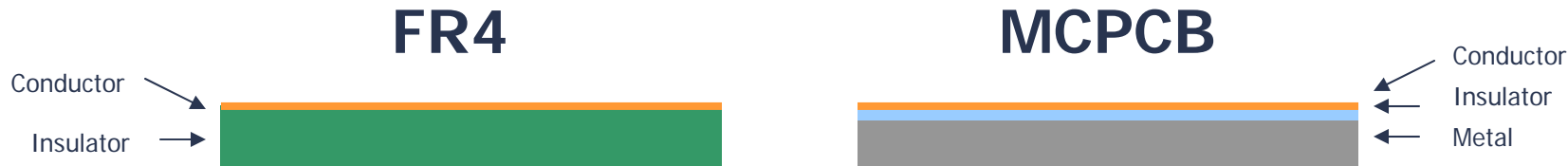


LED Design Considerations

Printed Circuit Boards
(PCB)

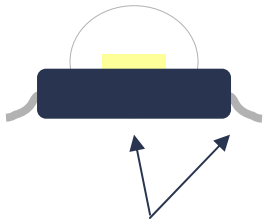
Printed Circuit Board Types



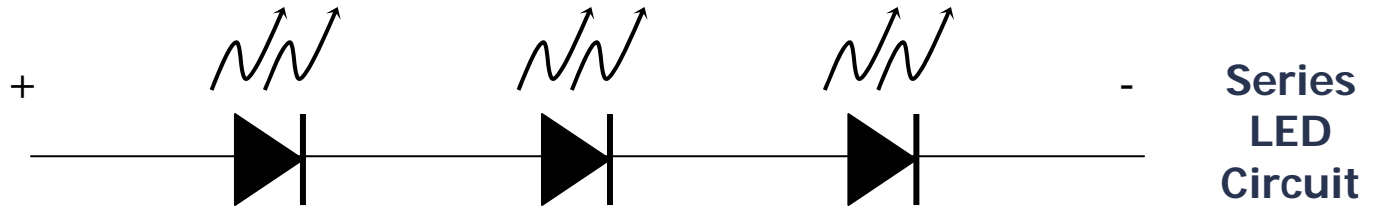
Material	FR-4	Metal Core PCB
Description	<ul style="list-style-type: none"> • Simple sandwich of conductive wires (typically copper) and common insulating material • High-volume workhorse of nearly every electronic assembly in the world 	<ul style="list-style-type: none"> • More complex, multi-layer sandwich of much more specialized materials • Typically used in high power, high-reliability, and military applications
Advantage	Very low cost	Best thermal conductivity
Disadvantage	Poor thermal conductivity	Higher cost relative to FR4

