

Introduction of Epson RTC Module (Real Time Clock Module)

MD Sales Department
Seiko Epson Corporation

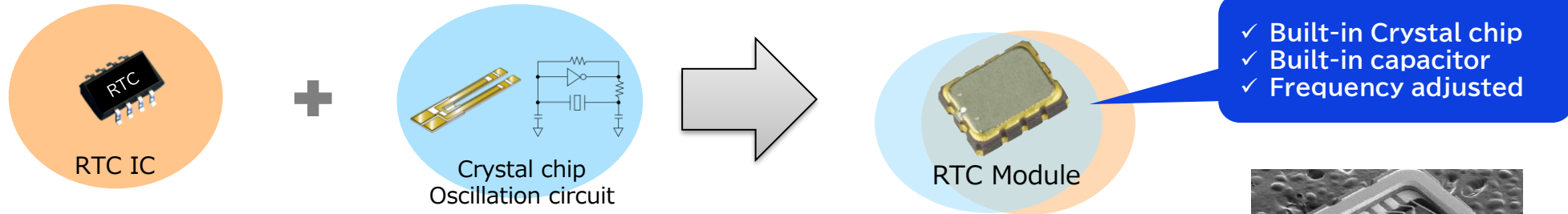
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- What is Epson RTC module ?
- RTC module functions
- RTC module use cases
- RTC module line-up

What is Epson RTC module ?

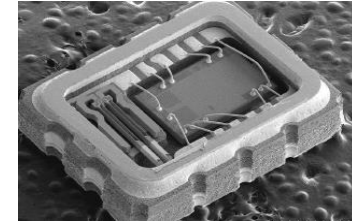
Epson RTC module :

Crystal chip, Oscillator circuit and RTC IC are in one package



Feature : Various functions for lower power consumption and higher system efficiency

- Low current consumption (maintaining time)
- Highly accurate calendar management, temperature compensation function※
- Extensive features such as wake-up timer, alarm, time stamp, etc.
- Modularization reduces customer hassle
 - … Reduced mounting process, no circuit matching, no power switching circuit required, wide selection of batteries



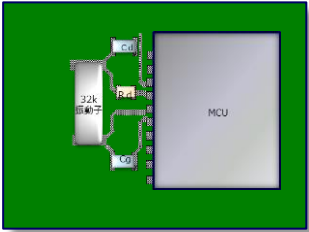
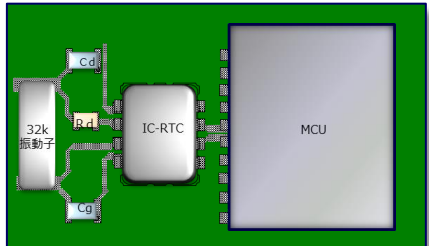
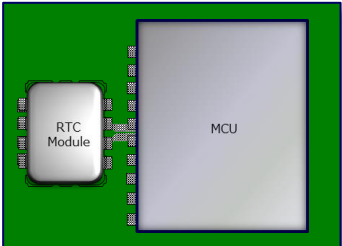
CE Package

Shipping Quantity : Around 100million pcs/year for various application

- ◆ Automotive : Clock, BMS
- ◆ FA:PLC, CNC, Encoder, Robot, NC
- ◆ OA:MultiFunctionPrinter
- ◆ Consumer:DSC, HVAC, White goods, Lighting
- ◆ Others:Smart meter, Video surveillance system, ATM, Datacenter , Basestation

※Some products

High accuracy, space saving, and high reliability make **RTC Modules** the best choice

	RTC solution	PCB Layout image	PCB space saving	Frequency adjustment	Lower current consumption	Ease in design
1	RTC in MCU +Crystal chip (external)		✓✓ • Crystal unit • Oscillator circuit	✓✓ • Accuracy adjustment by user	✓ ※1	✓ • Oscillator circuit design by user • Influenced by external environment※2 (Oscillator circuit mounted on board)
2	RTC IC +Crystal chip (external)		✓ • RTC IC • Crystal unit • Oscillator circuit	✓✓ • Accuracy adjustment by user	✓✓✓	✓ • Oscillator circuit design by user • Influenced by external environment※2 (Oscillator circuit mounted on board)
3	RTC Module Built-in Crystal		✓✓ • RTC module	✓✓✓ • No accuracy adjustment required • Temperature compensation (some products)	✓✓✓ Min. 100nA ※3	✓✓✓ • No oscillation circuit board design required • Minor influence of external environment※2 (Oscillator circuit encapsulated in PKG)

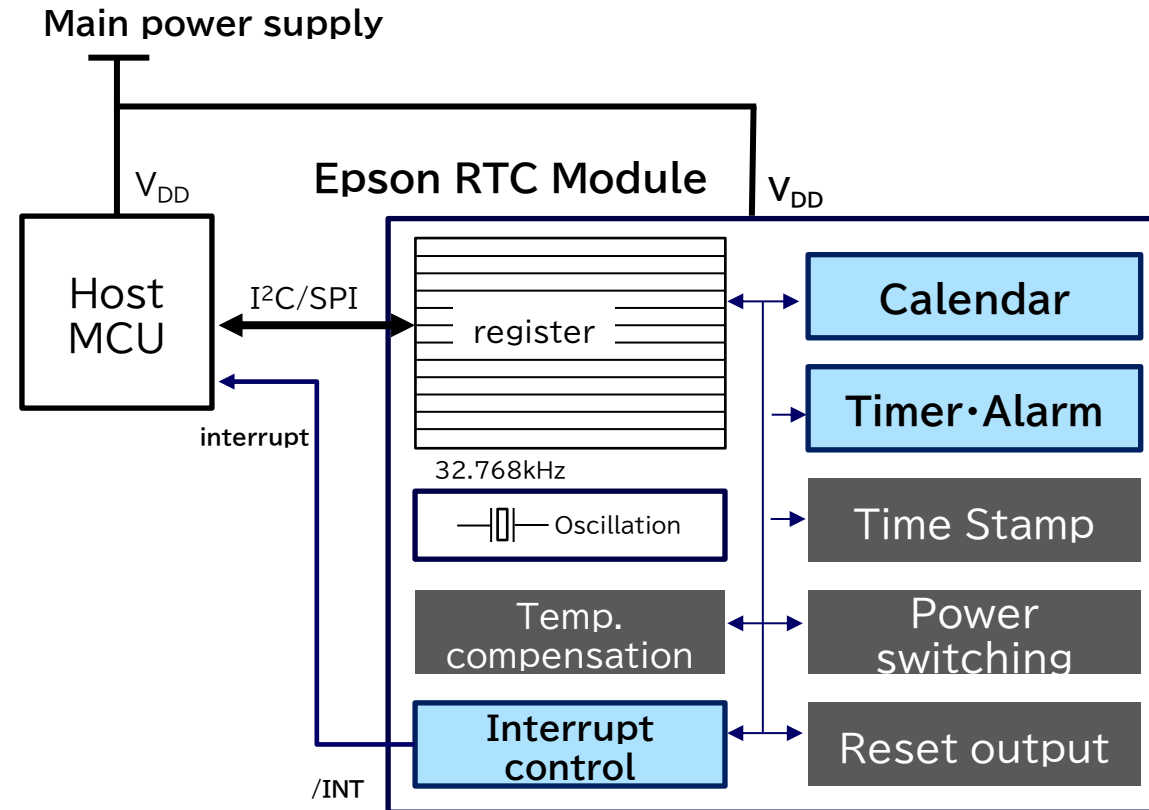
※1 : Assumes general product ※2 : Relative comparison ※3 : Spec is different by model

