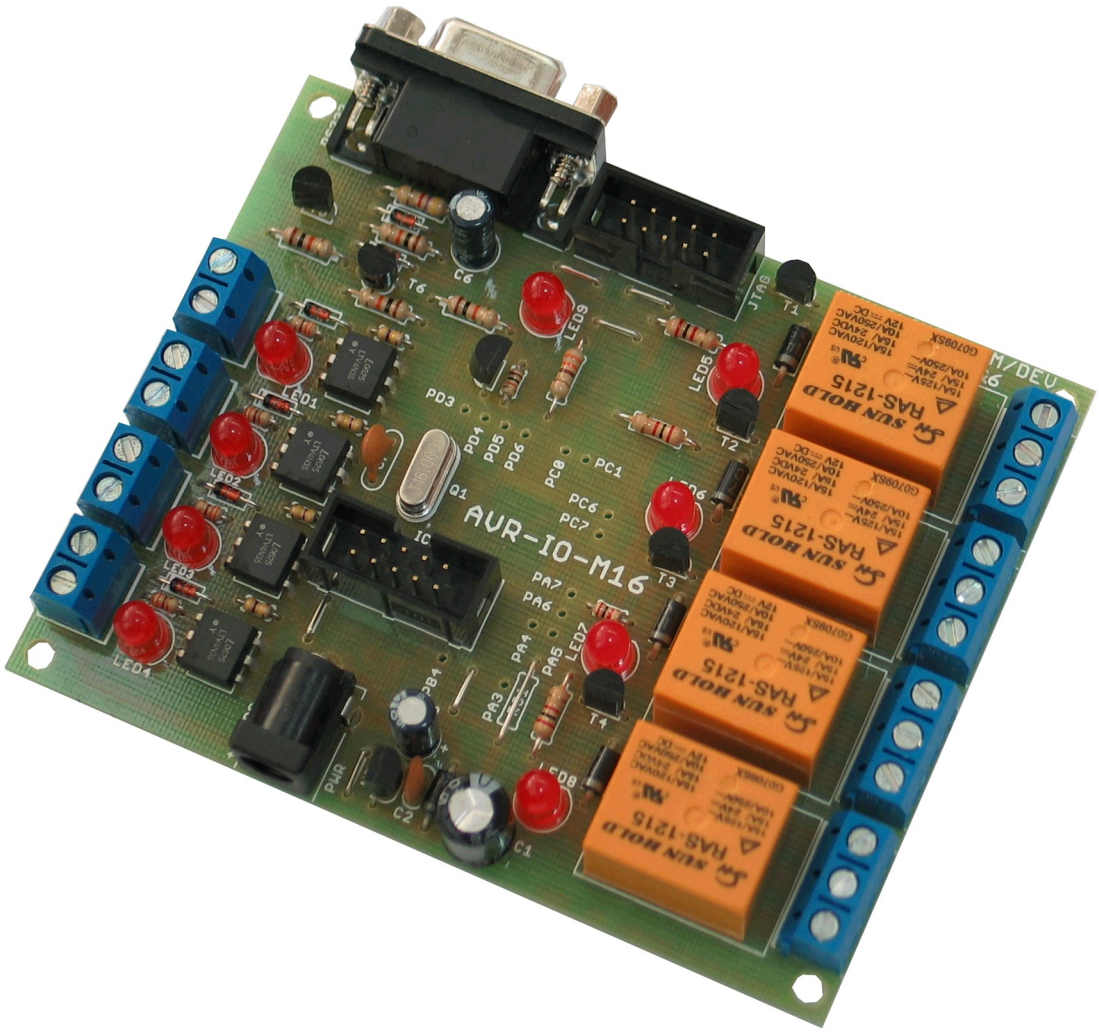


AVR-IO-M16 development board

Users Manual

Rev.A, July 2008

INTRODUCTION:

AVR-IO-M16 is small but powerful board, perfect for small automation projects.
The board has four Relays with 10A/250VAC current switching capabilities, four opto-isolated digital inputs and RS232 port. One of our demo software shows how easy it is to control the inputs and output by PC computer through the RS232 port.

