



## SD57120

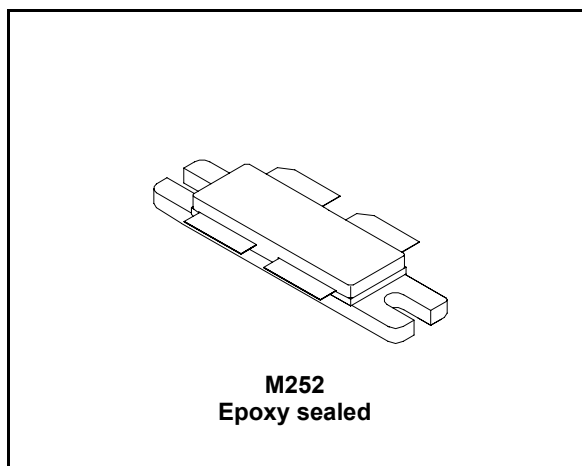
RF power transistor  
the LdmoST family

### Features

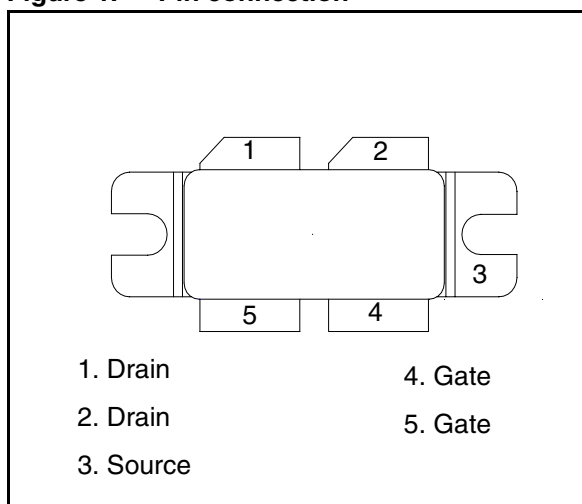
- Excellent thermal stability
- Common source configuration push-pull
- $P_{OUT} = 120W$  with 13dB gain @ 960MHz
- BeO free package
- Internal input matching
- In compliance with the 2002/95/EC european directive

### Description

The SD57120 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 SD57120 is designed for high gain and broadband performance operating in common source mode at 28V. Its internal matching makes it ideal for base station applications requiring high linearity.



**Figure 1. Pin connection**



**Table 1. Device summary**

| Order code | Package | Branding |
|------------|---------|----------|
| SD57120    | M252    | SD57120  |

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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                              | 14           | A           |
| $P_{DISS}$    | Power dissipation (@ $T_c = 70^{\circ}C$ ) | 236          | 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 | 0.55  | $^{\circ}C/W$ |

## 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   | $\mu\text{A}$ |
| $V_{\text{GS(Q)}}$          | $V_{\text{DS}} = 28\text{ V}$ | $I_{\text{D}} = 100\text{ mA}$ | 2.0 |     | 5.0 | V             |
| $V_{\text{DS(ON)}}$         | $V_{\text{GS}} = 10\text{ V}$ | $I_{\text{D}} = 3\text{ A}$    |     | 0.7 | 0.9 | V             |
| $G_{\text{FS}}$             | $V_{\text{DS}} = 10\text{ V}$ | $I_{\text{D}} = 3\text{ A}$    |     | 3   |     | S             |
| $C_{\text{ISS}}^{(1)}$      | $V_{\text{GS}} = 0\text{ V}$  | $V_{\text{DS}} = 28\text{ V}$  |     | 169 |     | pF            |
| $C_{\text{OSS}}$            | $V_{\text{GS}} = 0\text{ V}$  | $V_{\text{DS}} = 28\text{ V}$  |     | 48  |     | pF            |
| $C_{\text{RSS}}$            | $V_{\text{GS}} = 0\text{ V}$  | $V_{\text{DS}} = 28\text{ V}$  |     | 2.7 |     | pF            |

