



SLYW065

The New Audio Amplifier Benchmark

High Power Audio and Actuators (HPAA)



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The TPA32xx family: The new Benchmark in Integrated Power Amplifiers

TPA3244 / TPA3245 / TPA3250 / TPA3251 / TPA3255

What we design?



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Design for High-Resolution Audio

Designed for 96kHz / 24bit and 192kHz / 24bit high definition audio systems

Unrivaed Audio Performance

Lowest output noise and lowest THD from any Class-D

Optimized Energy Performance

Optimized to be efficient no matter the active output power, Highest power output to idle-loss ratio ever

Smallest Solution Size

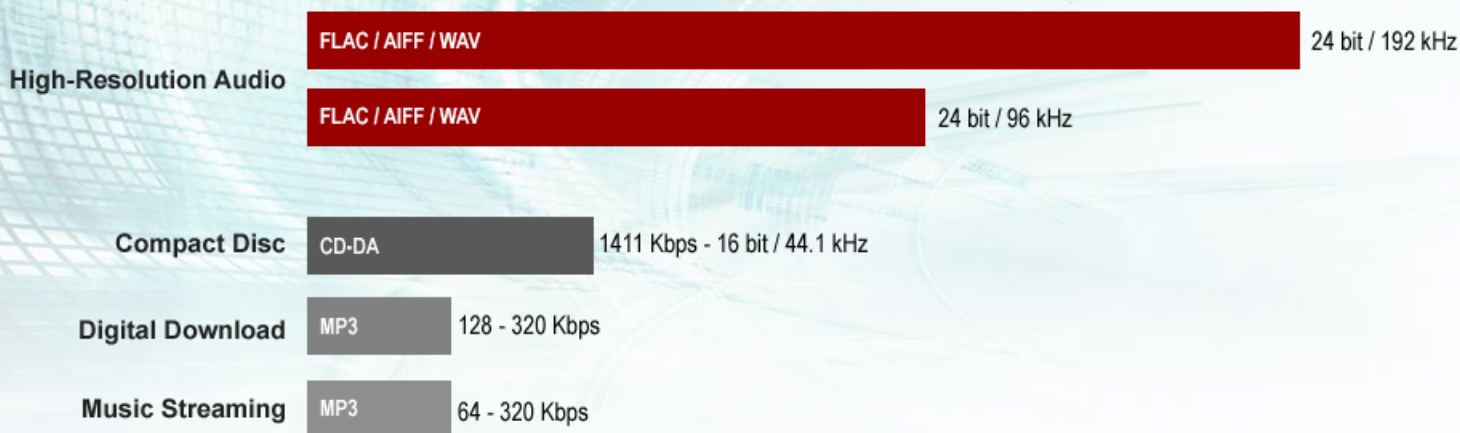
Integrated modulator, FETs, and protection reduce the size and cost of the solution

Audio Format Trends



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Audio download and streaming services are moving towards Hi-Res audio formats like FLAC



The **TPA32xx** enables **true premium high definition audio sound quality** (HD Audio / High Resolution Audio) with the **support of up to 192kHz / 24bit**

Highest Bandwidth Ever



Your Source for

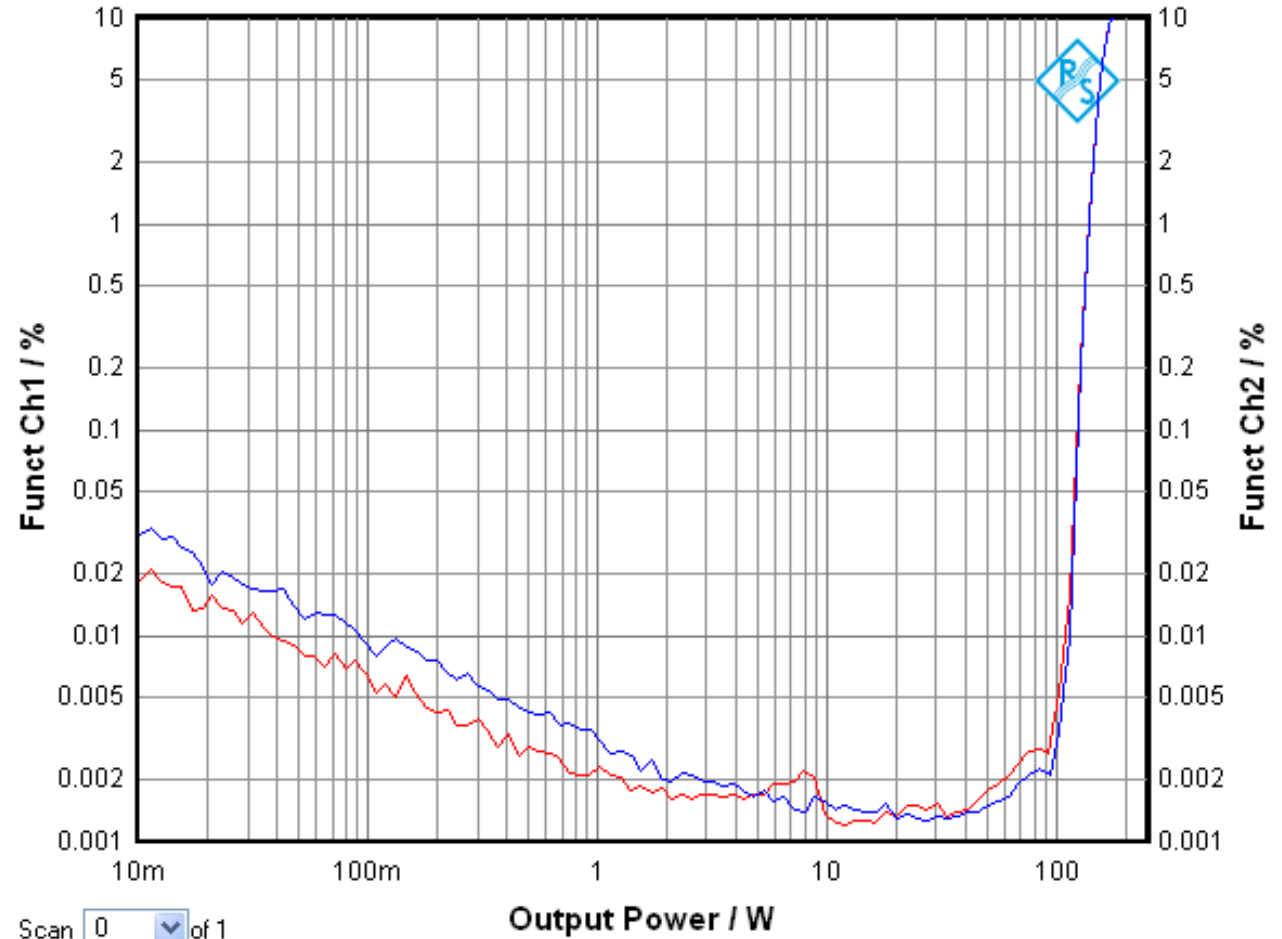
Inspiration

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TPA32xx – THD+N vs Power – 4Ω, 1kHz, Diff Input, 25degC, 250kHz BW

- Best THD+N all the way to clipping
- Increased loop bandwidth to minimize audio distortion

