KS10 FPGA DE10 Daughter Board Assembly Instructions

Please note: This is not a Heathkit. I've built one of these and it works for me.

Some thoughts:

- 1. I recommend assembling all of the surface mount components before assembling any of the through-hole connectors. That just makes it easier to hold the PWB if it is relatively flat. The order of assembly of the SMT components doesn't matter.
- 2. JP1, JP2, JP3, and JP7 are mounted on the bottom of the PWB. Before soldering I installed these connectors into the DE10 Nano board and then fitted the KS10 Daughter Board onto the connectors using the DE10 Nano board as a fixture to ensure that all the connectors were aligned and mated properly. Then I tack solder a few corner pins to hold the connectors in-place. One tack soldered, I removed the Daughter Board and inspected the connectors to ensure everything looked correct. Lastly I soldered all of the connector pins.
- 3. Lastly install the connectors for U2 and U3 on the top of the PWB. The FT4232 modules provide 8x RS232 channels which are used by the DZ11 terminal multiplexer and/or the LP20 printer.

J102 is a connector that will be eventually used as a gadget to connect multiple SD Cards emulating multiple RP06s. For now, it is not installed.

J103 is a connector that will be eventually wired to a front panel. For now, it is not installed.

Attached below is drawing of the top layer copper and top layer silkscreen, bottom layer copper and bottom layer silk screen, and a Bill of Materials from Digikey.

			_	
GND	~1	J10	2	
ESD-SCLK-N	\leq		4	
GND	<u>ئىر</u>	100	6	
ESD-DI-P	ٽــــــرَّ	-10 0	8	ESD-DI-
GND	55	ᅆ	10	
ESD-DO-N	> 1	မှစ	12	ESD-DO-I
+3.3V	5	70 0	14	- +3.34
GND	<u></u>	70 0	16	
BDIO	<u></u>	-00	18	
BRD-N	<u></u>	700	20	
BWR-N	<u></u>	700	22	
BA1		700	24 26	
BA3	<u>ب</u>	40 0	20	-< <u> </u>

	J	P2	
SD-CD	1	0	1015
SPAREØ	2	0	I014
	<u>х 3</u>	0	VREF
	4	ю	GND
RESET-LED	5	ю	1013
HALT-SW	6	ю	1012
HALT-LED	. 7	ю	I011
BOOT-SW	8	0	1010
BOOT-LED	9	0	109
SPARE2	10	0	108
	-	60	
RAM-WE#	ĭ	0	107
RAM-A18	2	0	106
RAM-A12	3	0	105
RAM-D15	4	0	104
RAM-D12	5	0	103
RAM-D09	- 6	0	102
USB-RXD3	7	ю	101
USB-TXD3	8	0	100
		_	

		110			
GND	>4	ᅌᅌ	2	SPAREØ	
+3.3V	>3	0 0	4	PWR-LED	
GND	5-5	00	<u> </u>	RESET-SW	
+3.3V	<u>} </u>	0 0	8	RESET-LED	
GND	59	0 0	10	HALT-SW	
+3.3V	$>$ $\frac{11}{1}$	ᅌᅌ	12	HALT-LED	
GND	> 13	0 0	14	BOOT-SW	
+3.3V	> 15	0 0	16	BOOT-LED	
GND	5 17	0 0	18	SPARE 1	
+3.32	- 19	0 0	20	SPARE2	

