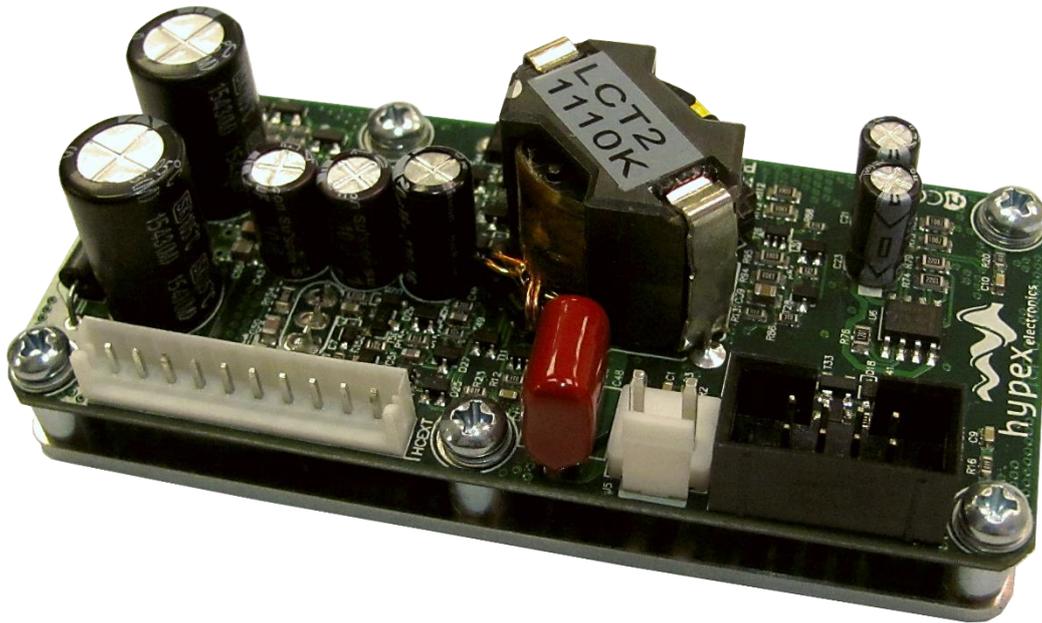


MP-NC Series High Frequency Channel Extension



Highlights

- ✓ High efficiency
- ✓ Flat, fully load-independent frequency response
- ✓ Low output impedance
- ✓ Very low, frequency-independent THD
- ✓ Very low noise

Features

- ✓ NC-MP Add-on
- ✓ External controlled operation
- ✓ Specifically designed as channel extension for our Mains Powered Ncore modules.
- ✓ Low weight: 75 gr.
- ✓ Compact: 85 x 39 x 27mm

Applications

- ✓ Monitor loudspeakers for recording and mastering studios
- ✓ Public address systems
- ✓ Active loudspeakers

Introduction

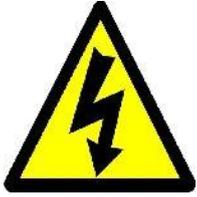
The NC100HF is a high performance Class D amplifier add-on module for the NCxxxMP series. It is designed to be used in active speaker applications as an additional power amplifier channel for the higher frequency audio band. The NC100HF has a wide input voltage range compatible with our whole NCxxxMP range. It is directly powered from the NCxxxMP module via the Hypex Channel Extension interface.

The amplifier used in the NC100HF 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 Safety precautions



This module operates at high voltage and carries hazardous voltages at accessible parts. These parts may never be exposed to inadvertent touch. Observe extreme care during installation and never touch any part of the unit while it is connected to the mains. Disconnect the unit from the mains and allow all capacitors to discharge for 10 minutes before handling it.



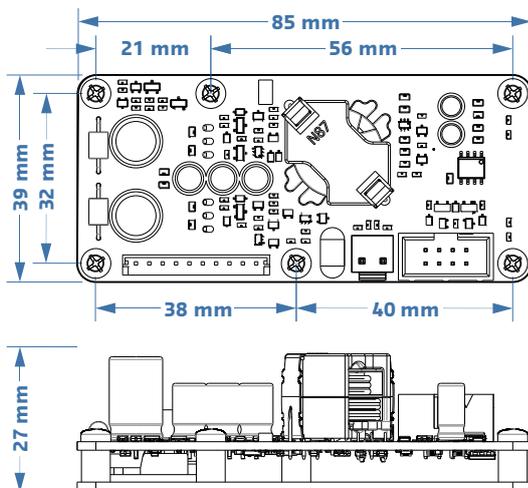
Attention: Observe precautions for handling electrostatic sensitive devices. This module uses semiconductors that can be damaged by electrostatic discharge (ESD).

