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# SLCO-1024000




## General Description

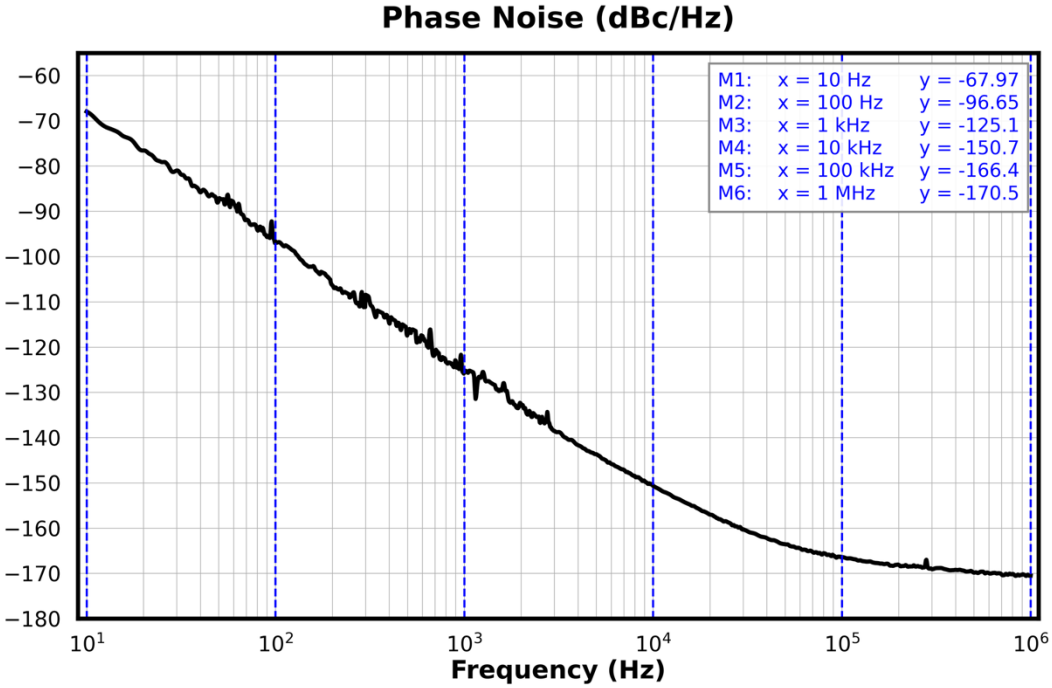
The SLCO-1024000 Sapphire-Loaded Cavity Oscillator uses a whispering-gallery sapphire resonator to deliver ultra-high-Q and exceptionally low phase noise at 10.24 GHz. Direct fundamental-frequency operation eliminates multiplication chains, achieving phase noise 20 to 40 dB lower than high-performance multiplied quartz and SAW oscillators. Integrated thermal management improves frequency stability and repeatability from 0 °C to 45 °C, while 10 MHz reference locking, lock detect, and graphical status monitoring simplify system integration.

## Features

- Whispering-gallery mode sapphire resonator for ultra-high-Q
- Fundamental 10.24 GHz operation
- Ultra-low phase noise performance, < -161 dBc/Hz @ 100 kHz Offset
- Integrated phase lock to 10 MHz reference with lock-detect
- Thermally stabilized operation (0 °C to 45 °C)
- Very High Reliability

## Applications

- High Frequency Synthesis
- Reference Source for RADAR Applications
- Reference Clock for High-Speed Data Converters
- Reference Source for High End Test Systems




## Part Ordering Options

| Part Number | Description | Connectors | Green Status | Product Lifecycle | Export Classification |
|---|---|---|---|---|---|
| SLCO-1024000 | 10.24 GHz Sapphire-Loaded Cavity Oscillator | - | RoHS REACH | Released | 3A001.b.10 |


