Real Time Clock Module with I²C Bus

AB-RTCMC-32.768kHz-AIGZ-S7

Moisture Sensitivity Level: MSL=1

FEATURES:

- 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
- Low operating current of 35 µA (at 400 kHz)
- 32.768kHz square wave on power-up to drive a microcontroller in low-power mode– Programmable from 1 Hz to 32.768kHz;– 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

STANDARD SPECIFICATIONS:

Absolute Maximum Ratings

In accordance with the Absolute Maximum Rating System IEC 60134

Parameters	Symbol	Conditions	Min.	Max.	Units
Supply Voltage	V _{DD}	>GND / $<$ V _{DD}	GND-0.3	+5.0	V
Input Voltage	VI		GND-0.2	V _{DD} +0.3	V
Output Voltage	Vo		GND-0.2	V _{DD} +0.3	V
Output Current	Io			20	mA
Power Dissipation	PD			1	W
Operating Ambient Temperature Range	T _{OPR}		-40	+85	°C
Storage Temperature Range	T _{STO}	Stored as bare product	-55	+125	°C
Electro Static Discharge Voltage	V _{ESD}	$HBM^{1} T_{A} = 25 °C$ $MM^{2} T_{A} = 25 °C$		>1500 >1000	V

1) HBM: Human Body Model, according to JESD22-A114.

2) MM: Machine Model, according to JESD22-A115.

These data are based on characterization results, not tested in production. Stresses above these listed maximum ratings may cause permanent damage to the device. Exposure beyond specified operating conditions may affect device reliability or cause malfunction.

Operating and AC Measurement Conditions¹⁾

Parameters	Symbol	Min.	Max.	Units
Supply Voltage	V _{DD}	1.3	4.4	V
Operating Ambient Temperature	T _A	-40	+85	°C
Load Capacitance	CL		50	pF
Input Rise and Fall Times			5	ns
Input Pulse Voltages		0.2*V _{DD}	0.8*V _{DD}	V
Input and Output timing ref. Voltage		0.3*V _{DD}	$0.7*V_{DD}$	V

1) Output Hi-Z is defined as the point where data is no longer driven.



5101 Hidden Creek Ln Spicewood TX 78669 Phone: 512-371-6159 | Fax: 512-351-8858 For terms and conditions of sales, please visit: www.abracon.com



ABRACON IS ISO9001-2015 CERTIFIED





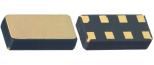
3.2 x 1.5 x 0.8 mm

> **APPLICATIONS**:

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

Real Time Clock Module with I²C Bus

AB-RTCMC-32.768kHz-AIGZ-S7



RoHS/RoHS II compliant 3.2

3.2 x 1.5 x 0.8 mm

Capacitance

Parameters ^{1) 2)}	Symbol	Min.	Max.	Units
Input Capacitance	C _{IN}		7	pF
Output Capacitance	$C_{OUT}^{3)}$		10	pF
Low-pass filter input time constant (SDA and SCL)	t _{LP}		50	ns

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

2) At 25°C, f = 1MHz.

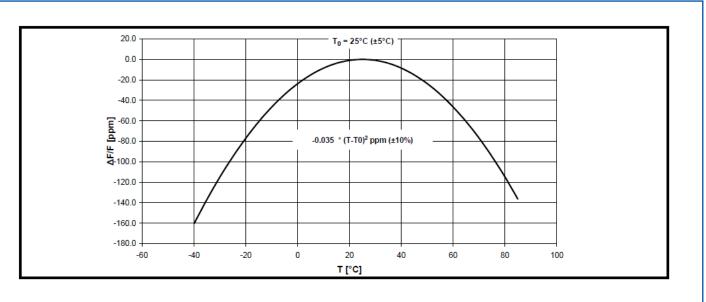
3) Outputs deselected.

