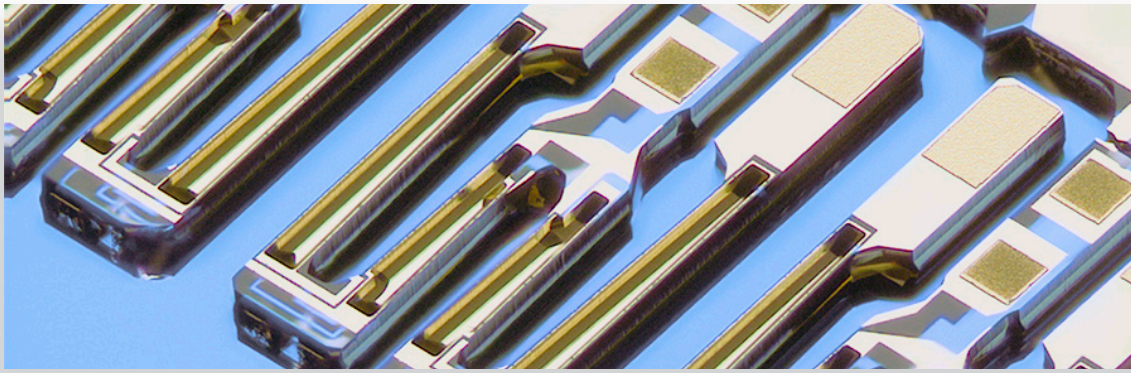
MICRO CRYSTAL SWITZERLAND

A COMPANY OF THE SWATCH GROUP

# Micro Crystal



## kHz Tuning Fork Crystals

## MHz AT-Cut Crystals

## Real-Time Clock Modules

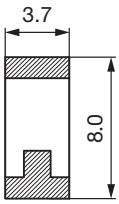
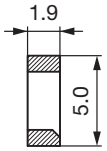
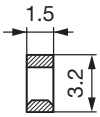
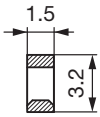
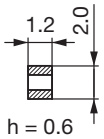
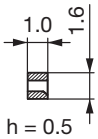
## Low Frequency Oscillators

## Medical Implantable Products




## Short Form Catalog Q3 2021

# kHz Tuning Fork Crystals in Ceramic Packages

| Crystal Type | | 30.0 kHz to 2'000 kHz Tuning Fork Crystals | | | | | | Units |
|---|---|---|---|---|---|---|---|---|
| **Product Type** | | **CC1V-T1A** | **CC4V-T1A** | **CM7V-T1A** | **CM7V-T1A low ESR** | **CM8V-T1A** | **CM9V-T1A** | |
| **Dimensions (l × w × h)** | | 8.0 x 3.7 x 1.75 | 5.0 x 1.9 x 0.9 | 3.2 x 1.5 x 0.65 | 3.2 x 1.5 x 0.65 | 2.0 x 1.2 x 0.6 | 1.6 x 1.0 x 0.5 | mm |
| RoHS COMPLIANT, lead-free, REACH | |  |  |  h = 0.35 on request |  |  h = 0.35 on request |  h = 0.35 on request | mm |
| PCB Footprint and Symbol available on product pages on website | |  h = 1.75 |  h = 0.9 |  h = 0.65 |  h = 0.65 |  h = 0.6 |  h = 0.5 | mm |
| **Lid Material** | | Ceramic | Ceramic | Metal | Metal | Metal | Metal | |
| **Operating Temp. Range TA** | | -40 to +85 | -40 to +85 | -40 to +85 | -40 to +85 | -40 to +85 | -40 to +85 | °C |
| **Operating Temp. Range TB** | 1) | -40 to +125 | -40 to +125 | -40 to +125 | -40 to +125 | -40 to +125 | -40 to +125 | °C |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Frequency** | $F_L$ | 32.768 | 32.768 | 32.768 | 32.768 | 32.768 | 32.768 | kHz |
| **Standard Load Capacitance** 2) | $C_L$ | 9 / 12.5 | 6 / 7 / 9 / 12.5 | 6 / 7 / 9 / 12.5 | 6 / 7 / 9 / 12.5 | 4 / 7 / 9 / 12.5 | 4 / 7 / 9 / 12.5 | pF |
| **Frequency Tolerance @ 25°C** 3) | ΔF/F | ±20 | ±20 | ±20 | ±20 | ±20 | ±20 | ppm |
| **Series Resistance typ./max.** | $R_S$ | 40 / 60 | 50 / 65 | 50 / 70 | 40 / 50 | 55 / 70 | 60 / 75 | kΩ |
| **Motional Capacitance typ.** | $C_1$ | 2.0 | 2.1 | 3.7 | 4.7 | 4.7 | 6.3 | fF |
| **Static Capacitance typ.** | $C_0$ | 1.6 | 1.2 | 1.2 | 1.3 | 1.2 | 1.4 | pF |
| **Drive Level max.** | P | 1.0 | 1.0 | 1.0 | 1.0 | 0.5 | 0.5 | µW |
| **Aging max. 1st Year @ 25°C** | ΔF/F | ±3 | ±3 | ±3 | ±3 | ±3 | ±3 | ppm |
| **Turnover Temperature** | $T_0$ | 25 ±5 | 25 ±5 | 25 ±5 | 25 ±5 | 25 ±5 | 25 ±5 | °C |
| **Frequency vs. Temperature** | ΔF/F | -0.035 ppm/°C² $(T-T_0)^2$ ±10% | | | | | | ppm |

