STK526 Rev. B

Hardware User Guide

ATMEL®

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 documents 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, etc. and supports all AVR development tools.

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

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

Figure 1-1 . STK526 Board
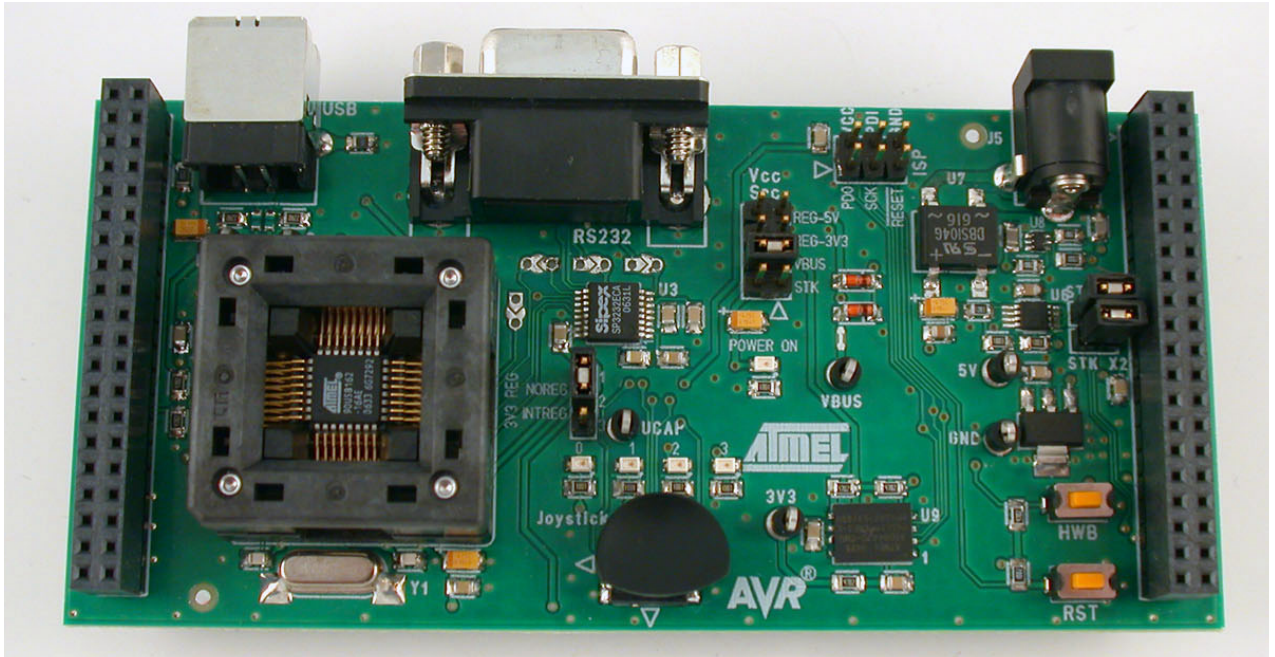
1.2   STK526 - AT90USB82/162 Starter Kit Features

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:
    – regulated 3.3 or 5V,
    – from an external power connector,
    – from the USB interface (USB device bus powered application),
    – from STK500 [2],
    – or using the 3.3V embedded 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,

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- On-board HWB button for force bootloader section 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 newest 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.
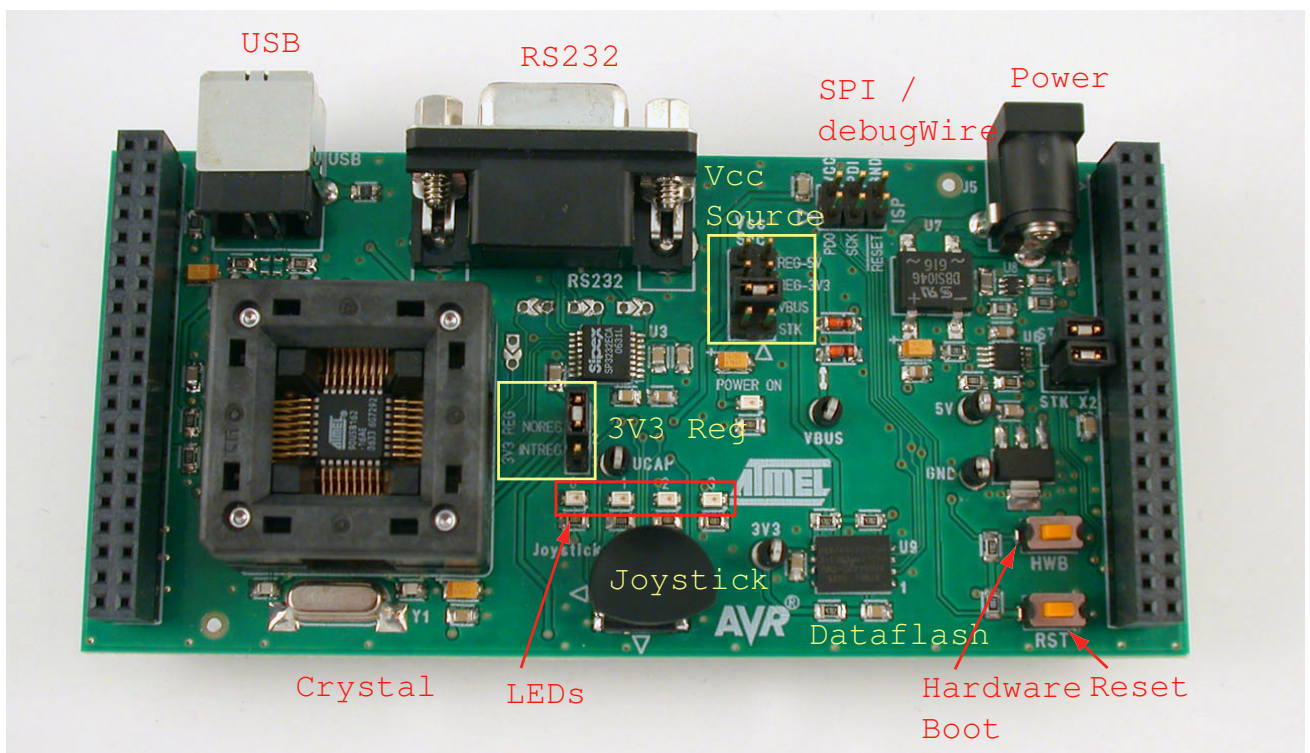
![ATMEL logo]

Section 2

Using the STK526

This chapter describes the board and all its features.

2.1   Overview

Figure 2-1 . STK526 Overview

Figure 2-1 labels: USB, RS232, SPI / debugWire, Power, Vcc Source, 3V3 Reg, Joystick, Crystal, LEDs, Dataflash, Hardware Boot, Reset

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2.2   Power Supply

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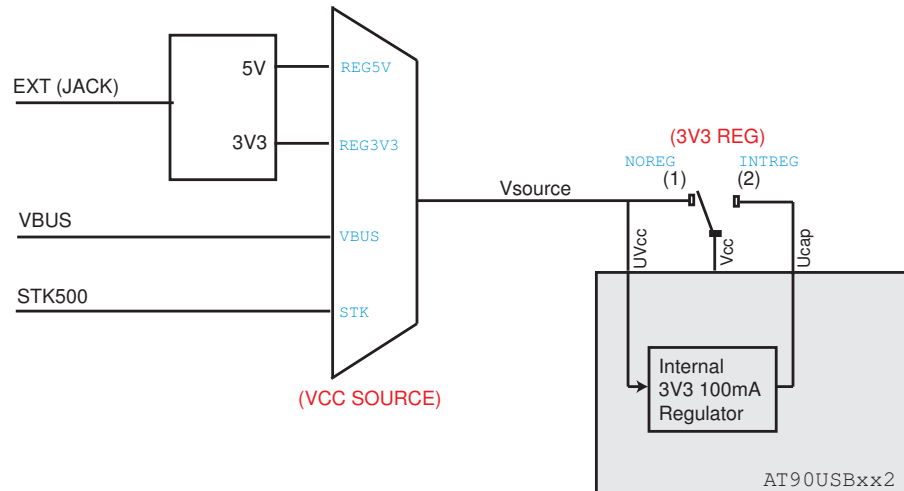
First, the board allows to drain power from three external sources, leading to four different solutions. The selected voltage is applied to the regulator input of the AT90USB82/162. Then user can choose to power the MCU I/O either directly with the primary power source (external 5V/3V3), or from the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

