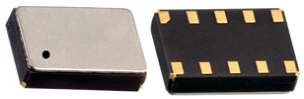
Real Time Clock Module with I²C Bus



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 µA (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	ºC	
Storage Temperature (T_{STO})	-55		+125	ºC	V_{DD} off, oscillator off

Frequency Characteristics

Parameters	Min.	Typ.	Max.	Units	Notes
Frequency Accuracy (ΔF/F)			±20	ppm	T_{AMB}=+25°C
Frequency vs Temperature ($\Delta F/T_{OPR}$)	-0.035ppm/°C^2 (T_{OPR}-T_O)^2 ±10%			ppm	T_{RER}=+25°C
Turnover Temperature (T_O)	+20	+25	+30	°C	
Aging (first year)	-3		+3	ppm	T_{AMB}=+25°C
Start-up Time (T_{START})			1	s	V_{CC}=3.0V
Start-up Voltage (V_{START})	1.5			V	≤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 (1)	-10			+10	
Load Capacitance (C_L)				50pF	

1. Reference value. T_A = 25 °C, V_{CC} = 3.0 V.

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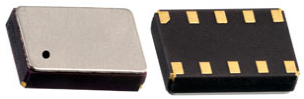


3.2 x 1.5 x 0.8 mm

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

Pb RoHS/RoHS II compliant

Static Characteristics

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

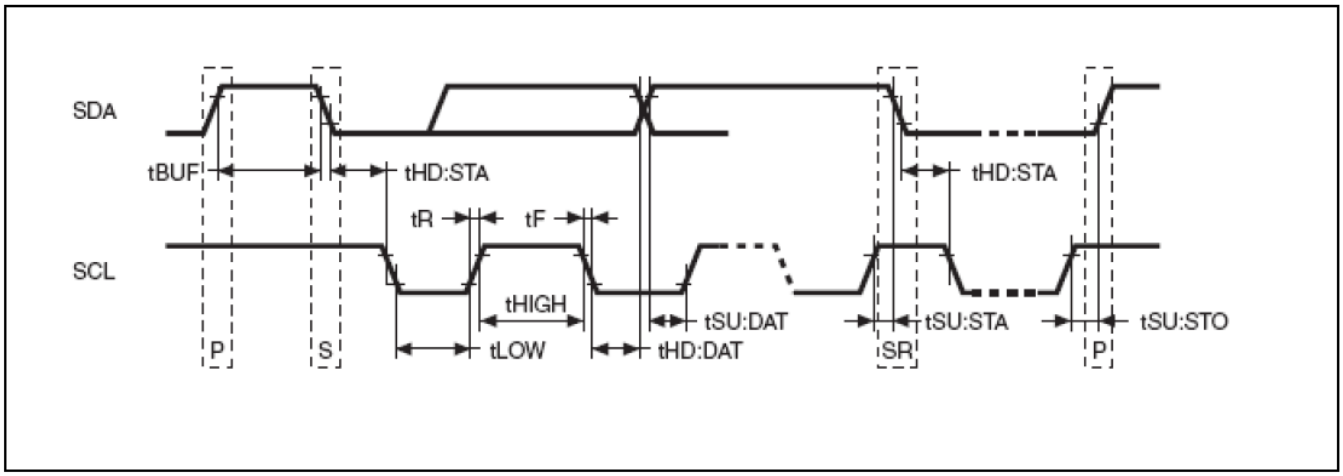
1. Valid for ambient operating temperature: T_A = –40 to 85 °C; V_{CC} = 1.3 V to 4.4 V (except where noted).
2. Oscillator startup guaranteed down to 1.5 V only
3. Effective capacitance measured with power supply at 3.6 V; sampled only, not 100% tested.
4. At 25 °C, f = 1 MHz.
5. Outputs deselected.

I²C Interface Dynamic Characteristics

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

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.

