Application Note

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egnite Software GmbH

Embedded Ethernet

AN-002: Medianut Hardware

Version 1.0.0 PRELIMINARY

EMBEDDED ETHERNET

Ethernut Application Note 002

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Contents

Chapter 1

Introduction

MP3 decoder with Ethernet, LCD and remote control.

This application note demonstrates how to use the Ethernut board for playing MP3 files loaded via Ethernet. The add-on board hardware described adds the following features:

- Supports MPEG audio layer 1, 2, and 3, ISO 11172-3.
- Supports MPEG 1 & 2 for all layers, and layer 3's 2.5 extensions, and all their sampling rates and bitrates, in mono and stereo.
- Supports variable bitrate for MP3.
- Stereo earphone output capable of driving a 30 Ohm load.
- Infrared remote control.
- LCD interface with LED backlight.

Chapter 2

Connections

Embedded Ethernet meets MP3.

Connecting the MP3 Decoder

Generally the MP3 decoder is connected via two serial busses. The first one, the data bus, is used to transfer the MP3 data stream from the Ethernut board to the decoder. This bus will be driven by the Ethernut hardware SPI. The second bus is used by the Ethernut board to read register contents from and write register values to the MP3 decoder. Of course, this is a bidirectional bus and has to be managed by software.

In order to save I/O lines, both busses share the same data line from the Ethernut board to the MP3 decoder. However, the paranoid designer spent an additional port bit to control the decoder's hardware reset line.

Note, that all port bits are routed via a 74LVC245 bus driver to convert the signal levels between the 5 Volt logic of the Ethernut board and the 3 Volt logic of the MP3 decoder.

Pin	MP3 Decoder Signal	Ethernut Connection
1	DREQ: Data request output	PE6 interrupt 6 input
2	DCLK: Data input clock input	PB1 (SCK) output
3	SDATA: Serial data input	PB2 (MOSI) output
4	BSYNC: Byte synchronization input	PB5 output
11	XCS: Chip select input	PB4 output
12	SCLK: Control bus clock input	PB0 output
13	SI: Control bus input	PB2 (MOSI) output
14	SO: Control bus output	PB3 (MISO) input
26	XRESET: Asynchronous reset input	PB7 output
18	AGND: Analog ground	DC and GND via on-board 3.3 Volt regulator
21		
25		
19	AVDD: Analog power supply	
23		
6	DGND: Digital ground	
10		
27		
5	DVDD: Digital power supply	
9		
28		

Connecting the LCD

The LCD is connected in the same way as explained in the Ethernut application note 1.

Pin	LCD Signal	Ethernut Connection
1	Power supply (GND)	DC and GND via LCD on-board regulator
2	Power supply (+5V)	
3	Contrast adjust	None
4	L = Instruction register H = Data register	PE2 output
5	Read/Write control L = Write to LCD H = Read from LCD	None, tied to GND
6	Enable (data strobe)	PE3 output
7	Data line bit 0	None, tied to GND in 4-bit mode
8	Data line bit 1	
9	Data line bit 2	
10	Data line bit 3	
11	Data line bit 4	PD4 output
12	Data line bit 5	PD5 output
13	Data line bit 6	PD6 output
14	Data line bit 7	PD7 output
15	Backlight supply +	DC and GND via on-board 5 Volt regulator and power MOSFET controlled by PB6 output
16	Backlight supply -	

Connecting the IR Receiver

The infrared receiver requires just a single port bit.

Pin	IR Receiver Signal	Ethernut Connection
1	Data output	PE4 interrupt 4 input
2	Power supply (GND)	DC and GND via on-board 5 Volt regulator
3	Power supply (+5V)	

Chapter 3

Schematics and Board Layout

Putting it all together.

Schematics

Two sides of the board may be plugged into the Ethernut expansion connector. This offers the possibility to install both boards either in the sandwhich way (using X1 and X2) or side by side (using X3 and X4).

In order to save pins and reduce EMI, each of the two expansion connectors is divided into two separate connectors. The higher speed data and address bus lines are not routed to the board. However, enough pads are on the board to insert the full 64-pin expansion connector of Ethernut version 1.3. Previous Ethernut versions got a 56-pin expansion connector, which requires to reduce X2 or X4 by two ground pins.

