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I22 Design Brief, 4 pages



I22 two channel integrated amplifier

The I22 is a two x 80 watt integrated amplifier utilising proprietary UFPD power technology. It is designed to provide high power output with very low distortion and system control for Primare's new 20 series range of hi-fi separates. 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 I22 is far superior to conventional Class A/B designs being extremely efficient without generating excessive heat. In addition it provides a special eco-friendly standby mode of just 0.3 W.

Audiophile Topology

The I22 houses two discrete UFPD amplifiers housed in a heavy gauge alloy steel chassis, which provides strength, rigidity, and screening, while being effective at damping vibrations from external sources. To reduce distortion the pre-amp section is being fed by a dedicated power supply. The I22 incorporates four pairs of RCA connectors, pre and record outputs, RS232, IR in/out, RF and trigger out.

All signal paths are as short as possible and all signal controls (source selection, volume and channel balance trims) are performed purely in the analogue domain. Volume and balance controls employ a single LM1972 attenuator. Source selection is via high performance signal relays.

Optional DAC Board

An optional DAC board is available, comprising three digital inputs for, among other things, streaming music files from PCs and Macs: isochronous USB-B (16-24bit/44.1-96kHz), TOSLINK (16-24 bit/44.1-192kHz) and S/PDIF (16-24bit/44.1-192kHz).

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All digital inputs are converted to 24bit/96kHz by Analog Devices' AD1855 high performance, single-chip stereo audio DAC and back to analogue by TI's PCM1792A 24bit/192kHz DAC. Although the I22 uses a conventional Isochronous USB input, it is non-standard, exhibiting reduced jitter and improved clock performance by using TI's USB streaming chip TAS1020B.

Through the TAS1020B, the firmware is re-coded for state-of-the-art digital PLL control and as a result, the jitter performance of the I22's USB has been greatly improved.

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, characterised by rising THD with frequency. Primare's UFPD (Ultra Fast Power Device) technology provides for the possibilities of a full-range 'audiophile' Class D design. It is a Class D technology which has a consistent 26dB feedback loop gain across the entire audio bandwidth and is stable way beyond the audible frequencies. 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

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, 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.

Ultra low-power standby

The I22 incorporates a very low power eco mode for standby. Power consumption is just 0.3W.

Easy User Interface

An easy set-up menu is available via the I22's VFD display, which is dimmable in four steps. Set-up includes power-up volume, maximum volume adjustment, input re-naming (up to 6 characters), and trim function (volume and balance) for each input in steps of 1dB.

Input 4 can be used to provide access to the I22's 80W power modules for additional channels of power amplification in a surround sound system. (SSP input)

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Back panel with optional DAC board installed.

Product specification 122

Output Power	2x 80W at 8Ω, 2x 160W at 4Ω
Analogue Inputs	4 pair RCA (L & R)
Optional DAC Board	1x USB-B input 1x Digital Optical input (1 TOSLINK) 1x Digital Coaxial input (1 RCA jack)
Input Impedance	15kΩ
Analogue Record Output	1 pair RCA (L & R)
Pre Out	1 pair RCA (L & R)
Output Impedance	RCA 94Ω
Frequency Response	10Hz – 20kHz, -0.5dB
THD + N	< 0.05%, 20Hz – 20kHz, 10W at 8Ω
Signal to Noise	-95dB
Power Consumption	Standby: 0.3W; Operate: 19W
Dimensions (wxdxh)	430 x 420 x 106 mm
Net weight	10 kg
Gross weight	12.5 kg
Colour Options	Black and Titanium