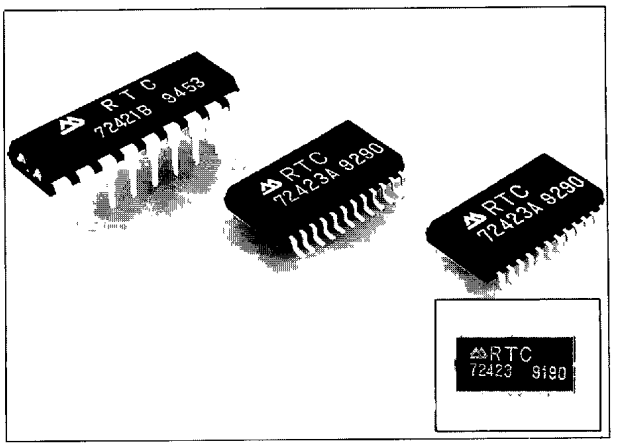
4-bit REAL TIME CLOCK MODULE

RTC-72421/72423

- The built-in quartz crystal makes regulation unnecessary and allows for easy design
- Direct bus-compatibility (120 ns. access time)
- ALE INPUT terminal available for 8048, 8051, and 8085 series
- Incorporates built-in Time (hour, minute, second), and Date (year, month, week, day) counters
- 12H/24H clock switchover function and automatic leap year setting
- Interrupt masking
- 30 seconds error adjustment function
- READ, WRITE, HOLD, STOP, RESET, and CHIP SELECT INPUTS
- Low current consumption and features a backup function



■Specifications (characteristics)

■Absolute Maximum 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	Under 260°C within 10 sec ×up to 2 times 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

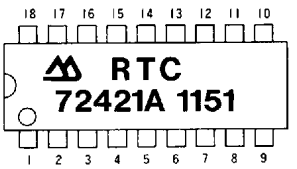
Item	Symbol	Condition		Specifications	Unit
Frequency tolerance	△f/fo	Ta=25°C V_{DD}=5V	72421A	±10	ppm
			72421B	±50	
			72423A	±20	
			72423	±50	
Frequency temperature characteristics		−10 to +70°C (25°C reference temperature)		+10/−120	
Aging	fa	V_{DD}=5V, Ta=25°C, first year		±5 MAX.	ppm/Y
Shock resistance	S. R.	Drop test of 3 times on a hard board from 75cm height or 3000G×0.3ms×1/2 sine wave×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	D_0 to D_3
"H" output voltage	V_{OH}	I_{OH}=−400μA	2.4	–	–		
"L" output voltage (2)	V_{OL2}	I_{OL}=2.5mA	–	–	0.4	V	STD.P
OFF leak current	I_{OFFLK}	V_I=V_{DD}/0V	–	–	10	μA	
Input capacity	C_I	Input frequency 1MHz	–	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	4/5V_{DD}	–	–	V	CS_1
"L" input voltage (2)	V_{IL2}		–	–	1/5V_{DD}		

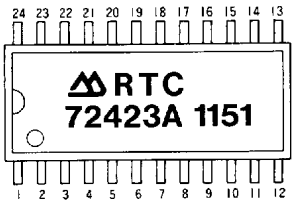
■Terminal Connection

● RTC-72421



1	STD P	18	V_{DD}
2	$\overline{CS_0}$	17	(V_{DD})
3	ALE	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	$\overline{RD}$	11	D_3
9	GND	10	$\overline{WR}$

● RTC-72423

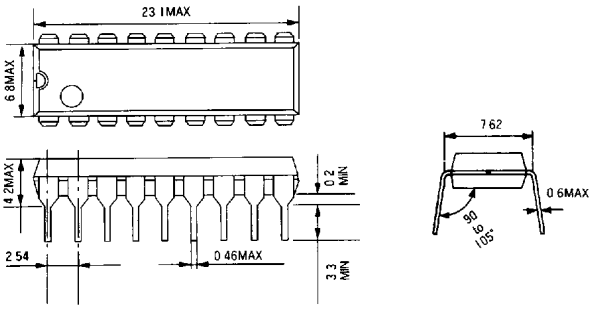


1	STD P	24	V_{DD}
2	$\overline{CS_0}$	23	(V_{DD})
3	NC	22	(V_{DD})
4	ALE	21	NC
5	A_0	20	CS_1
6	NC	19	D_0
7	A_1	18	NC
8	NC	17	NC
9	A_2	16	D_1
10	A_3	15	D_2
11	RD	14	D_3
12	GND	13	$\overline{WR}$

