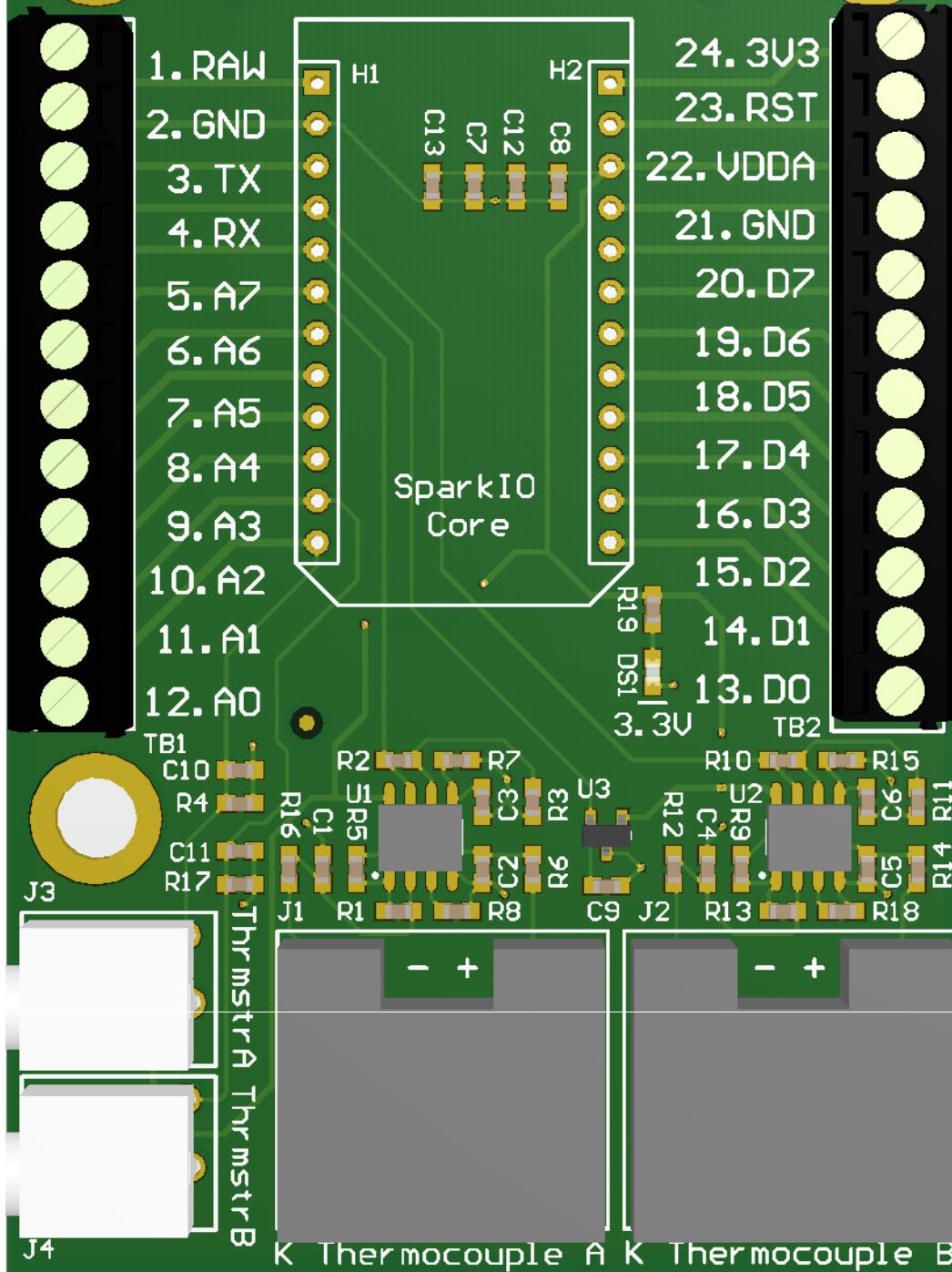
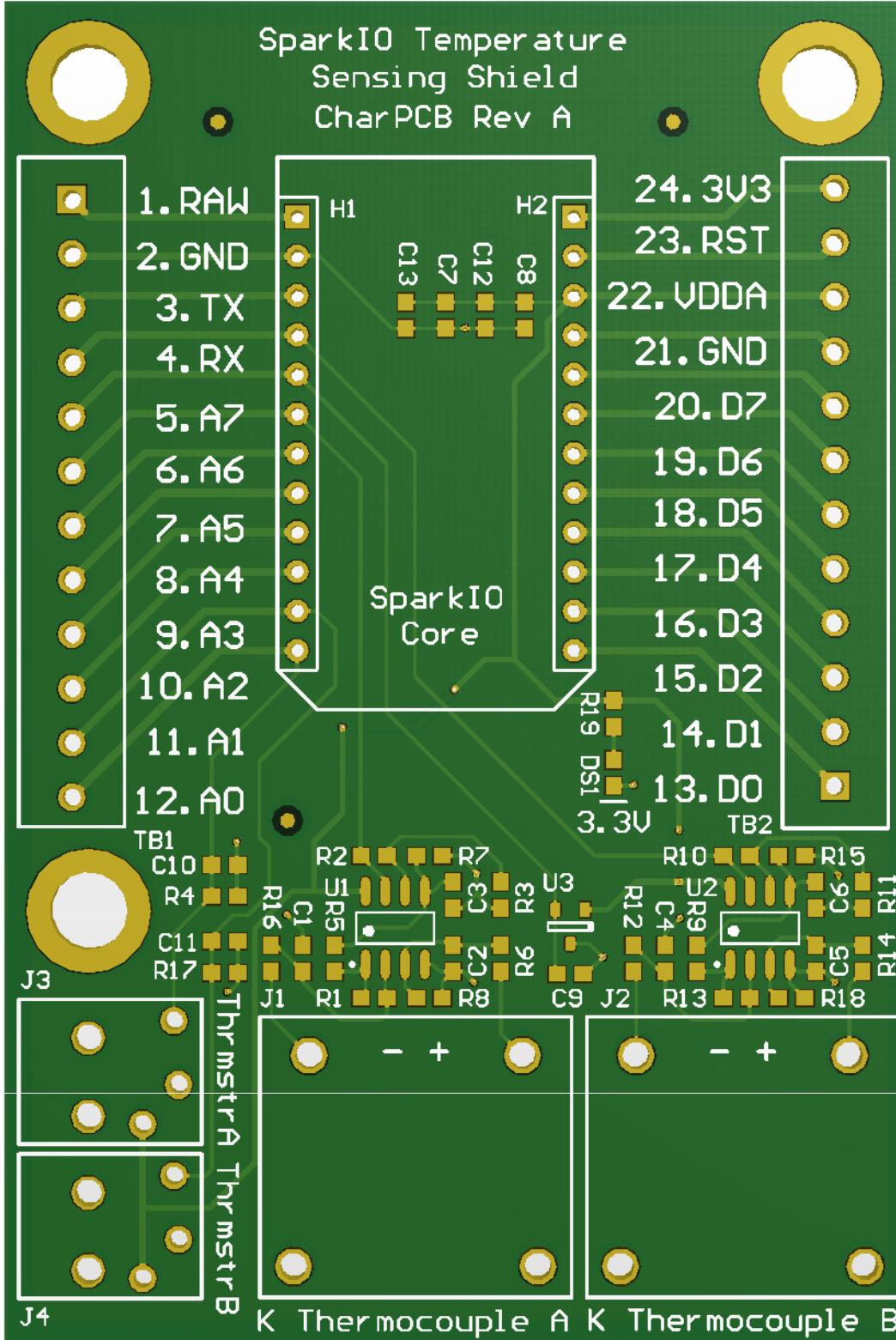
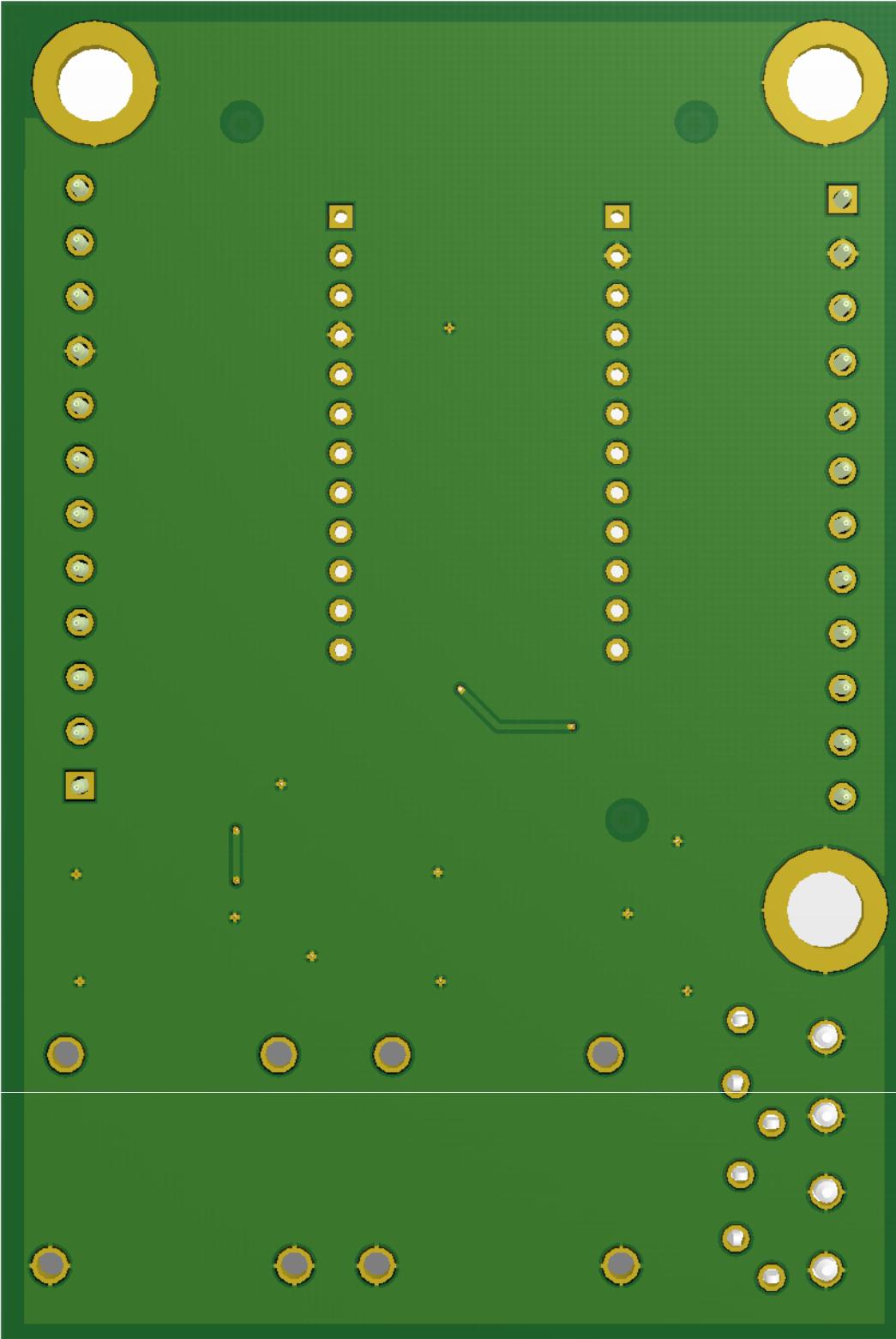


