

NEW PRODUCTS

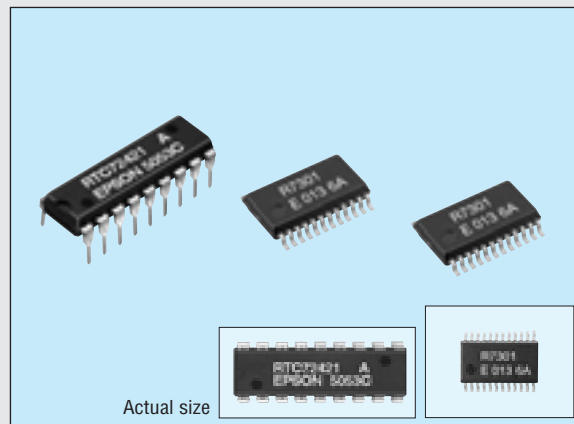
Real time clock module

4-bit REAL TIME CLOCK MODULE

RTC-7301DG/SF

- Built-in liquid crystal oscillator 32.768 kHz with frequency adjusted
- Frequency selectable clock output (32.768 kHz to 1/30 Hz)
- Built-in 30 second adjustment function, digital pace adjustment function (Max. adjustment: $\pm 192 \times 10^{-6}$)
- Built-in alarm and timer interrupt functions.
- Built-in semiconductor temperature sensor (Voltage output: $-7.8 \text{ mV} / ^\circ\text{C}$, RTC-7301SF)
- Operating voltage range: 2.4 V to 5.5 V, timekeeper (retained) voltage range: 1.6 V to 5.5 V
- Low current consumption (0.6 $\mu\text{A} / 3 \text{ V Typ.}$)
- High speed parallel interface compatible with S-RAM

The details are mentioned in the application manual.



<http://www.epson.co.jp/device/>

Specifications (characteristics)

Absolute Max. ratings

GND=0V

Item	Symbol	Condition	Min.	Max.	Unit
Power supply voltage	V _{DD}	—	-0.3	+7.0	V
Input voltage	V _{IN}	Input terminal, D0 to D3 pins	GND -0.3	V _{DD} + 0.3	
Output voltage(1)	V _{OUT1}	/ IRQ pin	GND -0.3	+ 8.0	
Output voltage(2)	V _{OUT2}	FOUT, D0-D3 pins, VTEMP pin	GND -0.3	V _{DD} + 0.3	
Storage temperature	T _{STG}	—	-55	+125	°C

Operating conditions

GND=0V

Item	Symbol	Condition	Min.	Max.	Unit
Power supply voltage	V _{DD}	—	2.4	5.5	V
Clock power supply voltage	V _{CLK}	—	1.6	5.5	V
Operating temperature	T _{OPR}	—	- 40	+ 85	°C

Frequency characteristics

Item	Symbol	Condition	Specifications	Unit
Frequency precision	$\Delta f/f_0$	T _a =+25 °C, V _{DD} = 3.0 V	5 ± 23	$\times 10^{-6}$
Frequency voltage characteristics	f/V	T _a =+25 °C, V _{DD} = 1.6 V to 5.5V	±2	$\times 10^{-6}/\text{V}$
Frequency temperature characteristics	T _{OP}	T _a =-10 °C to +70 °C, V _{DD} = 3.0 V	+10/-120	$\times 10^{-6}$
Oscillating starting time	t _{STA}	T _a =+25 °C, V _{DD} = 2.4 V	3 (Max.)	s
Aging amount	fa	T _a =+25 °C, V _{DD} = 3.0 V	±5	$\times 10^{-6}/\text{Y}$

DC characteristics

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

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Current consumption (When non-accessed)	I _{DD1}	V _{DD} = 5 V CS ₀ , RD, WR=V _{DD} A ₀ -A ₃ , CS ₁ =GND D ₀ -D ₃ , IRQ=Hi-z FOUT=Hi-z(OFF)	—	1.0	2.0	μA
FOUT =Output OFF VTEMP =Output OFF	I _{DD2}	V _{DD} = 3 V VTEMP (Temperature voltage output)=Hi-z(OFF)	—	0.6	1.0	μA

Note) There is no VTEMP pin on the RTC-7301DG so standards for the VTEMP pin within the conditions described above do not apply.

