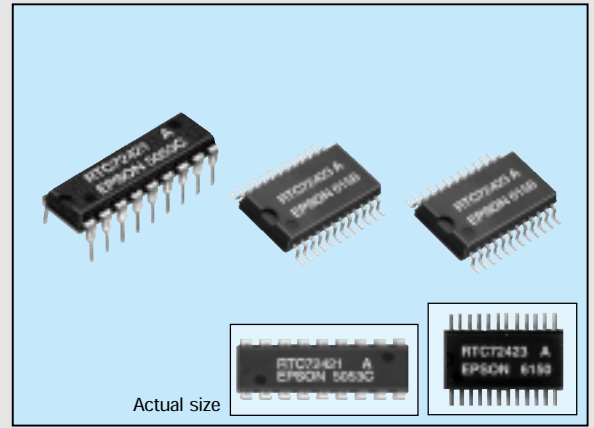


4-bit REAL TIME CLOCK MODULE

# RTC-72421/72423

- Built-in crystal unit allows adjustment-free efficient operation.
- ALE input terminal available for 8048, 8051, and 8085 series.
- 12/24H clock switchover function and automatic leap year setting.
- Interrupt masking.
- 30 second adjustment function.
- Low current consumption and features a backup function.



## Specifications (characteristics)

### Absolute Max. rating

Item	Symbol	Condition	Specifications	Unit
Power source voltage	V <sub>DD</sub>	T <sub>a</sub> =25°C	-0.3 to 7.0	
Input and output voltage	V <sub>I/O</sub>	T <sub>a</sub> =25°C	GND -0.3 to V <sub>DD</sub> +0.3	V
Storage temperature	T <sub>STG</sub>	RTC-72421	-55 to +85	°C
		RTC-72423	-55 to +125	
Soldering condition	T <sub>SOL</sub>	RTC-72421	Under 260°C within 10 sec. (lead part) (package should be less than 150°C)	
		RTC-72423	Twice at under 260°C within 10 sec., or under 230°C within 3 min.	

### Operating range

Item	Symbol	Condition	Specifications	Unit
Operating voltage	V <sub>DD</sub>		4.5 to 5.5	V
Operating temperature	T <sub>OPR</sub>	RTC-72421	-10 to 70	°C
		RTC-72423	-40 to 85	
Data holding voltage	V <sub>DH</sub>		2.0 to 5.5	V
CSI data holding time	t <sub>CDR</sub>	Refer to the data holding timing	2.0 min.	µs
Operation restoring time	t <sub>R</sub>	Refer to the data holding timing	2.0 min.	µs

### Frequency characteristics and current consumption characteristics

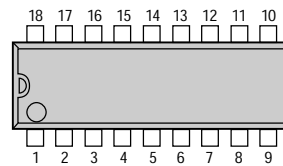
Item	Symbol	Condition	Specifications	Unit	
Frequency tolerance	Δf/fo	T <sub>a</sub> =25°C V <sub>DD</sub> =5V	72421 A	±10	ppm
			72421 B	±50	
			72423 A	±20	
			72423	±50	
Frequency temperature characteristics		-10 to +70°C (25°C reference temperature)	+10/-120		
Aging	f <sub>a</sub>	V <sub>DD</sub> =5V, T <sub>a</sub> =25°C, first year	±5 max.	ppm/y	
Shock resistance	S.R.	Three drops on a hard board from 75 cm or 3000G x 0.3ms x 1/2 sine wave x 3 directions	±10 max.	ppm	
Current consumption	I <sub>DD1</sub>	CS <sub>1</sub> =0V Exclude input/output current	V <sub>DD</sub> =5V	10 max.	µA
	I <sub>DD2</sub>		V <sub>DD</sub> =2V	5 max.	

### Electrical characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Applicable terminal
"H" input voltage (1)	V <sub>IH1</sub>	—	2.2	—	—	V	All inputs other than CS <sub>1</sub>
"L" input voltage (1)	V <sub>IL1</sub>						
Input leak current (1)	I <sub>LK1</sub>	V <sub>1</sub> =V <sub>DD</sub> /OV	—	—	±1	µA	Input other than Do to D <sub>3</sub>
Input leak current (2)	I <sub>LK2</sub>				±10		
"L" output voltage (1)	V <sub>OL1</sub>	I <sub>OL</sub> =2.5mA	—	—	0.4	V	Do to D <sub>3</sub>
"H" output voltage	V <sub>OH</sub>				0.4		
"L" output voltage (2)	V <sub>OL2</sub>	I <sub>OL</sub> =2.5mA	2.4	—	0.4	V	STD.P
Off leak current	I <sub>OFFLK</sub>				10		
Input capacity	C <sub>1</sub>	Input frequency 1 MHz	10	—	—	pF	Input other than Do to D <sub>3</sub>
			20				
"H" input voltage (2)	V <sub>IH2</sub>	V <sub>DD</sub> =2 to 5.5V	4/5 V <sub>DD</sub>	—	—	V	CS <sub>1</sub>
"L" input voltage (2)	V <sub>IL2</sub>		1/5 V <sub>DD</sub>				

