

APPLICATION NOTE

Document NO. AN-UHF-134-A

Date : 02th APR. 2012

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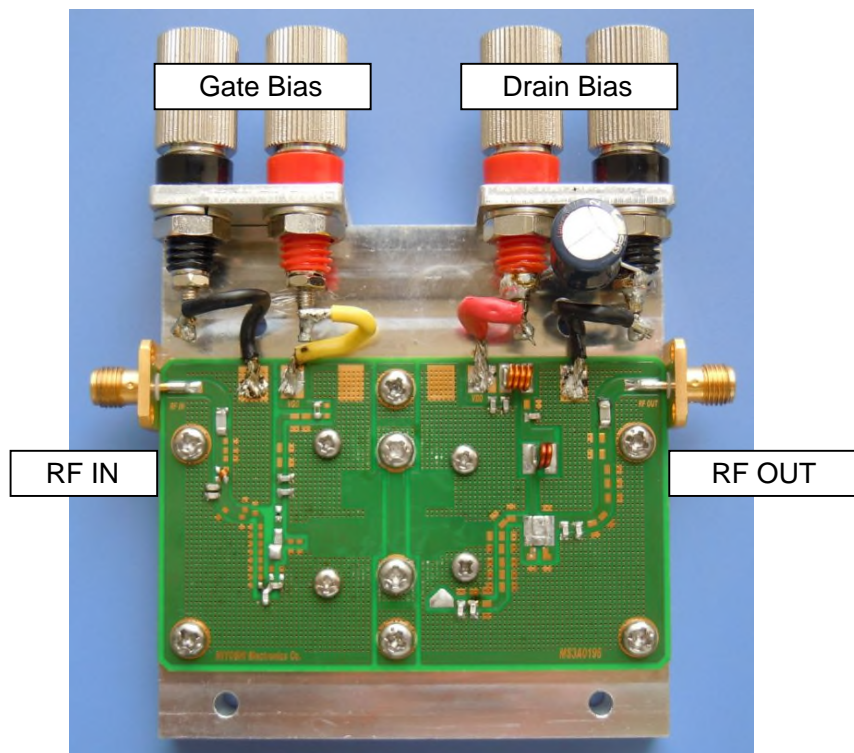
Confirmed : T.Okawa

(Taking charge of Silicon RF by
MIYOSHI Electronics)

SUBJECT: RD35HUF2 single-stage amplifier with f=330-to-400MHz evaluation board

Features:

- The evaluation board for RD35HUF2 single-stage amplifier
- Frequency: 330-400MHz
- Vdd: 12.5V
- Input power: 3W
- Output power: 36-46W
- Quiescent Current: 700mA
- Operating Current: approx . 6A
- Surface-mounted RF power amplifier structure

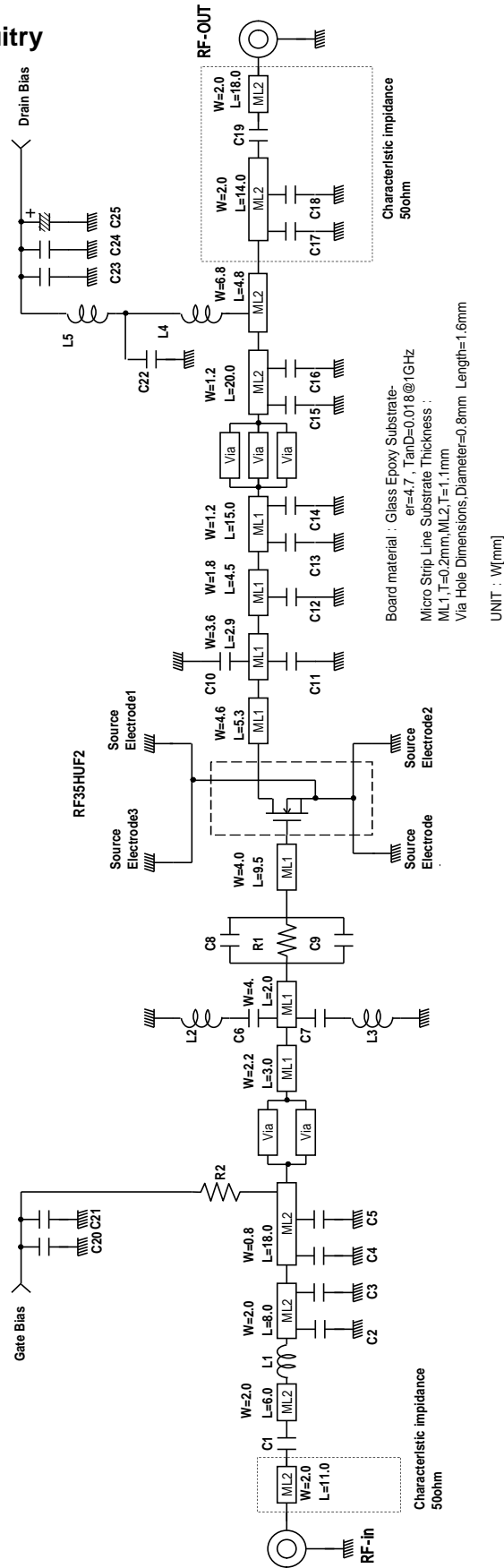


PCB L=75mm W=46mm

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1. Equivalent Circuitry



2. Component List and Standard Deliverable

- Component List

No.	Description			P/N	Qty	Manufacturer
	Capacitance	Size	Remarks			
Tr	MOSFET			RD35HUF2	1	Mitsubishi Electric Corporation
C 1	330 pF	3216	200V	GRM31M2C2D331JY21B	1	MURATA MANUFACTURING CO., LTD.
C 2	6.2 pF	1608	Hi-Q 50V	GQM1882C2A6R2DB01	1	MURATA MANUFACTURING CO., LTD.
C 3	6.2 pF	1608	Hi-Q 50V	GQM1882C2A6R2DB01	1	MURATA MANUFACTURING CO., LTD.
C 4	24 pF	1608	Hi-Q 50V	GQM1882C1H240JB01	1	MURATA MANUFACTURING CO., LTD.
C 5	18 pF	1608	Hi-Q 50V	GQM1882C1H180JB01	1	MURATA MANUFACTURING CO., LTD.
C 6	7.5 pF	1608	Hi-Q 50V	GQM1882C2A7R5DB01	1	MURATA MANUFACTURING CO., LTD.
C 7	7.5 pF	1608	Hi-Q 50V	GQM1882C2A7R5DB01	1	MURATA MANUFACTURING CO., LTD.
C 8	62 pF	1608	Hi-Q 50V	GQM1882C1H620JB01	1	MURATA MANUFACTURING CO., LTD.
C 9	62 pF	1608	Hi-Q 50V	GQM1882C1H620JB01	1	MURATA MANUFACTURING CO., LTD.
C 10	33 pF	1608	Hi-Q 50V	GQM1882C1H330JB01	1	MURATA MANUFACTURING CO., LTD.
C 11	33 pF	1608	Hi-Q 50V	GQM1882C1H330JB01	1	MURATA MANUFACTURING CO., LTD.
C 12	33 pF	1608	Hi-Q 50V	GQM1882C1H330JB01	1	MURATA MANUFACTURING CO., LTD.
C 13	10 pF	1608	Hi-Q 50V	GQM1882C1H100JB01	1	MURATA MANUFACTURING CO., LTD.
C 14	10 pF	1608	Hi-Q 50V	GQM1882C1H100JB01	1	MURATA MANUFACTURING CO., LTD.
C 15	5.6 pF	1608	Hi-Q 50V	GQM1882C2A5R6DB01	1	MURATA MANUFACTURING CO., LTD.
C 16	6.8 pF	1608	Hi-Q 50V	GQM1882C2A6R8DB01	1	MURATA MANUFACTURING CO., LTD.
C 17	5.6 pF	1608	Hi-Q 50V	GQM1882C2A5R6DB01	1	MURATA MANUFACTURING CO., LTD.
C 18	6.2 pF	1608	Hi-Q 50V	GQM1882C2A6R2DB01	1	MURATA MANUFACTURING CO., LTD.
C 19	330 pF	3216	200V	GRM31M2C2D331JY21B	1	MURATA MANUFACTURING CO., LTD.
C 20	1000 pF	2012	50V	GRM2162C1H102JA01B	1	MURATA MANUFACTURING CO., LTD.
C 21	1000 pF	2012	50V	GRM2162C1H102JA01B	1	MURATA MANUFACTURING CO., LTD.
C 22	1.2 pF	2012	Hi-Q 100V	GQM1884c2A1R2CB01	1	MURATA MANUFACTURING CO., LTD.
C 23	1000 pF	2012	100V	GRM2162C1H102JA01B	1	MURATA MANUFACTURING CO., LTD.
C 24	1000 pF	2012	100V	GRM2162C1H102JA01B	1	MURATA MANUFACTURING CO., LTD.
C 25	220 uF		35V	EEUFC1V221	1	Panasonic Corp.
R 1	100 ohm	1608		RPC05T101J	1	TAIYOSHA ELECTRIC CO.
R 2	2.2K ohm	1608		RPC05T222J	1	TAIYOSHA ELECTRIC CO.

