

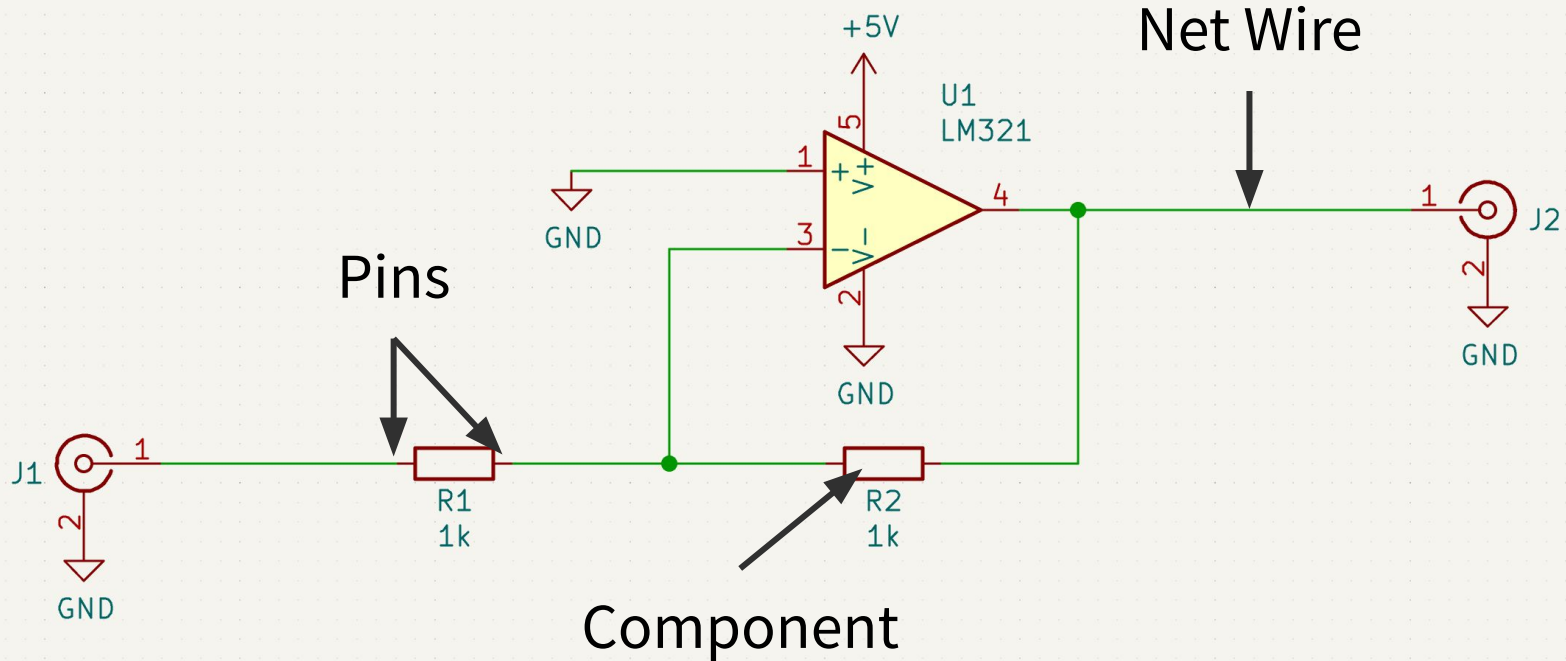
Real-time Netlisting in KiCad

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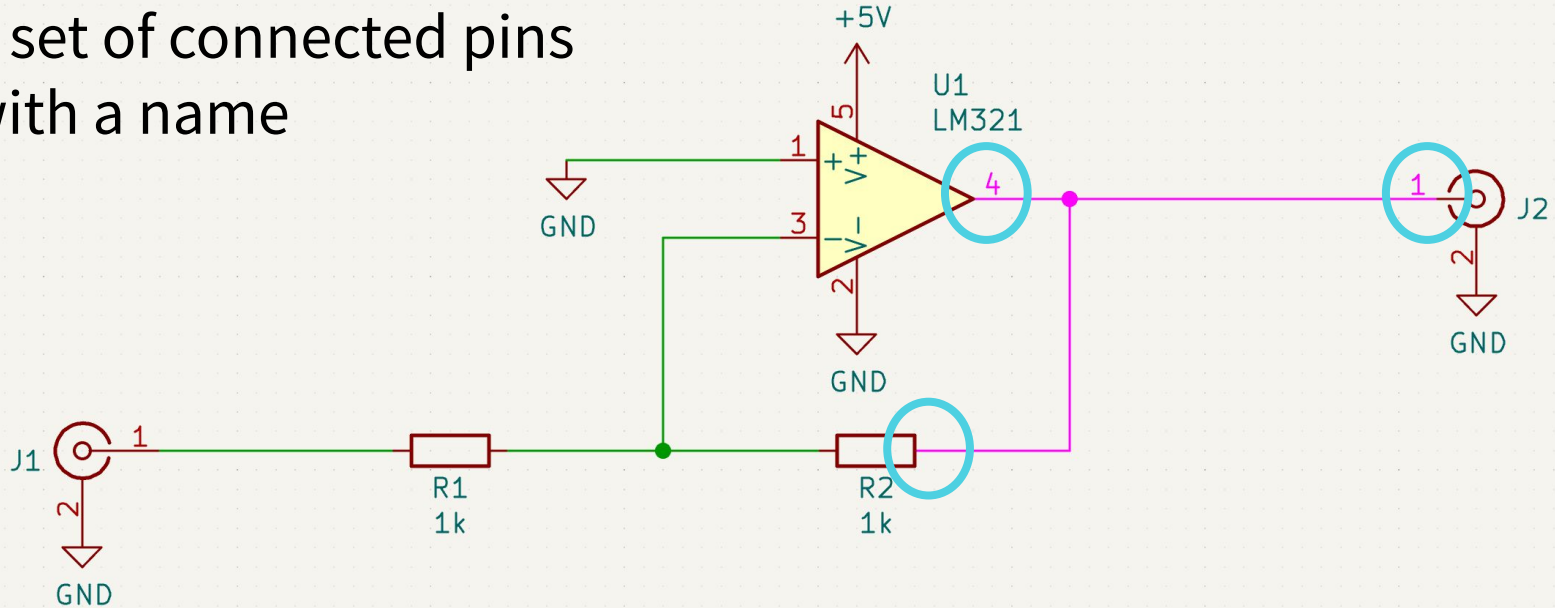
Crash Course in Schematic Jargon



