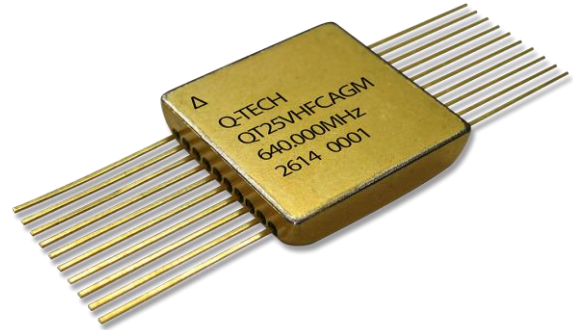


## Description

Q-Tech QT25VHF is a hybrid Voltage Controlled Lamb Wave Oscillator, which provides superior performance at operating frequencies from 400MHz to 1.3GHz. QT25VHF delivers low phase noise, -135 dBc/Hz at 10 kHz offset and -168 dBc/Hz noise floor, and an Absolute Pull Range (APR) of  $\pm 15$ ppm for all conditions. Typical vibration sensitivity is less than 2ppb/g.



## Features

- Made in USA
- Hermetically sealed packages
- Supply voltages 3.3Vdc, 5.0Vdc, and 12.0Vdc
- Temperature Range of -55°C to +125°C
- APR of  $\pm 15$ ppm for all conditions
- Screened and Quality Conformance Inspection to MIL-PRF-55310, Level B
- Sine Wave output
- Low phase noise and jitter
- Low vibration sensitivity <2ppb/g

## Applications

- Military and defense systems

## EAR Destination Control Statement

This product and related technical data are subject to the EAR as promulgated and implemented by the U.S. Department of Commerce Bureau of Industry and Security. This product and related technical data are controlled under Export Control Classification Number (ECCN) 9A515.e.1 of the Commerce Control List (CCL), and may not be exported, re-exported, or re-transferred outside of the U.S. or released or disclosed to Foreign Persons, as defined by the EAR, without first complying with all applicable U.S. Export Regulations.

## Ordering Information

For non-standard requirements, email Q-Tech Corporation at [Sales@Q-Tech.com](mailto:Sales@Q-Tech.com)

**Sample Part Number: QT25VHFCAGM-640.000MHz**

Series/ Package	Output and Supply Voltage	Stability Option	Temperature Options	Screening Level		Frequency
<b>QT25VHF</b>	<b>C</b>	<b>A</b>	<b>G</b>	<b>M</b>	<b>-</b>	<b>640.000MHz</b>
QT25VHF (straight leads)	D = 12Vdc $\pm$ 5%	A = $\pm$ 50ppm	E = -40°C to +85°C	BLANK = Unscreened	-	400MHz to 1.3GHz
QS25VHF (straight leads with solder dip)	C = 5Vdc $\pm$ 5%	B = $\pm$ 35ppm	F = -20°C to +70°C	M = Screening per MIL- PRF-55310, Level B		
QT27VHF (lead formed)	L = 3.3Vdc $\pm$ 5%	C = $\pm$ 20ppm	G = -55°C to +125°C			
QS27VHF (lead formed with solder dip)						

## Temperature Stability Code Availability

Temperature Range	Available Stability Options		
	$\pm$ 20ppm	$\pm$ 35ppm	$\pm$ 50ppm
-20°C to +70°C	✓	✓	✓
-40°C to +85°C	—	✓	✓
-55°C to +125°C	—	—	✓
✓ = Available — = Not Available			

