

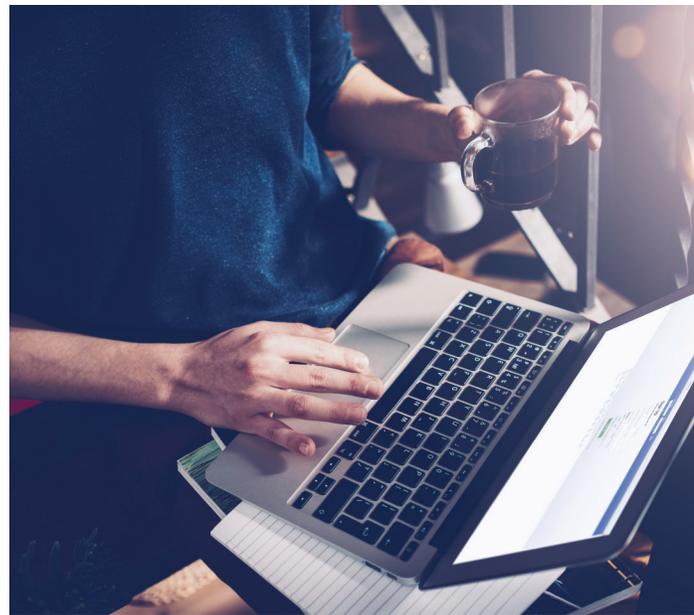
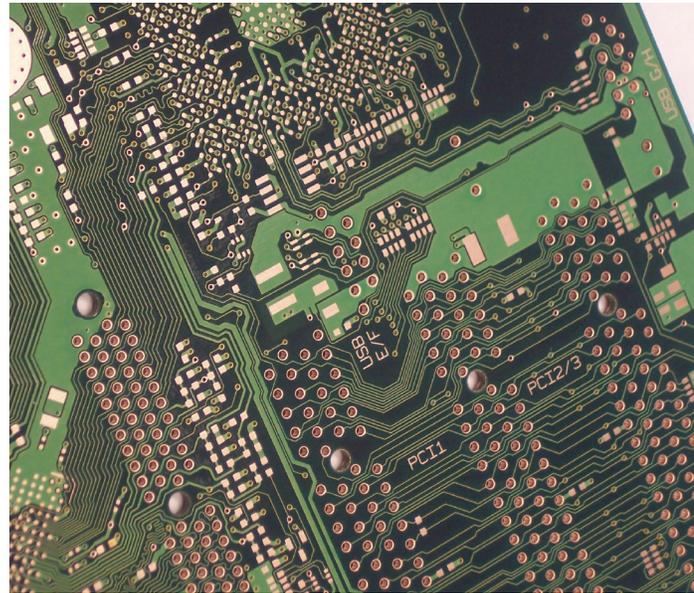
# Blackhole

Direct Metallization

## Versatile and Cost Efficient, the Worldwide Choice for Direct Metallization.

MacDermid Enthone's **Blackhole** is the choice of fabricators worldwide that prefer a low cost, environmentally friendly direct metallization alternative to electroless copper. Suitable for both simple and complex circuit boards, carbon-based Blackhole is a nanoscale electrostatic coating that satisfies every need for reliability and versatility.

Trusted by over 250 of the world's leading manufacturers, Blackhole is an automated, horizontal process whose unique technology enables users to reduce cycle time, decrease overall water consumption, completely eliminate the use of formaldehyde, and produce less waste than electroless copper plating. Blackhole is also the world's first totally chelator-free metallization process. Able to provide high performance results in conventional, flexible and complex multilayer circuit board designs, MacDermid Enthone's Blackhole is the most technically capable and cost effective option available today.



## KEY FEATURES

- Lowest cost direct plate alternative to electroless copper
- Direct copper-to-copper bonding improves interconnect reliability
- No chelators, formaldehyde or added metals
- Compatible with all circuit board types
- Horizontal conveyorized process
- Engineered for reliability and performance
- Simultaneous processing of multimaterial substrates



**MacDermid Enthone**

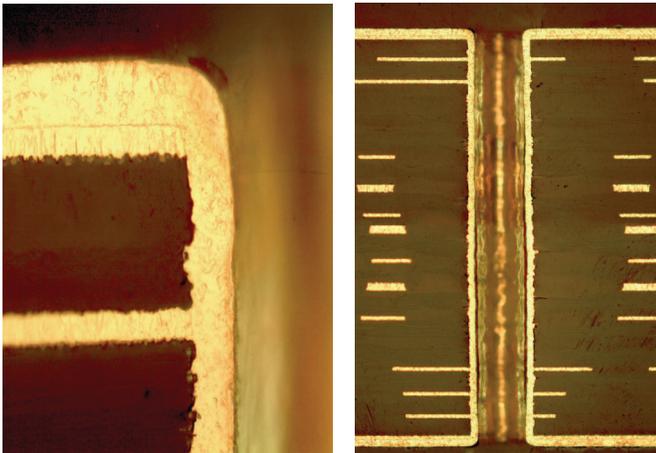
CIRCUITRY SOLUTIONS

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## The Lowest Cost Through-Hole Metallization Process Available

PCB fabrication costs are the result of many factors: chemical consumption, waste production, engineering support, and process yield, among others. **Blackhole** provides a value in use which drops right to your bottom line. The world's most efficient direct metallization process minimizes costs associated with installation, operation and final product yield. Chemical consumption is an order of magnitude lower than electroless copper systems, reducing maintenance, analysis and replenishment time. Fewer, shorter process steps dramatically reduce the cycle time while minimizing rinsing and waste-treatment requirements. The horizontal automation of Blackhole is equally well suited to high volume operation or quick-turn, prototype production. MacDermid Enthone's unrivaled experience with direct plate chemistry, equipment, and process control results in a trouble-free metallization solution.



**Blackhole** enables a uniform electrolytic coating and an intimate copper-to-copper bond for the highest reliability interconnects.

## Value-in-Use Cost Savings

<b>Blackhole</b>	<b>Savings</b>	<b>Electroless Copper</b>
2 to 3 min	Start-up Time: 97% Savings	90 min
8 min	Cycle Time: 87% Savings	60 min
7 mL/ssf	Chemical Replenishment: 90% Savings	70 mL/ssf
6 L/min	Water Consumption: 88% Savings	50 L/min
20 mL/ssf	Water Waste Treatment: 90% Savings	200 mL/ssf



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MacDermid Enthone is a product brand of MacDermid Alpha Electronics Solutions.