

Welcome to [E-XFL.COM](https://www.e-xfl.com)

What is "[Embedded - Microcontrollers](#)"?

"[Embedded - Microcontrollers](#)" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "[Embedded - Microcontrollers](#)"

Details

| | |
|----------------------------|---|
| Product Status | Obsolete |
| Core Processor | AVR |
| Core Size | 8-Bit |
| Speed | 48MHz |
| Connectivity | I ² C, SmartCard, SPI, UART/USART, USB |
| Peripherals | Brown-out Detect/Reset, DMA, LED, POR, PWM, WDT |
| Number of I/O | - |
| Program Memory Size | 64KB (64K x 8) |
| Program Memory Type | FLASH |
| EEPROM Size | 4K x 8 |
| RAM Size | 4K x 8 |
| Voltage - Supply (Vcc/Vdd) | 2.4V ~ 5.5V |
| Data Converters | - |
| Oscillator Type | Internal |
| Operating Temperature | -40°C ~ 85°C (TA) |
| Mounting Type | Surface Mount |
| Package / Case | 32-VFQFN Exposed Pad |
| Supplier Device Package | 32-QFN (5x5) |
| Purchase URL | https://www.e-xfl.com/product-detail/microchip-technology/at90scr100lsd-z1t |

General Features

- High Performance, Low Power AVR® 8-Bit Microcontroller
- Advanced RISC Architecture
 - 131 Powerful Instructions - Most Single Clock Cycle Execution
 - 32 x 8 General Purpose Working Registers
 - Up to 16MIPS Throughput at 16Mhz
 - On-chip 2-cycle Multiplier
- Non-volatile Program and Data Memories
 - 64K Bytes of In-System Self-Programmable Flash
 - Endurance: 10,000 Write/Erase Cycles
 - 4K Bytes EEPROM
 - Contains 128 Bytes of One Time Programmable Memory
 - Endurance: 100,000 Write/Erase Cycles
 - 4K Bytes Internal SRAM
 - Optional Boot Code Section
 - In-System Programming by On-chip Bootloader program
- JTAG (IEEE std. 1149.1 compliant) Interface
 - Boundary-scan Capabilities According to the JTAG Standard
 - Extensive On-chip Debug Support
 - Programming of Flash, EEPROM, Fuses, and Locks Bits through JTAG Interface
 - Locking JTAG for Software Security (using OTP programming)
- ISO7816 UART Interface Fully compliant with EMV, GIE-CB and WHQL Standards
 - Programmable ISO clock from 1 Mhz to 4.8, 6, 8 or 12Mhz
 - Card insertion/removal detection with automatic deactivation sequence
 - Programmable Baud Rate Generator from 372 to 3 clock cycles
 - Synchronous/Asynchronous Protocols T=0 and T=1 with Direct or Inverse Convention
 - Automatic character repetition on parity errors
 - 32 Bit Waiting Time Counter
 - 16 Bit Guard Time Counter/Block Guard Time Counter
 - Internal Step Up/Down Converter with Programmable Voltage Output if DC/DC embedded:
 - Class A: 5V +/-8% at 60mA, Vcc>2.85 (50mA if Vcc >2.7)
 - Class B: 3V +/-8% at 60mA, Vcc>2.85 (50mA if Vcc >2.7)
 - Class C: 1.8V +/-8% at 35mA
 - ISO7816-12 USB Host controller for card interface
 - Supports up to 60mA USB Smart Cards
 - Supports limited cable length to Smart Card Connector (~50cm)
 - 4 kV ESD (MIL/STD 883 Class 3) protection on whole Smart Card Interface
- USB 2.0 Full-speed Device Module
 - Complies fully with:
 - Universal Serial Bus Specification Rev 2.0
 - Supports data transfer rates up to 12 Mbit/s
 - Endpoint 0 for Control Transfers : up to 64-bytes
 - 8 Programmable Endpoints with IN or OUT Directions and with Bulk, Interrupt or Isochronous Transfers
 - 3 Programmable Endpoints with double buffering of 64x2 bytes
 - Suspend/Resume Interrupts, and Remote Wake-up Support
 - Power-on Reset and USB Bus Reset



