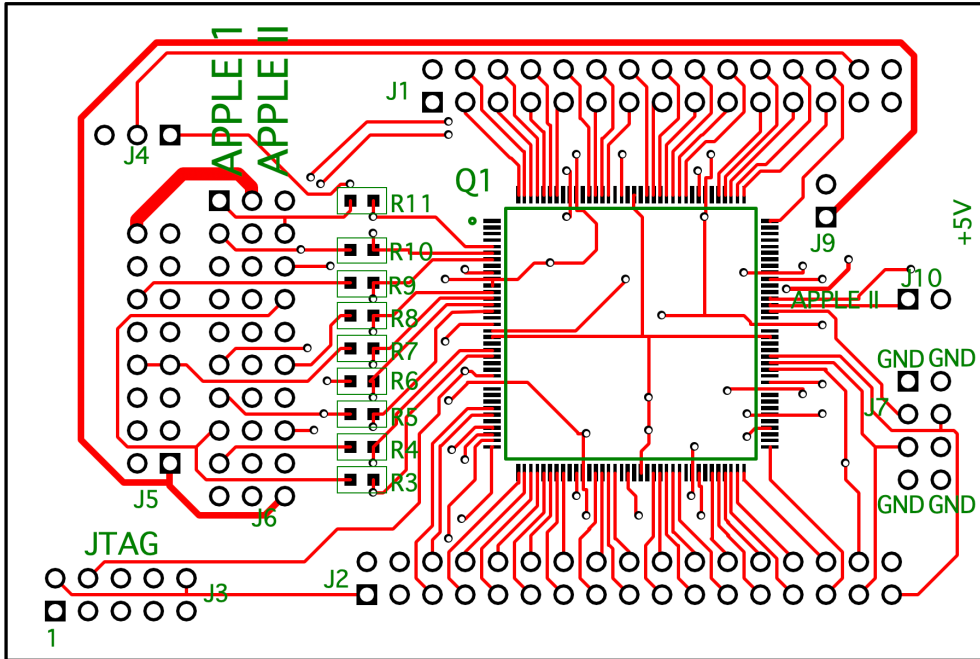


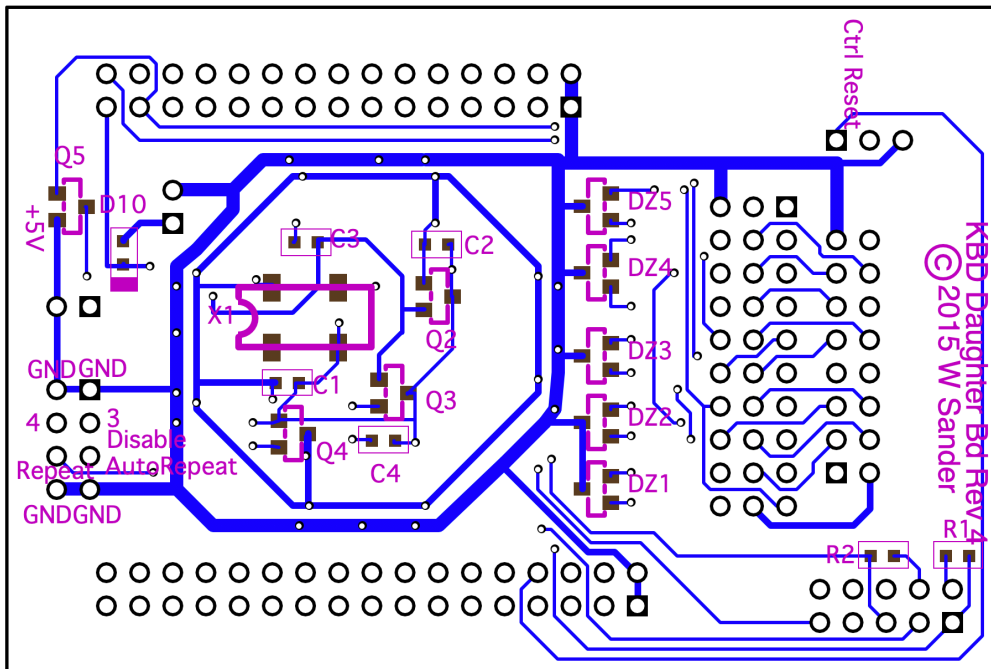
Schematic

Part	Designator	Value	Manufacturer	Mfg Part No.	Description
C1	CAPACITOR	0.1u	TDK	C1608X7R1E104K080AA	0603 CAPACITOR
C2	CAPACITOR	0.1u	TDK	C1608X7R1E104K080AA	0603 CAPACITOR
C3	CAPACITOR	1u	TDK	C1608X7R1A105K080AC	0603 CAPACITOR
C4	CAPACITOR	0.1u	TDK	C1608X7R1E104K080AA	0603 CAPACITOR
DZ1	Dual Zener Diode	3.9 V	DIODES INC	AZ23C3V9-7-F	SOT23
DZ2	Dual Zener Diode	3.9 V	DIODES INC	AZ23C3V9-7-F	SOT23
DZ3	Dual Zener Diode	3.9 V	DIODES INC	AZ23C3V9-7-F	SOT23
DZ4	Dual Zener Diode	3.9 V	DIODES INC	AZ23C3V9-7-F	SOT23
DZ5	Dual Zener Diode	3.9 V	DIODES INC	AZ23C3V9-7-F	SOT23
D10	Schottky Diode		DIODE INC	SDM10U45-7	0603 Diode
J1	HEADER	15X2	SAMTEC	TSS-115-01-L-D	2X15 0.1 In Shrouded
J2	HEADER	17X2	SAMTEC	TSS-117-01-L-D	2X17 0.1 In Shrouded
J3	HEADER	5X2	SAMTEC	TSW-105-07-L-D	2X5 0.1 In Header
J4	HEADER	1X3	SAMTEC	TSW-103-08-L-S-RA	1X3 0.1 In Header
J5	A1HEADER	2X8	3M	D2516-5002-AR	2X8 0.1 In RA Shrouded
J6	HEADER	3X10	SAMTEC	TSW-110-07-L-T	3X10 0.1 In Header
	Shorting Block	Decade	FCI	69145-220	Deca Shorting Block
J7	HEADER	4X2	SAMTEC	TSW-104-07-L-D	2X4 0.1 In Header
J9	HEADER	1X2	MOLEX	22-12-2024	1X2 0.1 In Connector
J10	HEADER	1X2	SAMTEC	TSW-102-07-L-S	1X2 0.1 In Header
Q1	144TQFP	MAX V 1270	ALTERA	5M1270ZT144C5N	144 PIN TQFP CPLD
Q2	LM3480-3.3	3.3 V LDO	TI	LM3480IM3	SOT23
Q3	AP7313-18	1.8 V LDO	DIODES INC	AP7313-18SAG-7	SOT23
Q4	MAX809	2.63 V Reset	ON SEMI	MAX809RTRG	SOT23
Q5	FJV3102R		Fairchild	FJV3102R	SOT23
R1	RESISTOR	1KΩ			0603 Resistor
R2	RESISTOR	1KΩ			0603 Resistor
R3	RESISTOR	240Ω 1/4 W	ROHM	ESR03EZPJ241	0603 Resistor
R4	RESISTOR	240Ω 1/4 W	ROHM	ESR03EZPJ242	0603 Resistor
R5	RESISTOR	240Ω 1/4 W	ROHM	ESR03EZPJ243	0603 Resistor
R6	RESISTOR	240Ω 1/4 W	ROHM	ESR03EZPJ244	0603 Resistor
R7	RESISTOR	240Ω 1/4 W	ROHM	ESR03EZPJ245	0603 Resistor
R8	RESISTOR	240Ω 1/4 W	ROHM	ESR03EZPJ246	0603 Resistor
R9	RESISTOR	240Ω 1/4 W	ROHM	ESR03EZPJ247	0603 Resistor
