

Real-time Clock protects your system

Immediate Tamper Detection / Protection

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1. Summary

The White Paper describes the combination of the Real-Time Clock Module RV-8803-C7 with tamper detection.

With the growing number of peripheral devices, all connected, IoT, the security aspect is gaining importance. The special RTC-Module RV-8803-C7 protects your application and detects intrusion round the clock, not increasing the power consumption.

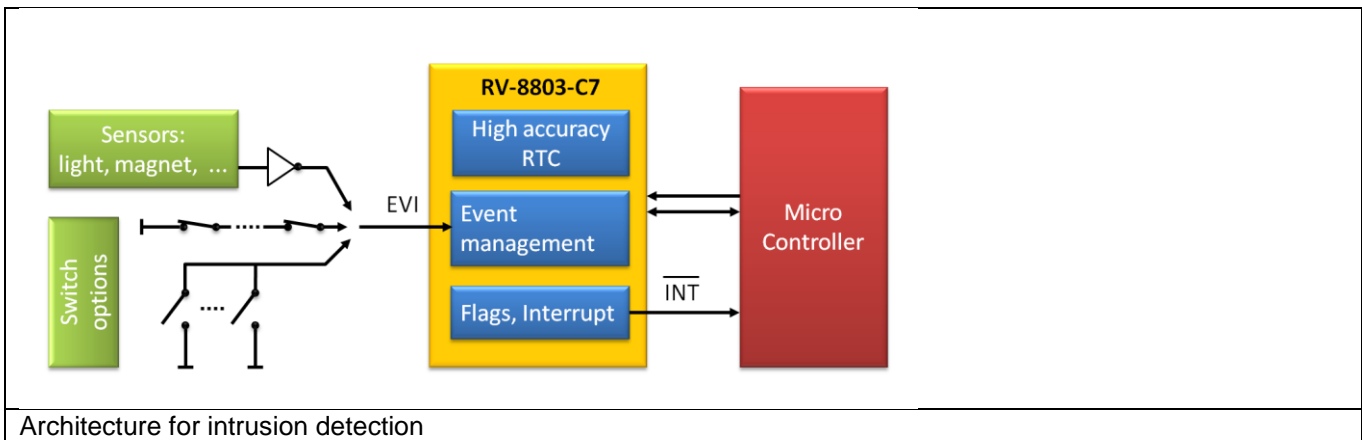
2. Key words

- Exact time
- Safety
- Vulnerability
- Attackable,
- Cheating
- Fraud
- Altering
- Changing
- No additional power demand

3. IoT: Vastly growing Systems networking, growing local area networks

Modern new devices are equipped with a network connection, either via USB, Bluetooth, WiFi or other means of wired or wireless connectivity. This offers a large comfort for controlling, updating or charging the device it. Contrary the vulnerability increases. Continuous measures are taken to keep the transmission save avoiding any manipulation via the network. On the other hand hardware attacks are hardly to avoid: So there must be a way to detect if someone is opening the box for manipulation. The systems designers' goal is to minimize the risk by making it robust, for instance mechanically by designing the enclosure hard to open and in addition by monitoring its operating status electronically.

The RTC-Modules RV-8803-C7 features a dedicated function block: Event detector. The external event input is ideal to monitor a number of switches or contacts.



The universal input EVI and its parameters are fully configurable: polarity for detection, filter settings to avoid false detection or debouncing mechanical switches, interrupt and or flags. In the application a number of mechanical contacts can be daisy chained, and a variety of methods for contacts are applicable: pins, micro-switch or local metallization of the 2 half shells for detecting if the 2 parts are separated. The goal is to detect immediately, when the casing (box) is opened up.



As a consequence the RTC interrupts the controller to take action:

- Stopping or disabling its functionality
- Alarming via interrupt
- Setting a flag to be detected with the next RTC access
- Triggering a communication to alarm the incident over the network
- Registering the exact time of the occurrence (Time Stamp)

Example: electronic metering: the utility provider likes to know when the meter was manipulated to consider a penalty accordingly. Good to know that the RTC-Module RV-8803-C7 is continuously monitoring without increasing the power consumption, this independent of the mode of operation.