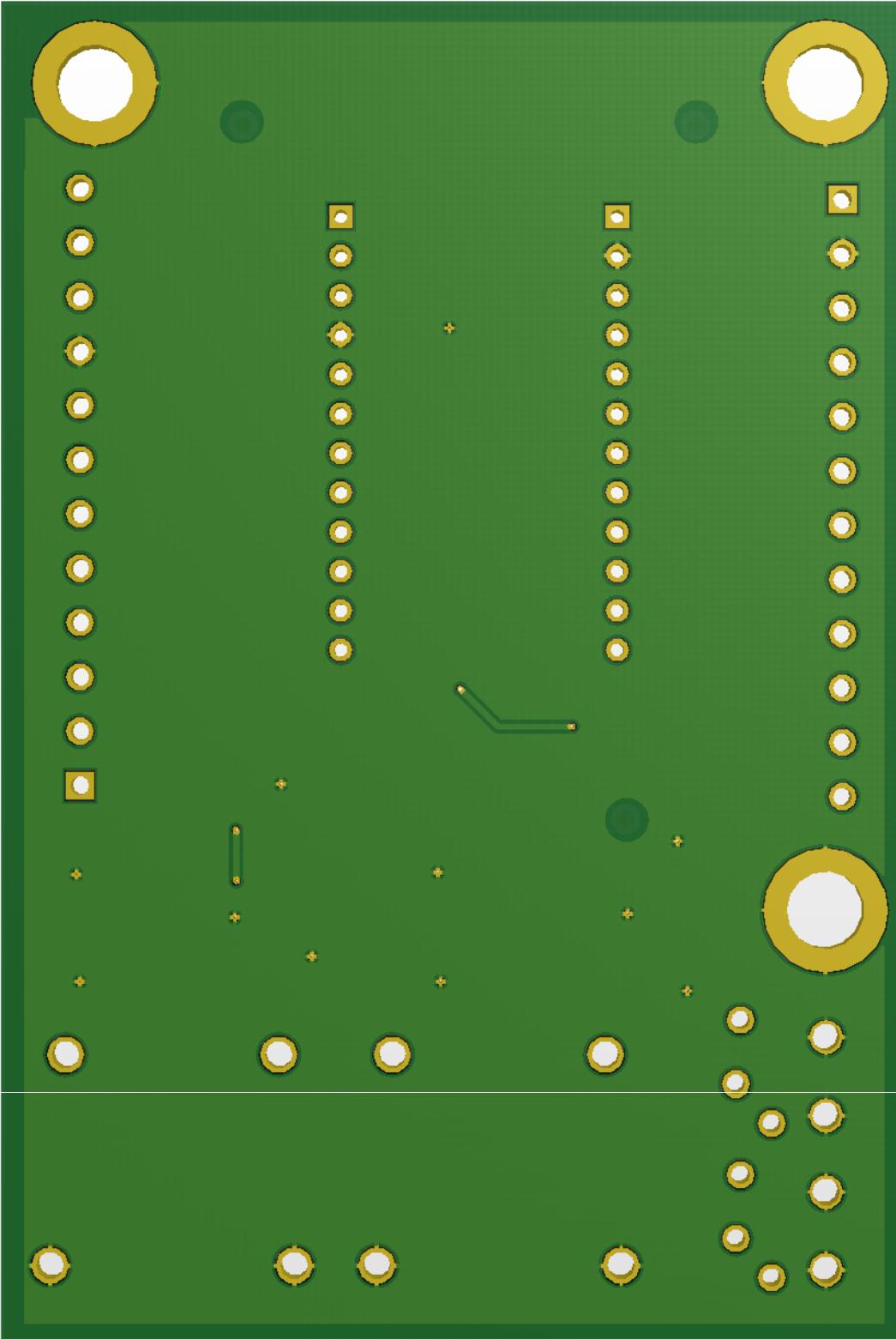
SparkIO Temperature
Sensing Shield
CharPCB Rev A