* Inductor of Rolling Coil measurement condition : f=100MHz

No.	Description				P/N	Qty	Manufacturer	Remarks
	Inductance	Diameter		T/N of coils				
		Wire Φ	Inside Φ					
L 1	12 nH *	0.23 mm	1.1 mm	3	2303A	1	YC Corporation Co.,Ltd.	Enameled wire
L 2	6.8 nH	1608			LQG18HN6N8SC	1	MURATA MANUFACTURING CO., LTD.	
L 3	6.8 nH	1608			LQG18HN6N8SC	1	MURATA MANUFACTURING CO., LTD.	
L 4	8 nH *	0.80 mm	1.6 mm	2	8004C	1	YC Corporation Co.,Ltd.	Enameled wire
L 5	17 nH *	0.80 mm	1.6 mm	4	8005C	1	YC Corporation Co.,Ltd.	Enameled wire

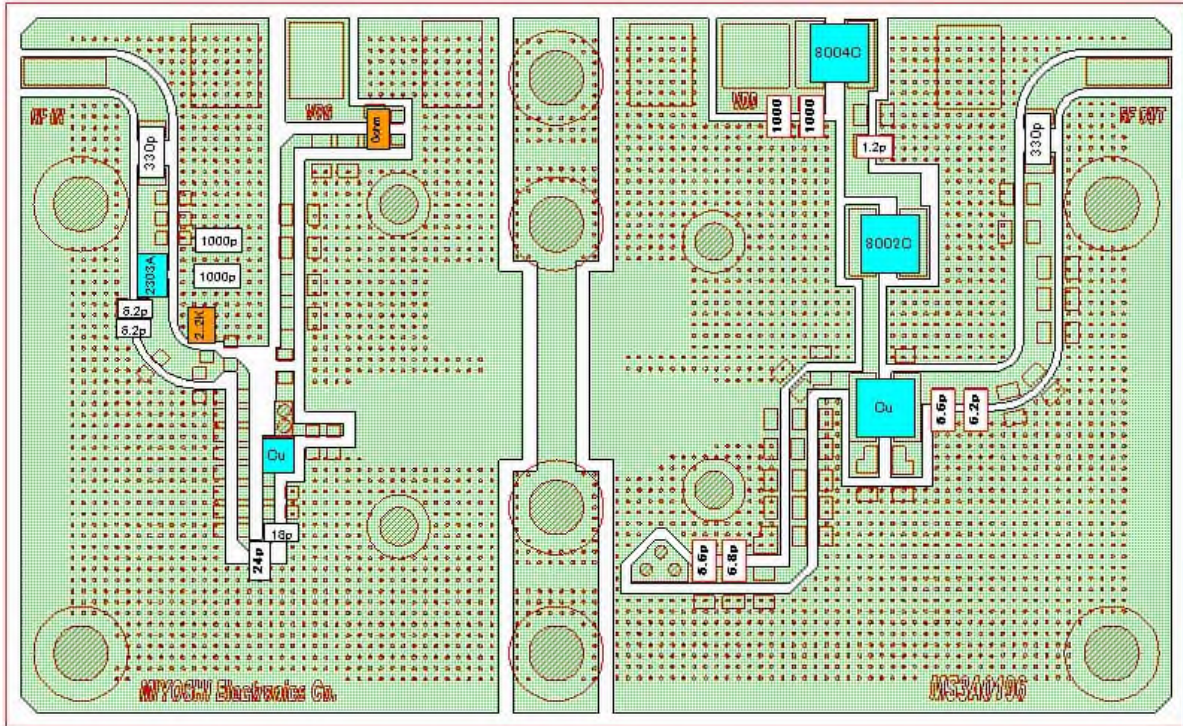
- Standard Deliverable

No.	Description	P/N	Qty	Manufacturer
Pb	PCB	MS3A0208	1	Homebuilt
√ OPTION				
Rc	SMA female connector	PAF-S00-002	2	GIGALANE Corporation
Bc 1	Bias connector red color	TM-605R	2	MSK Corporation
Bc 2	Bias connector black color	TM-605B	2	MSK Corporation
Pe	Aluminum pedestal	-	1	Homebuilt
Pd	Thermal Silicon Compound	G746	-	Shin-Etsu Chemical Co.,Ltd
Cu 1	Copper plate 2.8 x 1.8 x 0.4t (mm)	-	1	Homebuilt
	Conducting wire	-	6	Homebuilt
	Screw M3	-	2	-
	Screw M2.6	-	10	-
	Screw M2	-	10	-

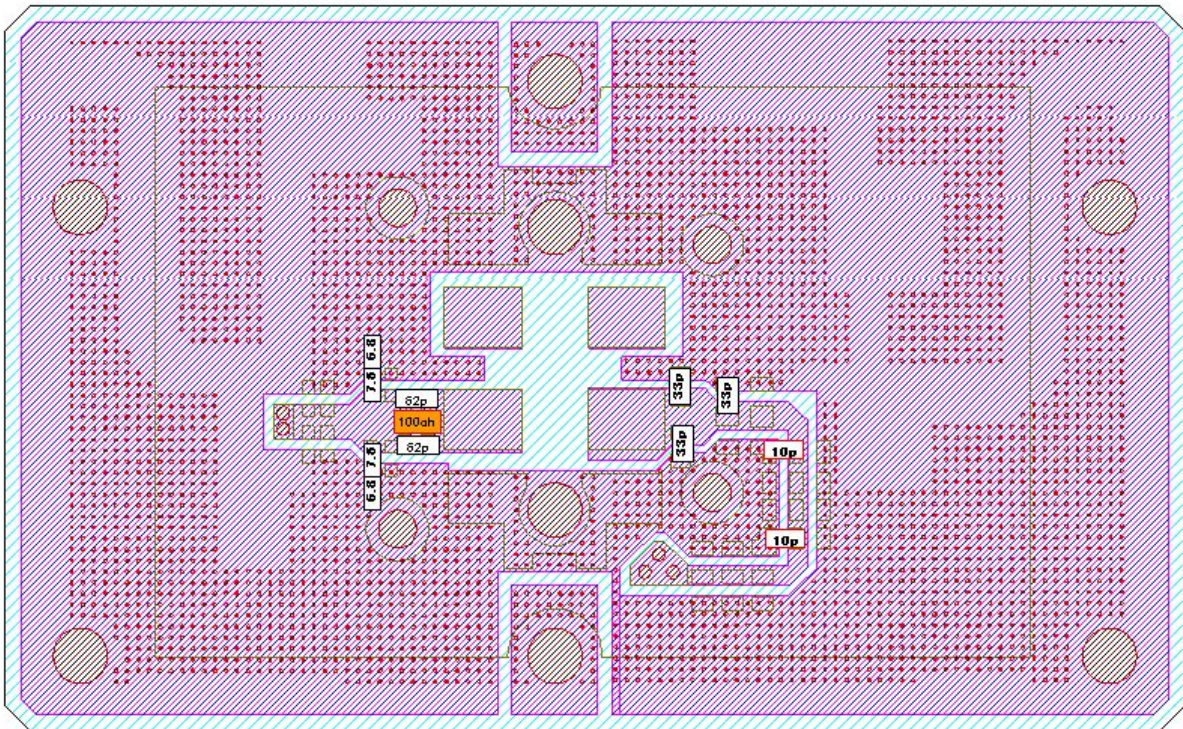
3. PCB Layout

BOARD OUTLINE: 75.0*46.0(mm)

TOP VIEW (Layer 1)

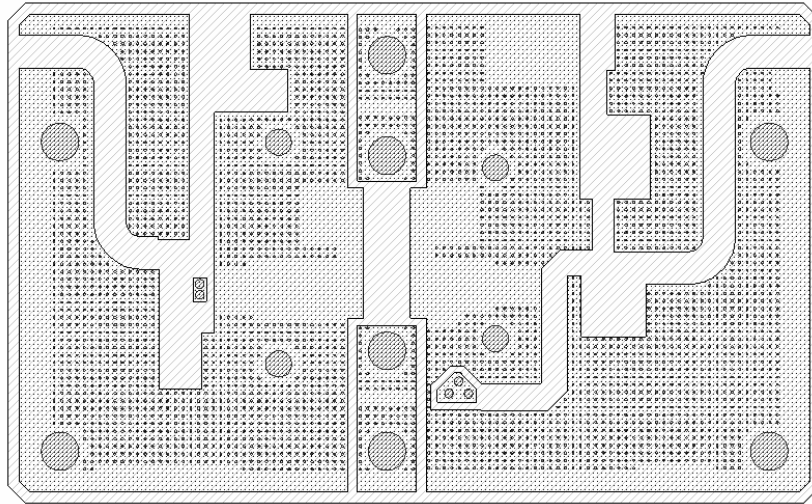


BOTTOM VIEW (Layer 4), Perspective through Top View

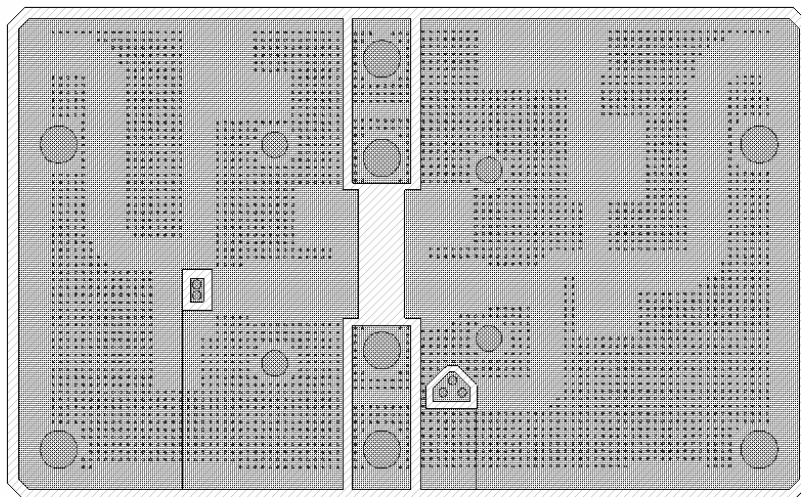


BOARD OUTLINE: 75.0*46.0(mm)

