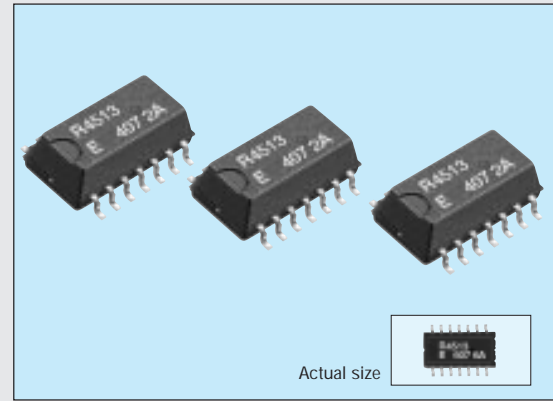


SERIAL-INTERFACE REAL TIME CLOCK MODULE

# RTC-4513

- Built-in crystal unit allows adjustment-free efficient operation.
- Using a serial interface, controllable only three signal lines.
- Automatic leap year correction.
- 30 second adjustment, available.
- Wide operating voltage from 2.7V to 5.5V.



### Specifications (characteristics)

#### Absolute Max. rating

Item	Symbol	Condition	Min.	Max.	Unit
Power source voltage	V <sub>DD</sub>	V <sub>DD</sub> -GND	-0.3	7.0	V
Input voltage	V <sub>IN</sub>			V <sub>DD</sub> +0.3	
Output voltage	V <sub>OUT</sub>				
Storage temperature	T <sub>STG</sub>		-55	+125	°C

#### Operating range

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating voltage	V <sub>DD</sub>		2.7	5.0	5.5	V
Date holding voltage	V <sub>CLK</sub>		2.0			V
Operating temperature	T <sub>OPR</sub>		-40		+85	°C

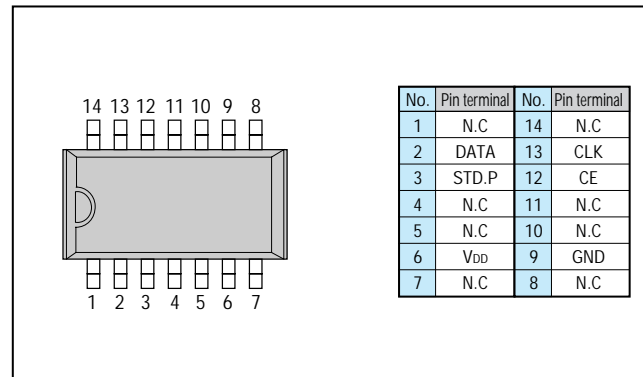
#### Frequency characteristics

Item	Symbol	Condition	Range	Unit
Frequency tolerance	$\Delta f/f_0$	T <sub>a</sub> =25°C, V <sub>DD</sub> =3V	0±25	ppm
Frequency temperature characteristics	T <sub>OP</sub>	-10 to +70°C	+10/-120	
f-V characteristics	f <sub>V</sub>	T <sub>a</sub> =25°C, V <sub>DD</sub> =2.0 to 5.5V	±5	ppm/V
Aging	f <sub>a</sub>	First year T <sub>a</sub> =25°C, V <sub>DD</sub> =3V		ppm/year

#### Electrical characteristics

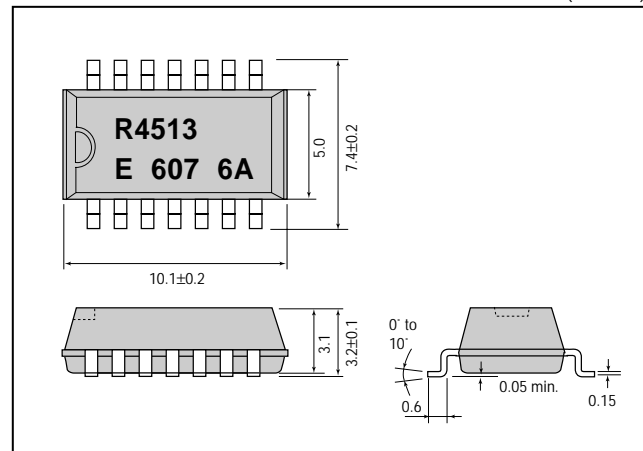
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
"H" input voltage	V <sub>IH</sub>	—	0.8V <sub>DD</sub>			V
"L" input voltage	V <sub>IL</sub>	—			0.2V <sub>DD</sub>	
Input leak current 1	I <sub>IL1</sub>	V <sub>IN</sub> =V <sub>DD</sub> /GND (CE,CLK)			1/-1	μA
Input leak current 2	I <sub>IL2</sub>	V <sub>IN</sub> =V <sub>DD</sub> /GND (DATA)			10/-10	
"L" output voltage 1	V <sub>OL1</sub>	I <sub>O</sub> =1mA (DATA)			0.2V <sub>DD</sub>	V
"H" output voltage	V <sub>OH</sub>	I <sub>O</sub> =400μA (DATA)	0.8V <sub>DD</sub>			
"L" output voltage 2	V <sub>OL2</sub>	I <sub>O</sub> =1mA (STD.P)			0.2V <sub>DD</sub>	V
Off leak current	I <sub>OFFL</sub>	V <sub>O</sub> =V <sub>DD</sub>			10.0	
Current consumption 1	I <sub>DD1</sub>	V <sub>DD</sub> =5V, V <sub>IN</sub> (CE)=0V		10.0	20.0	μA
Current consumption 2	I <sub>DD2</sub>	V <sub>DD</sub> =3V, V <sub>IN</sub> (CE)=0V		2.5	5.0	
Current consumption 3	I <sub>DD3</sub>	V <sub>DD</sub> =2V, V <sub>IN</sub> (CE)=0V		1.0	2.0	