R10	RESISTOR	240Ω 1/4 W	ROHM	ESR03EZPJ248	0603 Resistor
R11	RESISTOR	240Ω 1/4 W	ROHM	ESR03EZPJ249	0603 Resistor
X1	Crystal Oscillator PCB	10.000 MHz	EPSON SIERRA	SG-636PCE 10.000MCO	10 MHz Crystal Oscillator
	CABLE ASSY	16 PIN	Digikey	C4PXG-1618M-ND	16 PIN HEADER CABLE
	IDC PLUG	16 PIN	TE Connectivity	1658623-3	16 PIN IDC PLUG

Parts List



Top Assembly



Bottom Assembly

Keyboard Daughter Bd Rev 4
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J1	Function	Q1 Pin	J1	Function	Q1 Pin	J2	Function	Q1 Pin	J2	Function	Q1 Pin
J1-30	RESET		J1-29	+5V		J2-30	RETURN	Q1-73	J2-29	SHIFT	Q1-72
J1-28	RESET		J1-27	CLR		J2-28	;	Q1-71	J2-27	/	Q1-70
J1-26	-	Q1-108	J1-25	_	Q1-109	J2-26	L	Q1-69	J2-25	.	Q1-68
J1-24	:	Q1-110	J1-23	P	Q1-111	J2-24	K	Q1-67	J2-23	,	Q1-62
J1-22	0	Q1-112	J1-21	O	Q1-113	J2-22	J	Q1-61	J2-21	M	Q1-60
J1-20	9	Q1-118	J1-19	I	Q1-119	J2-20	H	Q1-59	J2-19	N	Q1-58
J1-18	8	Q1-120	J1-17	U	Q1-121	J2-18	G	Q1-52	J2-17	B	Q1-51
J1-16	7	Q1-122	J1-15	Y	Q1-123	J2-16	F	Q1-50	J2-15	V	Q1-49
J1-14	6	Q1-124	J1-13	T	Q1-130	J2-14	D	Q1-44	J2-13	C	Q1-43
J1-12	5	Q1-131	J1-11	R	Q1-132	J2-12	S	Q1-42	J2-11	X	Q1-41
J1-10	4	Q1-133	J1-9	E	Q1-138	J2-10	A	Q1-40	J2-9	Z	Q1-39
J1-8	3	Q1-139	J1-7	W	Q1-140	J2-8	CTRL	Q1-38	J2-7	CAPS OUT	Q1-37
J1-6	2	Q1-141	J1-5	Q	Q1-142	J2-6	CAPS LOCK	Q1-31	J2-5	SPACE	Q1-30
J1-4	1	Q1-143	J1-3	ESC	Q1-144	J2-4	NC		J2-3	NC	
J1-2	GND		J1-1	GND		J2-2	GND		J2-1	GND	

Connector Pin Descriptions

Programmer Setup

The Programmer software can be downloaded at:

<https://www.intel.com/content/www/us/en/programmable/downloads/software/prog-software/120sp2.html>

You will be asked to register with Altera. A Linux version is also available. The data file for programming is the file "keyboard.pof" in the Programmer Files Zip folder.

Figure 1 shows the connection to the Keyboard Daughter board for programming. The USB blaster is connected directly to the computer. The USB Blaster Driver file is in the Quartus II folder installed by the install program.

