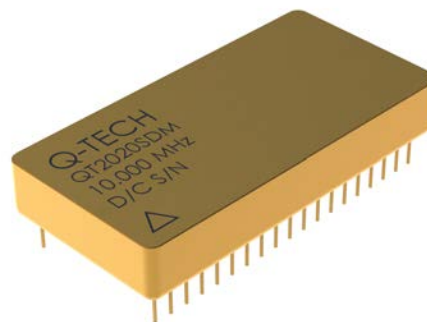


Description

Q-Tech's microcomputer compensated crystal oscillator, MCXO, uses a high stability overtone SC-cut crystal with microprocessor controlled compensation. The self-temperature sensing resonator, using a dual-mode oscillator, virtually eliminates thermometry related errors. As a result, all basic TCXO and OCXO limitations are overcome or significantly reduced in the MCXO.



RAD hard OCXO performance with 90mW maximum power consumption!

Features

- Made in the USA - ECCN: EAR99
- Radiation Tolerant
- Temperature Stability: ± 5 ppb to ± 30 ppb over temperature (see ordering information below)
- Maximum aging: ± 1.5 ppm over 20 years
- DC Power Input: 3.3Vdc, 90 milliwatts max
- Initialization: <5 seconds from power on to full performance
- High reliability signal generator that provides Sine wave or HCMOS output
- Designed to withstand radiation levels up to 50kRad (total dose), high shock, and vibration
- Outputs: 5 to 100MHz, 32.768kHz and 1PPS. Other frequency options available
- Capability to lock to GPS at 1PPS or 10MHz
- Environmental: Inherently rugged design capable of full military screening
- Low Phase Noise and Jitter
- Small Form Factor
- G-Sensitivity 1PPB/G maximum
- Custom design available tailored to meet customer's needs
- Consult factory for additional or tighter specifications
- Q-Tech does not use pure lead or pure tin in its products.
- DFARS 252-225-7014 Compliant:
Electronic Component Exemption
- Technology has 30 year heritage in high reliability military applications

Applications

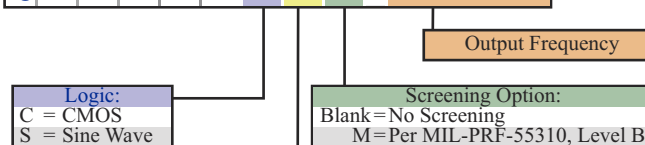
- Satellite terminals
- Underwater monitors
- GPS
- Mobile equipment

Ordering Information

(Sample part number)

QT2020CBM-10.000MHz

Q T 2 0 2 0 C B M - 10.000MHz

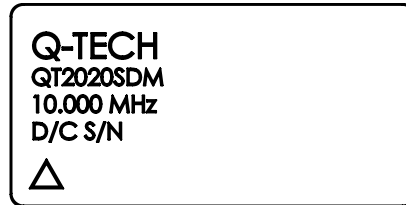
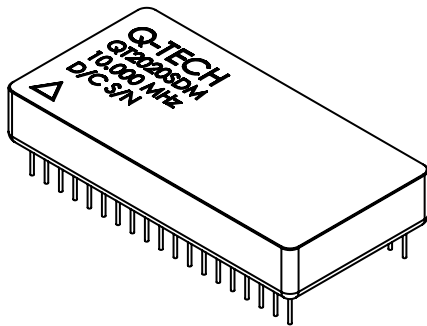


Frequency vs. Temperature Code:	
A	± 5 ppb at 0°C to +50°C
B	± 10 ppb at 0°C to +70°C
C	± 30 ppb at -40°C to +85°C
D	± 20 ppb at -40°C to +85°C
E	± 30 ppb at -55°C to +105°C
F	± 20 ppb at -55°C to +105°C

