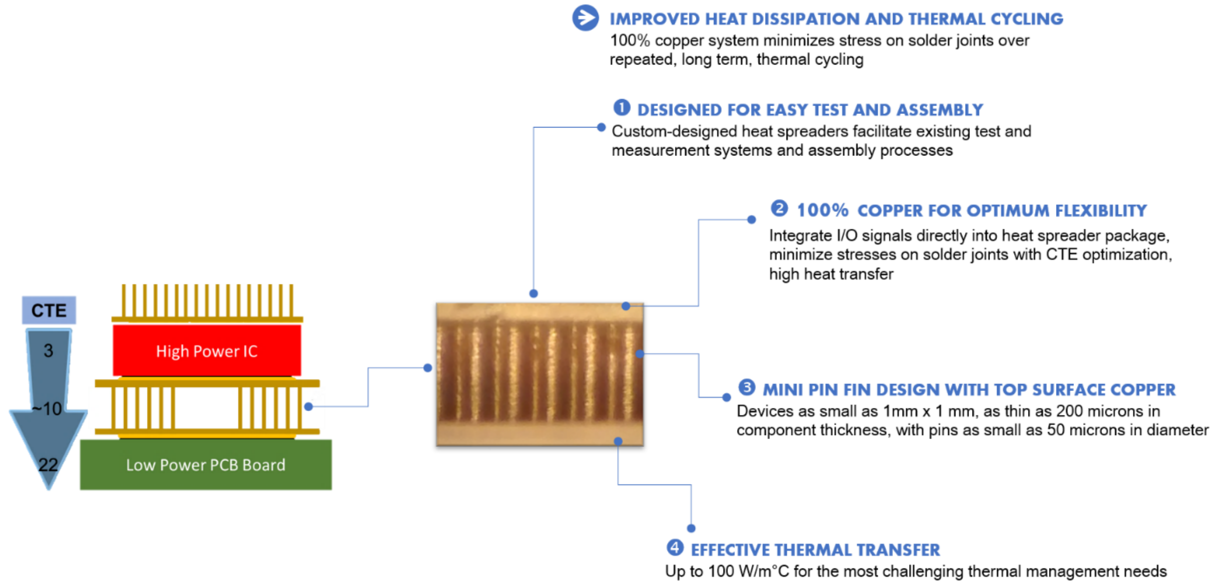
# Thermal Management
# Mini Pin Fin Heat Spreaders
# Mini Pin Fin Heat Sinks




## Improve performance and reduce package size

Heat spreaders and heat sinks from our unique mini pin fin manufacturing process enable designers of small electronics to build more compact packages.

Heat spreaders and heat sinks made in 100% copper can be made as small as 1 mm x 1mm, and as thin as 200 microns, enabling truly small packages.

## 100% Copper enables better performance

Copper has a higher thermal conductivity and conducts heat faster than aluminum. Therefore, the temperature across the heat spreader OR heatsink will be more uniform. With a higher volumetric heat capacity than aluminum, it takes a larger quantity of energy to raise temperature thus smoothing out the thermal load.

Copper heatsinks and heat spreaders better match the CTE of the solder joints which reduces fatigue failure from repeated, long-term thermal cycling. However, copper has a higher density and is traditionally more expensive than aluminum.

Heatsinks and heat spreaders from 3D Glass Solutions with the mini pin fin design leverage the advantages of the copper and minimize the disadvantages (weight and expense).

100% copper heat spreaders out-perform copper ‘coin’ designs as the mini pin fin internal structure enables torsion, relieving stresses from thermal cycling.

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## Applications

- RF amplifiers
    - GaN amplifiers
    - GaAs amplifiers
    - LDMOS amplifiers
- LED
- LCD
- Small electronics with heat management challenges

## Ultra small designs for ultra small packages

50 micron mini pin fins enable effective thermal transfers of up to 100 W/m°C. This is far superior to the single piece copper coin solution which is limited by its inherent surface area.

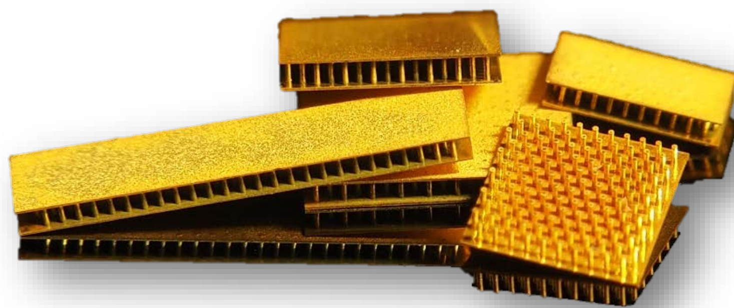
Traditional productions methods in the past have not been able to cost-effectively produce efficient AND small heat spreaders and heatsinks.

## Custom solutions for improved outcomes

Each application is unique in footprint, thermal management requirements, and additional features. Contact us directly with your specific needs.

