

Helping Customers Innovate, Improve & Grow



The MD-261 is a fully integrated GNSS disciplined oscillator module in a compact surface mount 25 x 20 mm package. The module has an embedded 34 channel receiver that is both GPS and GLONASS compatible, and provides an HCMOS 10 MHz and 1 pps output. An onboard OCXO or High Precision TCXO are available dependent on performance requirements. The module operates from -40 °C to +85 °C, and is capable of providing a holdover of 1.5 us over 4 hours over a +/-2°C temperature window. An evaluation kit with operating software is available for development purposes.

Features

- Embedded GNSS Receiver - GPS and Glonass Compatible
- Field upgradeable for Galileo
- 1pps HCMOS output signals standard
- 10MHz HCMOS output standard
- 1 pps auxiliary input
- Other output frequencies available
- Modified NMEA (VSIP)
- Holdover to 1.5 us over 4 hours, 8 us over 24 hours
- Evaluation kit with software available

Applications

- LTE
- Digital Video Broadcast
- E911 Location Systems
- General Timing and Synchronization
- Military Radio

Block Diagram

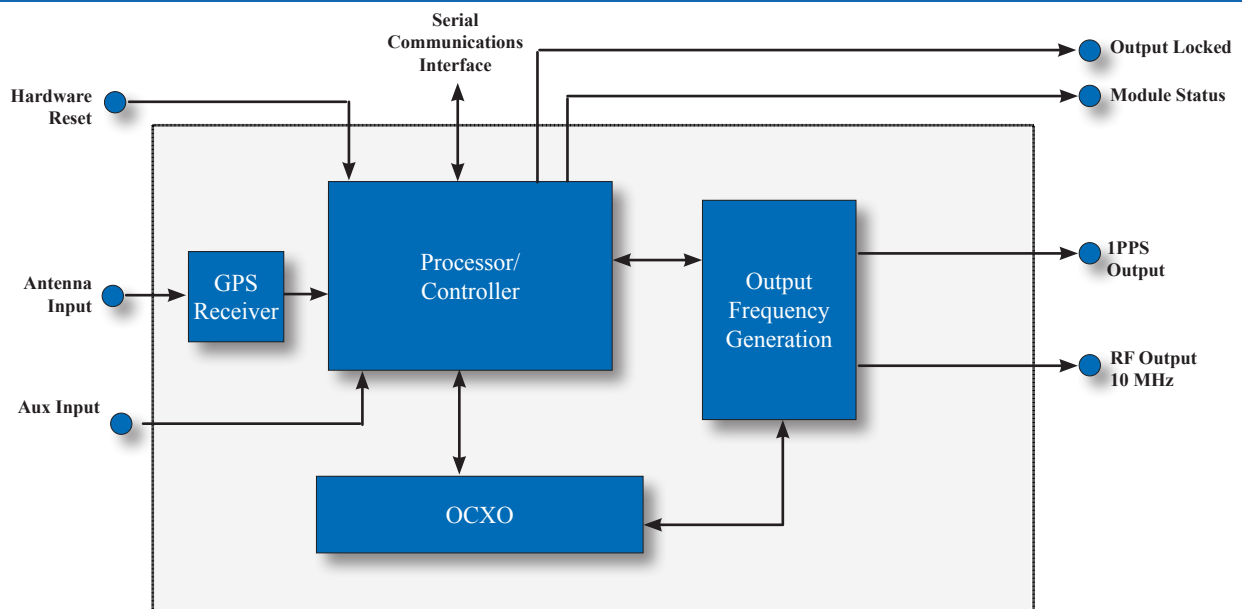


Figure 1. Functional Block Diagram

Summary Specifications

Comparitive Performance of Standard Modules

| Model | Embedded Oscillator | Typical Uses |
|-----------------------------|---------------------|--|
| MD-2610-EXE-OCXO-10M0000000 | OCXO | Applications requiring a GPS disciplined clock with holdover below 1.5 us in 4 hours |
| MD-2610-EXJ-HPTC-10M0000000 | Precision TCXO | Applications requiring 50 ppb stability when not disciplined to GPS |

