



The Project:

Semiconductor DLP Application. Injection Molded Component.

Debug and evaluate a single cavity interposer mold to produce a flash-free, injection molded component.

The Overview:

The end customer, a global semiconductor design and manufacture company, was interested in researching the feasibility of molding a thermally conductive LCP as a Research & Development project that would be applied towards future technologies.

The Challenge:

The overall product design presented multiple challenges from the onset given the designated LCP-based material selection, gate design, 200mm diameter and .9mm product wall thickness. This tool was transferred to our facility as the previous vendor was unable to produce an acceptable flash-free, unwarped product over an extensive and costly 6 month debug period. During our initial feasibility assessment meeting, we informed our customer the product design was "pushing the LCP envelope", given the above and especially due to the single end gated design (275 mm flow length), but possible.

Further, the part was exhibiting the classic "potato chip" warpage affect, given a host of factors:

- Residual stresses (process induced stresses molded/frozen in the part).
- Uneven shrinkage differences (orientation induced stresses) given 55% fiber loading of the material, flow length and gate design.

The Solution:

A cross-functional team of Matrix Tool's degreed Plastics Engineers and Design Engineers collectively reviewed the challenges and quickly

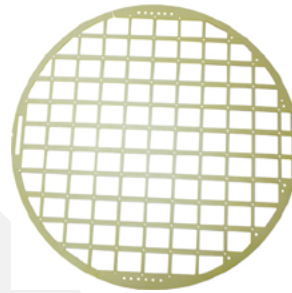


Fig 1: 200mm Diameter DLP Component

worked to address each individually. Firstly, and because a gating scheme redesign was disallowed by the customer, we decided to manipulate the shrinkage differential between the outside perimeter vs. inside grid by adding several flow restrictors around the perimeter of the part. This, in theory and later in practice, physically prevented the radial direction shrinkage differential (orientation induced stresses) from bowing the product in the "potato chip" shape. Flatness was dramatically improved via a quick tooling change that was done in-house and the flatness challenge was addressed within a 1 week window from tool receipt. We then focused our attention on eliminating the heavily flashed gate end region. After a thorough tool evaluation, this was accomplished by re-establishing the proper pinch, adding additional tool support and incorporating proper gate/runner design principals into the existing mold design.

The Benefits:

Much to the surprise of our customer, Matrix Tool was able to successfully accelerate the debug TTM (time to market) and coordinate mold conditioning efforts that resulted in a dimensionally accurate component and a production capable molding process. Our customer experienced first-hand the benefits of our in-house, full-service capabilities and was particularly impressed with our ability (and willingness) to sample in the morning, immediately allocate resources to identify the root cause(s) of troublesome areas and transition to a steel alteration mode in the same afternoon. This entire debug process helped the customer to achieve a product that they previously thought was 'unattainable' and allowed our customer to utilize the parts in their new technology trials.

Let's "push the envelope" together!

For a quotation or additional information, contact Matrix Tool Inc: