Features

- Fast Read Access Time 70 ns
- Dual Voltage Range Operation
 - Low Voltage Power Supply Range, 3.0V to 3.6V
 - or Standard 5V \pm 10% Supply Range
- Compatible with JEDEC Standard AT27C010
- Low Power CMOS Operation
 - 20 μ A max. (less than 1 μ A typical) Standby for V_{CC} = 3.6V
 - 29 mW max. Active at 5 MHz for V_{cc} = 3.6V
- JEDEC Standard Packages
 - 32-Lead PLCC
 - 32-Lead TSOP (8 x 20 mm)
 - 32-Lead VSOP (8 x 14 mm)
- High Reliability CMOS Technology
 - 2,000V ESD Protection
 - 200 mA Latchup Immunity
- Rapid[™] Programming Algorithm 100 µs/byte (typical)
- CMOS and TTL Compatible Inputs and Outputs – JEDEC Standard for LVTTL
- Integrated Product Identification Code
- Commercial and Industrial Temperature Ranges

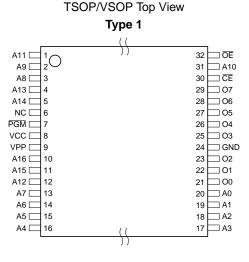
Description

The AT27LV010A is a high performance, low power, low voltage 1,048,576-bit onetime programmable read only memory (OTP EPROM) organized as 128K by 8 bits. It requires only one supply in the range of 3.0V to 3.6V in normal read mode operation, making it ideal for fast, portable systems using battery power. *(continued)*

Pin Configurations

Pin Name	Function
A0 - A16	Addresses
00 - 07	Outputs
CE	Chip Enable
ŌĒ	Output Enable
PGM	Program Strobe
NC	No Connect

PLCC Top View VPP VCC PGM R29 33 33 \cap A7 🗆 5 □ A14 A6 🗆 6 28 A13 A5 🗆 7 27] A8 26 A9 A4 🗆 8 A3 🗆 9 25 🗆 A11 24 A2 🗆 10 23 🗆 A10 A1 🗆 11 22 CE A0 12 00 🗆 ¹³[±] [£] [£] [£] [£] [£] [£] ⁶ ⁶ ²¹ □07





1-Megabit (128K x 8) Low Voltage OTP EPROM

AT27LV010A

Rev. 0548C-10/98





Atmel's innovative design techniques provide fast speeds that rival 5V parts while keeping the low power consumption of a 3.3V supply. At $V_{CC} = 3.0V$, any byte can be accessed in less than 70 ns. With a typical power dissipation of only 18 mW at 5 MHz and $V_{CC} = 3.3V$, the AT27LV010A consumes less than one fifth the power of a standard 5V EPROM. Standby mode supply current is typically less than 1 μ A at 3.3V.

The AT27LV010A is available in industry standard JEDECapproved one-time programmable (OTP) plastic PLCC and TSOP packages. All devices feature two-line control (\overline{CE} , \overline{OE}) to give designers the flexibility to prevent bus contention.

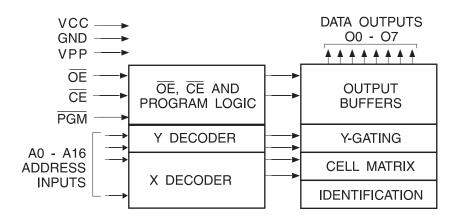
The AT27LV010A operating with V_{CC} at 3.0V produces TTL level outputs that are compatible with standard TTL logic devices operating at V_{CC} = 5.0V. The device is also capable of standard 5-volt operation making it ideally suited for dual supply range systems or card products that are pluggable in both 3-volt and 5-volt hosts.

Atmel's AT27LV010A has additional features to ensure high quality and efficient production use. The Rapid[™] Programming Algorithm reduces the time required to program the part and guarantees reliable programming. Programming time is typically only 100 μs/byte. The Integrated Product Identification Code electronically identifies the device and manufacturer. This feature is used by industry standard programming equipment to select the proper programming algorithms and voltages. The AT27LV010A programs exactly the same way as a standard 5V AT27C010 and uses the same programming equipment.

