

Technical Brief

Package Sealing Methods

Frequency Products

Hermetic packaging is used in many electronic assemblies. The hermetic seal provides an "air tight" atmosphere free from moisture, harmful gases and other contaminants surrounding the product; creating an inert operating environment that protects the components inside for years of failure free operation. This technical brief summarizes the common sealing methods used for quartz based crystal resonator and oscillator products.

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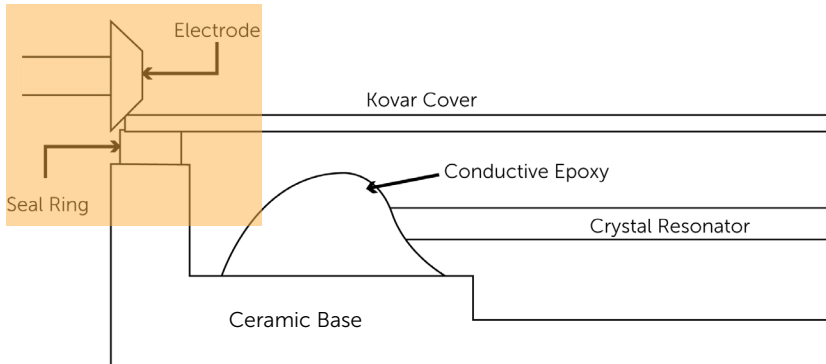


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Package Sealing Methods

Seam Welding [Seam Sealing]

The most common method used today to seal leadless ceramic packages. A Kovar cover is placed on a gold [Au] plated Kovar seal ring. Current is fed through opposing electrode rollers, generating heat by the electric resistance through which it passes and thereby fusing the contact portions of the cover and seal ring. Continuous movement of the roller produces a closed seam along the cover's edge.

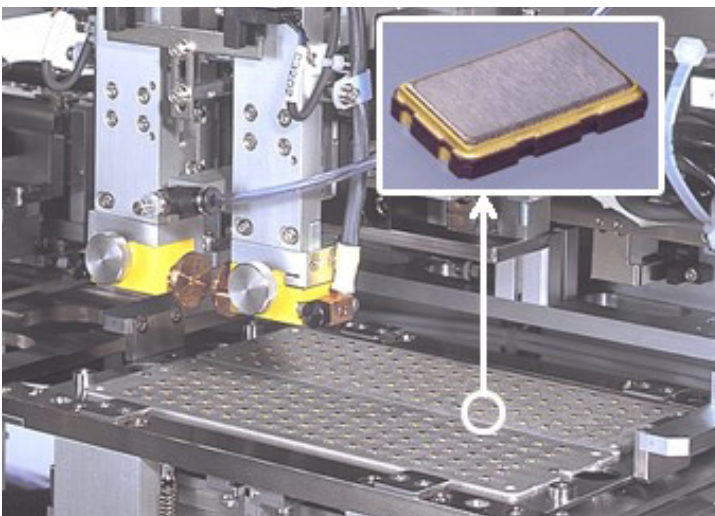


Advantages

- Hermetic seal
- Very high reliability
- Tight stability requirements
- Metal cover provides EMI shielding
- Good shock performance
- High productivity method
- Lead-Free



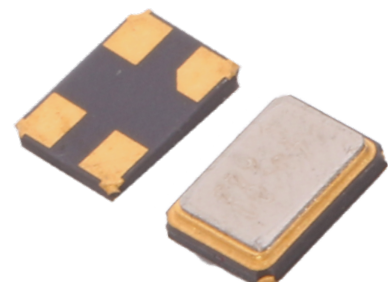
Sealing Machine



Work Surface

CTS Product Examples

[403](#), [405](#), [SA324](#), [CB3LV](#), [637](#), [357](#), [CA32](#)



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Electron Beam Sealing

The emerging low cost sealing method for very small leadless ceramic packages. A Kovar cover with silver [Ag] solder cladded on bottom edge is placed on a gold [Au] plated metalized layer. An electron beam moves along the edge of the metal cover, heating the cover, which melts the solder creating a seal with the gold layer below.

