Abracon New MEMS Oscillators
Low Power, Ultra-Miniature kHz MEMS
kHz MEMS Technology

• Abracon’s new low power, miniature kHz MEMS oscillators (watch-MEMS® series), utilizes all-silicon MEMS resonators, configured using proprietary MEMS technology.

• These MEMS resonator-based oscillators are vacuum-sealed, packaged in cost-effective plastic packages, yielding exceptional immunity to shock, vibration & aging, while providing significantly accurate timing, relative to a typical Tuning Fork Crystal

~ 524 kHz Low power resonator; core for 32.768kHz oscillator design
Size Advantage

Quartz

- 8 mm² Footprint
  - 3.2x1.5mm (3215) ABS07

- 5 mm² Footprint
  - 2.0x1.2mm (2012) ABS06

- 3 mm² Footprint
  - 1.6x1.0mm (1610) ABS05

watch-MEMS®

- 2.4 mm²
  - 2.0x1.2mm SMD

- 1.2 mm²
  - 1.5x0.8mm CSP

80% Smaller Than 2.0x1.2 mm Quartz Solution

60% Smaller Than 1.6x1.0 mm Quartz Solution

2012 size SMD package footprint
Output Swing Level Advantage
(for ASTMK, ASTMKJ, ASTMKH series)

- **New** Abracon MEMS Oscillators use technology that is optimized to yield output signal swing-level for lower power consumption.
- Reduced output swing level can interface directly into the XTAL input pin on the μController; thereby a quartz tuning fork crystal can be used on the same layout.

<table>
<thead>
<tr>
<th>Option Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCC</td>
<td>Rail-to-Rail LVCMOS</td>
</tr>
<tr>
<td>AA3</td>
<td>AC-coupled signal, swing level: 0.3V min.</td>
</tr>
<tr>
<td>D14</td>
<td>DC-coupled signal, $V_{OL}: 0.400V$ max, $V_{OH}: 1.100V$ min</td>
</tr>
<tr>
<td>D26</td>
<td>DC-coupled signal, $V_{OL}: 0.525V$ max, $V_{OH}: 1.225V$ min</td>
</tr>
</tbody>
</table>
ASTMTXK Series (1.54 x 0.84 x 0.6mm)
Temperature Compensated, Ultra-Miniature kHz MEMS Oscillator

Main Features:
• Package Size: 1.54 x 0.84 x 0.6mm
• Output Frequency: 32.768kHz
• Output Type: LVCMOS
• Supply Voltage: 1.5V to 3.63V
• Ultra-Low Current Consumption: 1.52µA max. (core current, no load)
• Frequency Stabilities include:
  ±5ppm, ±10ppm, ±20ppm over -10 to +70°C and -40 to +85°C
• Internal power supply filtering eliminates external bypass capacitor for Vdd port.

Typical Markets/Applications:
• Fitness/Medical monitoring sensors
• Smart Meters
• Portable devices
• RTC reference clocks
ASTMKJ Series (1.54 x 0.84 x 0.6mm)
Low Power, Ultra-Miniature kHz MEMS Oscillator

Main Features:
• Package Size: 1.54 x 0.84 x 0.6mm
• Output Frequency: 32.768kHz
• Output Type: LVCMOS
• Supply Voltage: 1.2V to 3.63V (-10 ~ +70°C); 1.5V to 3.63V (-40 ~ +85°C)
• Ultra-Low Current Consumption: 1.4µA max. (core current, no load)
• Frequency Stabilities include:
  ±75ppm over -10 to +70°C (@Vdd=1.5~3.36V); ±250ppm over -10 to +70°C (@Vdd=1.2~1.5V);
  ±100ppm over -40 to +85°C
• Internal power supply filtering eliminates external bypass capacitor for Vdd port.
• Proprietary MEMS Technology enables programmable output swing for lower power

Typical Markets/Applications:
• Timekeeping
• Battery Management
• Mobile devices
• RTC reference clock
• Wireless accessories
• Fitness/Medical monitoring sensors
• Sport video cams
ASTMKH Series (2.0 x 1.2 x 0.6mm)
Low Power, Ultra-Miniature kHz MEMS Oscillator

Main Features:

• Package Size: 2.0 x 1.2 x 0.6mm
• Output Frequency: 32.768kHz
• Output Type: LVCMOS
• Supply Voltage: 1.2V to 3.63V (-10 ~ +70°C); 1.5V to 3.63V (-40 ~ +85°C)
• Ultra-Low Current Consumption: 1.4µA max. (core current, no load)
• Frequency Stabilities include:
  ±75ppm over -10 to +70°C (@Vdd=1.5~3.36V); ±250ppm over -10 to +70°C (@Vdd=1.2~1.5V);
  ±100ppm over -40 to +85°C
• Internal power supply filtering eliminates external bypass capacitor for Vdd port.
• Proprietary MEMS Technology enables programmable output swing for lower power

Typical Markets/Applications:

• Timekeeping
• Battery Management
• Mobile devices
• RTC reference clock
• Wireless accessories
• Fitness/Medical monitoring sensors
• Sport video cams
ASTMK Series (2.0 x 1.2 x 0.6mm; 1.54 x 0.84 x 0.6mm)
Low Power, Ultra-Miniature kHz MEMS Oscillator

Main Features:
- Package Size: 2.0 x 1.2 x 0.6mm (SMD); 1.54 x 0.84 x 0.6mm (CSP)
- Output Frequency: 1Hz ~ 32.768kHz (factory programmable, in the powers of 2)
- Output Type: LVCMOS
- Supply Voltage: 1.2V to 3.63V (-10 ~ +70°C); 1.5V to 3.63V (-40 ~ +85°C)
- Ultra-Low Current Consumption: 1.4µA max. (core current, no load)
- Frequency Stabilities include:
  ±75ppm over -10 to +70°C (@Vdd=1.5~3.36V); ±250ppm over -10 to +70°C (@Vdd=1.2~1.5V); ±100ppm over -40 to +85°C
- Internal power supply filtering eliminates external bypass capacitor for Vdd port.
- Proprietary MEMS Technology enables programmable output swing for lower power

Typical Markets/Applications:
- Timekeeping
- Battery Management
- Mobile devices
- RTC reference clock
- Wireless accessories
- Fitness/Medical monitoring sensors
- Sport video cams
ASTMK06 Series (2.0 x 1.2 x 0.6mm)
Low Power, Ultra-Miniature kHz MEMS Oscillator

Main Features:
- Package Size: 2.0 x 1.2 x 0.6mm
- Output Frequency: 32.768kHz
- Output Type: LVCMOS
- Supply Voltage: 1.5V to 3.63V
- Ultra-Low Current Consumption: 1.0µA typ. (no load)
- Frequency Stabilities include:
  ±75ppm over -10 to +70°C
  ±100ppm over -40 to +85°C
- Internal power supply filtering eliminates external bypass capacitor for Vdd port.

Typical Markets/Applications:
- General Timekeeping
- Battery Management
- Portable devices
- RTC reference clock
- Bluetooth/WiFi modules
Summary

Target Market /Applications:

- Smart Watch
- Fitness Electronics
- Medical Monitoring Sensors / Devices
- Smart Meters
- Portable, consumer electronics
- RTC reference Clock

Competitors:

- Vectron

Abracon Advantage:

- In stock @ Abracon & Distribution Channel
- Registerable
- Competitively priced
## Summary

- Available in both temp. compensated and standard/non-temp. compensated versions
- Ultra-Miniature package size reduces board space
- Proprietary MEMS Technology enables programmable output swing for lower power
- High Shock/Vibration Resistance
- In stock @ Abracon and Distribution channel
- Registerable, in distribution stock and competitively priced

<table>
<thead>
<tr>
<th>Series</th>
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<th>Package Size</th>
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<tbody>
<tr>
<td>ASTMTXK</td>
<td>Temperature compensated, ultra-miniature 32.768kHz MEMS oscillator</td>
<td>1.54 x 0.84 x 0.6mm</td>
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<tr>
<td>ASTMJK</td>
<td>Low-power, ultra-miniature 32.768kHz MEMS oscillator, with <em>Programmable Output Swing</em></td>
<td>1.54 x 0.84 x 0.6mm</td>
</tr>
<tr>
<td>ASTMKH</td>
<td>Low-power, ultra-miniature 32.768kHz MEMS oscillator, with <em>Programmable Output Swing</em></td>
<td>2.0 x 1.2 x 0.6mm</td>
</tr>
<tr>
<td>ASTMK</td>
<td>Low-power, ultra-miniature 1Hz ~ 32.768kHz MEMS oscillator, with <em>Programmable Output Swing</em></td>
<td>1.54 x 0.84 x 0.6mm   &lt;br&gt; 2.0 x 1.2 x 0.6mm</td>
</tr>
<tr>
<td>ASTMK06</td>
<td>Low-power, ultra-miniature 32.768kHz MEMS oscillator</td>
<td>2.0 x 1.2 x 0.6mm</td>
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</table>
MHz MEMS
MHz MEMS Technology

• Abracon’s new MHz MEMS oscillators utilize all-silicon MEMS resonators, configured using proprietary High-Q MEMS technology.