Graph shows THD+N performance using a 250kHz bandwidth meter (not A-weighted)



Highest Bandwidth Ever



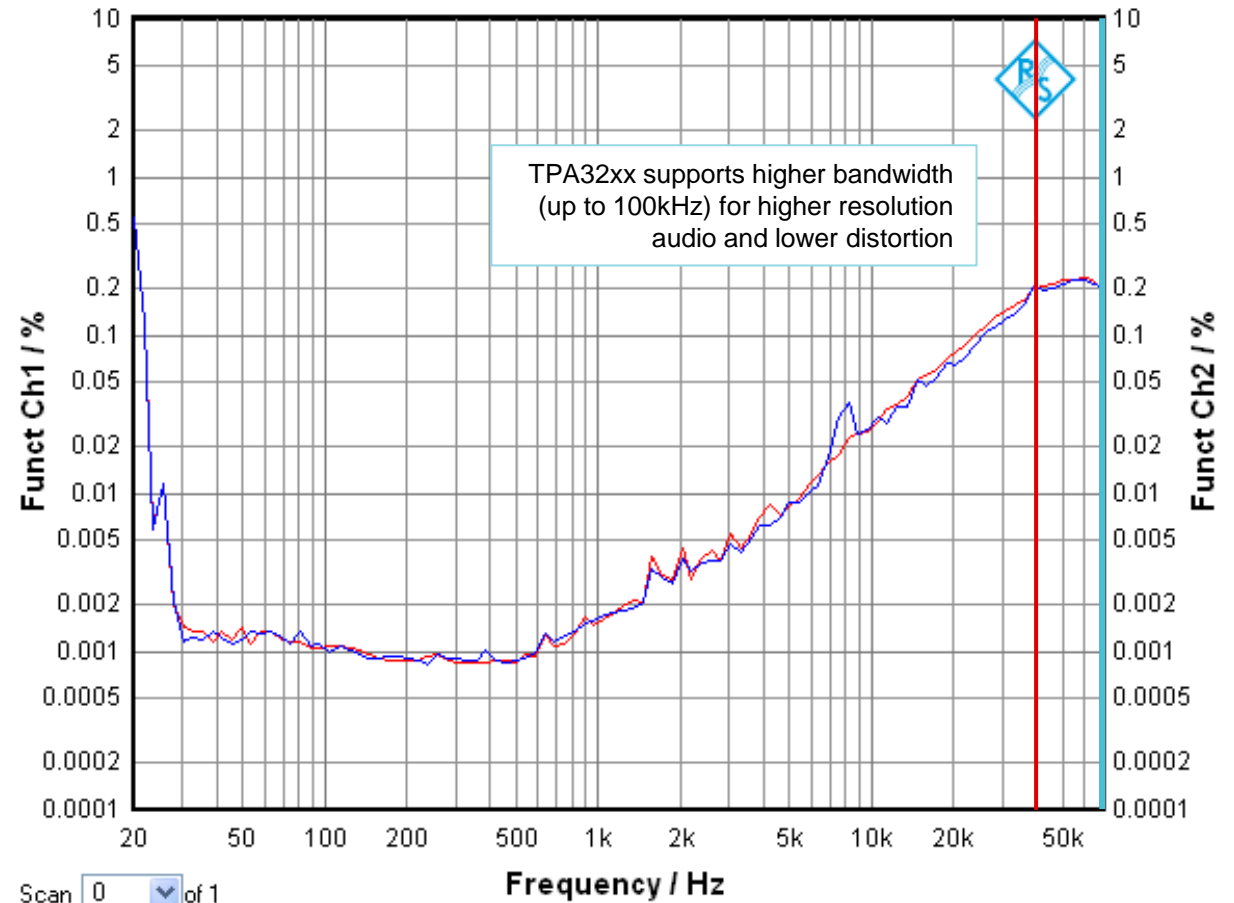
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TPA32xx – THD+N vs Frequency – 4Ω, 10W, Diff Input, 25degC, 250kHz BW

- Traditional amplifiers only support up to 40kHz bandwidth
- TPA32xx increased loop bandwidth up to 100kHz supports high-resolution audio

Graph shows THD+N performance using a 250kHz bandwidth meter (not A-weighted)



Tradition amplifiers only support up to 40kHz bandwidth

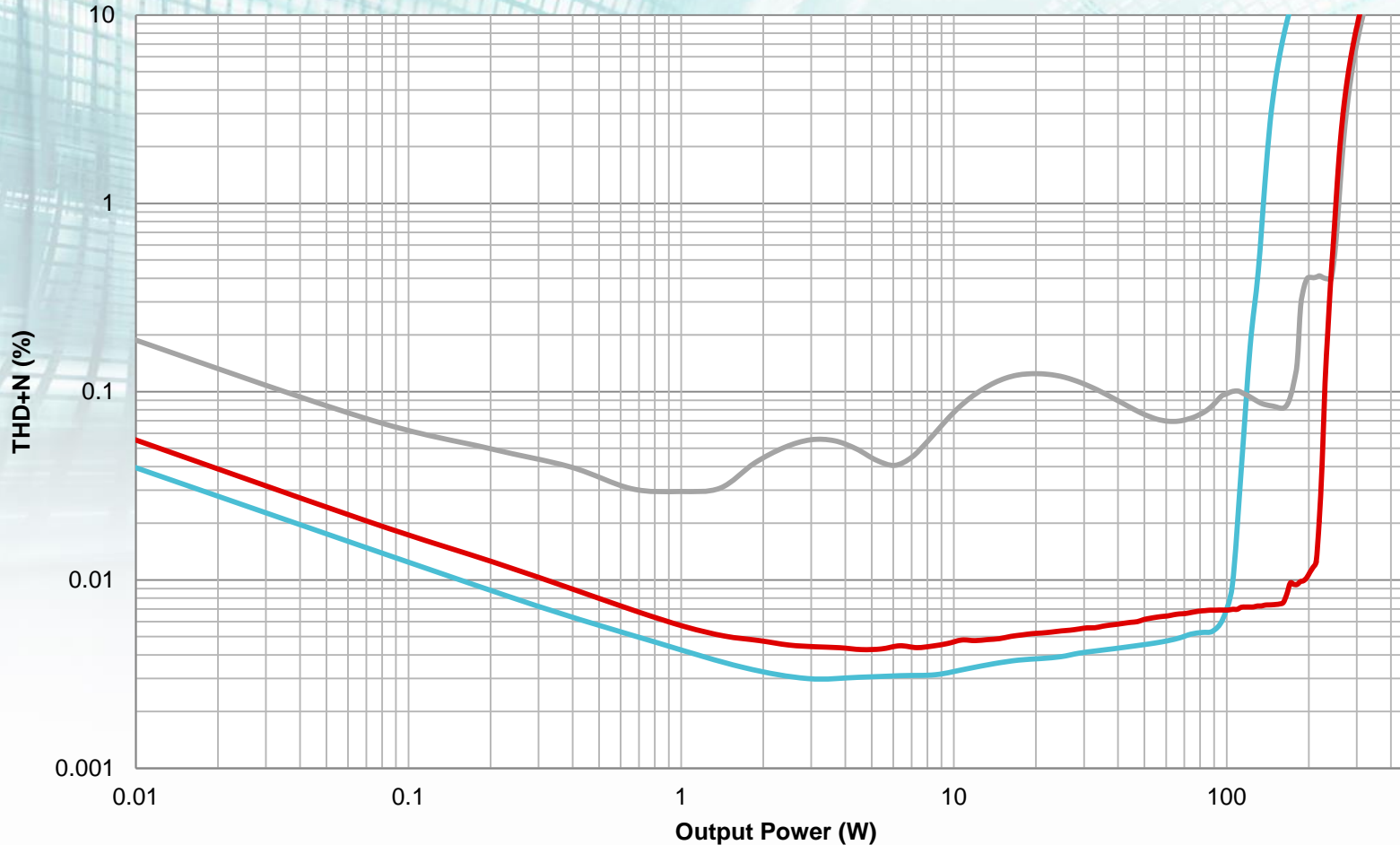
Unrivaled Audio Performance & Power



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TPA32xx – THD+N vs Output Power - BTL Single Channel



