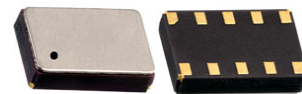


# Real Time Clock Module with I<sup>2</sup>C Bus



3.2 x 1.5 x 0.8 mm

AB-RTCMC-32.768kHz-AIGZ-S7 (Preliminary)



RoHS/RoHS II compliant

Moisture Sensitivity Level: MSL=1

## FEATURES:

- With state-of-the-art RTC Technology by Micro Crystal AG
- RTC module with built-in crystal oscillating at 32.768 kHz
- 350 nA timekeeping current at 3 V
- Timekeeping down to 1.0 V
- 1.3 V to 4.4 V I2C bus operating voltage– 4.4 V max VCC suitable for lithium ion battery operation
- Low operating current of 35  $\mu$ A (at 400 kHz)
- 32 KHz square wave on power-up to drive a microcontroller in low-power mode– Programmable from 1 Hz to 32 KHz;– Can be disabled
- 400 kHz I2C serial interface
- Oscillator stop detection circuit monitors clock operation
- Accurate programmable watchdog– 62.5 ms to 31 min timeout
- Counters for tenths/hundredths of seconds, seconds, minutes, hours, day, date, month, year, and century
- Software clock calibration to compensate deviation of crystal due to temperature
- Automatic leap year compensation
- Ultra-small, 3.2 x1.5 mm, lead-free 8-pin ceramic leadless chip carrier

## APPLICATIONS:

- Wide range in communication & measuring equipment
- Commercial & Industrial applications
- Automotive electronics applications
- Wireless communications
- PDA and Palm Pilots
- Credit Cards with Security Technology

## STANDARD SPECIFICATIONS:

### Absolute Maximum Ratings

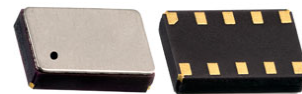
Parameters	Min.	Typ.	Max.	Units	Notes
Supply Voltage ( $V_{CC}$ )	-0.3		+5.0	V	
Input Output Voltage ( $V_{IO}$ )	-0.2		$V_{CC} + 0.3$	V	
Output Current ( $I_O$ )			20	mA	
Power Dissipation			1	mW	
Operating Temperature Range ( $T_{OPR}$ )	-40		+85	$^{\circ}$ C	
Storage Temperature ( $T_{STO}$ )	-55		+125	$^{\circ}$ C	$V_{DD}$ off, oscillator off

### Frequency Characteristics

Parameters	Min.	Typ.	Max.	Units	Notes
Frequency Accuracy ( $\Delta F/F$ )			$\pm 20$	ppm	$T_{AMB} = +25^{\circ}$ C
Frequency vs Temperature ( $\Delta F/T_{OPR}$ )	$-0.035 \text{ ppm}/^{\circ}\text{C}^2 (T_{OPR} - T_O)^2 \pm 10\%$			ppm	$T_{RER} = +25^{\circ}$ C
Turnover Temperature ( $T_O$ )	+20	+25	+30	$^{\circ}$ C	
Aging (first year)	-3		+3	ppm	$T_{AMB} = +25^{\circ}$ C
Start-up Time ( $T_{START}$ )			1	s	$V_{CC} = 3.0\text{V}$
Start-up Voltage ( $V_{START}$ )	1.5			V	$\leq 10$ seconds
Input Rise and Fall Time ( $t_r; t_f$ )			5	ns	$30\% * V_{CC}$ to $70\% * V_{CC}$
IC-to-IC Frequency Variation <sup>(1)</sup>	-10			+10	
Load Capacitance ( $C_L$ )				50pF	