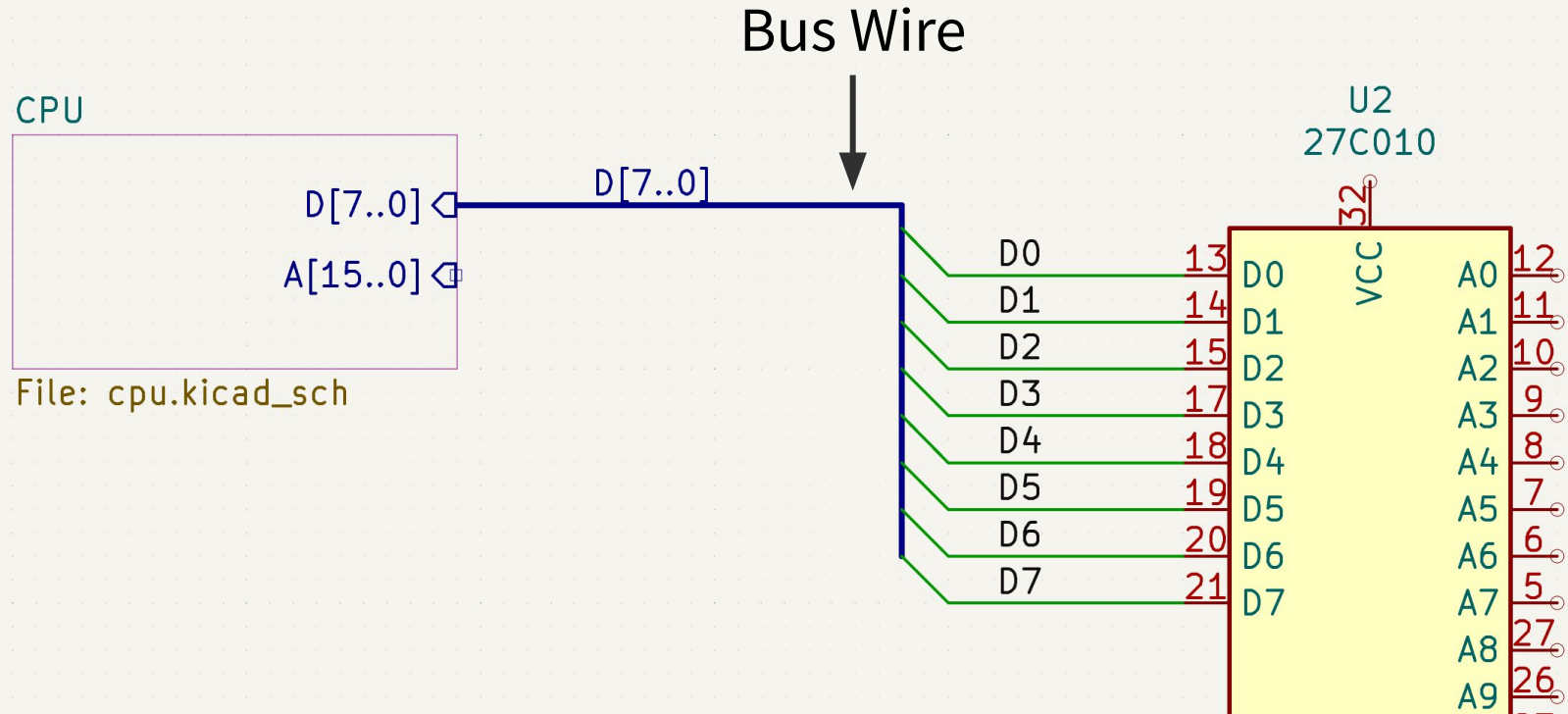
Crash Course in Schematic Jargon

Net:

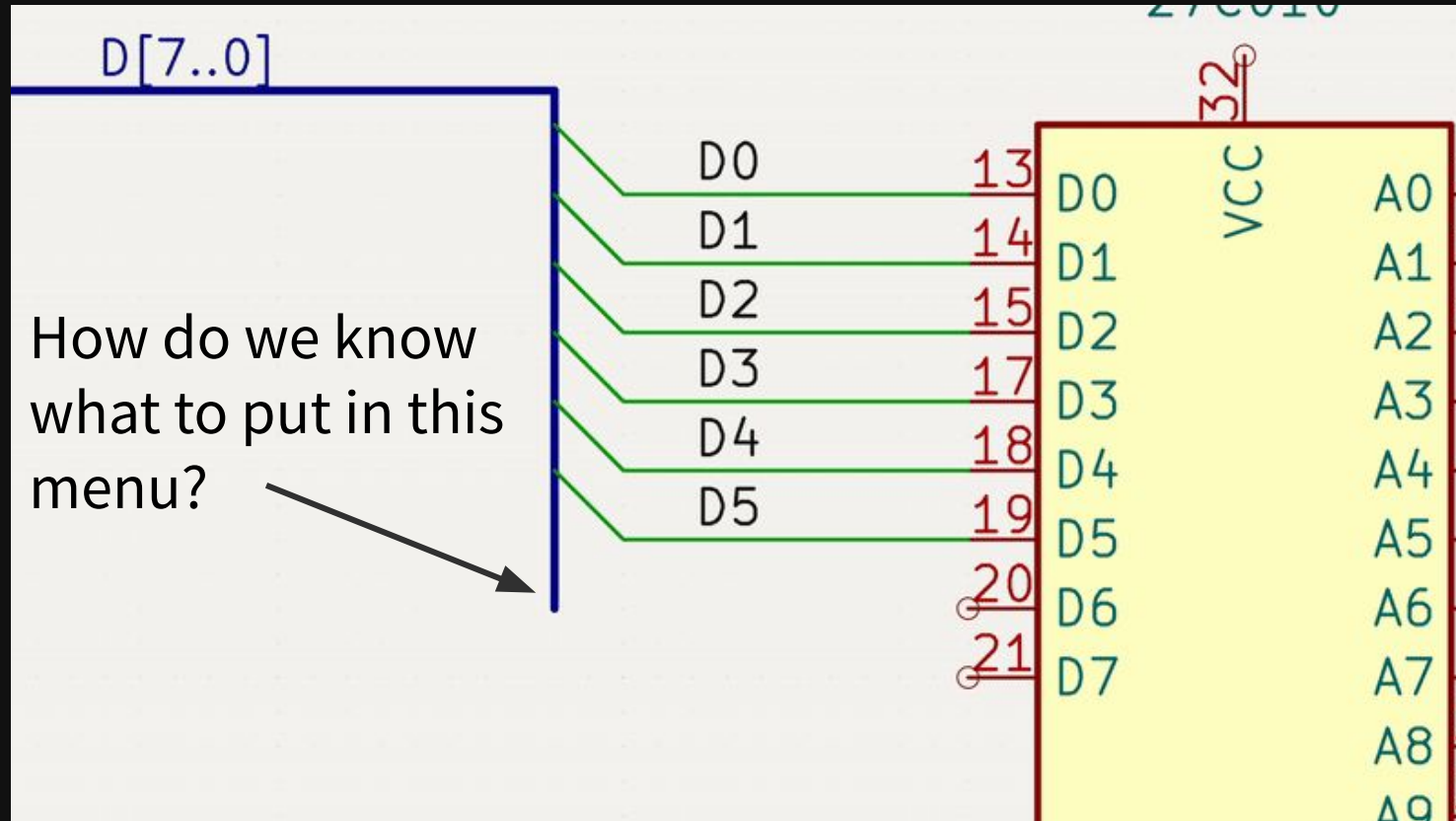
A set of connected pins
with a name



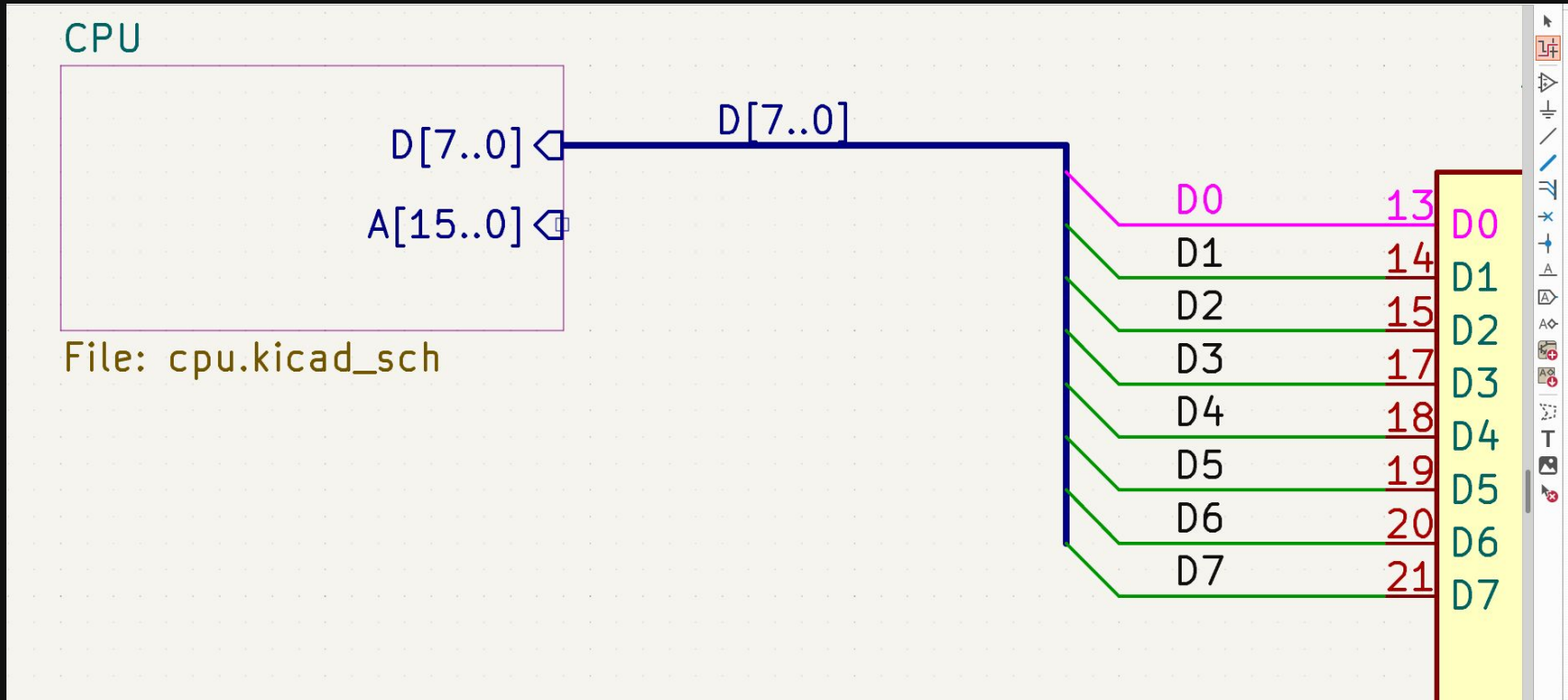
Backstory: Bus Upgrades



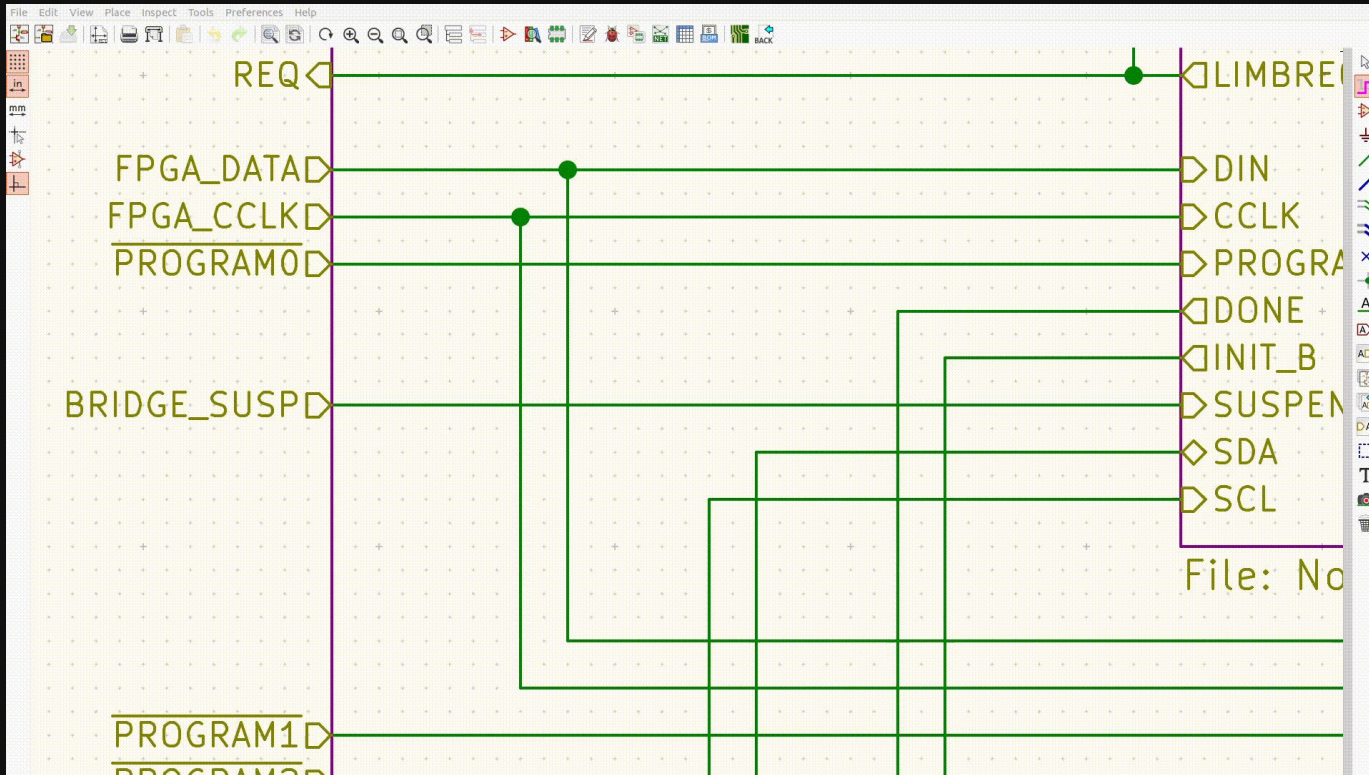
Bus Unfolding



But the Highlight tool already exists...?



This doesn't scale well...





Fast

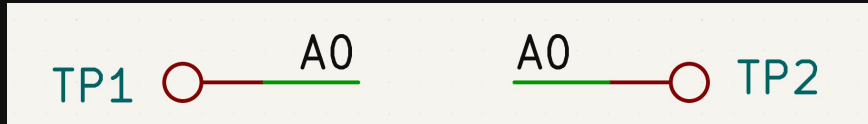
~~Real-time~~ Netlisting in KiCad

Connectivity Algorithm at a High Level

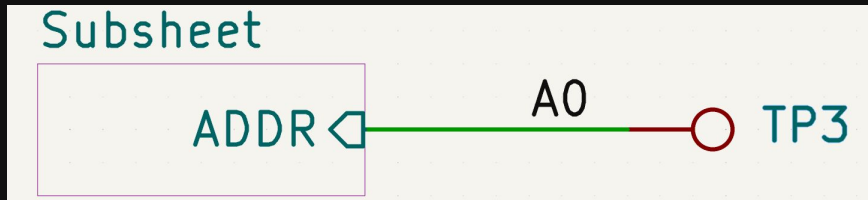
1. What is graphically connected?



