SPECIFICATIONS

A high performance 8 bit-microcontroller with low power consumption.
- ATmega64L/ATmega128L Family AVR® of Atmel®.

RISC architecture
- 133 powerful instructions, most of which execute in 1 cycle.

Memories:
- 64K/128K bytes FLASH EPROM for program: endurance 1000 cycles.
- 4K bytes EEPROM: endurance 100,000 cycles.
- 128K bytes SRAM. Battery-back-up circuitry or Supercap.
- 256K or 4MB SPI Data Flash®.
- 128MB Multimedia Card socket (SPI interface).

Program Loading:
- SPI interface for in-System programming.
- Bootloader.

Peripheral:
- 2 programmable serial ports (Dual USART).
- 8 channel A/D converter with 10 bits of resolution:
7 differential A/D chans, 2 with programmable gain x1, x10, x200.
- SPI Interface.
- 25 I/O pins.
- 4 possible PWM outputs.
- Real Time Clock with 32 KHz oscillator
- Programmable Watch-Dog.
- Internal Brown out detection.

Speed of operation:
- 4Mips max. with ceramic resonator, 8Mips max. with internal RC Oscillator.
- 4Mhz Cer. Resonator clock- frequency programmable by software.
- Internal RC Oscillator programmable up to 8Mhz.

Power Supply:
3V to 3V3, (consumes 10mA at 4Mhz).

Size: 40x30x5mm. Weight: 10 grs.

Compatibility:
- 100% Compatible one with the DmdOpen systems
- Radio Modem W868AT16M

Programming languages:
- Bascom Avr
- C
- Assembler

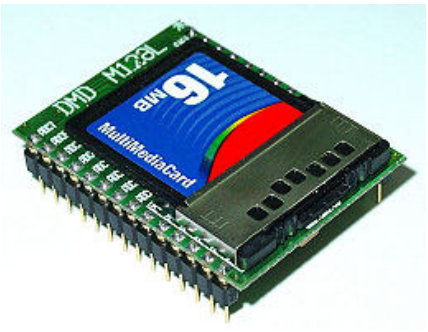
TYPICAL APPLICATIONS:

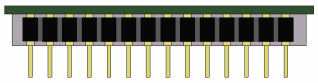
FIXED, MOBILE TERMINALS, INDUSTRIAL PDAS.
GPS. DOMESTIC, INDUSTRIAL CONTROLS, ROBOTS, ETC.

DMD
Digital Micro Devices

Dmd Open Compatible

M128LM





Size 40 x 30 x 5mm

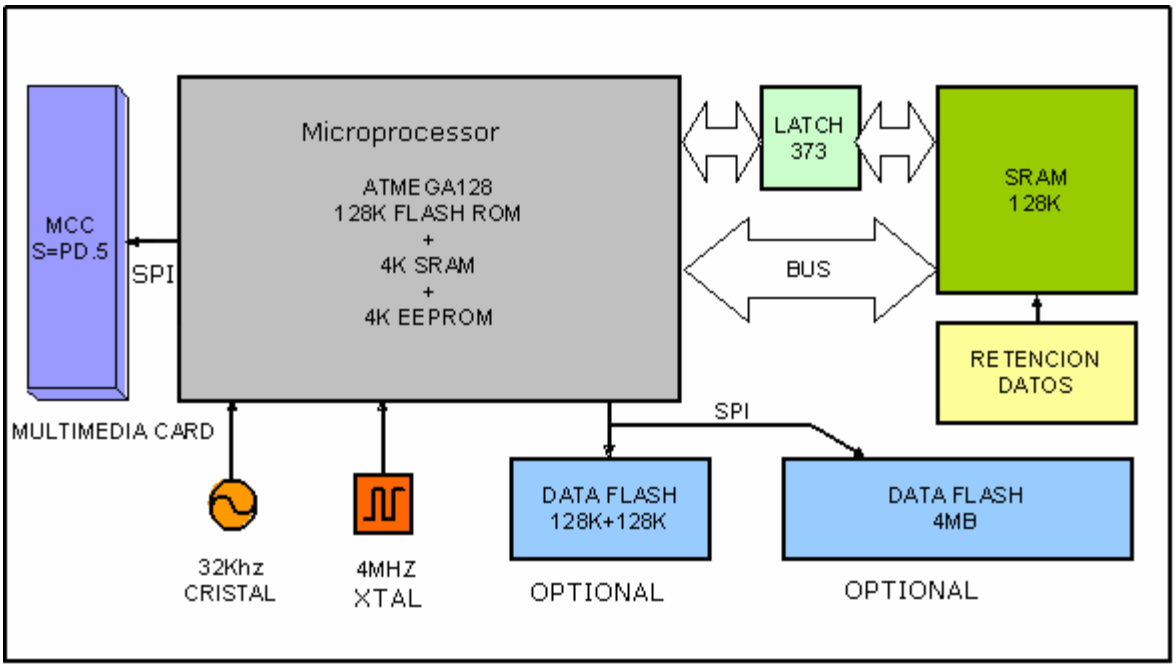
M128L is a modern microcontroller with low power consumption and small size, based on an Atmel ATmega128L from the AVR family. It also contains a 128Kb static ram and the necessary circuitry for data retention using either a 3V Lithium battery or a Supercap condenser.