I²C Interface Timing Characteristics



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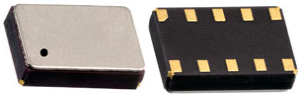


3.2 x 1.5 x 0.8 mm

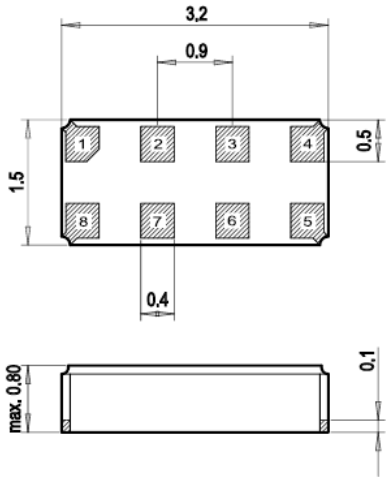
Pb RoHS/RoHS II compliant

PART IDENTIFICATIONS:

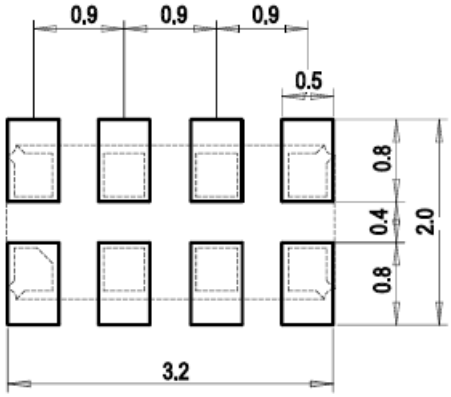
AB-RTCMC-32.768 kHz-AIGZ-S7- ☐

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_{SS}	Ground
4	NC	Not connected
5	V_{CC}	Supply voltage
6	$\overline{INT}$	Interrupt output pin
7	NC	Not connected
8	SCL	Serial clock input

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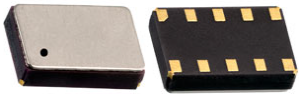

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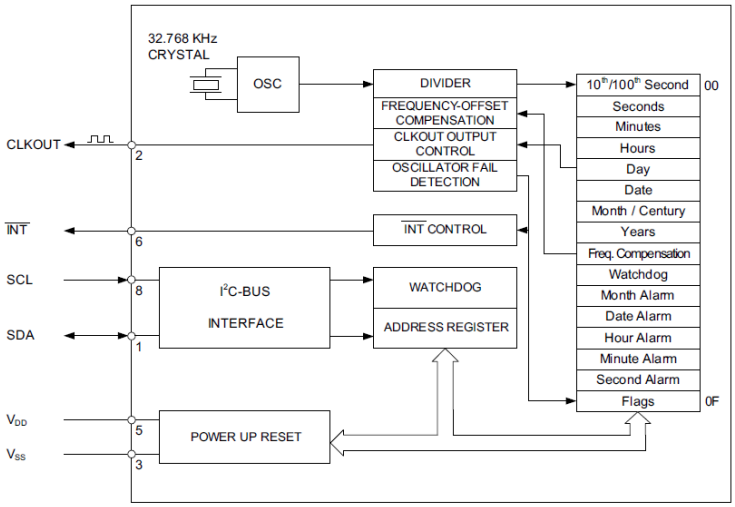
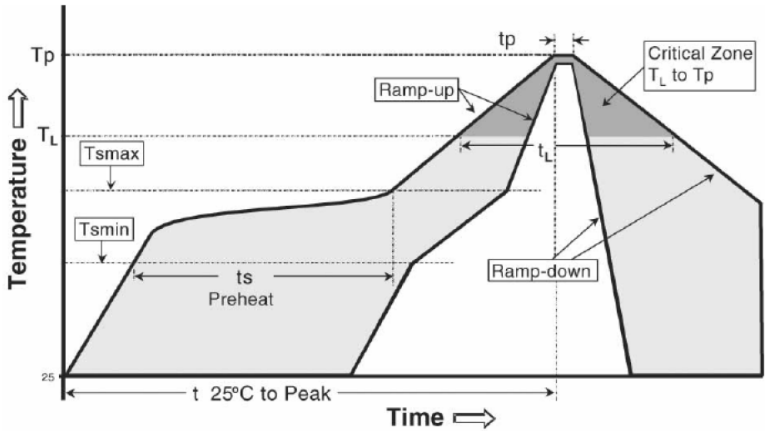
BLOCK DIAGRAM:



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℃/second max	℃/s
Ramp Down Rate (T_{cool})	6℃/second max	℃/s
Time 25℃ to Peak Temperature ($T_{to\text{-}peak}$)	8 minutes max	m
Preheat		
Temperature Min (T_{Smin})	150	℃
Temperature Max (T_{Smax})	200	℃
Time Ts_{min} to Ts_{max} (ts)	60 ~ 180	sec
Time Above Liquidus		
Temperature Liquidus (T_L)	217	℃
Time above Liquidus (t_L)	60 ~150	sec
Peak Temperature		
Peak Temperature (T_P)	260	℃
Time within 5℃ of Peak Temperature (t_P)	20 ~ 40	sec

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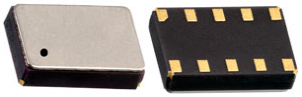

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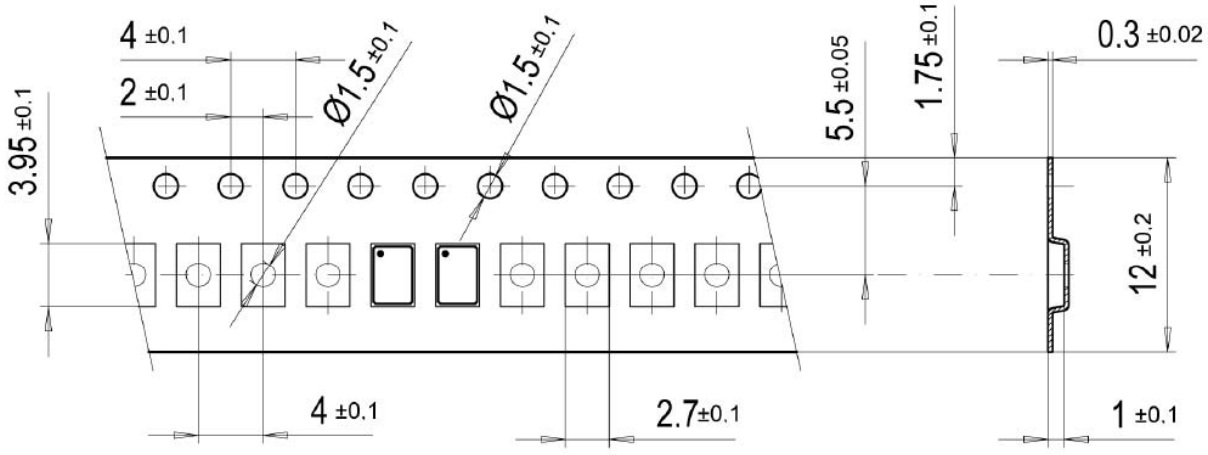
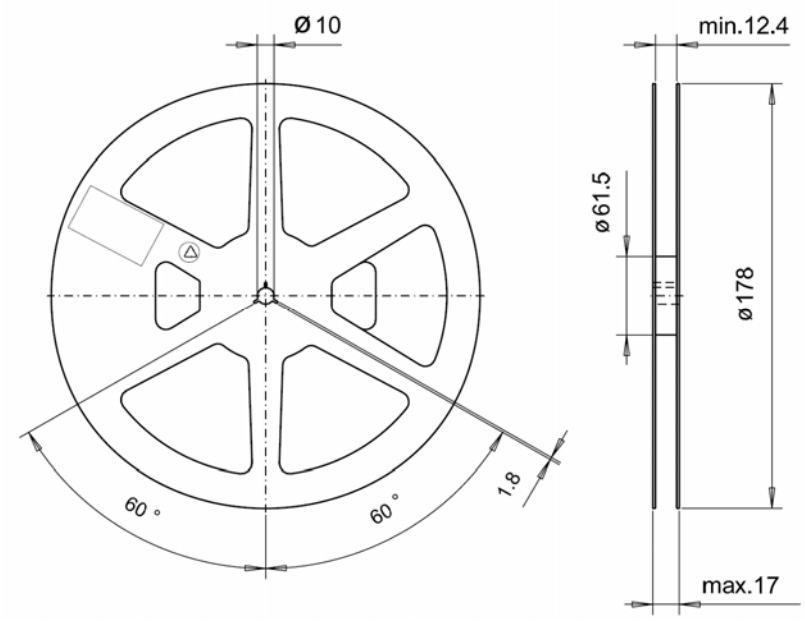
TAPE & REEL:

T = 1000pcs/reel





Dimension: mm