- ✓ Innovative closed-loop architecture
- ✓ THD as low as .005% to clipping
- ✓ With noise < 60uV, < half of the output noise of the nearest competitor

— TPA3251 - 4 Ω **New**

— TAS5630B - 4 Ω

— TPA3255 **New**

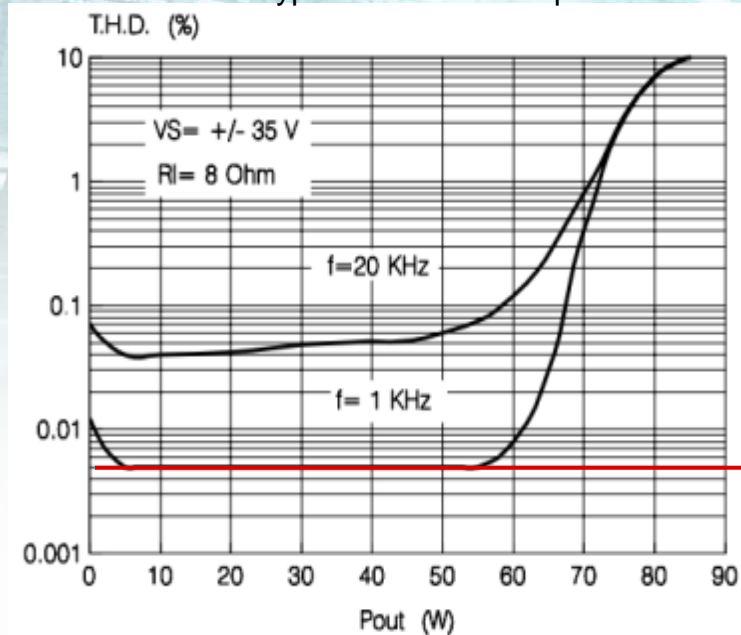
TPA32xx Class-D vs Class-AB Performance



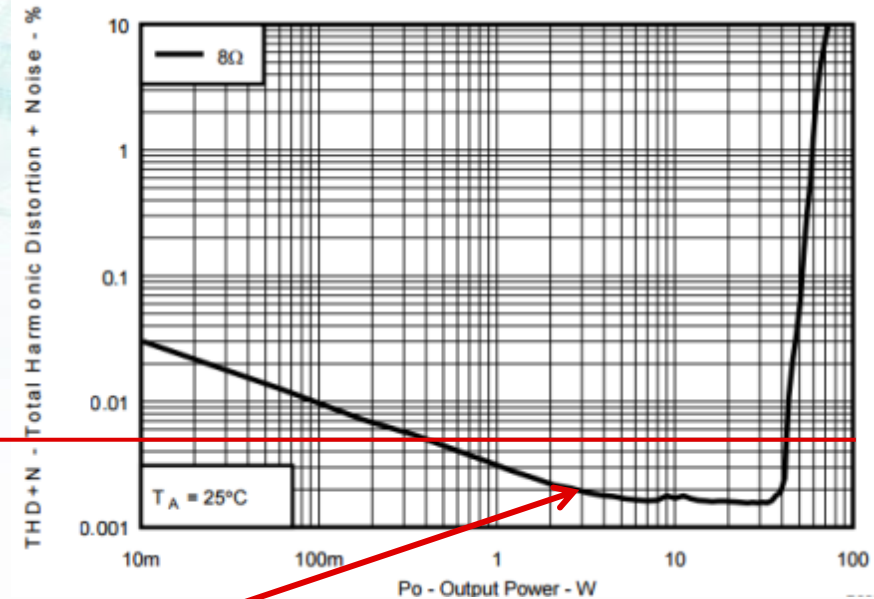
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Due to the extremely high audio performance of the TPA32xx amplifier family,
Class-D can now compete and replace Class-AB amplifier performance!

Typical Class-AB Amp



TI TPA3251 Class-D



Lower THD+N!

When is it important to be efficient?



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- TPA32xx is **>90% efficiency at full power** for high power applications; however, audio does not always operate at peak output power...



- With most audio having a crest factor of 1/8, low power and idle operation are very important.

$$\text{Music Crest Factor} = \frac{\text{Peak power}}{\text{Continuous Power}} = \frac{1}{8}$$

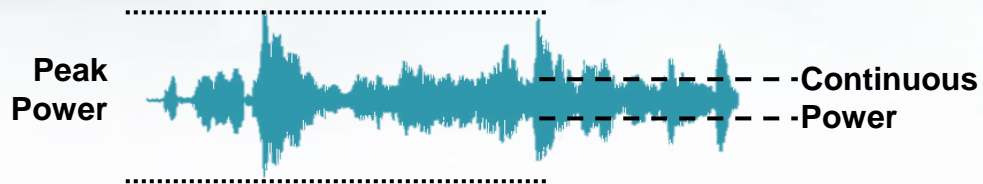
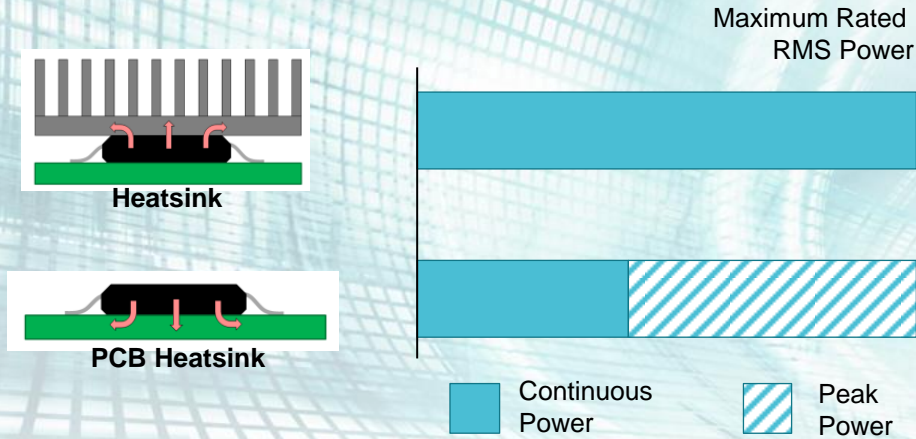
- TPA3251 idle power loss is always less than 1W - even when hot!
Highest Output Power to Idle-Loss ratio ever!



