{\text{GS}} = 20\text{ V}$ | $V_{\text{DS}} = 0\text{ V}$   |     |     | 1   | $\mu\text{A}$ |
| $V_{\text{GS(Q)}}$          | $V_{\text{DS}} = 28\text{ V}$ | $I_{\text{D}} = 250\text{ mA}$ | 2.0 |     | 5.0 | V             |
| $V_{\text{DS(ON)}}$         | $V_{\text{GS}} = 10\text{ V}$ | $I_{\text{D}} = 3\text{ A}$    |     | 0.7 | 0.8 | V             |
| $G_{\text{FS}}$             | $V_{\text{DS}} = 10\text{ V}$ | $I_{\text{D}} = 3\text{ A}$    | 2.5 |     |     | S             |
| $C_{\text{ISS}}^{(1)}$      | $V_{\text{GS}} = 0\text{ V}$  | $V_{\text{DS}} = 28\text{ V}$  |     | 88  |     | pF            |
| $C_{\text{OSS}}$            | $V_{\text{GS}} = 0\text{ V}$  | $V_{\text{DS}} = 28\text{ V}$  |     | 44  |     | pF            |
| $C_{\text{RSS}}$            | $V_{\text{GS}} = 0\text{ V}$  | $V_{\text{DS}} = 28\text{ V}$  |     | 1.7 |     | pF            |

1. Includes Internal Input Moscap.

### 2.2 Dynamic

| Symbol           | Test conditions               |                                                                                                         | Min | Typ | Max | Unit     |
|------------------|-------------------------------|---------------------------------------------------------------------------------------------------------|-----|-----|-----|----------|
| $P_{\text{OUT}}$ | $V_{\text{DD}} = 28\text{ V}$ | $I_{\text{DQ}} = 100\text{ mA}$ $f = 945\text{ MHz}$                                                    | 60  |     |     | W        |
| $G_{\text{PS}}$  | $V_{\text{DD}} = 28\text{ V}$ | $I_{\text{DQ}} = 100\text{ mA}$ $P_{\text{OUT}} = 60\text{ W}$ $f = 945\text{ MHz}$                     | 13  | 15  |     | dB       |
| $h_{\text{D}}$   | $V_{\text{DD}} = 28\text{ V}$ | $I_{\text{DQ}} = 100\text{ mA}$ $P_{\text{OUT}} = 60\text{ W}$ $f = 945\text{ MHz}$                     | 53  | 60  |     | %        |
| Load mismatch    | $V_{\text{DD}} = 28\text{ V}$ | $I_{\text{DQ}} = 100\text{ mA}$ $P_{\text{OUT}} = 60\text{ W}$ $f = 945\text{ MHz}$<br>All phase angles | 5:1 |     |     | VSW<br>R |

3 Impedance

Figure 2. Current conventions

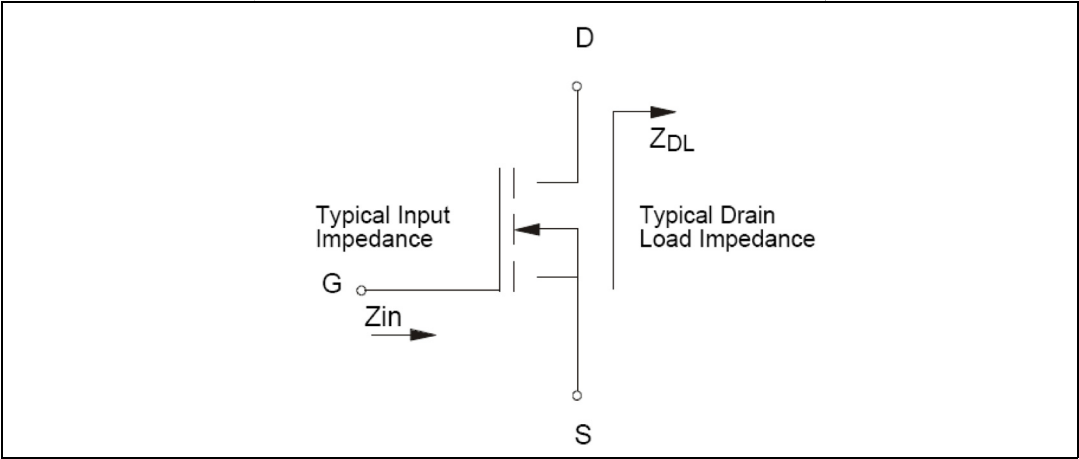


Table 5. Impedance data

| Freq. (MHz) | $Z_{IN} (\Omega)$ | $Z_{DL}(\Omega)$ |
|-------------|-------------------|------------------|
| 925 MHz     | $0.8 - j\ 0.095$  | $1.5 + j\ 0.48$  |
| 945 MHz     | $0.7 - j\ 0.05$   | $1.6 + j\ 0.25$  |
| 960 MHz     | $0.7 + j\ 0.1$    | $1.7 + j\ 0.130$ |