## Packaging Options

- Standard ESD packaging

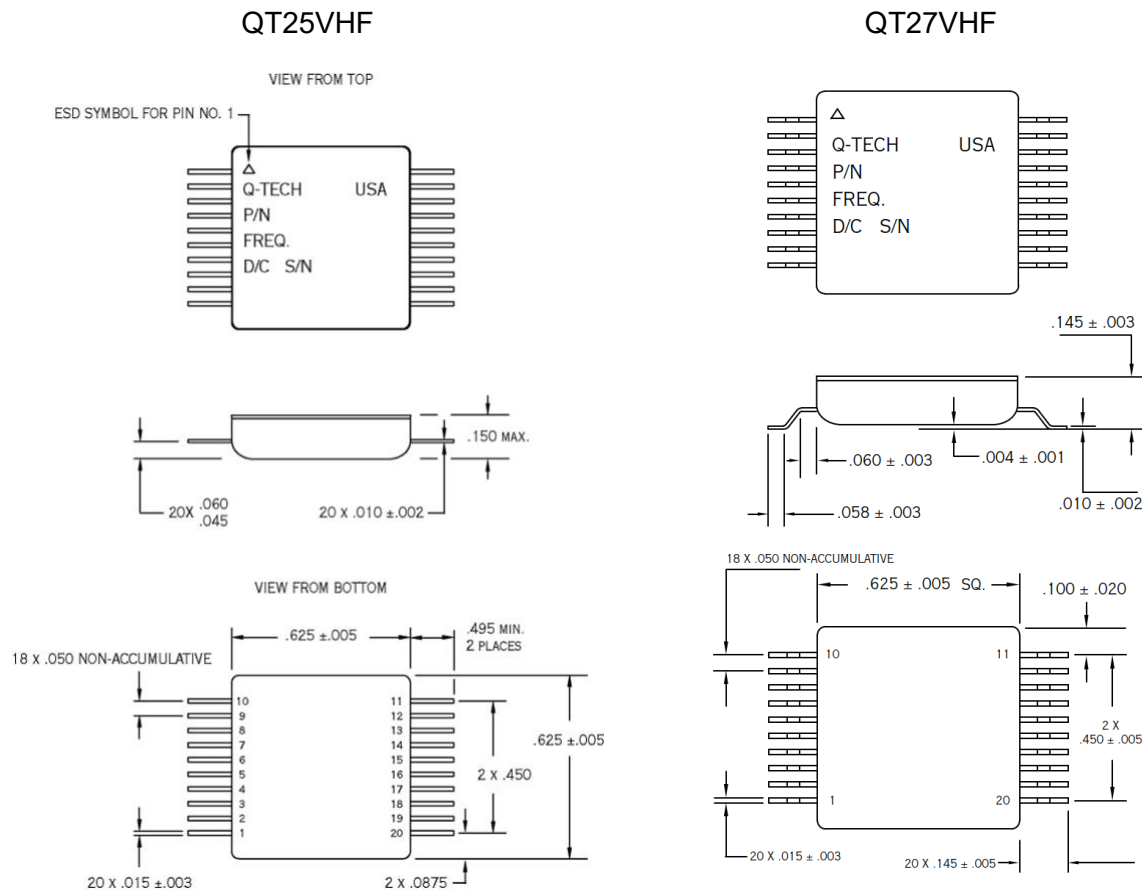
## Additional Options Available (with Additional Charge)

- Hot Solder Dip Sn60Pb40 per MIL-PRF-55310 (QS ordering option)
- Phase Noise test (Static and under vibration)
- Jitter test

**Specifications subject to change without prior notice.**

## Package Outline and Pin Connections

Dimensions are in inches



## Terminal Connections

Pin No.	Function	Pin No.	Function
1	Vc	10	GND/Case
2	GND/Case	11	GND/Case
3	GND/Case	12	GND/Case
4	GND/Case	13	GND/Case
5	GND/Case	14	GND/Case
6	GND/Case	15	GND/Case
7	GND/Case	16	GND/Case
8	Output	17	GND/Case
9	GND/Case	18	Vcc

