IoT Optimized Ultra-Miniature Quartz Crystal

ABM13W SERIES

**FEATURES**

- World’s smallest At-Cut MHz Crystal (1.20 x 1.00 x 0.33 mm package)
- Ideally suited for space constraint IoT, Wearables & Wireless applications
- Simultaneously optimized for low plating load & ESR over extended temperature range
- Enhanced performance for start-up time and power savings with Low Energy SoC’s
- Low profile ideal for height constraint designs
- Available with ±10 ppm set-tolerance

**APPLICATIONS**

- Wearables
- Wireless Modules
- Internet of Things (IoT)
- Bluetooth / Bluetooth Low Energy (BLE)
- Machine-to-Machine (M2M) Connectivity
- Ultra-Low Power MCU’s, SoC’s, Transceivers
- Near Field Communication
- ISM Band Applications

**Electrical Specifications**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td>32.0000</td>
<td>80.0000</td>
<td></td>
<td>MHz</td>
<td>Contact Abracon for Nonstandard Frequencies</td>
</tr>
<tr>
<td>Standard Available Frequencies</td>
<td>32.0000, 37.4000, 38.4000, 40.0000, 45.0000, 48.0000, 52.0000, 60.0000, 76.8000, 80.0000 MHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation Mode</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fundamental</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>-40</td>
<td>+85</td>
<td></td>
<td>ºC</td>
<td>See Options</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40</td>
<td>+125</td>
<td></td>
<td>ºC</td>
<td></td>
</tr>
<tr>
<td>Frequency Tolerance @ +25°C</td>
<td>-10</td>
<td>+10</td>
<td></td>
<td>ppm</td>
<td>See options</td>
</tr>
<tr>
<td>Frequency Stability over the Operating Temperature (ref. to +25°C)</td>
<td>-15</td>
<td>+15</td>
<td></td>
<td>ppm</td>
<td>See options</td>
</tr>
<tr>
<td>Equivalent series resistance (R1) (over -40°C to +125°C) at 5pF plating load*</td>
<td>&lt; 45</td>
<td>100</td>
<td></td>
<td>Ø</td>
<td>32.0000-32.9999MHz</td>
</tr>
<tr>
<td>Shunt capacitance (C0)</td>
<td></td>
<td></td>
<td>1.0</td>
<td>pF</td>
<td></td>
</tr>
<tr>
<td>Load capacitance (CL)</td>
<td>5.0</td>
<td></td>
<td></td>
<td>pF</td>
<td>See options</td>
</tr>
<tr>
<td>Drive Level</td>
<td>10</td>
<td>100</td>
<td></td>
<td>µW</td>
<td></td>
</tr>
<tr>
<td>Aging (1 year)</td>
<td>-2</td>
<td>+2</td>
<td></td>
<td>ppm</td>
<td>@25°C± 3°C</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>500</td>
<td></td>
<td></td>
<td>MΩ</td>
<td>@100 Vdc ± 15V</td>
</tr>
</tbody>
</table>

(*) Plating Load = Load Capacitance (CL)
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1.20 x 1.00 x 0.33mm
RoHS/RoHS II Compliant
MSL = N/A: Not Applicable

Options and Part Identification [Note 1]

ABM13W- MHz -

Frequency in MHz
Please specify the Frequency in MHz out to 4 digit accuracy after the decimal. (e.g. 32.0000MHz)

Load Capacitance (pF)
8: 8pF
7: 7pF
6: 6pF
5: 5pF

Custom ESR if other than standard
R □□: Specify a value in Ω (e.g.: R40)

Operating Temp.
B: -20°C ~ +70°C
N: -30°C ~ +85°C
D: -40°C ~ +85°C
J: -40°C ~ +105°C
K: -40°C ~ +125°C

Freq. Tolerance
H7: ± 7 ppm
1: ± 10 ppm
7: ± 15 ppm
2: ± 20 ppm

Freq. Stability
U: ± 10 ppm (*)
G: ± 15 ppm (**)
X: ± 20 ppm (**)
Y: ± 30 ppm (***)
Z: ± 50 ppm

(*) Only offered @ Operating Temp. Range options: B & N
(**) Only offered @ Operating Temp. Range options: B, N, & D
(***) Only offered @ Operating Temp. Range options: B, N, D, & J
Contact ABRACON for tighter Frequency Stability options.

Packaging
Blank: Bulk
T5: 5kpcs / reel

Note 1:
Contact Abracon for part number requests with carrier frequency callouts up to 5 & 6 digit accuracy after the decimal.
**IoT Optimized Ultra-Miniature Quartz Crystal**

**ABM13W SERIES**

1.20 x 1.00 x 0.33mm

RoHS/RoHS II Complaint

MSL = N/A: Not Applicable

Typical Frequency vs. Temperature Characteristics (ref. to +25°C):

![Frequency Stability vs. Temperature (ABM13W Package)](image)

Typical ESR (Equivalent Series Resistance) vs. Temperature Characteristics:

![ESR (Equivalent Series Resistance) vs. Operating Temperature](image)

For terms and conditions of sales, please visit: www.abracon.com
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SPICE Models (based on typical values at 25°C ± 3°C):

\[ \begin{array}{|c|c|c|}
\hline
\text{Frequency: 32.0000MHz} & \text{Frequency: 38.4000MHz} \\
\text{Plating Load: 8pF} & \text{Plating Load: 6pF} \\
C0 & C0 \\
R1 & R1 \\
L1 & L1 \\
C1 & C1 \\
\text{Plating Load: 6pF} & \text{Plating Load: 6pF} \\
C0 & C0 \\
R1 & R1 \\
L1 & L1 \\
C1 & C1 \\
\hline
\end{array} \]

Typical Frequency Tolerance Distribution (at 25°C ± 3°C):

Frequency Tolerance Distribution
100 Samples
32.0000MHz – 48.0000MHz
Typical ESR Distribution (at 25°C ± 3°C):

**ESR Distribution at @ 32.0000MHz**
- 100 Samples
- MAX ESR 57 Ω

**ESR Distribution at @ 38.4000MHz**
- 100 Samples
- MAX ESR 32 Ω

**ESR Distribution at @ 48.0000MHz**
- 100 Samples
- MAX ESR 24 Ω
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1.20 x 1.00 x 0.33mm

RoHS/RoHS II Complaint

MSL = N/A: Not Applicable

Mechanical Dimensions

Top View

Bottom View

Dimensions: mm

Pin #2: GND (Electrically connected to metallic package lid)
Pin #4: NC (No internal connection, leave floating or connect to GND)
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1.20 x 1.00 x 0.33mm
RoHS/RoHS II Complaint
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Reflow Profile

<table>
<thead>
<tr>
<th>Zone</th>
<th>Description</th>
<th>Temperature</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Preheat / Soak</td>
<td>$T_{\text{SMIN}} \sim T_{\text{SMAX}}$ 160±10°C</td>
<td>80 ~ 100 sec.</td>
</tr>
<tr>
<td>2</td>
<td>Reflow</td>
<td>$T_L$ 220°C</td>
<td>50 ~ 70 sec.</td>
</tr>
<tr>
<td>3</td>
<td>Peak heat</td>
<td>$T_p$ 260±5°C</td>
<td>5 sec. MAX.</td>
</tr>
</tbody>
</table>
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Packaging:

T5: Tape and reel (5,000pcs/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-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 LLC is required. Please contact Abracon LLC for more information.