Figure 1: Schematic Sheet 1

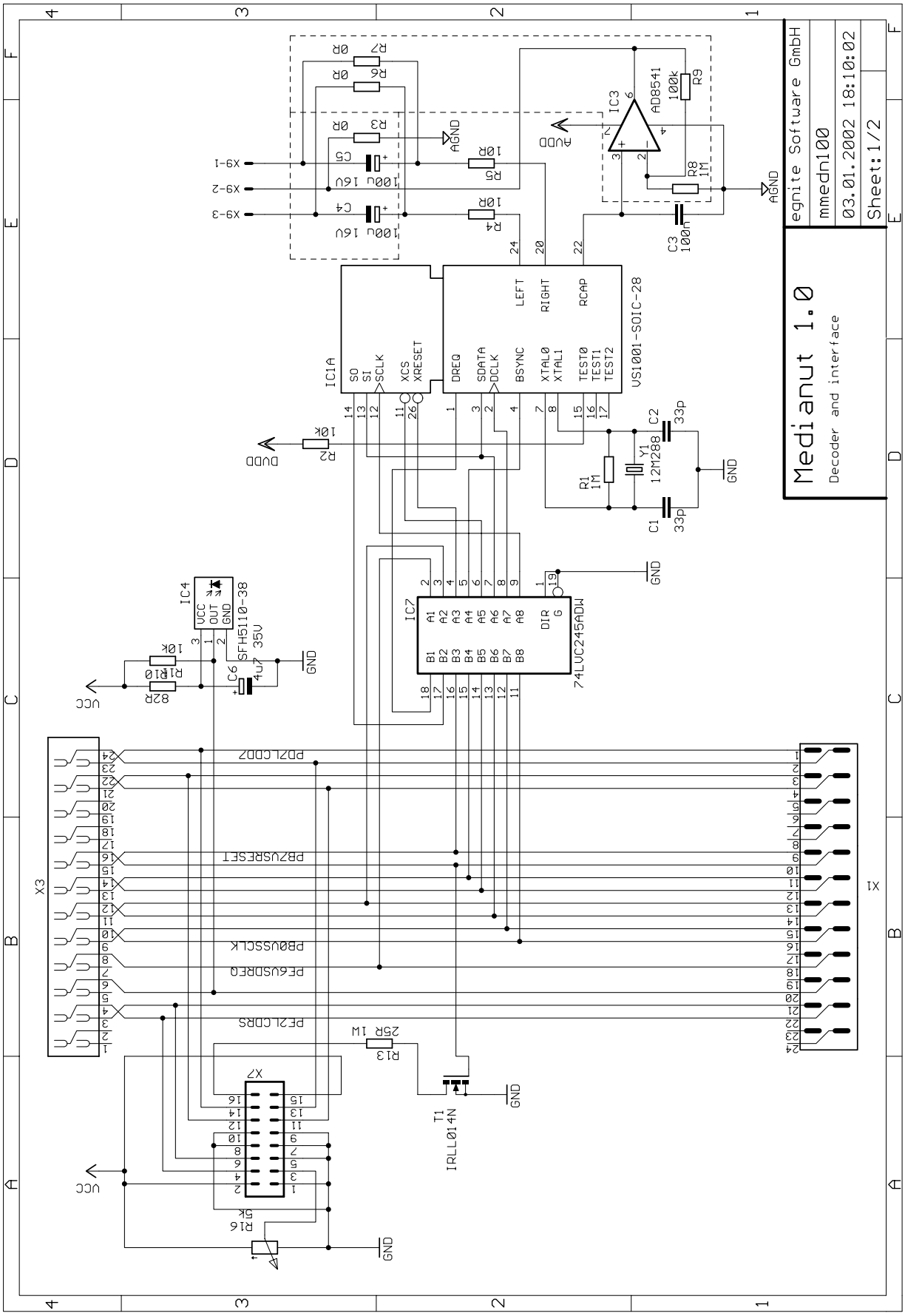
