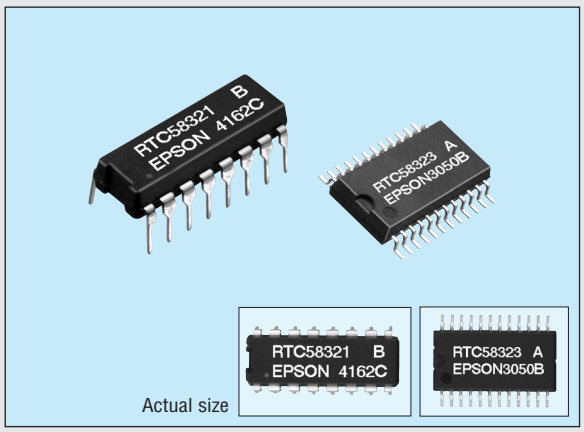
4-bit I/O CONNECTION REAL TIME CLOCK MODULE

RTC-58321/58323

- Built-in crystal unit allows adjustment-free efficient operation.
- Incorporating time counter (hour, minute, sec.) and calendar counter (year, month, day of week).
- Either 12 h or 24 h selectable and leap year automatically adjustable.
- Standard signal output selectable among a choice of 1024 Hz, 1 sec., 60 sec., and 1 hour.
- Provided with counter start, stop and reset functions.
- Data transmission is by 4-bit bidirectional bus line and memory read and write method.
- Low current consumption and backup function provided.



Specifications (characteristics)

Absolute Max. rating

Item	Symbol	Condition	Specifications	Unit
Power source voltage	V_{DD}	Ta=+25 °C	-0.3 to 6.5	V
Input and output voltage	$V_{I/O}$		-0.3 to V_{DD}+0.3	
storage temperature	T_{STG}	—	-55 to +85	°C
Soldering condition	T_{SOL}	RTC-58321	Under +260 °C within 10 s (lead part) (package should be less than +150 °C)	
		RTC-58323	Twice at under +260 °C within 10 s 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-58321	-10 to +70	°C
		RTC-58323	-30 to +85	
Data holding voltage	V_{DH}	—	2.2 to 5.5	V
CSI data holding time	t_{CDR}	Refer to the data holding timing	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}=5 V	58321 A	±10	x 10^{-6}
			58321 B	±50	
			58323	5±20	
Frequency temperature characteristics	—	-10 °C to +70 °C (+25 °C reference temperature)		+10/-120	
Aging	fa	V_{DD}=5 V, Ta=+25 °C, first year		±5 Max.	x 10^{-6}/year
Shock resistance	S.R.	Three drops on a hard board from 750 mm or 29400 m/s² x 0.3 ms x 1/2 sine wave x 3 directions		±10 Max.	x 10^{-6}
Current consumption	I_{DD1}	V_{DD}=5 V, CS_1=0 V		40 Max.	µA
	I_{DD2}	V_{DD}=3 V, CS_1=0 V		20 Max.	

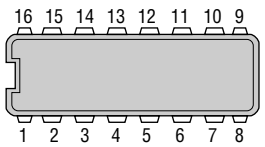
DC characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Applicable terminal
"H" input voltage	V_{IH1}	—	3.6	—	—	V	Input other than CS_1
"H" input voltage	V_{IH2}		V_{DD}-0.5				CS_1
"L" input voltage	V_{IL}		—		0.8		—
"L" output voltage	V_{OL}	I_{OL}=1.6 mA		—	0.4		
"L" output current	I_{OL}	V_O=0.4 V	1.6		—	mA	
"H" input current	I_{IH}	V_I=5 V	10	30	80	µA	Input other than D_0 to D_3
"L" input current	I_{IL}	V_I=0 V	—	—	-1		
Input leak current	I_{LIH}	V_I=5 V			1		D_0 to D_3
Input off leak current	I_{LIL}	V_I=0 V			-1		—
Input capacity	C_I	Input frequency 1 MHz		5	—	pF	
Oscillation start-up time	t_{OSC}	V_{DD}=5 V Ta=+25 °C		1.5	3.0	s	Busy output

Unless otherwise stated, characteristics (specifications) shown in the above table are based on the rated operating temperature and voltage condition.

