

EECO-Green™
SILVER-THROUGH-HOLE
DOUBLE-SIDED
PRINTED CIRCUIT
BOARDS

PRODUCT OVERVIEW
DESIGN CONSIDERATIONS
FAQ's

EECO®

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FAQ's ABOUT EECO-Green™ SILVER-THROUGH-HOLE PRINTED CIRCUIT BOARDS

Want to know more about our new **EECO-Green Silver-Through-Hole PCB** products? Here are the most frequently asked questions (FAQ's) and the answers you need. Don't see your question here? Feel free to ask!

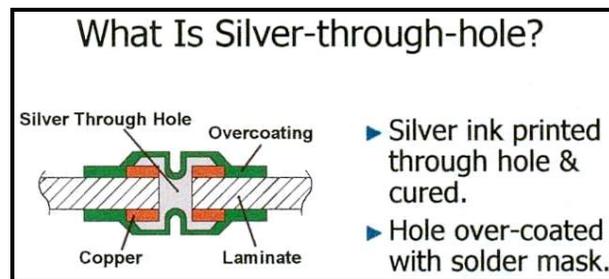
1. *EECO Switch is famous for switches and keypads. What does EECO Switch know about making printed circuit boards?*

Wen Tu, the chairman of the board of EECO Switch, has over 25 years of experience manufacturing printed circuit boards through our sister company, Ta Chien Technology (TCT). TCT operates under the "EECO Asia" name in the Far East marketplace. Headquartered in Taiwan and manufacturing in Mainland China, our customer list includes many of the major Asian OEMs in consumer and industrial electronics. Wen stays closely involved with the day-to-day operations of our PCB facility, and brings a wealth of experience and expertise to this new EECO Switch business unit.

After studying the American and European markets for PCBs we decided it was time to introduce our EECO-Green Silver-Through-Hole printed circuit boards to these customer as well.

2. *What is a Silver-Through-Hole printed circuit board?*

As most printed circuit boards are double-sided, the question has always been how to connect the top and bottom surfaces electrically to allow more complex board designs. The traditional method of making these connections has been Plated-Through-Hole technology (PTH). Very simply, a hole is drilled in the board and then plated with a conductive material to provide an electrical connection between the two surfaces.



Typical STH PC board construction

Silver-Through-Hole technology (STH) also provides an electrical connection between the top and bottom surfaces. However, STH PCBs use conductive silver ink printed on and through the holes to achieve the connection. The ink is printed using a silkscreen process, very similar to the way EECO Switch manufactures membrane switches. Silver or carbon inks may also be screen printed on a single surface to create electrical jumpers as well.

3. *What makes STH boards less costly than the equivalent PTH type?*

There are several reasons. Plating is a very harsh and complex process using many strong chemicals. Plating also produces a great deal of hazardous waste. PTH boards must be made from costly FR-4 base material for two important reasons. First, the holes must be drilled, then chemically cleaned and activated to ensure good plating. Second, the plating process itself is so harsh it would destroy lesser board materials.

Silkscreen printing, not plating, is a key element to STH board manufacturing. The processes and chemicals used are not harsh or hazardous, which permits the use of more economical board materials such as FR-1.

One of the biggest advantages to using STH technology is that FR-1 can be punched, eliminating multiple drilling operations. Punching multiple holes and other board features at one time allows faster production and further reduces costs.

4. *If STH technology eliminates plating, what keeps the bare copper on the PCB from tarnishing?*

Although our EECO-Green STH boards appear to have bare copper exposed, all boards are finished with Organic Solderability Preservative (OSP) applied to the copper areas. The OSP finish prevents tarnish and is not hazardous. The silver-through-holes are protected by the solder mask.

5. *Are there any other advantages to OSP?*

YES!! Our OSP finish offers two very important advantages. First, our STH boards are 100% LEAD-FREE! The electronics industry is quickly moving away from traditional lead-based solders, and lead will most likely disappear completely within the next five years. Second, the OSP coating is very thin and flat. This ensures the pads for surface mount (SMT) components are perfectly flat, eliminating misalignment of components during assembly.

6. *My manufacturing process is still using lead solder. Can I use OSP finished boards in my facility?*

YES!! Our OSP finish is completely compatible with all conventional soldering processes.

