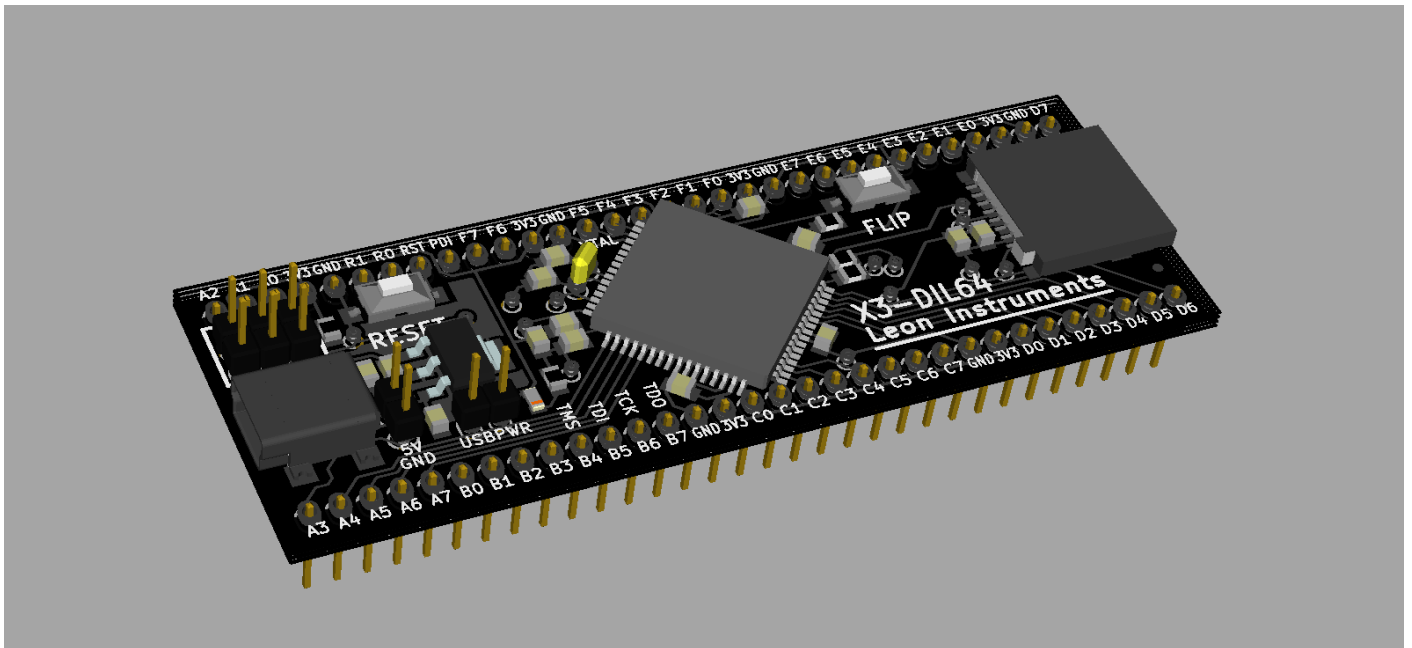


# X3-DIL64 prototyping module with ATxmega128A3U-AU processor



**Leon Instruments**  
[www.leon-instruments.pl](http://www.leon-instruments.pl)

version 2.1

X3-DIL64 prototyping module allows rapid development of electronic equipment with low cost and advanced ATxmega128A3U microcontroller by Atmel. The module is intended to be used in design offices, school laboratories and for hobbyists.

The X3-DIL64 design is copyrighted to Leon Instruments and it cannot be reproduced and copied without Leon Instruments' written permission. The producer and the dealer do not take responsibility for any damage caused by proper or improper module applications. Product datasheet may change and an upgraded version is available at producer's website.

## General description

The X3-DIL64 module is populated with:

- ATxmega128A3U-AU microcontroller
- MiniUSB connector
- MicroSD card socket
- PDI programming interface connector
- Crystal oscillator socket
- RESET button and button for enabling USB programming mode
- Voltage regulator and filters

## Absolute maximum ratings

Stresses exceeding absolute maximum ratings reduce device reliability and may cause permanent damage to the device.

