

AT89STK-08 Starter Kit

Hardware User Guide



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Section 1

Introduction

This document describes the AT89STK-08 board dedicated to the standard C51 micro-controllers with in-system programming.

All of the microcontroller I/Os are made available in two connectors for extension.

1.1 Features

- Stand-alone Board
- In-System Programmable (ISP) including 'Auto ISP' feature
- On-board Voltage Regulator
- Two sockets
 - PLCC44-pin package
 - PLCC68-pin package
- On-board 3V or 5V power supply circuitry
 - from an external power connector
 - from an external battery
- On-board RESET
- Leds : Power, ALE, RS232 Rx and Tx
- External MCU clock connector
- External PCA clock connector
- TWI, SPI and RS232 connectors
- INT0 Push-button
- Connectors for Card Extension
- Commercial Temperature Range: 0 to +70°C Operating Temperature
- Dimension: 75 mm x 100 mm

1.2 Supported Devices

- AT89C51RB2
- AT89C51RC2
- AT89C51RD2
- AT89C51IB2
- AT89C51ED2
- AT89C51IC2
- AT89C51ID2

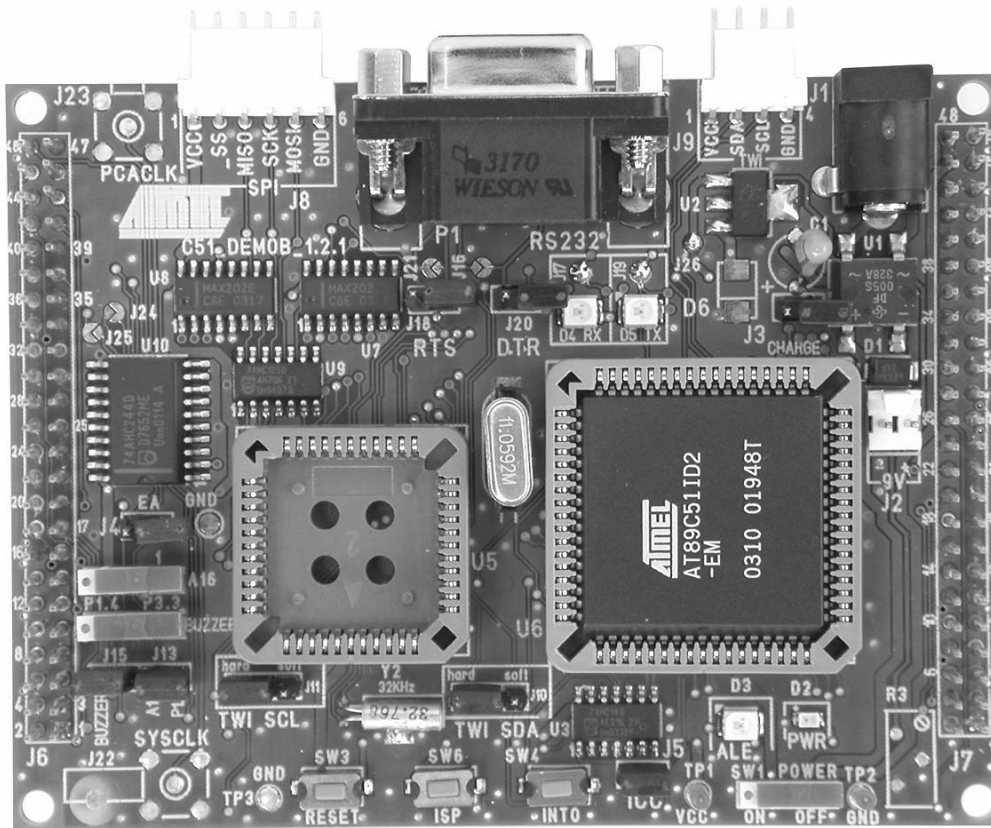


Section 2

Hardware Description

2.1 **Board Overview** Figure 2-1 shows the AT89STK-08 board.

