# RK409AVNS

The RK409AVNS is a compact NewSpace Ultra-Stable Oscillator (USO) that delivers $10^{-9}$ class frequency stability. Its Allan Variance (AV) achieves a short-term stability of 2.5E-13 at tau 1 s, providing exceptionally high performance. The frequency stability is ±0.2 ppb (over operating temperature -10 to 60 °C under vacuum).

The superior short-term stability makes the RK409AVNS well-suited for telecommunications, Low Earth Orbit (LEO), Global Navigation Satellite Systems (GNSS) and Precision Navigation and Timing (PNT) payload requirements.

## Features

- Frequency: 10 and 10.23 MHz
- Allan Variance: 2.5E-13 @ 1 s
- Warm-up consumption: 8 W max.
- Frequency stability vs. temperature: ±0.2 ppb typ. under vacuum
- Ageing: ±150 ppb max over 10 years at 10 MHz
- Quick delivery time
- Supply voltage: 12 V
- Output waveform: sine 50 Ω
- Output level from 4 to 8 dBm
- Weight: 135 g
- TID Limit: 30 krad
- Latch-up free up to LET: 43 MeV.cm²/mg

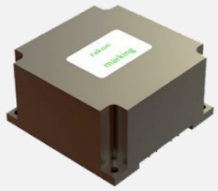
## Applications

- PNT
- GNSS
- Earth Observation
- Navigation
- Compact reference for MRO/FGU

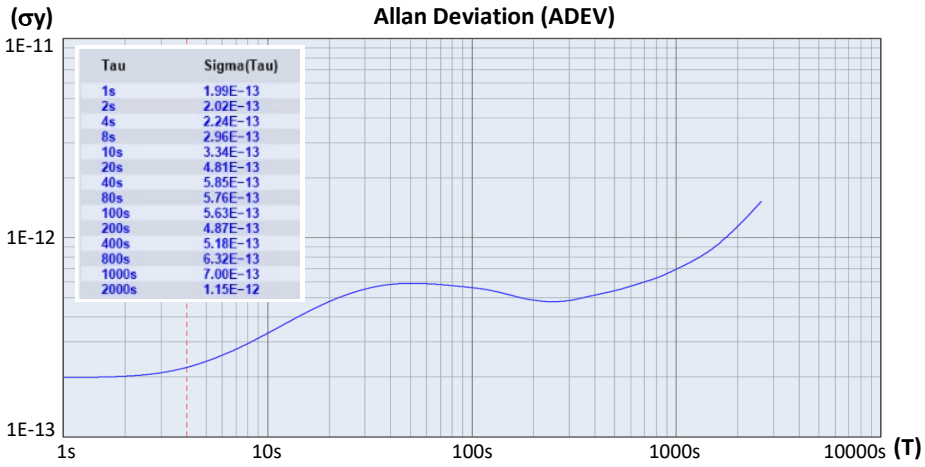
## 60 x 60 x 32 mm

Pb FREE

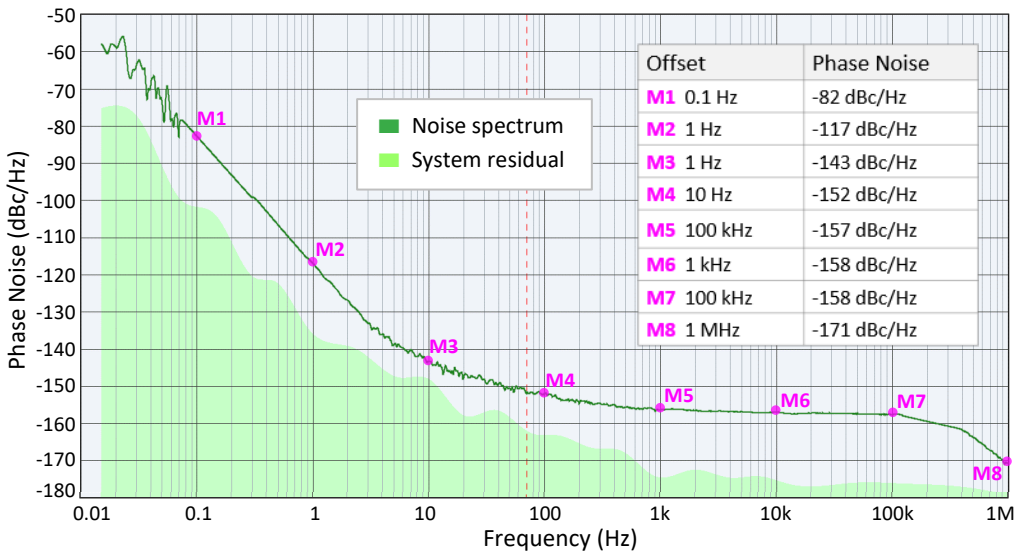
RoHS COMPLIANT



## Allan Deviation (ADEV)




## Phase Noise




Issue: A1, 51003083.110. 14 May 2024

## Environmental Conditions

| Parameter | Condition / Remarks | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Operating temperature (TOP) | - | -10 | 25 | +60 | °C |
| Switch-on temperature (TSO) | - | -25 | - | +65 | °C |
| Non-operating temperature (TNOP) | - | -30 | - | +70 | °C |
| Random vibration | MIL-STD-202 Method 214, conditions: 20 – 100 Hz +3 dB/oct, 100 – 400 Hz 0.7 $g^2$/Hz 400 – 2000 Hz -3 dB/oct, duration: 60 s/axis | | | | |
| Sine vibration | MIL-STD-202 Method 214, conditions: 5 – 21 Hz 11 mm peak, 21 – 100 Hz 20 g Sweep rate: 2 oct/mn up and down, 3 axis | | | | |
| Mechanical shock | Level as per MIL-STD-202, Method 213, conditions: half sine with a peak acceleration of 600 g for a duration of 0.3 ms | | | | |
| Radiation | Total Ionizing Dose (TID) is 30 krad, with a low dose rate. No SEL up to LET = 43 MeV.$cm^2$/mg | | | | |

## Electrical Interface

| Parameter | Condition / Remarks | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Power supply | - | 11.4 | 12 | 12.6 | V |
| Load impedance | VSWR 1.1 | 45 | 50 | 55 | Ω |
| Reference voltage (VREF) | - | 7.5 | 8 | 8.5 | V |
| Control voltage ($V_{CTRL}$) | When $V_{CTRL}$ option is selected | 0 | - | VREF | V |

