APPLICATION NOTE

MITSUBISHI ELECTRIC
Silicon RF Power Semiconductors

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Date : 18th Aug. 2010
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(Taking charge of Silicon RF by
MIYOSHI Electronics)

SUBJECT:

RD00HVS1 & RD02MUS1B 2-stage amplifier RF performance at f=400-470MHz, Vdd=7.2/6.5V

SUMMARY:

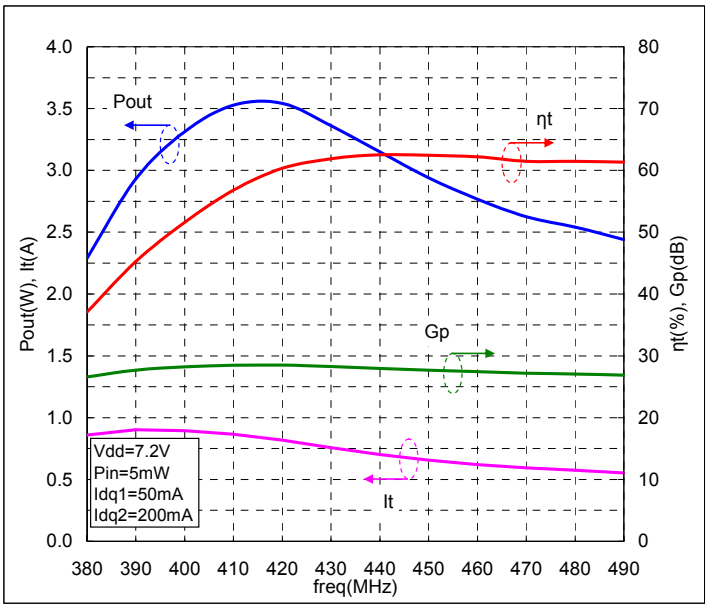
This application note shows the RF wide-band characteristics data (Frequency characteristics, Pout vs. Pin characteristics, Pout vs. Vdd characteristics) at f=400 to 470MHz.

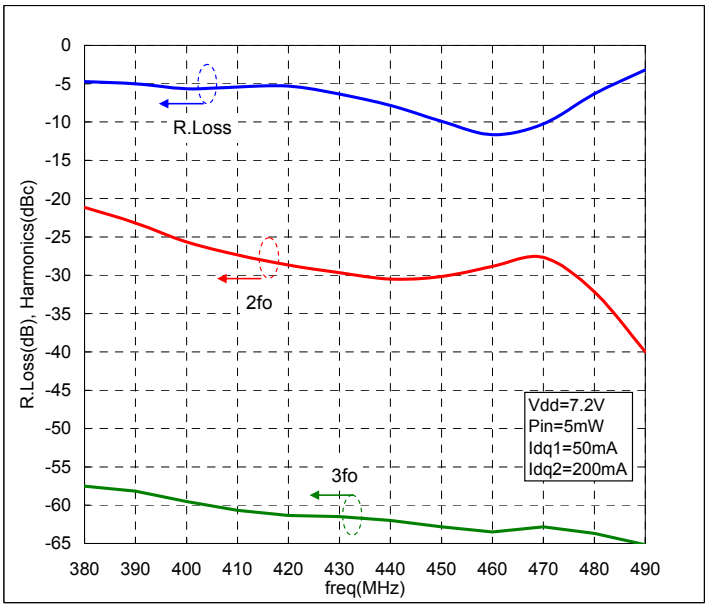
- Sample history:
  RD00HVS1: Lot number “551”
  RD02MUS1B: Lot number “103AJ-G”

- Evaluate conditions:
  @f=400MHz to 470MHz, Vdd=7.2V/6.5V, Idq1=50mA (Vgg1 adj.), Idq2=200mA(Vgg2 adj.)
  Typical Vgg: Vgg1=Vgg2=3.5V
- Results:
  Page 2 shows the typical frequency characteristics data @ Vdd=7.2V.
  Page 3 shows the typical frequency characteristics data @ Vdd=6.5V.
  Page 4-6 shows the typical Pout vs. Pin characteristics data @ Vdd=7.2V.
  Page 7-9 shows the typical Pout vs. Pin characteristics data @ Vdd=6.5V.
  Page 10-12 shows the typical Pout vs. Vdd characteristics data.
  Page 13-14 shows the equivalent circuit.

Frequency characteristics

@Vdd=7.2V, Pin=5mW, Idq1=50mA(Vgg1 adj.), Idq=200mA(Vgg2 adj.)

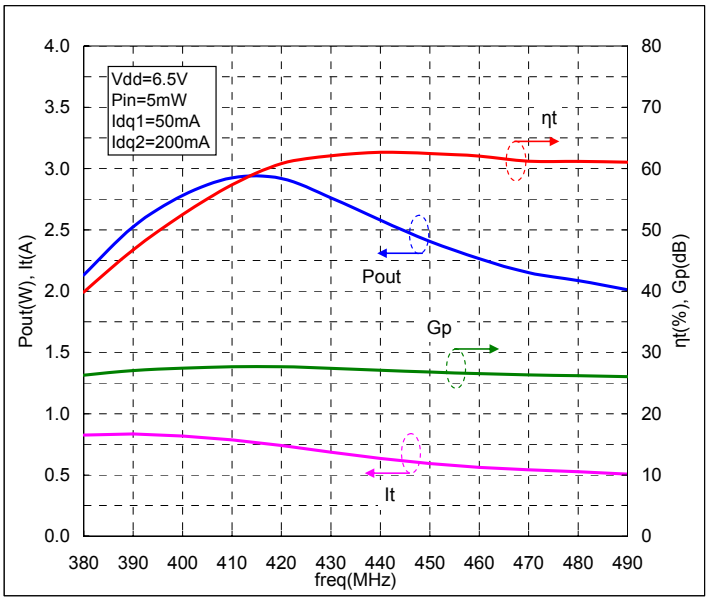


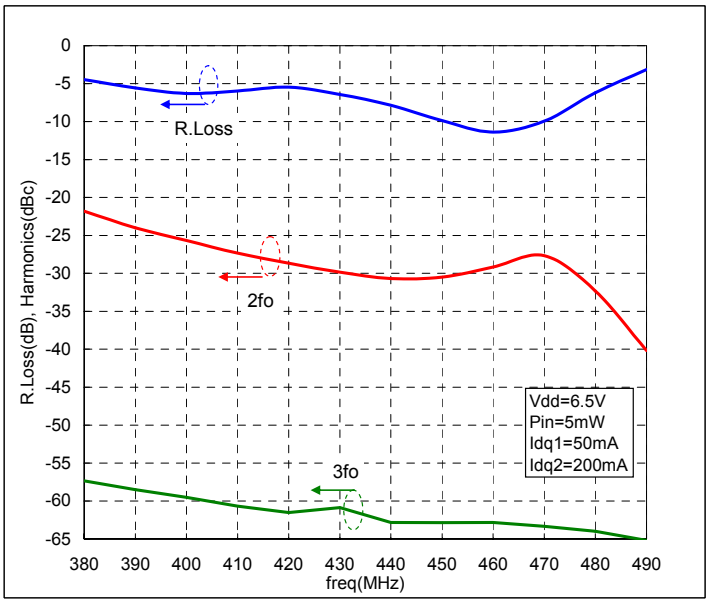


freq	Pout		Gp	It	ηt	R.Loss	2fo	3fo
(MHz)	(dBm)	(W)	(dB)	(A)	(%)	(dB)	(dBc)	(dBc)
380	33.6	2.29	26.6	0.86	37.1	-4.7	-21.2	-57.5
390	34.7	2.93	27.7	0.90	45.2	-5.0	-23.2	-58.2
400	35.2	3.31	28.2	0.89	51.6	-5.7	-25.7	-59.5
410	35.5	3.53	28.5	0.87	56.8	-5.4	-27.3	-60.7
420	35.5	3.54	28.5	0.82	60.3	-5.3	-28.7	-61.3
430	35.3	3.36	28.3	0.76	61.9	-6.4	-29.7	-61.5
440	35.0	3.15	28.0	0.70	62.5	-7.8	-30.5	-62.0
450	34.7	2.94	27.7	0.66	62.4	-9.9	-30.2	-62.8
460	34.4	2.77	27.4	0.62	62.2	-11.7	-28.8	-63.5
470	34.2	2.63	27.2	0.59	61.5	-10.2	-27.7	-62.8
480	34.1	2.54	27.1	0.58	61.5	-6.3	-32.2	-63.7
490	33.9	2.44	26.9	0.55	61.4	-3.2	-40.0	-65.2

Frequency characteristics

@Vdd=6.5V, Pin=5mW, Idq1=50mA(Vgg1 adj.), Idq=200mA(Vgg2 adj.)