1. Includes Internal Input Moscap.

### 2.2 Dynamic

**Table 5. Dynamic**

| Symbol           | Test conditions               |                                                                                                          | Min  | Typ | Max | Unit     |
|------------------|-------------------------------|----------------------------------------------------------------------------------------------------------|------|-----|-----|----------|
| $P_{\text{OUT}}$ | $V_{\text{DD}} = 28\text{ V}$ | $I_{\text{DQ}} = 800\text{ mA}$ $f = 960\text{ MHz}$                                                     | 120  |     |     | W        |
| $G_{\text{PS}}$  | $V_{\text{DD}} = 28\text{ V}$ | $I_{\text{DQ}} = 800\text{ mA}$ $P_{\text{OUT}} = 120\text{ W}$ $f = 960\text{ MHz}$                     | 13   | 14  |     | dB       |
| $h_{\text{D}}$   | $V_{\text{DD}} = 28\text{ V}$ | $I_{\text{DQ}} = 800\text{ mA}$ $P_{\text{OUT}} = 120\text{ W}$ $f = 960\text{ MHz}$                     | 50   |     |     | %        |
| Load mismatch    | $V_{\text{DD}} = 28\text{ V}$ | $I_{\text{DQ}} = 800\text{ mA}$ $P_{\text{OUT}} = 120\text{ W}$ $f = 960\text{ MHz}$<br>All phase angles | 10:1 |     |     | VSW<br>R |

3 Impedance

Figure 2. Current conventions

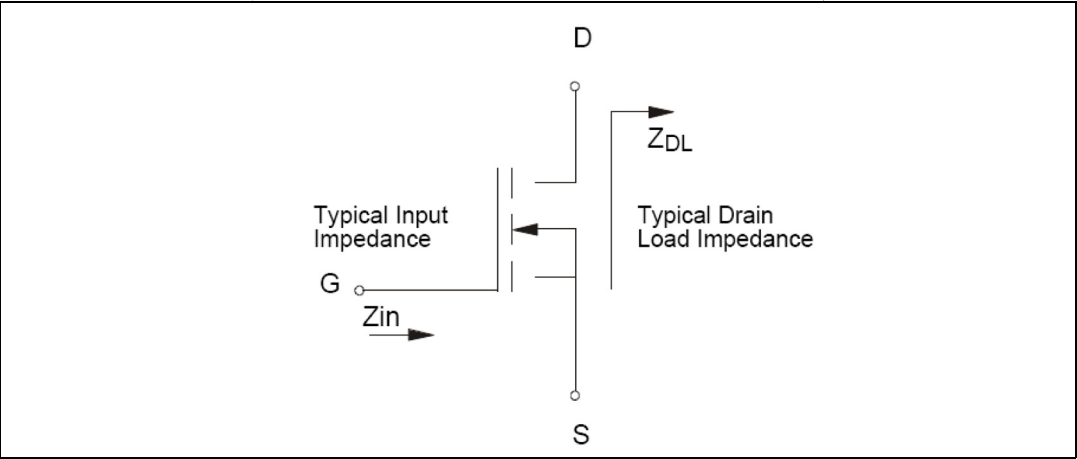


Table 6. Impedance data

| Freq. (MHz) | $Z_{IN} (\Omega)$ | $Z_{DL}(\Omega)$ |
|-------------|-------------------|------------------|
| 945 MHz     | $3.9 + j\ 4.9$    | $3.26 - j\ 5.1$  |
| 960 MHz     | $4.1 + j\ 4.6$    | $3.24 - j\ 4.74$ |
| 980 MHz     | $3.9 + j\ 5.2$    | $3.27 - j\ 6.9$  |

Note: Measured gateto gate and drain to drain respectively.