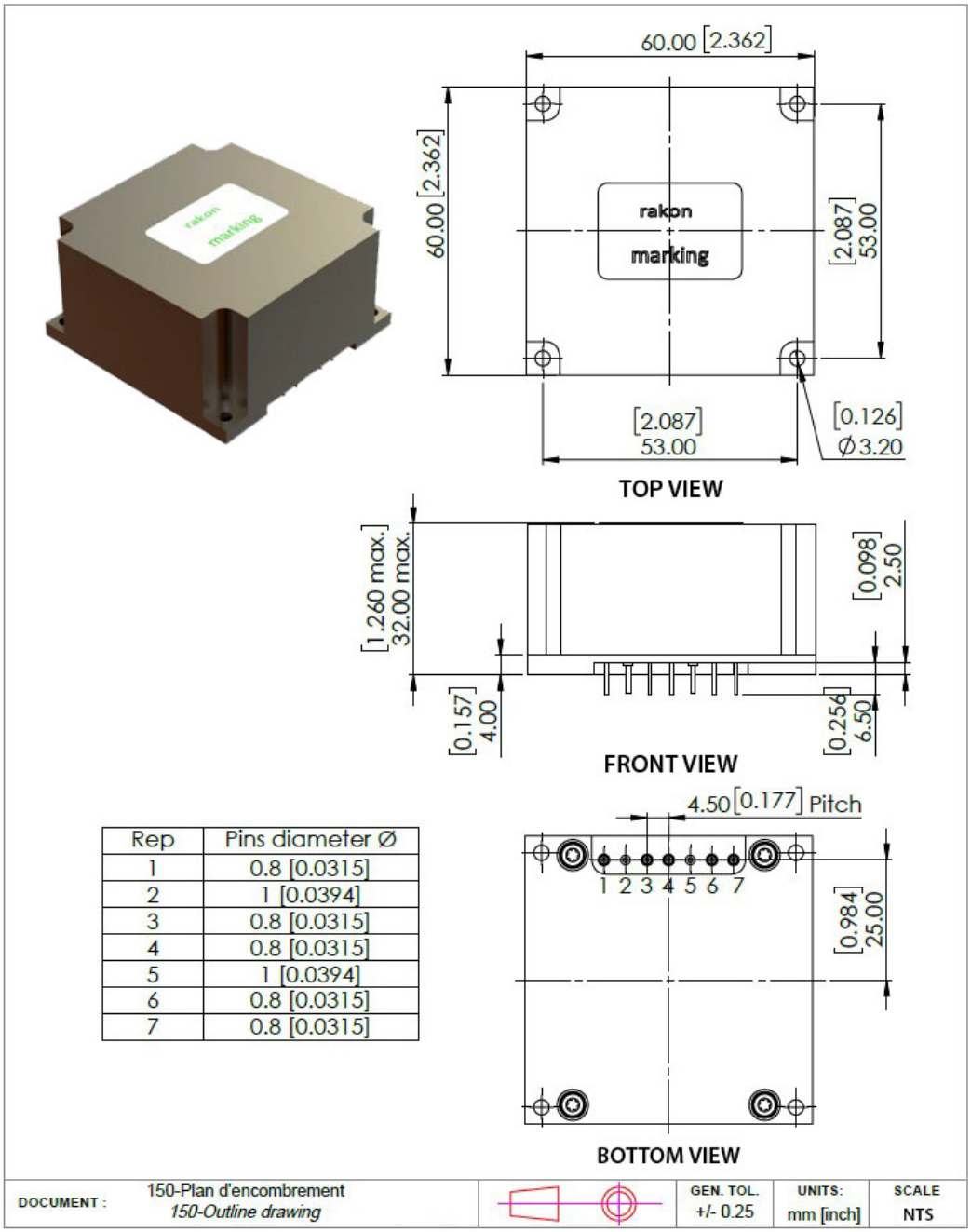
## Frequency Characteristics

| Parameter | Condition / Remarks | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Standard frequency | Custom option available on request | - | 10, 10.23 | - | MHz |
| Steady-state input current power | Vacuum @ -10°C | - | - | 5 | W |
| Warm-up supply power | - | - | - | 8 | W |
| Initial frequency accuracy | - | - | - | ±100 | ppb |
| Frequency adjustment | Positive slope | - | - | ±500 | ppb |
| Frequency stability over temperature | - | - | ±0.5 | ±1 | ppb |
| Supply voltage stability | Over operating temperature | - | - | ±0.1 | ppb |
| Load sensitivity | Over operating temperature | - | - | ±0.1 | ppb |
| Pressure | - | - | - | ±40 | ppb |
| Ageing | Over 1 year<br>Over 10 years | - | - | ±30<br>±150 | ppb |
| Allan variance (AV) | tau = 1 s<br>tau = 10 s<br>tau = 100 s | - | 2.5<br>3.5<br>5 | 3<br>6<br>10 | E-13 |
| Frequency warm-up | Vacuum @ -10 °C | - | - | 30 | mn |
| Output waveform | Sine | - | - | - | - |
| Output level | EOL | 4 | - | 8 | dBm |
| Harmonics level | From DC to 500 MHz | - | - | -40 | dBc |
| Non-harmonics level | From DC to 3 GHz | - | - | -85 | dBc |
| Phase noise | 1 Hz offset | - | -117 | -115 | dBc |
