

# HTU7G06S0P5P

## RoHS Compliant LDMOS RF Power Transistor



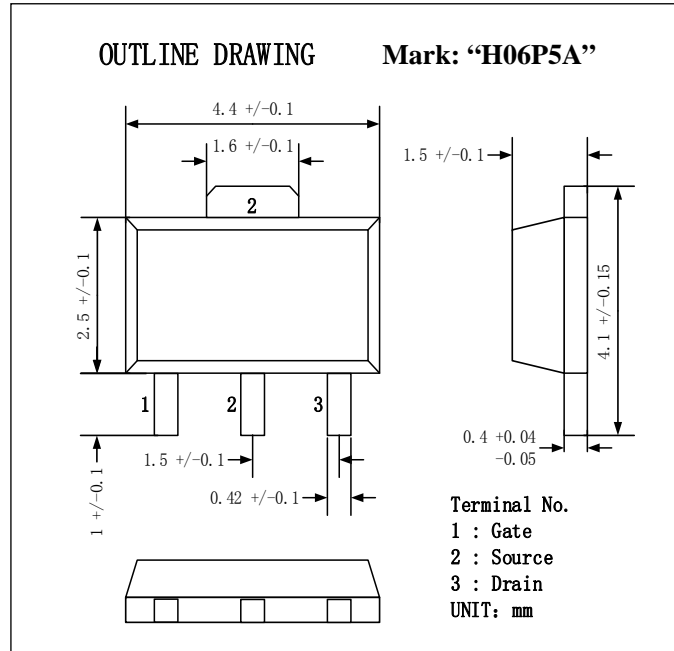
### 1. DESCRIPTION

HTU7G06S0P5P is a MOSFET type transistor specifically designed for VHF/UHF RF amplifier applications.

This device has an internal monolithic Zener diode from gate to source for ESD protection.

### 2. FEATURES

- High power:  
 $P_{out}=0.7W @V_{DD}=4V, f=430MHz$
- High Efficiency:  
 $\eta_d=70% @V_{DD}=4V, f=430MHz$
- Integrated gate protection diode



### 3. APPLICATION

- For output stage of high power amplifiers in VHF/UHF Band mobile radio sets.
- For drive stage of high power amplifiers in Universal Broadband.

### 4. ABSOLUTE MAXIMUM RATINGS

(  $T_c=25^{\circ}C$  UNLESS OTHERWISE NOTED )

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNIT
Drain to source voltage	$V_{DSS}$	$V_{gs} = 0V$	17	V
Gate to source voltage	$V_{GSS}$	$V_{ds} = 0V$	-5 ~ 10	V
Operating Voltage	$V_{DD}$	-	8.5	V
Drain Current	$I_D$	-	0.5	A

Input Power	$P_{in}$	$Z_g = Z_l = 50 \Omega$	100	mW
Storage temperature	$T_{stg}$	-	-55 ~ 150	°C
Operating Junction Temperature	$T_J$	-	-40 ~ 150	°C
Thermal resistance	$Z_{th(j-c)}$	Junction to case	25	°C/W

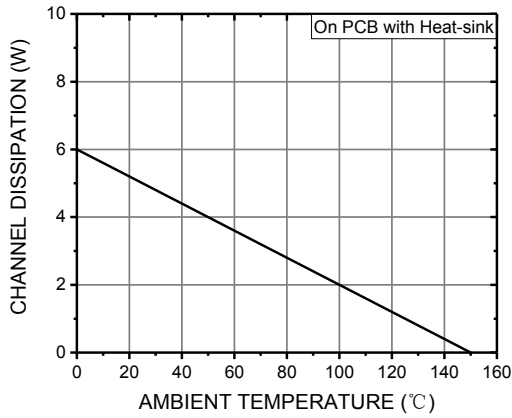
## 5. ELECTRICAL CHARACTERISTICS

( $T_c=25^\circ\text{C}$  UNLESS OTHERWISE NOTED)

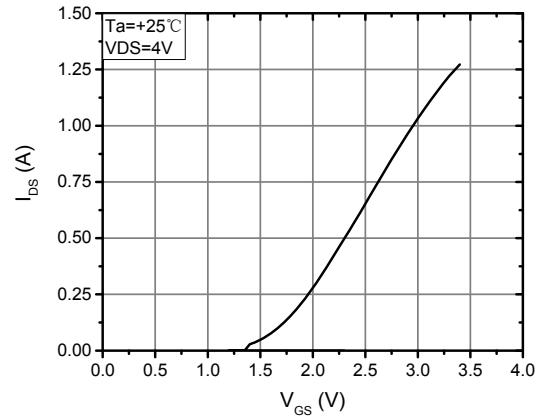
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Breakdown Voltage	$V_{(BR)DDS}$	$V_{GG} = 0V, I_D = 8\mu A$	17	-	-	V
Zero Gate Voltage Drain Leakage Current	$I_{DSS}$	$V_{DD} = 17V, V_{GG} = 0V$	1	-	-	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{DD} = 0V, V_{GG} = 10V$	1	-	-	$\mu A$
Gate Threshold Voltage	$V_{th}$	$V_{DD} = V_{gg}, I_d = 8\mu A$	0.5	1.0	1.5	V
Output Power	$P_{out}$	$V_{DD}=4V, P_{in}= 0.1W$ $f=430MHz, I_{dq}=50mA$		0.7		W
Drain Efficiency	$\eta_d$			70		%
Output Power	$P_{out}$	$V_{DD}=7.2V, P_{in}= 31mW$ $f=530MHz, I_{dq}=50mA$		1.5		W
Drain Efficiency	$\eta_d$			73		%

## 6. TYPICAL CHARACTERISTICS

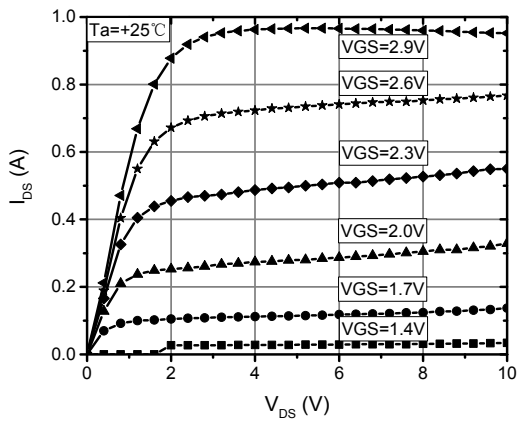
**CHANNEL DISSIPATION VS. AMBIENT TEMPERATURE**



