

**AT89C5131 Starter Kit**

.....  
**Hardware User Guide**







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# Section 1

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## Introduction

This document describes the AT89C5131 Starter Kit Evaluation Board dedicated to the AT89C5131 USB microcontroller. This board is designed to allow an easy evaluation of the product using demonstration software (refer to Software Guide).

To complement the evaluation and enable additional development capability, the AT89C5131 evaluation board can be plugged into the Atmel C51 Generic Board, featuring LCD, LED bar graph, Flash memory, etc.

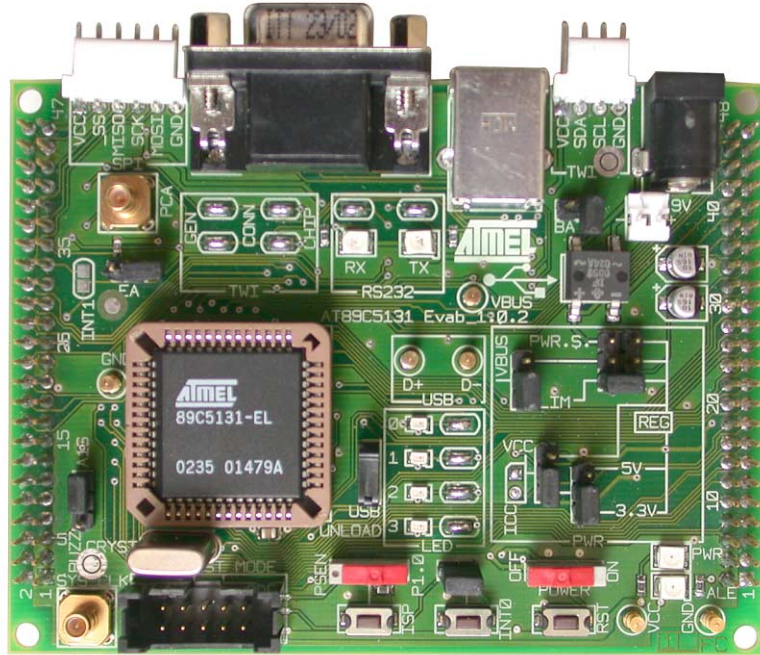
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### 1.1 Features

The AT89C5131 evaluation board provides the following features:

- Possibility to choose between two packages for the AT89C5131
  - PLCC 52-pin package
  - VQFP 64-pin package
- On-board power supply circuitry
  - from an external power connector
  - from an external battery
  - from the USB line via the USB on-board connector
- On-board reset, INT0, LEDs, EA, ISP and programming interface
- Power, ALE, RS232 Rx and Tx LEDs
- External system clock connector
- PCA clock connector
- USB, TWI, SPI and RS232 hardware connectors
- Connectors to interface with the C51 generic board

Figure 1-1. AT89C5131 Evaluation Board

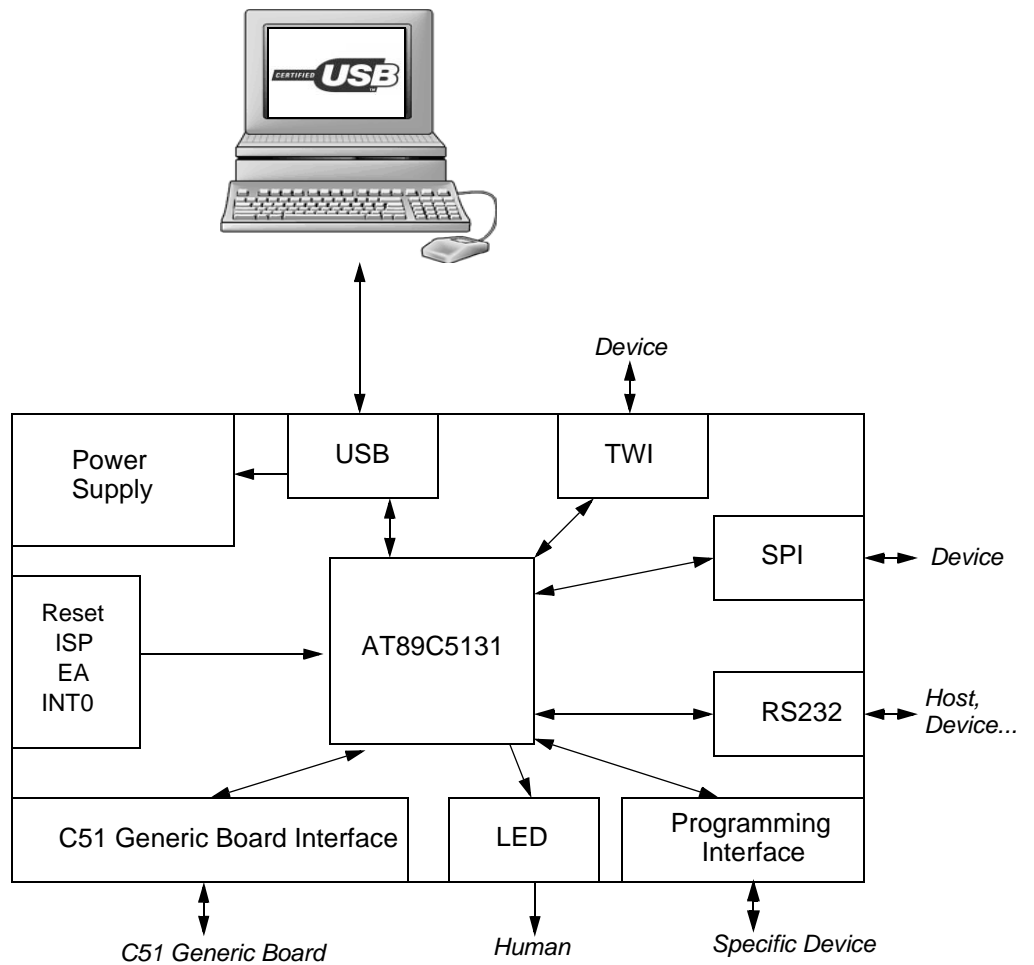


## Section 2

## Hardware Description

## 2.1 Block Diagram

Figure 2-1. AT89C5131 Evaluation Board Components



## 2.2 Power Supply

The on-board power supply circuitry allows various power supply configurations.

