



DK Thermal Solutions



Thermal Management of LED's

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Our Circuit Group

TCL Circuit
Companies



DK Thermal UK
DK Thermal Asia



IMPCB

GSPK Circuits



Multilayer
Double & Single
sided pcbs

Daleba Circuits
Asia Traded Pcbs





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Circuit Group DK



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Sales & Technical -
UK, USA, Germany, France, Spain
Netherlands, China, HK.

UK Thermal Board
Manufacture

Asia Thermal Board
Manufacture

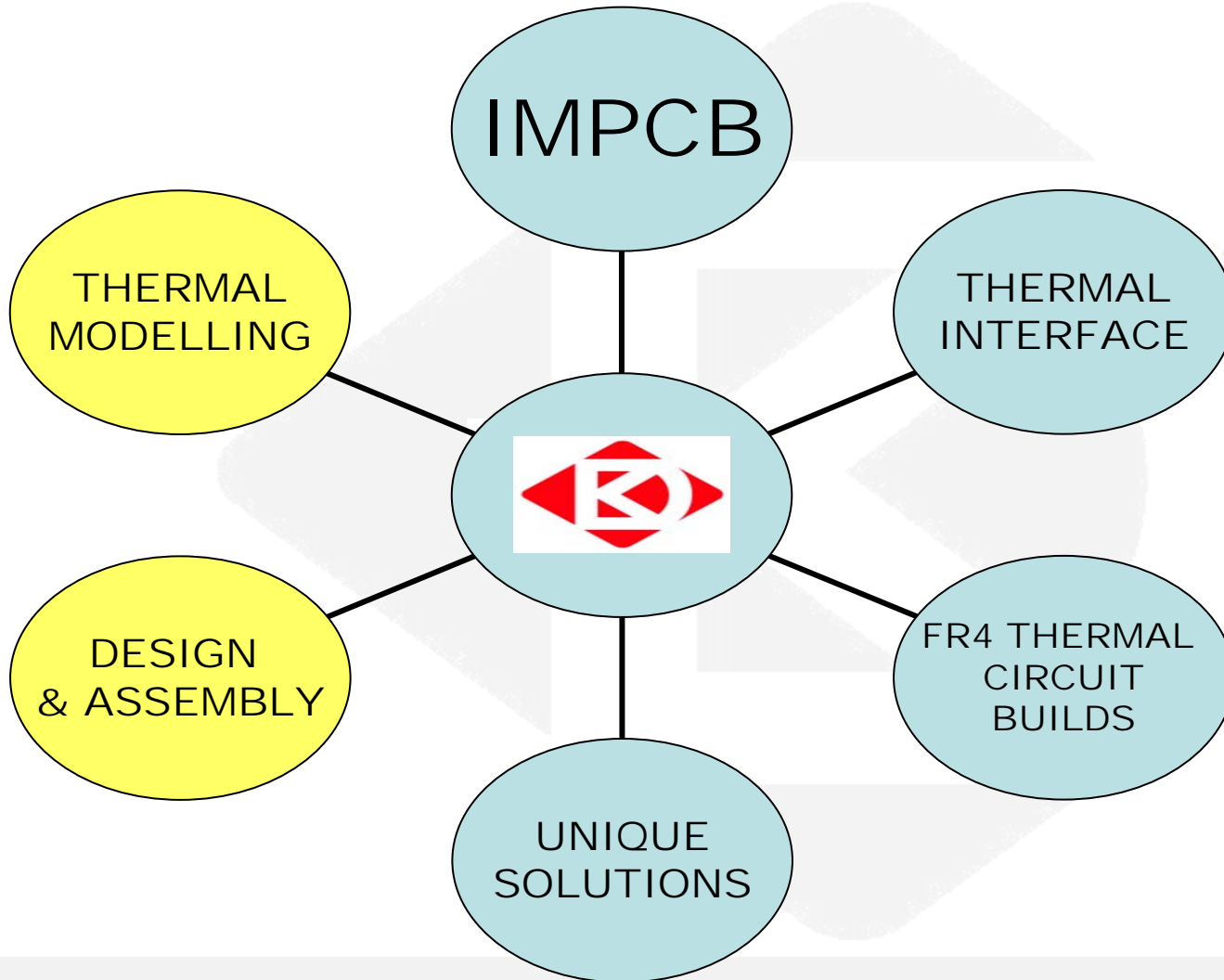




DKT PRODUCTS



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Heat Removal From LEDS

Efficient thermal management for LEDs is a critical consideration to achieve best light output and LED life. Unlike most other light sources LEDs generate heat within the device itself at the point where the die is active. This can only be removed by conducting away the heat through the PCB into the heat sink.

