

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

Features

- Gold metallization
- Excellent thermal stability
- Common source configuration
- $P_{OUT} = 300 \text{ W min. with } 20 \text{ dB gain @ } 30 \text{ MHz}$
- Thermally enhanced packaging for lower junction temperatures

Description

The SD2933-05 is a gold metallized N-channel MOS field-effect RF power transistor. It is intended for use in 50 V dc large signal applications up to 150 MHz. It's special low thermal resistance package, makes it ideal for ISM applications where reliability and ruggedness are critical factors.

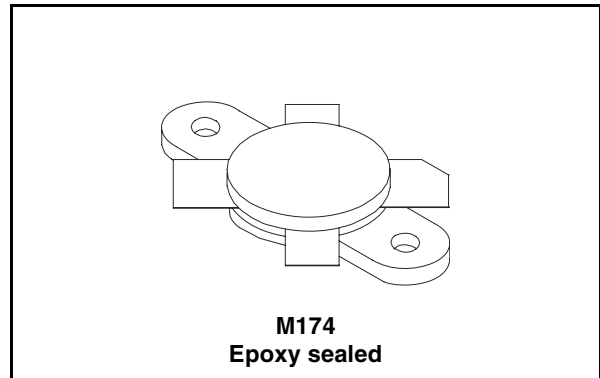


Figure 1. Pin connection

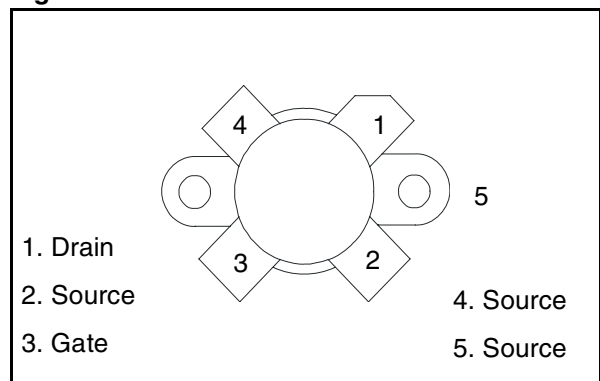


Table 1. Device summary

Order code	Marking	Package	Packaging
SD2933-05	SD2933	M177	Plastic tray

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1 Electrical data

1.1 Maximum ratings

Table 2. Absolute maximum ratings ($T_{CASE} = 25\text{ °C}$)

Symbol	Parameter	Value	Unit
$V_{(BR)DSS}$	Drain source voltage	130	V
V_{DGR}	Drain-gate voltage ($R_{GS} = 1\text{ M}\Omega$)	125	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current	40	A
P_{DISS}	Power dissipation	648	W
T_J	Max. operating junction temperature	200	°C
E_{AS}	Avalanche energy, single pulse ($I_D = 60\text{ A}$)	1500	mJ
$E_{AR}^{(1)}$	Avalanche energy, repetitive	50	mJ
T_{STG}	Storage temperature	-65 to +150	°C

1. Repetitive rating: Pulse width limited by maximum junction temperature
 Repetitive avalanche causes additional power losses that can be calculated as: $P_{AV} = E_{AR} \cdot f$

1.2 Thermal data

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Junction - case thermal resistance	0.27	°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
$V_{(\text{BR})\text{DSS}}^{(1)}$	$V_{\text{GS}} = 0\text{ V}$	$I_{\text{DS}} = 200\text{ mA}$	130			V
I_{DSS}	$V_{\text{GS}} = 0\text{ V}$	$V_{\text{DS}} = 50\text{ V}$			100	μA
I_{GSS}	$V_{\text{GS}} = 20\text{ V}$	$V_{\text{DS}} = 0\text{ V}$			500	nA
$V_{\text{GS(Q)}}$	$V_{\text{DS}} = 10\text{ V}$	$I_{\text{D}} = 250\text{ mA}$	2.5		3.0	V
$V_{\text{DS(ON)}}$	$V_{\text{GS}} = 10\text{ V}$	$I_{\text{D}} = 20\text{ A}$			3	V
g_{FS}	$V_{\text{DS}} = 10\text{ V}$	$I_{\text{D}} = 10\text{ A}$	10			mho
C_{ISS}	$V_{\text{GS}} = 0\text{ V}$	$V_{\text{DS}} = 50\text{ V}$		1000		pF
C_{OSS}	$V_{\text{GS}} = 0\text{ V}$	$V_{\text{DS}} = 50\text{ V}$		372		pF
C_{RSS}	$V_{\text{GS}} = 0\text{ V}$	$V_{\text{DS}} = 50\text{ V}$		29		pF