# 4 Typical performance

Figure 3. Output power and power gain vs input power

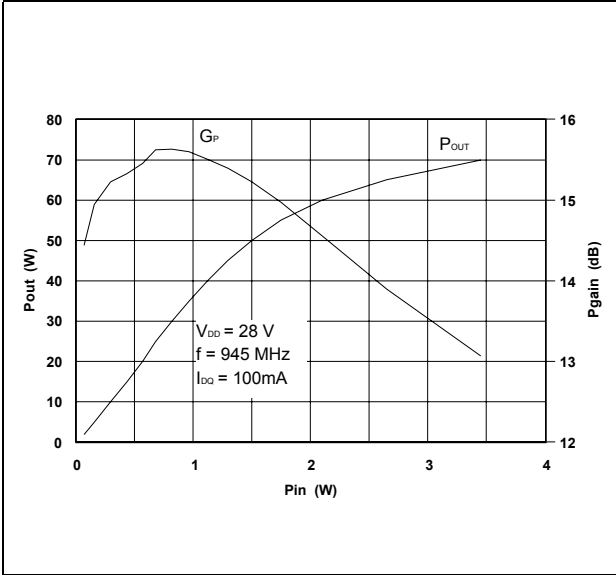


Figure 4. Output power and power gain vs input power

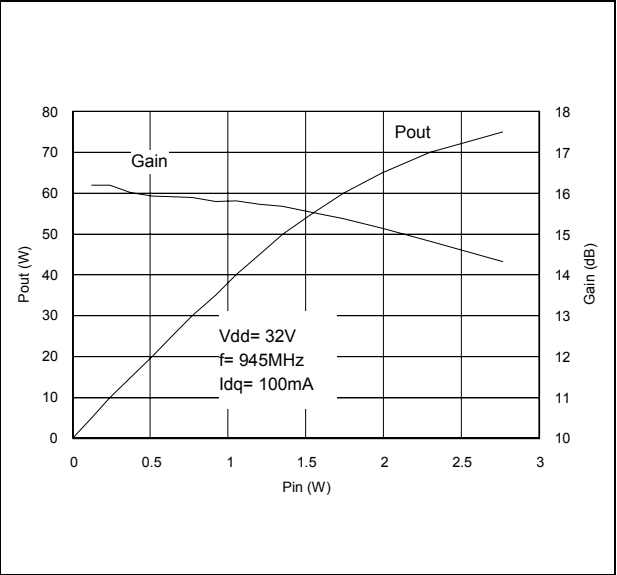


Figure 5. Efficiency vs output power

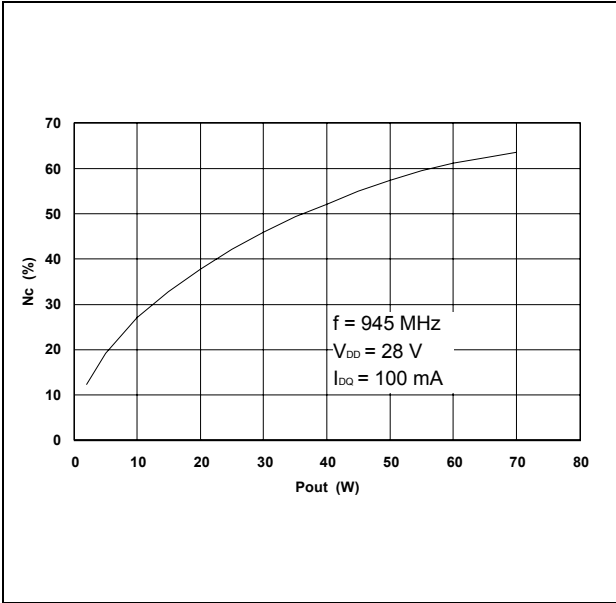


Figure 6. Efficiency vs output power

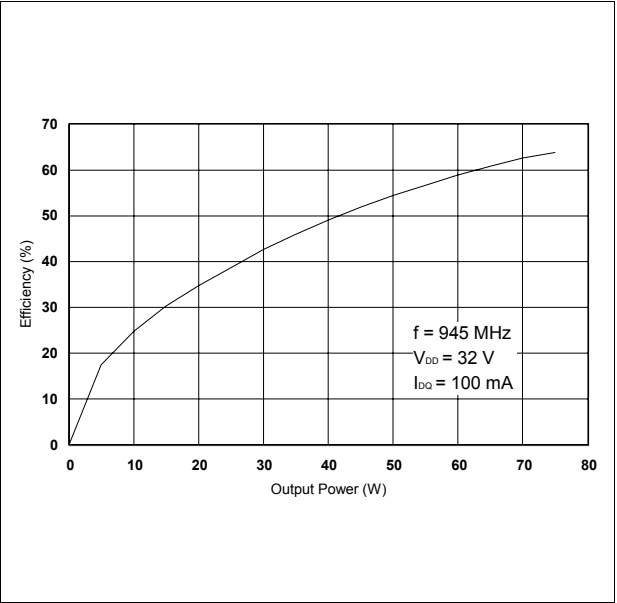


