

# Thermal Design Guidelines for LUXEON Rubix

AB-309B

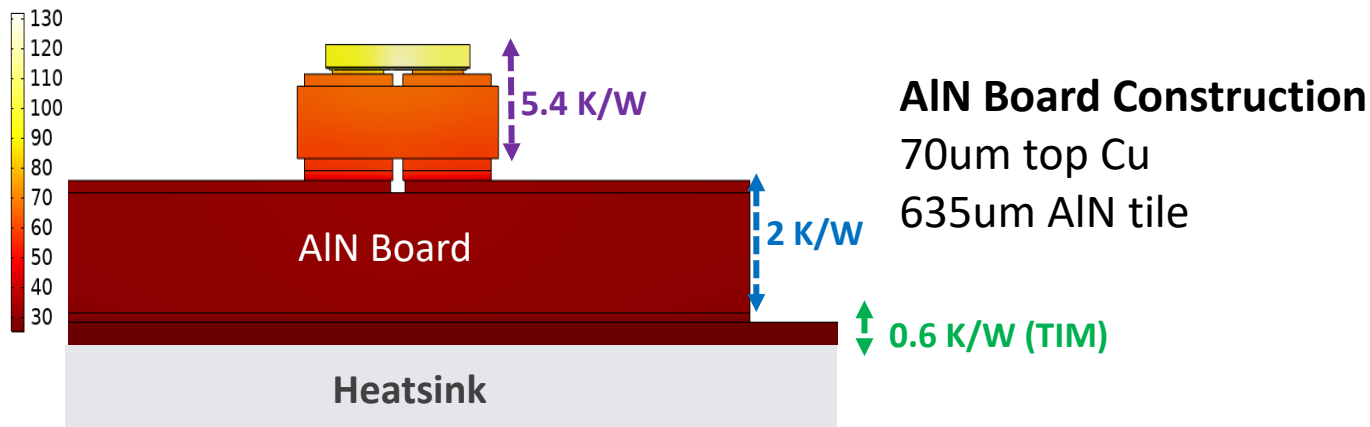
## Introduction

- This slide deck provides guidance on thermal design when using LUXEON Rubix
- We will examine heat dissipation for current operation between 1.5A to 3A when the LED is placed onto an AlN board or an aluminium MCPCB
- Comparisons will be made for temperature increases for the different color LEDs, but at the same drive current

# Thermals for LUXEON Rubix at 3A

Recommend AlN board for adequate heat dissipation

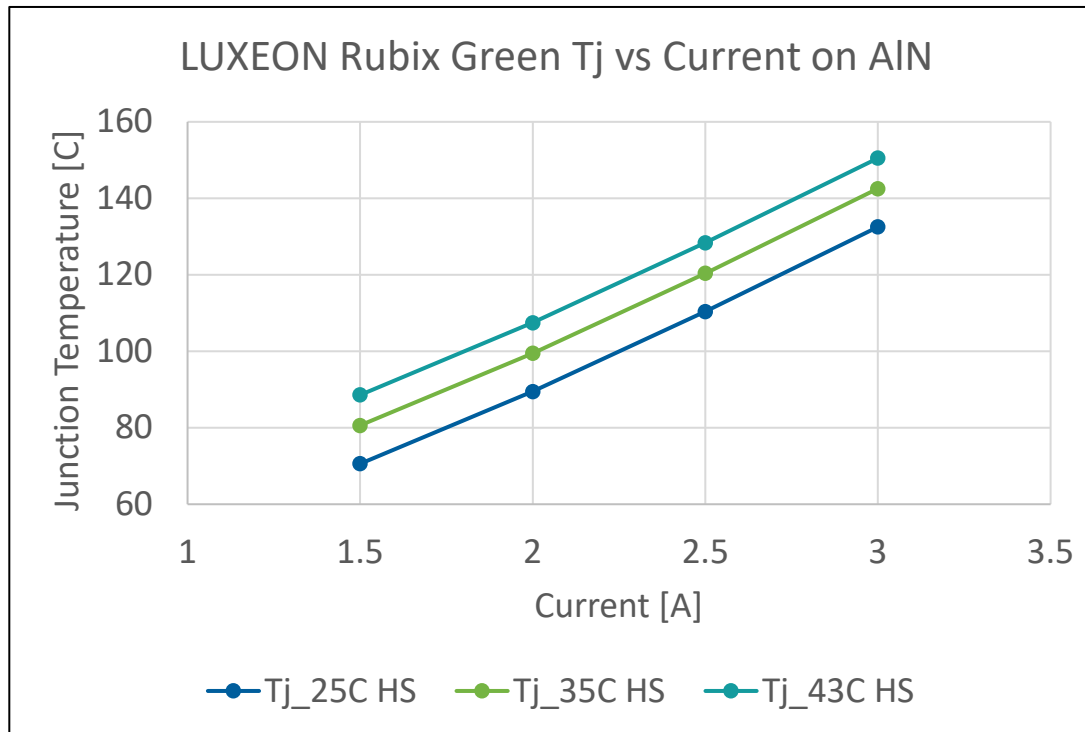
- At a drive current of 3A, LUXEON Rubix may dissipate more than 12W of power
- This requires the use of low thermal resistance boards and thermal paste to ensure adequate heat dissipation
- The following example illustrates the temperature rise as a function of current when using an AlN board along with a very highly thermally conductive TIM, such as, <https://www.dow.com/en-us/pdp.dowsil-da-6534-adhesive.04045124z.html>
- The thermal stack up is using the green LUXEON Rubix LED, an AlN board at 2K/W, and a 50μm TIM at 0.6K/W