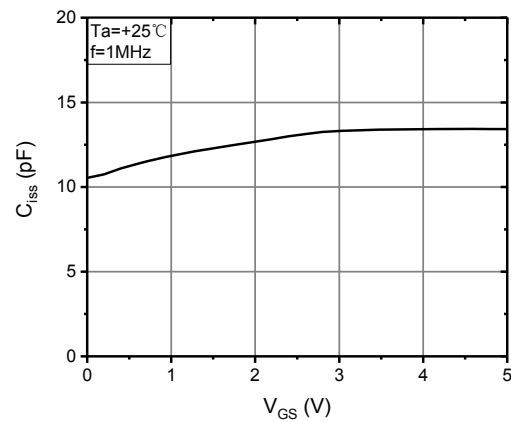
**I<sub>DS</sub> VS. V<sub>GS</sub>**



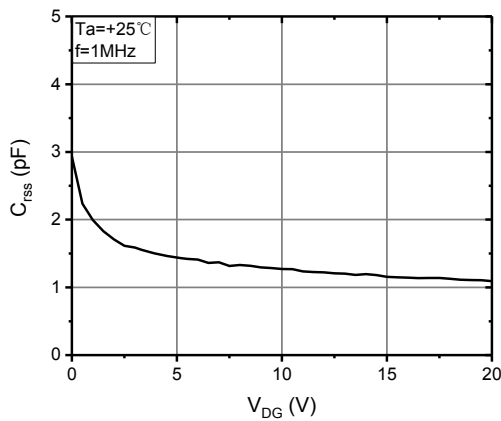
**I<sub>DS</sub> VS. V<sub>DS</sub>**



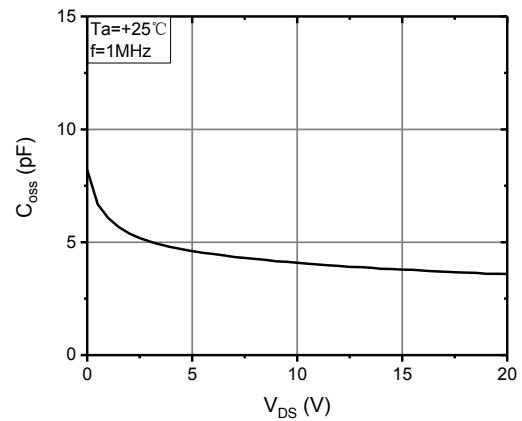
**C<sub>iss</sub> VS. V<sub>GS</sub>**



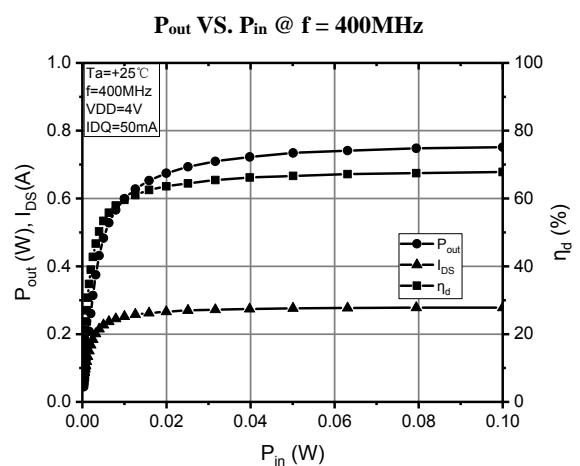
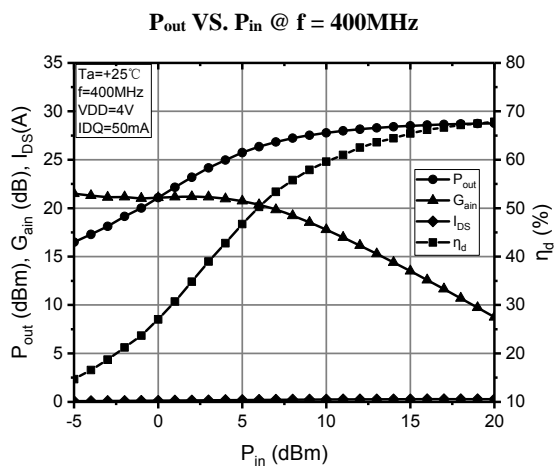
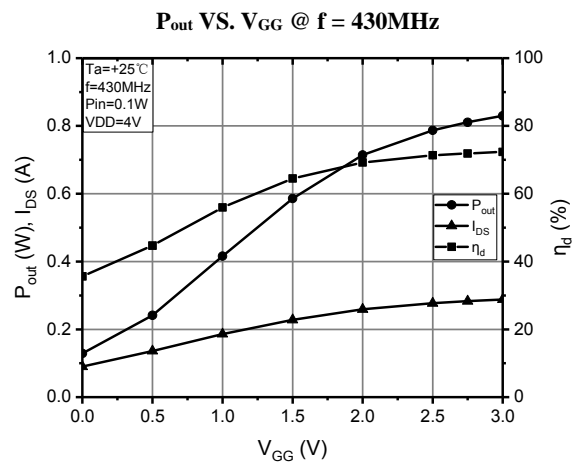
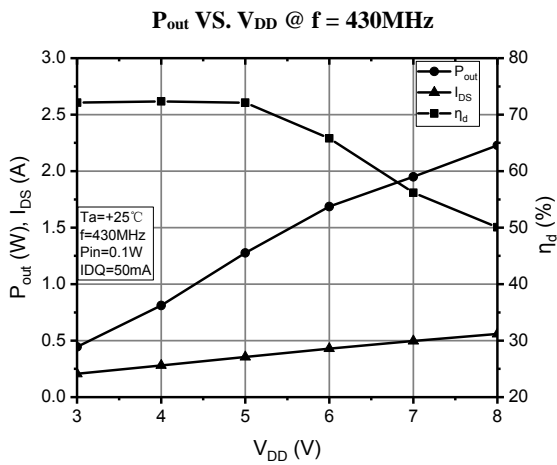
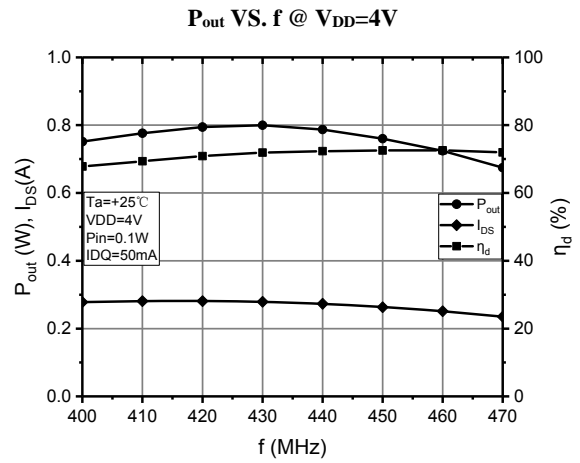
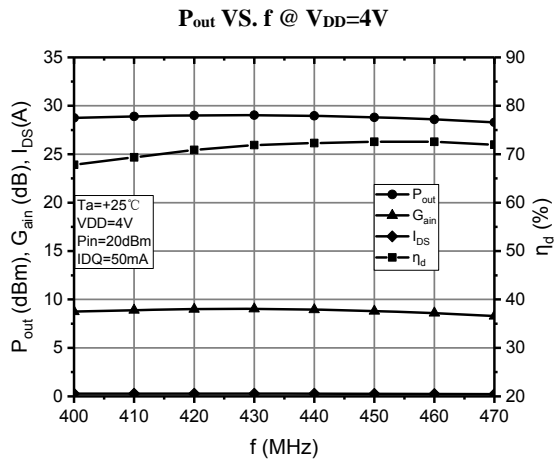
**C<sub>rss</sub> VS. V<sub>DG</sub>**



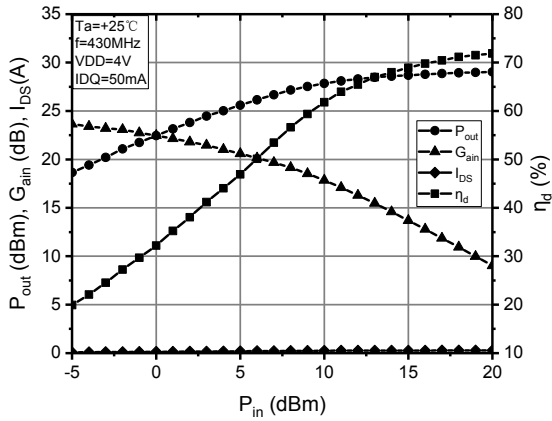
**C<sub>oss</sub> VS. V<sub>DS</sub>**



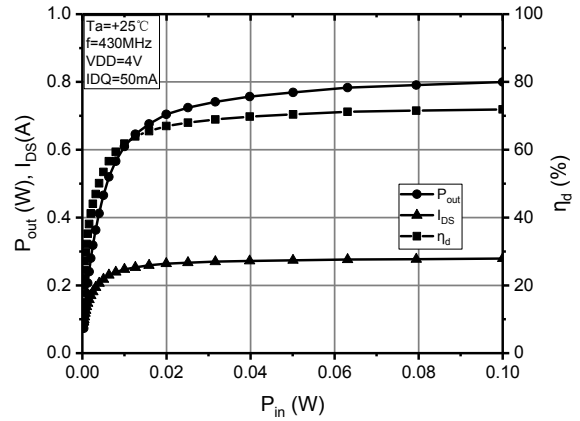
### 7. UHF-band,400-470MHz@V<sub>DD</sub>=4V,TYPICAL CHARACTERISTICS



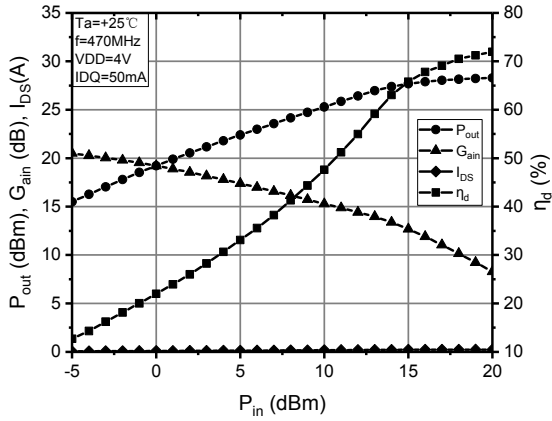
**P<sub>out</sub> VS. P<sub>in</sub> @ f = 430MHz**



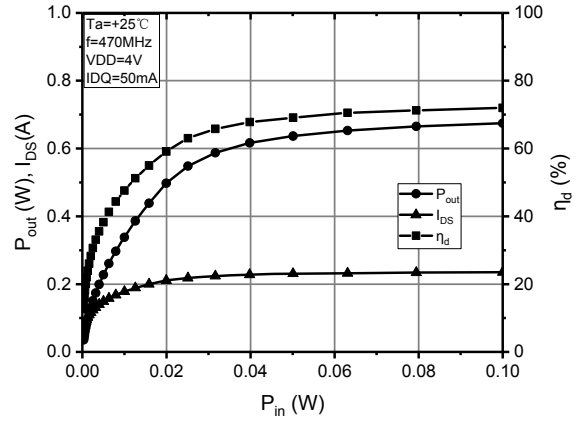
**P<sub>out</sub> VS. P<sub>in</sub> @ f = 430MHz**