## Package Information

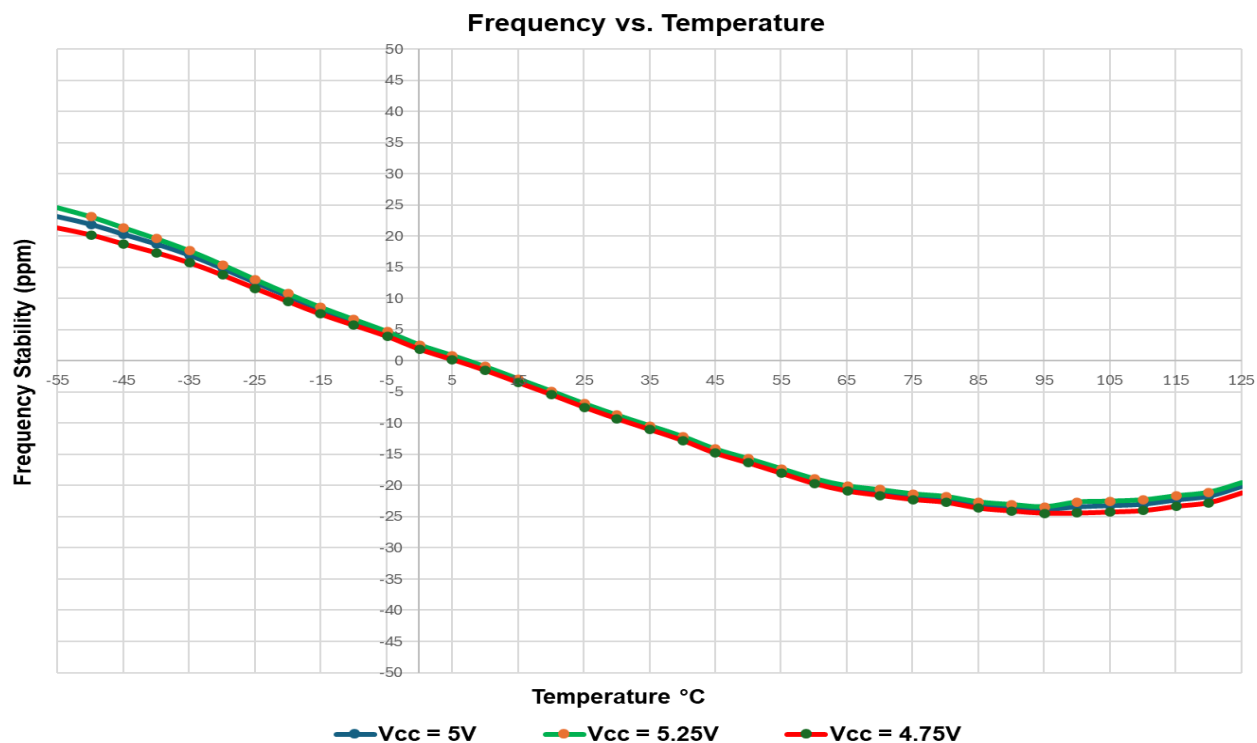
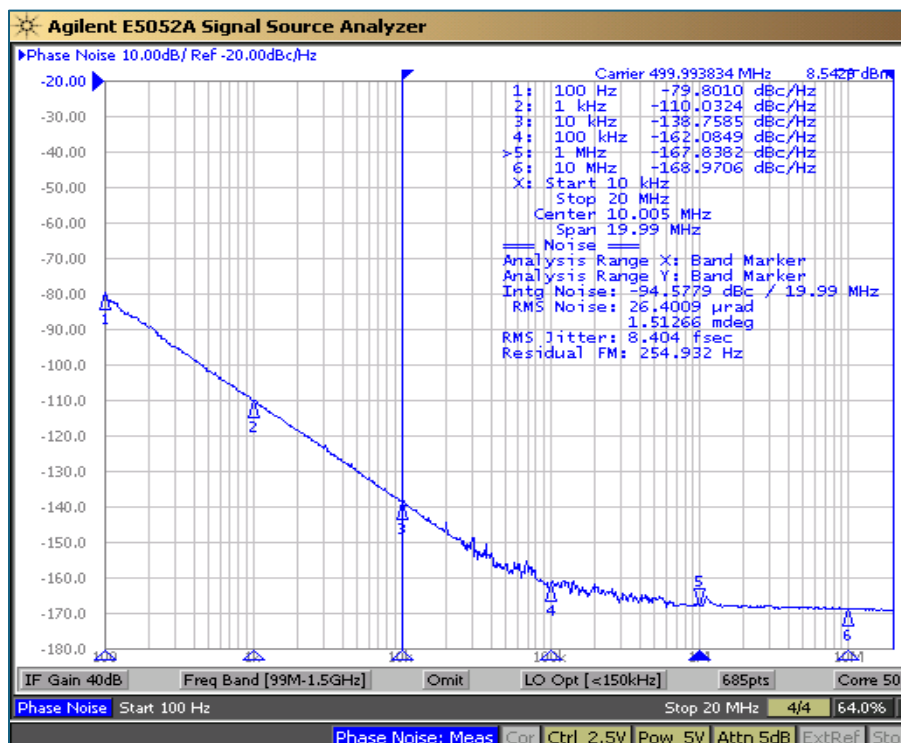
- 20 Pin Flat-Pack (.625" x .625")
- Package body and lead finish: Gold per MIL-PRF-38534
- Weight: Less than or equal to 6 grams
- ESD Class 1A (HBM)