# LUXEON Rubix Green

## Junction Temperature vs Drive Current

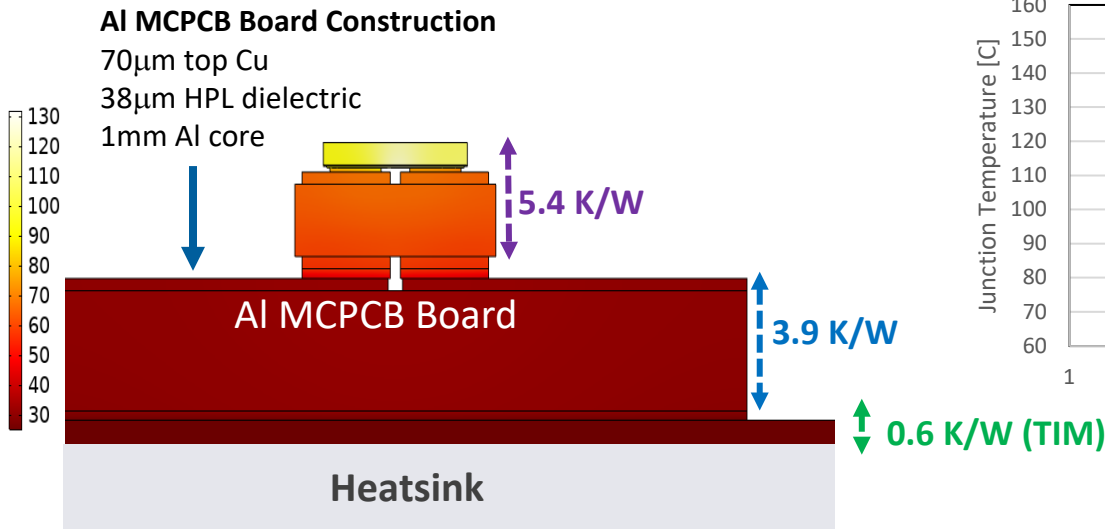
- Using construction described on the previous page, the LUXEON Rubix Green LED will reach maximum  $T_j$  (150degC) when the heatsink temperature is at 43degC
- The heatsink temperature may increase as current drops. For example, at the binning current of 1.5A, the heatsink may be maintained at 100degC for  $T_j < 150$ degC



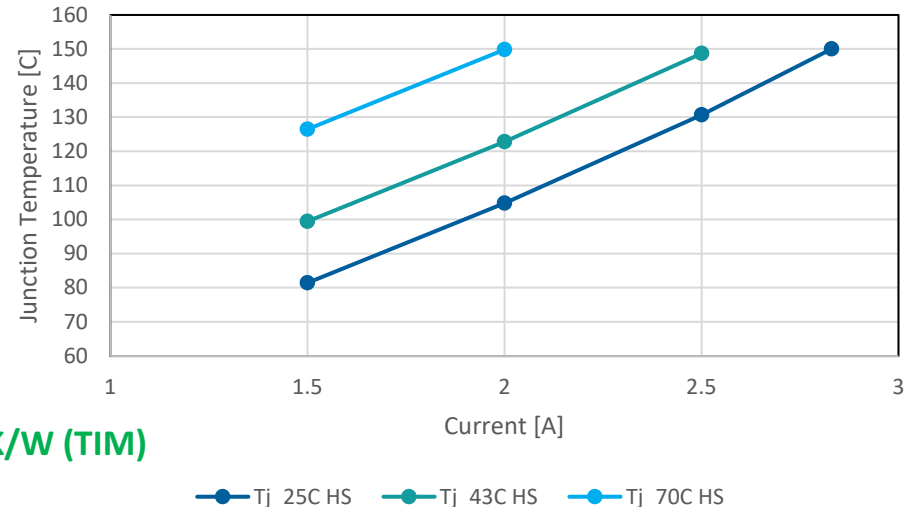
# Thermals for LUXEON Rubix <2.5A

## MCPCB boards for adequate heat dissipation

- Many applications require a current in the 1.5A to 2.5A range
- At these driving conditions ~6-10W of power are being dissipated
- These reduced power levels allow for the use of Al MCPCB with a  $R_{th}$  of 3.9K/W. In addition, the heatsink temperature can be allowed to increase
- For example, at 2A, Al MCPCB can be utilized with a heatsink temperature up to 70degC for LUXEON Rubix green LEDs



LUXEON Rubix Green  $T_j$  vs Current on Al MCPCB



# Comparison of Temperature Rise for LUXEON Rubix LEDs

Calculations done at 3A drive current

- The green LED has the highest thermal resistance and voltage. Therefore, it has the highest temperature rise and the previous simulations show the worse case thermals
- The other LEDs will operate at least 30degC cooler than the green LED at the maximum drive conditions
- For example, the white LED will run 39degC cooler compared to the green

LED	Rth_j-c [K/W]	Power at 3A [W]	Temperature rise [K]
Green	5.4	13.4	72.6
Blue	4.5	8.6	38.5
Royal Blue	4.1	10.4	42.4
Red @2.2	3.7	5.5	20.5
White	3.2	10.6	33.8



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