

APPLICATION NOTE

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(Taking charge of Silicon RF by
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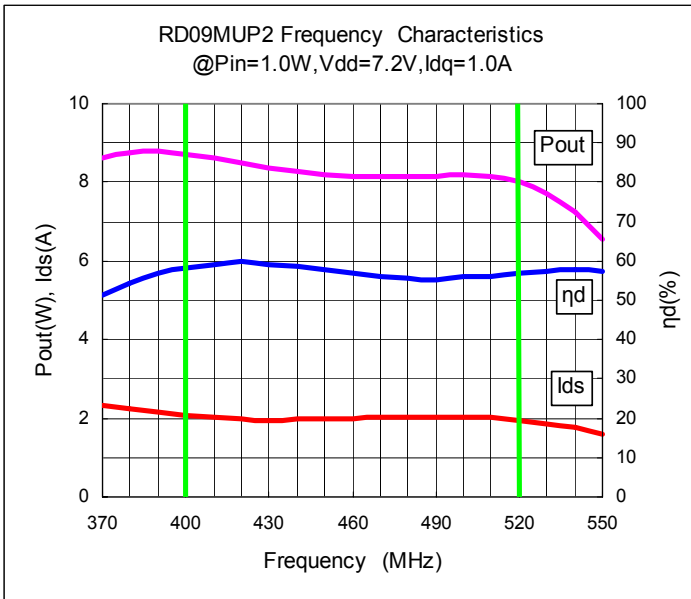
SUBJECT: "RD09MUP2" 400-520MHz RF characteristics data

SUMMARY:

This application note shows the RF characteristics (Frequency Characteristics, Pin vs. Pout characteristics and Vdd vs. Pout characteristics) data with RD09MUP2 using Broad-Band Test Fixture.

- Sample history:
 - RD09MUP2: Lot number "059XA-G"
- Evaluate conditions:
 - @f=400/520MHz : Vdd=7.2V, Idq=1.0A (Vgg adj.)
 - @f=400 to 520MHz : Pin=1.0W, Vdd=7.2V, Idq=1.0A (Vgg adj.)
- Results:
 - Page 2 shows the Frequency Characteristics data.
 - Page 3 shows the Pin vs. Pout characteristics data. @f=400MHz
 - Page 4 shows the Pin vs. Pout characteristics data. @f=520MHz
 - Page 5 shows the Vdd vs. Pout characteristics data. @f=400MHz
 - Page 6 shows the Vdd vs. Pout characteristics data. @f=520MHz
 - Page 7 to 8 shows the Broad-band Equivalent Circuit.

RD09MUP2 Frequency Characteristics (@ f=400 - 520MHz)



Lot No. 059XA-G

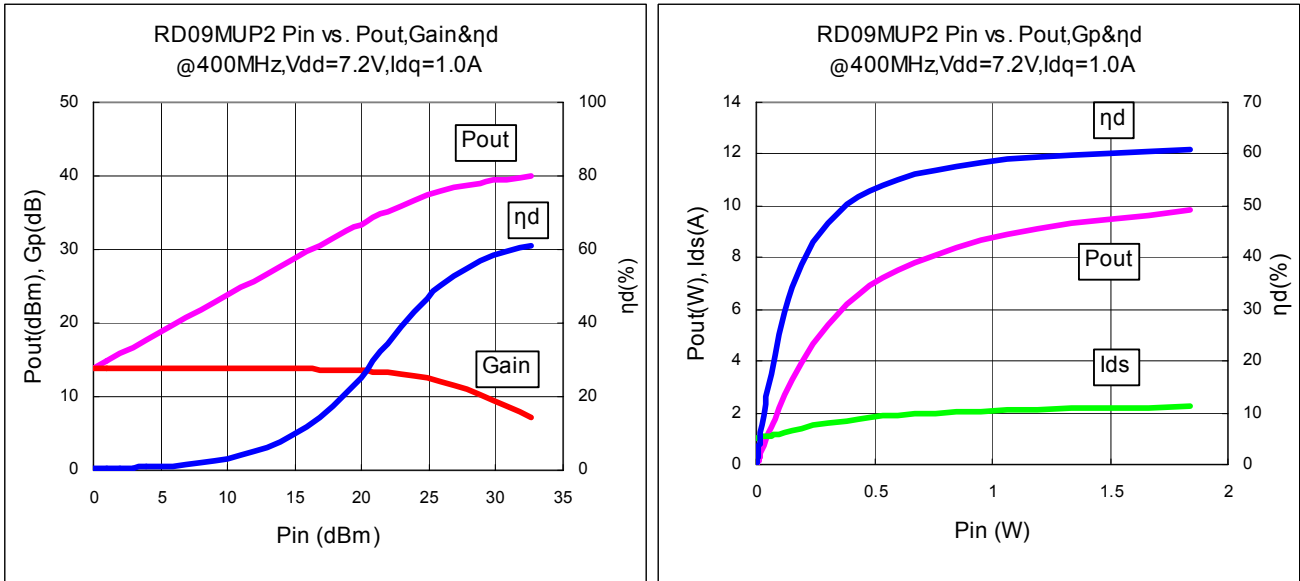
Vdd= 7.2 V
Idq= 1.0 A
Vgg= 2.55 V
Pin= 1.0 W

