



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.

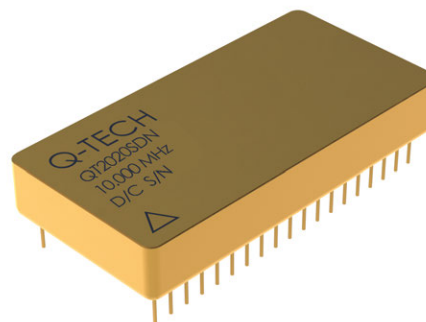
RAD tolerant OCXO performance with 90mW maximum power consumption!

Features

- Made in the USA - ECCN: 9A515.e.1
- Radiation Tolerant to 50kRad (Si)
- Temperature Stability: ± 10 ppb to ± 30 ppb over temperature (see ordering information)
- Maximum aging: ± 1.5 ppm over 20 years
- DC Power Input: 3.3Vdc, 90 milliwatts max
- Initialization: <30 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
- Tested for Single Event Latch-up to 75MeV-cm²/mg (QT2021)
- Outputs: 5 to 80MHz and 1PPS. Other frequency options available
- Capability to sync to GPS at 1PPS or 10MHz
- Environmental: Inherently rugged design capable of full military screening
- Low Phase Noise and Jitter
- Small Form Factor
- MIL-PRF-55310, Class 3 device (Discrete and Hybrid Technology)
- 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
- Breadboard and Engineering models built to requirements of Q-Tech document F1297, Definitions for PCB Based Product Development Levels

Applications

- Low Earth Orbit Space



Ordering Information

(Sample part number)

QT2020CBN-10.000MHz

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

Type:
 0 = 50kRad(Si) TID
 50kRad(Si) TID
 1 = and SEL immune to
 75 MeV-cm²/mg

Logic:
 C = CMOS
 S = Sine Wave

Output Frequency

Screening Option:
 B = Breadboard Model
 E = Engineering Model
 N = MIL-PRF-55310, Level B
 (modified)

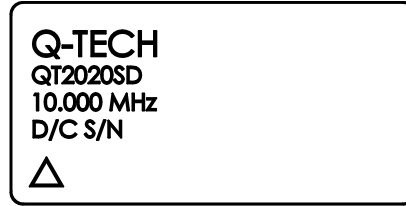
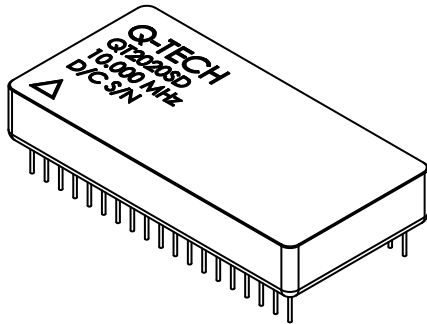
Frequency vs. Temperature Code:
 B = ± 10 ppb at 0°C to +70°C
 C = ± 30 ppb at -40°C to +85°C
 D = ± 20 ppb at -40°C to +85°C

