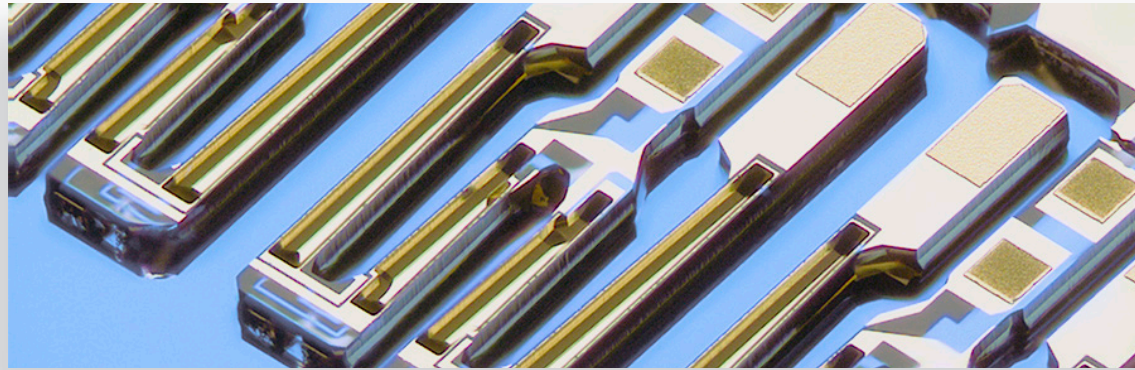


Micro Crystal



kHz Tuning Fork Crystals

MHz AT-Cut Crystals

Real-Time Clock Modules









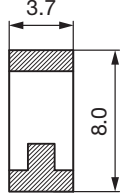
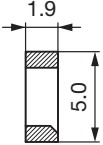
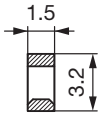
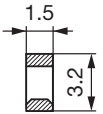
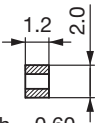
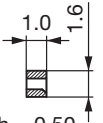
Low Frequency Oscillators

Medical Implantable Products



Short Form Catalog Q1 2023

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 x w x h) | 8.0 x 3.7 x 1.75 | 5.0 x 1.9 x 0.90 | 3.2 x 1.5 x 0.65 | 3.2 x 1.5 x 0.65 | 2.0 x 1.2 x 0.60 | 1.6 x 1.0 x 0.50 | | mm |
|  |  |  |  |  |  |  | | mm |
|  PCB Symbol, Footprint & 3D Model available on product pages on website |  |  |  |  |  |  | | 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 _i | 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/°C ² (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.

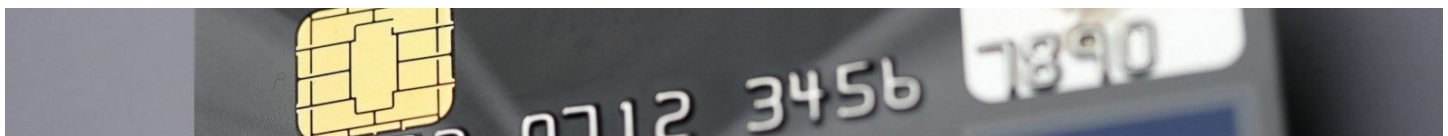
Applications

- 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









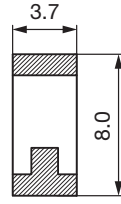
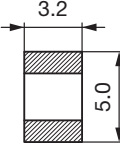
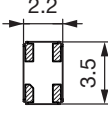
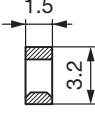
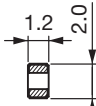
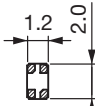
Ordering Information

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

| | |
|---|---|
| Ceramic package | Frequency F_L |
| Package lid C = Ceramic lid M = Metal lid | Load capacitance C_L |
| Package size 1 = 8.0 x 3.7 x 1.75 mm 4 = 5.0 x 1.9 x 0.90 mm 5 = 4.1 x 1.5 x 0.90 mm 7 = 3.2 x 1.5 x 0.65 mm 8 = 2.0 x 1.2 x 0.60 mm 9 = 1.6 x 1.0 x 0.50 mm | Frequency tolerance |
| Tuning fork | Temperature range TA = -40 to +85°C (Standard) TB = -40 to +125°C |
| SMD Package | Qualification QC = Commercial Grade (Standard) QA = Automotive Grade AEC-Q200 QM = Medical Grade (see page 6) |
| Au flashed pads | Special feature 0.3 = Lowest profile, 0.35 mm Low ESR = 50 kΩ max. |
| 2 pads | |