Figure 7. Output power vs drain-source voltage

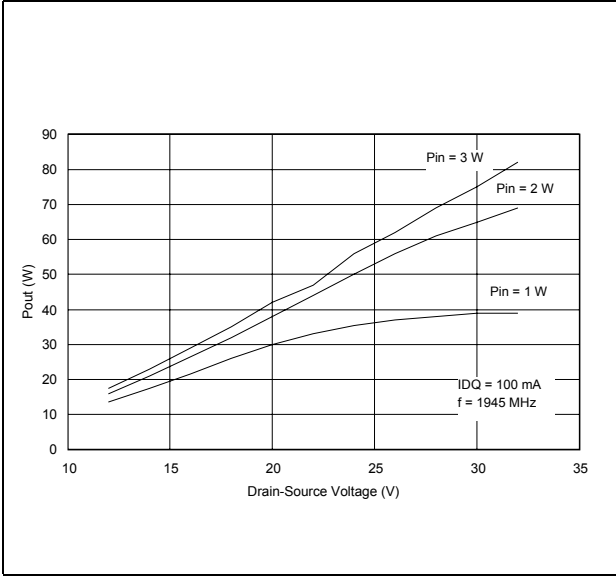


Figure 8. Intermodulation distortion vs output power

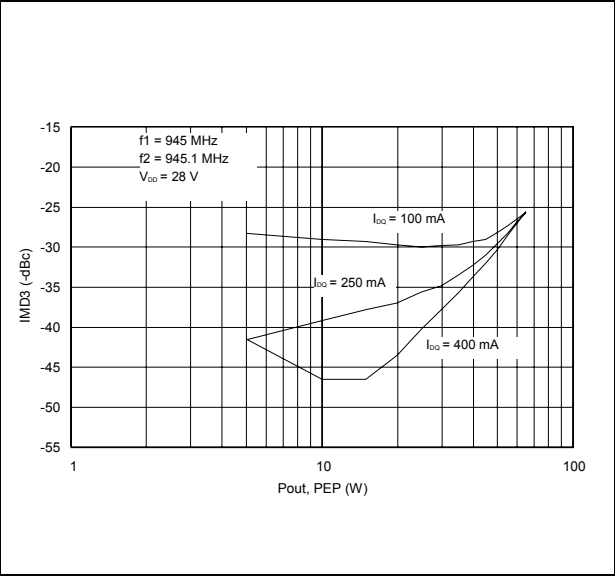


Figure 9. Power gain vs output power

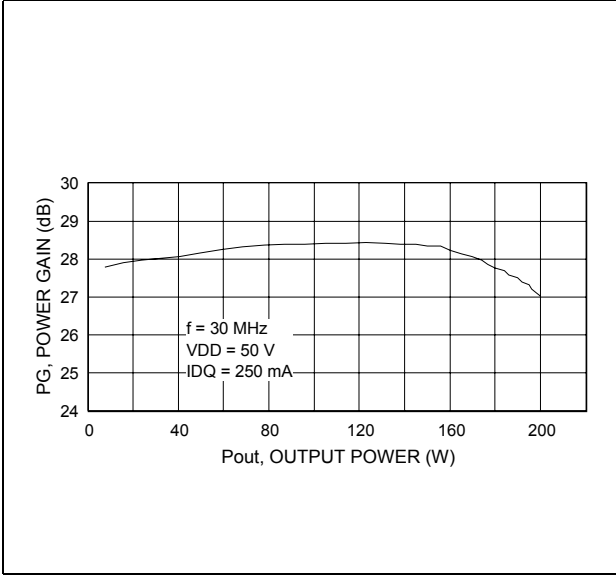
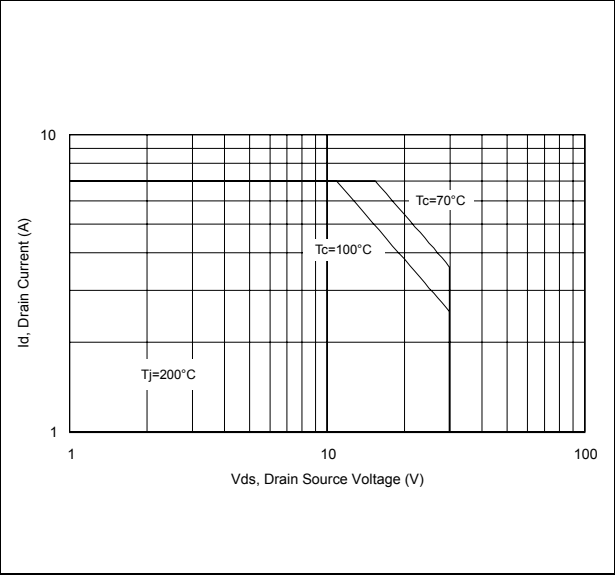
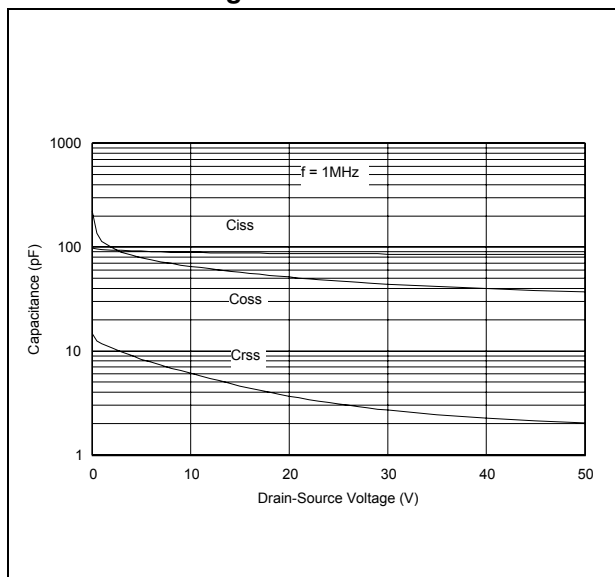