• These MEMS resonator-based oscillators are vacuum-sealed, packaged in cost-effective plastic packages, yielding exceptional immunity to shock, vibration & aging.
Programmable Output Drive Strength

Advanced programmable output drive strength feature is available for these new MHz MEMS oscillators with LVCMOS output.

Benefits of this feature are:

- Improves system radiated electromagnetic interference (EMI) by slowing down the clock rise/fall time
- Improves the downstream clock receiver’s (RX) jitter by speeding up the clock rise/fall time
- Improves the capability to drive large capacitive loads while maintaining full swing with sharp edge rates
Low Power MHz MEMS
ASTMLP Series
Low Power, MHz MEMS Oscillator

Main Features:

- Industry Standard Packages:
  2.0 x 1.6 x 0.75mm; 2.5 x 2.0 x 0.75mm; 3.2 x 2.5 x 0.75mm;
  5.0 x 3.2 x 0.75mm; 7.0 x 5.0 x 0.90mm
- Output Frequency: 1MHz to 110MHz; 115MHz to 137MHz
- Output Type: LVCMOS
- Supply Voltage: 1.8V, 2.5V, 2.8V, 3.0V, 3.3V, 2.25V~3.63V
- Low Current Consumption:
  3.5mA typ. (@20MHz, Vdd=1.8V, no load)
  4.9mA typ. (@125MHz, Vdd=1.8V, no load)
- Frequency Stabilities include:
  ±20ppm, ±25ppm, ±50ppm over -20 to +70°C and -40 to +85°C
- Factory programmable drive strength

Typical Applications:

- GPON, EPON
- Portable devices
- Consumer electronics
- Network switches, router, servers
- Ethernet, USB, SATA, SAS, Firewire
- Harsh environment (vibration, shock-prone and humid)
ASTMLPT Series (3.5 x 3.0 x 0.25mm)
Low Power, Ultra-low Profile MHz MEMS Oscillator

Main Features:
- Ultra-low Profile Package Size: 3.5 x 3.0 x 0.25mm
- Output Frequency: 1MHz to 110MHz
- Output Type: LVCMOS
- Supply Voltage: 1.8V, 2.5V, 2.8V, 3.3V
- Low Current Consumption: 3.2mA typ. (@20MHz, Vdd=1.8V, no load)
- Frequency Stabilities include:
  ±100ppm over -20 to +70°C and -40 to +85°C

Typical Applications:
- Smart cards
- SD cards
- High capacity SIM cards
- Near Field Communications
- Multi-chip modules and System-in-package
- Portable devices
High Temperature MHz MEMS
ASTMHT Series
High Temperature MHz MEMS Oscillator

Main Features:
• Industry Standard Packages:
  2.0 x 1.6 x 0.75mm; 2.5 x 2.0 x 0.75mm; 3.2 x 2.5 x 0.75mm;
  5.0 x 3.2 x 0.75mm; 7.0 x 5.0 x 0.90mm
• Output Frequency: 1MHz to 110MHz; 115MHz to 137MHz
• Output Type: LVCMOS
• Supply Voltage: 1.8V, 2.5V, 2.8V, 3.0V, 3.3V, 2.25V~3.63V
• Wide Operating Temperature Range:
  -40 ~ +105°C; -40 ~ +125°C; -55 ~ +125°C;
• Low Current Consumption:
  3.5mA typ. (@20MHz, Vdd=1.8V, no load)
  4.9mA typ. (@125MHz, Vdd=1.8V, no load)
• Frequency Stabilities include: ±20ppm, ±25ppm, ±30ppm, ±50ppm
• Factory programmable drive strength

Typical Applications:
• High temperature applications for industrial, medical, non-automotive and avionics
• Harsh environment (vibration, shock-prone and humid)
High Performance MHz MEMS
ASTMUPC Series
High Performance MHz MEMS Oscillator, LVCMOS

Main Features:

• Industry Standard Packages:
  2.7 x 2.4 x 0.75mm (compatible with 2520 footprint);
  3.2 x 2.5 x 0.75mm; 5.0 x 3.2 x 0.75mm; 7.0 x 5.0 x 0.90mm
• Output Frequency: 1MHz to 220MHz
• Output Type: LVCMOS
• Supply Voltage: 1.8V, 2.5V, 2.8V, 3.3V
• Low RMS Phase Jitter:
  0.5ps typ. (@ 156.25MHz, Integration BW: 12kHz to 20MHz)
• Frequency Stabilities include:
  ±10ppm, ±20ppm, ±25ppm, ±50ppm
  over -20°C to +70°C and -40°C to +85°C
• Factory programmable drive strength (for 1MHz ~80MHz only) for improved
  jitter, reduced EMI or higher capacitive output load
ASTMUPC Series
High Performance MHz MEMS Oscillator, LVCMOS

Typical Applications:
- Ethernet, SATA, SAS, PCI Express
- WiFi
- Video
- Computing
- Storage
- Networking
- Telecom
- Industrial control
- Harsh environment (vibration, shock-prone and humid)

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<tr>
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<tbody>
<tr>
<td>ASTMUPCD</td>
<td>2.7 x 2.4 x 0.75mm (compatible with 2520 footprint)</td>
</tr>
<tr>
<td>ASTMUPCE</td>
<td>3.2 x 2.5 x 0.75mm</td>
</tr>
<tr>
<td>ASTMUPCFL</td>
<td>5.0 x 3.2 x 0.75mm</td>
</tr>
<tr>
<td>ASTMLUPCV</td>
<td>7.0 x 5.0 x 0.90mm</td>
</tr>
</tbody>
</table>
ASTMUPLP, ASTMUPLD Series
High Performance MHz MEMS Oscillator, Differential

Main Features:
- Industry Standard Packages:
  3.2 x 2.5 x 0.75mm; 5.0 x 3.2 x 0.75mm; 7.0 x 5.0 x 0.90mm
- Output Frequency: 1MHz to 625MHz
- Output Type:
  ASTMUPLP: LVPECL
  ASTMUPLD: LVDS
- Supply Voltage: 1.8V, 2.5V, 3.3V, 2.25V~3.63V
- Low RMS Phase Jitter:
  0.6ps typ. (@156.25MHz, Integration BW: 12kHz to 20MHz)
- Frequency Stabilities include:
  ±10ppm, ±20ppm, ±25ppm, ±50ppm
  over -20°C to +70°C and -40°C to +85°C
ASTMUPLP, ASTMUPLD Series
High Performance MHz MEMS Oscillator, Differential

Typical Applications:
- 10GB Ethernet, SONET, SATA, SAS, PCI Express
- Storage
- Server
- Networking
- Telecom
- Instrumentation
- Industrial control
- Harsh environment (vibration, shock-prone and humid)

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<tr>
<td>ASTMUPLPPE</td>
<td>3.2 x 2.5 x 0.75mm</td>
</tr>
<tr>
<td>ASTMUPLDE</td>
<td>3.2 x 2.5 x 0.75mm</td>
</tr>
<tr>
<td>ASTMUPLFL</td>
<td>5.0 x 3.2 x 0.75mm</td>
</tr>
<tr>
<td>ASTMUPLDFL</td>
<td>5.0 x 3.2 x 0.75mm</td>
</tr>
<tr>
<td>ASTMUPLPV</td>
<td>7.0 x 5.0 x 0.90mm</td>
</tr>
<tr>
<td>ASTMUPLDV</td>
<td>7.0 x 5.0 x 0.90mm</td>
</tr>
</tbody>
</table>
Target Market/Applications:

- Consumer electronics
  e.g. Portable devices; Smartphones; DVR; IP Cameras; Set-top box
- Datacom infrastructure
  e.g. 10/100/1G/10G Ethernet; GPON/EPON/SONET;
- Networking, computing, storage devices
  e.g. Routers; Gateways; SATA/SAS/PCI Express; Laptop; Printer; SSD
- High temperature, harsh environment (shock/vibration/humidity)
  e.g. Industrial; Medical; Non-automotive/avionics

Competitors:

- Micrel
- Silicon Labs
- Vectron

Abracon Advantage:

- In stock @ Abracon & Distribution Channel
- Registrable
- Competitively priced
Summary

- Available in a broad portfolio from low power consumption, to wide operating temperature range, as well as low rms phase jitter
- Available in industry standard packages
- Ideal drop-in replacements for general purpose crystal oscillators
- Factory programmable drive strength for improved jitter, reduced EMI or higher capacitive output load
- High Shock/Vibration Resistance
- In stock @ Abracon and Distribution channel
- Registerable and competitively priced