System Considerations

Switching between active and standby conditions via the Chip Enable pin may produce transient voltage excursions. Unless accommodated by the system design, these transients may exceed data sheet limits, resulting in device non-conformance. At a minimum, a 0.1 μ F high frequency, low inherent inductance, ceramic capacitor should be utilized for each device. This capacitor should be connected between the V_{CC} and Ground terminals of the device, as close to the device as possible. Additionally, to stabilize the supply voltage level on printed circuit boards with large EPROM arrays, a 4.7 μ F bulk electrolytic capacitor should be utilized, again connected between the V_{CC} and Ground terminals. This capacitor should be positioned as close as possible to the point where the power supply is connected to the array.

Block Diagram



Absolute Maximum Ratings*

Temperature Under Bias40°C to +8	35°C
Storage Temperature65°C to +12	25°C
Voltage on Any Pin with Respect to Ground2.0V to +7.0)V ⁽¹⁾
Voltage on A9 with Respect to Ground2.0V to +14.0)V ⁽¹⁾
V _{PP} Supply Voltage with Respect to Ground2.0V to +14.0)√ ⁽¹⁾

- *NOTICE: Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability
- Note: 1. Minimum voltage is -0.6V dc which may undershoot to -2.0V for pulses of less than 20 ns. Maximum output pin voltage is V_{CC} + 0.75V dc which may be exceeded if certain precautions are observed (consult application notes) and which may overshoot to +7.0V for pulses of less than 20 ns.

Operating Modes

Mode \ Pin	CE	OE	PGM	Ai	V _{PP}	V _{cc}	Outputs
Read ⁽²⁾	V _{IL}	V _{IL}	X ⁽¹⁾	Ai	Х	V _{CC} ⁽²⁾	D _{OUT}
Output Disable ⁽²⁾	Х	V _{IH}	Х	Х	Х	V _{CC} ⁽²⁾	High Z
Standby ⁽²⁾	V _{IH}	Х	Х	Х	Х	V _{CC} ⁽²⁾	High Z
Rapid Program ⁽³⁾	V _{IL}	V _{IH}	V _{IL}	Ai	V _{PP}	V _{CC} ⁽³⁾	D _{IN}
PGM Verify ⁽³⁾	V _{IL}	V _{IL}	V _{IH}	Ai	V _{PP}	V _{CC} ⁽³⁾	D _{OUT}
PGM Inhibit ⁽³⁾	V _{IH}	Х	Х	Х	V _{PP}	V _{CC} ⁽³⁾	High Z
Product Identification ⁽³⁾⁽⁵⁾	V _{IL}	V _{IL}	х	$A9 = V_{H}^{(4)}$ $A0 = V_{IH} \text{ or } V_{IL}$ $A1 - A16 = V_{IL}$	х	V _{CC} ⁽³⁾	Identification Code

Notes: 1. X can be V_{IL} or V_{IH} .

- 2. Read, output disable, and standby modes require, 3.0V \leq V_{CC} \leq 3.6V, or 4.5V \leq V_{CC} \leq 5.5V.
- 3. Refer to Programming Characteristics. Programming modes require V_{CC} = 6.5V.
- 4. $V_{H} = 12.0 \pm 0.5 V.$
- 5. Two identifier bytes may be selected. All Ai inputs are held low (V_{IL}), except A9 which is set to V_H and A0 which is toggled low (V_{IL}) to select the Manufacturer's Identification byte and high (V_{IH}) to select the Device Code byte.



AIMEL

DC and AC Operating Conditions for Read Operation

			V010A		
		-70	-90	-12	-15
Operating Temperature	Com.	0°C - 70°C	0°C - 70°C	0°C - 70°C	0°C - 70°C
(Case)	Ind.	-40°C - 85°C	-40°C - 85°C	-40°C - 85°C	-40°C - 85°C
			3.0V to 3.6V	3.0V to 3.6V	3.0V to 3.6V
V _{CC} Power Supply		5V ± 10%	5V ± 10%	5V ± 10%	5V ± 10%

