Precision Frequency Control and Timing Solutions
Vectron Brand Quartz Crystal Oscillators

www.microchip.com/timing
Microchip’s timing portfolio includes the most extensive range of frequency control and timing solutions in the world. From silicon-based MEMs resonators, to quartz crystal and SAW oscillators, to atomic references, Microchip provides cost-effective solutions for any long or short-term stability requirement. Microchip’s network synchronization ICs include 1588, GNSS timing and Sync E. With clock generators, clock synthesizers, buffers and clock distribution, a total clock tree solution can be provided for any application.

This brochure highlights the precision frequency control solutions, including Vectron brand quartz crystal oscillators, atomic clocks and modular solutions that provide an additional layer of integration.

From deep water to deep space, and everywhere in between, Microchip synchronizes the universe.

- Integrated Precision Solutions
- Atomic Standards
- Chip Scale Atomic Clock (CSAC)
- Oven Controlled Crystal Oscillators (OCXO)
- Temperature Compensated Crystal Oscillators (TCXO)
- Clock Oscillators (XO)
- MEMs Oscillators
- Voltage Controlled Crystal Oscillators (OCXO)
- Voltage Controlled SAW Oscillators
- SAW Filters
- Quartz Crystals

Markets

Data Centers
Defense
Medical
Wireless

Aerospace
Energy Exploration
Test and Measurement
Wireline/Cable

Vectron™ a Microchip company
Integrated Precision Solutions

Hi-Temp Real Time Clock Module

- Timing, calendar and alarm set via FC BUS
- Built-in 32.768 kHz quartz oscillator
- Package: 13 x 13 mm, 8-pin DIP
- Supply voltage: 2.7 to 3.6V
- Continuous operating temperature range: –40°C to 200°C
- Tight temperature stability of ±100 ppm or better
- Low-power consumption of 100 μA or less

FX-700/FX-702
Frequency Translators

- SAW or BAW quartz-based low-jitter PLL frequency translators
- Output frequency: 1 MHz to 1 GHz
- Input frequency: 8 kHz to 1 GHz
- Output logic: CMOS (FX-700), LVDS and LVPECL (FX-702)
- Supply voltage: 3.3V (FX-700 and FX-702) or 5.0V (FX-700)

MD-261
Disciplined Oscillator Module

- Miniature 25 x 20 mm footprint
- Embedded GNSS receiver - GPS and Glonass compatible
- 1 pps and 10 MHz output signals standard
- Embedded precision oscillator
- Serial communications interface standard
- Evaluation kit available

MD-175/MD-176
GNSS Disciplined Oscillator Module

- Embedded GNSS receiver (MD-176)
- Accepts auxiliary 1 pps input
- 1.5 μs 24 hour holdover
- 10 MHz Sinewave or CMOS output
- 1 pps CMOS output
- Adapative aging correction
- 50 x 40 mm SMD design
- Evaluation kit available

MD-012/MD-013
GNSS Disciplined Oscillator Module

- Embedded GNSS receiver (MD-013)
- Accepts auxiliary 1 pps input
- 1.5 μs 24 hour holdover
- 10 MHz Sinewave or CMOS output
- 1 pps CMOS output
- Adapative aging correction
- Barometric pressure correction
- Evaluation kit available

Custom Module

- Build to source control drawing or Vectron custom datasheet
- Integrate existing Vectron products into single solution
- Ruggedization for military applications
- Options include: multiple outputs, multiple frequencies, low phase noise, frequencies to 1.5 GHz, input 1 pps, embedded receivers, embedded OCXO, TCXO, VCSO
MCXO, EMXO and OCXO
50 ppb to 0.4 ppb Temperature Stability

**MX-600**
Low Power

- Output: CMOS
- Frequency: 8 to 40 MHz
- Package: 7 x 9 x 4.1 mm
- Supply voltage: 3.3V
- Temperature stability: –20°C to 70°C; ±20 ppb
  –40°C to 85°C; ±30 ppb
- Phase noise: –153 dBc/Hz @ 10 kHz
- OCXO replacement with low power consumption

