

APPLICATION NOTE



RF POWER SEMICONDUCTORS

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(Taking charge of Silicon RF by
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SUBJECT: RD01MUS1 & RD07MVS1 2Stage amplifier RF characteristics data at 800MHz Band.

SUMMARY:

This application note show the RF Wide band characteristics data

(Po vs. Frequency characteristics, Pin-Po and Bias characteristics) at 800MHz Band.

- Sample history :
 - RD07MVS1: Lot number "031AA"
 - RD01MUS1: Lot number "291"

- Evaluate conditions :
 - RD07MVS1 @f=740-870MHz : Vdd=7.2V, Idq=0.75A (Vgg=3.5V)
 - RD01MUS1 @f=740-870MHz : Vdd=7.2V, Idq=100mA (Vgg=3.5V)

- Results :
 - Page 2 shows the typical RF characteristics (Po vs. Frequency characteristics) data.
 - Page 3-4 shows the typical RF characteristics (Pin-Po characteristics) data.
 - Page 4 shows the typical RF characteristics (Po and Idd vs Vdd characteristics) data.
 - Page 5 shows the typical RF characteristics (Po and Idd vs Vgg characteristics) data.
 - Page 6 shows the Equivalent Circuit.

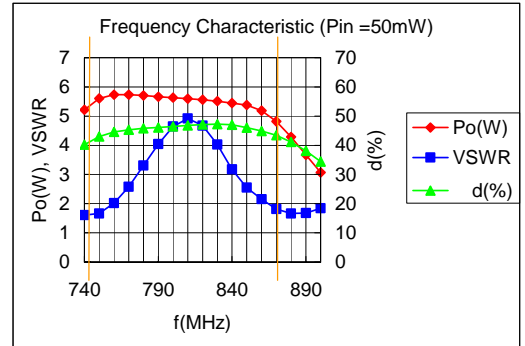
RD01MUS1 & RD07MVS1 2Stage amplifier RF characteristics data

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RD01MUS1 RD07MVS1 2Stage amplifier Matching Circuit's Frequency Characteristics f=740-870MHz

1 Conditions: Pin=50mW, Vdd=7.2V, Vgg=3.5V, Idq=850mA

f(MHz)	Pin(W)	Po(W)	Gp(dB)	Idd(A)	d(%)	R.L(dB)	VSWR (-)	Harmonics 2fo(dBc)	Harmonics 3fo(dBc)
740	0.050	5.21	20.20	1.802	40.17	-12.65	1.61	-52.07	<-60
750	0.050	5.60	20.51	1.809	42.99	-12.10	1.66	-55.06	<-60
760	0.050	5.73	20.56	1.787	44.55	-9.45	2.02	-56.09	<-60
770	0.050	5.73	20.60	1.758	45.26	-7.11	2.58	-54.85	<-60
780	0.050	5.70	20.58	1.730	45.77	-5.43	3.30	-52.65	<-60
790	0.050	5.66	20.54	1.706	46.11	-4.39	4.04	-53.10	<-60
800	0.050	5.63	20.50	1.682	46.48	-3.80	4.65	-53.29	<-60
810	0.050	5.59	20.52	1.659	46.84	-3.58	4.92	-53.93	-53.08
820	0.050	5.56	20.46	1.639	47.11	-3.78	4.67	<-60	-53.79
830	0.050	5.51	20.45	1.619	47.28	-4.41	4.02	<-60	<-60
840	0.050	5.45	20.37	1.608	47.03	-5.66	3.18	<-60	<-60
850	0.050	5.38	20.35	1.624	46.02	-7.19	2.55	-50.30	<-60
860	0.050	5.19	20.15	1.605	44.90	-8.74	2.15	-45.11	<-60
870	0.050	4.82	19.85	1.542	43.41	-10.75	1.82	-44.63	<-60
880	0.050	4.28	19.33	1.447	41.11	-12.09	1.66	-46.65	<-60
890	0.050	3.67	18.67	1.339	38.09	-11.95	1.68	-49.63	<-60
900	0.050	3.07	17.87	1.237	34.43	-10.57	1.84	-50.19	<-60



