

APPLICATION NOTE

Document NO. AN-UHF-087-A
Date : 9th Oct. 2007
Rev. Date : 22th Jun. 2010
Prepared : H.Sakairi
 S.Kametani
Confirmed : T.Okawa
(Taking charge of Silicon RF by
 MIYOSHI Electronics)

SUBJECT: RD01MUS2 Single-Stage amplifier RF performance at $f = 450\text{-}527\text{MHz}$

SUMMARY:

This application note shows the RF Wide band characteristics data

(Pout vs. Frequency characteristics, Pout vs. Pin characteristics) at 450-527 MHz Band.

- Sample history :
 RD01MUS2: Lot number "571"

- Evaluate conditions :
 RD01MUS2 @ $f=450\text{-}527\text{MHz}$: $V_{ds}=7.2\text{V}$, $I_{dq}=50\text{mA}$ (V_{gs} adjust)

- Results :
 Page 2 shows the typical RF characteristics (Pout vs. Frequency characteristics) data.
 Page 3-4 shows the typical RF characteristics (Pout vs. Pin characteristics) data.
 Page 5 shows the Equivalent Circuit.

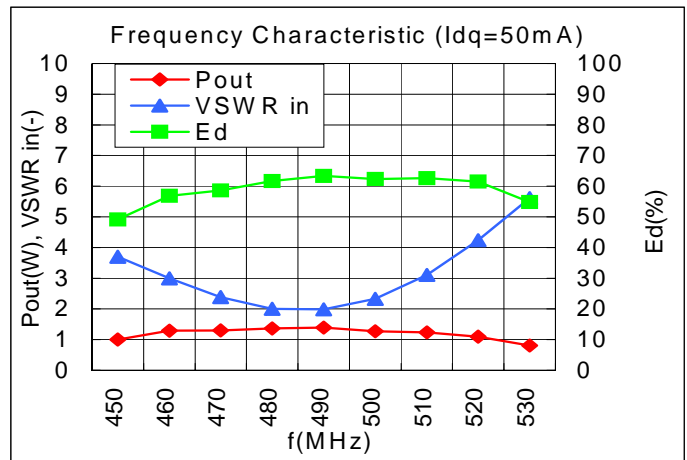
RD01MUS2 Single-Stage amplifier RF performance at f=450-527MHz

- AN-UHF-087-A-

RD01MUS2 Single-Stage amplifier Frequency Characteristics f=450-527MHz.

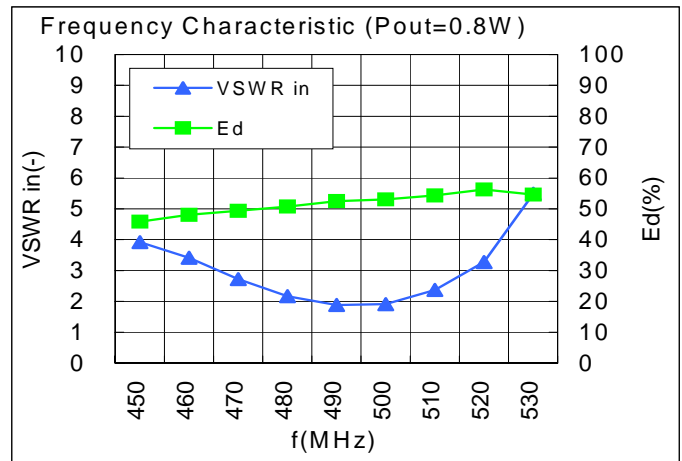
Pin=30mW, Vds=7.2V, Idq=50mA (Vgs Adjust)

f (MHz)	Pout (W)	Ids (A)	Ed (%)	RL (dB)	vSWR in (-)	2SP (dB)	3SP (dB)
450	1.00	0.30	49.2	4.8	3.7	-25.0	-61.2
460	1.29	0.33	56.9	6.0	3.0	-26.9	-57.2
470	1.30	0.32	58.7	7.8	2.4	-27.5	-54.5
480	1.36	0.32	61.6	9.5	2.0	-28.4	-48.7
490	1.39	0.32	63.3	9.7	2.0	-29.1	-45.5
500	1.27	0.30	62.3	8.0	2.3	-30.1	-45.1
510	1.23	0.29	62.6	5.8	3.1	-30.4	-43.3
520	1.10	0.26	61.5	4.2	4.2	-30.9	-42.9
530	0.81	0.22	54.8	3.1	5.6	-32.2	-45.6