8-bit AVR® Microcontroller for Smart Card Readers

AT90SCR100

Summary Preliminary

6568AX-SMS-23Oct08



SUMMARY PRELIMINARY



- 48 Mhz clock for Full-speed Bus Operation
- USB Bus Disconnection on Microcontroller Request
- **Peripheral Features**
 - One 8-bit Timer/Counters with Separate Prescaler, Compare Mode and PWM Channel
 - One 8-bit Timer/Counters with Separate Prescaler, Compare Mode and Real Time Counter on Separate Oscillator
 - One 16-bit Timer/Counters with Separate Prescaler and Compare Mode
 - Hardware Watchdog
 - Hardware AES 128/256 Engine
 - Random Number Generator (RNG)
- **Communication Peripherals**
 - High Speed Master/Slave SPI Serial Interface (Up to 20Mhz)
 - 2-Wire Serial Interface
 - USART interface (up to 2Mbps)
 - Standard SPI Interface (to ease the communication with most of RF front end chip)
- **Special Microcontroller Feature**
 - Power-on Reset and Brown-out Detection
 - Internal Calibrated Oscillator
 - External and Internal Interrupt Sources
 - Five Sleep Modes: Idle, Power-save, Power-down, Standby and Extended Standby
 - Supply Monitoring with Interruption Generation below a fixed level.
- Keyboard Interface with up to 5x4 Matrix Management Capability + Interrupts and Wake-Up on Key Pressed Event
- Up to 4 x I/O Ports: Programmable I/O Port
- Up to 4 x LED Outputs with Programmable Current Sources: 2 or 4 mA (not usable in emulation mode)
- Specific and Unique Serial Number per IC in production.
- **Operating Temperature**
 - Industrial (-40°C to +85°C)
- **Core Operating Voltages**
 - 2.4 - 5.5V
- **DC/DC Operating Voltages** (See “Smart Card Interface Characteristics” for details)
 - 2.7 - 5.5V
- **Maximum Frequency**
 - 8Mhz Clock Input

1. Description

Smart Cards and Smart Card Readers are increasingly being used in various systems such as Health Care, USB Token, Password Generator, Access control, Laptop Computer, Set Topbox, Payment Terminals... These applications require complex integration using different communicating interfaces.

The AT90SCR100 based on the powerful 8/16bit AVR® Core technology, meets the requirements of such applications thanks to its embedded communication interfaces: USB Full-speed, ISO7816 (1-4,12) interface, High Speed SPI supporting speed up to 20Mbps, USART, TWI.

The AT90SCR100 has been designed to support standard systems such as Contactless interface and Fingerchip, among others.

An AES engine is also embedded to ease the development of secured communication between AT90SCR100 and external peripherals.

All these features require a minimum of external components which makes this solution the best choice for low cost high integration in small environments.

