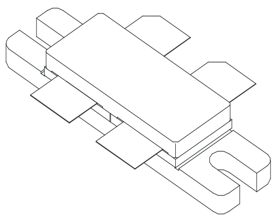
SD2932

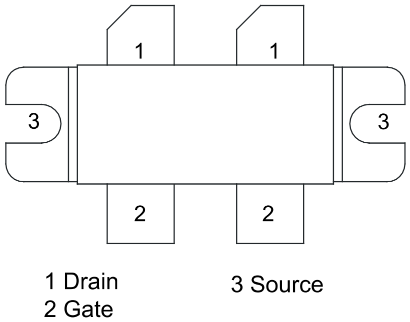
HF/VHF/UHF RF power N-channel MOSFET

Datasheet - production data



M244 epoxy sealed

Figure 1: Pin connection



Features

- Gold metallization
- Excellent thermal stability
- Common source push-pull configuration
- P_{OUT} = 300 W min. with 15 dB gain @ 175 MHz

Description

The SD2932 is a gold metallized N-channel MOS field-effect RF power transistor used for 50 V DC large signal applications up to 250 MHz.

Table 1: Device summary

Order code	Marking	Package	Packing
SD2932W	SD2932(1)	M244	Tube

Notes:

(1)For more details please refer to *Section 11: "Marking, packing and shipping specifications"*.

Contents

1 Electrical data

1.1 Maximum ratings

T_{CASE} = 25 °C

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
$V_{(BR)DSS}$	Drain source voltage	125	V
V_{DGR}	Drain-gate voltage (R_{GS} = 1 MΩ)	125	V
V_{GS}	Gate-source voltage	±40	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

1.2 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

Symbol	Test conditions			Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	V_{GS} = 0 V	I_{DS} = 100 mA		125			V
I_{DSS}	V_{GS} = 0 V	V_{DS} = 50 V				50	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
ΔV_{GS}(1)	V_{DS} = 10 V	I_D = 250 mA				200	mV
C_{ISS}	V_{GS} = 0 V	V_{DS} = 50 V	f = 1 MHz		480		pF
C_{OSS}	V_{GS} = 0 V	V_{DS} = 50 V	f = 1 MHz		190		pF
C_{RSS}	V_{GS} = 0 V	V_{DS} = 50 V	f = 1 MHz		18		pF

Notes:

(1)Absolute V_{GS} difference between side 1 and side 2 of the device.

Table 5: Dynamic

Symbol	Test conditions	Min.	Typ.	Max.	Unit
P_{OUT}	V_{DD} = 50 V I_{DQ} = 500 mA f = 175 MHz	300			W
G_{PS}	V_{DD} = 50 V I_{DQ} = 500 mA P_{OUT} = 300 W f = 175 MHz	15	16		dB
η_D	V_{DD} = 50 V I_{DQ} = 500 mA P_{OUT} = 300 W f = 175 MHz	50	60		%
Load mismatch	V_{DD} = 50 V I_{DQ} = 500 mA P_{OUT} = 300 W f = 175 MHz All phase angles	5:1			VSWR

3 Impedance data

Figure 2: Impedance data

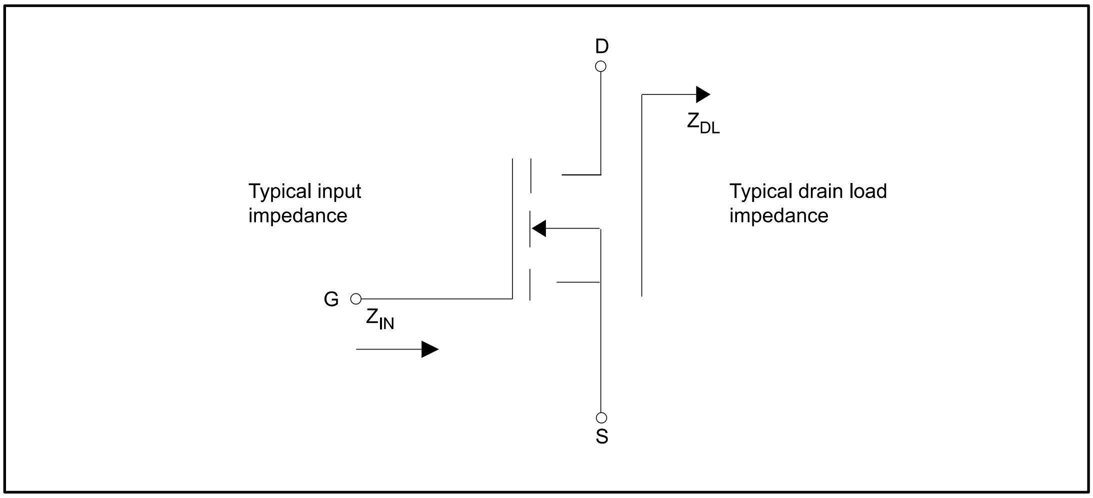


Table 6: Impedance data

f	$Z_{IN}(\Omega)$	$Z_{DL}(\Omega)$
175 MHz	0.92 - j 0.14	3.17 + j 4.34

Measured gate-to-gate and drain-to-drain, respectively.

