helion microsystems

10401

Kit Assembly Instructions

HU-320 USB Interface PCB Kit

Overview

The helion microsystems HU-320 represents the simplest and quickest path to USB connectivity. This device replaces a user microcontroller and USB interface hardware to provide many industry standard interfaces.

The HU-320 USB interface PCB kit is packaged in two bags; the black anti-static bag contains all of the ICs (integrated circuits) as well as the discrete components (resistors and capacitors), excepting the 1uF capacitor. This part has been included in the clear bag with the remaining parts, as it is indistinguishable from the 4.7uF capacitor. Be sure to not mix these up.

Parts List

Description	Identifier	Marking	Number
Printed circuit board			1
8MHz HC49 Crystal	X1		1
2 pin header	J5, J6		2
4 pin header	J3		1
3x2 pin header	J2, J4		2
15x2 pin header	J7		1
USB-B socket	J1		1
Header shunt			4
Preprogrammed processor	U1		1
MCP1825 Voltage regulator	U2		1
0805 LED	D1		1
0805 4.7 uF Capacitor	C6	None - Brown in colour	1
0805 1.0 uF Capacitor	C5	None - Brown in colour	1
0603 18 pF Capacitor	C1, C2	None - Grey in colour	2
0603 0.1 uF Capacitor	C3, C4, C7, C8, C9	None - Brown in colour	5
0603 22 Ohm Resistor	R2, R3	220	2
0603 680 Ohm Resistor	R12	681	1
0603 1.5 kOhm Resistor	R5, R6	152	2
0603 6.8 kOhm Resistor	R10	682	1
0603 10 kOhm Resistor	R7	103	1
0603 22 kOhm Resistor	R8	223	1
0603 47 kOhm Resistor	R9	473	1
0603 100 kOhm Resistor	R1	104	1

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Assembly

Assembly of the board is in two major steps; soldering the SMD components, then the through hole components. It is much easier to start with the surface mounted components, as they are smaller.
For this step you will need:

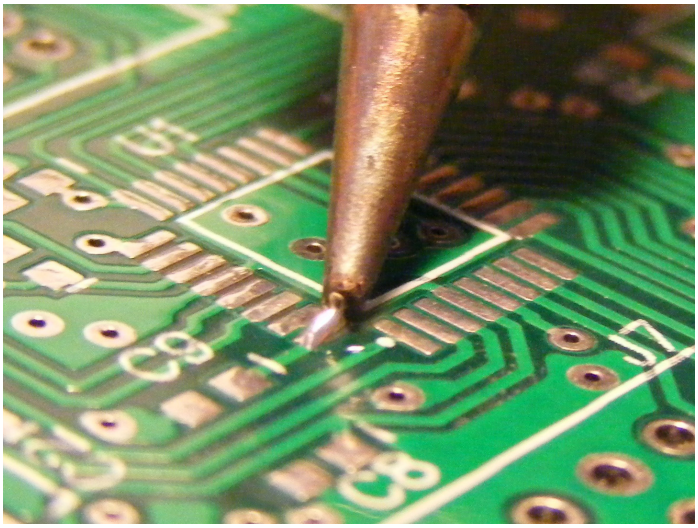
1. Tweezers
2. Solder wire or paste
3. Fine tipped soldering iron or toaster oven

There are a number of options for soldering the SMD components, they can be done by hand with a fine tipped soldering iron, or for better results, a toaster oven and solder paste can be used. As this tutorial is for beginners, we will focus on the hand-soldering option.

When hand-soldering SMD components, use the thinnest soldering iron tip available, and narrow gauge flux-cored solder wire. 0.7mm is a good size, but thinner is better.

