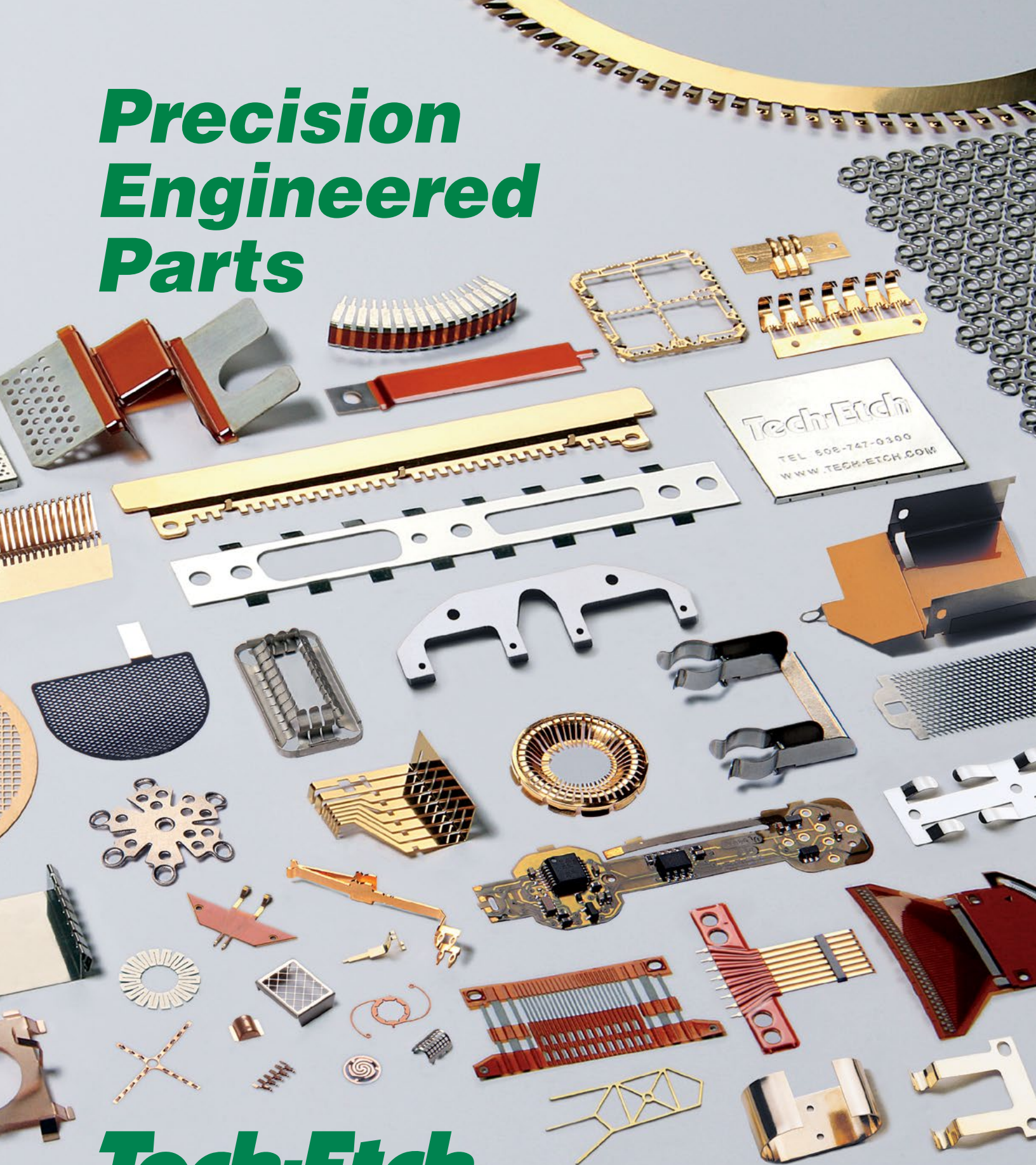


Precision Engineered Parts



Tech-Etch
TEL 508-747-0300
WWW.TECH-ETCH.COM

Tech-Etch

www.tech-etch.com

Photoetching • Laser Cutting • Forming • Finishing
Thin Metal Parts • Flexible Circuits • EMI Shielding Gaskets

