BUILDING YOUR KIT

For the **Toadstool** ***Mega328***

Crash Bang prototyping

www.crash-bang.com
@crashbang_proto

Congratulations!

You're one of the braver ones, looking for a little more of a challenge by assembling your own Toadstool Mega328 board. By assembling your own board, you should gain a little insight into how the board works and what makes it work.

What You'll Need

To assemble the Toadstool Mega328, you'll need:

- ✓ A reasonable soldering iron
- ✓ Solder (I use 0.7mm for the through-hole components, and 0.3mm for SMD components)
- ✓ Optionally: Some sort of helping hands or vise to hold your board
- ✓ Patience and a steady hand!

What's in the Kit

The kit contains all the components needed to assemble the board. We've included one extra of each of the smaller components in case one of them manages to escape – this is one kit where it's good to have a few pieces left over!

All SMD components are 0805, although most of the footprints will handle 1206 components if you prefer to use these.

A full list of components is contained in the appendix.

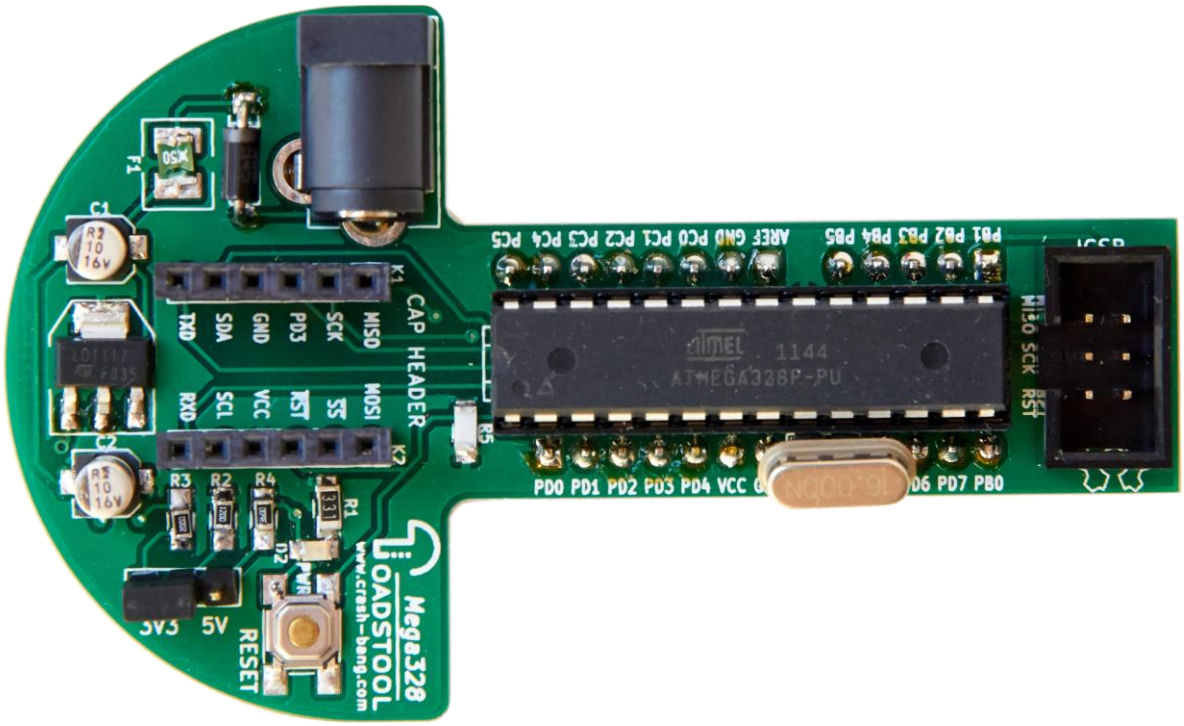
Tackling the Build

You may be seasoned at building kits, in which case you'll probably want to jump straight to the schematic and the list of components. If you'd prefer a little guidance, then keep reading.