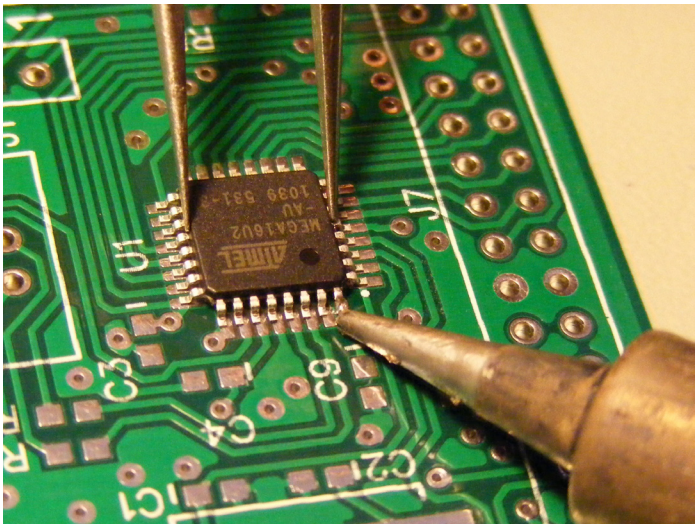
Soldering the TQFP package

Before removing the IC from the packaging, place a SMALL blob of solder on one of the corner pads, as shown: Soldering one pad first up allows us to get the orientation and alignment of the chip correct.



Next, place the chip on the pads, as well aligned as possible, it is OK if the chip does not sit flat due to the solder blob. Ensure that the silk-screened spot on the PCB is aligned with the dot engraved in the chip. These marks denote the placement of pin #1.

When the chip is properly aligned, apply heat to melt the solder blob, and fix the chip down. While the solder is molten, use the tweezers to make sure the chip is correctly aligned with all of the pads. Do this as quickly as possible, as we don't want to put too much heat into the chip.



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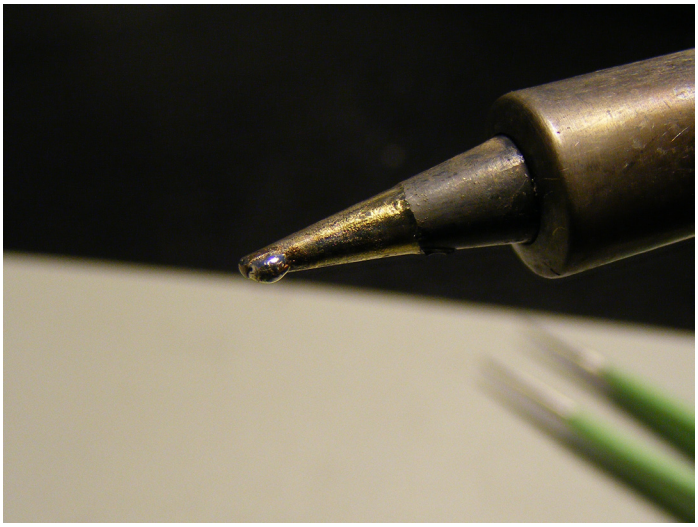
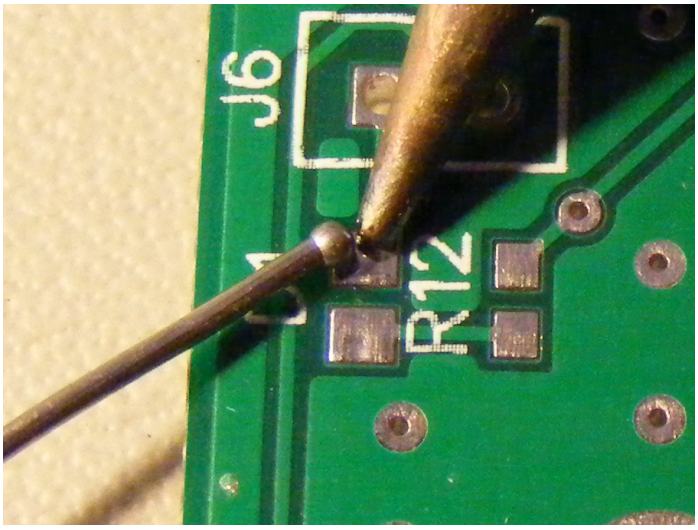
Next, solder the opposite pin to lock the chip down. Do this by first heating the pin, then applying solder. The soldering iron tip should have a small amount of solder to allow heat to transfer to the pin



Repeat this process to solder all pins on the chip. The same process should be used to solder U2, the voltage regulator IC.