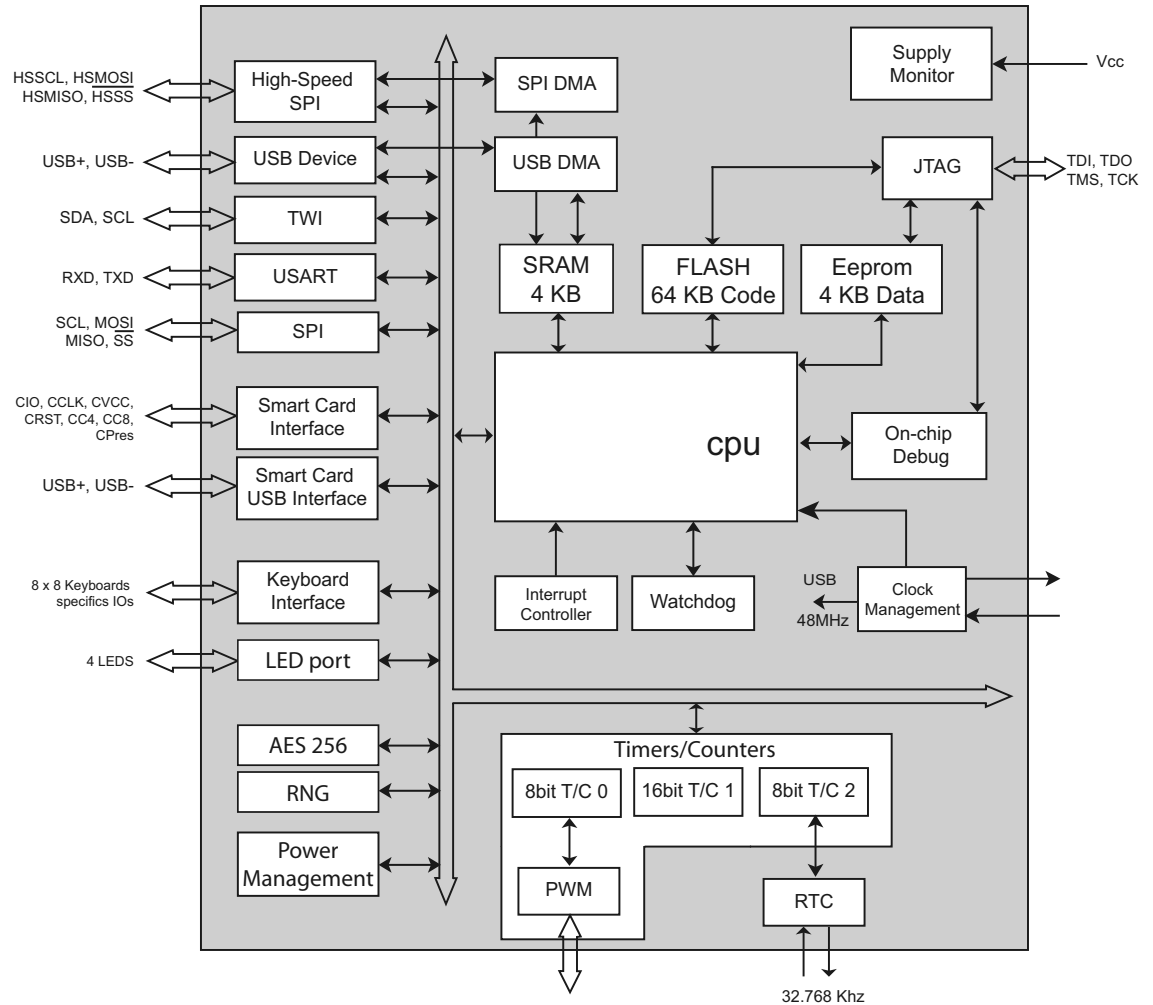
Its FLASH memory allows remote firmware management. The JTAG interface eases code development, and program loading in end-customers factories.

A low pincount package is also available for embedded application with size constraints, such as USB tokens, laptop computers.

A complete datasheet will soon be available on Atmel's website: www.atmel.com.

2. Block Diagram

Figure 2-1. Block Diagram



3. Pin List Configuration

- 2 package configurations to answer different needs
 - 32pins: **LowPinCount** package: for small package size, useful for small embedded systems (AT90SCR100L and AT90SCR100LS)
 - 64pins: **FullPinCount**: For full performance advanced reader (AT90SCR100H)



On Full Pin Count (FPC) package, the only supported package type is QFN, and we connect all the Vss signals to the e-pad. It is important to have it fully soldered on groundplane of final PCB.



- USBReg refers to 3.3V USB specific regulator
- PCINTx refer to Pin Change Interrupts. See “External Interrupt Registers” in full Datasheet.



Take care of the multiplexed fonctionnalités of each port. All fonctionnalités may be active at the same time. The only way to disable a feature is to deactivate it inside the corresponding peripheral block.

