



ATMEL[®] CORPORATION

AVR[®] Microcontrollers: Product Line Reference

December 2008 Customer Edition

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1 AVR Product Family

1.1 Product Selection Guide - tinyAVR®

Product	Status	Flash (KBytes)	EEPROM (Bytes)	SRAM (Bytes)	picoPower	I/O	Timers 16bit	Timers 8bit	PWM (Channels)	RTC	SPI	USART	TWI (I2C)	ISP	ADC 10bit (Channels)	Ana.Comp.	BOD	WDT	Int. RC	Interrupts (Interrupts)	Interrupts Ext. (Interrupts)	SPM	Vcc (V) Range	Clock Speed (MHz)	Package	Pb-free, Green	Temp. Range
ATtiny12	P	1	64 c)			6		1						Y	Y	Y	Y	Y	Y	6	2		1.8-5.5V	1,2	PDIP8, SOIC8	Y	-40°C to +85°C
	P	1	64 c)			6		1						Y	Y	Y	Y	Y	Y	6	2		2.7-5.5V	4	PDIP8, SOIC8	Y	-40°C to +85°C
	P	1	64 c)			6		1						Y	Y	Y	Y	Y	Y	6	2		4.0-5.5V	8	PDIP8, SOIC8	Y	-40°C to +85°C
ATtiny13	P	1	64	64		6		1	2					Y	4	Y	Y	Y	Y	10	2	Y	1.8-5.5V	10	MLF20, MLF10, PDIP8, SOIC8	Y	-40°C to +85°C
	P	1	64	64		6		1	2					Y	4	Y	Y	Y	Y	10	2	Y	2.7-5.5V	20	MLF20, MLF10, PDIP8, SOIC8	Y	-40°C to +85°C
ATtiny13A	I	1	64	64	Y	6		1	2					Y	4	Y	Y	Y	Y	10	2	Y	1.8-5.5V	20	MLF20, MLF10, PDIP8, SOIC8	Y	-40°C to +85°C
ATtiny2313	P	2	128	128		18	1	1	4	USI	1	USI	Y	Y	Y	Y	Y	Y	Y	19	3	Y	1.8-5.5V	10	MLF20, PDIP20, SOIC20	Y	-40°C to +85°C
	P	2	128	128		18	1	1	4	USI	1	USI	Y	Y	Y	Y	Y	Y	Y	19	3	Y	2.7-5.5V	20	MLF20, PDIP20, SOIC20	Y	-40°C to +85°C
ATtiny24	P	2	128	128		12	1	1	4	USI		USI	Y	Y	8	Y	Y	Y	Y	17	3	Y	1.8-5.5V	10	MLF20, PDIP14, SOIC14	Y	-40°C to +85°C
	P	2	128	128		12	1	1	4	USI		USI	Y	Y	8	Y	Y	Y	Y	17	3	Y	2.7-5.5V	20	MLF20, PDIP14, SOIC14	Y	-40°C to +85°C
ATtiny25	P	2	128	128		6	2 e)	4 f)		USI		USI	Y	Y	4	Y	Y	Y	Y	15	2	Y	1.8-5.5V	10	MLF20, PDIP8, SOIC8	Y	-40°C to +85°C
	P	2	128	128		6	2 e)	4 f)		USI		USI	Y	Y	4	Y	Y	Y	Y	15	2	Y	2.7-5.5V	20	MLF20, PDIP8, SOIC8	Y	-40°C to +85°C
ATtiny26	P	2	128	128		16		2	2	USI		USI	Y	Y	11	Y	Y	Y	Y	12	2		2.7-5.5V	8	MLF32, PDIP20, SOIC20	Y	-40°C to +85°C
	P	2	128	128		16		2	2	USI		USI	Y	Y	11	Y	Y	Y	Y	12	2		4.5-5.5V	16	MLF32, PDIP20, SOIC20	Y	-40°C to +85°C
ATtiny261	P	2	128	128		16	1	1 e)	5 g)	1+USI		USI	Y	Y	11	Y	Y	Y	Y				1.8-5.5V	10	MLF32, PDIP20, SOIC20	Y	-40°C to +85°C
	P	2	128	128		16	1	1 e)	5 g)	1+USI		USI	Y	Y	11	Y	Y	Y	Y				2.7-5.5V	20	MLF32, PDIP20, SOIC20	Y	-40°C to +85°C
ATtiny28	P	2		c)		11		1								Y	Y	Y	Y	6	2		1.8-5.5V	1,2	TQFP32, MLF32, PDIP28	Y	-40°C to +85°C
	P	2		c)		11		1								Y	Y	Y	Y	6	2		2.7-5.5V	4	TQFP32, MLF32, PDIP28	Y	-40°C to +85°C
ATtiny44	P	4	256	256		12	1	1	4	USI		USI	Y	Y	8	Y	Y	Y	Y	17	3	Y	1.8-5.5V	10	MLF20, PDIP14, SOIC14	Y	-40°C to +85°C
	P	4	256	256		12	1	1	4	USI		USI	Y	Y	8	Y	Y	Y	Y	17	3	Y	2.7-5.5V	20	MLF20, PDIP14, SOIC14	Y	-40°C to +85°C
ATtiny45	P	4	256	256		6	2 e)	4 f)		USI		USI	Y	Y	4	Y	Y	Y	Y	15	2	Y	1.8-5.5V	10	MLF20, PDIP8, SOIC8	Y	-40°C to +85°C
	P	4	256	256		6	2 e)	4 f)		USI		USI	Y	Y	4	Y	Y	Y	Y	15	2	Y	2.7-5.5V	20	MLF20, PDIP8, SOIC8	Y	-40°C to +85°C
ATtiny461	P	4	256	256		16	1	1 e)	5 g)	USI		USI	Y	Y	11	Y	Y	Y	Y	19	3	Y	1.8-5.5V	10	MLF32, PDIP20, SOIC20	Y	-40°C to +85°C
	P	4	256	256		16	1	1 e)	5 g)	USI		USI	Y	Y	11	Y	Y	Y	Y	19	3	Y	2.7-5.5V	20	MLF32, PDIP20, SOIC20	Y	-40°C to +85°C
ATtiny48	I	4	64	256	Y	28 i)	1	1	2	Y		Y	Y	Y	8	Y	Y	Y	Y	24	6	Y	1.8-5.5V	12	TQFP32, MLF32, MLF28, PDIP28	Y	-40°C to +85°C
ATtiny84	P	8	512	512		12	1	1	4	USI		USI	Y	Y	8	Y	Y	Y	Y	17	3	Y	1.8-5.5V	10	MLF20, PDIP14, SOIC14	Y	-40°C to +85°C
	P	8	512	512		12	1	1	4	USI		USI	Y	Y	8	Y	Y	Y	Y	17	3	Y	2.7-5.5V	20	MLF20, PDIP14, SOIC14	Y	-40°C to +85°C
ATtiny85	P	8	512	512		6	2 e)	4 f)		USI		USI	Y	Y	4	Y	Y	Y	Y	15	2	Y	1.8-5.5V	10	MLF20, PDIP8, SOIC8	Y	-40°C to +85°C
	P	8	512	512		6	2 e)	4 f)		USI		USI	Y	Y	4	Y	Y	Y	Y	15	2	Y	2.7-5.5V	20	MLF20, PDIP8, SOIC8	Y	-40°C to +85°C
ATtiny861	P	8	512	512		16	1	1 e)	5 g)	USI		USI	Y	Y	11	Y	Y	Y	Y	19	3	Y	1.8-5.5V	10	MLF32, PDIP20, SOIC20	Y	-40°C to +85°C
	P	8	512	512		16	1	1 e)	5 g)	USI		USI	Y	Y	11	Y	Y	Y	Y	19	3	Y	2.7-5.5V	20	MLF32, PDIP20, SOIC20	Y	-40°C to +85°C
ATtiny88	I	8	64	512	Y	28 i)	1	1	2	Y		Y	Y	Y	8	Y	Y	Y	Y	24	6	Y	1.8-5.5V	12	TQFP32, MLF32, MLF28, PDIP28	Y	-40°C to +85°C