The steps below are how I prefer to approach a build – it's a suggestion, and you may find a better way of doing it (in which case let me know!)

1 Review the Schematic

Before I start on a kit I like to familiarise myself with exactly what I'm building. I spend a little time comparing the schematic to the physical board, making sure I can match all the parts and getting an idea of the order in which I'm going to work. I suggest that you print the schematic out for reference, and use the following image of a completed board for comparison during the process.



2 Surface Mount First

Start with the fiddly parts first. They are easier to solder onto an empty board as you won't need to manoeuvre your hot iron around any other large components. I don't specifically follow any order, although it makes sense to do the same value components at the same time (eg. do all the 0.1uF capacitors at once).

If you use a reflow oven or hot air gun, then it of course makes sense to do all your SMD components first.

All the SMD components are marked on the board's silkscreen, so you should have no problem identifying where they belong. Some points to look out for:

1. Make sure you check the polarity of the LED – the tiny dot on the LED indicates the cathode, and is mirrored on the PCB silkscreen
2. The 10uF capacitors are polarised: the solid semi-circle on the PCB mirrors that on the actual component, and is the negative terminal.
3. The pushbutton switch only fits the PCB footprint in one orientation
4. The fuse is not polarised, even though the component itself seems to have a marking close to one terminal.

3 Through-Hole Next

Next work on the through-hole components. I prefer to do the components before the headers. The Diode of course is polarised, so match the stripe on the component to that on the PCB. Some things to take note of:

1. Breadboard Header pins: make sure the header pins parallel to the microcontroller are soldered on the top of the PCB, so that the pins point downwards to allow connection with a breadboard.
2. XTAL: Solder the two-pin female socket at these pins, pointing upwards – this is where you will connect your crystal if you choose to use one.
3. Voltage Selector pins: solder this 3-pin header pointing upwards, so you can connect a jumper to select the voltage.
4. CAP header: These female sockets should be soldered facing upwards, and allow the various Toadstool Caps to be connected. Ensure they are perpendicular to the PCB so that the Caps can be easily inserted.
5. ICSP header: This is polarised, so take note of the marking on the PCB that shows where the slot should be.
6. Microcontroller socket: Take note of the indent marking the polarity.

4 Testing

In order to prevent damage to any components, we should test the assembled board in a progressive manner. Before you insert your microcontroller, perform the following basic tests:

1. **Visual Check:** are all pins soldered, are all solder joints neat, are there any solder splashes or possibility of solder bridger?
2. **Check for shorts:** make sure that GND and VCC are not shorted (use a Multimeter)
3. **Add power:** check that the LED comes on, and that the voltage across GND and VCC matches that on your voltage selection jumper.
4. **Finally:** hold your breath, insert the microcontroller into the socket, and test the upload of a simple sketch that you know works.

If at any stage you smell any burning or feel any heat, disconnect the power immediately.

Where to From Here?

Congratulations on building your Toadstool kit! There are more resources online to take you further: refer to our website (www.crash-bang.com/toadstool) to access these.

Appendix: Kit Contents

Reference	Component	Value
	Microcontroller	ATmega328P-PU
	Crystal	16MHz
	Toadstool Mega328 PCB Board	
C1;C2	Capacitor - Aluminium	10uF
C4;C3	Capacitor - Ceramic	22pF
C5	Capacitor - Ceramic	100nF
CON1	2.1mm Barrel Connector	
D1	Diode	1N4007
D2	LED	Red
F1	PTC Fuse	750mA
IC1	DIP Socket	28-pin DIP
K2;K1	Female Socket	6-pin
K3	Male Header	3-pin
K4	Box Header	6-pin
K5	Male Header	7-pin
K6	Male Header	8-pin
K7	Female Socket	2-pin
K8	Male Header	5-pin
K9	Male Header	4-pin
R1	Resistor	330R
R2	Resistor	120R
R3	Resistor	200R
R4	Resistor	360R
R5	Resistor	10k
SW1	Switch	
U1	Voltage Regulator	LD1117STR