Damage due to inappropriate handling is not covered by warranty.

This product has no user-serviceable parts.

When mounting the module in an enclosure, a minimum safety distance of 6mm from the module to all possible conducting parts must be ensured. This includes parts on the top and the bottom of the board.

When the NC100HF is mounted in a tight space there needs to be at least 6mm clearance or a layer of insulation with a minimum thickness of 0.5mm between the top of the transformer and the housing.



This symbol indicates the presence of hazardous voltages at accessible conductive terminals on the board. Parts that are not highlighted in red may also carry voltages in excess of 160 Vdc!

Warning: To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. Protect the power cord from being walked on or pinched, particularly at plugs, convenience receptacles, and the point where they exit from the application.
7. Only use attachments/accessories specified or approved by the manufacturer.
8. Unplug this apparatus during lightning storms or when unused for long periods of time.
9. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally or has been dropped.
10. Do not run any cables across the top or the bottom of the module. Apply fixtures to cables to ensure that this is not compromised.
11. Observe a minimum clearance of 6mm with all possible conducting parts (housing etc.).
12. Natural convection should not be impeded by covering the module (apart from the end applications housing).
13. This product is to be used with Hypex NCxxxMP series modules only.
14. Before using this product, ensure all cables are correctly connected and the power cables are not damaged. If you detect any damage, do not use the product.
15. Changes or modifications not expressly approved by Hypex Electronics will void compliance and therefore the user's authority to operate the equipment.
16. Service or modifications by any person or persons other than by Hypex Electronics authorized personnel voids the warranty.

2 The NC-MP Series

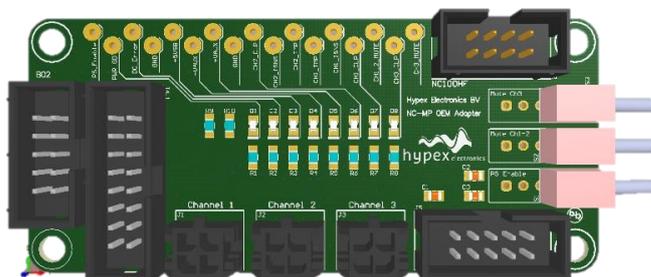
The NC-MP series is a range of mains powered Ncore amplifiers both single and dual channel. Next to the mains powered modules, this range of modules also include a single channel add-on module. This module can be used to add one extra channel to a mains powered module. In the next table there is an overview of the different models and their output power.

Model	Single channel, 4 Ohm	Dual channel, 4 Ohm
NC122MP	-	2 x 125 W
NC250MP	1 x 250 W	-
NC252MP	-	2 x 250 W
NC500MP	1 x 500 W	-
NC502MP	-	2 x 500 W
NC100HF	Hypex Channel Extension for tweeter	

The NC-MP is an all-in-one module, designed to be applied in a single module configuration and is certified as such. If a multi NC-MP setup is desired, one should take care of EMI, EMC, inrush currents and other related phenomena. Hypex Electronics cannot give support on configurations with multiple NC-MP modules in one application.

Evaluation board

For quick and easy evaluation, Hypex offers a special connection kit. This kit is specifically designed to make it easy to evaluate the new NCxxxMP series mains powered Ncore modules. Furthermore, the NC100HF can be easily connected using a 8-pin box interface cable. A 10-pin JST interface cable is included to connect the NC100HF with the NCxxxMP. The breakout board features three Molex Micro-Fit 3.0 connectors for audio input signals (Molex cable-end part no: 43025-0400). The evaluation board comes with 10mm nylon spacers which can be used to mount the board using M3 screws. For more information, go to our website.



Cables

In addition to this evaluation board, Hypex offers cable sets to interface between the modules and the application. These cables have a standardized length. For more information, visit our website.

3 Electrical Specifications

The NC100HF is designed as a single add-on module for the NC-MP series. Not more than one NC100HF can be added to a single NC-MP module. This module cannot be used in combination with other SMPS modules and therefore power supply information is not given.

