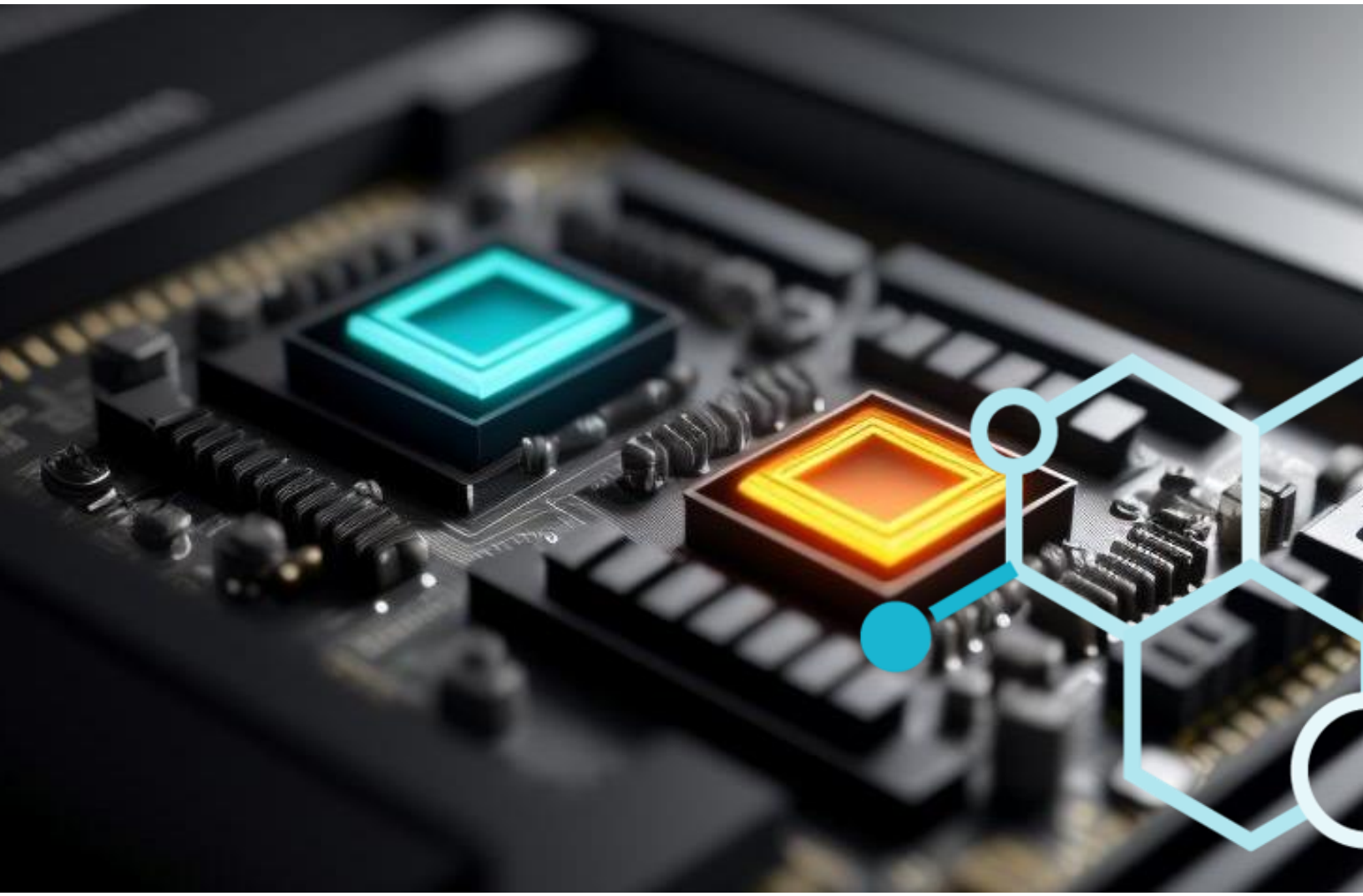
Revving Up Efficiency: Leveraging Formula1B to Build ESD-Safe Trays for SMD Components



AT A GLANCE

Challenge

01

- Long lead times & high cost of ESD-safe trays containing micro-sized pockets
- Inability of FFF to achieve necessary precision levels

Solution

02

- Use Formula1B resin which is compatible with a range of vat photopolymerization machines

Results

03

- Nano-Uniform ESD performance
- Exceptional feature resolution
- Outstanding surface finish

Impact

04

- Reduction in lead time from 8 weeks to 2 hours
- 88% Cost resduction

> The decision to internally fabricate ESD tools using Formula1B has significantly accelerated our New Product Introduction (NPI) processes, leading to a remarkable decrease in time to market.