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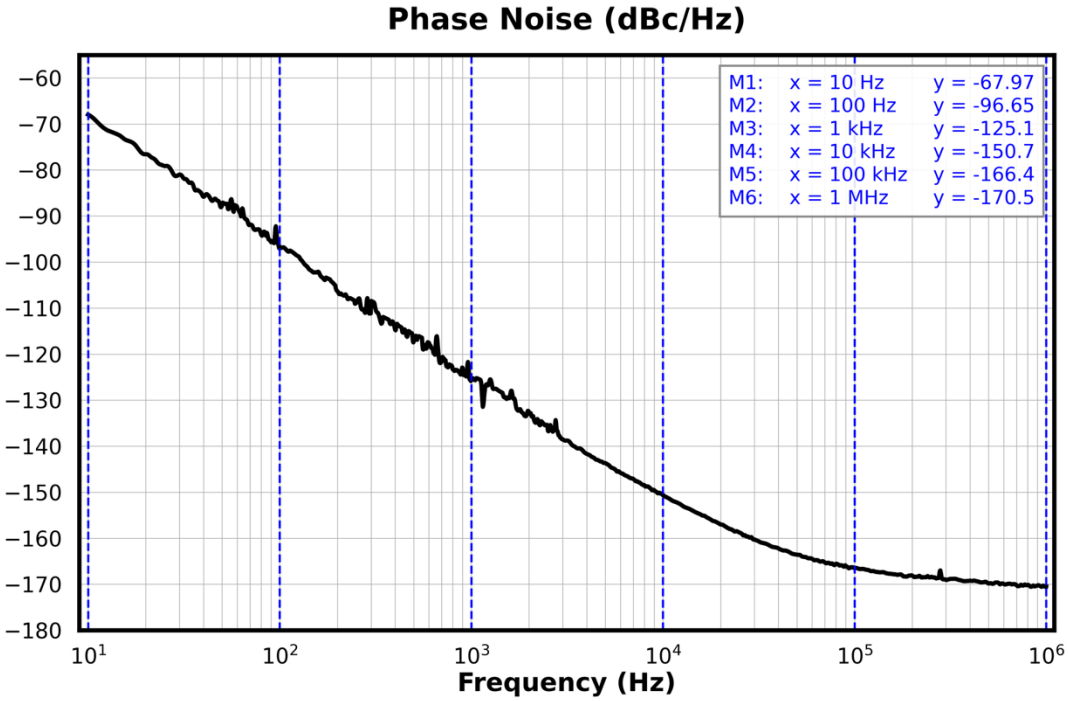

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## TYPICAL PERFORMANCE PLOTS

### Phase Noise at Frequency Offset




Phase Noise measured on a Rohde & Schwarz FSWP.


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## ELECTRICAL SPECIFICATIONS

| Parameter | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Frequency | - | - | 10.24 | - | GHz |
| Reference Input | 10 MHz Input | 0 | - | 15 | dBm |
| Accuracy[1] | Free running, after 60 min warmup | - | 1 | - | ppm |
| Accuracy[1] | Typical, After Warmup | - | 0.1 | - | ppm |
| Accuracy[1] | Within 5 minutes after power on | - | 100 | - | ppm |
| Output Power | - | 10 | 12 | 14 | dBm |
| Phase Noise @ 10 Hz Offset | - | - | -68 | - | dBc/Hz |
| Phase Noise @ 100 Hz Offset | - | -91 | -97 | - | dBc/Hz |
| Phase Noise @ 1 kHz Offset | - | -121 | -125 | - | dBc/Hz |
| Phase Noise @ 10 kHz Offset | - | -146 | -151 | - | dBc/Hz |
| Phase Noise @ 100 kHz Offset | - | -161 | -166 | - | dBc/Hz |
| Phase Noise @ 1 MHz Offset | - | -165 | -170 | - | dBc/Hz |

[1] Accuracy matches external reference when phase locked. External Reference to be within ±2 ppm of ideal 10 MHz. Phase locking may require full 60 min warmup.


