Thermal management voor leds

Ad Musters

30 november 2017

LED Event, 1931, Den Bosch

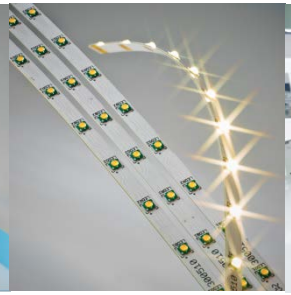
Overzicht

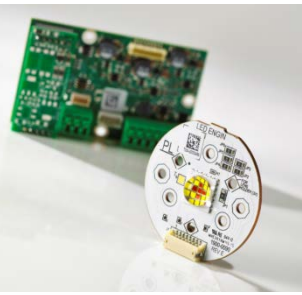
- Korte introductie Thal Technologies
- Overzicht van verschillende soorten leds
- Thermische eigenschappen van de led
- Substraat materialen.
- Thermisch interface materiaal
- Heatsinks
- Optimaliseren is maatwerk
- Berekenen, simuleren, meten
- Trends
- Ruimte voor vragen

Introductie Thal Technologies

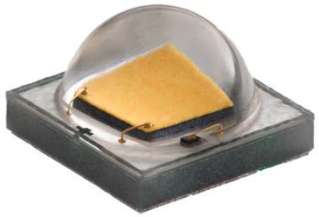
- Sinds 2003, voormalig Universal Science BV
- Onderscheidend in klantspecifieke oplossingen
- Prototypes en high volume SMD productie in huis
- Made in Holland, reshoring ondersteuning
- Development, distributie, assemblage, conversie
- LuxiTune™, LED Engin distributeur
- B2B, professionele toepassingen,
- Outdoor en indoor lighting



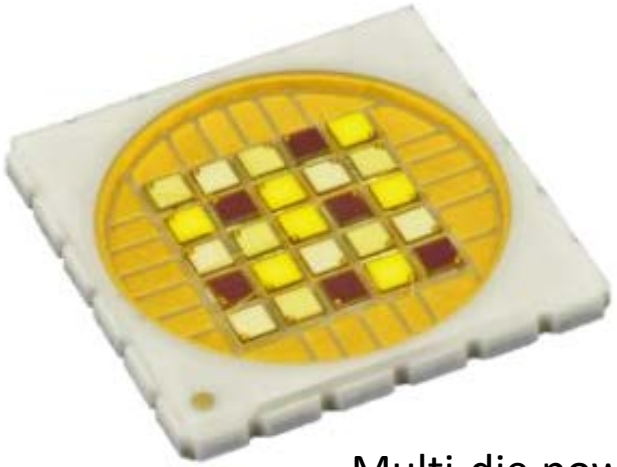


Overzicht verschillende leds

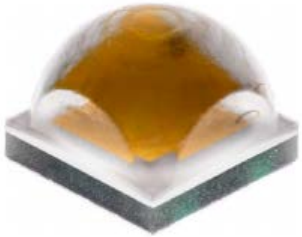


High power led
Cree 3.5 x 3.5mm
Max 4W

CSP power led
SeoulSemiconductor
1.8x1.8mm led
Max 7W

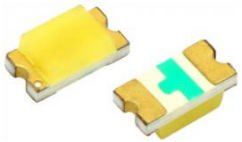


Multi-die power led
LED Engin
6.2x6.2mm
Max 80W

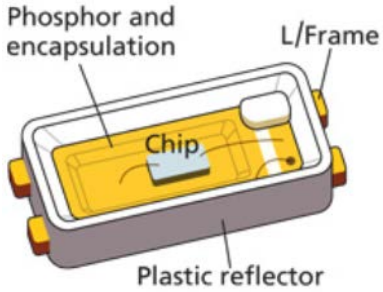


High power led
Cree 3.5 x 3.5mm
Max 9W

Level 1



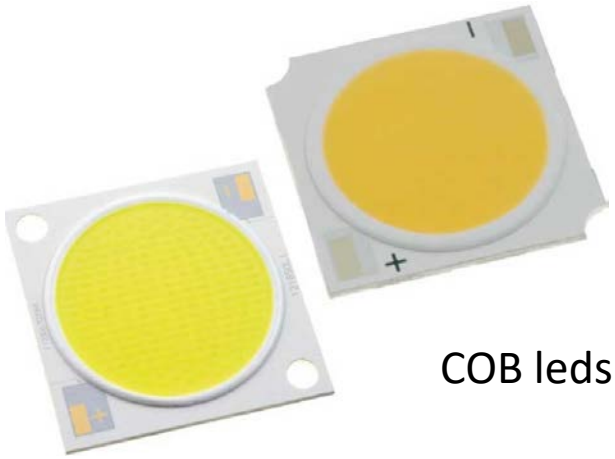
Low power Chipled
Vishay, 0.8 x 1.6 mm
Max 0.06W



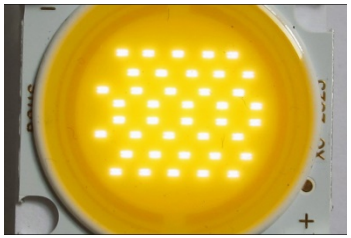
Mid power led
Samsung
3 x 5.6mm
Max 0.6W

