

Introducing...

SELF-PROGRAMMABLE AVR FLASH Microcontrollers...

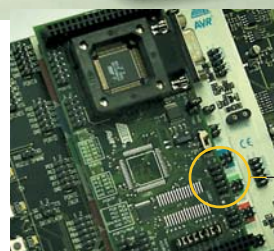
Following on from the success of the Atmel ATmega103(L) and ATmega163(L) microcontrollers, Atmel have recently introduced four new members to the ATmega AVR™ FLASH Microcontroller Family: ATmega8, ATmega161, ATmega323 & ATmega128. All four devices feature the powerful 'MegaAVR' core plus on-chip FLASH memory, EEPROM data memory, programmable UART(S)/USART(S), hardware multiplier, programmable brownout detector and 10bit A/D convertor. The ATmega8/161/163/323/128 feature 8K/16K/16K/32K/128K of on-chip 'Self-programmable' FLASH memory respectively.

ATmega128

The flagship device of the family is the ATmega128 with its 128K FLASH, 4K EEPROM, 4K RAM, 53 I/O pins, 2 x USARTS plus configurable 1/2/4/8 MHz on-chip RC oscillator. This device is designed to be a drop-in replacement for the ATmega103 microcontroller, allowing existing users to take advantage of the myriad of new features which this device offers. A low-cost JTAG In-Circuit Emulator (JTAG ICE) is now available which supports On-Chip Debugging (OCD) of code on the actual target device. This interfaces to the new 'STK501 - Adaptor/Development Board for the ATmega128/103' via a 10-pin JTAG ISP header.



A typical ATmega128 Development System: The STK501 is plugged into the STK500 board and the JTAG-ICE connects to the JTAG Port on the STK501



JTAG debug/ISP Port on the STK501

ATmega8

The ATmega8 is the natural upgrade for the existing AT90S4433 microcontroller bringing the power of the MegaAVR family to a 28-pin DIP or 32-pin TQFP or 5mm x 5mm MLF package device. If you need a compact powerful microcontroller with A/D and the ability to re-program itself in-situ, then look no further!

ATmega161

The ATmega161 is a drop-in replacement for the existing AT90S8515 microcontroller, doubling the Code memory capacity from 8K to 16K bytes and supporting the ability to 'Self-Program' the firmware/EEPROM. The addition of a second serial UART makes this device ideal for many communications applications e.g. protocol convertor.

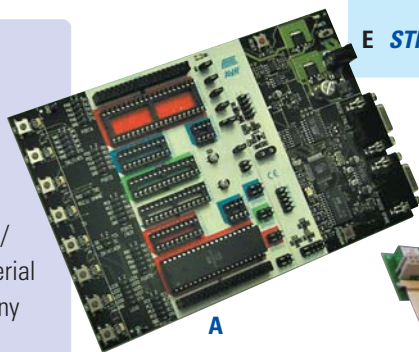
ATmega323

The ATmega323 is an upgrade path for the existing ATmega163 and AT90S8535 devices. It features more FLASH memory (32K bytes), self-programming capability and a JTAG interface for debugging/programming. The peripherals are the same as on the existing AT90S AVR™ devices.

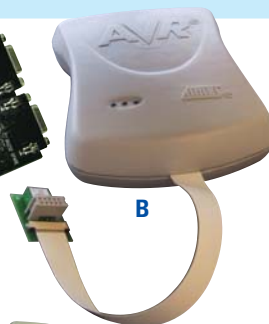


AVR™ Development Tools

- A STK500** - AVR™ FLASH Microcontroller Starter System
- B JTAG-ICE** - In-circuit JTAG debugger for ATmega128/323
- C AVRISP** - Low-cost AVR™ ISP Programmer
- D EPSILON5** - Universal In-System Programming (ISP) Tool for Atmel, Atmel Wireless (Temic) & Philips FLASH Microcontrollers
- E STK501** - Adaptor/Development Board for the ATmega128/103



A



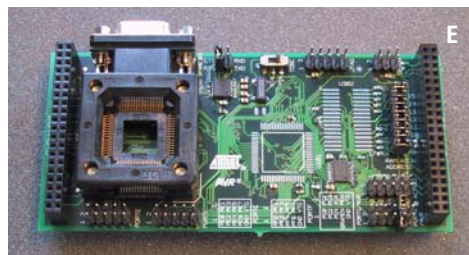
B



C



D



E

Please note: AVR™ is a trademark of the Atmel Corporation

Self-Programming of FLASH/EEPROM

The new ATmega microcontrollers have the ability to self-program both the FLASH and EEPROM areas of the device using an optional 'Boot Loader' which can be stored in the 'Boot Loader' section of the FLASH memory area. This effectively means that a product can update its own firmware without the need for an external programmer. This powerful feature opens up many possibilities for remote/field firmware updates without requiring any additional external hardware. The required 'Boot Loader' must be programmed into the device using either the SPI or JTAG ISP port before the target system leaves the production facility. Typical applications of this technology could include remote firmware updating of vending machines, portable instruments, telephone routers, distributed intelligent sensors etc.

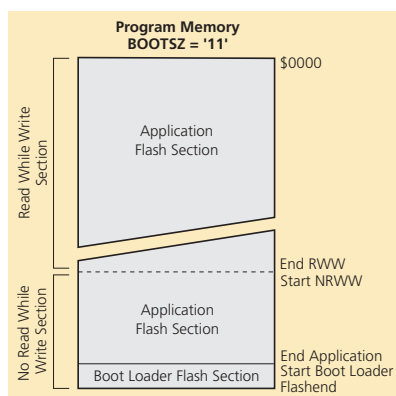


Figure 1: Memory Sections

The source code for a sample 'Boot Loader' is freely available from Atmel allowing the developer to write custom loaders which could theoretically work over any communications medium e.g. SPI, UART, USB etc. More advanced boot loaders could provide encryption protection for product firmware/EEPROM data updates, thereby protecting the code and data against software piracy. The 'Boot Loader' section is configurable in size allowing for different complexities of Boot Loaders and also features separate 'Security Lock Bits' to the 'Application FLASH Section' for maximum security protection during firmware updates. The 'Boot Block' can not be erased or re-programmed by the 'Application FLASH Code', so the Boot Loader firmware should be able to recover from any error during re-programming of the 'Application Code' without losing the whole device. If no Boot Loader capability is needed, the entire FLASH area is available for application code.