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

Standard Frequencies

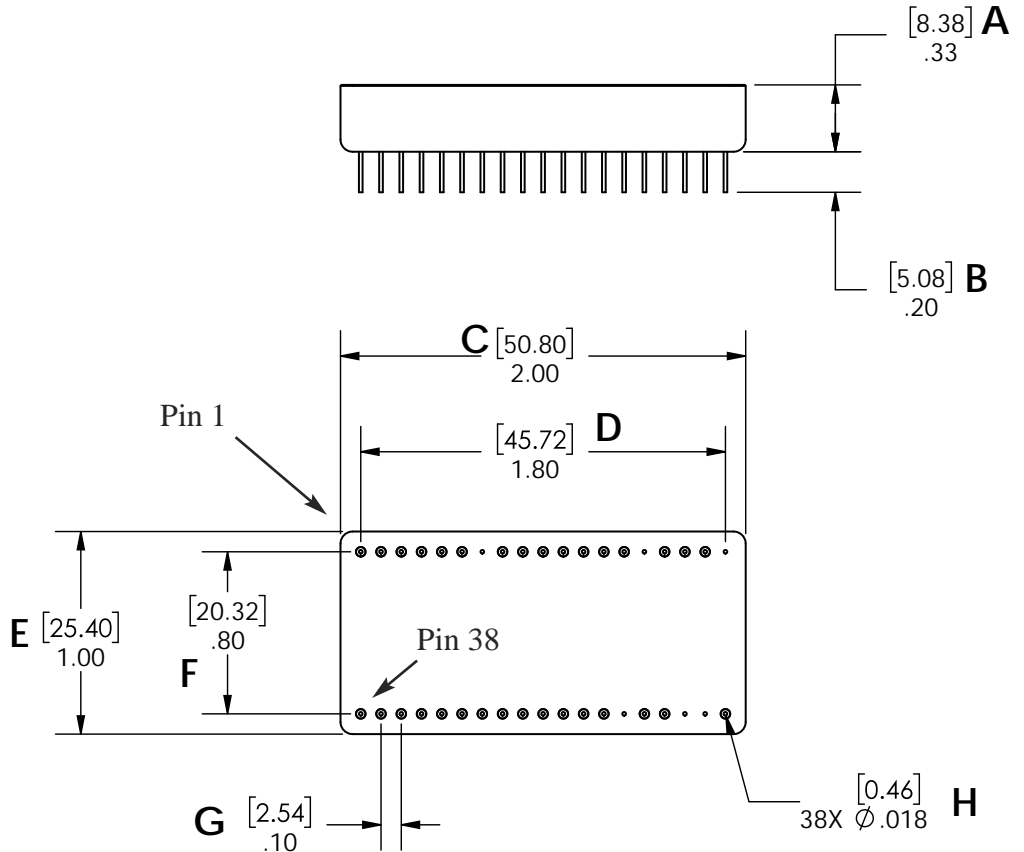
10MHz, 20MHz, 30MHz, 40MHz,
50MHz, 60MHz and 80MHz

Figure 1 - Package Outline and Pin Connections
 Dimensions are in [mm] inch



Pin No.	Function
1	Reference Frequency/ 10MHz Synchronization
2, 4, 8, 10, 12, 14, 16, 17, 18, 23, 24, 27, 28, 31, 34, 35, 37	N/C*
3, 6, 7, 15, 19, 21, 22, 25, 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

Installation Note:

- Care should be taken during installation of the MCXO. Hand soldering is recommended to avoid reflow of internal components and damage to the unit.

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 80MHz.

Pins #3, 7,

19, 21, Case Ground. This pin provides negative voltage (0V) to the MCXO. It is connected to the oscillator case to reduce EMI.
33:

Pins #1, 13: Reference Inputs. These inputs can be configured as Frequency Correction or Synchronization 10MHz or 1PPS. In the case of the Synchronization option, MCXO output will be frequency locked (FLL) to an 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 the case of the Frequency Correction option (Logic (0, 0)), 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.

For the Synchronization option (Logic (1, 0) - Output Frequency locked to 1PPS signal on Pin #13), the MCXO output will be frequency locked (FLL) to the external 1PPS signal as soon as it is applied to the input. With no signal applied, the MCXO maintains the specified stability over temperature and time.

Pin #29: 1PPS Output. This output provides 1PPS (1Hz) HCMOS signal.

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 provide 1PPS output. 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 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.



1 APPLICABLE DOCUMENTATION & REFERENCES

1.1 The following documents form a part of this drawing to the extent specified or modified herein.

1.2 Military & Industry

- 1.2.1 MIL-PRF-55310, Oscillator, Crystal Controlled, General Specification for
- 1.2.2 MIL-O-55310, Oscillator, Crystal Controlled, General Specification for
- 1.2.3 MIL-PRF-38534, Microcircuit Manufacturing, General Specification for
- 1.2.4 MIL-PRF-38535, Integrated Circuits, (Microcircuits) Manufacturing, General Specification for
- 1.2.5 MIL-PRF-19500, Semiconductor Devices, General Specification for
- 1.2.6 MIL-STD-202, Test Methods for Electronic and Electrical Component Parts
- 1.2.7 MIL-STD-750, Test Methods for Semiconductor Devices
- 1.2.8 MIL-STD-883, Test Methods and Procedures for Microelectronics
- 1.2.9 MIL-STD-1686, Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment
- 1.2.10 IPC-J-STD-001 Requirements for Soldering Electrical and Electronic Assemblies
- 1.2.11 ANSI/ASQ Q9001 (ISO 9001), Quality Management Systems – Requirements