Low power
Nichia
5mm led
Max 0.1W

Overzicht verschillende leds



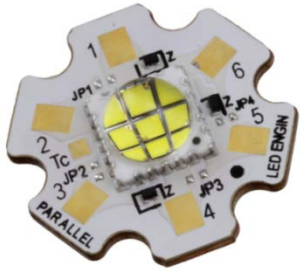
COB leds



Filament led

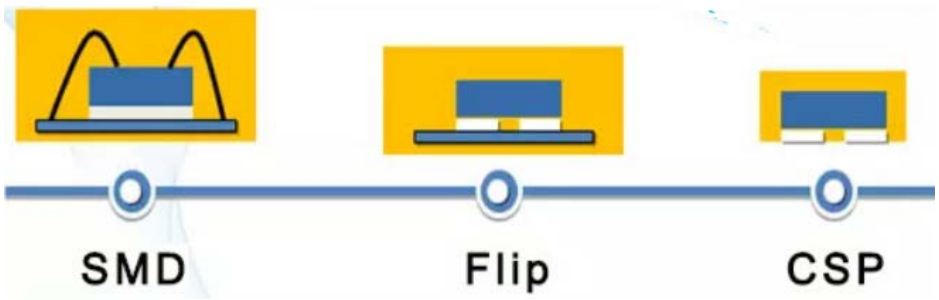
Level 2

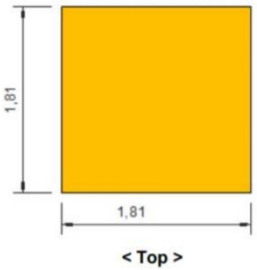
Led op flexibele drager (rol)

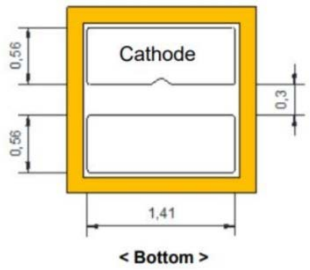


Led module/
PCB Assembly

Thermisch gedrag level 1

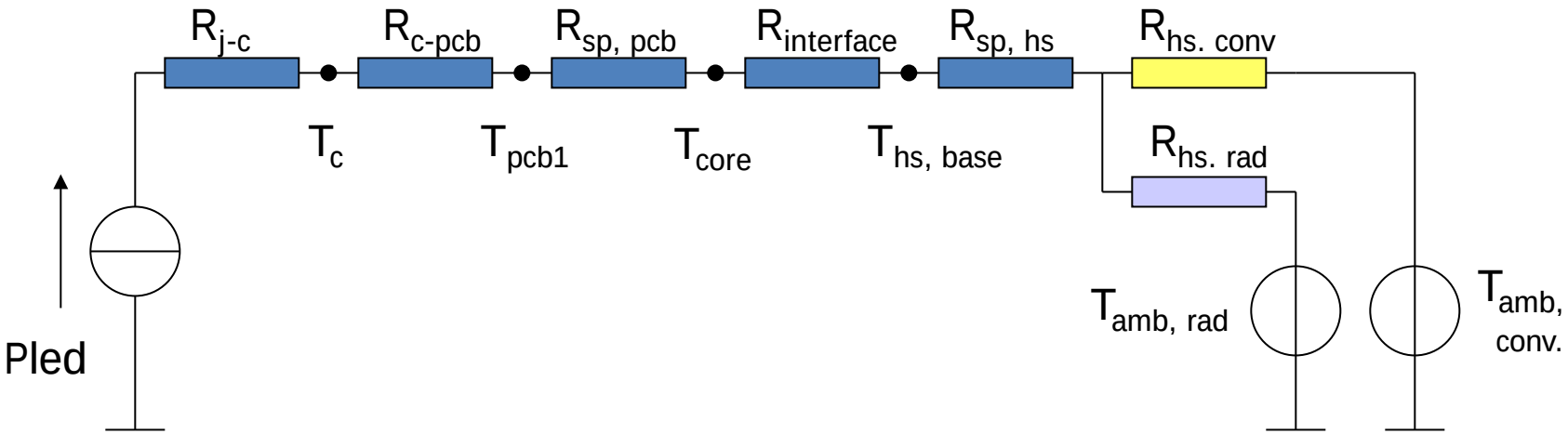






LED	Maximum Vermogen [W]	Soldeer Oppervlak [mm^2]	Warmte Flux [W/cm^2]
Cree XPG2	4	8,4	47,6
Cree XHP35	9	8,4	107,1
Vishay 0603 Chipled	0,06	0,9	6,7
Samsung 5630	0,6	7,4	8,1
SeoulSemi CSP	7	1,7	411,8
LED Engin LZP	80	22	363,6
Warmte van de zon :	800~1200 [W/m^2] = 0.08~0,12 [W/cm^2]		

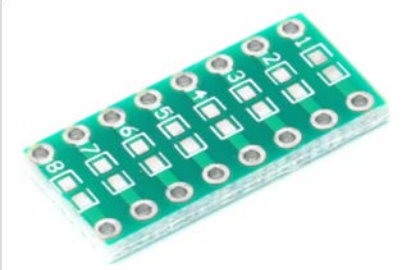
Thermische eigenschappen

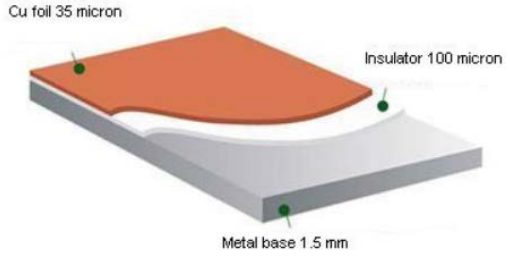


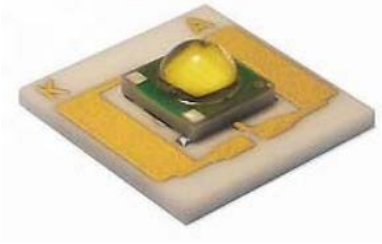
LED	Maximaal Vermogen [W]	Thermische weerstand Junction to solderpoint [K/W]	Warmte verlies Junction to solderpoint [K]	Thermische weerstand Junction to Air [K/W]	Warmte verlies Junction to air [K]
Cree XPG2	4	4	16,0		
Cree XHP35	9	1,8	16,2		
Vishay 0603 Chipled	0,06			550	33
Samsung 5630	0,6	16	9,6		
SeoulSemi CSP	7	4	28,0		
LED Engin LZP	80	0,5	40,0		

