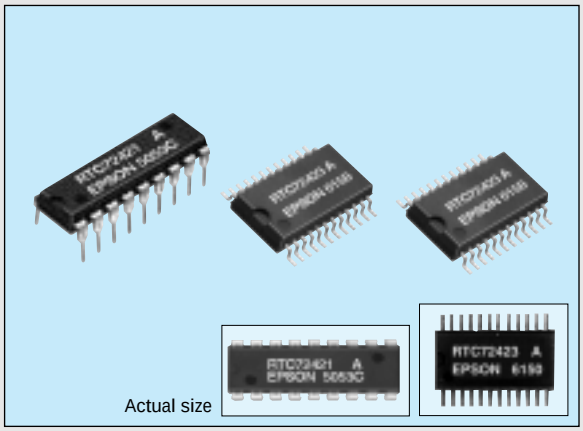
4-bit REAL TIME CLOCK MODULE

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_{DD}	Ta=25°C	-0.3 to 7.0	V
Input and output voltage	$V_{I/O}$	Ta=25°C	GND -0.3 to V_{DD}+0.3	
Storage temperature	T_{STG}	RTC-72421	-55 to +85	°C
		RTC-72423	-55 to +125	
Soldering condition	T_{SOL}	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_{DD}		4.5 to 5.5	V
Operating temperature	T_{OPR}	RTC-72421	-10 to 70	°C
		RTC-72423	-40 to 85	
Data holding voltage	V_{DH}		2.0 to 5.5	V
CSI data holding time	t_{CDR}	Refer to the data holding timing	2.0 min.	µs
Operation restoring time	t_R			

Frequency characteristics and current consumption characteristics

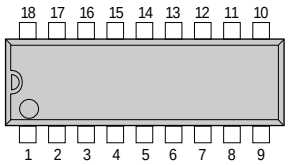
Item	Symbol	Condition		Specifications	Unit
Frequency tolerance	Δf/fo	Ta=25°C V_{DD}=5V	72421 A	±10	ppm
			72421 B	±50	
			72423 A	±20	
			72423	±50	
Frequency temperature characteristics		-10 to +70°C (25°C reference temperature)		+10/-120	
Aging	fa	V_{DD}=5V, Ta=25°C, first year		±5 max.	ppm/y
Shock 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_{DD1}	CS_1=0V Exclude input/output current	V_{DD}=5V	10 max.	µA
	I_{DD2}		V_{DD}=2V	5 max.	

Electrical characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Applicable terminal
"H" input voltage (1)	V_{IH1}	—	2.2	—	—	V	All inputs other than CS_1
"L" input voltage (1)	V_{IL1}		—		0.8		
Input leak current (1)	I_{LK1}	V_I=V_{DD}/0V	—	—	±1	µA	Input other than D_0 to D_3
Input leak current (2)	I_{LK2}				±10		D_0 to D_3
"L" output voltage (1)	V_{OL1}	I_{OL}=2.5mA			0.4	V	
"H" output voltage	V_{OH}	I_{OH}=-400µA	2.4		—		
"L" output voltage (2)	V_{OL2}	I_{OL}=2.5mA	—		0.4		STD.P
Off leak current	I_{OFFLK}	V_I=V_{DD}/0V			10	µA	
Input capacity	C_I	Input frequency 1 MHz		10	—	pF	Input other than D_0 to D_3
				20			D_0 to D_3
"H" input voltage (2)	V_{IH2}	V_{DD}=2 to 5.5V	4/5 V_{DD}	—	—	V	CS_1
"L" input voltage (2)	V_{IL2}		—		1/5 V_{DD}		

