

P R I M A R E

ULTRA FAST POWER DEVICE (UFPD) CLASS D AMPLIFICATION

2 PAGES

The naming of Class D

The "D" in class-D is sometimes said to stand for "digital." This is not correct because the operation of the class-D amplifier is based on analogue principles. There is no digital coding of the signal. Before the advent of the class-D amplifier, the standard classes were class-A, class-AB, class-B, and class-C. The "D" is simply the next letter in the alphabet after "C." Indeed, the earliest work on class-D amplifiers involved vacuum tubes and can be traced to the early 1950s.

Background

The use of switch mode power electronics is gaining in popularity as the result of its lower energy consumption and as a way to squeeze more amplifier channels into smaller spaces. Unfortunately Class D amplifiers and their switch mode power supplies have traditionally deserved a reputation for poor audio quality because it is very difficult to produce a full range 'hi-fi' signal through them. A major source of distortion is the demodulation filter on the output which is affected by variations in loudspeaker impedance unless it's controlled by sufficient feedback. The failure to provide enough feedback results in the 'classic' Class D sound characterised by rising THD with frequency. While very dynamic and vivid initially, Class D amplifiers can sound tiring and uncontrolled in the long term, especially when driving complex loads like multi-driver speakers.

Primare's UFPD (Ultra Fast Power Device) provides for the possibilities of an 'audiophile' Class D design. It is a Class D technology which has a consistent 26dB feedback loop gain across the entire audio range and is stable way beyond the audio band. This is quite easy to achieve in conventional linear 'continuous signal' amplifiers, but much more difficult in 'non-continuous' high speed switching amplifiers.

Rather than have the amplifier and then the filter as discrete stages, the UFPD design integrates the two, making control with feedback much more immediate and accurate. The UFPD amplifier actively adapts the loop gain to keep the total loop stable during start up, clipping and current limit. It senses the changes to the filter output and compensates by applying the precise amount of feedback. This adaptive pole control allows for several more dBs of constant loop gain across the audio band and maintains performance irrespective of load (impedance) variations.

Primare's UFPD treats all signals equally regardless of frequency or slew rate and has the ability to suppress the filter resonance entirely. Consequently THD is kept very low at all frequencies. With a very wide 'load independent' frequency response UFPD is able to drive any speaker while maintaining control and accuracy.

Primare has optimised the performance of its innovative UFPD design with the precise selection of circuit component values and quality, verifying the design with extensive measurement and listening.

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Summary

UFPD displays:

- Wide bandwidth
- Flat frequency response
- Load independant frequency response
- Low output impedance in the entire audio band
- Low THD in the entire audio band
- Low noise

Most Class D technologies display:

- Limited bandwidth
- Peaking frequency response
- Load dependant frequency response
- High output impedance at high frequencies
- High THD at high frequencies
- High noise



PFC Power Supply

In conjunction with UFPD, Primare uses an isolated PFC (Power Factor Control) technology in the power supply, which controls the current from the mains voltage so that it is a pure sine wave with the same frequency and phase as the mains voltage. This means that even if 1000W is taken from the mains, other equipment in the room will not be affected. Its presence becomes virtually invisible to the mains voltage! The isolating stage of the converter works in a ZVS mode and as a result, the switch flanks contain a lower quantity of harmonics, providing lower EMI and a clean environment for the amplifiers to work in.

ends 03/30/10