Hypex Electronics BV
Kattegat 8
9723 JP Groningen, The Netherlands
+31 50 526 4993
sales@hypex.nl
www.hypex.nl

NCx102EXT
NC(x)xxxMP add-on module

# MP-NC Series 2-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: 140 gr.
- ✓ Compact: 85 x 78 x 27mm

## Applications

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

## Introduction

The NCx102EXT is a high-performance Class D amplifier add-on module for the NC(x)xxxMP series. It is designed to be used in active speaker applications as an additional full audio band power amplifier channel, optimized for the higher-frequency audio band. The NCx102EXT has a wide input voltage range compatible with our whole NC(x)xxxMP range. It is directly powered from the NC(x)xxxMP module via the Hypex Channel Extension interface.

The amplifier used in the NCx102EXT 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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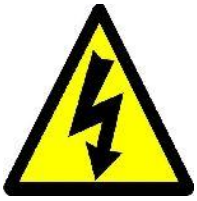
# 1 Safety precautions



**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.**

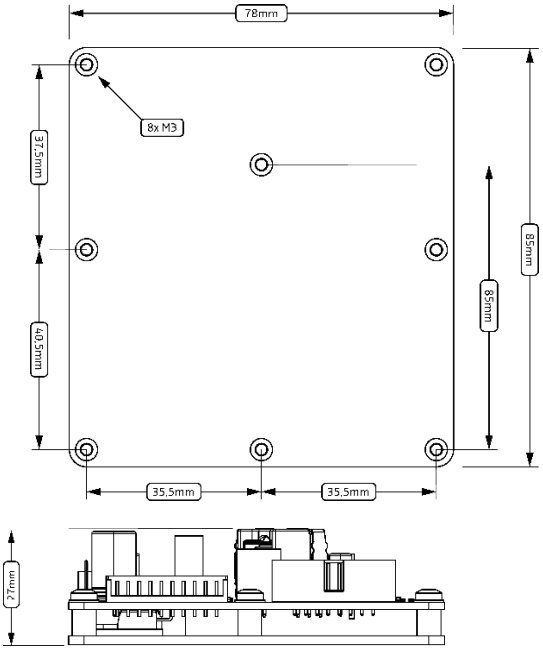
**Attention: Observe precautions for handling electrostatic sensitive devices. This module uses semiconductors that can be damaged by electrostatic discharge (ESD).**

**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 NCx102EXT 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 NC(x)xxxMP 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(x)-MP Series

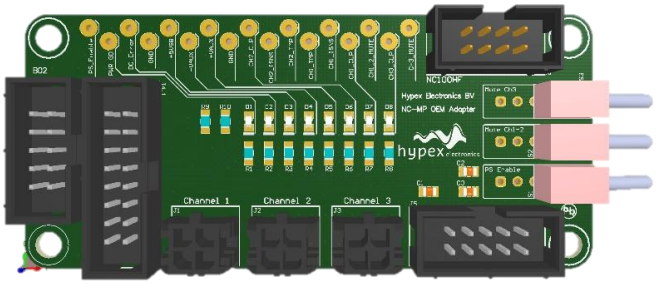
The NC(x)-MP series is a range of mains powered NC amplifiers both single and dual channel. Next to the mains powered modules, this range of modules also include a single channel add-on module. This module can be used to add one extra channel to a mains powered module. In the next table there is an overview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

| Model | Single channel, 4 Ohm | Dual channel, 4 Ohm |
|---|---|---|
| NC(x)122MP | - | 2 x 125 W |
| NC(x)250MP | 1 x 250 W | - |
| NC(x)252MP | - | 2 x 250 W |
| NC(x)500MP | 1 x 500 W | - |
| NC(x)502MP | - | 2 x 500 W |
| NC100HF | Hypex Channel Extension for Tweeter | |
| NCx102EXT | Hypex Dual Channel Extension Module | |

The NC(x)-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(x)-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(x)-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 NC(x)xxxMP series mains powered NCORE modules. Furthermore, the NCx102EXT can be easily connected using an 8-pin box interface cable. A 10-pin JST interface cable is included to connect the NCx102EXT with the NC(x)xxxMP. 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 NCx102EXT is designed as a single add-on module for the NC(x)-MP series. Not more than one NCx102EXT can be added to a single NC(x)-MP module. This module cannot be used in combination with other SMPS modules and therefore power supply information is not given.