**P<sub>out</sub> VS. P<sub>in</sub> @ f = 470MHz**

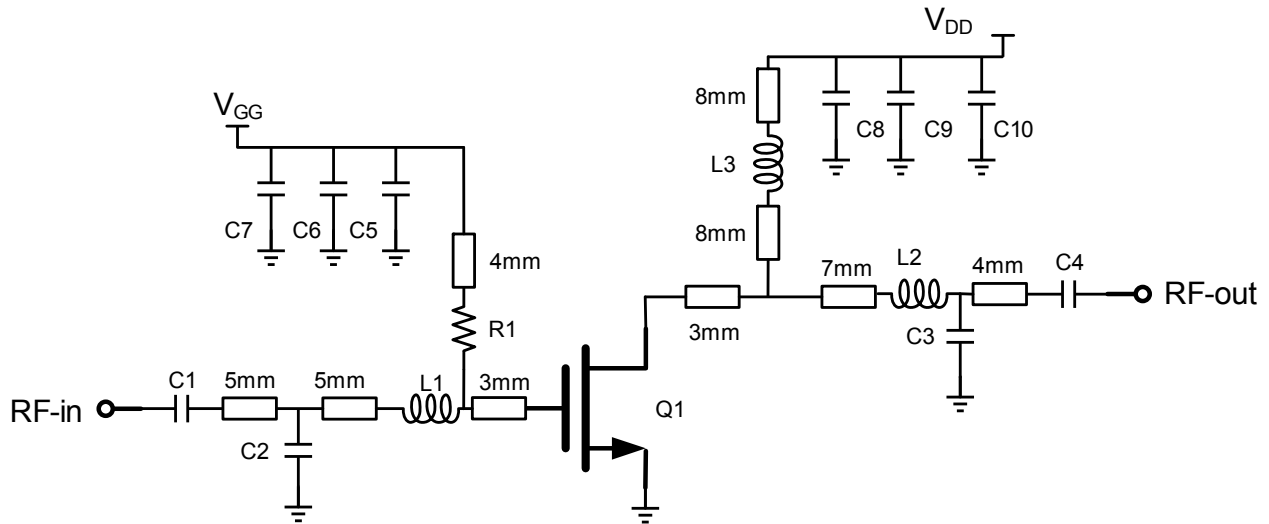


**P<sub>out</sub> VS. P<sub>in</sub> @ f = 470MHz**



## 8. TEST CIRCUIT

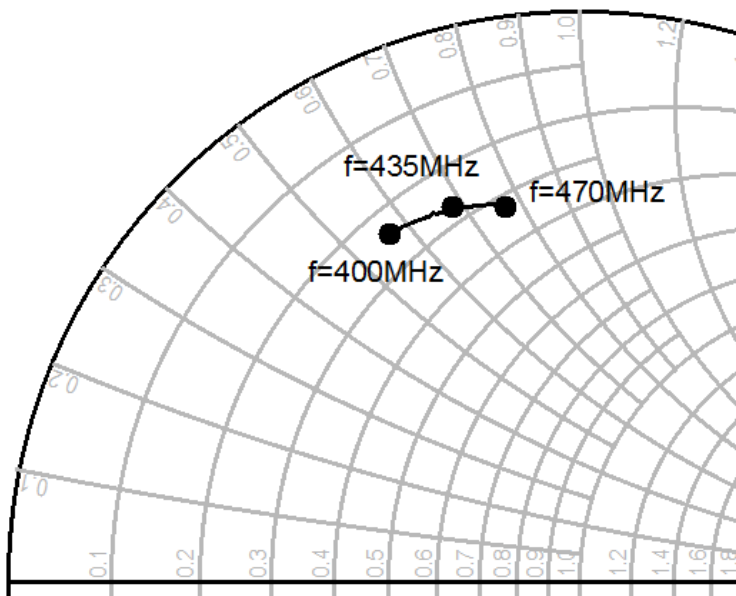
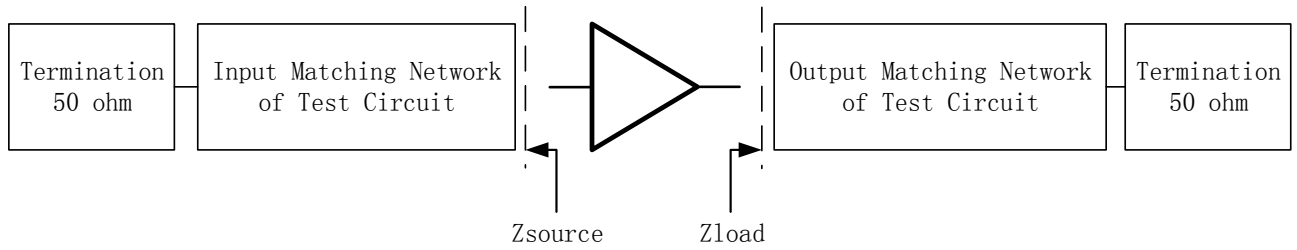
400-470MHz (@VDD=4.0V, Idq = 50mA)



Note: The characteristic impedance of all microstrip lines: 50ohm

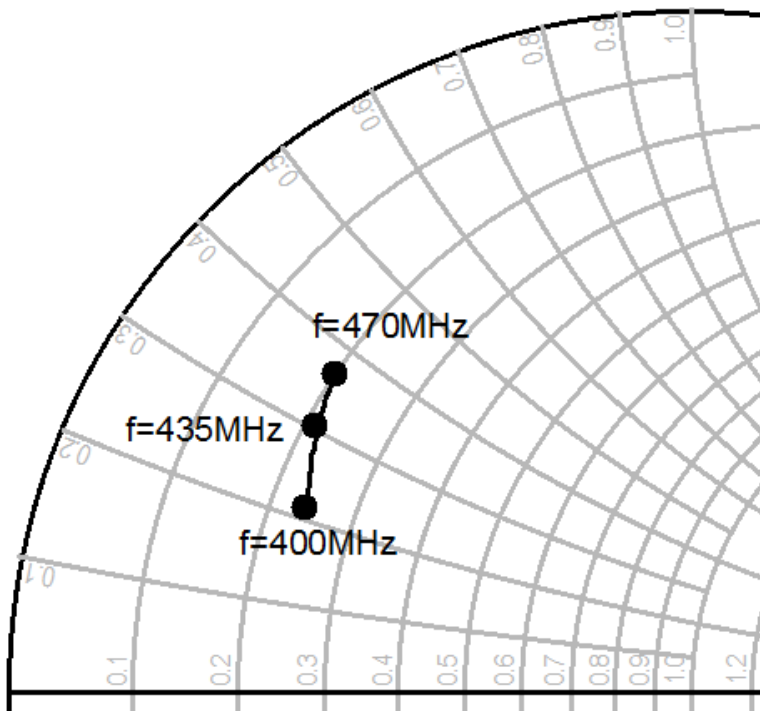
No.	Description	P/N	Manufacturer
C1	220pF Chip Ceramic Capacitors	GRM1885C1H221JA01	muRata
C2	15pF Chip Ceramic Capacitors	GRM1885C1H150JA01	muRata
C3	15pF Chip Ceramic Capacitors	GRM1885C1H150JA01	muRata
C4	220pF Chip Ceramic Capacitors	GRM1885C1H221JA01	muRata
C5	220pF Chip Ceramic Capacitors	GRM1885C1H220JA01	muRata
C6	1nF Chip Ceramic Capacitors	GRM1885C1H102JA01	muRata
C7	4.7uF Chip Ceramic Capacitors	GRM32ER61H474KA12L	muRata
C8	220pF Chip Ceramic Capacitors	GRM1885C1H221JA01	muRata
C9	1nF Chip Ceramic Capacitors	GRM1885C1H102JA01	muRata
C10	10uF Chip Ceramic Capacitors	GRM32ER61H105KA12L	muRata
L1	6.8nH Chip Ceramic inductance		arbitrary
L2	D: 0.31mm, Inside: 1.5mm, 2 Turns	Enameled wire	arbitrary
L3	D: 0.3mm, Inside: 1.5mm, 8 Turns	Enameled wire	arbitrary
R1	100Ω Chip Resistors		arbitrary
Q1	RF LDMOS	HTU7G06S0P5P	Kunshan Huatai Electronics Ltd.
PCB	Er=4.5	FR4	

