

**STK521**

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**User Guide**



## ***Table of Contents***

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### ***Section 1 1***

Introduction 1

Features 2

---

### ***Section 2 3***

Using the STK521 Top Module 3

Connecting the Atmel STK521 to the Atmel STK500 Starter Kit 3

Powering the STK521 4

Programming the AVR 5

Atmel AVR JTAGICE mkII Connector 7

Atmel STK521 switches configuration 9

Atmel STK521 headers 10

Atmel STK521 test points 11

Extra functions 11

---

### ***Section 3 12***

Troubleshooting Guide 12

---

### ***Section 4 13***

Technical Specifications 13

---

### ***Section 5 14***

Technical Support 14

---

### ***Section 6 15***

Complete Schematics 15

## Introduction

The Atmel® AVR® STK®521 kit is made of the Atmel AVR STK521 board.

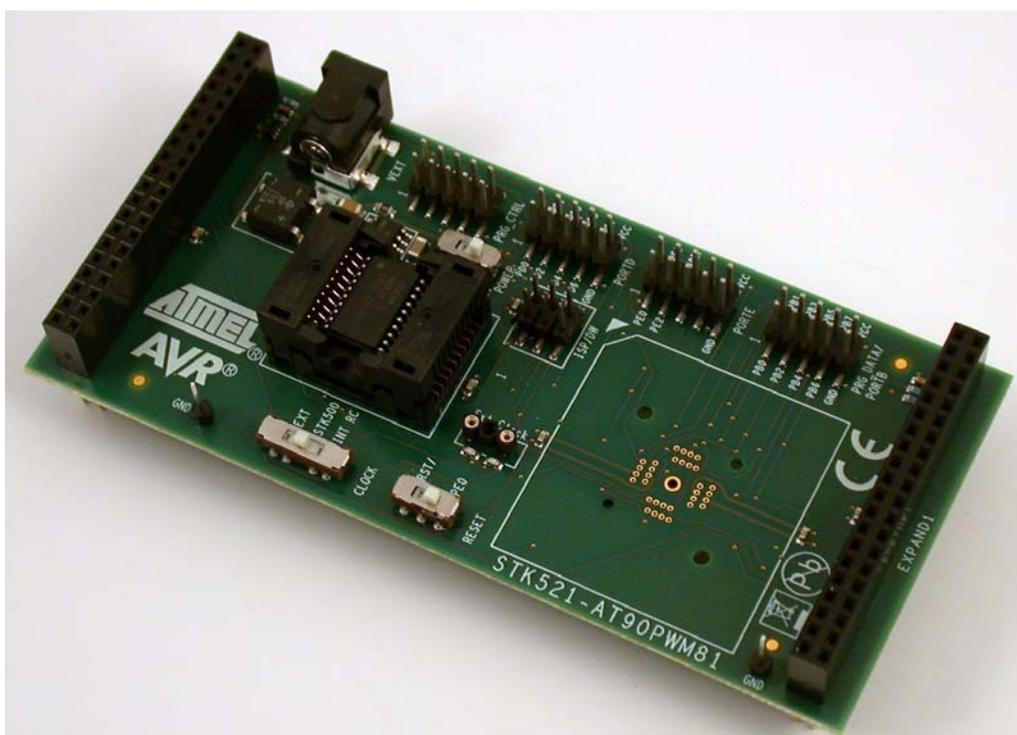
The STK521 board is a top module for the Atmel STK500 development board from Atmel Corporation. It is designed to support the Atmel AT90PWM81, Atmel AT90PWM161 products and future compatible derivatives.

The STK521 includes connectors and hardware allowing full utilization of the new features of the AT90PWM81/161, while the Zero Insertion Force (ZIF) socket allows easy to use of SOIC20 package for prototyping.

This user guide acts as a general getting started guide as well as a complete technical reference for advanced users.

Note that in this guide, the word AVR is used to refer to the target components (AT90PWM81/161). AT90PWM81 will be also used to refer to one of the products from this family.