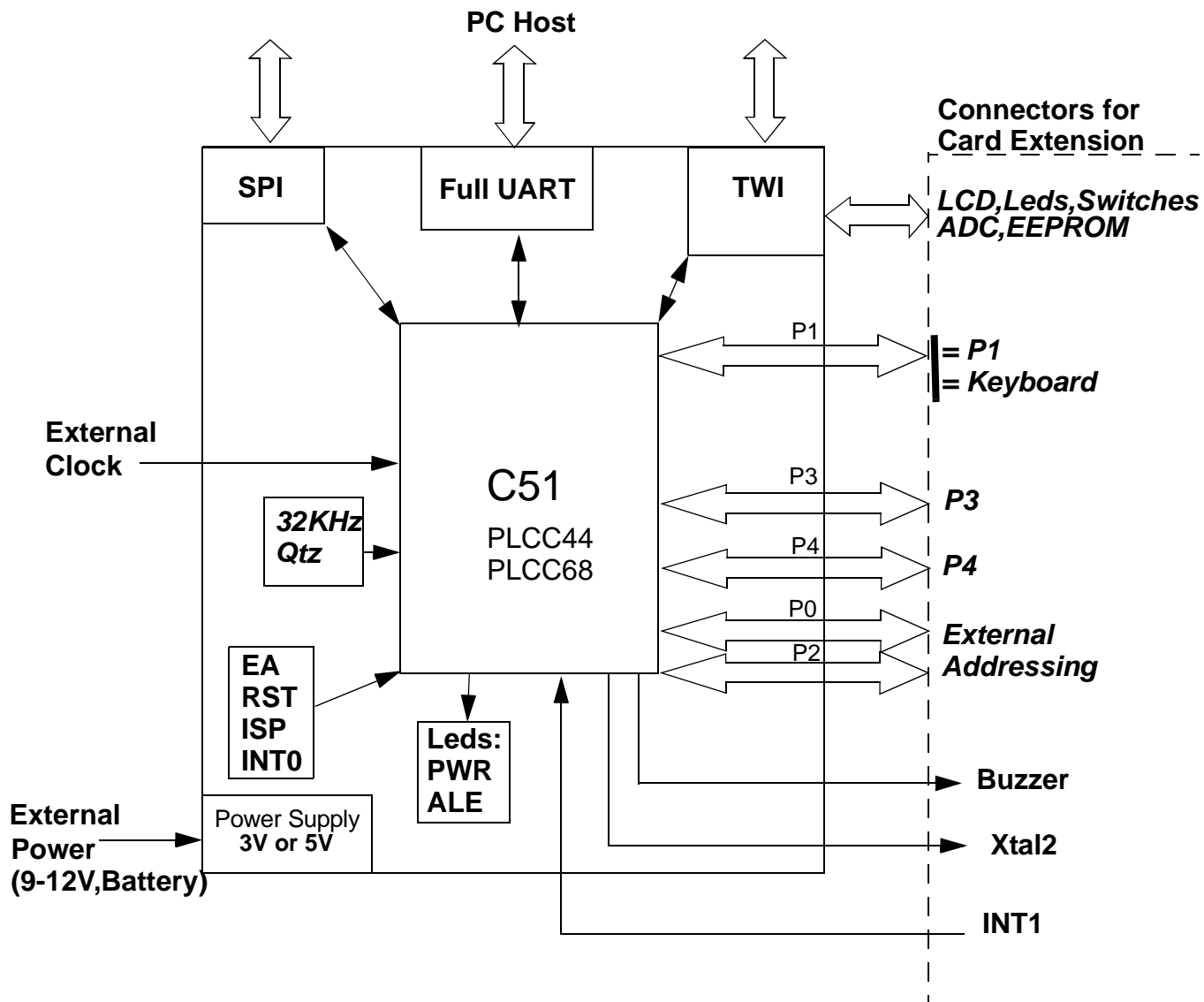
Figure 2-1. AT89STK-08



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2.2 Block Diagram Figure 2-2 shows the functional block diagram of the AT89STK-08, with the I/O usage.

Figure 2-2. Block Diagram of AT89STK-08



2.3 Power Supply The on-board power supply circuitry allows various power supply configurations.

- 2.3.1 Power Supply Sources** The power supply source can come from two different and **exclusive** sources:
- either from J1, JACK PWR connector
 - either from J2, 9V (Battery connector)

- 2.3.1.1 J1 - JACK PWR Connector**
- Requires a male JACK outlet
 - No specific polarization mandatory

Note: There is a diode voltage level between the negative output of the power supply and the "GND". This could introduce some voltage gap during measurement and instrumentation.

Figure 2-2 . Male JACK Outlet and Wires

Caution: Do not mount more than **one** power supply source on AT89STK-08 Board.

2.3.1.2 J2 - 9V Battery connector

- Need of a female 2 points connector
- Input supply from 6 up to 10V DC (example: 9V battery)
- Polarization mandatory

Figure 2-3 . EXT PWR Female Connector / Cable for 9V Battery

Caution: Do not mount more than **one** power supply source on board.

The jumper J3 can be used to reload a 9V battery. (**WARNING:** polarity connection must be verified).

2.3.2 Internal Voltages

Vcc can be controlled with R3 potentiometer.

2.4 Reset

To be compatible with Atmel microcontrollers which have (or not) its on-chip RESET circuitry (c.f. microcontroller datasheet), the board provides a RESET signal witch can come from 2 different sources:

2.4.1 Power-on RESET

The on-board RC network acts as power-on RESET.

2.4.2 RESET Push Button

By pressing the SW3 RESET push button on the board, a warm RESET of the microcontroller is performed.

