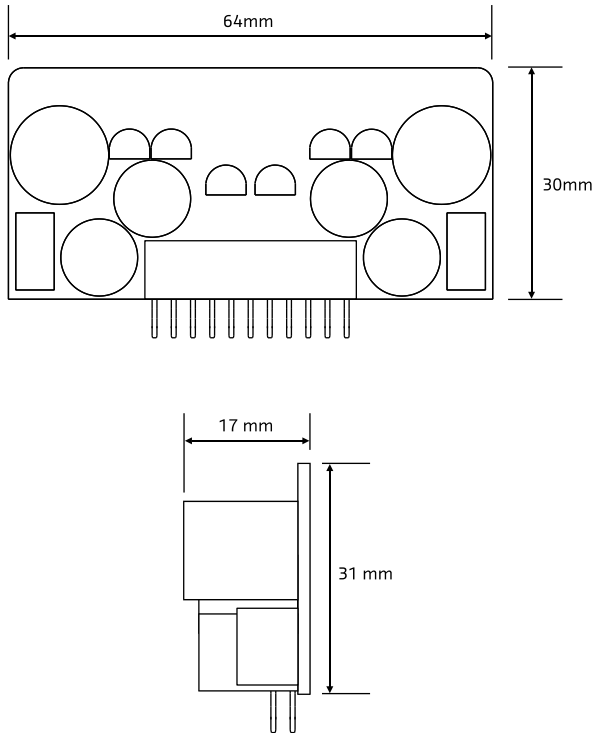


High Efficiency Dual Channel Power Amplifier Module



Highlights

- Flat, fully load-independent frequency response
- Low output impedance
- Very low, frequency-independent THD
- Fully passive loop control

Features

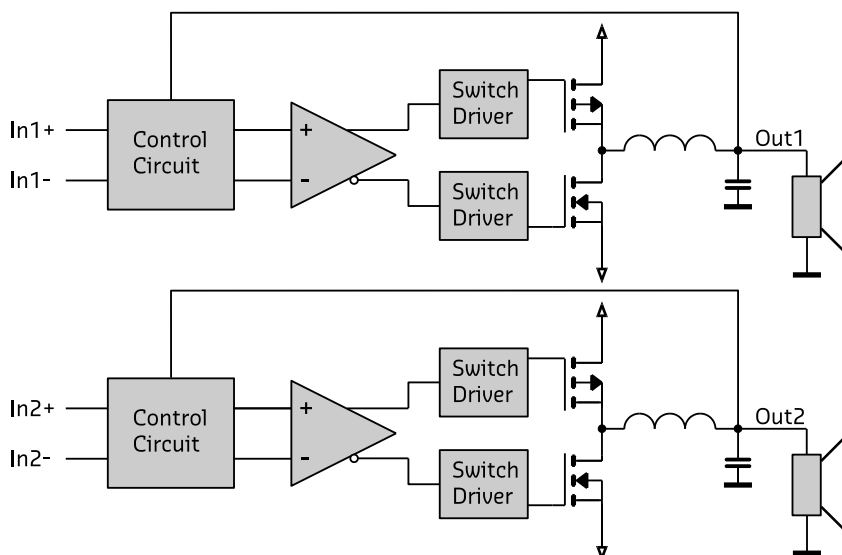
- Runs on unregulated +/- rails
- Pop-free start and stop control
- DC-fault detection
- Overcurrent protection
- Thermal protection
- Weight: 32g

Applications

- Monitor loudspeakers for recording and mastering studios
- Public Address systems
- Home theatre systems
- Active loudspeakers

Description

The UcD32 (OEM version) amplifier module is a self-contained high-performance class D amplifier intended for a wide range of audio applications, ranging from Public Address systems to ultrahigh-fidelity replay systems for studio and home use. Chief distinguishing features are flat frequency response irrespective of load impedance, nearly frequency-independent distortion behaviour and very low radiated and conducted EMI. Control is based on a phase-shift controlled self-oscillating loop taking feedback only at the speaker output.