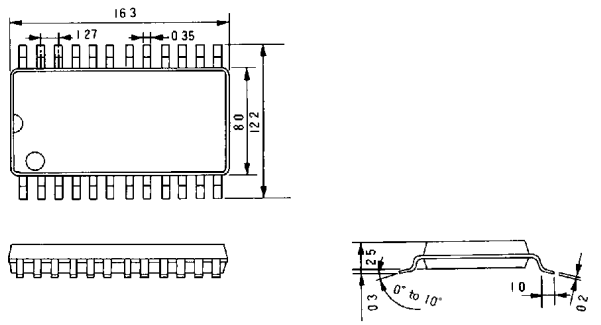
- (V_{DD}) is to be same level of voltage as of V_{DD}. Do not connect it to any external terminals
- NC is not connected internally

■External Dimensions (Unit: mm)

● RTC-72421



● RTC-72423



■Function 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-hour 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}	0 to 9	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	30sec ADJ	IRQ FLAG	BUSY	HOLD	——	Control Rigister 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" revel, 1="H" revel, 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 be set low ("0")

4)

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

5) TEST bit should be "0".

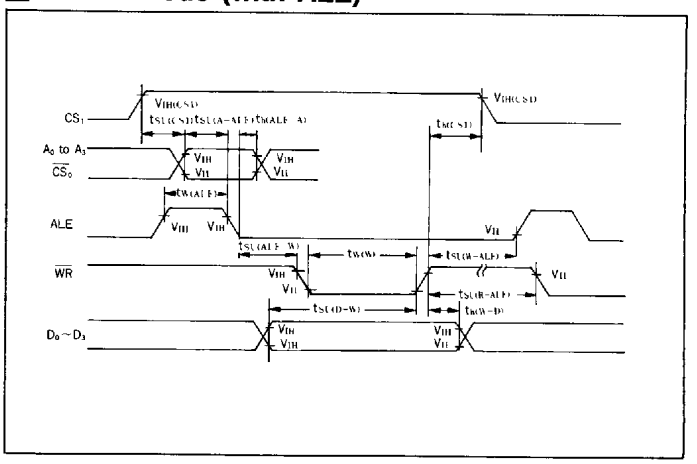
■Switching Characteristics (with ALE)

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

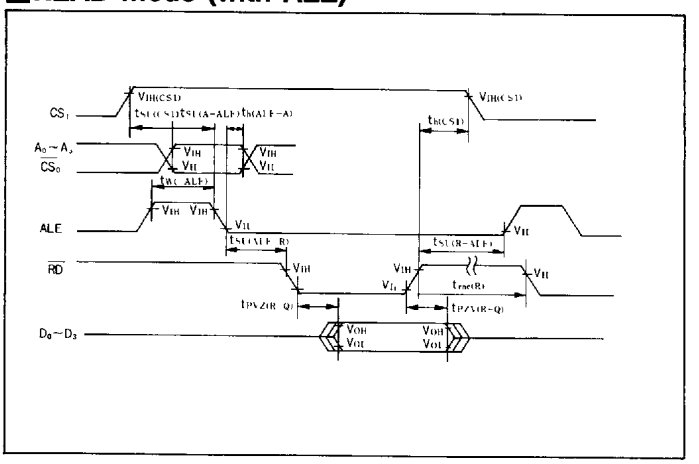
Item	Symbol	Condition	MIN	MAX	Unit
CS_1 Set up Time	$t_{SU\ (CS1)}$		1000	–	ns
Address Set up Time Before ALE	$t_{SU\ (A-ALE)}$		50	–	
Address HOLD Time After ALE	$t_{H(ALE-A)}$		50	–	
ALE Pulse Width	$t_{W\ (ALE)}$		80	–	
ALE Set up Time Before WRITE	$t_{SU\ (ALE-W)}$		0	–	
ALE Set up Time Before READ	$t_{SU\ (ALE-R)}$		0	–	
ALE Set up Time After WRITE	$t_{S(W-ALE)}$		50	–	
ALE Set up Time After READ	$t_{S(R-ALE)}$		50	–	
WRITE Pulse Width	$t_{W\ (W)}$		120	–	
DATA delay Time After READ	$t_{PZV\ (R-Q)}$	CL=150pF	–	120	
DATA Hold Time After READ	$t_{PVZ\ (R-Q)}$		0	70	
DATA Set up 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)

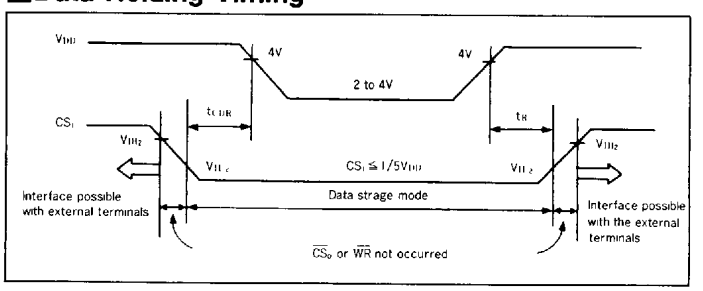
■WRITE mode (with ALE)



■READ mode (with ALE)



■Data Holding Timing



■Block Diagram