The aim of effective thermal management is to transfer the heat as quickly as possible through the stack and into the heat sink

Key considerations include

- 1, The PCB laminate & other materials used and their ability to transfer heat - Thermal conductivity
- 2, The thickness of the materials - Thinner material less total resistance
- 3, Best circuit design for heat spreading
- 4, Removal of air that prevents a conductive path.



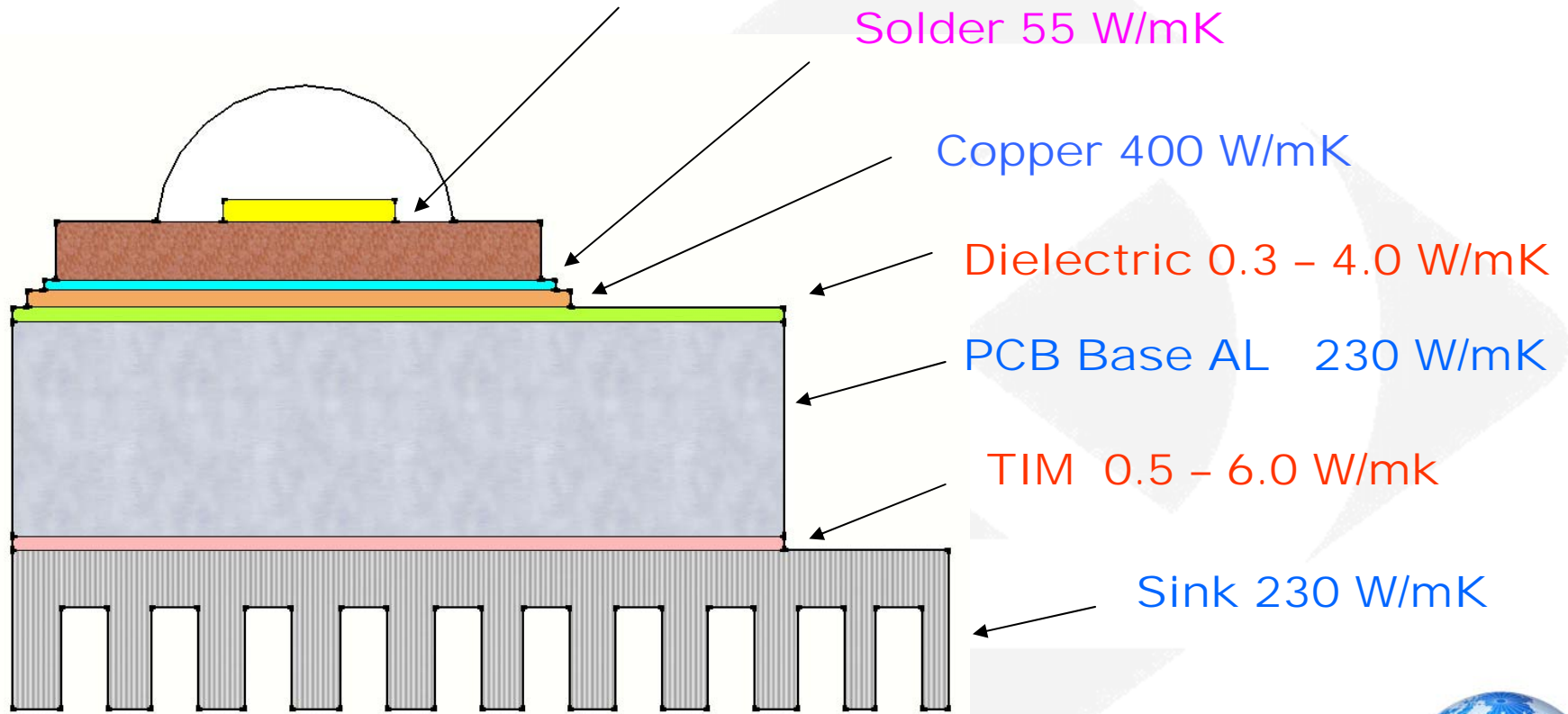


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Typical PCB Stack

Die Junction to heat slug (Manufacturer)



