Hermetic Solutions

- Aerospace
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Product Overview

THUNDERLINE Z

EMERSON

Trust Your Circuits to the Globally Recognized Hermetic Packaging Professionals

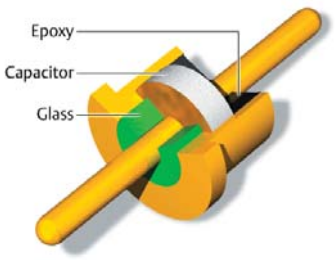
Contents

For over thirty years, Thunderline-Z has provided innovative and reliable solutions for glass-to-metal seal components and packages all over the world. Whether your need is for a feedthru, or a complex package with multiple solder schedules, we will assist you from preliminary design to volume manufacturing. By tapping into our technical experience in solder and furnace applications, and oven profiling, you can shorten your design cycles and eliminate wasteful prototyping. Our engineers are trained to work with your design team, providing support and information that is used to create the best glass-to-metal seal solution.

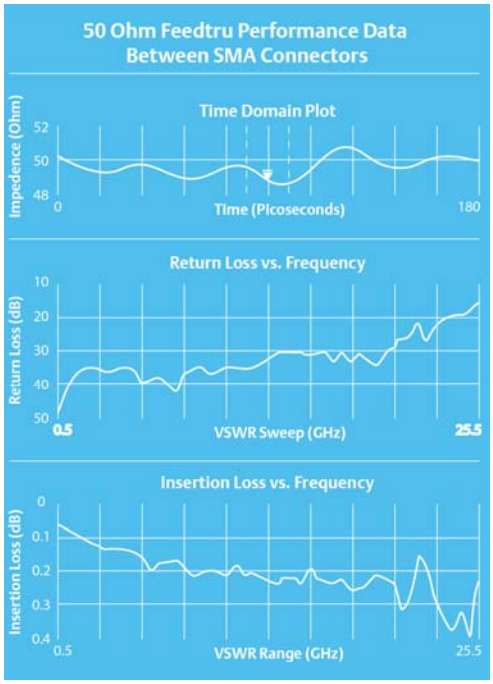
We are experienced in all aspects of military, commercial, and space applications, and deliver value added glass-to-metal seal solutions.

Thunderline Feedthrus

Thunderline-Z (TZ) is recognized the world over for manufacturing premium quality RF and DC feedthrus. We have achieved this reputation as a result of our attention to tight control of tolerances and unyielding commitment to clearly documented manufacturing processes. The result is optimum capability to yield up to zero meniscus levels in our feedthrus. Zero meniscus delivers high frequency response while also maintaining the metal-to-metal contact necessary to achieve optimal power transfer.



In addition to offering hundreds of standard RF and DC feedthrus, we specialize in incorporating filtering directly inside our DC feedthrus for capacitance requirements. Thunderline CapFeeds™ filter unwanted interference via an integrated capacitor across the DC line. This capacitor can range in value from 10 to 33,000 picofarads. The value of this capacitor is chosen based on the frequency of the spurious signal required to be shunted to the ground. TZ utilizes proprietary SolderTight™ construction to add this filtering capacitor which allows for varied soldering schedules up to 300°C.



Thunderline 50s ™
Our premium quality RF/50 Ohm feedthrus come in pin diameters from 0.009" to 0.020" and performance up to 65 GHz.

Thunderline DC Feeds ™
These rugged DC feedthrus come in an infinite mix of pin, body diameters, and lengths.

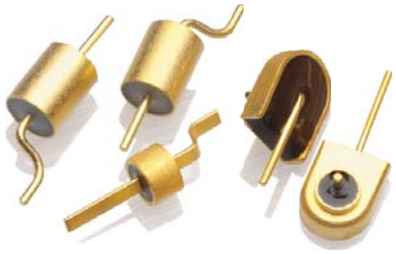
Thunderline CapFeeds ™
These capacitive feedthrus are available in body diameters from 0.098". A range of capacitance values at varying tolerances is available.

Our experience has yielded an impressive design library of Kovar and steel RF, DC, and capacitative feedthrus. We also offer varied pin tip options and body and pin length and diameters.

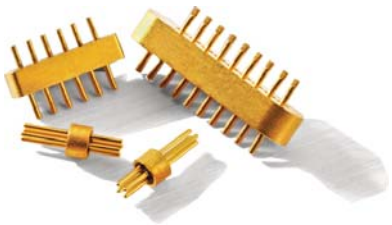
To find a solution that is right for you, simply visit our website and our online tools. When you are finished with these tools and your attention turns to our prototypes, contact our highly skilled sales support team who will search our available feedthru inventory for samples.

