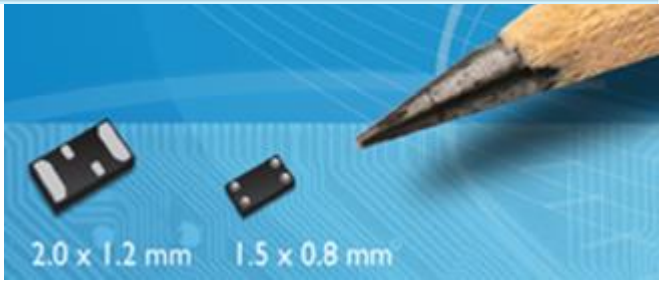
ABRACON® LLC
The Power of Linking Together

Abracon *New* MEMS Oscillators



ABRACON® LLC
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Low Power, Ultra-Miniature kHz MEMS

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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

80% Smaller Than 2.0x1.2 mm Quartz Solution

1.2 mm²

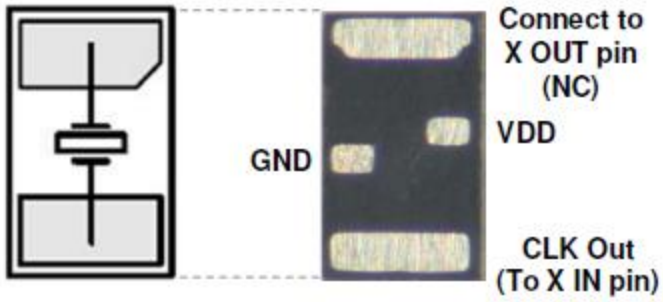
60% Smaller Than 1.6x1.0 mm Quartz Solution

1.5x0.8mm CSP

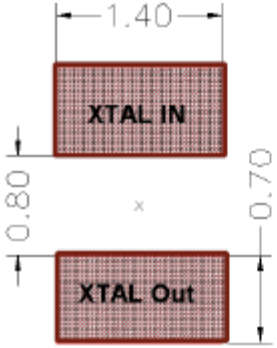
2012 size SMD package footprint

Quartz

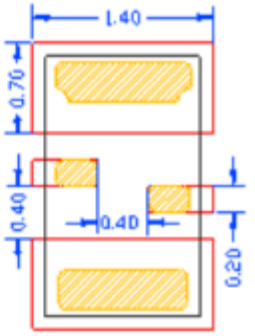
kHz MEMS



Quartz



kHz MEMS



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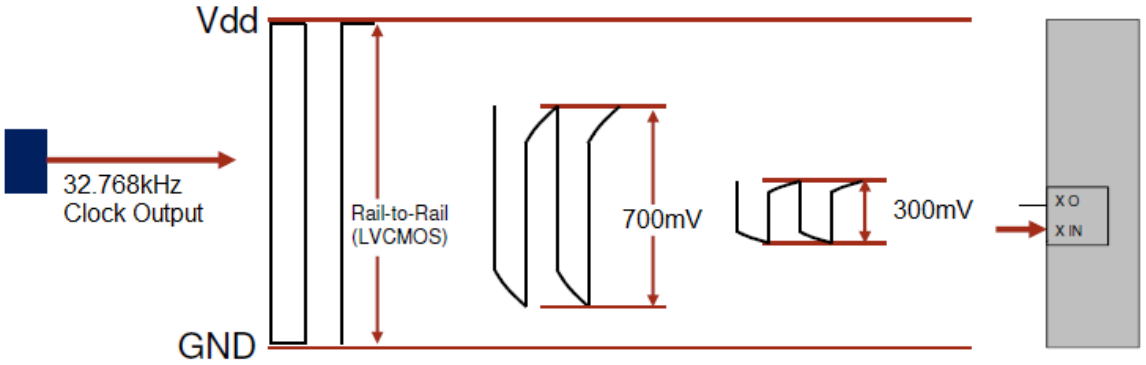
Output Swing Level Advantage

(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

Option Code	Description
DCC	Rail-to-Rail LVCMOS
AA3	AC-coupled signal, swing level: 0.3V min.
D14	DC-coupled signal, V_{OL}: 0.400V max, V_{OH}: 1.100V min
D26	DC-coupled signal, V_{OL}: 0.525V max, V_{OH}: 1.225V min



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:

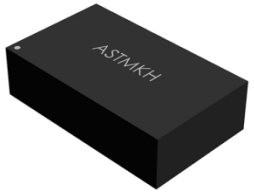
- Package Size: 1.54 x 0.84 x 0.6mm
- Output Frequency: 32.768kHz
- Output Type: LVCMOS
- Supply Voltage: 1.2V to 3.63V (-10 ~ +70°C); 1.5V to 3.63V (-40 ~ +85°C)
- Ultra-Low Current Consumption: 1.4µA max. (core current, no load)
- Frequency Stabilities include:
  ±75ppm over -10 to +70°C (@Vdd=1.5~3.36V); ±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:

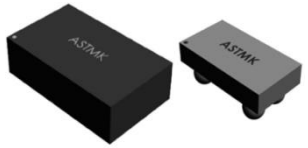
- Package Size: 2.0 x 1.2 x 0.6mm
- Output Frequency: 32.768kHz
- Output Type: LVCMOS
- Supply Voltage: 1.2V to 3.63V (-10 ~ +70°C); 1.5V to 3.63V (-40 ~ +85°C)
- Ultra-Low Current Consumption: 1.4µA max. (core current, no load)
- Frequency Stabilities include:
  ±75ppm over -10 to +70°C (@Vdd=1.5~3.36V); ±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

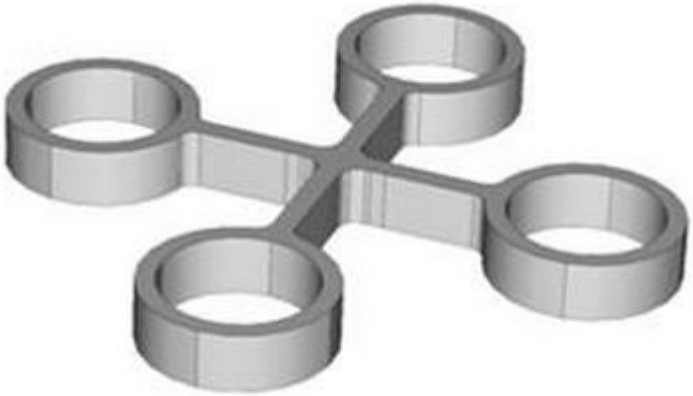
- Available in both temp. compensated and standard/non-temp. compensated versions
- Ultra-Miniature package size reduces board space
- Proprietary MEMS Technology enables programmable output swing for lower power
- High Shock/Vibration Resistance
- In stock @ Abracon and Distribution channel
- Registerable,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

Series	Description	Package Size
ASTMTXK	Temperature compensated, ultra-miniature 32.768kHz MEMS oscillator	1.54 x 0.84 x 0.6mm
ASTMKJ	Low-power, ultra-miniature 32.768kHz MEMS oscillator, with *Programmable Output Swing*	1.54 x 0.84 x 0.6mm
ASTMKH	Low-power, ultra-miniature 32.768kHz MEMS oscillator, with *Programmable Output Swing*	2.0 x 1.2 x 0.6mm
ASTMK	Low-power, ultra-miniature 1Hz ~ 32.768kHz MEMS oscillator, with *Programmable Output Swing*	1.54 x 0.84 x 0.6mm 2.0 x 1.2 x 0.6mm
ASTMK06	Low-power, ultra-miniature 32.768kHz MEMS oscillator	2.0 x 1.2 x 0.6mm

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.



MHz Resonator

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

Series	Package Size
ASTMLPA	2.0 x 1.6 x 0.75mm
ASTMLPD	2.5 x 2.0 x 0.75mm
ASTMLPE	3.2 x 2.5 x 0.75mm
ASTMLPFL	5.0 x 3.2 x 0.75mm
ASTMLPV	7.0 x 5.0 x 0.90mm

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

Series	Package Size
ASTMHTA	2.0 x 1.6 x 0.75mm
ASTMHTD	2.5 x 2.0 x 0.75mm
ASTMHTE	3.2 x 2.5 x 0.75mm
ASTMHTFL	5.0 x 3.2 x 0.75mm
ASTMHTV	7.0 x 5.0 x 0.90mm

Typical Applications:

- High temperature applications for industrial, medical, *non-automotive* and avionics
- Harsh environment (vibration, shock-prone and humid)

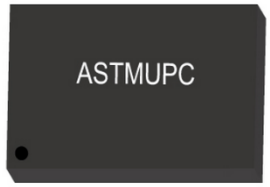
High Performance MHz MEMS

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)

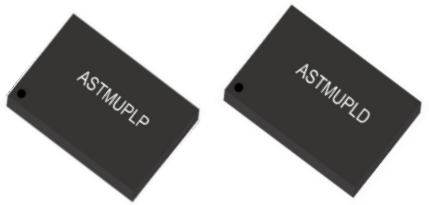
Series	Package Size
ASTMUPCD	2.7 x 2.4 x 0.75mm (compatible with 2520 footprint)
ASTMUPCE	3.2 x 2.5 x 0.75mm
ASTMUPCFL	5.0 x 3.2 x 0.75mm
ASTMLUPCV	7.0 x 5.0 x 0.90mm

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

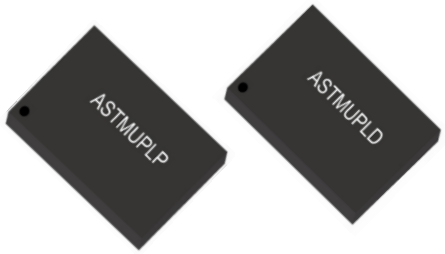


ASTMUPLP, ASTMUPLD Series

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)



Series	Package Size
ASTMUPLPE	3.2 x 2.5 x 0.75mm
ASTMUPLDE	
ASTMUPLPFL	5.0 x 3.2 x 0.75mm
ASTMUPLDFL	
ASTMUPLPV	7.0 x 5.0 x 0.90mm
ASTMUPLDV	

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