

**MINI-MAX/51-E**  
**Single Board Computer**  
**With Embedded Ethernet**

**Technical Manual**

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### **WARRANTY:**

BiPOM Electronics warrants MINI-MAX/51-E for a period of 1 year . If the board becomes defective during this period, BiPOM Electronics will at its option, replace or repair the board. This warranty is voided if the product is subjected to physical abuse or operated outside stated electrical limits. BiPOM Electronics will not be responsible for damage to any external devices connected to MINI-MAX/51-E. BiPOM Electronics disclaims all warranties express or implied warranties of merchantability and fitness for a particular purpose. In no event shall BiPOM Electronics be liable for any indirect, special, incidental or consequential damages in connection with or arising from the use of this product. BiPOM's liability is limited to the purchase price of this product.

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MINI-MAX/51-E Single Board Computer Technical Manual. No part of this work may be reproduced in any manner without written permission of BiPOM Electronics.

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## 1. Overview

MINI-MAX/51-E is a general purpose, low-cost and highly-expandable micro-computer system. It is based on the ATMEL 8051 compatible single-chip Flash micro-controller. The main feature of the system is an additional embedded Ethernet Controller to provide access to Ethernet. The Flash micro-controller can be serially programmed while in the target application circuit. Customers can program the micro-controller with the most recent firmware or custom firmware. This function of the FLASH micro-controller simplifies new program development and debugging. Downloading of a program to the micro-controller typically takes few seconds.

[Micro-IDE](#) Integrated Development Environment from BiPOM Electronics fully supports in-system programming and debugging on the MINI-MAX/51-E board using the serial port. A Windows-based program [WinLoad](#) is also provided to download programs to the board. MINI-MAX/51-E has connectors for a keypad, for standard alphanumeric LCD modules and for an expansion bus. A wide range of peripheral boards and accessories are provided by BiPOM Electronics. MINI-MAX/51-E should be powered from a 6 to 12 Volt (DC) external power source.

## 2. Specifications

MINI-MAX/51-E board has the following configuration:

- ATMEL T89C51ED2 micro-controller with
  - 64 Kbytes on-chip Flash program/data Memory,
  - 256 bytes scratch pad RAM
  - 1 Kbytes expanded RAM (XRAM)
  - 2 Kbytes EEPROM
- Cirrus Logic Inc. CS8900A Ethernet Controller
- LANLED and LINKLED indicators
- AT24C04A 512 byte data EEPROM
- Socket DIL-08 to install additional EEPROM
- Microchip PIC16C505 micro-controller to provide In-circuit Programming of the main Flash micro-controller through the RS232 Serial Port
- RS232 Serial Port connector for In-circuit Programming and for data communications
- RJ45 connector for 10BASE-T Ethernet Port
- 10-pin connector for matrix and non-matrix keypads
- Dual-row 14-pin LCD connector (with software contrast adjustment for LCD)
- 20-pin Expansion connector for a variety of peripheral boards ([http://www.bipom.com/periph\\_boards.php](http://www.bipom.com/periph_boards.php))
- Single operating unregulated voltage 6 10 12VDC
- On-board 5 Volt regulator
- Dimensions are 2.35 X 2.40 inches (5.97 X 6.10 centimeters).
- Mounting holes of 0.138 inches (3.5 millimeters) are on four corners.
- 0° - 70° C operating, -40° - +85° C storage temperature range.

## 3. Software

Software examples for MINI-MAX/51-E and BiPOM Peripheral boards are available from the link below:

<http://www.bipom.com/minimax51e.php>

## 4. Functional Blocks

Figure 1 shows the block diagram of the MINI-MAX/51-E board

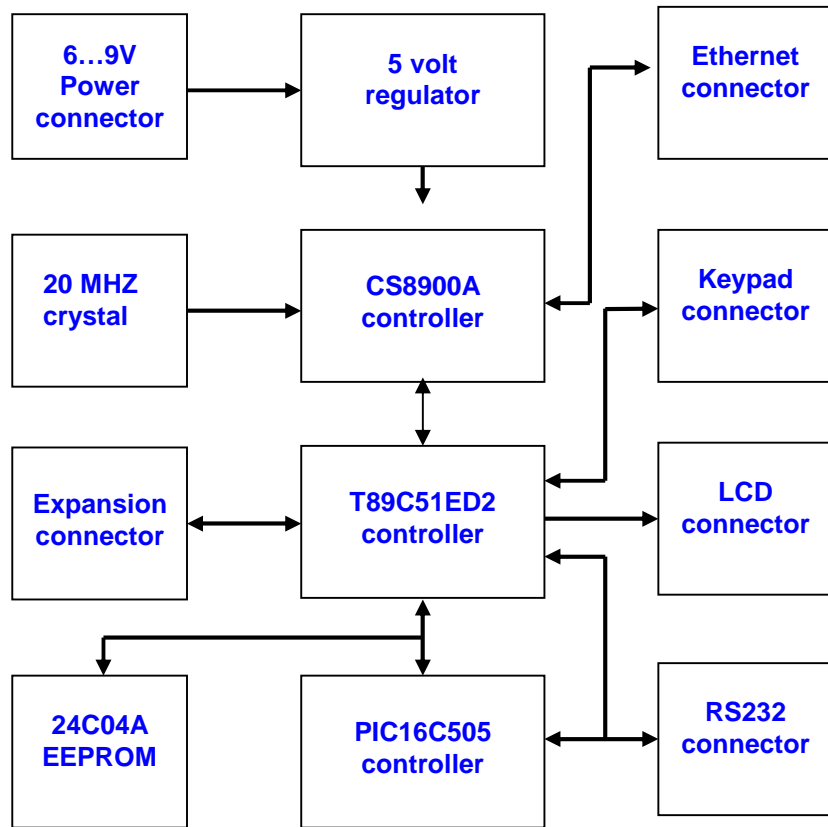


Figure 1

### RJ45 Ethernet Connector

Table 1 shows the pin assignments for the RJ45 connector

**RJ45 Ethernet Connector (J6)**

Name	Signal	Pin
-	Not Connected (NC)	8
-	NC	7
RXD-	Transformer Input	6
-	NC	5
-	NC	4
RXD+	Transformer Input	3
TXD-	Transformer Output	2
TXD+	Transformer Output	1

Table 1

### Asynchronous Serial Port

One asynchronous RS232 serial port is available on a 9-pin male D connector J2. The RS232 port can be used by both a PC for In-circuit Programming of the T89C51ED2 through the PIC16C505 microcontroller and by T89C51ED2 for data communications.

Table 2 shows the pin assignments for the RS232 serial port connector

**Serial Port Connector (J4)**

Name	Signal	Pin
-	Not Connected (NC)	1
<b>TXD</b>	Input	2
<b>RXD</b>	Output	3
<b>DTR</b>	NC or Vcc	4
<b>GND</b>	<b>GND</b>	5
-	NC	6
<b>RTS</b>	<b>RTS (Output)</b>	7
<b>CTS</b>	<b>CTS (Input)</b>	8
-	NC	9

Table 2

### Keypad Connector

8 port pins of the T89C51ED2 are connected to the Keypad Connector (J3). Matrix keypads such as 3 x 5 or 4 x 4 can be connected directly to the connector. 5 Volt and Ground power lines are also available on the connector.

The keypad connector can also be used as a general-purpose 8-pin input/output port.

Table 3 shows the pin assignments for the Keypad connector.

**Keypad Connector (J3)**

Name	Signal	Pin
VCC	+5V	10
GND	Ground	9
P2.7	In/Out	8
P2.6	In/Out	7
P2.5	In/Out	6
P2.4	In/Out	5
P2.3	In/Out	4
P2.2	In/Out	3
P2.1	In/Out	2
P2.0	In/Out	1

Table 3

## **LCD Connectors**

Alphanumeric 24 Characters x 2 lines LCD such as BiPOM's **LCD242**

([http://www.bipom.com/periph\\_boards.php](http://www.bipom.com/periph_boards.php))

or other LCD displays can be connected directly to MINI-MAX/51-E.

**LCD Connector (J4)**

Signal	Pin	Pin	Signal
P0.7	14	13	P0.6
P0.5	12	11	P0.4
Not connected	10	9	Not connected
Not connected	8	7	Not connected
P0.2	6	5	P0.3
P0.0	4	3	Vee
VCC (+5V)	2	1	GND

Table 4.

## **Input/Output expansion bus**

The 16 control pins and 5 Volt power supply pins are available on the 20-pin connector (J1) for interfacing to existing peripheral boards. A peripheral board can be connected to the MINI-MAX/51-E either as a piggyback daughter-board using standoffs or can be placed away from the MINI-MAX/51-E board using a 20-wire ribbon cable (Part #: EXPCABLE-6). Table 5 shows the pin assignments for the connector.