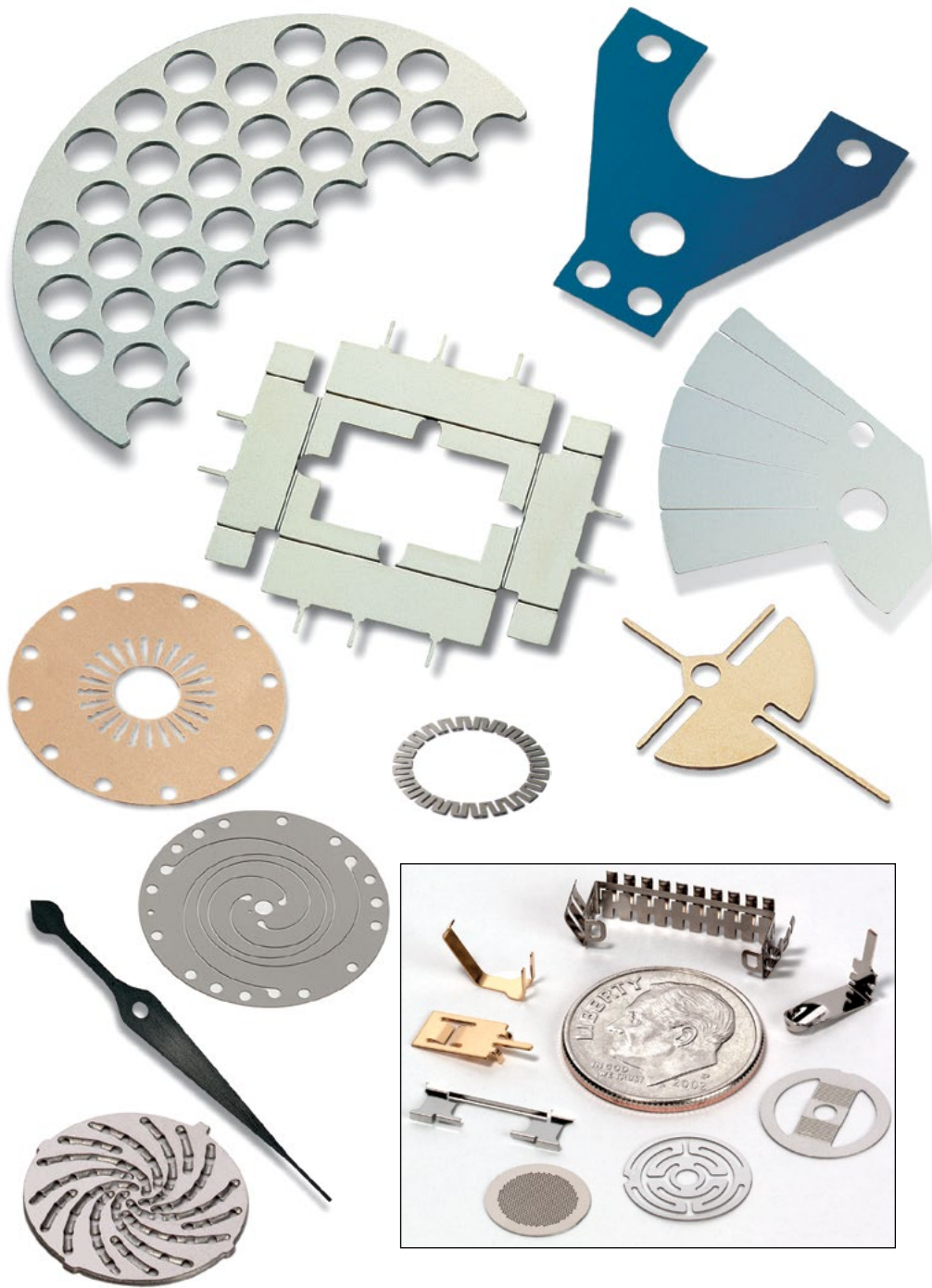


Figure 1
Typical Etched Edge

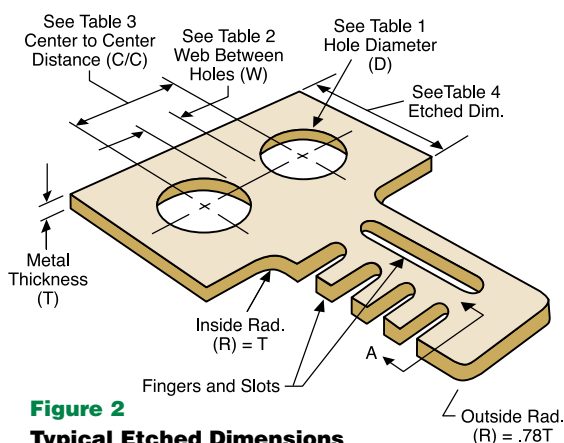
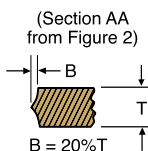


Figure 2
Typical Etched Dimensions

PHOTOETCHING

Tech-Etch specializes in the manufacture of light gauge metal parts. The photoetching process allows us to produce intricate metal components with close tolerances that are impossible to duplicate by other production methods. Tech-Etch is setting industry standards for the manufacture of encoders, masks, filters, lead frames, flat springs, strain gauges, laminations, chip carriers, step covers, heat sinks, shields, shutter blades, electron grids, fluidic circuit plates, reticles, drive bands, and shims. **Optimize your design with precision photoetching.**

MATERIALS

Tech-Etch photoetches many metals such as Copper Alloys, Beryllium Copper, Stainless Steels, Aluminum, Nickel and Nickel Alloys, Silver, and Spring Steels. Specialty materials such as Elgiloy, Niobium, Nitinol, Titanium, Tungsten, and Molybdenum can also be etched with intricate detail, as well as **polyimide film**. Manufactured parts range in thickness from .0005" to the maximum thickness that remains consistent with the dimensions and tolerances listed below.

