

APPLICATION NOTE

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(Taking charge of Silicon RF by
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SUBJECT: RD00HVS1 RF characteristics data at f=450-470MHz, Vdd=7.2V

SUMMARY:

This application note shows the RF characteristics (Frequency Characteristics and Pin vs. Pout characteristics) data with RD00HVS1 using Broad-Band Fixture and a schematic for test fixture.

- Sample history:

RD00HVS1: Lot number "552"

- Evaluate conditions:

@f=450MHz : Vdd=7.2V, Pin=5mW, Idq=0.05A (Vgg adj.)

@f=460MHz : Vdd=7.2V, Pin=5mW, Idq=0.05A (Vgg adj.)

@f=470MHz : Vdd=7.2V, Pin=5mW, Idq=0.05A (Vgg adj.)

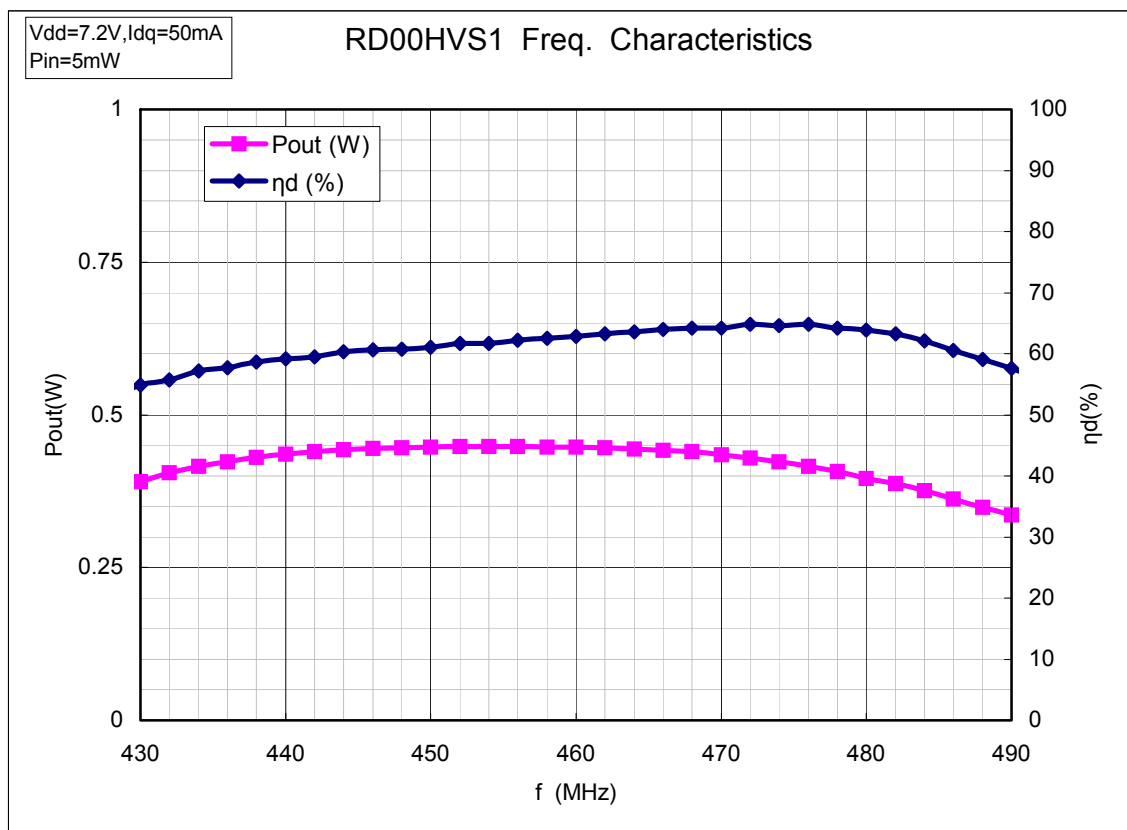
- Results:

Page 2 shows the RF characteristics (Frequency characteristics) data.

Page 3-5 shows the RF characteristics (Pin vs. Pout characteristics) data.