Epson RTC module Functions

Functions (1) Basic function

EPSON

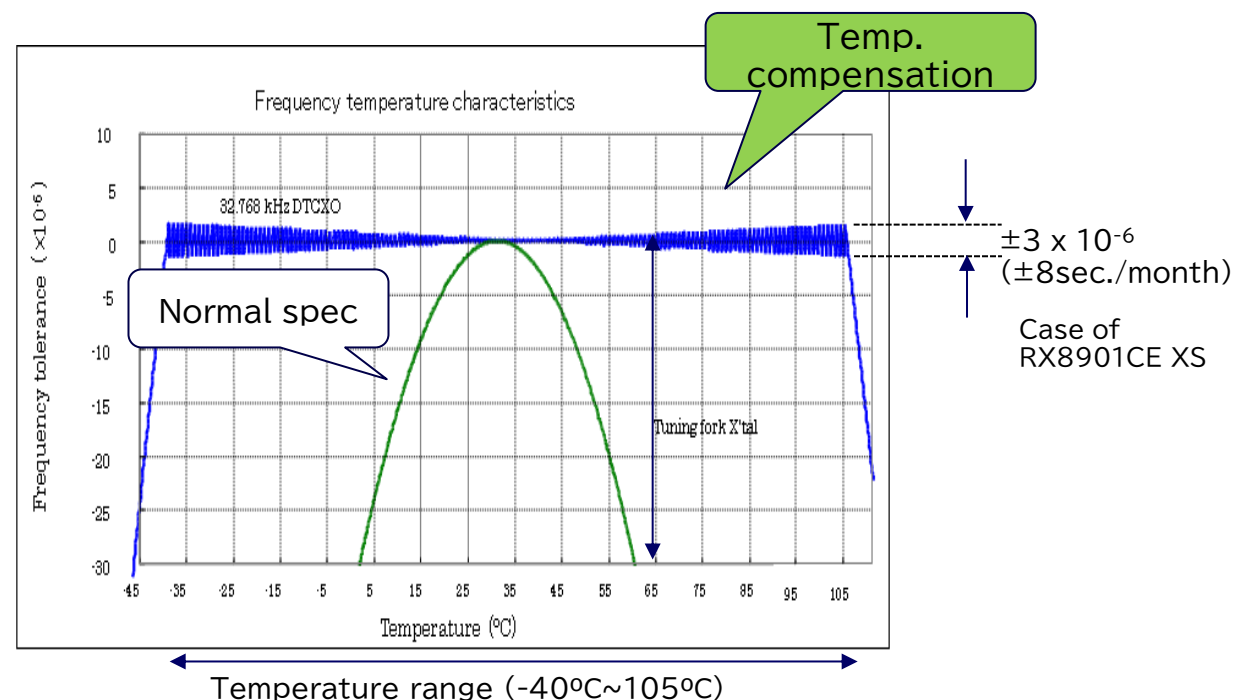
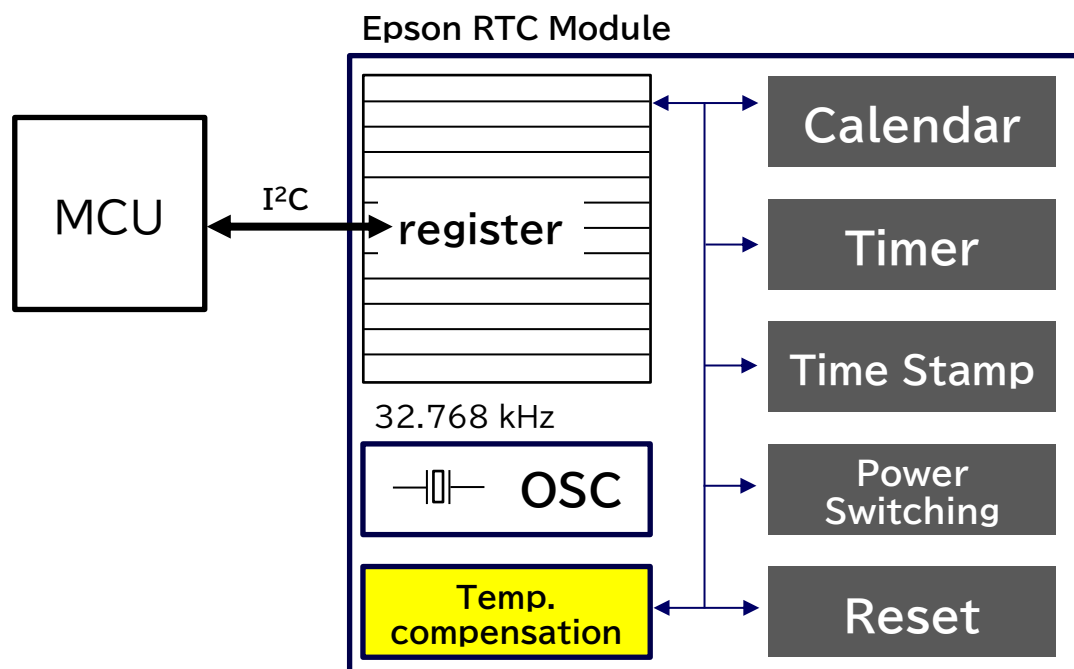
- ① **Calendar** Clock continues counting while power is supplied
- ② **Alarm** Generates an interrupt event at a specific date and time
- ③ **Wake up timer** Generates an interrupt event after a specified interval of time



Functions (2) Temperature compensation

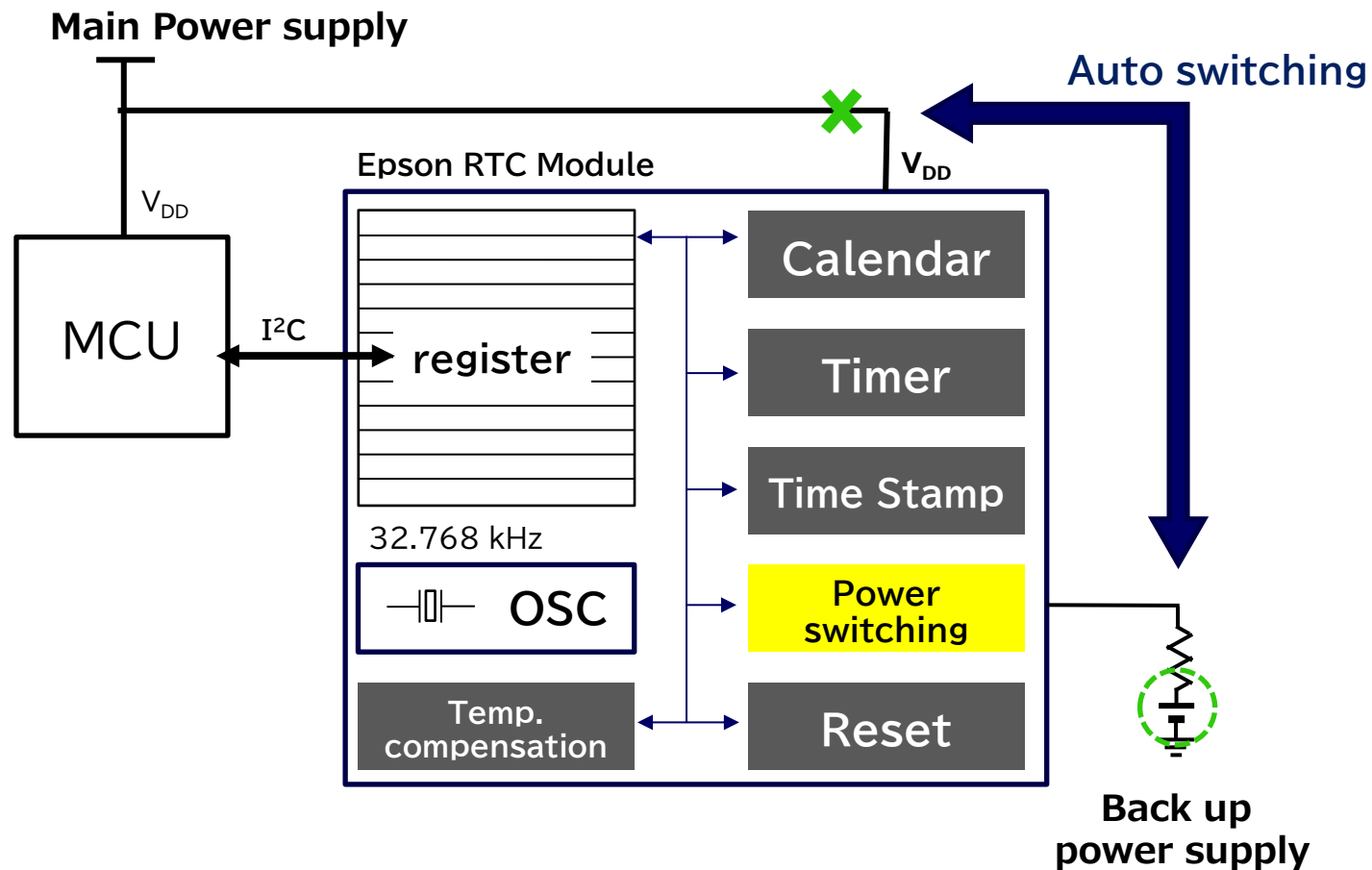
EPSON

Maintains accurate time through automatically compensating for changes in oscillation frequency caused by temperature fluctuations.



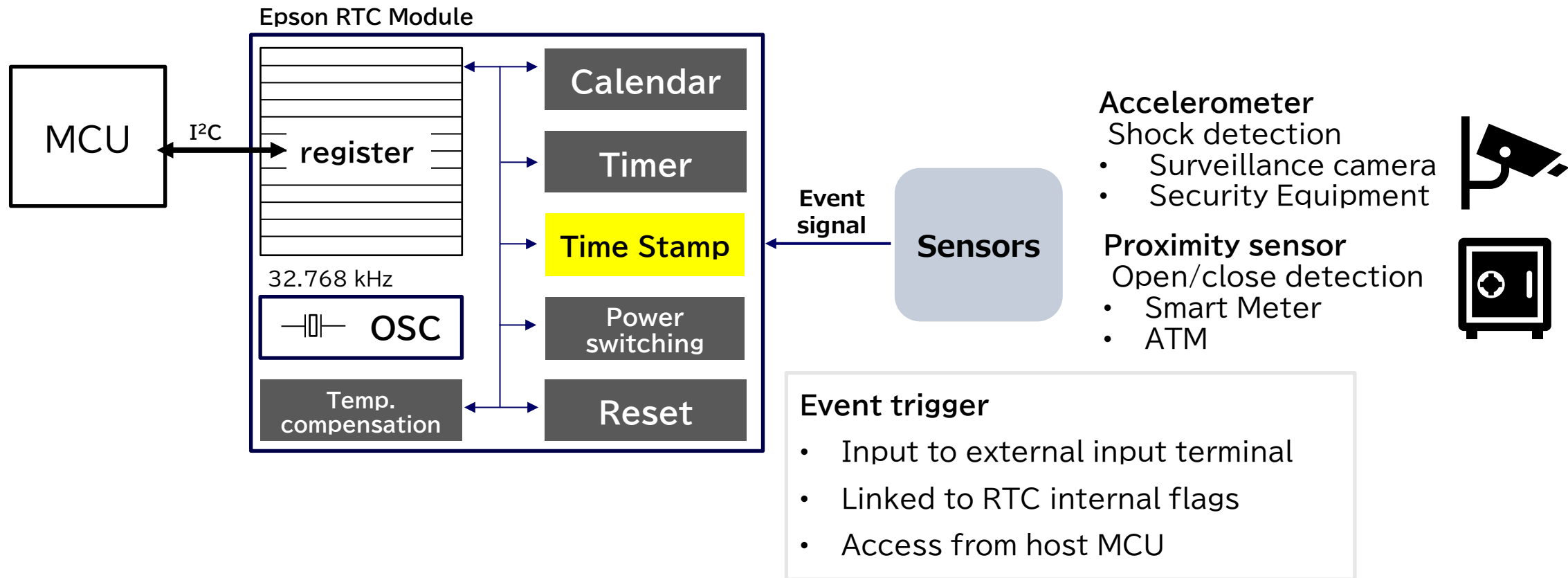
Functions (3) Power switching

Monitors the main power supply and automatically switches to the backup power supply to continue operation when the main power supply voltage drops.