4 Typical performance

Figure 3. Output power and efficiency vs input power

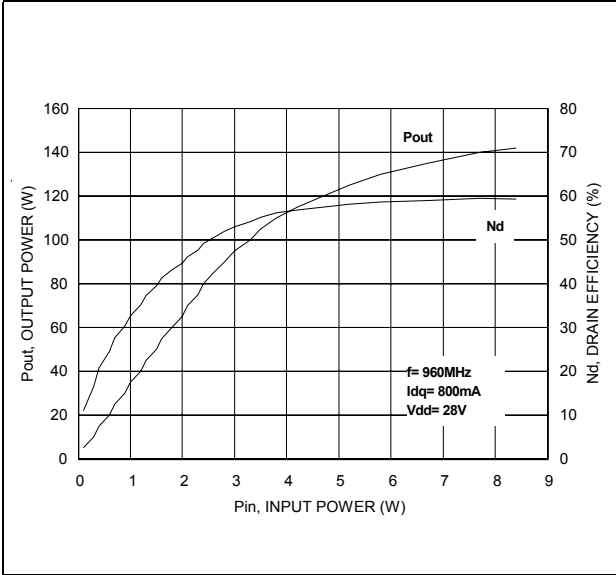


Figure 4. Power gain vs output power

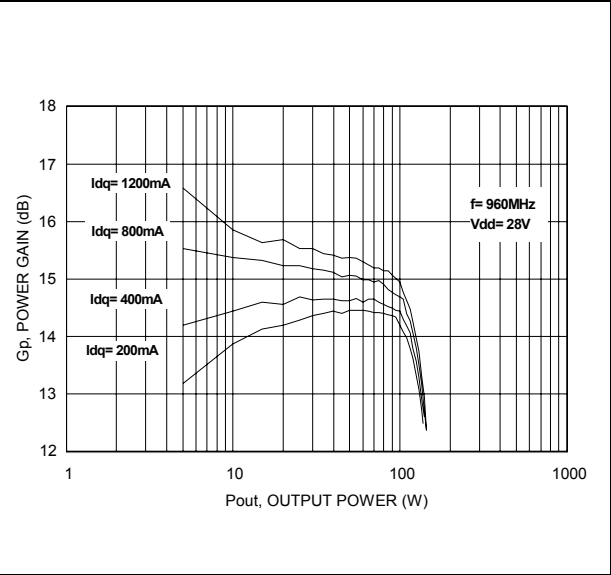


Figure 5. Intermodulation distortion vs output power

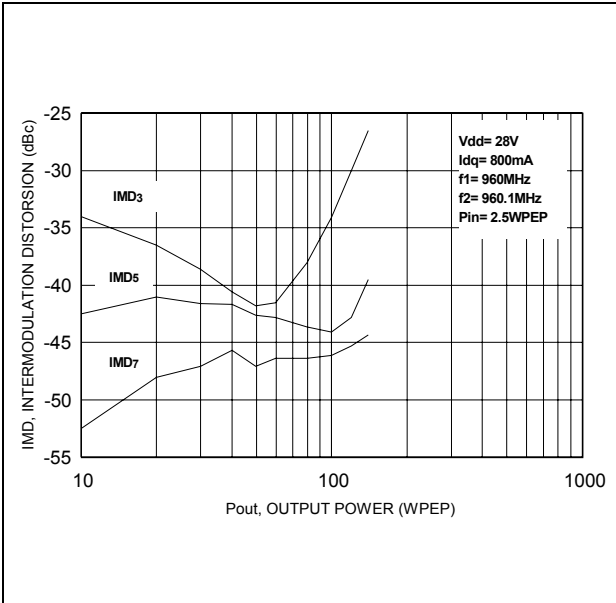