BOARD FEATURES:

- ATMega16-16AI AVR microcontroller
- ICSP 5x2 pin connector for In-Circuit Programming with AVR-PG1, AVR-PG2, AVR-ISP500, AVR-ISP500-TINY, AVR-ISP500-ISO or other compatible to 10 pin ICSP layout
- JTAG 5x2 pin connector for in-circuit programming with AVR-JTAG, AVR-JTAG-USB or other compatible to 10 pin JTAG layout
- Status LED
- Reset IC ZM33064
- Quartz crystal oscillator circuit 16MHz
- Voltage regulator +5V, 7805 and filtering capacitors
- Power plug-in jack
- RS232 DB9 female connector , RS232 and interface circuit with Tx, Rx signals
- 4 optocoupler isolated inputs with screw terminals
- Input status LEDs
- 4 relay outputs with 5A/250VAC contacts with screw terminals
- Output status LEDs
- One user status LED
- Four mounting holes 3.3 mm (0.13")
- FR-4, 1.5 mm (0.062"), green soldermask, white silkscreen component print
- Dimensions 80x100 mm (3.9 x 3.15")

ELECTROSTATIC WARNING:

The AVR-IO-M16 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

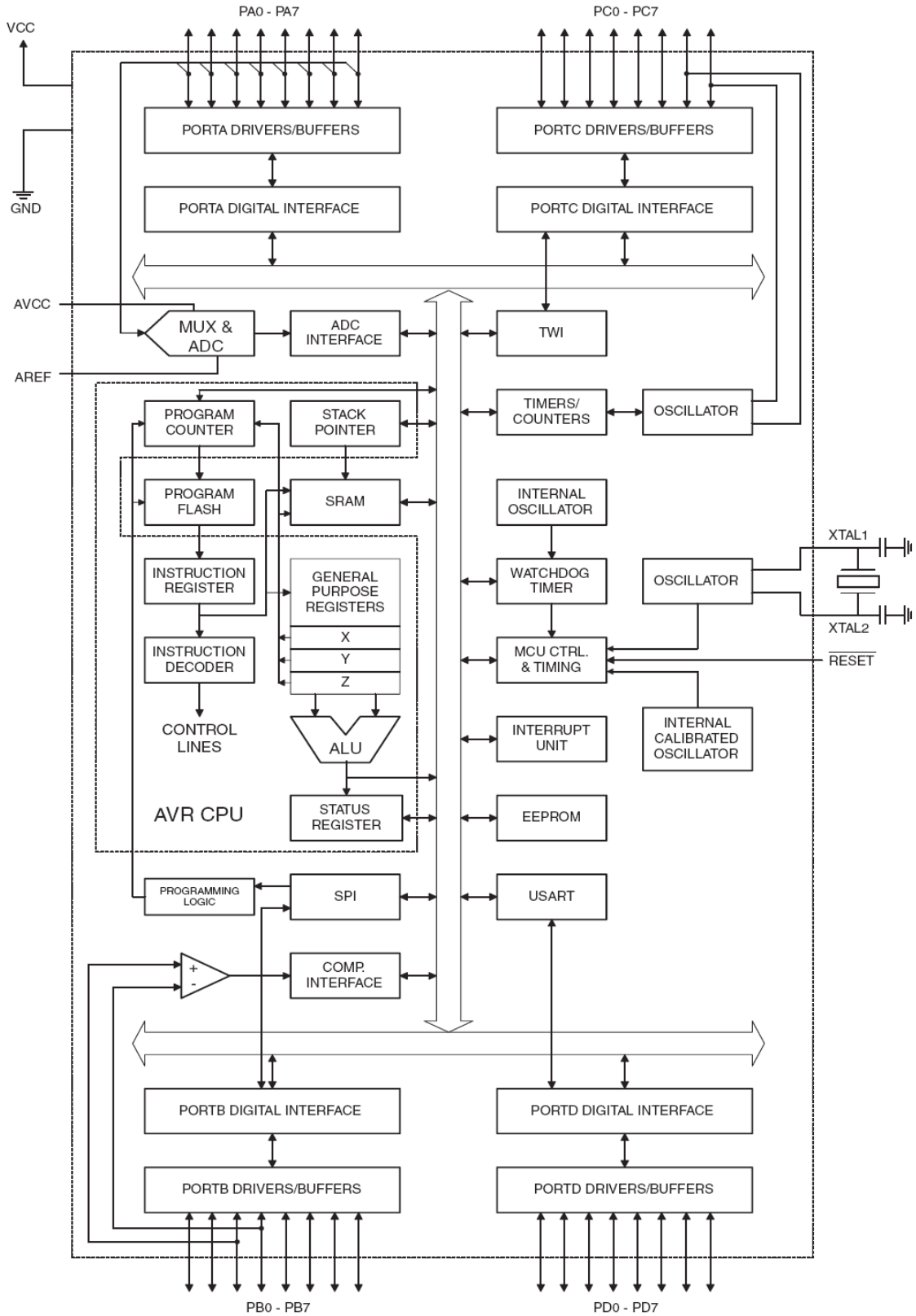
PROCESSOR FEATURES:

AVR-IO-M16 uses ATMega16 MCU from Atmel with the following 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
- Fully Static Operation
- Up to 16 MIPS Throughput at 16 MHz
- On-chip 2-cycle Multiplier
- Hight Endurance Nonvolatile Memory Segments
- 16K Bytes of In-System Self-Programmable 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
- 1024 Bytes EEPROM, Endurance: 100,000 Write/Erase Cycles
- 2K Byte Internal SRAM
- Programming Lock for Software Security
- JTAG (IEEE std. 1149.1 Compliant) Interface
- Two 8-bit Timer/Counters with Separate Prescalers and Compare Modes
- One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode
- Real Time Counter with Separate Oscillator
- Four PWM Channels
- 8-channel, 10-bit ADC
- Byte-oriented Two-wire Serial Interface
- Programmable Serial USART
- Master/Slave SPI Serial Interface
- Programmable Watchdog Timer with Separate On-chip Oscillator
- On-chip Analog Comparator
- Power-on Reset and Programmable Brown-out Detection
- Internal Calibrated RC Oscillator
- External and Internal Interrupt Sources
- Six Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, Standby and Extended Standby
- Operating Voltages 4.5 - 5.5V

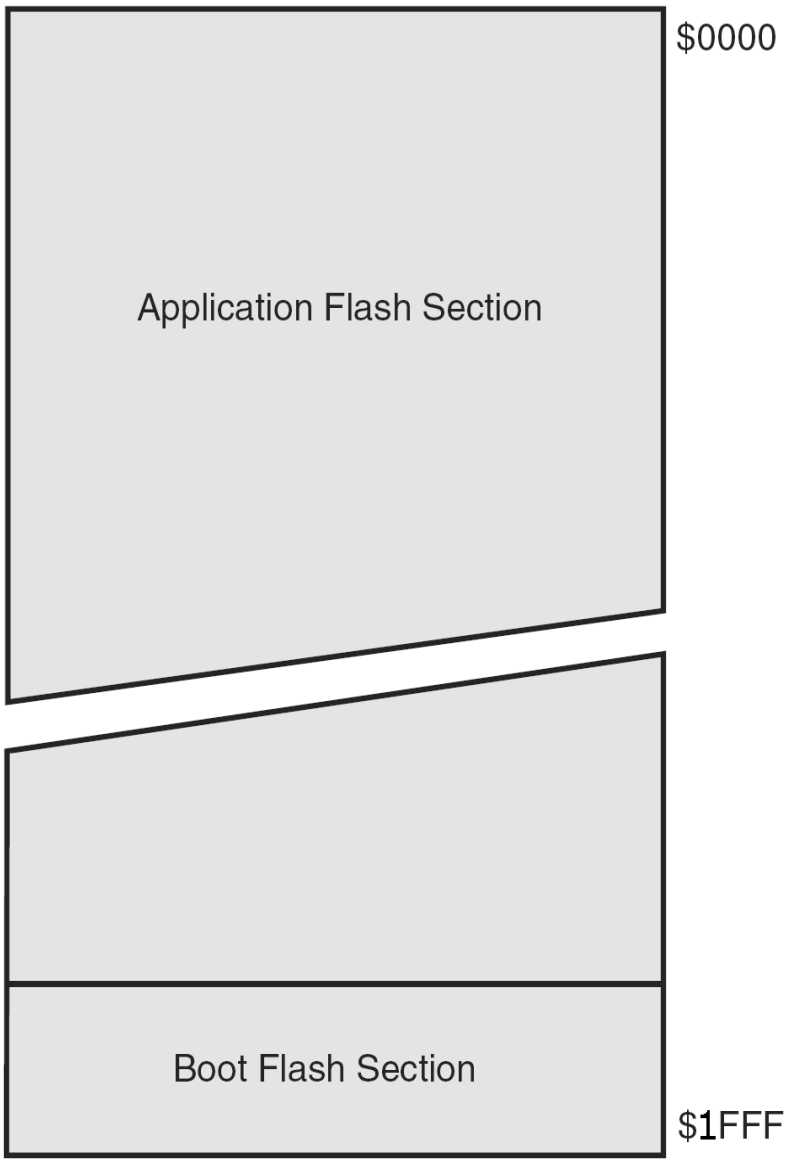
BLOCK DIAGRAM:

Figure 2. Block Diagram

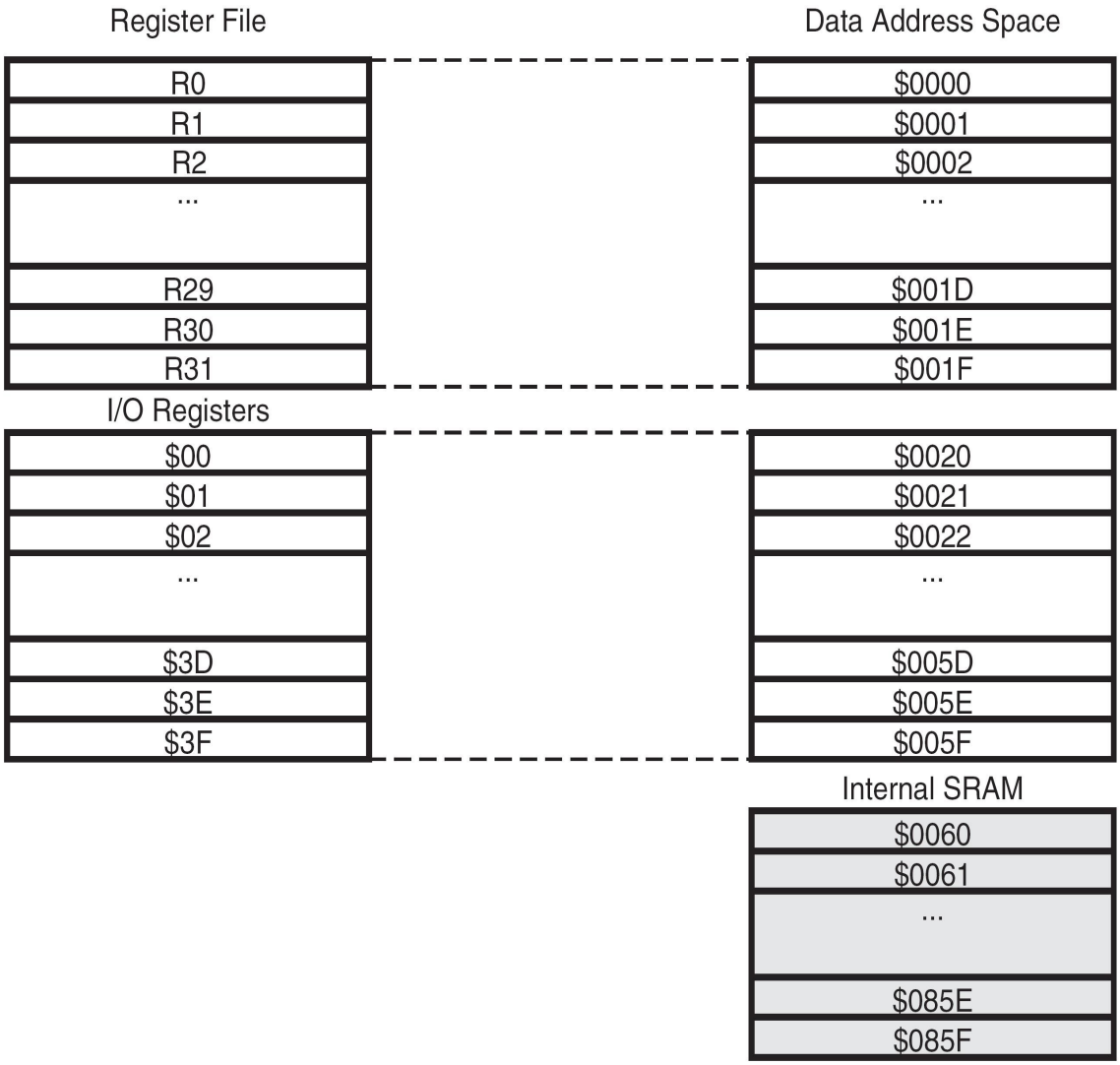


MEMORY MAP:

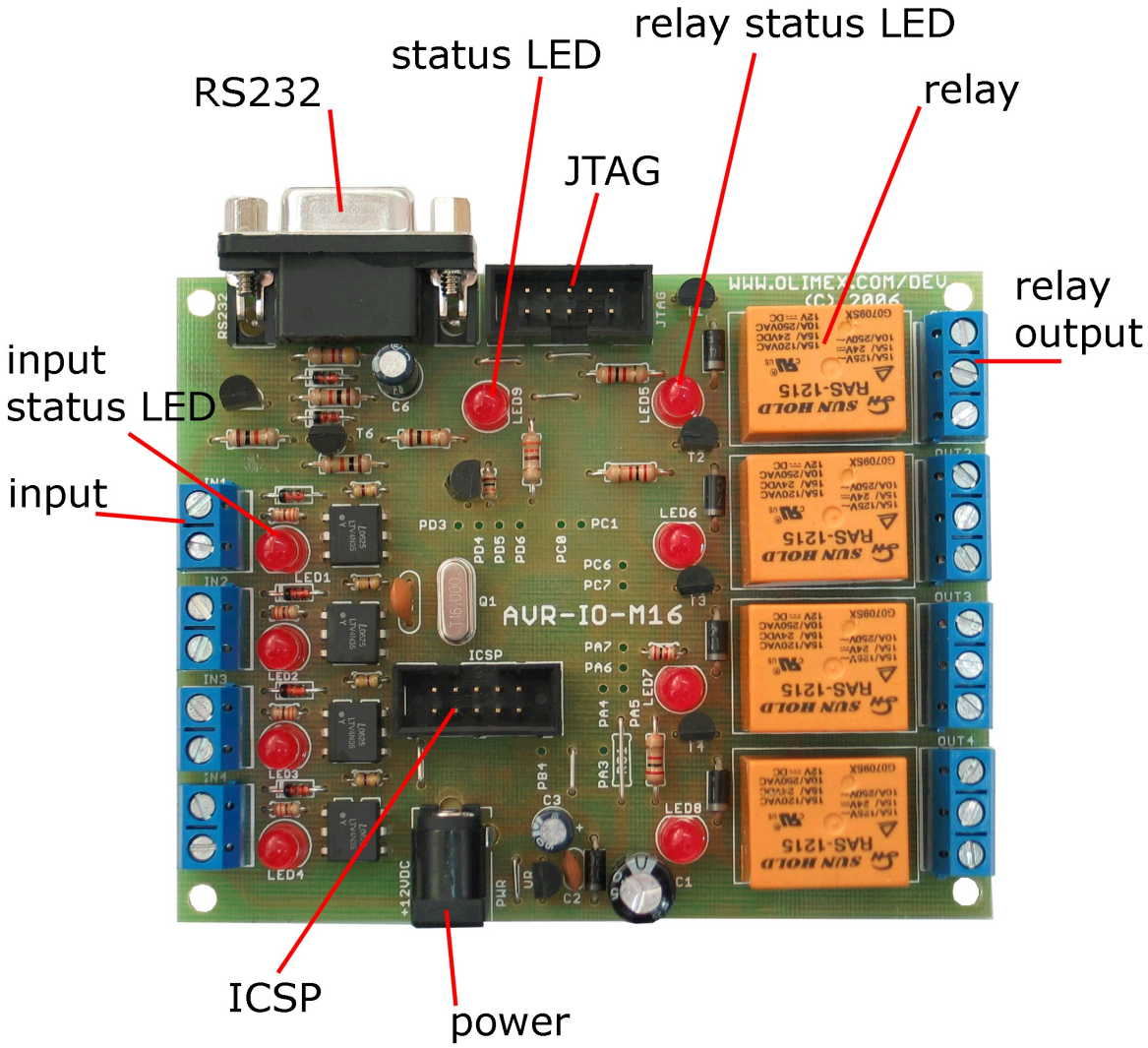
Program Memory Map



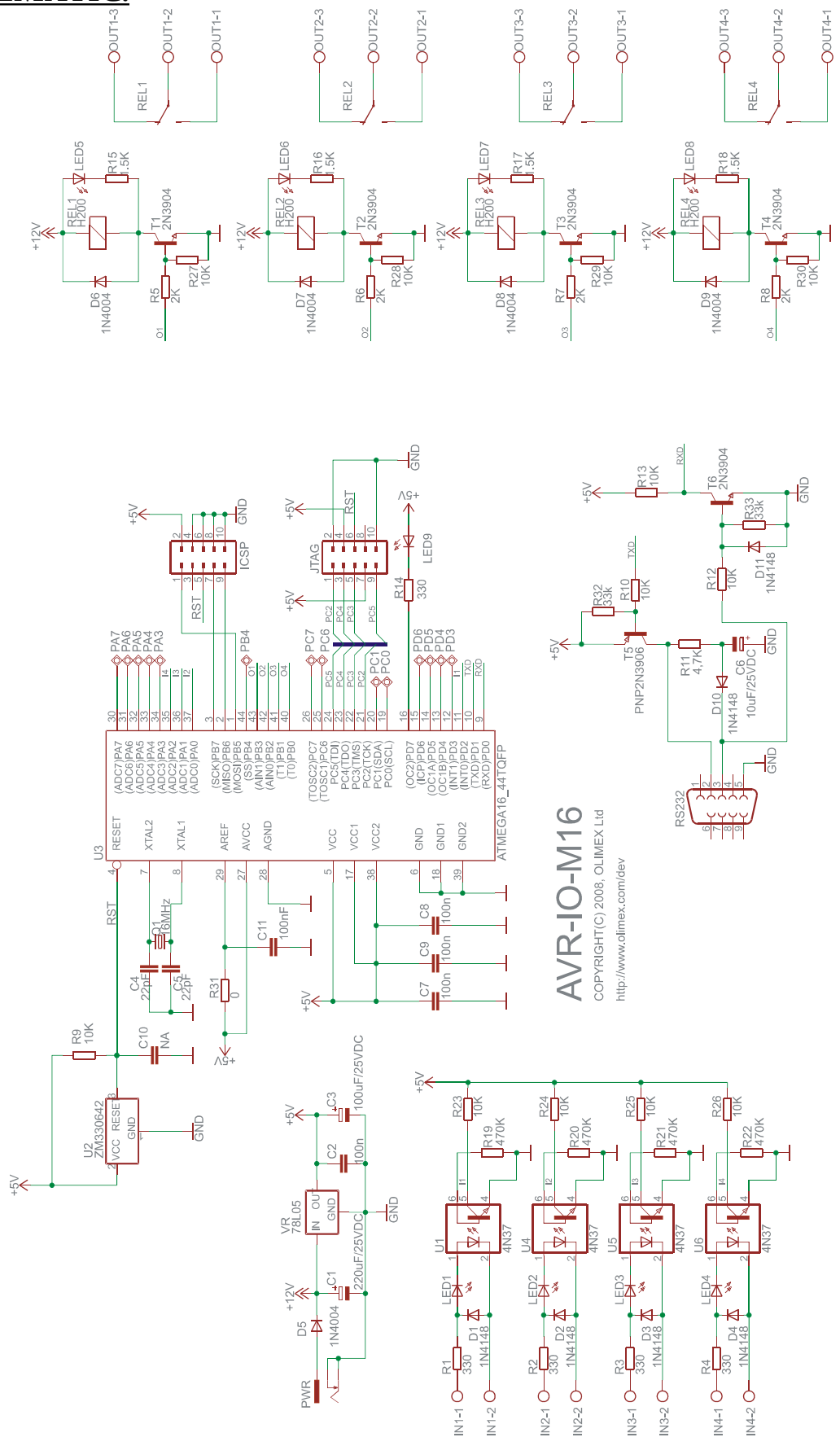
Data Memory Map



B


relay status LED
status LED
RS232
relay
JTAG
relay
output
input
status LED
input
ICSP
power
AVR-IO-M16
WWW.OLIMEX.COM/DEV
RS232
JTAG
ICSP
+12VDC
PWR
Q1
16.000
LED1
LED2
LED3
LED4
LED5
LED6
LED7
LED8
LED9
IN1
IN2
IN3
IN4
OUT1
OUT2
OUT3
OUT4
RAS-1215
SUN HOLD