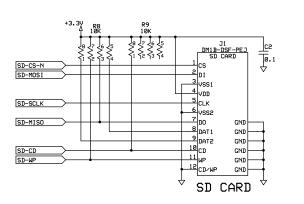
SD-SCLK	\rightarrow		6	04	\prec	SD-CS-N
SD-MISO	\rightarrow	5	Ľ		\prec	RAM-D08
PWR-LED	\rightarrow	7			\prec	RAM-D07
RESET-SW	\rightarrow			010	\prec	RAM-DØ6
	×	11		012	\prec	GND
RAM-D05	\rightarrow			014		RAM-D04
RAM-D03	\rightarrow		6			RAM-D02
RAM-D01	\rightarrow			018		RAM-D00
RAM-A06	\rightarrow		6	020	\prec	RAM-A07
RAM-CLK	\rightarrow	21	6	22	\prec	SPARE 1
RAM-A19	\rightarrow		6			RAM-ADV
RAM-A11	\rightarrow			0 26		RAM-A10
RAM-D16	\rightarrow			0 28	\prec	RAM-D17
+3.3V	\rightarrow			030	\prec	GND
RAM-D13	\rightarrow	31	6	032	\prec	RAM-D14
RAM-D10	\rightarrow		6		\prec	RAM-D11
USB-TXD5	\rightarrow			0 36		USB-RXD5
	\rightarrow	37	6	0 38		USB-TXD0
USB-RXD1	_	- 39		40		USB-RXD0
USB-TXD1	 		- - - - - - - - - - - - - 	97 97 92		USB-RXD4
USB-TXD1 USB-TXD7	->- ->-	1		27	\rightarrow	USB-RXD4
USB-TXD1 USB-TXD7 USB-RXD7		1] 	27 2 2 2 4		USB-RXD4 USB-TXD4
USB-TXD1 USB-TXD7 USB-RXD7 USB-RXD6		1	0	2 2 2 4 0 4	\square	USB-RXD4 USB-TXD4 USB-TXD6
USB-TXD1 USB-TXD7 USB-RXD7 USB-RXD6 USB-TXD2		1	000			USB-RXD4 USB-TXD4 USB-TXD6 USB-RXD2
USB-TXD1 USB-TXD7 USB-RXD7 USB-RXD6 USB-TXD2		1 3 7				USB-RXD4 USB-TXD4 USB-TXD6 USB-TXD6 USB-RXD2 RAM-A14
USB-TXD1 USB-TXD7 USB-RXD7 USB-RXD6 USB-TXD2 RAM-A13		1 3 7 9	0000	2 2 4 0 4 0 6 8 0 10 0 12		USB-RXD4 USB-TXD4 USB-TXD6 USB-RXD2 RAM-A14 GND
USB-TXD7 USB-TXD7 USB-RXD7 USB-RXD6 USB-TXD2 RAM-A13 RAM-A15		1 3 - 5 - 7 - 9 - 11 13		27 2 4 0 4 0 8 0 10 0 12 0 14		USB-RXD4 USB-TXD4 USB-TXD6 USB-RXD2 RAM-A14 GND RAM-A16
USB-TXD1 USB-TXD7 USB-RXD7 USB-RXD6 USB-TXD2 RAM-A13 RAM-A13 RAM-A15 RAM-A17		1 3 5 7 9 11 13 15		2 2 4 0 4 0 8 0 10 0 12 0 14 0 16 0 16		USB-RXD4 USB-TXD4 USB-TXD6 USB-RXD2 RAM-A14 GND RAM-A16 RAM-A06
USB-TXD1 USB-TXD7 USB-RXD7 USB-RXD6 USB-TXD2 RAM-A13 RAM-A13 RAM-A17 RAM-A09		1 3 7 9 11 13 15 17		7 2 4 0 4 0 8 0 10 0 12 0 14 0 18 18 0 18 0 18 0 18 0 18 18 18 18 18 18 18 18 18 18		USB-RXD4 USB-TXD4 USB-TXD6 USB-RXD2 RAM-A14 GND RAM-A16 RAM-A600 RAM-A600
USB-TXD1 USB-TXD7 USB-RXD7 USB-RXD6 USB-TXD2 RAM-A13 RAM-A13 RAM-A15 RAM-A17 RAM-A09 RAM-A21		1 3 7 9 11 13 15 17		27 2 4 5 6 8 5 10 5 10 5 10 5 10 5 10 5 10 5 10 5 10 5 5 10 5 5 5 5 5 5 5 5 5 5 5 5 5		USB-RXD4 USB-TXD4 USB-TXD6 USB-RXD2 RAM-A14 GND RAM-A16 RAM-A06 RAM-A020 RAM-A000