1. $T_{\text{J}} = +150\text{ }^{\circ}\text{C}$

2.2 Dynamic

Table 5. Dynamic

Symbol	Test conditions		Min	Typ	Max	Unit
P_{OUT}	$V_{\text{DD}} = 50\text{ V}$	$I_{\text{DQ}} = 250\text{ mA}$	300	400	-	W
G_{PS}	$V_{\text{DD}} = 50\text{ V}$	$I_{\text{DQ}} = 250\text{ mA}$	20	23.5		dB
h_{D}	$V_{\text{DD}} = 50\text{ V}$	$I_{\text{DQ}} = 250\text{ mA}$	50	65		%
Load mismatch	$V_{\text{DD}} = 50\text{ V}$	$I_{\text{DQ}} = 250\text{ mA}$	3:1			VSWR

Table 6. Gfs sorts

Marking	Min.	Max.
C	12	12.99
D	13	13.99
E	14	14.99

3 Impedance data

Figure 2. Impedance data

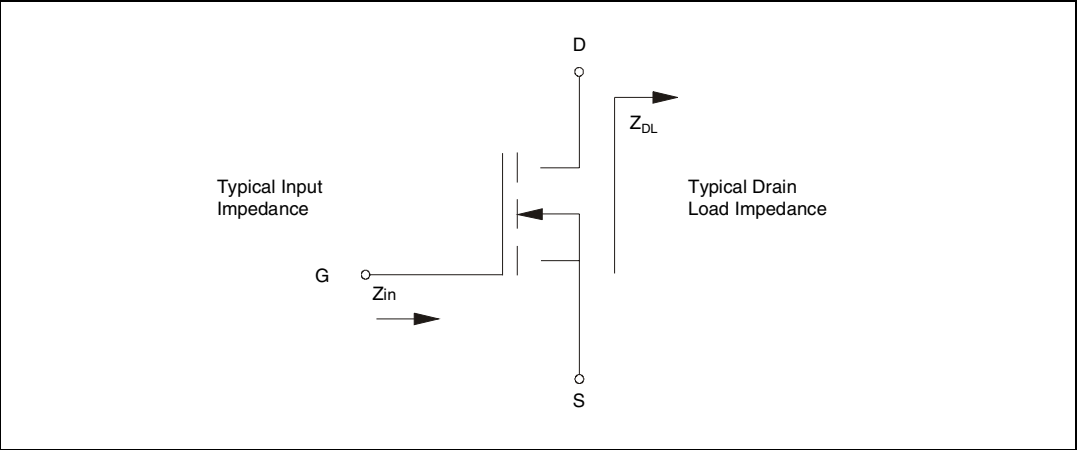


Table 7. Impedance data

Freq	$Z_{IN} (\Omega)$	$Z_{DL} (\Omega)$
30 MHz	$1.8 - j 0.2$	$2.8 + j 2.3$
108 MHz	$1.9 - j 0.2$	$1.6 + j 1.4$
175 MHz	$1.9 - j 0.3$	$1.5 + j 1.6$