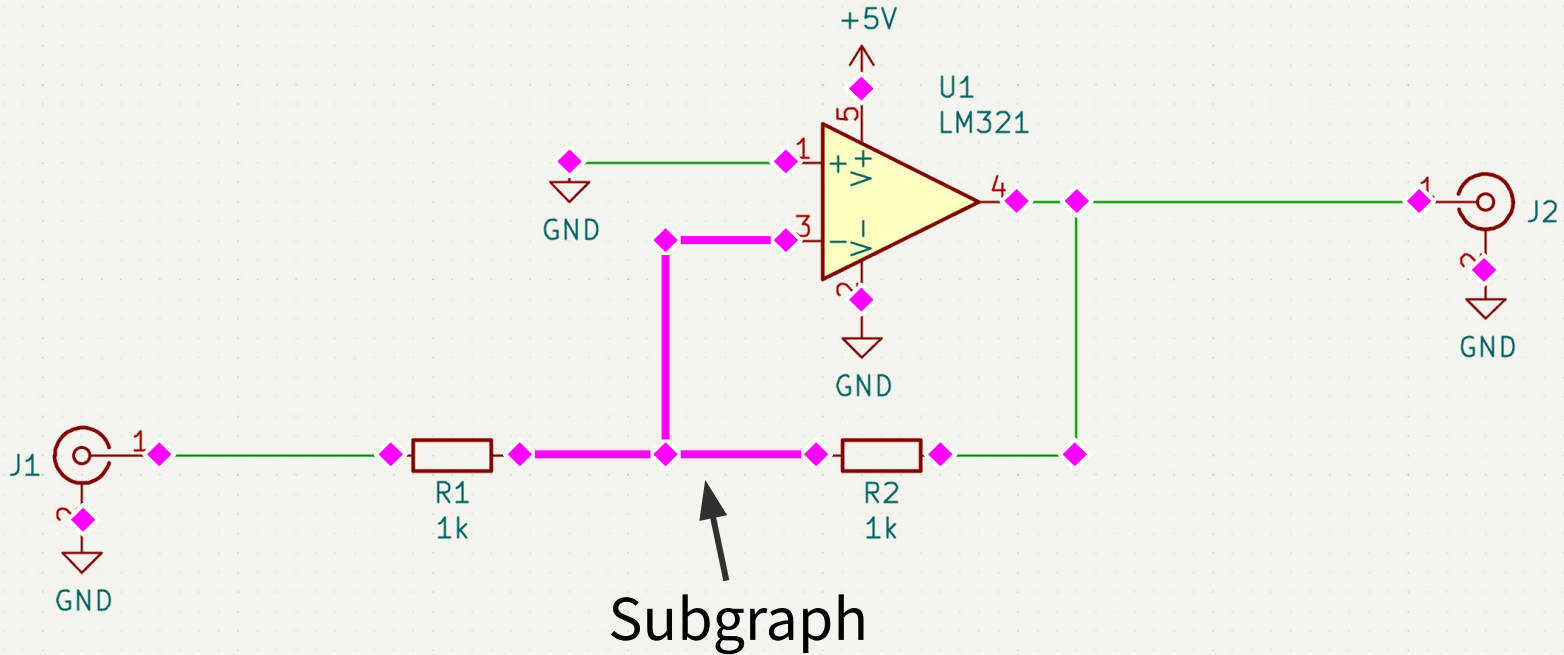
2. What is connected by labels?



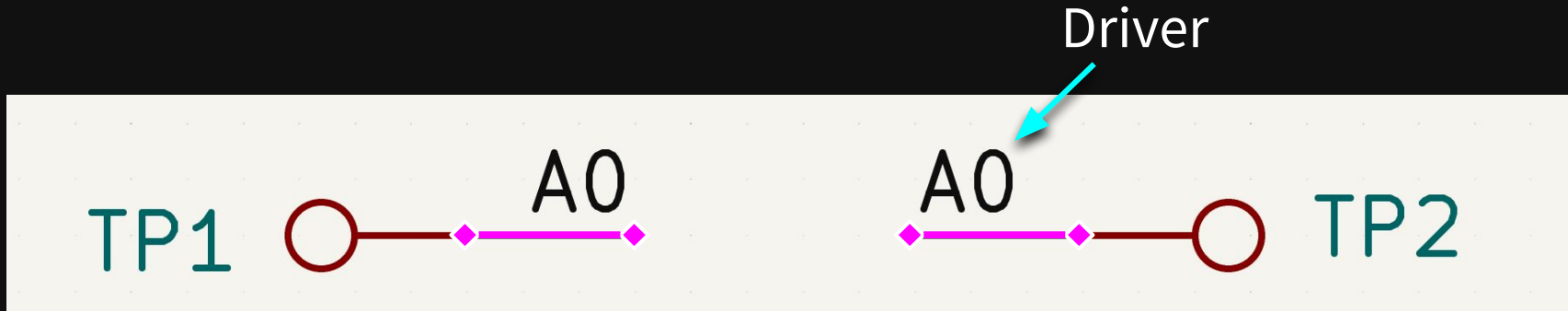
3. What about the hierarchy?



What is Graphically Connected?



What is Connected by Labels?



