



## Q-Tech Corporation

10150 West Jefferson Blvd. Culver City, CA 90232  
tel (310) 836 - 7900 fax (310) 836 - 2157

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### Crystal Oscillators for High Reliability Applications

Q-Tech crystal oscillators are a safe choice for demanding environments because they are designed, constructed and tested for those environments, and with the purpose of making a 100% reliable product for situations in which failure is expensive or life threatening.

The oscillators are designed for operation from -55 to +125 degree C, beginning with the quartz crystal element and including the circuitry. The angle at which the crystal is cut from the quartz bar is optimized for the exact temperature range. While COTS clocks may operate at -55C if they are turned on at room temperature and subsequently cooled down to -55C, they are known to have a problem starting when turned on at -55C or other cold temperatures (the cold-start problem).

Q-Tech parts are 100% tested to start at -55C. They are also tested at every temperature between -55 and +125C. They are 100% leak tested, and are 100% burned in for 30 days at high temperature, with before and after electrical tests for all parameters, including the requirement that they not change more than +-1.5 PPM during the 30 day burn in.

Q-Tech manufactures 100% of its products in its factory in Culver City Ca. Q-Tech uses only high reliability military grade components and has a rigorous incoming inspection, an anti-counterfeit parts program, and full traceability on all parts and products. Q-Tech is AS9100 certified, QPL approved, and committed to trying to avoid obsolescence of any of its products, even as new products are developed and introduced.

### Tests performed on 100% of all Q-Tech Class B oscillators:

#### GROUP A

- **ELECTRICAL TEST:** Supply Voltage, Input Current, Output Waveform, Output Voltage Power, Rise and Fall Times, Duty Cycle, and Start-Up Time (as required)
- **FREQUENCY-TEMPERATURE STABILITY:** Initial Accuracy at Reference Temperature, Initial Frequency-Temperature Accuracy and Frequency-Temperature Tolerance
- **FREQUENCY-VOLTAGE TOLERANCE:** Output Frequency is measured when oscillator supply voltage is adjusted to its specified nominal value up to its maximum / minimum values
- **OVERVOLTAGE SURVIVABILITY:** Overvoltage of 20% above the maximum specified
- **VISUAL AND MECHANICAL:** Verify Material, Design, Construction, Workmanship, Physical Dimensions, and Marking per MIL-PRF-55310
- **SOLDERABILITY TEST** per MIL-STD-202, Method 208

#### GROUP B

- **AGING TEST:** Oscillator is energized in oven for a continuous period of 30 days at 70°C ±3°C. The Output frequency is measured within an interval of 72 hours maximum per MIL-PRF-55310



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### Tests performed on a sample basis on all Q-Tech Class B oscillator types:

#### GROUP C

- **VIBRATION** (Sinusoidal) non-operating per MIL-STD-202, Method 204, per MIL-PRF-55310
- **SHOCK** (Specified Pulse) per MIL-STD-202, Method 213 (non-operating)
- **THERMAL SHOCK** per MIL-STD-202, Method 107
- **AMBIENT PRESSURE** (operating and non-operating) per MIL-STD-202, Method 105, and MIL-PRF-55310
- **STORAGE TEMPERATURE** per MIL-PRF-55310
- **RESISTANCE TO SOLDERING HEAT** per MIL-STD-202, Method 210
- **MOISTURE RESISTANCE** per MIL-STD-202, Method 106
- **SALT SPRAY** per MIL-STD-883, Method 1009
- **TERMINAL STRENGTH** per MIL-STD-202, Method 211
- **RESISTANCE TO SOLVENTS** per MIL-STD-202, Method 215

In contrast, COTS oscillators are almost always built in Asia, usually China and may come from a different factory each time they are procured, and even with a different design. This is true even when you buy COTS parts from a USA company with a USA brand name. By contrast Q-Tech manufactures all its own products in the USA and has strict design and configuration control.

### Known problems with COTS oscillators:

- **Lack of traceability**
- **Risk of counterfeiting**
- **Electrical performance limitations in cold starts**
- **Related activity dips over temperature.**
- **Environmental limitations due to restricted operating temperature ranges of -40C to +85 C**
- **Performance limitations over aging (frequency change over time)**
- **Performance limitations over phase noise due to vibration and shock caused by the use of a 2-point mounting style in strip-crystal vs. 4 point mounting style in round crystal oscillators**
- **Obsolescence due to continuous technology changes in the industrial and commercial market.**



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### Summary:

In conclusion, crystal oscillators are the heartbeat of all modern electronic equipment and a most important component for reliability reasons. Many circuits are sensitive to the particular characteristics of the crystal oscillator used, and may not perform properly with even a slightly different oscillator.

Q-Tech oscillators are designed, built and tested accordingly. When failure is expensive, and when the safety of human life may be involved, using Q-Tech crystal oscillators is by far the safest option available and is cost effective.

Ron Stephens  
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