**Figure 1-1.** STK521 Top Module for STK500.



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## 1.1 Features

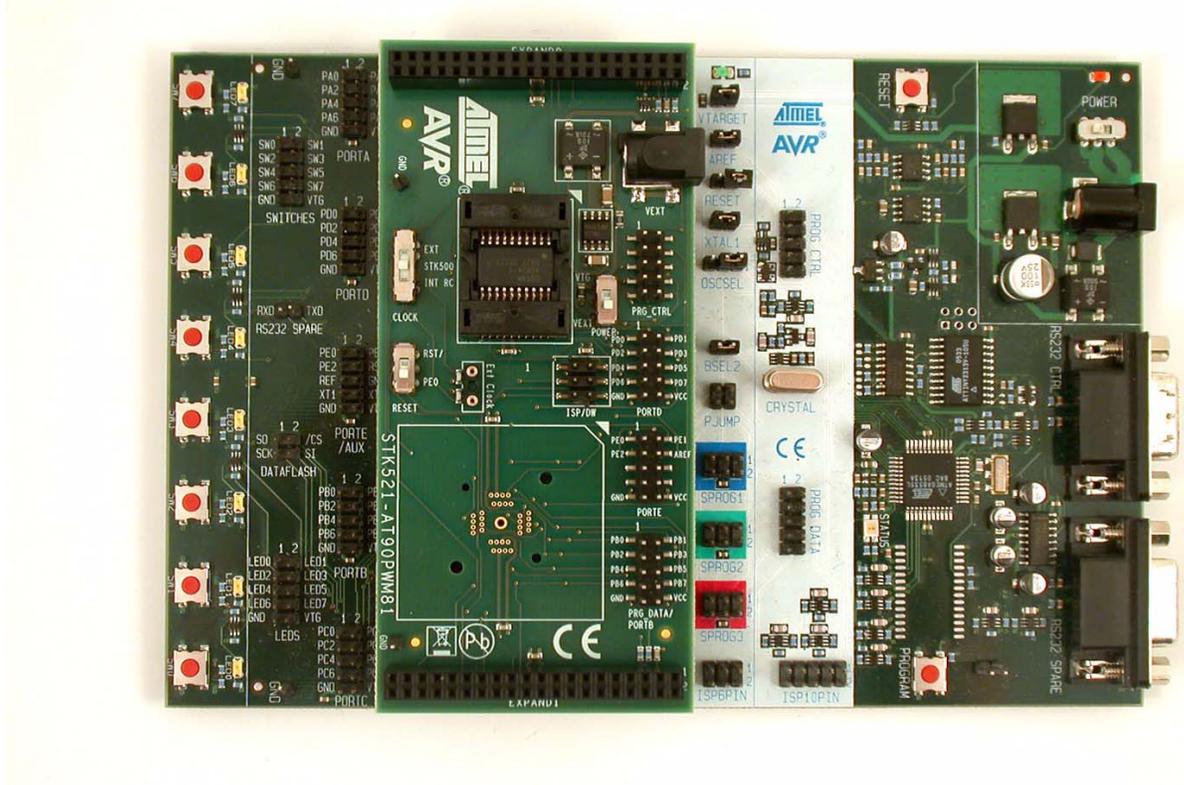
- Atmel AVR STK521 is a new member of the successful Atmel STK500 starter kit family
- Supports the Atmel AT90PWM81, Atmel AT90PWM161
- Supported by Atmel AVR Studio® 4.15 or above and Atmel AVR Studio 5.1
- Zero Insertion Force Socket for SOIC20 Package
- Zero Insertion Force Socket for QFN32 Package (not populated)
- High Voltage Parallel Programming
- Serial Programming
- 6-pin Connector for On-chip Debugging using Atmel AVR JTAGICE mkII or Atmel AVR Dragon™ emulators
- Switches for Reset/GPIOs configuration, Xtal/GPIOs or power supply configuration
- External power supply connector for standalone mode
- Quick Reference to all Jumpers in the Silk-Screen of the PCB

## Using the STK521 Top Module

### 2.1 Connecting the Atmel STK521 to the Atmel STK500 Starter Kit

Connect the STK521 to the STK500 expansion header 0 and 1. It is important that the top module is connected in the correct orientation as shown in [Figure 2-1](#). The EXPAND0 written on the STK521 top module should match the EXPAND0 written beside the expansion header on the STK500 board.

**Figure 2-1.** Connecting STK521 to the STK500 Board.

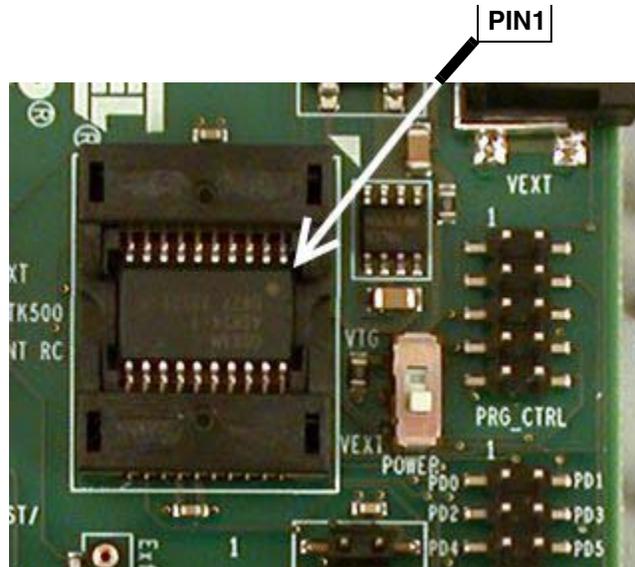


**Note:** Connecting the STK521 with wrong orientation may damage the board.

### 2.1.1 Placing an Atmel AT90PWM81 on the Atmel STK521

The STK521 contains a ZIF socket for a SOIC20 package. Care should be taken so that the device is mounted with the correct orientation. [Figure 2-2](#) shows the location of pin1 for the ZIF socket.

**Figure 2-2.** Pin1 on ZIF Socket.



**Caution:** Do not mount an Atmel AT90PWM81 on the STK521 at the same time as an AVR is mounted on the STK500 board. None of the devices might work as intended.

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## 2.2 Powering the STK521

The STK521 can be powered as follows :

1. Through the STK500 by selecting POWER switch to VTG.
2. Through an external power supply using the jack connector and selecting POWER switch to VEXT.

In this latter case, power supply must be 10V DC for a 5V device power supply.

