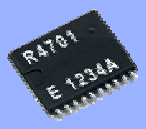
## Built-in Temperature Sensor
## SERIAL-INTERFACE REAL TIME CLOCK MODULE

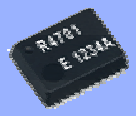
# RTC - 4701 JE / NB

- Built in frequency adjusted 32.768 kHz crystal unit.
- Interface Type : **3**-wire serial interface
- Operating voltage range : 1.6 V to 5.5 V
- Wide Timekeeper voltage range : 1.6 V to 5.5 V
- Built-in temperature sensor : Detects temperature. Converts output to analog voltage
- 32.768 kHz frequency output function: C-MOS output With Control Pin
- Function of time and calendar, the various interrupt function etc.

RoHS Compliant

Product Number (Please contact us)
**RTC-4701JE : Q41470171000200**
**RTC-4701NB: Q41470191000200**

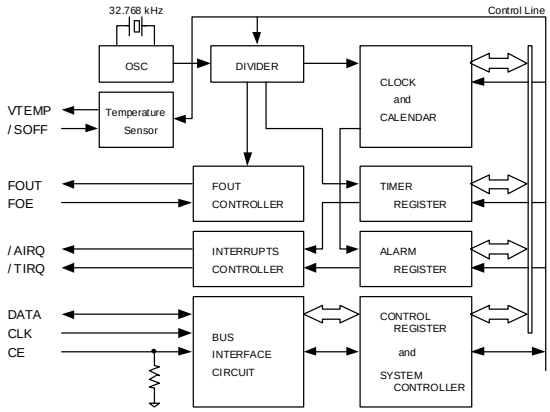



Actual size

| RTC-4701JE | RTC-4701NB |
|---|---|
|  |  |

## Block diagram




## Overview

- **Built-in temperature sensor**
  - Diode temperature sensor (analog voltage output)
    - * temperature sensor operating voltage : 2.7 V to 5.5 V
    - * temperature sensor tolerance : ± 5 °C ( Ta = +25 °C )
    - * voltage output (analog): −7.6 mV / °C Typ.
- **32.768 kHz frequency output function**
  - FOUT pin output (C-MOS output), CL=30 pF
  - FOE pin enables output on/off control.
- **The various interrupt function**
  - 12 bit additional counter. ( to 4095 count )
  - Timer function can be set up between 1/4096 second and 255 minutes.
  - Alarm function can be set to day of week, hour, or minute.

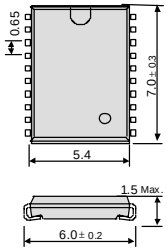
## Pin Function

| Signal Name | Input / Output | Function |
|---|---|---|
| CE | Input | The chip enabled input pin. (Built -in pull-down resistance) |
| CLK | Input | The shift clock input pin for serial data transfer. |
| DATA | Bi-directional | The data input / output pin for serial data transfer. |
| FOUT | Output | FOE input: HIGH → FOUT output: 32.768 kHz output * C-MOS output; FOE input: LOW → FOUT output: output OFF * Hi - z |
| FOE | Input | |
| VTEMP | Output | The voltage output pin for the temperature sensor ( analog ). |
| /SOFF | Input | The input pin for the temperature sensor control. |
| / AIRQ | Output | Output 1 pin ( N-ch open drain ) |
| / TIRQ | Output | Output 2 pin ( N-ch open drain ) |
| VDD | — | Connected to a positive power supply. |
| GND | — | Connected to a ground. |

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

RTC – 4701 JE

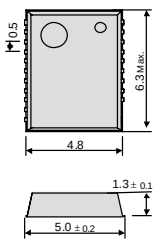
| | | | |
|---|---|---|---|
| 1. | VDD | 20. | N.C. |
| 2. | FOUT | 19. | N.C. |
| 3. | CE | 18. | N.C. |
| 4. | / AIRQ | 17. | N.C. |
| 5. | / TIRQ | 16. | N.C. |
| 6. | CLK | 15. | N.C. |
| 7. | DATA | 14. | N.C. |
| 8. | FOE | 13. | N.C. |
| 9. | VTEMP | 12. | N.C. |
| 10. | / SOFF | 11. | GND |




VSOJ – 20 pin

RTC – 4701 NB

| | | | |
|---|---|---|---|
| 1. | GND | 22. | N.C. |
| 2. | / SOFF | 21. | N.C. |
| 3. | VTEMP | 20. | N.C. |
| 4. | FOE | 19. | N.C. |
| 5. | DATA | 18. | N.C. |
| 6. | CLK | 17. | N.C. |
| 7. | / TIRQ | 16. | N.C. |
| 8. | / AIRQ | 15. | N.C. |
| 9. | CE | 14. | N.C. |
| 10. | FOUT | 13. | – |
| 11. | VDD | 12. | – |




SON – 22 pin

Metal may be exposed on the top or bottom of this product. This will not affect any quality, reliability or electrical spec.

