

# Hermetic Solutions

- Aerospace
- Defense

Product Overview



# Trust Your Circuits to the Globally Recognized Hermetic Packaging Professionals

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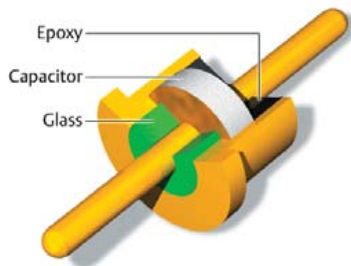
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For over thirty years, Thunderline-Z has provided innovative and reliable solutions for glass-to-metal seal components and packages all over the world. Whether your need is for a feedthru, or a complex package with multiple solder schedules, we will 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.

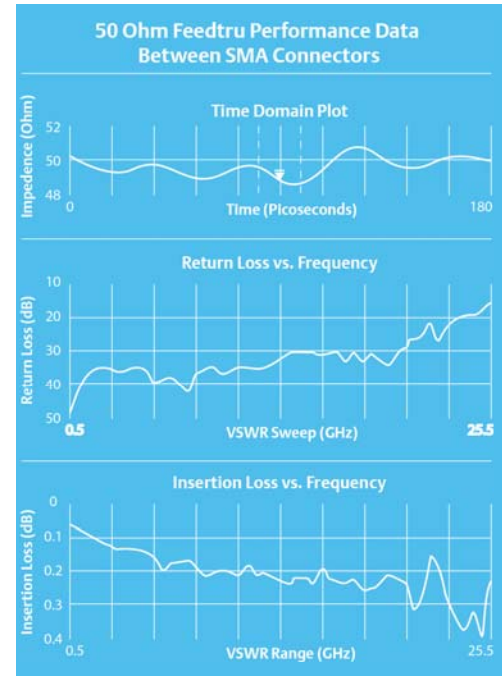
# Thunderline Feedthrus

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.



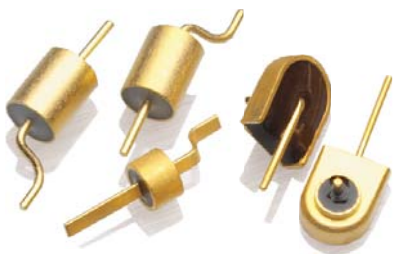
**Thunderline CapFeeds™**  
These capacitive feedthrus are available in body diameters from 0.098". A range of capacitance values at varying tolerances is available.

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

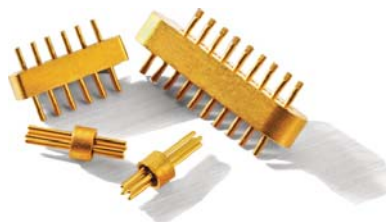
To find a solution that is right for you, simply visit our website and our online tools. When you are finished with these tools and your attention turns to our prototypes, contact our highly skilled sales support team who will search our available feedthru inventory for samples.

<b>Feedthru Fast Facts</b>	
<b>Pin Sizes</b>	.009" through .040"
<b>RF Performance</b>	up to 65 GHz
<b>Hermeticity</b>	$1 \times 10^{-8}$ ccHe/sec @ 1 atm
<b>DC Feedthrus</b>	Kovar and Steel
<b>Surface Mount</b>	RF & DC
<b>Dual Diameter Pins</b>	
<b>Multi-Pin Feedthrus</b>	
<b>Capacitive Feedthrus</b>	10 pf to 33,000 pf
<b>Flange and Straight Body</b>	
<b>Plate Options Gold or Tin</b>	
<b>Pin Tip Options</b>	
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™**  
 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™**  
 These multi-pin headers come in a variety of styles from 2 pin up to 10 or more pins. They are built for both DC and RF applications up to 42 GHz and are available with combined RF and DC functionality in the same header.



**Thunderline Thread-In Feedthrus™**  
 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  $1 \times 10^{-9}$  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**

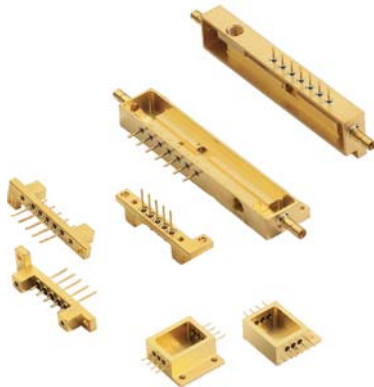
**Salt Spray**





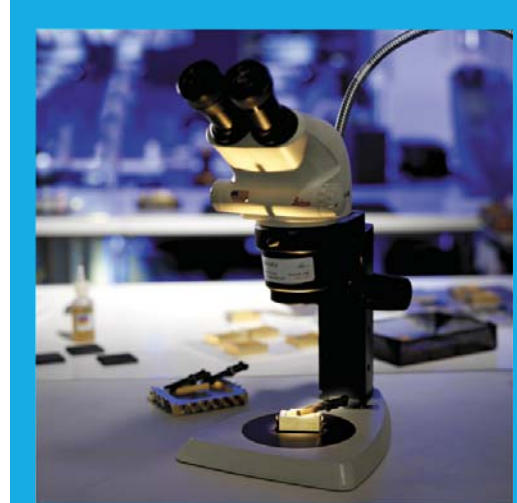
## Temperature Profiling

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
- Glove box welder for hermetic packages
- Stand-alone Class IV system for component installation
- Adjustable environment
- ANSI/ESD S20.20 compliant
- Fine and gross leak testing method 112, condition C and D
- Cross-sectional analysis
- X-ray analysis



# Built for Customization and Innovation

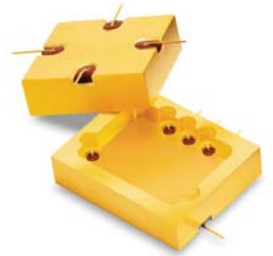
Complex machining? Varied solder schedules? Direct fire/solder combinations? Internal connections? Component mounting? Exotic plating? Filtered connections?

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





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