

# APPLICATION NOTE

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**SUBJECT:** RD00HVS1 RF characteristics data at f=150-162MHz, 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=150MHz : Vdd=7.2V, Pin=5mW, Idq=0.05A (Vgg adj.)

@f=156MHz : Vdd=7.2V, Pin=5mW, Idq=0.05A (Vgg adj.)

@f=162MHz : Vdd=7.2V, Pin=5mW, Idq=0.05A (Vgg adj.)

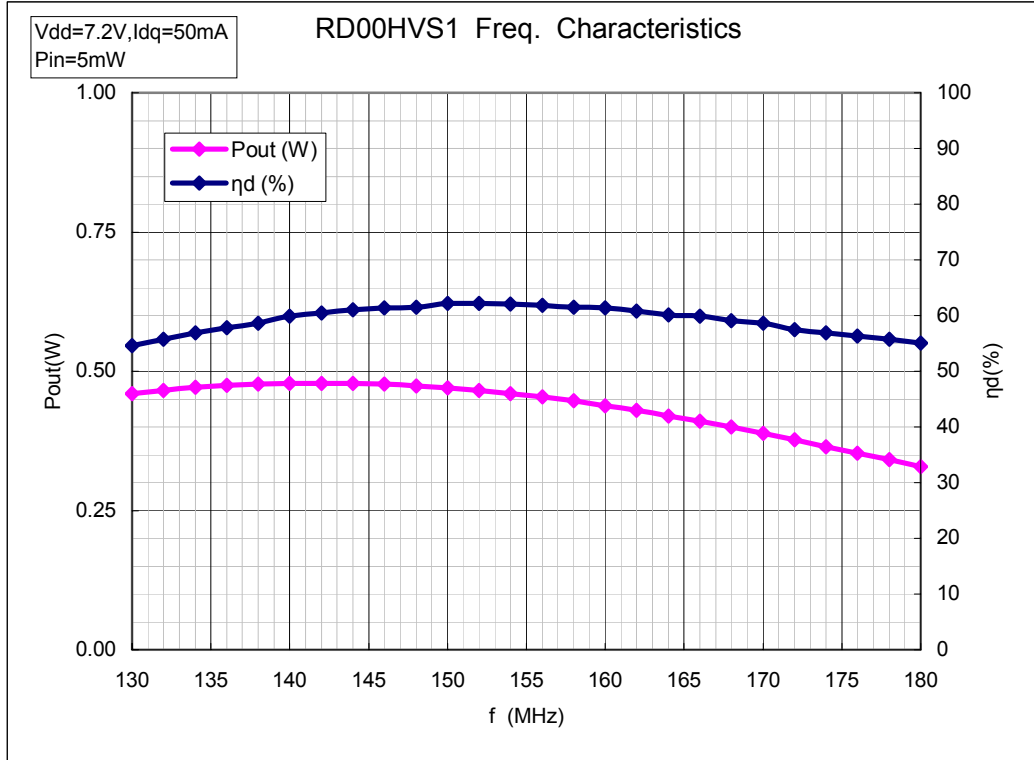
- Results:

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.

