STK526 Rev. B

Hardware User Guide

Section 1

Introduction

Congratulation for acquiring the AVR® STK526 - AT90USB82/162 Starter Kit. This kit is designed to give designers a quick start to develop code on the AT90USB82/162 and for prototyping and testing of new designs.

1.1 Overview

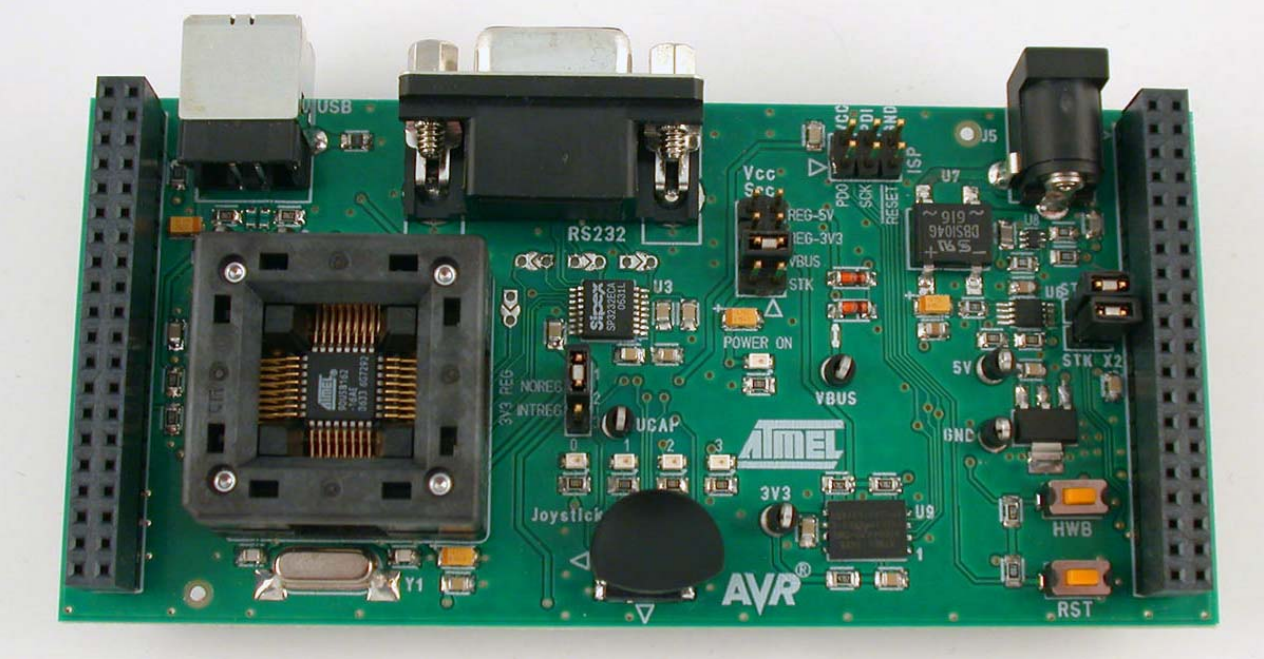
This document describes the STK526 dedicated to the AT90USB82/162 AVR microcontroller. This board is designed to allow an easy evaluation of the product using demonstration software. This document applies to the revision B of the board.

To complement the evaluation and enable additional development capability, the STK526 can be plugged into the Atmel STK500 Starter Kit Board in order to use the AT90USB82/162 with advanced features such as variable VCC, variable XTAL, Parallel Programming, and supports all AVR development tools.

It can also receive extension modules that Atmel or 3rd parties may release in future or that customers can develop for their projects.

To increase its demonstrative capabilities, this stand alone board has several on-board resources : USB, RS232, joystick, data-flash, LEDs.

Figure 1-1 . STK526 Board



1.2 STK526 - AT90USB82/162 Starter Kit Features

The STK526 rev. B provides the following features:

- AT90USB82/162 TQFP device (2.7V<Vcc<5.5V)
- AVR Studio® software interface (1)
- USB software interface for Device Firmware Upgrade (DFU bootloader) (2)
- STK500 compatible (supports Parallel High-Voltage Programming)
- Power supply flagged by “POWER-ON” LED:
  - from an external power connector, with a 3.3V or 5V regulation
  - from the USB interface (USB device bus powered application)
  - from STK500
  - using or not the 3.3V on-chip regulator of AT90USB82/162
- ISP connector :
  - for on-chip ISP
  - for on-chip debugging using JTAG ICE and debugWire protocol
- Serial interfaces:
  - 1 USB full speed device interface
  - RS-232C ports with RTS/CTS handshake lines
- On-board resources:
  - 4-ways + 1-select joystick
  - 4 LEDs
  - serial 8Mo dataflash memory
- On-board RESET button
- On-board HWB button for force bootloader execution at reset.

- System clock:
  - external clock from STK500 expand connectors
  - 8 MHz crystal
- Numerous access points for test

Notes:
1. The STK526 is supported by AVR Studio®, version 4.12SP2 or higher. For up-to-date information on this and other AVR tool products, please consult our web site. The latest version of AVR Studio®, AVR tools and this User Guide can be found in the AVR section of the Atmel web site, http://www.atmel.com.
2. ATMEL Flip®, In System Programming Version 3 or Higher shall be used for Device Firmware Upgrade. Please consult Atmel web site to retrieve the latest version of Flip and the DFU bootloader Hex file if needed.

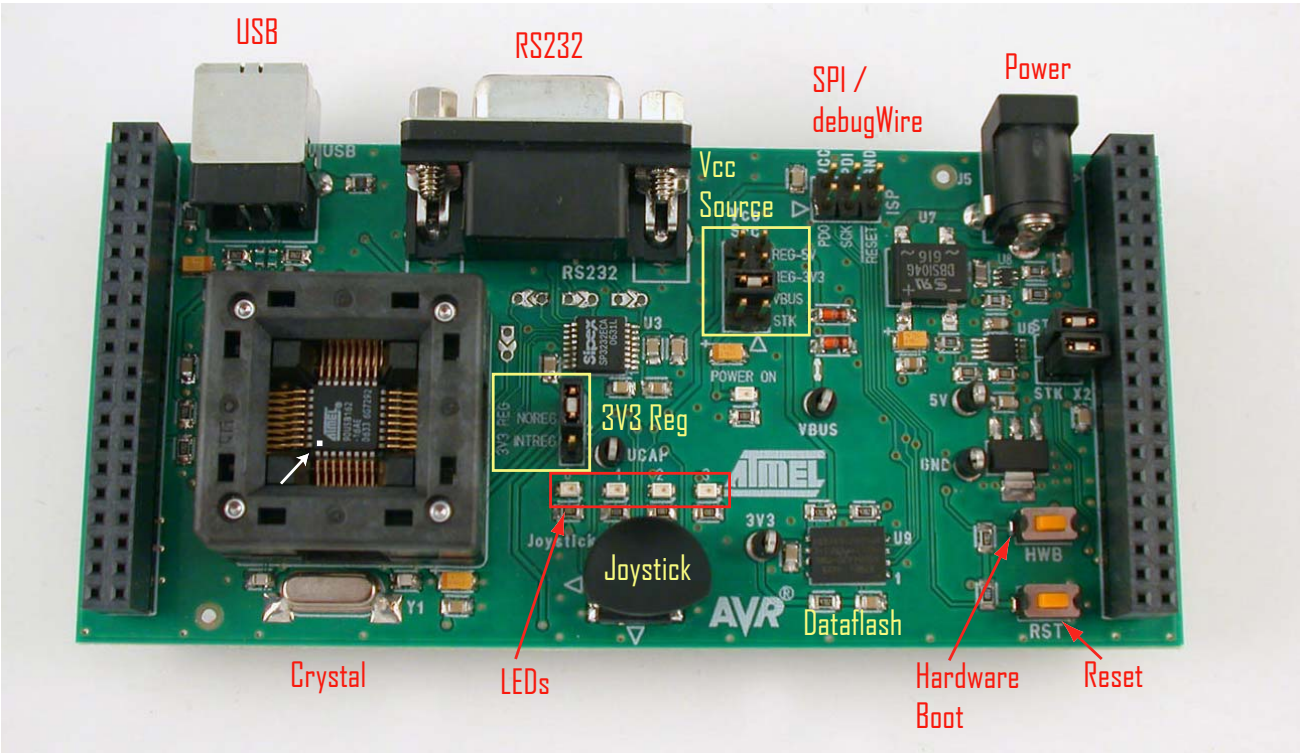
Section 2

Using the STK526

This chapter describes the board and all its features.

2.1 Overview

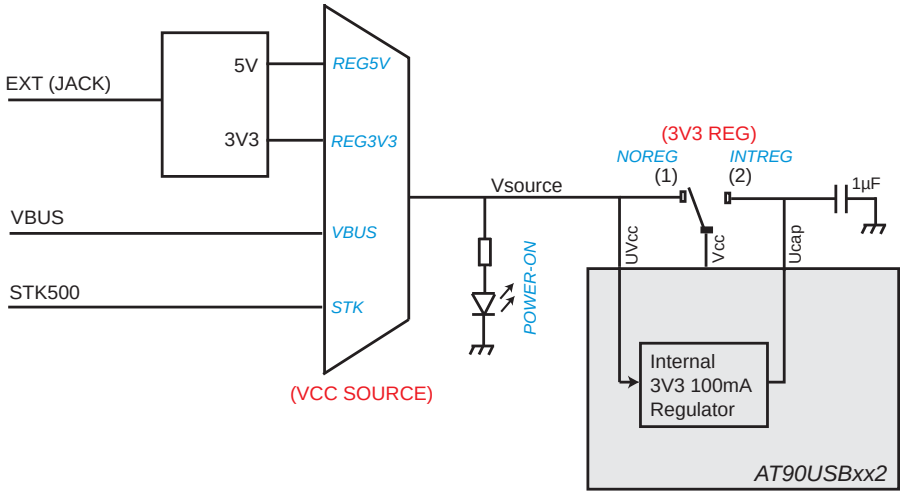
Figure 2-1 . STK526 Overview



2.2 Power Supply

The on-board power supply circuitry allows different power supply configurations. Because the AT90USB82/162 contains an internal 3V3 regulator that can be used to power an external circuitry, several power configurations are handled by the STK526. The power path is represented by the figure below :

Figure 2-2 . STK526 Power Configuration



First, the board allows to drain power from three external sources, leading to four different solutions. The selected voltage is applied to the regulator input of the AT90USB82/162. Then the user can choose to power the MCU I/O either directly with the primary power source (external 5V/3V3), or from the internal regulator itself (MCU auto-power).