SCHEMATIC:


AVR-IO-M16
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http://www.olimex.com/dev
ATMEGA16_44TQFP
ICSP
JTAG
RS232
PNP2N3906
4N37
2N3904
1N4148
1N4004
ZM330642
VR 78L05
OUT1-3
OUT1-2
OUT1-1
OUT2-3
OUT2-2
OUT2-1
OUT3-3
OUT3-2
OUT3-1
OUT4-3
OUT4-2
OUT4-1
REL1
REL2
REL3
REL4
IN1-1
IN1-2
IN2-1
IN2-2
IN3-1
IN3-2
IN4-1
IN4-2
PWR

POWER SUPPLY CIRCUIT:

The power supply of AVR-IO-M16 is taken from Power jack connector. The center pin is positive. The voltage range is +12-14VDC. The consumption is 20 mA with no relays switched on

RESET CIRCUIT:

AVR-IO-M16 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 ATMega16 pin 7 (XTAL2) and pin 8 (XTAL1).

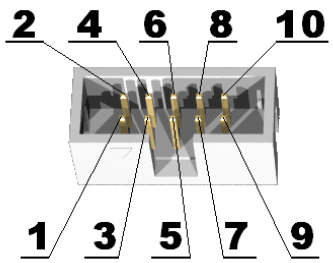
INPUT/OUTPUT:

Four **optoisplated digital inputs IN1-IN4**.
Four **red status LEDs** for the digital inputs – **from LED1 to LED4**.
Four **relays** – **from REL1 to REL2**.
Four **red status LEDs** for the relays – **from LED5 to LED8**.
One **red user status LED** with name **LED9**, connected to ATMega16 pin 16 (OC2/PD7).

CONNECTOR DESCRIPTIONS:

JTAG:

Pin #	Signal Name
1	PC2(TCK)
2	GND
3	PC4(TDO)
4	+5V
5	PC3(TMS)
6	RST
7	+5V
8	NC
9	PC5(TDI)
10	GND

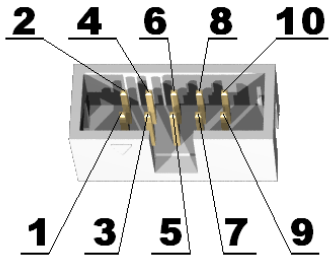


This connector allows programming and debugging via AVR-JTAG or other compatible tools.

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	MOSI
2	+5V
3	NC
4	GND
5	RST
6	GND
7	SCK
8	GND
9	MISO



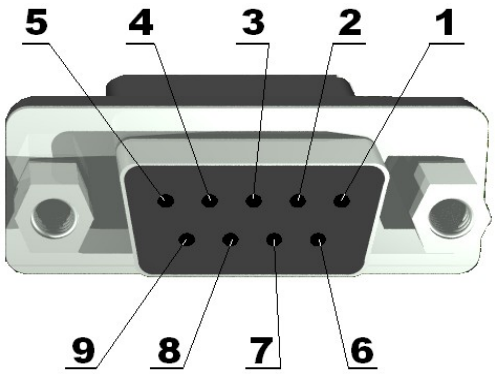
10	GND

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

MOSI I/O **Master Out Slave In.** SPI data transfer signal. It is either input or output depending on whether the MCU is master or slave.
MISO I/O **Master In Slave Out.** SPI data transfer signal. It is either input or output depending on whether the MCU is master or slave.
SCK I/O **Serial (Synchronization) Clock.** This is the synchronization signal. It could be either input(MCU – slave) or output (MCU – master).

RS232:

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

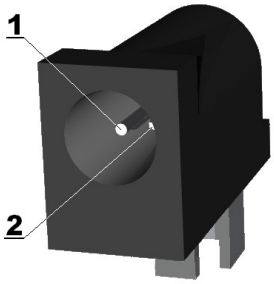


The RS232 level shifter is made with tricky schematic and doesn't allow more than 9600 bps connection, also the other RS232 party should supply correct RS232 levels

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.