Internal Layer (Layer 2) , Perspective Through Top View

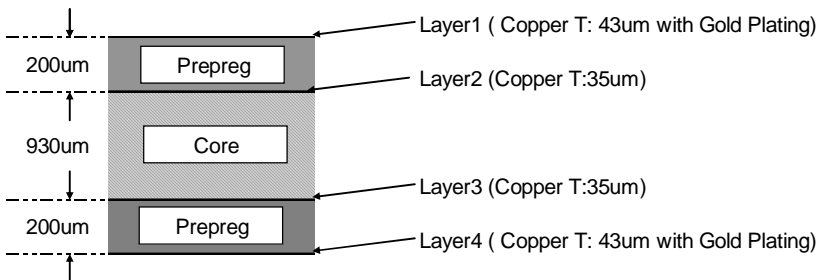


Internal Layer (Layer 3) , Perspective Through Top View



Substrate Condition

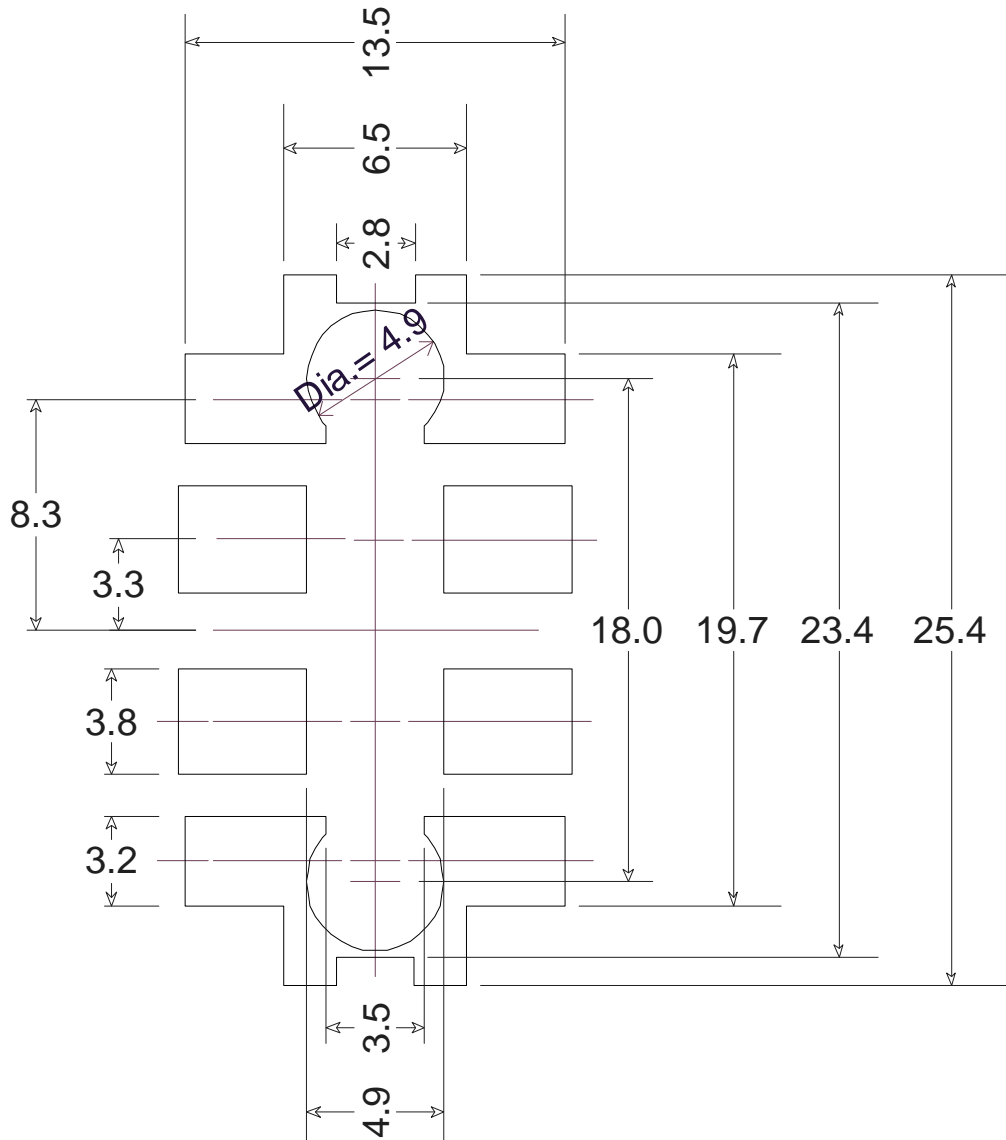
Nominal Total Completed Thickness (included resist coating): 1.6mm



Er: 4.7 @ 1GHz
TanD: 0.018 @ 1GHz

Material: MCL-E-679G(R), Hitachi Chemical Co.

4. Standard Land Pattern Dimensions

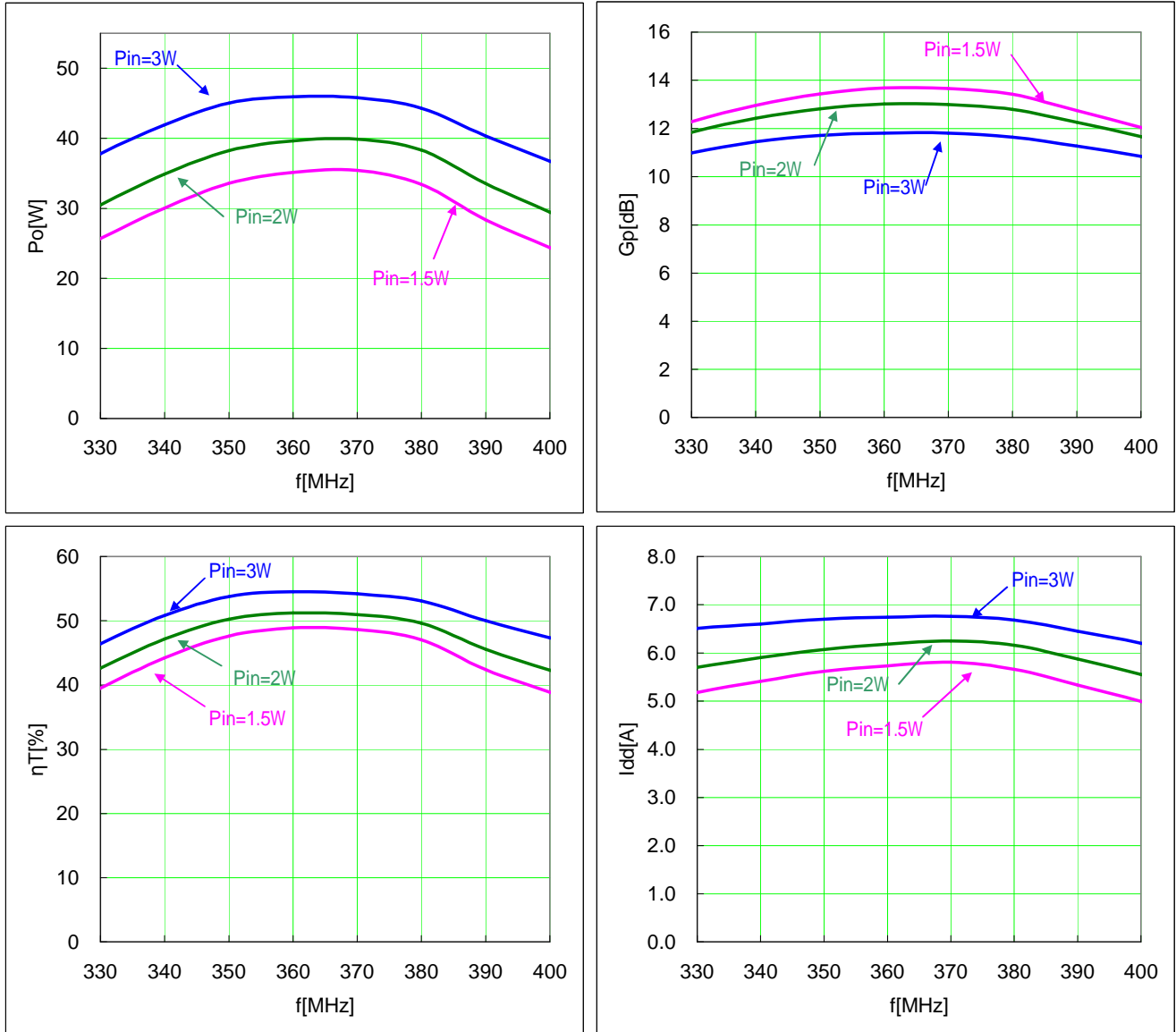


UNIT: mm

5. Typical RF Characteristics

5-1. Frequency characteristics

@ **Pin Control** (@ P_{in} =3W, 2W, 1.5W), V_{dd} =12.5V, I_{dq} =0.7A (V_{gg} =2.75V)



5-1-1. Frequency characteristics data**@ Pi=3W**, Vdd=12.5V, Idq=0.7A (Vgg=2.75V)

f [MHz]	Po [dBm]	Po [W]	Gp [dB]	Idd [A]	η_d [%]	2fo [dBc]	3fo [dBc]	R.L. [-dB]
330	45.77	37.8	11.0	6.51	46.4	-25.7	-40.5	-3.7
340	46.22	41.9	11.4	6.60	50.8	-28.2	-39.3	-5.0
350	46.53	45.0	11.7	6.70	53.8	-30.7	-38.0	-7.1
360	46.62	45.9	11.8	6.74	54.6	-31.8	-52.0	-10.7
370	46.61	45.8	11.8	6.76	54.2	-30.0	-49.8	-12.8
380	46.46	44.3	11.6	6.68	53.1	-24.3	-51.8	-9.4
390	46.06	40.3	11.3	6.45	50.0	-25.2	-51.3	-6.6
400	45.65	36.7	10.8	6.20	47.3	-29.0	-51.7	-5.1

@ Pi=2W, Vdd=12.5V, Idq=0.7A (Vgg=2.75V)