**MX-503**
Low Power

- Output: CMOS
- Frequency: 8 to 50 MHz
- Package: 9 x 14 x 3.8 mm
- Supply voltage: 3.3V
- Temperature stability: –20°C to 70°C; ±20 ppb
  –40°C to 85°C; ±30 ppb
  –40°C to 105°C; ±100 ppb
- Phase noise: 153 dBc/Hz @ 10 kHz
- OCXO replacement with low power consumption

**OX-601**

- Output: CMOS
- Frequency: 10 to 40 MHz
- Package: 9.6 x 7.4 x 4.1 mm
- Supply voltage: 3.3V
- Temperature stability: –40°C to 85°C; ±10 ppb
- High reliability OCXO ASIC design

**OX-503**

- Output: CMOS
- Frequency: 8 to 50 MHz
- Package: 9 x 14 x 3.8 mm
- Supply voltage: 3.3V
- Temperature stability: –20°C to 70°C; ±20 ppb
  –40°C to 85°C; ±30 ppb
  –40°C to 105°C; ±100 ppb
- Phase noise: 153 dBc/Hz @ 10 kHz
- OCXO replacement with low power consumption

**OX-221**

- Output: CMOS
- Frequency: 10 to 37.2 MHz
- Package: 22 x 25.4 x 12.1 mm
- Supply voltage: 3.3V
- Temperature stability: –40°C to 85°C; ±3 ppb
- TCXO replacement for better short term stability

**OX-405**

- Output: CMOS, Sinewave
- Frequency: 80 to 120 MHz
- Package: 13 x 20 x 8.3 mm
- Supply voltage: 3.3V or 5.0V
- Temperature stability: –40°C to 85°C; ±100 ppb
- Phase noise: –95 dBc/Hz @ 10 Hz
  –160 dBc/Hz @ 100 kHz

**EX-421**
Low Power

- Output: CMOS, Sinewave
- Frequency: 10 to 100 MHz
- Package: 13 x 13 x 10 mm
- Supply voltage: 3.3 or 5.0V
- Temperature stability: 0°C to 70°C; ±10 ppb
  –40°C to 85°C; ±30 ppb
- Low power: 0.25W steady state
- Aging: 1 ppb/day, 100 ppb/year
- Phase noise floor: –165 dBc/Hz
MCXO, EMXO and OCXO
50 ppb to 0.4 ppb Temperature Stability

OX-204/OX-205
Low Phase Noise

- Output: CMOS, Sinewave
- Frequency: OX-204 10 MHz standard (3.3, 5.0 or 12.0V)
- OX-205 100 MHz standard (5.0 or 12.0V)
- Package: 25.4 × 25.4 × 15 mm
- OX-204: phase noise –135 dBc/Hz @ 10 Hz
- –175dBc/Hz @ 10 kHz
- OX-205: phase noise –135 dBc/Hz @ 100 Hz
- –176 dBc/Hz @ 100 kHz
- Other frequencies available upon request

OX-208

- Output: CMOS, Sinewave
- Frequency: 5 to 20 MHz
- Package: 25.4 × 25.4 × 12.7 mm
- Supply voltage: 3.3 or 5.0V
- Temperature stability: 0°C to 70°C ; ±0.4 ppb
- –40°C to 85°C; ±0.8 ppb
- Low aging: 0.15 ppb/day

OX-228

- Output: CMOS, Sinewave
- Frequency: 5 to 20 MHz
- Package: 22 × 25.4 × 12.1 mm
- Supply voltage: 3.3V
- Temperature stability: –40°C to 85°C; 1 ppb [pk-pk]
- Low aging: 0.1 ppb/day

