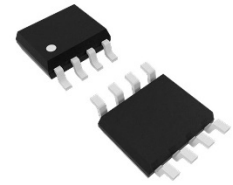


### Description

Abrakon's AB-RTC-TA-32.768kHz-2 Real-Time Clock (RTC) uses I2C communication interface to configure numerous features. These include frequency output selection of 32.768kHz, 1024Hz or 1 Hz, a leap year autocorrection, internal temperature sensing capability, and a temperature compensation function. The RTC has a broad operating power supply range of 2.5V to 5.5V with low power consumption. The RTC's integrated 32.768kHz crystal provides precise timing accuracy in a SOP-8 4.9 x 6.0 mm package.



### Features

- Build-in frequency adjusted 32.768kHz crystal unit
- Build-in Temperature Sensor
- Low current consumption: 1.0uA (Typ.)
- Communication interface: I2C bus
- Leap years autocorrection
- Frequency selection of (32.768kHz, 1024Hz, or 1Hz)
- [REACH/RoHS II Compliant | MSL Level 3](#)

### Typical Applications

- IoT, Wireless communication
- Medical instrumentation
- Utility meters
- Data loggers and Appliances
- Consumer electronics

### Absolute Maximum Ratings

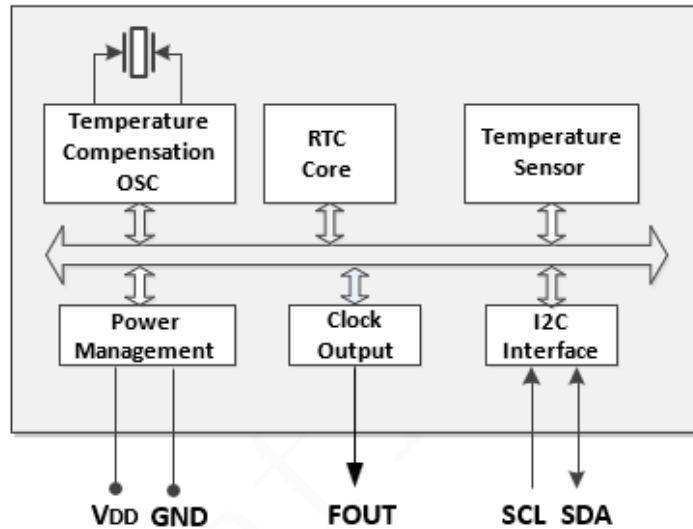
Parameters	Symbol	Min.	Typ.	Max.	Units	Notes
Supply Voltage	V <sub>DD</sub>	-0.3		6.5	V	
I/O Input Voltage	V <sub>IN</sub>	GND-0.3		6.5	V	SCL,SDA input
Clock output Voltage	V <sub>Out1</sub>	GND-0.3		6.5	V	SDA output
Operating Ambient Temperature Range	T <sub>OPR</sub>	-40		85	°C	
Storage Temperature Range	T <sub>STO</sub>	-55		125	°C	
Reflow Temperature				+260	°C	See Reflow Profile
ESD Protection	V <sub>ESD</sub>	4kV HBM,400V MM,2kV CDM (.1),2)				

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

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

Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational sections of this specification is not intended. Exposure to maximum rating conditions for extended periods may affect device reliability. The data sheet limits are not guaranteed if the device is operated beyond the recommended operating conditions.