**Input/Output Connector (J1)**

Signal	Pin	Pin	Signal
P3.0	20	19	P3.1
P3.2	18	17	P3.3
P3.4	16	15	P3.5
P3.6	14	13	P3.7
P1.0	12	11	P1.1
P1.2	10	9	P1.3
P1.6	8	7	P1.5
P1.6	6	5	P1.7
VCC (+5V)	4	3	GND
VCC (+5V)	2	1	GND

Table5

## **Power Supply Unit**

MINI-MAX/51-E board comes with a 6 VDC unregulated DC power supply. Other power supplies can also be used. External power supply should be able to supply 6 to 12 Volts DC at minimum 200mA current (more if peripheral boards are used). The inner pin of the supply connector is positive and the outer ring is negative.

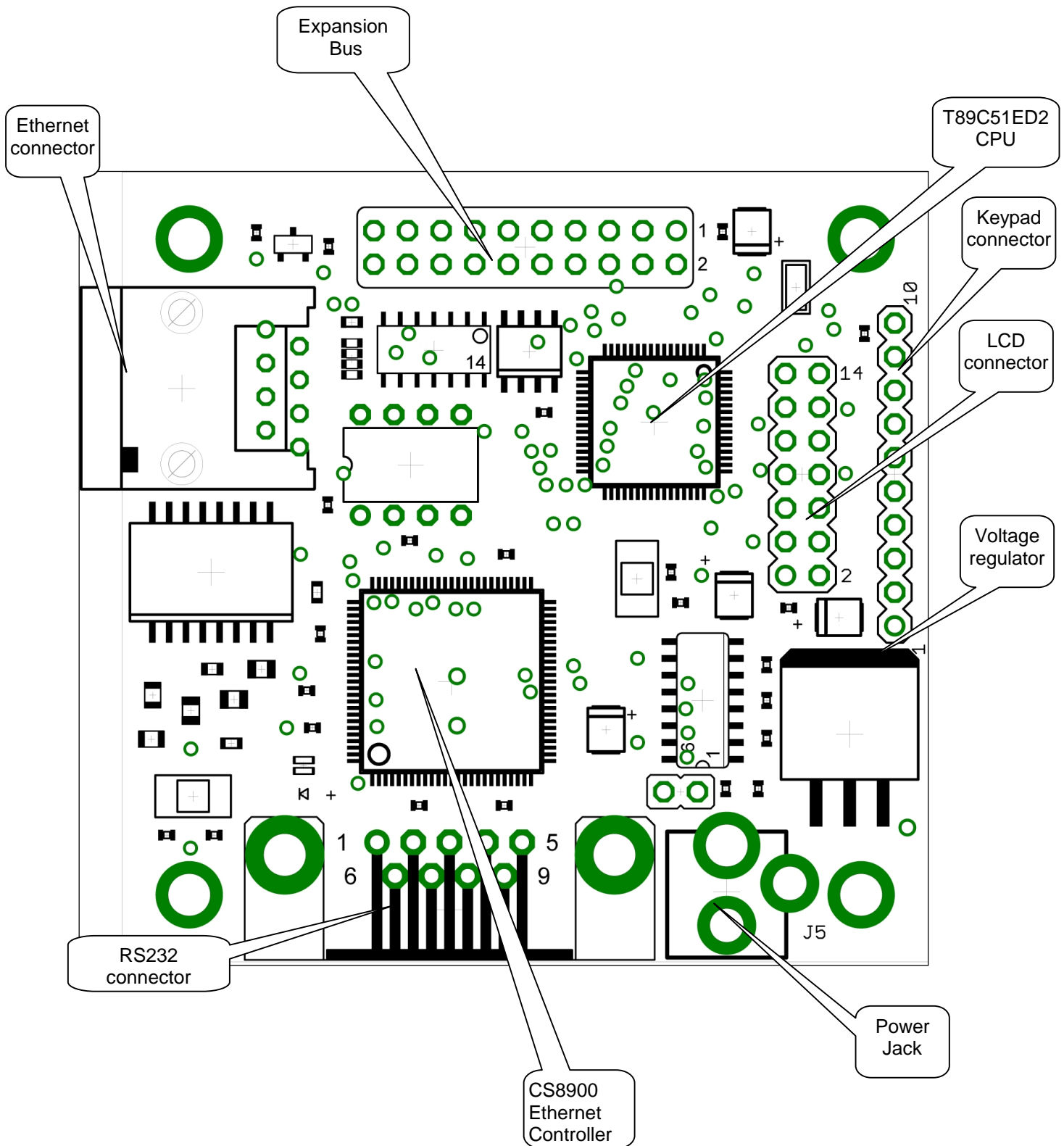
**WARNING:** Correct polarity should be observed when applying external DC supply to Power connector. MINI-MAX/51-E has an on-board low-dropout 5 Volt regulator LM2937 (IC5).

