

# SMD Low ESR Crystal

ABS06-107-32.768kHz-T



RoHS/RoHS II Compliant



2.0 x 1.2 x 0.6mm

Moisture Sensitivity Level (MSL) – This product is Hermetically Sealed and not Moisture Sensitive - MSL = N/A: Not Applicable

## FEATURES:

- 0.6mm max. height ideal for high density circuit boards
- Ceramic package offers excellent environmental & heat resistance
- Extended temperature -40°C to +85°C for industrial applications

## APPLICATIONS:

- Wide range in communication & measuring equipment
- Commercial & Industrial applications
- Wireless communications

## Overview

ABRACON's **ABS06-107-32.768kHz-T** Tuning Fork Crystal is optimized for Power Sensitive Designs, requiring minimal plating load (4pF) and Ultra-Low ESR. With guaranteed maximum ESR of 80k $\Omega$ , this device is ideally suited for **Ultra-Low Power - Real Time Clocking** solutions, requiring exceptionally low power consumption (*Reference*; ST Micro STM32L1, F2 & F4  $\mu$ controllers).

## Key Attributes

- 4pF plating load facilitates sustained oscillations with very low oscillator loop transconductance ( $g_m$ )  $\leq$  3 $\mu$ A/V
- Guaranteed maximum ESR of 80k $\Omega$  ensures lower overall power consumption & higher Gain Margin
- Tight Frequency Set Tolerance  $\leq$   $\pm$ 20 ppm into a 4pF Effective Oscillator Loop Load
- Wide Operating Temperature Range (-40°C to +85°C)
- $\leq$   $\pm$ 175 ppm typical stability over -40°C to +85°C;  $\pm$ 250 ppm guaranteed; referenced to measured frequency at 25°C $\pm$ 3°C
- Developed in close-cooperation with ST Micro for STM32L1, F2 & F4 Reference Designs
- Space saving **2.0x1.2x0.6 mm**, RoHS Compliant SMT package
- Low cost, available through Abracon's Global Distributors

## Reference Design Information

ABS06-107-32.768kHz-T device is Qualified on the following ST Micro's Reference Designs:

STM32F2 Series: <http://www.st.com/web/en/catalog/mmc/FM141/SC1169/SS1575>

STM32F4 Series: <http://www.st.com/web/en/catalog/mmc/FM141/SC1169/SS1577>

STM32L1 Series: <http://www.st.com/web/en/catalog/mmc/FM141/SC1169/SS1295>

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## STANDARD SPECIFICATIONS:

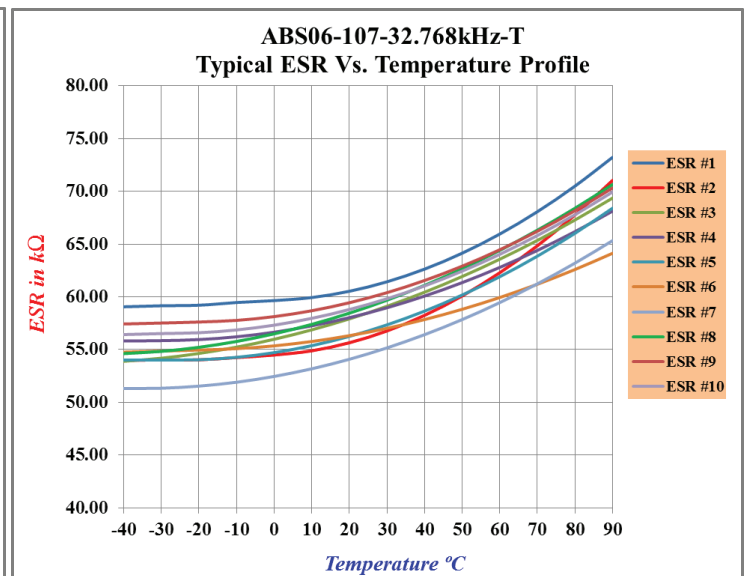
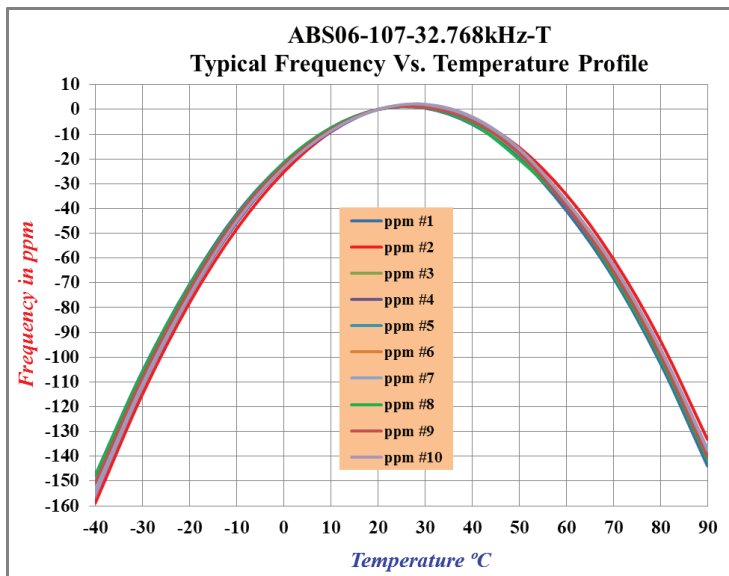
Parameters	Minimum	Typical	Maximum	Units	Notes
Frequency		32.768		kHz	
Operation Mode	Flexural Mode (Tuning Fork)				
Operating Temperature	-40		+85	°C	
Storage Temperature	-55		+125	°C	
Temperature Coefficient:	-0.039	-0.034	-0.029	ppm/T <sup>2</sup>	
Turn-over temperature:	+20	+25	+30	°C	
Frequency Stability over temperature	-250	< ±175	+250	ppm	Relative to the measured frequency at 25°C ± 3°C
Equivalent series resistance (R1)		< 60	80	kΩ	
Shunt Capacitance (C0)		< 1.50	1.70	pF	
Load capacitance (CL)	3.90	4.00	4.10	pF	See Note#1
Frequency Tolerance @+25°C	-20		+20	ppm	See Note#2 Tested at 0.5μW
Drive Level		0.1	0.5	μW	
Q value	9000	20,000			
Aging@25°C±3°C	-3		3	ppm	First year
Insulation Resistance	500			MΩ	@ 100Vdc ± 15V

