STATEK®
Est. 1970

# MILITARY PRODUCTS

## High-Reliability Crystals and Oscillators



## About Statek

In 1970, Statek Corporation was the first to use semiconductor technology such as photolithography, chemical etching and micromachining to manufacture quartz resonators in wafer form. Today, Statek remains at the forefront of innovation in the design, development and manufacturing of highly reliable, ultra-miniature quartz-based frequency control products.

For over 40 years, we have supported military programs with state-of-the-art crystal resonators and oscillators. We offer a complete portfolio of frequency control products manufactured and tested to military standards: oscillators to MIL-PRF-55310 Product Level B and resonators to MIL-PRF-3098. Our dedicated servicing of the demanding requirements of the military market makes us a preferred supplier to most major defense contractors.

All our products are designed, manufactured and tested in the United States.

## Technological Capability

Statek's core competence is its ability to design and manufacture ultra-miniature resonators in quartz wafers using its patented photolithographic and chemical milling processes.

With complete vertical integration, Statek has total in-house control over the manufacturing of its products. From cutting quartz bars into wafers, through lapping and polishing the wafers, making arrays of resonators by processing the wafers in the Wafer Fab lines, to assembling the resonators in ceramic packages and sealing them, Statek has the complete in-house capability to manufacture and test high-precision, extremely rugged and reliable ceramic-packaged quartz crystal resonators, oscillators and sensors.

Variable-size batch processing permits a balance between production efficiencies and a high mix of standard and custom devices.

## Materials

We cultivate long-term relationships with our domestic suppliers to ensure stable sources of high-quality materials. We manufacture our resonators with high-grade cultured alpha-quartz. Swept quartz is also available for applications requiring radiation hardness. To simplify and minimize the device circuitry, we use oscillator-dedicated integrated circuits. Lastly, we design our own ceramic packages, which are then manufactured by our sister company, AdTech Ceramics.

*Quality Assurance Inspection*

## Product Continuity

Statek provides the continuity of support required for long-term military programs. In addition to maintaining complete records and traceability, we are committed to supporting the life cycle of our customers' products.

## Quality Assurance

The entire Statek organization is committed to ensuring that its products and services meet or exceed its customers' expectations. Through continuous improvement, Statek has developed a quality system that incorporates AS9100C, ISO 9001:2008 and Total Quality Management programs.

## Military Applications

- Smart Munitions
- Airborne Communication Systems
- Battlefield Simulation
- Portable Field Equipment
- Projectile Electronics
- Robust Computing Platforms
- Telemetry
- Navigation
- GPS
- Unmanned Aerial Vehicles

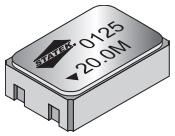
## Military Product Features

- **Extreme high shock survivability (highest in the industry)**
- **Ultra-miniature and low-profile packaging**
- **Excellent long-term aging**
- **Full product traceability**
- **High stability and high accuracy**
- **Extended temperature ranges (-55°C to 225°C)**
- **Swept quartz available for radiation resistance**
- **Low power consumption**
- **Low acceleration sensitivity**
- **Manufacture and testing to MIL-PRF-55310 (Oscillators)**
- **Manufacture and testing to MIL-PRF-3098 (Crystals)**

## Military Program Participation

| | |
|---|---|
| AMRAAM | (Advanced Medium-Range Air to Air Missile) |
| ASRAAM | (Advance Short-Range Air to Air Missile) |
| CSEL | (Combat Survivor Evader Locator) |
| DAGR | (Direct Attack Guided Rocket) |
| DAS | (Distributed Aperture System) |
| ERGM | (Extended Range Guided Munitions) |
| EXCALIBUR | (Extended Range Artillery Projectile) |
| JASSM | (Joint Air to Surface Standoff Missile) |
| JCM | (Joint Common Missile) |
| JTRS | (Joint Tactical Radio System) |
| JSF | (Joint Strike Fighter) |
| LGB | (Laser Guided Bomb) |
| M762/M767 | (ET Fuze Programs) |
| MRM | (Medium Range Munition) |
| PAC-3 | (Patriot Advanced Capability-3) |
| PGK | (Precision Guidance Kit) |
| SFW | (Sensor Fuzed Weapon) |
| SM-3 | (Standard Missile-3) |
| SYSI | (Systems Serial Interface) |
| WCMD | (Wind Corrected Munitions Dispenser) |

# MIL SURFACE MOUNT **OSCILLATORS**



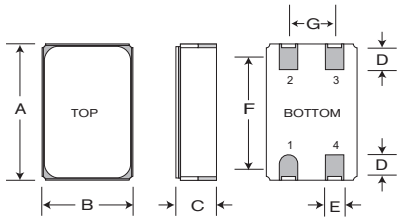


| | **HGXO** 5x7.5mm | | **CXOMKHG** 6.5x5mm | |
|---|---|---|---|---|
| Frequency Range | 32.768 kHz to 50 MHz | | 32.768 kHz to 160 MHz (up to 200 MHz for 3.3V) | |
| Supply Voltage | 1.8 V to 5.0 V | | 1.8 V to 5.0 V | |
| Standard Calibration Tolerances[1] | ±10 ppm, ±25 ppm, ±50 ppm, ±100 ppm | | ±25 ppm, ±50 ppm, ±100 ppm | |
| Frequency Stability Over Temp. Range[2] | ±25 ppm to ±100 ppm | | ±25 ppm to ±100 ppm | |
| Standard Operating Temperature Ranges | -40ºC to +85ºC / -55ºC to +125ºC | | -40ºC to +85ºC / -55ºC to +125ºC | |
| Supply Current (Typical) | 3.3 V | 5.0 V | 3.3 V | 5.0 V |
| | 10 mA for 50 MHz | 14 mA for 50 MHz | 10 mA for 50 MHz | 14 mA for 50 MHz |
| | 8 mA for 40 MHz | 12 mA for 40 MHz | 8 mA for 40 MHz | 12 mA for 40 MHz |
| | 6 mA for 30 MHz | 10 mA for 30 MHz | 6 mA for 30 MHz | 10 mA for 30 MHz |
| | 4 mA for 24 MHz | 8 mA for 24 MHz | 4 mA for 24 MHz | 8 mA for 24 MHz |
| Output Load (CMOS)[3] | 15 pF | | 15 pF | |
| Start-up Time | 5 ms MAX | | 5 ms MAX | |
| Rise/Fall Time | 6 ns MAX | | 3 ns TYP, 6 ns MAX | |
| Duty Cycle[1] | 40% MIN, 60% MAX | | 40% MIN, 60% MAX | |
| Aging, first year | Aging is dependent on frequency and other design considerations. Please contact factory. | | | |
| Shock, survival | Up to 100,000 g, 0.5 ms, 1/2 sine | | Up to 100,000 g, 0.5 ms, 1/2 sine | |
| Vibration, survival[4] | 20 g, 10-2000 Hz swept sine | | 20 g, 10-2000 Hz swept sine | |

