TECHNICIAN NOTE 002

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P1dB and P3dB Definitions

P1dB, the output power at 1 dB compression, is typically used when referring to amplifiers. It is defined as the output power level at which the actual gain deviates from the small signal gain by 1 dB. Similarly, P3dB is the power level at which actual gain deviates from small signal gain by 3 dB.

All active components have a linear dynamic range, which is the range over which the output power varies linearly with respect to the input power. As the output power approaches maximum, the component begins to saturate. The point at which the saturation effects differ 1 dB from linear is defined as the 1 dB compression point. From this point on, because of the nonlinear relationship between input and output power, the following rule then holds:

$$P_{OUT\ 1\ dB} = P_{IN\ 1\ dB} + \text{Linear Gain} - 1\ dB$$

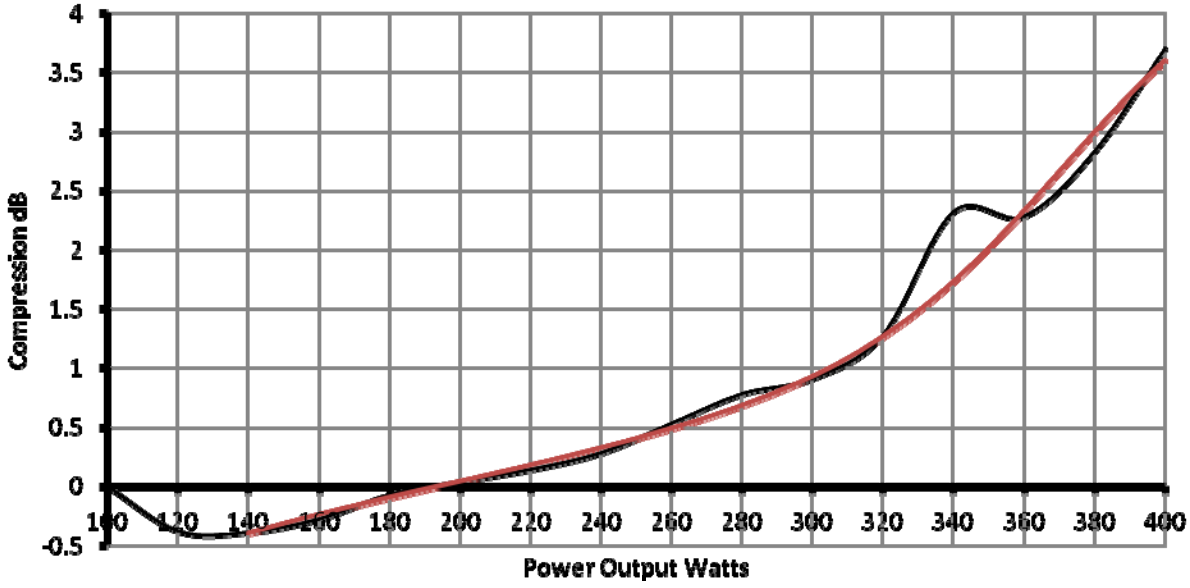
The chart below is an example of our IXZ2210N50L MOSFET in a Class A/B configuration at 30 MHz. The example is from actual data taken.

Power Input	P_{IN} (dBm)	Power Output (W)	P_{OUT} (dBm)	Gain (dB)	Gain (dBm)
1.0	30.00	100	50.00	20.00	20.00
3.7	35.68	300	54.77	19.09	19.09
7.3	38.63	380	55.80	17.17	17.17

From the chart, the P1db point appears to be about 300 W because the gain is down by about 1 dB. The component is considered linear to the P1dB point and then becomes nonlinear above that point.

The concept appears graphically in the following charts from the IXZ2210N50L at 30 MHz. In the first chart it is seen that the part becomes nonlinear above 305 W because that is the output power at which the curve crosses the +1 dB line. (The red chart line was placed in the chart to show the difference in slope more easily.)

Compression dB vs. Power output at 30MHz



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