

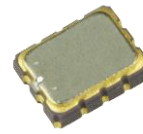
**REAL TIME CLOCK MODULE (SPI-Bus)**

Time stamp function and Low current consumption

**RX411CE**



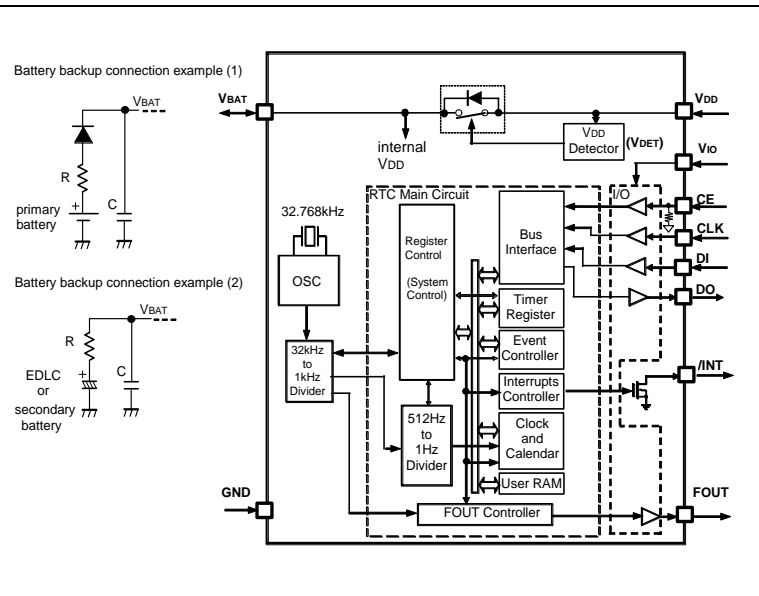
Product Number (2,000 pcs / Reel)  
**RX411CE (A grade): X1B000431000115**  
**RX411CE (B grade): X1B000431000215**



**RX411CE**  
 ( 3.2 x 2.5 mm , t = 1.0 mm Max. )

- Built in frequency adjusted 32.768 kHz crystal unit
- Operating Temperature : -40 °C to +105 °C
- Interface Type : SPI -Bus 4 wire
- Low backup current : 100 nA Typ. / 3 V
- Auto power switching function: Automatically switches to backup power supply by monitoring the VDD voltage.
- Time stamp function : 8 times stamped from year to 1/256 seconds
- Interrupt output : Wake up every minute or every second
- Alarm interruption : Day, date, hour, minute, second
- Auto repeat wakeup timer interruption
- Self-monitoring interruption: Crystal oscillation stop, V<sub>BAT</sub> low, V<sub>DD</sub> low

**Block diagram**



**Overview**

- Interface type  
 SPI-Bus interface (4 wire, 1 MHz)
- Auto power switch function  
 The V<sub>DD</sub> voltage is monitored and it switches to the backup power supply by the automatic operation  
 Backup power supply switching voltage 1.2V Min.
- Clock output function  
 Output frequency is selectable from 32.768 kHz, 1024 Hz, 1 Hz
- Wakeup timer function  
 Selectable from 244 μs to 32 years (24 bit 1 ch.)  
 Timer source clock selectable from 1/60 Hz, 1 Hz, 64 Hz, 4096 Hz  
 Auto release after interrupt output from /INT pin at timer completes  
 This operation is auto repeat with a selected cycle, it can be used like a watchdog timer
- Time stamp function  
 8 times stamped from year to 1/256 seconds  
 The time stamp trigger inputs from self-monitoring and SPI command
- Alarm function  
 It is possible program from year to second
- Self-monitoring interruption  
 Crystal oscillation stop, V<sub>BAT</sub> low, V<sub>DD</sub> low

**Pin Functin**

| Signal Name      | I / O             | Function   |
|------------------|-------------------|--|
| CE               | Input             | Chip enables input pin   |
| CLK              | Input             | Serial clock input pin   |
| DI               | Input             | Data input pin   |
| DO               | Output            | Data output pin  |
| FOUT             | Output            | Frequency output (CMOS)<br>(frequency selection: 32.768 kHz, 1024 Hz, 1 Hz)  |
| /INT             | Open-Drain Output | Interrupts output by Alarm and Timer events. (N-ch. open drain)  |
| VDD              | -                 | Power supply pin<br>Possible to supply different voltage from V <sub>IO</sub>  |
| V <sub>IO</sub>  | -                 | Interface power supply pin<br>Input to supply the voltage same as a host   |
| V <sub>BAT</sub> | -                 | Power supply pin for backup battery<br>Connect an EDLC, a secondary battery, a primary battery<br>In the backup voltage range, supplied to IC, from this pin |
| GND              | -                 | Ground pin   |

**Terminal connection / External dimensions (Unit: mm)**

**Specifications (characteristics)**

\* Refer to application manual for details

**Recommended Operating Conditions**

| Item                     | Symbol             | Conditions             | Min. | Typ. | Max. | Unit |
|--------------------------|--------------------|------------------------|------|------|------|------|
| Operating supply voltage | V <sub>DD</sub>    | -                      | 1.6  | 3.0  | 5.5  | V    |
| Clock supply voltage     | V <sub>CLK</sub>   | -                      | 1.1  | 3.0  | 5.5  | V    |
| Operating temperature    | T <sub>a</sub>     | -                      | -40  | +25  | +105 | °C   |
| VDD detect voltage       | -V <sub>DET1</sub> | V <sub>DD</sub> , Fall | 1.20 | 1.40 | 1.60 | V    |

**Frequency characteristics**

| Item                      | Grade | Symbol           | Conditions   | Min.  | Typ. | Max.  | Unit               |
|---------------------------|-------|------------------|--|-------|------|-------|--------------------|
| Frequency tolerance       | A     | Δf/f             | T <sub>a</sub> = +25 °C<br>V <sub>DD</sub> = 3.0 V | -11.5 | -    | +11.5 | × 10 <sup>-6</sup> |
|                           | B     |                  | -23  | -     | +23  |       |                    |
| Oscillation start-up time |       | t <sub>STA</sub> | V <sub>DD</sub> = 2.75 V to 5.5 V                  | -     | 0.3  | 1.0   | s                  |

**Current consumption characteristics**

T<sub>a</sub> = -40 °C to +105 °C

| Symbol           | Conditions  | T <sub>a</sub> (°C) | Typ. | Max. | Unit |
|------------------|---|---------------------|------|------|------|
| I <sub>DD</sub>  | Input pins = "L",<br>FOUT = OFF, /INT = OFF,<br>V <sub>DD</sub> = V <sub>IO</sub> = 3.0 V,<br>CHGEN = 0b, INIEN = 0b,                               | -40 ~ +85           | 100  | 450  | nA   |
|                  |   | -40 ~ +105          | 100  | 1000 |      |
| I <sub>32k</sub> | Input pins = "L",<br>FOUT = 32.768 kHz, /INT = OFF,<br>V <sub>DD</sub> = V <sub>IO</sub> = 3.0 V,<br>FOUT pin CL = 15 pF,<br>CHGEN = 0b, INIEN = 1b | -40 ~ +85           | 2.0  | 3.0  | μA   |
|                  |   | -40 ~ 105           | 2.0  | 3.5  |      |

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|   |   |
|---|---|
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