**CAUTION:** Depending on the current requirements of the any external circuitry such as peripheral boards that are attached to MINI-MAX/51-E and the level of input voltage applied, the power regulator IC5 may dissipate enough heat to cause skin injury upon touch. Contact with this regulator should be avoided at all times, even after the power to circuit has been switched off.

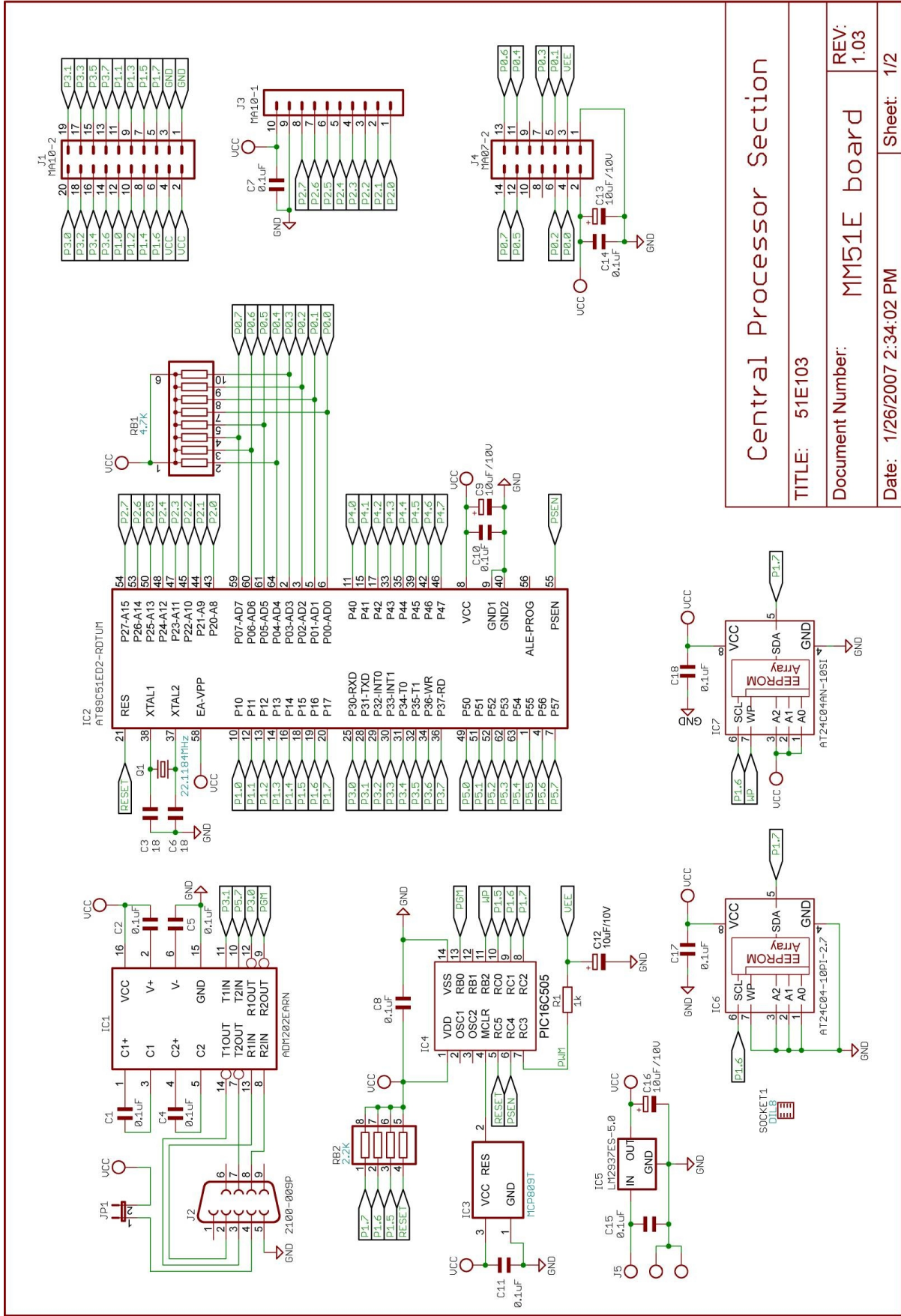
## 5. Board Layout

Figure 2 shows positions of major components, connectors and terminals on the MINI-MAX/51-E board.

