Class Z™
Direct digital feedback amplifiers
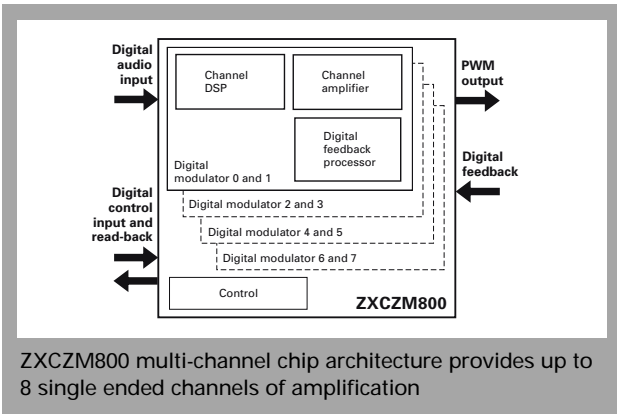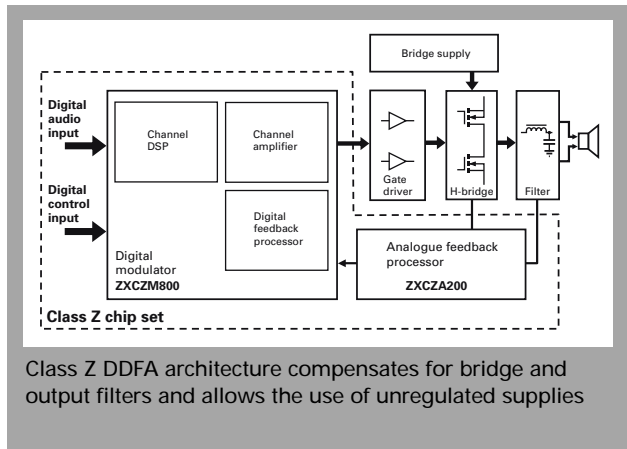
ZETEX
SEMICONDUCTORS

Quality, performance and simplicity

Class Z™ direct digital feedback amplifier (DDFA™) technology enables switching amplifier solutions capable of producing a sound quality to challenge that of the very best linear amplifier.

Comprising a multi-channel digital modulator (ZXCZM800) and a feedback processor (ZXCZA200), the Zetex Class Z chipset combines with Class D output stages to create high performance amplifiers achieving a THD+N of less than 0.004% and dynamic range of 120dB.

The scalable architecture of Zetex Class Z audio amplifiers suits a broad range of power levels, significantly reduces cost and dramatically simplifies system design.

Class Z DDFA architecture compensates for bridge and output filters and allows the use of unregulated supplies

ZXCZM800 multi-channel chip architecture provides up to 8 single ended channels of amplification

Digital audio inputs:
I²S and TDM interfaces support up to 32 bit resolution and sample rates from 32kHz to 192kHz.

DSP:
Configurable, high resolution DSP processing available to the system developer for custom EQ, channel mixing, active crossovers and much more.

Power management processing:
Clip management, dynamic compression, power and current limiting and intelligent protection.

Scaleable architecture - channel count:
8-channel digital modulator supports up to 8 channels single ended or 4 channels BTL.

2-channel feedback processors allow the efficient implementation of a wide variety of channel counts.

Scaleable architecture - power delivery:
Supports a range of output stage topologies up to 500W.

Complementary or all N-channel FET bridge architectures.

Feedback topology:
Supports feedback post-bridge and post-filter delivering outstanding performance.

No compromise design

DDFA technology provides a fast, accurate compensation loop solving a wide range of design issues, which previously compromised switching amplifier sound quality.

The Class Z amplifier architecture compensates for the limitations of FET output bridges at high powers, accommodates non-linearities in output filters and is tolerant to high levels of PSU noise, allowing the use of unregulated supplies.

Class Z also removes any trade-offs between distortion and dissipation in the output stage to ensure cool running and outstanding audio quality.

The highly integrated Class Z amplifier provides a single-step implementation of the conversion from digital source to power delivery at the speaker. The D to A conversion, pre-amplifier and power amplifier functions are accomplished in one, with an overall performance equal to that of a state of the art audio DAC. Put simply, Class Z delivers a new level of performance.
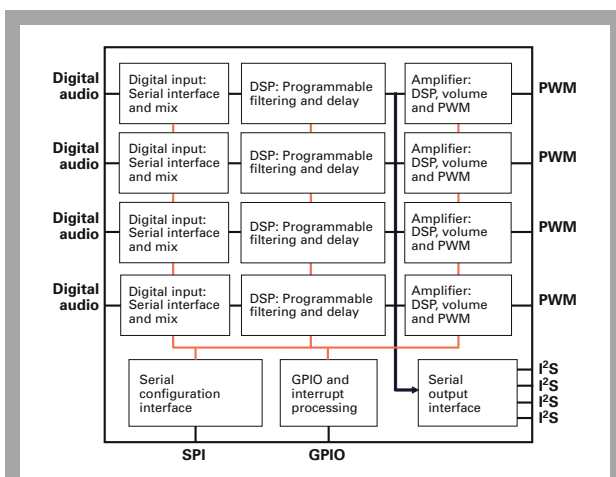
Simple control and fully featured DSP provides DAC, pre-amp and power amp in one.