2.2.1   Power Supply Sources

The power supply can come from three different [3] 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.
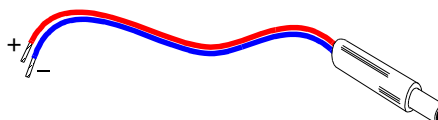
JACK PWR connector: – Need of a male JACK outlet,

– Input supply from 9 up to 15V [1] DC,

– No specific polarization [2] is required.

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Figure 2-3 . JACK PWR Connector (J6)

Figure 2-4 . Male JACK Outlet and Wires

STK500 Powered: (c.f. "STK500 Resources" on page 18).

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

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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.	VCC Source Reg 5 ■ ■ Reg 3.3 ■ ■ VBUS 5 [■ ■] STK ■ ■
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.	VCC Source Reg 5 [■ ■] Reg 3.3 ■ ■ VBUS 5 ■ ■ STK ■ ■
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.	VCC Source Reg 5 ■ ■ Reg 3.3 [■ ■] VBUS 5 ■ ■ STK ■ ■
STK	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).	VCC Source Reg 5 ■ ■ Reg 3.3 ■ ■ VBUS 5 ■ ■ STK [■ ■]

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

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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
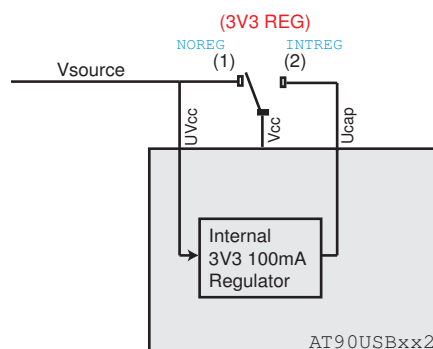
Once the power source selected, the internal regulator input of the AT90USB82/162 (UVcc) is powered. Firmware has the responsability to enable or disable the regulator. Ucap is the output pin of the internal regulator (decoupled with a 1µF capacitor), and Vcc is the main power source of the MCU. Several cases may be required by the user :

■ **Vsource = 5V, Vcc = 5V** : in this mode, the configuration switch (see figure above) must be in position serigraphied "**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** : in this mode, the configuration switch must be in the position serigraphied "**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** : in 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. But 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 level at 3.3V on the AT90USB82/162.	

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2.2.4 "POWER-ON" LED

The POWER-ON LED is always lit when power is applied to STK526 regardless of power supply source and the regulation.

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:
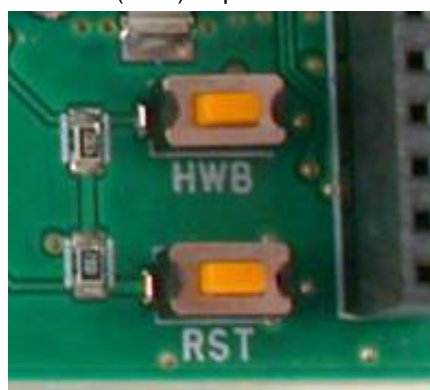
2.3.1 Power-on RESET

The power supply rise time acts as 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

(c.f. "RESET from STK500" on page 19)

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 cannot be used successfully to operate with the USB interface). Only the following crystal frequency allows proper USB operations: 8MHz, 16MHz. The STK526 comes with a default 8MHz crystal oscillator.

When closing STKX1 and STKX2 switches, and STK526 is connected to an STK500, the STK526 can operate with the "STK500 Osc" frequency parameter. The STK500 clock precedes the crystal connected.

2.4.2   Analog Power Supply
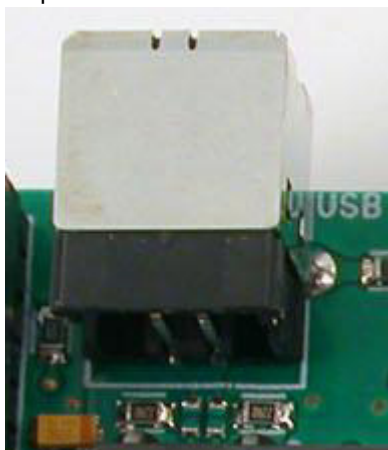
AVCC   AVCC is tied to VCC by hardware.

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 aim to receive a B-plug

Figure 2-8 . USB type-B receptacle

VBUS Detection   The board also implement 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, VBUS, even if not selected as primary power source, powers the on-board 3.3V regulator (through a diode to avoid current supply to USB) 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 in 3.3V. Since this feature can make current flowing from VBUS to power the board (and make unwanted extra-consumption), it can be disabled by cutting the configuration pad. See Section "Configuration Pads", page 25 for details.

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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 assumes the RS-232 connections.
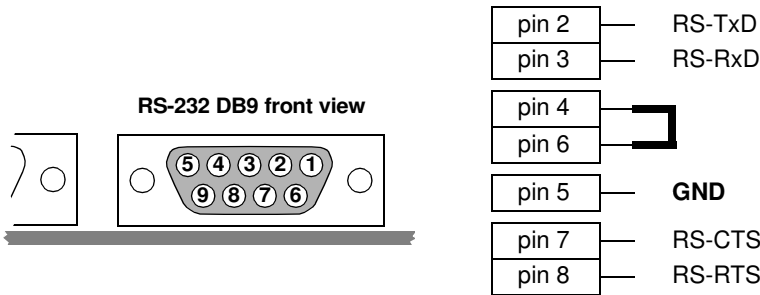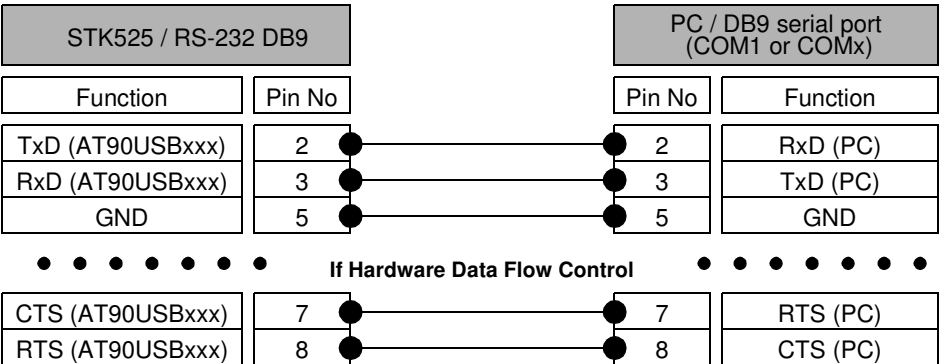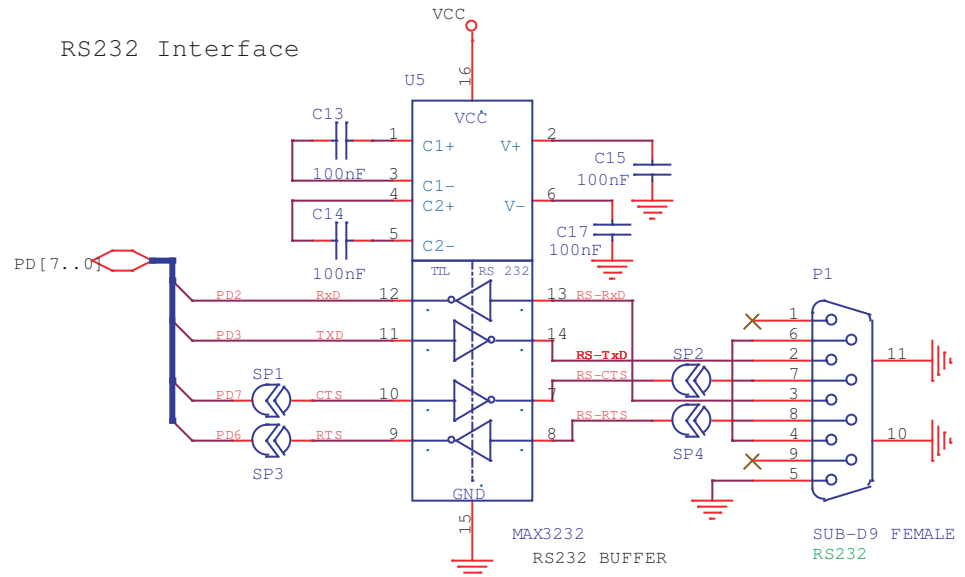
Figure 2-9 . RS-232 DB9 Connections