Table 3-1. Pin List Configuration

| Portmap | ID | SCR100L | SCR100LS | SCR100H | Supply | Configuration, Role | |
|------------------------|-------|---------|----------|------------------|---------|---------------------|--|
| Unmapped, generic pins | Vcc | x | x | x | - | Vcc | Voltage Supply |
| | Vss | x | x | e ⁽¹⁾ | | Vss | Ground |
| | AVss | x | x | e ⁽¹⁾ | | AVss | PLL Ground |
| | RST | x | x | x | Vcc | RST | Reset signal: Drive low to reinitialize the chip |
| | Xtal1 | x | x | x | | XTAL1 | Clock Input: Support up to 8 Mhz crystals |
| | Xtal2 | x | x | x | | XTAL2 | |
| | DVcc | x | x | x | | DVcc | Digital Vcc: Used for internal regulator decoupling |
| | Vcc2 | x | x | x | - | Vcc2 | Voltage Supply: To be tied to same Vcc supply voltage |
| | Vcc3 | - | - | x | | Vcc3 | Voltage Supply: To be tied to same Vcc supply voltage |
| | Vcc4 | - | - | x | | Vcc4 | Voltage Supply: To be tied to same Vcc supply voltage |
| | Vcc5 | - | - | x | | Vcc5 | Voltage Supply: To be tied to same Vcc supply voltage |
| | Vdcdc | x | x | x | | Vdcdc | Voltage Supply for DC/DC Converter. |
| | Vss2 | x | x | e ⁽¹⁾ | | Vss2 | Second Vss: To be tied to Vss |
| | Vss3 | x | x | e ⁽¹⁾ | | Vss3 | Third Vss: To be tied to Vss |
| | D+ | x | x | x | USB Reg | D+ | USB Interface |
| | D- | x | x | x | | D- | |
| | UCap | x | x | x | | UCap | USB Decoupling: Used for specific USB regulator decoupling |
| | RTC1 | - | - | x | Vcc | TOSC1 | TOSCx: 32.768 KHz cristal input for Real Time Clock. (Please note that these pins are not GPIO accessible). |
| | RTC2 | - | - | x | | TOSC2 | |