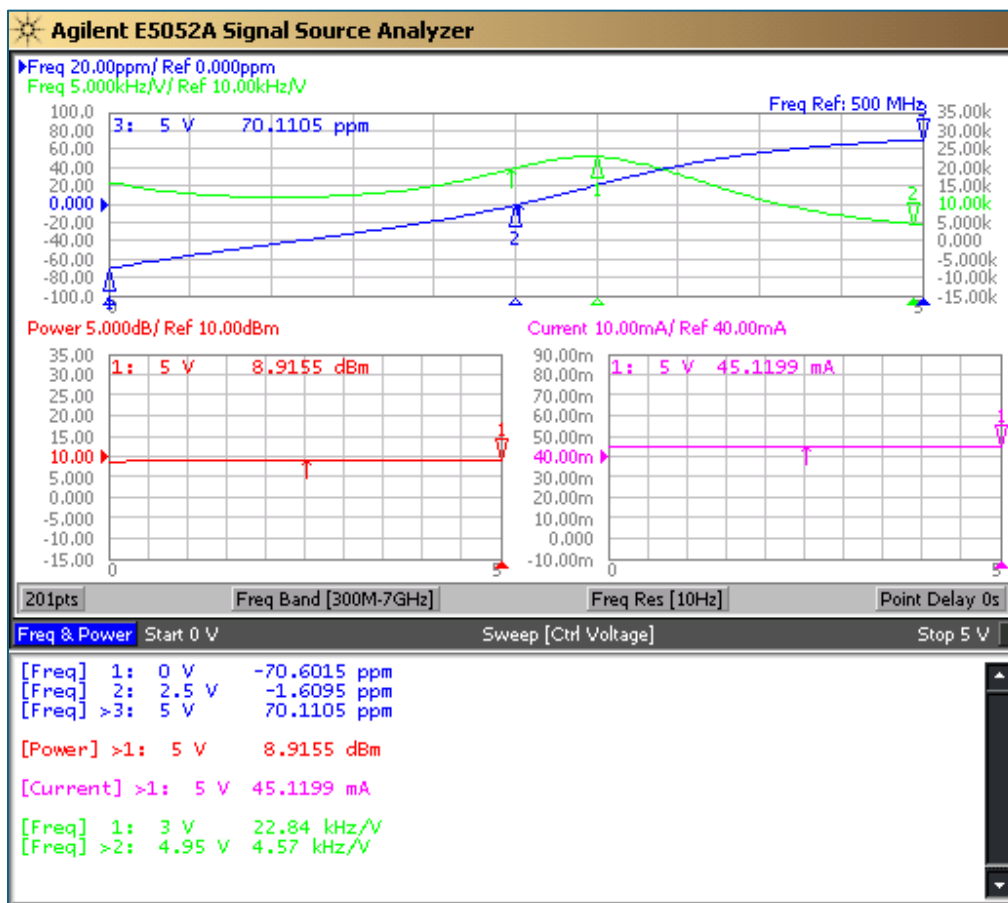
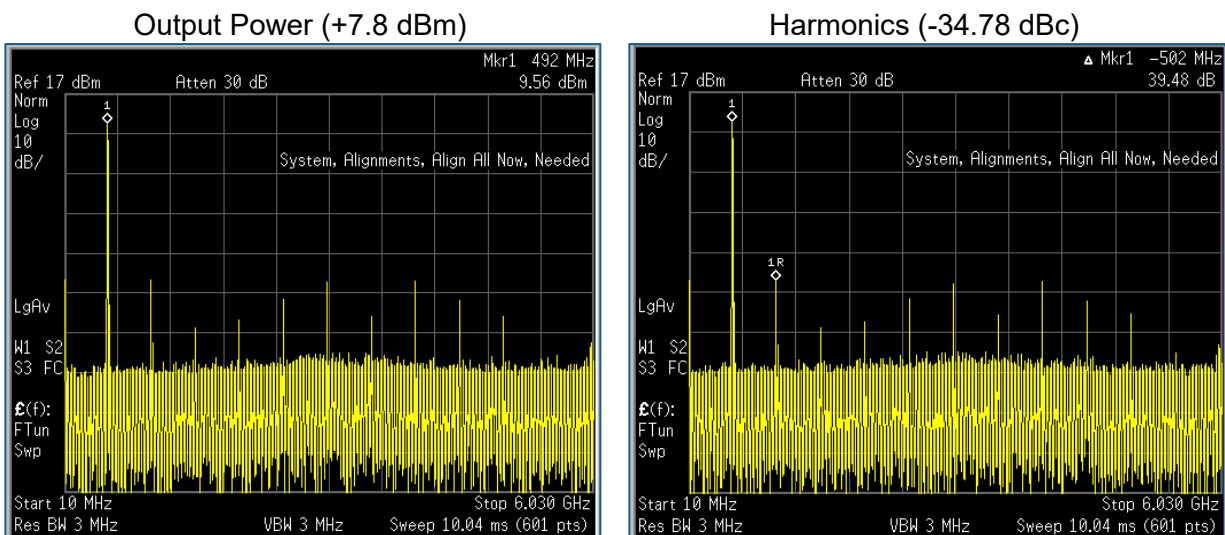
**Table 1 - Maximum Ratings**