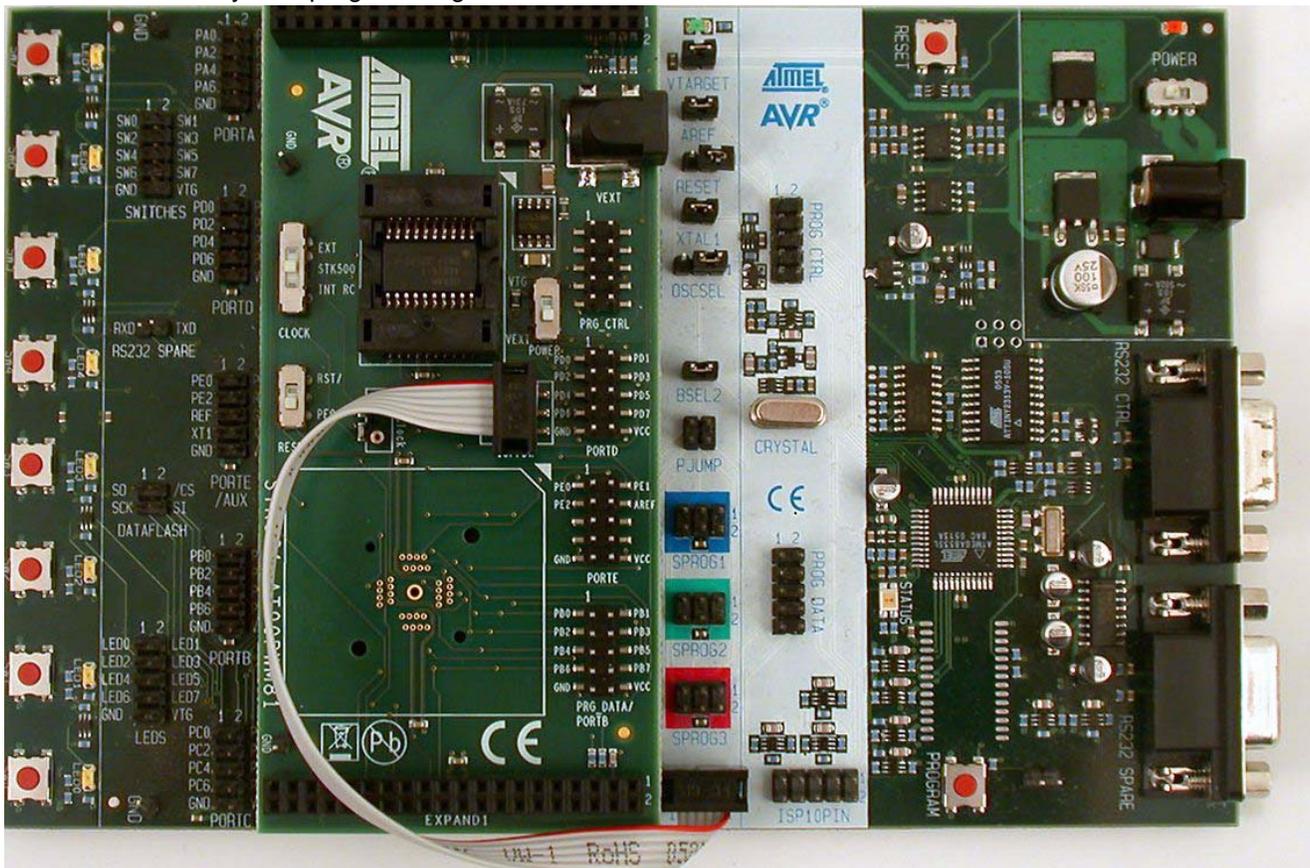
## 2.3 Programming the AVR

The Atmel AT90PWM81 can be programmed using both serial SPI and high-voltage parallel programming. This section will explain how to connect the programming cables to successfully use one of these two modes. The Atmel AVR Studio STK500 software is used in the same way as for other AVR parts.

**Note:** The AT90PWM81 also supports Self Programming, see the Atmel AVR109 application note for more information on this topic.

### 2.3.1 Serial in-system programming

**Figure 2-3.** Serial in-system programming.



To program the AT90PWM81 using ISP programming mode, connect the 6-wire cable between the ISP6PIN connector on the Atmel STK500 board and the ISP connector on the Atmel STK521 board as shown in [Figure 2-3](#). The device can be programmed using the Serial Programming mode in the AVR Studio 4 STK500 software.

The Atmel STK500 and STK521 jumpers must be configured as follows :

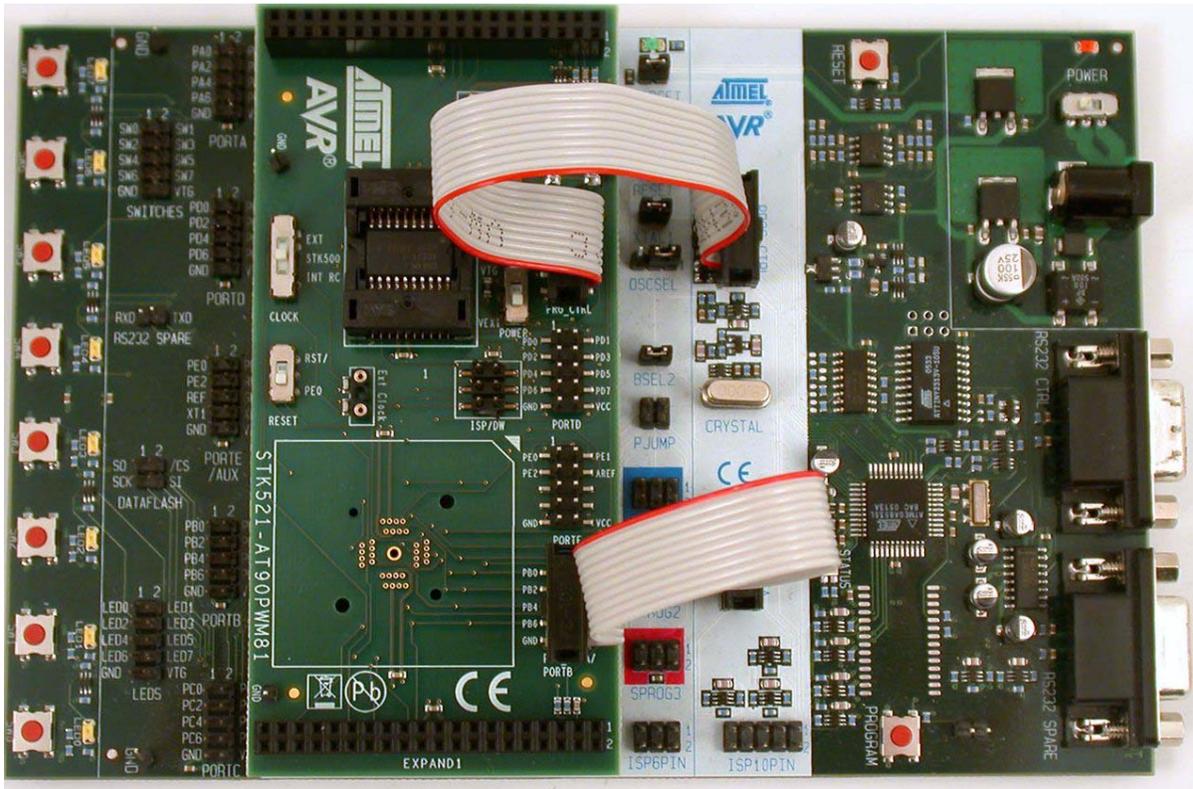
**Table 2-1.** In-System programming jumper settings for the Atmel AT90PWM81.