### 9. INPUT/OUTPUT IMPEDANCE VS. FREQ. CHARACTERISTICS



**@Pin=0.1W, VDS=4V, IDQ=50mA**

f(MHz)	Zsource (ohm)
400	11.88 + j 28.26
435	13.56 + j 33.71
470	15.93 + j 38.83

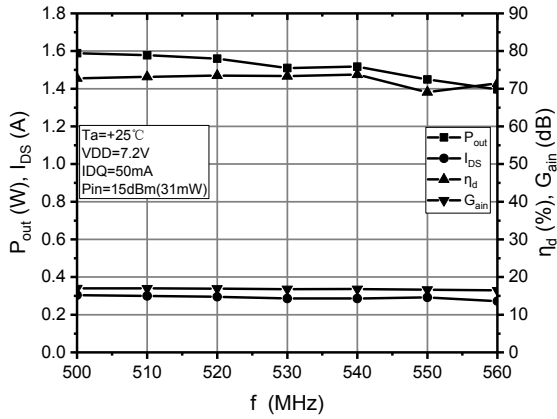


**@Pin=0.1W, VDS=4V, IDQ=50mA**

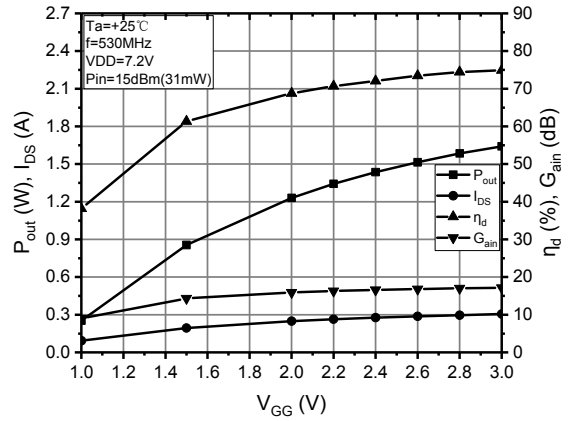
f(MHz)	Zload (ohm)
400	12.25 + j 10.64
435	11.03 + j 14.55
470	10.14 + j 18.41

### 10.UHF-band,500-560MHz@V<sub>DD</sub>=7.2V,TYPICAL CHARACTERISTICS

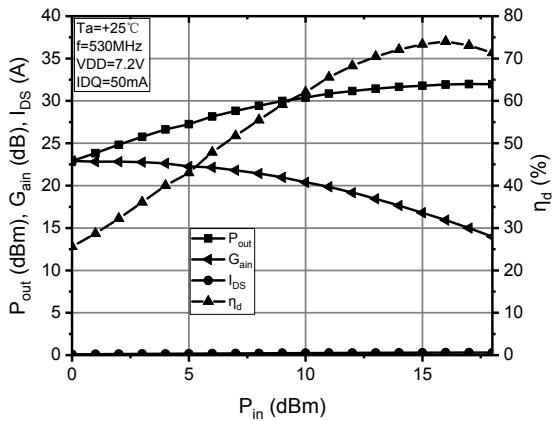
**P<sub>out</sub> VS. f @ V<sub>DD</sub>=7.2V**



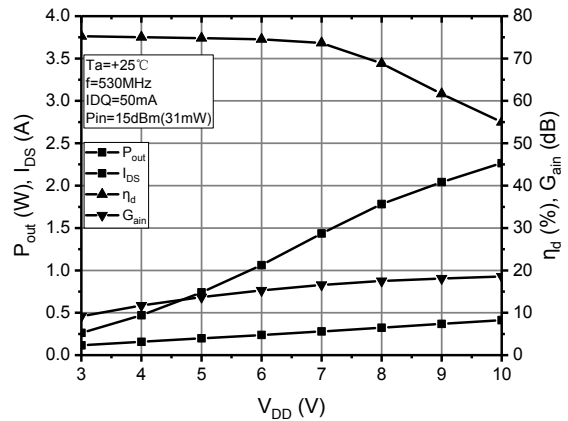
**P<sub>out</sub> VS. V<sub>GG</sub> @ f = 530MHz**



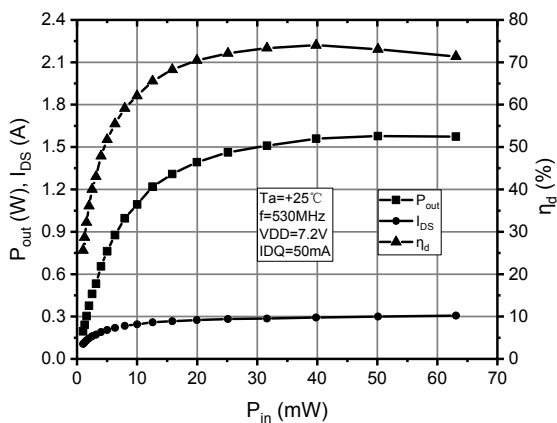
**P<sub>out</sub> VS. P<sub>in</sub> @ f = 530MHz**



**P<sub>out</sub> VS. V<sub>DD</sub> @ f = 530MHz**



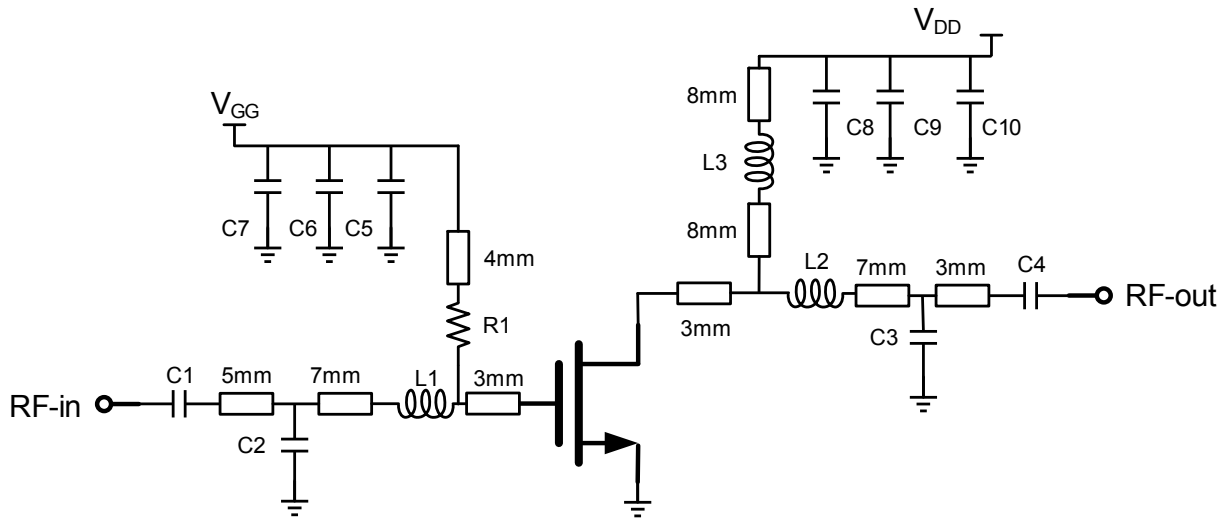
**P<sub>out</sub> VS. P<sub>in</sub> @ f = 530MHz**





## 11. TEST CIRCUIT

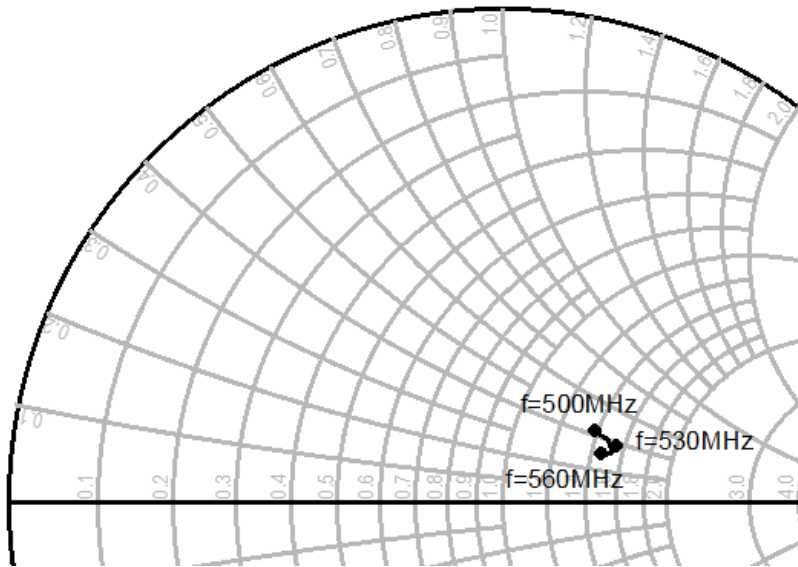
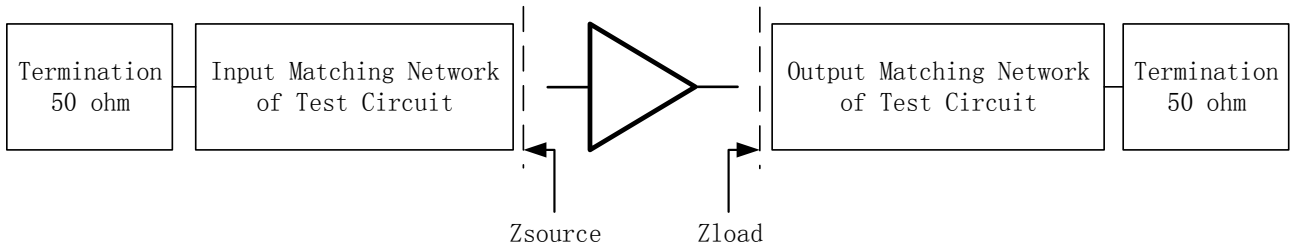
500-560MHz (@VDD=7.2V, Idq = 50mA)



