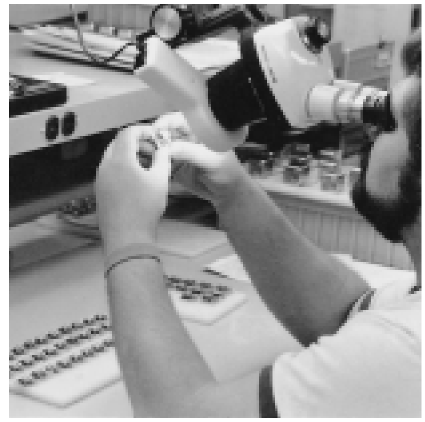
QUALITY CONTROL

Murata Electronics' Quality Control Department maintains product quality at a level equal to the company's high standards of performance and workmanship, which are certified to ISO-9001 requirements. The department is vested with the authority to exercise control over every phase of the manufacturing process. This control extends from incoming inspection of purchased material to in-process inspection, inspection of final product, packaging and shipping.



ENVIRONMENTAL TESTING

Product quality is guaranteed by our Quality Assurance Program. Many oscillators are custom designed to meet your needs.

Standard oscillator design parameters are:

Storage Temperature: –55°C to +85°C (to +125°C Optional)

Vibration: 10G's, 10 to 500Hz
MIL-STD-202, Method 204

Shock: Test condition A
30g, 11msec., ½ sine
MIL-STD-202, Method 213,
Test Condition J

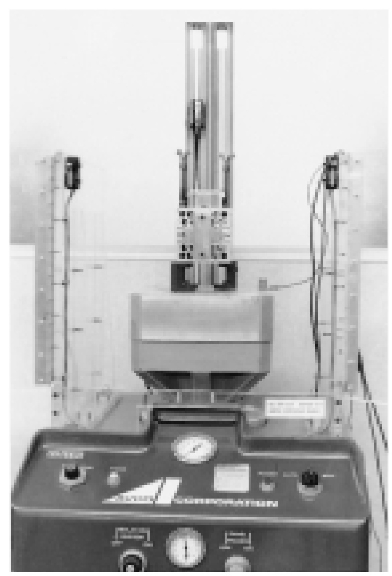
Altitude: Sea Level to space per
MIL-STD-202, Method 105

Seal: MIL-STD-202, Method 112
Test Condition D

More stringent specification levels are available. Consult our factory for details.

Other environmental conditions encountered by oscillators should be specified so that we may design units to meet your requirements. Such conditions would include soldering profiles, board washing, exposure to moisture, corrosive atmospheres, solvents, etc.

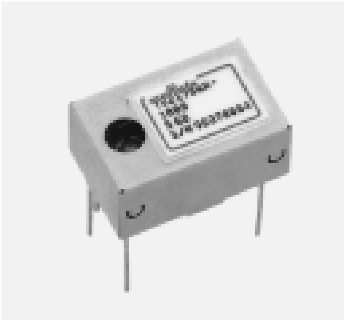
Standard environmental tests are conducted on site in the Corporate QA laboratory. Specialized environmental tests are conducted at independent testing laboratories.



MURATA ELECTRONICS MANUFACTURES A COMPLETE LINE OF OSCILLATORS

We are a volume producer of TTL, CMOS, ECL and Sine Wave Clock Oscillators for the instrumentation and communication industries. Excellent frequency stability is achieved with TCXO, Temperature Compensated Crystal Oscillators and OCXO, Ovenized (Proportional Control) Crystal Oscillators. Special requirements are met with VCXO, Voltage Controlled Crystal Oscillators, which can be frequency modulated, with combinations of the basic types such as the TC/VCXO or OC/VCXO. Murata has full-line expertise from economy models to sophisticated, high stability, very low phase noise oscillators that are used as standards for microwave transmitters. Our oscillator production lines are closely monitored by Quality Control through Incoming, In-Process and Final Inspections.