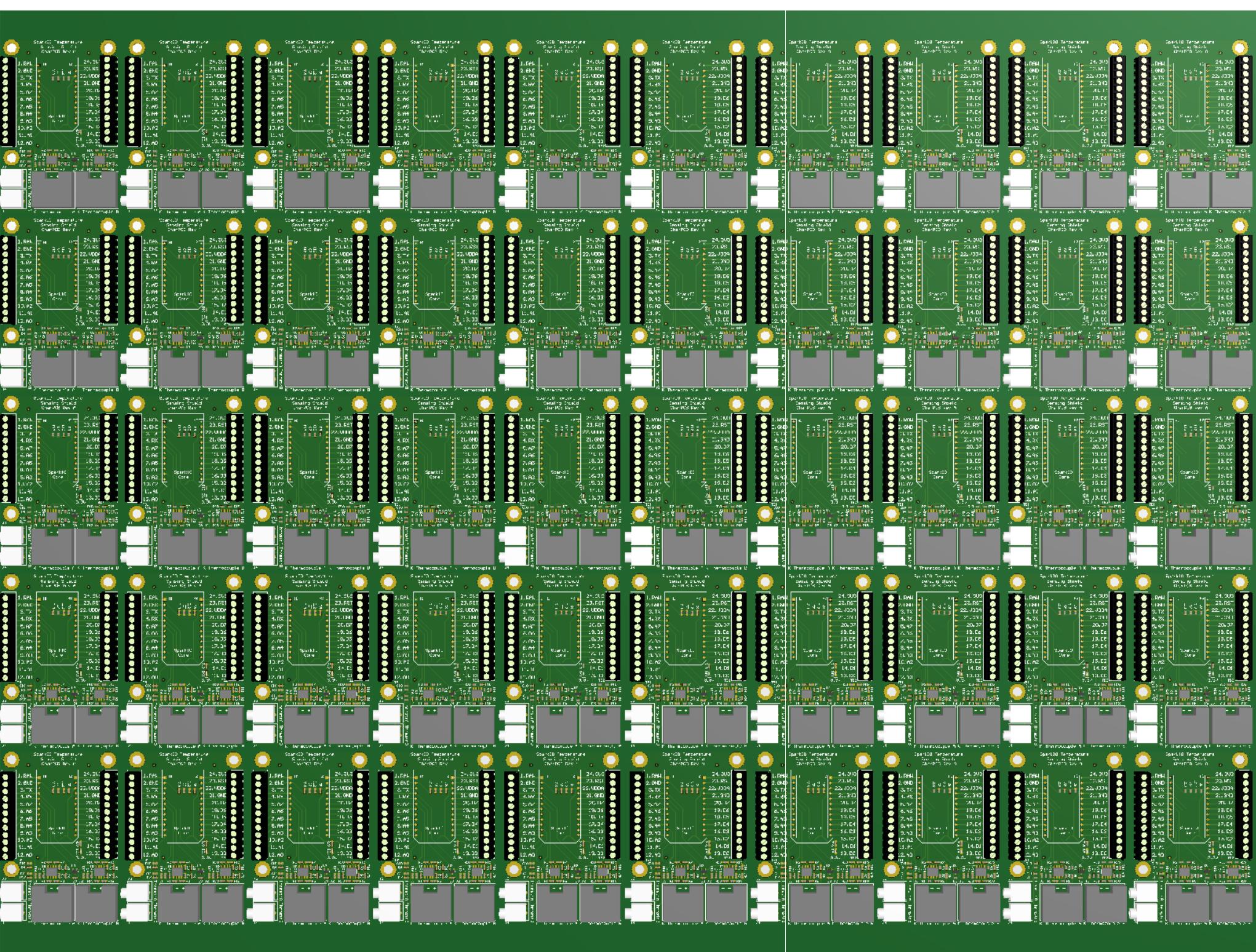


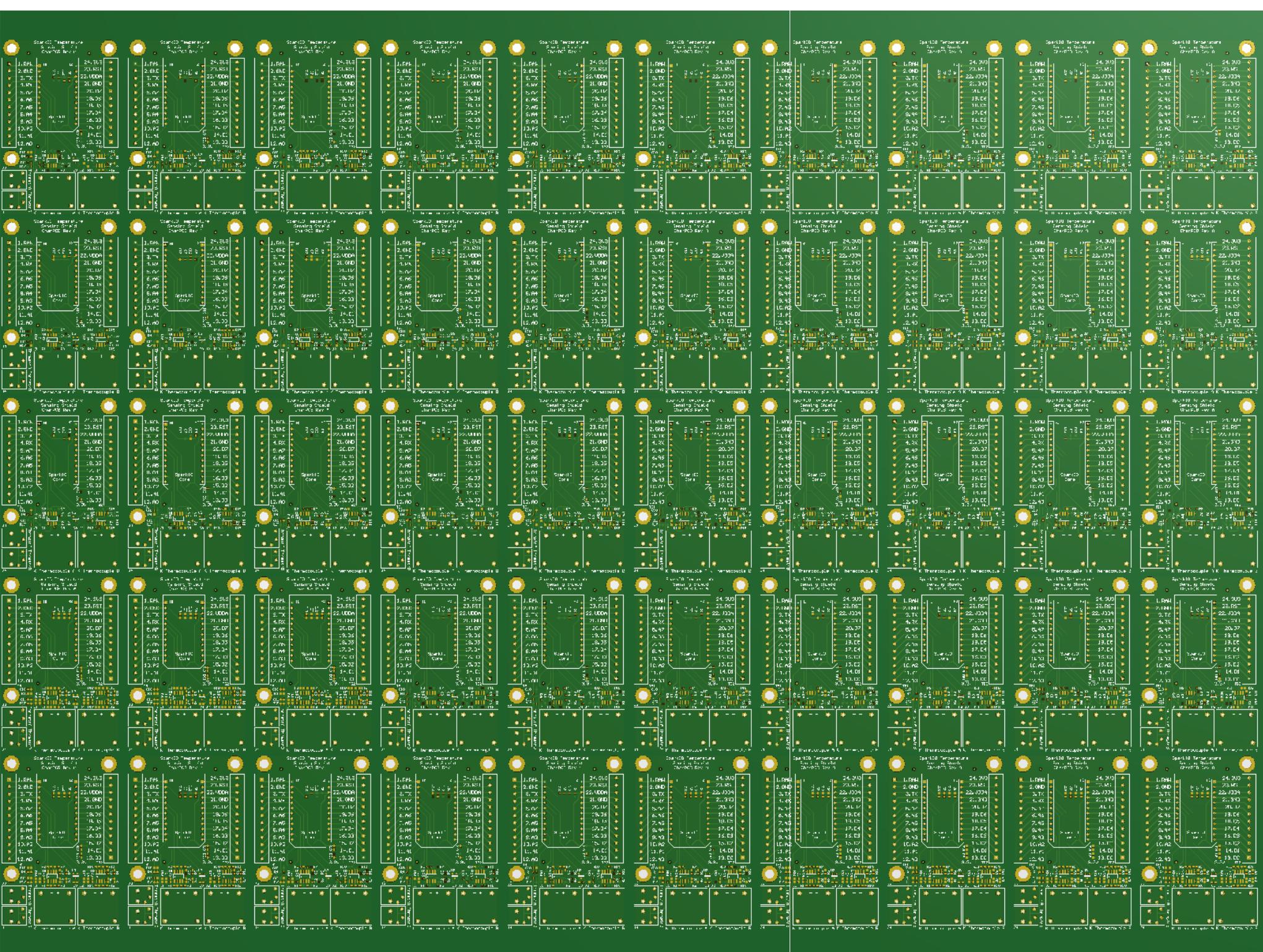
SparkIO Temperature Sensing Shield CharPCB Rev A