2.2.1 Power Supply Sources

The power supply can come from three different (1) sources:

- USB connector,
- JACK PWR connector (J5, See Figure 2-3),
- STK500

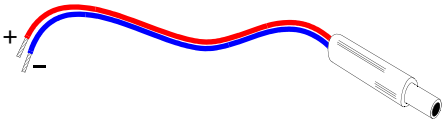
USB powered: When used as a USB device bus powered application, the STK526 can be powered via the USB VBUS power supply line.

JACK PWR connector:

- Use the JACK outlet provided with the kit (See Figure 2-4)
- Input supply from 9 up to 15V (2) DC,
- No specific polarization (3) is required.

Figure 2-3 . JACK PWR Connector (J6)

Figure 2-4 . Male JACK Outlet and Wires

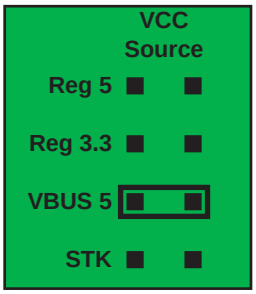
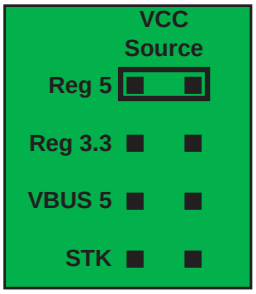
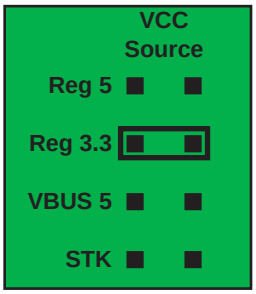
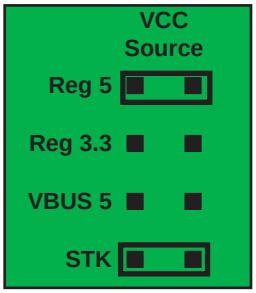


STK500 Powered: (c.f. "STK500 Resources" on page 17).

Notes:
1. **Caution**: Do not set more than **one** power supply source on STK526.
2. 15V is the maximum level limitation of an unidirectional transit diode.
3. There is a diode (bridge) voltage drop between the negative output of the power supply and the STK526 "GND". This could introduce some gap of voltage during measurement and instrumentation.

2.2.2 Power Source Setting

Table 2-1 . Power Supply [1] Setting

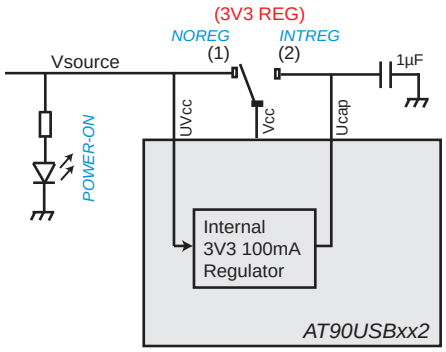
Vcc Source Jumper position	VCC power supply value	Comments	View
VBUS	**VBUS (4,8V to 5.2V)**	This is the default configuration. This should be used for a typical USB device “bus powered” application. In this mode, the STK526 is powered directly from the USB bus, and no other external power supply is required.	
REG 5V	**5V**	This configuration can be used for a USB “self powered” device application”. To use this configuration an external power supply must be connected to J5 connector. The on-board 5V regulator is used.	
REG 3V3	**3.3V**	This configuration allows the STK526 to be used in a 3V range application. To use this configuration an external power supply must be connected to J5 connector. The on-board 3V3 regulator is used.	
STK & REG 5V	**Depends on STK500 VTG setting**	This configuration allows the STK526 to be used with an STK500 board. In this mode, the STK526 power supply is generated and configured according to the “VTG” parameter of the STK500 (1). Caution : NO external power supply must be connected to STK526 to avoid conflict with STK500 power supply.	

Notes: 1. **Caution:** The STK500 has its own “ON/OFF” switch

2.2.3 AT90USB82/162 Power Configuration Settings

This section applies to the following part of the power path diagram :

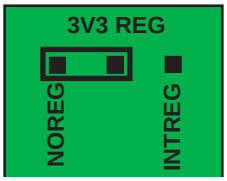
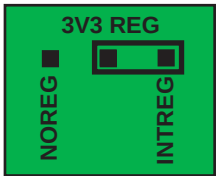
Figure 2-5 . MCU Power Configurations



Once the power source selected, the input of the AT90USB82/162 internal regulator (UVcc) is powered. Firmware has the responsability to enable or disable the regulator. Ucap is the output pin of the internal regulator, and Vcc is the core power input of the MCU. Several cases may be required by the user :

- **Vsource = 5V, Vcc = 5V**: for this mode, the configuration switch (see figure above) must be in the position labelled "**NOREG**". The MCU can still run a USB Device application if it enables the internal regulator that will power the USB pad and macro.
- **Vsource = 5V, Vcc = 3.3V**: for this mode, the configuration switch must be in the position labelled "**INTREG**". The Vcc pin will be tied to the regulator output, so that the AT90USB82/162 itself will power itself from its regulator, and the I/O will be at 3V3 level.
- **Vsource = 3.3V, Vcc = 3.3V**: for this mode all the MCU power inputs are at the 3V3 level. The configuration switch must be in the position "**NOREG**". In normal operation it is recommended to tie all the power pins together (UVcc, Vcc, Ucap) and to disable the regulator. However, the board configuration does not allow to tie together all the power pins, so that the regulator must be enabled by firmware in order to power the USB pad and macro (that can lead to some extra-consumption).

Table 2-2 . MCU Power Configuration Jumpers

"3V3 REG" Jumper position	AT90USB16 I/O power supply	Comments	View
"NOREG"	Primary power source	This is the default configuration.	
"INTREG"	Internal regulator	This configuration is relevant with a 5V primary powered application requiring I/O levels at 3.3V on the AT90USB82/162.	

2.2.4 "POWER-ON" LED

The POWER-ON LED is lit whenever power is applied to STK526 regardless of the power supply source and the voltage settings.

Figure 2-6 . "VCC-ON" LED

2.3 RESET

Although the AT90USB82/162 has its on-chip RESET circuitry (c.f. AT90USB82/162 Datasheet, section "System Control and Reset), the STK526 provides the AT90USB82/162 a RESET signal which can come from 3 different sources:

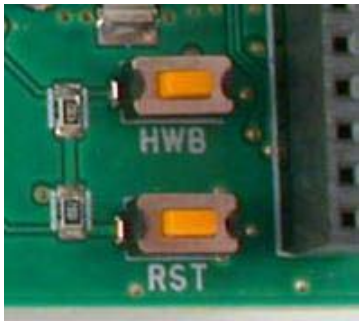
2.3.1 Power-on RESET

The power supply rise will conduce to an on-chip power-on RESET.

2.3.2 RESET Push Button

By pressing the RESET push button on the STK526, a warm RESET of the AT90USB82/162 is performed.

Figure 2-7 . RESET Push Button (RST) Implementation



2.3.3 STK500 RESET

See Section 2.7.4, page 18.

2.4 AT90USB82/162 AVR Microcontroller

2.4.1 Main Clock XTAL

To use the USB interface of the AT90USBxxx, the clock source should always be a crystal or external clock oscillator (the internal 8MHz RC oscillator is not accurate enough to comply with the USB specification). Only the following crystal frequency allows proper USB operations: 8MHz and 16MHz. The STK526 comes with a default 8MHz crystal oscillator.

If STK526 is connected to an STK500 and the jumpers “STKX1” and “STKX2” are set, the STK526 microcontroller operates with the “STK500 Osc” frequency parameter. The STK500 clock prevails over the STK526 crystal.

Figure 2-8 . STKX1 and STKX2 jumpers on STK526

2.4.2 Analog Power Supply

AVCC AVCC is tied to VCC by hardware.

2.5 Serial Links

2.5.1 USB

The STK526 is supplied with a standard USB type-B receptacle (identifying the board as a Device only) that aims to receive a B-plug

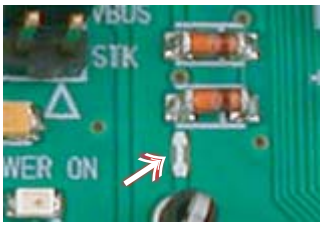
Figure 2-9 . USB type-B receptacle

VBUS Detection The board also implements a VBUS detection on a generic I/O. A low-power (50µA) voltage divider (/2) is connected from VBUS to PortC bit 2 pin. The VBUS presence is detected with a high level on the MCU pin.

VBUS Power Source Moreover, even if not selected as primary power source, VBUS powers the on-board 3.3V regulator (through a diode to avoid current being supplied to USB Host) in order to get 3V3 voltage in any condition (this allows to power the dataflash at any time, or to allow a USB Bus-powered operation with all the board at 3.3V.

However, this feature can make current flowing from VBUS to some board peripherals even if an alternate power source is used to power the board. That may lead to unwanted extra-consumption, so it can be disabled by cutting the configuration pad.

Figure 2-10 . Configuration Pad Location



Note: See Section “Configuration Pads”, page 24 for details.

2.5.2 RS-232C

The AT90USB82/162 is a microcontroller with an on-chip USART peripheral (USART1). Only the asynchronous mode is supported by the STK526.

The STK526 is supplied with a RS-232 driver/receiver. One female DB9 connector provides the RS-232 connections.

Figure 2-11 . RS-232 DB9 Connections

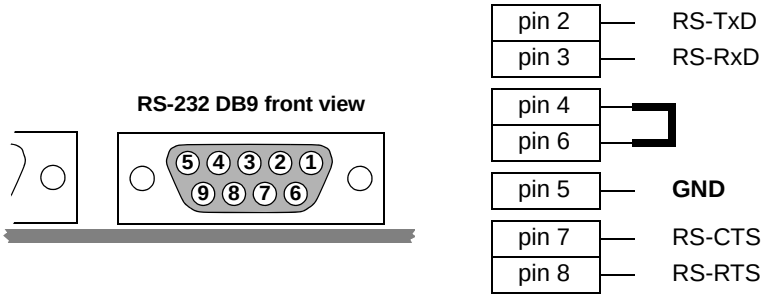
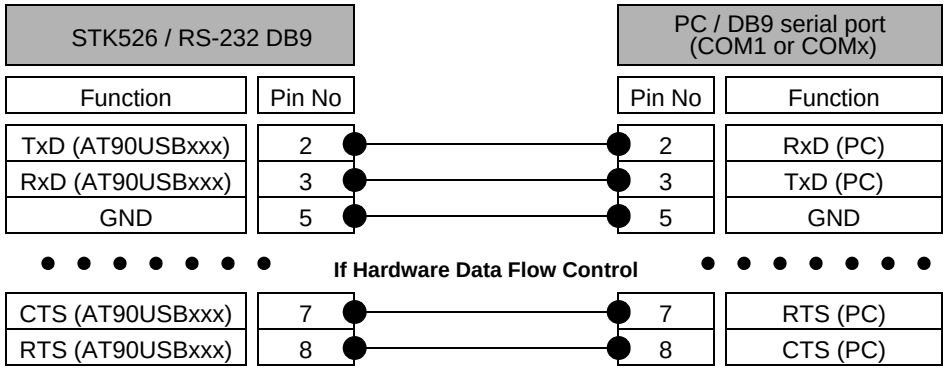
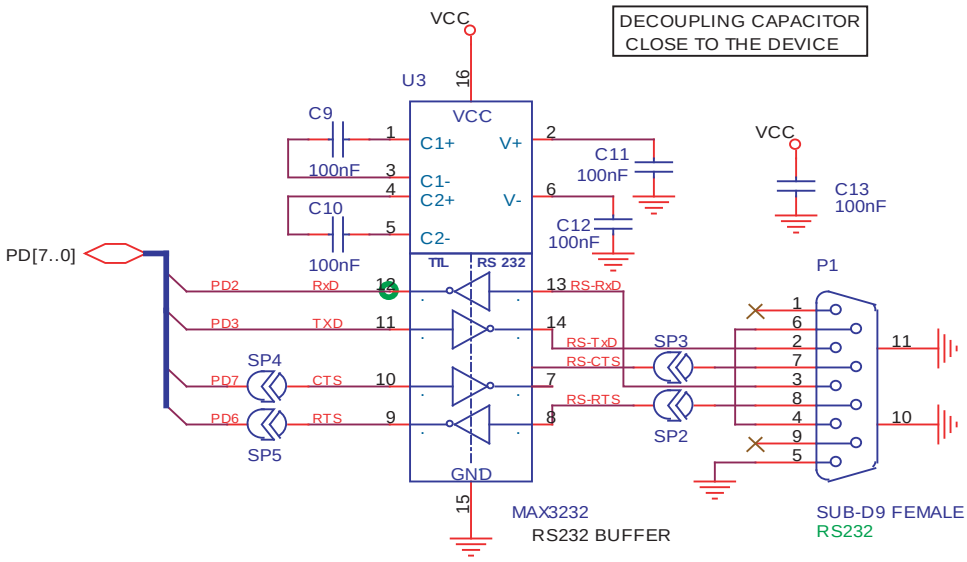


Figure 2-12 . Typical PC Connection Layout



The STK526 USART implementation allows an optional hardware flow control that can be enabled thanks to SP2, SP3, SP4, SP5 solder pads.

Figure 2-13 . USART Schematic



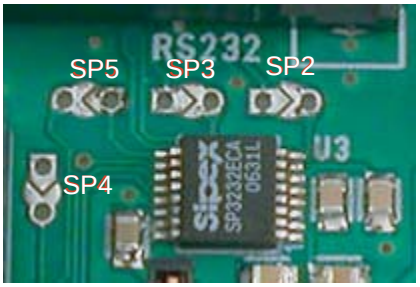
Note that the USART peripheral of the AT90USB82/162 includes an automatic Hardware Flow Control feature that makes the operation transparent for the user.

Table 2-3 . UART Settings

Mode	Solder Pads Configuration	DB9 Connection (1)	
Software Data Flow Control (default configuration)	SP2: open SP3: open SP4: open SP5: open	Tx Rx	Pin 2 Pin 3
Optional Hardware Flow Control	SP2: close SP3: close SP4: close SP5: close	Tx Rx CTS RTS	Pin 2 Pin 3 Pin 7 Pin 8

Note: 1. Tx reference: STK526 source, Rx reference: STK526 destination

Figure 2-14 . RS232 Solder Pad Location



2.6 On-board Resources

2.6.1 Joystick

The 4+1 ways joystick is convenient for developing input device (USB) application: it can easily emulate mouse movements, keyboard inputs, etc.
Closing a switch causes the corresponding signal to be pulled low, while releasing (not pressed) causes an H.Z state on the signal. The user must enable internal pull-ups on the input pins, removing the need for an external pull-up resistors on the switch.

Figure 2-15 . Joystick Schematic

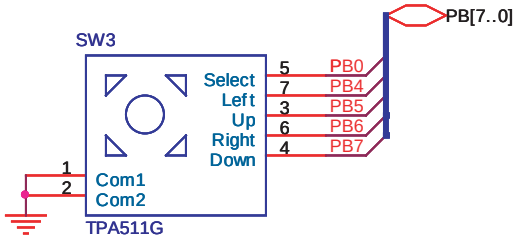
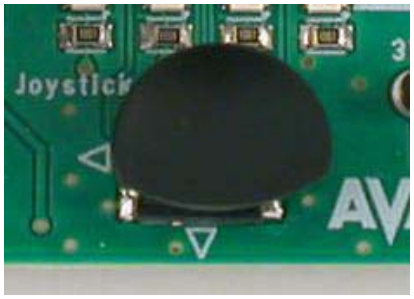


Figure 2-16 . Joystick Implementation



2.6.2 LEDs

The STK526 includes 4 green LEDs implemented on one line. They are connected to the low nibble of “Port D” of AT90USB82/162 (PORTD[3..0]).

To turn ON one LED, the corresponding port pin must drive a high level. To turn OFF one LED, the corresponding port pin must drive a low level. It is the opposite method used in STK500.

Figure 2-17 . STK526 LEDs

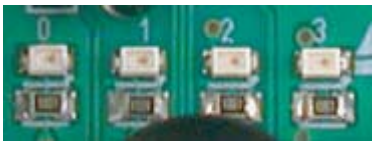
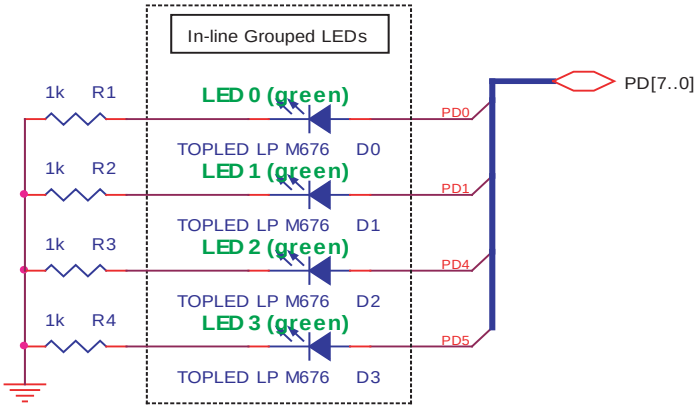


Figure 2-18 . LEDs Implementation Schematic

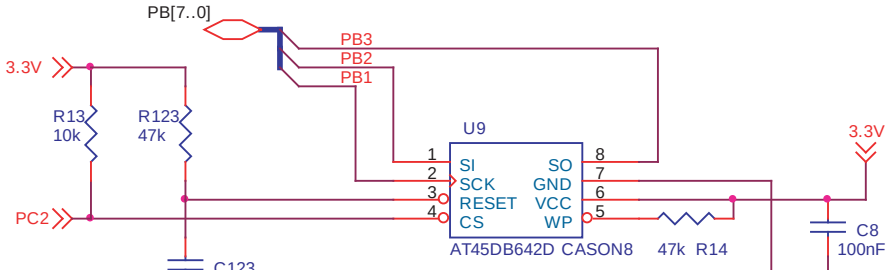


2.6.3 Data Flash Memory

For USB Mass-storage class demonstration purposes, the STK526 provides an on-chip serial Flash memory (AT45DB642x) connected to the AT90USB82/162 Serial Port Interface (SPI).

The data-flash chip select signal is connected to PortC bit 2 of the AT90USB82/162 (See Figure 2-19).

