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D&E event 2016

Thermal Management

Importance, Challenges, Solutions

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CTO

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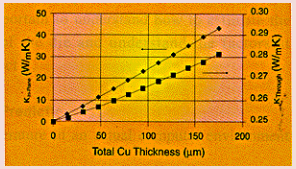
Topics

- Heat Sources
- Why Thermal Management is Crucial in PCB Design
- Solutions to Dissipate Heat
- General Guidelines in Selecting Heat Dissipation Solution
- Summary

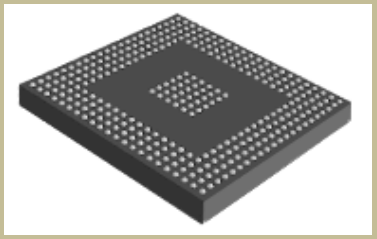
Heat Sources

Ambient Temperature

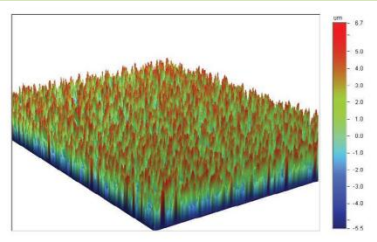
Power



Overall PCB
Heat Capacitance



Component
Power Consumption



Surface Roughness
in High Frequency

Why Thermal Management is Crucial in PCB Design

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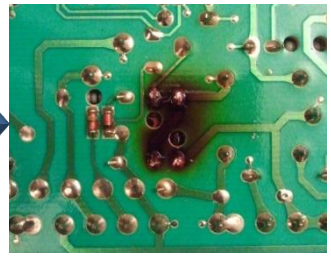
#1 Cause of Deficiencies