Some models include a pair of 128KB Dataflash memories (Atmel AT45DB011), adding 256kb of data or a 4Mb Dataflash memory (Atmel AT45DB0321), both connected using the SPI bus.
An optional socket on the top of the board is available to hold a Multimedia Card with a capacity of between 16Mb and 128Mb, also connected using the SPI bus.

The oscillator is a 4 MHz ceramic resonator. If the micro needs to be run at a different speed, it can be accomplished using the calibrated internal RC oscillator at speeds between 1 and 8 MHz. In addition, the user program can also change the clock speed on the fly.
At 4Mhz, the microcontroller can execute a maximum of 4 MIPS, with a good combination of low power consumption and reasonable speed.

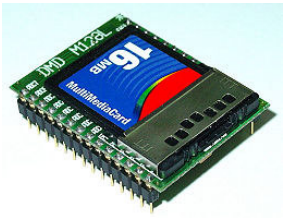
The typical Vcc power supply is 3V or 3V3, with low enough power consumption for use in portable equipment. In order to use it at 5V, a voltage regulator is needed and in some cases, adapting/ limiting the voltage on the I/O pins will be necessary. It can directly drive an LCD (which requires a Vcc of 5V) using its I/O port pins (see example circuits which follow).
In custom models, the M128L module can be supplied to work from 5V, and the crystal which is mounted can go up to 16Mhz, executing a maximum of 16 Mips.

BLOCK DIAGRAM



The goal of the Mega64L/128L family of microcontroller modules is to include large amounts of RAM/Flash memory onboard, to simplifiy the design work for technicians and engineers and allow then to get their product to market sooner and at a reasonable price.

For more information *on the AVR series of microcontrollers to go to* www.atmel.com.



A very interesting feature of this module is the possibility of connecting a **Multimedia Card** to the SPI bus, equipping it with the power and flexibility of exceptionally large data storage. Combined with the **Bascom-Avr** compiler and the **AVR-DOS** library, it can manipulate files in a powerful, simple and familiar surrounding.Port PD.5 serves as the Chip select for the MMC card.

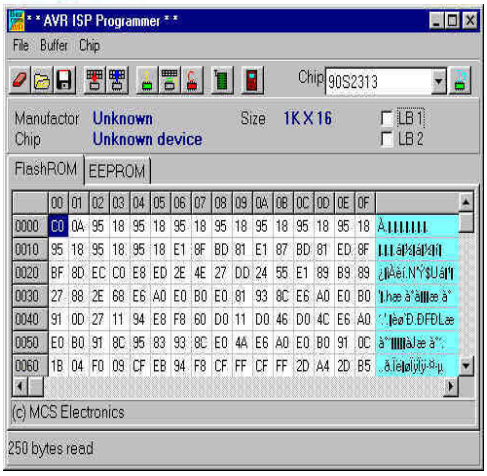
Up to 4 Mb of low-cost **DataFlash** memory, can be connected to the SPI bus, to add the potential of nonvolatile storage: very valuable to designers. Chip Select is PE.6 (single 128k or 4Mb DataFlash) and PE.7 (dual 128k DataFlash).