4 Typical performance

Figure 3. Capacitance vs drain-source voltage

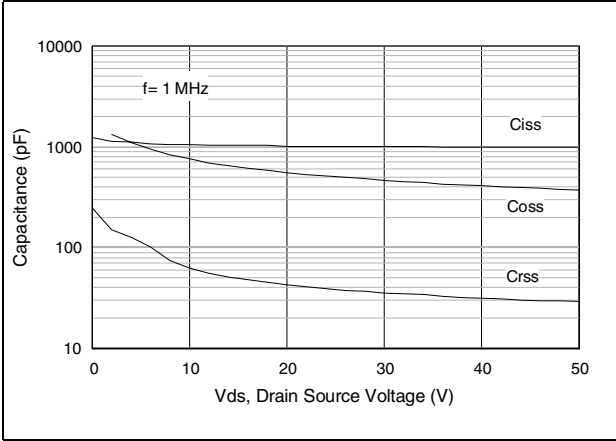


Figure 4. Drain current vs gate voltage

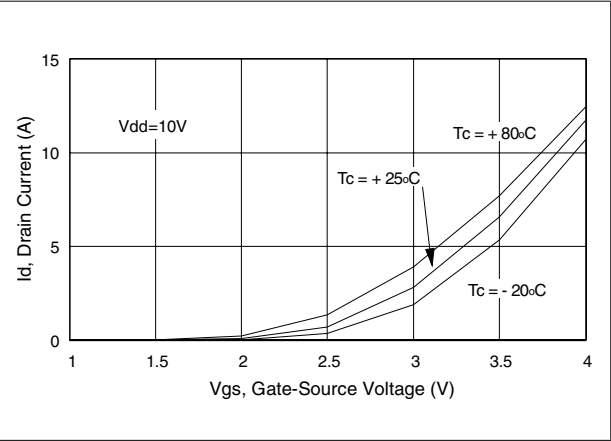


Figure 5. Gate-source voltage vs case temperature

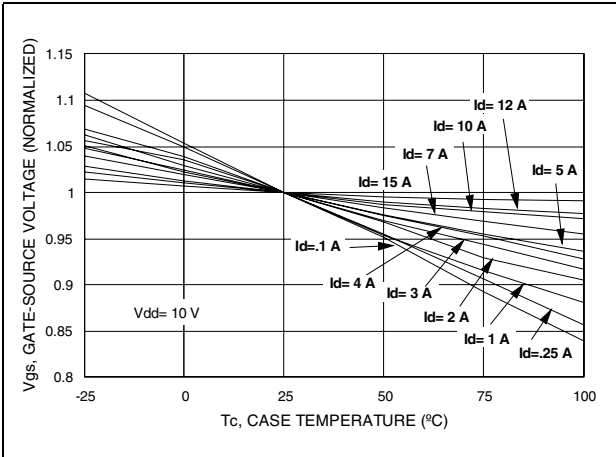


Figure 6. Maximum thermal resistance s case temperature

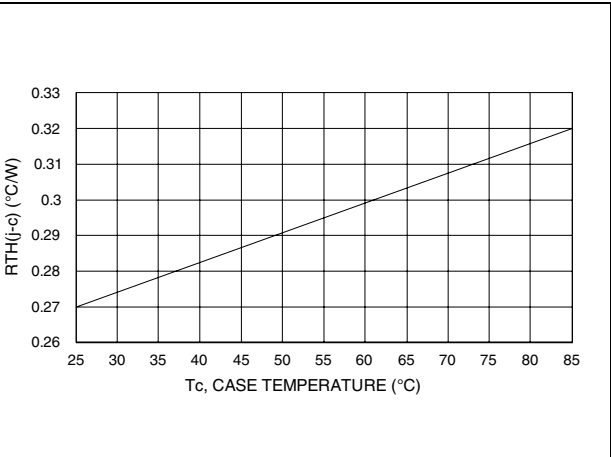


Figure 7. Output power vs input power