USB-TXD1 USB-TXD7 USB-RXD7 USB-RXD2 USB-TXD2 RAM-A13 RAM-A13 RAM-A15 RAM-A09 RAM-A21 RAM-A01		1 3 5 7 9 11 13 15 17 19 21				USB-RXD4 USB-TXD4 USB-TXD4 USB-RXD2 RAM-A14 GND RAM-A16 RAM-A02 RAM-A02 RAM-A02
USB-TXD1 USB-TXD7 USB-RXD7 USB-RXD6 USB-TXD2 RAM-A13 RAM-A13 RAM-A17 RAM-A09 RAM-A21 RAM-A01 RAM-A03		1 3 5 7 9 11 13 15 17 19 21 23		27 2 4 5 6 8 5 10 5 10 5 10 5 10 5 10 5 10 5 10 5 10 5 5 10 5 5 5 5 5 5 5 5 5 5 5 5 5		USB-RXD4 USB-TXD6 USB-TXD6 USB-RXD2 RAM-A14 GND RAM-A12 RAM-A02 RAM-A02 RAM-A02 RAM-A02 RAM-A02
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USB-TXD7 USB-TXD7 USB-TXD7 USB-RXD7 USB-RXD6 USB-TXD2 RAM-A13 RAM-A15 RAM-A15 RAM-A21 RAM-A21 RAM-A21 RAM-A20 RAM-A23 RAM-A23 RAM-A25 RAM-A25 RA3		1 3 5 7 9 11 13 15 17 19 21 23 25 27				USB-RXD4 USB-TXD4 USB-TXD6 USB-RXD2 RAM-A14 GND RAM-A06 RAM-A0
USB-TXD1 USB-RXD7 USB-RXD7 USB-RXD6 USB-TXD2 RAM-A13 RAM-A15 RAM-A15 RAM-A17 RAM-A09 RAM-A21 RAM-A09 RAM-A03 RAM-A03 RAM-A05 BA3 +3.3V		1 3 5 7 9 11 13 15 17 19 21 23 25 27		27 2 4 5 6 8 6 10 12 16 16 16 16 16 10 12 16 10 12 12 10 12 10 12 10 12 10 12 10 10 10 10 10 10 10 10 10 10		USB-RXD4 USB-TXD6 USB-TXD6 USB-RXD2 RAM-A14 GND RAM-A16 RAM-A06 RAM-A06 RAM-A06 RAM-A06 RAM-A04 RAM-A04 BA4 BA4 BA4 BA4
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USB-TXD7 USB-RXD7 USB-RXD7 USB-RXD6 USB-RXD6 USB-TXD2 RAM-A13 RAM-A13 RAM-A13 RAM-A03		1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33				USB-RXD4 USB-TXD4 USB-TXD6 USB-RXD2 RAM-A14 GND RAM-A02 RAM-A02 RAM-A02 RAM-A02 RAM-A04 BA4 BA4 BA4 BA4 BA4 BA4 BA4 BA4 BA4 BA
USB-TXD7 USB-RXD7 USB-RXD7 USB-RXD6 USB-TXD2 RAM-A13 RAM-A15 RAM-A15 RAM-A09 RAM-A21 RAM-A09 RAM-A03 RAM-A03 RAM-A03 RAM-A05 BA3 +3.3V BA1 BMR-N BRD-N		1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35				USB-RXD4 USB-TXD6 USB-TXD6 USB-RXD2 RAM-A14 GND RAM-A08 RAM-A08 RAM-A08 RAM-A08 RAM-A04 BA4 BA4 BA4 BA4 BA2 CND BA0 BR51-N BCS-N
USB-TXD7 USB-RXD7 USB-RXD7 USB-RXD6 USB-RXD6 USB-TXD2 RAM-A13 RAM-A13 RAM-A13 RAM-A17 RAM-A01 RAM-A01 RAM-A03		1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37				USB-RXD4 USB-TXD4 USB-TXD6 USB-RXD2 RAM-A10 RAM-A00 RA

