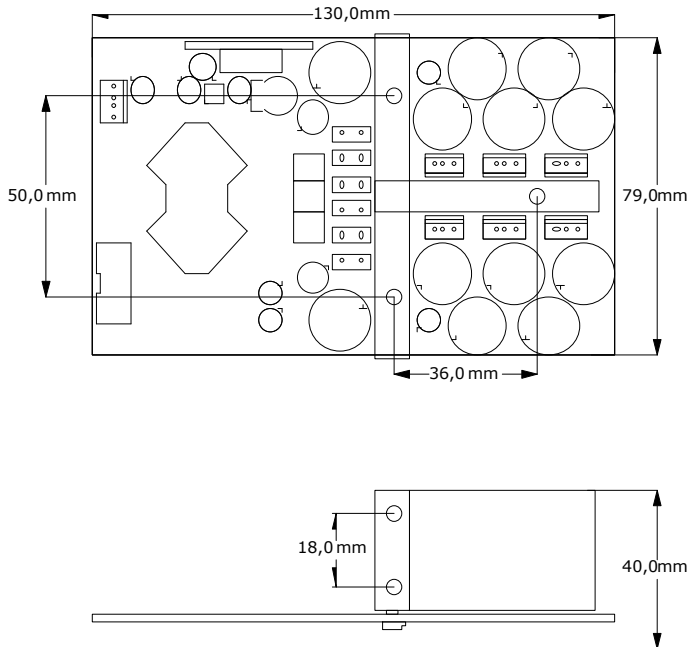


## High Efficiency Power Amplifier Module



### Highlights

- Flat, fully load-independent frequency response
- Low output impedance
- Very low, frequency-independent THD
- Very low noise
- Fully passive loop control
- Consistent top performer in listening trials

### Features

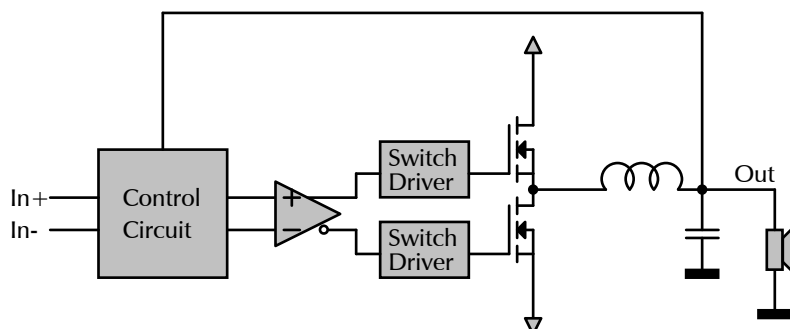
- Runs on unregulated +/- rails
- Pop-free start and stop control
- Differential audio input
- Overcurrent and overvoltage protection
- Weight: 280gms (14.7oz.)

### Applications

- Monitor loudspeakers for recording and mastering studios
- Audiophile power amplifiers for professional and consumer use
- Public Address systems
- Home theatre systems
- Active loudspeakers

### Description

The UcD700™ 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.





## Performance data

Power supply = +/-85V, Load=4Ω, MBW=40kHz, unless otherwise noted

Item	Symbol	Min	Typ	Max	Unit	Notes
Output Power	$P_R$	700	-	-	W	THD=1%
Distortion	THD+N	-	-	0.02	%	20Hz<f<20kHz Pout< $P_R/2$
		-	-	0.005	%	20Hz<f<20kHz Pout=1W
DC offset	$V_{DC}$	-	-	1m	V	
Output noise	$U_N$	-	30μ	35μ	V	Unwtd, 20Hz-20kHz
Output Impedance	$Z_{OUT}$	-	-	20m	Ω	f<1kHz
		-	-	150m	Ω	f<20kHz
Power Bandwidth	PBW		20-35k		Hz	
Frequency Response		10	-	50k	Hz	+0/-3dB. All loads
Voltage Gain	$A_V$	25.5	26	26.5	dB	
Supply Ripple Rejection	PSRR		65		dB	Either rail, all frequencies
Efficiency	$\eta$		92		%	Full power
Idle Losses	$P_0$		15		W	+/- 90V rails
Standby Current	$I_{STBY}$		10m		A	
Current Limit	$I_{OUT,P}$		28		A	Stop mode after limiting for 40ms

## 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		+/-100	V	Unit shuts down when either rail exceeds 96V
Driver supply voltage	$V_{DR}$	+15	V	Referred to $-V_B$
Peak output current	$I_{OUT,P}$		A	Unit current-limits at 28 A
Input voltage	$V_{IN}$	+/-12	V	Either input referred to ground
Air Temperature	$T_{AMB}$	65	°C	
Heat-sink temperature	$T_{SINK}$	90	°C	User to select heat sink to insure this condition under most adverse use case

## Recommended Operating Conditions

Item	Symbol	Min	Typ	Max	Unit	Notes
Power supply voltage	$V_B$	75	90	95	V	
Load impedance	$Z_{LOAD}$	1			Ω	
Source impedance	$Z_{SRC}$			7k	Ω	Differential. Corresponds to 3dB noise increase.
Effective power supply storage capacitance	$C_{SUP}$	10.000 μ			F	Per rail, per attached amplifier. 4Ω load presumed.