2.5	Feature Description	The Jumpers which are listed in the following descriptions are gathered in Table 2-1 on page 7.
2.5.1	LEDs	<ul style="list-style-type: none">- PWR : D2 led is driven by input of voltage regulator- Rx : D4 led is connected to Rx of UART MCU (J17 jumper can be soldered or not)- Tx : D5 led is connected to Tx of UART MCU (J19 jumper can be soldered or not)- ALE : D3 led
2.5.2	INT0	Switch SW4 can be used to activate INTO input
2.5.3	Clocks	An external clock can be connected at SYS CLK connector (J22) to control externally XTAL1 input clock of MCU. The J24 jumper is used to disconnect this optional input. Another external clock can be connected at PCA CLK connector (J23) to control externally the PCA clock (P1.2/ECI). The J25 jumper is used to disconnect this optional input.

2.6 Interface

2.6.1	TWI	<p>The TWI connector J9 can be controlled by:</p> <ul style="list-style-type: none">- Hardware TWI I/O of MCU (for Product including this feature). The signals TWI_hard_sda and TWI_hard_scl are controlled by the TWI ports of MCU.- Software TWI. This can be done using the J10 and J11 jumpers which respectively connect to TWI_soft_sda and TWI_soft_scl. They can be software driven on standard I/O P3.4 and P3.5 <p>This TWI bus is also connected to the J6 2X24 connector.</p> <p>External TWI pull-ups are not provided on the AT89STK-08.</p>
2.6.2	SPI	The SPI connector J8 is connected to SPI I/O of the MCU.
2.6.3	RS-232C	The P1 DB9 connector is connected to on-chip UART peripheral through a RS-232 driver/receiver.
2.6.4	Connectors for Card Extension	<p>Two 2 x 24 connectors offer an extension to the board.</p> <p>Be careful to plug the MCU board into an extension board correctly:</p> <ul style="list-style-type: none">■ All microcontroller I/Os are available in extension connectors.■ See Figure 4-5 on page 16.

2.7 Board Settings

The C51 Demo Board has the following settings:

- Jumpers
- Switches
- Solder straps
- Test points

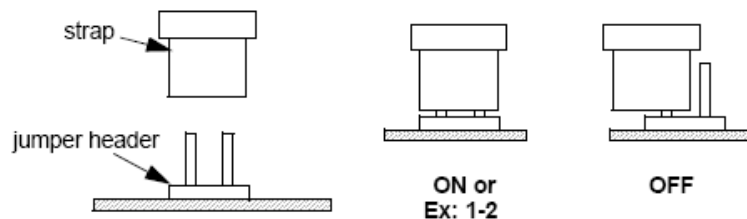
2.7.1 Jumpers, Switches

The following table provides an overview of the jumpers, switches and their default configuration.

Table 2-1. Jumpers and Switches Overview

Reference	PCB Label	Function	Default
Jumper J4	EA	External Address (external code)	OFF
Jumper J3		Refill of 9V accumulator	OFF
Jumper J5	ICC	Consumption measurement	ON
Jumper J11	TWI_SCL	Selection of SCL TWI : hard or soft	hard
Jumper J10	TWI_SDA	Selection of SDA TWI : hard or soft	hard
Jumper J18	RTS	RTS of RS232	OFF
Jumper J20	DTR	DTR of RS232	OFF
Switch SW1		Power On/Off	OFF
Solder strap J24	SYS CLK	External clock to control XTAL1	Not soldered
Solder strap J25	PCA CLK	External clock to control PCA clock	Not soldered
Switch	A16	A16 output (0, 1, or P1.4)	1
Jumper J13	J13	A16 = P1.4 or driven by A16 switch	ON
Switch	BUZZER	Buzzer output switched between P1.4 or P3.3 (J15 jumper in series)	P3.3
Jumper J15	J15	Disconnects BUZZER output	ON
Solder strap J17		Rx Led	Soldered
Solder strap J19		Tx Led	Soldered

Figure 2-3. Jumper Setting Definition



2.7.2 Solder Straps

Solder straps allow to modify the board configuration for specific usage.

Table 2-2. Solder Straps Overview

Reference	PCB Label	Function	Default
Solder strap J24	SYS CLK	External clock to control XTAL1	Open
Solder strap J25	PCA CLK	External clock to control PCA clock	Open
Solder strap J17		Rx Led	Close
Solder strap J19		Tx Led	Close

Figure 2-4. Solder Strap Definition



2.7.3 Test Points

Test points are used to check the internal power supply of the microcontroller.

Table 2-3. Table of Test Points

Reference	PCB Label	Function
TP1	Vcc	Test point for Vcc
TP2,TP3	GND	Test point for GND



Section 3

ISP Programming

The On-Chip memories and configuration bytes can be programmed using the ISP mode of the device and Atmel's FLexible In-system Programmer Software (FLIP) described below.