Assure Performance

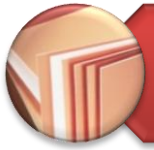
Increase Reliability

Solutions to Dissipate Heat

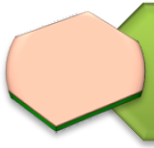
disclaimer

This Presentation **Will Not** Discuss Component / Assembly Level Solutions

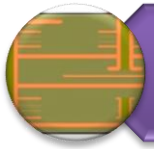
Solutions to Dissipate Heat



Material

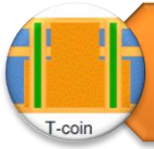


Copper Thickness



Thermal Via

Heat Sink



COIN Technology

Material – *heat capacitance*

Standard Heat Capacitance

- FR4
- Polyimide
- Flex Kapton HT

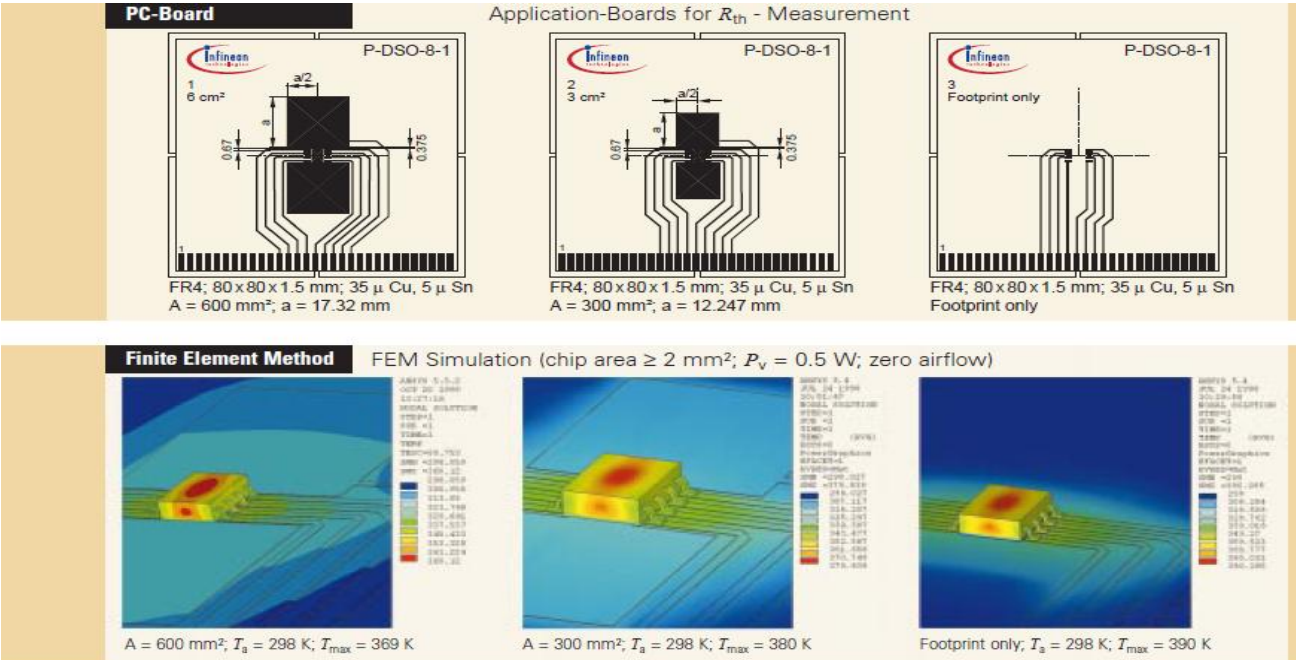
Enhanced Heat Capacitance

- TC350
- ML92
- TMM (Rogers ceramic)
- Bergquist

Material – *thermal properties*

	Cu	Multi-crystal Diamond (synthetic)	Single-crystal Diamond (natural)	Single-crystal Diamond (synthetic)
Thermal Conductivity (W/m*K)	401	900	2200	2200
Specific Thermal Resistivity (m*K/W)	2.49E-03	1.11E-03	4.55E-04	4.55E-04
Heat Capacity (J/g*K)	0.385	0.509	0.509	0.509
Density (g/cm^3)	8.96	3.52	3.52	3.52

