ELECTRONICS & DEFENSE

MRO-50 RUGGEDIZED

Low SWaP-C Mini-Rubidium Oscillator



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 -40ºC to +80ºC 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.

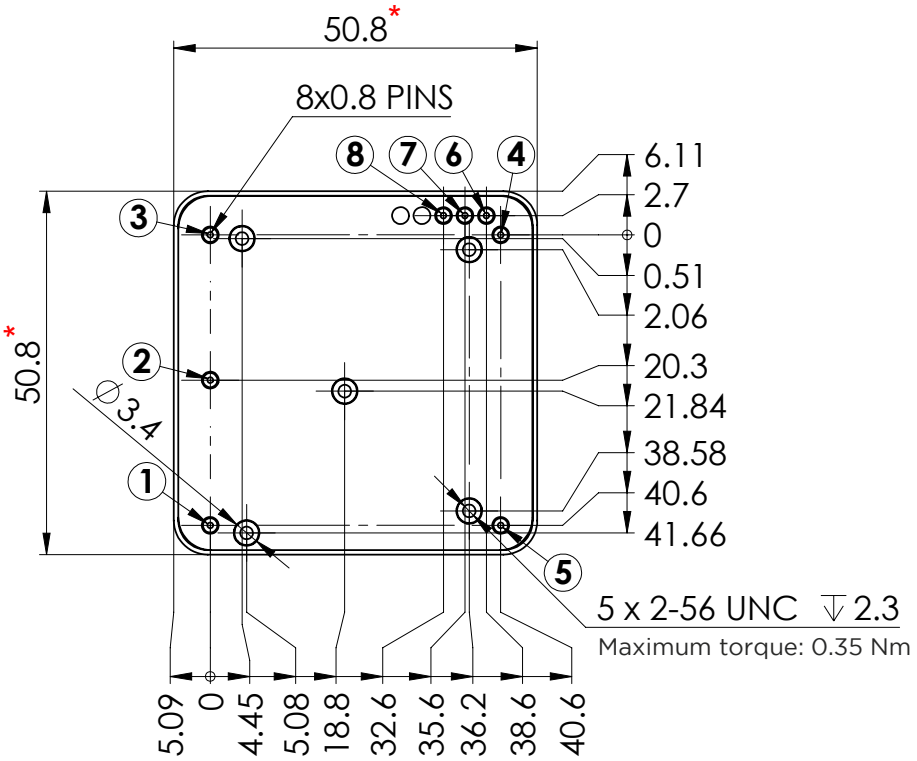
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Technical Specifications

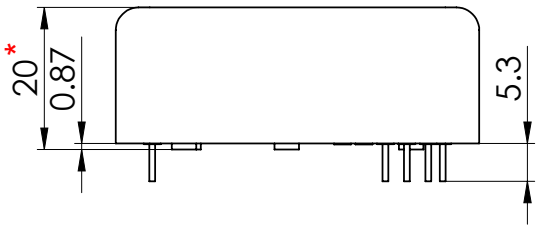
Package:

(all dimensions in mm)



* ± 0.4 mm

All other quotes are ± 0.2 mm



Pin Layout:

PIN	FUNCTION
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

Type	mRO-50 Ruggedized	
	Standard version	Options
Frequency	10 MHz	
Frequency change within operating temperature range	≤ 6×10^{-10} over -40°C to +80°C	
Linear drift measured over minimum 14 days After 3 months operations :	< 1×10^{-11} / day	(option code A) < 5×10^{-12} / day
Short term stability 1 sec 10 sec 100 sec	≤ 6×10^{-11} ≤ 1.9×10^{-11} ≤ 6×10^{-12}	(option code S) ≤ 4×10^{-11} ≤ 1.3×10^{-11} ≤ 4×10^{-12}
Phase noise (10 MHz) in dBc/Hz 1 Hz 10 Hz 100 Hz 1000 Hz 10000 Hz	≤ -66 ≤ -95 ≤ -120 ≤ -135 ≤ -140	(option code S) ≤ -70 ≤ -97 ≤ -120 ≤ -135 ≤ -140
Frequency retrace (in stable temperature, gravity, pressure and magnetic field conditions)	< 1×10^{-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) For stable operation, an external voltage shall be applied (cf. the user manual of the mRO-50 RUG for electrical scheme)	$1,6 \times 10^{-8}$ (± 20%) peak to peak (for supply 3,3V or 5V)	
Digital frequency adjustment range with serial RS-232 port.	Fine: ± 2×10^{-9} (resolution: $2,5 \times 10^{-12}$) ± 20% Coarse: ± 1×10^{-7} (resolution: 1.24×10^{-9})	
Output level	Square wave 0-3V	
Spurious f_0 ± 100kHz	< -80dBc	
Supply voltage Max Power Supply Ripple	5V < 50 mV peak to peak (from 1Hz to 1MHz frequency band)	3.3V (option code 3.3 V) < 5 mV peak to peak (from 1Hz to 1 MHz frequency band)
Input power @ 25°C	<0.57W steady state 2.5W start-up	<0.5W steady state 1,7W start-up
Lock Indicator Unlocked Locked	> 3 V < 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

Type	mRO-50 Ruggedized
Magnetic field sensitivity	< $1,3 \times 10^{-10}$ / 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 Altitude (qualification ongoing) Vibration, Shocks (qualification ongoing)	Meets or exceeds: MIL-STD-810H, Method 500.6 MIL-STD-810H, Method 514.8 Annexe E general exposure $7.7g_{RMS}$, (no loss of lock) MIL-STD-202, 50g, 11 ms, half sine
Humidity (qualification ongoing)	MIL-STD-810H, Method 507.6 35°C, 95% relative humidity
g-tip-over test	2×10^{-10} / g on worst sensitive axis

PHYSICAL

Type	mRO-50 Ruggedized
Size	50.8 x 50.8 x 20 mm (± 0.4 mm) 2” x 2” x 0.787”
Weight	80 g max. 2.82 oz. max.
Volume	< 52 cc

MBTF

Type	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.



AEROSPACE

- GNSS operation through interference
- Low Earth Orbit satellite missions

MILITARY

- Military communication systems
- Key Infrastructure Emergency Vehicles
- Radars
- Aircraft and UAVs

COMMERCIAL

- Secured telecom
- Underwater geological applications
- Autonomous cars
- Aircrafts

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