DC and Operating Characteristics for Read Operation

Symbol	Parameter	Condition	Min	Max	Units
V _{CC} = 3.0\	/ to 3.6V				
I _{LI}	Input Load Current	$V_{IN} = 0V$ to V_{CC}		±1	μΑ
I _{LO}	Output Leakage Current	$V_{OUT} = 0V$ to V_{CC}		±5	μΑ
I _{PP1} ⁽²⁾	V _{PP} ⁽¹⁾ Read/Standby Current	V _{PP} = V _{CC}		10	μΑ
	V (1) Standby Current	I_{SB1} (CMOS), $\overline{CE} = V_{CC \pm} 0.3V$		20	μΑ
I _{SB}	V _{CC} ⁽¹⁾ Standby Current	I_{SB2} (TTL), \overline{CE} = 2.0 to V_{CC} + 0.5V		100	μΑ
I _{cc}	V _{CC} Active Current	f = 5 MHz, I_{OUT} = 0 mA, \overline{CE} = V_{IL}		8	mA
V _{IL}	Input Low Voltage		-0.6	0.8	V
V _{IH}	Input High Voltage		2.0	V _{CC} + 0.5	V
V _{OL}	Output Low Voltage	I _{OL} = 2.0 mA		0.4	V
V _{OH}	Output High Voltage	I _{OH} = -2.0 mA	2.4		V
V _{CC} = 4.5V	/ to 5.5V				
I _{LI}	Input Load Current	$V_{IN} = 0V$ to V_{CC}		±1	μΑ
I _{LO}	Output Leakage Current	$V_{OUT} = 0V$ to V_{CC}		±5	μΑ
I _{PP1} ⁽²⁾	V _{PP} ⁽¹⁾ Read/Standby Current	$V_{PP} = V_{CC}$		10	μΑ
	V (1) Oten dby Ourrent	I_{SB1} (CMOS), $\overline{CE} = V_{CC} \pm 0.3V$		100	μA
I _{SB}	V _{CC} ⁽¹⁾ Standby Current	I_{SB2} (TTL), \overline{CE} = 2.0 to V_{CC} + 0.5V		1	mA
I _{cc}	V _{CC} Active Current	$f = 5 \text{ MHz}, I_{OUT} = 0 \text{ mA}, \overline{CE} = V_{IL}$		25	mA
V _{IL}	Input Low Voltage		-0.6	0.8	V
V _{IH}	Input High Voltage		2.0	V _{CC} + 0.5	V
V _{OL}	Output Low Voltage	I _{OL} = 2.1 mA		0.4	V
V _{OH}	Output High Voltage	I _{OH} = -400 μA	2.4		V

Notes: 1. V_{CC} must be applied simultaneously with or before V_{PP} and removed simultaneously with or after V_{PP}

2. V_{PP} may be connected directly to V_{CC}, except during programming. The supply current would then be the sum of I_{CC} and I_{PP}

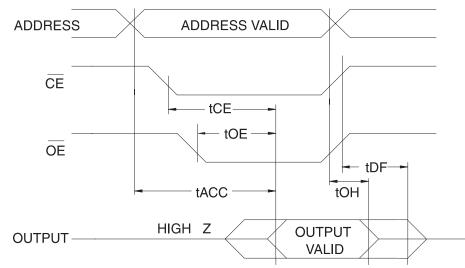
AT27LV010A

AC Characteristics for Read Operation

 V_{CC} = 3.0V to 3.6V and 4.5V to 5.5V

						AT27L	V010A				
			-7	70	-9	90	-1	2	-1	15	
Symbol	Parameter	Condition	Min	Max	Min	Max	Min	Max	Min	Мах	Units
t _{ACC} ⁽³⁾	Address to Output Delay	$\overline{CE} = \overline{OE} = V_{IL}$		70		90		120		150	ns
t _{CE} ⁽²⁾	CE to Output Delay	$\overline{OE} = V_{IL}$		70		90		120		150	ns
t _{OE} ⁽²⁾⁽³⁾	OE to Output Delay	$\overline{CE} = V_{IL}$		40		50		50		60	ns
t _{DF} ⁽⁴⁾⁽⁵⁾	OE or CE High to Output Float, whichever occurred first			35		40		40		50	ns
t _{OH}	Output Hold from Address, CE or OE, whichever occurred first		0		0		0		0		ns

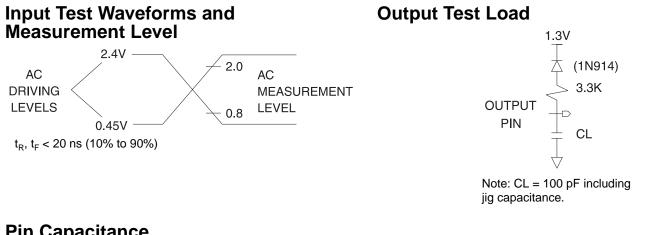
AC Waveforms for Read Operation⁽¹⁾



- Notes: 1. Timing measurement references are 0.8V and 2.0V. Input AC drive levels are 0.45V and 2.4V, unless otherwise specified.
 - 2. \overline{OE} may be delayed up to t_{CE} t_{OE} after the falling edge of \overline{CE} without impact on t_{CE}.
 - 3. $\overline{\text{OE}}$ may be delayed up to t_{ACC} t_{OE} after the address is valid without impact on t_{ACC} .
 - 4. This parameter is only sampled and is not 100% tested.
 - 5. Output float is defined as the point when data is no longer driven.