Material – *heat resistance*



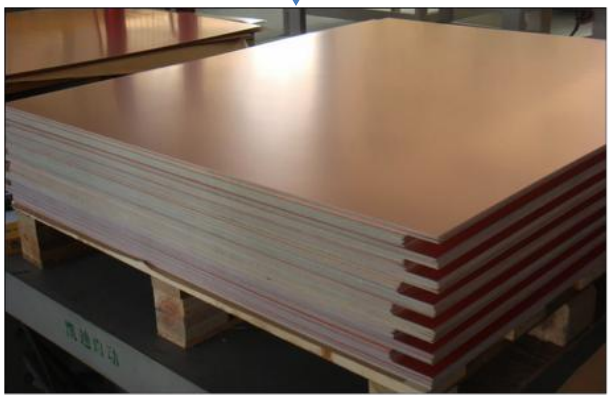
Copper Thickness

1oz

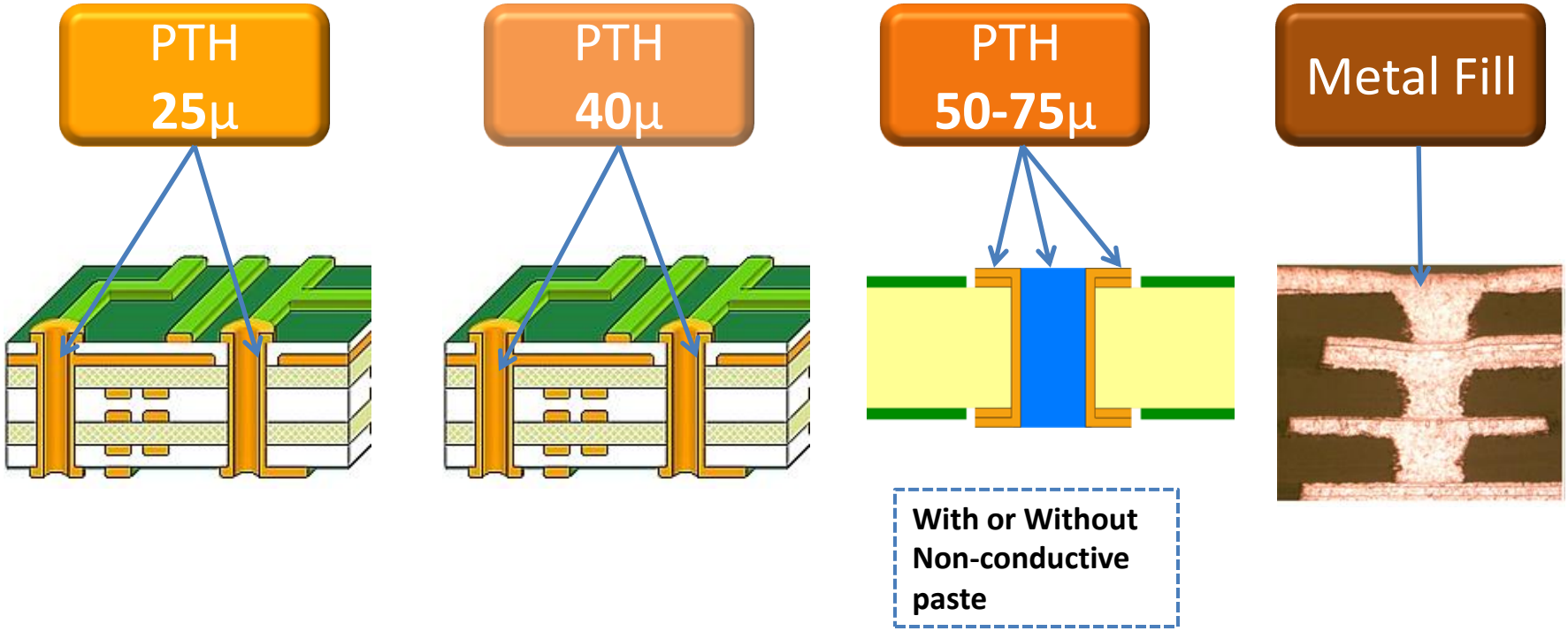
2oz

3oz

4oz

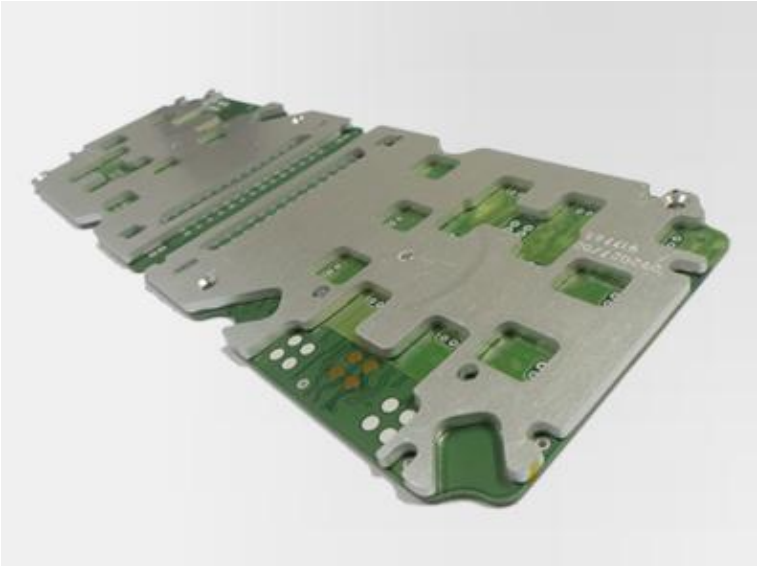


Thermal Via


PTH
25µ
PTH
40µ
PTH
50-75µ
Metal Fill
With or Without
Non-conductive
paste

Heat Sink

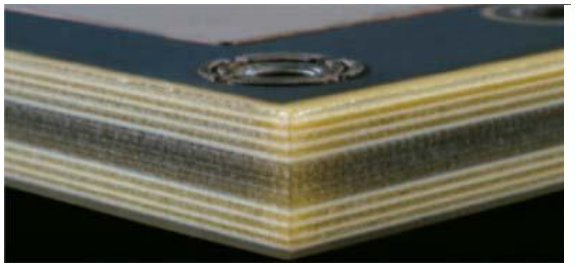
External Heat Sink

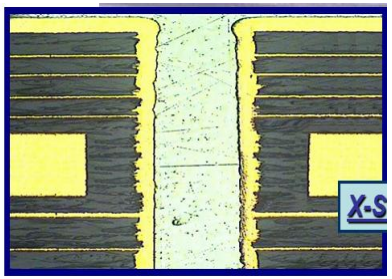


Aluminum

Copper

Internal Heat Sink





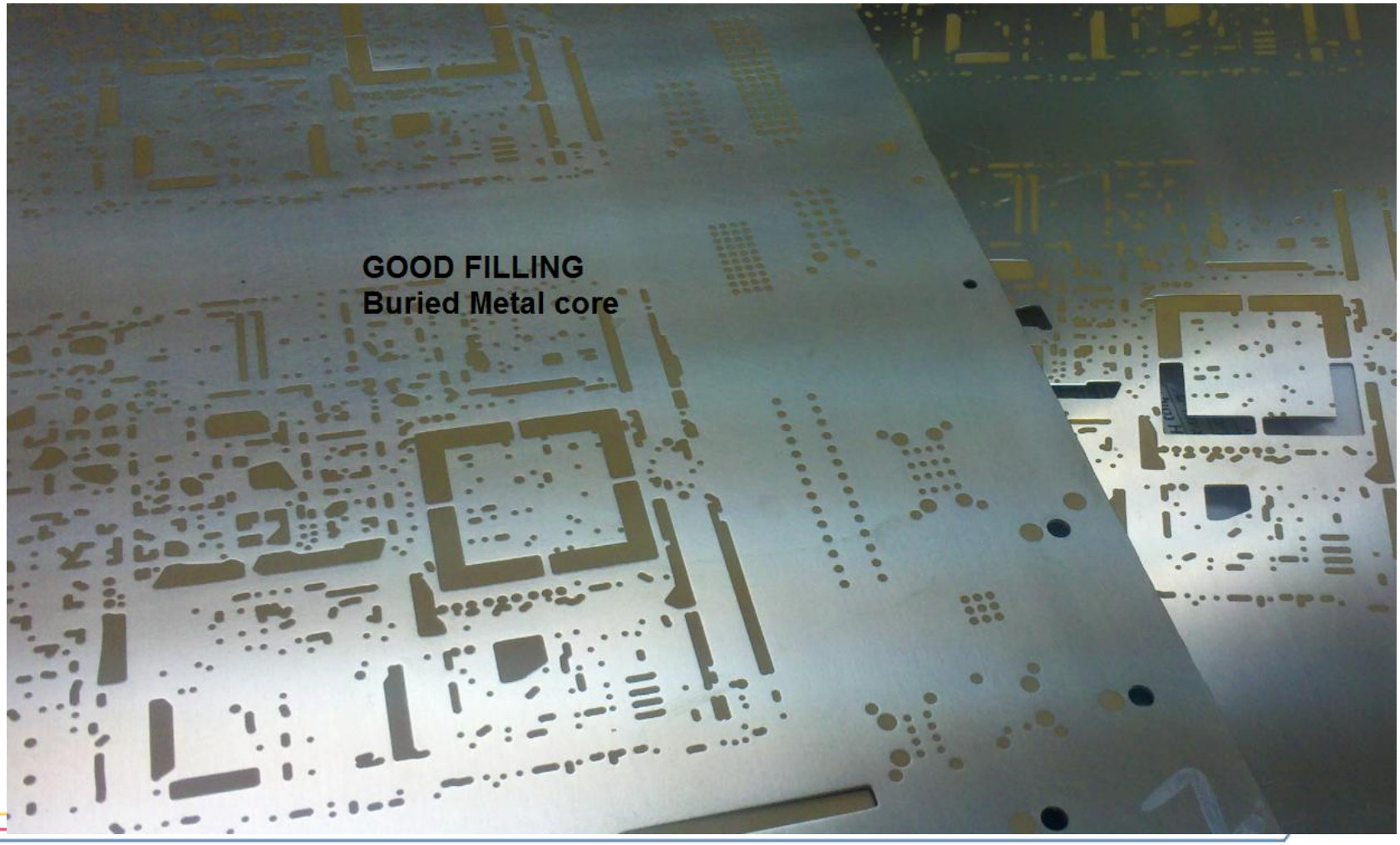
Carbon

Copper Invar Copper (C.I.C)

Copper

Aluminum

Heat Sink *cont'*



COIN Technology

U-Coin

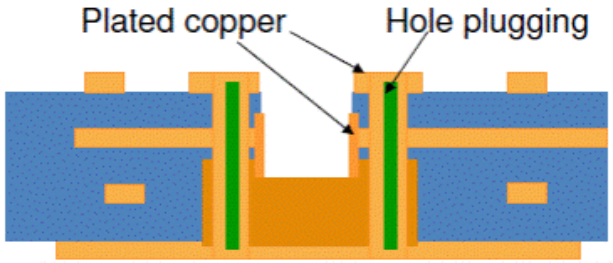
There will be cavity in each of the coin. The high power component can be placed into the cavity for heat dissipation. The grounding of coin can be done by plating of ground vias or cavity.

T-Coin

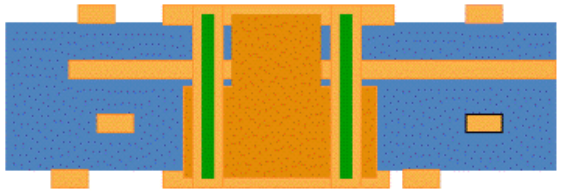
The coin embedded is T-shape. There are plated ground via holes drilled through the ground plane and coin for ground connection.
The flat surface makes it better for surface mount components thermal dissipation.

I-Coin

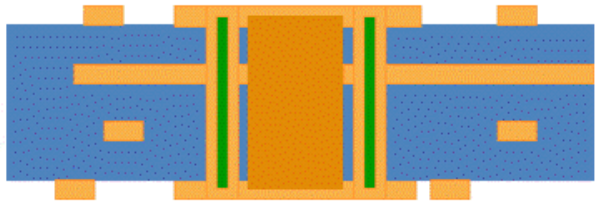
The shape of the coin is simply square. The ground via connected to the ground layer does not contact to the coin directly.



