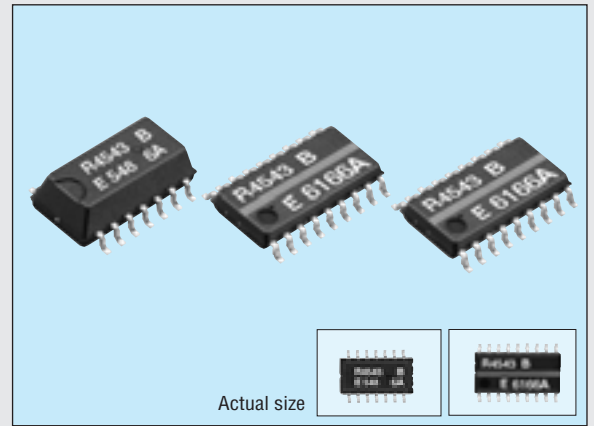


# SERIAL-INTERFACE REAL TIME CLOCK MODULE

## RTC-4543SA/SB

- Built-in crystal unit allows adjustment-free efficient operation.
- Automatic leap year correction.
- Output selectable between 32.768 kHz/1 Hz.
- Operating voltage range: 2.5 V to 5.5 V.
- Supply voltage detection voltage:  $1.7 \pm 0.3$  V.
- Low current consumption:  $1.0 \mu\text{A}/2.0$  V (Max.)



### 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	$^{\circ}\text{C}$

#### Operating range

Item	Symbol	Condition	Min.	Max.	Unit
Operating voltage	$V_{DD}$	—	2.5	5.5	V
Date holding voltage	$V_{CLK}$		1.4		
Operating temperature	$T_{OPR}$		-40	+85	

#### Frequency characteristics

Item	Symbol	Condition	Range	Unit
Frequency tolerance	$\Delta f/f_0$	$T_a = +25^{\circ}\text{C}$ , $V_{DD} = 5\text{ V}$	$5 \pm 23$	$\times 10^{-6}$
Frequency temperature characteristics	$T_{OP}$	-10 to $+70^{\circ}\text{C}$	$+10/-120$	
Frequency voltage characteristics	$f_v$	$T_a = +25^{\circ}\text{C}$ , $V_{DD} = 2.0$ to $5.5\text{ V}$	$\pm 2$	$\times 10^{-6}/\text{V}$
Oscillation start time	$t_{OSC}$	$T_a = +25^{\circ}\text{C}$ , $V_{DD} = 2.5\text{ V}$	3	s
Aging	$f_a$	First year $T_a = +25^{\circ}\text{C}$ , $V_{DD} = 5\text{ V}$	$\pm 5$	$\times 10^{-6}/\text{year}$

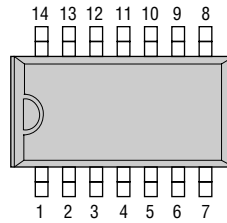
#### DC characteristics

( $V_{DD} = 5\text{ V} \pm 0.5\text{ V}$ ,  $T_a = -40$  to  $+85^{\circ}\text{C}$ )

Item	Symbol	Condition	Min.	Typ.	Max.	Unit		
"H" input voltage	$V_{IH}$	WR, DATA, CE, CLK, $F_{OE}, F_{SEL}$ pins	$0.8V_{DD}$	—	—	V		
"L" input voltage	$V_{IL}$		$0.2V_{DD}$					
Input off-leak current	$I_{OFF}$	WR, CE, CLK, $F_{OE}, F_{SEL}$ pins	—	—	0.5	$\mu\text{A}$		
"H" output voltage	$V_{OH1}$	$V_{DD} = 5.0\text{ V}$	$I_{OH} = -1.0\text{ mA}$	4.5	—	V		
	$V_{OH2}$	$V_{DD} = 3.0\text{ V}$	DATA, $F_{OUT}$ pins	2.5				
"L" output voltage	$V_{OL1}$	$V_{DD} = 5.0\text{ V}$	$I_{OL} = 1.0\text{ mA}$	—	0.5	V		
	$V_{OL2}$	$V_{DD} = 3.0\text{ V}$	DATA, $F_{OUT}$ pins	—	0.8			
Output leak current	$I_{OZH}$	$V_{OUT} = 5.5\text{ V}$	DATA, $F_{OUT}$ pins	-1.0	1.0	$\mu\text{A}$		
	$I_{OZL}$	$V_{OUT} = 0\text{ V}$						
Supply detection voltage	$V_{DT}$	—	1.4	1.7	2.0	V		
Output load conditions	$C_L$	$F_{OUT}$ pin	—	30 pF(Max.)		V		
	N			2LS-TTL				
Current consumption	1	$I_{DD1}$	$V_{DD} = 5.0\text{ V}$	—	1.5	3.0	$\mu\text{A}$	
	2	$I_{DD2}$	$V_{DD} = 3.0\text{ V}$		1.0	2.0		
	3	$I_{DD3}$	$V_{DD} = 2.0\text{ V}$		0.5	1.0		
	4	$I_{DD4}$	$V_{DD} = 5.0\text{ V}$		CE="L", $F_{OE}$ ="L" $F_{SEL}$ ="H"	4.0		10.0
	5	$I_{DD5}$	$V_{DD} = 3.0\text{ V}$		CE="L", $F_{OE}$ ="H" $F_{SEL}$ ="L"	2.5		6.5
	6	$I_{DD6}$	$V_{DD} = 2.0\text{ V}$		No load on the $F_{OUT}$ pin	1.5		4.0

