

Starboard Headers
Starboard_Headers.SchDoc

SPI_Star

SPI_CLK → SPI_CLK
SPI_MISO → SPI_MISO
SPI_MOSI → SPI_MOSI
SPI_nCS_S → SPI_nCS
SPI_nCS_SD ✕

U_AD7298 12-Bit SPI ADC

nPD/nRST

TSB

VIN[0..7]

VIN[0..7]
VIN0
VIN1
VIN2
VIN3
VIN4
VIN5
VIN6
VIN7

TP101

TP

TP102

TP

TP103

TP

TP104

TP

TP105

TP

T1

Temp_Sensor.SchDoc

V_Temp

T2

Temp_Sensor.SchDoc

V_Temp

T3

Temp_Sensor.SchDoc

V_Temp

PD1

Photodiode_Sun_Sensor.SchDoc

V_Photo

PD2

Photodiode_Sun_Sensor.SchDoc

V_Photo

PD3

Photodiode_Sun_Sensor.SchDoc

V_Photo

Current and Voltage Sensors
Current_Voltage_Sensor.SchDoc

V_buffer_out

I_buffer_out

V_out

V_ref

V_in

VStar+

VStar-

Photovoltaic Array
XTJ-Prime_2S1P.SchDoc

V_PV-

V_PV+

Mechanical Interfacing
Mech_Interface_Starboard.SchDoc

VStar-

Deployment_Star

Deployment_Star

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Title **Starboard**

University of Alberta
Department of Electrical
and Computer Engineering
Edmonton AB, Canada
T6G 1H9



Size: Letter

Number: 1

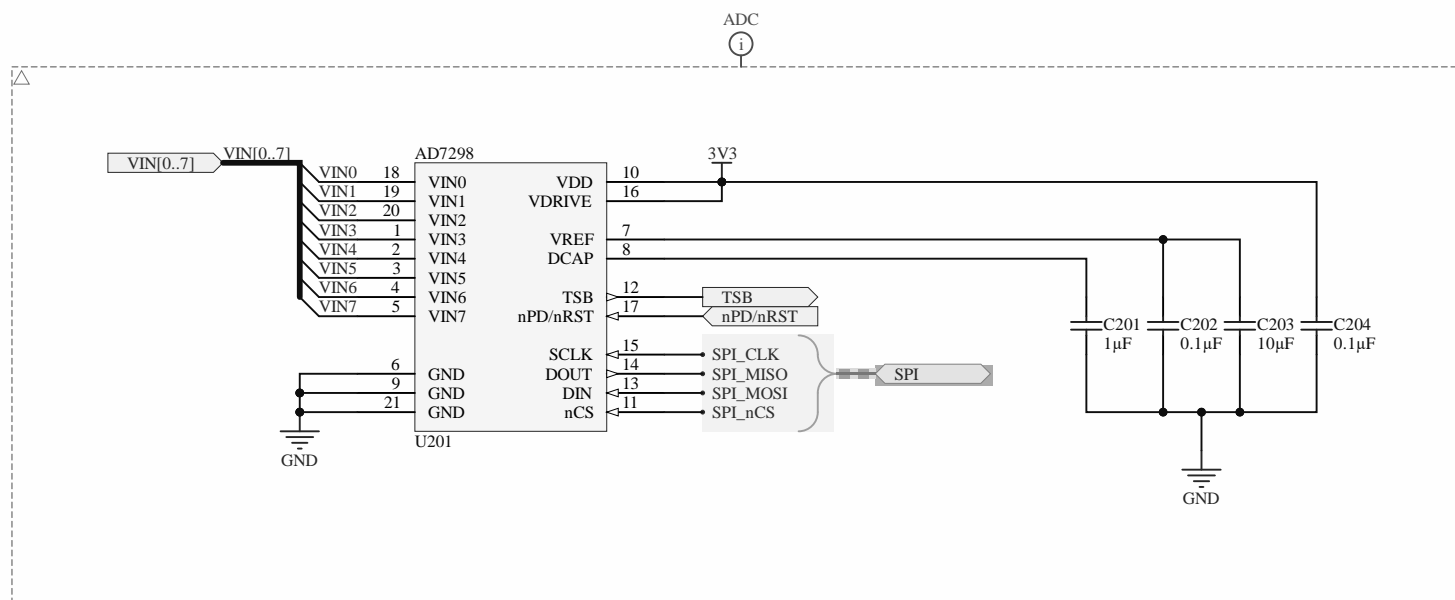
Revision:*

Date: 5/31/2020

Time: 9:46:30 PM

Sheet 1 of 8

File: C:\Users\nicho\AlbertaSat\projects\Hyperion Solar Panels\Starboard\Starboard.SchDoc