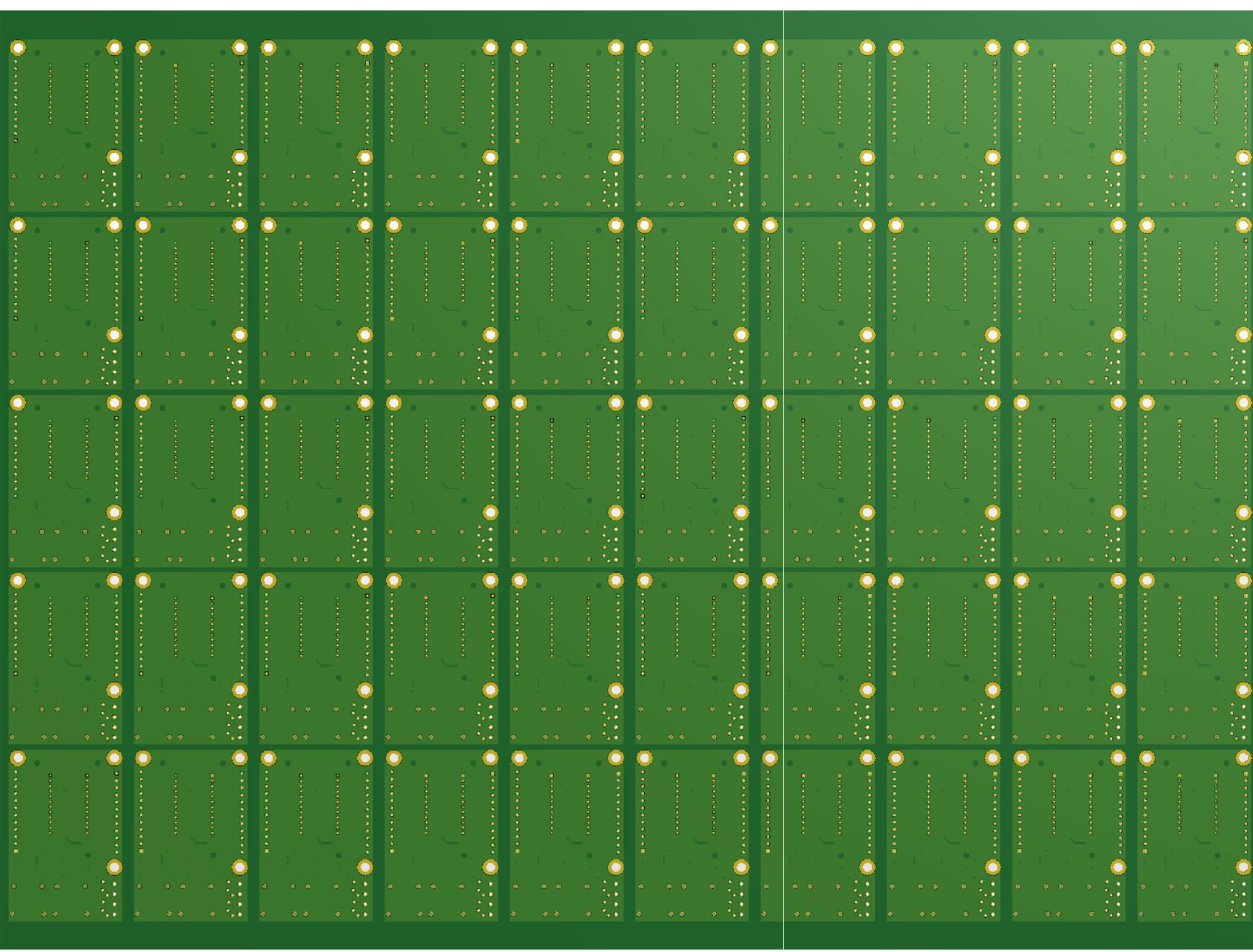


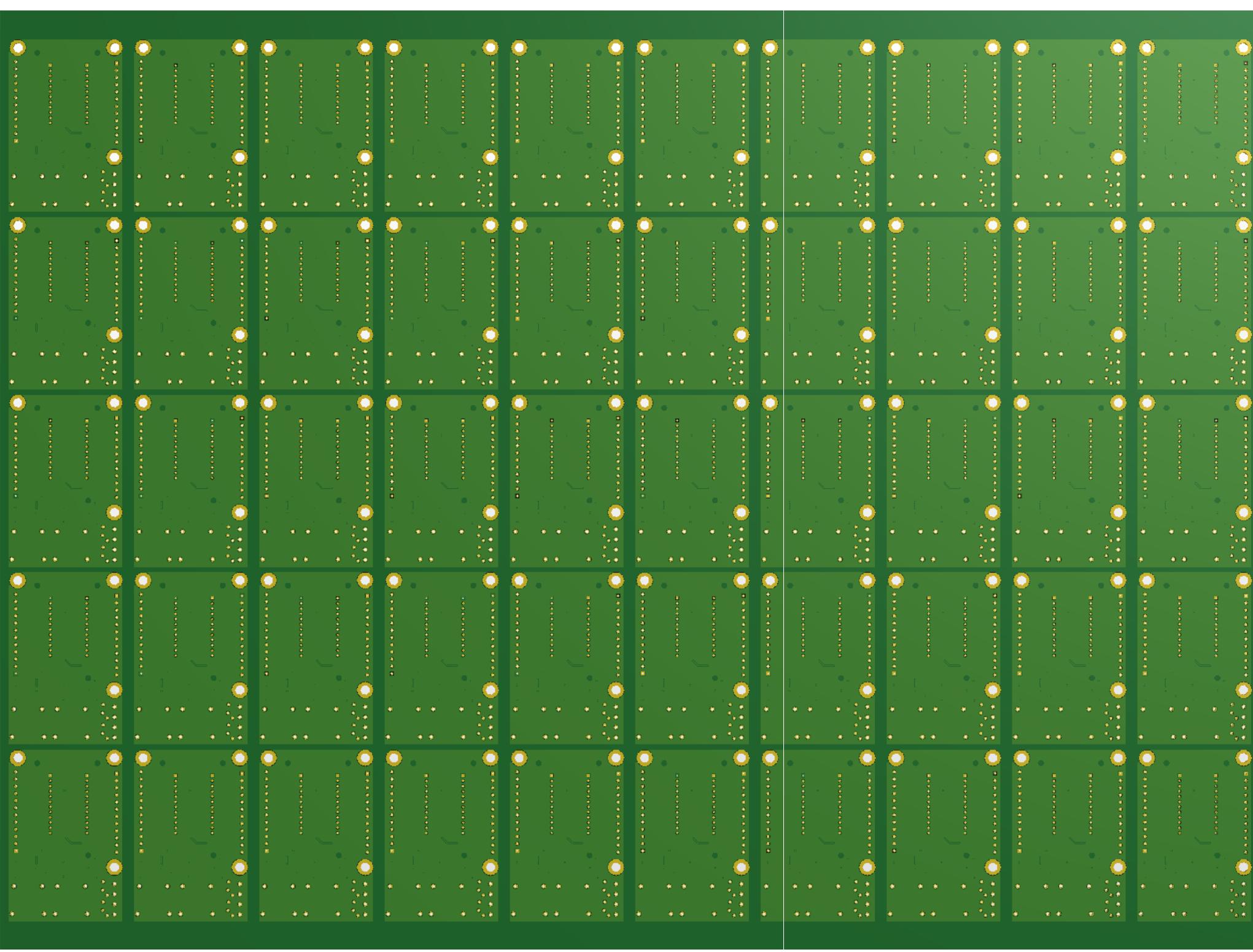


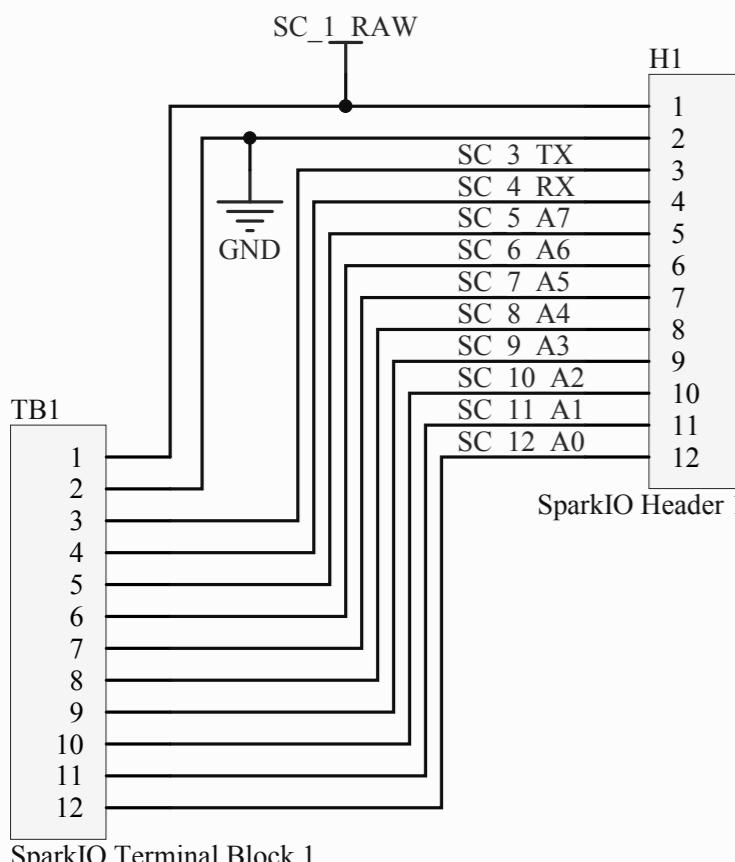




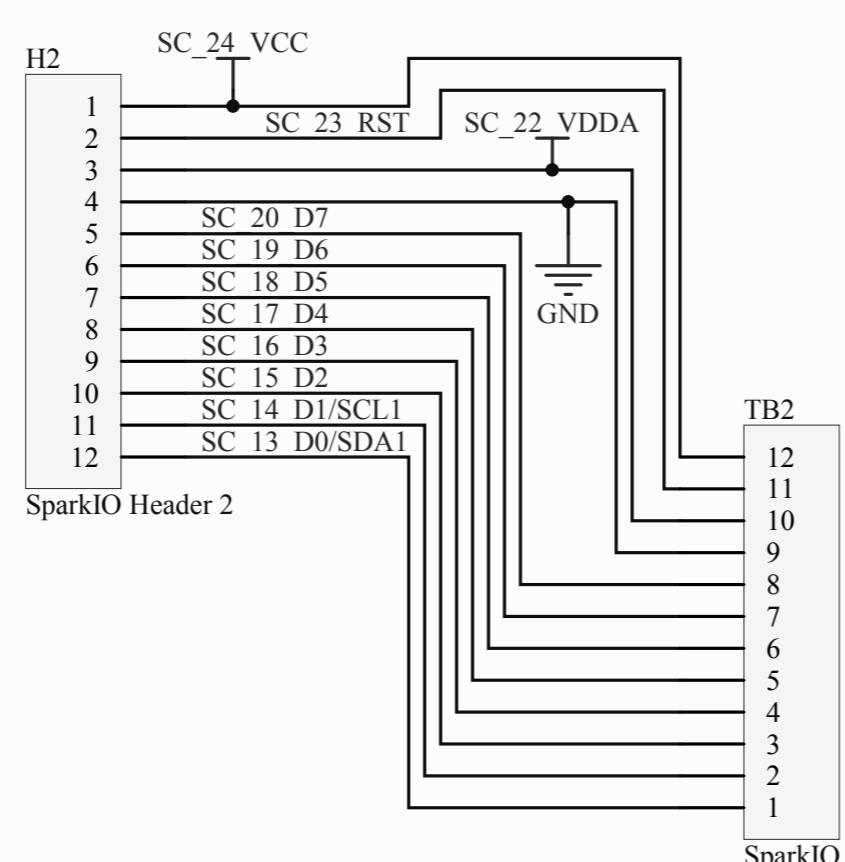








SparkIO Terminal Block 1



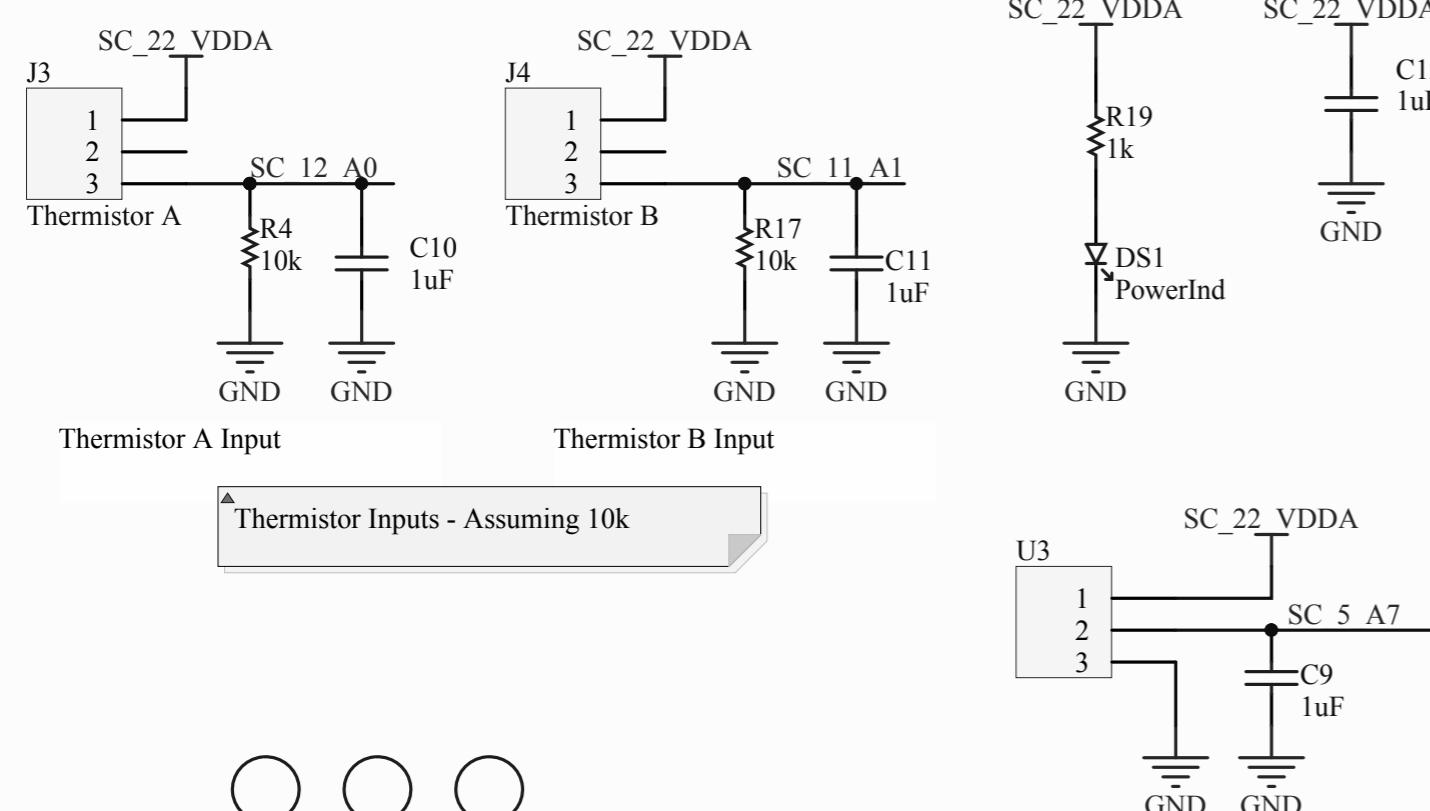
Chose ADC Pins on Core specifically to leave SPI interface and as many timer channels intact as possible.

*SparkIO Module
RAW = Diode drop down from +5VUSB
VCC = 3.3V, 500mA Max
VDDA = 3.3V through 500mA ferrite, analog VDD
RST = Reset switch on Spark.io Module
Spark Core has male headers - need female headers here

Linear approximation of a K-type thermocouple is about 40.8uV per degree C from -200C to +1350C
At 25C: V=1020uV = 1.02mV
At 100C, V=4008uV = 4.008mV
At 1000C, V=40.8mV
At 1350C, V=55.08mV