Figure 2-10 . Typical PC Connection Layout

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The STK526 USART implementation allows an optional hardware flow control that can be enabled thanks to SP1, SP2, SP3, SP4 solder pads (See Figure 2-11).

Figure 2-11 . USART Schematic

Note that the AT90USB82/162 integrates the Hardware Flow Control in its USART peripheral without special management by firmware (except init).

Table 2-3 . UART Settings

Mode	Solder Pads Configuration	DB9 Connection [1]	
Software Data Flow Control **(default configuration)**	SP4: open SP5: open SP7: open SP8: open	Tx Rx	Pin 2 Pin 3
Optional **Hardware Flow Control**	SP4: close SP5: close SP7: close SP8: close	Tx Rx CTS RTS	Pin 2 Pin 3 Pin 7 Pin 8

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

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2.6   On-board Resources

2.6.1   Joystick

The 4+1 way joystick offers an easy user interface implementation for a USB application (it can easily emulate mouse movements, keyboard inputs, etc.).
Pushing a push-button 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 push-button.

Figure 2-12 . Joystick Schematic
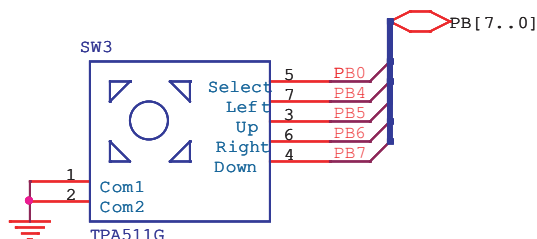
Figure 2-13 . Joystick Implementation

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

Figure 2-14 . LEDs Implementation Schematic
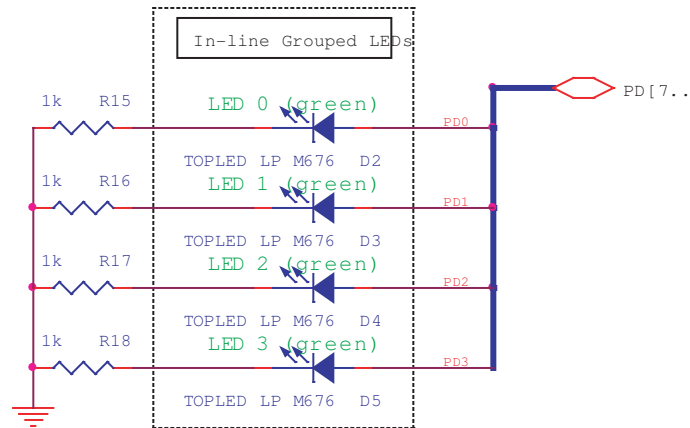
2.6.3   Data Flash Memory

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).
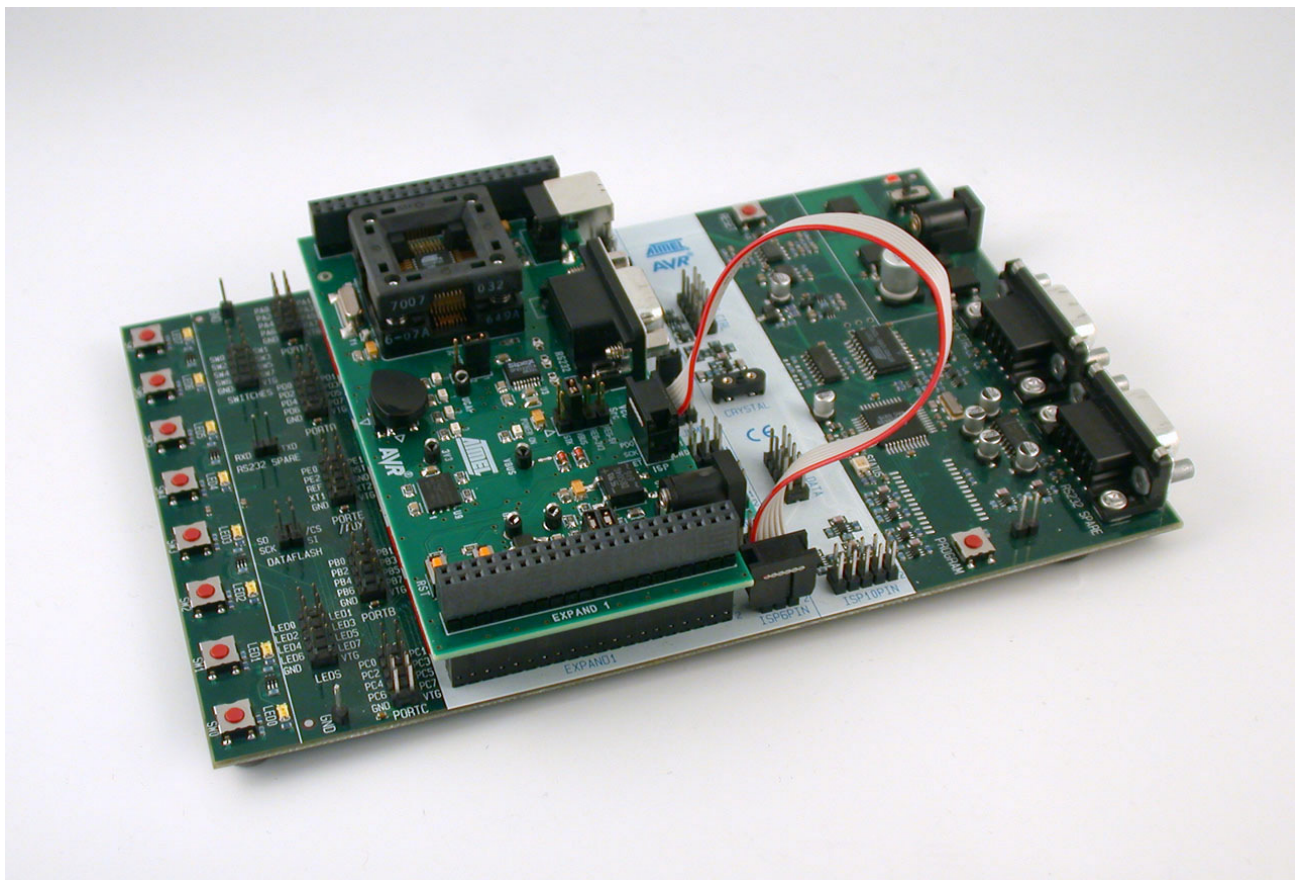
The data-flash chip select signal is connected to PortC bit 2 of the AT90USB82/162 (See Figure 2-15).