Figure 2

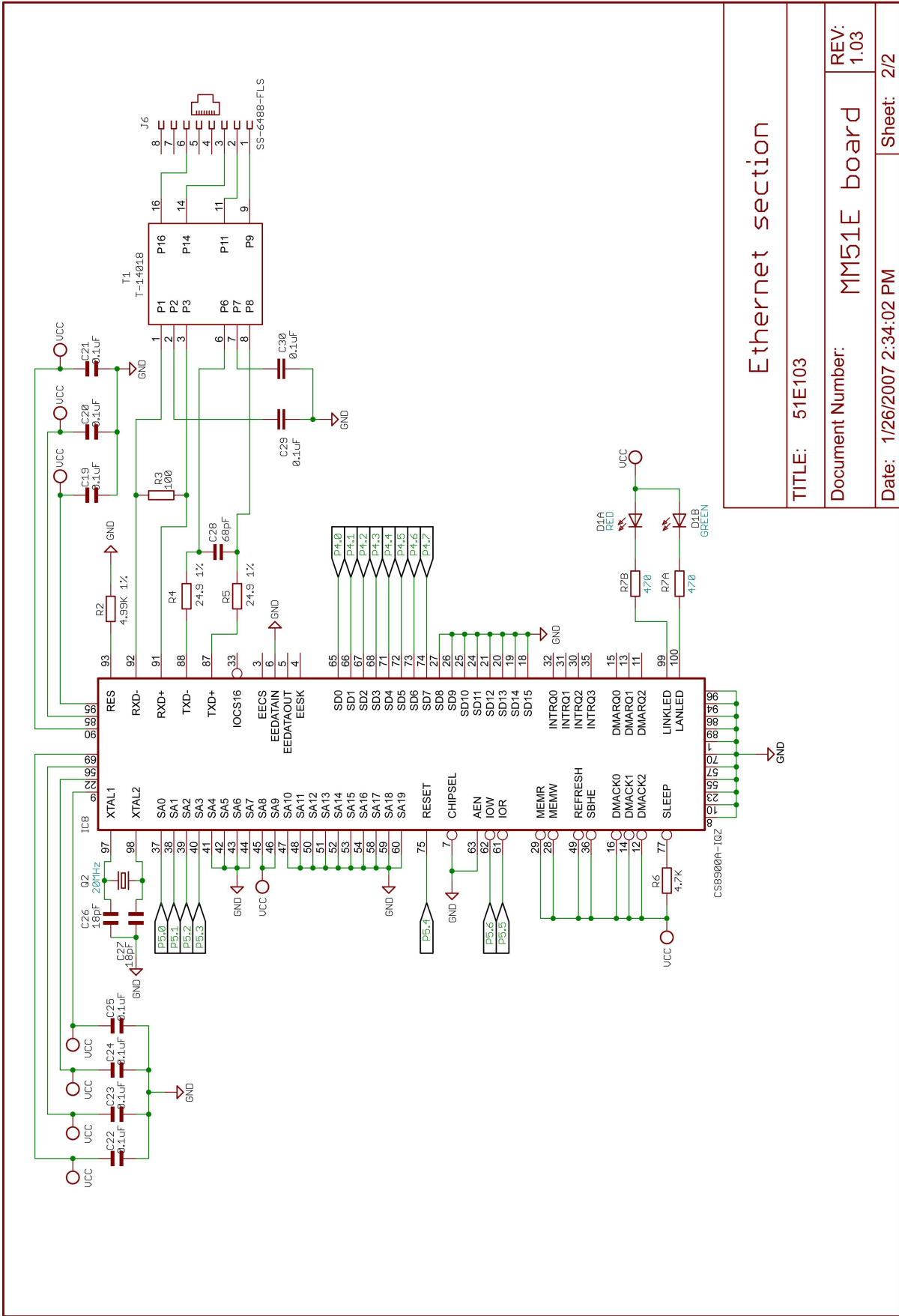


# 6. Schematics



<b>Central Processor Section</b>	
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Ethernet section

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