What sets Epson's RTC modules apart?

Introducing the RTC module

EPSON

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Epson’s crystal devices

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What are Epson’s crystal devices?

Epson leverages its efficient, compact, and precise technologies, advanced over many years, to manufacture low-power crystal devices that deliver outstanding quality and accuracy. Our crystal devices combine synthetic crystals grown through a convergence of advanced manufacturing technology and artisan skills with built-in ICs fabricated by Epson.

As a global leader in crystal devices, we have a broad lineup of products for a wide range of applications.

- **Crystal units of high quality**
- **Crystal oscillators that maintain high accuracy even in harsh environments**
- **RTC modules[1] that offer high accuracy and low power consumption**

2-1

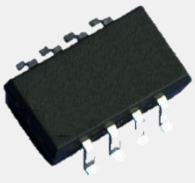
RTC modules that combine Epson's quartz crystals and RTC IC technology

Epson provides multi-function RTC modules by integrating quartz crystal and RTC IC in a single package. This RTC modules enable saving development time and cost while meeting customers' requirement for low power consumption.

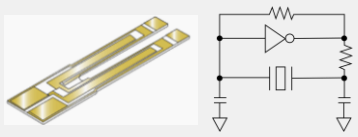
More than 100 million units shipped per year

Our RTC modules are used in a wide variety of applications

RTC IC



Crystal chip / Oscillation circuit



RTC module

- Reduced assembly process
- No need for circuit matching
- No need for power switching circuit
- Battery selectable
- [2] Meet automotive requirements

1 RTC = Real Time Clock

2 Automotive products

2

Epson’s RTC modules

2-1

Why RTCs are needed

There are innumerable applications out there that require accurate time. RTCs in products like smart meters, security systems, industrial and measuring equipment, and office automation provide various features beyond just displaying the time. RTC functions are also crucial for accurate timekeeping to manage electricity rates that fluctuate by time of day, and to maintain backups in the event of network failures.



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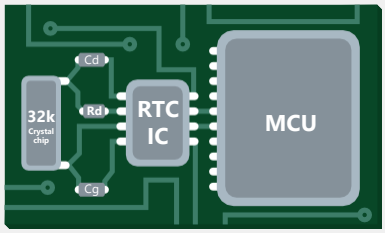
Recommend RTC modules as the optimal solutions

RTC ICs can be embedded in an MCU, you can also use either an RTC module or a discrete RTC, both separate from an MCU. Separating the RTC from the MCU allows the time to be kept independently, even when the MCU is in sleep mode. As shown below, RTC modules have crucial advantages over discrete RTCs.

Discrete

The crystal unit and RTC IC are separate

- The frequency needs to be adjusted and the match with the oscillator circuit needs to be evaluated.
- Circuitry is exposed on the board and susceptible to effects from the external environment.

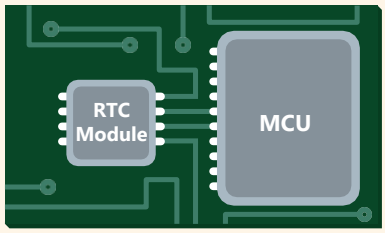


RTC solution： MCU + RTC IC ＋ Crystal chip ＋Oscillator circuit

Module

Crystal unit & RTC IC are integrated in a single package

- Frequency adjustment and oscillator circuit matching are done by Epson at the factory. Modules provide stable and accurate time information.
- Protection from the external environmental effects is provided by integrating the components into a single package.



RTC solution： MCU + RTC module

2-3

RTCs are more than just a timekeeping function! Four reasons to use Epson's RTC modules

Save space

Single chip

The crystal unit, external components, and controller IC are integrated onto a single chip. No power supply switching circuit is required.

Drift-free

High accuracy

Temperature compensation function provided

Drift is kept to within ± 9 seconds/month even over a wide temperature range.

* XA accuracy (-40°C to +105°C environment)

Low power consumption

Lower power consumption in Sleep mode

Low current consumption is maintained even during MCU sleep mode and high-temperature operation.

No hassle

Save time and work

Fewer parts and no circuit matching required

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List of RTC module functions

Basic Functions
Calendar
Timer
Alarm

Additional functions		
・Timestamp	・Reset output	・Event detection
・Auto power switching	・High temp. operation	・Frequency temperature compensation
・Rechargeable battery charge control		

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Products

Selection guide according to purpose

If you're seeking basic functions along with convenience not offered by discrete RTCs

Convenience Low power

Low current consumption with simple functions

- Lowest current consumption (100 nA Typ./3 V), timestamp (8 times max.), power supply switching — **Low consumption**
  RX8111CE & RX4111CE
- 8-pin SOP, low current consumption (160 nA Typ./3 V) — **Low consumption**
  RX8010SJ

If you are seeking

- multiple functionalities and high accuracy
- accurate timekeeping even in high temp. environments

Multi-function, high-accuracy

- A variety of advanced functions
- High timekeeping accuracy is maintained even over a wide temperature range.

With temperature compensation

- Low current consumption (240 nA Typ./3 V), withstands temperatures up to 105°C, timestamp (32 times max.), power supply switching — **Low consumption** **High temp.**
  RX8901CE & 4901CE
- Withstands temperatures up to 105°C, timestamp (1 time max.) — **High temp.**
  RX8804CE
- Power supply switching
  RX8900CE
- Power supply switching, rechargeable battery control, and reset output function
  RX8130CE

If you want to maintain timekeeping accuracy even in high-temperature environments and want automotive quality products

Automotive quality

AEC-Q100/200 compliant products
Can operate at up to 125°C
A variety of optional functions

With temperature compensation function

- Operating temperature up to 125°C, reset output function, two timestamps, AEC-Q100 compatible — **High temp.**
  RA8000CE & RA4000CE
- Operating temperature up to 105°C, AEC-Q100 compliant — **High temp.**
  RA8804CE
- Power supply switching, AEC-Q200 compliant
  RA8900CE

Package size SJ: 7.0 x 6.0 x 2.65 mm, CE: 3.2 x 2.5 x 1.0 mm

These are just some of the products in a very broad lineup.
See here for details: https://www5.epsondevice.com/en/products/rtc/

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Related material

What are real-time clock (RTC) modules? How they work, their applications, and how to reduce power consumption and maintain accurate timekeeping

https://www5.epsondevice.com/en/information/rtc/about-rtc.html

Special site for RTC modules

https://www5.epsondevice.com/en/information/rtc/

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Frequently Asked Questions

Q: What is the benefit of having an external RTC?

A: An external RTC maintains time information even when the CPU is in Sleep mode, reducing power consumption. In addition, since the accuracy of each RTC module is guaranteed, users can save time in things such as matching and allocate their development resources to improve other facets of design quality.

Q: What effect do changes in temperature have on accuracy?

A: You can use the Excel sheet at the link below to calculate frequency accuracy and timekeeping accuracy at each temperature point.

Calculation for Clock Stability vs Temperature

Q: I want to calculate how long the battery will last when using an RTC module.

A: You can use the Excel sheet at the link below to calculate battery backup time when using a button battery and EDLC.

Calculation for Battery Backup Time