Frequency Characteristics

 $T_{amb} = +25^{\circ}C; f_{OSC} = 32.768 \text{ kHz}$

Parameters	Symbol	Conditions	Min.		Max.	Units
Frequency Accuracy	$\Delta f/f$	$T_{amb} = +25^{\circ}C$	-20		+20	ppm
Frequency vs. Temperature Characteristics	$\Delta f/T_{OPR}$	T_{OPR} = -40 to +85°C	$_{\rm R}$ = -40 to +85°C -0.035 ^{ppm} /°C ² * (T _{OPR} - T ₀) ²		$(\pm 10\%)^2 (\pm 10\%)$	ppm
Turnover Temperature	To		+20	+25	+30	°C
Aging (first year)	$\Delta f/f$	$T_{amb} = +25^{\circ}C$	-3		+3	ppm
Oscillator Start-up Voltage	V _{Start}	≤ 10 seconds	1.5			V
Oscillator Start-up Time	T _{Start}	$V_{DD} = 3.0 V$			1	S
CLKOUT Duty Cycle		$F_{CLKOUT} = 32.768 \text{kHz}$ $T_{amb} = +25^{\circ}\text{C}$	40	50	60	%

FREQUENCY VS. TEMPERATURE CHARACTERISTICS





Phone: 512-371-6159 | Fax: 512-351-8858 For terms and conditions of sales, please visit: www.abracon.com

REVISED: 11.28.2018

ABRACON IS ISO9001-2015 CERTIFIED AB-RTCMC-32.768kHz-AIGZ-S7



RoHS/RoHS II compliant

3.2 x 1.5 x 0.8 mm

Static Characteristics

Valid for T_{amb} = -40°C to +85°C; V_{DD} = 1.3 V to 4.4 V (except where noted)

Parameters	Symbol	Conditions	Min.	Typ.	Max.	Units	
Supply Voltage	V _{DD} ¹⁾	Clock	1.0		4.4	V	
Supply Voltage	V DD	I ² C Bus (400kHz)	1.3		4.4	V	
		$V_{DD} = 4.4V$			100	μA	
Supply Current		$V_{DD} = 3.6V$		50	70	μA	
SCL=400kHz	I _{DD1}	$V_{DD} = 3.0 V$		35		μA	
No Load		$V_{DD} = 2.5 V$		30		μA	
		$V_{DD} = 2.0 V$		20		μA	
Supply Current (standby)		$V_{DD} = 4.4V$			950	nA	
SCL = 0Hz; CLKOUT off	I _{DD2}	$V_{DD} = 3.6V$		375	700	nA	
All inputs		$V_{DD} = 3.0V \text{ at } 25^{\circ}C$		350	500	nA	
$\geq V_{DD}$ -0.2V		$V_{DD} = 2.0V \text{ at } 25^{\circ}\text{C}$		310	450	nA	
$\leq V_{SS}$ +0.2V		$V_{DD} = 1.0V \text{ at } 25^{\circ}C$		270	400	nA	
LOW Level Input Voltage	V _{IL}		-0.2		0.3*V _{DD}	V	
HIGH Level Input Voltage	V _{IH}		0.7*V _{DD}		V _{DD} +0.3	V	
HIGH Level Output Voltage	V _{OH}	V_{DD} =4.4V, I_{OH} = - 1.0mA (push-pull)	2.4			V	
LOW Level Output	OW Level Output				0.4	V	
Voltage	V _{OL}	V_{CC} =4.4V, I_{OL} = 1.0mA (SQW, \overline{INT})			0.4	v	
Pull-up Supply voltage (open drain)		INT			4.4	V	
Input Leakage Current	I _{LI}	$0V \leq V_{IN} \leq V_{DD}$	-1		+1	μA	
Output Leakage Current	ILO	$0V \leq V_{OUT} \leq V_{DD}$	-1		+1	μA	

1. Oscillator startup guaranteed down to 1.5 V only.



Phone: 512-371-6159 | Fax: 512-351-8858 For terms and conditions of sales, please visit: www.abracon.com AB-RTCMC-32.768kHz-AIGZ-S7