## Temperature sensor characteristics

* Refer to application manual for details.

* If not specifically indicated, GND = 0 V , VDD = 2.7 V to 5.5 V , Ta = −40 °C to +85 °C

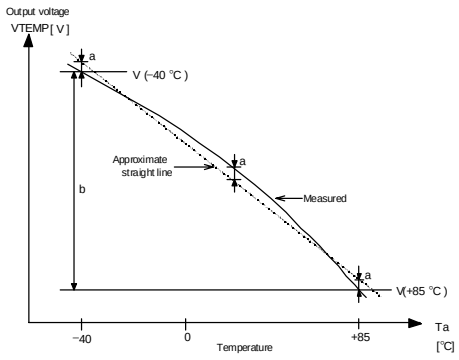
| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Temperature output voltage | VTEMP | VTEMP pin, Ta = +25 °C GND based output voltage | | 1.480 | | V |
| Output tolerance | TACR | Ta = +25 °C | | | ± 5.0 | °C |
| Temperature sensitivity | VSE | -40 °C ≤ Ta ≤ +85 °C | -7.1 | -7.6 | -8.1 | mV / °C |
| Linearity | ΔNL | -40 °C ≤ Ta ≤ +85 °C | | | ± 2.0 | % |
| Temperature detection range | TSOP | ΔNL ≤ ±2.0 % | −40 | | + 85 | °C |
| Output resistance | RO | VTEMP pin, Ta = +25 °C GND standard and VDD standard | | 1.0 | 3.0 | kΩ |

* Temperature sensitivity $V_{SE} = ( V(+85\,^{\circ}C) - V(-40\,^{\circ}C) ) / 125$ [ mV / °C ]

* Linearity $\Delta NL = \frac{a}{b} \times 100$ [ % ]

a : Maximum deviation between the measured value of VTEMP and approximate straight line.
b : Difference between the measured values at −40 °C and +85 °C.

* Output resistance ( Ro ) $Ro = \frac{\Delta V_1}{\Delta I_1}$ [ Ω ]



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In order to meet customer needs in a rapidly advancing digital, broadband and ubiquitous society, we are committed to offering products that are one step ahead of the market and a rank above the rest in quality. To achieve our goals, we follow a “3D (three device) strategy” designed to drive both horizontal and vertical growth. We will to grow our three device categories of “Timing Devices”, ”Sensing Devices” and “Optical Devices”, and expand vertical growth through a combination of products from these categories.
A Quartz MEMS is any high added value quartz device that exploits the characteristics of quartz crystal material but that is produced using MEMS (micro-electro-mechanical system) processing technology.
Market needs are advancing faster than previously imagined toward smaller, more stable crystal products, but we will stay ahead of the curve by rolling out products that exceed market speed and quality requirements. We want to further accelerate the 3D strategy by QMEMS.

Quartz devices have become crucial in the network environment where products are increasingly intended for broadband, ubiquitous applications and where various types of terminals can transfer information almost immediately via LAN and WAN on a global scale. Epson Toyocom Corporation addresses every single aspect within a network environment. The new corporation offers “Digital Convergence” solutions to problems arising with products for consumer use, such as, core network systems and automotive systems.

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At Epson Toyocom, all environmental initiatives operate under the Plan-Do-Check-Action(PDCA) cycle designed to achieve continuous improvements. The environmental management system (EMS) operates under the ISO 14001 environmental management standard.

ISO 14000 is an international standard for environmental management that was established by the International Standards Organization in 1996 against the background of growing concern regarding global warming, destruction of the ozone layer, and global deforestation.

All of our major manufacturing and non-manufacturing sites,in Japan and overseas, completed the acquisition of ISO 14001 certification.
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## WORKING FOR HIGH QUALITY

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ISO/TS 16949 is a global standard based on QS-9000, a severe standard corresponding to the requirements from the automobile industry.

**►Explanation of the mark that are using it for the catalog**

| | |
|---|---|
| Pb Free | **►Pb free.**<br>**►Complies with EU RoHS directive.** |
| RoHS Compliant | **►Pb free terminal designed. Contains Pb in products exempted by RoHS directive.**<br>**(Contains Pb in sealing glass, high melting temperature type solder or other.)**<br>**►Complies with EU RoHS directive.** |
| For Automotive | **►The products have been designed for high reliability applications such as Automotive.** |

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  Due to the on-going strategy of gradual unification of part numbers, please review product codes and markings, as they will change during the course of the coming months.

  We apologize for the inconvenience, but we will eventually have a unified part numbering system for Epson Toyocom that will be user friendly.