

WIDE-BAND RF AMPLIFIER



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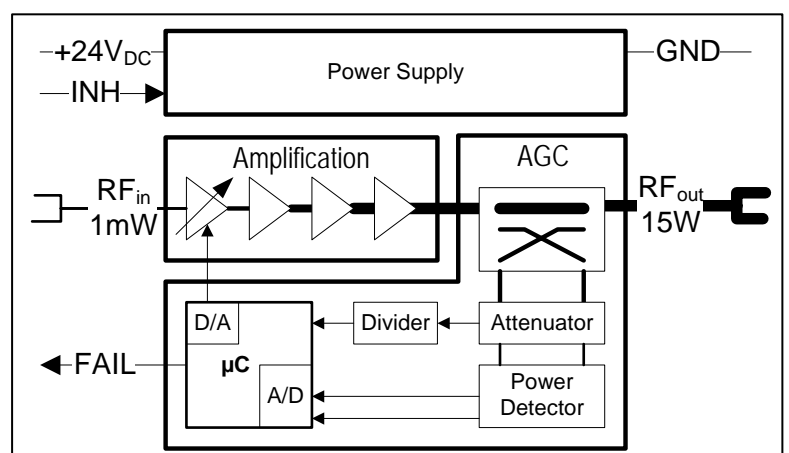


Mine detector

Problem: Mine detection is a challenging task and many lives could be saved every year, if a well performing mine detector was available. Albrecht Telecommunications is developing such a mine detector, which works on the principle of frequency interferometry, i.e., radio frequency waves are radiated into the ground and their reflected response is measured. A vital part of the system is the RF amplifier, which boosts the signal provided by an exciter to a sufficient power level.

Goal of our studies: The objective of this project is to develop a set of RF amplifiers for the wide frequency bandwidth (more than 1GHz) used by the mine detector. These amplifiers should have at least 15W of output power and have to be resistible against mismatch at the output under all conditions. The signal scheme used is continuous wave (CW). An important requirement to the amplifiers is linearity. Nevertheless, they should have a fair efficiency. Amplifiers with this enormous bandwidth, high gain and high output power are very demanding devices, which cannot just be bought off the shelf.

Approach: Based on a semester thesis, a MOSFET-powered push-pull amplifier was developed. This design offers certain advantages over a single-ended approach, but requires a good symmetry between both paths. Because of the high bandwidth and the limited space available, a traditional transistor matching using lumped elements is not possible. Therefore, carefully selected transistors, which provide good inter-stage matching, are used. To keep the output power of the signal constant over the full bandwidth and to prevent damage to the amplifier in case of mismatch, the forward and the reflected powers are measured. This information, together with the frequency measured, allows a microcontroller to control the gain of the first amplification stage.



Principle schematic