Feedthru Fast Facts
Pin Sizes .009" through .040"
RF Performance up 65 GHz
Hermeticity 1 x 10^{-8} ccHe/sec @ 1 atm
DC Feedthrus Kovar and Steel
Surface Mount RF & DC
Dual Diameter Pins
Multi-Pin Feedthrus
Capacitive Feedthrus 10 pf to 33,000 pf
Flange and Straight Body
Plate Options Gold or Tin
Pin Tip Options Flattened, Flattened and Pierced, Gull Wing Bend, Nail Head, Radiused, Straight Cut, Probe, Angled, Cone, Notched, Right Angle

Frequency GHz	Pin Dia. P/D	Body Dia. B/D	Body Length
65	.009	.068	.055
42	.012	.076	.040
42	.012	.076	.055
42	.012	.076	.075
42	.012	.076	.120
42	.012	.076	.160
28	.015	.098	.035
28	.015	.098	.040
28	.015	.098	.060
28	.015	.098	.062
28	.015	.098	.075
28	.015	.098	.090
28	.015	.098	.125
18	.018	.110	.040
18	.018	.110	.060
18	.018	.110	.090
8	.020	.158	.060
8	.020	.158	.060



Thunderline SMT Pins TM
Thunderline-Z offers a variety of conventional bent pin feedthrus, as well as the new Thunderline BellPin™-- a revolutionary patented design that provides optimal surface mount contact.



Thunderline Multi-Pins TM
These multi-pin headers come in a variety of styles from 2 pin up to10 or more pins. They are built for both DC and RF applications up to 42 GHz and are available with combined RF and DC functionally in the same header.

Thunderline Thread-In Feedthrus TM
Designed for floor installations not requiring hermeticity, Thunderline-Z Thread-In Feedthrus offer easy and reliable installation. In both DC and RF styles, these parts not only offer an excellent alternative to messy epoxy installation but also serve as an easy repair pin solution.

Custom Packaging

An advanced, flexible approach to creating premium custom packages

We can assist you with choosing the right approach to creating your custom packages. Whether your solution calls for our SolderTight or Directbond™ processes, we will guide you through every step in creating a rugged and reliable glass-to-metal seal package.

Our expertise includes working with Kovar™, aluminum, alumina alloys, brass, cold rolled steel (CRS), stainless steel, and inconel. Our experienced engineers will work closely with you with layout and can recommend hole sizes, oven profiling and solder selection. They will help you create a superior package design by optimizing holes for direct sealing Kovar or soldering into aluminum. Besides being experts in the use of gold/tin solder, we are also adept at other solders such as Sn96.

If you need a hybrid solution using both direct fire and solder we can assist you in mapping out the proper sequence of manufacturing.

Hermeticity is achievable to 1x 10^{-9} ccHe/sec @1 atm.

Manufacturing Services
Solder 8 Zone Solder Reflow Oven
Direct Fire Belt glass/ Brazing Furnaces
Brazing
Laser Welding
Temperature Profiling
Machining
Plating
Wire Cutting
Advanced Test & Measurement

SolderTight™

SolderTight technology blends Thunderline-Z's years of experience with proprietary soldering oven profiling techniques to create premium packages.

DirectBond™

DirectBond is our answer to the need for extremely high performance direct sealed packages where glass is matched and sealed directly to a metal housing.

ZBond™

Zbond brazing technology is used in combination with our DirectBond packaging solutions to add value when additional components such as ground pins, heat sinks, pads, and exhaust tubes need to be bonded within a package.

Components Installed
Thunderline 50s
Thunderline CapFeeds
Thunderline DCFeeds
Thunderline BellPins
Thunderline Profit Feeds
Thunderline Multipins
Press-on Connectors
Field Replaceable SMAs
Grounding Pins

Solder Experience
Gold/Tin (80/20)
Tin based (Sn96, Sb5)

Plating Options	
Nickel	***Gold***
Silver	***Copper***
Tin	

Base Materials
Kovar
Aluminum
Cold Rolled Steel (CRS)
Inconel
Stainless Steel
Copper
Brass

Perfected Process, Optimal Quality

A perfected process leads to optimal quality

At Thunderline-Z, quality is built into our entire process, leaving final inspection as a cross-check of our procedures.

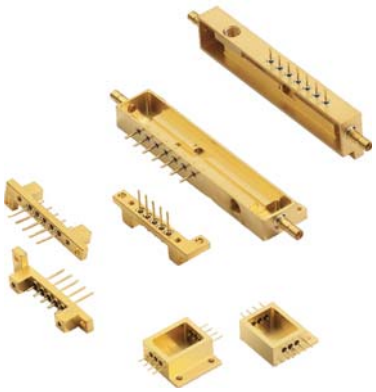
Quality Assurance and Reliability Testing

We provide products to a variety of customers in both the military and commercial marketplace. As such, we work with many standards and specifications. Our QA group also works diligently with our design and manufacturing teams to install inspection criteria into the beginning, middle, and end of our entire process. By building in quality at every step in the manufacturing process, we continue to secure our position as the true leader in the glass-to-metal seal industry.