The power source can be:

- $V_{BUS}$  from USB (5V)
- $V_{BUS}$  from USB (5V) through the current limiter
- External power supply (from 6 to 12V) or 9V battery

The voltage output can be the direct power source, regulated at 5V or 3.3V.

The power supply selection is performed using the JP2, JP3, JP4 and JP5 jumpers.

The power supply can be turned on/off using the “power” switch (SW6). Once the power is established, the power LED (D9) is lit.

**Figure 2-2.** Different Power Configurations

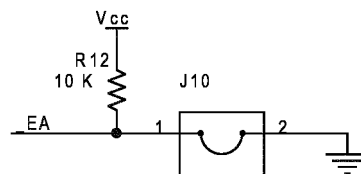
Power Source Regulation	VBUS	VBUS and Current Limiter	External
Direct Input			
5V Regulate			
3.3V Regulate			



## 2.3 C51 Standard Settings

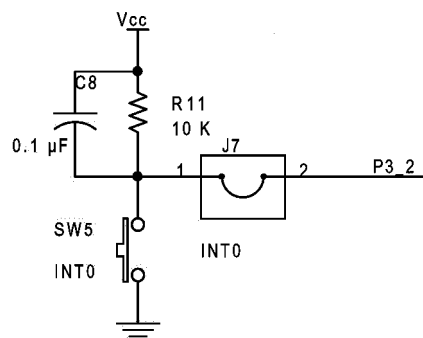
- 2.3.1 Reset** The external Reset push-button (SW3) is provided to easily generate a warm reset. This button is used for ISP process. The Reset applied is active low.
- 2.3.2 Clock** A crystal can be easily installed on the Y1 socket. The clock can also be provided using the J8 connector instead of the crystal.
- Note:** Remove the clock generators before the using the programmer.
- 2.3.3 EA** Place a jumper on the EA connector (J10) to force the  $\overline{EA}$  pin to ground and execute external code. Otherwise internal code will be executed.

**Figure 2-3.**  $\overline{EA}$  Circuitry



- 2.3.4 INT0** In order to use the on-board INT0 circuitry, connect the J7 Jumper to the AT89C5131. When you press the INT0 button (SW5), the P3.2 pin will go low which induces an interrupt event.
- Note:** Remove the J7 jumper before using the programmer. Otherwise the programmer will not function.

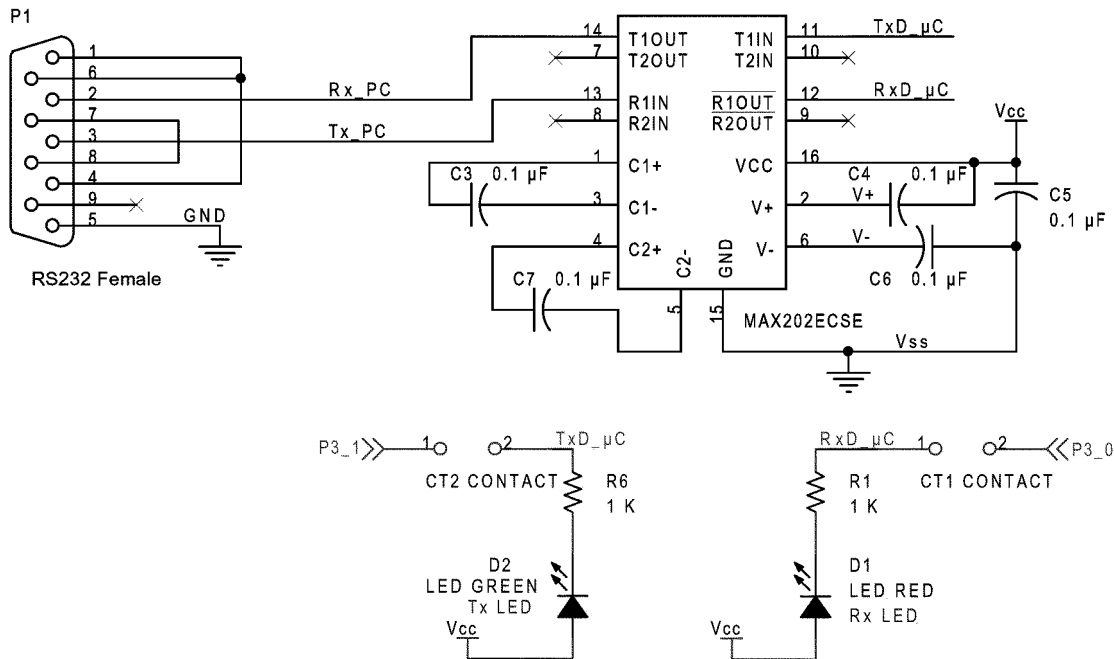
**Figure 2-4.**  $\overline{INT0}$  Circuitry



## 2.4 Feature Description

**2.4.1 RS232** The AT89C5131 evaluation board includes all the required hardware to manage the RS232 communication.

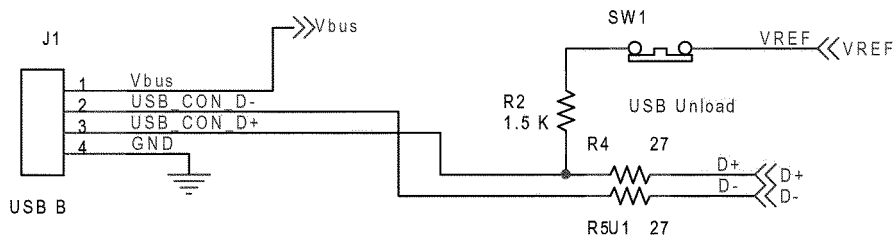
**Figure 2-5.** RS232 On-board Circuitry



**2.4.2 USB Peripheral** The AT89C5131 evaluation board provides all the required hardware to develop a USB firmware for the AT89C5131, this includes:

- a USB connector
- 2 test points on D+ and D-
- 1 test point on  $V_{BUS}$
- a USB UNLOAD button which allows to disconnect the pull-up on D+ and then to simulate an Attach/Detach of the USB cable

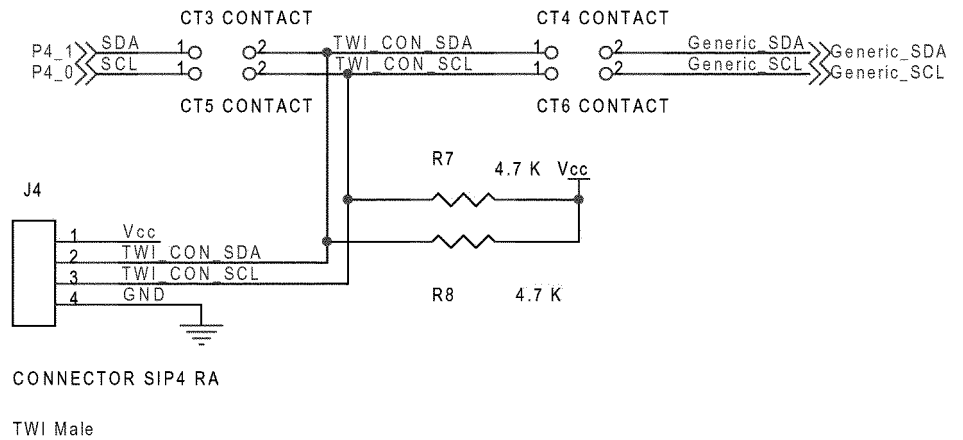
The USB peripheral can also be used to perform an In-System Programming.



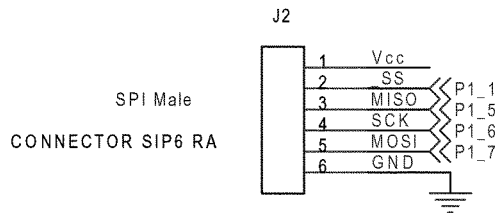
2.4.3 TWI Peripheral

The CT3 and CT5 contacts have to be soldered in order to use the SDA and SCL alternate P4.1 and P4.0 port configuration on the SPI connector (J4).

In order to use these signals on the J5 extension connector (SDA and SCL), the CT4 and CT6 contacts have to also be soldered.



2.4.4 SPI Peripheral



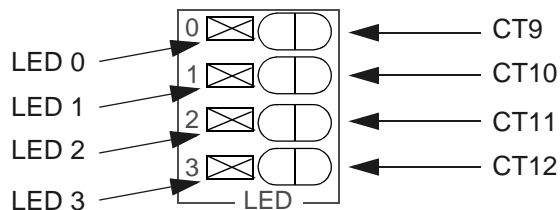
2.4.5 LED Controller

The AT89C5131 controller includes an LED controller on:

- P3.3 (LED 0)
- P3.5 (LED 1)
- P3.6 (LED 2)
- P3.7 (LED 3)

The on board LEDs can be controlled with the AT89C5131 if the corresponding contacts CT9, CT10, CT11 and CT12 are bypassed.

Figure 2-6. On-board LEDs for LED Controller



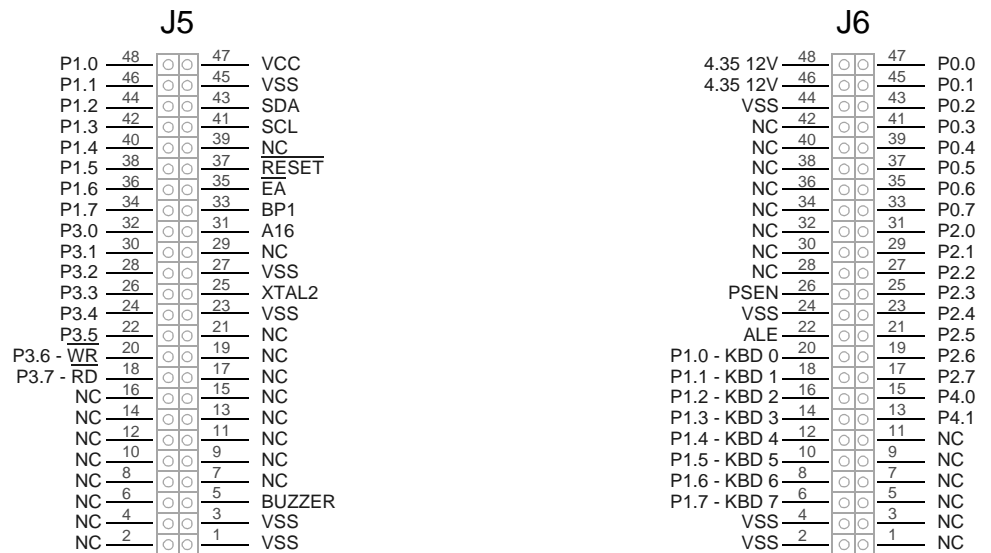
## 2.5 External Connectors

These two external connectors allow the use of the C51 generic board extension or to build a customer extension board easily.

For the C51 generic extension board, the main features are:

- P0-P2: external program memory (EA jumper has to be connected)
- RD/WR/PSEN/ALE
- P1: standard C51 port or Keyboard controller
- SDA/SCL: TWI bus

**Figure 2-7.** Top View of J5 and J6 Connectors





## Section 3

# Device Programming

### 3.1 In-System Programming

The user memory of the AT89C5131 part can be programmed using the ISP mode of the device. In order to enter in ISP mode, first select the high pin count mode (PSEN) or the low pin count mode (P1.0) using the ISP switch (SW2).