CTS Product Examples

[402](#), [416](#)



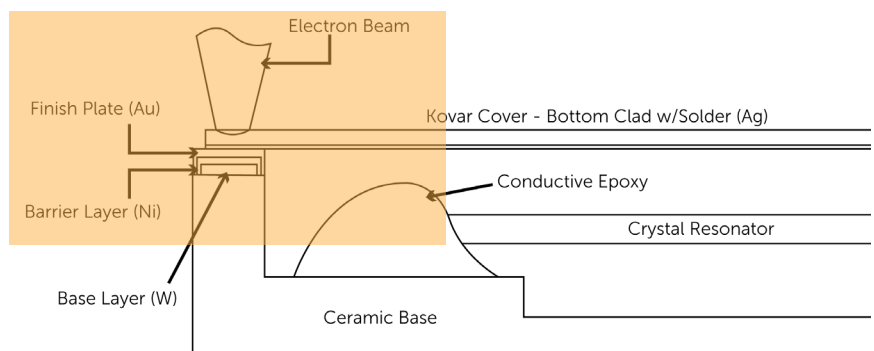
Sealing Machine



Work Surface

Advantages

- Hermetic seal
- Very high reliability
- Miniature package processing through fine-focused electron beam
- Less thermal stress on quartz resonator
- Tight tolerance and stability performance [$\pm 10\text{ppm}$]
- Low ESR capability through vacuum sealing environment
- Metal cover provides EMI shielding
- High productivity method
- Lead-Free



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Glass Sealing

Low cost sealing method that requires RoHS Exemption "7(c)-I, due to small amount of lead [Pb] in seal material. The ceramic cover and ceramic base are sealed by the fusion of low-melting-point glass frit, which melts at approximately +370°C.



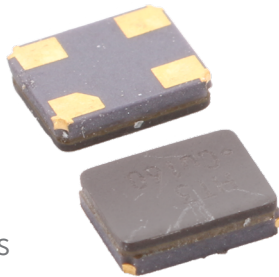
Sealing Machine

CTS Product Examples

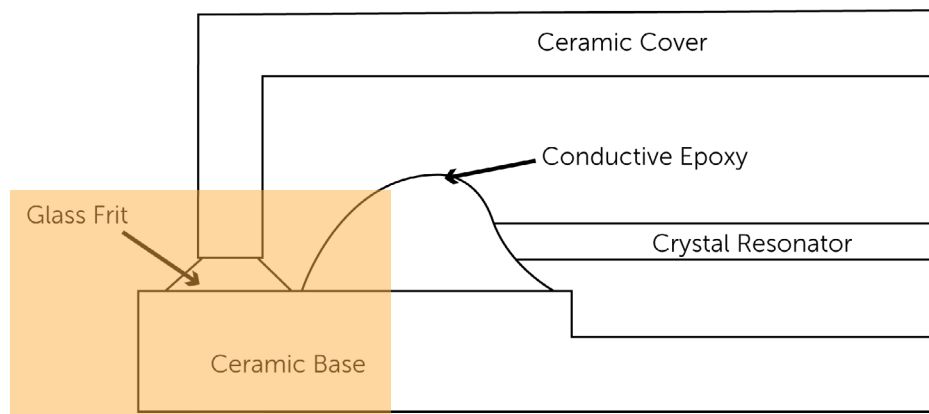
[443](#), [445](#)

