OLIMEX

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AVR-MT128 development board
Users Manual

INTRODUCTION:

AVR-MT128 is simple but powerful board which uses the MCU ATMega128 from Atmel. With its LCD, buttons, relay and variety of interfaces such as RS232 (in two variants – 4 pins and DB9), JTAG, ISCP, Dallas, etc. this board is suitable for different embedded systems applications.

BOARD FEATURES:

- MCU: **ATMega128-16AI** with128K Bytes Program Flash, 4K Bytes data EEPROM, 4K Bytes RAM
- JTAG connector for in-circuit programming and debugging with AVR-JTAG
- ICSP 5x2 (10) pin STKxxx compatible connector for in-circuit programming with AVR-PG1B or AVR-PG2B
- RS232 connector with TTL levels
- RS232 interface circuit with Tx, Rx signals
- RS232 DB9 female connector
- Dallas touch button port
- Frequency input
- LCD 16x2 display
- Status LED
- Five buttons
- Buzzer
- Power supply circuit +5V, 78L05 with plug-in power jack and diode bridge
- 32 768 Hz oscillator crystal
- 16 MHz crystal oscillator
- Power supply filtering capacitor
- RESET supervisor IC ZM33064
- RELAY with 10A/250VAC NO and NC contacts with screw terminals
- Extension headers for unused in the schematic ports available for external connection
- PCB: FR-4, 1.5 mm (0,062"), green soldermask, white silkscreen component print
- Four mounting holes 3.3 mm (0.13")
- Dimensions: 120x38 mm (4.7x1.5")

ELECTROSTATIC WARNING:

The AVR-MT128 board must not be subject to high electrostatic potentials. General practice for working with static sensitive devices should be applied when working with this board.

BOARD USE REQUIREMENTS:

Cables: RS232 straight male-to-female DB9 cable (Note: this is not a null modem cable)

Hardware: Programmer: AVR-PG1, AVR-PG2, AVR-ISP500, AVR-ISP500-TINY, AVR-ISP500-ISO or other compatible tool;
Debugger: AVR-JTAG, AVR-JTAG-USB or other compatible tool;