## 3.1 NCOREx® 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, 25ºC ambient temperature. | $P_{R,cont}$ | - | 20 | - | W | |
| Distortion | <10Hz-20kHz AES17 Pout<$P_R$/2 | THD+N | - | 0.0006 | 0.002 | % | 2) |
| | <10Hz-20kHz AES17 Pout=1W | | - | - | 0.002 | % | 2) |
| CMRR | | | 70 | - | - | dB | 3) |
| Signal-to-Noise Ratio | <10Hz-20kHz AES17 | | - | 125 | - | dB | |
| Output Noise | Unwtd, <10Hz-20kHz AES17, 0Ω termination | $U_N$ | - | 16µ | 40µ | V | |
| Output Impedance | f<1kHz | $Z_{OUT}$ | - | - | 500 | µΩ | |
| | f<20kHz | | - | - | 5 | mΩ | |
| Power Bandwidth | | PBW | | 20-35k | | Hz | |
| Frequency Response | +0/-3dB. All loads. | | 10 | - | 50k | Hz | |
| Voltage Gain Buffered | | $A_V$ | 19.5 | 20 | 20.5 | dB | 4) |
| Voltage Gain Unbuffered | | $A_V$ | 11.7 | 12.2 | 12.7 | dB | 4) |
| Efficiency | Full power | η | | 80 | - | % | |
| Idle Losses | Per channel | $P_0$ | - | 3.4 | | W | |
| Current Limit per Ch | Hiccup | | - | 12 | - | A | |

**Note 1:** When used in combination with the NC(x)122MP, the output power in 8 Ohm is limited by its supply voltage and will therefore not exceed the NC(x)122MP $P_{R,\ 8\Omega}$ power rating.
**Note 2:** An Audio Precision AES17 20 kHz filter is used in this measurement.
**Note 3:** 1kHz
**Note 4:** The factory default is a buffered input with a gain of 7.8 dB. This can be bypassed as explained in section 3.2 “Input buffer and gain”

## 3.2 NCOREx® 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 R102, R109, R302, and R309 and placing a 0hm 0603 size resistor on placeholder R100, R111, R300, and R311. Placement of these resistors are shown in Figure 1. Furthermore, changing the gain of the module is not supported.