Desired range is roughly up to 600F or 0C to 350C
At 0C: V=0V
At 350C: V=14.28mV

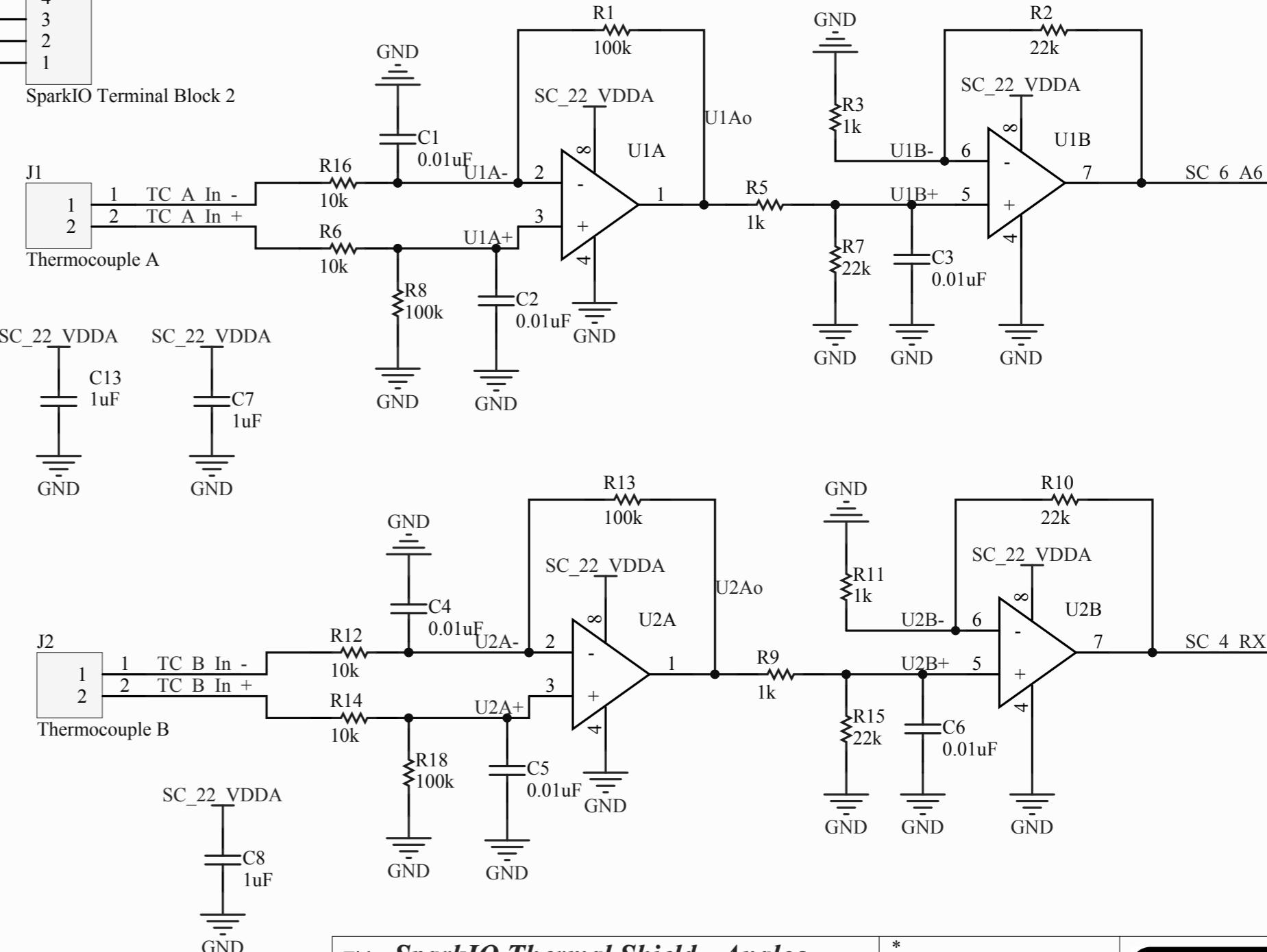
To scale this voltage to 3.2V, gain needed is
 $A = 3.2V/14.28mV = 224$



Thermistor Inputs - Assuming 10k

FID1 FID2 FID3

Cold Junction Temperature Compensation Thermistor
*Must be located very close to thermocouple connectors
U3 is analog thermistor IC



Title **SparkIO Thermal Shield - Analog**

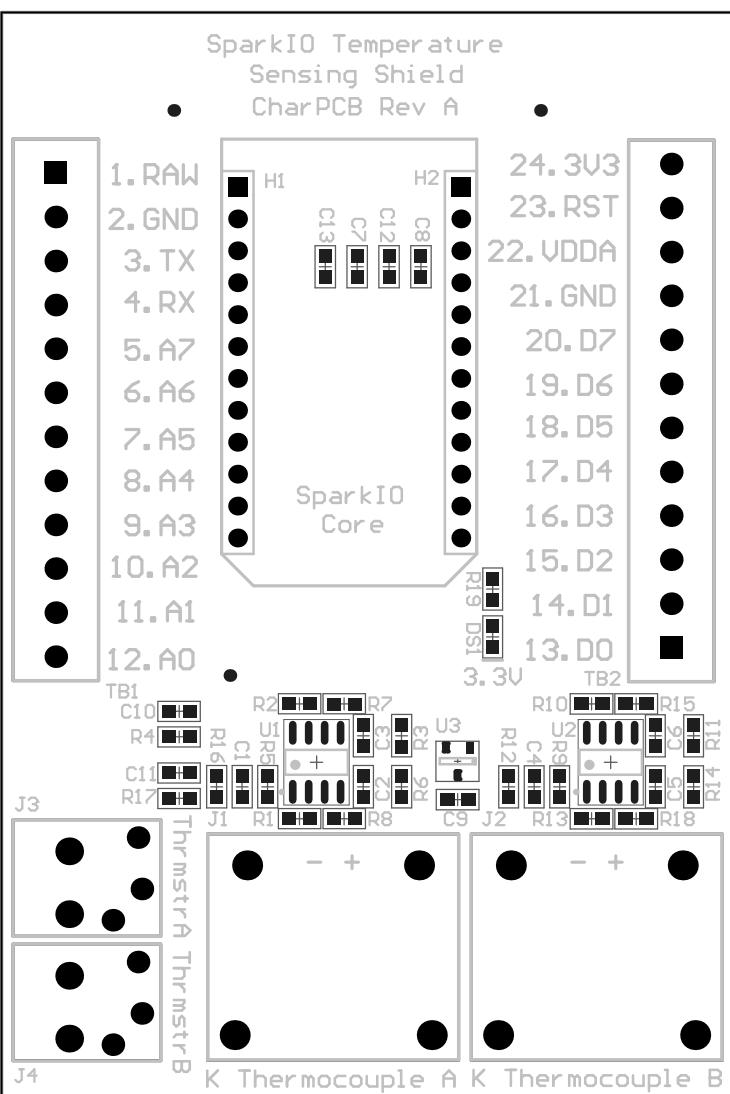
Size: A4 Number: * Revision: A

Date: 7/28/2014 Time: 6:00:38 PM Sheet 1 of 1

File: C:\Users\Jim Griazbacher\Documents\GitHub\probe\SparkIO Thermal Shield\SparkIO Thermal Shield - No Aux ADC.SchD

Altium

Project: SparkIO Thermal Shield
Revision: A
Drawn By: Jim Griszbacher
Date: 7/28/2014
Time: 6:00:39 PM



Visible Layer(s)

Top Overlay

[M1] Board Outline

[M15] Top Component Keepout

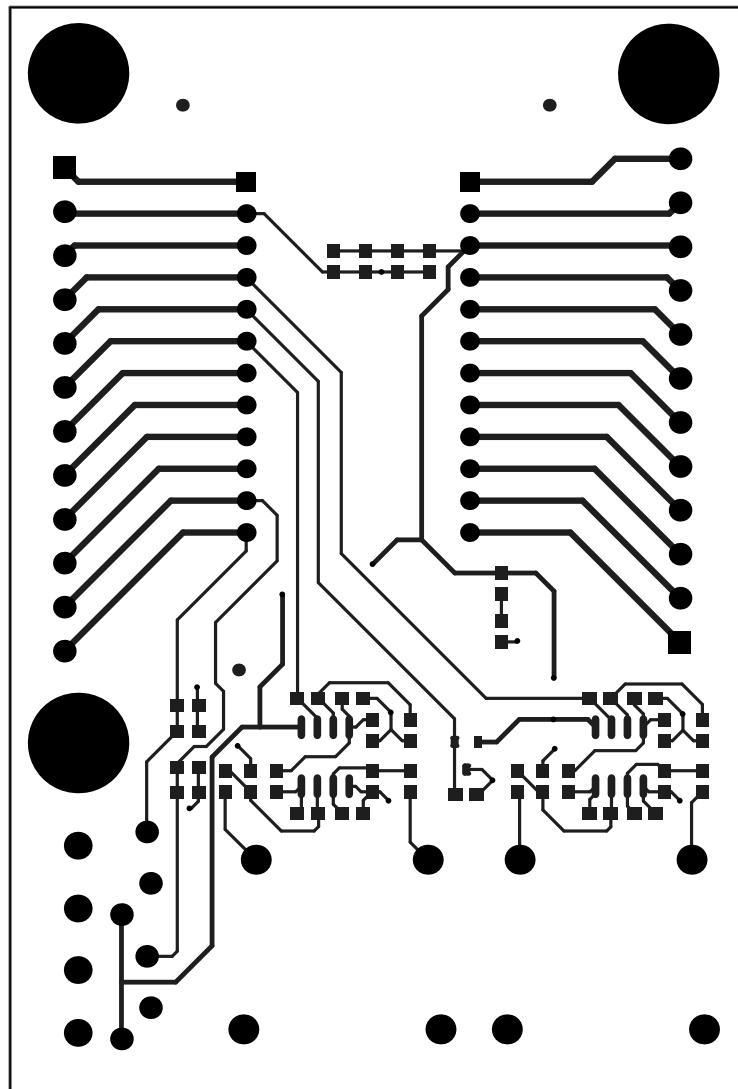
visible Layer(s)

Over Day

.] Board Outline

5.1 Top Component Keepout

Project: SparkIO Thermal Shield
Revision: A
Drawn By: Jim Griszbacher
Date: 7/28/2014
Time: 6:01:37 PM

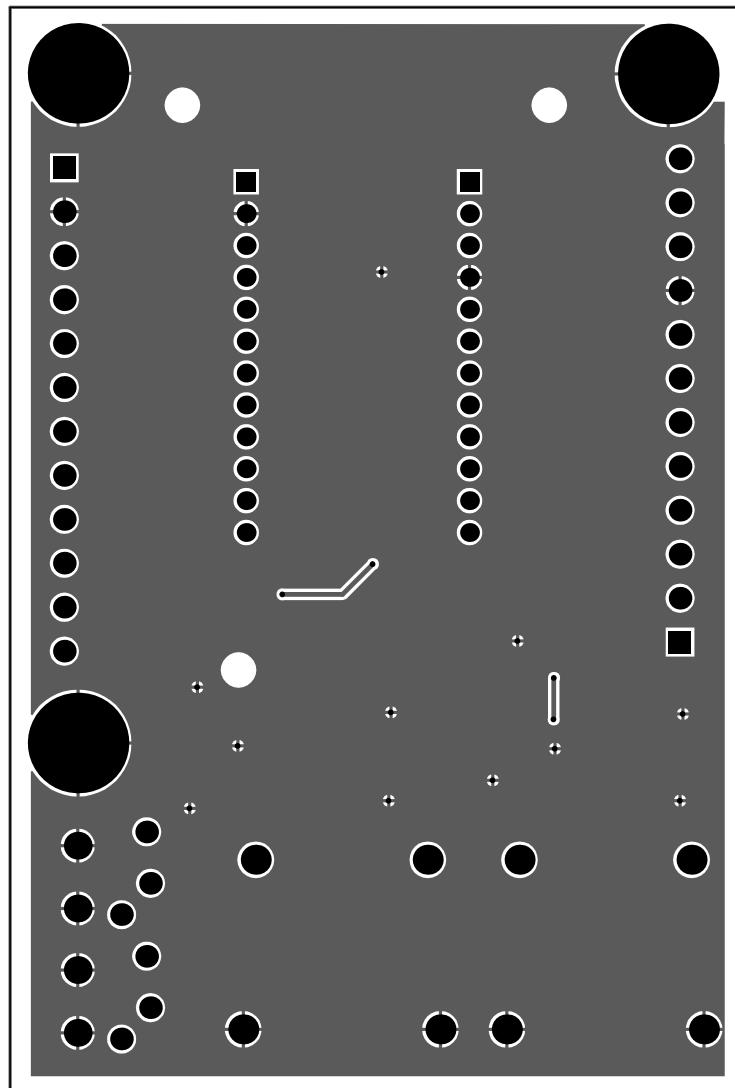


Visible Layer(s)