Table 3-1. Pin List Configuration

| Portmap | ID | SCR100L | SCR100LS | SCR100H | Supply | Configuration, Role | | | | |
|-----------------------|-----|---------|----------|---------|--------|---------------------|-------|-----|---------|--|
| PORT A | PA7 | - | - | x | Vcc | KbIN7 | | | PCINT7 | KbINx: Input for “Keyboard Interface” |
| | PA6 | - | - | x | | KbIN6 | | | PCINT6 | |
| | PA5 | - | - | x | | KbIN5 | | | PCINT5 | |
| | PA4 | - | - | x | | KbIN4 | | | PCINT4 | |
| | PA3 | - | - | x | | KbIN3 | | | PCINT3 | |
| | PA2 | - | - | x | | KbIN2 | | | PCINT2 | |
| | PA1 | - | - | x | | KbIN1 | | | PCINT1 | |
| | PA0 | - | - | x | | KbIN0 | | | PCINT0 | |
| PORT B | PB7 | x | - | x | Vcc | SCK | OC2A | | PCINT15 | SS, MISO, MOSI, SCK: Standard “SPI - Serial Peripheral Interface” OCxx: Output Comparator outputs. See “Timers”. ICP1: Input Capture. See “16-bit Timer/Counter1 with PWM” PWM: Output from “8-bit Timer/Counter0 with PWM” Tx: Clock input for “Timers” 0 and 1 XCK: Clock input for synchronous “USART” INTx: “External Interrupts” , default configuration CKO: System clock output. (only active if CKOUT fuse is enabled). “Fuse Low Byte” . |
| | PB6 | x | - | x | | MISO | OC2B | | PCINT14 | |
| | PB5 | x | - | x | | MOSI | OC1A | | PCINT13 | |
| | PB4 | x | - | x | | SS | OC0B | | PCINT12 | |
| | PB3 | - | - | x | | PWM | OC0A | | PCINT11 | |
| | PB2 | - | - | x | | | ICP1 | | PCINT10 | |
| | PB1 | - | - | x | | INT3 | T1 | CKO | PCINT9 | |
| | PB0 | - | - | x | | INT2 | T0 | XCK | PCINT8 | |
| PORT C ⁽³⁾ | PC5 | - | - | x | Vcc | JTGTDI | LED3 | | | JTGxxx: “JTAG Interface and On-chip Debug System” SDA, SCL: “2-wire Serial Interface _ TWI” signals LEDx: “LED” Outputs (IO driving current) INTxb: “External Interrupts” , bis configuration |
| | PC4 | - | - | x | | JTGTD0 | LED2 | | | |
| | PC3 | - | - | x | | JTGTM5 | LED1 | | | |
| | PC2 | x | x | x | | JTGTCCK | LED0 | | | |
| | PC1 | - | - | x | | SDA | INT3b | | | |
| | PC0 | - | - | x | | SCL | INT2b | | | |
| PORT D | PD7 | - | x | x | Vcc | HSMISO | | | PCINT23 | HSxxxx: “High-Speed SPI Controller” (MISO, MOSI, SCK, \overline{SS}) INTx: “External Interrupts” , default configuration TXD, RXD: “USART” signals OCxB: Output Comparators: See “Timers”. |
| | PD6 | - | x | x | | HSMOSI | | | PCINT22 | |
| | PD5 | - | x | x | | HSSCK | | | PCINT21 | |
| | PD4 | - | x | x | | HSSS | | | PCINT20 | |
| | PD3 | - | - | x | | INT1 | | | PCINT19 | |
| | PD2 | - | - | x | | INT0 | OC1B | | PCINT18 | |
| | PD1 | x | x | x | | TXD | | | PCINT17 | |
| | PD0 | x | x | x | | RXD | | | PCINT16 | |

Table 3-1. Pin List Configuration

| Portmap | ID | SCR100L | SCR100LS | SCR100H | Supply | Configuration, Role | | | | |
|-----------------|-----|---------|------------------|---------|---------|---------------------|--|--|---|---------------------------------------|
| PORT E | PE7 | - | - | x | Vcc | KbO7 | | | PCINT31 | KbOx: Output for “Keyboard Interface” |
| | PE6 | - | - | x | | KbO6 | | | PCINT30 | |
| | PE5 | - | - | x | | KbO5 | | | PCINT29 | |
| | PE4 | - | - | x | | KbO4 | | | PCINT28 | |
| | PE3 | - | - | x | | KbO3 | | | PCINT27 | |
| | PE2 | - | - | x | | KbO2 | | | PCINT26 | |
| | PE1 | - | - | x | | KbO1 | | | PCINT25 | |
| | PE0 | - | - | x | | KbO0 | | | PCINT24 | |
| | | | | | | | | | | |
| Smart Card PORT | x | x | x | Vcc | CPRES | | | | Cx: “Smart Card Interface Block (SCIB)” : Standard ISO7816 port and “USB Host Controller” . | |
| | x | x | x | CVcc | CCLK | | | | | |
| | x | x | x | | CRST | | | | | |
| | x | x | x | | CIO | | | | | |
| | x | x | x | (2) | CC4, DP | | | | Smart Card Interface: “DC/DC Converter” Supply Signals | |
| | x | x | x | CC8, DM | | | | | | |
| | x | x | x | CVcc | | | | | | |
| | x | x | x | CVSense | | | | | | |
| | x | x | e ⁽¹⁾ | CVss | | | | | | |
| | x | x | x | LI | | | | | | |
| | x | x | x | LO | | | | | | |

- Notes:
1. Should be connected to e-pad underneath QFN package
 2. According to the current configuration, these pins are supplied either by USB regulator or CVcc
 3. PORT C is not complete, due to RTC pins, dedicated to oscillator pads