1. Other tolerances available.
2. Does not include calibration tolerance. Other tolerances available.
3. TTL loads and higher CMOS loads available. Contact Factory.
4. Per MIL-STD-202G, Method 204D, Condition D. Random vibration testing also available.

Notes: Specifications are typical at 25ºC unless otherwise noted. Specifications are subject to change without notice.
All combinations may not be available. All parameters are measured at an ambient temperature with a 10 MΩ, 15 pF load.

## HGXO




**Pin Connections**

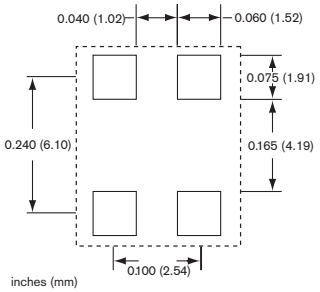
| | |
|---|---|
| 1 | Enable/Disable (E or T) or not connected (N) |
| 2 | Ground |
| 3 | Output |
| 4 | VDD |

**Dimensions**

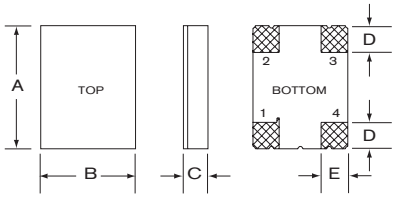
| | TYP. | | MAX. | |
|---|---|---|---|---|
| DIM | inches | mm | inches | mm |
| A | 0.295 | 7.50 | 0.302 | 7.68 |
| B | 0.197 | 5.00 | 0.204 | 5.18 |
| C* | 0.089 | 2.25 | 0.098 | 2.50 |
| D | 0.055 | 1.40 | | |
| E | 0.040 | 1.02 | | |
| F | 0.240 | 6.10 | | |
| G | 0.100 | 2.54 | | |

* SM1 (Termination material is Au over Ni over W). Solder dip (SM3 and SM5) also available.

**Suggested Land Pattern**




## CXOMKHG



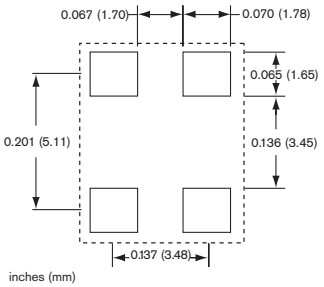

**Pin Connections**

| | |
|---|---|
| 1 | Enable/Disable (E or T) or not connected (N) |
| 2 | Ground |
| 3 | Output |
| 4 | VDD |

**Dimensions**

| | TYP. | | MAX. | |
|---|---|---|---|---|
| DIM | inches | mm | inches | mm |
| A | 0.256 | 6.50 | 0.263 | 6.68 |
| B | 0.197 | 5.00 | 0.204 | 5.18 |
| C (SM1) | 0.055 | 1.34 | 0.060 | 1.52 |
| C (SM3/SM5) | 0.060 | 1.52 | 0.065 | 1.65 |
| D | 0.055 | 1.40 | 0.065 | 1.65 |
| E | 0.060 | 1.52 | 0.070 | 1.78 |

**Suggested Land Pattern**





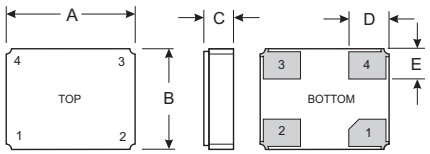
# MIL SURFACE MOUNT OSCILLATORS

| | CXOXHG 3.2x2.5mm | | CXOQHG 2.5x2mm | |
|---|---|---|---|---|
| Frequency Range | 32.768 kHz to 160 MHz | | 400 kHz to 100 MHz | |
| Supply Voltage | 1.8 V to 5.0 V | | 1.8 V to 3.3 V | |
| Standard Calibration Tolerances[1] | ±25 ppm, ±50 ppm, ±100 ppm | | ±30 ppm to ±100 ppm | |
| Frequency Stability Over Temp. Range[2] | ±25 ppm to ±100 ppm | | ±25 ppm to ±100 ppm | |
| Standard Operating Temperature Ranges | -40ºC to +85ºC / -55ºC to +125ºC | | -40ºC to +85ºC / -55ºC to +125ºC | |
| Supply Current (Typical) | 3.3 V | 5.0 V | 1.8 V | 3.3 V |
| | 6 mA for 50 MHz | 13 mA for 50 MHz | 3 mA for 50 MHz | 6 mA for 50 MHz |
| | 5.5 mA for 40 MHz | 12 mA for 40 MHz | 2 mA for 32 MHz | 5 mA for 32 MHz |
| | 5 mA for 32 MHz | 10 mA for 32 MHz | 1.5 mA for 24 MHz | 3 mA for 24 MHz |
| | 3 mA for 24 MHz | 8 mA for 24 MHz | | |
| Output Load (CMOS)[3] | 15 pF | | 15 pF | |
| Start-up Time | 5 ms MAX | | 5 ms MAX | |
| Rise/Fall Time | 3 ns TYP, 6 ns MAX | | 10 ns MAX | |
| Duty Cycle[1] | 45% MIN, 55% MAX | | 45% MIN, 55% MAX | |
| Aging, first year | Aging is dependent on frequency and other design considerations. Please contact factory. | | | |
| Shock, survival | Up to 100,000 g, 0.5 ms, 1/2 sine | | Up to 50,000 g, 0.5 ms, 1/2 sine | |
| Vibration, survival[4] | 20 g, 10-2000 Hz swept sine | | 20 g, 10-2000 Hz swept sine | |

1. Other tolerances available.
2. Does not include calibration tolerance. Other tolerances available.
3. TTL loads and higher CMOS loads available. Contact Factory.
4. Per MIL-STD-202G, Method 204D, Condition D. Random vibration testing also available.