DIMENSIONS and TOLERANCES

Practical limitations for dimensions of slots, spaces and holes (as shown in Figure 2) are determined by the metal's thickness. These limitations are expressed in the following guidelines. Tables 3 and 4 give photoetching dimension tolerances. Consult the factory for dimensions that exceed these guidelines.

Fingers and Slots

The minimum feature for a web or finger (ref. Fig. 2) is equal to material thickness. The minimum feature for holes or slots is equal to 1.1 times material thickness, .003" min. (e.g. min. feature on .002" thk. material is .003", min. feature on .003" thk. material is .0033".)

Relationship of Hole Diameter to Metal Thickness

Generally, the diameter of a hole cannot be less than the metal thickness. This relationship, however, varies as the metal thickness changes. A more exact relationship is illustrated in Table 1.

Table 1. HOLES OR SLOTS

Metal Thickness (T)	Diameter or Width
.001"-.005"	1.1 Times Metal Thickness (.003" Min.)
.005" or Over	Min. of 1.1 Times Metal Thickness

Table 2. WEB OR FINGER

Spaces Between Holes (W) ... At Least Metal Thickness

Table 3. CENTER TO CENTER TOLERANCES

C/C Dimensions (inches)	Tolerance Attainable
1.0" or Less	±.0005"
1.0" - 3.0"	±.0010"
3.0" - 6.0"	±.0020"
6.0" - 10.0"	±.0030"

Table 4. ETCHED DIMENSION TOLERANCES

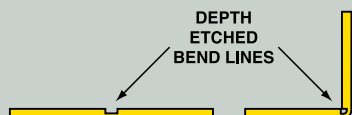
Thickness (T) (inches)					
.001"	.002"	.005"	.010"	.015"	.020"
Empirical ±.0010"	±.0010"	±.0015"	±.0020"	±.0030"	±.0050"

FORMING

Tech-Etch manufactures formed parts by combining photoetching, used for blanking, with inexpensive or universal tooling, used for forming. Select the etch and form manufacturing process for quick turn and low tooling cost. This method produces burr-free parts in intricate and complex designs and shapes. It also makes it possible to prove your design in preproduction quantities without having to commit to expensive, progressive die tooling. The following guidelines show practical methods to assure proper function and the best cost.

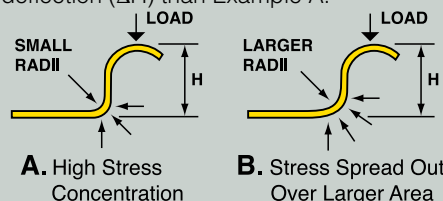
HAND FORMING

For bends that do not require structural strength and where a sharp internal radius is desired, such as board-level shielding applications, depth etched bend lines may be used for hand forming. The lines are produced by etching a groove along the bend line of the part. By eliminating the need for forming tools, the cost is lowered.



BEND RADII

In the forming process, care is taken to design the proper bend radii, since larger radii can withstand a larger deflection without failure. Example B is designed to take a larger deflection (ΔH) than Example A.

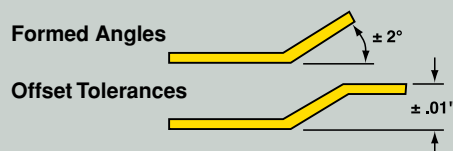


HEAT TREATMENT

Heat Treatment
Tech-Etch can heat-treat many materials, including Beryllium Copper, to achieve close dimensional control. Heat treatment enhances spring qualities by permitting greater deflection without compression set and without increasing the material's stiffness.

TOLERANCES

Preferred forming tolerances are as shown.

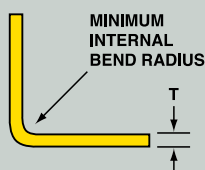


(Consult factory if tighter tolerances are desired.) Temper selected for a given bend radius depends on material thickness and the position of the bend with respect to grain direction. Table 5 shows suggested minimum bend radii.



Table 5

Minimum Bend Radius



T = Material Thickness
SB = Sharp Bend

MATERIAL	ALLOY	TEMPER	MINIMUM RADIUS FORMABILITY 90°		
			GRAIN DIRECTION		
			ACROSS	45°	WITH
BeCu	C172	A	SB	SB	SB
BeCu	C172	1/4 H	SB	SB	SB
BeCu	C172	1/2 H	0.5 x T	0.7 x T	1.1 x T
BeCu	C172	H	1.0 x T	2.0 x T	2.2 x T
BRASS	C260	A	SB	SB	SB
BRASS	C260	1/2 H	SB	SB	SB
BRASS	C260	H	0.7 x T	1.3 x T	1.6 x T
BRASS	C260	S	1.0 x T	1.8 x T	3.7 x T
STAINLESS STEEL	301/302	1/4 H	1.0 x T	1.0 x T	1.0 x T
STAINLESS STEEL	301/302	1/2H	1.0 x T	2.0 x T	2.0 x T
STAINLESS STEEL	301/302	H	2.0 x T	4.0 x T	4.0 x T

Consult factory if tighter radius is desired.