The USB Blaster device can be found on Amazon. You will need to make up a 5V supply for the Daughter Board using a Molex 22-01-202 connector. The +5V pin is labeled on the Daughter Board.



Figure 1

Install the USB Blaster before running the program, installation help can be found on the Internet. Run the Programmer and the screen of Figure 2 will appear, select Hardware Setup, the screen of Figure 3 will then appear and under Available hardware items select USB Blaster and close. Then select Add File as shown in Figure 4 and navigate to select the keyboard.pof file as shown in Figure 5. The screen of Figure 6 will appear and select Program/Configure to program the part, you can also Verify the part. The keyboard.pof file is contained in the keyboard.pof.zip file

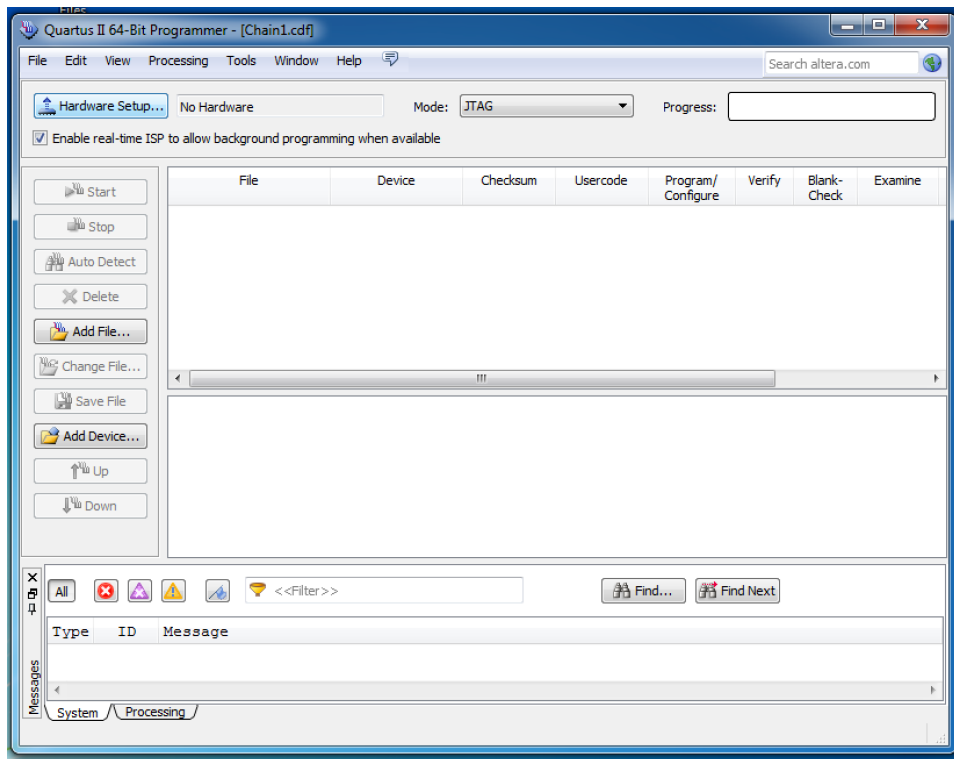


Figure 2

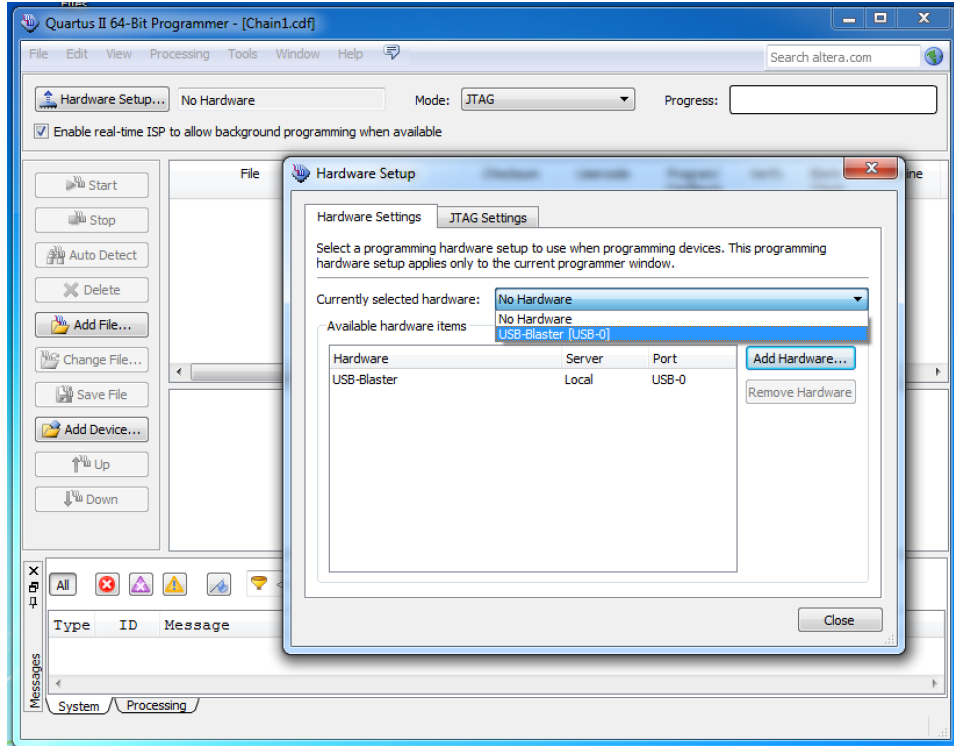


