



A few notes regarding power consumption:  
 With a cold heat plate, the current consumption is probably too high for the DC plug and the power supply, which are both rated at 5A. To reduce the current consumption, a PWM signal MUST be applied to the MOSFET gate during the warmup phase. The PWM frequency must be at least 50 kHz for the filter capacitors to work properly.  
 To calculate the allowed duty cycle, the user must enter the calculated or measured heat trace resistance before first use. With this information, the MCU can calculate the maximum current at 100% PWM, and then calculate the allowed duty cycle:

$$I_{cold} = V_{in} / R_{cold}$$

$$PWM_{max} = 4.75A / I_{cold} \text{ (0.25A as margin)}$$

As the temperature rises, the duty cycle can be set higher.  
 The resistance multiplies by approximately 1.63 from 20°C to 180°C.

With the calculated heat plate resistance, the results are:

$$R_{cold} = 1.56 \text{ Ohms}$$

$$V_{in} = 12V$$

$$I_{cold} = 7.7A$$

$$PWM_{max} = 61.7\%$$

The resistance of the hot heat plate is 2.54 Ohms, so the current flowing through a hot heat plate is 4.72 A, which is not overloading the PSU or DC plug. This means that even leaving the hot heat plate at 100% power will not destroy the PSU. Setting a cold heat plate to 100% power will most likely blow the resettable fuse, and if not, the current consumption will get to an acceptable level as the heat plate heats up.

Behind this link you can simulate the power draw: <https://tinyurl.com/ycre2dxa>

As always, some margin should be added to all calculations, do not run this device at full power all the time if it is available.

**WARNING: THIS DESIGN HAS NOT BEEN TESTED!**



Sheet: /  
 File: Heatplate\_v0.9.kicad\_sch

**Title: reflow solder plate (development version)**

Size: A4 Date: 2022-03-18

KiCad E.D.A. kicad (6.0.2)

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