MC-NANO

Arduino™ Nano Compatible Development Board

Overview

The MC-NANO is a small, complete, and breadboard-friendly board based on the ATmega328. It has more or less the same functionality of the MC-NOVE, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one.

Summary

Microcontroller	ATmega328
Operating Voltage (logic level)	5V
Input Voltage (recommended)	7 to 12V
Input Voltage (limits)	6 to 20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	8
DC Current per I/O Pin	40mA
Flash Memory	32KB of which 2KB used by bootloader
SRAM	2KB
EEPROM	1KB
Clock Speed	16MHz
Dimensions	0.73 inches x 1.70 inches

Power

The MC-NANO can be powered via the Mini-B USB connection, 6 to 20V unregulated external power supply (pin 30), or 5V regulated external power supply (pin 27). The power source is automatically selected to the highest voltage source.

The FTDI FT232RL chip on the Nano is only powered if the board is being powered over USB. As a result, when running on external (non-USB) power, the 3.3V output (which is supplied by the FTDI chip) is not available and the RX and TX LEDs will flicker if digital pins 0 or 1 are high.

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Memory

The ATmega328 has 32KB (with 2KB used for the bootloader). The ATmega328 has 2KB of SRAM and 1KB of EEPROM. (which can be read and written with the EEPROM library).

Input and Output

Each of the 14 digital pins on the Nano 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). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the FTDI USB-to-TTL Serial chip.
- External Interrupts: 2 and 3. 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: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analogWrite() function.
- SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication, which, although provided by the underlying hardware, is not currently included in the Arduino™ language.
- 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.

The Nano has 8 analog inputs, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the analogReference() function. Additionally, some pins have specialized functionality:

- I^2C: 4 (SDA) and 5 (SCL). Support I^2C (TWI) communication using the Wire library (documentation on the Wiring website).

There are a couple of other pins on the board:

- 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-NANO has a number of facilities for communicating with a computer, another board, or other microcontrollers. The ATmega328 provide UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An FTDI FT232RL on the board channels this serial communication over USB and the FTDI drivers (included with the Arduino™ software) provide a virtual com port to software on the computer. The Arduino™ software includes a serial monitor which allows simple textual data to be sent to and from the Arduino™ board. The RX and TX LEDs on the board will flash when data is being transmitted via the FTDI chip and USB connection to the computer (but not for serial communication on pins 0 and 1).

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

The ATmega328 also support I2C (TWI) and SPI communication. The Arduino™ software includes a Wire library to simplify use of the I2C bus; see the documentation for details. To use the SPI communication, please see the ATmega328 datasheet.

Programming

The MC-NANO can be programmed with the Arduino™ software (download). Select "Arduino™ Duemilanove or Nano w/ ATmega328" from the Tools > Board menu. For details, see the reference and tutorials.

The ATmega328 on the MC-NANO 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-NANO 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 ATmega168 or ATmega328 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 Nano 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 Nano. 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.

Schematic & Reference Design

EAGLE files: arduino-nano-reference-design.zip
Schematic: arduino-nano-schematic.pdf

Part Number Table

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

http://www.farnell.com
http://www.newark.com
http://www.cpc.co.uk