1.3 Q-Tech

- 1.3.1 0401-00287-0000, General Specification For Assembling PC Boards
- 1.3.2 0401-00035-0001, General Specification For Metallic Hybrid Packages, Product Assurance Level S/K
- 1.3.3 F1297, Definitions for PCB Based Product Development Levels

1.4 Order of Precedence

In the event of conflict between this document and the references cited herein or other requirements, the precedence in which requirements shall govern, in descending order, is as follows:

- a) Applicable Customer Detail SCD and/or Detail Drawing
- b) Applicable Q-Tech Corporation Detail SCD/Drawing
- c) Applicable Q-Tech Corporation General SCD
- d) Other Specifications, Standards, and Documentation Referenced Above

1.5 Customer Purchase Order Special Requirements

Additional special requirements may be specified in the applicable customer purchase order when additional requirements or modifications are needed for compliance to special programs or product line compliance. Unique identification of the items produced may be required.

2 GENERAL REQUIREMENTS

2.1 Approved Source of Supply

Crystal oscillators shall be supplied from the manufacturer specified in “Source of Supply” below.

2.2 Design and Construction

2.2.1 Component Selection

Devices are manufactured using COTS and automotive components.

2.2.1.1 Active Components - Single Event Latch-up

The parts manufactured using active components that have been tested for Single Event Latch-up (SEL). QT2020 is SEL immune up to <29MeV-cm²/mg. QT2021 is SEL immune up to 75MeV-cm²/mg.

2.2.2 **Outline Dimensions and Terminal Connections**

The outline dimensions and terminal connections shall be as shown in Figure 1 herein. Pinout descriptions shall be specified in the *Pinouts Description* page herein.

2.2.3 **Package Body and Finish**

The MCXO chassis and covers shall be Kovar, gold plated.

2.2.4 **Weight**

The weight of the device shall not exceed 50g (typ.).

2.2.5 **Element Selection**

All Passive elements except tantalum capacitors shall meet requirements of MIL-PRF-55310. All active components and tantalum capacitors shall provide adequate performance of the MCXO when oscillator screened according to MIL-PRF-55310.

2.2.6 **Element Derating**

All active and passive elements shall be derated in accordance with the applicable requirements of MIL-PRF-55310. Elements shall not operate in excess of derated values.

2.2.7 **Quartz Crystal**

Quartz crystal material for dual mode oscillator shall be swept synthetic, grade 2.2 or better. The crystal element shall be three-point minimum mounted in such a manner as to assure adequate crystal performance when the oscillator is subjected to the environmental conditions specified herein.

Quartz crystal for VCXO module can be lower grade with 2-point mount construction.

2.2.8 **Prohibited Metals**

All metals (internal as well as external) shall be such that they will not promote the growth of whiskers, dendrites, intermetallic formation or Kirkendall voids, corrosion, and shall not sublime in the intended application conditions. Mercury, zinc, cadmium and selenium are prohibited. Alloys and brazing materials containing cadmium or zinc shall not be used without overplating. Pure tin (greater than 97% by weight) is prohibited. Tin shall be alloyed with a minimum of 3% lead (Pb) by weight.

2.2.9 **Materials Requirements**

All nonmetallic and organic materials shall exhibit a Total Mass Loss (TML) of not more than 1.0 percent and a Collected Volatile Condensable Material (CVCMM) of not more than 0.1 percent. Data listed in the NASA Reference Publication 1124 for applicable materials may be used in lieu of actual testing. Materials having an out-gassing characteristic in excess of these limits shall require approval.

