

Micro-module sealing



AI Overview

Micro-module sealing involves creating precise, reliable seals at micro-scale for devices such as MEMS, microfluidics, and microelectronics, using metallic, elastomeric, or ceramic-based technologies.

Types of Micro Seals

- 1. Metallic Sealing Frames:** Metallic seals, such as eutectic gold-tin (Au-Sn) bonding, are used to hermetically seal microelectronic devices and MEMS modules. These seals are deposited directly on the active side of ASICs or wafers, allowing direct connection to micro sensors. Key considerations include wetting control of the liquid phase, adhesion promoters, barrier layers, and metallization across elevated wafer topography. Hermetic metallic frames can also include lateral electrical feedthroughs, enabling integration of CMOS wafers with MEMS devices (Fraunhofer ISIT).
- 2. Elastomeric Micro Seals:** Elastomer-based micro seals, such as MicroFORM® seals, are precision-molded from high-performance materials like FFKM or FKM. These seals are used in microfluidic pumps, valves, diagnostic equipment, and miniaturized reactors. They are manufactured in ISO Class 6 cleanrooms to minimize contamination and are designed for high chemical resistance, temperature tolerance, and long operational life, often exceeding millions of cycles (Precision Polymer Engineering, Freudenberg Sealing Technologies).
- 3. Ceramic and Hermetic Seals:** Ceramic packages provide highly effective hermetic sealing, with leak rates as low as $1.0 \times 10^{-9} \text{ Pa} \cdot \text{m}^3/\text{s}$. Sealing methods include solder sealing (AuSn) and seam welding, where a metal lid is welded to a metal or ceramic base. These methods are widely used in microelectronics, aerospace, and medical devices to prevent moisture ingress and ensure long-term reliability (Kyocera, AMADA MIYACHI).

.Applications

- Microelectronics and MEMS:** Hermetic metallic or ceramic seals protect sensitive circuits and sensors.
- Medical and Laboratory Devices:** Elastomeric micro seals ensure precise fluid control in pumps, valves, and syringes.
- Industrial Microfluidics:**

Article Content

Tiny Titans: Micro Parts Make a Big Impact | Machine

Small components with a big impact—this best describes the innovative micro parts from Freudenberg Sealing Technologies. The main areas of application for these

Hermetic Seam Sealing Microelectronic Devices

AMADA MIYACHI AMERICA has been a pioneer in the design and manufacture of welding, marking, cutting, hermetic sealing and bonding systems for more than 70 years!

Battery Pack Sealing

Sealing the deal Nick Flaherty assesses the various materials and processes used to seal and protect a battery pack Sealing a battery pack safely is a key

Sealing Frames

By the deposition of metallic sealing frames on the active side of ASICs, they can directly be connected with micro sensors. The deposition of frame structures or, if needed, of vertical contacts is made on

Seals and Cavity Plugs for Automotive | TE Connectivity

Automotive Connector Seals and Cavity Plugs We offer a broad portfolio of different seals and cavity plugs for most wire sizes and connector cavities designed for

How it works

Roxtec modular-based sealing system Roxtec sealing modules are inserted around cables or pipes in frames that are attached to the structure by welding, bolting, casting or in core drilled holes. The

Micro Seals

MicroFORM® is PPE's range of high performance elastomer micro seals, ideal for critical life science and semiconductor sealing requirements.

Hermetic Sealing | Device Protection | Ceramic

Hermetic sealing is one of the most effective methods of providing this protection. The material properties of ceramic packages and sealing methods that enable

RU2037280C1

The housing and the housing cover are made by milling, then a galvanic coating is applied to them, after which the housing connection is sealed by soldering using the sealing rubber gasket and...

Hermetic Microelectronic Packaging | SCHOTT

Often referred to as hybrid packages, multi-chip module housings, or IC packages, SCHOTT's hermetic microelectronic packages protect sensitive electrical

Packaging, Sealing, and Interconnection | part of 3D and Circuit ...

Summary <p>This chapter explains packaging for micro electro mechanical systems (MEMS) requires sealing for encapsulation and electrical interconnection. The water level packaging that uses the

Hermetic packaging

Headers, connectors, feedthroughs, or optical windows can be part of a package, allowing signals or power to pass through without breaking the seal. Lids are

Hermetic Seam Sealing Fundamentals

What is hermetic seam welding? What can go wrong with your process? The Solution: Hermetic Sealing. Encapsulation of the device into an air tight metal or ceramic housing.

Micro Seals

Hygienic seals for the smallest shafts These tiny components are primarily used in fluid-handling valves, pumps, mixers and small electric motors.

Reversible sealing techniques for microdevice applications

Reversible sealing of two different functional layers is an advancing and effective technique for the fabrication of microdevices. Reversible sealing enables microdevices to be

Hermetic Sealing Systems

Browse AMADA WELD TECH's product selection of hermetic sealing system and seam sealing and welding for resistance spot welding to create airtight seals.

Freudenberg Micro Simmerring & the Miniaturization Trend

The micro simmerring offers reliable sealing for shaft seals smaller than 3mm. Freudenberg micro simmerring provides an optimal solution for

Hermetic Seam Sealing Microelectronic Devices

Introduction - Basics: Principles of Hermetic Sealing The Objective: Protecting and controlling the internal conditions of the implantable medical and sensitive electronic devices from harsh or

Assembly Considerations for Analog Devices µModule LGA & BGA

When vacuum seal is not available, bake packages at 125°C for 48 hours minimum before reflow process. If the µModule product is already mounted on a board and is expected to be subjected to a

Hermetic Package Sealing Experts | MicroCircuit

Precision hermetic sealing for microelectronics and aerospace applications. Reliable, leak-tight packages built for extreme environments.

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Electronic module sealing and micromodule manufactured using said sealing technique

Semiconductor

Browse our key resources on elastomer sealing for semiconductor applications, including videos, animations, brochures and webinars. For our full range of

A Self-Sealing Modular Microfluidic System Using

Research shows that this approach works for open microfluidic networks. Additionally, when using polydimethylsiloxane (PDMS) as a base

Micro Seals in the Laboratory

Micro Seals for Laboratory Equipment When Absolute Accuracy Is Essential In today's hospitals, a wide range of highly sensitive laboratory equipment is used

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Perspective of power module packaging technology

Keywords: high power, frame-based modules, design, assembly technology Abstract This paper describes the assembly and interconnection technologies, design and trends of high-power

Micro seals — Small scale, big impact | GlobalSpec

Micro Seals are high-precision micro components that are indispensable in vital devices such as anesthesia and respiratory equipment.

Sealing and hermeticity

These technological building blocks (choice of resins and gels, thickness of deposits, polymerisation time, reliability of bonding after protection, etc.) all form part of our critical expertise and are

Laser Seam Sealing of Electronic and Opto-electronic Packages

Figure 1 – Laser seam sealed electronic package Leaks that result from poor seam sealing or micro-cracks may allow moisture and contaminants to enter the package. These may compromise the

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