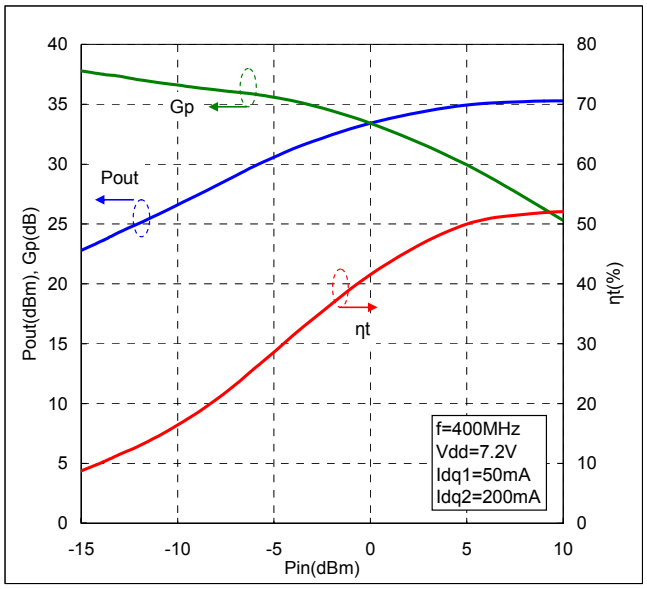


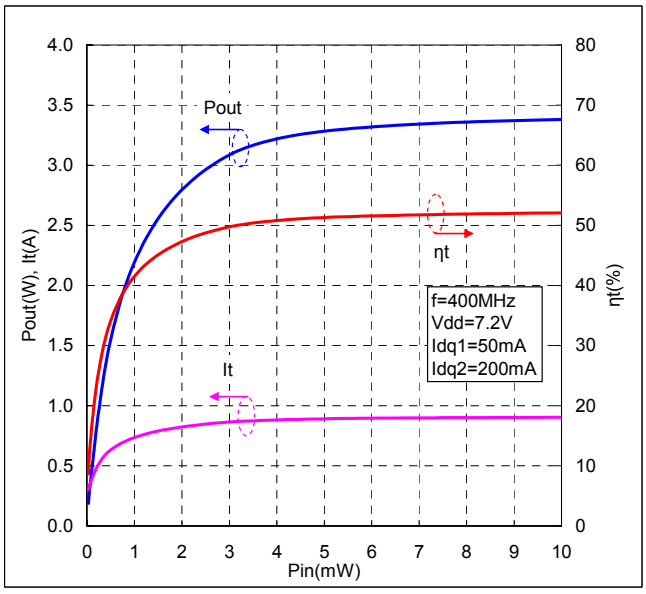


freq	Pout		Gp	It	ηt	R.Loss	2fo	3fo
(MHz)	(dBm)	(W)	(dB)	(A)	(%)	(dB)	(dBc)	(dBc)
380	33.3	2.13	26.3	0.83	39.9	-4.5	-21.8	-57.3
390	34.0	2.52	27.0	0.83	46.7	-5.6	-24.0	-58.5
400	34.4	2.78	27.4	0.82	52.5	-6.3	-25.7	-59.5
410	34.7	2.92	27.7	0.79	57.4	-6.0	-27.3	-60.7
420	34.7	2.92	27.7	0.74	60.8	-5.5	-28.7	-61.5
430	34.4	2.76	27.4	0.69	62.1	-6.4	-29.8	-60.8
440	34.1	2.58	27.1	0.64	62.7	-7.9	-30.7	-62.8
450	33.8	2.41	26.8	0.59	62.5	-9.9	-30.5	-62.8
460	33.5	2.26	26.5	0.56	62.0	-11.4	-29.2	-62.8
470	33.3	2.15	26.3	0.54	61.2	-10.0	-27.7	-63.3
480	33.2	2.09	26.2	0.53	61.2	-6.2	-32.3	-64.0
490	33.0	2.01	26.0	0.51	61.1	-3.1	-40.2	-65.2

Pout vs. Pin characteristics

@ f=400MHz, Vdd=7.2V, Idq1=50mA(Vgg1 adj.), Idq2=200mA(Vgg2 adj.)