1.2 Product Selection Guide - megaAVR®

Product	Status	Flash (KBytes)	EEPROM (Bytes)	SRAM (Bytes)	picoPower	I/O	Timers 16bit	Timers 8bit	PWM (Channels)	RTC	SPI	USART	TWI (I2C)	I ² S	ADC 10bit (Channels)	Ana.Comp.	BOD	WDT	Int. RC	HW MULT	Interrupts (Interrupts)	Interrupts Ext. (Interrupts)	SPM	Vcc (V) Range	Clock Speed (MHz)	Package	Pb-free, Green	Temp. Range
ATmega48	P	4	256	512		23	1	2	6	Y	1+USART	1	Y	Y	8 i)	Y	Y	Y	Y	Y	26	5	Y	1.8-5.5V	10	TQFP32, MLF32, MLF28, PDIP28	Y	-40°C to +85°C
	P	4	256	512		23	1	2	6	Y	1+USART	1	Y	Y	8 i)	Y	Y	Y	Y	Y	26	5	Y	2.7-5.5V	20	TQFP32, MLF32, MLF28, PDIP28	Y	-40°C to +85°C
ATmega48P	P	4	256	512	Y	23	1	2	6	Y	1+USART	1	Y	Y	8	Y	Y	Y	Y	Y	26	5	Y	1.8-5.5V	10	TQFP32, MLF32, PDIP28	Y	-40°C to +85°C
	P	4	256	512	Y	23	1	2	6	Y	1+USART	1	Y	Y	8	Y	Y	Y	Y	Y	26	5	Y	2.7-5.5V	20	TQFP32, MLF32, PDIP28	Y	-40°C to +85°C
ATmega8	P	8	512	1K		23	1	2	3	Y	1	1	Y	Y	8	Y	Y	Y	Y	Y	19	2	Y	2.7-5.5V	8	TQFP32, MLF32, PDIP28	Y	-40°C to +85°C
	P	8	512	1K		23	1	2	3	Y	1	1	Y	Y	8	Y	Y	Y	Y	Y	19	2	Y	4.5-5.5V	16	TQFP32, MLF32, PDIP28	Y	-40°C to +85°C
ATmega88	P	8	512	1K		23	1	2	6	Y	1+USART	1	Y	Y	8 i)	Y	Y	Y	Y	Y	26	5	Y	1.8-5.5V	10	TQFP32, MLF32, PDIP28	Y	-40°C to +85°C
	P	8	512	1K		23	1	2	6	Y	1+USART	1	Y	Y	8 i)	Y	Y	Y	Y	Y	26	5	Y	2.7-5.5V	20	TQFP32, MLF32, PDIP28	Y	-40°C to +85°C
ATmega88P	P	8	512	1K	Y	23	1	2	6	Y	1+USART	1	Y	Y	8	Y	Y	Y	Y	Y	26	5	Y	1.8-5.5V	10	TQFP32, MLF32, PDIP28	Y	-40°C to +85°C
	P	8	512	1K	Y	23	1	2	6	Y	1+USART	1	Y	Y	8	Y	Y	Y	Y	Y	26	5	Y	2.7-5.5V	20	TQFP32, MLF32, PDIP28	Y	-40°C to +85°C
ATmega8515	P	8	512	512		35	1	1	3		1	1	Y	Y	Y	Y	Y	Y	Y	Y	17	3	Y	2.7-5.5V	8	TQFP44, PLCC44, MLF44, PDIP40	Y	-40°C to +85°C
	P	8	512	512		35	1	1	3		1	1	Y	Y	Y	Y	Y	Y	Y	Y	17	3	Y	4.5-5.5V	16	TQFP44, PLCC44, MLF44, PDIP40	Y	-40°C to +85°C
ATmega8535	P	8	512	512		32	1	2	4		1	1	Y	Y	8	Y	Y	Y	Y	Y	21	3	Y	2.7-5.5V	8	TQFP44, PLCC44, MLF44, PDIP40	Y	-40°C to +85°C
	P	8	512	512		32	1	2	4		1	1	Y	Y	8	Y	Y	Y	Y	Y	21	3	Y	4.5-5.5V	16	TQFP44, PLCC44, MLF44, PDIP40	Y	-40°C to +85°C
ATmega1284P	I	128	4K	16K	Y	32	2	1	6	Y	1+USART	2	Y	Y	8	Y	Y	Y	Y	Y	35	7	Y	1.8-5.5V	20	TQFP44, MLF44, PDIP40	Y	-40°C to +85°C
ATmega16	P	16	512	1K		32	1	2	4	Y	1	1	Y	Y	8	Y	Y	Y	Y	Y	21	3	Y	2.7-5.5V	8	TQFP44, MLF44, PDIP40	Y	-40°C to +85°C
	P	16	512	1K		32	1	2	4	Y	1	1	Y	Y	8	Y	Y	Y	Y	Y	21	3	Y	4.5-5.5V	16	TQFP44, MLF44, PDIP40	Y	-40°C to +85°C
ATmega162	P	16	512	1K		35	2	2	6	Y	1	2	Y	Y	Y	Y	Y	Y	Y	Y	28	5	Y	1.8-5.5V	8	TQFP44, MLF44, PDIP40	Y	-40°C to +85°C
	P	16	512	1K		35	2	2	6	Y	1	2	Y	Y	Y	Y	Y	Y	Y	Y	28	5	Y	2.7-5.5V	16	TQFP44, MLF44, PDIP40	Y	-40°C to +85°C
ATmega164P	P	16	512	1K	Y	32	1	2	6	Y	1+USART	2	Y	Y	8	Y	Y	Y	Y	Y	31	7	Y	1.8-5.5V	10	TQFP44, MLF44, PDIP40	Y	-40°C to +85°C
	P	16	512	1K	Y	32	1	2	6	Y	1+USART	2	Y	Y	8	Y	Y	Y	Y	Y	31	7	Y	2.7-5.5V	20	TQFP44, MLF44, PDIP40	Y	-40°C to +85°C
ATmega165P	P	16	512	1K	Y	54	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	Y	22	3	Y	1.8-5.5V	8	TQFP64, MLF64	Y	-40°C to +85°C
	P	16	512	1K	Y	54	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	Y	22	3	Y	2.7-5.5V	16	TQFP64, MLF64	Y	-40°C to +85°C
ATmega168	P	16	512	1K		23	1	2	6	Y	1+USART	1	Y	Y	8 i)	Y	Y	Y	Y	Y	26	5	Y	1.8-5.5V	10	TQFP32, MLF32, PDIP28	Y	-40°C to +85°C
	P	16	512	1K		23	1	2	6	Y	1+USART	1	Y	Y	8 i)	Y	Y	Y	Y	Y	26	5	Y	2.7-5.5V	20	TQFP32, MLF32, PDIP28	Y	-40°C to +85°C
ATmega168P	P	16	512	1K	Y	23	1	2	6	Y	1+USART	1	Y	Y	8	Y	Y	Y	Y	Y	26	5	Y	1.8-5.5V	10	TQFP32, MLF32, PDIP28	Y	-40°C to +85°C
	P	16	512	1K	Y	23	1	2	6	Y	1+USART	1	Y	Y	8	Y	Y	Y	Y	Y	26	5	Y	2.7-5.5V	20	TQFP32, MLF32, PDIP28	Y	-40°C to +85°C
ATmega16A	I	16	512	1K		32	1	2	4	Y	1	1	Y	Y	8	Y	Y	Y	Y	Y	21	3	Y	2.7-5.5V	16	TQFP44, MLF44, PDIP40	Y	-40°C to +85°C
ATmega32	P	32	1K	2K		32	1	2	4	Y	1	1	Y	Y	8	Y	Y	Y	Y	Y	21	3	Y	2.7-5.5V	8	TQFP44, MLF44, PDIP40	Y	-40°C to +85°C
	P	32	1K	2K		32	1	2	4	Y	1	1	Y	Y	8	Y	Y	Y	Y	Y	21	3	Y	4.5-5.5V	16	TQFP44, MLF44, PDIP40	Y	-40°C to +85°C
ATmega324P	P	32	1K	2K	Y	32	1	2	6	Y	1+USART	2	Y	Y	8	Y	Y	Y	Y	Y	31	7	Y	1.8-5.5V	10	TQFP44, MLF44, PDIP40	Y	-40°C to +85°C
	P	32	1K	2K	Y	32	1	2	6	Y	1+USART	2	Y	Y	8	Y	Y	Y	Y	Y	31	7	Y	2.7-5.5V	20	TQFP44, MLF44, PDIP40	Y	-40°C to +85°C



AVR Microcontrollers

ATmega325	P	32	1K	2K		54	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	22	3	Y	1.8-5.5V	8	TQFP64, MLF64	Y	-40°C to +85°C
	P	32	1K	2K		54	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	22	3	Y	2.7-5.5V	16	TQFP64, MLF64	Y	-40°C to +85°C
ATmega325P	I	32	1K	2K	Y	54	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	22	3	Y	1.8-5.5V	10	TQFP64, MLF64	Y	-40°C to +85°C
	I	32	1K	2K	Y	54	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	22	3	Y	2.7-5.5V	20	TQFP64, MLF64	Y	-40°C to +85°C
ATmega32A	I	32	1K	2K		32	1	2	4	Y		1	Y	Y	8	Y	Y	Y	Y	21	3	Y	2.7-5.5V	16	TQFP44, MLF44, PDIP40	Y	-40°C to +85°C
ATmega3250	I	32	1K	2K		69	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	24	5	Y	1.8-5.5V	8	TQFP100	Y	-40°C to +85°C
	I	32	1K	2K		69	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	24	5	Y	2.7-5.5V	16	TQFP100	Y	-40°C to +85°C
ATmega3250P	I	32	1K	2K	Y	69	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	24	5	Y	1.8-5.5V	10	TQFP100	Y	-40°C to +85°C
	I	32	1K	2K	Y	69	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	24	5	Y	2.7-5.5V	20	TQFP100	Y	-40°C to +85°C
ATmega328P	I	32	1K	2K	Y	23	1	2	6	Y	1+USART	1	Y	Y	8	Y	Y	Y	Y	26	5	Y	1.8-5.5V	10	TQFP32, MLF32, PDIP28	Y	-40°C to +85°C
	I	32	1K	2K	Y	23	1	2	6	Y	1+USART	1	Y	Y	8	Y	Y	Y	Y	26	5	Y	2.7-5.5V	20	TQFP32, MLF32, PDIP28	Y	-40°C to +85°C
ATmega64	P	64	2K	4K		54	2	2	6+2	Y		1	2	Y	Y	8	Y	Y	Y	35	8	Y	2.7-5.5V	8	TQFP64, MLF64	Y	-40°C to +85°C
	P	64	2K	4K		54	2	2	6+2	Y		1	2	Y	Y	8	Y	Y	Y	35	8	Y	4.5-5.5V	16	TQFP64, MLF64	Y	-40°C to +85°C
ATmega640	P	64	4K	8K		86	4	2	12+4	Y	1+USART	4	Y	Y	16	Y	Y	Y	Y	57	11	Y	1.8-5.5V	8	TQFP100, CBGA100	Y	-40°C to +85°C
	P	64	4K	8K		86	4	2	12+4	Y	1+USART	4	Y	Y	16	Y	Y	Y	Y	57	11	Y	2.7-5.5V	16	TQFP100, CBGA100	Y	-40°C to +85°C
ATmega644	P	64	2K	4K		32	1	2	6	Y	1+USART	1	Y	Y	8	Y	Y	Y	Y	28	7	Y	1.8-5.5V	10	TQFP44, MLF44, PDIP40	Y	-40°C to +85°C
	P	64	2K	4K		32	1	2	6	Y	1+USART	1	Y	Y	8	Y	Y	Y	Y	28	7	Y	2.7-5.5V	20	TQFP44, MLF44, PDIP40	Y	-40°C to +85°C
ATmega644P	P	64	2K	4K	Y	32	1	2	6	Y	1+USART	2	Y	Y	8	Y	Y	Y	Y	31	7	Y	1.8-5.5V	10	TQFP44, MLF44, PDIP40	Y	-40°C to +85°C
	P	64	2K	4K	Y	32	1	2	6	Y	1+USART	2	Y	Y	8	Y	Y	Y	Y	31	7	Y	2.7-5.5V	20	TQFP44, MLF44, PDIP40	Y	-40°C to +85°C
ATmega645	P	64	2K	4K		54	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	22	3	Y	1.8-5.5V	8	TQFP64, MLF64	Y	-40°C to +85°C
	P	64	2K	4K		54	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	22	3	Y	2.7-5.5V	16	TQFP64, MLF64	Y	-40°C to +85°C
ATmega6450	I	64	2K	4K		69	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	24	5	Y	1.8-5.5V	8	TQFP100	Y	-40°C to +85°C
	I	64	2K	4K		69	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	24	5	Y	2.7-5.5V	16	TQFP100	Y	-40°C to +85°C
ATmega128	P	128	4K	4K		53	2	2	6+2	Y		1	2	Y	Y	8	Y	Y	Y	35	8	Y	2.7-5.5V	8	TQFP64, MLF64	Y	-40°C to +85°C
	P	128	4K	4K		53	2	2	6+2	Y		1	2	Y	Y	8	Y	Y	Y	35	8	Y	4.5-5.5V	16	TQFP64, MLF64	Y	-40°C to +85°C
ATmega1280	P	128	4K	8K		86	4	2	12+4	Y	1+USART	4	Y	Y	16	Y	Y	Y	Y	57	11	Y	1.8-5.5V	8	TQFP100, CBGA100	Y	-40°C to +85°C
	P	128	4K	8K		86	4	2	12+4	Y	1+USART	4	Y	Y	16	Y	Y	Y	Y	57	11	Y	2.7-5.5V	16	TQFP100, CBGA100	Y	-40°C to +85°C
ATmega1281	P	128	4K	8K		54	4	2	6+4	Y	1+USART	2	Y	Y	8	Y	Y	Y	Y	48	10	Y	1.8-5.5V	8	TQFP64, MLF64	Y	-40°C to +85°C
	P	128	4K	8K		54	4	2	6+4	Y	1+USART	2	Y	Y	8	Y	Y	Y	Y	48	10	Y	2.7-5.5V	16	TQFP64, MLF64	Y	-40°C to +85°C
ATmega2560	P	256	4K	8K		86	4	2	12+4	Y	1+USART	4	Y	Y	16	Y	Y	Y	Y	57	11	Y	1.8-5.5V	8	TQFP100, CBGA100	Y	-40°C to +85°C
	P	256	4K	8K		86	4	2	12+4	Y	1+USART	4	Y	Y	16	Y	Y	Y	Y	57	11	Y	4.5-5.5V	16	TQFP100, CBGA100	Y	-40°C to +85°C
ATmega2561	P	256	4K	8K		54	4	2	6+4	Y	1+USART	2	Y	Y	8	Y	Y	Y	Y	48	10	Y	1.8-5.5V	8	TQFP64, MLF64	Y	-40°C to +85°C
	P	256	4K	8K		54	4	2	6+4	Y	1+USART	2	Y	Y	8	Y	Y	Y	Y	48	10	Y	4.5-5.5V	16	TQFP64, MLF64	Y	-40°C to +85°C