Parameter	Symbol	Minimum	Maximum	Units
Supply Voltage (3.3V and 5V options)	V <sub>CC</sub>	-0.5	+7.0	V
Supply Voltage (12V option)	V <sub>CC</sub>	-0.5	+15.0	V
Operating Temperature Range	T <sub>C</sub>	-55	+125	°C
Storage Temperature	T <sub>STG</sub>	-65	+125	°C
Lead Solder Temperature/Time			+250/10	°C/s
Junction Temperature	T <sub>J</sub>		+150	°C
Package Thermal Resistance	Θ <sub>JC</sub>		50	°C/W

**Table 2 – Electrical Performance Characteristics**

Electrical Parameters	Symbol	Test Conditions	Limits			
			Min.	Typ.	Max.	Unit
Frequency, Nominal	fo	See Ordering Codes on Page 2	400		1300	MHz
Supply Voltage, Nominal	Vcc	See Ordering Codes on Page 2	3.135 4.75 11.4	3.3 5.0 12.0	3.465 5.25 12.6	V
Input Current	Is	At Vcc = 3.465V At Vcc = 5.25V At Vcc = 12.6V	- - -	50 45 35	60 55 45	mA
Frequency vs. Temperature Stability	$\Delta f/f_c$ (Ta)		See Ordering Codes on Page 2			ppm
Frequency vs. Voltage Stability	$\Delta f/f_c$ (Vcc)	±5% Vcc at +25°C			±4	ppm
Control Voltage ( <b>Note 1</b> )	Vc		0		Vcc	V
Tuning Range				±50		ppm
Absolute Pull Range ( <b>Note 2</b> )	APR		±15			ppm
Tuning K	Kvco			28		ppm/V
Tuning Kr (Kmax/Kmin)					4:1	
Load				50		Ω
Output Level		50Ω	+7.0	+8.0	+12.0	dBm
Harmonics				-30	-20	dBc
Sub-Harmonics				-30	-20	dBc
Spurious					-80	dBc
Aging, Max.	$\Delta f/f_o$	First Year Over Life ( <b>Note 3</b> )			±10 ±25	ppm
SSB Phase Noise at 640MHz (Vc = Center Voltage)	$\mathcal{E}(\Delta f)$	$\Delta f = 100\text{Hz}$ $\Delta f = 1\text{kHz}$ $\Delta f = 10\text{kHz}$ $\Delta f = 100\text{kHz}$ $\Delta f = 1\text{MHz}$		-80 -110 -140 -162 -168		dBc/Hz
Integrated Jitter (RMS) at 640MHz		10kHz to 20MHz		9		fs
<b>Notes</b> <ol style="list-style-type: none"> <li>The maximum tuning voltage range is 0 to Vcc. Parts may be tuned to a lower control voltage range to satisfy parameters. Please contact the factory for custom tuning voltage ranges.</li> <li>Absolute Pull Range (APR) is defined as the tuning range available after tuning the unit to nominal frequency over the mission life to compensate for the effects of aging, temperature, supply voltage, and load variations.               <ol style="list-style-type: none"> <li><b>APR</b> = <i>Tuning Range – Temperature Stability – Aging</i></li> </ol> </li> <li>The oscillator lifetime is defined as 15 years.</li> <li>Test Conditions unless otherwise specified: Nominal Vcc, Nominal Load, and +25°C ± 3°C.</li> </ol>						

**Figure 1: Typical Temperature Stability at 500MHz and 5V**

**Figure 2: Phase Noise – 500MHz and 5V at +25°C**


**Figure 3: Tuning Characteristics – 500MHz and 5V at +25°C**

**Figure 4: Output Power and Harmonics – 500MHz and 5V at +25°C**


**Table 3 – Delta Limits for Screening Options M**

Test	Parameter	Symbol	Delta Limits
Burn-in (After 160-hour burn in period)	Supply Current	Icc	±10% of initial reading

**Table 4 – 100% Screening Tests (Option M – MIL-PRF-55310, Level B)**

Test Description	Standard	Method	Condition	Comments
Internal Visual	883	2017	Level B	
Stabilization Bake	883	1008	C	48 hours at +150°C
Temperature Cycling	883	1010	B, 10 cycles	
Constant Acceleration	883	2001	A	Y1 direction only
Pre Burn-In Electrical	Refer to Table 2 and Table 8			
Burn-In	883	1015	125°C for 160 hours	Note 1
Final Electrical	Refer to Table 2 and Table 8			
Percentage Defective Allowance (PDA)	PDA = 10% (Supply Current only)			Note 2
Seal (Fine Leak)	883	1014	A1	
Seal (Gross Leak)	883	1014	C	
External Visual	883	2009		
<b>Notes</b> 1. Burn-in shall be under the specified load and nominal voltage conditions. 2. Percent defective allowable (PDA) of selected critical parameters is accountable from pre burn-in to final electrical testing of current at room temperature only (as specified in the Delta Limits Table 3).				