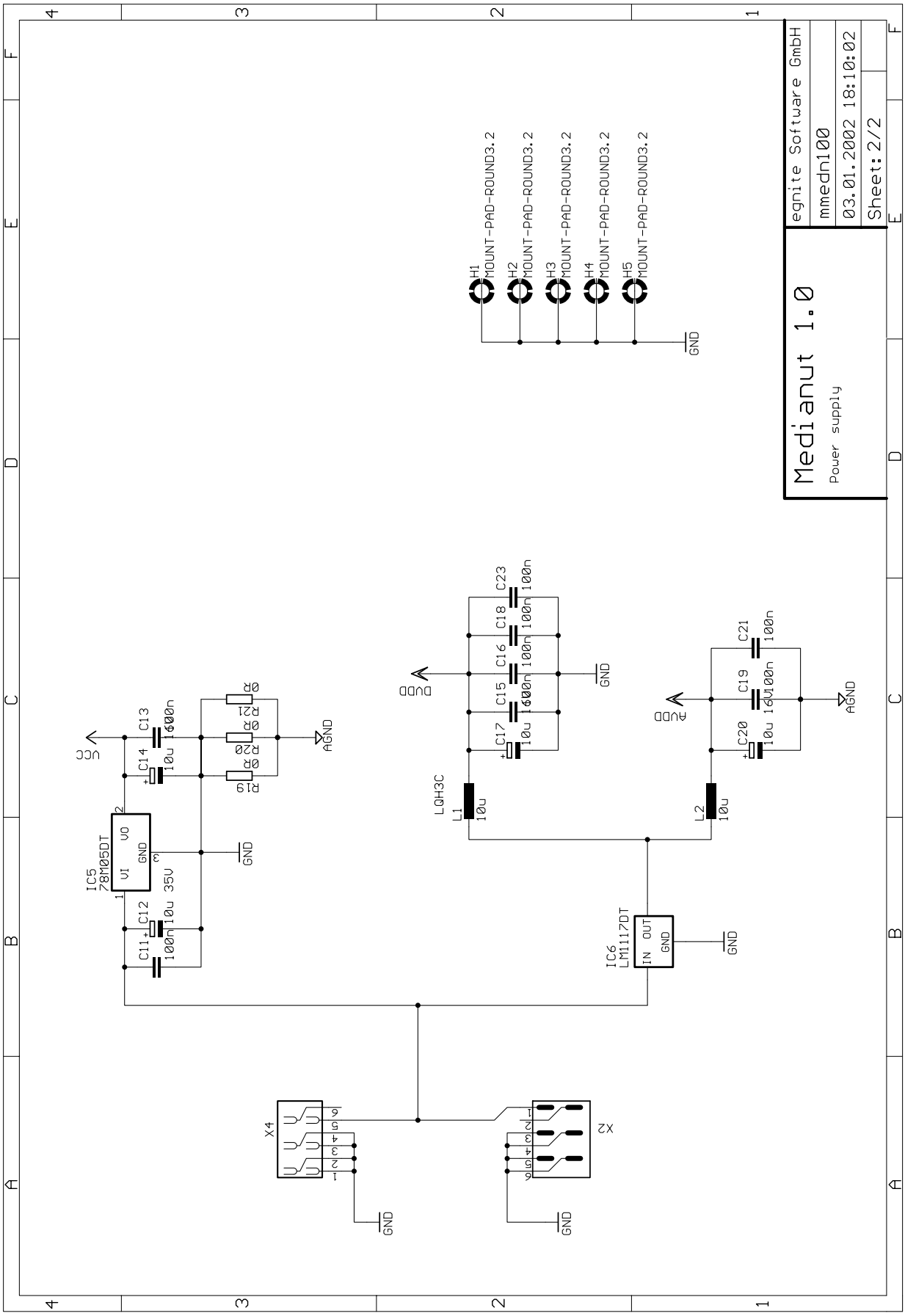