3.1 Typical Application

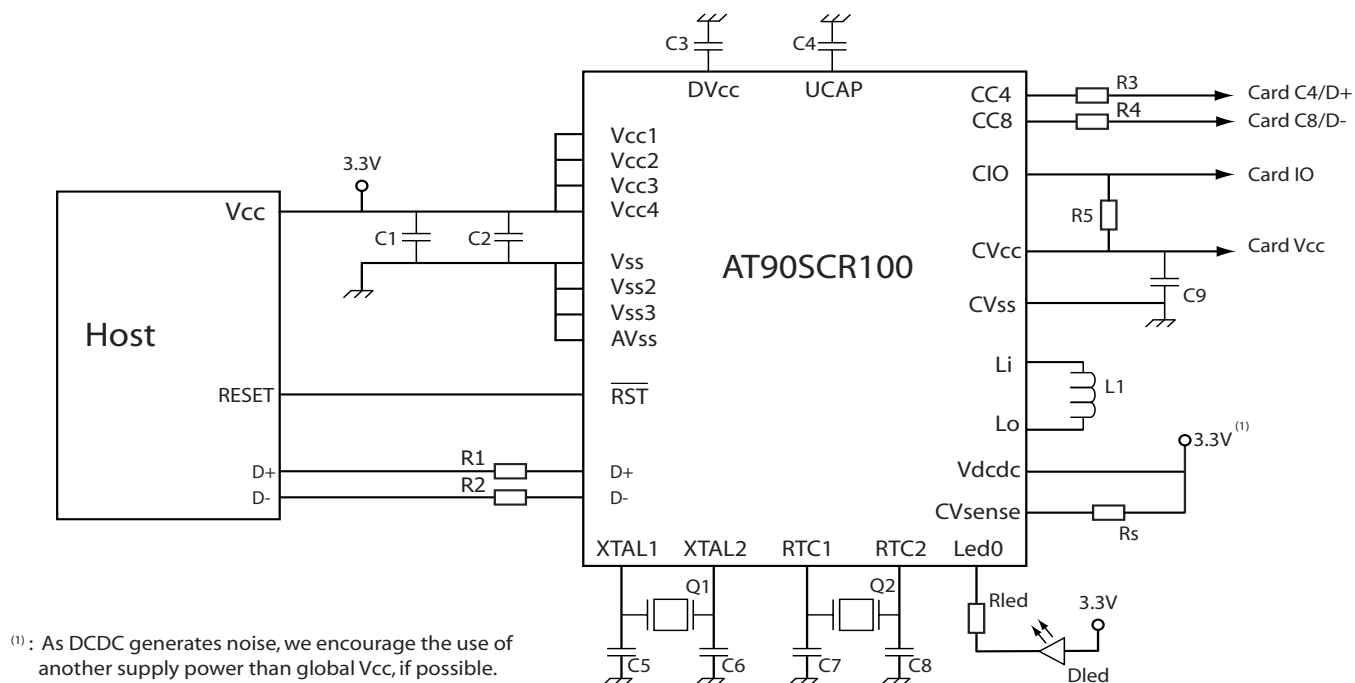


Table 3-2. External Components, Bill Of Materials

| Reference | Description | Value | Comment |
|------------------|--|--------------------------|---|
| R1, R2 R3, R4 | USB Pad Serial Resistor | 22Ω +/-10% | - |
| R5 | CIO Pull-up Resistor | 10KΩ +/-10% | (Optional) Can be required for high speed communication |
| Rs | DCDC Sense Resistor | 200mΩ +/-2% 125mW | Current Sensing: Overcurrent detection |
| C1 | Power Supply Decoupling capacitor | 4.7μF +/-10% | Maximum application capacitance allowed by USB standard is 10μF |
| C2 | Power Supply Filter capacitor | 100nF | - |
| C3 | Internal Core Regulator Decoupling capacitor | 2.2μF +/-10% | Used for internal regulator stability |
| C4 | Internal USB Regulator Decoupling capacitor | 2.2μF +/-10% | Used for internal regulator stability |
| C5, C6 | PLL Filter capacitors | 47pF +/-10% | - |
| C7, C8 | RTC Filter capacitors | 22pF +/-10% | Only if Real Time Counter is used. |
| C9 | DCDC Decoupling Capacitor | 10μF +/-10% esr=100mΩ | Tantalum capacitor is needed Recommended: AVX: TPSE106-035-200 |
| L1 | DCDC inductance | 6.8μH esr=20.2mΩ | Recommended: Gowanda: SMP3316LP-681M |
| Q1 | Crystal | 8.0 Mhz | |
| Q2 | Real Time Crystal | 3.768 Mhz | Only if Real Time Counter is used |
| Rled/Dled | LED mechanism | -- | Depends on the configuration of the Led Controller |

3.1.1 Recommendations

1. In Order to reduce the board parasitics, the external components for DCDC converter should be as close as possible to the chip pins (ideally soldered directly on the pins).
2. In order to have a correct current limitation, the board parasitic resistances must be taken into account in the choice of the R_s value (e.g., if each metal line connecting R_s to the chip adds a $10\text{ m}\Omega$ resistance, the correct R_s value should be $200 - 2 \times 10 = 180\text{ m}\Omega$)
3. CV_{cc} and CV_{ss} lines must have very low resistance (short and wide metal line).
4. R_1 , R_2 , R_3 and R_4 must be placed as close as possible to the chip pins.
5. Connect e-pad to ground. If possible connect it to ground plane



Headquarters

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

International