## Connections

### J7: Input and ON/OFF control

Connector type: 4-pin MOLEX® KK® series.

Pin	(Pin J6)	Function
1	4	Non inverting Audio Input
2	2, 7, 8	GND
3	3	Inverting Audio Input
4	5	ON/OFF control
	1	Protect
	10	+12V
	9	-12V

### Input Characteristics

Item	Symbol	Min	Typ	Max	Unit	Notes
Input Impedance	$Z_{IN}$		100k		$\Omega$	Either input to ground
Common Mode Rejection Ratio	CMRR		45		dB	All frequencies
Control voltage on pin 4, amplifier ON				3	V	
Control voltage on pin 4, amplifier OFF		12			V	Internally pulled up to 12V

Note: It is recommended to use an open collector output to control the on/off pin.

### J16: Loudspeaker output (hot)

Connector type: 1/4" FASTON® tab.

### J15: Loudspeaker output (cold)

Connector type: 1/4" FASTON® tab.

Internally connected to GND. Note: This is the feedback reference. For best performance, do not use another ground connection for the loudspeaker.

### J14: Positive power supply connection, +VB

Connector type: 1/4" FASTON® tab.

### J11: Power supply ground connection, GND

Connector type: 1/4" FASTON® tab.

### J12: Negative power supply connection, -VB

Connector type: 1/4" FASTON® tab.

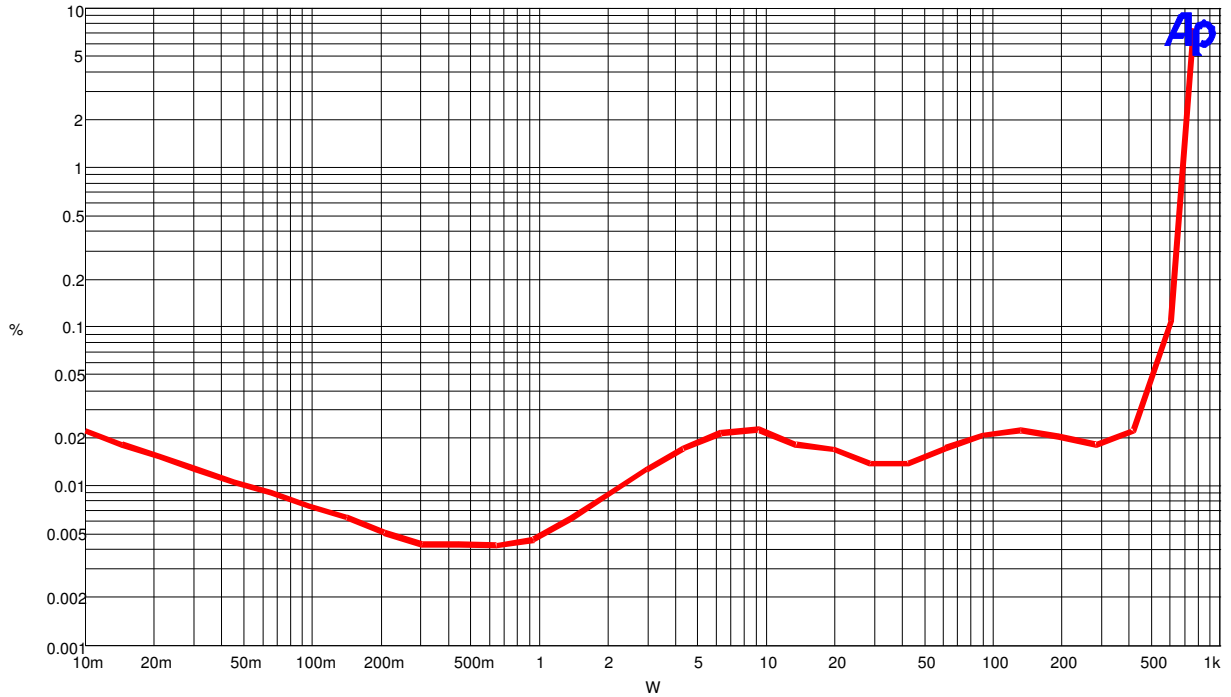
### J13: Driver supply connection, VDR (referred to -VB)

Connector type: 1/4" FASTON® tab.