Notes: Specifications are typical at 25ºC unless otherwise noted. Specifications are subject to change without notice.
All combinations may not be available. All parameters are measured at an ambient temperature with a 10 MΩ, 15 pF load.

## CXOXHG



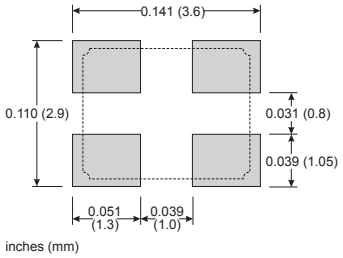

### Pin Connections

| | |
|---|---|
| 1 | Enable/Disable (E) or not connected (N) |
| 2 | Ground |
| 3 | Output |
| 4 | VDD |

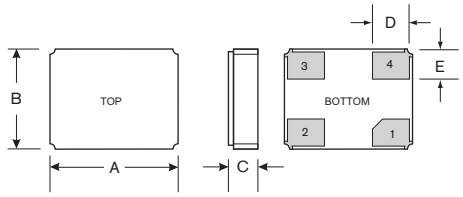
### Dimensions

| | TYP. | | MAX. | |
|---|---|---|---|---|
| DIM | inches | mm | inches | mm |
| A | 0.126 | 3.20 | 0.136 | 3.40 |
| B | 0.099 | 2.50 | 0.107 | 2.70 |
| $C_{(SM1)}$ | 0.039 | 1.00 | 0.043 | 1.09 |
| $C_{(SM3/SM5)}$ | 0.044 | 1.12 | 0.048 | 1.21 |
| D | 0.040 | 1.00 | 0.041 | 1.10 |
| E | 0.030 | 0.75 | 0.031 | 0.85 |

### Suggested Land Pattern




## CXOQHG



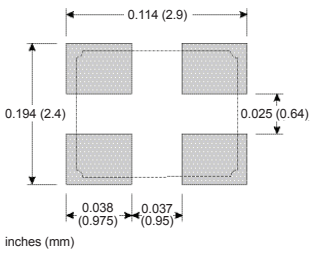

### Pin Connections

| | |
|---|---|
| 1 | Enable/Disable (E) or not connected (N) |
| 2 | Ground |
| 3 | Output |
| 4 | VDD |

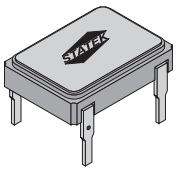
### Dimensions

| | TYP. | | MAX. | |
|---|---|---|---|---|
| DIM | inches | mm | inches | mm |
| A | 0.098 | 2.50 | 0.102 | 2.60 |
| B | 0.079 | 2.00 | 0.083 | 2.10 |
| $C_{(SM1)}$ | 0.035 | 0.89 | 0.039 | 1.00 |
| $C_{(SM3/SM5)}$ | 0.040 | 1.02 | 0.048 | 1.22 |
| D | 0.026 | 0.67 | 0.027 | 0.69 |
| E | 0.022 | 0.57 | 0.023 | 0.59 |

### Suggested Land Pattern



# MIL LEADED OSCILLATORS



## LHGAT

5x7mm w/ Leads

| | |
|---|---|
| Frequency Range | 320 kHz to 50 MHz |
| Supply Voltage | 1.8 V to 5.0 V |
| Standard Calibration Tolerances[1] | ±20 ppm and up |
| Frequency Stability Over Temp. Range[2] | ±40 ppm to ±100 ppm |
| Standard Operating Temperature Ranges | -40ºC to +85ºC / -55ºC to +125ºC |
| Supply Current (Typical) | 3.3 V: 6.0 mA for 50 MHz, 3.0 mA for 24 MHz<br>5.0 V: 13 mA for 50 MHz, 8.0 mA for 24 MHz |
| Output Load (CMOS)[3] | 15 pF |
| Start-up Time | 5 ms MAX |
| Rise/Fall Time | 4 ns TYP, 8 ns MAX |
| Duty Cycle[1] | 40% MIN, 60% MAX |
| Aging, first year[4] | See note below |
| Shock, survival | Up to 30,000 g, 0.5 ms, 1/2 sine |
| Vibration, survival[5] | 20 g, 10-2000 Hz swept sine |

1. Other specifications available.
2. Does not include calibration tolerance. Other tolerances available.
3. TTL loads and higher CMOS loads available. Contact Factory.
4. Aging is dependent on frequency and other design considerations. Please contact factory.
5. Per MIL-STD-202G, Method 204D, Condition D. Random vibration testing also available.

Notes: Specifications are typical at 25ºC unless otherwise noted. Specifications are subject to change without notice. All combinations may not be available. All parameters are measured at an ambient temperature with a 10 MΩ, 15 pF load.