2.3 **Performance Requirements**

2.3.1 **Maximum Ratings**

The maximum ratings shall be as specified in Table I herein.

2.3.2 **Electrical Performance Characteristics and Limits**

The electrical performance requirements and limits shall be in accordance with Table II herein.

2.3.3 **Total Dose Radiation Limits**

Crystal oscillators supplied in accordance with this detail SCD shall be capable of meeting the performance requirements after being exposed to 50 kRad(Si) total dose radiation levels.

2.3.4 **Engineering Model (EM) Oscillators**

The requirements for the EM oscillators shall be as follows:

- a) Design and manufacturing processes shall be identical to the flight units
- b) Finished units shall be functional over the operating temperature range.
- c) Screening test and/or Qualification Conformance Inspection is not required

3 **QUALITY ASSURANCE PROVISIONS**

3.1 **Responsibility for Inspection/Test**

Supplier shall be responsible for the performance of all inspections and tests specified herein and assure that the MCXO is in compliance with requirements set forth in this specification.

3.1.1 **Test Equipment and Inspection Facilities**

During testing, supplier shall assure that test and measuring equipment be capable of sufficient accuracy for required testing. All such equipment shall be controlled by a calibration system in accordance with ISO-10012-1 and ANSI-Z-540-1-1994.

3.2 **Classification of Tests and Inspections**

- a) Screening - MIL-PRF-55310, Level B (modified, see Table V)
- b) Group A Inspection (see Table VI)
- c) Group B Inspection (see Table VII)
- d) Group C Inspection (see Table VIII)

3.3 **Acceptance Test**

Each Flight Production Model MCXO delivered in accordance to this document shall have been subjected to and passed screening tests prior to delivery when specified by the purchase order. Screening and testing will be performed per an approved acceptance test procedure.

3.4 **Group A Inspection**

When specified on the purchase order, Group A Inspection shall be in accordance with MIL-PRF-55310 with the parameters defined in Table IV and Table VI.

3.5 **Group B Inspection**

Group B Inspection (Aging test) shall be in accordance with MIL-PRF-55310, and as specified in Table VII.

3.6 **Group C Inspection**

When specified on the purchase order, Group C Inspection shall be in accordance with MIL-PRF-55310 with the parameters defined in Table VIII.

3.7 **Deliverable Documentation**

3.7.1 **Data Package**

One copy of the test data report shall be delivered with each MCXO. The report shall include the test data sheets recorded during the test program, failure reports and analysis (if applicable), deviations and waivers (if applicable.) The test data report shall be traceable to the oscillator it represents.

3.7.2 **Certificate of Conformance**

A Certificate of Conformance shall be provided as part of the delivered documentation.

3.7.3 **Parts List**

An As-Designed Parts, Materials and Processes List (ADPMPL) and an As-Built Parts, Materials and Processes List (ABPMPL) shall be created and delivered in Microsoft Excel or other approved format. The ADPMPL shall be provided prior (60 days minimum) to the start of assembly of the first lot of parts and the ABPMPL shall be delivered with the Flight lot.

3.8 **Manufacturing Changes**

No changes shall be made to the design that affects the quality, reliability or electrical interchangeability of the devices without written notification and approval of the procurement authority of customer.



3.9 **Source Inspection**

The customer may choose to perform Source Inspection (Precap and Final).

3.10 **Counterfeit Parts Prevention**

Parts traceability to the original manufacturer or authorized distributor shall be provided.

4 **PREPARATION FOR DELIVERY**

4.1 **Preservation, Packaging, and Packing**

Crystal oscillators shall be prepared for delivery in accordance with MIL-PRF-55310.

4.2 **Electrostatic Discharge Sensitivity**

The devices supplied to this detail SCD shall be considered to be electrostatic discharge sensitive and require further protection and shall use one of the packaging requirements in accordance with MIL-PRF-38534, Category A, Section 5.