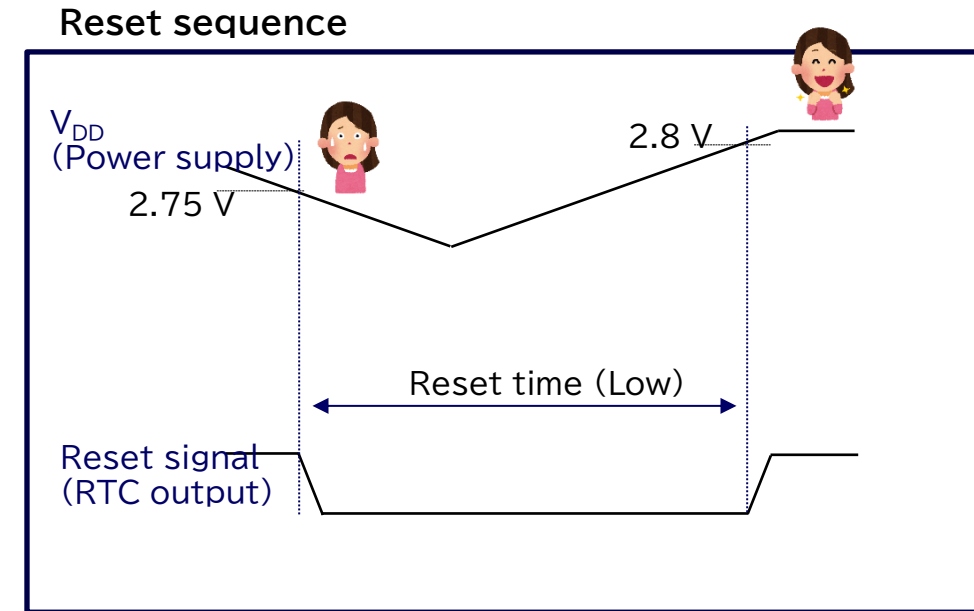
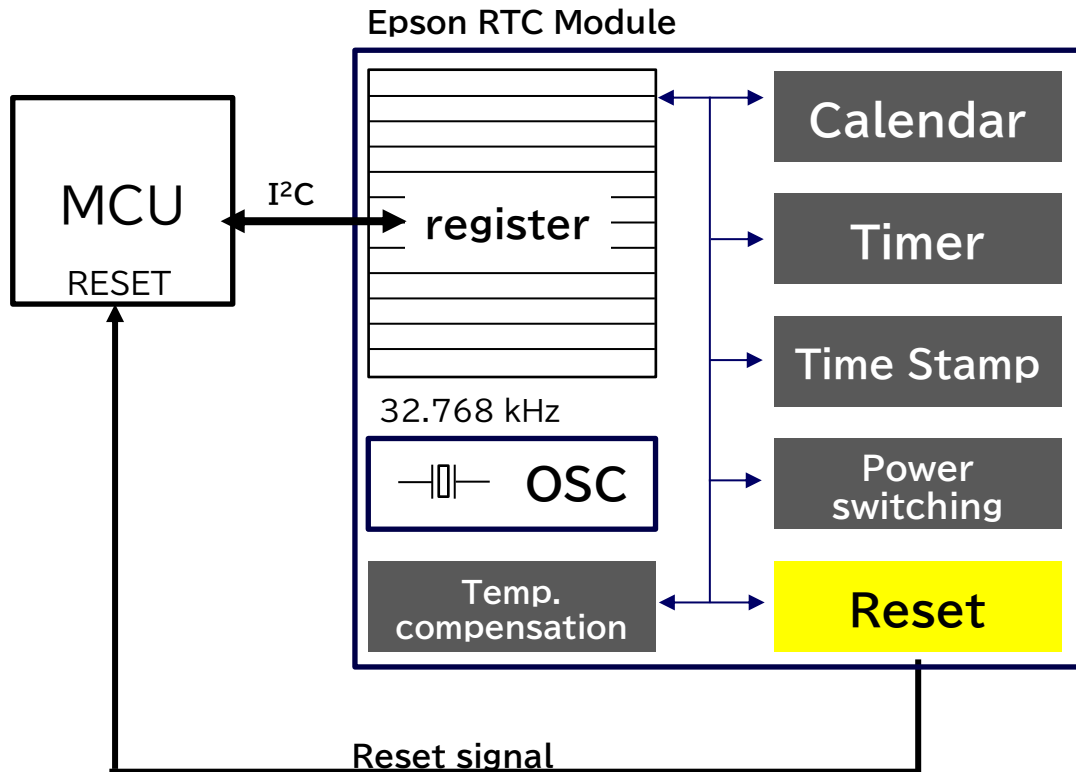
Functions (4) Time stamp

- The time stamp function stores the time information when an event (signal) is detected.
- The RTC can record the date and time even when the MCU is inactive because the RTC receives signals directly.



Functions (5) Reset output

- Detects a drop/rise in system power supply voltage and outputs a reset/reset release signal.
- Reduces the external reset IC, thus reducing the board space and number of parts



Epson RTC module Use cases

Target	Applications and requirements	Epson products
FA/CNC 	• Time information for work and event records • Clock pack-up (power switching) ✓ During factory vacations ✓ Maintains time from factory assy to transportation • Prevent clock deviation due to CPU heat generation (high accuracy)	<u>RX8901CE/4901CE</u> 240 nA, I²C/SPI Accurate clock (+105 °C) Time stamp (32times) Power switching <u>RX8111CE/4111CE</u> 100 nA, I²C/SPI Time Stamp(8 times) Power switching
Smart Meter (e-meter) 	• Accurate time information for time-of-day electricity rates (high accuracy) • Clock backup in case of power failure power switching) • Time logging by detecting case opening/closing (external input terminal, time stamp)	<u>RX8804CE</u> 350 nA, I²C Accurate clock (+105 °C) Time stamp (1time) <u>RX8900CE</u> 700 nA, I²C Accurate clock Power switching
MFP 	• Fax reception time logging in power saving mode (low current consumption) • Periodic CPU startup for head cleaning (timer function)	<u>RX8130CE</u> 300 nA, I²C Power switching Rechargeable battery charge management Reset output

Target	Applications and requirements	Epson products
Video surveillance system 	• Time information of shooting data • High accuracy for outdoor temperature environment • Clock backup in case of power failure (power switching)	<u>RX8901CE/4901CE</u> 240 nA, I ² C/SPI Accurate clock (+105 °C) Time stamp (32times) Power switching
DSC 	• Time information of shooting data • Maintains time information even when the battery is dead (power switching) • Prevents reverse current flow when rechargeable batteries are fully charged (charge management function)	<u>RX8111CE/4111CE</u> 100 nA, I ² C/SPI Time Stamp(8 times) Power switching
Smart lighting 	• Time information to turn lights on and off at the same timing • Clock backup in case of power failure (power switching) • High accuracy for outdoor temperature environment	<u>RX8804CE</u> 350 nA, I ² C Accurate clock (+105 °C) Time stamp (1time)
		<u>RX8900CE</u> 700 nA, I ² C Accurate clock Power switching
		<u>RX8130CE</u> 300 nA, I ² C Power switching Rechargeable battery charge management Reset output

Target	Applications and requirements	Epson products
Infotainment (Display Audio, Cluster Meter) 	• Low power consumption of timekeeping when engine is off (reduction of dark current) • Maintains clock accuracy in high temperature environments	RA8000CE 300 nA, I ² C Wide temperature(125°C) Accurate clock, Reset Time Stamp (2times) AEC-Q100
BMS (Battery Management System) 	• Battery charging time management, periodic activation of abnormality detection system (Timer function) • Reduction of dark current (low current consumption)	RA4000CE 300 nA, SPI Wide temperature(125°C) Accurate clock, Reset Time Stamp (2times) AEC-Q100
OBD (On Board Diagnostic system) 	• Periodic startup of the failure diagnosis system after engine off (Timer function) • Guaranteed operation in high temperature environments (high temperature compatible)	RA8804CE 350 nA, I ² C Wide temperature(105°C) Accurate clock Time Stamp(1time) AEC-Q100
		RA8900CE 700 nA, I ² C Accurate clock, Power switching AEC-Q200