JTAG On-chip Debug (OCD) support using the JTAG-ICE

The ATmega323/128 microcontrollers feature powerful on-chip debug (OCD) hardware which allows an external emulator to debug code which is running on the actual device. A fast JTAG (IEEE1149.1 compliant) interface is used to pass data between the emulator and the OCD hardware and can also be used as a fast method of in-system programming the device in a production environment.

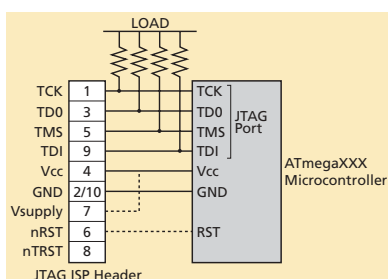


Figure 3: JTAG ISP Port Header
10-way IDC

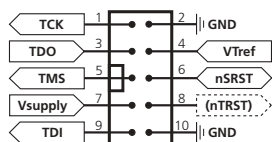


Figure 2: JTAG Port connections to an ATmegaxxx Microcontroller

Atmel have recently launched the 'JTAG ICE' which is designed to support in-circuit debugging of any current or future ATmega microcontroller which features the JTAG port. The ICE works by initially programming the user firmware/data into the FLASH/EEPROM memory of the actual target ATmega device and then controls the execution/debug of this code via the OCD hardware. The JTAG ICE supports reading/writing of the Program Counter (PC), FLASH, EEPROM, General Purpose Registers and SRAM contents to/from the PC control software suite, 'AVR™ Studio'. A limited number of 'Hardware Breakpoints' are supported with the ability to generate valid break conditions

by combining up to 3 break-point registers. It is also possible to set 'Software Breakpoints', but these involve re-writing a page of FLASH memory every time they are updated.

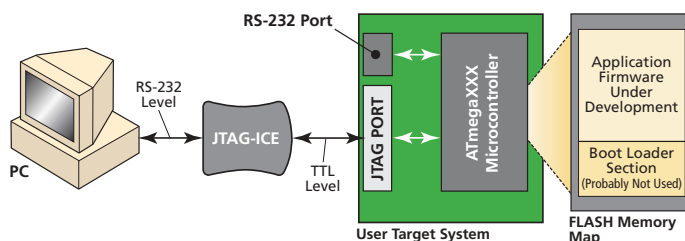


Figure 4: Typical development environment

Using the actual device as the 'Emulation Device' has the following advantages:

- Code is running on actual target device so the exact electrical and timing characteristics of the 'real' device are adhered to
- Operation of I/O, timers, A/D etc. is exactly as per the 'real' device
- No need for expensive and delicate surface mount emulator adaptors
- Final hardware can be emulated without having to revert back to a prototype with emulator adaptor
- The cost of the JTAG-ICE is significantly lower than a dedicated emulator

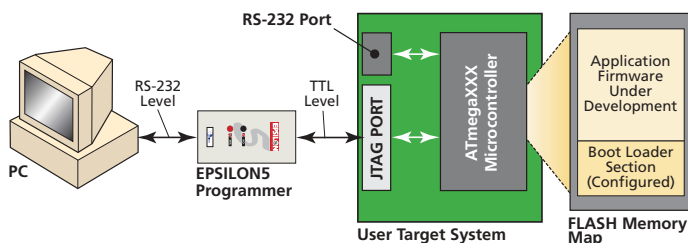


Figure 5: Typical production environment

AT-JTAGICE

ATmega128 is a drop-in replacement for the ATmega103

The ATmega128 microcontroller is designed to be a drop-in replacement for the already established ATmega103 microcontroller. The ATmega128 has a special 'ATmega103 Compatibility Mode' which disables all the new features of the ATmega128 allowing the device to run the original ATmega103 firmware without re-compilation. This mode is enabled by default when the device leaves the factory.

The ATmega128 has the following additional features to the ATmega103:

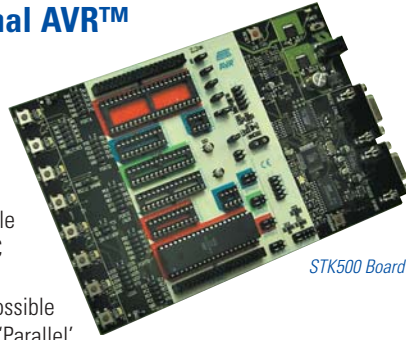
- Maximum clock frequency: 16MHz (compared to a maximum 6MHz with the ATmega103)
- On-chip calibrated RC Oscillator which can be configured to run at 1, 2, 4 or 8MHz
- 52 fully configurable I/O pins (ATmega103 has 32 I/O pins plus 8 x Input Only and 8 x Output Only)
- 2 x programmable serial USARTs
- JTAG On-Chip Debug (OCD) and fast JTAG ISP port
- User-configurable 'Boot Block' supporting 'Self-Programming Mode'
- Byte-orientated 2-wire Serial Interface

Please observe the following points when upgrading from the ATmega103 to ATmega128:

- i The ATmega128 programming algorithm must be used.
- ii The ATmega128 is shipped with a 1MHz (nominal) Internal RC oscillator enabled by default. It is necessary to re-program the 'Clock Selection Fuses CKSEL 0..3' to enable the device to work from an external crystal.
- iii The ATmega128 is shipped with the 'JTAG Interface' enabled. This must be disabled by un-programming the 'JTAGEN' fuse.