Peak Power vs Continuous Power



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- Low average power or low crest-factor applications may not require a heatsink
- TPA32xx family of devices have a pad-up or pad-down option for most power levels allowing either a heatsink or the PCB to be used for dissipating heat.
- This allows applications to deliver high peak power for short durations, while maintaining a small solution size.

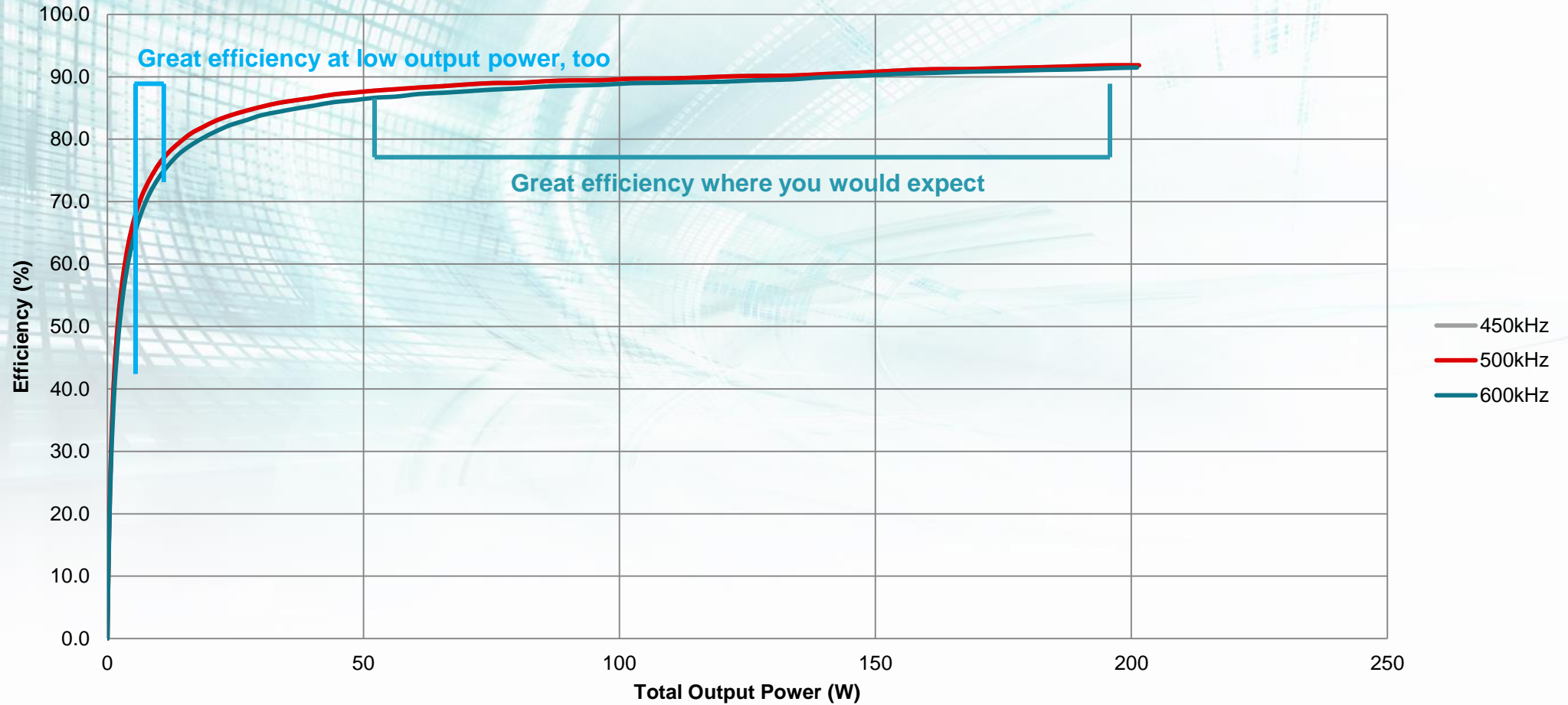
Efficiency



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TPA3251 Efficiency vs Output Power

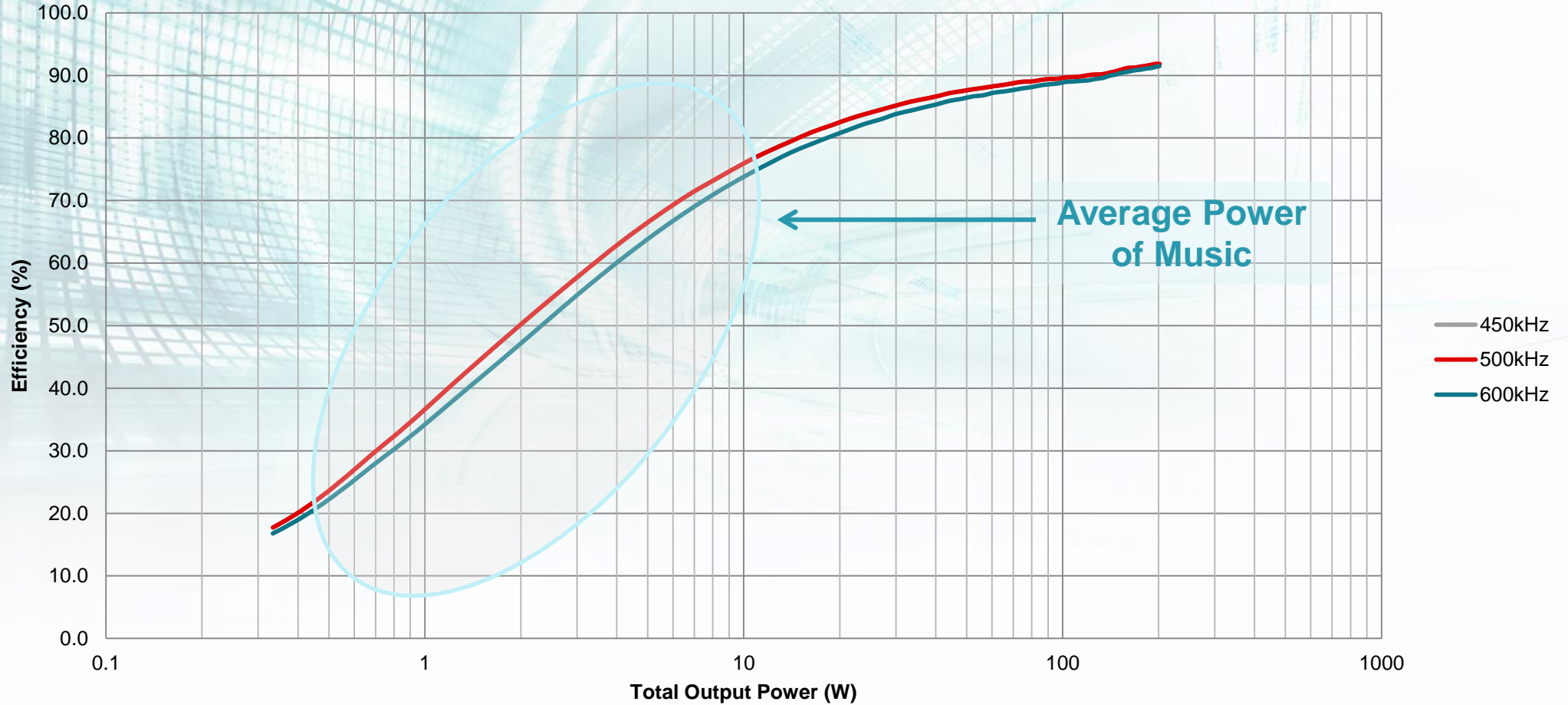


Efficiency at Low Output Power (Zoomed In)