**Block Diagram**



**Frequency Characteristics** (Unless otherwise specified, GND=0V, VDD = 2.5V ~ 5.5V, Ta=-40°C~+85°C)

Parameters	Symbol	Min.	Typ.	Max.	Units	Notes
Frequency stability	$\Delta f/f$	$\pm 20$			ppm	VDD=3.0V, -20°C to +70°C
		$\pm 50$			ppm	VDD=3.0V, -40°C to +85°C
Oscillation start time	$t_{STA}$			1	s	@25°C
Year Aging	$f_a$			$\pm 3$	ppm	First year@25°C

**DC Characteristics** (Unless otherwise specified, GND=0V, VBAT=VDD=1.2~5.5V, VIO=1.6V ~5.5V, Ta=-40°C~+85°C)

Parameters	Symbol	Min.	Typ.	Max.	Units	Notes
Power Supply (pad 8) <sup>[Note 1,2]</sup>	V <sub>DD</sub>	2.5	3.0	5.5	V	
Power Supply Time keeping (pad 8) <sup>[Note 1,2]</sup>	V <sub>DD</sub>	1.6	3.0	5.5	V	
Operating Temperature	T <sub>OPR</sub>	-40	25	85	°C	
Current consumption	I <sub>DD1</sub>		1.25	5.1	uA	VDD = 5.0V, fSCL=0Hz, SCL and SDA are low.
	I <sub>DD2</sub>		1.0	4.9	uA	VDD = 3.0V, fSCL=0Hz, SCL and SDA are low.
I <sup>2</sup> C clock signal (pad 6)	SCL					
Input voltage high-level	V <sub>IH</sub>	0.8*VDD		5.5	V	
Input voltage low-level	V <sub>IL</sub>	GND-0.3		0.2*V <sub>DD</sub>	V	
Input Leak Current	I <sub>LK</sub>	-0.1		0.1	uA	
I <sup>2</sup> C data signal (pad 5)	SDA					
Input voltage high-level	V <sub>IH</sub>	0.8*VDD		5.5	V	
Input voltage low-level	V <sub>IL</sub>	GND-0.3		0.2*V <sub>DD</sub>	V	
Output voltage low-level	V <sub>OL</sub>	GND		GND+0.4	V	VDD≥3.0V, IOL = 3mA
Input Leak Current	I <sub>LK</sub>	-0.1		0.1	uA	
Output Leak Current	I <sub>OZ</sub>	-0.1		0.1	uA	
Frequency Output (pad 3)	F <sub>OUT</sub>					
Output voltage high-level	V <sub>OH</sub>	4.0		5.0	V	VDD=5.0V, IOH = -1mA
		2.2		3.0		VDD=3.0V, IOH = -1mA
		2.9		3.0		VDD=3.0V, IOH = -100uA
Output voltage low-level	V <sub>OL</sub>	GND		GND+0.5	V	VDD=5.0V, IOL = 1mA
		GND		GND+0.8		VDD=3.0V, IOL = 1mA
		GND		GND+0.1		VDD=3.0V, IOL = 100uA

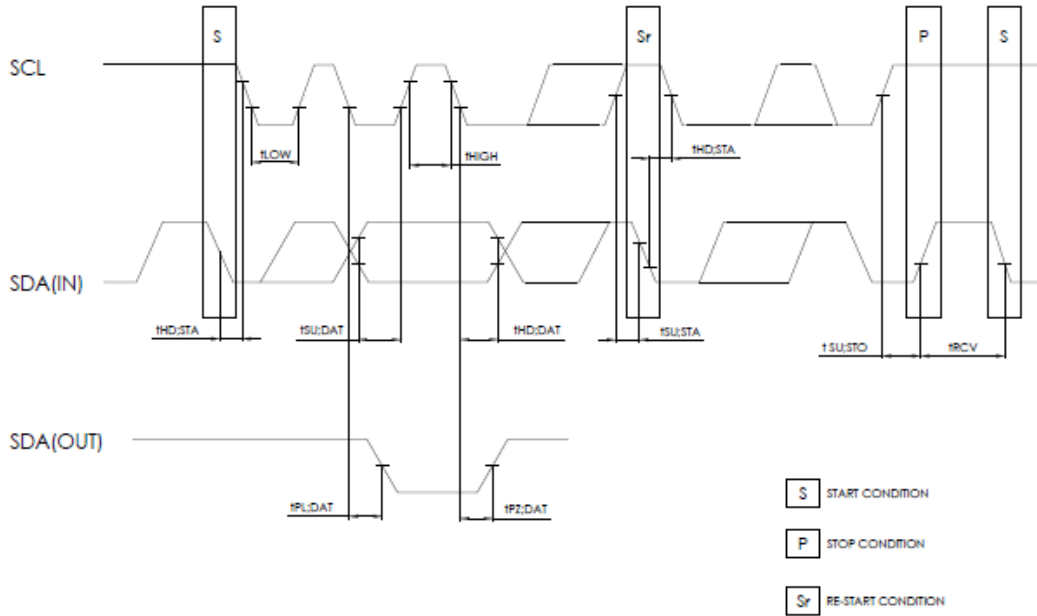
Note 1: During the power on and vibration starting time, a voltage of more than 2.5V must be provided to ensure the stable vibration starting of the oscillation circuit.

