

Description

Small size High Stability Oven Controlled Crystal Oscillator (OCXO) is a high reliability signal generator that provides Sine wave or HCMOS output. The OCXO is designed to be used in Aerospace applications.

It is designed to withstand radiation level up to 100kRad (*) (total dose), high shock and vibration. The OCXO has very low phase noise. Low G-Sensitivity SC-Cut Crystal utilized in the design guarantees 1PPB/G or better. The reliable construction of this design qualifies it for stringent environmental applications.

(*) Please contact factory for higher level of radiation hardness.



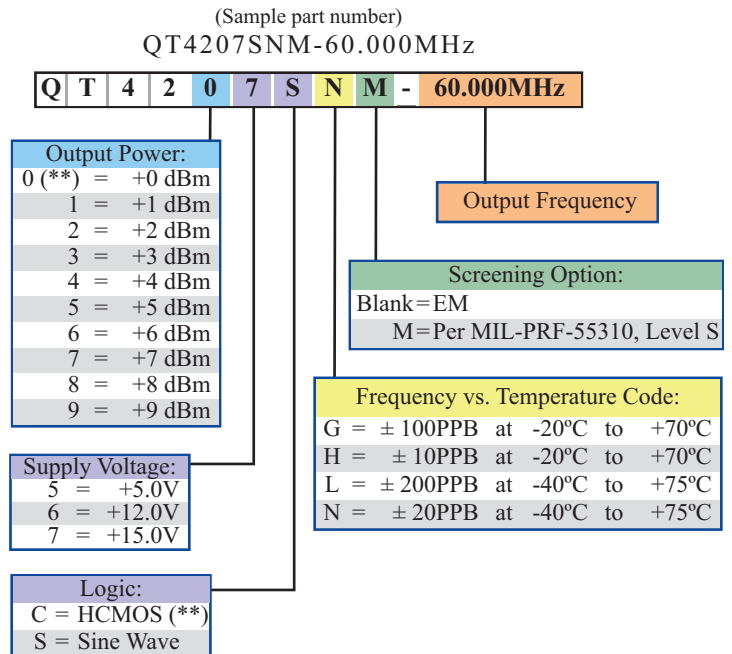
Features

- Made in the USA
- Supply voltages 5.0Vdc to 15Vdc
- Wide temperature range (-40°C to +75°C)
- SC-Cut crystal
- Low phase noise and jitter
- Choice of output power and load
- Radiation Hardened
- Custom design available tailored to meet customer's needs
- Ruggedized to withstand ultra high shock and vibration.

Applications

- Designed to meet today's requirements for Space Grade applications
- Control and measurement
- Signal processing

Ordering Information



(**) If CMOS output option is selected, zero (0) should be used at the Output Power position and it is not amplitude selector in this case. OCXO output will have standard CMOS amplitude.