Figure 2-15 . On-board data flash schematic
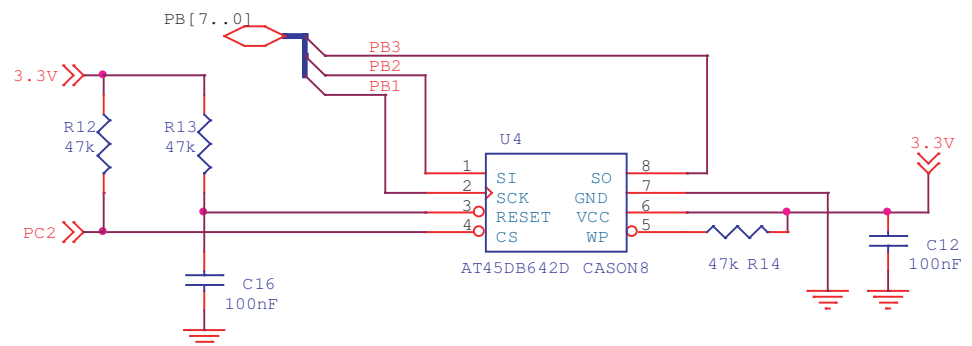
Although the dataflash is 3.3V powered, it withstands without problem 5V level signals.

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2.7   STK500 Resources

Figure 2-16 . 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 9 to configure "Vcc Source" jumper.

2.7.2   EXP.CON 0 & EXP.CON 1 Connectors

Figure 2-17 . EXP.CON 0 and EXP.CON 1 Connectors

```
        GND  1  2  GND              GND  1  2  GND
  n.c. (AUXI0) 3  4  n.c. (AUXO0)     n.c. (AUXI1) 3  4  n.c. (AUXO1)
   n.c. (CT7)  5  6  n.c. (CT6)       n.c. (DATA7) 5  6  n.c. (DATA6)
   n.c. (CT5)  7  8  n.c. (CT4)       n.c. (DATA5) 7  8  n.c. (DATA4)
   n.c. (CT3)  9 10  n.c. (CT2)       n.c. (DATA3) 9 10  n.c. (DATA2)
   n.c. (CT1) 11 12  n.c. (BSEL2)     n.c. (DATA1)11 12  n.c. (DATA0)
        n.c. 13 14  REF              n.c. (SI) 13 14  n.c. (SO)
        NRST 15 16  PG2              n.c. (SCK)15 16  n.c. (CS)
         PG1 17 18  PG0                   XT1 17 18  XT2
         GND 19 20  GND                   VTG 19 20  VTG
         VTG 21 22  VTG                   GND 21 22  GND
         PC7 23 24  PC6                   PB7 23 24  PB6
         PC5 25 26  PC4                   PB5 25 26  PB4
         PC3 27 28  PC2                   PB3 27 28  PB2
         PC1 29 30  PC0                   PB1 29 30  PB0
         PA7 31 32  PA6                   PD7 31 32  PD6
         PA5 33 34  PA4                   PD5 33 34  PD4
         PA3 35 36  PA2                   PD3 35 36  PD2
         PA1 37 38  PA0                   PD1 37 38  PD0
         GND 39 40  GND                   GND 39 40  GND

        EXP. CON 0                       EXP. CON 1
```

Top View

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-side application available for free on Atmel website 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 section execution after reset. (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' document and 'FLIP User Manual'.

2.8.2 Programming with AVR ISP mkII Programmer

The AT90USB82/162 can be programmed using specific SPI serial links. This sub section will explain how to connect the programmer.

The Flash, EEPROM and all Fuses and Lock Bits options ISP-programmable 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 23)

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 2-18.

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

Figure 2-18 . Programming from AVR ISP mkII programmer
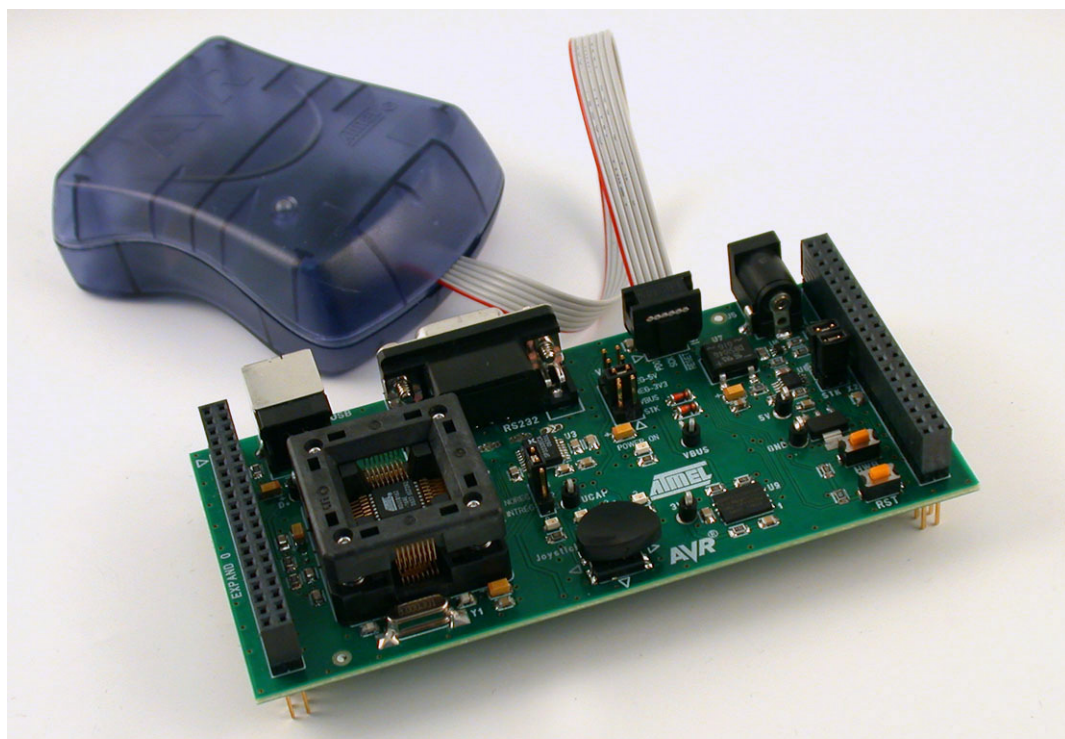
2.8.3 Programming with AVR JTAG ICE

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The AT90USB82/162 can be programmed using ISP capability of the JTAGICE (using the connector adapter that comes with the programmer). This sub-section will explain 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 23)