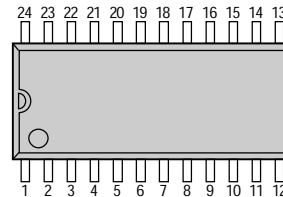
## Terminal connection

### RTC-72421



No.	72421	No.	72423
1	STD_P	1	STD_P
2	CS <sub>0</sub>	2	CS <sub>0</sub>
3	ALE	3	NC
4	A <sub>0</sub>	4	ALE
5	A <sub>1</sub>	5	A <sub>0</sub>
6	A <sub>2</sub>	6	NC
7	A <sub>3</sub>	7	A <sub>1</sub>
8	RD	8	NC
9	GND	9	A <sub>2</sub>
10	WR	10	A <sub>3</sub>
11	D <sub>7</sub>	11	RD
12	D <sub>6</sub>	12	GND
13	D <sub>5</sub>	13	WR
14	D <sub>4</sub>	14	D <sub>7</sub>
15	CS <sub>1</sub>	15	D <sub>6</sub>
16	(V <sub>DD</sub> )	16	D <sub>5</sub>
17	(V <sub>DD</sub> )	17	NC
18	V <sub>DD</sub>	18	NC
		19	D <sub>4</sub>
		20	CS <sub>1</sub>
		21	NC
		22	(V <sub>DD</sub> )
		23	(V <sub>DD</sub> )
		24	V <sub>DD</sub>

### RTC-72423

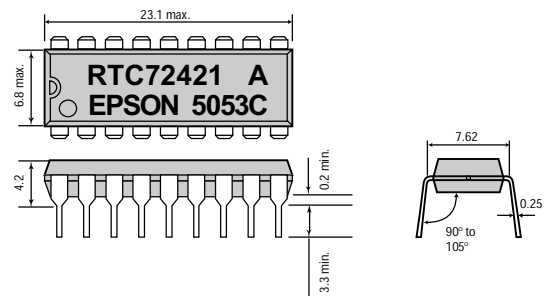


- (V<sub>DD</sub>) and V<sub>DD</sub> are to have the same level of voltage. Do not connect it to any external terminals.
- NC is not connected internally.

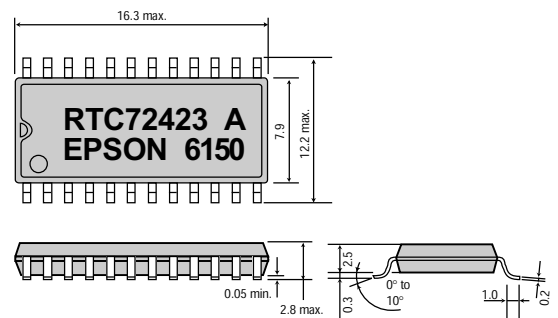
## External dimensions

(Unit: mm)

