Section 1
Introduction

This document describes the AT89STK-11 board dedicated to the standard C51 micro-
controllers with in-system programming.

All of the microcontroller I/Os are made available in an expansion area with prototyping
facilities.

1.1 Features

- Stand-alone Board
- In-System Programmable (ISP) including ‘Auto ISP’ feature
- On-board Voltage Regulator
- Microcontroller on its sockets
  - PLCC44-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 & INT1 Push-button
- Expansion area with prototyping facilities
- Commercial Temperature Range: 0 to +70°C Operating Temperature
- Dimension: 95 mm x 120 mm
1.2 Supported Devices

- AT89C51RE2
- AT89C51RB2
- AT89C51RC2/IC2
- AT89C51RD2/ID2/ED2
Section 2
Hardware Description

2.1 Board Overview

Figure 2-1 shows the AT89STK-11 board.

*Figure 2-1. AT89STK-11*

This photo is not contractual and may be modified without notification by Atmel.
2.2 Block Diagram  

Figure 2-2 shows the functional block diagram of the AT89STK-11, with the I/O usage.

**Figure 2-2.** Block Diagram of AT89STK-11

![Block Diagram of AT89STK-11](image)

2.3 Power Supply  
The on-board power supply circuitry allows various power supply configurations. This gives the user the capability to power the devices in the 3V and in the 5V voltage range.

2.3.1 Power Supply Sources  
The power supply source can come from two different and **exclusive** sources:

- either from the JACK PWR connector
- either from the 2-point sip EXT connector.

2.3.1.1 JACK PWR Connector  
The Jack power connector implemented on board is a female Jack connector with internal 2.1mm conductor. It requires a male JACK outlet with 2.1mm capability.

No specific polarization is mandatory as on-board diode rectifier gives a protection against inadvertent polarization inversion.

When using the JACK power supply, the board is powered with a 5V voltage.
Figure 2-3. Male JACK Outlet and Wires

Note: Do not mount more than one power supply source on AT89STK-11 Board.

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.

2.3.1.2 External EXT connector

The battery power connector implemented on board is a male two point SIP connector. It requires an external power cable with a female 2 points connector.

When powered though this interface, polarization is mandatory as no protection is given on board.

The EXT power supply circuitry support input supply from 2.7V up to 5.5V DC.

Figure 2-4. EXT PWR Female Connector / Cable

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

Note: Keep SP1 closed when using the EXT input

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 which 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 RESET push button on the board, a warm RESET of the microcontroller is performed.
Hardware Description

2.5 Features
This section presents the various features such as leds, buttons, etc... available on the board.

2.5.1 Push-Buttons
- RESET can be used to apply warm reset to the MCU
- ISP can be used with RESET to apply hardware conditions resulting in bootloader start
- INTO push-button can be used to activate INTO input
- INT1 push-button can be used to activate INT1 input

2.5.2 User Push buttons
- PB0, PB1, PB2 and PB3 are four push-buttons available for user application

2.5.3 Indicator LEDs
- PWR led is driven by input of voltage regulator
- Rx led is connected to Rx of UART MCU (SP3 jumper can be soldered or not)
- Tx led is connected to Tx of UART MCU (SP4 jumper can be soldered or not)
- ALE led is connected to ALE of MCU

2.5.4 User LEDs
- LED0, LED1, ... LED7 are height leds available for user application

2.5.5 Ports
Port 0 and Port 2 are made available on two 10 pins sockets to ease user interconnection to the MCU.

2.5.6 Clocks
An external clock can be connected to the board to control externally XTAL1 input clock of MCU by using the XTAL1 from the expansion area.

In the same way, another external clock can be connected to control externally the PCA clock (P1.2/ECI).

2.6 Interfaces

2.6.1 TWI
The TWI connector is controlled by hardware TWI I/O of MCU (for Product including this feature). The signals sda and scl are controlled by the TWI ports of MCU.

This TWI bus is also connected to the expansion area.

External TWI pull-ups are not provided on the AT89STK-11.

2.6.2 SPI
The SPI connector is directly connected to SPI I/O of the MCU.

2.6.3 RS-232
The DB9 connector is connected to on-chip UART peripheral through a standard RS232 driver/receiver. Two leds are provided to indicate activity on Rx and Tx lines (They can be disconnected removing solder pad SP3 and SP4).

2.6.4 OCD
The On-Chip Debug interface (OCD) is provided on a 6-pin connector.
This interface enables the debug of the application through ATMEL OCD dongle for AT89C51RE2/IE2/RD3/IE3 only.