Pout=0.8W Constant, Vgs Adjustment, Vds=7.2V, Pin=30mW

f (MHz)	Vgs (V)	Ids (A)	Ed (%)	RL (dB)	vSWR in (-)	2SP (dB)	3SP (dB)
450	2.29	0.26	45.8	4.5	3.9	-24.4	-65.0
460	1.98	0.25	48.1	5.3	3.4	-24.4	-57.1
470	1.94	0.24	49.4	6.7	2.7	-26.2	-54.2
480	1.92	0.23	50.7	8.7	2.2	-26.9	-50.9
490	1.71	0.23	52.5	10.3	1.9	-27.4	-46.4
500	1.77	0.22	53.0	10.1	1.9	-28.4	-45.7
510	1.81	0.22	54.3	7.8	2.4	-28.4	-44.8
520	1.92	0.21	56.3	5.5	3.3	-28.9	-44.3
530	2.43	0.21	54.6	3.2	5.5	-31.7	-46.7



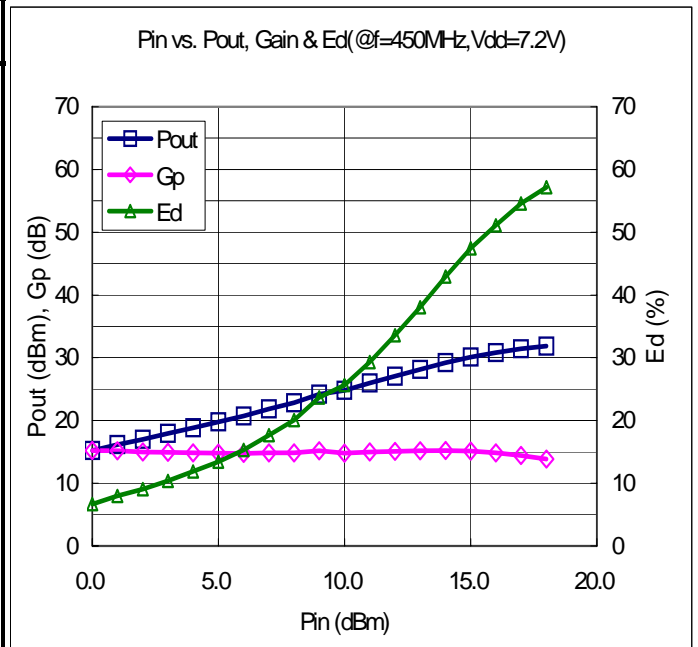
RD01MUS2 Single-Stage amplifier RF performance at f=450-527MHz

- AN-UHF-087-A-

RD01MUS2 Single-Stage amplifier Pout vs. Pin characteristics

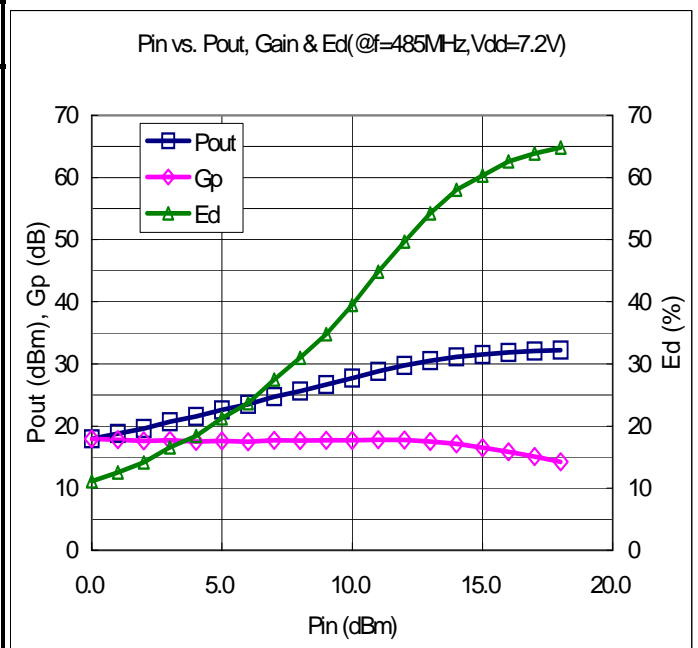
f=450MHz, Vds=7.2V, Idq=50mA(Vgs Adjust)

Pin		Pout		Gp (dB)	Ids (A)	Ed (%)
(dBm)	(mW)	(dBm)	(W)			
0.0	1.0	15.2	0.0	15.2	0.07	6.7
1.0	1.3	16.2	0.0	15.2	0.07	8.0
2.0	1.6	17.0	0.1	15.0	0.08	9.1
3.0	2.0	18.0	0.1	15.0	0.08	10.4
4.0	2.5	18.9	0.1	14.9	0.09	11.9
5.0	3.2	19.8	0.1	14.8	0.10	13.4
6.0	4.0	20.7	0.1	14.7	0.11	15.3
7.0	5.0	21.9	0.2	14.9	0.12	17.7
8.0	6.3	22.9	0.2	14.9	0.13	20.1
9.0	7.9	24.2	0.3	15.2	0.15	23.7
10.0	10.0	24.8	0.3	14.8	0.16	25.6
11.0	12.6	26.0	0.4	15.0	0.19	29.3
12.0	15.8	27.1	0.5	15.1	0.21	33.6
13.0	20.0	28.2	0.7	15.2	0.24	38.1
14.0	25.1	29.2	0.8	15.2	0.27	42.9
15.0	31.6	30.1	1.0	15.1	0.30	47.4
16.0	39.8	30.8	1.2	14.8	0.33	51.1
17.0	50.1	31.4	1.4	14.4	0.35	54.6
18.0	63.1	31.9	1.5	13.9	0.37	57.2