7. *STH technology sounds exciting! Why don't more PCB manufacturers offer this?*

While STH boards offer many advantages, they can be difficult to manufacture reliably. If a single hole is defective the entire PCB is scrap. This is the key to EECO's success. We have developed and perfected several "Tricks of the trade" to produce our STH boards reliably and efficiently. By mastering the art of STH technology, we are in a position to offer our customers the highest quality STH boards at extremely attractive prices.

8. *Are there any limitations to STH PCB technology?*

There are only a few relatively minor design considerations. First, STH holes are plugged with silver paste and cannot double as component lead holes. This issue is easily resolved by adding extra STH holes in the circuit as needed. Second, STH connections are slightly less conductive than plated through connections. The customer should allow a maximum 100 m Ω (45m Ω is typical) per STH hole when designing his circuit. Finally, STH boards should be limited to 300mA per hole when used in high current designs. This limitation is easily overcome by simply using multiple STH holes in parallel for higher current carrying STH connections.

9. *Are there any limits on the number of STH holes per board?*

Not really. We are currently producing STH boards with over 800 holes in a 5" x 7" circuit board. Hole count is normally not a major consideration.

10. *Can I visit your factory?*

Certainly you may visit us at any time, but be prepared for a long airplane ride. Our state of the art STH factory is located in Shenzhen, China. Shenzhen is a rapidly developing industrial area in Mainland China, north of Hong Kong. A team of long-term employees of TCT/EECO Asia, permanently located in China, manages the factory. The facility is also ISO 9002 certified and UL listed.

11. *So let's get to the real issue. How much can I expect to save?*

Lots and lots of money! Our EECO-Green STH PCBs are as much as **20 to 25%** less than an equivalent PTH board!

12. *I'm sold on EECO-Green STH boards! Who are your target customers?*

We are targeting customers with sufficiently high volume requirements to justify production in Mainland China. We define "high production" as a minimum shipment of \$5,000.00.

Our customer list includes consumer electronics, remote controls, security systems and hand held devices and telecommunications. Any large volume electronics manufacturer will be extremely interested in finding a reliable, low cost STH PCB supplier.

13. *I only need a single-sided PC board. Can EECO Switch supply these?*

While our factory can produce conventional single-sided printed circuit boards, we do NOT want to be just another PC board supplier. Should our customers want us to supply **BOTH** STH and single-sided printed circuit boards we will quote on mixed packages. However, we prefer to focus primarily on STH customers and opportunities.

14. *Can EECO Switch combine my STH PCB requirements with other products?*

Yes! EECO Switch can now offer our expertise in coded switches, elastomer keypads, and membrane switches along with our new STH PC boards. Our facility in China was designed with extra floor space to allow for additional assembly work. Our goal is to find and develop customers who can use our switch products and STH PCBs in combination with our low-cost China factory to produce complete front panels and value added assemblies. EECO Switch is your full service operator-interface provider.

15. Do I need to redesign my board to use EECO-Green Silver Through Hole technology?

This is ***THE*** most common question from circuit design engineers. Actually, there is no single formula to this question; it all depends on the design and usage of the PC board itself. So let's take a moment and review some typical applications and issues that might affect conversion to STH technology.