### Absolute Maximum Ratings

| | |
|---|---|
| Supply Voltage $V_{DD}$ | |
| Nominal voltage < 4.0 V | -0.5 V to 4.0 V |
| Nominal voltage ≥ 4.0 V | -0.5 V to 7.0 V |
| Storage Temperature | -55ºC to +125ºC |
| Maximum Process Temp. | 260ºC for 20 seconds |

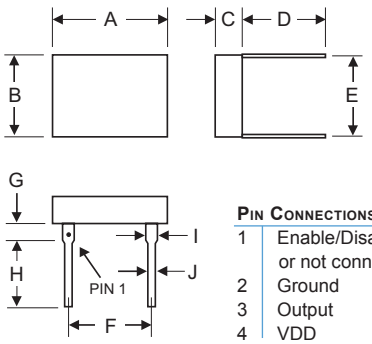
### Enable / Disable Options (E/T/N)

Statek offers three enable/disable options: E, T, and N. Both the E-version and T-version have Tri-State outputs and differ in whether the oscillator continues to run internally when the output is put into the high Z state: it stops in the E-version and continues to run in the T-version. So, the E-version offers very low current consumption when the oscillator is disabled and the T-version offers very fast output recovery when the oscillator is re-enabled. The N-version does not have PIN 1 connected internally and so has no enable/disable capability. The following table summarizes the three options.

| Options | E | T | N |
|---|---|---|---|
| **When enabled** *(PIN 1 is high*)* | | | |
| Output | Freq. output | Freq.output | Freq. output |
| Oscillator | Oscillates | Oscillates | Oscillates |
| Current | Normal | Normal | Normal |
| **When disabled** *(PIN 1 is low)* | | | |
| Output | High Z state | High Z state | Freq. output |
| Oscillator | Stops | Oscillates | Oscillates |
| Current | Very low | Lower than normal | Normal |
| **When re-enabled** *(PIN 1 changes from low to high)* | | | |
| Output recovery | Delayed | Immediate | N/A |

* When PIN 1 is allowed to float, it is held high by an internal pull-up resistor.

## LHGAT




**Pin Connections**

| | |
|---|---|
| 1 | Enable/Disable (E) or not connected (N) |
| 2 | Ground |
| 3 | Output |
| 4 | VDD |

**Dimensions**

| | TYP. | | MAX. | |
|---|---|---|---|---|
| DIM | inches | mm | inches | mm |
| A | 0.276 | 7.00 | 0.281 | 7.14 |
| B | 0.197 | 5.00 | 0.202 | 5.13 |
| C | 0.065 | 1.65 | 0.070 | 1.78 |
| D | 0.200 | 5.08 | 0.205 | 5.20 |
| E | 0.195 | 4.90 | 0.205 | 5.20 |
| F | 0.200 | 5.08 | 0.205 | 5.20 |
| G | 0.040 | 1.02 | | |
| H | 0.160 | 4.06 | | |
| I | 0.028 | 0.71 | | |
| J | 0.018 | 0.46 | 0.021 | 0.53 |

## How to Order | Specify

**CXOMKHG 5 D S T SM3 - 32.0M , A 1 BA**

| Model Number | Supply Voltage Code | Shock Level Code | Special or Custom | Enable/Disable Option Code | Termination Code | Frequency Code | Accuracy at 25ºC Code | Frequency/Temperature Stability Code | Test Option Code |
|---|---|---|---|---|---|---|---|---|---|
| HGXO<br>CXOMKHG<br>CXOXHG<br>CXOQHG<br>LHGAT | 1 = 1.8V<br>2 = 2.5V<br>3 = 3.0V<br>4 = 3.3V<br>5 = 5.0V | A = 5,000 g<br>B = 10,000 g<br>C = 20,000 g<br>D = 30,000 g<br>F = 50,000 g<br>G = 75,000 g<br>H = 100,000 g | S = Special or custom<br>Blank = Standard | E, T, or N<br>E and T are not available in all frequencies; contact factory with specific requirements. | SM1 & SM5 are Pb-free. SM3 is 60/40 Sn/Pb. | K = kHz<br>M = MHz | A = 100 ppm<br>D = 10 ppm<br>F = 25 ppm<br>G = 30 ppm<br>H = 50 ppm | 1 = 100 ppm; -40ºC to +85ºC<br>2 = 50 ppm; -40ºC to +85ºC<br>3 = 25 ppm; -40ºC to +85ºC<br>4 = 100 ppm; -55ºC to +125ºC<br>5 = 50 ppm; -55ºC to +125ºC | B0 = Standard Testing Only<br>B1 = Screening (MIL-PRF-55310)<br>BA = Screening + Group A<br>BB = Screening + Groups A & B<br>BC = Screening + Groups A, B, & C |

*example*

**CXOMKHG5DSTSM3-32.0M, A1BA**

see

# MIL
## SURFACE MOUNT AND LEADED **OSCILLATORS**

## OSCILLATOR PRODUCT LEVEL B TEST OPTIONS

**Standard Testing** includes: Internal Visual Inspection, Stabilization Bake, Seal Test, Electrical Test, & Final Visual Inspection.

Statek **Test Options**

**B0**

| | **Screening** | **MIL-Standard** | **Test Method** | **Condition** | **Sample Size** |
|---|---|---|---|---|---|
| | Internal Visual (Pre-Seal) | MIL-STD-883 | 2017 & 2032 | – | 100% |
| | Stabilization Bake (150°C) | MIL-STD-883 | 1008 | C | 100% |
| | Temperature Cycling | MIL-STD-883 | 1010 | B | 100% |
| | Constant Acceleration | MIL-STD-883 | 2001 | A (5000g, Y1 Axis only) | 100% |
| | Seal Test (Fine and Gross Leak) | MIL-STD-883 | 1014 | A1 & C | 100% |
| | Electrical Test | – | – | – | 100% |
| | Burn-in, operating | MIL-PRF-55310 | Table III | – | 100% |
| | Final Electrical Test | – | – | – | 100% |

**B1**

| subgroup | **Group A** | **MIL-Standard** | **Test Method** | **Condition** | **Sample Size** |
|---|---|---|---|---|---|
| 1 | Electrical Tests | MIL-STD-202 | – | – | per MIL-PRF-55310 |
| 2 | Visual & Mechanical | MIL-STD-202 | – | – | per MIL-PRF-55310 |
| 3 | Solderability | MIL-STD-202 | 208 | – | per MIL-PRF-55310 |