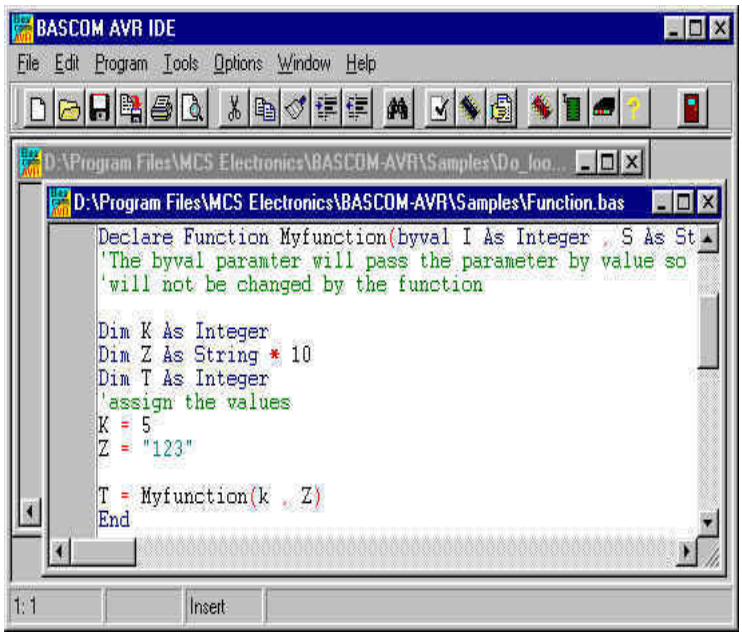
Ram memory is paged as two banks of 64k and by adding an external Supercap or a 3V battery, it becomes a non-volatile memory. RAM Chip select: PE.5=0, A16 is PE.2 (64k bank select)

Program loading is done from a PC via the SPI bus using the Atmel AVR-ISP in-system-programing routines. This can be done using a parallel port programmer.. Alternately it can be programmed serially using the onboard bootstrap program (loaded into high Flash memory). Pin 1 of the M128 CPU is the SPI Program Enable pin
The built-in Bootloader, (optional) even makes it possible to load programs under internal program control, directly via the serial port. This can be done through either a hard-wired connection or through a wireless RF device like the DMD W868AT16M, Bluetooth, GSM or GPRS. This allows for remote loading of programs which is very desirable for software developers, saving a great amount of time in remote system maintenance. The Bootloader also allows one to copy and load programs from Ram Bank 2 in a maximum of about 4 seconds.

M64L/M128L are 100% compatible with the DmdOpen platform and the W868AT16M RF module.

To program the M128L CPU quickly and easily, we recommend the MCS Electronics Bascom-AVR program, since it has a powerful user interface, Simulator, an excellent Help system, numerous examples and libraries. It is optimized for the Atmel AVR family of chips and in addition to BASIC, you can mix in assembly language when you need it.

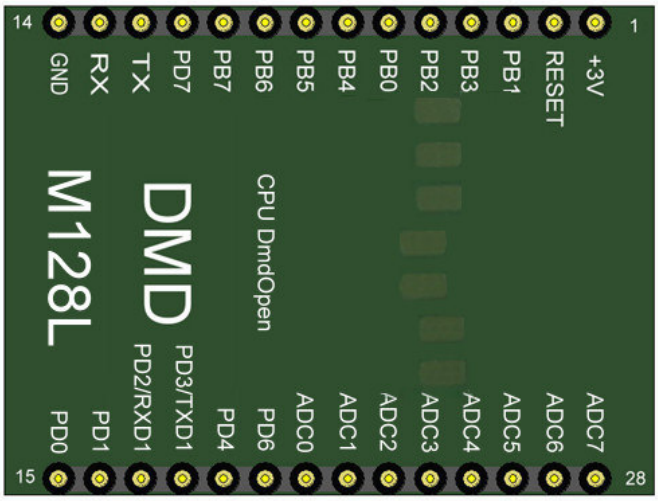


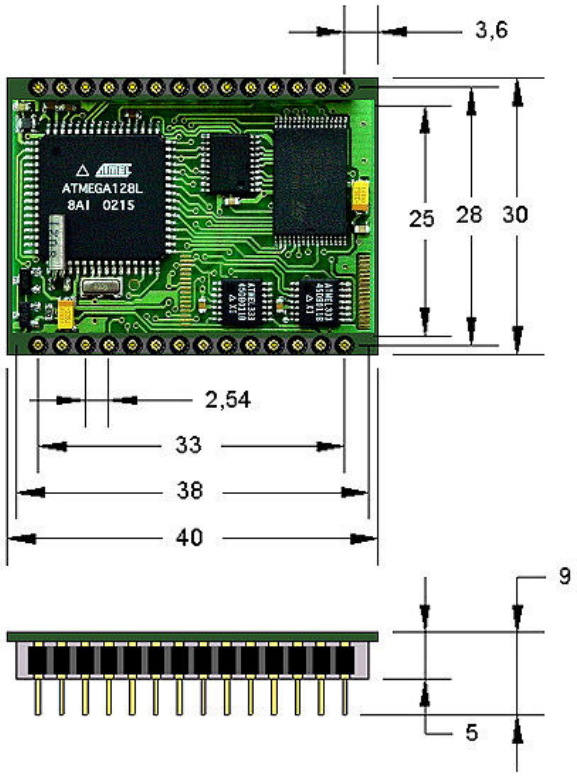


Bascom-Avr and Programmer kits, and a development Starter kit can be purchased from ***www.dmd.es*** or its authorized distributers.