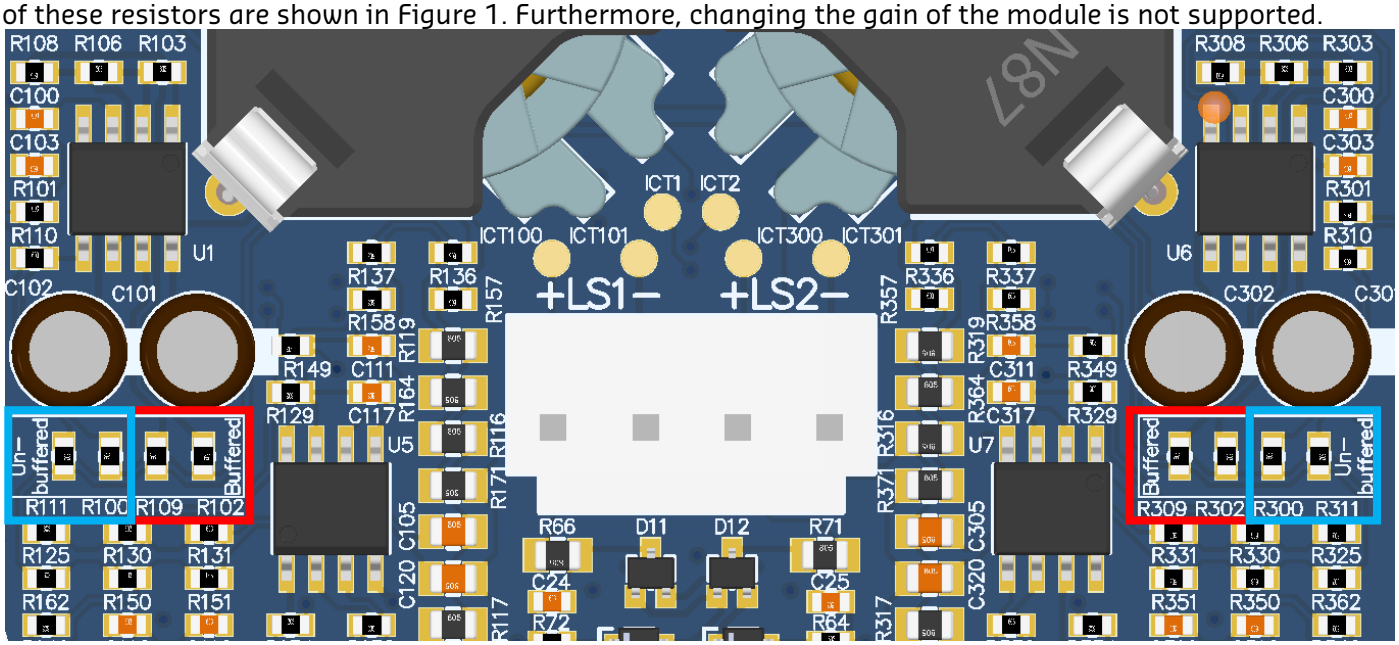



*Figure 1 Placement of the bypass resistors*

*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 | ºC | |
| | Operation | $T_{amb}$ | 0 | - | 50 | ºC | |
| **Heat-sink Temperature** | | $T_{h,max}$ | | | 95 | ºC | 1) |
| **Humidity** | Max 85 percent relative humidity, non-condensing. | | | | | | |

**Note 1:** The NCx102EXT 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.

# 5 IO Specifications

The NCx102EXT 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 NCx102EXT, this causes the connected NCx-MP module to switch off as described in the corresponding datasheet.

## 5.2 Amplifier Enable

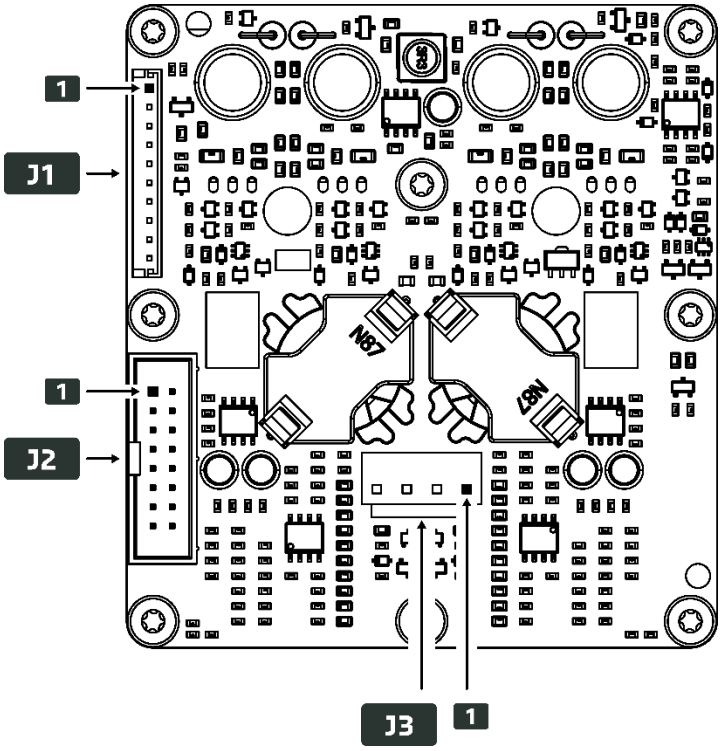
Amplifier Enable enables the NCx102EXT when the NCx-MP module is enabled and not muted. In the event that the on-board amplifier of the connected NCx-MP module is muted, the NCx102HF will also mute (switch off).

### Hypex Box interface

The NCx102EXT 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 NCx102EXT does not feature HW Address and Current Sense.