2.6.5 Expansion Area

In addition to a 16x29 pad array, two rows of pads are given on the right side of the board to offer all the MCU signals to user application. Any application expansion can be built on board through this interface.

2.7 Board Settings

The C51 Demo Board has the following settings:

- Jumpers
- Solder straps
- Test points

2.7.1 Jumpers

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

**Table 2-1. Jumpers and Switches Overview**

<table>
<thead>
<tr>
<th>Reference</th>
<th>PCB Label</th>
<th>Function</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jumper J11</td>
<td>J11</td>
<td>RTS of RS232</td>
<td>OFF</td>
</tr>
<tr>
<td>Jumper J12</td>
<td>J12</td>
<td>DTR of RS232</td>
<td>OFF</td>
</tr>
<tr>
<td>Jumper J13</td>
<td>J13</td>
<td></td>
<td>OFF</td>
</tr>
</tbody>
</table>

**Figure 2-5. 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**

<table>
<thead>
<tr>
<th>Reference</th>
<th>PCB Label</th>
<th>Function</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solder strap SP1</td>
<td>SP1</td>
<td>External Power Supply Isolation</td>
<td>Soldered</td>
</tr>
<tr>
<td>Solder strap SP2</td>
<td>ICC</td>
<td>Consumption measurement</td>
<td>Soldered</td>
</tr>
<tr>
<td>Solder strap SP3</td>
<td>SP3</td>
<td>Rx Led</td>
<td>Soldered</td>
</tr>
<tr>
<td>Solder strap SP4</td>
<td>SP4</td>
<td>Tx Led</td>
<td>Soldered</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Reference</th>
<th>PCB Label</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP1</td>
<td>VCC</td>
<td>Test point for Vcc</td>
</tr>
<tr>
<td>TP2,TP3</td>
<td>GND</td>
<td>Test point for GND</td>
</tr>
</tbody>
</table>
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.

### Section 3

#### ISP Programming

3.1 **Manual ISP Mode**

> See Section “FLIP Software”, page 11.

3.1.1 **Board Configuration**

To use ISP mode, no specific configuration is necessary on the board. Only make sure that the EA pin of the product is tied to Vcc (internal code execution only).

3.1.2 **Operating Mode**

To enter in ISP mode, press both the RESET and ISP 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 (J11) jumper
- Close DTR (J12) jumper
3.3 FLIP Software

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

The main purpose of batchisp is to automate ISP operations on several parts. It may also be launched from an IDE like Keil's uVision®2 IDE: 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.
Appendix A: Board Layout