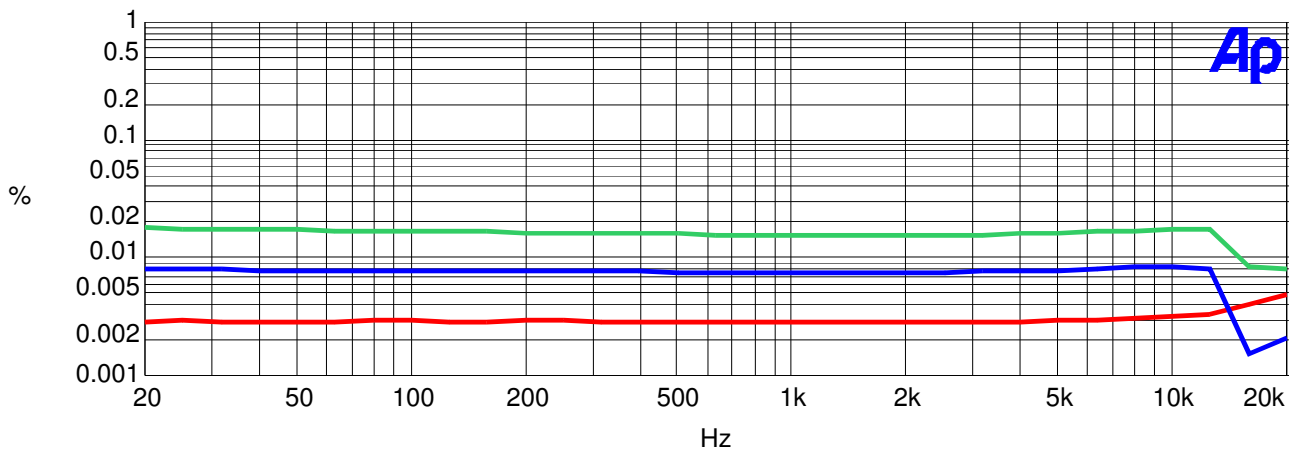


## Typical Performance Graphs

### THD vs. Power (1kHz, 4Ω)



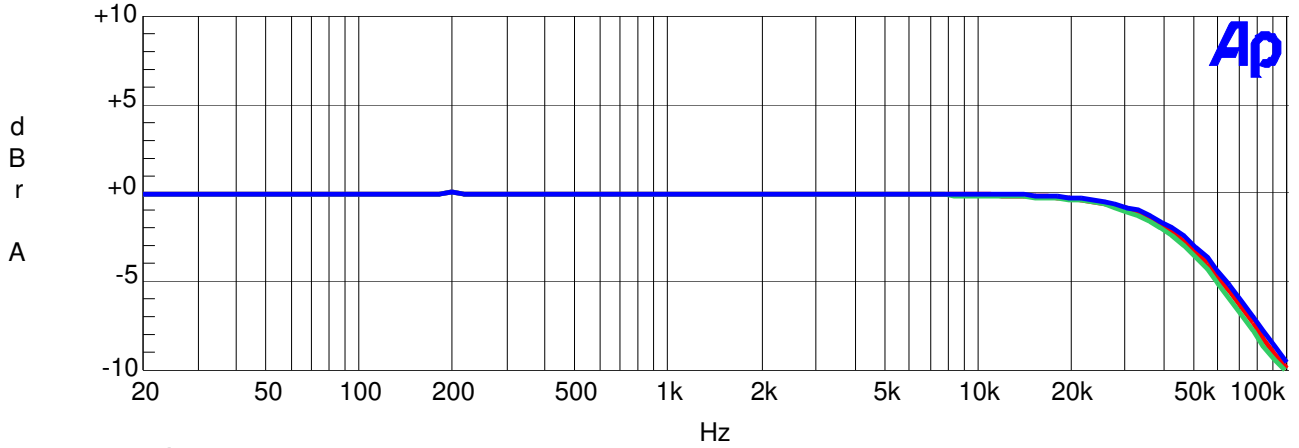
### THD vs. Frequency (8Ω)