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# SPECIFICATIONS

## Absolute Maximum Ratings

| Parameter | Maximum Rating |
|---|---|
| Storage Temperature | -40 ºC to 75 ºC<br><br>Below -20 °C, the LCD display is not specified and its operation is not guaranteed. This applies only to the display. The oscillator itself remains within specification across the full -40 °C to +75 °C storage range. The LCD display is not required for proper operation of the oscillator. |
| Operating Temperature | 0 ºC to 45 ºC (case temperature)<br><br>The oscillator output may not be available for a short time during thermal stabilization at turn on at temperature extremes (3 minutes max). Near 25 ºC approximately (20 ºC - 30 ºC) output will be available immediately. |
| Power Supply DC Voltage, Maximum | 14 V |
| Power Supply DC Voltage, Minimum | 11 V, as read on the display for DC input voltage. Below this, oscillator will operate, but thermal management will shut off. |
| MTBF | The combined MTBF of the components, cavity and thermal stabilization of the oscillator is calculated to be 200,000 hours. |

## Package Information

| Parameter | Rating |
|---|---|
| Weight | 1.1 kg |
| Dimensions | 148 x 102 x 76 mm |

## Recommended Operating Conditions

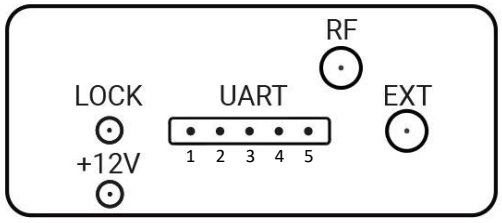
| Parameter | Rating |
|---|---|
| DC Power | • +12 V DC, 3.5 A<br>• Up to 42 W while thermally stabilizing (3.5 A) < 5 minutes<br>• ~2 W to 12 W nominal (0.15 A to 1.0 A, temperature dependent) after 5 minutes or less<br>• Power supply must be able to handle 4000 uF of capacitance and high inrush current |
| Warm Up | • 5 min to <100 ppm (guaranteed)<br>• 60 min to <1 ppm for phase locking (typical) |


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## PORT CONFIGURATION AND FUNCTIONS

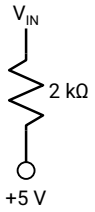
### Port Diagram

UART controller is not required for normal operation. For UART output, see Application Information. UART header uses 1.0 mm pitch female header pins. UART Baud rate is 1 Mbit/s.




Front Panel

### Port Functions

| Port | Function | Connector Type | Description | DC Equivalent Circuit |
|---|---|---|---|---|
| +12V | Positive DC Supply Voltage | SMBM | +12 V DC power input. The supply voltage must be low-noise and must not exceed +14 V. The power supply must be capable of supplying 3.5 A of current. Voltages greater than +14 V will result in catastrophic device failure. | - |
| EXT | External Reference | SMAF | 10 MHz Input Reference or External Tune Port (0 to 10 V), referencing the +5 V / 2 kΩ Thevenin equivalent circuit shown at right. This port auto-detects whether a 10 MHz reference or a DC voltage is present.<br>• 10 MHz reference: MUST be AC coupled. Do NOT terminate into 50 Ω.<br>• DC voltage: EXT functions as a tune port. Connected DC power supply must be able to both sink and source 2.5 mA minimum. |  |
| LOCK | Lock Detect | SMBM | Phase Lock Detect indicator (1 kΩ output impedance, 3.3 V logic). This output has two modes of operation:<br>• Free-running mode (EXT disconnected): Lock Detect is active high when the oscillator's output frequency is within 100 ppm.<br>• Phase-locked mode (EXT connected, 10 MHz reference applied): Lock Detect is active high when external 10 MHz is applied and phase locked. | - |
| RF | RF Output | SMAF | RF Output port delivers a 10.24 GHz signal generated by the internal oscillator. | - |
| UART Pin 1 | /RST | - | UART Pin 1 is located on the left side of the control interface. Pin 1 triggers Reset. UART uses 3.3 V Logic. | - |
| UART Pin 2 | +3.3 V | - | UART Pin 2 is the +3.3 V supply input and requires external 50 Ω series resistor between the 3.3 V source and this pin. | - |
| UART Pin 3 | Ground | - | UART Pin 3 should be connected to ground. | - |
| UART Pin 4 | Rx | - | UART Pin 4 is the receive pin on the device's processor. It accepts incoming data. | - |
| UART Pin 5 | Tx | - | UART Pin 5 is located on the right side of the control interface. Pin 5 is the transmit pin on the device's processor. It transmits incoming data. | - |


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# APPLICATION INFORMATION

## Heat Sinking

This device is designed to be mounted directly to a thermally conductive metal surface that also serves as an electrical ground.