Typical Power LEDs with MCPCB

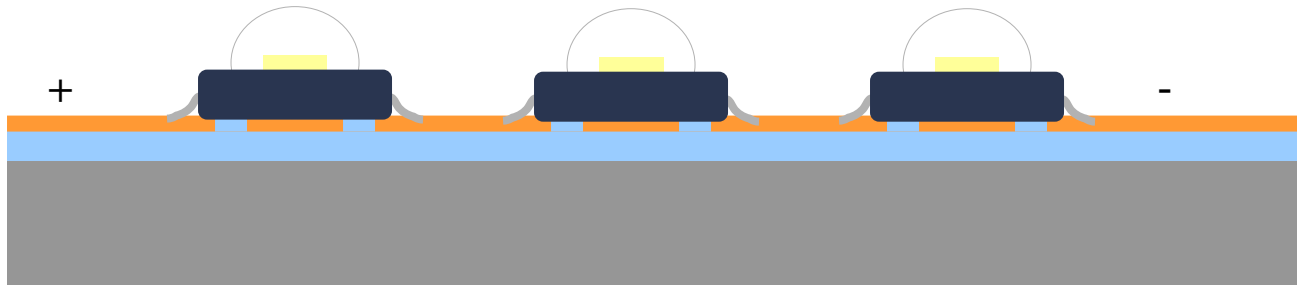
Typical Power LED



One lead & thermal path tied together

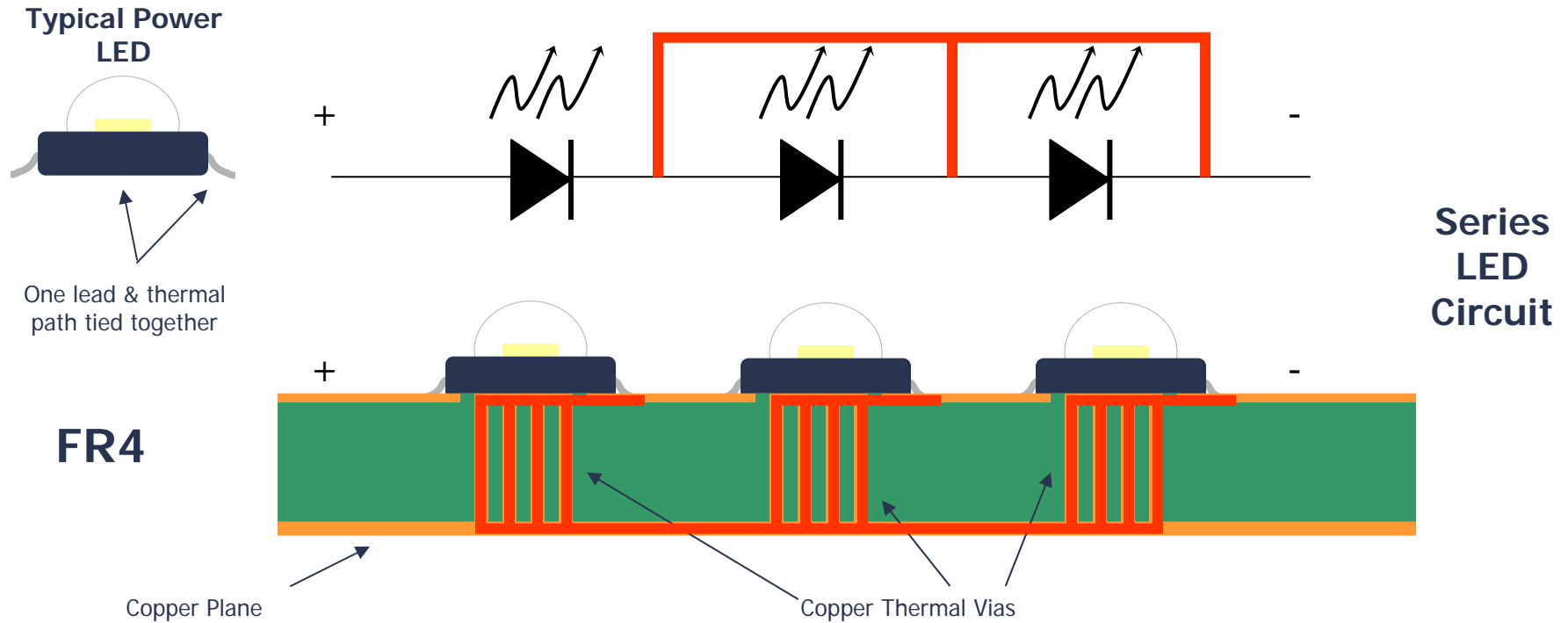


MCPCB



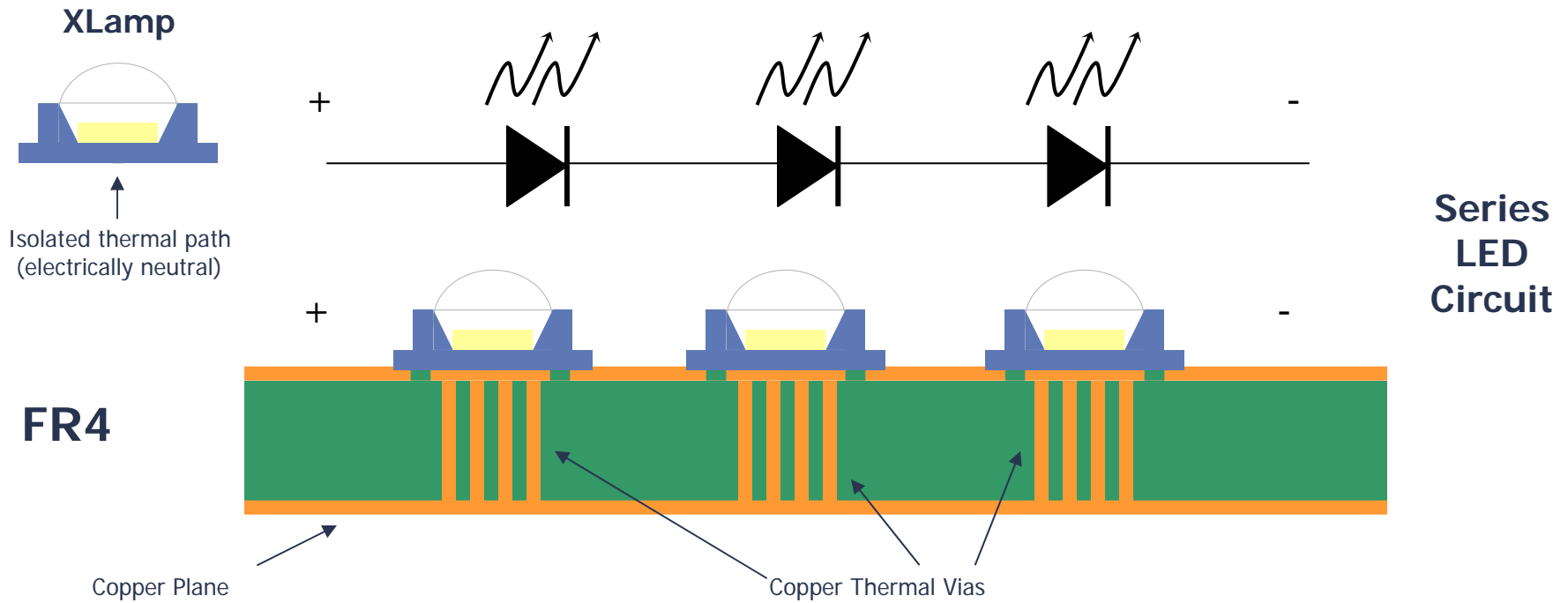
Adding board level lamp isolation on top of the cost of MCPCB makes board cost very high with most LED lamps.

Why Typical Power LEDs Won't Work with FR4



- FR4 affords no thermal path by itself – thermal vias and copper plane must be added
- But the thermal plane itself is conductive and will cause a short between LEDs

XLamp LEDs Do Work with FR4!



- With its isolated thermal path, the XLamp LED does not have any problem with shorting through the thermal plane
- However, good thermal design limits FR4 use to applications with thermal densities $< 1 \text{ W/in}^2$