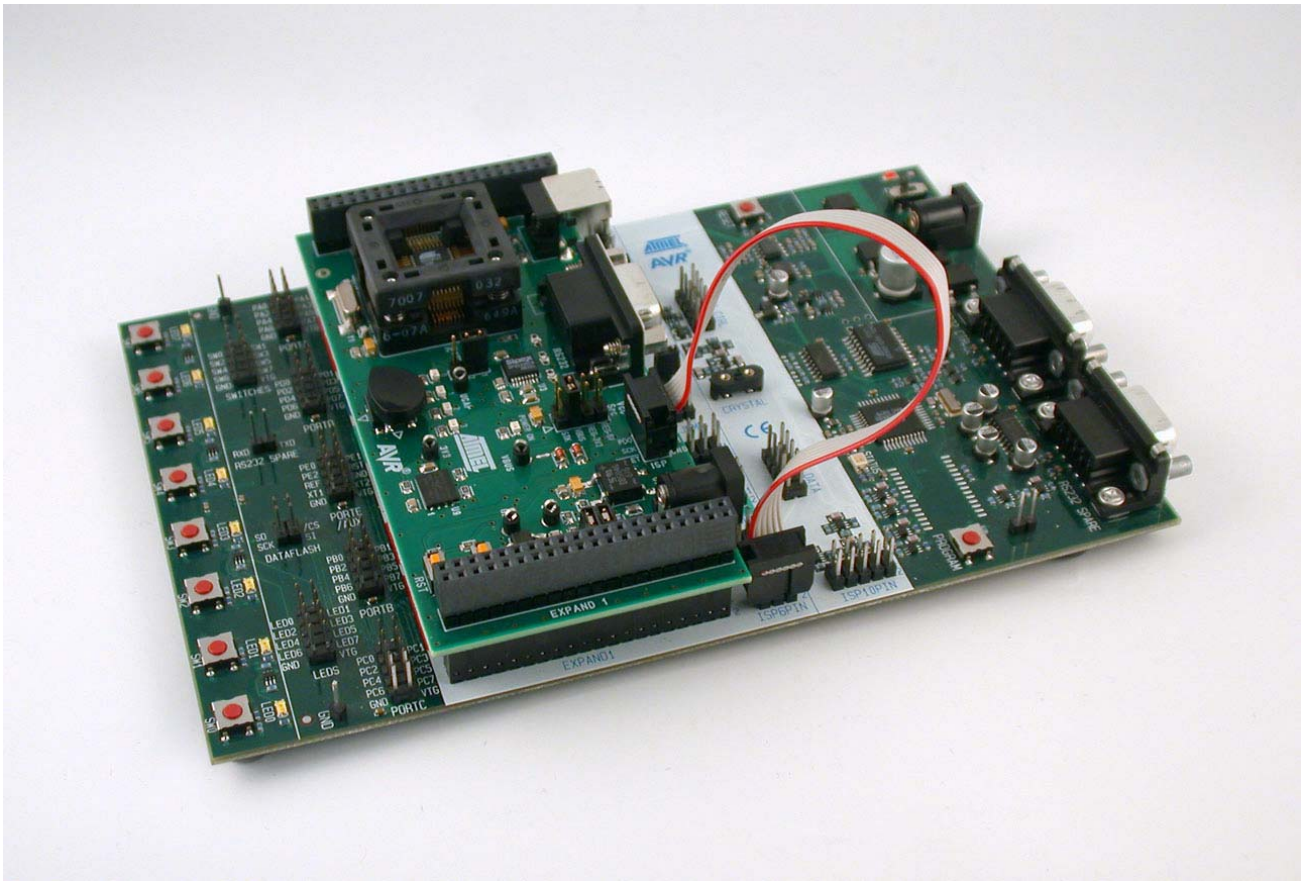
Figure 2-19 . On-board data flash schematic



Although the dataflash is 3.3V powered, it withstands without problem 5V level signals.

2.7 STK500 Resources

Figure 2-20 . Connecting STK526 to the STK500 Board



Note: **Caution:** Do not mount an AVR microcontroller on the STK500 board when STK526 is plugged on STK500.

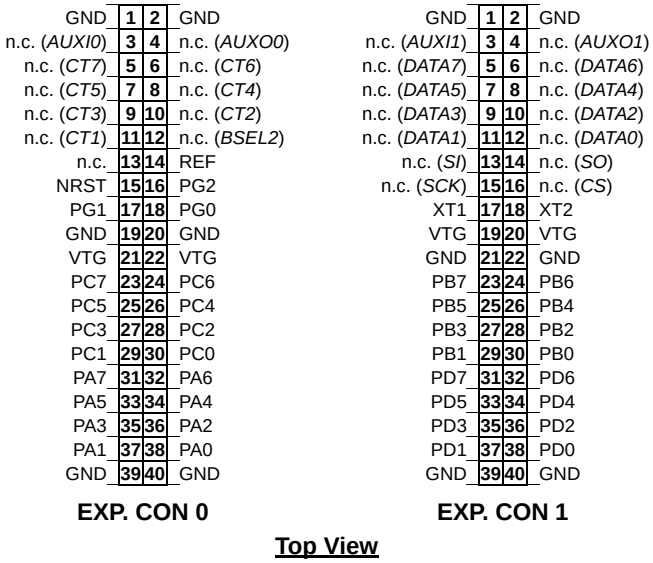
2.7.1 Supply Voltage from STK500

The AVR supply voltage coming from STK500 (VTG) can also be controlled from AVR Studio®.

- The supply voltage coming from STK500 is controlled by power supply circuitry of the STK526. Refer to Table 2-1 on page 8 to configure “Vcc Source” jumper.

2.7.2 EXP.CON 0 & EXP.CON 1 Connectors

Figure 2-21 . EXP.CON 0 and EXP.CON 1 Connectors



2.7.3 Main Clock from STK500

The AVR clock frequency (external) coming from STK500 (XT1/XT2) can also be controlled from AVR Studio®.

- "STKX1" and "STKX2" jumpers should be closed

2.7.4 RESET from STK500

The AVR RESET coming from STK500 (NRST - EXP.CON 0) can also control the STK526.

2.8 In-System Programming

2.8.1 Programming with USB bootloader: DFU (Device Firmware Upgrade)

AT90USB82/162 part comes with a default factory pre-programmed USB bootloader located in the on-chip boot section of the AT90USB82/162. This is the easiest and fastest way to reprogram the device directly over the USB interface. The "Flip" PC-based application offers a flexible and user friendly interface to reprogram the application over the USB bus.

The HWB pin of the AT90USB82/162 allows to force the bootloader execution after reset. (Please refer to AT90USB82/162 datasheet section "Bootloader support"). To force bootloader execution, operate as follows:

- Press both "RST" and "HWB" push buttons
- First release the "RST" push button
- Then release the "HWB" push button

For more information about the USB bootloader and FLIP software, please refer to the ‘USB bootloader datasheet’ and ‘FLIP User Manual’.

2.8.2 Programming with AVR ISP mkII Programmer

The AT90USB82/162 can be programmed through SPI. This section explains how to connect the programmer.

The Flash, EEPROM, all Fuses and Lock Bits can be programmed individually or with the sequential automatic programming option.

Note: The SPIEN fuse must be enabled in AT90USB82/162 to allow ISP operation. The SPIEN fuse is disabled when using debugWire channel (Section “Debugging”, page 22)

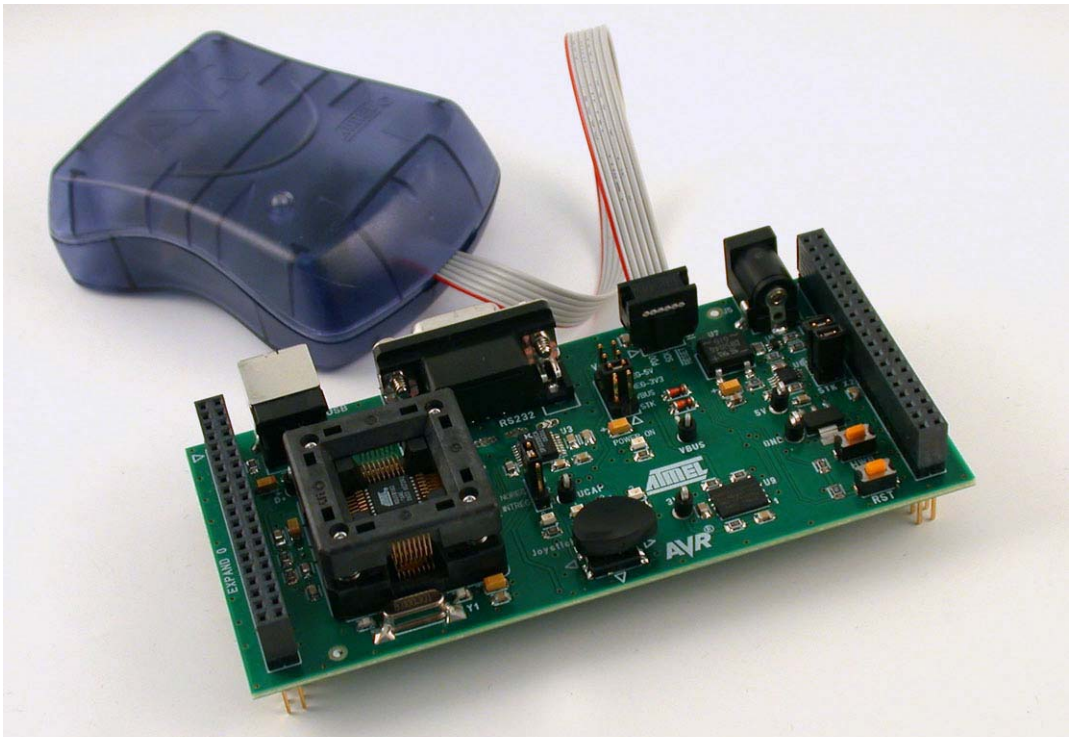
The AVR ISP mkII programmer is a compact and easy-to-use In-System Programming tool for developing applications with AT90USB82/162. Due to the small size, it is also an excellent tool for field upgrades of existing applications.

The AVR ISP programming interface is integrated in AVR Studio®.

To program the device using AVR ISP programmer, connect the 6-wire cable on the ISP connector of the STK526 as shown in Figure 2-22.

Note: See AVR Studio® on-line Help for information.