1) Also available in -55 to +125°C temp. range (TC).
2) Other load capacitance on request.
3) Tighter and wider frequency tolerances on request.

## Applications

- IoT
- Computing
- Automotive
- Wireless Units
- Smart Metering
- Industrial Control
- Embedded Modules
- GPS and Navigation
- Tablets, Smart Phones
- Security and Access Control
- Wearables, Portable Devices
- Remote Keyless Entry Systems
- High Temperature Range Designs
- Ultra Small Size Devices, Smart Cards
- Healthcare, Medical and Medical Implantable

## Ordering Information

**C M 7 V - T 1 A 0.3 32.768 kHz 12.5 pF ±20 ppm TA QC**

**Ceramic package**

**Package lid**
**C** = Ceramic lid
**M** = Metal lid

**Package size**
**1** = 8.0 x 3.7 x 1.75 mm
**4** = 5.0 x 1.9 x 0.9 mm
**5** = 4.1 x 1.5 x 0.9 mm
**7** = 3.2 x 1.5 x 0.65 mm
**8** = 2.0 x 1.2 x 0.6 mm
**9** = 1.6 x 1.0 x 0.5 mm

**Tuning fork**

**SMT Package**

**Au flashed pads**

**Pads on both ends**

**Special feature**
**0.3** = Lowest profile, 0.35 mm
**Low ESR** = 50 kΩ max.

**Frequency $F_L$**

**Load capacitance $C_L$**

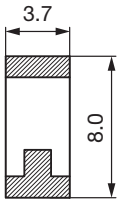
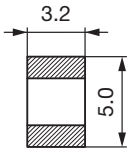
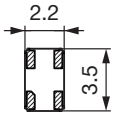
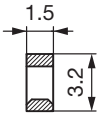
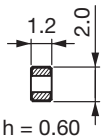
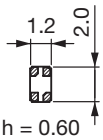
**Frequency tolerance**

**Temperature range**
**TA** = -40 to +85°C (Standard)
**TB** = -40 to +125°C

**Qualification**
**QC** = Commercial Grade (Standard)
**QA** = Automotive Grade AEC-Q200
**QM** = Medical Grade (see page 6)



# MHz AT-Cut Crystals in Ceramic Packages

| Crystal Type | MHz AT-Cut Crystals | | | | | |
|---|---|---|---|---|---|---|
| **Product Type** | **CC1A/F** | **CC2A** | **CC6A/F** | **CC7A** | **CC8A** | **CM8A** |
| **Dimensions (l × w × h) mm** | 8.0 x 3.7 x 1.75 | 5.0 x 3.2 x 1.2 | 3.5 x 2.2 x 1.0/0.8 | 3.2 x 1.5 x 0.75 | 2.0 x 1.2 x 0.6 | 2.0 x 1.2 x 0.6 |
| |  |  |  4 or 2 pads |  |  |  |
| PCB Footprint and Symbol available on product pages on website |  h = 1.75 |  h = 1.2 |  h = 1.0/0.8 |  h = 0.75 |  h = 0.60 |  h = 0.60 |

| Standard (Fundamental Mode) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Product Type** | **Number of pads** | **Frequency MHz** | **Operating Temp. °C** | **$R_S$ typ. in Ω @ Fmin - Fmax** | **$C_1$ typ. in fF @ Fmin - Fmax** | **$C_0$ typ. in pF @ Fmin - Fmax** | **Key Features / Applications** |
| CC1A-T1A | 2 | 8 - 30 | -55 to +125 | 60 - 30 | 4 - 11 | 2.0 - 4.0 | |
| CC1F-T1A | 2 | 30 - 250 | -55 to +125 | 35 - 15 | 4 - 7 | 2.0 - 4.0 | Inverted mesa crystal |
| CC2A-T1A | 2 | 12 - 70 | -55 to +125 | 60 - 10 | 3 - 12 | 2.0 - 5.0 | |
| CC6A-T1D | 4 | 16 - 70 | -55 to +125 | 60 - 20 | 2 - 5 | 1.5 - 3.0 | |
| CC6F-T1A | 2 | 70 - 250 | -55 to +125 | 30 - 15 | 5 - 6 | 2.4 - 3.2 | Inverted mesa crystal |
| CC6F-T1A F | 2 | 70 - 200 | -55 to +125 | 35 - 15 | 3 - 3 | 2.4 - 3.2 | Inverted mesa crystal<br>Filter applications - low spurious |
| CC7A-T1A | 2 | 20 - 50 | -55 to +125 | 40 - 25 | 2 - 2 | 0.7 - 0.7 | |
| CC8A-T1A | 2 | 24 - 50 | -55 to +125 | 40 - 20 | 1 - 1 | 0.7 - 0.7 | Smallest package |
| CM8A-T1D | 4 | 24 - 50 | -55 to +125 | 40 - 20 | 1 - 1 | 0.7 - 0.7 | Smallest package |

| High Temperature / Harsh Environment (Fundamental Mode) | | | | | | | |
|---|---|---|---|---|---|---|---|
| CC1A-T1A H | 2 | 8 - 24 | -55 to +200 | 100 - 50 | 4 - 9 | 2.0 - 3.2 | |
| CC2A-T1A H | 2 | 14 - 40 | -55 to +200 | 70 - 40 | 5 - 10 | 2.5 - 4.0 | |
| CC6A-T1D H | 4 | 16 - 40 | -55 to +200 | 80 - 50 | 2 - 4 | 1.5 - 2.5 | |

## Applications

Customer-specific applications such as:

- Filters
- Industrial
- Telemetry
- Animal Tracking
- Optical Network
- Airborne Equipment
- Avionics / Aerospace
- Radio Communication
- Geothermal Equipment
- TCXO, VCTCXO, VCXO
- Downhole and Well Drilling
- Healthcare, Medical and Medical Implantable

## Ordering Information

C C 6 A - T 1 D H 24.000 MHz 20.0 pF ±50 ppm TC QI

**Ceramic package**

**Package lid**
**C** = Ceramic lid
**M** = Metal lid

**Package size**
**1** = 8.0 x 3.7 x 1.75 mm
**2** = 5.0 x 3.2 x 1.2 mm
**6** = 3.5 x 2.2 x 1.0 mm
**7** = 3.2 x 1.5 x 0.75 mm
**8** = 2.0 x 1.2 x 0.6 mm

**Quartz blank**
**A** = AT-Cut
**F** = AT-Cut inverted mesa

**SMT Package**

**Au flashed pads**

**Pads layout**
**A** = 2 pads
**D** = 4 pads

**Frequency $F_L$**

**Load capacitance $C_L$**

**Frequency tolerance**

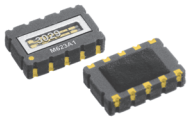
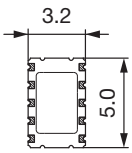
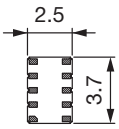
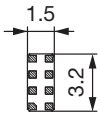
**Temperature range**
**TA** = -40 to +85°C (Standard)
**TB** = -40 to +125°C
**TC** = -55 to +125°C
**TD** = -55 to +175°C
**TG** = -55 to +200°C
**TX** = Custom