Epson RTC module Line-up

	RX8130CE	RX8111CE	RX8900CE	RX8804CE	RX8901CE
Temperature compensation			Yes	Yes	Yes
Interface	I ² C	I ² C	I ² C	I ² C	I ² C
Operating Temperature Max.	+85 °C	+105 °C	+85 °C	+105 °C	+105 °C
Frequency tolerance (x10 ⁻⁶)	B: 5 ± 23 @25°C (±60sec/month)	A: ±11.5 @25°C (±30sec/month) B: ±23.0 @25°C (±60sec/month)	UA: ±3.4 @-40~+85°C UB: ± 5.0 @-40~+85°C	XA: ± 3.4@-40~+85°C ± 8.0@+85~+105°C XB: ± 5.0@-40~+85°C ± 8.0@+85~+105°C	XS: ±3.0 @-40~+85°C ±5.0 @+85~+105°C XB: ±5.0 @-40~+85°C ±8.0 @+85~+105°C
Backup current Typ. / 3 V	300 nA	100 nA	700 nA	350 nA	240 nA
Time stamp (Max.)		8 times		1 time	32 times
Power switching	Yes	Yes	Yes		Yes
Reset output	Yes				
Others	Backup battery charge control function	SPI Interface RX4111CE	For Automotive RA8900CE	For Automotive RA8804CE	SPI Interface RX4901CE

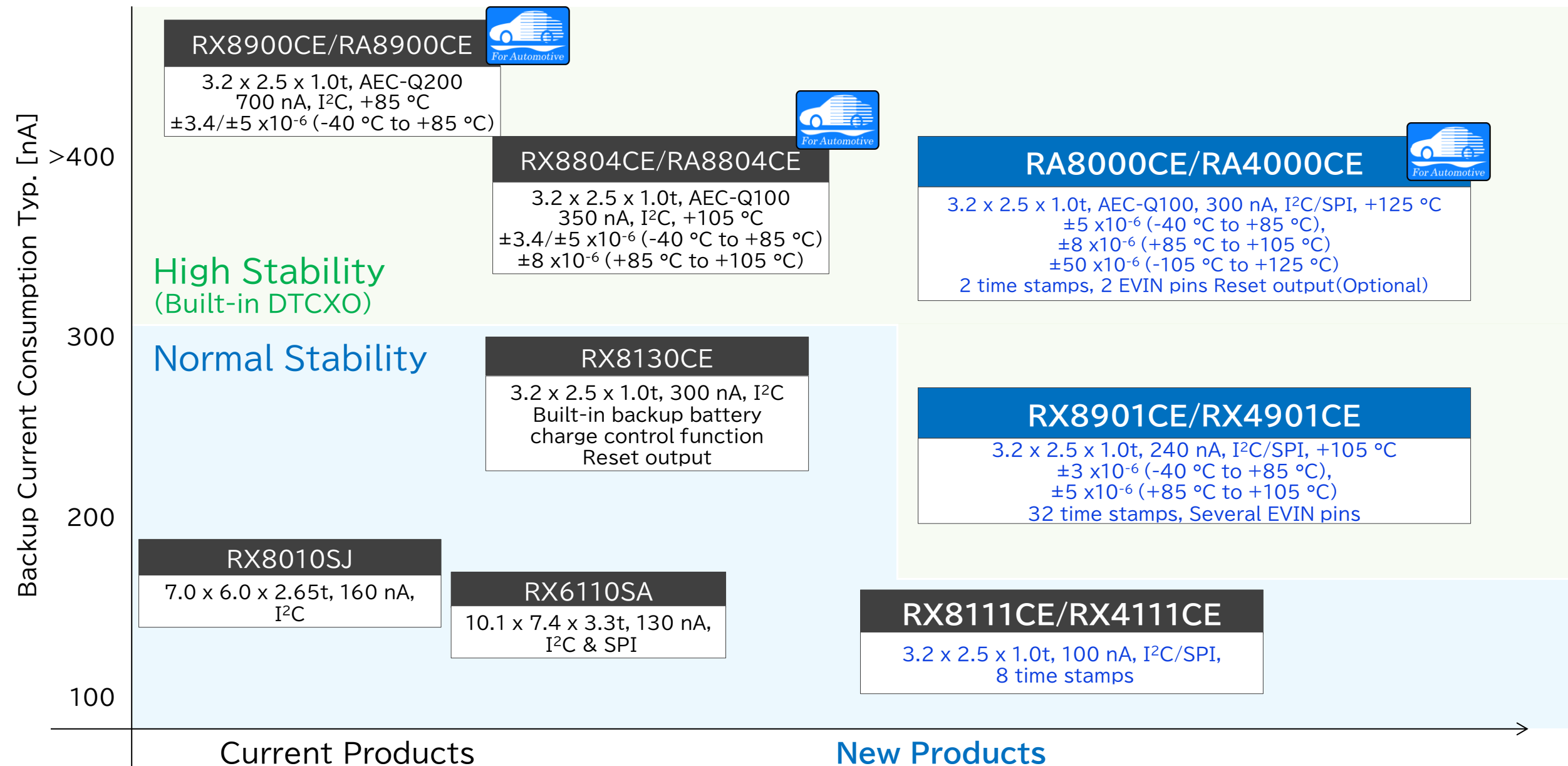
*Frequency tolerance:± 3.4 x10⁻⁶ (±9sec/month)、± 5.0 x10⁻⁶ (±13.2sec/month)、± 8.0 x10⁻⁶ (±21sec/month)

Package size…CE:3.2 x 2.5 x 1.0mm

	RA8900CE	RA8804CE	RA8000CE	RA4000CE
Temperature compensation	Yes	Yes	Yes	Yes
Interface	I ² C	I ² C	I ² C	SPI 3wire/4wire
Operating Temperature Max.	+85 °C	+105 °C	+125°C	+125°C
Frequency tolerance (x10 ⁻⁶)	UA: ±3.4 @-40~+85°C UB: ± 5.0 @-40~+85°C	XA: ± 3.4@-40~+85°C ± 8.0@+85~+105°C XB: ± 5.0@-40~+85°C ± 8.0@+85~+105°C	YB: ±5.0 @-40~+85°C ±8.0 @+85~+105°C ±50.0 @+105~+125°C	YB: ±5.0 @-40~+85°C ±8.0 @+85~+105°C ±50.0 @+105~+125°C
Backup current Typ. / 3 V	700 nA	350 nA	300 nA	300 nA
Time stamp (Max.)		1 time	2 times	2 times
Power switching	Yes			
Reset output			Yes	Yes
Automotive quality standard	AEC-Q200 compliant	AEC-Q100 compliant	AEC-Q100 compliant	AEC-Q100 compliant

*Frequency tolerance:± 3.4 x10⁻⁶ (±9sec/month)、± 5.0 x10⁻⁶ (±13.2sec/month)、± 8.0 x10⁻⁶ (±21sec/month)
Package size…CE:3.2 x 2.5 x 1.0mm

Product Positioning



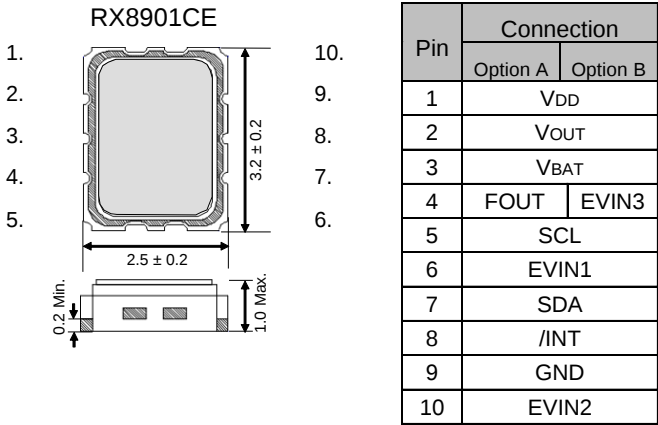
■Main Features

- Built-in frequency adjusted 32.768 kHz crystal unit and **DTCXO**
- Interface Type :I2C-Bus
- Low backup current :**240 nA Typ.** / 3 V
- Auto power switching function :Automatically switches to backup power supply by monitoring the V_{DD} voltage
- Time stamp function : **32 time stamps Max.** (year to 1/1024sec)
- Interrupt output :Wake up every minute or every second
- Alarm interruption :Day, date, hour, minute, second
- Auto repeat wakeup timer interruption (24 bit x 1 ch.)
- Self-monitoring interruption :Crystal oscillation stop, V_{BAT} low, V_{DD} low