Note2 : After the power supply is powered off, ensure that VDD = GND for more than 10 seconds, and then power on.

**AC Characteristics** (Unless otherwise specified, VDD =2.5V ~ 5.5V; Ta=-40°C ~ +85°C)

Parameters	Symbol	Min.	Typ.	Max.	Units	Notes
Start condition setup time <sup>[Note 1]</sup>	t <sub>HD,STA</sub>	0.6			us	
Start condition hold time <sup>[Note 1]</sup>	t <sub>SU,STA</sub>	0.6			us	
Stop condition setup time	t <sub>SU,STO</sub>	0.6			us	
Bus idle time between start condition and stop condition	t <sub>RCV</sub>	1.3			us	
Data setup time	t <sub>SU,DAT</sub>	100			ns	
Data hold time	t <sub>HD,DAT</sub>	0		0.9	ns	
<b>I<sup>2</sup>C clock signal (pad 6)</b>						
SCL clock frequency	f <sub>SCL</sub>			400	kHz	
SCL low voltage time	t <sub>LOW</sub>	1.3			us	
SCL high voltage time	t <sub>HIGH</sub>	0.6			us	
SCL rising time	t <sub>r</sub>			0.3	us	
SCL falling time	t <sub>f</sub>			0.3	us	
<b>I<sup>2</sup>C data signal (pad 5)</b>						
SDA rising time	t <sub>r</sub>			0.3	us	
SDA falling time	t <sub>f</sub>			0.3	us	