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1 Performance data

Power supply = +/-20V, Load=4Ω, MBW=40kHz, unless otherwise noted

| Item | Symbol | Min | Typ | Max | Unit | Notes |
|--|-------------|-----|-------|------|------|--|
| Output Power | P_R | - | 30+30 | - | W | THD=1%, Load=4Ω |
| | | - | TBD | - | W | THD=1%, Load=8Ω |
| Distortion | THD+N | - | - | 0.25 | % | 20Hz<f<20kHz ¹⁾ Pout<P _R /2 |
| | | - | - | 0.15 | % | 20Hz<f<20kHz Pout=1W |
| Output noise | U_N | - | - | 120 | μV | Unwtd, 20Hz-20kHz |
| Output Impedance | Z_{OUT} | - | - | 50 | mΩ | f<1kHz |
| | | - | - | 300 | mΩ | f<20kHz |
| Power Bandwidth | PBW | | 20-35 | | kHz | ²⁾ |
| Frequency Response | | 10 | - | 50k | Hz | +0/-3dB. All loads. |
| Voltage Gain total | A_V | 12 | 12.5 | 13 | dB | |
| Supply Ripple Rejection | PSRR | | TBD | | dB | Either rail, all frequencies. |
| Required input level for 30W/4Ω/THD=1% | | | 2.5 | | V | Appropriate supply voltage level assumed |
| Efficiency | η | | 85 | | % | Full power |
| Idle Losses | P_0 | | 3 | | W | |
| Current Protection | $I_{OUT,P}$ | | 6 | | A | Amplifiers are muted |

Note 1: At higher audio frequencies there are not enough harmonics left in the audio band to make a meaningful THD measurement. High frequency distortion is therefore determined using a 18.5kHz+19.5kHz 1:1 two-tone IMD test.

Note 2: Dielectric losses in the output capacitor limit long term (>30s) full-power bandwidth to 15kHz.

2 Absolute maximum ratings

Correct operation at these limits is not guaranteed. Operation beyond these limits may result in irreversible damage.

| Item | Symbol | Rating | Unit | Notes |
|----------------------|-------------|--------|------|-----------------------------------|
| Power supply voltage | V_B | +/-25 | V | |
| Peak output current | $I_{OUT,P}$ | 6 | A | Unit current-protects at 6A |
| Input voltage | V_{IN} | +/-5 | V | Either input referenced to ground |
| Air Temperature | T_{AMB} | 65 | °C | |

3 Recommended Operating Conditions

| Item | Symbol | Min | Typ | Max | Unit | Notes |
|--|------------|------------------|-----|-----|----------|---|
| Power supply voltage | V_B | 10 ¹⁾ | 18 | 22 | V | |
| Driver supply voltage | V_{dr} | 4.8 | 6.2 | 6.5 | V | |
| Driver supply current | | | 100 | | mA | |
| Load impedance | Z_{LOAD} | 4 | | | Ω | |
| Source impedance | Z_{SRC} | | | 7k | Ω | Differential. Corresponds to 3dB noise increase. |
| Effective power supply storage capacitance | C_{SUP} | 4700 μ^2) | | | F | Per rail, per attached amplifier. 4 Ω load presumed. |

Note 1: Reduced performance

Note 2: The effective power supply storage capacitance of Hypex SMPS is already in excess of 4700 μ F. Do not add supplementary capacitance.