From top to bottom: 40W, 10W, 1W

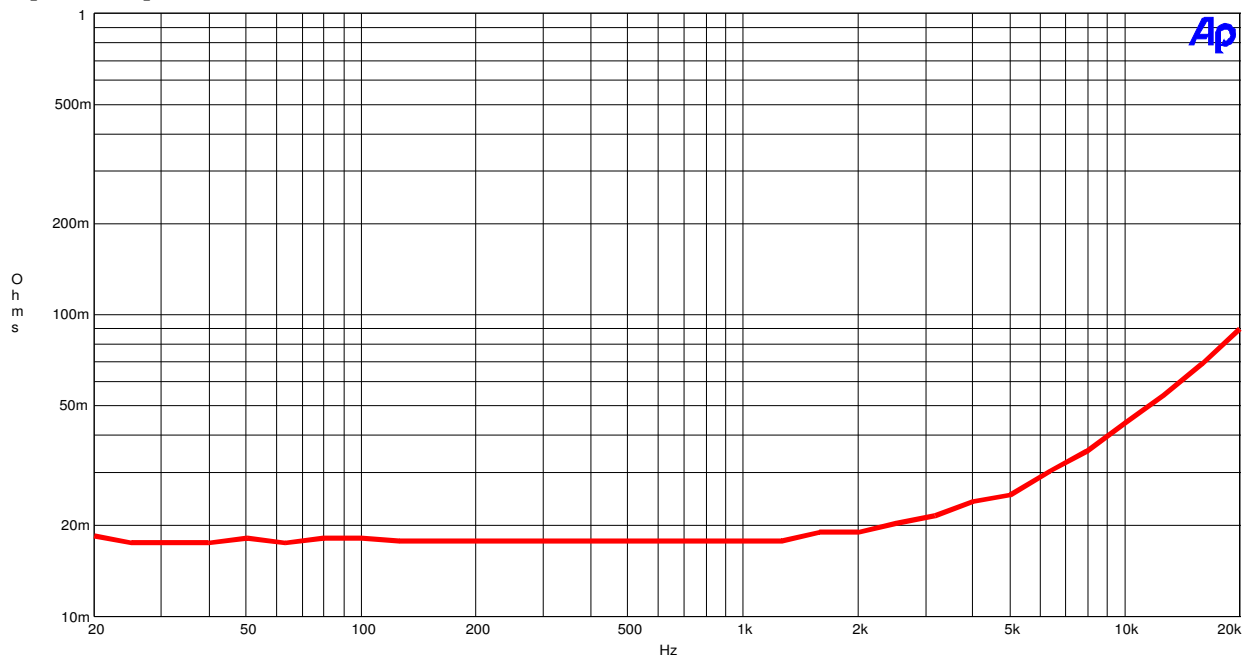


## Frequency Response (4Ω, 8Ω and open circuit)

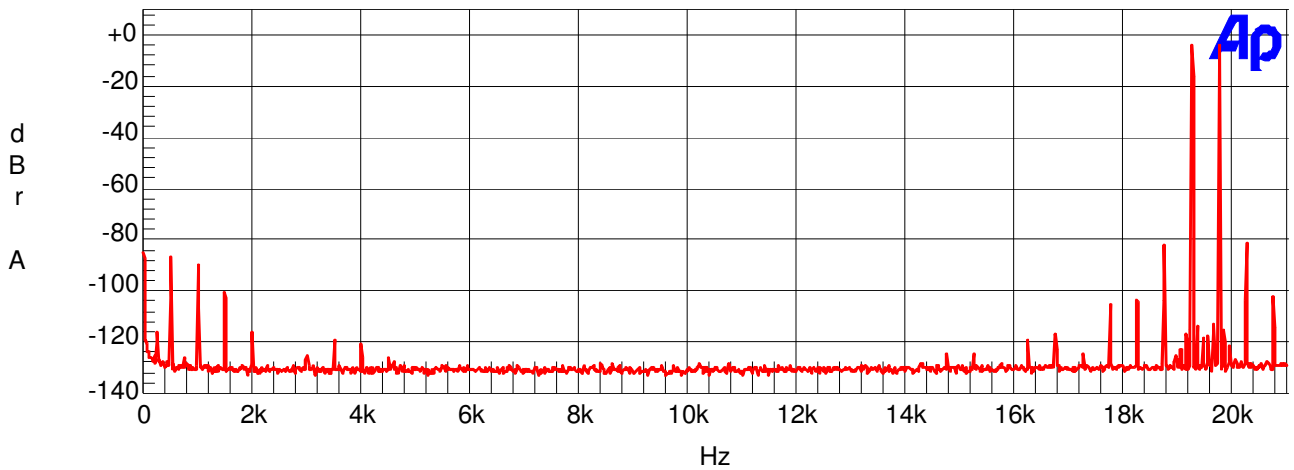


From top to bottom: open circuit, 8Ω, 4Ω

## Output Impedance



## 19+20kHz IMD (10W, 4 ohms)



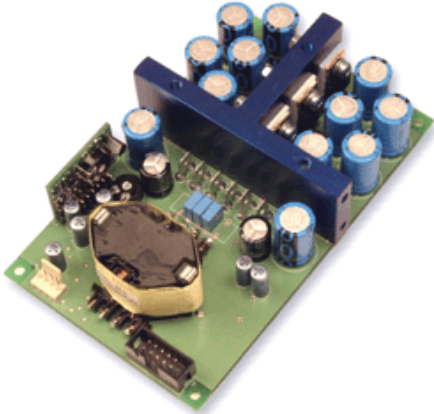


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UcD700™

# High Efficiency Power Amplifier Module

V1.1



## Highlights

- Flat, fully load-independent frequency response
- Low output impedance
- Very low, frequency-independent THD
- Very low noise
- Fully passive loop control
- Consistent top performer in listening trials

## Features

- Runs on unregulated +/- rails
- Pop-free start and stop control
- Differential audio input
- Overcurrent and overvoltage protection
- Weight: 280gms (14.7oz.)

## Description

The UcD700™ 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.

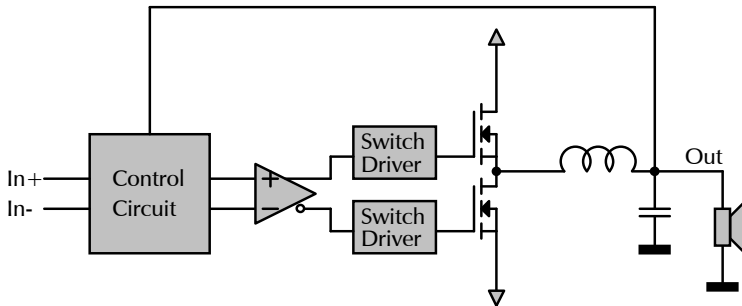


Fig 1. UcD diagram



### Package contents

Check your package for the following items:

- UcD700 unit
- 6 x Faston crimp connectors
- Flatcable
- 2 x jumper
- 4 x bolt M4x10mm