1.3 Product Selection Guide – AVR XMEGA™

Product	Status	Flash (KBytes)	Boot code (KBytes)	EEPROM (Bytes)	picoPower	SRAM (Bytes)	DMA (Channels)	Event (Channels)	I/O	Timers 16bit	PWM (Channels)	RTC 16-bit	RTC 32-bit	SPI	TWI (I2C)	USART	ADC 12bit (Channels)	DAC 12bit (Channels)	Ana.Comp.	BOD	WDT	Calibrated Int. RC	Interrupts (Interrupts)	Interrupts Ext. (Interrupts)	JTAG	PDI	Vcc (V) Range	Clock Speed (MHz)	Package	Pb-free, Green	Temp. Range
ATxmega384A1	I	384	8	4K	Y	32K	4	8	78	8	24	Y		4	4	8	2x8	2x2	4	Y	Y	32MHz, 2MHz, 32kHz	122	78	Y	Y	1.6-3.6V	32	TQFP100, CBGA100	Y	-40°C to +85°C
ATxmega256A1	I	256	8	4K	Y	16K	4	8	78	8	24	Y		4	4	8	2x8	2x2	4	Y	Y	32MHz, 2MHz, 32kHz	122	78	Y	Y	1.6-3.6V	32	TQFP100, CBGA100	Y	-40°C to +85°C
ATxmega192A1	I	192	8	4K	Y	16K	4	8	78	8	24	Y		4	4	8	2x8	2x2	4	Y	Y	32MHz, 2MHz, 32kHz	122	78	Y	Y	1.6-3.6V	32	TQFP100, CBGA100	Y	-40°C to +85°C
ATxmega128A1	I	128	8	2K	Y	8K	4	8	78	8	24	Y		4	4	8	2x8	2x2	4	Y	Y	32MHz, 2MHz, 32kHz	122	78	Y	Y	1.6-3.6V	32	TQFP100, CBGA100	Y	-40°C to +85°C
ATxmega64A1	I	64	4	2K	Y	4K	4	8	78	8	24	Y		4	4	8	2x8	2x2	4	Y	Y	32MHz, 2MHz, 32kHz	122	78	Y	Y	1.6-3.6V	32	TQFP100, CBGA100	Y	-40°C to +85°C
ATxmega256A3	I	256	8	4K	Y	16K	4	8	50	7	22	Y		3	2	7	2x8	1x2	4	Y	Y	32MHz, 2MHz, 32kHz	102	50	Y	Y	1.6-3.6V	32	TQFP64, MLF64	Y	-40°C to +85°C
ATxmega192A3	I	192	8	4K	Y	16K	4	8	50	7	22	Y		3	2	7	2x8	1x2	4	Y	Y	32MHz, 2MHz, 32kHz	102	50	Y	Y	1.6-3.6V	32	TQFP64, MLF64	Y	-40°C to +85°C
ATxmega128A3	I	128	8	2K	Y	8K	4	8	50	7	22	Y		3	2	7	2x8	1x2	4	Y	Y	32MHz, 2MHz, 32kHz	102	50	Y	Y	1.6-3.6V	32	TQFP64, MLF64	Y	-40°C to +85°C
ATxmega64A3	I	64	4	2K	Y	4K	4	8	50	7	22	Y		3	2	7	2x8	1x2	4	Y	Y	32MHz, 2MHz, 32kHz	102	50	Y	Y	1.6-3.6V	32	TQFP64, MLF64	Y	-40°C to +85°C



1.4 Product Selection Guide - AVR for LCD

Product	Status	Flash (KBytes)	EEPROM (Bytes)	SRAM (Bytes)	picoPower	I/O	LCD	Timers 16bit	Timers 8bit	PWM (Channels)	RTC	SPI	USART	TWI (I2C)	ISP	ADC 10bit (Channels)	BOD	WDT	Int. RC	HW MULT	Interrupts (Interrupts)	Interrupts Ext. (Interrupts)	SPM	Vcc (V) Range	Clock Speed (MHz)	Package	Pb-free, Green	Temp. Range
ATmega169P	P	16	512	1K	Y	54	4x25 seg	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	23	3	Y	1.8-5.5V	8	TQFP64, MLF64	Y	-40°C to +85°C
	P	16	512	1K	Y	54	4x25 seg	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	23	3	Y	2.7-5.5V	16	TQFP64, MLF64	Y	-40°C to +85°C
ATmega329	P	32	1K	2K		54	4x25 seg	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	23	3	Y	1.8-5.5V	8	TQFP64, MLF64	Y	-40°C to +85°C
	P	32	1K	2K		54	4x25 seg	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	23	3	Y	2.7-5.5V	16	TQFP64, MLF64	Y	-40°C to +85°C
ATmega329P	P	32	1K	2K	Y	54	4x25 seg	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	23	3	Y	1.8-5.5V	10	TQFP64, MLF64	Y	-40°C to +85°C
	P	32	1K	2K	Y	54	4x25 seg	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	23	3	Y	2.7-5.5V	20	TQFP64, MLF64	Y	-40°C to +85°C
ATmega3290	P	32	1K	2K		69	4x40 seg	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	25	5	Y	1.8-5.5V	8	TQFP100	Y	-40°C to +85°C
	P	32	1K	2K		69	4x40 seg	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	25	5	Y	2.7-5.5V	16	TQFP100	Y	-40°C to +85°C
ATmega3290P	I	32	1K	2K	Y	69	4x40 seg	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	25	5	Y	1.8-5.5V	10	TQFP100	Y	-40°C to +85°C
	I	32	1K	2K	Y	69	4x40 seg	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	25	5	Y	2.7-5.5V	20	TQFP100	Y	-40°C to +85°C
ATmega649	P	64	2K	4K		54	4x25 seg	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	23	3	Y	1.8-5.5V	8	TQFP64, MLF64	Y	-40°C to +85°C
	P	64	2K	4K		54	4x25 seg	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	23	3	Y	2.7-5.5V	16	TQFP64, MLF64	Y	-40°C to +85°C
ATmega6490	I	64	2K	4K		69	4x40 seg	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	25	5	Y	1.8-5.5V	8	TQFP100	Y	-40°C to +85°C
	I	64	2K	4K		69	4x40 seg	1	2	4	Y	1+USI	1	USI	Y	8	Y	Y	Y	Y	25	5	Y	2.7-5.5V	16	TQFP100	Y	-40°C to +85°C



1.5 Product Selection Guide - AVR Battery Management

Product	Status	Li-ion cells	Flash (KBytes)	EEPROM (Bytes)	SRAM (Bytes)	I/O	FET type	Bat.Prot.	ADC 12bit (Channels)	ADC 10bit (Channels)	CC-ADC	JTAG	DebugWIRE	Vcc (V) Range	Clock Speed (MHz)	Package	Pb-free, Green	Temp. Range
ATmega406	P	2 to 4	40	512	2K	18	P-ch	Y	10		18-bit	Y		4.0-25V	1	LQFP48	Y	-30°C to +85°C
ATmega8HVA	I	1 to 2	8	256	512	6	N-ch	Y	5		18-bit	Y	Y	1.8-9.0V	4	LGA36, TSOP28	Y	-20°C to +85°C
ATmega16HVA	I	1 to 2	16	256	512	6	N-ch	Y	5		18-bit	Y	Y	1.8-9.0V	4	LGA36, TSOP28	Y	-20°C to +85°C
ATmega16HVB	I	2 to 4	16	512	1K	18	N-ch	Y	10		18-bit	Y		4.0-25.0V	8	TSSOP44	Y	-30°C to +85°C
ATmega32HVB	I	2 to 4	32	1K	2K	18	N-ch	Y	10		18-bit	Y		4.0-25.0V	8	TSSOP44	Y	-30°C to +85°C
ATmega4HVD	I	1	4	256	512	4	N-ch	Y		3			Y	2.0-2.4V	4	DRDFN18	Y	-20°C to +85°C
ATmega8HVD	I	1	8	256	512	4	N-ch	Y		3			Y	2.0-2.4V	4	DRDFN18	Y	-20°C to +85°C

1.6 Product Selection Guide - AVR for USB

Product	Status	Flash (KBytes)	EEPROM (Bytes)	SRAM (Bytes)	I/O	USB Host/OTG	USB DRAM (Bytes)	USB Endpoints	USB Full speed	USB Low speed	Timers 16bit	Timers 8bit	PWM (Channels)	RTC	SPI	USART	TWI (I2C)	ISP	ADC 10bit (Channels)	BOD	WDT	Int. RC	HW MULT	Interrupts (Interrupts)	Interrupts Ext. (Interrupts)	SPM	Vcc (V) Range	Clock Speed (MHz)	Package	Pb-free, Green	Temp. Range
AT90USB82	P	8	512	512	22		176	4+1	Y		1	1	5		1	1		Y	Y	Y	Y	Y	29	10	Y	2.7-5.5V	16	MLF32	Y	-40°C to +85°C	
AT90USB162	P	16	512	512	22		176	4+1	Y		1	1	5		1	1		Y	Y	Y	Y	Y	29	10	Y	2.7-5.5V	16	TQFP32, MLF32	Y	-40°C to +85°C	
ATmega16U4	I	16	1K	1.25K	26		835	6+1	Y	Y	2	1	5+3+1		1	1	Y	Y	12	Y	Y	Y		43	6	Y	2.7-5.5V	16	MLF44	Y	-40°C to +85°C
ATmega32U4	I	32	1K	2.5K	26		835	6+1	Y	Y	2	1	5+3+1		1	1	Y	Y	12	Y	Y	Y		43	6	Y	2.7-5.5V	16	TQFP44, MLF44	Y	-40°C to +85°C
ATmega32U6	I	32	1K	2.5K	26		835	6+1	Y	Y	2	2	6+2		1	1	Y	Y	8	Y	Y	Y		43	6	Y	2.7-5.5V	16	TQFP44, MLF44	Y	-40°C to +85°C
AT90USB646	P	64	2K	4K	48		832	6+1	Y	Y	2	2	6+2	Y	1	1	Y	Y	8	Y	Y	Y	Y	38	9	Y	2.7-5.5V	16	MLF64	Y	-40°C to +85°C
AT90USB647	P	64	2K	4K	48	1	832	6+1	Y	Y	2	2	6+2	Y	1	1	Y	Y	8	Y	Y	Y	Y	38	9	Y	2.7-5.5V	16	TQFP64, MLF64	Y	-40°C to +85°C
AT90USB1286	P	128	4K	8K	48		832	6+1	Y	Y	2	2	6+2	Y	1	1	Y	Y	8	Y	Y	Y	Y	38	9	Y	2.7-5.5V	16	MLF64	Y	-40°C to +85°C
AT90USB1287	P	128	4K	8K	48	1	832	6+1	Y	Y	2	2	6+2	Y	1	1	Y	Y	8	Y	Y	Y	Y	38	9	Y	2.7-5.5V	16	TQFP64, MLF64	Y	-40°C to +85°C



1.7 Product Selection Guide - AVR for CAN

Product	Status	Flash (KBytes)	EEPROM (Bytes)	SRAM (Bytes)	I/O	CAN (CAN mess.obj.)	Timers 16bit	Timers 8bit	PWM (Channels)	RTC	SPI	USART	TWI (I2C)	ISP	ADC 10bit (Channels)	BOD	WDT	Int. RC	HW MULT	Interrupts (Interrupts)	Interrupts Ext. (Interrupts)	SPM	Vcc (V) Range	Clock Speed (MHz)	Package	Pb-free, Green	Temp. Range
AT90CAN32	P	32	1K	2K	53	15	2	2	6+2	Y	1	2	Y	Y	8	Y	Y	Y	Y	37	8	Y	2.7-5.5V	16	TQFP64, MLF64	Y	-40°C to +85°C
AT90CAN64	P	64	2K	4K	53	15	2	2	6+2	Y	1	2	Y	Y	8	Y	Y	Y	Y	37	8	Y	2.7-5.5V	16	TQFP64, MLF64	Y	-40°C to +85°C
AT90CAN128	P	128	4K	4K	53	15	2	2	6+2	Y	1	2	Y	Y	8	Y	Y	Y	Y	37	8	Y	2.7-5.5V	16	TQFP64, MLF64	Y	-40°C to +85°C