4 Connections

In order to ease connecting the amplifier, all necessary connections to operate the amplifier are grouped in one standard 2.54mm pitch dual row 22 pin header.

| Pin | Type | Function |
|---------------------|----------------|--|
| 1 | Out | Loudspeaker connection Channel 1 (Hot) |
| 2 ¹⁾ | Out | Loudspeaker connection Channel 1 (Cold) |
| 3 | In | Channel 1 input (Hot or noninverting) |
| 4 | In | Channel 1 input (Cold or inverting) |
| 6 | Open Collector | Amplifier Ready detection (low=not ready) |
| 7 | In, pulled up | ON/OFF control (Active low) |
| 8 | Open Collector | DC-fault detection (low=fault) |
| 9,10 | Power | Positive power supply connection |
| 11,12 | Power | Negative power supply connection |
| 13,14 ¹⁾ | GND | Power supply ground connection |
| 15 | Power | Positive Driver Voltage |
| 16 | Power | Negative Driver Voltage |
| 19 | In | Channel 2 input (Hot or noninverting) |
| 20 | In | Channel 2 input (Cold or inverting) |
| 21 | Out | Loudspeaker connection Channel 2 (Hot) |
| 22 ¹⁾ | Out | Loudspeaker connection Channel 2 (Cold) |

Note 1: Electrically connected together on the amplifier module.

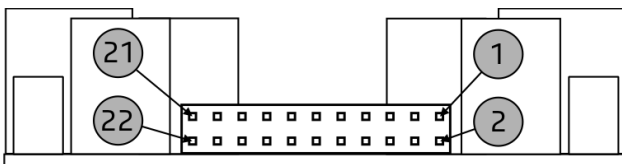


Fig1. Connector pinning UcD32 (OEM version).

4.1 Input Characteristics

| Item | Symbol | Min | Typ | Max | Unit | Notes |
|--------------------|----------|------|------|------|----------|-----------------|
| Input Impedance | Z_{IN} | | 1.8k | | Ω | |
| CM Rejection Ratio | CMRR | | 45 | | dB | All frequencies |
| Common Mode Range | | -VDR | | +VDR | | |

4.2 Amplifier Ready Detection Characteristics

This signal indicates whether the amplifier is muting or not by means of pulling the line low whenever the amps are muted. It is up to the user to verify whether this mute condition is forced by the user or by the amplifier itself. The latter indicates there is a fault condition forcing the amplifier in self protection mode. This protection mode can be triggered by over current. When the amplifier enters this mode it will wait a period of at least 1 second before trying to restart. It will keep trying to restart until the fault condition has disappeared.

| Item | Type | Min | Typ | Max | Unit | Notes |
|-----------------------------|--------|-----|-----|-----|------|---------------------------------------|
| Voltage on pin 6, AMP_Ready | Output | | | 0,7 | V | Internal open collector ¹⁾ |

Note 1: Must be pulled to a positive voltage by means of an external resistor. Open collector maximum output current: 100mA. Maximum collector voltage: 65V.

4.3 DC-Error Detection Characteristics

The UcD32 (OEM version) has an integrated DC-error detection which will pull pin 15 low in case of such an event. It is recommended to sense this fault condition and to interrupt both power supply lines in such an event.

| Item | Type | Min | Typ | Max | Unit | Notes |
|----------------------------|--------|-----|-----|-----|------|---------------------------------------|
| Voltage on pin 8, DC-error | Output | | | 0,7 | V | Internal open collector ¹⁾ |

Note 1: Must be pulled to a positive voltage by means of an external resistor. Open collector maximum output current: 100mA. Maximum collector voltage: 65V.

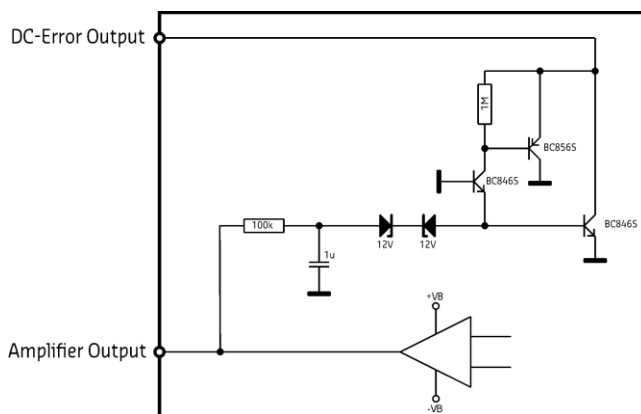


Fig3. DC-Error Output interface.