note: part of hatching show out of target

min 4.82 19.85 1.54 40.17 -12.65 1.61
max 5.73 20.60 1.81 47.28 -3.58 4.92

Vgg= 3.50 V Vdd= 7.20 V
Idq= 850 mA

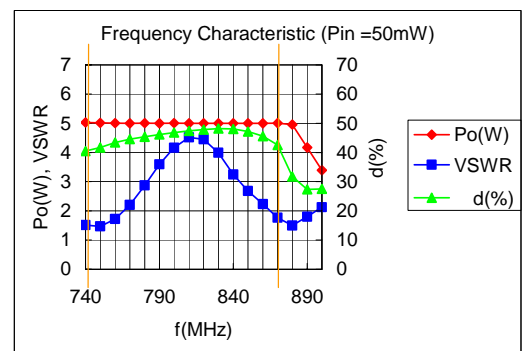
2 Conditions: Po=5W constant, Vgg adjustment, Vdd=7.2V

f(MHz)	Pin(W)	Po(W)	Gp(dB)	Idd(A)	d(%)	R.L(dB)	VSWR (-)	Harmonics 2fo(dBc)	Harmonics 3fo(dBc)	Vgg (V)	Vgs1 (V)	Vgs2 (V)
740	0.057	5.03	19.43	1.725	40.48	-13.81	1.51	-51.49	<-60	3.36	2.63	2.37
750	0.050	5.01	19.99	1.670	41.70	-14.46	1.47	-51.53	<-60	3.35	2.62	2.36
760	0.050	5.00	19.98	1.602	43.39	-11.53	1.72	-52.24	<-60	3.25	2.54	2.29
770	0.050	5.00	19.99	1.559	44.55	-8.51	2.20	-52.60	<-60	3.22	2.52	2.27
780	0.050	5.00	20.02	1.530	45.41	-6.31	2.87	-50.41	<-60	3.20	2.51	2.26
790	0.050	5.00	19.99	1.504	46.14	-4.97	3.59	-50.29	<-60	3.20	2.51	2.26
800	0.050	5.00	20.01	1.485	46.80	-4.26	4.16	-49.73	<-60	3.22	2.52	2.27
810	0.050	5.00	20.00	1.466	47.37	-3.91	4.51	-48.94	-53.39	3.23	2.53	2.28
820	0.050	5.00	20.00	1.451	47.83	-3.97	4.45	-49.28	<-60	3.25	2.54	2.29
830	0.050	5.00	19.99	1.442	48.15	-4.45	3.99	-49.76	<-60	3.27	2.56	2.31
840	0.050	5.00	20.00	1.444	48.05	-5.53	3.25	-50.38	<-60	3.29	2.58	2.32
850	0.050	4.99	19.99	1.471	47.16	-6.82	2.68	-51.48	<-60	3.30	2.58	2.33
860	0.050	5.00	19.99	1.524	45.57	-8.36	2.24	-47.05	<-60	3.40	2.66	2.40
870	0.050	5.00	20.03	1.633	42.55	-11.16	1.77	-43.24	<-60	3.62	2.83	2.56
880	0.050	4.96	19.96	2.168	31.75	-13.98	1.50	-40.61	<-60	4.31	3.38	3.05
890	0.050	4.17	19.22	2.115	27.37	-10.86	1.80	-43.38	<-60	4.27	3.34	3.01
900	0.050	3.40	18.32	1.716	27.48	-8.89	2.12	-47.12	<-60	3.95	3.09	2.79

