

Comparison : MCU with a built-in RTC vs. RTC IC vs. RTC module

Comparison Items	MCU with a Built-in RTC	RTC IC	RTC Module
RTC solution			
PCB layout	1: MCU 2: 32-kHz crystal 3: Component for oscillation	1: MCU 2: RTC IC 3: 32-kHz crystal 4: Component for oscillation	1: MCU 2: RTC module
Layout design flexibility	Low	Middle	High
Number of external parts	•2 capacitors •32-kHz crystal	•2 capacitors •32-kHz crystal •RTC IC	•RTC Module
Mass production quality	4M changes and aging characteristics of the components directly affect mass production quality		Mass production quality is ensured by the guaranteed quality of the RTC module
Circuit design (circuit matching)	1: Oscillator circuit design requires verification: Component matching, pattern verification, and other analog verification 2: Checking and verification are required every time there is a 4M change involving a component 3: Temperature compensation is difficult to build in		Not required
Effects from external environment (relative comparison)	Crystal units & oscillator circuits mounted on boards are susceptible to effects from the external environment		Protected from the external environment by being packaged
Timekeeping current	MCU current consumption	500 nA – 100 nA	
Minimum timekeeping voltage	MCU operating voltage	Approx. 1.0 V	
Freq. accuracy / time accuracy (full operating temp. range)	Low		High
Freq. accuracy / time accuracy (room temp. 25°C±3)	Low		High
Parts receiving / management man-hours	Moderate	High	Low
Power switching circuit	No	Yes	Yes
Maintaining timestamps when networks are down or power is interrupted	No	Yes	Yes
Temp. compensation	Generally, no	No	Yes
Determination criteria	Suitable where the current design has sufficient margin for timekeeping clock accuracy and where the risk of component quality problems caused by 4M changes are low	Suitable where designs are studied based on extensive knowledge of RTC peripheral design	Best for first-time RTC users and when you want to further improve system quality, differentiate your system with various functions, and add more value