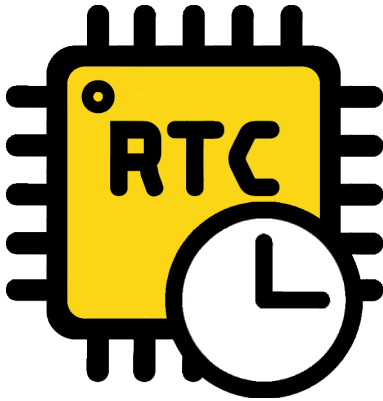



Real-Time Clock Module

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Key Choice Criteria



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Content

1. Introduction..... 3

2. Our proposition..... 3

3. Key Choice Criteria Table 4

4. Standards 5

5. Questions/Feedback 5

6. Reference documents 6

7. Document version 6

1. Introduction

At Micro Crystal, our portfolio encompasses Quartz Crystals, Oscillators, OCXOs, and Real-Time Clock (RTC) Modules for the world's leading manufacturers of IoT, wearables, consumer products, GPS modules, automotive electronics, industrial, healthcare, medical and medical implantable devices.

As a recognized industry leader and innovator of extreme-low power, highly accurate, ultra small Real-Time Clock solutions, Micro Crystal stay in close cooperation with customers worldwide from early design-in activities through mass production.

2. Our proposition

The features present in our RTCs address and solve the design's challenges that microcontroller-based hardware are not able to fulfill alone.

Even if your system processor has an integrated RTC, there is often the need for extra alarms, timestamp linked to damper detection, backup battery management or more commonly a higher time accuracy. Those are only a few added functions available and provided by RTC modules. You can learn more about RTC and associated features in ["RTC Selection and FAQ \(Technical Note\)"](#).

To simplify the selection process of your RTC module and guide you through the various options available, most of the key selection criteria are covered in the following table and specific part numbers are proposed with ranking.

3. Key Choice Criteria Table

Criteria	Recommended RTC Part Number												Comment	Key Application	Problem solved	
	RV-3032-C7	RV-3028-C7	RV-5028-C7	RV-8803-C7	RV-8263-C8	RV-4162-C7	RV-8523-C3	RV-8564-C3	RV-8564-C2	RV-3129-C3	RV-8063-C8	RV-2123-C2				RV-3149-C3
Ultra-low consumption	⊕	⊕	⊕	○	○	○	○	○	○	○	○	○	○	RV-3028-C7 , market best-in-class product with as low as 45 nA @ 3V in timekeeping mode (can last up to 4.5 months in timekeeping mode with a 1 F capacity). RV-3032-C7 , lowest current consumption for temperature compensated RTC module.	Wearable, IoT, portable, and all power sensitive applications	<ul style="list-style-type: none"> Make the most of MCU reduced power modes able to wake-up MCU from deep-sleep mode Longer battery operation and backup time
Extreme accuracy	⊕	⊕	⊕	⊕	○	○	○	○	○	○	○	○	○	as low as ± 0.5 min /year at ambient temperature	Maintenance free, timing critical (ex. billing applications, POS, metering)	<ul style="list-style-type: none"> Timekeeping accuracy No need to periodically reset time over years
Component size	⊕	⊕	⊕	⊕	⊕	○	○	○	○	○	○	○	○	C8 package (2.0 x 1.2 mm) is 25% of uSOP-8 package footprint and 50% of the C7. C8 is extremely lightweight and compact with only 0.7 mm in height. (0.8 mm for C7 and 1 mm for RV-5028-C7 Medical).	Wearable, IoT	<ul style="list-style-type: none"> Minimize size of final device Easy implementation Reduced BOM cost (smaller PCB)
High accuracy over temperature	⊕	-	-	⊕	-	-	-	-	-	○	-	-	○	Use of integrated Temperature Compensated Crystal Oscillators (TCXO) allows to ensure as low as ± 0.26 sec/day over full temperature range of -40 to +85°C	Servers, Telematics, GPS, Power Meters	<ul style="list-style-type: none"> Timekeeping accuracy in outdoor conditions
Extended temperature range (105°C/ 125°C)	⊕	-	-	⊕	-	-	-	-	-	⊕	-	-	⊕	In harsh conditions, temperature can easily rise well above 85°C.	Automotive Industrial	<ul style="list-style-type: none"> Harsh environmental conditions
Timestamp	⊕	⊕	⊕	⊕	-	-	-	-	-	-	-	-	-	External Event Input is typically used as trigger for Timestamp function on those parts. Temperature threshold (min & max) crossing can be Timestamped with RV-3032-C7	Power Meters, Wearable, IoT Coldchain	<ul style="list-style-type: none"> Event record independent of MCU activity Tamper and Temp. threshold detection
Watchdog Timer	-	-	-	-	-	⊕	⊕	-	-	-	-	⊕	-	Watchdog timers can be set to multiple values from milliseconds to hours. RV-2123-C2 has an SPI interface watchdog timer.	Servers, Telematics, GPS, Power Meters	<ul style="list-style-type: none"> Alert system or reset processor whose software has experienced a freeze or hang
Temperature readings availability	⊕	-	-	-	-	-	-	-	-	⊕	-	-	⊕	Ultra-low power temperature measurement with threshold alarms. RV-3032-C7 features temperature readings with a resolution of 0.0625°C/step and an accuracy of ±1°C.	Power Meters, Wearable, IoT	<ul style="list-style-type: none"> Combine always-on low power functions (timekeeping + temperature monitoring) No extra component required for T_{amb} measurement
Medical Implantable	-	-	⊕	-	-	-	-	-	-	-	-	-	-	<ul style="list-style-type: none"> Medical grade implantable component Reliable and safe operation in Helium environment Small size, ultra-low power, high time accuracy at ambient temperature 	Class III implantable medical devices, non-implantable medical applications and Healthcare	<ul style="list-style-type: none"> Highest reliability Traceability & records Product lifecycle
Clock output control	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	A programmable square wave is available at CLKOUT pin. Frequencies of 32.768 kHz, 1024 Hz, 32 Hz, 1 Hz and sometimes even several other frequencies can be generated. RV-3032-C7 features CLKOUT up to 52 MHz..	For use as a system clock, MCU clock, input to a charge pump or for test purposes	<ul style="list-style-type: none"> System or MCU clock availability Reference frequency for test
Battery switchover	⊕	⊕	⊕	-	-	-	⊕	-	-	⊕	-	-	⊕	The supply voltage (main supply vs. backup battery) is selected automatically.	Device requiring smart backup mode of operation	<ul style="list-style-type: none"> Automatic transition towards backup battery No additional component required
Trickle charge	⊕	⊕	⊕	-	-	-	-	-	-	⊕	-	-	⊕	Configurable trickle charge circuit through current limiting resistors settings. RV-3032-C7 features charge pump allowing higher charging voltage thus extending backup time.	Device requiring backup mode of operation with longest backup time	<ul style="list-style-type: none"> Charging of Supercap or secondary battery No additional component required
SPI bus	-	-	-	-	-	-	-	-	-	⊕	⊕	⊕	-	All other RTCs in the portfolio are with an I ² C (up to 400 kHz) interface. RV-8523-C3 (up to 1000 kHz (FM+))	Automotive	<ul style="list-style-type: none"> Communication interface compatibility
Product Lifecycle	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	Best option is to select specific parts where Micro Crystal has in-house management of RTC's IC manufacturing. Follow technology roadmap to select most recent products and check status (avoid NRND).	Automotive Medical	<ul style="list-style-type: none"> Obsolescence issue Product built for the long-haul
Cost	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	QC: Consumer Quality Grade at lower price than QA: Automotive Grade. All parts can be provided with AEC-Q200 and AEC-Q100 test report.	Consumer, Wearable, IoT Automotive for PPAP	<ul style="list-style-type: none"> Trade-off between performance/highly cost sensitive solution