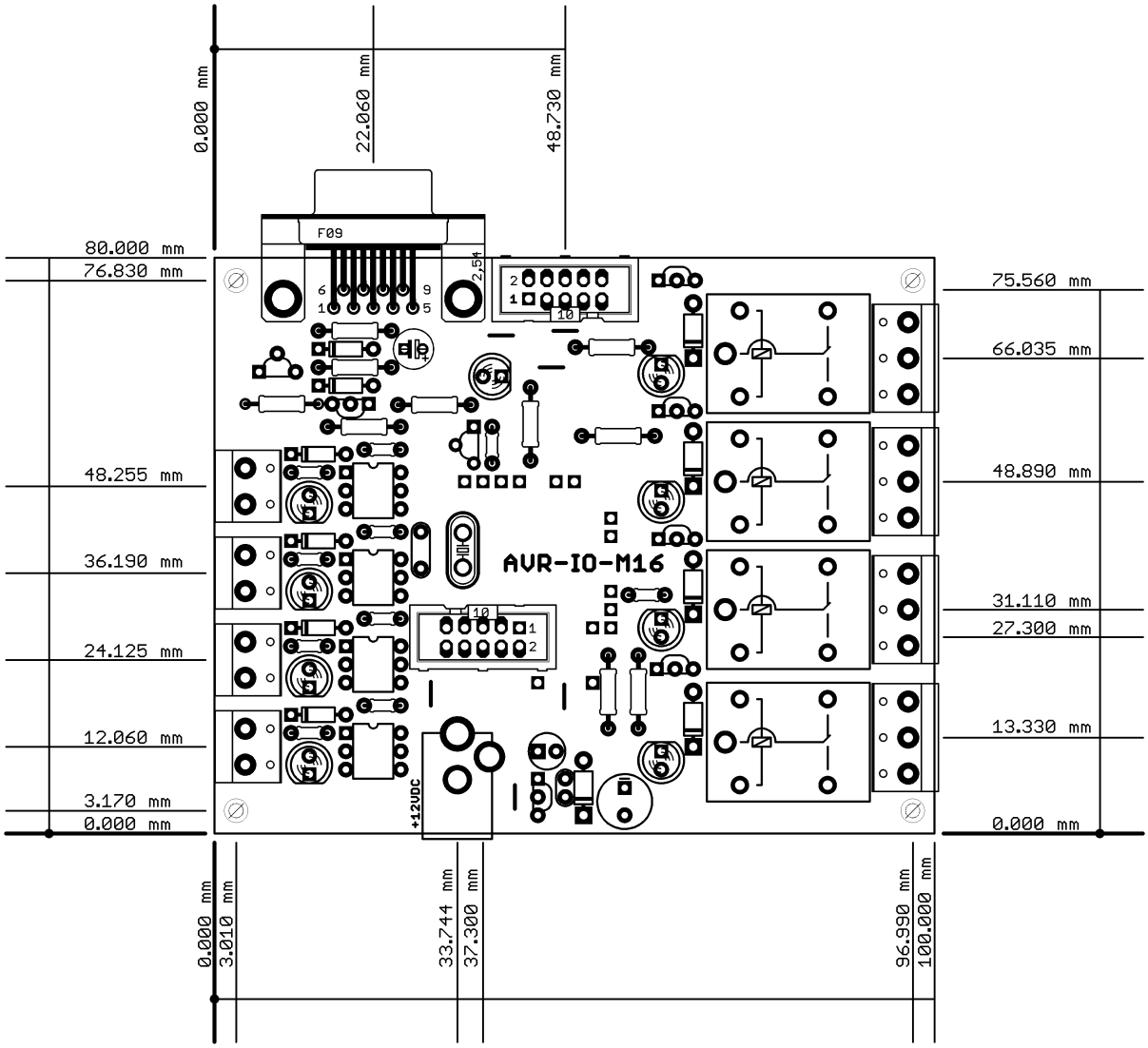
PWR:

Pin #	Signal Name
1	PWR
2	GND



You should apply +(12-14)VDC on pin 1.

MECHANICAL DIMENSIONS:



AVAILABLE DEMO SOFTWARE:

Check for available demo software for **AVR-IO-M16** on our website: www.olimex.com/dev.

ORDER CODE:

AVR-IO-M16 – 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

Revision history:

REV.A - created July 2008

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