Page 6 shows the Equivalent Circuit and schematic for test fixture.

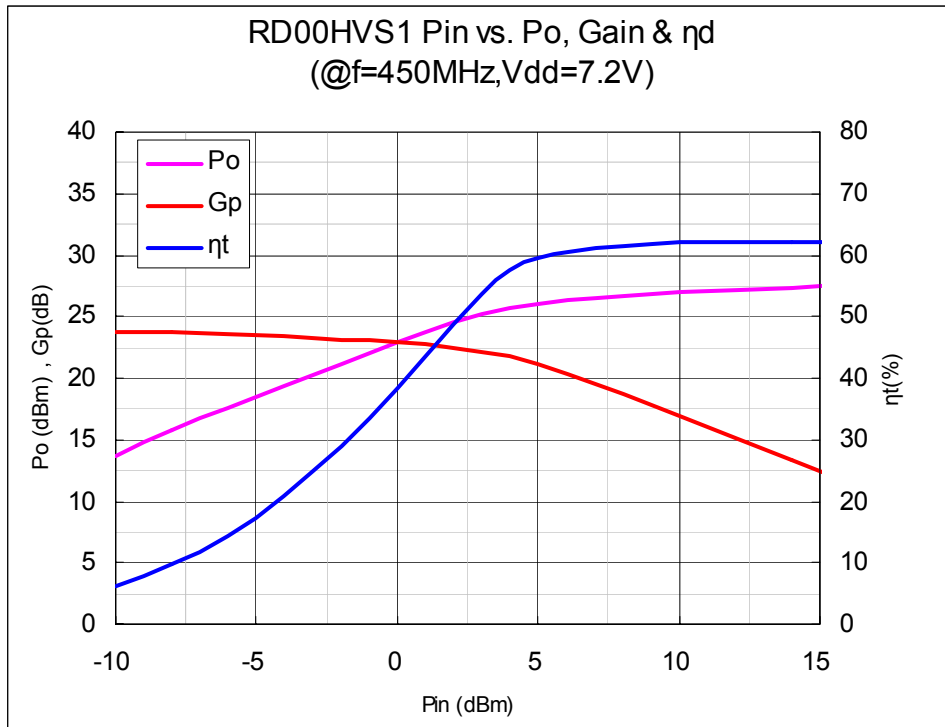
RD00HVS1 Frequency Characteristics (@ f=450 - 470MHz)



Freq. (MHz)	Vgg (V)	Vdd (V)	Pin (dBm)	Pin (mW)	Pout (dBm)	Pout (W)	Gp (dB)	ID(RF) (A)	η_d (%)	Return Loss. (dB)	2fo (dBc)	3fo (dBc)
400	2.60	7.21	7.0	5.02	21.1	0.13	14.1	0.071	25.46	-0.09	-31.8	<-60
405	2.60	7.21	7.0	5.00	21.8	0.15	14.8	0.073	28.64	-0.10	-32.0	<-60
410	2.60	7.21	7.0	4.98	22.4	0.18	15.5	0.075	32.44	-0.12	-32.1	<-60
415	2.60	7.21	7.0	5.00	23.1	0.21	16.1	0.079	36.17	-0.13	-32.8	<-60
420	2.60	7.21	7.0	5.02	23.9	0.24	16.8	0.083	40.63	-0.20	-32.9	<-60
425	2.60	7.21	7.0	5.02	24.6	0.29	17.6	0.087	45.75	-0.30	-33.2	<-60
430	2.60	7.21	7.0	4.98	25.3	0.34	18.3	0.093	50.09	-0.46	-33.7	<-60
435	2.60	7.20	7.0	4.97	25.8	0.38	18.8	0.097	54.39	-0.75	-34.4	<-60
440	2.60	7.20	7.0	4.99	26.1	0.41	19.1	0.099	57.01	-1.19	-35.3	<-60
445	2.60	7.20	7.0	4.96	26.2	0.42	19.3	0.099	58.67	-1.79	-36.3	<-60
450	2.60	7.20	7.0	5.00	26.3	0.42	19.3	0.099	59.60	-2.55	-37.4	<-60
455	2.60	7.20	7.0	4.96	26.3	0.43	19.3	0.098	60.43	-3.47	-37.9	<-60
460	2.60	7.20	7.0	5.01	26.3	0.43	19.3	0.097	60.94	-4.58	-38.4	<-60
465	2.60	7.20	7.0	4.96	26.2	0.42	19.3	0.094	61.93	-5.78	-37.9	<-60
470	2.60	7.20	7.0	4.97	26.1	0.41	19.1	0.091	62.22	-6.71	-37.1	<-60
475	2.60	7.20	7.0	4.96	25.9	0.39	18.9	0.087	62.09	-6.94	-36.4	<-60
480	2.60	7.20	7.0	4.99	25.6	0.36	18.6	0.084	60.01	-6.49	-36.1	<-60
485	2.60	7.20	7.0	4.98	25.2	0.33	18.2	0.081	56.87	-5.87	-35.9	<-60
490	2.60	7.20	7.0	5.02	24.7	0.30	17.7	0.078	53.10	-5.31	-35.8	<-60
495	2.60	7.21	7.0	5.03	24.2	0.26	17.2	0.075	48.84	-4.88	-36.0	<-60
500	2.60	7.21	6.9	4.95	23.6	0.23	16.6	0.073	43.26	-4.52	-36.2	<-60