Measurement day: 2006/2/6

Freq. (MHz)	Pout		Gp (dB)	ID(RF) (A)	ηd (%)	R.L. (dB)	Harmonics 2fo(dBc)	Harmonics 3fo(dBc)
	(dBm)	(W)						
370	39.4	8.63	9.4	2.34	51.30	-1.70	-42.49	-56.36
380	39.4	8.76	9.5	2.24	54.39	-1.85	-42.95	-57.12
390	39.4	8.81	9.5	2.15	56.88	-2.06	-40.28	-57.21
400	39.4	8.71	9.4	2.08	58.28	-2.34	-36.07	-56.23
410	39.3	8.61	9.4	2.02	59.24	-2.76	-35.05	-57.28
420	39.3	8.51	9.3	1.98	59.72	-3.32	-40.98	-57.96
430	39.2	8.35	9.2	1.96	59.20	-4.11	-46.77	-55.69
440	39.2	8.26	9.1	1.96	58.47	-5.19	-51.83	-55.29
450	39.1	8.18	9.2	1.97	57.55	-6.80	-54.45	-56.11
460	39.1	8.16	9.1	2.00	56.75	-9.14	-54.93	-55.58
470	39.1	8.16	9.1	2.02	56.08	-12.49	-54.01	-56.99
480	39.1	8.14	9.1	2.04	55.54	-15.94	-51.03	-56.17
490	39.1	8.14	9.1	2.04	55.34	-14.74	-45.95	-56.06
500	39.1	8.20	9.1	2.04	55.82	-11.47	-45.62	-55.94
510	39.1	8.13	9.1	2.01	56.15	-9.02	-50.29	-55.55
520	39.0	8.01	9.0	1.96	56.74	-7.29	-53.27	-55.95
530	38.9	7.73	8.9	1.87	57.33	-6.05	-54.93	<-60
540	38.6	7.25	8.6	1.75	57.65	-5.08	-56.21	<-60
550	38.2	6.54	8.1	1.59	57.24	-4.27	<-60	<-60

note: part of hatching show out of target

RD09MUP2 Pin vs. Pout Characteristics (@ f=400MHz)