Software: AVR Studio + WinAVR – free C compiler and debugger can be downloaded at avrfreaks.org web site. IAR IW for AVR is a commercial software for development of embedded systems software.
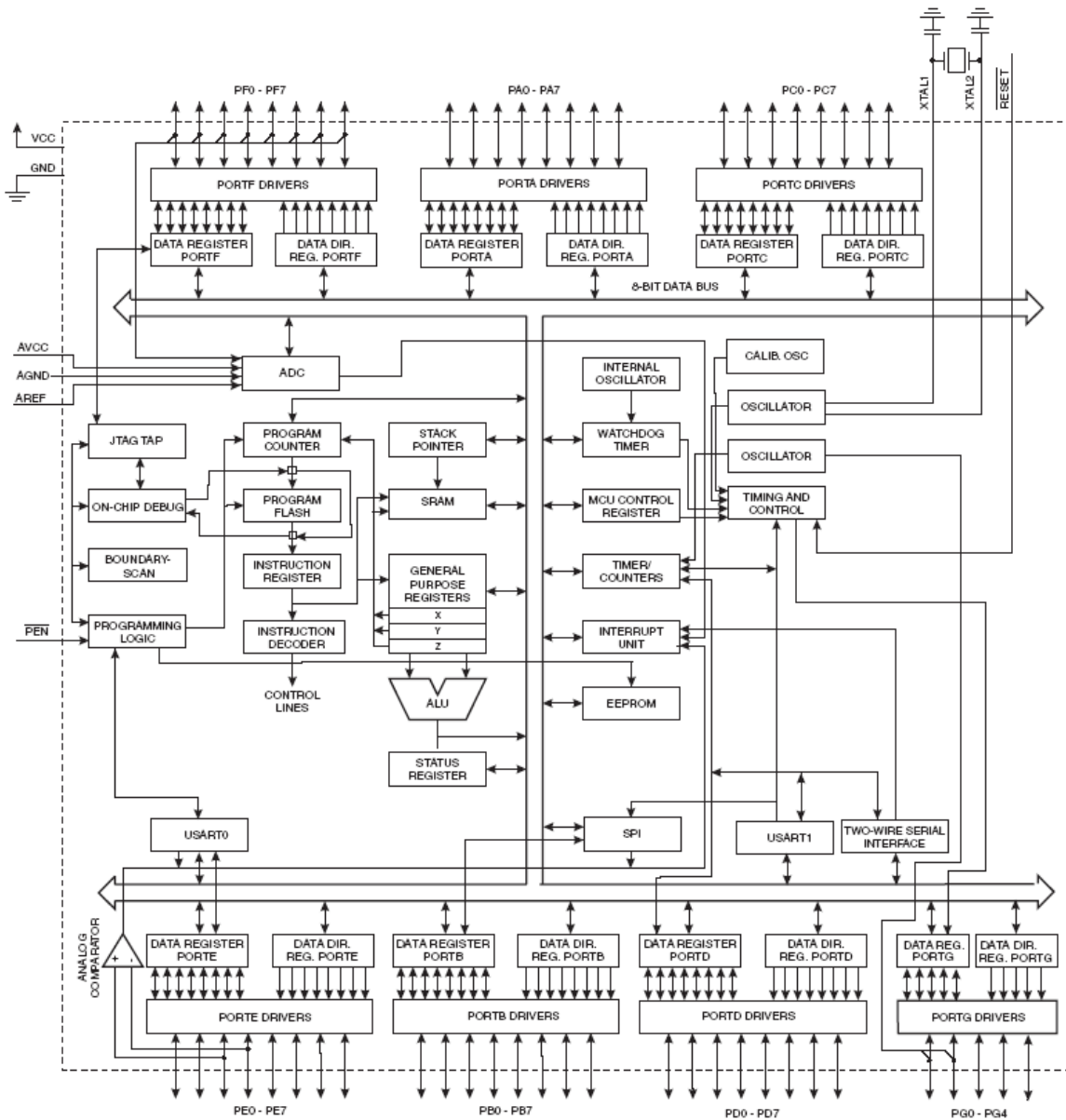
PROCESSOR FEATURES:

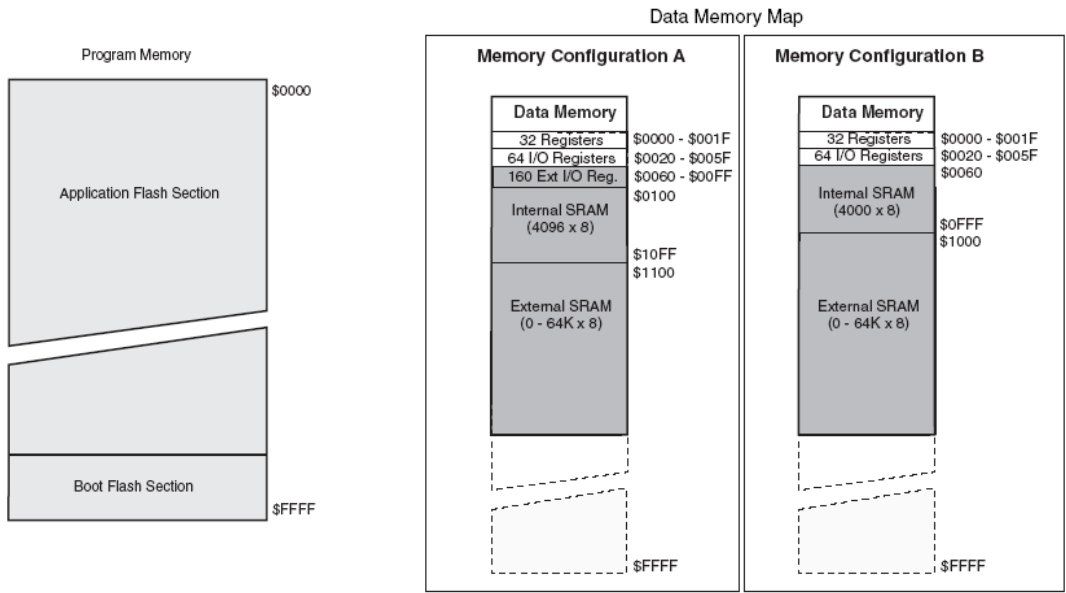**AVR-MT128** uses ATMega128 MCU from Atmel with the following features:
- High-performance, Low-power AVR® 8-bit Microcontroller
- Advanced RISC Architecture
    - 133 Powerful Instructions – Most Single Clock Cycle Execution
    - 32 x 8 General Purpose Working Registers + Peripheral Control Registers
    - Fully Static Operation
    - Up to 16 MIPS Throughput at 16 MHz
    - On-chip 2-cycle Multiplier
      Nonvolatile Program and Data Memories
    - 128K Bytes of In-System Reprogrammable Flash
      Endurance: 10,000 Write/Erase Cycles
    - Optional Boot Code Section with Independent Lock Bits
      In-System Programming by On-chip Boot Program
      True Read-While-Write Operation
    - 4K Bytes EEPROM
      Endurance: 100,000 Write/Erase Cycles
    - 4K Bytes Internal SRAM
    - Up to 64K Bytes Optional External Memory Space
    - Programming Lock for Software Security
    - SPI Interface for In-System Programming
- 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 Lock Bits through the JTAG Interface
- Peripheral Features
    - Two 8-bit Timer/Counters with Separate Prescalers and Compare Modes
    - Two Expanded 16-bit Timer/Counters with Separate Prescaler, Compare Mode and Capture Mode
    - Real Time Counter with Separate Oscillator
    - Two 8-bit PWM Channels
    - 6 PWM Channels with Programmable Resolution from 2 to 16 Bits
    - Output Compare Modulator
    - 8-channel, 10-bit ADC
      8 Single-ended Channels
      7 Differential Channels
      2 Differential Channels with Programmable Gain at 1x, 10x, or 200x
    - Byte-oriented Two-wire Serial Interface
    - Dual Programmable Serial USARTs
    - Master/Slave SPI Serial Interface
    - Programmable Watchdog Timer with On-chip Oscillator
    - On-chip Analog Comparator
- Special Microcontroller Features
    - Power-on Reset and Programmable Brown-out Detection
    - Internal Calibrated RC Oscillator
    - External and Internal Interrupt Sources

