



POWER CONVERSION CHART

dBm	mW	dBm	mW	dBm	mW
-20	0.010	-7	0.200	+6	3.98
-19	0.012	-6	0.250	+7	5.01
-18	0.016	-5	0.316	+8	6.30
-17	0.020	-4	0.398	+9	7.94
-16	0.025	-3	0.501	+10	10.0
-15	0.032	-2	0.630	+11	12.6
-14	0.040	-1	0.794	+12	15.8
-13	0.050	0	1.00	+13	19.9
-12	0.063	+1	1.25	+14	25.1
-11	0.079	+2	1.58	+15	31.6
-10	0.100	+3	2.00	+16	39.8
-9	0.130	+4	2.51	+17	50.1
-8	0.160	+5	3.16	+18	63.1

dBm	W	dBm	W	dBm	W
+19	0.079	+33	2.00	+47	50.1
+20	0.100	+34	2.55	+48	63.1
+21	0.120	+35	3.16	+49	79.4
+22	0.159	+36	3.91	+50	100.0
+23	0.200	+37	5.01	+52	126.0
+24	0.251	+38	6.31	+52	158.0
+25	0.316	+39	7.94	+53	200.0
+26	0.398	+40	10.0	+54	251.0
+27	0.501	+41	12.6	+55	316.0
+28	0.631	+42	15.8	+56	398.0
+29	0.794	+43	20.0	+57	501.0
+30	1.00	+44	25.1	+58	631.0
+31	1.26	+45	31.6	+59	794.0
+32	1.59	+46	39.8	+60	1000

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$$VSWR = \frac{E_{max}}{E_{min}}$$

$$= \frac{I_{max}}{I_{min}}$$

$$= \frac{1 + \Gamma}{1 - \Gamma}$$

Γ = reflection coefficient.

$$\text{Return loss} = -20 \log \frac{1}{\Gamma}$$

Multi-tone amplifier test

IP_n = Intercept point of order n.

$$IP_n = P_o + \left\{ \frac{P_o - P_i}{(n-1)} \right\}$$

P_o = output level of each tone.

P_i = output power of IMD product of order n.

For 2-tone test:

$$TOI = \frac{CIM + P_o}{2}$$

TOI = third order intercept

CIM = intermod. Level

For the two tones F₁ and F₂, the third order intermodulation products occur at:

$$2F_1 - F_2 \text{ and } 2F_2 - F_1$$

For a FET, Power added efficiency:

$$\eta_{ADD} = \left\{ \frac{P_{1dB} - P_{in}}{V_{DS} - I_D} \right\} \times 100\% \quad \begin{array}{l} P_{1dB} \text{ and } P_{in} \\ \text{are in Watts.} \end{array}$$

Noise Figure (NF)

$$NF = 10 \log \left\{ \frac{T + 1}{290} \right\}$$

T = noise temperature in °K

Miscellaneous:

$$dBm = 10 \times \log(W \times 1000)$$

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VSWR effect on power

VS WR	Ret. Loss dB	Trans. Loss dB	Volt. Refl. Coeff.	Pwer Refl. %	Power Trans. %
1.00	0	.000	.00	.0	100.0
1.01	46.1	.000	.00	.0	100.0
1.02	40.1	.000	.01	.0	100.0
1.03	36.6	.001	.01	.0	100.0
1.04	34.2	.002	.02	.0	100.0
1.05	32.3	.003	.02	.1	99.9
1.06	30.7	.004	.03	.1	99.9
1.07	29.4	.005	.03	.1	99.9
1.08	28.3	.006	.04	.1	99.9
1.09	27.3	.008	.04	.2	99.8
1.10	26.4	.010	.05	.2	99.8
1.11	25.7	.012	.05	.2	99.7
1.12	24.9	.014	.06	.2	99.7
1.13	24.3	0.016	.06	.4	99.6
1.14	23.7	0.019	.07	.4	99.6
1.15	23.1	0.021	.07	.5	99.5
1.16	22.6	0.024	.07	.5	99.5
1.17	22.1	0.027	.08	.6	99.4
1.18	21.7	0.030	.08	.7	99.3
1.19	21.2	0.033	.09	.8	99.2
1.20	20.8	0.036	.09	.8	99.2
1.25	19.1	0.054	.11	1.2	98.8
1.30	17.7	0.075	.13	1.7	98.3
1.40	15.6	0.122	.17	2.8	97.2
1.50	14.0	0.177	.20	4.0	96.0
1.60	12.7	0.238	.23	5.3	94.7
1.70	11.7	0.302	.26	6.7	93.3
1.80	10.9	0.370	.29	8.2	91.8
1.90	10.2	0.440	.31	9.6	90.4
2.00	9.5	0.512	.33	11.1	88.9
3.00	6.0	1.24	.50	25.0	75.0
4.00	4.4	1.93	.60	36.0	64.0
5.00	3.5	2.55	.67	44.4	55.6
10.0	1.7	4.80	.82	66.9	33.1
20.0	0.9	7.41	.90	81.9	18.1