Figure 2-22 . Programming from AVR ISP mkII programmer

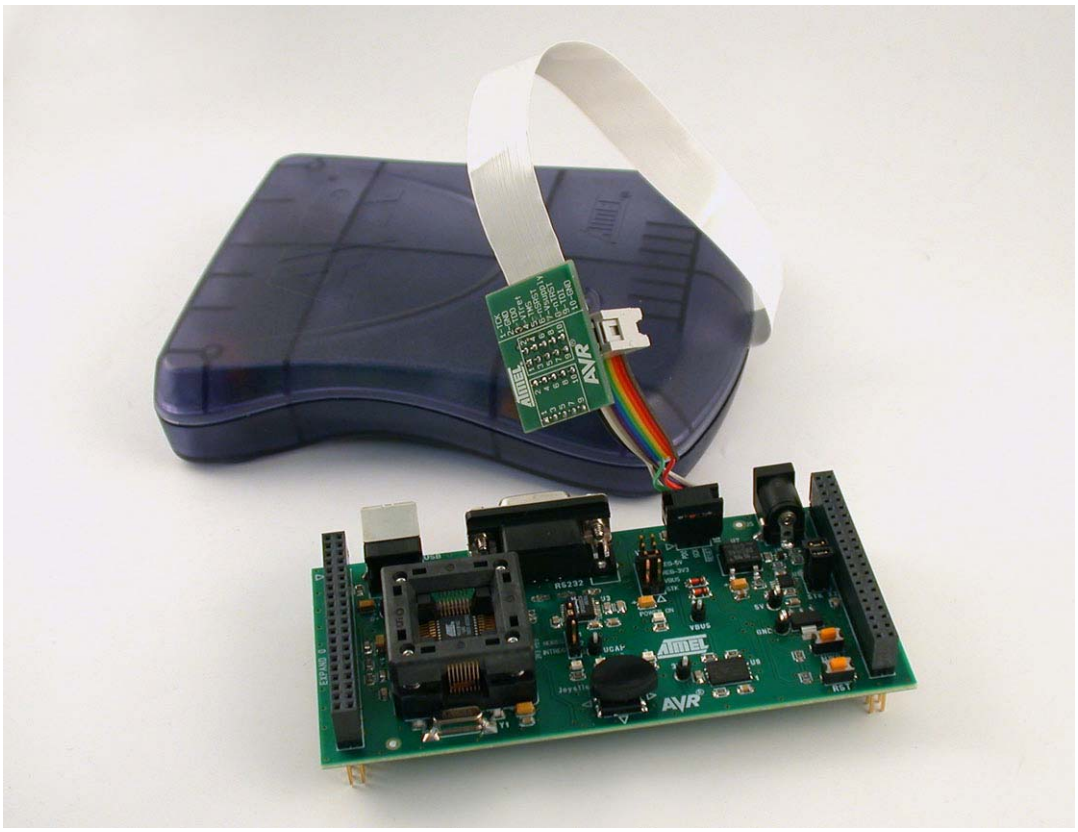


2.8.3 Programming with AVR JTAG ICE

The AT90USB82/162 can be programmed using ISP capability of the JTAGICE (using the connector adapter that comes with the programmer). This section explains how to connect and use the AVR JTAG ICE.

Note: The SPIEN fuse must be enabled in AT90USB82/162 to allow ISP operation. The SPIEN fuse is disabled when using debugWire channel (Section “Debugging”, page 22)

Figure 2-23 . Connecting AVR JTAG ICE to STK526



The Flash, EEPROM, all Fuse and Lock Bit options ISP-programmable can be programmed individually or with the sequential automatic programming option.

Note: See AVR Studio® on-line Help for information.

2.8.4 Programming with STK500

Serial Programming

The AT90USB82/162 can be programmed using the serial programming mode from STK500 firmware. The software interface (In-System Programming of an external target system) is integrated in AVR Studio®.

To program the device using ISP from STK500, connect the 6-wire cable between the ISP6PIN connector of the STK500 board and the ISP connector of the STK526 as shown in Figure 2-20.

See Figure 2-20 to see connection example for ISP with STK500.

Parallel High-Voltage Programming

The STK526 is compatible with the Parallel Programming mode of the STK500. The embedded RESET circuitry supports the HighVoltage pulses used during programming.

Once the STK526 is plugged into the STK500 Expand connectors, the following configuration must be set before powering the boards :

On the STK526 :

- set the primary power source (**Vcc Src** jumper) to STK and REG 5V
- set the **3V3REG** jumper to “NOREG”
- mount the jumper **STKX1** to enable the STK500 clock signal

On the STK500 :

- connect the PROG_CTRL header (10 pts) to the PORTD header (10pts)
- connect the PROG_DATA header (10 pts) to the PORTB header (10pts)
- mount the following jumpers : VTARGET, RESET, XTAL1, BSEL2
- mount a jumper on the position 1-2 (= right side) of the OSCSEL header

All the Flash memory, EEPROM, all Fuse and Lock Bit can be programmed individually or with the sequential automatic programming option.

Figure 2-24 . Connecting STK526 to STK500 for High Voltage Parallel Programming

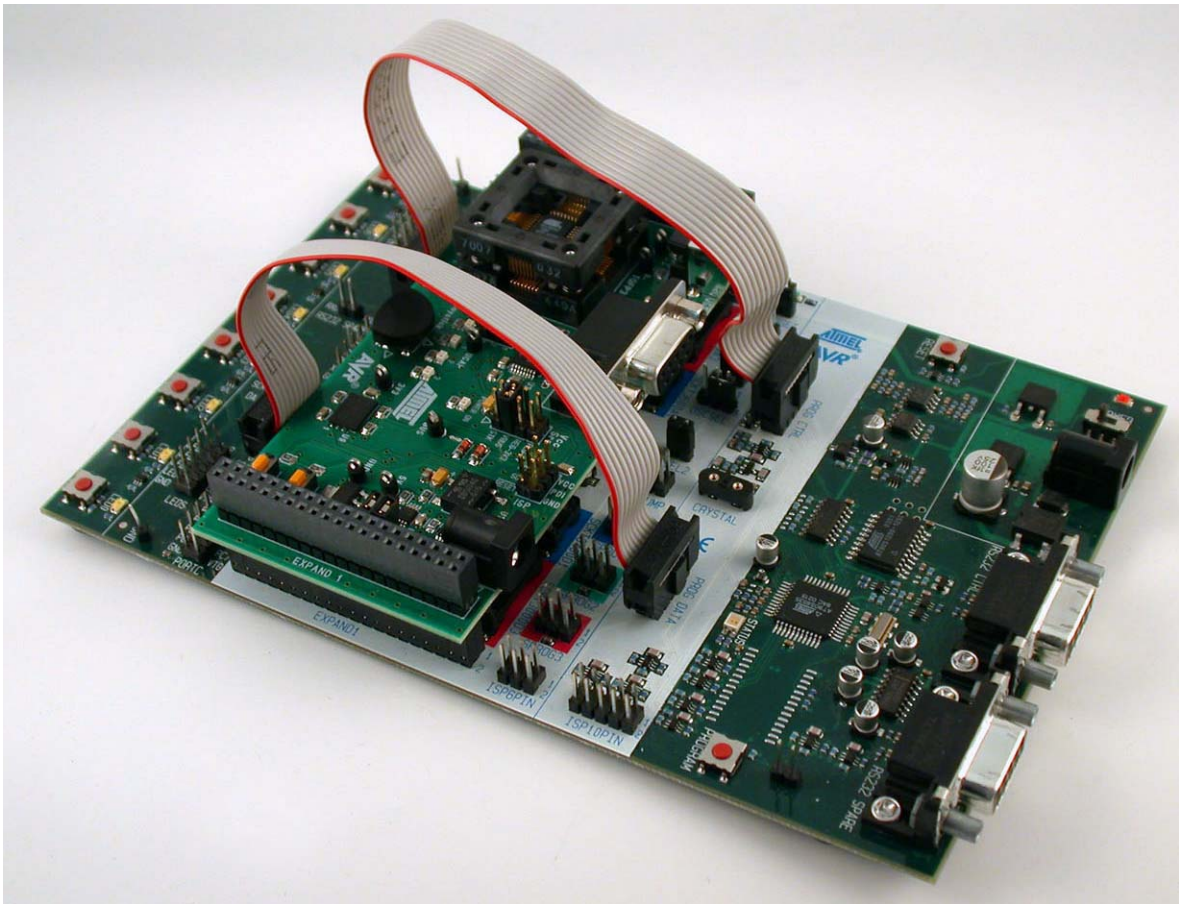
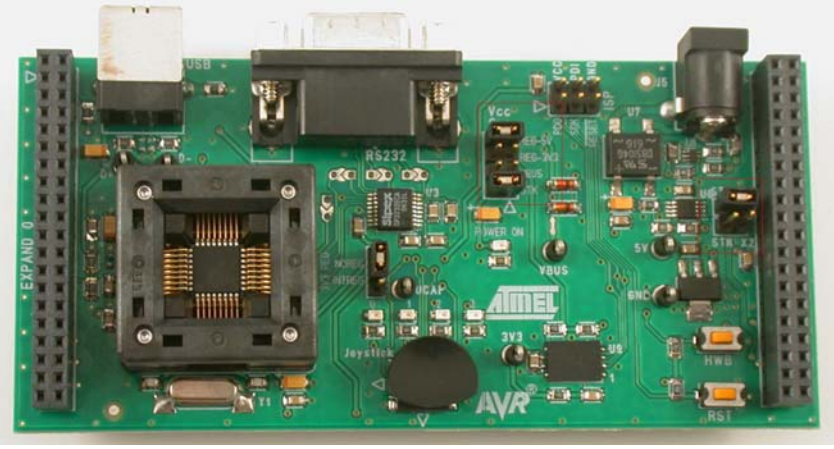


Figure 2-25 . STK526 Configuration for Parallel Programming



High Voltage Parallel Programming allows any operation on the device. This mode is very usefull if a crucial fuse has been erased inadvertently. For example, if user disables the SPIEN fuse from ISP mode, it can only be restored using Parallel Programming.

