SERIAL REAL TIME CLOCK MODULE WITH TEMPERATURE SENSOR

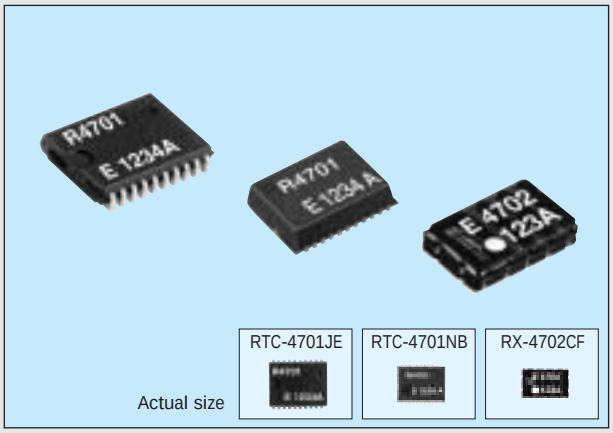
RTC-4701JE/NB RX-4702CF

Product number (please refer to page 2)

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.
- Automatic adjustment for leap year.
- 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.)

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}	$\overline{TIRQ}$, $\overline{AIRQ}$, $\overline{IRQ}$		+8.0	
	V_{OUT2}	FOUT,DATA		V_{DD}+0.3	
Storage temperature	T_{STG}	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	V_{OPR}	No condensation	-40	+85	°C

Frequency characteristics

Item	Symbol	Condition	Range	Unit
Frequency tolerance	Δf/fo	Ta=+25 °C, V_{DD}=3 V	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=-10 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 V	±5 Max.	x 10^{-6}/year

* Please ask tighter tolerance.

DC characteristics

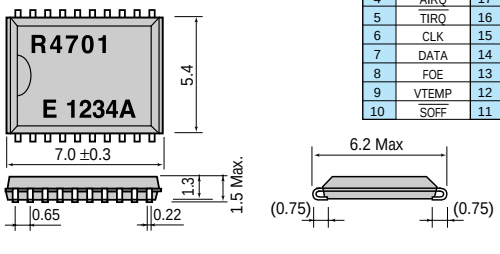
(GND=0 V, V_{DD}=1.6 V to 5.5 V,Ta=-40 °C to +85 °C)

Item	Symbol	Condition		Min.	Typ.	Max.	Unit
Standby current 1	I_{DD1}	V_{DD}=5 V	CE,FOE,$\overline{SOFF}$=GND $\overline{AIRQ}$,$\overline{TIRQ}$,$\overline{IRQ}$=V_{DD} 32.768 kHz output is OFF. Sensor output is OFF.	—	1.0	2.0	µA
Standby current 2	I_{DD2}	V_{DD}=3 V			0.5	1.0	
Input voltage	V_{IH}	CE,CLK,DATA, FOE,$\overline{SOFF}$		0.8V_{DD}	—	V_{DD}+0.3	V
	V_{IL}			GND-0.3		0.2V_{DD}	
Input leakage current	I_{LK}	CLK,DATA,FOE,$\overline{SOFF}$ V_{IN}=V_{DD} or GND		-0.5		0.5	µA
Pulldown R1	R_{DWN1}	V_{DD}=5 V	CE pins V_{IN}=V_{DD}	75	150	300	kΩ
Pulldown R2	R_{DWN2}	V_{DD}=3 V		150	300	600	
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		3.0	
	V_{OH3}		I_{OH}=-100 µA DATA,FOUT pins	2.9			
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+0.8	
	V_{OL3}		I_{OL}=100 µA DATA,FOUT pins			GND+0.1	
	V_{OL4}	V_{DD}=5 V	I_{OL}=1 mA $\overline{AIRQ}$, $\overline{TIRQ}$, $\overline{IRQ}$ pins			GND+0.25	
	V_{OL5}	V_{DD}=3 V				GND+0.4	
Leakage current	I_{OZ}	V_{OUT}=GND or V_{DD}, FOUT,DATA , $\overline{AIRQ}$, $\overline{TIRQ}$, $\overline{IRQ}$ pins		-0.5		0.5	µA