JP1 1002 3004

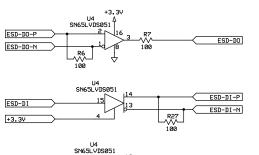
SD-WP

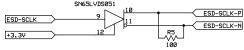
SD-CS-N

SD-MOSI SD-SCLK





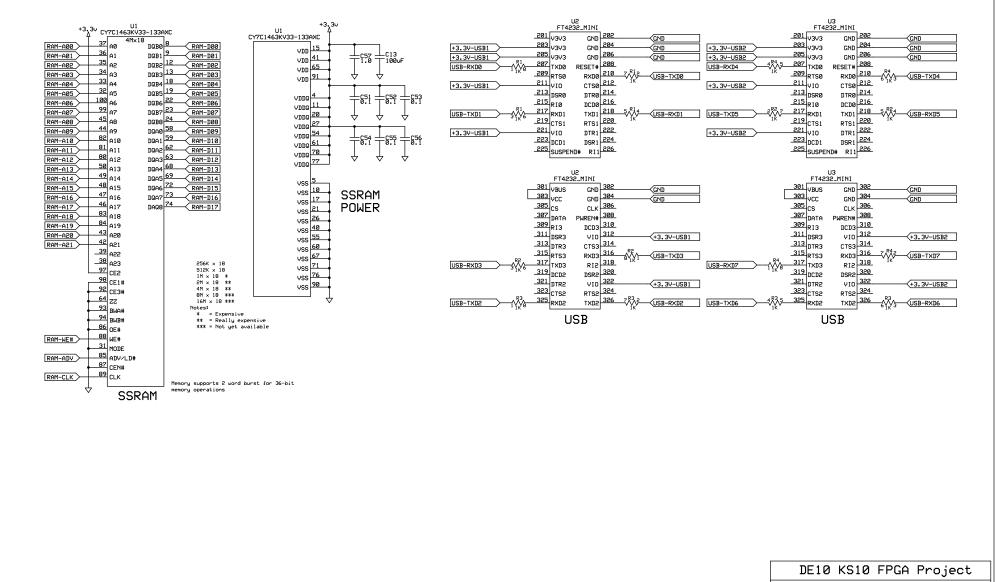




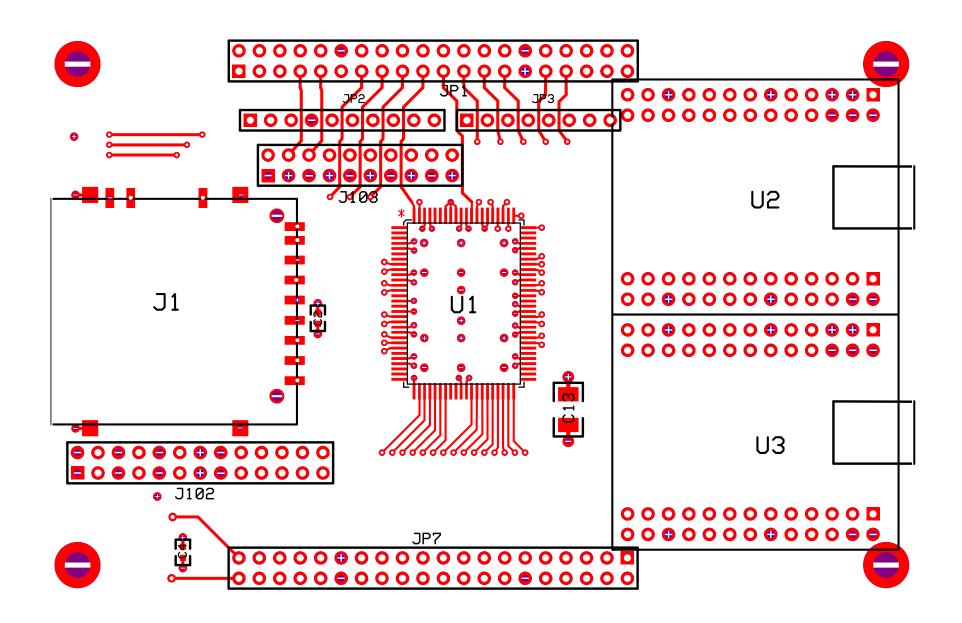
DE10 KS	510 FPGA P	roject				
Daughter Board						
Rob Doyle	Rev 1.0	Page 1 of 2				
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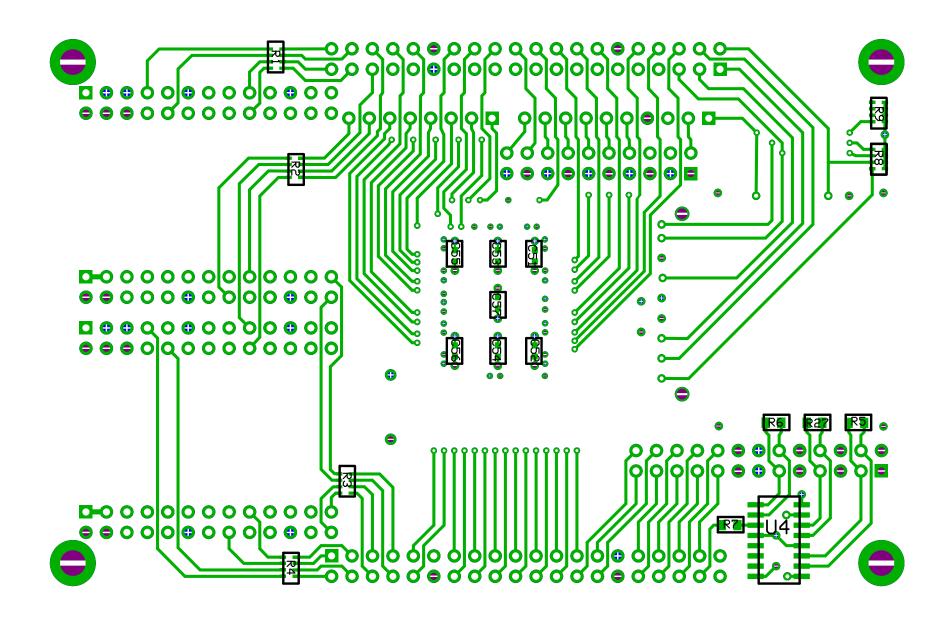
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QTY	Manufacturer	Manufacturer Part Number	Cost (ea / USD)	Cost (total / USD)	Digikey Part Number	Description	Reference Designator
8	AVX	06033C104KAT2A	\$0.10	\$0.80	478-3714-1-ND	CAP CER 0.1UF 25V X7R 0603	C2,C4,C51,C52,C53,C54,C55,C56
1	AVX	0603ZD105KAT2A	\$0.20	\$0.20	478-1251-1-ND	CAP CER 1UF 10V X5R 0603	C57
1	AVX	GRM32ER60J107ME20L	\$0.80	\$0.80	490-3390-2-ND	CAP CER 100UF 6.3V X5R 1210	C13
1	Hirose	DM1AA-SF-PEJ(21)	\$3.58	\$3.58	HR845CT-ND	CONN SD CARD PUSH-PUSH R/A SMD	J1
2	Samtec	ESW-120-13-L-D	\$8.66	\$17.32	ESW-120-13-L-D-ND	CONN SOCKET 40POS 0.1 GOLD PCB	JP1,JP7