1.8 Product Selection Guide - AVR for Lighting and Motor Control

Product	Status	Flash (KBytes)	EEPROM (Bytes)	SRAM (Bytes)	I/O	DALI	Timers 16bit	Timers 8bit	PWM (Channels)	RTC	SPI	USART	TWI (I2C)	ISP	ADC 10bit (Channels)	BOD	WDT	Int. RC	HW MULT	Interrupts (Interrupts)	Interrupts Ext. (Interrupts)	SPM	Vcc (V) Range	Clock Speed (MHz)	Package	Pb-free, Green	Temp. Range
AT90PWM1	P	8	512	512	19		1	1	7		1			Y	8	Y	Y	Y	Y	26	4	Y	2.7-5.5V	16	SOIC24	Y	-40°C to +105°C
AT90PWM2	P	8	512	512	19	Y	1	1	7		1	1		Y	8	Y	Y	Y	Y	29	4	Y	2.7-5.5V	16	SOIC24	Y	-40°C to +105°C
AT90PWM3	P	8	512	512	27	Y	1	1	10		1	1		Y	11	Y	Y	Y	Y	29	4	Y	2.7-5.5V	16	QFN32, SOIC32	Y	-40°C to +105°C
AT90PWM81	I	8	512	256	16/20		1		4		1			Y	11	Y	Y	Y	Y	20	3	Y	2.7-5.5V	16	QFN32, SOIC20	Y	-40°C to +105°C
AT90PWM216	P	16	512	1024	19	Y	1	1	7		1	1		Y	8	Y	Y	Y	Y	29	4	Y	2.7-5.5V	16	SOIC24	Y	-40°C to +105°C
AT90PWM316	P	16	512	1024	27	Y	1	1	10		1	1		Y	11	Y	Y	Y	Y	29	4	Y	2.7-5.5V	16	QFN32, SOIC32	Y	-40°C to +105°C



1.9 Product Selection Guide – Automotive AVR

Product	Status	Flash (KBytes)	EEPROM (Bytes)	SRAM (Bytes)	µPower	I/O	CAN (CAN mess.obj.)	LIN	USART	UART	USI	SPI	Timers 8bit	Timers 12bit	Timers 16bit	PWM (Channels)	ADC 10bit (Channels)	Analog Gain	DebugWIRE	JTAG	Vcc (V) Range	Clock Speed (MHz)	Package	Pb-free, Green	Temp. Range
ATtiny24	P	2	128	128		12		S			1	USI	1		1	4	8	Y	Y		2.7-5.5V	16	MLF20, SOIC14	Y	-40°C to +125°C
ATtiny25	P	2	128	128		6		S			1	USI	2 e)			4 f)	4	Y	Y		1.8-3.6V	8	SOIC8	Y	-40°C to +85°C
	P	2	128	128		6		S			1	USI	2 e)			4 f)	4	Y	Y		2.7-5.5V	16	MLF20, SOIC8	Y	-40°C to +125°C
ATtiny44	P	4	256	256		12		S			1	USI	1	1	1	4	8	Y	Y		1.8-3.6V	8	MLF20, SOIC14	Y	-40°C to +85°C
	P	4	256	256		12		S			1	USI	1	1	1	4	8	Y	Y		2.7-5.5V	16	MLF20, SOIC14	Y	-40°C to +125°C
ATtiny45	P	4	256	256		6		S			1	USI	2 e)			4 f)	4	Y	Y		1.8-3.6V	8	SOIC8	Y	-40°C to +85°C
	P	4	256	256		6		S			1	USI	2 e)			4 f)	4	Y	Y		2.7-5.5V	16	MLF20, SOIC8	Y	-40°C to +150°C
ATtiny84	P	8	512	512		12		S			1	USI	1	1	1	4	8	Y	Y		2.7-5.5V	16	MLF20	Y	-40°C to +125°C
ATtiny85	P	8	512	512		6		S			1	USI	2 e)			4 f)	4	Y	Y		1.8-3.6V	8	SOIC8	Y	-40°C to +85°C
	P	8	512	512		6		S			1	USI	2 e)			4 f)	4	Y	Y		2.7-5.5V	16	MLF20, SOIC8	Y	-40°C to +125°C
ATmega48	P	4	256	512		23		S	1			1+USART	2		1	6	8 i)		Y		2.7-5.5V	16	TQFP32, MLF32	Y	-40°C to +125°C
ATmega88	P	8	512	1K		23		S	1			1+USART	2		1	6	8 i)		Y		1.8-3.6V	8	TQFP32, MLF32	Y	-40°C to +85°C
	P	8	512	1K		23		S	1			1+USART	2		1	6	8 i)		Y		2.7-5.5V	16	TQFP32, MLF32	Y	-40°C to +150°C
ATmega164P	P	16	512	1K	Y	32		S	2			1+USART	2		1	6	8	Y		Y	2.7-5.5V	16	TQFP44, MLF44	Y	-40°C to +125°C
ATmega168	P	16	512	1K		23		S	1			1+USART	2		1	6	8 i)		Y		2.7-5.5V	16	TQFP32, MLF32	Y	-40°C to +150°C
ATmega324P	P	32	1K	2K	Y	32		S	2			1+USART	2		1	6	8	Y		Y	2.7-5.5V	16	TQFP44, MLF44	Y	-40°C to +125°C
ATmega328P	I	32	1K	2K	Y	23		S	1			1+USART	2		1	6	8	Y		Y	2.7-5.5V	16	TQFP32, MLF32	Y	-40°C to +125°C
ATmega644P	P	64	2K	4K	Y	32		S	2			1+USART	2		1	6	8	Y		Y	2.7-5.5V	16	TQFP44, MLF44	Y	-40°C to +125°C
ATmega16M1	I	16	1K	2K		32	6	H		1			1	1	1	6+4 f)	11	Y	Y		2.7-5.5V	16	TQFP32, QFN32	Y	-40°C to +150°C
ATmega32C1	I	32	1K	2K		32	6	H		1			1	1	1	4	11	Y	Y		2.7-5.5V	16	TQFP32, QFN32	Y	-40°C to +150°C
ATmega32M1	I	32	1K	2K		32	6	H		1			1	1	1	6+4 f)	11	Y	Y		2.7-5.5V	16	TQFP32, QFN32	Y	-40°C to +150°C
ATmega64C1	I	64	2K	4K		32	6	H		1			1	1	1	4	11	Y	Y		2.7-5.5V	16	TQFP32, QFN32	Y	-40°C to +150°C
ATmega64M1	I	64	2K	4K		32	6	H		1			1	1	1	6+4 f)	11	Y	Y		2.7-5.5V	16	TQFP32, QFN32	Y	-40°C to +150°C
ATmega169P	I	16	512	1K	Y	54		S	1		1	1+USI	2		1	4	8		Y		2.7-5.5V	16	TQFP64, MLF64	Y	-40°C to +85°C
AT90CAN32	P	32	1K	2K		53	15	S	2				1	2	2	6+2	8	Y		Y	2.7-5.5V	16	TQFP64, MLF64	Y	-40°C to +125°C
AT90CAN64	P	64	2K	4K		53	15	S	2				1	2	2	6+2	8	Y		Y	2.7-5.5V	16	TQFP64, MLF64	Y	-40°C to +125°C
AT90CAN128	P	128	4K	4K		53	15	S	2				1	2	2	6+2	8	Y		Y	2.7-5.5V	16	TQFP64, MLF64	Y	-40°C to +125°C
ATtiny87	I	8	512	256		16		H		1	1	1+USI	1		1	4		Y	Y		2.7-5.5V	16	QFN32, SOIC20, TSSOP20	Y	-40°C to +150°C
ATtiny167	I	16	512	512		16		H		1	1	1+USI	1		1	4			Y		2.7-5.5V	16	QFN32, SOIC20, TSSOP20	Y	-40°C to +150°C



1.10 Product Selection Guide – MCU Wireless

Product	Status	MCU	RF dev	Flash (KBytes)	EEPROM (Bytes)	SRAM (Bytes)	ISM Band	ISM Sensitivity (dBm)	ISM Output Power (dBm)	Vcc (V) Range	Clock Speed (MHz)	Package	Pb-free, Green	Temp. Range
AT86RF212	I						800/900 MHz n)	-110	-10 to +10	1.8-3.6V		QFN32	Y	-40°C to +85°C
AT86RF230	P						2,4 GHz	-101	-17 to +3	1.8-3.6V		QFN32	Y	-40°C to +85°C
AT86RF231	I						2,4 GHz	-101	-17 to +3	1.8-3.6V		QFN32	Y	-40°C to +85°C
ATmega64RZA	P	ATmega644	AT86RF230	64	2K	4K	2,4 GHz	-101	-17 to +3	1.8-3.6V	10	TQFP44, MLF44, PDIP40	Y	-40°C to +85°C
ATmega64RZAP	P	ATmega644P	AT86RF230	64	2K	4K	2,4 GHz	-101	-17 to +3	1.8-3.6V	10	TQFP44, MLF44	Y	-40°C to +85°C
ATmega1284RZAP	I	ATmega1284P	AT86RF230	128	4K	16K	2,4 GHz	-101	-17 to +3	1.8-3.6V	20	TQFP44, MLF44	Y	-40°C to +85°C
ATmega128RZA	P	ATmega1281	AT86RF230	128	4K	8K	2,4 GHz	-101	-17 to +3	1.8-3.6V	8	TQFP64, MLF64	Y	-40°C to +85°C
ATmega128RZB	P	ATmega1280	AT86RF230	128	4K	8K	2,4 GHz	-101	-17 to +3	1.8-3.6V	8	TQFP100, CBGA100	Y	-40°C to +85°C
ATmega256RZA	P	ATmega2561	AT86RF230	256	4K	8K	2,4 GHz	-101	-17 to +3	1.8-3.6V	8	TQFP64, MLF64	Y	-40°C to +85°C
ATmega256RZB	P	ATmega2560	AT86RF230	256	4K	8K	2,4 GHz	-101	-17 to +3	1.8-3.6V	8	TQFP100, CBGA100	Y	-40°C to +85°C
ATmega644PR231	I	ATmega644P	AT86RF231	64	2K	4K	2,4 GHz	-101	-17 to +3	1.8-3.6V	10	TQFP44, MLF44	Y	-40°C to +85°C
ATmega1280R231	I	ATmega1280	AT86RF231	128	4K	8K	2,4 GHz	-101	-17 to +3	1.8-3.6V	8	TQFP100, CBGA100	Y	-40°C to +85°C
ATmega1281R231	I	ATmega1281	AT86RF231	128	4K	8K	2,4 GHz	-101	-17 to +3	1.8-3.6V	8	TQFP64, MLF64	Y	-40°C to +85°C
ATmega1284PR231	I	ATmega1284P	AT86RF231	128	4K	16K	2,4 GHz	-101	-17 to +3	1.8-3.6V	20	TQFP44, MLF44	Y	-40°C to +85°C
ATmega2560R231	I	ATmega2560	AT86RF231	256	4K	8K	2,4 GHz	-101	-17 to +3	1.8-3.6V	8	TQFP100, CBGA100	Y	-40°C to +85°C
ATmega2561R231	I	ATmega2561	AT86RF231	256	4K	8K	2,4 GHz	-101	-17 to +3	1.8-3.6V	8	TQFP64, MLF64	Y	-40°C to +85°C
ATmega644R212	I	ATmega644	AT86RF212	64	2K	4K	800/900 MHz	-110	10	1.8-3.6V	10	TQFP44, MLF44	Y	-40°C to +85°C
ATmega1280R212	I	ATmega1280	AT86RF212	128	4K	8K	800/900 MHz	-110	10	1.8-3.6V	8	TQFP100, CBGA100	Y	-40°C to +85°C
ATmega1281R212	I	ATmega1281	AT86RF212	128	4K	8K	800/900 MHz	-110	10	1.8-3.6V	8	TQFP64, MLF64	Y	-40°C to +85°C
ATmega1284PR212	I	ATmega1284P	AT86RF212	128	4K	16K	800/900 MHz	-110	10	1.8-3.6V	20	TQFP44, MLF44	Y	-40°C to +85°C
ATmega2560R212	I	ATmega2560	AT86RF212	256	4K	8K	800/900 MHz	-110	10	1.8-3.6V	8	TQFP100, CBGA100	Y	-40°C to +85°C
ATmega2561R212	I	ATmega2561	AT86RF212	256	4K	8K	800/900 MHz	-110	10	1.8-3.6V	8	TQFP64, MLF64	Y	-40°C to +85°C



