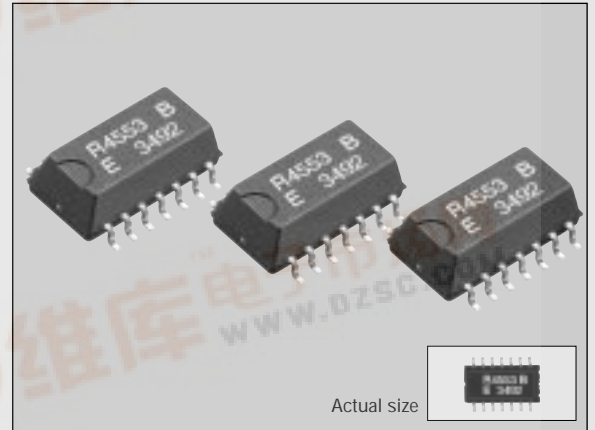


Real time clock module

SERIAL-INTERFACE REAL TIME CLOCK MODULE

RTC-4553

- Built-in crystal unit allows adjustment-free efficient operation.
- The small package makes high-density mounting possible. (SOP 14-pin)
- Automatic calendar function (year, month, day, day of the week, hour, minute, second).
- Automatic leap year correction. (up to 2099)
- Built-in 30 x 4-bit S-RAM.
- High-speed access.
- Reference pulse output. (1024 Hz, 1/10 Hz)
- Low current consumption. (1 μ A typical)
- Similar mounting method to that used for universal type SMD IC.



Specifications (characteristics)

Absolute Max. rating

Item	Symbol	Condition	Min.	Max.	Unit
Supply voltage	V _{DD}	V _{DD} -GND		+6.0	V
Input voltage	V _{IN}	S _{IN} , S _{CK} , WR, CS ₀ , CS ₁	-0.3	V _{DD} +0.3	
Output voltage	V _{OUT}	S _{OUT} , T _{POUT}			
Storage temperature	T _{STG}	Stored without tape & reel	-55	+125	°C
Soldering conditions	T _{SOL}		Twice at under 260°C within 10 sec. or under 230°C within 3 min.		

Operating range

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating voltage	V _{DD}	—	2.7	5.0	5.5	V
Operating temperature	T _{OPR}	—	-30	—	+70	°C

Frequency characteristics

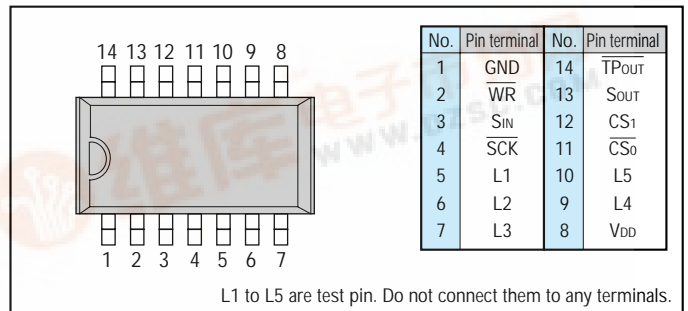
Item	Symbol	Condition	Range	Unit	
Frequency tolerance	$\Delta f/f_0$	T _a =25°C, V _{DD} =5V	AA	5±5	ppm
			A	5±10	
			B	5±20	
Frequency temperature characteristics	T _{OP}	T _a =-10 to 70°C, V _{DD} =5V Reference at 25°C	+10 -120	ppm	
Frequency voltage characteristics	f _V	T _a =Fix, V _{DD} =2 to 5.5V Reference at 5V	±5		
Aging	f _A	T _a =25°C, V _{DD} =5V, first year		ppm/year	

DC characteristics

● V_{DD}=5V±10% (GND=0V, T_a=-30°C to +70°C)