Figure 3

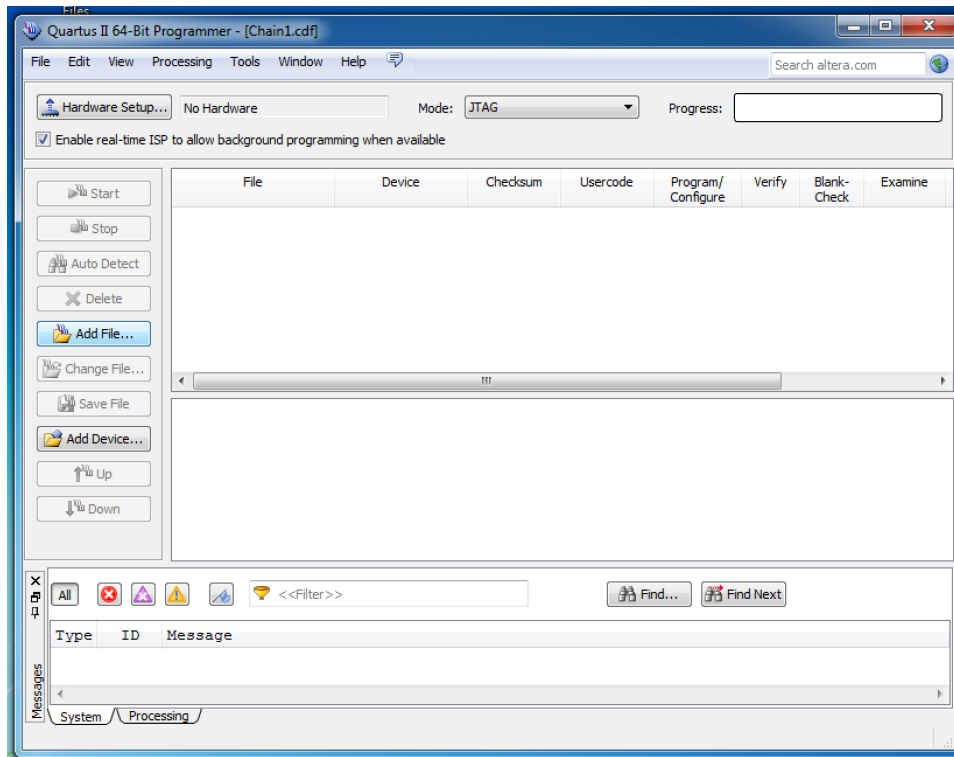


Figure 4

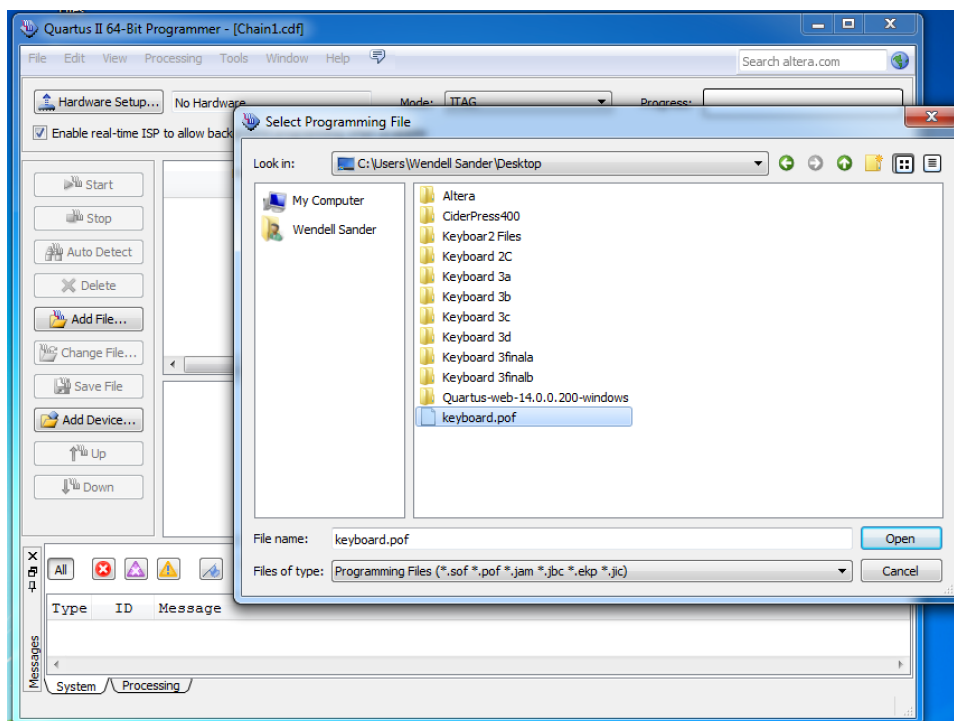


Figure 5

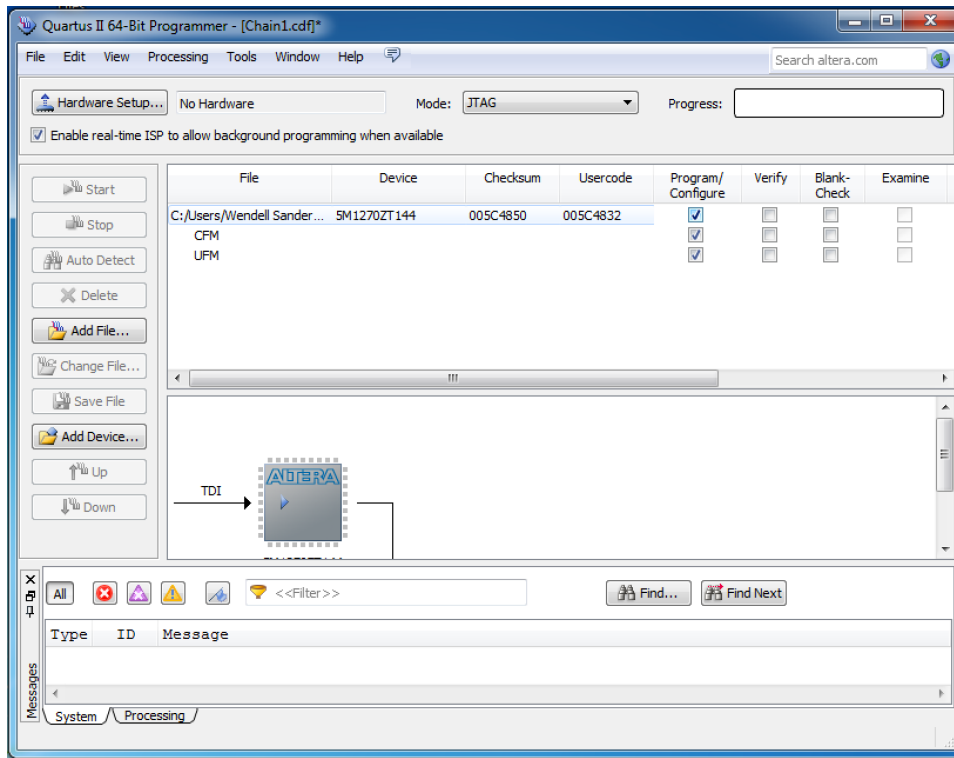


Figure 6

Keyboard Daughter Board Assembly

This document suggests a sequence for assembly of the Keyboard Daughter Board. The part that requires the most care is the 144 pin TQFP Q1. This should be put on the board first to allow the most room for careful inspection and repair. The method I used to solder the part is illustrated pretty well in the YouTube video

<https://youtu.be/5uiroWBkdFY>

I used resin solder and the method uses extra flux so after soldering it is important to thoroughly clean the traces to look for solder bridges and opens. In looking for bridges there is one pair of pins, pin 10 and 11 that have a trace between them as shown in figure 1, this will always look like a bridge as shown in Figure 2 so just ignore the apparent bridge.