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Title **AD7298 12-Bit SPI ADC**

University of Alberta
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 T6G 1H9



Size: Letter

Number: 2

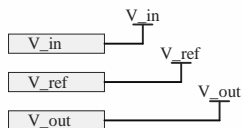
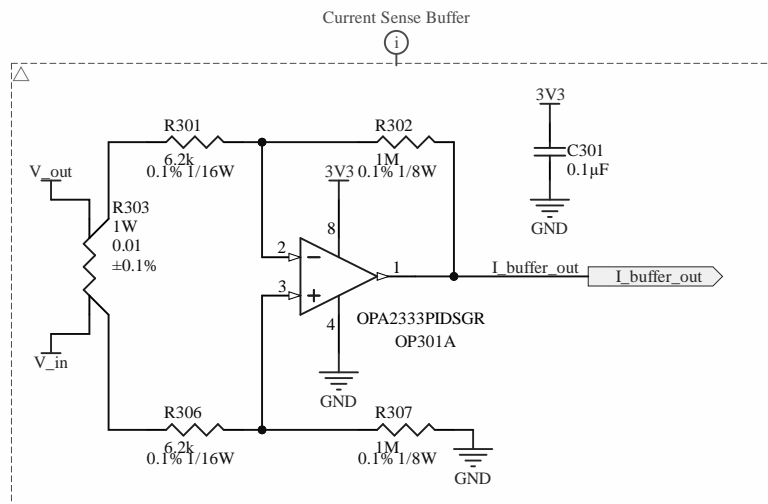
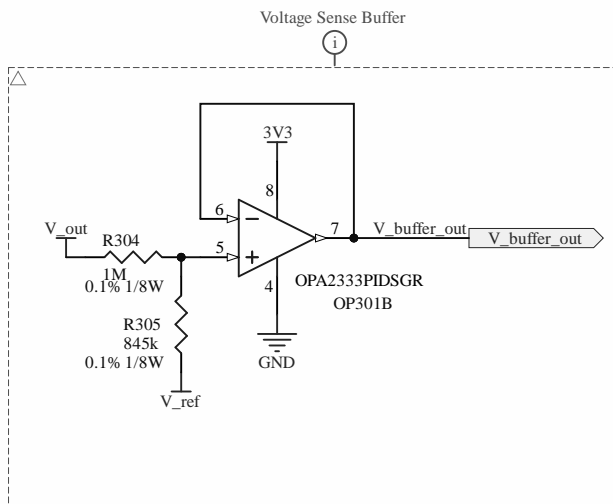
Revision: *

Date: 5/31/2020

Time: 9:46:30 PM

Sheet 2 of 8

File: C:\Users\nicho\AlbertaSat\libraries\Schematic Sheets\AD7298 12-Bit SPI ADC.SchDoc



Voltage Sense Buffer:

$$V_{\text{buffer_out}} = V_{\text{out}} \cdot (R305 / (R305 + R304))$$

$$= 0.458 V_{\text{out}}$$

$$\leq 2.49 \text{ V}$$

Current Sense Buffer:

$$V_{\text{sense}} = V_{\text{in}} - V_{\text{out}}$$

$$= I \cdot R303$$

$$\leq 1.5 \text{ A} \cdot 0.01 \text{ Ohm}$$

$$\leq 0.015 \text{ V}$$

$$G_{\text{diff}} = R304 / R301$$

$$= 1 \text{ M} / 6.2 \text{ k} = 161$$

$$G_{\text{cm}} = 0$$

$$I_{\text{buffer_out}} \leq 2.415 \text{ V}$$

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Title **Current_Voltage_Sensor**

University of Alberta
Department of Electrical
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T6G 1H9



Size: Letter

Number: 3

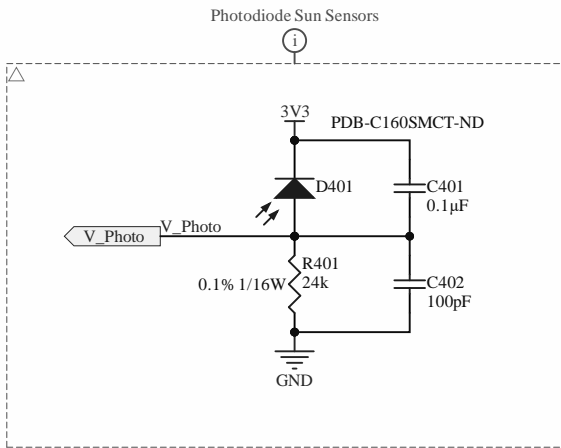
Revision: *

Date: 5/31/2020

Time: 9:46:30 PM

Sheet 3 of 8


File: C:\Users\nicho\AlbertaSat\projects\Hyperion Solar Panels\Common Schematics\Current_Voltage_Sensor.SchDoc