SPECIAL PROCESSES LAMINATING & ETCHING POLYIMIDE FILM

When a dielectric is required to maintain accurate finger spacing or for insulation, Tech-Etch can laminate materials such as polyimide. **Polyimide** can be die-cut and directly bonded in place or full sheet laminated and then **photoetched** for extremely accurate positioning. Parts can be formed after lamination of insulation.

ASSEMBLY

Tech-Etch's precision spot welding equipment is used to join small parts as well as accurately close cylinders and boxes. Soldering is an alternative. Various adhesives are also applied to join assembled components or for attachment. Staked or welded studs and contacts can also be applied.

FINISHING

Tech-Etch has a full in-house plating and mechanical finishing facility. This includes Gold, Nickel, Electroless Nickel, Copper, Tin, and Tin-lead plating, plus solder hot oil reflow, electropolishing, surface polishing, and vibratory tumbling. Masking can be used for selective plating.

LASER CUTTING

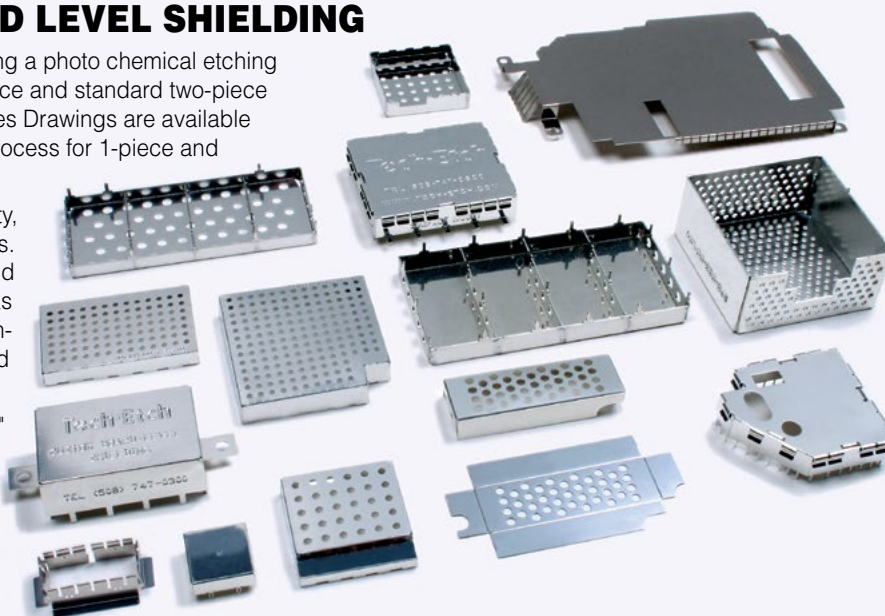
Tech-Etch's powerful 2.5 KW CO2 pulse laser brings additional precision and speed to parts fabrication. It is particularly well suited to prototype applications and for cutting thicker materials to precise specifications. Laser cutting requires only a CAD drawing and no hard tooling. Position tolerances are $\pm .0005$ " and feature tolerances are $\pm .002$ ".003".

STANDARD & CUSTOM BOARD LEVEL SHIELDING

Standard and custom designs are manufactured using a photo chemical etching process making it possible to offer custom single piece and standard two-piece designs with no tooling charges. Interactive PDF Sales Drawings are available for download on the website to simplify the design process for 1-piece and 2-piece standard board level shields.

The photoetching process improves design flexibility, shortens lead times, and eliminates hard tooling costs. Prototypes are available in five days. Fences, covers and mounting pins can be designed in any configuration, as can through holes, slots and internal dividers. Depth-etch bend lines facilitate hand forming, and soldered or resistance welded seams are available.

Board level shielding is typically etched from .007" - .020" tin plated brass, nickel silver, copper or cold rolled steel. Board level shielding can also be manufactured out of beryllium copper, if extra strength is desired. Other materials, thicknesses and finishes are also available. For additional information contact one of our application engineers at 508-747-0300 or visit www.tech-etch.com/shield.



FLEXIBLE CIRCUIT AND RIGID FLEX MANUFACTURING

Tech-Etch specializes in manufacturing high reliability flexible circuits using both **adhesive based** and **adhesiveless** raw materials. By using an additive process, copper features and spaces as small as .0015" can be produced in production volumes.

PLATED THROUGH VIAS

This capability provides hole sizes down to .001" dia. for micro via and blind via multilayer circuits. Tech-Etch offers through, blind and buried vias in multilayer flex circuits.

ASSEMBLY

Tech-Etch is equipped for both through hole and SMT assembly of components on flex circuits. Package sizes down to 0201 and .4mm pitch can be accommodated using our state-of-the-art SMT equipment. Precision Single Point and Bar bonding assembly capabilities are also offered.

CONTACT FINGERS

Tech-Etch can provide fingers assembled to the circuit conductors for use as contacts, terminals or pins. Material thickness is generally .010" and can be beryllium copper. Pitch can be as low as .050" and fingers can be formed for 90° assembly applications.