**For Non-Standard requirements, contact Q-Tech Corporation at
Sales@Q-Tech.com**

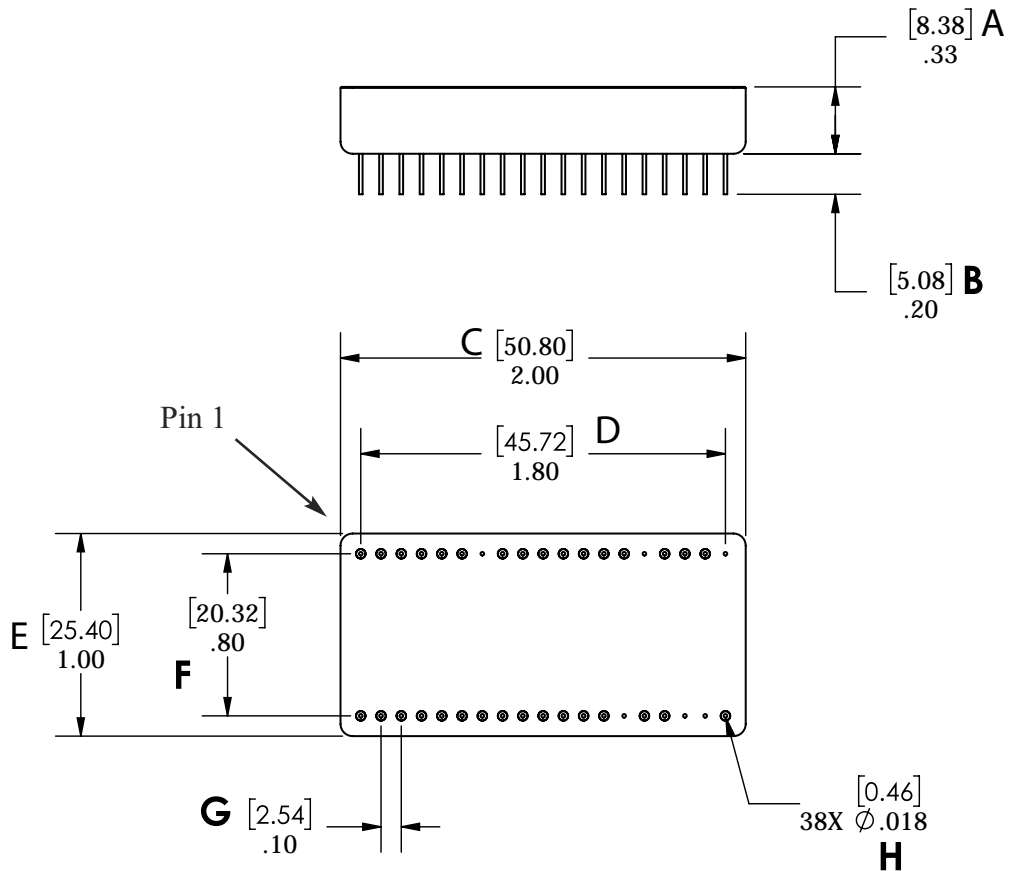
Package Outline and Pin Connections

Dimensions are in [mm] inch



Pin No.	Function
1	Reference Frequency/ 10MHz Synchronization
2, 4, 6, 8, 10, 12, 14 - 18, 22 - 25, 27, 28, 31, 34, 35, 37	N/C*
3, 7, 19, 21, 33	GND / CASE
5	Mode Select
13	1PPS Input
9, 11, 36	Factory Use*
20	Frequency Output
26	Sync 1
30	Sync 2
29	1PPS Output
32	Status
38	Voltage Supply

*PINS MAY HAVE INTERNAL CONNECTION. DO NOT GROUND.

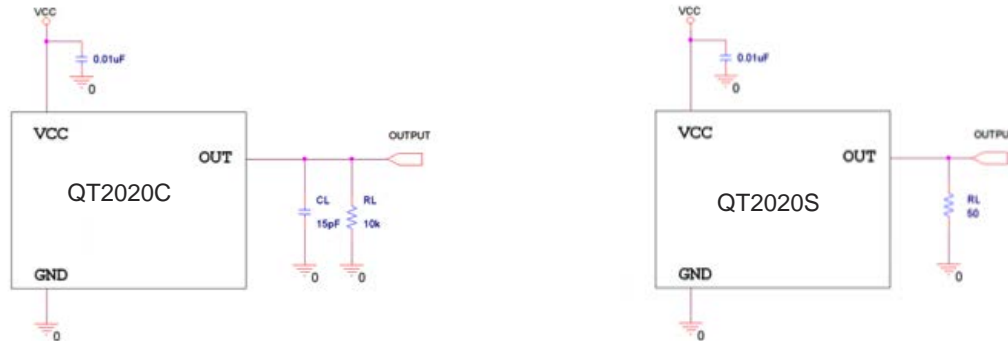


Package Material:

- Material: Kovar
- Finish: 50 μinches gold over nickel plate
- Weight: 50g typical

Pinout Description

Pin #20: Frequency Output. Depends on specification part number, Frequency output can be HCMOS or Sine Wave. HCMOS output has 10 kOhm in parallel with 15pF load. Sine Wave output has 50 Ohm load.



Frequency Output range is 5MHz to 100MHz.

**Pins #3, 7,
19, 21,
33:**

Case Ground. This pin provides negative voltage (0V) to the MCXO. It is connected to the oscillator case to reduce EMI.

Pins #1, 13: Reference Input. This input can be configured as Frequency Correction or Synchronization 10MHz or 1PPS. The configuration is one time programming at the factory according to customer request. In case of Synchronization option, MCXO output will be locked to external signal as soon as it is applied to the input. With no signal applied, the MCXO maintains specified stability over temperature and time. In case of Frequency Correction setup, the MCXO performs one time routine to adjust frequency to reference signal. When signal is provided to the pin, the MCXO starts aging correction routine and synchronizes both frequency and timing mode outputs to the reference signal. The routine takes about 10-15 seconds. After frequency is synchronized, the MCXO continues to operate as normal. In order to perform synchronization again, the reference should be disconnected and connected one more time. Precision of synchronization is +/-5PPB.

Pin #29: 1PPS Output. This output provides 1PPS (1Hz) HCMOS signal. It also can be configured to provide 32.768 kHz HCMOS signal. The configuration is one time programming at the factory according to customer request.

Pin #5: Mode Select. This pin is responsible for MCXO operating modes. If low level (<0.5V) signal is applied to the pin, MCXO will start to operate in Frequency Mode. It will output signal with specified frequency at the pin #20. Pin #29 will be disabled. Power consumption will be according to Frequency Mode specification. If high level (>2.8V) signal is applied to the pin, MCXO will start to operate in Timing Mode. It will output 1PPS or 32.768 kHz signal at Pin #29. Power consumption will be according to Timing Mode specification. Pin #20 will be disabled.

Pins #26, 30: Synchronization Options. See Table II for detailed synchronization options. All operations are performed while in 'Frequency Mode' (See Pin #5, Mode Select).

Pin #32: Status. Status output has low level signal during normal operation. It provides low frequency signal (2-4Hz) for 5-10 seconds after power is applied to Pin #38. It goes high during aging correction routine. It also goes high in case of MCXO malfunction. It can be connected to LED to indicate MCXO status.

Pin #38: Voltage Supply. This pin provides positive voltage (3.3V) to the MCXO. Minimum value of bypass capacitor is 2.2uF. It has to be installed close to Pin #38.

Other Pins: Not Connected. Leave these pins not connected. They have internal functions and grounding them may lead to MCXO malfunction.

Contact factory for deviations from the standard functions and operation.

