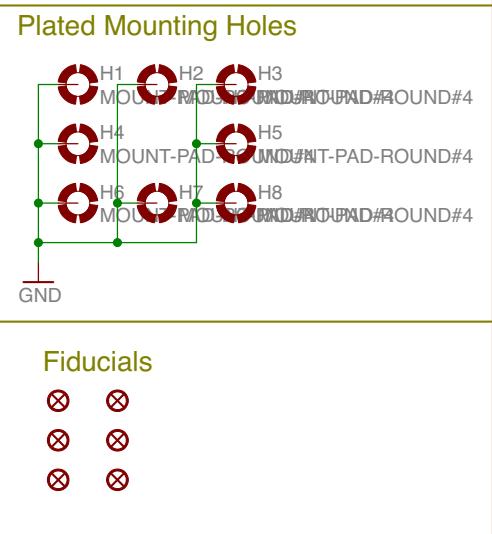
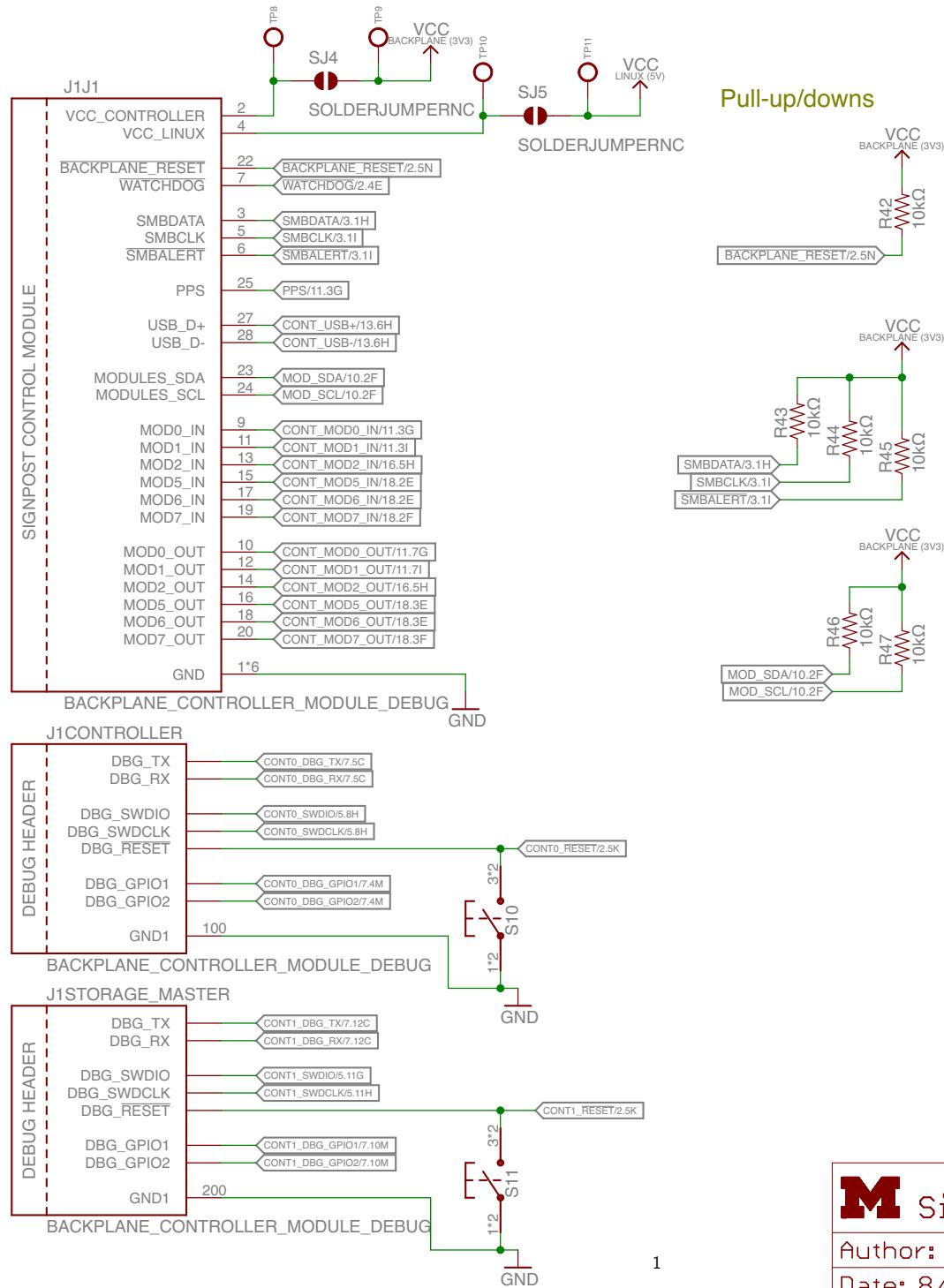


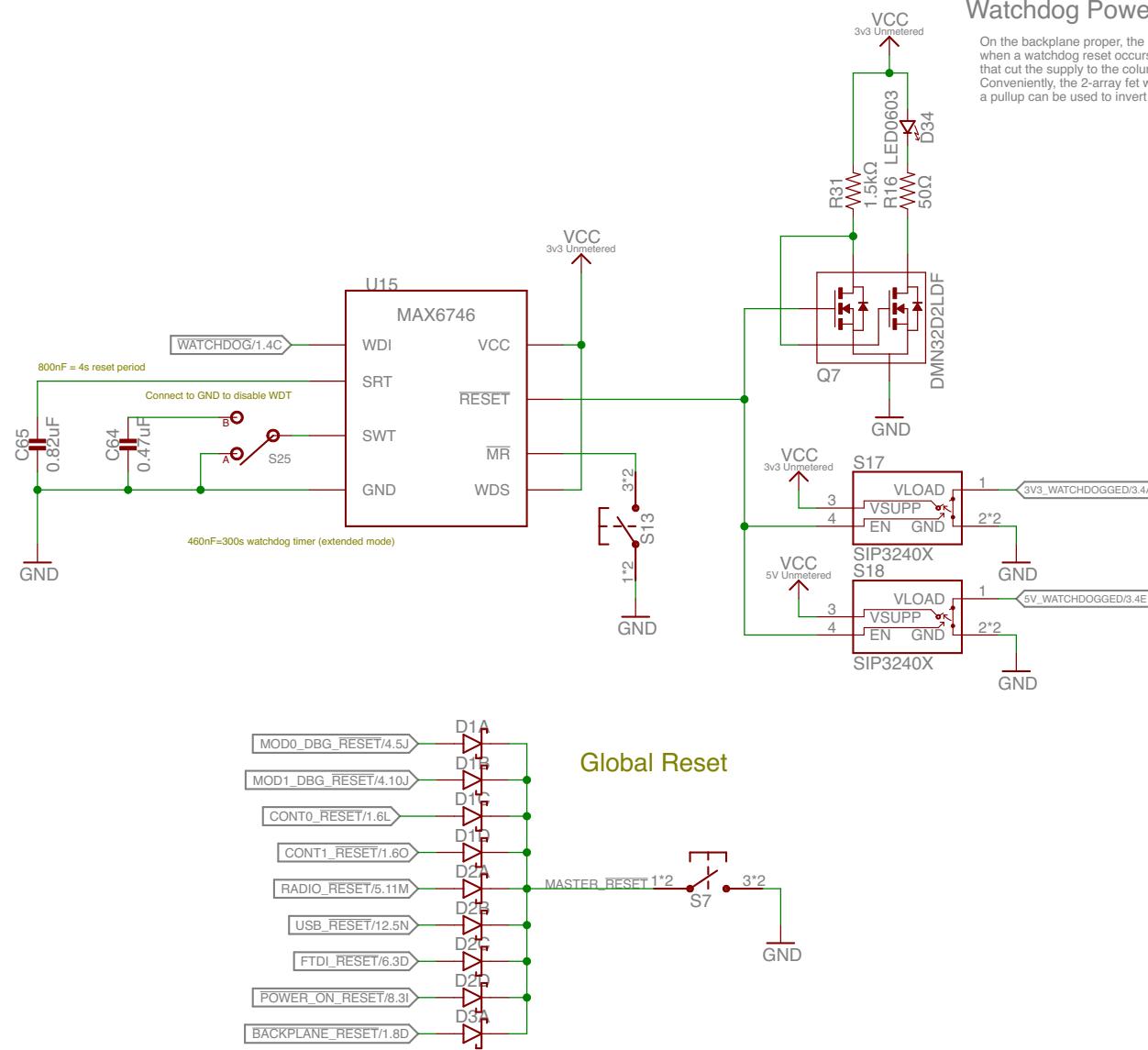
Special Modules



M	Signpost Debug Backplane	REV: C
Author: Joshua Adkins and Pat Pannuto		
Date: 8/15/17 01:32		Sheet: 1/18

Watchdog Power Cut-Off

On the backplane proper, the power module completely cuts power when a watchdog reset occurs. We do that here with load switches that cut the supply to the column counters. Conveniently, the 2-array fet we already have elsewhere on the board with a pullup can be used to invert the watchdog's RESET control for the LED