note: part of hatching show out of target

min 4.99 19.43 1.44 40.48 -14.46 1.47
max 5.03 20.03 1.73 48.15 -3.91 4.51

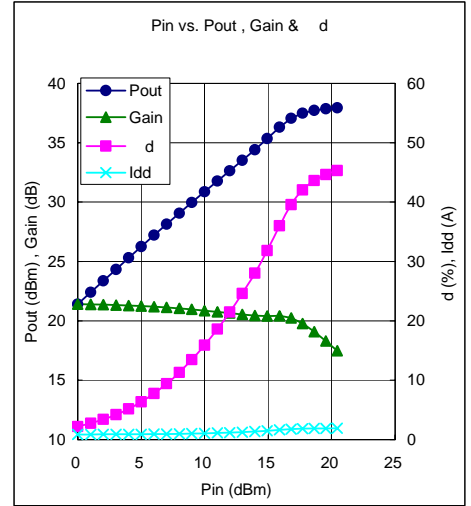
Vgg= 3 ~ 4.3 V Vdd= 7.20 V
Idq= 850 mA



RD01MUS1& RD07MVS1 2Stage amplifier Pin-Po characteristics

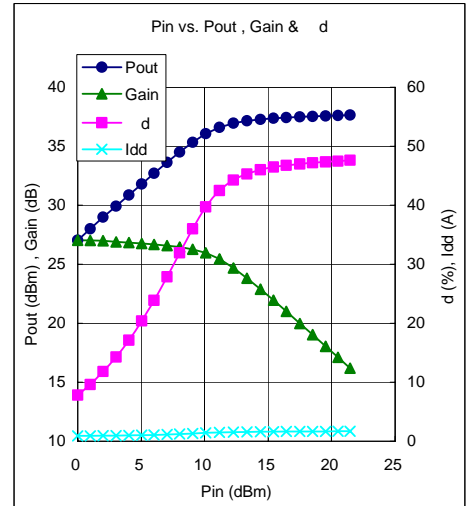
1. f= 740 MHz Idq= 0.834 A
Vdd= 7.2 V Vgg= 3.5 V

Pin		Pout		Idd (A)	d (%)	Gain (dB)	R.L. (dB)	Harmonics 2fo(dBc)	Harmonics 3fo(dBc)
(dBm)	(W)	(dBm)	(W)						
0.00	0.001	21.40	0.14	0.879	2.18	21.40	-13.25	<-60	<-60
1.02	0.000	22.40	0.17	0.883	2.74	21.38	-13.94	<-60	<-60
2.01	0.002	23.37	0.22	0.888	3.40	21.36	-14.19	<-60	<-60
3.02	0.002	24.34	0.27	0.896	4.21	21.32	-14.32	<-60	<-60
4.02	0.003	25.31	0.34	0.907	5.20	21.29	-14.43	<-60	<-60
5.00	0.003	26.25	0.42	0.920	6.37	21.25	-14.58	<-60	<-60
6.02	0.004	27.21	0.53	0.938	7.79	21.20	-14.76	<-60	<-60
7.01	0.005	28.14	0.65	0.960	9.43	21.13	-14.91	<-60	<-60
8.01	0.006	29.06	0.81	0.988	11.32	21.05	-15.06	<-60	<-60
8.99	0.008	29.96	0.99	1.022	13.47	20.97	-15.19	<-60	<-60
10.00	0.010	30.87	1.22	1.066	15.92	20.87	-15.39	<-60	<-60
11.00	0.013	31.76	1.50	1.120	18.62	20.77	-15.56	<-60	<-60
11.99	0.016	32.64	1.84	1.187	21.48	20.65	-14.94	-50.98	<-60
12.97	0.020	33.52	2.25	1.268	24.64	20.55	-15.71	-50.63	<-60
13.96	0.025	34.41	2.76	1.367	28.02	20.45	-15.27	-50.82	<-60
14.94	0.031	35.34	3.42	1.492	31.84	20.40	-15.39	-51.66	<-60
15.90	0.039	36.32	4.28	1.653	35.99	20.42	-15.22	-51.51	<-60
16.81	0.048	37.06	5.08	1.781	39.60	20.24	-13.74	-52.91	<-60
17.71	0.059	37.48	5.60	1.850	42.06	19.77	-12.07	-54.2	<-60
18.63	0.073	37.72	5.91	1.882	43.63	19.09	-10.93	-54.66	<-60
19.55	0.090	37.86	6.10	1.898	44.66	18.30	-10.13	-55.63	<-60
20.46	0.111	37.94	6.23	1.909	45.32	17.49	-9.48	-55.68	<-60