Num	Name	Denomination
1	VCC	+ 3V or +3V3. Regulated power supply.
2	/RESET+BAT	Reset input. A low level for more than 20msec generates a reset. Also connection for 3V Lithium Battery for Sram battery back-up.
3	SCK/PB1	Port B bit 1. /SCK SPI BUS.
4	MISO/PB3	Port B bit 3. /MISO SPI BUS.
5	MOSI/PB2	Port B bit 2. /MOSI SPI BUS.
6	SS/PB0	Port B bit 0. /Slave Select SPI BUS.
7	PB4/PWM0	Port B bit 4. /OC0/PWM0.
8	PB5/PWM1A	Port B bit 5. /OC1A/PWM1A.
9	PB6/PWM1B	Port B bit 6. /OC1B/PWM1B.
10	PB7/PWM2	Port B bit 7. /PWM2.
11	PD7/T2	Port D bit 7. /T2.
12	TX/PE1	USART1. Transmit Output *(connect to RX of another uC or W868AT16M)* /Port E bit 1
13	RX/PE0	USART1. Receive Input (*connect to TX of another uC or W868AT16M)* /Port E bit 0
14	GND	0V. Power supply .
15	PD0/INT0	Port D bit 0. / INT0 interrupt input.
16	PD1/INT1	Port D bit 1. / INT1 interrupt input.
17	PD2/INT2/RXD1	Port D bit 2. / INT2 interrupt input /USART2. Receive input
18	PD3/INT3/TXD1	Port D bit 3. / INT3 interrupt input /USART2. Transmit Output
19	PD4/IC1	Port D bit 4. /IC1.
20	PD6/T1	Port D bit 6. /T1.
21	ADC0	Port F bit 0. Input/output. Analog input 0.
22	ADC1	Port F bit 1. Input/output. Analog input 1.
23	ADC2	Port F bit 2. Input/output. Analog input 2.
24	ADC3	Port F bit 3. Input/output. Analog input 3.
25	ADC4	Port F bit 4. Input/output. Analog input 4.
26	ADC5	Port F bit 5. Input/output. Analog input 5.
27	ADC6	Port F bit 6. Input/output. Analog input 6.
28	ADC7	Port F bit 7. Input/output. Analog input 7.

DIMENSIONS (mm):





TECHNICAL SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS

Supply Voltage (Vcc to GND).....	-0.5 to +3.7 Volts.
Voltage on any pins except –RESET …….....	-0.5 to Vcc+0.5.
DC Current per I/O pin…….…….....	40 mA.
DC Current Vcc and GND pins….....	200 mA.
Storage temperature.....	-25 to +80º C.
Operating temperature.....	-15 to +55º C.