The mounting surface **must be flat and conductive** to ensure proper thermal sinking and grounding.

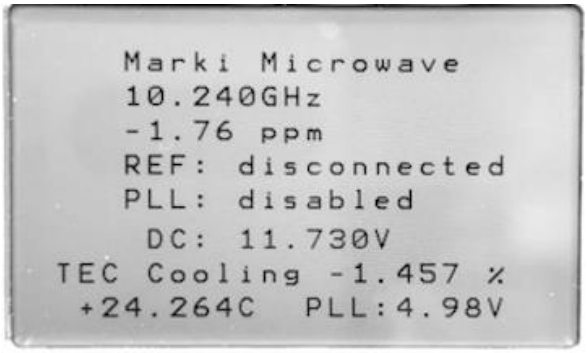
**No insulating materials** (e.g., thermal pads, interface sheets) may be placed between the device and the mounting surface.

**Do not use thermal pads or dielectric interface materials**, as they will **break the electrical ground connection** and degrade performance.

Failure to maintain direct metal-to-metal contact may result in loss of electrical grounding, degraded performance, or device malfunction.

## Graphic Display

A 400 x 240 graphic display shows the oscillator status including frequency tracking, mode of operation and lock status. The display updates the device status once per second. The example display image shown below is from a device operating in Free-Running mode.



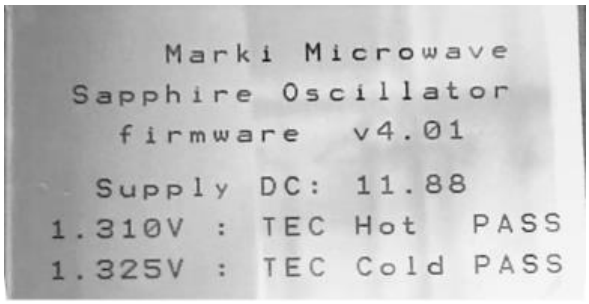

## Turn-On & Warm Up

Provide 12V supply. Warm up time is 5 minutes to 100ppm and one hour to 1 ppm. This is assuming the housing is well heat sunk to a thermally stable mount.

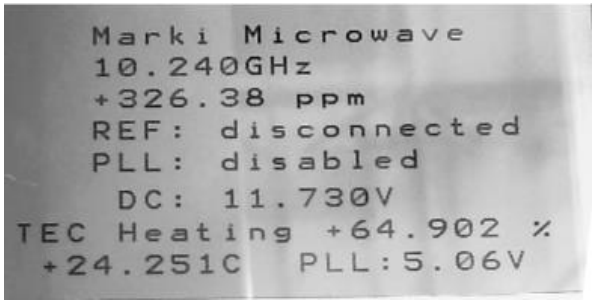

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## Start-Up Sequence

Upon power-up, the display indicates the status of the thermoelectric cooler (TEC) in both heating and cooling modes. Both should indicate PASS, confirming successful operation in each mode, as shown below.




During the initial warm-up period, the display may indicate a large positive or negative frequency offset and high TEC heating or cooling output. These values are expected to decrease in magnitude as the oscillator approaches thermal equilibrium.




## Operational Modes

The two modes of operation, auto-detected include:

- Free-Running: The oscillator is stabilized to within 1ppm of the internal 10 MHz.

- Phase Locked: When a 10 MHz external reference is applied with the correct power and frequency, the oscillator will stabilize then lock to the external reference automatically.

## Calibration

The SLCO-1024000 requires no specific annual calibration. The calibration process may be a ‘performance check’ only, no adjustment is required. The internal 10 MHz is automatically ‘calibrated’ to the external reference when connected. The unit dynamically tracks the reference when phase locked to an external 10 MHz. The dynamic nature of the self monitoring means there is no inherent aging in the oscillator, it is always self stabilizing.

## UART Output

When the device receives a serial input from the PC, UART controller returns a status response similar to the one shown below. This contains the same information that is displayed in the topside Graphic Display panel. Example readout is displayed below.