Inspection and Reliability Testing
Quality Standard MIL-I-45208A
Calibrations System MIL-STD 883
Audited to ISO 9001:2015
RoHs Compliance
DFARS Clause 252.225-7014
X-Ray Analysis First Article or 100%
Dye Penetrate Evaluation
Dimensions: Drop Gauges, Micrometer, Vernier Deltronic Optical Comparitor
Coordinate Measurement Machine (CMM)
Stabilization Bake MIL-STD 883/ Method 1008.2
Temperature Cycling MIL-STD 883/Method 1010.7
Helium Fine Leak Test MIL-STD 883/ Method 1014.1
Electrical Hi-Pot and Continuity 202/ Method 301
Capacitance
Steam Age
Solderability
Lead Integrity
Moisture
Salt Spray

Temperature Profiling

The key to helping ensure a reliable, high quality, hermetic seal lies in establishing proper oven profiles. TZ utilizes state-of-the-art multi-atmosphere and multi-zone temperature solder ovens and glass furnaces to create unique settings for various requirements. As part of the first article evaluation, our skilled operators evaluate each design for thermal mass, temperature coefficient of expansion, fixturing, plating, solder type and other key criteria to establish a precise oven profile for each assembly. Once identified, each oven profile is stored in our operation methods for use in future builds. Whether your need is for a solder module, or a matched glass seal, direct fire assembly, we have the right combination of equipment and experience to provide you a high performance, hermetic package. With over thirty years of solder and direct fire experience, Thunderline-Z has the expertise to deliver your design on schedule and in budget.



Machined Housings
Thunderline-Z has extensive knowledge of housing materials and plating finishes, and a wide array of component installation options. With tolerance as tight as 0.001 inches, our attention to detail is second to none.

Fixturing

We design, build, and control every aspect of the fixturing used in the assembly process. Fixturing is the key to reliability and repeatability of both our feedthrus and packages. Each require extremely tight-tolerance, machine carbon fixtures. Our design team can guide you through first article units, providing stress testing and mechanical evaluation as required prior to the first volume build. In-house control of our fixtures, combined with archived oven profiles (which are verified with every repeat build) are important steps in our quality assurance program.

Laser Sealing Capabilities

Laser Lidding

With a state-of-the-art laser center, we are your total RF/Microwave packaging solution provider. High powered laser systems complete the packaging cycle and offer the best solution to lidding concerns. Our laser technicians are highly skilled in delivering consistent, repeatable seals and are specialists for stability. Using a combination of continuously variable laser power and pulse shaping techniques, our team achieves consistently accurate welds between lids and packaged housings while employing the know-how to work around critical circuit paths.

Component Installation

With a second station in our laser center featuring a low-power laser system, we can perform reliable placement and sealing of the most challenging feedthrus and connectors. Compared to conventional solder sealing or seam sealing approaches, our laser welding forms the most robust metal-to-metal seal around the perimeter of a package. This maintains a higher level of hermeticity for the most demanding environments, including Class S (space-based) applications.

Laser Center Features	
• State-of-the-art ND YAG laser	• ANSI/ESD S20.20 compliant
• Glove box welder for hermetic packages	• Fine and gross leak testing method 112, condition C and D
• Stand-alone Class IV system for component installation	• Cross-sectional analysis
• Adjustable environment	• X-ray analysis

Built for Customization and Innovation

Complex machining? Varied solder schedules? Direct fire/solder combinations? Internal connections? Component mounting? Exotic plating? Filtered connections?

You name it, we have your packaging issues covered.

Go with the Pros

We are dedicated to supplying high quality hermetic packages. We've optimized our electrical design, RF design, application engineering, fixturing, tooling, machining, wire and lead fabrication, sealing and brazing departments into a one-stop resource. When combining DC and RF leads in the same package, there are many technical issues to consider: mechanical tolerances that affect RF or electrical performance; power dissipation; material selection; and solder options. We are fully equipped to handle these issues efficiently.

Our surface mount bell pins are available in .015" and .009" diameter, affording designers performance options well into K-band

Visit Emerson.com for more details.

Custom Packaging Capabilities

Hermetically Engineered RF/Microwave Modules

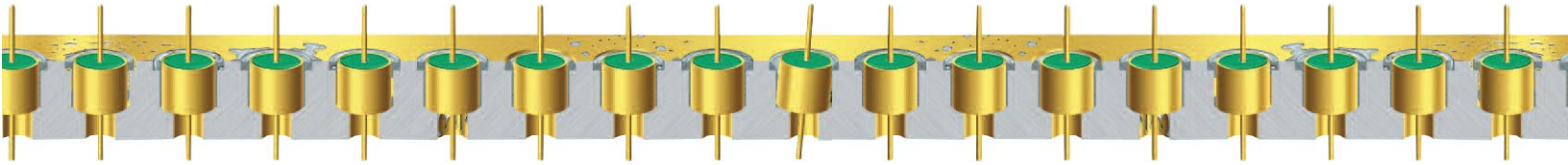
Thunderline-Z's advanced hermetic package manufacturing line employs multi-atmosphere and multi-zone oven temperature control, along with a broad range of soldering technology in the microwave business. Our expertise includes working with Kovar, aluminum, alumina alloys, brass, cold rolled steel (CRS), stainless steel, and inconel. Our highly experienced engineers can help you calculate hole sizes, oven profiling and solder selection and in creating a superior package design for direct sealing Kovar or soldering into aluminum. Thunderline-Z is an industry leader in the use of Au/Sn solder and uniquely qualified in the use of Sn96 and Sb5. If a hybrid solution using both direct fire and solder is needed, we can assist in mapping out the proper manufacturing sequence.