Signpost Debug Backplane

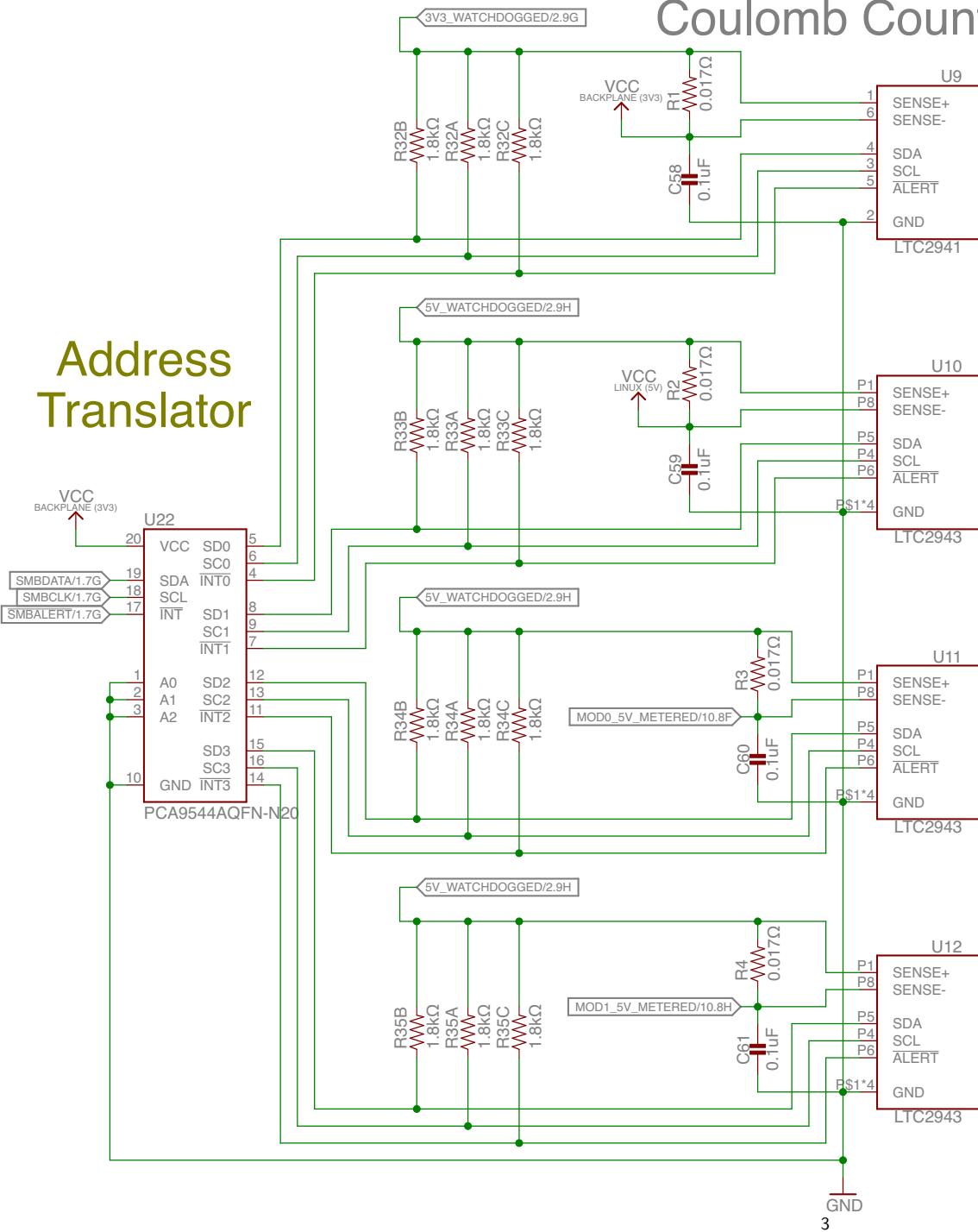
REV:
C

Author: Joshua Adkins and Pat Pannuto

Date: 8/15/17 01:32

Sheet: 2/18

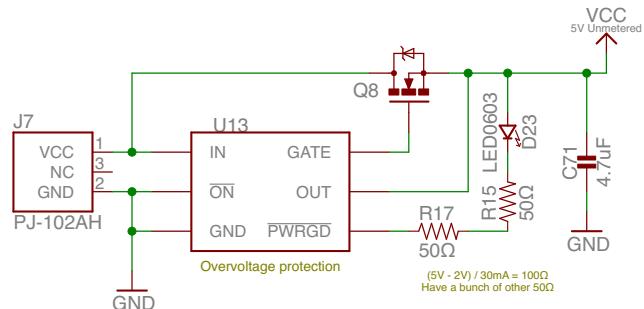
Address Translator



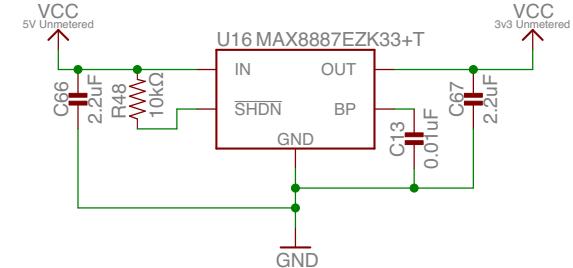
Coulomb Counters

Power Supply

5V Barrel Jack



3V3 Regulator



Signpost Debug Backplane

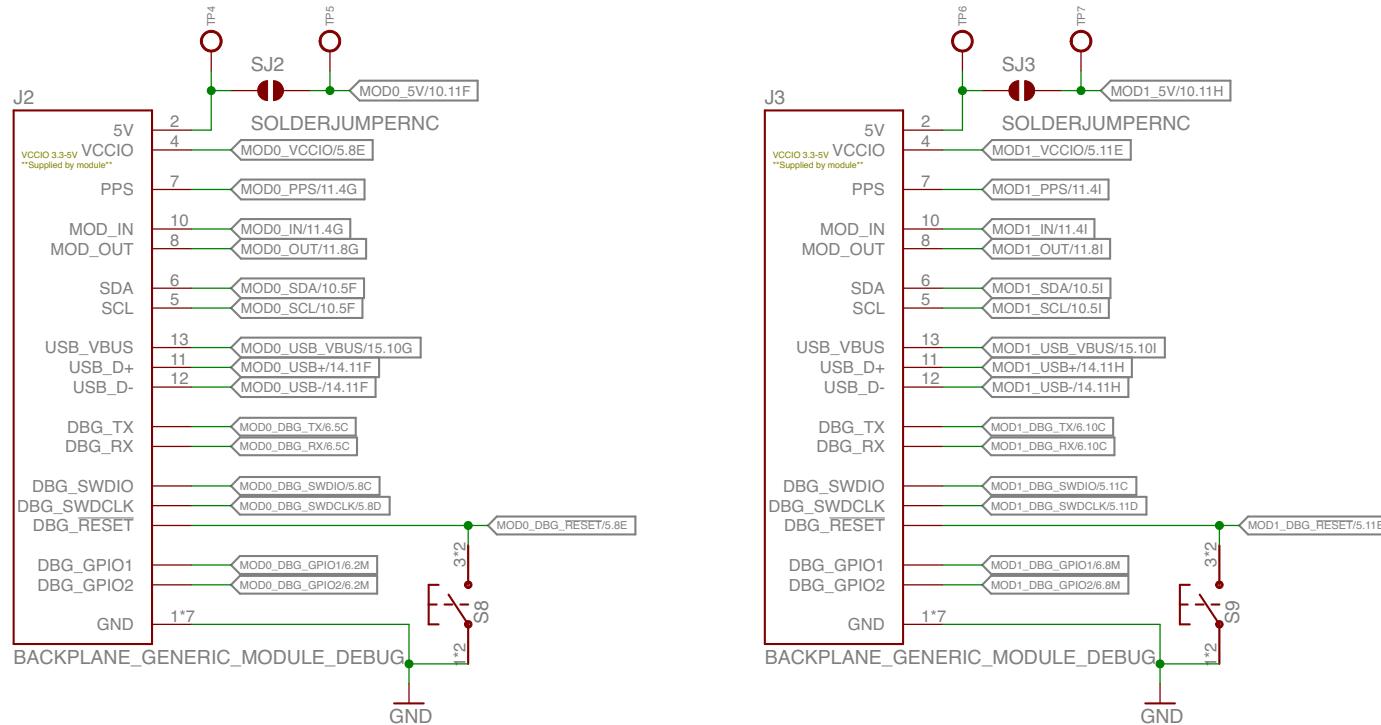
REV:
C

Author: Joshua Adkins and Pat Pannuto

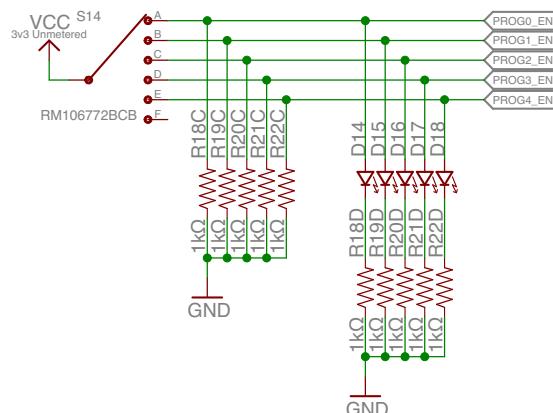
Date: 8/15/17 01:32

Sheet: 3/18

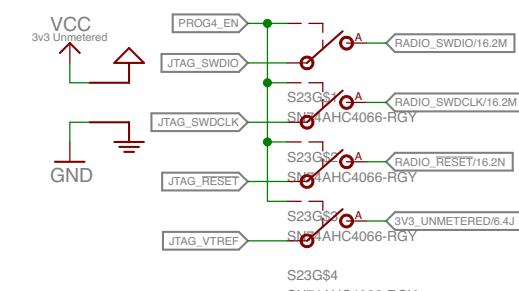
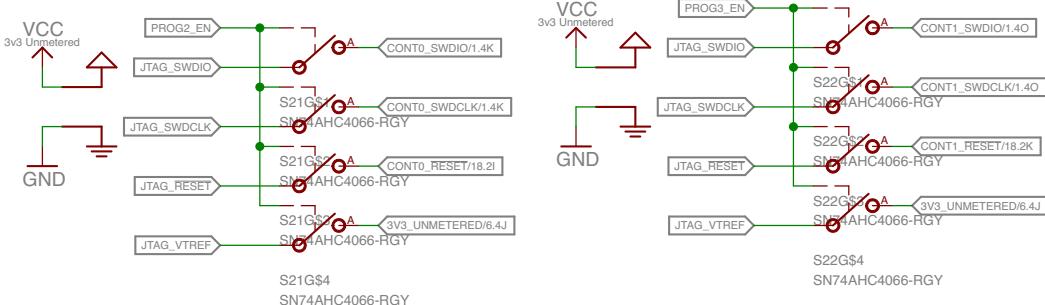
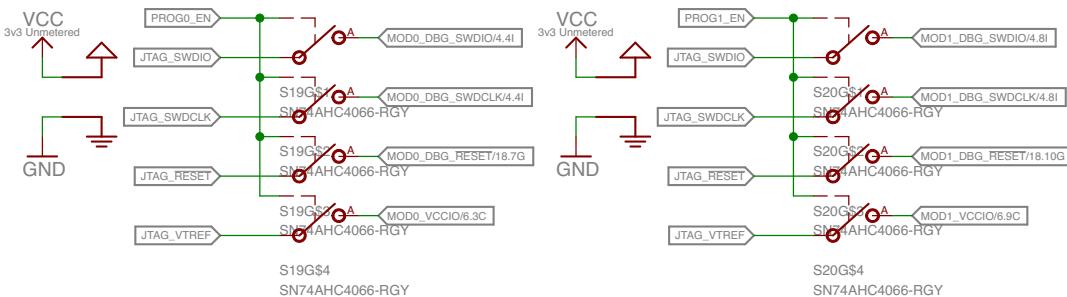
Generic Modules



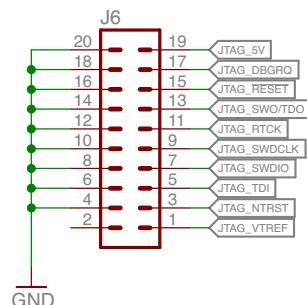
One-Hot Enable Lines



Signal Enable ICs



JTAG Header

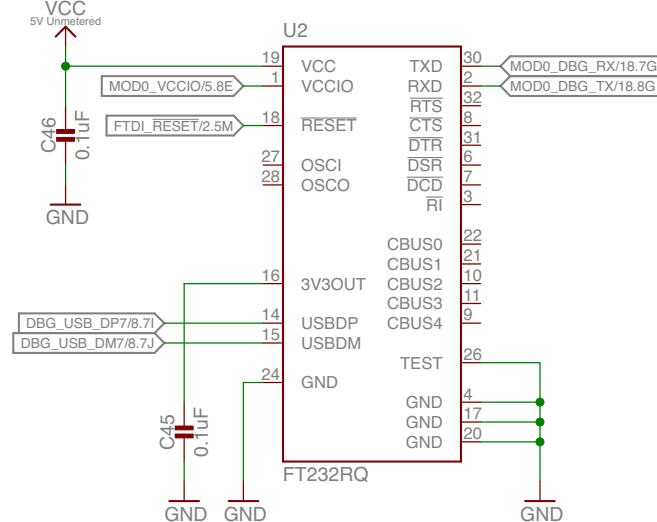


Ties SWDIO to Reset

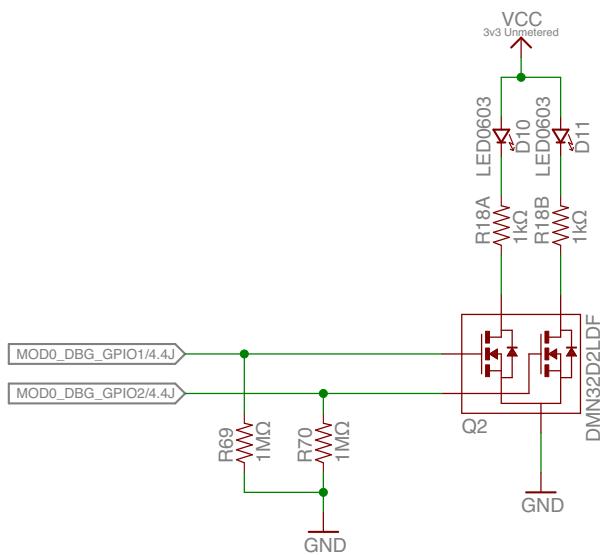
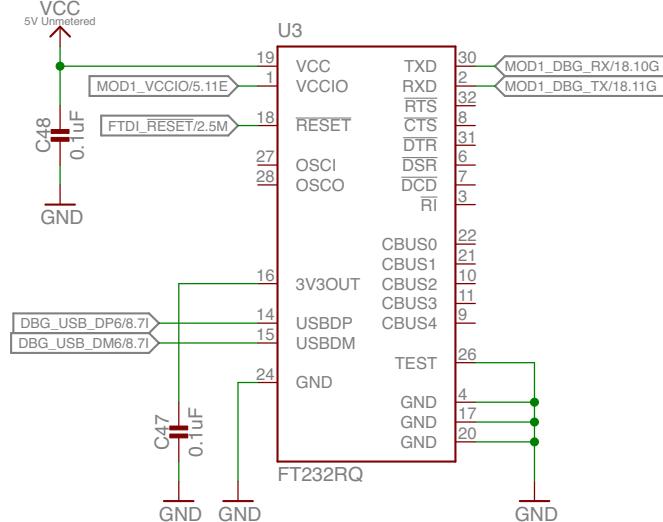


Module Debugging

Module 0



Module 1



Signpost Debug Backplane

REV:
C

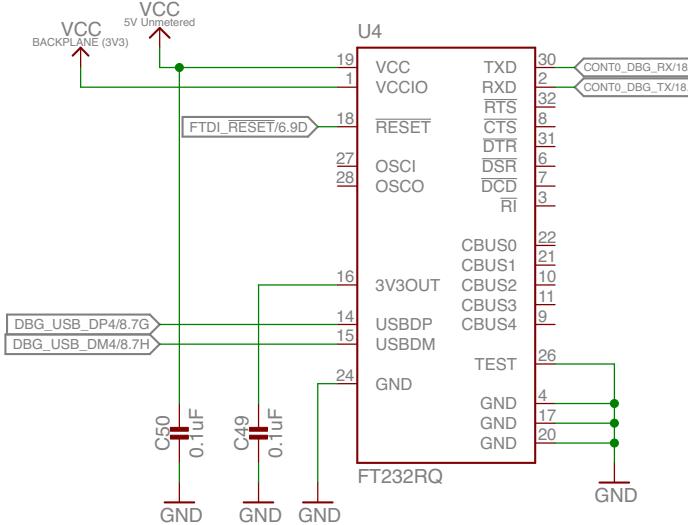
Author: Joshua Adkins and Pat Pannuto

Date: 8/15/17 01:32

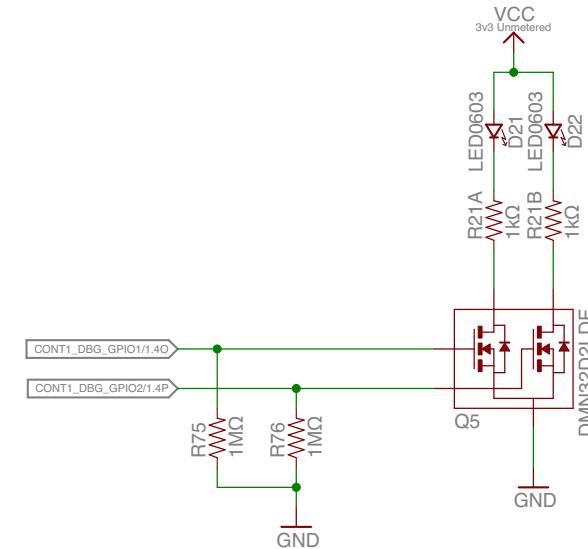
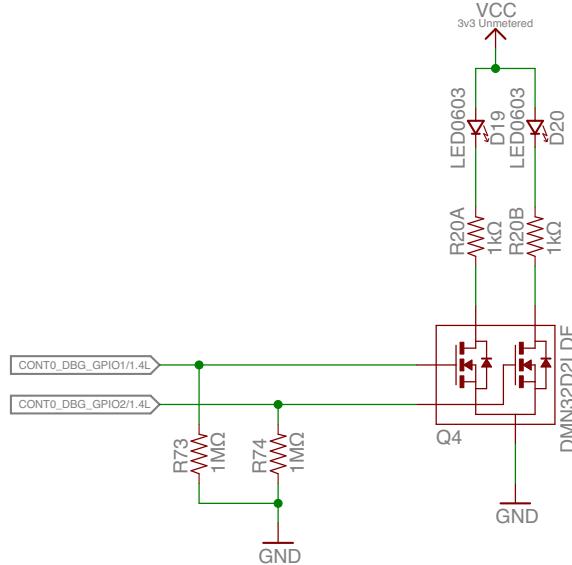
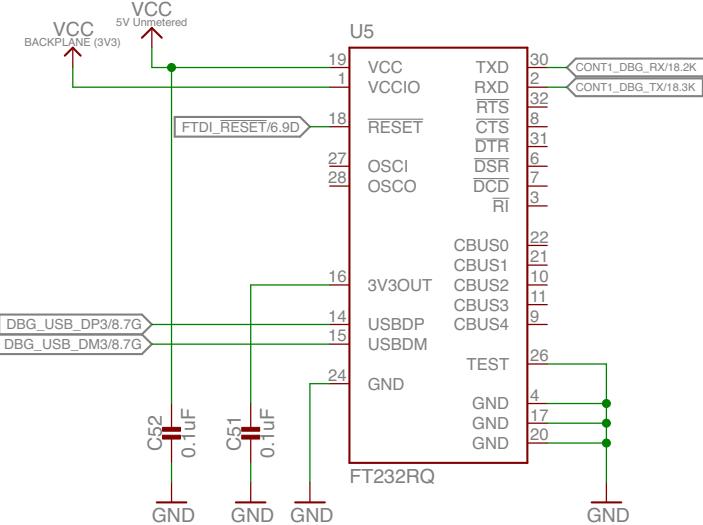
Sheet: 6/18