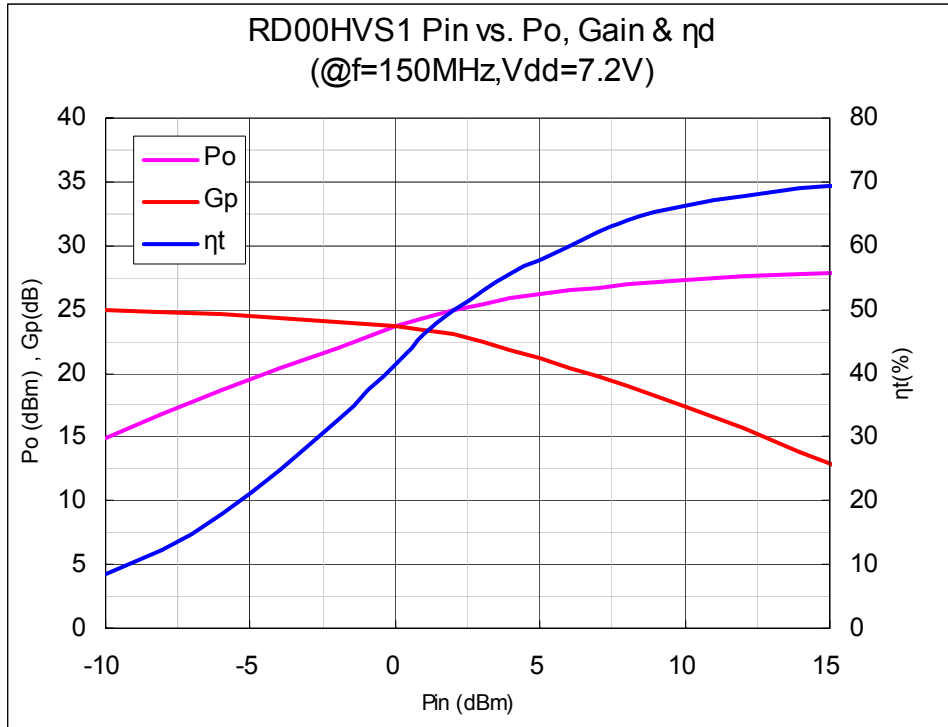
**RD00HVS1 Frequency Characteristics (@ f=150 - 162MHz)**



Freq. (MHz)	Vgg (V)	Vdd (V)	Pin		Pout		Gp (dB)	ID(RF) (A)	ηd (%)	Return Loss. (dB)	2fo (dBc)	3fo (dBc)
			(dBm)	(mW)	(dBm)	(W)			(%)			
130	2.76	7.22	7.0	4.97	26.6	0.46	19.7	0.117	54.64	-3.13	-9.9	-22.3
132	2.76	7.22	7.0	4.96	26.7	0.47	19.7	0.116	55.72	-3.37	-10.4	-22.4
134	2.76	7.22	7.0	4.99	26.7	0.47	19.7	0.115	56.87	-3.66	-10.9	-22.4
136	2.76	7.22	7.0	5.00	26.8	0.47	19.8	0.114	57.84	-3.97	-11.3	-22.5
138	2.76	7.22	7.0	5.00	26.8	0.48	19.8	0.113	58.66	-4.33	-11.7	-22.6
140	2.76	7.22	7.0	4.98	26.8	0.48	19.8	0.111	59.83	-4.74	-12.2	-22.7
142	2.76	7.22	7.0	4.98	26.8	0.48	19.8	0.110	60.44	-5.23	-12.7	-22.9
144	2.76	7.22	7.0	5.01	26.8	0.48	19.8	0.109	60.99	-5.81	-13.1	-22.9
146	2.76	7.22	7.0	5.02	26.8	0.48	19.8	0.108	61.36	-6.48	-13.7	-23.0
148	2.76	7.22	7.0	5.00	26.8	0.47	19.8	0.107	61.51	-7.27	-14.2	-23.0
150	2.76	7.22	7.0	4.99	26.7	0.47	19.7	0.105	62.17	-8.21	-14.7	-23.1
152	2.76	7.23	7.0	5.01	26.7	0.47	19.7	0.104	62.19	-9.36	-15.3	-23.0
154	2.76	7.23	7.0	5.00	26.6	0.46	19.6	0.10	62.05	-10.76	-15.8	-23.1
156	2.76	7.23	7.0	5.01	26.6	0.45	19.6	0.102	61.83	-12.48	-16.4	-23.1
158	2.76	7.23	7.0	5.01	26.5	0.45	19.5	0.101	61.47	-14.71	-17.1	-23.2
160	2.76	7.23	6.9	4.95	26.4	0.44	19.5	0.099	61.42	-17.83	-17.8	-23.4
162	2.76	7.23	7.0	4.98	26.3	0.43	19.4	0.098	60.86	-21.79	-18.6	-23.5
164	2.76	7.23	7.0	4.99	26.2	0.42	19.2	0.097	60.15	-22.81	-19.4	-23.8
166	2.76	7.23	7.0	4.99	26.1	0.41	19.1	0.095	59.94	-18.90	-20.4	-24.1
168	2.76	7.23	7.0	5.02	26.0	0.40	19.0	0.094	59.09	-15.27	-21.4	-24.5
170	2.76	7.23	7.0	5.01	25.9	0.39	18.9	0.092	58.64	-12.53	-22.8	-24.9
172	2.76	7.23	7.0	5.00	25.8	0.38	18.8	0.091	57.47	-10.41	-24.3	-25.5
174	2.76	7.23	7.0	4.98	25.6	0.36	18.6	0.089	56.90	-8.73	-26.1	-26.2
176	2.76	7.23	7.0	4.99	25.5	0.35	18.5	0.087	56.34	-7.36	-27.0	-27.0
178	2.76	7.23	7.0	4.98	25.3	0.34	18.4	0.085	55.75	-6.25	-28.0	-28.0
180	2.76	7.23	6.9	4.95	25.2	0.33	18.2	0.083	55.07	-5.30	-29.2	-29.2

