

Frequency and Timing Space Products

Trusted in High-Reliability Timing and Frequency Control



Strong Space Heritage

Superior Reliability and Precision

Frequency and Timing Solutions



Trusted in High Reliability Timing and Frequency Control

Microsemi—the leading worldwide supplier of atomic clocks, network synchronization, and timing solutions—designs, develops, and manufactures quartz timing and frequency control solutions for space. With a track record spanning over 40 years, Microsemi is one of the most experienced and trusted providers in the market. Customers know that Microsemi's products perform reliably and accurately under the most extreme conditions, and designs and program support can be tailored to fit their unique needs.

Harsh Environments, Precise Accuracy, and Superior Reliability

The most demanding timing applications are in space. This environment is the harshest, the need for accuracy is the greatest, and the price of failure is the highest. High-performance frequency and timing products make modern communications and navigation possible, and set the standards by which time itself can be measured everywhere. The environmental challenges—extreme temperatures, high radiation, large g-forces, and severe vibrations—are unrivaled. Yet, products must operate flawlessly, sometimes for years, without the possibility of maintenance or repair.

Microsemi's cesium clocks have worked on GPS Block I and II/A satellites—and GPS Block II F satellites—maintaining millisecond accuracy over an entire decade. Microsemi OCXOs will also be used on GPS III.

Radiation Experience

Microsemi has a significant amount of experience in the analysis and testing of oscillators under various radiation environments, including:

- Total dose and neutron
- Low and high dose rates
- Prompt dose/flash X-ray
- Single event effects
- Low-dose proton screening of crystals
- Prompt dose crystal screening

Meeting Customer Needs and Exceeding Expectations

Microsemi offers each customer the right mix of performance, price, and features. Our capabilities include:

- Spacecraft Master Oscillator Groups (MOGs)
- Radiation baselined platforms

- Local oscillators for transponders, up/down converters, GPS receivers, transmitters, transceivers, and beacons, and other spaceborne equipment

Customers in the space, defense, and avionics market know what they need from a technology provider. They also recognize that Microsemi's long list of customers speaks for itself.

Technical Excellence

Small size, low power consumption, fast warm-up, excellent stability, and superior spectral purity make Microsemi's products ideal for applications such as radio navigation, satellite transmission, and tracking and guidance.

Product Depth

A choice of technologies in a range of form factors, varying levels of performance, frequency outputs, price points, and environmental qualifications gives Microsemi's customers a head start in finding the right solution for their specific needs.

ISO 9001-2000 and MIL-STD Certified

Microsemi maintains ISO 9001-2000 and MIL-STD certifications to assure the highest-quality design, manufacturing, and test facilities available in the industry today. Microsemi is also AS9100 registered, and workmanship standards include NASA J-STD-001DS.

Heritage

Providing solutions to the most demanding requirements for over 40 years has not only given Microsemi extensive experience, but also an extensive heritage in design and flight—allowing customers to achieve the maximum degree of success possible. We are proud to have participated in many of the highest-profile programs in the past, and we are delighted at the opportunity to participate in such programs again—now and in the future.

Legacy Programs

GPS IIF, SBIRS, MUOS, GPS III, CLOUDSAT, CHIRP, LRO, PAN, KOMPSAT, Cosmo IV, WorldView III, Space-borne GPS receivers, EchoStar 21, JPSS-1, MESSENGER, STEREO, NextView, ICESat

Products



9920/9940

Hybrid Space-Qualified XO and VCXO

Microsemi's hybrid oscillators are ideal for space-qualified applications requiring minimal size, weight, and power. Choose between the model 9920 Series crystal oscillator (XO) or 9940 Series voltage-controlled crystal oscillator (VCXO).

Key Features

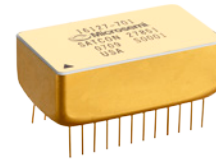
- 10 MHz to 1.2 GHz output frequency
- MIL-PRF-38534C class K-certified
- Sine wave or PECL outputs
- Low aging and phase noise
- Radiation-hardened
- Environmentally robust

Key Benefits

- Class K certification for the most demanding space applications
- Low aging to meet long mission life requirements

Applications

- Satellite transmission
- Satellite time and frequency control
- Satellite tracking and guidance



9960

Hybrid Space-Qualified TCXO

The 9960 is a temperature-compensated crystal oscillator (TCXO) capable of fixed-frequency or voltage-controlled operation. Its hybrid construction minimizes size, weight, and power requirements. These hybrid oscillators are based on heritage designs and manufacturing techniques proven for reliability in numerous space applications.

Key Features

- Fixed-frequency or voltage-controlled TCXOs option
- 10 MHz to 225 MHz output frequency
- MIL-PRF-38534 class K-certified exceptional long-term frequency accuracy
- Temperature stability better than ± 1 ppm
- Low aging and phase noise
- Radiation-hardened
- Environmentally robust

Key Benefits

- The best performance available in a space-qualified TCXO
- Proven design maximizes reliability
- Low aging to meet long mission life requirements

Applications

- Satellite transmission
- Satellite time and frequency control
- Satellite tracking and guidance

Products



Quantum™ SA.45s Space CSAC

Chip-Scale Atomic Clock

The Microsemi Quantum SA.45s Commercial Space Chip-Scale Atomic Clock's (CSAC) potential for low size, weight, and power (SWaP), and high timing performance at relatively low cost makes it very attractive for low Earth orbit (LEO) applications. In addition to being a stand-alone atomic clock with a 10 MHz output, the CSAC also has a 1PPS output and can be disciplined with a 1PPS input. The Space CSAC retains this functionality and is a timing module that can be disciplined with a GPS-derived 1PPS input.