**Qualification**
**QI** = Industrial Grade (Standard)
**QM** = Medical Grade (see page 6)
**QS** = Custom Specification

**Special feature**
**H** = Harsh environment
**F** = Filter applications



# RTC Modules in Ceramic Packages

| Product Type | RV-xxxx-C2 | RV-xxxx-C3 | RV-xxxx-C7 |
|---|---|---|---|
| Dimensions (l × w × h) mm | 5.0 x 3.2 x 1.2 | 3.7 x 2.5 x 0.9 | 3.2 x 1.5 x 0.8 |
| |  |  |  |
| PCB Symbol, Footprint & 3D Model<br>available on product pages on website | <br>h = 1.2 | <br>h = 0.9 | <br>h = 0.8 |
| Lid Material | Glass | Metal | Metal |

## I²C-Bus Interface

| Product Type | Main Feature | Time Acc. @ 25°C | Temp. Comp. -40°C to 85°C | Supply $V_{DD}$ V | Current $I_{DD}$ nA | $T_{OP}$°C | Offset Comp. | Backup Switch | Trickle Charge | Event Input | RAM Bytes | EEPROM Bytes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RV-3028-C7 | Lowest Power | ±1 ppm | | 1.1 to 5.5 | 45 | -40 to +85 | ✓ | ✓ | ✓ | ✓ | 2 | 43 |
| RV-4162-C7 | Smallest Package | ±20 ppm | | 1.0 to 4.4 | 350 | -40 to +85 | ✓ | | | | | |
| RV-8263-C7 | Low Power | ±20 ppm | | 0.9 to 5.5 | 190 | -40 to +85 | ✓ | | | | 1 | |
| RV-8564-C2 | | ±20 ppm | | 1.2 to 5.5 | 250 | -40 to +85 | | | | | | |
| RV-8564-C3 | Small Package | ±20 ppm | | 1.2 to 5.5 | 250 | -40 to +85 | | | | | | |
| RV-8523-C3 | Low Power | ±20 ppm | | 1.2 to 5.5 | 130 | -40 to +85 | ✓ | ✓ | | | | |
| RV-3129-C3 | Highest Accuracy Readable 8-bit T-Sensor | | Opt. A: ±6 ppm<br>Opt. B: ±25 ppm | 1.3 to 5.5 | 800 | -40 to +125 | | ✓ | ✓ | | 8 | 2 |
| RV-8803-C7 | Highest Accuracy | | ±3 ppm | 1.5 to 5.5 | 240 | -40 to +105 | ✓ | | | ✓ | 1 | |
| RV-3032-C7 | Highest Accuracy Readable 12-bit T-Sensor | | ±3 ppm | 1.1 to 5.5 | 160 | -40 to +85 | ✓ | ✓ | ✓ | ✓ | 16 | 32 |

## SPI-Bus Interface

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RV-8063-C7 | Low Power | ±20 ppm | | 0.9 to 5.5 | 190 | -40 to +85 | ✓ | | | | 1 | |
| RV-2123-C2 | Low Power | ±20 ppm | | 1.1 to 5.5 | 130 | -40 to +85 | ✓ | | | | | |
| RV-3149-C3 | Highest Accuracy | | Opt. A: ±6 ppm<br>Opt. B: ±25 ppm | 1.3 to 5.5 | 800 | -40 to +125 | | ✓ | ✓ | | 8 | 2 |

## Applications

System power consumption can be greatly reduced by using Micro Crystal's small, high-accuracy and low-power RTC Modules for:

- IoT
- Telemetry
- Smart Metering
- POS, SPS Control
- Energy Harvesting Solutions
- Battery Management Systems
- Automotive, GPS and Drive Recorders
- IP Cameras, Alarm and Building Control
- Door Lock and Access Control Systems
- Industrial, Computing, Embedded Systems
- Wearables, Activity Bands, Fitness Trackers
- Healthcare, Medical and Medical Implantable