STK500 - Professional AVR™ Starter System

The Atmel STK500 is a comprehensive Starter System for the Atmel AVR™ FLASH Microcontroller Family. The system comprises of a single board module which features IC sockets for all the popular dual-in-line AVR™ devices. It possible to in-system program (ISP) and 'Parallel' program AVR™ devices on the STK500 and also to use the board to ISP a device on a separate Target System. The STK500 can be used as an evaluation board by connecting up the various on-board peripherals including LED's, push buttons and Serial Dataflash.



STK500 Board

Features:

- AVR™ Studio Software Interface
- RS-232 Interface to PC for Programming and Configuration
- Second RS-232 port for user application
- External power supply required (9V - 12V DC)
- Sockets for 8, 20, 28 and 40 pin AVR™ devices
- Serial In-System Programming (ISP) of AVR™ devices
- In-System Programmer for programming AVR™ device in an External Target System
- Parallel and Serial High-voltage programming of AVR™ devices
- 8 x Push buttons and 8 x LED's for general use
- All AVR™ I/O ports easily accessible through pin header connectors
- Expansion connectors for plug-in modules (e.g. STK501) and prototyping area
- On-board 2 Megabit Serial Dataflash for non-volatile data storage
- Flexible clocking, voltage and reset system

Device Support:

- ISP (on-board) - AT90S, ATtiny, ATmega (ATmega103/128 - requires STK501) devices
- Parallel (on-board) - AT90S, ATmega (ATmega103/128 - requires STK501) devices
- ISP (off-board) - AT90S, ATtiny, ATmega

AT-STK500

AVRISP - Low-cost In-System Programmer for Atmel AVR™ FLASH Microcontroller Family

The 'AVRISP' is a low-cost in-system programmer (ISP) supporting the Atmel AVR™ FLASH Microcontroller Family. The programmer plugs into the user Target System via a 6 or 10-pin ISP header and draws its power from the target. The Atmel 'AVR™ Studio' application is used to control the programmer via a spare PC COM (serial) port.



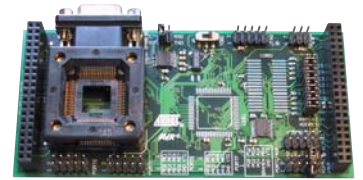
Features:

- ISP programming of all in-system programmable AVR™ devices
- Programs FLASH, EEPROM, FUSE and Security bits
- Supports programming of the RC Oscillator Calibration Byte
- Powers from Target System (2.7-5.5V - no external power supply required)
- Adjustable SPI speed. Supports all Target Boards running at > 8KHz
- 'AVR™ Studio' PC Interface Software
- DOS Command Line Interface also available
- Connects to spare PC COM (serial) port
- Supplied with both Atmel 6-way and 10-way ISP cables

AT-AVRISP

STK501 - Adaptor/Development Board for the ATmega128/103

The STK501 is a new plug-in module designed to add ATmega128/103 support to the existing Atmel STK500 development board. The module plugs into the two expansion headers on the STK500 board thereby routing power and most of the I/O ports to the relevant ports on the STK500 board. The STK501 features a 64-pin TQFP Zero Insertion Force (ZIF) socket which will accept manual placement of either the ATmega128 or ATmega103 surface mount devices. All the new features of the ATmega128 device are supported including extra I/O ports, JTAG port and additional serial USART. The STK501 can be controlled from the STK500 via 'AVR™ Studio' or the 'JTAG ICE' can be plugged into the JTAG port and then used to program/debug the target ATmega128 device.



STK501 Adaptor Board

Features:

- STK500 Starter System compatible.
- AVR™ Studio compatible
- JTAG ICE compatible
- Supports ATmega128 and ATmega103 devices in TQFP package without soldering
- TQFP footprint to allow emulator (ICE) adaptor to be soldered to the module
- Supports all new features of the ATmega128 including extra I/O ports, JTAG port and additional serial USART
- Adds external SRAM support to the STK500 board
- On-board 32kHz clock oscillator for easy implementation of Real Time Clock (RTC)
- Supports programming of Atmega128 device via SPI, JTAG (using 'JTAG ICE' or 'Epsilon5') and high-voltage parallel mode

AT-STK501

Epsilon5 MKII - ISP Programmer

The Epsilon5 ISP programmer is an all-in-one development/field/production programmer supporting most in-system programmable microcontrollers from Atmel, Atmel Wireless (Temic) and Philips. The programmer can be controlled from the PC or used in Standalone Mode.



Device support:

- Atmel - LV SPI ISP: AT90S, ATtiny and ATmega AVR™ microcontrollers
- Atmel - JTAG ISP: ATmega323/128 (license upgrade)
- Atmel - HV (+12V Vpp) ISP: ATtiny11/12/15L
- Atmel - AT89(L)S51/52/53/8252 8051 microcontrollers
- Atmel Wireless (Temic) - Boot Loader: T89C51Rx2, T89C51CC01
- Philips - Boot Loader: P89C51Rx2, P89C66x

Features:

- Controlled/configured by Equinox EQTools Software
- Powerful 'project-based' environment with full version control
- Standalone Mode - programmer can be used without a PC
- Supports programming of FLASH, EEPROM, FUSE bits, Security bits and RC Oscillator Calibration bytes
- Ideal for development, field or small-scale production use
- Single Key Auto-Program
- Status LED's - Busy/Pass/Fail
- 4 x ISP Headers - Atmel 6-way/10-way/JTAG, Equinox 10-way
- 2Mbits of on-board non-volatile FLASH memory for user project storage
- Can be powered directly from the Target System (3.0V to 5.0V)
- JTAG Port - FAST ISP using JTAG algorithm (license upgrade)
- Upgrades include JTAG ISP support, Labview control, Visual Basic control