2.9 Debugging

2.9.1 Debugging with AVR JTAG ICE mkII

Every STK526 can be used for debugging with JTAG ICE MK II using the debugWire protocol through the ISP connector.

Connect the JTAG ICE mkII as shown in Figure 2-23 (like for a simple programming operation), for debugging help, please refer to AVR Studio® Help information.

As AT90USB82/162 parts are factory configured with the higher security level set, a chip erase operation will be performed on the part before debugging with JTAG ICE MK II. Thus the on-chip flash bootloader will be erased. It can be restored after the debug session using the bootloader hex file available from ATMEL website or from the CD-ROM included in the starter kit.

Note: Starting a debugWire session will enable the DWEN fuse and disable the SPIEN fuse, that will prevent ISP programming. AVR Studio® can restore the SPIEN fuse before closing a debugWire session. However the fuse bits can also be restored in Parallel Programming mode.

2.10 Test Points

There are 7 test points implemented, these test points are referred in the full schematics section.

Config. Pads Reference	Related Signals	Function
TP1	D+	USB D+ data line
TP2	D-	USB D- data line
TP3	3.3V	3.3V on-board regulated power supply
TP4	5V	5V on-board regulated power supply
TP5	Gnd	Ground (measure reference)
TP6	VBUS	USB Vbus power line
TP121	Ucap	AT90USB82/162 internal 3V3 regulator output

2.11 Configuration Pads

Configuration pads are used to disconnect/connect on-board peripherals or elements, their default configuration is: **connect**.

2.11.1 Configuration Pads Listing

Table 2-4 . Configuration Pads

Config. Pads Reference	Related Signals	Function
CP121	VBUS	Connect VBUS to the on-board 3V3 regulator. Cut to avoid extra-consumption from USB (in self-powered application only).

2.11.2 Configuration Pads - Disconnection

Figure 1. Configuration Pad - Disconnection

Cut Connection

2.11.3 Configuration Pads - Connection

Figure 2. Configuration Pad - Re-connection

Drop of solder **Wire**

2.12 Solder Pads

Solder pads are used to disconnect/connect on-board peripherals or elements, their default configuration is: **disconnect**. User may solder the pad to enable it.

2.12.1 Solder Pads Listing

Table 2-5 . Solder Pads

Solder. Pads Reference	Related Signals	Function
SP4	PD7 / CTS	This solder pad allows to enable the logical CTS signal for hardware control flow on RS232 interface.
SP3	RS232 / CTS	This solder pad allows to enable the physical CTS signal for hardware control flow on RS232 interface.
SP5	PD6 / RTS	This solder pad allows to enable the logical RTS signal for hardware control flow on RS232 interface.
SP2	RS232 / RTS	This solder pad allows to enable the physical CTS signal for hardware control flow on RS232 interface.

Section 3

Troubleshooting Guide

Figure 3-1 . Troubleshooting Guide

Problem	Reason	Solution
The Green “Power-ON” LED is not on	No power supply	Verify the power supply source level
		Verify the power supply source selector
STK526 does not work		Connect the DC power supply source, or USB interface or STK500.
The AT90USB82/162 cannot be programmed	STK500 Configuration not respected.	Connect ISP cable between STK500 and STK526. Check Parallel Programming hardware configuration on both STK500 and STK526.
	The AVR ISP probe is not connected	Connect the AVR ISP 6-PIN header to the correct STK526 ISP header (page 19). Take care of polarity.
	The AVR JTAG ICE probe is not connected	Connect the JTAG ICE 10-PIN header to the correct STK526 JTAG header (page 19). Take care of polarity.
	The memory lock bits are programmed	Erase the memory before programming
	The fuse bits are wrongly programmed	Check the fuse bits (SPIEN, DWEN if previous operation was debugging).
	Programming too fast with ISP SPI	Check oscillator settings and make sure it is not set higher than SPI clock
AVR Studio does not detect the AVR tool used	RS232/USB cable is not connected, or power is off	Connect the RS232 cable (STK500 - AVR ISP) and check power connections
		Connect the USB (JTAG ICE MKII, AVR ISPmkIII) and check power connections
	PC COM port is in use	Disable other programs that are using PC COM port.
		Change PC COM port
	AVR Studio does not detect COM port.	Disable COM port auto-detection in AVR Studio file menu. Force COM port to the correct COM port

Section 4

Technical Specifications

- **System Unit**
  - Physical Dimensions ..... L=119 x W=56 x H=27 mm
  - Weight ..... 70 g

- **Operating Conditions**
  - Internal Voltage Supply ..... 2.7V - 5.5V
  - External Voltage Supply ..... 9V -15V (100mA)
  - USB ..... 4.4V -5.25V (100mA)

- **Connections**
  - USB Connector ..... Type-B receptacle
  - USB Communications ..... Full speed 2.0
  - RS 232C Connector ..... 9-pin D-SUB female
  - RS 232C Communications Maximum Speed ..... 250 kbps

Section 5

Technical Support

For Technical support, please contact 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, Parallel or specific Boot-Loader)
- Hardware revisions of the AVR tools, found on the PCB
- Version number of 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
- Country and distributor or Atmel contact

Section 6

Complete Schematics

On the next pages, the following documents of STK526 revision 4381B are shown:

- Complete schematics
- Assembly drawing
- Bill of materials
- Default configuration summary