### Connection Diagram

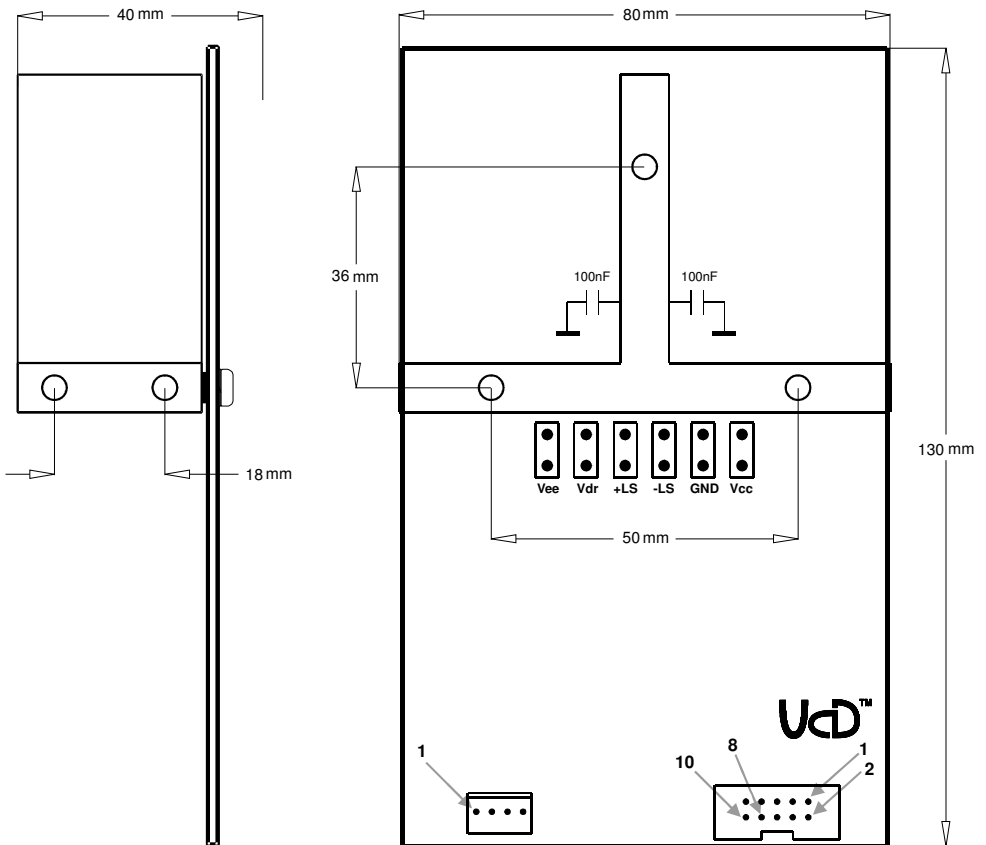


Fig 2. UcD700 dimensions



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# UcD700™

High-Efficiency Audio Power Amplifier

## Signal Connectors Specification

Pin (4-pin MOLEX® KK®)	Pin (10-pin Flatcable header)	Function
1	4	Non inverting Audio Input
2	2, 7, 8	GND
3	3	Inverting Audio Input
4	5	ON/OFF control
	1	DC Protect
	10	+12V (*)
	9	-12V (*)

## Power Connectors Specification

Pin FASTON® tab	Function
Vee	Negative power supply connection
Vdr	Driver supply connection (referred to Vee!) (*)
+LS	Loudspeaker output (hot)
-LS	Loudspeaker output (cold)
GND	Power supply ground connection
Vcc	Positive power supply connection

\* **NOTE** : These voltages have to be applied externally. The UcD700 does not provide these voltages.

## Cabling

The Faston crimp connectors included in this package are suitable for a maximum wire gauge of 13 AWG (2.5mm<sup>2</sup>). Make sure these connectors are crimped with a suitable crimp tool. A well crimped Faston connector cannot be removed from the wire by pulling the ends with force. Check this thoroughly! Poor cable connections may result in loss of performance or in damage to the device.

Even with the low EMI produced by the UcD700 it is advisable to twist the loudspeaker cables and to bundle all the power supply cables (Vee, Vdr, GND and Vcc) to reduce EMI even more.





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# UCD700™

High-Efficiency Audio Power Amplifier

## Performance Data

**Power supply = +/-85V, Load=4Ω, MBW=40kHz, unless otherwise noted**

Item	Symbol	Min	Typ	Max	Unit	Notes
Output Power	$P_R$	700	-	-	W	THD=1%
Distortion	THD+N	-	-	0.02	%	20Hz<f<20kHz Pout< $P_R/2$
		-	-	0.005	%	20Hz<f<20kHz Pout=1W
DC offset	$V_{DC}$	-	-	1m	V	
Output noise	$U_N$	-	30μ	35μ	V	Unwtd, 20Hz-20kHz
Output Impedance	$Z_{OUT}$	-	-	20m	Ω	f<1kHz
		-	-	150m	Ω	f<20kHz
Power Bandwidth	PBW		20-35k		Hz	
Frequency Response		10	-	50k	Hz	+0/-3dB. All loads
Voltage Gain	$A_v$	25.5	26	26.5	dB	
Supply Ripple Rejection	PSRR		65		dB	Either rail, all frequencies
Efficiency	$\eta$		92		%	Full power
Idle Losses	$P_0$		15		W	+/- 90V rails
Standby Current	$I_{STBY}$		10m		A	
Current Limit	$I_{OUT,P}$		28		A	Stop mode after limiting for 40ms

## 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	$V_B$	+/- 100	V	Unit shuts down when either rail exceeds 96V
Driver supply voltage	$V_{DR}$	+15	V	Referred to - $V_B$
Peak output current	$I_{OUT,P}$		A	Unit current-limits at 28 A
Input voltage	$V_{IN}$	+/-12	V	Either input referred to ground
Air Temperature	$T_{AMB}$	65	°C	
Heat-sink temperature	$T_{SINK}$	90	°C	User to select heat sink to insure this condition under most adverse use case

## Recommended Operating Conditions

Item	Symbol	Min	Typ	Max	Unit	Notes
Power supply voltage	$V_B$	75	90	95	V	
Load impedance	$Z_{LOAD}$	1			Ω	
Source impedance	$Z_{SRC}$			7k	Ω	Differential. Corresponds to 3dB noise increase.
Effective power supply storage capacitance	$C_{SUP}$	10.000 μ			F	Per rail, per attached amplifier. 4Ω load presumed.