Figure 2-19 . Connecting AVR JTAG ICE to STK526
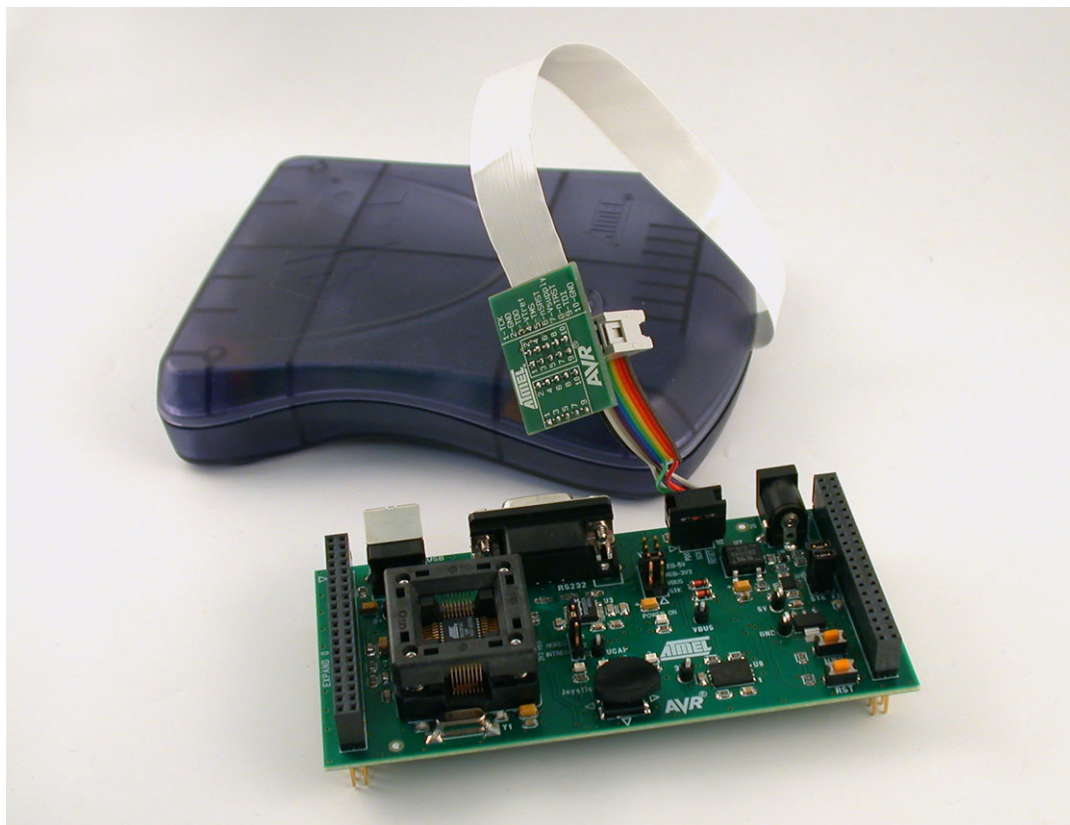
The Flash, EEPROM and all Fuse and Lock Bit options ISP-programmable can be programmed individually or with the sequential automatic programming option.

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 in the AVR Studio STK500 software. 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 2-16.

See AVR Studio® on-line Help for information.

See Figure 2-16 to see connection example for ISP with STK500.

Parallel High-Voltage Programming

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

Once the STK526 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 <u>and</u> REG 5V
– set the **3V3REG** jumper must be set 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 and all Fuse and Lock Bit options can be programmed individually or with the sequential automatic programming option.

Figure 2-20 . Connecting STK526 to STK500 for High Voltage Parallel Programming
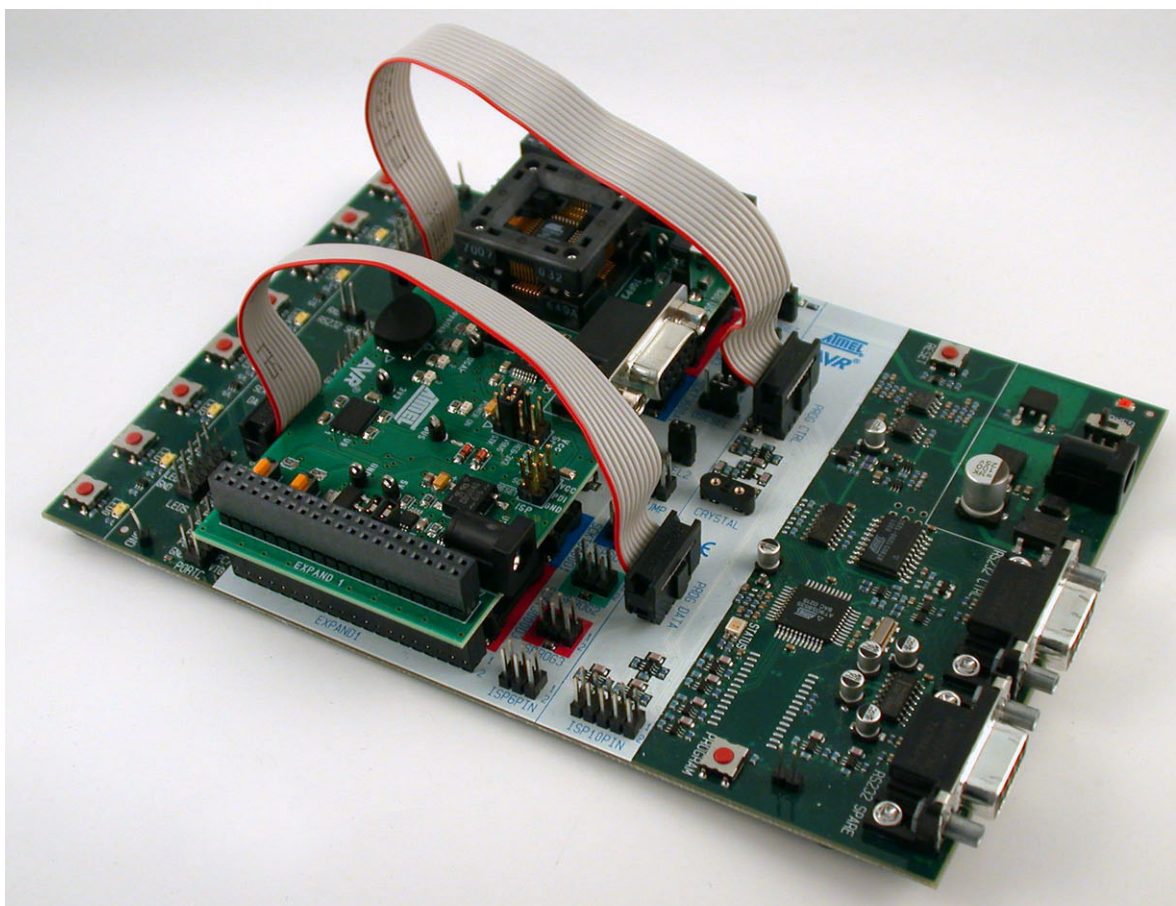
Figure 2-21 . STK526 Configuration for Parallel Programming
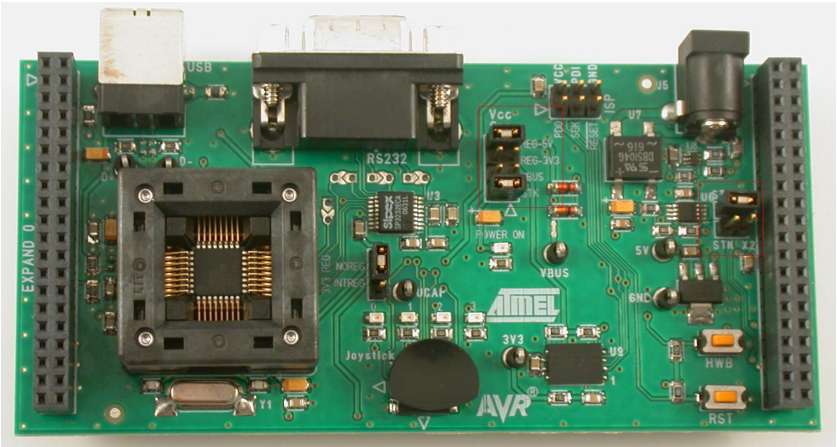
Parallel Programming allows any operation on the device. This mode is very usefull if a crucial fuse has been erased inadvertently. For example, if user disables the SPIEN fuse from ISP mode, it can only be restored using Parallel Programming.

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 2-19 (like a simple programming operation), for debugging help, please refer to AVR Studio® Help information.

When using JTAG ICE MK II for debugging, and 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. 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.