4 Typical performance

Figure 3: Maximum thermal resistance vs. case temperature

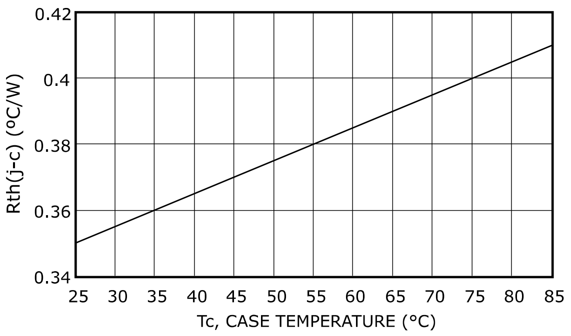


Figure 4: Gate voltage vs. case temperature

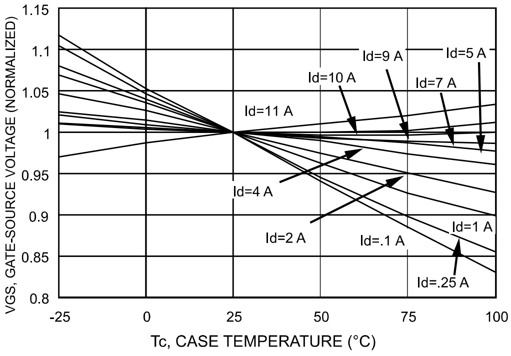


Figure 5: Capacitance vs. drain-source voltage

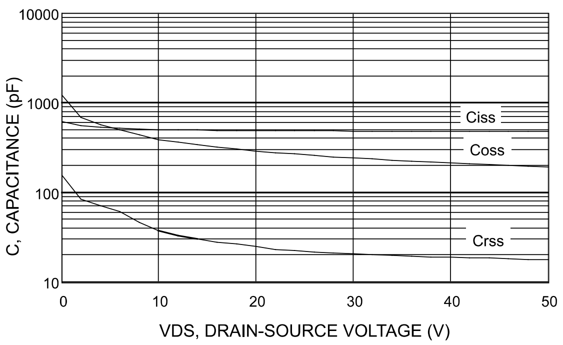