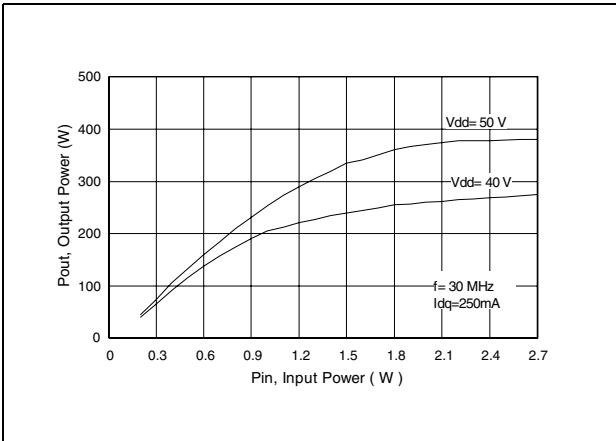


Figure 8. Output power vs input power

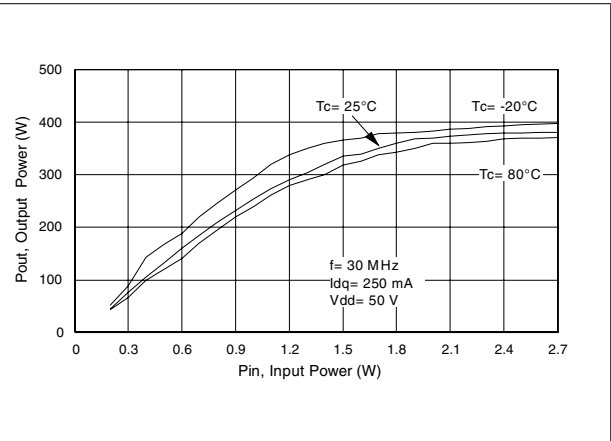


Figure 9. Power gain vs output power

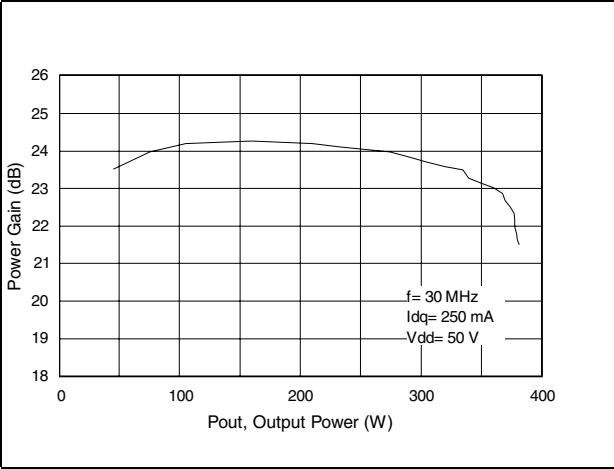


Figure 10. Efficiency vs output power

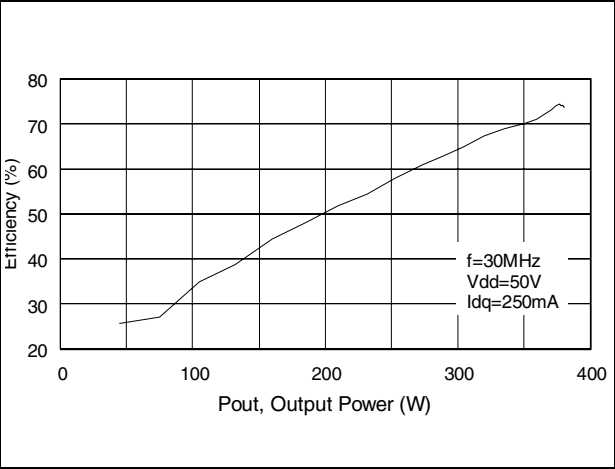


Figure 11. Output power vs supply voltage

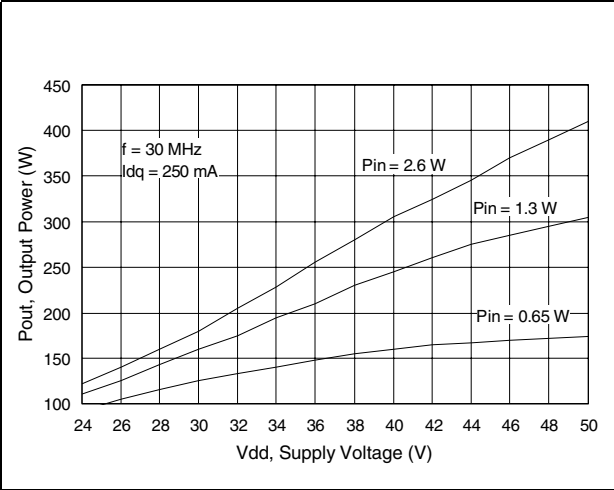
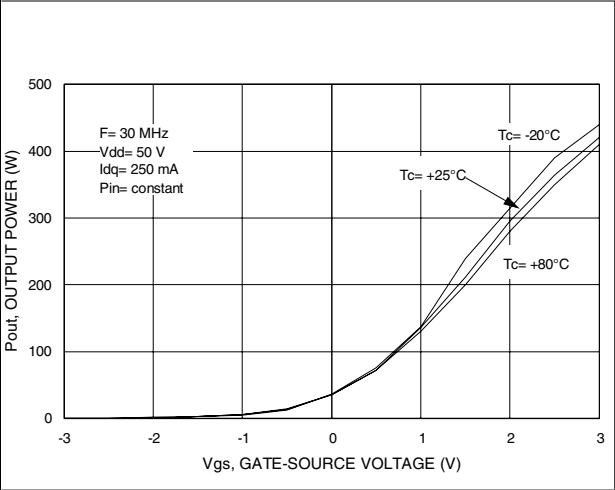


