
Features

- Advanced RISC Architecture, 130 Powerful Instructions, Most Single Clock Cycle Execution
- Clock Generator Provides CPU Rates up to 48 MHz
- Only One External Clock Crystal of 12 MHz Can Generate All the Required System Clocks:
 - Internal Clock for Standard UART Rates
 - A 48 MHz and 96 MHz Clock for USB Data Recovery
 - AVR Processor and System Clock
- Full-speed USB Interface (12 Mbit/s) 2.0 Compliant
- Two On-chip 16550 UARTs Supporting Baud Rates up to 921 Kbaud
 - Both UARTs Incorporate Individual Transmit and Receive FIFOs of 16 Bytes
 - UART0 Supports Modem Control Signals
- Programmable SPI Interface
- On-chip Bootstrap ROM Provides a Variety of Firmware Upgrade Modes
 - Device Firmware Upgrade Through USB for the Internal Program SRAM (No External Non-volatile SPI Memory Required)
 - Device Firmware Upgrade Through USB for both the Internal Program SRAM and the External SPI DataFlash® or EEPROM
 - SPI Program Mode from the External DataFlash or EEPROM
- External Memory Interface Supporting up to 32 Kbytes of External RAM in Address Multiplexed Mode, 2 Banks of 256 Bytes in Non-multiplexed Mode, FIFO, or with an Extra 20 GPIOs
- DMA Channels Allow Fast Data Transfers between Endpoint Buffers and Internal or External SRAM (The DMA Transfer Rate is 12 MHz for All Channels)
- 8K x 16 bits (up to 11K x 16 bits), In-System SRAM for Program Code (Program Memory)
- On-chip 8 Kbytes SRAM for Data and Variables (Two, Four, and Eight Kbytes can be Re-Mapped for Program Storage in the Address Area Above the Program Memory)
- Two 8-bit Timer/Counters
- One 16-bit Timer/Counter
- Four External Interrupts Through GPIOs
- Programmable Watchdog Timer
- Low Voltage Operation:
 - 1.8V for the Core
 - 1.8V or 3.3V for the Periphery
 - 3.3V for the USB
- 100-pin TQFP Package



High-speed (48 MHz) AVR Microcontroller with USB Interface

AT76C713 Summary

5665AS-USB-10/04





Overview

The AT76C713 is a low-power, high performing USB 2.0 full-speed microcontroller providing advanced features for USB peripherals. It combines a number of functions required in such a device, including the following:

- The device is based on the AVR-enhanced RISC architecture core, which combines an advanced instruction set with 32 general-purpose working registers. By executing powerful instructions in a single clock cycle, the AT76C713 achieves throughputs approaching 1 MIPS per MHz, allowing the system designer to optimize the power consumption versus the processing speed.
- The clock generation circuit requires a clock input of 12 MHz and provides standard clock rates for the USB module and the on-chip UARTs, as well as several AVR CPU rates varying from 16 MHz up to 48 MHz.
- Internal DMA channels allow fast data transfers between the USB buffers and the external or the on-chip memory without processor interruption. USB DMA transfers use devoted data paths with 12 Mbytes/s transfer rate.
- An on-chip flexible memory controller allows dynamic memory mapping and provides the required timing for interfacing with slow or fast external memory devices, like SRAM or FIFOs.
- Five multipurpose I/O ports, PORT(A-E), provide the signals for all the serial and parallel interfaces. Programmable strobe signals are provided for external FIFO access. In addition, the AT76C713 supports various power-down modes and offers four external interrupts, a programmable watchdog timer, and flexible timer/counters with compare modes.
- On power-up, the bootstrap code is executed from the boot ROM. The purpose of the bootstrap code is to load the application code into the program memory. The application code is executed from the on-chip SRAM program memory, contributing to the low-power consumption. Different programming modes are supported, depending on the application (that is, the mode is selected externally by the PMODE0 and PMODE1 pins).
- In the slave programming mode, an external system (that is, the Host), operating as SPI master, can transfer the program image in a raw format to the program memory of the device. In this case, the AT76C713 operates as an SPI slave and starts running from the internal boot ROM code, which switches to the start of program memory when it detects the end of a valid program transfer from the host to the AT76C713.
- In the master programming mode, the AT76C713 reads the whole program image from an external serial EEPROM or DataFlash and switches to the start of the program memory when it completes this reading. Alternatively, the AT76C713 reads only configuration parameters from a small serial non-volatile memory (EEPROM or DataFlash), enables the USB Controller, and executes the USB Device Firmware Upgrade (DFU) code stored in the boot ROM.
- The USB Controller consists of a Serial Interface Engine (SIE), a Function Interface Unit (FIU), and a System Interface (SI). The SIE performs bit processing, line coding, packet generation, packet type recognition, serial-parallel data conversion, and packet delineation. The FIU consists of a protocol engine and a USB device with one Control Endpoint (EP0) and seven programmable Endpoints with up to 512 bytes maximum total size. All Endpoints support double buffering in order to provide the maximum performance specified for the USB.
- The AT76C713 supports two 16550 UART modules with 16 bytes FIFOs in each direction. UART0 serial interface provides full modem control functionality with the RTS/CTS, DTR/DSR, RI, and CD signals. These signals are provided by the general-purpose I/O pins of PORTD.

- The AT76C713 AVR is supported with a full suite of program and system development tools, including: C compiler, macro assemblers, program debugger/simulators, in-circuit emulators, and evaluation kits.



Atmel Corporation

2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 487-2600

Regional Headquarters

Europe

Atmel Sarl
Route des Arsenalux 41
Case Postale 80
CH-1705 Fribourg
Switzerland
Tel: (41) 26-426-5555
Fax: (41) 26-426-5500

Asia

Room 1219
Chinachem Golden Plaza
77 Mody Road Tsimshatsui
East Kowloon
Hong Kong
Tel: (852) 2721-9778
Fax: (852) 2722-1369

Japan

9F, Tonetsu Shinkawa Bldg.
1-24-8 Shinkawa
Chuo-ku, Tokyo 104-0033
Japan
Tel: (81) 3-3523-3551
Fax: (81) 3-3523-7581

Atmel Operations

Memory

2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 436-4314

Microcontrollers

2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 436-4314

La Chantrerie
BP 70602
44306 Nantes Cedex 3, France
Tel: (33) 2-40-18-18-18
Fax: (33) 2-40-18-19-60

ASIC/ASSP/Smart Cards

Zone Industrielle
13106 Rousset Cedex, France
Tel: (33) 4-42-53-60-00
Fax: (33) 4-42-53-60-01

1150 East Cheyenne Mtn. Blvd.
Colorado Springs, CO 80906, USA
Tel: 1(719) 576-3300
Fax: 1(719) 540-1759

Scottish Enterprise Technology Park
Maxwell Building
East Kilbride G75 0QR, Scotland
Tel: (44) 1355-803-000
Fax: (44) 1355-242-743

RF/Automotive

Theresienstrasse 2
Postfach 3535
74025 Heilbronn, Germany
Tel: (49) 71-31-67-0
Fax: (49) 71-31-67-2340

1150 East Cheyenne Mtn. Blvd.
Colorado Springs, CO 80906, USA
Tel: 1(719) 576-3300
Fax: 1(719) 540-1759

Biometrics/Imaging/Hi-Rel MPU/ High Speed Converters/RF Datacom

Avenue de Rochepleine
BP 123
38521 Saint-Egreve Cedex, France
Tel: (33) 4-76-58-30-00
Fax: (33) 4-76-58-34-80

Literature Requests

www.atmel.com/literature

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