| STK500  |                      |
|---------|----------------------|
| VTARGET | Mounted              |
| AREF    | Open                 |
| RESET   | Open                 |
| XTAL1   | Mounted              |
| OSCSEL  | Mounted, pin 1 and 2 |
| BSEL2   | Open                 |
| PJUMP   | Open                 |

**Note:** See the Atmel STK500 User Guide for information on how to use the STK500 front-end software for ISP Programming.

### 2.3.2 High-voltage programming

**Figure 2-4.** High-voltage (parallel) programming.



To program the AVR using high-voltage (parallel) programming, connect the PROG\_CTRL of the Atmel STK500 to PRG\_CTRL of the Atmel STK521 and PROG\_DATA of STK500 to PRG\_DATA of STK521 as shown in [Figure 2-4](#). Make sure that the CLOCK switch is placed in the STK500 position.

The STK500 and STK521 jumpers & switches must be configured as follows :

**Table 2-2.** High-Voltage programming jumper settings for the Atmel AT90PWM81.

| STK500  |                      |
|---------|----------------------|
| VTARGET | Mounted              |
| AREF    | Open                 |
| RESET   | Mounted              |
| XTAL1   | Mounted              |
| OSCSEL  | Mounted, pin 1 and 2 |
| BSEL2   | Mounted              |
| PJUMP   | Open                 |

**Table 2-3.** High-voltage programming switches settings for AT90PWM81.

| STK521 |        |
|--------|--------|
| POWER  | VTG    |
| CLOCK  | STK500 |
| RESET  | RST/   |

The device can now be programmed using the high-voltage programming mode in the Atmel AVR Studio STK500 software.

**Note:** See the Atmel STK500 User Guide for information on how to use the STK500 front-end software in high-voltage programming mode.

For the high-voltage programming mode to function correctly, the target voltage must be higher than 4.5V.

## 2.4 Atmel AVR JTAGICE mkII Connector

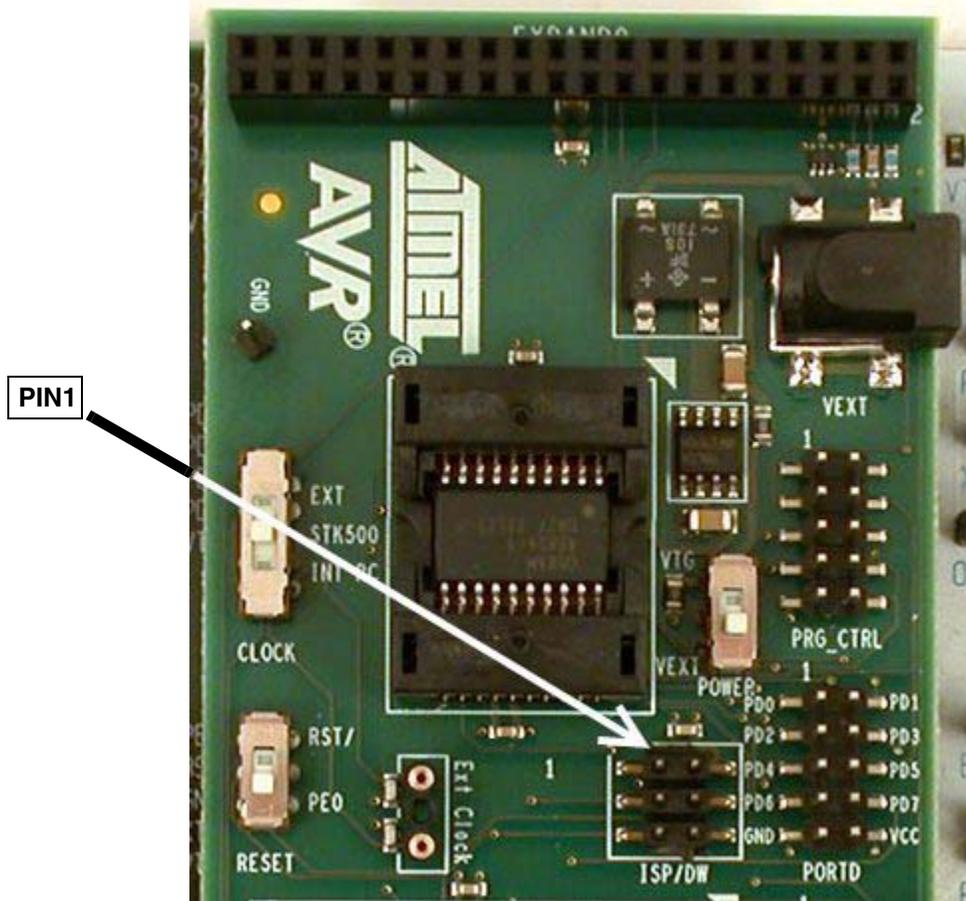
See the following document :

“JTAGICE mkII Quick Start Guide” which purpose is “Connecting to a target board with the AVR JTAGICE mkII”.