Packaging Options

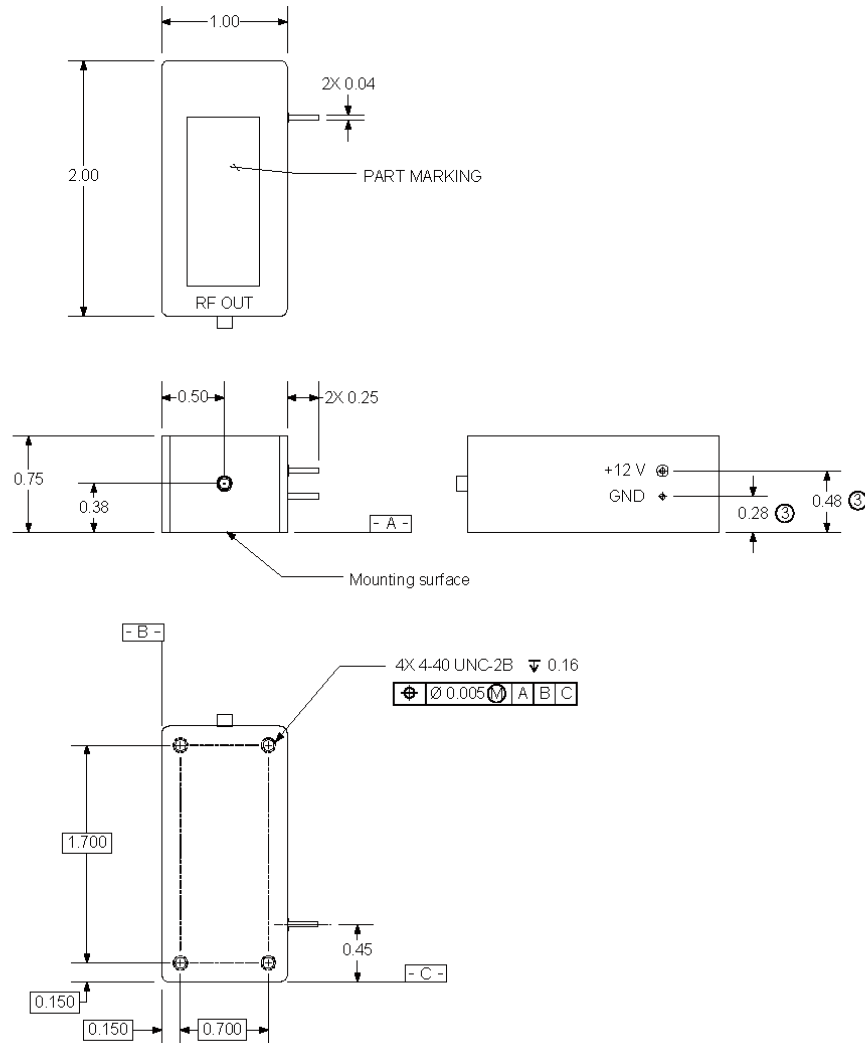
- Standard ESD packaging

Other Options Available For An Additional Charge

- Phase Noise test (Static and under vibration)
- Jitter test

Specifications subject to change without prior notice. For Non-Standard requirements, contact Q-Tech Corporation at Sales@Q-Tech.com

Package Outline - Dimensions are in inches



Package Information

- Package Material: Kovar
- Weight: 100g typical
- Package Finish: 50 micro Inches Gold over nickel plate
- MSSS Connector: Body / Pin Material; KOVAR, MIL-I-23011 ASTM-F15
Body / Pin Finish; Gold Plate, MIL-G-45204, Type 3, Grade A,
40-80 Microinches over Type 1, Grade C, CLASS 1
Insulators; Glass, Corning #7070 or Equivalent

Electrical Characteristics

Parameters	Conditions	Requirements	
Output Frequency Range (Fo)		1MHz — 125MHz	
Supply Voltage (Vdd)	±5.0%	+5Vdc, +12Vdc or +15Vdc	
Initial Tolerance	@+25°C	±0.2ppm	
Temperature Range		See Option Codes	
Frequency Stability vs. Temperature		See Option Codes	
Frequency Stability vs. Voltage Variation	Over Temperature Range	±10PPB	
Frequency Stability vs. Load Variation	±5.0% Load Variation	±20PPB	
Warm-up Power max.	@-40°C	4.8W	
Steady State Power max.	@+25°C	2.7W	
Warm-up Time	@+25°C to ±100PPB (2 hours ref.)	10 min.	
Output Waveform		Sine Wave	HCMOS
Output Power (See note 1)		See Option Codes	
Output Power Stability (See note 2)	Over Temperature Range	±1dBm	
Duty Cycle	Over Temperature Range		50%±5.0%
Output Load		50Ω	10kΩ/15pF
Harmonics	Over Temperature Range	-35dBc	
Spurious (See note 3)	Over Temperature Range	-90dBc	
Aging	Per Day	1PPB	
	15 years	1.5PPM	
G-Sensitivity max.		1PPB/G	
Phase Noise for 80MHz OCXO (typ.)	10Hz	-95dBc/Hz	
	100Hz	-125dBc/Hz	
	1kHz	-148dBc/Hz	
	10kHz	-160dBc/Hz	
	100kHz	-160dBc/Hz	

Other Design and Test Options

- Phase Noise and Jitter built to specification including static and vibration.
- Low supply current
- QCI tests
- Tight frequency stability versus temperature, supply voltage, and load variations
- Low spurious (see note 3)
- Low frequency aging, Allan Variance
- High-shock resistant

Notes:

1. The output level is determined by the supply voltage, load, and package size.
2. Typical amplitude stability over temperature is ±10% or less.
3. Typical spurious level is better than -100dBc over the spectrum of 100kHz to 1GHz.