EQ-EPSILON5-A1

Atmel AVR™ FLASH Microcontroller Family - Product Selection Guide

	ATmega8 (L)	ATmega163 (L)	ATmega323 (L)	ATmega161 (L)	ATmega103 (L)	ATmega128 (L)
ON-CHIP MEMORY						
FLASH (Bytes)	8K	16K	32K	16K	128K	128K
EEPROM (Bytes)	512	512	1K	512	4K	4K
SRAM (Bytes)	1K	1K	2K	1K	4K	4K
In-System Programmable (ISP)	YES+BL	YES+BL	YES+BL+JTAG	YES+BL	YES	YES+BL+JTAG
HARDWARE FEATURES						
I/O Pins	23	32	32	35	32I/O, 80, 8I	53
On-chip RC Oscillator	YES ³	YES ¹	YES	NO	NO	YES ³
Real Time Clock (RTC)	YES	YES	YES	YES	YES	YES
SPI Port	YES	YES	YES	YES	YES	YES
Full Duplex Serial UART	1 x (USART)	1	1 x (USART)	2	1	2 x (USART)
Watchdog Timer	YES	YES	YES	YES	YES	YES
Timer/Counters	3	2	3	3	3 + RTC	4 + RTC
PWM Channels (10-bit)	3	4	4	2	2	6 (16-bit)
Analogue Comparator	YES	YES	YES	YES	NO	YES
A/D Channel (10-bit)	6/8	8	8	-	8	17
IDLE and Power Down modes	YES	YES	YES	YES	YES	YES
Interrupts	TBA	17	19	20	24	24+
MISCELLANEOUS						
AVR™ Instructions	130	130	130	130	121	133
ATmegaxxxL (Low Voltage)	0-8MHz	0-4MHz	0-4MHz	0-4MHz	0-4MHz	0-8MHz
Frequency/Voltage Range	2.7-5.5V	2.7-5.5V	2.7-5.5V	2.7-5.5V	2.7-3.6V	2.7-5.5V
ATmegaxxx	0-16MHz	0-8MHz	0-8MHz	0-8MHz	0-6MHz	0-16MHz
Frequency/Voltage Range	4.5-5.5V	4.0-5.5V	4.0-5.5V	4.5-5.5V	4.0-5.5V	4.5-5.5V
EQUINOX SUPPORT TOOLS						
Epsilon 5	LVISP/JTAG	LVISP	LVISP	LVISP	LVISP	LVISP
FS2000A	LVISP	LVISP	LVISP	LVISP	LVISP	LVISP
PRO101	LVISP	LVISP	LVISP	LVISP	LVISP	LVISP
AVRISP	LVISP	LVISP	LVISP	LVISP	LVISP	LVISP
STK500	LVISP/PAR	LVISP/PAR	LVISP/PAR	LVISP/PAR	LVISP	LVISP
STK500 C+	LVISP	LVISP/PAR	LVISP	LVISP	LVISP	LVISP
STK501	-	-	-	-	LVISP/PAR	LVISP/PAR
Imagecraft C Compiler	ICCAVR	ICCAVR	ICCAVR	ICCAVR	ICCAVR	ICCAVR
PACKAGE TYPES						
	28P3	44A	40P6	40P6	64A	64A
	32A	40P6	44A	44A		

* Max speed depends on Vcc voltage. Frequencies and Currents listed are for Vcc = 5.0V & T = 25°C

Please verify correct part codes for low voltage parts before ordering.

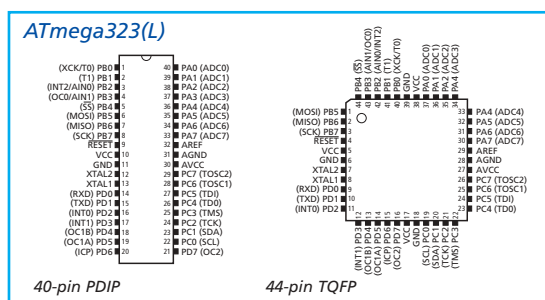
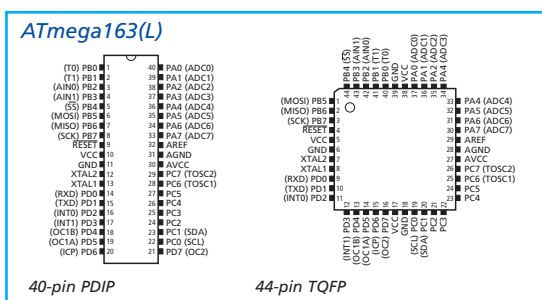
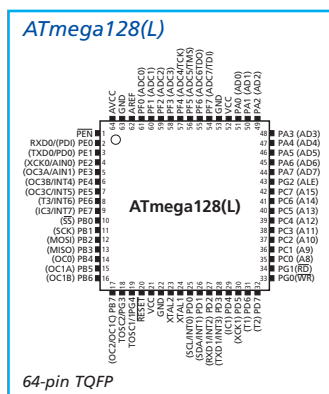
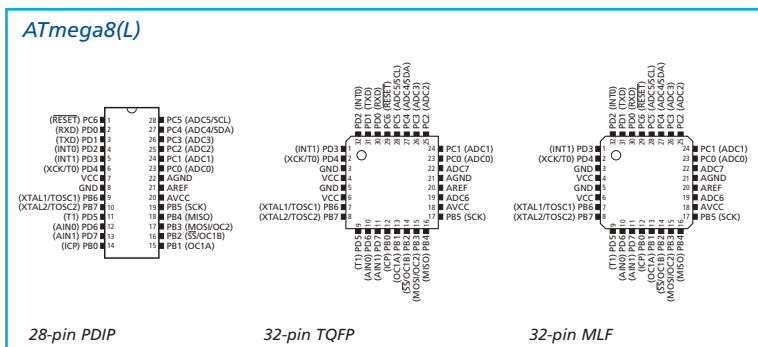
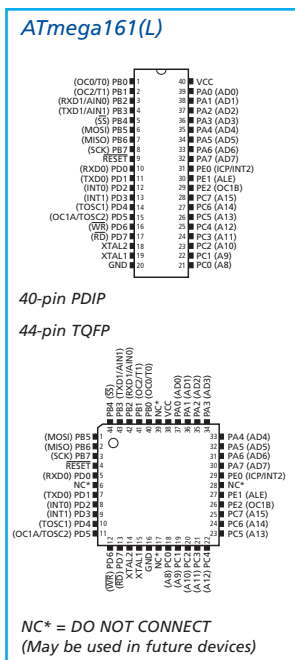
Key