1. Reference value.  $T_A = 25^{\circ}$ C,  $V_{CC} = 3.0$  V.





## Static Characteristics

Parameters <sup>(1)</sup>		Min.	Typ.	Max.	Units	Notes
Supply Voltage (V <sub>CC</sub> ) <sup>(2)</sup>		1.0		4.4	V	Time keeping
		1.3		4.4		I <sup>2</sup> C Bus active
Supply Current (I <sub>CC1</sub> )	V <sub>DD</sub> = 4.4V			100	μA	f <sub>SCL</sub> =400kHz No load
	V <sub>DD</sub> = 3.6V		50	70		
	V <sub>DD</sub> = 3.0V		35			
	V <sub>DD</sub> = 2.5V		30			
	V <sub>DD</sub> = 2.0V		20			
Supply Current (I <sub>CC2</sub> ) (standby)	V <sub>DD</sub> = 4.4V			950	nA	f <sub>SCL</sub> =0Hz SQW off All inputs ≥V <sub>CC</sub> -0.2V ≤V <sub>SS</sub> +0.2V
	V <sub>DD</sub> = 3.6V		375	700		
	V <sub>DD</sub> = 3.0V@25°C		350			
	V <sub>DD</sub> = 2.0V@25°C		310			
LOW Level Input Voltage (V <sub>IL</sub> )		-0.2		30%* V <sub>CC</sub>	V	
HIGH Level Input Voltage (V <sub>IH</sub> )		70%* V <sub>CC</sub>		V <sub>CC</sub> +0.3	V	
HIGH Level Output Voltage (V <sub>OH</sub> )		2.4			V	V <sub>CC</sub> = 3.6V; I <sub>OH</sub> = -1.0mA (push-pull)
LOW Level Output Voltage (V <sub>OL</sub> )	CMOS or open drain			0.4	V	V <sub>CC</sub> = 3.6V; I <sub>OL</sub> = 3.0mA
	Pin SQW,/IRQ			0.4		V <sub>CC</sub> = 3.6V; I <sub>OL</sub> = 1.0mA
Pull-up supply Voltage (open drain)	Pin: /IRQ/OUT			4.4	V	
Input Leakage Current (I <sub>LI</sub> )		-1		+1	μA	0V ≤ V <sub>IN</sub> ≤ V <sub>CC</sub>
Output Leakage Current (I <sub>LO</sub> )		-1		+1	μA	0V ≤ V <sub>OUT</sub> ≤ V <sub>CC</sub>
Input Capacitance (C <sub>IN</sub> ) <sup>(3)(4)</sup>						
Output Capacitance (C <sub>OUT</sub> ) <sup>(3)(4)(5)</sup>						
Low-pass filter input time constant (SDA and SCL) (t <sub>LP</sub> ) <sup>(3)(4)</sup>						

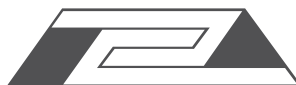
1. Valid for ambient operating temperature: T<sub>A</sub> = -40 to 85 °C; V<sub>CC</sub> = 1.3 V to 4.4 V (except where noted).

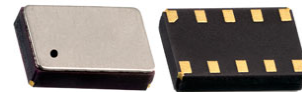
2. Oscillator startup guaranteed down to 1.5 V only

3. Effective capacitance measured with power supply at 3.6 V; sampled only, not 100% tested.

4. At 25 °C, f = 1 MHz.

5. Outputs deselected.





3.2 x 1.5 x 0.8 mm

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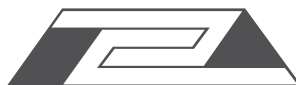
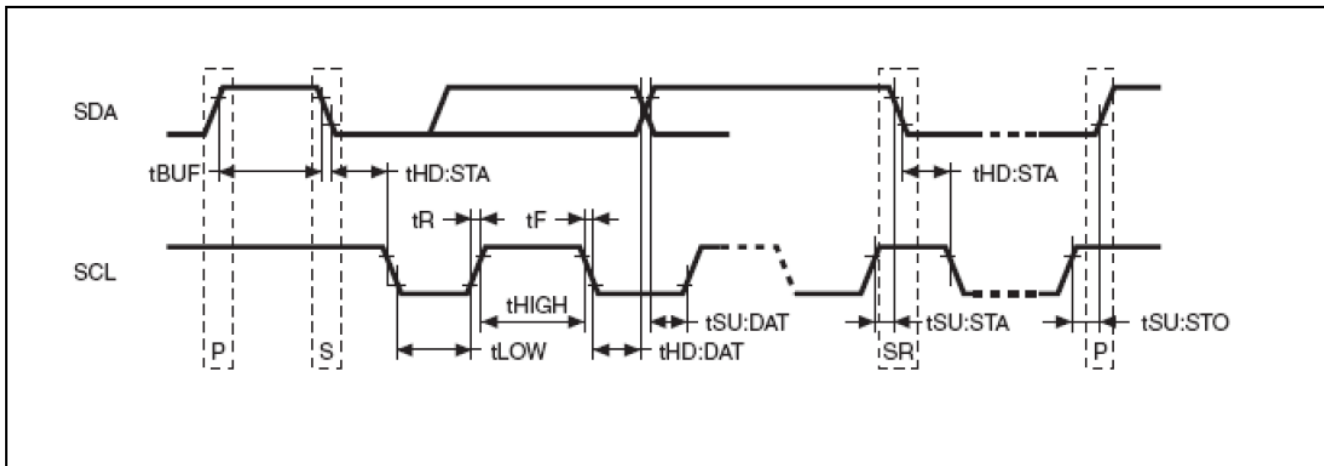
## I<sup>2</sup>C Interface Dynamic Characteristics

