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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 "<u>Embedded -</u> <u>Microcontrollers</u>"

Details

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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/at90scr100lhs-z1t

Email: info@E-XFL.COM

Address: Room A, 16/F, Full Win Commercial Centre, 573 Nathan Road, Mongkok, Hong Kong

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 programmation)
- 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 of 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 833 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



- 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 Callibrated 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





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 functionnalities of each port. All functionnalities may be active at the same time. The only way to disable a feature is to deactive it inside the corresponding peripheral blokck.

					0		
Portmap	ID	SCR100L	SCR100LS	SCR100H	Supply	c	Configuration, Role
	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		RST	Reset signal: Drive low to reinitialize the chip
oins	Xtal1	x	x	x		XTAL1	Clash Innut, Curnet up to 0 Mhz eristele
eric p	Xtal2	x	x	x	VCC	XTAL2	CIOCK INPUT: Support up to 8 Minz cristais
gene	DVcc	x	x	x		DVcc	Digital Vcc:Used for internal regulator decoupling
ed, e	Vcc2	x	x	x		Vcc2	Voltage Supply: To be tied to same Vcc supply voltage
lapp	Vcc3	-	-	x		Vcc3	Voltage Supply: To be tied to same Vcc supply voltage
Unr	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	D+	USB Interface
	D-	x	x	x	Reg	D-	
	UCap	x	x	х		UCap	USB Decoupling : Used for specific USB regulator decoupling
	RTC1	-		x		TOSC1	TOCOM 22.769 Khz orielal input for Deal Time Clash, (Disco
-	RTC2	-	-	x	Vcc	TOSC2	note that these pins are not GPIO accessible).
	11102	_	-	~		10002	

Table 3-1.Pin List Configuration





Table 3-1.Pin List Configuration

Portmap	ID	SCR100L	SCR100LS	SCR100H	Supply				C	Configuration, Role	
	PA7	-	-	x	-	KbIN7			PCINT7		
-	PA6	-	-	x		KbIN6			PCINT6		
-	PA5	-	-	x		KbIN5			PCINT5		
۲Þ	PA4	-	-	x	Vee	KbIN4			PCINT4	KhiNy: Input for "Keyboard Interface"	
OR ⁻	PA3	-	-	x	VCC	KbIN3			PCINT3		
	PA2	-	-	x		KbIN2			PCINT2		
	PA1	-	-	x		KbIN1			PCINT1		
-	PA0	-	-	x		KbIN0			PCINT0		
-	PB7	x	-	x		SCK	OC2A		PCINT15	SS, MISO, MOSI, SCK: Standard "SPI - Serial Peripheral	
PORT B	PB6	x	-	x		MISO	OC2B		PCINT14	Interface"	
	PB5	x	-	x	-	MOSI	OC1A		PCINT13	ICP1: Input Capture. See "16-bit Timer/Counter1 with PWM"	
	PB4	x	-	x	Vcc	SS	OC0B		PCINT12	PWM: Output from "8-bit Timer/Counter0 with PWM"	
	PO	PB3	-	-	x		PWM	OC0A		PCINT11	Tx: Clock input for "Timers" 0 and 1
	PB2	-	-	x	-		ICP1		PCINT10	INTx: "External Interrupts", default configuration	
	PB1	-	-	x		INT3	T1	СКО	PCINT9	CKO: System clock output. (only active if CKOUT fuse is	
	PB0	-	-	x		INT2	Т0	ХСК	PCINT8	enabled). "Fuse Low Byte" .	
	DC5	_		×		ITCTDI					
-	PCJ	-	-	×						ITGyyy: "ITAC Interface and On chin Debug System"	
C ⁽³⁾	PC3	-	-	~ ~	Vcc	ITGTMS				SDA, SCL: "2-wire Serial Interface _ TWI" signals	
RT	PC2	Y	v	~ ×	VCC	ІТСТСК				LEDx: "LED" Outputs (IO driving current)	
P P	PC1	-	-	×		SDA	INT3b			INTxb : "External Interrupts", bis configuration	
-	PC0	-	-	×		SCI	INT2b				
	1.00			X		002	11125				
	PD7	-	x	x		HSMISO			PCINT23		
	PD6	-	x	x		HSMOSI			PCINT22		
	PD5	-	x	x		HSSCK			PCINT21	HSxxxx: "High-Speed SPI Controller" (MISO, MOSI, SCK,	
RT D	PD4	-	x	x	Vcc	HSSS			PCINT20	SS)	
POR	PD3	-	-	x		INT1			PCINT19	TXD, RXD: "USART" signals	
	PD2	-	-	x		INT0	OC1B		PCINT18	OCxB: Output Comparators: See "Timers".	
	PD1	x	x	x		TXD			PCINT17		
	PD0	x	x	x		RXD			PCINT16		

AT90SCR100

Table 3-1.Pin List Configuration

Portmap	ID	SCR100L	SCR100LS	SCR100H	Supply			c	Configuration, Role
	PE7	-	-	x		KbO7		PCINT31	
	PE6	-	-	x		KbO6		PCINT30	
	PE5	-	-	x		KbO5		PCINT29	
Ш	PE4	-	-	x	Vcc	KbO4		PCINT28	
POR	PE3	-	-	x		KbO3		PCINT27	KDOX : Output for "Keyboard Interface
	PE2	-	-	x		KbO2		PCINT26	
	PE1	-	-	x		KbO1		PCINT25	
	PE0	-	-	x		KbO0		PCINT24	
					Maa	00050			
		X	X	X	CVcc	CPRES			
		×	×	×		COLK			
		x	x	X		CKSI			Cx: "Smart Card Interface Block (SCIB)" : Standard ISO7816 port and "USB Host Controller"
	ORT	x	X	X					
	rd P		X	(2)					
	rt Ca	X	X	X	CVcc				
	Smai	X	X	X		CVCC			
		x	x	x		CVSense			Create Conductorface: "DC/DC Converter" Currely Circula
		x	X	e.,,		UVSS			Smart Card Interface: "DC/DC Converter Supply Signals
		x	x	X		LI			
1			х	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 $10 \mu \text{F}$
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 solded 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 Rs value (e.g., if each metal line connecting Rs to the chip adds a 10 m Ω resistance, the correct Rs value should be 200-2x10=180m Ω)
- 3. CVcc and CVss lines must have very low resistance (short and wide metal line).
- 4. R1, R2, R3 and R4 must be placed as close as possible to the chip pins.
- 5. Connect e-pad to ground. If possible connect it to ground plane





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