-
- 3.1 Manual ISP Mode** See Section “FLIP Software”, page 10.
- 3.1.1 Board Configuration** To use ISP mode, the board should be configured as follow:
- POWER switch (SW1) on “ON” position
 - EA jumper should be open (internal code execution only).
- 3.1.2 Operating Mode** To enter in ISP mode, press both the RESET (SW3) and ISP (SW6) buttons simultaneously.
First release the RESET button and then the ISP button. The device enters in ISP mode.
-
- 3.2 Auto ISP Mode** It allows the host PC application (ATMEL Flip software for example) to control the hardware conditions from the serial lines RTS and DTR.
Thus with the Auto ISP mode, the user does not need to push the ISP and RESET buttons.
- 3.2.1 Board Configuration** To use Auto ISP mode, put the board in the same configuration as ISP mode and also:
- Close RTS (J18) jumper
 - Close DTR (J20) jumper

3.3 FLIP Software FLIP software runs on Windows® and Linux® Operating Systems. FLIP supports in-system programming of Flash C51 devices through RS232. The latest version of FLIP software can be downloaded from the Atmel web site, www.atmel.com.

3.4 Batchisp Software Batchisp is an In-System Programming application which can perform the same operations than FLIP but is designed to be launched from the DOS command window.

The main purpose of batchisp is to automate ISP operations on a lot of parts. It may also be launched from an IDE like Keil's uVision2 one : you can compile and link your embedded program, generate the HEX file and download it to the target hardware without leaving the Keil's IDE. This makes embedded software development and test faster.

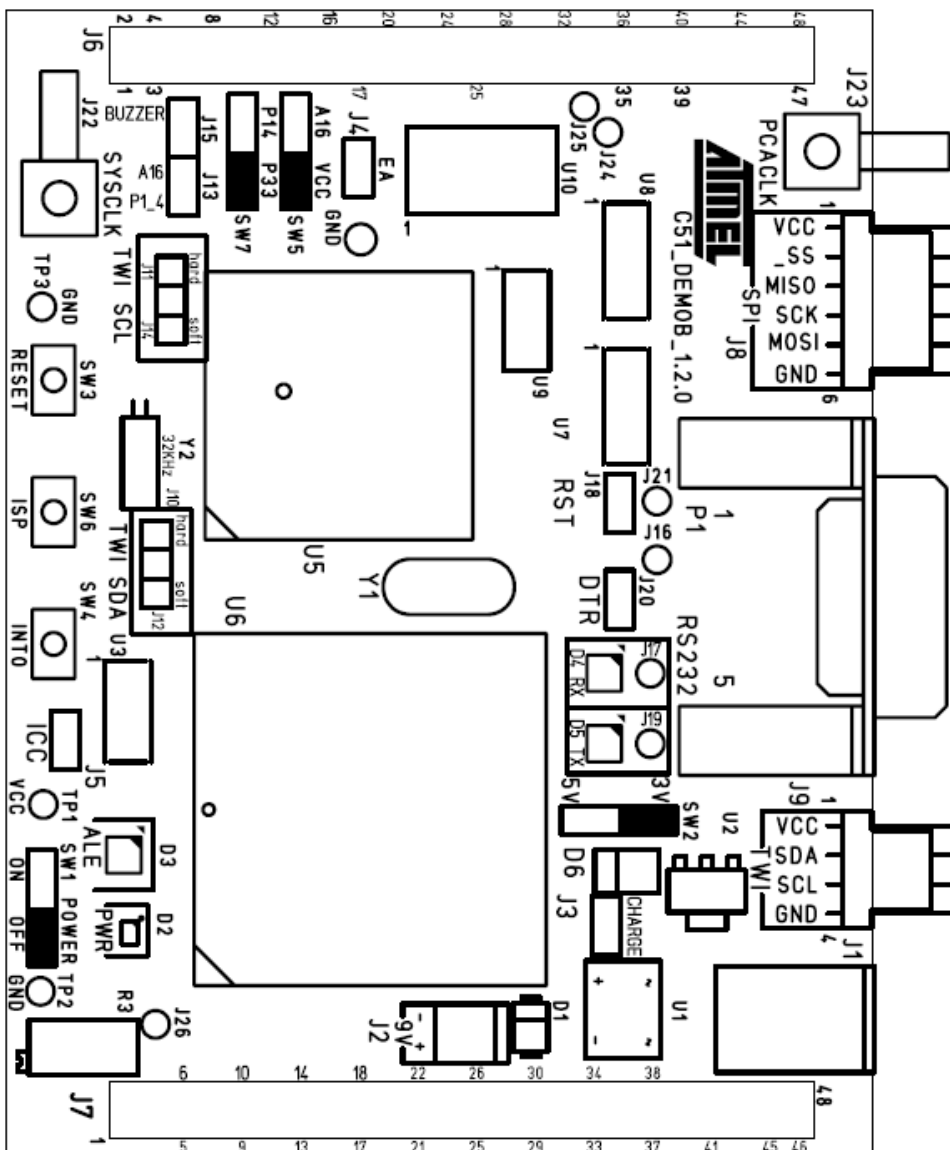
Autoisp function is an operation which allows to enter in ISP mode without any hardware handling. This is done thanks to DTR and RTS RS232 signals which can control on the Board the RST and PSEN I/O of MCU.