[1] Top Layer

[M1] Board Outline

Project: SparkIO Thermal Shield
Revision: A
Drawn By: Jim Griszbacher
Date: 7/28/2014
Time: 6:01:38 PM

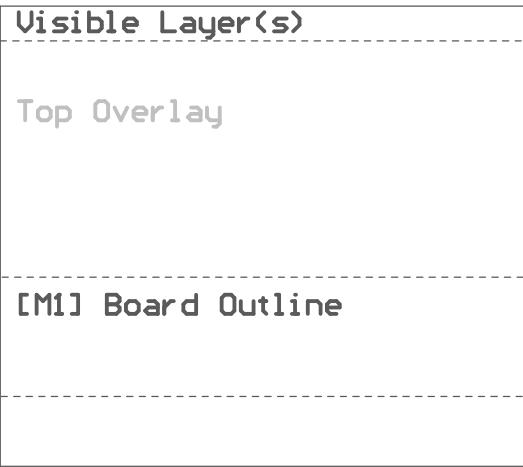
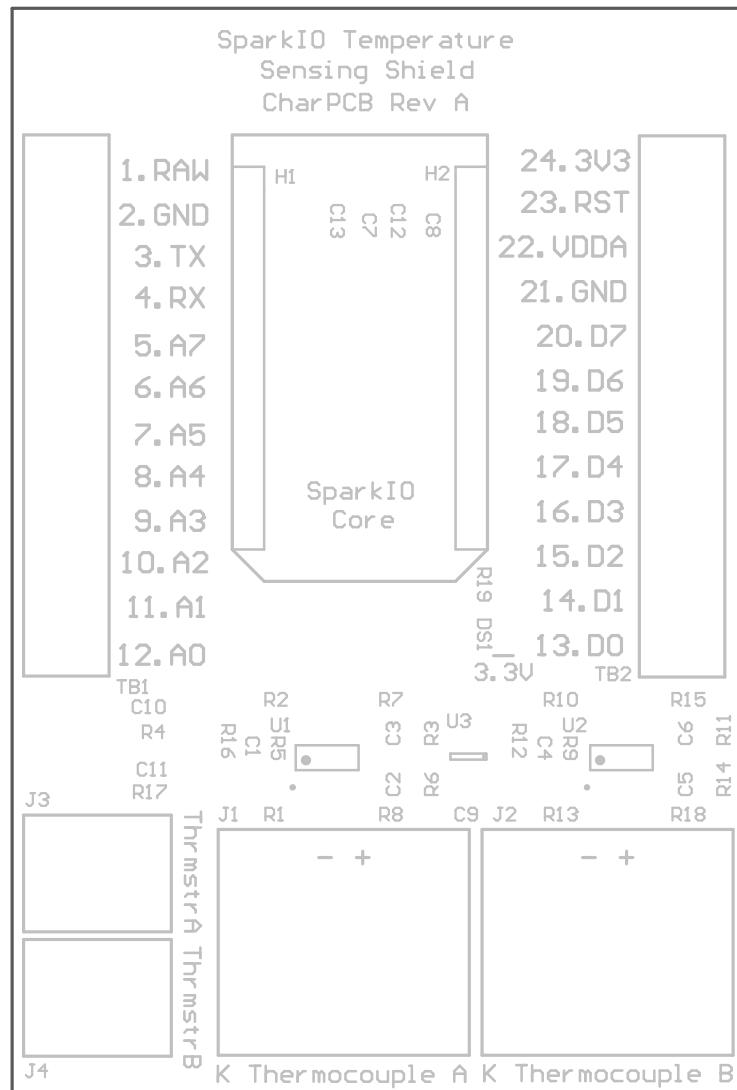


Visible Layer(s)

[2] Bottom Layer

[M1] Board Outline

Project: SparkIO Thermal Shield
Revision: A
Drawn By: Jim Grissbacher
Date: 7/28/2014
Time: 6:01:38 PM

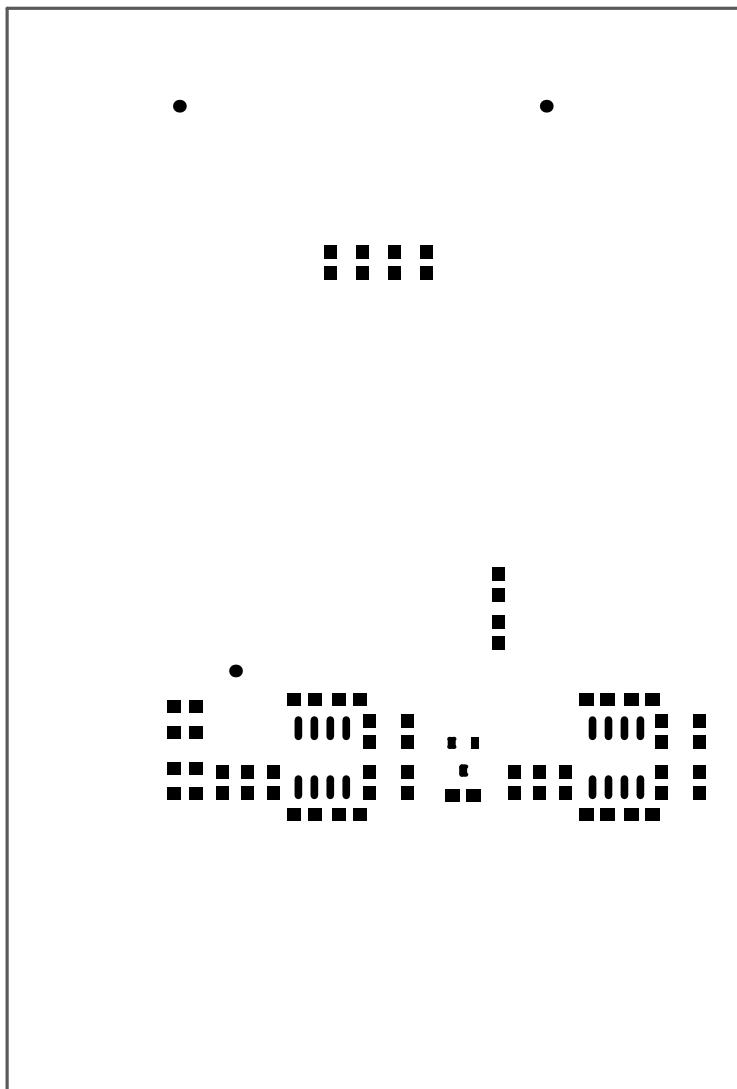


Project: SparkIO Thermal Shield
Revision: A
Drawn By: Jim Griszbacher
Date: 7/28/2014
Time: 6:01:38 PM

Visible Layer(s)

Top Paste

[M1] Board Outline

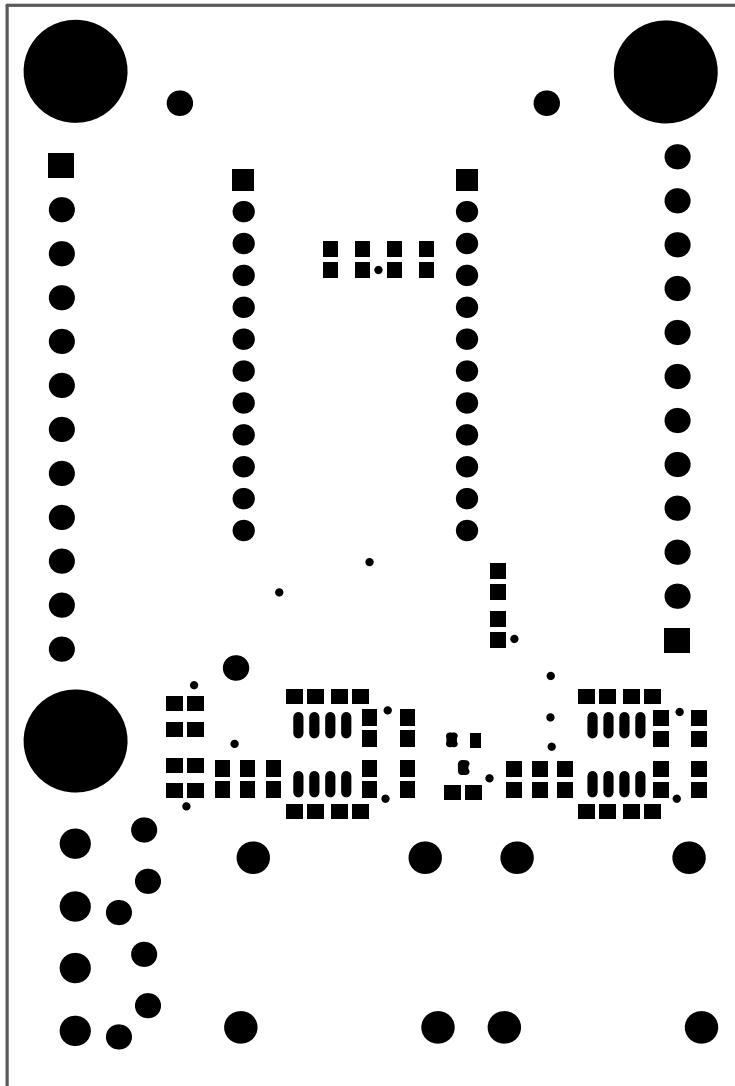


Project: SparkIO Thermal Shield
Revision: A
Drawn By: Jim Griszbacher
Date: 7/28/2014
Time: 6:01:39 PM

