

SERIAL REAL TIME CLOCK MODULE WITH TEMPERATURE SENSOR

RTC-4701JE / NB RX-4702CF

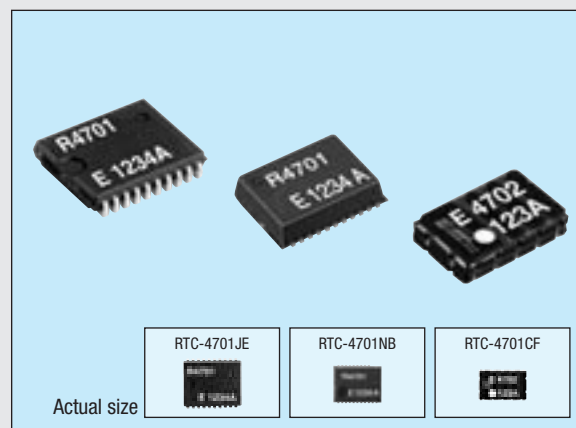
Product number (please refer to page 5)

Q4147017x000200

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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		VDD +0.3	
Output voltage	VOUT1	TIRQ, AIRQ, IRQ	GND -0.3	+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	$\Delta f/f$	Ta = +25 °C, VDD = 3 V	B: 5 ±23*	x 10 ⁻⁶
Oscillation start up time	tSTA	Ta = +25 °C, VDD = 3.0 V	3 Max.	s
Frequency temperature characteristics	T _{op}	Ta = -20 °C to +70 °C Reference at +25 °C	+10 -120	x 10 ⁻⁶
Frequency voltage characteristics	f/V	Ta = +25 °C, VDD = 1.6 to 5.5 V	±2 Max.	x 10 ⁻⁶ / V
Aging	fa	Ta = +25 °C, VDD = 3.0 V	±5 Max.	x 10 ⁻⁶ / year

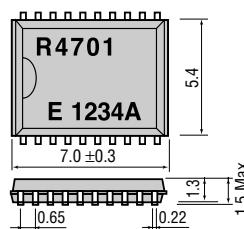
* Please ask tighter tolerance.

■ 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	0.8VDD	—	VDD +0.3	V	
Input voltage	VIL		GND-0.3		0.2VDD		
Output voltage 1	VOH1	VDD = 5 V	IOH = -1 mA	4.5	5.0	V	
	VOH2	VDD = 3 V	DATA, FOUT pins	2.0			
	VOH3		IOH = -100 µA DATA, FOUT pins	2.9			3.0
Output voltage 2	VOL1	VDD = 5 V	IOL = 1 mA	GND	—		GND +0.5
	VOL2	VDD = 3 V	DATA, FOUT pins				GND +0.8
	VOL3		IOL = 100 µA DATA, FOUT pins				GND +0.1
	VOL4		VDD = 5 V				IOL = 1 mA
	VOL5	VDD = 3 V	AIRQ, TIRQ, IRQ pins				GND +0.4

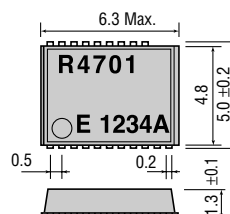
■ External dimensions / Terminal connection (Unit: mm)

● RTC-4701JE (VSQJ 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

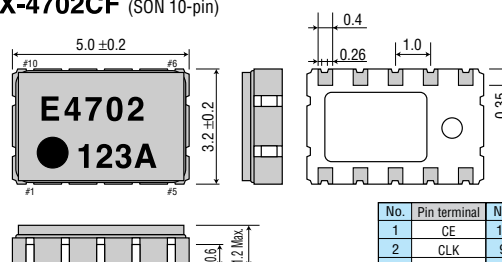
● RTC-4701NB (SON 22-pin)



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	-7.1	-7.6	-8.1	mV / °C
		RTC-4701JE / 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	Min 4	Min 2	Min 1
2	Hour	fr	0	Hour 20	Hour 10	Hour 8	Hour 4	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 ₁	TD ₀	*	*	*	*
D	Timer Counter	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

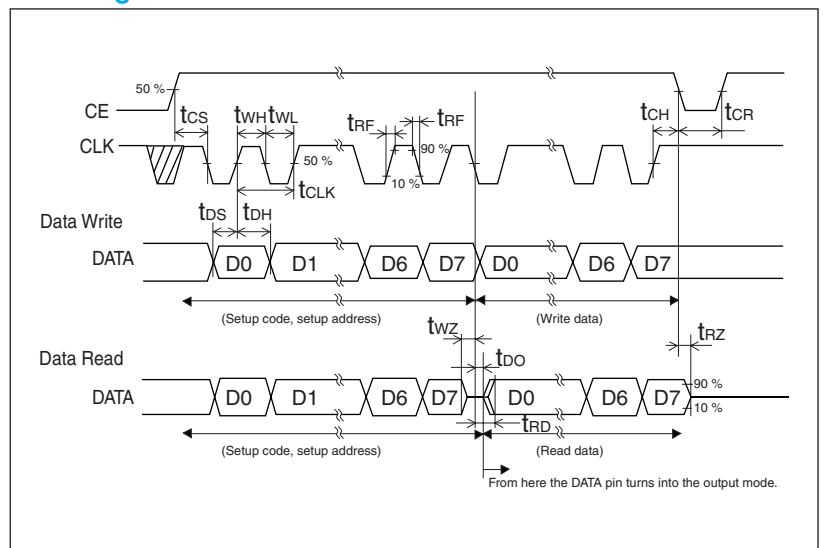
Address	Register symbol	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
B	Additional counter 1	128	64	32	16	8	4	2	1
C	Additional counter 2	fr	AC1	AC0	OVF	2048	1024	512	256
D	—	—	—	—	—	—	—	—	—
E	—	—	—	—	—	—	—	—	—
F	Control 3	FOES	TEST	—	—	—	ACIE	ACE	SON

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

■ Timing chart



■ Block diagram