### RTC-72421



### RTC-72423



Register table

Address	A <sub>3</sub>	A <sub>2</sub>	A <sub>1</sub>	A <sub>0</sub>	Register	Data				Count Value	Remarks
						D <sub>3</sub>	D <sub>2</sub>	D <sub>1</sub>	D <sub>0</sub>		
0	0	0	0	0	S <sub>1</sub>	S <sub>8</sub>	S <sub>4</sub>	S <sub>2</sub>	S <sub>1</sub>	0 to 9	1- second digit register
1	0	0	0	1	S <sub>10</sub>	*	S <sub>40</sub>	S <sub>20</sub>	S <sub>10</sub>	0 to 5	10- second digit register
2	0	0	1	0	M <sub>1</sub>	mi <sub>8</sub>	mi <sub>4</sub>	mi <sub>2</sub>	mi <sub>1</sub>	0 to 9	1- minute digit register
3	0	0	1	1	M <sub>10</sub>	*	mi <sub>40</sub>	mi <sub>20</sub>	mi <sub>10</sub>	0 to 5	10- minute digit register
4	0	1	0	0	H <sub>1</sub>	h <sub>8</sub>	h <sub>4</sub>	h <sub>2</sub>	h <sub>1</sub>	0 to 9	1- hour digit register
5	0	1	0	1	H <sub>10</sub>	*	PM/AM	h <sub>20</sub>	h <sub>10</sub>	0 to 2 or 0 to 1	PM/AM, 10- hours digit register
6	0	1	1	0	D <sub>1</sub>	d <sub>8</sub>	d <sub>4</sub>	d <sub>2</sub>	d <sub>1</sub>	0 to 9	1- day digit register
7	0	1	1	1	D <sub>10</sub>	*	*	d <sub>20</sub>	d <sub>10</sub>	0 to 3	10- day digit register
8	1	0	0	0	M <sub>0</sub>	mo <sub>8</sub>	mo <sub>4</sub>	mo <sub>2</sub>	mo <sub>1</sub>	0 to 9	1- month digit register
9	1	0	0	1	M <sub>0</sub>	*	*	*	mo <sub>10</sub>	0 to 1	10- month digit register
A	1	0	1	0	Y <sub>1</sub>	y <sub>8</sub>	y <sub>4</sub>	y <sub>2</sub>	y <sub>1</sub>	0 to 9	1- year digit register
B	1	0	1	1	Y <sub>10</sub>	y <sub>80</sub>	y <sub>40</sub>	y <sub>20</sub>	y <sub>10</sub>		10- year digit register
C	1	1	0	0	W	*	w <sub>4</sub>	w <sub>2</sub>	w <sub>1</sub>	0 to 6	Week register
D	1	1	0	1	RegD	30 sec. ADJ	IRQ FLAG	BUSY	HOLD		Control Register D
E	1	1	1	0	RegE	t <sub>i</sub>	t <sub>o</sub>	ITRPT /STND	MASK		Control Register E
F	1	1	1	1	RegF	TEST	24/12	STOP	REST		Control Register F

0="L" level, 1="H" level, REST = RESET ITRPT/ STND=INTERRUPT/STANDARD

- Bit \* does not exist.
- Please mask AM/PM bit with 10's of hours operations.
- Busy is read only. IRQ can only. IRQ can only be set low ("0").
- | Data Bit | PM/AM | ITRPT/STND | 24/12 |
|----------|-------|------------|-------|
| 1        | PM    | ITRPT      | 24    |
| 0        | AM    | STND       | 12    |
- TEST bit should be "0".

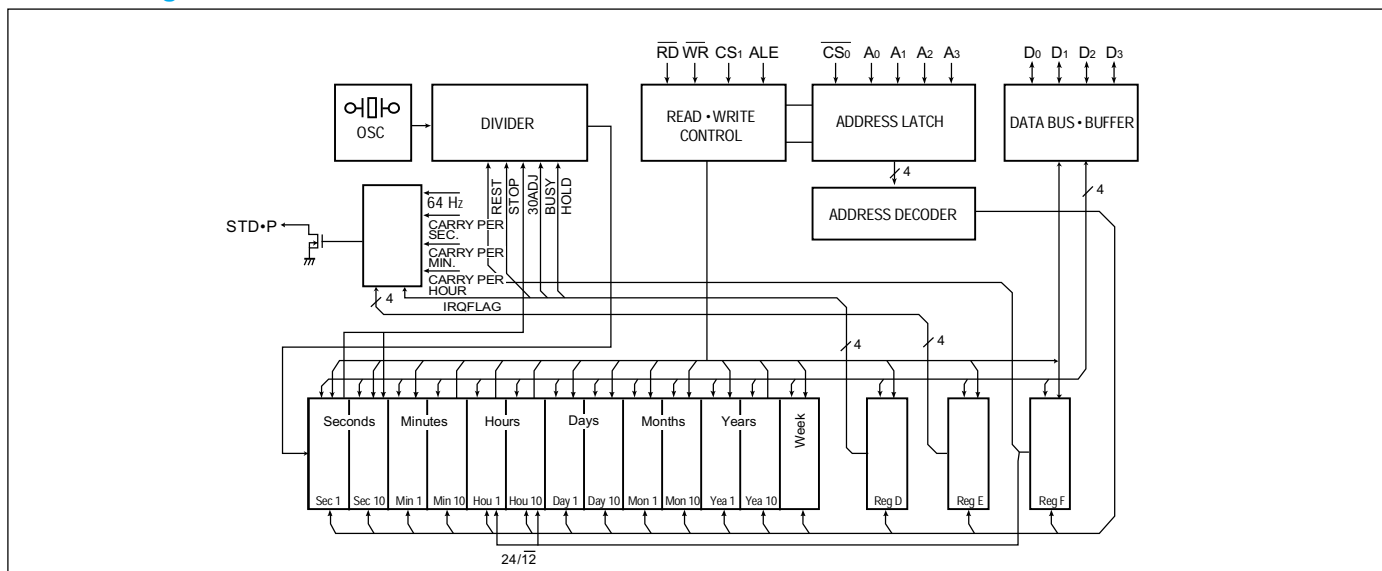
Switching characteristics (with ALE)

(Please connect ALE to V<sub>DD</sub> if the microprocessor does not have an ALE output.)