Visible Layer(s)

Top Solder

[M1] Board Outline

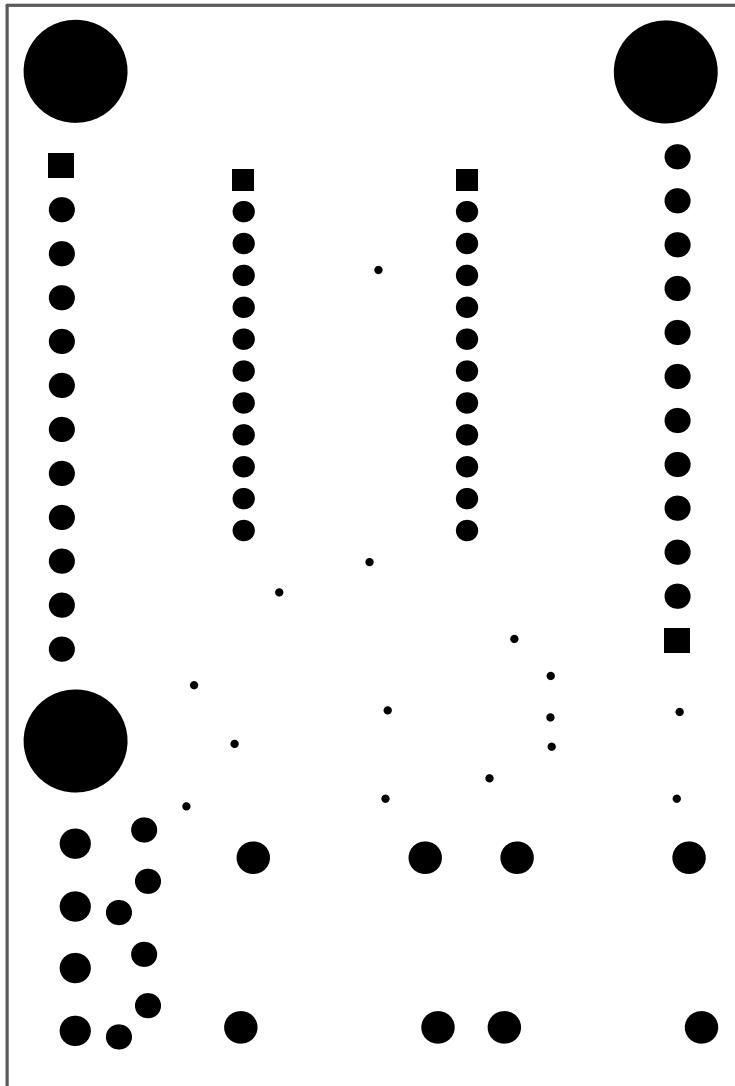


Project: SparkIO Thermal Shield
Revision: A
Drawn By: Jim Griszbacher
Date: 7/28/2014
Time: 6:01:39 PM

Visible Layer(s)

Bottom Solder

[M1] Board Outline

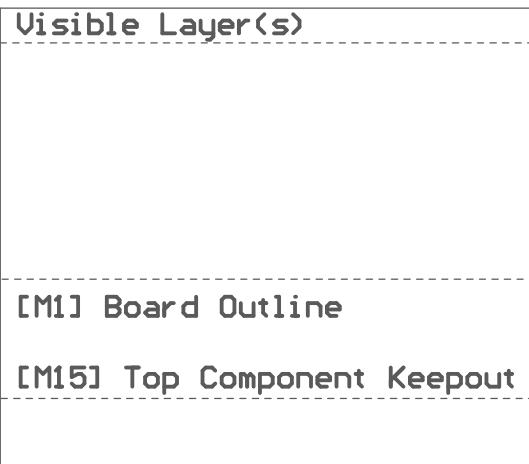
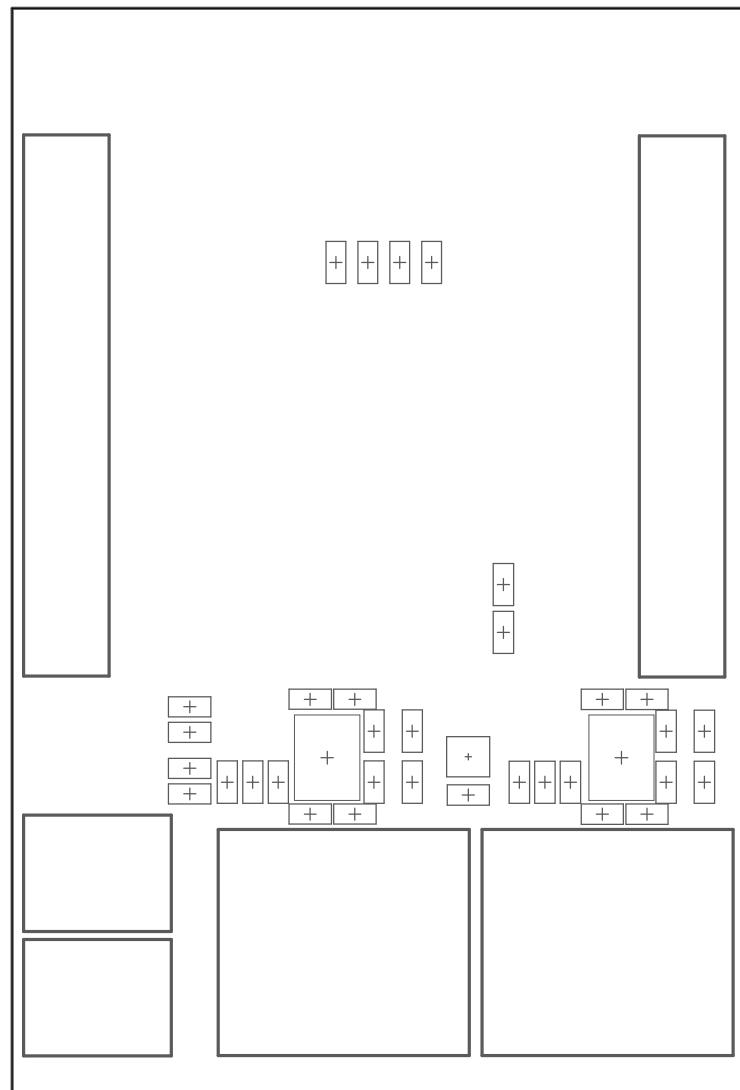


Project: SparkIO Thermal Shield
Revision: A
Drawn By: Jim Griszbacher
Date: 7/28/2014
Time: 6:01:39 PM

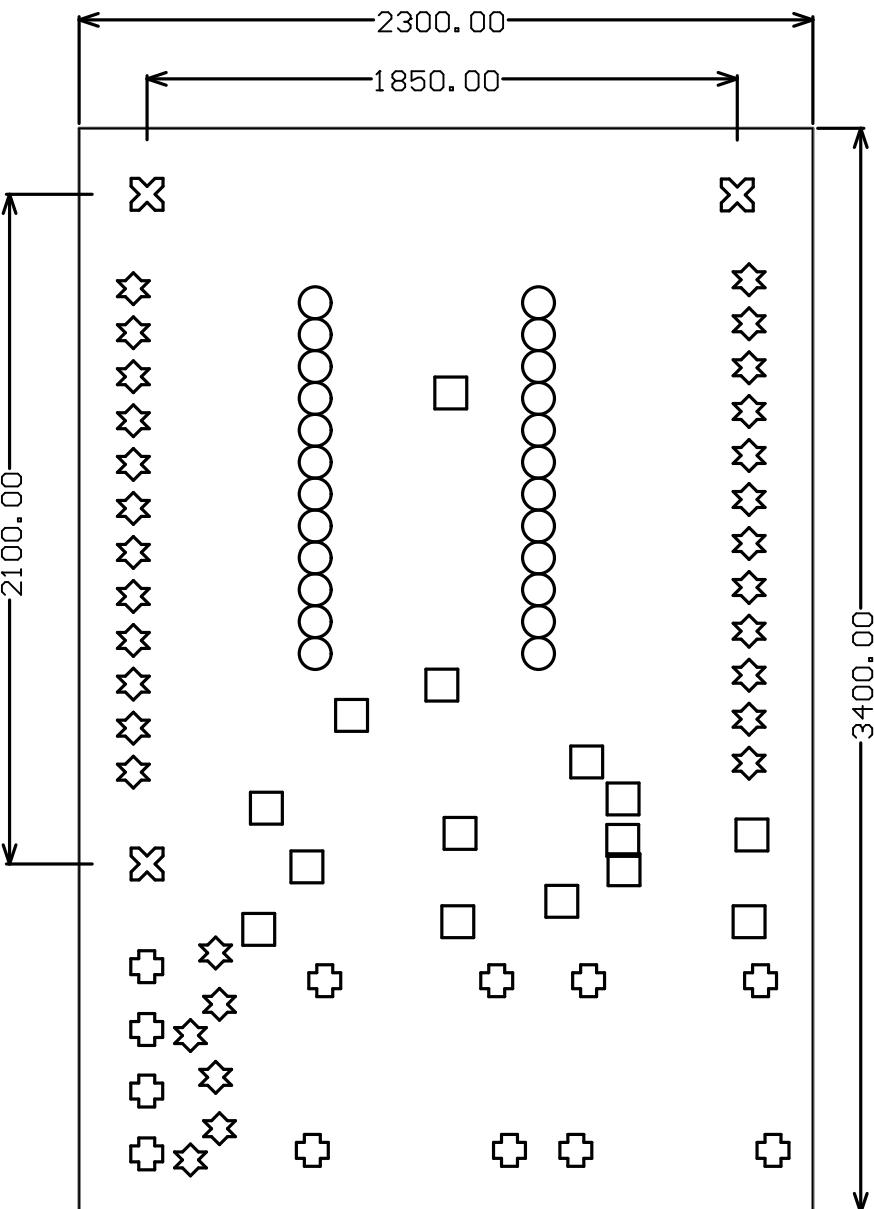
Visible Layer(s)

