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
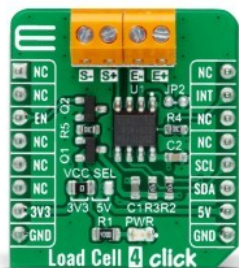www.mikroe.com

Load Cell 4 Click

PID: MIKROE-4458

Load Cell 4 Click is a compact add-on board that contains a resistive sensor signal conditioner with a fast power-up data output response. This board features the ZSC31014, a CMOS integrated circuit for highly accurate amplification and analog-to-digital conversion of differential and half-bridge input signals from Renesas. This Click board™ is well suited for sensor-specific correction of bridge sensors and adjustable to nearly all piezo-resistive bridge sensors. Digital compensation of signal offset, sensitivity, temperature drift, and non-linearity is accomplished via an internal signal processor running a correction algorithm with calibration coefficients stored in a non-volatile EEPROM. This Click board™ has many features that make it a perfect solution for safety-critical and weight measurement applications.

Load Cell 4 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 4 Click is based on the ZSC31014, a CMOS integrated circuit for highly accurate amplification and analog-to-digital conversion of differential and half-bridge input signals from Renesas. The ZSC31014 has a fully differential chopper-stabilized preamplifier with 8 programmable gain settings (1.5, 3, 6, 12, 24, 48, 96, and 192) through a 14-bit ADC. The resolution of the output depends on the input span and the analog gain setting. The system clock of the ZSC31014 can operate at 1MHz (lower power, better noise performance) or at 4MHz (faster sample rates). Internal DSP core uses coefficients stored in EEPROM to precisely calibrate/condition the amplified differential input signal. Temperature can be measured from an internal temperature sensor, which can be calibrated to compensate for the temperature

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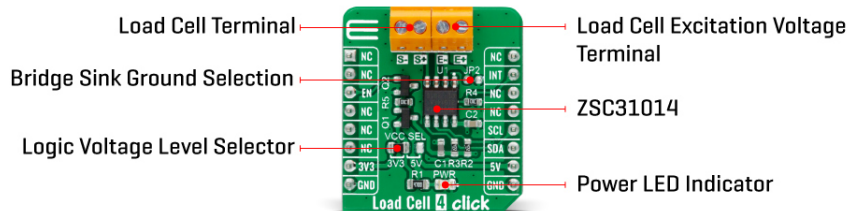
ISO 27001: 2013 certification of informational security management system.
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effects of the sensor bridge.

After the Power-On Reset function, the ZSC31014 wakes, and if it receives the Start_CM command during the command window, it goes into Command Mode. This Mode is primarily used in the calibration environment, and during Command Mode, the device executes commands sent by the I2C master. The ZSC31014 remains in Command Mode until it receives the Start_NOM command, which starts the Normal Operation Mode. Operation after the Power-On sequence depends on whether the part is programmed in Sleep Mode or Update Mode. In Sleep Mode, the ZSC31014 waits for commands from the master before taking measurements, while in Update Mode, data is taken at a fixed, selectable rate.

Load Cell 4 Click communicates with MCU using the standard I2C 2-Wire interface with a clock frequency from 100 up to 400 kHz. The INT pin of the mikroBUS™ socket, used as an interrupt, rises when new output data is ready and falls when the next I2C communication occurs. It is most useful if the part is configured in Sleep Mode to indicate to the system that a new conversion is ready. Besides, this Click board™ also possesses an Enable pin labeled as EN, routed to the CS pin of the mikroBUS™ socket, which serves to turn the ZSC31014's power supply on/off.

This Click board™ is designed to operate with both 3.3V and 5V logic voltage levels selected via the VCC SEL jumper. It allows for both 3.3V and 5V capable MCUs to use the I2C communication lines properly. 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	Force
Applications	Can be used for safety-critical and weight measurement applications.
On-board modules	Load Cell 4 Click is based on the ZSC31014, a CMOS integrated circuit for highly accurate amplification and analog-to-digital conversion of differential and half-bridge input signals from Renesas.
Key Features	High accuracy, digital compensation of sensor

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	offset, sensitivity, temperature drift, and non-linearity, eight programmable analog gain settings, internal temperature compensation for sensor correction and for corrected temperature output, and more.
Interface	I2C
Feature	No ClickID
Compatibility	mikroBUS™
Click board size	S (28.6 x 25.4 mm)
Input Voltage	3.3V or 5V

Pinout diagram

This table shows how the pinout on Load Cell 4 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	NC	
	NC	2 RST	INT 15	**INT**	Interrupt
Enable	**EN**	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
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
JP1	VCC SEL	Left	Logic Level Voltage Selection 3V3/5V: Left position 3V3, Right position 5V
JP2	-	Unpopulated	Bridge Sink Ground Selection

Load Cell 4 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	2.7	-	5.5	V
Resolution	-	14	-	bits
Operating Temperature Range	-40	-	+125	°C

Software Support

We provide a library for the Load Cell 4 Click on our LibStock page, as well as a demo application (example), developed using MikroElektronika compilers. The demo can run on all

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the main MikroElektronika [development boards](#).

Library Description

The library covers all the necessary functions to control Load Cell 4 Click board™. Library performs a standard I2C interface communication.

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

Key functions:

- void loadcell4_tare (loadcell4_data_t *cell_data) - Tare the scales function.
- uint8_t loadcell4_calibration (uint16_t cal_val, loadcell4_data_t *cell_data) - Calibration function.
- float loadcell4_get_weight (loadcell4_data_t *cell_data) - Get weight function.

Examples description

The application is composed of three sections :

- System Initialization - Initializes I2C, set INT pin as input, set CS pin as output and start to write log.
- Application Initialization - Initializes I2C driver and performs the power on. Sets tare the scale, calibrate scale and start measurements.
- Application Task - This is an example that demonstrates the use of the Load Cell 4 Click board™. The Load Cell 4 Click board™ can be used to measure weight, shows the measurement of scales in grams [g]. Results are being sent to the Usart Terminal where you can track their changes. All data logs write on USB uart changes for every 4 sec.

Additional Functions :

- void log_display (float display_val) - Function displays readings as floating point value with two decimal places.

The full application code, and ready to use projects can be found on our [LibStock](#) page.

Other mikroE Libraries used in the example:

- I2C
- UART
- Conversions

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

ZSC31014 datasheet

Load Cell 4 click 2D and 3D files

Load Cell 4 click schematic

Load Cell 4 click example on Libstock

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