MIKROELEKTRONIKA D.O.O, Batajnički drum 23, 11000 Belgrade, Serbia
VAT: SR105917343 Registration No. 20490918
Phone: + 381 11 78 57 600 Fax: + 381 11 63 09 644 E-mail: office@mikroe.com
www.mikroe.com

Load Cell 5 Click

PID: MIKROE-4510

Load Cell 5 Click is a compact add-on board that represents a weigh scale solution. This board features the AD7780, a pin-programmable, low power, 24-bit sigma-delta ΣΔ ADC from Analog Devices. It interfaces directly to the load cell, where the low-level signal from the load cell is amplified by the AD7780's internal low noise programmable gain amplifier programmed to operate with a gain of 128 or 1. It also has a power-down mode allowing the user to switch off the power to the bridge sensor and power-down the AD7780 when not converting, increasing the product battery life. This Click board™ has many features that make it a perfect solution for safety-critical and weight measurement applications.

Load Cell 5 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?

Load Cell 5 Click as its foundation uses the AD7780, a pin programmable, low power, low drift 24-bit ΣΔ ADC from Analog Devices, that includes a PGA and uses an internal clock. The AD7780 typically consumes only 330µA and simplifies this weigh scale design since most of the system building blocks are already on the chip. The AD7780 has two filter options selectable via FIL pin(low state - the 16.7Hz, high state - 10Hz) and a Power-Down Mode allowing the user to switch off the power to the bridge sensor and power-down the AD7780 when not converting, increasing the battery life.
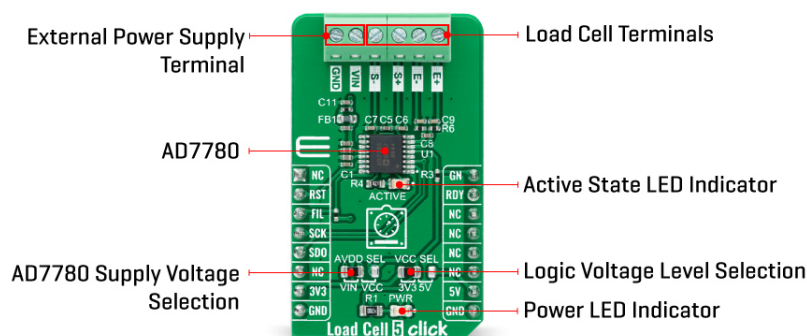
Since the AD7780 provides an integrated solution for weighing scales, it interfaces directly to the load cell. The only required external components, which are also on the Click board™, are filters on the analog inputs and capacitors on the reference pins for EMC purposes. The low-level signal from the load cell is amplified by the AD7780's internal PGA programmed via the PWM pin of the mikroBUS™ socket, labeled as GN, to operate with a gain of 128 or 1. The conversions from the AD7780 are then sent to the MCU through SPI serial interface, where the digital information is converted to weight.

This Click board™ uses the 6-wire load cell configuration, which has two sense pins, ground, power supply, and two output connections. The load cell differential SENSE lines connected to the AD7780 reference inputs create a ratiometric configuration immune to low-frequency changes in the power supply excitation voltage. Those sense pins are connected to the high and low sides of the Wheatstone bridge, where voltage can be accurately measured, regardless of the voltage drop due to the wiring resistance.

The AD7780 has separate analog and digital power supply pins. The analog and digital power supplies are independent of each other to be different, or the same, potentials achieved with the AVDD SEL jumper. This feature allows selecting the AD7780 power supply between an external power supply (2.7 - 5.25V) and logic voltage levels supplied via mikroBUS™ rails.

Load Cell 5 Click communicates with MCU using a standard SPI interface with a dual-purpose DOUT/RDY line. This line can function as a regular data output pin for the SPI interface or as a data ready pin (interrupt) labeled as RDY and routed on the INT pin of the mikroBUS socket. Also, it uses the RST pin on the mikroBUS™ socket, which performs the Hardware Reset function by putting this pin in a logic low state, and a blue diode labeled as ACTIVE used to indicate the device's Active Operational Status.

This Click board™ can operate with both 3.3V and 5V logic voltage levels selected via the VCC SEL jumper. This way, it is allowed for both 3.3V and 5V capable MCUs to properly use the I2C communication lines. 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	Force
Applications	Can be used for safety-critical and weight

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	measurement applications.
On-board modules	AD7780 - pin-programmable, low power, 24-bit sigma-delta ΣΔ ADC from Analog Devices
Key Features	Low power consumption, pin-programmable filter response, pin-programmable reset and gain, internal bridge power-down switch, independent interface power supply, and more.
Interface	SPI
Feature	No ClickID
Compatibility	mikroBUS™
Click board size	M (42.9 x 25.4 mm)
Input Voltage	3.3V or 5V,External

Pinout diagram

This table shows how the pinout on Load Cell 5 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikro™ BUS			Pin	Notes
	NC	1	AN	PWM	16	**GN**	Gain Selection
Reset	**RST**	2	RST	INT	15	**RDY**	Interrupt / Data Ready
Filter Select	**FIL**	3	CS	RX	14	NC	
SPI Clock	**SCK**	4	SCK	TX	13	NC	
SPI Data OUT	**SDO**	5	MISO	SCL	12	NC	
	NC	6	MOSI	SDA	11	NC	
Power Supply	**3.3V**	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
LD2	ACTIVE	-	Active State LED Indicator
JP1	VCC SEL	Left	Logic Level Voltage Selection 3V3/5V: Left position 3V3, Right position 5V
JP2	AVDD SEL	Left	AD7780 Supply Voltage Selection VIN/VCC: Left position VIN, Right position VCC

Load Cell 5 Click electrical specifications

![MIKROE Time-saving embedded tools]

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Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
External Supply Voltage VIN	2.7	-	5.25	V
Resolution	24	-	-	bits
Operating Temperature Range	-40	+25	+105	°C

Software Support

We provide a library for the Load Cell 5 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 Load Cell 5 Click driver.

Key functions:

- loadcell5_cfg_setup - Config Object Initialization function.
- loadcell5_init - Initialization function.
- loadcell5_default_cfg - Click Default Configuration function.

Examples description

This library contains API for Load Cell 5 Click driver. The library initializes and defines the SPI bus drivers to read status and ADC data. The library also includes a function for tare, calibration and weight measurement.

The demo application is composed of two sections :

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.LoadCell5

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™

mikroSDK

Click board™ Catalog

Click Boards™

Downloads

Load Cell 5 click schematic

Load Cell 5 click 2D and 3D files

AD7780 datasheet

Load Cell 5 click example on Libstock

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