ECE 3992

Team Members

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MP3 Portable Player

Description:

- The player will store pre-encoded MP3 files on an internal hard drive.
- The MP3 files will be transferred from a PC to the player over a USB 2.0 interface.
- The user will have the ability to search and sort through a playlist containing all the stored files and select one to play.
- The selected file will then be decoded and sent through an audio output on the player.

Hardware Components

- **Hard drive** – Stores the MP3 files received over USB 2.0 connection for retreival by the processor
- **Processor -** A processor will run the player's software (playlist control, user input, stream data to the decoder)
- **MP3 decoder -** The decoder will accept MP3 data from the processor, decode it, and send it to the audio output.
- **Digital-to-Analog Converter-** Converts the digital signal from the decoder to an analog audio signal.
- **Audio output** - The decoded audio will be sent out via an analog headphone jack.
- **RAM** - Used for program operation and buffering.
- **EEPROM** - Used to store the player software.
- **Input buttons** – Allow user to control the player
- **LCD –** Displays playlist and song information
- **Power Supply**

Software Components

- **PC software/driver** – The PC will see the player as a hard drive, allowing the user to use Windows Explorer to drag and drop MP3 files to the player over a USB 2.0 interface.
- **Player software –** The player will need its own internal software to run. It will need software to transfer files from the PC, to control the storage and retrieval of files, to control the playlist, and to stream the files to the decoder.

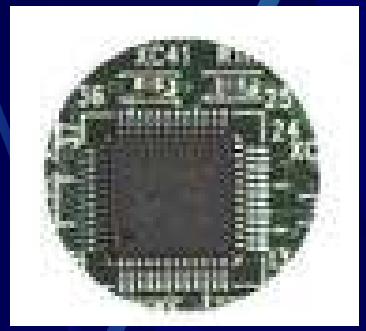
PC

Input

2.5” Hard Drive

USB 2.0

IDE

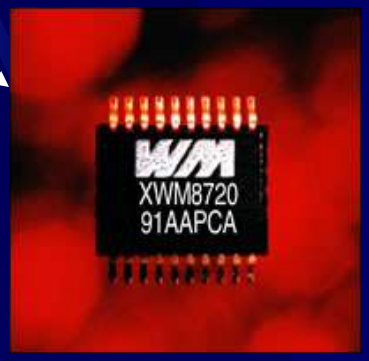


ATMEL
AT89C51SND1
Processor

VGA

I^{2S}

Phillips
UDA1330ATS
DAC



Analog
Audio

Headphone
Jack

USB 2.0

- This involves setting up the processor to enable it to receive data from the USB cable. The processor will then route the data to the hard drive.

Back

IDE

- Communication between the processor and hard drive will take place over a standard IDE interface.

Back

I2S

- The decoder will output the digital audio signal over an I²S audio interface to a digital to analog converter