#### Terminal connection



#### External dimensions

(Unit: mm)



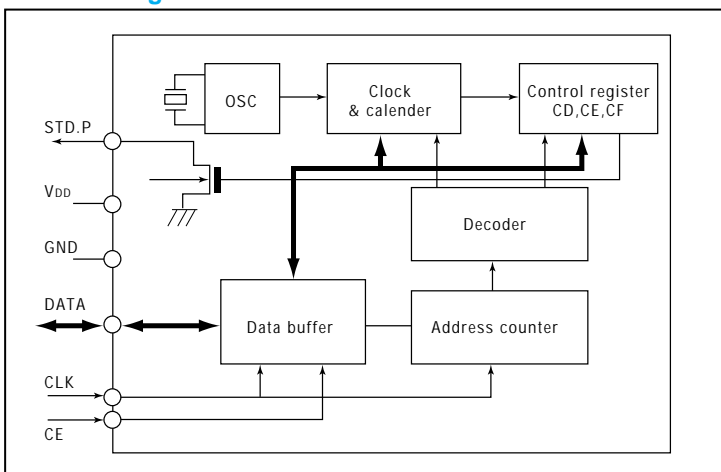
Register table

Address	Address				Register symbol	D <sub>3</sub> (MSB)	D <sub>2</sub>	D <sub>1</sub>	D <sub>0</sub> (LSB)		Register name
	A <sub>3</sub>	A <sub>2</sub>	A <sub>1</sub>	A <sub>0</sub>							
0	0	0	0	0	S <sub>1</sub>	s8	s4	s2	s1	0 to 9	1-second digit register
1	0	0	0	1	S <sub>10</sub>	f0	s40	s20	s10	0 to 5	10-second digit register
2	0	0	1	0	M <sub>1</sub>	mi8	mi3	mi2	mi1	0 to 9	1-minute digit register
3	0	0	1	1	M <sub>10</sub>	fr	mi40	mi20	mi10	0 to 5	10-minute digit register
4	0	1	0	0	H <sub>1</sub>	h8	h4	h2	h1	0 to 9	1-hour digit register
5	0	1	0	1	H <sub>10</sub>	fr	pm/am	h20	h10	0 to 1,2	10-hour digit register
6	0	1	1	0	D <sub>1</sub>	d8	d4	d2	d1	0 to 9	1-day digit register
7	0	1	1	1	D <sub>10</sub>	fr	*	d20	d10	0 to 3	10-day digit register
8	1	0	0	0	MO <sub>1</sub>	mo8	mo4	mo2	mo1	0 to 9	1-month digit register
9	1	0	0	1	MO <sub>10</sub>	fr	*		mo10	0 to 1	10-month digit register
A	1	0	1	0	Y <sub>1</sub>	y8	y4	y2	y1	0 to 9	1-year digit register
B	1	0	1	1	Y <sub>10</sub>	y80	y40	y20	y10		10-year digit register
C	1	1	0	0	W	fr	w4	w2	w1	0 to 6	day of the week register
D	1	1	0	1	CD	30ADJ	IRO-F	CAL/HW	HOLD	—	Control register D
E	1	1	1	0	CE	t1	t0	INT/STND	MASK		Control register E
F	1	1	1	1	CF	TEST	24/12	STOP	RESET		Control register F

Switching characteristics

Item	Symbol	Condition	Min.	Max.	Unit	
CLK "H" time	t <sub>WH</sub>	—	300	—	ns	
CLK "L" time	t <sub>WL</sub>					
CE setup time	t <sub>CS</sub>					
CE hold time	t <sub>CH</sub>					
CE recovery time	t <sub>CR</sub>					
CLK setup time	t <sub>CKS</sub>					
CLK hold time	t <sub>CKH</sub>					
Write data setup time	t <sub>DS</sub>					50
Write data hold time	t <sub>DH</sub>					
Read data delay time	t <sub>RD</sub>					Cl=50pF
Read data disable delay time	t <sub>RDZ</sub>	—	—	100		
CLK rise time/fall time	t <sub>RF</sub>	—	—	20		

Block diagram



Timing chart