Figure 10. Safe operating area



**Figure 11. Capacitance vs drain-source voltage**



## 5 Common source s-parameter

### 5.1 SD57060 ( $V_{DS} = 13.5V$ $I_{DS} = 2A$ )

Table 6. S-parameter

| Freq (MHz) | s11 MAG | s11 ang | s21 MAG | s21 ang | s12 MAG | s12 ang | s22 MAG | s22 ang |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|
| 50         | 0.896   | -168.86 | 15.679  | 85.012  | 0.0116  | -5.1128 | 0.796   | -170.27 |
| 60         | 0.896   | -169.3  | 14.859  | 84.592  | 0.0116  | -5.4369 | 0.796   | -170.49 |
| 70         | 0.869   | -169.76 | 14.004  | 84.14   | 0.0116  | -5.7912 | 0.797   | -170.7  |
| 80         | 0.869   | -170.23 | 13.122  | 83.644  | 0.0115  | -6.0658 | 0.797   | -170.9  |
| 90         | 0.897   | -170.71 | 12.213  | 83.074  | 0.0115  | -6.3789 | 0.798   | -171.1  |
| 100        | 0.897   | -171.19 | 11.285  | 82.404  | 0.0114  | -6.8198 | 0.799   | -171.29 |
| 150        | 0.9     | -173.39 | 6.9575  | 76.841  | 0.0111  | -9.6817 | 0.808   | -171.96 |
| 200        | 0.905   | -174.29 | 4.751   | 71.951  | 0.0103  | -11.87  | 0.821   | -171.79 |
| 250        | 0.912   | -174.64 | 3.637   | 68.471  | 0.0097  | -12.957 | 0.836   | -171.36 |
| 300        | 0.92    | -174.9  | 2.889   | 64.839  | 0.0089  | -13.493 | 0.851   | -171.03 |
| 350        | 0.927   | -175.08 | 2.428   | 62.538  | 0.0083  | -11.937 | 0.866   | -170.76 |
| 400        | 0.934   | -175.3  | 2.077   | 58.748  | 0.0077  | -11.228 | 0.881   | -170.6  |
| 450        | 0.941   | -175.5  | 1.802   | 56.081  | 0.0071  | -8.7753 | 0.894   | -170.49 |
| 500        | 0.947   | -175.73 | 1.592   | 51.84   | 0.0066  | -7.5009 | 0.907   | -170.47 |
| 550        | 0.952   | -176.02 | 1.379   | 48.632  | 0.0059  | -4.8834 | 0.917   | -170.55 |
| 600        | 0.956   | -176.29 | 1.221   | 45.777  | 0.0053  | 0.12909 | 0.927   | -170.67 |
| 650        | 0.96    | -176.6  | 1.049   | 42.778  | 0.0048  | 5.0249  | 0.936   | -170.82 |
| 700        | 0.962   | -176.9  | 0.924   | 42.212  | 0.0043  | 13.591  | 0.943   | -170.94 |
| 750        | 0.965   | -177.22 | 0.814   | 40.376  | 0.0039  | 22.729  | 0.95    | -171.05 |
| 800        | 0.968   | -177.51 | 0.723   | 41.348  | 0.0036  | 37.954  | 0.956   | -171.14 |
| 850        | 0.97    | -177.83 | 0.662   | 40.788  | 0.0037  | 51.305  | 0.961   | -171.16 |
| 900        | 0.972   | -178.19 | 0.6     | 41.719  | 0.0041  | 63.188  | 0.966   | -171.24 |
| 950        | 0.974   | -178.56 | 0.566   | 41.469  | 0.0047  | 73.463  | 0.971   | -171.24 |
| 1000       | 0.975   | -178.96 | 0.523   | 41.747  | 0.0055  | 80.707  | 0.974   | -171.25 |
| 1050       | 0.976   | -179.28 | 0.504   | 41.439  | 0.0064  | 88.27   | 0.977   | -171.26 |
| 1100       | 0.978   | -179.62 | 0.477   | 40.692  | 0.0074  | 92.504  | 0.979   | -171.36 |
| 1150       | 0.979   | -179.85 | 0.466   | 39.239  | 0.0084  | 96.743  | 0.981   | -171.43 |
| 1200       | 0.981   | -179.9  | 0.444   | 36.775  | 0.0097  | 98.282  | 0.982   | -171.5  |
| 1250       | 0.982   | -179.68 | 0.431   | 34.788  | 0.011   | 99.121  | 0.983   | -171.58 |
| 1300       | 0.983   | -179.52 | 0.408   | 31.862  | 0.0125  | 98.773  | 0.983   | -171.71 |
| 1350       | 0.984   | -179.35 | 0.395   | 30.219  | 0.0136  | 97.973  | 0.983   | -171.86 |
| 1400       | 0.985   | -179.24 | 0.382   | 26.465  | 0.0148  | 97.464  | 0.984   | -171.94 |
| 1450       | 0.987   | -179.13 | 0.365   | 23.869  | 0.0157  | 95.39   | 0.984   | -171.98 |
| 1500       | 0.988   | -179.09 | 0.351   | 21.267  | 0.0165  | 93.871  | 0.985   | -171.98 |