Symbol	Parameter	Min	Typ.	Max	Unit
$V_{USB}$	USB connector voltage	0	5	5.5	V
$I_{USB}$	USB connector current	0		0,5	A
$V_{CC}$	Processor supply voltage	-0,3	3,3	4,0	V
$I_{CC}$	Processor current	0		0,2	A
$V_{PIN}$	Voltage applied to any I/O	-0,5	3,3	4	V
$I_{PIN}$	I/O current	-25		25	mA
$T_A$	Storage temperature	-20		70	°C
$T_J$	Operating temperature	0		70	°C

Other parameters are listed in ATxmega128A3U datasheet.

### STORAGE AND HANDLING

Static electricity can significantly shorten the lifespan of electronic components. Please observe these tips to prevent damage that could occur from electro-static discharge:

- Use anti-static precautions such as operating on an anti-static mat and wearing an anti-static wrist-band.
- Store the evaluation board in the packaging provided.
- Touch a metal USB housing to equalize voltage potential between you and the board.

## ATxmega128A3U microcontroller

General description of the microcontroller's functionality and parameters:

- Memory: 128kB Flash, 8kB SRA, 2kB EEPROM
- Four-channel DMA controller
- Eight-channel event system
- Seven programmable timers/counters
- Full-speed USB
- Seven USARTs with IrDA support for one USART
- Two two-wire interfaces with dual address match (I2C and SMBus compatible)
- Three serial peripheral interfaces (SPIs)
- AES and DES crypto engine
- CRC-16 (CRC-CCITT) and CRC-32 (IEEE® 802.3) generator
- Two sixteen-channel, 12-bit, 2msps Analog to Digital Converters
- One two-channel, 12-bit, 1msps Digital to Analog Converter
- Four Analog Comparators with window compare function, and current sources
- External interrupts on all general purpose I/O pins
- Programmable watchdog timer with separate on-chip ultra low power oscillator
- QTouch® library support

### CPU CLOCK FREQUENCY

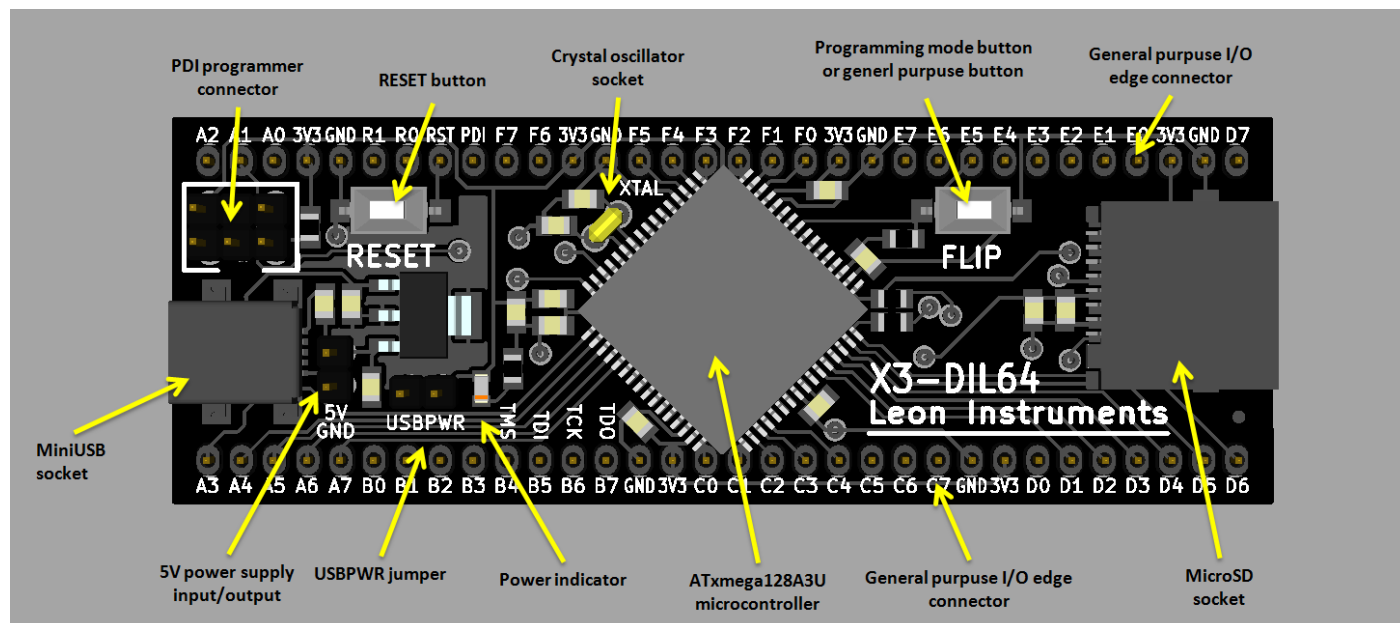
32MHz at 2,7V; 12MHz at 1,6V.

