

# Headphone AMP 3 Click



PID: MIKROE-5721

**Headphone AMP 3 Click** is a compact add-on board that contains a stereo headphone amplifier. This board features the [INA1620](#), a high-fidelity audio operational amplifier with integrated thin-film resistors and EMI filters from [Texas Instruments](#). Over its dual amplifiers, it achieves a very low noise density and drives a 32Ω load at 150mW of output power. Total harmonic distortion plus noise (THD+N), a degree to which an amplifier alters a pure sinusoidal signal by adding harmonics to the fundamental signal, is ultra-low, some -119.2dB at 1KHz. This Click board™ makes the perfect solution for developing high-fidelity (Hi-Fi) headphone drivers, professional audio equipment, audio test, measurement devices, analog and digital mixing consoles, and more.

## How does it work?

Headphone AMP 3 Click is based on the INA1620, a high-fidelity audio operational amplifier with integrated thin-film resistors and EMI filters from Texas Instruments. The amplifier has a high slew rate, high capacitive-load drive capability, high open-loop gain, low quiescent current per channel, low-power shutdown mode, and thermal shutdown. The internal amplifiers use a unique topology to deliver high output current with extremely low distortion while consuming minimal supply current. The amplifier input pins of the INA1620 are protected from excessive differential voltage with back-to-back diodes; thus, in most applications, the inputs will have no consequences.

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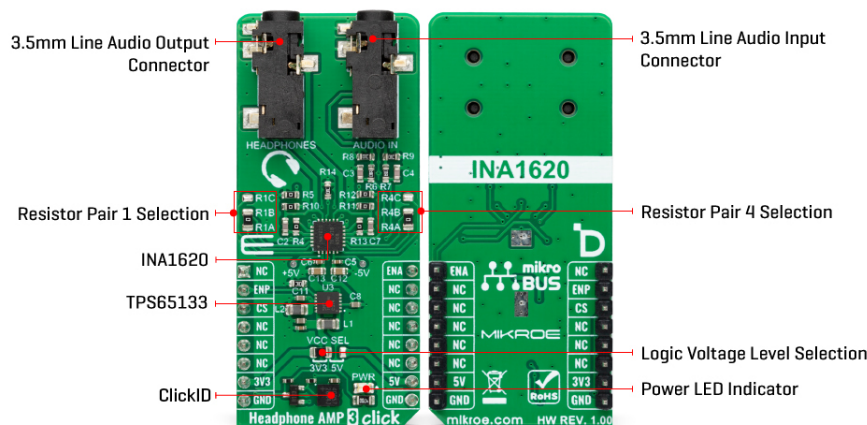
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The INA1620 has two functional modes: a Shutdown and an Enabled mode. In Shutdown mode, the INA1620 will have minimal power consumption. However, applying signals to the output while in Shutdown mode will parasitically power the output stage of the audio amplifier. While in Enabled mode, the INA1620 uses a few tricks to clean things up. The INA1620 uses efficient electromagnetic interference (EMI) rejection as an immunity to change in offset, thus having a higher EMIRR.

Onboard, there are two 3.5mm audio connectors for connecting the audio source and headphones. The INA1620 uses positive and negative power supplies; on this Click board™, +5V and -5V power supplies are provided by the [TPS65133](#), a ±5V, 250mA dual output power supply from Texas Instruments. The TPS65133 provides fixed positive and negative 5V with ±1% output voltage accuracy and high efficiency. It also includes a boost converter that allows a 3.3V power supply from the mikroBUS™ socket to be used.

The INA1620 has integrated thin-film resistors in four blocks. You can use blocks 1 and 4 to create very high-performance audio circuit configurations. Blocks 2 and 3 are already used and configured in a circuit of this Click board™. All resistors are of 1K, where all A and C are internally connected to a B point. The Headphone AMP 3 Click comes with jumpers to set those configurations. Points R1B and R4B are connected by a trace with the appropriate A points. Cut the trace with a sharp knife and solder jumper resistors to connect B points to C.

The Headphone AMP 3 Click board uses two enable pins as its only connection with the host MCU. The ENA pin enables the INA1620 with a logic HIGH, as the pin is pulled LOW. The ENP is used similarly to enable the TPS65133 boost and buck-boost converter with a logic HIGH as the pin is pulled down.