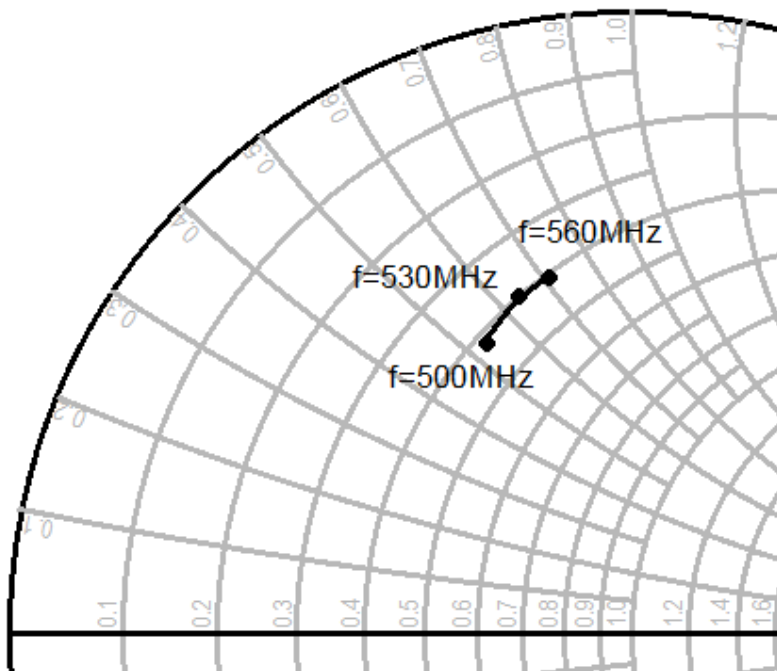
Note: The characteristic impedance of all microstrip lines: 50ohm

No.	Description	P/N	Manufacturer
C1	100pF Chip Ceramic Capacitors	GRM1885C1H101JA01	muRata
C2	10pF Chip Ceramic Capacitors	GRM1885C1H100JA01	muRata
C3	6pF Chip Ceramic Capacitors	GRM1885C1H060JA01	muRata
C4	100pF Chip Ceramic Capacitors	GRM1885C1H101JA01	muRata
C5	100pF Chip Ceramic Capacitors	GRM1885C1H101JA01	muRata
C6	1nF Chip Ceramic Capacitors	GRM1885C1H102JA01	muRata
C7	4.7uF Chip Ceramic Capacitors	GRM32ER61H474KA12L	muRata
C8	100pF Chip Ceramic Capacitors	GRM1885C1H101JA01	muRata
C9	1nF Chip Ceramic Capacitors	GRM1885C1H102JA01	muRata
C10	10uF Chip Ceramic Capacitors	GRM32ER61H105KA12L	muRata
L1	6.8nH Chip Ceramic inductance		arbitrary
L2	D: 0.35mm, Inside: 1.5mm, 2 Turns	Enameled wire	arbitrary
L3	D: 0.3mm, Inside: 1.5mm, 8 Turns	Enameled wire	arbitrary
R1	100Ω Chip Resistors		arbitrary
Q1	RF LDMOS	HTU7G06S0P5P	Kunshan Huatai Electronics Ltd.
PCB	Er=4.5	FR4	

## 12. INPUT/OUTPUT IMPEDANCE VS. FREQ. CHARACTERISTICS

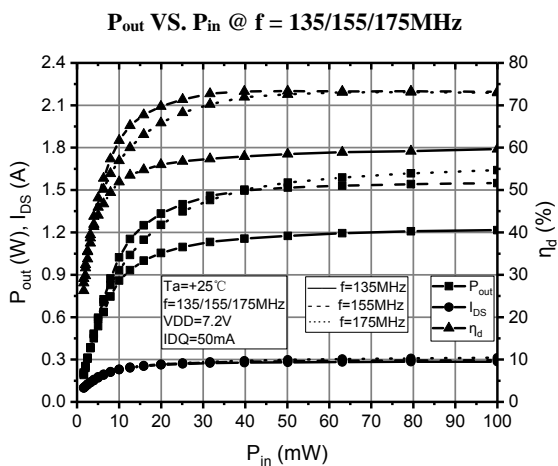
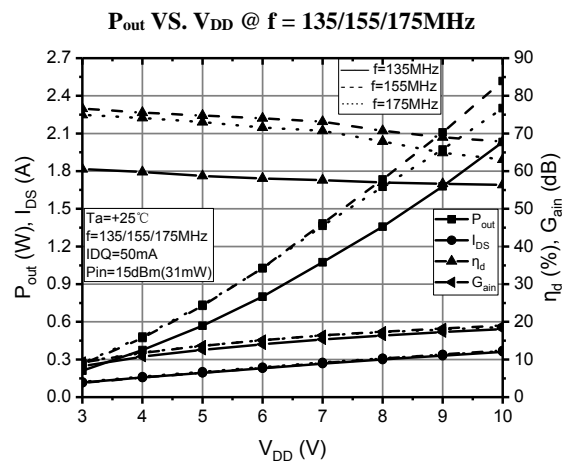
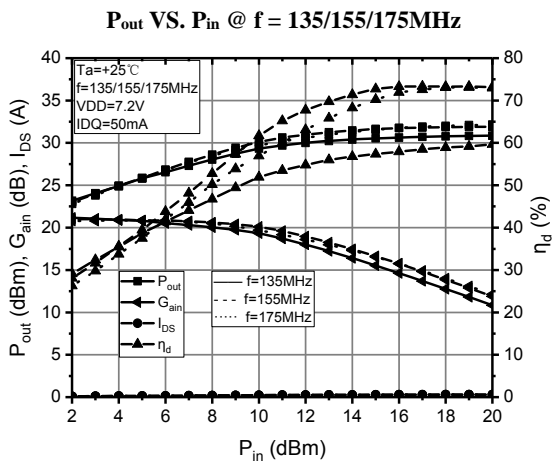
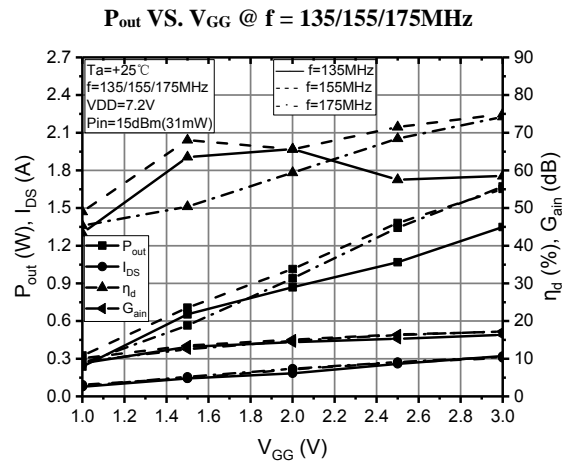
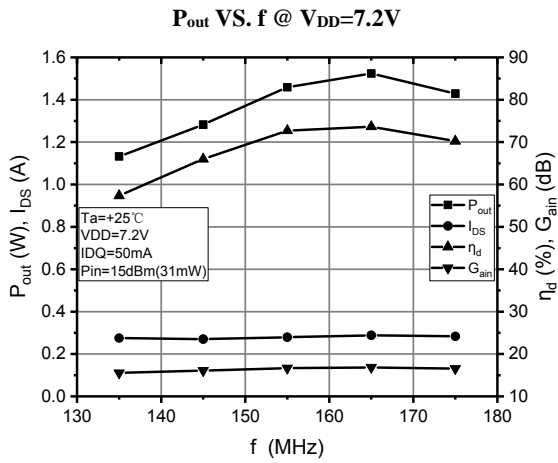