Table 7. Intermodulation distortion vs output power

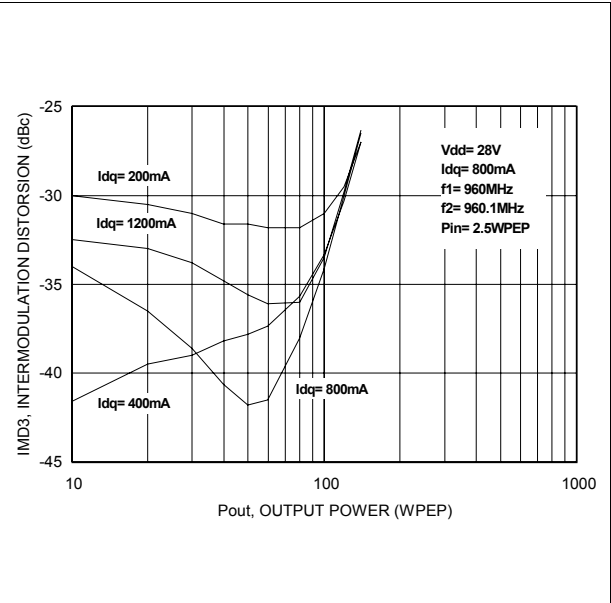


Table 8. Output power vs gate voltage

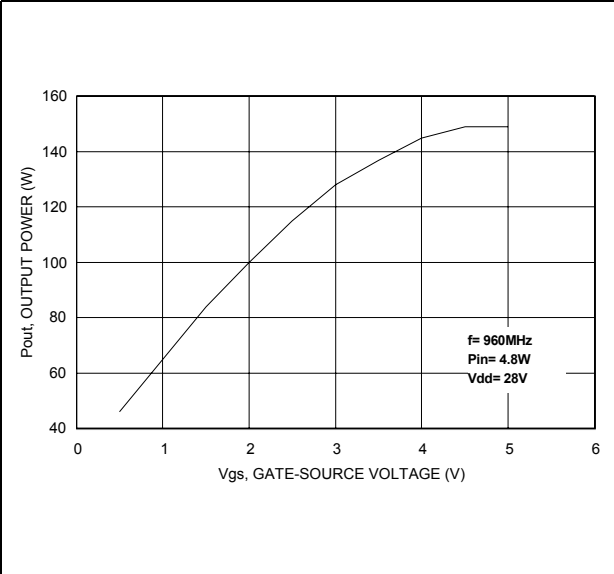


Figure 6. Output power vs drain voltage

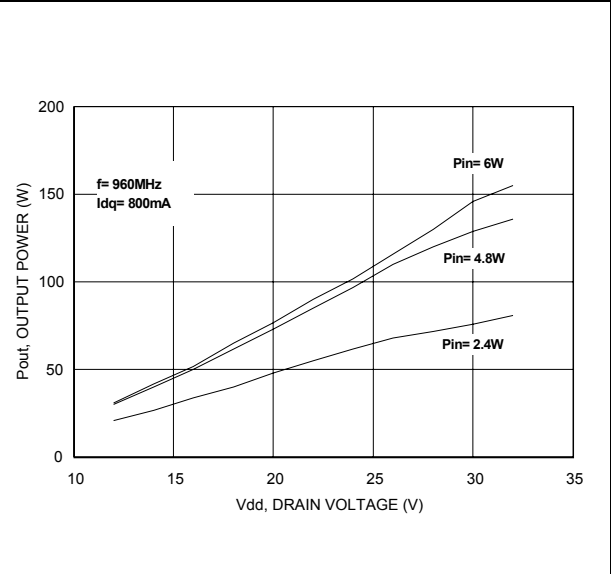


Figure 7. Capacitance vs drain voltage