**Table 5 – 100% Group A (Option M – MIL-PRF-55310, Level B)**

Subgroup	Test Description	Condition
1 (Notes 1 and 2)	Supply Current	+25°C and temperature extremes
	Frequency vs. Temperature Stability	Over specified operating temperature range, measure output frequency at minimum eleven equally spaced points of the temperature extremes. Test points shall include room temperature.
	Frequency vs. Voltage Stability	+25°C and temperature extremes
	Output Power	
	Harmonics	
	Sub-Harmonics	
	Absolute Pull Range	
	Spurious	
	Phase Noise	+25°C
2	Visual and Mechanical	MIL-STD-883, Method 2009 & 2016
3 (Note 3)	Solderability	MIL-STD-202, Method 208 <b>5 Samples Only</b>
<b>Notes</b> <ol style="list-style-type: none"> <li>All electrical performance shall be performed during Group A with the exception of any tests performed as part of the final electrical testing during 100 percent screening.</li> <li>Electrical performance characteristics and requirements shall be in accordance with Table 2 and Table 8 herein.</li> <li>Per MIL-PRF-55310, electrical rejects from the Subgroup 1 test and/or screening rejects that have been subjected to burn-in, as a minimum can be used for the test. As an alternative, the manufacturer may use empty test packages for the solderability test provided the empty packages have been subjected to the same environmental conditions and processes as the completed oscillators. If there are one or more defects, the lot shall be considered to have failed.</li> </ol>		

**Table 6 – 100% Group B Aging (Option M – MIL-PRF-55310, Level B)**

Test Description	Test Condition
Frequency Aging	Per MIL-PRF-55310: +70°C ± 3°C for 30 days ( <b>Note 1</b> )
<b>Notes</b> <ol style="list-style-type: none"> <li>Normally, frequency aging tests are for 30 days. However, the frequency aging test may be ceased if after 15 days the measured aging rate is less than half of the specified aging rate in Table 2.</li> <li>Long term aging projections are performed per MIL-O-55310.</li> </ol>	

**Table 7 – Group C (Option M – MIL-PRF-55310, Level B) – Tested only when specified on the PO**

Subgroup	Test Description	Test Conditions and Requirements	Quantity Accept (Reject)
1	Vibration, Sinusoidal (Non-Operating)	MIL-STD-202, Method 204, Condition G	8 (0)
	Shock, Specified Pulse (Non-Operating)	MIL-STD-202, Method 213, Condition I Two Blows in each of the three mutually perpendicular axis MIL-PRF-55310, Paragraph 4.8.41	
2	Thermal Shock	MIL-STD-202, Method 107, Condition B MIL-PRF-55310, Paragraph 4.8.45	
	Ambient Pressure (Non-Operating)	MIL-PRF-55310, Paragraph 4.8.46.1	
	Ambient Pressure (Operating)	MIL-STD-202, Method 105, Condition C MIL-PRF-55310, Paragraph 4.8.46.2	
	Storage Temperature	MIL-PRF-55310, Paragraph 4.8.47	
3	Resistance to Soldering Heat	MIL-STD-202, Method 210, Condition C MIL-PRF-55310, Paragraph 4.8.49.1	4 (0)
	Moisture Resistance	MIL-STD-202, Method 106 (Step 7b, Vibration sub cycle shall be omitted) MIL-PRF-55310, Paragraph 4.8.50	
	Salt Atmosphere	MIL-STD-883, Method 1009, Condition A	
4	Terminal Strength	MIL-STD-202, Method 211, Condition A (Pull Test: 2lbs each terminal for 10 sec) and MIL-STD-202, Method 211, Condition C (Bend: 5 times each terminal at 45° angle, using 1lb weight) MIL-PRF-55310, Paragraph 4.8.52.2	2 (0)
	Resistance to Solvents	MIL-STD-202, Method 215 MIL-PRF-55310, Paragraph 4.8.54	2 (0)
<b>Notes</b> 1. Eight (8) sample units shall be selected from inspection lots which have passed quality conformance inspection. Group C may be completed with a minimum sample size of four (4) units as specified by the qualifying activity. 2. All tests in accordance with MIL-PRF-55310.			