4.4 Amplifier Mute/Unmute Characteristics

The UcD32 (OEM version) is unmuted by pulling pin 8 low. Leaving pin 8 floating will put the amplifier in mute.

| Item | Min | Typ | Max | Unit | Notes |
|---------------------------------|-----|-----|-----|------|------------------------------------|
| Voltage on pin 7, left floating | | | 5 | V | Internally pulled up ¹⁾ |
| Output attenuation when muted | 85 | | | dB | |

Note 1: Must be pulled low by means of an open collector.

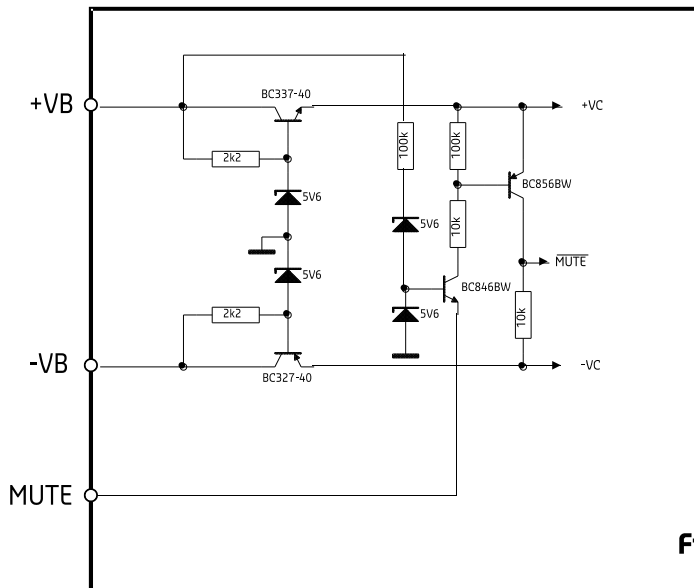


Fig4. Amplifier Mute/Unmute Control interface.

4.5 Input signal recommendation

The UcD32 (OEM version) is DC-coupled. Only when it is absolutely certain that the signal source does not contain a DC component, input capacitors may be omitted.

4.6 Amplifier start-up

Unlike other amplifiers from the UcD-series, this amplifier is automatically enabled right after power-up. When the amplifier is muted, the output level is attenuated by at least 85dB.

4.7 Loudspeaker connection recommendation

The loudspeaker is to be connected between Hot and Cold output pins. The loudspeaker should not be connected to any other circuit pin. The Cold pin should not be connected to anything else but the loudspeaker. Connecting the loudspeaker return and/or the Cold output pins to GND will adversely affect performance of the amplifier and the application circuit.

4.8 Input buffer recommendation

All standard recommendations apply. Note that the input common mode range is from +VDR to -VDR.