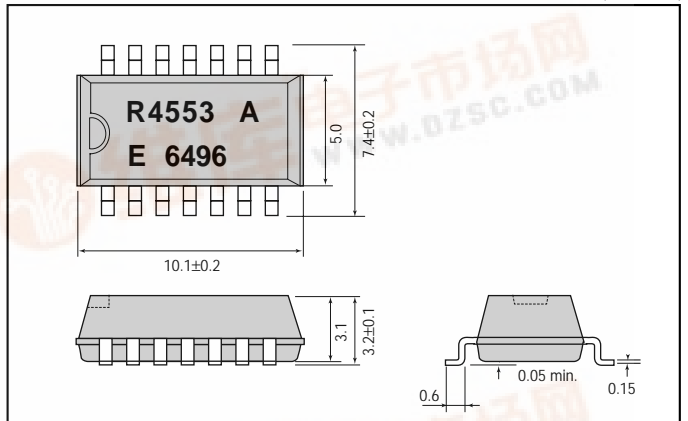
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Data holding voltage	V _{DH}	—	2.0	—	5.5	V
Current consumption	I _{DD1}	S _{CK} =500 kHz	—	—	100	μ A
	I _{DD2}	S _{CK} =DC	—	1.0	3.0	
Output voltage	V _{OH}	I _{OH} =-400 μ A	V _{DD} -0.4	—	—	V
	V _{OL}	I _{OL} =1.6mA	—	—	0.4	
Off leak current	I _{OZH}	V _{OUT} =5.5V	-2.0	—	2.0	μ A
	I _{OZL}	V _{OUT} =0V				
Input voltage	V _{IH}	—	4/5 V _{DD}	—	—	V
	V _{IL}	—	—			
Input current	I _{IH}	V _{IN} =5.5V	-2.0	—	2.0	μ A
	I _{IL}	V _{IN} =0V				
Oscillation start-up time	T _{OSC}	T _a =25°C	—	—	3.0	s

Terminal connection



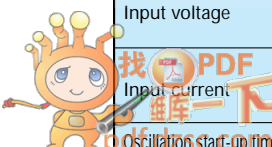
External dimensions

(Unit: mm)



● V_{DD}=3V±10% (GND=0V, T_a=-30°C to +70°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Data holding voltage	V _{DH}	—	2.0	—	3.3	V
Current consumption	I _{DD1}	S _{CK} =300 kHz	—	—	100	μ A
	I _{DD2}	S _{CK} =DC	—	1.0	3.0	
Output voltage	V _{OH}	I _{OH} =-400 μ A	V _{DD} -0.4	—	—	V
	V _{OL}	I _{OL} =1.6mA	—	—	0.4	
Off leak current	I _{OZH}	V _{OUT} =3.3V	-2.0	—	2.0	μ A
	I _{OZL}	V _{OUT} =0V				
Input voltage	V _{IH}	—	4/5 V _{DD}	—	—	V
	V _{IL}	—	—			
Input current	I _{IH}	V _{IN} =3.3V	-2.0	—	2.0	μ A
	I _{IL}	V _{IN} =0V				
Oscillation start-up time	T _{OSC}	T _a =25°C	—	—	3.0	s