**BA**

| | **Group B** | **MIL-Standard** | **Test Method** | **Condition** | **Sample Size** |
|---|---|---|---|---|---|
| | 30-day Age | MIL-PRF-55310 | Para. 4.7.1.5 | – | per MIL-PRF-55310 |

**BB**

| subgroup | **Group C** (Destructive Tests) | **MIL-Standard** | **Test Method** | **Condition** | **Sample Size** |
|---|---|---|---|---|---|
| 1 | Vibration | MIL-STD-202 | 204 | D | 8 Units |
| | Shock | MIL-STD-202 | 213 | I | |
| 2 | Thermal Shock | MIL-STD-202 | 107 | B | 4 Units |
| | Ambient Pressure | MIL-PRF-55310 | Para. 4.8.46 | – | |
| | Storage Temperature | MIL-PRF-55310 | Para. 4.8.47 | – | |
| 3 | Resistance to Soldering Heat | MIL-STD-202 | 210 | B | 2 Units |
| | Moisture Resistance | MIL-STD-202 | 106 | – | |
| | Salt Atmosphere | MIL-STD-883 | 1009 | A | |
| 4 | Terminal Strength (as applicable) | MIL-STD-202 | 211 | C | 2 Units |
| | Resistance to Solvents | MIL-STD-202 | 215 | – | |

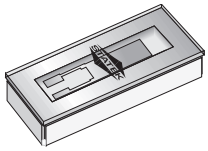
**BC**

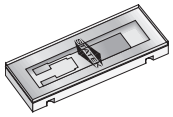
- The paragraph numbers listed in this table refer to MIL-PRF-55310, Revision E
- Please contact factory for additional tests, including MIL-PRF-55310 Level S tests

## IN-HOUSE TEST CAPABILITIES FOR OSCILLATORS:

| | | | |
|---|---|---|---|
| Aging (Elevated Temperature) | MIL-PRF-55310, Para. 4.8.35 | Salt Atmosphere | MIL-STD-883, Method 1009 |
| Burn-in | MIL-PRF-55310, Table III | Solderability | MIL-STD-883, Method 2003 |
| Die Shear Strength | MIL-STD-883, Method 2019 | Temperature Cycling | MIL-STD-883, Method 1010 |
| Fine/Gross Leak Testing | MIL-STD-883, Method 1014; MIL-STD-202, Method 112 | Temperature Range | MIL-PRF-55310, Para. 1.2.1.3, Table III |
| | | Thermal Shock | MIL-STD-202, Method 107 |
| Lead Integrity | MIL-STD-883, Method 2004 | Vibration | MIL-STD-202, Method 204 |
| Moisture Resistance | MIL-STD-202, Method 106 | Wirebond Pull Test | MIL-STD-883, Method 2023 |
| PIND (Particle Impact Noise Detection) | MIL-STD-883, Method 2020; MIL-STD-202, Method 217 | | |

# MIL SURFACE MOUNT CRYSTALS



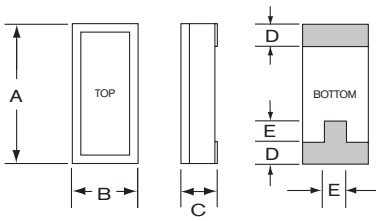


| | CX1HGSM 8x3.56mm | | | CX4HGSM 5x1.83mm | | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency Range | 6 MHz to 250 MHz | | | 14 MHz to 50 MHz | | | | |
| Fundamental Frequency | 10 MHz | 32 MHz | 155.52 MHz | 14.7456 MHz | 16 MHz | 20 MHz | 32 MHz | 40 MHz |
| Motional Resistance R1 (Ω) | 30 | 25 | 15 | 60 | 75 | 50 | 30 | 30 |
| Motional Capacitance C1 (fF) | 5.5 | 6.2 | 4.0 | 1.4 | 1.5 | 1.4 | 2.5 | 1.5 |
| Quality Factor Q (k) | 100 | 30 | 30 | 120 | 90 | 110 | 70 | 90 |
| Shunt Capacitance C0 (pF) | 2.2 | 2.3 | 2.3 | 0.8 | 0.9 | 0.9 | 1.1 | 1.0 |
| Calibration Tolerance[1] | ±100 ppm, or tighter as required | | | ±100 ppm, or tighter as required | | | | |
| Load Capacitance[2] | 20 pF for f ≤ 50 MHz<br>10 pF for f > 50 MHz | | | 10 pF | | | | |
| Drive Level | 500 µW max for f ≤ 50 MHz<br>200 µW max for f > 50 MHz | | | 200 µW max | | | | |
| Frequency - Temp. Stability[3] | ±30 ppm to ±100 ppm | | | ±30 ppm to ±100 ppm | | | | |
| Standard Operating Temp. Ranges | -40ºC to +85ºC / -55ºC to +125ºC | | | -40ºC to +85ºC / -55ºC to +125ºC | | | | |
| Aging, first year | Aging is dependent on frequency and other design considerations. Please contact factory. | | | | | | | |
| Shock, survival[4] | Up to 100,000 g, 0.5 ms, 1/2 sine | | | Up to 100,000 g, 0.5 ms, 1/2 sine | | | | |
| Vibration, survival[5] | 20 g, 10-2,000 Hz swept sine | | | 20 g, 10-2,000 Hz swept sine | | | | |
| Storage Temp. Range | -55ºC to +125ºC | | | -55ºC to +125ºC | | | | |
| Max Process Temperature | +260ºC for 20 sec. | | | +260ºC for 20 sec. | | | | |

1. Other tolerances available, contact factory. 2. Other specifications available, contact factory.
3. Does not include calibration tolerance. The characteristics of the frequency stability over temperature follow that of the AT thickness-shear mode.
4. For over 100,000 g. Contact factory.
5. Per MIL-STD-202G, Method 204D, Condition E. Random vibration testing also available.