3.1 Ncore Amplifier Specifications

Parameter	Conditions	Symbol	Min	Typ	Max	Unit	Note
Peak Output Power	1KHz, THD=1%, all channels driven. Per channel.	$P_{R, 4\Omega}$	-	-	100	W	
		$P_{R, 8\Omega}$	-	-	100	W	1)
Continuous Output Power	Per channel, 25°C ambient temperature.	$P_{R,cont}$	-	20	-	W	
Distortion	<10Hz-20kHz AES17 $P_{out} < P_{R}/2$	THD+N	-	0.00 16	0.00 26	%	2)
	<10Hz-20kHz AES17 $P_{out} = 1W$		-	-	0.00 18	%	2)
CMRR			40	-	-	dB	5)
Signal-to-Noise Ratio	<10Hz-20kHz AES17		-	106	-	dB	
Output Noise	Unwtd, <10Hz-20kHz AES17, 0Ω termination	U_N	-	-	40μ	V	
Output Impedance	f<1kHz	Z_{OUT}	-	-	2	mΩ	
	f<20kHz		-	-	10	mΩ	
Power Bandwidth		PBW		20-35k		Hz	3)
Frequency Response	+0/-3dB. All loads.		10	-	50k	Hz	3)
Voltage Gain Buffered		A_v	19.5	20	20.5	dB	4) 6)
Voltage Gain Unbuffered		A_v	11.5	12	12.5	dB	6)
Efficiency	Full power	η		92	-	%	
Idle Losses	Per channel	P_0	-	3.5		W	
Current Limit per Ch	Hiccup		-	9	-	A	

Note 1: When used in combination with the NC122MP, the output power in 8 Ohm is limited by its supply voltage and will therefore not exceed the NC122MP $P_{R, 8\Omega}$ power rating.

Note 2: An Audio Precision AES17 20 kHz filter is used in this measurement.

Note 3: By design, NCore has a full range frequency response and power bandwidth. However this module is designed to be used for mid- and high frequencies, i.e. starting at approximately 500Hz.

Note 4: Gain was changed in revision 0300, revisions 02xx and lower have a typical gain of 25,5dB.

Note 5: 1kHz

Note 6: The factory default is a buffered input with a gain of 8 dB. This can be bypassed as explained in section 3.5 "Input buffer and gain"

3.2 Ncore Amplifier Audio IO Characteristics

Parameter	Conditions	Symbol	Min	Typ	Max	Unit	Note
Input Impedance	Either input to ground	Z _{IN}		47k		Ω	
Input Impedance unbuffered	Either input to ground	Z _{IN}		1.8k		Ω	
Loudspeaker impedance range		Z _{L,SE}	2	4	-	Ω	

Signal Coupling

To achieve optimal signal coupling, the audio signal inputs are all DC coupled. One must make sure that the connected application is free of DC offset.

Input buffer and gain

This module is equipped with an input buffer. It is possible to bypass the input buffer by removing R76, R1002 and R1003 and placing a 0hm 0603 size resistor on placeholder R1001 and R1004. Placement of these resistors are shown in Figure 1 and Figure 2. Furthermore, changing the gain of the module is not supported.

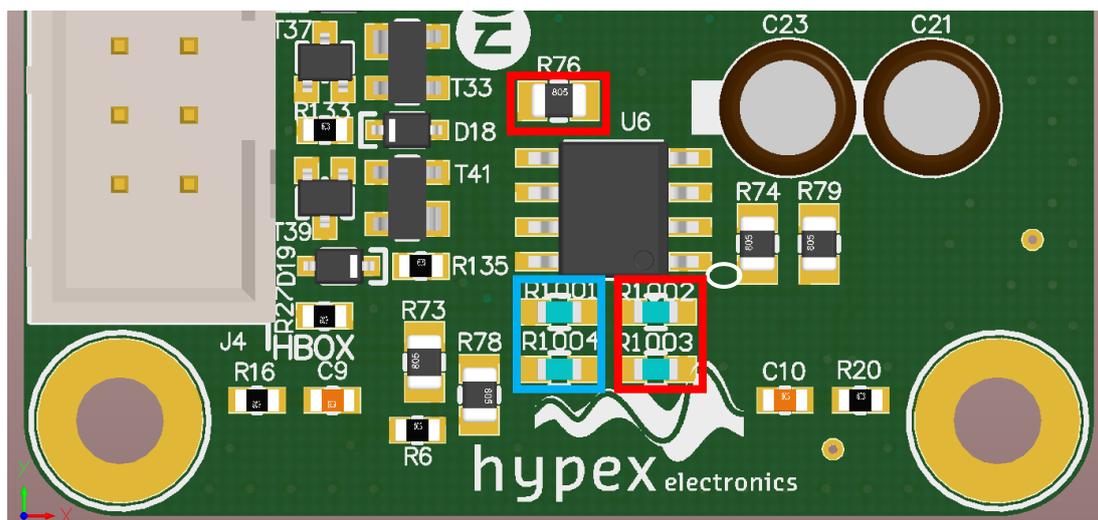


Figure 1 Placement of the bypass resistors

Resistors in the red squares need to be removed, resistors in the blue square need to be added for unbuffered operation