Section 4

Appendix A: Board Layout

Figure 4-1. Board Components View Diagram



Appendix B: Bill of Materials

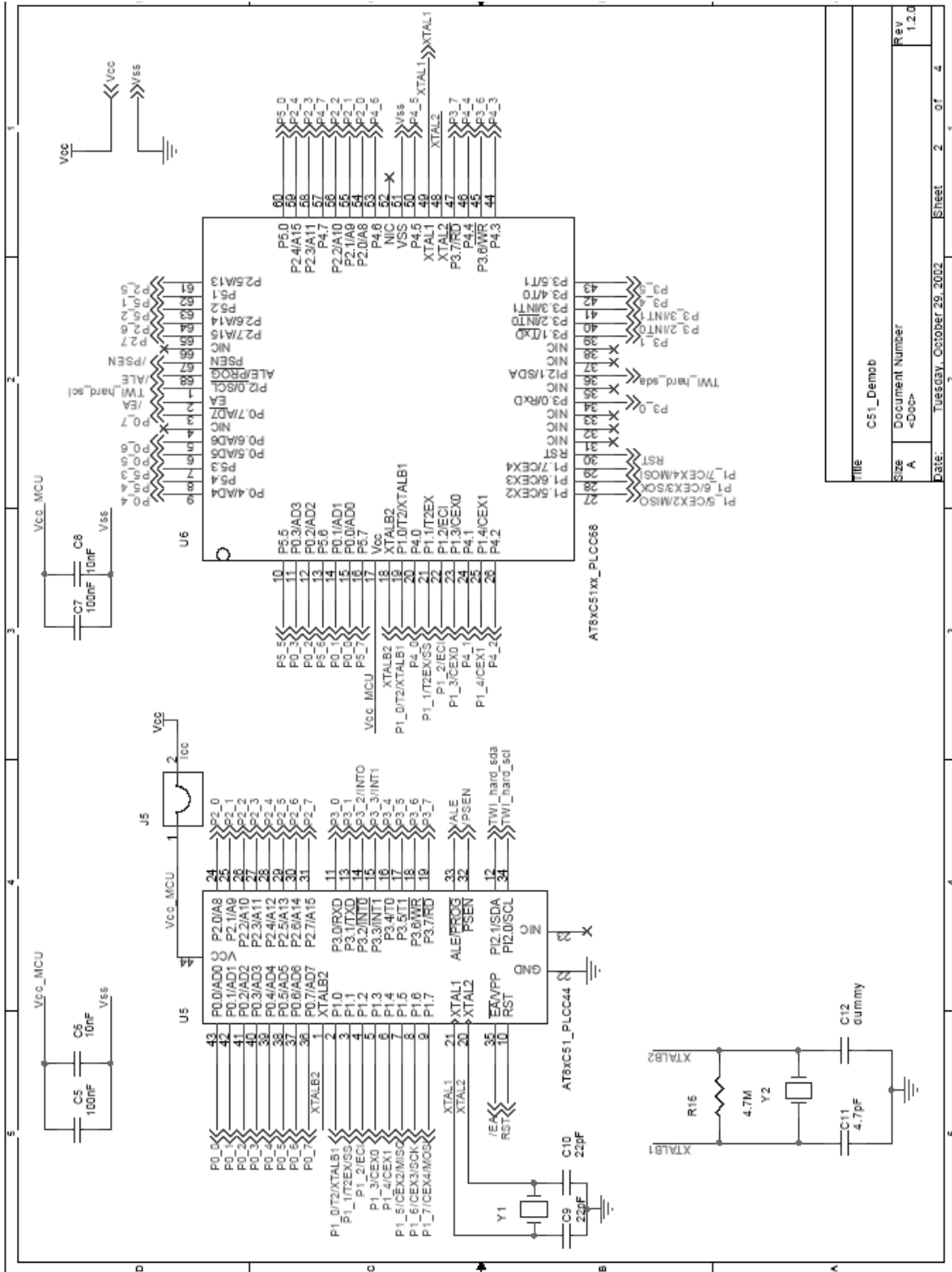
Figure 4-2. Bill of Materials Table

Item	Qty	Reference	Part	Comments	Tech. Characteristics	Package	Manufacturer
1	6	C3, C10	2pF	CAPACITOR	50V-5% Ceramic	CASE 0805	Kemet
2	1	C11	4.7pF	CAPACITOR	50V-5% Ceramic	CASE 0603	Kemet
3	0	C12	dummy	CAPACITOR	50V-5% Ceramic	CASE 0603	Kemet
4	2	C3, C6	10nF	CAPACITOR	50V-10% Ceramic	CASE 0805	Kemet
5	18	C5, C7, OD1, OD2, OD3, OD4	100nF	CAPACITOR	50V-10% Ceramic	CASE 0805	Kemet
			OD5, OD6, C15, C16, C17, C18				
			C19, C20, C21, C22, C23, C24				
7	1	C1	10uF	CAPACITOR	16V-20+80%	CASE T366	Kemet
8	3	C2, C3, C4	1uF	CAPACITOR	16V-20+80%	CASE 0805	Kemet
9	1	R5	180	RESISTOR	1/16W-5% SMD	CASE 0603	Philips
10	6	R1, R9, R13, R14, R15, R18	1K	RESISTOR	1/16W-5% SMD	CASE 0603	Philips
11	2	R10, R11	2.2K	RESISTOR	1/16W-5% SMD	CASE 0603	Philips
12	3	R6, R7, R8	10K	RESISTOR	1/16W-5% SMD	CASE 0603	Philips
13	1	R2	270	RESISTOR	1/16W-5% SMD	CASE 0603	Philips
14	1	R12	100K	RESISTOR	1/16W-5% SMD	CASE 0603	Philips
15	1	R16	4.7M	RESISTOR	1/16W-5% SMD	CASE 0603	Philips
16	1	R17	820	RESISTOR	1/16W-5% SMD	CASE 0603	Philips
17	1	R3	1K ADJ	11 Turns Trimmer	1/4W-5% SMD	T63XB	Cermet
18	2	D5, D8	LED GREEN	LED Green	LG1679-COILED Green TOPLED 2mA SMD	FLOC-2	Siemens
19	1	D4	LED RED	LED Red	LS1679-COILED Red TOPLED 2mA SMD	FLOC-2	Siemens
20	1	D2	LED PWM GREEN	LED GREEN	LPM670 LED Green Mini TOPLED 10mA SMD		Siemens
