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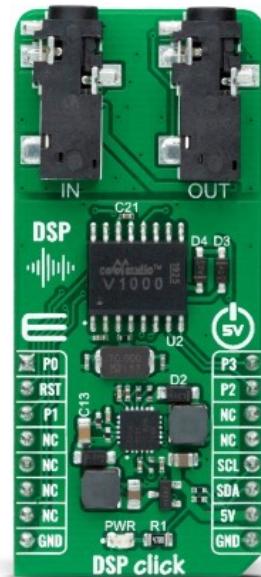www.mikroe.com

DSP Click

PID: MIKROE-4431

DSP Click is a compact add-on board that contains a multi-effects digital signal processor. This board features the V1000, a complete multi-effects audio DSP with ultra-high quality audio performance in a rapid 'time-to-market' solution from Coolaudio. The V1000 includes its integrated RAM with 16 built-in multi-effects and reverb controlled via I/O pins or I2C interface. Combined with a low-cost A/D-D/A codec like the V4220, this Click board™ provides an ultra-low cost FX solution. This Click board™ is suitable for applications as a standalone audio player, PC accessories, and Hi-Tech toys, conventional consumer electronic devices, and many more.

DSP Click is supported by a mikroSDK compliant library, which includes functions that simplify software development. This Click board™ comes as a fully tested product, ready to be used on a system equipped with the mikroBUS™ socket.

How does it work?

DSP Click is based on the V1000, a complete multi-effects audio DSP with ultra-high quality audio performance in a rapid 'time-to-market' solution from Coolaudio. The V1000 is a specialized microprocessor chip with its architecture optimized for the needs of digital signal processing. It includes serially programmable SRAM for program development and integrated RAM with 16 built-in effects such as multiple reverbs, echo, phaser, chorus, flanger, etc. Alongside the 16 internal programs, programmable SRAM is easily accessible through the I2C serial interface by setting the V1000 to external mode, while in internal mode, the four GPIO pins (P0-P3) may be used to select between the different algorithms.

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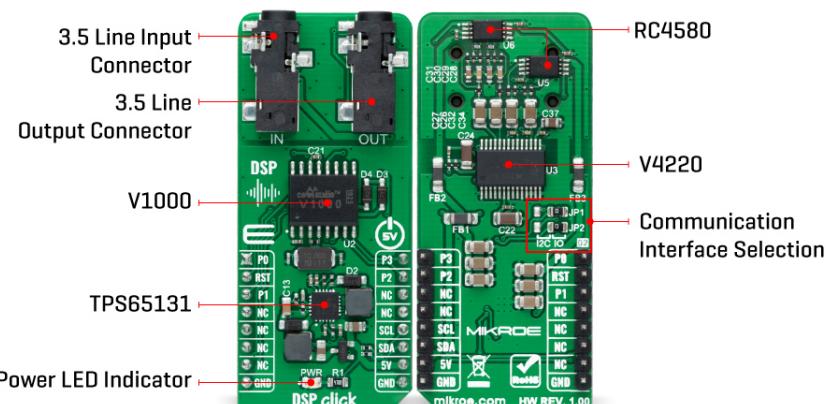
Combined with a low-cost codec like the V4220 from Coolaudio, this Click board™ provides an ultra-low-cost FX solution. The V4220 is a high-performance 24-bit audio codec providing stereo A/D and D/A converters using the latest conversion technology. It operates from a single +5V power supply, features low power consumption, and a selectable de-emphasis filter for 32, 44.1, and 48kHz sample rates. It also includes an analog volume control architecture that can make a 113.5dB attenuation in 0.5dB steps, preserving dynamic range during attenuation. The V4220 provides a serial interface to read/write the internal registers operating in either Master or Slave Mode.

This audio player consists of two analog channels, input and output routed to the 3.5mm audio jack connectors. The functional configuration of these audio channels consists of two dual audio operational amplifiers, the RC4580 from Texas Instruments, used as headphone amplifiers. It offers low noise, high gain-bandwidth, low harmonic distortion, and high output current, powered by ±15V obtained by the TPS65131, dual-output DC-DC converter generating a positive output voltage up to 15V and a negative output voltage down to –15V with output currents in a 200mA range from Texas Instruments.

Also, this Click board™ can be reset through the Hardware Reset pin, labeled as RST on the mikroBUS™ socket, and has two jumpers on its bottom side labeled as JP1 and JP2, which very easily adjusts the way the V1000 communicates with the MCU, between I2C communication or IO pins, by positioning SMD jumpers to an appropriate position. Note that all jumpers must be placed to the same side, or else the Click board™ may become unresponsive.

This Click board™ is designed to be operated only with a 5V logic voltage level. A proper logic voltage level conversion should be performed before the Click board™ is used with MCUs with different logic levels. However, the Click board™ comes equipped with a library that contains functions and an example code that can be used, as a reference, for further development.

Specifications

Type	Signal Processing
Applications	Can be used for applications as a standalone audio player, PC accessories, and Hi-Tech toys, conventional consumer electronic devices, and many more.
On-board modules	V1000 - complete multi-effects audio DSP with

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	ultra-high quality audio performance in a rapid 'time-to-market' solution from Coolaudio V4220 - 24-bit stereo codes from Coolaudio
Key Features	Low power consumption, built-in reverb and multi-effects, ultra-high quality audio performance, optimized for digital signal processing, in combination with V4220 provides an ultra-low-cost FX solution, and more.
Interface	GPIO,I2C
Feature	No ClickID
Compatibility	mikroBUS™
Click board size	L (57.15 x 25.4 mm)
Input Voltage	5V

Pinout diagram

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

Notes	Pin		mikro™ BUS			Pin	Notes
Program Selector PIN 0	**P0**	1	AN	PWM	16	**P3**	Program Select Pin 3
Reset	**RST**	2	RST	INT	15	**P2**	Program Select Pin 2
Program Select Pin 1	**P1**	3	CS	RX	14	NC	
	NC	4	SCK	TX	13	NC	
	NC	5	MISO	SCL	12	**SCL**	I2C Clock
	NC	6	MOSI	SDA	11	**SDA**	I2C Data
	NC	7	3.3V	5V	10	**5V**	Power Supply
Ground	**GND**	8	GND	GND	9	**GND**	Ground

Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
JP1-JP2	-	Right	Communication Interface Selection I2C/IO: Left position I2C, Right position IO

DPS Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	5	-	V
ADC/DAC Dynamic Range	92	100	-	dB
Attenuation Step Size	0.35	0.5	0.65	dB
Sample Rate	-	48	-	kHz
Operating Temperature Range	-40	+25	+85	°C

Software Support

We provide a library for the DSP Click as well as a demo application (example), developed using MikroElektronika compilers. The demo can run on all the main MikroElektronika 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 DSP Click driver.

Key functions:

- void dsp_cfg_setup (dsp_cfg_t *cfg); - Config Object Initialization function.
- err_t dsp_init (dsp_t *ctx, dsp_cfg_t *cfg); - Initialization function.
- void dsp_default_cfg (dsp_t *ctx); - Click Default Configuration function.

Examples description

This application controls reverb and multi-effects Digital Multi-Effects DSP provides different sound performance of the DSP Click.

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.Dsp

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. The terminal available in all MikroElektronika compilers, or any other terminal application of your choice, can be used to read the message.

mikroSDK

This Click board™ is supported with mikroSDK - MikroElektronika 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™

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mikroSDK

Click board™ Catalog

Click Boards™

Downloads

DSP click 2D and 3D files

RC4580 datasheet

V4220 datasheet

V1000 datasheet

TPS65131 datasheet

DSP click schematic

DSP click example on Libstock