Register table

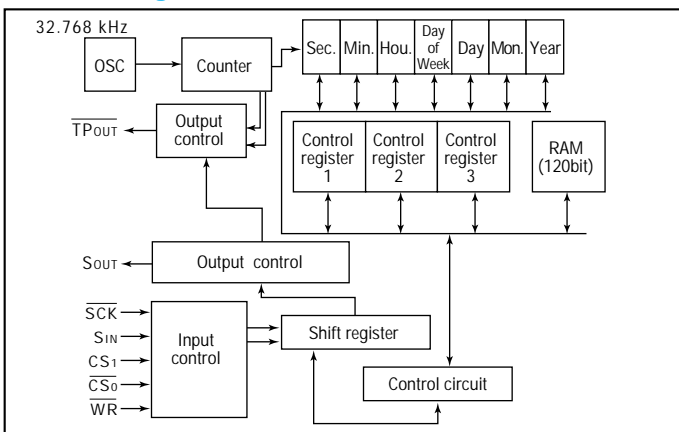
Address					MODE 0					MODE 1				MODE 2							
					Register symbol	Counter control register				User RAM Domain 1				User RAM Domain 2							
A ₃	A ₂	A ₁	A ₀	D ₃		D ₂	D ₁	D ₀	Register name				D ₃	D ₂	D ₁	D ₀	D ₃	D ₂	D ₁	D ₀	
0	0	0	0	0	S ₁	S ₈	S ₄	S ₂	S ₁	1-second digit register				RA ₃	RA ₂	RA ₁	RA ₀	RA ₆₃	RA ₆₂	RA ₆₁	RA ₆₀
1	0	0	0	1	S ₁₀	0	S ₄₀	S ₂₀	S ₁₀	10-second digit register				RA ₇	RA ₆	RA ₅	RA ₄	RA ₆₇	RA ₆₆	RA ₆₅	RA ₆₄
2	0	0	1	0	MI ₁	mi ₈	mi ₄	mi ₂	mi ₁	1-minute digit register				RA ₁₁	RA ₁₀	RA ₉	RA ₈	RA ₇₁	RA ₇₀	RA ₆₉	RA ₆₈
3	0	0	1	1	MI ₁₀	0	mi ₄₀	mi ₂₀	mi ₁₀	10-minute digit register				RA ₁₅	RA ₁₄	RA ₁₃	RA ₁₂	RA ₇₅	RA ₇₄	RA ₇₃	RA ₇₂
4	0	1	0	0	H ₁	h ₈	h ₄	h ₂	h ₁	1-hour digit register				RA ₁₉	RA ₁₈	RA ₁₇	RA ₁₆	RA ₇₉	RA ₇₈	RA ₇₇	RA ₇₆
5	0	1	0	1	H ₁₀	PM/AM	0	h ₂₀	h ₁₀	10-hour digit register				RA ₂₃	RA ₂₂	RA ₂₁	RA ₂₀	RA ₈₃	RA ₈₂	RA ₈₁	RA ₈₀
6	0	1	1	0	W	0	w ₄	w ₂	w ₁	Day of the week digit register				RA ₂₇	RA ₂₆	RA ₂₅	RA ₂₄	RA ₈₇	RA ₈₆	RA ₈₅	RA ₈₄
7	0	1	1	1	D ₁	d ₈	d ₄	d ₂	d ₁	1-day digit register				RA ₃₁	RA ₃₀	RA ₂₉	RA ₂₈	RA ₉₁	RA ₉₀	RA ₈₉	RA ₈₈
8	1	0	0	0	D ₁₀	0	0	d ₂₀	d ₁₀	10-day digit register				RA ₃₅	RA ₃₄	RA ₃₃	RA ₃₂	RA ₉₅	RA ₉₄	RA ₉₃	RA ₉₂
9	1	0	0	1	MO ₁	mo ₈	mo ₄	mo ₂	mo ₁	1-month digit register				RA ₃₉	RA ₃₈	RA ₃₇	RA ₃₆	RA ₉₉	RA ₉₈	RA ₉₇	RA ₉₆
A	1	0	1	0	MO ₁₀	0	0	0	mo ₁₀	10-month digit register				RA ₄₃	RA ₄₂	RA ₄₁	RA ₄₀	RA ₁₀₃	RA ₁₀₂	RA ₁₀₁	RA ₁₀₀
B	1	0	1	1	Y ₁	y ₈	y ₄	y ₂	y ₁	1-year digit register				RA ₄₇	RA ₄₆	RA ₄₅	RA ₄₄	RA ₁₀₇	RA ₁₀₆	RA ₁₀₅	RA ₁₀₄
C	1	1	0	0	Y ₁₀	y ₈₀	y ₄₀	y ₂₀	y ₁₀	10-year digit register				RA ₅₁	RA ₅₀	RA ₄₉	RA ₄₈	RA ₁₁₁	RA ₁₁₀	RA ₁₀₉	RA ₁₀₈
D	1	1	0	1	C ₁	TPS	30ADJ	CNTR	24/12	Control register 1				RA ₅₅	RA ₅₄	RA ₅₃	RA ₅₂	RA ₁₁₅	RA ₁₁₄	RA ₁₁₃	RA ₁₁₂
E	1	1	1	0	C ₂	BUSY	PONC	—	*	Control register 2				RA ₅₉	RA ₅₈	RA ₅₇	RA ₅₆	RA ₁₁₉	RA ₁₁₈	RA ₁₁₇	RA ₁₁₆
F	1	1	1	1	C ₃	SYSR	TEST	MS ₁	MS ₀	Control register 3				Same as MODE 0				Same as MODE 0			

Note: * TEST bit should be "0".

Switching characteristics (Ta=-30°C to +70°C, VDD=5V±10%, GND=0V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
SCK input frequency	f _{SCK}		—	—	500	kHz
SCK "L" time	t _{W_{SCKL}}		—	—	—	μs
SCK "H" time	t _{W_{SCKH}}		1.0	—	—	
SCK pause time	t _{PS}		—	—	—	
CS ₀ setup time	t _{SCS}		0	—	—	
CS ₀ hold time	t _{HCS}		0.5	—	—	
SIN data setup time	t _{SD}		0.2	—	—	
SIN data Hold time	t _{HD}		—	—	—	
WR setup time	t _{SWR}		1.0	—	—	
WR hold time	t _{HWR}		0.5	—	—	
SOUT delay time	t _{DSO}		—	150	500	
CS ₀ and CS ₁ enable to Sout output	t _{DSZ1}	CL=100pF	—	—	100	
CS ₀ disable to Sout high Z	t _{DSZ2}		—	—	—	
CS ₁ enable to Sout output	t _{DPZ1}		—	—	—	
CS ₁ enable to Sout high Z	t _{DPZ2}		—	—	—	

Block diagram



Timing chart