Notes: Specifications are typical at 25ºC unless otherwise noted. Specifications are subject to change without notice. All combinations may not be available.

## CX1HGSM



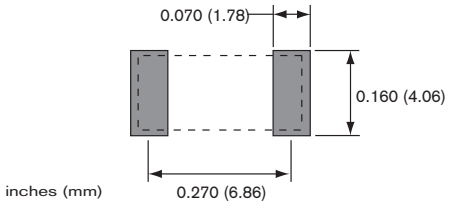

**Dimensions**

| DIM | TYP. inches | TYP. mm | MAX. inches | MAX. mm |
|---|---|---|---|---|
| A | 0.315 | 8.00 | 0.330 | 8.38 |
| B | 0.140 | 3.56 | 0.155 | 3.94 |
| C | – | – | see below | |
| D | 0.045 | 1.14 | 0.055 | 1.40 |
| E | 0.060 | 1.52 | 0.070 | 1.78 |

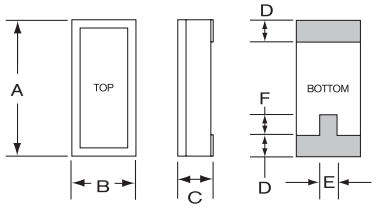
**Thickness Dimension C** (Maximum)

| Temination | Glass Lid inches | Glass Lid mm | Ceramic Lid inches | Ceramic Lid mm |
|---|---|---|---|---|
| SM1 | 0.065 | 1.65 | 0.070 | 1.78 |
| SM2/SM4 | 0.067 | 1.70 | 0.072 | 1.83 |
| SM3/SM5 | 0.070 | 1.78 | 0.075 | 1.90 |

**Suggested Land Pattern**




## CX4HGSM



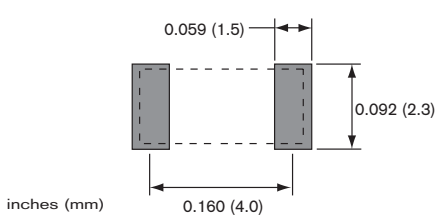

**Dimensions**

| DIM | TYP. inches | TYP. mm | MAX. inches | MAX. mm |
|---|---|---|---|---|
| A | 0.197 | 5.00 | 0.210 | 5.33 |
| B | 0.072 | 1.83 | 0.085 | 2.16 |
| C | – | – | see below | |
| D | 0.036 | 0.91 | 0.046 | 1.16 |
| E | 0.020 | 0.51 | – | – |
| F | 0.025 | 0.64 | – | – |

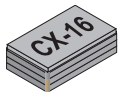
**Thickness Dimension C** (Maximum)

| Temination | Glass Lid inches | Glass Lid mm | Ceramic Lid inches | Ceramic Lid mm |
|---|---|---|---|---|
| SM1 | 0.045 | 1.14 | 0.050 | 1.27 |
| SM2/SM4 | 0.046 | 1.17 | 0.051 | 1.30 |
| SM3/SM5 | 0.048 | 1.22 | 0.053 | 1.35 |

**Suggested Land Pattern**



# MIL SURFACE MOUNT CRYSTALS

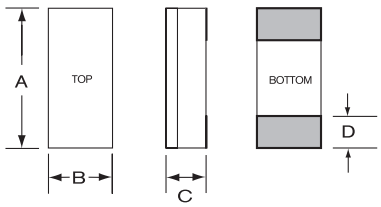




| | CX11LHGSM 3.2x1.5mm | | CX16HGSM 2.0x1.2mm | |
|---|---|---|---|---|
| Frequency Range | 16 MHz to 50 MHz | | 24 MHz to 50 MHz | |
| Fundamental Frequency | 16 MHz | 24 MHz | 24 MHz | 26.5 MHz |
| Motional Resistance R1 (Ω) | 90 | 30 | 100 | 90 |
| Motional Capacitance C1 (fF) | 1.5 | 1.6 | 1.3 | 1.4 |
| Quality Factor Q (k) | 70 | 150 | 30 | 30 |
| Shunt Capacitance C0 (pF) | 0.7 | 0.7 | 0.6 | 0.6 |
| Calibration Tolerance[1] | ±100, or tighter as required | | ±100 ppm, or tighter as required | |
| Load Capacitance | 10 pF (unless specified otherwise) | | 10 pF (unless specified otherwise) | |
| Drive Level | 200 µW max | | 200 µW max | |
| Frequency - Temp. Stability[2] | ±30 ppm to ±100 ppm | | ±30 ppm to ±100 ppm | |
| Standard Operating Temp. Ranges | -40ºC to +85ºC / -55ºC to +125ºC | | -40ºC to +85ºC / -55ºC to +125ºC | |
| Aging, first year | Aging is dependent on frequency and other design considerations. Please contact factory. | | | |
| Shock, survival | Up to 75,000 g, 0.5 ms, 1/2 sine | | Up to 50,000 g, 0.5 ms, 1/2 sine | |
| Vibration, survival[3] | 20 g, 10-2,000 Hz swept sine | | 20 g, 10-2,000 Hz swept sine | |
| Storage Temp. Range | -55ºC to +125ºC | | -55ºC to +125ºC | |
| Max Process Temperature | +260ºC for 20 sec. | | +260ºC for 20 sec. | |

1. Other tolerances available, contact factory.
2. Does not include calibration tolerance.
   The characteristics of the frequency stability over temperature follow that of the AT thickness-shear mode.
3. Per MIL-STD-202G, Method 204D, Condition E. Random vibration testing also available.

Notes: Specifications are typical at 25ºC unless otherwise noted. Specifications are subject to change without notice. All combinations may not be available.