Substraat materialen

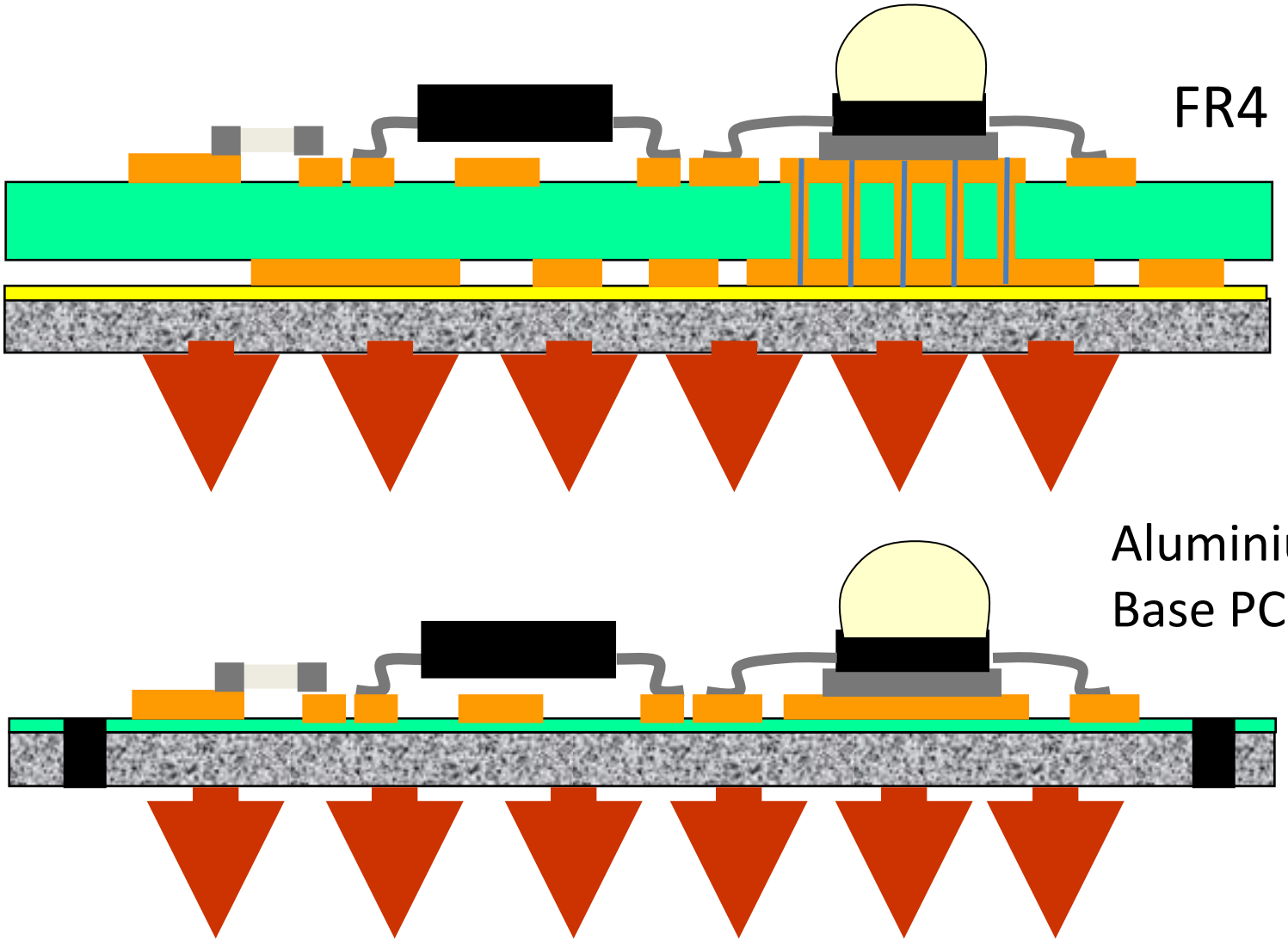
- FR4 (glas/epoxy), single of dual layer
- CEM (glas/papier/epoxy), meestal single layer
- Flex print materiaal
- Aluminium base met FR4 of thermisch geleidend laminaat
- Koper base thermisch geleidend laminaat
- Koper base pedestal design
- Keramiek AluminiumOxide
- Keramiek Aluminium Nitride