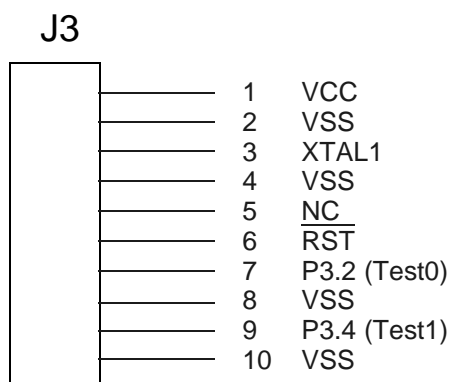
To enter in ISP mode, press both the RESET (SW3) and ISP (SW4) buttons simultaneously. First release the RESET button and then the ISP button. The device enters in ISP mode.

ISP can then be performed using the USB bus (or with the peripheral corresponding with the bootloader version). The user may need to re-enumerate the USB bus using the USB UNLOAD button (SW1) if the USB cable is already connected.

### 3.2 Using a Programmer

The AT89C5131 microcontroller can also be programmed using a programmer with the J3 connector. Connect all required signals between the programmer and the J3 connector and remove the J7 jumper to disconnect the EA circuitry. No clock should be enabled on the board, except the clock coming from the J3 connector.

**Figure 3-1.** J3 Connector Schematic





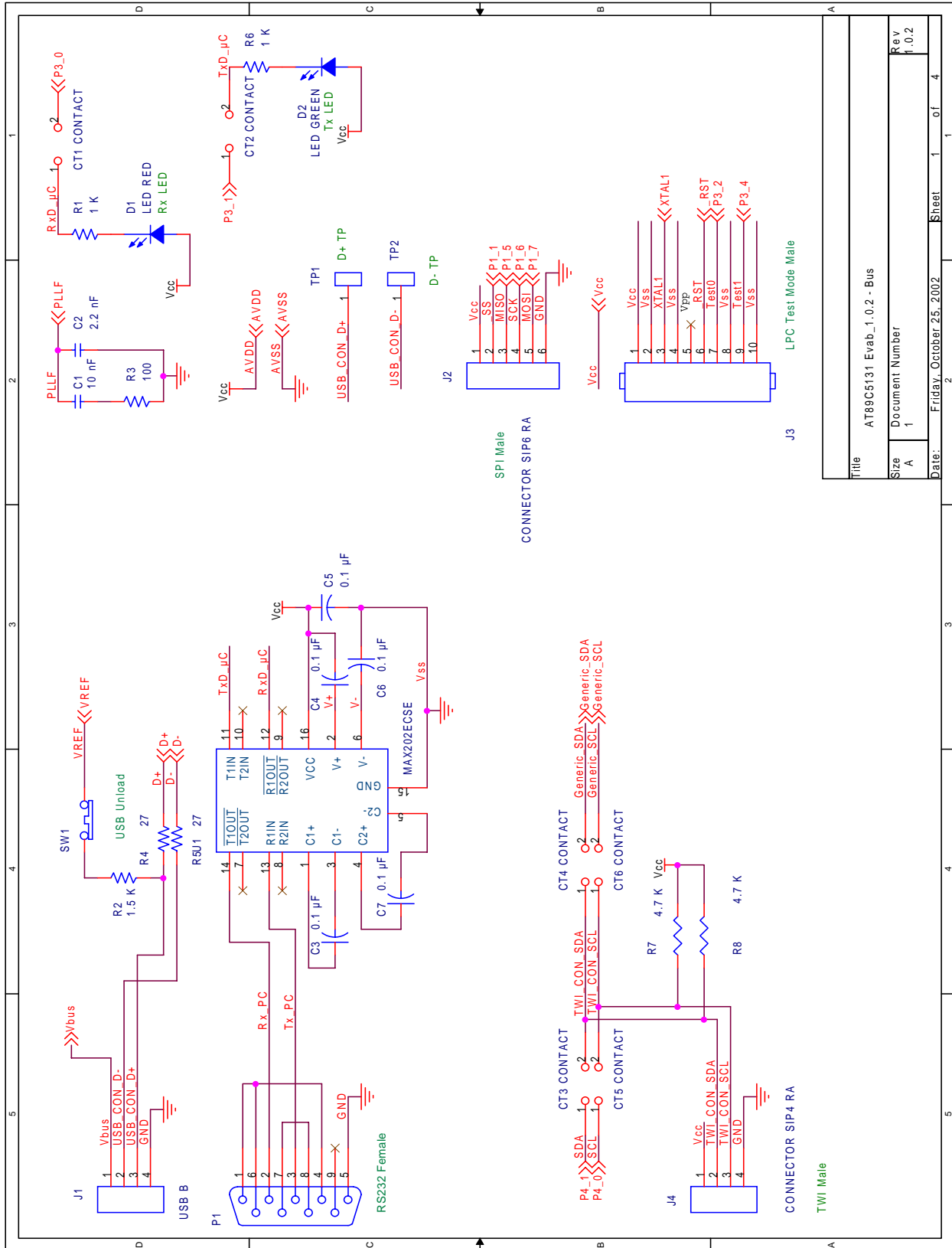


## Section 4

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## Appendix

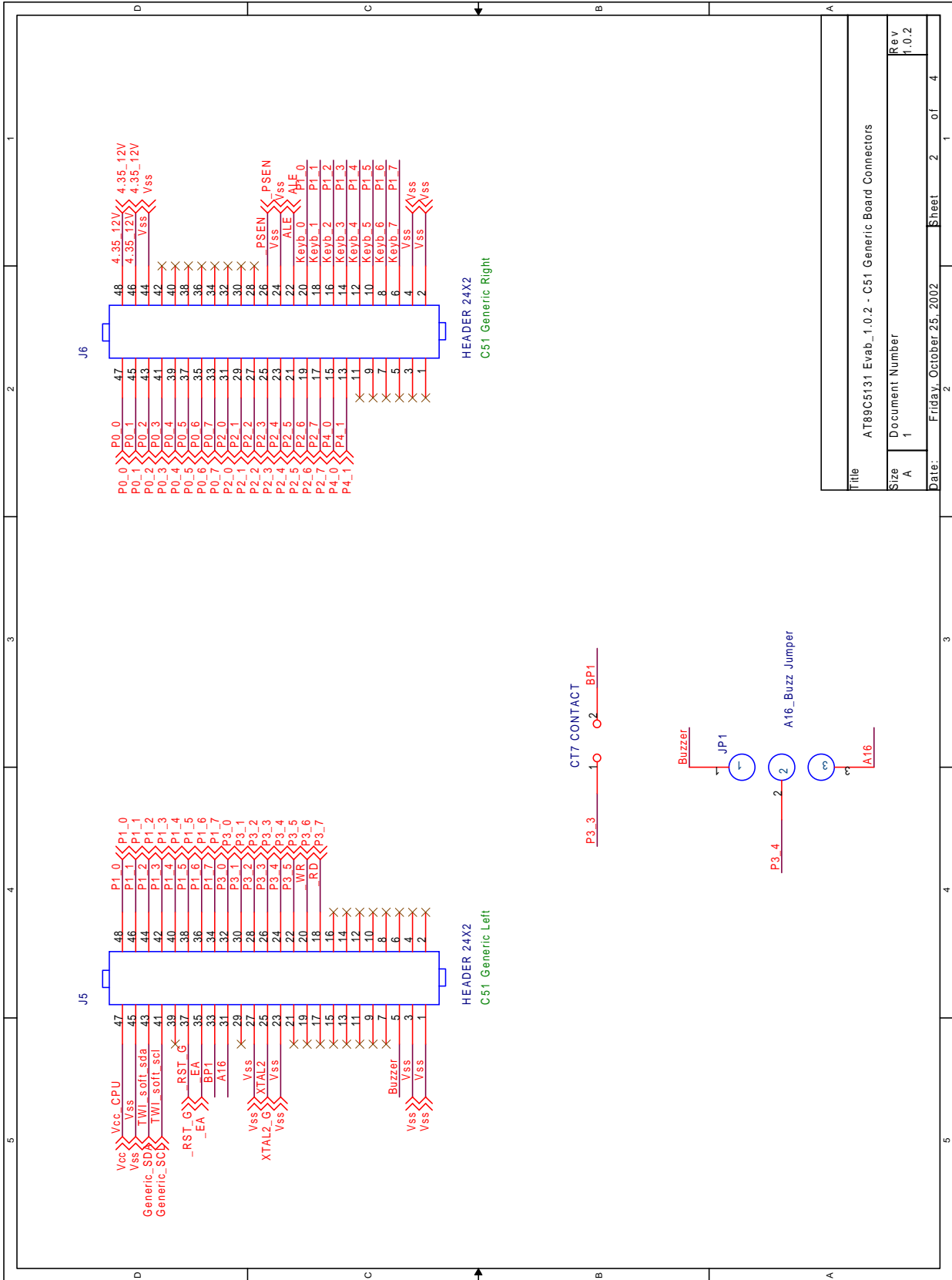