note: part of hatching show out of target  
 Vdd= 7.2 V Vgg= 2.79 V  
 Idq= 50.0 mA

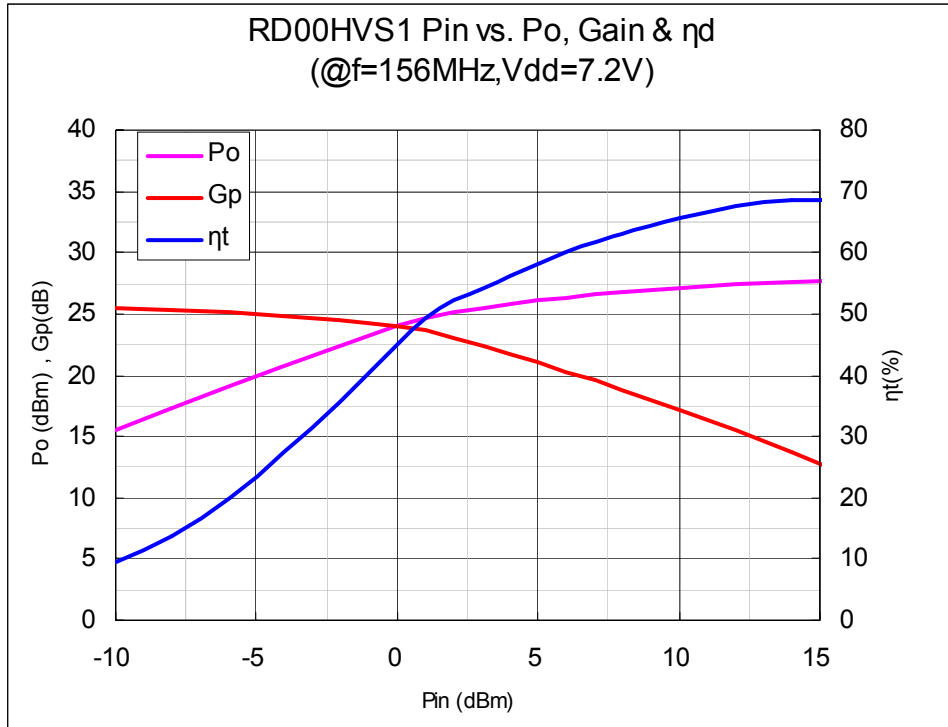
**RD00HVS1 Pin vs. Pout characteristics (@ f=150MHz)**