This note explains which signals are required for ISP and which signals are required for debugWIRE.

[Figure 2-5](#) shows how to connect the Atmel AVR JTAGICE mkII probe on the STK521 board.

**Figure 2-5.** Connecting the Atmel AVR JTAGICE mkII to the Atmel STK521.



The ISP connector is used for the Atmel AT90PWM81 built-in debugWire interface. The pin out of the connector is shown in Table 2-4 and is compliant with the pin out of the JTAG ICE available from Atmel. Connecting a JTAGICE mkII to this connector allows on-chip debugging of the AT90PWM81.

More information about the JTAGICE mkII and on-chip debugging can be found in the Atmel AVR JTAGICE mkII User Guide, which is available at the Atmel web site, [www.atmel.com](http://www.atmel.com).

**Note:** Remove the RESET jumper on the Atmel STK500 to work run properly JTAGICE mkII.

**Table 2-4.** STK521 ISP/DW connector pinout.

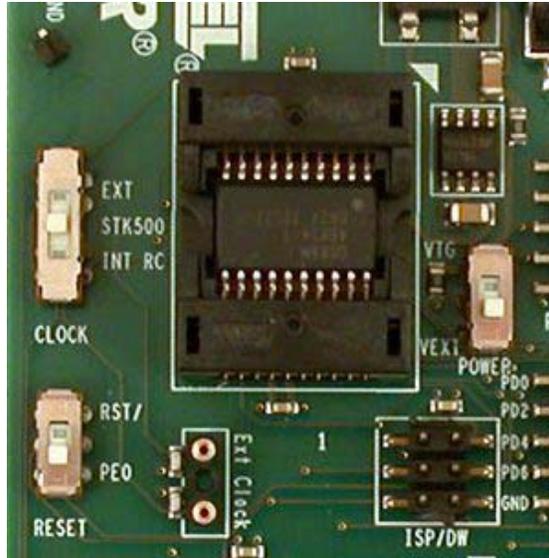
| Squid cable colors | Target pins | STK521 ISP pinout |   | Target pins | Squid cable colors |
|--------------------|-------------|-------------------|---|-------------|--------------------|
| grey               | MISO        | 1                 | 2 | VTG         | purple             |
| black              | SCK         | 3                 | 4 | MOSI        | red                |
| green              | RESET       | 5                 | 6 | GND         | brown              |

**Note:** MISO, MOSI, and SCK lines can be disconnected when the product is in debugging mode. They can then be used for application purpose.

## 2.5 Atmel STK521 switches configuration

The switches shown in [Figure 2-6](#) are described in [Table 2-5](#) .

**Figure 2-6.** STK521 switches.



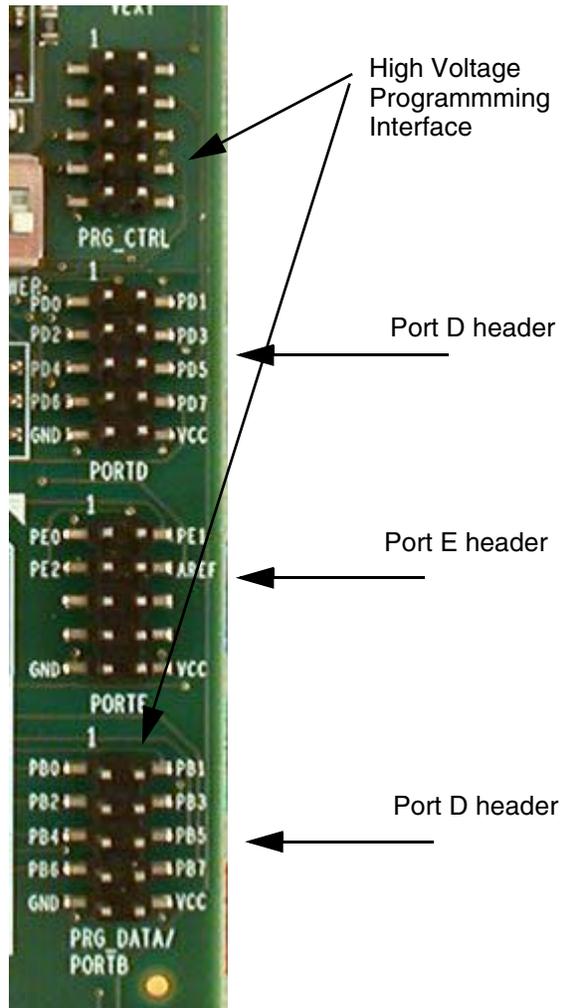
**Table 2-5.** STK521 switches description.

| Switches | Function                      | Description   |
|----------|-------------------------------|---|
| CLOCK    | Clock source selection        | EXT: clock from crystal plugged in Ext Clock socket<br>STK500: clock from Atmel STK500<br>INT RC: clock from internal RC oscillator |
| RESET    | Reset pin configuration       | RST/: Product reset pin is connected to STK500 reset button<br>PE0: Product reset pin is connected to PE0 on PORTE header           |
| POWER    | Power supply source selection | VEXT: External power supply through power jack<br>VTG: STK500 power supply through expansion header                                 |

## 2.6 Atmel STK521 headers

Headers are populated for both high voltage programming purpose as well as for port connection to LEDs or switches.

**Figure 2-7.** STK521 port headers.



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## 2.7 Atmel STK521 test points

**Table 2-6.** STK521 test points.

| Test Point | Function | Description    |
|------------|----------|----------------|
| T1         | GND      | GND test point |
| T2         | GND      | GND test point |

These are placed on both right and left side of the board for probes.

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## 2.8 Extra functions

The STK521 includes a footprint for a ZIF QFN32 5x5 mm socket to evaluate QFN32 package. The socket is not mounted but can be populated using the PN : QFN32(40)BT-0.5-02 from Enplas.