Figure 2: Schematic Sheet 2



Board Layout

A 4-layer board has been created for reliable operation and low noise. However, it should be not too difficult to create a board of the same size with 2 layers only.

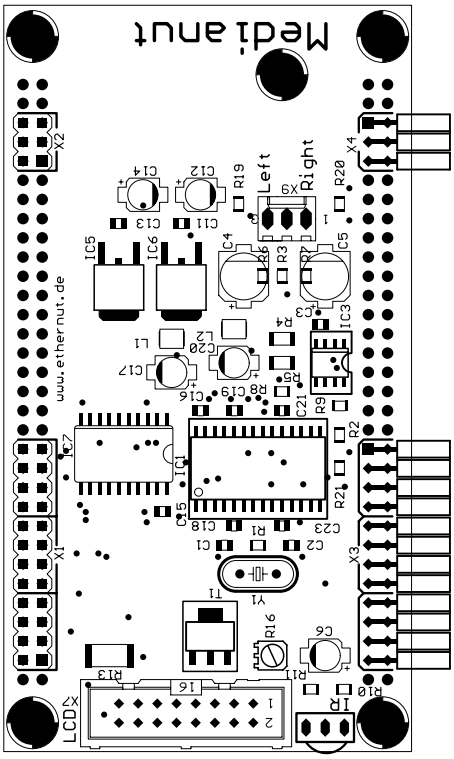


Figure 3: Component Placement

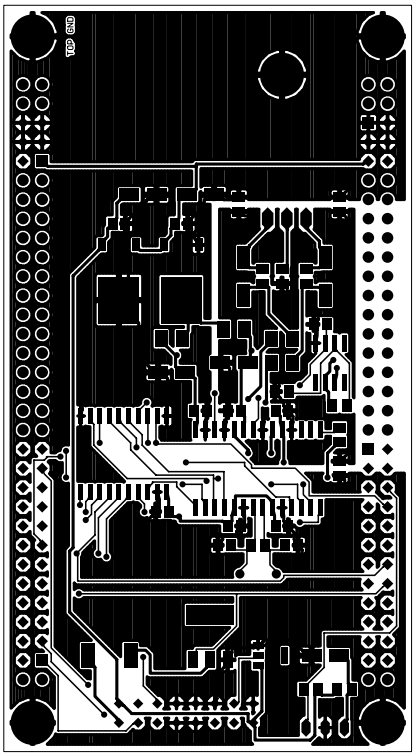


Figure 4: Top Layer

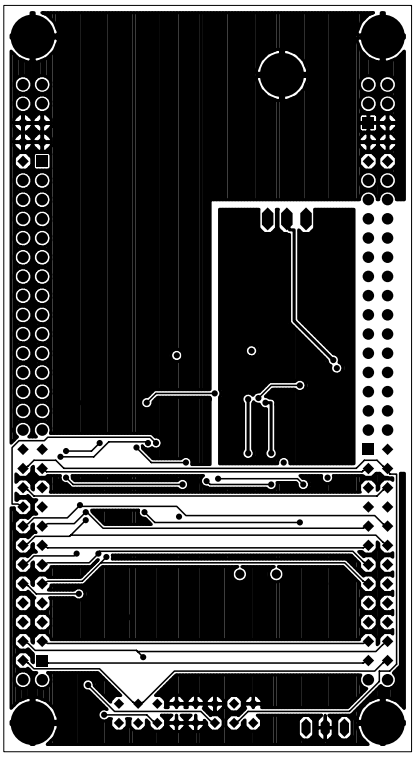


Figure 5: Bottom Layer

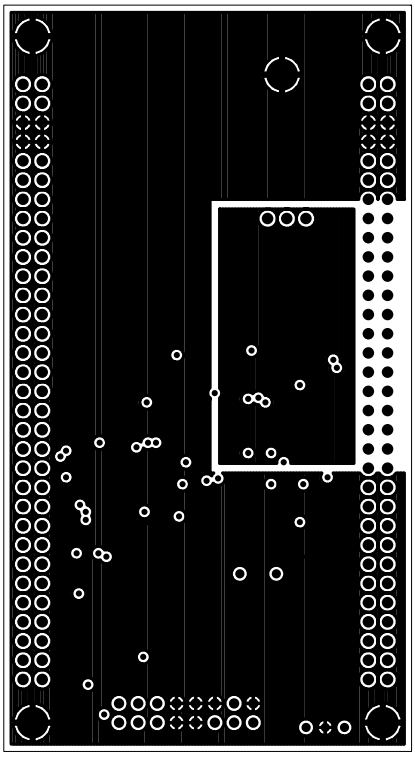


Figure 6: Ground Plane

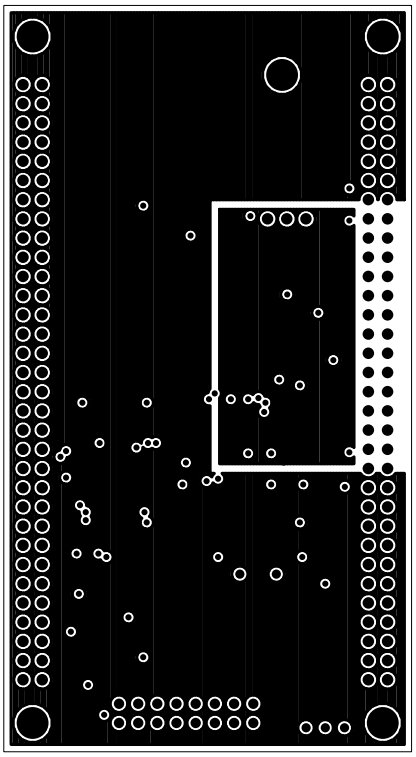


Figure 7: Supply Plane

Chapter 4

Links

Where to find additional information.

http://www.ethernut.de/

Information about the Ethernut board.

http://www.egnite.de/

Home of egnite Software GmbH, the developer of the Ethernut hardware.

http://www.myplace.nu/mp3/

Home of yampp, yet another MP3 Player by Jesper Hansen, who developed the first MP3 add-on for Ethernut and helped with the software.

Chapter 5

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