Figure 6: Drain current vs. gate voltage

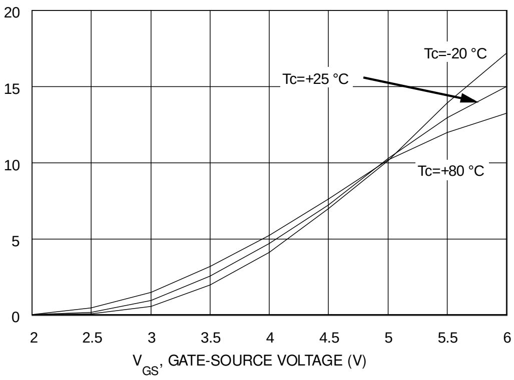


Figure 7: Maximum safe operating area

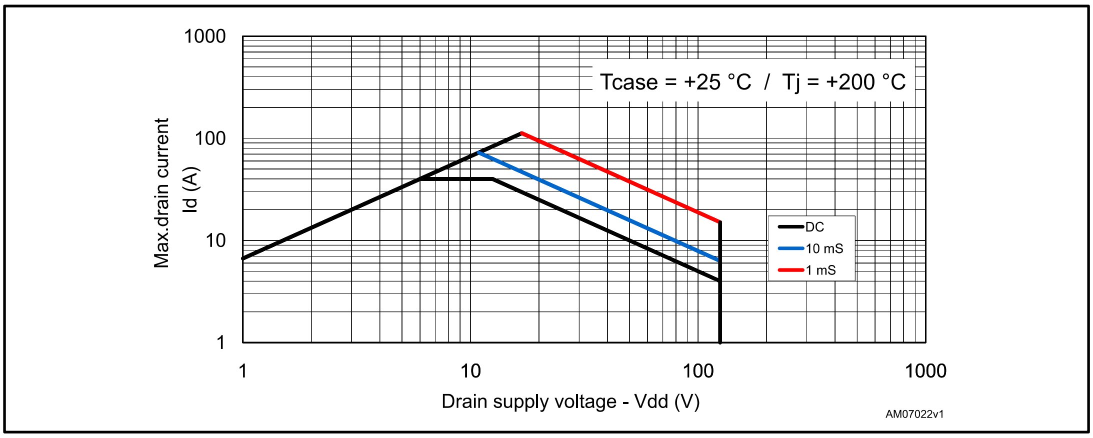


Figure 8: Transient thermal impedance

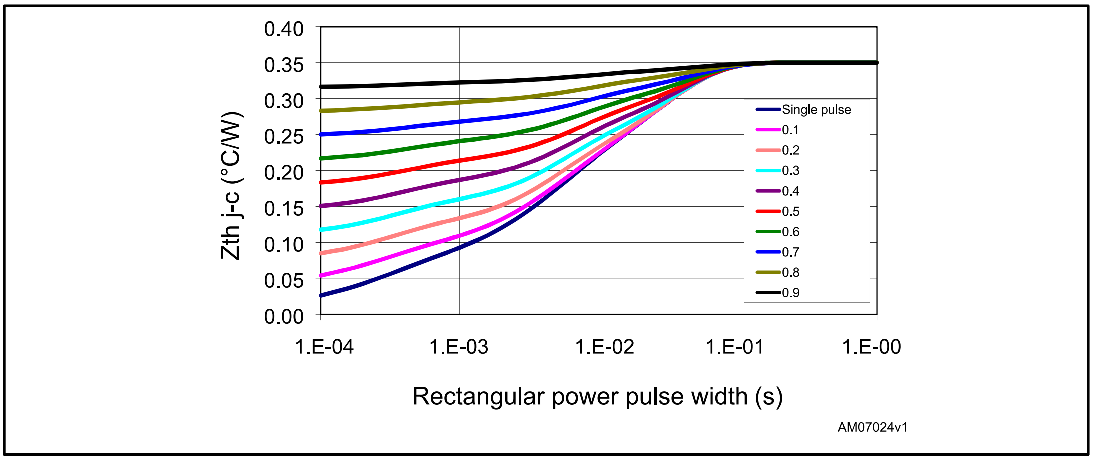
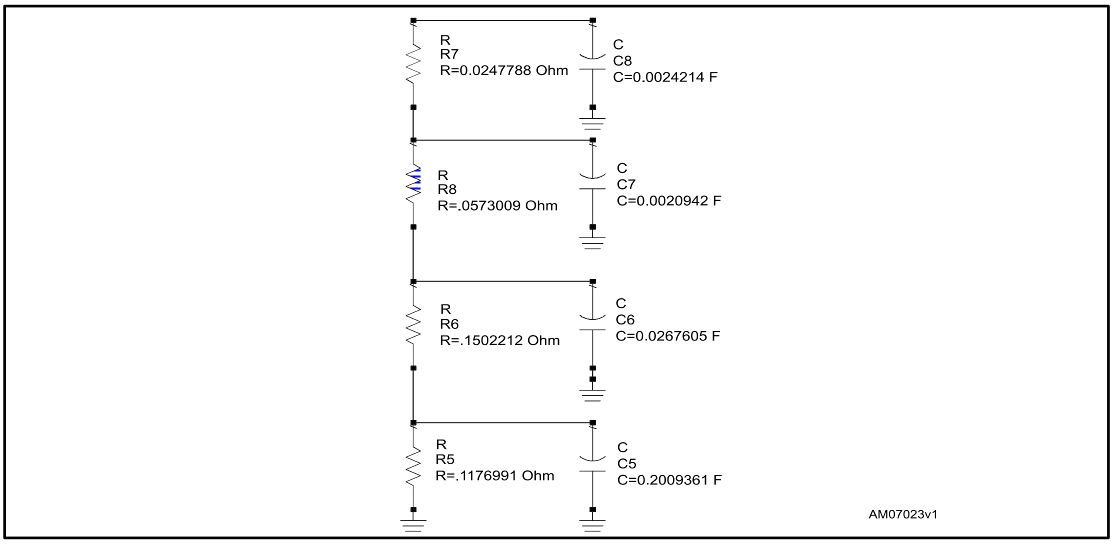