## Ordering Information

**RV - 3129 - C3 Option A TA QC**

**RTC Module**

**Product type**

**Package size**
**C2** = 5.0 x 3.2 x 1.2 mm
**C3** = 3.7 x 2.5 x 0.9 mm
**C7** = 3.2 x 1.5 x 0.8 mm

**Time accuracy**
**Option A** = ±6 ppm @ -40°C to +85°C
**Option B** = ±25 ppm @ -40°C to +85°C

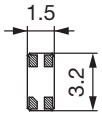
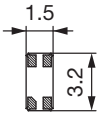
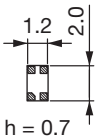
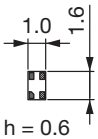
**Qualification**
**QC** = Commercial Grade (Standard)
**QA** = Automotive Grade AEC-Q200
**QM** = Medical Grade (see page 6)

**Temperature range**
**TA** = -40 to +85°C (Standard)
**TB** = -40 to +125°C

**Linux Drivers available**



# Low Frequency Oscillators in Ceramic Packages

| Product Type | OM-xxxx-C7 | OV-xxxx-C7 | OM-xxxx-C8 | OM-xxxx-C9 |
|---|---|---|---|---|
| Dimensions (l × w × h) mm | 3.2 x 1.5 x 0.7 | 3.2 x 1.5 x 1.0 | 2.0 x 1.2 x 0.7 | 1.6 x 1.0 x 0.6 |
| |  |  |  |  |
| PCB Symbol, Footprint & 3D Model<br>available on product pages on website | <br>h = 0.7 | <br>h = 1.0 | <br>h = 0.7 | <br>h = 0.6 |
| Lid Material | Metal | Ceramic | Metal | Metal |

| 32.768 kHz Oscillators | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Product Type | Dimensions (l × w × h) mm | Frequency kHz | ΔF/F @ 25°C ppm | Supply $V_{DD}$ V | Current $I_{DD}$ nA | $T_{OP}$ °C | Duty Cycle % | CLKOE Input | Δf/V ppm/V | Aging 1Y @ 25°C ppm |
| OM-7604-C7 | 3.2 x 1.5 x 0.7 | 32.768 | ±20 [1] | 1.2 to 5.5 | 300 | -40 to +125 | 40 to 60 | ✓ | ±1.5 | ±3.0 |
| OV-7604-C7 | 3.2 x 1.5 x 1.0 | 32.768 | ±20 [1] | 1.2 to 5.5 | 300 | -40 to +125 | 40 to 60 | ✓ | ±1.5 | ±3.0 |
| OM-7605-C8 | 2.0 x 1.2 x 0.7 | 32.768 | ±20 [1] | 1.6 to 5.5 | 450 | -40 to +125 | 40 to 60 | ✓ | ±3.0 | ±3.0 |
| OM-7605-C9 | 1.6 x 1.0 x 0.6 | 32.768 | ±20 [1] | 1.6 to 5.5 | 450 | -40 to +125 | 40 to 60 | ✓ | ±3.0 | ±3.0 |
| **100.000 kHz Oscillators** | | | | | | | | | | |
| OM-0100-C7 | 3.2 x 1.5 x 0.7 | 100.000 | ±20 [1] | 1.2 to 5.5 | 650 | -40 to +85 | 40 to 60 | ✓ | ±1.5 | ±3.0 |
| OM-0100-C8 | 2.0 x 1.2 x 0.7 | 100.000 | ±100 [1] | 1.6 to 5.5 | 550 | -40 to +85 | 40 to 60 | ✓ | ±3.0 | ±3.0 |

1) Tighter and wider frequency tolerances on request.

## Applications

Lowest current, smallest package and high accuracy make Micro Crystal's oscillators ideal for:

- IoT
- Smart Pens
- Industrial Computing
- Wearables and Activity Bands
- Automotive, Driver Assistance
- Driving Recorders, Camera Systems
- Navigation and Emergency Call Systems
- Bluetooth Low Energy (BLE) Applications
- Tire Pressure Monitoring Systems (TPMS)
- Healthcare, Medical and Medical Implantable