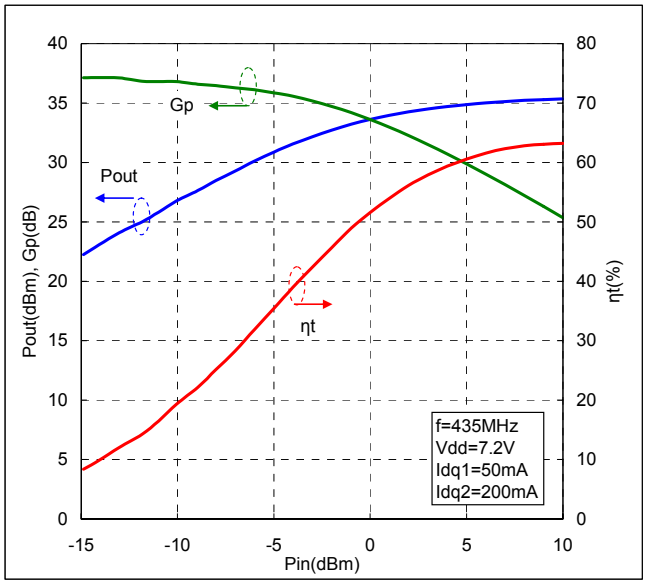


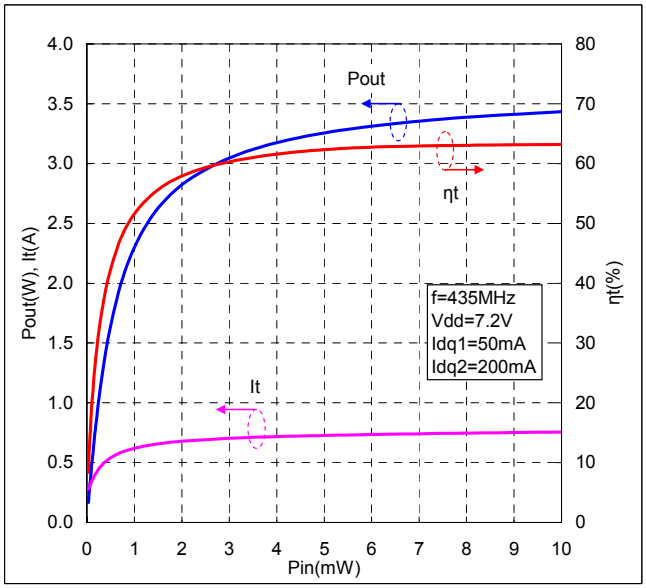
Pin		Pout		Gp	It	ηt	R.Loss	2fo	3fo
(dBm)	(mW)	(dBm)	(W)	(dB)	(A)	(%)	(dB)	(dBc)	(dBc)
-15.1	0.03	22.7	0.19	37.8	0.30	8.6	-4.4	-30.0	-
-13.8	0.04	23.6	0.23	37.5	0.31	10.2	-4.1	-28.7	-
-13.0	0.05	24.3	0.27	37.4	0.33	11.5	-3.4	-27.8	-
-12.1	0.06	25.0	0.32	37.1	0.34	12.8	-2.9	-27.0	-
-11.0	0.08	25.8	0.38	36.8	0.36	14.6	-3.0	-26.7	-
-10.0	0.10	26.6	0.46	36.6	0.39	16.5	-2.7	-25.8	-
-9.0	0.12	27.4	0.54	36.4	0.41	18.3	-2.7	-25.2	-
-8.0	0.16	28.2	0.66	36.2	0.44	20.6	-2.5	-24.8	-
-7.0	0.20	29.0	0.80	36.0	0.48	23.2	-2.8	-24.8	-
-6.0	0.25	29.8	0.96	35.8	0.52	25.9	-2.5	-24.8	-
-5.0	0.32	30.6	1.14	35.6	0.56	28.6	-2.9	-24.7	-61.7
-4.0	0.40	31.3	1.34	35.3	0.60	31.4	-2.6	-25.0	-61.8
-3.0	0.50	31.9	1.55	34.9	0.63	34.1	-3.0	-25.2	-61.5
-2.0	0.63	32.5	1.76	34.4	0.67	36.7	-3.1	-25.0	-60.3
-1.0	0.79	33.0	1.97	34.0	0.70	39.2	-3.0	-24.8	-60.5
0.0	1.00	33.4	2.19	33.4	0.73	41.5	-2.9	-25.2	-60.3
1.0	1.26	33.8	2.40	32.8	0.77	43.6	-3.1	-25.2	-59.5
2.0	1.59	34.2	2.60	32.1	0.80	45.6	-3.4	-25.2	-59.7
3.0	1.99	34.5	2.79	31.5	0.82	47.3	-3.6	-25.2	-58.8
4.0	2.51	34.7	2.97	30.7	0.85	48.8	-3.8	-25.3	-59.5
5.0	3.16	34.9	3.12	29.9	0.87	50.0	-4.1	-25.2	-59.5
6.0	3.98	35.1	3.22	29.1	0.88	50.8	-4.8	-25.3	-59.7
7.0	5.01	35.2	3.28	28.2	0.89	51.3	-5.7	-25.3	-58.8
8.0	6.31	35.2	3.33	27.2	0.90	51.6	-6.8	-25.2	-59.0
9.0	7.95	35.3	3.36	26.3	0.90	51.9	-8.0	-25.3	-58.8
10.0	10.01	35.3	3.38	25.3	0.90	52.1	-9.5	-25.2	-59.5

Remarks: "-" is out of range.

Pout vs. Pin characteristics

@ f=435MHz, Vdd=7.2V, Idq1=50mA(Vgg1 adj.), Idq2=200mA(Vgg2 adj.)



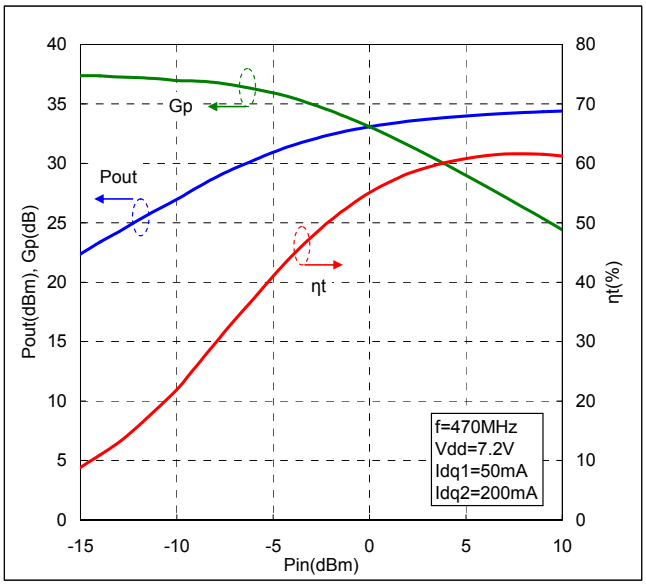


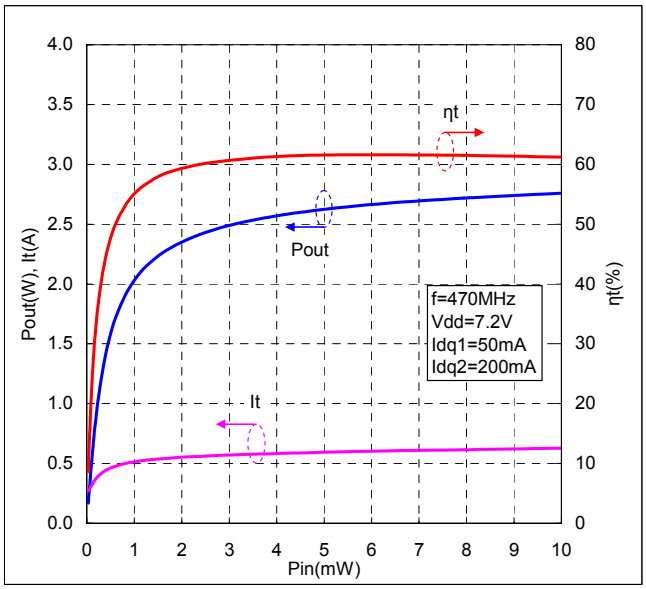
Pin		Pout		Gp	It	ηt	R.Loss	2fo	3fo
(dBm)	(mW)	(dBm)	(W)	(dB)	(A)	(%)	(dB)	(dBc)	(dBc)
-14.9	0.03	22.2	0.17	37.1	0.28	8.4	-9.3	-37.8	-
-14.1	0.04	23.1	0.20	37.1	0.29	9.9	-9.2	-37.0	-
-13.0	0.05	24.1	0.26	37.1	0.30	12.0	-9.0	-36.2	-
-11.8	0.07	25.0	0.32	36.8	0.31	14.2	-8.7	-35.2	-
-11.0	0.08	25.8	0.38	36.8	0.32	16.5	-8.6	-34.3	-
-10.0	0.10	26.8	0.48	36.8	0.34	19.3	-7.9	-33.4	-
-8.9	0.13	27.6	0.58	36.6	0.36	22.2	-7.3	-32.5	-
-8.0	0.16	28.5	0.70	36.5	0.39	25.1	-7.0	-32.3	-
-7.0	0.20	29.3	0.84	36.3	0.42	28.3	-6.7	-31.8	-
-6.0	0.25	30.1	1.03	36.1	0.45	31.9	-6.7	-31.5	-63.7
-5.0	0.32	30.9	1.22	35.9	0.48	35.5	-6.4	-31.4	-63.5
-4.0	0.40	31.5	1.43	35.6	0.51	39.0	-6.6	-31.3	-63.0
-3.0	0.50	32.2	1.65	35.2	0.54	42.4	-6.7	-31.3	-63.7
-2.0	0.63	32.7	1.87	34.7	0.57	45.7	-6.6	-30.8	-63.0
-1.0	0.80	33.2	2.10	34.2	0.60	49.0	-6.9	-31.0	-62.7
0.0	1.00	33.6	2.30	33.6	0.62	51.6	-6.7	-30.8	-63.0
1.0	1.26	34.0	2.49	33.0	0.64	53.9	-7.0	-30.7	-62.5
2.0	1.58	34.3	2.67	32.3	0.66	56.1	-6.9	-30.5	-62.0
3.0	2.00	34.5	2.82	31.5	0.68	57.9	-6.4	-30.3	-62.0
4.0	2.51	34.7	2.95	30.7	0.69	59.4	-6.6	-30.3	-61.5
5.0	3.17	34.9	3.07	29.9	0.71	60.6	-6.7	-30.2	-61.7
6.0	3.99	35.0	3.17	29.0	0.72	61.6	-6.8	-30.2	-61.3
7.0	5.01	35.1	3.26	28.1	0.73	62.3	-7.0	-29.8	-61.7
8.0	6.30	35.2	3.33	27.2	0.74	62.8	-7.2	-30.0	-61.8
9.0	7.93	35.3	3.39	26.3	0.75	63.1	-7.4	-29.8	-61.7
10.0	10.00	35.4	3.43	25.4	0.76	63.2	-7.7	-30.2	-61.5

Remarks: “-“ is out of range.