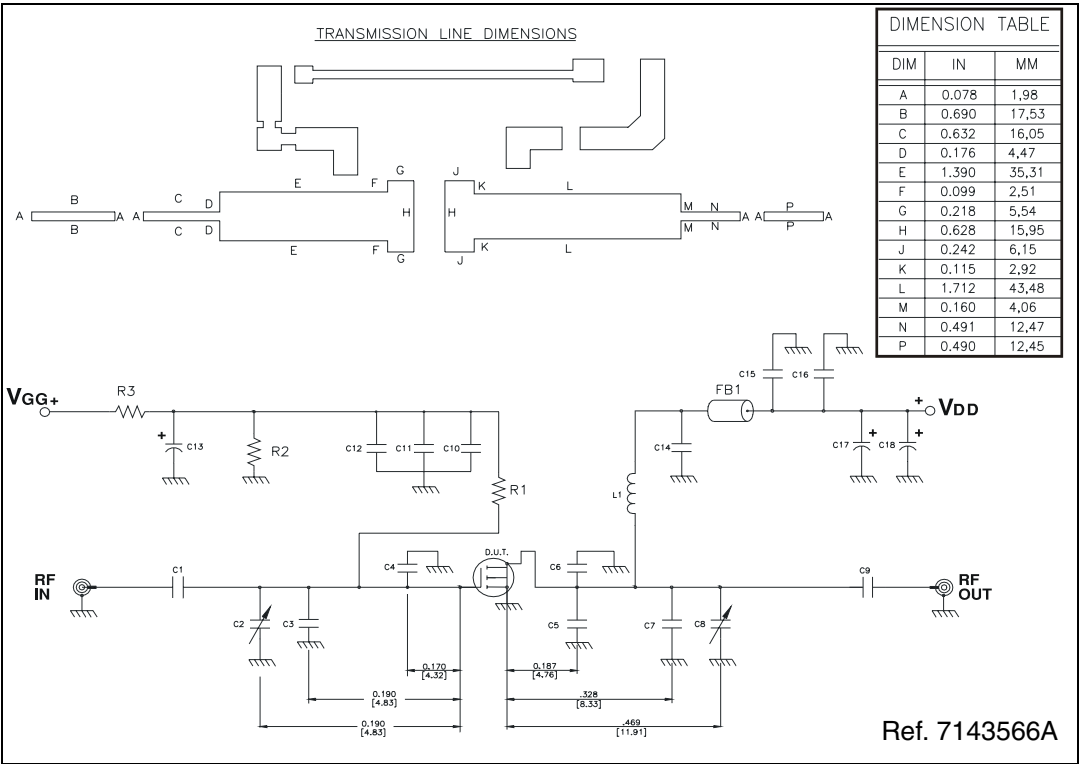
## 5.2 SD57060 ( $V_{DS} = 28V$ $I_{DS} = 2A$ )