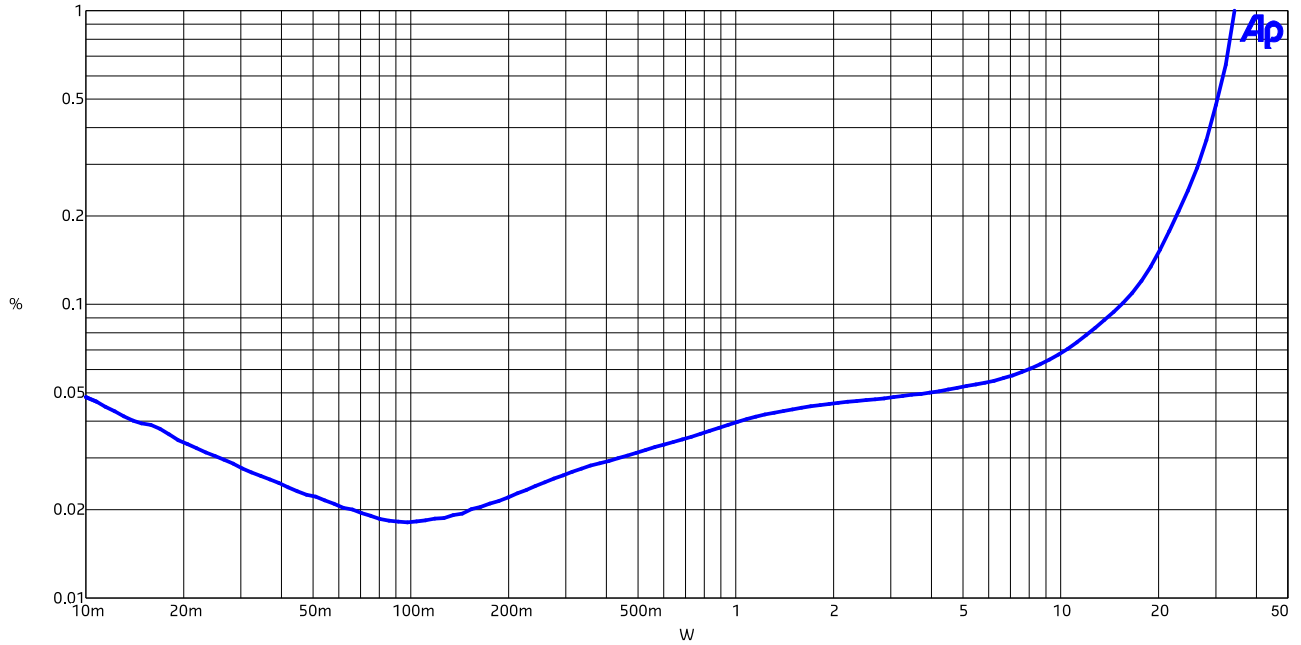
4.9 External drive voltages

The external +/-VDR inputs must be connected to +/-6V auxiliary rails. These should be up no later than 100ms after the power supplies. Running the UcD32 module without VDR supply for extended periods of time will irreparably damage the circuit.

| Item | Min | Typ | Max | Unit | Notes |
|--------------|------|-----|------|------|-------|
| +VDR, pin 15 | 4.8 | 6.2 | 6.5 | V | |
| -VDR, pin 16 | -4.8 | 6.2 | -6.5 | V | |

5 Typical Performance Graphs

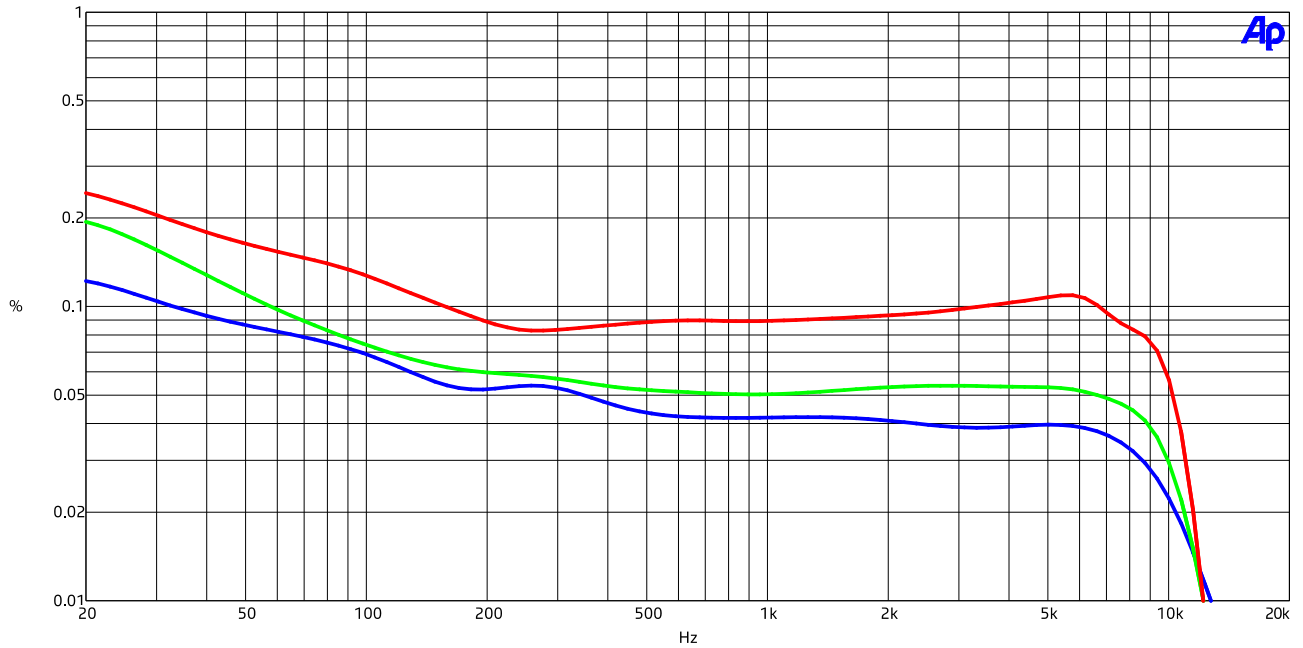
5.1 THD vs. Power (1kHz, 4Ω)