Revving Up Efficiency: Leveraging Formula1B to Build ESD-Safe Trays for SMD Components

INDUSTRY	TECHNOLOGY	MATERIAL
Surface Mount Devices	Vat Photopolymerization	Formula1B

Customer Profile

Confidential customer ("Customer") is a manufacturer of ultra-miniature Surface Mount Devices (SMDs) for aerospace and defense, medical, and industrial markets.

Challenge

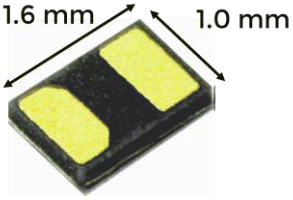


Figure 1: *Miniature SMD that requires ESD tray for transportation.*

Precision machined ESD (Electrostatic Discharge) trays, are an integral part of the manufacturing process of ultra-miniature SMDs (*see* **Figure 1**). These trays are crucial for the safe transportation of components during the production process. The fabrication of these trays using precision machining is a time-consuming process, taking around 8 weeks to complete. Moreover, the cost associated with each tray surpasses $700, making it a significant investment for the Customer. The fabrication of these trays using traditional manufacturing methods has become a bottleneck in the introduction of new products to the market.

Additive Manufacturing (AM) presents a broad range of potential solutions to address Customer's fabrication needs for ESD trays. Initially, the Customer used the Fused Filament Fabrication (FFF) method for tray production. It quickly became evident that FFF was incapable of meeting the necessary tolerances for the ultra-miniature component tray, even with a threefold increase in feature size (*see* **Figure 2**). Consequently, the Customer pursued an alternative solution that offers higher part resolution and satisfies the ESD requirements.

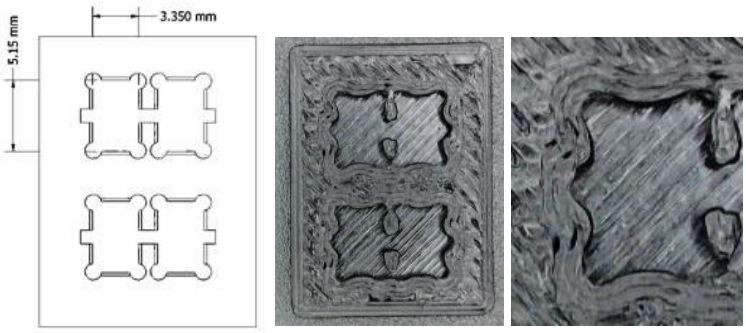


Figure 2: *Component design and part fabricated using FFF. Poor resolution of the 5.15×3.35 mm pocket rendered part unusable.*

Solution

After discovering the new ESD resin options for vat photopolymerization, the customer was motivated to explore this technology as a potential solution. However, their investigation of one of the SLA resins in the market yielded unsatisfactory results. Despite offering improved resolution, the resulting parts were rendered unusable due to notable inconsistencies in their dimensions, poor feature resolution, and surface resistance readings (*see* **Figure 3**).

Determined to leverage AM, the Customer continued to seek out the best possible material and process for ESD trays manufacturing, ultimately discovering Mechnano's Formula1B. Being machine agnostic, Formula1B ESD resin was quickly adopted from a variety of available vat photopolymerization systems. The results exceeded all expectations, allowing fabricated components to have extremely fine resolution, accuracy, and uniform ESD readings.

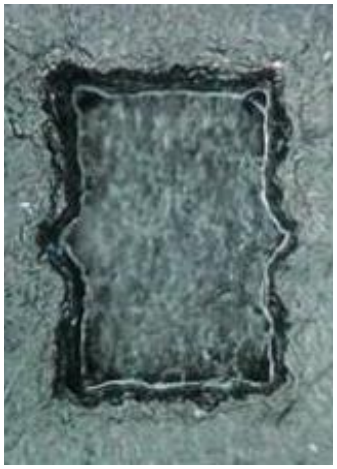


Figure 3: *Microscopy image of the ESD tray pocket fabricated using SLA ESD resin. The part was rendered unusable due to poor resolution and dimensional deviations.*

Results

Figure 4: *Photos of the first component fabricated using Formula1B. Exceptional resolution and surface finish is apparent compared to SLA (**Figure 3**) and FFF (**Figure 2**).*

Mechnano worked closely with the Customer to validate Formula1B as an alternative to the precision machining process used to fabricate ESD trays. The initial fabrication of one of the components using Formula1B surpassed the Customer's expectations on multiple fronts. Notably, the component exhibited outstanding feature resolution, excellent surface finish, and exceptional dimensional accuracy (*see* **Figure 4**).