Table 7. S-parameter

| Freq (MHz) | s11 MAG | s11 ang | s21 MAG | s21 ang | s12 MAG | s12 ang | s22 MAG | s22 ang |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|
| 50         | 0.857   | -159.69 | 22.757  | 85.934  | 0.0114  | -3.8342 | 0.67    | -161.72 |
| 60         | 0.86    | -160.69 | 21.547  | 85.328  | 0.0113  | -4.4852 | 0.672   | -162.07 |
| 70         | 0.862   | -161.73 | 20.287  | 84.672  | 0.0112  | -5.1512 | 0.674   | -162.41 |
| 80         | 0.865   | -162.8  | 18.987  | 83.933  | 0.0111  | -5.8379 | 0.677   | -162.74 |
| 90         | 0.869   | -163.89 | 17.65   | 83.083  | 0.011   | -6.5533 | 0.679   | -163.07 |
| 100        | 0.872   | -164.98 | 16.286  | 82.083  | 0.011   | -7.4226 | 0.683   | -163.39 |
| 150        | 0.891   | -169.66 | 9.9447  | 74.03   | 0.0103  | -12.13  | 0.708   | -164.66 |
| 200        | 0.905   | -171.43 | 6.719   | 67.256  | 0.0094  | -15.548 | 0.74    | -164.87 |
| 250        | 0.915   | -172.29 | 5.074   | 62.268  | 0.0086  | -17.236 | 0.774   | -164.99 |
| 300        | 0.926   | -172.84 | 3.978   | 57.533  | 0.0077  | -18.625 | 0.806   | -163.35 |
| 350        | 0.935   | -173.34 | 3.297   | 54.035  | 0.0069  | -17.313 | 0.834   | -165.82 |
| 400        | 0.943   | -173.79 | 2.775   | 49.488  | 0.0061  | -16.81  | 0.86    | -166.35 |
| 450        | 0.951   | -174.24 | 2.376   | 46.121  | 0.0054  | -13.006 | 0.881   | -166.85 |
| 500        | 0.957   | -174.67 | 2.061   | 41.541  | 0.0048  | -9.175  | 0.898   | -167.35 |
| 550        | 0.962   | -175.11 | 1.766   | 38.23   | 0.0041  | -2.5323 | 0.913   | -167.83 |
| 600        | 0.966   | -175.53 | 1.546   | 35.173  | 0.0035  | -7.641  | 0.925   | -168.25 |
| 650        | 0.969   | -175.95 | 1.32    | 32.548  | 0.0031  | 19.501  | 0.937   | -168.57 |
| 700        | 0.972   | -176.34 | 1.162   | 31.674  | 0.0031  | 34.423  | 0.946   | -168.81 |
| 750        | 0.974   | -176.75 | 1.021   | 29.983  | 0.0032  | 48.345  | 0.954   | -168.93 |
| 800        | 0.976   | -177.15 | 0.91    | 30.341  | 0.0035  | 62.927  | 0.96    | -168.98 |
| 850        | 0.977   | -177.57 | 0.826   | 29.318  | 0.004   | 74.982  | 0.967   | -168.95 |
| 900        | 0.978   | -177.98 | 0.749   | 29.508  | 0.0047  | 81.962  | 0.973   | -168.88 |
| 950        | 0.979   | -178.41 | 0.696   | 28.477  | 0.0054  | 87.332  | 0.978   | -168.77 |
| 1000       | 0.979   | -178.85 | 0.639   | 27.949  | 0.0063  | 90.913  | 0.982   | -168.72 |
| 1050       | 0.98    | -179.24 | 0.601   | 26.768  | 0.0072  | 95.707  | 0.984   | -168.75 |
| 1100       | 0.981   | -179.61 | 0.561   | 25.598  | 0.0082  | 98.95   | 0.985   | -168.87 |
| 1150       | 0.981   | -179.95 | 0.533   | 23.746  | 0.0094  | 101.25  | 0.986   | -169.13 |
| 1200       | 0.982   | 179.72  | 0.498   | 21.331  | 0.011   | 102.03  | 0.985   | -169.64 |
| 1250       | 0.983   | 179.44  | 0.472   | 19.005  | 0.012   | 102.21  | 0.981   | -170.42 |
| 1300       | 0.984   | 179.23  | 0.44    | 16.272  | 0.0131  | 101.78  | 0.976   | -171.5  |
| 1350       | 0.985   | 179.02  | 0.417   | 14.424  | 0.0143  | 100.61  | 0.969   | -172.89 |
| 1400       | 0.986   | 178.85  | 0.394   | 11.161  | 0.0156  | 99.505  | 0.96    | -174.72 |
| 1450       | 0.986   | 178.7   | 0.372   | 8.789   | 0.0163  | 97.699  | 0.949   | -176.87 |
| 1500       | 0.986   | 178.6   | 0.354   | 6.5533  | 0.0168  | 96.68   | 0.94    | -178.58 |

# 6 Test circuit

Figure 12. Test circuit schematic



- 1 Dimensions at component symbols are reference for component placement.
- 2 Gap between ground & transmission line = 0.056 [1.42] +0.002 [0.05] -0.000 [0.00] typ.
- 3 Dimensions of input and output component from edge of transmission lines.

**Table 8. Test circuit component part list**

| Component | Description                                                                                                |
|-----------|------------------------------------------------------------------------------------------------------------|
| L1        | INDUCTOR, 5 TURNS AIR WOUND #18 AWG, ID = 0.125 [3.18] NYLON COATED MAGNET WIRE                            |
| FB1       | SHIELD BEAD SURFACE MOUNT EMI                                                                              |
| R1        | 1 K Ohm, SURFACE MOUNT CHIP RESISTOR                                                                       |
| R2        | 18 K Ohm, SURFACE MOUNT CHIP RESISTOR                                                                      |
| R3        | 10 K Ohm, SURFACE MOUNT CHIP RESISTOR                                                                      |
| C1        | 36 pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                        |
| C2,C8     | 0.8-8.0 pF GIGA TRIM VARIABLE CAPACITOR                                                                    |
| C3        | 4.7 pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                       |
| C4        | 11 pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                        |
| C5        | 1.3 pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                       |
| C6        | 7.5 pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                       |
| C7        | 8.2 pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                       |
| C9        | 100 pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                       |
| C10,C14   | 47 pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                        |
| C11,C15   | 10000 pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                     |
| C12,C16   | 0.1 $\mu$ F / 500 V SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                   |
| C13,C17   | 10 $\mu$ F / 50 V ALUMINIUM ELECTROLITIC RADIAL LEAD CAPACITOR                                             |
| C18       | 220 $\mu$ F / 63 V V ALUMINIUM ELECTROLITIC RADIAL LEAD CAPACITOR                                          |
| PCB       | ULTRALAM 2000, WOVEN FIBERGLASS REINFORCED PTFE.<br>0.030" THK, $\epsilon_r$ = 2.55, 2 OZ ED CU BOTH SIDES |