### Typical Performance Graphs

Fig 3. THD vs. Power (1KHz, 4Ω)

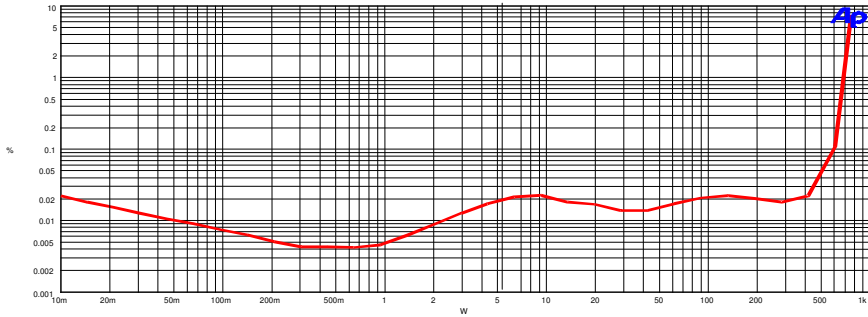
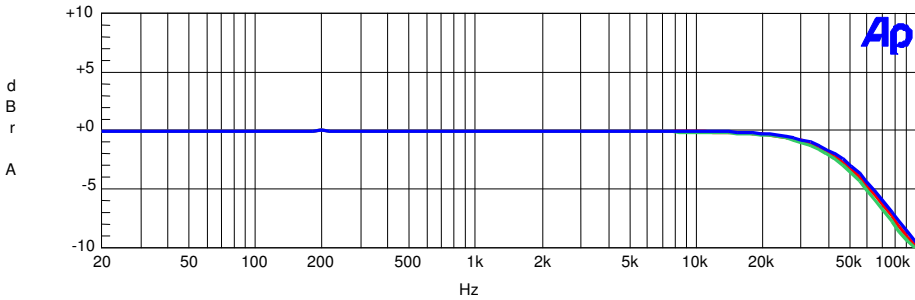
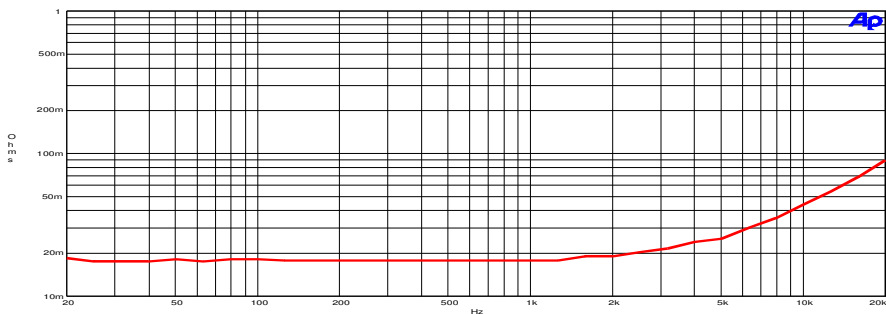


Fig 4. Frequency Response (4Ω, 8Ω and open circuit)



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

Fig 5. Output Impedance



## Application Information

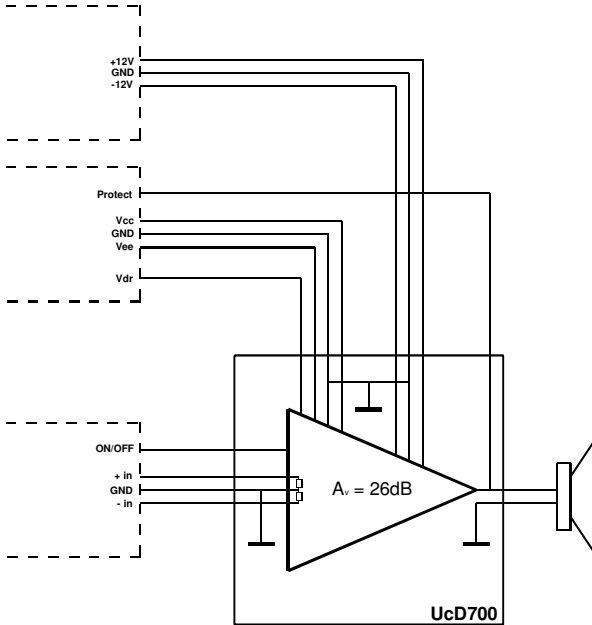


Fig 6. Typical application

## Standby Control

The Standby pin is used to put the amplifier in a low power consumption mode. When this pin is held low the amplifier will become active after approx. 1.5s. When the UcD700 is used with the matching UcD700 power supply, this pin will be controlled automatically upon (dis)connecting the mains voltage. When external control has been selected, ON/OFF must be controlled as shown in Fig 7 or Fig 8.