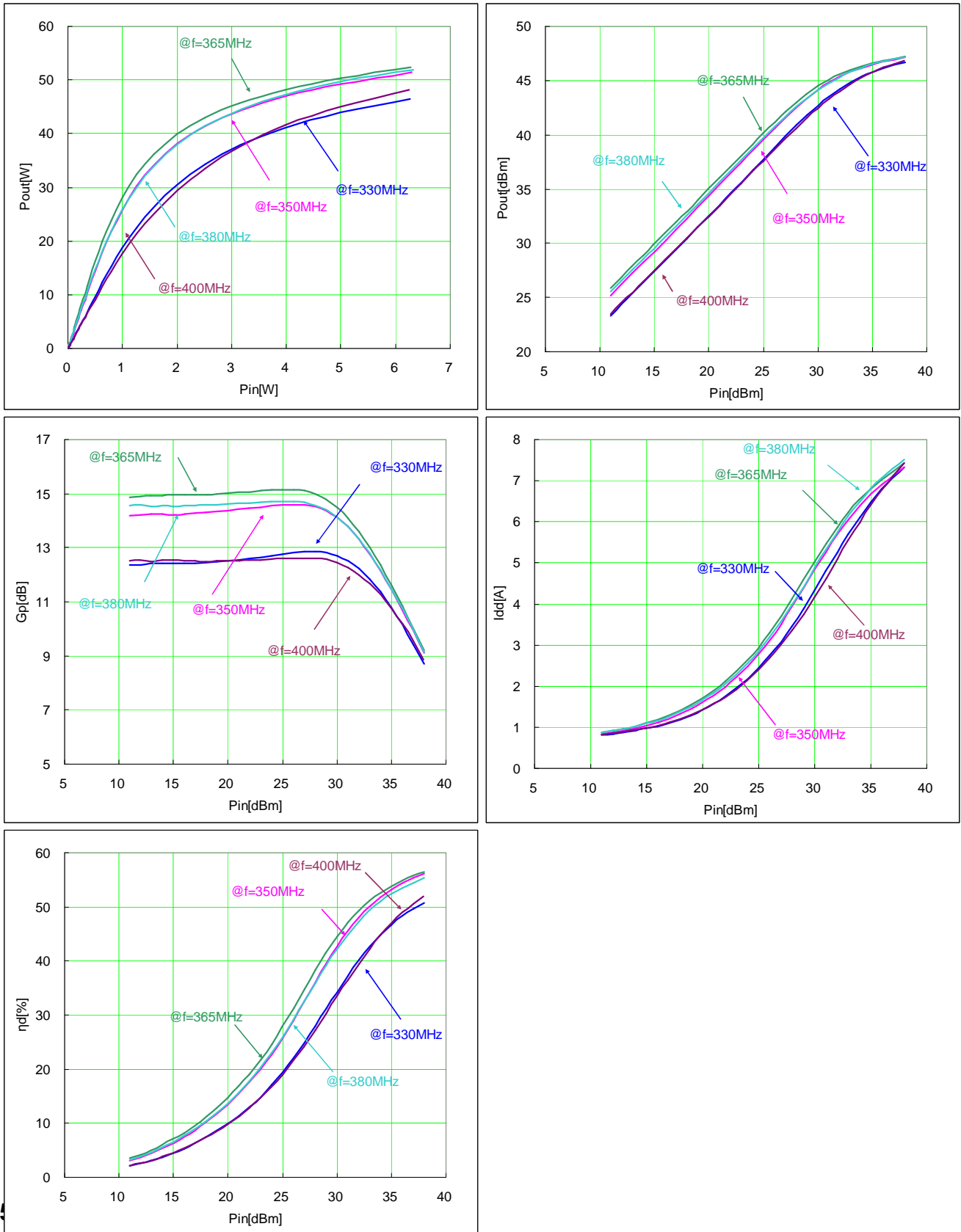
f [MHz]	Po [dBm]	Po [W]	Gp [dB]	Idd [A]	η_d [%]	2fo [dBc]	3fo [dBc]	R.L. [-dB]
330	45.77	37.8	11.0	6.51	46.4	-25.7	-40.5	-3.7
340	46.22	41.9	11.4	6.60	50.8	-28.2	-39.3	-5.0
350	46.53	45.0	11.7	6.70	53.8	-30.7	-38.0	-7.1
360	46.62	45.9	11.8	6.74	54.6	-31.8	-52.0	-10.7
370	46.61	45.8	11.8	6.76	54.2	-30.0	-49.8	-12.8
380	46.46	44.3	11.6	6.68	53.1	-24.3	-51.8	-9.4
390	46.06	40.3	11.3	6.45	50.0	-25.2	-51.3	-6.6
400	45.65	36.7	10.8	6.20	47.3	-29.0	-51.7	-5.1

@ Pi=1.5W, Vdd=12.5V, Idq=0.7A (Vgg=2.75V)

f [MHz]	Po [dBm]	Po [W]	Gp [dB]	Idd [A]	η_d [%]	2fo [dBc]	3fo [dBc]	R.L. [-dB]
330	44.10	25.7	12.3	5.18	39.5	-21.2	-42.5	-4.0
340	44.78	30.0	13.0	5.41	44.2	-23.3	-39.7	-5.3
350	45.26	33.6	13.4	5.62	47.6	-25.3	-38.3	-7.7
360	45.46	35.1	13.7	5.73	48.9	-25.2	-49.8	-12.2
370	45.49	35.4	13.7	5.81	48.6	-23.2	-50.8	-18.0
380	45.24	33.4	13.4	5.66	47.1	-18.3	-49.8	-12.4
390	44.53	28.4	12.7	5.33	42.4	-20.3	-49.0	-8.2
400	43.87	24.4	12.0	4.99	38.9	-25.5	-48.5	-6.1

5-2. Pout vs. Pin characteristics

@ Vdd=12.5V, Idq=0.7A (Vgg=2.75V), f=330MHz, 350MHz, 365MHz, 380MHz, 400MHz



5-2-1. Pout vs. Pin characteristics data

Conditions : Vdd=12.5V, Idq=0.7A (Vgg=2.75V)

@ f=330MHz

Pin [dBm]	Pin [W]	Po [dBm]	Po [W]	Gp [dB]	Idd [A]	η_d [%]	2fo [dBc]	3fo [dBc]	R.L. [-dB]
10.97	0.01	23.34	0.22	12.37	0.81	2.1	-26.7	-28.3	-3.6
11.99	0.02	24.36	0.27	12.37	0.84	2.6	-23.7	-28.7	-3.7
12.94	0.02	25.35	0.34	12.42	0.87	3.1	-23.2	-30.0	-3.6
13.99	0.03	26.40	0.44	12.41	0.91	3.8	-22.0	-31.7	-3.6
14.96	0.03	27.37	0.55	12.41	0.97	4.4	-22.0	-31.0	-3.6
15.96	0.04	28.38	0.69	12.42	1.02	5.3	-21.5	-33.2	-3.7
16.99	0.05	29.42	0.87	12.43	1.10	6.3	-20.8	-33.5	-3.7
18.01	0.06	30.44	1.11	12.44	1.18	7.4	-20.5	-35.5	-3.7
18.99	0.08	31.47	1.40	12.48	1.29	8.6	-19.3	-36.2	-3.7
19.97	0.10	32.47	1.77	12.50	1.42	9.8	16.7	-0.2	-3.7
20.97	0.12	33.52	2.25	12.55	1.57	11.3	-18.5	-38.0	-3.8
22.01	0.16	34.62	2.90	12.61	1.75	13.1	-18.2	-39.3	-3.8
23.01	0.20	35.66	3.68	12.65	1.95	14.9	-17.8	-40.5	-3.8
24.01	0.25	36.73	4.71	12.72	2.18	17.1	-18.0	-41.0	-3.8
25.00	0.32	37.77	5.99	12.77	2.44	19.4	-18.0	-42.7	-3.9
26.00	0.40	38.83	7.63	12.82	2.74	22.1	-17.7	-43.2	-3.9
27.00	0.50	39.86	9.68	12.86	3.08	24.9	-17.7	-44.2	-4.0
28.02	0.63	40.89	12.27	12.87	3.47	28.1	-17.7	-45.0	-4.0
29.02	0.80	41.85	15.31	12.83	3.89	31.3	-46.3	-49.3	-4.0
29.99	1.00	42.70	18.64	12.72	4.33	34.2	-19.0	-45.2	-4.0
31.00	1.26	43.52	22.50	12.52	4.80	37.3	-20.2	-24.7	-4.0
32.01	1.59	44.24	26.53	12.23	5.26	40.2	-21.5	-38.7	-3.9
33.00	2.00	44.84	30.46	11.83	5.70	42.6	-22.7	-41.3	-3.9
34.00	2.51	45.36	34.32	11.36	6.11	44.9	-24.5	-42.0	-3.7
34.98	3.15	45.78	37.81	10.79	6.47	46.7	-26.0	-41.2	-3.6
35.97	3.96	46.13	41.05	10.16	6.79	48.3	-27.5	-40.5	-3.5
36.99	5.00	46.43	43.93	9.44	7.08	49.7	-29.3	-40.0	-3.3
37.97	6.26	46.67	46.40	8.70	7.32	50.8	-30.8	-41.7	-3.2