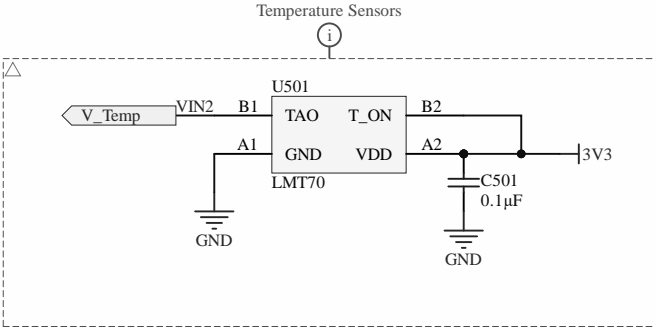


Photodiode:

$I_{sc} = 80\mu A$; $I_{dark} = 2nA \rightarrow I_{illum} < 100\mu A$

$V_{photo} = I_{illum} R \leq 2.5 V \rightarrow R \geq 25k\Omega$


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Title <i>Photodiode_Sun_Sensor</i>			University of Alberta Department of Electrical and Computer Engineering Edmonton AB, Canada T6G 1H9		
Size: Letter	Number: 4	Revision: *	 UNIVERSITY OF ALBERTA EDMONTON · ALBERTA · CANADA		
Date: 5/31/2020	Time: 9:46:30 PM	Sheet 4 of 8			
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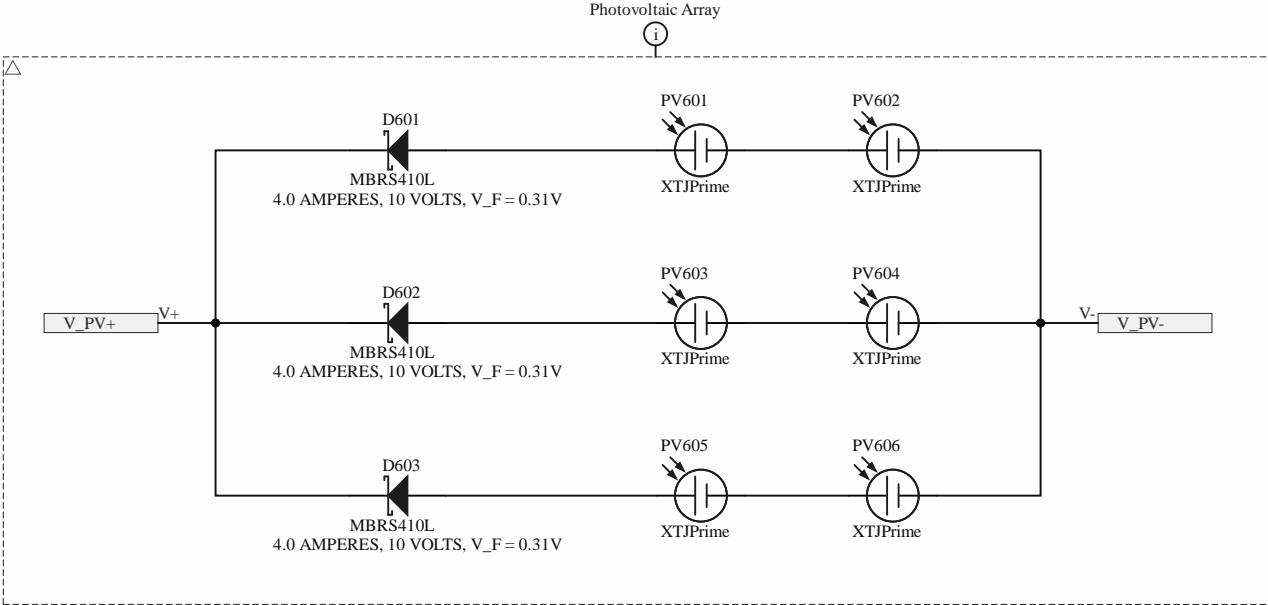


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Title <i>Temp_Sensor</i>			University of Alberta Department of Electrical and Computer Engineering Edmonton AB, Canada T6G 1H9	 UNIVERSITY OF ALBERTA EDMONTON · ALBERTA · CANADA
Size: Letter	Number: 5	Revision: *		
Date: 5/31/2020	Time: 9:46:30 PM	Sheet 5 of 8		
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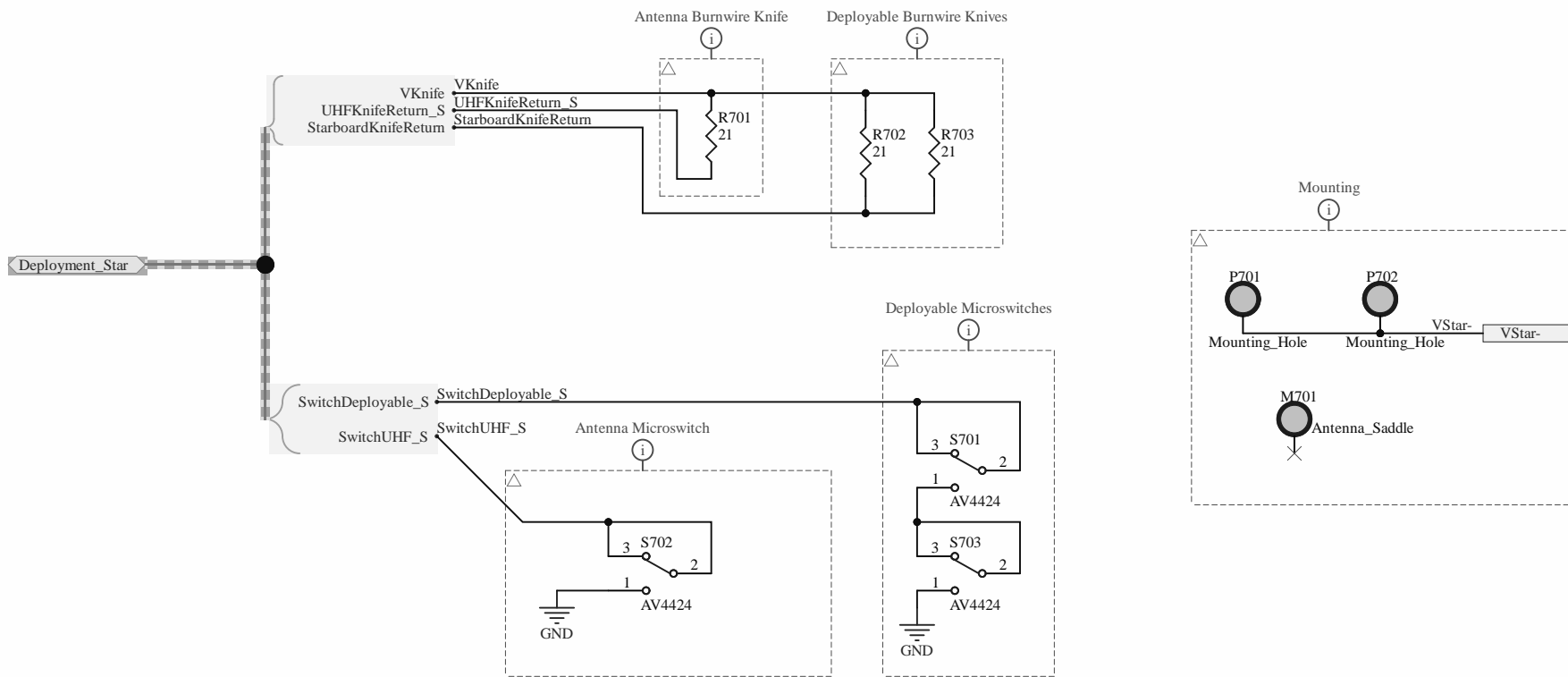


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Title <i>XTJ-Prime_2S2P</i>			University of Alberta Department of Electrical and Computer Engineering Edmonton AB, Canada T6G 1H9	UNIVERSITY OF ALBERTA EDMONTON · ALBERTA · CANADA
Size: Letter	Number: 6	Revision: *		
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Title **Mech_Interface_Starboard**

University of Alberta
 Department of Electrical
 and Computer Engineering
 Edmonton AB, Canada
 T6G 1H9



Size: Letter

Number: 7

Revision: *

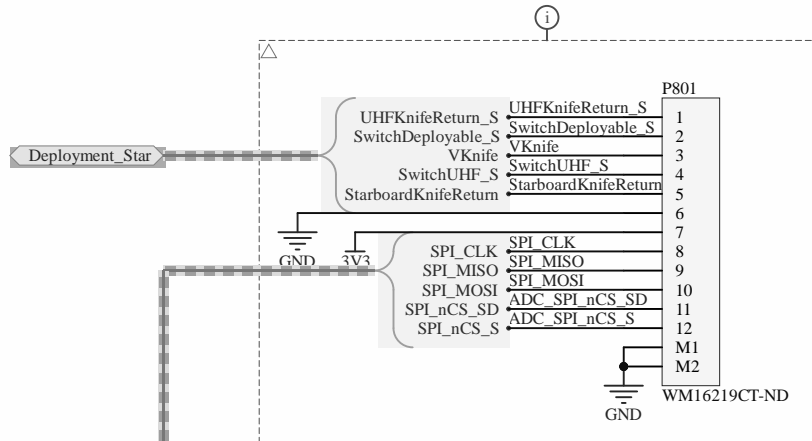
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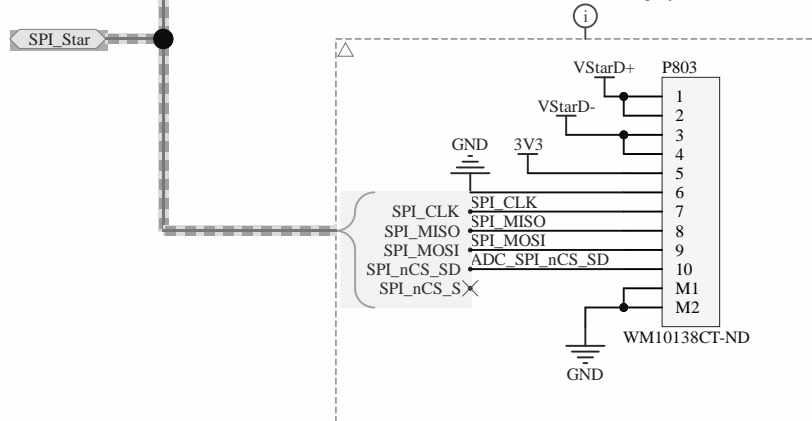
Sheet 7 of 8

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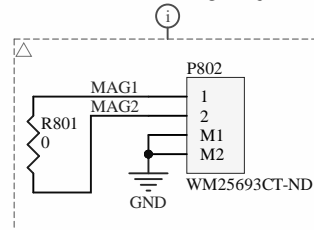
Starboard to Athena Burnwires/SPI



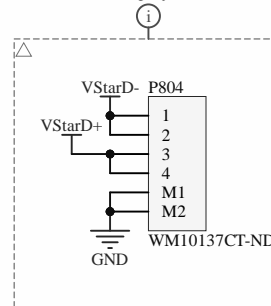
Starboard to Starboard Deployable



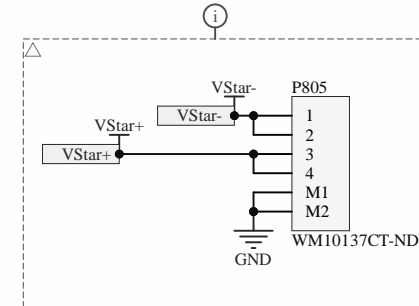
Starboard to Athena Magnetorquers



Starboard Deployable to EPS



Starboard to EPS



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Title **Starboard_Headers**

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Size: Letter

Number: 8

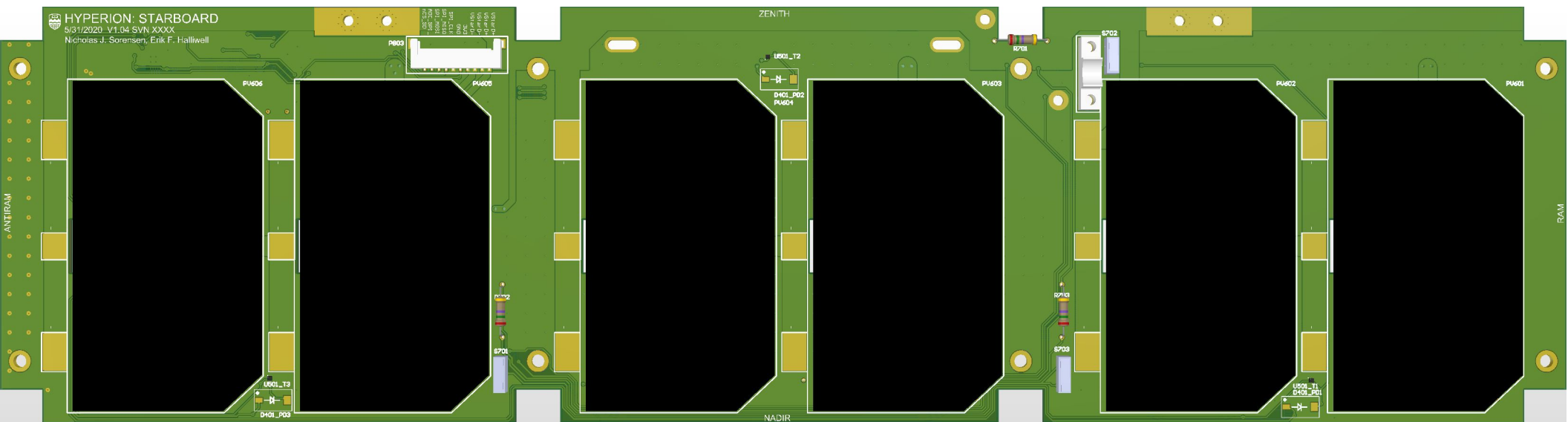
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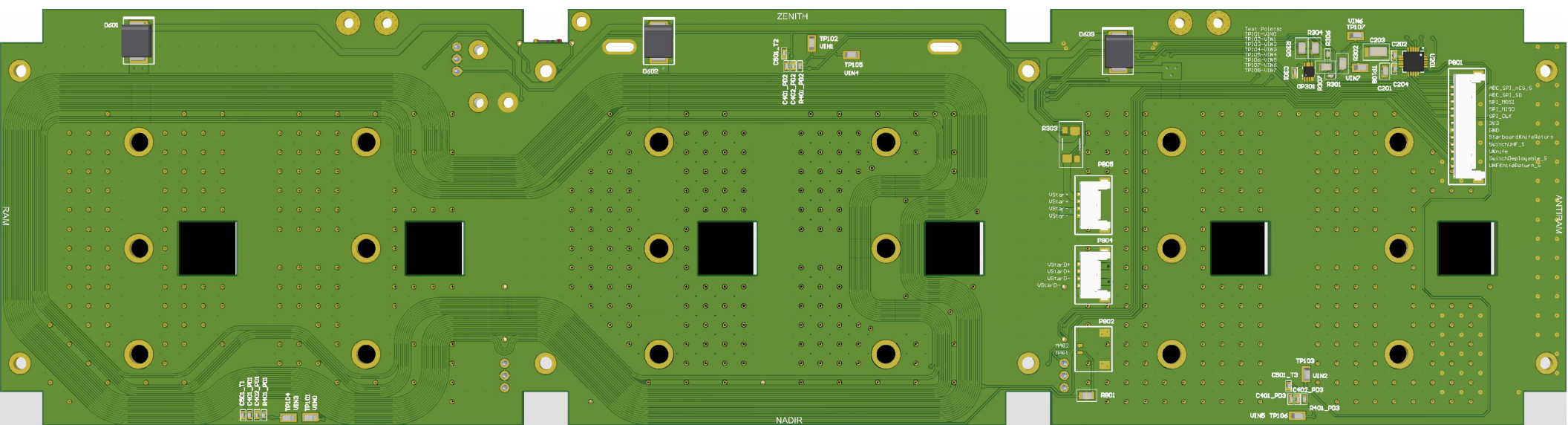
Date: 5/31/2020