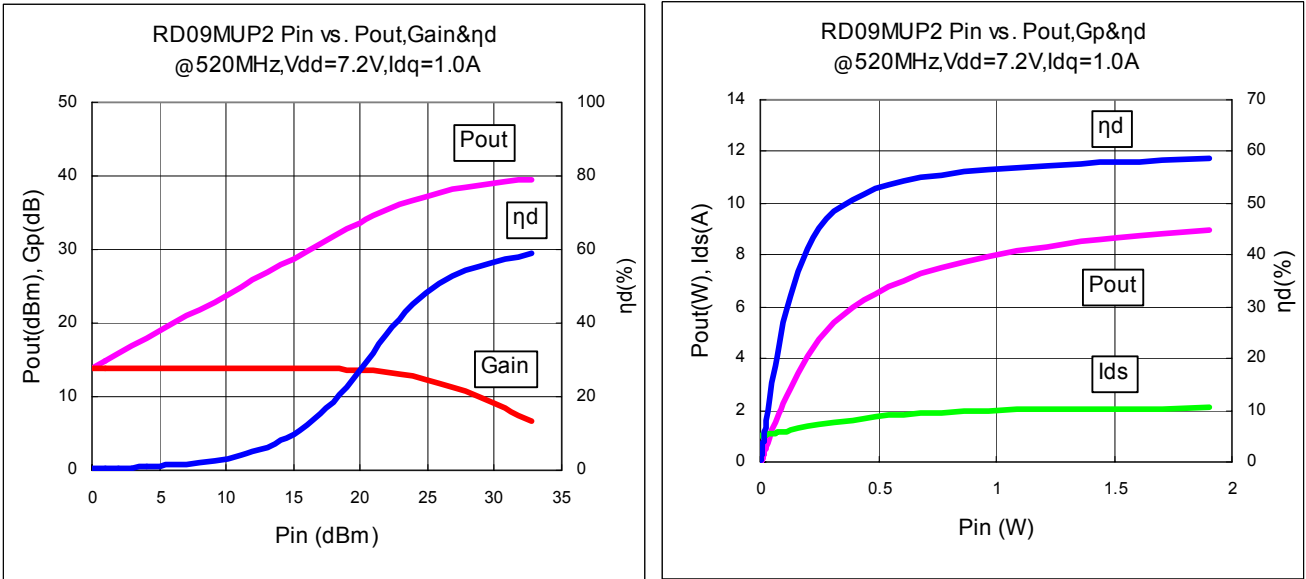


Lot No. 059XA-G
 f= 400 MHz
 Vdd= 7.2 V
 Idq= 1.0 A
 Vgg= 2.55 V

Measurement day: 2006/2/6

Pin (dBm)	Pin (W)	Pout (dBm)	Pout (W)	Gp (dB)	ID(RF) (A)	ηd (%)	R.L. (dB)	Harmonics 2fo(dBc)	Harmonics 3fo(dBc)
0.0	0.00	13.8	0.02	13.9	1.03	0.3	-3.25	<-60	<-60
0.9	0.00	14.8	0.03	13.9	1.03	0.4	-3.37	<-60	<-60
1.9	0.00	15.8	0.04	13.9	1.03	0.5	-3.37	<-60	<-60
2.9	0.00	16.8	0.05	13.8	1.03	0.6	-3.35	<-60	<-60
4.0	0.00	17.8	0.06	13.8	1.03	0.8	-3.36	<-60	<-60
4.9	0.00	18.8	0.08	13.8	1.03	1.0	-3.36	<-60	<-60
5.9	0.00	19.8	0.09	13.8	1.03	1.3	-3.32	<-60	<-60
7.0	0.00	20.8	0.12	13.8	1.04	1.6	-3.31	<-60	<-60
7.9	0.01	21.8	0.15	13.8	1.04	2.0	-3.30	<-60	<-60
9.0	0.01	22.8	0.19	13.8	1.04	2.5	-3.30	<-60	<-60
10.0	0.01	23.8	0.24	13.8	1.04	3.2	-3.29	-43.70	<-60
11.0	0.01	24.8	0.30	13.8	1.05	4.0	-3.29	-43.63	<-60
11.9	0.02	25.7	0.38	13.8	1.05	5.0	-3.28	-42.91	<-60
12.9	0.02	26.7	0.47	13.8	1.06	6.2	-3.27	-42.70	<-60
13.9	0.02	27.7	0.59	13.8	1.06	7.7	-3.27	-41.94	<-60
14.9	0.03	28.7	0.74	13.7	1.07	9.6	-3.27	-41.55	<-60
15.9	0.04	29.7	0.92	13.7	1.09	11.8	-3.23	-39.99	<-60
16.9	0.05	30.6	1.15	13.7	1.11	14.5	-3.22	-39.34	<-60
17.9	0.06	31.6	1.43	13.7	1.13	17.7	-3.20	-37.95	<-60
18.9	0.08	32.5	1.77	13.6	1.16	21.2	-3.20	-36.99	<-60
19.9	0.10	33.4	2.18	13.5	1.20	25.3	-3.17	-35.97	<-60
20.9	0.12	34.3	2.67	13.4	1.25	29.7	-3.12	-34.65	<-60
21.9	0.15	35.1	3.26	13.3	1.32	34.3	-3.08	-33.57	<-60
22.9	0.19	35.9	3.92	13.1	1.41	38.7	-3.04	-33.23	<-60
23.8	0.24	36.7	4.65	12.8	1.50	43.0	-3.01	-33.47	<-60
24.8	0.30	37.3	5.42	12.5	1.61	46.8	-2.97	-34.85	<-60
25.8	0.38	37.9	6.18	12.1	1.71	50.1	-2.87	-37.01	<-60
26.8	0.48	38.4	6.90	11.6	1.81	52.9	-2.77	-39.4	-57.1
27.8	0.60	38.8	7.53	11.0	1.90	55.0	-2.64	-40.2	-56.9
28.8	0.76	39.1	8.11	10.3	1.99	56.7	-2.53	-38.7	-56.2
29.8	0.95	39.4	8.64	9.6	2.06	58.2	-2.39	-36.6	-56.0
30.8	1.19	39.6	9.10	8.8	2.13	59.3	-2.26	-34.7	-56.0
31.7	1.49	39.8	9.51	8.0	2.19	60.3	-2.15	-33.5	-55.9
32.7	1.84	39.9	9.85	7.3	2.24	61.0	-2.07	-32.5	-55.4

RD09MUP2 Pin vs. Pout Characteristics (@ f=520MHz)