Encouraged by the positive outcomes, the Customer proceeded with the fabrication of an ESD tray that entails even more demanding specifications. The individual requirements included 1.7×1.1×0.8 mm micro-pockets and stringent standards for flatness across the entire tray. The end results of using Formula1B are impressive. The exceptional level of detail achieved through use of the Formula1B alongside chosen Vat Photopolymerization equipment rivals that of machined parts and mold tooling, surpassing the surface finish achievable with FFF (*see* **Figure 5**). This level of precision has had a profound impact on the Customer, enabling them to produce ESD carriers and trays, leading to significant savings in time and costs.

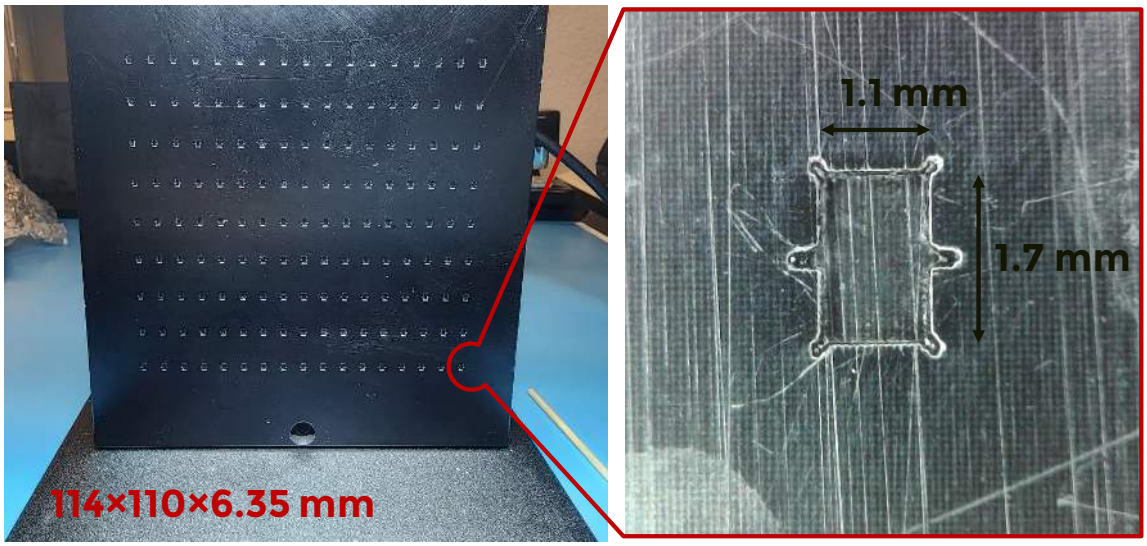


Figure 5: *Photo of the fabricated ESD tray and microscopy image of a single pocket highlighting the capabilities of using Formula1B alongside chosen Vat Photopolymerization system.*

Impact

The Customer made the decision to opt for Formula1B/DLP over FFF to bring in-house fabrication of ESD parts as a replacement for outsourced machining. By utilizing Formula1B for the ESD tray containing micro pockets, the Customer was able to reduce leads times exponentially from 8 weeks to just 2 hours and significantly cut down on fabrication costs, from $700 to a mere $80 per pallet. This strategic transition to in-house ESD tooling fabrication has greatly expedited the New Product Introduction (NPI) cycles and resulted in a notable reduction in time to market for the Customer.

	Time Savings	Cost Reduction
Vat Photopolymerization with Formula1B	**2 hours**	**$80**
Precision Machining	**8 weeks**	**$700**

Designed with the latest technology and extensive research, Mechnano's resins are perfect for customers who want superior electrostatic discharge protection. Don't settle for outdated solutions that could jeopardize your sensitive electronic components. With Mechnano's ESD resins, you can trust that your products will be shielded from static electricity, ensuring optimal performance and longevity. Contact Mechnano today and unlock the power of ESD resins. Your success story begins here.

MECHNANO, LLC
3850 Baseline Rd., Suite 125
Mesa, AZ 85206
(480) 648-9919
www.mechnano.com