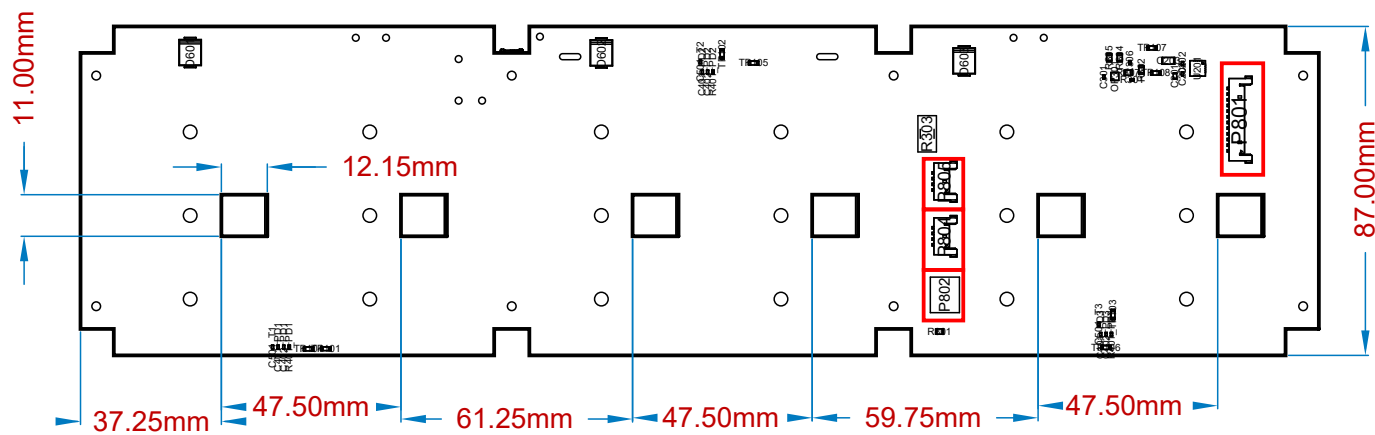
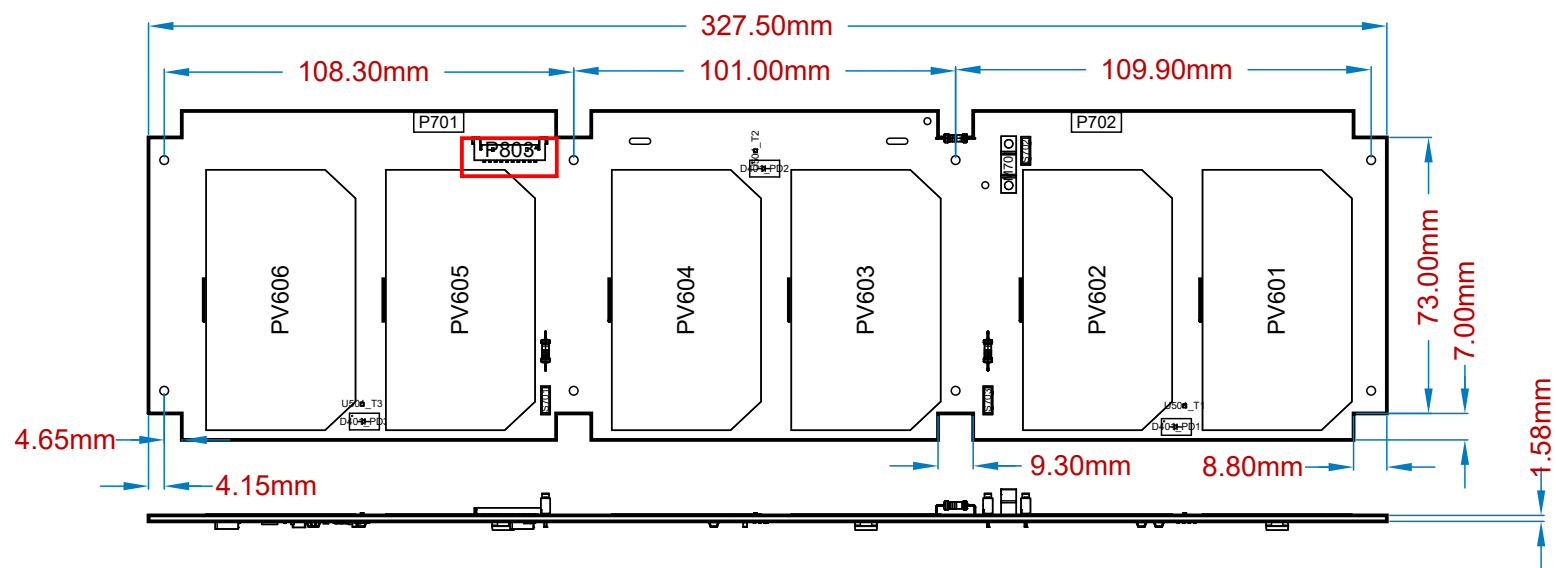
Time: 9:46:31 PM

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File: C:\Users\nicho\AlbertaSat\projects\Hyperion Solar Panels\Starboard\Starboard_Headers.SchDoc