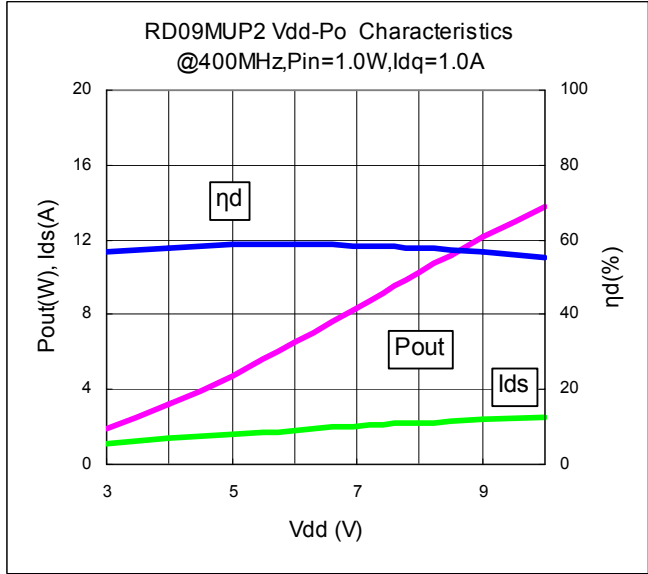
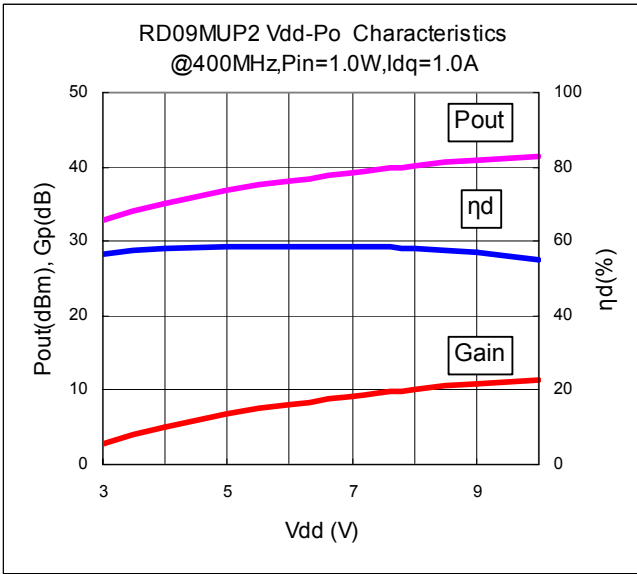


Lot No. 059XA-G
 f= 520 MHz
 Vdd= 7.2 V
 Idq= 1.0 A
 Vgg= 2.55 V

Measurement day: 2006/2/6

Pin (dBm)	Pin (W)	Pout (dBm)	Pout (W)	Gp (dB)	ID(RF) (A)	ηd (%)	R.L. (dB)	Harmonics 2fo(dBc)	Harmonics 3fo(dBc)
0.0	0.00	13.9	0.02	13.9	1.03	0.3	-10.83	<-60	<-60
1.0	0.00	14.9	0.03	13.9	1.03	0.4	-10.94	<-60	<-60
2.0	0.00	15.9	0.04	13.9	1.03	0.5	-11.02	<-60	<-60
3.0	0.00	16.9	0.05	13.9	1.03	0.7	-10.94	<-60	<-60
4.1	0.00	17.9	0.06	13.8	1.03	0.8	-10.91	<-60	<-60
5.0	0.00	18.9	0.08	13.9	1.04	1.0	-10.84	<-60	<-60
6.0	0.00	19.9	0.10	13.8	1.04	1.3	-10.81	<-60	<-60
7.0	0.01	20.9	0.12	13.9	1.04	1.6	-9.85	<-60	<-60
8.0	0.01	21.9	0.15	13.9	1.04	2.1	-9.82	<-60	<-60
9.1	0.01	22.9	0.20	13.9	1.04	2.6	-9.84	<-60	<-60
10.1	0.01	23.9	0.25	13.9	1.04	3.3	-9.83	<-60	<-60
11.1	0.01	24.9	0.31	13.8	1.05	4.1	-9.81	<-60	<-60
12.0	0.02	25.9	0.39	13.9	1.05	5.1	-9.75	<-60	<-60
13.0	0.02	26.9	0.49	13.8	1.06	6.4	-9.80	<-60	<-60
14.1	0.03	27.9	0.61	13.8	1.06	8.0	-9.78	<-60	<-60
15.1	0.03	28.8	0.76	13.8	1.07	9.9	-9.83	<-60	<-60
16.0	0.04	29.8	0.96	13.8	1.08	12.4	-9.75	<-60	<-60
17.0	0.05	30.8	1.20	13.8	1.10	15.2	-9.75	<-60	<-60
18.0	0.06	31.8	1.50	13.8	1.12	18.6	-9.75	<-60	<-60
19.0	0.08	32.7	1.86	13.7	1.15	22.6	-9.72	<-60	<-60
20.0	0.10	33.6	2.30	13.6	1.18	27.0	-9.72	<-60	<-60
21.0	0.12	34.5	2.83	13.6	1.23	31.9	-9.66	<-60	<-60
21.9	0.16	35.3	3.42	13.4	1.29	36.7	-9.55	<-60	<-60
22.9	0.20	36.1	4.07	13.2	1.37	41.3	-9.36	<-60	<-60
23.9	0.25	36.7	4.72	12.8	1.45	45.2	-9.14	<-60	<-60
24.9	0.31	37.3	5.37	12.4	1.54	48.3	-8.90	<-60	<-60
25.9	0.39	37.8	5.96	11.8	1.63	50.8	-8.64	<-60	<-60
26.9	0.49	38.1	6.52	11.3	1.72	52.8	-8.35	-56.3	-55.6
27.8	0.61	38.5	7.03	10.6	1.80	54.3	-8.05	-54.6	-55.9
28.8	0.77	38.7	7.49	9.9	1.88	55.5	-7.76	-54.5	-56.1
29.8	0.97	39.0	7.94	9.1	1.95	56.6	-7.36	-53.5	-55.1
30.8	1.22	39.2	8.31	8.4	2.01	57.4	-7.00	-53.3	-55.3
31.8	1.52	39.4	8.66	7.6	2.07	58.1	-6.64	-52.7	-55.6
32.8	1.90	39.5	8.96	6.7	2.12	58.7	-6.33	-52.5	-55.5

