

SERIAL REAL TIME CLOCK MODULE WITH TEMPERATURE SENSOR

# RTC-4701JE / NB RX-4702CF

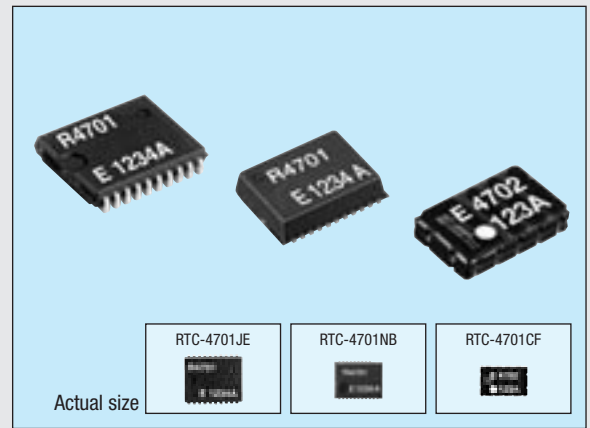
Product number (please refer to page 5)

Q4147017x000200

Q4147019x000200

Q414702Axxxxx00

- Built-in crystal unit allows adjustment-free efficient operation.
- Serial interface which can be controlled by three signal lines.
- Alarm interrupt function for day of week, day, hour, and minute.
- Timer interrupt function which can be set up between 1/4096 second and 255 minutes. (Except for RX-4702CF)
- OVF interrupt function based on 12-bit additional counter.
- Ability to detect stopping of oscillation and time update.
- Built-in temperature sensor. (voltage output RTC-4701JE / NB : -7.6 mV / °C Typ. RX-4702CF : -7.8 mV / °C Typ.)
- Wide range of voltage between 1.6 V and 5.5 V.
- Low power consumption at 0.5 μA / 3 V. (Typ.)
- Available for lead (Pb) - free soldering.
- Lead (Pb) - free terminal (RX-4702CF), Available for lead (Pb) - free terminal (RTC-4701JE / NB).



The details are mentioned in the application manual.

<http://www.epsondevice.com>

## Specifications (characteristics)

### Absolute Max. rating

Item	Symbol	Condition	Min.	Max.	Unit
Supply voltage	VDD	VDD to GND	-0.3	+7.0	V
Input voltage	VIN	Input Pin	GND -0.3	VDD +0.3	
Output voltage	VOUT1	TIRQ, AIRQ, IRQ		+8.0	
	VOUT2	FOUT, DATA		VDD +0.3	
Storage temperature	TSTG	Stored as bare product after unpacking	-55	+125	°C

### Operating range

Item	Symbol	Condition	Min.	Max.	Unit
Power voltage	VDD	-	1.6	5.5	V
Clock voltage	VCLK	-			
Operating temperature	TOPR	No condensation	-40	+85	°C

### Frequency characteristics

Item	Symbol	Condition	Range	Unit
Frequency tolerance	Δf/f	Ta = +25 °C, VDD = 3 V	B: 5 ±23*	x 10 <sup>-6</sup>
Oscillation start up time	tSTA	Ta = +25 °C, VDD = 3.0 V	3 Max.	s
Frequency temperature characteristics	T <sub>op</sub>	Ta = -20 °C to +70 °C Reference at +25 °C	+10 -120	x 10 <sup>-6</sup>
Frequency voltage characteristics	f/V	Ta = +25 °C, VDD = 1.6 to 5.5 V	±2 Max.	x 10 <sup>-6</sup> / V
Aging	fa	Ta = +25 °C, VDD = 3.0 V	±5 Max.	x 10 <sup>6</sup> / year

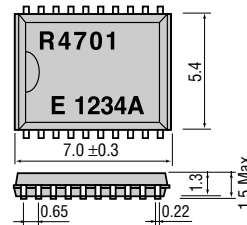
\* Please ask tighter tolerance.