## Section 3

# Troubleshooting Guide

**Table 3-1.** Troubleshooting guide.

| Problem   | Reason   | Solution  |
|---|--|---|
| Unable to do ISP and high-voltage programming using Internal 1MHz RC oscillator | Usage of internal 1MHz RC oscillator not recommended | To start the microcontroller in low power mode, use the 128KHz oscillator |
|   |  |   |
|   |  |   |



## Section 4

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# Technical Specifications

### System unit

Physical dimensions . . . . . 56mm x 119mm x 27mm

Weight . . . . . 70g

### Operating conditions

Voltage supply . . . . . 1.8V - 5.5V

Temperature . . . . . 0°C - 50°C



## Section 5

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# Technical Support

For technical support, please contact [avr@atmel.com](mailto:avr@atmel.com). When requesting technical support, please include the following information:

- Which target AVR device is used (complete part number)
- Target voltage and speed
- Clock source and fuse setting of the AVR
- Programming method (ISP or high-voltage)
- Hardware revisions of the AVR tools, found on the PCB
- Version number of the Atmel AVR Studio. This can be found in the AVR Studio help menu
- PC operating system and version/build
- PC processor type and speed
- A detailed description of the problem



## Section 6

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# Complete Schematics

On the following pages the complete schematics and assembly drawing of the Atmel STK521 revision B are shown.

Figure 6-1. Schematics, 1 of 3.

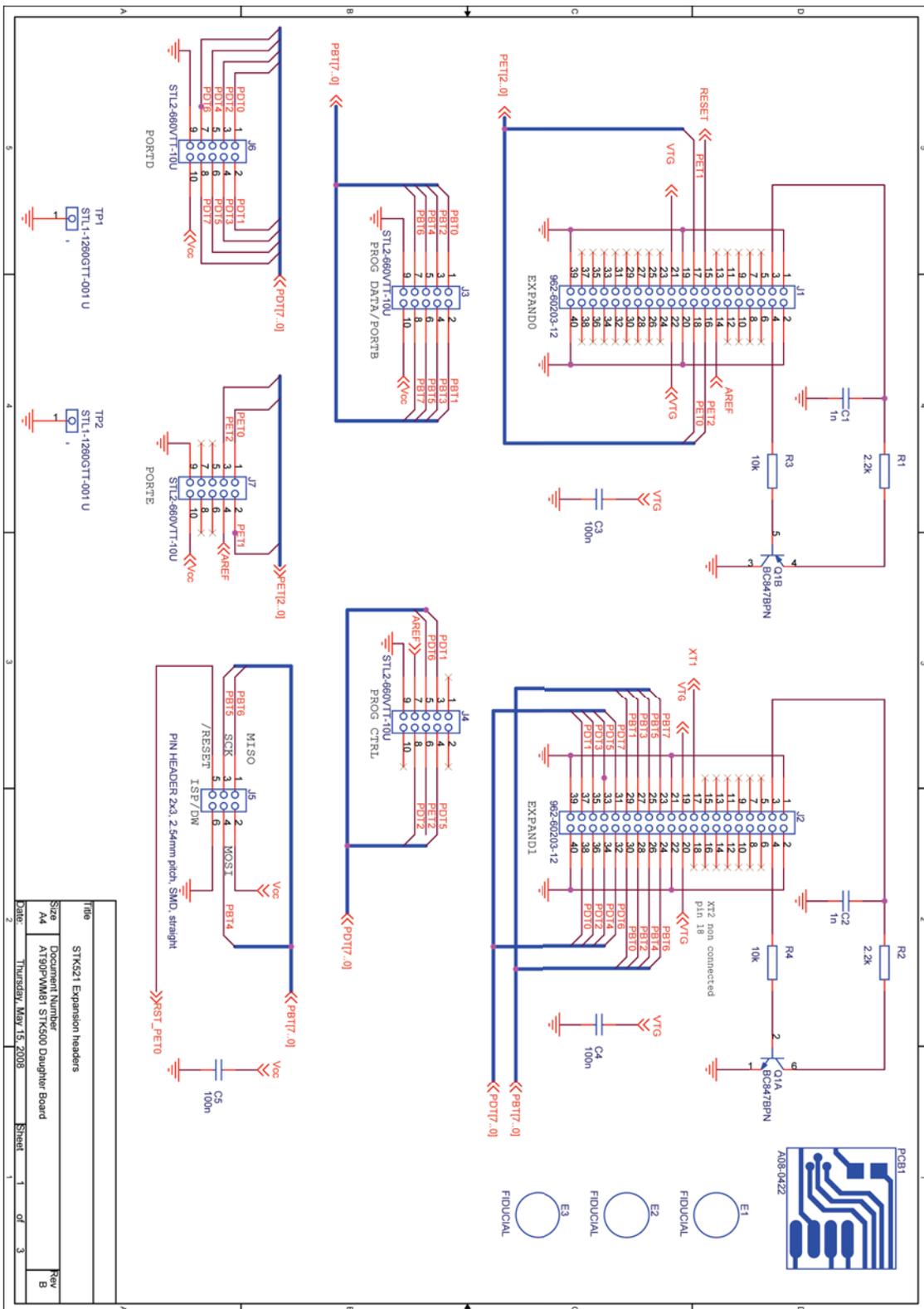


Figure 6-2. Schematics, 2 of 3.