⊕	Excellent Choice/Matching with criteria	⊕	Good Choice/Matching with criteria	○	Average Choice/Matching with criteria	-	Not Applicable or No Matching with criteria
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4. Standards

As common characteristics, all Micro Crystal’s RTC modules benefit of long-term reliability linked to the high stability of the oscillator circuits used and to the premium quality standards applied during manufacturing, assembly, calibration and test of the modules.

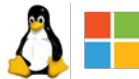
Other common features are:

Sample availability:



For customer evaluation, Micro Crystal offers [a pack of five RTC samples and a dedicated evaluation board](#) containing a soldered RTC module.

Linux drivers and Windows GUI:



Micro Crystal provides Linux drivers and Windows GUI on request.

RoHS/Lead-free compliance report:



[Environmental and recycling compliance certificate](#) is available.

AEC-Q200 qualification report:



When ordered as QA-Type (Automotive Grade Product), qualification report and PPAP file are available on demand.

ECAD model availability:



Verified [PCB symbol, footprint and 3D models](#) are available for all parts. These models are compatible with all major ECAD tools and allow speeding up development phase, reducing errors while increasing workflow with focus on design.

Engineering support:



Talk to us and our team of experts:

tech-support@microcrystal.com

Global Sales support:



Europe, Asia, Americas:

sales@microcrystal.com

5. Questions/Feedback

We believe that “Great Questions” lead to “Great Designs”, so do not hesitate to contact us for any question you may have about your application and your RTC design.

Micro Crystal values feedback on its RTC modules. Please send feedback to Micro Crystal via:

marketing@microcrystal.com

6. Reference documents

Document	Name	Link
Certificates for RTCs	Certificate of Compliance Environment	Download
Parametric Table	RTC Modules Parametric Table	Download
Technical Note	RTC Selection and FAQ	Download

7. Document version

Date	Version #	Changes
June-28-2021	1.0	Initial version - NMO
November-23-2022	1.1	Updated 3.Key Choice Criteria Table with Extended temperature range (105°C) for RV-3032-C7
July-18-2023	1.2	Adding C8 parts

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