

# NEW Low SWaP-C Miniaturized Rb Oscillator

The mRO-50 Ruggedized is a breakthrough microwave optical double resonance (MODR) low SWaP-C Miniaturized Rubidium Oscillator designed to meet the latest commercial, military and aerospace requirements where time stability and power consumption are critical.

It provides a one day holdover below 1 µs and a retrace below 1E-10 in a form factor (50,8 x 50,8 x 20mm) that takes up only 51 cc of volume (about one-third of the volume compared to standard rubidiums) and consumes only 0.5W of power, which is about ten times less than existing solutions with similar capabilities.

## **Applications**

The mRO-50 Ruggedized Oscillator provides accurate frequency and precise time synchronization to mobile applications, such as military radio-pack systems in GNSS denied environments. Its wide-ranging operating temperature of -40°C to +80°C is also ideal for UAVS and underwater applications.

Applications: Military comms, Radars, Low Earth Orbit, Electronic Warfare, Airborn and Avionics, UAV/UGV/USV/UUV and other harsh environments.

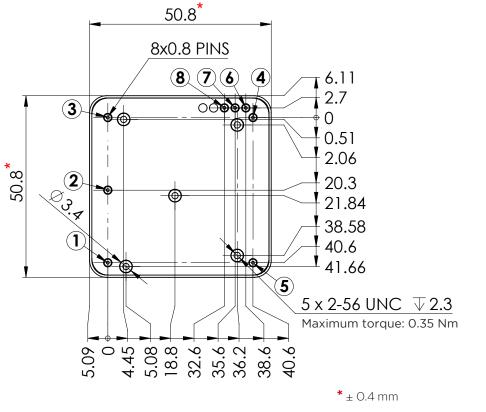
Safran Electronics & Defense is with you every step of the way, building in the intelligence that gives you a critical advantage in observation, decisionmaking and guidance.



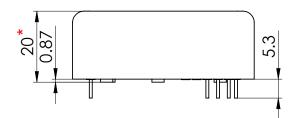
## **Technical Specifications**

### Package:

(all dimensions in mm)



All other quotes are ± 0.2 mm



### **Pin Layout:**

- 1 Frequency Adjust (Analog +1,5V +/-1V)
- 2 GND
- 3 10MHz square output (0-3V)
- 4 GND
- 5 Power 5V or 3.3V depending on model
- 6 /LOCK (Bit)
- 7 TxD
- 8 RxD

### **Patent numbers:**

China : ZL 2014 8 0075019.0 USA : 10,191,452 B2 EU : 3102983 Japan : JP 6416921

### ELECTRICAL

| Туре   | mRO-50 Ruggedized   |   |
|--|---|---|
|  | Standard version  | Options   |
| Frequency  | 10 MHz  |   |
| Frequency change within operating temperature range  | ≤ 6 x 10 <sup>-i0</sup><br>over -40°C to +80°C  |   |
| Linear drift measured over minimum 14 days<br>After 3 months operations :  | < 1 x 10 <sup>-11</sup> / day   | (option code A)<br>< 5 x 10 <sup>-12</sup> / day  |
| Short term stability 1 sec<br>10 sec<br>100 sec  | $\leq 6 \times 10^{-11}$<br>$\leq 1.9 \times 10^{-11}$<br>$\leq 6 \times 10^{-12}$  | (option code S)<br>$\leq 4 \times 10^{-11}$<br>$\leq 1.3 \times 10^{-11}$<br>$\leq 4 \times 10^{-12}$ |
| Phase noise (10 MHz) in dBc/Hz<br>1 Hz<br>10 Hz<br>100 Hz<br>1000 Hz<br>10000 Hz   | ≤ -66<br>≤ -95<br>≤ -120<br>≤ -135<br>≤ -140  | (option code S)<br>≤ -70<br>≤ -97<br>≤ -120<br>≤ -135<br>≤ -140                                       |
| Frequency retrace (in stable temperature, gravity, pressure and magnetic field conditions)   | $< 1 \times 10^{-10}$ within 1 h after 24 h off   |   |
| Warm-up time   | Lock < 2 minutes at over the full temperature range   |   |
| Analog frequency adjustment (+1,5V +/-1V)<br>For stable operation, an external voltage shall be applied<br>(cf. the user manual of the mRO-50 RUG for electrical scheme) | 1,6 x 10 $^{\circ}$ (± 20%) peak to peak (for supply 3,3V or 5V)  |   |
| Digital frequency adjustment range with serial RS-232 port.  | Fine: $\pm 2 \times 10^{-9}$ (resolution: 2,5 x 10 <sup>-12</sup> ) $\pm 20\%$<br>Coarse: $\pm 1 \times 10^{-7}$ (resolution: 1.24 x 10 <sup>-9</sup> ) |   |
| Output level   | Square wave 0-3V  |   |
| Spurious $f_0 \pm 100 \text{kHz}$  | <-80dBc   |   |
| Supply voltage<br>Max Power Supply Ripple  | 5V<br>< 50 mV peak to peak (from 1Hz to 1MHz<br>frequency band)   | 3.3V (option code 3.3 V)<br>< 5 mV peak to peak (from 1Hz to 1 MHz<br>frequency band)                 |
| Input power @ 25°C   | <0.57W steady state<br>2.5W start-up  | <0.5W steady state<br>1,7W start-up   |
| Lock Indicator<br>Unlocked<br>Locked   | > 3 V<br>< 0.4 V  | ·   |
| Communication with serial RS-232 port  | Rx and Tx signals are idles at low level (to invert polarity use option COMSTD)   |   |

#### **ENVIRONMENTAL**

| Туре  | mRO-50 Ruggedized   |
|---|---|
| Magnetic field sensitivity  | < 1,3 x 10 <sup>-10</sup> / Gauss   |
| Storage Temperature   | - 55°C to + 105°C   |
| Operating Temperature   | -40°C to +80°C (maximum temperature of the thermal chamber with air flow around unit)   |
| Overall Environment Effects<br>Altitude (qualification ongoing)<br>Vibration,<br>Shocks (qualification ongoing) | Meets or exceeds:<br>MIL-STD-810H, Method 500.6<br>MIL-STD-810H, Method 514.8 Annexe E general exposure 7.7g <sub>RMS</sub> , (no loss of lock)<br>MIL-STD-202, 50g, 11 ms, half sine |
| Humidity (qualification ongoing)  | MIL-STD-810H, Method 507.6<br>35°C, 95% relative humidity   |
| g-tip-over test   | 2 x 10 <sup>-10</sup> / g on worst sensitive axis   |

#### PHYSICAL

| Туре   | mRO-50 Ruggedized                                  |
|--------|--|
| Size   | 50.8 x 50.8 x 20 mm (± 0.4 mm)<br>2" x 2" x 0.787" |
| Weight | 80 g max.<br>2.82 oz. max.                         |
| Volume | < 52 cc  |

#### **MBTF**

| Туре                 | mRO-50 Ruggedized                |
|----------------------|----------------------------------|
| Cell lifetime / MTBF | 10 years / 155860 hours at +25°C |

# **MORE ON APPLICATIONS**

The Spectratime mRO-50 Ruggedized design has been improved to reduce power consumption and size to meet the latest requirements necessary to support various levels of military and commercial applications.





safran-navigation-timing.com