@ $P_{in}=31mW, V_{DS}=7.2V, I_{DQ}=50mA$	
f(MHz)	Zsource (ohm)
500	70.45 + j 20.79
530	76.29 + j 16.66
560	74.05 + j 16.43



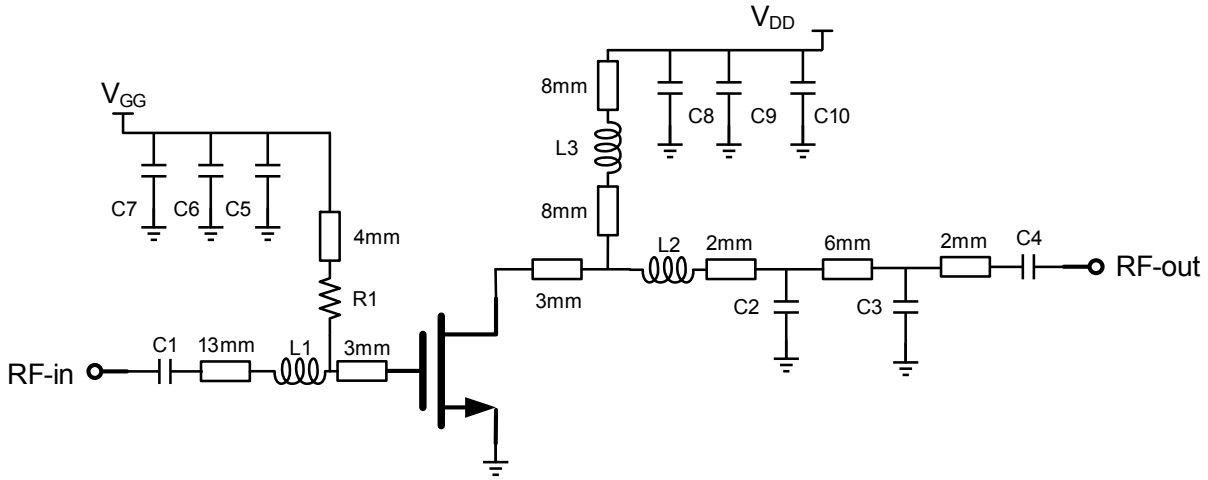
@ $P_{in}=31mW, V_{DS}=7.2V, I_{DQ}=50mA$	
f(MHz)	Zload (ohm)
500	20.66 + j 27.01
530	20.16 + j 31.00
560	20.08 + j 35.28

### 13. VHF-band, 135-175MHz @ $V_{DD}=7.2V$ , TYPICAL CHARACTERISTICS



## 14. TEST CIRCUIT

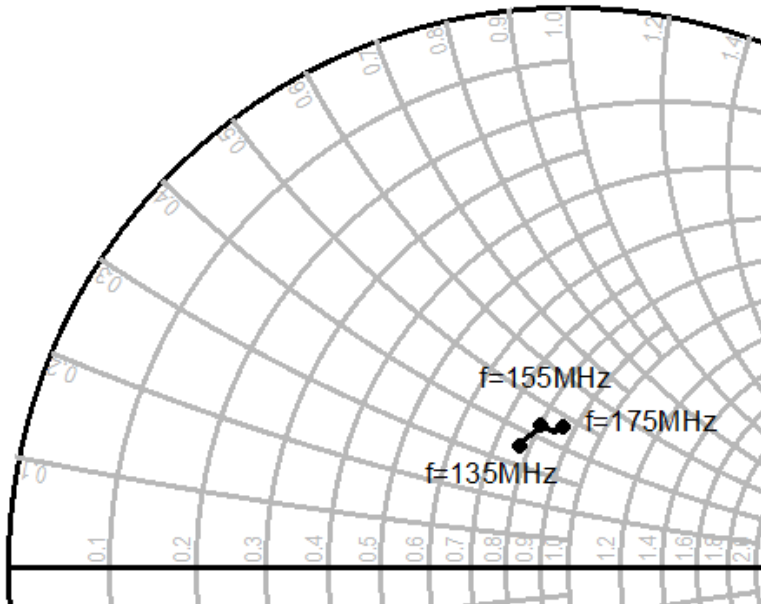
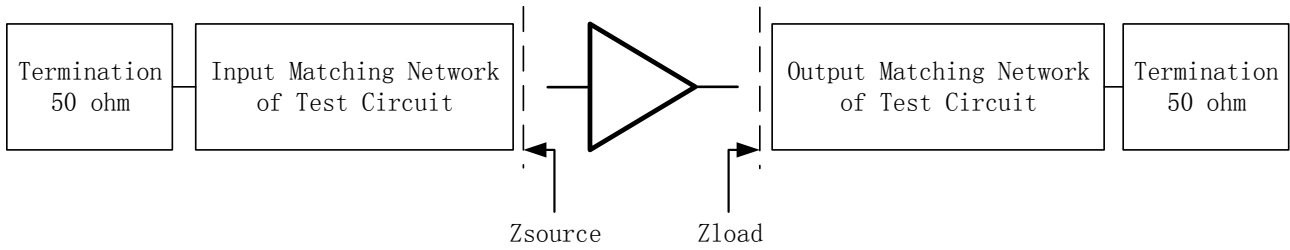
135-175MHz (@VDD=7.2V, Idq = 50mA)



Note: The characteristic impedance of all microstrip lines: 50ohm

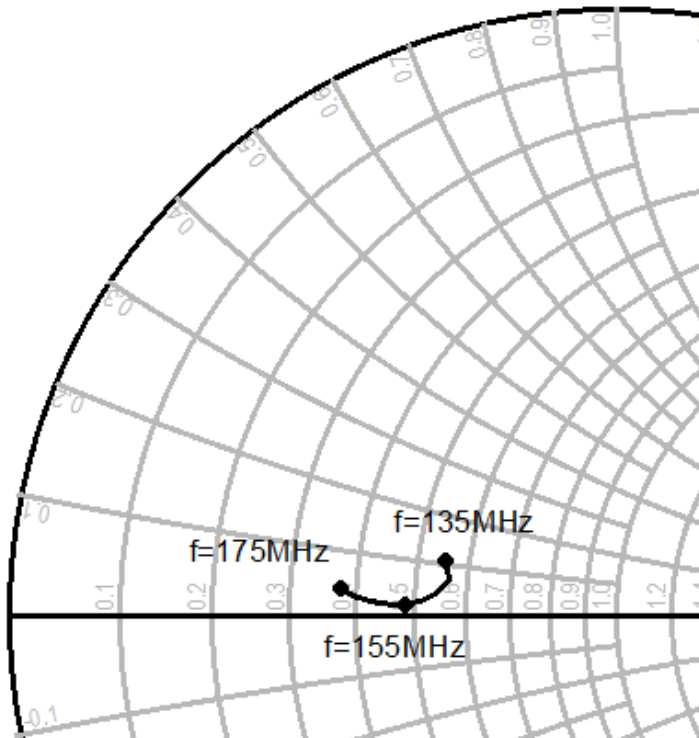
No.	Description	P/N	Manufacturer
C1	470pF Chip Ceramic Capacitors	GRM1885C1H471JA01	muRata
C2	10pF Chip Ceramic Capacitors	GRM1885C1H100JA01	muRata
C3	15pF Chip Ceramic Capacitors	GRM1885C1H150JA01	muRata
C4	470pF Chip Ceramic Capacitors	GRM1885C1H471JA01	muRata
C5	470pF Chip Ceramic Capacitors	GRM1885C1H471JA01	muRata
C6	1nF Chip Ceramic Capacitors	GRM1885C1H102JA01	muRata
C7	4.7uF Chip Ceramic Capacitors	GRM32ER61H474KA12L	muRata
C8	470pF Chip Ceramic Capacitors	GRM1885C1H471JA01	muRata
C9	1nF Chip Ceramic Capacitors	GRM1885C1H102JA01	muRata
C10	10uF Chip Ceramic Capacitors	GRM32ER61H105KA12L	muRata
L1	47nH Chip Ceramic inductance		arbitrary
L2	D: 0.35mm, Inside: 1.5mm, 3 Turns	Enameled wire	arbitrary
L3	D: 0.3mm, Inside: 1.5mm, 8 Turns	Enameled wire	arbitrary
R1	100Ω Chip Resistors		arbitrary
Q1	RF LDMOS	HTU7G06S0P5P	Kunshan Huatai Electronics Ltd.
PCB	Er=4.5	FR4	