OX-205

- Output: CMOS, Sinewave
- Frequency: OX-204 10 MHz standard (3.3, 5.0 or 12.0V)
- OX-205 100 MHz standard (5.0 or 12.0V)
- Package: 25.4 × 25.4 × 15 mm
- OX-204: phase noise –135 dBc/Hz @ 10 Hz
- –175dBc/Hz @ 10 kHz
- OX-205: phase noise –135 dBc/Hz @ 100 Hz
- –176 dBc/Hz @ 100 kHz
- Other frequencies available upon request

OX-171

- Output: CMOS, Sinewave
- Frequency: 5 to 20 MHz
- Package: 38 × 28 × 14 mm
- Supply voltage: 3.3, 5.0 or 12.0V
- Excellent temperature stability: 0°C to 70°C ; ±0.4 ppb
- –40°C to 85°C; ±0.8 ppb
- Allan deviation: 5E-12 @ 1 s
- Low aging: 0.06 ppb/day

MD-173

- Coefficient corrected crystal oscillator
- FC interface with frequency coefficient
- On-board temperature sensor
- Temperature stability: –40°C to 85°C; 0.4ppb [pk-pk] without correction
- Low aging: 0.06 ppb/day
- Frequency: 5 to 20 MHz
- Package: 38 × 25.4 × 22 mm

OX-047/OX-48
Low g, Low Phase noise

- Output: 10 MHz Sinewave (OX-047)
- 100 MHz Sinewave (OX-048)
- Low g-sensitivity: 0.02 ppb/g to 250 Hz (OX-047)
- 0.05 ppb/g to 250 Hz (OX-048)
- Low phase noise: –135 dBc/Hz @ 10 Hz (OX-047)
- –135 dBc/Hz @ 100 Hz (OX-048)
- Package: 50 × 75 × 25 mm with SMA connector
- Supply voltage: 12.0 or 15.0V
- Operating range: –40°C to 85°C
VT-860
- Output: Clipped Sinewave
- Frequency range: 13 to 52 MHz
- Package: 2 x 1.6 x 0.7 mm
- Supply voltage: 1.8V to 3.3V
- Temperature stability: -40°C to +85°C; ±500 ppb
- Phase noise: -153 dBc/Hz @ 100 kHz

VT-803
- Output: CMOS, Clipped Sinewave
- Frequency: 10 to 52 MHz
- Package: 5 x 3.2 x 1.5 mm
- Supply voltage: 2.8, 3.0, 3.3 or 5.0V
- Temperature stability: -10°C to 70°C; ±100 ppb
  -40°C to 85°C; ±200 ppb
- Optional VCXO function available

TX-707/TX-708
Low g
- Output: CMOS, Clipped Sinewave
- Frequency: 10 to 52 MHz (TX-707)
  96 to 160 MHz (TX-708)
- Package: 7 x 5 x 2.8 mm
- Supply voltage: 3.3 or 5.0V
- Temperature stability: -40°C to 85°C; ±1 ppm
- Low g-sensitivity: 0.1 ppb/g option

TX-500
- Output: CMOS, Sinewave, PECL
- Frequency: 6.4 to 160 MHz
- Package: 9 x 14 x 5.9 mm
- Supply voltage: 3.3V or 5.0V
- Temperature stability: -40°C to 85°C; ±0.28 ppm
- EFC standard
- Low phase noise option
- Low profile

TX-321
Low Phase Noise
- Output: CMOS, Sinewave
- Frequency: 5 to 52 MHz
- Package: 23 x 18 x 4.5 mm
- Supply voltage: 3.3 or 5.0V
- Temperature stability: -40°C to 85°C; ±1 ppm
- Low g-sensitivity: 0.2 ppb/g
- Ultra-low phase noise: -116 dBc/Hz @ 10 Hz (10 MHz)
  -165 dBc/Hz noise floor

MXT57
High Frequency
- Output: CMOS, LVPECL, LVDS, HCSL
- Frequency: 2.5 to 850 MHz
- Package: 7 x 5 x 1.4 mm
- Supply voltage: 2.3 to 3.6V
- Temperature stability: -40°C to 85°C; ±2.5 ppm
- Jitter: 500 fs-rms typical, 12 kHz to 20 MHz
- Spurious: <−100 dBc