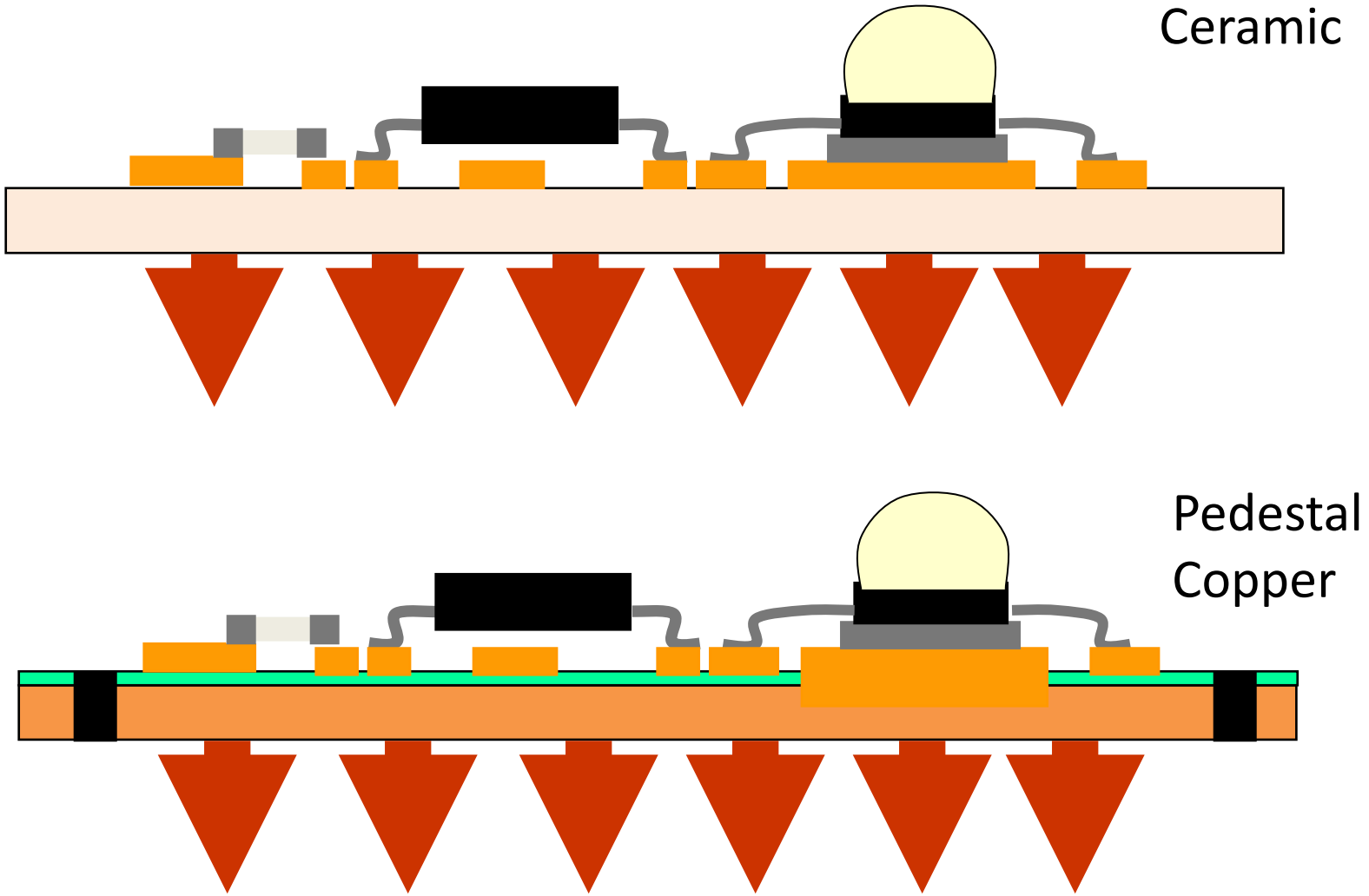




Substraat materialen

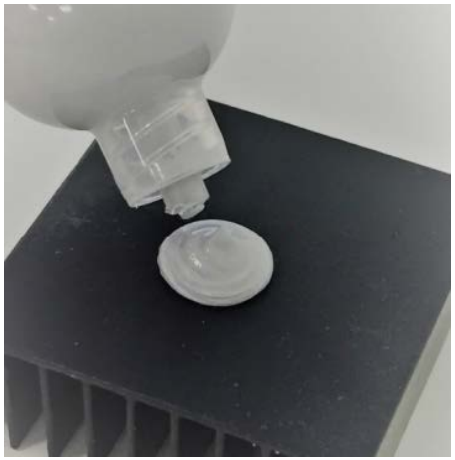


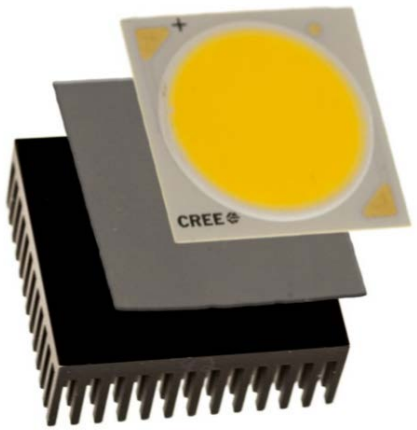
Substraat materialen



Thermal interface materialen

- Thermische pasta (grease)
- Phase change folie
- Thermische geleidende dubbelzijdige tape
- Dunne (silicone) gap filler
- Electrisch isolerende thermisch geleidende folie