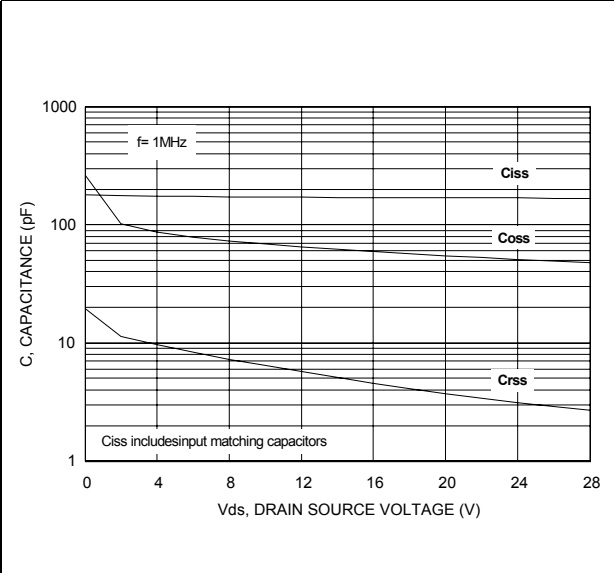
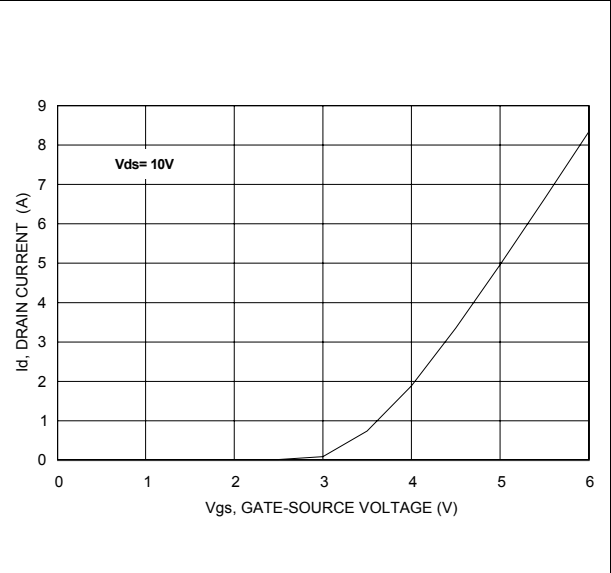
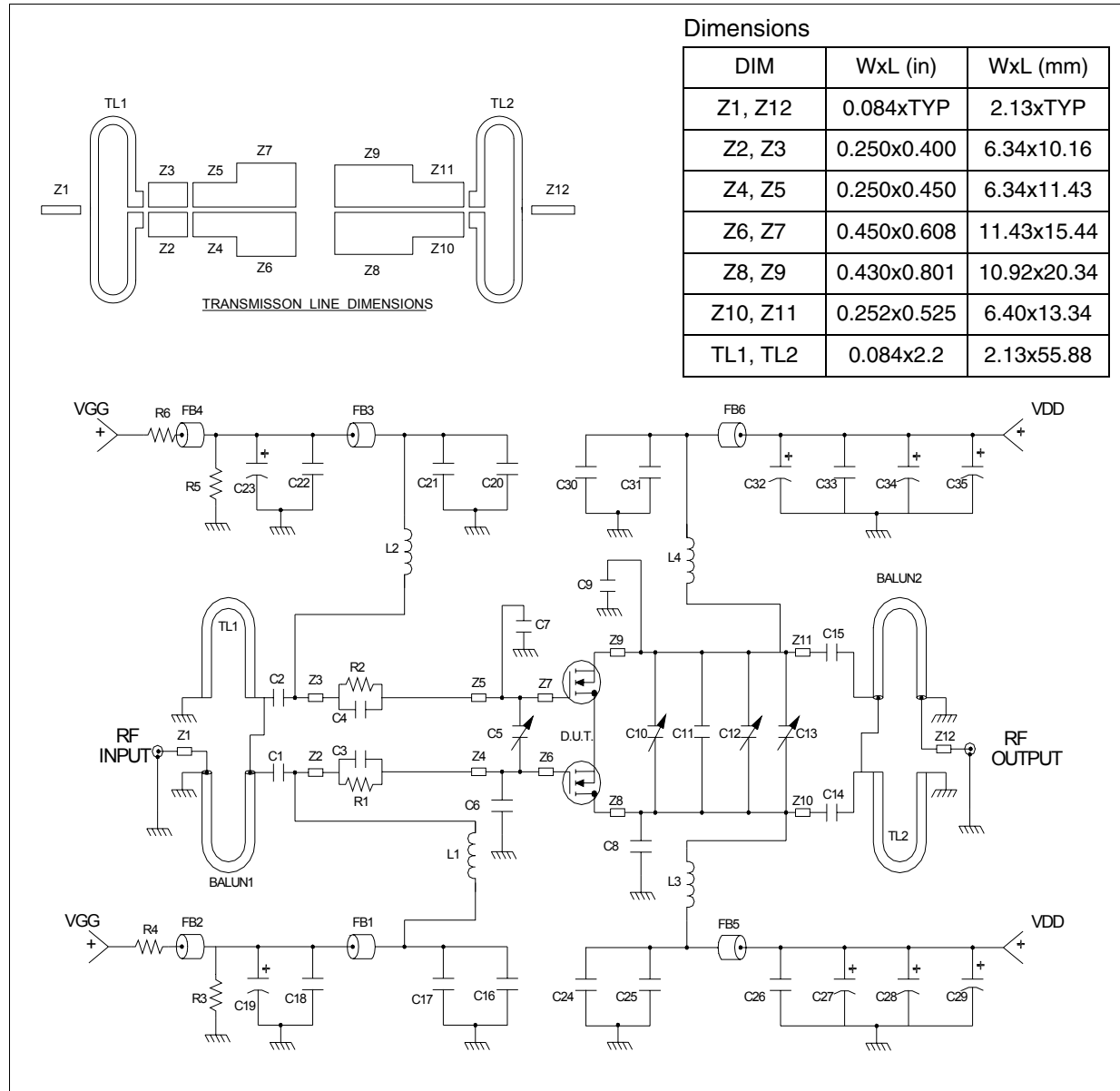


Figure 8. Drain current vs gate voltage



## 5 Test circuit

Figure 9. 960MHz 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 Dimension of microstrip = 1/2 printed balun only.