2. f= 810 MHz Idq= 0.834 A
Vdd= 7.2 V Vgg= 3.5 V

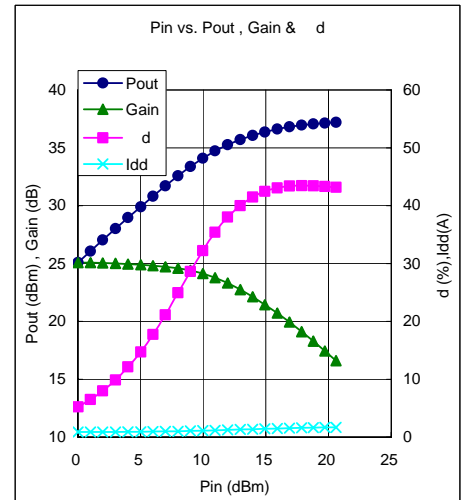
Pin		Pout		Idd (A)	d (%)	Gain (dB)	R.L. (dB)	Harmonics 2fo(dBc)	Harmonics 3fo(dBc)
(dBm)	(W)	(dBm)	(W)						
0.00	0.001	27.03	0.50	0.896	7.82	27.03	-9.54	<-60	<-60
0.98	0.000	28.00	0.63	0.912	9.61	27.02	-10.31	<-60	<-60
2.00	0.002	28.99	0.79	0.932	11.80	26.99	-10.43	<-60	<-60
3.03	0.002	29.93	0.98	0.958	14.26	26.90	-10.62	<-60	<-60
4.03	0.003	30.86	1.22	0.990	17.12	26.84	-10.61	<-60	<-60
5.04	0.003	31.80	1.52	1.032	20.39	26.77	-10.60	-49.51	<-60
6.01	0.004	32.70	1.86	1.082	23.89	26.69	-9.57	-49.8	<-60
7.05	0.005	33.63	2.31	1.149	27.88	26.58	-9.47	-49.77	<-60
8.04	0.006	34.50	2.82	1.226	31.93	26.46	-9.29	-48.77	<-60
9.06	0.008	35.33	3.41	1.315	36.02	26.27	-9.01	-49.26	<-60
10.09	0.010	36.06	4.04	1.412	39.72	25.97	-8.40	-50.27	<-60
11.16	0.013	36.61	4.58	1.498	42.48	25.45	-7.38	-50.61	<-60
12.27	0.017	36.95	4.96	1.555	44.26	24.68	-6.26	-51.72	-53.36
13.34	0.022	37.15	5.19	1.591	45.29	23.81	-5.43	-52.45	-54.44
14.39	0.027	37.28	5.35	1.614	46.00	22.89	-4.81	-52.32	-54.23
15.42	0.035	37.37	5.46	1.631	46.46	21.95	-4.33	-52.66	-53.48
16.43	0.044	37.44	5.54	1.646	46.75	21.01	-3.93	-53.66	-54.25
17.50	0.056	37.49	5.61	1.659	46.98	19.99	-3.60	-53.91	-53.8
18.50	0.071	37.54	5.67	1.669	47.18	19.03	-3.33	-53.75	-53.37
19.52	0.090	37.58	5.72	1.678	47.36	18.05	-3.10	-54.2	-53.42
20.50	0.112	37.61	5.77	1.688	47.49	17.11	-2.90	-54.54	-52.98
21.45	0.140	37.65	5.82	1.697	47.63	16.20	-2.72	-54.53	-53.42