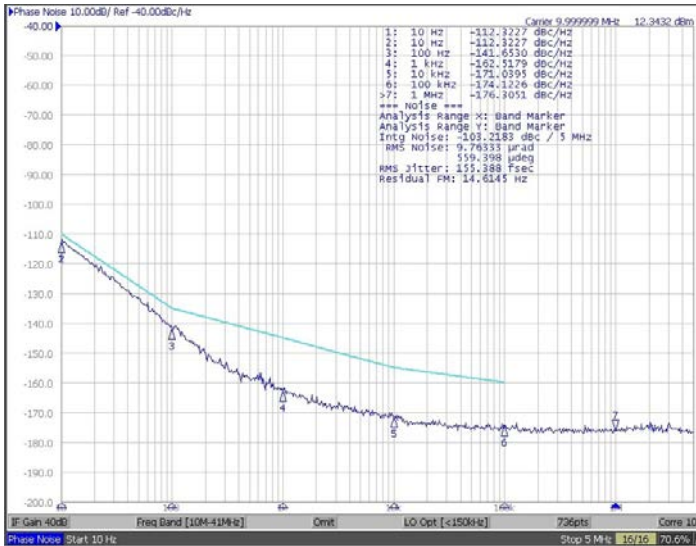
Table I - Electrical Characteristics

Parameters	Symbol	Conditions	Value	Unit
Frequency Mode Parameters				
Frequency Range	fo		5.000 - 100.000	MHz
Supply Voltage, Nominal	Vs	Vs ± 5%	3.3	V
Power Consumption (max.)	Ps	Vs, nom. / Ta = +25°C (No Load)	90	mW
Nominal Tolerance	Fnom	Vs, nom. / Ta = +25°C	±10	ppb
Freq. Stability vs Temperature	Δf/fc (Ta)	See Ordering Codes on Page 1		ppb
Frequency Stability vs Load Variation	Δfl	HCMOS 10kΩ//15pF ±5% Load Change	SINE WAVE 50Ω ± 5%	±20 ppb
Frequency Stability vs Voltage Supply Variation	Δfv	±5% Input Voltage Change		±20 ppb
Aging (max.)	Δf/fo	Per Day Over 10 Years Over 20 Years	±1.0 ±1.0 ±1.5	ppb ppm ppm
Output Waveform			HCMOS 3.3V	SINE WAVE 3 ± 3dBm
Symmetry		Over Operating Temperature	50 ± 5	%
Rise/Fall Time (max.)		Over Operating Temperature	3	nsec
Startup Time (max.)		Over Operating Temperature	20	nsec
Stabilization Time (max.)		Over Operating Temperature	3	sec
Phase Noise (10MHz)		10Hz	-110	dBc/Hz
		100Hz	-135	dBc/Hz
		1kHz	-150	dBc/Hz
		10kHz	-163	dBc/Hz
		100kHz	-168	dBc/Hz
Phase Noise Jitter		1kHz to 20MHz	1	psec
Spurious (max.)		Over Operating Temperature, >1kHz offset	-100	dBc
Aging Adjustment (10MHz ref.)		Ta = +25°C, stable environment	±0.02	ppm
Timekeeping Mode Parameters				
Frequency, Nominal	Ft	Over Operating Temperature	1	PPS
Power Consumption (max.)	Ps	Vs, nom. / Ta = +25°C (No Load)	90	mW
Freq. Stability vs Temperature	Δf/Ft (Ta)	See Ordering Codes on Page 1		ppb
Output Waveform			HCMOS 3.3V	
Symmetry		Over Operating Temperature	50 ± 5	%
Rise/Fall Time (max.)		Over Operating Temperature	100	nsec
Startup Time (max.)		Over Operating Temperature	500	msec
Stabilization Time (max.)		Over Operating Temperature	3	sec
Period Jitter			5	nsec