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

Config. Pads Reference	Related Signals	Function
TP2	D-	USB D- data line
TP3	VBUS	USB Vbus power line
TP4	Ucap	AT90USB82/162 internal 3V3 regulator output
TP5	5V	5V on-board regulated power supply
TP6	3.3V	3.3V on-board regulated power supply
TP7	Gnd	Ground (measure reference)

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
CP1	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
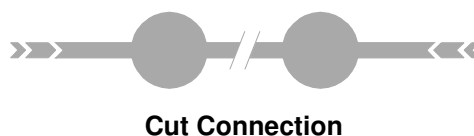
Cut Connection

2.11.3   Configuration Pads - Connection

Figure 2. Configuration Pad - Re-connection

Drop of solder   **Wire**

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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
SP1	PD7 / CTS	This solder pad allows to enable the logical CTS signal for hardware control flow on RS232 interface.
SP2	RS232 / CTS	This solder pad allows to enable the physical CTS signal for hardware control flow on RS232 interface.
SP3	PD6 / RTS	This solder pad allows to enable the logical RTS signal for hardware control flow on RS232 interface.
SP4	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. Or 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 20). Take care to polarity.
	The AVR JTAG ICE probe is not connected	Connect the JTAG ICE 10-PIN header to the correct STK526 JTAG header (page 20). Take care to 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	Serial/USB cable is not connected, or power is off	Connect serial cable to RS232 (STK500 - AVR ISP) and check power connections
		Connect serial cable to USB (JATG 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 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)

■ **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

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![ATMEL logo]

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

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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