Figure 4-1. Board Components View Diagram
## Appendix B: Bill of Materials

### 4.1 Bill of Materials

#### Table

<table>
<thead>
<tr>
<th>Item</th>
<th>Qty</th>
<th>Reference</th>
<th>Part</th>
<th>Tech. Characteristics</th>
<th>Package</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>29</td>
<td>CD1,CD2,C2,CD3,C3,C4,CD5,C5,CD6,C6,CD7,C7,C8,Cl,C10,Cl1,Cl2,Cl3,Cl6,Cl7,Cl8,Cl9,Cl10,Cl11,Cl12,Cl13,Cl16,Cl17,Cl18,Cl19,Cl20,Cl21,Cl22,Cl23,Cl24,Cl25,Cl26</td>
<td>100n</td>
<td>50V-10% Ceramic</td>
<td>CASE 0805</td>
<td>PHYCOMP</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>CD1</td>
<td>1µF</td>
<td>10Vmin ±10%</td>
<td>Case A</td>
<td>AVX</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>C14,C15</td>
<td>22pF</td>
<td>10Vmin ±10%</td>
<td>EIA/IECQ 3216</td>
<td>PHYCOMP</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>D1</td>
<td>Red Led</td>
<td>1=10 mA</td>
<td>Agilent®</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>11</td>
<td>D2,D3,D4,D5,D6,D7,D8,D9,D10,D11,D12</td>
<td>Green Led</td>
<td>1=10 mA</td>
<td>Agilent®</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>J1</td>
<td>SIP2 SOCKET</td>
<td>Pitch 2.54mm</td>
<td>Molex®</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>J2</td>
<td>CONNECTOR JACK PWR</td>
<td>Int.Diam=2.1mm</td>
<td>Cliff®</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>J3</td>
<td>HEADER 31x2/SM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>J4,J8</td>
<td>HEADER 3X2</td>
<td>BARRETTE SECABLE</td>
<td>Pitch 2.54mm</td>
<td>Tyco Elec. / AMP</td>
</tr>
<tr>
<td>10</td>
<td>3</td>
<td>J5,J6,J10</td>
<td>HEADER 5X2</td>
<td>BARRETTE SECABLE</td>
<td>Pitch 2.54mm</td>
<td>Tyco Elec. / AMP</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>J7</td>
<td>CONNECTOR SIP6 RA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>J9</td>
<td>SIP4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>3</td>
<td>J11,J12,J13</td>
<td>JUMPER</td>
<td>Pitch 2.54mm</td>
<td>Tyco® Elec. / AMP</td>
<td></td>
</tr>
<tr>
<td>13bis</td>
<td>3</td>
<td>JUMPER shunt</td>
<td></td>
<td>Pitch 2.54mm</td>
<td>Arwin</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>P1</td>
<td>SUB-D9 FEMALE</td>
<td>90° with harpoons</td>
<td>Tyco Elec. / AMP</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>R1</td>
<td>270</td>
<td>1/16W-5% SMD</td>
<td>Case 0603</td>
<td>Multicomp</td>
</tr>
<tr>
<td>16</td>
<td>14</td>
<td>R2,R5,R14,R15,R16,R17,R18,R19,R20,R21,R22,R23,R24</td>
<td>1K</td>
<td>0.06W, 5%</td>
<td>Case 0603</td>
<td>Multicomp</td>
</tr>
<tr>
<td>17</td>
<td>1</td>
<td>R3</td>
<td>820</td>
<td>1/16W-5% SMD</td>
<td>Case 0603</td>
<td>Multicomp</td>
</tr>
<tr>
<td>18</td>
<td>8</td>
<td>R4,R6,R8,R9,R10,R11,R12,R13</td>
<td>10k</td>
<td>0.06W, 5%</td>
<td>Case 0603</td>
<td>Multicomp</td>
</tr>
<tr>
<td>19</td>
<td>4</td>
<td>R13</td>
<td>SolderPad</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>8</td>
<td>SW1,SW2,SW3,SW4,SW5,SW6,SW7,SW8</td>
<td>PUSH-BUTTON</td>
<td>SMD, rectangular</td>
<td>See DS</td>
<td>TT Canon®</td>
</tr>
</tbody>
</table>
## Appendix B: Bill of Materials

<table>
<thead>
<tr>
<th>Item</th>
<th>Qty</th>
<th>Reference</th>
<th>Part</th>
<th>Tech. Characteristics</th>
<th>Package</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>3</td>
<td>TP1,TP2,TP3</td>
<td>TEST POINT</td>
<td>Through Hole Pad</td>
<td>Hole 1.1mm</td>
<td>Vero</td>
</tr>
<tr>
<td>22</td>
<td>1</td>
<td>U1</td>
<td>DF005S</td>
<td>TO269AA</td>
<td>Vishay®</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>1</td>
<td>U2</td>
<td>LM317</td>
<td>SOT-223</td>
<td>National®</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>1</td>
<td>U6</td>
<td>AT8xC51_PLCC44</td>
<td>Socket</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25bis</td>
<td>1</td>
<td>U6</td>
<td>AT8xC51_PLCC44</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>2</td>
<td>U7,U8</td>
<td>SIPEX-SP3232ECA</td>
<td>Ref=SP3232ECA</td>
<td>SSOP16</td>
<td>Maxim®</td>
</tr>
<tr>
<td>27</td>
<td>1</td>
<td>J9</td>
<td>74HC125/SO</td>
<td>SOIC</td>
<td>texas</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>1</td>
<td>Y1</td>
<td>CRYSTAL</td>
<td>HC49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28bis</td>
<td>2</td>
<td>Y1</td>
<td>CRYSTAL tulip</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>8</td>
<td>R100, R101, R102, R103, R104, R105, R106, R107</td>
<td>4.7K</td>
<td>0.06W, 5%</td>
<td>Case 0603</td>
<td>Multicomp</td>
</tr>
</tbody>
</table>
Appendix C: Board Schematics
Figure 4-2. AT89STK-11 Schematics (1 of 4)
Figure 4-3. AT89STK-11 Schematics (2 of 4)
Figure 4-4. AT89STK-11 Schematics (3 of 4)
Appendix D: References/Acronyms

4.2 References

4.3 Acronyms
- FLIP: FLexible In-system Programming
- ISP: In-System programming
Appendix D: References/Acronyms

Document Revision History

Changes from 7676A to 7676B

2. Section 2.3.1.2, page 2-5: SP1 must be kept closed.
3. Section 3.1.1, page 3-11: SW1 switch and EA jumper do not exist.
4. Appendix A, page 4-13: the given board layout was wrong. Replaced by the right one.
5. Appendix C, page 4-19: there was an error on page 4 of the schematic. Pin5 of U9B is now connected to Vcc instead of GND.
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