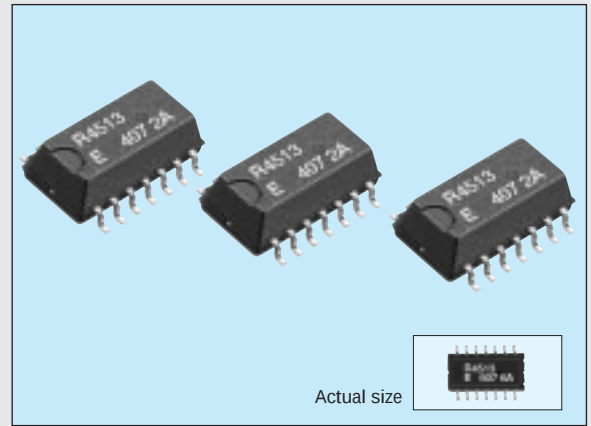


SERIAL-INTERFACE REAL TIME CLOCK MODULE

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 _{DD}	V _{DD} -GND	-0.3	7.0	V
Input voltage	V _{IN}			V _{DD} +0.3	
Output voltage	V _{OUT}				
Storage temperature	T _{STG}		-55	+125	°C

■ Operating range

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating voltage	V_{DD}		2.7	5.0	5.5	V
Date holding voltage	V_{CLK}		2.0			
Operating temperature	T_{OPR}		-40		+85	°C

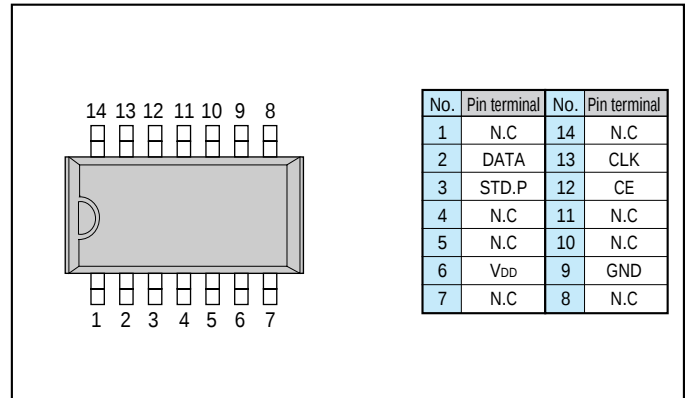
■ Frequency characteristics

Item	Symbol	Condition	Range	Unit
Frequency tolerance	$\Delta f/f_0$	$T_a=25^\circ\text{C}$, $V_{DD}=3\text{V}$	0 ± 25	ppm
Frequency temperature characteristics	T_{OP}	-10 to $+70^\circ\text{C}$	$+10/-120$	
f-V characteristics	f_v	$T_a=25^\circ\text{C}$, $V_{DD}=2.0$ to 5.5V	± 5	ppm/V
Aging	f_a	First year $T_a=25^\circ\text{C}$, $V_{DD}=3\text{V}$		ppm/year

■ Electrical characteristics

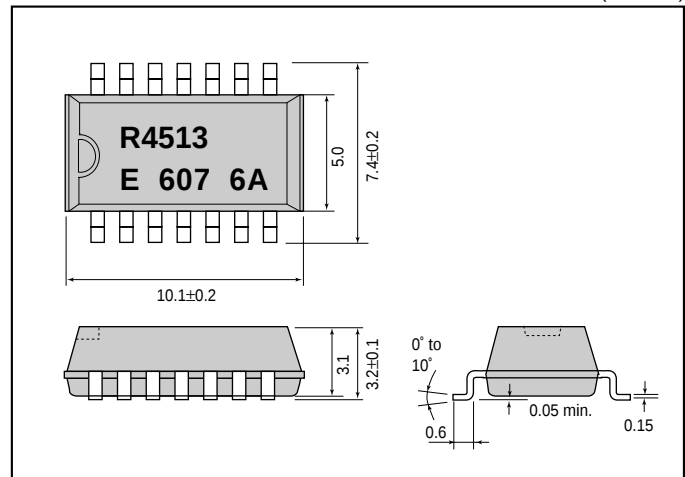
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
"H" input voltage	V_{IH}	—	$0.8V_{DD}$			V
"L" input voltage	V_{IL}	—			$0.2V_{DD}$	
Input leak current 1	I_{IL1}	$V_{IN}=V_{DD}/GND$ (CE, CLK)			1/-1	μA
Input leak current 2	I_{IL2}	$V_{IN}=V_{DD}/GND$ (DATA)			10/-10	
"L" output voltage 1	V_{OL1}	$I_O=1\text{mA}$ (DATA)			$0.2V_{DD}$	V
"H" output voltage	V_{OH}	$I_O=-400\mu\text{A}$ (DATA)	$0.8V_{DD}$			
"L" output voltage 2	V_{OL2}	$I_O=1\text{mA}$ (STD.P)			$0.2V_{DD}$	
Off leak current	I_{OFLK}	$V_O=V_{DD}$			10.0	μA
Current consumption 1	I_{DD1}	$V_{DD}=5\text{V}$, V_{IN} (CE) = 0V		10.0	20.0	
Current consumption 2	I_{DD2}	$V_{DD}=3\text{V}$, V_{IN} (CE) = 0V		2.5	5.0	
Current consumption 3	I_{DD3}	$V_{DD}=2\text{V}$, V_{IN} (CE) = 0V		1.0	2.0	