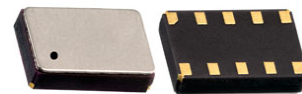
Parameters <sup>(1)</sup>	Min.	Typ.	Max.	Units
SCL clock frequency ( $f_{SCL}$ )	0		400	kHz
Hold time (repeated) START condition ( $t_{HD:STA}$ )	0.6			$\mu$ s
Startup time for repeated START condition ( $t_{SU:STA}$ )	0.6			$\mu$ s
LOW period of SCL clock ( $t_{LOW}$ )	1.3			$\mu$ s
HIGH period of SCL clock ( $t_{HIGH}$ )	0.6			$\mu$ s
Bus free time between STOP and START condition ( $t_{BUF}$ )	1.3			$\mu$ s
Rise time of both SDA and SCL signals ( $t_r$ )			0.3	$\mu$ s
Fall time of both SDA and SCL signals ( $t_f$ )			0.3	$\mu$ s
Data setup time ( $t_{SU:DAT}$ ) <sup>(2)</sup>	100			ns
Data hold time ( $t_{HD:DAT}$ )	0			$\mu$ s
Setup time for STOP condition ( $t_{SU:STO}$ )	0.6			$\mu$ s

1. Valid for ambient operating temperature:  $T_A = -40$  to  $85$  °C;  $V_{CC} = 1.3$  to  $4.4$  V (except where noted).

2. Transmitter must internally provide a hold time to bridge the undefined region (300 ns max) of the falling edge of SCL.

## I<sup>2</sup>C Interface Timing Characteristics





3.2 x 1.5 x 0.8 mm

AB-RTCMC-32.768kHz-AIGZ-S7 (Preliminary)