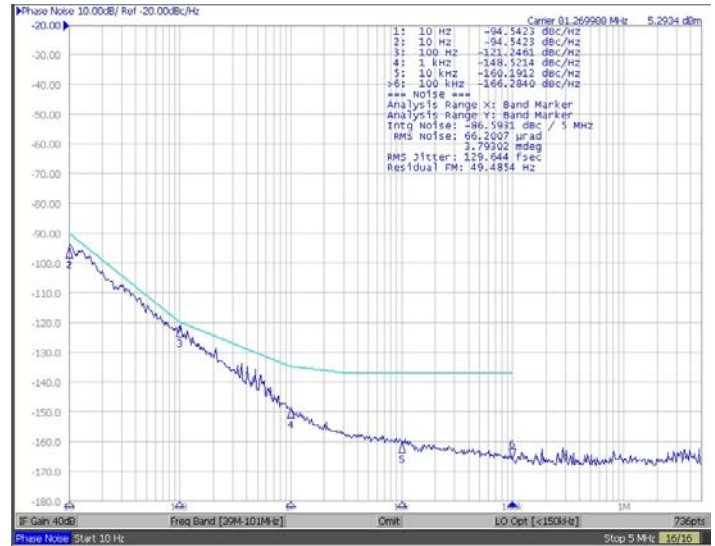
Table II - Synchronization Options

Synchronization Options			
Pin #	26	30	Mode
Function	Sync 1	Sync 2	All operations performed in 'Frequency Mode' (Pin #5)
Logic Level	0	0	Aging adjustment when signal present on Pin#1
	0	1	Output frequency locked to 10MHz signal on Pin#1
	1	0	Output frequency locked to 1PPS signal on Pin#13
	1	1	Reference signals ignored

Phase Noise Plots



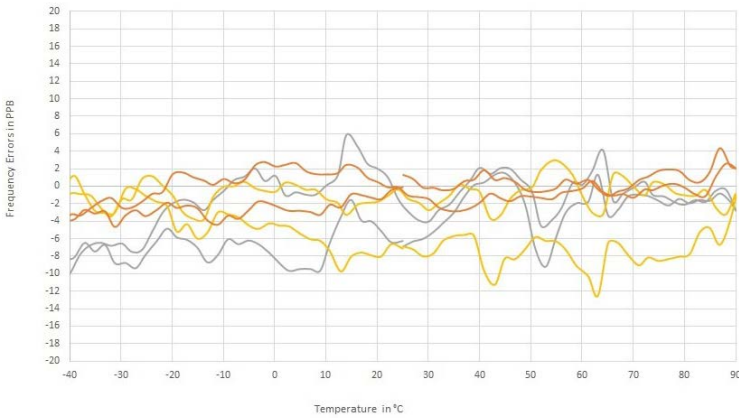
QT2020CD-10.000MHZ



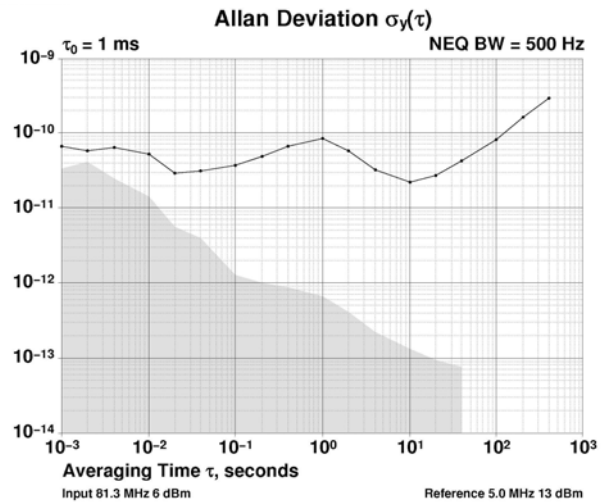
QT2020SD-81.270MHZ

Temperature Stability

Temperature Stability Test



Allan Deviation





Revision History

REV	DCO	REVISION SUMMARY	Page	Date
PRELIM	7907	Preliminary Release		03/07/2018
PRELIM 2	8034	Changed to ECCN: EAR99 Additions to the 'Features' section on Page 1 Added/revised Pinouts (1, 13, 25, 27), added/revised Pinout Descriptions, and added Table II for Synchronization Options	1	03/28/2018
PRELIM 3	8902	Revise pinouts table (Sync 1 and Sync 2 have new pinouts) Revise Revision Summary to track changes between Preliminary revisions	1	10/01/2018
PRELIM 4	9062	Add new page (2) and move package outline previously on page 1 Package outline updated: Package Height ('A'): .325 inches to .33 inches Pin Length ('B'): .25 inches to .20 inches Pin Diameter ('H'): .047 inches to .018 inches Pins 7, 15, 19, 21, 22, and 25 are now drawn correctly	1, 2	11/7/2018
		Add package render to page 1	1	
		Revise pinout numbering in 'Pinout Description' and Table II to match new sync pinouts	3, 4	