# 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 |
|---|---|---|---|
| J2.1 | Input | CH1 In - | Inverting audio input Channel 1 |
| J2.2 | Input | CH1 In + | Non-inverting audio input Channel 1 |
| J2.3 | - | NTC Reference | Temperature readout reference |
| J2.4 | Input | Mute | Amplifier mute (both channels) |
| J2.5 | Output | CH1 Clip | Clip indicator Channel 1 |
| J2.6 | Input | CH1 HWAddr | Not connected |
| J2.7 | Output | CH1 ISense(1) | Not connected |
| J2.8 | Output | CH1 Thermal | Temperature readout Channel 1 |
| J2.9 | Output | CH2 Thermal | Temperature readout Channel 2 |
| J2.10 | Output | CH2 ISense(2) | Not connected |
| J2.11 | Input | CH2 HWAddr | Not connected |
| J2.12 | Output | CH2 Clip | Clip indicator Channel 2 |
| J2.13 | Input | Mute | Amplifier mute (both channels) |
| J2.14 | - | NTC Reference | Temperature readout reference |
| J2.15 | Input | CH2 In + | Non-inverting audio input Channel 2 |
| J2.16 | Input | CH2 In - | Inverting audio input Channel 2 |

**Connector type equivalent:** T821116A1S100CEU
**Contact material:** Brass, gold flash over nickel

## 6.2 H-Channel extension

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

| Pin | Direction | Function | Remarks |
|---|---|---|---|
| J1.1 | Input | HV+ | Positive power supply |
| J1.2 | Input | HV- | Negative power supply |
| J1.3 | - | GND | Ground |
| J1.4 | - | NC | Not connected |
| J1.5 | Output | nFatal | High if amplifier has no error |
| J1.6 | Input | Positive $V_{REG}$ | |
| J1.7 | Input | Negative $V_{REG}$ | |
| J1.8 | Input | Amp Enable | Amplifier enable |
| J1.9 | - | NC | Not connected |
| J1.10 | - | NC | Not connected |

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

## 6.3 Loudspeaker Connector

| Pin | Direction | Function | Remarks |
|---|---|---|---|
| J3.1 | - | LS2- | Cold Loudspeaker Output On-board Amp Channel 2 |
| J3.2 | Output | LS2+ | Hot Loudspeaker Output On-board Amp Channel 2 |
| J3.3 | - | LS1- | Cold Loudspeaker Output On-board Amp Channel 1 |
| J3.4 | Output | LS1+ | Hot Loudspeaker Output On-board Amp Channel 1 |

**Connector type:** B4P-VH(LF)(SN)

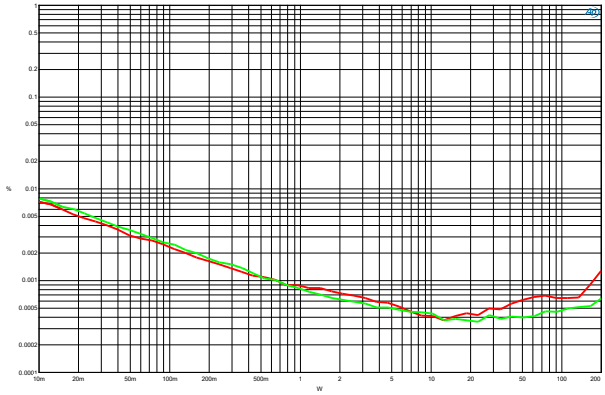
## 6.4 Temperature Readout

A NTC is placed near the amplifier FET's and can be used to monitor the temperature. The NTC is connected to NTC Reference and accessible via the H-Box connector. The characteristics of the NTC are stated in the datasheet of the NTC manufacturer.

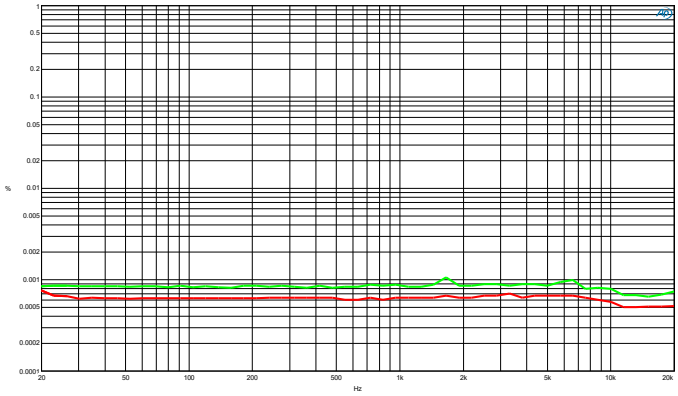
| Parameter | Remarks | Symbol | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|---|---|
| Resistor value | 100˚C – 25˚C | | 0.9 | - | 10 | kΩ | |
| Permissive Operating Current | 25ºC | | | | 0.31 | mA | |