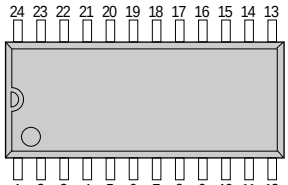
Terminal connection

RTC-72421



No.	72421	No.	72423
1	STD. P	1	STD. P
2	$\overline{CS_0}$	2	$\overline{CS_0}$
3	ALE	3	NC
4	A_0	4	ALE
5	A_1	5	A_0
6	A_2	6	NC
7	A_3	7	A_1
8	RD	8	NC
9	GND	9	A_2
10	$\overline{WR}$	10	A_3
11	D_3	11	RD
12	D_2	12	GND
13	D_1	13	$\overline{WR}$
14	D_0	14	D_3
15	CS_1	15	D_2
16	(V_{DD})	16	D_1
17	(V_{DD})	17	NC
18	V_{DD}	18	NC
		19	D_0
		20	CS_1
		21	NC
		22	(V_{DD})
		23	(V_{DD})
		24	V_{DD}

RTC-72423

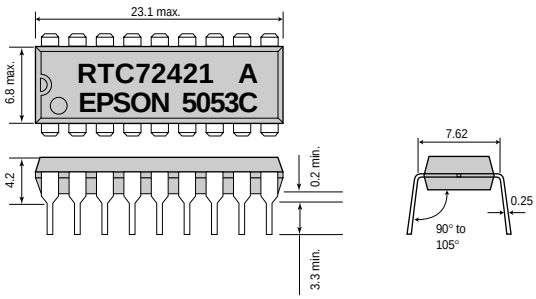


- (V_{DD}) and V_{DD} are to have the same level of voltage. Do not connect it to any external terminals.
- NC is not connected internally.

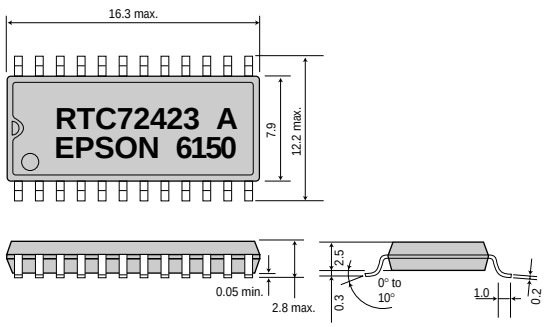
External dimensions

(Unit: mm)

RTC-72421



RTC-72423



Register table

Address	A_3	A_2	A_1	A_0	Register	Data D_3	Data D_2	Data D_1	Data D_0	Count Value	Remarks
0	0	0	0	0	S_1	s_8	s_4	s_2	s_1	0 to 9	1- second digit register
1	0	0	0	1	S_{10}	*	s_{40}	s_{20}	s_{10}	0 to 5	10- second digit register
2	0	0	1	0	MI_1	mi_8	mi_4	mi_2	mi_1	0 to 9	1- minute digit register
3	0	0	1	1	MI_{10}	*	mi_{40}	mi_{20}	mi_{10}	0 to 5	10- minute digit register
4	0	1	0	0	H_1	h_8	h_4	h_2	h_1	0 to 9	1- hour digit register
5	0	1	0	1	H_{10}	*	PM/AM	h_{20}	h_{10}	0 to 2 or 0 to 1	PM/AM,10- hours digit register
6	0	1	1	0	D_1	d_8	d_4	d_2	d_1	0 to 9	1- day digit register
7	0	1	1	1	D_{10}	*	*	d_{20}	d_{10}	0 to 3	10 -day digit register
8	1	0	0	0	MO_1	mo_8	mo_4	mo_2	mo_1	0 to 9	1- month digit register
9	1	0	0	1	MO_{10}	*	*	*	mo_{10}	0 to 1	10- month digit register
A	1	0	1	0	Y_1	y_8	y_4	y_2	y_1	0 to 9	1- year digit register
B	1	0	1	1	Y_{10}	y_{80}	y_{40}	y_{20}	y_{10}		10- year digit register
C	1	1	0	0	W	*	w_4	w_2	w_1	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_1	t_0	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

1) Bit * does not exist.
2) Please mask AM/PM bit with 10's of hours operations.
3) Busy is read only. IRQ can only. IRQ can only be set low ("O").
4)

Data Bit	PM/AM	ITRPT/STND	24/12
1	PM	ITRPT	24
0	AM	STND	12

5) TEST bit should be "O".