3.1. What is needed?

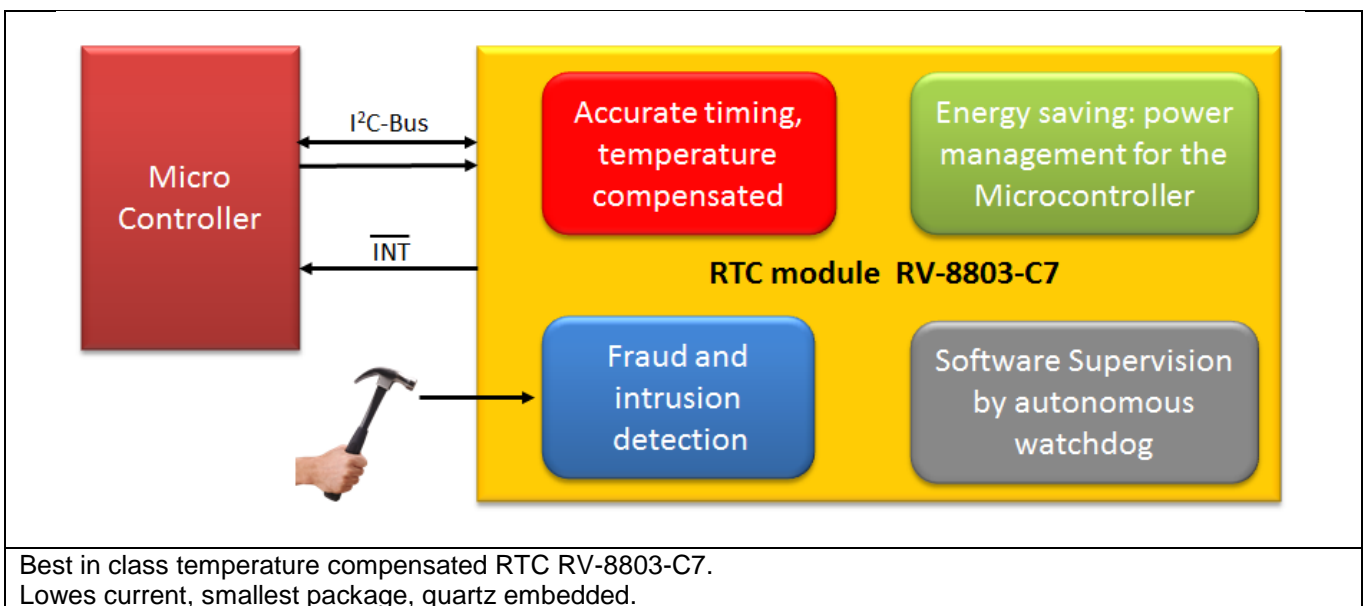
Requirements:

- A switch or a contact
- A small firmware update in the interrupt execution routine

3.2. What is gained?

The big benefits having this functionality in the RTC and not in the main microcontroller are:

- Active all the time: Normal system operation, stand-by mode, power-down or even in hibernation mode.
- No extra power consumption
- Independent of software stack and priority in the standard program routines of the microcontroller



The RTC offloads some vital functions of the application to the RTC with uninterrupted power supply:

- Tracking and keeping time: RV-8803-C7 with highest accuracy ($\pm 0.26\text{s/day}$) at just $0.24\mu\text{A} / 3\text{V}$
- Fraud detection: Event input
- Software monitoring: by the Watchdog
- Sleep mode power management; waking up the controller periodically
- Universal timer

Consequently the main controller can remain in standby mode, conserving power.

4. Conclusion

The industry's lowest power temperature compensated Real-Time Clock Module RV-8803-C7 features also a dedicated event input. It allows the industry for the first time with a power consumption of just 240nA to protect the system against tampering. No need for keeping the Microcontroller active all the time.

In addition low cost RTC back-up solutions utilizing minimal PC-board area and requiring little BOM impact can now be designed-in simply by using a Supercap, a Schottky-diode, and the RTC Module RV-8803-C7 manufactured by Micro Crystal.

All-in-one:

- Accurate timing: Deviation less than 2 s per week
- Tamper detection
- Lowest power: 240 nA / 3 V \approx 0.72 μ W
- Smallest package: 1.5 x 3.2 x 0.8 mm

5. References

Document	Name	Link
Datasheet	RV-8803-C7	Down load
Application Manual	RV-8803-C7	Down load
White Paper	Temperature compensated Real-Time Clock with back-up power supply	Down load

6. Document version

Date	Version #	Changes
August 8 2016	1.0	First release

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