Temperature sensor characteristics

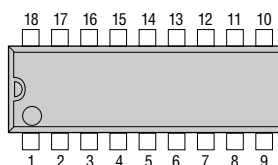
GND=0 V, T_a= - 40 °C to + 85 °C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Temperature output voltage	VTEMP	T _a = +25 °C, GND based output voltage VTEMP pins, V _{DD} =2.7 V to 5.5 V		1.470		V
Output precision	T _{ACR}	T _a = +25 °C, V _{DD} =2.7 V to 5.5 V			±5.0	°C
Temperature sensitivity	V _{SE}	-40 °C ≤ T _a ≤ +85 °C, V _{DD} =2.7 V to 5.5 V	-7.3	-7.8	-8.3	mV/°C
Linearity	ΔNL	-40 °C ≤ T _a ≤ +85 °C, V _{DD} =2.7 V to 5.5 V			±2.0	%
Temperature detection range	T _{SOP}	ΔNL ≤ ± 20 %, V _{DD} =2.7 V to 5.5 V	-40		+85	°C
Output resistance	R _o	T _a = +25 °C, VTEMP pins, V _{DD} =2.7 V to 5.5 V GND standard and V _{DD} standard		1.0	3.0	kΩ
Load condition	C _L	V _{DD} =2.7 V to 5.5 V			100	pF
	R _L	V _{DD} =2.7 V to 5.5 V	500			kΩ
Response time	t _{rsp}	V _{DD} =3.3 V C _L =50 pF, R _L = 500 kΩ, Max. ±1 °C			200	μs

Note) There is no temperature sensor function on the RTC-7301DG.

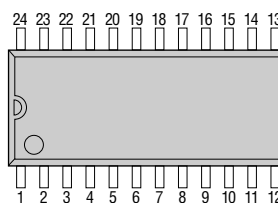
Terminal connection

RTC-7301DG



No.	Pin terminal	No.	Pin terminal
1	CS ₀	18	V _{DD}
2	FOUT	17	(V _{DD})
3	IRQ	16	(V _{DD})
4	A ₀	15	CS ₁
5	A ₁	14	D ₀
6	A ₂	13	D ₁
7	A ₃	12	D ₂
8	RD	11	D ₃
9	GND	10	WR

RTC-7301SF



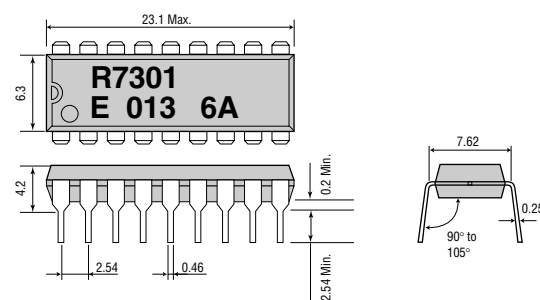
No.	Pin terminal	No.	Pin terminal
1	CS ₀	24	V _{DD}
2	FOUT	23	(V _{DD})
3	FOUT	22	(V _{DD})
4	VTEMP	21	(V _{DD})
5	(V _{DD})	20	(V _{DD})
6	IRQ	19	(V _{DD})
7	A ₀	18	CS ₁
8	A ₁	17	D ₀
9	A ₂	16	D ₁
10	A ₃	15	D ₂
11	RD	14	D ₃
12	GND	13	WR

- (V_{DD}) and V_{DD} are to have the same level of voltage. Do not connect it to any external terminals.
- NC is not connected internally.

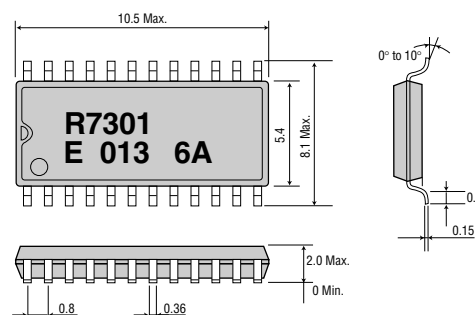
External dimensions

(Unit: mm)

RTC-7301DG



RTC-7301SF



Register table

Bank0 Clock and calendar registers

Address	Register	bit3	bit2	bit1	bit0
0	1 second digit	8	4	2	1
1	10 second digit	Fos	40	20	10
2	1 minute digit	8	4	2	1
3	10 minute digit	o	40	20	10
4	1hour digit	8	4	2	1
5	10 hour digit	o	o	20	10
6	Day digit	o	4	2	1
7	1 day digit	8	4	2	1
8	10 day digit	o	o	20	10
9	1 month digit	8	4	2	1
A	10 month digit	o	o	o	10
B	1 year digit	8	4	2	1
C	10 year digit	80	40	20	10
D	100 year digit	800	400	200	100
E	1000 year digit	TEST	TEMP	2000	1000
F	Control registers	Bank Sel 1	Bank Sel 0	STOP	BUSY/ADJ