f=485MHz, Vds=7.2V, Idq=50mA(Vgs Adjust)

Pin		Pout		Gp (dB)	Ids (A)	Ed (%)
(dBm)	(mW)	(dBm)	(W)			
0.0	1.0	17.9	0.1	17.9	0.08	11.1
1.0	1.3	18.8	0.1	17.8	0.08	12.5
2.0	1.6	19.6	0.1	17.6	0.09	14.1
3.0	2.0	20.7	0.1	17.7	0.10	16.6
4.0	2.5	21.5	0.1	17.5	0.11	18.4
5.0	3.2	22.6	0.2	17.6	0.12	21.3
6.0	4.0	23.5	0.2	17.5	0.13	23.7
7.0	5.0	24.7	0.3	17.7	0.15	27.5
8.0	6.3	25.6	0.4	17.6	0.16	31.0
9.0	7.9	26.7	0.5	17.7	0.19	34.8
10.0	10.0	27.7	0.6	17.7	0.21	39.5
11.0	12.6	28.8	0.8	17.8	0.24	44.8
12.0	15.8	29.8	0.9	17.8	0.26	49.7
13.0	20.0	30.5	1.1	17.5	0.29	54.2
14.0	25.1	31.1	1.3	17.1	0.31	58.0
15.0	31.6	31.5	1.4	16.5	0.33	60.3
16.0	39.8	31.9	1.5	15.9	0.34	62.6
17.0	50.1	32.1	1.6	15.1	0.35	63.9
18.0	63.1	32.2	1.7	14.2	0.36	64.8



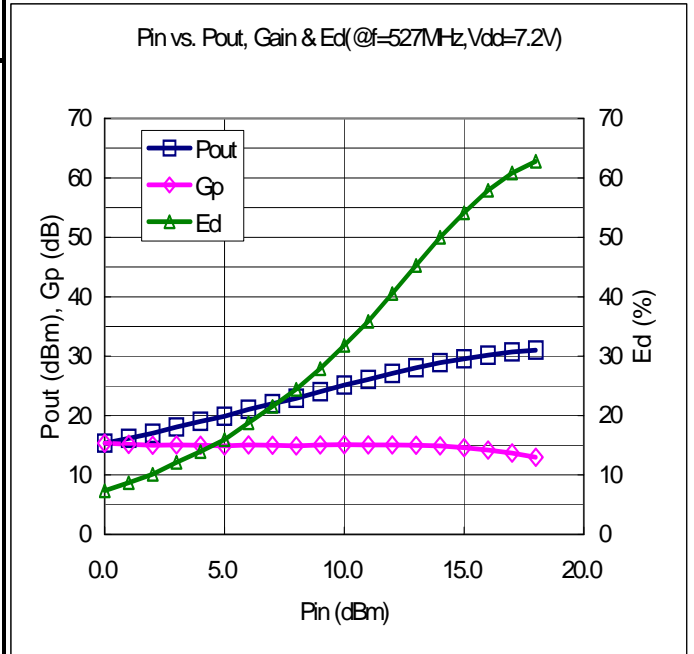
RD01MUS2 Single-Stage amplifier RF performance at f=450-527MHz

- AN-UHF-087-A-

RD01MUS2 Single-Stage amplifier Pout vs. Pin Characteristics

f=527MHz, Vds=7.2V, Idq=50mA(Vgs Adjust)

