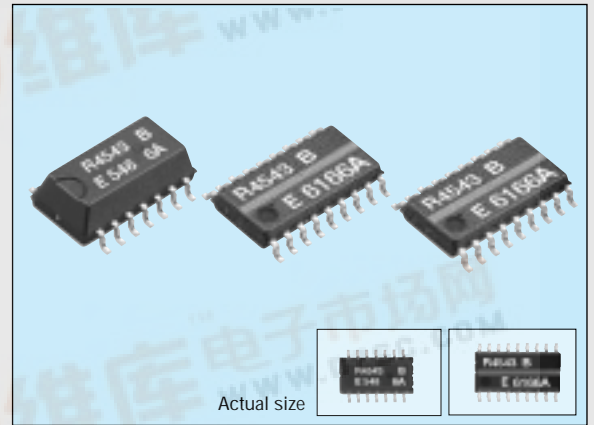


# SERIAL-INTERFACE REAL TIME CLOCK MODULE

## RTC-4543SA/SB

- Built-in crystal unit allows adjustment-free efficient operation.
- Automatic leap year correction.
- Output selectable between 32.768 kHz/1 Hz.
- Operating voltage range: 2.5V to 5.5V.
- Supply voltage detection voltage: 1.7±0.3V.
- Low current consumption: 1.0 μA/2.0V (Max.)



### Specifications (characteristics)

#### Absolute Max. rating

Item	Symbol	Condition	Min.	Max.	Unit
Power source voltage	V <sub>DD</sub>	V <sub>DD</sub> -GND		7.0	V
Input voltage	V <sub>IN</sub>	—	-0.3	V <sub>DD</sub> +0.3	
Output voltage	V <sub>OUT</sub>				
Storage temperature	T <sub>STG</sub>		-55	+125	°C

#### Operating range

Item	Symbol	Condition	Min.	Max.	Unit
Operating voltage	V <sub>DD</sub>	—	2.5	5.5	V
Date holding voltage	V <sub>CLK</sub>		1.4		
Operating temperature	T <sub>OPR</sub>		-40	+85	°C

#### Frequency characteristics

Item	Symbol	Condition	Range	Unit
Frequency tolerance	Δf/fo	T <sub>a</sub> =25°C, V <sub>DD</sub> =5V	5±23	ppm
Frequency temperature characteristics	T <sub>OP</sub>	-10 to +70°C	+10/-120	
Frequency voltage characteristics	f <sub>v</sub>	T <sub>a</sub> =25°C, V <sub>DD</sub> =2.0 to 5.5V	±2	ppm/V
Oscillation start time	t <sub>OSC</sub>	T <sub>a</sub> =25°C, V <sub>DD</sub> =2.5V	3	s
Aging	f <sub>a</sub>	First year T <sub>a</sub> =25°C, V <sub>DD</sub> =5V	±5	ppm/year

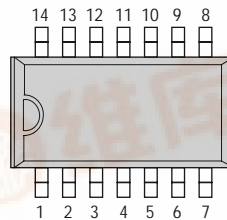
#### DC characteristics

(V<sub>DD</sub>=5V±0.5V, T<sub>a</sub>=-40 to +85°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit		
"H" input voltage	V <sub>IH</sub>	WR, DATA, CE, CLK, F <sub>OE</sub> , F <sub>SEL</sub> pins	0.8V <sub>DD</sub>		—	V		
"L" input voltage	V <sub>IL</sub>		—		0.2V <sub>DD</sub>			
Input off-leak current	I <sub>OFF</sub>	WR, CE, CLK, F <sub>OE</sub> , F <sub>SEL</sub> pins			0.5	μA		
"H" output voltage	V <sub>OH1</sub>	V <sub>DD</sub> =5.0V I <sub>OH</sub> =-1.0 mA	4.5		—	V		
	V <sub>OH2</sub>	V <sub>DD</sub> =3.0V DATA, F <sub>OUT</sub> pins	2.5		—			
"L" output voltage	V <sub>OL1</sub>	V <sub>DD</sub> =5.0V I <sub>OL</sub> =1.0 mA	—		0.5	V		
	V <sub>OL2</sub>	V <sub>DD</sub> =3.0V DATA, F <sub>OUT</sub> pins	—		0.8			
Output leak current	I <sub>OZH</sub>	V <sub>OUT</sub> =5.5V DATA, F <sub>OUT</sub> pins	-1.0		1.0	μA		
	I <sub>OZL</sub>	V <sub>OUT</sub> =0V						
Supply detection voltage	V <sub>DT</sub>	—	1.4	1.7	2.0	V		
Output load conditions	C <sub>L</sub>	F <sub>OUT</sub> pin	30 pF(max.)					
	N		2LS-TTL					
Current consumption	1	I <sub>DD1</sub>	V <sub>DD</sub> =5.0V	CE="L", F <sub>OE</sub> ="L" F <sub>SEL</sub> ="H"	1.5	3.0	μA	
	2	I <sub>DD2</sub>	V <sub>DD</sub> =3.0V		1.0	2.0		
	3	I <sub>DD3</sub>	V <sub>DD</sub> =2.0V		0.5	1.0		
	4	I <sub>DD4</sub>	V <sub>DD</sub> =5.0V		CE="L", F <sub>OE</sub> ="H" F <sub>SEL</sub> ="L"	4.0		10.0
	5	I <sub>DD5</sub>	V <sub>DD</sub> =3.0V			2.5		6.5
	6	I <sub>DD6</sub>	V <sub>DD</sub> =2.0V		No load on the F <sub>OUT</sub> pin	1.5		4.0