TCXOs
2.5 ppm to 100 ppb
**VC-840**
- Output: CMOS
- Frequency: 1 to 160 MHz
- Package: 2.5 × 2 × 0.9 mm
- Supply voltage: 1.8, 2.5 or 3.3V
- Enable/disable for board test and debug
- Temperature stability: –40°C to 105°C; ±25 ppm

**VC-827**
- Output: LVPECL, LVDS
- Frequency: 20 to 220 MHz
- Package: 2.5 × 2 × 0.9 mm
- Supply voltage: 1.8, 2.5 or 3.3V
- Enable/disable for board test and debug
- Operating temperature: –40°C to 105°C
- Jitter: 90 fs-rms typical, 12 kHz to 20 MHz

**HT-MM900B**
- MEMS
- Output: CMOS
- Frequency: 1 to 100 MHz
- Package: 3.2 × 2.5/2.5 × 2/2 × 1.6/1.6 × 1.2
- Supply voltage: 1.71 to 3.3V
- Enable/disable for board test and debug
- Operating temperature: –40°C to 85°C
- MEMs oscillator

**PX-702**
- **High Temp**
- Output: CMOS
- Frequency: 32.768 kHz to 50 MHz
- Package: 5 × 7 × 1.8 mm, 4 or 6 pad
- Supply voltage: 1.8, 2.5, 3.3 or 5.0V
- Operating temperature range: –55°C to 230°C
- Designed for high shock and vibration

**HT-RTC-XO**
- **High Temp**
- Output: CMOS
- Frequency: 32.768 kHz
- Package: 6 different available footpints
- Ultra-low current option: 70 µA @ 1.8V, 90 µA @ 3.3V
- Enable/disable for board test and debug
- Operating temperature: –55°C to 200°C
- Designed for high shock and vibration

**VC-711**
- **Low Jitter**
- Output: LVPECL, LVDS
- Frequency: 10 to 170 MHz
- Package: 5 × 7 × 1.8 mm
- Supply voltage: 2.5 or 3.3V
- Enable/disable for board test and debug
- Operating temperature: –40°C to 105°C
- Jitter: 75 fs-rms typical, 12 kHz to 20 MHz
**VCSO**

**Pullable Oscillators up to 6 GHz**

**VS-800**

- Output: Sinewave, Balanced Sinewave
- Frequency: 800 MHz to 3.2 GHz
- Package: 5 × 3.2 × 1.8 mm
- Supply voltage: 3.3V
- Jitter: 6 fs-rms typical
  (\(f_N = 1.56897 \text{ GHz}, \text{DIFF } 1x\), 12 kHz to 20 MHz)

**VS-705**

- Output: LVPECL or LVDS
- Frequency: 122.88 MHz to 1 GHz
- Package: 5 × 7.5 × 2.5 mm
- Supply voltage: 2.5 or 3.3V
- Jitter: <120 fs-rms (\(f_N = 622.08 \text{ MHz}, 12 \text{ kHz to } 20 \text{ MHz}\))
  <105 fs-rms (\(f_N = 622.08 \text{ MHz}, 50 \text{ kHz to } 80 \text{ MHz}\))
- Spurious suppression, 90 dBc typical
- Tri-State output select (OD, OS, OE)

**VS-709**

- Output: LVPECL, LVDS
- Frequency: 155.52 to 983.04 MHz
- Package: 5 × 7 × 1.8 mm
- Supply voltage: 2.5 or 3.3V
- Dual-frequency VCSO
- Jitter: <120 fs-rms (\(f_N = 622.08 \text{ MHz}, 12 \text{ kHz to } 20 \text{ MHz}\))
  <105 fs-rms (\(f_N = 622.08 \text{ MHz}, 50 \text{ kHz to } 80 \text{ MHz}\))
- Tri-state frequency select (F1, OD, F2)