RD09MUP2 Vdd vs. Pout Characteristics (@ f=400MHz)



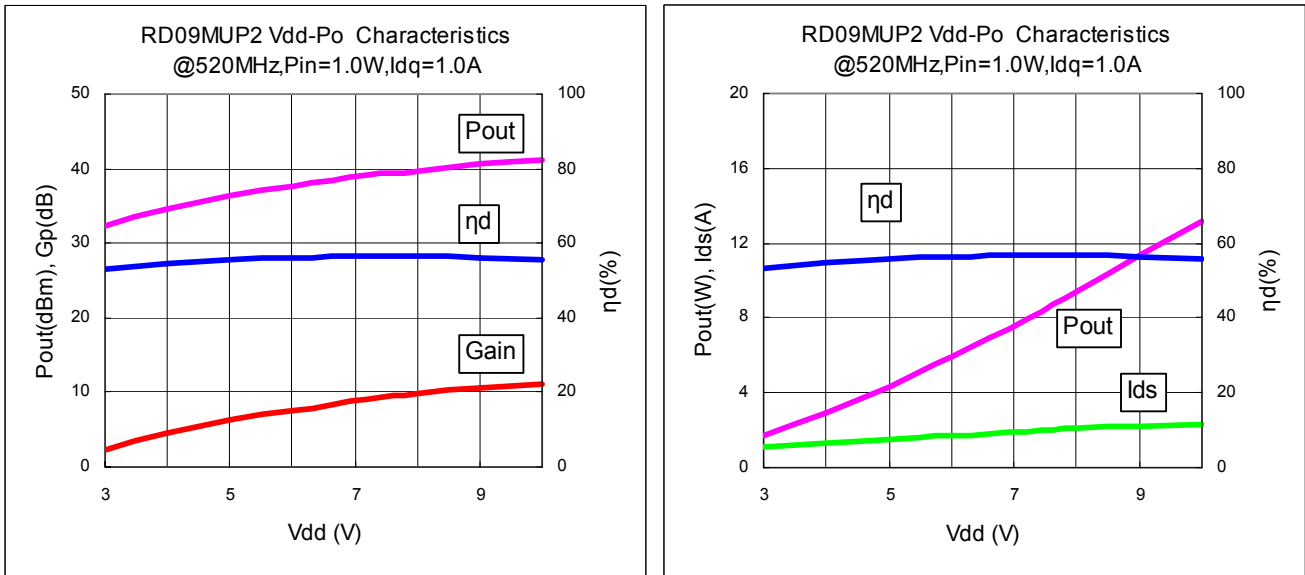
Lot No. 059XA-G

f= 400 MHz
Idq= 1.0 A
Vgg= 2.55 V
Pin= 1.0 W

Measurement day: 2006/2/6

Vdd (V)	Pout		Gp (dB)	ID(RF) (A)	ηd (%)	R.L. (dB)	Harmonics 2fo(dBc)	Harmonics 3fo(dBc)
	(dBm)	(W)						
3.0	32.7	1.88	2.7	1.11	56.6	-1.63	-26.9	<-60
4.0	35.0	3.20	5.0	1.38	57.9	-1.83	-28.7	<-60
5.0	36.8	4.76	6.7	1.62	58.6	-2.01	-31.3	<-60
6.0	38.1	6.50	8.1	1.84	58.8	-2.20	-34.0	-59.47
7.2	39.4	8.75	9.4	2.08	58.5	-2.37	-37.3	-58.1
8.0	40.1	10.28	10.1	2.22	58.0	-2.47	-39.0	-57.0
9.0	40.8	12.14	10.8	2.37	56.9	-2.58	-36.1	-54.3
10.0	41.4	13.75	11.4	2.49	55.3	-2.67	-36.8	-54.4