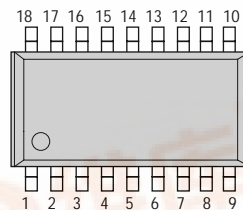
### Terminal connection

#### RTC-4543SA



No.	4543SA	4543SB
1	GND	N.C
2	N.C	N.C
3	CE	N.C
4	FSEL	N.C
5	WR	F <sub>OE</sub>
6	F <sub>OE</sub>	WR
7	N.C	FSEL
8	N.C	CE
9	V <sub>DD</sub>	GND
10	CLK	F <sub>OUT</sub>
11	DATA	DATA
12	N.C	CLK
13	N.C	N.C
14	F <sub>OUT</sub>	V <sub>DD</sub>
15	—	N.C
16	—	N.C
17	—	N.C
18	—	N.C

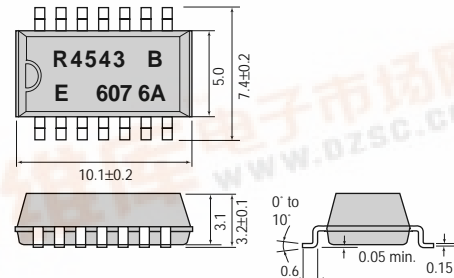
#### RTC-4543SB



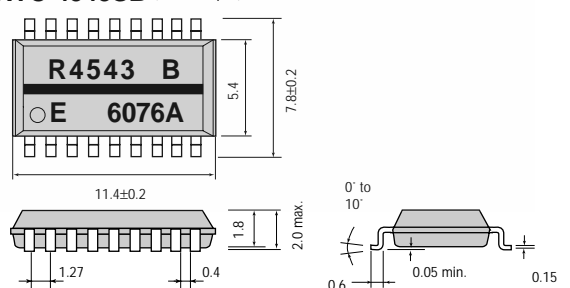
### External dimensions

(Unit: mm)

#### RTC-4543SA (SOP 14-pin)



#### RTC-4543SB (SOP 18-pin)



Register table

	MSB							
Seconds (0 to 59)	FDT	s 40	s 20	s 10	s 8	s 4	s 2	s 1
Minutes (0 to 59)	*	mi 40	mi 20	mi 10	mi 8	mi 4	mi 2	mi 1
Hour (0 to 23)	*	*	h 20	h 10	h 8	h 4	h 2	h 1
Day of the week (1 to 7)					*	w 4	w 2	w 1
Day (1 to 31)	*	*	d 20	d 10	d 8	d 4	d 2	d 1
Month (1 to 12)	TM	*	*	mo 10	mo 8	mo 4	mo 2	mo 1
year (0 to 99)	y 80	y 40	y 20	y 10	y 8	y 4	y 2	y 1

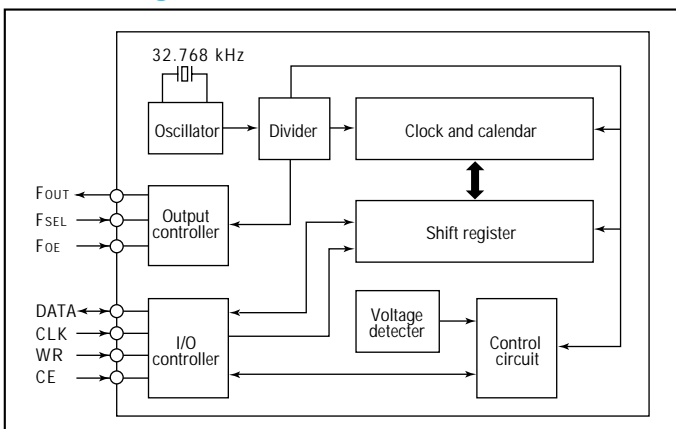
FDT bit: Supply voltage detection bit. TM bit: Test bit always set this bit to "0".