**Note #1:** The oscillator loop needs to present an effective loop capacitance of 4.0 pF, not to exceed 4.50 pF. This loop capacitance is required to ensure Safety Factor of > 5.0 for the entire population of crystals.

**Note #2:** With an effective loop capacitance of 4.0 pF, the oscillator circuit will be with-in (32.768 kHz) ±20 ppm.

Depending on production equipment capability, these parts might be tested at a different load, with guaranteed projected performance at 4.0 pF.

## FREQUENCY VS. TEMPERATURE CHARACTERISTICS



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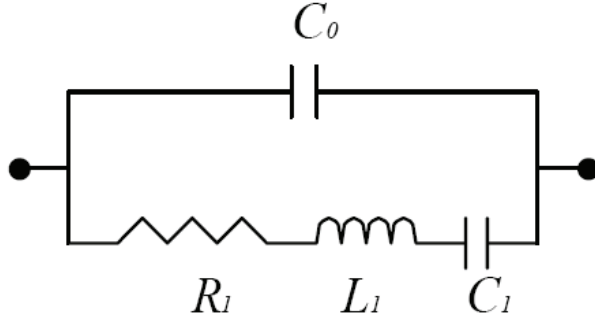
RoHS/RoHS II Compliant



2.0 x 1.2 x 0.6mm

## SPICE MODEL:

SPICE Model (based on typical values at 25°C ± 3°C):

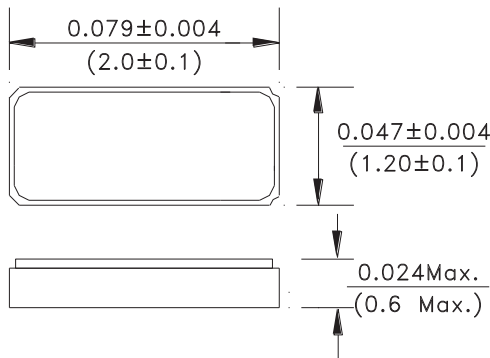


**C0** = 1.30 pF  
**R1** = 57 kΩ  
**L1** = 4,625 H  
**C1** = 5.51 fF

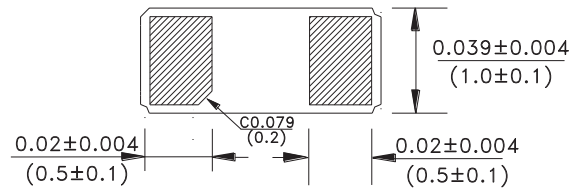
## PART IDENTIFICATION

ABS06-107-32.768 kHz-T

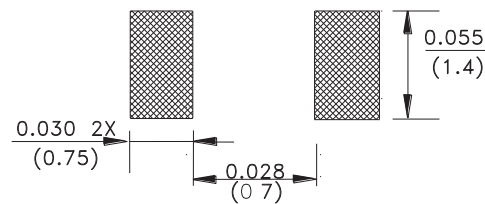
## OUTLINE DIMENSIONS:



Internal Connection (Top View)



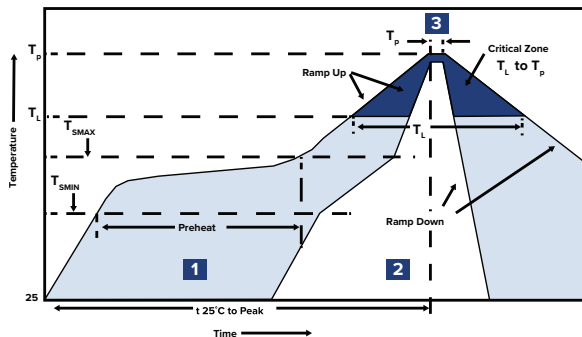
Recommended land pattern



**Note:** Due to material availability, the outline and finish color of the component may vary. This variation in no way affects the electrical performance of the product.