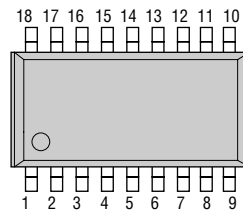
### Terminal connection

#### RTC-4543SA



No.	4543SA	4543SB
1	GND	N.C
2	N.C	N.C
3	CE	N.C
4	$F_{SEL}$	N.C
5	WR	$F_{OE}$
6	$F_{OE}$	WR
7	N.C	$F_{SEL}$
8	N.C	CE
9	$V_{DD}$	GND
10	CLK	$F_{OUT}$
11	DATA	DATA
12	N.C	CLK
13	N.C	N.C
14	$F_{OUT}$	$V_{DD}$
15	—	N.C
16	—	N.C
17	—	N.C
18	—	N.C

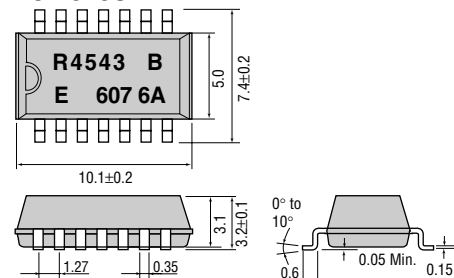
#### RTC-4543SB



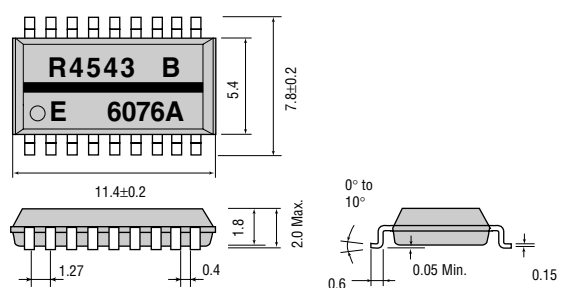
### External dimensions

(Unit: mm)

#### RTC-4543SA (SOP 14-pin)



#### RTC-4543SB (SOP 18-pin)



Register table

		MSB							
Seconds (0 to 59)	FDT	s 40	s 20	s 10	s 8	s 4	s 2	s 1	
Minutes (0 to 59)	*	mi 40	mi 20	mi 10	mi 8	mi 4	mi 2	mi 1	
Hour (0 to 23)	*	*	h 20	h 10	h 8	h 4	h 2	h 1	
Day of the week (1 to 7)					*	w 4	w 2	w 1	
Day (1 to 31)	*	*	d 20	d 10	d 8	d 4	d 2	d 1	
Month (1 to 12)	TM	*	*	mo 10	mo 8	mo 4	mo 2	mo 1	
year (0 to 99)		y 80	y 40	y 20	y 10	y 8	y 4	y 2	y 1

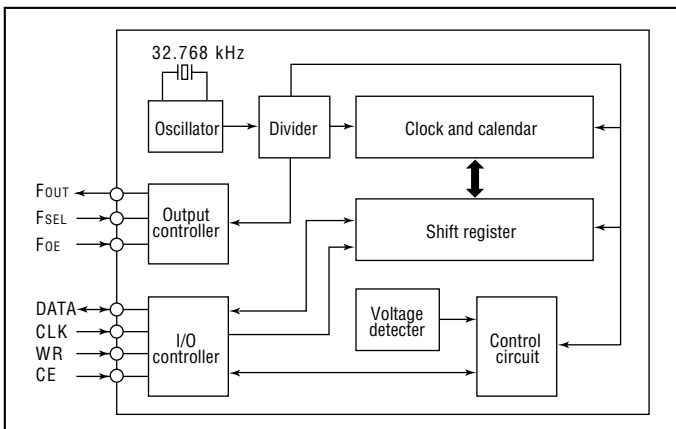
FDT bit: Supply voltage detection bit. TM bit: Test bit always set this bit to "0".

Switching characteristics

(Ta=-40 to +85 °C, CL=50 pF)

Item	Symbol	VDD= 5 V± 10 %		VDD= 3 V± 10 %		Unit
		Min.	Max.	Min.	Max.	
CLK clock cycle	t <sub>CLK</sub>	0.75	7800	1.5	7800	μs
CLK high pulse width	t <sub>CLKH</sub>	0.375	3900	0.75	3900	
CLK low pulse width	t <sub>CLKL</sub>					
CE setup time	t <sub>CES</sub>					
CE hold time	t <sub>CEH</sub>					
CE enable time	t <sub>CE</sub>	—	0.9	—	0.9	s
Write data setup time	t <sub>SD</sub>	0.1		0.2		μs
Write data hold time	t <sub>HD</sub>			0.1		
WR setup time	t <sub>WRS</sub>	100		100		ns
WR hold time	t <sub>WRH</sub>					
DATA output delay time	t <sub>DATA</sub>		0.2		0.4	μs
DATA output floating time	t <sub>DZ</sub>		0.1		0.2	
Clock input rise time	t <sub>r1</sub>		50		100	ns
Clock input fall time	t <sub>f1</sub>					
Fout rise time	t <sub>r2</sub>		100			
Fout fall time	t <sub>f2</sub>					
Disable time	t <sub>ZX</sub>	Cl= 30 pF				
Enable time	t <sub>ZK</sub>					
Fout duty ratio	Duty	40	60	40	60	%
Wait time	t <sub>RCV</sub>	0.95	—	1.9	—	μs

Block diagram



Timing chart