**Table 9. Test circuit component part list**

| Component                           | Description                                                                         |
|-------------------------------------|-------------------------------------------------------------------------------------|
| BF1-BF4                             | SURFACE MOUNT EMI SHIELD BEAD                                                       |
| L1,L2,L3,L4                         | INDUCTOR, 3 TURN AIR-WOUND #20AWG ID=0.126[3.20] 24.7nH<br>MAGNET WIRE              |
| B1, B2                              | BALUN, 50 OHM SUCOFORM, OD 0.141. 2.20 LG COAXIAL CABLE OR<br>EQUIVALENT            |
| R1,R2                               | 75 OHM 1 W SURFACE MOUNT CHIP RESISTOR                                              |
| R3,R5                               | 1.2 K OHM 1 W SURFACE MOUNT CHIP RESISTOR                                           |
| R4,R6                               | 1 K OHM 1 W SURFACE MOUNT CHIP RESISTOR                                             |
| C1,C2,C14,C15                       | 47 pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                 |
| C3,C4                               | 42 pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                 |
| C5,C12                              | 0.8-8 pF GIGATRIM VARIABLE CAPACITOR                                                |
| C6,C7,C11                           | 1.7 pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                |
| C8,C9                               | 5.6 pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                |
| C10,C13                             | 0.6-4.5 pF GIGATRIM VARIABLE CAPACITOR                                              |
| C16,C17,C20,C21,<br>C24,C25,C30,C31 | 300 pF ATC 700B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                |
| C18,C22                             | 10000 pF ATC 200B SURFACE MOUNT CERAMIC CHIP CAPACITOR                              |
| C19,C23,C27,C28,<br>C32,C34         | 10 $\mu$ F, 50 V ALUMINUM ELECTROLYTICS RADIAL LEAD CAPACITOR                       |
| C26,C33                             | 20000 pF ATC 900B SURFACE MOUNT CERAMIC CHIP CAPACITOR                              |
| C29,C35                             | 220 $\mu$ F, 50 V ALUMINUM ELECTROLYTICS RADIAL LEAD CAPACITOR                      |
| BOARD                               | ULTRA LAM 2000. 0.030" THK, $\epsilon_r = 2.55$ , 2 O <sub>2</sub> ED CU BOTH SIDES |

