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RTC 22 Click

PID: MIKROE-6280

RTC 22 Click is a compact add-on board for accurate timekeeping and power management in low-power applications. This board features the AM1805AQ, an ultra-low power real-time clock IC from Ambiq, using the innovative SPOT® CMOS platform for minimal energy consumption. The board features on-chip oscillators, battery backup with a rechargeable micro-energy battery (the PWY0150S from ITEN), and an intelligent system sleep manager, ensuring reliable timekeeping with power consumption as low as 14nA. It communicates via an I2C interface and offers programmable timers, alarms, a watchdog timer, and flexible power control options. RTC 22 Click is ideal for power-sensitive embedded systems such as medical devices, utility meters, data loggers, consumer electronics, and communication equipment, where precise timing and efficient power management are essential.

For more information about **RTC 22 Click** visit the official product page.

How does it work?

RTC 22 Click is based on the AM1805AQ, an ultra-low-power real-time clock with integrated power management from Ambiq. Using Ambiq's proprietary SPOT® (Subthreshold Power Optimized Technology) CMOS platform, this RTC sets a new industry standard with power consumption as low as 14nA, making it an ideal solution for power-sensitive applications. The AM1805AQ incorporates on-chip oscillators to ensure minimal power usage while providing full RTC functionality, including battery backup, programmable timers, counters, and alarms, along with an I2C interface for communication with a host MCU. Its integrated power switch and intelligent system sleep manager enable precise control over power states, allowing the RTC to be a supervisory component in MCU-based systems such as medical devices, utility meters, data loggers, household appliances, consumer electronics, and communication equipment.

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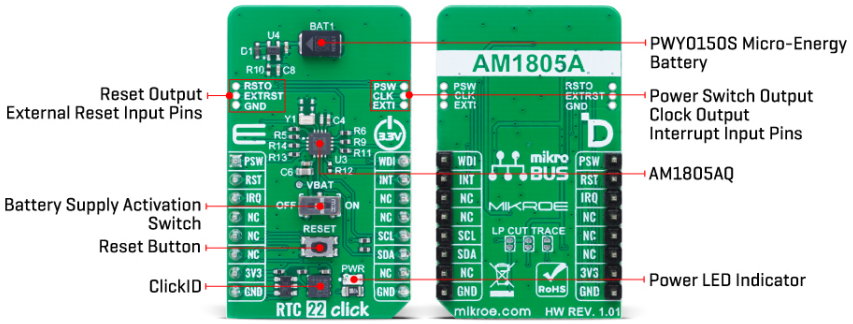

The AM1805AQ’s functionality is divided into baseline timekeeping, advanced timekeeping, and power management. Baseline timekeeping uses a 32.768kHz crystal oscillator, offering maximum frequency accuracy with an ultra-low current draw of just 55nA. Its digital calibration algorithm ensures frequency tuning accuracy down to 2ppm at specific temperatures. Advanced timekeeping introduces additional oscillation modes, including an RC oscillator and an auto-calibration mode, along with a finite state machine that manages host MCU transitions between active and low-power states. The integrated power switch, with an impedance of approximately 1Ω, can cut off ground current to the host MCU, reducing sleep current to below 1nA, making RTC 22 Click an essential component for any low-power embedded system.

RTC 22 Click is powered from the 3.3V mikroBUS™ power rail but also supports standalone operation, thanks to the PWY0150S micro-energy storage device from ITEN. This highly integrated, high-power-density battery delivers up to 20mA of current with a capacity of 150µAh in a compact SMD QFN package. Designed for high performance, it supports fast charging and can endure up to 1000 cycles at 100% depth of discharge (DoD). PWY0150S’s contribution to the design ensures reliable and efficient energy storage, enabling RTC 22 Click to maintain functionality even in low-power scenarios.

The battery is recharged by the onboard XC6240 series charging IC for rechargeable batteries, providing a stable 2.7V charging voltage after battery depletion. Battery power can be enabled via the VBAT switch by toggling it from OFF to ON. Transitioning to standalone operation allows for significant power savings by cutting specific traces on the back of the board, which disables the lower part of the board below the RESET button, including the power indicator and ClickID circuitry. In this low-power mode, the timer interrupt signal can be used on the IRQ pin by connecting the right-side LP CUT trace on the back of the board, whereas in normal operation, this pin is reserved for ClickID communication.