Description	Designator	LibRef	Quantity	Footprint	Supplier 1	Supplier Link
CAP CER 1UF 25V X7R 0603	C201	PC-TDK-02603	1	TDK-CGA3E	Digi-key	http://www.digikey.ca/product-search/en?keywords=445-6931-1-ND
CAP CER 0.1UF 50V X7R 0402	C202, C204	PC-TDK-02259	2	TDK-CGA2B	Digi-key	http://www.digikey.ca/product-search/en?keywords=445-6899-1-ND
CAP CER 10UF 25V X7R 1206	C203	PC-TDK-02917	1	TDK-CGA5L	Digi-key	http://www.digikey.ca/product-search/en?keywords=445-6990-1-ND
CAP CER 0.1UF 35V X7R 0402, CAP CER 0.1UF 50V X7R 0402, CAP CER 100PF 50V COG 0402	C301, C401_PD1, C401_PD2, C401_PD3, C402_PD1, C402_PD2, C402_PD3, C501_T1, C501_T2, C501_T3	PC-TDK-02255, PC-TDK-02259, PC-TDK-01227	10	TDK-CGA2B	Digi-key	http://www.digikey.ca/product-search/en?keywords=445-6901-1-ND , http://www.digikey.ca/product-search/en?keywords=445-6899-1-ND , http://www.digikey.ca/product-search/en?keywords=445-5596-1-ND
SENSOR PHOTODIODE 850NM 2SMD GW	D401_PD1, D401_PD2, D401_PD3	PXX-ADP-00000	3	PDB-C160SM	Digi-key	
SCHOTTKY BARRIER RECTIFIERS 4.0 AMPERES, 10 VOLTS, V_F = 0.31V	D601, D602, D603	PXX-ONS-00003	3	ONS-875	Digi-key	#https://www.digikey.com/product-detail/en/on-semiconductor/MBRS410LT3G/MBRS410LT3GOSCT-ND/1967073#
	M701	PXX-ABS-00001	1	ANTENNA_SADDLE	Digi-key	
CMOS Amplifier 2 Circuit Rail-to-Rail 8-WSON (2x2)	OP301	73	1	TI-DSG0008A	Digi-Key	#https://www.digikey.ca/product-detail/en/texas-instruments/OPA2333PIDSGR/296-51501-1-ND/9745865#
	P701, P702	PXX-ABS-00004	2	DEPHINGE_MOUNTING_HOLE_BODY	Digi-key	
CONN HEADER SMD R/A 12POS 1.5MM	P801	71	1	MOLX-5040501291	Digi-Key	#https://www.digikey.ca/product-detail/en/molex/5040501291/WM16219CT-ND/6702294#
CONN HEADER SMD R/A 2POS 1.5MM	P802	61	1	MOLX-5040500291	Digi-Key	#https://www.digikey.ca/product-detail/en/molex/5040500291/WM25693CT-ND/9954119#
CONN HEADER SMD R/A 10POS 1.5MM	P803	69	1	MOLX-5040501091	Digi-Key	#https://www.digikey.ca/product-detail/en/molex/5040501091/WM10138CT-ND/4357655#
CONN HEADER SMD R/A 4POS 1.5MM	P804, P805	63	2	MOLX-5040500491	Digi-Key	#https://www.digikey.ca/product-detail/en/molex/5040500491/WM10137CT-ND/4357653#
	PV601, PV602, PV603, PV604, PV605, PV606	PBT-SPEC-00002	6	XJT Prime	Spectrolab	
RES SMD 6.2K OHM 0.1% 1/16W 0402, RES SMD 24K OHM 0.1% 1/16W 0402	R301, R306, R401_PD1, R401_PD2, R401_PD3	16853, 17830	5	PANA-ERA2A	Digi-Key	http://www.digikey.ca/product-search/en?keywords=P6.2KCNCCT-ND , http://www.digikey.ca/product-search/en?keywords=P24KCNCCT-ND
RES SMD 1M OHM 0.1% 1/8W 0805, RES SMD 845K OHM 0.1% 1/8W 0805	R302, R304, R305, R307	19706, 19643	4	PANA-ERA6A	Digi-Key	http://www.digikey.ca/product-search/en?keywords=P1MDACT-ND , http://www.digikey.ca/product-search/en?keywords=P845KDACT-ND
RES SMD 0.01 OHM 0.1% 1W 2512	R303	PR-VSH-00237	1	VSH-2512R4C	Digi-key	http://www.digikey.ca/product-search/en?keywords=Y1487-.01-ND
21 Ohms ±1% 1W Through Hole Resistor Axial Flame Proof, Moisture Resistant, Safety Metal Film	R701, R702, R703	PR-VSH-00317	3	VSH-CPF1	Digi-key	#https://www.digikey.ca/product-detail/en/vishay-dale/CPF121R000FKEE6/CPF21.0CCT-ND/2713126#
RES SMD 0.0 OHM JUMPER 1/5W 0805	R801	PR-VSH-00003	1	VSH-0805MCU	Digi-key	http://www.digikey.ca/product-search/en?keywords=MCU0805-0.0-ZZCT-ND
SWITCH SNAP ACT SPDT 500MA 30V	S701, S702, S703	20035	3	PANA-AV4424	Digi-Key	#https://www.digikey.com/product-detail/en/panasonic-electric-works/AV4424/255-3743-ND/646766#
PC TEST POINT MINI SMD	TP101, TP102, TP103, TP104, TP105, TP106, TP107, TP108	PTP-KS-00001	8	KS-5017	Digi-key	http://www.digikey.ca/product-detail/en/keystone-electronics/5017/36-5017TR-ND/2217304
IC ADC 12BIT SAR 20LFCSP-WQ	U201	PU-ADI-00007	1	ADI-CP-20-8	Digi-key	#https://www.digikey.ca/product-detail/en/analog-devices-inc/AD7298BCPZ/AD7298BCPZ-ND/2507320#
Temperature Sensor Analog, Local -55°C ~ 150°C 5.194mV/°C 4-DSBGA (0.81x0.81)	U501_T1, U501_T2, U501_T3	70	3	TI-YFQ0004	Digi-Key	#https://www.digikey.ca/product-detail/en/texas-instruments/LMT70YFQR/296-47337-1-ND/7688347#