Switching characteristics

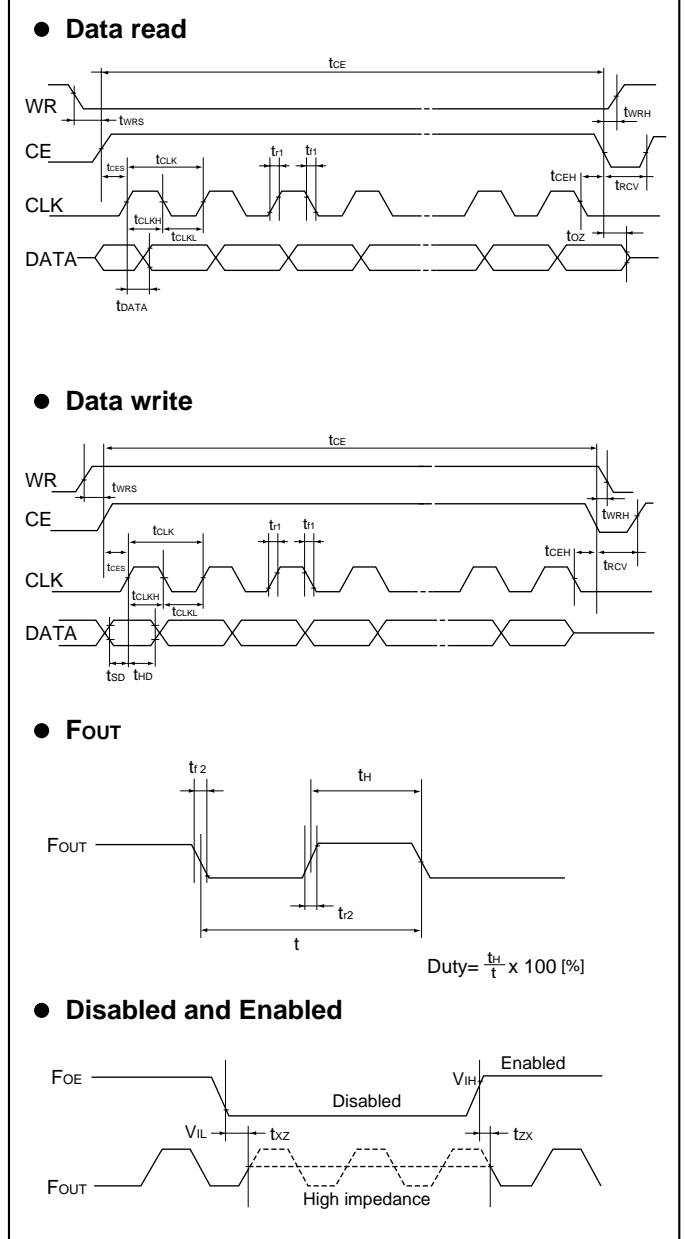
(Ta=-40 to +85°C, Cl=50 pF)

Item	Symbol	V <sub>DD</sub> = 5V± 10%		V <sub>DD</sub> = 3V± 10%		Unit
		Min.	Max.	Min.	Max.	
CLK clock cycle	t <sub>CLK</sub>	0.75	7800	1.5	7800	μs
CLK high pulse width	t <sub>CLKH</sub>	0.375	3900	0.75	3900	
CLK low pulse width	t <sub>CLKL</sub>					
CE setup time	t <sub>CES</sub>					
CE hold time	t <sub>CEH</sub>					s
CE enable time	t <sub>CE</sub>		0.9		0.9	
Write data setup time	t <sub>SD</sub>	0.1		0.2		μs
Write data hold time	t <sub>HD</sub>			0.1		
WR setup time	t <sub>WRS</sub>	100		100		ns
WR hold time	t <sub>WRH</sub>					
DATA output delay time	t <sub>DATA</sub>		0.2		0.4	μs
DATA output floating time	t <sub>DZ</sub>		0.1		0.2	
Clock input rise time	t <sub>r1</sub>		50		100	ns
Clock input fall time	t <sub>f1</sub>					
F <sub>OUT</sub> rise time	t <sub>r2</sub>		100		200	
F <sub>OUT</sub> fall time	t <sub>f2</sub>					
Disable time	t <sub>ZX</sub>					%
Enable time	t <sub>ZX</sub>					
F <sub>OUT</sub> duty ratio	Duty	40	60	40	60	
Wait time	t <sub>RCV</sub>	0.95		1.9		μs