The microcontroller is equipped with an internal RC oscillator, providing CPU clock without the need of external crystal connection. Internal RC oscillator is enabled as default. Maximum frequency of crystal oscillator is 16MHz.

For further information please refer to ATxmega128A3U datasheet.

# X3-DIL64 User's Guide

The module components are listed in the **figure 1**.



**Fig. 1.** X3-DIL64 components

## POWER

X3-DIL module can be powered in many ways:

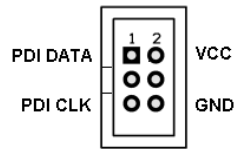
- 1) **MiniUSB connector** – connect the module to your computer with a MiniUSB cable. Put the USBPWR jumper on. You can measure USB bus voltage with a voltmeter connected to 5V/GND.
- 2) **5V/GND connector** – apply 5V voltage to 5V/GND connector and put the USBPWR jumper on. In this case connection to a computer via MiniUSB is not allowed.
- 3) **PDI programmer connector** – if your programmer provides powering the programmed circuit, the X3-DIL64 module can be powered from PDI connector. Take the USBPWR jumper off. Connection to a computer via MiniUSB is possible.
- 4) **Any 3V3 and GND pin on edge connector** – apply 3.3V voltage to any pin signed 3V3 and connect any GND pin to the ground. All 3V3 and GND pins are joined together so there's no need to join them manually. The USBPWR jumper should be taken off. Connection to a computer via MiniUSB is possible.

Regardless of the powering method, on all 3V3 pins should be measured 3.3V. Improper configuration of the USBPWR jumper may cause permanent damage to the X3-DIL64 module and/or other equipment.

## MEMORY PROGRAMMING

ATxmega128A3U has internal 128kB flash memory to store software and 2kB EEPROM for user data. You can access these memories with following tools:

1. **Programmer compatible with PDI standard** – example of this kind programmer is Atmel's AVR ISPMkII. Pinout of PDI connector is shown in **figure 2**.



**Fig. 2.** PDI connector pinout

- 1) **FLIP bootloader** – the microcontroller populated in X3-DIL64 module is programmed with FLIP bootloader to make possible memory programming without PDI programmer. FLIP loader is available at <http://www.atmel.com/tools/FLIP.aspx> and should be installed on your computer. To enter the programming mode, press and hold RESET and FLIP button. Then release RESET and your computer should immediately recognize a new USB device. Next, release FLIP button. Now ATxmega128A3U is in programming mode and ready to download new software from the computer.
- 2) **JTAG interface** – there is no JTAG connector on X3-DIL64 board but ATxmega128A3U supports this interface. Connect JTAG programmer to TDO, TCK, TDI, TMS pins.

Do not disconnect power or programming cable while the downloading process is in progress because it may damage the microcontroller.

## USB INTERFACE

ATxmega128A3U supports full-speed USB 2.0 interface. USB signal lines are connected to following processor I/O pins:

- **D+** – pin D7
- **D-** – pin D6

Anti-spike 22R resistors are placed between the USB connector and the microcontroller.

## MICROSD CARD SOCKET

X3-DIL64 is populated with a MicroSD card socket. MicroSD uses SPI interface connected as follows:

- **MISO** – pin C6
- **MOSI** – pin C5
- **SCK** – pin C7
- **CS** – pin C4
- **CARD-DETECT** – pin E0

After MicroSC card insertion, pin E0 is shorted to ground with 470R resistor. In case the user doesn't have MicroSD it is possible to use port C for other purpose but the socket must be empty.

### FLIP BUTTON

FLIP button is designed to switch the microcontroller into memory programming mode but it can be used as general purpose button for user's applications. When pressed, it shorts E5 pin to the ground. Pin E5 is pulled-up with a 100k resistor.