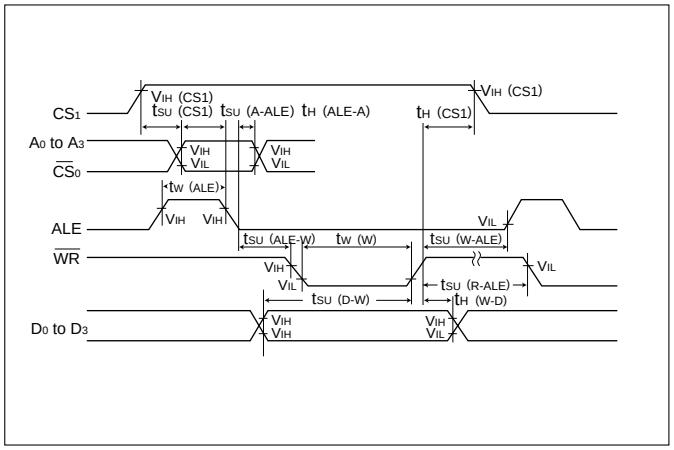
Switching characteristics (with ALE)

(Please connect ALE to V_{DD} if the microprocessor does not have an ALE output.)

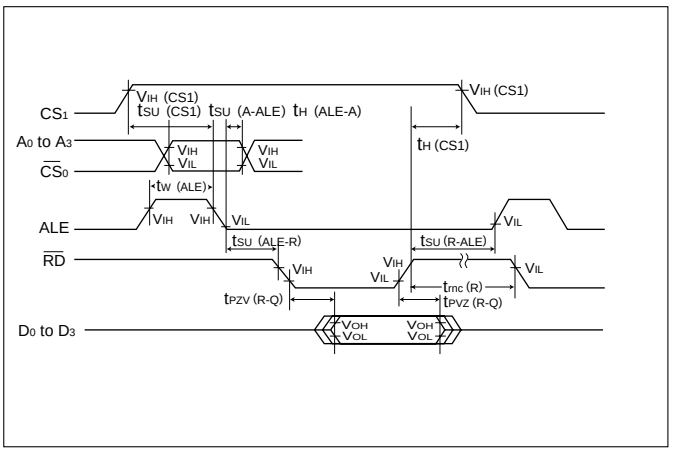
Item	Symbol	Condition	Min.	Max.	Unit
CS_1 setup time	$t_{SU\ (CS1)}$		1000	—	ns
Address setup time before ALE	$t_{SU\ (A-ALE)}$		50		
Address hold time after ALE	$t_{H\ (ALE-A)}$		50		
ALE pulse width	$t_{W\ (ALE)}$		80		
ALE setup time before WRITE	$t_{SU\ (ALE-W)}$		0		
ALE setup time before READ	$t_{SU\ (ALE-R)}$		0		
ALE setup time after WRITE	$t_{SU\ (W-ALE)}$		50		
ALE setup time after READ	$t_{SU\ (R-ALE)}$		50		
WRITE pulse width	$t_{W\ (W)}$		120		
DATA delay time after READ	$t_{PZV\ (R-Q)}$	C_L=150pF	—	120	
DATA Hold time after READ	$t_{PVZ\ (R-Q)}$		0	70	
DATA setup time before WRITE	$t_{SU\ (D-W)}$		80	—	
DATA hold time after WRITE	$t_{H\ (W-D)}$		10		
CS_1 hold time	$t_{H\ (CS1)}$		1000		
READ/WRITE recovery time	$t_{REC\ (R/W)}$		200		

(V_{DD} = 5V ± 0.5V)