@ f=350MHz

Pin [dBm]	Pin [W]	Po [dBm]	Po [W]	Gp [dB]	Idd [A]	η_d [%]	2fo [dBc]	3fo [dBc]	R.L. [-dB]
10.97	0.01	25.16	0.33	14.19	0.84	3.1	-25.8	-29.5	-7.0
11.99	0.02	26.21	0.42	14.22	0.88	3.7	-26.2	-31.2	-7.0
12.95	0.02	27.21	0.53	14.26	0.92	4.5	-24.5	-31.8	-7.0
14.01	0.03	28.25	0.67	14.24	0.98	5.4	-24.5	-32.8	-7.1
15.02	0.03	29.25	0.84	14.23	1.04	6.4	-21.8	-34.2	-7.1
16.02	0.04	30.27	1.07	14.25	1.12	7.5	-22.0	-34.7	-7.1
16.98	0.05	31.26	1.34	14.28	1.21	8.7	-21.0	-35.8	-7.2
17.98	0.06	32.29	1.69	14.31	1.32	10.1	-20.3	-37.3	-7.2
18.98	0.08	33.32	2.15	14.34	1.45	11.7	-20.3	-38.0	-7.2
19.98	0.10	34.35	2.73	14.37	1.60	13.5	-19.7	-38.2	-7.3
20.99	0.13	35.42	3.48	14.42	1.78	15.5	-19.3	-39.8	-7.4
21.98	0.16	36.44	4.40	14.45	1.98	17.6	-19.3	-40.0	-7.4
22.96	0.20	37.46	5.57	14.50	2.21	19.9	-19.2	-42.3	-7.5
24.01	0.25	38.55	7.16	14.54	2.49	22.8	-18.8	-43.5	-7.6
25.01	0.32	39.58	9.09	14.58	2.79	25.8	-19.0	-44.7	-7.7
26.01	0.40	40.61	11.50	14.60	3.13	29.1	-19.0	-44.7	-7.7
27.01	0.50	41.60	14.45	14.59	3.51	32.7	-19.2	-46.3	-7.8
28.01	0.63	42.53	17.89	14.52	3.94	36.1	-20.0	-42.7	-7.9
29.02	0.80	43.39	21.84	14.37	4.39	39.6	-20.8	-43.8	-8.0
30.02	1.00	44.14	25.96	14.13	4.84	42.7	-22.2	-41.5	-8.0
31.01	1.26	44.80	30.17	13.78	5.28	45.5	-23.8	-40.7	-7.8
32.03	1.60	45.36	34.32	13.33	5.69	48.1	-25.7	-40.8	-7.6
33.04	2.01	45.81	38.13	12.77	6.07	50.2	-27.5	-40.2	-7.4
34.02	2.53	46.18	41.48	12.16	6.39	51.9	-29.5	-39.5	-7.0
35.03	3.18	46.48	44.43	11.45	6.67	53.3	-31.8	-39.3	-6.7
36.03	4.01	46.72	47.04	10.69	6.92	54.4	-34.3	-38.3	-6.3
36.99	5.00	46.93	49.30	9.94	7.13	55.4	-37.2	-39.2	-6.0
37.99	6.30	47.11	51.38	9.12	7.32	56.2	-38.8	-40.3	-5.8

5-2-1. Pout vs. Pin characteristics data**Conditions : Vdd=12.5V, Idq=0.7A (Vgg=2.75V)****@ f=365MHz**

Pin [dBm]	Pin [W]	Po [dBm]	Po [W]	Gp [dB]	Idd [A]	η_d [%]	2fo [dBc]	3fo [dBc]	R.L. [-dB]
11.00	0.01	25.87	0.39	14.87	0.87	3.5	-24.3	-31.7	-14.3
12.00	0.02	26.88	0.49	14.89	0.91	4.2	-22.8	-32.5	-14.4
12.92	0.02	27.86	0.61	14.94	0.96	5.0	-22.0	-33.0	-14.4
13.97	0.02	28.89	0.77	14.92	1.02	6.0	-21.7	-35.2	-14.5
14.94	0.03	29.89	0.98	14.96	1.09	7.1	-20.8	-35.2	-14.6
15.95	0.04	30.92	1.23	14.96	1.18	8.3	-20.2	-36.0	-14.7
16.98	0.05	31.92	1.56	14.94	1.28	9.6	-19.7	-37.2	-14.8
18.02	0.06	32.99	1.99	14.97	1.40	11.2	-19.0	-38.8	-14.9
18.98	0.08	33.96	2.49	14.98	1.54	12.8	-18.7	-39.2	-15.1
19.99	0.10	35.00	3.17	15.01	1.70	14.7	-18.3	-40.8	-15.3
21.00	0.13	36.04	4.02	15.05	1.89	16.8	-18.2	-41.7	-15.4
22.00	0.16	37.06	5.08	15.07	2.11	19.1	-17.7	-42.5	-15.6
23.02	0.20	38.13	6.49	15.11	2.36	21.8	-17.7	-42.7	-15.8
24.00	0.25	39.13	8.19	15.13	2.64	24.6	-17.3	-44.3	-16.1
24.99	0.32	40.13	10.31	15.14	2.94	27.8	-17.2	-45.8	-16.3
26.00	0.40	41.14	13.00	15.14	3.30	31.2	-17.3	-44.8	-16.6
27.01	0.50	42.12	16.29	15.11	3.71	34.9	-17.7	-47.7	-17.0
28.01	0.63	43.00	19.94	14.99	4.14	38.3	-18.7	-27.2	-17.3
28.98	0.79	43.77	23.83	14.79	4.58	41.4	-20.0	-29.3	-17.5
30.00	1.00	44.49	28.09	14.49	5.03	44.5	-21.2	-49.8	-17.1
31.01	1.26	45.10	32.37	14.09	5.47	47.2	-23.0	-48.8	-16.3
31.99	1.58	45.59	36.20	13.60	5.86	49.3	-25.0	-38.7	-15.3
32.99	1.99	46.00	39.83	13.01	6.22	51.1	-27.2	-45.3	-14.1
33.99	2.51	46.33	43.00	12.35	6.53	52.6	-29.5	-47.5	-12.9
34.97	3.14	46.60	45.72	11.63	6.80	53.8	-32.0	-37.3	-11.8
36.00	3.98	46.83	48.22	10.83	7.03	54.9	-35.3	-47.2	-10.8
37.00	5.01	47.03	50.41	10.03	7.23	55.8	-38.5	-48.2	-10.0
37.98	6.28	47.19	52.36	9.21	7.42	56.5	-41.8	-47.7	-9.3

@ f=380MHz

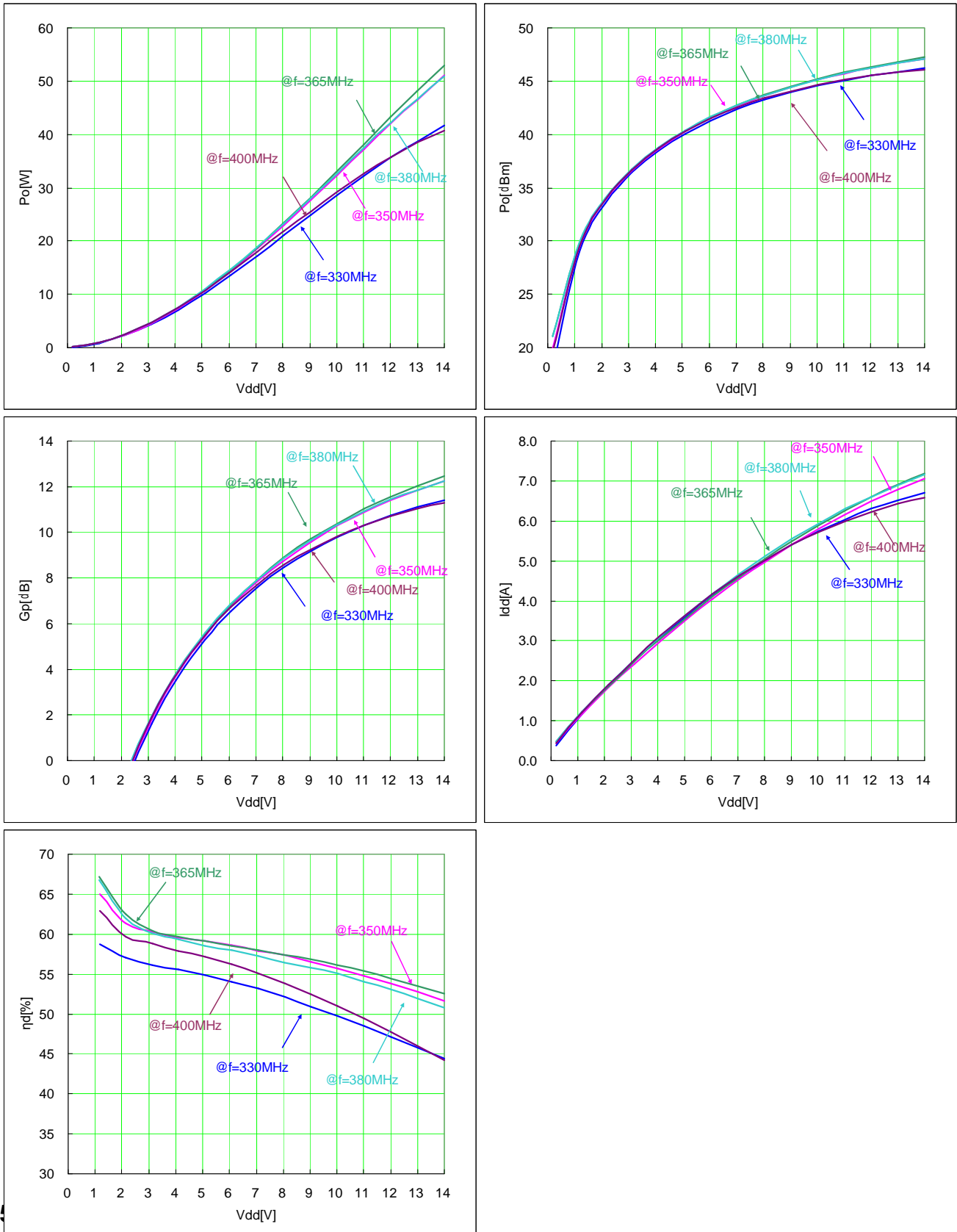
Pin [dBm]	Pin [W]	Po [dBm]	Po [W]	Gp [dB]	Idd [A]	η_d [%]	2fo [dBc]	3fo [dBc]	R.L. [-dB]
10.96	0.01	25.52	0.36	14.56	0.88	3.2	-7.7	-11.5	-16.7
11.97	0.02	26.55	0.45	14.58	0.92	3.9	-18.3	-32.3	-16.5
13.00	0.02	27.53	0.57	14.53	0.96	4.7	-18.2	-33.3	-16.6
13.99	0.03	28.55	0.72	14.56	1.02	5.5	-17.0	-34.0	-16.5
14.99	0.03	29.52	0.90	14.53	1.09	6.5	-16.2	-35.3	-16.4
16.01	0.04	30.55	1.13	14.54	1.16	7.7	-15.5	-35.7	-16.3
16.98	0.05	31.55	1.43	14.56	1.26	8.9	-15.2	-36.7	-16.2
18.00	0.06	32.58	1.81	14.58	1.38	10.4	-14.5	-38.2	-16.1
18.99	0.08	33.58	2.28	14.59	1.51	11.9	-14.2	-38.0	-16.0
19.97	0.10	34.58	2.87	14.61	1.66	13.7	-13.7	-38.7	-15.9
20.99	0.13	35.63	3.65	14.64	1.84	15.7	-13.2	-41.3	-15.9
21.99	0.16	36.64	4.62	14.65	2.05	17.8	-12.8	-41.7	-15.8
22.99	0.20	37.67	5.84	14.68	2.28	20.3	-12.7	-42.8	-15.7
23.99	0.25	38.70	7.41	14.70	2.56	22.9	-12.5	-43.8	-15.6
25.01	0.32	39.72	9.39	14.71	2.86	26.0	-12.7	-45.0	-15.5
26.00	0.40	40.71	11.78	14.71	3.20	29.2	-12.7	-46.5	-15.3
27.01	0.50	41.68	14.73	14.67	3.58	32.7	-13.0	-46.7	-15.1
28.00	0.63	42.57	18.05	14.57	3.99	35.9	-13.8	-46.7	-14.7
29.00	0.79	43.38	21.80	14.39	4.42	39.2	-14.5	-49.3	-14.1
30.01	1.00	44.13	25.91	14.12	4.88	42.3	-15.8	-49.3	-13.5
30.99	1.26	44.77	29.98	13.78	5.32	44.9	-17.0	-49.2	-12.8
32.00	1.59	45.33	34.13	13.33	5.75	47.4	-18.7	-50.8	-12.1
33.01	2.00	45.80	38.01	12.79	6.14	49.4	-20.5	-49.8	-11.4
33.99	2.51	46.18	41.46	12.18	6.49	51.1	-22.3	-49.8	-10.6
35.03	3.18	46.50	44.63	11.47	6.81	52.4	-24.7	-49.3	-9.9
35.98	3.96	46.74	47.20	10.76	7.06	53.5	-27.2	-49.8	-9.2
36.98	4.99	46.96	49.66	9.98	7.30	54.5	-29.8	-50.8	-8.5
38.01	6.33	47.15	51.93	9.14	7.51	55.4	-31.8	-48.7	-7.9