Dimensions: inches (mm)

## REFLOW PROFILE:



Zone	Description	Temperature	Time
1	Preheat / Soak	T <sub>SMIN</sub> ~ T <sub>SMAX</sub> 150°C ~ 180°C	60 ~ 120 sec.
2	Reflow	T <sub>L</sub> 230°C	30 ~ 40 sec.
3	Peak heat	T <sub>P</sub> 260°C	10 sec. MAX

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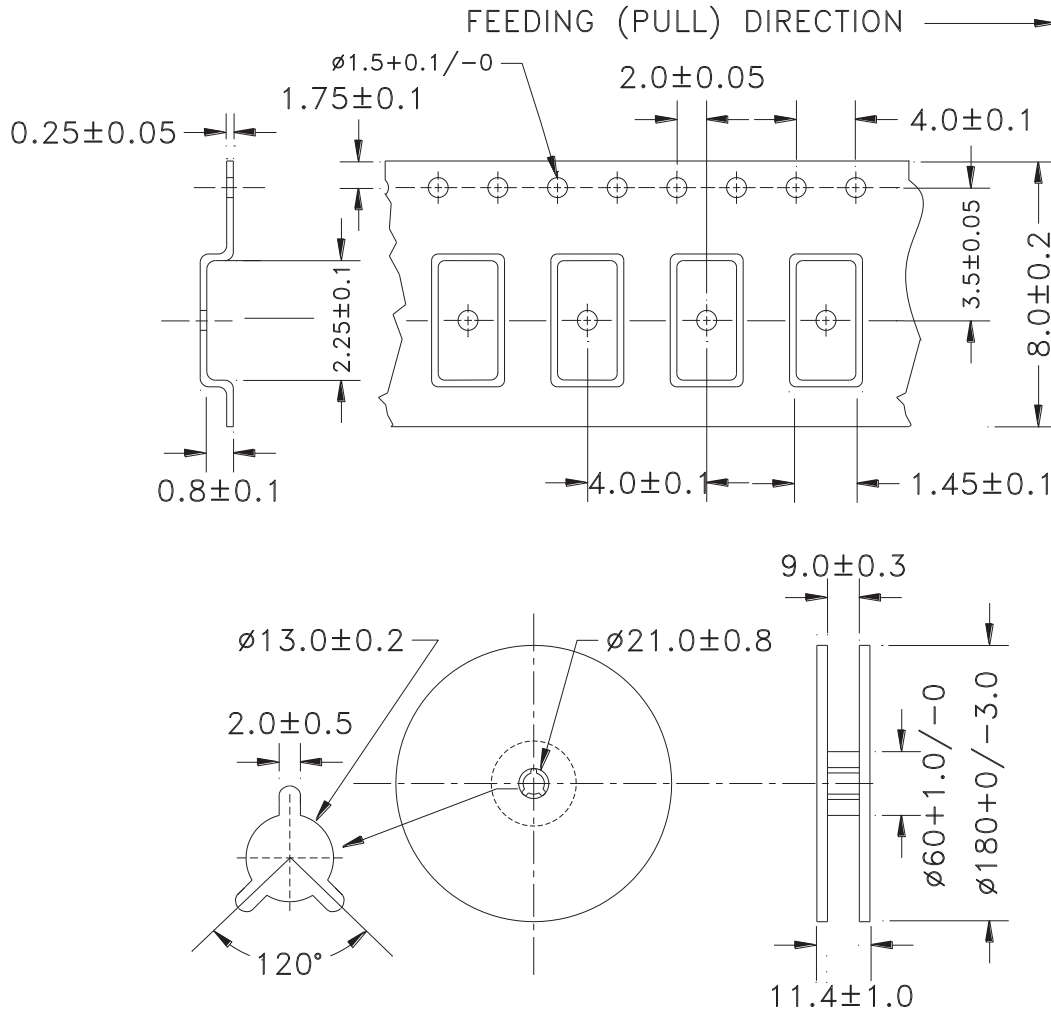
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2.0 x 1.2 x 0.6mm

## TAPE & REEL:

T=Tape and reel (3,000pcs/reel)



Dimensions: mm

**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.