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Music has low average output power with high peaks, TPA3251 Efficiency

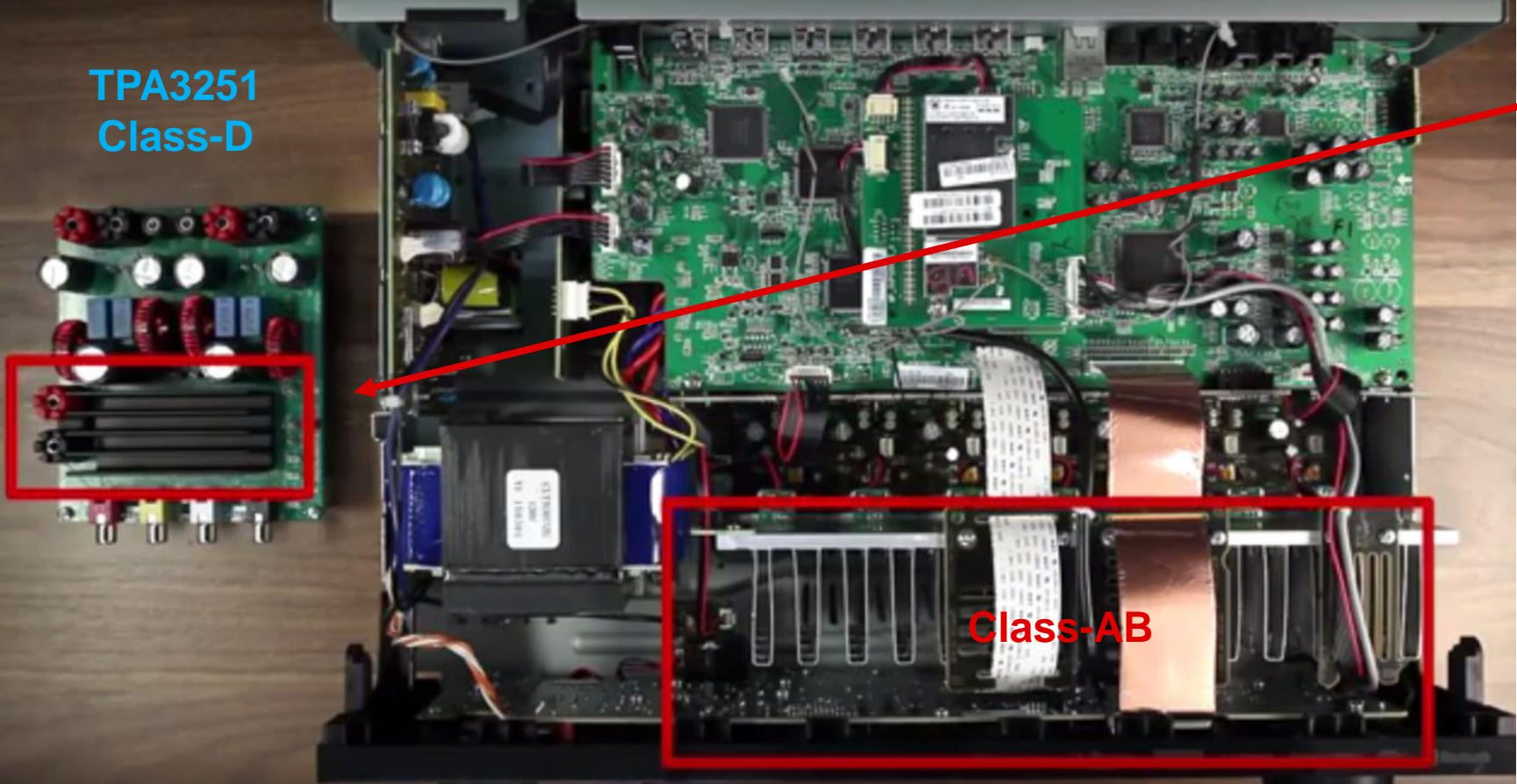


Solution Size: Class-AB vs Class-D



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TPA3251
Class-D

Reduced
heatsink size

Class-AB

Smallest Solution Size – Integrated Protection



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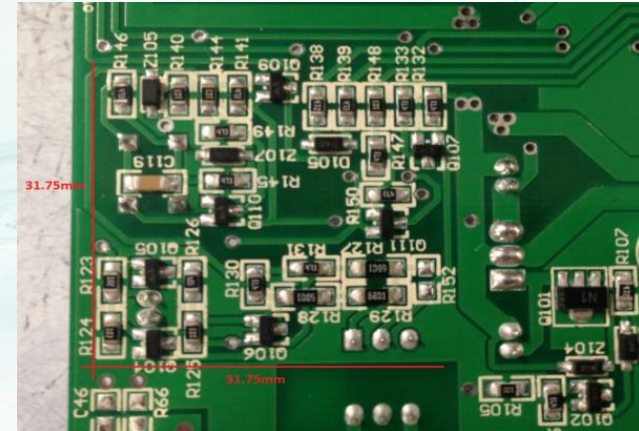
Save space, component costs and assembly costs

TPA3251 with integrated protection

- Clipping Detection
- Over-current protection
- Cycle-by-Cycle Current Limit
- Over temperature Warning (OTW)
- Over temperature Shutdown (OTE)
- Under voltage
- DC Protection (BTL)
- Pin to Pin short (PPSC)

No additional components required

Compared with a discrete Class-D



Protection Circuitry: 31.75mm x 31.75mm

1008 mm²

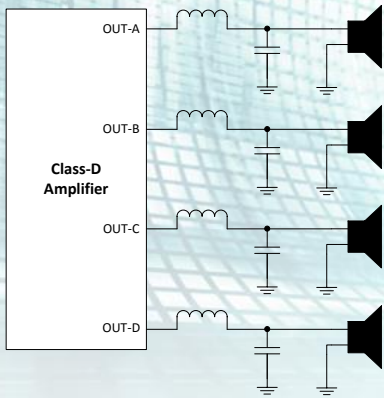
Additional Component Area

Flexible Output Configuration

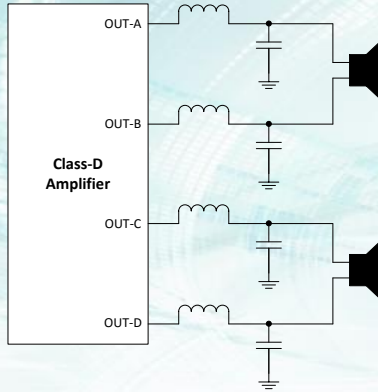


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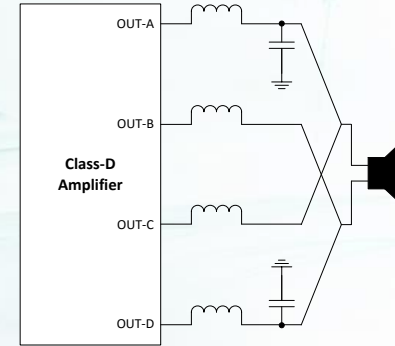
The TPA32xx family supports single-ended (SE), bridge-tied load (BTL), and parallel bridge-tied load (PBTL) output configurations.