1.11 Product Selection Guide – AVR32 AP family

Product	Status	SRAM (Bytes)	SDRAM	NAND Flash	DSP Instr.	Vector mult.	Ethernet MAC	USB High speed	USB Hos/OTG	LCD	USART	PWM (Channels)	I/O	PDC (Channels)	Timers 16bit	RTC	SPI	Audio DAC (16bit)	Audio	ISI	PS/2 interf.	SSC (I2S Audio)	TWI (I2C)	Crystal Osc.	PLL	MMU	JTAG	Nexus	TSADC 10bit (Channels)	Vcc (V) Range	Package	Pb-free, Green	Temp. Range
AT32AP7000	P	32K	Y	Y	Y	Y	2	Y		2048x2048 24-bit	4	4	160	15	6	Y	2	Stereo	AC97, 3xI2S	CMOS	Y	3	Y	2	2	Y	Y	Class 3	1.8+3.3V	CTBGA256	Y	-40°C to +85°C	
AT32AP7001	P	32K	Y	Y	Y	Y	Y				4	4	90	15	6	Y	2	Stereo	AC97, 3xI2S	CMOS	Y	3	Y	2	2	Y	Y	Class 3	1.8+3.3V	QFP208	Y	-40°C to +85°C	
AT32AP7002	P	32K	Y	Y	Y	Y	Y			2048x2048 18-bit	4	4	85	15	6	Y	2	Stereo	AC97, 3xI2S	CMOS	Y	3	Y	2	2	Y	Y	Class 3	1.8+3.3V	CTBGA196	Y	-40°C to +85°C	
AT32AP7200	I	64K	Y	Y	Y	Y	1	Y	Y	2048x2048 24-bit	6	4	146	15	6	Y	4	Stereo	AC97, 3xI2S			3	2	2	2	Y	Y	Class 3	6 1.2+3.3V	TFBGA324	Y	-40°C to +85°C	

1.12 Product Selection Guide – AVR32 UC3 family

Product	Status	Flash (KBytes)	SRAM (Bytes)	SD/MMC	Ethernet MAC	USB High speed	USB Full speed	USB Hos/OTG	USART	PWM (Channels)	I/O	NAND Flash	System Bus Layers	PDC (Channels)	Timers 16bit	RTC	SPI	SSC (I2S Audio)	TWI (I2C)	Crystal Osc.	MPU	ADC 10bit (Channels)	AES	Vcc (V) Range	Clock Speed (MHz)	Package	Pb-free, Green	Temp. Range
AT32UC3A0128	P	128	32K		1	Y	Y	4	13	109			6	7	3	Y	2	1	Y	2	Y	8		3.3V	66	LQFP144, CTBGA144	Y	-40°C to +85°C
AT32UC3A0256	P	256	64K		1	Y	Y	4	13	109			6	7	3	Y	2	1	Y	2	Y	8		3.3V	66	LQFP144, CTBGA144	Y	-40°C to +85°C
AT32UC3A0512	P	512	64K		1	Y	Y	4	13	109			6	7	3	Y	2	1	Y	2	Y	8		3.3V	66	LQFP144, CTBGA144	Y	-40°C to +85°C
AT32UC3A1128	P	128	32K		1	Y	Y	4	13	69			6	7	3	Y	2	1	Y	2	Y	8		3.3V	66	TQFP100	Y	-40°C to +85°C
AT32UC3A1256	P	256	64K		1	Y	Y	4	13	69			6	7	3	Y	2	1	Y	2	Y	8		3.3V	66	TQFP100	Y	-40°C to +85°C
AT32UC3A1512	P	512	64K		1	Y	Y	4	13	69			6	7	3	Y	2	1	Y	2	Y	8		3.3V	66	TQFP100	Y	-40°C to +85°C
AT32UC3B064	P	64	16K			Y	Y	3	13	44			5	7	3	Y	1	1	Y	2	Y	8		3.3V	60	TQFP64, QFN64	Y	-40°C to +85°C
AT32UC3B0128	P	128	32K			Y	Y	3	13	44			5	7	3	Y	1	1	Y	2	Y	8		3.3V	60	TQFP64, QFN64	Y	-40°C to +85°C
AT32UC3B0256	P	256	32K			Y	Y	3	13	44			5	7	3	Y	1	1	Y	2	Y	8		3.3V	60	TQFP64, QFN64	Y	-40°C to +85°C
AT32UC3B164	P	64	16K			Y		2	13	28			5	7	3	Y	1	Y	1	Y	6		3.3V	60	TQFP48, QFN48	Y	-40°C to +85°C	
AT32UC3B1128	P	128	32K			Y		2	13	28			5	7	3	Y	1	Y	1	Y	6		3.3V	60	TQFP48, QFN48	Y	-40°C to +85°C	
AT32UC3B1256	P	256	32K			Y		2	13	28			5	7	3	Y	1	Y	1	Y	6		3.3V	60	TQFP48, QFN48	Y	-40°C to +85°C	
AT32UC3A3128	I	128	128K	Y	1	Y	Y	4	13	110			6	8	3	Y	2	1	Y	2	Y	8	Y	3.3V	66	LQFP144, TBGA144	Y	-40°C to +85°C
AT32UC3A3256	I	256	128K	Y	1	Y	Y	4	13	110			6	8	3	Y	2	1	Y	2	Y	8	Y	3.3V	66	LQFP144, TBGA144	Y	-40°C to +85°C
AT32UC3A364	I	64	128K	Y	1	Y	Y	4	13	110			6	8	3	Y	2	1	Y	2	Y	8	Y	3.3V	66	LQFP144, TBGA144	Y	-40°C to +85°C



1.13 Product Selection Guide – Capacitive Touch Sense Controllers

Products	Technology	Touch Keys	Wheel/Slider function	Inputs/Outputs	Interface	FMEA Self test and diagnostics features	AKS™ Adjacent Key Suppression™	Low Power Mode	Self Calibration	Noise filtering	Auto drift compensation	Spread spectrum acquisition	Evaluation Board	Package	Voltage range (in V)	Temperature range (in C°)
QT100A	QTouch™	1		0/1 digital				Yes	Yes	Yes	Yes	Yes	E100S	WSON- 6	2.0 to 5.0	-40°C to +85°C
QT220	QTouch™	2		0/2 digital				Yes	Yes	Yes	Yes	Yes	E240B	SSOP-20	3.9 to 5.5	-40°C to +85°C
QT240	QTouch™	4		0/4 digital				Yes	Yes	Yes	Yes	Yes	E240B	SSOP-20	3.9 to 5.5	-40°C to +85°C
QT1080	QTouch™	8		0/8 digital			Yes	Yes	Yes	Yes	Yes	Yes	E1080	QFN-32	2.8 to 5.0	-40°C to +85°C
QT1081	QTouch™	8		0/8 digital			Yes	Yes	Yes	Yes	Yes	Yes	E1081	QFN-32	2.8 to 5.0	-40°C to +85°C
QT1101	QTouch™	10		0/0	1 or 2-wire		Yes	Yes	Yes	Yes	Yes	Yes		QFN-32	2.8 to 5.0	-40°C to +85°C
QT1103	QTouch™	10		0/0	1 or 2-wire		Yes	Yes	Yes	Yes	Yes	Yes	E1103	QFN-32	2.8 to 5.0	-40°C to +85°C
QT1106	QTouch™	7	Yes	0/0	SPI		Yes	Yes	Yes	Yes	Yes	Yes	E1106	QFN-32	2.8 to 5.0	-40°C to +85°C
QT60160	QMatrix™	16		0/0	I ² C compatible, Parallel Shift Reg		Yes	Yes	Yes	Yes	Yes	Yes	E6240	QFN- 32	1.8 to 5.5	-40°C to +85°C
QT60168	QMatrix™	16		0/0	SPI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	E6248	TQFP-32	3.0 to 5.25	-40°C to +85°C
QT60240	QMatrix™	24		0/0	I2C compatible, Parallel Shift Reg		Yes	Yes	Yes	Yes	Yes	Yes	E6240	QFN-32	1.8 to 5.5	-40°C to +85°C
QT60248	QMatrix™	24		0/0	SPI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	E6248	TQFP-32	3.0 to 5.25	-40°C to +85°C
QT60326	QMatrix™	32		0/0	SPI, UART	Yes	Yes	Yes	Yes	Yes	Yes	Yes	E6486	TQFP-44	4.75 to 5.25	-40°C to +85°C
QT60486	QMatrix™	48		0/0	SPI, UART	Yes	Yes	Yes	Yes	Yes	Yes	Yes	E6486	TQFP-44	4.75 to 5.25	-40°C to +85°C
AT42QT2160	QMatrix™	16	Yes	3/11 digital (PWM o/p)	I ² C compatible		Yes	Yes	Yes	Yes	Yes	Yes	AT42EVK2160A	QFN-28	1.8 to 5.5	-40°C to +85°C
AT42QT1060	QTouch™	6		7/7 digital (PWM o/p)	I ² C compatible		Yes	Yes	Yes	Yes	Yes	Yes	AT42EVK1060	QFN-28	1.8 to 5.5	-40°C to +85°C



AVR Microcontrollers

- a) Pb-free packaging alternative, complies to the European Directive for Restriction of Hazardous Substances (RoHS directive). Also Halide free and fully Green.
- b) 8 pin wide SOIC package, 209 mil wide.
- c) The AVR core has 32 internal registers that can be used as RAM storage.
- d) 8 pin narrow SOIC package, 150 mil wide.
- e) One high speed 8-bit timer/counter.
- f) Two High Frequency, 250kHz, PWM Outputs.
- g) Three High Frequency PWM Outputs for BLDC motor control.
- h) F: Future Device, I: Device under Introduction, P: Product in Full Production. Please contact your local sales contact for details
- i) Only 6 ADC in PDIP packages.
- j) T: -40°C to +85°C, T1: -40°C to +105°C, Z: -40°C to +125°C
- k) S: Software, H: Hardware
- l) 28 Programmable I/O Lines in 32-lead TQFP and 32-pad QFN/MLF package, 24 Programmable I/O Lines in 28-pin PDIP and 28-pad QFN/MLF package
- m) In the 0°C to +60°C temperature range
- n) European ISM Band from 863 to 870 MHz, North American ISM Band from 902 to 928 MHz
- o) Include Battery backup function

2 Application area in Focus: Atmel's new Battery Management Family

Atmel announced in October a family of single-chip Li-ion battery management devices. Combining Atmel's patented high voltage manufacturing process and AVR® microcontrollers' technology, the new family gives an extremely high analog accuracy at very low power consumption, while ensuring that portable handheld applications have all the necessary safety functions.

Li-ion batteries are very popular in applications like mobile phones, media players, digital still cameras, PDAs or notebooks to name a few. While they offer high energy density, low weight and volume, they require careful monitoring and charging control to ensure safety and optimum life time.

Safety is a major criterion for battery usage and recent industry problems – generating huge recalls from manufacturers – illustrates the importance of safe and accurate control functions. This also includes the need for authentication to ensure the user will use a certified battery and not a copy that can potentially be unsafe.

Atmel has been working with key battery manufacturers to develop optimized solutions and is now offering a full range of microcontrollers dedicated to Li-ion battery management supporting 1 to 4 cells. This product family offers a unique set of features to optimize performance and safety.

By giving extremely accurate voltage measurements it is possible to control the charge and discharge cut-off voltages more accurately, thus making it possible to use up to 15% extra energy of the battery compared to less accurate solutions while maintaining all safety requirements. The accuracy is achieved using Atmel's patented method for calibrating the voltage reference in conjunction with high resolution Delta Sigma Analog to Digital converters for voltage measurement. The family consists of 6 devices targeting different end markets. The ATmega4HVD and ATmega8HVD target the low-end consumer market requiring protection and authentication. For applications requiring gas gauge, the ATmega8HVA and ATmega16HVA are the ideal products, while the ATmega16HVB and ATmega32HVB targets the notebook battery market. All parts are single chip battery side solutions incorporating a protection with high-side N-channel FET drivers.

2.1 Development boards / Reference designs

Atmel has designed reference design kits showing how to build a complete battery pack using the new AVR battery management devices. The reference design kits include complete firmware and provide all needed safety measures for a Li-ion battery design. This includes over- and under-voltage protection and protection against excessive charge and discharge currents. The reference designs also features high accuracy voltage and current measurements, temperature checks, communication interface with command set based on battery specification, authentication and gas gauging.