Controller Debugging

Controller



Storage Master



Signpost Debug Backplane

REV:
C

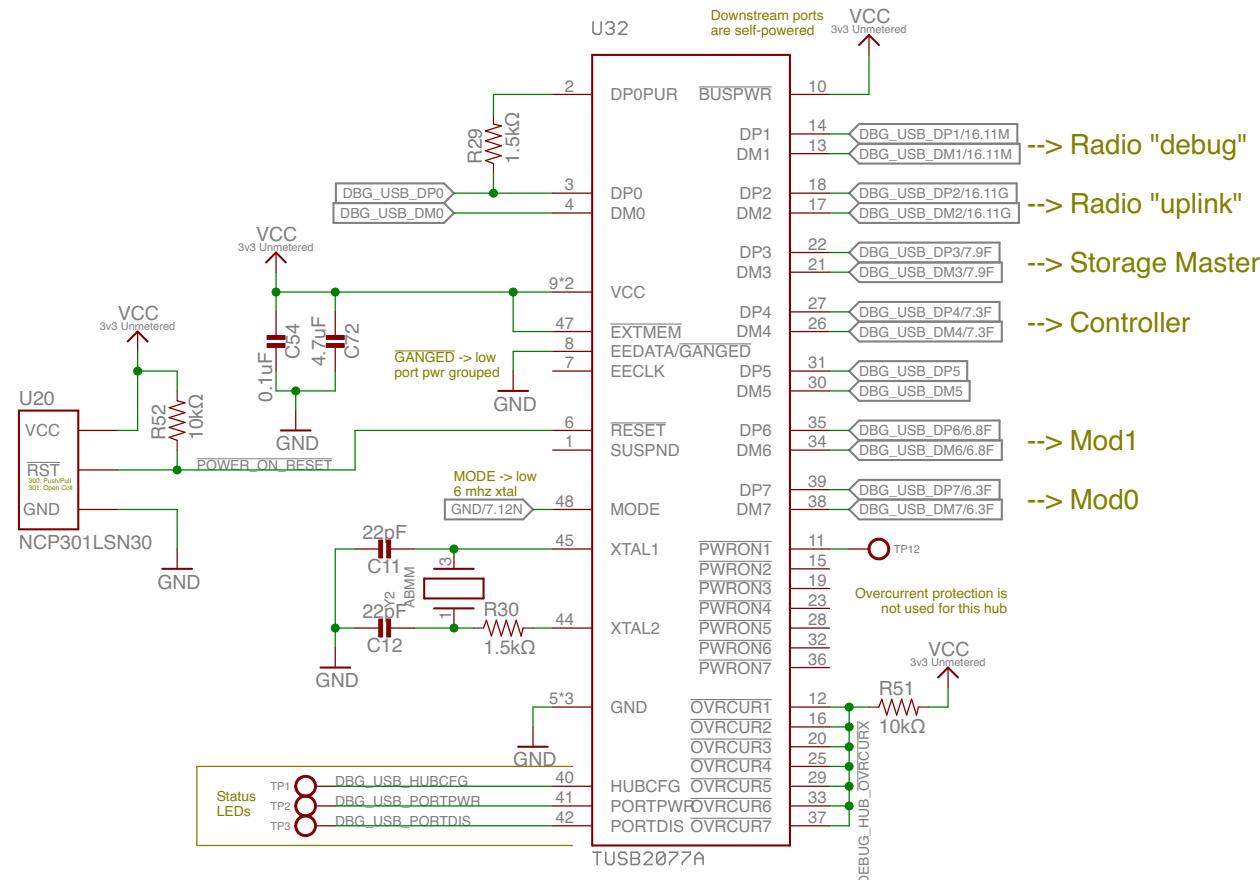
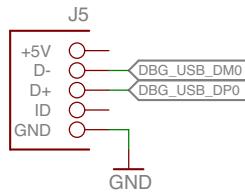
Author: Joshua Adkins and Pat Pannuto

Date: 8/15/17 01:32

Sheet: 7/18

Debugging USB Hub

This aggregates all of the debug USB ports behind one on-board hub for ease of use



Signpost Debug Backplane

REV:
C

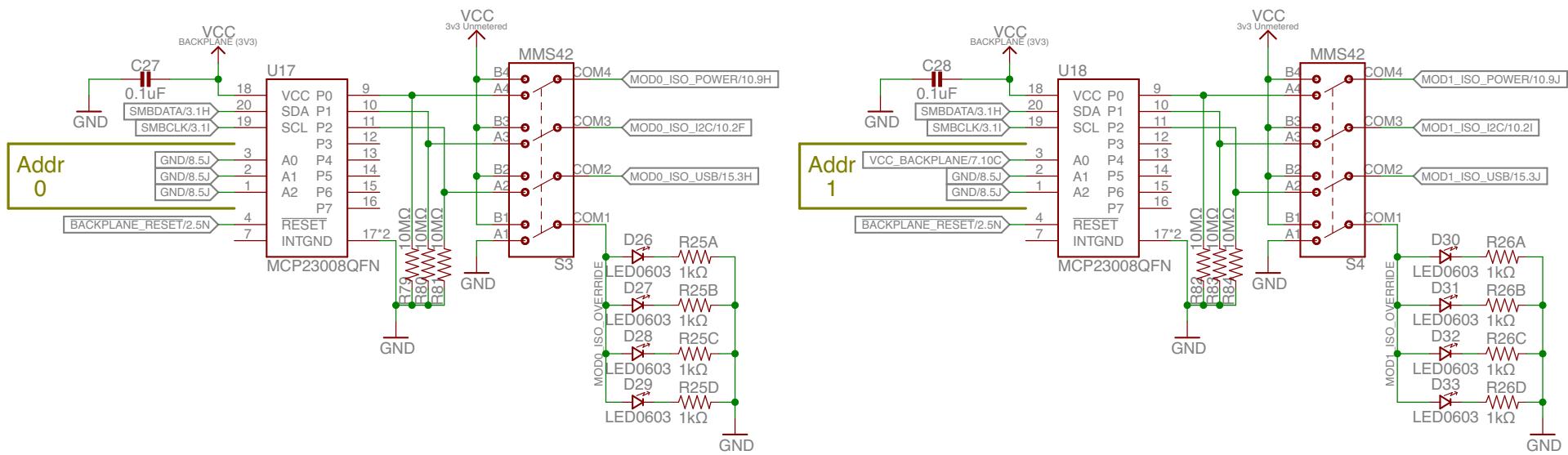
Author: Joshua Adkins and Pat Pannuto

Date: 8/15/17 01:32

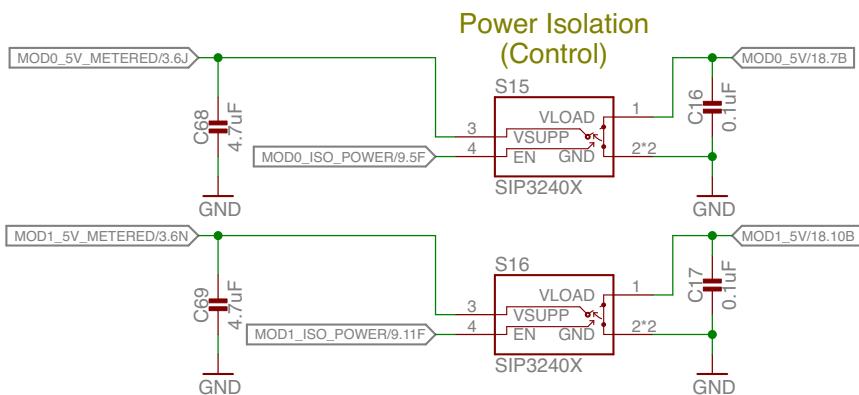
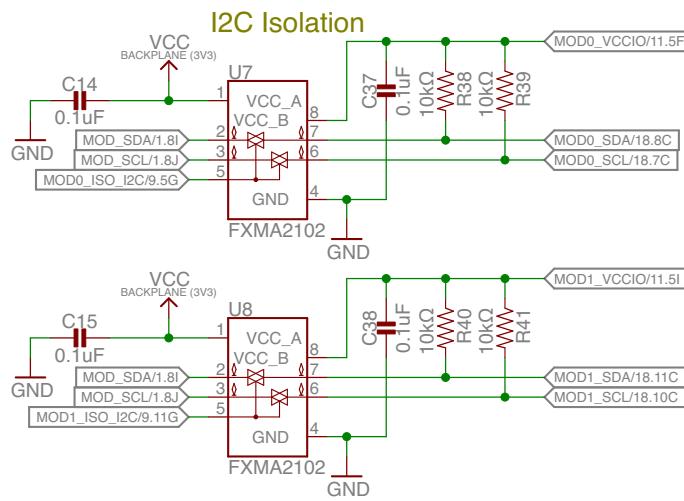
Sheet: 8/18

Isolation Control

I2C to GPIO for Isolation. Conected to SMBUS



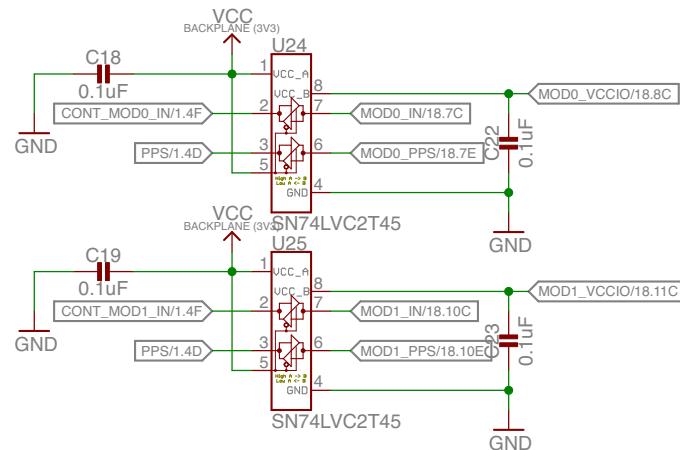
Module Isolation



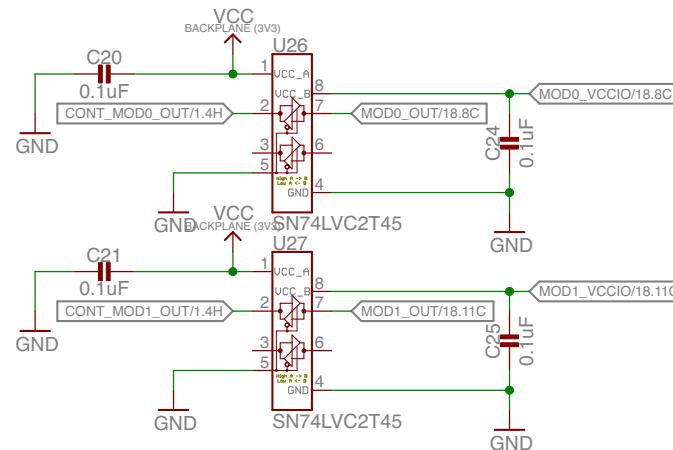
Module Isolation

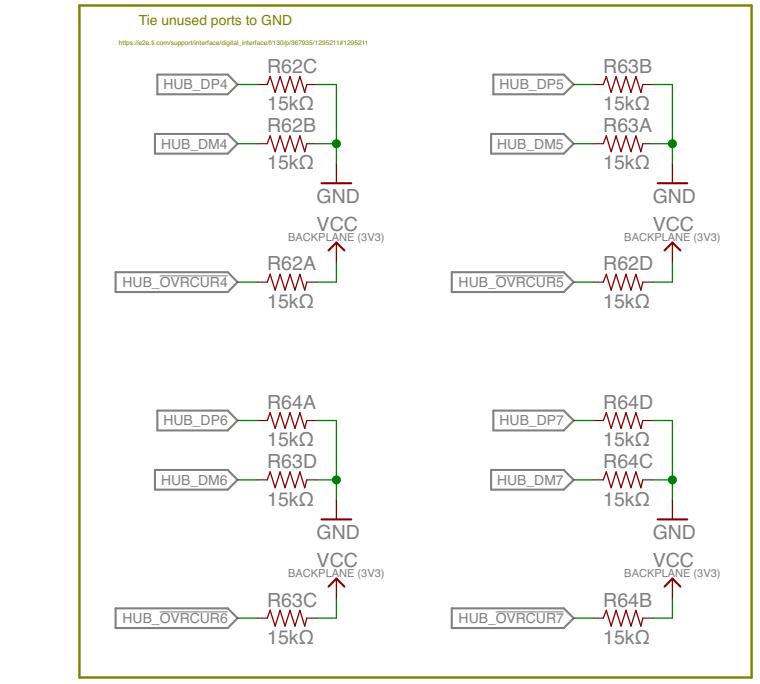
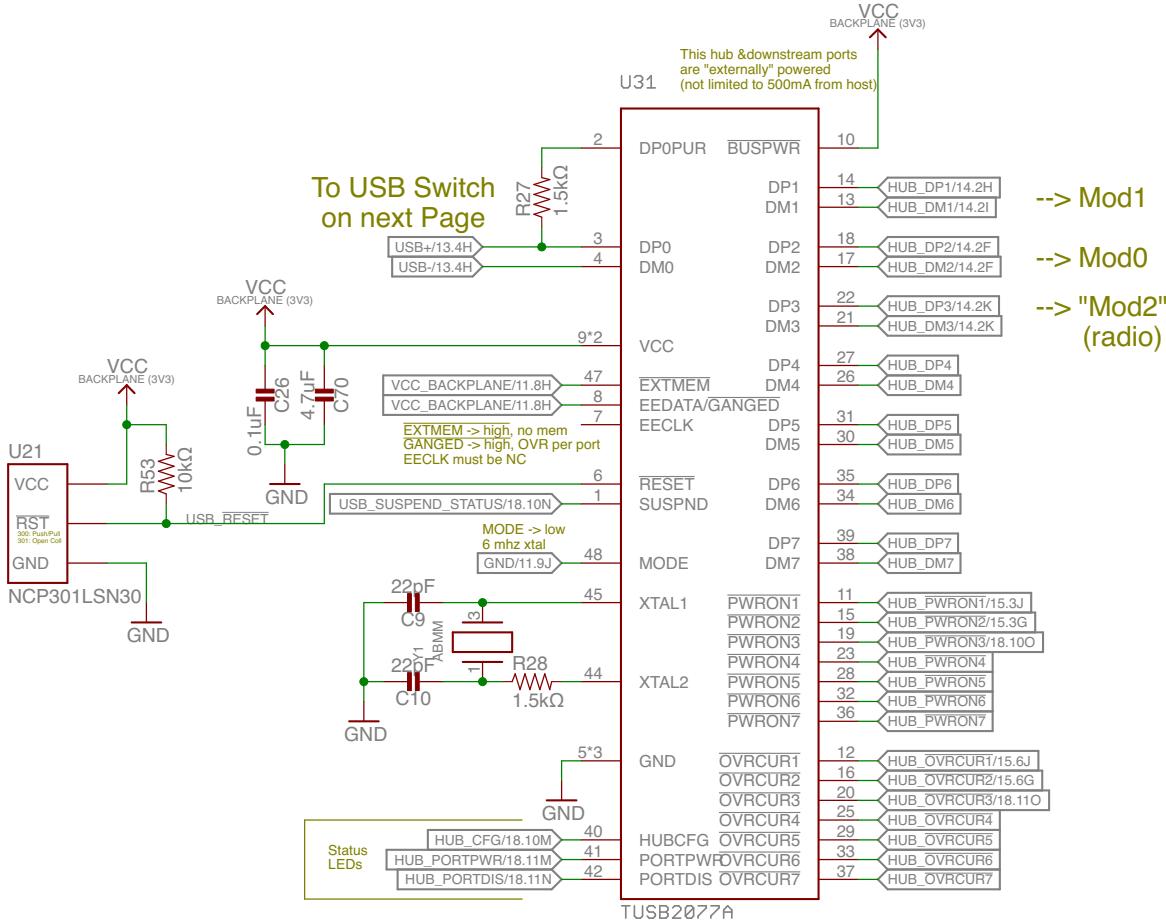
MOD_IN, MOD_OUT, PPS

