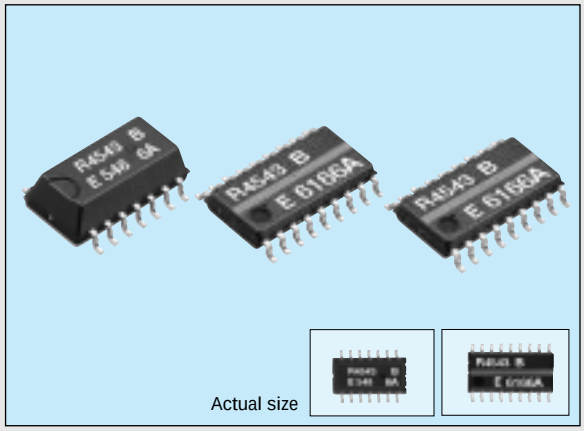
SERIAL-INTERFACE REAL TIME CLOCK MODULE

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_{DD}	V_{DD}-GND	-0.3	7.0	V
Input voltage	V_{IN}	—		V_{DD}+0.3	
Output voltage	V_{OUT}				
Storage temperature	T_{STG}		-55	+125	˚C

Operating range

Item	Symbol	Condition	Min.	Max.	Unit
Operating voltage	V_{DD}	—	2.5	5.5	V
Date holding voltage	V_{CLK}		1.4		
Operating temperature	T_{OPR}		-40	+85	˚C

Frequency characteristics

Item	Symbol	Condition	Range	Unit
Frequency tolerance	Δf/fo	Ta=25˚C, V_{DD}=5V	5±23	ppm
Frequency temperature characteristics	Top	-10 to +70˚C	+10/-120	
Frequency voltage characteristics	fv	Ta=25˚C, V_{DD}=2.0 to 5.5V	±2	ppm/V
Oscillation start time	tosc	Ta=25˚C, V_{DD}=2.5V	3	s
Aging	fa	First year Ta=25˚C, V_{DD}=5V	±5	ppm/year

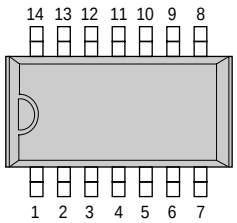
DC characteristics

(V_{DD}=5V±0.5V, Ta=-40 to +85˚C)

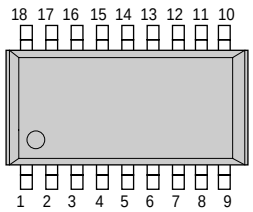
Item		Symbol	Condition		Min.	Typ.	Max.	Unit
"H" input voltage		V_{IH}	WR, DATA, CE, CLK, F_{OE},F_{SEL} pins		0.8V_{DD}	—	—	V
"L" input voltage		V_{IL}			—		0.2V_{DD}	
Input off-leak current		I_{OFF}	WR, CE, CLK, F_{OE},F_{SEL} pins				0.5	µA
"H" output voltage		V_{OH1}	V_{DD}=5.0V	I_{OH}=-1.0 mA	4.5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

Terminal connection

● **RTC-4543SA**



● **RTC-4543SB**

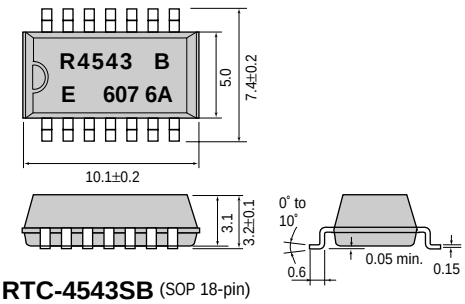


No.	4543SA	4543SB
1	GND	N.C
2	N.C	N.C
3	CE	N.C
4	F_{SEL}	N.C
5	WR	F_{OE}
6	F_{OE}	WR
7	N.C	F_{SEL}
8	N.C	CE
9	V_{DD}	GND
10	CLK	F_{OUT}
11	DATA	DATA
12	N.C	CLK
13	N.C	N.C
14	F_{OUT}	V_{DD}
15	—	N.C
16	—	N.C
17	—	N.C
18	—	N.C

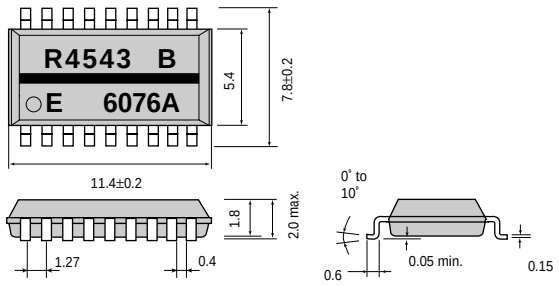
External dimensions

(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

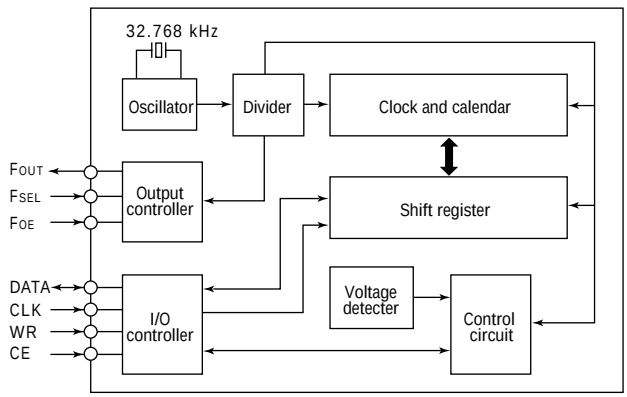
FDT bit: Supply voltage detection bit. TM bit: Test bit always set this bit to "0".