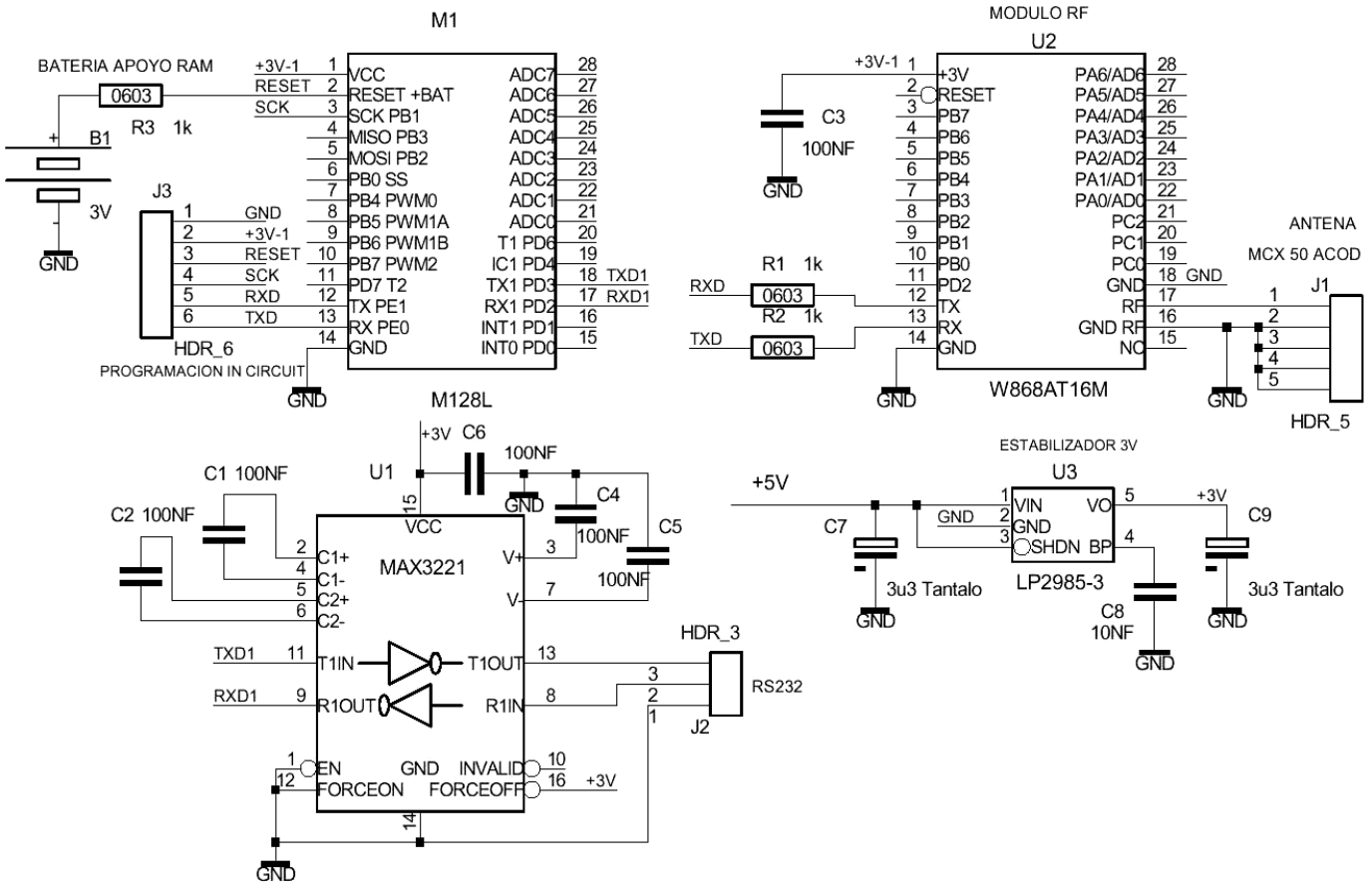
Ambient temperature = 20º Celsius Supply Voltage Vcc = 3.0 Volts.

	SPECIFICATION				
PARAMETER	**MIN**	**TYPICAL**	**MAX**	**UNITS**	**CONDITION / NOTE**
Power Supply					
Supply Voltage	2.85	3.0	3.6	V	
Supply Current	5	6	10	mA	
Supply Current Vcc and GND pins			150	mA	
Time Power On	64	80	100	mS	
Suplply Voltaje for reset	2.6	2.7	2.8	V	
Dc Current +Bat	2	4	5	uA	For Data Retention
Port Section					The sum of IOL, for all ports < 400mA
Input Low Voltage	-0.5	0	0.3Vcc	V	
Input High Voltage	0.6Vcc	3	0.1Vcc	V	
Output Low Voltage			0.5	V	IOL=10mA, Vcc=3V
Output High Voltage	2.2			V	IOL=-10mA, Vcc=3V
Input Low Leakage Current I/O pin			8	uA	Vcc=3V, pin low (absolute Value)
Input High Leakage Current I/O pin			8	uA	Vcc=3V, pin high (absolute Value)
Reset Pull-Up Resistor	30		100	KΩ	
Pen Pull-Up Resistor	25		100	KΩ	
I/O Pin Pull-Up Resistor	33		122	KΩ	
A/D Section					
A/D resolution		10		Bits	Single Ended conversion
“		8		Bits	Differential conversion Gain x1 to x20
“		7		Bits	Differential conversion Gain x200
A/D Absolute Accuracy		1		LSB	Single Ended conversion
A/D Non-Linearity		0.5		LSB	
A/D Zero error (offset)		1		LSB	
A/D Internal Voltage reference		2.56		V	Internal reference
A/D Input Voltage	0		2.56	V	
A/D Conversion time	65		260	uS	

