

THUNDERLINE 



The Science of Hermeticity

Packaging Solutions for RF, Microwave and Fiber Optic Circuits





Trust Your Circuits to the Globally Recognized Hermetic Packaging Professionals

If your circuits require nothing but the best packaging solutions trust them to the professionals at Thunderline-Z and Emerson. For over twenty 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, Thunderline-Z 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 you can use to create the best glass to metal seal solution.

In 2000, Thunderline-Z joined forces with Fusite, a division of Emerson. Based in Cincinnati, Ohio, with five manufacturing centers around the globe, Fusite is a recognized leader in glass to metal seals used in the HVAC, Sensor and Automotive industries. This unique partnership affords Thunderline-Z the ability to offer manufacturing and technical expertise throughout the world.

If you need a glass to metal seal solution, Thunderline-Z can deliver. We're experienced in all aspects of military, commercial, and space applications.



FEEDTHRU FAST FACTS

◇ **Pin Sizes** .005" through .060"

◇ **RF Performance** up to 125 GHz

◇ **Hermeticity**

1 x 10⁻⁹ccHe/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

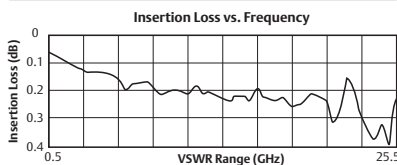
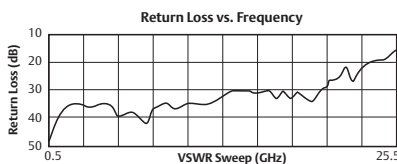
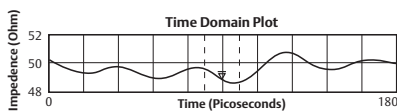
◇ **Flange and Straight Body**

◇ **Plate Options** Gold or Tin

◇ **Pin Tip Options**

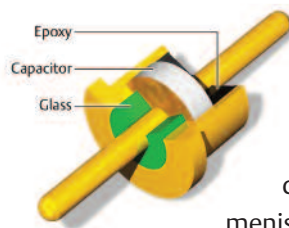
Flattened, Flattened and Pierced,
Bent, Nail Head, Radiused,
Straight Cut, Probe, Angled,
Cone, Notched, Right Angle

50 Ohm Feedthru Performance Data
Between SMA Connectors



High performance packages depend on superior feedthrus

Thunderline-Z 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 an unyielding commitment to clearly documented manufacturing processes. The result is an unprecedented



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, Thunderline-Z specializes 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 ground. Thunderline-Z utilizes proprietary SolderTight™ construction to add this filtering capacitor which allows for varied soldering schedules up to 300° C.

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 diameters.

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



Thunderline 50s™

Our premium quality RF/50 Ohm feedthrus come in pin diameters from 0.005" to 0.020" and performance up to 125 GHz



Thunderline DC Feeds™

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



Thunderline CapFeeds™

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



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 Pro-Fit™

If one of our standard feedthrus doesn't fit your application, allow us to put our expertise to work in designing and manufacturing an exact solution with Thunderline Pro-fit.

CSZ
Cincinnati Sub-Zero



FAULT O₂ [CO₂

TEMPERATURE CONTROLLER/PROGRAM
CH1 - UPPER CHAMBER
CH2 - LOWER CHAMBER

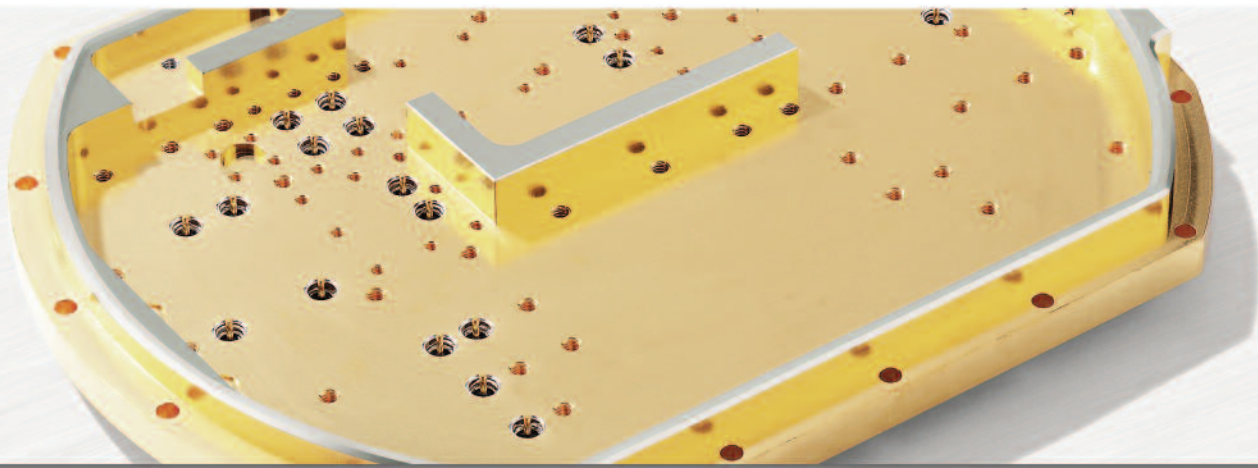
HEAT	COOL
22	22
20	20

CSZ

GUARANTEED SOAK CONTROLLER
PART TEMPERATURE

Honeywell

22



An advanced, flexible approach to creating premium custom packages

SolderTight™

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

DirectBond™

Direct Bond 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.