Passives

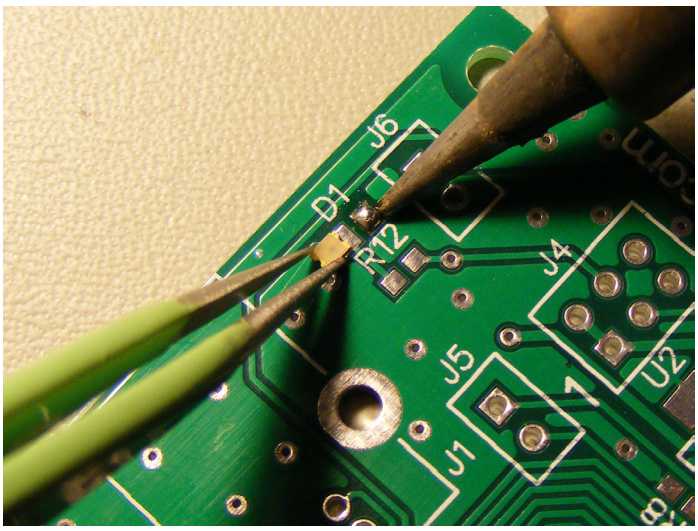
The other surface mounted parts on the board are all passive components in 0603 or 0805 packages. The resistors and capacitors are non-polarised, meaning they do not have specific +/- ends. However we must take care with the LED.



To solder one of these passive components, we first apply a blob of solder to one of the pads (not both!).

Next heat this solder blob, and slide the component across the other pad until is in the correct location. Then solder the other pad.

The two 1.5kOhm resistors are used as pull-ups for the I2C interface. They can interfere with external circuitry if the pins are used for digital IO, thus these parts are optional.



The passive parts should be identified by the silk-screened markings on the PCB itself. The values can be found in the table on the first page of this document. the SMD resistors can be identified by the markings printed on the packages, or alternatively by measurement with a multimeter.

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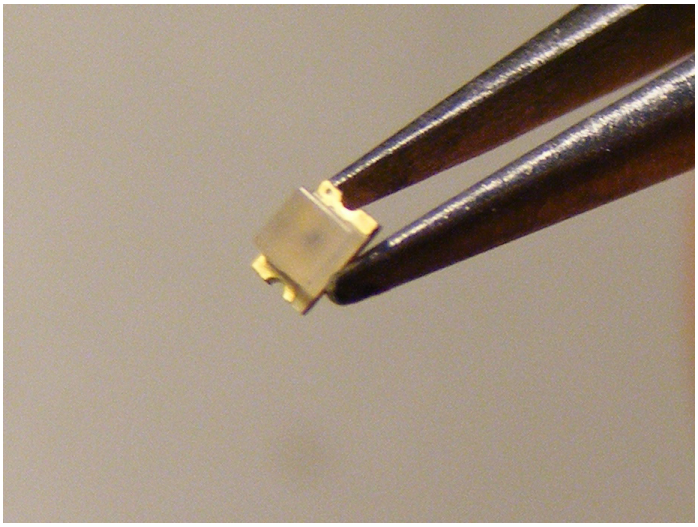
The resistors are generally placed with the maring side up, however this is just a convention. Capacitors may be placed in any orientation.

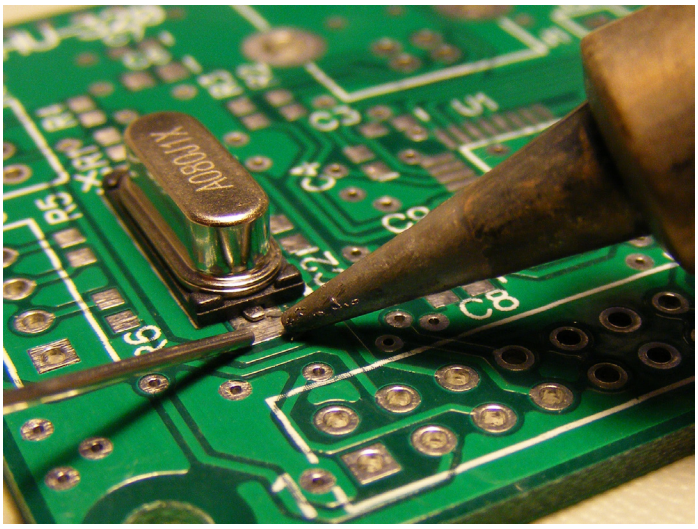
For the LED, the process is the same, but we need to ensure the polarity is correct. Looking very closely, we can see a small indent on the gold part at one end. We place this end closest to the header J6, as shown above.