5.2 THD vs. Power (1kHz, 8Ω)

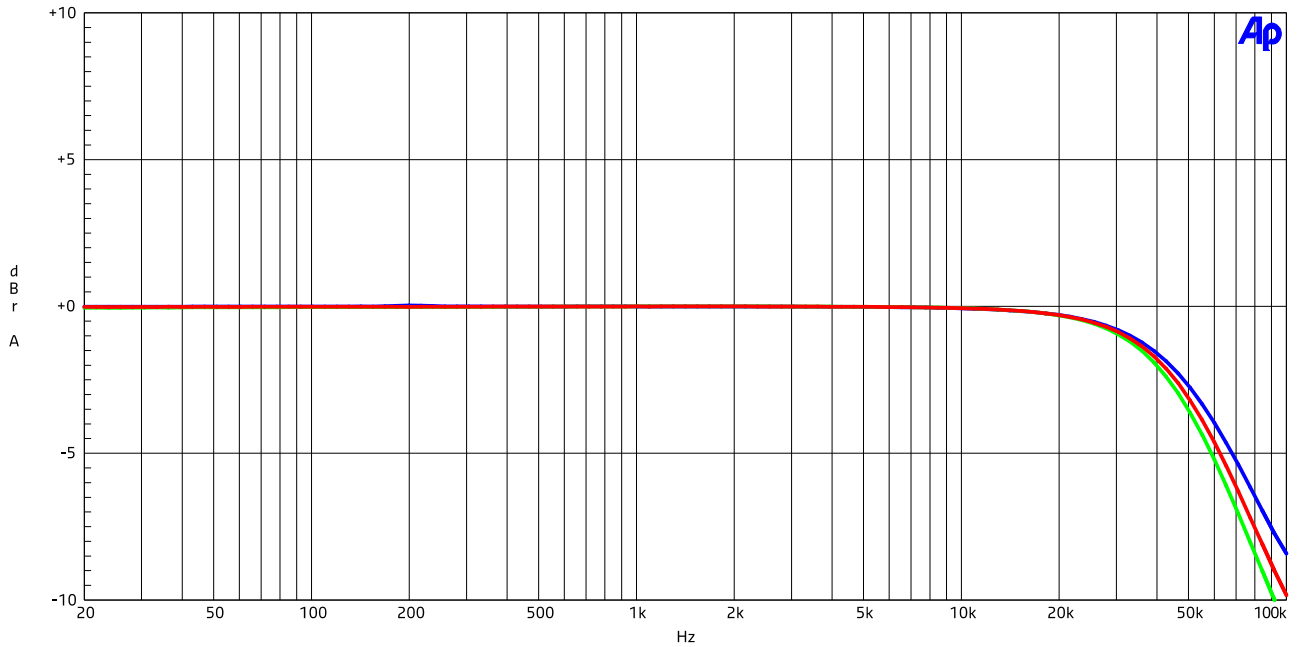
TBD

5.3 THD vs. Frequency (4Ω)



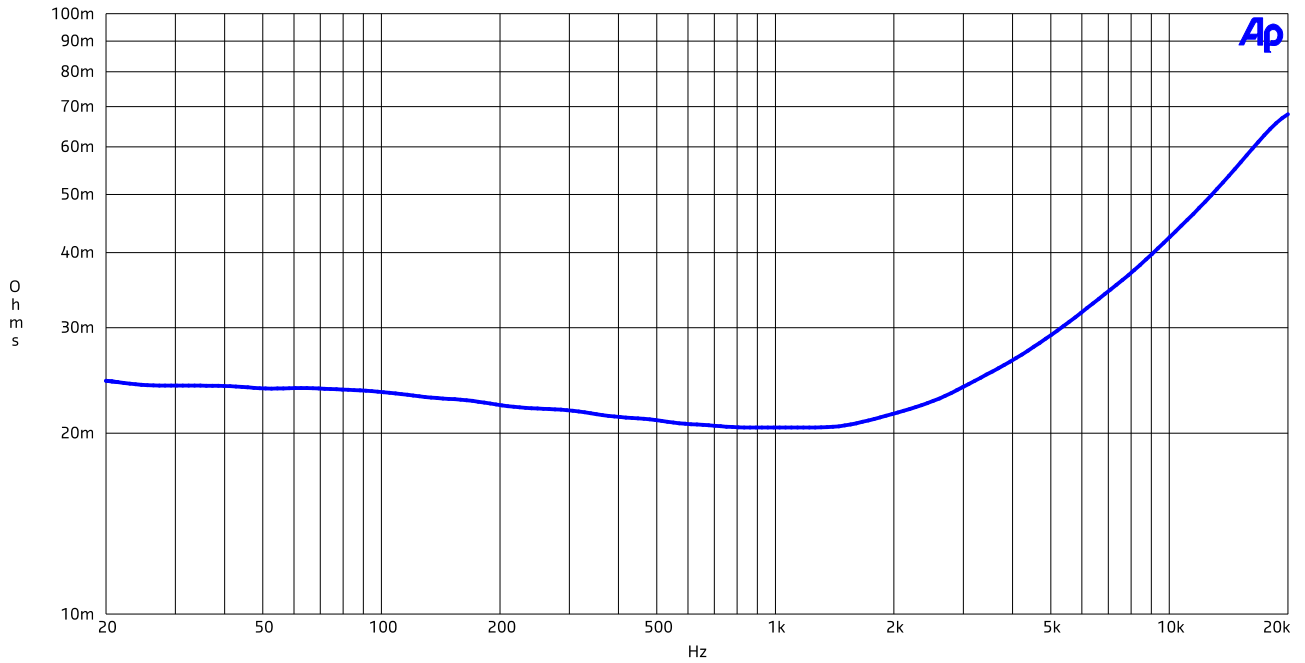
From top to bottom: 15W, 5W, 1W

5.4 Frequency Response (4Ω, 8Ω and open circuit)

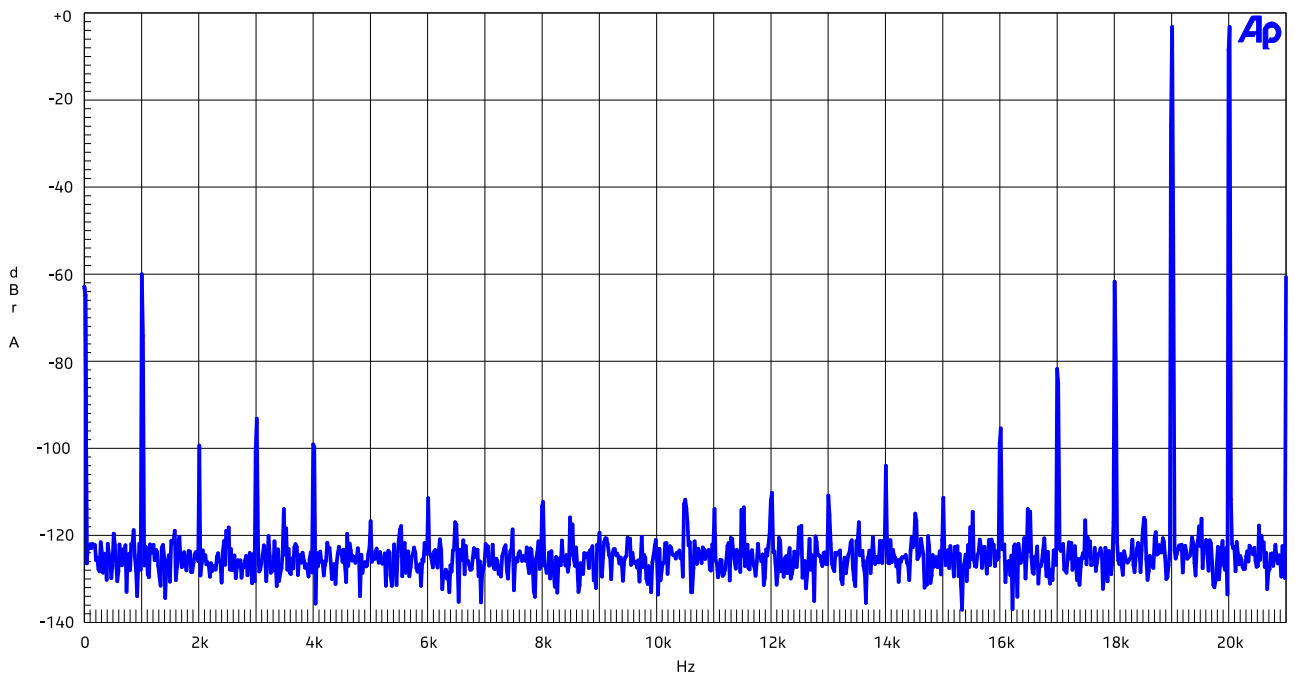


From top to bottom: open circuit, 8Ω and 4Ω

5.5 Output Impedance



5.6 19+20kHz IMD (5W, 4Ω)



DISCLAIMER: This subassembly is designed for use in music reproduction equipment only. No representations are made as to fitness for other uses. Except where noted otherwise any specifications given pertain to this subassembly only. Responsibility for verifying the performance, safety, reliability and compliance with legal standards of end products using this subassembly falls to the manufacturer of said end product.