5-2-1. Pout vs. Pin characteristics data**Conditions : Vdd=12.5V, Idq=0.7A (Vgg=2.75V)****@ f=400MHz**

Pin [dBm]	Pin [W]	Po [dBm]	Po [W]	Gp [dB]	Idd [A]	η_d [%]	2fo [dBc]	3fo [dBc]	R.L. [-dB]
10.97	0.01	23.50	0.22	12.53	0.82	2.2	-30.0	-33.8	-6.7
11.94	0.02	24.50	0.28	12.56	0.85	2.6	-29.8	-35.3	-6.7
13.03	0.02	25.50	0.35	12.47	0.89	3.1	-27.7	-32.3	-6.7
13.97	0.02	26.50	0.45	12.53	0.93	3.8	-29.0	-32.7	-6.7
14.95	0.03	27.49	0.56	12.54	0.98	4.5	-27.2	-32.8	-6.6
16.01	0.04	28.52	0.71	12.50	1.04	5.4	-26.7	-35.0	-6.7
17.00	0.05	29.50	0.89	12.51	1.11	6.3	-28.0	-35.2	-6.6
17.99	0.06	30.49	1.12	12.50	1.20	7.4	-26.0	-35.8	-6.6
18.99	0.08	31.49	1.41	12.51	1.30	8.6	-25.7	-37.5	-6.6
20.01	0.10	32.53	1.79	12.52	1.43	9.9	-24.8	-38.8	-6.6
21.01	0.13	33.53	2.25	12.52	1.58	11.3	-24.3	-40.2	-6.6
22.00	0.16	34.53	2.84	12.53	1.74	12.9	-23.8	-40.3	-6.6
22.98	0.20	35.54	3.58	12.56	1.92	14.7	-23.5	-40.8	-6.5
23.99	0.25	36.57	4.54	12.58	2.14	16.8	-23.2	-43.3	-6.5
25.01	0.32	37.61	5.76	12.60	2.40	19.0	-23.2	-44.3	-6.5
25.99	0.40	38.60	7.25	12.61	2.68	21.4	-22.8	-44.5	-6.5
26.97	0.50	39.59	9.10	12.62	2.99	24.1	-23.2	-46.7	-6.5
28.02	0.63	40.63	11.55	12.61	3.36	27.3	-23.3	-45.7	-6.5
29.00	0.79	41.56	14.33	12.56	3.75	30.3	-23.3	-47.7	-6.4
30.00	1.00	42.45	17.60	12.45	4.17	33.5	-24.3	-49.3	-6.3
31.01	1.26	43.28	21.28	12.26	4.63	36.6	-25.0	-49.8	-6.2
32.02	1.59	44.02	25.25	12.00	5.09	39.5	-25.8	-49.3	-6.0
33.02	2.00	44.68	29.41	11.67	5.55	42.3	-26.8	-49.7	-5.8
34.00	2.51	45.26	33.57	11.26	5.98	44.8	-28.0	-51.0	-5.5
35.01	3.17	45.77	37.72	10.76	6.41	47.0	-29.7	-51.8	-5.3
36.01	3.99	46.19	41.63	10.18	6.79	49.0	-30.8	-52.5	-5.1
37.00	5.01	46.54	45.12	9.54	7.13	50.6	-32.2	-53.0	-4.8
37.96	6.25	46.83	48.21	8.87	7.44	51.9	-33.2	-53.5	-4.6

5-3. Pout vs. Vdd characteristics

@ $P_i=3W$ (=34.8dBm), $I_{dq}=0.7A$ ($V_{gg}=2.75V$), **f=330MHz**, **350MHz**, **365MHz**, **380MHz**, **400MHz**



5-3-1. Pout vs. Vdd characteristics data**Conditions : Pi=3W (=34.8dBm), Idq=0.7A (Vgg=2.67V)****@ f=330MHz**

Vdd [V]	Idq [A]	Po [dBm]	Po [W]	Gp [dB]	Idd [A]	η_d [%]	2fo [dBc]	3fo [dBc]	R.L. [-dB]
0.2	0.320	18.1	0.1	-16.7	0.38	0.0	-22.7	-28.2	-1.6
1.2	0.530	29.0	0.8	-5.8	1.17	58.7	-31.7	-32.8	-1.9
2.2	0.530	33.6	2.3	-1.2	1.86	57.1	-30.3	-37.0	-2.1
3.1	0.540	36.4	4.4	1.6	2.50	56.1	-33.8	-39.8	-2.3
4.1	0.570	38.5	7.0	3.7	3.09	55.5	-38.8	-41.0	-2.5
5.1	0.580	40.1	10.2	5.3	3.64	54.8	-43.0	-42.5	-2.6
6.1	0.610	41.3	13.6	6.5	4.15	54.0	-41.5	-44.3	-2.8
7.1	0.630	42.4	17.3	7.6	4.61	53.1	-38.3	-40.3	-3.0
8.1	0.650	43.2	21.1	8.5	5.03	52.1	-35.0	-40.7	-3.1
9.0	0.670	44.0	24.9	9.2	5.41	50.9	-32.0	-41.2	-3.3
10.0	0.700	44.6	28.6	9.8	5.74	49.7	-29.5	-40.7	-3.4
11.0	0.730	45.1	32.3	10.3	6.04	48.5	-28.0	-40.5	-3.5
12.0	0.760	45.5	35.6	10.7	6.30	47.1	-26.2	-40.5	-3.6
13.0	0.790	45.9	38.8	11.1	6.51	45.8	-25.0	-42.5	-3.6
14.0	0.820	46.2	41.7	11.4	6.71	44.4	-23.8	-41.5	-3.7

@ f=350MHz

Vdd [V]	Idq [A]	Po [dBm]	Po [W]	Gp [dB]	Idd [A]	η_d [%]	2fo [dBc]	3fo [dBc]	R.L. [-dB]
0.2	0.340	19.9	0.1	-14.9	0.43	0.0	-24.0	-29.2	-2.9
1.2	0.540	29.5	0.9	-5.4	1.17	65.0	-27.5	-34.0	-3.3
2.2	0.550	33.8	2.4	-1.0	1.83	61.3	-28.0	-38.2	-3.6
3.1	0.570	36.6	4.6	1.8	2.43	60.3	-31.0	-40.5	-4.0
4.1	0.590	38.7	7.4	3.9	3.01	59.5	-32.8	-40.2	-4.3
5.1	0.600	40.3	10.7	5.5	3.55	59.1	-35.3	-39.8	-4.6
6.1	0.620	41.6	14.5	6.8	4.06	58.6	-38.2	-38.7	-4.9
7.1	0.640	42.7	18.6	7.9	4.55	57.9	-38.5	-43.5	-5.3
8.1	0.650	43.6	23.1	8.8	5.00	57.3	3.7	-4.8	-5.5
9.0	0.680	44.4	27.7	9.6	5.42	56.5	-39.5	-43.8	-5.8
10.0	0.700	45.1	32.5	10.3	5.81	55.7	-38.5	-49.0	-6.1
11.0	0.730	45.7	37.2	10.9	6.17	54.8	-35.0	-39.0	-6.4
12.0	0.760	46.2	42.0	11.4	6.49	53.9	-32.3	-38.5	-6.6
13.0	0.800	46.7	46.5	11.8	6.79	52.7	-30.5	-39.2	-6.8
14.0	0.830	47.1	51.0	12.2	7.06	51.6	-28.7	-39.3	-7.0