Advantages

- Hermetic seal
- High temperature applications
- Low cost process



Work Surface

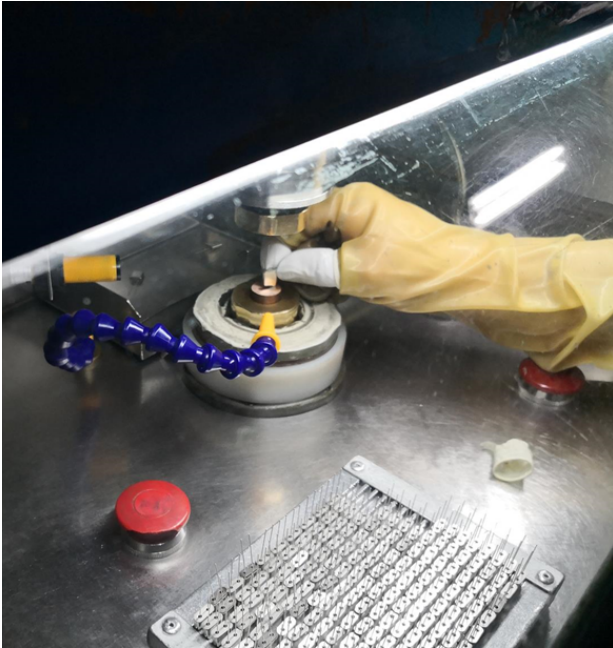


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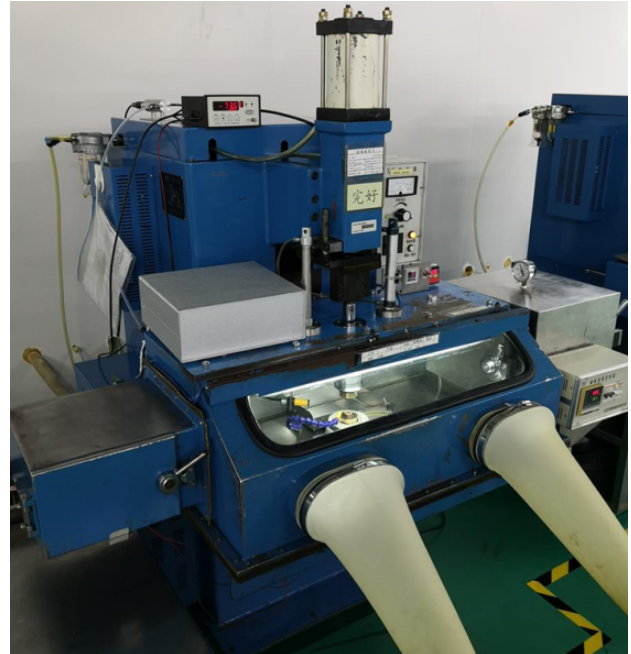
Package Sealing Methods

Resistance Welding

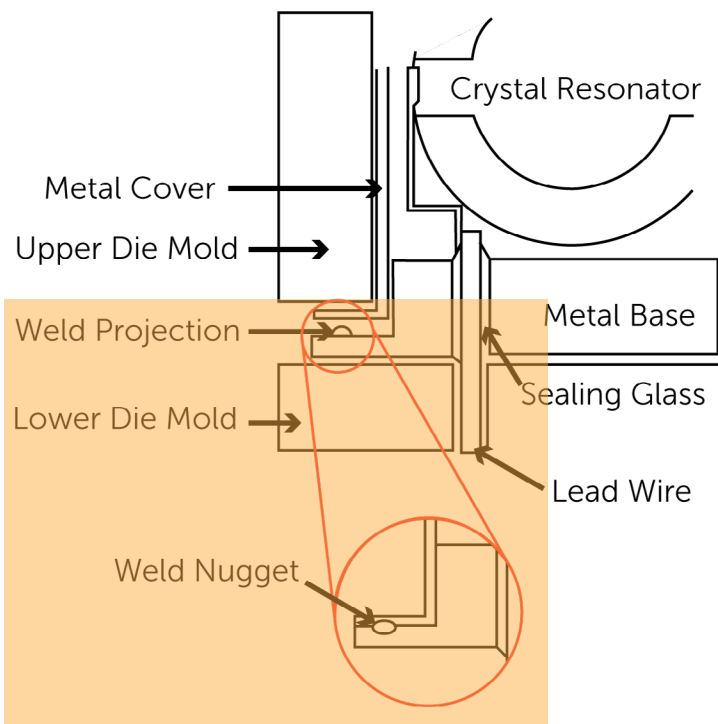
Method used for standard crystal and oscillator devices housed in metal can enclosures. Pressure is applied through a die-set to make the metal cover and base come into contact with each other. A high current is sent through the dies, welding the metallic contact portion of the cover and base, which is fused by the electric resistance.



Work Surface



Sealing Machine



CTS Product Examples

[MP](#), [ATS](#), [ATS-SM](#), [MXO45](#)



Advantages

- Hermetic seal
- Low cost legacy metal packages
- Very high reliability
- Lead-Free