

## RF Amplifier Gain

Normally expressed in decibels, dB Power Gain (dB) =  $10 \log_{10} (\text{RF Output Power} / \text{RF Input Power})$

Gain is defined as the ratio of the output power to the input power in dB. Assume that the input power is 10 mW (+10 dBm) and the output power is 1 W (1000 mW, +30 dBm). The ratio will be  $1000/10 = 100$ , and the gain will be  $10 * \log 100 = 20$  dB.

It is much easier to calculate gain by converting the power to dBm first, so the gain of the above amplifier will be  $30-10 = 20$  dB. A simple reduction will reveal the gain. In tradition, all power is read in dBm and the gain is in dB.

### Example:

A low noise amp (30 dB gain) cascades with a driver amp (20 dB gain) and a power amp (10 dB gain). The total gain will be  $30+20+10 = 60$  dB.

Frequently Used Decibel Conversions	
dB	Power Ratio
0	1
1 (-1)	1.26 (0.8)
3 (-3)	2 (1/2)
6 (-6)	4 (1/4)
10 (-10)	10 (0.1)
13	20
17	50
20	100
30	1000