

June 2014

## DESIGN BRIEF

### A60 Reference Power Amplifier 4-pages



#### Introduction

The A60 is a reference audiophile, fully balanced 2 x 250W UFPD stereo power amplifier designed to complement all high-end pre-amplifiers but chiefly as a companion to its matching PRE60 pre-amplifier. With the 60 series components, Primare reclaims its presence in the high-end music system market, reprising the iconic designs of previous decades with ravishing new separates, complete with state-of-the-art audio streaming performance and striking two-tone bodywork. By combining our traditional build quality and analogue circuit design with the finest digital processing, the first 60 series music system represents a major step-up from the 30 series and introduces a new supremely audiophile level of performance to our product range.

The A60 is designed to provide high power output with very low distortion for our PRE60, as well as multi-channel audio processors. UFPD's instantaneous rise time results in a naturally fast, clean and agile sound over a much wider frequency range and with exceptional headroom. Ecologically the A60 is far superior to conventional Class A/B designs being extremely efficient without generating excessive heat.

#### Audiophile Topology

The A60 houses four discrete UFPD amplifiers (two per channel) in a fully balanced configuration, housed in a heavy gauge alloy steel chassis (15mm aluminum front panel), which provides strength, rigidity, and screening, while being effective at damping vibrations from external sources. Each channel incorporates unbalanced RCA and balanced Neutrik XLR inputs, as well as high quality WBT Nextgen speaker terminals, trigger and RS232 control inputs. Unbalanced input signals are converted to balanced signals by an integral high quality conversion stage.

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Balanced signal transmission means that two identical signal lines are used to carry the same signal with opposite phase. Any noise is common to both lines is present in equal amounts and with identical phase. At the receiving end a (differential) receiver retains the opposite phase signals (music) and rejects the common phase ones (noise), leaving only the pure original signal. Balanced circuits therefore keep the signal as free as possible from interference.

The A60 design employs a discrete, heavy-duty, regulated switch-mode power supply (2600 VA peak) feeding a four-layer board incorporating custom heat sinks, excellent 1% MELF transistors, very short signal paths and optimized grounding for best performance. The A60 is fully protected against DC or overheating by the automatic muting of the loudspeaker output. Van Den Hul SCS12 cable is used for internal connection to the speaker terminals.

We have optimized the performance of the A60's innovative UFPD design with the precise selection of circuit component values and quality, verifying the design with extensive measurement and listening.

### **Ultra Fast Power Device (UFPD) Class-D Amplifier**

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 becomes unstable with variations in loudspeaker impedance, unless it's controlled by sufficient feedback. The failure to provide enough feedback to cope with dynamic changes in loudspeaker impedance across the audio band results in the 'classic' Class D sound of rising THD with frequency. While very dynamic and vivid initially, it can sound tiring and uncontrolled in the long term, especially when driving complex loads like multi-driver speakers.

Our 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.

Our 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.

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## Notes

- UFPD switching frequency is above 300kHz.
- The output filter cut-off is higher than the audio band but is well below 300kHz.
- UFPD displays:
  - Wide bandwidth
  - Flat frequency response
  - Load independent 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 dependent frequency response
  - High output impedance at high frequencies
  - High THD at high frequencies
  - High noise

## PFC Power Supply

Although switch mode power supplies have gained a reputation for noise and unreliability, the theoretical advantages of the design are well known. The rails can be regulated with precision and current demand from the mains is lower as the result of high efficiency and the absence of current spikes: energy is taken from the mains over a larger period of the sine wave.

In conjunction with UFPD, we use 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 system 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.



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**Made in Sweden****Product features A60**

- Fully balanced signal transmission
- UFPD technology with 4 output models (2 for each channel) in balanced configuration.
- Heavy Switch mode power supplies (2600VA peak)
- Excellent 1% MELF resistors
- Multi-layer Board (4) for very short signal paths, optimum grounding and best performance
- Fully protected (In case of DC or overheating is indicated, the A60 will mute the loudspeaker output)
- Custom made heat-sinks for best signal path and performance (direct mount on the PCB board)
- High grade WBT nextgen Speaker connectors (two pairs)
- High grade WBT nextgen RCA sockets
- Neutrik XLR connections
- Van Den Hul SCS12 Cable (for internal speaker connection)
- Unbalanced input signal will be transformed to balanced
- Discrete regulated power supply for the input stage
- Heavy-duty chassis with aluminium front panel (15mm)
- Integrated LOGO, standby/power button.
- RS232, trigger in/out

**Product specification A60**

Output power:

2x250W 8 ohm (both channels driven), max 610W

2x500W 4 ohm (both channels driven), max 1230W

THD+N: <0.02% (1kHz 250W 8 ohm); <0.002 (10W 8 ohm)

Signal to Noise: 20-20kHz unweighted -105dBV

Gain: 26dB Unbalanced, 20dB balanced

Power Consumption Standby: 0.5W; Operate: max 32W

Dimensions (WxDxH) 430 x 385 x 142mm

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