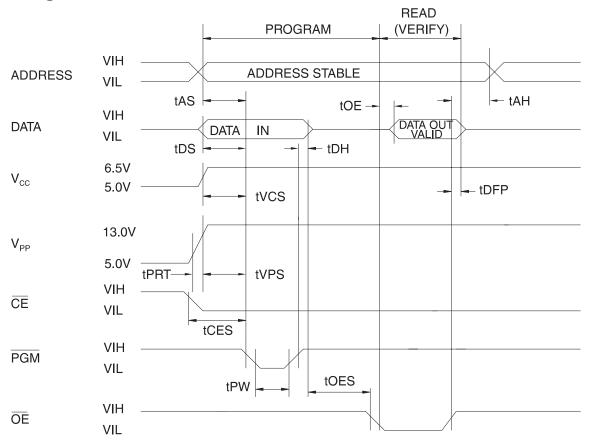
Pin Capacitance

 $f = 1 \text{ MHz}, T = 25^{\circ}C^{(1)}$

Symbol	Тур	Мах	Units	Conditions
C _{IN}	4	8	pF	$V_{IN} = 0V$
C _{OUT}	8	12	pF	$V_{OUT} = 0V$

Note: 1. Typical values for nominal supply voltage. This parameter is only sampled and is not 100% tested.

Programming Waveforms⁽¹⁾



- Notes: 1. The Input Timing Reference is 0.8V for $\rm V_{IL}$ and 2.0V for $\rm V_{IH}.$
 - 2. t_{OE} and t_{DFP} are characteristics of the device but must be accommodated by the programmer.
 - 3. When programming the AT27LV010A a 0.1 μ F capacitor is required across V_{PP} and ground to suppress spurious voltage transients.

DC Programming Characteristics

 $T_{A} = 25 \pm 5^{\circ}C, \ V_{CC} = 6.5 \pm 0.25V, \ V_{PP} = 13.0 \pm 0.25V$

			Lin		
Symbol	Parameter	Test Conditions	Min	Max	Units
I _{LI}	Input Load Current	$V_{IN} = V_{IL}, V_{IH}$		±10	μA
V _{IL}	Input Low Level		-0.6	0.8	V
V _{IH}	Input High Level		2.0	V _{cc} + 0.5	V
V _{OL}	Output Low Voltage	I _{OL} = 2.1 mA		0.4	V
V _{OH}	Output High Voltage	I _{OH} = -400 μA	2.4		V
I _{CC2}	V _{CC} Supply Current (Program and Verify)			40	mA
I _{PP2}	V _{PP} Supply Current	$\overline{CE} = \overline{PGM} = V_{IL}$		20	mA
V _{ID}	A9 Product Identification Voltage		11.5	12.5	V





AC Programming Characteristics

 $T_{A} = 25 \pm 5^{\circ}C, \ V_{CC} = 6.5 \pm 0.25V, \ V_{PP} = 13.0 \pm 0.2V$

			Lii		
Symbol	Parameter	Test Conditions ⁽¹⁾	Min	Min Max	
t _{AS}	Address Setup Time		2		μs
t _{CES}	CE Setup Time		2		μs
t _{OES}	OE Setup Time	Input Rise and Fall Times:	2		μs
t _{DS}	Data Setup Time	(10% to 90%) 20 ns	2		μs
t _{AH}	Address Hold Time	Input Pulse Levels:	0		μs
t _{DH}	Data Hold Time	0.45V to 2.4V	2		μs
t _{DFP}	OE High to Output Float Delay ⁽²⁾		0	130	ns
t _{VPS}	V _{PP} Setup Time	Input Timing Reference Level: 0.8V to 2.0V	2		μs
t _{VCS}	V _{CC} Setup Time		2		μs
t _{PW}	PGM Program Pulse Width ⁽³⁾	Output Timing Reference Level:	95	105	μs
t _{OE}	Data Valid from \overline{OE}	0.8V to 2.0V		150	ns
t _{PRT}	V _{PP} Pulse Rise Time During Programming		50		ns

Notes: 1. V_{CC} must be applied simultaneously or before V_{PP} and removed simultaneously or after V_{PP}

2. This parameter is only sampled and is not 100% tested. Output Float is defined as the point where data is no longer driven—see timing diagram.