RD09MUP2 Vdd vs. Pout Characteristics (@ f=520MHz)



Lot No. 059XA-G

f= 520 MHz

Idq= 1.0 A

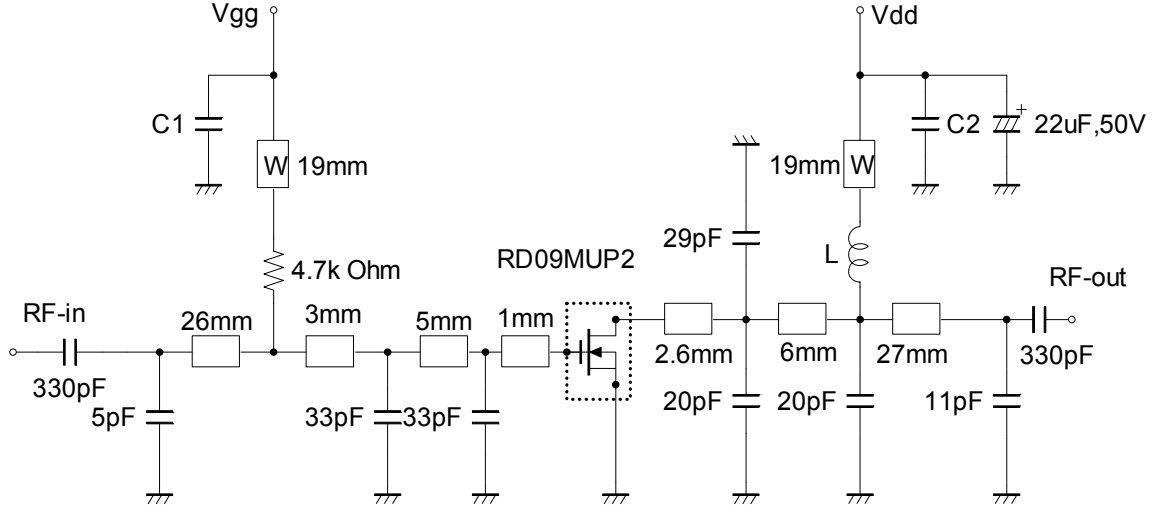
Vgg= 2.55 V

Pin= 1.0 W

Measurement day: 2006/2/6

Vdd (V)	Pout		Gp (dB)	ID(RF) (A)	ηd (%)	R.L. (dB)	Harmonics 2fo(dBc)	Harmonics 3fo(dBc)
	(dBm)	(W)						
3.0	32.4	1.72	2.3	1.08	53.1	-5.05	-50.1	<-60
4.0	34.6	2.88	4.6	1.32	54.5	-5.60	-50.5	<-60
5.0	36.3	4.28	6.3	1.54	55.5	-6.15	-52.2	<-60
6.0	37.7	5.88	7.7	1.74	56.2	-6.68	-54.1	-58.9
7.2	39.0	7.98	9.0	1.96	56.6	-7.32	-55.6	-58.0
8.0	39.8	9.46	9.7	2.09	56.6	-7.71	-56.2	-57.0
9.0	40.5	11.31	10.5	2.23	56.3	-8.17	-56.7	-55.9
10.0	41.2	13.14	11.2	2.36	55.7	-8.61	-57.9	-54.8

RD09MUP2 Equivalent Circuit (f=400 - 520MHz)