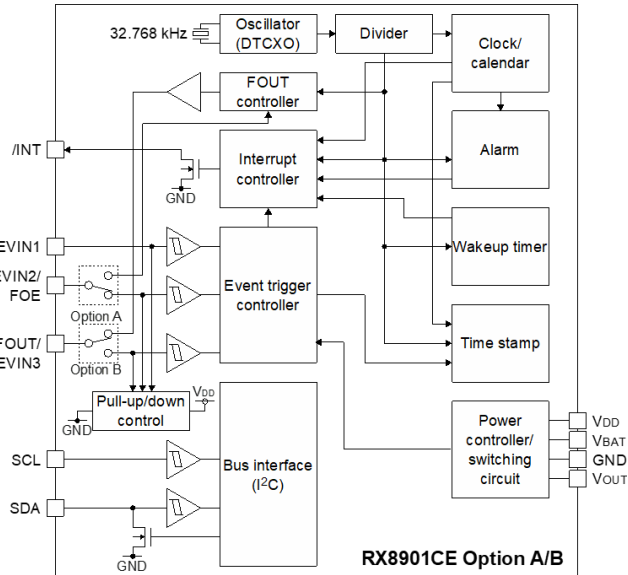
■Specification

	Item	Symbol	Specs
Operating Conditions	Operating supply voltage	V_{DD}	1.6 V to 5.5 V
	V_{DD} detect voltage	$-V_{DET1}$	1.35 V to 1.55 V (V_{DD} , Fall)
	Operating temperature	T_a	-40 °C to +105 °C
Characteristics	Frequency tolerance	$\Delta f/f$	XS $\pm 3 \times 10^{-6}$ (-40°C to +85 °C) $\pm 5 \times 10^{-6}$ (+85°C to +105 °C)
			XB $\pm 5 \times 10^{-6}$ (-40°C to +85 °C) $\pm 8 \times 10^{-6}$ (+85°C to +105 °C)
	Current consumption	I_{BAT}	240 nA / Typ. 3 V 1,500 nA / Max. 3 V

■Pin & Function



■Block diagram



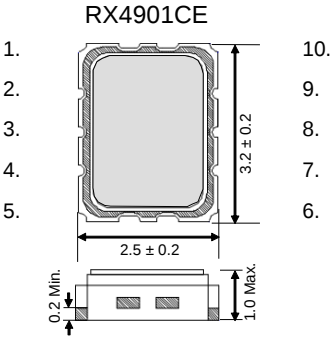
■Main Features

- Built-in frequency adjusted 32.768 kHz crystal unit and **DTCXO**
- Interface Type : 3 wire / 4 wire SPI-Bus
- Low backup current : **240 nA Typ.** / 3 V
- Auto power switching function :Automatically switches to backup power supply by monitoring the V_{DD} voltage
- Time stamp function : **32 time stamps Max.** (year to 1/1024sec)
- Interrupt output :Wake up every minute or every second
- Alarm interruption :Day, date, hour, minute, second
- Auto repeat wakeup timer interruption (24 bit x 1 ch.)
- Self-monitoring interruption :Crystal oscillation stop, V_{BAT} low, V_{DD} low

■Specification

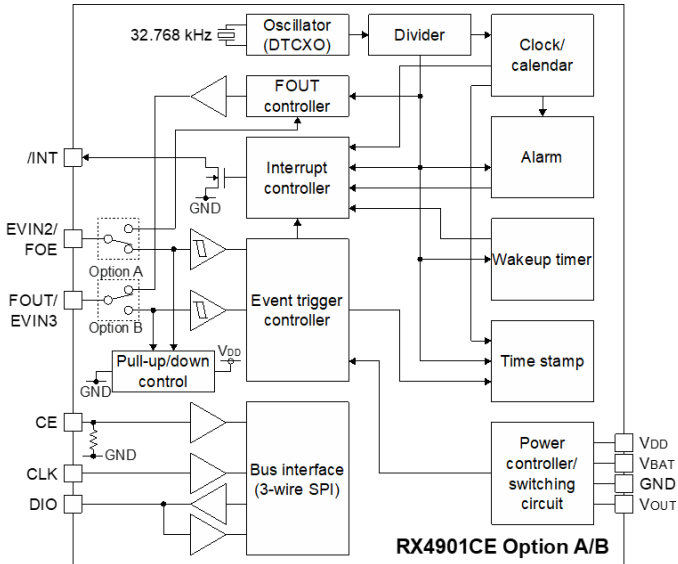
	Item	Symbol	Specs
Operating Conditions	Operating supply voltage	V_{DD}	1.6 V to 5.5 V
	V_{DD} detect voltage	$-V_{DET1}$	1.35 V to 1.55 V (V_{DD} , Fall)
	Operating temperature	T_a	-40 °C to +105 °C
Characteristics	Frequency tolerance	$\Delta f/f$	XS $\pm 3 \times 10^{-6}$ (-40°C to +85 °C) $\pm 5 \times 10^{-6}$ (+85°C to +105 °C)
			XB $\pm 5 \times 10^{-6}$ (-40°C to +85 °C) $\pm 8 \times 10^{-6}$ (+85°C to +105 °C)
	Current consumption	I_{BAT}	240 nA / Typ. 3 V 1,500 nA / Max. 3 V

■Pin & Function



Pin	Connection			
	Opt. A	Opt. B	Opt. C	Opt. D
	3 wire		4 wire	
1	VDD			
2	VOUT			
3	VBAT			
4	FOUT	EVIN3	FOUT	EVIN3
5	CLK			
6	CE			
7	DIO		DO	
8	/INT			
9	GND			
10	EVIN2		DI	

■Block diagram



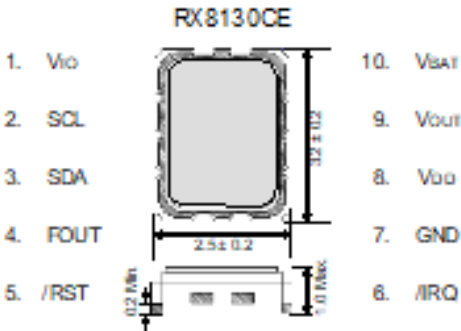
■Main Features

- Built in frequency adjusted 32.768 kHz crystal unit
- Interface Type :I2C-Bus
- Auto power switching function :Automatically switches to backup power supply by monitoring the VDD voltage
- Backup battery charge control function:For the rechargeable battery
- Reset/Reset release output
- Interrupt output :Wake up every minute or every second
- Alarm interruption :Day, date, hour, minute, second
- Auto repeat wakeup timer interruption (16 bit x 1 ch.)
- Self-monitoring interruption :Crystal oscillation stop, V_{BAT} low, V_{DD} low

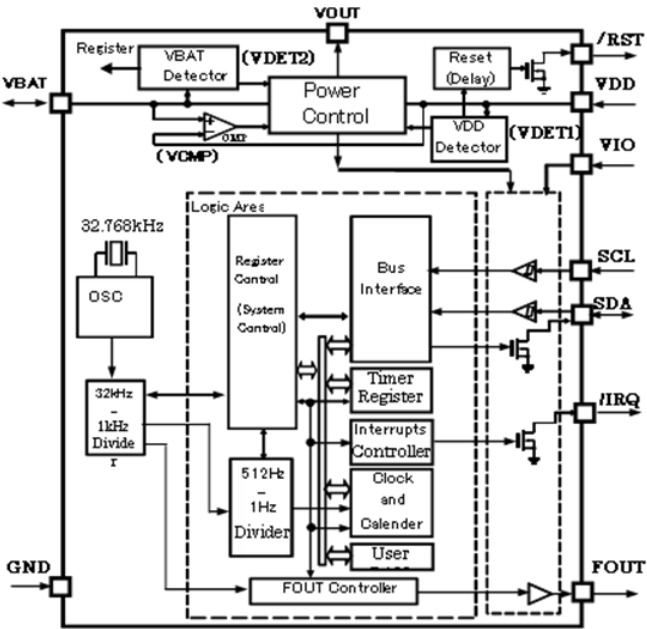
■Specification

	Item	Symbol	Specs
Operating conditions	Operating supply voltage	V _{DD}	1.25 V to 5.5 V
	VDD detect voltage	-V _{DET2}	1.2 V to 1.4 V (V _{DD} , Fall)
	Operating temperature	T _a	-40 °C to +85 °C
Characteristics	Frequency tolerance	Δf/f	B: +5±23 x 10 ⁻⁶ / +25 °C
	Current consumption	I _{BAT}	300 nA / Typ. 3 V 500 nA / Max. 3 V (T _a = -40 °C to +85 °C)

■Pin & Function



■Block diagram



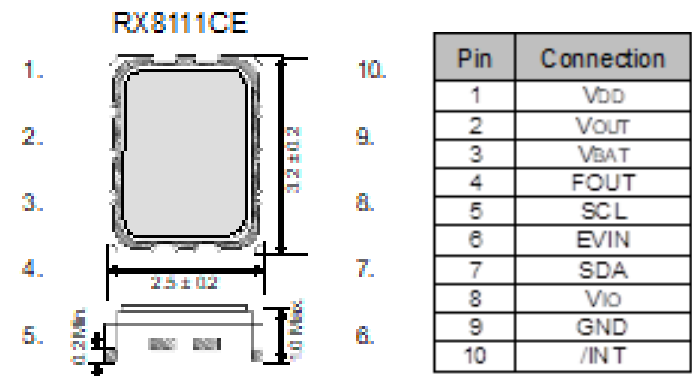
■Main Features

- Built in frequency adjusted 32.768 kHz crystal unit
- Interface Type :I2C-Bus
- Low backup current : **100 nA Typ.** / 3 V
- Auto power switching function :Automatically switches to backup power supply by monitoring the V_{DD} voltage
- Time stamp function : **8 time stamps** (year to 1/256 sec)
- Interrupt output :Wake up every minute or every second
- Alarm interruption :Day, date, hour, minute, second
- Auto repeat wakeup timer interruption (24 bit x 1 ch.)
- Self-monitoring interruption :Crystal oscillation stop, V_{BAT} low, V_{DD} low