Advanced functionality

The Class Z modulator and feedback processor chipset provides the functionality to dramatically enhance amplifier system design.

Digital audio input:
4 fully independent digital audio input ports.
I²S, left and right justify input formats.
4 fully independent TDM input ports.
32 bit input allows full resolution transfer from DSP.

Signal mapping and mixing:
Any input can be mapped to any amplifier output.
Multiple channel mixing with common sample rates.

Sample rate converter:
Integrated clock oscillator and sample rate converter avoids jitter problems with external clocks and PLLs.

Simple tone control:
Selectable corner frequencies including tilt setting.

DSP:
High resolution DSP resources.
35 bit data-path with 62 bit accumulators.
Simple coefficient configuration interface.
14 user programmable biquads per channel.

Volume control:
Master volume and channel offset modes.
-91db to +36dB in 0.5dB steps.

Advanced power management:
Dynamic compression including "night-time" modes.
Configurable clipping management options including soft clipping mode with variable thresholds.
Power and current limits.
Speaker impedance detection.

Protection and diagnostics:
Integrated intelligent protection and fault reporting

Performance and the listening experience

Listeners compare the sound produced by Class Z amplifiers to that of the very best linear amplifiers. They comment on how realistic and warm the sound is and describe the sound stage as wide and deep.

Even on crowded tracks listeners can identify the fine detail, the precise instrument positioning and separation and at the low end, a tight punchy bass. Outstanding small signal linearity allows the true character of the music to be heard just the way it was recorded.

Dynamic range:
The extraordinary dynamic range of 120dB leads to a very low residual output noise voltage of less than 60µV.
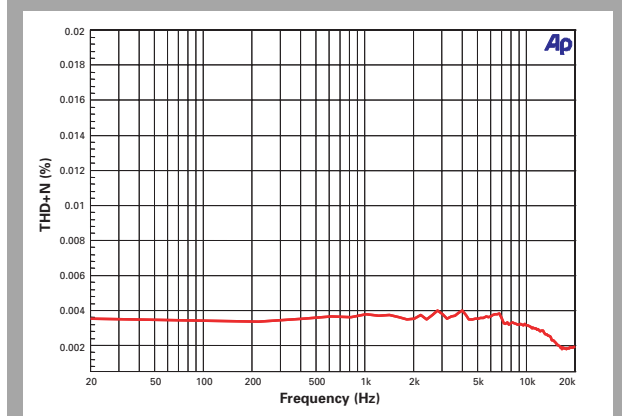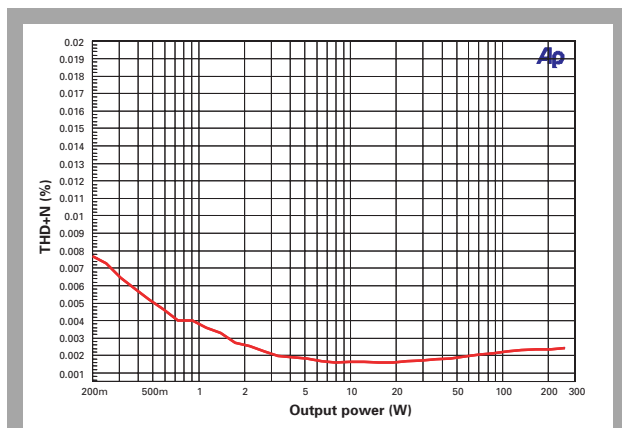
Distortion and noise:
Less than 0.004% from 1W to 250W into 8 .

Frequency response:
±0.5dB up to 20kHz with 44.1kHz sampled data.
85kHz with higher sampling rates.

Damping factor:
Low frequency damping factor more than 5000 at 50Hz.

THD+N well under 0.004% with frequency, and for power levels between 1W and 250W into 8 and beyond, provide the best listening experience.

Optimized for the application

The design options provided for each of Class Z's three system elements: modulator, feedback processor and output bridges, gives designers the flexibility to exploit the technology for a whole range of applications.

Multi-channel home theater:
A large range of channel configurations are supported from 2.1 through to 7.1 with a single ZXCZM800 device. The LFE outputs can be implemented on unused amplifier channels with the same outstanding performance and digital front end.

Stereo Hi-Fi:
The exceptional end-to-end digital performance enables outstanding 2-channel products. The scalable architecture allows exotic features such as bi-amping to be implemented. Auxiliary analog outputs can be provided for pre-out or headphone applications. High resolution tone and volume controls give a highly linear and low noise operation.

