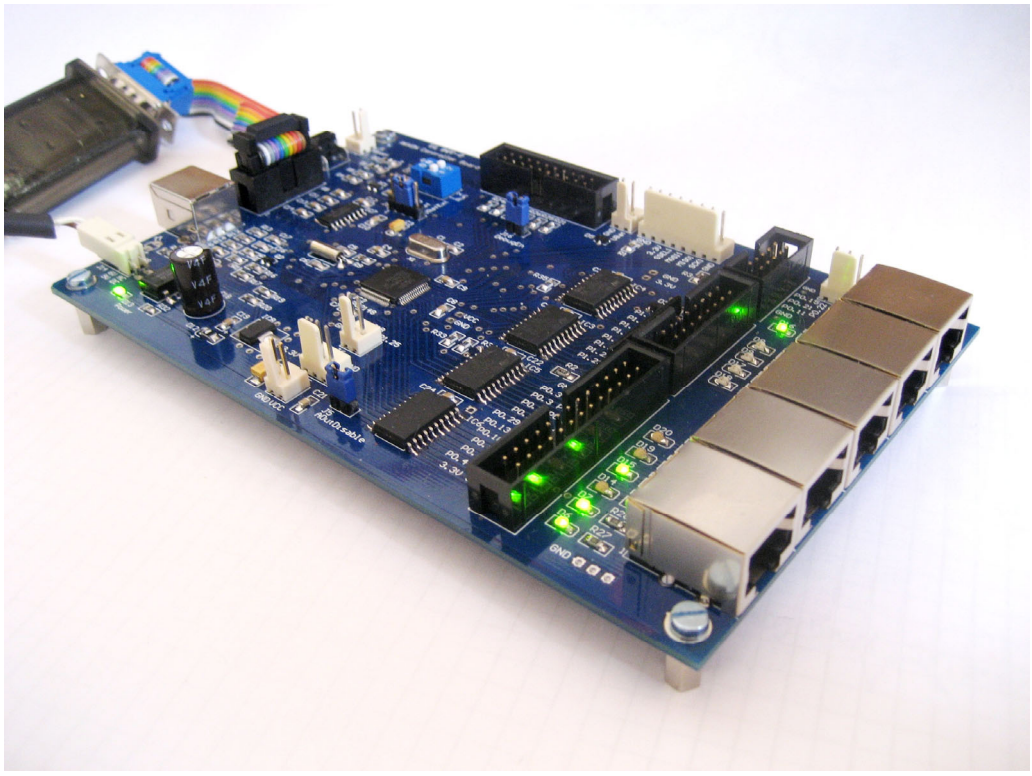
TN012

AKKON USB CONTROLLER BOARD

USB microcontroller board with the ARM7 LPC2148™*

Datasheet



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Attachments: no attachments

Table of versions

Version	Date	Remarks
1.0	28.05.2008	first version
1.1	23.06.2008	improvement

1 Introduction

The AKKON USB Controller Board is a prototyping or development board based on the LPC2148 ARM7 micro controller, with USB support, power supply and IO drivers. The board is designed as development kit for starting up working with ARM7 microcontrollers and for fast development of new devices.

1.1 Why for starting up?

The board can be assembled with low requirements on the assembly tools. Starters have well documented hardware and some small software examples available.

1.2 Why for fast development?

Common used hardware configuration is available on board. A lot of applications can be realized with no further hardware. Assembling of the hardware in two types of housings is very easy.

1.3 Other documents

TN003 Technical note about how to built the AKKON USB Controller Board (German language)

2 Features of the AKKON USB CONTROLLER BOARD

2.1 General information

- MCU: LPC2148 16/32 bit ARM7TDMI-S™ with 512KB Flash and 42KB RAM
- 32.768 kHz crystal and RTC backup battery connector
- Power input <12V DC or 9V AC
- On board voltage regulator for 3.3V, 800mA
- 5 Volt tolerant IO
- USB 2.0 interface with USB link led
- RS 232 interface using flat cable
- SPI interface
- Programmable using serial, USB or JTAG interface
- Standard JTAG connector with ARM 2x10 pin layout for programming/debugging with ARM-JTAG
- Reset button
- External reset using RS232 interface

2.2 Specific features

- Pin P0.25 alternatively usable as digital output or analogue output
- 1 PWM output on RJ45 connector
- 16 digital outputs driven by 74x245 drivers
- 10 digital inputs, 1 digital input with extended voltage protection and pullup resistor
- 6 further digital inputs or outputs alternatively to JTAG (depending on hardware configuration)
- 4 led associated to digital inputs

- 5 led associated to digital outputs
- 1 led for power supply
- 2 analogue inputs alternatively usable as digital IO
- Most of IO pins connected to IDC header board plugs
- 5 RJ45 connectors for easy connection of the hardware with other hardware
- Extra connectors for SPI, analogue output, Power, PintP0.21, reference voltage for ADC and reset circuit

2.3 Dimensions and mounting

- Europa card format 160cm * 10cm for 19” mounting
- 4 holes for mounting in a case

3 Software development

Development can be done using the free gnu c-compiler. There is also a full solution using the free integrated development environment Eclipse available

Editor: Eclipse

Compiler: gnu c-compiler

Debugging hardware: Wiggler [Self made wiggler]: http://www.frozeneskimo.com/electronics/arm-tutorials/jtag-wiggler-clone/

Hardware for programming and debugging the AKKON USB Controller Board

Please have a look at the Yagarto project: [Yet Another Gnu Arm TOolchain] http://www.yagarto.de/

provided by Michael Fischer;

Full development package including excellent tutorial how to setup the development environment, compile, run and debug applications for ARM micro controllers.

