

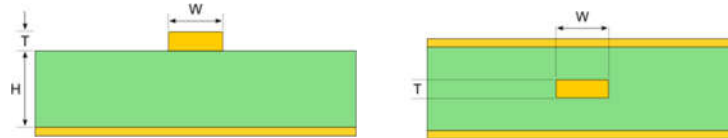


HACETTEPE UNIVERSITY
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
ELE338 MICROPROCESSOR ARCHITECTURE and PROGRAMMING LAB.

Project Name: PCB Trace Width Calculator

Project Explanation:

Calculation the width of a copper printed circuit board conductor or "trace" required to carry a given current while keeping the resulting increase in trace temperature below a specified limit. There are two calculations of width of trace with respect to be internal layers or external layers. Widths are significantly higher for traces on internal layers of a circuit board compared to those on a board's outer surface.



Project Requirements:

1. You can use equations given below for calculations.
2. For exponential operations, you can calculate an approximate value with the Taylor series. For example, you can use $1 + 1.3(x - 1)$ for $x^{1.3}$.
3. There should be realized two calculations for each internal or external layers.
 - a. One is to compute minimum trace width value according to the given current.
 - b. Another is to compute the maximum current value that trace can carry according to given trace width value
4. Therefore, there should be a menu to select which calculation will be done. Calculation options as follows:
 - a. Maximum current calculation from trace width in internal layer
 - b. Maximum current calculation from trace width in external layer
 - c. Minimum trace width calculation from current in internal layer
 - d. Minimum trace width calculation from current in external layer
5. With respect to calculations, the results should be plot on the screen like the figures above. Results should be printed on the screen in a clear and understandable way.
6. According to the calculation type, the required values should be inputted by the user, and the which units are wanted should be expressed.
7. Program should be able to terminate with the ESC key on the keyboard at any time and return to the operating system successfully.
8. The application should not get stuck in any infinite loops.

Equations:

$$Area = \left(\frac{Current}{k * Temp_Rise^b} \right)^{\frac{1}{c}} \quad Width = \frac{Area}{Thickness * 1.378}$$

for internal layers: $k = 0.024$, $b = 0.44$, $c = 0.725$

for external layers: $k = 0.048$, $b = 0.44$, $c = 0.7$

Area	mils ²
Current	amps
Temp_Rise	deg C
Width	mils
Thickness	oz

Common values:
Thickness: 1 oz
Ambient: 25 C
Temp rise: 10 C

Project Inputs and Outputs:

	Inputs	Outputs
Calculation 1	Trace width	Maximum current
Calculation 2	Current	Minimum trace width

Project Grading:

- Input and output interfaces: %20
- Results of the trace width calculations: %30
- Results of current calculations: %30
- Accuracy of general template and intelligibility of the codes: %20