U-coin

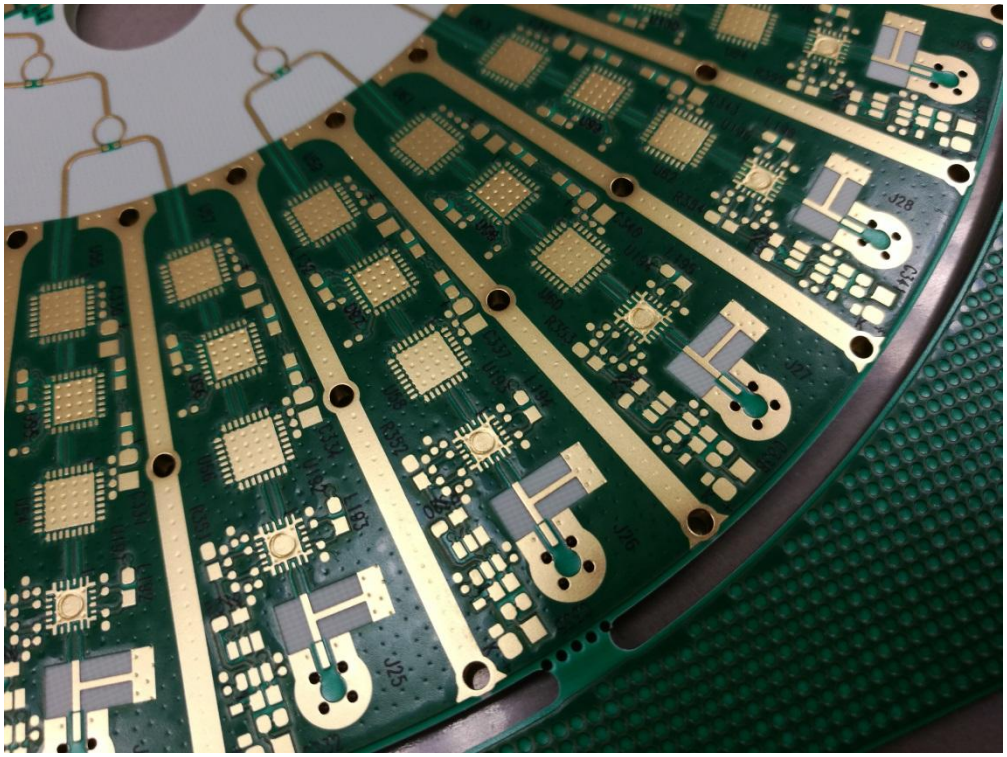


T-coin

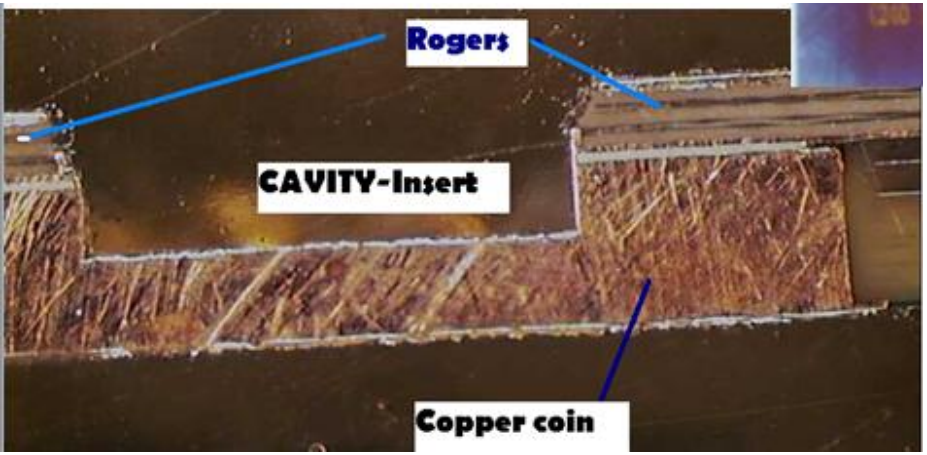


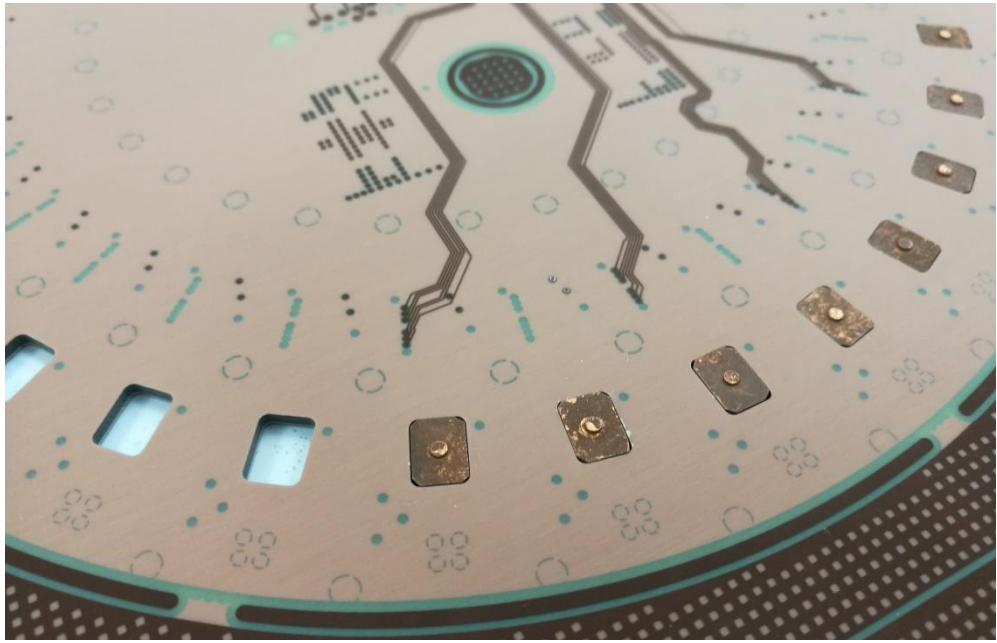
I-coin

COIN Technology