RD01MUS1 RD07MVS1 Pin-Po characteristics

3. f= 870 MHz Idq= 0.834 A
 Vdd= 7.2 V Vgg= 3.5 V

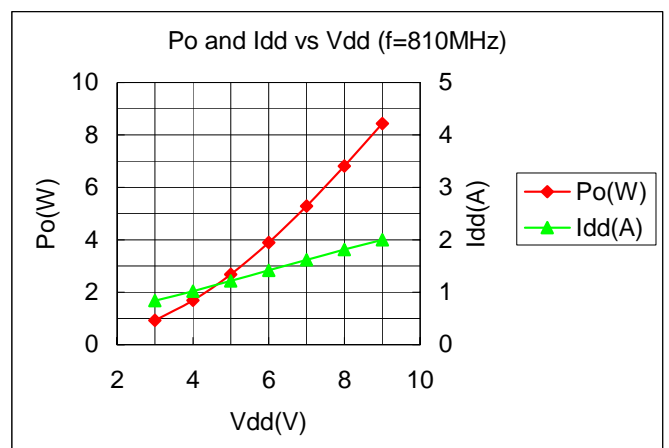
Pin		Pout		Idd (A)	d (%)	Gain (dB)	R.L. (dB)	Harmonics 2fo(dBc)	Harmonics 3fo(dBc)
(dBm)	(W)	(dBm)	(W)						
0.01	0.001	25.09	0.32	0.862	5.20	25.07	-11.21	<-60	<-60
1.00	0.000	26.07	0.40	0.868	6.47	25.06	-12.06	<-60	<-60
1.98	0.002	27.04	0.51	0.878	8.00	25.06	-12.26	<-60	<-60
3.01	0.002	28.01	0.63	0.890	9.87	25.01	-12.35	<-60	<-60
4.00	0.003	28.96	0.79	0.903	12.11	24.96	-12.33	<-60	<-60
5.02	0.003	29.90	0.98	0.922	14.72	24.88	-12.40	<-60	<-60
6.00	0.004	30.82	1.21	0.945	17.75	24.82	-12.41	<-60	<-60
6.99	0.005	31.71	1.48	0.975	21.13	24.72	-12.42	<-60	<-60
7.99	0.006	32.58	1.81	1.010	24.91	24.59	-11.41	-49.24	<-60
8.98	0.008	33.38	2.18	1.056	28.64	24.41	-11.40	<-60	<-60
9.97	0.010	34.10	2.57	1.108	32.23	24.13	-11.36	<-60	<-60
10.95	0.012	34.73	2.97	1.166	35.39	23.78	-11.32	<-60	<-60
11.95	0.016	35.26	3.36	1.228	38.02	23.31	-11.26	<-60	<-60
12.97	0.020	35.71	3.72	1.293	40.00	22.74	-11.20	-51.89	<-60
13.95	0.025	36.07	4.04	1.355	41.46	22.12	-11.12	-50.03	<-60
14.93	0.031	36.37	4.33	1.418	42.45	21.44	-11.08	-48.29	<-60
15.91	0.039	36.62	4.59	1.480	43.04	20.71	-11.06	-46.37	<-60
16.88	0.049	36.81	4.80	1.537	43.39	19.94	-10.98	-45	<-60
17.85	0.061	36.96	4.97	1.587	43.46	19.11	-10.80	-44.15	<-60
18.78	0.076	37.07	5.09	1.627	43.43	18.28	-10.48	-43.43	<-60
19.70	0.093	37.14	5.18	1.661	43.32	17.44	-10.09	-43.03	<-60
20.60	0.115	37.20	5.25	1.689	43.19	16.61	-9.65	-42.76	<-60



RD01MUS1 & RD07MVS1 2Stage amplifier Matching circuit's Po and Idd vs Vdd characteristics

Conditions: f=810MHz, Pin=50mW, Vdd=7.2V, Vgg=3.5V, Idq=850mA (Initial)

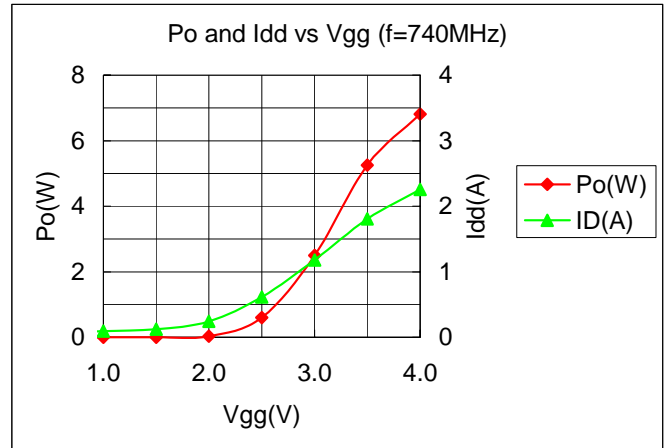
Vdd(V)	Pin(W)	Po(W)	Gp(dB)	Idd(A)	d(%)
3.0	0.050	0.93	12.68	0.840	36.83
4.0	0.049	1.69	15.34	1.020	41.48
5.0	0.050	2.68	17.29	1.215	44.09
6.0	0.050	3.90	18.88	1.419	45.77
7.0	0.050	5.29	20.27	1.619	46.64
8.0	0.050	6.82	21.35	1.814	46.99
9.0	0.050	8.44	22.26	2.000	46.88



RD01MUS1 & RD07MVS1 2Stage amplifier Matching circuit's Po and Idd vs Vgg characteristics