Active speaker:
The inbuilt high resolution DSP capability offers the tools for active cross-over implementation. The DSP architecture has been specifically engineered to deliver low noise performance even with high order, low frequency filters. Fine resolution per-channel delay facilitates time alignment of drive units. Offset per-channel volume controls cater for differing impedance drive units.

Custom install:
System scalability to high channel count configurations supports a range of distributed audio architectures. Power management features allow the system to adapt to situations where speakers are used in parallel. Installation faults such as short circuits can be detected and reported. Configurable channel mapping and phase inversion can solve installation errors. Soft clipping can prevent speaker damage through misuse.
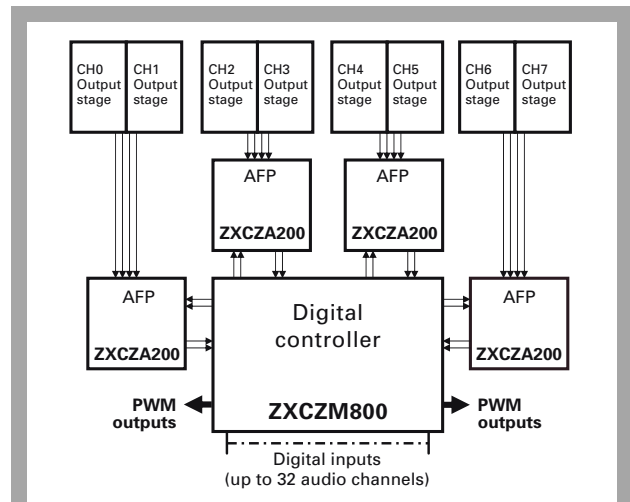
8 channel single ended configuration ideal for home theater applications.
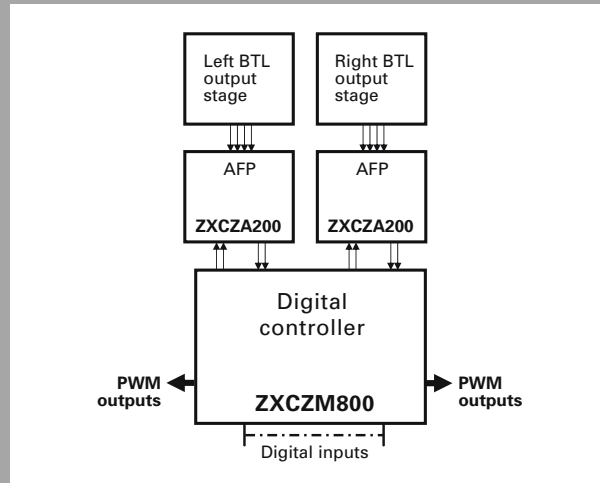
2 channel BTL configuration provides ultimate performance for Hi-Fi applications.

Flexibility in design

The Class Z architecture provides the flexibility for system designers to achieve their objectives in both specification and sound.

Output power:
The ability to operate in single-ended or BTL modes and support of complimentary or all N-channel FET bridges provides a large range of power possibilities.

Power supply:
The Class Z system allows the use of either regulated or unregulated power supplies. The PSRR of 80dB means that outstanding performance can be achieved without exporting technical problems to the power supply designer.

Delivering the sound:
The extensive DSP facilities provide many tools to the designer. Add the designer's expertise in selecting external components and the required sound character can be achieved.

Further information

Zetex aims to provide the most appropriate advice and support for users of Class Z technology and other switching amplifier products. For further assistance refer to www.zetex.com/audio or email audio@zetex.com with your current project details.

![ZETEX SEMICONDUCTORS logo]

About Zetex

Zetex Semiconductors designs and manufactures high performance semiconductor solutions for analog signal processing and the management of power in automotive, communications, consumer and industrial electronics.

Meeting the demand for greater power economy, precision and speed in analog circuit design, the broad Zetex product range comprises application specific linear ICs and discrete semiconductor devices in multiple package configurations.

As a specialist in analog technology, Zetex offers a diverse series of ICs for motor control, lighting and DC-DC conversion as well as audio, video and linear applications. Its discrete component range features trench MOSFETs, IntelliFET™ smart MOSFETs and bipolar transistors.

Headquartered near Manchester in the UK, Zetex Semiconductors has manufacturing and sales operations in Asia, Europe and the USA and is supported by distributors in more than 45 countries.

For more information about Zetex, please visit
www.zetex.com
www.zetex.cn

Zetex Semiconductors is committed to protecting the environment and compliance with all relevant national and international legislation. In line with the European Union's RoHS directive (2002/95/EC), lead and other prohibited substances are being eliminated from the entire Zetex product range. For further information visit www.zetex.com/leadfree.