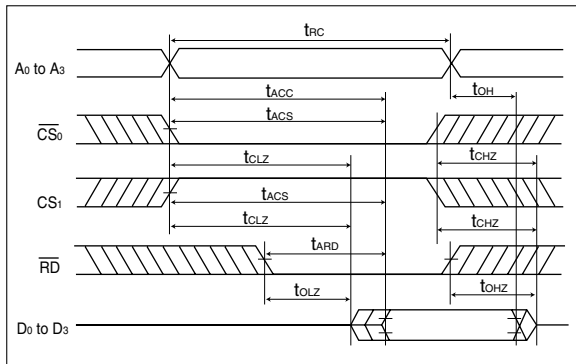
Bank1 Alarms and FOUT registers

Address	Register	bit3	bit2	bit1	bit0
0	1 second digit	8	4	2	1
1	10 second digit	AE	40	20	10
2	1 minute digit	8	4	2	1
3	10 minute digit	AE	40	20	10
4	1hour digit	8	4	2	1
5	10 hour digit	AE	•	20	10
6	Day digit	AE	4	2	1
7	1 day digit	8	4	2	1
8	10 day digit	AE	•	20	10
9	—	•	•	•	•
A	—	•	•	•	•
B	CS1 Controller	CTEMP	CDT_ON	•	•
C	FOUT divider ratio setting register	o	FD2	FD1	FD0
D	FOUT divider ratio setting register	FE	o	FD4	FD3
E	Alarm control	TEST	TEMP	AF	AIE
F	Control register	Bank Sel 1	Bank Sel 0	STOP	BUSY/ADJ

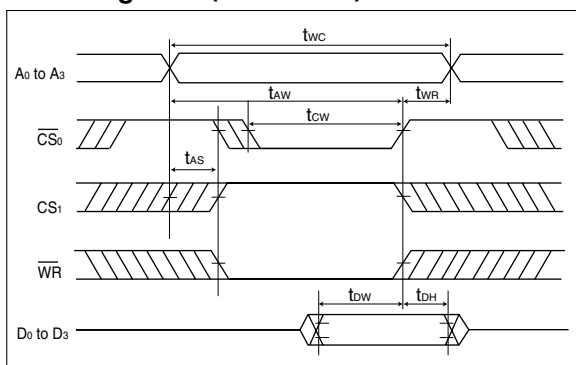
Bank2 Digital offset and timer registers

Address	Registers	bit3	bit2	bit1	bit0
0	Digital offset	DT3	DT2	DT1	DT0
1		DT_ON	DT6	DT5	DT4
2	—	o	o	o	o
3	—	o	o	o	o
4	Timer counter preset value	8	4	2	1
5		128	64	32	16
6	Timer counter data	8	4	2	1
7		128	64	32	16
8	Timer settings	TE	TI/TP	TD1	TD0
9	—	o	o	o	o
A	—	o	o	o	o
B	—	o	o	o	o
C	—	o	o	o	o
D	—	o	o	o	o
E	Timer control	TEST	TEMP	TF	TIE
F	Control register	Bank Sel 1	Bank Sel 0	STOP	BUSY/ADJ

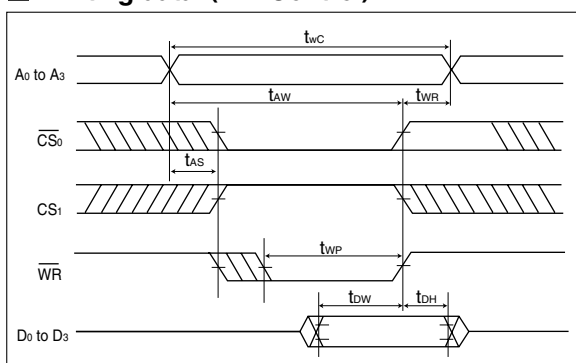
Reading data



Writing data (CS Control)



Writing data (WR Control)



Switching characteristics

*GND=0 V, Ta= -40 °C to + 85 °C *Input conditions: Vi= 0.5 x VDD, Vo= 0.5 x VDD *Output load: Ci= 100 pF (tACC,tACS,tARD)

Item	Symbol	Condition	VDD=2.4 to 3.6 V		VDD=4.5 to 5.5 V		Unit
			Min.	Max.	Min.	Max.	
Read cycle time	t _{RC}	—	150	—	85	—	ns
Address access time	t _{ACC}	—	—	150	—	85	ns
CE access time	t _{ACS}	—	—	150	—	85	ns
RD access time	t _{ARD}	—	—	100	—	45	ns
CE output set time	t _{CLZ}	—	5	—	3	—	ns
CE output floating	t _{CHZ}	—	—	60	—	30	ns
RD output set time	t _{OLZ}	—	5	—	3	—	ns
RD output floating	t _{OHZ}	—	—	60	—	30	ns
Output hold time	t _{OH}	—	10	—	5	—	ns
Write cycle time	t _{WC}	—	150	—	85	—	ns
Chip select time	t _{CW}	—	140	—	70	—	ns
Address valid end of write	t _{AW}	—	140	—	70	—	ns
Address setup time	t _{AS}	—	0	—	0	—	ns
Address hold time	t _{WR}	—	0	—	0	—	ns
Write pulse width	t _{WP}	—	130	—	65	—	ns
Input data set time	t _{DW}	—	80	—	35	—	ns
Input data hold time	t _{DH}	—	0	—	0	—	ns
FOUT output frequency duty	DUTY	FOUT= 32.768 kHz	40	60	40	60	%

Block diagram