The SA.45s provides 10 MHz and 1PPS outputs at standard CMOS levels, with short-term stability (Allan Deviation) of 3.0×10^{-10} at TAU = 1 sec, typical long-term aging of $<9 \times 10^{-10}$ /month, and maximum frequency change of $\pm 5 \times 10^{-10}$ over an operating temperature range of $-10 \text{ }^\circ\text{C}$ to $70 \text{ }^\circ\text{C}$.

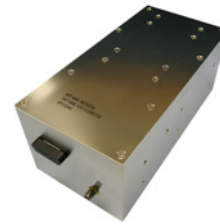
A standard CMOS-level RS-232 serial interface is built into the SA.45s. This is used to control and calibrate the unit and to provide a comprehensive set of status monitors. The interface is also used to set and read the CSAC's internal time-of-day clock.

Features

- Power consumption $<120 \text{ mW}$
- Less than 17 cc volume, $1.6" \times 1.39" \times 0.45"$
- Radiation-tolerant: 20 krad
- 10 MHz CMOS-compatible output
- 1PPS output and 1PPS input for synchronization
- RS-232 interface for monitoring and control
- Short-term stability (Allan Deviation) of 3.0×10^{-10} at TAU = 1 sec

Applications

- Satellite timing and frequency control
- Satellite clock reference
- Assured position, navigation, and timing (PNT)
- Atomic clock accuracy
- Satellite cross-linking



9500B

Ovenized Quartz Master Oscillator

The 9500B is a space-qualified OVCXO intended for use as a master oscillator. It delivers the best stability performance available in a commercial OVCXO product.

Key Features

- Output frequency: 4 MHz–25 MHz
- Frequency stability at 5 MHz $<3\text{E}-13$ from 1 sec–100 secs
- Space-qualified and radiation-rated to $>100 \text{ krad (Si)}$
- Power consumption: $<3.6 \text{ W}$ at $25 \text{ }^\circ\text{C}$
- Size: $4.25" \times 6.0" \times 8.62"$
- Frequency aging at 5 MHz: $<5.0\text{E}-11/\text{day}$, $<1.5\text{E}-8/\text{year}$
- Temperature range: $-24 \text{ }^\circ\text{C}$ to $60 \text{ }^\circ\text{C}$

Applications

- Navigation payload frequency reference
- GPS space borne frequency reference
- Satellite on-board frequency standard
- Remote station primary frequency standard

Products



9600QT

Compact High-Performance Space-Qualified OCXO

The space-qualified 9600QT can be delivered in 4 weeks for engineering models and 12 weeks for flight models. The 9600QT has been analyzed for worst case circuit effects, radiation, thermal and structural analysis, derating, and reliability. It also features a third overtone SC-cut class S quartz resonator and sustaining electronics controlled at a precise temperature to achieve temperature insensitive performance with excellent short-term stability, phase noise, and aging.

Key Features

- Short lead time space-qualified parts: 1 month for engineering models and 3 months for flight models
- Output frequency: 5 MHz
- Short term stability: $<2E-12$ for $t = 1$ to 10 seconds
- Low power consumption: <1.3 W at 25 °C (in vacuum)
- Compact size: 2.5" x 2.08" x 1.21"
- Frequency aging: $<1.0E-10$ /day
- Frequency change versus temperature: $\pm 5.0E-9$: (-30 °C to 65 °C)
- Radiation-rated: 100 krad (Si), SEE immune

Key Benefits

- Class K-qualified hybrid circuitry allows for the greatest possible reduction in size without compromises in performance or reliability
- A standard configuration enables industry-leading delivery times for a space-qualified OCXO designed to perform under 30 grms random vibration and pyrotechnic shock of up to 3000 g

Applications

- Satellite clock reference
- Satellite transmission
- Satellite tracking and guidance



9600/9700

Ultra-Miniature Space and Military OCXO

Microsemi's 9600 and 9700 ultra-miniature OCXOs are designed to provide high-stability output for a wide variety of military and space applications. The use of hybrid circuitry reduces size without compromising performance or reliability.

Key Features

- Output frequency: 4 MHz–60 MHz
- Warm-up time: ≤ 5 minutes from 25 °C
- Fast warm-up option available
- Low power consumption: <1.3 W at 25 °C (in vacuum)
- Frequency aging: $<3.0E-11$ /day at 10 MHz
- Frequency change vs. temperature: $\pm 4.0E-9$ (-40 °C to 65 °C)
- Total dose radiation: 100 krad (Si) (9700)
- Optional low-g sensitivity (9600)

Key Benefits

- Compact size for high performance, even when space is at a premium
- Two different package styles allow unit to be board-mounted or panel-mounted
- Proven designs with extensive legacy

Applications

- Navigation
- Satellite transmission
- Satellite tracking and guidance
- Radar warning receivers

Microsemi is continually adding new products to its industry-leading portfolio.

For the most recent updates to our product line and for detailed information and specifications, please call, email, or visit our website.

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