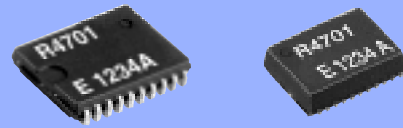




**Built-in Temperature Sensor  
SERIAL-INTERFACE REAL TIME CLOCK MODULE**

**RTC - 4701 JE / NB**

- Built-in 32.768 kHz quartz oscillator : Frequency adjusted for high accuracy. ( $5 \pm 23 \times 10^{-6}$ )
- Interface Type : Serial interface in 3 lines form.
- 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.



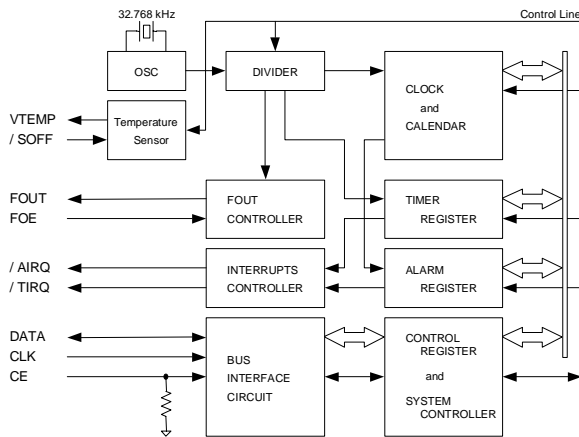
Actual size

RTC-4701JE

RTC-4701NB



**Block diagram**



**Overview**

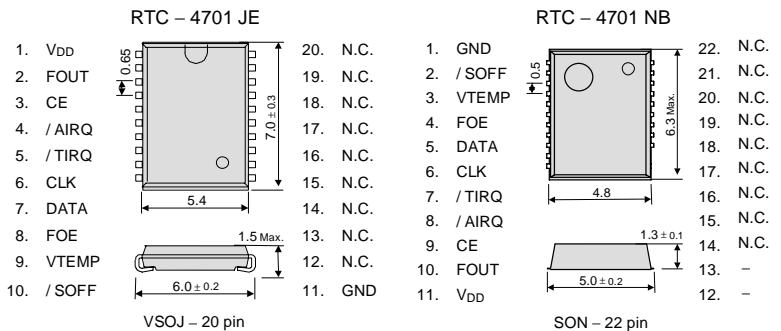
- **Built-in temperature sensor**
  - Diode temperature sensor (analog voltage output)
    - \* temperature sensor operating voltage : 2.7 V to 5.5 V
    - \* temperature sensor tolerance :  $\pm 5^\circ\text{C}$  ( $T_a = +25^\circ\text{C}$ )
    - \* voltage output (analog):  $-7.6 \text{ mV} / ^\circ\text{C}$  Typ.
- **32.768 kHz frequency output function**
  - FOUT pin output (C-MOS output),  $CL=30 \text{ pF}$
  - 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	<table border="1"> <thead> <tr> <th>FOE input</th> <th>FOUT output</th> </tr> </thead> <tbody> <tr> <td>HIGH</td> <td>32.768 kHz output * C-MOS output</td> </tr> <tr> <td>LOW</td> <td>output OFF * Hi - z</td> </tr> </tbody> </table>	FOE input	FOUT output	HIGH	32.768 kHz output * C-MOS output	LOW	output OFF * Hi - z
FOE input	FOUT output							
HIGH	32.768 kHz output * C-MOS output							
LOW	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 )						
V <sub>DD</sub>	—	Connected to a positive power supply.						
GND	—	Connected to a ground.						

**Terminal connection / External dimensions**

(Unit:mm)



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, V<sub>DD</sub> = 2.7 V to 5.5 V, T<sub>a</sub> = -40 °C to +85 °C

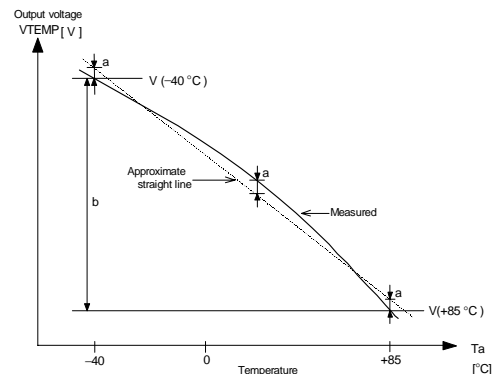
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Temperature output voltage	VTEMP	VTEMP pin, T <sub>a</sub> = +25 °C GND based output voltage		1.480		V
Output tolerance	TACR	T <sub>a</sub> = +25 °C			$\pm 5.0$	°C
Temperature sensitivity	VSE	-40 °C ≤ T <sub>a</sub> ≤ +85 °C	-7.1	-7.6	-8.1	mV / °C
Linearity	ΔNL	-40 °C ≤ T <sub>a</sub> ≤ +85 °C			$\pm 2.0$	%
Temperature detection range	TSOP	ΔNL ≤ $\pm 2.0$ %	-40		+ 85	°C
Output resistance	Ro	VTEMP pin, T <sub>a</sub> = +25 °C GND standard and V <sub>DD</sub> standard		1.0	3.0	kΩ

\* Temperature sensitivity  $VSE = (V(+85^\circ\text{C}) - V(-40^\circ\text{C})) / 125 [\text{mV} / ^\circ\text{C}]$

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

\* Output resistance (Ro)  $Ro = \frac{\Delta V}{\Delta I} [\Omega]$

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.



# “3D STRATEGY” EPSON TOYOCOM

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.

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. All of our major manufacturing and non-manufacturing sites, in Japan and overseas, completed the acquisition of ISO 14001 certification. In the future, new group companies will be expected to acquire the certification around the third year of operations.

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.

## WORKING FOR HIGH QUALITY

Epson Toyocom quickly began working to acquire company-wide ISO 9000 series certification, and has acquired ISO 9001 or ISO 9002 certification for all targeted products manufactured in Japanese and overseas plants.

Epson Toyocom has acquired QS-9000 certification, which is of a higher level. Also, TS 16949 certification, which is also of a higher level, has been acquired.

QS-9000 is an enhanced standard for quality assurance systems formulated by leading U.S. automobile manufacturers based on the international ISO 9000 series.

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

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