Figure 12. Efficiency vs gate voltage



5 Test circuit

Figure 13. Test circuit

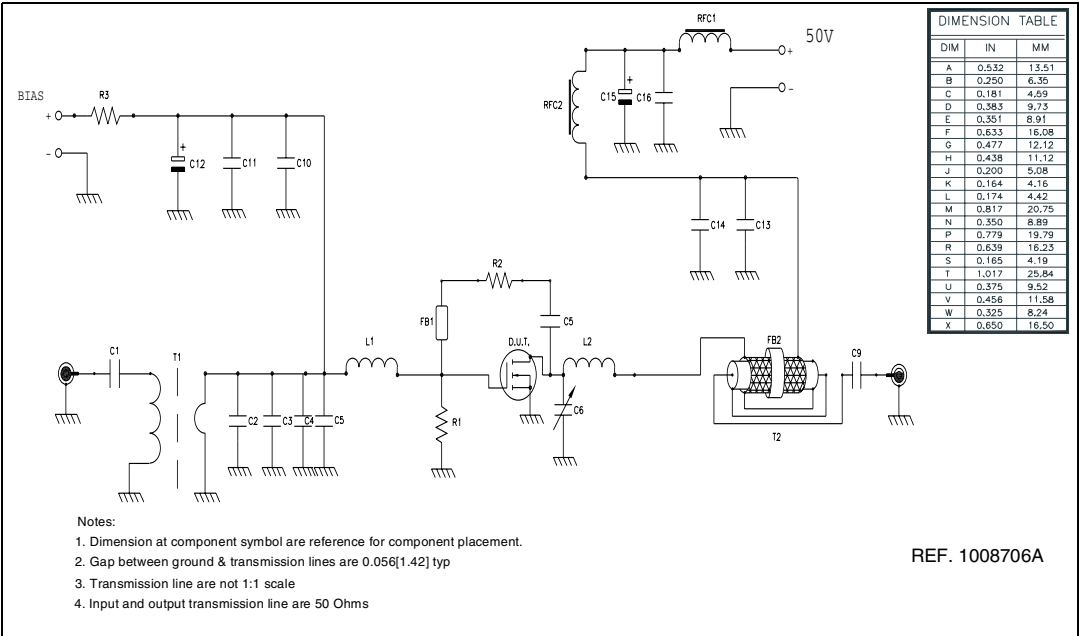


Table 8. Components part list

Item	Description
C1,C9	0.01 μ F / 500 V surface mount ceramic chip capacitor
C2, C3	750 pF ATC 700B surface mount ceramic chip capacitor
C4	300 pF ATC 700B surface mount ceramic chip capacitor
C5,C10,C11,C14,C1	10000 pF ATC 200B surface mount ceramic chip capacitor
C6	510 pF ATC 700B surface mount ceramic chip capacitor
C7	300 pF ATC 700B surface mount ceramic chip capacitor
C8	175-680 pF type 46 standard trimmer capacitor
C12	47 μ F / 63 V aluminum electrolytic radial lead capacitor
C13	1200 pF ATC 700B surface mount ceramic chip capacitor
C15	100 μ F / 63 V aluminum electrolytic radial lead capacitor
R1,R3	1 K Ohm 1 W surface mount chip resistor
R2	560 Ohm 2 W wire-wound axils lead resistor
T1	HF 2-30 MHz surface mount 9:1 transformer
T2	RG - 142B/U 50 Ohm coaxial cable OD = 0.165[4.18] L 15"[381.00] covered
L1	1 3/4 turn air-wound 16 AWG ID = 0.219 [5.56] poly-coated magnet wire
L2	1 3/4 turn air-wound 12 AWG ID = 0.250 [6.34] bus bar wire
RFC1, RFC2	3 turns 14 AWG wire through fair rite toroid
FB1	Surface mount EMI shield bead
FB2	Toroid
PCB	Ultralam 2000. 0.030" thk, $\epsilon_r = 2.55$, 2 Oz ED Cu both sides