4 Channels – Single-Ended



2 Channels – Bridge-Tied Load (BTL)



1 Channel – Parallel Bridge-Tied Load (PBTL)

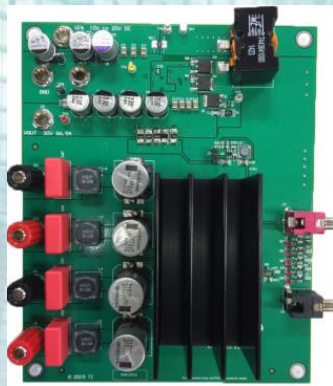
Supports small speaker impedances down to 2Ω

Power Supply Reference Designs



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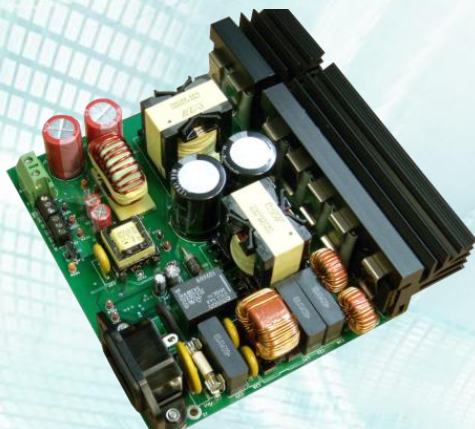
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30V, 200W

PMP10710 – Stereo TI Design

- **TI Audio:** TAS5611A
- **TI Power:** LM5122
- Applications
 - Portable PA Speakers
 - Public Announcement Systems
 - Portable Speakers
 - Mini and Micro Audio Systems



36V, 800W

New

PMP10215 – 400W (800W peak)

- **TI Audio:** TPA3251, TPA3250, TPA3244, TPA3255
- **TI Power:** UCC27714
- Applications
 - PA Systems
 - AVR, Wireless AVRs
 - High-Power Speaker Bars



50V, 600W

SLOU293C – 600W

- **TI Audio:** TPA3255
- **TI Power:** UCC25600
- Applications
 - High-Voltage Audio
 - PA Systems
 - AVR, Wireless AVRs
 - High-Power Speaker Bars



36V, 700W

New

Q100

PMP11769 – 700W

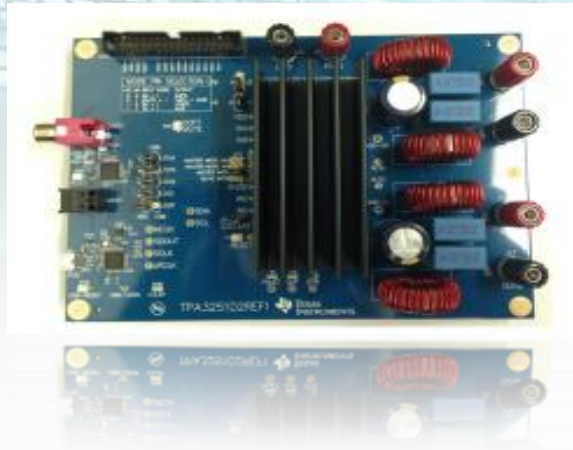
- **TI Audio:** TPA3251, TPA3250, TPA3244, TPA3245
- **TI Power:** LM25122
- Dual Phase Boost Design
- Applications
 - Automotive Amplifiers
 - External high-power, high performance amplifiers

Works well with TI DACs.



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- PCM5242: 2ch 114dB DAC, fully programmable mini-DSP
- PCM5252: 2ch 114dB DAC, SmartAmp DSP **(New)**
- PCM1690: 8ch 113dB DAC



Directly connect PCM5242,
PCM5252, and PCM1690 directly to
the TPA32xx Family, **no filtering or
op amps required!**

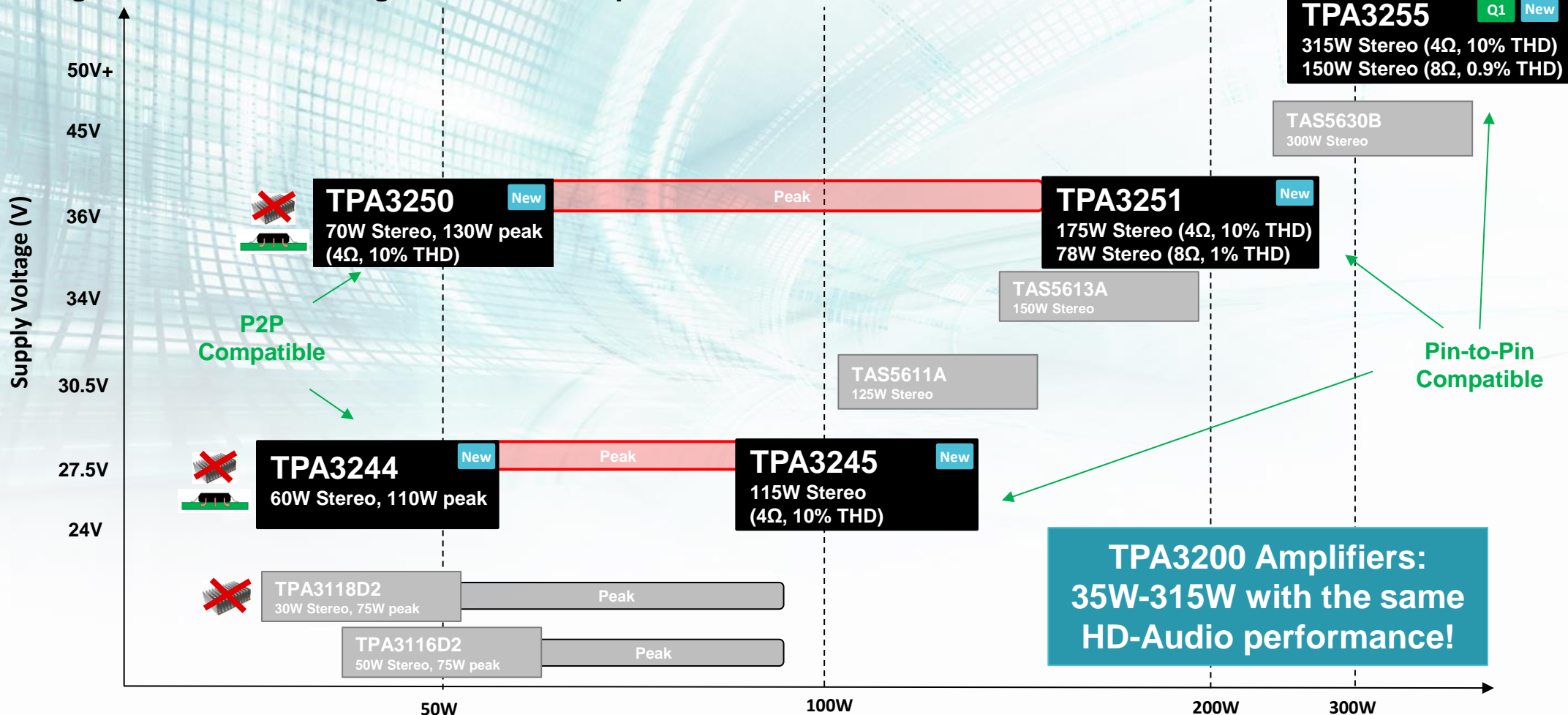
TPA3200 Product Portfolio



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Highest Performance Integrated Class-D Amplifiers