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Figure 6-1 . Schematics, 1 of 4
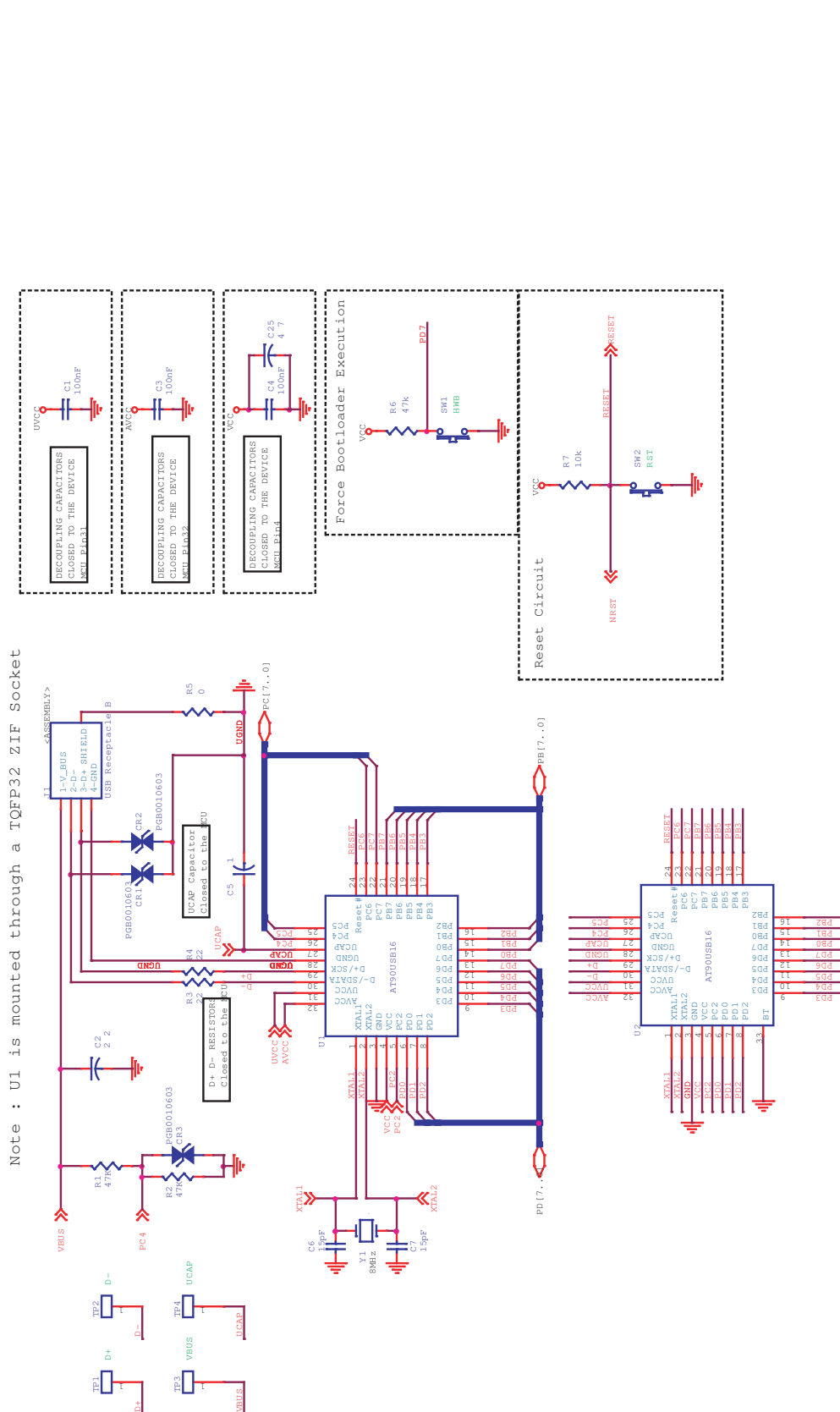
Figure 6-2 . Schematics, 2 of 4
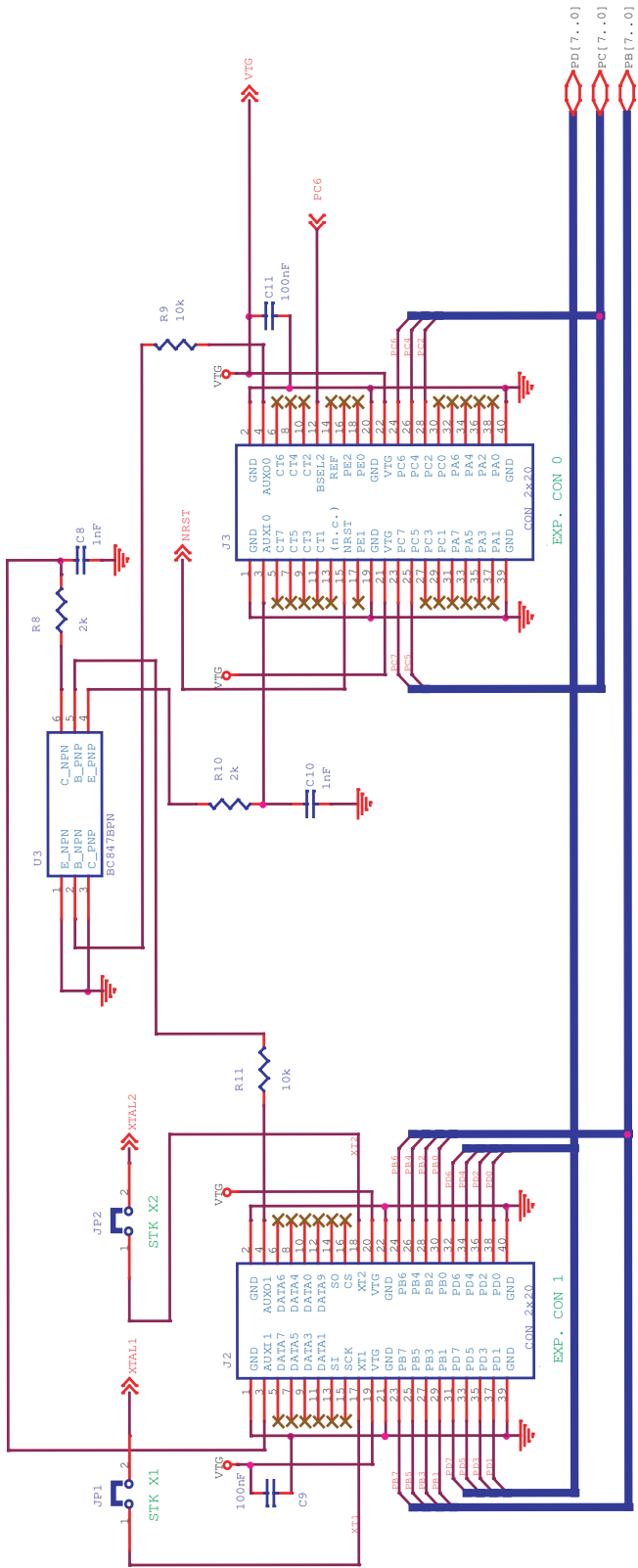
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Figure 6-3 . Schematics, 3 of 4
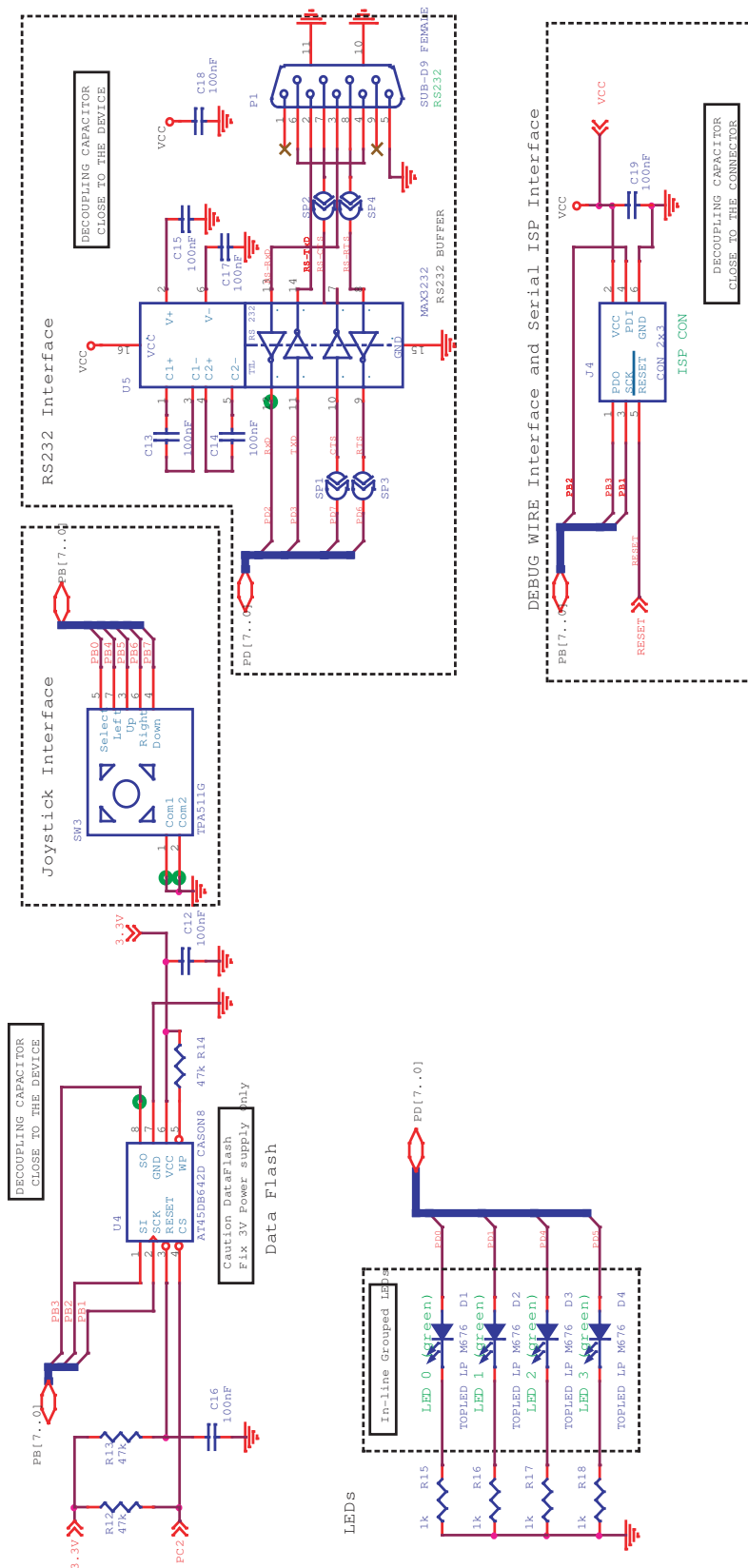
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Figure 6-4 . Schematics, 4 of 4
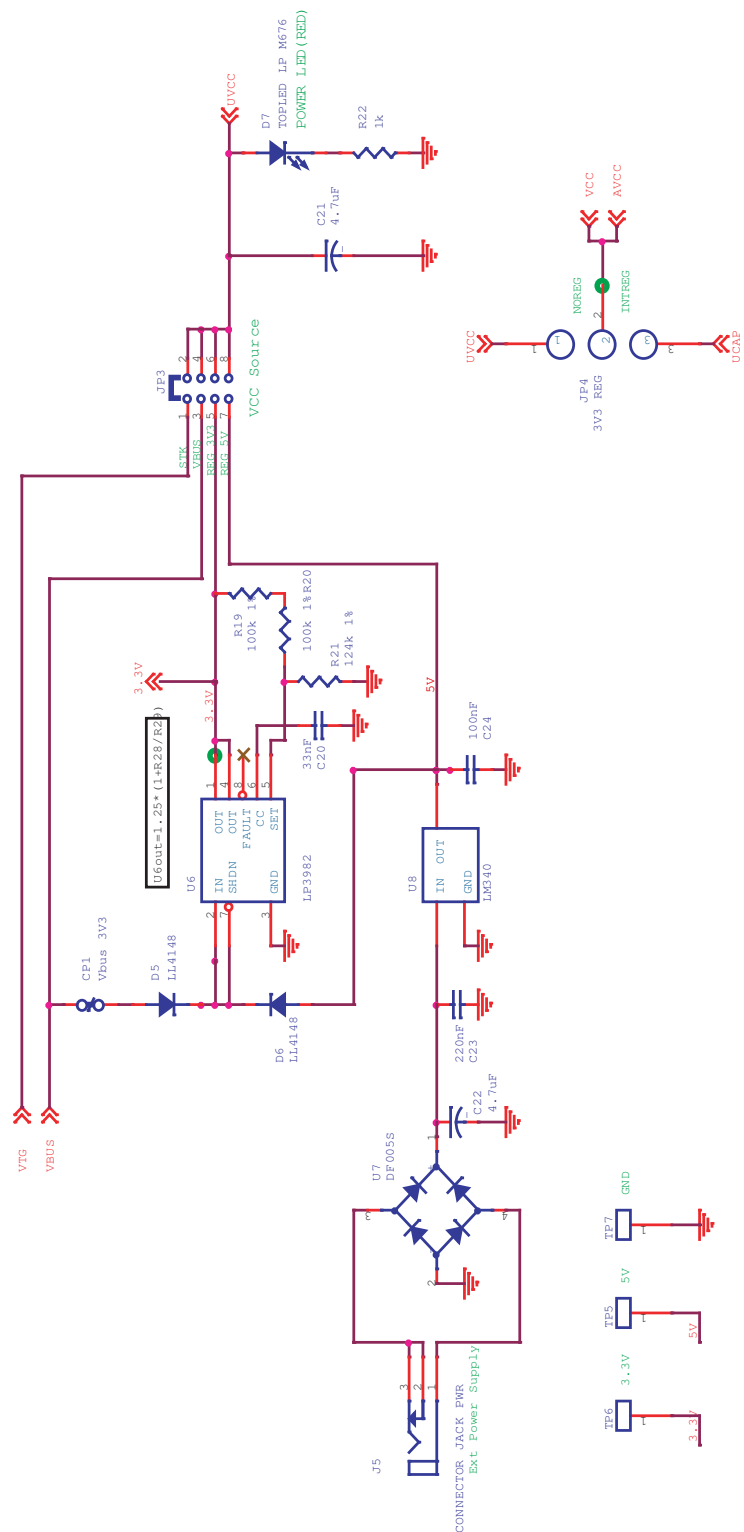
Figure 6-5 . Assembly Drawing, 1 of 2 (component side)
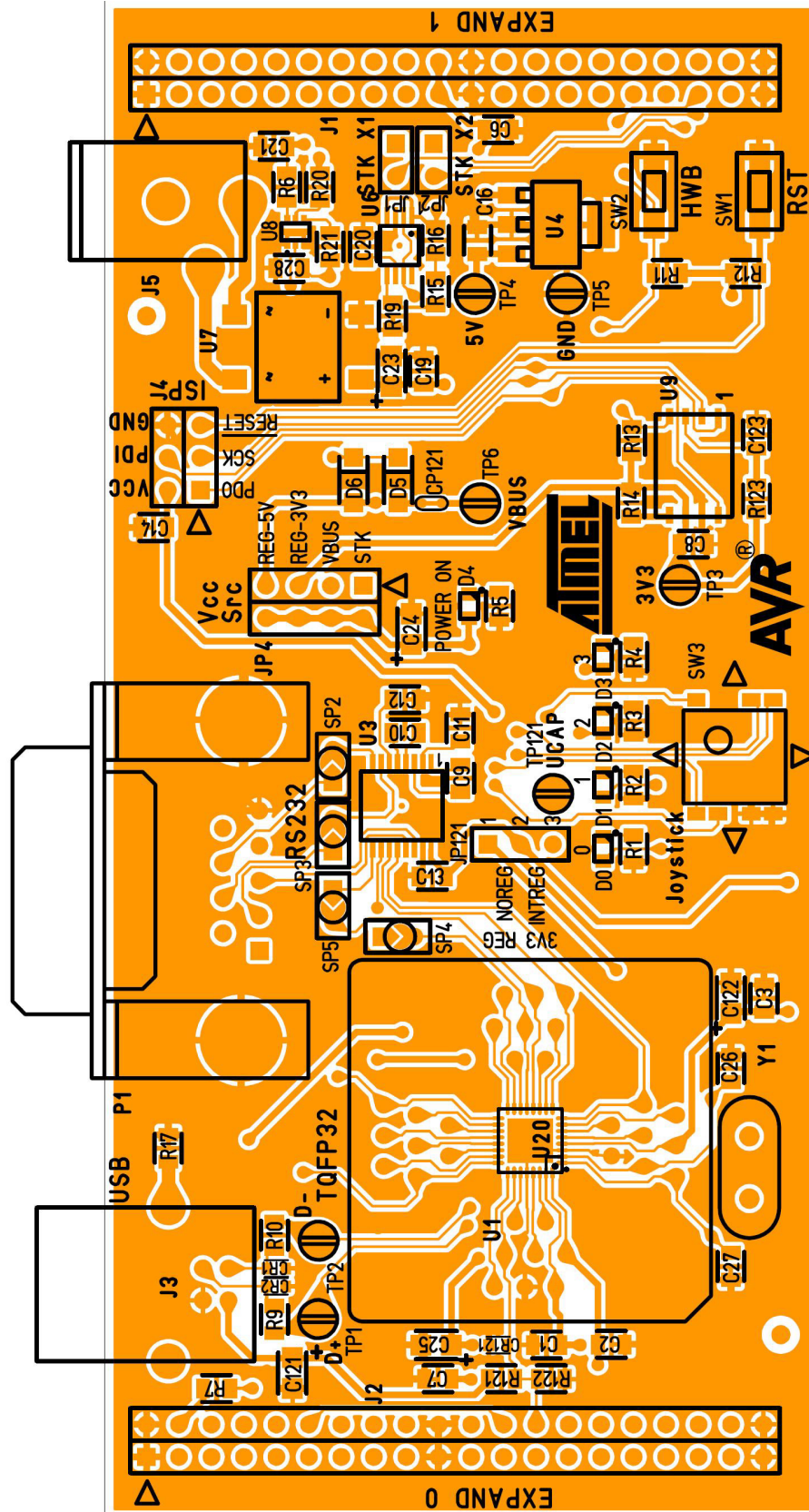
Table 6-1 . Bill of Materials