21	1	D1	MR4007	DIODE Rectifier	SMD Vf=1.1 If=1.0 Vrrm=1000	SMA	ON
22	0	D6	SVBU15A				
23	1	U10	744HC244D	8 Lines Non-Inverter Buffer		SO20	Philips
24	2	U7, U8	MAX02ECSE	RS-232 Transceiver		SO16	MAXIM
25	1	U1	DF005S	Point redresseur	Vrrm=50 If=1.0 Ifsma=50.0 Vf=1.1 If=5u	SMD specific	General Sem
26	1	U2	LM817	Regulator 3V/5V		SOT-223	National
27	1	U3	74HC14D	Inverter		SO	
28	1	U5	AT8XC51_FLOC44	Socket FLOC44	Socket		
29	1	U6	AT8XC51xx_FLOC68	Socket FLOC68	Socket		
30	1	U9	74HC125SO	Buffer			
31	3	TP1, TP2, TP3	TEST POINT	TEST POINT			
32	7	J3, J4, J5, J13, J15, J18, J20	JUMPER	2 WAYS JUMPER DROT SIMPLE RANGE	PART NUMBER FCN724F036-AU/S BARE TEL.		Fujitsu
33	2	J10, J11	JUMPER	3 WAYS JUMPER DROT SIMPLE RANGE	PART NUMBER FCN724F036-AU/S BARE TEL.		
34	7	J16, J17, J19, J21, J24, J25, J26	"grain de café"				
36	1	J1	CONNECTOR JACK	POWER CONNECTOR	Diam 2.5mm		
36	2	J2, J23	CONNECTOR BNC		SVB RIGHT ANGLE		
37	1	P1	SUB-D9 FEMALE	CONNECTOR SUB-D9 FEMALE COUDE	PITCH 2,54mm or 2,84mm with lrapoons		
38	2	J6, J7	HEADER 2x2	2x24 Headers			SAMTEC
39	1	J2	CONNECTOR SIP2	Connector MTA 2cts			
40	1	J9	CONNECTOR SIP4	Connector MTA right angle 4cts			
41	1	J8	CONNECTOR SIP6	Connector MTA right angle 6cts			
42	3	SM3, SM4, SM6	PUSHBUTTON	PUSHBUTTON	SMD		
43	2	SM1, SM5	SWITCH	Switch ON/OFF	09 03201 02 montage droit 500mA type 1K2		
44	1	SW7	SW/KEY-SFDT	Switch ON/ON			
45	1	Y1	CRYSTAL	Crystal 16MHz	HC49S 16MHz		Kory
46	1	Y2	CRYSTAL	Crystal 32.768kHz			Kory