Pout vs. Pin characteristics

@ f=470MHz, Vdd=7.2V, Idq1=50mA(Vgg1 adj.), Idq2=200mA(Vgg2 adj.)



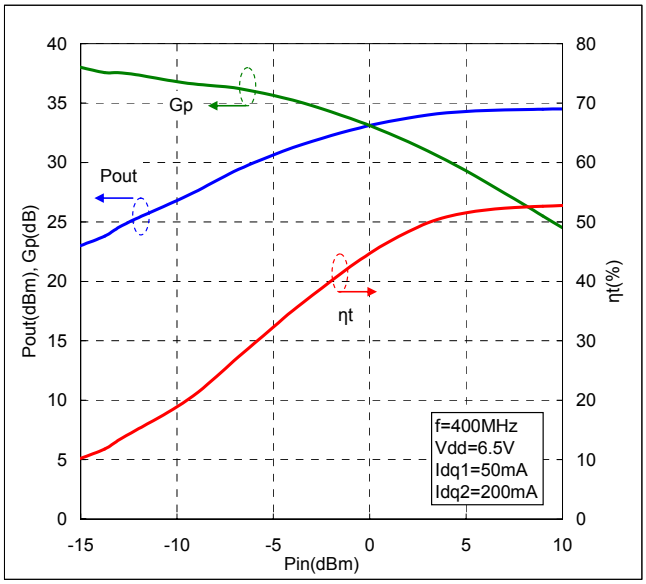


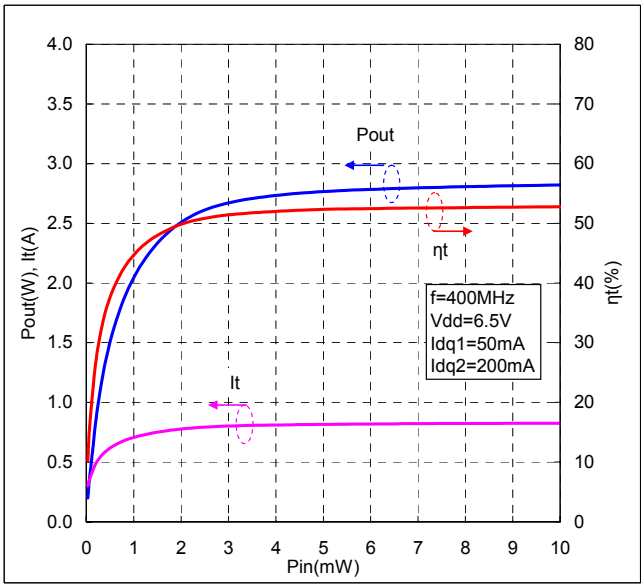
Pin		Pout		Gp	It	ηt	R.Loss	2fo	3fo
(dBm)	(mW)	(dBm)	(W)	(dB)	(A)	(%)	(dB)	(dBc)	(dBc)
-15.1	0.03	22.3	0.17	37.4	0.27	8.6	-12.4	-37.8	-
-14.0	0.04	23.4	0.22	37.4	0.28	10.9	-12.5	-36.2	-
-13.0	0.05	24.2	0.26	37.3	0.28	13.0	-12.6	-35.7	-
-12.0	0.06	25.2	0.33	37.2	0.29	15.8	-12.7	-34.5	-
-10.9	0.08	26.2	0.41	37.1	0.30	18.9	-12.6	-33.3	-
-9.9	0.10	27.0	0.50	36.9	0.32	22.2	-12.5	-32.7	-
-9.0	0.13	27.9	0.62	36.9	0.33	25.8	-12.4	-31.7	-
-8.1	0.15	28.7	0.74	36.8	0.35	29.2	-12.2	-31.2	-
-7.0	0.20	29.5	0.90	36.6	0.37	33.4	-12.3	-30.5	-
-6.0	0.25	30.3	1.07	36.3	0.40	37.3	-12.1	-30.2	-
-5.0	0.31	30.9	1.23	35.9	0.42	41.0	-11.9	-29.8	-
-4.1	0.39	31.5	1.40	35.5	0.44	44.3	-11.5	-29.8	-64.3
-3.0	0.50	32.0	1.58	35.0	0.46	47.7	-11.6	-29.5	-65.7
-2.0	0.63	32.4	1.74	34.4	0.48	50.5	-11.5	-29.2	-65.3
-1.0	0.80	32.8	1.90	33.7	0.50	53.0	-11.7	-28.8	-65.0
0.0	1.00	33.1	2.03	33.1	0.51	55.1	-11.6	-28.7	-63.3
1.0	1.26	33.3	2.15	32.3	0.53	56.8	-11.7	-28.3	-62.8
2.0	1.59	33.5	2.26	31.5	0.54	58.3	-11.7	-28.3	-62.5
3.0	2.00	33.7	2.35	30.7	0.55	59.3	-11.7	-28.0	-63.5
4.0	2.51	33.9	2.43	29.9	0.56	60.2	-11.6	-28.0	-63.7
5.0	3.17	34.0	2.51	29.0	0.57	60.8	-11.4	-27.7	-64.2
6.0	3.99	34.1	2.57	28.1	0.58	61.3	-10.4	-27.7	-63.7
7.0	5.01	34.2	2.62	27.2	0.59	61.6	-10.3	-27.7	-63.0
8.0	6.30	34.3	2.67	26.3	0.60	61.6	-10.1	-27.5	-63.3
9.0	7.95	34.3	2.72	25.3	0.62	61.5	-10.0	-27.3	-62.8
10.0	9.98	34.4	2.76	24.4	0.63	61.2	-9.9	-27.3	-63.7

Remarks: “-“ is out of range.

Pout vs. Pin characteristics

@ f=400MHz, Vdd=6.5V, Idq1=50mA(Vgg1 adj.), Idq2=200mA(Vgg2 adj.)