### 15. INPUT/OUTPUT IMPEDANCE VS. FREQ. CHARACTERISTICS



**@ $P_{in}=31mW, V_{DS}=7.2V, I_{DQ}=50mA$**

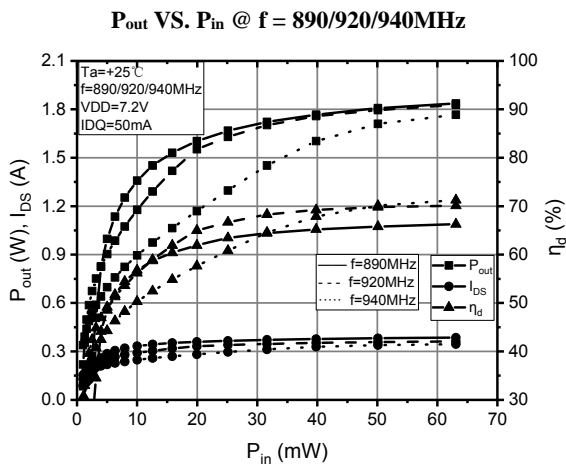
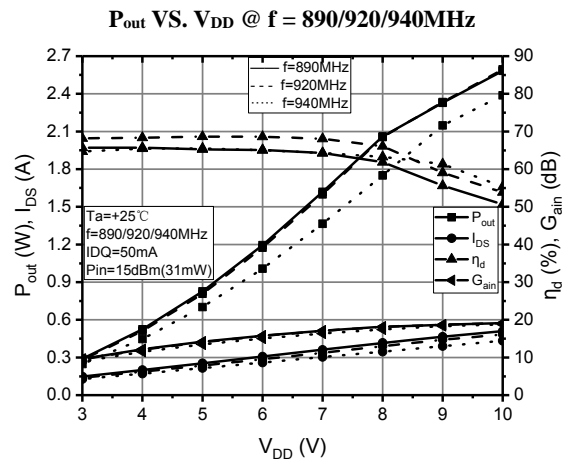
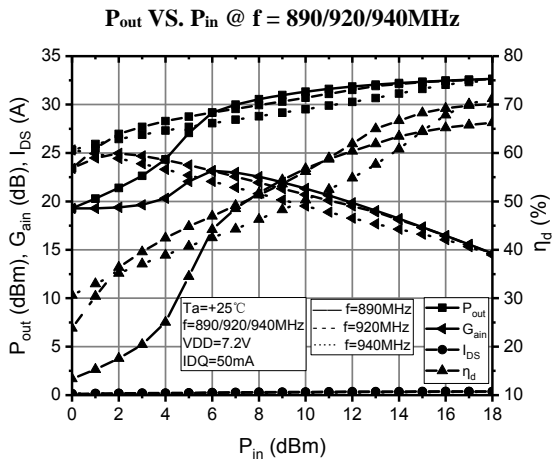
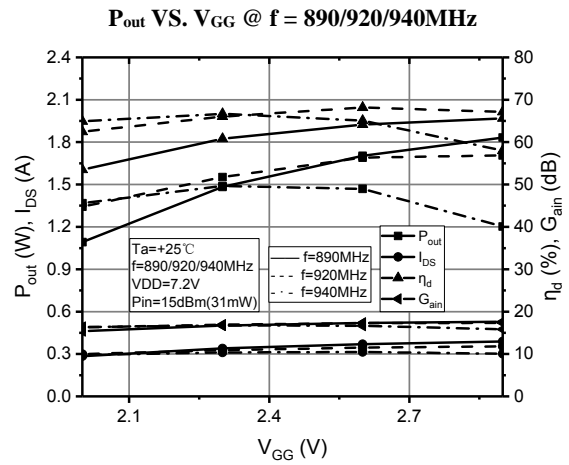
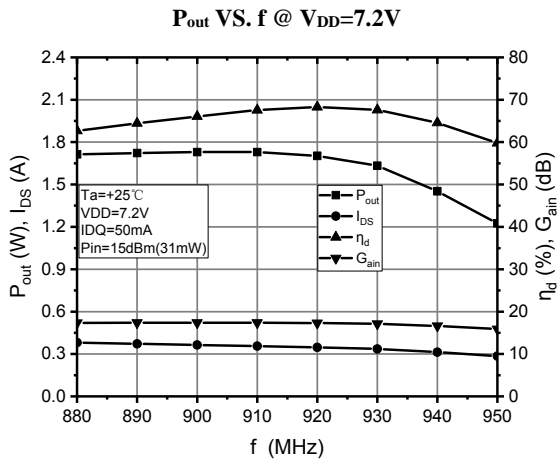
f(MHz)	Zsource (ohm)
135	38.34 + j 17.95
155	40.96 + j 21.88
175	42.73 + j 22.86



**@ $P_{in}=31mW, V_{DS}=7.2V, I_{DQ}=50mA$**

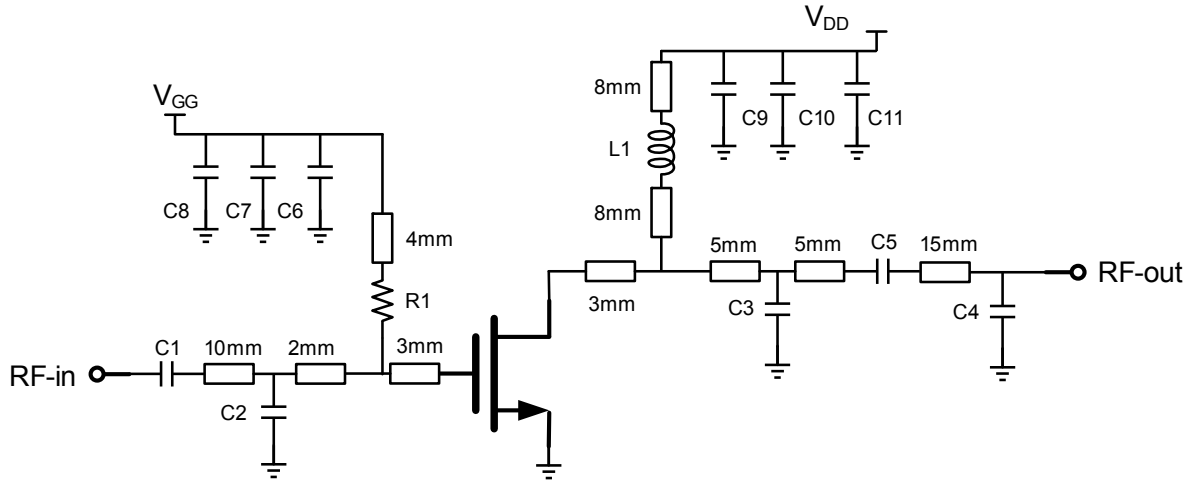
f(MHz)	Zload (ohm)
135	27.70 + j 5.53
155	24.01 + j 1.02
175	18.70 + j 2.03

### 16. 880-950MHz@V<sub>DD</sub>=7.2V,TYPICAL CHARACTERISTICS



## 17. TEST CIRCUIT

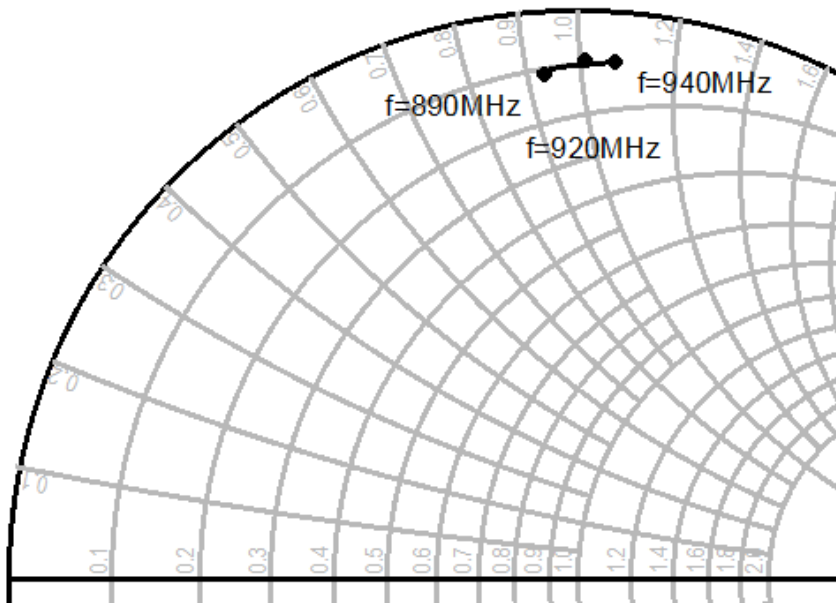
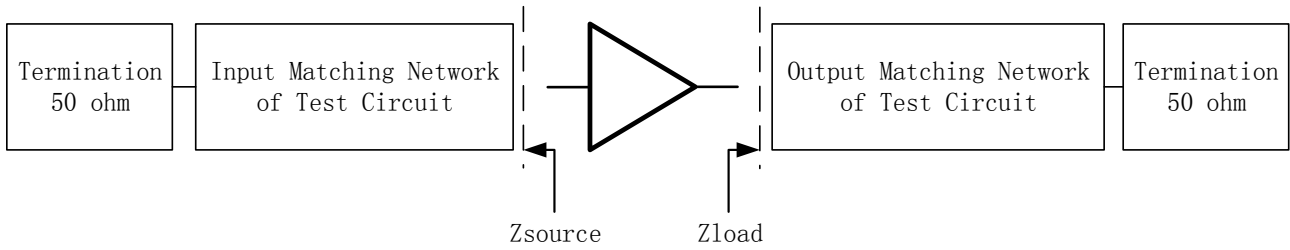
880-950MHz (@VDD=7.2V, Idq = 50mA)