- **FLIP** – pin E5

### CRYSTAL OSCILLATOR SOCKET

X3-DIL64 module supports fast and easy crystal oscillator replacement without the need of soldering. Just plug the oscillator into the socket. HC49 type crystals are compatible with the socket. Maximum frequency of crystal oscillator is 16MHz.

### DUAL-IN-LINE CONNECTORS

X3-DIL64 module has two 32-pin connectors on the both edges of the board. The placement and dimensions of these connectors were designed to be identical as standard DIL64 package. Numbers of TQFP64 pins package are same as DIL64 package and placed in the same order.

## Demonstration Software

ATxmega128A3U is pre-programmed with a demonstration program. The processor generates low frequency square signals on port F. When FLIP button pressed, the frequency of these signals doubles. You can observe this using a LED diode with 470R serial resistor connected between any port F pin and the ground or to any other port F pin.

```
#include <avr/io.h>
#include <util/delay.h>

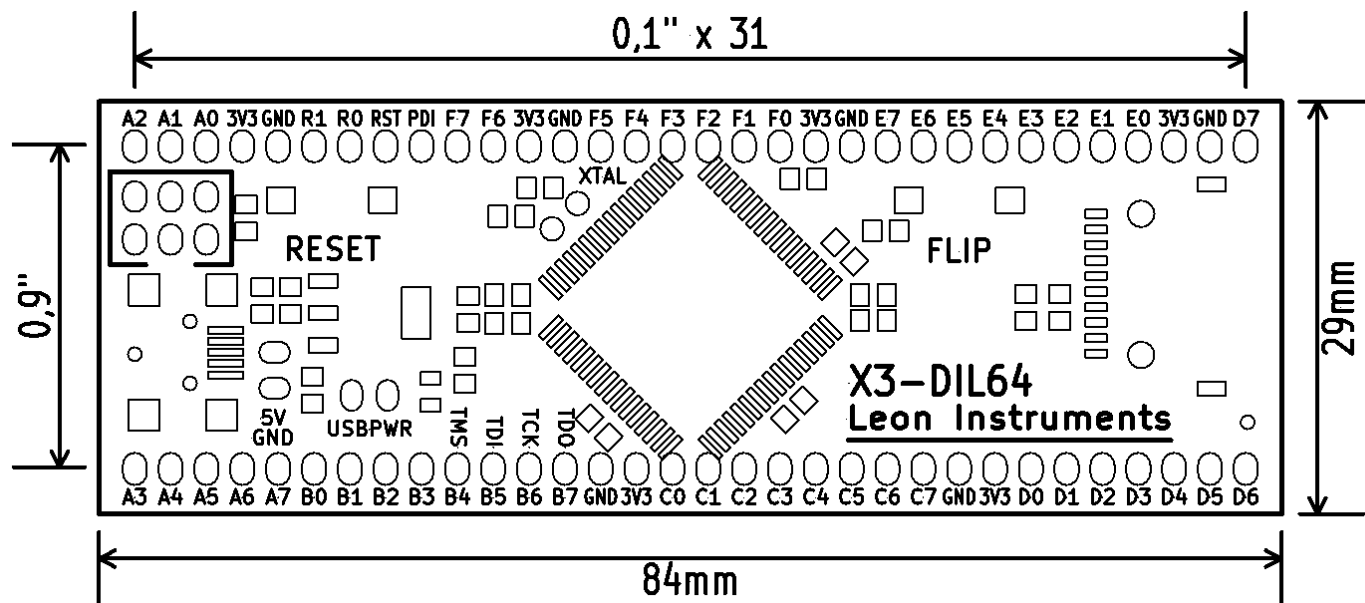
int main(void) {

    PORTE.DIR = 0;                // port E as input
    PORTF.DIR = 0b11111111;      // port F as output
    uint8_t counter = 0;        // to control blinking LEDs

    while(1) {
        counter++;
        PORTF.OUT = counter;
        if(PORTE.IN & (1<<5)) { // if FLIP pressed
            _delay_ms(100);
        } else {                 // if FLIP released
            _delay_ms(50);
        }
    }
}
```

This and other demonstration designs are available at <http://www.leon-instruments.pl>.

# Technical Drawing



# Revision History

Date	Version	Change Summary
2013.12.19	2.1	Added SD Card detection, applies to 1349 v21 board version
2013.10.01	2.0	Board design change, applies to 1326 v20 board version
2013.04.28	1.0	Initial release, applies to 1312 v10 board version

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