5 **MARKING**

5.1 Marking may be accomplished with permanent ink.

5.1.1 Ink shall meet outgassing and marking permanency requirements for space applications.

5.2 The MCXO shall be marked with the following information:

5.2.1 Supplier Name and or Cage Code

5.2.2 Part Number

5.2.3 Lot Date Code

5.2.4 Serial Number

Table I - Maximum Ratings

Parameters	Symbol	Conditions	Min	Max.	Unit
Maximum Applied Voltage	Vs		0	5.5	V
Operating Temperature Range	Top		-40	+85	°C
Storage Temperature Range	Tstg		-55	+105	°C
Thermal Resistance	θJC			38.5	°C/W
Thermal Resistance	θJB			94.5	°C/W
Junction Temperature				+88.5	°C

Table II - Electrical Characteristics

Parameters	Symbol	Conditions	Value	Unit	
Frequency Mode Parameters					
Frequency Range	fo		5.000 - 80.000	MHz	
Supply Voltage	Vs		3.3 ± 5%	V	
Power Consumption (max.)	Ps	Vs, nom. / Ta = +25°C (No Load)	90	mW	
Initial Accuracy	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 Voltage/Output Power			HCMOS 3.3V	SINE WAVE 3 ± 3dBm	
Output Waveform Symmetry		Over Operating Temperature	50 ± 10	N/A	%
Rise/Fall Time (max.)		Over Operating Temperature	3	N/A	nsec
Startup Time (max.)		To Output, Over Operating Temperature	20		msec
Stabilization Time (max.)		To Frequency vs. Temperature Stability Over Operating Temperature	30		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)	70		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	30		sec
Period Jitter			5		nsec



Table III - 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

Table IV - Test Matrix

Requirements	Initial Electrical Test @ +25°C	Pre-Burn-in Testing @ +25°C	Final Electrical Test @ +25°C	Final Electrical Test @ Low Temperature	Final Electrical Test @ High Temperature	Group A Testing (min, max and 25°C) (Note 1, 3)
Initial Accuracy	N	N	N, E, B			N
Temperature Stability			N, E, B (Note 2)			N (Note 2)
Phase Noise			N, E, B			N
Spurious (Sine Wave, CMOS)			N, E, B			N
Harmonics (Sine Wave)			N, E, B			N
Stability vs. Voltage Variation			N, E, B			N
Stability vs. Load Variation			N, E, B			N
Output Wave Form Symmetry (CMOS)	N	N	N, E, B	N, E (Note 4)	N, E (Note 4)	N
Output Voltage (CMOS)	N	N	N, E, B	N, E (Note 4)	N, E (Note 4)	N
Rise and Fall Time (CMOS)	N	N	N, E, B	N, E (Note 4)	N, E (Note 4)	N
Output Power (Sine Wave)	N	N	N, E, B	N, E (Note 4)	N, E (Note 4)	N
Start-up Time			N, E, B	N, E (Note 4)	N, E (Note 4)	N
Power Consumption	N	N	N, E, B	N, E (Note 4)	N, E (Note 4)	N
Stabilization Time			N, E, B			N

B = Breadboard Model Units
 E = Engineering Model Units
 N = Flight Model Units, Screening Option N

Notes:

1. Group A shall not be tested for Screening Option N unless specified on the Purchase Order.
2. Frequency stability over temperature verification shall be performed over the specified operating temperature range.
3. Parameters tested as part of Final Electrical Tests are not required to be re-tested as part of Group A.
4. Parameters tested as part of Final Electrical Tests are required to be tested over the specified operating temperature range.

