

## Technology Profile Fact Sheet

**Title:** All-Digital Audio Power Amplifier with Random Switching

**Aliases:** None

**Technical Challenge:** Battery-powered audio power amplifier applications demand a compromise between battery life, size, weight, and cost. Typical devices suffer, however, from power inefficiencies during transitions between “on” and “off” states, and may generate excessive electromagnetic interference as well.

**Description:** Small, battery-operated audio power amplifiers, such as those found in MP3 players, hearing aids, and audio surveillance equipment, require the utmost efficiency to obtain sufficient battery life, small size, lower weight, and reduced cost. This invention uses a fundamentally new concept that increases efficiency and greatly reduces electromagnetic interference. Increased efficiency translates into greater battery life and/or fewer batteries. Reduced EMI results in the ability to employ the device without additional shielding.

A transistor draws very little power when it is operating fully switched “on” or fully switched “off.” In an analog power amplifier, however, it is usually operating between these two extremes and wastes power by creating wasted heat. This invention takes an input signal directly in digital form. It compares each input digital sample with numbers generated by a pseudo-random number generator (PRNG). When the input is greater than the random number, the output of the comparator is switched “on.” Otherwise it is switched “off.” The output controls a switching amplifier, which is then mostly “on” when the input to the comparator is high and mostly “off” when the input is low. Electromagnetic interference is not concentrated at the switching frequency as was the case with the pulse width modulator. Instead it is “spread” over a broad frequency range by the randomness of the switching times.

**Demonstration Capability:** There is currently no demonstration available, but one easily could be built at minimum cost.

**Potential Commercial Applications:** Potential applications include consumer electronics such as MP3 players, hearing aids, and audio surveillance devices.

**Patent Status:** A patent application has been filed with the USPTO.

**Reference Number:** 1488