RoHS/RoHS II compliant

3.2 x 1.5 x 0.8 mm

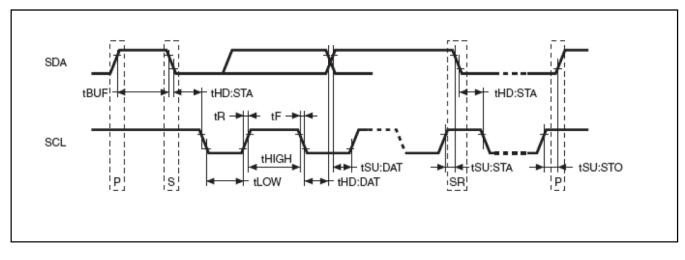
I²C Interface Dynamic Characteristics

Valid for T_{amb} = -40°C to +85°C; V_{DD} = 1.3 V to 4.4 V (except where noted)

Parameters	Symbol	Min.	Тур.	Max.	Units
SCL Clock Frequency	$\mathbf{f}_{\mathrm{SCL}}$	0		400	kHz
START Condition Setup Time (only relevant for a repeated start condition)	t _{SU:STA}	600			ns
START Condition Hold Time (after this period the first clock pulse is generated)	t _{HD:STA}	600			ns
Data Setup Time ¹⁾	t _{SU:DAT}	100			ns
Data Hold Time	t _{HD:DAT}	0			μs
STOP Condition Setup Time	t _{SU:STO}	600			ns
Bus Free Time between STOP and START condition	t _{BUF}	1.3			μs
SCL "LOW time"	t_{LOW}	1.3			μs
SCL "HIGH time"	t _{HIGH}	600			ns
SCL and SDA Rise Time	t _R			300	ns
SCL and SDA Fall Time	t _F			300	ns
Watchdog Output Pulse Width	t _{REC}	96		98	ms

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

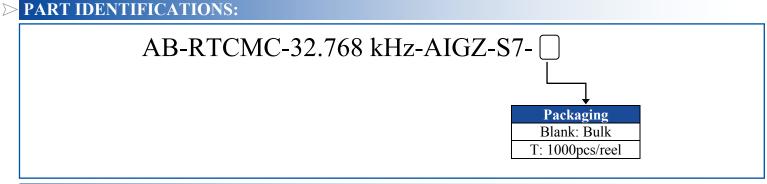
I²C Interface Timing Characteristics



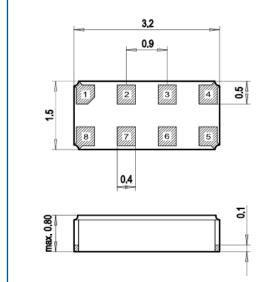


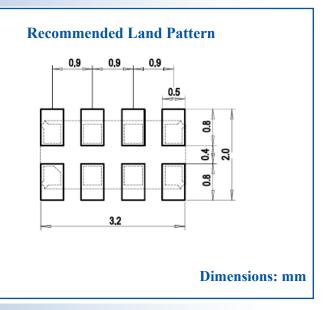
Phone: 512-371-6159 | Fax: 512-351-8858 For terms and conditions of sales, please visit: www.abracon.com

3.2 x 1.5 x 0.8 mm



OUTLINE DIMENSIONS:





PIN DESCRIPTIONS:

Pin No.	Pin Name	Function
1	SDA	Serial data; open-drain; requires pull-up resistor
2	CLKOUT	Clock Output
3	V _{SS}	Ground
4	NC	Not connected
5	V_{DD}	Power Supply voltage
6	INT	Interrupt output; open-drain; requires pull-up resistor; active low
7	NC	Not connected
8	SCL	Serial clock input; requires pull-up resistor



Phone: 512-371-6159 | Fax: 512-351-8858 For terms and conditions of sales, please visit: www.abracon.com

