

## CHARGER 13 CLICK

PID: MIKROE-3748  
Weight: 20 g

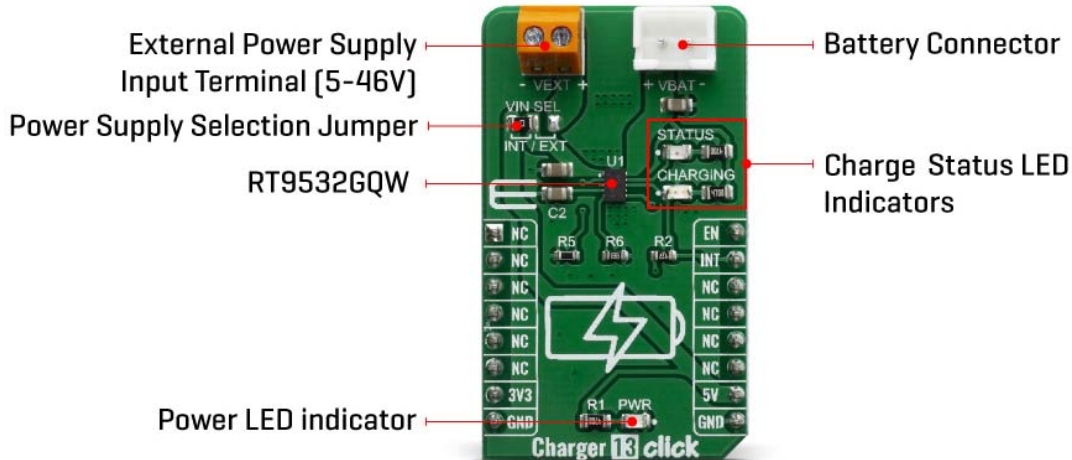
**Charger 13 Click** is a single lithium-ion (Li+) cell battery charger. This click can be used for Low-Cost Li-Ion battery chargers, or Power Tools, toys, backup energy storage solutions, etc. Charger 13 click is based on the RT9532GQW battery charger IC, which has some extra features enabling charging without too much hassle. This IC has an internal switching-mode regulation with input current limiting, allowing it to use an external power supply from a cheap wall adapter, rated up to 28V. On the board, there is a Power LED and two extra LED's which can be used for charging indications.

Charger 13 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.

Charging of the Li+ battery cell is a demanding task that requires a very accurate current and voltage monitoring and limiting. In addition, it also requires specific charging conditions, depending on the battery level (constant current mode, constant voltage mode). Li+ batteries contain flammable chemical compounds and can easily be ignited. The RT9532GQW IC closely monitors the battery voltage and current during the charging process, ensuring safe and reliable operation. Charger 13 click is a perfect solution for the development of multiple Li+ battery cell charging applications, offering a set of connectors, pins, and LED indicators, allowing fast and easy prototyping.

## HOW DOES IT WORK?

Charger 13 click is based on the RT9532GQW - fully integrated single cell Li-ion battery charger IC ideal for portable applications. The RT9532 optimizes the charging task by using a control algorithm including pre-charge mode, fast charge mode and constant voltage mode. The input voltage range of the VIN pin can be as high as 28V. When the input voltage exceeds the OVP threshold, it will turn off the charging MOSFET to avoid overheating of the chip. Along with its small physical size, the low number of external components makes this IC ideally suitable for various applications. The 4.2V factory preset reference voltage simplifies design.



The RT9532GQW IC is designed with reliability in mind: the IC prevents draining the battery below the critical level, offers prequel charging (for deeply depleted batteries), features an overvoltage protection, charging status monitoring and so on. The Click board™ itself is equipped with a set of indicators used to monitor both charging process and power distribution.

- CHARGE LED indicates the charge-in-progress status.
- STATUS LED indicates power status during the charging process.

On the left side of the click board is an input screw terminal with corresponding markings, where the external voltage as high as 28V can be applied. The connector on the right side is reserved for a Li-Ion battery with GND and VBAT+ markings. When connected to power source, the green STATUS LED will indicate it, while the red – CHARGING LED will indicate the charging in progress and will turn off once the battery charging is finished.


The voltage range which can be used to power up the Charger 13 click, allows for it to work with both 3.3V and 5V capable MCUs. It can be selected by soldering a small SMD jumper, labeled as VCC SEL to the correct position.