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 x w x h) mm | 8.0 x 3.7 x 1.75 | 5.0 x 3.2 x 1.20 | 3.5 x 2.2 x 1.0/0.8 | 3.2 x 1.5 x 0.75 | 2.0 x 1.2 x 0.60 | 2.0 x 1.2 x 0.60 |
|  |  |  |  4 or 2 pads |  |  |  |
|  PCB Symbol, Footprint & 3D Model available on product pages on website |  h = 1.75 |  h = 1.20 |  h = 1.0/0.80 |  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 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:


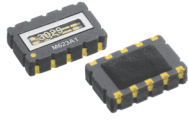



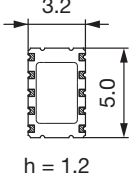
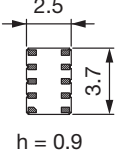
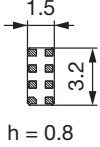
- Filters
- Industrial
- Telemetry
- Animal Tracking
- Optical Network
- Airborne Equipment
- Avionics / Aerospace
- Radio Communication
- Geothermal Equipment
- TCXO, VCTCXO, VCXO
- Downhole and Well Drilling
- Healthcare, Medical and Medical Implantable

Ordering Information

| | |
|--|--|
| C Ceramic package | 24.000 MHz Frequency F _L |
| 6 Package lid C = Ceramic lid M = Metal lid | 20.0 pF Load capacitance C _L |
| A Package size 1 = 8.0 x 3.7 x 1.75 mm 2 = 5.0 x 3.2 x 1.20 mm 6 = 3.5 x 2.2 x 1.00 mm 7 = 3.2 x 1.5 x 0.75 mm 8 = 2.0 x 1.2 x 0.60 mm | ±50 ppm Frequency tolerance |
| T Quartz blank A = AT-Cut F = AT-Cut inverted mesa | TC 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 |
| D SMD Package | QI Qualification QI = Industrial Grade (Standard) QM = Medical Grade (see page 6) QS = Custom Specification |
| H Au flashed pads | QI Special feature H = Harsh environment F = Filter applications |
| 1 Number of pads A = 2 pads D = 4 pads | |



RTC Modules in Ceramic Packages

| Product Type | RV-xxxx-C2 | RV-xxxx-C3 | RV-xxxx-C7 |
|--|---|--|---|
| Dimensions (l x w x 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 available on product pages on website |  |  |  |
| 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 Opt. B: ±25 ppm | 1.3 to 5.5 | 800 | -40 to +125 | | ✓ | ✓ | | 8 | 2 |
| RV-8803-C7 | Highest Accuracy | | ±3.0 ppm | 1.5 to 5.5 | 240 | -40 to +105 | ✓ | | | ✓ | 1 | |
| RV-3032-C7 | Highest Accuracy Readable 12-bit T-Sensor | | ±2.5 ppm | 1.3 to 5.5 | 160 | -40 to +105 | ✓ | ✓ | ✓ | ✓ | 16 | 32 |

SPI-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-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 Readable 8-bit T-Sensor | | Opt. A: ±6 ppm 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







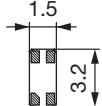
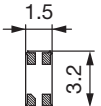
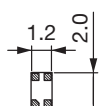
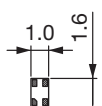
| | | | |
|--|-----------------|-----------|---|
| RV - 3129 - C3 | Option A | TA | QC |
| RTC Module | | | Qualification |
| Product type | | | QC = Commercial Grade (Standard) |
| Package size | | | QA = Automotive Grade AEC-Q200 |
| C2 = 5.0 x 3.2 x 1.2 mm | | | QM = Medical Grade (see page 6) |
| C3 = 3.7 x 2.5 x 0.9 mm | | | Temperature range |
| C7 = 3.2 x 1.5 x 0.8 mm | | | TA = -40 to +85°C (Standard) |
| Time accuracy | | | TB = -40 to +125°C |
| Option A = ±6 ppm @ -40°C to +85°C | | | |
| Option B = ±25 ppm @ -40°C to +85°C | | | |