@ f=365MHz

Vdd [V]	Idq [A]	Po [dBm]	Po [W]	Gp [dB]	Idd [A]	η_d [%]	2fo [dBc]	3fo [dBc]	R.L. [-dB]
0.2	0.340	21.1	0.1	-13.7	0.47	0.0	-23.7	-26.2	-4.4
1.2	0.550	29.8	1.0	-5.0	1.22	67.2	-23.8	-34.5	-4.9
2.2	0.560	34.0	2.5	-0.8	1.86	62.5	-26.3	-38.8	-5.5
3.1	0.570	36.7	4.7	1.9	2.48	60.4	-28.2	-40.8	-6.1
4.1	0.590	38.7	7.5	4.0	3.05	59.7	-29.2	-42.0	-6.7
5.1	0.610	40.4	10.9	5.5	3.60	59.1	-30.8	-45.8	-7.2
6.1	0.630	41.7	14.6	6.8	4.12	58.5	-34.2	-45.8	-7.8
7.1	0.640	42.8	18.9	7.9	4.60	58.0	-37.3	-46.8	-8.5
8.1	0.660	43.7	23.4	8.9	5.07	57.3	-45.0	-45.7	-9.1
9.0	0.680	44.5	28.2	9.7	5.49	56.8	-45.5	-50.3	-9.8
10.0	0.710	45.2	33.2	10.4	5.90	56.1	-40.7	-47.5	-10.4
11.0	0.730	45.8	38.2	11.0	6.26	55.3	-36.8	-50.3	-11.1
12.0	0.760	46.4	43.2	11.6	6.61	54.4	-33.0	-46.5	-11.7
13.0	0.790	46.8	48.1	12.0	6.92	53.5	-30.7	-48.2	-12.3
14.0	0.830	47.2	52.9	12.4	7.19	52.6	-28.5	-46.0	-12.9

5-3-1. Pout vs. Vdd characteristics data**Conditions: Vdd=12.5V, Idq=0.7A (Vgg=2.75V)**@ **f=380MHz**

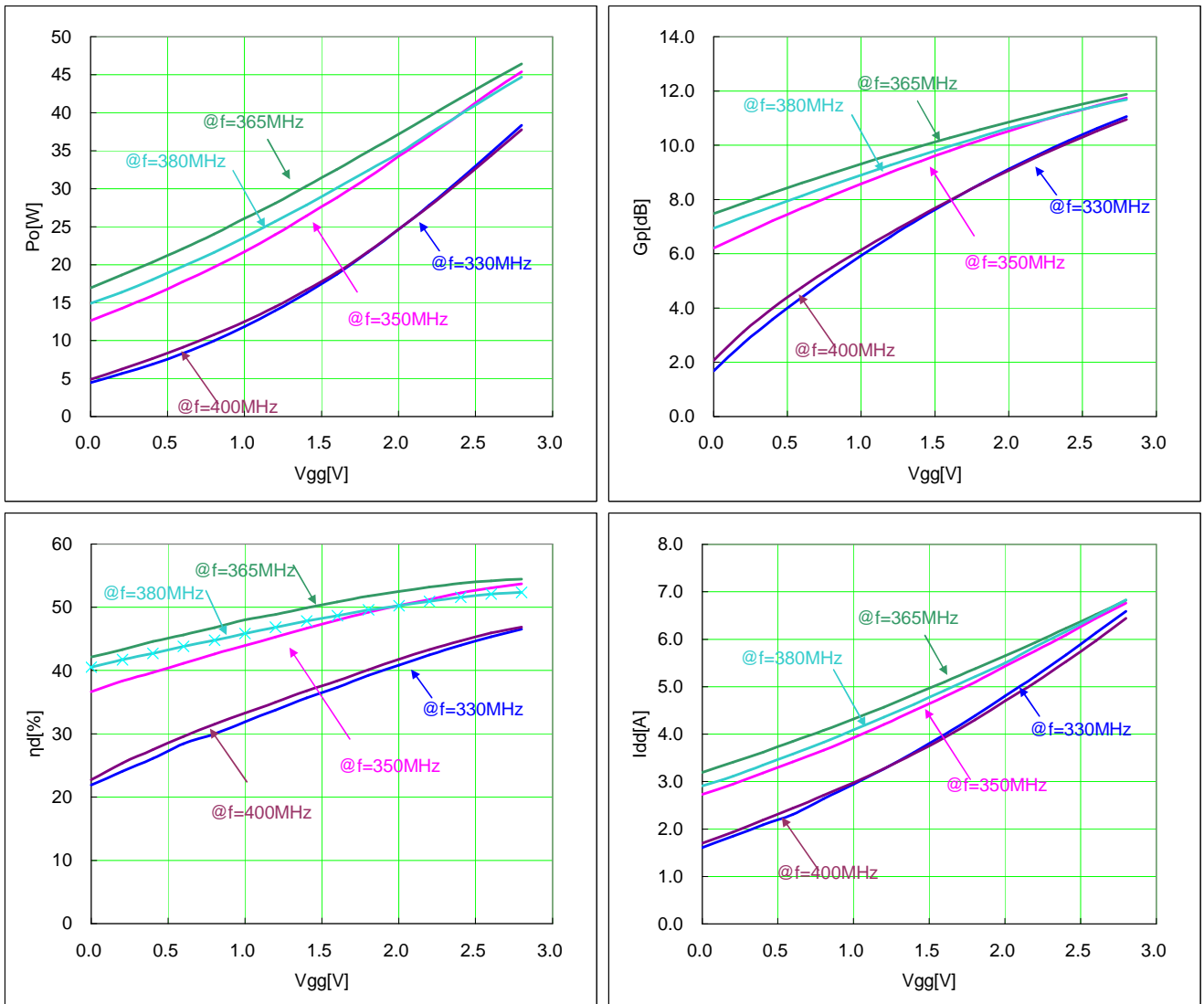
Vdd [V]	Idq [A]	Po [dBm]	Po [W]	Gp [dB]	Idd [A]	η_d [%]	2fo [dBc]	3fo [dBc]	R.L. [-dB]
0.2	0.320	21.0	0.1	-13.8	0.48	0.0	-18.3	-26.2	-3.6
1.2	0.540	29.8	1.0	-5.0	1.24	66.7	-20.2	-35.5	-4.2
2.2	0.540	34.1	2.5	-0.8	1.91	61.9	-21.8	-39.5	-4.7
3.1	0.560	36.8	4.7	2.0	2.53	60.1	-23.2	-42.0	-5.2
4.1	0.570	38.8	7.6	4.0	3.11	59.3	-25.5	-44.7	-5.7
5.1	0.590	40.4	10.9	5.6	3.67	58.5	-28.5	-46.0	-6.3
6.1	0.610	41.7	14.7	6.9	4.18	58.0	-32.3	-46.8	-6.8
7.1	0.630	42.8	18.9	7.9	4.67	57.3	-38.7	-47.7	-7.3
8.1	0.660	43.7	23.4	8.9	5.14	56.5	-49.0	-52.2	-7.9
9.0	0.680	44.5	28.0	9.6	5.55	55.8	-36.5	-48.7	-8.4
10.0	0.710	45.2	32.8	10.3	5.94	55.0	-30.7	-50.0	-8.9
11.0	0.730	45.7	37.5	10.9	6.30	54.1	-28.0	-50.2	-9.4
12.0	0.760	46.2	42.1	11.4	6.61	53.1	-25.0	-48.7	-9.9
13.0	0.800	46.7	46.6	11.9	6.90	52.0	-23.3	-50.8	-10.3
14.0	0.830	47.1	50.9	12.2	7.16	50.8	-21.8	-51.7	-10.7

@ **f=400MHz**

Vdd [V]	Idq [A]	Po [dBm]	Po [W]	Gp [dB]	Idd [A]	η_d [%]	2fo [dBc]	3fo [dBc]	R.L. [-dB]
0.2	0.340	19.6	0.1	-15.2	0.43	0.0	-25.0	-30.3	-2.1
1.2	0.550	29.5	0.9	-5.3	1.21	62.9	-33.7	-35.3	-2.4
2.2	0.560	33.9	2.5	-0.9	1.91	59.7	-39.5	-40.3	-2.7
3.1	0.580	36.7	4.6	1.9	2.53	58.8	-40.0	-42.5	-3.1
4.1	0.590	38.7	7.4	3.9	3.13	57.9	-42.3	-45.2	-3.4
5.1	0.610	40.3	10.7	5.5	3.67	57.2	-43.2	-46.0	-3.7
6.1	0.620	41.5	14.2	6.7	4.17	56.2	-41.5	-47.8	-4.0
7.1	0.640	42.6	18.0	7.7	4.63	55.0	-39.2	-48.8	-4.3
8.1	0.660	43.4	21.9	8.6	5.04	53.9	-36.8	-49.5	-4.5
9.0	0.690	44.1	25.6	9.3	5.40	52.5	-33.8	-50.3	-4.8
10.0	0.710	44.7	29.3	9.8	5.72	51.0	-32.2	-51.0	-5.0
11.0	0.740	45.1	32.7	10.3	6.00	49.4	-30.5	-51.8	-5.2
12.0	0.770	45.5	35.7	10.7	6.22	47.7	-29.7	-51.8	-5.3
13.0	0.800	45.9	38.5	11.0	6.43	46.0	-28.5	-51.8	-5.5
14.0	0.840	46.1	40.8	11.3	6.58	44.3	-27.8	-51.7	-5.6