## SPECIFICATIONS

<b>Type</b>	Battery charger
<b>Applications</b>	Charger 13 is a perfect choice for development lithium-ion (Li+) cell battery charging applications.
<b>On-board modules</b>	RT9532GQW, a highly Integrated, linear battery charger from Richtek
<b>Key Features</b>	Intelligent, constant-current, constant voltage (CCCV), temperature-regulated battery charger
<b>Interface</b>	GPIO
<b>Click board size</b>	M (42.9 x 25.4 mm)
<b>Input Voltage</b>	3.3V,5V

## PINOUT DIAGRAM

This table shows how the pinout on Charger 13 click corresponds to the pinout of the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin					Pin	Notes
	NC	1	AN	PWM	16	EN	Enable In
	NC	2	RST	INT	15	INT	Charging Interrupt Out
	NC	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	3.3V	7	3.3V	5V	10	5V	Power Supply
Ground	GND	8	GND	GND	9	GND	Ground

## ONBOARD SETTINGS AND INDICATORS

Designator	Name	Default Position	Default Options	Description
JP1	VIN SEL	Left	5V	Power Supply Selection Jumper INT/EXT, left position INT, right position EXT
LD1	STATUS	-	-	Power Status LED indicator
LD2	CHARGING	-	-	Charging Status LED indicator
LD3	PWR	-	-	Power LED Indicator

# SOFTWARE SUPPORT

We provide a library for the Charger 13 click on our LibStock page, as well as a demo application (example), developed using MikroElektronika compilers. The demo can run on all the main MikroElektronika development boards.

## Library Description

The library covers all the necessary functions to control Charger 13 Click board. The library contains a function which enables or disable charging and check battery charging states.

Key functions:

- `void charger13_enable()` - Enable the charging function.
- `void charger13_disable()` - Disable the charging function.
- `uint8_t charger13_check()` - Check battery charging function

## Examples description

The application is composed of three sections :

- System Initialization - Initializes GPIO and LOG structures, sets INT pin as input and PWM pin as output and start to write log.
- Application Initialization - Initialization driver enable's - GPIO, also write log.
- Application Task - (code snippet) This is an example which demonstrates the use of Charger 13 click board. This example shows the automatic control of the Charger 13 click, waits for valid user input and executes functions based on a set of valid commands and check the battery charge status. Results are being sent to the Usart Terminal where you can track their changes. All data logs on usb uart for approximately every 1 sec when the data value changes.
- Commands : 'E' - Enable charging; 'D' - Disable charging;

```
void applicationTask()
{
    char receivedData;

    if ( UART_Rdy_Ptr() )
    {
        receivedData = UART_Rd_Ptr();

        switch ( receivedData )
        {
            case 'E' :
            {
```

```

        if ( enableFlag == 0 )
        {
            enableFlag = 1;
            charger13_enable();
            mikrobus_logWrite( "Charging Status : Enabled", _LOG_LINE );
            mikrobus_logWrite( "-----", _LOG_LINE );
        }
        break;
    }
    case 'D' :
    {
        if ( enableFlag == 1 )
        {
            enableFlag = 0;
            charger13_disable();
            mikrobus_logWrite( "Charging Status : Disable", _LOG_LINE );
            mikrobus_logWrite( "-----", _LOG_LINE );
        }
        break;
    }
}

if ( charger13_check() != chargerFlag )
{
    chargerFlag = charger13_check();

    if ( chargerFlag == 0 )
    {
        mikrobus_logWrite( " Battery is charging ", _LOG_LINE );
        mikrobus_logWrite( "-----", _LOG_LINE );
    }
    else
    {
        mikrobus_logWrite( " Battery does not charge ", _LOG_LINE );
        mikrobus_logWrite( "-----", _LOG_LINE );
    }
}

```

```
}  
}
```

The full application code, and ready to use projects can be found on our LibStock page. Other mikroE Libraries used in the example:

- UART

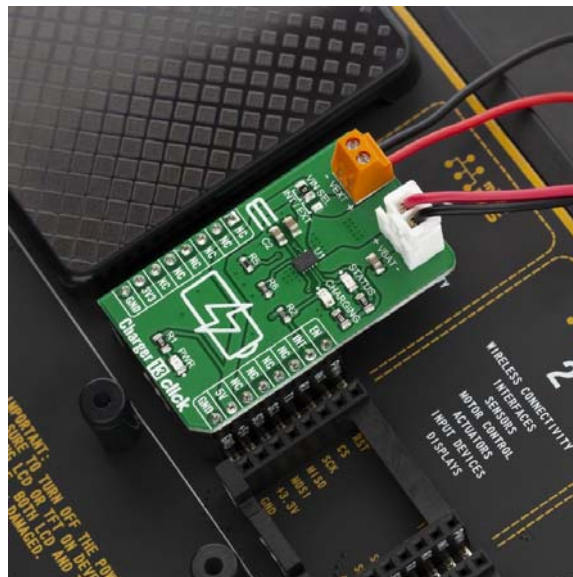
### **Additional notes and informations**

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.



<https://www.mikroe.com/charger-13-click/10-9-19>