Figure 9: Transient thermal model



4.1 Typical performance (175 MHz)

Figure 10: Output power vs. input power

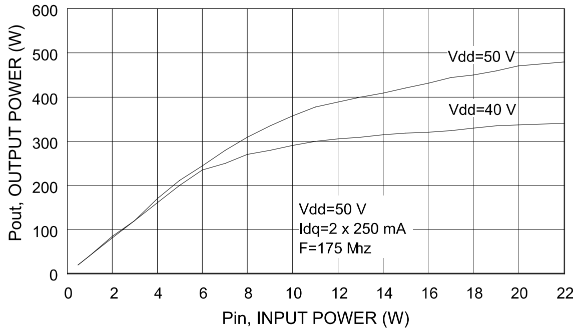


Figure 11: Output power vs. input power at different T_c

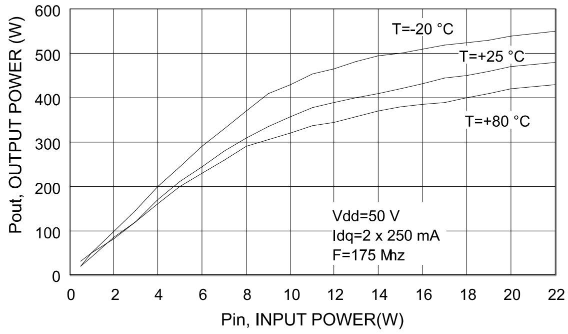


Figure 12: Power gain vs. output power

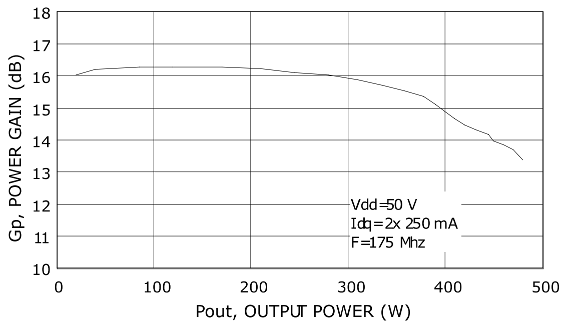


Figure 13: Efficiency vs. output power

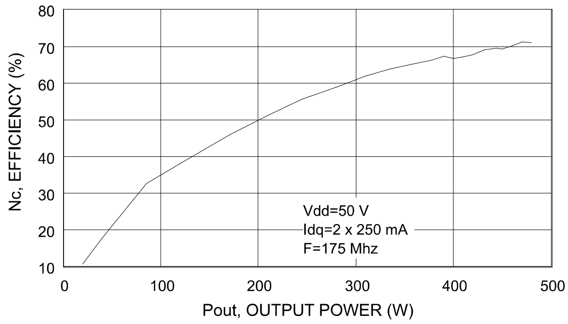


Figure 14: Output power vs. supply voltage

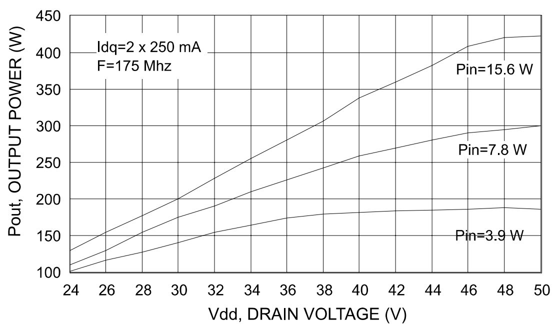
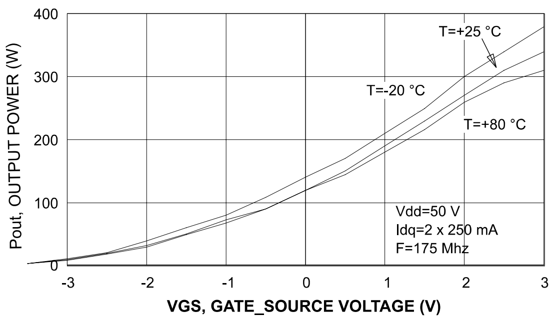


Figure 15: Output power vs. gate voltage



5 Test circuit (175 MHz)

Figure 16: 175 MHz production test circuit schematic

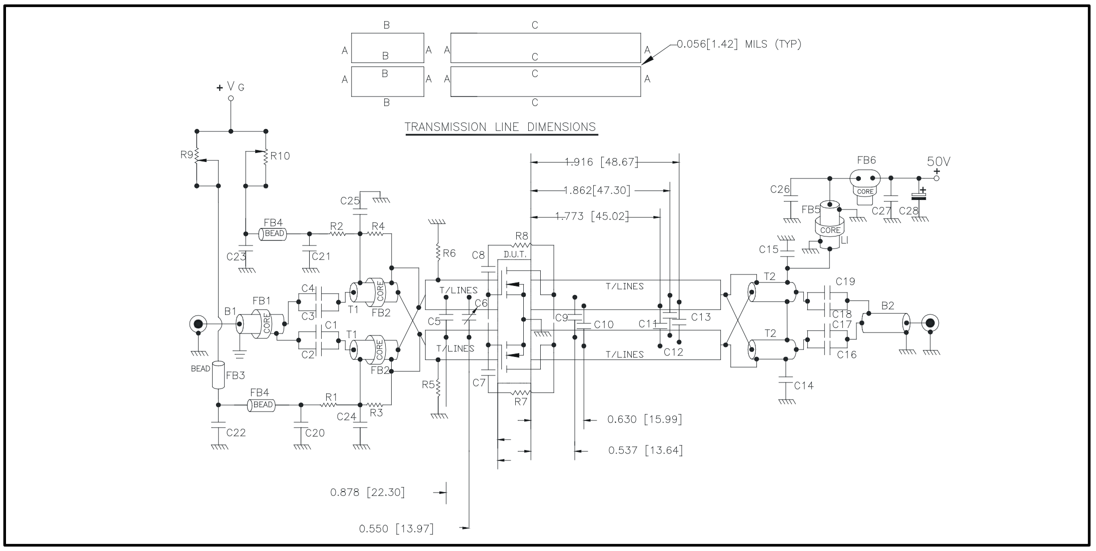


Table 7: 175 MHz test circuit part list

Component	Description
R1, R2, R5, R6	470 Ohm 1 W, surface mount chip resistor
R3, R4	360 Ohm 0.5 W, carbon comp. axial lead resistor or equivalent
R7, R8	560 Ohm 2 W, resistor 2 turn wire air-wound axial lead resistor
R9, R10	20 kOhm 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 Ohm RG316 O.D 0.076[1.93] L = 11.80[299.72] flexible coaxial cable 4 turns through ferrite bead
B2	50 Ohm RG-142B O.D 0.165[4.19] L = 11.80[299.72] flexible coaxial cable

Component	Description
T1	R.F. transformer 4:1, 25 Ohm O.D RG316-25 O.D 0.080[2.03] L = 5.90[149.86] flexible coaxial cable 2 turns through ferrite multi-aperture core
T2	R.F. transformer 1:4, 25 Ohm semi-rigid coaxial cable O.D. 0.141[3.58] L = 5.90[149.86]
L1	Inductor λ 1/4 wave 50 Ohm O.D 0.165[4.19] L = 11.80 [299.72] flexible coaxial cable 2 turns through ferrite 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