- o Six Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, Standby, and Extended Standby
- o Software Selectable Clock Frequency
- o ATmega103 Compatibility Mode Selected by a Fuse
- o Global Pull-up Disable
- – I/O and Packages
  - o 53 Programmable I/O Lines
  - o 64-lead TQFP and 64-pad MLF
- – Operating Voltages
  - o 4.5 - 5.5V for ATmega128
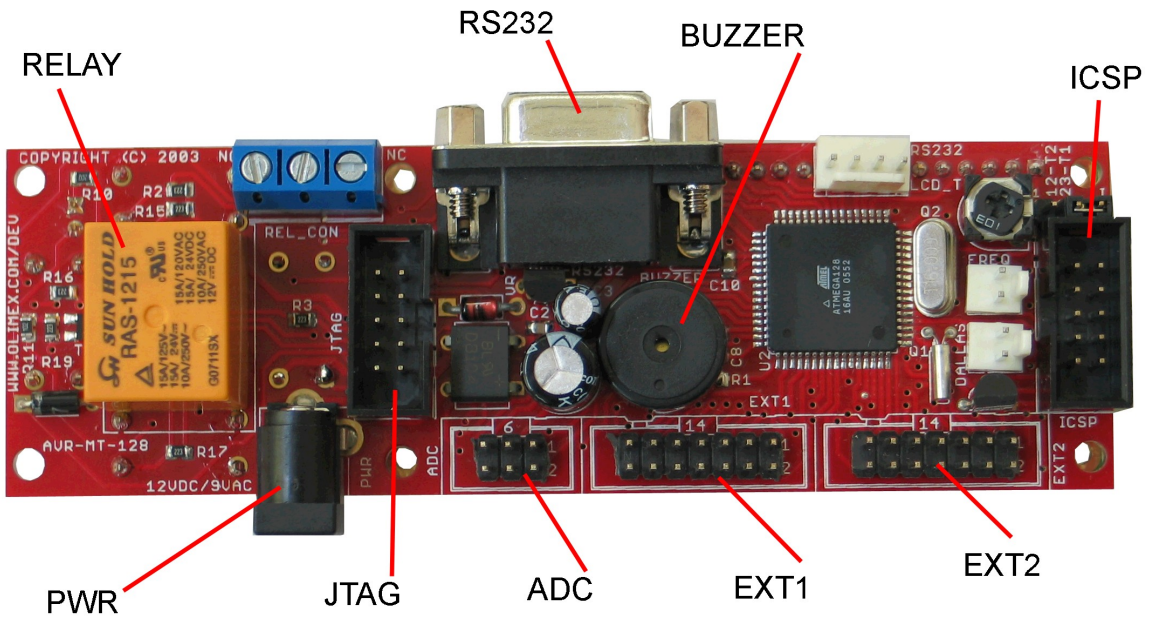- – Speed Grades
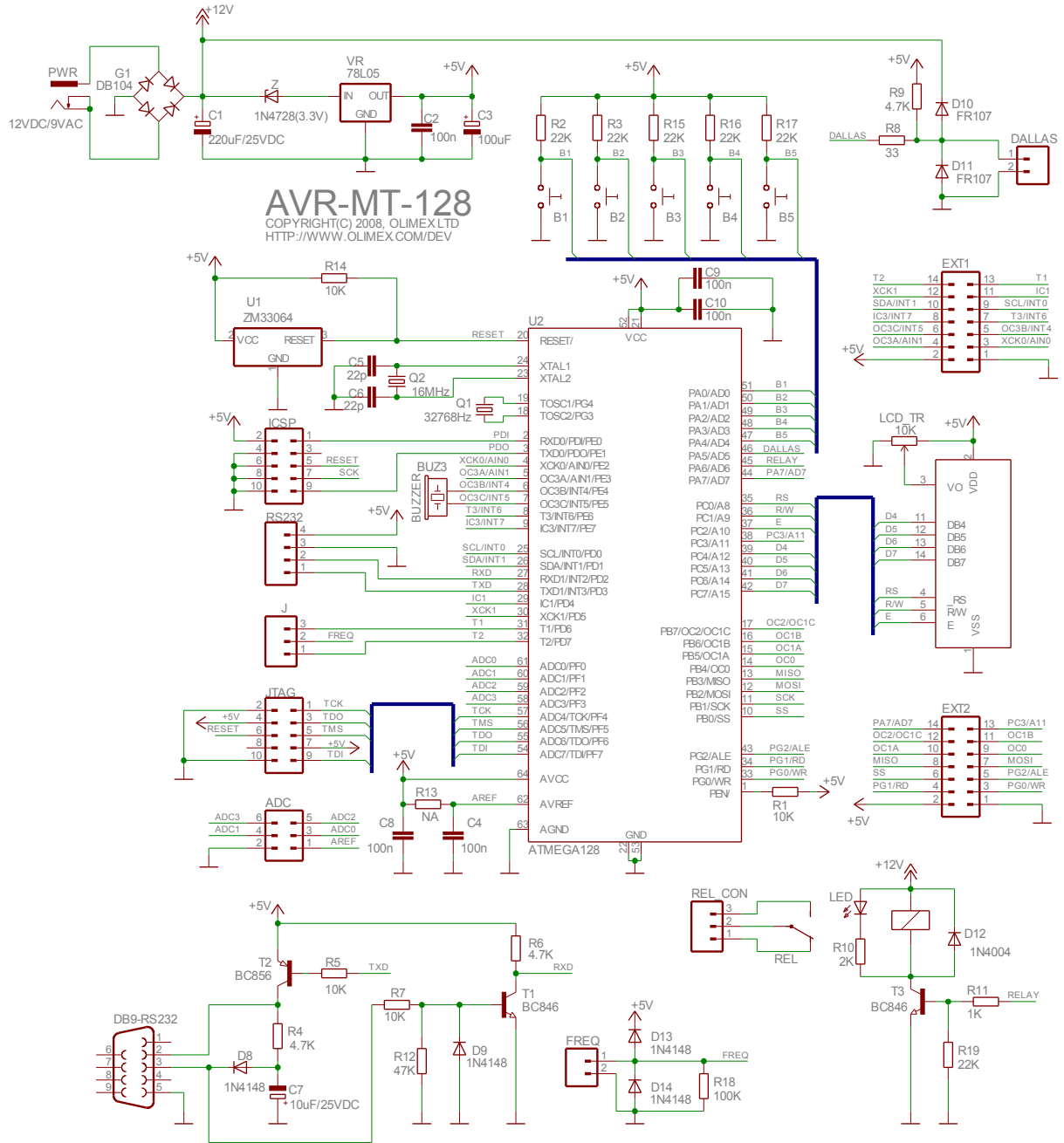 - o 0 - 16 MHz for ATmega128