To evaluate the performance of the reference designs, they are supported with the SB200 evaluation board. This board includes Lithium-ion batteries, a programmable charger and load, and a USB communication gateway between the reference kits and a PC. The SB200 connects to AVR Studio® by starting the AVR battery management services plug-in. Through this interface all battery parameters can be observed and modified, and the ATAVRSB200 functions are also controlled through this interface.



Video podcasts introducing the new devices and the development tools are available on the AVR TV website at <http://www.avrtv.com>.

2.2 Availability and Pricing

The ATmega8HVA and ATmega16HVA, in 36-pin LGA and 28-pin TSOP packages, are in production now. Engineering samples of the ATmega8HVD in 28-pin DFN packages are available now, while the ATmega4HVD, ATmega16HVB and ATmega32HVB will be sampling in Q1 2009. Prices start at \$0.95, \$1.14, \$2.08 and \$2.49 in 10,000 quantity pieces for ATmega4HVD, ATmega8HVD, ATmega8HVA and ATmega16HVA, respectively.

The ATmega8HVA and ATmega16HVA are supported by the SB201 reference design (ordering number: ATAVRSB201) that is available now at \$139. The ATmega8HVD is supported by the SB204 reference design available at \$99. The SB200 evaluation kit is available at \$199.

3 Devices not recommended for new designs

The following table gives an overview of devices not recommended for new designs and their replacements.

Device	Use	Comments
AT90S1200	ATtiny2313	End of life
AT90S2313	ATtiny2313	End of life
AT90S2323	ATtiny25	End of life
AT90S2343	ATtiny25	End of life
AT90S4433	ATmega8	End of life
AT90S8515	ATmega8515	End of life
AT90S8535	ATmega8535	End of life
ATmega103	ATmega128	End of life
ATmega161	ATmega162	End of life
ATmega163	ATmega16	End of life
ATmega323	ATmega32A	End of life
ATtiny11	ATtiny13A	End of life
ATtiny15L	ATtiny25	End of life
ATmega165	ATmega165P	End of life
ATmega169	ATmega169P	End of life
ATtiny13	ATtiny13A	New and better device
ATtiny26	ATtiny261	New and better device
ATmega32	ATmega32A	New and better device
ATmega16	ATmega16A	New and better device
ATmega88	ATmega88PA	New and better device
ATmega88P	ATmega88PA	New and better device
ATmega324P	ATmega324PA	New and better device

4 AVR Development Tools

Atmel provides a complete range of development tools for the AVR products.

4.1 Tools Reference

Part Number	Description
Software	
AVR Studio	Front end software for AVR development tools
AVR32 Studio	Front end software for AVR32 development tools
Starter Kits	
ATSTK500	Starter Kit and development system for AVR
ATSTK501	Expansion of STK500 to support 64-pin megaAVR devices
ATSTK502	Expansion of STK500 for 64-pin LCD AVR devices
ATSTK503	Expansion of STK500 for 100-pin megaAVR devices
ATSTK504	Expansion of STK500 for 100-pin LCD AVR devices
ATSTK505	Expansion of STK500 for 14-pin SOIC and 20-pin PDIP AVR devices
ATSTK520	Expansion of STK500 for AT90PWM products
ATSTK524	Expansion for ATmega32M1, ATmega32C1 products
ATSTK525	Starter Kit for AT90USB646/647/1286/1287
ATSTK526	Starter Kit for AT90USB82/162
ATSTK600	Starter Kit and development system for AVR & AVR32
ATSTK600-DIP40	Socket adapter card for 40-pin PDIP packages ⁽¹⁾
ATSTK600-TQFP44	Socket adapter card for 44-pin TQFP packages ⁽¹⁾
ATSTK600-TQFP64	Socket adapter card for 64-pin TQFP packages ⁽¹⁾
ATSTK600-TQFP100	Socket adapter card for 100-pin TQFP packages ⁽¹⁾
ATSTK600-uC3A0X-144	Socket adapter card for 144-pin UC3 devices ⁽¹⁾
ATSTK600-TinyX3U	Socket adapter card for ATtinyX3U ⁽¹⁾
ATSTK600-TQFP32	Socket adapter card for 32-pin TQFP packages ⁽¹⁾
ATSTK600-SOIC	Socket adapter card for SOIC packages ⁽¹⁾
ATSTK600-TQFP64-2	Socket adapter card for 64-pin TQFP UC3B devices ⁽¹⁾
ATSTK600-TQFP48	Socket adapter card for 48-pins packages ⁽¹⁾
ATSTK1000	Starter Kit for AVR32AP7xxx devices
ATSTK1005	AVR32 AP7200 upgrade kit for STK1000
ATSTK1006	AVR32 AP7000 memory upgrade kit for STK1000
Evaluation Kits	
ATAVRBFLY	ATmega169 Demo Board with LCD and Speaker
ATAVRRZRAVEN	2.4GHz Evaluation and Starter Kit
ATAVRRAVEN	2.4 GHz Raven Board
ATAVRRZUSBSTICK	2.4 GHz RZ USB Stick
ATAVRFBKIT	DALI Dimmable Fluorescent Ballast Kit
ATAVRRTOS	AVR Real Time Operating System development kit
AT90USBKEY	AVR USB Key Demonstration Kit
ATAVRRZ201	Pack of 5 Radio-Controller Boards
ATAKSTK512-3	Remote Access Control – Unidirectional Kit 315 MHz
ATAKSTK512-4	Remote Access Control – Unidirectional Kit 434 MHz
ADEVK1100	Evaluation kit for AVR32 UC3A series
ADEVK1101	Evaluation kit for AVR32 UC3B series
ADEVK1104	Evaluation kit for AVR32 UC3A3 series
ADEVK1105	Evaluation kit for AVR32 UC3A series



Part Number	Description
ATEVK525	AVR USB Mass Storage Evaluation Kit
ATAVRAUTOEK1	AVR Automotive Evaluation Kit
ATAVRMC300	Power Stage Controller Board
ATAVRMC310	Device board for ATmega32M1
Development Kits	
ATAVRMC100	BLDC Motor Control with AT90PWM3
ATAVRMC200	AC Induction Motor Kit
ATAVRMC201	Induction Motor for ATAVRMC200
ATDVK90CAN1	DVK90CAN1 Development Kit for AT90CAN devices
ATAVRSB100	Smart Battery Development Kit for Atmega406
ATAVRSB200	Smart Battery Development Kit
ATAVRSB201	Smart Battery Reference Kit
ATAVRBC100	Reference design/development kit that targets especially battery charging
ATAVRDB101	Display module
ATAVRISP2	AVRISP mkII is an ISP programmer for all AVR ISP devices
ATAVRRZ502	Z-Link RF Accessory Kit
ATAVRRZ541	Z-Link Packet Sniffer Kit
ATAVRDRAGON	AVR Dragon is a starter kit supporting On-Chip Debugging and programming for AVR.
ATNGW100	Network Gateway design kit and development board for the AT32AP7000
ATAVRUSBRF01	Reference design for development with AVR®
Emulators	
ATJTAGICE2	JTAGICE mkII On-Chip Debugger supporting all AVR and AVR32 with debugWIRE or JTAG interface
JTAGPROBE	JTAGICE mkII Probe including Flex Cables
ATAVRONEKIT	Development tool for on-chip debugging and programming of all AVR32 devices
ATADAPCAN01	STK500/501 90CAN128 CAN adapter
ATAVRAUTO102	AVR Automotive Debugger

⁽¹⁾See AVR Studio Tools User Guide for device support

4.2 AVR Studio® Tools and Device Support

AVR Studio 4.13 with the latest Service Pack supports all new Atmel debug platforms and devices. Some of the old devices are not supported. See below for a table of currently supported tools and devices in AVR Studio. This support is in progress, and the table below is not guaranteed to be complete when this is read.

This information can also be found in the AVR Studio online help and on www.atmel.com/avr

The latest AVR Studio SW can be found on:

www.atmel.com/dyn/products/tools_card.asp?tool_id=2725

Device	Simulator/ Assembler	JTAGICE mkII	AVR ONE !	Starter kit	AVR Dragon	AVRISP mkII
ATtiny12	•			ATSTK500, ATSTK600	• ⁽¹⁾	•
ATtiny13	•	•		ATSTK500, ATSTK600	•	•
ATtiny13A	•	•		ATSTK500, ATSTK600	•	•
ATtiny24	•	•		ATSTK500 + ATSTK505, ATSTK600	•	•
ATtiny25	•	•		ATSTK500, ATSTK600	•	•
ATtiny26	•			ATSTK500 (+ATSTK505),	• ⁽¹⁾	•



Device	Simulator/ Assembler	JTAGICE mkII	AVR ONE !	Starter kit	AVR Dragon	AVRISP mkII
				ATSTK600		
ATtiny261	•	•		ATSTK500 (+ATSTK505), ATSTK600	•	•
ATtiny28	•			ATSTK500, ATSTK600	• ⁽¹⁾	
ATtiny44	•	•		ATSTK500 + ATSTK505, ATSTK600	•	•
ATtiny45	•	•		ATSTK500, ATSTK600	•	•
ATtiny461	•	•		ATSTK500 (+ATSTK505), ATSTK600	•	•
ATtiny48	•	•		ATSTK500, ATSTK600	•	•
ATtiny84	•	•		ATSTK500 + ATSTK505, ATSTK600	•	•
ATtiny85	•	•		ATSTK500, ATSTK600	•	•
ATtiny861	•	•		ATSTK500 (+ATSTK505), ATSTK600	•	•
ATtiny88	•	•		ATSTK500, ATSTK600	•	•
ATtiny2313	•	•		ATSTK500, ATSTK600	•	•
ATmega48	•	•		ATSTK500, ATSTK600	•	•
Atmega48P	•	•		ATSTK500, ATSTK600	•	•
ATmega8	•			ATSTK500, ATSTK600	• ⁽¹⁾	•
ATmega88	•	•		ATSTK500, ATSTK600	•	•
ATmega88P	•	•		ATSTK500, ATSTK600	•	•
ATmega88PA	•	•		ATSTK500, ATSTK600	•	•
ATmega8515	•			ATSTK500, ATSTK600	• ⁽¹⁾	•
ATmega8535	•			ATSTK500, ATSTK600	• ⁽¹⁾	•
ATmega16	•	•		ATSTK500, ATSTK600	•	•
ATmega16A	•	•		ATSTK500, ATSTK600	•	•
ATmega162	•	•		ATSTK500, ATSTK600	•	•
ATmega164P	•	•		ATSTK500, ATSTK600	•	•
ATmega165	•	•		ATSTK500 + ATSTK502, ATSTK600	•	•
ATmega165P	•	•		ATSTK500 + ATSTK502, ATSTK600	•	•
ATmega168	•	•		ATSTK500, ATSTK600	•	•
Atmega168P	•	•		ATSTK500, ATSTK600	•	•
ATmega169	•	•		ATSTK500 + ATSTK502, ATSTK600	•	•
ATmega169P	•	•		ATSTK500 + ATSTK502, ATSTK600	•	•
ATmega32	•	•		ATSTK500, ATSTK600	•	•
ATmega32A	•	•		ATSTK500, ATSTK600	•	•
ATmega324P	•	•		ATSTK500, ATSTK600	•	•
ATmega324PA	•	•		ATSTK500, ATSTK600	•	•
ATmega325	•	•		ATSTK500 + ATSTK502, ATSTK600	•	•
ATmega325P	•	•		ATSTK500 + ATSTK502, ATSTK600	•	•
ATmega3250	•	•		ATSTK500 + ATSTK504, ATSTK600	•	•
ATmega3250P	•	•		ATSTK500 + ATSTK504, ATSTK600	•	•
ATmega329	•	•		ATSTK500 + ATSTK502, ATSTK600	•	•
ATmega329P	•	•		ATSTK500 + ATSTK502, ATSTK600	•	•
ATmega3290	•	•		ATSTK500 + ATSTK504,	•	•