### I2C BUS Timing Characteristics



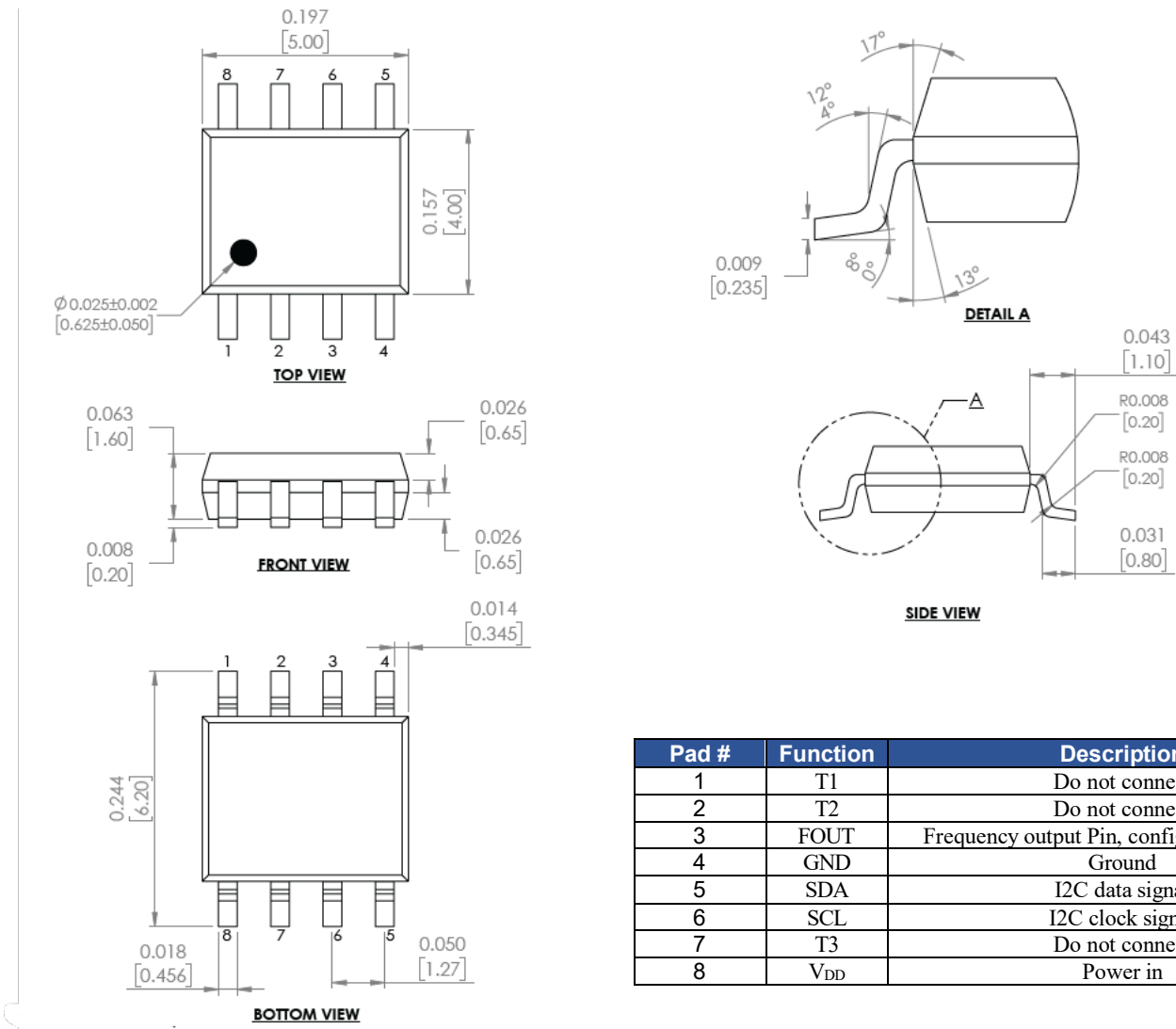
I2C BUS TIMING CHART

### Part Identification

AB - RTC - TA - 32.768kHz - 2 -

Packaging
Blank: Bulk
T3: 3000pcs / reel

**Mechanical Dimensions**



Pad #	Function	Description
1	T1	Do not connect
2	T2	Do not connect
3	FOUT	Frequency output Pin, configurable, CMOS.
4	GND	Ground
5	SDA	I2C data signal
6	SCL	I2C clock signal
7	T3	Do not connect
8	V <sub>DD</sub>	Power in

Dimensions: inches[mm]

Reflow Profile [JEDEC J-STD-020]