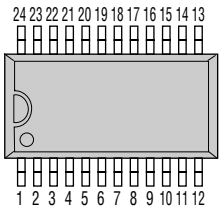
Terminal connection

RTC-58321



No.	58321	No.	58323
1	CS_2	1 to 4	N.C
2	WRITE	5	CS_2
3	READ	6	WRITE
4	D_0	7	READ
5	D_1	8	D_0
6	D_2	9	D_1
7	D_3	10	D_2
8	GND	11	D_3
9	ADDRESS WRITE	12	GND
10	$\overline{BUSY}$	13	ADDRESS WRITE
11	STOP	14	BUSY
12	TEST	15	STOP
13	CS_1	16	TEST
14 to 15	N.C	17	CS_1
16	V_{DD}	18 to 24	V_{DD}

RTC-58323

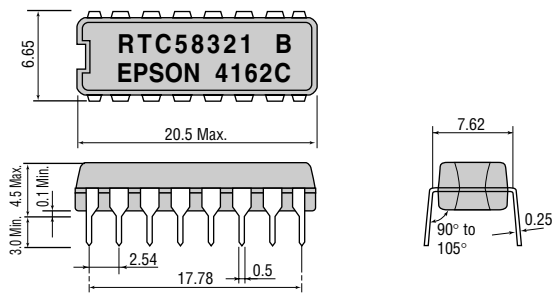


● NC is not connected internally.

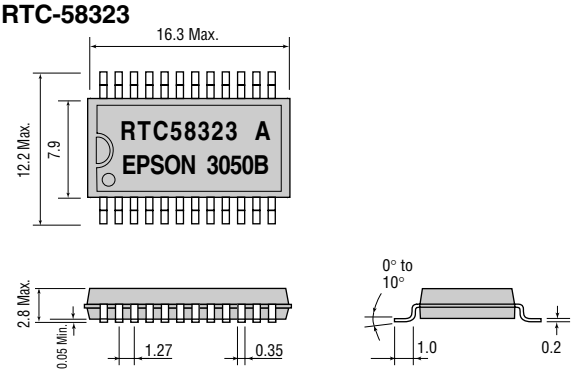
External dimensions

(Unit: mm)

RTC-58321



RTC-58323



Supplement

0= "L" level 1= "H" level

Item	Description
* mark	Writable. Recognized as 0 while in read mode
24/12	"1" =24 h mode,"0" =12 h mode
PM/AM	"1" =PM, "0" =AM. In 24 h mode, this will be "0"
D_3 and D_2 of 10 days digit	Used to select leap year. Calculated according to the surplus after dividing 10 year digit by 4
Reset register	These selections are for resetting 5-stage and the busy circuit after $1/2^{15}$ frequency stage. Resetting is activated by latching this code on to the address latch and setting WRITE=H
Standard signal register	By latching this code to the address latch and setting READ to H, the standard signals will be output at D_0 to D_3

Calendar	D_3	D_2	Surplus after dividing 10 year digit by 4	Example of leap year
Gregorian calendar	0	0	0	96, 00
		1	3	
Spare	1	0	2	
		1	1	

Note: • Do not enter erroneous data for clock.
• This may result in time keeping error.
• Do not change STOP more than once while in BUSY mode.