High Frequency Surface Mount Packages

Utilizing our the BellPin feedthru, we can quickly deliver hermetically sealed custom aluminum alloy packages with true surface mount connections that perform through K-band. This unique approach offers several pin position options and delivers premium VSWR characteristics while helping to ensure low parasitic inductance. These packages are ideal for everything from prototype jobs to high volume manufacturing. They are supplied 100% hermetically tested and are available in a variety of plating options including nickel, silver, or gold.

Inspection and Reliability Measure	
• Quality Standard: ISO-9001-2008	• Dye Penetrate Evaluation
• Calibrations System: MIL-C-45662	• Stabilization Bake: MIL-STD 883/ Method 1008.2
• Audited to AS-9003	• Temperature Cycling: MIL-STD 883/Method 1010.7/MIL-STD 2020
• RoHs Compliance	• Helium Fine Leak Test: MIL-STD 883/Method 1014.1
• DFARS Clause 252.225-7014	• Capacitance
• X-Ray Analysis: First Article or 100%	• Lead Integrity
• Electrical: Hi-Pot and Continuity 202/ Method 301	
• Solderability	

Top Ten Soldering Pitfalls and How to Avoid Them

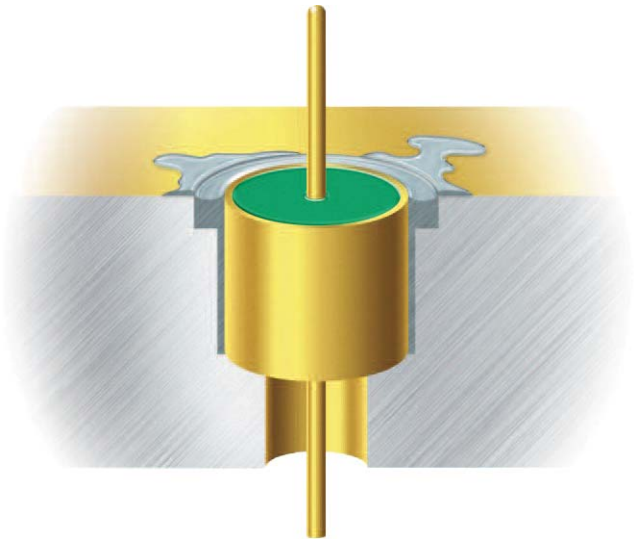


The quality of the package is only as good as the performance of the feedthru.

The performance of the feedthru is only as good as the integrity of the solder joint.

Soldering feedthrus can be tricky business, and a faulty solder joint can make or break the performance of a package. Thunderline-Z's extensive package design and manufacturing experience has helped us to understand many of the soldering problems you may be facing. We have assembled this guide to help you avoid the most common feedthru installation pitfalls and to recognize them, should they occur.

1 Solder Overflow

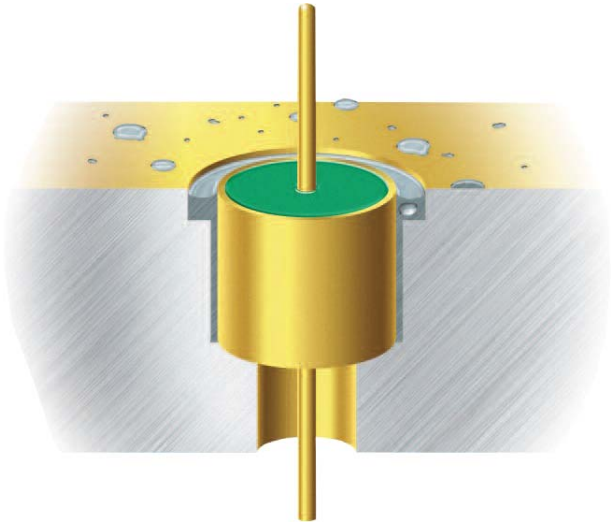


Problem: Solder overflow is the appearance of uneven solder flowing out of and around the solder joint area. In addition to being a visual reason for part rejection, overflowing solder is a cause for concern.

Causes: A number of uncontrolled processes can cause solder overflow including temperature, solder volume and package hole geometry. Excessive temperature and uneven heat distribution are the most common causes. Another, less common but more concerning cause, is a mismatch between solder volume and the hole geometry in the soldered package.

Solutions: The solutions to solder overflow are to control temperature and engineer hole geometry for the solder used. The best way to control temperature is with a soldering furnace with tightly monitored temperature profiles and atmosphere management. To select the optimum solder, the design of the housing is the first consideration. The hole geometry must be matched to the type of feedthru or connector being used and to the characteristics and volume of the solder selected. Further control is gained by utilizing tight tolerance solder preforms to supply the proper volume of solder to the joint.