## Ordering Information

**O M - 7604 - C7 ±20 ppm TA QC**

**Product**
**O** = Oscillator

**Package lid**
**M** = Metal lid
**V** = Ceramic lid

**Frequency**
**0100** = 100.000 kHz
**7604** = 32.768 kHz
**7605** = 32.768 kHz

**Package size**
**C7** = 3.2 x 1.5 mm
**C8** = 2.0 x 1.2 mm
**C9** = 1.6 x 1.0 mm

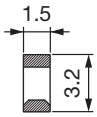
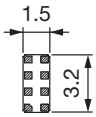
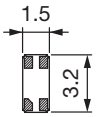
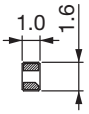
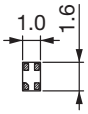
**Frequency tolerance**[1)]

**Temperature range**
**TA** = -40 to +85°C (Standard)
**TB** = -40 to +125°C

**Qualification**
**QC** = Commercial Grade (Standard)
**QA** = Automotive Grade AEC-Q200
**QM** = Medical Grade (see page 6)



# Medical Implantable Products

| Product Type | CC7 | RV-xxxx-C7 | OV-xxxx-C7 | CC8 | OV-xxxx-C8 | CC9 | OV-xxxx-C9 |
|---|---|---|---|---|---|---|---|
| Dimensions (l x w) mm | 3.2 x 1.5 | | | 2.0 x 1.2 | | 1.6 x 1.0 | |
| |  |  |  |  |  |  |  |
| **Full Ceramic Packages** PCB Symbol, Footprint & 3D Model available on product pages on website |  Crystal |  RTC |  Oscillator |  Crystal |  Oscillator |  Crystal |  Oscillator |

## kHz Tuning Fork Crystals

| Product Type | Height mm | Frequency kHz | Frequency Tol. @ 25°C |
|---|---|---|---|
| CC7V-T1A Medical | 0.90 | 32 - 100 | ±20 ppm |
| CC8V-T1A Medical | 0.67 | 32 - 102.4 | ±20 ppm |
| CC8V-T1A Thin Medical | 0.48 | 32.768 | ±20 ppm |
| CC9V-T1A Medical [1] | 0.55 | 32.768 | ±20 ppm |

## MHz AT-Cut Crystals

| Product Type | Height mm | Frequency MHz | Frequency Tol. @ 25°C |
|---|---|---|---|
| CC7A-T1A Medical | 0.75 | 14 - 50 | ±30 ppm |
| CC8A-T1A Medical | 0.60 | 24 - 50 | ±30 ppm |
| CC9A-T1A Medical [1] | 0.50 | 24 - 50 | ±30 ppm |

## Low Frequency Clock Oscillators

| Product Type | Height mm | Frequency kHz | Supply $V_{DD}$ V | Current $I_{DD}$ nA |
|---|---|---|---|---|
| OV-7604-C7 Medical | 1.0 | 32.768 | 1.2 to 5.5 | 300 |
| OV-7605-C8 Medical | 0.85 | 32.768 | 1.6 to 5.5 | 450 |
| OV-7605-C9 Medical | 0.65 | 32.768 | 1.6 to 5.5 | 450 |
| OV-0100-C7 Medical | 1.0 | 100.000 | 1.2 to 5.5 | 650 |
| OV-0100-C8 Medical | 0.85 | 100.000 | 1.6 to 5.5 | 550 |

## Real-Time Clock Module

| Product Type | Height mm | Time Acc. @ 25°C | Supply $V_{DD}$ V | Current $I_{DD}$ nA |
|---|---|---|---|---|
| RV-5028-C7 Medical | 1.0 | ±1 ppm | 1.1 to 5.5 | 45 |

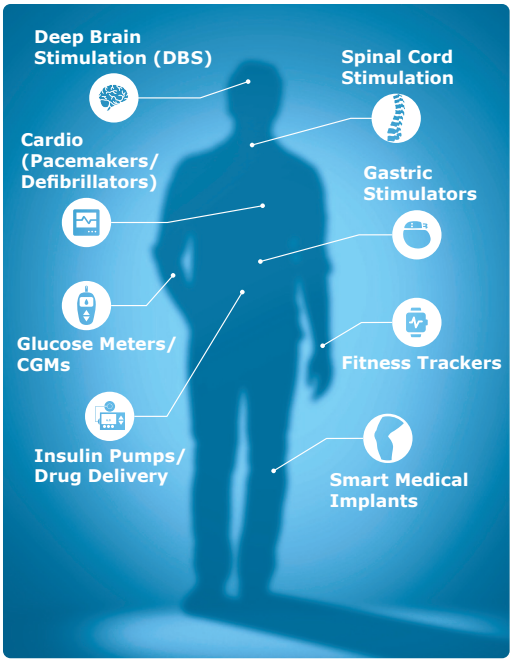
1) In qualification.