The Crystal Oscillators featured in this catalog are designed to meet the requirements of most high technology market applications today. However, oscillators can be custom designed to meet your needs. Send us your specifications (see Page 388). We have full-line capability backed by a well staffed engineering department. Murata will assist you in defining your oscillator requirements and provide the support to take your project from the conceptual stage through implementation, including fast prototype turnaround.



OSCILLATOR TECHNICAL PERFORMANCE

If you have a formal specification, send us a copy for quotation. If not, make a copy of our Specification and RFQ Form on Page 388 to help you specify an oscillator to meet your requirements. Select those specifications relevant to your application; cost increases as electrical and mechanical requirements become more stringent. Murata Electronics will produce a cost effective product which will meet all of your oscillator requirements. Since tradeoffs exist in many instances, we are always happy to quote options when cost/performance or cost/size tradeoffs exist. Attach additional sheets to our specification sheet if necessary.

The following material briefly describes our in-house standards and offers some cost/performance tradeoffs.

ENVIRONMENTAL CONDITIONS

See Page 384.

FREQUENCY RANGE

From less than 1Hz to 1GHz, Murata Electronics designs typically center around the “AT” cut crystals, but “SC,” “IT,” and other cuts are used for certain applications. Fundamental mode crystals from 3MHz and overtones from 5 to 400MHz are utilized in the oscillators. This range is extended through the use of dividers and multipliers. (Oscillators in the microwave range are available through the Murata RF and Microwave Products Group in State College, Pennsylvania.)

FREQUENCY STABILITY

Is generally defined in two ways:

1.0 Total Frequency Stability – the maximum frequency excursion from the nominal for all conditions. This is usually expressed as a ± fraction centered at the nominal frequency.

$$\text{FREQUENCY STABILITY [ppm]} \equiv \frac{\triangle f\,[\text{Hz}]}{f_c\,[\text{MHz}]}$$

2.0 Specific Stabilities –

2.1 Accuracy – the frequency setting tolerance at room temperature at time of shipment. Oscillators may incorporate external adjustments for exact calibration. TCXO’s typically exhibit a resolution of ±1pp 10^7. For OCXO’s, the typical resolution is to ±1pp 10^9.

2.2 Frequency Stability Versus Temperature – a maximum change from the nominal frequency. Oscillators relying on the temperature characteristics of the “AT” crystal can be designed to meet a stability requirement as tight as ±10ppm from –10°C to +60°C. Tighter stabilities to ±0.1ppm require temperature compensation techniques. Ovenized oscillators are used for stabilities to ±5pp 10^{10}.

2.3 Frequency Stabilities Versus Supply Voltage and Load Variation – these parameters may be improved by the use of voltage regulation and additional buffer stages. The tighter the stability requirements, the more complex the design.

2.4 Stability Versus Time – can be expressed over periods of milliseconds to years. Through use of high quality crystals typical aging rates of ±1ppm/year are achieved. For OCXO’s, it is possible to achieve aging rates as low as ±5pp 10^{10} per day. Short term stability can be expressed as an Allan Variance over a range of gate times from less than 1msec to 10sec, or in terms of SSB phase noise in the frequency domain.

OUTPUT CHARACTERISTICS

Oscillator output waveforms are either sine or square waves.

1.0 Sine Waves – outputs are specified by stating the amplitude of the signal (mW or V_{RMS} and the nominal load impedance (typically) 50 ohms or 1K ohms).

Harmonic and Sub-Harmonic distortion less than –20dBc is standard.

Deviations from the standards can be accommodated. Consult our engineering department.

2.0 Square Wave*

	TTL	CMOS	ECL
Logic “0” Level	0.4V Max.	1.0V Max.	–1.89V
Logic “1” Level	2.4V Min.	Vcc – 1.0V	–0.89
Symmetry	40/60	40/60	40/60
Load	10 Gates	50pF Max.	50 ohms to –2VDC
Freq. Range	1Hz to 100MHz	1Hz to 100MHz	4.0MHz to 700MHz

*Specify logic type to be driven

INPUT POWER CHARACTERISTICS

Specification of input voltage and current parameters is vital for the proper design of all oscillators. Voltage, power limits and regulation should be specified for all supplies available. If no regulation is listed, ±5% will be assumed and a voltage regulation circuit incorporated if needed. For ovenized oscillators, the oven input voltage may differ from the oscillator input voltage.