BLOCK DIAGRAM:

MEMORY MAP:

Program Memory

$0000

Application Flash Section

Boot Flash Section

$FFFF

Data Memory Map

Memory Configuration A

Data Memory

32 Registers	$0000 - $001F
64 I/O Registers	$0020 - $005F
160 Ext I/O Reg.	$0060 - $00FF
	$0100
Internal SRAM (4096 x 8)	
	$10FF
	$1100
External SRAM (0 - 64K x 8)	

$FFFF

Memory Configuration B

Data Memory

32 Registers	$0000 - $001F
64 I/O Registers	$0020 - $005F
	$0060
Internal SRAM (4000 x 8)	
	$0FFF
	$1000
External SRAM (0 - 64K x 8)	

$FFFF

BOARD LAYOUT:

RELAY

RS232

BUZZER

ICSP

PWR

JTAG

ADC

EXT1

EXT2

SCHEMATIC:

AVR-MT-128
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HTTP://WWW.OLIMEX.COM/DEV

POWER SUPPLY CIRCUIT:

The power supply of AVR-MT128 is taken from Power jack connector. You should apply 9 VAC or +12 VDC at the positive central pin.
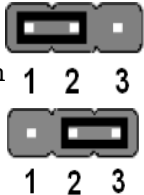The consumption of the board is about 30 mA.

RESET CIRCUIT:

AVR-MT128 reset circuit is made with ZM33064 with typical threshold 4.5V. When the voltage falls bellow that minimum, the MSU resets.

CLOCK CIRCUIT:

Quartz crystal 16MHz for maximum performance is connected to ATMega128 pin 23 (XTAL2) and pin 24 (XTAL1).
Additional 32 768 Hz tact generator is connected to ATMega128 pin 18 (TOSC2/PG3) and pin 19 (TOSC1/PG4) and supplies the Real Time Clock.

JUMPER DESCRIPTION:

J

pin 31 frequency pin connected to

This jumper supplies the input user frequency FREQ to either (T1/PD6) or pin 32 (T2/PD7). When 1-2 is shorted the input is connected to T2. When 2-3 is shorted the input frequency pin is T1.

Default state is 1-2 shorted.