COIN Technology





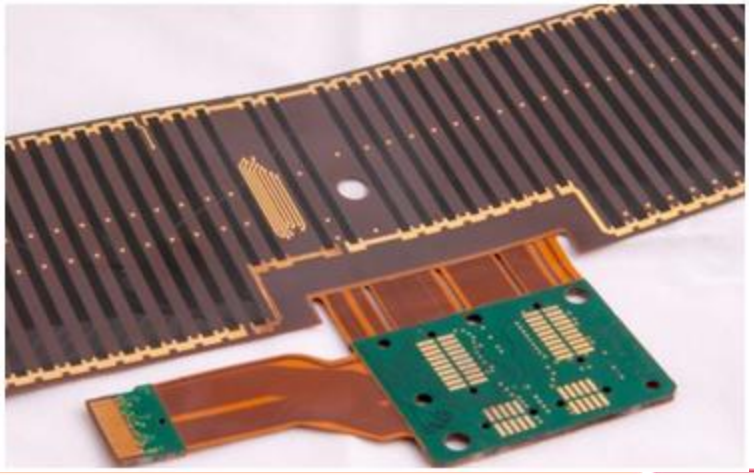
Heat Dissipation vs. Management

Is Heat really that bad ?

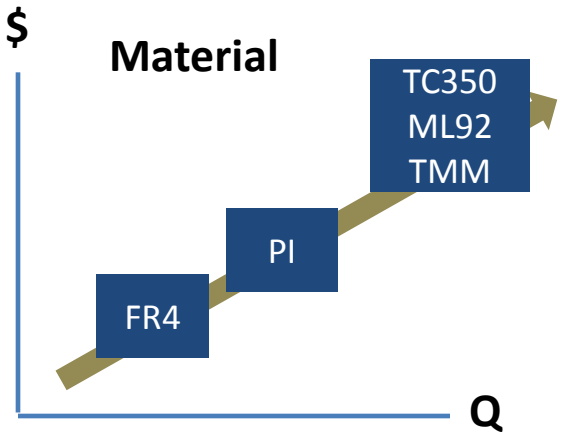
Not necessarily !