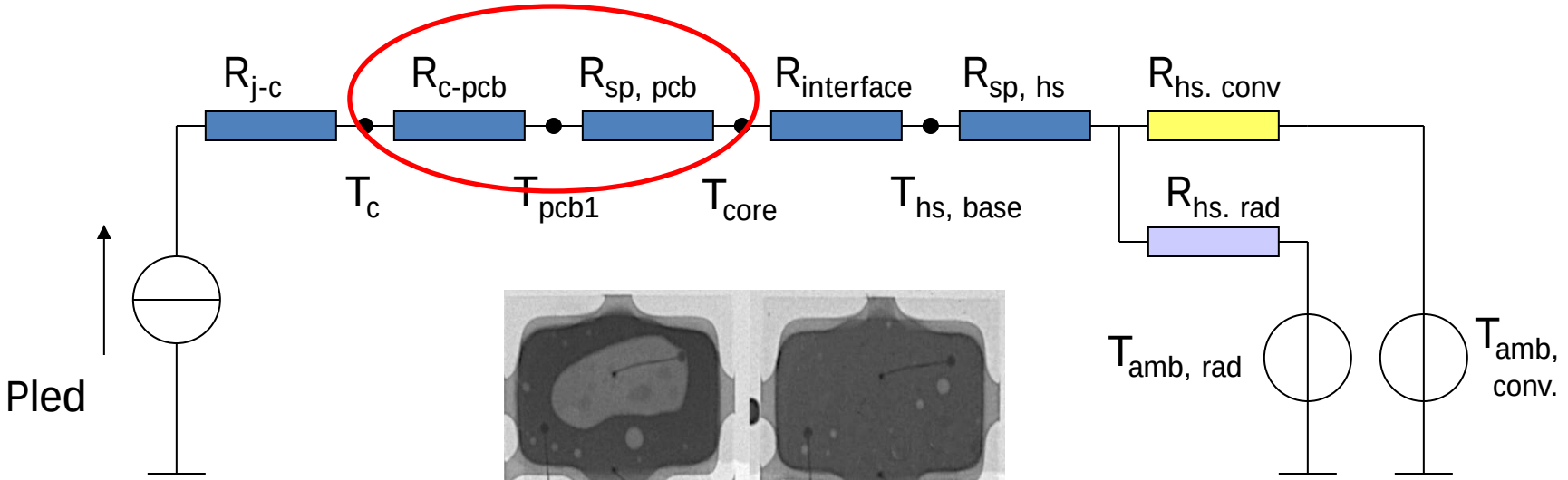




Led heatsinks

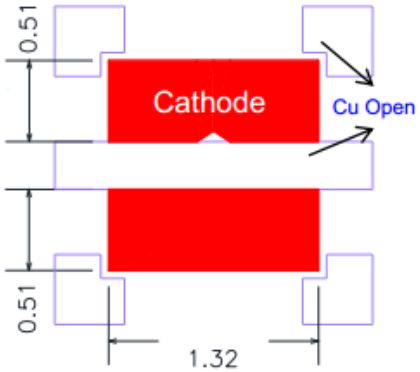
THAL TECHNOLOGIES

Optimalisatie thermisch level 1



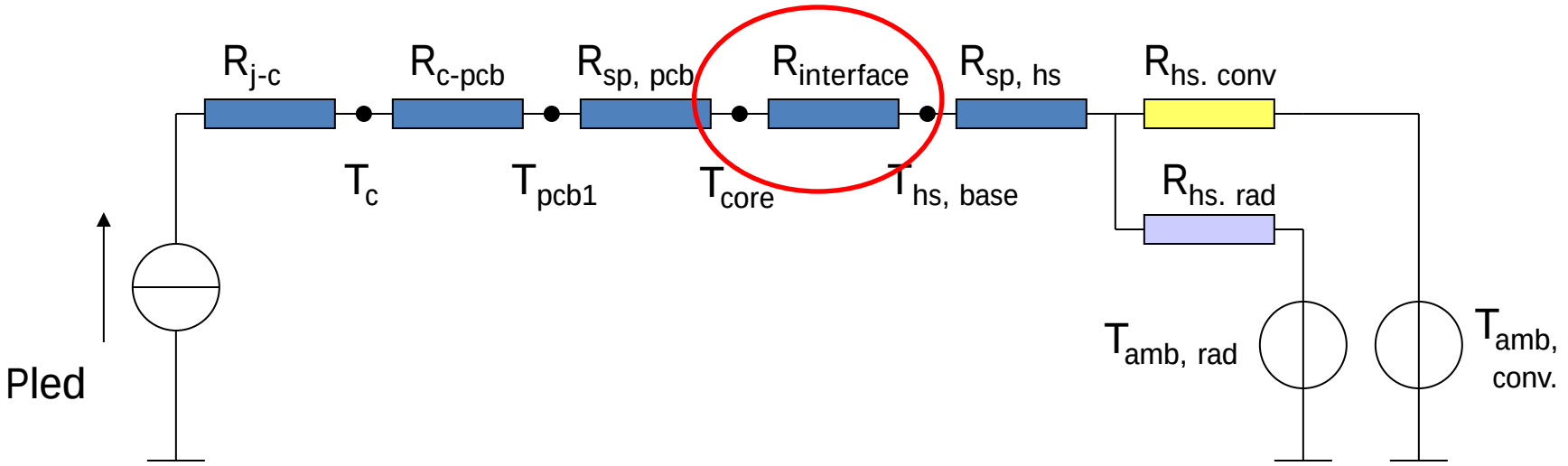
Led op PCB:

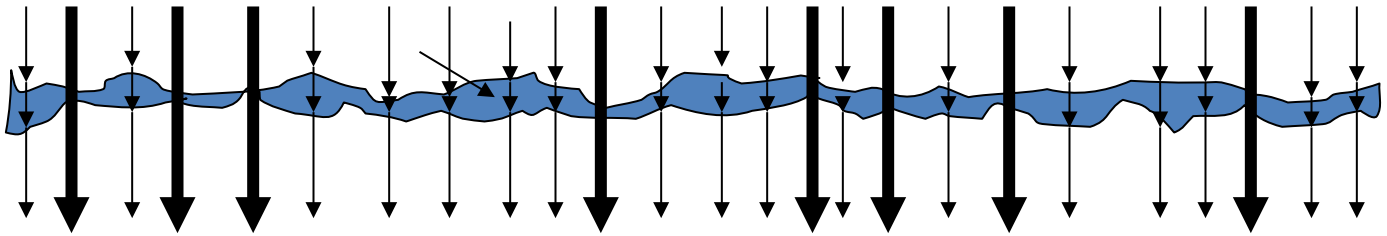
1. Juiste soldering, geen voids
2. Minimaliseer spreidingsweerstand door maximaal koper oppervlak
3. Hou aanbevolen footprint aan



< Recommended Solder Pattern >

Optimalisatie thermisch level 2





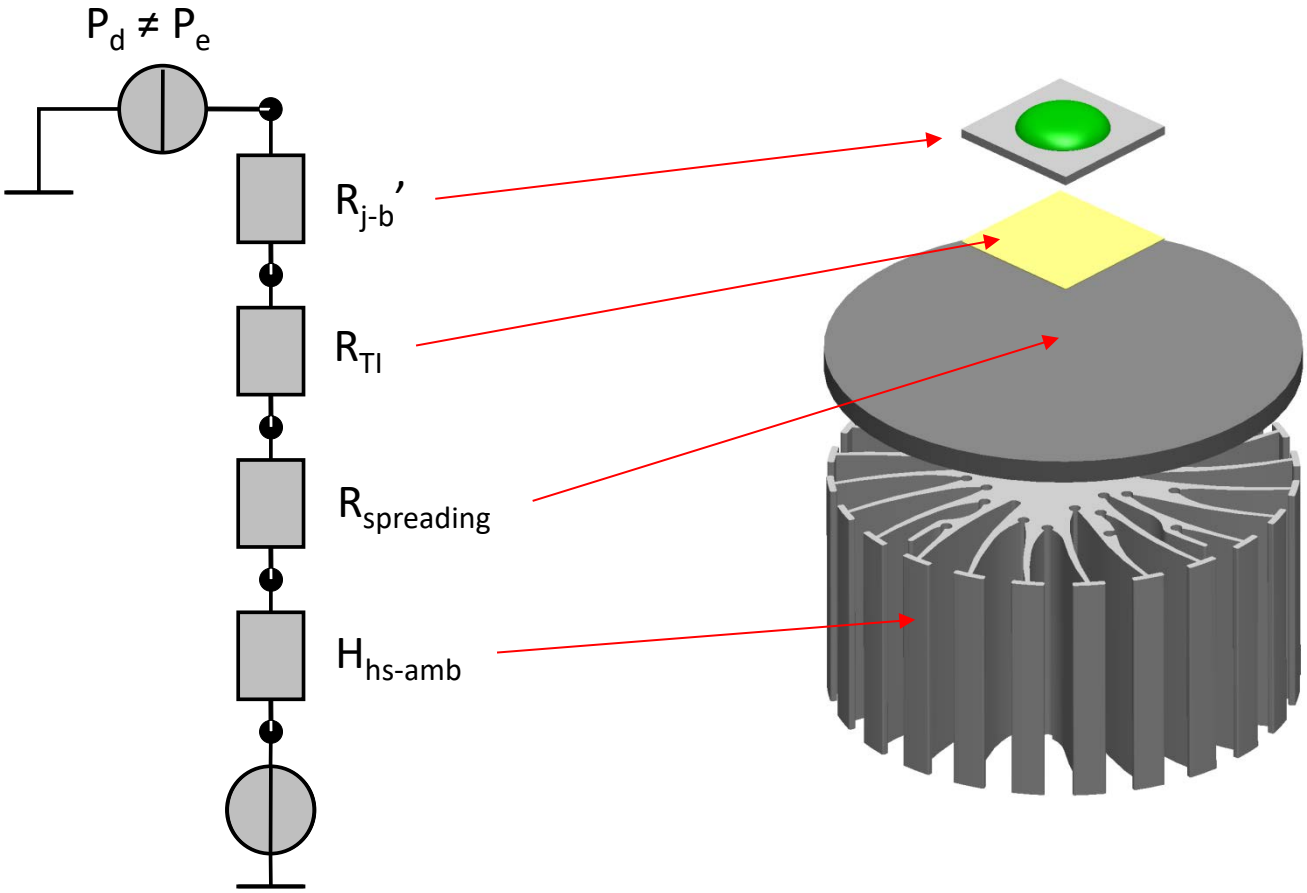
Voorkom lucht in thermische overgang

Optimalisatie heatink

Doel van heatsink is om de warmte energie van het materiaal zo efficient mogelijk over te dragen aan de lucht.