REVISED: 11.28.2018

ABRACON IS ISO9001-2015 CERTIFIED

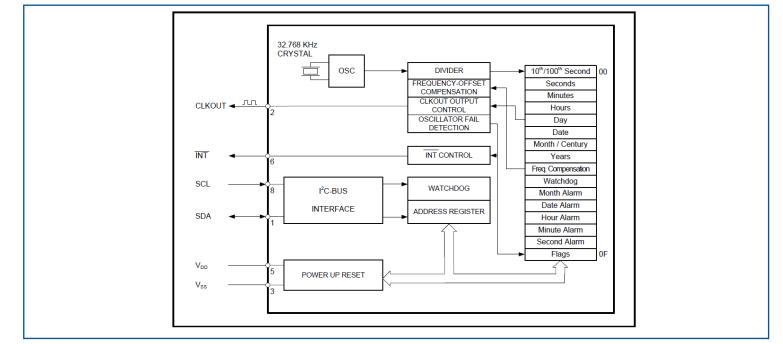
Real Time Clock Module with I²C Bus

AB-RTCMC-32.768kHz-AIGZ-S7



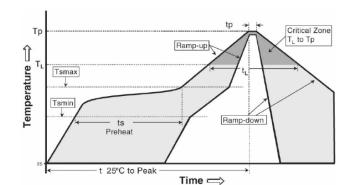
RoHS/RoHS II compliant

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	
Preheat			
Temperature Min (T _{Smin})	150	°C	
Temperature Max (T _{Smax})	200	°C	
Time Ts _{min} to Ts _{max} (ts)	$60 \sim 180$	sec	
Time Above Liquidus			
Temperature Liquidus (T _L)	217	°C	
Time above Liquidus (t _L)	60~150	sec	
Peak Temperature			
Peak Temperature (T _P)	260	°C	
Time within 5°C of Peak Temperature (t _P)	$20 \sim 40$	sec	

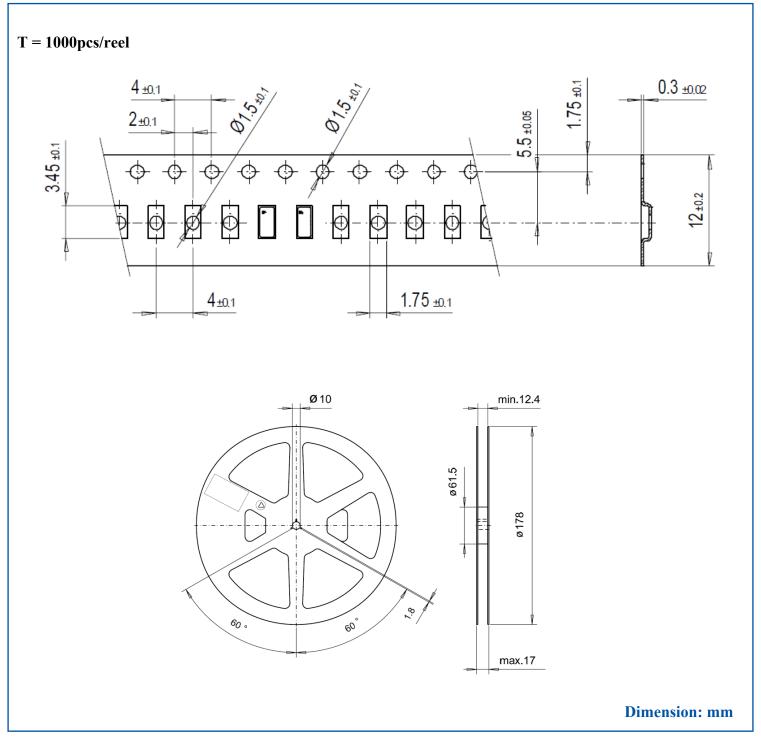


Phone: 512-371-6159 | Fax: 512-351-8858 For terms and conditions of sales, please visit: www.abracon.com

REVISED: 11.28.2018

ABRACON IS ISO9001-2015 CERTIFIED

▷ TAPE & REEL:



Pb

RoHS/RoHS II compliant

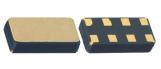
ATTENTION: Abracon LLC's products are COTS – Commercial-Off-The-Shelf products; suitable for Commercial, Industrial and, where designated, Automotive Applications. Abracon's products are not specifically designed for Military, Aviation, Aerospace, Life-dependent Medical applications or any application requiring high reliability where component failure could result in loss of life and/or property. For applications requiring high reliability and/or presenting an extreme operating environment, written consent and authorization from Abracon LLC is required. Please contact Abracon LLC for more information.



Phone: 512-371-6159 | Fax: 512-351-8858 For terms and conditions of sales, please visit: www.abracon.com

REVISED: 11.28.2018

ABRACON IS ISO9001-2015 CERTIFIED



3.2 x 1.5 x 0.8 mm