2	Samtec	TSW-110-15-G-S	\$1.64	\$3.28	SAM12344-ND	ESW-120-13-L-D-ND	JP2,JP3 (Note 1)
DNI	Samtec	TSW-113-07-F-D	\$2.62	N/A	SAM12370-ND	CONN HEADER VERT 26POS 2.54MM	J102,J103 (Note 2, Note 3)
4	Sullins	PPTC132LFBN-RC	\$1.58	\$6.32	S7081-ND	CONN HDR 26POS 0.1 TIN PCB	Socket for U2,U3
4	Bourns	CAY16-102J4LF	\$0.10	\$0.40	CAY16-102J4LFCT-ND	RES ARRAY 4 RES 1K OHM 1206	R1,R2,R3,R4
DNI	Stackpole	RMCF0805JT100R	\$0.10	N/A	RMCF0805JT100RCT-ND	RES 100 OHM 5% 1/8W 0805	R27,R5,R6,R7 (Note 3)
2	Bourns	CAY16-103J4LF	\$0.10	\$0.20	CAY16-103J4LFCT-ND	RES ARRAY 4 RES 10K OHM 1206	R8,R9
1	Cypress	CY7C1463KV33-133AXC	\$26.43	\$26.43	2015-CY7C1463KV33-133AXC-ND	IC SRAM 36MBIT PARALLEL 100TQFP	U1
2	FTDI	FT4232H MINI MODULE	\$33.02	\$66.04	768-1031-ND	MOD USB HS FT4232H EVAL	U2,U3
DNI	TI	SN65LVDS051	\$4.63	N/A	296-24422-1-ND	IC TRANSCEIVER FULL 2/2 16SOIC	U4 (Note 3)

Note 1: Cut JP3 to size before installing.

\$125.37 Total Cost

Note 2: Cut J103 to size before installing Note 3: Do not install (DNI)