Buffer / Level
Backplane --> Module



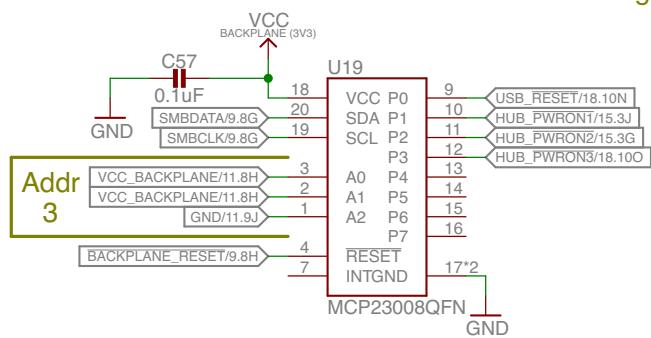
Buffer / Level
Backplane <-- Module





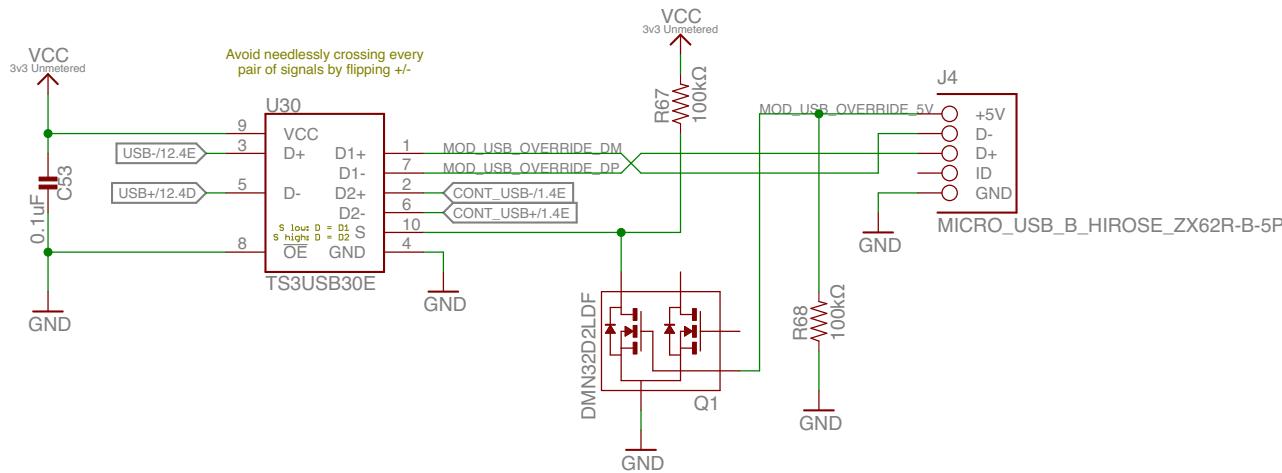
VCC BACKPLANE (3V3)
R50 10kΩ
GND
VCC BACKPLANE (3V3)
R62C 15kΩ
GND
VCC BACKPLANE (3V3)
R62B 15kΩ
GND
VCC BACKPLANE (3V3)
R63A 15kΩ
GND
VCC BACKPLANE (3V3)
R63B 15kΩ
GND
VCC BACKPLANE (3V3)
R62A 15kΩ
GND
VCC BACKPLANE (3V3)
R62B 15kΩ
GND
VCC BACKPLANE (3V3)
R64A 15kΩ
GND
VCC BACKPLANE (3V3)
R63D 15kΩ
GND
VCC BACKPLANE (3V3)
R64B 15kΩ
GND
VCC BACKPLANE (3V3)
R63C 15kΩ
GND
VCC BACKPLANE (3V3)
R64D 15kΩ
GND
VCC BACKPLANE (3V3)
R64C 15kΩ
GND
VCC BACKPLANE (3V3)
R64D 15kΩ
GND
VCC BACKPLANE (3V3)
R64C 15kΩ
GND
Port 3 is going to the "radio chip".
It doesn't have isolation, still needs a pullup

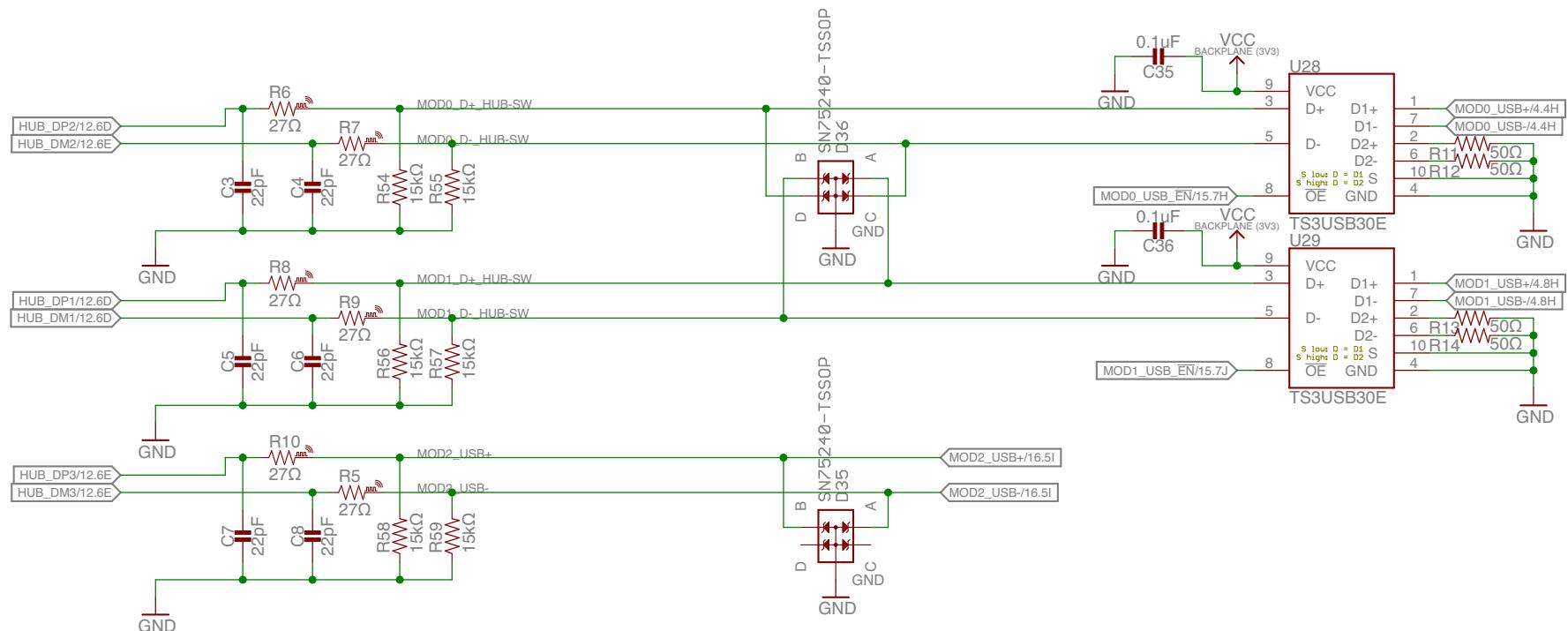
GPIO Extender for controller access to Hub signals



USB SWITCH

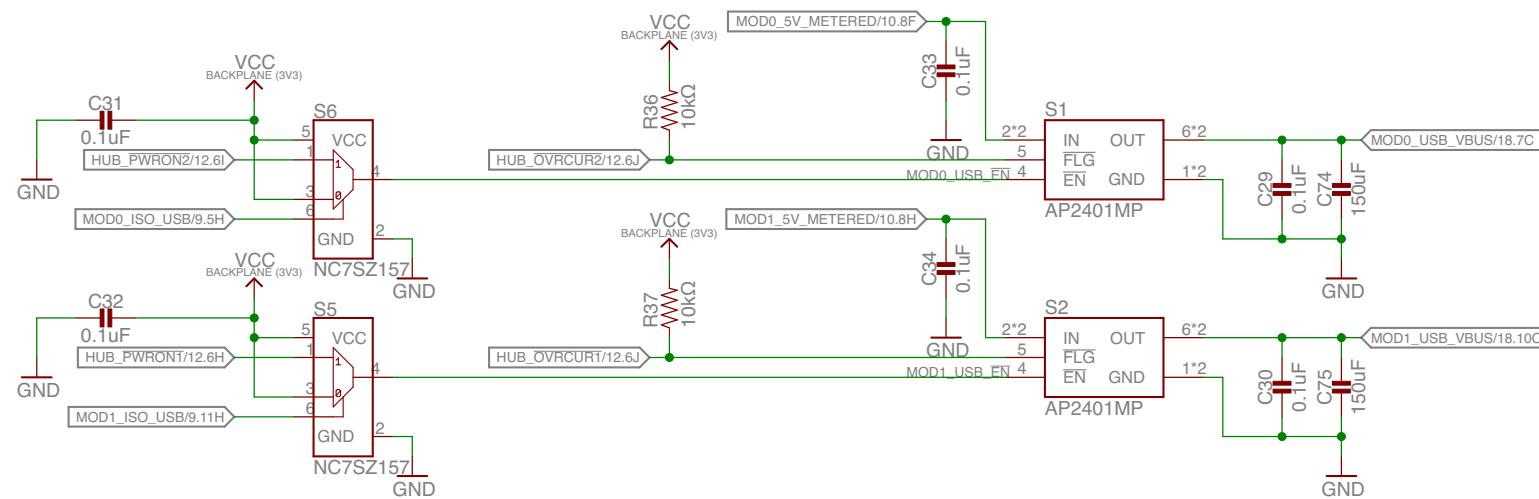
Allows USB port to act as host
instead of the Controller.
Useful for Debugging Module USB.





Transient voltage protection





Signpost Debug Backplane

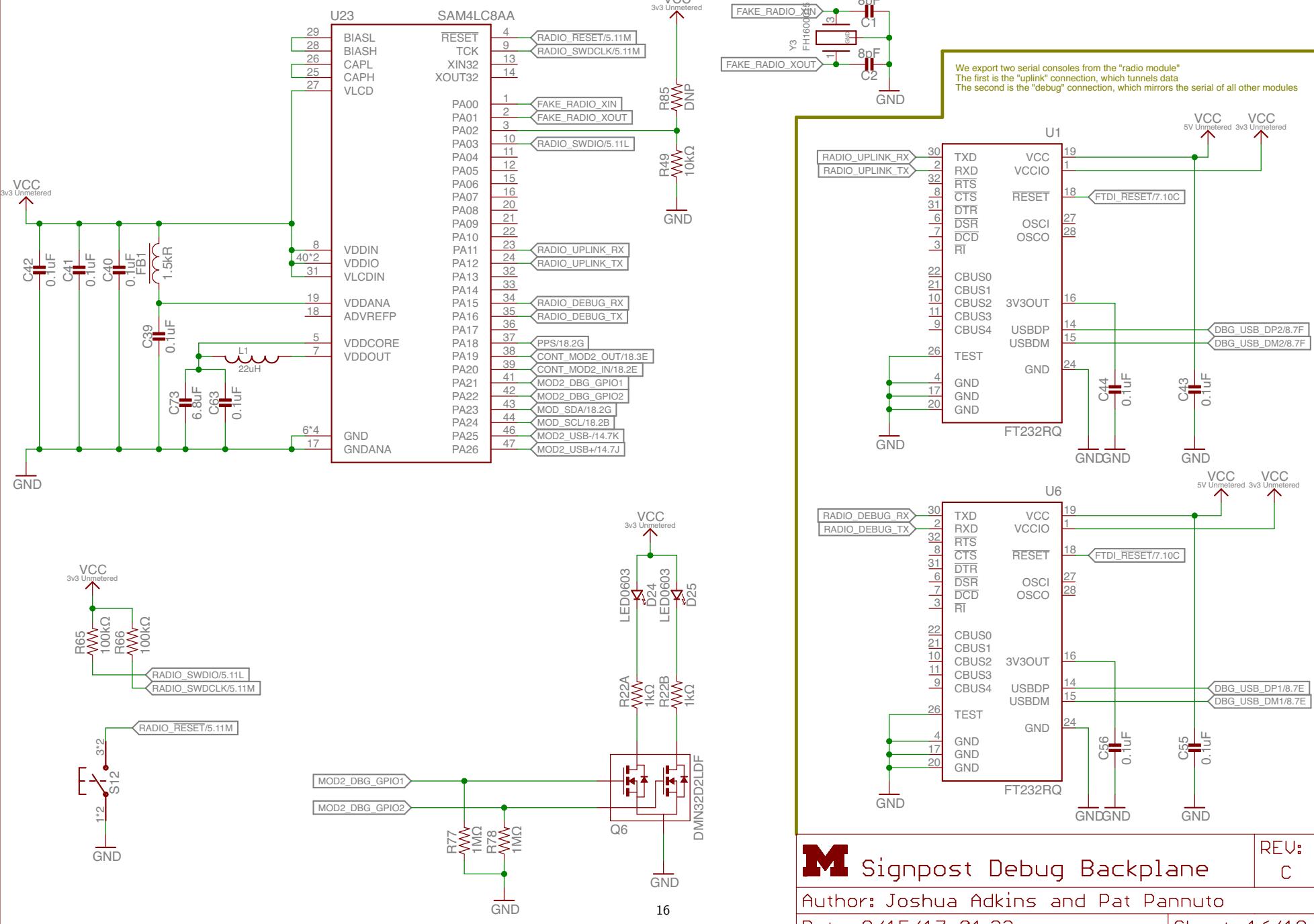
REV:
C

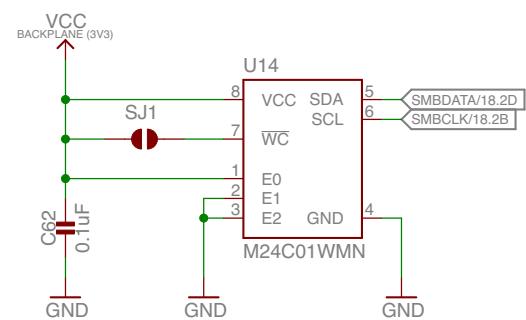
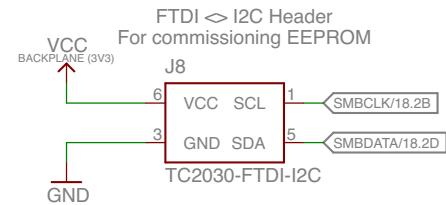
Author: Joshua Adkins and Pat Pannuto