NOTES

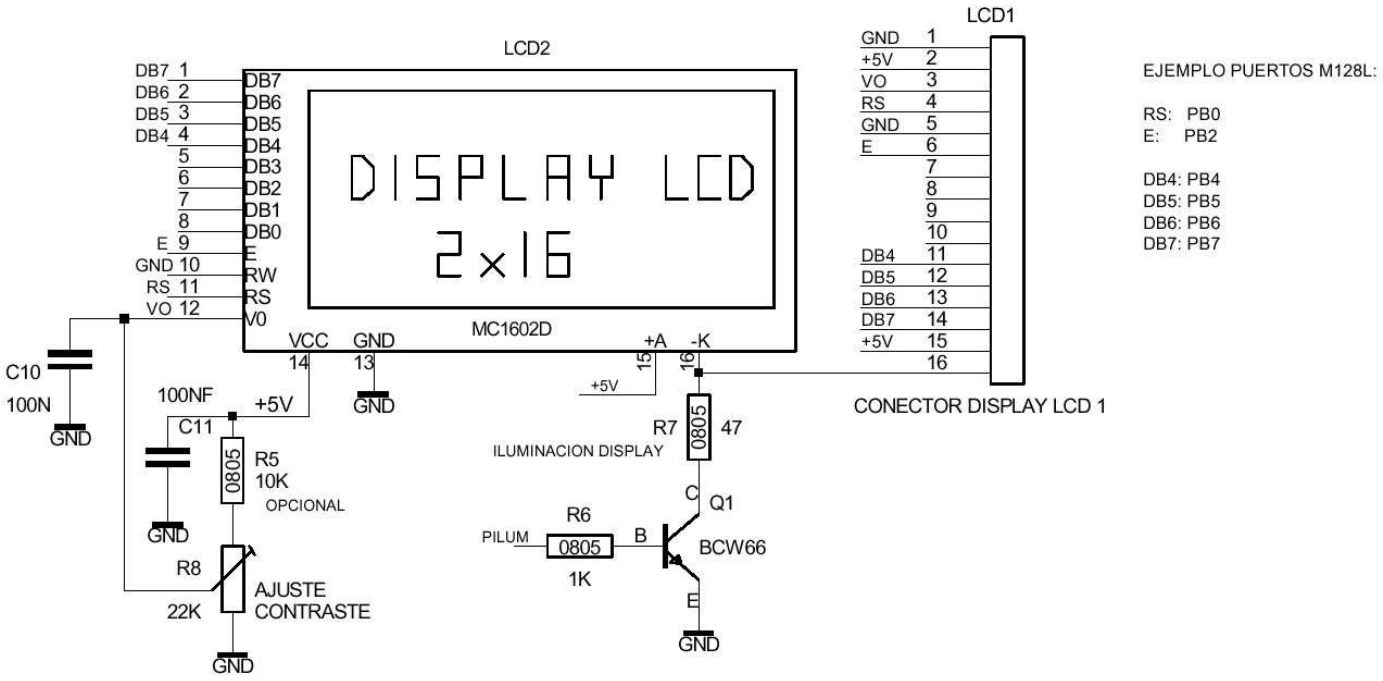
1. ATMEGA128L microcontroller information-, www.atmel.com .

EXAMPLE: CONNECTION to SPI program loader, RS232 level converter and RF Module :



EXAMPLE: INTERFACE WITH 2X16 LCD DISPLAY:

Note: M128L module requires 3V-3V3 and LCD display requires 5V.



CONSIDERATIONS REGARDING MEMORY ACCESS:

External 128k byte sram:

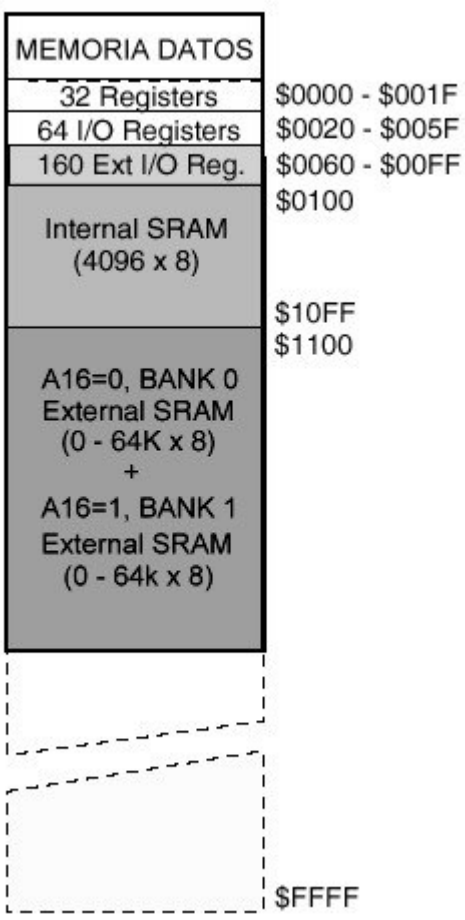
M64L and M128L have a 128K byte static ram memory that can be made nonvolatile connecting a 3V battery (CR2020) or Supercap condensor of 0.5 Farads between GND and the Reset+BAT pin through a 10K resistor. (this pin is shared with the reset signal, which is also used for ISP program loading via SPI bus.

If the application does not require data retention during power interruption, then the battery is not needed.