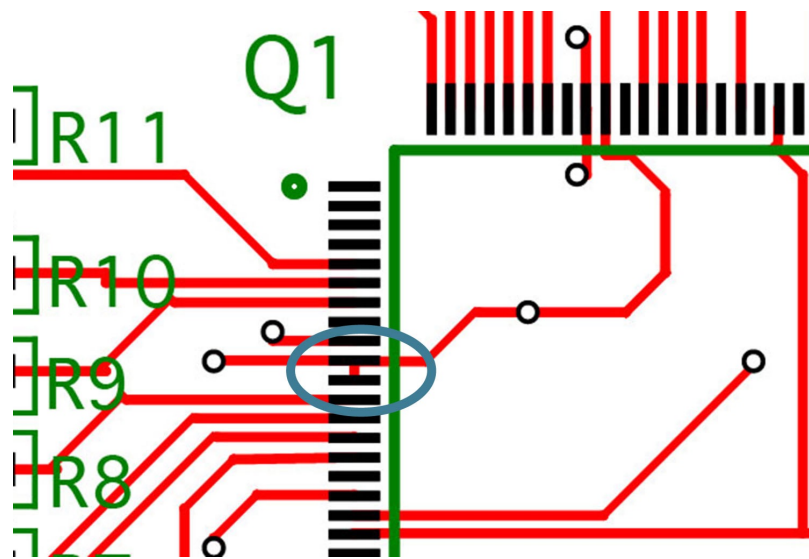


Figure 1

When inspecting the leads bridges are fairly easily seen but opens are less obvious. The best way to look for opens is to make sure there is a fillet off the end of the package lead onto the board as can be seen in Figure 2. If there is no fillet it is likely an open.

The method I use for board cleaning is to first use a flux cleaner but that still leaves a residue. The residue can be removed with Goo Gone and then the Goo Gone can be removed by washing the board with Soap and Water. After cleaning a final assembly I usually bake out the board in a kitchen oven at 175°F, just place the board on something to prevent direct exposure to the heating element. It is best to wash the boards with soft water if possible.

