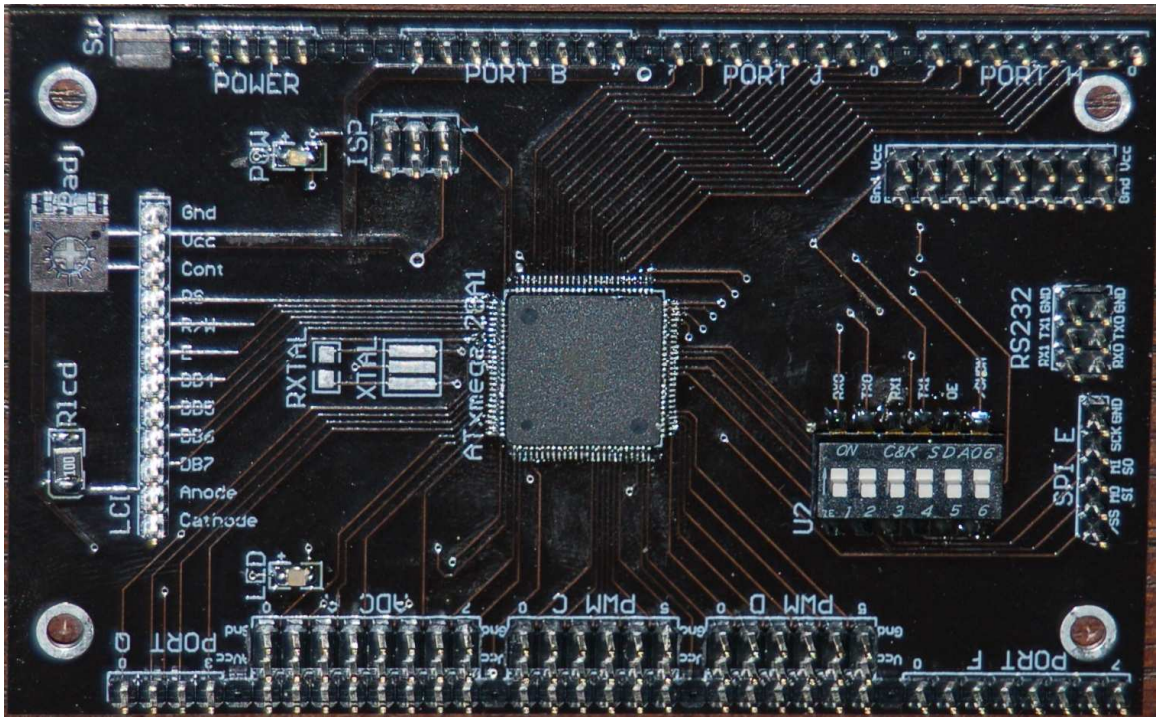
Pridgen Vermeer Robotics Xmega128 Manual



Features:
12x PWM signals with 5V supply
8x A/D Inputs with 3.3V supply
2x RS 232 Terminals
1x SPI Interface
4x 8-bit Digital IO ports
3.3V Power Bus
LCD Header (4-bit mode)
Smart Power Connecter
Power Switch Header
32MHz Operation
Power LED
Debug LED

Powering the Board

The Pridgen Vermeer Robotics Xmega128 Board uses a smart power connector to prevent reversing battery voltage into the regulators. The power connector uses a 4-pin 0.100” header with one outside pin connected to the positive battery voltage (+) and the opposite inside pin connected to the negative battery voltage (–).

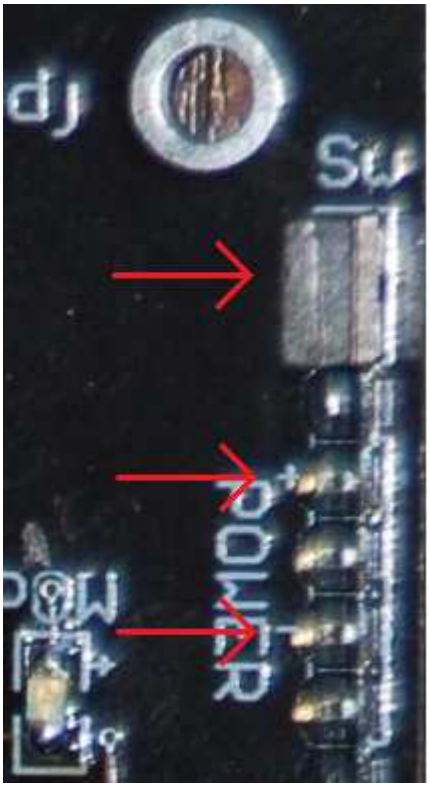


Figure 1

Reversing the power connecter or shifting to either side by one pin will not adversely affect the Xmega128 Board because the battery voltage will not be electronically connected to the board. Next to the power connector is the Power Switch Header. These two pins must be shorted to provide power to the board. Using the standard jumper supplied with the board will work, but a cable with a SPDT switch is recommended. The cable and switch must be able to continuously carry 2 amps. When the power is plugged into the board correctly, the blue POW LED will turn on.