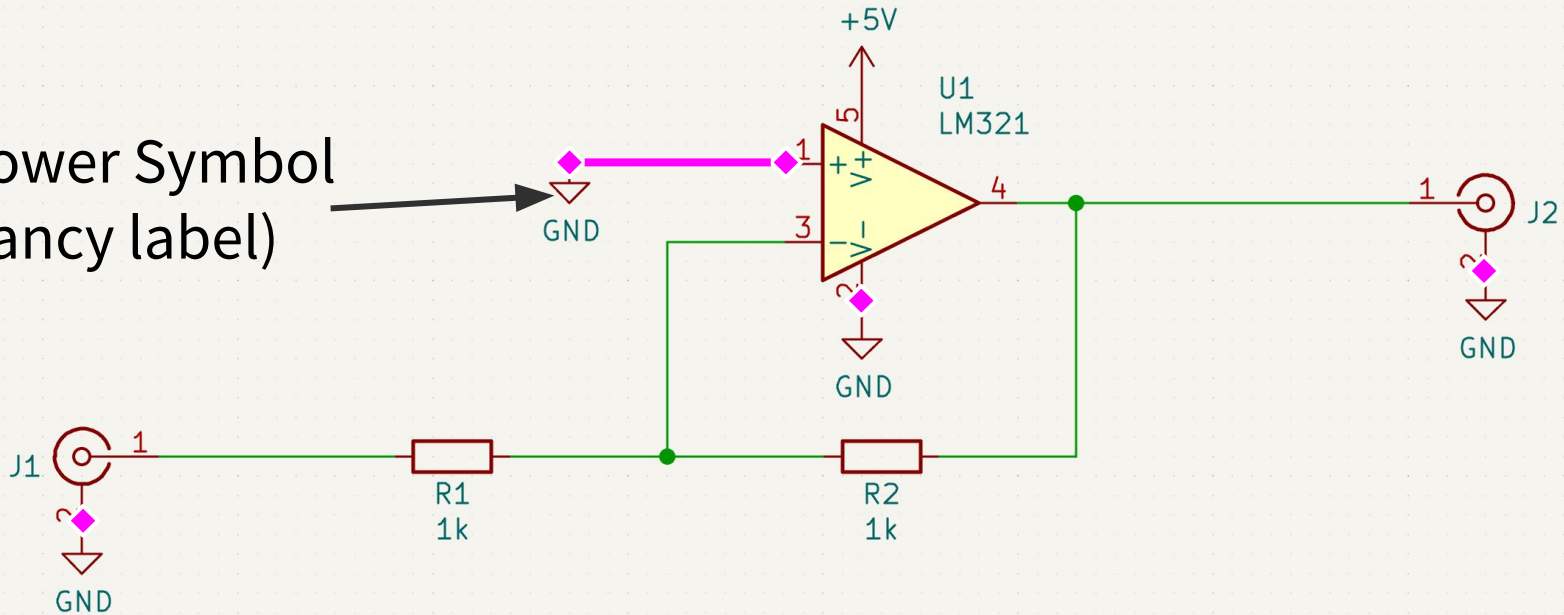
Hierarchy of Drivers



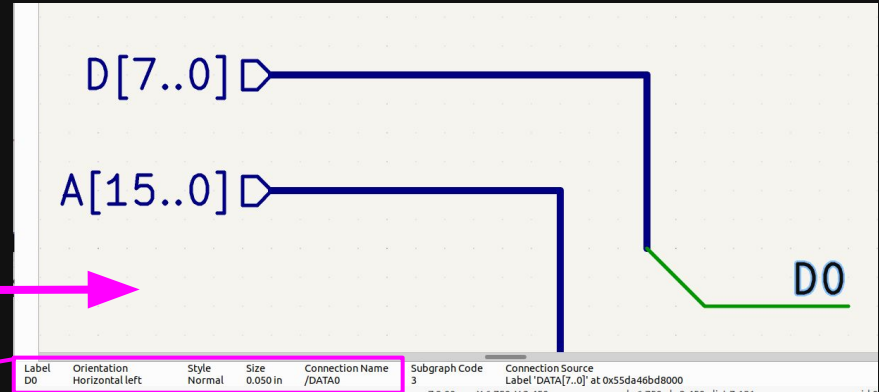
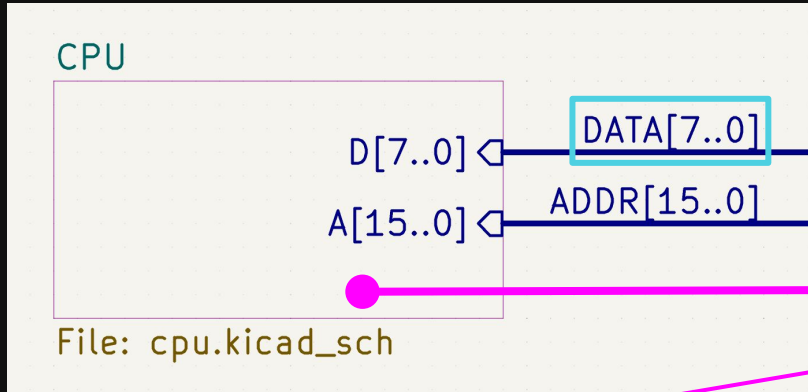
Driver Type	Label Scope	Example
Component Pin	Global	Net - (R1-Pad1)
Hierarchical Sheet Pin	Local	/sheet/path/A
Hierarchical Label	Local	/sheet/path/B
Local Label	Local	/sheet/path/C
Power Symbol Pin	Global	GND
Global Label	Global	MY_NET

What is Connected by Labels?

Power Symbol
(fancy label)

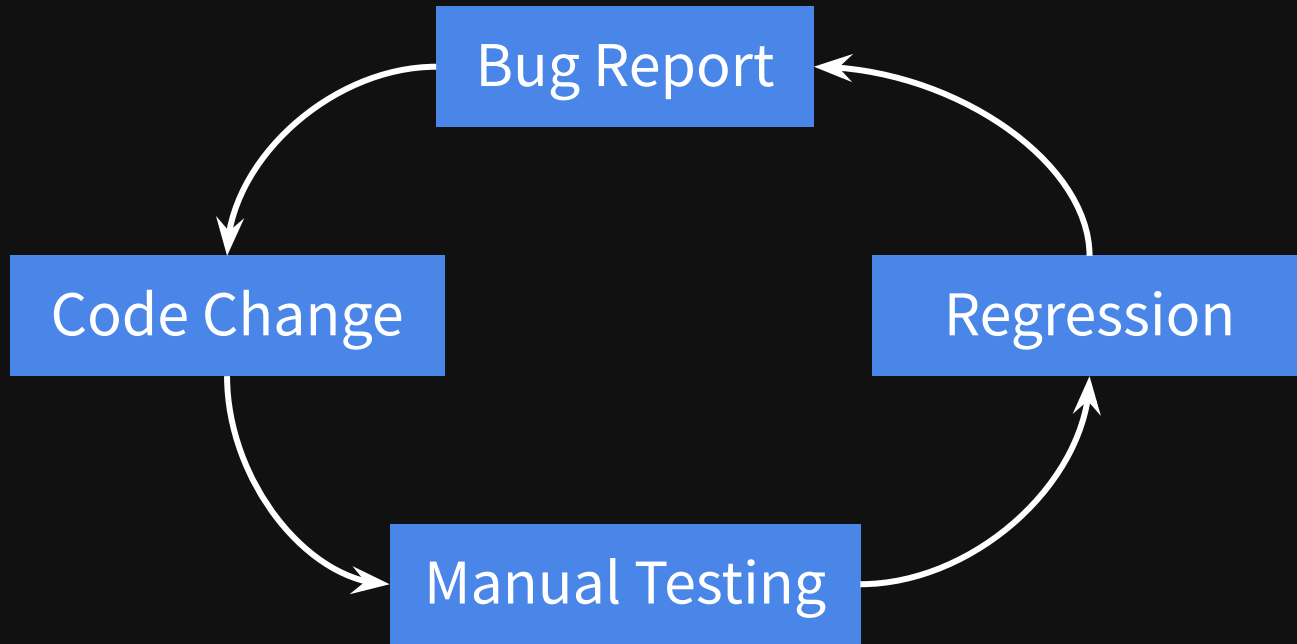


Handling Hierarchical Designs



Label	Orientation	Style	Size	Connection Name
D0	Horizontal left	Normal	0.050 in	/DATA0

Managing Complexity



KiCad 5.1

KiCad 5.99

Change

Design A

35 sheets

240 ms

57 ms

-76%

Design B

13 sheets

180 ms

81 ms

-50%

Design C

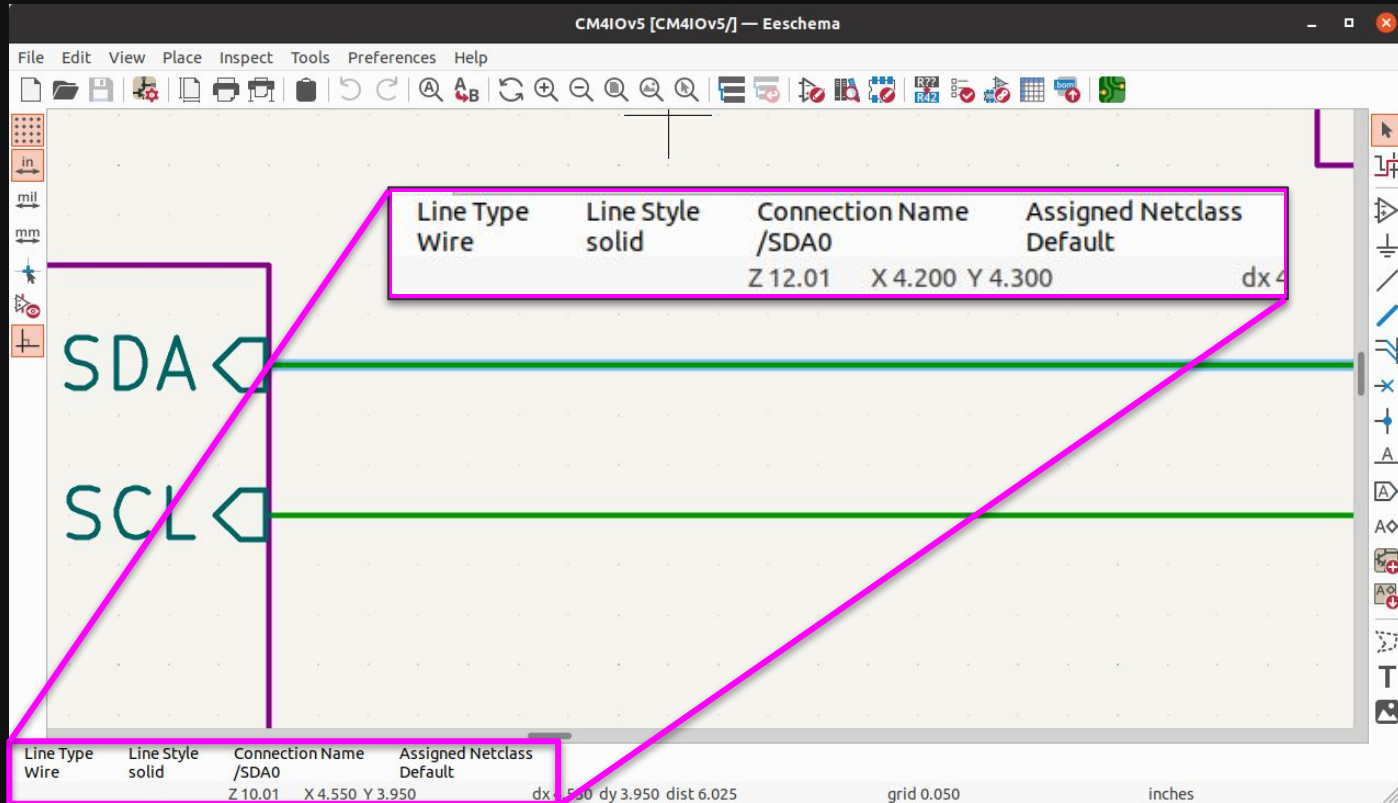
10 sheets

625 ms

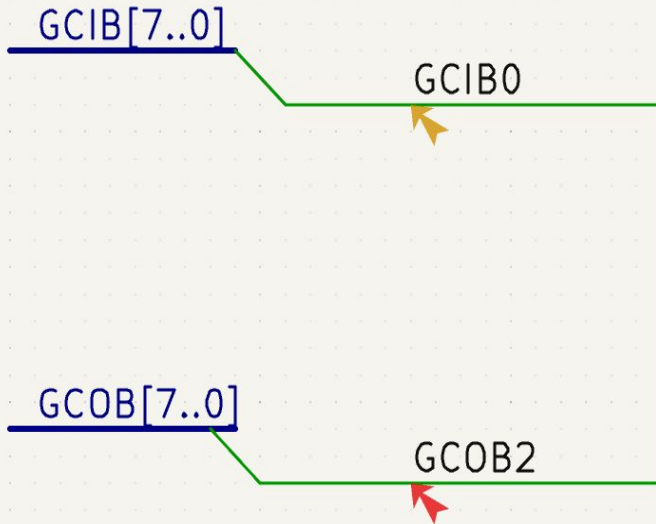
150 ms

-76%

Unanticipated Benefits



Improving Electrical Rule Checks



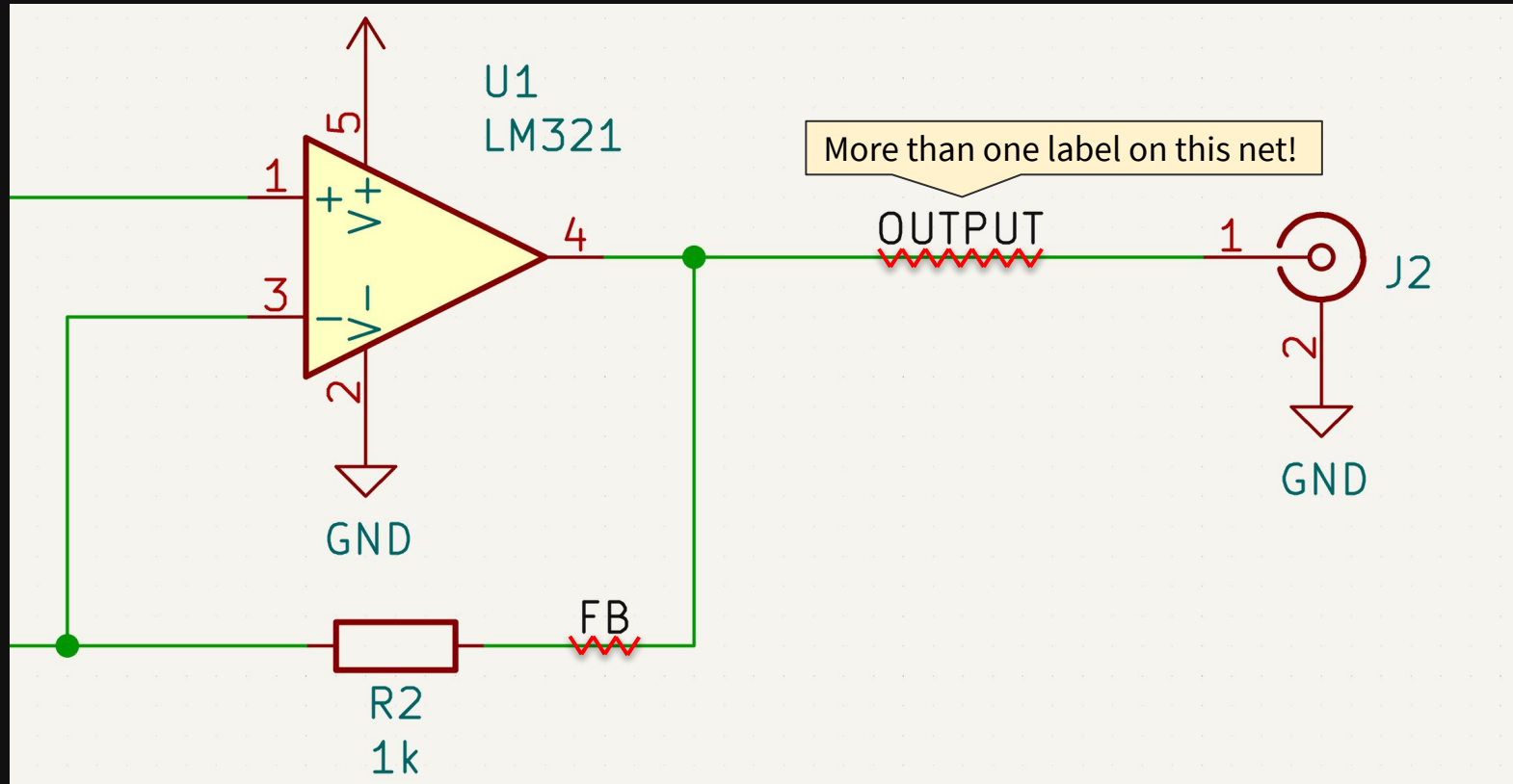
The screenshot shows the Electrical Rules Checker (ERC) window. The window title is "Electrical Rules Checker". It has two tabs: "Messages" and "Violations". The "Violations" tab is active, showing a list of violations. The first violation is "Label not connected to anything" for "Label 'GRANDCHILD_A0'". The second violation is "Label not connected to anything" for "Label 'GRANDCHILD_A2'". The third violation is highlighted in orange: "Both GCIB0 and GCOB2 are attached to the same items; GCIB0 will be used in the netlist". Below this violation, the labels "Label 'GCIB0'" and "Label 'GCOB2'" are listed. The fourth violation is "Label not connected to anything" for "Label 'GRANDCHILD_IN_C1'". The fifth violation is "Label not connected to anything" for "Label 'GRANDCHILD_OUT_C1'". At the bottom of the window, there are controls for "Show:" with checkboxes for "All", "Errors" (checked, 19), "Warnings" (checked, 9), and "Exclusions". There are also buttons for "Save...", "Delete Markers", "Close", and "Run ERC".

Opportunities for Improvement

Make it even faster!

- Incremental updates
- Caching hierarchical sheet information
- Refactoring for performance

Real-time ERC



Q&A

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