### DC characteristics (GND = 0 V, VDD = 1.6 V to 5.5 V, Ta = -40 °C to +85 °C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Standby current 1	IDD1	VDD = 5 V CE, FOE, SOFF = GND AIRQ, TIRQ, IRQ = VDD 32.768 kHz output is OFF. Sensor output is OFF.	-	1.0	2.0	μA
	IDD2	VDD = 3 V	-	0.5	1.0	
Standby current 2	VIH	CE, CLK, DATA, FOE, SOFF	0.8 VDD	-	VDD +0.3	V
Input voltage	UIL		GND -0.3	-	0.2 VDD	
Output voltage 1	VOH1	VDD = 5 V	IOH = -1 mA DATA, FOUT pins	4.5	5.0	V
	VOH2	VDD = 3 V		2.0		
	VOH3	VDD = 3 V	IOH = -100 μA DATA, FOUT pins	2.9	3.0	
Output voltage 2	VOL1	VDD = 5 V	IOL = 1 mA DATA, FOUT pins	GND	GND +0.5	V
	VOL2	VDD = 5 V			GND +0.8	
	VOL3	VDD = 3 V	IOL = 100 μA DATA, FOUT pins	GND +0.1		
	VOL4	VDD = 5 V	IOL = 1 mA	GND +0.25		
	VOL5	VDD = 3 V	AIRQ, TIRQ, IRQ pins	GND +0.4		

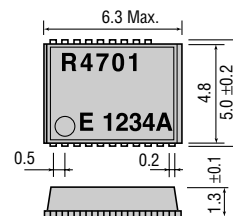
## External dimensions / Terminal connection (Unit: mm)

### RTC-4701JE (VSOJ 20-pin)



No.	Pin terminal	No.	Pin terminal
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

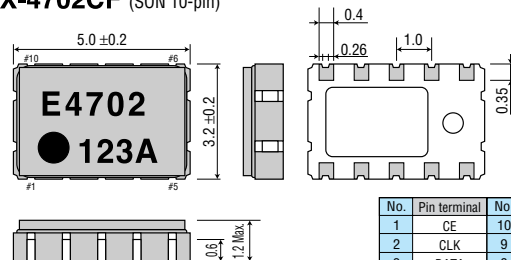
### RTC-4701NB (SON 22-pin)



No.	Pin terminal	No.	Pin terminal
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	-

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

### RX-4702CF (SON 10-pin)



No.	Pin terminal	No.	Pin terminal
1	CE	10	VDD
2	CLK	9	VTEMP
3	DATA	8	TIRQ
4	SOFF	7	FOE
5	GND	6	FOUT

## Temperature sensor characteristics

GND = 0 V, Ta = -40 °C to +85 °C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	
Temperature output voltage	VTEMP	Ta = +25 °C, GND based output voltage VTEMP pin, VDD = 2.7 V to 5.5 V		1.48		V	
Output precision	TACR	Ta = +25 °C, VDD = 2.7 V to 5.5 V			±5.0	°C	
Temperature sensitivity	VSE	-40 °C ≤ Ta ≤ +85 °C, VDD = 2.7 V to 5.5 V	RTC-4701JE/	-7.1	-7.6	-8.1	mV / °C
		RX-4702CF	-7.3	-7.8	-8.3		
Linearity	ΔNL	-40 °C ≤ Ta ≤ +85 °C, VDD = 2.7 V to 5.5 V			±2.0	%	
Output resistance	Ro	Ta = +25 °C, VTEMP pin, VDD = 2.7 V to 5.5 V GND standard and VDD standard		1.0	3.0	kΩ	

■ Register table

RTC-4701 JE / NB : BANK0

Address	Register symbol	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
0	Sec	fos	S 40	S 20	S 10	S 8	S 4	S 2	S 1
1	Min	fr	Min 40	Min 20	Min 10	Min 8	Min4	Min 2	Min 1
2	Hour	fr	0	Hour 20	Hour 10	Hour 8	Hour4	Hour 2	Hour 1
3	Day of Week	fr	W 6	W 5	W 4	W 3	W 2	W 1	W 0
4	Day	fr	0	Day 20	Day 10	Day 8	Day 4	Day 2	Day 1
5	Month	fr	C	0	Month 10	Month 8	Month 4	Month 2	Month 1
6	Year	Year 80	Year 40	Year 20	Year 10	Year 8	Year 4	Year 2	Year 1
7	Minutes Alarm	AE	A-Min 40	A-Min 20	A-Min 10	A-Min 8	A-Min 4	A-Min 2	A-Min 1
8	Hours Alarm	AE	*	A-Hr 20	A-Hr 10	A-Hr 8	A-Hr 4	A-Hr 2	A-Hr 1
9	Day of week Alarm	AE	A-W 6	A-W 5	A-W 4	A-W 3	A-W 2	A-W 1	A-W 0
A	Day Alarm	AE	*	A-Day 20	A-Day 10	A-Day 8	A-Day 4	A-Day 2	A-Day 1
B	-	-	-	-	-	-	-	-	-
C	Timer setup	TE	*	TD <sub>1</sub>	TD <sub>0</sub>	*	*	*	*
D	Timer Couner	128	64	32	16	8	4	2	1
E	Control 1	0	0	0	TI / TP	AF	TF	AIE	TIE
F	Control 2	0	TEST	STOP	RESET	HOLD	0	0	0