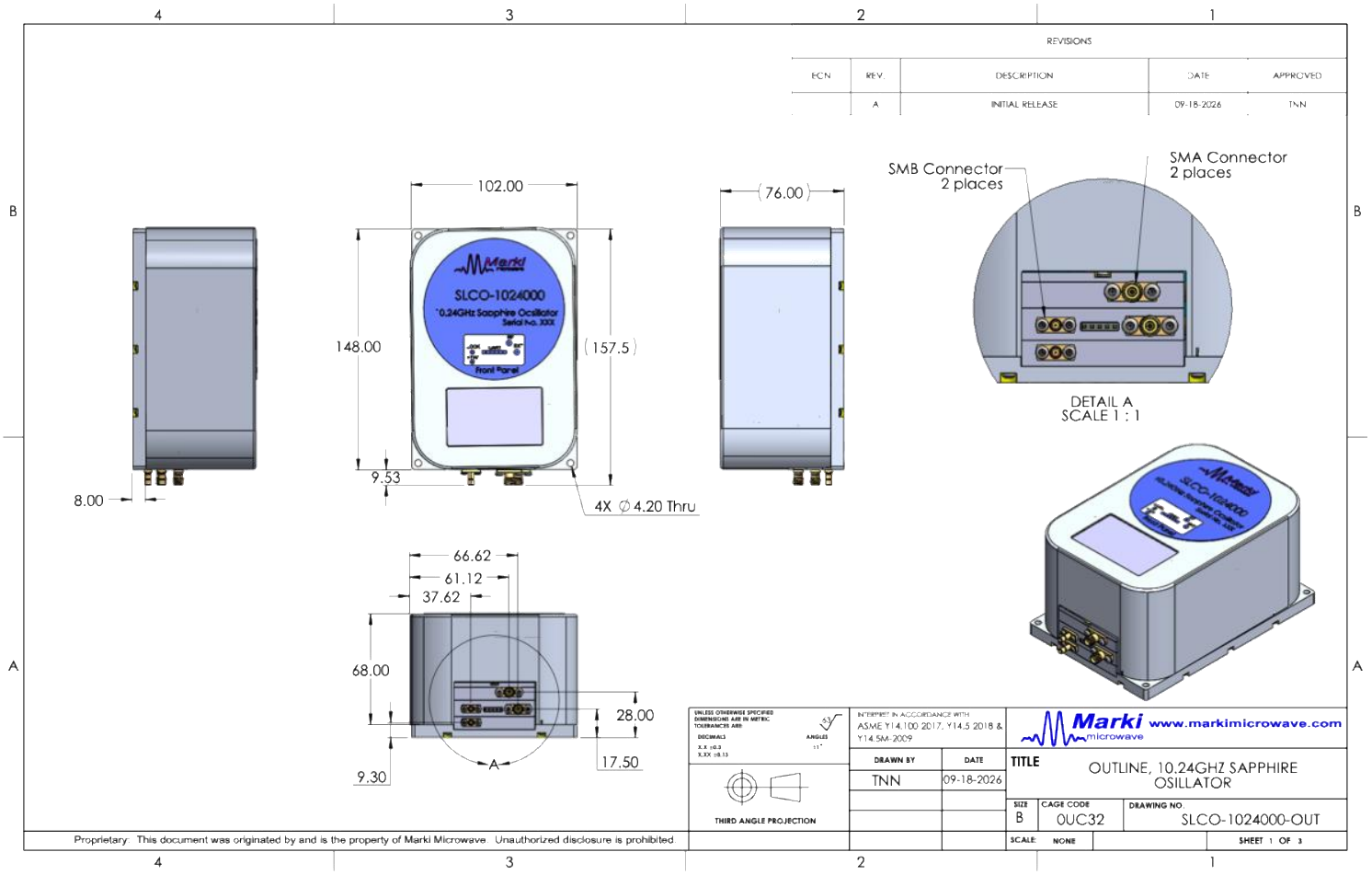
```
FREQ:0.27ppm;REF:NC;PLL:disabled:4.996V;DC:11.537V;TEMP:33.911C;TEC:C:-12.918%
```



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## MECHANICAL DATA

### Outline Drawing




Mounting holes are M4, 4.2 mm diameter, 8.0 mm depth.


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## REVISION HISTORY

| Revision Code | Revision Date | Comment |
|---|---|---|
| - | 2026-11-16 | Initial Release |


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