**NTC type:** NCP18XH103J03RB

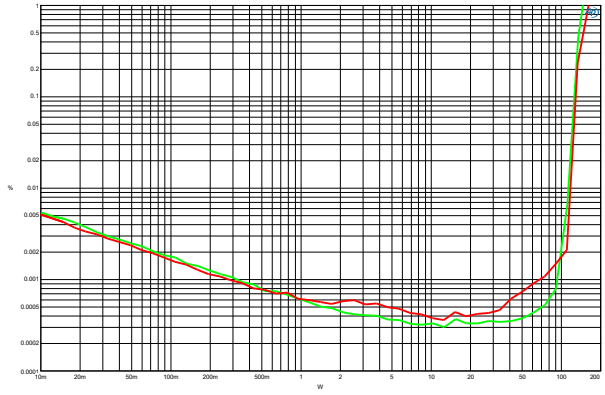
# 7 Typical Performance Graphs



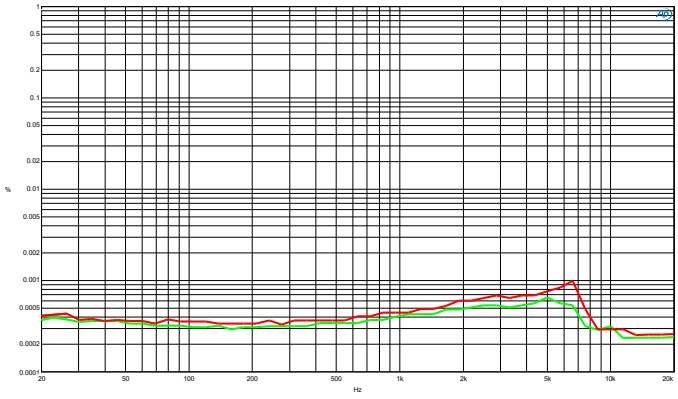
THD+N vs. power at 1kHz (green) and 6kHz (red) (4Ω).



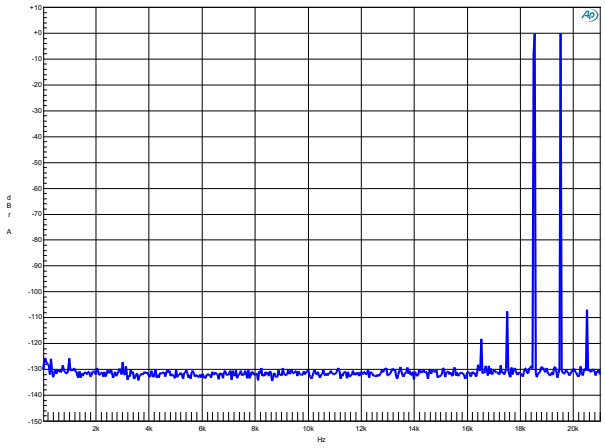
THD+N vs. Frequency at 1W in 4Ω (green) and 8Ω (red).



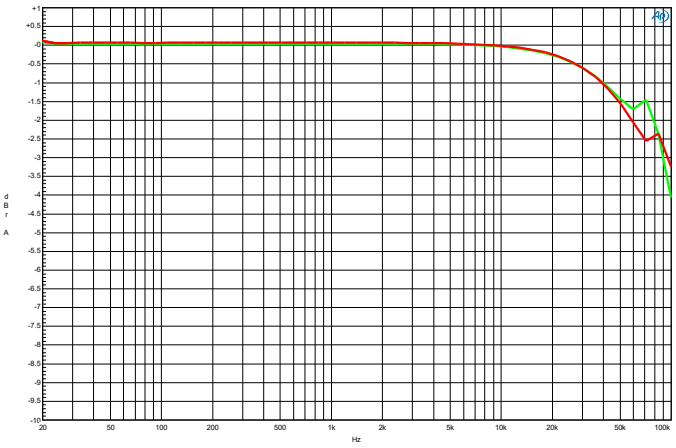
THD+N vs. power at 1kHz (green) and 6kHz (red) (8Ω).