Atmel Asia
Unit 01-05 & 16, 19/F
BEA Tower, Millennium City 5
418 Kwun Tong Road
Kwun Tong, Kowloon
Hong Kong
Tel: (852) 2245-6100
Fax: (852) 2722-1369

Atmel Europe
Le Krebs
8, Rue Jean-Pierre Timbaud
BP 309
78054 Saint-Quentin-en-
Yvelines Cedex
France
Tel: (33) 1-30-60-70-00
Fax: (33) 1-30-60-71-11

Atmel 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

Product Contact

Web Site
www.atmel.com

Technical Support
scr@atmel.com

Sales Contact
www.atmel.com/contacts

Literature Requests
www.atmel.com/literature

Disclaimer: The information in this document is provided in connection with Atmel products. No license, express or implied, by estoppel or otherwise, to any intellectual property right is granted by this document or in connection with the sale of Atmel products. **EXCEPT AS SET FORTH IN ATMEL'S TERMS AND CONDITIONS OF SALE LOCATED ON ATMEL'S WEB SITE, ATMEL ASSUMES NO LIABILITY WHATSOEVER AND DISCLAIMS ANY EXPRESS, IMPLIED OR STATUTORY WARRANTY RELATING TO ITS PRODUCTS INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT. IN NO EVENT SHALL ATMEL BE LIABLE FOR ANY DIRECT, INDIRECT, CONSEQUENTIAL, PUNITIVE, SPECIAL OR INCIDENTAL DAMAGES (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF PROFITS, BUSINESS INTERRUPTION, OR LOSS OF INFORMATION) ARISING OUT OF THE USE OR INABILITY TO USE THIS DOCUMENT, EVEN IF ATMEL HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.** Atmel makes no representations or warranties with respect to the accuracy or completeness of the contents of this document and reserves the right to make changes to specifications and product descriptions at any time without notice. Atmel does not make any commitment to update the information contained herein. Unless specifically provided otherwise, Atmel products are not suitable for, and shall not be used in, automotive applications. Atmel's products are not intended, authorized, or warranted for use as components in applications intended to support or sustain life.

© Atmel Corporation 2008. All Rights Reserved. Atmel®, Atmel logo and combinations thereof, AVR® and others are registered trademarks or trademarks of Atmel Corporation or its subsidiaries. Other terms and product names may be trademarks of others.