$$q = -KA\Delta T = -KL\frac{dT}{dx}$$

($5V \times 0.8A$)

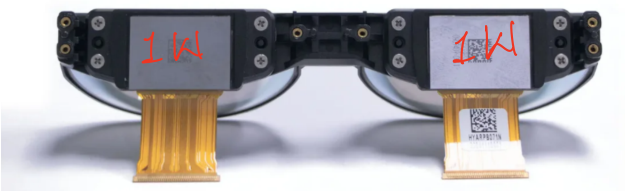
Of the 4W provided, precisely 2W is lost as heat

$$2W = -KA\Delta T$$

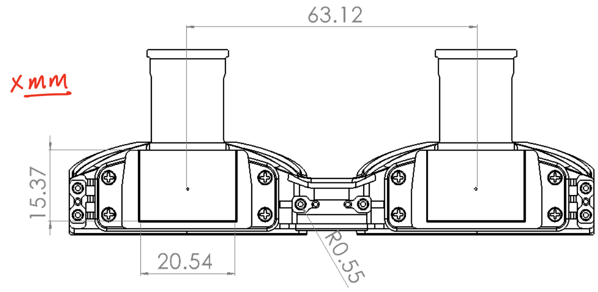
$K_a = 237$ W/mK

$K_c = 400$ W/mK

approx. 1W per surface



A is the cross-sectional area of the surface

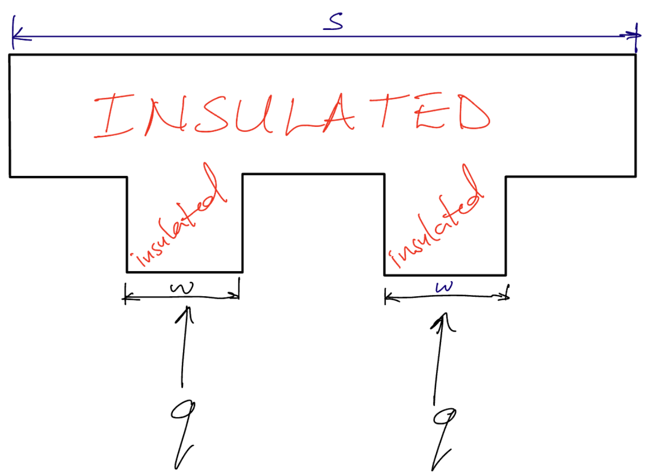


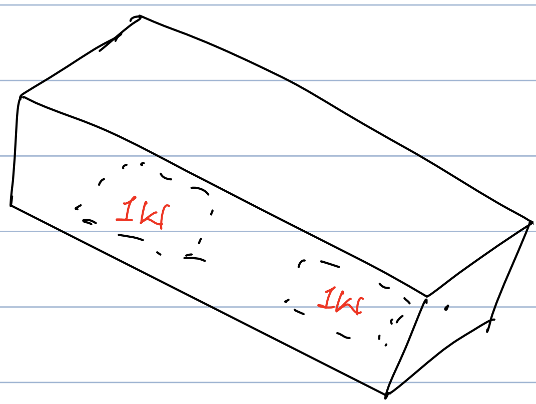
The optical module has a max operating temperature of 70°C

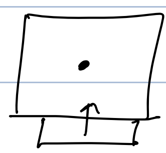
$T_h = 70°C$ $q = q''A$

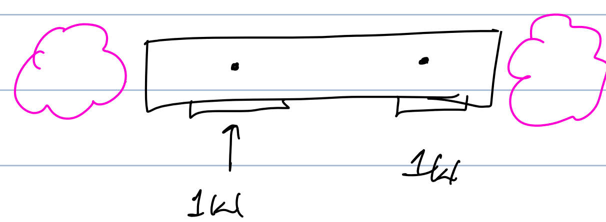
$$q'' = -K\frac{dT}{dx} = -K\frac{\Delta T}{\Delta x}$$