# 4.1 Electrical Schematics



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Rev	1.0.2		

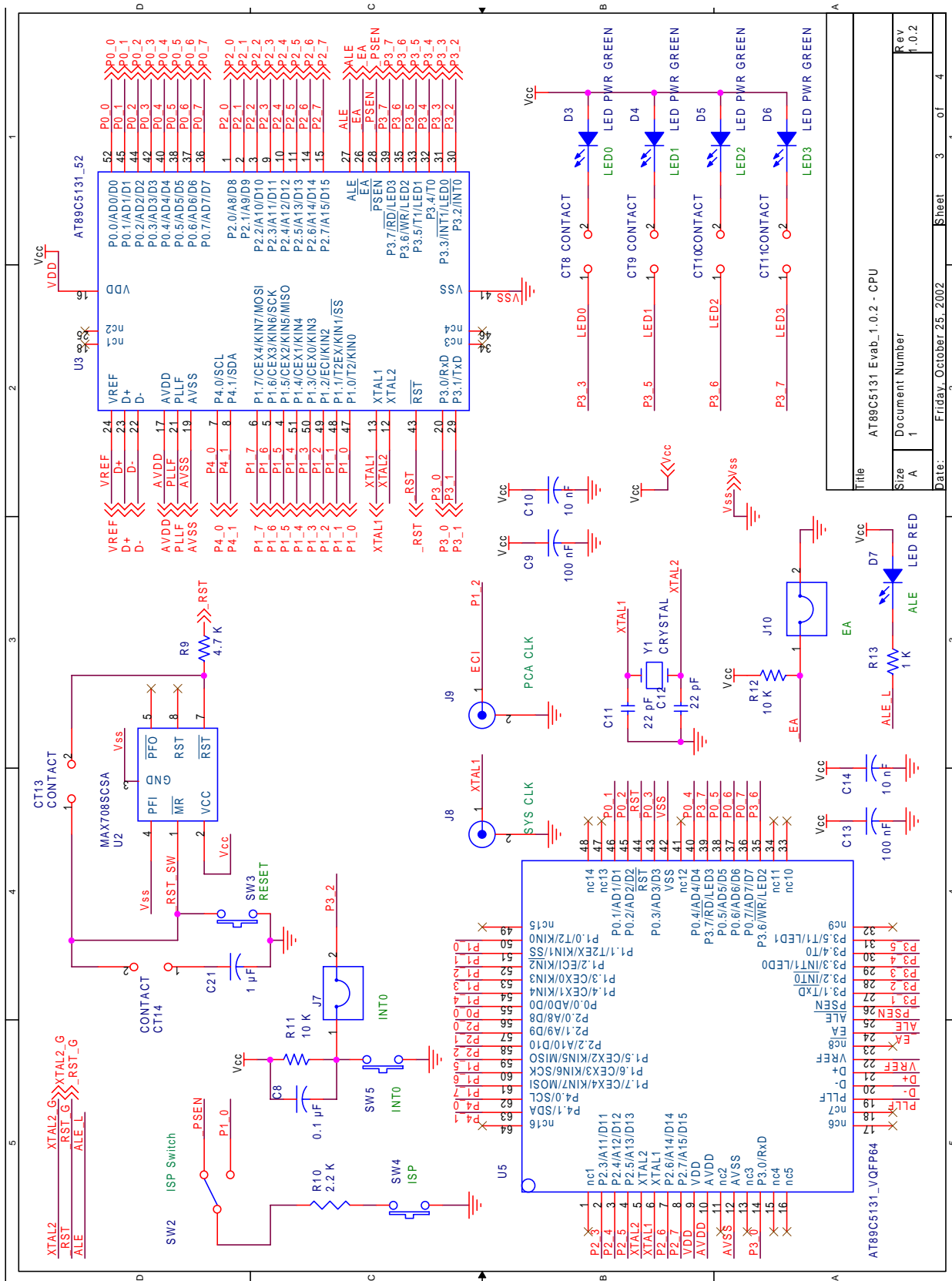




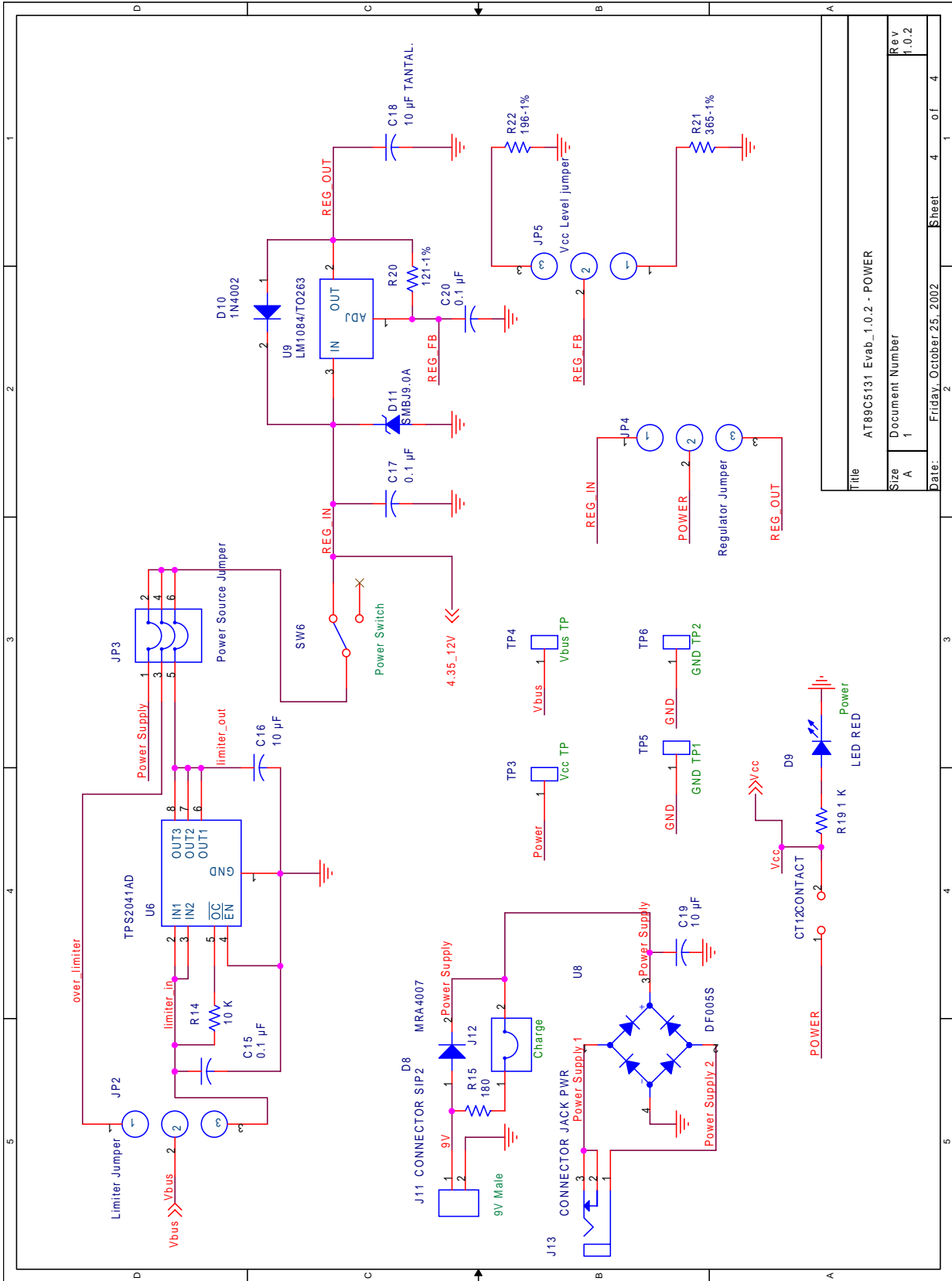


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Date:	Friday, October 25, 2002	Sheet	2 of 4





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Rev	1.0.2		
Date:	Friday, October 25, 2002	Sheet	3 of 4



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AT89C5131 Evab_1.0.2 - POWER			
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## 4.2 Component Placement