- SRAM** - Static RAM
- ISP** - In-System Programmable
- BL** - Boot Loader
- JTAG** - JTAG ISP/Debug Port
- I/O** - Input/Output
- ADC** - Analogue to Digital Convertor
- SPI** - Serial Peripheral Interface
- PWM** - Pulse Width Modulation
- PAR** - Parallel programming mode
- FLASH** - Reprogrammable Code Memory
- EEPROM** - Reprogrammable Data Memory
- YES¹** - Nominal Frequency 1MHz
- YES²** - Nominal Frequency 1.6MHz
- YES³** - Nominal Frequency 1/2/4/8MHz
- LVISP** - Low Voltage ISP (On target PCB)
- HVISP** - High Voltage ISP
- L** - Low Voltage (device)
- N/A** - Not Available
- TBA** - To Be Announced
- ICCAVR** - AVR™ C Compiler - Full ([302-2274](#))

Package Descriptions

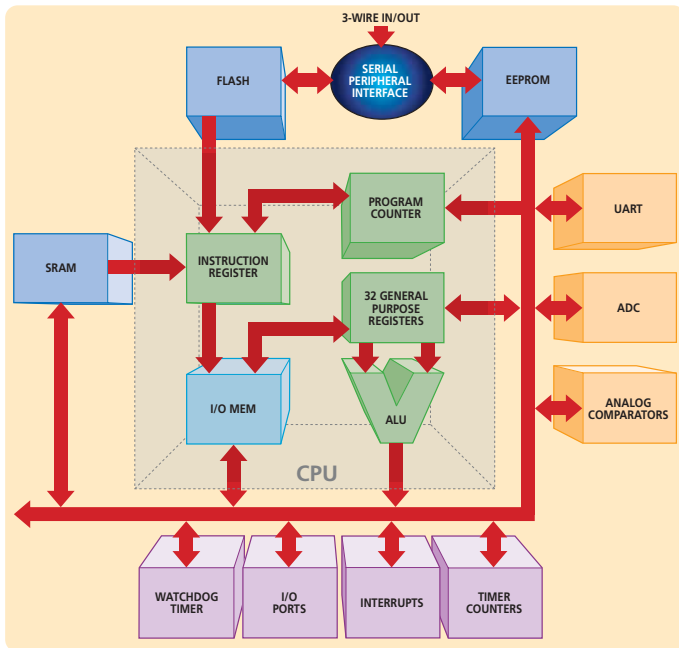
- 8S2** - 8-Lead, 0.200" Wide, Plastic Gull-Wing Small Outline Package (EIAJ SOIC)
- 32A** - 32-Lead, Thin (1.0mm) Plastic Gull-Wing Quad Flat Package (TQFP)
- 8P3** - 8-Lead, 0.300" Wide, Plastic Dual In-line Package (PDIP)
- 40P6** - 40-Lead, Thin (1.0mm) Plastic Dual In-line Package (PDIP)
- 20S** - 20-Lead, 0.300" Wide, Plastic Gull-Wing Small Outline (SOIC)
- 44A** - 44-Lead, Thin (1.0mm) Plastic Gull-Wing Quad Flat Package (TQFP)
- 20P3** - 20-Lead, 0.300" Wide, Plastic Dual In-line Package (PDIP)
- 44J** - 44-Lead, Plastic J-Leaded Chip Carrier (PLCC)
- 28P3** - 28-Lead, 0.300" Wide, Plastic Dual In-line Package (PDIP)
- 64A** - 64-Lead, Thin (1.0mm) Plastic Gull-Wing Quad Flat Package (TQFP)

Atmel AVR™ FLASH Microcontroller Pinouts



Try an Atmel 'AVR FLASH MICROCONTROLLER' in your next embedded design...

The Atmel 'AVR™ FLASH Microcontroller Family' brings low-cost, high-performance re-programmable microcontrollers within the reach of every embedded design engineer. These devices are supported by optimising high-level language compilers for ANSI C and Pascal so you can write portable non chip-specific code with no need to learn a new instruction set. A low-cost In-Circuit Emulator (ICE200) supports low and high-level language in-circuit emulation of most of the popular AT90S and ATtiny devices and nearly all devices can be programmed in-situ on your target board using a suitable ISP programmer.

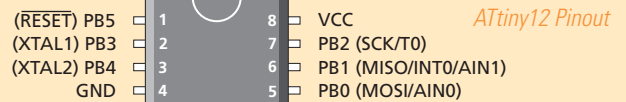


AT90S AVR™ Family (AT90S1200/2313/4433/8515/8535)

These devices offer a whole host of powerful features at a low cost. The 1200 and 2313 are both 20-pin devices with 15 I/O pins and are capable of speeds of up to 12 MIPS (1200). The 2313 has 2K FLASH CODE memory, 128 bytes of EEPROM and an on-chip UART making it ideal for many low-cost serial communications/control applications. At the top-end of the family, the 8535 features 8K FLASH CODE memory, 512 bytes of EEPROM and an on-chip 8-channel 10-bit A/D convertor. All devices are fully supported by the STK500(C+) Starter/Development Systems and the ICE200 In-Circuit Emulator.