MECHANICAL SPECIFICATIONS

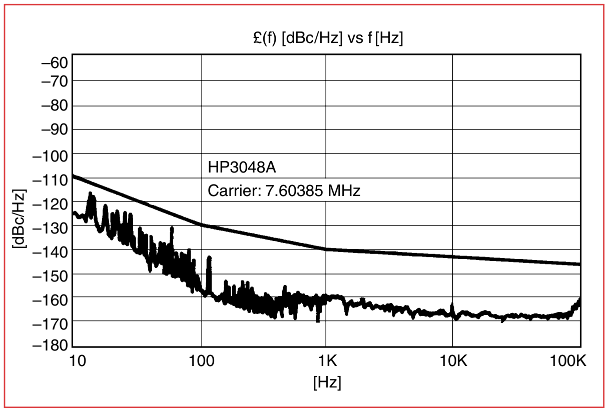
Mechanical Specifications are often unique to your application, but standard sizes and tolerances are ±0.030” for outer dimensions and ±0.010” to ±0.015” for pin spacing. Specify only those dimensions that are critical and let us supply you with a completed outline drawing.

The purpose of these standards is to help you define specifications without over-designing.

PHASE NOISE

Phase noise, which is a measure of the short term frequency fluctuations of the oscillator, is a critical parameter and the limiting factor in the performance of many systems. This is usually specified as the single sideband power density in a 1Hz bandwidth at a specified offset frequency from the carrier.

At Murata Electronics, we use a state-of-the-art phase noise measurement system, which can accurately characterize the phase noise of our oscillators. This system has a noise floor below –170dBc/Hz so that even the best sources may be measured. A typical graph produced by the HP3048A is shown.



VOLTAGE CONTROL/ VCXO

This capability allows the frequency of the oscillator to be changed via an external control voltage. The three most important parameters are:

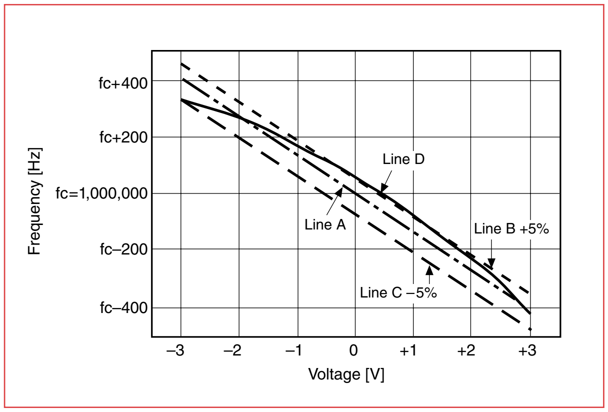
1.0 Frequency Deviation – this is how far the center frequency will change as a function of the control voltage; usually specified in ±percentage or ppm. As the deviation is made larger, other stabilities such as, temperature and aging will usually degrade.

2.0 Linearity – the allowable error from the best straight line. This can be interpreted in a number of ways.

Murata defines linearity per MIL-0-55310, as a ±percentage of the total deviation, for example:
a) control voltage of ±3VDC
b) deviation of ± .04% (400ppm)
c) linearity of ±5%

For a center frequency of 1.0MHz, the total deviation of ±0.04% equals 800 ppm (800Hz). Line “A” shows the ideal transfer function. Line “B” shows the upper limit, which is 5% of the total deviation (0.05 x 800Hz) above the nominal curve. Conversely, line “C” shows the lower 5% limit. Line “D” shows a typical oscillator which meets the 5% specification.

3.0 Response Slope – the slope of the frequency versus the control voltage (i.e. for a negative slope, the output frequency decreases as the control voltage increases).



Note:
Frequency can also be controlled with a digital input signal (serial or parallel) instead of an analog voltage. Consult the factory for options.