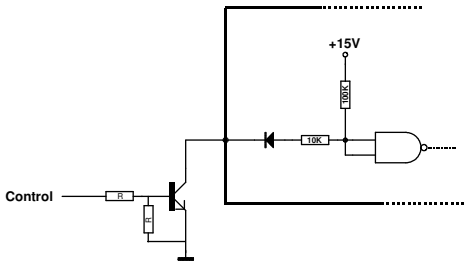


Fig 7. Transistor controlled ON/OFF

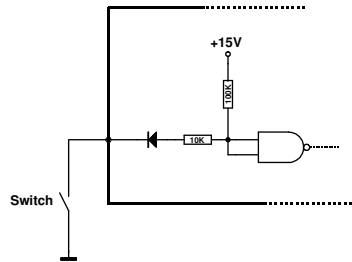


Fig 8. Switch controlled ON/OFF



### Input Select

The default settings for input select are based on using the UcD700 with the matching Power Supply: ON/OFF controlled by supply and audio signal must be applied to the 4-pin connector.

User selectable options can be made by means of a 0Ω SMD0805 resistor according the table below.

Item Select	R78	R76 / R77	Notes
<b>ON/OFF</b> (4-pin MOLEX® KK®)	not placed	NA	
<b>ON/OFF</b> (10-pin Flatcable header)	placed	NA	Default setting
<b>Input Signal</b> (4-pin MOLEX® KK®)	NA	not placed	Default setting
<b>Input Signal</b> (10-pin Flatcable header)	NA	placed	

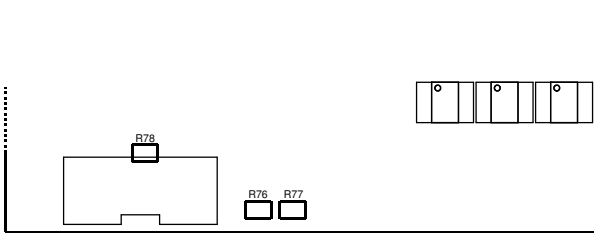


Fig 9. User selectable input (bottom side PCB)

### Signal Coupling Select

Default signal coupling on the UcD700 is set to AC. This means that unwanted DC-components present on the input signal will be blocked in order to protect the connected loudspeaker from being damaged. DC voltages entering the amplifier will also cause 'supply pumping' causing the amplifier to go in overvoltage protection. For sonic reasons however, one can select DC-coupling by placing jumpers (included) like shown below.

**WARNING!** If DC-coupling is selected, the signal source must be absolutely free of DC-components. Pre-amps (tube), that produce nasty 'pops' when switched off, will cause loud bangs in the loudspeaker and may trigger either the overvoltage protection or DC protection.

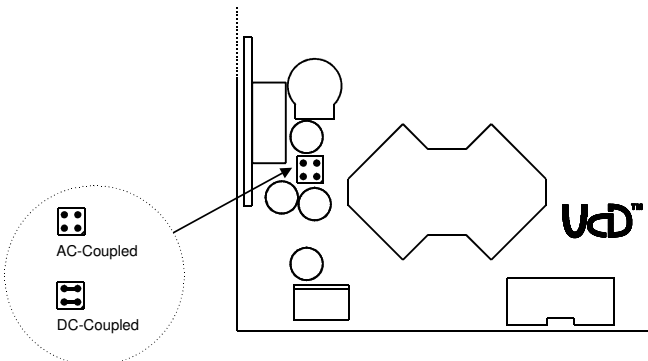


Fig 10. Selecting signal coupling

## Adjusting DC offset

The amplifier's DC offset is factory adjusted at  $<1\text{mV}$  for AC coupling. If the coupling is set to DC, the amplifier may need some readjusting due to DC offset in the amplifier's input buffering. Adjusting is done by turning the potentiometer located on the small PCB.

**! Never change the setting of the potentiometer on the main board.**

Checking / adjusting DC offset:

- Short circuit the signal inputs to ground.
- Connect a proper voltmeter (mV) to the amplifier's output.  
(Due to the HF switching residue of the amplifier ( $600\text{mV}_{\text{rms}}$ ) present at the output, some cheaper voltmeters will display an incorrect value).
- Switch the amplifier 'ON' and let the amplifier settle for a couple of minutes.
- Use a suitable screwdriver and gently turn the potentiometer left or right until a voltage of  $<1\text{mV}$  is displayed.
- Switch off the amplifier