Figure 6-1 . Schematics, 1 of 4

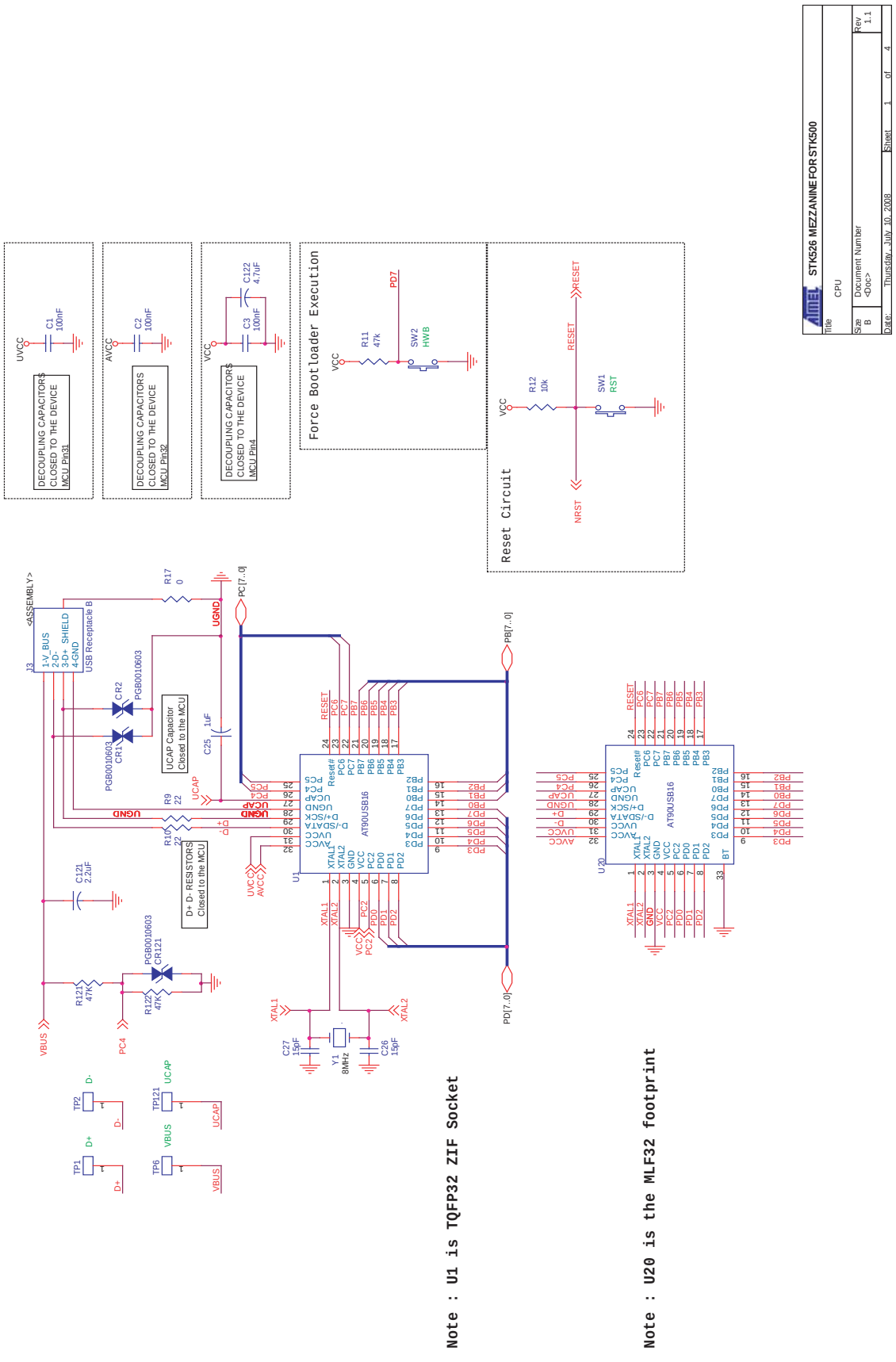


Figure 6-2 . Schematics, 2 of 4

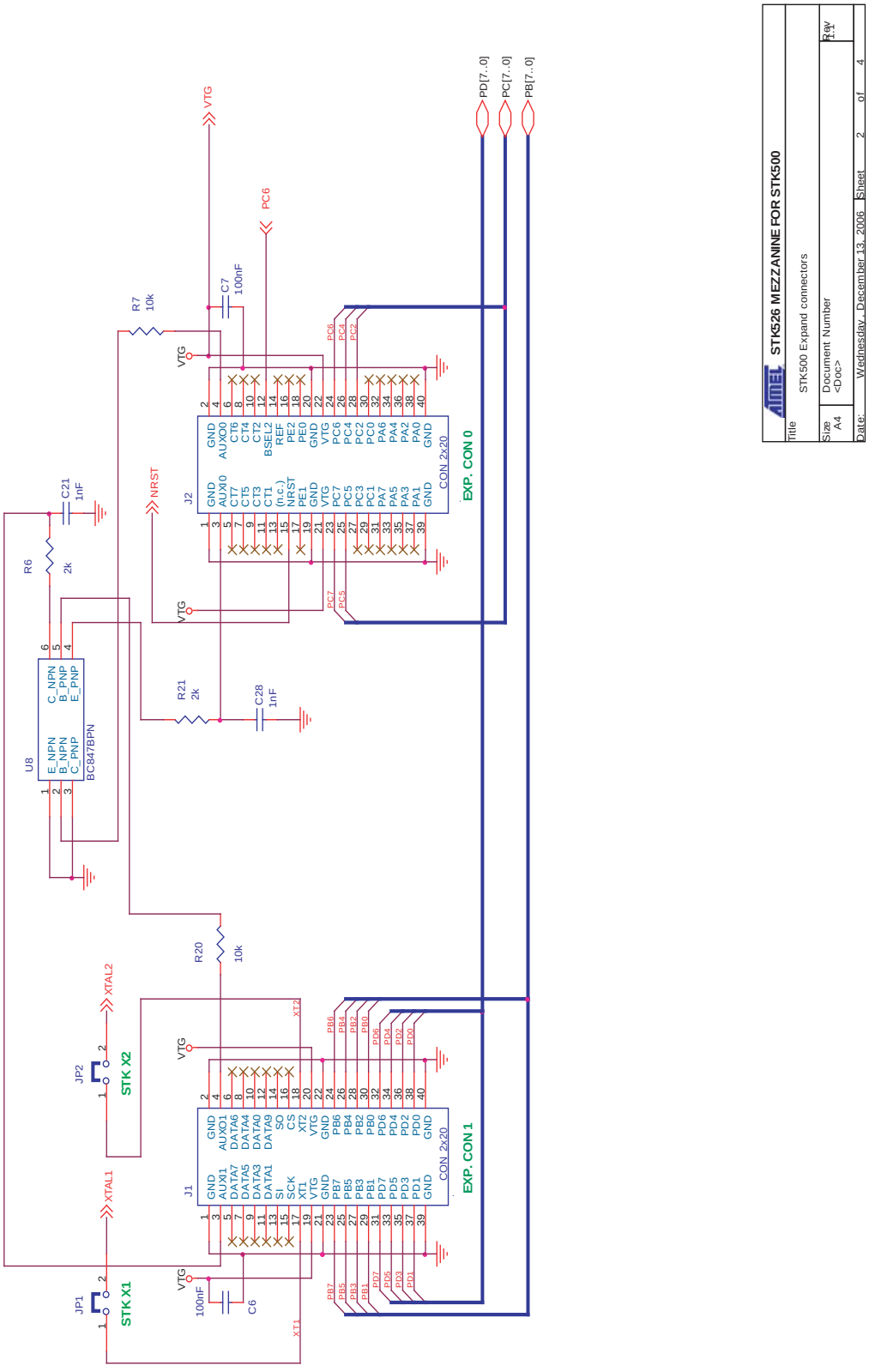


Figure 6-3 . Schematics, 3 of 4

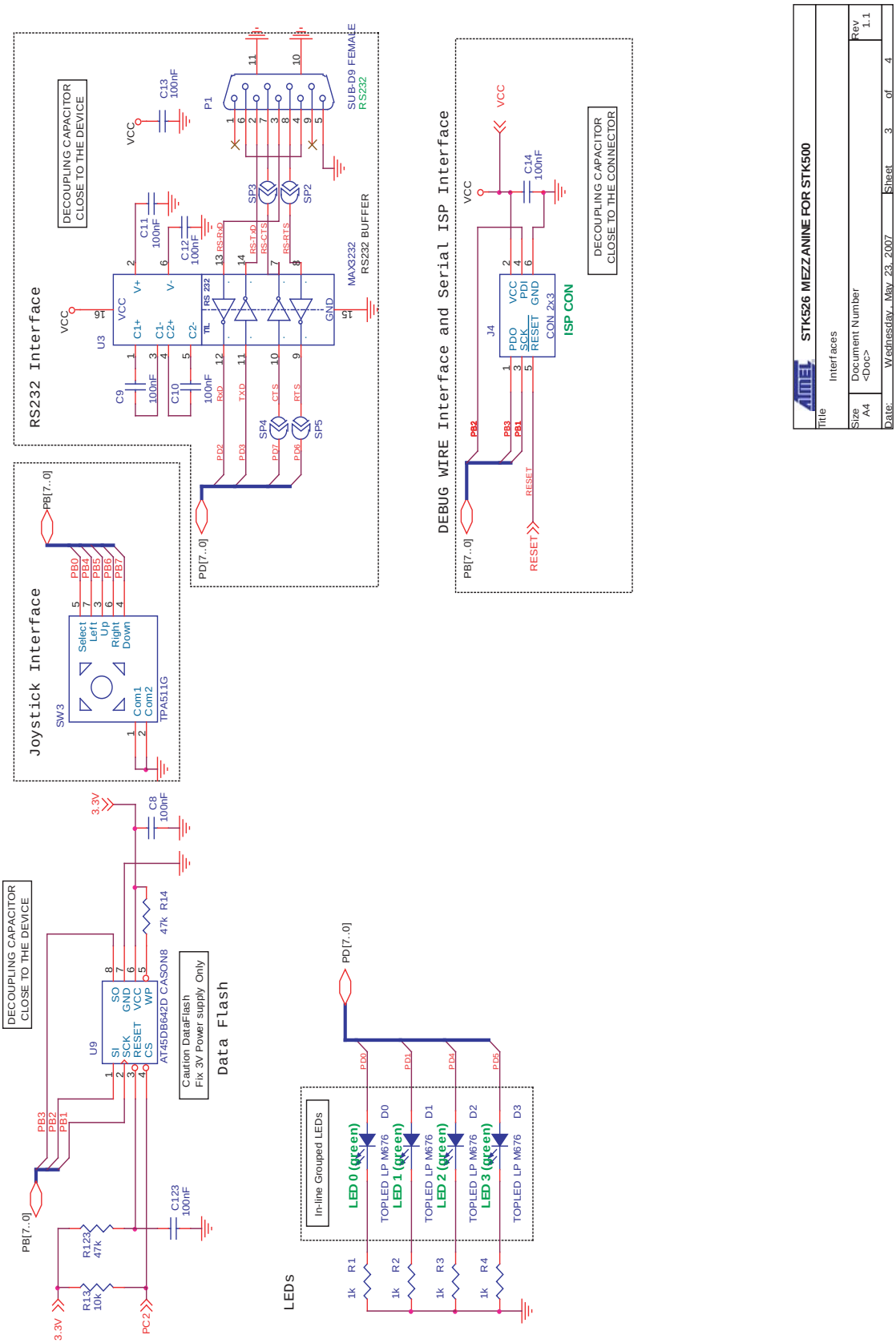


Figure 6-4 . Schematics, 4 of 4

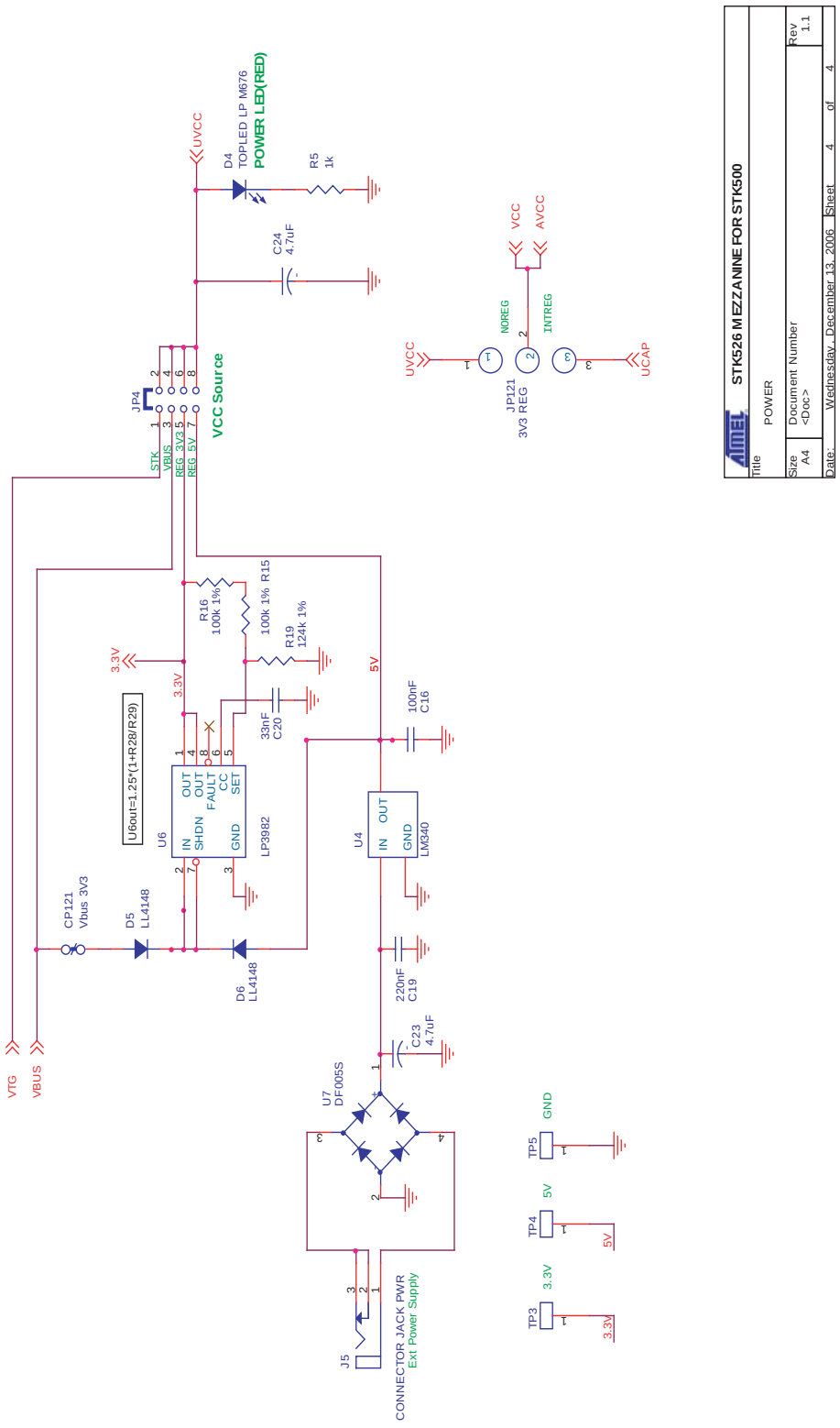


Figure 6-5 . Assembly Drawing, 1 of 2 (component side)