## CX11LHGSM



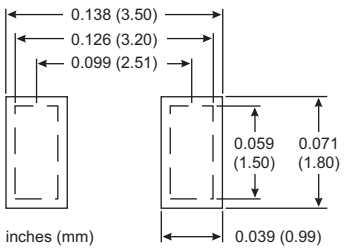

**Dimensions**

| DIM | TYP. inches | TYP. mm | MAX. inches | MAX. mm |
|---|---|---|---|---|
| A | 0.127 | 3.20 | 0.135 | 3.48 |
| B | 0.060 | 1.50 | 0.068 | 1.73 |
| C | – | – | see below | |
| D | 0.028 | 0.71 | 0.037 | 0.94 |

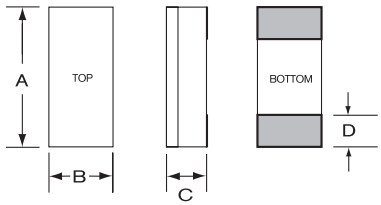
**Thickness Dimension C** (Maximum)

| Termination | Glass Lid inches | Glass Lid mm | Ceramic Lid inches | Ceramic Lid mm |
|---|---|---|---|---|
| SM1 | 0.034 | 0.87 | 0.023 | 0.59 |
| SM2/SM4 | 0.035 | 0.89 | 0.024 | 0.60 |
| SM3/SM5 | 0.037 | 0.94 | 0.025 | 0.63 |

**Suggested Land Pattern**




## CX16HGSM



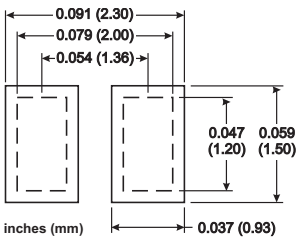

**Dimensions**

| DIM | TYP. inches | TYP. mm | MAX. inches | MAX. mm |
|---|---|---|---|---|
| A | 0.079 | 2.00 | | |
| B | 0.047 | 1.20 | | |
| C | – | – | | |
| D | 0.025 | 0.64 | | |

**Thickness Dimension C** (Maximum)

| Termination | Ceramic Lid inches | Ceramic Lid mm |
|---|---|---|
| SM1 | 0.017 | 0.43 |

**Suggested Land Pattern**



# MIL SURFACE MOUNT CRYSTALS

| | CX18HGSM<br>1.55x0.95mm | |
|---|---|---|
| Frequency Range | 30 MHz to 50 MHz | |
| Fundamental Frequency | 32 MHz | 49 MHz |
| Motional Resistance R1 (Ω) | 150 | 50 |
| Motional Capacitance C1 (fF) | 0.9 | 1.1 |
| Quality Factor Q (k) | 60 | 54 |
| Shunt Capacitance C0 (pF) | 0.6 | 0.5 |
| Calibration Tolerance[1] | ±30 to ±50 ppm, or tighter as required | |
| Load Capacitance | 10 pF (unless specified otherwise) | |
| Drive Level | 100 µW max | |
| Frequency - Temp. Stability[2] | ±30 ppm to ±100 ppm | |
| Standard Operating Temp. Ranges | -40ºC to +85ºC / -55ºC to +125ºC | |
| Aging, first year[3] | See note below | |
| Shock, survival | Up to 75,000 g, 0.5 ms, 1/2 sine | |
| Vibration, survival[4] | 20 g, 10-2,000 Hz swept sine | |
| Storage Temp. Range | -55ºC to +125ºC | |
| Max Process Temperature | +260ºC for 20 sec. | |

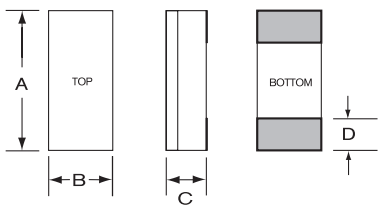
1. Other tolerances available, contact factory.
2. Does not include calibration tolerance.
   The characteristics of the frequency stability over temperature follow that of the AT thickness-shear mode.
3. Aging is dependent on frequency and other design considerations. Please contact factory.
4. Per MIL-STD-202G, Method 204D, Condition E. Random vibration testing also available.

Notes: Specifications are typical at 25ºC unless otherwise noted. Specifications are subject to change without notice.
All combinations may not be available.

## Statek's Crystal Expertise

Statek's innovative design and manufacturing processes can support the most demanding applications. Photo-lithographic micromachining and ceramic packaging expertise allows us to offer ultra-miniature highly reliable products with frequencies ranging from 1 Hz to 250 MHz, the broadest industry offering for crystal resonators and oscillators.

## CX18HGSM



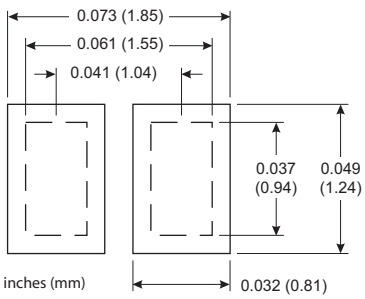

**Dimensions**

| DIM | TYP. inches | TYP. mm | MAX. inches | MAX. mm |
|---|---|---|---|---|
| A | 0.061 | 1.55 | | |
| B | 0.037 | 0.95 | | |
| C | see below | | | |
| D | 0.020 | 0.51 | | |

**Thickness Dimension C** (Maximum)

| Termination | Glass Lid | |
|---|---|---|
| | inches | mm |
| SM1 | 0.0138 | 0.35 |

**Suggested Land Pattern**




## How to Order | Specify

| CX4 | HG3 | S | C | SM3 | XMC | - 32.0M | , 100 / 100 / – / | M |
|---|---|---|---|---|---|---|---|---|
| **Model Number** | **Shock Level Code** | **Special or Custom Code** | **Lid Code** | **Termination Code** | **Screening Code** | **Frequency and Code** | **Accuracy at 25ºC / Frequency Stability Over Temp Range Code** | **Operating Temperature Range Code** |
| CX1<br>CX4<br>CX11L<br>CX16<br>CX18 | Blank = Standard shock level<br>HG1 = 10,000 g<br>HG2 = 20,000 g<br>HG3 = 30,000 g<br>HG4 = 50,000 g<br>HG5 = 75,000 g<br>HG6 = 100,000 g | S = Special or custom<br>Blank = Standard | C = Ceramic<br>Blank = Glass | SM1, SM4, & SM5 are Pb-free.<br>SM2 & SM3 are 60/40 Sn/Pb. | XMA, XMB, or XMC<br>See chart on next page. | K = kHz<br>M = MHz | As required or Combined | C = -10ºC to +70ºC<br>I = -40ºC to +85ºC<br>M = -55ºC to +125ºC<br>S = Customer Specified |

Note: Other package styles are available, please inquire.