ATtiny AVR™ Family (ATtiny11/12/15)

These low-cost 'Tiny' 8-pin microcontrollers feature a slightly reduced version of the standard AVR™ core with no on-chip SRAM. The ATtiny12 and ATtiny15 have on-chip EEPROM and have an internal RC oscillator so no external clock is required. The ATtiny15 even has a 4-channel 10-bit A/D. These devices are therefore ideal for high-volume applications where low cost and small physical size are required.



ATmega AVR™ Family (ATmega8/323/161/163/103)

The first five members of the megaAVR family are highly integrated devices and have from 8K to 128K Bytes of Flash program Memory, EEPROM, a programmable UART, hardware multiplier, programmable brownout detector and 10 bit A/D converter. They are housed in the industry standard 32, 44 or 64 pin TQFP or 28 and 40 pin PDIP packages. With the exception of the ATmega103, all members of this family feature an optional 'Boot Code' section which can be used to store a custom Boot Loader allowing the FLASH/EEPROM to be re-programmed via any customer-specified interface. The ATmega128 and ATmega161 both feature two Serial Ports making them ideal for many control/communications applications.

ICCAVR V6 (Full) - Low Cost ANSI-C Compiler

IDE: Powerful IDE including Editor, Project Manager, C Compiler and assembler

ANSI-C Compiler

- Modern fast C Compiler with full support for the ANSI C language
- Optimised 'switch' handling, algebraic simplifications, advanced register allocation, peephole optimization
- Supports 32-bit longs & 32-bit IEEE single precision floating point
- Full support for interrupt handlers in C
- Supports in-line assembly
- Supports automatic generation of bit I/O instructions
- Strings can be placed in either RAM or FLASH
- Subset of ANSI C library is provided which includes printf, memory allocation, strings and maths functions

AVR™ Features:

- Advanced RISC Architecture for high-performance and low-power
- In-System Programmable FLASH CODE Memory (1,000+ Write/Erase cycles)
- In System Programmable EEPROM DATA Memory (100K+ Write/Erase cycles)
- Some devices support 'Self Programming' of the FLASH/EEPROM using a custom Boot Loader
- On-chip Internal SRAM - 128 to 4K bytes
- Throughput of up to 16 MIPS on higher-end devices
- Device Pin counts from 8 to 64 pins
- Configurable I/O pin architecture with Sink/Source capability
- Support In-System Programming (ISP) via simple 3-wire SPI Interface + control of RESET pin
- Wide voltage supply range (2.7 to 5.5V - choose 'L' device for <4V operation)
- Many AVR™ devices feature on-chip RC Oscillator (1/4/8 MHz)
- Programmable Watchdog Timer
- On-chip brownout circuit to guard against power supply drop-out conditions
- Multiple 'Sleep Modes' - ideal for low-power applications

Please note: AVR™ is a trademark of the Atmel Corporation

IM-AVRC-1

STK500 C+

AVRTM Professional FLASH Microcontroller Development System

The Atmel STK500 C+ AVRTM development system contains everything you need to develop projects for the Atmel AVRTM FLASH Microcontroller Family. The system includes an integrated AVRTM programming/evaluation/prototyping board, a fully functional C compiler (4K bytes code limit) and sample AVRTM microcontrollers. The STK500 module supports both parallel programming and off-board In-System Programming (ISP) of a user target system (not supplied). The software supplied includes the 'ICCAVR Integrated Development Environment (IDE)' which is fully integrated with the Atmel 'AVRTM Studio 3.0 Interface' and supports compile, program to target device and run from a single menu selection.

The STK500 starter kit includes the following:

Software

- AVRTM Studio 3.0 Interface software
- Imagecraft ICCAVR ANSI C compiler and IDE for Atmel AVRTM (4K bytes code limit)

Hardware

- STK500 programming/evaluation/prototyping board
- Sample AVRTM FLASH microcontrollers
- 9-way PC Serial Cable
- Power cable (external PSU not supplied)
- 10-way IDC cable (for off-board ISP)



STK500 module features:

- RS232 Interface to PC for Programming and Control
- Power Supply Input: 10-15V DC regulated
- Sockets for 8, 20, 28 and 40-pin AVRTM Microcontroller Devices
- Serial In-System Programming (ISP) of AVRTM Devices
- In-System Programmer (ISP) for Programming AVRTM Devices in External Target System
- Parallel and Serial High-voltage Programming of most AVRTM Microcontroller Devices
- Software Upgradable from AVRTM Studio to Support Future AVRTM Devices
- All AVRTM I/O Ports Easily Accessible through Pin Header Connectors
- RS232 Port for General Use
- Expansion Connectors for Plug-in Modules and Prototype Area
- On-board 2-megabit DataFlashTM for Nonvolatile Data Storage
- 8 Push Buttons and 8 LED's for General Use
- Flexible Clocking, Voltage and Reset System

STK500 C+

EPSILON5 MKII

Universal In-System Programming (ISP) Tool for Atmel & Philips FLASH Microcontrollers

The Epsilon5 ISP programmer is an all-in-one development/field/production programmer supporting most in-system programmable microcontrollers from Atmel, Atmel Wireless (Temic) and Philips. The programmer can be controlled from the PC or used in Standalone Mode.