Solder Splash 2

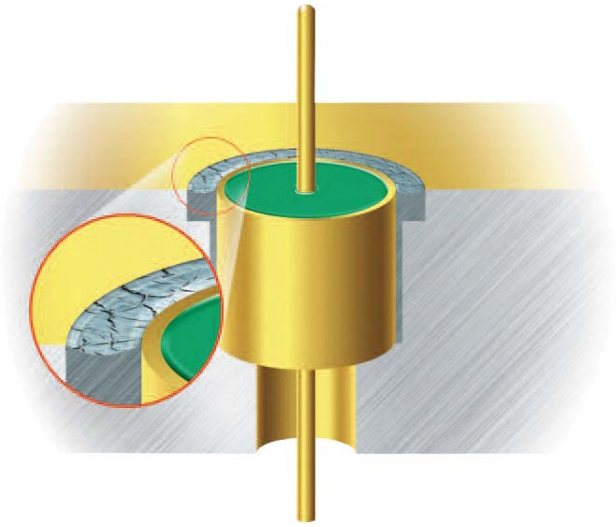


Problem: Solder splash is recognized by small bursts of solder extending away from the solder joint.

Causes: There are several potential causes for solder splash: uneven temperature gradients within the receptor housing during solder flow; improper flux and/or solder selection; incompatible housing or feedthru plating; or an incorrect flow temperature for the solder. Poor preparation of the housing before solder application can also lead to solder splash.

Solutions: To prevent solder splash it is important to allow enough time for heat to be introduced to the package housing. This is accomplished best by thermocouple monitoring and accurately controlling the dwell time within the furnace prior to increasing temperature for solder flow. It is also important to thoroughly clean the housing to remove residual dirt and oils. This helps ensure an uninterrupted flow of solder to the solder joint. Gaining an understanding of solder types and fluxes is also important.

3 Solder Crystallization

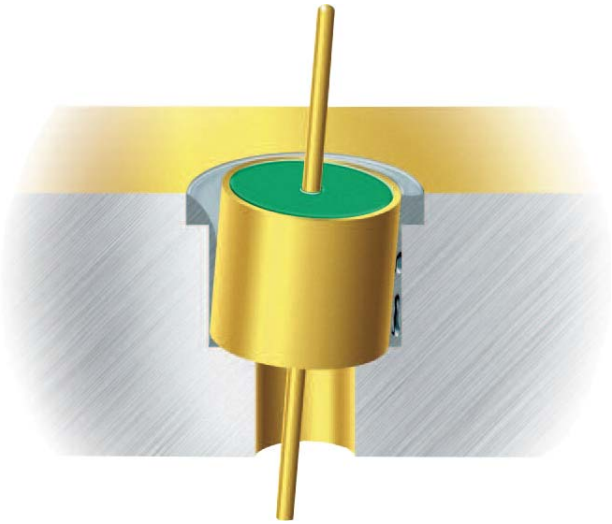


Problem: Solder crystallization is characterized by a cracked and uneven appearance of the solder joint. Although not necessarily an immediate cause for visual rejection, crystallization in the joint may indicate a poor solder joint that will fail over time and should be corrected.

Causes: Solder crystallization commonly occurs as a result of improper flux selection or not thoroughly cleaning the housing with the right cleaning materials. Crystallization can also occur as a result of temperature gradients during the soldering process. In an oven soldering process the wrong mix of forming gases can also result in crystallization.

Solutions: The selection of a flux that matches the soldering process conditions, such as temperature and cleaning, is important to avoiding crystallization. The use of a soldering oven also adds considerable control to the process. Tailoring the temperature profile and ambient gas flows to the selected solder and plating materials is key in creating a quality solder joint. By uniformly increasing temperature and matching the forming gases in the furnace to the selected solder and housing plating material, you will gain control over the key parameters in avoiding crystallization.

Crooked Feedthru 4

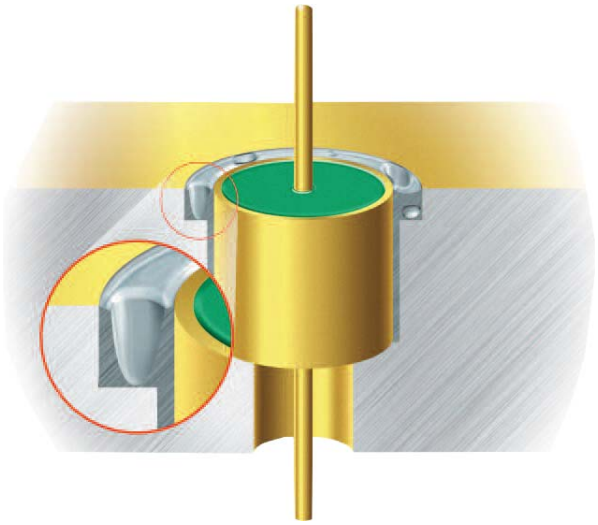


Problem: When the body of a feedthru is not flush with the housing this is a visual clue that the body shell is not parallel with the walls of the hole. A crooked feedthru is also an indication of an uneven soldered joint and therefore a weak point and reason for failure upon inspection.