Qtty	Schematic Reference	Part Reference	Description	Case
			CAPACITORS	
14	C1,C3,C4,C9, C11-C19, C24	100nF	Ceramic capacitor	0805
1	C2	2.2µF	Tantalum capacitor	Type A
1	C23	220nF	Ceramic capacitor	0805
1	C20	33nF	Ceramic capacitor	0805
2	C8, C10	1nF	Ceramic capacitor	0805
3	C21, C22, C25	4.7µF	Tantalum capacitor	Type A
1	C5	1µF	Tantalum capacitor	Type A
2	C6, C7	15pF	Ceramic capacitor	0805
			DIODES	
3	CR1-CR3	PGB1010603MR	ESD Protection (Littlefuse)	0603
4	D1-D4	KA-3022SGC	Green LED	Mini Topled
1	D7	KA-3022SRC	Red LED	Mini Topled
2	D5, D6	LL4148	Small signal diode, If max 200mA	LL-34
			CONNECTORS	
2	J2, J3	M20-6102005	PC104 2x20-pin through-hole female press-fit stackable connector	2.54mm pitch
1	J1	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	JP3	Jumper 2x4	Header for configuration 2x4 pts	2.54mm pitch
1	JP4	Jumper 1x3	Header for configuration 1x3 pts	2.54mm pitch
1	CP1	Configuration Pad	Enabled by default. Can be disabled cutting it.	N/A
4	SP1-SP4	Solder Pad	Disabled by default. Can be enabled with a solder drop.	N/A
			RESISTORS	
5	R15-R18, R22	1 kOhms	1/16W-5% SMD	0805
2	R8, R10	2 kOhms	1/16W-1% SMD	0603
3	R7, R9, R11	10 kOhms	1/16W-5% SMD	0603
2	R3, R4	22 Ohms	1/16W-5% SMD	0603
6	R1, R2, R6, R12-R14	47 kOhms	1/16W-1% SMD	0805
2	R19, R20	100 kOhms	1/16W-1% SMD	0805
1	R5	0 Ohms / strap	N/A	0603
1	R21	120 kOhms 1%	1/16W-1% SMD	0805
			INTEGRATED CIRCUITS	
1	U1 socket	TQFP32 ZIF	Socket for QFP 32 pitch 0.8 mm 7x7 - 9x9 mm	Special
1	U1/U2	AT90USBxx2	MCU	TQFP32/QFN32

Table 6-1 . Bill of Materials

Qtty	Schematic Reference	Part Reference	Description	Case
1	U4	AT45DB642C	8Mo dataflash memory	CASON8
1	U5	MAX3232ECAE+	RS232 transceiver	SSOP16
1	U8	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	U3	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-TP7	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	JP3	Primary power source selection	"VBUS" position
3V3 REG	JP4	AT90USB82/162 I/O power selection	"NOREG" position
		Solder PADS	
	SP1	TTL - CTS	OPEN
	SP2	RS232 - CTS	OPEN
	SP3	TTL - RTS	OPEN
	SP4	RS232 - RTS	OPEN
		Configuration PADS	
	CP1	Connect VBUS to 3V3 on-board regulator	CLOSED

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