 **Linux Drivers available**

 **Demo Boards available**



Low Frequency Oscillators in Ceramic Packages

| Product Type | OM-xxxx-C7 | OV-xxxx-C7 | OM-xxxx-C8 | OM-xxxx-C9 |
|--|---|--|---|---|
| Dimensions (l x w x h) mm | 3.2 x 1.5 x 0.70 | 3.2 x 1.5 x 1.0 | 2.0 x 1.2 x 0.70 | 1.6 x 1.0 x 0.60 |
|  |  |  |  |  |
|  PCB Symbol, Footprint & 3D Model available on product pages on website |  h = 0.70 |  h = 1.0 |  h = 0.70 |  h = 0.60 |
| Lid Material | Metal | Ceramic | Metal | Metal |

32.768 kHz Oscillators

| Product Type | Dimensions (l x w x h) mm | Frequency kHz | $\Delta F/F$ @ 25°C ppm | Supply V _{DD} V | Current I _{DD} nA | T _{OP} °C | Duty Cycle % | CLKOE Input | $\Delta f/V$ ppm/V | Aging 1Y @ 25°C ppm |
|----------------------------|---------------------------|---------------|-------------------------|--------------------------|----------------------------|--------------------|--------------|-------------|--------------------|---------------------|
| OM-7604-C7 | 3.2 x 1.5 x 0.70 | 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 0.70 | 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 0.60 | 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 0.70 | 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 0.70 | 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:










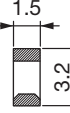
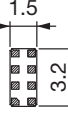
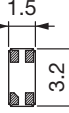
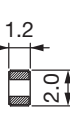
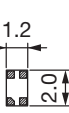
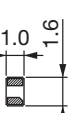
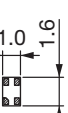
- IoT
- Smart Pens
- Industrial Computing
- Wearables and Activity Bands
- Automotive, Driver Assistance
- Driving Recorders, Camera Systems
- Navigation and Emergency Call Systems
- Bluetooth Low Energy (BLE) Applications
- Tire Pressure Monitoring Systems (TPMS)
- Healthcare, Medical and Medical Implantable

Ordering Information

| | | | | | | |
|----------------------------------|--|--|--|---|--|---|
| 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 | 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 | Frequency tolerance¹⁾ |
|----------------------------------|--|--|--|---|--|---|



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 | 32 - 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.

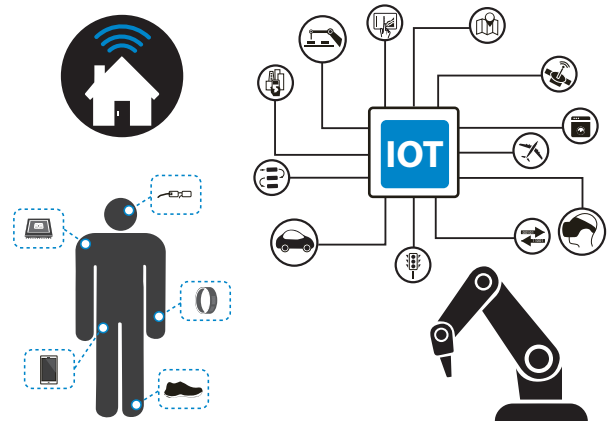


Applications and Markets

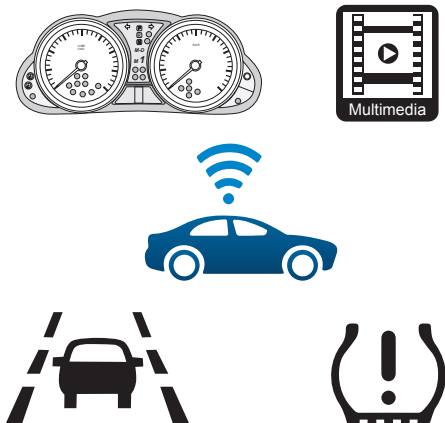
Telecommunications and Industrial



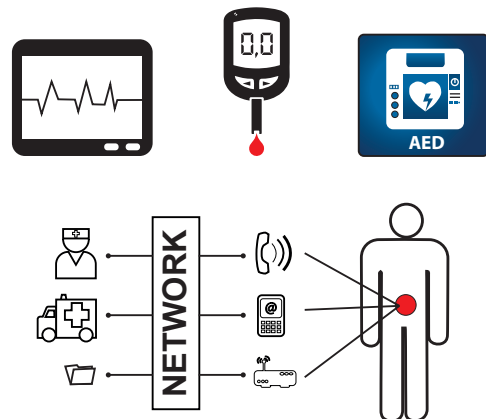
Wearables and IoT



Automotive



Healthcare and Medical Implantable



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