CONTOURED CIRCUITS

Tech-Etch can provide circuits with integral fingers for solder attachment to PCB's. Starting with copper .010" thick, the trace areas are etched down, or contoured, to approximately .003" thick. Portions of the circuit, which benefit from heavier copper, are masked and not etched down. The benefits are:

- Integral connector contact pins - cost saving and simplified interconnect schemes in assemblies.
- Raised solder pads above the cover layer - more reliable solder connections.
- Particularly useful for high current carrying applications.

POLYIMIDE ETCHING

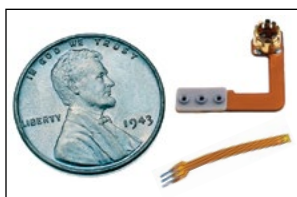
By using Tech-Etch's proprietary polyimide etch process, single layer circuits can be supplied with single or both side access, windowing, and cantilevered leads. Multilayer circuits can be made with direct access to any layer from either side.

LASER PROCESSING

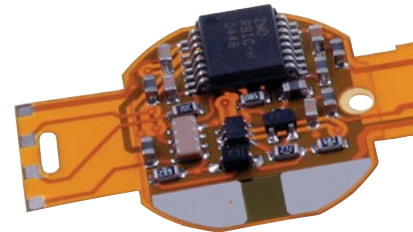
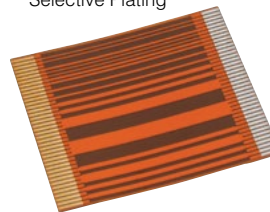
Tech-Etch's laser processing capability supports precision drilling and ablating of polyimide laminates. Laser processing has the ability to control the circuit outline to a very tight tolerance without the cost and long lead time associated with precision hard tooling.

STIFFENERS

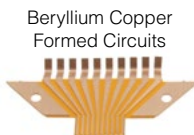
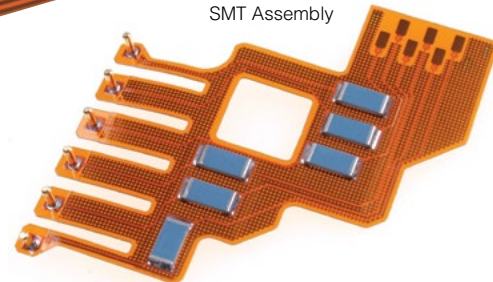
Packaging techniques often make it necessary to mount components directly on the circuit. Typically, polyimide or epoxy-glass is laminated in place to provide additional support.



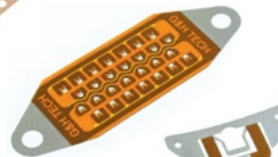
Selective Plating



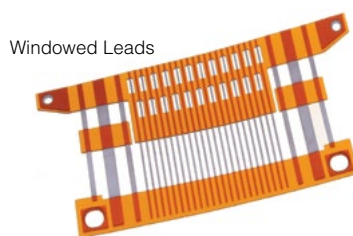
SMT Assembly



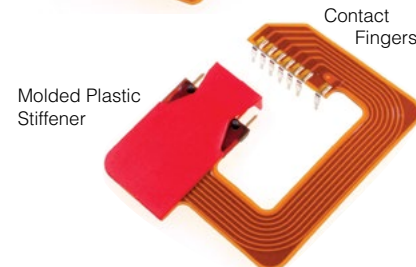
Beryllium Copper Formed Circuits



Stainless Steel Circuits

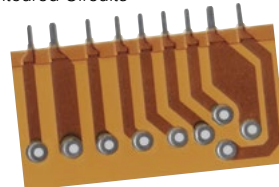


Windowed Leads

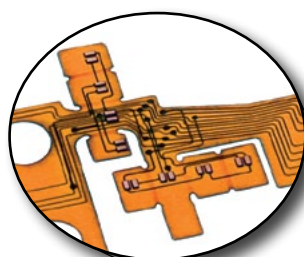
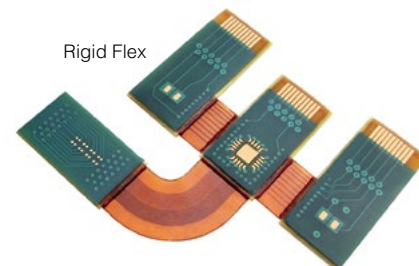


Molded Plastic Stiffener

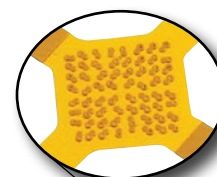
Contoured Circuits



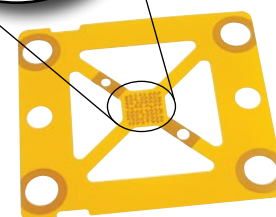
Rigid Flex



Fine Line Micro-Via Circuits



BGA Pad Array

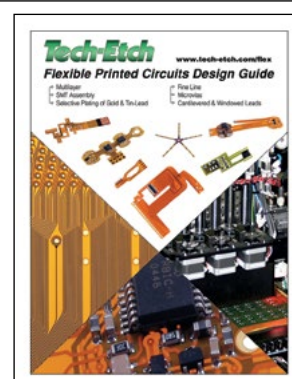


Send For Tech-Etch Flexible Printed Circuit Design Guide

Contains detailed application information on:

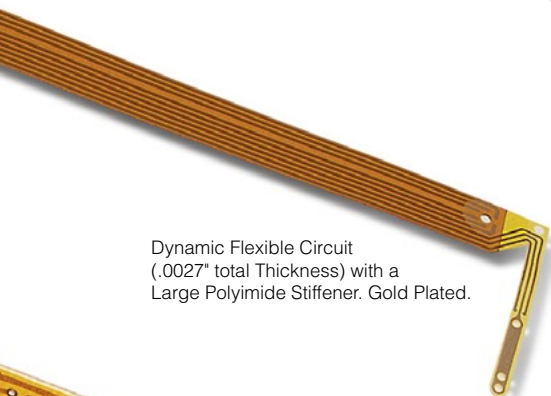
- **MULTILAYER CIRCUITS**
- **RIGID FLEX**
- **SMT ASSEMBLY**
- **SHIELDED CIRCUITS**
- **FINE LINE APPLICATIONS**
- **MICROVIAS**
- **CANTILEVERED AND WINDOWED LEADS**
- **BERYLLIUM COPPER CONDUCTORS**

To order the Design Guide call 508-747-0300 or visit our web site at www.tech-etich.com.





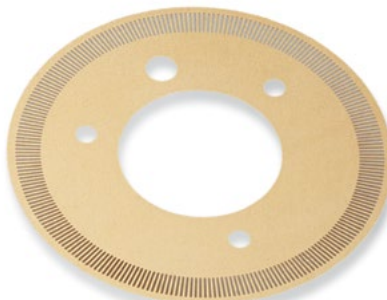
.050" Thick Titanium Fuel Cell Flow Field Plate.
Chem Milled.



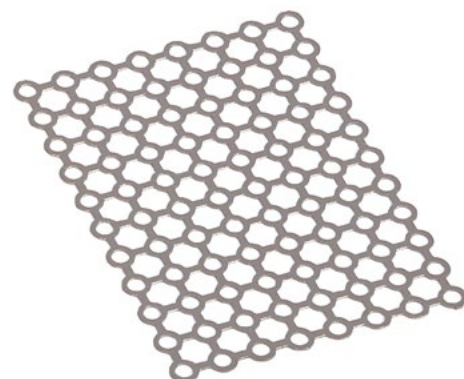
Dynamic Flexible Circuit
(.0027" total Thickness) with a
Large Polyimide Stiffener. Gold Plated.



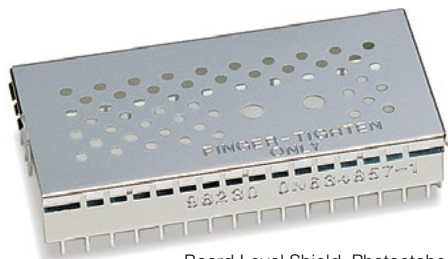
Single Layer Flexible
Circuit with FR-4 Stiffeners
and .010" Copper Fingers.



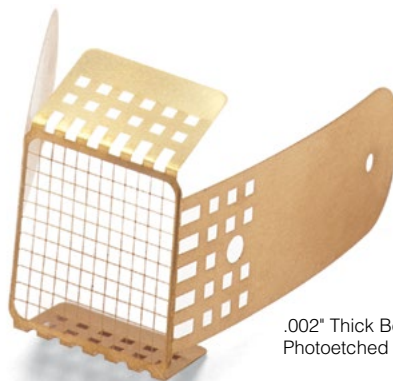
.005" Thick Beryllium Copper
Alloy 25 Encoder Disc.
Photoetched Blank.



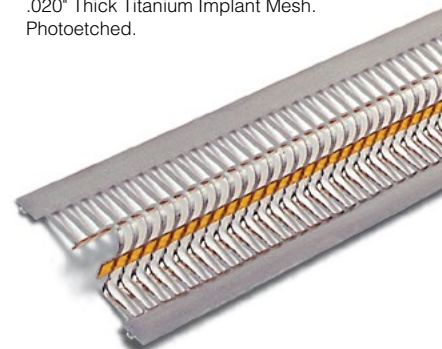
.020" Thick Titanium Implant Mesh.
Photoetched.



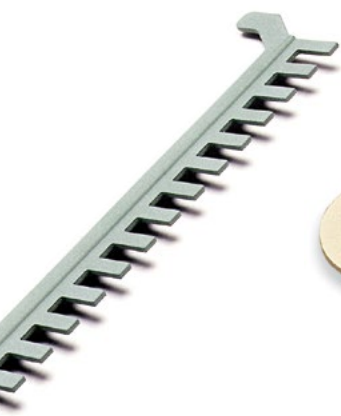
Board Level Shield. Photoetched Blank.
Cover: .010" Thick FH Brass Die Formed.
Fence: .015" Thick 1/2H Brass.
Depth Etched Bend Lines. Hand Formed.
Solder Corner. Tin Plated.