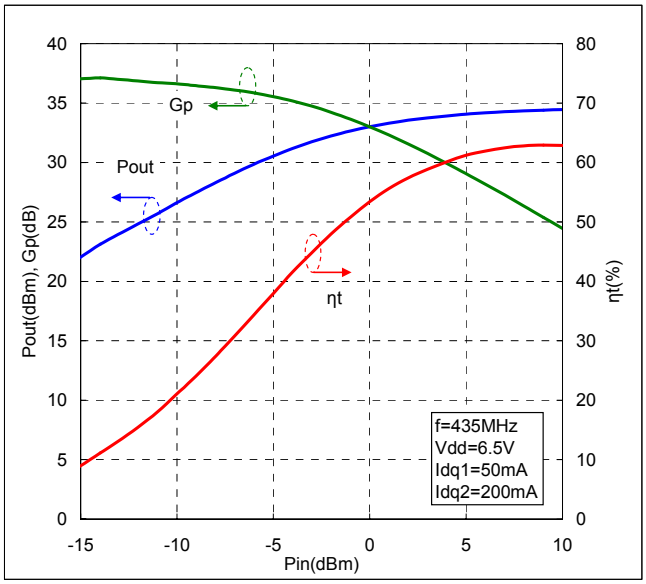


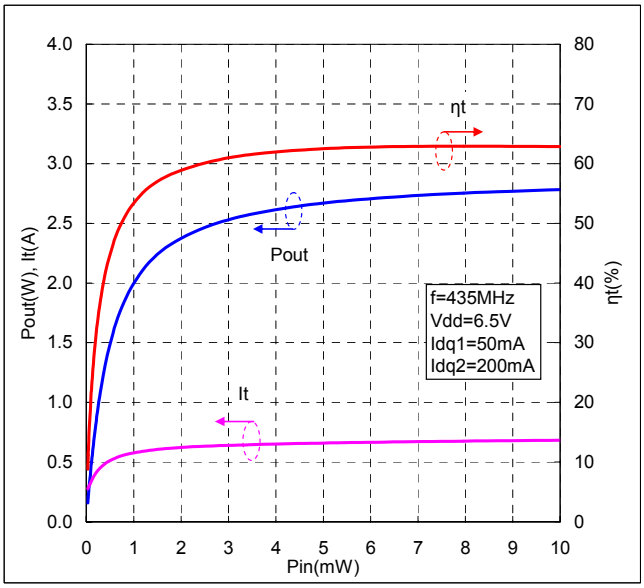
Pin		Pout		Gp	It	ηt	R.Loss	2fo	3fo
(dBm)	(mW)	(dBm)	(W)	(dB)	(A)	(%)	(dB)	(dBc)	(dBc)
-15.0	0.03	23.0	0.20	38.0	0.30	10.2	-3.6	-29.8	-
-13.8	0.04	23.8	0.24	37.6	0.31	11.8	-3.5	-28.8	-
-13.1	0.05	24.5	0.28	37.6	0.33	13.2	-2.7	-28.2	-
-12.1	0.06	25.3	0.34	37.4	0.35	15.0	-2.7	-27.3	-
-11.0	0.08	26.1	0.41	37.1	0.37	17.0	-2.3	-26.7	-
-10.0	0.10	26.8	0.48	36.8	0.39	18.9	-2.3	-26.0	-
-8.9	0.13	27.7	0.58	36.6	0.42	21.4	-2.4	-25.7	-
-7.9	0.16	28.5	0.71	36.4	0.45	24.0	-2.3	-25.7	-
-7.1	0.20	29.2	0.84	36.3	0.49	26.6	-2.4	-25.5	-61.5
-6.0	0.25	30.0	0.99	36.0	0.52	29.5	-2.2	-25.3	-61.8
-5.0	0.32	30.6	1.16	35.6	0.55	32.3	-2.3	-25.3	-60.8
-4.0	0.40	31.3	1.34	35.2	0.59	35.1	-2.6	-25.7	-61.8
-3.0	0.50	31.8	1.51	34.8	0.62	37.7	-2.6	-25.3	-60.5
-2.0	0.63	32.3	1.68	34.3	0.65	40.1	-2.9	-25.5	-60.7
-1.0	0.79	32.7	1.87	33.7	0.68	42.5	-2.9	-25.3	-59.3
0.0	1.01	33.1	2.05	33.1	0.71	44.8	-2.7	-25.5	-60.3
1.0	1.26	33.5	2.21	32.4	0.73	46.7	-2.9	-25.2	-59.5
2.0	1.59	33.7	2.37	31.7	0.76	48.4	-3.0	-25.5	-59.8
3.0	2.00	34.0	2.51	31.0	0.78	49.8	-3.3	-25.5	-59.7
4.0	2.51	34.2	2.61	30.2	0.79	50.9	-3.7	-25.3	-59.8
5.0	3.16	34.3	2.68	29.3	0.80	51.5	-4.3	-25.5	-59.5
6.0	3.97	34.4	2.73	28.4	0.81	52.0	-5.2	-25.7	-59.8
7.0	5.02	34.4	2.77	27.4	0.82	52.3	-6.3	-25.7	-59.8
8.0	6.32	34.5	2.79	26.4	0.82	52.5	-7.6	-25.3	-59.7
9.0	7.92	34.5	2.81	25.5	0.82	52.6	-9.0	-25.3	-60.2
10.0	10.02	34.5	2.82	24.5	0.83	52.8	-10.5	-25.5	-59.7

Remarks: "-" is out of range.

Pout vs. Pin characteristics

@ f=435MHz, Vdd=6.5V, Idq1=50mA(Vgg1 adj.), Idq2=200mA(Vgg2 adj.)



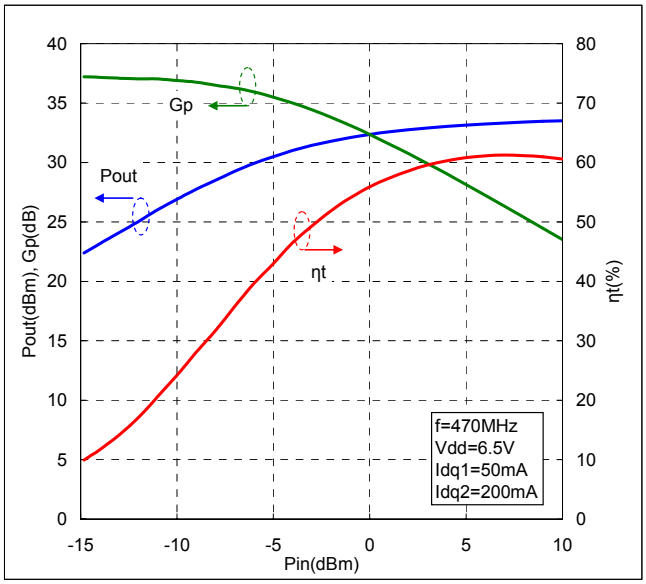


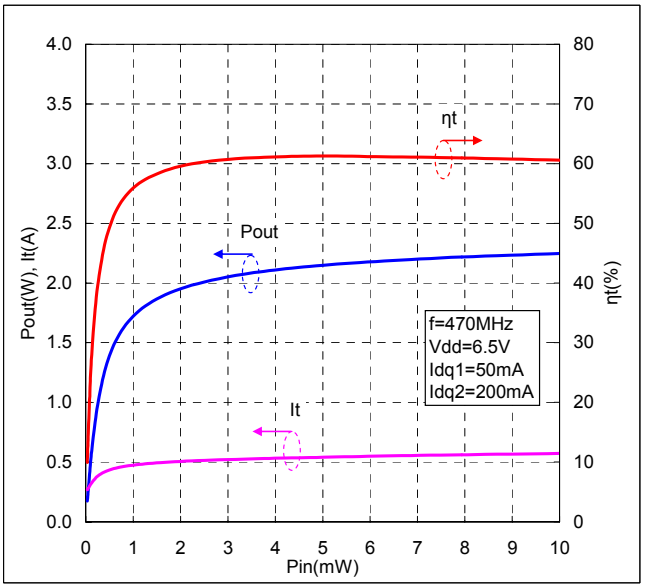
Pin		Pout		Gp	It	ηt	R.Loss	2fo	3fo
(dBm)	(mW)	(dBm)	(W)	(dB)	(A)	(%)	(dB)	(dBc)	(dBc)
-15.1	0.03	22.0	0.16	37.0	0.28	8.8	-9.5	-38.8	-
-14.0	0.04	23.1	0.21	37.1	0.28	11.1	-9.3	-37.3	-
-13.1	0.05	23.9	0.25	37.0	0.29	13.0	-9.2	-36.5	-
-12.0	0.06	24.8	0.30	36.9	0.30	15.4	-9.0	-35.8	-
-11.0	0.08	25.7	0.37	36.7	0.32	18.0	-8.5	-34.8	-
-10.1	0.10	26.6	0.45	36.6	0.34	20.8	-7.9	-33.8	-
-9.2	0.12	27.3	0.54	36.5	0.35	23.6	-7.4	-33.3	-
-8.0	0.16	28.3	0.68	36.3	0.38	27.5	-7.5	-32.7	-
-7.0	0.20	29.1	0.81	36.1	0.41	30.7	-7.2	-32.5	-
-6.0	0.25	29.8	0.96	35.9	0.43	34.3	-7.0	-32.2	-
-5.0	0.32	30.6	1.14	35.5	0.46	38.1	-7.2	-32.2	-
-4.0	0.40	31.2	1.31	35.2	0.49	41.6	-7.0	-31.7	-64.8
-3.0	0.50	31.7	1.49	34.7	0.51	44.8	-6.9	-31.8	-64.3
-2.0	0.63	32.2	1.67	34.2	0.54	47.9	-7.1	-31.5	-63.2
-1.0	0.80	32.7	1.84	33.6	0.56	50.9	-7.3	-31.3	-62.3
0.0	1.00	33.0	2.00	33.0	0.58	53.4	-7.0	-31.2	-62.8
1.0	1.26	33.3	2.14	32.3	0.59	55.6	-7.2	-31.2	-61.8
2.0	1.59	33.6	2.27	31.6	0.61	57.4	-7.3	-30.7	-62.5
3.0	2.00	33.8	2.37	30.8	0.62	58.9	-6.6	-30.5	-62.2
4.0	2.52	33.9	2.47	29.9	0.63	60.1	-6.7	-30.5	-61.8
5.0	3.15	34.1	2.55	29.1	0.64	61.2	-6.8	-30.2	-61.5
6.0	3.99	34.2	2.61	28.2	0.65	61.9	-6.9	-30.5	-62.3
7.0	5.01	34.3	2.67	27.3	0.66	62.5	-7.1	-30.2	-62.3
8.0	6.30	34.3	2.72	26.3	0.67	62.8	-7.3	-30.3	-62.0
9.0	7.97	34.4	2.75	25.4	0.68	62.9	-7.5	-30.3	-62.2
10.0	10.00	34.4	2.78	24.4	0.68	62.9	-7.8	-30.3	-61.5