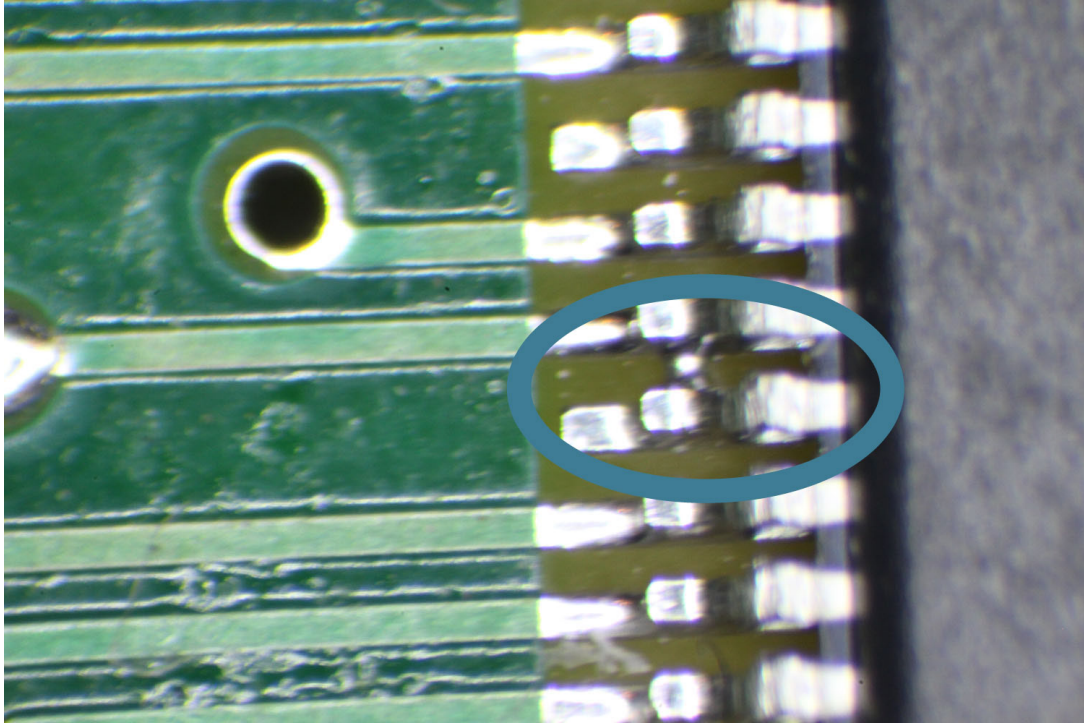


Figure 2

The next parts to be put in are the 240Ω resistors on the top side. Note that these are special high wattage resistors, not run-of-the-mill 0603's. See Figure 3.

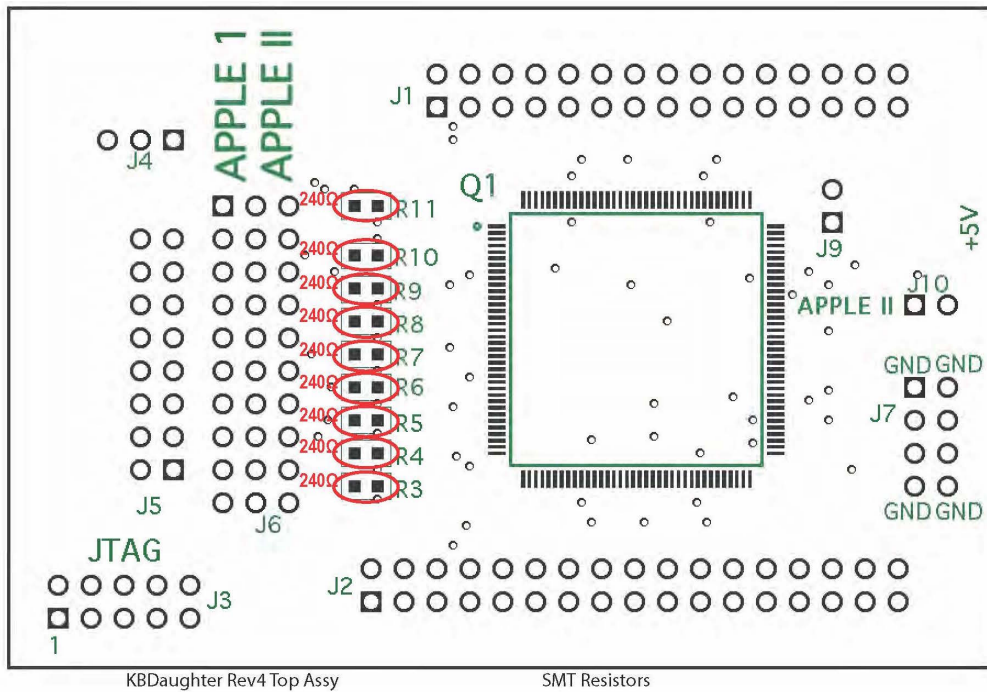


Figure 3

On the bottom side I start with the 1KΩ resistors as shown in Figure 4, then the 0603 Capacitors as shown in Figure 5