This Click board™ communicates with the host MCU via an I2C interface, supporting clock frequencies up to 400kHz to ensure fast and reliable data exchange. Alongside the standard I2C pins, the board includes an INT pin, an open-drain interrupt output, that signals when the RTC is ready to be accessed through the serial interface. Additionally, the WDI pin serves as a watchdog timer reset signal, safeguarding against system failures by resetting the host MCU if it becomes unresponsive, thus ensuring continuous operation. This pin can also function as an external interrupt input, offering further flexibility for triggering specific events within the system.

RTC 22 Click also features a group of unsoldered pins that provide additional functionality and

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flexibility. On the left side of the board, the RSTO pin serves as an open-drain reset output signal from the main AM1805AQ IC, used to reset the host MCU or other connected devices when triggered by internal RTC events, ensuring proper system initialization and recovery. Alongside it, the EXTRST pin functions as an external reset input, allowing the host MCU or external sources to reset the RTC itself when necessary. This same reset functionality is also accessible via the onboard RESET button, offering a manual alternative for triggering a system reset.

On the right side, three unsoldered pins offer further capabilities: PSW acts as a power switch output for controlling external devices (also available as PSW pin on mikroBUS™ socket), turning their power supply ON or OFF; CLK provides a square-wave clock output that can serve as a precise timing reference for the host MCU or other peripherals; and EXTI functions as an external interrupt input, allowing external signals to trigger interrupts within the RTC, facilitating event-driven operations and synchronized timing in complex embedded systems.

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

Specifications

Type	RTC
Applications	Ideal for power-sensitive embedded systems such as medical devices, utility meters, data loggers, consumer electronics, and communication equipment
On-board modules	AM1805AQ - ultra-low power real-time clock IC from Ambiq
Key Features	Ultra-low power consumption, on-chip oscillator with ±2ppm digital calibration, integrated power management, rechargeable battery for standalone operation, I2C interface, Interrupts and watchdog, and more
Interface	I2C
Feature	ClickID
Compatibility	mikroBUS™
Click board size	M (42.9 x 25.4 mm)
Input Voltage	3.3V

Pinout diagram

This table shows how the pinout on RTC 22 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS				Pin	Notes
Power Switch Output	**PSW**	1	AN	PWM	16	**WDI**	Watchdog Timer Input
ID SEL	**RST**	2	RST	INT	15	**INT**	Interrupt

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Timer Interrupt / ID COMM	**IRQ**	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	VBAT	Left	Battery Supply Activation Switch OFF/ON: Left position OFF, Right position ON
T1	RESET	-	Reset Button

RTC 22 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3	-	V

Software Support

RTC 22 Click demo application is developed using the NECTO Studio, ensuring compatibility with mikroSDK's open-source libraries and tools. Designed for plug-and-play implementation and testing, the demo is fully compatible with all development, starter, and mikromedia boards featuring a mikroBUS™ socket.

Example Description

This example demonstrates the use of RTC 22 Click board by reading and displaying the time and date values.

Key Functions

- rtc22_cfg_setup Config Object Initialization function.
- rtc22_init Initialization function.
- rtc22_set_time This function sets the starting time values - second 100th, second, minute and hour.
- rtc22_read_time This function reads the current time values - second 100th, second, minute and hour.
- rtc22_set_date This function sets the starting date values - day of week, day, month and year.

Application Init

Initializes the driver, checks the communication, and sets the starting time and date.

Application Task

Reads and displays on the USB UART the current time and date values once per second.

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Application Output

This Click board can be interfaced and monitored in two ways:

- Application Output - Use the "Application Output" window in Debug mode for real-time data monitoring. Set it up properly by following this tutorial.
- UART Terminal - Monitor data via the UART Terminal using a USB to UART converter. For detailed instructions, check out this tutorial.

Additional Notes and Information

The complete application code and a ready-to-use project are available through the NECTO Studio Package Manager for direct installation in the NECTO Studio. The application code can also be found on the MIKROE GitHub account.

Resources

mikroBUS™

mikroSDK

Click board™ Catalog

Click boards™

ClickID

Downloads

RTC 22 click example package

AM18x5 series datasheet

RTC 22 click 2D and 3D files v101

RTC 22 click schematic v101

PWY0150S datasheet