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| Document Revision | PCB Version | Description | Date |
|-------------------|-------------|--|------------|
| R1 | UcD32OEMV1 | Initial Draft. | 16.04.09 |
| R2 | UcD32OEMV1 | Input buffer bypassed to enable users own buffer configuration. This affects the input impedance and gain: - gain (26dB) > 13dB. - input impedance (100k) > 1k8. Input buffer recommendation added to doc. | 09.07.09 |
| R3 | UcD32OEMV2 | - Current limiter improved. Short circuit protection is now long term stable. - Gain is set to 12,5dB. | 21.08.09 |
| R4 | UcD32OEMV3 | - Muting circuit drastically improved (30dB -> 85dB). - Over temperature protection added. - Amplifier ready monitoring output added. - Signal-input changed to asymmetrically topology. - Input buffer requirement changed. | 06.08.09 |
| R6 | UcD32OEMV5 | - Pinouts changed - Driver voltage characteristics added - Temperature protection removed | 16.03.11 |
| R7 | UcD32OEMV5 | - Format changed | 22.12.2011 |
| R8 | UcD32OEMV6 | - Chapter 4, Function description updated. | 31.01.2012 |
| R9 | UcD32OEMV6 | - Recommended operating conditions updated | 25.05.2012 |
| R10 | UcD32OEM V7 | - Vdr supply requirements added | 27.01.2015 |
| R11 | UcD32OEM V7 | - Pin numbering corrected | 19-05-2016 |