Table V - Screening (Screening Option N)

Subgroup	MIL-STD	Method	Condition	Comments
Initial Electrical Test	Refer to Tables II and IV			
Thermal Shock	202	107	A-1	25 cycles from -55°C to +85°C
Pre Burn-in Electrical Test				
Initial Accuracy	55310	4.8.6	25°C	
Power Consumption	55310	4.8.5.1		
Output Waveform	55310	4.8.20		
Output Voltage (CMOS)/Power (Sine)	55310	4.8.21		
Burn-In (Load)	55310	Table II	At max operating temperature for 160 hours	
Final Electrical Test			Refer to Table IV	
Initial Accuracy		4.8.6	25°C	
Frequency Stability vs. Temperature	55310	4.8.10.1	25°C, low and high temperature	
Frequency Stability vs. Voltage Variation	55310	4.8.14	25°C	
Frequency Stability vs. Load Variation	55310	4.8.15	25°C	
Power Consumption	55310	4.8.5.1	25°C, low and high temperature	
Output Waveform	55310	4.8.20	25°C, low and high temperature	
Output Voltage (CMOS)	55310	4.8.21	25°C, low and high temperature	
Rise and Fall Time (CMOS)	55310	4.8.22	25°C, low and high temperature	
Output Power (Sine)	55310	4.8.21	25°C, low and high temperature	
Harmonics (Sine)	55310	4.8.24	25°C	
Spurious (Sine, CMOS)	55310	4.8.25	25°C	
Phase Noise	55310	4.8.17.1	25°C	
Start-up Time	55310	4.8.29	25°C, low and high temperature	
Stabilization Time	55310	4.8.8	25°C	
Fine and Gross Leak	883	1014	A1 and C	
External Visual	883	2009		

Table VI - Group A Inspection (when specified on the Purchase Order)

Test Description	Standard	Condition	Comments
Power Consumption	MIL-PRF-55310	4.8.5.1	
Initial Accuracy	MIL-PRF-55310	4.8.6	
Start-up Time	MIL-PRF-55310	4.8.29	
Stabilization Time	MIL-PRF-55310	4.8.8	
Frequency Stability vs. Temperature	MIL-PRF-55310	4.8.10.1	
Frequency Stability vs. Voltage Variation	MIL-PRF-55310	4.8.14	
Frequency Stability vs. Load Variation	MIL-PRF-55310	4.8.15	
Phase Noise	MIL-PRF-55310	4.8.17.1	
Output Voltage (CMOS)	MIL-PRF-55310	4.8.21.3	
Rise and Fall Time (CMOS)	MIL-PRF-55310	4.8.22	
Duty Cycle (CMOS)	MIL-PRF-55310	4.8.23	
Harmonics (Sine Wave)	MIL-PRF-55310	4.8.24	No Limit Specified, for information purposes only
Spurious (Sine Wave, CMOS)	MIL-PRF-55310	4.8.25	

Table VII - Group B Inspection

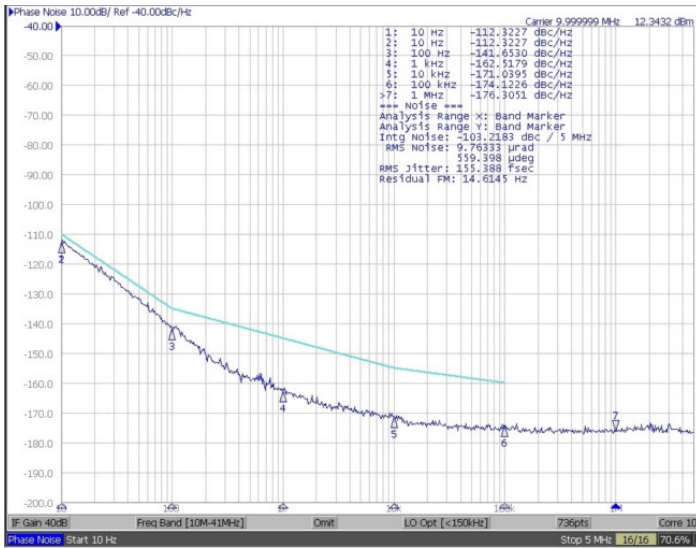
Subgroup	Test	Condition	QTY
1	Frequency Aging	MIL-PRF-55310, Type 7 Aging Projections Calculated Using MIL-O-55310. (Note 1)	100%
2	Final Electrical	Refer to Tables II and IV	100%

Note 1: At the discretion of the supplier, in process aging may be used for Subgroup 1 aging. Aging Projections Calculated Using MIL-O-55310. With consent of customer, aging may be terminated at any time after 10 days (instead of 30 days). Aging is performed at 70°C ± 3°C per MIL-PRF-55310 Para. 4.8.35.2.1.