Environmental Specifications

Q-Tech Standard Screening similar to (MIL-PRF-55310) is available. Q-Tech can also customize screening and test procedures to meet your specific requirements. The packages are designed and processed to exceed the following test conditions:

Environmental Test	Test Conditions
Initial Accuracy at Reference Temperature	MIL-PRF-55310, Type 4, Class 3
Frequency Warm-up	MIL-PRF-55310, Type 4, Class 3
Initial Frequency-Temperature Accuracy	MIL-PRF-55310 (4.8.10.1)
Frequency-Voltage Tolerance	MIL-PRF-55310
Frequency-Load Tolerance	MIL-PRF-55310
Phase Noise Steady-State	MIL-PRF-55310
Phase Noise Random Vibration	MIL-PRF-55310
Output Power (Sinusoidal Waveform)	MIL-PRF-55310
Output Logic Voltage Levels (Square wave)	MIL-PRF-55310
Rise Time and Fall Time (Square wave)	MIL-PRF-55310
Duty Cycle (Square wave)	MIL-PRF-55310
Harmonic and Sub-harmonic Distortion	MIL-PRF-55310
Spurious Response	MIL-PRF-55310
Oven Input Current-Power	MIL-PRF-55310, Type 4, Class 3
Temperature Cycling	MIL-STD-883, Method 1010, Cond. B
Constant Acceleration	MIL-STD-883, Method 2001, Cond. A, Y1
Seal Fine Leak	MIL-STD-883, Method 1014, Cond. A & C
Burn-in	240 hours, At highest operating temperature with load
Aging	30 days, MIL-PRF-55310, Type 4, Class 3
Random Vibration	MIL-STD-883, Method 2026
Shock, Non Operating	MIL-STD-883, Method 2002
Thermal Shock, Non Operating	MIL-STD-202, Method 107, Cond. B
Ambient Pressure	MIL-STD-202, 105, Cond. G, 5 minutes dwell time minimum
Resistance to Solder Heat	MIL-STD-202, Method 210, Cond. C
Terminal Strength	MIL-STD-202, Method 211, Cond. C
Resistance to Solvents	MIL-STD-202, Method 215
Solderability	MIL-STD-202, Method 208
ESD Classification	MIL-STD-883, Method 3015, Class 1HBM 0 to 1,999V
Non-destructive Bond Pull	MIL-STD-883, Method 2023

Please contact Q-Tech for higher shock requirements



Design and Construction

The design and construction of the crystal oscillator shall be as specified herein. As a minimum, the oscillators shall meet the design and construction requirements of MIL-PRF-55310.

Element De-rating

All active and passive elements shall be derated in accordance with the applicable hybrid microcircuit element requirements of MIL-STD-975. Elements shall not operate in excess of de-rated values.

Worst Case Circuit Analysis

Worst case analysis shall be based on:

- a. Maximum rated value
- b. The worst case design value
- c. Derating factor for each element
- d. Temperature variation
- e. Radiation

MTBF

Mean Time between Failure analysis shall be done based on MIL-HDBK-217

Element Evaluation

All piece parts shall be derived from lots that meet the element evaluation requirements of MIL-PRF-38534, Class K except for the following exceptions:

Active Elements

- a) Visual inspection of silicon on sapphire microcircuits. Semicircular crack(s) or multiple adjacent cracks, not in the active area, starting and terminating at the edge of the die are acceptable. Attached (chip in place) sapphire is nonconductive material and shall not be considered as foreign material and will be considered as nonconductive material for all inspection criteria.
- b) Subgroup 4, Scanning Electron Microscope (SEM) inspection. The manufacturer may allow the die distributor, at his option, select two (2) dice from a wafer pack (containing a maximum quantity of 100 die), visually inspect for the worst case metallization of the 2 dice, and take SEM photographs of the worst case.
- c) Subgroup 5 radiation tests. Subgroup 5 radiation tests are not required unless otherwise specified in the detail specification.

Package Elements

- a) Salt spray. Salt spray testing is not required.

Quartz Crystal Material

Unless otherwise specified by the detail specification, the quartz Crystal material shall be swept synthetic, grade 2.2 or better.