Switching characteristics

(Ta=-40 to +85˚C, C_L=50 pF)

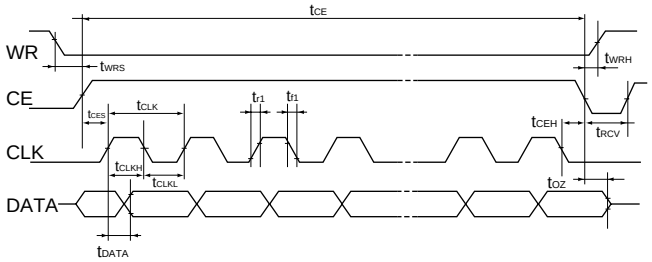
Item		Symbol	V_{DD}= 5V± 10%		V_{DD}= 3V± 10%		Unit
			Min.	Max.	Min.	Max.	
CLK clock cycle		t_{CLK}	0.75	7800	1.5	7800	µs
CLK high pulse width		t_{CLKH}	0.375	3900	0.75	3900	
CLK low pulse width		t_{CLKL}					
CE setup time		t_{CES}					
CE hold time		t_{CEH}		—		—	
CE enable time		t_{CE}	—	0.9	—	0.9	s
Write data setup time		t_{SD}	0.1	—	0.2	—	µs
Write data hold time		t_{HD}			0.1		
WR setup time		t_{WRS}	100		100		ns
WR hold time		t_{WRH}					
DATA output delay time		t_{DATA}	—	0.2	—	0.4	µs
DATA output floating time		t_{DZ}		0.1		0.2	
Clock input rise time		t_{r1}		50		100	ns
Clock input fall time		t_{f1}					
F_{OUT} rise time	C_L= 30pF	t_{r2}		100		200	
F_{OUT} fall time		t_{f2}					
Disable time		t_{XZ}					
Enable time		t_{ZX}					
F_{OUT} duty ratio		Duty	40	60	40	60	%
Wait time		t_{RCV}	0.95	—	1.9	—	µs

Block diagram

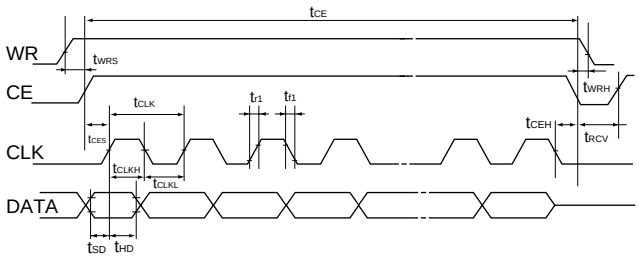


Timing chart

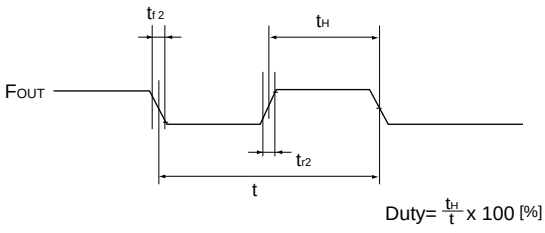
Data read



Data write

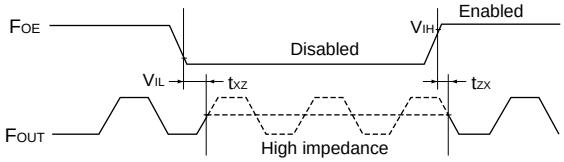


FOUT



Duty= $\frac{t_H}{t}$ x 100 [%]

Disabled and Enabled



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

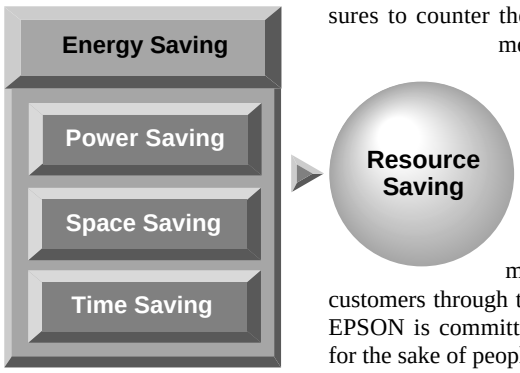
ENERGY SAVING EPSON

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 CO2, 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.