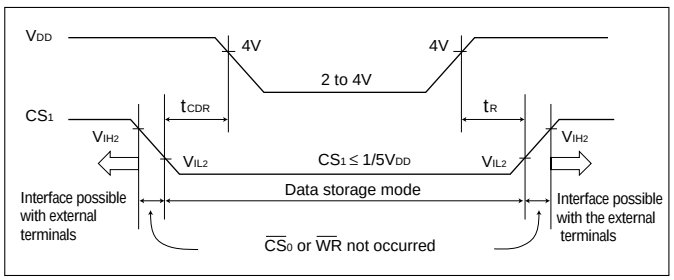
Write mode (with ALE)



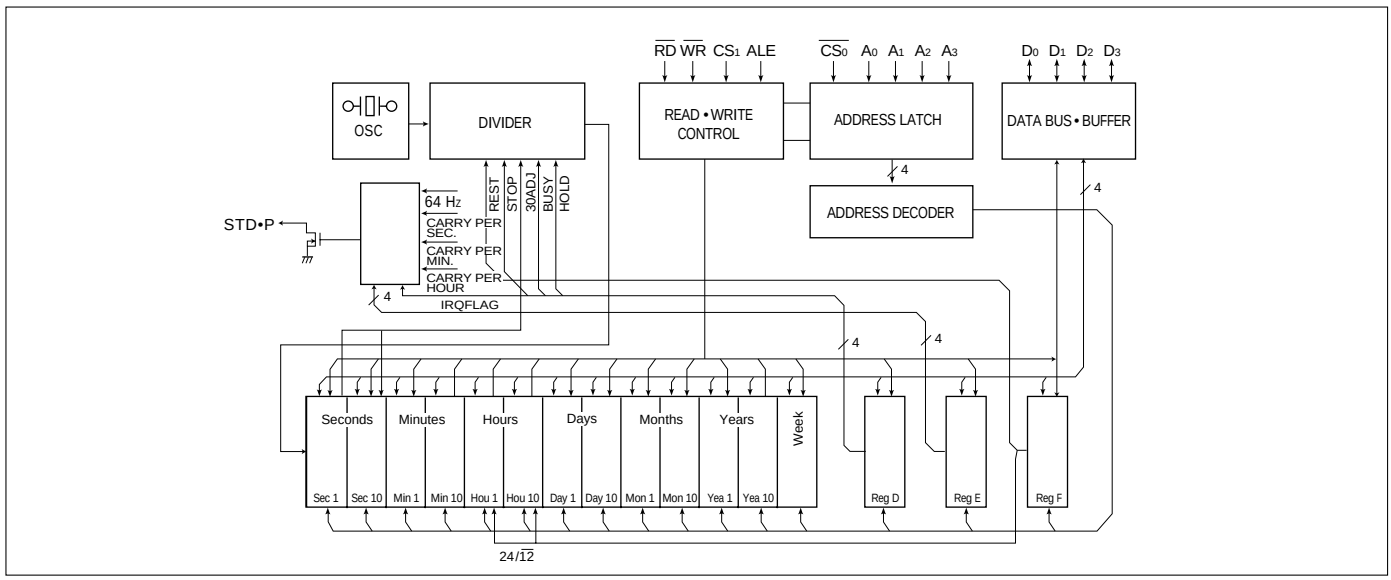
Read mode (with ALE)



Data holding timing



Block diagram



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

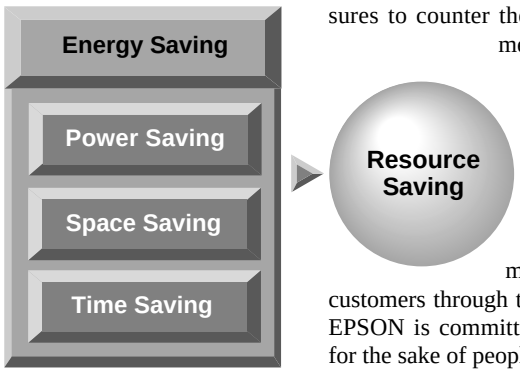
ENERGY SAVING EPSON

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.