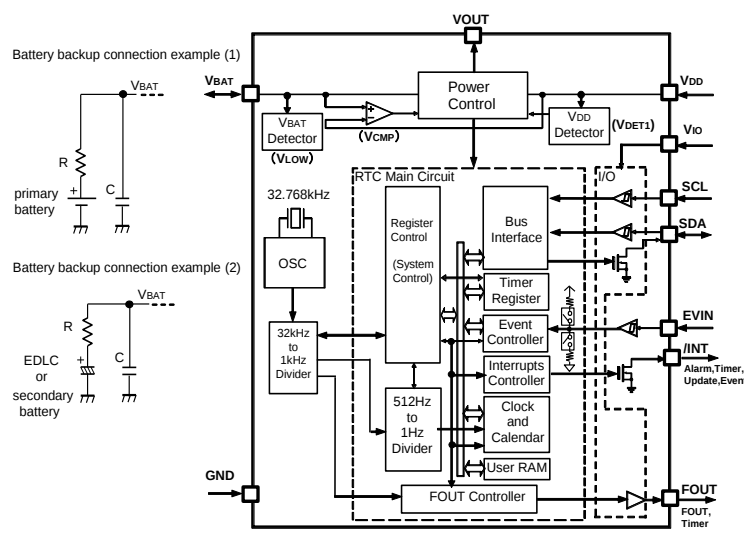
■Specification

	Item	Symbol	Specs
Operating Conditions	Operating supply voltage	V _{DD}	1.6 V to 5.5 V
	V _{DD} detect voltage	-V _{DET1}	1.2 V to 1.6 V (V _{DD} , Fall)
	Operating temperature	T _a	-40 °C to +105 °C
Characteristics	Frequency tolerance	Δf/f	A ±11.5 x 10 ⁻⁶ (+25 °C) B ±23 x 10 ⁻⁶ (+25 °C)
	Current consumption	I _{BAT}	100 nA / Typ. 3 V 450 nA / Max. 3 V (T _a = -40 °C to +85 °C)

■Pin & Function



■Block diagram



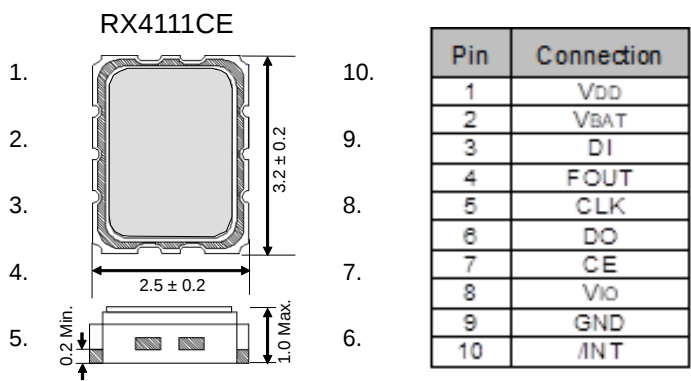
■Main Features

- Built in frequency adjusted 32.768 kHz crystal unit
- Interface Type : 4 wire SPI-Bus
- Low backup current : **100 nA Typ.** / 3 V
- Auto power switching function :Automatically switches to backup power supply by monitoring the V_{DD} voltage
- Time stamp function :**8 time stamps** (year to 1/256 sec)
- Interrupt output :Wake up every minute or every second
- Alarm interruption :Day, date, hour, minute, second
- Auto repeat wakeup timer interruption (24 bit x 1 ch.)
- Self-monitoring interruption :Crystal oscillation stop, V_{BAT} low, V_{DD} low

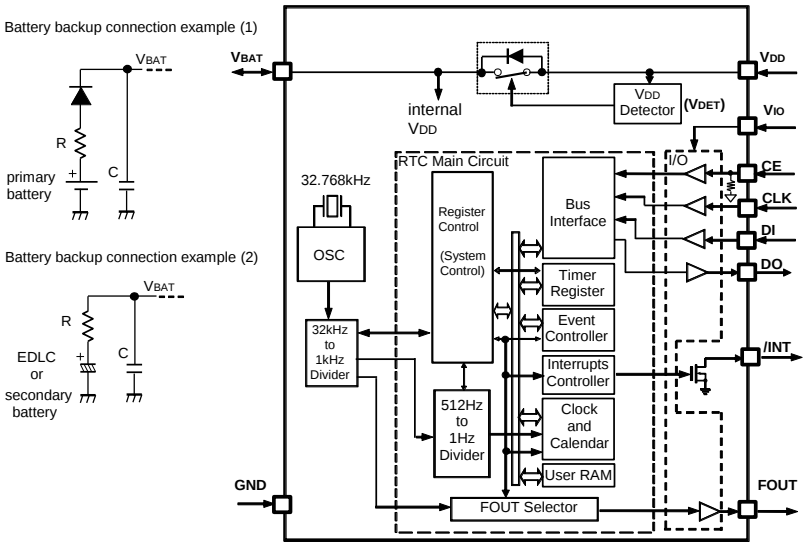
■Specification

	Item	Symbol	Specs
Operating Conditions	Operating supply voltage	V _{DD}	1.6 V to 5.5 V
	V _{DD} detect voltage	-V _{DET1}	1.2 V to 1.6 V (V _{DD} , Fall)
	Operating temperature	T _a	-40 °C to +105 °C
Characteristics	Frequency tolerance	Δf/f	A ±11.5 x 10 ⁻⁶ (+25 °C)
			B ±23 x 10 ⁻⁶ (+25 °C)
	Current consumption	I _{BAT}	100 nA / Typ. 3 V 450 nA / Max. 3 V (T _a = -40 °C to +85 °C)

■Pin & Function



■Block diagram



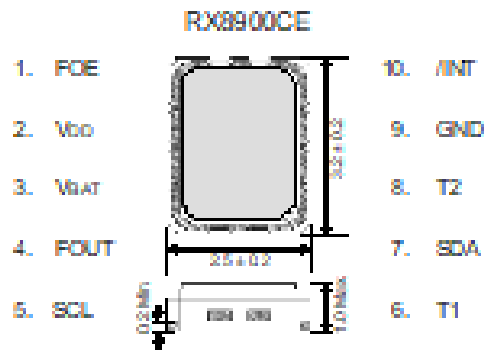
■Main Features

- Built-in frequency adjusted 32.768 kHz crystal unit and **DTCXO**
- Interface Type :I2C-Bus
- Selectable clock output :32.768 kHz, 1024 Hz, 1 Hz
- Auto power switching function :Automatically switches to backup power supply by monitoring the V_{DD} voltage
- Interrupt output :Wake up every minute or every second
- Alarm interruption :Day, date, hour, minute
- Auto repeat wakeup timer interruption (12 bit x 1ch.)

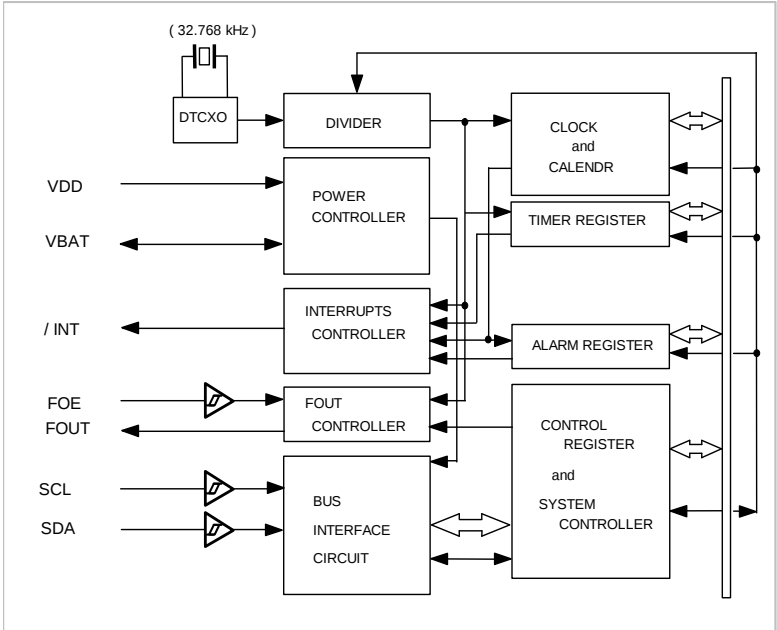
■Specification

	Item	Symbol	Specs	
Operating Conditions	Operating supply voltage	V _{DD}	2.5 V to 5.5 V	
	V _{DD} detect voltage	V _{DET3}	2.3 V to 2.5 V	
	Operating temperature	T _a	-40 °C to +85 °C	
Characteristics	Frequency tolerance	Δf/f	UA	±3.4 x 10 ⁻⁶ (-40 °C to 85 °C)
			UB	±5 x 10 ⁻⁶ (-40 °C to 85 °C)
	Current consumption	I _{DD2}	700 nA / Typ. 3 V 1,400 nA / Max. 3 V (Temp. Compensation interval: 2.0 s)	