Date: 8/15/17 01:32

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The "Radio Module"

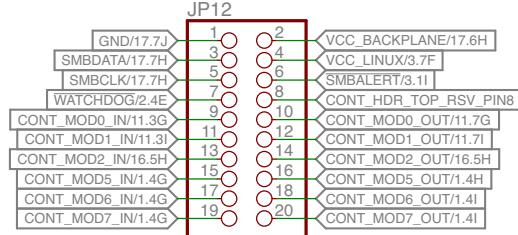




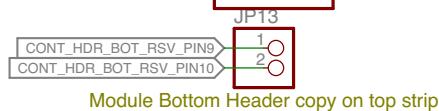
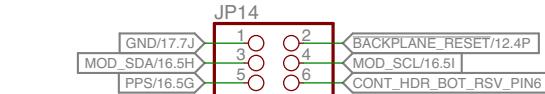
Controller Debugging



Header adjacent to module



Module Top Header copy on top strip



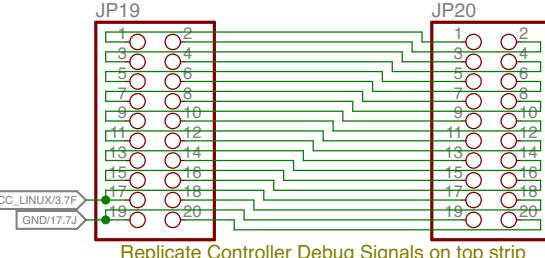
Module Bottom Header copy on top strip



Controller Debug Header copy on top strip



Storage Debug Header copy on top strip

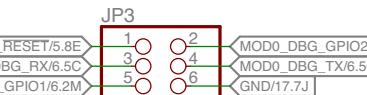
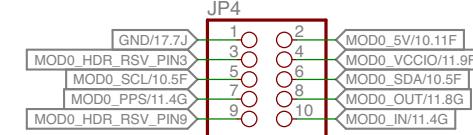


Replicate Controller Debug Signals on top strip

MOD0 Debugging



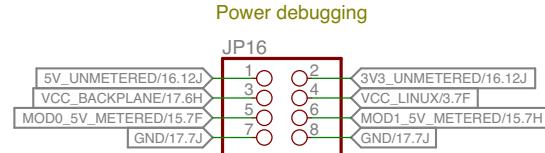
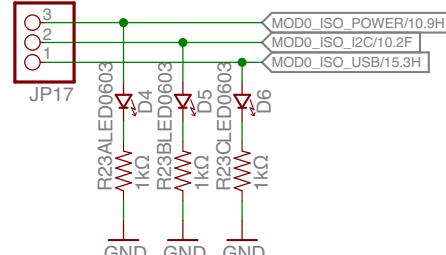
Header adjacent to module



Module debug header copy on top strip

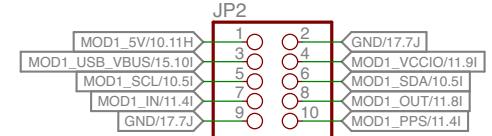


Module debug header copy on top strip

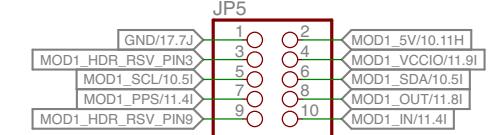


Debugging

MOD1 Debugging



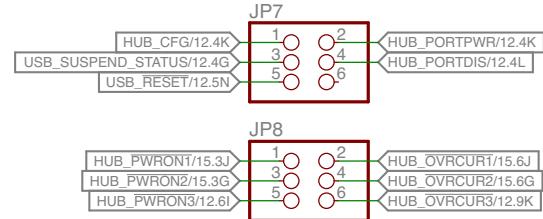
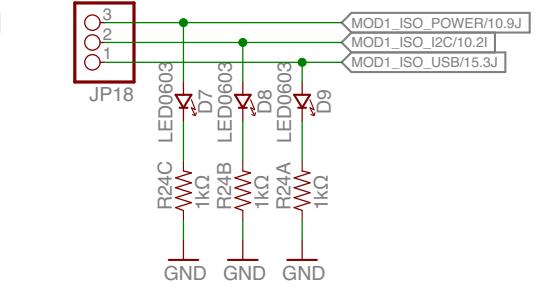
Header adjacent to module