RX-4702CF : BANK0

Address	Register symbol	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
B	Additional counter 1	128	64	32	16	8	4	2	1
C	Additional counter 2	fr	AC1	AC0	OVF	2048	1024	512	256
D	Control 3	FOES	TEST1	0	0	-	ACIE	ACE	SON
E	Control 1	0	0	0	0	AF	0	AIE	0
F	Control 2	0	TEST0	STOP	RESET	HOLD	0	0	0

RTC-4701 JE / NB : BANK1

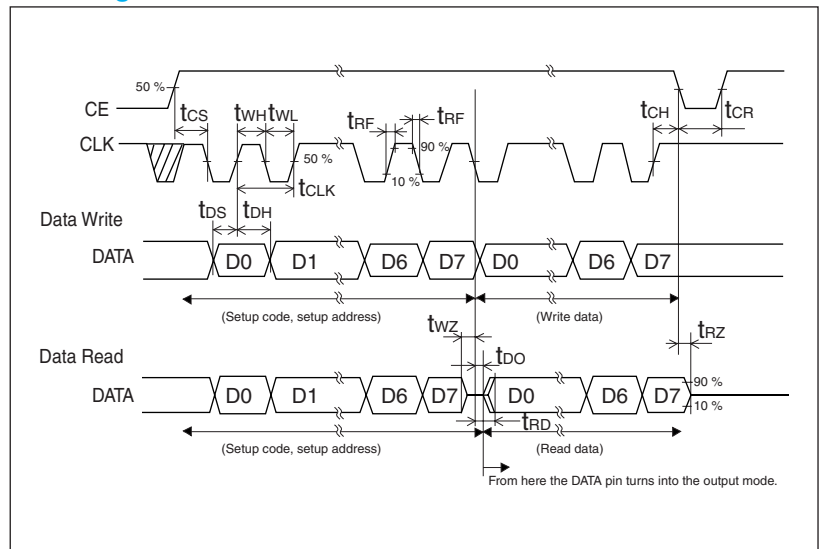
Address	Register symbol	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
B	Additional counter 1	128	64	32	16	8	4	2	1
C	Additional counter 2	fr	AC1	AC0	OVF	2048	1024	512	256
D	-	-	-	-	-	-	-	-	-
E	-	-	-	-	-	-	-	-	-
F	Control 3	FOES	TEST	-	-	-	ACIE	ACE	SON

Registers 0 to A are the same in BANK0 and BANK1.

■ AC characteristics (GND = 0 V, Ta = -40 °C to +85 °C)

Item	Symbol	Control	V <sub>DD</sub> = 3.0 V ± 10 %		V <sub>DD</sub> = 5.0 V ± 10 %		Unit
			Min.	Max.	Min.	Max.	
CLK clock cycle	t <sub>CLK</sub>		600		350		ns
CLK H Pulse Width	t <sub>WH</sub>						
CLK L Pulse Width	t <sub>WL</sub>				175		
CE setup time	t <sub>CS</sub>		300				
CE hold time	t <sub>CH</sub>						
CE recovery time	t <sub>CR</sub>		400		300		
Write data setup time	t <sub>DS</sub>		75		50		
Write data hold time	t <sub>DH</sub>						
Write data disable delay time	t <sub>DZ</sub>		0		0		
Output mode switching time	t <sub>DO</sub>						
Read data delay time	t <sub>RD</sub>	CL = 50 pF		300		120	
Output disable time	t <sub>TRZ</sub>	CL = 50 pF RL = 10 kΩ		200		100	
Rise and fall time	t <sub>RF</sub>			100		50	
FOUT duty ratio (32.768 kHz output)	Duty		40	60	40	60	

■ Timing chart



■ Block diagram