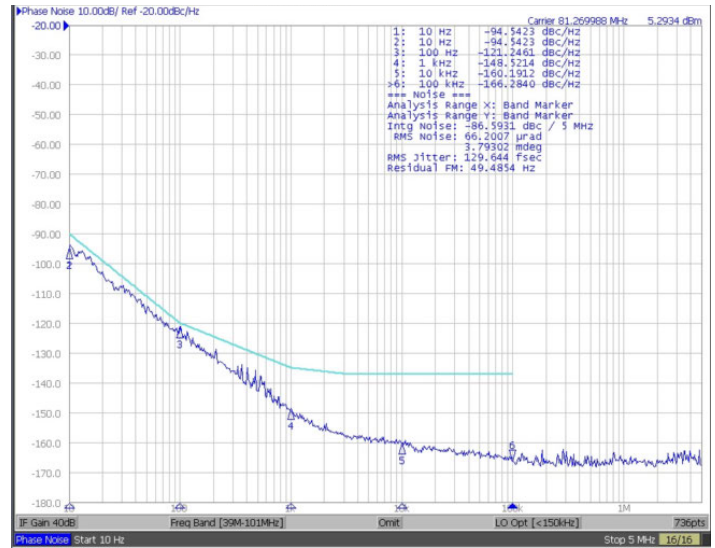
Table VIII - Group C Inspection (when specified on the Purchase Order)

Subgroup	Inspection	Description	Quantity
1	Shock (non-operating)	Per MIL-PRF-55310, Paragraph 4.8.41.1 MIL-STD-202, Method 213, Condition F	All Units
	Random Vibration (non-operating)	Per MIL-PRF-55310, Paragraph 4.8.39.3 MIL-STD-202, Method 214, Condition I-B, 5 minutes per axis	
2	Thermal Shock	Per MIL-PRF-55310, Paragraph 4.8.45 MIL-STD-202, Method 107, Condition A-1, 10 cycles	1/2 Units - B Level
	Ambient Pressure (operating)	Per MIL-PRF-55310, Paragraph 4.8.46.2 MIL-STD-202, Method 105, 8.0E-5 mBar	
	Storage Temperature	Per MIL-PRF-55310, Paragraph 4.8.47	
3	Resistance to Soldering Heat	Per MIL-PRF-55310, Paragraph 4.8.49 MIL-STD-202, Method 210, Condition C	1/4 Units
	Moisture Resistance	Per MIL-PRF-55310, Paragraph 4.8.50 MIL-STD-202, Method 106	
	Salt Atmosphere	Per MIL-PRF-55310, Paragraph 4.8.51 MIL-STD-883, Method 1009, Condition A	
4	Terminal Strength (Lead Integrity)	Per MIL-PRF-55310, Paragraph 4.8.52.2 MIL-STD-202, Method 211, Condition C	1/4 Units
	Resistance to Solvents	Per MIL-PRF-55310, Paragraph 4.8.54 MIL-STD-202, Method 215	