Device	Simulator/ Assembler	JTAGICE mkII	AVR ONE !	Starter kit	AVR Dragon	AVRISP mkII
				ATSTK600		
ATmega3290P	•	•		ATSTK500 + ATSTK504, ATSTK600	•	•
ATmega64	•	•		ATSTK500 + ATSTK501, ATSTK600	• ⁽¹⁾	•
ATmega640	•	•		ATSTK500 + ATSTK503, ATSTK600	• ⁽¹⁾	•
ATmega644	•	•		ATSTK500, ATSTK600	• ⁽¹⁾	•
ATmega644P	•	•		ATSTK500, ATSTK600	• ⁽¹⁾	•
ATmega645	•	•		ATSTK500 + ATSTK502, ATSTK600	• ⁽¹⁾	•
ATmega6450	•	•		ATSTK500 + ATSTK504, ATSTK600	• ⁽¹⁾	•
ATmega649	•	•		ATSTK500 + ATSTK502, ATSTK600	• ⁽¹⁾	•
ATmega6490	•	•		ATSTK500 + ATSTK504, ATSTK600	• ⁽¹⁾	•
ATmega128	•	•		ATSTK500 + ATSTK501, ATSTK600	• ⁽¹⁾	•
ATmega1280	•	•		ATSTK500 + ATSTK503, ATSTK600	• ⁽¹⁾	•
ATmega1281	•	•		ATSTK500 + ATSTK501, ATSTK600	• ⁽¹⁾	•
ATmega2560	•	•		ATSTK500 + ATSTK503, ATSTK600	• ⁽¹⁾	•
ATmega2561	•	•		ATSTK500 + ATSTK501, ATSTK600	• ⁽¹⁾	•
ATmega406	•	•			•	
ATmega16HVA	•	•		ATSTK500 ⁽²⁾	• ⁽¹⁾	•
ATmega32HVB	•	•		ATSTK500 ⁽²⁾ , ATSTK600	• ⁽¹⁾	•
ATxmega128A1	•	•		ATSTK600		
AT90CAN32	•	•		ATSTK500 + ATSTK501, ATSTK600, ATADAPCAN1	•	•
AT90CAN64	•	•		ATSTK500 + ATSTK501, ATSTK600, ATADAPCAN1	• ⁽¹⁾	•
AT90CAN128	•	•		ATSTK500 + ATSTK501, ATSTK600, ATADAPCAN1	• ⁽¹⁾	•
ATmega32M1	•	•		ATSTK500 + ATSTK524, ATSTK600	•	•
AT90PWM2	•	•		ATSTK500+ATSTK520, ATSTK600	•	•
AT90PWM3	•	•		ATSTK500+ATSTK520, ATSTK600	•	•
AT90PWM216	•	•		ATSTK500+ATSTK520, ATSTK600	•	•
AT90PWM316	•	•		ATSTK500+ATSTK520, ATSTK600	•	•
AT90USB646	•	•		ATSTK500 + ATSTK525, ATSTK600	• ⁽¹⁾	•
AT90USB647	•	•		ATSTK500 + ATSTK525, ATSTK600	• ⁽¹⁾	•
AT90USB1286	•	•		ATSTK500 + ATSTK525, ATSTK600	• ⁽¹⁾	•
AT90USB1287	•	•		ATSTK500 + ATSTK525, ATSTK600	• ⁽¹⁾	•
AT90USB82	•	•		ATSTK500 + ATSTK526, ATSTK600	• ⁽¹⁾	•



Device	Simulator/ Assembler	JTAGICE mkII	AVR ONE !	Starter kit	AVR Dragon	AVRISP mkII
AT90USB162	•	•		ATSTK500 + ATSTK526, ATSTK600	• ⁽¹⁾	•
AT32AP7000		•	•	ATSTK1000		
AT32AP7001		•	•	ATSTK1000		
AT32AP7002		•	•	ATSTK1000		
AT32UC3A0		•	•	ATSTK600		
AT32UC3A1		•	•	ATSTK600		
AT32UC3A3		•	•	ATSTK600		
AT32UC3B0		•	•	ATSTK600		
AT32UC3B1		•	•	ATSTK600		

⁽¹⁾ Programming only

⁽²⁾ Only ISP support, not socket on STK500 supports this device

5 Documentation

All documents listed can be downloaded from Atmel Corporation's web site:

<http://www.atmel.com> under the product section. For other documentation, please send your request to avr@atmel.com.

5.1 Datasheets

The datasheets of all AVR devices can be downloaded.

AVR: http://www.atmel.com/dyn/products/datasheets.asp?family_id=607.

AVR32: http://www.atmel.com/dyn/products/datasheets.asp?family_id=682

Family	Devices	Language	Preliminary	Summary	Complete	Last Update
Auto AVR	ATtiny25/45/85 Automotive	English	X		X	03/08
Auto AVR	Appendix A - ATtiny45 Automotive specification at 150°C	English	X		X	04/08
Auto AVR	Appendix B - ATtiny25/45/85 Automotive Specification at 1.8V	English	X		X	04/07
Auto AVR	ATtiny24/44/84 Automotive	English	X		X	09/07
Auto AVR	ATtiny261/461/861	English	X		X	08/08
Auto AVR	ATmega48/88/168 Automotive	English			X	10/07
Auto AVR	ATmega88/168 Automotive - 150°C Specification - Appendix A	English	X			03/08
Auto AVR	ATtiny167 Automotive Preliminary	English	X		X	07/08
Auto AVR	ATmega164P/324P/644P	English	X		X	08/08
Auto AVR	AT90CAN32/64/128 Automotive	English	X		X	04/08
Auto AVR	ATmega32C1, ATmega32M1, ATmega64C1, ATmega64M1 Automotive Advance Information	English	X		X	08/08
Auto AVR	Appendix A - ATmega32M1/C1 Automotive specification at 150°C	English	X		X	05/08
CAN AVR	AT90CAN32/64/128	English	X	X	X	08/08
LCD AVR	ATmega169(V)	English		X	X	07/06
LCD AVR	ATmega169(V)	Chinese	X		X	09/04
LCD AVR	ATmega329/3290/649/6490	English	X	X	X	08/07
Lighting AVR	AT90PWM1	English	X	X	X	09/08
Lighting AVR	AT90PWM2(B), AT90PWM3(B)	English	X		X	01/08
Lighting AVR	AT90PWM216/316	English	X		X	01/08
Wireless	AT86RF230 ZigBee™/IEEE 802.15.4-Transceiver	English	X		X	12/07
Wireless	AT86RF231	English	X	X	X	05/08
megaAVR	ATmega48/88/168	English	X	X	X	09/07
megaAVR	ATmega48/88/168	Chinese	X		X	02/05
megaAVR	ATmega8(L)	English		X	X	05/08
megaAVR	ATmega8(L)	Chinese			X	07/04
megaAVR	ATmega8515(L)	English		X	X	10/06



Family	Devices	Language	Preliminary	Summary	Complete	Last Update
megaAVR	ATmega8515(L)	Chinese			X	09/04
megaAVR	ATmega8535(L)	English	X	X	X	10/06
megaAVR	ATmega8535(L)	Chinese	X		X	09/04
megaAVR	ATmega16(L) – Not recommended for new designs	English		X	X	06/08
megaAVR	ATmega16(L)	Chinese			X	10/04
megaAVR	Atmega16A	English	X	X	X	06/08
megaAVR	ATmega162(V)	English		X	X	08/07
megaAVR	ATmega165(V)	English	X	X	X	08/06
megaAVR	ATmega32(L) – Not recommended for new designs	English		X	X	06/08
megaAVR	ATmega32(L)	Chinese	X		X	09/04
megaAVR	Atmega32A	English	X	X	X	06/08
megaAVR	ATmega325/3250/645/6450	English	X	X	X	08/07
megaAVR	ATmega64(L)	English		X	X	05/08
megaAVR	ATmega64(L)	Chinese	X		X	09/04
megaAVR	ATmega640/1280/1281/2560/2561	English	X	X	X	08/07
megaAVR	ATmega644	English	X	X	X	08/07
megaAVR	ATmega128(L)	English		X	X	06/08
megaAVR	ATmega128(L)	Chinese			X	05/04
picoPower megaAVR	ATmega164P/324P/644P	English	X	X	X	09/08
picoPower megaAVR	ATmega165P(V)	English	X	X	X	08/07
<i>picoPower megaAVR</i>	<i>ATmega324PA</i>	<i>English</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>11/08</i>
picoPower megaAVR	ATmega325P/3250P	English	X	X	X	06/08
picoPower megaAVR	ATmega48P/88P/168P	English	X	X	X	08/08
<i>picoPower megaAVR</i>	<i>ATmega88PA</i>	<i>English</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>11/08</i>
picoPower megaAVR	ATmega1284P	English	X	X	X	05/08
picoPower LCD megaAVR	ATmega169P(V)	English	X	X	X	08/08
picoPower LCD megaAVR	ATmega329P/3290P	English	X	X	X	06/08
Smart Battery AVR	ATmega406	English	X	X	X	07/06
Smart Battery AVR	ATmega8HVA/16HVA	English	X	X	X	04/08
Smart Battery AVR	ATmega16HVB/32HVB	English	X			09/08
Smart Battery AVR	ATmega4HVD/8HVD	English	X			09/08
tinyAVR	ATtiny11/12	English		X	X	06/07
tinyAVR	ATtiny13 - Not recommended for new designs	English	X	X	X	05/08
tinyAVR	ATtiny13 - Not recommended for new designs	Chinese	X		X	01/07
tinyAVR	ATtiny13A	English	X	X	X	05/08
tinyAVR	ATtiny15L	English		X	X	09/07
tinyAVR	ATtiny2313	English	X	X	X	04/06
tinyAVR	ATtiny2313	Chinese	X		X	07/04
tinyAVR	ATtiny24/44/84	English	X	X	X	01/08
<i>tinyAVR</i>	<i>ATtiny24A/44A</i>	<i>English</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>12/08</i>
tinyAVR	ATtiny25/45/85	English	X	X	X	01/08
tinyAVR	ATtiny26(L)	English		X	X	06/07
tinyAVR	ATtiny26(L)	Chinese	X		X	12/03
tinyAVR	ATtiny261/461/861	English	X	X	X	08/08
tinyAVR	ATtiny28(L)(V)	English		X	X	07/06
tinyAVR	ATtiny48/88	English	X	X	X	06/08



Family	Devices	Language	Preliminary	Summary	Complete	Last Update
USB AVR	AT90USB1287/1286/646/647	English	X		X	11/08
USB AVR	AT90USB82/162	English	X		X	11/08
USB AVR	USB DFU Bootloader Datasheet	English			X	03/08
USB AVR	Atmega16U4/32U4	English	X	X	X	11/08
USB AVR	ATmega32U4	English	X		X	03/08
AVR XMEGA	ATxmega A Manual Preliminary	English	X		X	06/08
AVR XMEGA	ATxmega64A1/128A1/192A1/256A1 Preliminary	English	X		X	11/08
AVR XMEGA	ATxmega64A3/128A3/192A3/256A3 Advance Information	English			X	11/08
AVR XMEGA	ATxmega16A4/32A4/64A4/128A4 Advance Information	English			X	11/08
AVR XMEGA	ATxmega256A3B	English	X		X	11/08
AVR32	AT32AP7000	English	X	X	X	10/07
AVR32	AT32AP7001	English	X	X	X	01/08
AVR32	AT32AP7002	English	X	X	X	10/07
AVR32	AVR32 Architecture Manual	English	X		X	11/07
AVR32	AVR32 AP Technical Reference Manual	English	X		X	06/06
AVR32	AVR32 UC Technical Reference Manual	English	X		X	11/07
AVR32	AVR32 Java Technical Reference Manual	English	X		X	10/06
AVR32	AVR32 UC3 USB DFU Bootloader	English			X	07/07
AVR32	AT32UC3A0512, AT32UC3A0256, AT32UC3A0128, AT32UC3A1512, AT32UC3A1256, AT32UC3A1128	English	X	X	X	08/08
AVR32	AT32UC3B0256, AT32UC3B0128, AT32UC3B064, AT32UC3B1256, AT32UC3B1128, AT32UC3B164	English	X	X	X	04/08

5.2 Application Notes

The application notes for all AVR devices can be downloaded.