Device support:

- Atmel - LV SPI ISP: AT90S, ATtiny and ATmega AVRTM microcontrollers
- Atmel - JTAG ISP: ATmega323/128 (license upgrade)
- Atmel - HV (+12V Vpp) ISP: ATtiny11/12/15L
- Atmel - AT89(L)S51/52/53/8252 8051 microcontrollers
- Atmel Wireless (Temic) - Boot Loader: T89C51Rx2, T89C51CC01
- Philips - Boot Loader: P89C51Rx2, P89C66x

Features:

- Controlled/configured by Equinox EQTools Software
- Powerful 'project-based' environment with full version control
- Standalone Mode - programmer can be used without a PC
- Supports programming of FLASH, EEPROM, FUSE bits, Security bits and RC Oscillator Calibration bytes
- Ideal for development, field or small-scale production use
- Single Key Auto-Program
- Status LED's - Busy/Pass/Fail
- 4 x ISP Headers - Atmel 6-way/10-way/JTAG, Equinox 10-way
- 2Mbits of on-board non-volatile FLASH memory for user project storage
- Can be powered directly from the Target System (3.0V to 5.0V)
- JTAG Port - FAST ISP using JTAG algorithm (license upgrade)
- Upgrades include JTAG ISP support, Labview control, Visual Basic control

EPSILON5-A1

FS2000A

Portable Development/Field/Production ISP Programmer for Atmel AVRTM and AT89S Microcontrollers

The FS2000A is an all-in-one Development/Field/Production Programmer supporting high-speed in-system programming (ISP) of Atmel AVRTM and AT89S(8051) FLASH microcontrollers. The programmer can be controlled from a PC during the development phase and can also be used standalone for field and production applications. Any one of up to 64 independent 'Programming Projects' can be recalled from on-board non-volatile memory and then programmed into a Target Device by pressing a single key.



Hardware features:

- Very fast programming speeds suitable for high-throughput production environments
- Portable programmer design - ideal for development, production or field use
- Supports 'Standalone' operation i.e. no PC required after programmer has been configured
- On-board 4Mbits FLASH Memory Store capable of storing up to 64 independent programming projects
- Simple selection of project using LCD and keypad
- Operator can not inadvertently change the programming data or settings
- Single key auto-program mode
- Can be powered from the target system (+5V only) or externally powered using PSU included
- Robust SPI I/O stage
- Supports both Atmel and Equinox 10-way target ISP header connections
- Programmable frequency generator output on SCK2 pin supports external clocking of ATmega163, ATtiny12, AT90S2333/4433 AVRTM microcontrollers to speed up programming
- Programmer firmware is field upgradable to cater for future algorithms

System contents:

- FS2000A Portable ISP Programmer
- 10-way ISP Ribbon Cable
- 9W PC Serial cable + 9-25W adaptor
- User manual
- EQTools software on CD-ROM

FS2000A Ordering Information:

The FS2000A is available with the following mains power supply types:

FS2000A(UK) UK 3-pin 240V @ 50Hz
FS2000A(EU) Euro 2-pin 230V @ 50Hz
FS2000A(US) US 2-pin 110V @ 60Hz
FS2000A(AS) ASIA 3-pin 240V @ 50Hz

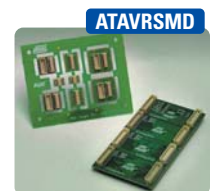
AVRTM ICE200

In-Circuit Emulator

The ICE200 is a true Real-Time In-Circuit Emulator for the Atmel AVRTM Microcontroller Family. The system offers full speed emulation of most AT90S and ATtiny AVRTM derivatives including emulation of memory, I/O and on-chip peripherals. Full symbolic debugging in 'C' or assembler is supported using the powerful 'AVRTM Studio' IDE from Atmel. The ICE200 comes complete with target pods for 8-pin, 20-pin, 28-pin and 40-pin (standard and A/D) derivatives.

Hardware Features:

- Non-intrusive single-chip emulation of processor core, I/O, peripherals and EEPROM memory using dedicated AVRTM emulator chip from Atmel
- Supports most AT90S derivatives plus ATtiny11/ATtiny12 derivatives (ATmega not supported)
- Full support for devices featuring A/D converters
- Emulation pods for 8-pin, 20-pin, 28-pin and 40-pin DIL devices included as standard
- Wide target voltage range (+2.7V to +5.5V) with automatic voltage sensing



