SERIAL REAL TIME CLOCK MODULE WITH TEMPERATURE SENSOR

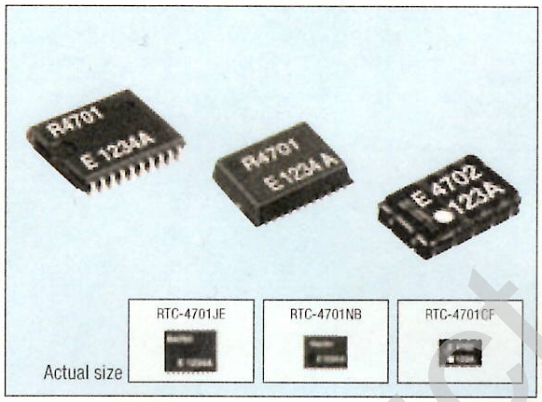
RTC-4701JE / NB RX-4702CF

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 termainal (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	V_{DD}	V_{DD} to GND	-0.3	+7.0	V
Input voltage	V_{IN}	Input Pin	GND -0.3	V_{DD} +0.3	
Output voltage	V_{OUT1}	$\overline{TIRQ}$, $\overline{AIRQ}$, IRQ		+8.0	
	V_{OUT2}	FOUT, DATA		V_{DD} +0.3	
Storage temperature	TSTG	Stored as bare product after unpacking	-55	+125	°C

Operating range

Item	Symbol	Condition	Min.	Max.	Unit
Power voltage	V_{DD}	–	1.6	5.5	V
Clock voltage	V_{CLK}	–			
Operating temperature	TOPR	No condensation	-40	+85	°C

Frequency characteristics

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

* Please ask tighter tolerance.

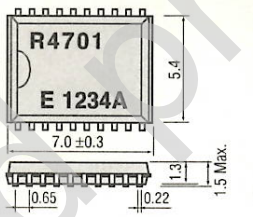
DC characteristics

(GND = 0 V, V_{DD} = 1.6 V to 5.5 V, Ta = -40 °C to +85 °C)

Item	Symbol	Condition		Min.	Typ.	Max.	Unit
Standby current 1	I_{DD1}	V_{DD} = 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
	I_{DD2}	V_{DD} = 3 V			0.5	1.0	
Standby current 2	V_{IH}	CE, CLK, DATA, FOE, SOFF		0.8 V_{DD}	–	V_{DD} +0.3	V
Input voltage	V_{IL}			GND -0.3		0.2 V_{DD}	
Output voltage 1	V_{OH1}	V_{DD} = 5 V	I_{OH} = -1 mA DATA, FOUT pins	4.5	–	5.0	V
	V_{OH2}	V_{DD} = 3 V		2.0			
	V_{OH3}		I_{OH} = -100 µA DATA, FOUT pins	2.9		3.0	
Output voltage 2	V_{OL1}	V_{DD} = 5 V	I_{OL} = 1 mA DATA, FOUT pins	GND		GND +0.5	
	V_{OL2}	V_{DD} = 3 V				GND +0.9	
	V_{OL3}		I_{OL} =100 µA DATA, FOUT pins			GND +0.1	
	V_{OL4}	V_{DD} = 5 V	I_{OL} = 1 mA $\overline{AIRQ}$, $\overline{TIRQ}$, IRQ pins			GND +0.25	
	V_{OL5}	V_{DD} = 3 V				GND +0.4	

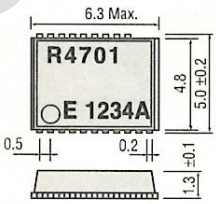
External dimensions / Terminal connection (Unit: mm)

RTC-4701JE (VSOJ 20-pin)



No.	Pin terminal	No.	Pin terminal
1	V_{DD}	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

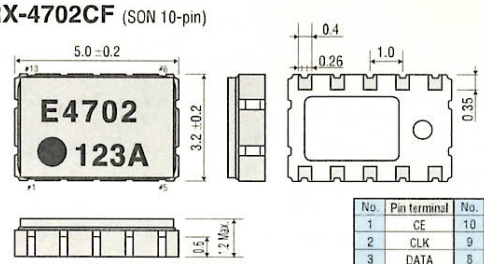
RTC-4701NB (SON 22-pin)



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	V_{DD}	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	V_{DD}
2	CLK	9	VTEMP
3	DATA	8	IRQ
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, V_{DD} = 2.7 V to 5.5 V			1.48		V
Output precision	TACR	Ta = +25 °C, V_{DD} = 2.7 V to 5.5 V				±5.0	°C
Temperature sensitivity	VSE	-40 °C ≤ Ta ≤ +85 °C, V_{DD} = 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, V_{DD} = 2.7 to 5.5 V				±2.0	%
Output resistance	Ro	Ta = +25 °C, VTEMP pin, V_{DD} = 2.7 V to 5.5 V GND standard and V_{DD} 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	*	TD1	TD0	*	*	*	*
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

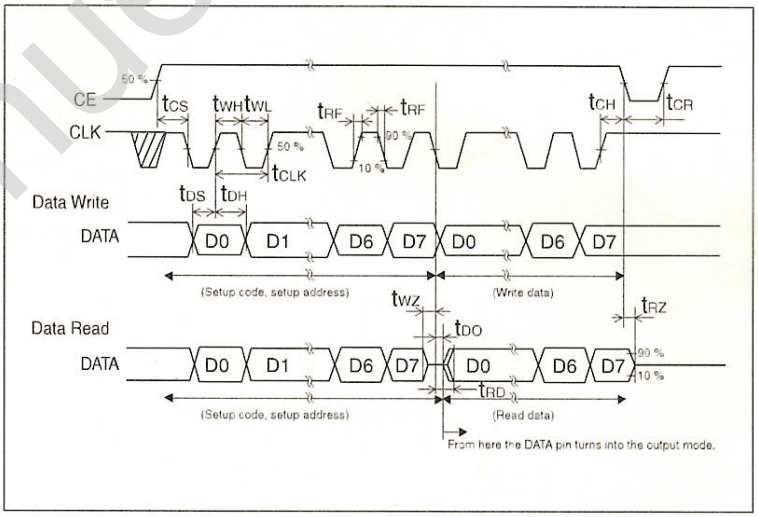
Registers 0 to A are the same in BANK0 and BANK1.

AC characteristics

(GND = 0 V, Ta = -40 °C to +85 °C)

Item	Symbol	Control	V_{DD} = 3.0 V ± 10 %		V_{DD} = 5.0 V ± 10 %		Unit
			Min.	Max.	Min.	Max.	
CLK clock cycle	tCLK	–	600	–	350	–	ns
CLK H Pulse Width	tWH		300		175		
CLK L Pulse Width	tWL						
CE setup time	tCS						
CE hold time	tCH						
CE recovery time	tCR		400		300		
Write data setup time	tDS		75		50		
Write data hold time	tDH						
Write data disable delay time	tWZ		0		0		
Output mode switching time	tDO						
Read data delay time	tRD	CL = 50 pF	–	300	–	120	
Output disable time	tRZ	CL = 50 pF RL = 10 kΩ	–	200	–	100	
Rise and fall time	tRF	–		100		50	
FOUT duty ratio (32.768 kHz output)	Duty	–	40	60	40	60	%

Timing chart



Block diagram