Note: Not all shock levels are available for all packages listed.
Shock levels beyond 100,000 g are available, please consult the factory.

*example*

**CX4HG3CSM3XMC-32.0M,100/100/–/M**

**— / — / 200 / M**


**STATEK CORPORATION** 512 N. Main St., Orange, CA 92868 Tel. 714-639-7810 Fax 714-997-1256 www.statek.com

# MIL SURFACE MOUNT CRYSTALS

## CRYSTAL SCREENING OPTIONS

Statek Test Option **XMA**

**Standard Testing** includes: Internal Visual Inspection, Frequency & Resistance over Operating Temperature Range, Seal Test, Electrical Testing, and Final Visual Inspection.

Statek Test Option **XMB**

| Screening | Standard | Method | Condition | Comments |
|---|---|---|---|---|
| Internal Visual | Statek Internal Standard | | | Pre-seal |
| Unwanted Modes | MIL-PRF-3098 | | | Spurious-mode ratio of 2:1 or greater |
| Frequency and Resistance over Operating Temperature Range | MIL-PRF-3098 | | | Measure every 2.5ºC or tighter over the operating temperature range; frequency and resistance must meet specification. |
| Seal Test (Fine Leak) | MIL-STD-202 | 112 | C | |
| Seal Test (Gross Leak) | MIL-STD-202 | 112 | D or E | |
| DLD Testing | Modified IEC 60444-6 | | | Sweep from 10 nW to nominal drive level and back again in 1 dB steps, requiring that resistance be no greater than the maximum allowed resistance or 1.5 times the minimum resistance. |
| Final Electrical Test | IEC 60444 | π-Network | | Measure Fs, R1, C1, C0, Q, and FL |
| External Visual | Statek Internal Standard | | | Post-seal |

Statek Test Option **XMC**

| Screening | Standard | Method | Condition | Comments |
|---|---|---|---|---|
| Internal Visual | Statek Internal Standard | | | Pre-seal |
| PIND Testing | MIL-STD-883 | 2020 | A | Performed in both the thickness and width directions. |
| Unwanted Modes | MIL-PRF-3098 | | | Spurious-mode ratio of 2:1 or greater |
| Frequency and Resistance over Operating Temperature Range | MIL-PRF-3098 | | | Measure every 2.5ºC or tighter over the operating temperature range; frequency and resistance must meet specification. |
| Thermal Shock | MIL-STD-202 | 107 | B | Frequency and resistance must meet specification before and after thermal shock. |
| Seal Test (Fine Leak) | MIL-STD-202 | 112 | C | |
| Seal Test (Gross Leak) | MIL-STD-202 | 112 | D or E | |
| Accelerated Aging | MIL-PRF-3098 | | | Aging at 105ºC ± 3ºC for a minimum of 168 hours. For all parts, their frequency and resistance must meet specification before and after aging. For 30 randomly selected parts, the change in series frequency must be not greater than than 5 ppm. |
| DLD Testing | Modified IEC 60444-6 | | | Sweep from 10 nW to nominal drive level and back again in 1 dB steps, requiring that resistance be no greater than the maximum allowed resistance or 1.5 times the minimum resistance. |
| Final Electrical Test | IEC 60444 | π-Network | | Measure Fs, R1, C1, C0, Q, and FL |
| Radiographic Inspection | MIL-STD-202 | 209 | | Viewed from both the thickness and width directions. Inspected to remove parts that are abnormal or defective. |
| External Visual | Statek Internal Standard | | | Post-seal |

## IN-HOUSE TEST CAPABILITIES FOR CRYSTALS

| | | | |
|---|---|---|---|
| Electrical Testing | Full crystal parameters, DLD behavior, and more | PIND (Particle Impact Noise Detection) | MIL-STD-883, Method 2020, Condition A |
| Temperature Testing | Crystal frequency and resistance over temperature | Radiographic Inspection | MIL-STD-202, Method 209 |
| Thermal Shock | MIL-STD-202, Method 107, Condition B | Moisture Resistance | MIL-STD-202, Method 106 |
| Fine & Gross Leak Testing | MIL-STD-202, Method 112 | Salt Atmosphere | MIL-STD-202, Method 101, Condition B |
| Mechanical Shock | MIL-STD-202, Method 213, Conditions A–F | Solderability | MIL-STD-202, Method 208 |
| Vibration | MIL-STD-202, Method 204, Condition A | Aging | MIL-PRF-3098 |


**Statek Corporation**
**512 N. Main Street**
*Orange, California*

**Statek Corporation maintains synergetic relationships with its sister companies Greenray Industries (high precision oscillators) and Advanced Technical Ceramics Company (HTCC, ceramic feedthroughs, multilayer ALN, chemical milling, injection molding) both leaders in their respective industries. Our alliance helps us to serve our customers with leading-edge innovation and world-class manufacturing, all from a single source.**

All of our products are designed and manufactured in the United States of America.


**1449 W. Orange Grove Ave.**
*Orange, California*


**Greenray Industries**
*Mechanicsburg, Pennsylvania*

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## Ultra-Miniature, High-Reliability
## Quartz Crystals, Oscillators and Sensors

**AS9100C** **ISO 9001**

SYSTEM CERTIFICATION AS 9100 SGS **CERTIFIED** SYSTEM CERTIFICATION ISO 9001 SGS

**10175 - Rev E**

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