note: part of hatching show out of target
Vdd= 7.2 V Vgg= 2.65 V
Idq= 50.0 mA

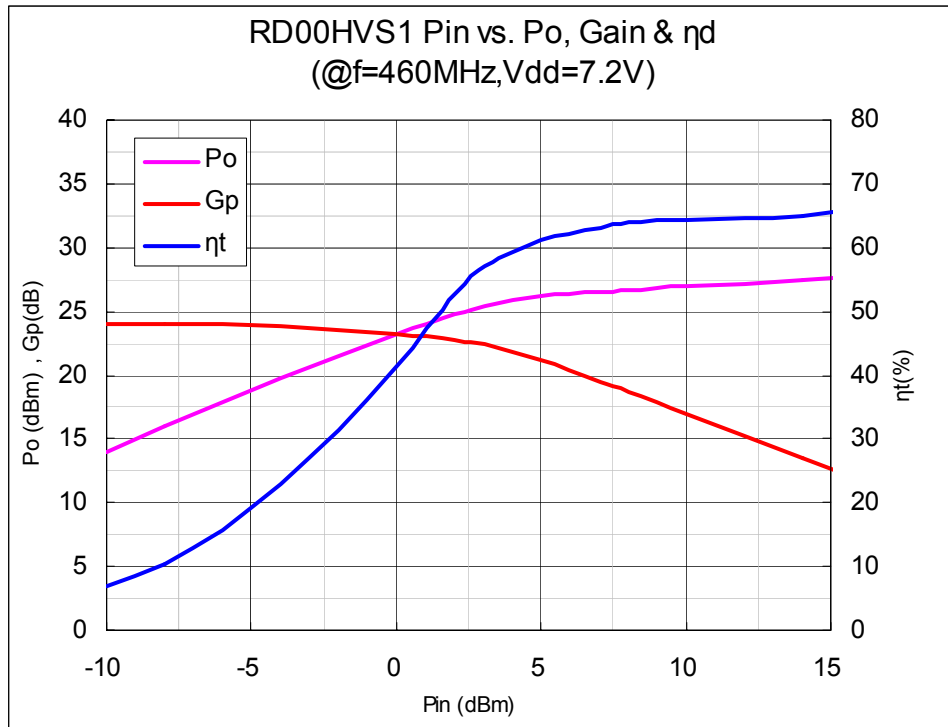
RD00HVS1 Pin vs. Pout characteristics (@ f=450MHz)