This Click board™ can operate with either 3.3V or 5V logic voltage levels selected via the VCC SEL jumper. This way, both 3.3V and 5V capable MCUs can use the communication lines properly. However, the Click board™ comes equipped with a library containing easy-to-use functions and an example code that can be used, as a reference, for further development.

## Specifications

Type	Amplifier, Signal Processing
Applications	Can be used for the development of high-fidelity (Hi-Fi) headphone drivers, professional audio equipment, audio test, and

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	measurement devices, analog and digital mixing consoles, and more
On-board modules	INA1620 - high-fidelity audio operational amplifier with integrated thin-film resistors and EMI filters from Texas Instruments TPS65133 - $\pm 5V$ , 250mA dual output power supply from Texas Instruments
Key Features	Low power consumption, shutdown feature, short-circuit protection, 32 $\Omega$ load at 150mW, EMI filters, integrated thin resistors for configuration, two 3.5mm audio connectors (IN and OUT), boost and buck-boost power supply onboard with positive and negative output voltage, and more
Interface	GPIO
Feature	ClickID
Compatibility	mikroBUS™
Click board size	L (57.15 x 25.4 mm)
Input Voltage	3.3V or 5V

## Pinout diagram

This table shows how the pinout on Headphone AMP 3 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin					Pin	Notes
	NC	1	AN	PWM	16	<b>ENA</b>	Amplifier Enable
Power Supply Enable	<b>ENP</b>	2	RST	INT	15	NC	
ID COMM	<b>CS</b>	3	CS	RX	14	NC	
	NC	4	SCK	TX	13	NC	
	NC	5	MISO	SCL	12	NC	
	NC	6	MOSI	SDA	11	NC	
Power Supply	<b>3.3V</b>	7	3.3V	5V	10	<b>5V</b>	Power Supply
Ground	<b>GND</b>	8	GND	GND	9	<b>GND</b>	Ground

## Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
JP1	VCC SEL	Left	Logic Level Voltage Selection 3V3/5V: Left position 3V3, Right position 5V
JP2	-	Unpopulated	Resistor Pair 4 Selection C/A: Up position C, Down position A

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JP3	-	Unpopulated	Resistor Pair 1 Selection C/A: Up position C, Down position A
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## Headphone AMP 3 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
Output Power	-	150	-	mW
Load Resistance	-	32	-	Ω

## Software Support

We provide a library for the Headphone AMP 3 Click as well as a demo application (example), developed using MIKROE [compilers](#). The demo can run on all the main MIKROE [development boards](#).

Package can be downloaded/installed directly from NECTO Studio Package Manager(recommended way), downloaded from our [LibStock™](#) or found on [Mikroe github account](#).

## Library Description

This library contains API for Headphone AMP 3 Click driver.

Key functions

- headphoneamp3\_enable\_power Headphone AMP 3 power pin setting function.
- headphoneamp3\_enable\_amp Headphone AMP 3 amp pin setting function.

## Example Description

This library contains API for the Headphone AMP 3 Click driver. This demo application shows use of a Headphone AMP 3 Click board™.

The full application code, and ready to use projects can be installed directly from NECTO Studio Package Manager(recommended way), downloaded from our [LibStock™](#) or found on [Mikroe github account](#).

Other Mikroe Libraries used in the example:

- MikroSDK.Board
- MikroSDK.Log
- Click.HeadphoneAMP3

## Additional notes and informations

Depending on the development board you are using, you may need [USB UART click](#), [USB UART 2 Click](#) or [RS232 Click](#) to connect to your PC, for development systems with no UART to USB interface available on the board. UART terminal is available in all MIKROE [compilers](#).

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## mikroSDK

This Click board™ is supported with [mikroSDK](#) - MIKROE Software Development Kit. To ensure proper operation of mikroSDK compliant Click board™ demo applications, mikroSDK should be downloaded from the [LibStock](#) and installed for the compiler you are using.

For more information about mikroSDK, visit the [official page](#).

## Resources

[mikroBUS™](#)

[mikroSDK](#)

[Click board™ Catalog](#)

[Click Boards™](#)

[ClickID](#)

## Downloads

[Headphone AMP 3 click example on Libstock](#)

[Headphone AMP 3 click 2D and 3D files](#)

[TPS65133 datasheet](#)

[INA1620 datasheet](#)

[Headphone AMP 3 click schematic](#)

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