■Pin & Function



■Block diagram



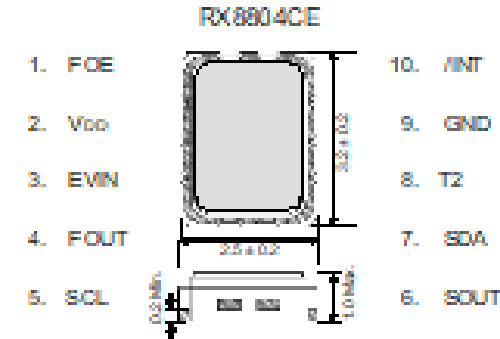
■ Main Features

- Built-in frequency adjusted 32.768 kHz crystal unit and [DTCXO](#)
- Interface Type :I2C-Bus
- Selectable clock output :32.768 kHz, 1024 Hz, 1 Hz
- Time stamp function :1 time stamp (year to second)
- Interrupt output :Wake up every minute or every second
- Alarm interruption :Day, date, hour, minute
- Auto repeat wakeup timer interruption (24 bit x 1 ch.)
- SOUT pin outputs that selected flag bit value (H or L)

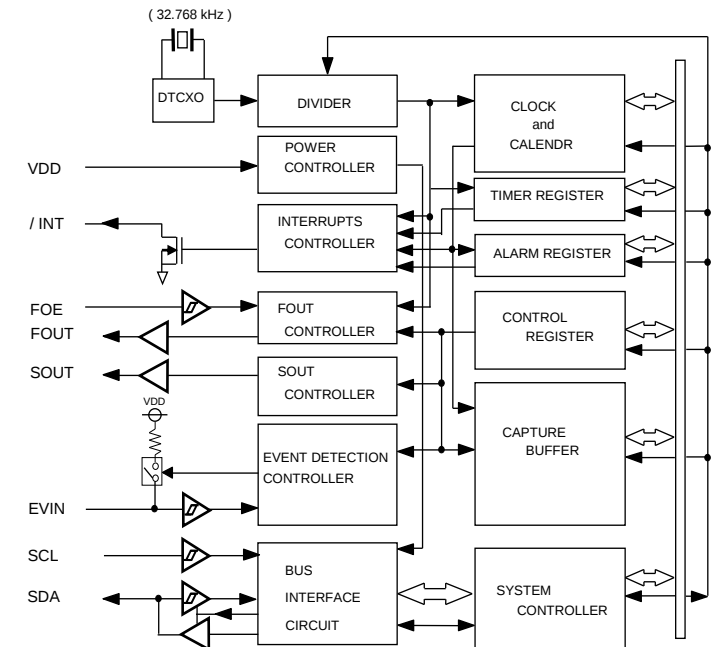
■ Specification

	Item	Symbol	Specs	
Operating Conditions	Operating supply voltage	V _{DD}	1.6 V to 5.5 V	
	Operating temperature	T _a	-40 °C to +105 °C	
Characteristics	Frequency tolerance	Δf/f	XA	±3.4 x 10 ⁻⁶ (-40 °C to 85 °C) ±8 x 10 ⁻⁶ (-40 °C to 105 °C)
			XB	±5 x 10 ⁻⁶ (-40 °C to 85 °C) ±8 x 10 ⁻⁶ (-40 °C to 105 °C)
	Current consumption	I _{DD2}	350 nA / Typ. 3 V 1,500 nA / Max. 3 V (Temp. Compensation interval: 2.0 s)	

■ Pin & Function



■ Block diagram





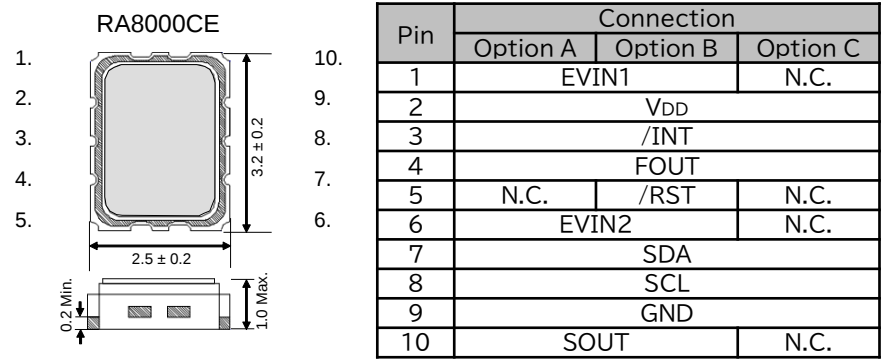
■Main Features

- Built in frequency adjusted 32.768kHz crystal unit and **DTCXO**
- Interface Type : I²C-Bus
- Reset/Reset release output (option)
- Time stamp function : 2 time stamps Max. (year to 1/1024sec)
- Alarm interruption : Day, date, hour, minute, second
- Auto repeat wakeup timer interruption(24 bit x 1 ch.)
- Self-monitoring interruption : Crystal oscillation stop, V_{DD} low
- **AEC-Q100 compliant**

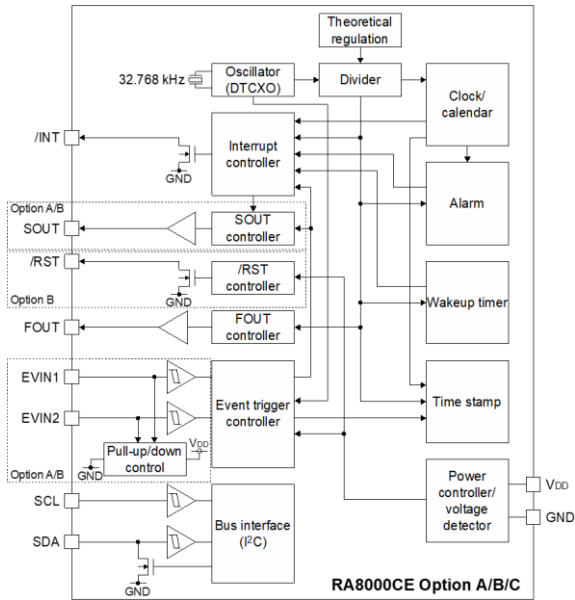
■Specification

Item		Symbol	Specs
Operating Conditions	Operating supply voltage	V _{DD}	1.6 V to 5.5 V
	Operating temperature	T _a	-40 °C to +125 °C
Characteristics	Frequency tolerance	Δf/f	±5 x 10 ⁻⁶ (-40°C to +85 °C) ±8 x 10 ⁻⁶ (+85°C to +105 °C) ±50 x 10 ⁻⁶ (+105°C to +125 °C)
	Current consumption	I _{DD}	Normal 300 nA / Typ. 3 V 1,700 nA / Max. 3 V
			With /RST pin 600 nA / Typ. 2 V 2,250 nA / Max. 2 V

■Pin & Function



■Block diagram





■Main Features

- Built in frequency adjusted 32.768kHz crystal unit and **DTCXO**
- Interface Type :3 wire / 4 wire SPI-Bus
- Reset/Reset release output (option)
- Time stamp function: 2 time stamps Max. (year to 1/1024sec)
- Alarm interruption : Day, date, hour, minute, second
- Auto repeat wakeup timer interruption(24 bit x 1 ch.)
- Self-monitoring interruption : Crystal oscillation stop, V_{DD} low
- **AEC-Q100 compliant**

■Specification

	Item	Symbol	Specs
Operating Conditions	Operating supply voltage	V _{DD}	1.6 V to 5.5 V
	Operating temperature	T _a	-40 °C to +125 °C
Characteristics	Frequency tolerance	Δf/f	±5 x 10 ⁻⁶ (-40°C to +85 °C)
			±8 x 10 ⁻⁶ (+85°C to +105 °C)
			±50 x 10 ⁻⁶ (+105°C to +125 °C)
	Current consumption	I _{DD}	Normal 300 nA / Typ. 3 V 1,700 nA / Max. 3 V
			With /RST pin 600 nA / Typ. 2 V 2,250 nA / Max. 2 V

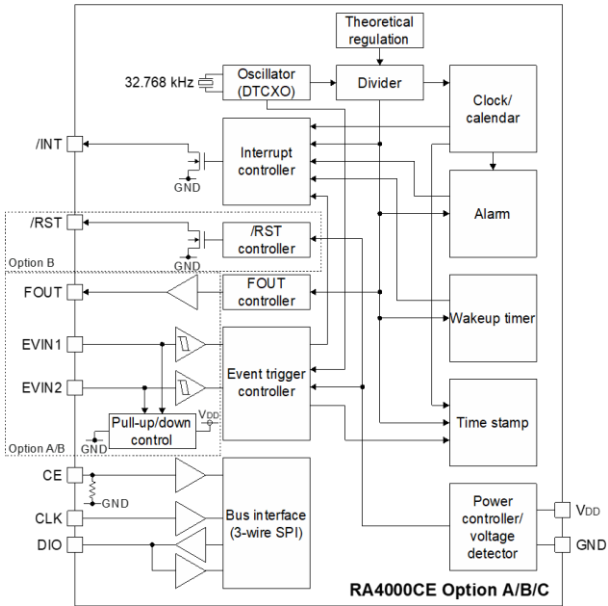
■Pin & Function

RA4000CE

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.