AVR: http://www.atmel.com/dyn/products/app_notes.asp?family_id=607

AVR32: http://www.atmel.com/dyn/products/app_notes.asp?family_id=682

Note Number	Description	Last Update
AVR000	Register and Bit-Name Definitions for the AVR Microcontroller	04/98
AVR001	Conditional Assembly and Portability Macros	04/08
AVR030	Getting Started with IAR Embedded Workbench for Atmel AVR	10/04
AVR031	Getting Started with ImageCraft C for AVR	05/02
AVR032	Linker Command Files for the IAR ICCA90 Compiler	05/02
AVR033	Getting Started with the CodeVision AVR C Compiler	04/08
AVR034	Mixing C and Assembly Code with AVR Embedded Workbench for AVR	04/03
AVR035	Efficient C Coding for AVR	01/04
AVR040	EMC Design Considerations	06/06
AVR041	EMC Performances Improvement for ATmega32M1	02/08
AVR042	AVR Hardware Design Considerations	04/08
AVR053	Calibration of the Internal RC Oscillator	05/06
AVR054	Run-time calibration of the internal RC oscillator	04/08
AVR055	Using a 32kHz XTAL for run-time calibration of the internal RC	07/08
AVR060	JTAGICE	01/04
AVR061	STK500 Protocol	04/03
AVR063	LCD Driver for the STK@504	04/06
AVR064	STK502 – A Temperature Monitoring System with LCD Output	02/06
AVR065	LCD Driver for the STK502	07/08
AVR067	JTAGICE mkII Communication Protocol	04/06



Note Number	Description	Last Update
AVR068	STK500 Communication Protocol	06/06
AVR069	AVRISP mkII Communication Protocol	02/06
AVR070	Modifying AT90ICEPRO to Support Emulation of AT90	05/02
AVR072	Accessing 16-bit I/O Registers	05/02
AVR073	Accessing 10- and 16-bit registers in ATtiny261/461/861	01/08
AVR074	Upgrading AT90ICEPRO to ICE10	05/02
AVR078	STK524 User's Guide	02/08
AVR079	STK600 Communication Protocol	04/08
AVR080	ATmega103 Replaced by ATmega128	01/04
AVR081	Replacing AT90S4433 by ATmega8	07/03
AVR082	Replacing ATmega161 by ATmega162	01/04
AVR083	Replacing ATmega163 by ATmega16	09/05
AVR084	Replacing ATmega323 by ATmega32	07/03
AVR085	Replacing AT90S8515 by ATmega8515	01/04
AVR086	Replacing AT90S8535 by ATmega8535	04/08
AVR087	Migrating between ATmega8515 and ATmega162	07/03
AVR088	Migrating between ATmega8535 and ATmega16	01/04
AVR089	Migrating between ATmega16 and ATmega32	06/03
AVR090	Migrating between ATmega64 and ATmega128	06/03
AVR091	Replacing AT90S2313 by ATtiny2313	10/03
AVR092	Replacing ATtiny11/12 by ATtiny13	10/03
AVR093	Replacing AT90S1200 by ATtiny2313	10/03
AVR094	Replacing ATmega8 by ATmega88	04/05
AVR095	Migrating between ATmega48, ATmega88 and ATmega168	02/04
AVR096	Migrating from ATmega128 to AT90CAN128	03/04
AVR097	Migration between ATmega128 and ATmega2561	04/08
AVR098	Migration between ATmega169, ATmega329 and ATmega649	02/07
AVR099	Replacing AT90S4433 by ATmega48	07/04
AVR100	Accessing the EEPROM	09/05
AVR101	High Endurance EEPROM Storage	09/02
AVR102	Block Routines	05/02
AVR103	Using the EEPROM Programming Modes	03/05
AVR104	Buffered Interrupt Controlled EEPROM Writes	07/03
AVR105	Power Efficient High Endurance Parameter Storage in Flash Memory	09/03
AVR106	C functions for reading and writing to Flash memory	08/06
AVR107	Interfacing AVR serial memories	03/05
AVR108	Setup and Use of the LPM Instructions	05/02
AVR109	Self-programming	06/04
AVR120	Characterization and Calibration of the ADC on an AVR	02/06
AVR121	Enhancing ADC resolution by oversampling	09/05
AVR122	Calibration of the AVR's internal temperature reference	02/08
AVR128	Setup and Use the Analog Comparator	05/02
AVR130	Setup and use the AVR Timers	02/02
AVR131	Using the AVR's High-speed PWM	09/03
AVR132	Using the Enhanced Watchdog Timer	06/08
AVR133	Long Delay Generation Using the AVR Microcontroller	02/04
AVR134	Real-Time Clock using the Asynchronous Timer	08/06
AVR135	Using Timer Capture to Measure PWM Duty Cycle	10/05
AVR136	Low-jitter Multi-channel Software PWM	05/06
AVR138	ATmega32M1 family PSC Cookbook	03/08
AVR137	Writing Software Compatible for AT90PWM2/3 and AT90PWM2B/3B	12/06
AVR140	ATmega48/88/168 family run-time calibration of the Internal RC oscillator	09/06
AVR151	Setup and use of the SPI	07/08
AVR155	Accessing I2C LCD Display Using the AVR 2-Wire Serial Interface	09/05



Note Number	Description	Last Update
AVR172	Sensorless Commutation of Brushless DC Motor (BLDC) using ATmega32M1 and ATAVRMC320	10/08
AVR180	External Brown-Out Protection	05/02
AVR181	Automotive Grade0 - PCB and Assembly Recommendations	09/07
AVR182	Zero Cross Detector	01/04
AVR186	Best practices for the PCB layout of Oscillators	03/08
AVR191	Anti-Pinch Algorithm for AVR Adaptation Procedure	11/06
AVR194	Brushless DC Motor Control using ATmega32M1	04/08
AVR1000	Getting Started Writing C-code for XMEGA	02/08
AVR1001	Getting Started With the XMEGA Event System	02/08
AVR1003	Using the XMEGA Clock System	02/08
AVR1300	Using the XMEGA ADC	04/08
AVR1301	Using the XMEGA DAC	04/08
AVR1302	Using the XMEGA Analog Comparator	04/08
AVR1303	Use and configuration of IR communication module	07/08
AVR1304	Using the XMEGA DMA Controller	04/08
AVR1305	XMEGA Interrupts and the Programmable Multi-level Interrupt Controller	02/08
AVR1306	Using the XMEGA Timer/Counter	02/08
AVR1307	Using the XMEGA USART	02/08
AVR1308	Using the XMEGA TWI	02/08
AVR1309	Using the XMEGA SPI	02/08
AVR1310	Using the XMEGA Watchdog Timer	04/08
AVR1311	Using the XMEGA Timer/Counter Extensions	04/08
AVR1312	Using the XMEGA External Bus Interface	02/08
AVR1313	Using the XMEGA IO Pins and External Interrupts	02/08
AVR1314	Using the XMEGA Real Time Counter	02/08
AVR1315	Accessing the XMEGA EEPROM	04/08
AVR1316	XMEGA Self-programming	11/08
AVR1317	Using the XMEGA built-in DES accelerator	04/08
AVR1318	Using the XMEGA built-in AES accelerator	04/08
AVR1600	Using the XMEGA Quadrature	08/08
AVR1900	Getting started with ATxmegaA1	04/08
AVR200	Multiply and Divide Routines	05/06
AVR201	Using the AVR Hardware Multiplier	06/02
AVR202	16-Bit Arithmetic	05/02
AVR204	BCD Arithmetic	01/03
AVR220	Bubble Sort	05/02
AVR221	Discrete PID controller	05/06
AVR222	8-Point Moving Average Filter	05/02
AVR223	Digital Filters with AVR	07/08
AVR230	DES Bootloader	04/05
AVR231	AES Bootloader	08/06
AVR236	CRC Check of Program Memory	05/02
AVR240	4x4 Keypad-Wake Up on Keypress	06/06
AVR241	Direct driving of LCD display using general I/O	05/04
AVR242	8-bit Microcontroller Multiplexing LED Drive & a 4x4 Keypad	05/02
AVR243	Matrix Keyboard Decoder	01/03
AVR244	UART as ANSI Terminal Interface	11/03
AVR245	Code Lock with 4x4 Keypad and I2C™ LCD	10/05
AVR270	USB Mouse Demonstration	03/08
AVR271	USB Keyboard Demonstration	07/08
AVR272	USB CDC Demonstration UART to USB Bridge	04/08
AVR273	USB Mass Storage Implementation	04/06
AVR274	Single-wire Software UART	03/07
AVR276	USB Software Library for AT90USBxxx Microcontrollers	02/07



Note Number	Description	Last Update
AVR277	On-The-Go (OTG) add-on to USB Software Library	07/07
AVR280	USB Host CDC Demonstration	09/07
AVR282	USB Firmware Upgrade for AT90USB	01/08
AVR286	LIN Firmware Base for LIN/UART Controller	03/08
AVR292	LIN Break-in-Data Feature of LIN/UART Controller	03/08
AVR293	USB Composite Device	08/08
AVR296	AVRUSBRF01 USB RF Dongle	07/08
AVR298	USB Audio Demonstration with ATmega32(16)U4	11/08
AVR2001	AT86RF230 Software Programmer's Guide	07/07
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AVR2004	LC-Balun for AT86RF230	04/08
AVR2005	Design Considerations for the AT86RF230	08/07
AVR2006	Design and characterization of the Radio Controller Boards 2.4 GHz PCB Antenna	08/07
AVR2007	IEEE802.15.4 MAC power consumptions for AT86RF230 and ATmega1281	09/07
AVR2009	AT86RF230 – Software Programming Model	08/07
AVR2014	AT86RF230 Receiver sensitivity measurements	04/08
AVR2015	RZRAVEN Quick Start Guide	03/08
AVR2016	RZRAVEN Hardware User's Guide	04/08
AVR2021	AT86RF231 Antenna Diversity	06/08
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AVR414	User Guide - ATAVRRZ502 - Accessory Kit	12/06
AVR415	RC5 IR Remote Control Transmitter	05/03
AVR430	MC300 Hardware User Guide	10/08
AVR433	Power Factor Corrector (PFC) with AT90PWM2 Re-triggable High Speed PSC	03/06
AVR434	PSC Cookbook	10/06
AVR435	BLDC/BLAC Motor Control Using a Sinus Modulated PWM Algorithm	09/06
AVR440	Sensorless Control of Two-Phase Brushless DC Motor	09/05
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AVR450	Battery Charger for SLA, NiCd, NiMH and Li-ion Batteries	09/06
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AVR487	AVRUSBRF01 Quick Start	04/08
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AVR494	AC Induction Motor Control Using the constant V/f Principle and a Natural PWM Algorithm	12/05
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AVR500	Migration between Atmega64 and Atmega645	09/04
AVR501	Replacing ATtiny15 with ATtiny25	03/05
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AVR504	Migrating from ATtiny26 to ATtiny261/461/861	04/08
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AVR507	Migration from ATmega329 to ATmega329P	11/06
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AVR600	STK600 Expansion, routing and socke	08/08
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AVR914	CAN & UART based Bootloader for AT90CAN32, AT90CAN64, & AT90CAN128	05/06
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AVR32000	Introduction to AVR32 header files	05/06
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AVR32004	AVR32 AP7 How to add software package to Buildroot	11/08
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AVR32006	Getting Started with GCC for AVR32	12/07
AVR32007	UC3 C-coding Guidelines for ARM7 Developers	03/08
AVR32008	How to Compile the UC3 Software Framework in AVR32 Studio V1.0	12/07
AVR32015	AVR32 Studio getting started	04/08
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AVR32708	AVR32 UC3A and UC3B Flash JTAG Programming Algorithms	11/07
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AVR32717	Compatibility Note AT32UC3Ax Revision E to Revision H or later	08/08
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AVR32749	AVR32 UC3 Software Workaround Implementation for the Erratum Flash Read-after-Write	05/08
AVR32752	Using the AVR32 UC3 Static Memory Controller	08/08
AVR32753	AVR32 UC3 How to connect to an SSL-server	07/08

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