6 Test circuit photomaster

Figure 17: 175 MHz test circuit photomaster

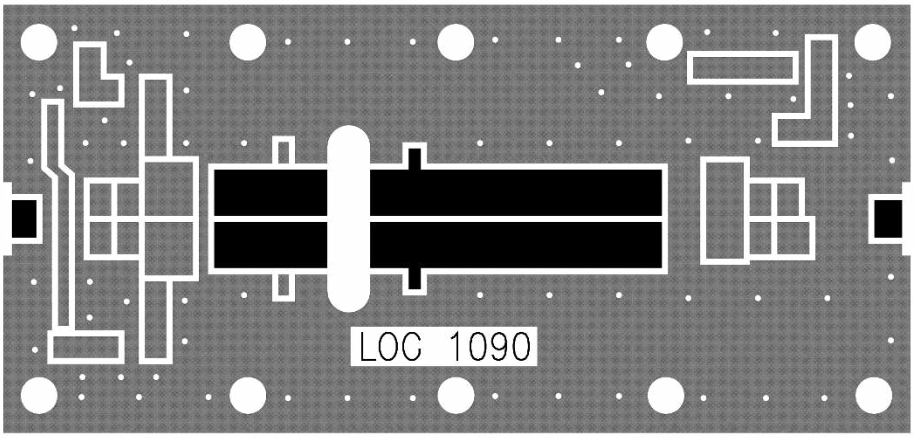
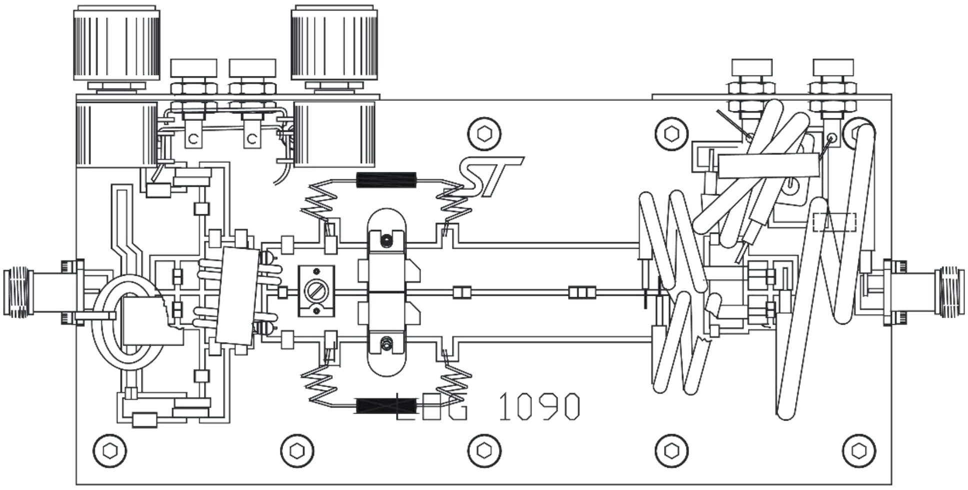