Pin		Po		Vdd	Vgg	Idd	ηd	Gain	R.L.	Harmonics	Harmonics
(dBm)	(mW)	(dBm)	(W)	(V)	(V)	(A)	(%)	(dB)	(dB)	2fo(dBc)	3fo(dBc)
-10.03	0.1	14.95	0.03	7.23	2.760	0.052	8.32	24.98	-7.02	-27.06	<-60
-8.04	0.2	16.81	0.05	7.23	2.760	0.054	12.30	24.85	-7.05	-25.11	-49.18
-6.00	0.3	18.65	0.07	7.23	2.760	0.057	17.81	24.65	-7.07	-23.03	-46.41
-4.02	0.4	20.36	0.11	7.23	2.761	0.061	24.66	24.38	-7.10	-20.89	-43.68
-2.01	0.6	22.00	0.16	7.23	2.761	0.067	32.77	24.02	-7.16	-18.93	-40.62
-0.01	1.0	23.61	0.23	7.22	2.760	0.077	41.28	23.62	-7.30	-17.52	-37.70
2.03	1.6	25.01	0.32	7.22	2.760	0.088	49.91	22.99	-7.66	-16.77	-32.54
3.96	2.5	25.81	0.38	7.22	2.760	0.095	55.53	21.85	-7.96	-16.64	-27.37
5.99	4.0	26.45	0.44	7.22	2.760	0.102	59.97	20.46	-8.17	-14.72	-23.48
8.02	6.3	26.97	0.50	7.22	2.760	0.108	63.88	18.95	-8.22	-14.02	-22.21
9.98	10.0	27.33	0.54	7.22	2.760	0.113	66.26	17.34	-8.14	-12.85	-21.05
12.01	15.9	27.62	0.58	7.22	2.760	0.118	67.86	15.61	-7.98	-12.16	-20.51
13.99	25.0	27.81	0.60	7.22	2.760	0.121	69.17	13.82	-7.81	-11.77	-20.35

Vdd= 7.2 V      Vgg= 2.760 V  
 Idq= 50.0 mA  
 f= 150 MHz

**RD00HVS1 Pin vs. Pout characteristics (@ f=156MHz)**



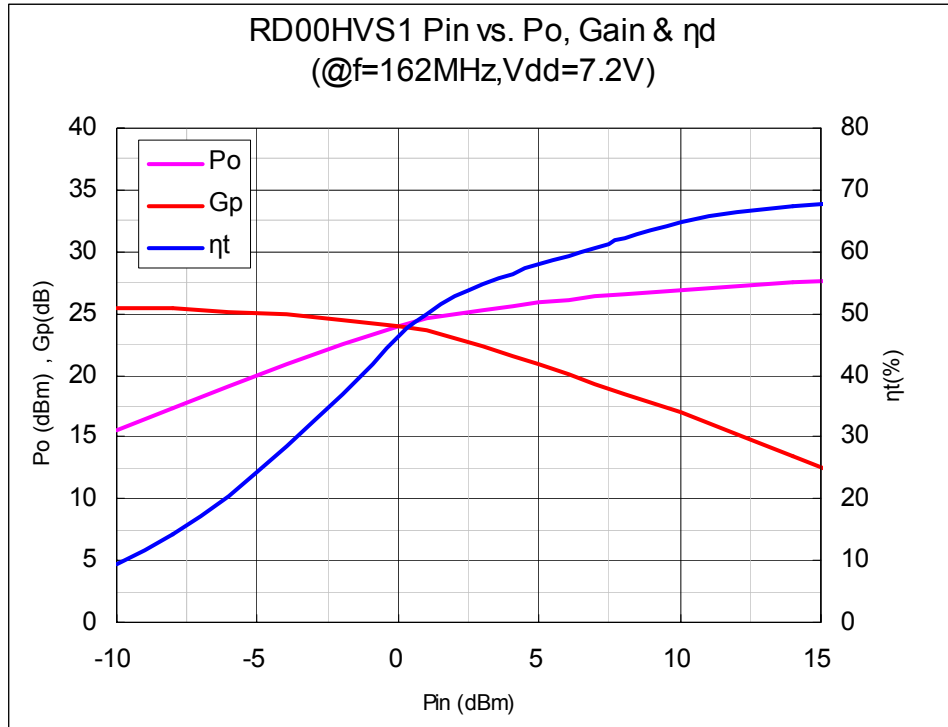
Pin		Po		Vdd	Vgg	Idd	ηd	Gain	R.L.	Harmonics	Harmonics
(dBm)	(mW)	(dBm)	(W)	(V)	(V)	(A)	(%)	(dB)	(dB)	2fo(dBc)	3fo(dBc)
-10.02	0.1	15.45	0.04	7.22	2.759	0.052	9.34	25.47	-11.65	-28.28	<-60
-8.00	0.2	17.33	0.05	7.22	2.759	0.054	13.85	25.33	-11.69	-26.20	-50.23
-5.97	0.3	19.14	0.08	7.22	2.759	0.057	19.93	25.12	-11.71	-24.18	-47.81
-4.02	0.4	20.80	0.12	7.22	2.759	0.061	27.30	24.83	-11.73	-22.11	-44.90
-2.01	0.6	22.43	0.18	7.22	2.759	0.068	35.64	24.44	-11.78	-20.22	-41.63
-0.04	1.0	23.95	0.25	7.22	2.759	0.077	44.66	23.99	-12.06	-18.95	-37.65
2.02	1.6	25.10	0.32	7.22	2.759	0.086	52.17	23.08	-12.65	-18.92	-31.85
4.00	2.5	25.77	0.38	7.22	2.759	0.093	56.23	21.77	-12.82	-18.81	-27.09
6.01	4.0	26.32	0.43	7.22	2.759	0.099	59.95	20.31	-12.64	-17.34	-24.17
8.00	6.3	26.79	0.48	7.22	2.759	0.104	63.57	18.79	-12.20	-15.61	-22.20
10.04	10.1	27.18	0.52	7.22	2.759	0.110	65.72	17.14	-11.59	-14.26	-21.00
12.02	15.9	27.45	0.56	7.22	2.759	0.114	67.54	15.43	-11.01	-13.32	-20.33
14.01	25.2	27.67	0.58	7.22	2.758	0.118	68.61	13.65	-10.55	-12.71	-19.75