Appendix C: Board Schematics

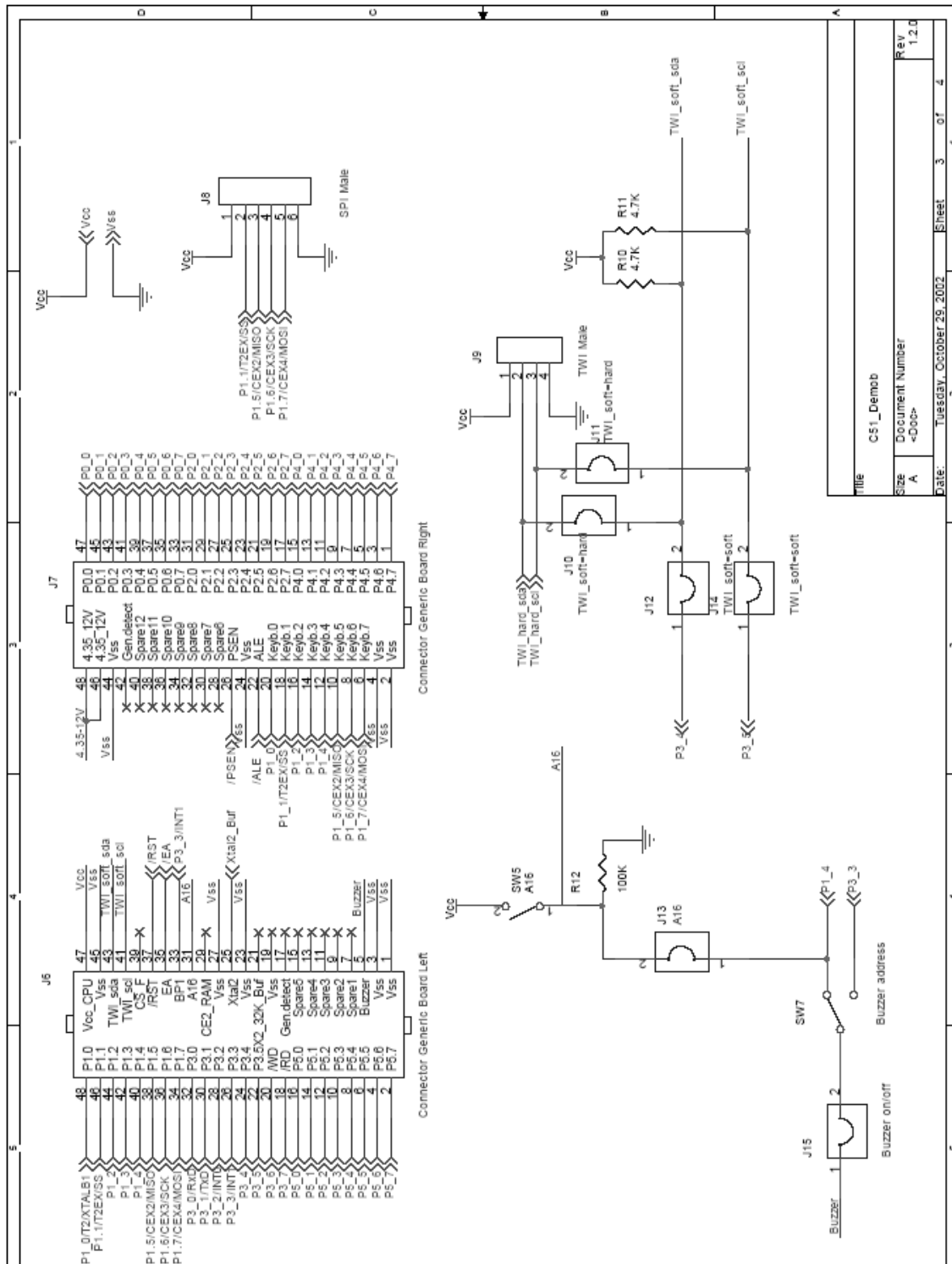
Figure 4-4. AT89STK-08 Schematics (2 of 4)