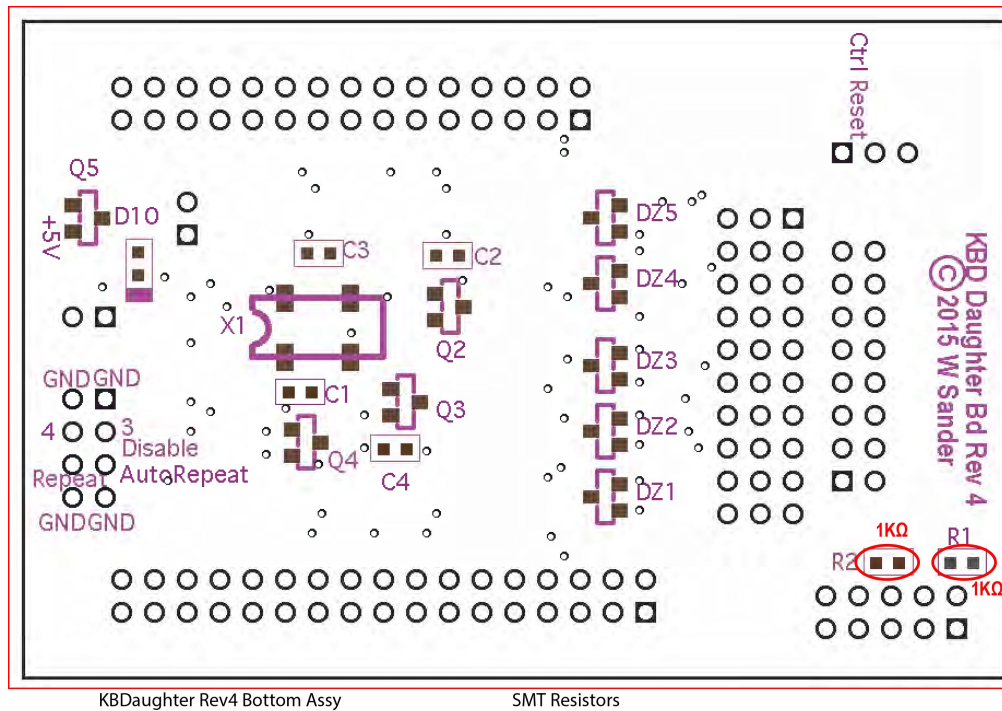


Figure 4

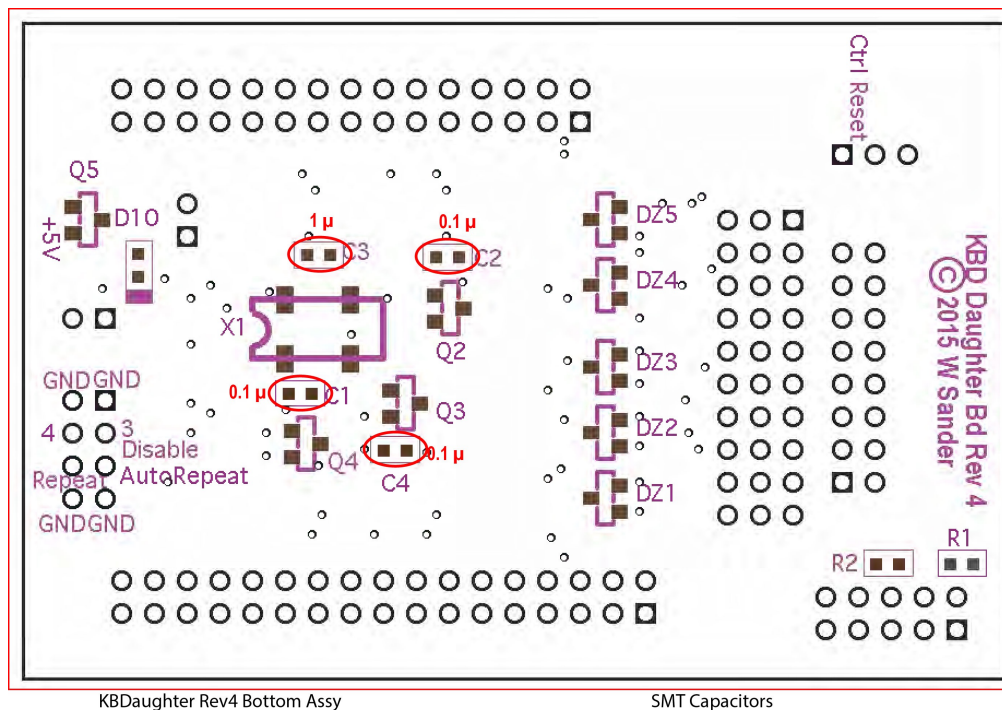


Figure 5

The Zener Diodes are shown next in Figure 6 and the other SOT23 parts in Figure 7. Then the Crystal Oscillator X1 can complete the surface mount parts.