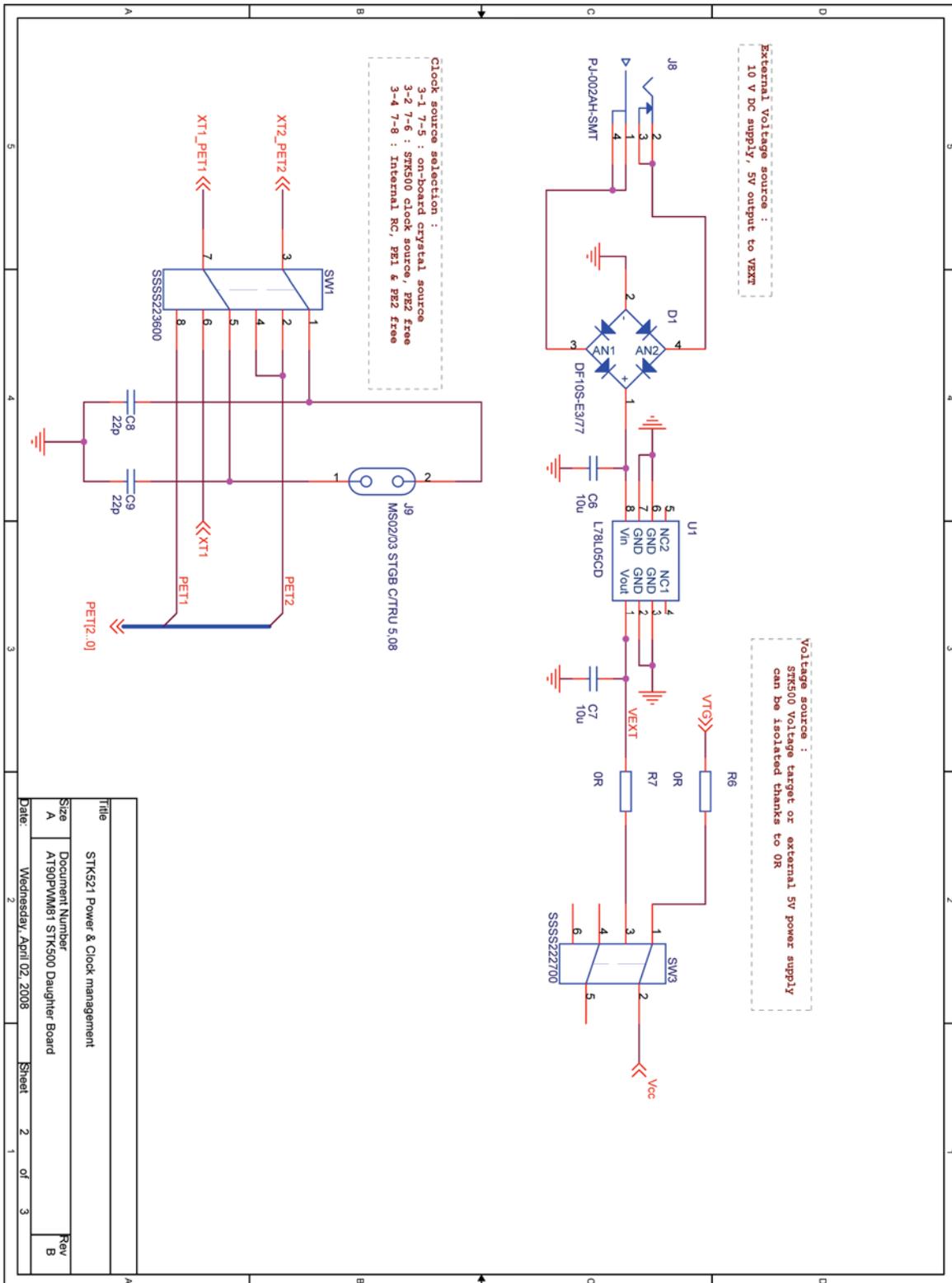


Figure 6-3. Schematics, 3 of 3.