5-4. Pout vs. Vgg characteristics

@ Vdd=12.5V, Pi=3W (=34.8dBm), f=330MHz, 350MHz, 365MHz, 380MHz, 400MHz



5-4-1. Pout vs. Vgg characteristics data

Conditions : Vdd=12.5V, Pi=3W (=34.8dBm)

@ **f=330MHz**

Vgg [V]	Idq [A]	Po [dBm]	Po [W]	Gp [dB]	Idd [A]	η_d [%]	2fo [dBc]	3fo [dBc]	R.L. [-dB]
0.00	0.000	36.49	4.46	1.68	1.61	21.9	-8.8	-39.5	-2.2
0.20	0.000	37.51	5.63	2.71	1.85	24.1	-9.3	-38.3	-2.3
0.40	0.000	38.39	6.90	3.59	2.09	26.1	-10.0	-39.8	-2.4
0.60	0.000	39.19	8.30	4.40	2.31	28.4	-10.5	-40.2	-2.5
0.80	0.010	40.00	9.99	5.20	2.64	30.0	-11.3	-42.5	-2.6
1.00	0.000	40.74	11.87	5.93	2.95	31.9	-12.2	-43.0	-2.7
1.20	0.000	41.44	13.92	6.64	3.27	33.8	-12.8	-41.7	-2.8
1.40	0.000	42.11	16.26	7.32	3.62	35.7	-14.0	-41.8	-2.9
1.60	0.010	42.73	18.75	7.94	3.99	37.3	-14.8	-42.0	-3.1
1.80	0.010	43.36	21.66	8.55	4.39	39.2	-16.3	-41.2	-3.2
2.00	0.000	43.91	24.63	9.12	4.80	40.9	-17.7	-40.0	-3.3
2.20	0.010	44.44	27.81	9.65	5.22	42.5	-19.2	-40.0	-3.4
2.40	0.080	44.95	31.28	10.17	5.67	44.0	-21.0	-40.7	-3.5
2.60	0.350	45.41	34.79	10.63	6.13	45.3	-23.3	-40.7	-3.7
2.80	1.690	45.84	38.33	11.06	6.59	46.5	-25.8	-41.2	-3.8

@ **f=350MHz**

Vgg [V]	Idq [A]	Po [dBm]	Po [W]	Gp [dB]	Idd [A]	η_d [%]	2fo [dBc]	3fo [dBc]	R.L. [-dB]
0.00	0.000	41.01	12.63	6.21	2.73	36.7	-12.0	-40.0	-4.9
0.20	0.000	41.54	14.27	6.73	2.95	38.3	-12.7	-39.2	-5.1
0.40	0.000	42.02	15.92	7.22	3.18	39.7	-13.3	-41.0	-5.2
0.60	0.000	42.49	17.73	7.68	3.42	41.1	-14.0	-39.8	-5.4
0.80	0.000	42.93	19.65	8.15	3.66	42.6	-14.8	-38.8	-5.5
1.00	0.010	43.37	21.73	8.58	3.93	43.9	-15.5	-40.0	-5.7
1.20	0.000	43.79	23.93	9.00	4.20	45.3	-16.5	-40.5	-5.9
1.40	0.000	44.22	26.42	9.41	4.50	46.7	-17.7	-40.0	-6.0
1.60	0.000	44.60	28.86	9.80	4.79	48.0	-18.8	-39.2	-6.2
1.80	0.000	44.98	31.50	10.18	5.10	49.2	-20.2	-38.8	-6.4
2.00	0.000	45.35	34.26	10.53	5.43	50.3	-21.5	-38.8	-6.5
2.20	0.010	45.67	36.91	10.87	5.75	51.2	-23.3	-38.8	-6.7
2.40	0.070	46.01	39.86	11.19	6.09	52.3	-25.7	-38.5	-6.8
2.60	0.340	46.31	42.75	11.47	6.44	53.0	-28.2	-39.0	-7.0
2.80	1.420	46.57	45.40	11.74	6.76	53.7	-32.0	-39.0	-7.1

@ **f=365MHz**

Vgg [V]	Idq [A]	Po [dBm]	Po [W]	Gp [dB]	Idd [A]	η_d [%]	2fo [dBc]	3fo [dBc]	R.L. [-dB]
0.00	0.000	42.29	16.95	7.48	3.19	42.1	-11.7	-46.5	-8.3
0.20	0.010	42.70	18.62	7.87	3.41	43.3	-12.5	-46.8	-8.6
0.40	0.010	43.08	20.34	8.25	3.62	44.6	-13.2	-47.3	-8.8
0.60	0.000	43.45	22.11	8.61	3.85	45.6	-14.0	-48.2	-9.1
0.80	0.010	43.81	24.03	8.97	4.08	46.8	-14.7	-48.8	-9.4
1.00	0.000	44.16	26.09	9.31	4.32	48.0	-15.5	-47.8	-9.6
1.20	0.000	44.48	28.06	9.65	4.57	48.9	-16.3	-47.3	-9.9
1.40	0.000	44.82	30.33	9.97	4.84	49.9	-17.3	-45.7	-10.2
1.60	0.000	45.13	32.56	10.28	5.10	50.9	-18.5	-46.2	-10.5
1.80	0.000	45.43	34.92	10.57	5.38	51.8	-19.7	-46.8	-10.9
2.00	0.010	45.70	37.18	10.86	5.65	52.5	-21.3	-47.8	-11.2
2.20	0.010	45.97	39.51	11.13	5.93	53.2	-23.0	-46.5	-11.5
2.40	0.080	46.23	41.94	11.40	6.23	53.8	-25.3	-46.3	-11.9
2.60	0.350	46.45	44.20	11.64	6.52	54.2	-28.3	-44.7	-12.2
2.80	1.010	46.67	46.42	11.88	6.82	54.4	-32.2	-45.8	-12.6

5-4-1. Pout vs. Vgg characteristics data

Conditions : Vdd=12.5V, Pi=3W (=34.8dBm)

@ **f=380MHz**

Vgg [V]	Idq [A]	Po [dBm]	Po [W]	Gp [dB]	Idd [A]	η_d [%]	2fo [dBc]	3fo [dBc]	R.L. [-dB]
0.00	0.010	41.73	14.89	6.94	2.91	40.5	-6.0	-47.2	-6.8
0.20	0.000	42.14	16.37	7.36	3.11	41.7	-6.7	-46.3	-7.1
0.40	0.010	42.56	18.04	7.75	3.35	42.7	-7.3	-47.0	-7.3
0.60	0.000	42.96	19.77	8.14	3.58	43.8	-8.3	-48.2	-7.5
0.80	0.010	43.35	21.61	8.54	3.83	44.8	-8.8	-47.7	-7.8
1.00	0.000	43.73	23.59	8.91	4.09	45.8	-9.7	-48.7	-8.0
1.20	0.000	44.10	25.69	9.27	4.36	46.8	-10.5	-48.7	-8.3
1.40	0.000	44.45	27.84	9.63	4.63	47.8	-11.7	-49.2	-8.5
1.60	0.010	44.78	30.09	9.97	4.92	48.7	-12.7	-49.7	-8.8
1.80	0.000	45.11	32.42	10.30	5.21	49.6	-13.8	-50.7	-9.0
2.00	0.000	45.40	34.67	10.63	5.50	50.2	-15.3	-50.7	-9.3
2.20	0.010	45.71	37.28	10.90	5.84	50.9	-16.8	-48.8	-9.5
2.40	0.070	46.00	39.80	11.20	6.16	51.6	-18.8	-51.3	-9.8
2.60	0.340	46.26	42.31	11.46	6.49	52.1	-21.7	-50.5	-10.0
2.80	1.020	46.50	44.72	11.69	6.83	52.3	-25.2	-46.5	-10.2

@ **f=400MHz**

Vgg [V]	Idq [A]	Po [dBm]	Po [W]	Gp [dB]	Idd [A]	η_d [%]	2fo [dBc]	3fo [dBc]	R.L. [-dB]
0.00	0.000	36.89	4.89	2.07	1.70	22.7	-13.8	-43.2	-3.4
0.20	0.010	37.94	6.23	3.13	1.94	25.4	-14.5	-44.0	-3.6
0.40	0.000	38.81	7.61	4.00	2.19	27.5	-15.0	-45.2	-3.7
0.60	0.000	39.60	9.12	4.78	2.44	29.6	-15.8	-45.2	-3.9
0.80	0.010	40.33	10.79	5.50	2.71	31.5	-16.2	-46.0	-4.0
1.00	0.000	40.97	12.51	6.15	2.98	33.3	-17.3	-46.3	-4.0
1.20	0.000	41.59	14.42	6.77	3.27	35.0	-18.2	-47.2	-4.2
1.40	0.000	42.21	16.65	7.39	3.59	36.8	-19.0	-48.2	-4.3
1.60	0.000	42.78	18.97	7.97	3.93	38.3	-19.8	-48.0	-4.5
1.80	0.000	43.37	21.71	8.55	4.30	40.1	-21.0	-49.2	-4.7
2.00	0.000	43.92	24.68	9.08	4.70	41.8	-22.2	-49.8	-4.8
2.20	0.010	44.42	27.68	9.59	5.09	43.3	-23.7	-49.5	-5.0
2.40	0.070	44.92	31.02	10.08	5.53	44.7	-25.3	-50.5	-5.2
2.60	0.350	45.36	34.35	10.53	5.97	45.9	-27.0	-50.5	-5.4
2.80	1.020	45.77	37.79	10.95	6.44	46.9	-29.8	-51.3	-5.5