Crystal Mounting

The crystal element shall be four-point mounted in such a manner as to assure adequate crystal performance when the oscillator

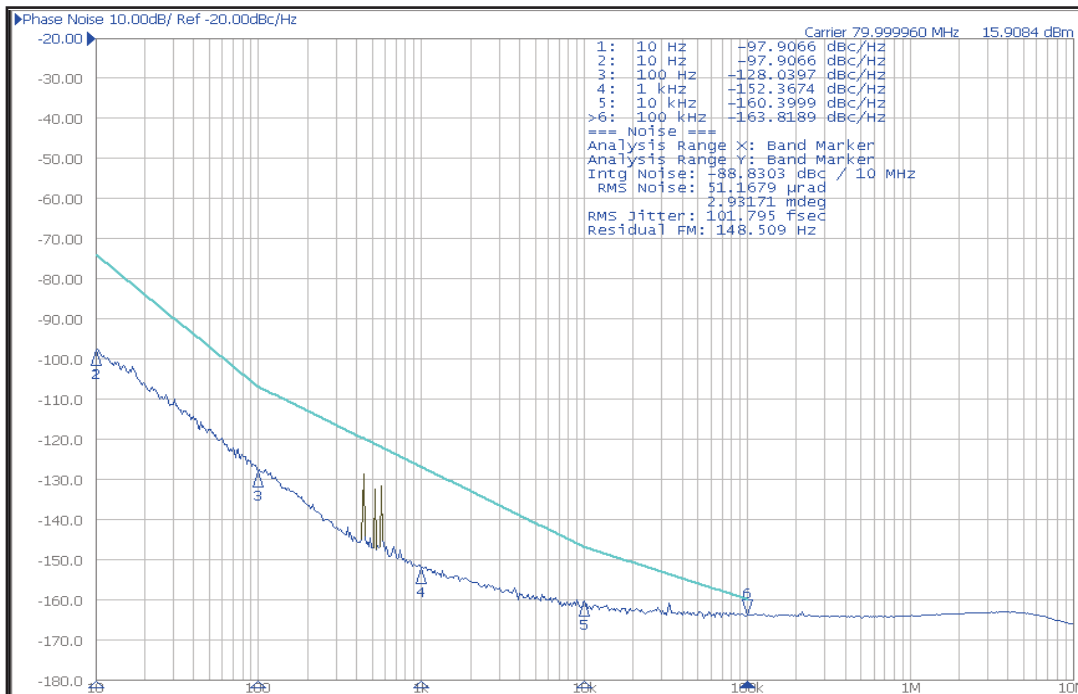
Phase Noise and Phase Jitter Integration

Phase noise is measured in the frequency domain, and is expressed as a ratio of signal power to noise power measured in a 1Hz bandwidth at an offset frequency from the carrier, e.g. 10Hz, 100Hz, 1kHz, 10kHz, 100kHz, etc. Phase noise measurement is made with an Agilent E5052A Signal Source Analyzer (SSA) with built-in outstanding low-noise DC power supply source. The DC source is floated from the ground and isolated from external noise to ensure accuracy and repeatability.

In order to determine the total noise power over a certain frequency range (bandwidth), the time domain must be analyzed in the frequency domain, and then reconstructed in the time domain into an RMS value with the unwanted frequencies excluded. This may be done by converting $L(f)$ back to $S\phi(f)$ over the bandwidth of interest, integrating and performing some calculations.

Symbol	Definition
$\int L(f)$	Integrated single side band phase noise (dBc)
$S\phi(f) = (180/\pi) \times \sqrt{2} \int L(f) df$	Spectral density of phase modulation, also known as RMS phase error (in degrees)
RMS jitter = $S\phi(f) / (f_{osc} \cdot 360^\circ)$	Jitter (in seconds) due to phase noise. Note $S\phi(f)$ in degrees.

The value of RMS jitter over the bandwidth of interest, e.g. 10kHz to 20MHz, 10Hz to 20MHz, represents 1 standard deviation of phase jitter contributed by the noise in that defined bandwidth.



ECO	REV	REVISION SUMMARY	Page
	-	Initial Release	
	A	Added CMOS Output power note, changed picture, removed proprietary	1
		name from outline drawing	2