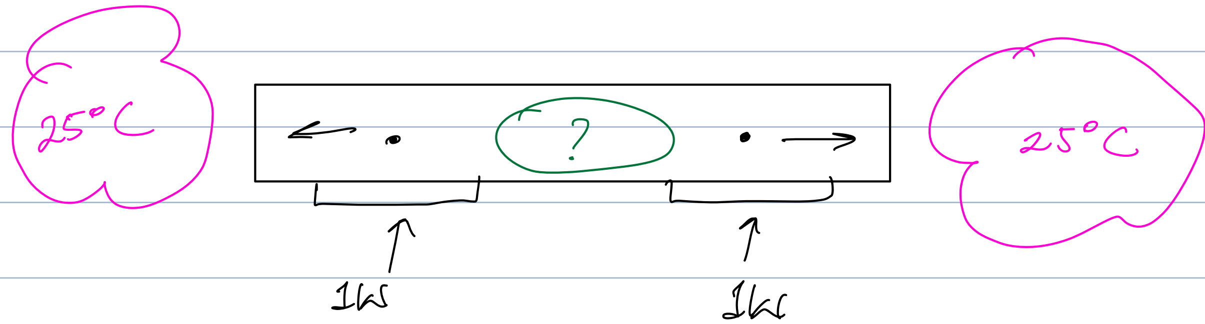
$$q'' = -K\frac{(T_c - T_h)}{L}$$











$q = hA\Delta T$ = 1W? for one side only?

~~Analyse as 2D heat transfer?~~ no

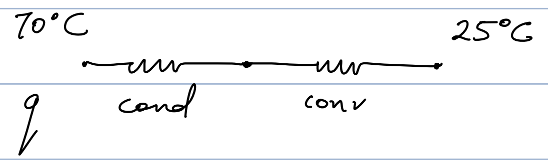
driver board straight up instead of folded over?
Just find max space and use that. Active cooling not an option

enclosure design

$1 = hA(T_s - T_\infty)$

→ from conduction? back to 2D?

Another approach



$q = \frac{\Delta T}{R_{tot}}$ $\qquad R_{tot} \le \frac{\Delta T}{q}$

up

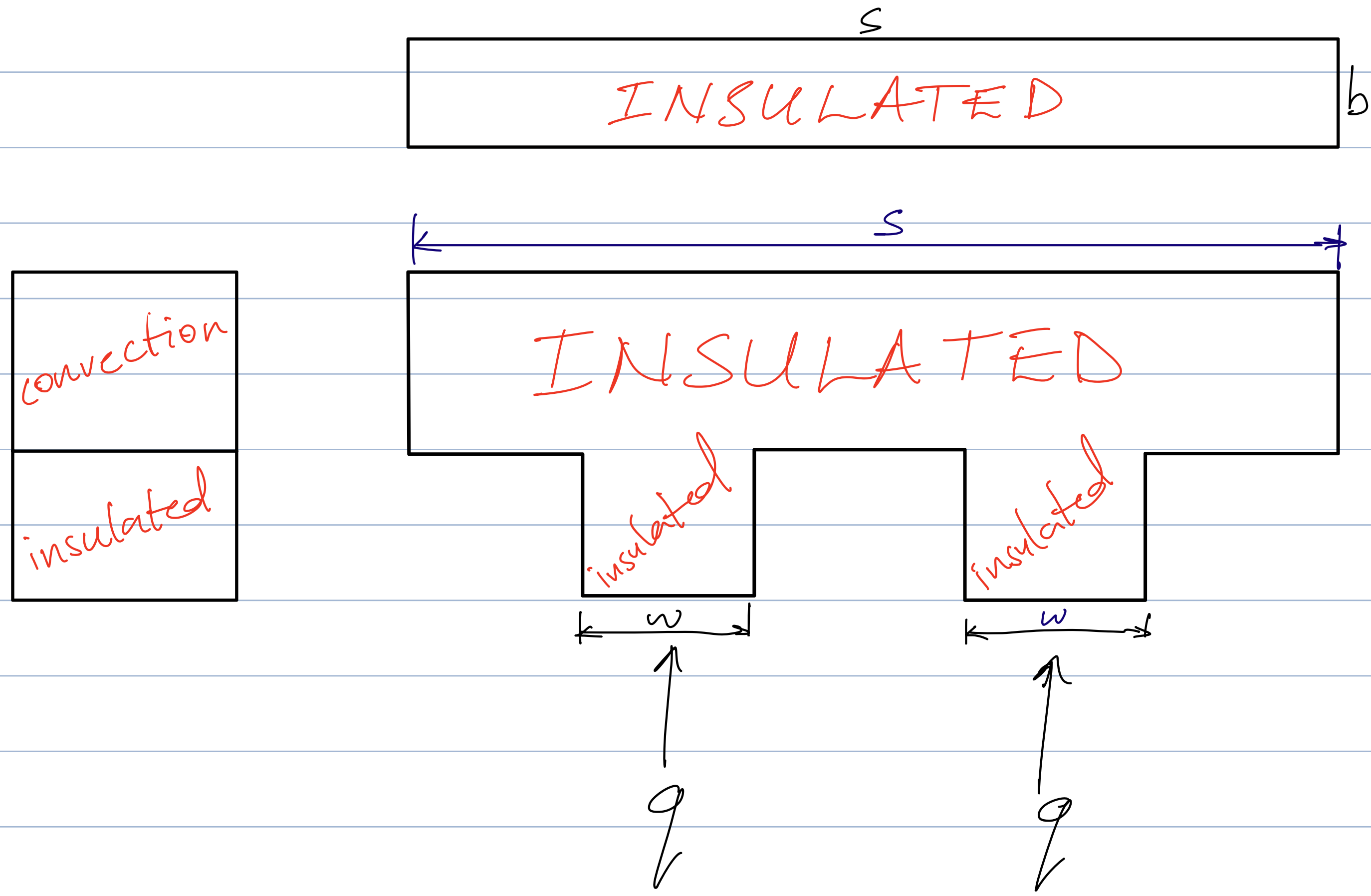
$\frac{L}{KA} + \frac{1}{hA} \le \frac{\Delta T}{q}$ → $70 - 25$, q → 1W