Causes: There can be a number of reasons for poor mechanical alignment between the feedthru and housing hole, including: a poorly machined hole; a poorly designed or built fixture; a worn fixture; or the wrong hole geometry.

Solutions: A statistical inspection of housings prior to soldering can ensure the base structure is proper. Having a fixture engineered for a specific housing layout and tolerances is key. Designing the hole cavity to work with the fixture and soldering preform is another important design consideration.

5 Solder Blow Holes

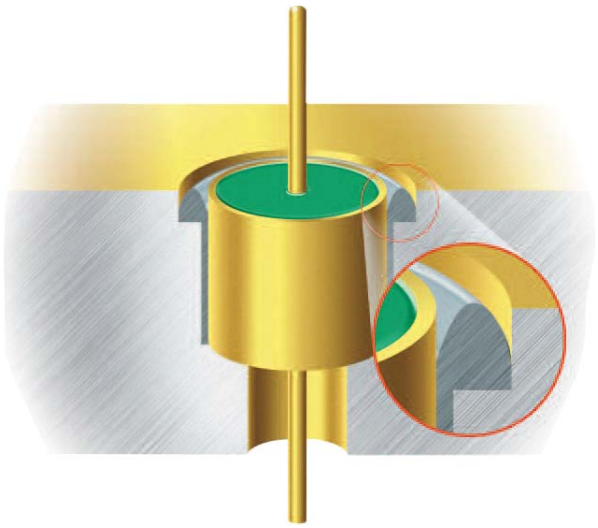


Problem: Voids in a solder joint will visually appear as pin holes or have a crater like, or “blow hole”, appearance where the bottom of the void is not visible. Both of these appearances are reasons for rejection and concern for the integrity of a solder joint.

Causes: The cause for solder voids can be singular or a combination of many factors. The primary reasons for solder voids include: improper volume of solder; an uneven temperature profile; poorly designed hole geometry; improper alignment of the feedthru leading to uneven solder paths; or selecting the wrong flux.

Solutions: Precision cavity and solder preform are essential to ensuring an optimum fill of the solder area. To eliminate voids caused by uneven solder flow it is important to maintain feedthru alignment using a fixture during assembly and oven transport. Establishing and controlling a soldering temperature profile is also key to managing the flux evaporation rate to eliminate voids during soldering.

Poor Fillet/ Wetting Angle 6

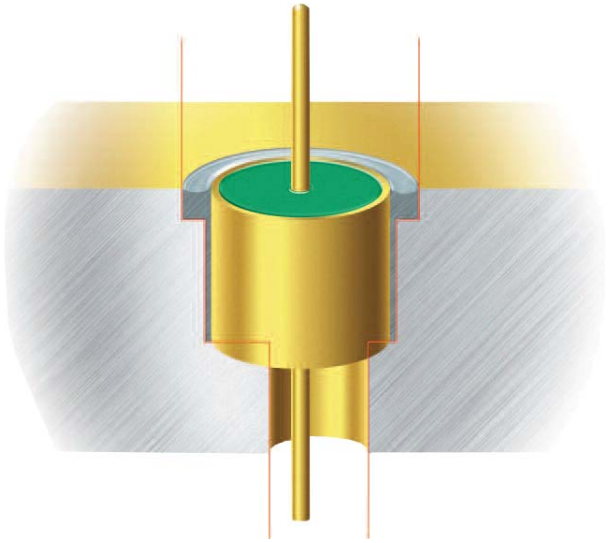


Problem: A poor wetting angle, or lack of wetting, is an indication that there is an improper solder flow and thus poor bonding. A good solder joint will have an angular filler at the base of a joint, a strong wetting angle is an indication that the solder joint has a strong bond.

Causes: A prime cause for a poor fillet or poor wetting angle is the result of insufficient heat energy from either poor temperature control or component duration in a heating zone. Parts that are not properly prepared to remove contamination can reject solder, this rejection will also lead to a poor wetting angle. The breakdown of flux at the soldering temperature can also be a possible cause to investigate poor wetting.

Solutions: Engineering an oven temperature profile for the housing to be soldered will ensure the right distribution of heat energy for good solder flow. Regular oven calibration for temperature will ensure the repeatability of a temperature profile. Cleaning of metal surfaces is essential to ensure the removal of oils and oxide contaminants prior to soldering. Selecting the proper flux for the temperature ranges to be worked is also critical in forming a strong solder bond.