**TPA3200 Amplifiers:
35W-315W with the same
HD-Audio performance!**

Power (Stereo/Watts @ 10%THD)

TPA3255

315W Stereo / 600W Mono PurePath™ Ultra-HD, Analog-In Class-D Amplifier



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Features

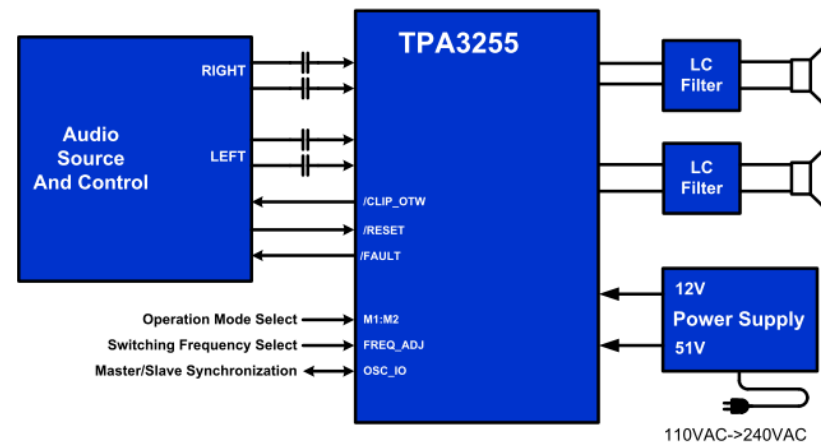
- Total Output Power at 10%THD+N:
 - 315-W Stereo into 4 Ω in BTL Configuration
 - 195-W Stereo into 8 Ω in BTL Configuration
 - 600-W Mono into 2 Ω in PBTL Configuration
- \uparrow 90% Efficient Class-D (4 Ω , stereo) with 80m Ω MOSFETs
- <0.005% THD+N at 1W/4 Ω ; <0.01% THD+N to clipping
- <85 μ V output noise, A-weighted
- >111dB SNR
- Wide 18V to 53.5V supply voltage operation
- Analog inputs; Click & pop free startup

Applications

- Audio Video Receivers (AVR)
- Mini Combo Systems
- Wireless Speakers
- Home Theater in a Box (HTiB) Systems
- Active Speakers and Subwoofers
- Blu-ray Disk™ / DVD

Benefits

- Highest Performance HD fidelity audio
- Only a small heatsink is needed
- Smart Amp power stage takes full benefit of maximum peak power
- Class-G compliant
- Few external components
- Full featured integrated protection system
- Configurable as: 2xBTL (Stereo), 1xBTL+2xSE (2.1), 4xSE or 1xPBTL (Mono)



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TPA3251

175W Stereo / 350W Mono PurePath™ Ultra-HD, Analog-In Class-D Amplifier



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Features

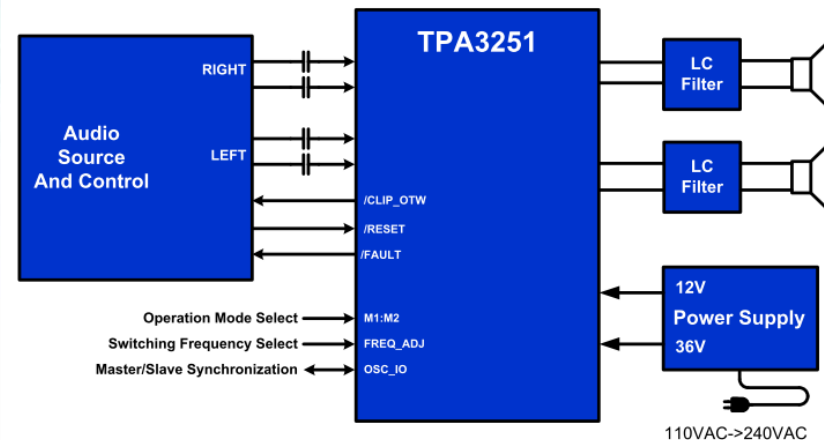
- Total Output Power at 10%THD+N:
 - 175-W Stereo into 4 Ω in BTL Configuration
 - 350-W Mono into 2 Ω in PBTL Configuration
- Up to 90% Efficient Class-D operation (4 Ω) with 60m Ω MF
- <0.005% THD+N at 1W/4 Ω
- <0.01% THD+N to clipping
- <60 μ V output noise, A-weighted
- >111dB SNR
- Wide 12V to 36V supply voltage operation
- Analog inputs
- Click & pop free startup

Applications

- Active Speakers and Subwoofers
- Sound bars
- Mini Combo Systems
- Home Theater in a Box (HTiB) Systems
- Wireless Speakers
- Blu-ray Disk™ / DVD

Benefits

- Highest Performance HD fidelity audio
- Only a small heatsink is needed
- Smart Amp power stage takes full benefit of maximum peak power
- Class-G compliant
- Few external components
- Full featured integrated protection system
- Configurable as: 2xBTL, 1xBTL+2xSE, 4xSE & 1xPBTL



TPA3250

70W Stereo / 130W Peak Ultra-HD, Analog-In, Pad-Down Class-D Amplifier



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Features

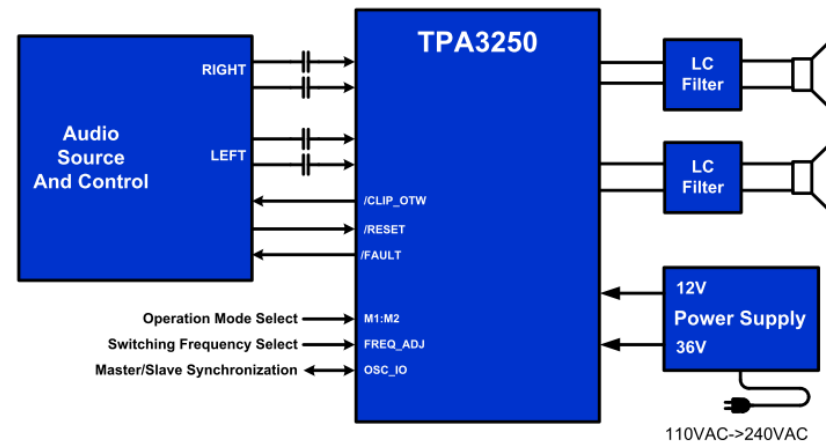
- 70W stereo / 8Ω (BTL) Continuous
- 130W / 4Ω (BTL, 10% THD+N) Peak
- Up to 92% Efficient Class-D (8Ω, stereo) w/60mΩ MOSFETs
- <0.005% THD+N at 1W/4Ω
- <0.01% THD+N to clipping
- <60μV output noise, A-weighted
- >110dB SNR
- Wide 12V to 36V supply voltage operation
- Analog inputs
- Click & pop free startup