Pin	Connection						
	Opt. A	Opt. B	Opt. C	Opt. D	Opt. E		
	3 wire			4 wire			
1	EVIN1		N.C.	DI			
2	VDD						
3	CE						
4	FOUT		/INT				
5	N.C.	/RST	N.C.	/RST			
6	EVIN2		N.C.	EVIN2			
7	DIO			DO			
8	CLK						
9	GND						
10	/INT		N.C.	SOUT			

■Block diagram





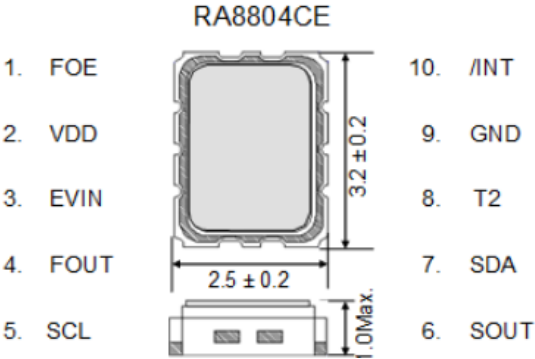
■Main Features

- Built-in frequency adjusted 32.768 kHz crystal unit and **DTCXO**
- Interface Type :I2C-Bus
- Selectable clock output :32.768 kHz, 1024 Hz, 1 Hz
- Time stamp function :1 time stamp (year to second)
- Interrupt output :Wake up every minute or every second
- Alarm interruption :Day, date, hour, minute
- Auto repeat wakeup timer interruption (24 bit x 1 ch.)
- SOUT pin outputs that selected flag bit value (H or L)
- **AEC-Q100 compliant**

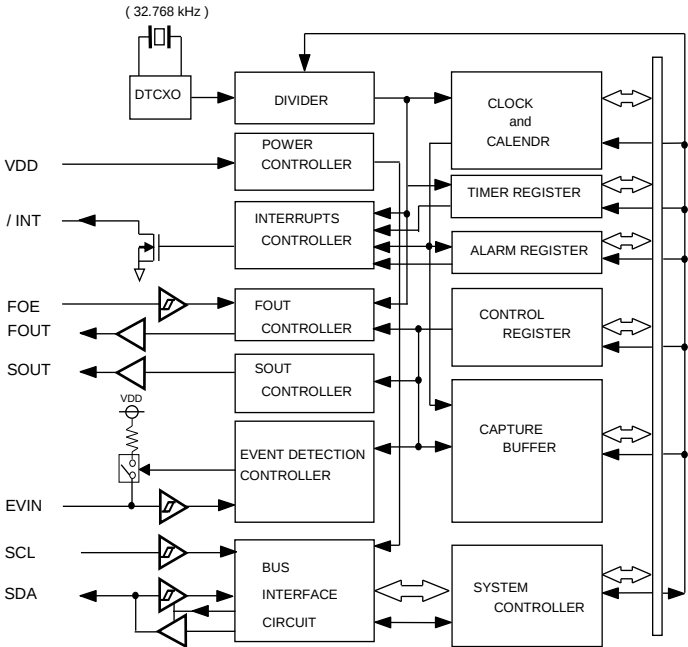
■Specification

Item		Symbol	Specs
Operating Conditions	Operating supply voltage	V _{DD}	1.6 V to 5.5 V
	Operating temperature	T _a	-40 °C to +105 °C
Characteristics	Frequency tolerance	Δf/f	XA ±3.4 x 10 ⁻⁶ (-40 °C to 85 °C) ±8 x 10 ⁻⁶ (-40 °C to 105 °C)
			XB ±5 x 10 ⁻⁶ (-40 °C to 85 °C) ±8 x 10 ⁻⁶ (-40 °C to 105 °C)
	Current consumption	I _{DD2}	350 nA / Typ. 3 V 1,500 nA / Max. 3 V (Temp. Compensation interval: 2.0 s)

■Pin & Function



■Block diagram





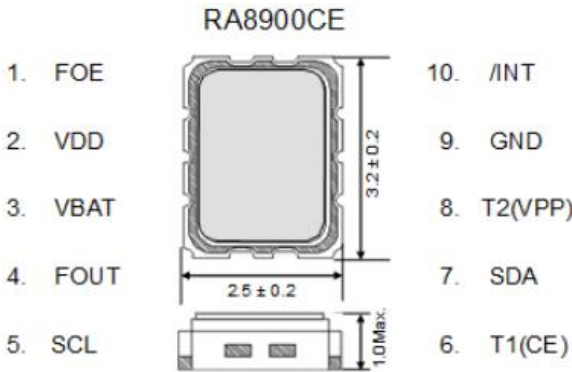
■Main Features

- Built-in frequency adjusted 32.768 kHz crystal unit and **DTCXO**
- Interface Type :I2C-Bus
- Selectable clock output :32.768 kHz, 1024 Hz, 1 Hz
- Auto power switching function :Automatically switches to backup power supply by monitoring the V_{DD} voltage
- Interrupt output :Wake up every minute or every second
- Alarm interruption :Day, date, hour, minute
- Auto repeat wakeup timer interruption (12 bit x 1ch.)
- **AEC-Q100 compliant**

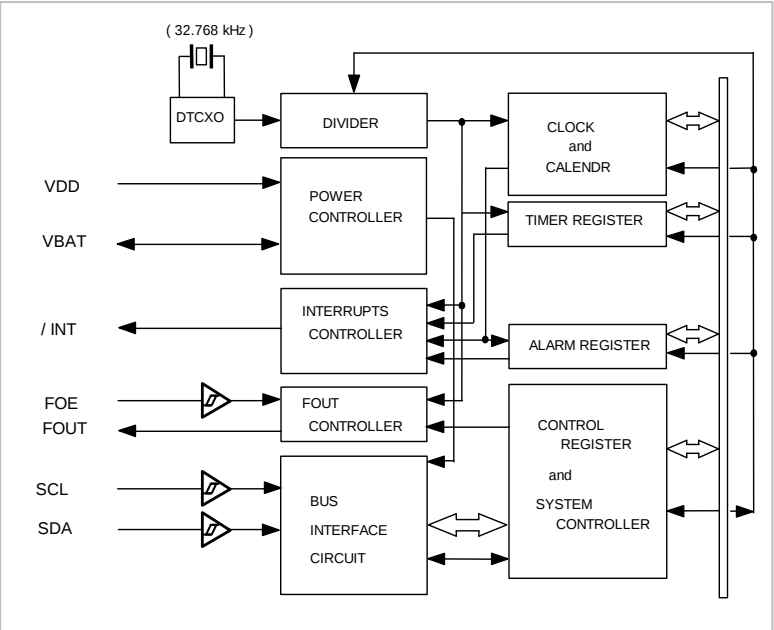
■Specification

	Item	Symbol	Specs	
Operating Conditions	Operating supply voltage	V _{DD}	2.5 V to 5.5 V	
	V _{DD} detect voltage	V _{DET3}	2.3 V to 2.5 V	
	Operating temperature	T _a	-40 °C to +85 °C	
Characteristics	Frequency tolerance	Δf/f	UA	±3.4 x 10 ⁻⁶ (-40 °C to 85 °C)
			UB	±5 x 10 ⁻⁶ (-40 °C to 85 °C)
	Current consumption	I _{DD2}	700 nA / Typ. 3 V 1,400 nA / Max. 3 V (Temp. Compensation interval: 2.0 s)	

■Pin & Function



■Block diagram



If you're interested in use cases by function or application-specific examples, we have prepared some materials for you.

Epson's RTC modules provide solutions for three major issues

Epson's RTC module helps to solve issues below.

Technical challenge	Provided function	Overview
Extra time and procedures are required to reset the time information when the system is rebooting.	Power Self-m	The FA equipment with a backup battery will
Event detection and recording are required even when the system is stopped.	Time s	
Incorrect time caused by heat generated from FA equipment.	Built-i (Digital T Compens Oscillator)	

Power switching function

What is Power switching function

RTC module detects a voltage drop in the main power supply and automatically switches to a backup power supply and continue to provide accurate time.

Technical challenge

Even during a long power or ne accurate time and ensure the c immediately upon restart. To utilize the smallest capacity efficient power supply switchin

Propose Epson's RTC module as solution

Epson's RTC modules, equippe an automatic power switching f accuracy, enabling the design c

2-2. Temperature compensation Use case : Infotainment

Issues

Vehicle clocks gradually lose time.

Configuration example : MCU with a built-in RTC + 32-kHz xtal

Tuning fork crystal frequency-temperature coefficient

The 32-kHz crystal unit has a quadratic frequency-temperature characteristic. Temperature fluctuations inside vehicles are large, resulting in frequency fluctuations and clock deviations.

Accuracy : Frequency deviation at room temperature + Frequency-temperature coefficient (Quadratic curve)

Ex.) Operated continuously for one month

Environment	Monthly rate
+60° C	Equivalent to 1 min. 50 sec. / month
-10° C	Equivalent to 1 min. 50 sec. / month
-40° C	Equivalent to 6 min. / month

You can download all of these materials by requesting them.

Document Request ➔

- **Functions and Use Case examples**
This document introduces applications that can leverage RTC functionality, along with use cases addressing related challenges and solutions.
- **Solving Time Data Issue in FA Equipment**
Regarding the time data in FA devices: (1) It is difficult to determine whether the time needs resetting upon device startup. (2) Error signal detection and logging are required even when the system is stopped. (3) The time may deviate due to device heat generation. This material explains how to use the RTC module to address these three issues.
- **Solving Technical Issues in Security Cameras**
For security cameras, accurate date and time data must be maintained even in the event of a long power outage or network outage, and the occurrence history of high-priority event signals must be maintained even when power is lost. This material explains how to use RTC modules to solve the following three problems: (1) when installed outdoors, (2) the temperature changes rapidly, and (3) time accuracy cannot be maintained.

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