rakon

High-Reliability Products for Space

Made in France with a long history of reliability

Rakon is one of the world's largest solutions providers of high reliability frequency control products. Its high reliability solutions are found in Space, Defence and Industrial applications which require the most stringent performance criteria. This is why many government and commercial programmes use Rakon oscillators across the globe, in systems where high performance is required under the most demanding conditions. Rakon continuously develops state of the art frequency control products at the cutting edge of innovative technology.

Industry contribution

Rakon has a proven record of taking Space specifications and creating high reliability and cost effective solutions in order to meet the most demanding requirements.

Rakon is involved in most of the scientific programmes managed by the European Space Agency (ESA), and has been supplying ESA qualified crystals since the 1980s. Rakon is now the exclusive manufacturer in the world delivering qualified Space XOs according to the ESCC standard.

As your strategic frequency control partner, Rakon can provide standard products or customised solutions, ranging from high performance crystals, all the way through to complex sub-systems.

Space product advantages

Rakon space grade oscillators (Flight Models) are designed to meet TID of 100 kRad, low dose rate (36 – 360 rad/h) as per ESCC22900 and latch-up free up to LET of 60 MeV. cm²/mg

Rakon is the top worldwide supplier of Ultra Stable OCXO for Space and ground applications. The mini Space USO (Ultra Stable Oscillator) offers a guaranteed frequency stability vs. temperature of 5E-11 (-20 to +50°C) and a short-term stability (Allan Standard Deviation) below 2E-13 from 1 to 100 seconds and below 6E-14 for the ground version.

Space product range and heritage



Rakon has a long history of providing high reliability products with some customers having an association with Rakon for 30 years or more. Rakon offers a complete range of ITAR-free frequency control products based on Space grade crystal technology.

Rakon France Hi-Rel products can be found in many international programmes

Alphabus, AMOS, ATV, BepiColombo, CBERS, Cryosat, Chandrayaan, DORIS, FarthCARE, EgyptSat, ELISA, ENVISAT, Galileo, Globalstar, Herschel-Planck, Himawari, HTV, Iridium, Jason, JUNO, LEOStar, KOMPSAT, Mars Express, METOP, MTG, O3B, PARASOL, PLEIADES, Rosetta, SARAL, SAR-Lupe, Syracuse, Sentinel, Spacebus, SPOT, SWARM, Spacebus, PRISMA, SATCOM, SeoSar, TanDEM-X, THEOS and Venus Express





Rakon products for High-Reliability Space

Rakon has an extensive portfolio of products that meet the most extreme environmental challenges. We have frequency control solutions for all types of spacecraft including: Navigation, Observation, Telecommunication Satellites, Transportation Vehicles and **Exploration Probes.**

MROs **TCXOs** The Hi-Rel Space MRO (Master Reference Oscillator) modular Space grade products for Transponders, TE300, TE310 equipment is used for applications which require high stability and GPS Receivers, Converters, Synthesizers, reliable signals. This equipment is suitable for different orbits, including FGU and Digital Boards. GEO and has a lifetime of 20 years. Frequency: 10 to 100 MHz Frequency: 5 to 200 MHz Package size: 20 x 20 x 13 mm MRO Overall frequency stability: ±100 ppb for 20 years 25 x 25 x 13 mm Frequency Disribution Unit (FDU) FvT: ±1 ppm (-20 to +70°C) Power bus: 100 V Radiation hardness: 100 kRad Typical phase noise: -133 dBc/Hz @ 10 Hz Low weight: 20 g -145 dBc/Hz @ 100 Hz (@ 10 MHz) Low power consumption: 0.15 W -150 dBc/Hz @ 1 kHz -155 dBc/Hz @ 10 kHz VCXOs **OCXOs** Space grade products for MEO/GEO/HEO TE200 A wide range of Space grade OCXOs with satellites, and radiation tolerant COTS products stability classes from 10⁻⁶ to 10⁻¹⁰. for LEO satellites/mega-constellations. RK407 10⁻⁷ class: FvsT ±0.25 ppm (-40 to +70°C), TE200: 10 to 40 MHz 25 x 25 x 17 mm, low weight 25g, low Package size: 20 x 20 x 13 mm consumption 0.7 W EOL Absolute pulling range: Up to ±70 ppm RK408 10⁻⁸ class: FvsT ±30 ppb (-40 to +70°C), XOs guaranteed phase noise: -165 dBc/Hz @ 10 kHz (for 10 MHz). RK115 Space grade products for MEO/GEO/ RK409 10⁻⁹ class: FvsT ±1 ppb (-20 to +70°C), HEO satellites, and radiation tolerant Allan Variance of 1 x 10⁻¹² or better, COTS products for LEO satellites/megaageing of ±150 ppb / 15 years constellations. RK410 **RK135¹** 10⁻¹⁰ class: FvsT ±0.1 ppb (-20 to +60°C), RK115: 2 to 100 MHz. Following the (QPL) Allan Variance of 5 x 10⁻¹³ or better, guidelines of MIL-PRF-55310 ageing of ±100 ppb / 18 years RK135: 4 to 100 MHz. ESA standard RK508HR Package: Flat pack or DIP World's 1st ASIC OCXO for Space NEW Crystal Resonators¹ ESA/SCC 3501, MIL-PRF-3098 qualified Crystals for ultra stable TCXOs and OCXOs in **Crystal Filters** Custom harsh environments. A series of custom designed crystal filters. Custom Frequency up to 140 MHz Fundamental mode or overtone 3 and 5 High stability and low ageing



- Frequency range: 3 to 150 MHz
- Relative bandwidth: from 0.001 up to 1 % Insertion loss: 2 to 8 dB depending on
- frequency, number of poles and width

¹ The RK135 and some crystals resonators are featured on the ESCC qualified parts list.

Swept HQ crystal premium

Low phase noise and low g-sensitivity

Ground applications products – High Stability OCXOs (HSOs)

Rakon's Ground USO is ideally suited for the high stability frequency requirements of calibration and metrology laboratories, as well as other applications requiring high performance reference oscillators.

- HSO13 10⁻¹³ short term stability
- Frequency: 5 to 10 MHz
- Package size: 67 x 60 x 40 mm FvsT: ±5 x 10⁻¹¹ (0 to 50°C)
- Allan Deviation: 2 x 10⁻¹³
- Guaranteed phase noise @ 5 MHz:
- -125 dBc/Hz @ 1 Hz offset



HSO14 10⁻¹⁴ short term stability

- Frequency: 5 to 10 MHz
- Package size: 73 x 135 x 84 mm
- FvsT: ±5 x 10⁻¹¹ (0 to 50°C)
- Allan Deviation: 6 x 10⁻¹⁴
- Guaranteed phase noise @ 5 MHz: -130 dBc/Hz @ 1 Hz offset



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