Applications

- Audio Video Receivers (AVR)
- Audio Subsystem: Sound Bar
- WIFI Multi-room Speakers
- Audio Subsystem: Home Theater in a Box (HTiB)
- Audio Subsystem: Speaker Dock

Benefits

- Highest Performance HD fidelity audio
- No need for heatsink (cooling to PCB)
- Smart Amp power stage takes full benefit of maximum peak power
- Class-G compliant
- Few external components
- Full featured integrated protection system
- Configurable as: 2xBTL, 1xBTL+2xSE, 4xSE & 1xPBTL



TPA3245

115W Stereo / 230W Mono PurePath™ Ultra-HD, Analog-In Class-D Amplifier



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Features

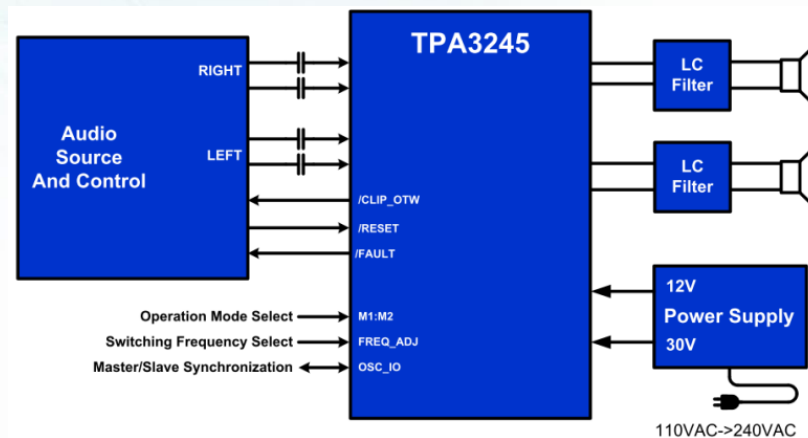
- Total Output Power at 10%THD+N:
 - 115-W Stereo into 4 Ω in BTL Configuration
 - 145-W Stereo into 3 Ω in BTL Configuration
 - 230-W Mono into 2 Ω in PBTL Configuration
- \uparrow 90% Efficient Class-D (4 Ω , stereo) with 60m Ω MOSFETs
- <0.005% THD+N at 1W/4 Ω ; <0.01% THD+N to clipping
- <55 μ V output noise, A-weighted
- >111dB SNR
- Wide 12V to 30V supply voltage operation
- Analog inputs; Click & pop free startup

Applications

- Home Theater in a Box (HTiB) Systems
- Wireless Speakers
- Sound bars
- Mini Combo Systems
- Active Speakers and Subwoofers
- Blu-ray Disk™ / DVD

Benefits

- Highest Performance HD fidelity audio
- Only a small heatsink is needed
- Smart Amp power stage takes full benefit of maximum peak power
- Class-G compliant
- Few external components
- Full featured integrated protection system
- Configurable as: 2xBTL (Stereo), 1xBTL+2xSE (2.1), 4xSE or 1xPBTL (Mono)



TPA3244

60W Stereo / 110W Peak Ultra-HD Analog-In, Pad-Down Class-D Amplifier



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Features

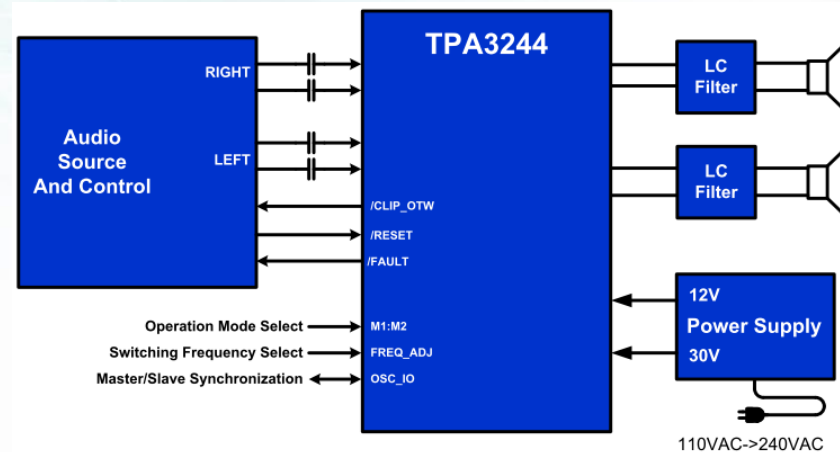
- 60W stereo / 8Ω (BTL) Continuous
- 110W / 4Ω (BTL, 10% THD+N) Peak
- Up to 92% Efficient Class-D operation
- <0.005% THD+N at 1W/4Ω
- <0.01% THD+N to clipping
- <55μV output noise, A-weighted
- >110dB SNR
- Wide 12V to 32V supply voltage operation
- Analog inputs
- Click & pop free startup

Applications

- Wireless Speakers
- Sound bars
- Mini Combo Systems
- Active Speakers and Subwoofers
- HTiB Systems
- Blu-ray Disk™ / DVD Receivers

Benefits

- Highest Performance HD fidelity audio
- No need for a heatsink (cooling to PCB)
- Smart Amp power stage takes full benefit of maximum peak power
- Class-G compliant
- Few external components
- Full featured integrated protection system
- Configurable as: 2xBTL, 1xBTL+2xSE, 4xSE & 1xPBTL

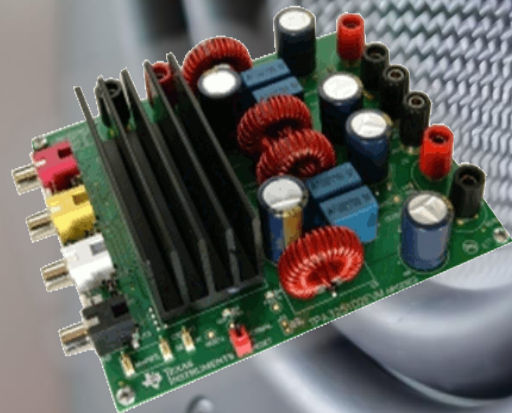


Experience the TPA32xx

- Experience the most realistic sound on the market

| Device | Max Power to BTL/Ch (W) Stereo | Max Power to PBTL (W) Mono |
|---------|-----------------------------------|-------------------------------|
| TPA3255 | 315 | 605 |
| TPA3251 | 220 | 355 |
| TPA3250 | 130 | 190 |
| TPA3245 | 145 | 230 |
| TPA3244 | 110 | 160 |

- Best Noise & THD Performance
< 0.001% THD, < 60uV noise
- EVM Includes:
 - TPA32xx Device
 - Output Filter & passive components optimized for superb performance
- Ask about a demo at your location or visit Ti.com/highpoweraudio



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Applications

| | |
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