Vdd= 7.2 V      Vgg= 2.758 V

I<sub>dq</sub>= 50.0 mA

f= 156 MHz

## RD00HVS1 Pin vs. Pout characteristics (@ f=162MHz)



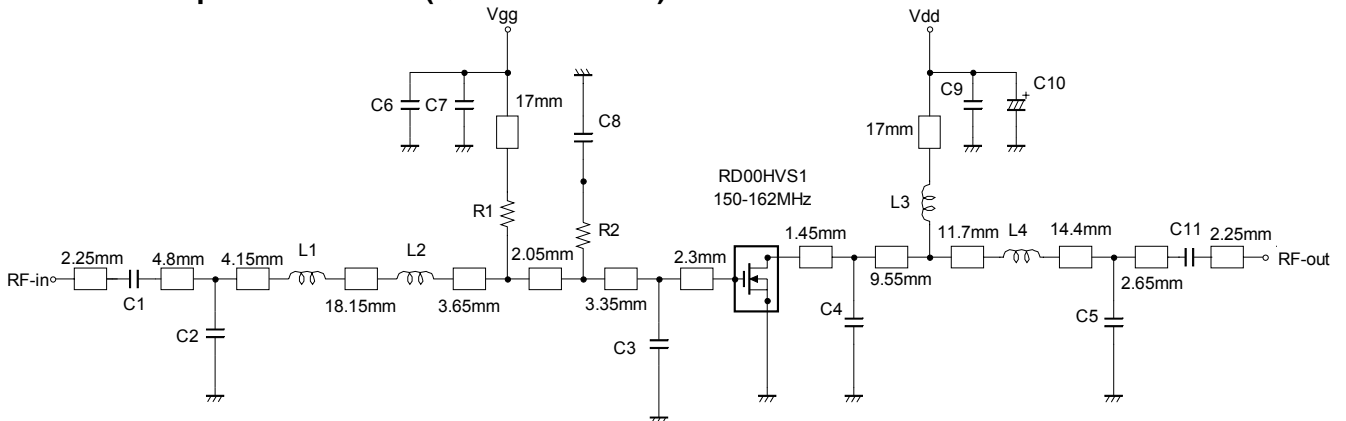
Pin		Po		Vdd	Vgg	Idd	$\eta_d$	Gain	R.L.	Harmonics	Harmonics
(dBm)	(mW)	(dBm)	(W)	(V)	(V)	(A)	(%)	(dB)	(dB)	2fo(dBc)	3fo(dBc)
-9.99	0.1	15.49	0.04	7.23	2.759	0.052	9.42	25.48	-17.56	-30.19	<-60
-7.98	0.2	17.37	0.05	7.23	2.758	0.053	14.25	25.35	-18.10	-28.20	-50.56
-6.02	0.3	19.15	0.08	7.23	2.759	0.056	20.31	25.16	-18.67	-26.04	-49.13
-3.99	0.4	20.90	0.12	7.22	2.759	0.060	28.36	24.88	-19.78	-23.92	-46.06
-2.01	0.6	22.50	0.18	7.22	2.759	0.067	36.77	24.51	-20.98	-22.02	-42.87
0.01	1.0	24.00	0.25	7.22	2.759	0.075	46.37	23.99	-22.14	-20.93	-38.19
2.01	1.6	25.00	0.32	7.22	2.759	0.083	52.79	22.99	-24.56	-21.3	-32.41
4.04	2.5	25.60	0.36	7.22	2.759	0.089	56.50	21.56	-27.55	-21.5	-27.73
6.05	4.0	26.10	0.41	7.22	2.759	0.095	59.40	20.05	-23.64	-19.8	-24.71
8.03	6.3	26.56	0.45	7.22	2.760	0.101	62.08	18.53	-19.82	-17.4	-22.48
10.00	10.0	26.95	0.50	7.22	2.759	0.106	64.72	16.94	-17.29	-15.6	-21.20
12.00	15.8	27.27	0.53	7.22	2.759	0.111	66.50	15.27	-15.59	-14.3	-20.10
14.03	25.3	27.51	0.56	7.22	2.760	0.116	67.31	13.48	-14.50	-13.47	-19.47