Note: The characteristic impedance of all microstrip lines: 50ohm

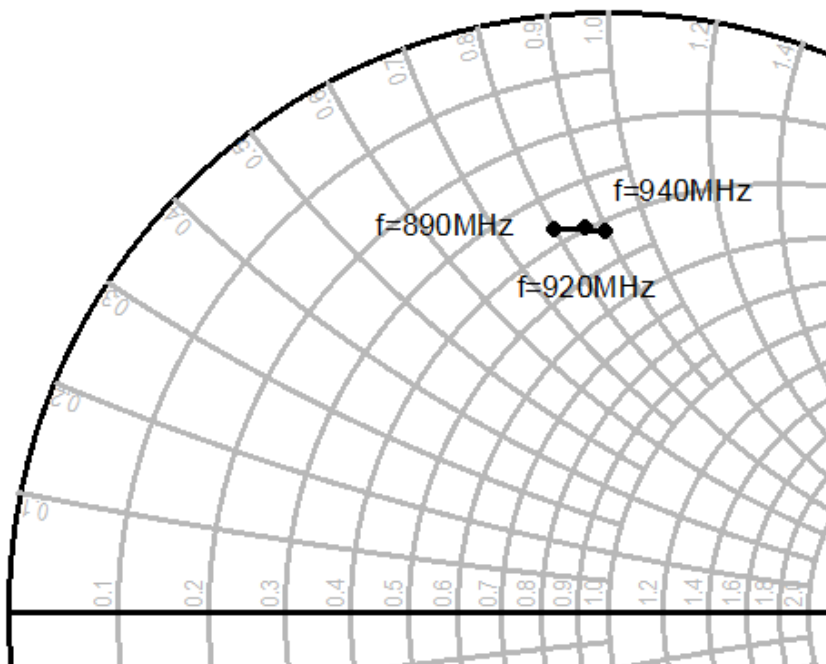
No.	Description	P/N	Manufacturer
C1	47pF Chip Ceramic Capacitors	GRM1885C1H470JA01	muRata
C2	15pF Chip Ceramic Capacitors	GRM1885C1H150JA01	muRata
C3	6pF Chip Ceramic Capacitors	GRM1885C1H060JA01	muRata
C4	2pF Chip Ceramic Capacitors	GRM1885C1H020JA01	muRata
C5	47pF Chip Ceramic Capacitors	GRM1885C1H470JA01	muRata
C6	100pF Chip Ceramic Capacitors	GRM1885C1H101JA01	muRata
C7	1nF Chip Ceramic Capacitors	GRM1885C1H102JA01	muRata
C8	4.7uF Chip Ceramic Capacitors	GRM32ER61H474KA12L	muRata
C9	100pF Chip Ceramic Capacitors	GRM1885C1H101JA01	muRata
C10	1nF Chip Ceramic Capacitors	GRM1885C1H102JA01	muRata
C11	10uF Chip Ceramic Capacitors	GRM32ER61H105KA12L	muRata
L1	D: 0.35mm, Inside: 1.5mm, 2 Turns	Enameled wire	arbitrary
R1	51Ω Chip Resistors		arbitrary
Q1	RF LDMOS	HTU7G06S0P5P	Kunshan Huatai Electronics Ltd.
PCB	Er=4.5	FR4	

### 18. INPUT/OUTPUT IMPEDANCE VS. FREQ. CHARACTERISTICS



**@ $P_{in}=31mW, V_{DS}=7.2V, I_{DQ}=50mA$**

f(MHz)	Zsource (ohm)
890	5.09 + j 47.15
920	5.02 + j 50.19
940	5.00 + j 52.41



**@ $P_{in}=31mW, V_{DS}=7.2V, I_{DQ}=50mA$**

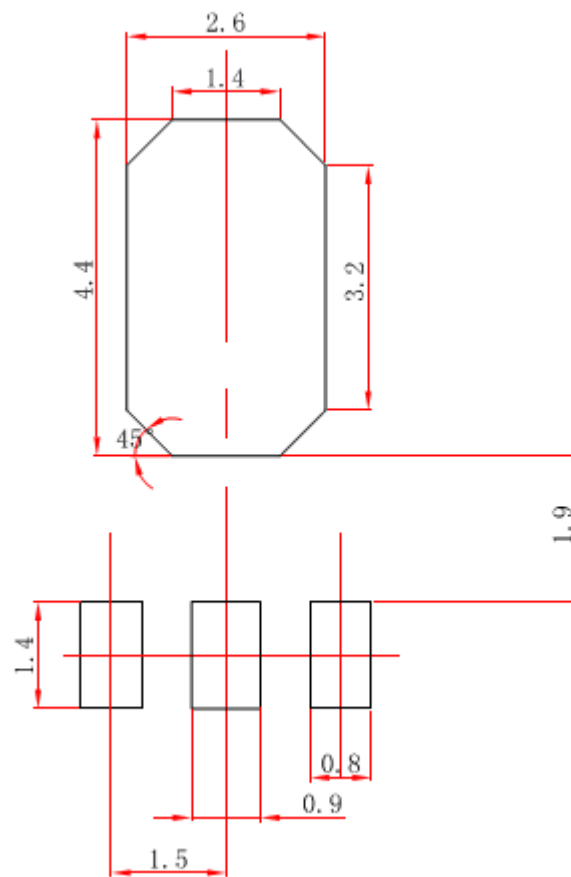
f(MHz)	Zload (ohm)
890	18.87 + j 41.11
920	20.17 + j 43.18
940	20.86 + j 44.49



**19. HTU7G06S0P5P S-PARAMETER DATA ( $V_{DD} = 4V$ ,  $I_{dq} = 50mA$ )**

Freq (MHz)	S11		S21		S12		S22	
	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)
300	0.954	-165.3	9.687	-74.5	0.088	-164.6	0.515	-96.1
350	0.890	-176.8	8.132	-113.8	0.086	157.0	0.531	-167.5
400	0.846	173.7	6.981	-151.1	0.083	120.5	0.539	126.5
430	0.829	168.6	6.440	-172.8	0.082	99.2	0.545	88.2
470	0.810	162.5	5.840	158.7	0.082	71.2	0.552	38.1
500	0.803	158.1	5.465	137.4	0.081	50.2	0.557	0.3
550	0.793	151.0	4.922	102.3	0.080	15.8	0.561	-61.5
600	0.783	144.0	4.473	67.4	0.079	-18.9	0.564	-122.8
650	0.773	137.5	4.069	32.9	0.077	-52.6	0.569	177.1
700	0.764	131.4	3.726	-1.1	0.076	-86.3	0.574	117.4
750	0.759	125.7	3.448	-34.7	0.075	-119.1	0.580	59.1
800	0.757	120.1	3.217	-68.3	0.074	-152.0	0.584	1.0
850	0.758	114.5	3.017	-102.0	0.074	174.3	0.584	-57.4
900	0.754	109.0	2.830	-135.6	0.072	141.3	0.577	-116.9
950	0.753	103.6	2.657	-169.2	0.071	108.2	0.575	-176.5
1000	0.749	98.2	2.493	157.4	0.070	75.6	0.575	124.3
1050	0.743	93.2	2.342	124.4	0.068	43.2	0.579	66.8
1100	0.740	88.5	2.217	91.8	0.068	11.0	0.581	10.2
1150	0.743	84.0	2.123	59.3	0.068	-21.2	0.581	-47.1
1200	0.747	79.2	2.040	26.3	0.067	-54.0	0.578	-105.2
1250	0.751	74.2	1.963	-6.7	0.066	-86.7	0.577	-163.5
1300	0.753	69.2	1.889	-39.8	0.066	-119.2	0.579	137.7
1350	0.754	64.2	1.816	-72.8	0.065	-151.8	0.580	79.7
1400	0.754	59.3	1.745	-105.7	0.064	175.5	0.580	21.6
1450	0.756	54.6	1.697	-138.1	0.064	144.2	0.578	-34.9
1500	0.756	49.6	1.655	-171.2	0.064	111.4	0.571	-92.9

## 20. RECOMMENDED PCB PAD LAYOUT



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