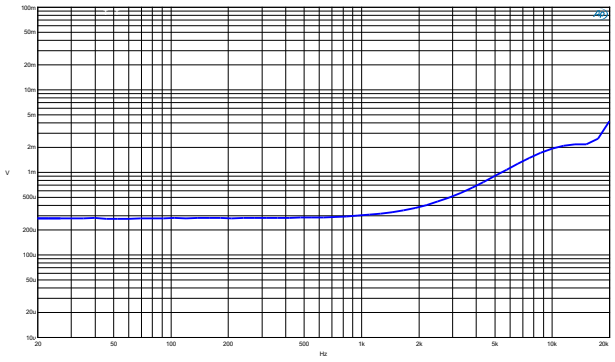
THD+N vs. Frequency at $P_R/2$ in 4Ω (green) and 8Ω (red).



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

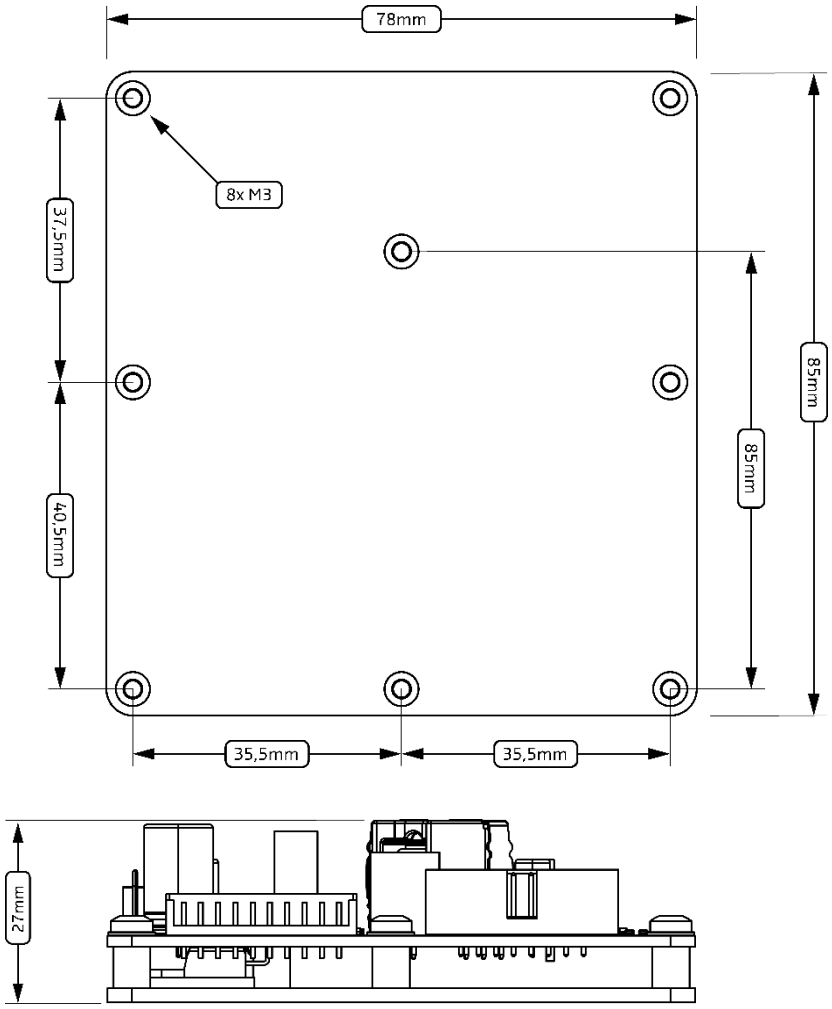


Frequency response in 4Ω (green) and 8Ω (red).