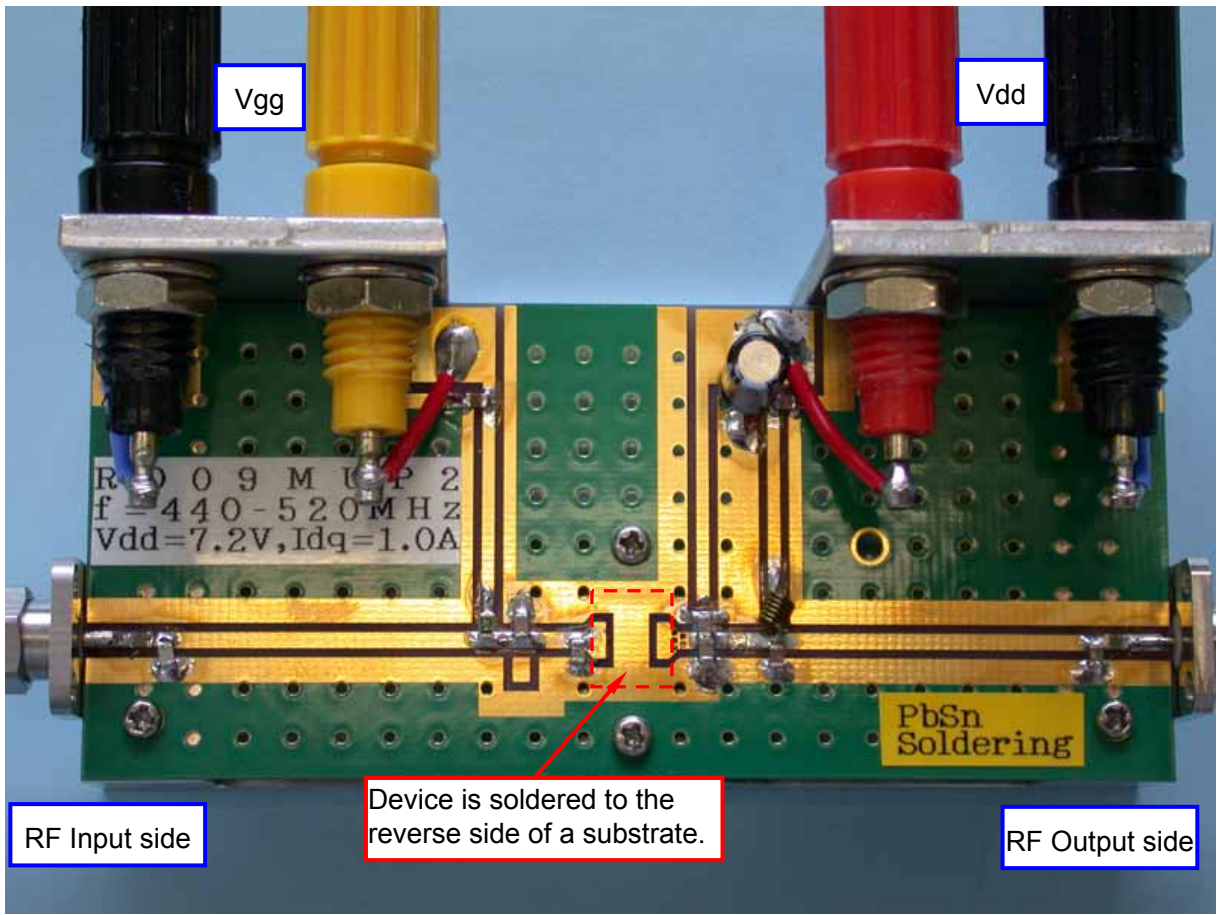
Note:Board material= glass-Epoxy Substrate

Micro strip line width=1.3mm/50OHM,er=4.8,t=0.8mm

W:Line width=1.0mm

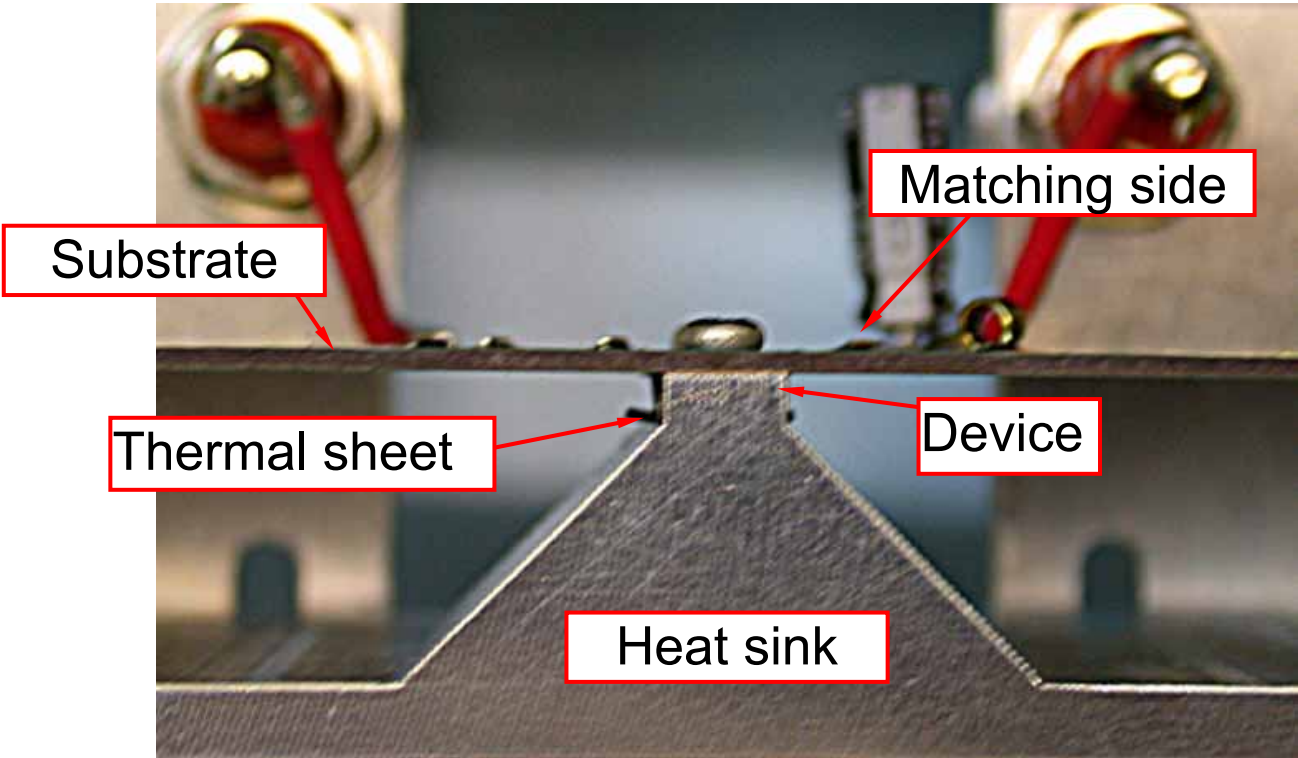
L:43.7nH,6Turns,D:0.43mm,2.46mm(outside diameter)