Input sensitivity

Below a formula is given to calculate the balanced input signal level for a desired output level. Furthermore, an example is give using P_{RATED} 100W, Load 4Ω, Gain 20.1

$\frac{\sqrt{P_{RATED} * \Omega_{LOAD}}}{10^{\left(\frac{Gain}{20}\right)}} = Input V_{RMS}$	$V_{RMS} * \sqrt{2} = Input V_{Peak}$	$20 * \log_{10} \left(\frac{V_{RMS}}{0.7746} \right) = Input dBu$
↓	↓	↓
$\frac{\sqrt{100 * 4}}{10^{\left(\frac{20.1}{20}\right)}} = 1.98 V_{RMS}$	$1.98 * \sqrt{2} = 2.80 V_{Peak}$	$20 * \log_{10} \left(\frac{1.17}{0.7746} \right) = 8.15 dBu$

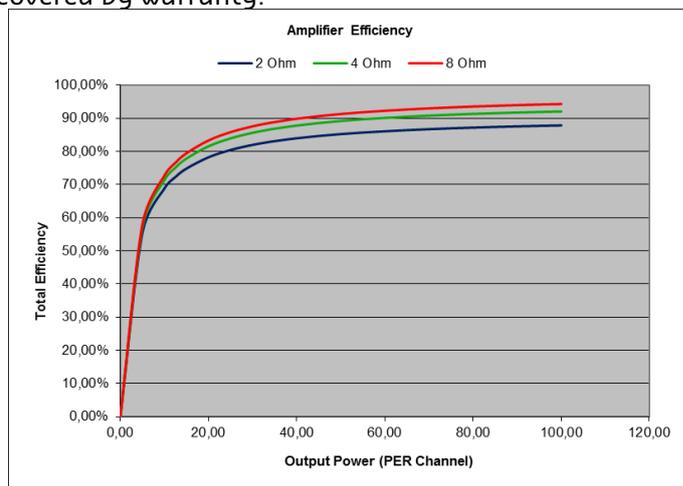
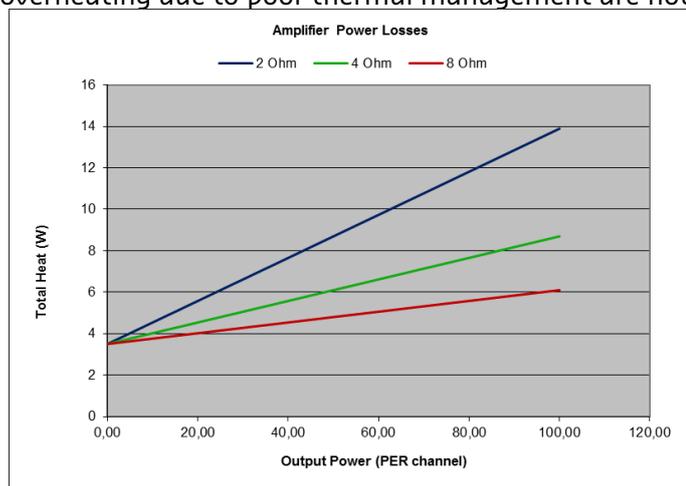
4 Environmental Specifications

Parameter	Conditions	Symbol	Min	Typ	Max	Unit	Note
Ambient Temperature	Storage		0	-	70	°C	
	Operation	T_{amb}	0	-	50	°C	
Heat-sink Temperature		$T_{h,max}$			95	°C	1)
Humidity	Max 85 percent relative humidity, non-condensing.						

Note 1: The NC100HF is designed to be used for mid- and high frequencies and over temperature is not expected. Therefore it is not equipped with an over temperature protection circuit.

4.1 Heat dissipation

Class D amplifiers' known high efficiency often leads to a gross underestimation of the cooling required. Please apply adequate cooling to the module to ensure the module operates within specification. The following graphs provide an indication of the heat (in Watts) generated at different output levels. For more information regarding cooling, please refer to our application note "Thermal Design", available on our website. Defects caused by overheating due to poor thermal management are not covered by warranty.