Simple and more advanced examples programs are available on www.burger-web.com.

4 Details about the features

4.1 Supported devices

The AKKON USB Controller Board is primarily designed for the ARM7 LPC2148 micro controller. Depending on the application pin compatible parts like the LPC2138 can be assembled. Further compatibility has not been checked yet.

4.2 Power supply

Power supply is supported on board but can also be provided directly from external power supply.

4.3 Oscillator frequency and RTC

Standard assembly is a 12MHz oscillator. The internal clock is multiplied by PLL to 60MHz. Beyond that the board can be assembled with different oscillator configurations (see datasheet). Clock rates can be

defined by the configuration bits of the microcontroller. Furthermore an oscillator with 32678Hz can be assembled for the Real Time Clock of the LPC2148 micro controller.

4.4 Progamming and debugging

The AKKON USB Controller Board is equipped with a JTAG interface that can be used for programming and debugging. The tool can be connected on connector J12. There are do it yourself programming and debugging tools (Wiggler project) as well as commercial tools like the KEIL uLink, D-Link etc. available.

4.5 RS232 interface

The RS232 interface can be reached over connector J8. For RS232 communication the Rx and Tx signals are available. The RS232 interface can also be used for programming the ARM7 micro controller using a free upload tool provided by NXP.

4.6 Status LEDs

The AKKON USB board can be equipped with 13 Leds. Following configuration is available:

No.	Designator	Description
1	D4	USB
2	D8, D9, D17, D18	State of four input signals, free usable depending on user application
3	D13	State of 3.3V power supply
4	D6, D7, D14, D15, D19, D20	State of six digital output signals, free usable depending on user application
5	D16	State of PWM output or digital output

Figure 1: Configuration of LEDs on AKKON USB Controller Board

4.7 Reset Logic

The AKKON USB Controller Board is equipped with an advanced reset logic. Reset can either be initiated on power up by the MCP120T reset circuit, RS232 or Reset button S1. This button can either be equipped on board or on connector J1.

4.8 Digital inputs with input protection

There are different digital inputs and outputs available on the board. Most of them are bufferd by 74HC245 or 74LV245 driver that can drive a load of 10mA per channel.

4.9 Pulse width modulation output

There is on Pulse Width Modulation (PWM)-Output available on the board. I can alternatively be connected over J7 RJ45-socket or J3. The state of the PWM-output is indicated by a led D16.

4.10 USB Bus

The AKKON USB Controller Board is equipped with a USB 2.0 compatible interface. The USB interface is also connected to the voltage regulator of the board. By that way no further power supply is necessary. Linkage state of USB is indicated on Led D1.

4.11 Bootloader

The ARM7 LPC2148 micro controller is equipped wit an internal serial boot loader. Programs can be upladed over the RS232 interface using the free Update flash utility that can be downloaded on www.nxp.com. Furthermore there is a technical (TN014) not how to upload firmware to the AKKON USB Controller Board available on www.burger-web.com.

4.12 Analogue inputs and outputs

The AKKON USB Controller Board normally has all inputs and outputs used as digital IOs. If analogue inputs or an analogue output is necessary the board can be configured by jumper J5 and by assembling specific parts on the hardware.

5 Further information

5.1 Datasheets, tutorials, libraries and example projects

[NXP: Data sheets and example programs as well as examples]: http://www.nxp.com

[Martin Thomas] Lots of examples and libaries http://www.siwawi.arubi.uni-kl.de/avr_projects/arm_projects/

[Free USB stack Bertrik Sikken] http://wiki.sikken.nl/

[Web page of Ulrich Radig] http://www.ulrichradig.de/

interesting projects, examples and software libraries

ARM assembler tutorial: http://www.heyrick.co.uk/assembler/index.html

5.2 Forums

[Mikrocontroller.net]: www.mikrocontroller.net

[ARM connected]: http://forums.arm.com/index.php

[Embedded related]: http://www.embeddedrelated.com/groups/lpc2000/kw/LPC-E2294.php

5.3 Books

http://www.hitex.co.uk/arm/lpc2000book/ - The Insider's Guide To The Philips ARM7-Based Microcontrollers (LPC21xx)

5.4 Further information to the board

Schematics, mounting plan, part list, movie how to create the AKKON USB Controller Board. movie about soldering of SMD parts and software examples are available on www.burger-web.com.

Information about the LPC2148 ARM7 micro controller can be found on www.nxp.com.

Please read the warranty conditions at the end of the document.

6 Related files

Identification	Description	format	Filename
TN011	Schematics and mounting	pdf	TN011_AKKON_Controller_Board_V1_5_Design

	plan, part list		.pdf
TN013	Construction and description of the board (German language)	pdf	TN013_AKKON_USB_Controller_Board_Construction_de.pdf
TN014	Description how to upload firmware to the AKKON USB Controller Board	pdf	TN014_AKKON_USB_Controller_Board_RS232_Firmware_Update.pdf
TN015	Example application: How to use the AKKON USB Board as CNC controller	pdf	TN015_AKKON_CncSystem_Datasheet.pdf

7 Disclaimer

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