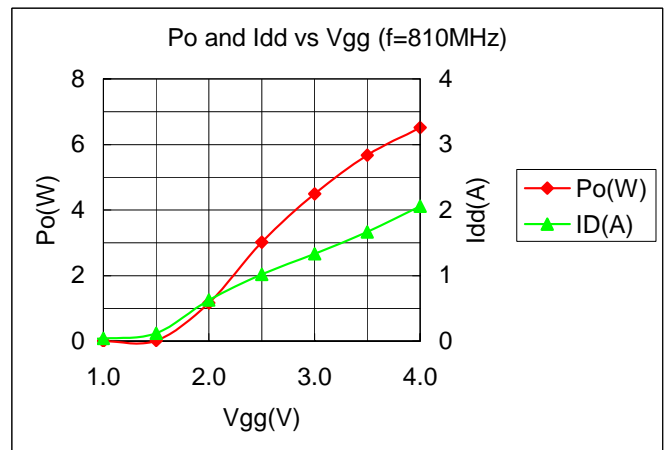
Conditions: f=740MHz, Pin=50mW, Vdd=7.2V

Vgg(V)	Pin(W)	Po(W)	Gp(dB)	Idd(A)	d(%)
0.0	0.050	0.00	-31.81	0.046	0.01
0.5	0.050	0.00	-27.66	0.069	0.02
1.0	0.050	0.00	-24.57	0.095	0.03
1.5	0.050	0.00	-21.78	0.124	0.04
2.0	0.049	0.03	-2.10	0.242	1.75
2.5	0.050	0.60	10.76	0.616	13.50
3.0	0.050	2.50	17.02	1.179	29.45
3.5	0.050	5.26	20.25	1.805	40.45
4.0	0.050	6.81	21.36	2.257	41.91



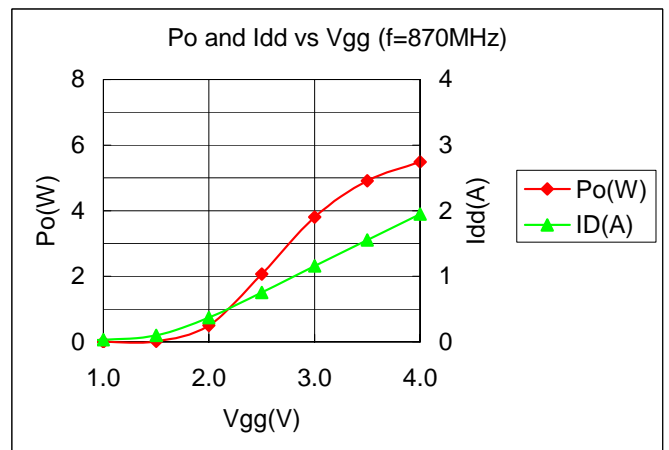
Conditions: f=810MHz, Pin=50mW, Vdd=7.2V

Vgg(V)	Pin(W)	Po(W)	Gp(dB)	Idd(A)	d(%)
0.0	0.050	0.00	-39.03	0.009	0.01
0.5	0.050	0.00	-29.18	0.022	0.04
1.0	0.050	0.00	-22.90	0.042	0.09
1.5	0.050	0.01	-5.34	0.121	1.69
2.0	0.051	1.16	13.62	0.628	25.72
2.5	0.050	3.02	17.85	1.020	41.14
3.0	0.050	4.49	19.50	1.333	46.83
3.5	0.050	5.67	20.56	1.666	47.29
4.0	0.050	6.52	21.12	2.059	43.95



Conditions: f=870MHz, Pin=50mW, Vdd=7.2V

Vgg(V)	Pin(W)	Po(W)	Gp(dB)	ID(A)	d(%)
0.0	0.050	0.00	-38.16	0.009	0.01
0.5	0.050	0.00	-28.41	0.018	0.06
1.0	0.050	0.00	-22.20	0.032	0.13
1.5	0.050	0.02	-4.62	0.097	2.46
2.0	0.050	0.51	10.03	0.369	19.06
2.5	0.050	2.07	16.19	0.753	38.19
3.0	0.049	3.80	18.86	1.156	45.71
3.5	0.050	4.91	19.89	1.553	43.88
4.0	0.050	5.49	20.41	1.947	39.14



RD01MUS1 & RD07MVS1 2Stage amplifier Equivalent Circuit (@f=764-870MHz)