Hold Over Performance ¹

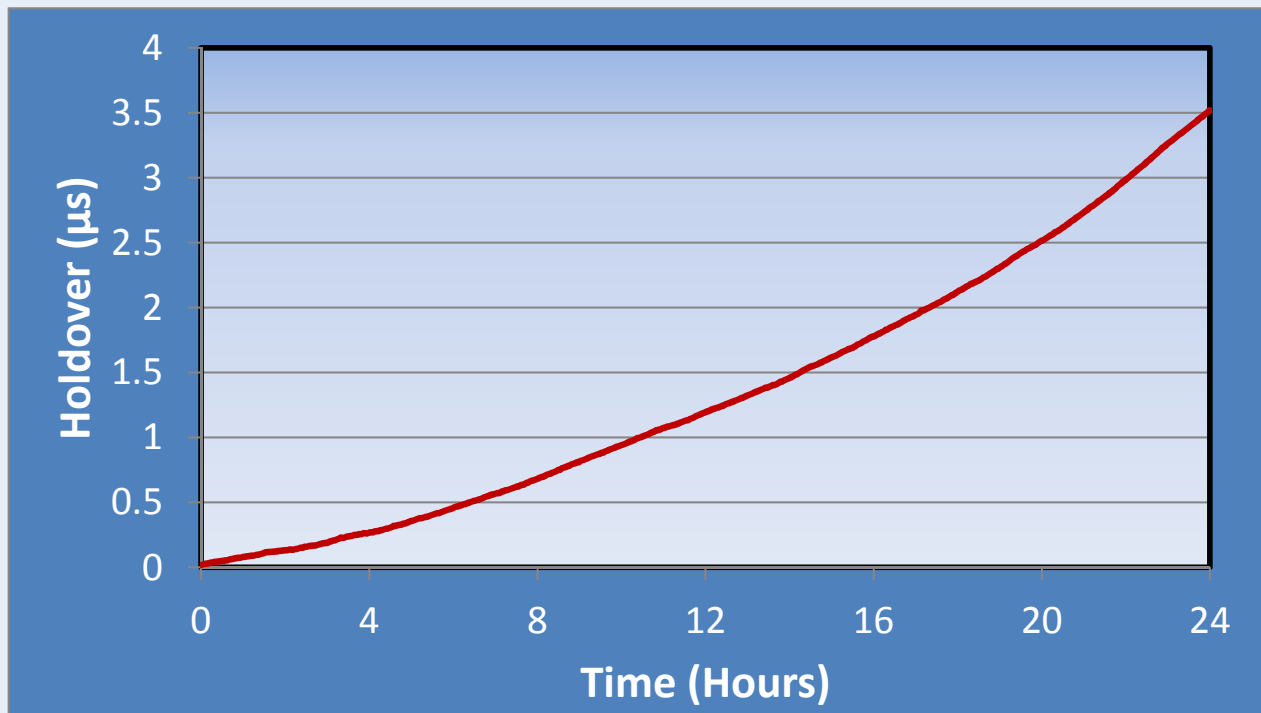
| Hold Over Time | 10 min | 1 hr | 1 hr | 4 hr | 4 hr | 24hr | 24 hr |
|------------------------------|-------------------------------------|--------------------------------|---------------------------------|--------------------------------|---------------------------------|--------------------------------|---------------------------------|
| Hold Over Temperature Change | $\Delta T = 2^{\circ}\text{C}$ | $\Delta T = 2^{\circ}\text{C}$ | $\Delta T = 10^{\circ}\text{C}$ | $\Delta T = 2^{\circ}\text{C}$ | $\Delta T = 10^{\circ}\text{C}$ | $\Delta T = 2^{\circ}\text{C}$ | $\Delta T = 10^{\circ}\text{C}$ |
| Model | Maximum Accumulated Hold Over in us | | | | | | |
| MD-2610-EXE-OCXO-10M0000000 | .03 | 0.3 | 1 | 1.5 | 4 | 8 | 20 |
| MD-2610-EXJ-HPTC-10M0000000 | 3 | 40 | 75 | 100 | 300 | 1000 | 2500 |

Summary Performance Characteristics

| Model | Warm Up Time (minutes) | Aging / day (ppb) ¹ | Temperature Stability (ppb) ¹ | Module Height (mm) | 1 pps precision (rms) ² (ns) | Accuracy at 24 hours ³ | Warm up Power @ 25 °C (W) | Steady State Power @ 25 °C (W) | Voltage (V) |
|-----------------------------|------------------------|--------------------------------|---|--------------------|---|-----------------------------------|---------------------------|--------------------------------|-------------|
| MD-2610-EXE-OCXO-10M0000000 | 5 | 0.2 | 1 ppb (-10 to 85°C) 4 ppb (-40 to -10°C) | 14 | 20 | 1E-12 | 3.5 | 1.5 | 3.3 |
| MD-2610-EXJ-HPTC-10M0000000 | 5 | 10 | 50 | 14 | 100 | 1E-10 | 0.33 | 0.33 | 3.3 |

