

Wire standards in the project

In phase 3 we considered some parameters to select the width of the wire:

- The current which will pass through the track.
The current carrying rating is determined by the conductor size and the thermal heating of the track. The track spacing, application and insulation materials are relevant to the dissipation of this heat.
- Voltage regulation.
Voltage regulation is not usually a problem with well-designed electrical power systems, but the voltage drop incurred with excessively long cable runs needs to be accounted for.
- Short circuit rating.
Short circuit ratings are based on the maximum current withstand capability of the track in a short circuit condition. The track should be capable of withstanding this current without thermal damage.

Doing calculations, we found that the maximum current passing through the circuit $I = \frac{V_{max}}{R_{total}} = \frac{12}{8000} = 1.5 \text{ mA}$. Knowing that the thickness of the FR4-Single Layer is $18\mu\text{m}$, we managed to calculate the thickness of our track using this equation:

First, the Area is calculated:

$$Area = \frac{Current}{\left(k * (Temp_{Rise}^b)\right)^{\frac{1}{c}}}$$

Then, the Width is calculated:

$$Width = Area / (Thickness[oz] * 1.378[mils/oz])$$

For IPC-2221 internal layers: $k = 0.024$, $b = 0.44$, $c = 0.725$

For IPC-2221 external layers: $k = 0.048$, $b = 0.44$, $c = 0.725$

where k , b , and c are constants resulting from curve fitting to the IPC-2221 curves

the track's thickness of low pass filter was equal to 0.000193mm and was to 0.0000390mm for the band pass one. We didn't manage to use that width due to the manual method that we used to print our circuit. The probability of errors was very high, so our track thickness in our circuit was 1.75 mm and the distance between tracks was 1.5 mm .