Module header copy on top strip



Module debug header copy on top strip



Signpost Debug Backplane

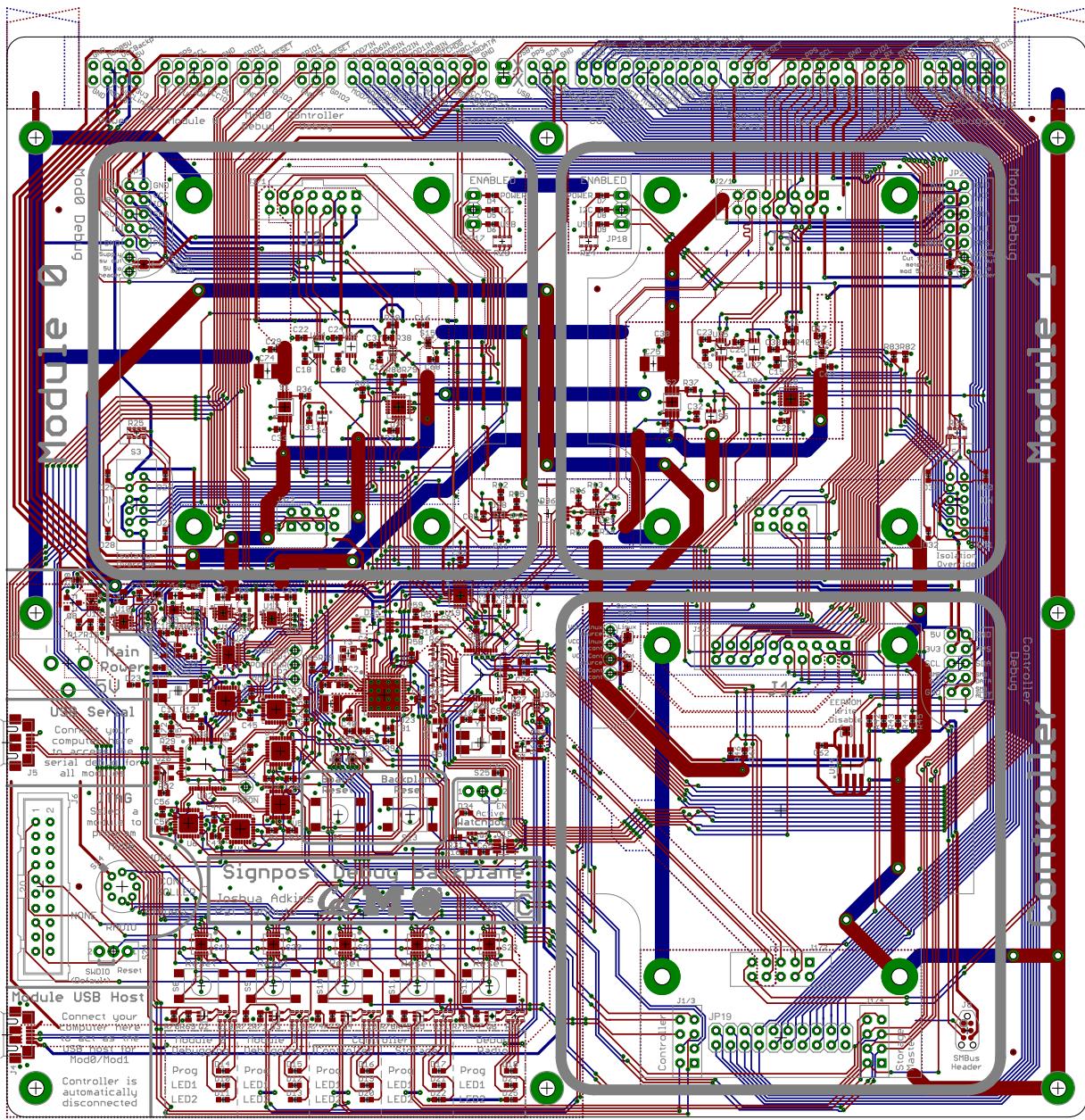
REV:
C

Author: Joshua Adkins and Pat Pannuto

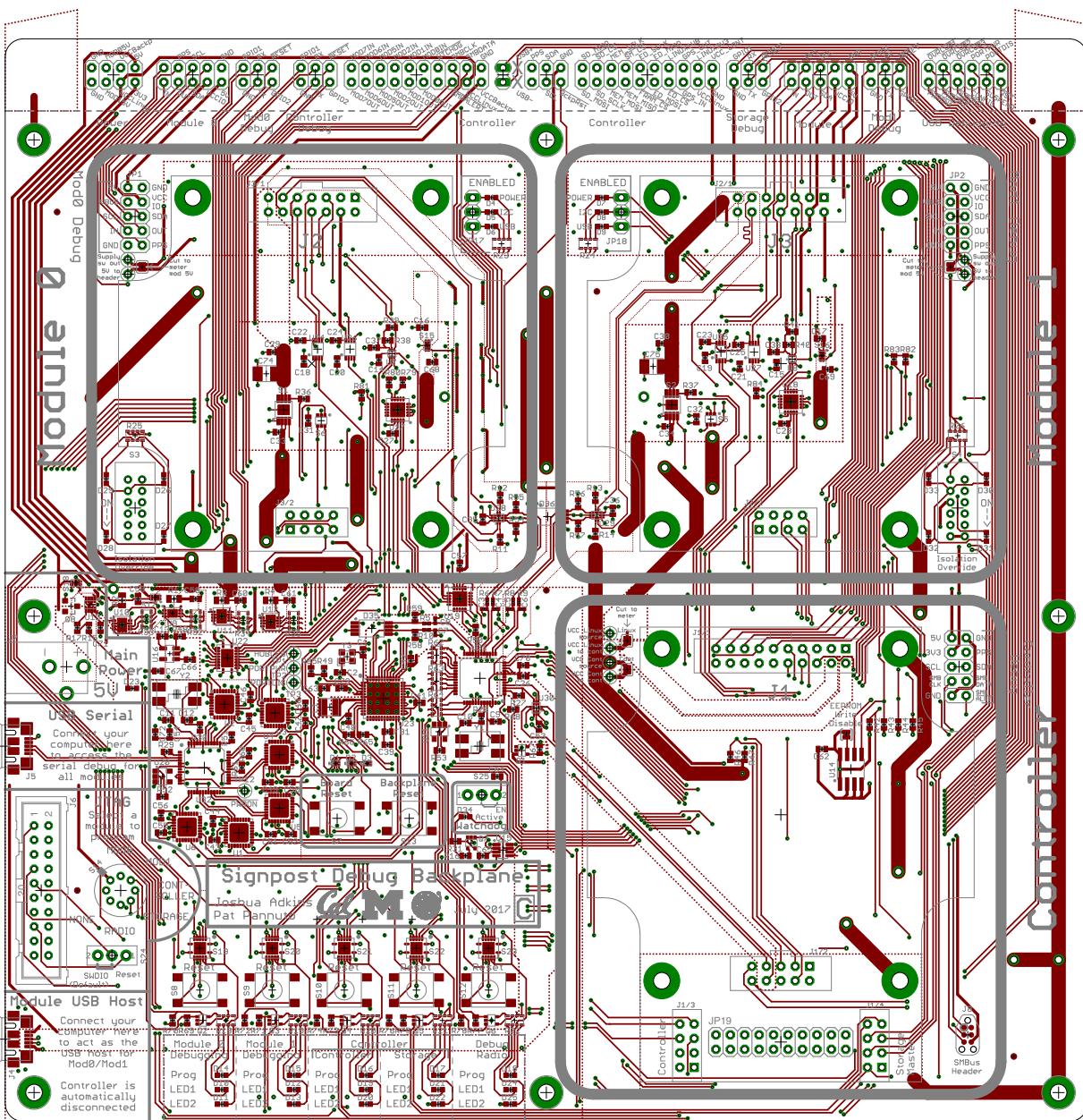
Date: 8/15/17 01:32

Sheet: 18/18

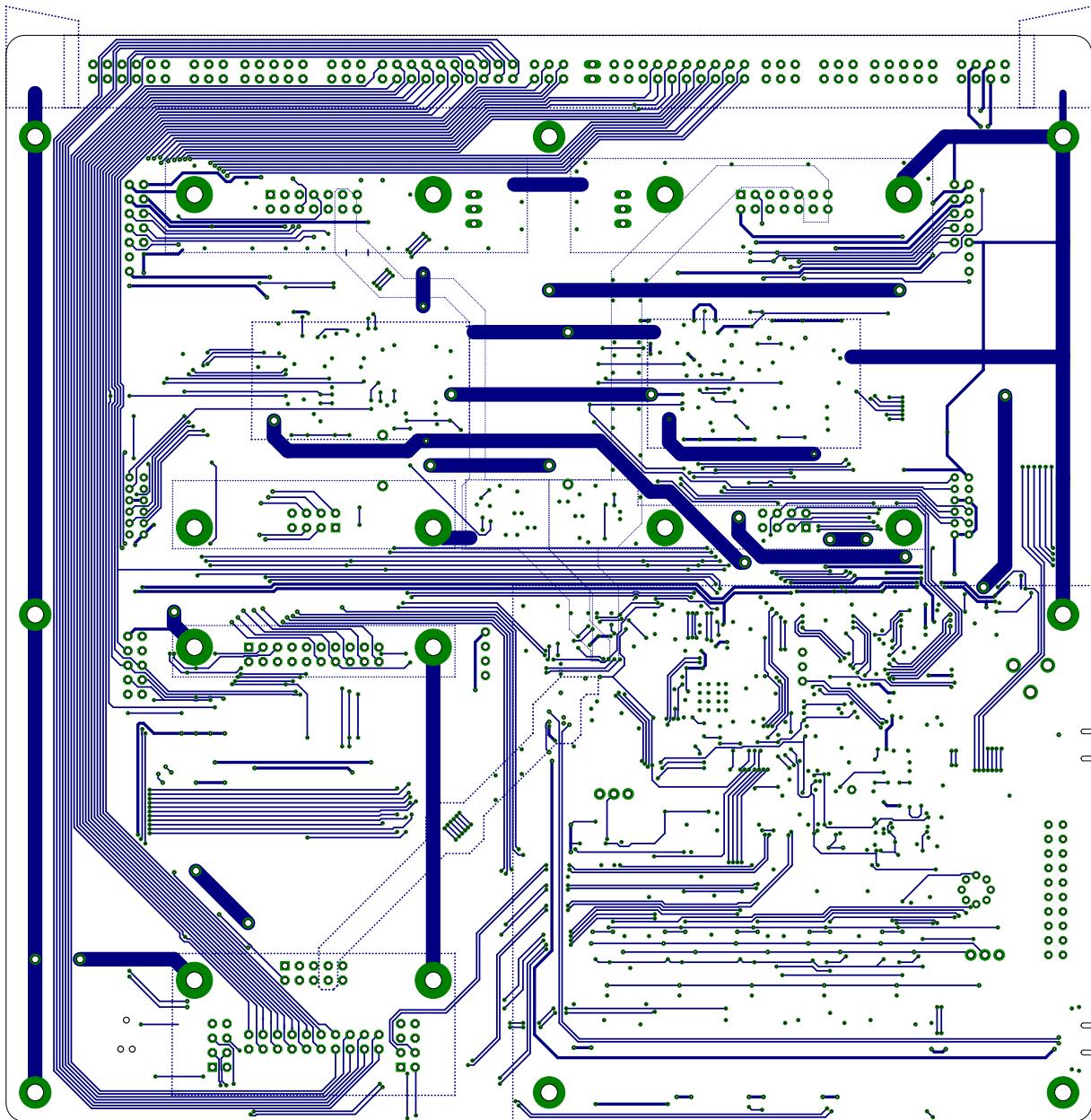
Top and Bottom Layers



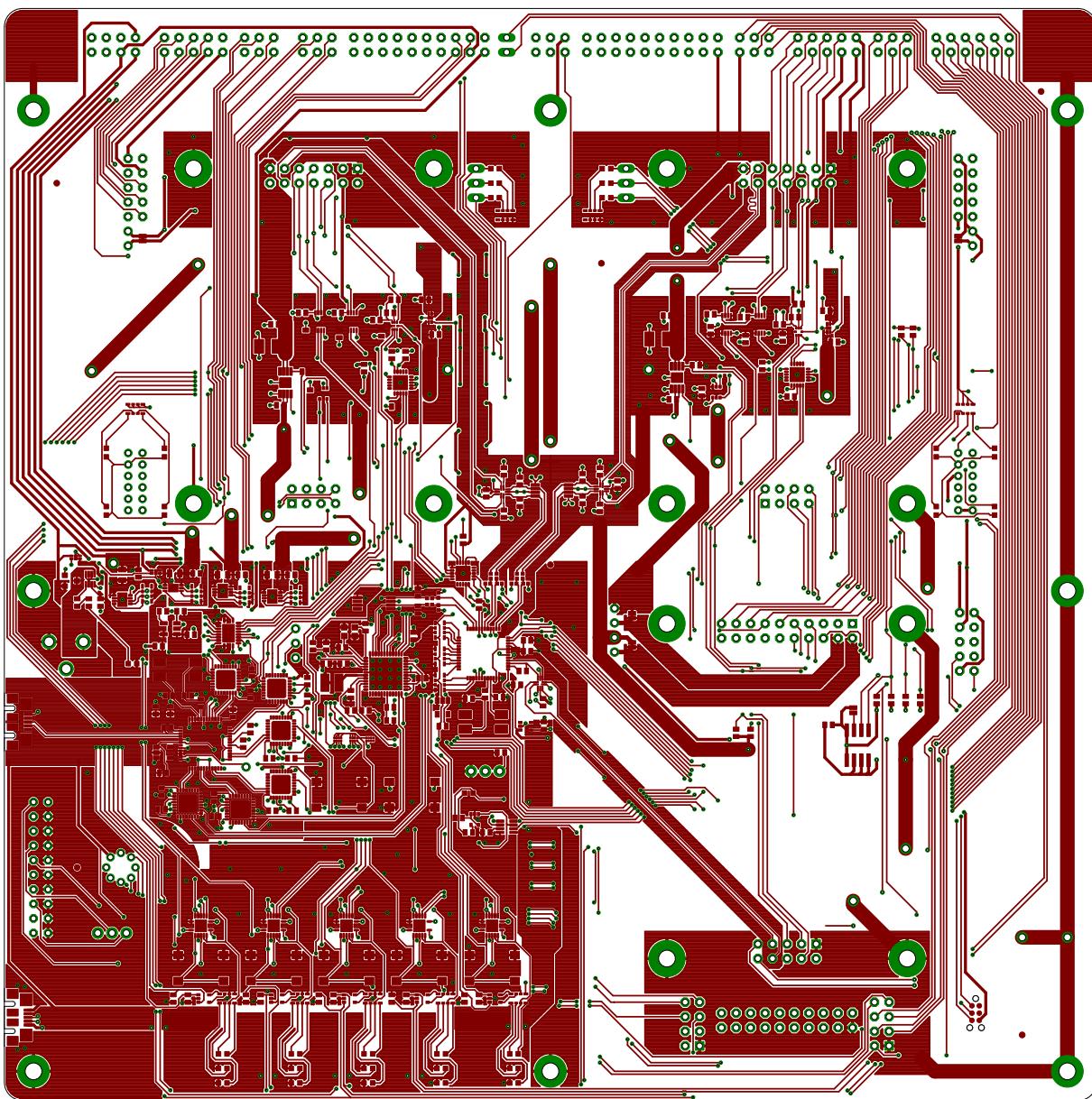
Top Layer



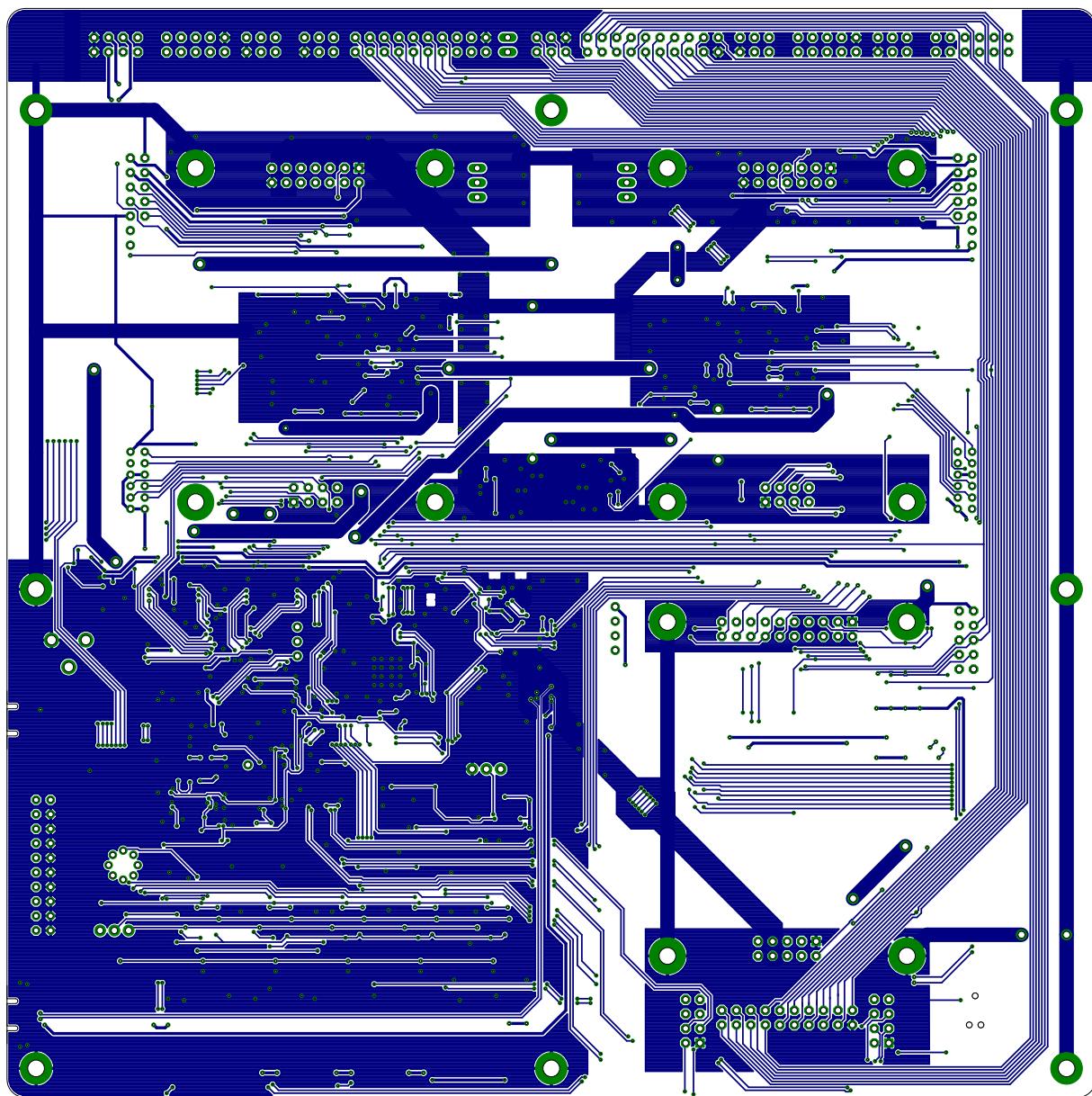
Bottom Layer



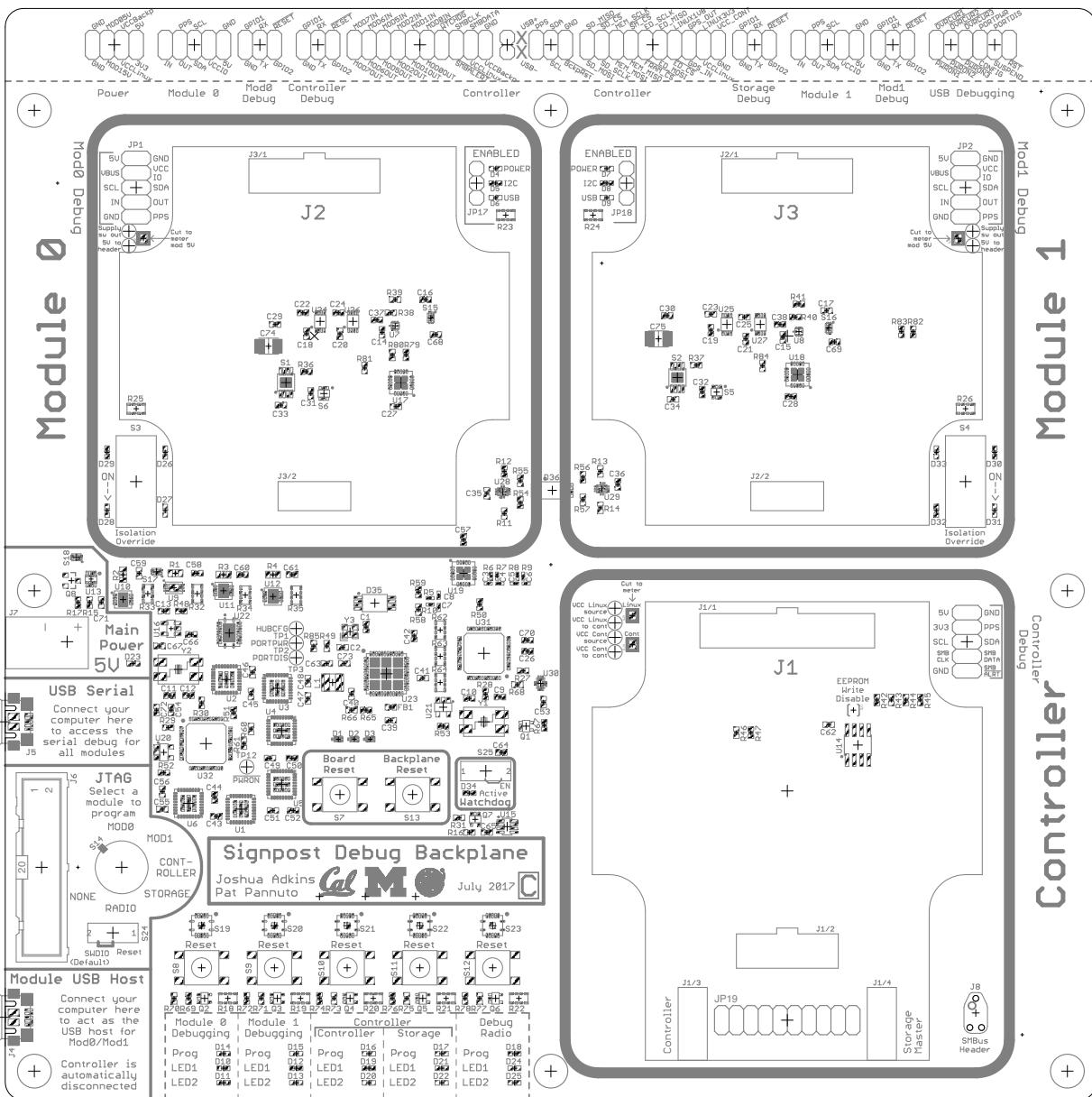
Top Copper Layer



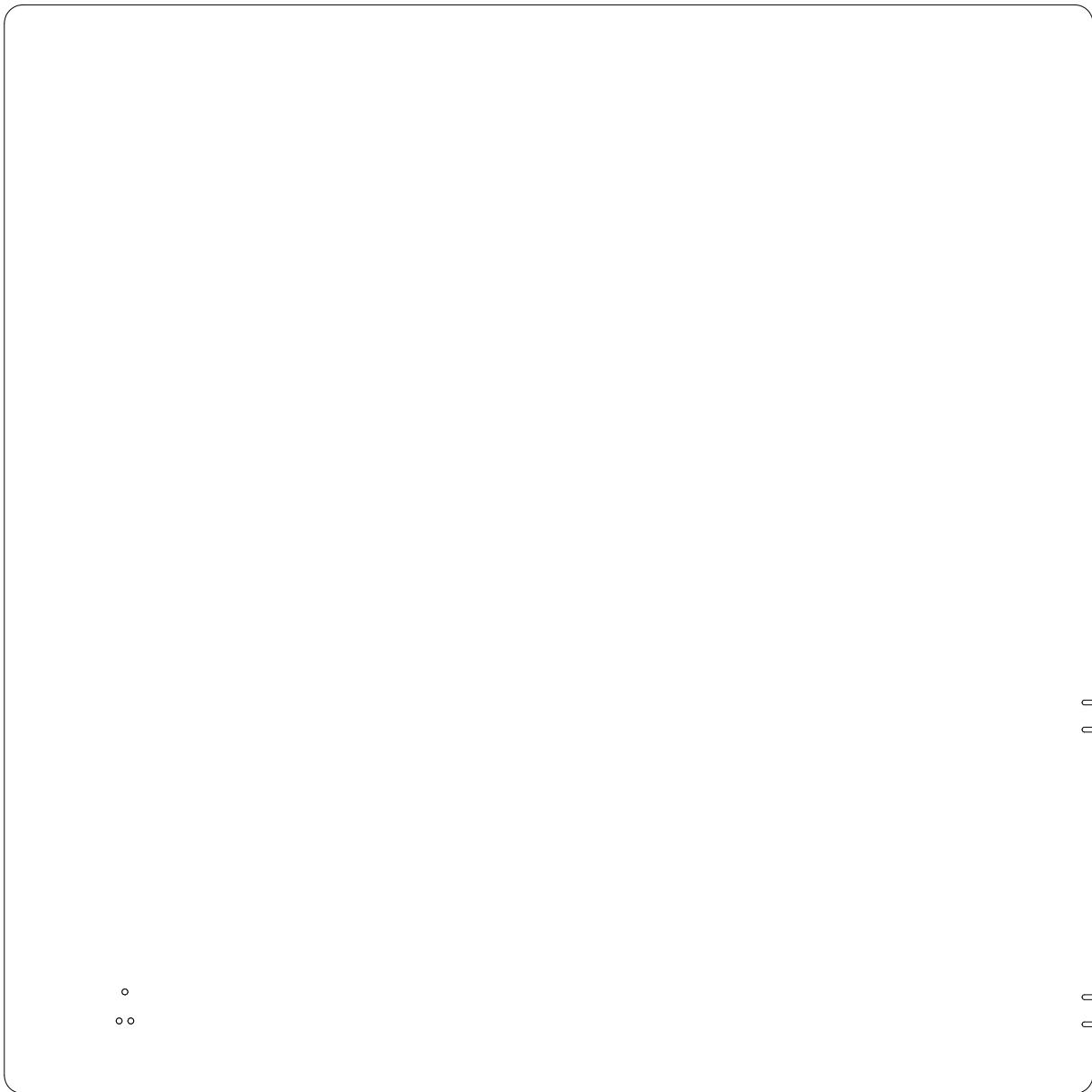
Bottom Copper Layer



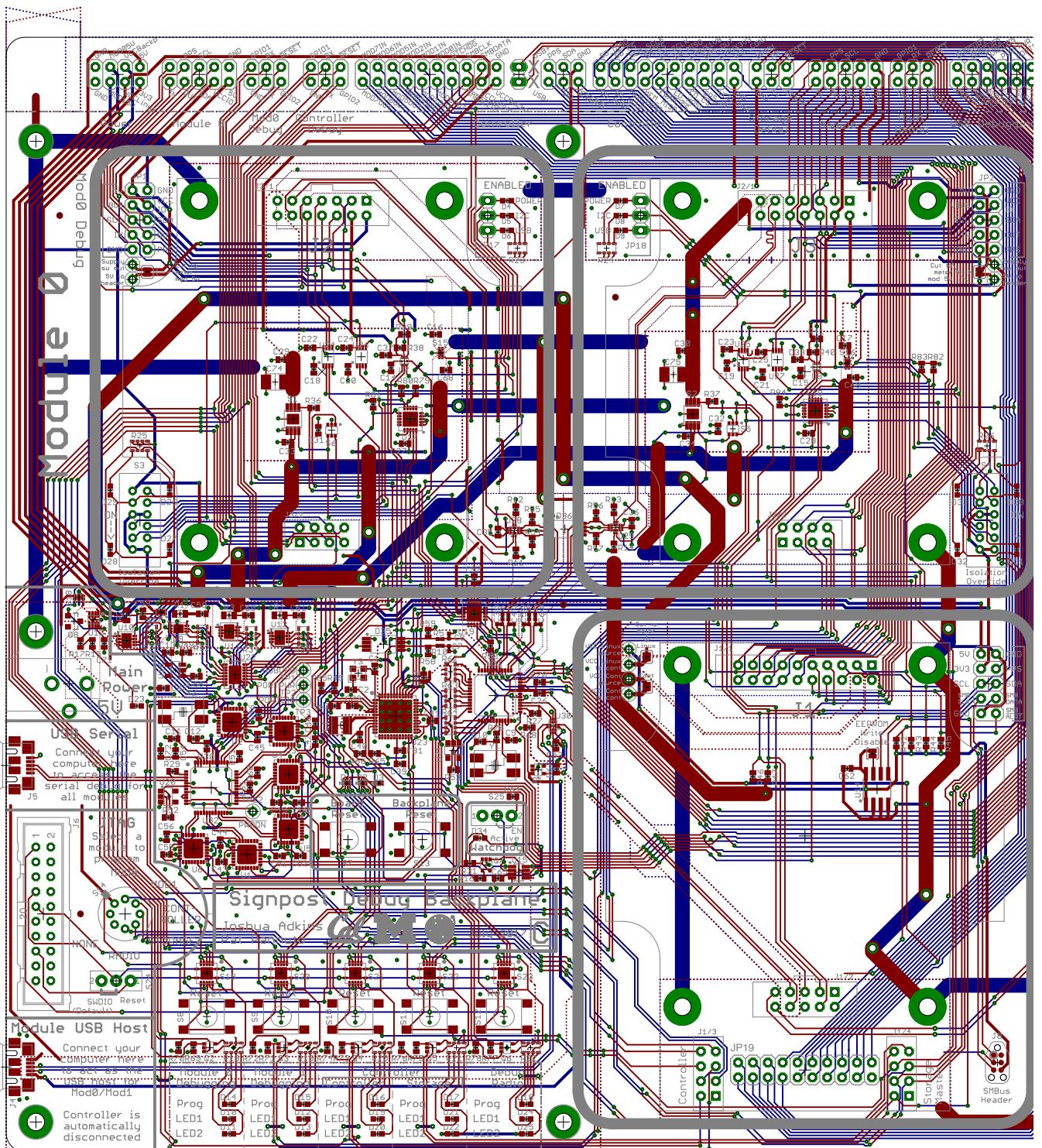
Top Paste Layer with Silkscreen

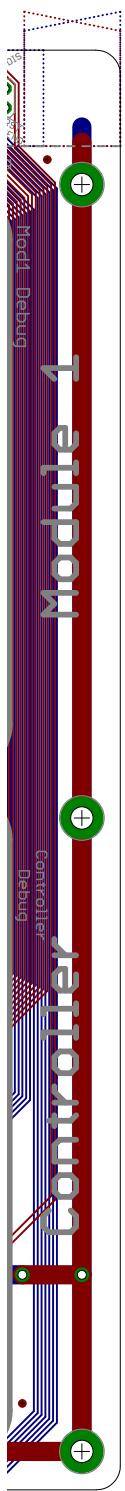


Bottom Paste Layer with Silkscreen

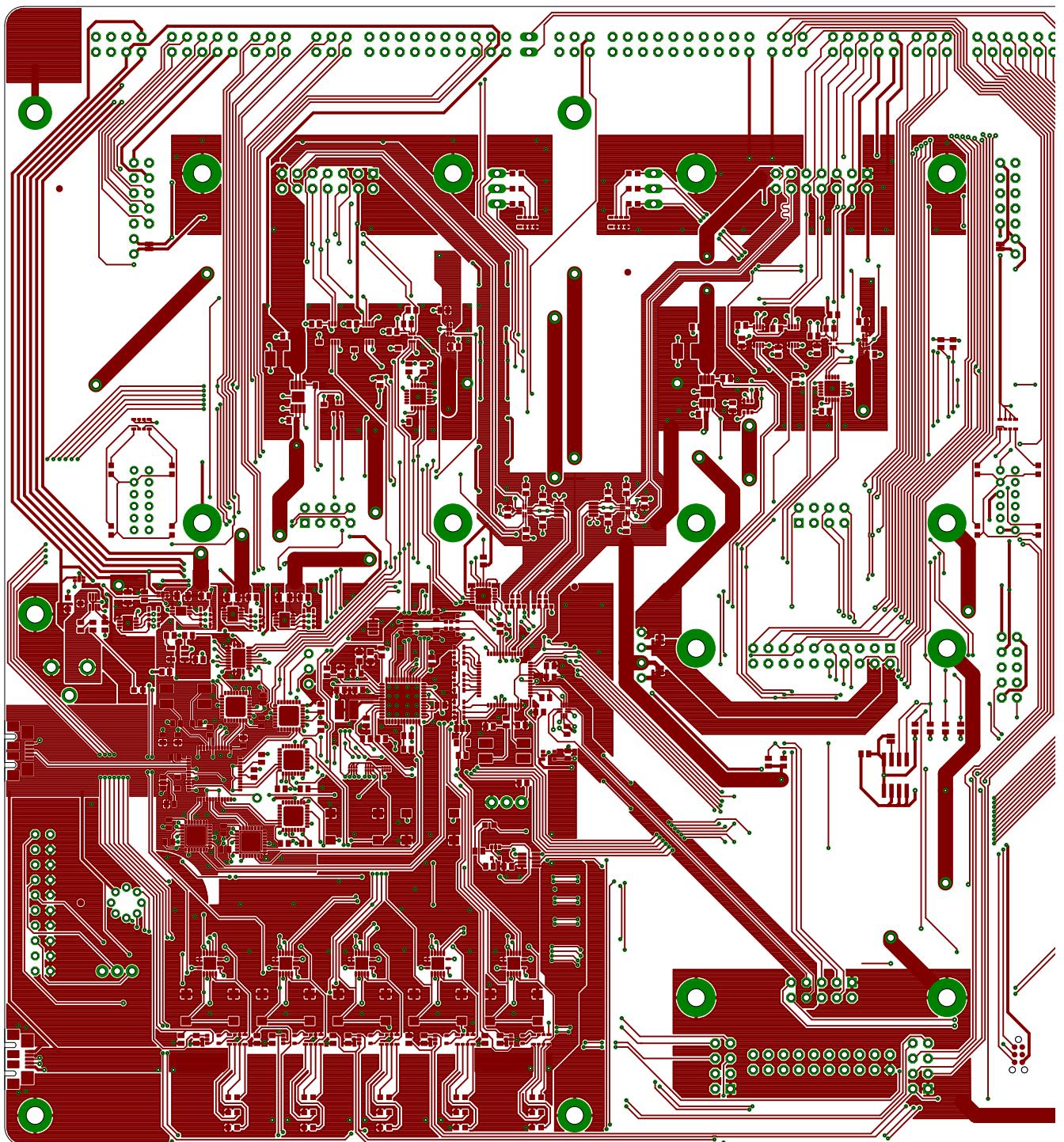


Top and Bottom Layers 1:1 Scale

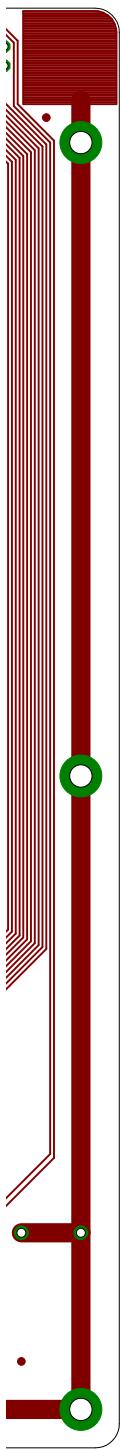




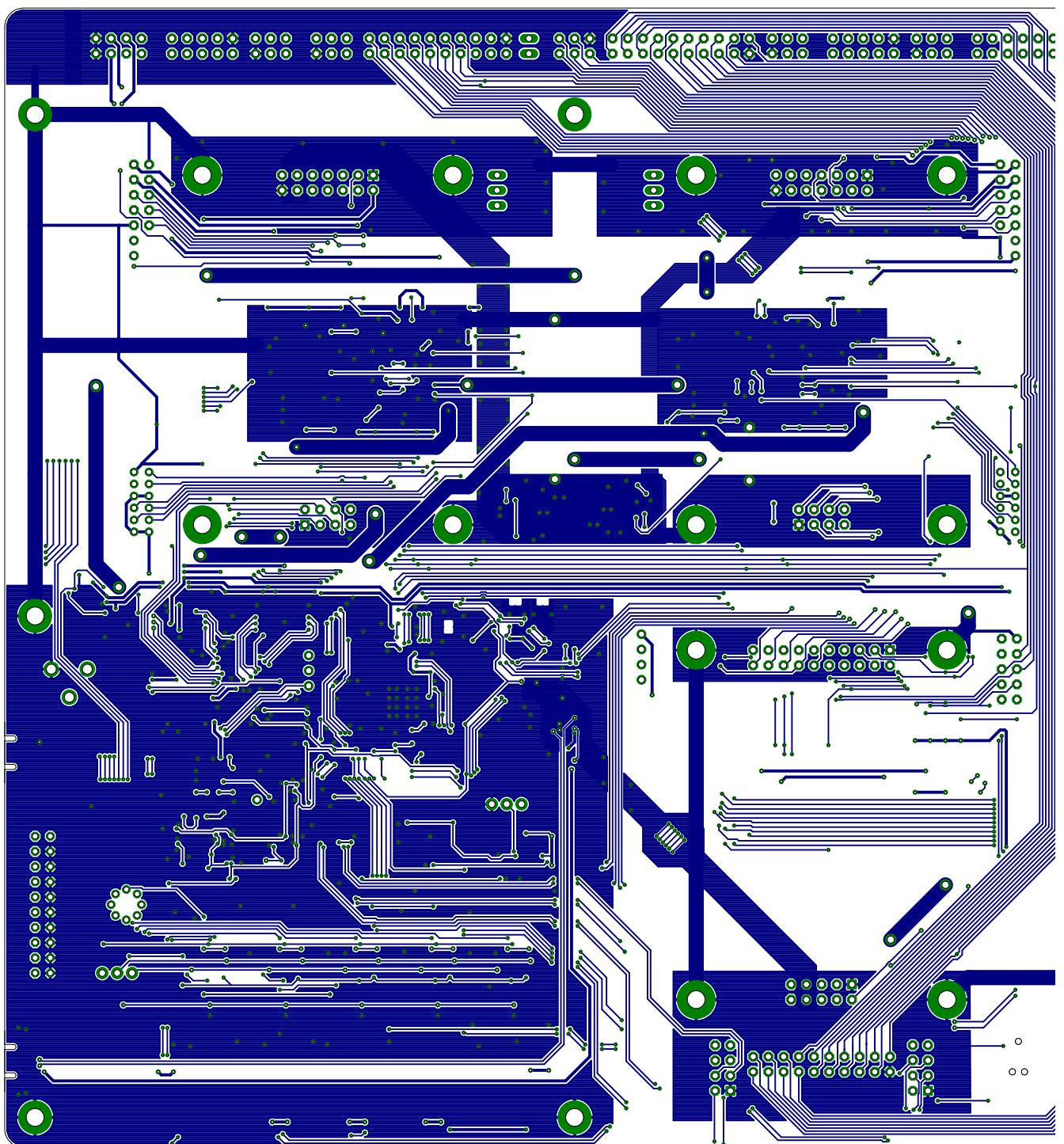
Top Layer 1:1 Scale



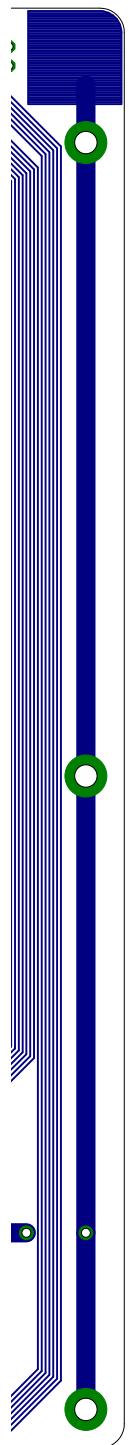
Top Layer 1:1 Scale



Bottom Copper Layer 1:1 Scale



Bottom Copper Layer 1:1 Scale



Category	Part Number	Value	Do Not Insert	Can Substitute?	Device	Package	Description	DIGIKEY	DIGIKEY2	DIGIKEY3	DIGIKEY4	MANUFACTURER	MPN	Notes	
C1	C1	8pF			CAPACITOR0603, CAP	0603, CAP	CAP CER 08P 0805 0805-0003	490-957-010-ND				Murata	GRM188524B0800A010		
6 C3	C3, C4, C5, C6, C7, C8	22pF			CAPACITOR0603, CAP	0402, CAP	CAP CER 22PF 50V C0G/N0 P0402	490-556-8-ND				Murata	GRM15522C050A0101D		
4 C9, C10, C11, C12	22pF				CAPACITOR0603, CAP	0603, CAP	CAP CER 22PF 50V C0G/N0 P0603	176-1023-1-ND				Samsung	C1L0220B8NNNC		
1 C13		0.01uF			CAPACITOR0603, CAP	0603, CAP	CAP CER 1000nF 50V X7R 0603	490-1512-1-ND				Murata	GRM1887147103K401D		
50 C14	C15, C16, C17, C18, C19, C20, C21	0.47uF			CAPACITOR0603, CAP	0603, CAP	CAP CER 0.47uF 10V X5R 0603	490-1539-1-ND				Murata	GRM188614474X610		
1 C64		0.82uF			CAPACITOR0603, CAP	0603, CAP	CAP CER 0.82uF 6.3V X5R 0603	490-1149-1-ND				Murata	GRM18860824X401D		
1 C65		1.05uF			CAPACITOR0603, CAP	0603, CAP	CAP CER 1.05uF 10V X5R 0603	490-2396-1-ND				Murata	GRM18861272C15E1D		
5 C68	C69, C70, C71, C72	2.2uF			CAPACITOR0603, CAP	0603, CAP	CAP CER 2.2uF 10V X5R 0603	120-1000-1-ND				Samsung	CL10220B8NNNC		
1 C73		4.7uF			CAPACITOR0603, CAP	0603, CAP	CAP CER 4.7uF 6.3V X5R 0603	445-7490-1-ND				TDK	CL608X8RU065X09AB		
2 C74, C75	150uF				CAPACITOR1210, CAP	1210, CAP	CAP CER 150uF 6.3V X5R 1210	176-3387-1-ND				Samsung	C132A157MVQVNNE		
3 D2, D3		100nA			LEDS003, LED	LED-0603	LEDS003, LED	RE52320000000000001CT-ND				Rohm Semiconductor	ROHM78A054Z61		