External dimensions/Terminal connection

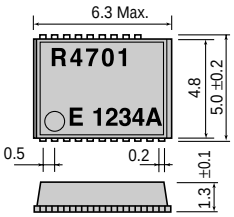
(Unit: mm)

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	$\overline{AIRQ}$	17	N.C
5	$\overline{TIRQ}$	16	N.C
6	CLK	15	N.C
7	DATA	14	N.C
8	FOE	13	N.C
9	VTEMP	12	N.C
10	$\overline{SOFF}$	11	GND

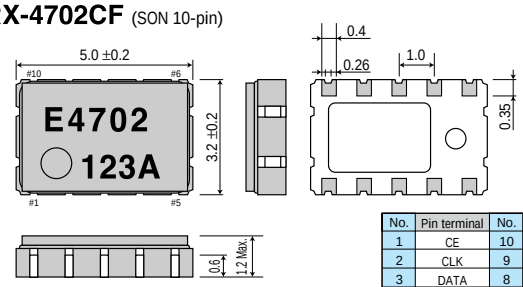
RTC-4701NB (SON 22-pin)



No.	Pin terminal	No.	Pin terminal
1	GND	22	N.C
2	$\overline{SOFF}$	21	N.C
3	VTEMP	20	N.C
4	FOE	19	N.C
5	DATA	18	N.C
6	CLK	17	N.C
7	$\overline{TIRQ}$	16	N.C
8	$\overline{AIRQ}$	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	$\overline{IRQ}$
4	$\overline{SOFF}$	7	FOE
5	GND	6	FOUT

Temperature sensor characteristics

GND=0 V,Ta=-40 °C to +85 °C

Parameter	Symbol	Condition		Min.	Typ.	Max.	Unit
Temperature output voltage	V_{TEMP}	Ta=+25 °C, GND based output voltage VTEMP pin, V_{DD}=2.7 V to 5.5 V			1.48		V
Output precision	T_{ACR}	Ta=+25 °C, V_{DD}=2.7 V to 5.5 V				±5.0	°C
Temperature sensitivity	V_{SE}	-40 °C ≤ Ta ≤ +85 °C, V_{DD}=2.7 V to 5.5 V	RTC-4701JE/NB	-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 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	*	TD_1	TD_0	*	*	*	*
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

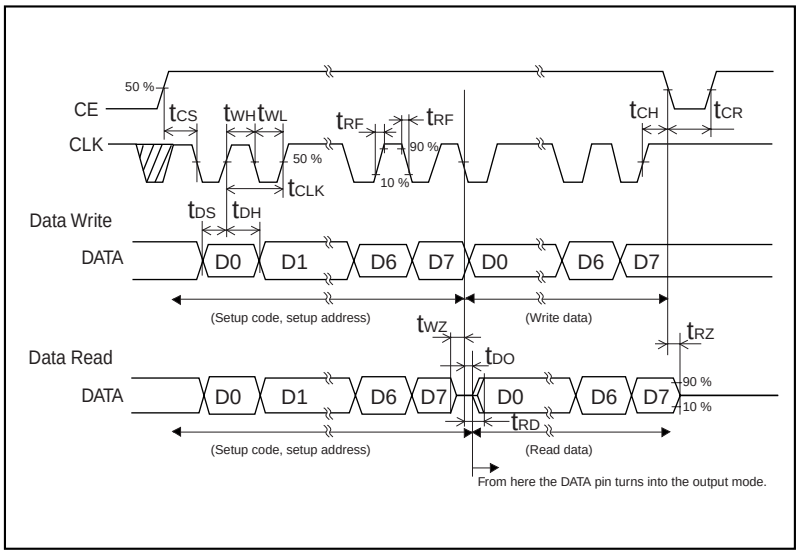
0 : Always set this bit to"0". Registers 0 to A are the same in BANK0 and BANK1.

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}		300		175		
CLK L Pulse Width	t_{WL}						
CE setup time	t_{CS}						
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_{WZ}		0		0		
Output mode switching time	t_{DO}						
Read data delay time	t_{RD}	C_L=50 pF	—	300	—	120	
Output disable time	t_{RZ}	C_L=50 pF R_L=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