5 IO Specifications

The NC100HF has no control pins available for the end user application. Functions as DC error and Amp Enable are controlled via the Hypex Extension interface. Although it is not allowed to tap into this interface, a short description is given to clarify some matters.

5.1 nFatal

nFatal is pulled low in an event of a DC error at the output of the NC100HF, this causes the connected NC-MP module to switch off as described in the corresponding datasheet.

5.2 Amplifier Enable

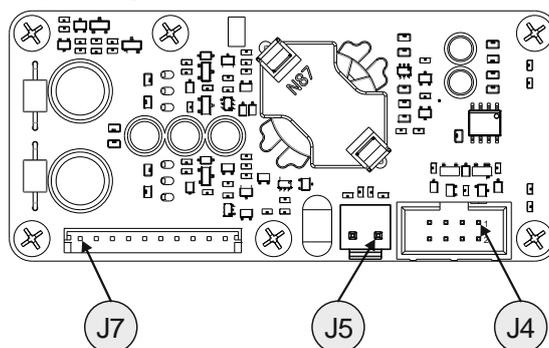
Amplifier Enable enables the NC100HF when the NC-MP module is enabled and not muted. In the event that the on-board amplifier of the connected NC-MP module is muted, the NC100HF will also mute (switch off).

Hypex Box interface

The NC100HF is equipped with a stripped version of a single channel Hypex Box interface. Audio signal is connected directly from the end-user appliance via this interface. The NC100HF does not feature clip detection, HW Address, Current Sense and Thermal readout.

6 Connector Pinouts

This chapter describes the functional connectors of the amplifier module. A connector not stated in this chapter is only used for production or quality control and must remain unconnected in the end user application. The arrow points towards pin1 of the connector, for more information regarding a specific connector, please refer to the corresponding datasheet.



6.1 H-Box connector

Pin	Direction	Function	Remarks
J4.1	Input	CH1 In -	Inverting audio input Channel 1
J4.2	Input	CH1 In +	Non-inverting audio input Channel 1
J4.3	-	CH1 GND	Not connected
J4.4	Input	Mute	Not connected
J4.5	Output	CH1 Clip	Not connected
J4.6	Input	CH1 HWAddr	Not connected
J4.7	Output	CH1 ISense(1)	Not connected
J4.8	Output	CH1 Thermal	Not connected

Connector type equivalent: T821108A1S100CEU

Contact material: Brass, gold flash over nickel

6.2 H-Channel extension

This connector is only to connect to the NC-MP modules. External use of this connector is not supported and therefore no additional information is specified.

Pin	Direction	Function	Remarks
J7.1	Input	HV+	Positive power supply
J7.2	Input	HV-	Negative power supply
J7.3	-	GND	Ground
J7.4	Input	VDR	VDR power supply
J7.5	Output	nFatal	High if amplifier has no error
J7.6	Input	Positive V _{REG}	
J7.7	Input	Negative V _{REG}	
J7.8	Input	Amp Enable	Amplifier enable
J7.9	-	NC	Not connected
J7.10	-	NC	Not connected

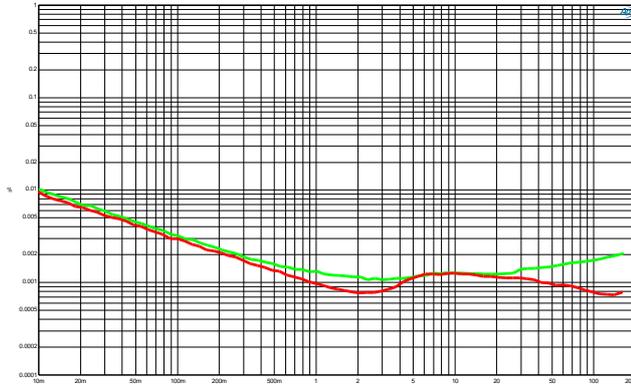
Connector type: B10B-EH-A(LF)(SN)