Pin		Po		Vdd	Vgg	Idd	ηd	Gain	R.L.	Harmonics	Harmonics
(dBm)	(mW)	(dBm)	(W)	(V)	(V)	(A)	(%)	(dB)	(dB)	2fo(dBc)	3fo(dBc)
-10.02	0.1	13.73	0.02	7.22	2.651	0.052	6.31	23.76	-1.20	-42.30	<-60
-7.98	0.2	15.70	0.04	7.22	2.650	0.053	9.73	23.67	-1.22	-41.12	<-60
-6.04	0.2	17.54	0.06	7.22	2.651	0.055	14.35	23.58	-1.23	-40.34	<-60
-4.02	0.4	19.39	0.09	7.22	2.651	0.058	20.82	23.41	-1.25	-38.89	<-60
-1.98	0.6	21.18	0.13	7.21	2.651	0.063	28.93	23.16	-1.29	-36.86	<-60
0.02	1.0	22.87	0.19	7.21	2.650	0.070	38.40	22.85	-1.37	-35.80	<-60
2.00	1.6	24.49	0.28	7.21	2.651	0.080	48.80	22.48	-1.50	-34.59	<-60
4.01	2.5	25.77	0.38	7.21	2.652	0.091	57.62	21.76	-1.68	-35.31	<-60
6.03	4.0	26.35	0.43	7.21	2.651	0.099	60.55	20.32	-1.68	-356.97	<-60
8.01	6.3	26.68	0.47	7.21	2.651	0.105	61.53	18.66	-1.50	-39.49	-54.86
10.04	10.1	26.93	0.49	7.21	2.651	0.110	62.23	16.89	-1.29	-43.28	-53.96
12.00	15.9	27.15	0.52	7.21	2.652	0.116	62.05	15.14	-1.08	-47.82	-51.57
14.01	25.2	27.37	0.55	7.21	2.652	0.122	62.10	13.36	-0.86	-42.03	-50.86

Vdd= 7.20 (V) Vgg= 2.650 (V)
 Idq= 50 (mA)
 f= 450 (MHz)

RD00HVS1 Pin vs. Pout characteristics (@ f=460MHz)



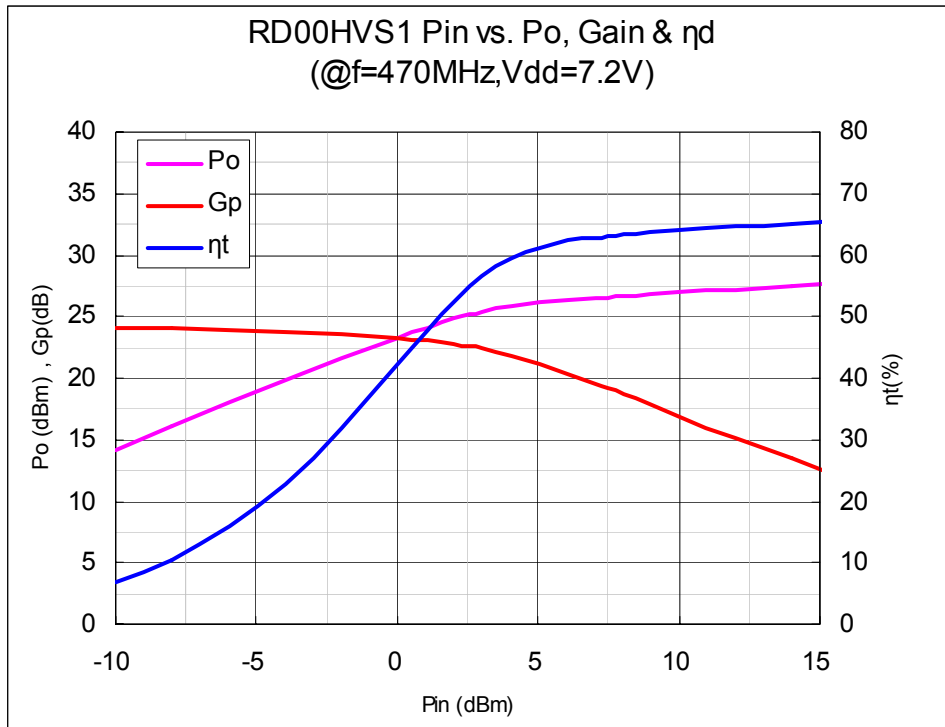
Pin		Po		Vdd	Vgg	Idd	η_d	Gain	R.L.	Harmonics	Harmonics
(dBm)	(mW)	(dBm)	(W)	(V)	(V)	(A)	(%)	(dB)	(dB)	2fo(dBc)	3fo(dBc)
-10.03	0.1	14.03	0.03	7.22	2.649	0.052	6.76	24.07	-3.48	-41.35	<-60
-7.98	0.2	16.03	0.04	7.22	2.650	0.053	10.50	24.01	-3.52	-41.55	<-60
-5.98	0.3	17.95	0.06	7.22	2.650	0.055	15.75	23.93	-3.54	-40.52	<-60
-3.99	0.4	19.79	0.10	7.21	2.649	0.058	22.83	23.78	-3.57	-39.56	<-60
-2.02	0.6	21.54	0.14	7.21	2.649	0.063	31.44	23.56	-3.63	-37.87	<-60
0.00	1.0	23.26	0.21	7.21	2.650	0.071	41.47	23.26	-3.75	-36.13	<-60
2.00	1.6	24.82	0.30	7.21	2.649	0.080	52.70	22.82	-4.01	-35.31	<-60
4.05	2.5	25.85	0.39	7.21	2.648	0.090	59.42	21.81	-4.12	-35.96	<-60
5.97	4.0	26.34	0.43	7.21	2.649	0.096	62.23	20.36	-3.78	-37.79	-54.12
8.00	6.3	26.67	0.46	7.21	2.649	0.101	63.85	18.67	-3.17	-39.82	-56.04
10.00	10.0	26.94	0.49	7.21	2.649	0.107	64.21	16.95	-2.57	-40.56	-53.65
12.02	15.9	27.21	0.53	7.21	2.649	0.113	64.70	15.19	-2.05	-38.72	-51.53
14.03	25.3	27.49	0.56	7.21	2.649	0.120	65.01	13.47	-1.66	-35.89	-50.81