Figure 4-1. AT89C5131 Evaluation Board Overview

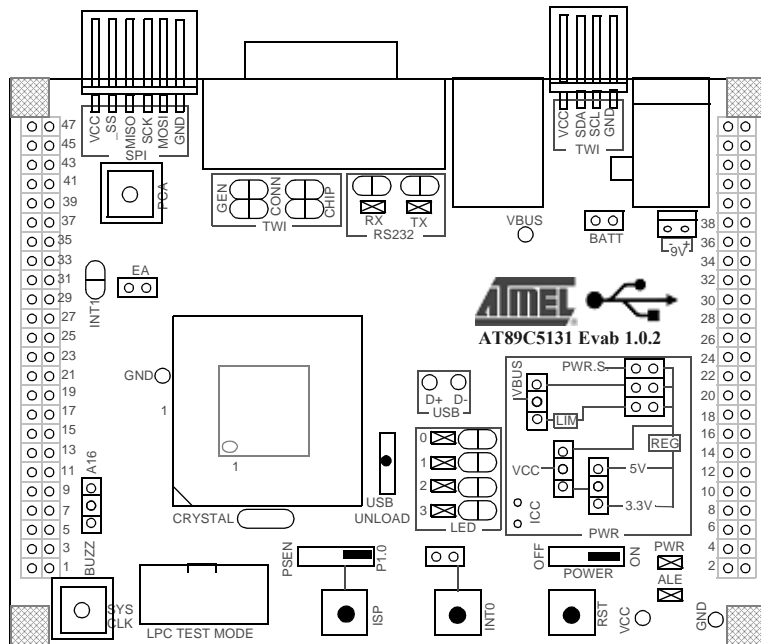
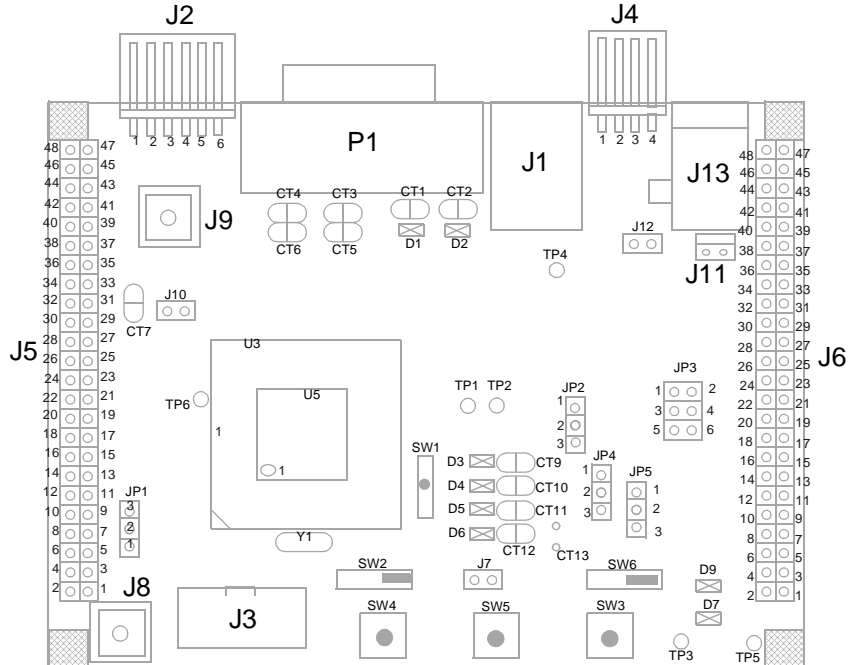
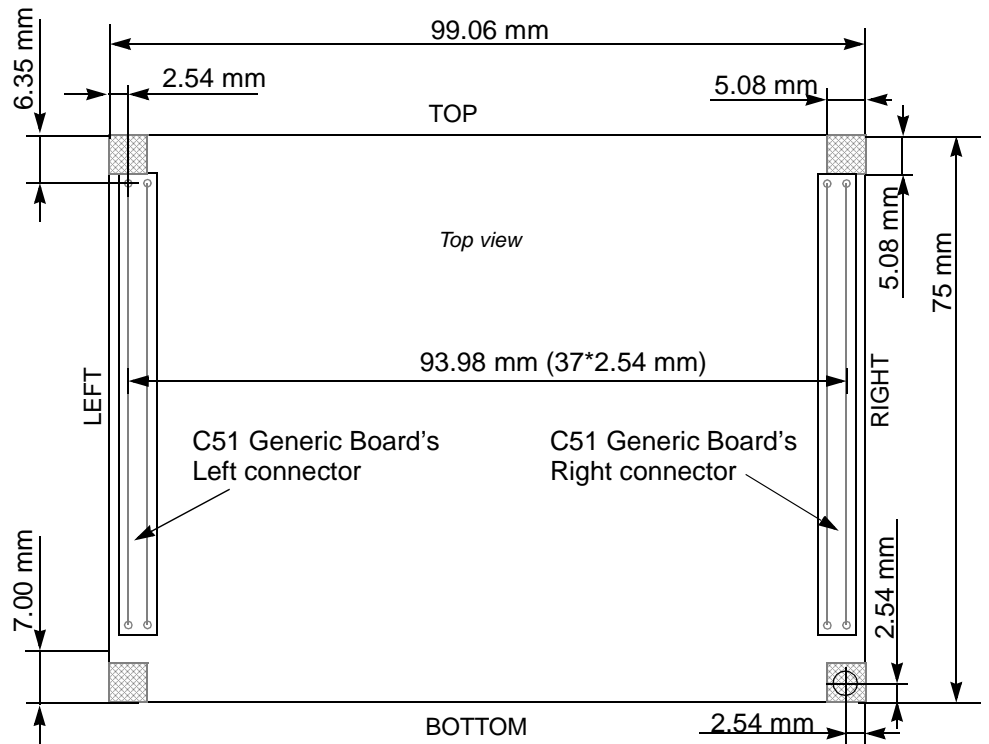


Figure 4-2. AT89C5131 Evaluation Board Component Implementation



### 4.3 Mechanical Outlines

**Figure 4-3.** AT89C5131 Evaluation Board Mechanical Outlines



### 4.4 Bill of Materials

**Table 4-1.** Bill of Materials

Item	Quantity	Reference	Part	Description	Package
1	2	C11	22 pF		CASE 0805
		C12	22 pF		CASE 0805
2	1	C2	2.2 nF		CASE 0805
3	3	C1	10 nF		CASE 0805
		C10	10 nF		CASE 0805
		C14	10 nF		CASE 0805
4	2	C9	100 nF		CASE 0805
		C13	100 nF		CASE 0805

Table 4-1. Bill of Materials (Continued)