The Xmega128 Board requires a 6-15V input for the regulators to supply the correct voltage to the components. The servo header supply voltage is regulated to 5V with Ports C and D each having its own regulator. All other electronics on the board use a 3.3V V_{CC}.

Power Bus

A power bus is provided on the Xmega128 Board for powering external devices. V_{CC} is regulated to 3.3V and is supplied from the same regulator providing power to the on-board electronics. Do not draw more than 500 mA through the power bus.

Figure 2

Programming the Board

The Xmega128 Board uses AVR PDI programming. The recommended programmer is the AVR ISP mkII In-System Programmer. Connect the programmer to the ISP port on the board and to your computer's USB port to establish a connection. The ISP header has pin 1 labeled. Please ensure pin 1 on the cable is connected to pin 1 on the header.

Figure 3

I/O Ports

The Xmega128 Board has four 8-bit Input/Output ports labeled Ports B, F, H, and J plus a 4-bit Input/Output port labeled Port Q. The I/O ports are located on the sides of the Xmega128 board. These I/O ports will not affect the use of the specialized ports.

I/O Pin Special Functions

A/D Conversion

Port ADC A is an 8-bit port connected to pins A7..0 on the Xmega128 and should be used as Analog inputs for the internal A/D converter. Analog signals should be connected directly to pins A7..0, the outside pins (see Figure 5). For convenience, a 3.3V AV_{CC} and Ground are provided. The available internal reference voltages for the Xmega128 are 1.00V and $V_{CC}/1.6$ (~2.0V). If a different reference voltage is desired, simply connect the supply to the ADCA0 signal line and set the ADC to use AREFA as the reference source in the ADC setup code. For example, placing a jumper from the AV_{CC} pin to ADCA0 signal pin would allow the use of 3.3V as a reference voltage.

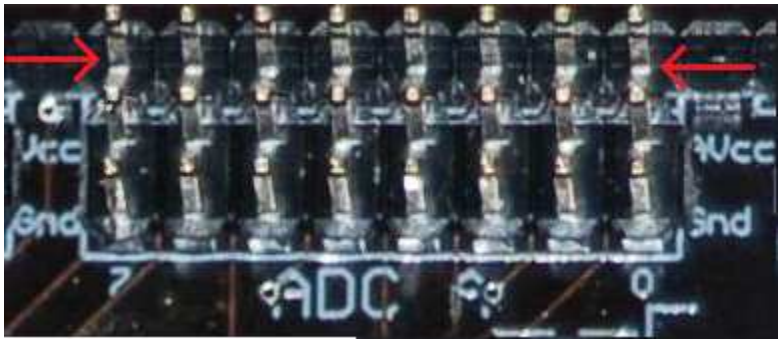


Figure 5

In addition to Port ADC A, Port B can also be used for A/D conversion. However, Port B does not have the supplied AV_{CC} and GND pins and should only be used for A/D if more than 8 lines are necessary

RS 232/SPI

Port E is adapted for the use of RS 232 serial communication or SPI. Port E allows for the use of two separate asynchronous channels, which are routed through a line-driver to make RS 232 compatible signals. When using RS 232 serial communication, the DIP switches OE and /SHDN should be ON. Also, the Rx and Tx switches corresponding to the RS 232 terminals used should be ON. When not using RS 232 communication, turn the switches OFF to conserve power.

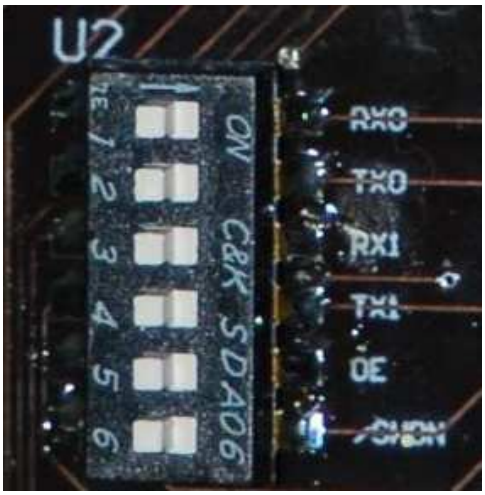


Figure 6

Figure 7

The Xmega128 Board can use Port E for SPI communication rather than RS 232. Simply connect the Select (/SS), MOSI, MISO, SCK, and Ground lines to the SPI device and configure Port E in software for SPI mode.

Figure 8

Port F may also be used for two additional TTL level serial communication lines or one additional SPI interface if more serial connections are necessary.

LCD Connector

Port K of the Xmega128 Board is used to run the LCD connector. The LCD connector provides all the necessary inputs and supply voltages for 3.3V standard character LCDs running in 4-bit mode. The contrast voltage is changed using the nearby potentiometer. The connector also supplies voltage for the LCD backlight. Please ensure the connected LCD will operate correctly with a 10Ω resistor as a backlight current limiter as some LCDs will require a different current limiting resistor.