■ Terminal connection



■ External dimensions

(Unit: mm)



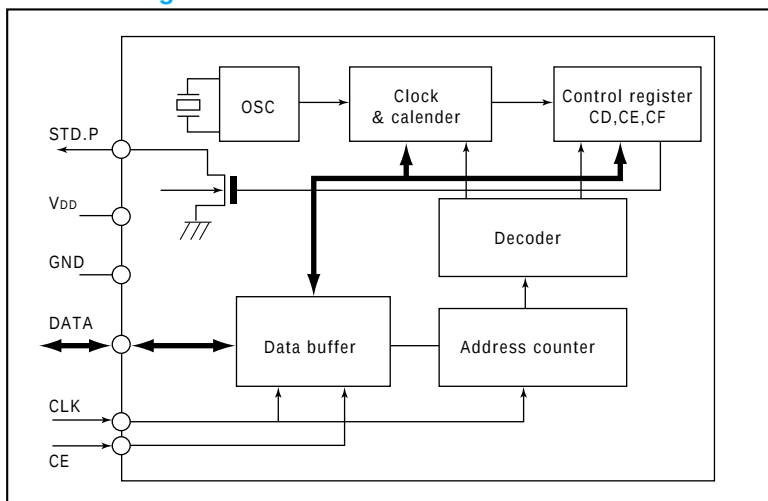
Register table

	Address				Register symbol	D ₃ (MSB)	D ₂	D ₁	D ₀ (LSB)		Register name
	A ₃	A ₂	A ₁	A ₀							
0	0	0	0	0	S ₁	s8	s4	s2	s1	0 to 9	1-second digit register
1	0	0	0	1	S ₁₀	f0	s40	s20	s10	0 to 5	10-second digit register
2	0	0	1	0	MI ₁	mi8	mi3	mi2	mi1	0 to 9	1-minute digit register
3	0	0	1	1	MI ₁₀	fr	mi40	mi20	mi10	0 to 5	10-minute digit register
4	0	1	0	0	H ₁	h8	h4	h2	h1	0 to 9	1-hour digit register
5	0	1	0	1	H ₁₀	fr	pm/am	h20	h10	0 to 1,2	10-hour digit register
6	0	1	1	0	D ₁	d8	d4	d2	d1	0 to 9	1-day digit register
7	0	1	1	1	D ₁₀	fr	*	d20	d10	0 to 3	10-day digit register
8	1	0	0	0	MO ₁	mo8	mo4	mo2	mo1	0 to 9	1-month digit register
9	1	0	0	1	MO ₁₀	fr	*		mo10	0 to 1	10-month digit register
A	1	0	1	0	Y ₁	y8	y4	y2	y1	0 to 9	1-year digit register
B	1	0	1	1	Y ₁₀	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	IRQ-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 _{WH}	—	300	—	ns
CLK "L" time	t _{WL}				
CE setup time	t _{CS}		150		
CE hold time	t _{CH}		200		
CE recovery time	t _{CR}		300		
CLK setup time	t _{CKS}		20		
CLK hold time	t _{CKH}		50		
Write data setup time	t _{DS}				
Write data hold time	t _{DH}				
Read data delay time	t _{RD}	CL=50pF		250	
Read data disable delay time	t _{RZ}	—		100	
CLK rise time/fall time	t _{RF}	—		20	

Block diagram



Timing chart