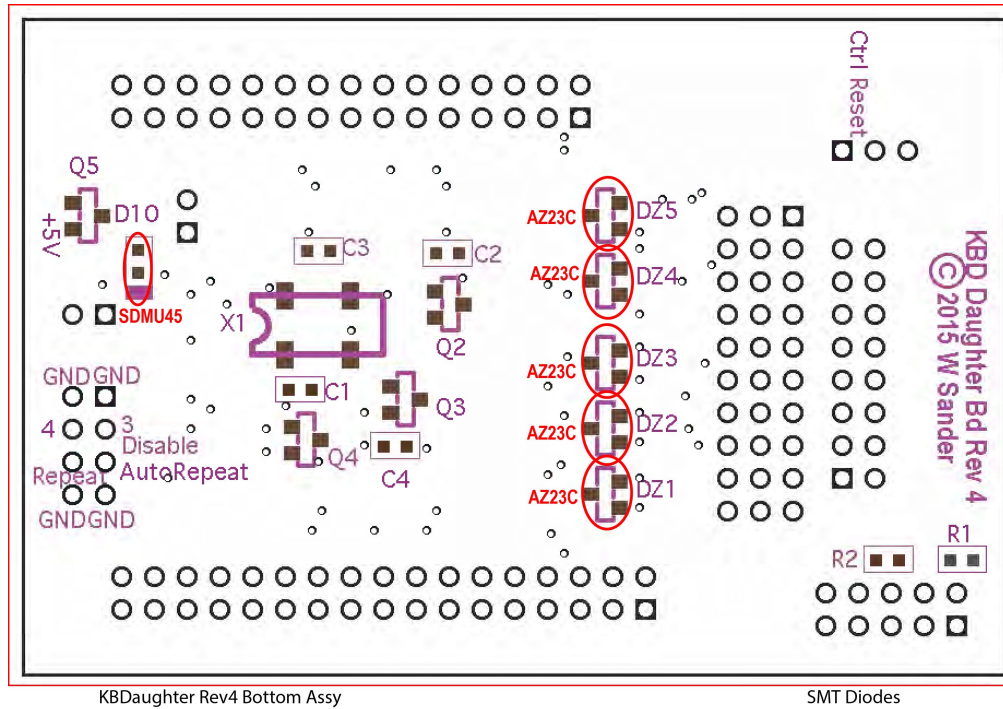


Figure 6

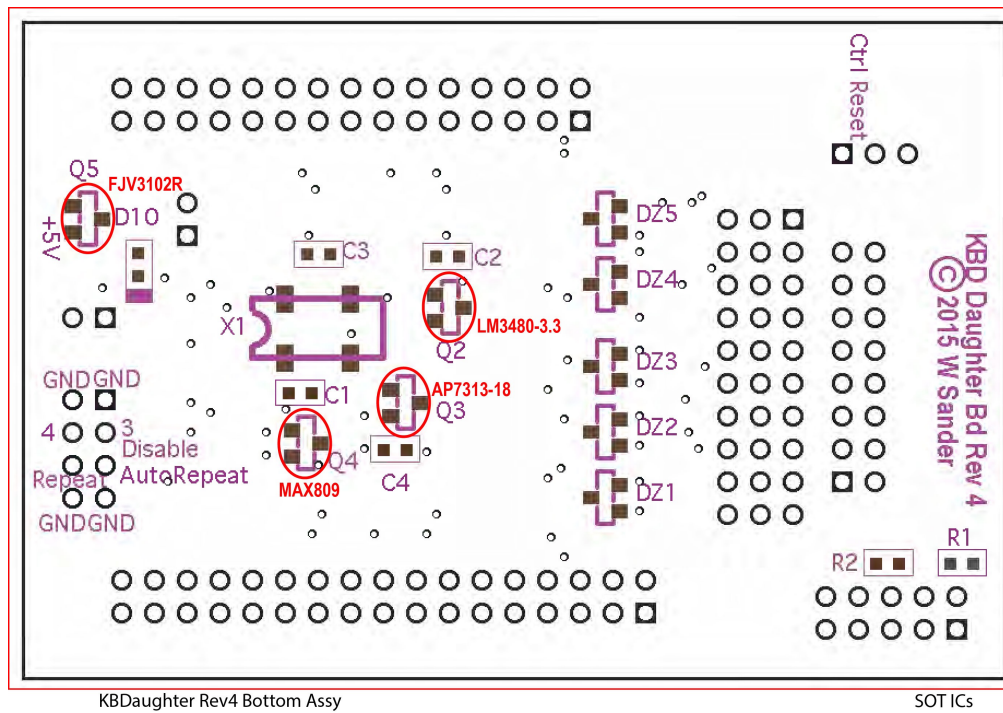


Figure 7

With all the the surface mount parts in place do a very careful inspection, particularly on the top side since repair or retouch becomes much more difficult after the connectors are mounted, especially J1 and J2. Note that all connectors mount on the Top side. I suggest mounting J3 and J9 next, not that J9 is the right angle keyed connector. After these two connectors are mounted the FPGA Q1 can be programmed. Programming is discussed in another document.

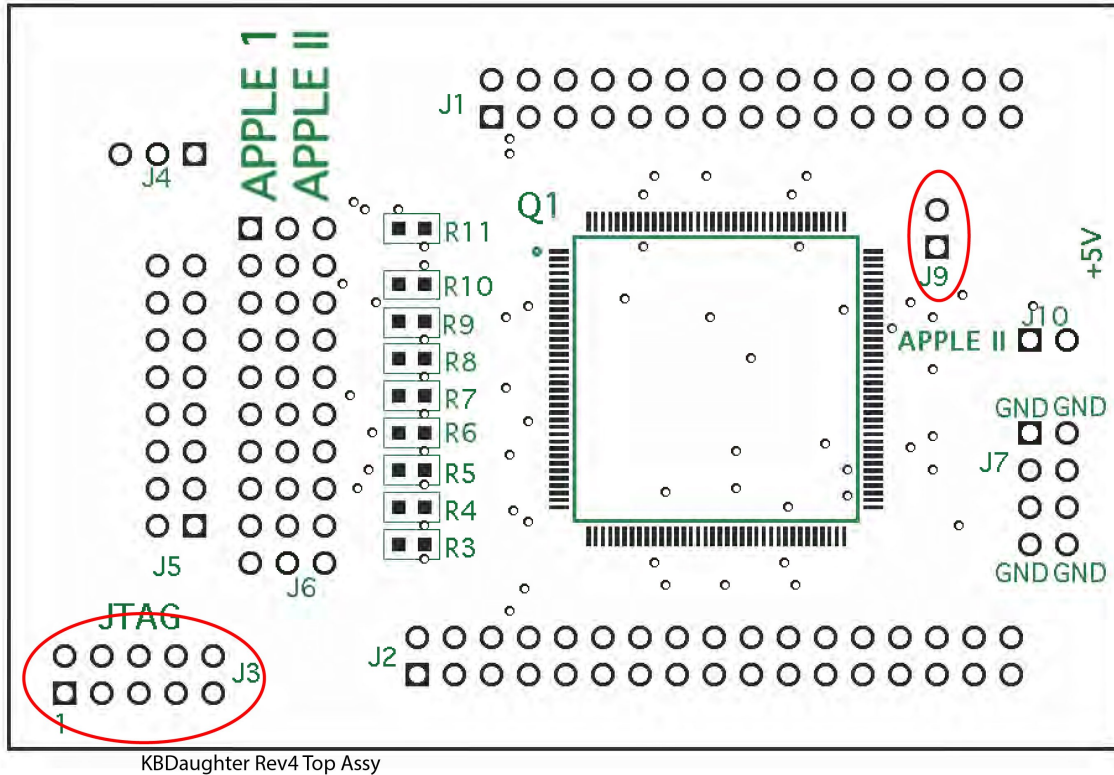


Figure 8

After mounting all the connectors do not forget to put the shorting block on J6 before testing with the Main Keyboard.

The KBDAughter Documents folder on the thumb drive contains a schematic and a parts list in three formats, pdf, Numbers and Excel. It was created in Numbers but not everyone uses that.

A good website for getting price and availability on standard parts is:

<http://www.eciaauthorized.com>.