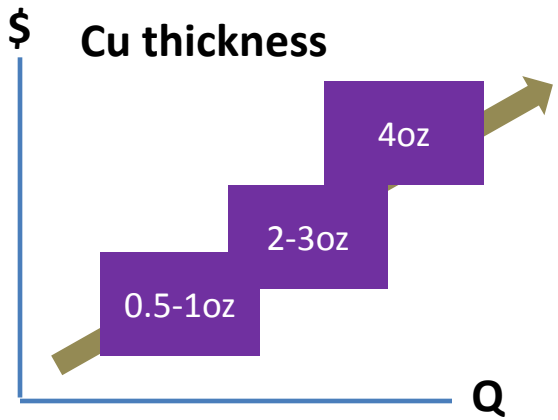
Using PCB technology to create **Heaters** to stabilize system environments – especially optical

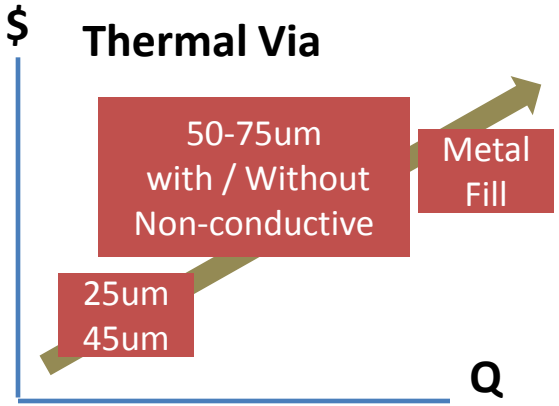
Carbon resistors

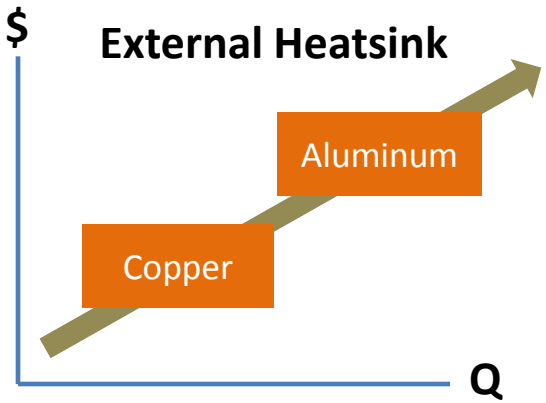


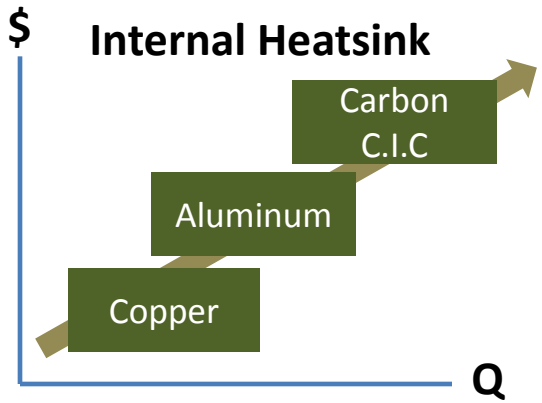
General Guidelines in Selecting Heat Dissipation Solution

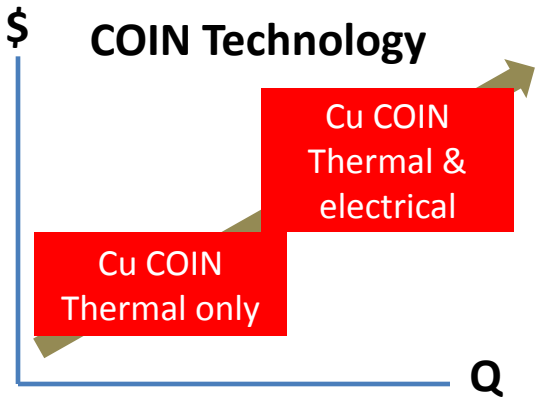












Summary

- Heat has high impact on product reliability
- Heat dissipation solution is a **Key** when design-to-reliability is needed
- There are various solutions to dissipate heat
- We are at your service to select the right solution !

Please Contact Our Valuable Representative

D&E booth number 27

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Dank Je

Vragen ?

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