Output Impedance

# 8 Dimensions

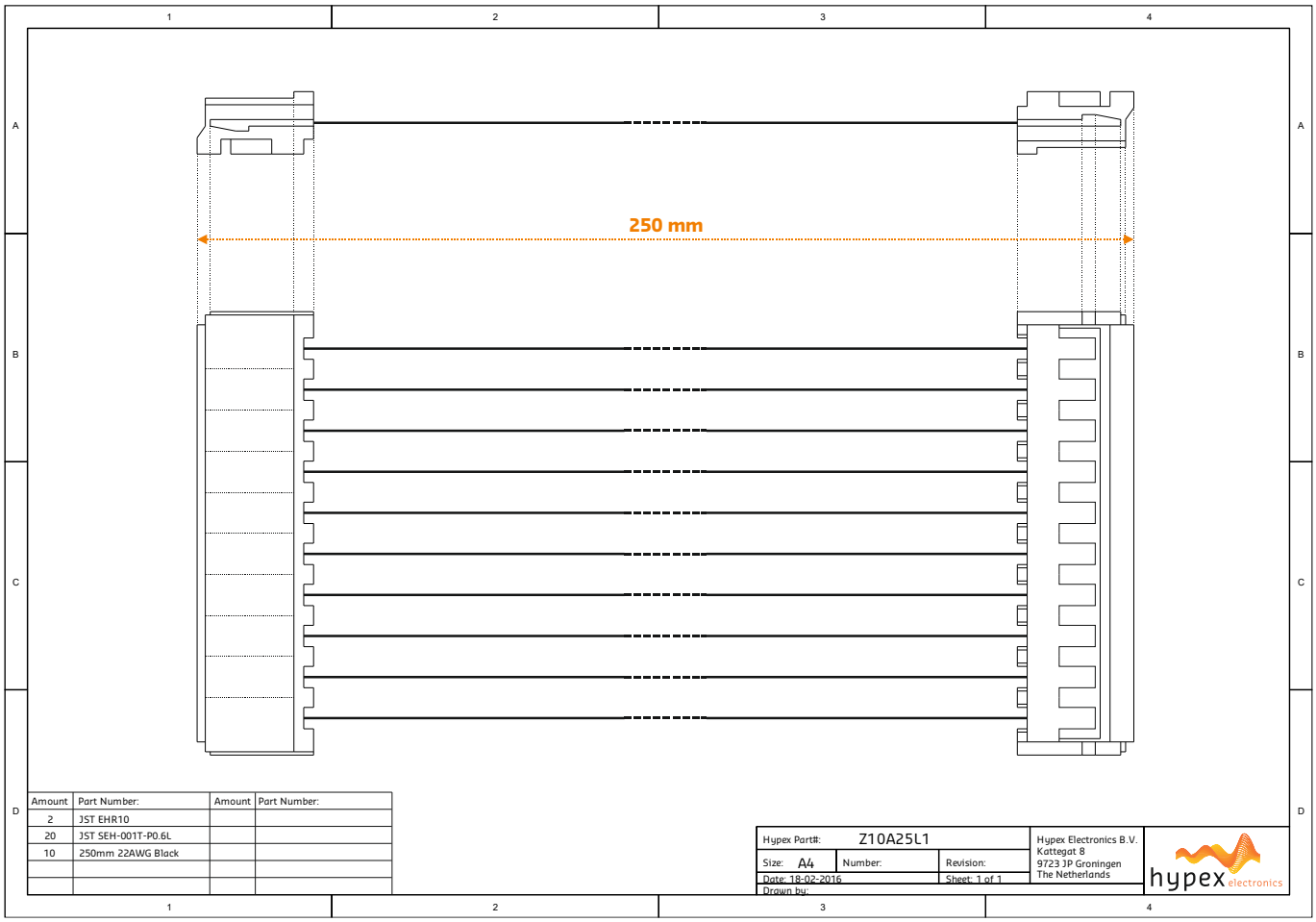



## 8.1 Drill pattern

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!
The 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 | NCx102EXT 00xx | Pre-release version | Dec '24 |
| 02 | NCx102EXT 01xx | Update datasheet to revision 01xx | May '25 |

# 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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