[M1] Board Outline

Project: SparkIO Thermal Shield
Revision: A
Drawn By: Jim Griszbacher
Date: 7/28/2014
Time: 6:01:40 PM



Layer Stack Up Detail: Final PCB Thickness is 62.0mil				
Layer Name	Gerber Document	Copper Thickness (Final Height)	Dielectric Height	Material
Top Solder Mask	(.GTS)	0.5mil	PSR 4000 Taiyo	
Top Layer	(.GTL)	1.4mil (1oz)		
		58.2mil	Lam, 370HR	
Bottom Layer	(.GBL)	1.4mil (1oz)		
Bottom Solder Mask	(.GBS)	0.5mil	PSR 4000 Taiyo	



Project: SparkIO Thermal Shield
Revision: A
Drawn By: Jim Griszbacher
Date: 7/28/2014
Time: 6:01:40 PM

Visible Layer(s)

[M1] Board Outline

Drill Drawing

Fabrication


- Green Solder Mask SMOBC, in accordance to IPC-SM-840
- White Silkscreen on Top Side: No ink shall be on exposed pads
- ENIG Surface Finish
- PCB shall be RoHS material and RoHS process compliant, T_(g) > 170C, T_(d)-288 test >5 minutes
- PCB is 10mil min trace/space design
- Drill sizes are finished size after plating
- PCB core is 58.2mil thick 370HR material or equivalent

Assembly

- RoHS Clean process, in accordance to IPC-A-600 and IPC-A-610 Class II
- Top Side contains through-hole and surface-mount components
- Bottom Side contains no components, design is single sided
- Only populate the components marked as 'Fitted' in the Bill of Materials
- No electrical testing required


Symbol	Hit Count	Finished Hole Size	Plated	Hole Type
X	3	196.85mil (5.000mm)	PTH	Round
+	12	69.69mil (1.770mm)	PTH	Round
*	30	47.24mil (1.200mm)	PTH	Round
O	24	35.43mil (0.900mm)	PTH	Round
□	15	10.00mil (0.254mm)	PTH	Round
84 Total				


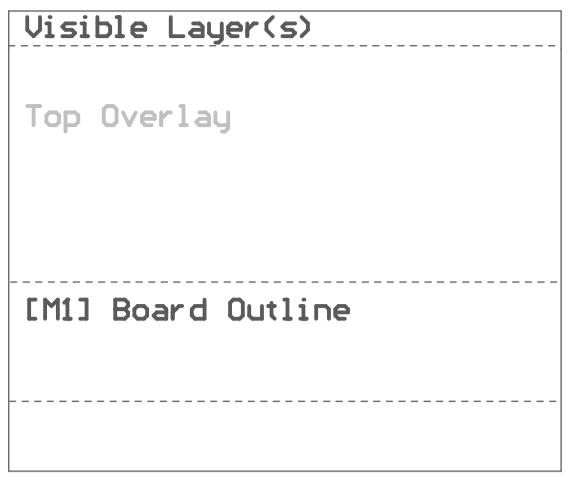
Visible Layer(s):
 Top Layer
 Board Outline



Project: SparkIO Thermal Shield
Revision: A
Drawn By: Jim Griszbacher
Date: 7/28/2014
Time: 6:02:08 PM

Visible Layer(s):
[2] Bottom Layer
[M1] Board Outline






Project: SparkIO Thermal Shield
Revision: A
Drawn By: Jim Griszbacher
Date: 7/28/2014
Time: 6:02:48 PM

Visible Layer(s):
Top Paste

[M1] Board Outline



Visible Layer(s):
Top Solder
[M1] Board Outline




Project: SparkIO Thermal Shield
Revision: A
Drawn By: Jim Griszbacher
Date: 7/28/2014
Time: 6:03:15 PM

Visible Layer(s):

Bottom Solder

[M1] Board Outline



Project: SparkIO Thermal Shield
Revision: A
Drawn By: Jim Griszbacher
Date: 7/28/2014
Time: 6:03:29 PM


Visible Layer(s):

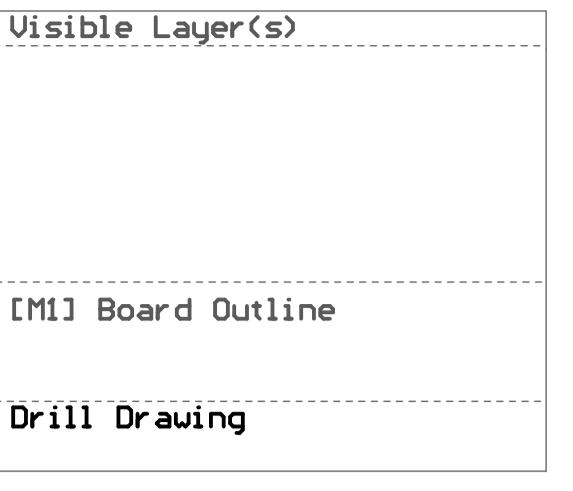
[M1] Board Outline

.....



Visible Layer(s):
[M1] Board Outline
[M15] Top Component Keepout

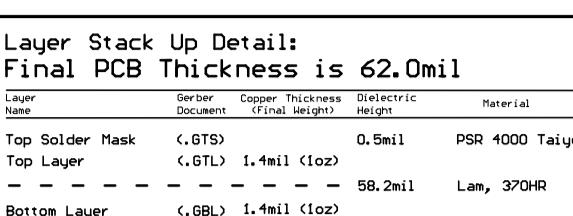
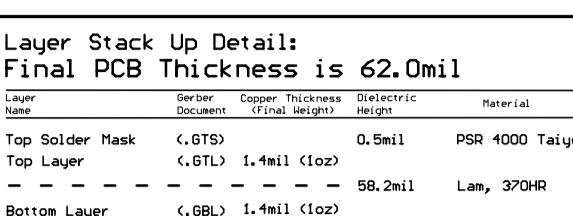
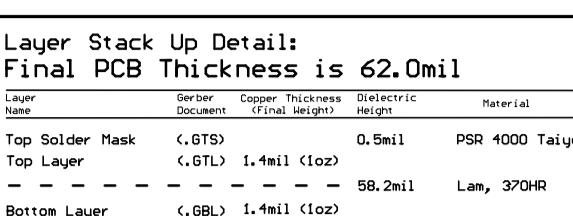





Fabrication
i. Green Solder Mask SM0BC, in accordance to IPC-SM-840
ii. White Silkscreen on Top Side; No ink shall be on exposed pads
iii. Panel shall be FR4
iv. PCB shall be RoHS material and RoHS process compliant,
 Tg > 175°C, 2AFL, 35.6 mil
v. PCB is 16mil trace width design
vi. Drill sizes are finished size after plating
vii. There are 58.2mil thick 3DVAR material or equivalent

Panel Design
i. Panel is 18 inches by 24 inches with 500mil width rails
ii. Rous are 5 up with U-Score between each PCB
iii. 10 rows are fitted on the panel, each separated with a 100mil width route

Assembly
i. RoHS Clean process, in accordance to IPC-A-600 and IPC-A-610 Class II
ii. Top Side contains through-hole and surface-mount components
iii. Bottom Side contains no components, design is single sided
iv. Only populate the components marked as "Fitted" in the Bill of Materials
v. No electrical testing required



Symbol	Hit Count	Finished Hole Size	Plated	Hole Type
x	150	196.85mil (5.00mm)	PTH	Round
o	600	69.69mil (1.770mm)	PTH	Round
□	250	10.00mil (0.254mm)	PTH	Round
○	1200	35.43mil (0.900mm)	PTH	Round
◆	1500	47.24mil (1.200mm)	PTH	Round
	4200 Total			



Item #	Designator	Fitted/Not Fitted	Quantity	Manufacturer	Manufacturer Part Number	Name	Supplier	Supplier Part Number
1	C1, C2, C3, C4, C5, C6	Fitted	6	TDK Corporation	C1608X7R1E103K080AA	CAP CER 10000PF 25V 10% X/R 0603	Digikey	445-5100-1-ND
2	C7, C8, C9, C10, C11, C12, C13	Fitted	7	TDK Corporation	C1608X7R1C105K080AC	CAP CER 1UF 16V 10% X/R 0603	Digikey	445-1604-1-ND
3	DS1	Fitted	1	LiteOn	LST-C190KGKT	Green LED 20mA 2V VF	Digikey	160-1435-1-ND
4	H1, H2	Fitted	2	Sullins Interconnect	PPTC121LFBN-RC	CONN HEADER FEM 12POS .1" SGL TIN	Digikey	S6100-ND
5	J1, J2	Fitted	2	Omega	PCC-SMP-K	K Type Thermocouple Mini Horizontal TH Connector	Newark	01H0905
6	J3, J4	Fitted	2	CUI Inc	MJ-2509N	3/32" Mono Audio Jack Right Angle TH	Digikey	CP-M2509N-ND
7	R1, R8, R13, R18	Fitted	4	Vishay	CRCW0603100KFKEA	RES 100K OHM 1/10W 1% 0603 SMD	Digikey	541-100KHCT-ND
8	R2, R7, R10, R15	Fitted	4	Vishay	CRCW060322K0FKEA	RES 22.0K OHM 1/10W 1% 0603 SMD	Digikey	541-22.0KHCT-ND
9	R3, R5, R9, R11, R19	Fitted	5	Vishay	CRCW06031K00FKEA	RES 1.00K OHM 1/10W 1% 0603 SMD	Digikey	541-1.00KHCT-ND
10	R4, R6, R12, R14, R16, R17	Fitted	6	Vishay	CRCW060310K0FKEA	RES 10.0K OHM 1/10W 1% 0603 SMD	Digikey	541-10.0KHCT-ND
11	TB1, TB2	Fitted	2	On Shore Technology	OSTTE120104	TERMINAL BLOCK 3.5MM 12POS PCB	Digikey	ED2737-ND
12	U1, U2	Fitted	2	Texas Instruments	OPA2376AIDR	IC Op Amp Dual GBP 5.5MHz 8SOIC	Digikey	296-22564-1-ND
13	U3	Fitted	1	Microchip	TC1046VNBTTR	Precision Temperature Sensing IC	Digikey	TC1046VNBTTRCT-ND