## Key Features

- Hermetic full ceramic package
- Safe for Helium environment
- Proprietary manufacturing and testing processes
- Full traceability records retained

## Applications

- Pacemakers
- Defibrillators
- Infusion Pumps
- Neurostimulators
- Cochlear Implants
- Smart Orthopedic Implants
- Cardiac Monitoring Devices
- Implantable Drug Delivery Pumps






# Micro Crystal – The Art of Timing

## Company

Micro Crystal AG is a company of the Swatch Group Inc. Switzerland, the world's leading watchmaker. Micro Crystal applies high-tech Swiss MEMS technology for the manufacture of ultra-high precision Quartz Crystal Resonators, Oscillators and Real-Time Clock Modules. Focused on mass production of high-quality components, Micro Crystal supports not only large volume consumer applications, but also high-reliability automotive and medical implantable components. Using its manufacturing facilities in Switzerland and Thailand, the company produces the smallest available Quartz Crystal Resonators, Oscillators and Real-Time Clock Modules. Micro Crystal timing devices, offering the world's lowest power consumption, are perfectly suited for today's IoT and wearables applications. Most of its products are AEC-Q200 qualified. Micro Crystal's production facilities are ISO 9001, ISO 14001 and IATF 16949 certified; and comply with all social and environmental regulations.

Micro Crystal, a leading player in this market, offers cost competitive products through its worldwide distribution and customer support networks.

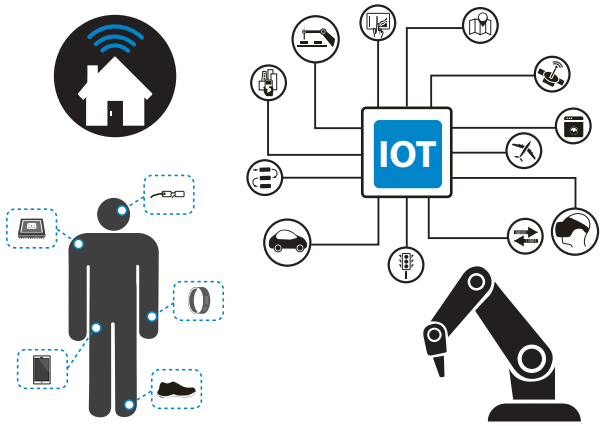
RoHS COMPLIANT · lead-free · REACH COMPLIANT

## Applications and Markets

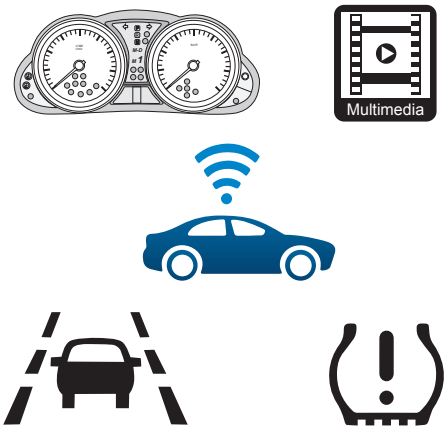
### Telecommunications and Industrial



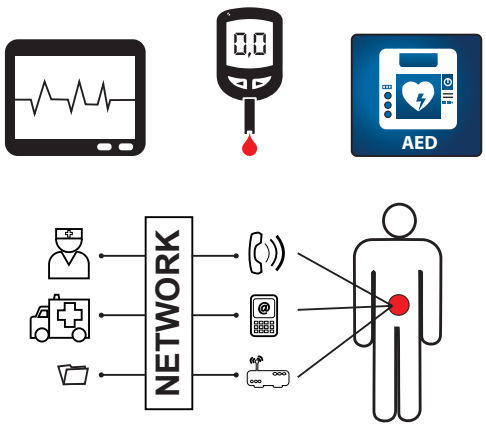
### Wearables and IoT




### Automotive




### Healthcare and Medical Implantable



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