Surface Mount Adaptor Kit

AVRTM ICE200
ATAVRSMDS

Atmel AVR™ FLASH Microcontroller Family - Product Selection Guide

	AT90S1200	AT90S2313	AT90S2343	AT90S4433	AT90S8515	AT90S8535	ATmega103	NEW ATmega128	NEW ATmega163	Attiny11	Attiny12	Attiny15
ON-CHIP MEMORY												
FLASH (Bytes)	1K	2K	2K	4K	8K	8K	128K	128K	16K	1K	1K	1K
EEPROM (Bytes)	64	128	128	256	512	512	4K	4	512	0	64	64
SRAM (Bytes)	0	128	128	128	512	512	4K	4	1K	0	0	0
In-System Programmable (ISP)	YES	YES	YES	YES	YES	YES	YES	YES+BL+JTAG	YES	NO	YES	YES
HARDWARE FEATURES												
I/O Pins	15	15	5	20	32	32	32/I/O, 80, 8I	53	32	5x0 + 1I	5x0 + 1I	5x0 + 1I
On-chip RC Oscillator	YES¹	NO	YES¹	NO	NO	NO	NO	YES³	YES¹	NO	YES¹	YES²
Real Time Clock (RTC)	NO	NO	NO	NO	NO	NO	YES	YES	YES	NO	NO	NO
SPI Port	NO	NO	NO	YES	YES	YES	YES	YES	YES	NO	NO	NO
Full Duplex Serial UART	-	1	-	1	1	1	1	2 x (USART)	1	-	-	-
Watchdog Timer	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Timer/Counters	1	2	2	1	2	2	3+RTC	4+RTC	2	1	1	2
PWM Channels (10-bit)	-	1	-	1	2	3	2	6 (16-BIT)	4	-	-	1
Analogue Comparator	YES	YES	NO	YES	NO	NO	NO	YES	YES	YES	YES	YES
A/D Channel (10-bit)	NO	NO	NO	6	NO	8	8	17	8	NO	NO	4
IDLE and Power Down modes	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Interrupts	4	11	3	14	13	17	24	24+	17	4	5	8
MISCELLANEOUS												
AVR™ Instructions	89	118	118	120	118	120	121	133	130	90	90	9
Max External Clock Frequency	12MHz	10MHz	10MHz	8MHz	8MHz	8MHz	6MHz	16MHz	8MHz	6MHz	8MHz	N/A
Vcc Voltage Range (V)	4.0-6.0V	4.0-6.0V	4.0-6.0V	4.0-6.0V	4.0-6.0V	4.0-6.0V	4.0-6.0V	4.5-5.5V	4.0-5.5V	4.0-5.5V	4.0-5.5V	4.0-5.5V
EQUINOX SUPPORT TOOLS												
STK500 C+	LVISP+PAR	LVISP+PAR	LVISP+PAR	LVISP+PAR	LVISP+PAR	LVISP+PAR	LVISP	LVISP	LVISP+PAR	PAR	LVISP+PAR	LVISP+PAR
Epsilon 5	LVISP	LVISP	LVISP	LVISP	LVISP	LVISP	LVISP	LVISP	LVISP	HVISP	LV/HVISP	LV/HVISP
FS2000A	LVISP	LVISP	LVISP	LVISP	LVISP	LVISP	LVISP	LVISP	LVISP	-	LVISP	LVISP
PRO101	LVISP	LVISP	LVISP	LVISP	LVISP	LVISP	LVISP	LVISP	LVISP	-	LVISP	LVISP
Micro-Pro Device Programmer	PAR only	PAR only	-	-	ZIF-ISP	-	-	-	-	-	-	-
AVR™ ICE200 Emulator	YES	YES	YES	YES	YES	YES	-	-	-	YES	YES	YES
Imagecraft C Compiler	ICctiny	ICCAVR	ICCAVR	ICCAVR	ICCAVR	ICCAVR	ICCAVR	ICCAVR	ICCAVR	ICctiny	ICctiny	ICctiny
PACKAGE TYPES												
PDIP	20P3	20P3	8P3	28P3	40P6	40P6	-	-	40P6	8P3	8P3	8P3
Farnell Part Code	690752 (C)	111454 (C)	111430 (C)	3617944 (I)	111491 (C)	120960 (C)	-	-	3618043 (I)	3617981 (I)	3618006 (I)	3618020 (I)
PLCC	-	-	-	-	44J	44J	-	-	-	-	-	-
Farnell Part Code	-	-	-	-	111508 (C)	120959 (C)	-	-	-	-	-	-
TQFP	-	-	-	32A	44A	44A	64A	64A	44A	-	-	-
Farnell Part Code	-	-	-	3617956 (I)	TBA	3617968 (I)	3618031 (I)	TBA	3618055 (I)	-	-	-
SOIC	20S	20S	8S2	-	-	-	-	-	-	8S2	8S2	8S2
Farnell Part Code	690934 (C)	111466 (C)	111442 (C)	-	-	-	-	-	-	3617970 (I)	3617993 (I)	3618018 (I)

* Max speed depends on Vcc voltage. Frequencies and Currents listed are for Vcc = 5.0V & T = 25°C

Please verify correct part codes for low voltage parts before ordering.

Key

- SRAM
- Static RAM
- ISP
- In-System Programmable
- BL
- Boot Loader
- JTAG
- JTAG ISP/Debug Port
- I/O
- Input/Output
- ADC
- Analogue to Digital Convertor
- SPI
- Serial Peripheral Interface
- PWM
- Pulse Width Modulation
- PAR
- Parallel programming mode
- FLASH
- Reprogrammable Code Memory
- EEPROM
- Reprogrammable Data Memory
- YES¹
- Nominal Frequency 1MHz
- YES²
- Nominal Frequency 1.6MHz
- YES³
- Nominal Frequency 1/2/4/8MHz
- LVISP
- Low Voltage ISP
- HVISP
- High Voltage ISP
- N/A
- Not Available
- TBA
- To Be Announced
- ICCAVR
- AVR™ C Compiler - Full (302-2274)
- ICctiny
- ATtiny C Compiler (TBA)

Operating Temperature Ranges

- (C)
- Commercial Operating Range (0°C to 70°C)
- (I)
- Industrial Operating Range (-40°C to 85°C)

Package Descriptions

- 8S2
- 8-Lead, 0.200" Wide, Plastic Gull-Wing Small Outline Package (EIAJ SOIC)
- 32A
- 32-Lead, Thin (1.0mm) Plastic Gull-Wing Quad Flat Package (TQFP)
- 8P3
- 8-Lead, 0.300" Wide, Plastic Dual Inline Package (PDIP)
- 40P6
- 40-Lead, Thin (1.0mm) Plastic Dual Inline Package (PDIP)
- 20S
- 20-Lead, 0.300" Wide, Plastic Gull-Wing Small Outline (SOIC)
- 44A
- 44-Lead, Thin (1.0mm) Plastic Gull-Wing Quad Flat Package (TQFP)
- 20P3
- 20-Lead, 0.300" Wide, Plastic Dual Inline Package (PDIP)
- 44J
- 44-Lead, Plastic J-Leaded Chip Carrier (PLCC)
- 28P3
- 28-Lead, 0.300" Wide, Plastic Dual Inline Package (PDIP)
- 64A
- 64-Lead, Thin (1.0mm) Plastic Gull-Wing Quad Flat Package (TQFP)