KA: alum on OM

hA: of conv face

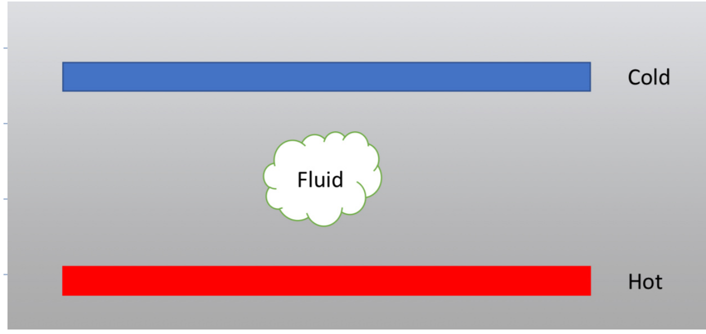
if this holds (use A_{conv}) then

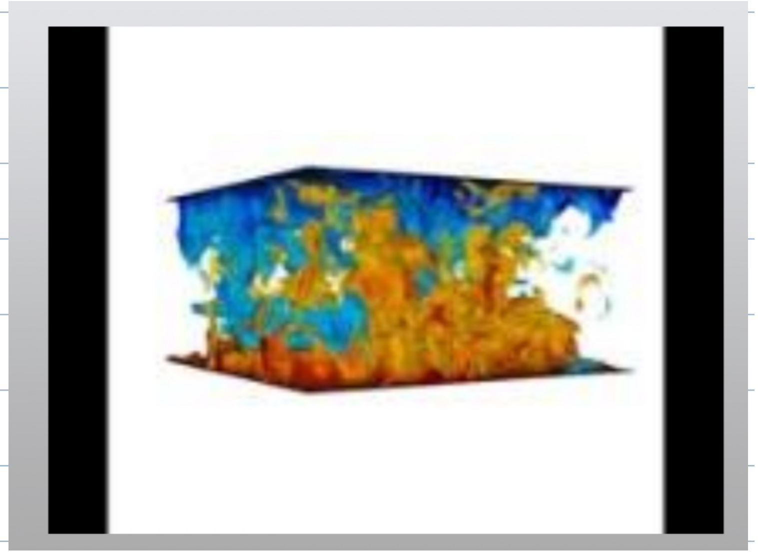
- get L should be known from design, use A_{conv} you got, simulate.



Design not viable.

Material Removal





Empirical correlations

Upper Surface of Hot Plate or Lower Surface of Cold Plate [19]:

$$\overline{Nu}_L = 0.54\, Ra_L^{1/4} \qquad (10^4 \lesssim Ra_L \lesssim 10^7,\ Pr \gtrsim 0.7) \tag{9.30}$$

$$\overline{Nu}_L = 0.15\, Ra_L^{1/3} \qquad (10^7 \lesssim Ra_L \lesssim 10^{11},\ \text{all } Pr) \tag{9.31}$$

Lower Surface of Hot Plate or Upper Surface of Cold Plate [20]:

$$\overline{Nu}_L = 0.52\, Ra_L^{1/5} \qquad (10^4 \lesssim Ra_L \lesssim 10^9,\ Pr \gtrsim 0.7) \tag{9.32}$$

$$q = hA\Delta T$$