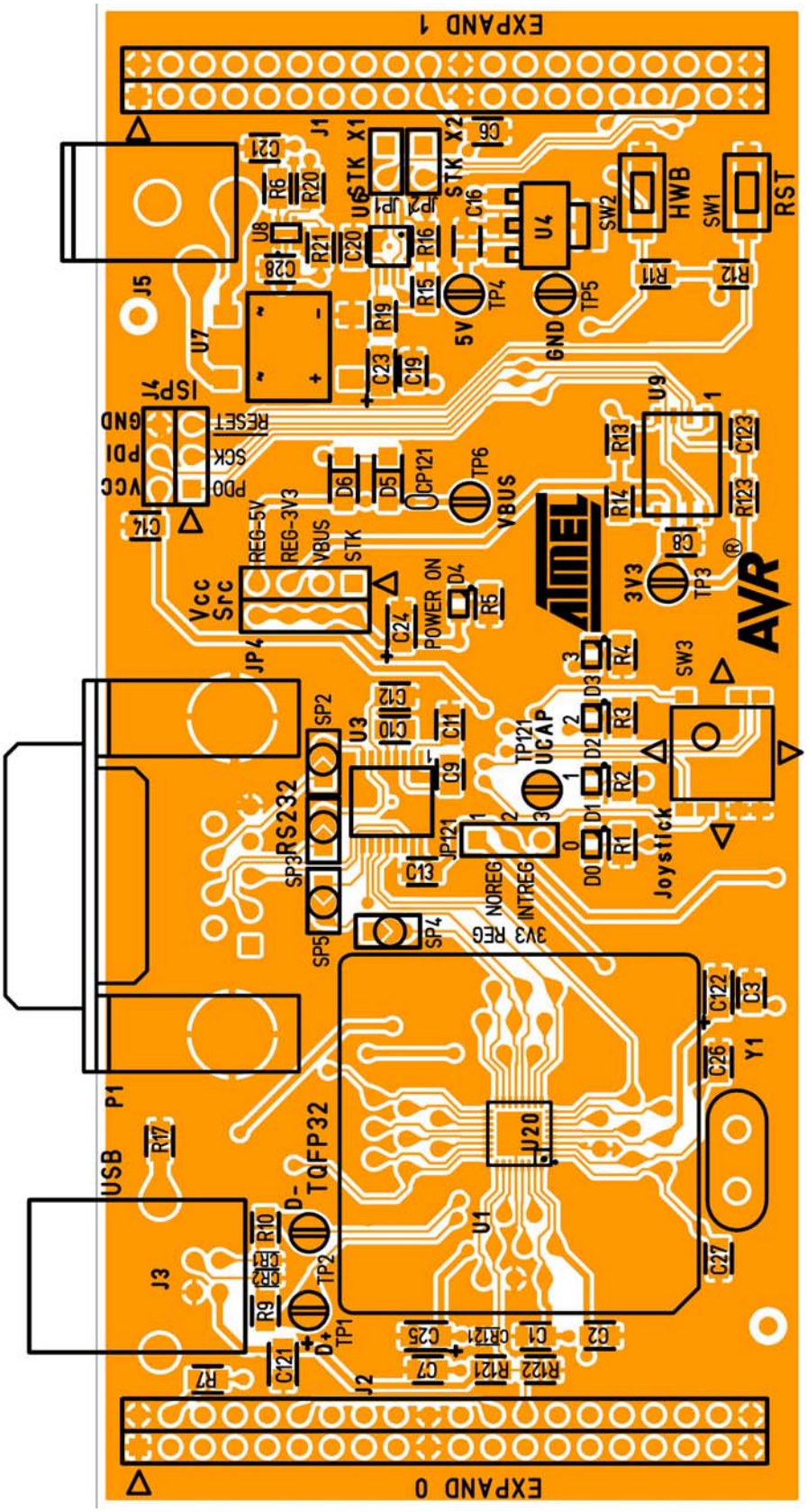


Table 6-1 . Bill of Materials

Qtty	Schematic Reference	Part Reference	Description	Case
		CAPACITORS		
14	C1, C2, C3, C6-C14, C16, C123	100nF	Ceramic capacitor	0805
1	C121	2.2µF	Tantalum capacitor	Type A
1	C19	220nF	Ceramic capacitor	0805
1	C20	33nF	Ceramic capacitor	0805
2	C21, C28	1nF	Ceramic capacitor	0805
3	C23, C24, C122	4.7µF	Tantalum capacitor	Type A
1	C25	1µF	Tantalum capacitor	Type A
2	C26, C27	15pF	Ceramic capacitor	0805
		DIODES		
3	CR1, CR2, CR123	PGB1010603MR	ESD Protection (Littlefuse)	0603
4	D0-D3	KA-3022SGC	Green LED	Mini Topled
1	D4	KA-3022SRC	Red LED	Mini Topled
2	D5, D6	LL4148	Small signal diode, If max 200mA	LL-34
		CONNECTORS		
2	J1, J2	M20-6102005	PC104 2x20-pin through-hole female press-fit stackable connector	2.54mm pitch
1	J3	USB type B	USB type B receptacle	Special
1	J4	Header 2x3	Male header 2x3 pts for ISP connection	2.54mm pitch
1	J5	Jack Power 2.1	Jack Power Receptacle with diam. 2.1mm	Special
1	P1	DB9 female	DB9 Female 90° receptacle for RS-232	Special
		CONFIGURATION		
2	JP1, JP2	Jumper 1x2	Header for configuration 1x2 pts	2.54mm pitch
1	JP4	Jumper 2x4	Header for configuration 2x4 pts	2.54mm pitch
1	JP121	Jumper 1x3	Header for configuration 1x3 pts	2.54mm pitch
1	CP121	Configuration Pad	Enabled by default. Can be disabled cutting it.	N/A
4	SP2-SP5	Solder Pad	Disabled by default. Can be enabled with a solder drop.	N/A
		RESISTORS		
5	R1-R5	1 kOhms	1/16W-5% SMD	0805
2	R6, R21	2 kOhms	1/16W-1% SMD	0603
4	R7, R12, R13, R20	10 kOhms	1/16W-5% SMD	0603
2	R9, R10	22 Ohms	1/16W-5% SMD	0603
5	R11, R14, R121, R122, R123	47 kOhms	1/16W-1% SMD	0805
2	R15, R16	100 kOhms	1/16W-1% SMD	0805
1	R17	0 Ohms / strap	N/A	0603
1	R19	120 kOhms 1%	1/16W-1% SMD	0805
		INTEGRATED CIRCUITS		

Table 6-1 . Bill of Materials

Qtty	Schematic Reference	Part Reference	Description	Case
1	U1 socket	TQFP32 ZIF	Socket for QFP 32 pitch 0.8 mm 7x7 - 9x9 mm	Special
1	U20	AT90USBxx2	MCU	TQFP32/QFN32
1	U9	AT45DB642C	8Mo dataflash memory	CASON8
1	U3	MAX3232ECAE+	RS232 transceiver	SSOP16
1	U4	LM340	5V regulator	SOT223
1	U6	LP3982IMM-ADJ	LDO regulator 3V3 (Vin max 6V), 300mA	MSOP8
1	U7	DBS104G	Diode bridge 400V 1A	Special
1	U8	BC847BPN	Transistor double NPN/PNP Ic max = 200mA	SC-88
MISCELLANEOUS				
2	SW1, SW2	Pushbutton	Normally Open ; 1.6N	6x3.5mm
1	SW3	TPA511G	4 ways joystick + center CMS mount	Special
7	TP1-TP6, TP121	Test Point	Test point for measurements	D=1.32mm
1	Y1	8MHz	8MHz crystal	HQ49/4H
4	JP1-JP4	Shunts	Shunts for configuration headers	N/A

6.0.1 Default Configuration - Summary

Table 6-2 . Default Configuration summary

Name	Ref.	Function	State
Jumpers			
STK X1	JP1	AT90USB82/162 Clock configuration pin X1	OPEN
STK X2	JP2	AT90USB82/162 Clock configuration pin X2	OPEN
VCC SOURCE	JP4	Primary power source selection	“VBUS” position
3V3 REG	JP121	AT90USB82/162 I/O power selection	“NOREG” position
Solder PADS			
	SP4	TTL - CTS	OPEN
	SP3	RS232 - CTS	OPEN
	SP5	TTL - RTS	OPEN
	SP2	RS232 - RTS	OPEN
Configuration PADS			
	CP121	Connect VBUS to 3V3 on-board regulator	CLOSED

6.1 Document Revision History

6.2 7709B

1. Schematic drawings updated.

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