**VS-507**

- Output: Sinewave, Balanced Sinewave
- Frequency range: 3.0 to 6.0 GHz
- Package 9 × 14 × 4.9 mm
- Supply voltage: 3.3V
- Ultra-low jitter performance
- Jitter: <10 fs-rms, 12kHz to 20 MHz

**VS-508**

- Output: Sinewave, Balanced Sinewave, LVPECL
- Frequency range: 800 MHz to 2.9 GHz
- Low g-sensitivity:<0.6 ppb/g
- High shock and vibration
- Supply voltage: 3.3 or 5.0V
- Jitter: < 12 fs-rms, 12 KHz to 20 MHz

**101765**

**Low Phase Noise**

- Output: Sinewave
- Frequency: 320 MHz to 2.5 GHz
- Package: 25 × 25 × 5 mm kovar flatpack
- Temperature stability: –40°C to 85°C; ± 20 ppm
- Supply voltage: 5–15V
- Phase noise: –160 dBc/Hz @ 10 KHz (600 MHz)
  –180 dBc/Hz noise floor (fundamental)
- Output power: +18 dBm (fundamental)
Precision Frequency Control and Timing Solutions

**VV-800**
Low Jitter

- Output: CMOS
- Frequency: 1.544 to 77.76 MHz
- Package: 3.2 × 5 × 1.2 mm
- Supply voltage: 3.3 or 5.0 V
- Fundamental crystal design with low-jitter performance
- Output disable feature
- Absolute pull range: ±50 ppm min

**VX-805**

- Output: LVPECL
- Frequency: 100 to 200 MHz
- Package: 5 × 3.2 × 1.8 mm
- Supply voltage: 3.3 V
- Output disable feature
- Absolute pull range: ±50 ppm min
- Operating temperature: –40°C to 105°C
- Low phase noise: –148 dBC/Hz @ 10 kHz (122.88 MHz)

**VX-808**
High Temperature

- Output: CMOS
- Frequency: 2 to 40 MHz
- Package: 5 × 7 × 1.8 mm, 4 or 6 Pad SMD
- Supply voltage: 3.3 V
- Continuous operating temperature range –55°C to 180°C
- Low jitter and phase noise
- Compliant crystal mount for high shock and vibration

**VX-504**

- Output: CMOS
- Frequency: 30 to 160 MHz
- Package: 9 × 14 × 2.8 mm
- Supply voltage: 3.3 or 5.0 V
- Low g-sensitivity: 0.3 ppb/g
- Temperature stability: –40°C to 85°C; ±30 ppm
- Phase noise: –150 dBC/Hz @ 10 kHz

**VX-505**

- Output: CMOS and PECL
- Frequency: 10 MHz to 1.2 GHz
- Package: 14 × 9 × 5.9 mm or height option 2.8 mm
- Supply voltage: 3.3 or 5.0 V
- Jitter: 100 fs-rms typical, 12 kHz to 20 MHz
- Absolute pull range: ±100 ppm

**VS-702**

- Output: LVPECL, LVDS
- Frequency: 150 MHz to 1 GHz
- Package: 5 × 7 × 2 mm
- Supply voltage: 3.3 V
- Jitter: 100 fs-rms typical, 12 kHz to 20 MHz
- Absolute pull range: ±100 ppm
- Improved temperature stability over standard VCSO
- VCXO with on-board SAW filter

VCXO and VCSO
Pullable Oscillators up to 6 GHz
Crystals and Filters

Crystals
- Frequency: 32.768 kHz to 200 MHz
- Packages from HC-49 to SMD 1.6 × 1.2 mm
- Fundamental or third overtone modes
- Temperature stabilities of 10 to 50 ppm
- Load capacitance: 6 to 32 pF

Hi-Temp Packaged Crystals
- Frequency: 3 to 200 MHz
- Operating temperature range up to 250°C
- AT, SC, FC, AC and IT-Cut resonators
- Multiple package options available
- Designed for high shock and vibration
- Low aging
- Low phase noise

