The Global Leader in
Resilient **PNT**

mRO-50 Ruggedized

Low SWaP-C Mini-Rubidium 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 1µs 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 0.36W of power, which is about ten times less than existing solutions with similar capabilities.

Miniature, Low SWaP-C, ultra-portable high precision & performance Atomic Frequency Source

Key Features

Frequency Stability - ADEV

1s	< 4E-11 (Option S)
100s	< 4E-12 (Option S)

Phase Noise (SSB)

10Hz	< -97 (Option S)
100Hz	< -120 (Option S)
1KHz	< -135 (Option S)

Aging (After 30 days)

Per day < (option A) 5E-12 / day

Warm up time

< 2 min

Operating Temp	-40° to +80°C
DC power	0.45W @5V and 0.36W @3.3V (option)
Cell lifetime/MTBF	10 years/155860 hours at +25°C
Vibration	7.7 grms/axis per MIL-STD-810, Fig 514.7E-1, Category 24
Shock	MIL-STD-202G, Test Condition A, 50g, 11 ms, half sine

Applications

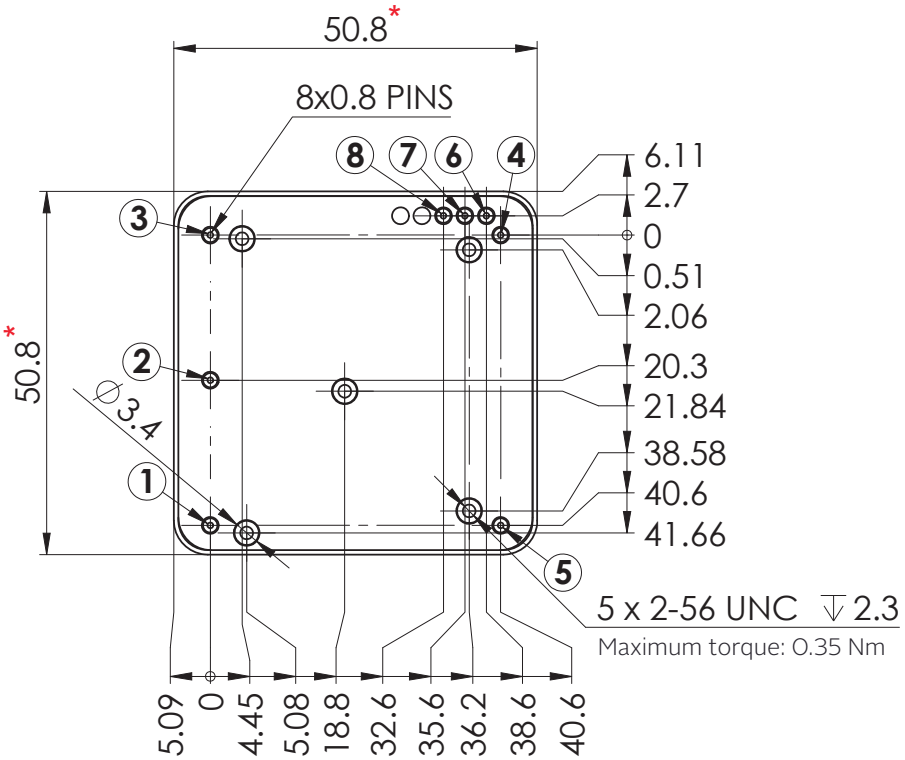
The mRO-50 Ruggedized Oscillator provides accurate frequency and precise time synchronization to mobile applications, such as military radio-pack systems in GNSS denied environments. Its wide-ranging operating temperature of -40° to +80°C is also ideal for UAVs and underwater applications.

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

mRO-50 Ruggedized

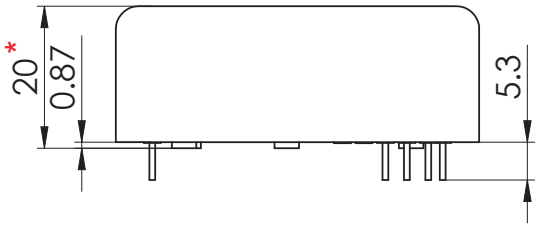
Package:

(all dimensions in mm)



* ± 0.4 mm

All other quotes are ± 0.2 mm



Pin Layout:

PIN	FUNCTION
1	Frequency Adjust (Analog 0-3V)
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

SPECIFICATIONS

ELECTRICAL

Type	mRO-50 Ruggedized	
	Standard version	Options
Frequency	10 MHz	
Frequency change within operating temperature range	≤ 6 x 10^{-10} over -40°C to +80°C	
Linear drift measured over minimum 14 days After 3 months operations :	< 1 x 10^{-11} / day	**(option code A)** < 5 x 10^{-12} / day
Short term stability 1 sec 10 sec 100 sec	≤ 6 x 10^{-11} ≤ 1.9 x 10^{-11} ≤ 6 x 10^{-12}	**(option code S)** ≤ 4 x 10^{-11} ≤ 1.3 x 10^{-11} ≤ 4 x 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 x 10^{-10} within 1 h after 24 h off	
Warm-up time	Lock < 2 minutes at over the full temperature range	
Analog frequency adjustment. For stable operation, an external voltage shall be applied (cf. the manual of the mRO-50 for electrical scheme)	1 x 10^{-8} ± 20% (3.3V) 1 x 10^{-8} ± 20% (5V)	
Digital frequency adjustment range with serial RS-232 port.	Fine: ± 7 x 10^{-9} (resolution: 3 x 10^{-12}) Coarse: ± 1 x 10^{-7} (resolution: 1.24x 10^{-9})	
Output level	Square wave 0-3V	
Spurious f_o ± 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 (typical values)	3.3V **(option code 3.3 V)** 0.5W steady state 1.7W start-up (typical values)
Lock Indicator Unlocked Locked	> 3 V < 0.4 V	

ENVIRONMENTAL

Type	mRO-50 Ruggedized
Magnetic field sensitivity	< 1 x 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, Test Condition A, Method 514.8 Annex E general exposure 7.7g_{RMS}, (no loss of lock) MIL-STD-202G, 50g, 11 ms, half sine
Humidity (qualification ongoing)	MIL-STD-810H, Method 507.6 35°C, 95% relative humidity
g-tip-over test	2 x 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 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 interfere
- Low Earth Orbit satellite missions

MILITARY

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

COMMERCIAL

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

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