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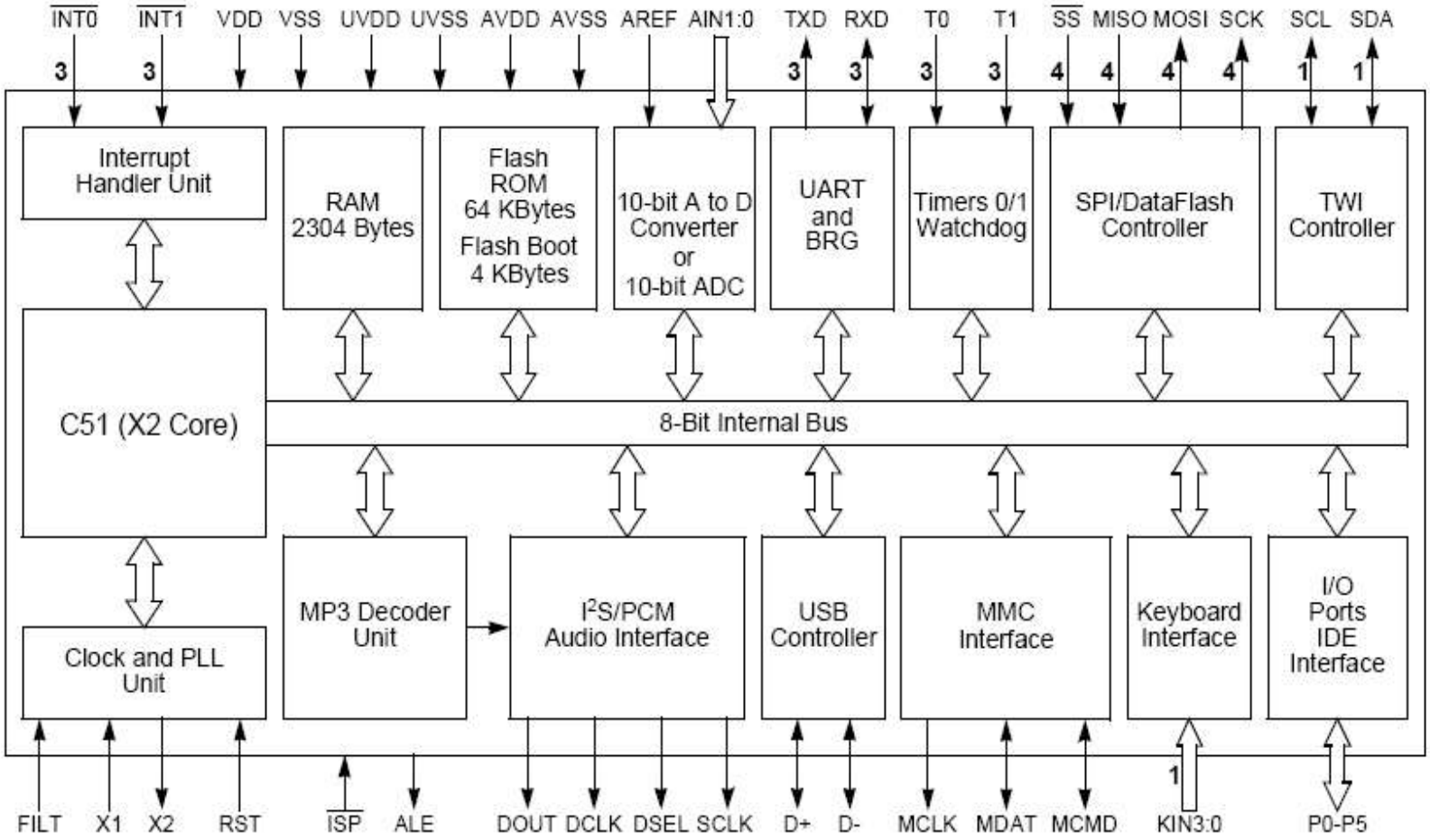
Processor Block Diagram

Figure 1. AT8xC51SND1C Block Diagram



1 Alternate function of Port 1
3 Alternate function of Port 3
4 Alternate function of Port 4

Back

Risk Assessment

Task	Risk Level	Nature	Back-up Plan
Player to PC interface	Low	Interfacing the player's internal hard drive with both the ATA connection from the processor and the USB 2.0 connection from the PC will be the greatest risk here. Tthere is a lot of information available on how to do this so this risk is not too great.	If we cannot get this interface working properly we can physically attach the ATA hard drive to the PC and upload a lot of mp3 files to it, then re-insert it into the player.
Processor to hard drive interface	None	This is a very basic interface and shouldn't pose a risk.	
Processor to decoder interface	Medium	This interface is one of the greatest risks of the project. The processor will have to stream the mp3 data to the decoder in a very precise manner.	Find a different decoder with an easier-to-use interface or buy a processor chip with an mp3 decoder already embedded on it.

Decoder	Low	We would like to build our own mp3 decoder. This will require more research to get a better idea of the feasibility of this. If we decide to try this the risk will be high. However by using a commercial decoder this risk vanishes.	Use a commercially available decoder.
Input	Low	All of us have experience using interrupt driven I/O, so although this may require a lot of work, the risk is not that great.	If we cannot get all the desired input buttons working correctly we can reduce the number of buttons. This will make the player a little less user-friendly.
LCD screen	High	This is potentially the highest risk of the project. It may be very difficult to get the LCD screen working properly because of signal noise, lack of a standard interface, and lack of experience.	Find an easier-to-use LCD screen or we could use a much simpler LED screen if we cannot get the LCD screen working.

Tentative Tasking

- **Bryce:** Decoder research, purchasing, interfacing and configuration. Mainboard research, purchasing, implementation and configuration.
- **Huy:** Software design and implementation, including playlist software and test benches. Hard drive research, purchasing, implementation and configuration.
- **Brian:** Processor research, purchasing, programming, implementation and interfacing. Will also assist with mainboard research, purchasing, implementation and configuration.
- **Seth:** Audio out research, purchasing, implementation and configuration. Power supply research, purchasing and implementation. I/0 configuration and parts purchasing including buttons, case and LCD display panel.