Vdd= 7.2 V Vgg= 2.759 V

Idq= 50.0 mA

f= 162 MHz

**RD00HVS1 Equivalent Circuit (@f=150-162MHz)**



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	24pF	GRM2162C1H240GD01E	Murata Manufacturing Co., Ltd.
C3	3pF	GRM2163C1H3R0CD01E	Murata Manufacturing Co., Ltd.
C4	20pF	GRM2162C1H200GD01E	Murata Manufacturing Co., Ltd.
C5	2pF	GRM2164C1H2R0CD01E	Murata Manufacturing Co., Ltd.
C6	1000pF	GRM216R11H102KA01E	Murata Manufacturing Co., Ltd.
C7	0.022μF	GRM216R11H223KA01E	Murata Manufacturing Co., Ltd.
C8	1000pF	GRM216R11H102KA01E	Murata Manufacturing Co., Ltd.
C9	0.022μF	GRM216R11H223KA01E	Murata Manufacturing Co., Ltd.
C10	22μF	A0603	NICHICON CORPORATION
C11	68pF	GRM2162C1H680GD01E	Murata Manufacturing Co., Ltd.
R1	4.7K OHM	CR1/10-472JB	Hokuriku Electric Industry Co.,Ltd.
R2	240 OHM	CR1/10-241JB	Hokuriku Electric Industry Co.,Ltd.
L1	18nH (Enameled wire 4Turns, Diameter:0.43mm, φ1.66mm (the out side diameter))	LLQ1608	TOKO,INC.
L2	79.8nH (Enameled wire 13Turns, Diameter:0.23mm, φ1.60mm (the out side diameter))	2313A	Yoneda Processing Place Co.,Ltd.
L3	43.7nH (Enameled wire 6Turns, Diameter:0.43mm, φ1.66mm (the out side diameter))	4006C	Yoneda Processing Place Co.,Ltd.
L4	37.8nH (Enameled wire 7Turns, Diameter:0.23mm, φ1.60mm (the out side diameter))	2307A	Yoneda Processing Place Co.,Ltd.

**RD00HVS1 test fixture (@f=150-162MHz)**