**Table 8 – Electrical Test Measurement Requirements Matrix (Option M – MIL-PRF-55310, Level B)**

Electrical Parameters	Pre Burn-in at 25°C	Pre Burn-in at Low Temp.	Pre Burn-in at High Temp.	Post Burn-in at 25°C	Post Burn-in at Low Temp.	Post Burn-in at High Temp.	Group A at 25°C	Group A at Low Temp.	Group A at High Temp.	Group C
Output Frequency	X	X	X	X	X	X	X	X	X	X
Frequency vs Temperature Stability							See Note 2			See Note 3
Frequency vs. Voltage Stability	X			X			X	X	X	X
Input Current	X			X	X	X	X			X
Output Power	X	X	X	X	X	X	X			X
Harmonics	X	X	X	X	X	X	X			X
Sub-Harmonics	X	X	X	X			X			X
Absolute Pull Range	X	X	X	X			X			X
Phase Noise	X			X			X			X
Spurious	X			X			X			X
X = Required Measurement  <b>Notes</b> <ol style="list-style-type: none"> <li>Electrical performance characteristics shall be in accordance with Table 2 herein.</li> <li>Measure the output frequency at minimum eleven equally spaced points of the specified operating temperature range. Test points shall include reading at room temperature.</li> <li>As required in accordance with MIL-PRF-55310.</li> <li>Read and recorded all measurements.</li> </ol>										



## **1.0 Requirements**

### **1.1 General Requirements**

The parts shall comply with the requirements of MIL-PRF-55310, Level B, for Class 2, Type 9 devices except as modified or supplemented herein.

### **1.2 Maximum Ratings**

The maximum ratings shall be as specified in Table 1 herein.

### **1.3 Design and Construction**

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

### **1.4 Resonator Mounting**

The package resonator shall be epoxy attached in such a manner as to assure adequate crystal performance when the oscillator is subjected to the environmental conditions specified herein.

### **1.5 Package Material and Finish**

The package material and finish shall be gold in accordance with MIL-PRF-38534.

### **1.6 Lead Material and Finish**

The lead material and finish shall be gold in accordance with MIL-PRF-38534.

#### **1.6.1 Solder Dip Lead Finish**

When ordered with part numbering option **QS**, the leads shall be hot solder dipped with Sn60Pb40 in accordance with MIL-PRF-55310.

### **1.7 Weight**

The weight of the oscillator shall be 6 grams maximum.

### **1.8 Marking**

Each unit shall be permanently marked with the manufacturer's name or symbol, part number, lot date code number, and serial number. The unit shall be marked with the outline of an equilateral triangle near pin 1 to show that it contains devices which are sensitive to electrostatic discharge.

## **2.0 Quality Assurance Provisions**

### **2.1 Screening Option M (MIL-PRF-55310, Level B)**

#### **2.1.1 Screening, MIL-PRF-55310, Level B**

Screening shall be tested on 100% of parts in accordance with MIL-PRF-55310, Level B as specified in Table 4 herein.



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**2.1.2 Group A, MIL-PRF-55310, Level B**

Group A shall be tested on 100% of parts in accordance with MIL-PRF-55310, Level B as specified in Table 5 herein.

**2.1.3 Group B (Aging), MIL-PRF-55310, Level B**

Group B (Aging) shall be tested on 100% of parts in accordance with MIL-PRF-55310, Level B as specified in Table 6 herein.

**2.1.4 Group C, MIL-PRF-55310, Level B (When Specified on the Purchase Order)**

When specified in the Purchase Order, Group C shall be tested in accordance with MIL-PRF-55310, Level B as specified in Table 7 herein.

## Revision Log

DCO	Revision	Revision Summary	Page(s) Affected	Date
23605	-	Initial Release	-	02/06/2026