| | 10 Hz offset | - | -152 | - 138 | dBc |
| | 100 Hz offset | - | -157 | - 145 | dBc |
| | 1 kHz offset | - | -158 | - 150 | dBc |
| | 10 kHz offset | - | -158 | - 155 | dBc |

## Model Outline and Pin Connections package

| Parameter | Package | Pin # | Connections | |
|---|---|---|---|---|
| Package and pin connection | Pin-through hole (PTH)<br>Size: 60 x 60 x 32 mm | 1 | SF | RF output |
| | | 2 | GND | RF electrical & mechanical |
| | | 3 | VCTRL | Voltage control for electrical |
| | | 4 | VREF | Reference voltage |
| | | 5 | GND | Electrical & mechanical ground |
| | | 6 | NC | Not connected |
| | | 7 | VCC | Supply voltage |

Model outline




| Rep | Pins diameter Ø |
|---|---|
| 1 | 0.8 [0.0315] |
| 2 | 1 [0.0394] |
| 3 | 0.8 [0.0315] |
| 4 | 0.8 [0.0315] |
| 5 | 1 [0.0394] |
| 6 | 0.8 [0.0315] |
| 7 | 0.8 [0.0315] |

## 3D Step file

| Parameter | Package |
|---|---|
| Net weight | Typical: 125 g<br>Maximum: 135 g |
| STEP file | RK409AVNS 3D model<br>*To open or view the STP file, you will need to import it into one of the following software programs: Autodesk Fusion 360, CATIA, SolidWorks, Solid Edge, TurboCAD, Kubotek KeyCreator, FreeCAD, ABViewer, ShareCAD, or eMachineShop.* |

## Ordering Part Example