ZBond™

Z Bond 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.

Thunderline-Z 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.

Thunderline-Z's expertise includes working with Kovar, aluminum, alumina alloys, brass, cold rolled steel (CRS), stainless steel, and inconel. Our experienced engineers will aid 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 1×10^{-9} ccHe/sec @1 atm.

Manufacturing Services

Solder

Belt Soldering Ovens (2-5 Zones)

Direct Fire

Belt Glass/Brazing Furnaces

Brazing

Welding

Temperature Profiling

Machining

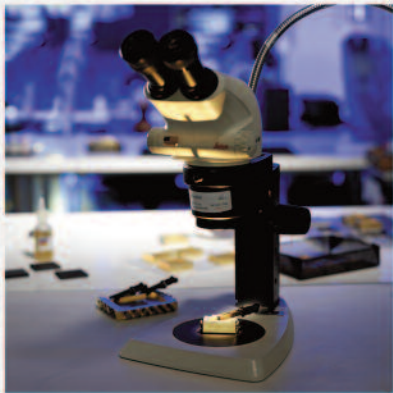
Plating

Wire Cutting

Advanced Test & Measurement

A perfected process leads to optimal quality

At Thunderline-Z, quality isn't something we do a final test for, it's something that's built into our entire process—leaving final inspection as a cross-check of our procedures.



Fixturing

Thunderline-Z designs, builds and controls 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 requires extremely tight-tolerance, machined 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.

Quality Assurance and Reliability Testing

Thunderline-Z provides 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 manufacturing 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.

Temperature Profiling

The key to ensuring a reliable, high quality, hermetic seal lies in establishing proper oven profiles. Thunderline-Z 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, Thunderline-Z has the right combination of equipment and experience to provide you a high performance, hermetic package. With over twenty years of solder and direct fire experience, Thunderline-Z has the expertise to deliver your design on schedule and in budget.

Inspection and Reliability Testing

Quality Standard MIL-I-45208A

Calibrations System MIL-STD 883

Audited to AS-9003

RoHs Compliance

DFARS Clause 252.225-7014

X-ray Analysis First Article or 100%

Dye Penetrate Evaluation

Dimensions:

Drop Gauges, Micrometer, Vernier
Deltronic Optical Comparator

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/Methods 301

Capacitance

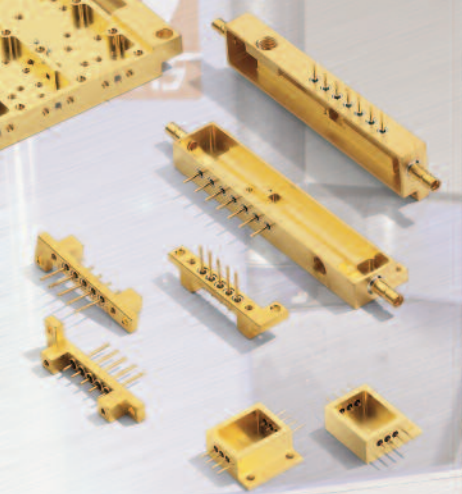
Steam Age

Solderability

Lead Integrity

Moisture

Salt Spray



Machined Housings

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



Stamped/Coined Modules

Thunderline-Z has the know-how and experience to deliver your custom stamped or coined modules. We offer several base material and plating options and can employ various types of custom and standard seals.



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

Thunderline-Z is dedicated to supplying the highest quality hermetic packages. By vertically integrating our in-house facilities, 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 that is unsurpassed. 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. Thunderline-Z is fully equipped to handle these issues efficiently.

The Future of High Frequency Surface Mount



Utilizing our patented feedthru, the BellPin™, we can quickly deliver hermetically sealed custom aluminum or alumina 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 and low parasitic inductance.

Visit ThunderlineZ.com for more details.

This multi-feedthru housing for a NASA phased array antenna required the installation of 616 RF feedthrus in a single pass.

Base Materials

<i>Kovar</i>	<i>Copper</i>
<i>Aluminum</i>	<i>Brass</i>
<i>Alumina Alloys</i>	<i>Molybdenum</i>
<i>Cold Rolled Steel (CRS)</i>	<i>Inconel</i>
<i>Stainless Steel</i>	

Plating Options

<i>Nickel</i>	<i>Gold</i>
<i>Silver</i>	<i>Copper</i>
<i>Tin</i>	<i>Zinc</i>

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*

Feedthru Reference

Frequency GHz	Pin Dia. P/D	Body Dia. B/D	Body Length
125	.005	.060	.040
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
28	.015	.098	.138
18	.018	.110	.040
18	.018	.110	.060
18	.018	.110	.090
8	.020	.158	.060
8	.020	.158	.070

**To learn more, visit
ThunderlineZ.com**

Our Website features several tools for creating optimal packages.

Feedthru search tool: This tool allows you to search over 2,000 parts in our library of RF/50 Ohm, DC, and Capacitor/Filter feedthrus to find a model that most closely resembles your application. Detailed specs are provided.

Impedance reference calculator: This tool allows engineers to calculate the complementary dimension of glass to pin, or pin to glass, that will achieve optimal impedance in a package.

Soldering Design Guide: This quick reference guide provides in-depth problems, causes and solutions to the ten most common soldering pitfalls feedthru installers encounter.

Clearance section: This section includes a variety of overstocked items and is an excellent resource when prototyping.



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