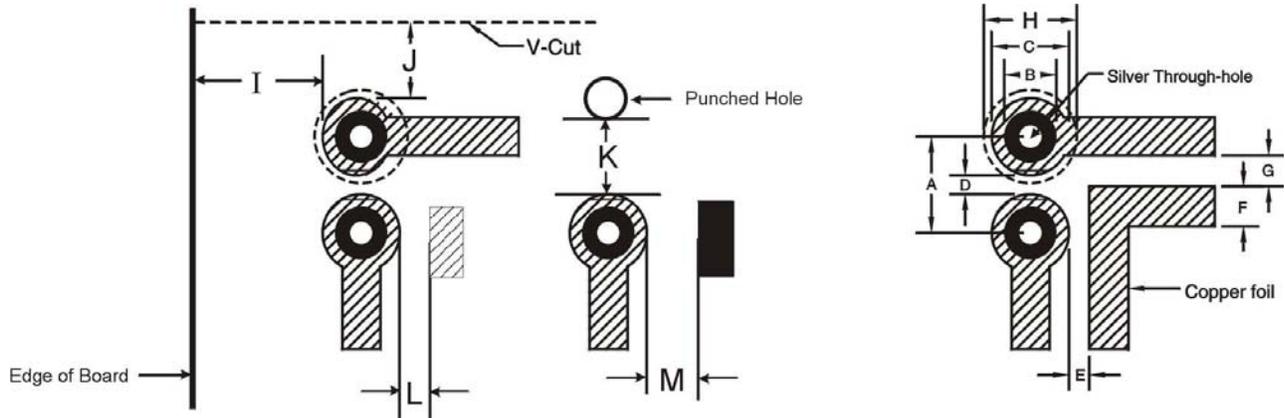
<i>Current PCB Design</i>	<i>Changes Required To Use EECO-Green STH technology</i>
1. Lightly to moderately populated board with primarily SMT components.	No changes to minor changes required. The via holes may require resizing to utilize STH process, usually a minor modification as long as the via holes do not interfere with existing traces or other board components and features.
2. Lightly to moderately populated board with primarily through hole components.	Normally only minor changes required. The via holes may require resizing to utilize the STH process. Additional via holes may be required if the leaded component holes are also serving as vias. If so, two holes will be required for the circuit, one for the leaded component and a parallel STH hole for the via.
3. Lightly to moderately populated board with mixed through hole and SMT components	Similar to #2. Changes required may vary from simple to more complex, depending upon component density. Via holes may require resizing to utilize the STH process. Additional via holes may be required if leaded component holes are also serving as vias. If so, two holes will be required for the circuit, one for the leaded component and a parallel STH hole for the via.
4. Moderately to heavily populated boards.	Changes required vary from moderate to extensive. Design factors will include the number of via holes, trace spacing and width, and general component layout. Enlarging the via holes for STH may require modifying or moving existing traces and /or components. Adding parallel via holes for leaded component may also require changes to the existing design.
5. Moderately to heavily populated boards with high current carrying requirements.	Changes required vary from moderate to extensive. STH technology requires multiple via holes in parallel for high current requirements. Design factors will include the number of via holes, trace spacing and general component layout.

16. What if I need additional assistance or technical support?

Then pick up the nearest telephone and dial 1-800-854-3808 and find out all you need to know about EECO-Green Silver-Through-Hole Printed Circuit Boards. We want to help you save money and save the environment!

**EECO-Green™ SILVER-THROUGH-HOLE
PRINTED CIRCUIT BOARDS**

DESIGN RULES



Item	Feature Description	Preferred Dimension	Minimum Acceptable
A	Hole Pitch	1.50 mm	1.25 mm
B	Silver Through Hole Land	1.00 mm (Max)	0.80 mm
C	Copper Land Diameter	1.25 mm	1.00 mm
D	Space Between Copper Lands	0.25 mm	0.20 mm
E	Space between Copper Land and Trace	0.25 mm	0.20 mm
F	Copper Trace Width	0.25 mm	0.20 mm
G	Space between Copper Traces	0.25 mm	0.20 mm
H	Through Hole Overcoat Diameter		Copper Land + 0.30 mm
I	Space Between Copper Land and Board Edges		2.00 mm
J	Space Between Copper Land Scoring line (V-Cut)		1.00 mm
K	Space Between Silver Through Hole Land and Closest Edge of Punched Hole		1.60 mm
L	Space Between STH Copper Lands and SMD pads	> 0.50 mm	0.50 mm
M	Space Between STH Copper Lands and Carbon Pad	1.2 mm	1.00 mm
	Silver Through Hole Diameter (Typ.)		0.50 mm

***EECO-Green™ SILVER-THROUGH-HOLE
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ELECTRICAL SPECIFICATIONS

#	Characteristic	Specification
1	Silver Through Hole Voltage	Maximum 50V DC
2	Silver Through Hole Resistance	Maximum 100mΩ / Silver Through Hole
3	Silver Through Hole Rated Current *	Maximum 1 Amp / Silver Through Hole
4	Silver Through Hole Insulation Resistance	Minimum 10 ⁸ Ω

* Use multiple Silver Through-Holes in parallel for greater current-carrying capacity

MATERIALS SPECIFICATIONS¹

#	Characteristic	Specification
1	Laminate	FR-1
2	Copper Thickness	1 OZ (35μ)
3	Board Thickness	1.0 mm ~ 1.6 mm
4	Panel Size	Maximum 350 X 330 mm

¹ Other laminates available – contact factory for additional information

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