## Design Limits

| Parameters | Typical |
|---|---|
| Size | 5 mm x 5 mm |
| Height | 250 µm |
| Mini pin fin spacing | 50 – 200 µm |
| Mini pin fin diameter | 50 – 100 µm |



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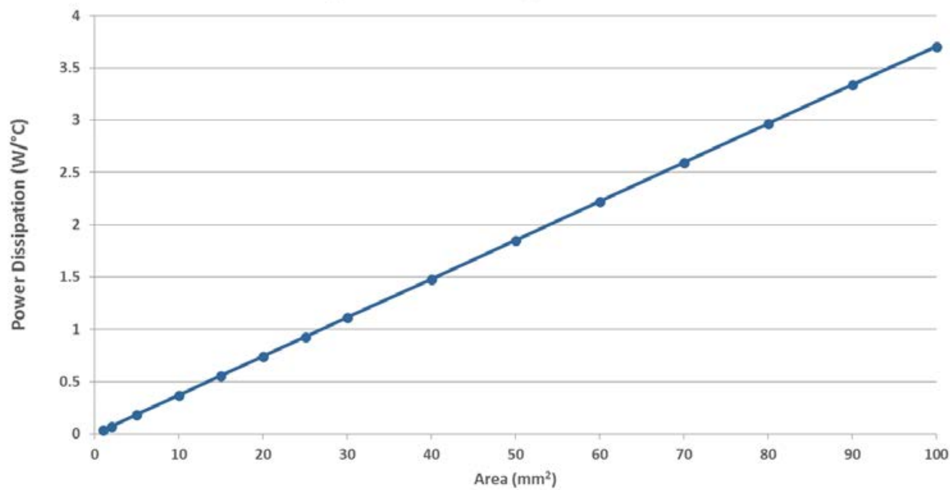
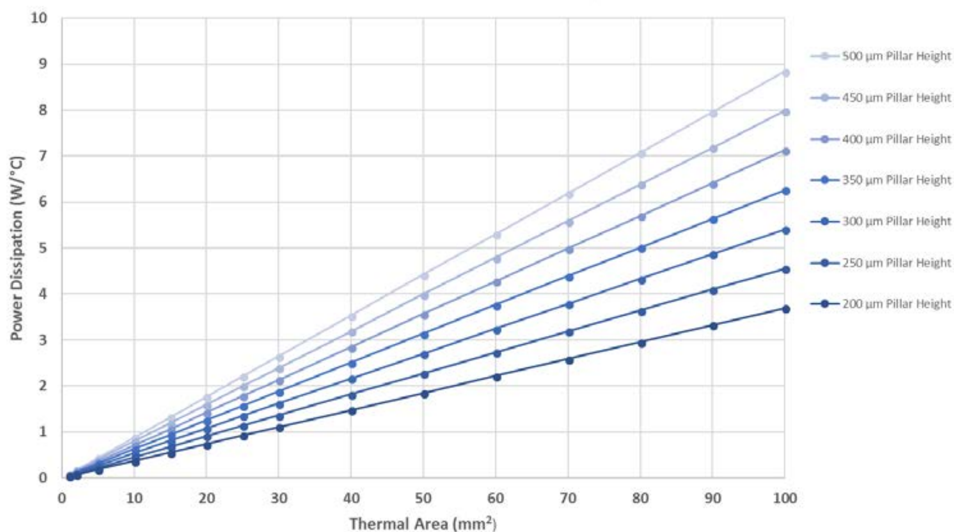


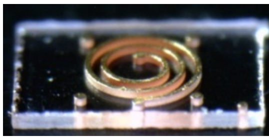




Data represents the standard performance range and gives the maximum power dissipation for a given area assuming a pin diameter = 60µm & pin pitch = 120µm.

Pin diameter, pitch and height can all be customized (within design guidelines) to meet specific needs.

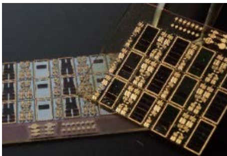
To calculate total watts dissipated, the W/°C value needs to be multiplied by the temperature delta between the chip and air [Watts dissipated = W/°C x ΔT].

# Other Products



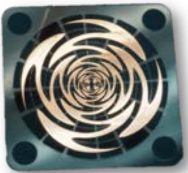
## Discrete Custom Ls and Cs

Discrete custom inductor and capacitor components fabricated in our proprietary APEX® Glass offer the highest Quality factors (High Q) in the smallest form-factor. 3D Glass Solutions offers a wide variety of inductive and capacitive devices that cover a broad array of power handling and frequency capabilities targeted specifically for the RF community.



## IPD Matching Networks

IPD-ready components improve impedance matching networks with high efficiency energy transfer and reduced losses. Significantly improve Power Amplifier efficiency performance compared to RF Silicon or planar IPDs.

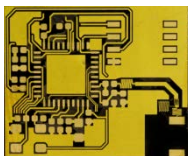


## Antennas

Our unique design and manufacturing capabilities enable antenna designers to generate radiative antenna structures with dielectric constants as low as 1.5. Tailorable dielectric performance ranging from 1.5 to 6.4 is realized by integrating radiative metal patterns on a matrix of glass and air.

## Integrated Passive Devices

Custom integrated passive devices from 3D Glass Solutions are used in a wide variety of wireless applications where low-loss and compact device size matter. Three dimensional IPDs fabricated in our proprietary glass possess improved performance over traditional silicon or planar glass IPD products, with greater design flexibility and integration capability.



## RF System-in-a-Package (SiP)

Glass-based RF SiP interposers allow you to offer significant product differentiation. Our proprietary APEX® Glass allows you to realize high-value system integration in the most compact footprint enabling you to meet even the most demanding product definitions for next-generation RF and wireless products.