.002" Thick Beryllium Copper Screen.
Photoetched Blank. Die Formed. Gold Plated.



.003" Thick Beryllium Copper Interconnection
with Laminated Polyimide Support Strip.
Photoetched Blank. Die Formed.
Tin Lead Plated with Solder Dip.

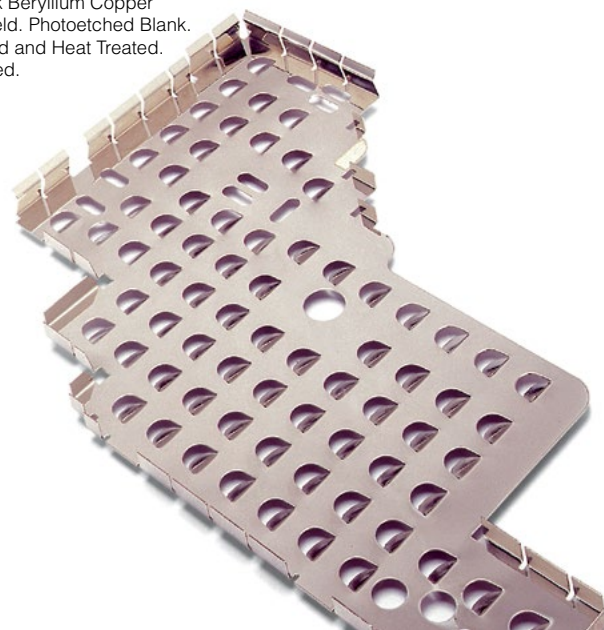


.020" Thick Stainless Steel.
Indexed Plate. Photoetched Blank.
Die Formed and Teflon Coated.



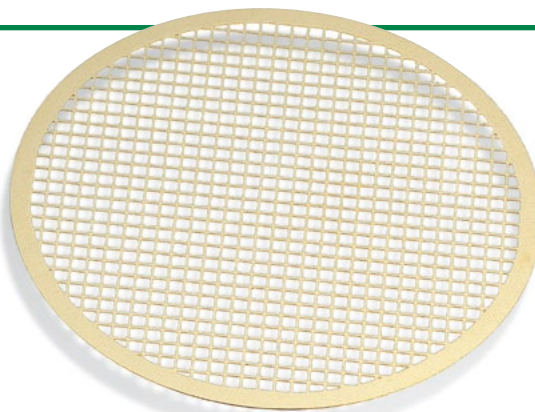
.020" Thick Brass. Depth Etched for Weight Reduction.
Photoetched Blank.

.005" Thick Beryllium Copper
Cover Shield. Photoetched Blank.
Die Formed and Heat Treated.
Silver Plated.





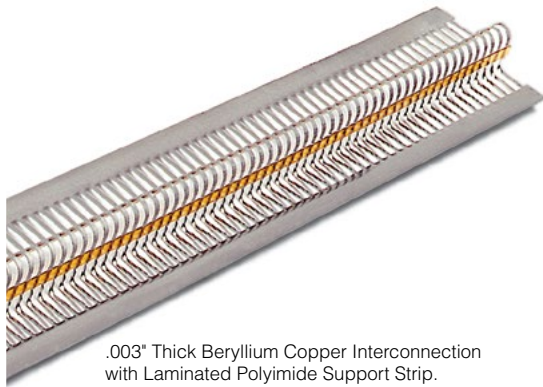
.003" Thick Beryllium Copper RFI Shield.
Photoetched Blank. Die Formed.
Heat Treated. Gold Plated



.032" Thick Brass Filter Support.
Photoetched Blank.



.012" Thick Beryllium Copper
Contact Springs.
Photoetched Blank. Die Formed.
Heat Treated. Gold Plated.



.003" Thick Beryllium Copper Interconnection
with Laminated Polyimide Support Strip.
Photoetched Blank. Die Formed.
Tin Lead Plated with Solder Dip.



.093" Thick Stainless Steel
Deflection Gauge. Photoetched Graphics.
Laser Cut Blank.



.008" Thick Beryllium Copper RF Shield.
Photoetched Blank. Die Formed.
Heat Treated. Bright Tin Plated.