Phase Noise/ AVAR

| | -10 Hz | -100 Hz | -1 kHz | -10 kHz | -100 kHz | AVAR ($\tau=1\text{s}$) | AVAR ($\tau=10\text{s}$) |
|-----------------------------|--------|---------|--------|---------|----------|---------------------------|----------------------------|
| MD-2610-EXE-OCXO-10M0000000 | -120 | -130 | -145 | -150 | -150 | 3E-11 | 5E-11 |
| MD-2610-EXJ-HPTC-10M0000000 | -90 | -115 | -140 | -155 | -155 | 5E-10 | 5E-10 |



Measured accumulated phase error at 25 °C

Specifications

| Internal Receiver Characteristics | | | | | |
|--|--|---------|-----|------------------|---|
| Parameter | | | | | Condition |
| Type | Timing w/ Auto Position Lock | | | | |
| Number of channels | 34 | | | | |
| Frequency band | GPS L1 C/A | | | | |
| | SBAS L1 C/A | | | | WAAS, MSAS, EGNOS, GAGAN |
| | GLONASS L1 OF | | | | |
| | Galileo | | | | Firmware update will be required |
| Tracking capability | 12 satellites - GPS 34 satellites all GNSS source | | | | |
| Position Accuracy | < 2.5 m CEP | | | | Open sky. 24 hours |
| TTFF (receiver - position only) | <5 seconds | | | | HOT (current almanac, position, time and ephemeris) |
| | <35 seconds | | | | Warm (current almanac, position, time) |
| | < 35 seconds | | | | Cold (no data) |
| GPS Antenna | | | | | |
| Parameter | Min | Typical | Max | Units | Condition |
| Antenna Voltage ⁴ | 0 | 3.3 | 5.5 | V _{DC} | 3.3 or 5V antenna operation supported - pin 21 |
| Antenna Current | | 20 | 100 | mA | see protocol for short circuit protection |
| RF Output Waveform Characteristics | | | | | |
| Waveform | LVCMOS | | | | |
| High Level Output Voltage (V _{OH}) | 90 | | 100 | %V _{CC} | |
| Low Level Output Voltage (V _{OL}) | | 0.0 | 20 | %V _{CC} | |
| Rise/Fall Time | | 3 | 5 | nSec | 15 pF 10kOhm |
| Duty Cycle | 40 | 50 | 60 | % | 15 pF 10kOhm |
| 1pps Output Characteristics | | | | | |
| Parameter | Min | Typical | Max | Units | Condition |
| Waveform | LVCMOS | | | | |
| High-level output voltage (V _{OH}) | 90 | | 100 | %V _{CC} | 15 pF 10kOhm |
| Low-level output voltage (V _{OL}) | | 0.0 | 20 | %V _{CC} | 15 pF 10kOhm |
| Pulse Width | | 10 | | us | |
| Aux 1pps input Characteristics | | | | | |
| Parameter | Min | Typical | Max | Units | Condition |
| Waveform | LVCMOS, TTL | | | | |
| High-level input voltage (V _{IH}) | 2.4 | | 5 | VDC | 15 pF 10kOhm |
| Low-level input voltage (V _{IL}) | | 0.0 | 0.3 | VDC | 15 pF 10kOhm |

Specifications

| Lock Status Indicator | | | | | |
|---|---|---------|------|------------------|--|
| Parameter | Min | Typical | Max | Units | Condition |
| Module Locked | 90 | | 100 | %V _{CC} | 15 pF 10kOhm |
| Module Not Locked | 0 | | 20 | %V _{CC} | 15 pF 10kOhm |
| Module Hardware OK Indicator | | | | | |
| Module Hardware OK | 90 | | 100 | %V _{CC} | 15 pF 10kOhm |
| Module Hardware Failure | 0 | | 20 | %V _{CC} | 15 pF 10kOhm |
| Module Hardware Reset | | | | | |
| Reset Module | 0 | | 0.5 | V _{DC} | 10 kOhm internal pullup |
| Serial Communications Interface | | | | | |
| Rx high-level input voltage (V _{IH}) | 90 | | 100 | %V _{CC} | |
| Rx low-level input voltage (V _{IL}) | 0 | | 20 | %V _{CC} | |
| Tx high-level output voltage (V _{OH}) | 90 | | 100 | %V _{CC} | |
| Tx low-level output voltage (V _{OL}) | 0 | | 20 | %V _{CC} | |
| Baud rate | | 115.2 | | kBaud | 8N1 |
| Communications Protocol | Vectron Binary/NMEA 0183 | | | | See VSIP Command List for Full Details |
| Pulse width | 10 | | | usec | |
| Supply Voltage | | | | | |
| Supply voltage (V _{CC}) | +3.15 | +3.3 | +3.4 | V _{DC} | |
| Absolute Maximum Ratings | | | | | |
| Supply voltage (V _{CC}) | | | 3.5 | V _{DC} | |
| Dc voltage on any I/O pin | | | 4.0 | V _{DC} | |
| Output load | 1 | | | kOhms | |
| AC ripple | | | 50 | mVpk-pk | 10Hz to 1MHz |
| Environmental Conditions | | | | | |
| Parameter | Min | Typical | Max | Units | Condition |
| Operating temperature | see ordering information for available ranges | | | | |
| Humidity @ 40°C | | | 90 | % | |
| Storage Temperature | -55 | | +125 | °C | |
| Physical Characteristics | | | | | |
| | | | 120 | g | |

