



GETTING STARTED

With the Toadstool *Mega328*



www.crash-bang.com

@crashbang_proto

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Meet the Toadstool Family

The Toadstool *Mega328* is part of a larger group of open source prototyping boards and breakout modules. This family was designed to let you quickly and easily prototype your microcontroller-based projects. The Toadstool *Mega328* is one of a range of prototyping boards, and contains the ATmega328P¹ from Atmel.

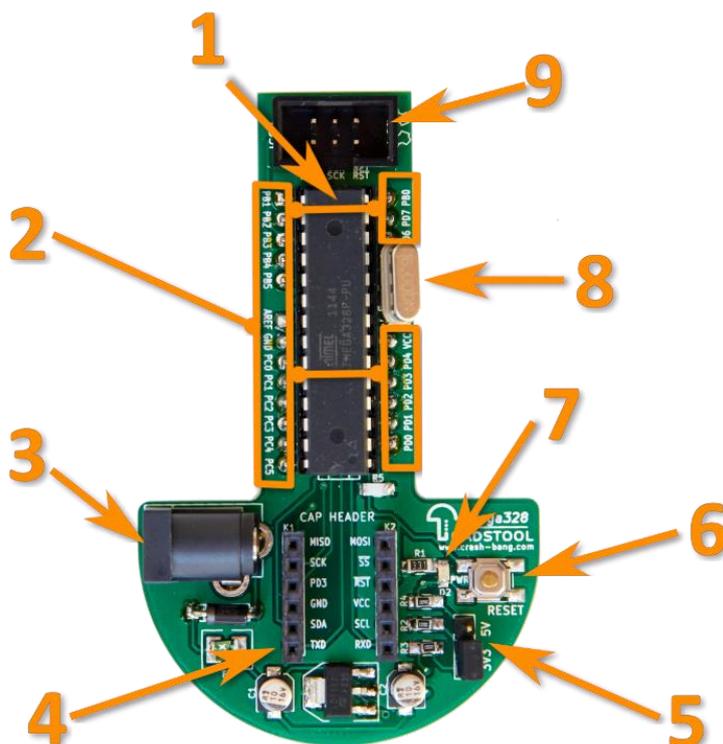
Prototyping Boards and *Caps*



The Toadstool *Mega328* is a prototyping board – it houses a microcontroller and plugs directly into a breadboard. There are a number of other Toadstool boards containing a range of microcontrollers from various manufacturers. All these boards come with a standard header interface that allows standardised breakout boards to be connected.

There is a growing range of *Caps* designed for Toadstool prototyping boards: *Caps* are small modules that connect to the prototyping boards, each containing specific functionality (eg. EEPROM, USB-to-Serial, humidity sensor), and are interfaced through the standard header on the prototyping boards. The design of the header allows you to stack multiple *Caps* onto a single Toadstool board.

Overview of the Toadstool *Mega328*



Key Components

1. Microcontroller Socket: Ships with the ATmega328P. Can be switched out for greater flexibility.
2. Breakout Pins: All I/O pins are broken out, as well as VCC and GND
3. Power Jack: Connect 2.1mm centre-positive power supply (recommend max of 9V)
4. *Cap* header: Connect a range of *Caps* to this standard header
5. Voltage Selection Jumper: Select whether microcontroller supplied with VCC of 3.3V or 5V
6. Reset Switch
7. Power LED
8. Crystal Socket: Connect external crystal if needed
9. ICSP Header: Connect an ISP programmer or debugWIRE-compatible debugger

Features of the Toadstool *Mega328*

The Toadstool prototyping boards are designed to be flexible and feature-rich. Some of these include:

- **Power:** The 2.1mm Jack allows you to fire your project up away from your PC – connect up to 9V to power your project. Your circuit is protected from incorrect polarity and over-current conditions.
- **Choose your Voltage:** a jumper allows you to choose between 5V or 3.3V – allowing you to handle both 5V and 3.3V modules, as well as to manage your power consumption.
- **Choose your Crystal:** Run your projects faster or slower by selecting the crystal that's best-suited to your specific project; or leave a crystal off completely and use the internal oscillator on the ATmega328P.
- **Program and Debug:** use the ICSP header socket to connect an external programmer or debugger
- **Switch your Microcontroller:** you can choose to use an alternative pin-compatible microcontroller (ATmega8/48/88/168/328); or replace just the microcontroller if you accidentally toast it!

Requirements

Required Hardware

The only additional hardware required is an external programmer or debugger with a 6-pin SPI interface. There are a range of these available, from lower-cost USBTiny and USBASP models, to the fully-fledged Atmel tools.

Required Software

Programs/sketches for the Toadstool Mega328 needs to be written in some form of editor, and then compiled, linked and uploaded to the Toadstool. There are various IDEs (Integrated Development Environments) and GNU toolchains available, including WinAVR, Atmel Studio and of course the Arduino IDE. Most of our guides will use Atmel Studio, as it works “out the box” without requiring any additional configuration. It also supports a number of advanced features (such as debugging and simulation) and is freely downloadable from Atmel’s website².

Solder Your Headers

To reduce the risk of damage, the Toadstool ships without the header pins soldered on. You will need to solder the male headers on, ensuring that the pins point downwards to connect to the breadboard. The female sockets for the Caps should be soldered pointing upwards, and perpendicular to the board to enable the Caps to be easily connected.

External Crystal

When they ship, ATmega328P chips are configured to use the internal oscillator, running at 1MHz. To configure them to use an external crystal, visit the FAQ on the Toadstool homepage.

Resources

The Toadstool Homepage:

<http://www.crash-bang.com/toadstool>

Toadstool Github Examples:

<https://github.com/CrashBangProto/Toadstool-Example-Projects>

“Beyond the Arduino”: a series of tutorials in Nuts and Volts magazine, March 2015 onwards:

http://www.nutsvolts.com/magazine/contributor/andrew_retallack

Get in touch with us on Twitter:

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...or ask for help on e-mail:

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¹ Atmel ATmega328P product page: <http://www.atmel.com/devices/ATMEGA328P.aspx>

² Atmel Studio product page: <http://www.atmel.com/tools/atmelstudio.aspx>