Remarks: "-" is out of range.

Pout vs. Pin characteristics

@ f=470MHz, Vdd=6.5V, Idq1=50mA(Vgg1 adj.), Idq2=200mA(Vgg2 adj.)



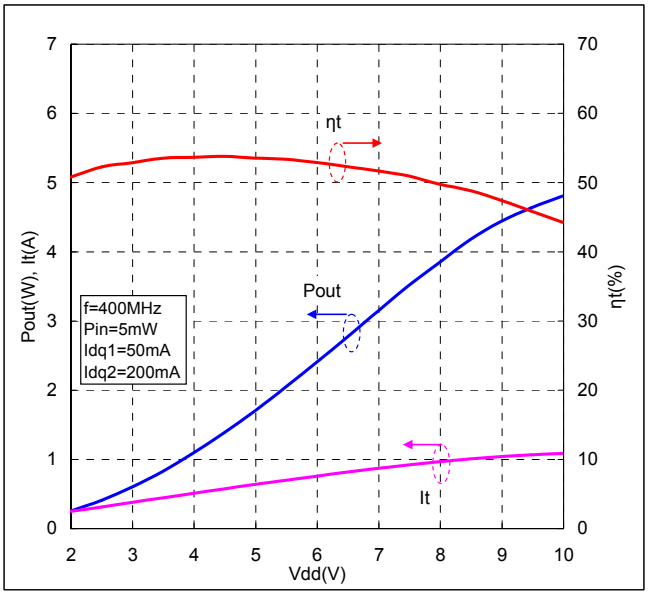


Pin		Pout		Gp	It	ηt	R.Loss	2fo	3fo
(dBm)	(mW)	(dBm)	(W)	(dB)	(A)	(%)	(dB)	(dBc)	(dBc)
-14.8	0.03	22.4	0.17	37.2	0.27	9.9	-11.2	-37.7	-
-14.0	0.04	23.2	0.21	37.2	0.27	11.7	-11.7	-36.8	-
-13.1	0.05	24.0	0.25	37.1	0.28	14.0	-12.0	-35.8	-
-11.9	0.06	25.1	0.32	37.0	0.29	17.3	-12.2	-34.8	-
-11.0	0.08	26.0	0.40	37.0	0.30	20.6	-12.1	-34.0	-
-9.9	0.10	27.0	0.50	36.9	0.31	24.5	-12.0	-32.8	-
-9.0	0.13	27.7	0.59	36.8	0.33	28.0	-11.9	-32.2	-
-8.0	0.16	28.5	0.71	36.5	0.34	31.8	-11.7	-31.7	-
-7.0	0.20	29.2	0.84	36.3	0.36	35.6	-10.8	-31.3	-
-6.0	0.25	29.9	0.98	35.9	0.38	39.6	-10.6	-30.8	-
-5.0	0.32	30.5	1.12	35.5	0.40	42.9	-10.3	-30.5	-
-4.0	0.40	31.0	1.26	35.0	0.42	46.4	-10.2	-30.0	-
-3.0	0.50	31.4	1.39	34.5	0.44	49.3	-10.4	-29.7	-65.7
-2.0	0.63	31.8	1.51	33.8	0.45	51.9	-10.8	-29.3	-65.4
-1.0	0.80	32.1	1.63	33.1	0.46	54.1	-10.8	-29.0	-65.2
0.0	1.01	32.4	1.72	32.3	0.48	56.0	-10.9	-28.8	-63.5
1.0	1.26	32.6	1.81	31.6	0.49	57.4	-11.0	-28.5	-62.8
2.0	1.58	32.7	1.88	30.8	0.50	58.6	-11.0	-28.3	-63.8
3.0	2.00	32.9	1.95	29.9	0.51	59.6	-11.1	-28.2	-64.0
4.0	2.51	33.0	2.01	29.0	0.51	60.3	-11.1	-28.0	-63.2
5.0	3.16	33.1	2.06	28.1	0.52	60.8	-11.1	-27.8	-63.3
6.0	3.98	33.2	2.11	27.2	0.53	61.1	-10.0	-27.8	-63.2
7.0	5.01	33.3	2.15	26.3	0.54	61.3	-9.9	-27.8	-63.7
8.0	6.30	33.4	2.18	25.4	0.55	61.2	-9.8	-27.7	-63.8
9.0	7.94	33.5	2.22	24.5	0.56	61.0	-9.8	-27.7	-64.0
10.0	10.01	33.5	2.25	23.5	0.57	60.6	-9.6	-27.5	-63.5

Remarks: “-“ is out of range.

Pout vs. Vdd characteristics

@ f=400MHz, Pin=5mW, Idq1=50mA(Vgg1 adj.), Idq2=200mA(Vgg2 adj.)