6.3 Loudspeaker Connector

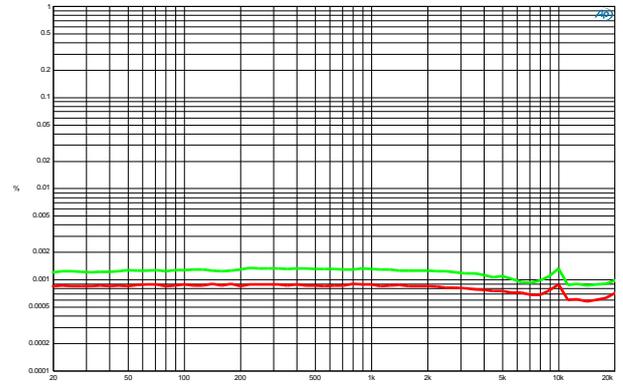
Pin	Direction	Function	Remarks
J5.1	-	LS1-	Cold Loudspeaker Output
J5.2	Output	LS1+	Hot Loudspeaker Output

Connector type: B2P-VH(LF)(SN)

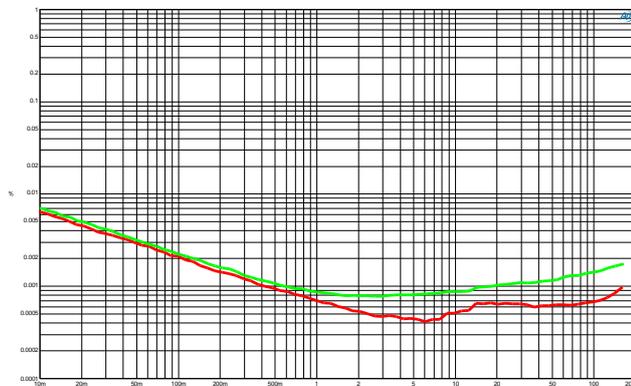
7 Typical Performance Graphs



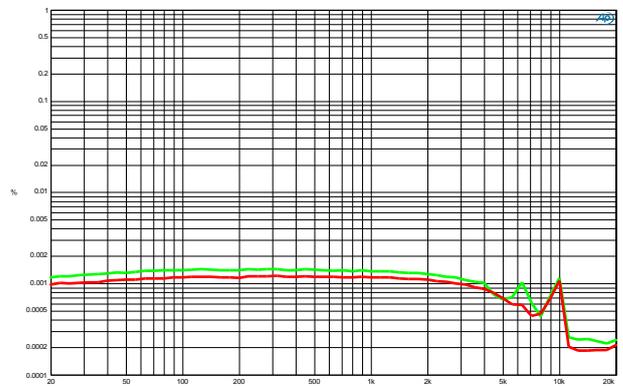
THD+N vs. power at 1kHz (green) and 6kHz (red) (4Ω).



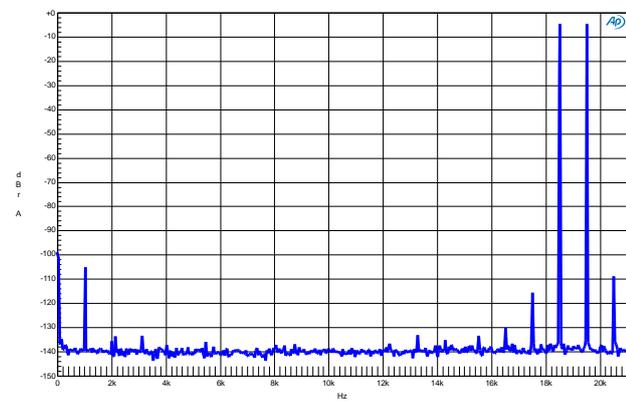
THD+N vs. Frequency at 1W in 4Ω (green) and 8Ω (red).



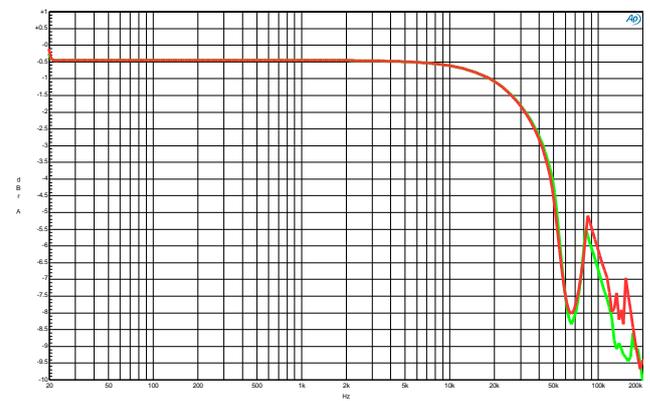
THD+N vs. power at 1kHz (green) and 6kHz (red) (8Ω).



