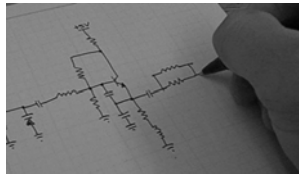


Schematic Capture

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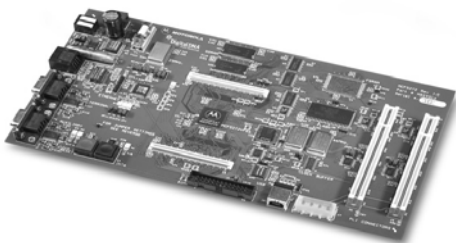


ENG SC757 - Advanced Microprocessor Design

Schematic Capture

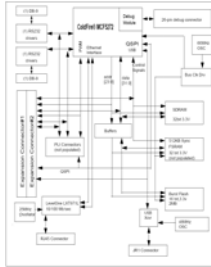
- The Schematic Capture tool is part of a suite of Computer Aided Design (CAD) tools which assist engineers in the design of modern circuits
- The CAD tool can be used to “capture” a virtual representation of a digital circuit on a computer, which can then be analyzed and simulated before an actual circuit board is created
- There are many varieties of Schematic Capture CAD tools, allowing designers to create anything from complex VLSI circuitry which can be simulated to fully, to Microprocessor based boards, which cannot!

The Goal

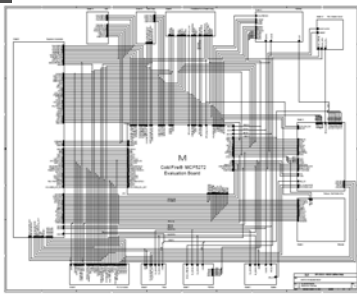


The Block Diagram

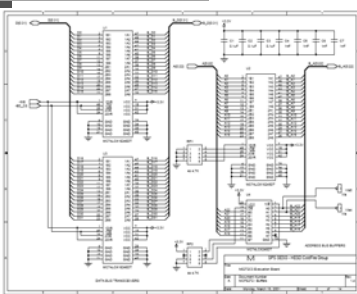
- Every schematic begins with a block diagram
- The Block Diagram gives an architectural overview and shows the data paths and interrelationships between components of a system



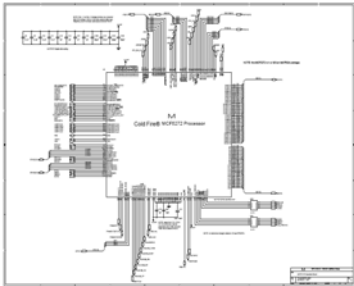
Example of a Schematic



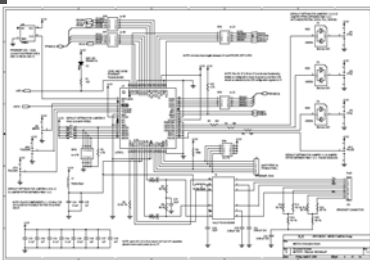
Example of a Schematic



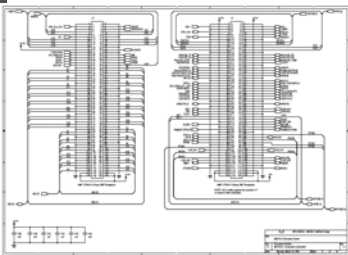
Example of a Schematic



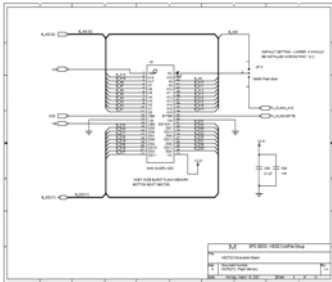
Example of a Schematic



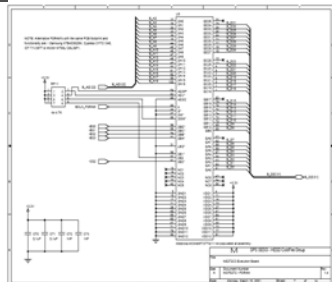
Example of a Schematic



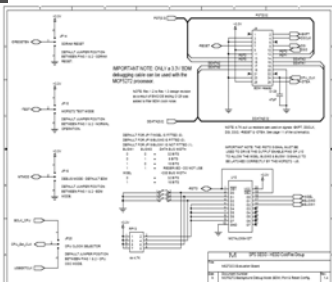
Example of a Schematic



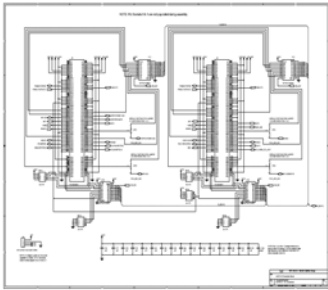
Example of a Schematic



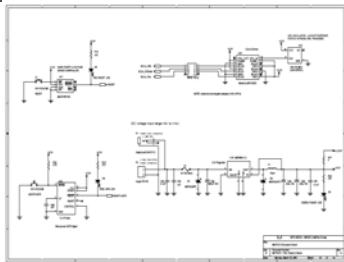
Example of a Schematic



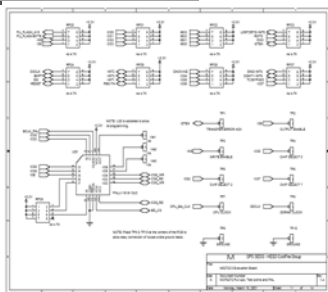
Example of a Schematic



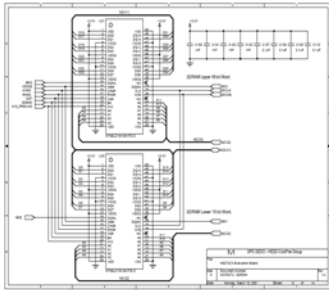
Example of a Schematic



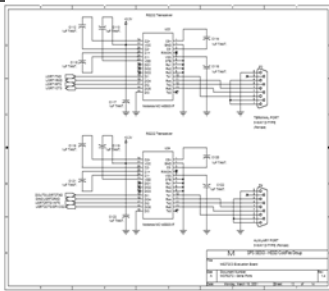
Example of a Schematic



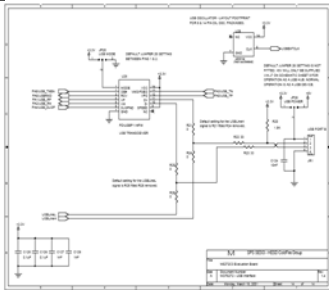
Example of a Schematic



Example of a Schematic



Example of a Schematic



Requirements

- There are many Schematic Capture CAD tools available to designers, providing:
 - Good user-interface, allowing the designer to seamlessly connect and modify different components
 - Good library support, which not only allows for creation of complex libraries, but also their usage in a hierarchical fashion
- Electrical Rule Check
 - No two outputs are connected together
 - Inputs aren't left floating
 - Fan-in and Fan-out limitations
- Netlist generation and management
 - Enabling import/export to other modules such as simulators, or other CAD tools

Simulation

- Schematic Capture tools also allow for simulation of the electrical components
- However, with a microprocessor based design, there is no way of simulating the behavior of the circuit, in particular that of the microprocessor
- Instead, we design as carefully as possible, and hope for the best!
- Most designs go through at least one phase of redesign. This is why we first make a prototype of the system and then address all the changes in the production run of the board

Creating Libraries

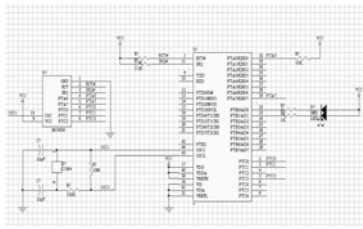
- Many CAD packages come equipped with a wide array of component libraries, which include everything from resistors and capacitors, to integrated circuits
- Chances are, however, that you will need to create a library for most of your ICs, including the microprocessor from scratch
- Creating libraries is time consuming, but of crucial importance, since it is the building blocks of your schematic
- Components in a library must be checked and re-checked to ensure pins aren't mislabeled and that there are no other errors

Pin Properties

- Each pin of the component has a set of parameters that needs to be set at the time of creating the library component
- This is important later on when we run the Electrical Rule Check (ERC) to ensure that no two outputs are connected to each other, and Power and Ground pins aren't shorted



Adding components



Annotating the Schematic

- Annotating the schematic assigns a unique number to every component which can then be used to create a Bill Of Materials (BOM) which is then further used for manufacturing and component placement

RP Resistor Pack
 R Resistors
 C Capacitors
 L Inductors and ferrite beads
 D Diodes
 Q Transistor
 Y Crystal
 OSC Oscillator
 H Header
 JP Jumper
 J Connector
 RL Relay
 U Other components

C?	=>	C1
U?	=>	U1
R?	=>	R1
R?	=>	R2
U?	=>	U2
R?	=>	R3
R?	=>	R4
R?	=>	R5
D?	=>	D1
D?	=>	D2
C?	=>	C2
X?	=>	X1
R?	=>	R6
R?	=>	R7

Annotated Schematic