Block diagram



Timing chart



# EPSON

SEIKO EPSON CORPORATION  
Electronics Device & Components Marketing Div.  
3F OD Bldg.421-8 Hino,Hino-shi,Tokyo,191-8501

Dec.28,1998

## Re :The Year 2000 Readiness Disclosure for Real Time Clock Module

Dear valued customer:

This letter is to inform you of the operation of our Real Time Clock Module (RTC) products with respect to so-called year 2000 issue. Please refer to the following information. In addition, information concerning Year 2000 readiness disclosed herein constitutes a Year 2000 Readiness Disclosure as that term is defined in the Year 2000 Information and Readiness Disclosure Act, U.S. P.L. 105-271. Nothing in this disclosure shall be deemed to amend the terms of any contract or warranty unless otherwise expressly agreed by Seiko Epson Corporation.

1. Our RTC products do not have counters of the four-digit year.
2. In other words, there are two categories regarding the counter construction.  
A: Year counter consists of the bottom two digits of the four-digit year .(RTC shown in appendix A) or  
B: Year counter consists of one digit and it is available with zero to three (ie,0,1,2,3)  
(RTC shown in appendix B)  
This counter is incremented every year (it will go to 0 after 3).  
Initial setting of the year counter is required as follows;  
Leap year ; set "0" to the year counter  
Leap year +1 ; set "1"  
Leap year +2 ; set "2"  
Year before leap year ; set "3"
3. The years having multiples of four or having 00 are recognized as a leap year. (RTC shown in appendix A )
4. The years having 0 in the year counter are recognized as a leap year.(RTC shown in appendix B)
5. For your information, year 2000 is a leap year, however, 1900 or 2100 is not a leap year. (Usually, multiples of a hundred is not a leap year, but a leap year comes every 400 years.) In terms of a leap year recognition, our RTC Products will work correctly until 2099.

You are requested to prepare for so-called year 2000 issue by yourself in conjunction with the above RTC Products. You need to make or modify your own program algorithm accordingly based on the above information. If you do not, the above RTC Products may not work appropriately.

If you have any questions regarding this matter, please contact a nearest sales office or representatives

### Appendix A

RTC45xx,RTC58xxx,RTC62xxx,RTC63xxx,RTC64xxx,RTC65xxx,RTC72xxx series and  
RTC8563

### Appendix B

RTC-8583,RTC8593

Sincerely yours,

Y2K project  
Electronics Device & Components Marketing Div.

# THE CRYSTALMASTER



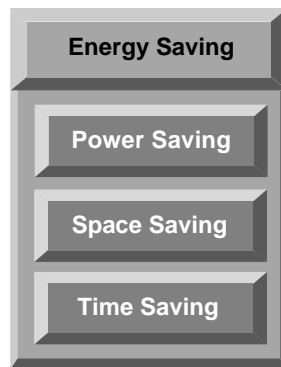
## ENERGY SAVING EPSON

EPSON offers effective savings to its customers through a wide range of electronic devices, such as semiconductors, liquid crystal display (LCD) modules, and crystal devices. These savings are achieved through a sophisticated melding of three different efficiency technologies.

Power saving technology provides low power consumption at low voltages.

Space saving technology provides further reductions in product size and weight through super-precise processing and high-density assembly technology.

Time saving technology shortens the time required for design and development on the customer side and shortens delivery times.



Our concept of Energy Saving technology conserves resources by blending the essence of these three efficiency technologies. The essence of these technologies is represented in each of the products that we provide to our customers.

In the industrial sector, leading priorities include measures to counter the greenhouse effect by reducing CO<sub>2</sub>, measures to preserve the global environment, and the development of energy-efficient products. Environmental problems are of global concern, and although the contribution of energy-saving technology developed by EPSON may appear insignificant, we seek to contribute to the development of energy-saving products by our customers through the utilization of our electronic devices. EPSON is committed to the conservation of energy, both for the sake of people and of the planet on which we live.



**SEIKO EPSON CORP. QUARTZ DEVICE DIVISION acquired ISO9001 and ISO14001 certification by B.V.Q.I. (Bureau Veritas Quality International) .**

**ISO9001 in October, 1992.**

**ISO14001 in November, 1997.**

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