Vdd= 7.20 (V) Vgg= 2.650 (V)

Idq= 50 (mA)

f= 460 (MHz)

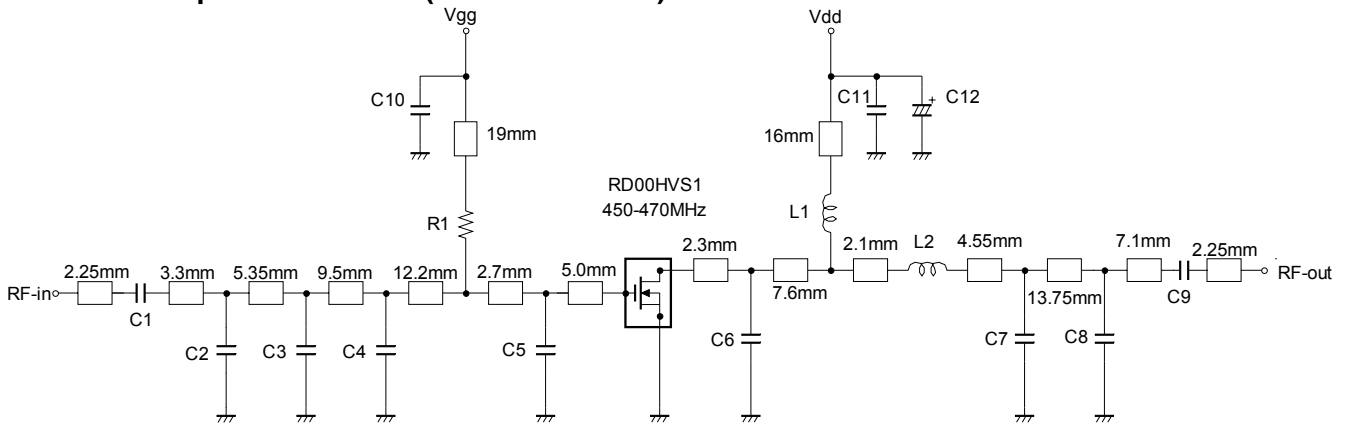
RD00HVS1 Pin vs. Pout characteristics (@ f=470MHz)