## 7 Text circuit layout

Figure 13. Test fixture

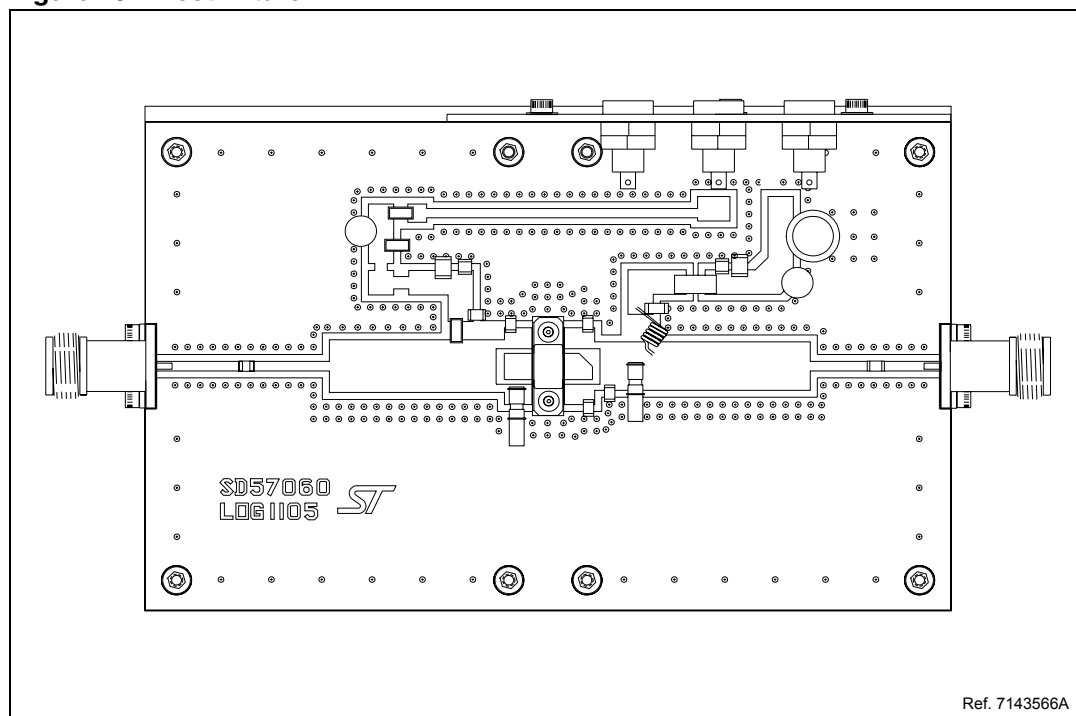
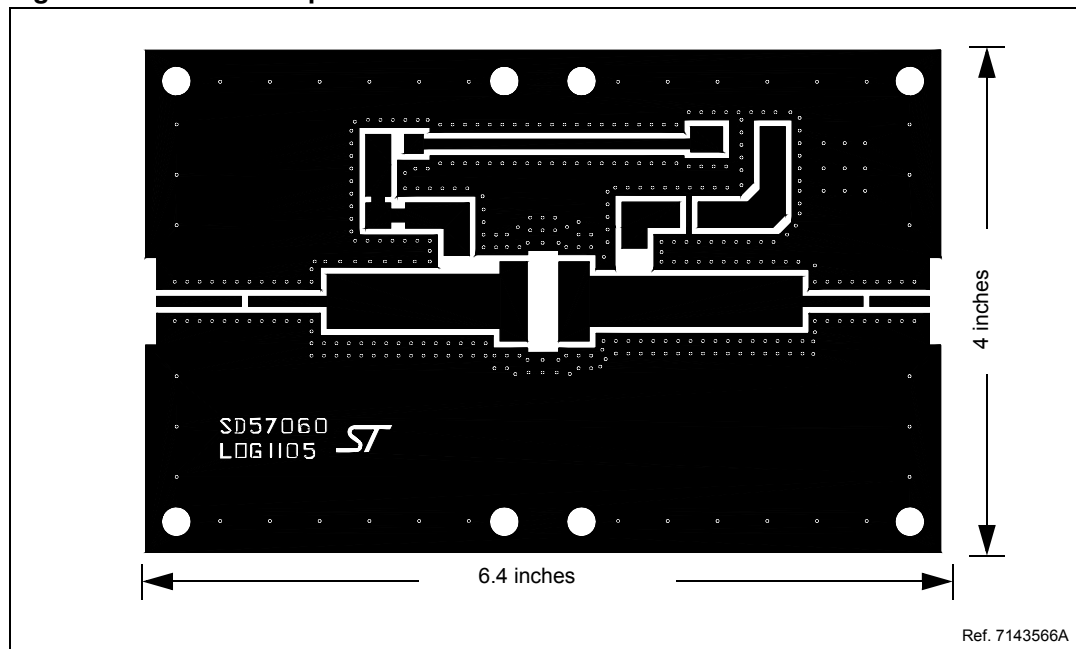