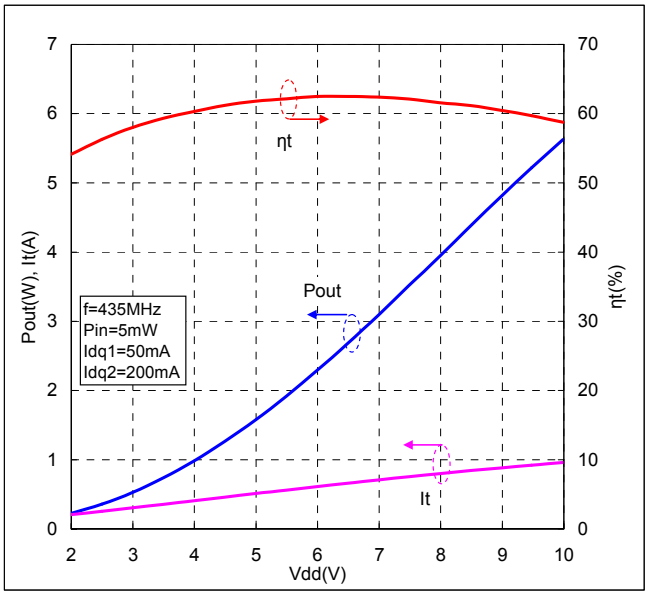


Vdd	Pout		It	ηt	R.Loss	2fo	3fo
(V)	(dBm)	(W)	(A)	(%)	(dB)	(dBc)	(dBc)
2.0	24.0	0.25	0.25	50.8	-18.8	-28.2	-
2.5	26.1	0.41	0.32	52.3	-17.6	-27.5	-
3.0	27.8	0.60	0.38	52.9	-15.5	-27.2	-60.8
3.5	29.2	0.83	0.44	53.5	-12.2	-26.7	-61.0
4.0	30.4	1.09	0.51	53.6	-10.8	-26.3	-60.3
4.5	31.4	1.39	0.57	53.8	-9.6	-26.3	-60.0
5.0	32.3	1.70	0.64	53.5	-8.6	-26.0	-60.5
5.5	33.1	2.05	0.70	53.4	-7.7	-25.8	-59.7
6.0	33.8	2.40	0.76	52.9	-7.0	-25.5	-59.5
6.5	34.4	2.76	0.82	52.3	-6.4	-25.3	-59.3
7.0	35.0	3.15	0.87	51.7	-5.8	-25.0	-59.2
7.5	35.5	3.51	0.92	51.0	-5.5	-25.2	-59.2
8.0	35.8	3.84	0.97	49.8	-5.3	-25.2	-59.0
8.5	36.2	4.18	1.01	48.9	-5.2	-24.5	-58.7
9.0	36.5	4.44	1.04	47.4	-5.3	-24.7	-58.8
9.5	36.7	4.64	1.07	45.9	-5.4	-24.3	-57.8
10.0	36.8	4.80	1.09	44.3	-5.6	-24.2	-58.2

Remarks: “-“ is out of range.

Pout vs. Vdd characteristics

@ f=435MHz, Pin=5mW, Idq1=50mA(Vgg1 adj.), Idq2=200mA(Vgg2 adj.)

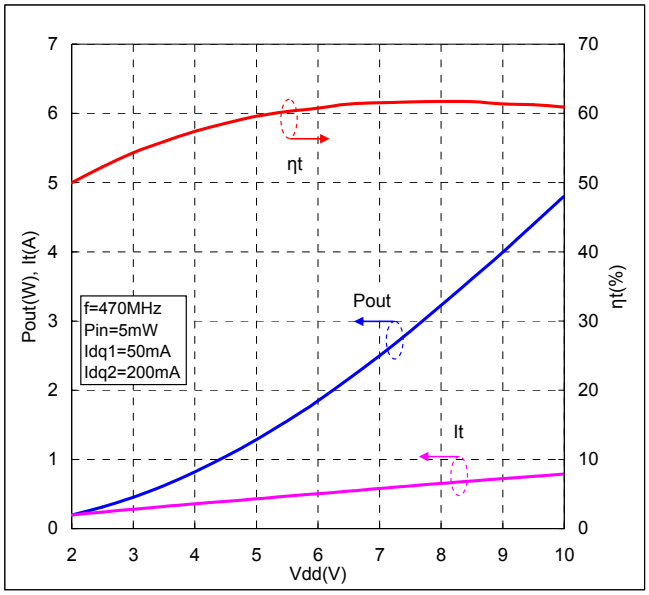


Vdd	Pout		It	ηt	R.Loss	2fo	3fo
(V)	(dBm)	(W)	(A)	(%)	(dB)	(dBc)	(dBc)
2.0	23.4	0.22	0.21	54.1	-12.7	-32.5	-
2.5	25.5	0.36	0.26	56.3	-10.8	-32.0	-
3.0	27.2	0.53	0.30	58.0	-9.5	-31.7	-
3.5	28.7	0.73	0.36	59.3	-8.5	-31.3	-62.2
4.0	29.9	0.98	0.41	60.3	-7.8	-31.0	-61.3
4.5	31.0	1.26	0.46	61.2	-7.8	-30.7	-62.5
5.0	32.0	1.57	0.51	61.8	-7.4	-30.8	-61.8
5.5	32.8	1.92	0.56	62.2	-7.2	-30.5	-61.3
6.0	33.6	2.29	0.61	62.5	-7.2	-30.3	-61.7
6.5	34.3	2.67	0.66	62.5	-7.1	-30.2	-61.5
7.0	34.9	3.09	0.71	62.4	-7.1	-30.5	-61.8
7.5	35.5	3.52	0.76	62.1	-7.0	-30.2	-61.8
8.0	35.9	3.93	0.80	61.6	-7.0	-29.8	-61.3
8.5	36.4	4.38	0.84	61.2	-6.9	-29.8	-61.0
9.0	36.8	4.80	0.88	60.5	-6.8	-29.5	-61.2
9.5	37.2	5.22	0.92	59.7	-6.8	-29.8	-61.0
10.0	37.5	5.63	0.96	58.8	-6.8	-29.7	-61.5

Remarks: “-“ is out of range.

Pout vs. Vdd characteristics

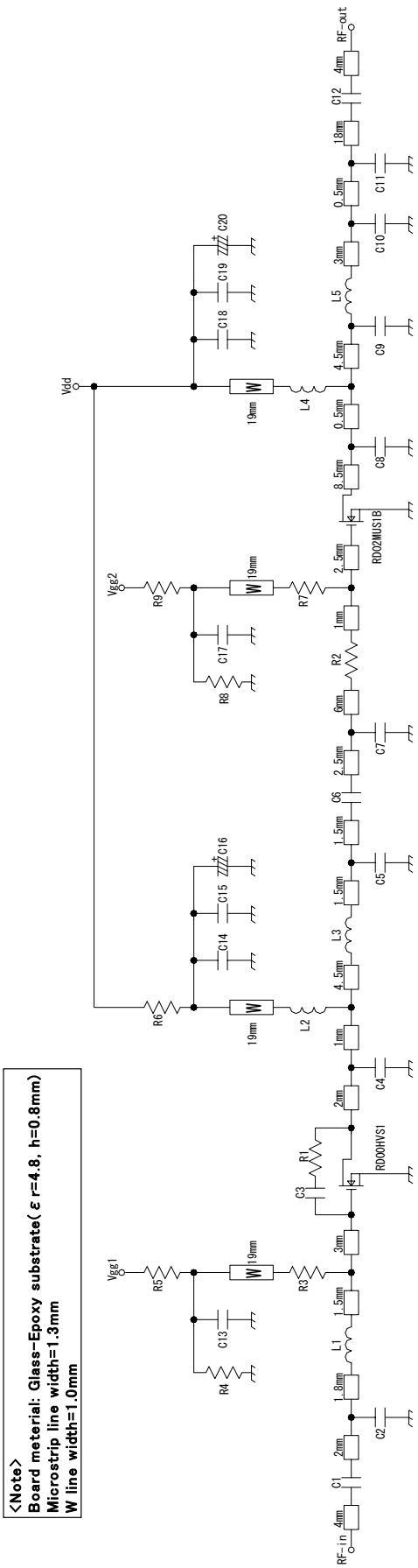
@ f=470MHz, Pin=5mW, Idq1=50mA(Vgg1 adj.), Idq2=200mA(Vgg2 adj.)