INPUT/OUTPUT:

Status LED (red) connected to the relay.
Relay with name **REL** connected to ATMega128 pin 45 (PA6/AD6).
Trimmer LED_TR connected to the LCD.
Liquid crystal display.
Buzzer with name **BUZZ** connected to ATMega128 pin 6 (OC3B/INT4/PE4) and pin 7 (OC3C/INT5/PE5).
User button B1 connected to ATMega128 pin 51 (PA0/AD0).
User button B2 connected to ATMega128 pin 50 (PA1/AD1).
User button B3 connected to ATMega128 pin 49 (PA2/AD2).
User button B4 connected to ATMega128 pin 48 (PA3/AD3).
User button B5 connected to ATMega128 pin 47 (PA4/AD4).

CONNECTOR DESCRIPTIONS:

JTAG:

Pin #	Signal Name
1	TCK
2	GND
3	TDO
4	+5V
5	TMS
6	RESET
7	+5V
8	NC
9	TDI
10	GND
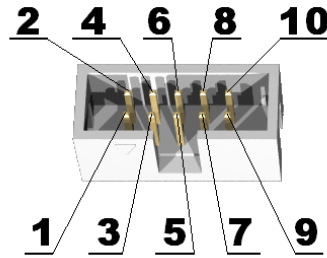
This connector allows programming and debugging via AVR-JTAG or other compatible tools.

**TDI**   Input   **Test Data In**. This is the serial data input for the shift register.
TDO   Output**Test Data Out**. This is the serial data output for the shift register. Data is shifted out of the device on the negative edge of the TCK signal.
TMS   Input   **Test Mode Select**. The TMS pin selects the next state in the TAP state machine.
TCK   Input   **Test Clock**. This allows shifting of the data in, on the TMS and TDI pins. It is a positive edge triggered clock with the TMS and TCK signals that define the internal state of the device.

ICSP:

Pin #	Signal Name
1	PDI
2	+5V
3	NC
4	GND
5	RST
6	GND
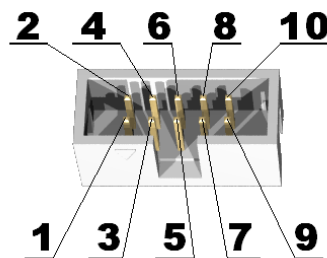
Pin #	Signal Name
7	SCK
8	GND
9	PDO
10	GND

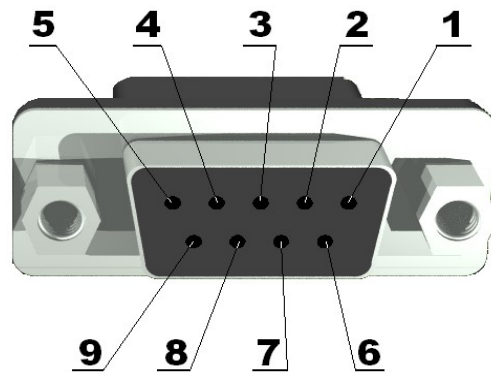This connector allows programming via AVR-PG1, AVR-PG2 or other compatible tool.

PDI Input **Program Data In.** This pin is serial data input for the MCU.
PDO Output **Program Data Out.** This pin is serial data output from the MCU.
SCK I/O   **Serial (Synchronization) Clock.** This is the synchronization signal.

DB9-RS232:

Pin #	Signal Name
1	NC
2	TXD
3	RXD
4	NC
5	GND
6	NC
7	NC
8	NC
9	NC

TXD Output **Transmit Data.** This is the asynchronous serial data output for the RS232 interface.
RXD Input **Receive Data.** This is the asynchronous serial data input for the RS232 interface.