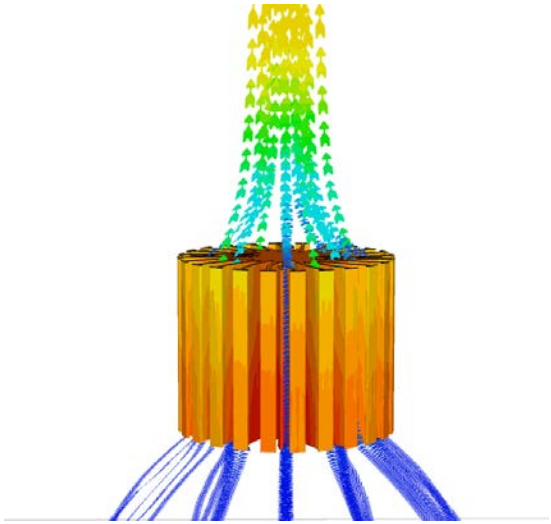
- Pakket van eisen vaststellen
- geleiding
- Convectie
- Straling
- Fin efficiency
- heatpipes

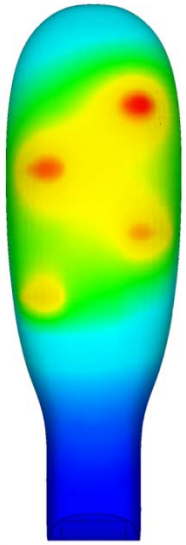
Berekenen, Simuleren, meten

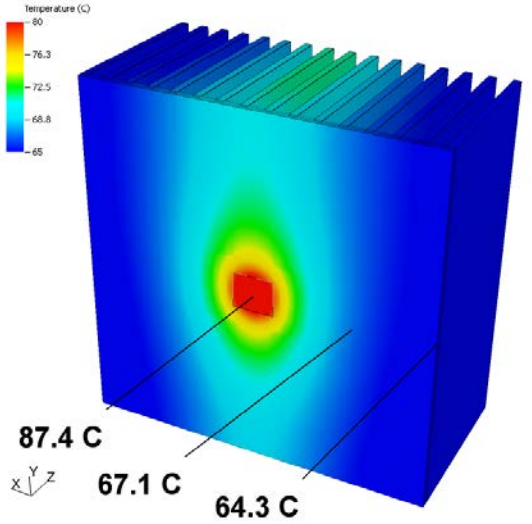


Berekenen, Simuleren, meten

Computational Fluid Dynamics (CFD)