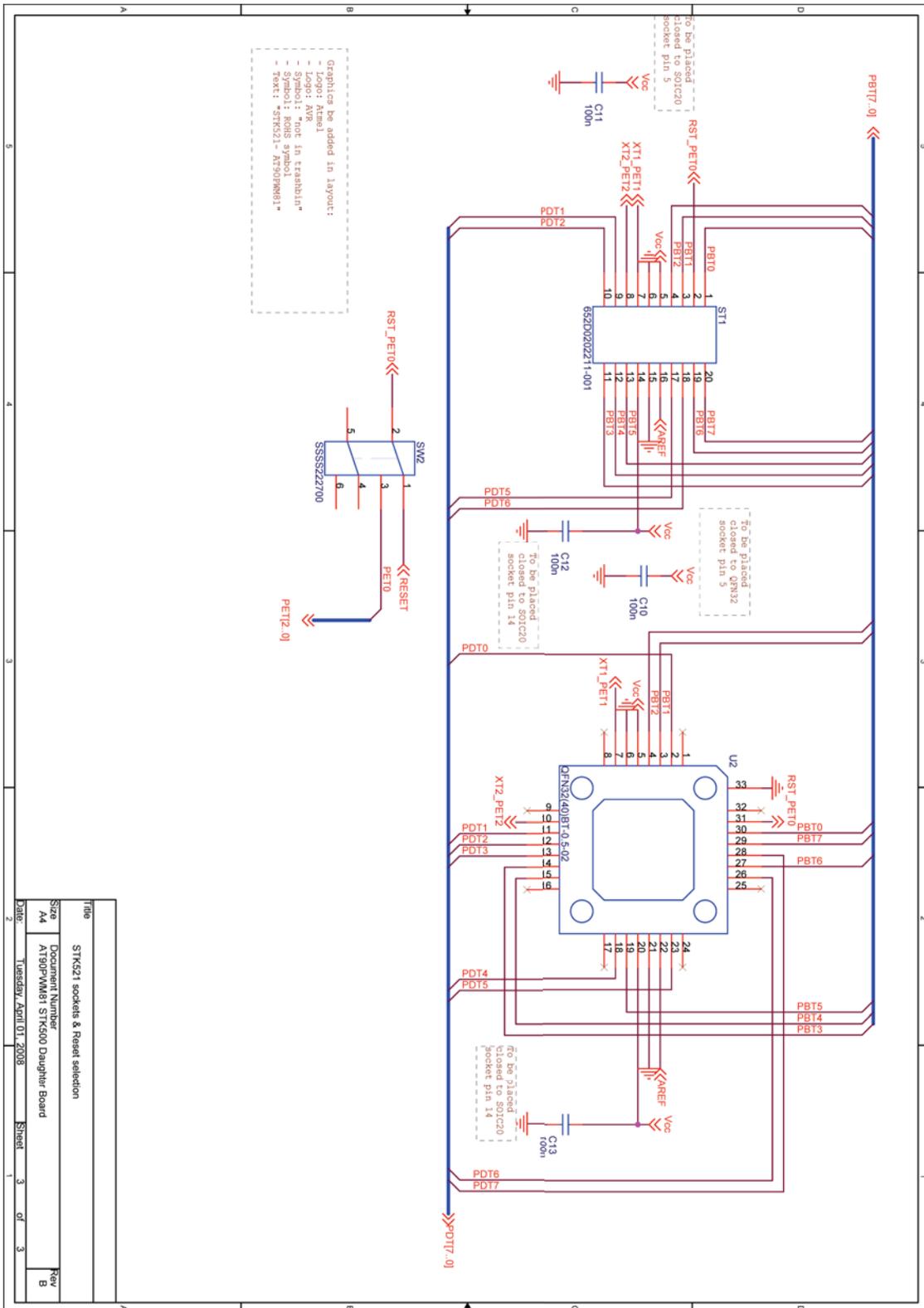
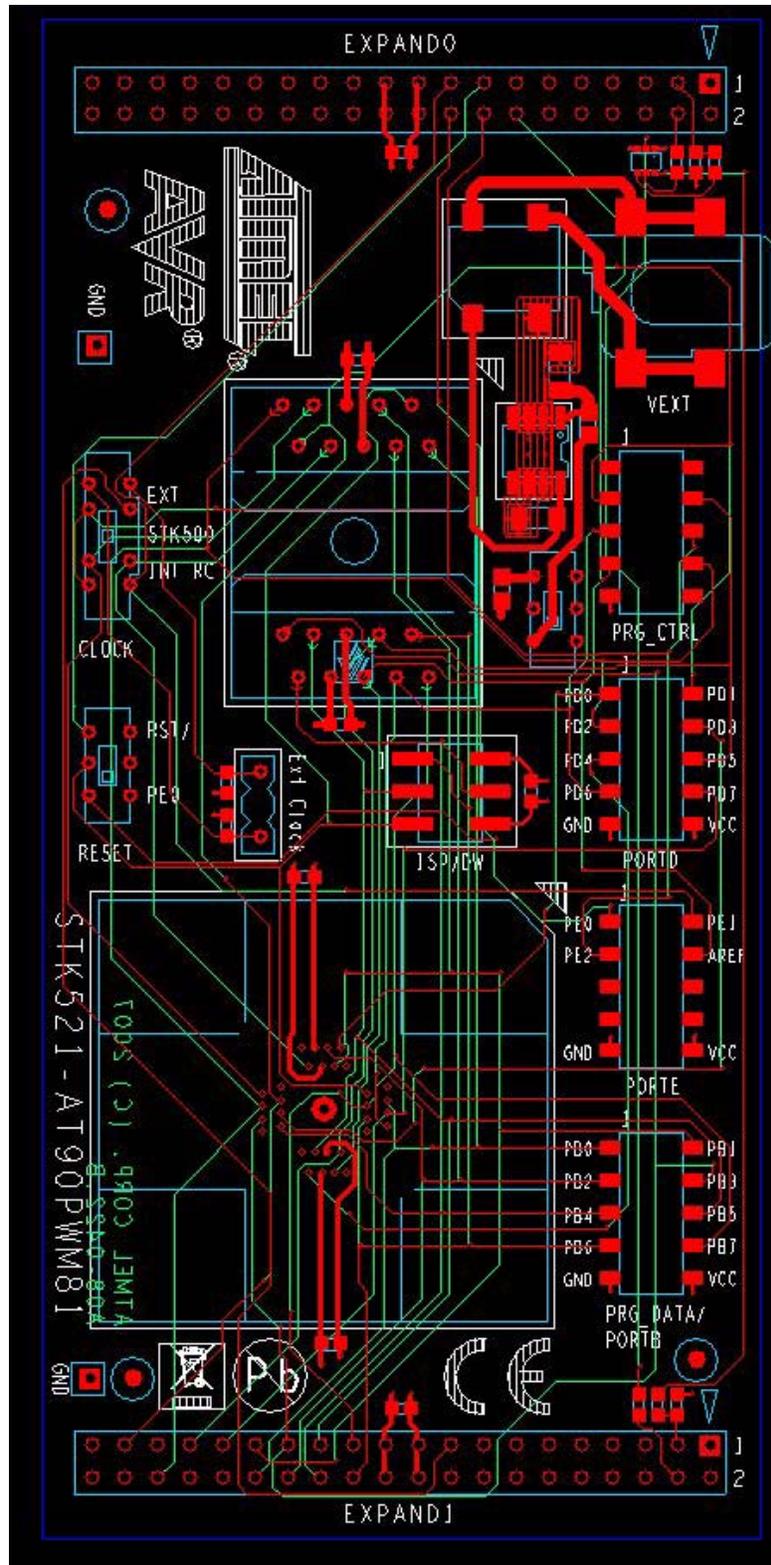


Figure 6-4. Assembly drawing, 1 of 1.



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