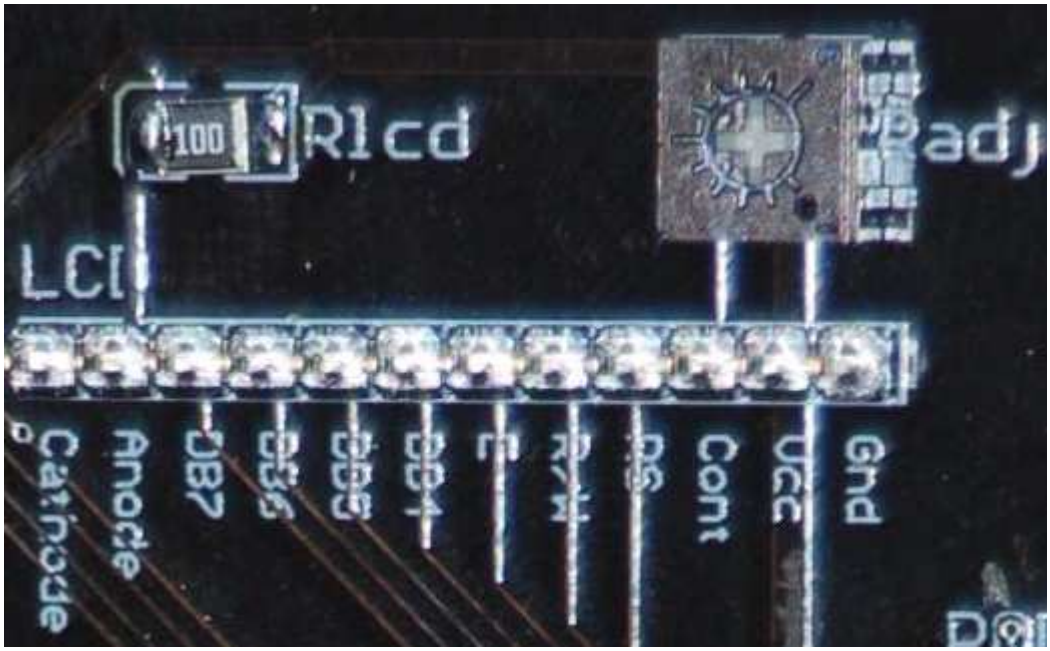


Figure 9

Debug LED

Pin Q0 is connected to the Debug LED on the board. When using Q0 for normal I/O functions, ignore the LED. When using Q0 for the debug LED, use active high signals (i.e. write a 1 to turn on the LED and a 0 to turn off the LED).

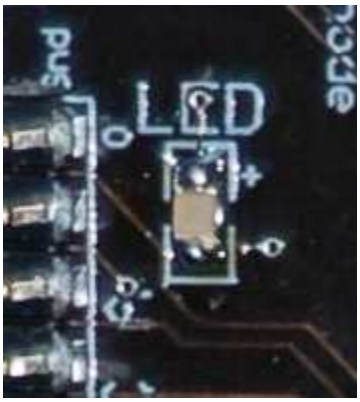


Figure 10

PWM/Servo Header

Ports C and D are set up to run servos. For both ports, signal lines 0 through 3 use the ports Timer 0 and lines 4 and 5 use Timer 1. The PWM signal line will appear on the pin next to the edge of the board (see Figure 11). Each port, C and D, are provided with their own regulated 5V V_{CC} to ensure constant performance out of the servo. Please refer to the Xmega datasheet for PWM signal generation.

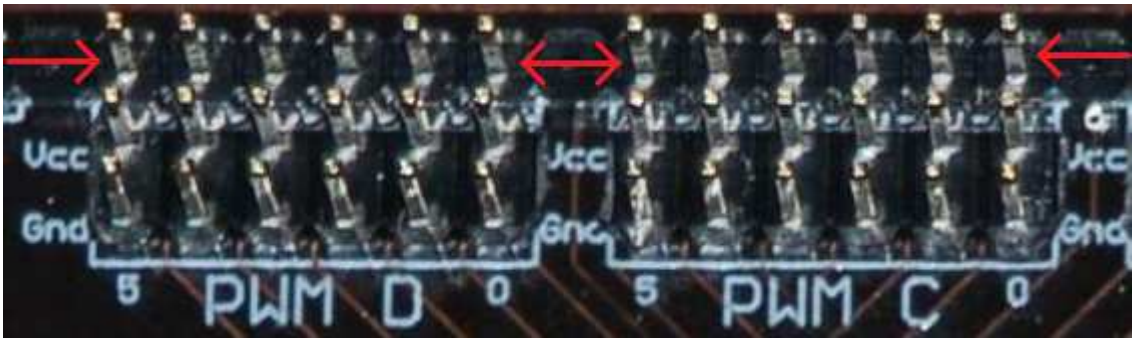


Figure 11

External Oscillator

The Xmega128 Board allows for the use of an external oscillator to run at custom frequencies. If an external oscillator is desired, simply connect the oscillator to the pads labeled XTAL on the board and the oscillator resistor to the part labeled RXTAL. Please use an oscillator with built in capacitors. The middle pad is connected to Ground and the pads on either side connect to the XTAL1 and XTAL2 pins on the Xmega128. The Xmega128 supports external oscillators up to 16MHz.

Figure 12

Contact Info

For questions or additional support, please contact Mike Pridgen at mike.pridgen.pvr@gmail.com.