THERMAL CONDUCTIVITY OF AIR = 0.025 W/mK



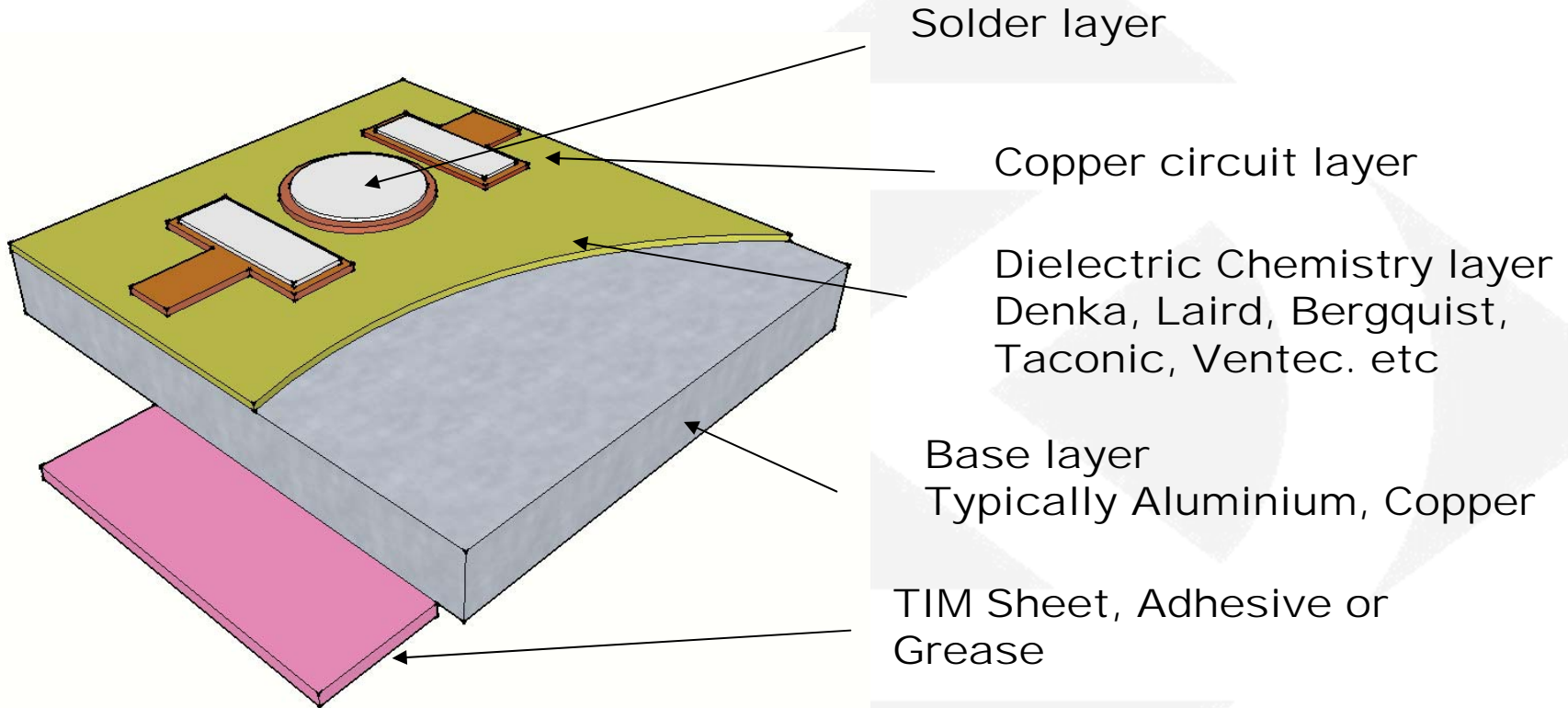


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The Technology..... Insulated Metal Substrate IMS™

Basic Single Layer Laminate Structure



Circuit Layer Thickness	35 - 350 μ m	(1oz to 10oz)
Dielectric Thickness	75 - 150 μ m	
Base Layer Thickness	0.5 - 3.2mm	



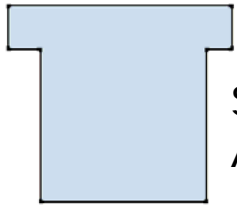


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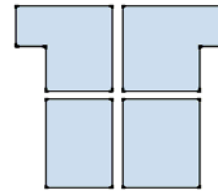


Lets look at the layers.....

Solder – In assembly we want to achieve good wetting, a thin layer with no solder build up & most importantly to minimise voiding. If air is trapped in the solder paste, conduction cannot occur. CEMs will change the stencil thickness & the paste design for this reason

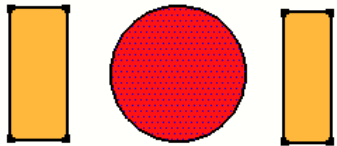


Solid paste may trap air
And cause voiding

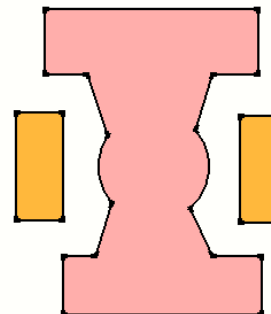


Paste format designed to
allow venting of air gasses

Copper – Excellent for moving heat, add copper fill to your design and use thicker copper layers and you will remove the hot spots by spreading.



No copper fill
All heat moves
through this
area



Copper fill spreads
the heat over a
larger area





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Lets Look at the layers.....