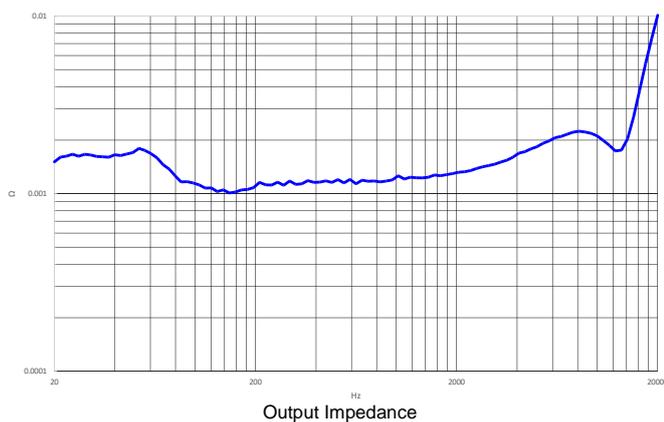
THD+N vs. Frequency at $P_R/2$ in 4Ω (green) and 8Ω (red).



IMD spectrum at 18.5kHz + 19.5kHz, $P_R/2$ in 8Ω (blue).

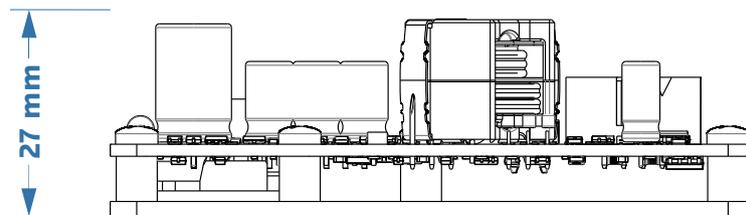
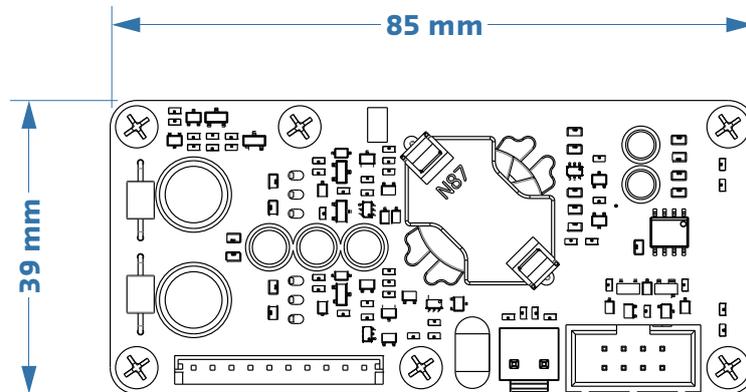


Frequency response in 4Ω (green) and 8Ω (red).