# 6      Text circuit layout

Figure 10. 960MHz production test fixture

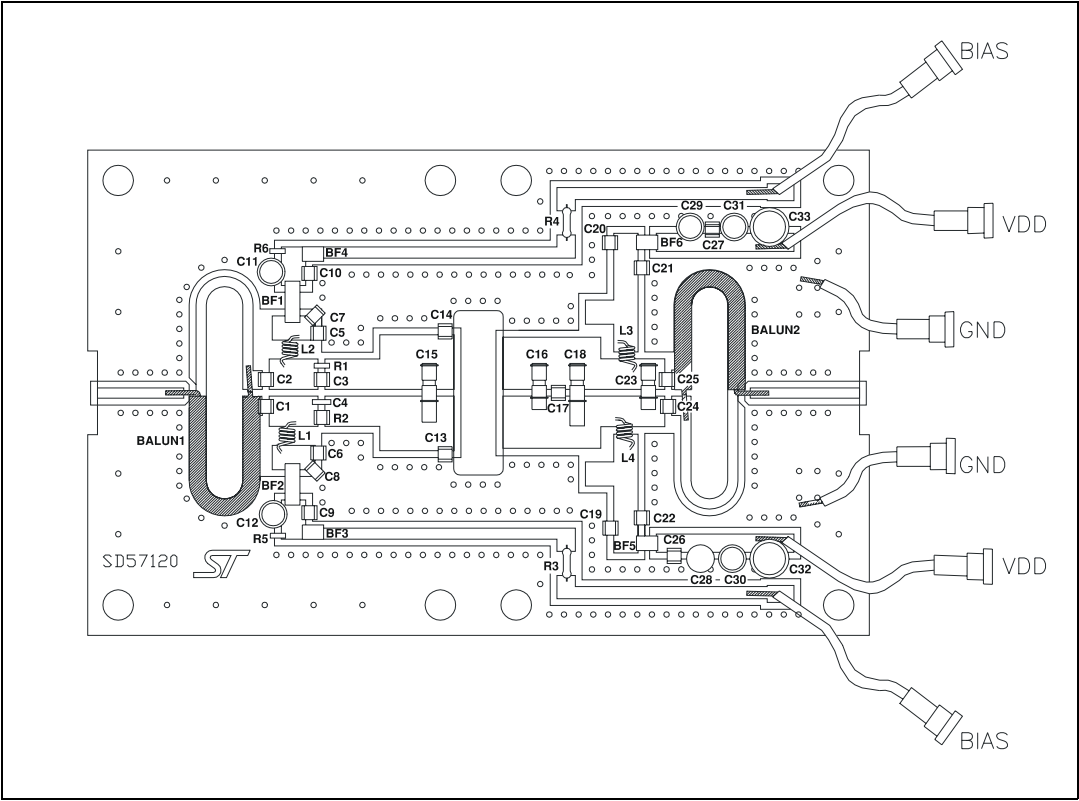
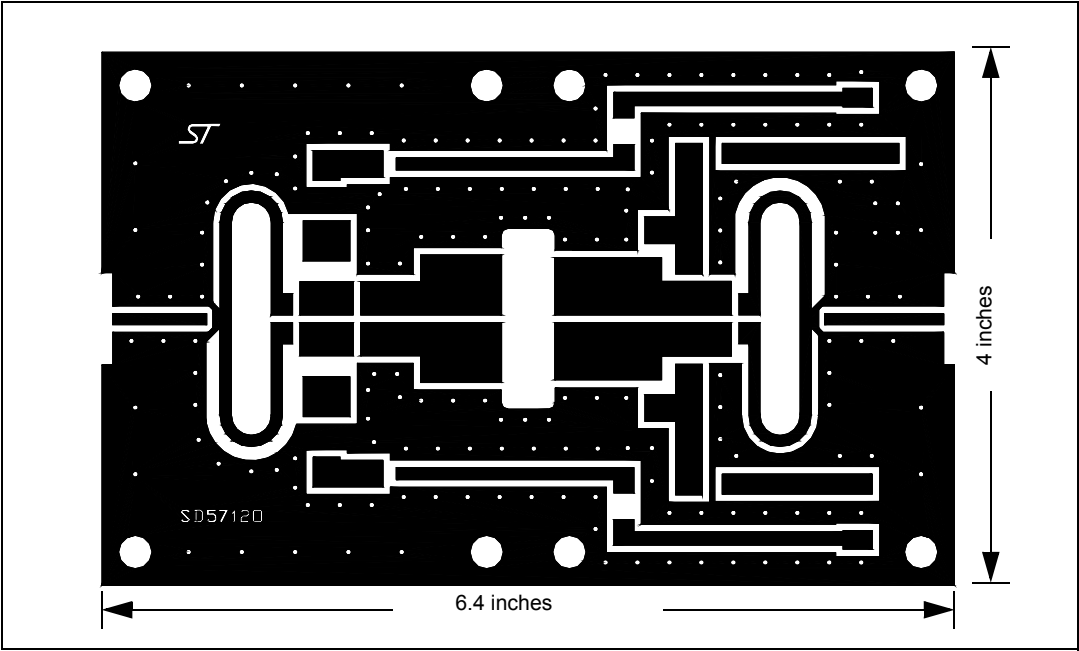