Figure 18: 175 MHz test fixture



7 Typical broadband data (175-230 MHz)

Figure 19: Input power vs. frequency

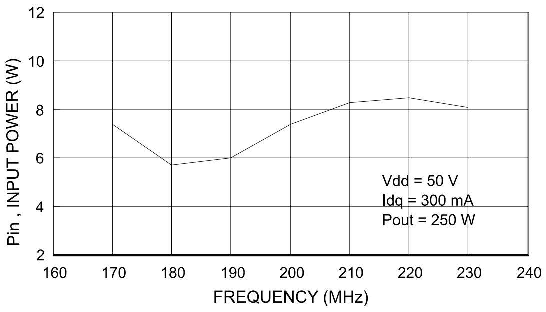


Figure 20: Power gain vs. frequency

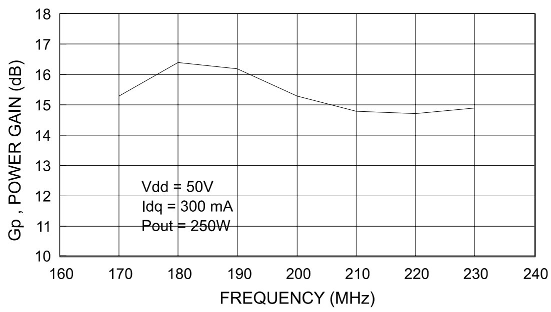


Figure 21: Efficiency vs. frequency

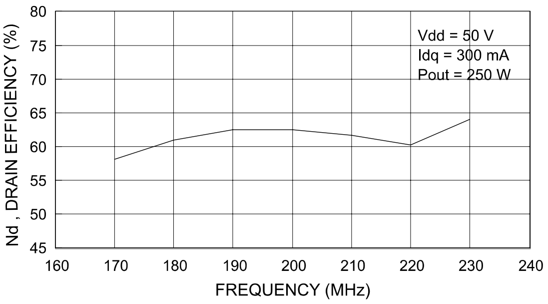


Figure 22: Return loss vs. frequency

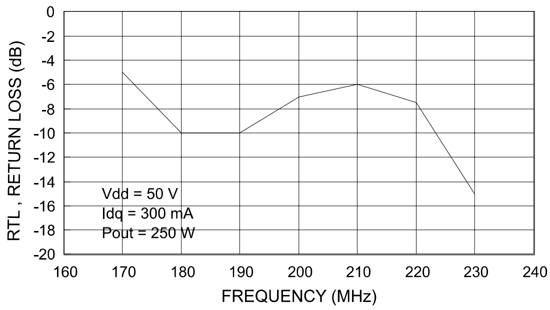
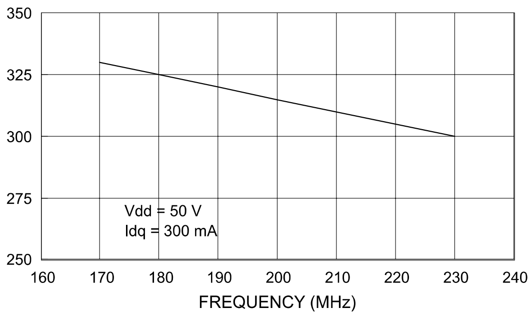


Figure 23: 1 dB compression point vs. frequency



8 Test circuit 175 - 230 MHz

Figure 24: 175 - 230 MHz test circuit layout (engineering fixture)

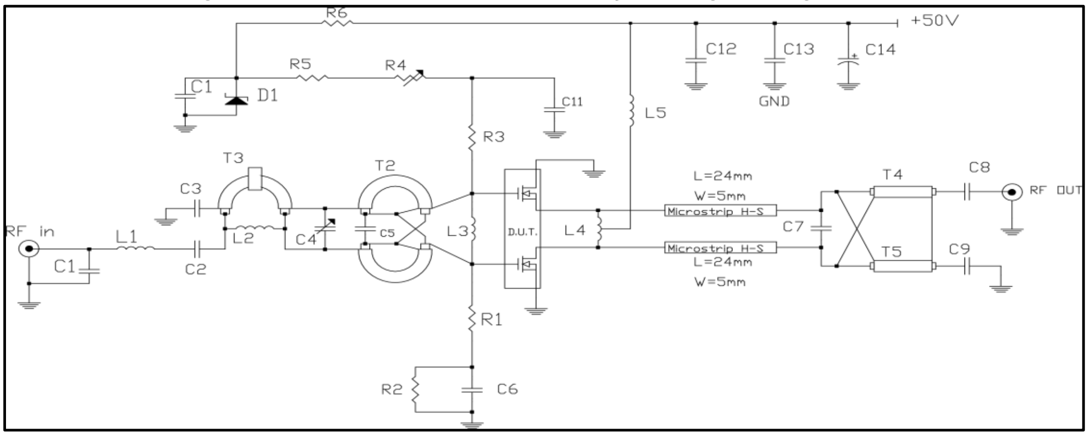


Table 8: 175 - 230 MHz circuit layout component part list

Component	Description
PCB	1/32” woven fiberglass 0.030 Cu, sides, εr = 4.8
T1	50 Ohm flexible coax cable OD 0.06”, 3” long. ferrite core NEOSIDE
T2, T3	9:1 transformer, 16.5 Ohm flexible coax cable 0.1”, 3” long
T4, T5	4:1 transformer, 25 Ohm flexible coax cable OD 0.06”, 5” long
C1	8.2 pF ceramic cap
C2, C3	100 pF ceramic cap
C4	2 - 18 pF chip cap
C5	47 pF ceramic cap
C6, C11	47 nF ceramic cap
C7	56 pF ATC chip cap
C8, C9, C13	470 pF ATC chip cap
C10	100 nF ceramic cap
C12	2 x 330 nF / 50 V cap
C14	10 nF / 63 V electrolityc cap
R1, R3	47 Ohm resistor
R2	6.8 kOhm chip resistor
R4	4.7 kOhm multi turn trim resistor
R5	8.2 kOhm / 5 W resistor
R6	3.3 kOhm / 5 W resistor
D1	6.8 V Zener diode
L1	20 nH inductor
L2	70 nH inductor
L3	30 nH inductor
L4	10 nH inductor
L5	15 nH inductor

9 Typical broadband data (88 - 108 MHz)

Figure 25: Input power vs. frequency (P_{OUT}=300)

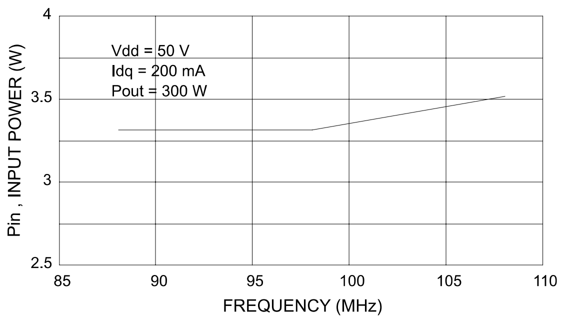


Figure 26: Power gain vs. frequency (P_{OUT}=300)

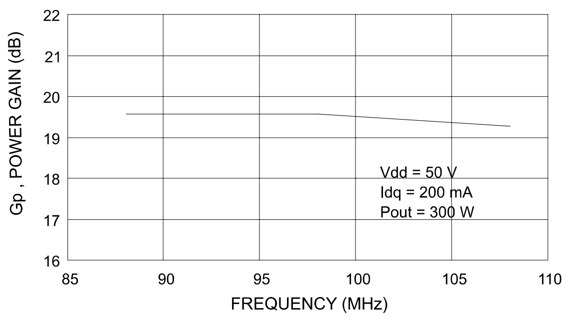


Figure 27: Efficiency vs. frequency (P_{OUT}=300)

