

## CASE STUDY



*A 2025 Award of Distinction Winner in the Electronic/Electrical Components category for metal injection molded PM components*

### ALN Heatsink

**Process:**  
Metal Injection Molding (MIM)

**Material:**  
Aluminum nitride ceramic

**Density:**  
3.32 g/cm<sup>3</sup> minimum

**Thermal Conductivity:**  
170 W/(m·K) minimum

#### End Use and Function

The ALN heatsink is a brittle aluminum nitride component used in silicon photonics optical modules, providing mounting and efficient heat dissipation for heat-generating components.

#### Fabrication

The heatsink is produced with stringent specifications to prevent chipping and ensure precision. Manufacturing techniques focus on achieving flatness and parallelism within 0.03 mm, with surface roughness maintained between 0.3 and 0.8  $\mu\text{m}$  Ra. The part achieves a density greater than 3.32 g/cm<sup>3</sup>, alongside critical thermal properties, including a thermal conductivity over 170 W/(m·K) and a linear thermal expansion coefficient of 3.6–4.5  $\mu\text{m}/\text{m}\cdot^\circ\text{C}$ , ensuring reliable performance in optical communications.

#### Results

The heatsink effectively manages heat dissipation in silicon photonics modules, accommodating multiple heat-generating components. Its precision and adherence to strict dimensional and thermal properties enhance optical communication performance, significantly reducing defects like chipping and ensuring reliable operation, which has supported successful mass production of similar designs.



*PickPM is a resource created by the Metal Powder Industries Federation, a trade association for the metal powder industry, for the benefit of the metal powder industry. To learn more about powder metallurgy, or to find a part fabricator, visit us at [PickPM.com](https://www.PickPM.com)*