Bill of Materials

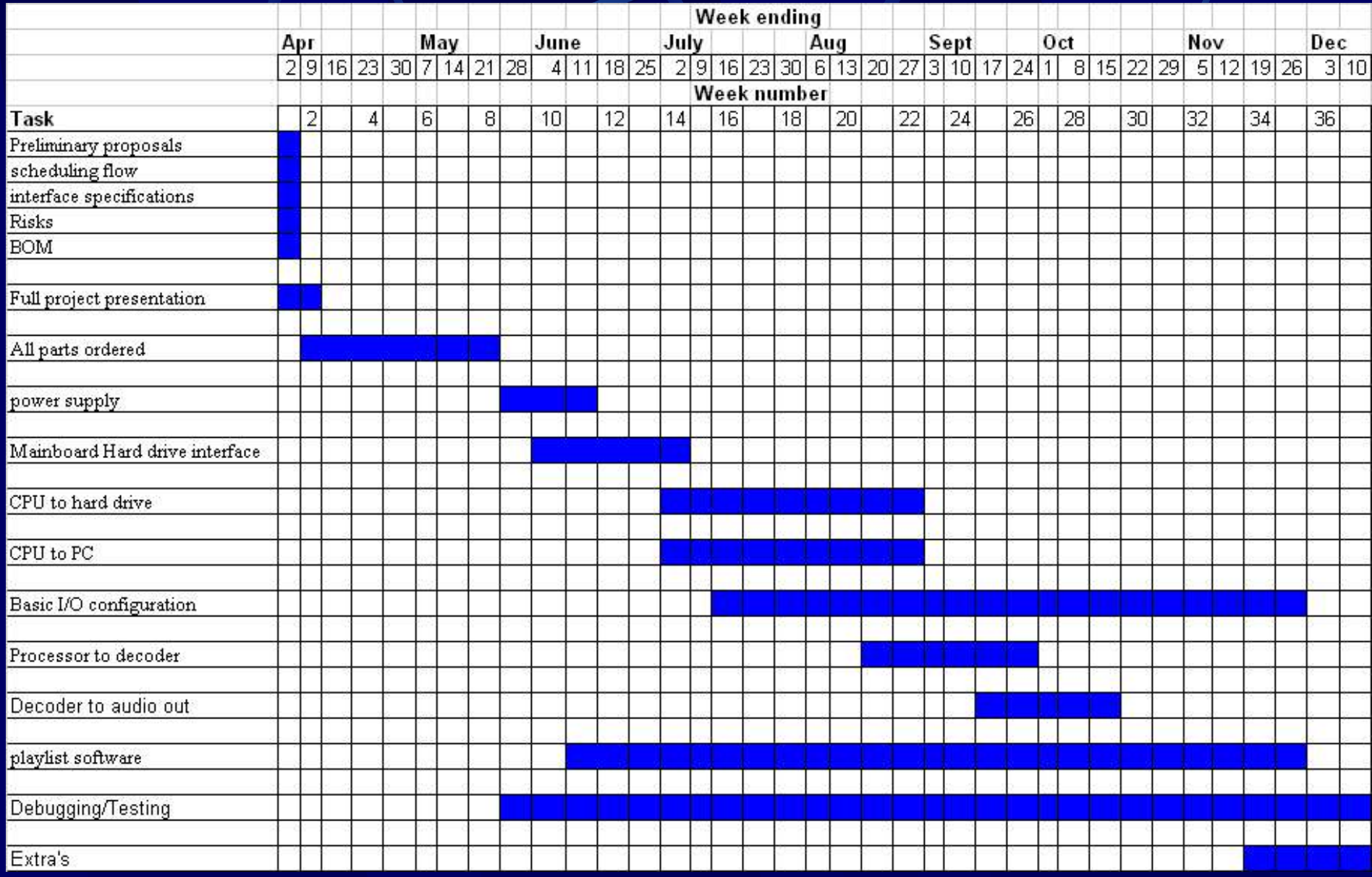
Part	Primary Supplier	Secondary Supplier	Cost Estimate
Processor	Atmel	Motorola	$8
Hard Drive	New Egg	Toshiba	$84
Input Buttons			
LCD	Goldmine-elec	Sony	$20

Bill of Materials

Part	Primary Supplier	Secondary Supplier	Cost Estimate
Decoder	Atmel	Jelu.se	$20
DAC	Arrow.com	HKInventory	< $5
Audio Jack	Goldmine-elec	SMD	$1
Power Supply	Goldmine-elec	Ipodbattery.com	$20 -$30

Bill of Materials

Part	Primary Supplier	Secondary Supplier	Cost Estimate
Miscellaneous Parts/Wires/ Cables			$30
Total			~$200


Week ending
Apr
May
June
July
Aug
Sept
Oct
Nov
Dec
2 9 16 23 30 7 14 21 28 4 11 18 25 2 9 16 23 30 6 13 20 27 3 10 17 24 1 8 15 22 29 5 12 19 26 3 10
Week number
Task
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36
Preliminary proposals
scheduling flow
interface specifications
Risks
BOM
Full project presentation
All parts ordered
power supply
Mainboard Hard drive interface
CPU to hard drive
CPU to PC
Basic I/O configuration
Processor to decoder
Decoder to audio out
playlist software
Debugging/Testing
Extra's

Questions?