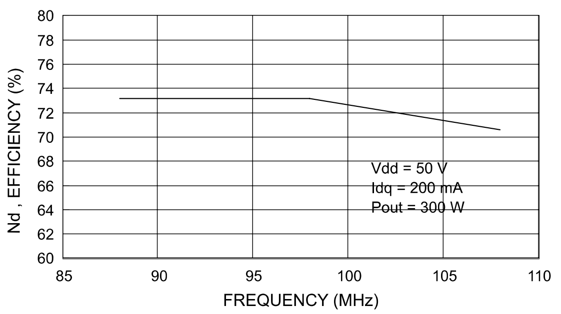


Figure 28: Return loss vs. frequency (P_{OUT}=300)

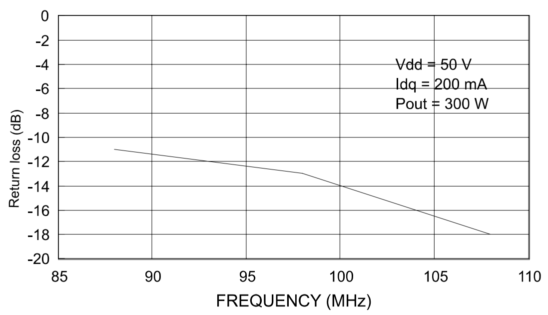


Figure 29: 2nd harmonic vs. frequency (88 - 108 MHz)

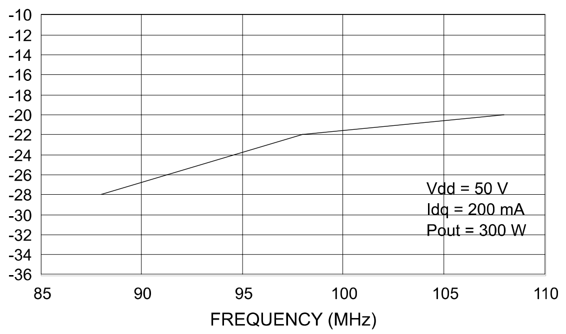
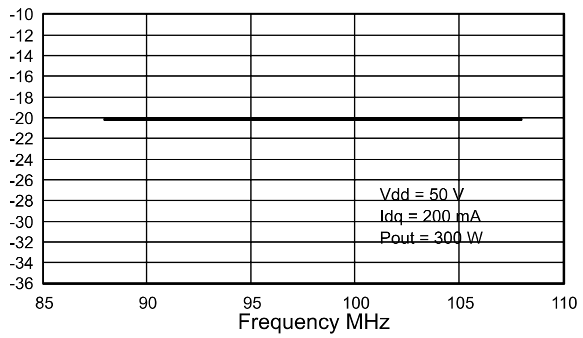


Figure 30: 3rd harmonic vs. frequency (88 - 108 MHz)



10 Test circuit 88-108 MHZ

Figure 31: 88 - 108 MHz test circuit layout (engineering fixture)