In some cases, when data retention for a few minutes only is sufficient, it can be accomplished using a 470 uF/6.3V condenser or greater connected to the RESET /BAT pin through a 10K resistor (as in the case of the battery). A 1 to 10K resistor, connected to Vcc, is needed to charge the capacitor.

Ram memory is connected to the microcontroller bus through a '373 latch and is addressable as two banks of 64k using port PE.2 as the A16 address line.

When PE.2=0,bank 0 is selected. If PE.2=1 bank 1 is selected.



Port PE.5 is the sram Chip Select and must be set to "0" to access the sram.. A "1" prevents sram memory access and lowers power consumption.. It is good practice when not using ram, to deselect it, to protect against execution of erratic code by the microcontroller.

Note that the first 4K of ram always is located within the microcontroller's internal 4K ram block, so the first 4K of external ram memory will never be written to/read from. This is useful, since swapping data between the two 64K banks requires a buffer if one is using Bascom-AVR without assembly language routines. This internal 4K ram space can be used as this buffer.

DataFlash 256k bytes:

The M128LDF256 and M64LDF256 modules incorporate two Atmel AT45DB011DataFlash memory chips (128Kb), adding 256k bytes of additional nonvolatile data memory.

They are connected to the SPI bus . This bus can also be used to access other external devices, by using different port pins for a Chip Enable for each device. To select one of the two DataFlash memories it, you must assert a "0" on the following port pin.

Chip Enable PE.6 selects first 128K DataFlash and PE.7 selects the second 128K DataFlash.

These memory devices are also connected to port PE.4: /RST (Reset) and to port PE.3: /WP (Write Protect).

For more information see www.atmel.com.

DataFlash 4M bytes:

The M128LDF4M and M64LDF4M modules incorporate an Atmel AT45DB321 4Mb DataFlash memory chip.

It is connected to the SPI bus. In order to select this Dataflash memory, you must assert a "0" on port PE.6, its Chip Enable pin.

.

This memory is also connected to port PE.4: /RST (Reset) and port PE.3: /WP (Write Protect).

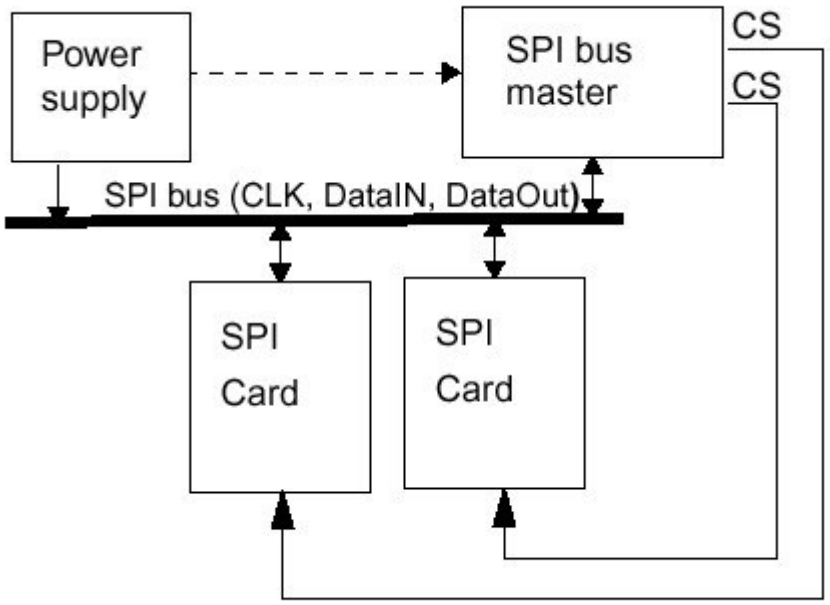
For more information see www.atmel.com.

CONSIDERATIONS REGARDING MULTIMEDIA CARD ACCESS:

Multimedia Card:

The modules contain a socket on the top of the PC board to host a Multimedia card with a capacity of 16, 32, 64 or 128Mbytes.

It is connected to the SPI bus. This bus is also used to access the on-board Data Flash as well as optional, external devices, like additional Multimedia cards, by using separate Chip Enable lines for each device.
To select the onboard Multimedia Card socket, port PD.5 is used.