Item	Quantity	Reference	Part	Description	Package
5	9	C3	0.1 $\mu$ F		CASE 0805
		C4	0.1 $\mu$ F		CASE 0805
		C5	0.1 $\mu$ F		CASE 0805
		C6	0.1 $\mu$ F		CASE 0805
		C7	0.1 $\mu$ F		CASE 0805
		C8	0.1 $\mu$ F		CASE 0805
		C15	0.1 $\mu$ F		CASE 0805
		C17	0.1 $\mu$ F		CASE 0805
		C20	0.1 $\mu$ F		CASE 0805
6	1	C21	1 $\mu$ F		CASE 0805
7	2	C19	10 $\mu$ F		
		C16	10 $\mu$ F		
8	2	R5	27		CASE 0805
		R4	27		CASE 0805
9	1	R3	100		CASE 0805
10	1	R15	180		CASE 0805
11	4	R1	1K		CASE 0805
		R6	1K		CASE 0805
		R13	1K		CASE 0805
		R19	1K		CASE 0805
12	1	R2	1.5K		CASE 0805
13	1	R10	2.2K		CASE 0805
14	3	R7	4.7K		CASE 0805
		R8	4.7K		CASE 0805
		R9	4.7K		CASE 0805
15	3	R11	10K		CASE 0805
		R12	10K		CASE 0805
		R14	10K		CASE 0805
16	1	D2	LED GREEN	Tx LED	PLCC-2
17	3	D1	LED RED	Rx LED	PLCC-2
		D7	LED RED	ALE	PLCC-2
		D9	LED RED	Power	PLCC-2
18	4	D3	LED PWR GREEN		LED0
		D4	LED PWR GREEN		LED1
		D5	LED PWR GREEN		LED2
		D6	LED PWR GREEN		LED3

Table 4-1. Bill of Materials (Continued)

Item	Quantity	Reference	Part	Description	Package
5	9	C3	0.1 $\mu$ F		CASE 0805
		C4	0.1 $\mu$ F		CASE 0805
		C5	0.1 $\mu$ F		CASE 0805
		C6	0.1 $\mu$ F		CASE 0805
		C7	0.1 $\mu$ F		CASE 0805
		C8	0.1 $\mu$ F		CASE 0805
		C15	0.1 $\mu$ F		CASE 0805
		C17	0.1 $\mu$ F		CASE 0805
		C20	0.1 $\mu$ F		CASE 0805
6	1	C21	1 $\mu$ F		CASE 0805
7	2	C19	10 $\mu$ F		
		C16	10 $\mu$ F		
8	2	R5	27		CASE 0805
		R4	27		CASE 0805
9	1	R3	100		CASE 0805
10	1	R15	180		CASE 0805
11	4	R1	1K		CASE 0805
		R6	1K		CASE 0805
		R13	1K		CASE 0805
		R19	1K		CASE 0805
12	1	R2	1.5K		CASE 0805
13	1	R10	2.2K		CASE 0805
14	3	R7	4.7K		CASE 0805
		R8	4.7K		CASE 0805
		R9	4.7K		CASE 0805
15	3	R11	10K		CASE 0805
		R12	10K		CASE 0805
		R14	10K		CASE 0805
16	1	D2	LED GREEN	Tx LED	PLCC-2
17	3	D1	LED RED	Rx LED	PLCC-2
		D7	LED RED	ALE	PLCC-2
		D9	LED RED	Power	PLCC-2
18	4	D3	LED PWR GREEN		LED0
		D4	LED PWR GREEN		LED1
		D5	LED PWR GREEN		LED2
		D6	LED PWR GREEN		LED3



Table 4-1. Bill of Materials (Continued)

Item	Quantity	Reference	Part	Description	Package
19	1	D8	MRA4007		SMA
20	1	D11	SMBJ9.0A		SMB/DO-214AA
21	1	U1	MAX202ECSE		SO16
22	1	U8	DF005S		SMD specific
23	6	TP1	TEST POINT	D+ TP	.
		TP2	TEST POINT	D- TP	.
		TP3	TEST POINT	Vcc TP	.
		TP4	TEST POINT	Vbus TP	.
		TP5	TEST POINT	GND TP1	.
		TP6	TEST POINT	GND TP2	.
24	3	J7	JUMPER	INT0	.
		J10	JUMPER	EA	.
		J12	JUMPER	Charge	.
25	1	J13	CONNECTOR JACK PWR	.	
26	2	J8	CONNECTOR BNC		SYS CLK
		J9	CONNECTOR BNC		PCA CLK
27	1	P1	SUB-D9 FEMALE		.
28	1	J1	USB B		.
29	2	J6	HEADER 24X2		.
		J5	HEADER 24X2		.
30	1	J11	CONNECTOR SIP2		9V Male
31	1	J4	CONNECTOR SIP4 RA		TWI Male
32	1	J2	CONNECTOR SIP6 RA		SPI Male
33	1	J3	CONNECTOR HE10		LPC Test Mode Male
34	2	SW6	SW KEY-SPDT		Power Switch
		SW2	SW KEY-SPDT		ISP Switch
35	1	U3	AT89C5131_52		PLCC52
36	1	U5	AT89C5131_VQFP64		VQFP64



Table 4-1. Bill of Materials (Continued)

Item	Quantity	Reference	Part	Description	Package
37	14	CT1	CONTACT		
		CT2	CONTACT		
		CT3	CONTACT		
		CT4	CONTACT		
		CT5	CONTACT		
		CT6	CONTACT		
		CT7	CONTACT		
		CT8	CONTACT		
		CT9	CONTACT		
		CT10	CONTACT		
		CT11	CONTACT		
		CT12	CONTACT		
		CT13	CONTACT		
		CT14	CONTACT		
38	1	C18	10 $\mu$ F TANTAL		
39	1	D10	1N4002		
40	1	JP1	A16_Buzz Jumper		
41	1	JP2	Limiter Jumper		
42	1	JP3	Power Source Jumper		
43	1	JP4	Regulator Jumper		
44	1	JP5	V <sub>CC</sub> Level jumper		
45	1	R20	121-1%		
46	1	R21	365-1%		
47	1	R22	196-1%		
48	1	SW1	CONTACT BREAKER	USB Unload	
49	1	SW3	PUSH-BUTTON	RESET	
50	1	SW4	PUSH-BUTTON	ISP	
51	1	SW5	PUSH-BUTTON	INT0	
52	1	U2	MAX708SCSA		
53	1	U6	TPS2041AD		
54	1	U9	LM1084/TO263		
55	1	Y1	CRYSTAL		



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