Figure 11. 960MHz test circuit photomaster

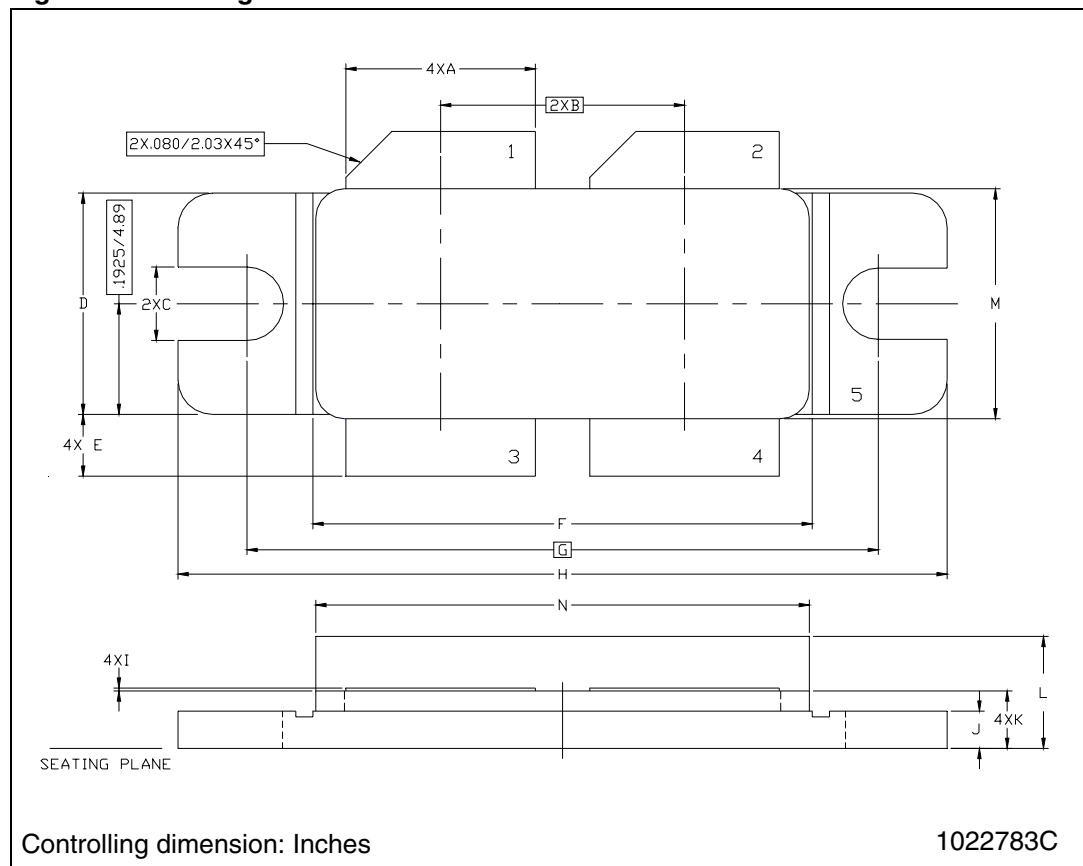


## 7 Package mechanical data

**Table 10. M252 (.400 x .860 4L BAL N/HERM W/FLG) mechanical data**

| Dim. | mm.   |       |       | Inch  |       |       |
|------|-------|-------|-------|-------|-------|-------|
|      | Min   | Typ   | Max   | Min   | Typ   | Max   |
| A    | 8.13  |       | 8.64  | .320  |       | .340  |
| B    |       | 10.80 |       |       | .425  |       |
| C    | 3.00  |       | 3.30  | .118  |       | .130  |
| D    | 9.65  |       | 9.91  | .380  |       | .390  |
| E    | 2.16  |       | 2.92  | .085  |       | .115  |
| F    | 21.97 |       | 22.23 | .865  |       | .875  |
| G    |       | 27.94 |       |       | 1.100 |       |
| H    | 33.91 |       | 34.16 | 1.335 |       | 1.345 |
| I    | 0.10  |       | 0.15  | .004  |       | .006  |
| J    | 1.52  |       | 1.78  | .060  |       | .070  |
| K    | 2.36  |       | 2.74  | .093  |       | .108  |
| L    | 4.57  |       | 5.33  | .180  |       | .210  |
| M    | 9.96  |       | 10.34 | .392  |       | .407  |
| N    | 21.64 |       | 22.05 | .852  |       | .868  |

**Figure 12. Package dimensions**



## 8 Revision history

**Table 11. Document revision history**

| Date        | Revision | Changes                                    |
|-------------|----------|--------------------------------------------|
| 24-Mar-2003 | 6        | First Issue.                               |
| 11-Jul-2007 | 7        | Document reformatted, added lead free info |
| 27-Aug-2007 | 8        | Cover page title updated                   |

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