Output Impedance

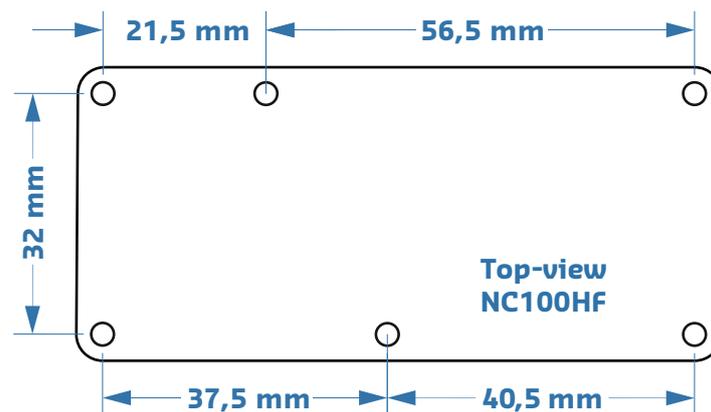
8 Dimensions



8.1 Drill pattern

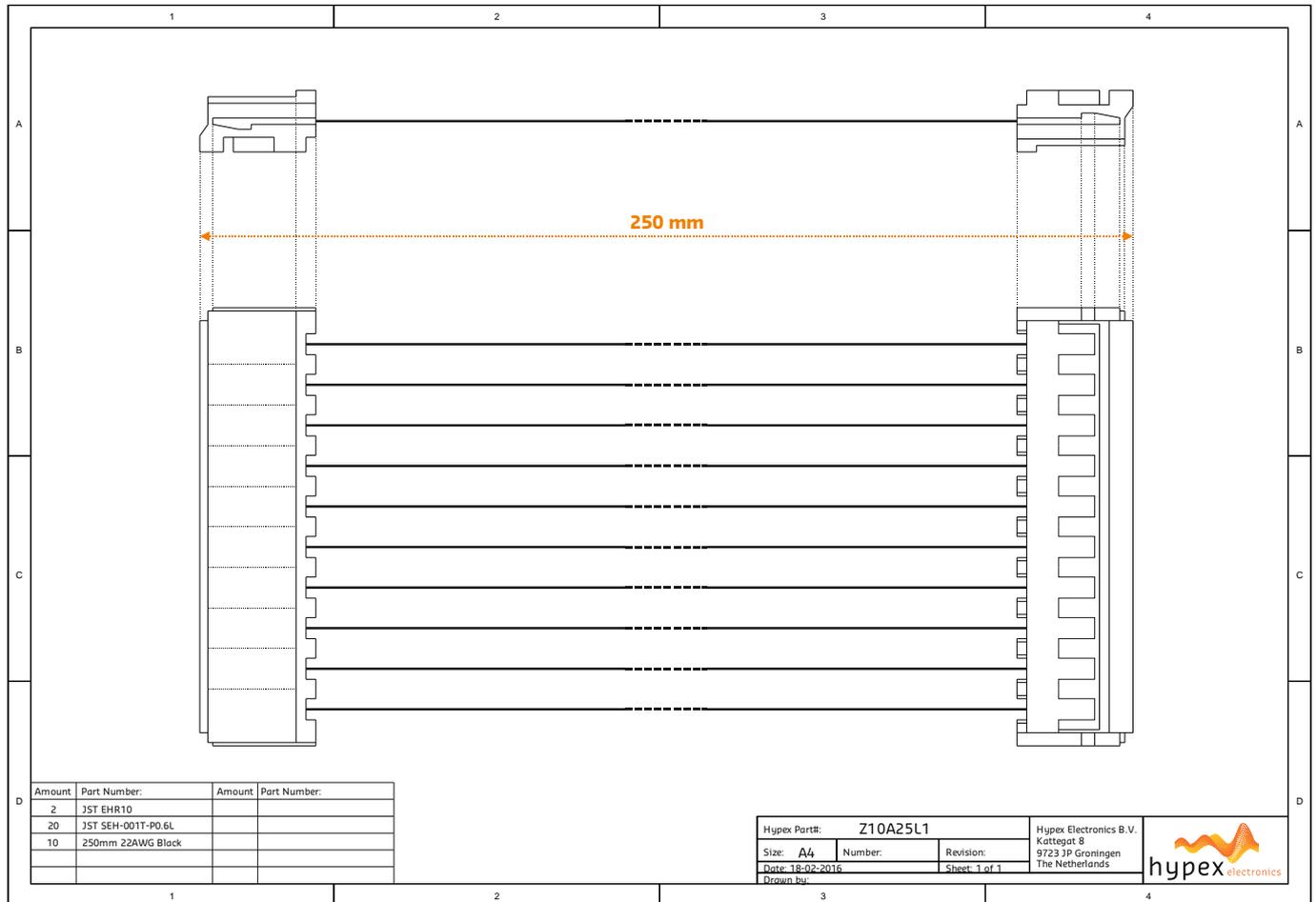
If printed correctly (scale 100%, A4), the scale of the image below should be 1:1. You may use it as a model to drill holes in your casing. Please verify before drilling!

Maximum allowed protruding depth inside each spacer is 4mm. Spacer threads are M3.



9 Standard cable assembly

To interface with the main NC-MP module, a standard cable assembly is available for separate purchase. This cable assembly is 250mm long and is not included with the module. Contact [sales](#) for more information.



10 Revisions

Document revision	Module revision	Change log	Date
01	NC100HF 01xx	Pre-release version	Oct '16
02	NC100HF 02xx	Input buffer changed	Oct '16
03	NC100HF 02xx	Textual mistakes corrected	Oct '16
04	NC100HF 02xx	Drill pattern dimensions corrected	Nov '16
05	NC100HF 02xx	Irregularity in the Hypex-box corrected: differential signal inputs were swapped, resulting in a 180° phase shift.	Dec '16
06	NC100HF 03xx	Gain has been lowered to improve application compatibility.	Apr '18
07	NC100HF 04xx	Update datasheet to revision 04xx	Dec '18
08	NC100HF 04xx	Added buffer selection to datasheet Added evaluation board and cable remarks	Nov' 20

11 Disclaimer

All products, product specifications and data are subject to change without notice to improve reliability, function or design or otherwise.

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