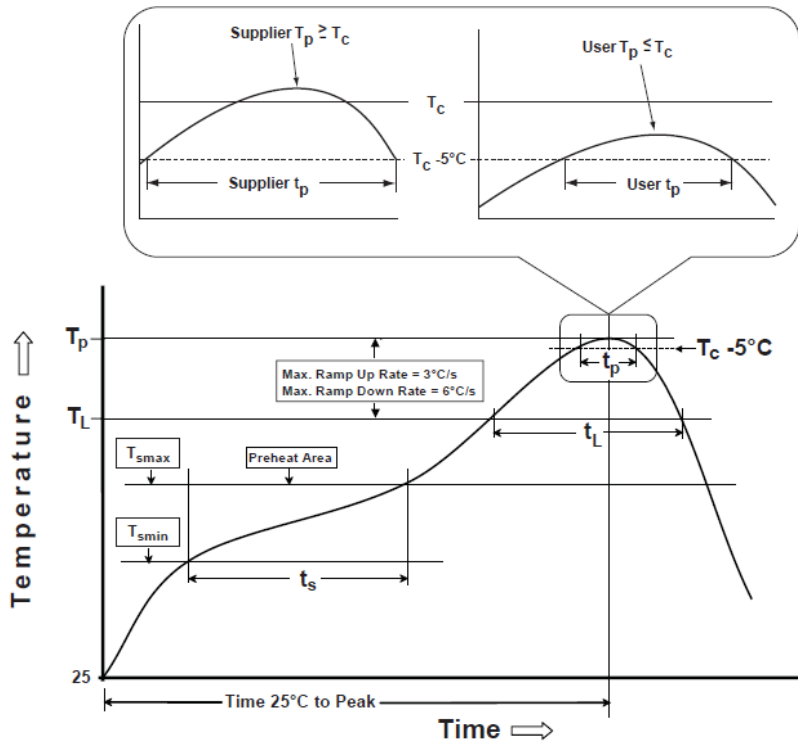


Table 1

SnPb Eutectic Process Classification Temperatures ( $T_c$ )		
Package Thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

Table 2

Pb-Free Process Classification Temperatures ( $T_c$ )			
Package Thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> 350-2000	Volume mm <sup>3</sup> >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm - 2.5 mm	260 °C	250 °C	245 °C
>2.5 mm	250 °C	245 °C	245 °C

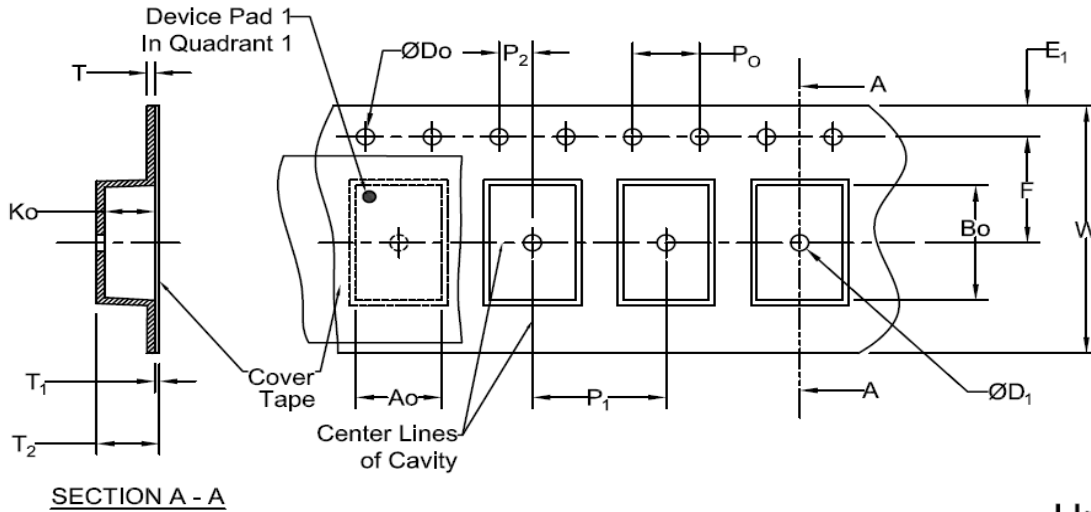
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat / soak		
Temperature minimum ( $T_{smin}$ )	100°C	150°C
Temperature maximum ( $T_{smax}$ )	150°C	200°C
Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ )	60 - 120 sec.	60 - 120 sec.
Average ramp-up rate ( $T_{smax}$ to $T_p$ )	3°C/sec. max	3°C/sec. max
Liquidous temperature ( $T_L$ )	183°C	217°C
Time at liquidous ( $t_L$ )	60 - 150 sec.	60 - 150 sec.
Peak package body temperature ( $T_p$ )*	see Table 1	see Table 2
Time ( $t_p$ )** within 5°C of the specified classification temperature ( $T_c$ )	20 sec.	30 sec.
Ramp-down rate ( $T_p$ to $T_{smax}$ )	6°C/sec. max	6°C/sec. max
Time 25°C to peak temperature	6 min. max	8 min. max
Reflow cycles	2 max	2 max

\*Tolerance for peak profile temperature ( $T_p$ ) is defined as a supplier minimum and a user maximum.