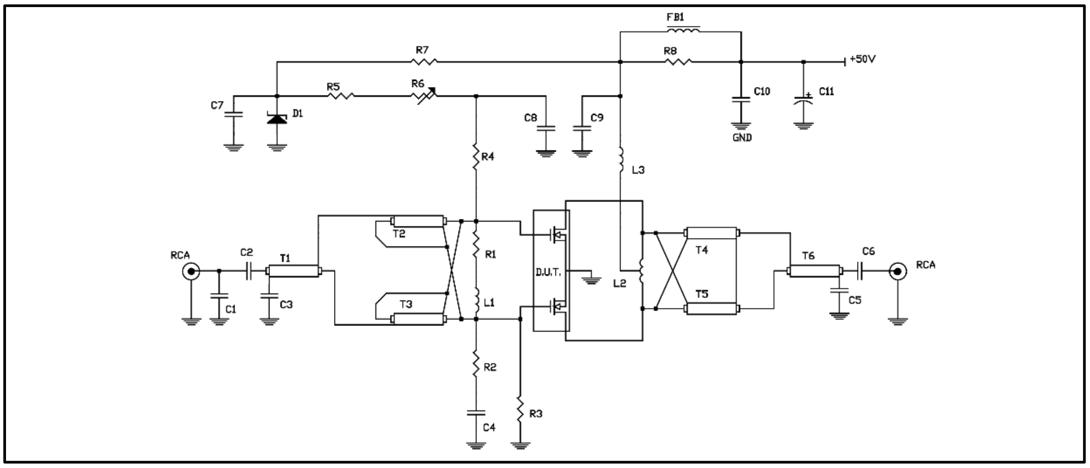


Table 9: 88 - 108 MHz circuit layout component part list

Component	Description
PCB	1/32” woven fiberglass 0.030 Cu, sides, εr = 4.8
T1	50 Ohm flexible coax cable OD 0.06”, 3” long
T2, T3	9:1 transformer, 25 Ohm flexible coax cable 0.1”, 3.9” ferrite core NEOSIDE
T4, T5	4:1 transformer, 25 Ohm flexible coax cable OD 0.1”, 5” long
T6	50 Ohm flexible coax cable OD 0.1”, 5” long
FB1	vk200
C1	10 pF ceramic cap
C2, C3, C4, C7, C8	1 nF chip cap
C5, C6	1 nF ATC chip cap
C9	470 pF ceramic cap
C10	100 nF chip cap
C11	100 mF / 63 V electrolytic cap
R1	56 Ohm resistor
R2, R4	10 Ohm chip resistor
R3	10 kOhm resistor
R5	5.6 Ohm resistor
R6	10 kOhm, 10 turn trim resistor
R7	3.3 kOhm / 5 W resistor
R8	15 Ohm / 5 W resistor
D1	6.8 V Zener diode
L1	10 nH inductor
L2	40 nH inductor
L3	70 nH inductor

11 Marking, packing and shipping specifications

Table 10: Packing and shipping specifications

Order code	Packing	Pieces per tray	Dry pack humidity	V_{GS} and G_{FS} code	Lot code
SD2932W	Tube	15	< 10%	Not mixed	Not mixed

Figure 32: SD2932 marking layout

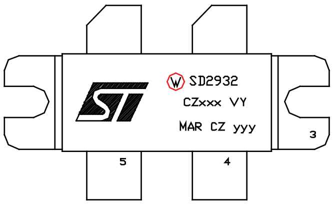


Table 11: Marking specifications

Symbol	Description
W	Wafer process code
CZ	Assembly plant
xxx	Last 3 digits of diffusion lot
VY	Diffusion plant
MAR	Country of origin
CZ	Test and finishing plant
y	Assembly year
yy	Assembly week

12 Package information

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.

12.1 M244 package information

Figure 33: M244 (0.400 x .860 4L BAL N/HERM W/FLG) package outline

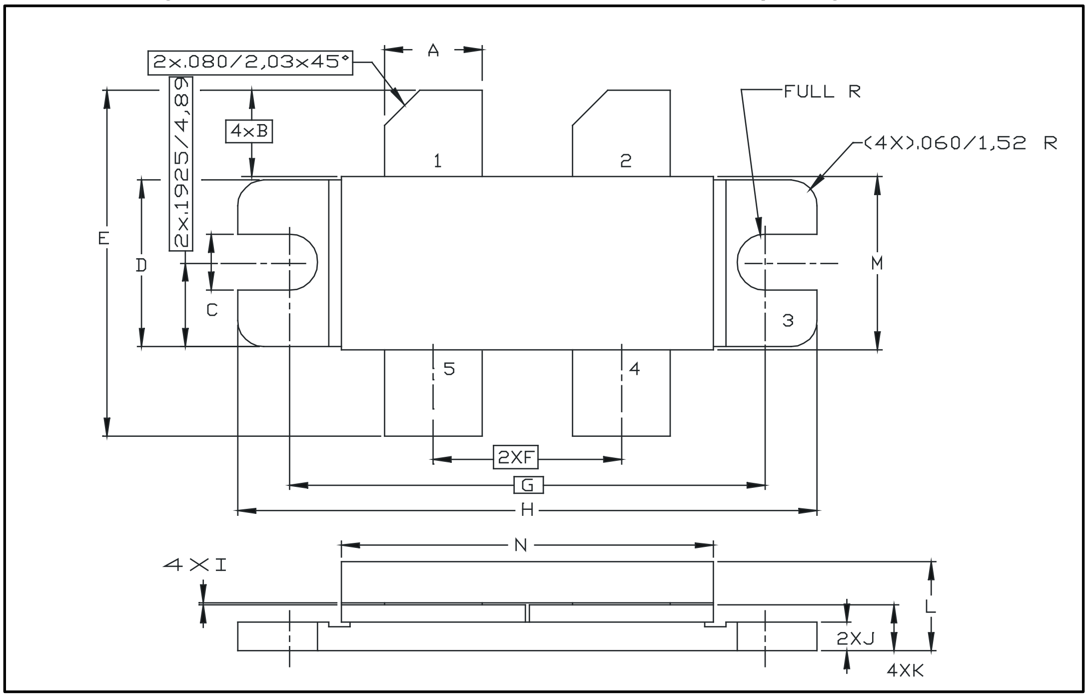


Table 12: M244 (0.400 x .860 4L BAL N/HERM W/FLG) package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	5.59		5.84
B		5.08	
C	3.02		3.28
D	9.65		9.91
E	19.81		20.82
F	10.92		11.18
G		27.94	
H	33.91		34.16
I	0.10		0.15
J	1.52		1.78
K	2.59		2.84
L	4.83		5.84
M	10.03		10.34
N	21.59		22.10

13 Revision history

Table 13: Document revision history

Date	Revision	Changes
15-Jul-2004	5	
24-Jan-2006	6	Updated *Table 4: Static (per section)*.
23-Nov-2009	7	Inserted Δ_{VGS} in *Table 4: Static (per section)*.
31-Mar-2010	8	Added *Figure 7*, *Figure 8* and *Figure 9*.
11-Jan-2012	9	Inserted *Chapter 12: Marking, packing and shipping specifications*. Minor text changes.
24-Nov-2016	10	Updated *Section 1.1: "Maximum ratings"*.