



### Overview

The MC-MEGA is a microcontroller board based on the ATmega1280 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

### Summary

Microcontroller	ATmega1280
Operating Voltage	5V
Input Voltage (recommended)	7 to 12V
Input Voltage (limits)	6 to 20V
Digital I/O Pins	54 (of which 14 provide PWM output)
Analog Input Pins	16
DC Current per I/O Pin	40mA
DC Current for 3.3V Pin	50mA
Flash Memory	128KB of which 4KB used by bootloader
SRAM	8KB
EEPROM	4KB
Clock Speed	16MHz

### Power

The MC-MEGA can be powered via the USB connection or with an external power supply

The power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm centre-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the power connector.

The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

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### The power pins are as follows:

- VIN. The input voltage to the board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- 5V. The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.
- 3V3. A 3.3 volt supply generated by the on-board FTDI chip. Maximum current draw is 50mA.
- GND. Ground pins.

### Memory

The ATmega1280 has 128 KB of flash memory for storing code (of which 4 KB is used for the bootloader), 8 KB of SRAM and 4 KB of EEPROM (which can be read and written with the EEPROM library).

### Input and Output

Each of the 54 digital pins on the mega can be used as an input or output, using `pinMode()`, `digitalWrite()` and `digitalRead()` functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40mA and has an internal pull-up resistor (disconnected by default) of 20 to 50k ohms. In addition, some pins have specialized functions:

- Serial: 0 (RX) and 1 (TX), Serial 1: 19 (RX) and 18 (TX), Serial 2: 17 (RX) and 16 (TX), Serial 3: 15 (RX) and 14 (TX). Used to receive (RX) and transmit (TX) TTL serial data. Pins 0 and 1 are also connected to the corresponding pins of the FTDI USB-to-TTL Serial chip.
- External Interrupts: 2 (interrupt 0), 3 (interrupt 1), 18 (interrupt 5), 19 (interrupt 4), 20 (interrupt 3), and 21 (interrupt 2). These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the `attachInterrupt()` function for details.
- PWM: 0 to 13. Provide 8-bit PWM output with the `analogWrite()` function.
- SPI: 50 (MISO), 51 (MOSI), 52 (SCK), 53 (SS). These pins support SPI communication, which, although provided by the underlying hardware, is not currently included in the Arduino™ language. The SPI pins are also broken out on the ICSP header, which is physically compatible with the Duemilanove and Diecimila.
- LED: 13. There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is low, it's off.
- I<sup>2</sup>C: 20 (SDA) and 21 (SCL). Support I<sup>2</sup>C (TWI) communication using the Wire library (documentation on the Wiring website). Note that these pins are not in the same location as the I<sup>2</sup>C pins on the Duemilanove or Diecimila.

The Mega has 16 analog inputs, each of which provides 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though it is possible to change the upper end of their range using the AREF pin and `analogReference()` function.

- AREF. Reference voltage for the analog inputs. Used with `analogReference()`.
- Reset. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

### Communication

The MC-MEGA has a number of facilities for communicating with a computer, another Board, or other microcontrollers. The ATmega1280 provides four hardware UARTs for TTL (5V) serial communication. An FTDI FT232RL on the board channels one of these over USB and the FTDI drivers provide a virtual com port to software on the computer.

A SoftwareSerial library allows for serial communication on any of the Mega's digital pins.

The ATmega1280 also supports I<sup>2</sup>C (TWI) and SPI communication. The Arduino™ software includes a Wire library to simplify use of the I<sup>2</sup>C bus; see the documentation on the Wiring website for details. To use the SPI communication, please see the ATmega1280 datasheet.

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### Programming

The MC-MEGA can be programmed with the Arduino™ software (download). For details, see the reference and tutorials.

The ATmega1280 on the MC-MEGA comes pre-burned with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files).

You can also bypass the bootloader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header; see these instructions for details.

### Automatic (Software) Reset

Rather than requiring a physical press of the reset button before an upload, the MC-MEGA is designed in a way that allows it to be reset by software running on a connected computer. One of the hardware flow control lines (DTR) of the FT232RL is connected to the reset line of the ATmega1280 via a 100 nanofarad capacitor. When this line is asserted (taken low), the reset line drops long enough to reset the chip. The Arduino™ software uses this capability to allow you to upload code by simply pressing the upload button in the Arduino environment. This means that the bootloader can have a shorter timeout, as the lowering of DTR can be well-coordinated with the start of the upload.

This setup has other implications. When the Mega is connected to either a computer running Mac OS X or Linux, it resets each time a connection is made to it from software (via USB). For the following half-second or so, the bootloader is running on the Mega. While it is programmed to ignore malformed data (i.e. anything besides an upload of new code), it will intercept the first few bytes of data sent to the board after a connection is opened. If a sketch running on the board receives one-time configuration or other data when it first starts, make sure that the software with which it communicates waits a second after opening the connection and before sending this data.

The Mega contains a trace that can be cut to disable the auto-reset. The pads on either side of the trace can be soldered together to re-enable it. It's labelled "RESET-EN". You may also be able to disable the auto-reset by connecting a 110 ohm resistor from 5V to the reset line; see this forum thread for details.

### USB Overcurrent Protection

The MC-MEGA has a resettable polyfuse that protects your computer's USB ports from shorts and overcurrent. Although most computers provide their own internal protection, the fuse provides an extra layer of protection. If more than 500 mA is applied to the USB port, the fuse will automatically break the connection until the short or overload is removed.

### Physical Characteristics and Shield Compatibility

The maximum length and width of the Mega PCB are 4 and 2.1 inches respectively, with the USB connector and power jack extending beyond the former dimension. Three screw holes allow the board to be attached to a surface or case. Note that the distance between digital pins 7 and 8 is 160 mil (0.16 inches), not an even multiple of the 100 mil spacing of the other pins.

### Schematic & Reference Design

EAGLE files: [arduino-mega-reference-design.zip](#)

Schematic: [arduino-mega-schematic.pdf](#)

### Part Number Table

Description	Part Number
BOARD, ATMEGA1280, MEGA-COMPATIBLE	MC-MEGA



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