7 Misaligned Holes

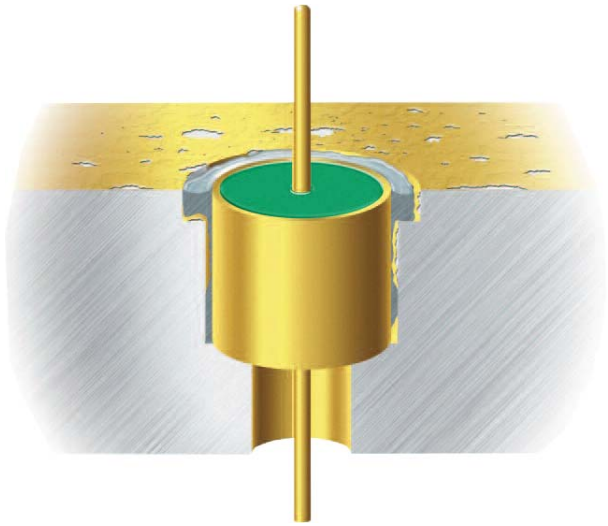


Problem: To the installer or inspector a misaligned hole may not be readily apparent. A properly machined hole however, is crucial in providing a repeatable and sustainable solder joint. Improper width or depth can lead to feedthru damage and alter electrical performance. If the cavity for the solder joint is too small the solder may not flow evenly to reach and completely wet the area of the two metal surfaces to be joined. If the cavity is too big or too wide there is greater chance for the component being sealed to move or for solder to find its way out of the cavity.

Causes: Poor mechanical design and machining.

Solutions: The key is to pay as much attention to the design and tolerances of the holes for each type of component as is spent on the overall package design. This will prevent individual components from becoming the weak link in the final package. This requires an understanding of the relationship of hole and component geometries and knowledge of soldering processes for varied applications.

Poor/Improper Plating 8

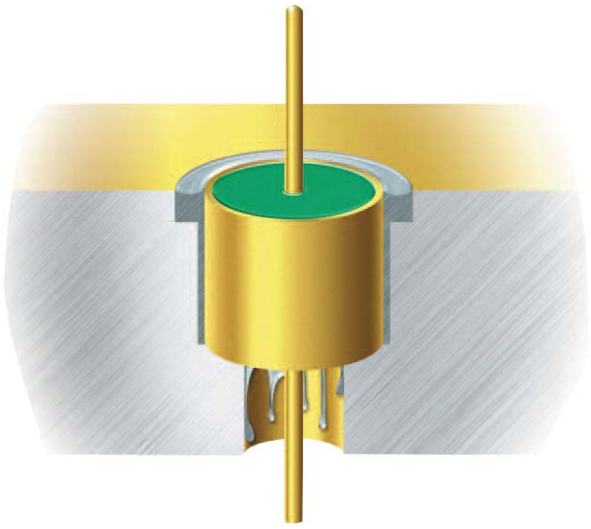


Problem: Blisters, voids or flaking of the plating in the solder joint area can lead to poor solder adhesion and therefore a weak joint that may later result in a hermetic or electrical failure. While the plating finish may be correct for the base metal, the plating selection also needs to match requirements for adherence to the filler metal used in the solder joint.

Causes: Poor plating adhesion is often the result of impurities left on metal surfaces prior to plating or storage, or can be the result of selecting the wrong plating for the desired application. In making plating choices the base housing material and the solder filler metal need to be taken into consideration.

Solutions: To select the right plating for a specific application involved, it is necessary to consider the housing base metal, the soldering process and the environmental conditions that the final package will incur. Proper cleaning of the base metal is also essential to provide a strong plated surface. Matching fluids and cleaners not properly selected and managed will cause a plating adhesion problem.

9 Airline Obstruction

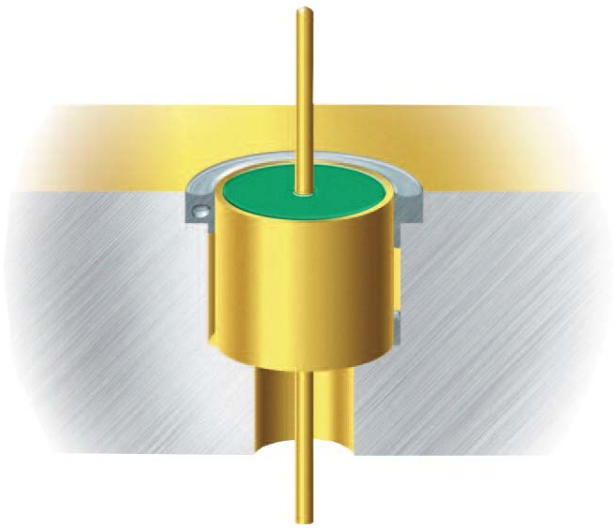


Problem: Airline obstructions caused by uncontrolled solder flow creates an improper ratio of pin diameter to aperture diameter which determine the ohmic impedance value.

Causes: Alteration in the airline geometry is generally the result of solder flowing into an area where it does not belong. This creep of solder can be the result of having an excess solder volume, poor heat control during the flow of solder or poor fixturing for the solder operation.