Figure 2 - Typical Phase Noise Plots



QT2020CD-10.000MHZ



QT2020SD-81.270MHZ

Figure 3 - Typical Temperature Stability

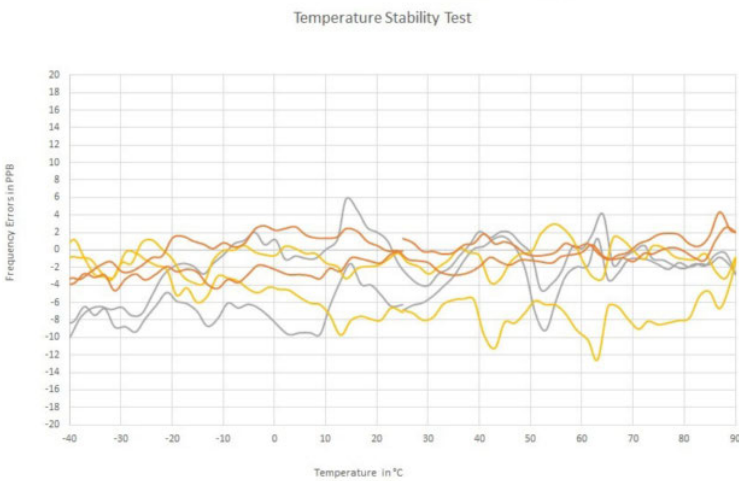
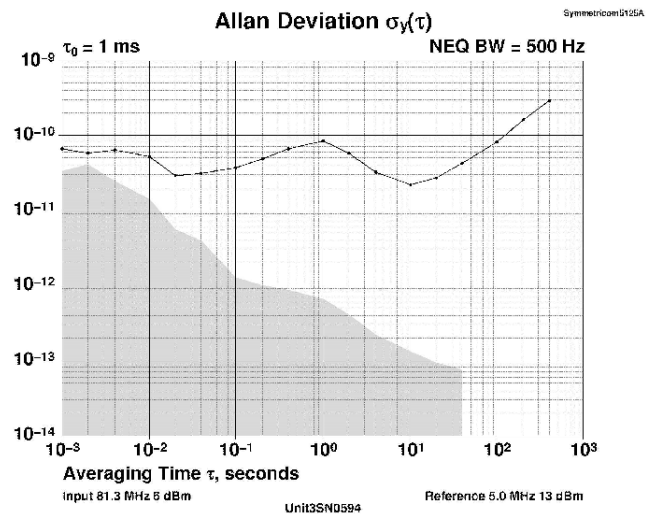


Figure 4 - Typical Allan Deviation



Revision History

REV	DCO	REVISION SUMMARY	Page	Date
-	12522	Revise Stabilization Time to 30 seconds	8	10/16/2020
		Lower Timekeeping power consumption to 70mW	8	
A	13134	Revise Screening Table V to remove thermal vacuum testing (moved to Group A) Thermal vacuum testing is performed as part of Group A (clarified by Table VI, Note 1) Fix Thermal Shock cold temperature. Was -40°C, changed to -55°C to match MIL-STD-202	10	02/23/2021
B	14955	Remove Thermal Vacuum requirements for Group A	9, 10	10/27/2022
		Modify Group B test requirements to match MIL-PRF-55310 Para. 4.8.35.2.1. Changed test temperature from +25°C to +70°C.	11	
		Update Q-Tech Address and Fax Number	All	
		Lower max frequency from 100MHz to 80MHz, remove 32.768kHz	All	
		ECCN changed from EAR99 to 9A515.e.1 Modify 'Applications' Section	11	
		Update Table IV - Test Matrix	All	
		Update all test requirement tables to match parameter nomenclature specified in Table III	All	
		Add screening option N and all accompanying screening tables and requirements Remove screening option M	All	
		Revise duty cycle to 50±10% (was ±5%)	8	
C	16615	Revise verbiage Rad Hard to Rad Tolerant	1	02/14/2023
		Add F1297 to Q-Tech Documents	4	
		Paragraph 2.2 updated to clarify COTS and automotive components are used	4	
D	16773	Removed over temperature testing for pre burn-in in Table IV to match Table V Clarification to tests performed in Final Electrical Tests in Table V	9, 10	03/24/2023
E	17683	Add 'Type' Ordering option. Add QT2021 option	1	08/14/2023
		Add Par. 2.2.1.1 for Single Event Latch-up performance of the active devices in QT2020/QT2021	4	
F	18071	Correct/clarify GND and NC pins Add Installation Note for hand soldering recommendation	2	10/06/2023
		Make clarifications for Reference Inputs on Pins #1, 13 Add clarification to Pin #5 (Mode Select) for functionality of Pin #29 in Frequency Mode	3	
		Add CMOS to Spurious parameter on Test Matrix/Tables	9, 10, 11	