\*\*Tolerance for time at peak profile temperature ( $t_p$ ) is defined as supplier minimum and a user maximum.

**Packaging**

T3: 3,000pcs/reel

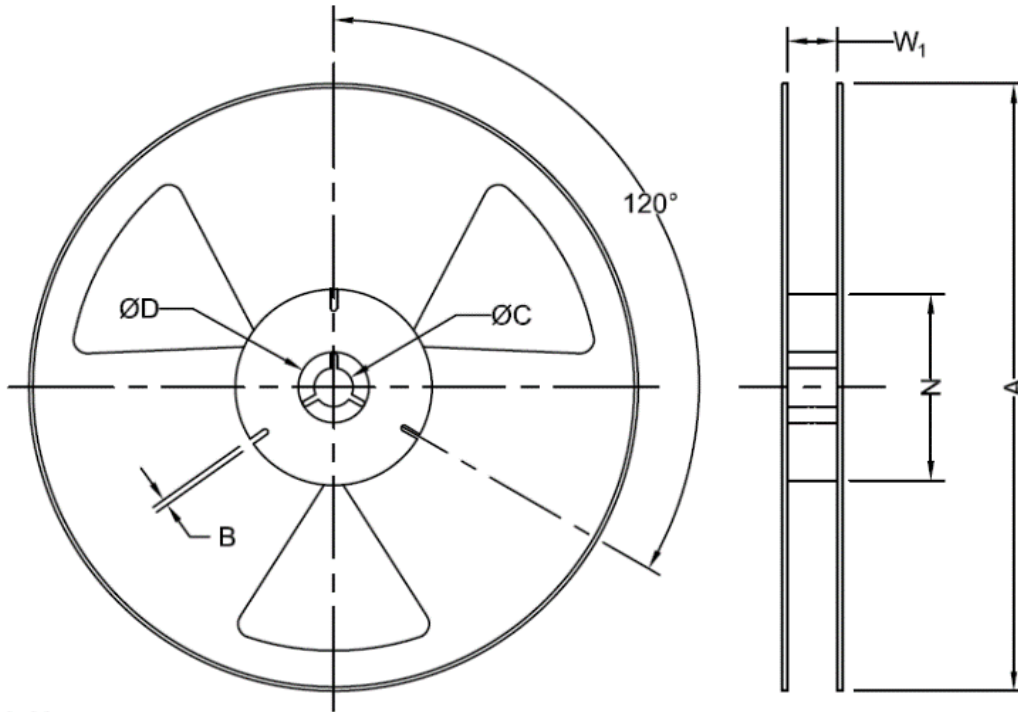


Unit: mm

Tape Specifications (mm)							
Width	Ao	Bo	Do	D <sub>1</sub> (Min)	E <sub>1</sub>	F	Ko
12mm	*	*	1.5+0.1/-0.0	1.0	1.75±0.1	5.5±0.05	*

Tape Specifications (mm)							
Width	P <sub>1</sub>	P <sub>2</sub>	P <sub>0</sub>	T (Max)	T <sub>1</sub> (Max)	T <sub>2</sub> (Max)	W (Max)
12mm	8.0±0.1	2.0±0.05	4.0±0.1	0.6	0.1	6.5	12.3





Unit: mm

Tape Specifications (mm)							
Width	Qty/Reel	A (Nom)	B (Min)	C (Min)	D (Min)	N (Min)	* $W_1$
12mm	3000	178	1.5	13.0+0.5/-0.2	20.2	50	12.4+2.0/-0.0