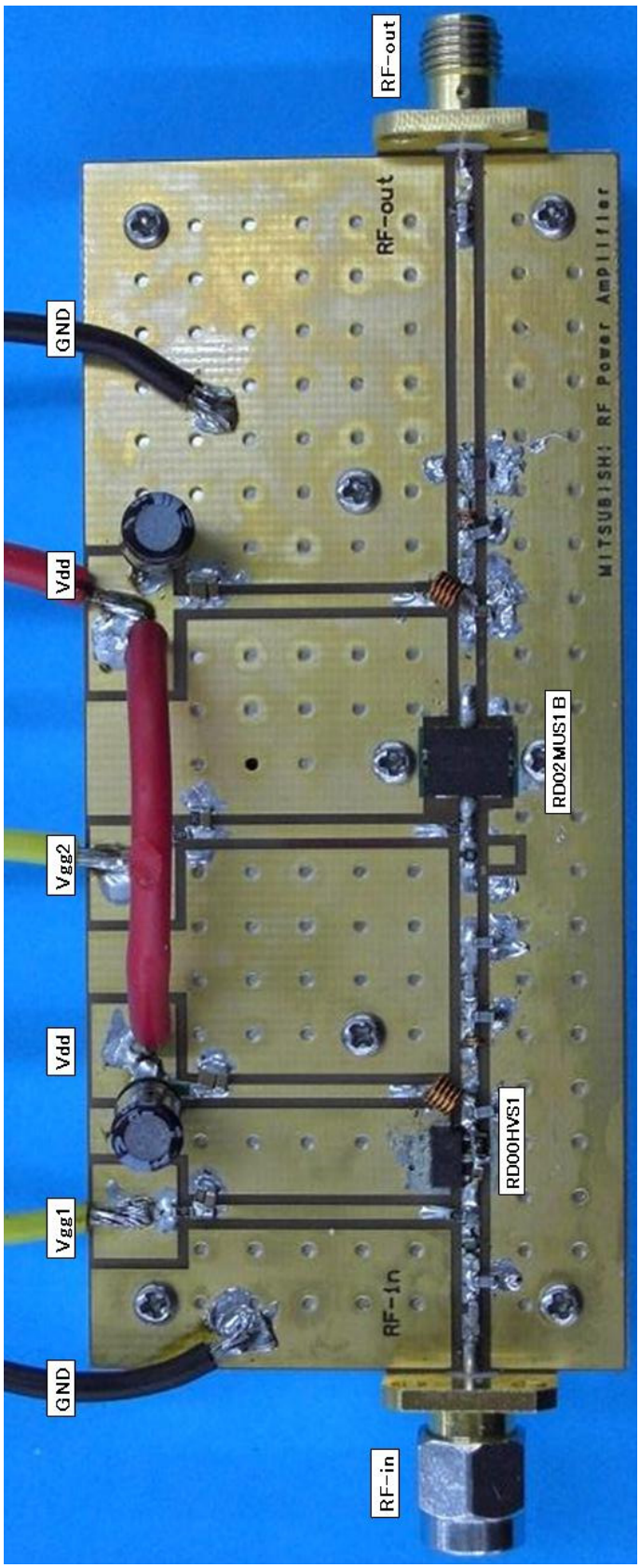
Vdd	Pout		It	ηt	R.Loss	2fo	3fo
(V)	(dBm)	(W)	(A)	(%)	(dB)	(dBc)	(dBc)
2.0	22.9	0.19	0.20	49.9	-7.9	-28.8	-
2.5	24.9	0.31	0.24	52.3	-7.7	-28.8	-
3.0	26.6	0.45	0.28	54.3	-7.7	-28.8	-
3.5	27.9	0.62	0.32	55.9	-7.8	-28.5	-61.7
4.0	29.1	0.82	0.36	57.4	-8.2	-28.3	-62.0
4.5	30.2	1.04	0.39	58.6	-8.6	-28.2	-63.7
5.0	31.1	1.28	0.43	59.6	-9.0	-28.0	-64.2
5.5	31.9	1.55	0.47	60.3	-9.3	-27.8	-63.0
6.0	32.7	1.84	0.51	60.8	-9.6	-27.8	-62.7
6.5	33.3	2.16	0.54	61.3	-9.8	-27.7	-63.8
7.0	34.0	2.50	0.58	61.5	-10.0	-27.7	-63.0
7.5	34.5	2.84	0.62	61.6	-10.2	-27.5	-63.7
8.0	35.1	3.21	0.65	61.7	-10.4	-27.3	-63.7
8.5	35.6	3.60	0.69	61.7	-10.6	-27.2	-63.2
9.0	36.0	3.98	0.72	61.4	-10.8	-27.2	-63.0
9.5	36.4	4.39	0.76	61.3	-11.0	-27.0	-62.2
10.0	36.8	4.79	0.79	60.9	-11.1	-27.2	-63.2

Remarks: “-“ is out of range.

Equivalent Circuit



<Note>
Board meterial: Glass-Epoxy substrate(ε r=4.8, h=0.8mm)
Microstrip line width=1.3mm
W line width=1.0mm



Equivalent Circuit (parts list)

Parts Type	Symbol	Value	Type name	Vender
Capasitor	C1	100pF	GRM1882C1H101JA01D	Murata Manufacturing Co.,Ltd.
	C2	10pF	GRM1882C1H100JA01D	Murata Manufacturing Co.,Ltd.
	C3	47pF	GRM1882C1H470JA01D	Murata Manufacturing Co.,Ltd.
	C4	12pF	GRM1882C1H120JA01D	Murata Manufacturing Co.,Ltd.
	C5	18pF	GRM1882C1H180JA01D	Murata Manufacturing Co.,Ltd.
	C6	100pF	GRM1882C1H101JA01D	Murata Manufacturing Co.,Ltd.
	C7	39pF	GRM1882C1H390JA01D	Murata Manufacturing Co.,Ltd.
	C8	30pF	GRM1882C1H300JA01D	Murata Manufacturing Co.,Ltd.
	C9	15pF	GRM1882C1H150JA01D	Murata Manufacturing Co.,Ltd.
	C10	5pF	GRM1882C1H5R0CZ01D	Murata Manufacturing Co.,Ltd.
	C11	9pF	GRM1882C1H9R0DZ01D	Murata Manufacturing Co.,Ltd.
	C12	100pF	GRM1882C1H101JA01D	Murata Manufacturing Co.,Ltd.
	C13	1nF	GRM188R11H102KA01D	Murata Manufacturing Co.,Ltd.
	C14	1nF	GRM188R11H102KA01D	Murata Manufacturing Co.,Ltd.
	C15	22nF	GRM188R11H223KA01D	Murata Manufacturing Co.,Ltd.
	C16	22uF	UVZ1H220MDD	NICHICON COPORATION
	C17	1nF	GRM188R11H102KA01D	Murata Manufacturing Co.,Ltd.
	C18	1nF	GRM188R11H102KA01D	Murata Manufacturing Co.,Ltd.
	C19	22nF	GRM188R11H223KA01D	Murata Manufacturing Co.,Ltd.
	C20	22uF	UVZ1H220MDD	NICHICON COPORATION
Resistance	R1	470Ω	RPC10-471J	TAIYOSHA ELECTRIC CO.,Ltd.
	R2	1Ω	RPC05-1R0J	TAIYOSHA ELECTRIC CO.,Ltd.
	R3	100Ω	RPC05-101J	TAIYOSHA ELECTRIC CO.,Ltd.
	R4	30KΩ	RPC10-303J	TAIYOSHA ELECTRIC CO.,Ltd.
	R5	10KΩ	RPC05-103J	TAIYOSHA ELECTRIC CO.,Ltd.
	R6	0Ω	RPC05-0R0	TAIYOSHA ELECTRIC CO.,Ltd.
	R7	100Ω	RPC05-101J	TAIYOSHA ELECTRIC CO.,Ltd.
	R8	39KΩ	RPC05-393J	TAIYOSHA ELECTRIC CO.,Ltd.
	R9	10KΩ	RPC05-103J	TAIYOSHA ELECTRIC CO.,Ltd.
Inductance	L1	18nH	LQG18HN18NJ00D	Murata Manufacturing Co.,Ltd.
	L2	34.5nH Enameled wire 5Turns, Diameter:0.40mm,φ2.46mm(the out side diameter)	4005A	yc corporation
	L3	6.6nH Enameled wire 2Turns, Diameter:0.23mm,φ1.62mm(the out side diameter)	2302S	yc corporation
	L4	34.5nH Enameled wire 5Turns, Diameter:0.40mm,φ2.46mm(the out side diameter)	4005A	yc corporation
	L5	6.6nH Enameled wire 2Turns, Diameter:0.23mm,φ1.62mm(the out side diameter)	2302S	yc corporation