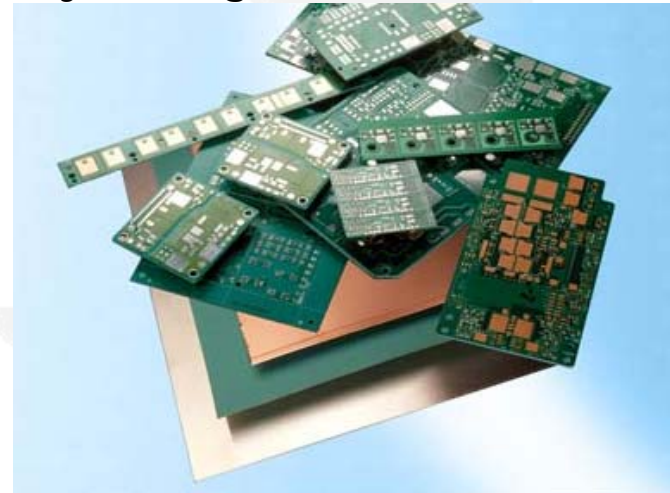
Dielectric – Very important. This layer must pass heat whilst electrically isolating the circuit from the base

By its very nature the material is an insulator so filler material is added to the chemical compound to increase the thermal conductivity.

By keeping the layer to the thickness of a human hair the thermal impedance is lower

Price – Thermals – insulation properties, all consideration in the correct material selection

Identifying the correct recipe is DKTs key strength





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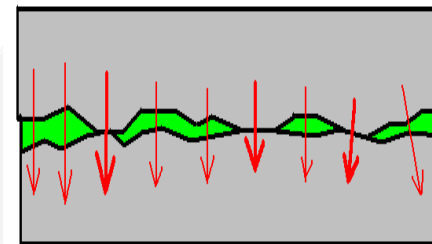
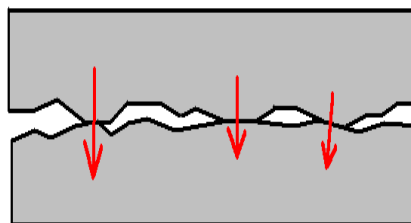
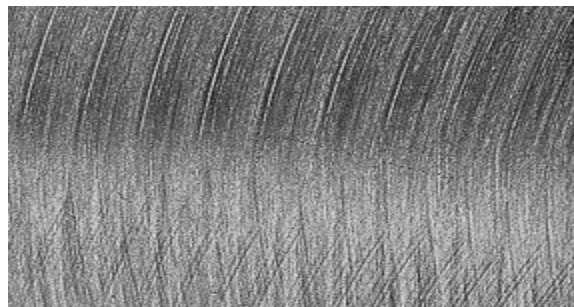


Lets Look at the layers.....

TIM – Thermal interface materials

Why would you add a piece of material between the board and the heat sink both of which are already good conductors of heat?

The answer is that the surfaces are not intimately joined, they touch on the peaks only – air is present.



Using a grease or a compliant sheet material fills all those nasty micro void air gaps allowing increased thermal conduction.

Materials can include Greases – Phase change products – Graphite & compliant pads for larger gap filling





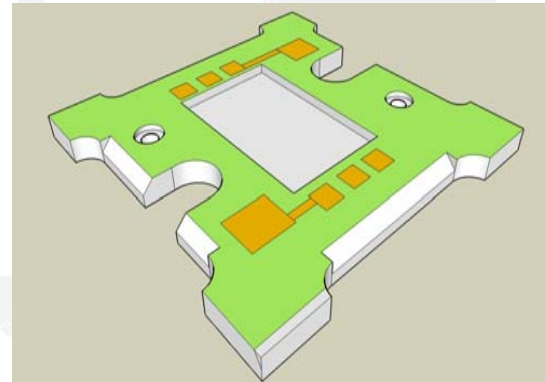
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DKT & Osram

DKT – Have been a LLFY Partner for the last 4 years
We have worked with Osram in Regensburg for both SSL and OS
with thermal boards and more recently the design centre in Shenzhen.
These board designs are built at their plants in Italy Treviso & Guangzhou
in China

More recently we are working with Chip on board technology circuits
for the assembly plants in Penang, Malaysia where automotive headlamp
demands are pushing power ratings





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Interesting Material developments

Flexible dielectrics allow
Formable PCBs

A material that can be formed
after assembly whilst at the same
time maintaining electrical
strength

Street lighting is the key
Market.





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Thank you for listening I hope you found this of interest.

A large, faded version of the DK Thermal Solutions logo is centered on the page, serving as a watermark. It consists of the same red diamond with a white 'DK' inside, but is much lighter in color and semi-transparent.