C1,C2:2200pF

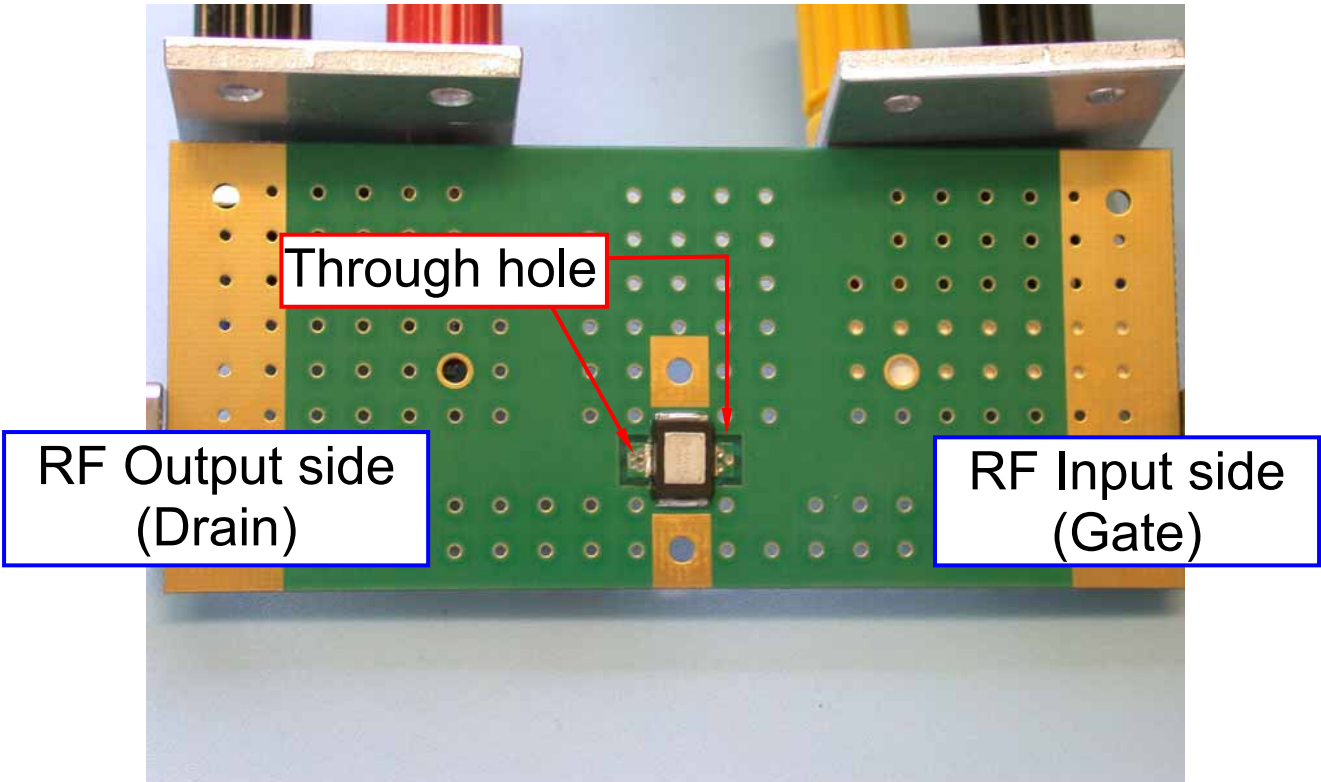


***RF matching is mediated by a through hole.**

Front side View



Device contact View



Reverse side View