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Expand 9 Click

PID: MIKROE-4853

Expand 9 Click is a compact add-on board that contains a multi-port I/O expander. This board features the SX1509QB, the world's lowest voltage level shifting GPIO expander from Semtech Corporation. The SX1509QB comes in a 16-channel configuration and allows easy serial expansion of I/O through a standard I2C serial interface. It also has a built-in level shifting feature making it highly flexible in power supply systems where communication between incompatible I/O voltages is required, an integrated LED driver for enhanced lighting, and a keypad scanning engine to implement keypad applications up to 8x8 matrix. This Click board™ provides a simple solution when additional I/Os are needed, suitable for low-power portable equipment, keypad scanning, driving LEDs, and many more.

Expand 9 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?

Expand 9 Click as its foundation uses the SX1509QB, a 16-channel lowest voltage level shifting GPIO expander from Semtech Corporation. The expander devices, like this one, can provide additional control and monitoring when the MCU has insufficient I/O ports or in systems where serial communication and control from a remote location are advantageous. The SX1509QB has a built-in level shifting feature making it highly flexible in power supply systems where communication between incompatible I/O voltages is required, thus eliminating extra level translating circuits.

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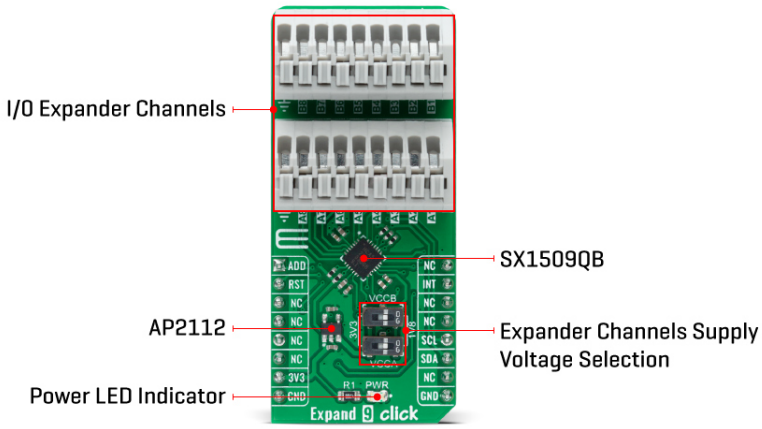

The SX1509QB features a fully programmable LED driver with an internal oscillator for enhanced lighting control such as intensity (via 256-step PWM), blinking, and breathing (fade In/Out) which makes them highly versatile for a wide range of LED applications. Also, keypad applications are supported with an on-chip scanning engine enabling continuous keypad monitoring up to 64 keys (8x8 matrix) without any additional host interaction reducing bus activity.

Expand 9 Click communicates with MCU using the standard I2C 2-Wire interface to read data and configure settings, supporting a Fast Mode operation up to 400kHz. The selection of the I2C slave address is also possible, using the ADD pin routed to the AN pin of the mikroBUS™ socket. This way, the SX1509QB provides the opportunity of the two possible different I2C addresses by setting ADD pin to an appropriate logic state. In addition to selecting a Slave address, the SX1509QB can generate mask-programmable interrupts based on a falling/rising edge of any of its GPIO lines. A dedicated interrupt pin, routed to the INT pin of the mikroBUS™ socket, indicates to a host controller that a state change occurred on one or more of the expand lines, while the RST pin of the mikroBUS™ socket represents a Reset feature used to reset the chip at any time.

Each GPIO on I/O Expander channels is programmable via a bank of 8-bit configuration registers, including data, direction, pull-up/pull-down, interrupt mask, and interrupt registers. The user is also given an option of selecting the expander port supply voltage, which is realized by two onboard switches labeled as VCCA and VCCB, allowing one to choose between 3.3V and 1.8V. To obtain 1.8V, a small LDO regulator is added, AP2112 from Dialog Incorporated, to provide 1.8V out of mikroBUS™ power rail.

This Click board™ can be operated only with a 3.3V logic voltage level. The board must perform appropriate logic voltage level conversion before use with MCUs with different logic levels. However, the Click board™ comes equipped with a library containing functions and an example code that can be used, as a reference, for further development.

Specifications

Type	Port expander
Applications	Can be used for low-power portable equipment, keypad scanning, driving LEDs, and many more

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On-board modules	SX1509QB - 16-channel lowest voltage level shifting GPIO expander from Semtech Corporation
Key Features	Low power consumption, integrated LED driver for enhanced lighting, on-chip keypad scanning engine, interrupt and reset feature, selectable I2C slave address, and more
Interface	I2C
Feature	No ClickID
Compatibility	mikroBUS™
Click board size	L (57.15 x 25.4 mm)
Input Voltage	3.3V

Pinout diagram

This table shows how the pinout on Expand 9 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS				Pin	Notes
I2C Address Selection	**ADD**	1	AN	PWM	16	NC	
Reset	**RST**	2	RST	INT	15	**INT**	Interrupt
	NC	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	NC	
Ground	**GND**	8	GND	GND	9	**GND**	Ground

Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
SW1-SW2	VCCA-VCCB	-	Expander Channels Supply Voltage Selection 3V3/1V8: Left position 3V3, Right position 1V8

Expand 9 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3	-	V
Maximum GPIO Input Voltage	-	-	5.5	V
Maximum GPIO Output Current	-	-	15	mA
Operating Temperature Range	-40	+25	+85	°C

Software Support

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We provide a library for the Expand 9 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 Expand 9 Click driver.

Key functions

- expand9_set_ch_output_state Expand 9 set channel output state function.
- expand9_led_driver_config Expand 9 LED driver configuration function.
- expand9_soft_reset Expand 9 software reset function.

Example Description

This is an example that demonstrates the use of the Expand 9 Click board™. The library initializes and defines the I2C bus drivers to write and read data from registers.

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.Expand9

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 MikroElektronika compilers.

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

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AP2112 datasheet

SX1509QB datasheet

Expand 9 click 2D and 3D files

Expand 9 Click schematic

Expand 9 click example on Libstock