## 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></td>
<td>80.0000</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>Fundamental</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>-40</td>
<td></td>
<td>+85</td>
<td>°C</td>
<td>See Options</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40</td>
<td></td>
<td>+125</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Frequency Tolerance @ +25°C</td>
<td>-10</td>
<td></td>
<td>+10</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></td>
<td>+15</td>
<td>ppm</td>
<td>See options</td>
</tr>
<tr>
<td>Equivalent series resistance (R1) (over -40°C to +125°C)</td>
<td>&lt; 45</td>
<td></td>
<td>100</td>
<td>Ω</td>
<td>32.0000-32.9999MHz</td>
</tr>
<tr>
<td></td>
<td>&lt; 35</td>
<td></td>
<td>80</td>
<td>Ω</td>
<td>33.0000-36.9999MHz</td>
</tr>
<tr>
<td></td>
<td>&lt; 25</td>
<td></td>
<td>50</td>
<td>Ω</td>
<td>37.0000-80.0000MHz</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></td>
<td>5.0</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></td>
<td>+2</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>
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## ABM13W SERIES

### Options and Part Identification

**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

**Packaging**
- Blank: Bulk
- T5: 5kpcs / reel

### Notes:

- **Note 1:** Contact Abracon for part number requests with carrier frequency callouts up to 5 & 6 digit accuracy after the decimal.
- (*) 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.
Typical Frequency vs. Temperature Characteristics (ref. to +25°C):

Typical ESR (Equivalent Series Resistance) vs. Temperature Characteristics:
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1.20 x 1.00 x 0.33mm
RoHS/RoHS II Complaint
MSL = N/A: Not Applicable

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

Typical Frequency Tolerance Distribution (at 25°C ± 3°C):
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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ABM13W SERIES

Mechanical Dimensions

Top View

Recommended Land Pattern

Bottom View

Dimensions: mm

1.20 x 1.00 x 0.33mm
RoHS/RoHS II Complaint
MSL = N/A: Not Applicable
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>

**Reflow Profile**

- **Zone 1**: Preheat / Soak with temperature range from $T_{\text{SMIN}}$ to $T_{\text{SMAX}}$ and duration from 80 to 100 seconds.
- **Zone 2**: Reflow with $T_L$ at 220°C and duration from 50 to 70 seconds.
- **Zone 3**: Peak heat with $T_p$ at 260 ± 5°C and maximum duration of 5 seconds.

**Critical Zones**

- **TL to TP**: Represents the critical zone where the temperature ranges from $T_L$ to $T_P$.
- **Ramp Up** and **Ramp Down**: Indicate the changes in temperature over time during the reflow process.

**Reflow Profile Description**

- **Temperature Gradient**: The gradient of temperature over time is shown.
- **Time Duration**: The time duration for each zone is specified.

**MSL = N/A: Not Applicable**

**RoHS/RoHS II Complaint**

- **Pb Free**
- **Compliant with RoHS/RoHS II**

**Technical Specifications**

- **Dimensions**: 1.20 x 1.00 x 0.33 mm
- **Environmental Rating**: Not Applicable (N/A)

**Additional Information**

- **Website**: www.abracon.com
- **Contact Information**: 5101 Hidden Creek Ln Spicewood TX 78669
- **Phone**: 512-371-6159 | Fax: 512-351-8858
- **ISO 9001-2015 Certified**

**Revision Date**: 08.15.2018
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ABM13W SERIES

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.