RoHS/RoHS II compliant

## ➤ PART IDENTIFICATIONS:

AB-RTCMC-32.768 kHz-AIGZ-S7-

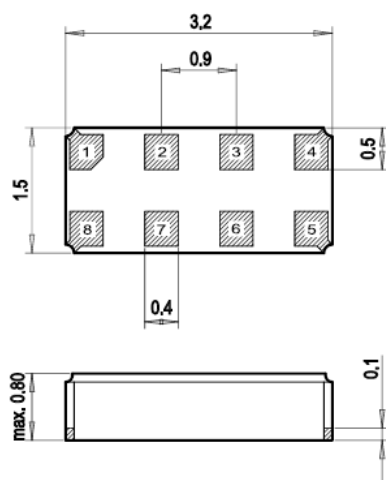


### Packaging

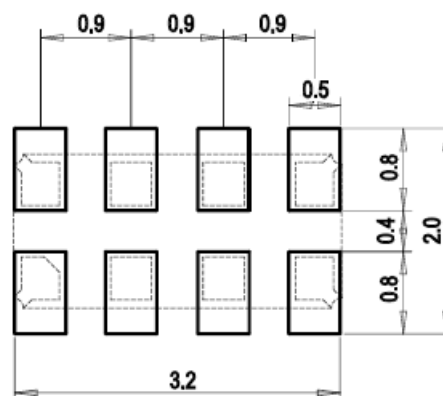
Blank: Bulk

T: 1000pcs/reel

## ➤ OUTLINE DIMENSIONS:



### Recommended Land Pattern



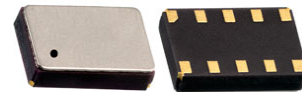
Dimensions: mm

## ➤ PIN DESCRIPTIONS:

Pin No.	Pin Name	Function
1	SDA	Serial data input/output
2	CLKOUT	Clock output pin
3	V <sub>SS</sub>	Ground
4	NC	Not connected
5	V <sub>CC</sub>	Supply voltage
6	$\overline{\text{INT}}$	Interrupt output pin
7	NC	Not connected
8	SCL	Serial clock input



# Real Time Clock Module with I<sup>2</sup>C Bus



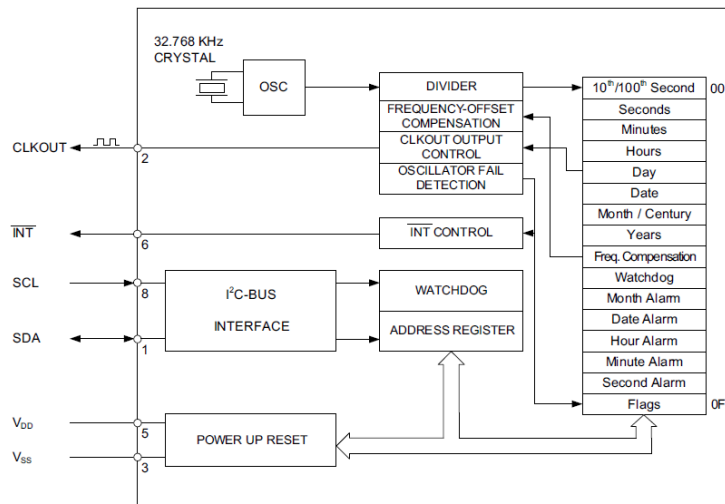
3.2 x 1.5 x 0.8 mm

AB-RTCMC-32.768kHz-AIGZ-S7 (Preliminary)



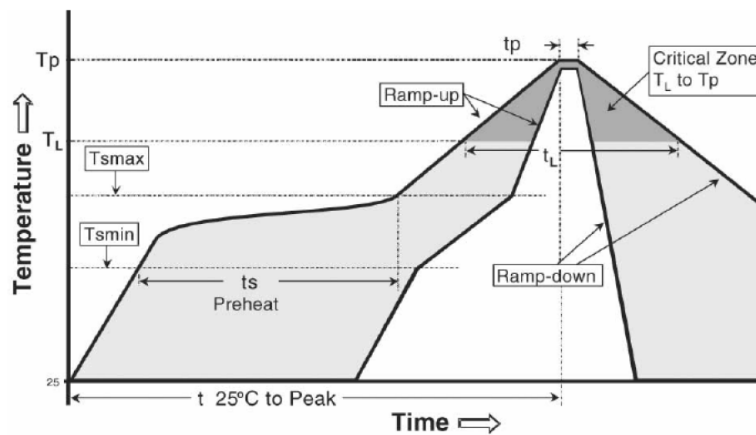
RoHS/RoHS II compliant

## BLOCK DIAGRAM:



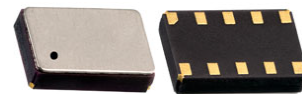
## RECOMMENDED REFLOW PROFILE:

Maximum Reflow Conditions in accordance with IPC/JEDEC J-STD-020C "Pb-free"



Temperature	Conditions	Units
Average Ramp-up Rate ( $T_{Smax}$ to $T_P$ )	3°C/second max	°C/s
Ramp Down Rate ( $T_{cool}$ )	6°C/second max	°C/s
Time 25°C to Peak Temperature ( $T_{to-peak}$ )	8 minutes max	m
<b>Preheat</b>		
Temperature Min ( $T_{Smin}$ )	150	°C
Temperature Max ( $T_{Smax}$ )	200	°C
Time $T_{Smin}$ to $T_{Smax}$ ( $t_s$ )	60 ~ 180	sec
<b>Time Above Liquidus</b>		
Temperature Liquidus ( $T_L$ )	217	°C
Time above Liquidus ( $t_L$ )	60 ~ 150	sec
<b>Peak Temperature</b>		
Peak Temperature ( $T_P$ )	260	°C
Time within 5°C of Peak Temperature ( $t_p$ )	20 ~ 40	sec