Crystal Oscillator

Because the pad around the crystal oscillator is so large, it can be soldered in place. Simply place the component on the pads, and while holding it down with tweezers, heat the pin with the soldering iron and allow some solder to flow over and around the pin.

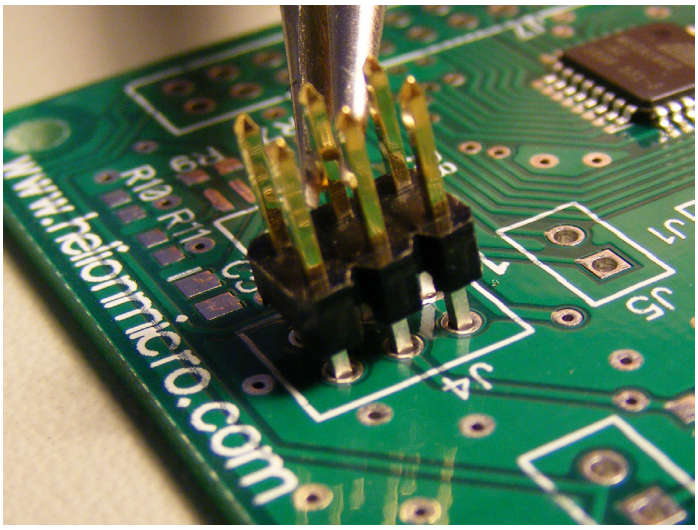
A good joint is critical on this component, as many issues can be traced to a bad clock.



Through-hole components

Now that the SMDs are all soldered, the next step is the through-hole connectors. This process is made easier by soldering the lowest components first. In this case, the headers are all the same height and only the USB connector is larger.

The header should be placed through the holes as shown. The black plastic retainer can slip on the pins, so ensure that it is correcty located. The pins should extend through the bottom of the board by about 1-2mm.



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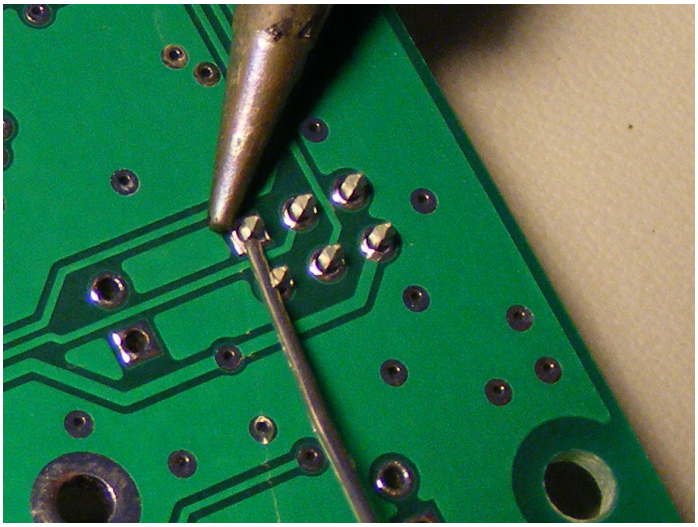
Solder one of the corner pins first, as shown. Apply the soldering iron tip (with a small amount of solder to aid heat transfer) to the pin, then apply the solder wire to melt and form the joint.



With just one pin soldered, flip the board and ensure the connector is properly seated flat on the board. With only one pin soldered, it is easy to correct the location of the connector.

If the connector is not seated well, applying pressure with a fingernail to the plastic retainer and heating the soldered pin is a simple way of correcting this problem. (Caution, the pin will get very hot on both sides of the board!)

Repeat this process for all the other through-hole connectors on the board. The assembly is now complete!

Jumper settings

Some of the connectors on the PCB are for selection of hardware settings. Selections are made using the supplied shunts.

J4 controls the voltage used by the IO pins. Selectable values are 5V and 3.3V, as shown. Ensure that these shunts are correctly located before power is applied to the circuit. Shunts may only be used in the two cofigurations shown. Other arrangements may cause damage to the board

Jumper	Setting / Purpose
J2	STK200/500 programming port (SPI)
J3	I2C / Power Port
J4	3.3V / 5V IO Selection
J5	Linier PSU control from PC2
J6	LED control from PC4
J7	Primary breakout connector