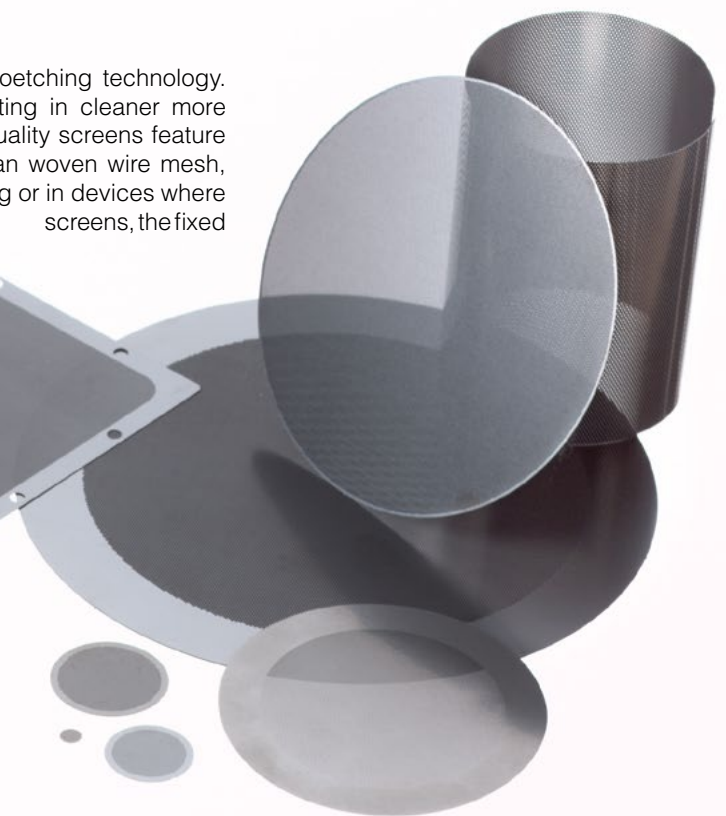
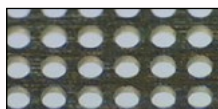
MICROETCH® SCREENS

MicroEtch® Screens are manufactured by Tech-Etch using photoetching technology. Unlike stamping, photoetching yields a burr-free product resulting in cleaner more efficient screens with greater material integrity. These superior quality screens feature higher tolerance hole sizes and greater dimensional stability than woven wire mesh, which makes them ideal in applications requiring frequent cleaning or in devices where there is mechanical contact. Unlike woven wire mesh screens, the fixed photoetched openings will not change through use. Photoetching also enables designers to specify a tapered hole, which facilitates liquid filtration and back flow cleaning.

Typical applications of MicroEtch® Screens are filters used in the medical market, hydraulic valve screens, fuel filters, laser light filters, extruding screens, as well as particle separation and sizing. These tight tolerance screens are primarily produced from Stainless Steel, but other materials are available. Tech-Etch, Inc. offers a standard line of screens with holes in a 60° or 90° pattern that are available with a maximum guaranteed perforated area of 18" x 21". Other sizes and custom shapes are also available.



Holes offered in
cone (left) and
straight (right) profiles.



A TOTAL CAPABILITY

Manufacturing Facilities

Tech-Etch corporate headquarters is located in Plymouth, Massachusetts, just 40 minutes south of Boston. Using the latest etching, metal fabrication and metal finishing equipment, Tech-Etch specializes in photoetching, forming and laminating engineered components and flexible circuits. The Laser Machining Center provides the additional capability to cut thicker materials to precise specifications. In all, Tech-Etch has over 150,000 square feet of manufacturing and office space. Tech-Etch conforms to all local and EPA regulations, and waste treatment facilities set the standard for the industry.

Wide Range of Services

Tech-Etch performs a wide variety of services, and this single-source capability enables it to assume total responsibility for the quality and delivery of our precision products. In-plant services include photoetching and chemical milling, artwork generation and phototooling, stamping from coil stock and forming from etched blanks, tool and die making, production heat treating, flexible circuit design and production, welding and soldering, metal finishing, plating, and laser cutting. Secondary operations such as soldering joints to seal seams, spot welding, and the application of pressure sensitive tapes and insulation materials are also available. **Tech-Etch has the expertise, the equipment and the capacity to do your job.**

ISO 9001:2015 and AS9100D Certification

Tech-Etch operates a Quality Management System that is registered to ISO 9001:2015 and AS9100D, the internationally recognized standards of quality. These standards set guidelines that a company follows to provide confidence to its customers that it is able to supply products that consistently meet requirements. AS9100D is based on the core requirements of ISO 9000, but includes additional requirements necessary to meet the needs of the aerospace industry.

★ Special Products & Capabilities ★

EMI/RFI SHIELDING

Tech-Etch designs and manufactures a broad line of standard and custom EMI/RFI shielding products including beryllium copper and wire mesh gaskets, conductive elastomers, metalized fabric over foam, and board level shielding. A catalog is available upon request.

FLEXIBLE CIRCUITS

Flex circuits are built to exacting customer specifications, meeting the most demanding Medical, Aerospace, and Telecommunications applications. Capabilities include adhesiveless construction, selective plating, and complete SMT and through hole component assembly services.

MEDICAL COMPONENTS

Its capability to etch extremely corrosion resistant materials such as Titanium, Tungsten, Nitinol, Molybdenum, Elgiloy, Niobium, Polyimide, special stainless alloys, and refractories enables Tech-Etch to produce complex parts for medical tools and implants.

The data presented in this brochure is based on testing and to our knowledge is accurate and true. Since applications, test measures, and test procedures may vary, we recommend that users of our products perform their own tests to assure the suitability of these products for their specific applications.

www.tech-etich.com

Tech-Etch

TECH-ETCH, INC.

**ISO 9001
AS9100D
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