RS232:

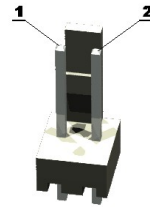| Pin #	Signal Name
1	TXD
2	RXD
3	GND
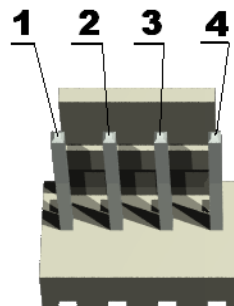
4	+5V

RELAY CONNECTOR:

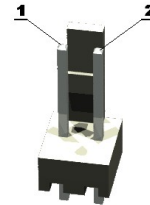This connector provides the user with access to the contact plates of the relay.

FREQ:

Pin #	Signal Name
1	FREQ
2	GND

External input frequency is applied at pin 1.

DALLAS:

Pin #	Signal Name
1	DALLAS
2	GND

Signal from Dallas chips is applied at pin 1 of the Dallas interface.

ADC:

Pin #	Signal Name
1	AREF
2	GND
3	ADC0
4	ADC1
5	ADC2
6	ADC3
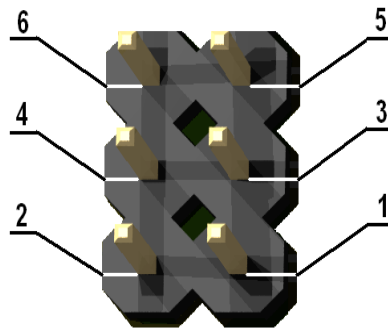
Some of the Analog to Digital Converter signals are grouped into an extension.

EXT1:

Pin #	Signal Name
1	GND
2	+5V
3	XCK0/AIN0
4	OC3A/AIN1
5	OC3B/INT4
6	OC3C/INT5
7	T3/INT6
8	IC3/INT7
9	SCL/INT0
10	SDA/INT1
11	IC1
12	XCK1
13	T1
14	T2
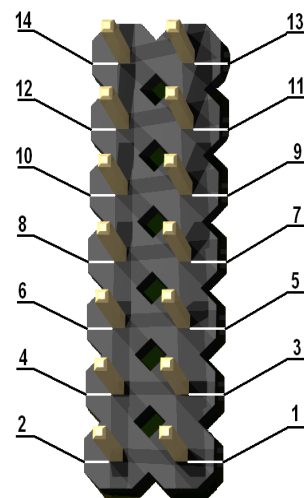
EXT2:

Pin #	Signal Name
1	GND
2	+5V
3	PG0/WR
4	PG1/RD
5	PG2/ALE
6	SS
7	MOSI
8	MISO
9	OC0
10	OC1A
11	OC1B
12	OC2/OC1C
13	PC3/A11
14	PA7/AD7
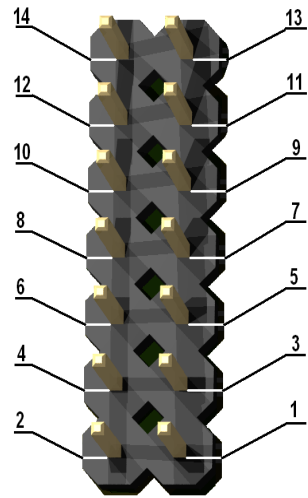
PWR:

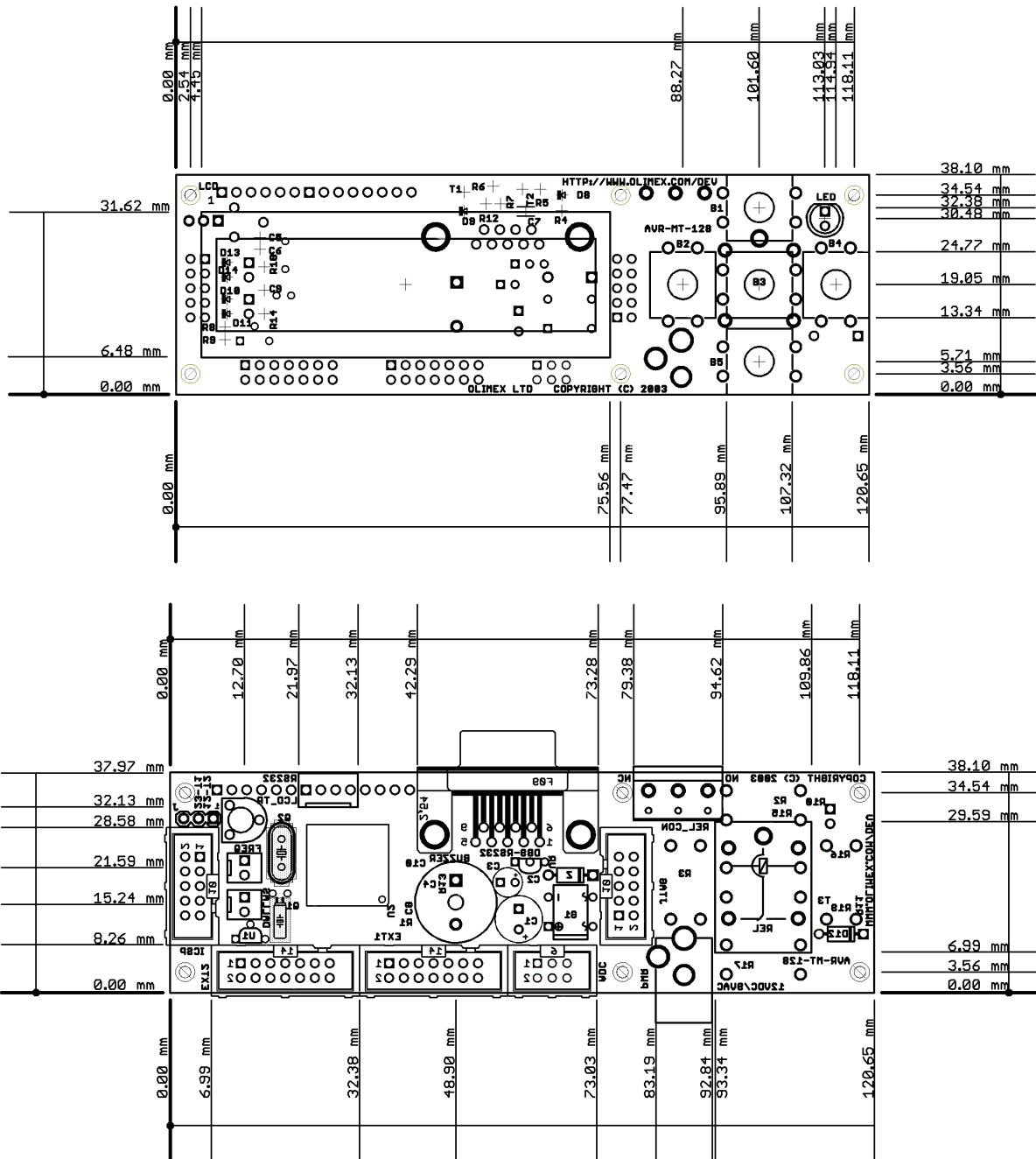| Pin #	Signal Name
1	PWR
2	GND
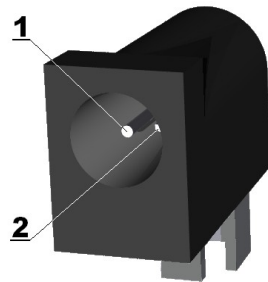
You should apply 9 VAC or +12VDC on pin 1.

MECHANICAL DIMENSIONS:

All measures are in mm.

AVAILABLE DEMO SOFTWARE:

Check for available demo software for **AVR-MT128** on our website:
www.olimex.com/dev.

ORDER CODE:

AVR-MT128 – assembled and tested (no kit, no soldering required)

How to order?
You can order to us directly or by any of our distributors.
Check our web www.olimex.com/dev for more info.

 All boards produced by Olimex are ROHS compliant