Switching characteristics

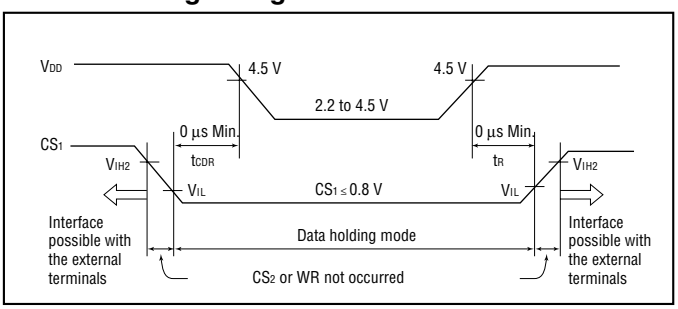
Write & read mode

(V_{DD}=5 V±0.5 V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit.
CS setup time	t_{CS}	—	0	—	—	µs
Address setup time	t_{AS}					
Address write pulse width	t_{AW}		0.5			
Address hold time	t_{AM}		0.1			
Data setup time	t_{DS}		0			
Write pulse width	t_{WW}		2			
Data hold time	t_{CH}		0			
Read inhibit time	t_{RI}					
Read access time	t_{RA}		—		*1	
Read delay time	t_{DD}				1	
CS hold time	t_{CH}		0		—	

*1 t_{RA}=1 µs+C x R x ln $[V_{DD}/(V_{DD}-V_H)]$ C: Data line capacity
R: Pull-up resistance
V_H: "H" input voltage connected to the data line
ln: Natural logarithm

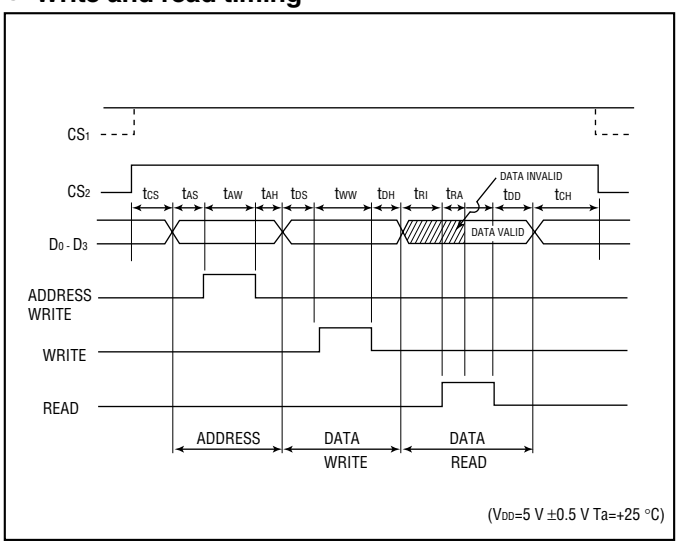
Date holding timing



Register table

Address	D_3 A_3	D_2 A_2	D_1 A_1	D_0 A_0	Name of register	D_3	D_2	D_1	D_0	Count	Note
0	0	0	0	0	S_1	S_8	S_4	S_2	S_1	0 to 9	1- sec. digit register
1	0	0	0	1	S_{10}	*	S_{40}	S_{20}	S_{10}	0 to 5	10 - sec. digit register
2	0	0	1	0	MI_1	mi_8	mi_4	mi_2	mi_1	0 to 9	1 - min. digit register
3	0	0	1	1	MI_{10}	*	mi_{40}	mi_{20}	mi_{10}	0 to 5	10 - min. 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}	24/12	PM/AM	h_{20}	h_{10}	0 to 2 or 0 to 1	10 - hour digit register
6	0	1	1	0	W	*	W_4	W_2	W_1	0 to 6	Week register
7	0	1	1	1	D_1	d_8	d_4	d_2	d_1	0 to 9	1 - day digit register
8	1	0	0	0	D_{10}	Leap year selection		d_{20}	d_{10}	0 to 3	10 - day digit register
9	1	0	0	1	MO_1	mo_8	mo_4	mo_2	mo_1	0 to 9	1- month digit register
A	1	0	1	0	MO_{10}	*			mo_{10}	0 to 1	10 -month digit register
B	1	0	1	1	Y_1	y_8	y_4	y_2	y_1	0 to 9	1 - year digit register
C	1	1	0	0	Y_{10}	y_{80}	y_{40}	y_{20}	y_{10}		10 - year digit register
D	1	1	0	1	—	*					Reset register
E	1	1	1	0	—	1 hour	1 min.	1 sec.	1024 Hz		Standard signal register
F	1	1	1	1							

Write and read timing



(VDD=5 V ±0.5 V Ta=+25 °C)

Block diagram