SAW Filters

High Performance Telecom
- Frequency: 70 MHz to 2.6 GHz
- Standard/custom filters for GSM, TDMA, EDGE, CDMA, W-CDMA, UMTS and 4G-LTE
- Custom frequencies available
- Low loss, wide bandwidth
- Low temperature coefficient of frequency
- Package: optimized SMD and PIN
- High-input power capabilities

RF Filters
- Frequency: 700 MHz to 2.7 GHz
- Bandwidth: 0.2 to 85 MHz
- Low Loss: <=1 dB
- Custom designs
- Balanced, unbalanced and mixed mode
- Package: miniature SMD (3 × 3, 2.5 × 2 and 2 × 1.6 mm)
- High-input power capabilities
- Temperature-Compensated SAW (TC-SAW) solutions available

Military and Space
- Frequency: 35.42, 70, 465 MHz and others
- Bandwidth: 0.2 to 100 MHz
- Low loss: <10 dB depends on bandwidth
- Balanced or unbalanced or mixed mode
- Package: small SMD (3 × 3 and 13 × 6 mm LCC)
- Many custom designs
- High-input power capabilities

Navigation (GPS/GIS)
- 1.2 to 1.6 GHz for high precision receivers
- 1.227, 1.237, 1.57542, 1.590 GHz
- Frequency: 1227, 1237, 1575.42, 1590 MHz
- Bandwidth: 2.4, 20, 40 MHz
- Low loss: <2 dB
- Low ripple: <0.3 dB
- Balanced, unbalanced and mixed mode
- Package: miniature SMD (3 × 3 and 2.5 × 2 mm)
- High-input power capabilities

ISM Band Filters and Resonators
- Frequency: 433.92, 315, 868, 915 MHz
- Bandwidth: 0.1 to 2 MHz
- Custom frequencies available
- Low loss: <2 dB
- Low temperature coefficient of frequency
- Package: small SMD (3.8 × 3.8 and 3 × 3 mm)
- High-input power capabilities

Monolithic Crystal Filters
- Frequency: 4 to 250 MHz
- Bandwidth: 0.1 to 500 kHz
- Package: 3.8 × 3.8 and 3 × 3 mm, SMD
- Poles: up to 12
- High selectivity
- High frequency stability
- Internal matching available
**CSAC**

- Power consumption <120 mW
- Less than 17 cc volume, 1.6” x 1.39” x 0.45”
- 10 MHz CMOS-compatible output
- 1 PPS output and 1 PPS input for synchronization
- RS-232 interface for monitoring and control
- Low-noise options and space versions available
- Temperature stability: –10°C to 70°C; ±0.5 ppb
- Low aging: < 0.9 ppb/month

**MAC**

- High-precision atomic clock
- Small form factor (standard OCXO pinout)
- 1.5 μs 24 hour typical holdover over temperature (SA.35m)
- Low power consumption
- Temperature Stability: –10°C to 75°C; ±0.1 ppb
- Low aging: 0.1 ppb/month

**8200/8200 LN**

- 10 MHz output
- 1 PPS output (8200 LN only)
- 1 PPS input (8200 LN only)
- Low phase noise (82000 LN only)
- Low weight < 2 lbs
- Shock/vibration hardened
- Digital monitor and control
- Low physical profile (<1.0” high)
- Temperature stability: –40°C to 75°C; ±0.3 ppb
- Low aging: < 0.05 ppb/month

**Cesium Standards**

- Frequency accuracies up to ±5e–13
- Long-term stabilities up to 1e–14
- Multiple output configurations available
- Rack mountable
- Optional battery backups

**Hydrogen Masers**

- Patented magnetic quadrupole for superior atomic beam focusing
- Demonstrated lifetime of greater than 20 years
- Unique, cavity auto tuning feature for exceptional long-term standalone stability
- A low-phase noise option for superior short-term stability in an active hydrogen maser
- Two year standard warranty
- Ultra-low aging: <2E-15/day
- Allan Deviation: < 1.5E-15 @ 10,000s

**Atomic References**

1E-9 to 1E-15 Stabilities
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