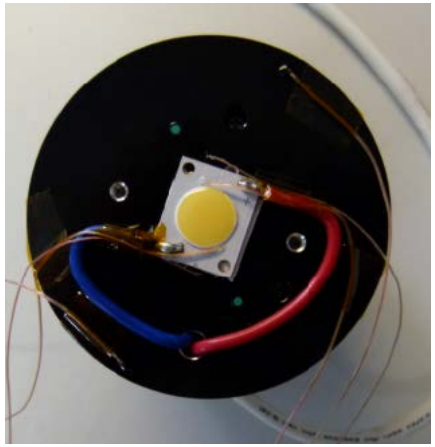


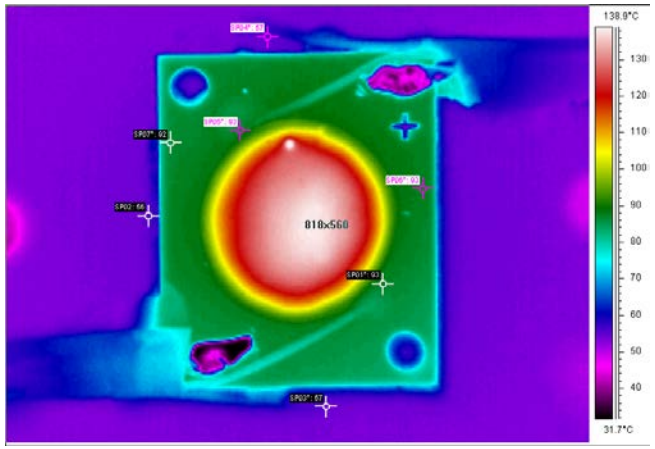




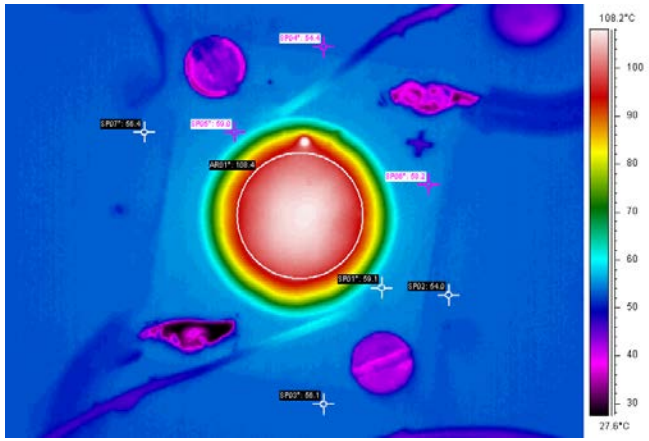
Berekenen, Simuleren, meten

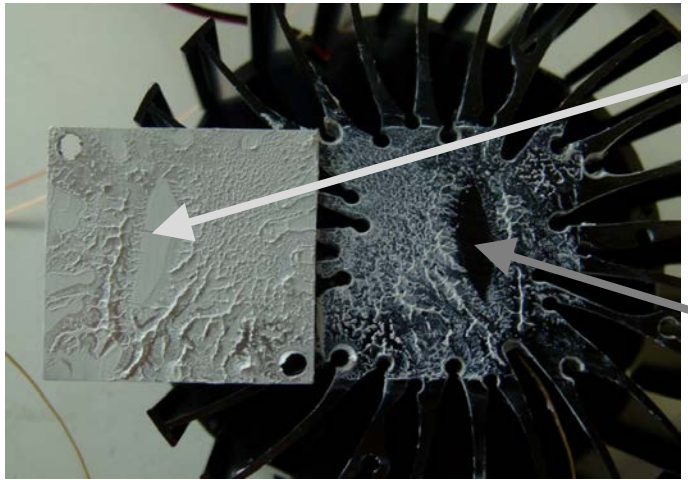
Slechte thermal interface





Correcte thermal interface



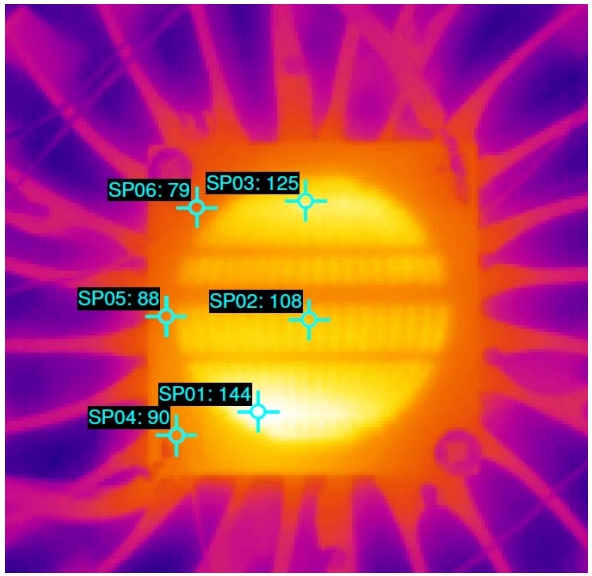


Corresponderend ‘ongebruikt’ vlak

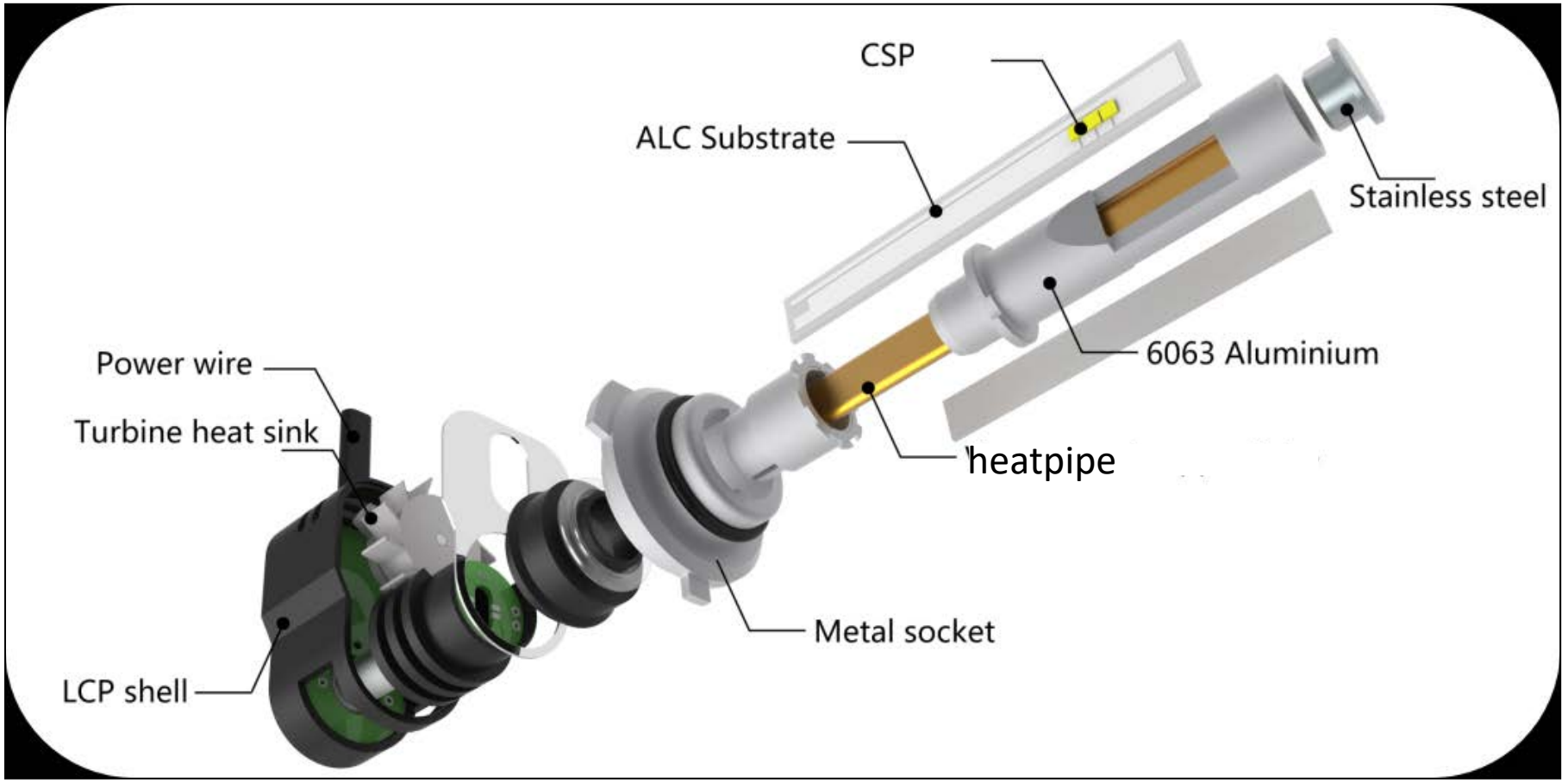
Geen thermal grease
Resulteert in **hotspot** in COB

144°C

28°C



Voorbeeld koeling H7 koplamp



Vragen?