12 D4, D5, D6, D7, D8, D9, D11, D13, D20, LED6023		100nA			LEDS003, LED	LED-0603	LEDS003, LED	RE52320000000000001CT-ND				Life-On	LTST-C1542K4T		
6 D10, D11, D12, D13, D24, D34	LED6023				LEDS003, LED	LED-0603	LEDS003, LED	RE52320000000000001CT-ND				Life-On	LTST-C1519KRT		
13 D14, D15, D16, D17, D18, D26, D27, D36, D6033	LED6023				LEDS003, LED	LED-0603	LEDS003, LED	RE52320000000000001CT-ND				Life-On	LTST-C1591KT-5A		
2 T8, T9, D8	SN74240-TSSOP				TSSOP-8		TSSOP-8					Texas Instruments	SN74240PW		
1 T81		1.5uA			FERRITE BEAD, 1.5 uH	0603, CAP	FERRITE BEAD 1.5 uH KOM-0603 1LN	490-5216-1-ND				Murata	BLM18HE1153N1D		
8 H1, H2, H3, H4, H5, H6, H7, H8	MOUNT-PAD-ROUND#4	X			MOUNT-PAD-ROUND#4		MOUNTING PAD, round								
*** 4 Part *** PTH 20 pins + PTH 8 pins + PTH 8 pins															
J1	J1	BACKPLANE_CONTROLLER_MODULE_DEBUG	N	BACKPLANE_CONTROLLER_PTH 10 pins + PTH 8 pins	Control module for signpost, with debug h59197ND			S9194-ND	S7072-ND	S7072-ND	S7072-ND	Sullins Connector	SFH11-BPC-B-D10-ST-BK	J1 is 4 physical parts	
J1 is 4 physical parts															
J2, J3	J4, J5	BACKPLANE_GENERIC_MODULE_DEBUG	N	BACKPLANE_GENERIC_M0 + 2 Parts**	2 parts** A backplane header for the debug module	9591-ND		S7072-ND				Sullins Connector	SFH11-BPC-B-D07-ST-BK and PPT		
1 J6		MICRO-USB_B_HIROSE_ZU5B-MICRO_B-HIROSE-ZU5B	N	MICRO-USB_B_HIROSE_ZU5B-MICRO_B-HIROSE-ZU5B Micro B Connector		H1574CT-ND						Hirose Connector Co Ltd	ZX6R-B-5P		
1 J7	PJ102AH		N	MINI-USB-A_HIROSE_ZU5B		H1575CT-ND						Sullins Connector	SBH11-BPC-B-D10-ST-BK		
1 J8	TC2030-FTDI-12C	X	N	PINP0H-2X5	PTH 10 pins	A94268-1-ND						EL Connectivity	TE Connectivity		
1 JP1, JP2, JP3, JP4, JP5, JP11	JP1, JP2, JP3, JP4, JP5, JP11		N	PINP0H-10D	PTH 10 pins	A94268-1-ND						TE Connectivity	9-1452-0-05		
3 JP3, JP4, JP19, JP20	JP3, JP4, JP19, JP20		N	PINP0H-1X2	PTH 2 pins	A94268-01-ND						TE Connectivity	9-1452-0-10		
1 JP5	JP1, JP2, JP3, JP4, JP5, FIDUCIAL1X2	X	N	FIDUCIAL1X2		Fiducial Alignment Points						TE Connectivity	9-1452-0-01		
1 JP6		PINH0H-2X6	N	PINH0H-2X6	PTH 6 pins	A94268-08-ND						Würth Electronics	733-S1316		
2 JP7, JP8		PINH0H-3X3	N	PINH0H-3X3	PTH 3 pins	A94268-08-ND						Würth Electronics	733-S1316		
7 JP3, JP6, JP7, JP8, JP9, JP10, JP14	JP3, JP6, JP7, JP8, JP9, JP10, JP14		N	PINH0H-2X3	PTH 6 pins	A94268-08-ND						Diodes Incorporated	LQHNP22N0M00L		
1 L1	2.1uH	NL1024H	N	NL1024H	SMD	LH43NP Inductor	949-5350-1-ND					Diodes Incorporated	DO4320ZD120L		
7 D1, D2, Q3, Q4, Q5, Q6, Q7	MOSFET-NCHANNELSMD		N	MOSFET-NCHANNELSMD	SO73-3	Common Source Bias Diode-Channel MOSFET-NCHANNELSMD	DO4320ZD120L					Diodes Incorporated	DO4320ZD120L		