Solutions: Using the correct volume of solder for the feedthru- and hole design provides a basis to control the flow of solder outside of the joint area. Holding the system securely in place with proper fixturing and maintaining this fixturing builds upon this base. The optimal system for heat control is using an oven to form the solder joint. Realizing the heat profile of the oven is most important. Proper maintenance, multiple oven zones, and repeatability in temperature and oven atmosphere, are essential to completely control the solder joint formation.

Hidden Solder Voids 10



Problem: The most difficult, and perhaps most dangerous pitfall of all, is when voids are out of sight. Hidden voids can be a cause for mechanical failure or hermeticity loss over time. Electrical performance may also be in jeopardy.

Causes: Any one or several of the previously discussed causes may have occurred.

Solutions: Because voids below the surface are not visible, your first line of defense is proper electrical testing and an understanding of the potential causes of poor performance. Reviewing all of the previously discussed solutions and systematically addressing each one, is the only way to prevent hidden voids from reoccurring.

Start Your Installation With a High Quality Feedthru From Thunderline-Z


50s TM


DC Feeds TM


CapFeeds TM


BellPins TM


SMT Pins TM


Thread-In Feedthrus TM

Thunderline 50s

Thunderline 50s are the world's largest variety of RF feedthrus in the industry, with pin diameters from 0.009 to 0.040 and frequency ranges from 3 to 65 GHz. High quality levels are achieved through tight control of tolerances and the manufacturing process to yield a zero meniscus. This allows for higher frequency response while maintaining a metal-to-metal contact with the housing to achieve optimal power transfer.

Thunderline CapFeeds

Thunderline CapFeeds offer a DC feedthru filtered to the customer's specification. The robust construction allows the customer the freedom of the broadest solder schedule available. CapFeeds are available in diameters from 0.098 upward. A complete range of capacitance values at varying tolerances is available as single feedthrus or in multi-header designs.

Thunderline DC Feeds

Thunderline DC Feeds are manufactured using precision components and controlled furnace technologies. Feedthrus are available in all quantities from research and development to high volume commercial applications. These rugged DC feedthrus come in an infinite mix of pin and body diameters and lengths. They are designed to satisfy the desire of quality minded engineers while meeting the competitive pricing demands needed in today's marketplace.

Thunderline BellPins

The Thunderline BellPin is a revolutionary design that has been developed to work with lightweight, aluminum or brass housings. They easily attach to the bottom of packages to create true hermetic surface-mountable parts. They are an ideal solution to costly, bulky Kovar packaging problems. By employing BellPins in your next design you'll be able to decrease costs while maintaining package integrity.

Thunderline Thread-In

Designed for floor installations not requiring hermeticity, Thunderline-Z Thread-In Feedthrus offer easy and reliable installation . Available in 2-56 and 4-40 external thread sizes and, in both DC and RF styles, these parts not only offer an excellent alternative to messy epoxy installation but also serve as an easy repair pin solution.

Put Thunderline-Z's Packaging Expertise to Work for You.

If you're struggling with production constraints, quality issues or a limited time frame in which to complete your packages, turn to Thunderline-Z. In addition to providing the world's most popular feedthrus over the last three decades, we have also delivered over 1,000,000 custom hermetic packages.

It all starts with our oven technology. Our state-of-the art process employs multi-atmosphere and multi-zone temperature control. And our experience encompasses the broadest range of soldering technology in the microwave business. You can trust our industry trained engineering team because they know the unique science of designing for hermeticity. We can provide turnkey packages with any combination of feedthrus, press on connectors and multi-pin headers you can imagine.

SolderTight

SolderTight technology is a proprietary soldering approach that blends Thunderline-Z's years of metallurgy experience with advanced oven profiling techniques. This technology allows us to create premium packages with any combination of Thunderline Feedthrus and a variety of connector options including custom connector designs. From basic tin for general applications, to gold/tin solder for applications demanding higher strength and longevity, we have the extensive experience and controlled manufacturing processes to deliver exceptional quality. Customers prefer our packages because they are truly hermetic, easily affordable and delivered to their schedule.

DirectBond

DirectBond is Thunderline-Z's answer to the need for extremely high performance direct sealed packages where glass is matched and sealed directly to a metal housing. While our experience in soldering has led to premium soldering packages, our additional research and development of tightly monitored temperature control ensure the tightest matched direct seal packages as well. By utilizing these controls we have perfected an approach that guarantees true hermeticity over the widest temperature ranges and helps solve high frequency power loss problem inherent in other manufacturing techniques.

ZBond

ZBond technology is used in combination with our DirectBond packaging solutions to add value when additional components such as ground pins, heat sinks, pads, and exhaust tubes need to be bonded within a package. Our extensive knowledge of stainless steel, Kovar, molybdenum, copper and multitude of alloys have led to this unique brazing approach that provides flexibility for heat dissipation and thermal transfer in package designs.

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Users must determine the suitability of any Therm-O-Disc component for their specific application, including the level of reliability required, and are solely responsible for the function of the end-use product. It is important to review the Application Notes which can be found at **Emerson.com/thermodisc**