SMD Low ESR Crystal

ABS06-107-32.768kHz-T

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 80kΩ, this device is ideally suited for Ultra-Low Power - Real Time Clocking solutions, requiring exceptionally low power consumption (Reference; ST Micro STM32L1, F2 & F4 µcontrollers).

Key Attributes
- 4pF plating load facilitates sustained oscillations with very low oscillator loop transconductance ($g_m$) $\leq$ 3µA/V
- Guaranteed maximum ESR of 80kΩ ensures lower overall power consumption & higher Gain Margin
- Tight Frequency Set Tolerance $\leq$ ±20 ppm into a 4pF Effective Oscillator Loop Load
- Wide Operating Temperature Range (-40°C to +85°C)
- $\leq$ ±175 ppm typical stability over -40°C to +85°C; ±250 ppm guaranteed; referenced to measured frequency at 25°C±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:

## STANDARD SPECIFICATIONS:

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Minimum</th>
<th>Typical</th>
<th>Maximum</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>32.768</td>
<td></td>
<td></td>
<td>kHz</td>
<td></td>
</tr>
<tr>
<td>Operation Mode</td>
<td>Flexural Mode (Tuning Fork)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40</td>
<td>+85</td>
<td></td>
<td>ºC</td>
<td></td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-55</td>
<td>+125</td>
<td></td>
<td>ºC</td>
<td></td>
</tr>
<tr>
<td>Temperature Coefficient</td>
<td>-0.039</td>
<td>-0.034</td>
<td>-0.029</td>
<td>ppm/T²</td>
<td></td>
</tr>
<tr>
<td>Turn-over temperature</td>
<td>+20</td>
<td>+25</td>
<td>+30</td>
<td>ºC</td>
<td></td>
</tr>
<tr>
<td>Frequency Stability over temperature</td>
<td>-250</td>
<td>&lt; ±175</td>
<td>+250</td>
<td>ppm</td>
<td>Relative to the measured frequency at 25ºC ± 3ºC</td>
</tr>
<tr>
<td>Equivalent series resistance (R1)</td>
<td>&lt; 60</td>
<td>80</td>
<td></td>
<td>kΩ</td>
<td></td>
</tr>
<tr>
<td>Shunt Capacitance (C0)</td>
<td>&lt; 1.50</td>
<td>1.70</td>
<td></td>
<td>pF</td>
<td></td>
</tr>
<tr>
<td>Load capacitance (CL)</td>
<td>3.90</td>
<td>4.00</td>
<td>4.10</td>
<td>pF</td>
<td>See Note #1</td>
</tr>
<tr>
<td>Frequency Tolerance @+25ºC</td>
<td>-20</td>
<td>+20</td>
<td></td>
<td>ppm</td>
<td>See Note #2 Tested at 0.5µW</td>
</tr>
<tr>
<td>Drive Level</td>
<td>0.1</td>
<td>0.5</td>
<td></td>
<td>µW</td>
<td></td>
</tr>
<tr>
<td>Q value</td>
<td>9000</td>
<td>20,000</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Aging@25ºC±3ºC</td>
<td>-3</td>
<td>3</td>
<td></td>
<td>ppm</td>
<td>First year</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>500</td>
<td></td>
<td></td>
<td>MΩ</td>
<td>@ 100Vdc ± 15V</td>
</tr>
</tbody>
</table>

**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 within (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

![ABS06-107-32.768kHz-T Typical Frequency Vs. Temperature Profile](image)

![ABS06-107-32.768kHz-T Typical ESR Vs. Temperature Profile](image)
SMD Low ESR Crystal

ABS06-107-32.768kHz-T

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):

\[
\begin{align*}
C_0 & = 1.47 \, \text{pF} \\
R_1 & = 56,974 \, \Omega \\
L_1 & = 6,304 \, \text{H} \\
C_1 & = 3.869 \, \text{fF}
\end{align*}
\]

PART IDENTIFICATION

ABS06-107-32.768 kHz-T

OUTLINE DIMENSIONS:

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:

Visit www.abracon.com for Terms & Conditions of Sale Revised: 07.11.13

ABRACON CORPORATION
30332 Esperanza, Rancho Santa Margarita, California 92688
tel 949-546-8000 | fax 949-546-8001 | www.abracon.com
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RoHS/RoHS II Compliant

2.0 x 1.2 x 0.6mm

TAPE & REEL:

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

FEEDING (PULL) DIRECTION

ATTENTION: Abracon Corporation’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-dependant 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 Corporation is required. Please contact Abracon Corporation for more information.

Dimensions: mm