Figure 14. Test circuit photomaster

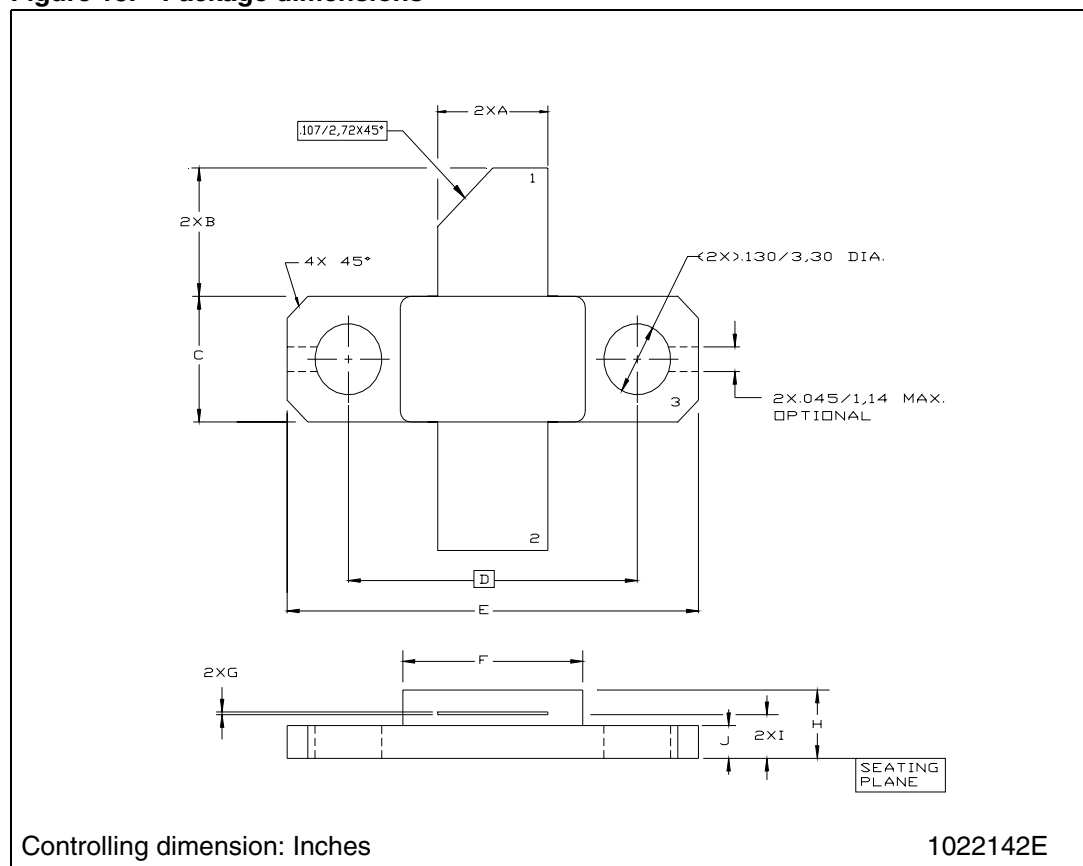


## 8 Package mechanical data

**Table 9. M243 (.230 x .360 2L N/HERM W/FLG) mechanical data**

| Dim. | mm.   |       |       | Inch  |       |       |
|------|-------|-------|-------|-------|-------|-------|
|      | Min   | Typ   | Max   | Min   | Typ   | Max   |
| A    | 5.21  |       | 5.72  | 0.205 |       | 0.225 |
| B    | 5.46  |       | 6.48  | 0.215 |       | 0.255 |
| C    | 5.59  |       | 6.10  | 0.220 |       | 0.240 |
| D    |       | 14.27 |       |       | 0.562 |       |
| E    | 20.07 |       | 20.57 | 0.790 |       | 0.810 |
| F    | 8.89  |       | 9.40  | 0.350 |       | 0.370 |
| G    | 0.10  |       | 0.15  | 0.004 |       | 0.006 |
| H    | 3.18  |       | 4.45  | 0.125 |       | 0.175 |
| I    | 1.83  |       | 2.24  | 0.072 |       | 0.088 |
| J    | 1.27  |       | 1.78  | 0.050 |       | 0.070 |

**Figure 15. Package dimensions**



## 9 Revision history

**Table 10. Document revision history**

| Date        | Revision | Changes                                    |
|-------------|----------|--------------------------------------------|
| 24-Mar-2003 | 5        | First Issue.                               |
| 23-Jul-2007 | 6        | Document reformatted, added lead free info |
| 24-Aug-2007 | 7        | Cover page title updated                   |

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