6 Circuit layout

Figure 14. 30 MHz test circuit photometer

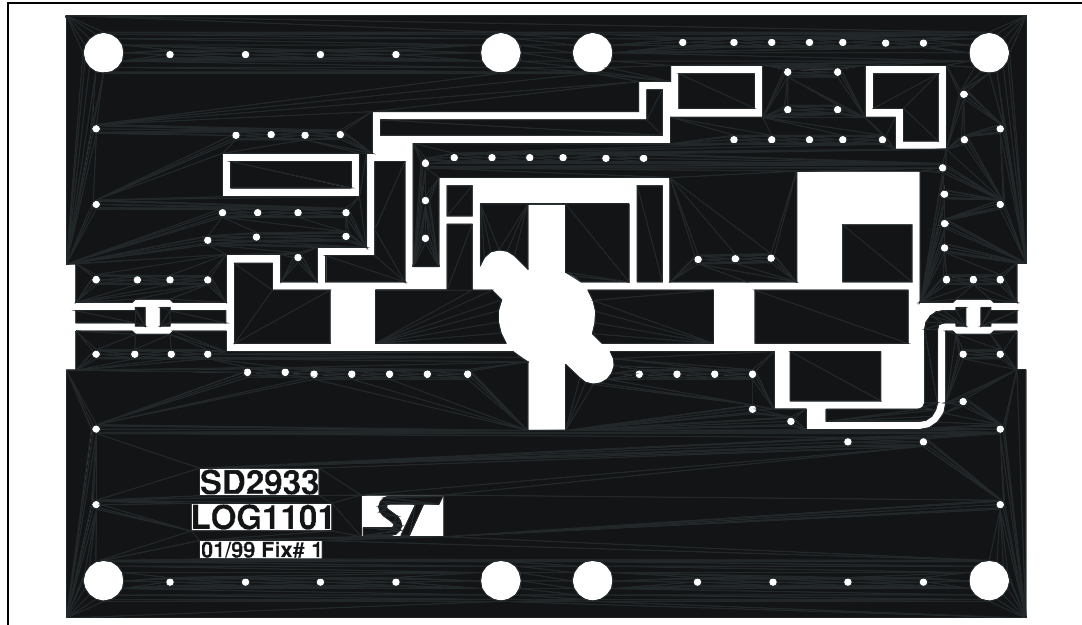
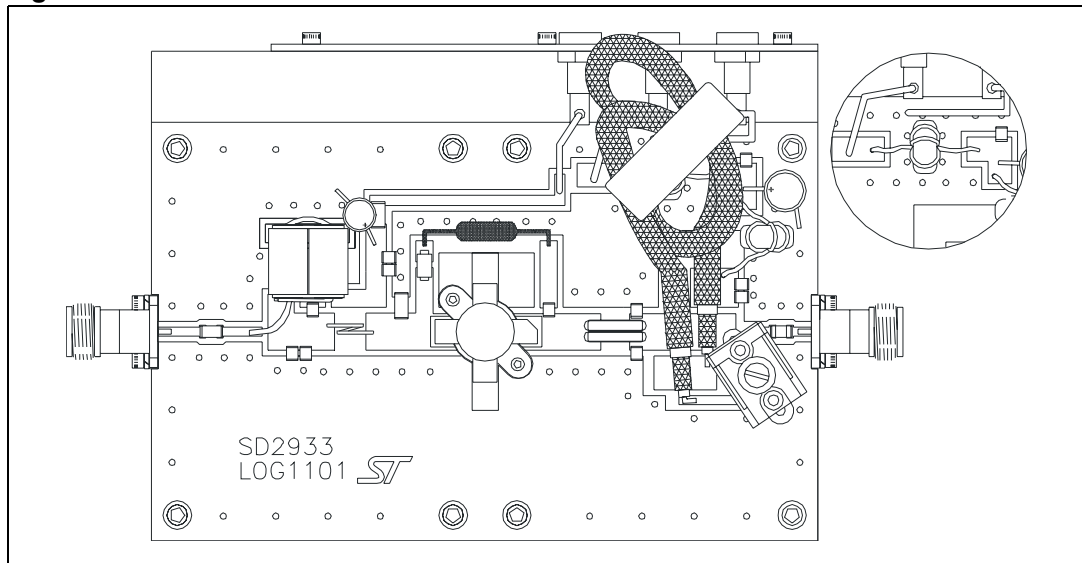