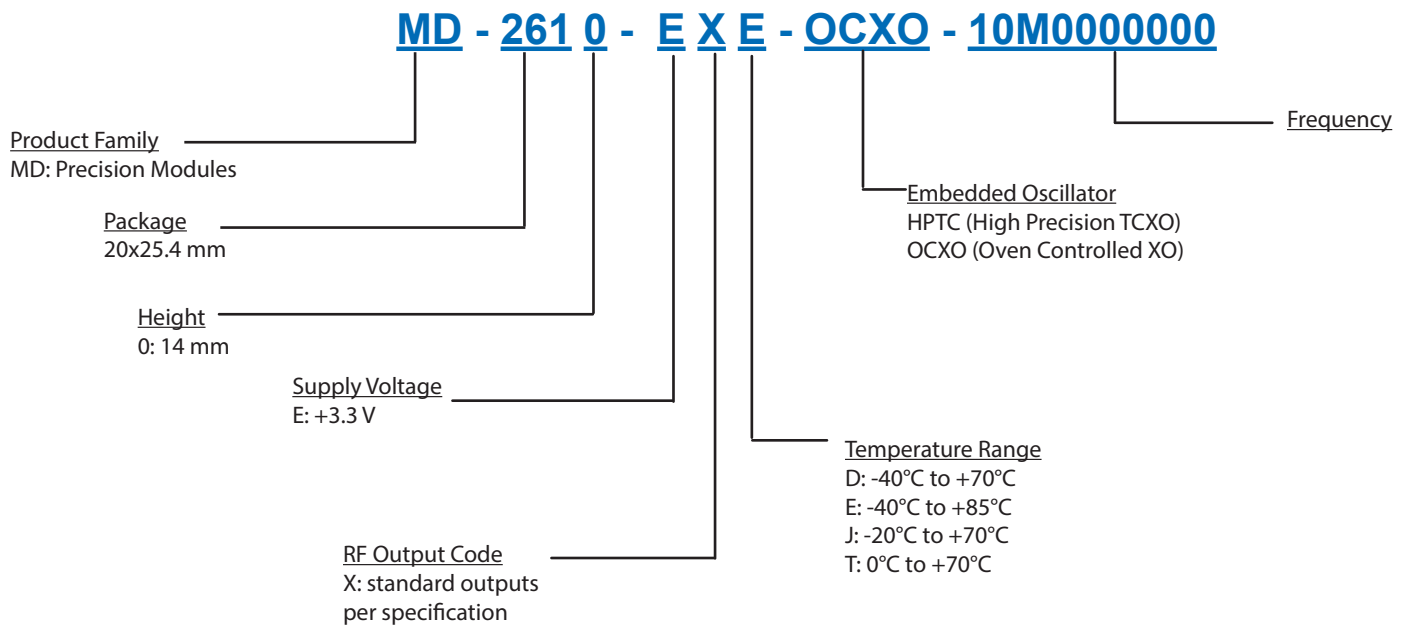
Accessories

| Vectron Partnumber | Description |
|--------------------|---|
| MD-261-EK | MD-261X-XXX-XXXX Module with Evaluation Kit |

Ordering Information Instructions

The MD-261 series of GNSS disciplined oscillators has multiple options with embedded OCXOs and TCXOs. Options are created to optimize customer hold over requirements while meeting pricing needs. Customization to unique customer requirements is available and is common for this level of integration. Common customizations include alternate output frequencies, temperature ranges, differing values and methods of hold over specification. Not all combinations of codes are available.

Ordering Information



Notes

- 1) Holdover and aging performance is after 7 days of power-on time. Temperature and aging rates are when device is not locked. Performance measured in still air. 1 ppb temperature stability is measured in factory, however due to internal heating and variations in airflow, -40 to -10 °C values vary in the differing environments . The MD-2610-EXE-OCXO-10M0000 may vary by as much as 4ppb, unlocked, over
- 2) After customer applies offset corrected using cable delay command while locked, after 24 hours of locked operation
- 3) Allan Variance at $\tau=86400s$ while locked, after 24 hours of locked operation
- 4) Antenna supply pin at pin 21 is an input voltage from customer. Vectron couples the DC input voltage to the rf signal of the GPS signal. The customer does not need to provide any additional blocking or coupling circuitry.

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