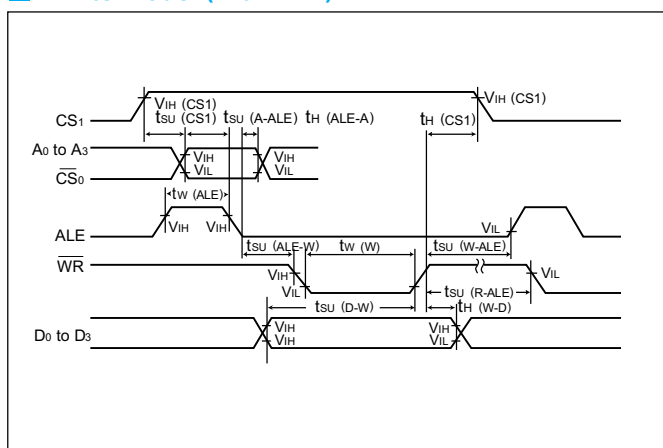
Item	Symbol	Condition	Min.	Max.	Unit
CS <sub>1</sub> setup time	t <sub>SU</sub> (CS1)		1000		ns
Address setup time before ALE	t <sub>SU</sub> (A-ALE)		50		
Address hold time after ALE	t <sub>H</sub> (ALE-A)		50		
ALE pulse width	t <sub>W</sub> (ALE)		80		
ALE setup time before WRITE	t <sub>SU</sub> (ALE-W)		0		
ALE setup time before READ	t <sub>SU</sub> (ALE-R)		0		
ALE setup time after WRITE	t <sub>SU</sub> (W-ALE)		50		
ALE setup time after READ	t <sub>SU</sub> (R-ALE)		50		
WRITE pulse width	t <sub>W</sub> (W)		120		
DATA delay time after READ	t <sub>PZV</sub> (R-Q)	C <sub>L</sub> =150pF	—	120	
DATA Hold time after READ	t <sub>PVZ</sub> (R-Q)		0	70	
DATA setup time before WRITE	t <sub>SU</sub> (D-W)		80		
DATA hold time after WRITE	t <sub>H</sub> (W-D)		10		
CS <sub>1</sub> hold time	t <sub>H</sub> (CS1)		1000		
READ/WRITE recovery time	t <sub>REC</sub> (R/W)		200		

(V<sub>DD</sub> = 5V ± 0.5V)

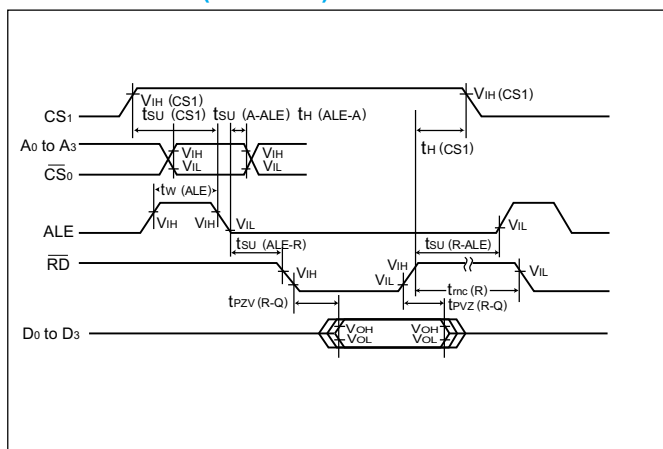
Block diagram



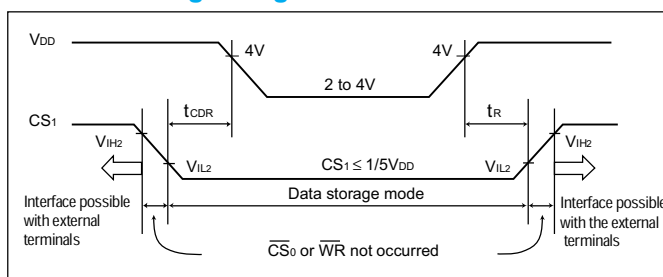
Write mode (with ALE)



Read mode (with ALE)



Data holding timing



# 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



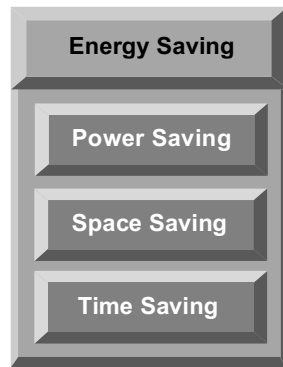
## ENERGY SAVING EPSON

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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