1 R1, R2, R3, R4	0.0170	PJ102AH	N	PJ102AH	SO73-3	MOSFET-NCHANNELSMD	DO4320ZD120L					Vishay Dale	WSL10050170FEB	2A minimum	
7 R11, R12, R13, R14, R15, R16, R17	500	RES100K	N	RES100K	RES	RSM SMD 0.10Ω 1% 1W 10W 0805	WSL10050170FEB					Rohm	TR00E2PF9499		
9 R18, R19, R20, R21, R22, R23, R24, R25	100K	RES100K	N	RES100K	RES	RSM SMD 0.09Ω 1% 1W 10W 0805	WSL10050170FEB					Panasonic	EE-38V125UL		
4 R26, R27, R28, R29, R30, R31	100K	RES100K	N	RES100K	RES	RSM SMD 0.10Ω 1% 1W 10W 0805	WSL10050170FEB					Panasonic	EX-38V125UL		
6 R29, R30, R71, R72, R73, R74, R75, R76, R77	100K	RES100K	N	RES100K	RES	RSM SMD 0.09Ω 1% 1W 10W 0805	WSL10050170FEB					Panasonic	EX-38V135V		
6 R78, R80, R81, R82, R83, R84	100K	RES100K	N	RES100K	RES	RSM SMD 0.10Ω 1% 1W 10W 0805	WSL10050170FEB					Samsung	RC1005104CS		
1 R85	DNP		N	RES100K	RES	RSM SMD 0.10Ω 1% 1W 10W 0805	WSL10050170FEB					Rohm	RSR03E2PF9105		
2 S1, S2	AP201IMP		N	AP201IMP		Resistor						Rohm	RSR03E2PF9105		
2 S3, S4	AP201IMP		N	AP201IMP		Resistor						Diodes Incorporated	DO4320-1P-13		
25 S5, S6	NL1024H		N	NL1024H		MOSFET						Diodes Incorporated	AMM25-2		
7 S7, S8, S9, S10, S11, S12, S13	NC72517		N	NC72517	SC70-6	Tactile Switch SPST-NO Top Actuated Surface Mount	NC72517SPKCT-ND					Fairchild Semiconductor	NC72517SPKCT		
1 S14		PT5645-M435MTR92	N	PT5645-M435MTR92		Tactile Switch SPST-NO Top Actuated Surface Mount	PT5645-M435MTR92-ND					C&K	PT5645-M435MTR92 LFS		
4 S15, S16, S17, S18	PT5645-M435MTR92		N	PT5645-M435MTR92	SC70-6	Relays SPDT 2A 120VAC 50/60Hz	CM107105-ND					C&K	PT5645-M435MTR92		
3 S20, S21, S22, S23	SN74AHC0466-RGY		N	SN74AHC0466-RGY	S-PVQFN-14-3.5MM	High Speed CMOS Logic 24A 3.5mm High Speed	TS400-1447-ND					Vishay Silivrisic	TS400-1447-ND		
2 S24, S25	TE_S5512/S5512		N	TE_S5512/S5512	SC70-6	TE_S5512/S5512	TS400-1447-ND					Texas Instruments	SN74AHC0466RGY		
1 S26	SOLIDQUARTZ-PIPERCO	X	N	SOLIDQUARTZ-PIPERCO	SC70-6	Solder Jumper Normally Open	TS400-1447-ND					TE Connectivity	SSA12		
4 S12, S13, S14, S15	SOLIDQUARTZ-PIPERCO		N	SOLIDQUARTZ-PIPERCO	SC70-6	Solder Jumper Normally Closed	TS400-1447-ND					Solder Jumper	DO NOT bridge this connection		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Keystone Electronics	5001		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					FTDI	FT232RQ		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND					Linear Technology	LT24100DCGMRPB		
Y TEST, POINT, 0.040in	FNT232RQ		N	TEST, POINT, 0.040in	PTH 1 pin	0.040in Test Point	5001-ND			</td					