Figure 15. 30 MHz test circuit



7 Package mechanical data

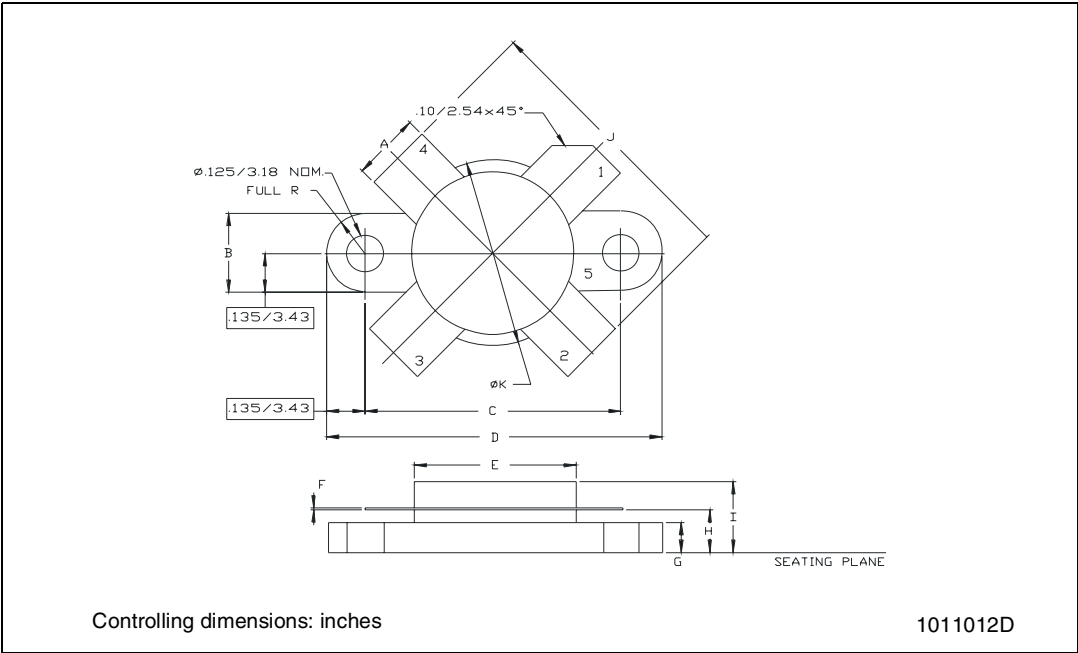
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Table 9. M177 (.550 DIA 4/L N/HERM W/FLG) mechanical data

Dim.	mm.			Inch		
	Min	Typ	Max	Min	Typ	Max
A	5.72		5.97	0.225		0.235
B	6.73		6.96	0.265		0.275
C	21.84		22.10	0.860		0.870
D	28.70		28.96	1.130		1.140
E	13.84		14.10	0.545		0.555
F	0.08		0.18	0.003		0.007
G	2.49		2.74	0.098		0.108
H	3.81		4.32	0.150		0.170
I			7.11			0.280
J	27.43		28.45	1.080		1.120
K	15.88		16.13	0.625		0.635

4

Figure 16. Package dimensions



8 Revision history

Table 10. Document revision history

Date	Revision	Changes
04-Jun-2009	1	First release
08-Jul-2009	2	Updated $V_{(BR)DSS}$ voltage value from 125 V to 130 V on Table 2 on page 3 and Table 4 on page 4

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