3. Program Pulse width tolerance is 100 μ sec \pm 5%.

Atmel's 27LV010A Integrated Product Identification Code⁽¹⁾

		Pins							Hex	
Codes	A0	07	O 6	O5	04	O3	02	01	00	Data
Manufacturer	0	0	0	0	1	1	1	1	0	1E
Device Type	1	0	0	0	0	0	1	0	1	05

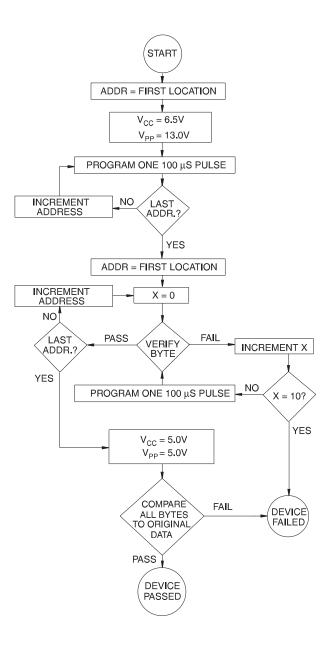
Note: 1. The AT27LV010A has the same Product Identification Code as the AT27C010. Both are programming compatible.

AT27LV010A

Rapid Programming Algorithm

A 100 μ s PGM pulse width is used to program. The address is set to the first location. V_{CC} is raised to 6.5V and V_{PP} is raised to 13.0V. Each address is first programmed with one 100 μ s PGM pulse without verification. Then a verification / reprogramming loop is executed for each address. In the event a byte fails to pass verification, up to 10 successive 100 μ s pulses are applied with a verification

after each pulse. If the byte fails to verify after 10 pulses have been applied, the part is considered failed. After the byte verifies properly, the next address is selected until all have been checked. V_{PP} is then lowered to 5.0V and V_{CC} to 5.0V. All bytes are read again and compared with the original data to determine if the device passes or fails.