Pin #	SPI Mode		
	Name	Type	Description
1	CS	I	Chip Select (neg true)
2	DI	I/PP	Data In
3	VSS	S	Supply voltage ground
4	VDD	S	Supply voltage
5	SCLK	I	Clock
6	VSS2	S	Supply voltage ground
7	DO	O/PP	Data Out

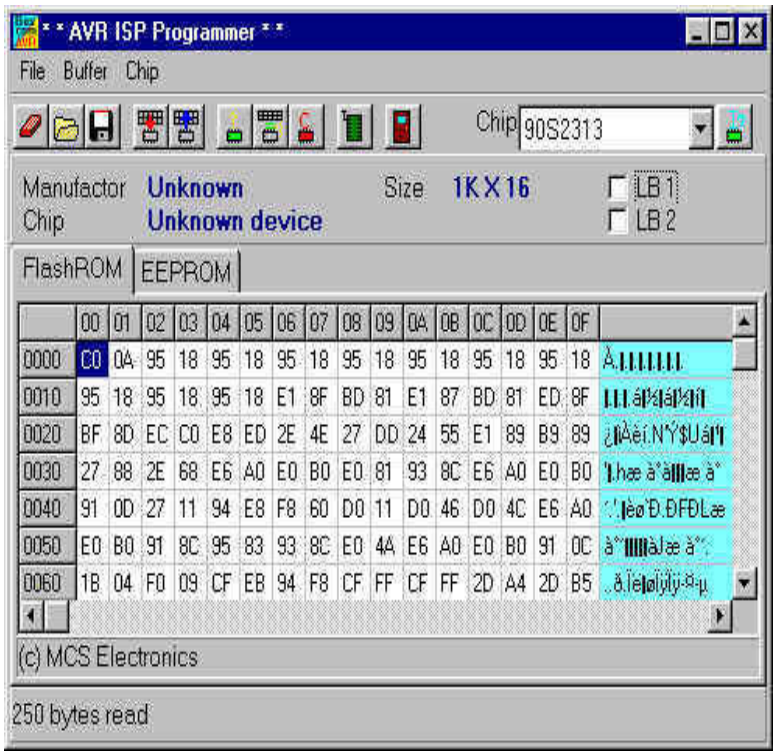
SPI interface pin configuration

1)S: power supply; I: input; O: output; PP: push-pull;
OD: open-drain; NC: Not connected (or logical high)

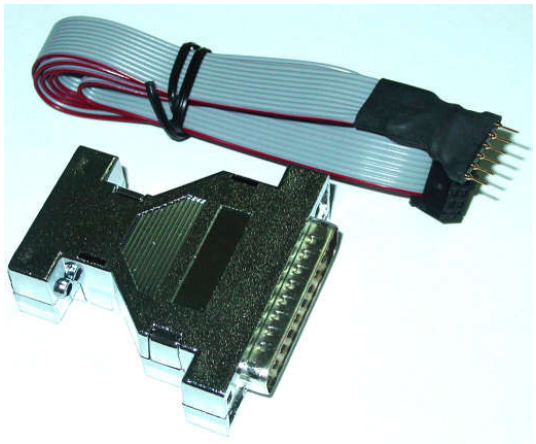
ISP PROGRAM LOADING:

SPI Bus ISP:

All versions of M64L and M128L allow loading application programs by means of the SPI bus using pins GND, +3V, RESET, SCK, RXD and TXD.



Program Loading can be accomplished from a PC's COM port, with the Atmel AVR-ISP and Atmel's program loading software. This programmer is designed for development and prototypes.



Another interesting option is to use an AVR-ISP Parallel Port programmer and software available in **Bascom-AVR** by **MCS Electronics**, as shown in adjacent images. This programmer is adapted for development. The schematic diagram of this programmer can be found in the Bascom-AVR Help files.

Bootloader (optional)**:**

It's even possible to load programs from within your own firmware (using pin 1 of the M128 CPU), either directly or through RF devices such as DMD's W868AT16M, Bluetooth, GSM or GPRS. This allows for remote program loading/updating which is very useful to software developers, as it saves a great amount of time in remote maintenance of the system. The Bootloader also allows one to copy/load program code from bank 2 of the ram, in about 4 seconds at most.

VERSION NOTES, BUGS AND IMPROVEMENTS:

Present version April 2004:1.0 *b* ***no known bugs*.**

V:1.0a 1-1-2004:

Engineering prototypes.

V:1.0b 1-3-2004:

Improvements:
Changes and improvements to initial printed circuit board.
Serial port Bootloader and Sram copy. Optional at the moment .

Rev:1.0: Initial data sheet, Preliminary information.

NOTE: Even though the SPI Programming interface re-uses the SPI I/O module, there is one important difference: The MOSI/MISO pins that are mapped to PB2 and PB3 in the SPII/O module are not used in the Programming interface. Instead, PE0 and PE1 are used for data in SPI Programming mode, for MOSI and MISO respectively. This is the case for the normal Mega128 too.

Digital Micro Devices

Dmd Open Compatible

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