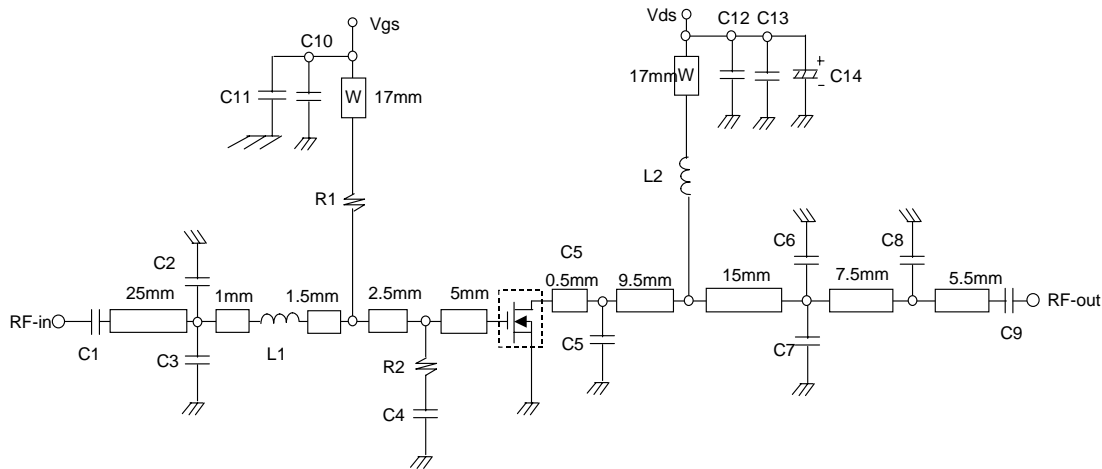
Pin		Pout		Gp	Ids	Ed
(dBm)	(mW)	(dBm)	(W)			
0.0	1.0	15.4	0.0	15.4	0.06	7.4
1.0	1.3	16.2	0.0	15.2	0.07	8.7
2.0	1.6	17.0	0.1	15.0	0.07	10.1
3.0	2.0	18.1	0.1	15.1	0.07	12.1
4.0	2.5	19.0	0.1	15.0	0.08	14.0
5.0	3.2	19.9	0.1	14.9	0.09	15.9
6.0	4.0	21.0	0.1	15.0	0.09	18.8
7.0	5.0	22.0	0.2	15.0	0.10	21.6
8.0	6.3	22.9	0.2	14.9	0.11	24.4
9.0	7.9	24.0	0.3	15.0	0.13	27.9
10.0	10.0	25.1	0.3	15.1	0.14	31.8
11.0	12.6	26.1	0.4	15.1	0.16	35.9
12.0	15.8	27.1	0.5	15.1	0.17	40.5
13.0	20.0	28.0	0.6	15.0	0.20	45.3
14.0	25.1	28.9	0.8	14.9	0.22	50.0
15.0	31.6	29.6	0.9	14.6	0.23	54.1
16.0	39.8	30.2	1.0	14.2	0.25	57.9
17.0	50.1	30.7	1.2	13.7	0.27	60.8
18.0	63.1	31.0	1.3	13.0	0.28	62.8



RD01MUS2 Single-Stage amplifier RF performance at f=450-527MHz

- AN-UHF-087-A-

RD01MUS2 Single-Stage amplifier Equivalent Circuit (@f=450-527MHz)



Note: Board material= glass-Epoxy Substrate
 Micro strip line width= 1.3mm/50OHM , $\epsilon_r=4.8$, $t=0.8$ mm
 W: Line width=1.0mm

Parts Number	Capacity	type name	corporation
C1	1000pF	GRM1882C1H102JA01	Murata Manufacturing Co., Ltd
C2	2pF	GRM1882C1H2R0CZ01	Murata Manufacturing Co., Ltd
C3	15pF	GRM1882C1H150JA01	Murata Manufacturing Co., Ltd
C4	0.022uF	GRM188B11H223KA01	Murata Manufacturing Co., Ltd
C5	15pF	GRM1882C1H150JA01	Murata Manufacturing Co., Ltd
C6	5pF	GRM1882C1H5R0CZ01	Murata Manufacturing Co., Ltd
C7	5pF	GRM1882C1H5R0CZ01	Murata Manufacturing Co., Ltd
C8	4pF	GRM1882C1H4R0CZ01	Murata Manufacturing Co., Ltd
C9	180pF	GRM1882C1H181JA01	Murata Manufacturing Co., Ltd
C10	1000pF	GRM1882C1H102JA01	Murata Manufacturing Co., Ltd
C11	0.022uF	GRM188B11H223KA01	Murata Manufacturing Co., Ltd
C12	1000pF	GRM1882C1H102JA01	Murata Manufacturing Co., Ltd
C13	0.022uF	GRM188B11H223KA01	Murata Manufacturing Co., Ltd
C14	22uF	A0603	NICHICON CORPORATION
R1	4.7K OHM	CR1/10-472JB	Hokuriku Electric Industry Co.,Ltd.
R2	68 OHM	CR1/10-680JB	Hokuriku Electric Industry Co.,Ltd.
L1	10.8nH Enameled wire 4 Turns, D:0.43mm, 1.66mm(outside diameter)	4804A	Yoneda Processing Place Co.,Ltd.
L2	24.4nH Enameled wire 5 Turns, D:0.43mm, 1.37mm(outside diameter)	4005A	Yoneda Processing Place Co.,Ltd.