# Real Time Clock Module with I<sup>2</sup>C Bus



3.2 x 1.5 x 0.8 mm

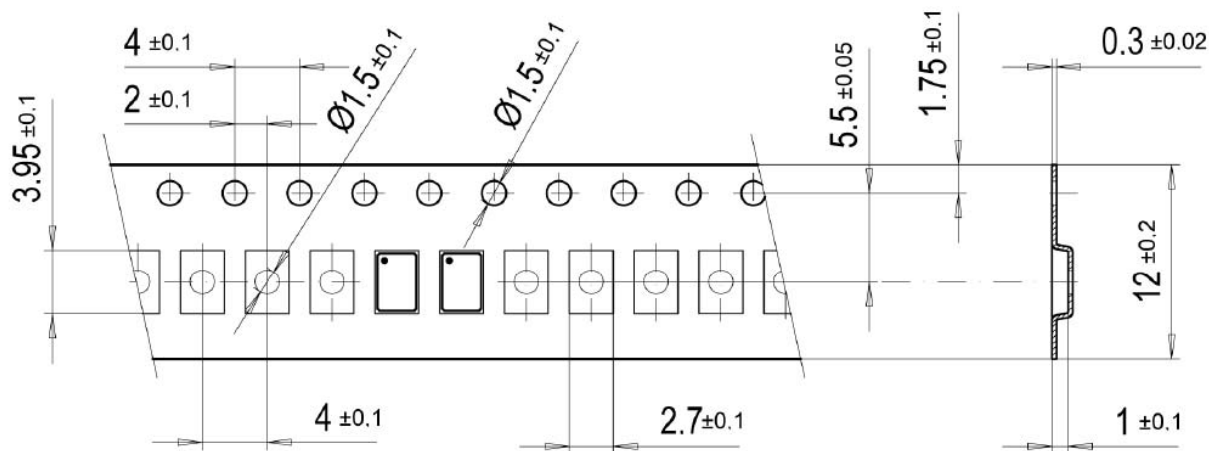
AB-RTCMC-32.768kHz-AIGZ-S7 (Preliminary)



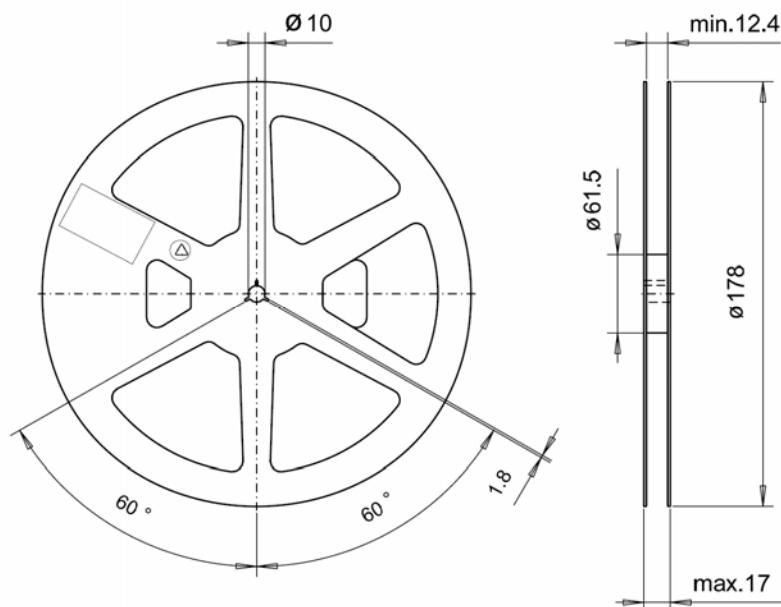
RoHS/RoHS II compliant

## TAPE & REEL:

T = 1000pcs/reel



 User Direction of Feed



Dimension: mm

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