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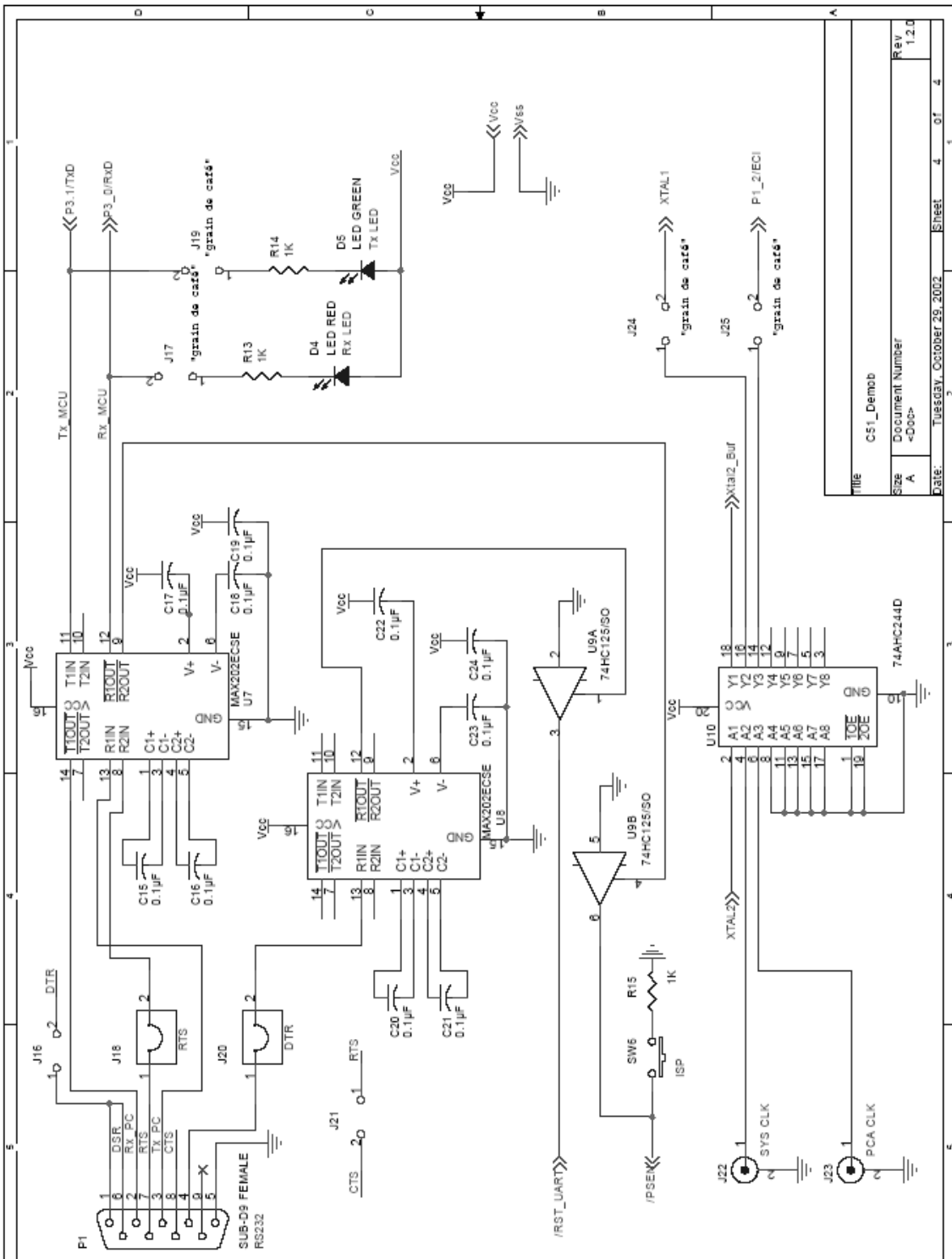
Figure 4-5. AT89STK-08 Schematics (3 of 4)



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Figure 4-6. AT89STK-08 Schematics (4 of 4).



Appendix D: References/Acronyms

4.1 **References** ■ AT89C51Rx2 Product Datasheet.

4.2 **Acronyms**

- FLIP: FLEXible In-system Programming
- ISP: In-System programming
- LPC: Low Pin Count microcontroller
- HPC: High Pin Count microcontroller (by opposition to LPC)



Atmel Headquarters

Corporate Headquarters

2325 Orchard Parkway
San Jose, CA 95131
TEL 1(408) 441-0311
FAX 1(408) 487-2600

Europe

Atmel Sarl
Route des Arsenaux 41
Case Postale 80
CH-1705 Fribourg
Switzerland
TEL (41) 26-426-5555
FAX (41) 26-426-5500

Asia

Room 1219
Chinachem Golden Plaza
77 Mody Road Tsimhatsui
East Kowloon
Hong Kong
TEL (852) 2721-9778
FAX (852) 2722-1369

Japan

9F, Tonetsu Shinkawa Bldg.
1-24-8 Shinkawa
Chuo-ku, Tokyo 104-0033
Japan
TEL (81) 3-3523-3551
FAX (81) 3-3523-7581

Atmel Operations

Memory

2325 Orchard Parkway
San Jose, CA 95131
TEL 1(408) 441-0311
FAX 1(408) 436-4314

Microcontrollers

2325 Orchard Parkway
San Jose, CA 95131
TEL 1(408) 441-0311
FAX 1(408) 436-4314

La Chantrerie
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FAX 1(719) 540-1759

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Maxwell Building
East Kilbride G75 0QR, Scotland
TEL (44) 1355-803-000
FAX (44) 1355-242-743

RF/Automotive

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Postfach 3535
74025 Heilbronn, Germany
TEL (49) 71-31-67-0
FAX (49) 71-31-67-2340

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TEL 1(719) 576-3300
FAX 1(719) 540-1759

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38521 Saint-Egreve Cedex, France
TEL (33) 4-76-58-30-00
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e-mail

literature@atmel.com

Web Site

<http://www.atmel.com>

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