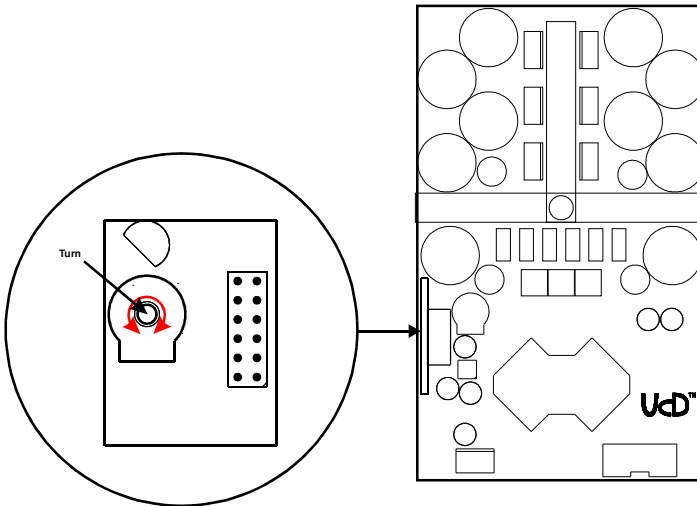


Fig 11. Adjusting DC offset



### Protection

- Output current is limited to  $28A_{pk}$ . To prevent overheating in case of a continuous overcurrent condition, the unit will shut down if an overcurrent condition persists for over 40ms. Operation is automatically resumed after 1.5s.
- If the applied supply voltage exceeds a level of 96V (either rail) the unit shuts off until a safe supply voltage is being applied.
- For optimal performance and protection the matching UcD700 power supply should be used to ensure your loudspeakers are fully protected against dangerous DC voltages. This means that in case of an amplifier component failure the supply is switched off until the amplifier is disconnected from the mains for about 3 minutes. DC error is interfaced like shown below.

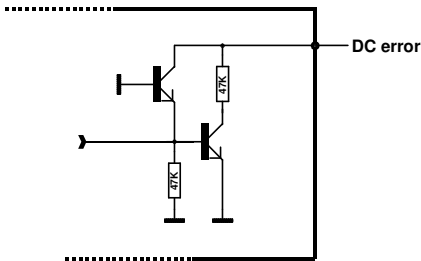


Fig 12. DC error out

**WARNING!** The amplifier has a DC error detection to signal catastrophic failure of the power stage. This is an open collector line. If this line is pulled down, the power supply should shut down and remain latched off until the power is cycled. The Hypex UcD700 power supply board supports this feature.

To fully ensure the protection of your loudspeaker the matching Hypex UcD700 supply is very much recommended.



### Heatsink Considerations

Even with an efficiency of over 90% there is almost 70 Watts to dissipate with 700W continuously output. The UcD700 has no temperature sensing. When in a certain application temperature monitoring is required, it has to be done externally by the customer (The Hypex SoftStart module could be used for this purpose).

Since the UcD700 is designed for music only it will never have to deliver 700 Watts continuously. Therefore the heatsink can remain relatively small. Mounting the module on an aluminium backplane (use thermal compound) is sufficient under normal conditions.

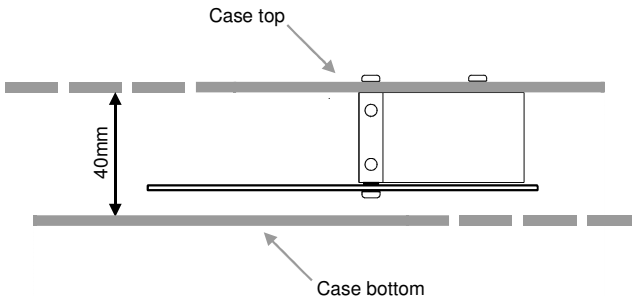


Fig 13. UcD700 1HE implementation

Because of the small dimension of the UcD700 it is relatively easy to implement the module in a 1HE 19" housing with an internal height of only 40mm.

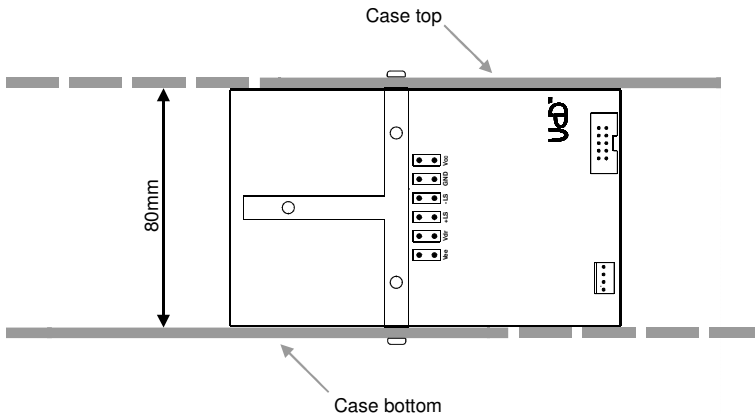


Fig 14. UcD700 2HE implementation

When more room is available the module can be turned on its side which has the advantage of saving space in the center of the housing.



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UcD700™

High-Efficiency Audio Power Amplifier

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## User notes

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# UcD700™

High-Efficiency Audio Power Amplifier

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Also available from Hypex Electronics:



## Supply UcD700™

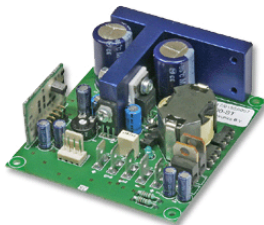
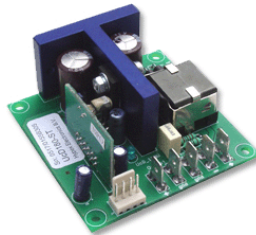
### Features

- Audiophile 100V Slit-Foil capacitors
- DC-protection
- On-board fuses
- Dual high-speed rectifier bridges
- Fits in a 2HE housing when mounted on its side.

### Applications

- UcD700 mono or stereo applications
- Monitor loudspeakers for recording and mastering studios
- Audiophile power amplifiers for professional and consumer use
- Public Address systems
- Home theatre systems
- Active loudspeakers

# UcD180™



# UcD400™

Hypex UcD™ - Series