Ordering Information

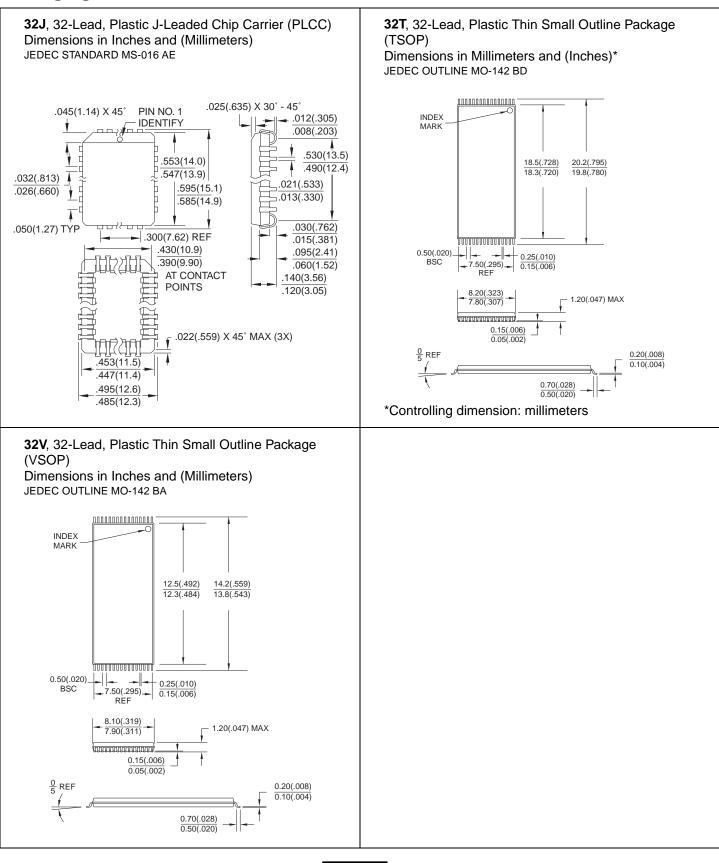
t _{ACC}	$\begin{array}{c c} & I_{CC} (mA) \\ t_{ACC} & V_{CC} = 3.6V \\ \hline (ns) & Active & Standby \end{array}$				
			Ordering Code	Package	Operation Range
70	8	0.02	AT27LV010A-70JC	32J	Commercial
			AT27LV010A-70TC	32T	(0°C to 70°C)
			AT27LV010A-70VC	32V	
	8	0.02	AT27LV010A-70JI	32J	Industrial
			AT27LV010A-70TI	32T	(-40°C to 85°C)
			AT27LV010A-70VI	32V	
90	8	0.02	AT27LV010A-90JC	32J	Commercial
			AT27LV010A-90TC	32T	(0°C to 70°C)
			AT27LV010A-90VC	32V	
	8	0.02	AT27LV010A-90JI	32J	Industrial
			AT27LV010A-90TI	32T	(-40°C to 85°C)
			AT27LV010A-90VI	32V	
120	8	0.02	AT27LV010A-12JC	32J	Commercial
			AT27LV010A-12TC	32T	(0°C to 70°C)
			AT27LV010A-12VC	32V	
	8	0.02	AT27LV010A-12JI	32J	Industrial
			AT27LV010A-12TI	32T	(-40°C to 85°C)
			AT27LV010A-12VI	32V	
150	8	0.02	AT27LV010A-15JC	32J	Commercial
			AT27LV010A-15TC	32T	(0°C to 70°C)
			AT27LV010A-15VC	32V	
	8	0.02	AT27LV010A-15JI	32J	Industrial
			AT27LV010A-15TI	32T	(-40°C to 85°C)
			AT27LV010A-15VI	32V	

	Package Type						
32J	32-Lead, Plastic J-Leaded Chip Carrier (PLCC)						
32T	32-Lead, Plastic Thin Small Outline Package (TSOP) (8 x 20 mm)						
32V	32-Lead, Plastic Thin Small Outline Package (VSOP) (8 x 14 mm)						

AT27LV010A

AT27LV010A

Packaging Information







Atmel Headquarters

Corporate Headquarters 2325 Orchard Parkway San Jose, CA 95131

TEL (408) 441-0311 FAX (408) 487-2600

Europe

Atmel U.K., Ltd. Coliseum Business Centre Riverside Way Camberley, Surrey GU15 3YL England TEL (44) 1276-686677 FAX (44) 1276-686697

Asia

Atmel Asia, Ltd. Room 1219 Chinachem Golden Plaza 77 Mody Road Tsimshatsui East Kowloon, Hong Kong TEL (852) 27219778 FAX (852) 27221369

Japan

Atmel Japan K.K. Tonetsu Shinkawa Bldg., 9F 1-24-8 Shinkawa Chuo-ku, Tokyo 104-0033 Japan TEL (81) 3-3523-3551 FAX (81) 3-3523-7581

Atmel Operations

Atmel Colorado Springs

1150 E. Cheyenne Mtn. Blvd. Colorado Springs, CO 80906 TEL (719) 576-3300 FAX (719) 540-1759

Atmel Rousset

Zone Industrielle 13106 Rousset Cedex, France TEL (33) 4 42 53 60 00 FAX (33) 4 42 53 60 01

Fax-on-Demand

North America: 1-(800) 292-8635 International: 1-(408) 441-0732

e-mail literature@atmel.com

Web Site http://www.atmel.com

BBS 1-(408) 436-4309

© Atmel Corporation 1998.

Atmel Corporation makes no warranty for the use of its products, other than those expressly contained in the Company's standard warranty which is detailed in Atmel's Terms and Conditions located on the Company's website. The Company assumes no responsibility for any errors which may appear in this document, reserves the right to change devices or specifications detailed herein at any time without notice, and does not make any commitment to update the information contained herein. No licenses to patents or other intellectual property of Atmel are granted by the Company in connection with the sale of Atmel products, expressly or by implication. Atmel's products are not authorized for use as critical components in life support devices or systems.

Marks bearing [®] and/or [™] are registered trademarks and trademarks of Atmel Corporation.

Terms and product names in this document may be trademarks of others.