Pin		Po		Vdd	Vgg	Idd	η_t	Gain	R.L.	Harmonics	Harmonics
(dBm)	(mW)	(dBm)	(W)	(V)	(V)	(A)	(%)	(dB)	(dB)	2fo(dBc)	3fo(dBc)
-10.01	0.1	14.12	0.03	7.22	2.649	0.052	6.89	24.12	-3.47	-42.26	<-60
-7.98	0.2	16.06	0.04	7.22	2.649	0.053	10.57	24.04	-3.50	-42.49	<-60
-5.97	0.3	17.98	0.06	7.22	2.650	0.055	15.86	23.95	-3.43	-39.82	<-60
-3.98	0.4	19.81	0.10	7.22	2.649	0.058	22.91	23.79	-3.56	-28.56	<-60
-1.98	0.6	21.58	0.14	7.21	2.649	0.063	31.75	23.57	-3.62	-37.31	<-60
0.02	1.0	23.28	0.21	7.21	2.650	0.070	42.25	23.27	-3.75	-35.96	<-60
2.01	1.6	24.84	0.30	7.21	2.649	0.081	52.23	22.82	-3.99	-35.97	<-60
4.03	2.5	25.85	0.38	7.21	2.650	0.090	59.35	21.82	-4.11	-37.69	<-60
6.04	4.0	26.34	0.43	7.21	2.649	0.096	62.33	20.30	-3.76	-38.09	<-60
8.03	6.4	26.67	0.46	7.21	2.650	0.102	63.25	18.64	-3.15	-39.75	-54.25
9.98	10.0	26.94	0.49	7.21	2.650	0.107	64.10	16.96	-2.57	-40.64	-53.69
12.04	16.0	27.21	0.53	7.21	2.649	0.113	64.69	15.18	-2.05	-38.69	-51.37
14.04	25.3	27.49	0.56	7.21	2.650	0.120	64.93	13.45	-1.67	-35.60	-51.26

Vdd= 7.20 (V) Vgg= 2.650 (V)
 Idq= 50 (mA)
 f= 470 (MHz)

RD00HVS1 Equivalent Circuit (@f=450-470MHz)



Note: Board material- Glass epoxy copper-clad laminates FR-4(90 mm * 40 mm)
Micro strip line width=1mm, er:4.8, t=0.6mm

Parts Number	Capacity	type name	corporation
C1	68pF	GRM2162C1H680GD01E	Murata Manufacturing Co., Ltd.
C2	15pF	GRM2162C1H150GD01E	Murata Manufacturing Co., Ltd.
C3	10pF	GRM2162C1H100FD01E	Murata Manufacturing Co., Ltd.
C4	4pF	GRM2162C1H4R0CD01E	Murata Manufacturing Co., Ltd.
C5	10pF	GRM2162C1H100FD01E	Murata Manufacturing Co., Ltd.
C6	11pF	GRM2162C1H110GD01E	Murata Manufacturing Co., Ltd.
C7	5pF	GRM2162C1H5R0CD01E	Murata Manufacturing Co., Ltd.
C8	10pF	GRM2162C1H100FD01E	Murata Manufacturing Co., Ltd.
C9	68pF	GRM2162C1H680GD01E	Murata Manufacturing Co., Ltd.
C10	0.022μF	GRM216R11H223KA01E	Murata Manufacturing Co., Ltd.
C11	0.022μF	GRM216R11H223KA01E	Murata Manufacturing Co., Ltd.
C12	22μF	A0603	NICHICON CORPORATION
R1	4.7K OHM	CR1/10-472JB	Hokuriku Electric Industry Co.,Ltd.
L1	34.5nH (Enameled wire 4Turns, Diameter:0.43mm, φ2.46mm (the out side diameter))	4005A	Yoneda Processing Place Co.,Ltd.
L2	10.8nH (Enameled wire 4Turns, Diameter:0.43mm, φ1.66mm (the out side diameter))	4804A	Yoneda Processing Place Co.,Ltd.

RD00HVS1 test fixture (@f=450-470MHz)

